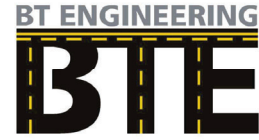


## Appendix I

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Technical Memos



509 Talbot Street  
 London, Ontario N6A 2S5  
 519-672-2222

## MEMORANDUM

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**TO:** Steve Taylor **DATE:** June 4, 2025  
**FROM:** Eyad Farahteh **PROJECT #:** 23-041  
**PROJECT:** County of Essex Country Road 46 EA  
**SUBJECT:** Country Road 46 E Cross Culverts & Pike Creek Bridge – Recommendations

---

### 1.0 INTRODUCTION

This memo is prepared as part of the planned road widening and infrastructure upgrades along Country Road 46 East, Concession Road 8, and Concession Road 9 in Essex County. Five culverts and Pike Creek bridge were inspected (Figure 1) and photographed on May 14, 2025 (Attachment 1).

Proposed improvements will result in widening Country Road 46 to five traffic lanes and increasing the right-of-way on the Country Road 46 to 40 metres, and the right-of-way will be increased to 36 metres on Concession Road 8, proposed future road cross sections (refer to Attachment 4). The existing culvert and structure will not accommodate the wider cross-sections and require lengthening.

### 2.0 CULVERTS IDENTIFIED FOR IMPROVEMENT

#### Culvert #1

This is a 2000 mm diameter circular CSP culvert with headwall and endwall. The culvert is in good condition, where no cracks or deterioration were observed on the head and end wall, and no surface discoloration or opening in joints observed on the barrel.

#### Culvert #2

Culvert 2 is also a 2000 mm diameter CSP culvert with headwall and endwall. The culvert is in good condition, where no cracks or deterioration observed on the headwall and endwall, and no surface discoloration or opening in joints observed on the barrel.

#### Culvert #3

This culvert consists of two circular CSP culvert, each 2000 mm in diameter. Both share the same headwall and endwall. Walls condition is good as no cracks or poor joints observed. For barrels, no surface discoloration or opening in joints observed.

**Subject:** Essex County Country Road 46 EA Cross Culverts – Recommendations  
**Project:** 23-041, County of Essex Country Road 46 EA  
**Date:** June 2, 2025



#### Culvert #4

Culvert 4 is a concrete box culvert with 3850mm width and 2800mm approximately. The structure is in good condition; no cracks on the walls or the soffit, and no damages to the structure and wingwalls were observed. The Box Culvert OSIM report can be found in **Attachment 6**.

#### Pike Creek Bridge Crossing

This is a concrete crossing bridge with clear span is 8000m and 2400mm height approximately. The structure is in good condition as no defects or major cracks were sighted, narrow cracks were observed at the East abutment wall, however, the length is not sufficient for the proposed road widening and will need to be improved. The Pike Creek Bridge OSIM report can be found in **Attachment 5**.

#### Culvert #5

Located on Concession Road 8, this culvert is a 300 mm diameter circular PVC pipe. It is in good condition as no sign of defect, discoloration or slit was observed.

### 3.0 RECOMMENDATION ALTERNATIVES

The following technical recommendation; are based on current conditions and observations. The timing of road improvements is uncertain, and asset condition will change over time. Asset conditions and recommendation shou be reassessed at the time of detail design.

#### 1. Extending existing culverts and Pike Creek Bridge Alternative 1

For CSP Culverts #1, #2, and #3, extension is cost-effective and reuses the good-condition culverts, but the interface between the existing culvert and the extension may become a maintenance concern.

For Culvert #4 (Concrete Box), extending with precast sections is less expensive and preserves the structure, but the interface between the existing culvert and the extension may become a maintenance concern, and future changes in road grading or increased loading may require additional reinforcement.

For the Pike Creek Bridge, widening or extending the existing bridge is less costly than full replacement and allows for phased construction. This solution makes use of the current structure’s remaining service life. However, integrating new and old bridge elements may require specialized repairs at the joints, and future changes in road grading or increased loading may require additional reinforcement.

For Culvert #5 (PVC), extension is quick and low cost, but joint leakage and future upsizing needs are concerns. Hydraulic capacity to be reviewed in detailed design.



**2. Replacing existing culverts and Pike Creek Bridge Alternative 2**

For Culverts #1, #2, and #3, replacing the CSP culverts has higher initial cost, but ensures full compatibility with the new road cross section and eliminates concerns about joint integrity this approach provides a consistent, and durable structure.

For Culvert #4, replacement has higher initial cost, offers a single, continuous structure that meets future hydraulic capacity and structural loading. It reduces the risk of future maintenance at joints and addresses any hidden deterioration in the existing culvert.

For the Pike Creek Bridge, replacement has higher initial cost but removes all concerns about integrating new and old components and addresses any hidden defects or aging issues, and addresses all structural and hydraulic concerns, ensuring long term safety and capacity.

For Culvert #6, replacement has higher initial cost, allows for upsizing and consistent quality, reducing future maintenance and hydraulic risks, but increases construction effort.

This alternative may be higher in cost; however, it ensures that the new culverts have consistent durability and maintenance intervals, align properly with the new road cross sections, and reduce construction constraints and potential quality imperfections.

**4.0 COMPARISON OF ALTERNATIVES**

**SUMMARY TABLE**

| Alternative      | Pros   | Cons  |
|------------------|--|---|
| Extend Culverts  | Cost effective, minimal disruption, reuses structure | Joint maintenance, alignment/hydraulic limits, not ideal for large widening |
| Replace Culverts | Best alignment, durability, hydraulic upgrades       | Higher initial cost, more construction effort                               |
| Defer Decision   | Flexible, real-time assessment                       | Risk of delays, late design changes   |

**5.0 RECOMMENDED ALTERNATIVE**

For Culverts #1, #2, #3, and #5, full replacement is recommended. This approach ensures the new culverts will be properly sized and aligned for the widened five-lane road, meet current hydraulic and structural standards, and minimize long-term maintenance concerns.

For Culvert #4 (precast concrete box > 3m span) and the Pike Creek Bridge, the best solution should be determined during the future detailed design phase as further structural assessment required. This will allow for a thorough structural and hydraulic assessment to confirm whether extension or replacement is most appropriate based on actual site conditions and project requirements at that time.



- Attachments:*
1. Country Rd 46 E inspection memo
  2. Study area map
  3. Culvert photos and notes
  4. Proposed Road cross sections
  5. Pike Creek Bridge OSIM report
  6. Box Culvert OSIM report

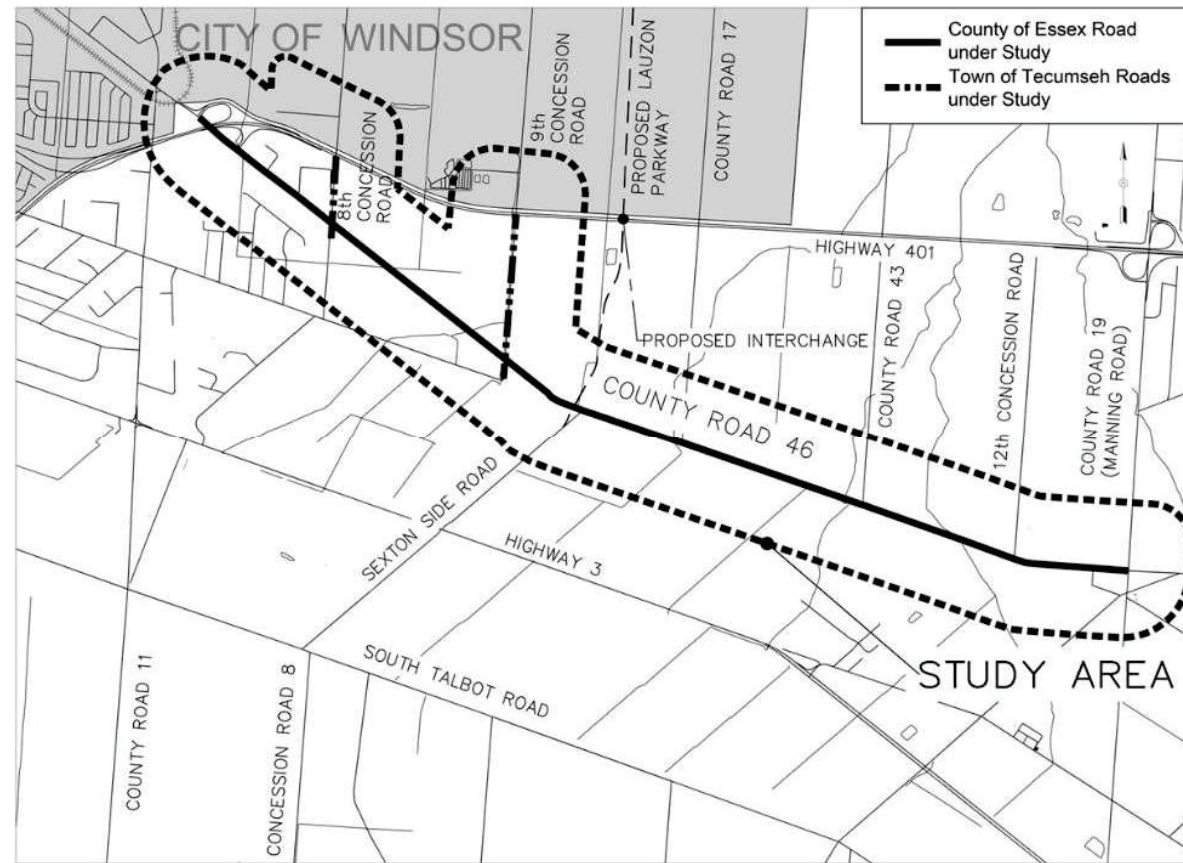
# MEMORANDUM

**TO:** File **DATE:** June 4, 2025  
**FROM:** Eyad Farahteh **PROJECT #:** 23-041  
**PROJECT:** County of Essex Country Road 46 EA  
**SUBJECT:** Inspection of Country Road 46 E Cross Culverts & Pike Creek Bridge

Culvert inspections were conducted for 6 road crossing culverts on May 14, 2025, to assess condition. 4 culverts (1-4) and 1 bridge crossing are located along Country Rd 46 E. One culvert (5) located along Concession Road 8 draining from east to west. The key map below shows the existing culvert locations and numbers.



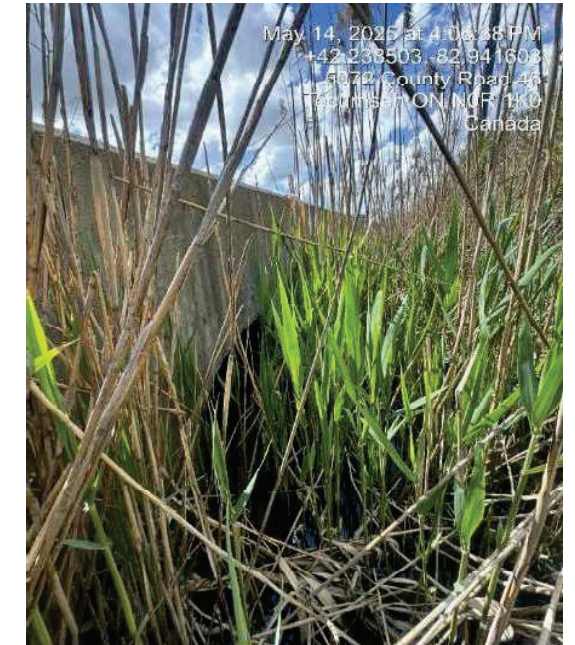
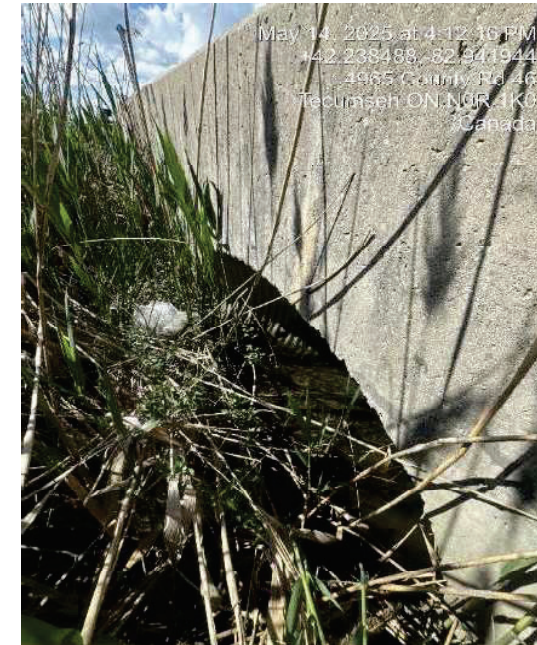
## ATTACHMENT 2 – Study Area Map



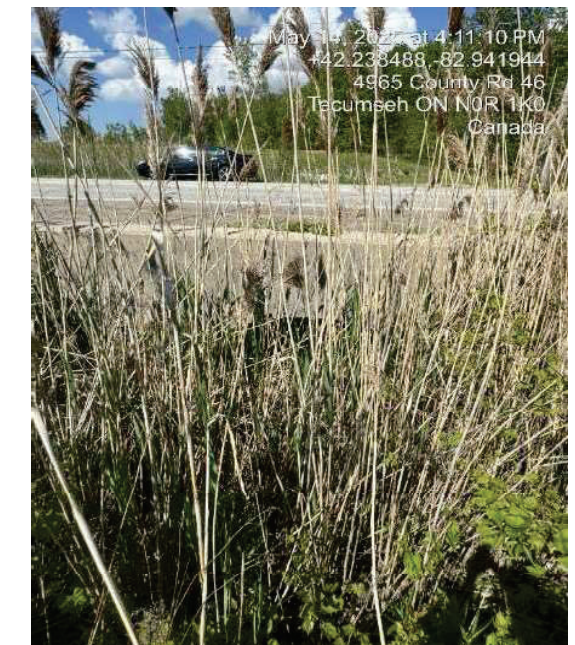
The map above shows the area where the culvert inspections were conducted. The area includes Country Rd 46 East, extending from 401 to Concession Road 19. As well as Part of Concession Road 8 and 9 are included within the project as shown on the map.

## ATTACHMENT 3 – Culverts Photo

### Culvert #1



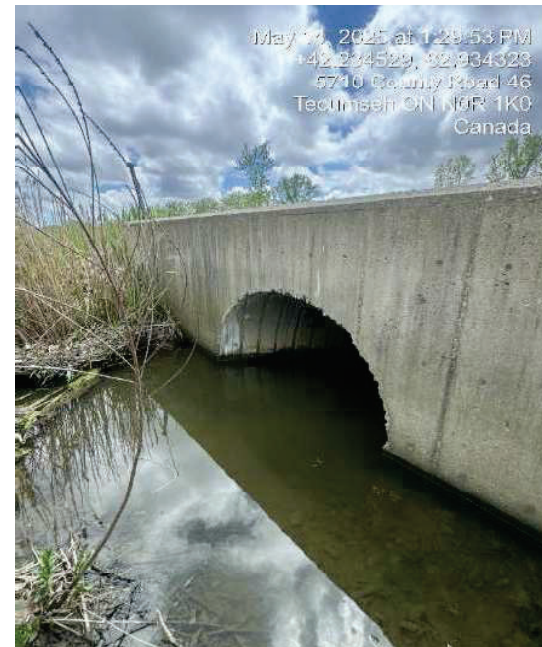
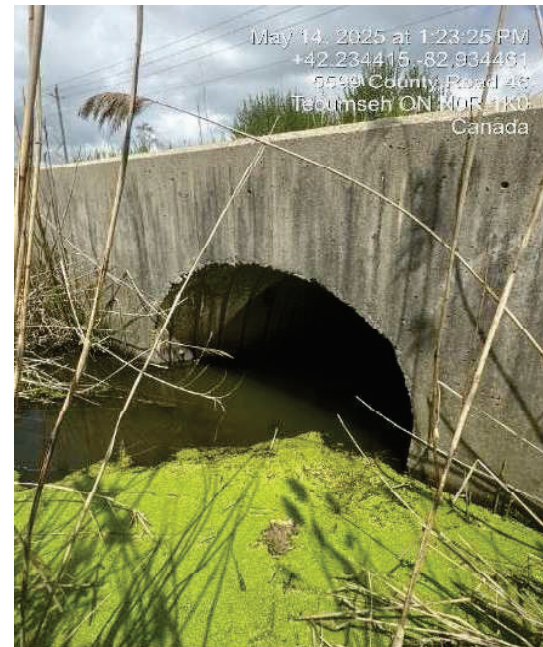
Culvert #1 is a CSP, 2000mm diameter barrel with concrete headwall and endwall. The culvert crosses the County Rd 46 E. The northern end is 3.6 m away from the E.P, southern end is 4.1m away from E.P. Due to dense vegetation and overgrown plants surrounding and inside the culvert the photos are unclear. Headwall & endwall condition is good; no cracks were observed. But the culvert length is not sufficient for the future road cross section.



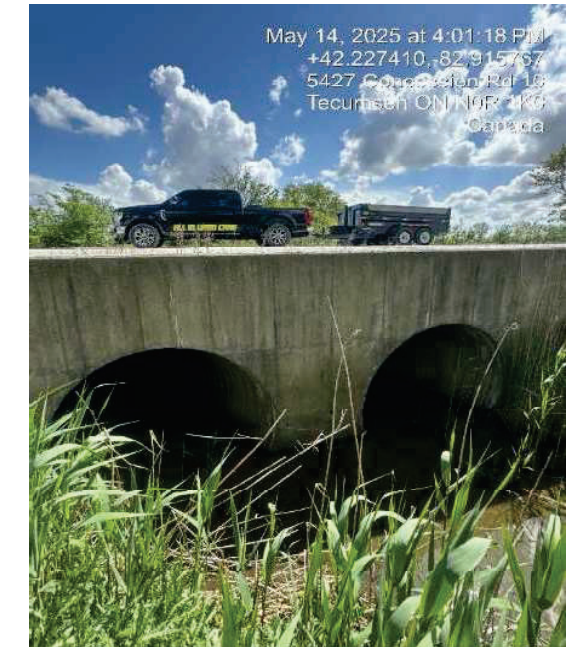
### ATTACHMENT 3 – Culverts Photo

### ATTACHMENT 3 – Culverts Photo

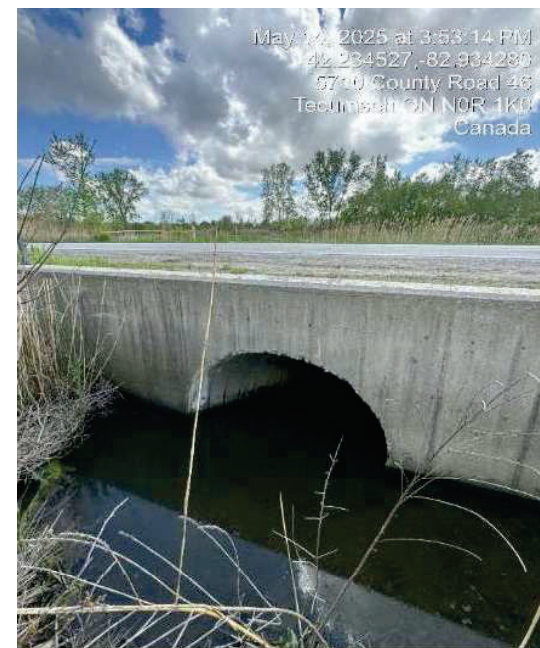
**Culvert #2**



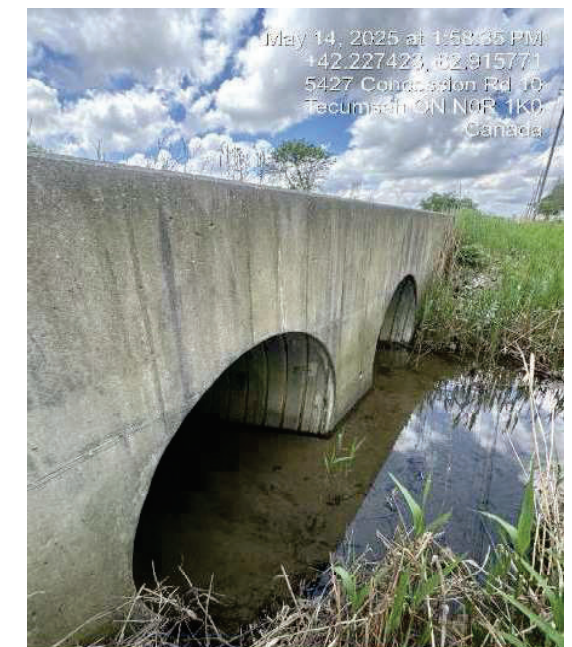
**Culvert #3**



Culvert #2 is a CSP, 2000mm diameter barrel with concrete headwall and endwall. Water level is covering almost 40% of the culvert. The culvert crosses the Country Rd 46 E. The northern end is 3.9m away from the existing road edge, southern end is 4.5 m away from the existing road edge. Culvert is in good condition; no cracks or deterioration observed on the headwall or endwall, and no opening in joints or surface discolouration observed on barrels. But the culvert length is not sufficient for the future road cross section.

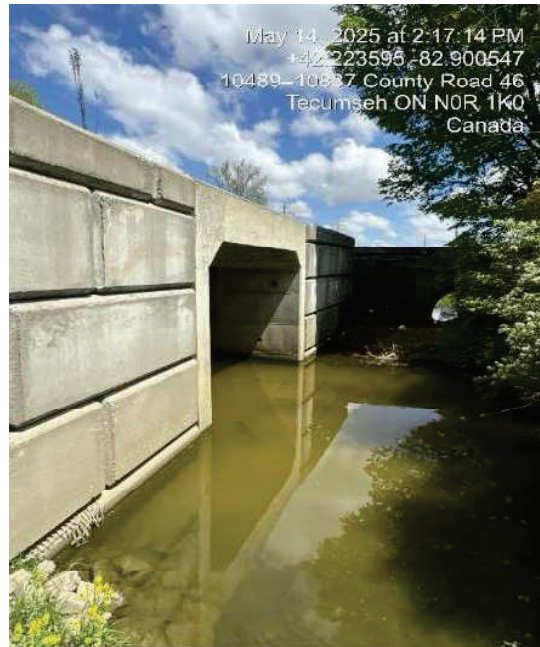


Culvert #3 contains 2 CSP, 2000mm diameter barrel with concrete headwall and endwall. No flow observed, and low level of standing water. The culvert crosses Country Rd 46 E. The northern end is 3.5m away from E.P, southern end is 5.7m away from E.P. Little sediment build-up in pipe. Culvert is in good condition; no cracks or deterioration observed on the headwall or endwall, and no opening in joints or surface discolouration observed on barrels. But the culvert length is not sufficient for the future road cross section.

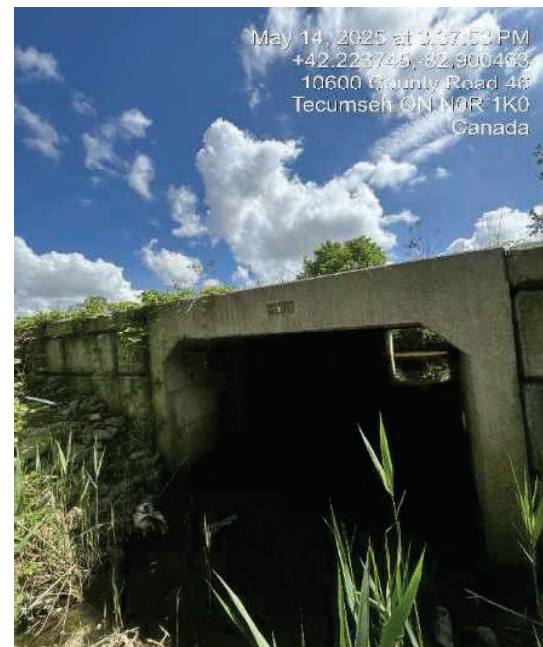


## ATTACHMENT 3 – Culverts Photo

### Culvert # 4

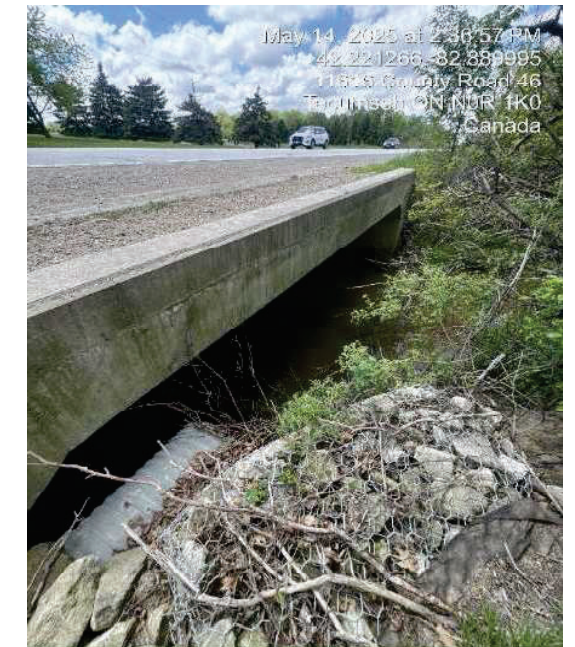
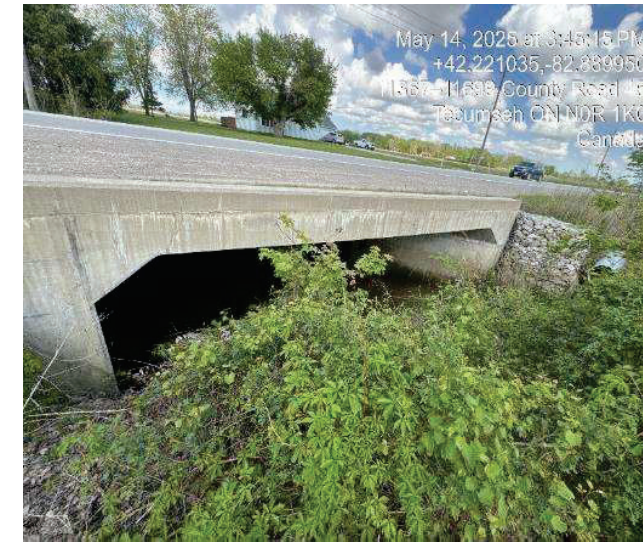


Culvert #4 is precast concrete box culvert. The clear span is 3850mm and approximately 2800mm height. The culvert crosses Country Rd 46 E. The northern end is 5.2m away from E.P, southern end is 6.8m away from E.P. Box culvert is in condition is good; no cracks on the walls or the soffit, and no damages or deterioration on the structure and on the precast concrete wingwalls were observed. But the bridge length is not sufficient for the future road cross section. Refer to OSIM report attached 46-055.



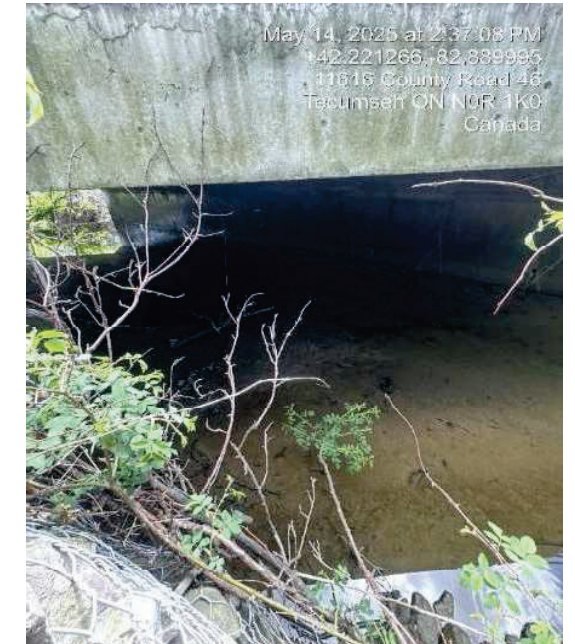
## ATTACHMENT 3 – Culverts Photo

### Pike Creek Bridge



Pike Creek Bridge is a concrete bridge. The clear span is 8000mm and 2400mm height approximately.

The bridge crosses Country Rd 46 E. The northern end is 4.8m away from E.P, southern end is 4.9m away from E.P. bridge condition is good, no major cracks or deterioration, narrow cracks were observed at the East abutment wall Refer to OSIM Report B-46-06 attached. But the bridge length is not sufficient for the future road cross section.



## ATTACHMENT 3 – Culverts Photo

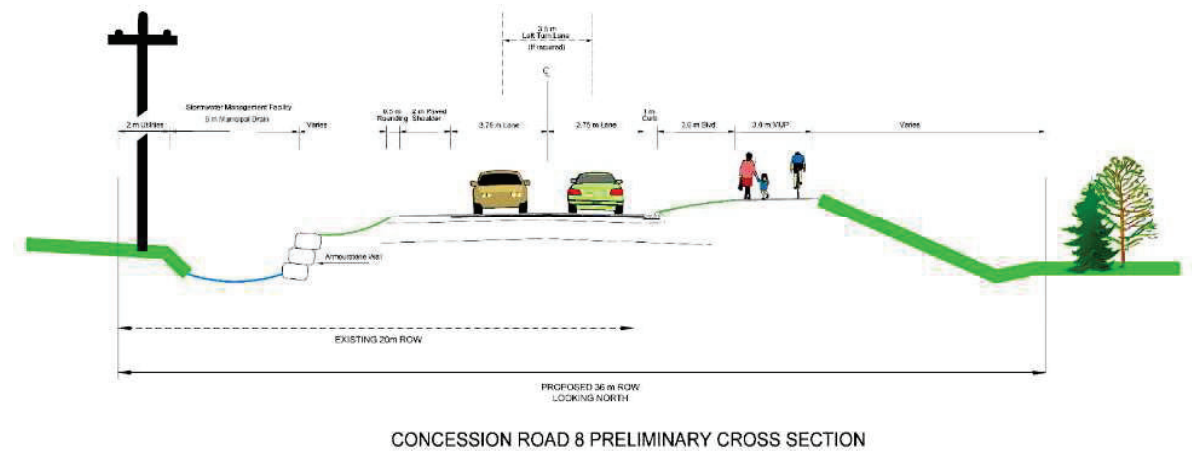
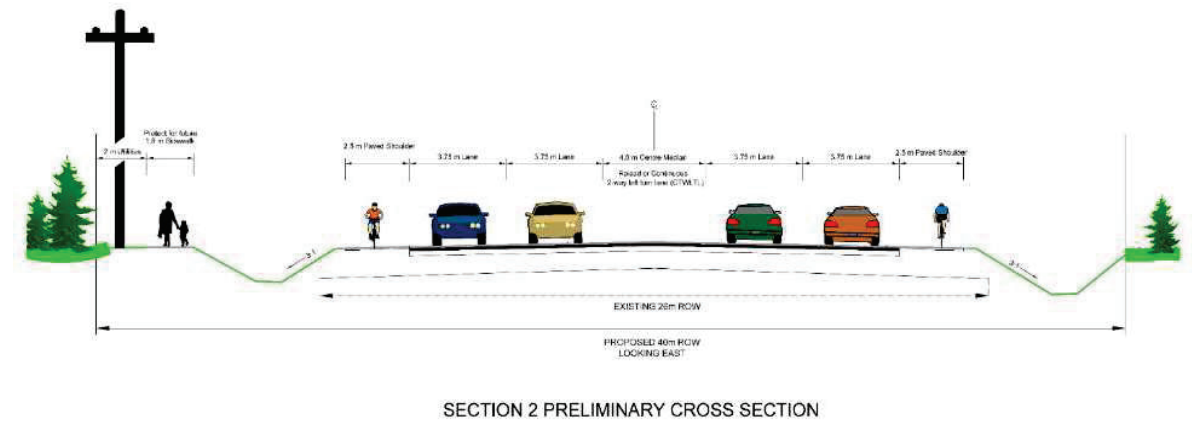
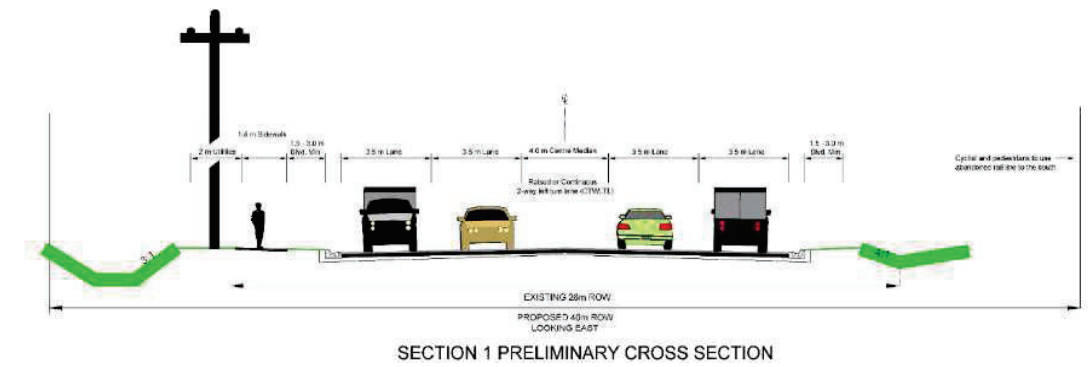
### Culvert # 5



Culvert # 6 is a PVC round shape culvert with 300mm diameter and concrete ditch inlet on the eastern end. No flow or standing water observed at the time of inspection.

The culvert crosses Concession Rd 8. Culvert condition is good; no sign of defect was observed. But the culvert width is not sufficient for future road cross section.

## ATTACHMENT 4 – Road Cross Sections



Cross section 1 and 2 represent the proposed design for Country Rd 46 E. As the road is being widened, the culverts also need to be expanded to accommodate the new road requirements. The new ROW for Country Rd 46 will be 40m which includes 5 traffic lanes. For Concession Rd 8 the new design is proposing 36m ROW as shown in the third cross section.

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

| Inventory Data                     |   |                                |                            |
|------------------------------------|---|--------------------------------|----------------------------|
| Structure Name:                    | PIKE CREEK  |                                |                            |
| Structure Type:                    | Bridge  |                                |                            |
| Structure Location:                | Location Description: ON COUNTY ROAD 46, FORMER HWY 98, OVER PIKE CREEK BRIDGE, LOCATED APPROX. 833m EAST OF COUNTY ROAD 43 |                                |                            |
| Latitude:                          | 4676108   | Longitude:                     | 344062                     |
| Owner(s):                          | AADT: 8800 (2021)   |                                |                            |
| Truck %:                           |   |                                |                            |
| Municipality:                      | County of Essex   |                                |                            |
| Average Span Length (m) :          | 6.800 m   | Crossing Skew Degrees :        | 46.13                      |
| Deck Area (m2) :                   | 183.610 m2  | Direction of Structure :       | East / West                |
| Deck Length (m) :                  | 7.800 m   | Inspection Route Sequence:     |                            |
| Detour Length around Bridge (km) : | 17.000 km   | Interchange Number :           |                            |
| Fill on Structure (m) :            | 0.365 m   | Interchange Structure Number : |                            |
| Min. Vertical Clearance (m) :      | 2.000 m   | Legal Speed Limit :            | 80                         |
| Number of Spans (items) :          | 1.000 items   | Maximum Weight One :           |                            |
| Overall Structure Width (m) :      | 23.540 m  | Number of Lanes :              | 2                          |
| Roadway Width (m) :                | 7.300 m   | Structure Type :               | Rigid Frame, Cast-in Place |
| Total Span Length (m) :            | 6.800 m   |                                |                            |
| Road Class:                        | Arterial  |                                |                            |
| Heritage Status:                   | Has not been considered   |                                |                            |
| Special Route                      |   |                                |                            |
| Commuter Route                     | Emergency Route   | School Route                   | Truck Route                |
| Crossing Type                      |   |                                |                            |
| Non-Navigable Waterway             | Over water  |                                |                            |
| Historical Data                    |   |                                |                            |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

| Year Built:                      | 1929-06-01                                   | Year of Last Major Rehab.:                                  | 2007 |
|----------------------------------|--|---|------|
| Last OSIM Inspection:            | 2020-01-01                                   | Last Evaluation:  |      |
| Last Enhanced OSIM Inspection:   |  | Current Load Limit:   |      |
| Last Underwater Inspection:      |  | Load Limit By-Law #:  |      |
| Last Condition Survey:           | 2004-10-13                                   | By-Law Expiry Date:   |      |
| Rehab History (Date/Description) |  |   |      |
| Event Date                       | Description                                  | Completed By  |      |
| 2007-06-01                       | Rehabilitation or Reconstruction performed   |   |      |
| 2007-01-01 2007-06-01            | Recommended Improvement                      | ENG DESIGN AND APPROVALS-CONT #212007, ACCT # 13107-181,257 |      |
|                                  | Rehabilitation or Reconstruction performed   | CONT # 21-2007, ACCT#13107-181,257                          |      |
| Field Inspection Information     |  |   |      |
| Biennial Inspection:             | 2023-05-23                                   |   |      |
| Type of Inspection:              | <input checked="" type="radio"/> OSIM        | <input type="radio"/> Enhanced OSIM                         |      |
| Biennial Inspection:             | Kory Snelgrove, P.Eng.                       |   |      |
| Others in Party:                 | Alex MacDonald                               |   |      |
| Equipment Used:                  | Hammer, Measuring Tape, Camera, Chest Waders |   |      |
| Weather:                         | Sunny  |   |      |
| Temperature:                     | 24C  |   |      |
| Additional Investigations        |  |   |      |
| Investigation Notes :            |  |   |      |
| Recommended Work                 |  |   |      |
|                                  |  |   |      |
| Associated Work                  |  |   |      |
|                                  |  |   |      |
| Justification                    |  |   |      |
|                                  |  |   |      |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06

| Overall Structure Notes                         |   |
|---|---|
| Recommended Work On Structure :<br>Major Rehab. | <input type="radio"/> None <input type="radio"/> Repair <input type="radio"/> Minor Rehab. <input checked="" type="radio"/> Replace |
| Timing of Recommended Work :<br>10 years        | <input type="radio"/> Urgent <input type="radio"/> Within 1 year <input type="radio"/> 1 to 5 years <input type="radio"/> 6 to      |
| Next Inspection :                               | 11/1/2024   |
| Comments :                                      |   |
| Schedule Improvements                           |   |
| Regional Priority Number :                      | Programmed Work Year :  |
| Nature of Program Work :                        |   |
| Element Data                                    |   |
| Overall Structure:                              | B-46-06-PIKE CREEK  |
| Element Group:                                  | Abutments   |
| Element:  | Abutment Walls  |
| Material:                                       | Cast-in-place Concrete  |
| Length (m):                                     | 23.540 m  |
|   | Count (items): 2.000 items  |
| Width :<br>m2                                   | Total Quantity (m2):141.240   |
| Height (m):                                     | 3.000 m   |
| Limited Inspection :                            | <input type="checkbox"/>  |
| Direction of Structure :                        | East / West   |
| Element Type :                                  | Legs of Rigid Frame   |
| Location :                                      |   |
| Protecting Element :                            | Deck top  |
| Protection System :                             | None  |
| Type :  |   |
| Environment :                                   | <input checked="" type="radio"/> Benign <input type="radio"/> Moderate <input type="radio"/> Severe                                 |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06

| Condition Data:  |                                |         |                |         |
|--|--------------------------------|---------|----------------|---------|
| Units  | Excellent                      | Good    | Fair           | Poor    |
| m <sup>2</sup> / m / each / % / all  | 137.49 m2                      | 3.75 m2 | 0.00 m2        | 0.00 m2 |
| Comments   |                                |         |                |         |
| Total approx. length of 15.0m of narrow cracking located at equal distances on lower half of abutment walls. |                                |         |                |         |
| Suspected Performance Deficiency   |                                |         |                |         |
|  |                                |         |                |         |
| Maintenance Needs  |                                |         |                |         |
|  |                                |         |                |         |
| Element Data   |                                |         |                |         |
| Overall Structure:   | B-46-06-PIKE CREEK             |         |                |         |
| Element Group:   | Approaches                     |         |                |         |
| Element:   | Wearing Surfaces<br>(Approache |         |                |         |
| Material:  |                                |         |                |         |
| Length:  |                                |         | Count (items): | items   |
| Width :  | Total luanity (m 2):           |         |                |         |
| Height :   |                                |         |                |         |
| Limited Inspection :   | <input type="checkbox"/>       |         |                |         |
| Condition Data:  |                                |         |                |         |
| Units  | Excellent                      | Good    | Fair           | Poor    |
| m <sup>2</sup> / m / each / % / all  |                                |         |                |         |
| Comments   |                                |         |                |         |
|  |                                |         |                |         |
| Suspected Performance Deficiency   |                                |         |                |         |
|  |                                |         |                |         |
| Maintenance Needs  |                                |         |                |         |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |   |                      |             |
|---|---|----------------------|-------------|
| <b>Element Data</b>                     |   |                      |             |
| Overall Structure:                      | B-46-06-PIKE CREEK  |                      |             |
| Element Group:                          | Deck  |                      |             |
| Element:                                | Interior Soffit - Thick Slab  |                      |             |
| Material:                               | Cast-in-place Concrete  |                      |             |
| Length (m):                             | 7.800 m   | Count (items):       | 1.000 itens |
| Width (m):                              | 23.540 m  | Total Quantity (m2): | 183.600m2   |
| Height :                                |   |                      |             |
| Limited Inspection :                    | <input type="checkbox"/>  |                      |             |
| Direction of Structure :                | East / West   |                      |             |
| Location :                              |   |                      |             |
| Protecting Element :                    | Wearing Surface   |                      |             |
| Protection System :                     | None  |                      |             |
| Type :                                  |   |                      |             |
| Environment :                           | <input checked="" type="radio"/> Benign <input type="radio"/> Moderate <input type="radio"/> Severe |                      |             |
| Condition Data:                         |   |                      |             |
|   | Units   | Excellent            | Good        |
|   | m <sup>2</sup> / m / each / % / all   | 183.60 m2            | 0.00 m2     |
|   |   | Fair                 | Poor        |
|   |   | 0.00 m2              | 0.00 m2     |
| <b>Comments</b>                         |   |                      |             |
|   |   |                      |             |
| <b>Suspected Performance Deficiency</b> |   |                      |             |
|   |   |                      |             |
| <b>Maintenance Needs</b>                |   |                      |             |
|   |   |                      |             |
| <b>Element Data</b>                     |   |                      |             |
| Overall Structure:                      | B-46-06-PIKE CREEK  |                      |             |
| Element Group:                          | Deck  |                      |             |
| Element:                                | Wearing Surface (Decks)   |                      |             |
| Material:                               | Asphalt   |                      |             |
| Length (m):                             | 7.800 m   | Count (items):       | 1.000 item  |
| Width (m):                              | 7.300 m   | Total Quantity (m2): | 56.940 m2   |
| Height (m):                             | 0.090 m   |                      |             |
| Limited Inspection :                    | <input type="checkbox"/>  |                      |             |
| Direction of Structure :                | East / West   |                      |             |
| Location :                              |   |                      |             |
| Protecting Element :                    | None  |                      |             |
| Protection System :                     | None  |                      |             |
| Type :                                  |   |                      |             |
| Environment :                           | <input type="radio"/> Benign <input type="radio"/> Moderate <input checked="" type="radio"/> Severe |                      |             |
| Condition Data:                         |   |                      |             |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |   |                      |             |         |
|---|---|----------------------|-------------|---------|
| Material:   | Cast-in-place concrete  |                      |             |         |
| Length:   | 7.800 m   | Count (items):       | 1.000 items |         |
| Width :   | 7.300 m   | Total Quantity :     | 56.94 m2    |         |
| Height :  |   |                      |             |         |
| Limited Inspection :  | <input checked="" type="checkbox"/>   |                      |             |         |
| Condition Data:   |   |                      |             |         |
|   | Units   | Excellent            | Good        | Fair    |
|   | m <sup>2</sup> / m / each / % / all   | 0.00 m2              | 56.94 m2    | 0.00 m2 |
|   |   | Poor                 |             |         |
|   |   | 0.00 m2              |             |         |
| <b>Comments</b>   |   |                      |             |         |
| Limited Inspection. Concrete deck could not be inspected due to asphalt cover. Estimated quantities are based off of condition of soffit and asphalt wearing surface. |   |                      |             |         |
| <b>Suspected Performance Deficiency</b>   |   |                      |             |         |
|   |   |                      |             |         |
| <b>Maintenance Needs</b>  |   |                      |             |         |
|   |   |                      |             |         |
| <b>Element Data</b>   |   |                      |             |         |
| Overall Structure:  | B-46-06-PIKE CREEK  |                      |             |         |
| Element Group:  | Deck  |                      |             |         |
| Element:  | Wearing Surface (Decks)   |                      |             |         |
| Material:   | Asphalt   |                      |             |         |
| Length (m):   | 7.800 m   | Count (items):       | 1.000 item  |         |
| Width (m):  | 7.300 m   | Total Quantity (m2): | 56.940 m2   |         |
| Height (m):   | 0.090 m   |                      |             |         |
| Limited Inspection :  | <input type="checkbox"/>  |                      |             |         |
| Direction of Structure :  | East / West   |                      |             |         |
| Location :  |   |                      |             |         |
| Protecting Element :  | None  |                      |             |         |
| Protection System :   | None  |                      |             |         |
| Type :  |   |                      |             |         |
| Environment :   | <input type="radio"/> Benign <input type="radio"/> Moderate <input checked="" type="radio"/> Severe |                      |             |         |
| Condition Data:   |   |                      |             |         |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

| Units                                   | Excellent   | Good     | Fair    | Poor    |
|---|---|----------|---------|---------|
| m <sup>2</sup> / m / each / % / all     | 0.00 m2   | 56.94 m2 | 0.00 m2 | 0.00 m2 |
| <b>Comments</b>                         |   |          |         |         |
|   |   |          |         |         |
| <b>Suspected Performance Deficiency</b> |   |          |         |         |
|   |   |          |         |         |
| <b>Maintenance Needs</b>                |   |          |         |         |
|   |   |          |         |         |
| <b>Element Data</b>                     |   |          |         |         |
| Overall Structure:                      | B-46-06-PIKE CREEK  |          |         |         |
| Element Group:                          | Embankments & Streams   |          |         |         |
| Element:                                | Embankments   |          |         |         |
| Material:                               |   |          |         |         |
| Length:                                 | Count (items):  |          |         |         |
| Width :                                 | Total Quantity (each): 4.000 each   |          |         |         |
| Height :                                |   |          |         |         |
| Limited Inspection :                    | <input type="checkbox"/>  |          |         |         |
| Direction of Structure :                | North / South   |          |         |         |
| Element Type :                          |   |          |         |         |
| Location :                              |   |          |         |         |
| Protecting Element :                    | None  |          |         |         |
| Protection System :                     | None  |          |         |         |
| Type :                                  |   |          |         |         |
| Environment :                           | <input type="radio"/> Benign <input checked="" type="radio"/> Moderate <input type="radio"/> Severe |          |         |         |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

| <b>Condition Data:</b>                  |                              |           |           |           |
|---|------------------------------|-----------|-----------|-----------|
| Units                                   | Excellent                    | Good      | Fair      | Poor      |
| m <sup>2</sup> / m / each / % / all     | 0.00 each                    | 4.00 each | 0.00 each | 0.00 each |
| <b>Comments</b>                         |                              |           |           |           |
|   |                              |           |           |           |
| <b>Suspected Performance Deficiency</b> |                              |           |           |           |
|   |                              |           |           |           |
| <b>Maintenance Needs</b>                |                              |           |           |           |
|   |                              |           |           |           |
| <b>Element Data</b>                     |                              |           |           |           |
| Overall Structure:                      | B-46-06-PIKE CREEK           |           |           |           |
| Element Group:                          | Embankments & Streams        |           |           |           |
| Element:                                | Slope Protection             |           |           |           |
| Material:                               |                              |           |           |           |
| Length:                                 | Count (items):               |           |           |           |
| Width :                                 | Total Quantity (each): 4.000 |           |           |           |
| Height :                                |                              |           |           |           |
| Limited Inspection :                    | <input type="checkbox"/>     |           |           |           |
| Direction of Structure :                | North / South                |           |           |           |
| Element Type :                          | Vegetation                   |           |           |           |
| Location :                              |                              |           |           |           |
| Protecting Element :                    | None                         |           |           |           |
| Protection System :                     | None                         |           |           |           |
| Type :                                  |                              |           |           |           |
| <b>Condition Data:</b>                  |                              |           |           |           |
| Units                                   | Excellent                    | Good      | Fair      | Poor      |
| m <sup>2</sup> / m / each / % / all     | 0.00 each                    | 4.00 each | 0.00 each | 0.00 each |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |           |   |      |      |
|---|-----------|---|------|------|
| <b>Comments</b>                         |           |   |      |      |
|   |           |   |      |      |
| <b>Suspected Performance Deficiency</b> |           |   |      |      |
|   |           |   |      |      |
| <b>Maintenance Needs</b>                |           |   |      |      |
|   |           |   |      |      |
| <b>Element Data</b>                     |           |   |      |      |
| Overall Structure:                      |           | B-46-06-PIKE CREEK  |      |      |
| Element Group:                          |           | Embankments & Streams   |      |      |
| Element:                                |           | Streams and Waterways   |      |      |
| Material:                               |           |   |      |      |
| Length:                                 |           | Count (items):  |      |      |
| Width :                                 |           | Total quantity (items): All   |      |      |
| Height :                                |           |   |      |      |
| Limited Inspection :                    |           | <input type="checkbox"/>  |      |      |
| Direction of Structure :                |           | North / South   |      |      |
| Element Type :                          |           |   |      |      |
| Location :                              |           |   |      |      |
| Protecting Element :                    |           | None  |      |      |
| Protection System :                     |           | None  |      |      |
| Type :                                  |           |   |      |      |
| Environment :                           |           | <input checked="" type="radio"/> Benign <input type="radio"/> Moderate <input type="radio"/> Severe |      |      |
| Condition Data:                         |           |   |      |      |
| Units                                   | Excellent | Good  | Fair | Poor |
| m <sup>2</sup> / m / each / % / all     |           | All   |      |      |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |          |                                     |      |      |
|---|----------|-------------------------------------|------|------|
| <b>Comments</b>                         |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Suspected Performance Deficiency</b> |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Maintenance Needs</b>                |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Element Data</b>                     |          |                                     |      |      |
| Overall Structure:                      |          | B-46-06-PIKE CREEK                  |      |      |
| Element Group:                          |          | Foundations                         |      |      |
| Element:                                |          | Foundation (Below Ground Level)     |      |      |
| Material:                               |          |                                     |      |      |
| Length:                                 |          | Count (items): items                |      |      |
| Width :                                 |          | Total quantity :                    |      |      |
| Height :                                |          |                                     |      |      |
| Limited Inspection :                    |          | <input checked="" type="checkbox"/> |      |      |
| Condition Data:                         |          |                                     |      |      |
| Units                                   | Excelent | Good                                | Fair | Poor |
| m <sup>2</sup> / m / each / % / all     |          |                                     |      |      |
| <b>Comments</b>                         |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Suspected Performance Deficiency</b> |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Maintenance Needs</b>                |          |                                     |      |      |
|   |          |                                     |      |      |
| <b>Element Data</b>                     |          |                                     |      |      |
| Overall Structure:                      |          | B-46-06-PIKE CREEK                  |      |      |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |   |             |           |           |
|---|---|-------------|-----------|-----------|
| Element Group:                          | Signs   |             |           |           |
| Element:                                | Sign  |             |           |           |
| Material:                               | Aluminium   |             |           |           |
| Length:                                 | Count (items):  | 4.000 items |           |           |
| Width :                                 | Total Quantity (items):   | 4.000 items |           |           |
| Height :                                |   |             |           |           |
| Limited Inspection :                    | <input type="checkbox"/>  |             |           |           |
| Direction of Structure :                | East / West   |             |           |           |
| Location :                              |   |             |           |           |
| Protecting Element :                    | None  |             |           |           |
| Protection System :                     | None  |             |           |           |
| Type :                                  |   |             |           |           |
| Environment :                           | <input type="radio"/> Benign <input type="radio"/> Moderate <input checked="" type="radio"/> Severe |             |           |           |
| Condition Data:                         |   |             |           |           |
|   | Units   | Excellent   | Good      | Fair      |
|   | m <sup>2</sup> / m / each / % / all   | 0.00 each   | 4.00 each | 0.00 each |
| <b>Comments</b>                         |   |             |           |           |
| <b>Suspected Performance Deficiency</b> |   |             |           |           |
| <b>Maintenance Needs</b>                |   |             |           |           |
| <b>Element Data</b>                     |   |             |           |           |
| Overall Structure:                      | B-46-06-PIKE CREEK  |             |           |           |
| Element Group:                          | Sidewalk / Curbs  |             |           |           |
| Element:                                | Curbs   |             |           |           |

## ATTACHMENT 5 - Pike Creek Bridge OSIM Report

### Ontario Structure Inspection Results

Site Number: 46-06

|   |   |                      |             |         |
|---|---|----------------------|-------------|---------|
| Material:                               | Cast-in-place Concrete  |                      |             |         |
| Length (m):                             | 7.800 m   | Count (items):       | 2.000 items |         |
| Width (m):                              | 0.400 m   | Total Quantity (m2): | 15.600 m2   |         |
| Height (m):                             | 0.300 m   |                      |             |         |
| Limited Inspection :                    | <input type="checkbox"/>  |                      |             |         |
| Direction of Structure :                | East / West   |                      |             |         |
| Location :                              |   |                      |             |         |
| Protecting Element :                    | None  |                      |             |         |
| Protection System :                     | Metallizing   |                      |             |         |
| Type :                                  |   |                      |             |         |
| Environment :                           | <input type="radio"/> Benign <input type="radio"/> Moderate <input checked="" type="radio"/> Severe |                      |             |         |
| Condition Data:                         |   |                      |             |         |
|   | Units   | Excellent            | Good        | Fair    |
|   | m <sup>2</sup> / m / each / % / all   | 0.00 m2              | 15.60 m2    | 0.00 m2 |
| <b>Comments</b>                         |   |                      |             |         |
| <b>Suspected Performance Deficiency</b> |   |                      |             |         |
| <b>Maintenance Needs</b>                |   |                      |             |         |

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 1 - Asphalt Wearing Surface Facing West



Figure 2 - Asphalt Wearing Surface Facing North

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 3 - South Elevation



Figure 4 - Interior Soffit Looking North

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 5 - West Abutment Wall



Figure 6 - East Abutment Wall

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 7 - Narrow Cracking on East Abutment Wall



Figure 8 - Wall Drain

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 9 - Interior Soffit Looking South



Figure 10 - North Elevation

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 11 - Southeast Embankment/Slope Protection



Figure 12 - Southwest Embankment/Slope Protection

# ATTACHMENT 5 - Pike Creek Bridge OSIM Report

Ontario Structure Inspection Results

Site Number: 46-06



Figure 13 - Northeast Embankment/Slope Protection



Figure 14 - Northwest Embankment/Slope Protection

# ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455

| Inventory Data:            |  |                              |   |
|----------------------------|--|------------------------------|---|
| Structure Name             | C-46-055 at Gzowski Drain  |                              |   |
| Non-Navig. Water           | <input type="checkbox"/>   | On Crossing                  | <input type="checkbox"/> Rail <input type="checkbox"/> Road <input checked="" type="checkbox"/> Ped. <input type="checkbox"/> Navig. Water      |
| Main Hwy/Road #            | 46   | Under                        | Type: Other   |
| Hwy/Road Name              | County Road No. 46 (Formerly Highway No. 98)   |                              |   |
| Structure Location         | 0.14km West of Eleventh Concession Road  |                              |   |
| Latitude                   | 343159   | Longitude                    | 4676358   |
| Owner (s)                  | Corporation of the County of Essex   |                              |   |
| MTO Region                 | Road: Southwestern   | Class:                       | <input type="checkbox"/> Freeway <input checked="" type="checkbox"/> Arterial <input type="checkbox"/> Collector <input type="checkbox"/> Local |
| MTO District               | n/a  | Posted Speed                 | 80 km/hr  |
| Old County                 | Essex  | AADT                         | 8760 (2021)   |
| Geographic Twp.            | Tecumseh   | % Trucks                     | 0.081   |
| Special Routes:            | <input type="checkbox"/> Transit <input type="checkbox"/> Truck <input type="checkbox"/> School <input type="checkbox"/> Bicycle |                              |   |
| Structure Type             | Precast Concrete Box Culvert   | Detour Length Around Bridge  | 13 (km)   |
| Total Deck Length          | 4.0 (m)  | Fill on Structure            | 0.5 (m)   |
| Overall Str. Width         | 20.0 (m)   | Skew Angle                   | 0 (Degrees)   |
| Total Deck Area            | 80.00 (sq.m)   | Direction of Structure       | N-S   |
| Roadway Width              | 7.2 (m)  | No. of Spans                 | 1   |
| Span Lengths               | Total = 3.5 (1) = 3.5; (m)   |                              |   |
| Historical Data:           |  |                              |   |
| Year Built:                | 2015   | Last Biennial Inspection     | 2021  |
| Current Load Limit         | n/a  | Last BridgeMaster Inspection | n/a   |
| Load Limit By-Law #        | n/a (tonnes)   | Last Evaluation              | n/a   |
| By-Law Expiry Date         | n/a  | Last Underwater Inspection   | n/a   |
| Minimum Vertical Clearance | 2.7 (m)  | Last Condition Survey        | n/a   |



## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

|                       |  |  |
|-----------------------|--|--|
| Traffic Control       |  |  |
| Utilities             |  |  |
| Right of Way          |  |  |
| Environmental Study   |  |  |
| Other                 |  |  |
| Contingencies         |  |  |
| <b>Total Cost</b>     |  |  |
| <b>Justification:</b> |  |  |
|                       |  |  |

**Element Data**

|  |  |                 |                       |              |      |    |    |
|--|--|-----------------|-----------------------|--------------|------|----|----|
| Element Group:   | Decks  | Length:         | 4.0m                  |              |      |    |    |
| Element Name:  | Wearing Surface  | Width:          | 7.2m                  |              |      |    |    |
| Location:  | n/a  | Height:         | 0.17m                 |              |      |    |    |
| Material:  | Asphalt  | Count:          | n/a                   |              |      |    |    |
| Element Type:  | n/a  | Total Quantity: | 28.8sq.m.             |              |      |    |    |
| Environment:   | <input type="checkbox"/> Benign <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe | Not Inspected   |                       |              |      |    |    |
| Protection System:   | n/a  |                 | Perform. Deficiencies | Maint. Needs |      |    |    |
| Condition Data:*   | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m                                   | Exc.            | Good                  | Fair         | Poor | 00 | 00 |
|  | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all                        |                 | 28.8                  |              |      |    |    |
| <b>Comments:</b><br>No structural deficiencies noted at time of inspection.  |  |                 |                       |              |      |    |    |
| <b>Recommended Work:</b> <input type="checkbox"/> None <input type="checkbox"/> 1-5 years <input type="checkbox"/> < 1 year <input type="checkbox"/> Urgent<br>No recommended work items at this time. |  |                 |                       |              |      |    |    |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

|  |   |                 |                                     |              |      |  |  |
|--|---|-----------------|-------------------------------------|--------------|------|--|--|
| Element Group:   | Decks   | Length:         |                                     |              |      |  |  |
| Element Name:  | Deck Top  | Width:          |                                     |              |      |  |  |
| Location:  |   | Height:         |                                     |              |      |  |  |
| Material:  |   | Count:          |                                     |              |      |  |  |
| Element Type:  |   | Total Quantity: |                                     |              |      |  |  |
| Environment:   | <input type="checkbox"/> Benign <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   | <input checked="" type="checkbox"/> |              |      |  |  |
| Protection System:   | Hot Applied Asphalt Membrane with Protection Board  |                 | Perform. Deficiencies               | Maint. Needs |      |  |  |
| Condition Data:*   | Units: <input type="checkbox"/> sq.m <input type="checkbox"/> m                                   | Exc.            | Good                                | Fair         | Poor |  |  |
|  | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all             |                 |                                     |              |      |  |  |
| <b>Comments:</b><br>No deficiencies noted.   |   |                 |                                     |              |      |  |  |
| <b>Recommended Work:</b> <input checked="" type="checkbox"/> None <input type="checkbox"/> 1-5 years <input type="checkbox"/> < 1 year <input type="checkbox"/> Urgent<br>No recommended work. |   |                 |                                     |              |      |  |  |

|   |  |                 |                       |              |      |    |    |
|---|--|-----------------|-----------------------|--------------|------|----|----|
| Element Group:  | Decks  | Length:         | 4.0m                  |              |      |    |    |
| Element Name:   | Soffit - Thick Slab  | Width:          | n/a                   |              |      |    |    |
| Location:   | Exterior   | Height:         | 0.3m                  |              |      |    |    |
| Material:   | Precast Concrete   | Count:          | 2                     |              |      |    |    |
| Element Type:   | n/a  | Total Quantity: | 2.4sq.m.              |              |      |    |    |
| Environment:  | <input type="checkbox"/> Benign <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   |                       |              |      |    |    |
| Protection System:  | n/a  |                 | Perform. Deficiencies | Maint. Needs |      |    |    |
| Condition Data:*  | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m                                   | Exc.            | Good                  | Fair         | Poor | 00 | 00 |
|   | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all                        | 2.4             |                       |              |      |    |    |
| <b>Comments:</b><br>No structural deficiencies noted at time of inspection.   |  |                 |                       |              |      |    |    |
| <b>Recommended Work:</b> <input type="checkbox"/> None <input type="checkbox"/> 1-5 years <input type="checkbox"/> < 1 year <input type="checkbox"/> Urgent<br>No recommended work items. |  |                 |                       |              |      |    |    |

**Element Data**

|                    |  |                 |                       |              |      |  |  |
|--------------------|--|-----------------|-----------------------|--------------|------|--|--|
| Element Group:     | Decks  | Length:         | 3.7m                  |              |      |  |  |
| Element Name:      | Soffit - Thick Slab  | Width:          | 20.0m                 |              |      |  |  |
| Location:          | Interior   | Height:         | n/a                   |              |      |  |  |
| Material:          | Precast Concrete   | Count:          | n/a                   |              |      |  |  |
| Element Type:      | n/a  | Total Quantity: | 74.0sq.m.             |              |      |  |  |
| Environment:       | <input checked="" type="checkbox"/> Benign <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   |                       |              |      |  |  |
| Protection System: | n/a  |                 | Perform. Deficiencies | Maint. Needs |      |  |  |
|                    |  | Exc.            | Good                  | Fair         | Poor |  |  |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

|                         |   |    |  |  |    |    |
|-------------------------|---|----|--|--|----|----|
| <b>Condition Data:*</b> | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m            | 74 |  |  | 00 | 00 |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all |    |  |  |    |    |

**Comments:**  
No structural deficiencies noted at time of inspection.

**Recommended Work:**      \_\_\_ None  1-5 years  < 1 year  Urgent  
No recommended work items.

|                |  |                 |           |
|----------------|--|-----------------|-----------|
| Element Group: | Sidewalks / Curbs  | Length:         | 4.0m      |
| Element Name:  | Curbs  | Width:          | 0.38m     |
| Location:      | n/a  | Height:         | 0.3m      |
| Material:      | Precast Concrete   | Count:          | 2         |
| Element Type:  | n/a  | Total Quantity: | 5.44sq.m. |
| Environment:   | <input type="checkbox"/> Benign <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe | Not Inspected   |           |

|                         |   |      |      |  |  |      |  |      |  |                       |              |
|-------------------------|---|------|------|--|--|------|--|------|--|-----------------------|--------------|
| <b>Condition Data:*</b> | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m            |      | Good |  |  | Fair |  | Poor |  | Perform. Deficiencies | Maint. Needs |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all |      |      |  |  |      |  |      |  |                       | 00           |
|                         |   | Exc. | 5.44 |  |  |      |  |      |  |                       |              |

**Comments:**  
No structural deficiencies noted at time of inspection.

**Recommended Work:**      None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

|                    |  |                       |               |
|--------------------|--|-----------------------|---------------|
| Element Group:     | Sidewalks / Curbs  | Length:               | 5.025m (Avg.) |
| Element Name:      | Curbs  | Width:                | 0.75m         |
| Location:          | n/a  | Height:               | 0.30m         |
| Material:          | Precast Concrete Blocks  | Count:                | 4             |
| Element Type:      | n/a  | Total Quantity:       | 21.11sq.m.    |
| Environment:       | <input type="checkbox"/> Benign <input type="checkbox"/> Moderate <input checked="" type="checkbox"/> Severe | Not Inspected         |               |
| Protection System: | n/a  |                       |               |
|                    |  | Exc.                  | Good          |
|                    |  | Fair                  | Poor          |
|                    |  | Perform. Deficiencies | Maint. Needs  |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

|                         |   |  |       |  |  |    |    |
|-------------------------|---|--|-------|--|--|----|----|
| <b>Condition Data:*</b> | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m            |  | 21.11 |  |  | 00 | 00 |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all |  |       |  |  |    |    |

**Comments:**  
Light scaling starting to occur on top of precast blocks. Light corrosion also present on exposed lift hooks on top of blocks.

**Recommended Work:**      \_\_\_ None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

**Element Data**

|                |  |                 |          |
|----------------|--|-----------------|----------|
| Element Group: | Abutments  | Length:         | 20m      |
| Element Name:  | Abutment Walls   | Width:          | n/a      |
| Location:      | n/a  | Height:         | 2.7m     |
| Material:      | Precast concrete   | Count:          | 2        |
| Element Type:  | n/a  | Total Quantity: | 108sq.m. |
| Environment:   | <input checked="" type="checkbox"/> Benign <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   |          |

|                         |   |      |      |  |      |  |  |      |  |      |  |                       |              |
|-------------------------|---|------|------|--|------|--|--|------|--|------|--|-----------------------|--------------|
| <b>Condition Data:*</b> | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m            |      | Exc. |  | Good |  |  | Fair |  | Poor |  | Perform. Deficiencies | Maint. Needs |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all |      |      |  |      |  |  |      |  |      |  |                       | 00           |
|                         |   | Exc. | 108  |  |      |  |  |      |  |      |  |                       |              |

**Comments:**  
No structural deficiencies noted at time of inspection.

**Recommended Work:**      \_\_\_ None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

|                    |  |                       |              |
|--------------------|--|-----------------------|--------------|
| Element Group:     | Abutments  | Length:               | 5.025m       |
| Element Name:      | Wingwalls  | Width:                | n/a          |
| Location:          | n/a  | Height:               | 2.2m         |
| Material:          | Precast concrete   | Count:                | 4            |
| Element Type:      | n/a  | Total Quantity:       | 44.22sq.m.   |
| Environment:       | <input type="checkbox"/> Benign <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected         |              |
| Protection System: | n/a  |                       |              |
|                    |  | Exc.                  | Good         |
|                    |  | Fair                  | Poor         |
|                    |  | Perform. Deficiencies | Maint. Needs |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

|                         |   |       |  |  |  |    |    |
|-------------------------|---|-------|--|--|--|----|----|
| <b>Condition Data:*</b> | Units: <input checked="" type="checkbox"/> sq.m <input type="checkbox"/> m            | 44.22 |  |  |  | 00 | 00 |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input type="checkbox"/> all |       |  |  |  |    |    |

**Comments:**  
No structural deficiencies noted at time of inspection.

**Recommended Work:**                      None  1-5 years  < 1 year  Urgent  
No recommended work items.

|                         |   |                       |                                     |
|-------------------------|---|-----------------------|-------------------------------------|
| Element Group:          | Foundations   | Length:               |                                     |
| Element Name:           | Foundations (below ground level)  | Width:                |                                     |
| Location:               |   | Height:               |                                     |
| Material:               |   | Count:                |                                     |
| Element Type:           |   | Total Quantity:       |                                     |
| Environment:            | <input type="checkbox"/> Benign <input type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected         | <input checked="" type="checkbox"/> |
| Protection System:      | n/a   |                       |                                     |
| <b>Condition Data:*</b> | Units: <input type="checkbox"/> sq.m <input type="checkbox"/> m                                   | Exc.                  | Good                                |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input checked="" type="checkbox"/> all  |                       |                                     |
|                         |   | Fair                  | Poor                                |
|                         |   | Perform. Deficiencies | Maint. Needs                        |
|                         |   |                       | 00      00                          |

**Comments:**

**Recommended Work:**                       None  1-5 years  < 1 year  Urgent

**Element Data**

|                         |  |                       |              |
|-------------------------|--|-----------------------|--------------|
| Element Group:          | Embankments and Streams  | Length:               | n/a          |
| Element Name:           | Streams and Waterways  | Width:                | n/a          |
| Location:               | n/a  | Height:               | n/a          |
| Material:               | n/a  | Count:                | n/a          |
| Element Type:           | n/a  | Total Quantity:       | n/a          |
| Environment:            | <input type="checkbox"/> Benign <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected         |              |
| Protection System:      | n/a  |                       |              |
| <b>Condition Data:*</b> | Units: <input type="checkbox"/> sq.m <input type="checkbox"/> m  | Exc.                  | Good         |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input checked="" type="checkbox"/> all             |                       |              |
|                         |  | Fair                  | Poor         |
|                         |  | Perform. Deficiencies | Maint. Needs |
|                         |  |                       | 00      00   |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form County of Essex Site Number: C-46-0455

**Comments:**  
No deficiencies noted at time of inspection.

**Recommended Work:**                      \_\_\_ None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

\* A quantity must be estimated using the appropriate unit (e.g. sq.m). Percent should not be used.

|                    |  |                 |     |
|--------------------|--|-----------------|-----|
| Element Group:     | Embankments and Streams  | Length:         | n/a |
| Element Name:      | Embankments  | Width:          | n/a |
| Location:          | n/a  | Height:         | n/a |
| Material:          | n/a  | Count:          | n/a |
| Element Type:      | n/a  | Total Quantity: | n/a |
| Environment:       | <input type="checkbox"/> Benign <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   |     |
| Protection System: | n/a  |                 |     |

|                         |  |      |      |      |      |                       |              |
|-------------------------|--|------|------|------|------|-----------------------|--------------|
| <b>Condition Data:*</b> | Units: <input type="checkbox"/> sq.m <input type="checkbox"/> m                                  | Exc. | Good | Fair | Poor | Perform. Deficiencies | Maint. Needs |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input checked="" type="checkbox"/> all |      |      |      |      | 00                    | 00           |
|                         |  |      | All  |      |      |                       |              |

**Comments:**  
No deficiencies noted at time of inspection.

**Recommended Work:**                      None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

|                    |  |                 |     |
|--------------------|--|-----------------|-----|
| Element Group:     | Embankments and Streams  | Length:         | n/a |
| Element Name:      | Slope Protection   | Width:          | n/a |
| Location:          | n/a  | Height:         | n/a |
| Material:          | n/a  | Count:          | n/a |
| Element Type:      | n/a  | Total Quantity: | n/a |
| Environment:       | <input type="checkbox"/> Benign <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Severe | Not Inspected   |     |
| Protection System: | n/a  |                 |     |

|                         |  |      |      |      |      |                       |              |
|-------------------------|--|------|------|------|------|-----------------------|--------------|
| <b>Condition Data:*</b> | Units: <input type="checkbox"/> sq.m <input type="checkbox"/> m                                  | Exc. | Good | Fair | Poor | Perform. Deficiencies | Maint. Needs |
|                         | <input type="checkbox"/> each <input type="checkbox"/> % <input checked="" type="checkbox"/> all |      |      |      |      | 00                    | 00           |
|                         |  |      | All  |      |      |                       |              |

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455

### Comments:

No deficiencies noted at time of inspection.

### Recommended Work:

None  1-5 years  < 1 year  Urgent  
No recommended work items at this time.

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455



Figure 1 - Asphalt Wearing Surface



Figure 2 - South Headwall

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455



Figure 3 - South Headwall/Curb



Figure 4 - Interior Soffit (Looking North)

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455



Figure 5 - Abutment Wall (Looking North)



Figure 6 - North Headwall

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455



Figure 7 - NE corner of Headwall



Figure 8 - North Headwall/Curb

## ATTACHMENT 6 – Box Culvert OSIM Report

Ontario Structure Inspection Manual - Inspection Form

County of Essex Site Number: C-46-0455



Figure 9 - Culvert Barrel (Looking South)



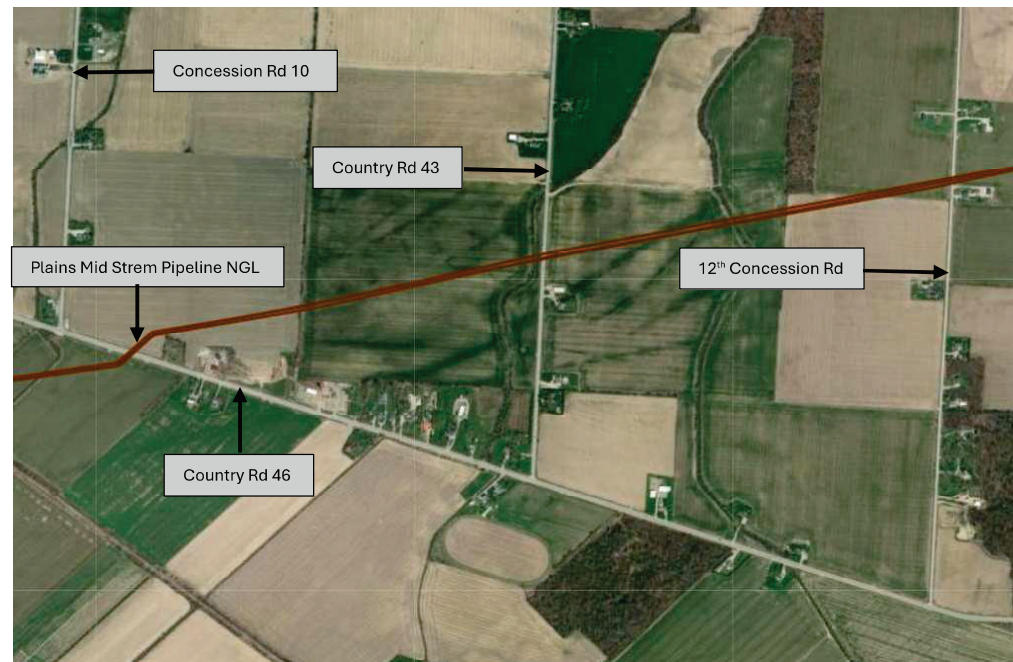
Figure 10 - Culvert Barrel (Looking South)

# MEMORANDUM

|  |                           |
|--|---------------------------|
| <b>TO:</b> File                                    | <b>DATE:</b> June 6, 2025 |
| <b>FROM:</b> Eyad Farahteh                         | <b>PROJECT #:</b> 23-041  |
| <b>PROJECT:</b> County of Essex Country Road 46 EA |                           |
| <b>SUBJECT:</b> Plains Midstream Pipeline Crossing |                           |

## 1.0 PROJECT OVERVIEW

The proposed project involves the widening of Country Road 46 from a two lane to a five-lane configuration. The expansion includes upgrading the existing right-of-way to a total width of 40 metres, as part of long-term planning for regional traffic demand. Within the proposed widening, an existing Natural Gas Liquids (NGL) pipeline owned and operated by Plains Midstream Canada ULC crosses the road from South to North, see **Figure 1**. This memo outlines key considerations related to the presence of this pipeline and outlines necessary coordination and compliance requirements.



**Figure 1: Plains Midstream Canada Pipeline Crossing Country Road 46**

**Subject:** Plains Midstream Pipeline Crossing  
**Project:** 23-041, County of Essex Country Road 46 EA  
**Date:** June 6, 2025

## 2.0 IMPACTS OF ROAD WIDENING

The road widening will introduce several potential impacts to the existing pipeline infrastructure. Construction operations such as excavation, and raising the road grade, may alter the depth of cover over the pipeline, which could compromise its structural integrity. Additionally, heavy construction equipment operating near or over the pipeline could introduce dynamic loads or vibrations. There may also be conflicts between the pipeline and proposed infrastructure and/or underground utilities, which will need to be evaluated in the design phase. Referring to the technical guideline of Plains Midstream Canada, all work must ensure 1.2 metre minimum cover and 3 metre maximum cover for paved roads.

## 3.0 CONSTRUCTION COORDINATION WITH PLAINS MIDSTREAM

Any ground disturbance within 30m of the pipeline requires Coordination with Plains Midstream Canada as follow:

1. A letter of request will be sent for Plains' Damage Prevention Department outlining the scope of work and the location of the pipeline.
2. Plains Crossing Application Form will be completed and submitted.
3. Detailed design drawings, including plan and profile views showing the relationship between the proposed construction and the pipeline will be submitted.
4. Plains Midstream must be notified at least three working days prior starting the work through calling One Call Center or by visiting the Click Before You Dig website.

## 4.0 PIPELINE CROSSING APPROACH FOR WIDER ROAD

### 4.1 Protection Pipeline in Place

As part of the proposed widening of Country Road 46, the existing Plains Midstream NGL pipeline will be crossed by the expanded roadway within the new 40-metre right-of-way. Based on the current understanding of the site, the pipeline will remain in its existing alignment and be protected in place. This approach will maintain or improve the depth of cover over the pipeline in accordance with Plains Midstream's technical guidelines, which specify that the minimum depth of cover shall be 1.2 metres from the top of the pipeline to the final road grade, and the maximum allowable depth of cover shall not exceed 3 metres. Additionally, no parking or storage of materials or vehicles is permitted within 3 metres of the pipeline's centerline. These requirements will be incorporated into both the design cross sections and construction staging plans to ensure full compliance.

### 4.2 Loads Consideration

The widened roadway cross-section will include a new pavement structure, granular base layers, and subgrade material over the pipeline. To ensure that the additional dead and live loads from the widened pavement and construction equipment do not impact the pipeline, protective measures will be implemented. These may include load distribution methods such as geotextile reinforcement, engineered fill, or a reinforced concrete slab may be implemented as required. The final crossing design, including plan and profile drawings, will be submitted to Plains Midstream for review and approval.

These drawings will clearly show the proposed road grades, pipeline depth, and protective measures to demonstrate compliance with technical guidelines.

#### **4.3 Utilities and Drainage Considerations**

The crossing design will also ensure that no subsurface utilities or drainage infrastructure are installed in direct conflict with the pipeline or within the restricted buffer zone without prior approval. Design drawings submitted to Plains will include both plan and profile views of the crossing, showing the horizontal alignment, depth of cover, and relationship to the pipeline to verify compliance with their technical guidelines.

#### **4.4 Construction Considerations**

During construction, protective measures may be used if temporary equipment crossings are required directly over the pipeline. Construction will be directed to minimize loading and disturbance over the pipeline until protective measures are in place. All work will be subject to Plains Midstream's inspection and approval, and no construction activity at the crossing location will proceed without their formal written consent.

*Attachment:* Plains Midstream Technical Guidelines

## *Technical Guidelines for Construction near Pipeline Facilities*

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### 1.0 PURPOSE

Plains Midstream Canada (“Plains”) owns and operates a wide variety of strategically located pipelines throughout Canada and the United States. The continued safety of the public, employees, contractors and environment are top priorities for Plains. Activities that occur near pipelines without appropriate notification or consent, such as facility construction or ground disturbance, can cause damage to pipelines and pose a risk to public safety.

Third parties – including landowners, contractors, utility companies, or municipalities – who are planning to conduct a ground disturbance activity near a Plains pipeline must contact Plains and obtain written consent. The impacts of the proposed activity need to be assessed by Plains to ensure that the activity will not pose a risk of damage to the pipeline. The consent must be provided in a written form, and must contain the conditions necessary to protect the pipe from damage when conducting the proposed activity.

This document provides guidance that will assist third parties when preparing an application for consent. Plains will work closely with third parties to ensure that all necessary consents are in place before any ground disturbance work begins.

### 2.0 REGULATORY GOVERNANCE

Plains pipelines are regulated by the following:

- Canada Energy Board
- Alberta Energy Regulator
- Technical Standards & Safety Authority (Ontario)
- The Ministry of Energy and Resources
- Manitoba Public Utilities Board

Refer to Section 11.0 for a list of specific Codes and Standards to be referenced when designing a facility to be installed in proximity to or crossing a Plains pipeline.

### 3.0 ACTIVITIES REQUIRING AN AGREEMENT

To ensure the safety of the public and the integrity of the pipelines, the following activities require a written agreement from Plains:

- a) Facility construction or ground disturbance across, on, along or under the pipeline right-of-way;
- b) Ground disturbance within 30 metres of the centreline of pipeline; and
- c) Operation of a vehicle or mobile equipment across the pipeline or within the right-of-way, outside the travelled portion of a highway or public road, excluding agricultural vehicles (see section 4.0 below).

A “facility” is any structure that is constructed or placed on or in the right-of-way or across the pipeline, such as a concrete slab, concrete conduit, retaining wall or chain link fence, highway, public or private road, railway, ditch, drain/drainage system, sewer, dike, buried and overhead cable, or pipeline.

A “ground disturbance” means any work, operation or activity on or under the existing surface resulting in a disturbance or displacement of the soil or ground cover. Ground disturbances can include, but are not limited to, digging, excavation, trenching, ditching, tunneling, boring/drilling/pushing, augering, topsoil stripping, land levelling/grading, plowing, tree planting, land clearing and stump removal, subsoiling, blasting/use of explosives, quarrying, grinding and milling of asphalt/concrete, seismic exploration, driving fence posts, bars, rods, pins, anchors, or pilings, and crossing of buried pipelines or other underground infrastructure by heavy loads off the travelled portion of a public roadway.

Ground disturbance does not include:

- a) Activity to a depth less than 30 centimetres, or;
- b) Agricultural cultivation to a depth less than 45 centimetres that does not reduce ground cover.

**A person planning to operate a vehicle or mobile equipment across a pipeline, which includes the right-of-way, must contact Plains to obtain written consent. The movement of vehicles and mobile equipment over a pipeline increases the stresses on the pipe and, in some cases, may result in damage to the pipeline. The actual stress changes can only be assessed through engineering calculations. A thorough assessment of pipeline safety requires detailed knowledge about ground conditions, design**

factors and operating characteristics. Depending on ground conditions, even vehicles such as all-terrain vehicles (ATV) or pick-up trucks have the potential to cause damage to the pipeline. Please contact [crossingrequests@plainsmidstream.com](mailto:crossingrequests@plainsmidstream.com) or work with the pipeline operator if you are uncertain if your vehicle poses a risk to the pipeline.

In order to protect the pipeline from mining operations, no person shall work or prospect for mines or minerals laying under a pipeline or within 40 metres of the pipeline right-of-way without obtaining consent from the Canada Energy Board. This can include activities such as seismic exploration, blasting/use of explosives or quarrying, etc.

**Note:** Some activities that do not require written approval may still require a site visit by a Plains representative to locate and mark the pipeline(s). Always Call or Click Before You Dig prior to start of work (See Section 8.0).

#### 4.0 NON-ROUTINE PROJECTS

Plains defines “Non-Routine Projects” as any of the following criteria:

- A request where parallel construction is planned within 5 metres of a Plains ROW for an area greater than 500 metres
- Construction activity will exceed 90 days
- Where the same type of activity is being requested in more than five geographical locations
- Activity that requires the potential re-location of the Plains pipeline
- Activities such as mining, quarrying, etc.

Plains will work closely with those who are planning a Non-Routine Project to mitigate potential risks and hazards in order to expedite consent and avoid conflicts. Collaboration prior to the commencement of the project ensures the requestor has the information required to work safely.

**\*If your project does not meet the above criteria it is considered to be a routine project. Please follow the crossing requests application process noted below.**

#### 5.0 AGRICULTURAL ACTIVITY NOT REQUIRING AN AGREEMENT

The operation of an agricultural vehicle or mobile equipment across the pipeline does not require a written Agreement if the following conditions are met:

- a) The loaded axle weight and tire pressures of the vehicle or mobile equipment are within the manufacturer’s approved limited and operating guidelines; and
- b) The point of crossing has not been the subject of a notification from the pipeline company that crossing at that location could impair the pipeline’s safety or security.

This applies to vehicles or mobile equipment used for agricultural activities in the production of crops and the raising of animals and includes pasturing and cultivation activities such as tillage, plowing, disking and harrowing.

Agricultural Activity is defined as operations which specifically support the cultivation and harvesting of crops on agricultural lands. This includes the preparation of soil beds to facilitate seeding to a depth of 450 mm (18”) without the removal of cover. Agricultural activity excludes the use of industrial, heavy, equipment specifically designed for bulk movement of soil. Generally, equipment employing steel tracks and having implements engineered for excavation (buckets, blades, teeth) are not considered equipment which directly support agricultural activity.

If you are unsure whether the proposed agricultural activity meets the above conditions, or whether the proposed agricultural activity could jeopardize the safe and secure operation of the pipeline, please contact [crossingrequests@plainsmidstream.com](mailto:crossingrequests@plainsmidstream.com) before proceeding with the activity.

#### 6.0 APPLICATION PROCESS

The following process will be followed:

- a) The applicant prepares and submits the application documents to Plains via email.

- b) The application information is reviewed, assessed, and conditions for safe work are identified\*.
- c) Plains’s Damage Prevention representative processes the application and sends the applicable Agreement to the applicant for signature.
- d) The applicant signs the Agreement and returns to Plains for execution.
- e) A fully executed Agreement is sent to the applicant.
- f) The applicant notifies Plains a minimum of three (3) working days prior to the start of work by calling the provincial one-call system or visiting [clickbeforeyoudig.com](http://clickbeforeyoudig.com).
- g) The Plains inspector arranges a site meeting, locates the pipeline, and inspects the construction or ground disturbance activities.
- h) If required, the Plains inspector will issue a Locate and Stakeout Form and a Ground Disturbance Form.

*\*No activity having the potential to damage a pipeline shall proceed until such time as the continued safe operation of the pipeline can be assured by Plains.*

#### 7.0 APPLICATION REQUIREMENTS

All applications for written agreements must be submitted to [crossingrequests@plainsmidstream.com](mailto:crossingrequests@plainsmidstream.com).

The application must include:

- A request letter which includes the scope of work, proposed activity date and legal land location;
- A completed Plains Crossing Application Form, if required (available at <https://www.plains.com/sustainability/safety/damage-prevention-program/crossings-encroachments-for-our-canadian-assets>); and
- Survey plan and/or design drawings (including plan view and profile or elevation view drawings) that shows the proposed activity in relation to the Plains asset.

For all applications please note:

- the crossing angle of proposed new facilities crossing the pipeline and/ or rights-of-way must be as close to 90° as possible
- no pre-load or surcharge will be allowed within the pipeline right-of-way. Pre-loading adjacent to a right-of-way is subject to review and approval by Plains

#### 8.0 DRAWING AND DESIGN REQUIREMENTS - GENERAL

##### 8.1 PLAN VIEW DRAWINGS

All plan view drawings must include the following information:

- the unverified location of any of the pipeline and right-of-way boundary (to be verified by physical locate);
- a complete legal land description and civic address of the property, and/or GPS coordinates in decimal degree format;
- the location of the proposed crossing circled in red with dimensions to a reference point such as a legal property line, the pipeline, or right-of-way boundary;
- the location of all applicable property boundaries as well as road and utility right-of-way boundaries;
- the location of all Plains assets must be clearly identified and labeled; and
- a north arrow.

##### 8.2 PROFILE OR ELEVATION VIEW DRAWINGS

The elevation view drawing must include:

- the location of any pipeline and associated depth of cover; and
- all horizontal and vertical dimensions (clearances) from the pipeline(s)

*Plains reserves the right to increase the minimum clearances listed in this document if deemed necessary.*

The profile view drawings must comply with the following:

- for surface crossings, the profile shall be taken along the pipeline(s).
- for underground and aerial crossings, the profile shall be taken along the proposed new crossing facility.

- For crossings where depth of cover is being removed to construct a new road or alter an existing ditch, a crossing specific drawing is required which shows how much cover is being removed and what the proposed remaining cover will be over the Plains Pipeline(s) as part of the application.

Plan, profile and elevation view drawings will require additional information as outlined below, depending on the type of facility to be installed.

## 9.0 DRAWING AND DESIGN REQUIREMENTS – FACILITY TYPE

### 9.1 VEHICLE AND EQUIPMENT CROSSINGS

The following additional information is required on the plan view drawing:

- ‘Crossing Application Form – Road or Heavy Equipment Crossings’ required for all vehicle and equipment crossings;
- All makes and models of vehicles and equipment crossing the Plains pipeline(s) must be submitted and will be listed as the only vehicles permitted to cross the pipeline(s) in Schedule B of the agreement;
- For failure stress due to vehicle crossing weights and/or reduced depth of cover, rig mats are required.

### 9.2 PAVED ROADS AND PARKING LOTS

The following additional information is required on the plan view drawing:

- all existing buildings within 30 metres (100 feet) of the pipeline;
- the parking stall layout; and
- the location of all access roads

The following additional information is required on the profile and elevation view drawings:

- a section view or description providing the proposed backfill structure around the pipeline

Design requirements:

- minimum depth of cover shall be 1.2 metres (4 feet) from the top of the pipeline to the final road grade
- maximum depth of cover shall not exceed 3 metres (9.8 feet)
- no parking or storage is permitted within 3 metres (10 feet) of a pipeline

### 9.3 GRAVEL ROADS

The following additional information is required for gravel road crossings:

- The road must meet the Municipality or Province’s minimum requirement for gravel roads;
- The road design requirements (sub grade, compaction, gravel type and size, etc.) and the construction plan for suitability for pipeline crossing;
- Engineered civil design drawing showing the road being constructed will not result in load transfer to the pipeline.
- GIS coordinates and Google view of the planned road to be provided.

### 9.4 RAILWAYS

Specific requirements for new railway crossings will be established based on location and other considerations. Please contact Plains directly.

### 9.5 TRAILS

Design requirements:

- minimum depth of cover shall be 1.2 metres (4 feet) from the top of the pipeline to the final grade

### 9.6 DITCHES

The following additional information is required on the profile and elevation view drawings:

- a section view shall include the dimensions of the width at the top of the ditch, the invert width of the ditch, and the depth of the ditch

Design requirements:

- minimum depth of cover shall be 1.2 metres (4 feet) from the top of the pipeline to the invert of the ditch.
- For pipelines that contain water (ie: Empress Raw Water Pipelines) the minimum depth of cover shall be 2.5 meters (8 feet) for water line crossings.

A description of any proposed ditch liners including the material type shall be included in the application

### 9.7 AERIAL CABLE UTILITIES

The following additional information is required on the plan view drawing:

- the location of all proposed poles, towers, guys, anchors, or any other supporting structure
- None of these facilities will be permitted within the pipeline right-of-way.*

The following additional information is required on the profile and elevation view drawings:

- section view providing a dimension of the proposed minimum height of the overhead cable(s) across the right-of-way

Design requirements:

- a description of the type, size, and voltage of the proposed cable(s)/powerline as applicable shall be included in the application.
- Note, Aerial Markers must be installed by the third party for any crossing over a Plains pipeline as warning for Plains air patrol.

### 9.8 UNDERGROUND UTILITIES

The following information is required in the application:

- for electrical, telephone, fibre optic, or other buried cables, the voltage (if applicable), conduit size, and method of installation must be included
- for pipelines including services, mains, and distribution systems, the pipeline specifications, type of cathodic protection, pipeline products and method of installation must be included

Design requirements:

- all underground utilities shall cross underneath the pipeline unless site conditions make it impractical
- for parallel works within a road allowance, the minimum horizontal clearance from the edge of the pipeline shall be 1.5 metres (5 feet)
- no parallel works are permitted within the right-of-way
- for underground utilities, the minimum vertical clearance from the edge of the pipeline shall be 0.6 metres (2 feet)
- for trenchless construction such as directional drills or boring, for all utilities the minimum vertical clearance from the edge of the pipeline shall be 1 metres (3.3 feet)
- all underground facilities shall maintain a constant elevation across the entire width of the right-of-way and extend a minimum of 0.6 metres (2 feet) beyond the right-of-way boundaries
- cables installed using trenching methods shall be installed within rigid PVC type conduit and encased in concrete with applicable warning marker tape across the entire width of the right-of-way
- for steel pipelines, the installation of a test tap may be required at the crossing location to monitor cathodic protection
- no junction boxes, manholes, kiosks, catch basins, valves, meters, or other similar facilities related to underground utilities are permitted within the right-of-way

### 9.9 LANDSCAPING

Design requirements:

- height of mature vegetation shall not exceed 0.6 metres (2 feet) within 3 metres (10 feet) of the pipeline and shall not exceed 1.8 metres (6 feet) on the remaining portions of the right-of-way
- tree canopies may be restricted over Plains’ right-of-way to enable adequate aerial visual surveillance

- Pathways must maintain a minimum setback distance of 5 metres from the closest edge of the pathway to the edge of the pipeline surface. This distance must clearly be shown on the plan(s).

### 9.10 FENCING/POSTS

The following information is required in the application:

- fence height and material of construction

Design requirements:

- minimum horizontal distance from the centreline of the pipe to the centreline of a post, sign or bollard shall be 2 metres (6.5 feet)

### 9.11 CULVERTS

The following guidelines must be followed when installing culverts:

- ‘Crossing Application Form – Pipeline Crossings’ are required for all culvert installations;
- Culverts shall be made of galvanized material with a design that does not allow the depth of cover to be washed away;
- Culvert vertical position relative to the buried pipeline should be designed to flush with grade and prevent erosion control;
- If culvert is being installed via open cut method, the minimum clearance from the culvert bottom to the top of the pipeline should be no less than 3.0 metres (1 foot);
- Culverts are only permitted on top of the pipeline if there is enough support underneath with geo fiber and rip rap;
- Design with a hump is less recommended providing that the water only flows through culvert and no stream across the culvert.

### 9.12 DRAIN TILE

The following guidelines must be followed when installing drain tile:

- Permitted field tile or drainage pipe shall cross Plains’ pipeline right-of-way at or as near to 90° as possible with a minimum clearance of 12 inches above or below the pipeline. Crossings less than 45° are not permitted.
- Drain tile shall not drain onto a Plains right-of-way.
- Longitudinal runs of drain tile shall not be installed within Plains’ pipeline right-of-way.

### 9.13 PILE INSTALLATIONS

The following guidelines must be followed when installing piles:

- The pile design and locations in GPS coordinates (decimal degree format);
- Distance to the buried centerline must be provided;
- The piles specification (steel, screw, timber or helical/screw);
- Method of installation and the compressive driving stress;
- No piling activities are authorized within 2 metres (6.6 feet) of the pipeline;
- If piling is mandatory within 2 metres (6.6 feet) of the pipeline, it is mandatory to insert a steel plate at the auger hole to guide the auger not to stray

### 9.14 BOREHOLES

The following guidelines must be followed when conducting ground disturbance via boreholes:

- Grantee must provide the GPS coordinates and/or the distance from the borehole to Plains’ Pipeline centreline as well a map overlay of the proposed borehole's location.

## 10.0 ONE-CALL SERVICE AND CLICK BEFORE YOU DIG

A minimum of three working days prior to commencing any construction or ground disturbance activities, contact the one-call service for your location:

Canada One-Call service website: [www.ClickBeforeYouDig.com](http://www.ClickBeforeYouDig.com)

Alberta: 1-800-242-3447

Saskatchewan: 1-866-828-4888

Manitoba: 1-800-940-3447

Ontario: 1-800-400-2255

## 11.0 REGULATIONS, CODES AND STANDARDS

The following provide requirements for facility installation over and in proximity to pipelines:

- Canada Energy Regulator Act
- Canada Energy Regulator Pipeline Damage Prevention Regulations – Authorizations
- Canada Energy Regulator Pipeline Damage Prevention Regulations – Obligations of Pipeline Companies
- Canadian Standards Association CSA Z662 – Oil and Gas Pipeline Systems
- CSA C22.3 No. 1 – Overhead Systems
- Transport Canada TC E-10 – Standards Respecting Pipeline Crossings Under Railways
- Alberta Pipeline Act
- Alberta Regulation (Pipeline Rules)
- Saskatchewan Pipelines Act 1998
- Saskatchewan Pipeline Regulations 2000
- Manitoba Oil and Gas Act
- Ontario Environmental Protection Act



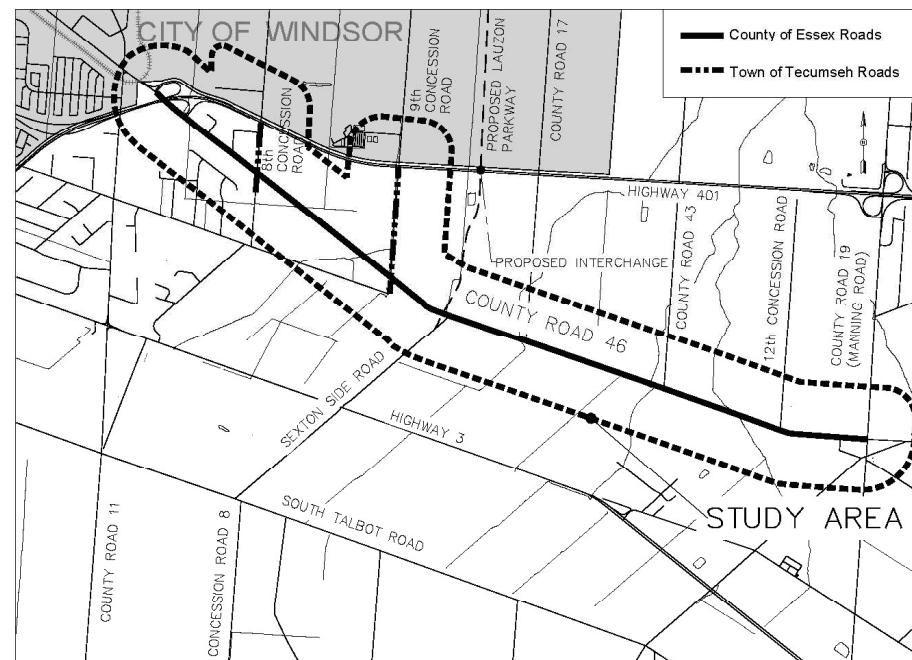
509 Talbot Street  
 London, ON N6A 2S5  
 519-672-2222

# MEMORANDUM

**TO:** File  
**FROM:** Steve Taylor, P.Eng., M.Eng.  
**PROJECT:** County of Essex, County Road 46 Environmental Assessment  
**SUBJECT:** Inventory of County Road 46 Structures with Spans Greater than 3.0 m

**DATE:** February 26, 2024  
**PROJECT:** 23-041

BT Engineering Inc. (BTE) has been retained by the County of Essex to complete a Municipal Class Environmental Assessment (MCEA) for improvements to County Road 46 from the City of Windsor limits easterly to County Road 19 (Manning Road) within the Town of Tecumseh. In parallel, BTE is also completing the MCEA for improvements to Concession Roads 8 and 9, from the City of Windsor limits southerly to County Road 49. The Study Area is in **Figure 1**.



**Figure 1: Study Area**

This memorandum describes the existing culverts and bridges with spans greater than 3.0 m along County Road 46 within the Study Area.

**Table 1** summarizes the existing culverts and bridges, and the OSIM Report recommendations for rehabilitation and/or replacement. **Attachment 1** shows the location of all the culverts and bridges along County Road 46. There are no culverts or bridges with spans greater than 3.0 m along Concession Road 8 or 9.

**Subject:** Inventory of County Road 46 Structures with Spans Greater than 3.0 m  
**Project:** BTE File 23-041, County of Essex, County Road 46 Environmental Assessment  
**Date:** February 26, 2024



| Table 1: Summary of Existing Culverts and Bridges |  |  |           |  |   |
|---|--|--|-----------|--|---|
| Culvert/Bridge I.D.                               | Location   | Type                                   | Span (mm) | Year Built   | Recommended Work  |
| C-46-077  | At the intersection of County Road 19 (Manning Road) at West Townline & Mooney Creek Drain | Rigid Frame - Vertical Legs            | 5500      | 1940 (extensions were added in 1964 and 1997)  | None identified during inspection   |
| C-46-055  | 0.14 km west of Eleventh Concession Road at Gzowski Drain                                  | Precast Concrete Box Culvert           | 3500      | Original built in 1930, extension to the South in 1950. Structure was replaced in 2015 | None identified during inspection   |
| C-46-042  | 0.03 km west of County Road No. 17 at Sullivan Creek                                       | Twin Aluminized Ultra Flo Pipe (round) | 2x2000    | 2004   | Install hazard markers in accordance with OSIM and the Roadside Safety Manual |
| B-46-06   | 0.833 km east of County Road 43 at Pike Creek  | Rigid Frame                            | 6800      | 1929 (Rehabilitation or Reconstruction performed in 2007)                              | None identified during inspection   |

**Attachments:** 1. Culverts and Bridges Location Map



## MEMORANDUM

|   |                                |
|---|--------------------------------|
| <b>TO:</b> File   | <b>DATE:</b> November 25, 2025 |
| <b>FROM:</b> Eyad Farahteh  | <b>PROJECT #:</b> 23-041       |
| <b>PROJECT:</b> County of Essex Country Road 46 EA                        |                                |
| <b>SUBJECT:</b> Country Road 46, Concession Roads 8 & 9 Utilities Summary |                                |

### 1.0 OVERVIEW

The planned widening of County Road 46 and Concession Roads 8 and 9 will impact existing utilities, necessitating the relocation of utility poles along the corridor. The placement of utility poles can influence collision rates, collision severity, and driver sightlines. Buried telecommunications infrastructure must be as it may be directly affected by the widening.

The project will cross the existing NGL Plains Midstream pipeline infrastructure. Construction activities such as excavation and raising the road grade, could alter the depth of cover over the pipeline, potentially compromising its structural integrity. The use of heavy construction equipment near or over the pipeline could introduce dynamic loads or vibrations. There is also potential for conflicts between the pipeline and proposed infrastructure or underground utilities.

As part of the widening, the right-of-way (ROW) will increase from 26 to 40 metres on County Road 46, from 20 to 36 metres on Concession Road 8, and from 30 to 36 metres on Concession Road 9.

### 2.0 HYDRO POLES

#### 2.1 Existing Conditions

On County Road 46, the existing right-of-way (ROW) is 26 metres, with hydro poles primarily located along the north side of the roadway. The pole density is relatively low, fewer than 20 poles per kilometre, and they are typically spaced about 60 metres apart. Most of these poles have an offset of approximately 7.5 to 8 metres from the edge line of the roadway, see **Figure 1**.

Several hydro poles are also located on the south side of County Road 46, primarily between Highway 401 and Concession Road 8, serving adjacent buildings. The offset of these poles varies between 4 and 8 metres from the roadway edge.



**Figure 1: Typical Example of Existing Condition**

For Concession Road 8, the existing ROW is 20 metres. Hydro poles are mostly found on the west side of the road, offset between 4 and 6 metres from the pavement edge. Similar to County Road 46, the density remains below 20 poles/km, with typical spacing of about 60 metres. A smaller number of poles are located on the east side, serving adjacent properties, and generally maintain a similar offset of 4 to 6 metres.

On Concession Road 9, where the existing ROW is 30 metres, hydro poles are primarily located on the east side of the roadway, with offsets of approximately 8 metres from the pavement edge. The density remains below 20 poles/km, with spacing typically between 60 and 65 metres.

A single hydro pole is also located on the west side of Concession Road 9, within the project limits just before Highway 401.

#### 2.2 Relocation

For County Road 46, relocated hydro poles should maximize the offset from the travel lane in space identified at the outside of the future right-of-way. Given the new 40-metre right-of-way (ROW), the poles will need to be shifted back approximately 8 metres. **Figure 2** illustrates a proposed cross section for County Road 46.

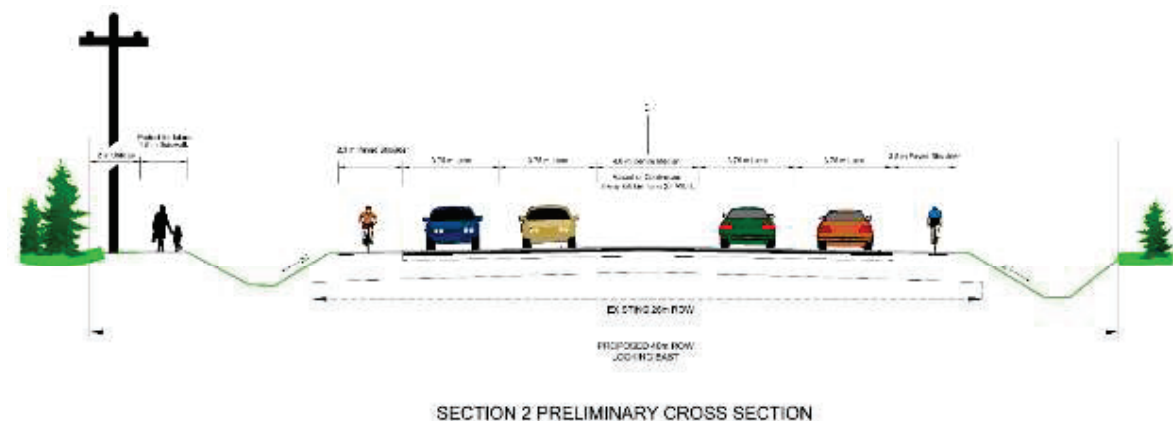


Figure 2: : Proposed Cross Section for Country Road 46

For Concession Roads 8 and 9, new or relocated poles should be located at the edge of the new right-of-way as illustrated on the proposed cross sections. With a new ROW of 36 metres, the hydro poles will need to be relocated approximately 8 metres back on Concession Road 8 and about 3 metres on Concession Road 9.

Additionally, all hydro poles must be set back at least 4.8 metres from any building, in accordance with Hydro One’s safety requirements, to minimize electrical hazards to adjacent properties.

The new pole locations will also be coordinated to avoid conflicts with existing infrastructure, such as underground utility lines, the Plains Midstream Pipeline, gas lines, watermains, and sewer networks.

The approach will ensure early and ongoing coordination with utility providers and the use of up-to-date utility mapping are essential to identify and resolve potential conflicts before construction begins. The relocation strategy will consider future infrastructure needs, allow for safe access for maintenance, and minimize disruption to both utility services and residents.

### 3.0 TELECOMMUNICATION LINE

The relocation of the hydro poles will require relocation of Bell aerial telecommunication lines on the existing hydro poles to the new hydro pole alignment.

Further coordination with Bell is required to identify any underground infrastructure. A Bell Locator will issue a locate sheet, including a sketch that outlines the underground network within the defined locate area or limit. This sketch will detail the number and location of cables, conduits, and duct structures, along with a description of the locate area or boundary.

### 4.0 PLAINS MIDSTREAM PIPELINE

Within the proposed widening, an existing Natural Gas Liquids (NGL) pipeline owned and operated by Plains Midstream Canada ULC crosses the road from South to North, see **Figure 3**.

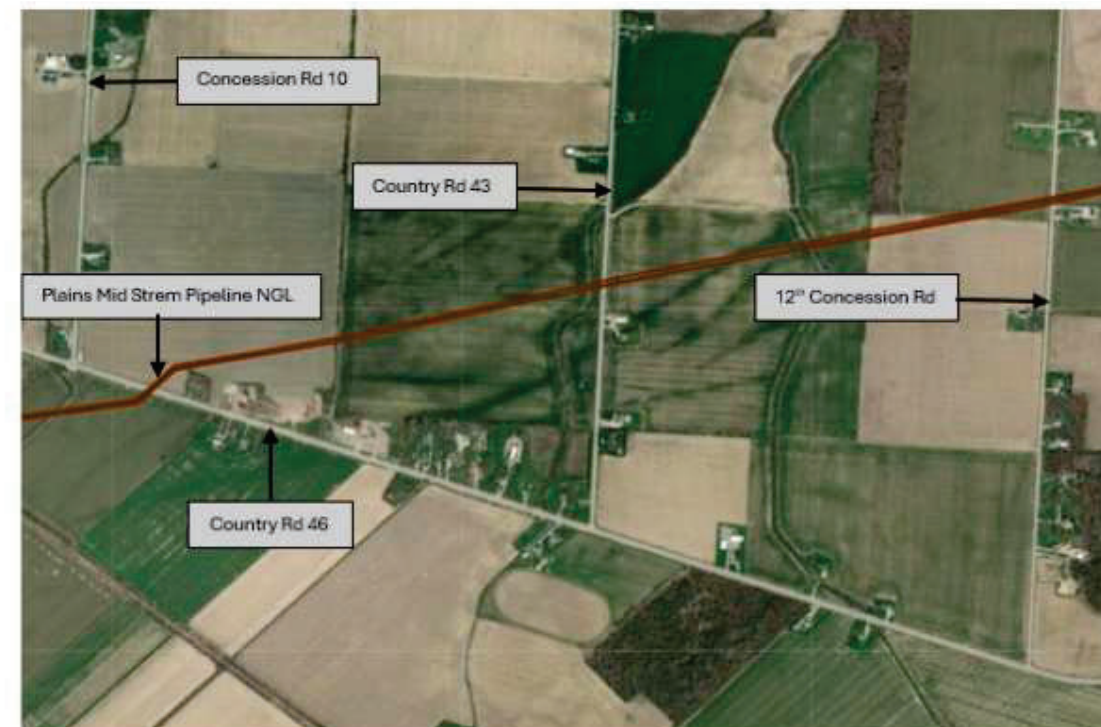


Figure 3: Plains Midstream Canada Pipeline Crossing Country Road 46

#### 4.1 Construction Coordination with Plains Midstream

Any ground disturbance within 30m of the pipeline requires Coordination with Plains Midstream Canada as follow:

1. A letter of request will be sent for Plains’ Damage Prevention Department outlining the scope of work and the location of the pipeline.
2. Plains Crossing Application Form will be completed and submitted.
3. Detailed design drawings, including plan and profile views showing the relationship between the proposed construction and the pipeline will be submitted.
4. Plains Midstream must be notified at least three working days prior starting the work through calling One Call Center or by visiting the Click Before You Dig website.

#### 4.2 Pipeline Crossing Approach for Wider Road

##### 4.2.1 Protection Pipeline in Place

As part of the proposed widening of Country Road 46, the existing Plains Midstream NGL pipeline will be crossed by the expanded roadway within the new 40-metre right-of-way. Based on the current understanding of the site, the pipeline will remain in its existing alignment and be protected in place. This approach will maintain or improve the depth of cover over the pipeline in accordance with Plains Midstream's technical guidelines, which specify that the minimum depth of cover shall be 1.2 metres

from the top of the pipeline to the final road grade, and the maximum allowable depth of cover shall not exceed 3 metres. Additionally, no parking or storage of materials or vehicles is permitted within 3 metres of the pipeline's centerline. These requirements will be incorporated into both the design cross sections and construction staging plans to ensure full compliance.

#### **4.2.2 Load Consideration**

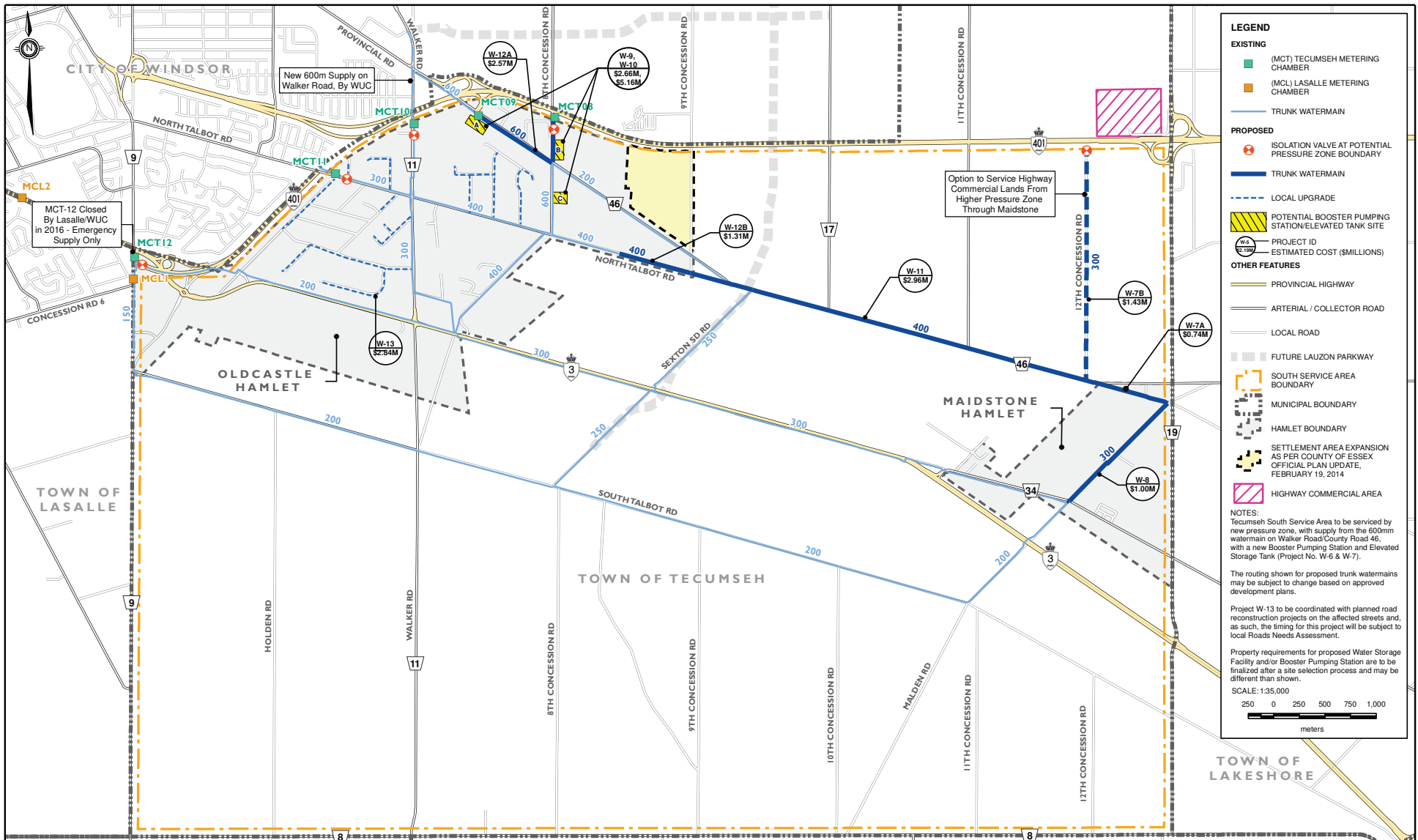
The widened roadway cross-section will include a new pavement structure, granular base layers, and subgrade material over the pipeline. To ensure that the additional dead and live loads from the widened pavement and construction equipment do not impact the pipeline, protective measures will be implemented. These may include load distribution methods such as geotextile reinforcement, engineered fill, or a reinforced concrete slab may be implemented as required. The final crossing design, including plan and profile drawings, will be submitted to Plains Midstream for review and approval. These drawings will clearly show the proposed road grades, pipeline depth, and protective measures to demonstrate compliance with technical guidelines.

#### **4.2.3 Utilities and Drainage Considerations**

The crossing design will also ensure that no subsurface utilities or drainage infrastructure are installed in direct conflict with the pipeline or within the restricted buffer zone without prior approval. Design drawings submitted to Plains will include both plan and profile views of the crossing, showing the horizontal alignment, depth of cover, and relationship to the pipeline to verify compliance with their technical guidelines.

#### **4.2.4 Construction Considerations**

During construction, protective measures may be used if temporary equipment crossings are required directly over the pipeline. Construction will be directed to minimize loading and disturbance over the pipeline until protective measures are in place. All work will be subject to Plains Midstream's inspection and approval, and no construction activity at the crossing location will proceed without their formal written consent.



**LEGEND**

**EXISTING**

- (MCT) TECUMSEH METERING CHAMBER
- (MCL) LASALLE METERING CHAMBER
- TRUNK WATERMAIN

**PROPOSED**

- ISOLATION VALVE AT POTENTIAL PRESSURE ZONE BOUNDARY
- TRUNK WATERMAIN
- LOCAL UPGRADE
- POTENTIAL BOOSTER PUMPING STATION/ELEVATED TANK SITE
- PROJECT ID
- ESTIMATED COST (\$MILLIONS)

**OTHER FEATURES**

- PROVINCIAL HIGHWAY
- ARTERIAL / COLLECTOR ROAD
- LOCAL ROAD
- FUTURE LAUZON PARKWAY
- SOUTH SERVICE AREA BOUNDARY
- MUNICIPAL BOUNDARY
- HAMLET BOUNDARY
- SETTLEMENT AREA EXPANSION AS PER COUNTY OF ESSEX OFFICIAL PLAN UPDATE, FEBRUARY 19, 2014
- HIGHWAY COMMERCIAL AREA

**NOTES:**

Tecumseh South Service Area to be serviced by new pressure zone, with supply from the 600mm watermain on Walker Road/County Road 46, with a new Booster Pumping Station and Elevated Storage Tank (Project No. W-6 & W-7).

The routing shown for proposed trunk watermains may be subject to change based on approved development plans.

Project W-13 to be coordinated with planned road reconstruction projects on the affected streets and, as such, the timing for this project will be subject to local Roads Needs Assessment.

Property requirements for proposed Water Storage Facility and/or Booster Pumping Station are to be finalized after a site selection process and may be different than shown.

SCALE: 1:35,000

250 0 250 500 750 1,000 meters



CLIENT

TOWN OF TECUMSEH

PROJECT NAME:

**WATER AND WASTEWATER MASTER PLAN UPDATE  
PREFERRED WATER SERVICE STRATEGY  
SOUTH SERVICE AREA**

DRAWING No:

**FIG ES-2**

**LEGEND**

**EXISTING**

- PUMPING STATION
- OUTLET LOCATION FOR DISCHARGE OF MONITORED FLOW
- FLOW CONTROL CHAMBER
- TRUNK SEWER
- TEMPORARY DIVERSION SEWER TO LRWP
- TRUNK SEWER TO LRWP
- NORTHEAST WINDSOR TRUNK SEWER

**PROPOSED**

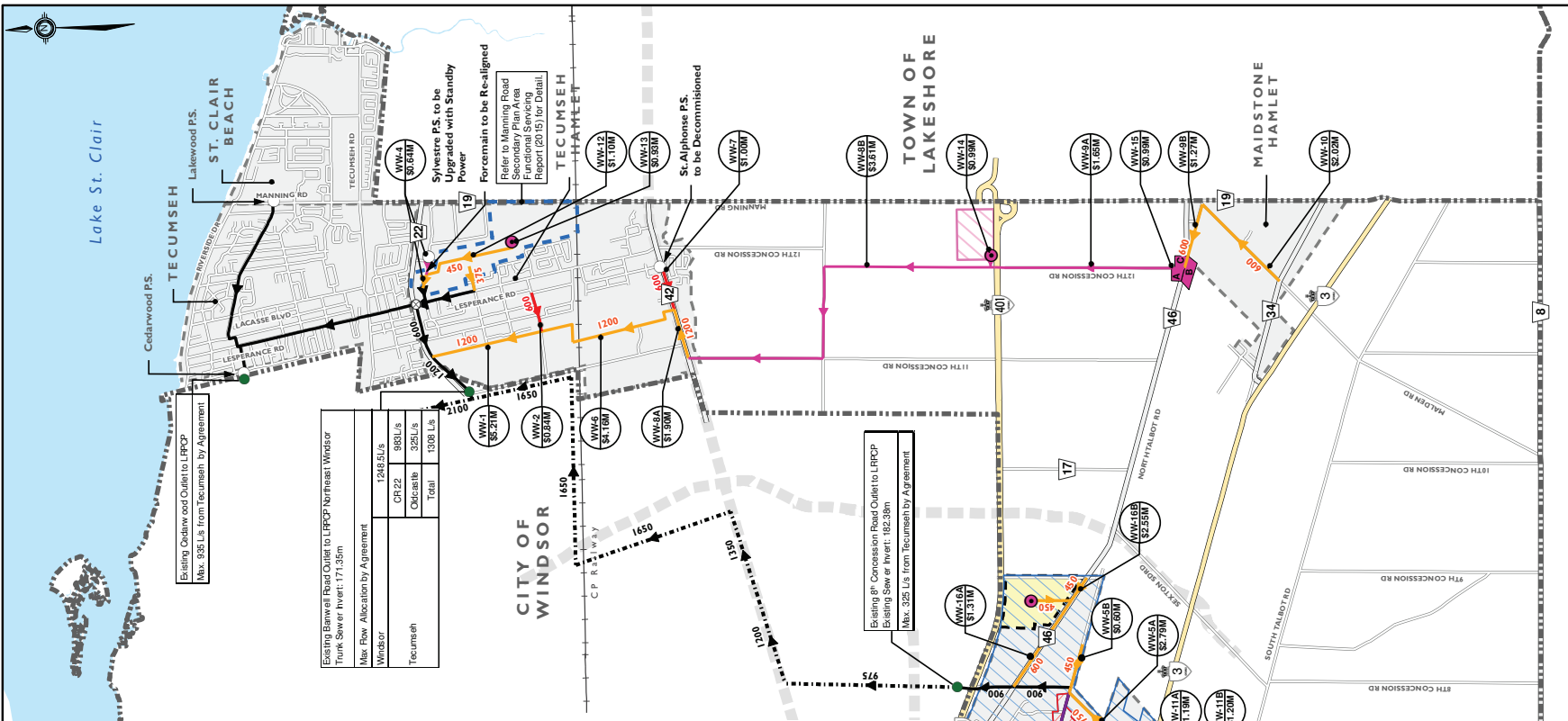
- PUMPING STATION
- POTENTIAL SITES FOR MAIDSTONE PUMPING STATION
- WASTEWATER FORCEMAIN
- DIVERSION SEWER
- TRUNK SEWER
- 8TH CONCESSION ROAD SANITARY SEWER OUTLET SERVICE AREA
- NORTH TALBOT ROAD SANITARY SEWER OUTLET SERVICE AREA
- NOT INCLUDED IN SANITARY SEWER SERVICE AREA
- PROJECT ID
- ESTIMATED COST (\$MILLIONS)

**OTHER FEATURES**

- PROVINCIAL HIGHWAY
- COUNTY ROAD
- LOCAL ROAD
- FUTURE LAIZON PARKWAY
- HIGHWAY COMMERCIAL AREA
- MUNICIPAL BOUNDARY
- HAMLET BOUNDARY
- SETTLEMENT AREA EXPANSION PER COUNTY OF ESSEX OFFICIAL PLAN UPDATE, FEBRUARY 19, 2014

**NOTES:**  
 The routing shown for proposed trunk sewers may be subject to change based on approved development plans.  
 The exact location of the Sewage Pumping Stations to be determined through the detailed design process and/or through the Ontario Planning Services No. 14.5 as identified in Ontario's Wastewater Servicing - 8th Conc. Trunk Sanitary Sewer Outlet Preliminary Design Report. (Dillon Consulting, May 2017)

SCALE: 1:55,000  
 500 250 0 500 1,000 1,500 2,000  
 meters

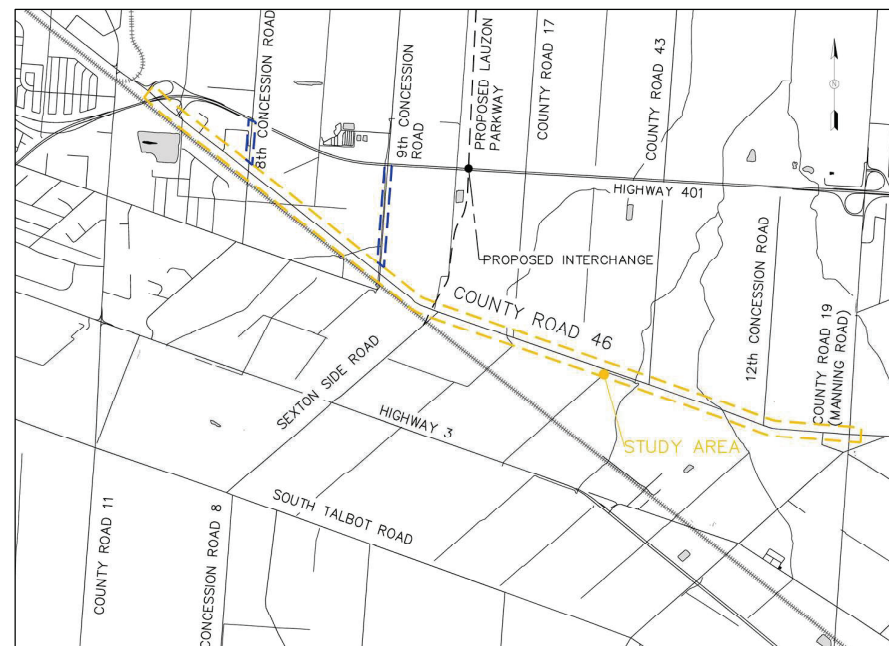


# TECHNICAL MEMORANDUM

**TO:** Steve Taylor, P.Eng. **DATE:** March 31, 2026  
**FROM:** Daniela Hurtado Caicedo, M.A.Sc., EIT **PROJECT #:** 23-041  
**PROJECT:** County Road 46 and Concession Roads 8 and 9 Environmental Assessment Study  
**SUBJECT:** Drainage Conditions Assessment and Stormwater Management Recommendations

## 1.0 INTRODUCTION

The County of Essex (County), in partnership with the Town of Tecumseh (Town), retained BT Engineering Inc. (BTE) to undertake an Environmental Assessment (EA) Study for improvements to County Road 46 and Concession Roads 8 and 9 within the Town of Tecumseh. The objective of this assessment is to provide a characterization of existing drainage systems and watersheds; a preliminary estimate of proposed impervious areas in comparison to existing conditions; a summary of culvert condition considerations; and preliminary stormwater management recommendations. The Study Area is illustrated in **Figure 1**.



**Figure 1: Study Area**

## 2.0 BACKGROUND INFORMATION

Background information was obtained from:

- *Sandwich South Master Servicing Study, Stormwater Management Technical Report*, May 2023, by Dillon Consulting Ltd.
- *Town of Tecumseh Storm Drainage Master Plan, Volume 2 - Final Technical Modelling Report*, June 2019, by Dillon Consulting Ltd.
- *Master Plan Report (Volume 1), Upper Little River Watershed Drainage and Stormwater Management Master Plan, Class Environmental Assessment, Windsor and Tecumseh, Ontario*, January 2023, by Stantec Consulting Ltd.
- *Repair and Improvement to the 7th Concession Drain*, November 23, 2017, by Baird AE.
- *Municipal Drains*, April 25, 2017, by Town of Tecumseh.
- *Pike Creek Watershed Area*, April 29, 2025, by Town of Tecumseh.
- *Drainage Report for the Demonte Branch Drain, Town of Tecumseh*, August 5, 2022, by Dillon Consulting Ltd.
- *Drainage Report South Part of the 9th Concession Drain Township of Sandwich South*, March 14, 1988, by Bruce D. Crozier Engineering.
- *Plan and Profiles of the Beahan Drain, Extension and Branches in the Township of Sandwich South, County of Essex*, January 12, 1970, by C.G. Russell Armstrong Associates Ltd.
- *Plan and Profile of the Croft Drain in the Township of Sandwich South, County of Essex*, May 24, 1977, by C.G. Russell Armstrong Associates Ltd.
- *Plan, Profile and Cross-Sections of the Grondin Drain in the Township of Sandwich South*, May 16, 1963, by C.G. Russell Armstrong.
- *2nd Reconsidered Drainage Report for the Gzowski Drain and Branch*, February 27, 2014, by Dillon Consulting.
- *Emergency Culvert Replacement – Gzowski Drain, Report Number PWES-2025-43*, July 22, 2025, Public Works & Engineering Services, Town of Tecumseh.
- *Gzowski Drain and Branch Location Map*, PWES-2025-43 Attachment 1, June 30, 2025, by Town of Tecumseh.
- *Hurley Relief Branch Drain and Upper Part of Hurley Relief Drain, Part of Lots 11 & 12, Concession 8*, November 20, 2019, by Rood Engineering Inc.
- *Plan of the Upper Part of the Little River Drain in the Township of Sandwich South, County of Essex*, September 1, 1983, by C.G. Russell Armstrong Ltd.
- *McLean-Hergott Drain, Water Department Bridge*, August 25, 2021, by Rood Engineering Inc.
- *North 12th Concession Drain Plan*, June 10, 2025, by R. Dobbin Engineering Inc.

- *Plan, Profile and Cross-Sections of the North Talbot Road Drain in the 12th Concession in the Township of Sandwich South, County of Essex*, December 22, 1967, by C.G. Russell Armstrong Associates Ltd.
- *Drainage Report for the O’Keefe Drain*, September 30, 2015, by Dillon Consulting.
- *Drainage Report for the New Access Bridge Serving Pt. Lot 292, Concession S.T.R. Over the Pike Creek Drain (McLean Bridge)*, February 10, 2014, by Dillon Consulting.
- *Little River Floodplain Mapping Project Status Updates (BD 20/22)*, August 29, 2022, by Essex Region Conservation Authority.
- *South Port Sailing Club Request for Financial Assistance to Dredge Pike Creek, Report Number PWES-2025-33*, May 13, 2025, Public Works & Engineering Services, Town of Tecumseh.
- *Pike Creek Watershed Area*, PWES-2025-33 Attachment 2, April 29, 2025, by Town of Tecumseh.
- *Plan, Profile and Cross-Sections of the Robinson Drain in the Township of Sandwich South*, April 12, 1962, by C.G. Russell Armstrong.
- *Plan and Profile of the Ruston Drain in the Township of Sandwich South, County of Essex*, June 29, 1982, C.G. Russell Armstrong Ltd.
- *Shuttleworth Drain (Repair and Improvement) Reconsidered Report*, August 21, 2023, Rood Engineering Inc.
- *Sullivan Creek Drain Repair and Improvement*, January 9, 2023, by Rood Engineering Inc.
- *Reconsidered Drainage Report for the Talbot McCarthy Drain (Upper Portion) and Talbot McCarthy Relief Drain*, November 29, 2007, by Dillon Consulting.
- *Washbrook Drain Enclosure in the Town of Tecumseh*, March 10, 2010, Bruce D. Crozier Engineering Inc.
- *Municipal Drainage Report for the Repair and Improvement of the Wellwood Drain in the Town of Tecumseh*, May 8, 2019, by RC Spencer Associates Inc.
- *West Branch Delisle Drain Repair and Improvement*, April 28, 2016, by Rood Engineering Inc.
- *Plan of Drainage Area of the West Townline Drains in the Township of Maidstone and in the Township of Sandwich South*, September 21, 1978, by C.G. Russell Armstrong Ltd.
- *County Road 46 E Cross Culverts & Pike Creek Bridge – Recommendations*, June 4, 2025, by BT Engineering Inc.
- *Draft Analysis and Evaluation Report*, May 2025, by BT Engineering Inc.
- *Drainage Management Manual (DMM)*, October 1997 by Ontario Ministry of Transportation (MTO).
- Soil Survey Complex Database by Agricultural Information Atlas by the Ministry of Agriculture, Food and Rural Affairs (OMAFRA)
- Ontario Land Cover Compilation v.2.0 Dataset by OMAFRA.
- Constructed Drain Dataset by OMAFRA.

- Lidar-Derived Digital Surface and Terrain Models for the Lake Erie project area, 2016 - 2018 Retrieved from Ontario Elevation Mapping Program.
- Aerial Imagery from the Southwestern Ontario Orthophotography Project (SWOOP) 2015.
- 2023 Aerial Imagery, by Town of Tecumseh.
- Town of Tecumseh Open Data.

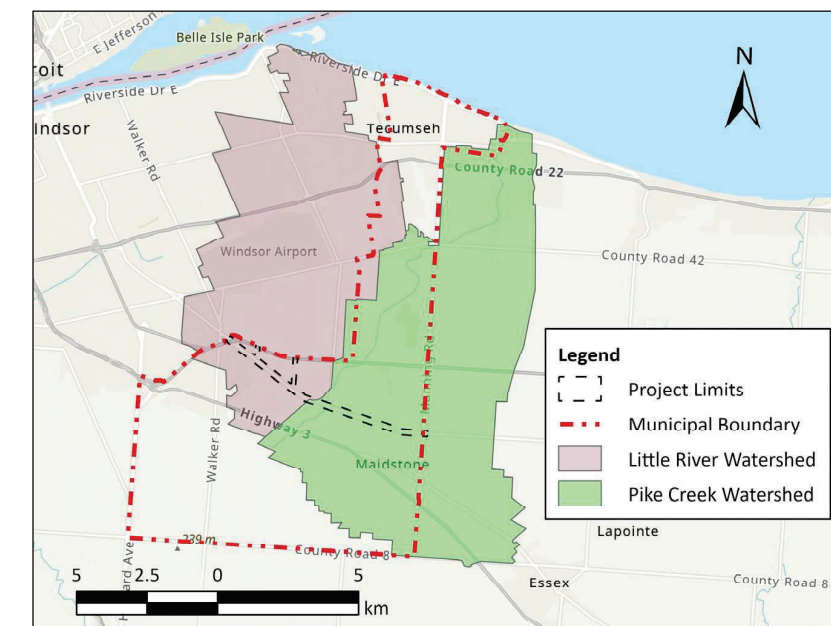
### 3.0 EXISTING CONDITIONS

#### 3.1 Watershed Characteristics

The Town of Tecumseh is located within the Lake St. Clair and Detroit River watersheds, shown in **Attachment A (Figure A-1 and Figure A-2, respectively)**. The Study Area (**Figure 1**) lies within the Little River and Pike Creek watersheds, as illustrated in **Figure 2**.

According to the *Little River Floodplain Mapping Project Status Updates* (Essex Region Conservation, 2022) and the *Request for Financial Assistance to Dredge Pike Creek* (Town of Tecumseh, 2025b), the Little River and Pike Creek drain an area of approximately 63 km<sup>2</sup> and 87 km<sup>2</sup>, respectively. The watershed limits shown in **Figure 2** were retrieved and adapted from the *Little River Watershed Map and Study Area Map (Sandwich South Master Servicing Study Plan, Dillon Consulting, 2023)* and *Pike Creek Watershed Area* (Town of Tecumseh, 2025a).

There are multiple municipal drains within the Study Area that drain to these two main watercourses. A summary of the municipal drains relevant to the Study Area (**Figure 1**) is provided in **Section 3.2**.



**Figure 2: Little River and Pike Creek Subwatersheds**

### 3.2 Municipal Drains

Based on the Town of Tecumseh master municipal drains map (2017) and a desktop review, 19 municipal drains were identified as relevant to the Study Area (**Figure 1**) and the proposed road improvements. These drains receive drainage from County Road 46 and the Concession Roads. The general characteristics of each drain are summarized and illustrated in **Sections 3.2.1 to 3.2.19**.

The drain alignments were obtained from GIS data provided by the Town of Tecumseh and verified against available engineer's reports. Drainage areas were delineated using a combination of available engineer's reports and OMAFRA LiDAR-derived Digital Elevation Model (DEM) data analyzed in ArcGIS Pro. Additional details regarding the delineation approach are provided within the individual drain descriptions.

In the figures in **Section 3.2**, each drain is shown in cyan and nearby drains are shown in blue. The municipal boundary is shown with a red dashed line, and the catchment area of the subject drain is highlighted in red. For some drains, the full drainage area is shown. For others, only the portion of the drainage area relevant to the proposed road improvements is presented, as described in the corresponding drain sections. The catchment areas presented below were developed for this preliminary assessment using available mapping, engineer's reports, and DEM interpretation. Confirmation of final drainage boundaries should be completed during detail design.

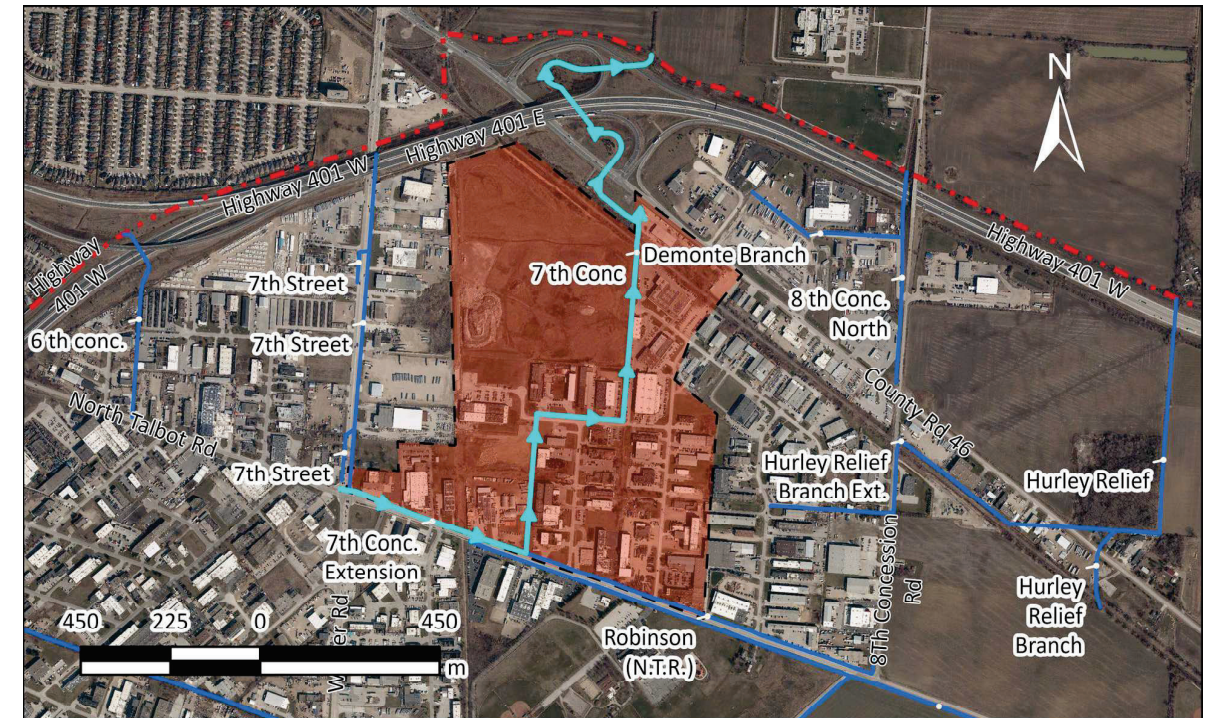
Ten (10) of these municipal drains cross County Road 46 via culverts and bridges. These crossings are referenced throughout this section and are described in more detail in **Section 3.3**.

#### 3.2.1 7th Concession Drain

The 7th Concession Drain (**Figure 3**) begins just east of Walker Road, starting as a closed drain flowing east along the north side of North Talbot Road and then opening before turning north to outlet under the former railway (Baird, 2017). According to the 8th Concession Drain North *Watershed Plan* (Dillon Consulting, 2022), the drain meanders north and crosses County Road 46 through Culvert 0 (**Section 3.3.1**) approximately 190 m east of Highway 401. It continues north, crossing Highway 401, and ends at the Town boundary. In addition, the OMAFRA Land Information Ontario (LIO) *Constructed Drain* layer indicates that the drain continues further north as the 7th Concession Drain beyond the Town boundary.

This drain system is located within the Little River watershed. The repair and improvements report (Baird, 2017) notes that the contributing catchment area for the 7th Concession Drain is 57.83 ha at the outlet immediately north of the former railway. The drain alignment and catchment limits are shown in **Figure 3**. The catchment limits were extracted from the 7th Concession Drain *Drainage Area* drawing (Baird, 2017), and the east end was adjusted slightly using catchment information from the Hurley Relief Drain report (Rood Engineering, 2019), as it is the more recent of the two drawings. Based

on the delineated catchment, the 7th Concession Drain appears to receive drainage from a portion of the south side of County Road 46.



**Figure 3: 7th Concession Drain and Nearby Drains**

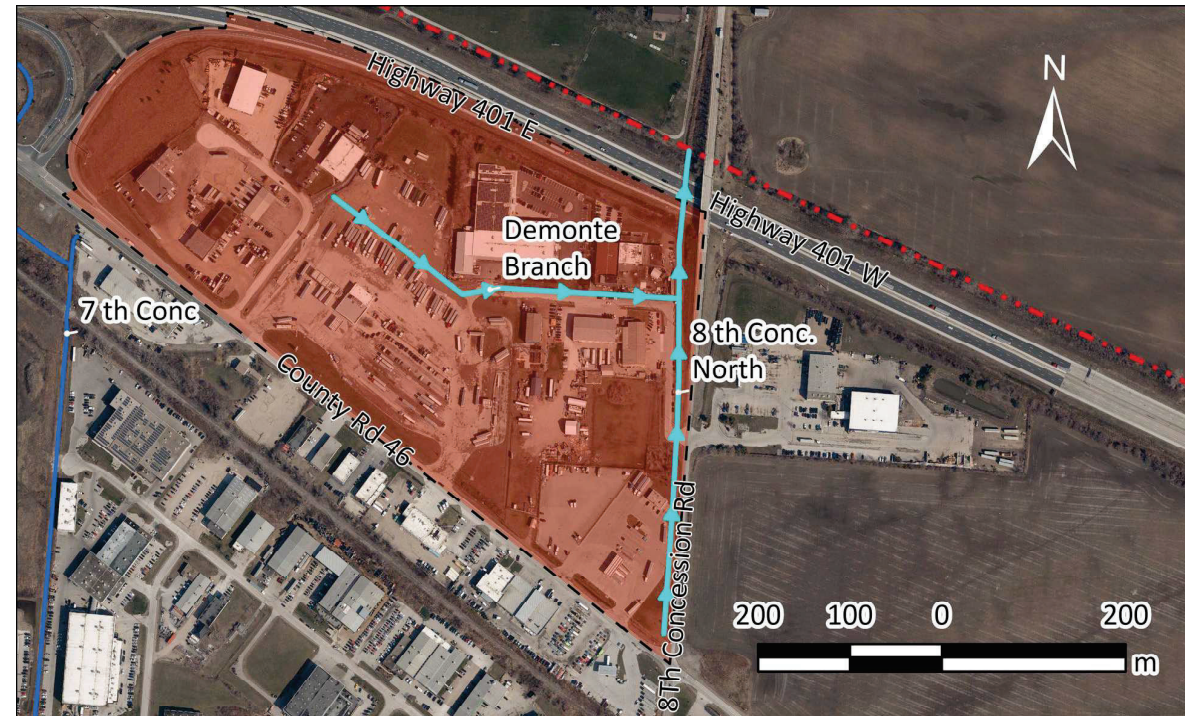
#### 3.2.2 8th Concession Drain North

The 8th Concession Drain North (**Figure 4**) begins immediately northeast of the County Road 46/8th Concession Road intersection and flows north on the west side of 8th Concession Road within its right-of-way, crossing Highway 401. Available 2023 aerial imagery provided by the Town indicates that the drain is open along this reach. Within the Town, the drain ends at the municipal boundary. The OMAFRA LIO *Constructed Drain* indicates that the drain continues north beyond the municipal boundary under the same name and ultimately outlets to Little River (Town of Tecumseh, 2017).

The Demonte Branch Drain is a tributary of the 8th Concession Drain North. According to the *Watershed Plan* (Dillon Consulting, 2022), the Demonte Branch Drain begins approximately 425 m west of 8th Concession Road, north of County Road 46 (Lot 13, Concession 7), and flows slightly southeast and then east to outlet into the 8th Concession Drain North, approximately 95 m south of Highway 401.

The catchment for the 8th Concession Drain North, shown in **Figure 4**, was delineated using DEM analysis and refined using watershed drawings for the Demonte Branch Drain (Dillon Consulting, 2022), the Hurley Relief Branch Drain (Rood Engineering, 2019), and the 7th Concession Drain (Baird, 2017).

Based on the delineated catchment, the 8th Concession Drain North appears to receive drainage from the west side of 8th Concession Road within the project limits and from a portion of the north side of County Road 46.



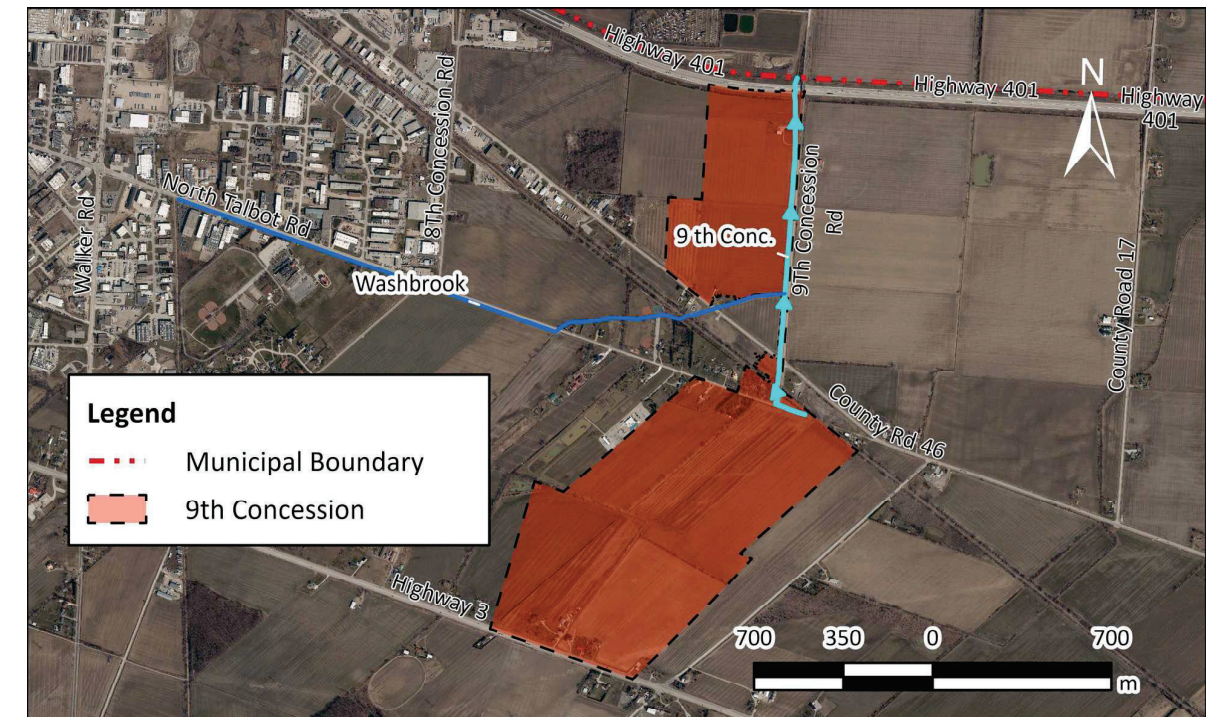
**Figure 4: 8th Concession Drain North and Nearby Drains**

### 3.2.3 9th Concession Drain

According to the Hurley Relief Branch Drain report, which aligns with the Town’s municipal drain GIS layer, the 9th Concession Drain (**Figure 5**) begins approximately 110 m east of the North Talbot Road/9th Concession Road intersection. It flows west and then turns north along the west side of 9th Concession Road, where it continues within the road right-of-way. The drain crosses County Road 46 immediately west of its intersection with 9th Concession Road through Culvert 2A (**Section 3.3.5**). Available 2023 aerial imagery provided by the Town indicates that the drain is open along this reach. Within the Town boundary, the mapped municipal portion ends immediately north of Highway 401. The 9th Concession Drain continues further north outside the municipal limit and outlets into the Hurley Relief Drain (Bruce D. Crozier Engineering, 1988).

This drain system is located within the Little River watershed. The catchment area shown in **Figure 5** was delineated using the 9th Concession Drain plan and profile drawing (Bruce D. Crozier Engineering, 1988). The catchment was further refined on the west side using the Hurley Relief Branch Drain drawing (Rood Engineering, 2019) and the *Shuttleworth Drain Watershed Plan* (Rood

Engineering, 2023b), on the south side using the Talbot-McCarthy Drain *Overall Plan* (Lower Portion; Dillon Consulting, 2007), and on the north side using DEM analysis.



**Figure 5: 9th Concession Drain and Nearby Drain**

The delineated catchment (**Figure 5**) includes only lands directly contributing to the 9th Concession Drain north of North Talbot Road and excludes the Washbrook Drain catchment (**Section 3.2.17**), which was delineated separately because that system is directly affected by the County Road 46 improvements. However, it does include the upstream catchments of drains such as the Beahan Drain (C.G. Russell Armstrong Associates, 1970) and the lower portion of the Talbot-McCarthy Drain (Dillon Consulting, 2007). Based on the delineated catchment, the 9th Concession Drain appears to receive drainage from the west side of 9th Concession Road within the project limits and from a portion of the north side of County Road 46.

### 3.2.4 Croft Drain

The Croft Drain (**Figure 6**) is an open drain that begins approximately 115 m north of County Road 46 (at the property line between Lots 9 and 10 in Concession 10), and from there flows north across Lots 10, 11, and 12, which lie between County Road 17 and County Road 43 (11th Concession Road), before ultimately discharging into the Sullivan Creek Drain (C.G. Russell Armstrong Associates, 1977).

This drain system is located within the Pike Creek watershed, and the catchment shown in **Figure 6** was delineated using DEM analysis, as no contributing area information was provided in the Croft Drain

engineer's report (Russell Armstrong Associates, 1977). Based on the delineated catchment, the Croft Drain appears to receive drainage from a portion of the north side of County Road 46.

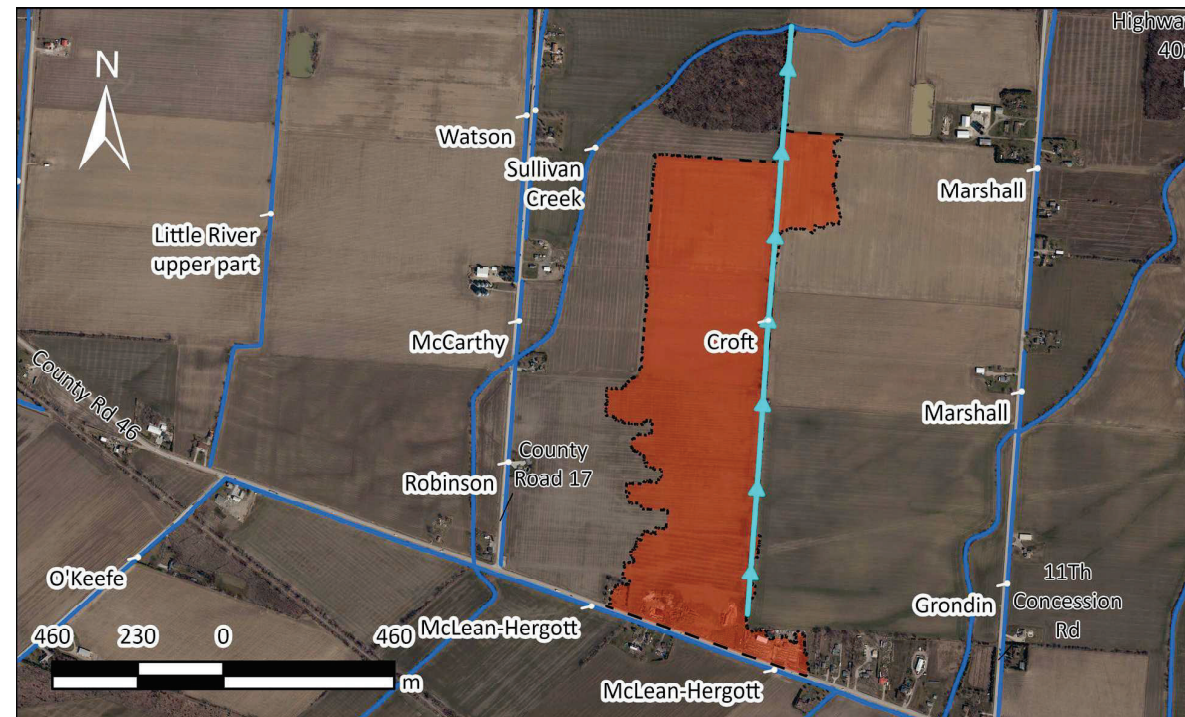


Figure 6: Croft Drain and Nearby Drains

### 3.2.5 Grondin Drain

According to the plan and profile drawing of the Grondin Drain (Figure 7; C.G. Russell Armstrong, 1963), this open drain begins at the northeast corner of the intersection of County Road 43 and County Road 46 and flows north along the east side of County Road 43 within the road right-of-way before discharging into the Gzowski Drain.

This drain system is located within the Pike Creek watershed, and the catchment illustrated in Figure 7 was delineated using DEM analysis, as no mapped catchment area was provided in the plan and profile drawing of the drain. Based on the delineated catchment, the Grondin Drain appears to receive drainage from the east side of County Road 43 along the drain extent and from a portion of the north side of County Road 46.



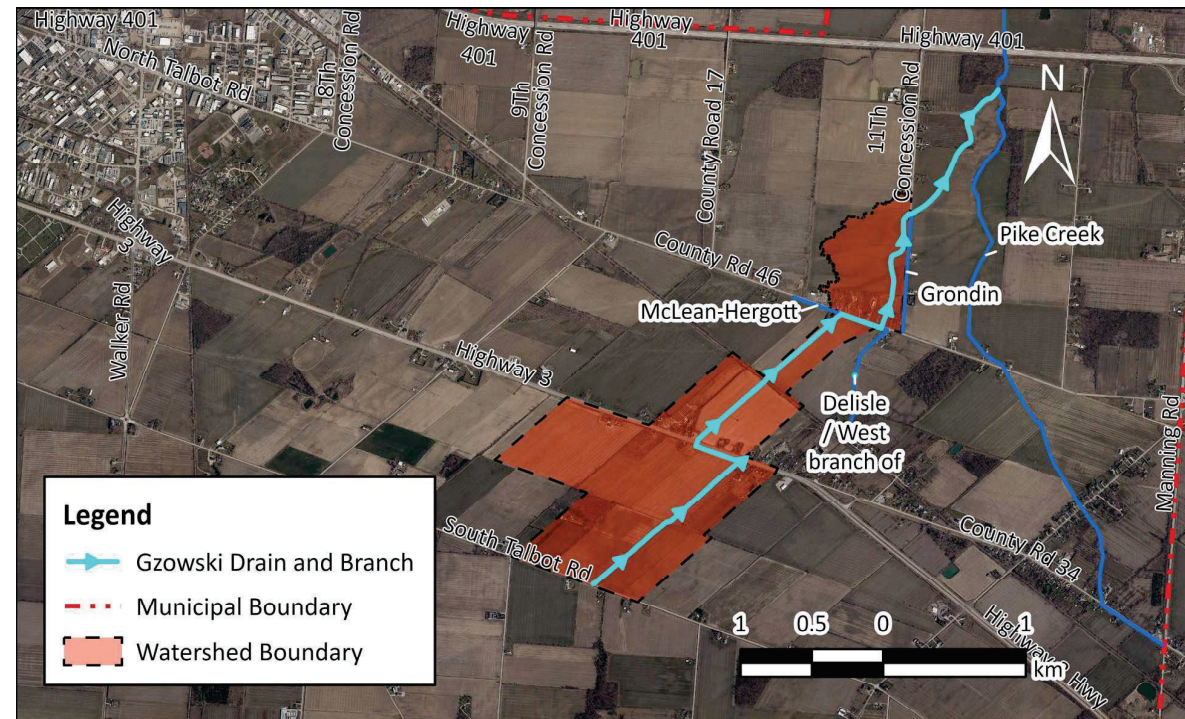
Figure 7: Grondin Drain and Nearby Drains

### 3.2.6 Gzowski Drain and Branch

The Gzowski Drain and Branch (Figure 8) begin at South Talbot Road and flow northerly across Highway 3. Because the engineer's report and the accompanying *Overall Plan* (Dillon Consulting, 2014b) cover the Gzowski Drain alignment only up to the former railway, the remainder of the alignment north of this location was confirmed using the Town's municipal drain GIS layer and the *Gzowski Drain and Branch Location Map* attached to Report PWES-2025-43 (Town of Tecumseh, 2025c). The drain crosses County Road 46 through Culvert 4 (Section 3.3.7) approximately 140 m west of its intersection with County Road 43. It continues north toward Highway 401 to ultimately outlet into the Pike Creek Drain. Based on available information, this drain and branch include both open and closed drain sections (Dillon Consulting, 2014b).

To delineate the contributing catchment for the portion of the drain encompassing County Road 46, the *Overall Plan* (Dillon Consulting, 2014b) and the *Gzowski Drain and Branch Location Map* (Town of Tecumseh, 2025c) were used to establish the general watershed configuration on the south side of County Road 46. This was supplemented with the Sullivan Creek (Rood Engineering, 2023a) and the West Branch Delisle Drain watershed plans (Rood Engineering, 2016) to refine the eastern and western boundaries, respectively. North of County Road 46, the PWES-2025-43 location map depiction of the catchment was found to be inaccurate, as it encompassed lands belonging to the Croft Drain

watershed, which outlets into the Sullivan Creek Drain (refer to **Section 3.2.16**); therefore, the northern portion of the catchment was delineated using DEM analysis to reflect local topography.



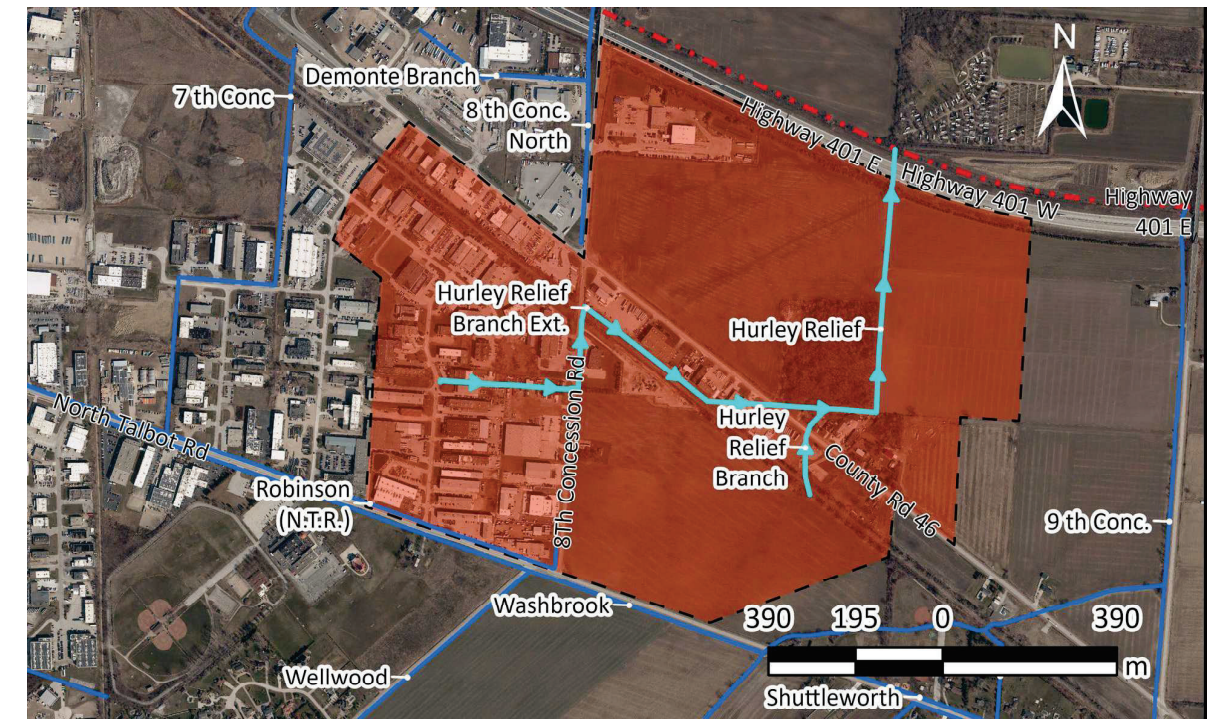
**Figure 8: Gzowski Drain and Nearby Drains**

The catchment shown in **Figure 8** therefore represents only the portion of the Gzowski Drain watershed that encompasses the Study Area (**Figure 1**) and the proposed road improvements, and extends only up to its confluence with the Grondin Drain (**Figure 7**). The drainage area shown also excludes the contributing catchments of McLean-Hergott, West Branch of the Delisle, and the Grondin drains because these are directly affected by the road works and are delineated separately in the current section. However, the catchment shown in **Figure 8** does include upstream contributing catchments such as the Halford and Moynahan Drains. Based on the delineated catchment, the Gzowski Drain appears to receive drainage from a portion of the west side of County Road 43 and from portions of both the north and south sides of County Road 46.

### 3.2.7 Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain

The Hurley Relief Branch Drain (shown as Hurley Relief Branch Ext in **Figure 9**, based on Town's GIS layer) begins 310 m west of 8th Concession Road (Lot 12, Concession 7). It flows eastward and northward and eventually crosses County Road 46 through Culvert 1 (**Section 3.3.2**), approximately 540 m southeast of its intersection with 8th Concession Road, then joins the Upper Part of the Hurley

Relief Drain (shown as Hurley Relief Branch in **Figure 9**, based on Town's GIS layer). This system includes both open and closed drain sections.



**Figure 9: Hurley Relief Drain and Nearby Drains**

The Upper Part of the Hurley Relief Drain begins 140 m south of County Road 46 (Lot 11, Concession 8). It flows north to cross County Road 46 through Culvert 1A (**Section 3.3.3**), approximately 640 m southeast of its intersection with 8th Concession Road and then joins the Hurley Relief Branch Drain. Downstream of this confluence, the system becomes the Hurley Relief Drain.

The Hurley Relief Drain (main drain) begins north of County Road 46 (Lot 12, Concession 8) and flows north through the same lot, crossing Highway 401. The portion within the Town ends at the municipal boundary, but the drain continues beyond it, flowing north and east, and appears to outlet into the Little River.

The catchment shown in **Figure 9** was retrieved from the Hurley Relief Drain watershed plan (Rood Engineering, 2019). Only the area south of Highway 401 is shown, as that is the part affected by the County Road 46 improvements. One modification was made near 8th Concession Road by including the property at 5000 8th Concession Road, since it does not appear to drain to any other system. Based on the delineated catchment, this drain system appears to receive drainage from the east side of 8th Concession Road and from portions of both the north and south sides of County Road 46.

### 3.2.8 Upper Part of the Little River Drain

The Upper Part of the Little River Drain (**Figure 10**) begins immediately north of County Road 46 (Lot 10, Concession 9) and flows northward through Lots 11 and 12 of Concession 9, crossing Highway 401, where its municipally mapped extent ends at the Town boundary. Available 2023 aerial imagery and the engineer’s report suggest that it is an open drain. North of the municipal boundary, the drain continues north until it crosses Baseline Road, where the 1983 engineer’s report identifies the outlet for this system, beyond which the watercourse continues as a tributary of the Little River (C.G. Russell Armstrong, 1983).

The catchment shown in **Figure 10** was delineated using the *Existing Conditions Drainage Plan* in the *Upper Little River Watershed Management Master Plan Class EA* (Stantec Consulting, 2023) to establish the general watershed context. The south limits were refined using the Sullivan Creek Drain *Watershed Plan* (Rood Engineering, 2023a), together with the Talbot-McCarthy Drain (Dillon Consulting, 2007) and the O’Keefe Drain (Dillon Consulting, 2015) overall plans. Based on the delineated catchment, this drain system appears to receive drainage from the east side of 9th Concession Road and from portions of both the north and south sides of County Road 46.

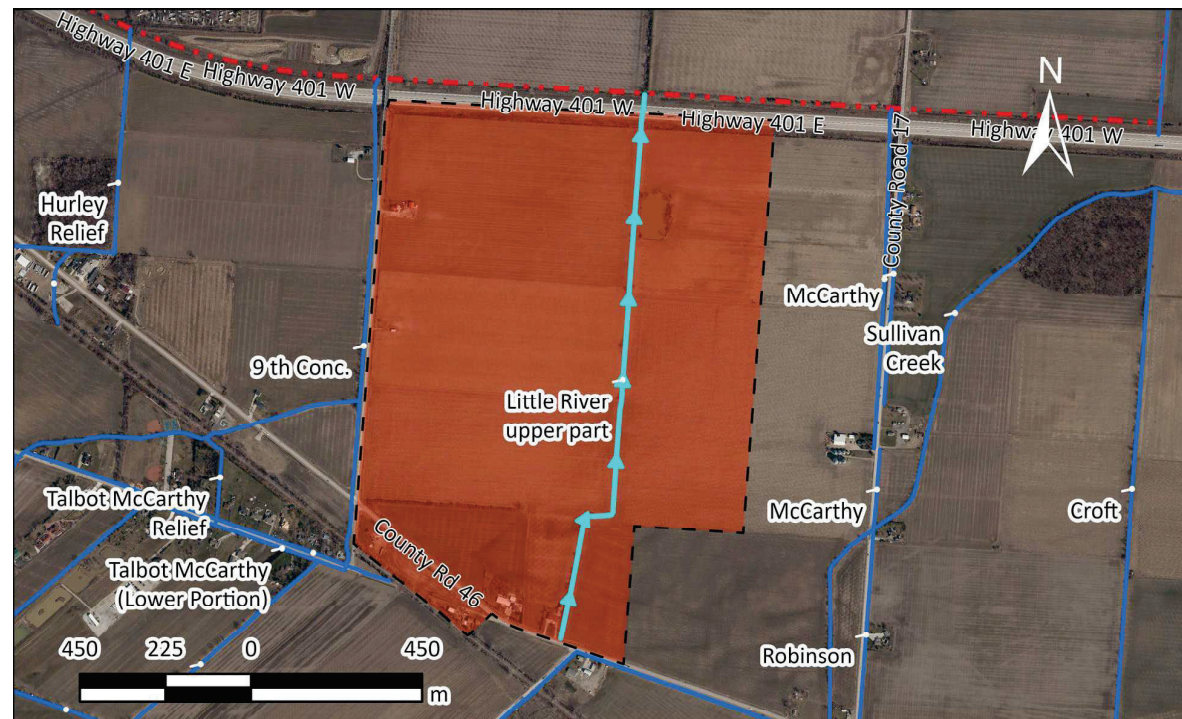


Figure 10: Upper Part of the Little River Drain and Nearby Drains

### 3.2.9 McLean-Hergott Drain

The McLean-Hergott Drain (**Figure 11**) is an open drain located along the south side of County Road 46. According to the drain’s *Watershed Plan* (Rood Engineering, 2021), it has two distinct flow directions originating approximately 610 m southeast of the County Road 46/County Road 17 intersection (near the west end of Lot 298, Concession NTR). One branch flows southeast, remaining south of the County Road 46 right-of-way as it crosses Lot 297, and outlets into the Gzowski Drain. The second branch also begins near the west end of Lot 298, but flows northwest within the County Road 46 right-of-way across the same lot, and drains into the Sullivan Creek Drain immediately upstream of where Sullivan Creek crosses County Road 46 (**Section 3.2.16**).

This drain system is located within the Pike Creek watershed. The catchment shown in **Figure 11** for the McLean-Hergott Drain was based on the overall drainage area shown in the *Watershed Plan* (Rood Engineering, 2021). However, as the plan did not identify the internal drainage divide between the portions of the system draining to the Gzowski and Sullivan Creek drains, available DEM data were used to distinguish these areas. Based on the delineated catchment, the McLean-Hergott Drain appears to receive drainage from a portion of the south side of County Road 46.

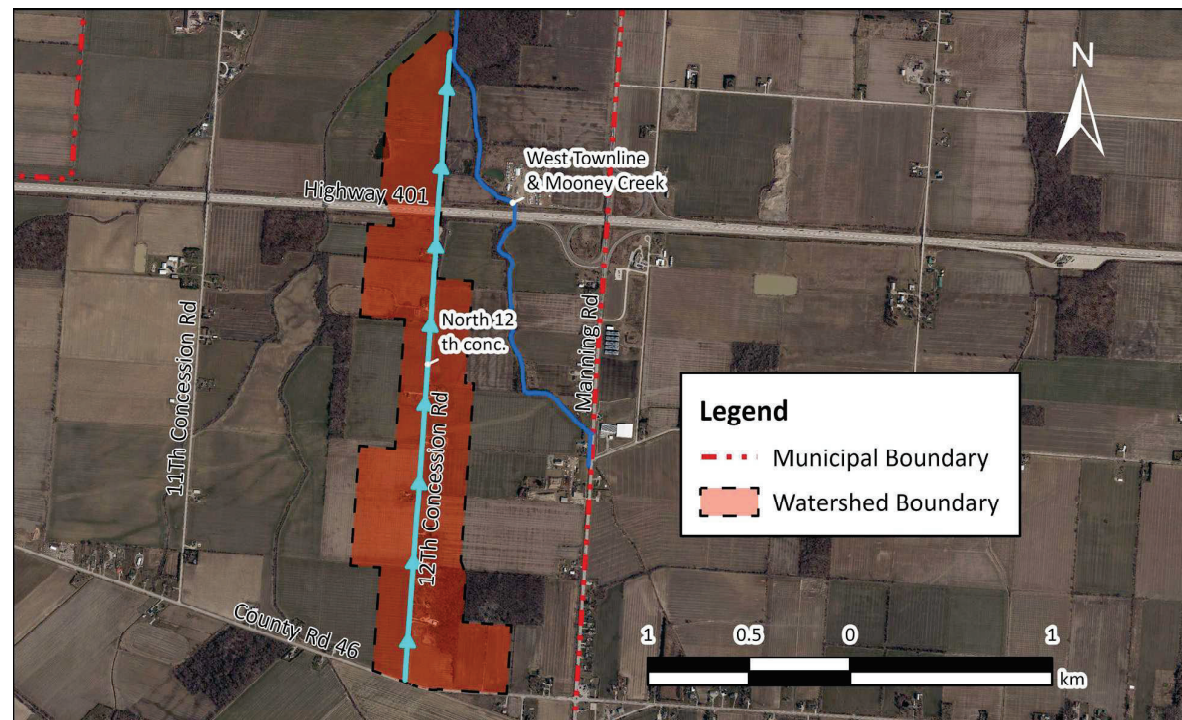


Figure 11: McLean-Hergott Drain and Nearby Drains

### 3.2.10 North 12th Concession

The North 12th Concession Drain (**Figure 12**) is an open drain that begins at the northwest corner of the County Road 46/12th Concession Road intersection and flows north along the west side of 12th Concession Road within the road right-of-way. The drain continues north across Highway 401 and ultimately discharges into the West Townline Drain (R. Dobbin Engineering, 2025).

This drain system is located within the Pike Creek watershed. The catchment area shown in **Figure 12** was retrieved directly from the *North 12th Concession Drain Plan* (R. Dobbin Engineering, 2025) and was not modified for this study. Based on the delineated catchment, the North 12th Concession Drain appears to receive drainage from portions of the north side of County Road 46.

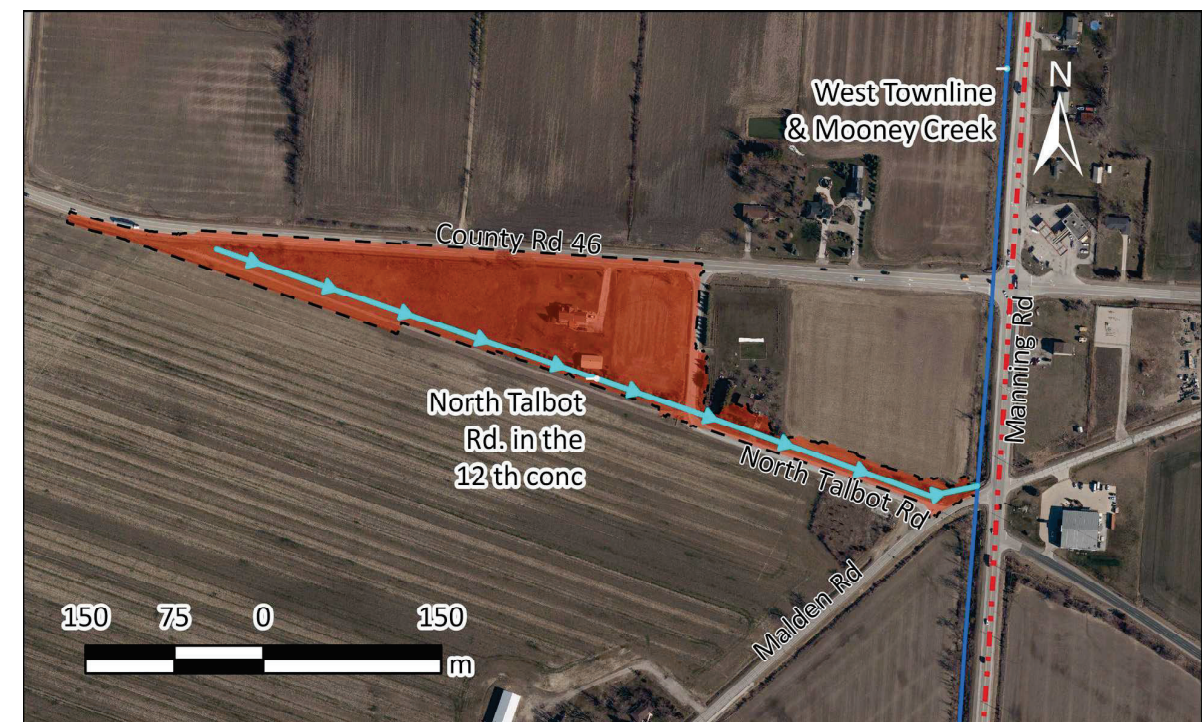


**Figure 12: North 12th Concession and Nearby Drain**

### 3.2.11 North Talbot Road Drain in the 12th Concession

The North Talbot Road Drain (**Figure 13**) is an open drain that begins immediately south of County Road 46 and approximately 670 m west of County Road 19 (Manning Road). From there, it flows southeast, crossing North Talbot Road, and then continues southeast on the north side of North Talbot Road within the road right-of-way. The drain eventually outlets into the West Townline Drain, approximately 170 m south of the County Road 46/County Road 19 intersection.

This drain system is located within the Pike Creek watershed. The plan and profile drawing of the North Talbot Road Drain (C.G. Russell Armstrong Associates, 1967) does not include a catchment area, so the catchment shown in **Figure 13** was delineated using DEM analysis and was refined using the *North 12th Concession Drain Plan* (R. Dobbin Engineering, 2025). Based on the delineated catchment, the North Talbot Road Drain appears to receive drainage from portions of the south side of County Road 46.



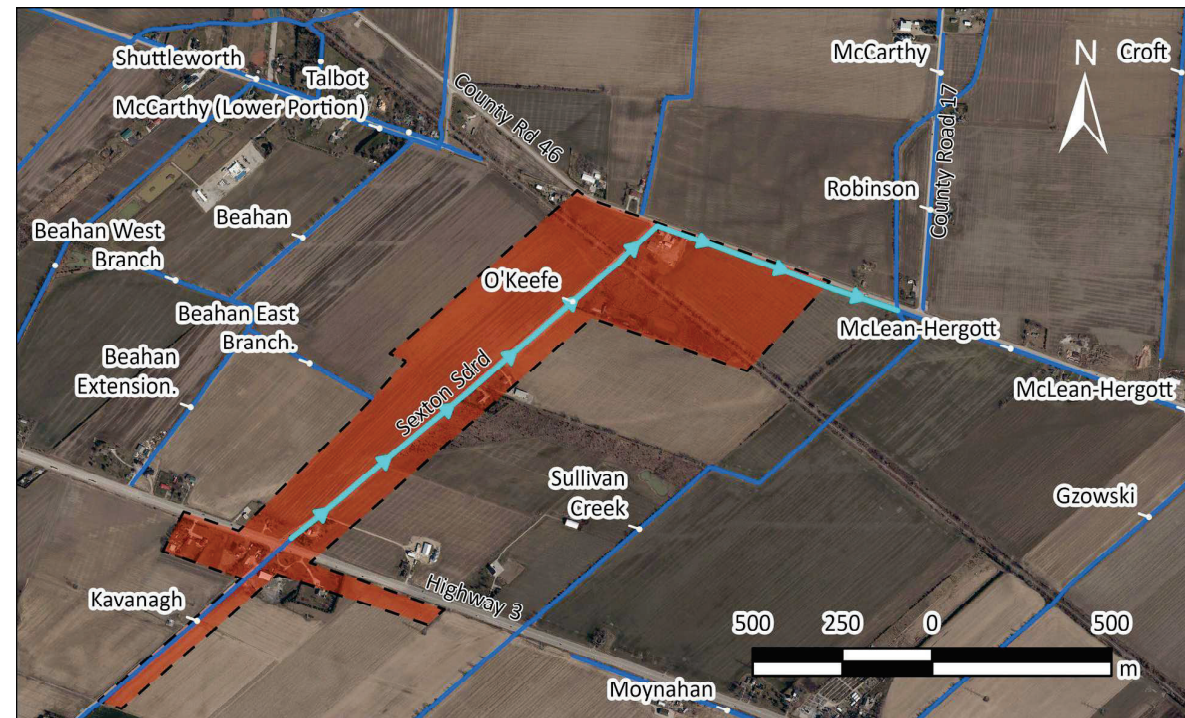
**Figure 13: North Talbot Road Drain in the 12th Concession and Nearby Drain**

### 3.2.12 O’Keefe Drain

The O’Keefe Drain (**Figure 14**) is an open drain beginning immediately north of Highway 3 and flowing northeast along the east side of Sexton Side Road within the road right-of-way to County Road 46. From there, it turns east and continues along the south side of County Road 46 also within its right-of-way to its outlet in the Sullivan Creek Drain, approximately 60 m west of the County Road 46/County Road 17 intersection (Dillon Consulting, 2015). The O’Keefe Drain alignment shown in the engineer’s report and Town’s GIS layer continues east along the south side of County Road 46; however, the watershed boundary in the 2015 report terminates upstream and does not encompass this downstream reach. The report contains no discussion of why this segment lies outside the defined catchment.

This drain system is located within the Pike Creek watershed. The engineer’s report identifies a total watershed area of 53.7 ha for the O’Keefe Drain. The catchment boundary shown in **Figure 14** was

extracted directly from the O’Keefe Drain *Overall Plan* (Dillon Consulting, 2015) and was not modified for this study. Based on the delineated catchment, the O’Keefe Drain appears to receive drainage from portions of the south side of County Road 46.

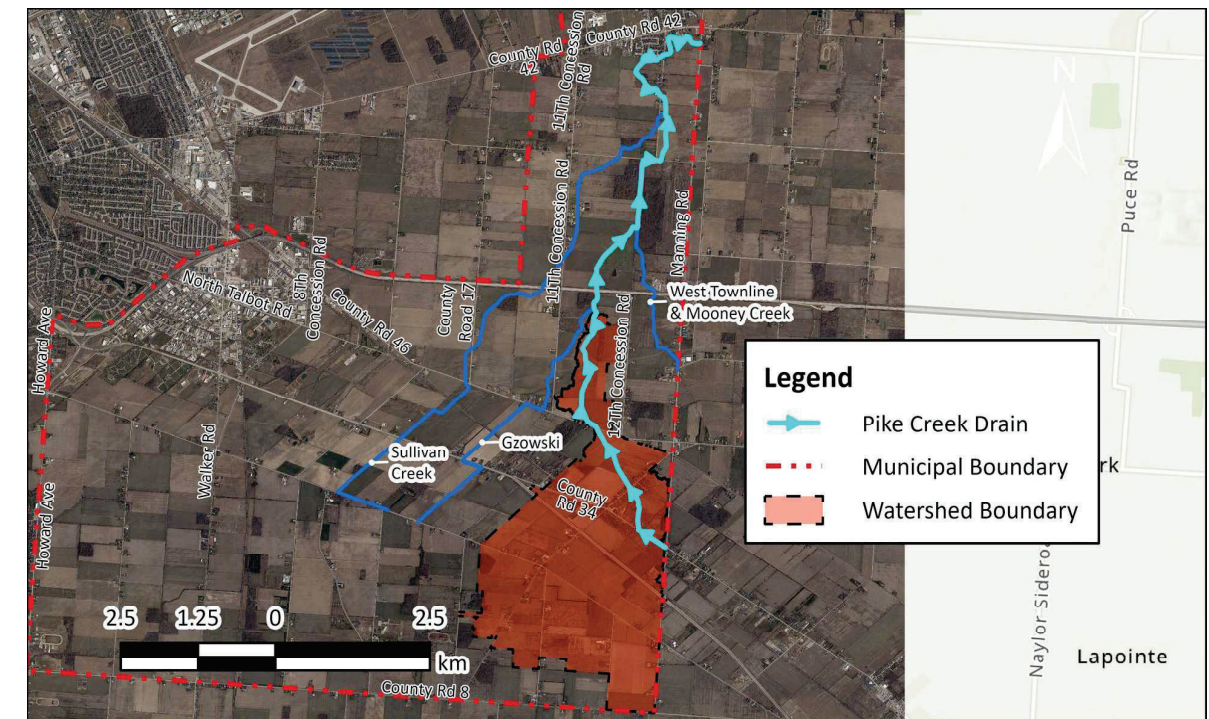


**Figure 14: O’Keefe Drain and Nearby Drains**

### 3.2.13 Pike Creek Drain

The Pike Creek Drain alignment used in this study (**Figure 15**) was extracted from the Town of Tecumseh’s GIS layer. The available engineer’s report (Dillon Consulting, 2014) could not be used to verify the full municipal alignment as it covers only a short reach of the watercourse adjacent to the McLean Bridge.

Within the Town of Tecumseh, the Pike Creek Drain is an open drain that begins at the southwest corner of the County Road 19/County Road 34 intersection and flows generally northward, meandering in places but maintaining an overall northerly direction. The drain crosses County Road 46 approximately 430 m northwest of the County Road 46/12th Concession Road intersection through the Pike Creek Bridge (**Section 3.3.9**), then continues north to cross Highway 401. The drain’s mapped extent within the municipal boundary terminates south of the County Road 42/County Road 19 intersection, where it continues north through the Town of Lakeshore and ultimately outlets into Lake St. Clair (Dillon Consulting, 2014a).



**Figure 15: Pike Creek Drain**

The general watershed context for Pike Creek was obtained from the *Pike Creek Watershed Area* attached to Report PWES-2025-33 (Town of Tecumseh, 2025a). Refinement of the northern portion of the catchment was completed using the *North 12th Concession Drain Plan* (R. Dobbin Engineering, 2025) together with DEM analysis. Refinement on the east side was based on the delineated catchment boundary for the West Townline and Mooney Creek Drains (**Section 3.2.19**). The displayed catchment extends north only to the confluence of the Pike Creek Drain with the Gzowski Drain (**Figure 8**), located approximately 270 m south of Highway 401, as this is the portion considered relevant to the Study Area (**Figure 1**). Based on the delineated catchment, the Pike Creek Drain appears to receive drainage from portions of both sides of County Road 46.

### 3.2.14 Robinson Drain

The Robinson Drain (**Figure 16**) is an open drain that begins at the northeast corner of the County Road 46/County Road 17 intersection and flows north along the east side of County Road 17 within the road right-of-way. The drain outlets into the Sullivan Creek Drain approximately 570 m north of County Road 46.

This drain system is located within the Pike Creek watershed. The plan and profile drawing of the Robinson Drain in the 1962 engineer’s report (C.G. Russell Armstrong, 1962a) does not include watershed mapping. Therefore, the catchment area shown in **Figure 16** was delineated using DEM

analysis. Based on the delineated catchment, the Robinson Drain appears to receive drainage from the east side of County Road 17 along its reach, and portions of the north side of County Road 46.

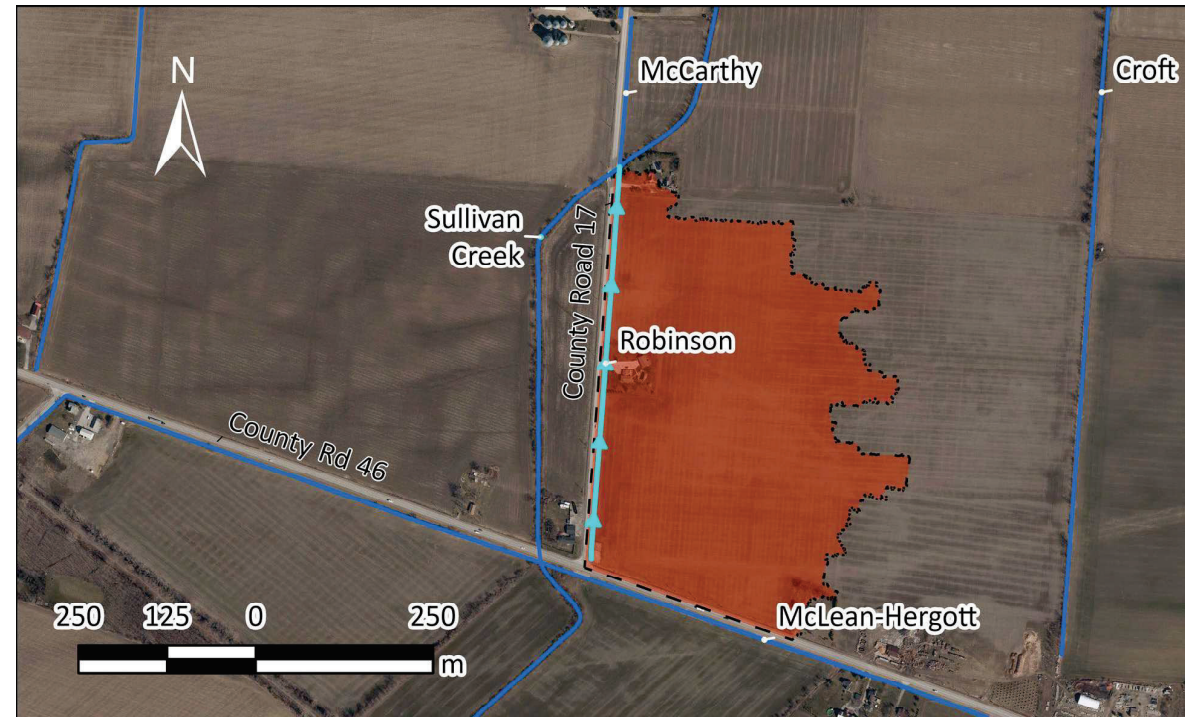


Figure 16: Robinson Drain and Nearby Drains

### 3.2.15 Ruston Drain

The Ruston Drain (Figure 17) begins south of County Road 46 near the line between the east half and west half of Lot 295 in the NTR Concession (C.G. Russell Armstrong, 1982). From this location, it flows westerly to the east end of Lot 296 of the same concession then turns north and continues flowing toward County Road 46. The drain crosses County Road 46 through Culvert 4A (Section 3.3.8) approximately 625 m northwest of the County Road 46/12th Concession Road intersection and ultimately discharges into the Pike Creek Drain north of County Road 46 (south end of Lot 9, Concession 11). Available 2023 aerial imagery and the engineer’s report suggest that the drain is open.

This drain system is located within the Pike Creek watershed. The plan and profile drawing of the Ruston Drain (C.G. Russell Armstrong, 1982) does not include a catchment boundary, so the contributing watershed shown in Figure 17 was delineated using DEM analysis. Refinement on the west side of the catchment was completed using the West Branch Delisle Drain Watershed Plan (Rood Engineering, 2016). Based on the delineated catchment, the Ruston Drain appears to receive drainage from portions of both sides of County Road 46.



Figure 17: Ruston Drain and Nearby Drains

### 3.2.16 Sullivan Creek Drain

The Sullivan Creek Drain (Figure 18) is an open drain that begins within the right-of-way of South Talbot Road, where it flows west and then turns north. Upon turning north, according to the engineer’s report (Dillon Consulting, 2023), the upper portion of the drain lies approximately 740 m east of Sexton Side Road and runs through Lots 299 in the Concession STR, and Lots 298 and 299 in the NTR Concession, toward County Road 46. The drain crosses County Road 46 through Culvert 3 (see Section 3.3.6) approximately 70 m northwest of the County Road 46/County Road 17 intersection. The drain continues north, crossing Highway 401, and it ultimately outlets into the Pike Creek Drain at a location north of Baseline Road and west of County Road 19 (Dillon Consulting, 2023).

The catchment area shown in Figure 18 was obtained from the Sullivan Creek Drain Watershed Plan (Rood Engineering, 2023a). Only the catchment area directly contributing to the Sullivan Creek Drain is shown. The catchment shown excludes the contributing catchments of the McLean-Hergott, Gzowski, and O’Keefe drains on the south side of County Road 46, and the Robinson Drain on the north side, as these are delineated and assessed individually within this study.

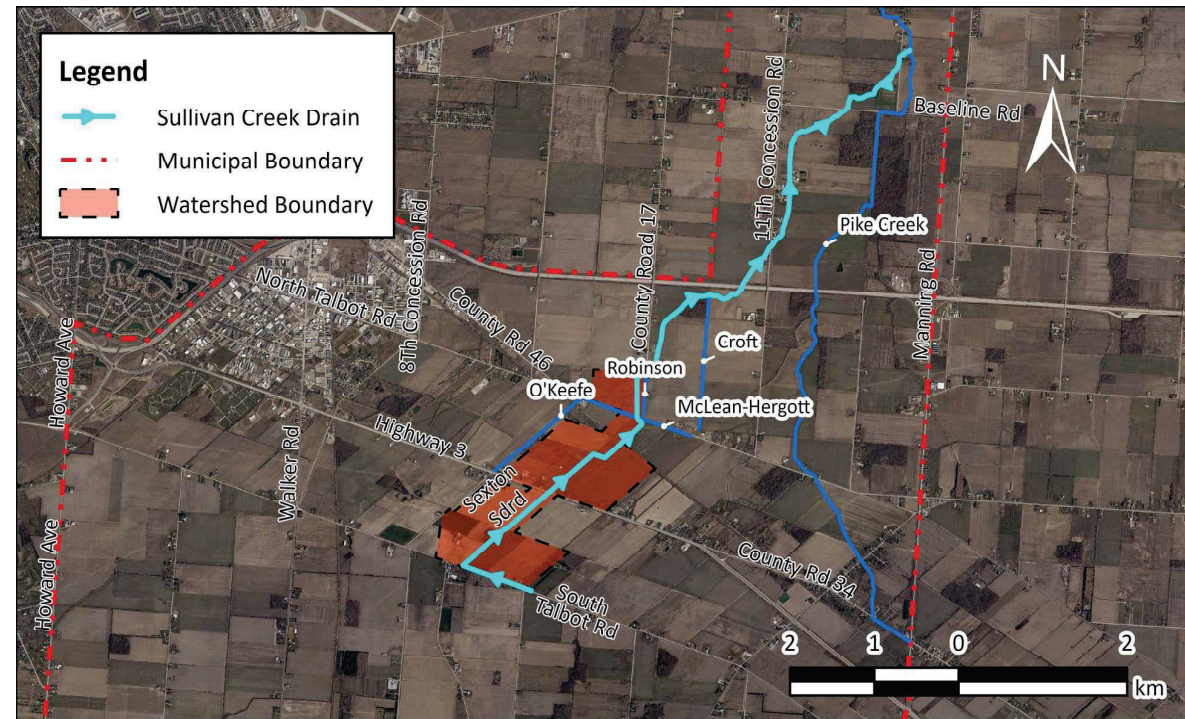


Figure 18: Sullivan Creek Drain and Nearby Drains

The displayed catchment is also limited to the portion considered relevant to the Study Area (Figure 1). The delineation was limited up to the point where the Sullivan Creek Drain receives flow from the Robinson Drain (see Figure 16). Based on the delineated catchment, the Sullivan Creek Drain appears to receive drainage from portions of the west side of County Road 17, and both sides of County Road 46.

### 3.2.17 Washbrook Drain

The Washbrook Drain alignment shown in Figure 19 was extracted from the Town of Tecumseh GIS layer and reviewed against the 2010 Washbrook drainage report (Bruce D. Crozier Engineering) and the 9th Concession Drain engineer's report (Bruce D. Crozier Engineering, 1988). The 2010 report covers only the enclosed section of the drain along North Talbot Road. Based on the Town's GIS layer, the drain appears to begin approximately 330 m east of the North Talbot Road/Walker Road intersection and continue southeast along the south side of North Talbot Road. The 2010 Washbrook Drain report does not show the upstream part of the drain. However, together with the Town's GIS mapping, it indicates that the enclosed section ends immediately south of the North Talbot Road/8th Concession Road intersection. From there, the drain continues northeast toward County Road 46, crossing the road through Culvert 2 (Section 3.3.4) approximately 350 m northwest of its intersection with 9th Concession Road. It continues northwest and ultimately outlets into the 9th Concession Drain (Figure

5). Available 2023 aerial imagery and the engineer's report suggest that the drain is open in this latter reach.

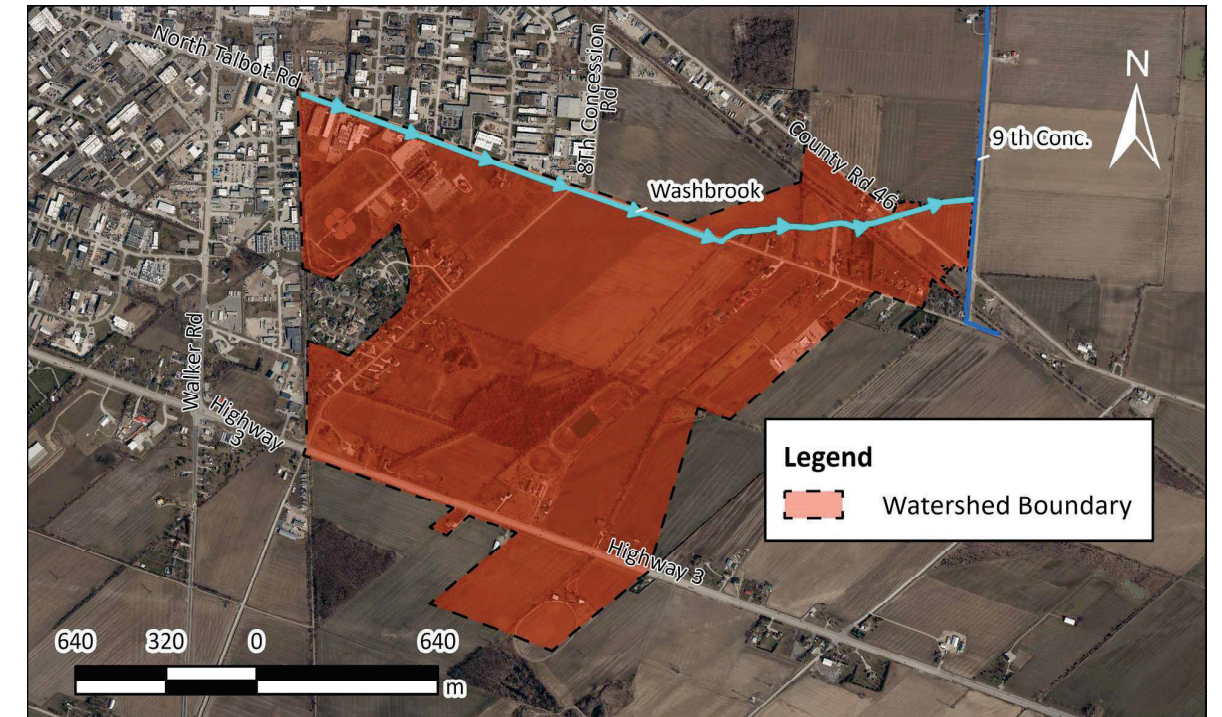


Figure 19: Washbrook Drain and Nearby Drain

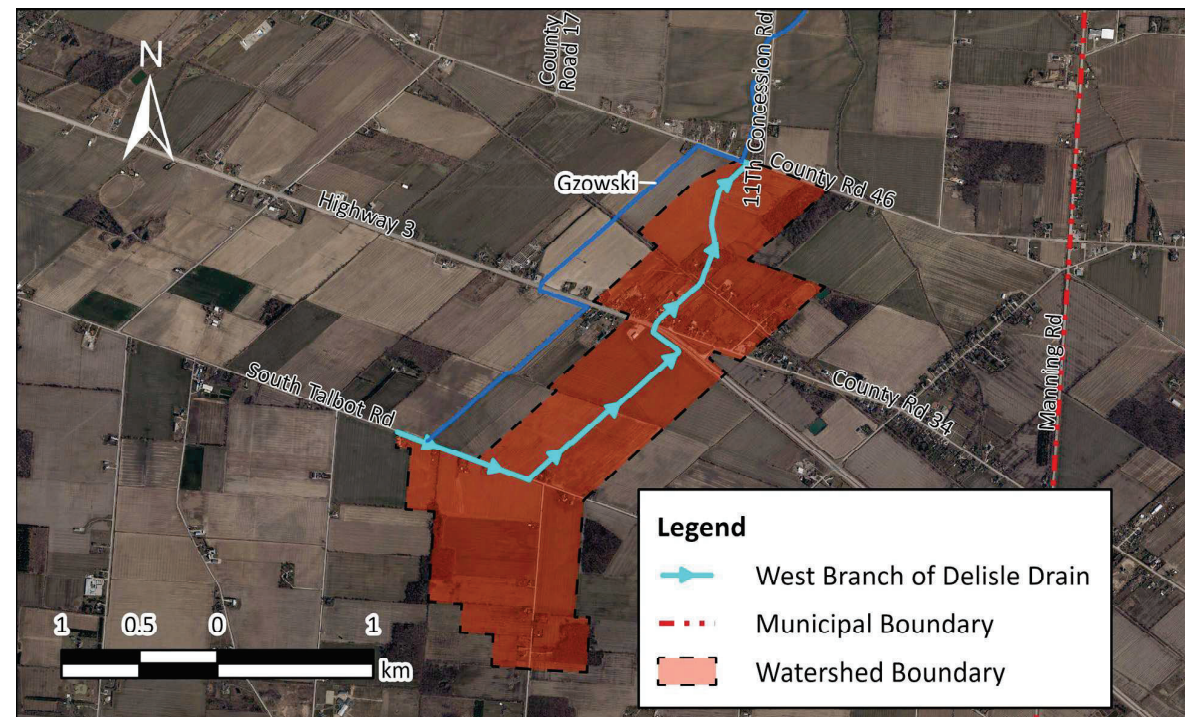
This drain system is located within the Little River watershed. The 2010 engineer's report for the Washbrook Drain provides plan and profile drawings for the enclosed portion of the drain, but does not include any catchment boundary or watershed mapping. To delineate the contributing area for this study, the overall drainage area context was first established using the 9th Concession Drain plan and profile drawing (Bruce D. Crozier Engineering, 1988) and the *Little River Watershed Map and Study Area Map* (Dillon Consulting, 2023). The catchment was further refined on the west side using catchment information from the Hurley Relief Branch Drain (Rood Engineering, 2019) and the *Shuttleworth Drain Watershed Plan* (Rood Engineering, 2023b), on the south and east sides using the *Talbot-McCarthy Drain Overall Plan (Lower Portion)* (Dillon Consulting, 2007), and on the north side using DEM analysis. Based on the delineated catchment, the Washbrook Drain appears to receive drainage from portions of both sides of County Road 46.

### 3.2.18 West Branch Delisle Drain

The West Branch Delisle Drain (Figure 20) is an open drain that begins on the south side of South Talbot Road, flows southeast, then turns north, crossing South Talbot Road and continuing northerly

through Lots 296 and 297 in the Concession STR. The drain outlets into the Gzowski Drain immediately south of County Road 46, approximately 140 m northwest of its intersection with County Road 43.

This drain system is located within the Pike Creek watershed. The catchment area shown in **Figure 20** was retrieved directly from the West Branch Delisle Drain *Watershed Plan* (Rood Engineering, 2016) and was not modified for this study. Based on the delineated catchment, the West Branch Delisle Drain appears to receive drainage from portions of the south side of County Road 46.



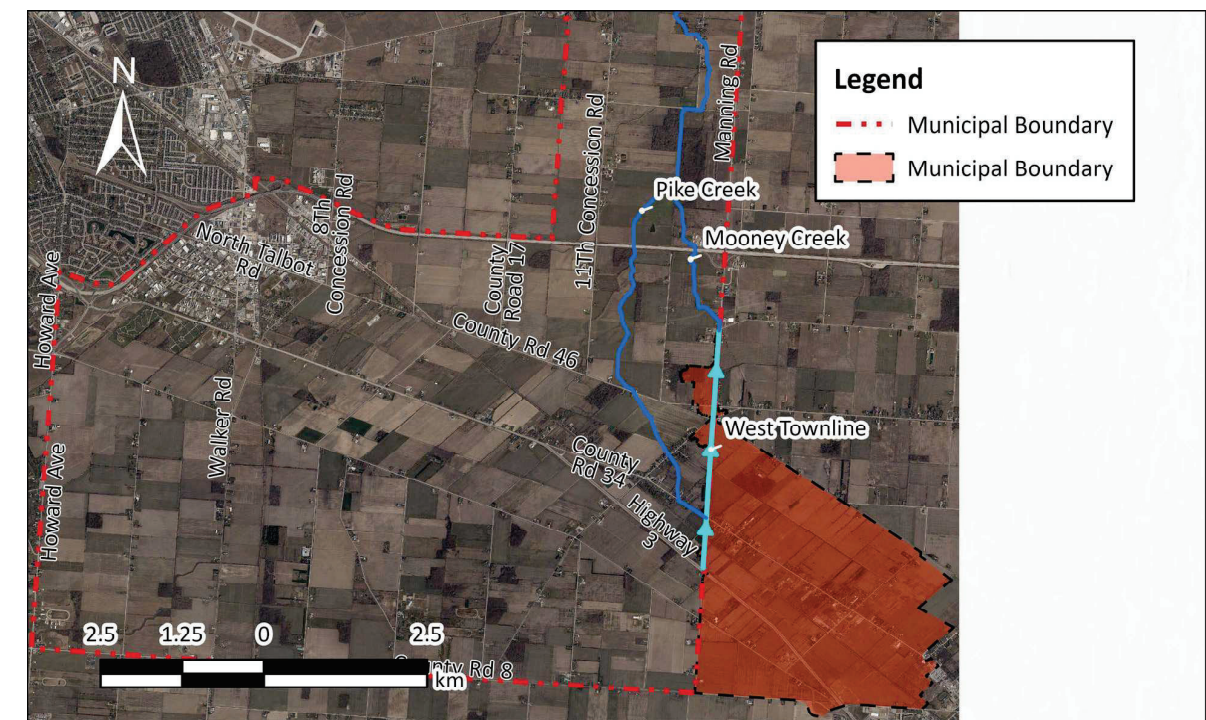
**Figure 20: West Branch Delisle Drain and Nearby Drain**

### 3.2.19 West Townline Drain

Based on the Town’s GIS layer and engineer’s report (C.G. Russell Armstrong, 1978b), the West Townline Drain (**Figure 21**) begins at the northwest corner of the Highway 3/County Road 19 intersection, flowing north within the County Road 19 right-of-way. The drain crosses County Road 46 immediately west of its intersection with County Road 19 through Culvert 4B (**Section 3.3.10**) and continues northward. At the point where it meets a watercourse named Croft, the system appears to transition to the Mooney Creek Drain, which continues flowing north and ultimately outlets into the Pike Creek Drain. Available 2023 aerial imagery and the engineer’s report suggest that it is an open drain system.

The drainage area plan of the West Townline Drain (C.G. Russell Armstrong, 1978b) does not provide any catchment mapping. As a starting point, the *Pike Creek Watershed Area* attached to Report

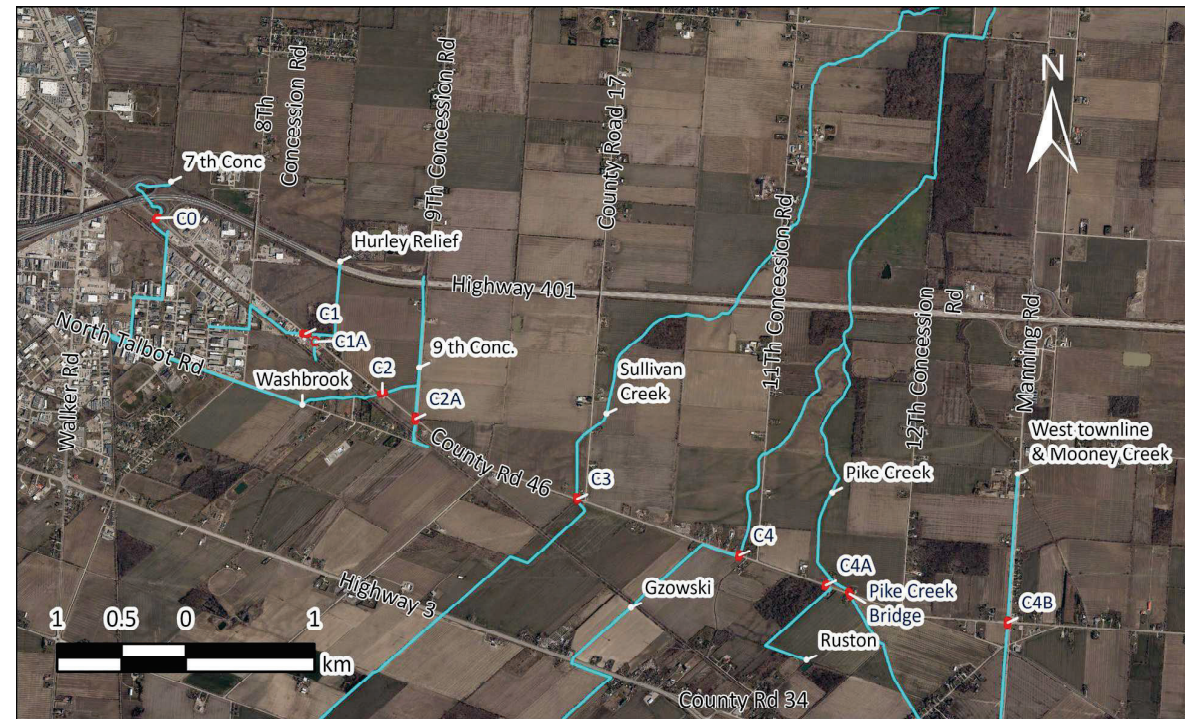
PWES-2025-33 (Town of Tecumseh, 2025a) was used to establish the overall watershed context. From this base, DEM analysis was applied to determine the northern and western limits of the catchment area contributing to the West Townline Drain. The northern limits were further refined using the *North 12th Concession Drain Plan* (R. Dobbin Engineering, 2025). Based on the delineated catchment, the West Townline Drain appears to receive drainage from portions of both sides of County Road 46.



**Figure 21: West Townline Drain and Nearby Drains**

### 3.3 Culvert and Bridge Inventory

The culvert and bridge crossings along County Road 46 were identified through review of BTE’s *County Road 46 E Cross Culverts & Pike Creek Bridge – Recommendations* (2025), desktop analysis, and the municipal drain review presented in **Section 3.2**. The culvert and bridge crossings are illustrated in **Figure 22** and described below.



**Figure 22: Cross Culvert Locations**

### 3.3.1 Culvert 0

This structure is in line with the 7th Concession Drain (**Section 3.2.1**). According to the 7th Concession Drain's repair and improvements report (Baird, 2017), Culvert 0 was expected to be constructed as an 1800 mm diameter CSP culvert. The culvert is outside the project limits (**Attachment C**).

### 3.3.2 Culvert 1

This structure is a 2000 mm diameter CSP culvert and is in line with the Hurley Relief Branch Drain (**Section 3.2.7**).

### 3.3.3 Culvert 1A

This structure is in line with the Upper Part of the Hurley Relief Drain and according to the plan drawing (Rood Engineering, 2019), is a 900 mm CSP culvert.

### 3.3.4 Culvert 2

This structure is a 2000 mm diameter CSP culvert and is in line with the Washbrook Drain (**Section 3.2.17**).

### 3.3.5 Culvert 2A

This structure is in line with the 9th Concession Drain (**Section 3.2.3**) and according to the profile plan (Bruce D. Crozier Engineering, 1988), appears to be a concrete box culvert with a 1.5 m span.

### 3.3.6 Culvert 3

This crossing consists of twin 2000 mm diameter CSP culverts and is in line with the Sullivan Creek Drain (**Section 3.2.16**).

### 3.3.7 Culvert 4

This structure is a concrete box culvert with a 3850 mm span and 2800 mm rise and is in line with the Gzowski Drain (**Section 3.2.6**).

### 3.3.8 Culvert 4A

This structure is in line with the Ruston Drain (**Section 3.2.15**) and according to the engineer's report (C.G. Russell Armstrong, 1982), it appears to be a 750 mm (30 in) diameter corrugated iron pipe.

### 3.3.9 Pike Creek Bridge

This structure is a concrete bridge at the Pike Creek crossing (**Section 3.2.13**) with an approximate span of 8000 mm and rise of 2400 mm.

### 3.3.10 Culvert 4B

This structure is in line with the West Townline Drain (**Section 3.2.19**). The engineer's report (C.G. Russell Armstrong, 1978b) does not include information about the crossing at this location.

## 4.0 PROPOSED CONDITIONS (TECHNICALLY PREFERRED PLAN)

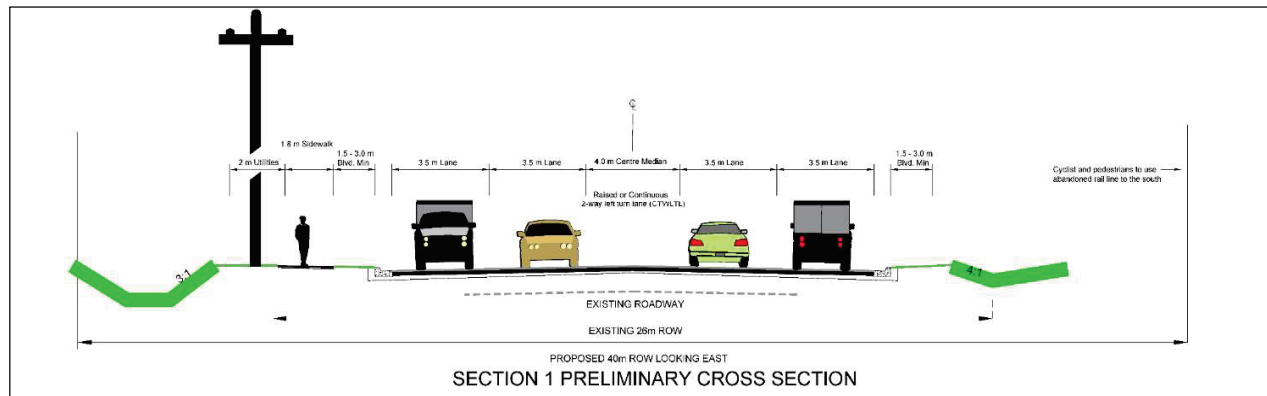
### 4.1 Road Cross-Section Improvements

This section summarizes the proposed improvements to County Road 46 and 8th and 9th Concession Roads under the Technically Preferred Plan, based on BTE's *Draft Analysis and Evaluation Report* (2025). Cross-section changes are described below. Preliminary Design Drawings illustrating the proposed roadway layout and right-of-way features are provided in **Attachment C**.

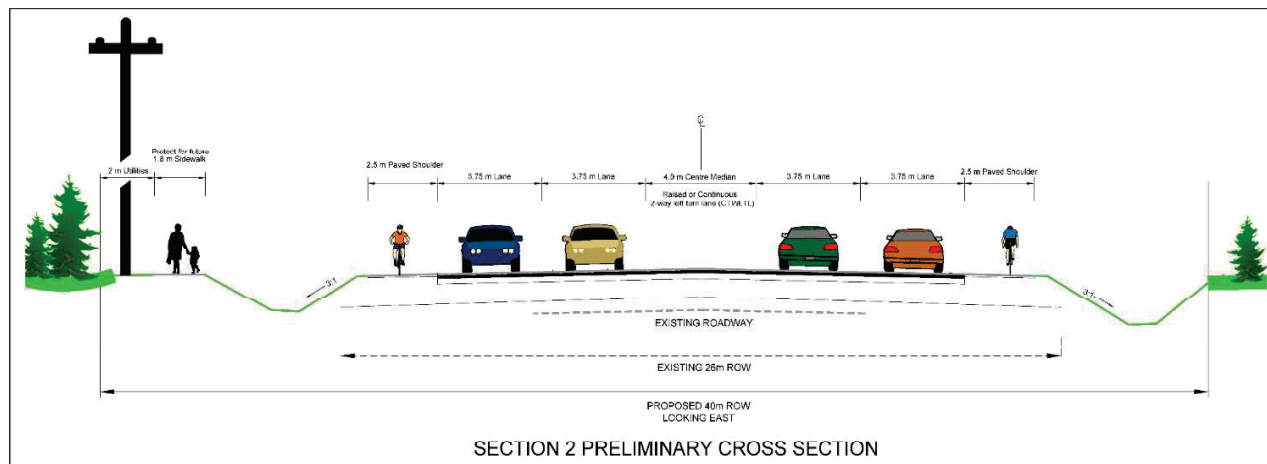
#### 4.1.1 County Road 46

County Road 46 improvements are proposed from east of Highway 401 to County Road 19. Within these limits, the Technically Preferred Plan includes three cross-section segments:

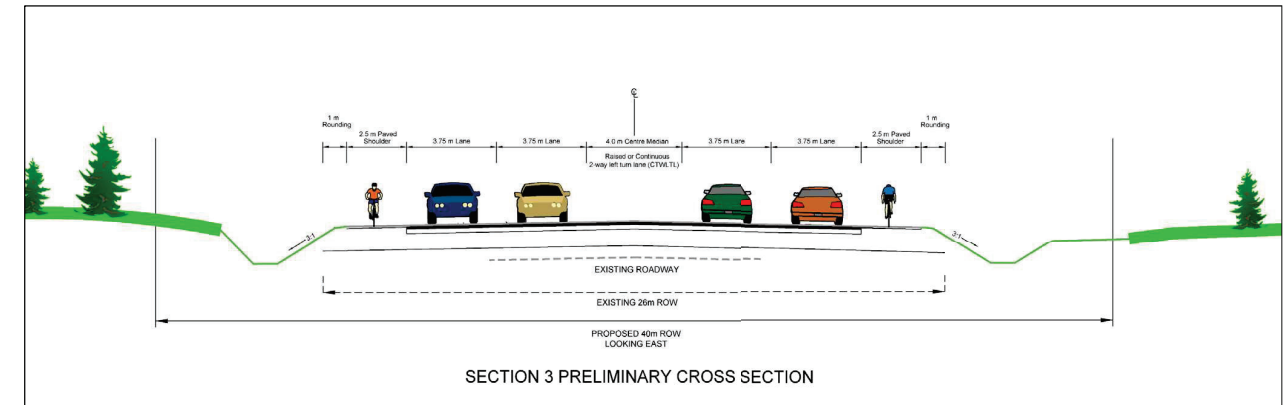
- **Section 1:** From Highway 401 to 8th Concession Road (670 m), County Road 46 will be improved to a five-lane urban cross-section with a sidewalk on the north side, a continuous two-way left-turn lane, and roadside ditches on both sides of the road as shown in **Figure 23**.
- **Section 2:** From 8th Concession Road to a point east of the future Lauzon Parkway Intersection (**Attachment C**; 2.1 km), County Road 46 will be improved to a five-lane rural cross-section with paved shoulders, a sidewalk on the north side, a continuous two-way left-turn lane, and roadside ditches on both sides of the road (with the north-side ditch located between the shoulder and sidewalk) as shown in **Figure 24**.
- **Section 3:** From the future Lauzon Parkway Intersection to County Road 19 (4.3 km), County Road 46 will be improved to a five-lane rural cross-section with a continuous two-way left-turn lane and roadside ditches on both sides of the road as shown in **Figure 25**.



**Figure 23: County Road 46 Section 1 Proposed Cross-Section**



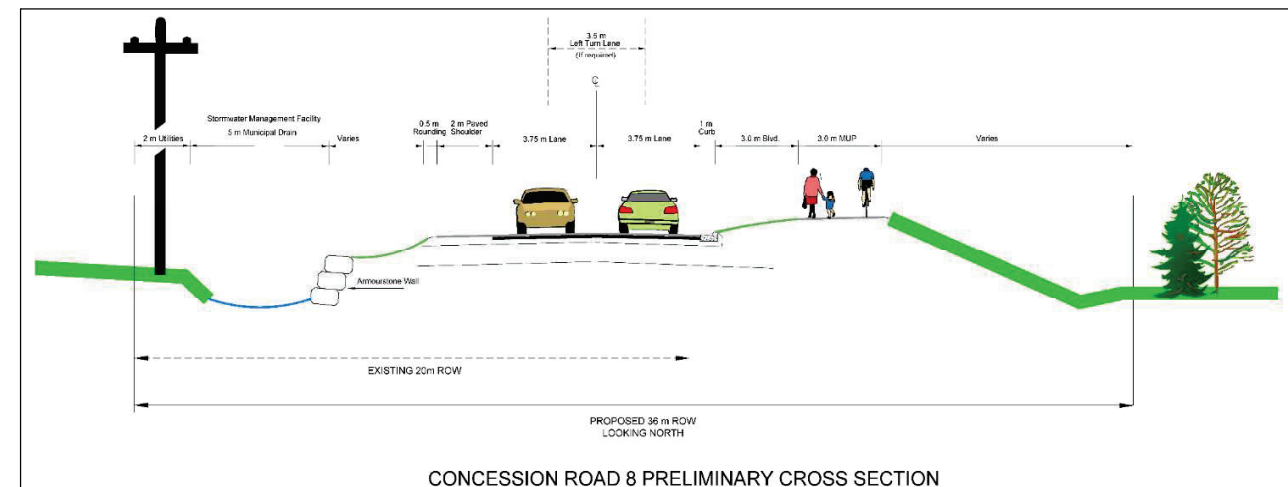
**Figure 24: County Road 46 Section 2 Proposed Cross-Section**



**Figure 25: County Road 46 Section 3 Proposed Cross-Section**

#### 4.1.2 8th Concession Road

From County Road 46 to Highway 401 (436 m), 8th Concession Road will be improved to a two-lane semi-urban cross section with a paved shoulder on the west side of the road and an urban cross section with curb and gutter on the east side. A multi-use path (MUP) will be provided on the east side. On the west side, an armour stone wall will be located immediately east of the 8th Concession Drain (**Section 3.2.2**), which will maintain its existing alignment (**Attachment C**). **Figure 26** illustrates these improvements.

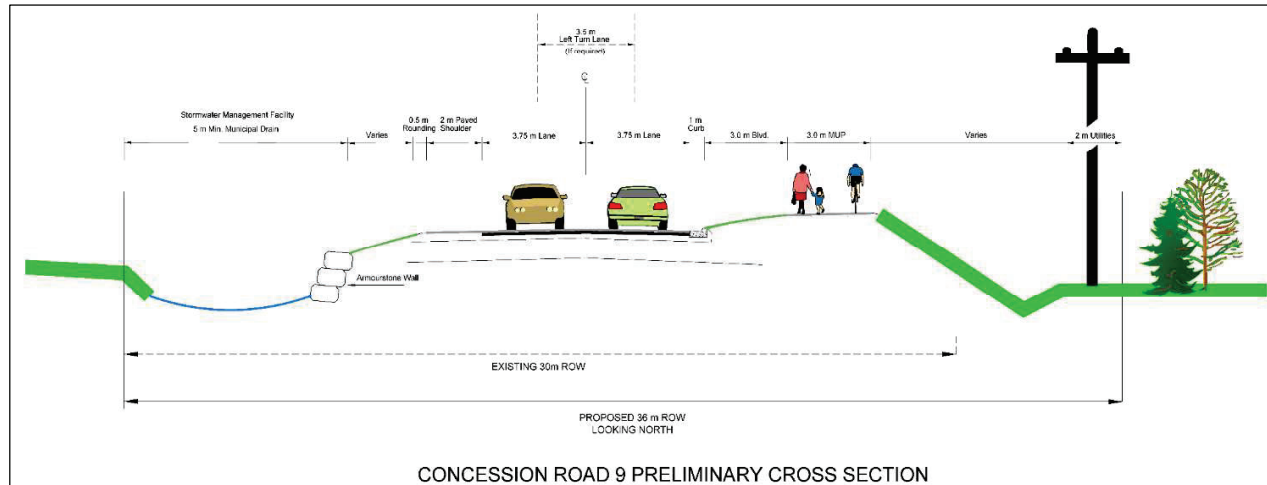


**Figure 26: 8th Concession Road Proposed Cross-Section**

#### 4.1.3 9th Concession Road

From County Road 46 to Highway 401 (1 km), 9th Concession Road will be improved to a two-lane semi-urban cross section with a paved shoulder on the west side of the road and an urban cross section with curb and gutter on the east side. An MUP will be provided on the east side. On the west

side, an armour stone wall will be located immediately east of the 9th Concession Drain (**Section 3.2.3**), which will maintain its existing alignment (**Attachment C**). **Figure 27** illustrates these improvements.



**Figure 27: 9th Concession Road Proposed Cross-Section**

#### 4.2 Road Intersection Improvements

The proposed improvements include seven (7) intersections along County Road 46.

- Roundabouts at 8th and 9th Concession Roads.
- Signalized four-legged intersections at Lauzon Parkway and County Road 19.
- Unsignalized three-legged intersections at County Road 17, County Road 43, and 12th Concession Road.

### 5.0 INCREASE IN IMPERVIOUSNESS

#### 5.1 Methodology

Existing imperviousness was estimated using SWOOP 2015 orthophotography, with land cover classification completed in ArcGIS Pro to generate the existing conditions land use raster. The proposed land use raster was developed by converting the Preliminary Design roadway polygons (see **Attachment C**) to raster format and integrating these into the existing raster.

The increase in imperviousness was calculated within the right-of-way off the roads for each municipal drain; therefore, only the portion of each drain catchment within the right-of-way was analyzed (Figure B-1).

Runoff coefficients (C) were assigned by overlaying land use, slope class (derived from the DEM), and soils (Soil Survey Complex layer). Design Chart 1.07 (Rural) from the *Drainage Management Manual*

(MTO) was then applied under both existing and proposed conditions. A more detailed description of this methodology is provided in **Attachment B**.

The land use rasters developed for this study are intended for preliminary assessment only. Both the existing and proposed condition rasters should be confirmed and refined during detail design using final grading, updated survey and topographic information, and other more comprehensive datasets as they become available. The proposed condition raster is based on preliminary corridor design information.

#### 5.2 Catchments and Imperviousness Results Overview

**Table 1** summarizes the estimated existing and proposed composite runoff coefficients and imperviousness for the portion of each municipal drain catchment within the roads right-of-way.

**Table 1: Summary of Composite C Values and Imperviousness**

| Catchment (Drain)                    | ROW Area (ha) | Ex C Value | Prop C Value | Δ C Value | Ex Imperv. (%) | Prop Imperv. (%) | Δ Imperv. (%) |
|--------------------------------------|---------------|------------|--------------|-----------|----------------|------------------|---------------|
| 7th Concession                       | 0.66          | 0.80       | 0.82         | 0.02      | 74.67          | 76.53            | 1.86          |
| 8th Concession Drain North           | 2.65          | 0.70       | 0.76         | 0.06      | 51.73          | 56.28            | 4.54          |
| 9th Concession                       | 2.20          | 0.66       | 0.70         | 0.03      | 44.89          | 39.52            | -5.38         |
| Croft                                | 1.12          | 0.65       | 0.86         | 0.21      | 38.89          | 79.49            | 40.59         |
| Grondin                              | 0.88          | 0.65       | 0.83         | 0.18      | 36.17          | 76.35            | 40.19         |
| Gzowski Drain and Branch             | 1.76          | 0.60       | 0.80         | 0.20      | 39.29          | 70.87            | 31.58         |
| Hurley Relief Drain                  | 8.53          | 0.64       | 0.77         | 0.13      | 38.53          | 63.90            | 25.37         |
| McLean-Hergott (to Gzowski)          | 0.92          | 0.67       | 0.82         | 0.15      | 38.84          | 67.61            | 28.77         |
| McLean-Hergott (to Sullivan Creek)   | 1.27          | 0.67       | 0.81         | 0.14      | 41.50          | 65.26            | 23.76         |
| North 12th Concession                | 1.54          | 0.69       | 0.83         | 0.14      | 40.73          | 71.13            | 30.40         |
| North Talbot Road Drain              | 1.61          | 0.66       | 0.78         | 0.13      | 37.49          | 62.61            | 25.12         |
| O'Keefe                              | 4.12          | 0.64       | 0.76         | 0.12      | 23.61          | 51.66            | 28.05         |
| Pike Creek                           | 2.56          | 0.65       | 0.79         | 0.14      | 34.53          | 62.48            | 27.95         |
| Robinson                             | 0.63          | 0.69       | 0.83         | 0.13      | 47.75          | 72.84            | 25.10         |
| Ruston                               | 0.90          | 0.63       | 0.79         | 0.17      | 41.55          | 70.20            | 28.66         |
| Sullivan Creek                       | 2.04          | 0.64       | 0.82         | 0.18      | 35.67          | 72.47            | 36.80         |
| Upper Part of the Little River Drain | 11.30         | 0.58       | 0.73         | 0.16      | 16.00          | 53.07            | 37.07         |
| Washbrook                            | 2.05          | 0.63       | 0.73         | 0.10      | 37.72          | 51.84            | 14.12         |
| West Branch Delisle Drain            | 1.38          | 0.62       | 0.76         | 0.15      | 42.67          | 64.49            | 21.83         |
| West Townline                        | 5.25          | 0.69       | 0.81         | 0.12      | 36.46          | 64.62            | 28.16         |

As shown in **Table 1**, the proposed roadway improvements generally increase both composite runoff coefficient and percent imperviousness across the catchments within the right-of-way. The largest increases occur at the Croft, Grondin, and Sullivan Creek drains, where imperviousness increases by

approximately 41%, reflecting the concentration of intersection modifications and roadway widening within relatively small contributing areas. A similarly high increase is observed for the Upper Part of the Little River Drain (37% increase), where the proposed condition reflects not only roadway widening but also the urbanization associated with the future Lauzon Parkway.

Moderate increases in the range of 20-30% are observed across the majority of catchments, including in the Hurley Relief, O’Keefe, and West Townline drains, where the larger right-of-way drainage areas distribute the impact of the proposed works. The 9th Concession catchment is an exception, showing a slight decrease in percent imperviousness despite additional roadway being introduced, which reflects an adjustment to the contributing drainage boundary under proposed conditions, as discussed below.

In a few locations, the comparison between existing and proposed conditions was also influenced by minor changes in contributing drainage limits. Where roadway alignment, crown, or grading changes are expected to alter runoff direction, the proposed drainage boundary was adjusted to reflect the expected drainage pattern under proposed conditions. As a result, changes in composite runoff coefficient and percent imperviousness should be considered together with the corresponding change in contributing area. This is particularly relevant where a catchment becomes slightly larger under proposed conditions, which can reduce the reported percent imperviousness even where additional roadway surface is introduced, as in the case of the 9th Concession drain portion within the right-of-way.

## 6.0 STORMWATER MANAGEMENT AND CULVERT CONSIDERATIONS

This section discusses stormwater management and culvert considerations associated with the proposed roadway improvements.

### 6.1 Stormwater Management

The proposed roadway improvements are expected to increase runoff and alter drainage conditions within portions of the municipal drains in the Study Area (**Figure 1**). Based on the preliminary assessment presented in **Section 5.0**, stormwater management will need to be considered during detail design to address potential impacts associated with the increased imperviousness, changes in runoff characteristics, and modifications to roadway grading and drainage patterns. Stormwater management measures will be required to control post-development runoff to acceptable levels relative to pre-development conditions.

The extent of stormwater quantity and quality controls required, as well as the type, size, capacity, configuration, and location of any stormwater management facilities, shall be determined based on detailed hydrologic and hydraulic analyses, in accordance with the Windsor/Essex Region Stormwater Management Standards Manual (2018). The analysis shall consider final roadway grading, outlet and tailwater conditions, design water levels, emergency overflow routing, potential backwater or flooding

effects from adjacent drains, erosion and scour considerations, and integration with adjacent or future developments.

Conceptual stormwater management facility locations shown on the preliminary drawings (**Attachment C**) are for illustrative purposes only, and any associated property requirements shall be determined during detail design.

### 6.2 Culvert Condition Considerations

Based on BTE’s *County Road 46 E Cross Culverts & Pike Creek Bridge – Recommendations (2025)* and the existing conditions review completed for this report, several culvert and bridge crossings along the corridor will require replacement or further assessment as part of the proposed road improvements. Existing conditions and preliminary recommendations are summarized in **Table 2**.

**Table 2: Culvert and Bridge Condition Summary and Recommendations**

| Structure ID | Associated Drain                | Size/Type  | Condition | Recommendation  |
|--------------|---------------------------------|--|-----------|---|
| Culvert 1    | Hurley Relief Branch            | 2000 mm dia. CSP culvert                           | Good      | Full replacement; confirm required hydraulic capacity and size replacement for widened roadway.             |
| Culvert 1A   | Upper Part of the Hurley Relief | 900 mm CSP culvert                                 | Unknown   | Confirm condition and required hydraulic capacity; extend for road widening; upsize or replace if required. |
| Culvert 2    | Washbrook                       | 2000 mm dia. CSP culvert                           | Good      | Full replacement; confirm required hydraulic capacity and size replacement for widened roadway.             |
| Culvert 2A   | 9th Concession                  | Concrete structure, 1.5 m span                     | Unknown   | Confirm condition and required hydraulic capacity; extend for road widening; upsize or replace if required. |
| Culvert 3    | Sullivan Creek                  | Twin 2000 mm dia. CSP culverts                     | Good      | Full replacement; confirm required hydraulic capacity and size replacement for widened roadway.             |
| Culvert 4    | Gzowski                         | Concrete box culvert, 3850 mm span by 2800 mm rise | Good      | Preferred treatment to be confirmed during detail design following structural and hydraulic assessment.     |
| Culvert 4A   | Ruston                          | 750 mm dia. corrugated iron pipe                   | Unknown   | Confirm condition and required hydraulic capacity; extend for road widening; upsize or replace if required. |

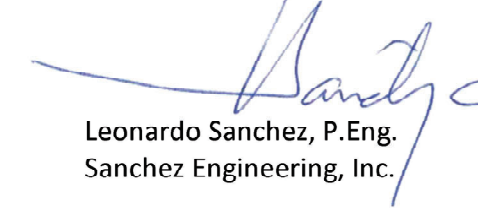
| Structure ID      | Associated Drain | Size/Type   | Condition | Recommendation   |
|-------------------|------------------|---|-----------|--|
| Pike Creek Bridge | Pike Creek       | Concrete bridge, approx. 8000 mm span by 2400 mm rise | Good      | Preferred treatment to be confirmed during detail design following structural and hydraulic assessment.                  |
| Culvert 4B        | West Townline    | Size/type not available from reviewed records         | Unknown   | Confirm size, type, condition, and required hydraulic capacity; extend for road widening; upsize or replace if required. |

Prepared by:



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Reviewed and Approved by:



Leonardo Sanchez, P.Eng.  
 Sanchez Engineering, Inc.



**Attachments:** Attachment A: Lake St. Clair Watershed and Detroit River Subwatersheds  
 Attachment B: Imperviousness and Runoff Coefficient Supporting Information  
 Attachment C: Preliminary Design Drawings

### 7.0 FUTURE WORK

- During detail design, it should be confirmed whether a Notice of Request for Drain Improvement under Section 78 of the Drainage Act is required where road widening or related drainage works may alter existing municipal drains or increase flows within the drainage system.
- Hydrologic and hydraulic analysis should be completed during detail design to confirm the capacity and performance of the cross-culverts and bridges, including any erosion or scour protection requirements.
- A detailed hydrologic analysis should be completed during detail design, using final roadway grading and updated topographic data, to confirm proposed drainage boundaries, quantify runoff to each receiving drain, assess potential impacts to the municipal drain systems, and determine the extent of stormwater management measures required to manage post-development runoff relative to pre-development conditions in accordance with the Windsor/Essex Region Stormwater Management Standards Manual (2018).
- The size, type, and location of any required stormwater management measures shall be determined during detail design. In the area of the Ministry's Lauzon Parkway (O'Keefe Drain/Upper Part of the Little River Drain), stormwater management will be planned as part of that project and integrated with the County Road 46 project.
- Any drainage improvements shall consider fish habitat sensitivity within the affected municipal drains.

## Attachment A

### Lake St. Clair Watershed and Detroit River Subwatersheds

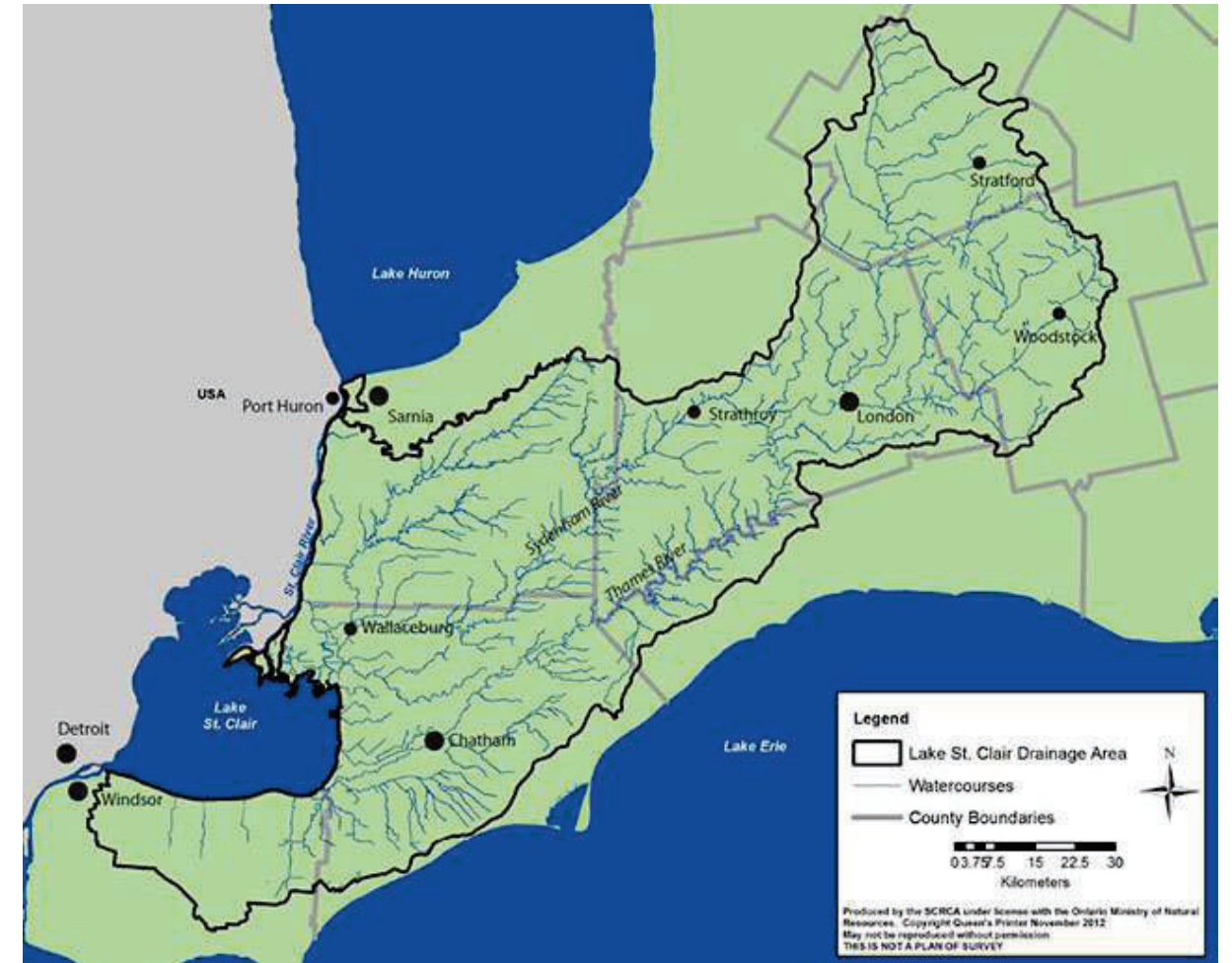


Figure A-1: Lake St. Clair Canadian Watershed (from <https://www.scrca.on.ca/>)

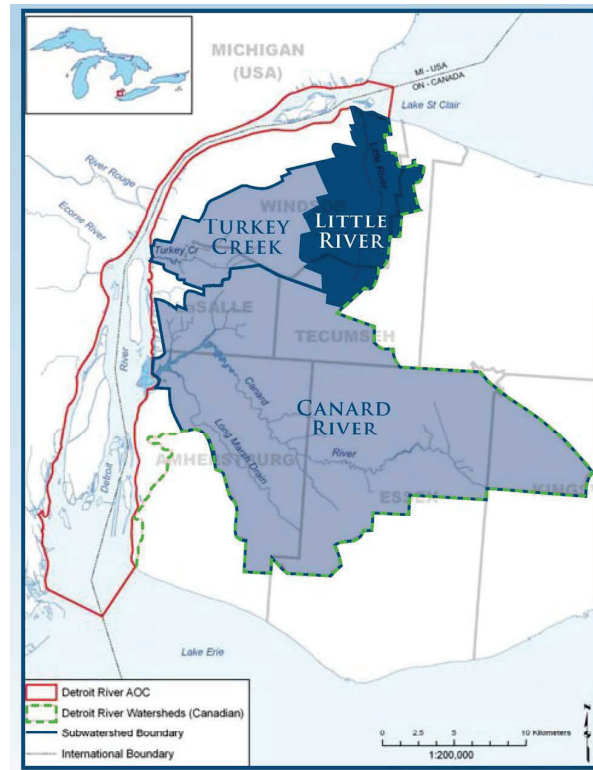


Figure A-2: Detroit River Canadian Subwatersheds (from <https://detroitriver.ca>)

## Attachment B

### Imperviousness and Runoff Coefficient Supporting Information

**Overview**

This attachment provides supporting information used to develop the existing and proposed land use (imperviousness) rasters. It also summarizes the calculations of percent imperviousness and composite runoff coefficients (C) for each catchment within the roads right-of-way under existing and proposed conditions within the Study Area (**Figure 1**).

**Data Sources and Preprocessing**

- **Imagery:** Imagery from the 2015 South Western Ontario Orthophotography Project (SWOOP 2015) was used for land cover classification because it provided clearer spectral differentiation between land cover types than more recent imagery (e.g., 2023 aerial imagery provided by the Town).
- **Topography:** OMAFRA LiDAR-derived DEM data from the Lake Erie project were used to determine terrain slope and catchment areas for each culvert. The slope raster derived from the DEM was reclassified to bins (0-5%, 5-10%, and >10%) to apply Design Chart 1.07 in the *Drainage Management Manual* (MTO).
- **Soils:** The OMAFRA Soil Survey Complex dataset was used to assign soil types within the Study Area. The soil texture field in the dataset was used and mapped to the soil categories from Design Chart 1.07.
- **Catchments:** Catchment boundaries were delineated using the DEM data and the municipal drain engineer’s reports. Catchment boundaries were subsequently clipped to the right-of-way limits.

**Land Use Raster Development**

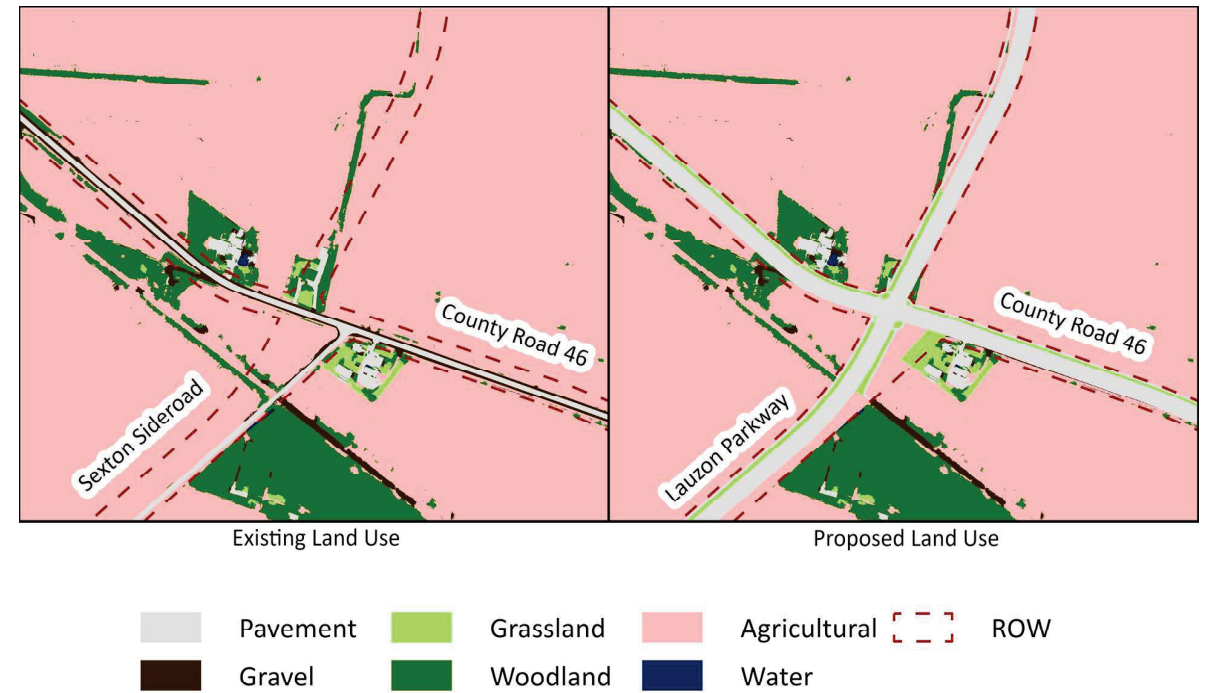
The existing land use raster was generated using supervised classification in ArcGIS Pro. The proposed land use was developed by rasterizing the preliminary corridor model polygons and replacing the corresponding areas in the existing raster to represent proposed conditions.

**Runoff Coefficient and Imperviousness Calculation**

Catchment boundaries and soils polygons were rasterized and overlaid with the land use and slope rasters to assign runoff coefficients (C) using Design Chart 1.07 (Rural) from the *Drainage Management Manual* (MTO). Composite runoff coefficients were then calculated for each catchment. Land use classes were grouped into impervious and pervious areas to determine percent imperviousness for each culvert catchment.

**Classification Results**

**Figure B-1** presents the final land use classification for a portion of the Study Area (**Figure 1**) under existing conditions, shown as an example. **Table B-1** summarizes the results for the entire Study Area (**Figure 1**) within the right-of-way under existing conditions, by catchment, land use group, soil group, and slope bin. Soil categories were remapped to match the classifications used in MTO Design Chart 1.07.



**Figure B-1: Existing and Proposed Conditions Land Use**

**Table B-1: Overlay Results for Existing Conditions**

| Catchment      | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                                      | Land Use   | Soil Type | Slope Class     | Area (ha)* |
|----------------|--------------|-----------|-----------------|------------|--|------------|-----------|-----------------|------------|
| 7th Concession | Agricultural | Clay Loam | Flat (0-5%)     | 0.04       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Flat (0-5%)     | 0.05       |
| 7th Concession | Agricultural | Clay Loam | Hilly (>10%)    | 0.01       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Hilly (>10%)    | 0.00       |
| 7th Concession | Agricultural | Clay Loam | Rolling (5-10%) | 0.02       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Rolling (5-10%) | 0.02       |
| 7th Concession | Impervious   | Clay Loam | Flat (0-5%)     | 0.43       | North Talbot Road Drain in the 12th Concession | Impervious | Clay Loam | Flat (0-5%)     | 0.41       |
| 7th Concession | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       | North Talbot Road Drain in the 12th Concession | Impervious | Clay Loam | Hilly (>10%)    | 0.04       |

| Catchment                  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                                      | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|----------------------------|--------------|-----------|-----------------|------------|--|--------------|-----------|-----------------|------------|
| 7th Concession             | Impervious   | Clay Loam | Rolling (5-10%) | 0.03       | North Talbot Road Drain in the 12th Concession | Impervious   | Clay Loam | Rolling (5-10%) | 0.16       |
| 7th Concession             | Water        | Clay Loam | Flat (0-5%)     | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland     | Clay Loam | Flat (0-5%)     | 0.11       |
| 7th Concession             | Water        | Clay Loam | Hilly (>10%)    | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland     | Clay Loam | Hilly (>10%)    | 0.11       |
| 7th Concession             | Water        | Clay Loam | Rolling (5-10%) | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland     | Clay Loam | Rolling (5-10%) | 0.05       |
| 7th Concession             | Woodland     | Clay Loam | Flat (0-5%)     | 0.06       | O'Keefe  | Agricultural | Clay Loam | Flat (0-5%)     | 2.04       |
| 7th Concession             | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | O'Keefe  | Agricultural | Clay Loam | Hilly (>10%)    | 0.66       |
| 7th Concession             | Woodland     | Clay Loam | Rolling (5-10%) | 0.03       | O'Keefe  | Agricultural | Clay Loam | Rolling (5-10%) | 0.20       |
| 8th Concession Drain North | Agricultural | Clay Loam | Flat (0-5%)     | 0.13       | O'Keefe  | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       |
| 8th Concession Drain North | Agricultural | Clay Loam | Hilly (>10%)    | 0.25       | O'Keefe  | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       |
| 8th Concession Drain North | Agricultural | Clay Loam | Rolling (5-10%) | 0.12       | O'Keefe  | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       |
| 8th Concession Drain North | Grassland    | Clay Loam | Flat (0-5%)     | 0.15       | O'Keefe  | Impervious   | Clay Loam | Flat (0-5%)     | 0.60       |
| 8th Concession Drain North | Grassland    | Clay Loam | Hilly (>10%)    | 0.06       | O'Keefe  | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       |
| 8th Concession Drain North | Grassland    | Clay Loam | Rolling (5-10%) | 0.13       | O'Keefe  | Impervious   | Clay Loam | Rolling (5-10%) | 0.28       |
| 8th Concession Drain North | Impervious   | Clay Loam | Flat (0-5%)     | 1.03       | O'Keefe  | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| 8th Concession Drain North | Impervious   | Clay Loam | Hilly (>10%)    | 0.15       | O'Keefe  | Water        | Clay Loam | Hilly (>10%)    | 0.01       |

| Catchment                  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment  | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|----------------------------|--------------|-----------|-----------------|------------|------------|--------------|-----------|-----------------|------------|
| 8th Concession Drain North | Impervious   | Clay Loam | Rolling (5-10%) | 0.19       | O'Keefe    | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| 8th Concession Drain North | Water        | Clay Loam | Flat (0-5%)     | 0.00       | O'Keefe    | Woodland     | Clay Loam | Flat (0-5%)     | 0.04       |
| 8th Concession Drain North | Water        | Clay Loam | Hilly (>10%)    | 0.00       | O'Keefe    | Woodland     | Clay Loam | Hilly (>10%)    | 0.16       |
| 8th Concession Drain North | Water        | Clay Loam | Rolling (5-10%) | 0.00       | O'Keefe    | Woodland     | Clay Loam | Rolling (5-10%) | 0.03       |
| 8th Concession Drain North | Woodland     | Clay Loam | Flat (0-5%)     | 0.06       | Pike Creek | Agricultural | Clay Loam | Flat (0-5%)     | 0.66       |
| 8th Concession Drain North | Woodland     | Clay Loam | Hilly (>10%)    | 0.28       | Pike Creek | Agricultural | Clay Loam | Hilly (>10%)    | 0.47       |
| 8th Concession Drain North | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       | Pike Creek | Agricultural | Clay Loam | Rolling (5-10%) | 0.15       |
| 9th Concession             | Agricultural | Clay Loam | Flat (0-5%)     | 0.24       | Pike Creek | Grassland    | Clay Loam | Flat (0-5%)     | 0.03       |
| 9th Concession             | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | Pike Creek | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| 9th Concession             | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | Pike Creek | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| 9th Concession             | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Pike Creek | Impervious   | Clay Loam | Flat (0-5%)     | 0.56       |
| 9th Concession             | Impervious   | Clay Loam | Flat (0-5%)     | 0.70       | Pike Creek | Impervious   | Clay Loam | Hilly (>10%)    | 0.05       |
| 9th Concession             | Impervious   | Clay Loam | Hilly (>10%)    | 0.07       | Pike Creek | Impervious   | Clay Loam | Rolling (5-10%) | 0.28       |
| 9th Concession             | Impervious   | Clay Loam | Rolling (5-10%) | 0.23       | Pike Creek | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| 9th Concession             | Water        | Clay Loam | Flat (0-5%)     | 0.00       | Pike Creek | Water        | Clay Loam | Hilly (>10%)    | 0.00       |
| 9th Concession             | Water        | Clay Loam | Hilly (>10%)    | 0.00       | Pike Creek | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| 9th Concession             | Water        | Clay Loam | Rolling (5-10%) | 0.00       | Pike Creek | Woodland     | Clay Loam | Flat (0-5%)     | 0.10       |
| 9th Concession             | Woodland     | Clay Loam | Flat (0-5%)     | 0.13       | Pike Creek | Woodland     | Clay Loam | Hilly (>10%)    | 0.17       |
| 9th Concession             | Woodland     | Clay Loam | Hilly (>10%)    | 0.28       | Pike Creek | Woodland     | Clay Loam | Rolling (5-10%) | 0.08       |
| 9th Concession             | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       | Robinson   | Agricultural | Clay Loam | Flat (0-5%)     | 0.14       |
| Croft                      | Agricultural | Clay Loam | Flat (0-5%)     | 0.19       | Robinson   | Agricultural | Clay Loam | Hilly (>10%)    | 0.12       |
| Croft                      | Agricultural | Clay Loam | Hilly (>10%)    | 0.26       | Robinson   | Agricultural | Clay Loam | Rolling (5-10%) | 0.05       |

| Catchment                | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment      | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--------------------------|--------------|-----------|-----------------|------------|----------------|--------------|-----------|-----------------|------------|
| Croft                    | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | Robinson       | Impervious   | Clay Loam | Flat (0-5%)     | 0.17       |
| Croft                    | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       | Robinson       | Impervious   | Clay Loam | Hilly (>10%)    | 0.04       |
| Croft                    | Grassland    | Clay Loam | Hilly (>10%)    | 0.02       | Robinson       | Impervious   | Clay Loam | Rolling (5-10%) | 0.09       |
| Croft                    | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | Robinson       | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       |
| Croft                    | Impervious   | Clay Loam | Flat (0-5%)     | 0.22       | Robinson       | Woodland     | Clay Loam | Hilly (>10%)    | 0.01       |
| Croft                    | Impervious   | Clay Loam | Hilly (>10%)    | 0.05       | Robinson       | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       |
| Croft                    | Impervious   | Clay Loam | Rolling (5-10%) | 0.17       | Ruston         | Agricultural | Clay Loam | Flat (0-5%)     | 0.09       |
| Croft                    | Woodland     | Clay Loam | Flat (0-5%)     | 0.05       | Ruston         | Agricultural | Clay Loam | Hilly (>10%)    | 0.12       |
| Croft                    | Woodland     | Clay Loam | Hilly (>10%)    | 0.04       | Ruston         | Agricultural | Clay Loam | Rolling (5-10%) | 0.03       |
| Croft                    | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | Ruston         | Grassland    | Clay Loam | Flat (0-5%)     | 0.01       |
| Grondin                  | Agricultural | Clay Loam | Flat (0-5%)     | 0.26       | Ruston         | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Grondin                  | Agricultural | Clay Loam | Hilly (>10%)    | 0.14       | Ruston         | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       |
| Grondin                  | Agricultural | Clay Loam | Rolling (5-10%) | 0.06       | Ruston         | Impervious   | Clay Loam | Flat (0-5%)     | 0.22       |
| Grondin                  | Grassland    | Clay Loam | Flat (0-5%)     | 0.03       | Ruston         | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       |
| Grondin                  | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Ruston         | Impervious   | Clay Loam | Rolling (5-10%) | 0.12       |
| Grondin                  | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       | Ruston         | Woodland     | Clay Loam | Flat (0-5%)     | 0.12       |
| Grondin                  | Impervious   | Clay Loam | Flat (0-5%)     | 0.18       | Ruston         | Woodland     | Clay Loam | Hilly (>10%)    | 0.09       |
| Grondin                  | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       | Ruston         | Woodland     | Clay Loam | Rolling (5-10%) | 0.06       |
| Grondin                  | Impervious   | Clay Loam | Rolling (5-10%) | 0.11       | Sullivan Creek | Agricultural | Clay Loam | Flat (0-5%)     | 0.74       |
| Grondin                  | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | Sullivan Creek | Agricultural | Clay Loam | Hilly (>10%)    | 0.25       |
| Grondin                  | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | Sullivan Creek | Agricultural | Clay Loam | Rolling (5-10%) | 0.11       |
| Grondin                  | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | Sullivan Creek | Grassland    | Clay Loam | Flat (0-5%)     | 0.02       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Flat (0-5%)     | 0.04       | Sullivan Creek | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Hilly (>10%)    | 0.18       | Sullivan Creek | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Rolling (5-10%) | 0.04       | Sullivan Creek | Impervious   | Clay Loam | Flat (0-5%)     | 0.44       |
| Gzowski Drain and Branch | Grassland    | Clay Loam | Flat (0-5%)     | 0.04       | Sullivan Creek | Impervious   | Clay Loam | Hilly (>10%)    | 0.12       |

| Catchment  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|--------------------------------------|--------------|-----------|-----------------|------------|
| Gzowski Drain and Branch   | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Sullivan Creek                       | Impervious   | Clay Loam | Rolling (5-10%) | 0.17       |
| Gzowski Drain and Branch   | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       | Sullivan Creek                       | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| Gzowski Drain and Branch   | Impervious   | Clay Loam | Flat (0-5%)     | 0.38       | Sullivan Creek                       | Water        | Clay Loam | Hilly (>10%)    | 0.00       |
| Gzowski Drain and Branch   | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       | Sullivan Creek                       | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| Gzowski Drain and Branch   | Impervious   | Clay Loam | Rolling (5-10%) | 0.22       | Sullivan Creek                       | Woodland     | Clay Loam | Flat (0-5%)     | 0.04       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Flat (0-5%)     | 0.00       | Sullivan Creek                       | Woodland     | Clay Loam | Hilly (>10%)    | 0.12       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Hilly (>10%)    | 0.00       | Sullivan Creek                       | Woodland     | Clay Loam | Rolling (5-10%) | 0.02       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Rolling (5-10%) | 0.00       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Flat (0-5%)     | 6.74       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Flat (0-5%)     | 0.35       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.88       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Hilly (>10%)    | 0.30       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Rolling (5-10%) | 0.45       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Rolling (5-10%) | 0.12       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Flat (0-5%)     | 0.08       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Agricultural | Clay Loam | Flat (0-5%)     | 2.63       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Rolling (5-10%) | 0.03       |
| Hurley Relief Branch   | Agricultural | Clay Loam | Rolling (5-10%) | 0.29       | Upper Part of the Little River Drain | Impervious   | Clay Loam | Flat (0-5%)     | 1.10       |

| Catchment  | Land Use   | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use   | Soil Type | Slope Class     | Area (ha)* |
|--|------------|-----------|-----------------|------------|--------------------------------------|------------|-----------|-----------------|------------|
| Drain and Upper Part of the Hurley Relief Drain                      |            |           |                 |            |                                      |            |           |                 |            |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Grassland  | Clay Loam | Flat (0-5%)     | 0.42       | Upper Part of the Little River Drain | Impervious | Clay Loam | Hilly (>10%)    | 0.14       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Grassland  | Clay Loam | Hilly (>10%)    | 0.19       | Upper Part of the Little River Drain | Impervious | Clay Loam | Rolling (5-10%) | 0.57       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Grassland  | Clay Loam | Rolling (5-10%) | 0.14       | Upper Part of the Little River Drain | Water      | Clay Loam | Flat (0-5%)     | 0.35       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Flat (0-5%)     | 2.25       | Upper Part of the Little River Drain | Water      | Clay Loam | Hilly (>10%)    | 0.00       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Hilly (>10%)    | 0.40       | Upper Part of the Little River Drain | Water      | Clay Loam | Rolling (5-10%) | 0.00       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Rolling (5-10%) | 0.63       | Upper Part of the Little River Drain | Woodland   | Clay Loam | Flat (0-5%)     | 0.31       |

| Catchment  | Land Use | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--|----------|-----------|-----------------|------------|--------------------------------------|--------------|-----------|-----------------|------------|
| Hurley Relief Drain  |          |           |                 |            |                                      |              |           |                 |            |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water    | Clay Loam | Flat (0-5%)     | 0.00       | Upper Part of the Little River Drain | Woodland     | Clay Loam | Hilly (>10%)    | 0.43       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water    | Clay Loam | Hilly (>10%)    | 0.00       | Upper Part of the Little River Drain | Woodland     | Clay Loam | Rolling (5-10%) | 0.21       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water    | Clay Loam | Rolling (5-10%) | 0.00       | Washbrook                            | Agricultural | Clay Loam | Flat (0-5%)     | 0.41       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland | Clay Loam | Flat (0-5%)     | 0.43       | Washbrook                            | Agricultural | Clay Loam | Hilly (>10%)    | 0.24       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland | Clay Loam | Hilly (>10%)    | 0.52       | Washbrook                            | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland | Clay Loam | Rolling (5-10%) | 0.24       | Washbrook                            | Grassland    | Clay Loam | Flat (0-5%)     | 0.05       |

| Catchment                          | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                 | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|------------------------------------|--------------|-----------|-----------------|------------|---------------------------|--------------|-----------|-----------------|------------|
| McLean-Hergott (to Gzowski)        | Agricultural | Clay Loam | Flat (0-5%)     | 0.22       | Washbrook                 | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| McLean-Hergott (to Gzowski)        | Agricultural | Clay Loam | Hilly (>10%)    | 0.18       | Washbrook                 | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| McLean-Hergott (to Gzowski)        | Agricultural | Clay Loam | Rolling (5-10%) | 0.06       | Washbrook                 | Impervious   | Clay Loam | Flat (0-5%)     | 0.44       |
| McLean-Hergott (to Gzowski)        | Grassland    | Clay Loam | Flat (0-5%)     | 0.02       | Washbrook                 | Impervious   | Clay Loam | Hilly (>10%)    | 0.14       |
| McLean-Hergott (to Gzowski)        | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       | Washbrook                 | Impervious   | Clay Loam | Rolling (5-10%) | 0.20       |
| McLean-Hergott (to Gzowski)        | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | Washbrook                 | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Flat (0-5%)     | 0.24       | Washbrook                 | Water        | Clay Loam | Hilly (>10%)    | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Hilly (>10%)    | 0.01       | Washbrook                 | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Rolling (5-10%) | 0.10       | Washbrook                 | Woodland     | Clay Loam | Flat (0-5%)     | 0.20       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | Washbrook                 | Woodland     | Clay Loam | Hilly (>10%)    | 0.18       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Hilly (>10%)    | 0.06       | Washbrook                 | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       | West Branch Delisle Drain | Agricultural | Clay Loam | Flat (0-5%)     | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Flat (0-5%)     | 0.27       | West Branch Delisle Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.14       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Hilly (>10%)    | 0.28       | West Branch Delisle Drain | Agricultural | Clay Loam | Rolling (5-10%) | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | West Branch Delisle Drain | Grassland    | Clay Loam | Flat (0-5%)     | 0.16       |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       | West Branch               | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       |

| Catchment                          | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                 | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|------------------------------------|--------------|-----------|-----------------|------------|---------------------------|--------------|-----------|-----------------|------------|
| Sullivan Creek)                    |              |           |                 |            | Delisle Drain             |              |           |                 |            |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | West Branch Delisle Drain | Grassland    | Clay Loam | Rolling (5-10%) | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | West Branch Delisle Drain | Impervious   | Clay Loam | Flat (0-5%)     | 0.42       |
| McLean-Hergott (to Sullivan Creek) | Impervious   | Clay Loam | Flat (0-5%)     | 0.32       | West Branch Delisle Drain | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Impervious   | Clay Loam | Hilly (>10%)    | 0.07       | West Branch Delisle Drain | Impervious   | Clay Loam | Rolling (5-10%) | 0.14       |
| McLean-Hergott (to Sullivan Creek) | Impervious   | Clay Loam | Rolling (5-10%) | 0.14       | West Branch Delisle Drain | Woodland     | Clay Loam | Flat (0-5%)     | 0.17       |
| McLean-Hergott (to Sullivan Creek) | Woodland     | Clay Loam | Flat (0-5%)     | 0.00       | West Branch Delisle Drain | Woodland     | Clay Loam | Hilly (>10%)    | 0.15       |
| McLean-Hergott (to Sullivan Creek) | Woodland     | Clay Loam | Hilly (>10%)    | 0.07       | West Branch Delisle Drain | Woodland     | Clay Loam | Rolling (5-10%) | 0.07       |
| McLean-Hergott (to Sullivan Creek) | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       | West Townline             | Agricultural | Clay Loam | Flat (0-5%)     | 1.14       |
| North 12th Concession              | Agricultural | Clay Loam | Flat (0-5%)     | 0.39       | West Townline             | Agricultural | Clay Loam | Hilly (>10%)    | 1.01       |
| North 12th Concession              | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | West Townline             | Agricultural | Clay Loam | Rolling (5-10%) | 0.27       |
| North 12th Concession              | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | West Townline             | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       |
| North 12th Concession              | Impervious   | Clay Loam | Flat (0-5%)     | 0.31       | West Townline             | Impervious   | Clay Loam | Flat (0-5%)     | 1.54       |
| North 12th Concession              | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       | West Townline             | Impervious   | Clay Loam | Hilly (>10%)    | 0.06       |
| North 12th Concession              | Impervious   | Clay Loam | Rolling (5-10%) | 0.23       | West Townline             | Impervious   | Clay Loam | Rolling (5-10%) | 0.32       |
| North 12th Concession              | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | West Townline             | Water        | Clay Loam | Flat (0-5%)     | 0.01       |
| North 12th Concession              | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | West Townline             | Water        | Clay Loam | Hilly (>10%)    | 0.03       |

| Catchment                                      | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                                      | Land Use   | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|--|------------|-----------|-----------------|------------|
| North 12th Concession                          | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | West Townline                                  | Water      | Clay Loam | Rolling (5-10%) | 0.01       |
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Flat (0-5%)     | 0.17       | West Townline                                  | Woodland   | Clay Loam | Flat (0-5%)     | 0.14       |
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Hilly (>10%)    | 0.34       | West Townline                                  | Woodland   | Clay Loam | Hilly (>10%)    | 0.62       |
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Rolling (5-10%) | 0.15       | West Townline                                  | Woodland   | Clay Loam | Rolling (5-10%) | 0.11       |
| 7th Concession                                 | Agricultural | Clay Loam | Flat (0-5%)     | 0.04       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Flat (0-5%)     | 0.05       |
| 7th Concession                                 | Agricultural | Clay Loam | Hilly (>10%)    | 0.01       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Hilly (>10%)    | 0.00       |
| 7th Concession                                 | Agricultural | Clay Loam | Rolling (5-10%) | 0.02       | North Talbot Road Drain in the 12th Concession | Grassland  | Clay Loam | Rolling (5-10%) | 0.02       |
| 7th Concession                                 | Impervious   | Clay Loam | Flat (0-5%)     | 0.43       | North Talbot Road Drain in the 12th Concession | Impervious | Clay Loam | Flat (0-5%)     | 0.41       |
| 7th Concession                                 | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       | North Talbot Road Drain in the 12th Concession | Impervious | Clay Loam | Hilly (>10%)    | 0.04       |
| 7th Concession                                 | Impervious   | Clay Loam | Rolling (5-10%) | 0.03       | North Talbot Road Drain in the 12th Concession | Impervious | Clay Loam | Rolling (5-10%) | 0.16       |
| 7th Concession                                 | Water        | Clay Loam | Flat (0-5%)     | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland   | Clay Loam | Flat (0-5%)     | 0.11       |

| Catchment                  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                                      | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|----------------------------|--------------|-----------|-----------------|------------|--|--------------|-----------|-----------------|------------|
| 7th Concession             | Water        | Clay Loam | Hilly (>10%)    | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland     | Clay Loam | Hilly (>10%)    | 0.11       |
| 7th Concession             | Water        | Clay Loam | Rolling (5-10%) | 0.00       | North Talbot Road Drain in the 12th Concession | Woodland     | Clay Loam | Rolling (5-10%) | 0.05       |
| 7th Concession             | Woodland     | Clay Loam | Flat (0-5%)     | 0.06       | O'Keefe  | Agricultural | Clay Loam | Flat (0-5%)     | 2.04       |
| 7th Concession             | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | O'Keefe  | Agricultural | Clay Loam | Hilly (>10%)    | 0.66       |
| 7th Concession             | Woodland     | Clay Loam | Rolling (5-10%) | 0.03       | O'Keefe  | Agricultural | Clay Loam | Rolling (5-10%) | 0.20       |
| 8th Concession Drain North | Agricultural | Clay Loam | Flat (0-5%)     | 0.13       | O'Keefe  | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       |
| 8th Concession Drain North | Agricultural | Clay Loam | Hilly (>10%)    | 0.25       | O'Keefe  | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       |
| 8th Concession Drain North | Agricultural | Clay Loam | Rolling (5-10%) | 0.12       | O'Keefe  | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       |
| 8th Concession Drain North | Grassland    | Clay Loam | Flat (0-5%)     | 0.15       | O'Keefe  | Impervious   | Clay Loam | Flat (0-5%)     | 0.60       |
| 8th Concession Drain North | Grassland    | Clay Loam | Hilly (>10%)    | 0.06       | O'Keefe  | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       |
| 8th Concession Drain North | Grassland    | Clay Loam | Rolling (5-10%) | 0.13       | O'Keefe  | Impervious   | Clay Loam | Rolling (5-10%) | 0.28       |
| 8th Concession Drain North | Impervious   | Clay Loam | Flat (0-5%)     | 1.03       | O'Keefe  | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| 8th Concession Drain North | Impervious   | Clay Loam | Hilly (>10%)    | 0.15       | O'Keefe  | Water        | Clay Loam | Hilly (>10%)    | 0.01       |
| 8th Concession Drain North | Impervious   | Clay Loam | Rolling (5-10%) | 0.19       | O'Keefe  | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| 8th Concession Drain North | Water        | Clay Loam | Flat (0-5%)     | 0.00       | O'Keefe  | Woodland     | Clay Loam | Flat (0-5%)     | 0.04       |
| 8th Concession Drain North | Water        | Clay Loam | Hilly (>10%)    | 0.00       | O'Keefe  | Woodland     | Clay Loam | Hilly (>10%)    | 0.16       |

| Catchment                  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment  | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|----------------------------|--------------|-----------|-----------------|------------|------------|--------------|-----------|-----------------|------------|
| 8th Concession Drain North | Water        | Clay Loam | Rolling (5-10%) | 0.00       | O'Keefe    | Woodland     | Clay Loam | Rolling (5-10%) | 0.03       |
| 8th Concession Drain North | Woodland     | Clay Loam | Flat (0-5%)     | 0.06       | Pike Creek | Agricultural | Clay Loam | Flat (0-5%)     | 0.66       |
| 8th Concession Drain North | Woodland     | Clay Loam | Hilly (>10%)    | 0.28       | Pike Creek | Agricultural | Clay Loam | Hilly (>10%)    | 0.47       |
| 8th Concession Drain North | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       | Pike Creek | Agricultural | Clay Loam | Rolling (5-10%) | 0.15       |
| 9th Concession             | Agricultural | Clay Loam | Flat (0-5%)     | 0.24       | Pike Creek | Grassland    | Clay Loam | Flat (0-5%)     | 0.03       |
| 9th Concession             | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | Pike Creek | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| 9th Concession             | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | Pike Creek | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| 9th Concession             | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Pike Creek | Impervious   | Clay Loam | Flat (0-5%)     | 0.56       |
| 9th Concession             | Impervious   | Clay Loam | Flat (0-5%)     | 0.70       | Pike Creek | Impervious   | Clay Loam | Hilly (>10%)    | 0.05       |
| 9th Concession             | Impervious   | Clay Loam | Hilly (>10%)    | 0.07       | Pike Creek | Impervious   | Clay Loam | Rolling (5-10%) | 0.28       |
| 9th Concession             | Impervious   | Clay Loam | Rolling (5-10%) | 0.23       | Pike Creek | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| 9th Concession             | Water        | Clay Loam | Flat (0-5%)     | 0.00       | Pike Creek | Water        | Clay Loam | Hilly (>10%)    | 0.00       |
| 9th Concession             | Water        | Clay Loam | Hilly (>10%)    | 0.00       | Pike Creek | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| 9th Concession             | Water        | Clay Loam | Rolling (5-10%) | 0.00       | Pike Creek | Woodland     | Clay Loam | Flat (0-5%)     | 0.10       |
| 9th Concession             | Woodland     | Clay Loam | Flat (0-5%)     | 0.13       | Pike Creek | Woodland     | Clay Loam | Hilly (>10%)    | 0.17       |
| 9th Concession             | Woodland     | Clay Loam | Hilly (>10%)    | 0.28       | Pike Creek | Woodland     | Clay Loam | Rolling (5-10%) | 0.08       |
| 9th Concession             | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       | Robinson   | Agricultural | Clay Loam | Flat (0-5%)     | 0.14       |
| Croft                      | Agricultural | Clay Loam | Flat (0-5%)     | 0.19       | Robinson   | Agricultural | Clay Loam | Hilly (>10%)    | 0.12       |
| Croft                      | Agricultural | Clay Loam | Hilly (>10%)    | 0.26       | Robinson   | Agricultural | Clay Loam | Rolling (5-10%) | 0.05       |
| Croft                      | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | Robinson   | Impervious   | Clay Loam | Flat (0-5%)     | 0.17       |
| Croft                      | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       | Robinson   | Impervious   | Clay Loam | Hilly (>10%)    | 0.04       |
| Croft                      | Grassland    | Clay Loam | Hilly (>10%)    | 0.02       | Robinson   | Impervious   | Clay Loam | Rolling (5-10%) | 0.09       |
| Croft                      | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | Robinson   | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       |
| Croft                      | Impervious   | Clay Loam | Flat (0-5%)     | 0.22       | Robinson   | Woodland     | Clay Loam | Hilly (>10%)    | 0.01       |
| Croft                      | Impervious   | Clay Loam | Hilly (>10%)    | 0.05       | Robinson   | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       |

| Catchment                | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment      | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--------------------------|--------------|-----------|-----------------|------------|----------------|--------------|-----------|-----------------|------------|
| Croft                    | Impervious   | Clay Loam | Rolling (5-10%) | 0.17       | Ruston         | Agricultural | Clay Loam | Flat (0-5%)     | 0.09       |
| Croft                    | Woodland     | Clay Loam | Flat (0-5%)     | 0.05       | Ruston         | Agricultural | Clay Loam | Hilly (>10%)    | 0.12       |
| Croft                    | Woodland     | Clay Loam | Hilly (>10%)    | 0.04       | Ruston         | Agricultural | Clay Loam | Rolling (5-10%) | 0.03       |
| Croft                    | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | Ruston         | Grassland    | Clay Loam | Flat (0-5%)     | 0.01       |
| Grondin                  | Agricultural | Clay Loam | Flat (0-5%)     | 0.26       | Ruston         | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Grondin                  | Agricultural | Clay Loam | Hilly (>10%)    | 0.14       | Ruston         | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       |
| Grondin                  | Agricultural | Clay Loam | Rolling (5-10%) | 0.06       | Ruston         | Impervious   | Clay Loam | Flat (0-5%)     | 0.22       |
| Grondin                  | Grassland    | Clay Loam | Flat (0-5%)     | 0.03       | Ruston         | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       |
| Grondin                  | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Ruston         | Impervious   | Clay Loam | Rolling (5-10%) | 0.12       |
| Grondin                  | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       | Ruston         | Woodland     | Clay Loam | Flat (0-5%)     | 0.12       |
| Grondin                  | Impervious   | Clay Loam | Flat (0-5%)     | 0.18       | Ruston         | Woodland     | Clay Loam | Hilly (>10%)    | 0.09       |
| Grondin                  | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       | Ruston         | Woodland     | Clay Loam | Rolling (5-10%) | 0.06       |
| Grondin                  | Impervious   | Clay Loam | Rolling (5-10%) | 0.11       | Sullivan Creek | Agricultural | Clay Loam | Flat (0-5%)     | 0.74       |
| Grondin                  | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | Sullivan Creek | Agricultural | Clay Loam | Hilly (>10%)    | 0.25       |
| Grondin                  | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | Sullivan Creek | Agricultural | Clay Loam | Rolling (5-10%) | 0.11       |
| Grondin                  | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | Sullivan Creek | Grassland    | Clay Loam | Flat (0-5%)     | 0.02       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Flat (0-5%)     | 0.04       | Sullivan Creek | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Hilly (>10%)    | 0.18       | Sullivan Creek | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| Gzowski Drain and Branch | Agricultural | Clay Loam | Rolling (5-10%) | 0.04       | Sullivan Creek | Impervious   | Clay Loam | Flat (0-5%)     | 0.44       |
| Gzowski Drain and Branch | Grassland    | Clay Loam | Flat (0-5%)     | 0.04       | Sullivan Creek | Impervious   | Clay Loam | Hilly (>10%)    | 0.12       |
| Gzowski Drain and Branch | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | Sullivan Creek | Impervious   | Clay Loam | Rolling (5-10%) | 0.17       |
| Gzowski Drain and Branch | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       | Sullivan Creek | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| Gzowski Drain and Branch | Impervious   | Clay Loam | Flat (0-5%)     | 0.38       | Sullivan Creek | Water        | Clay Loam | Hilly (>10%)    | 0.00       |

| Catchment  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|--------------------------------------|--------------|-----------|-----------------|------------|
| Gzowski Drain and Branch   | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       | Sullivan Creek                       | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| Gzowski Drain and Branch   | Impervious   | Clay Loam | Rolling (5-10%) | 0.22       | Sullivan Creek                       | Woodland     | Clay Loam | Flat (0-5%)     | 0.04       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Flat (0-5%)     | 0.00       | Sullivan Creek                       | Woodland     | Clay Loam | Hilly (>10%)    | 0.12       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Hilly (>10%)    | 0.00       | Sullivan Creek                       | Woodland     | Clay Loam | Rolling (5-10%) | 0.02       |
| Gzowski Drain and Branch   | Water        | Clay Loam | Rolling (5-10%) | 0.00       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Flat (0-5%)     | 6.74       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Flat (0-5%)     | 0.35       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.88       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Hilly (>10%)    | 0.30       | Upper Part of the Little River Drain | Agricultural | Clay Loam | Rolling (5-10%) | 0.45       |
| Gzowski Drain and Branch   | Woodland     | Clay Loam | Rolling (5-10%) | 0.12       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Flat (0-5%)     | 0.08       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Agricultural | Clay Loam | Flat (0-5%)     | 2.63       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | Upper Part of the Little River Drain | Grassland    | Clay Loam | Rolling (5-10%) | 0.03       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Agricultural | Clay Loam | Rolling (5-10%) | 0.29       | Upper Part of the Little River Drain | Impervious   | Clay Loam | Flat (0-5%)     | 1.10       |
| Hurley Relief Branch Drain and                                       | Grassland    | Clay Loam | Flat (0-5%)     | 0.42       | Upper Part of the Little River Drain | Impervious   | Clay Loam | Hilly (>10%)    | 0.14       |

| Catchment  | Land Use   | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use   | Soil Type | Slope Class     | Area (ha)* |
|--|------------|-----------|-----------------|------------|--------------------------------------|------------|-----------|-----------------|------------|
| Upper Part of the Hurley Relief Drain                                |            |           |                 |            |                                      |            |           |                 |            |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Grassland  | Clay Loam | Hilly (>10%)    | 0.19       | Upper Part of the Little River Drain | Impervious | Clay Loam | Rolling (5-10%) | 0.57       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Grassland  | Clay Loam | Rolling (5-10%) | 0.14       | Upper Part of the Little River Drain | Water      | Clay Loam | Flat (0-5%)     | 0.35       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Flat (0-5%)     | 2.25       | Upper Part of the Little River Drain | Water      | Clay Loam | Hilly (>10%)    | 0.00       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Hilly (>10%)    | 0.40       | Upper Part of the Little River Drain | Water      | Clay Loam | Rolling (5-10%) | 0.00       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Impervious | Clay Loam | Rolling (5-10%) | 0.63       | Upper Part of the Little River Drain | Woodland   | Clay Loam | Flat (0-5%)     | 0.31       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water      | Clay Loam | Flat (0-5%)     | 0.00       | Upper Part of the Little River Drain | Woodland   | Clay Loam | Hilly (>10%)    | 0.43       |

| Catchment  | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                            | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|--------------------------------------|--------------|-----------|-----------------|------------|
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water        | Clay Loam | Hilly (>10%)    | 0.00       | Upper Part of the Little River Drain | Woodland     | Clay Loam | Rolling (5-10%) | 0.21       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Water        | Clay Loam | Rolling (5-10%) | 0.00       | Washbrook                            | Agricultural | Clay Loam | Flat (0-5%)     | 0.41       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland     | Clay Loam | Flat (0-5%)     | 0.43       | Washbrook                            | Agricultural | Clay Loam | Hilly (>10%)    | 0.24       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland     | Clay Loam | Hilly (>10%)    | 0.52       | Washbrook                            | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       |
| Hurley Relief Branch Drain and Upper Part of the Hurley Relief Drain | Woodland     | Clay Loam | Rolling (5-10%) | 0.24       | Washbrook                            | Grassland    | Clay Loam | Flat (0-5%)     | 0.05       |
| McLean-Hergott (to Gzowski)  | Agricultural | Clay Loam | Flat (0-5%)     | 0.22       | Washbrook                            | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       |
| McLean-Hergott (to Gzowski)  | Agricultural | Clay Loam | Hilly (>10%)    | 0.18       | Washbrook                            | Grassland    | Clay Loam | Rolling (5-10%) | 0.01       |
| McLean-Hergott (to Gzowski)  | Agricultural | Clay Loam | Rolling (5-10%) | 0.06       | Washbrook                            | Impervious   | Clay Loam | Flat (0-5%)     | 0.44       |
| McLean-Hergott (to Gzowski)  | Grassland    | Clay Loam | Flat (0-5%)     | 0.02       | Washbrook                            | Impervious   | Clay Loam | Hilly (>10%)    | 0.14       |

| Catchment                          | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                 | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|------------------------------------|--------------|-----------|-----------------|------------|---------------------------|--------------|-----------|-----------------|------------|
| McLean-Hergott (to Gzowski)        | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       | Washbrook                 | Impervious   | Clay Loam | Rolling (5-10%) | 0.20       |
| McLean-Hergott (to Gzowski)        | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | Washbrook                 | Water        | Clay Loam | Flat (0-5%)     | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Flat (0-5%)     | 0.24       | Washbrook                 | Water        | Clay Loam | Hilly (>10%)    | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Hilly (>10%)    | 0.01       | Washbrook                 | Water        | Clay Loam | Rolling (5-10%) | 0.00       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Rolling (5-10%) | 0.10       | Washbrook                 | Woodland     | Clay Loam | Flat (0-5%)     | 0.20       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | Washbrook                 | Woodland     | Clay Loam | Hilly (>10%)    | 0.18       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Hilly (>10%)    | 0.06       | Washbrook                 | Woodland     | Clay Loam | Rolling (5-10%) | 0.09       |
| McLean-Hergott (to Gzowski)        | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       | West Branch Delisle Drain | Agricultural | Clay Loam | Flat (0-5%)     | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Flat (0-5%)     | 0.27       | West Branch Delisle Drain | Agricultural | Clay Loam | Hilly (>10%)    | 0.14       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Hilly (>10%)    | 0.28       | West Branch Delisle Drain | Agricultural | Clay Loam | Rolling (5-10%) | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | West Branch Delisle Drain | Grassland    | Clay Loam | Flat (0-5%)     | 0.16       |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       | West Branch Delisle Drain | Grassland    | Clay Loam | Hilly (>10%)    | 0.00       |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Hilly (>10%)    | 0.01       | West Branch Delisle Drain | Grassland    | Clay Loam | Rolling (5-10%) | 0.03       |
| McLean-Hergott (to Sullivan Creek) | Grassland    | Clay Loam | Rolling (5-10%) | 0.00       | West Branch Delisle Drain | Impervious   | Clay Loam | Flat (0-5%)     | 0.42       |
| McLean-Hergott (to Gzowski)        | Impervious   | Clay Loam | Flat (0-5%)     | 0.32       | West Branch               | Impervious   | Clay Loam | Hilly (>10%)    | 0.03       |

| Catchment                                      | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment                 | Land Use     | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|---------------------------|--------------|-----------|-----------------|------------|
| Sullivan Creek)                                |              |           |                 |            | Delisle Drain             |              |           |                 |            |
| McLean-Hergott (to Sullivan Creek)             | Impervious   | Clay Loam | Hilly (>10%)    | 0.07       | West Branch Delisle Drain | Impervious   | Clay Loam | Rolling (5-10%) | 0.14       |
| McLean-Hergott (to Sullivan Creek)             | Impervious   | Clay Loam | Rolling (5-10%) | 0.14       | West Branch Delisle Drain | Woodland     | Clay Loam | Flat (0-5%)     | 0.17       |
| McLean-Hergott (to Sullivan Creek)             | Woodland     | Clay Loam | Flat (0-5%)     | 0.00       | West Branch Delisle Drain | Woodland     | Clay Loam | Hilly (>10%)    | 0.15       |
| McLean-Hergott (to Sullivan Creek)             | Woodland     | Clay Loam | Hilly (>10%)    | 0.07       | West Branch Delisle Drain | Woodland     | Clay Loam | Rolling (5-10%) | 0.07       |
| McLean-Hergott (to Sullivan Creek)             | Woodland     | Clay Loam | Rolling (5-10%) | 0.00       | West Townline             | Agricultural | Clay Loam | Flat (0-5%)     | 1.14       |
| North 12th Concession                          | Agricultural | Clay Loam | Flat (0-5%)     | 0.39       | West Townline             | Agricultural | Clay Loam | Hilly (>10%)    | 1.01       |
| North 12th Concession                          | Agricultural | Clay Loam | Hilly (>10%)    | 0.37       | West Townline             | Agricultural | Clay Loam | Rolling (5-10%) | 0.27       |
| North 12th Concession                          | Agricultural | Clay Loam | Rolling (5-10%) | 0.10       | West Townline             | Grassland    | Clay Loam | Flat (0-5%)     | 0.00       |
| North 12th Concession                          | Impervious   | Clay Loam | Flat (0-5%)     | 0.31       | West Townline             | Impervious   | Clay Loam | Flat (0-5%)     | 1.54       |
| North 12th Concession                          | Impervious   | Clay Loam | Hilly (>10%)    | 0.09       | West Townline             | Impervious   | Clay Loam | Hilly (>10%)    | 0.06       |
| North 12th Concession                          | Impervious   | Clay Loam | Rolling (5-10%) | 0.23       | West Townline             | Impervious   | Clay Loam | Rolling (5-10%) | 0.32       |
| North 12th Concession                          | Woodland     | Clay Loam | Flat (0-5%)     | 0.01       | West Townline             | Water        | Clay Loam | Flat (0-5%)     | 0.01       |
| North 12th Concession                          | Woodland     | Clay Loam | Hilly (>10%)    | 0.02       | West Townline             | Water        | Clay Loam | Hilly (>10%)    | 0.03       |
| North 12th Concession                          | Woodland     | Clay Loam | Rolling (5-10%) | 0.01       | West Townline             | Water        | Clay Loam | Rolling (5-10%) | 0.01       |
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Flat (0-5%)     | 0.17       | West Townline             | Woodland     | Clay Loam | Flat (0-5%)     | 0.14       |
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Hilly (>10%)    | 0.34       | West Townline             | Woodland     | Clay Loam | Hilly (>10%)    | 0.62       |

| Catchment                                      | Land Use     | Soil Type | Slope Class     | Area (ha)* | Catchment     | Land Use | Soil Type | Slope Class     | Area (ha)* |
|--|--------------|-----------|-----------------|------------|---------------|----------|-----------|-----------------|------------|
| North Talbot Road Drain in the 12th Concession | Agricultural | Clay Loam | Rolling (5-10%) | 0.15       | West Townline | Woodland | Clay Loam | Rolling (5-10%) | 0.11       |

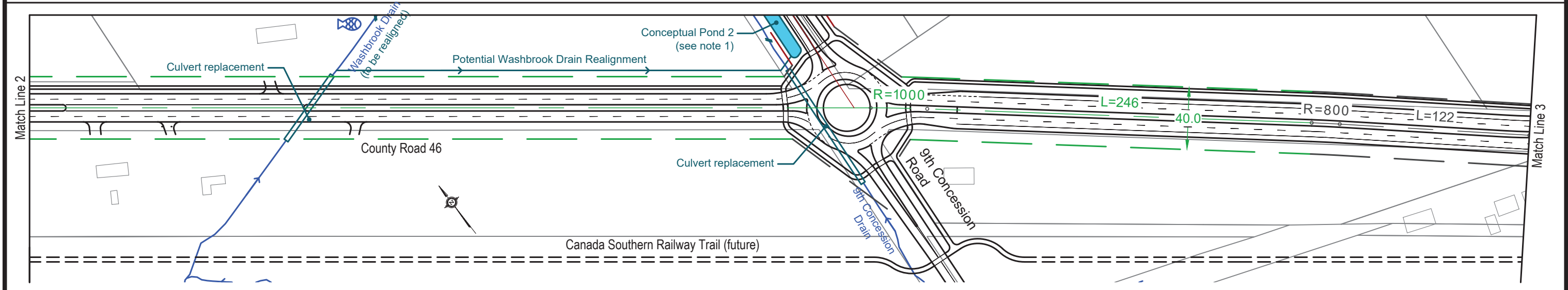
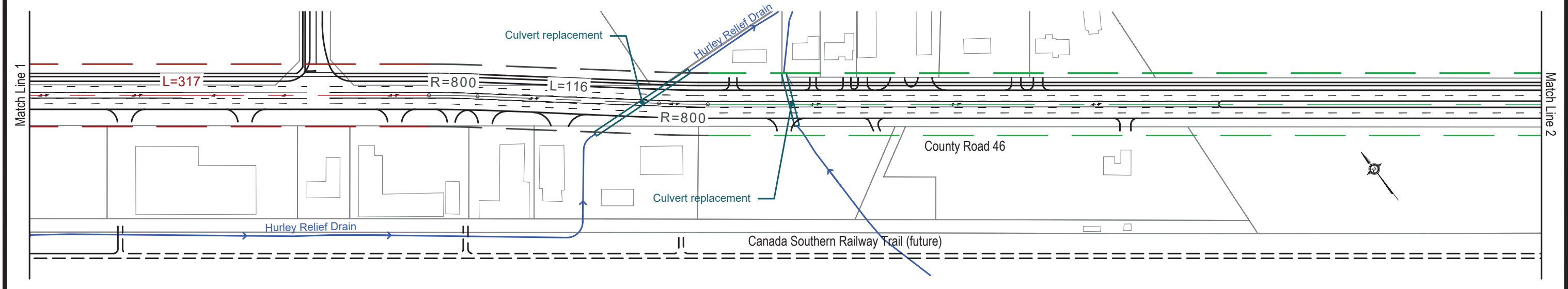
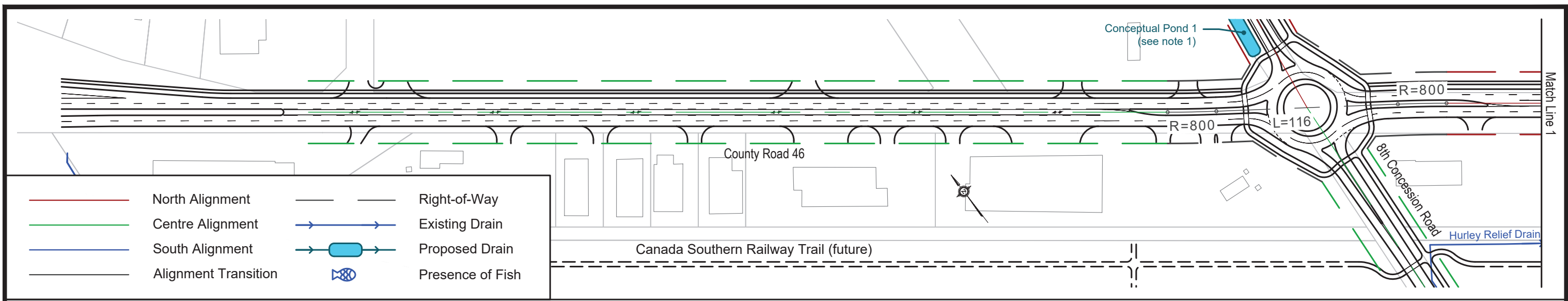
\*Values <0.005 ha are rounded to 0.00 ha

## Attachment C

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Preliminary Design Drawings

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 PLODATE: Mar 31, 2028 - 9:53am



Note 1: Conceptual stormwater management facility location only illustrated and size and location to be considered further in detail design and consider any integration with land storm water requirements from integrated developments at the time of implementation. Property requirements to be determined by the future stormwater design.

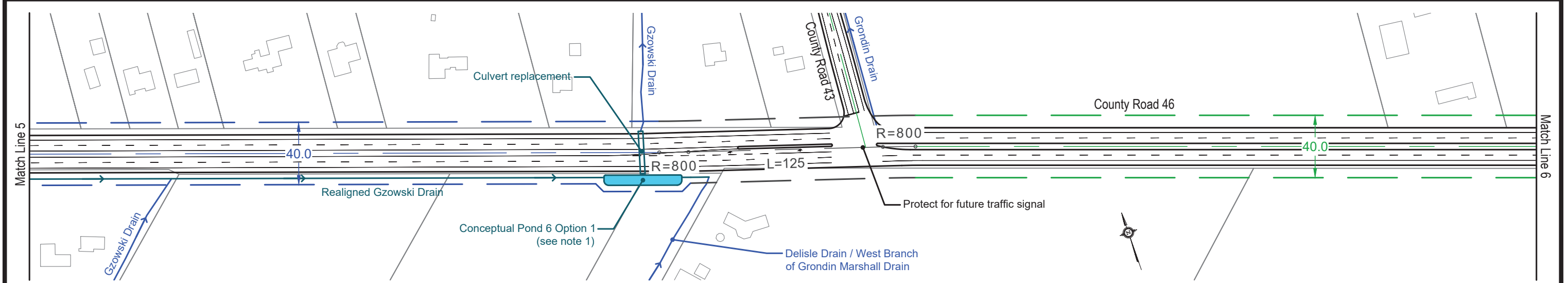
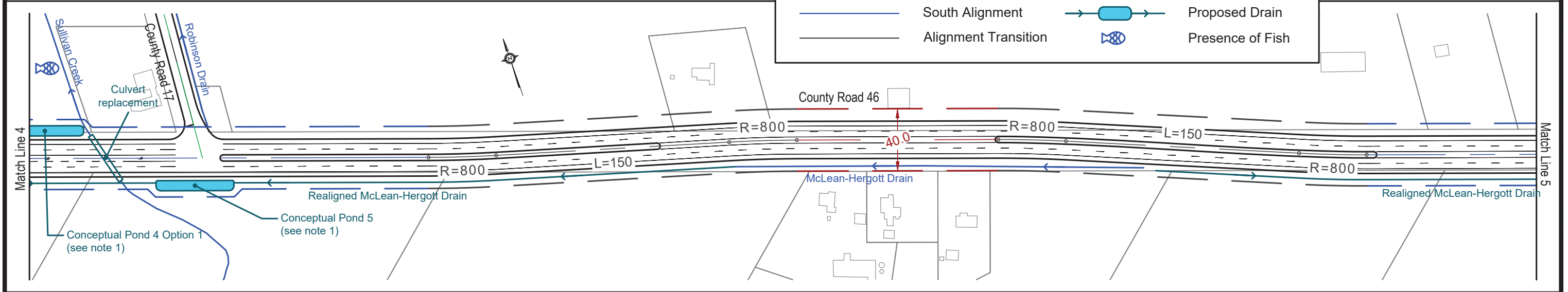
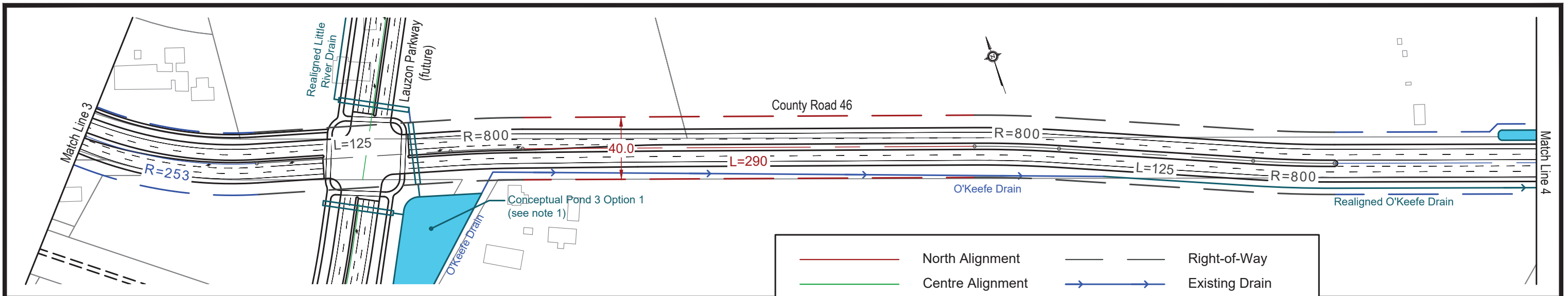


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| DRAWN BY | D.R.              |
| FILE No. | 23-041            |

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|---|
| COUNTY OF ESSEX ROAD 46   |
| Preliminary Technically Preferred Alternative<br>Sections 1 and 2 |

PLATE  
1

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Note 1: Conceptual stormwater management facility location only illustrated and size and location to be considered further in detail design and consider any integration with land storm water requirements from integrated developments at the time of implementation. Property requirements to be determined by the future stormwater design.

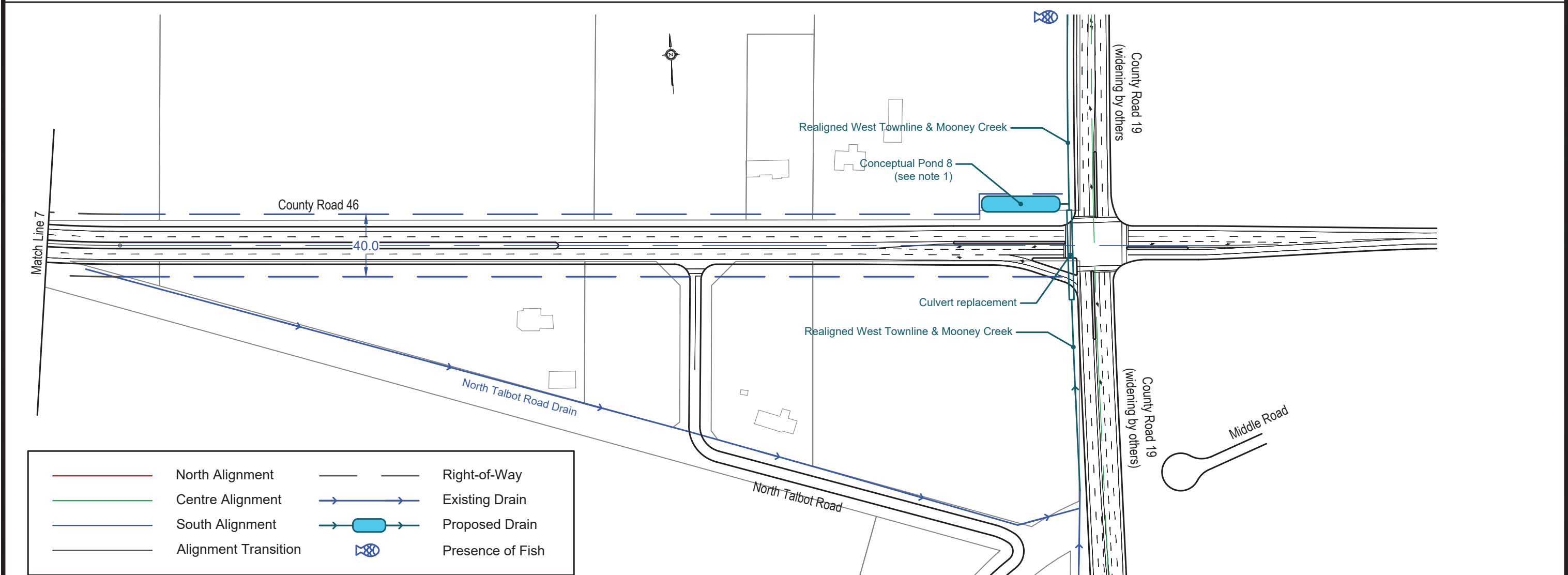
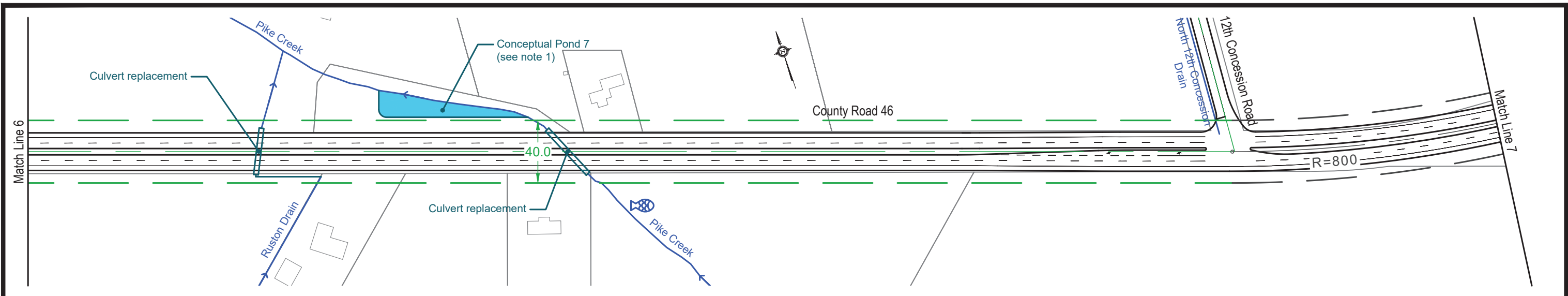


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| COUNTY OF ESSEX ROAD 46   |
| Preliminary Technically Preferred Alternative<br>Section 3 West |

PLATE  
2

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 PLODATE: Mar 31, 2028 - 9:53am



|  |                      |  |                  |
|--|----------------------|--|------------------|
|  | North Alignment      |  | Right-of-Way     |
|  | Centre Alignment     |  | Existing Drain   |
|  | South Alignment      |  | Proposed Drain   |
|  | Alignment Transition |  | Presence of Fish |

Note 1: Conceptual stormwater management facility location only illustrated and size and location to be considered further in detail design and consider any integration with land storm water requirements from integrated developments at the time of implementation. Property requirements to be determined by the future stormwater design.

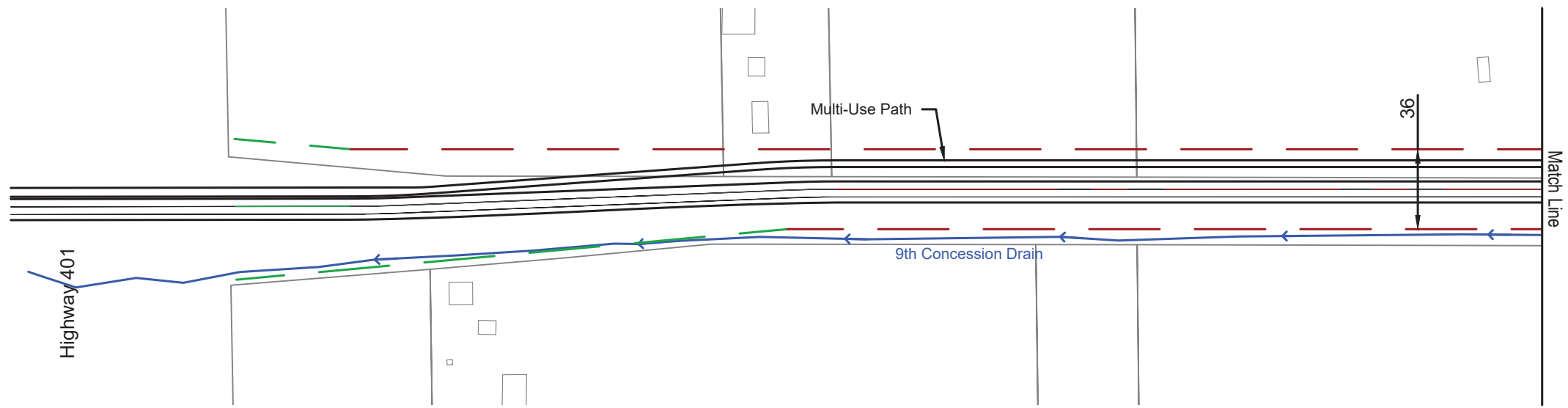


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| COUNTY OF ESSEX ROAD 46   |
| Preliminary Technically Preferred Alternative<br>Section 3 East |

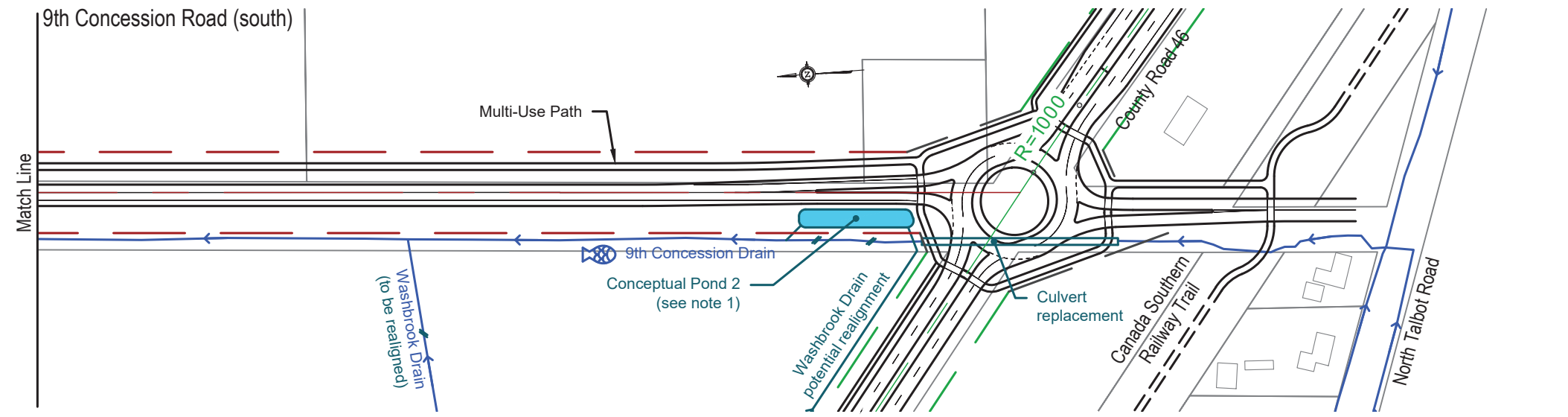
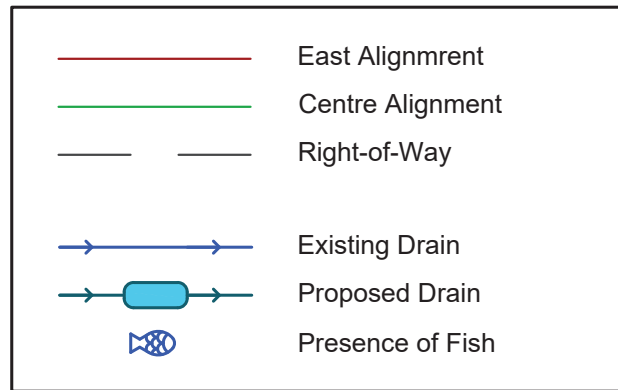
PLATE  
3

9th Concession Road (north)

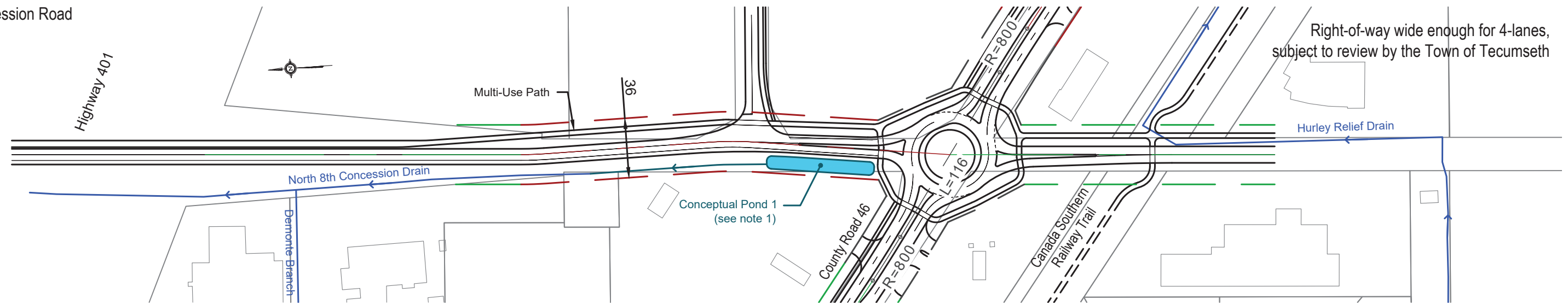


Note 1: Conceptual stormwater management facility location only illustrated and size and location to be considered further in detail design and consider any integration with land storm water requirements from integrated developments at the time of implementation. Property requirements to be determined by the future stormwater design.

9th Concession Road (south)



8th Concession Road



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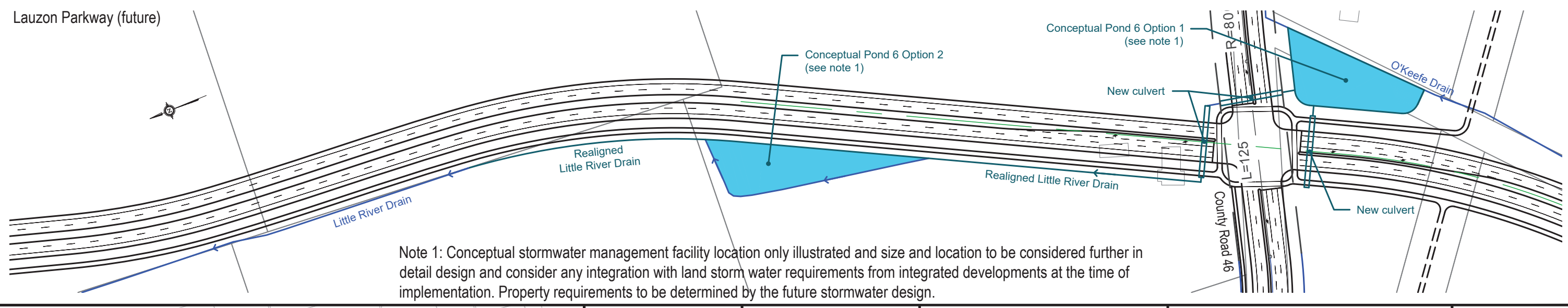
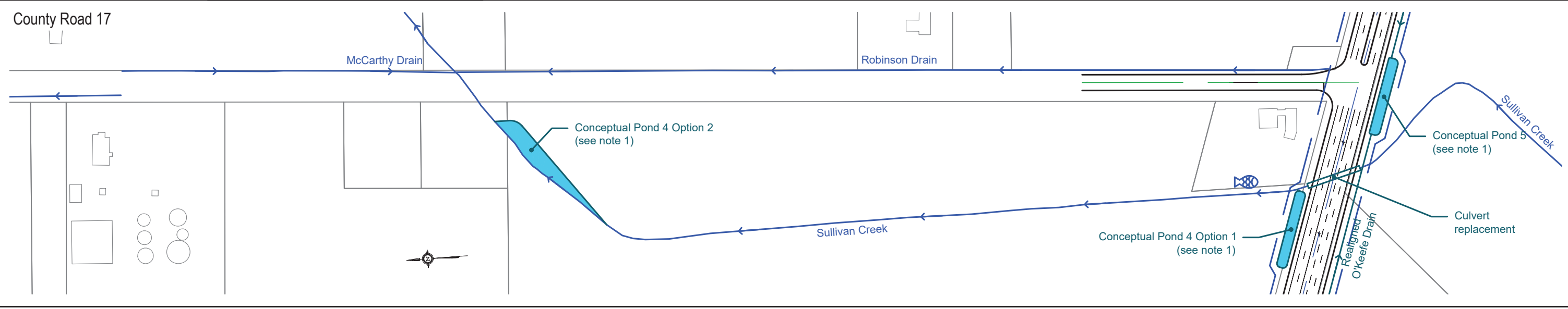
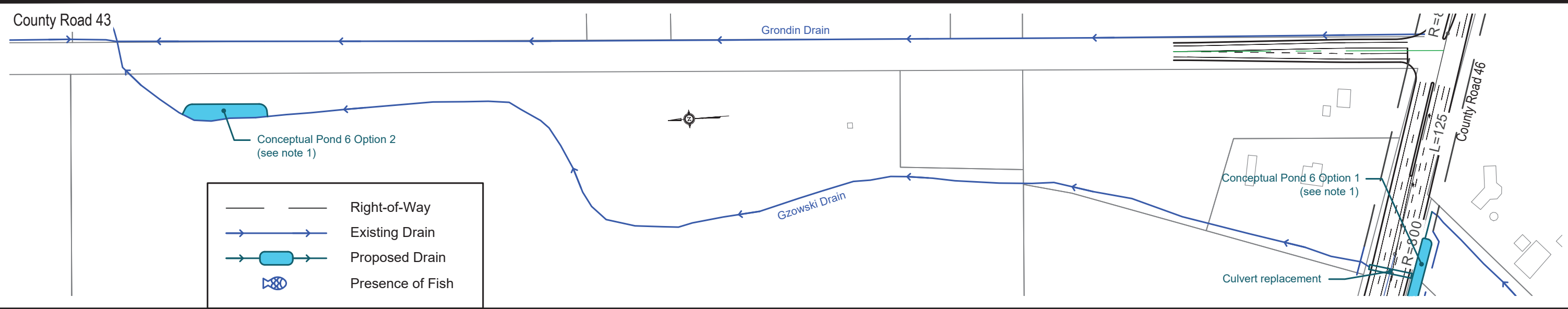


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| FILE No. | 23-041            |

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|---|
| COUNTY OF ESSEX ROAD 46   |
| Preliminary Technically Preferred Alternative<br>8th and 9th Concession Roads |

PLATE  
4

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Note 1: Conceptual stormwater management facility location only illustrated and size and location to be considered further in detail design and consider any integration with land storm water requirements from integrated developments at the time of implementation. Property requirements to be determined by the future stormwater design.



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| DATE     | March 31, 2026    |
| DRAWN BY | D.R.              |
| FILE No. | 23-041            |

COUNTY OF ESSEX ROAD 46

Preliminary Technically Preferred Alternative  
Lauzon Parkway, County Roads 17 and 43

PLATE  
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