



## TOWNSHIP OF WELLINGTON NORTH

TO: Mayor and Council

DATE: June 22, 2026

MEETING TYPE: Open

SUBMITTED BY: Tammy Stevenson, Manager of Infrastructure & Engineering

REPORT #: INF 2026-008

REPORT TITLE: Mount Forest Southeast Drainage Study

### RECOMMENDED MOTION

THAT the Council of the Corporation of the Township of Wellington North receive Report INF 2026-008;

AND THAT the preliminary findings be shared with the property owners within the Mount Forest Southeast Drainage Study area in order to get feedback on the potential recommendations;

AND FURTHER that staff report back to Council in the Fall of 2026 with recommendations for consideration, including financial impacts, to be included in the 2027 Capital budget deliberations.

### PREVIOUS REPORTS/BY-LAWS/RESOLUTIONS

2026 Capital Budget

INF 2025-021 Mount Forest Southeast Drainage

### BACKGROUND

The Mount Forest Southeast Drainage Study area is located east of Main Street South (Highway 6), south of Queen Street East (Highway 89) within the urban boundary with a total of approximately 83 Ha of land.

A Public Information Centre was held on September 16, 2025, to gather preliminary information for residents within the study area with the results outlined in staff report INF 2025-021.

## ANALYSIS

The study area was analyzed within 6 catchment areas. Driveway culverts, road crossing culverts and 100-year storm flow conveyed within Township right-of-ways were reviewed as found in B.M. Ross and Associates Memo, see Attachment 1.

In general, the municipal improvement recommendations are as follows:

- Closed Circuit Television (CCTV) Inspection of existing storm sewers.;
- Driveway culverts should be reviewed for obstructions with the recommendation of replacement of a few undersized driveway culverts;
- Corrugated Steel Pipe Road crossing culverts to be replaced with HDPE pipe;
- Roadside ditching where ditches have been filled in over the year to be cleaned out to allow for the intended road drainage;
- Storm outlets to be replaced with engineered pipe sizing including headwall and repair erosion at outlet including large culvert at the outlet of catchment 1;
- Diversion of sub-catchment 3 through the unopened Oxford Street right-of-way to Outlet 2; and
- Continued maintenance, inspections and monitoring of area infrastructure to ensure the system is working as intended.

Private property upgrade suggestions include:

- Ensuring positive grading away from buildings;
- Ensuring there are adequate drainage swales;
- Installation of window wells complete with stone drainage hydraulically connected to the foundation drains;
- Periodic inspection of drainage features especially before heavy rain forecasts or snowmelt events;
- Ensuring that landscaping does not impede or alter adjacent Municipal drainage works in any way.

Proposed Next Steps:

Summer 2026    Host a Public Information Centre (PIC) to present the preliminary findings and receive public and stakeholders feedback.

Fall 2026        Present final study and recommendations to Council including community feedback from the summer PIC, identify possible mitigation measures and other improvements that can be considered by Council.

## CONSULTATION

CAO and Township Engineers.

## FINANCIAL CONSIDERATIONS

There are no financial considerations in receiving this report for information . Storm drainage study engineering work is within the approved 2026 Capital Budget.

## ATTACHMENTS

Attachment 1 BMROSS Memo dated June 9, 2026.

## STRATEGIC PLAN 2024

- ☐ Shape and support sustainable growth  
How:
- ☐ Deliver quality, efficient community services aligned with the Township's mandate and capacity  
How:
- ☐ Enhance information sharing and participation in decision-making  
How:
- ☒ N/A Core-Service

## ASSESSIBILITY FOR ONTARIANS DISABILITIES ACT CONSULTATION

Does this report apply to any of the standards under the AODA that require consultation

- ☐ Customer Service Standard
- ☐ Information and Communications Standard
- ☐ Employment Standard
- ☐ Transportation Standard
- ☐ Design of Public Spaces Standard
- ☒ Not applicable

Approved by: ☒

Brooke Lambert, Chief Administrative Officer



## Memo

From: Izaak De Jager  
[idejager@bmross.net](mailto:idejager@bmross.net)

|                |                                                            |
|----------------|------------------------------------------------------------|
| <b>To:</b>     | Tammy Stevenson, Manager of Infrastructure and Engineering |
| <b>Re:</b>     | Mount Forest Drainage Study                                |
| <b>File #:</b> | 25155                                                      |
| <b>Date:</b>   | June 11, 2026                                              |

### 1.0 Background

The Township of Wellington North retained B.M. Ross & Associates Ltd. (BMROSS) to identify and investigate the performance of Township storm water conveyance infrastructure in the southeast portion of the Community of Mount Forest. The project kickoff meeting was March 3, 2026, and BMROSS began work shortly thereafter with the construction of a hydrologic/hydraulic model using the industry standard modelling software *Personal Computer Storm Water Management Model* (PCSWMM). An initial site visit/survey was completed on April 8, 2026, to verify drainage features and to establish key elevations by Global Positioning System (GPS) survey. Progress meetings were held on April 22 and June 2, 2026, where preliminary results and conclusions were presented to Township staff and feedback was solicited.

### 2.0 Study Area

The Study Area is generally defined as the area within the urban boundary of Mount Forest that is located east of Main Street South (Hwy 6), south of Queen Street East (Hwy 89) and southeast of the South Saugeen River – a total of approximately 83 Ha of land, and also necessarily includes any external drainage areas which drain into the urban area – an additional 92 Ha of land. The Study Area is illustrated in Figure 1 below.

For the purpose of developing a PCSWMM model, the Study Area topography and drainage features were analyzed and then subdivided into six (6) distinct outlets corresponding to six (6) distinct drainage areas (catchments). The six (6) outlets/catchments are listed in Table 1 below and illustrated in Figure 2. For ease of interpretation, the different catchments in Figure 2 have been colour-coded.

It should be noted that any lands within the Study Area that do not drain to one of the six (6) outlets listed in Table 1 were not analyzed. Also, particular attention should be paid to the catchment sizes and the sizes of the outlet pipes, as several of the catchments are quite large in comparison to typical urban catchment areas.

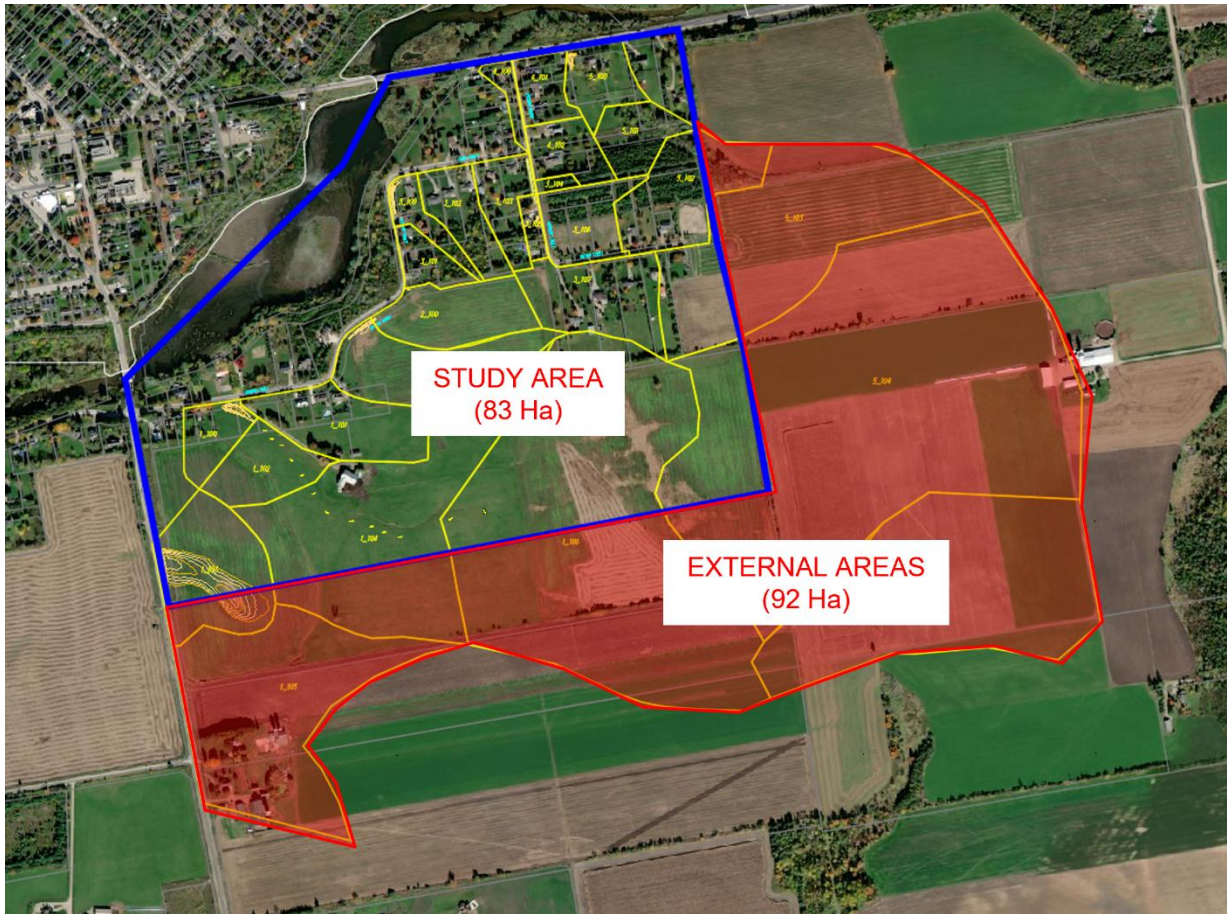


Figure 1 – Study Area

Table 1 – Outlet/Catchment Summary

| Outlet No. | Outlet Location                                                      | Outlet Description                                                                              | Catchment Size (Ha) |
|------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------|
| 1          | Murphy Street – at Playground, ~150m east of Hwy 6                   | 750mm diameter CSP culvert under Murphy Street, through park, discharging to river              | 64                  |
| 2          | Murphy Street/Glasgow Street bend                                    | 450mm diameter CSP culvert under road, discharging to forested area adjacent to river           | 3                   |
| 3          | Glasgow Street/Clyde Street bend                                     | 900mm diameter CSP culvert under road, discharging to river                                     | 12                  |
| 4          | Queen Street East, south side of road, ~100m west of Ayrshire Street | 600mm diameter CSP culvert under driveway to #680 Queen Street East, discharging to river flats | 3                   |
| 5          | Queen Street East, ~100m east of Ayrshire Street                     | 1200mm diameter CSP culvert under Queen Street East, discharging to river flats                 | 73                  |

| Outlet No. | Outlet Location                                      | Outlet Description                                                                             | Catchment Size (Ha) |
|------------|------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------|
| 6          | Murphy Street, ~80m southwest of Murphy/Glasgow Bend | 450mm diameter CSP culvert under Murphy Street, discharging to forested area adjacent to river | 4                   |

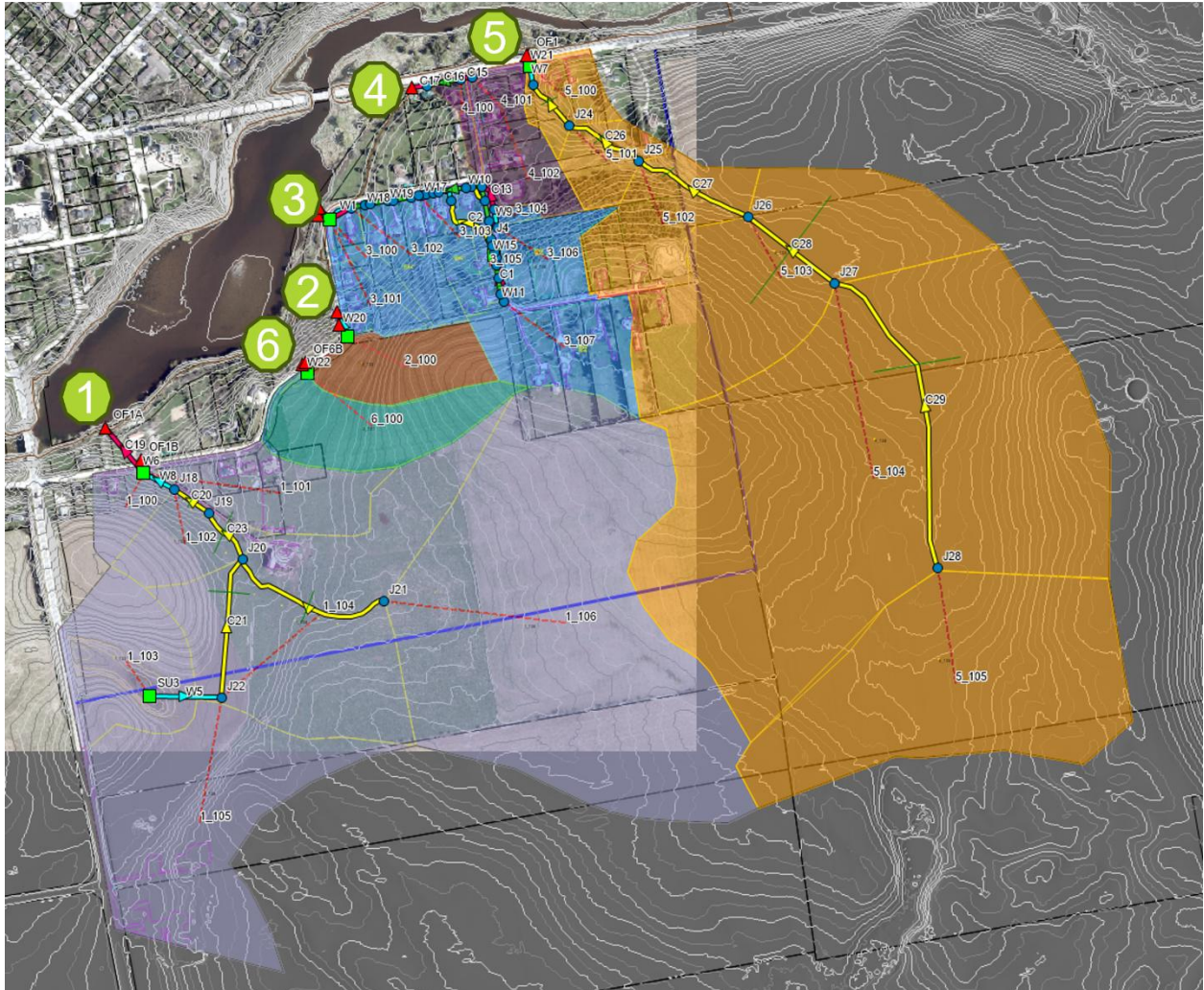


Figure 2 – Drainage Outlets and Corresponding Catchments

### 3.0 Design Storms

Per the Township of Wellington North Municipal Servicing Standards (MSS), a 6-hr SCS Type II design storm distribution curve was used for the analysis, and rainfall depths for the various design storms were assigned based on MTO IDF curves. Table 2 summarizes the design storms used for the PCSWMM modelling work.

**Table 2 – Design Storms**

| <b>Return Period<br/>(Yrs)</b> | <b>6-hr Rainfall Depth<br/>(mm)</b> |
|--------------------------------|-------------------------------------|
| 5                              | 54                                  |
| 10                             | 62                                  |
| 25                             | 73                                  |
| 100                            | 89                                  |

#### **4.0 Evaluation Criteria**

For the purpose of evaluating whether a particular drainage feature is performing adequately (at least according to the model), the Township MSS was consulted, and the following evaluation criteria were established:

- Driveway culverts must convey the 10-year storm flow without the driveway overtopping
- Road crossing culverts must convey the 25-year storm flow without the road overtopping
- The 100-year storm flow must be conveyed within Township rights-of-way without resulting in flooding of adjacent properties or structures.

These criteria form the basis upon which an evaluation of the performance of the drainage features in the Study Area were made.

#### **5.0 Existing Conditions Assessment**

The PCSWMM model for existing conditions was constructed using publicly available provincial LIDAR topographic data, aerial photography, and GPS survey at select locations. It should be noted that the PCSWMM model represents an interpretation of the existing conditions and that many simplifications and assumptions are inherent in the modelling process. The model is generally considered conservative in nature, and field observations of flow conditions were not available for calibration purposes. As a result, the model may predict drainage impacts or flow behaviour that have not necessarily been historically observed by the Township or local residents. Furthermore, localized grading variations not visible in the available topographic data or not identified during site investigations may influence actual drainage behaviour. It is also important to note that the modelling work assumes that the drainage features (i.e. ditches, culverts, sewers, etc.) are in good condition and function as intended. A detailed condition assessment of the infrastructure in the study area is outside the scope of the work authorized thus far, although obvious deficiencies that were observed in the field were noted and are mentioned in subsequent sections of this memo. Finally, we note that the model is a rainfall-runoff model and does not specifically simulate snowmelt events; however, the potential impacts of snow and ice blockages are discussed qualitatively when relevant.

The following subsections provide the existing conditions model results according to the six (6) major outlets/catchments identified in a previous section and provide a discussion as to whether the results meet the evaluation criteria for the various drainage features within each catchment.

### 5.1 Outlet/Catchment 1

Outlet 1 consists of a 750mm diameter<sup>1</sup> culvert crossing under Murphy Street approximately 150m east of Main Street South (Hwy 6). The catchment area contributing to this outlet is very large, consisting of approximately 64 Ha of mostly farm fields and pasturelands. The average sub-catchment slope is 6.5%. The size and topography combine to produce significant peak flows at the location of the culvert which crosses under Murphy Street. Figure 3 illustrates the location of Outlet 1 and the contributing Catchment 1. Table 3 summarizes the modelling results for Outlet/Catchment 1.

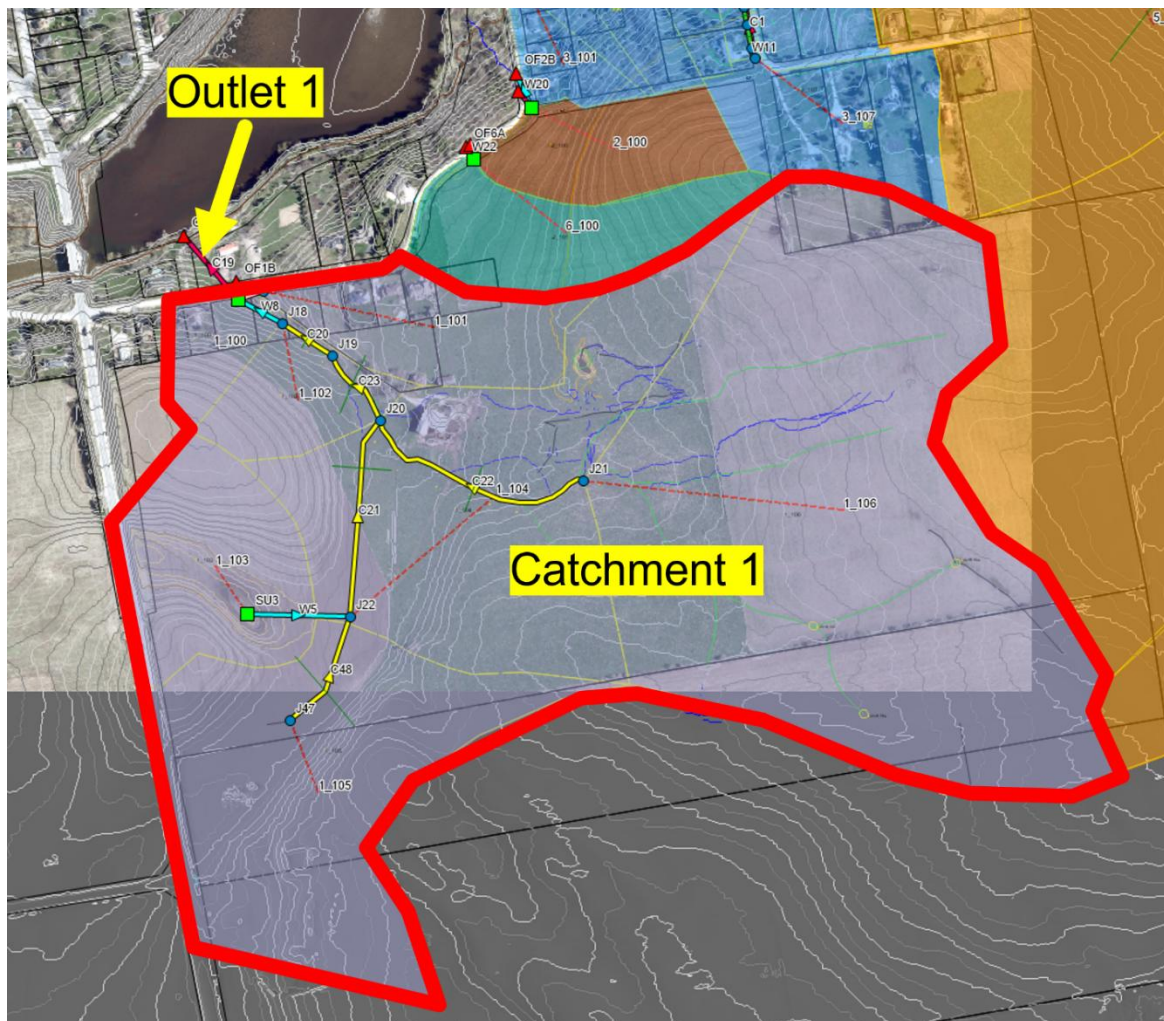


Figure 3 – Outlet/Catchment 1

<sup>1</sup> The upstream end measures at 900mm diameter, but the downstream end measures 750mm diameter. The smaller diameter was used for modelling and is commonly used to denote the size of the culvert.

**Table 3 – Existing Conditions Model Results – Outlet/Catchment 1**

|                                         | <b>DESIGN STORM FREQUENCY &amp; TOTAL RAINFALL DEPTH</b> |                           |                           |                            |
|-----------------------------------------|----------------------------------------------------------|---------------------------|---------------------------|----------------------------|
| <b>Location/Issue</b>                   | <b>5 yr<br/>(54.0mm)</b>                                 | <b>10 yr<br/>(62.4mm)</b> | <b>25 yr<br/>(73.2mm)</b> | <b>100 yr<br/>(89.4mm)</b> |
| Murphy Street overtopped                | No                                                       | No <sup>1</sup>           | Yes – 1.32 cms            | n/a                        |
| DW culvert at #180 Murphy St overtopped | No                                                       | Yes - minor - 4 L/s       | n/a                       | n/a                        |

<sup>1</sup>The model predicted that the floodwaters on the upstream side of the culvert were only ~2 cm below the spill elevation for the 10-year storm event.

Red font denotes an existing level of service below Township standards

Green font denotes an existing level of service at or above Township standards

In our opinion the predicted overtopping of the driveway to #180 Murphy Street should be considered a very minor deficiency, given the minor overtopping flow predicted and the conservative nature of the PCSWMM model. The issue of the overtopping of Murphy Street is much more significant, as the model predicts that this will occur under conditions only marginally greater than the 10-year storm event, and predicts a significant overtopping flow of 1.32 cms under the 25-year storm flow, whereas the Township standards require road crossing culverts to convey the 25-year storm flow without resulting in overtopping. The large size of Catchment #1 (64 Ha) and the steep topography combine to produce peak flows that result in this existing culvert being undersized.

We note that during our site visit the downstream end of this culvert was observed to be in poor condition with visible holes in the top of the pipe and likely significant root intrusion due to the presence of a large tree almost directly on top of the outlet. The existing culvert is approximately 100m in length and extends all the way from the south side of Murphy Street to the edge of the river. The diameter of the pipe measures 900mm at the inlet end and 750mm at the outlet end. From publicly available historical aerial photography (1954), it appears that what is currently buried culvert on the north side of Murphy Street formerly consisted of an open ditch. Therefore, it is possible that this culvert was much shorter in the past and was extended due to the development of the park. Figure 4 illustrates the location of the culvert in 1954.

The extension of the culvert may have been completed by adding a 750mm diameter extension onto the downstream end of a formerly 900mm diameter culvert, which would explain the discrepancy between upstream and downstream diameters observed in the field. If the culvert was lengthened in the past this would have a negative impact on hydraulic performance, resulting in more upstream head required to “push” flows through. Regardless of the historical background, the modelling found the culvert to be undersized based on the evaluation criteria, and this should be addressed. A subsequent section will outline recommendations for the resolution of this deficiency.

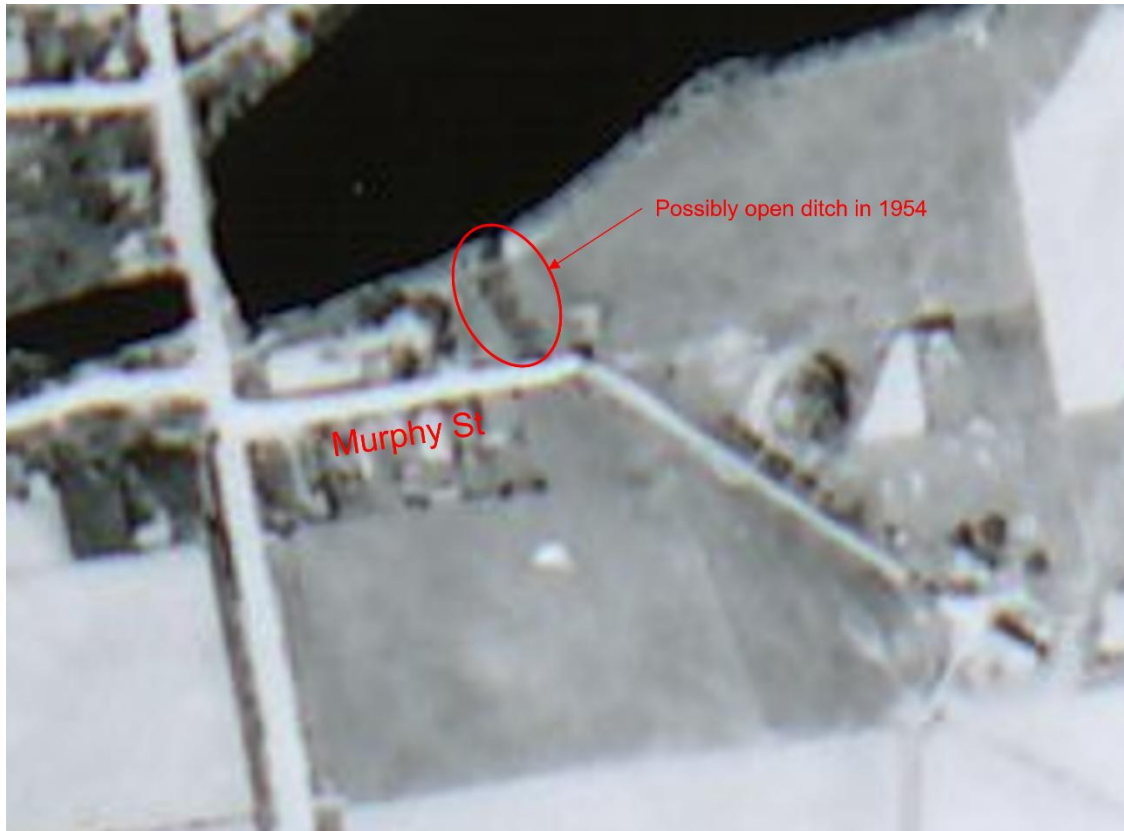


Figure 4 – Outlet 1 in 1954 (Background Imagery from University of Toronto Archive)

## 5.2 Outlet/Catchment 2

Outlet 2 consists of a 450mm diameter culvert crossing under Murphy/Glasgow Street at the bend in the road. The catchment area contributing to this outlet is relatively small, consisting of approximately 3 Ha of farm fields. The catchment has an average slope of 6.9%. Figure 5 illustrates the location of Outlet 2 and the contributing Catchment 2.

The existing conditions PCSWMM model predicts that the culvert as currently configured is sufficient to convey the 25-year storm peak flow without resulting in road overtopping. We do note that during the site visit we observed erosion at the discharge end of the culvert that should be addressed. Furthermore, we also note that discharge from the outlet eventually crosses over the South Wetlands Trail which runs between Murphy Park and the intersection of Glasgow and Clyde Street.

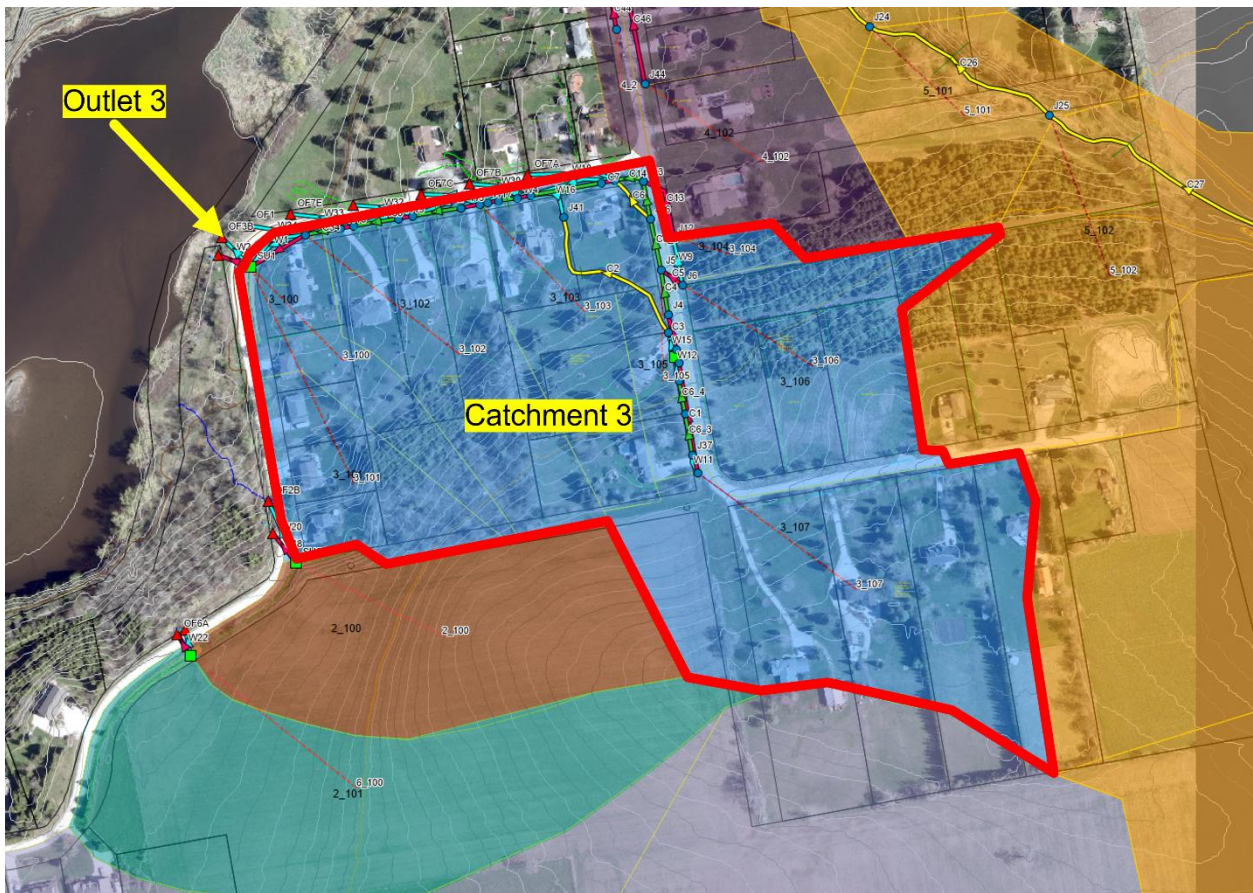
## 5.3 Outlet/Catchment 3

Outlet 3 consists of a 900mm diameter<sup>2</sup> culvert crossing under Glasgow/Clyde Street at the bend in the road. The catchment area contributing to this outlet is medium sized, consisting of approximately 12 Ha of primarily estate residential lots.

---

<sup>2</sup> The upstream end measures 1030x740mm CSP arch, but the downstream end measures 900mm diameter. These sizes have the same hydraulic capacity. 900mm diameter round pipe was used for modelling.





### Figure 6 – Outlet/Catchment 3

**Table 4 – Existing Conditions Model Results – Outlet/Catchment 3**

|                                                                    | DESIGN STORM FREQUENCY & TOTAL RAINFALL DEPTH |                   |                   |                    |
|--------------------------------------------------------------------|-----------------------------------------------|-------------------|-------------------|--------------------|
| Location/Issue                                                     | 5 yr<br>(54.0mm)                              | 10 yr<br>(62.4mm) | 25 yr<br>(73.2mm) | 100 yr<br>(89.4mm) |
| Ayrshire St west ditch capacity downstream of diagonal culvert OK? | Yes                                           | Yes               | Yes               | Yes                |
| Peak Flow split at upstream end of diagonal road crossing culv.    | 96% West                                      | 87% West          | 73% West          | 72% West           |
|                                                                    | 4% East                                       | 13% East          | 27% East          | 28% East           |
| Ditch Spill into east side yard of #460 Clyde                      | No                                            | No                | No                | No                 |
| Spill across #425 Ayrshire DW onto #417 Ayrshire front             | No                                            | No                | No                | Yes                |

|                                                           | DESIGN STORM FREQUENCY & TOTAL RAINFALL DEPTH |                                        |                          |                    |
|-----------------------------------------------------------|-----------------------------------------------|----------------------------------------|--------------------------|--------------------|
| Location/Issue                                            | 5 yr<br>(54.0mm)                              | 10 yr<br>(62.4mm)                      | 25 yr<br>(73.2mm)        | 100 yr<br>(89.4mm) |
| yard and #460 Clyde rear yard                             |                                               |                                        |                          |                    |
| Clyde St. south side DWs overtopped                       | No                                            | Yes - minor - 7 L/s at #450 DW only    | n/a                      | n/a                |
| Spill across Clyde Street from south ditch to north ditch | No                                            | Yes - minor - 7 L/s at #460 Clyde only | Yes - multiple locations | n/a                |
| Road overtopped at Glasgow/Clyde Bend                     | No                                            | No                                     | No                       | n/a                |

Red font denotes an existing level of service below Township standards

Green font denotes an existing level of service at or above Township standards

Orange font denotes an undesirable condition that does not necessarily fail to meet Township standards

With this said, we note that our model results (which again did not account for recent work completed to build up the west side of the ditch) indicated relatively little additional capacity beyond that required to convey the 100-year storm. As a result, hydraulic performance at this location may be more sensitive to reductions in conveyance capacity resulting from ice accumulation, debris, vegetation growth, sediment deposition, unauthorized landscaping, or downstream restrictions than other conveyance elements within the system. For example, a blockage within the Clyde Street south ditch downstream of this location could result in backwater conditions that reduce the capacity of the Ayrshire Street west ditch and potentially cause flows to spill into the side yard of #460 Clyde Street during significant storm events. Similarly, snow and ice accumulation within this ditch section would reduce the available conveyance capacity and would increase the potential for localized overtopping. For context, the majority of runoff from approximately 6.3 Ha of land flows through this ditch section downstream of the road crossing culvert. Figure 7 illustrates the contributing drainage area (shaded in dark blue) represented in the PCSWMM model.

Based on our interpretation of the LIDAR topographic data and field observations, the model does predict a spill onto private property under the 100-year storm at the driveway to #425 Ayrshire Street. At this location, during a 100-year storm, the west ditch flow would build up on the upstream side of the driveway and would then spill over the driveway, across the front yard of #417 Ayrshire Street and into the rear yard of #460 Clyde Street. From there it would likely meander through the rear yard to an existing side yard swale and out to the Clyde Street south ditch. Figure 8 illustrates the inferred flow route.

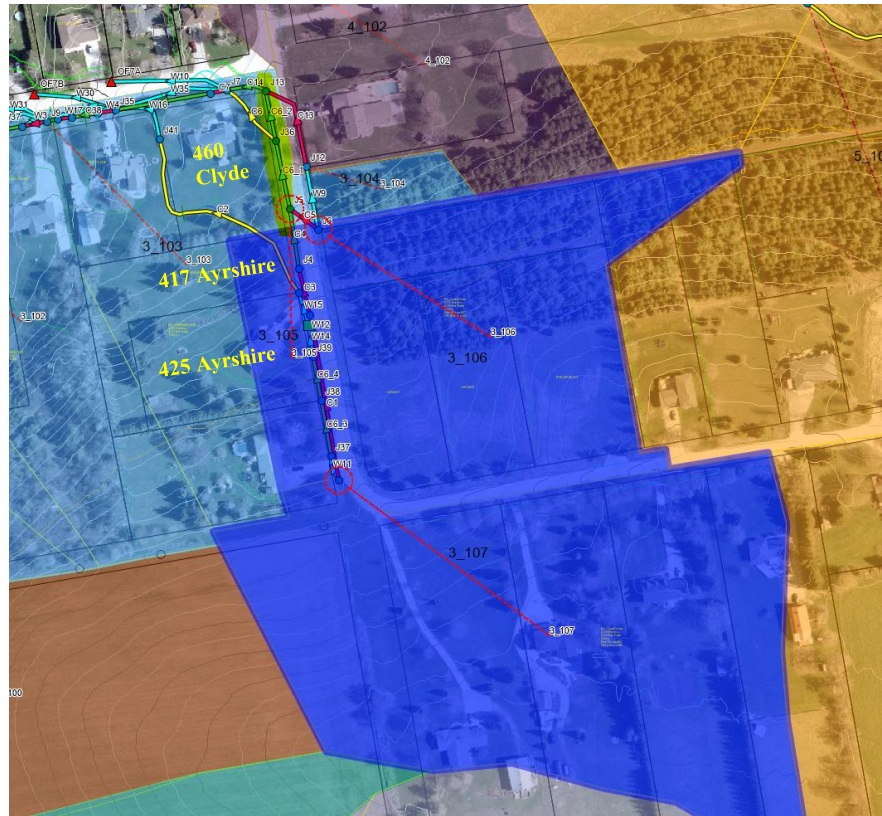


Figure 7 – Lands contributing to Ayrshire Street west ditch adjacent to #460 Clyde Street lot

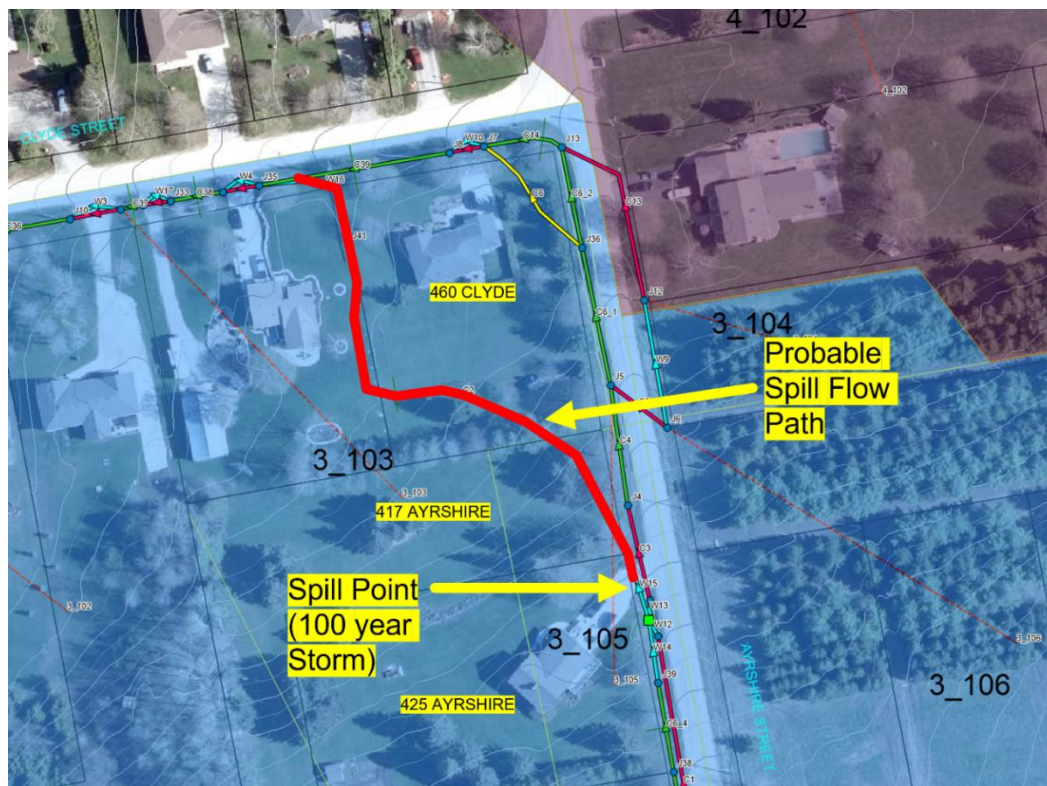


Figure 8 – Spill route (100-year storm) through private property (Note: House at #417 built after date of aerial imagery)

As noted, this inferred overland drainage path is based on our interpretation of the LIDAR topographic data and supported by field observations but should be understood to be highly sensitive to the presence of snow/ice blockages, private landscaping features, and variations inherently present in the topographic data. Therefore, it is possible for these spills to follow an alternate path under the right conditions which could result in negative impacts to the property of #417 Ayrshire Street or #460 Clyde Street. As a result, this existing condition is considered deficient and should be resolved. Possible solutions are discussed in a subsequent section.

We discovered several deficiencies related to the ditching along Clyde Street. Firstly, we note that under the 10-year storm the model predicts minor overtopping of the east driveway to #450 Clyde Street (no other driveways along the Clyde Street south ditch are predicted to overtop during the 10-year storm). This deficiency is considered relatively minor. Secondly, we note that even during the 10-year storm, and increasingly under more significant rainfall events, the model predicts spill(s) across the road from the south ditch to the north ditch. This is predicted to first occur near the intersection with Ayrshire Street under the 10-year storm, and at other locations further to the west under more significant events. We note that the LIDAR topographic data indicates that near the Clyde/Ayrshire intersection, Clyde Street does not have a crowned cross-section and the road “tips” to the north, which encourages spills. Furthermore, our site visit noted that while the majority of the driveway culverts along the Clyde Street south ditch are 600mm diameter, one (#450 Clyde Street north driveway) appears to be 450mm diameter, and another (#460 Clyde Street) appears to be 525mm diameter. These smaller diameter culverts would have the impact of “throttling” the flow in the ditch as compared to the typical 600mm diameter driveway culverts located downstream. The effects of upsizing the driveway culverts and other possibilities for the modification to the Clyde Street south ditch system are discussed in a subsequent section.

Regarding flows that cross over Clyde Street from the south ditch to the north ditch, it is our opinion that this should be prevented from occurring under any of the design storm events, at least until or unless the north ditch is upgraded and specifically designed to convey these overflows. Therefore, we consider the existing conditions to be deficient. A detailed model of the north ditch system was not incorporated into the overall PCSWMM model. From site observations we also note that the existing north ditch is poorly defined and it is possible and even likely that flows which enter the north ditch (regardless of source) will spill onto the adjacent residential properties (#155, #415, #425 and #435 Clyde Street).

#### **5.4 Outlet/Catchment 4**

Outlet 4 consists of a 600mm diameter<sup>3</sup> culvert crossing under the driveway to #680 Queen Street East and discharging to the river flats. The catchment area contributing to this outlet is relatively small, consisting of approximately 3 Ha of primarily estate

---

<sup>3</sup> The upstream end measures 600mm diameter, but the downstream end measures 750mm diameter. The smaller diameter was used for modelling and is commonly used to denote the size of the culvert.

residential lots. The average sub-catchment slope is 6.7%. Figure 9 illustrates the location of Outlet 4 and the contributing Catchment 4. Table 5 summarizes the modelling results for Catchment 4.

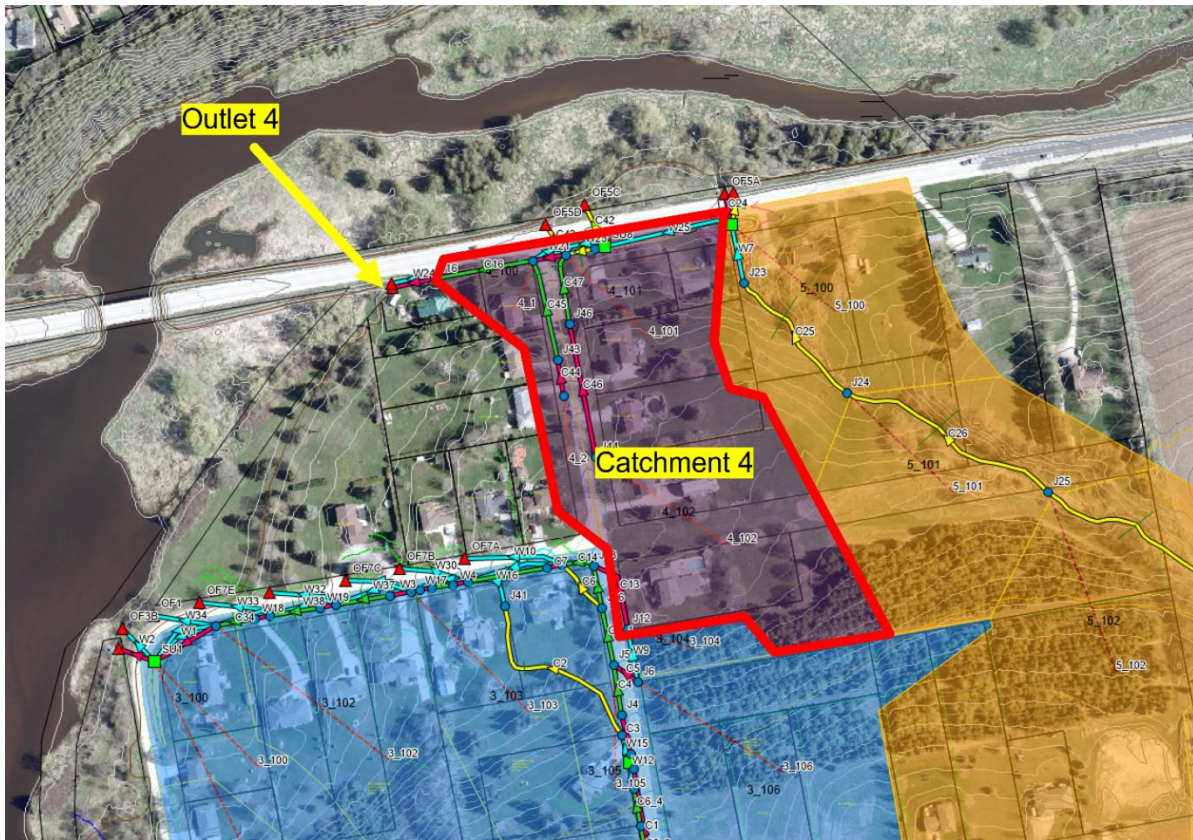


Figure 9 – Outlet/Catchment 4

Table 5 – Existing Conditions Model Results – Outlet/Catchment 4

| Location/Issue                                     | DESIGN STORM FREQUENCY & TOTAL RAINFALL DEPTH |                   |                   |                    |
|----------------------------------------------------|-----------------------------------------------|-------------------|-------------------|--------------------|
|                                                    | 5 yr<br>(54.0mm)                              | 10 yr<br>(62.4mm) | 25 yr<br>(73.2mm) | 100 yr<br>(89.4mm) |
| Ayrshire Street<br>overtopped (at Queen)           | No                                            | No                | No                | n/a                |
| Queen St South DWs<br>overtopped                   | No                                            | No                | n/a               | n/a                |
| Ayrshire St West Side<br>DW Culverts<br>Overtopped | No                                            | No                | n/a               | n/a                |
| Ayrshire St East Side<br>DW Culverts<br>Overtopped | No                                            | No                | n/a               | n/a                |

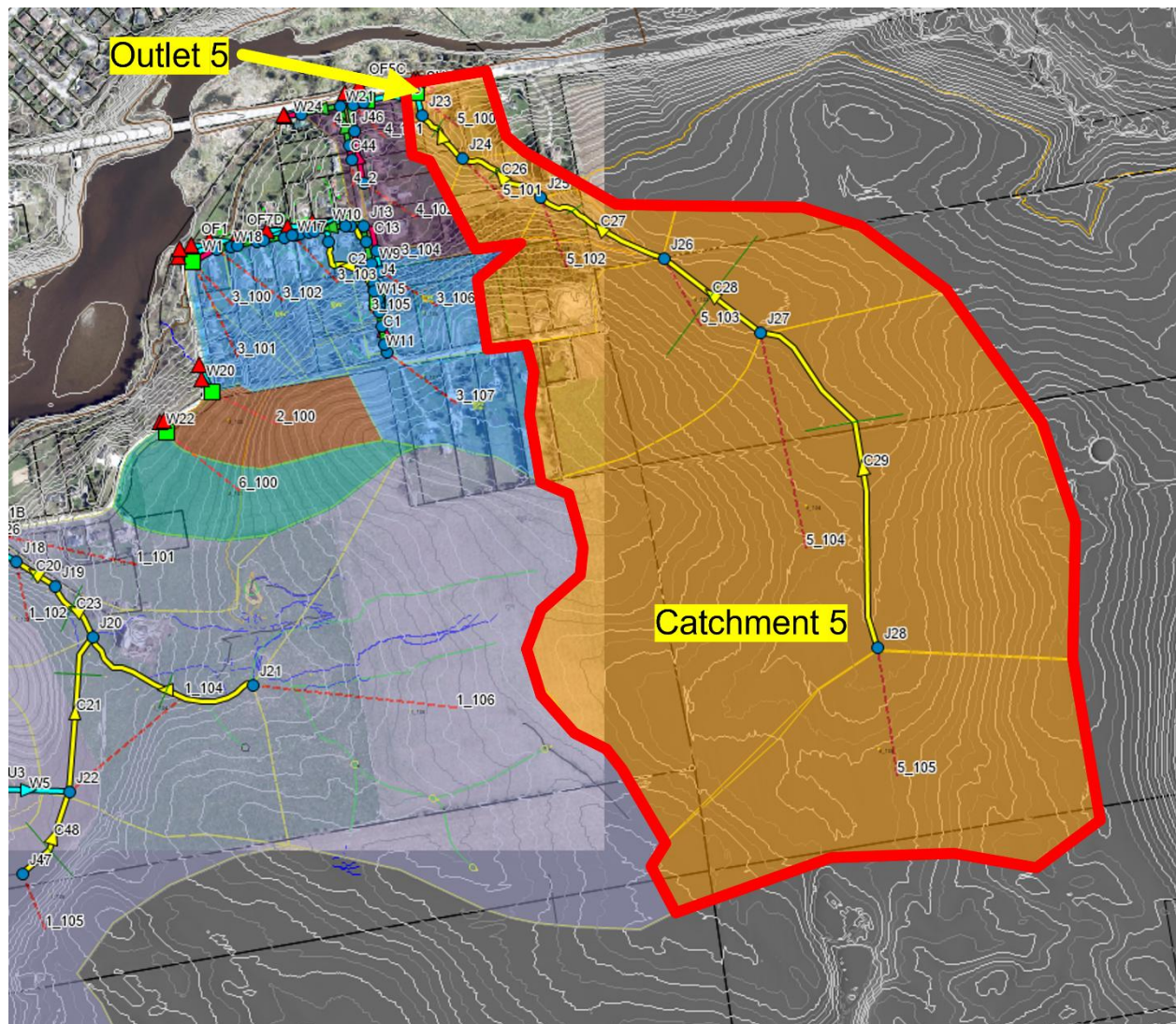
Red font denotes an existing level of service below Township standards

Green font denotes an existing level of service at or above Township standards

The modelling indicated no obvious deficiencies in the drainage features for Catchment 4. Our site visit however did indicate that the ditches along Ayrshire Street between Clyde Street and Queen Street East are poorly defined, and that some of the driveway culverts are partially or fully buried (the model assumed functional culverts).

## 5.5 Outlet/Catchment 5

Outlet 5 consists of a 1200mm diameter culvert crossing under Queen Street East (Hwy 89) approximately 100m east of Ayrshire Street and discharging to the river flats. The culvert is within the MTO designated “Connecting Link” for Highway 89 and therefore within the jurisdiction of the Township. The catchment area contributing to this outlet is very large, consisting of approximately 73 Ha of mostly farm fields and pasturelands. The average sub-catchment slope is 5.9%. Figure 10 illustrates the location of Outlet 5 and the contributing Catchment 5. Table 6 summarizes the modelling results for Catchment 5.



**Table 6 – Existing Conditions Model Results – Outlet/Catchment 5**

|                                                              | <b>DESIGN STORM FREQUENCY &amp; TOTAL RAINFALL DEPTH</b> |                           |                           |                            |
|--------------------------------------------------------------|----------------------------------------------------------|---------------------------|---------------------------|----------------------------|
| <b>Location/Issue</b>                                        | <b>5 yr<br/>(54.0mm)</b>                                 | <b>10 yr<br/>(62.4mm)</b> | <b>25 yr<br/>(73.2mm)</b> | <b>100 yr<br/>(89.4mm)</b> |
| Queen Street overtopped                                      | No                                                       | No                        | No                        | n/a                        |
| Spill to Queen Street South Ditch                            | No                                                       | No                        | No                        | Yes                        |
| Flooding at upstream culvert end impacts adjacent structures | No                                                       | No                        | No                        | No                         |

Orange font denotes an undesirable condition that does not necessarily fail to meet Township standards

Green font denotes an existing level of service at or above Township standards

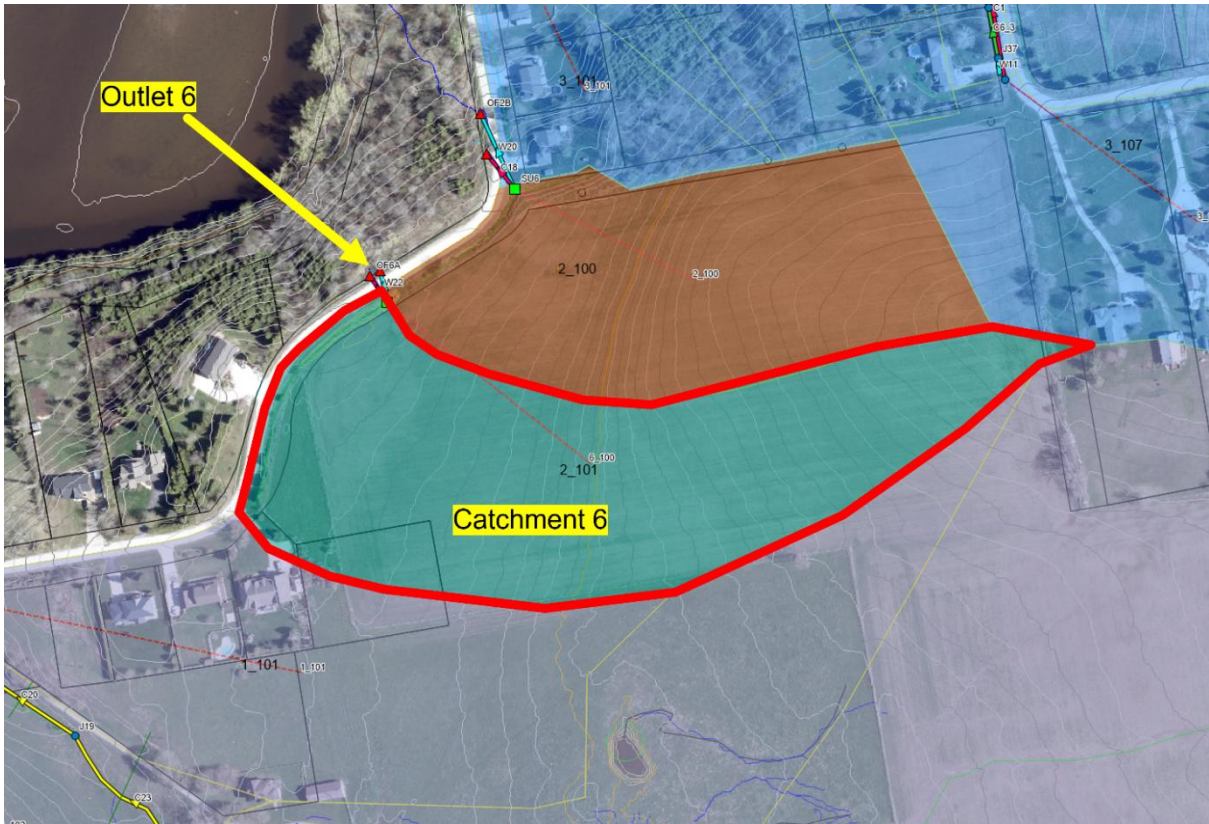
As noted earlier, Catchment 5 is very large (73 Ha) and consists of mostly fields or pasturelands. From the aerial imagery it appears that a gully develops approximately 100m upstream of the culvert and there is evidence of significant erosion from there to the culvert inlet. We note that almost no portion of the catchment or corresponding watercourse lies within Township property. At the downstream end of the culvert we observed significant scour such that the culvert outlet is exposed and protrudes beyond the embankment face, with discharge freely falling into a scour pool below.

Under significant (100-year storm) conditions, there will be significant ponding at the upstream end of the culvert. Beyond the discharge from the culvert itself, additional relief is provided by the overtopping of Queen Street and also the discharge of some water to the west along the Queen Street ditch towards Outlet 4. Although this overflow to the west does not necessarily contravene any Township standard, we believe it is nonetheless undesirable for this to occur. The model predicts that during the 100-year storm the maximum level of ponding at the upstream end of the culvert will not adversely impact the adjacent structures at 710 and 736 Queen Street East.

## **5.6 Outlet/Catchment 6**

Outlet 6 consists of a 450mm diameter culvert crossing under Murphy Street approximately 80m southwest of the Murphy/Glasgow bend and discharging to the forested area adjacent to the river. The catchment area contributing to this outlet is relatively small, consisting of approximately 4 Ha of farm fields. The catchment has an average slope of 4.2%. Figure 11 illustrates the location of Outlet 6 and the contributing Catchment 6.

The model results indicate that Murphy Street will not overtop during the 25-year storm at the location of the outlet, and therefore the Township standard is met at that location. While on site it was observed that the upstream end of the culvert is partly crushed which would have the effect of restricting capacity; therefore, the model results may not be indicative of actual performance at this location.



**Figure 11 – Outlet/Catchment 6**

Furthermore, based on our late May 2026 observations, we note that between the downstream end of Outlet 6 and the river, the runoff crosses the South Wetlands Trail and that there is significant erosion at this crossing such that the culvert is exposed, and the trail requires maintenance to restore accessibility to pedestrians.

## 6.0 Alternative Solutions Assessment

The following subsections provide a brief discussion of the potential solutions for addressing the deficiencies discovered through modelling and those observed in the field. The list of solutions identified and discussed is comprised of both those identified by BMROSS and those which the Township asked BMROSS to investigate. The list should not be considered exhaustive of all possibilities for addressing the observed deficiencies.

## 6.1 Outlet/Catchment 1

As outlined in section 5.1, the deficiencies observed for Outlet/Catchment 1 are as follows:

- Overtopping of Murphy Street under 25-year storm, contrary to Township standard;
- Minor overtopping of driveway to #180 Murphy Street during 10 year storm; contrary to Township standard;
- Poor condition of existing outlet.

BMROSS notes the following possible solutions/next steps to address these deficiencies.

1. **CCTV Inspection**

This would be useful to confirm whether the existing 100m long 750mm dia. culvert under Murphy Street and Murphy Park is in poor condition throughout its length or whether this is confined to the end.

2. **Further Model Discretization**

As noted in an earlier section, the model is an interpretation of existing conditions which includes simplifications and is considered conservative in nature.

Catchment 1 is large (~64 Ha) and given the time and budget constraints of the project there was a practical limit on the degree of discretization of the catchment into sub-catchments and drainage features. Currently the model is constructed such that the catchment is discretized into seven (7) sub-catchments ranging in size from 1.4 Ha to 27.5 Ha with an average size of 9.1 Ha. This approach, especially the inclusion of large rural catchments, will tend to produce an overestimate of actual flows. The Township could consider authorizing additional budget to increase the level of modelling discretization/detail for Catchment 1, which would likely result in a decrease in predicted flows and could possibly result in the model no longer predicting the overtopping of Murphy Street under the 25-year storm or the overtopping of the driveway to #180 Murphy Street under the 10-year storm. To support this possibility, we note that Township staff indicated that they had no knowledge of the road being overtopped at this location. Given this, we also recognize that it may be more suitable to address any issues related to this outlet at the time further development occurs within Catchment 1.

3. **Culvert Replacement**

Depending on the results of items 1 and 2 above and Township priorities, the Township could consider a replacement of the existing 750mm culvert as a capital project. As the model stands currently (i.e. without further discretization), we predict that a 900mm or 1050mm culvert will be sufficient to prevent overtopping of Murphy Street. The replacement project would require the provision of new pipe and would likely require a structure for a change in alignment, and inlet/outlet headwalls. Figure 12 illustrates a possible replacement project. This work could be done under the Township's CLI ECA but would require approval from the Conservation Authority as it would involve work within the SVCA's regulated area. Any tree removals required would need to be completed outside of bird nesting period of April 1 to August 31. Any in-water work would need to be completed in accordance with applicable fisheries timing windows, and the Township would likely need to obtain a permit/letter of advice from the DFO. Finally, we note that the detailed design would need to account for the presence of site utilities, which were not assessed at this time.

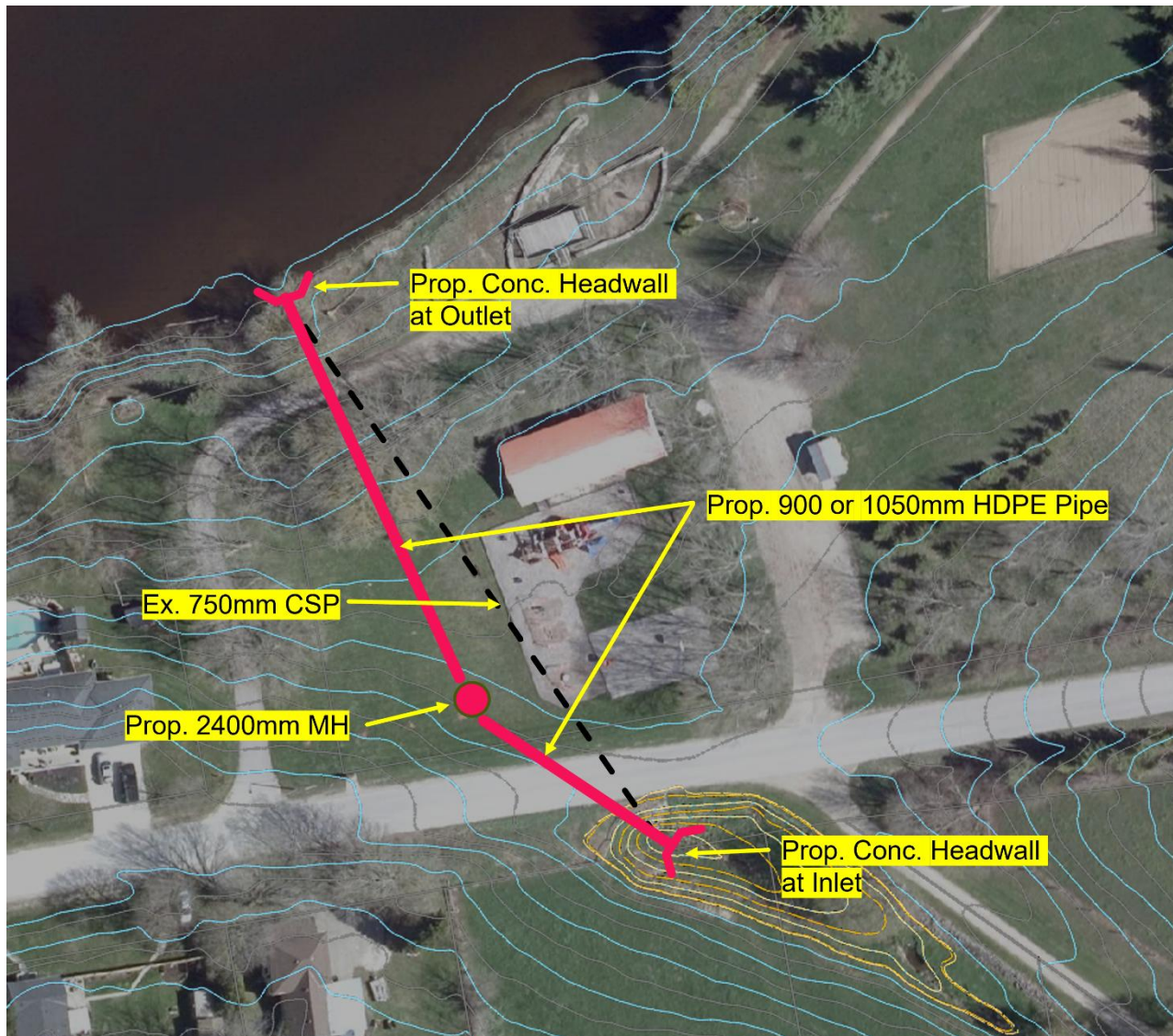


Figure 12 – Replacement of Outlet 1 at Murphy Park

## 6.2 Outlet/Catchment 2

As outlined in Section 5.2, the existing conditions PCSWMM model does not predict any flow conditions contrary to Township standards. It was noted that erosion was observed at the discharge end of the culvert and that this should be addressed.

A subsequent section regarding Outlet/Catchment 3 will outline a possible solution for deficiencies in that catchment wherein a certain sub-catchment of Catchment 3 is diverted to Outlet/Catchment 2. This would require a replacement of Outlet 2 with a larger culvert. If such a project is not completed in the near future, we recommend the following solutions/next steps for Outlet 2.

1. **CCTV Inspection and Detailed Condition Assessment**

A CCTV inspection and detailed condition assessment should be carried out for this culvert to determine if it is in poor condition and requires replacement.

2. **Repair of Erosion at Outlet**

BMROSS recommends that the Township complete a repair of the erosion at the outlet with minor excavation and placement of appropriately sized riprap.

This work could be considered as operations/maintenance and would likely not be classified as a capital project. It is not anticipated that any agency approvals would be required for this work.

3. **Define Conveyance from Current Outlet to River**

We note that the conveyance route from the existing culvert end to the river is undefined, and it appears as though the discharge flows uncontrolled along this section including across the South Wetlands Trail. As such BMROSS recommends the construction of a lined ditch through this section including a culvert crossing at the trail.

### **6.3 Outlet/Catchment 3**

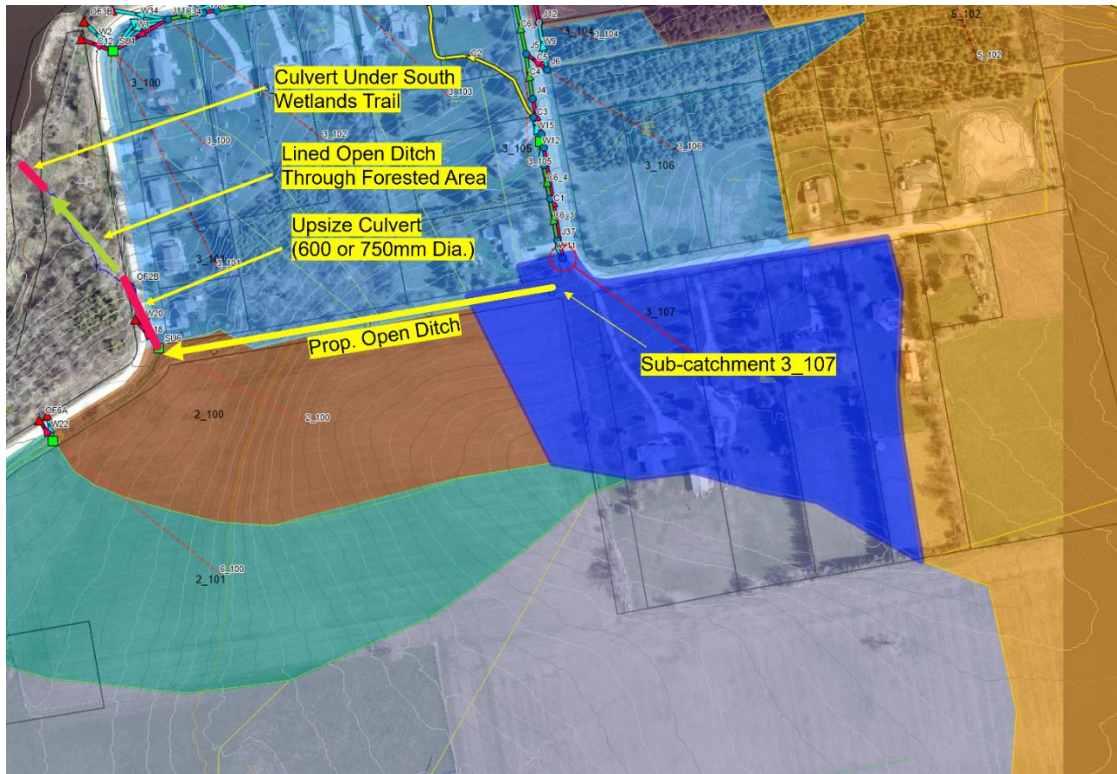
As outlined in Section 5.3, the deficiencies observed for Outlet/Catchment 3 are as follows:

- Spill across #425 Ayrshire Street driveway onto private property (front yard of #417 Ayrshire Street and rear yard of #460 Clyde Street) during 100-year storm;
- Minor overtopping of #450 Clyde Street driveway under 10-year storm;
- Spills from Clyde Street south ditch across the road to the north ditch under various storm events;
- Two driveway culverts along the south ditch are undersized in comparison to the typical driveway culverts observed elsewhere along this ditch;

We also note that, although we do not consider the west ditch on Ayrshire Street adjacent to #460 Clyde Street to be deficient, it may be more sensitive to reductions in capacity than other conveyance elements within the catchment. BMROSS notes the following possible solutions and next steps to address the identified deficiencies and/or reduce reliance on the ditch adjacent to #460 Clyde Street. Unless explicitly noted, each alternative was considered independent of all others.

1. **Diversion of Sub-Catchment 3-107 (Project 3.1)**

As noted previously, the Ayrshire Street west ditch adjacent to #460 Clyde Street is solely responsible for conveying a significant quantity of runoff. Figure 7 provided earlier illustrates the land which currently contributes runoff to this ditch – 6.3 Ha. To reduce reliance on this ditch, a portion of these contributing lands could be diverted westward towards Outlet 2. Figure 13 below illustrates this concept, where sub-catchment 3\_107 (3.7 Ha) is diverted to the west through the unopened Oxford Street right-of-way (ROW) to Outlet 2.



**Figure 13 – Diversion of Sub-Catchment 3\_107**

This would in effect reduce the drainage area which contributes to the above-noted ditch by about 50%. This would likely be a capital project and would require the following work:

- Creation of open ditch along unopened Oxford Street ROW from Clyde Street to Glasgow Street. A likely hydraulically suitable design would consist of a simple 'v' ditch with a typical depth of 600-900mm and 2:1 side slopes, lined with turf reinforcement where slopes warrant. 3:1 ditch side slopes are also likely possible if desired.
- Upgrading existing 450mm CSP culvert at Outlet 2 to a 600mm or 750mm culvert.
- Creation of a proper open ditch from the downstream end of the culvert to the South Saugeen River, including the installation of a culvert crossing the location where the ditch crosses the South Wetlands Trail (Alternatively, create a conveyance along the west side of Glasgow Street toward Outlet 3).

While completing our site investigation we were able to survey the existing tree line along the unopened Oxford Street ROW as well as the survey bars where the ROW intersects with Ayrshire Street. A review of this data indicates that there is 10-11m of space between the south edge of the ROW and the tree line, which should be sufficient to construct a drainage ditch with dimensions noted above without requiring any tree removals.

The creation of the drainage ditch between the downstream end of the road crossing culvert and the South Saugeen River would involve the removal of trees as this is a forested area. This project could be completed under the Township's CLI ECA. The creation of the open ditch between the road crossing culvert and the South Saugeen River would result in work within the SVCA's regulated area, and therefore the project would require SVCA approval. Any tree removals required would need to be completed outside of bird nesting period of April 1 to August 31. Any in-water work would need to be completed in accordance with applicable fisheries timing windows, and the Township would likely need to obtain a permit/letter of advice from the DFO. It is also possible that a permit from the MNRF would be required.

The existing conditions PCSWMM model was modified to produce a proposed conditions model with the diversion project completed. The model results are provided in Table 7 below.

**Table 7 – Proposed Conditions Model Results – Outlet/Catchment 3 with Diversion Project Completed**

| <b>PROPOSED CONDITIONS SCENARIO - DIVERSION OF SUBCATCHMENT 3_107 TO OUTLET 2 – PROJECT 3.1</b> |                                                          |                           |                           |                            |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------|---------------------------|----------------------------|
|                                                                                                 | <b>DESIGN STORM FREQUENCY &amp; TOTAL RAINFALL DEPTH</b> |                           |                           |                            |
| <b>Location/Issue</b>                                                                           | <b>5 yr<br/>(54.0mm)</b>                                 | <b>10 yr<br/>(62.4mm)</b> | <b>25 yr<br/>(73.2mm)</b> | <b>100 yr<br/>(89.4mm)</b> |
| Ayrshire St west ditch capacity downstream of diagonal road crossing culvert sufficient?        | Yes                                                      | Yes                       | Yes                       | Yes                        |
| Ditch Spill into east side yard of #460 Clyde                                                   | No                                                       | No                        | No                        | No                         |
| Spill across #425 Ayrshire DW onto #417 Ayrshire front yard and #460 Clyde rear yard            | No                                                       | No                        | No                        | No                         |
| Clyde St. south side DWs overtopped                                                             | No                                                       | No                        | n/a                       | n/a                        |
| Spill across Clyde St from south ditch to north ditch                                           | No                                                       | No                        | No                        | Yes - multiple locations   |
| Road overtopped at Glasgow/Clyde Bend                                                           | No                                                       | No                        | No                        | n/a                        |

Red font denotes an existing level of service below Township standards

Green font denotes an existing level of service at or above Township standards

When the results of Table 7 are compared with the results of the existing conditions model (Table 4), we see that the diversion project would resolve all of the identified deficiencies with the exception of the spills from the Clyde Street south ditch across to the Clyde Street north ditch.

## **2. Upgrading Culverts in Clyde Street South Ditch**

### **Option 1 – Minor Upgrades (Project 3.2A)**

Before discussing a more significant project, it is worth noting that a simple upgrade of the (north) driveway culvert to #450 Clyde Street to a 600mm diameter culvert (it is currently 450mm diameter) and an upgrade of the driveway culvert to #460 Clyde Street to a 600mm diameter (it is currently 525mm diameter and was observed in the field to be partially filled with gravel and the downstream end is damaged) would provide tangible benefits and would result in consistency of size for the driveway culverts along the south ditch of Clyde Street. The model predicts that this minor project would eliminate the overtopping of the #450 Clyde Street (north) driveway predicted to occur under the 10-year storm based on existing conditions, and is also predicted to eliminate spills across Clyde Street from the south ditch to the north ditch under the 10-year storm (although the spills would still be expected to occur under more severe storm events). Since the #450 Clyde Street (north) driveway was the only one along the ditch section in question predicted to overtop during the 10-year storm, the singular upgrade of this driveway culvert would effectively result in complete compliance of the driveway culverts along the ditch section in question with the Township standard. This work could be considered as operations/maintenance, and it is not anticipated that any agency approvals would be required for completion.

### **Option 2 – Major Upgrades (Project 3.2B)**

A wholesale upgrade of the culverts along the south ditch of Clyde Street will now be discussed. First, we note that at many locations along this ditch the existing driveway culverts at least partially exhibit cover less than the 300mm minimum typically required by CSP and HDPE pipe manufacturers. Therefore, it can be concluded that any upgrading of the culverts along this section (even a twinning project where the maximum diameter remains the same as existing) will require some excavation of the existing ditch to achieve minimum cover over the proposed pipes. To minimize the amount of ditch excavation required, a simple twinning program was investigated and modelled in PCSWMM. This project would involve placing 2-600mm diameter HDPE culverts at each driveway and 2-900mm diameter HDPE culverts under the road at the Glasgow/Clyde Bend. To account for the 300mm minimum cover requirement, the ditch invert is assumed to require a uniform drop of approximately 200mm from existing conditions. This project was modelled in PCSWMM and results are provided in Table 8 below.

**Table 8 – Proposed Conditions Model Results – Outlet/Catchment 3 with Culvert Twinning Project Completed**

| <b>PROPOSED CONDITIONS SCENARIO - CULVERT TWINNING ALONG CLYDE SOUTH DITCH – PROJECT 3.2B</b> |                                                          |                           |                           |                            |
|-----------------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------------|---------------------------|----------------------------|
|                                                                                               | <b>DESIGN STORM FREQUENCY &amp; TOTAL RAINFALL DEPTH</b> |                           |                           |                            |
| <b>Location/Issue</b>                                                                         | <b>5 yr<br/>(54.0mm)</b>                                 | <b>10 yr<br/>(62.4mm)</b> | <b>25 yr<br/>(73.2mm)</b> | <b>100 yr<br/>(89.4mm)</b> |
| Ayrshire St west ditch capacity downstream of diagonal road crossing culvert sufficient?      | Yes                                                      | Yes                       | Yes                       | Yes                        |
| Ditch Spill into east side yard of #460 Clyde                                                 | No                                                       | No                        | No                        | No                         |
| Spill across #425 Ayrshire DW onto #417 Ayrshire front yard and #460 Clyde rear yard          | No                                                       | No                        | No                        | Yes                        |
| Clyde St. south side DWs overtopped                                                           | No                                                       | No                        | N/A                       | N/A                        |
| Spill across Clyde St from south ditch to north ditch                                         | No                                                       | No                        | No                        | No                         |
| Road overtopped at Glasgow/Clyde Bend                                                         | No                                                       | No                        | No                        | N/A                        |

Red font denotes an existing level of service below Township standards

Green font denotes an existing level of service at or above Township standards

When the results of Table 8 are compared with the results of the existing conditions model (Table 4), we see that the twinning project would resolve all of the identified deficiencies with the exception of the spill onto private property at #425 Ayrshire Street. The work outlined under Project 3.2B would likely constitute a capital project. This work could be completed under the Township's CLI ECA. The twinning of the culvert under the road at the Glasgow/Clyde bend would result in work within the SVCA's regulated area, and therefore the project would require SVCA approval. Any in-water work would need to be completed in accordance with applicable fisheries timing windows, and the Township would likely need to obtain a permit/letter of advice from the DFO.

### **3. Combination of Diversion Project and Culvert Upgrades (Project 3.3)**

A combined approach would involve a combination of the diversion project (Project 3.1) and some form of culvert upgrades along the Clyde Street south ditch (Projects 3.2A, 3.2B or an alternate option). Such an approach could result in a complete resolution of all the deficiencies identified for Outlet/Catchment 3.

**4. Ditch/Culvert Upgrade at #425 Ayrshire Street (Project 3.4)**

This project would involve work on the Ayrshire Street west ditch south of the driveway to #425 Ayrshire Street, and the replacement of the driveway culvert which crosses under this driveway (and also under the driveway to the recently constructed residence at #417 Ayrshire Street) to eliminate the identified deficiency of spills into the rear yard of #460 Clyde Street. The ditching work would involve excavation or building up of the west edge in order to increase capacity, along with potential re-grading of a portion of the #425 and #417 driveways to direct overflows to the next downstream ditching section. This work could be considered as operations/maintenance and would likely not be classified as a capital project. It is not anticipated that any agency approvals would be required for this work.

**5. Redirect Discharge from Diagonal Road Crossing Culvert (Project 3.5)**

When we originally met with the Township, we noted that the Ayrshire Street ditch adjacent to #460 Clyde Street would be undersized to convey the 100-year storm flow; however, after completing further work and modifying the PCSWMM model ditch element to better represent the ditch, we are no longer predicting a spill onto #460 Clyde Street from this ditch. We also note that work has been recently completed on this ditch by a developer's contractor by building up the western edge, further increasing capacity from what is predicted by our model. Even though the ditch in its current form is hydraulically sufficient to convey the 100-year storm flow with the diagonal culvert in place, a redirection of the discharge end of this culvert from its current location to the southwest corner of the Ayrshire/Clyde intersection would reduce reliance on the critical ditch section adjacent to #460 Clyde Street. Practically speaking, this work would likely take the following form:

- Elimination of existing 600mm diameter diagonal culvert;
- Replacement of existing 450mm diameter CSP system currently on east side of road with new 600mm diameter HDPE pipe.

This minor project would result in a 40% reduction in the peak flow in the ditch adjacent to #460 Clyde under the 100-year storm. With this said, it is important to note that as a stand-alone project as the completion of this work would not actually eliminate any of the deficiencies noted in Section 5.3.

**6. Urbanization of Ayrshire Street (Project 3.6)**

The urbanization of Ayrshire Street to the Township standard, complete with curb & gutter and storm sewer could provide some minor benefits to the drainage performance for Catchment/Outlet 3. In such a scenario, minor flows (5-year storm or less) would be conveyed by a buried storm sewer, whereas major flows would be conveyed by the road platform (i.e. between the curbs). If the urbanization was completed from Oxford Street to Clyde Street only, a ditch inlet structure would be required in the east boulevard at the Ayrshire Clyde intersection, complete with a road crossing culvert discharging in the Clyde Street south ditch to accommodate major flows contained within the east half of the

crown road section. The intersection would also need to be carefully graded such that major flows contained within the west half of the crown road section would “turn the corner” and also enter the south ditch. While no PCSWMM modelling was completed for this potential project, it is reasonable to assume that the only deficiency that this option would actually address is the spill of the Ayrshire Street west ditch flows at the driveway to #425 Ayrshire Street. As a result, it is concluded that in terms of addressing the identified deficiencies for Outlet/Catchment 3, an urbanization of Ayrshire Street (Oxford to Clyde) would have little impact and would be cost prohibitive. An urbanization of Ayrshire Street (Oxford to Queen) would provide some marginal benefit over and above the single block urbanization option, as it would address the poor condition of the existing drainage system along the Clyde to Queen block; however, we still believe this would be cost prohibitive and that there are much more efficient ways to address the identified deficiencies along Ayrshire Street.

**7. Improvements to Clyde Street North Ditch Drainage Works (Project 3.7)**

In Section 5.3 we noted that the existing north ditch on Clyde Street is poorly defined, and that as a result flows which cross the road from south to north may impact adjacent properties. This deficiency could be addressed by an improvement of the ditching along this section – namely excavation to ensure flows do not spill, and a correction of any issues related to driveway culverts. While a detailed condition assessment was not completed, it is probably fair to say that complete replacement of the driveway culverts, along with an excavation of the north ditch is warranted. Furthermore, this project could be designed in such a way that the north ditch receives flows which cross the road by design – i.e. the ditch geometry and culvert design could be set such that it can accommodate both flows from the north side of the road and flows predicted to spill over from the south ditch. This could potentially eliminate the need for major upgrades of the culverts on the south side of the road, provided the Township is willing to accept spills across Clyde Street from the south ditch to the north ditch under the 25-year and 100-year storm events.

**8. Re-grading of Clyde Street (Project 3.8)**

The model predicts spills across Clyde Street at multiple locations from the south ditch to the north ditch. These spills would likely be eliminated through a regrading of Clyde Street which could take the following forms:

- Re-grade the road such that there is a better-established crown. We note that the DEM contours indicate a poorly defined crown at several sections, including especially at the intersection with Ayrshire Street.
- Re-grade the road such that it is superelevated with the north edge as the “high side”.

We note that while this project would likely solve an identified deficiency it would also likely be very costly.

## **9. Private Property Upgrades**

While landowners should not be expected to construct works to mitigate deficiencies in the municipal drainage system, there is also no doubt that there are certain measures that property owners can implement to provide additional protection for their properties in the event of any future exceedances in capacity of the municipal system or of drainage generated from adjacent upgradient properties, especially given future climatic uncertainty and the potential for storm events that are even more severe than what the municipal system is designed for. Simple, cost-effective measures to protect private property include items such as:

- Ensuring positive grading away from buildings;
- Ensuring there are adequate drainage swales;
- Installation of window wells complete with stone drainage hydraulically connected to the foundation drains.
- Periodic inspections of drainage features especially before heavy rain forecasts or snowmelt events.
- Ensuring that landscaping does not impede or alter adjacent Municipal drainage works in any way.

In summary, even though a municipal drainage system may be present, there are many practical ways that landowners in the study area can protect their property in the event of an exceedance of the design capacity of the municipal system.

## **10. Monitoring Program**

Regardless of any projects completed, we strongly recommend a monitoring program to be implemented by the Township for the entire study area, with special focus on Catchment/Outlet 3 as this catchment is both relatively densely populated and contains certain critical drainage features and has a history of issues. The monitoring program would ensure that critical drainage features are inspected in advance of forecasted heavy rainfall events (for example, perhaps when 50+ mm of rain is forecasted for a 24-hour period), and before any anticipated significant snow-melt events. For a brief example of why a program like this would be helpful, we note that while on site we found a catch basin in the Ayrshire Street west ditch on the south side of the driveway to #435 Ayrshire Street with a grate completely covered over with debris such that the inlet capacity was likely reduced to near zero.

## **11. Culvert Condition Assessment and Cleaning**

Regardless of any projects completed, we strongly recommend the Township conduct a detailed condition assessment of any driveway or road crossing culverts within Catchment 3. While obvious deficiencies visible during our site visits were noted, a more detailed assessment ought to be carried out. This would include inspecting upstream and downstream culvert ends, culvert barrels, CCTV inspection when deemed necessary, and culvert cleaning to ensure maximum hydraulic capacity.

While numerous potential projects and work have been presented in this section, it is important to note that none of these represents a substitute for the proper monitoring and maintenance of the drainage system. Even if ditches, culverts, or sewers are designed with sufficient hydraulic capacity, this capacity can be quickly reduced through the buildup of debris, snow, and ice. As such we reiterate the recommendation contained above concerning the implementation of a monitoring program which will enable a proactive rather than reactive approach to resolving drainage issues. Such a program represents the Township's best defense against the impacts of snow/ice and also against the impacts of future storm events that may exceed those for which the system is already designed. Finally, we note that the detailed design for any of the potential projects listed above would need to account for the presence of site utilities, which were not assessed at this time.

#### **6.4 Outlet/Catchment 4**

As outlined in Section 5.4, the modelling of existing conditions for Outlet/Catchment 4 did not identify any obvious deficiencies; however, our site visit did indicate that the ditches along Ayrshire Street between Clyde Street and Queen Street East are poorly defined, and that some of the driveway culverts are partially or fully buried. As such, we recommend the following work be completed by the Township:

- Excavation along both sides of Ayrshire Street (Clyde to Queen) to restore ditch functionality; and,
- Replacement of existing driveway culverts.

#### **6.5 Outlet/Catchment 5**

As outlined in Section 5.5, the modelling of existing conditions for Outlet/Catchment 5 did not identify any obvious deficiencies which contradicted Township standards, although it could be considered undesirable that under the 100-year storm some of the water which ponds at the upstream end of the 1200mm diameter road crossing culvert will overflow and spill to the west, ultimately discharging to the river flats via the Queen Street south ditch and Outlet 4. We also noted significant erosion at the downstream end of the existing 1200mm diameter culvert. We therefore recommend the Township complete the following work, at minimum:

- Complete a detailed condition assessment of this culvert including CCTV inspection; and,
- Repair erosion/scour at the downstream end.

The Township could also consider authorizing additional budget for further discretization of the upstream rural catchments, which would tend to result in lower predicted flows, and could possibly eliminate the prediction of the spill to the Queen Street south ditch. If major repairs are required, the Township could apply for provincial funding assistance through the Connecting Link program.

Finally, we note that it is our understanding that concerns have been raised by at least one resident through whose property the trunk drainage route for Catchment 5 flows, regarding the severity of the flows observed. It is unsurprising to us that these concerns have been raised as the Catchment is very large (~73 Ha) and the predicted flows are significant (~ 4 cms upstream of the 1200mm culvert under the 100-year storm). There is little that the Township can do to alleviate these concerns, as these flows are not the product of Township infrastructure or any lack therein, but simply a product of the large, rural catchment. On this point we also would like to briefly state that in our opinion, recent minor adjustments to the drainage patterns of several lots along Oxford Street has little to no impact on the peak flows expected to occur through Catchment 5. Concerned residents have the option of addressing the various items of concern by petitioning for drainage improvements through the Drainage Act.

## **6.6 Outlet/Catchment 6**

As outlined in Section 5.6, the modelling of existing conditions for Outlet/Catchment 6 did not identify any obvious deficiencies which contradicted Township standards. During a site visit, we observed that the upstream end of the 450mm culvert at Outlet 6 is crushed, and we also observed significant erosion at the culvert crossing at the South Wetlands Trail. To address deficiencies observed in the field, BMROSS recommends a replacement of the 450mm diameter road crossing under Murphy Street, and a replacement/restoration of the culvert crossing under the South Wetlands Trail. The Township could also consider constructing a defined open channel between the downstream end of the road crossing culvert and the river. Approval requirements for this project would be similar to those of the project outlined for Outlet 2.