SOURCE TO STREAM 2023 Conference

Canada's Premier Stormwater and Erosion and Sediment Control Conference

Thank you to our sponsors!

EXECUTIVE SPONSORS

CULTEC

Canadian Society for Civil Engineering / Société canadienne de génie civil

ADS – Our reason is water.™

CUPOLEX® ENGINEERING SOLUTIONS INC.

ENVIROPOD™

York Region

filtrexx® CANADA SUSTAINABLE TECHNOLOGIES – let nature do it.®

DICORP – DOWN TO EARTH BUSINESS

GEO MORPHIX™

Hydro International

NEXT STORM

Greck

Sustainable Technologies EVALUATION PROGRAM

OPPORTUNITIES SPONSOR

AECOM

MEDIA SPONSORS

WATER CANADA

HOSTS

Presented by:

Toronto and Region Conservation Authority

In association with:

Lake Simcoe Region conservation authority

Credit Valley Conservation – inspired by nature

Sustainable Technologies
EVALUATION PROGRAM

www.sustainabletechnologies.ca

Sewershed and Overland Flow Route Delineation with Arc Hydro

Presented by: James Cowan

March 23, 2023

Sustainable Technologies
EVALUATION PROGRAM

The water component of STEP is a collaborative of:

Lake Simcoe Region conservation authority

Credit Valley Conservation inspired by nature

Toronto and Region Conservation Authority

Overview

Purpose

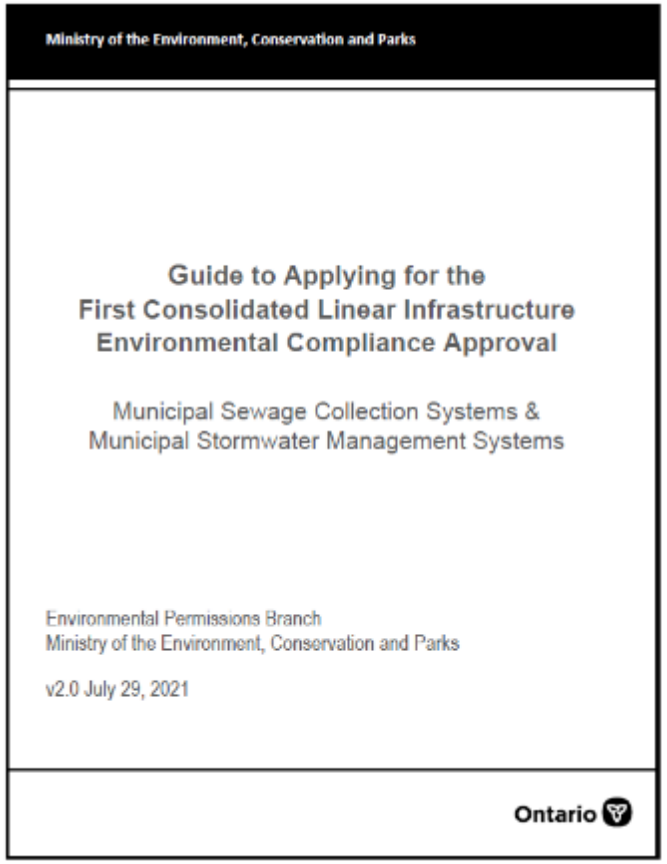
Data Requirements

Methodology

Results

Purpose

CLI-ECA



- First consolidated linear infrastructure environmental compliance approval (CLI-ECA)

TOWN OF CALEDON

Information Needed (i.e. SWM Ponds, Sewers, Swales)

Location	Latitude and longitude or physical address (UTM coordinates can be provided in addition)
Watershed/Subwatershed	Lake Simcoe/Bunkers Creek
Receiver of discharge	e to "BLANK" creek
Outlet location	itude. (UTM coordinates can be provided in addition)
Catchment Area	
Level of Treatment fo	70/80%) Long-term suspended solids removal, or specify if other treatment
Treatment for other contaminants, as required	phosphorus, water temperature
Level of Volume control	Local 90th percentile rainfall event or local water balance (X mm)
Design Storm	Quantity: X-yr storm; Quality: X-yr storm
Reference ECA(s)	If there is an existing ECA for the facility, it should be indicated here (e.g., 1234-5A6BCD)
Reference Works as part of treatment train	102-LID Bioretention Facility; ECA# if private works
Brief Description	Include model number if equipment is used (e.g. OGS/filters)*
Receive Emergency Sanitary Overflows	Y/N; briefly describe
Notes / Additional Information	Provide any additional information relevant to this facility not captured above

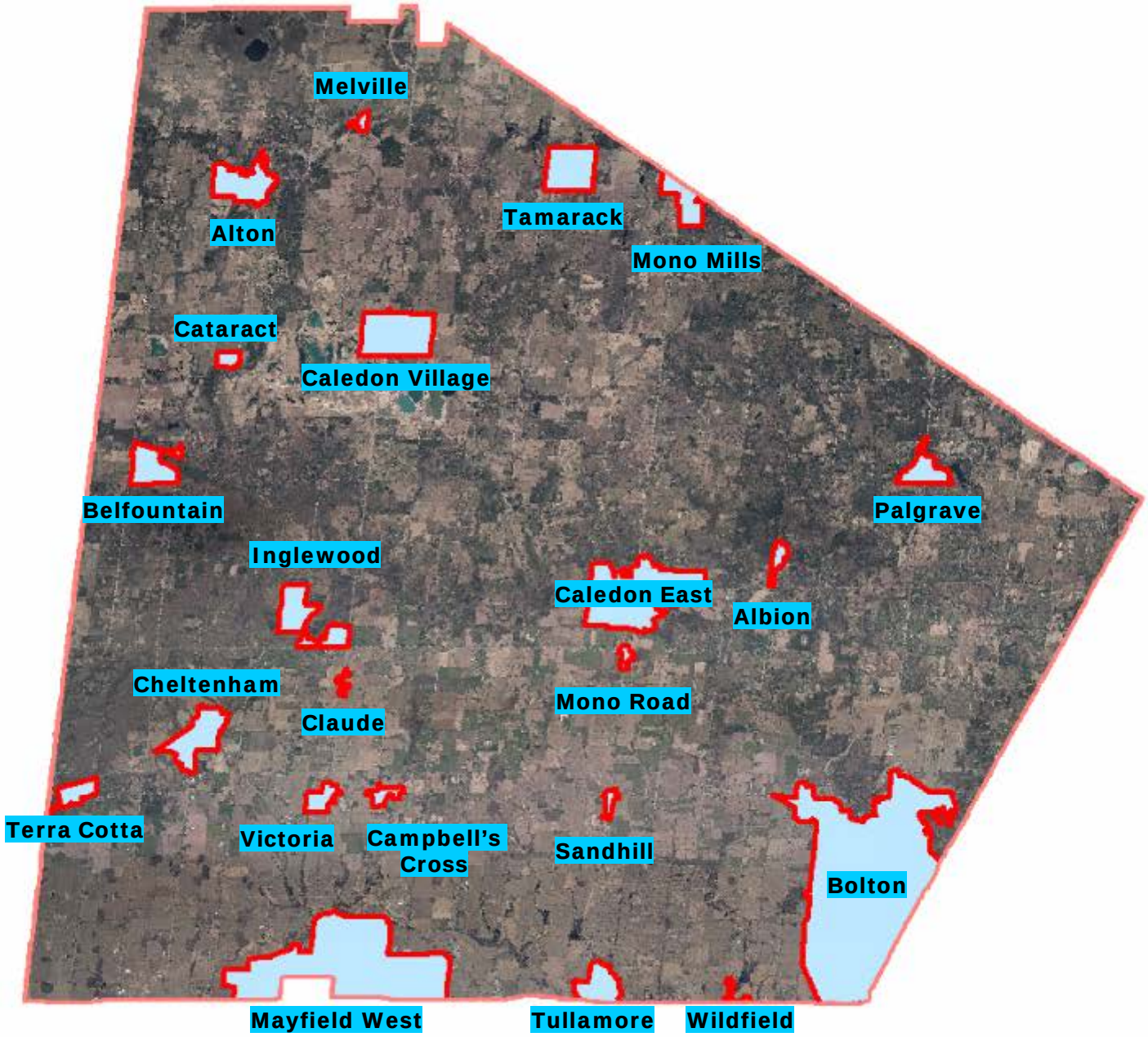
This is the information we planned to obtain with the study

CVC Jurisdiction

Alton
Melville
Terra Cotta
Caledon Village
Inglewood
Cheltenham
Cataract
Belfountain
Mono Road
Claude

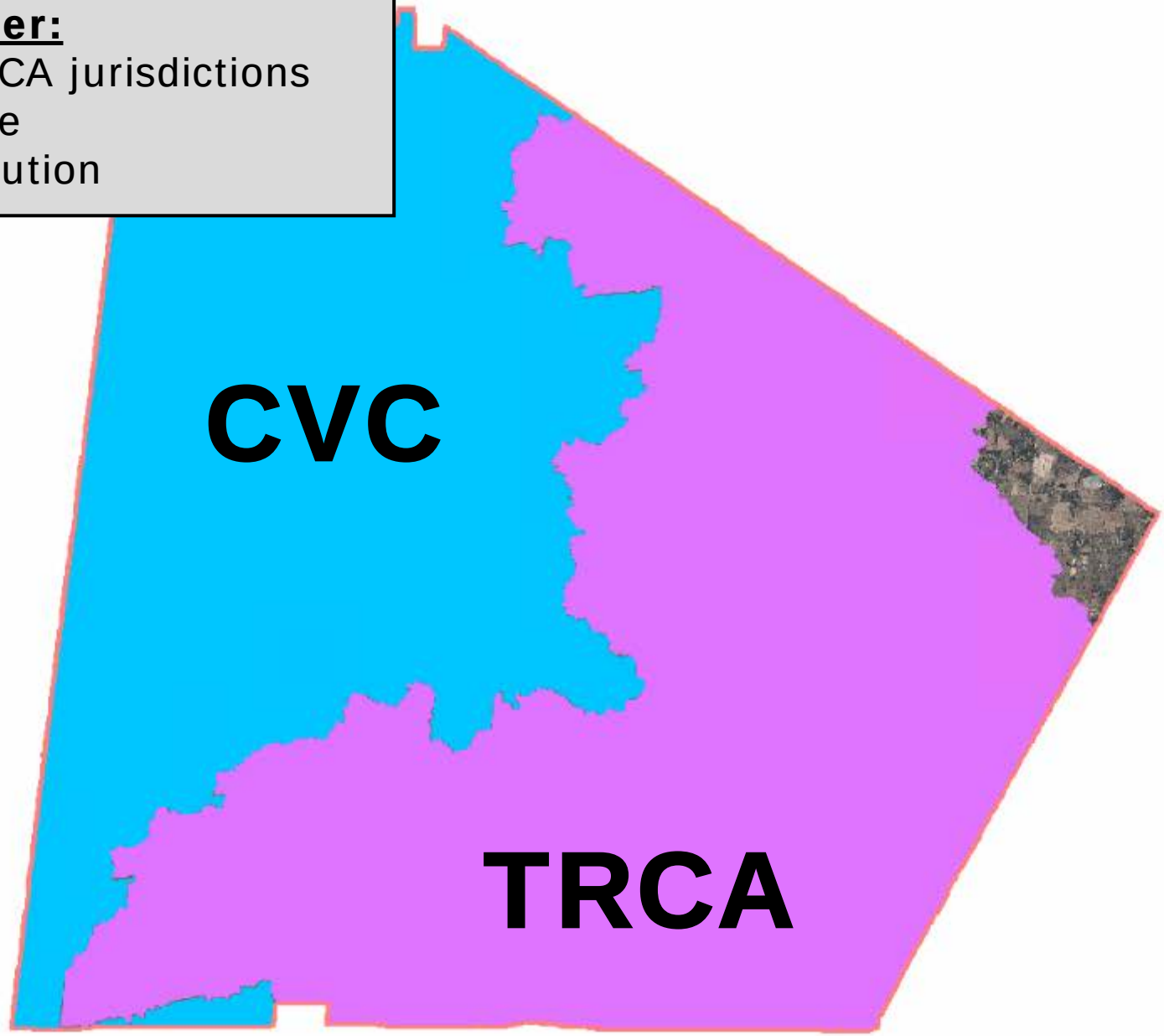
TRCA Jurisdiction

Caledon East
Palgrave
Bolton
Mayfield West
Campbell's Cross
Tamarack
Mono Mills
Albion
Victoria
Wildfield
Tullamore
Sandhill



Benefits of STEP Water:

- Collaboration across CA jurisdictions
- Transfer of knowledge
- Efficient project execution



Minor System Components

Curbs and Gutters

Pipes and Culverts

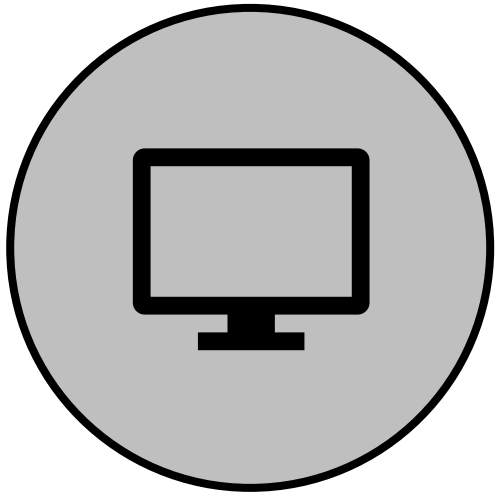
Swales/Ditches

Catchbasins

Major System Components

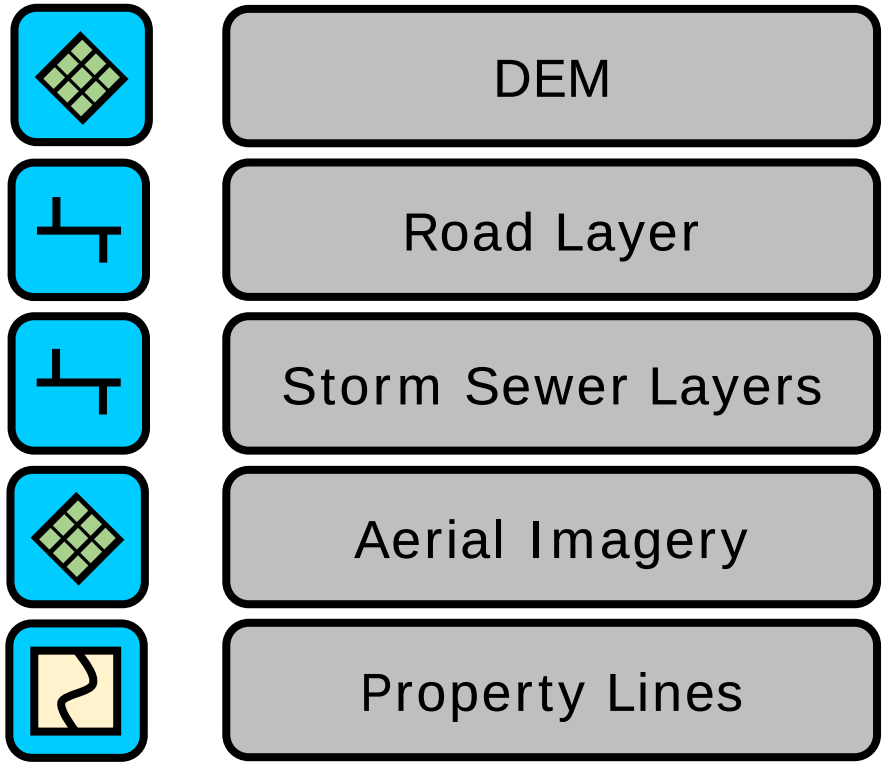
Data Requirements

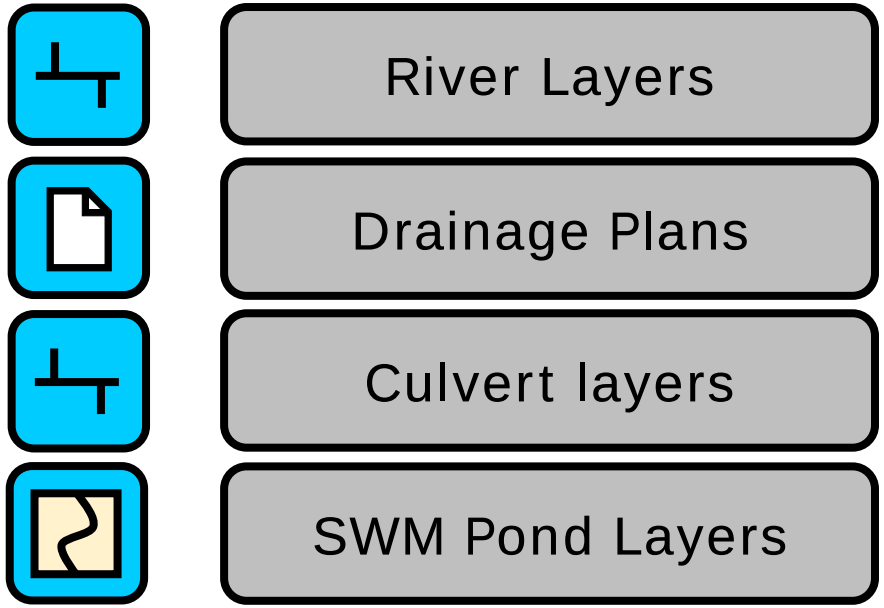
Software Requirements



- ArcMap
- Arc Hydro (Extension)
- Spatial Analyst License (ArcMap)
- Google Earth

Data Requirements

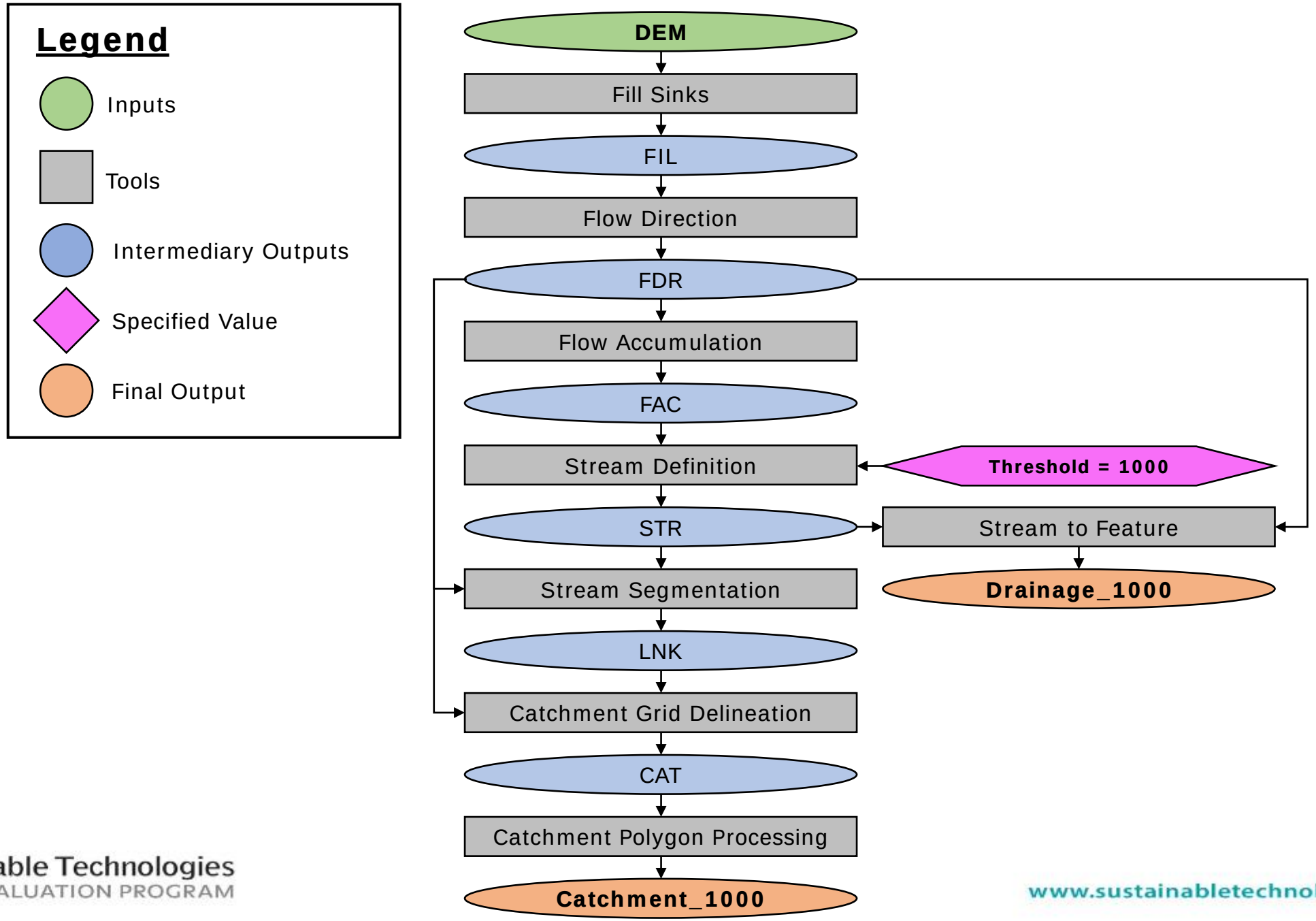




Methodology

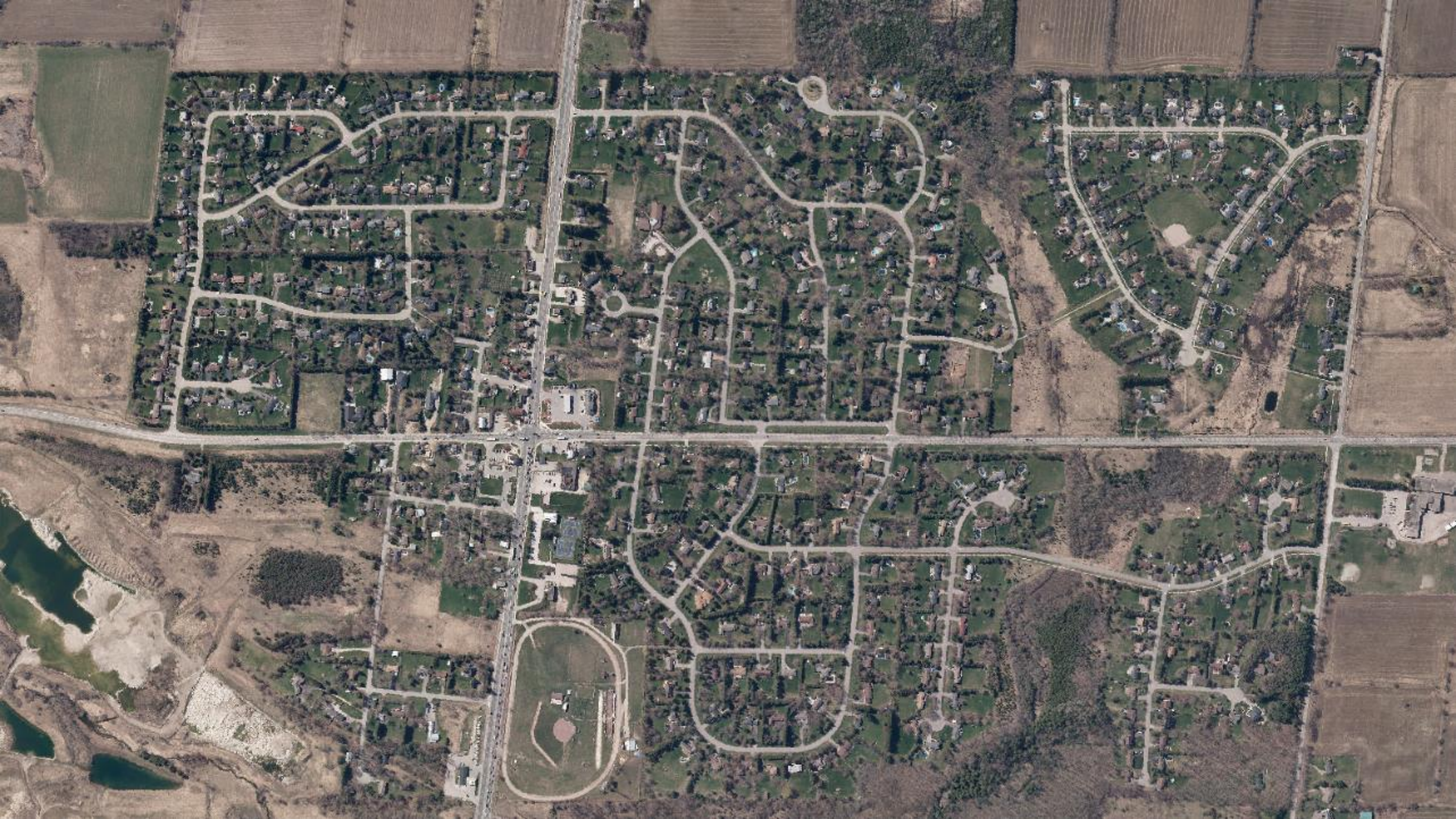
Arc Hydro

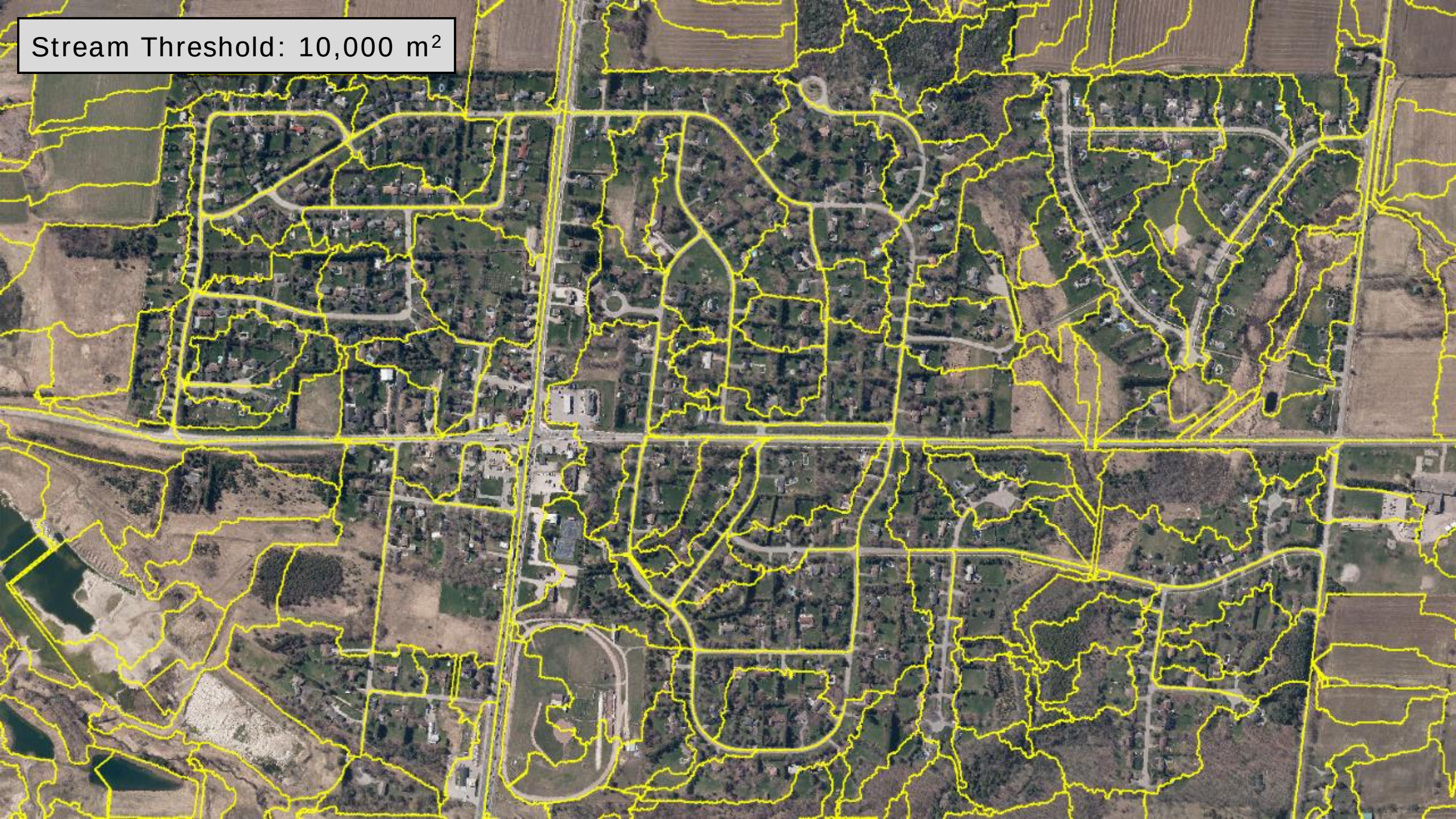
- Arc Hydro uses DEM to identify overland flow routes
- Usually represents drainage from roads accurately
- Useful for delineating minor and major drainage patterns

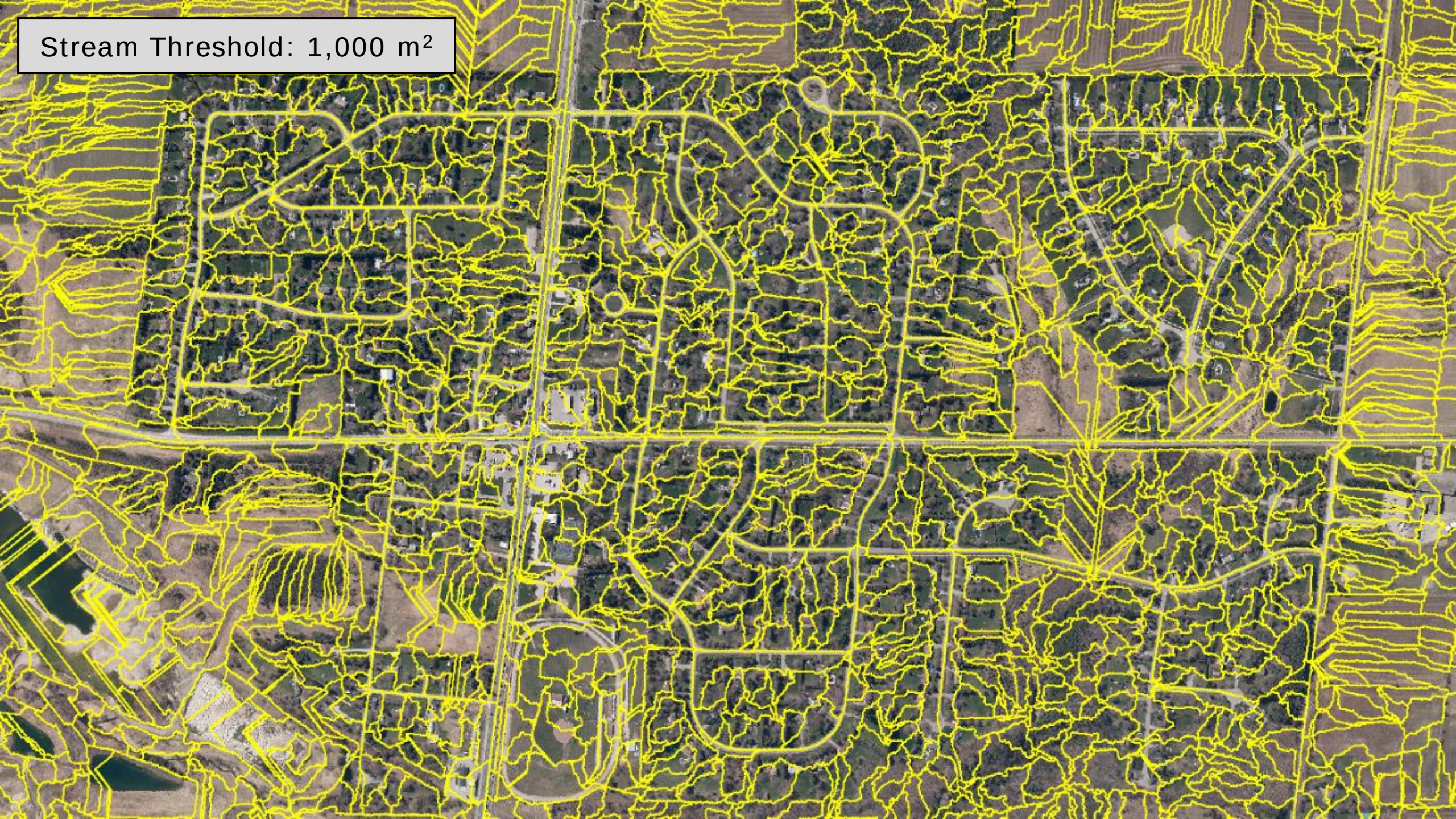


Sustainable Technologies
EVALUATION PROGRAM

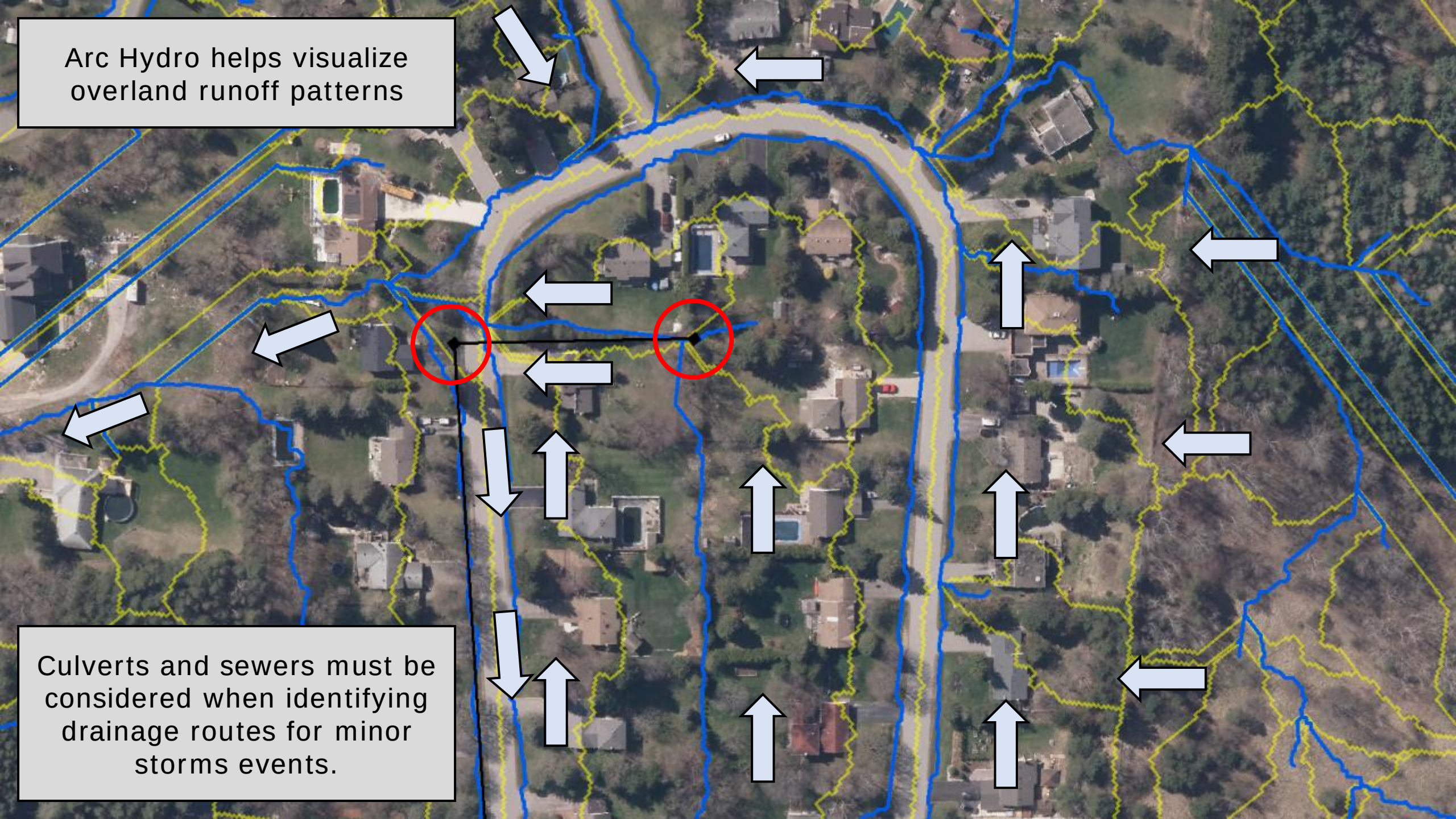
www.sustainabletechnologies.ca

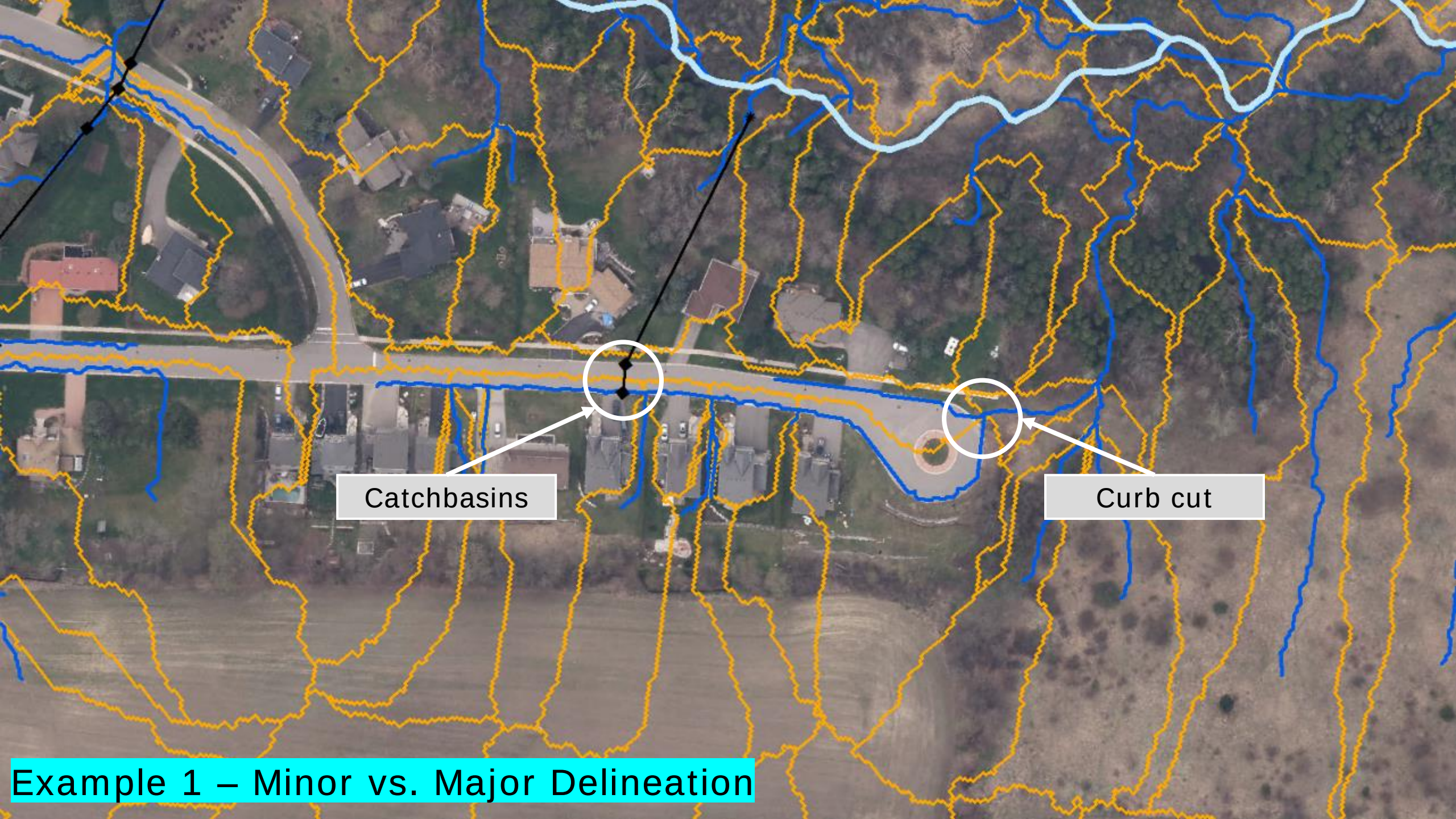



Stream Threshold: 10,000 m²

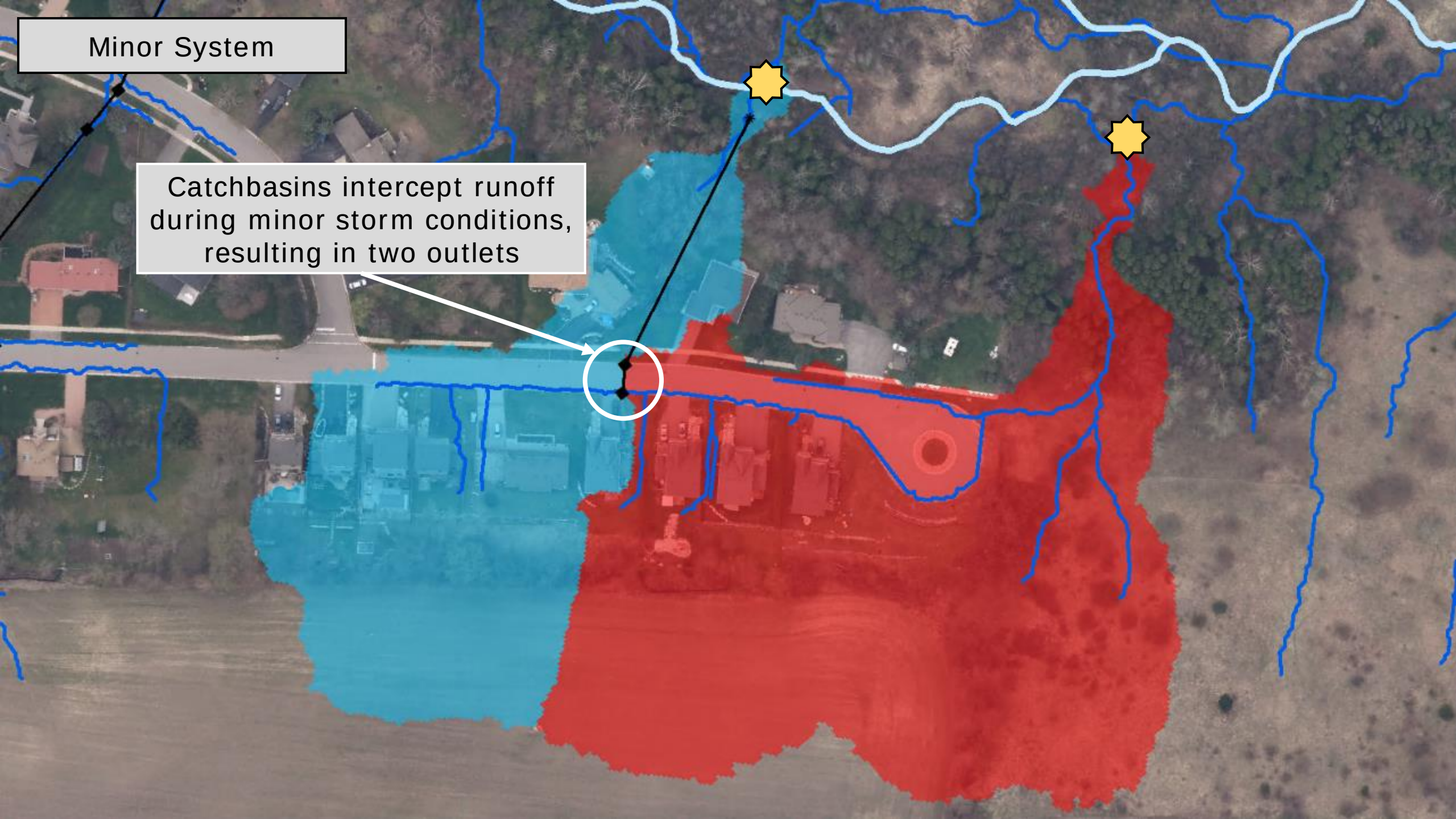

Stream Threshold: 1,000 m²

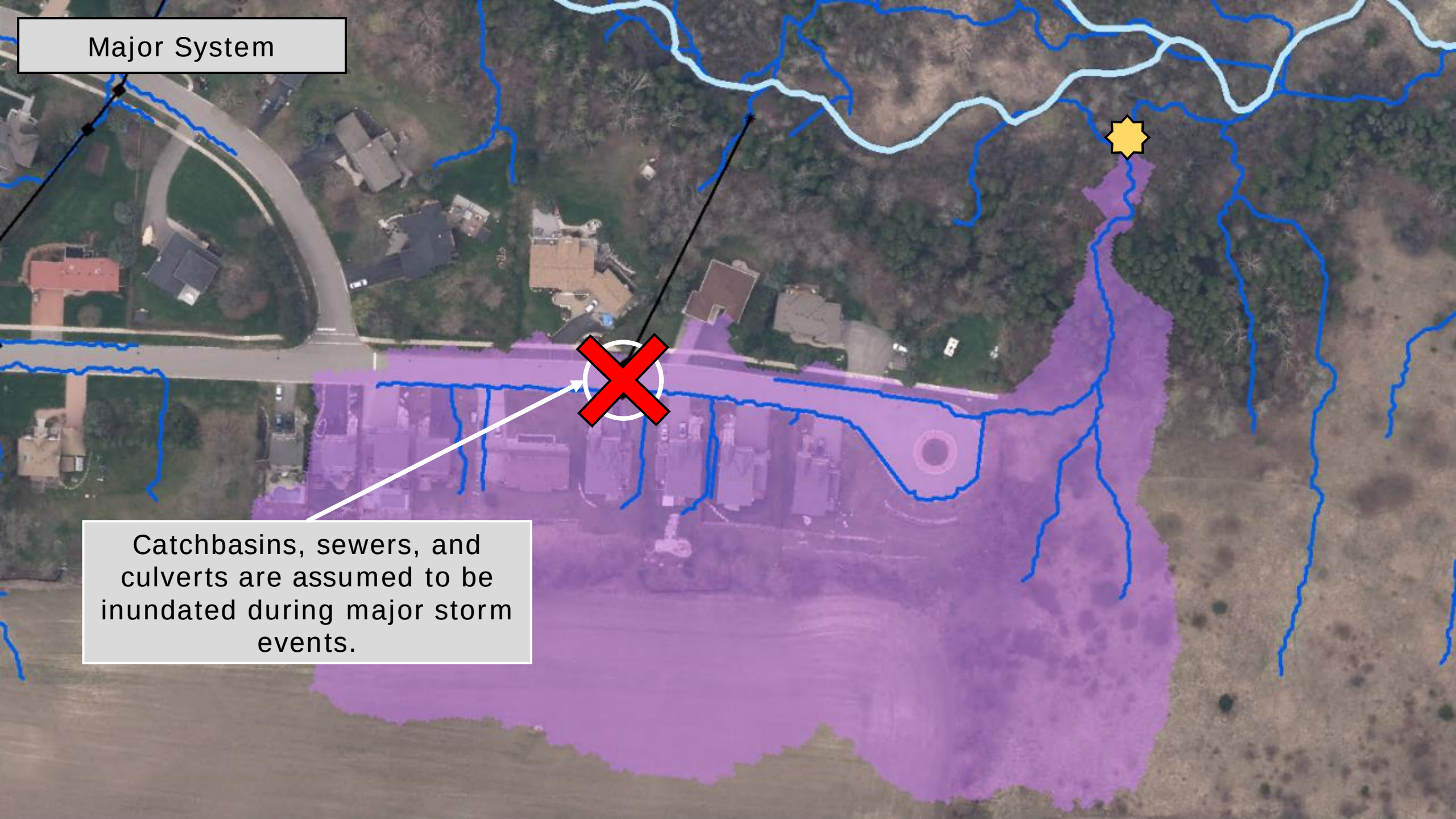

Stream Threshold: 100 m²

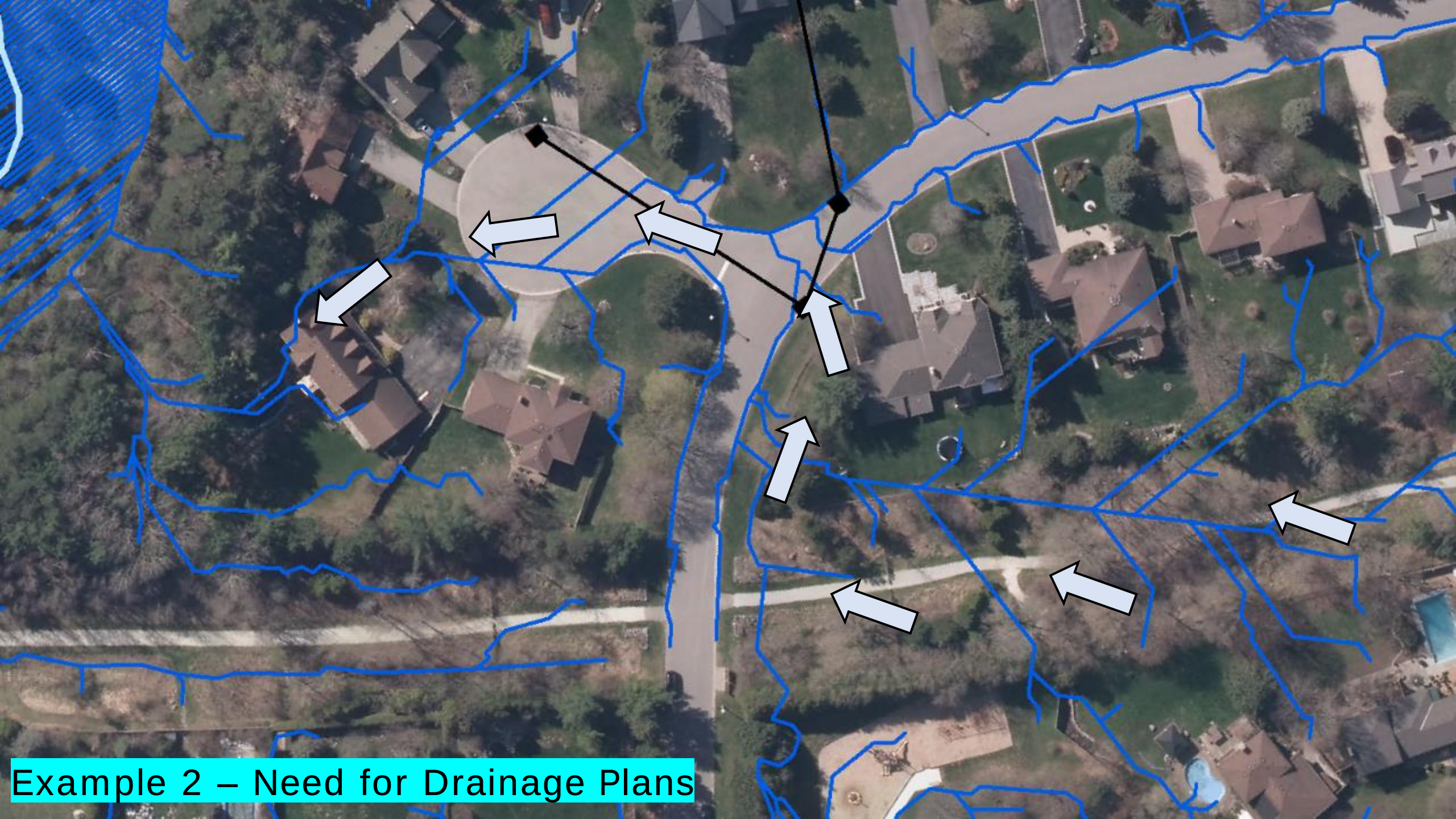

Arc Hydro helps visualize overland runoff patterns
Culverts and sewers must be considered when identifying drainage routes for minor storms events.



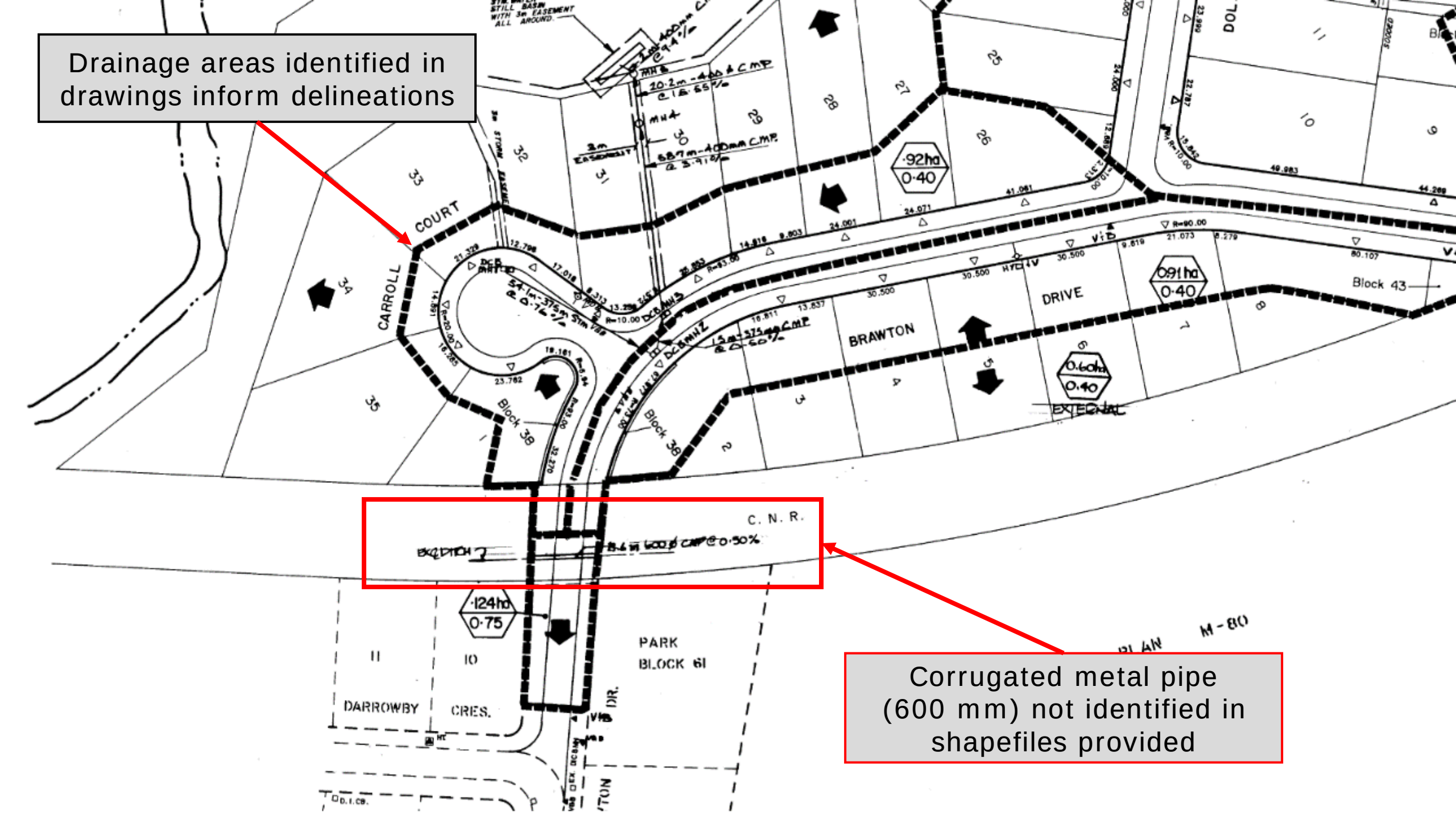
Example 1 – Minor vs. Major Delineation

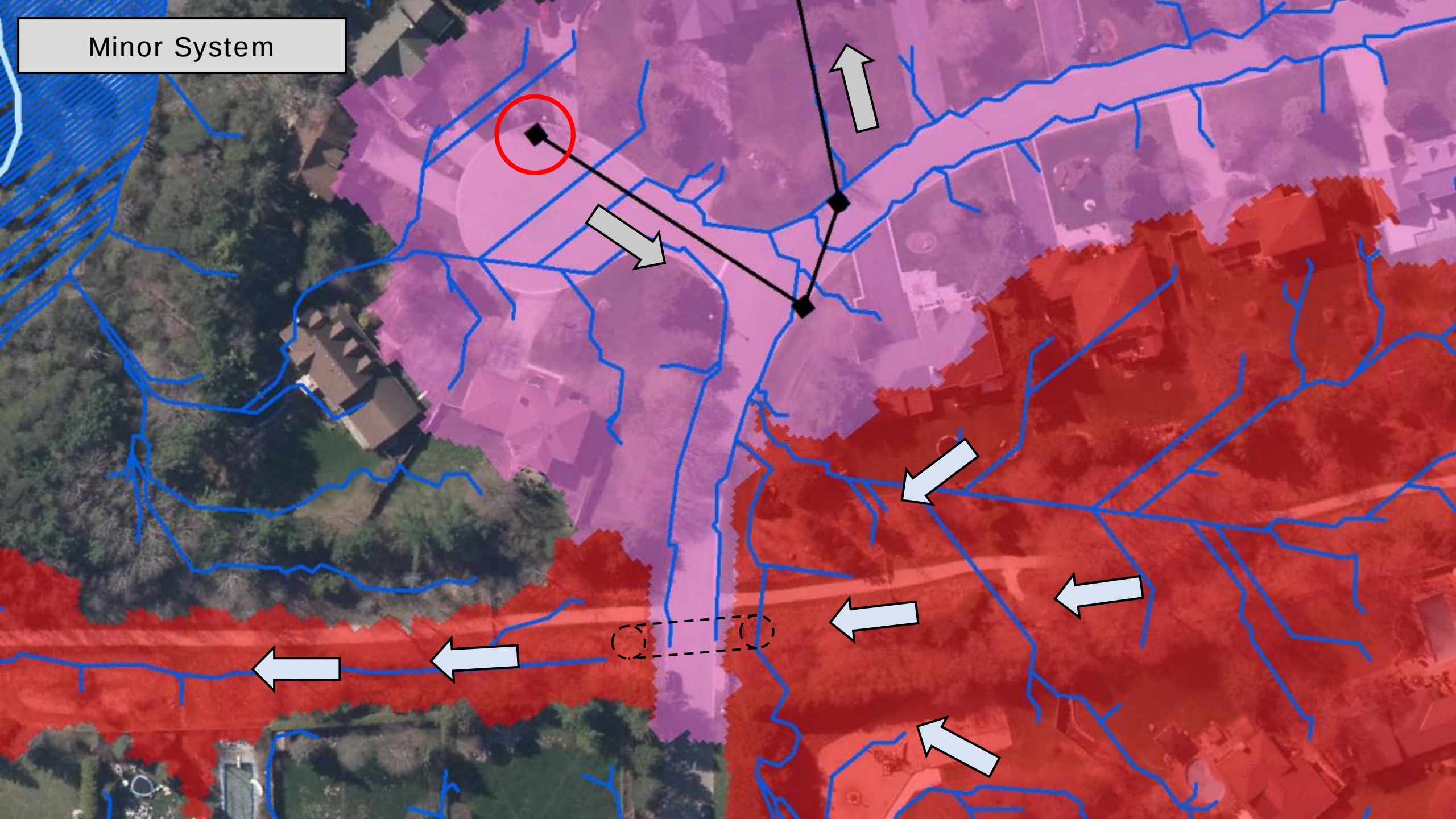

Minor System
Catchbasins intercept runoff during minor storm conditions, resulting in two outlets

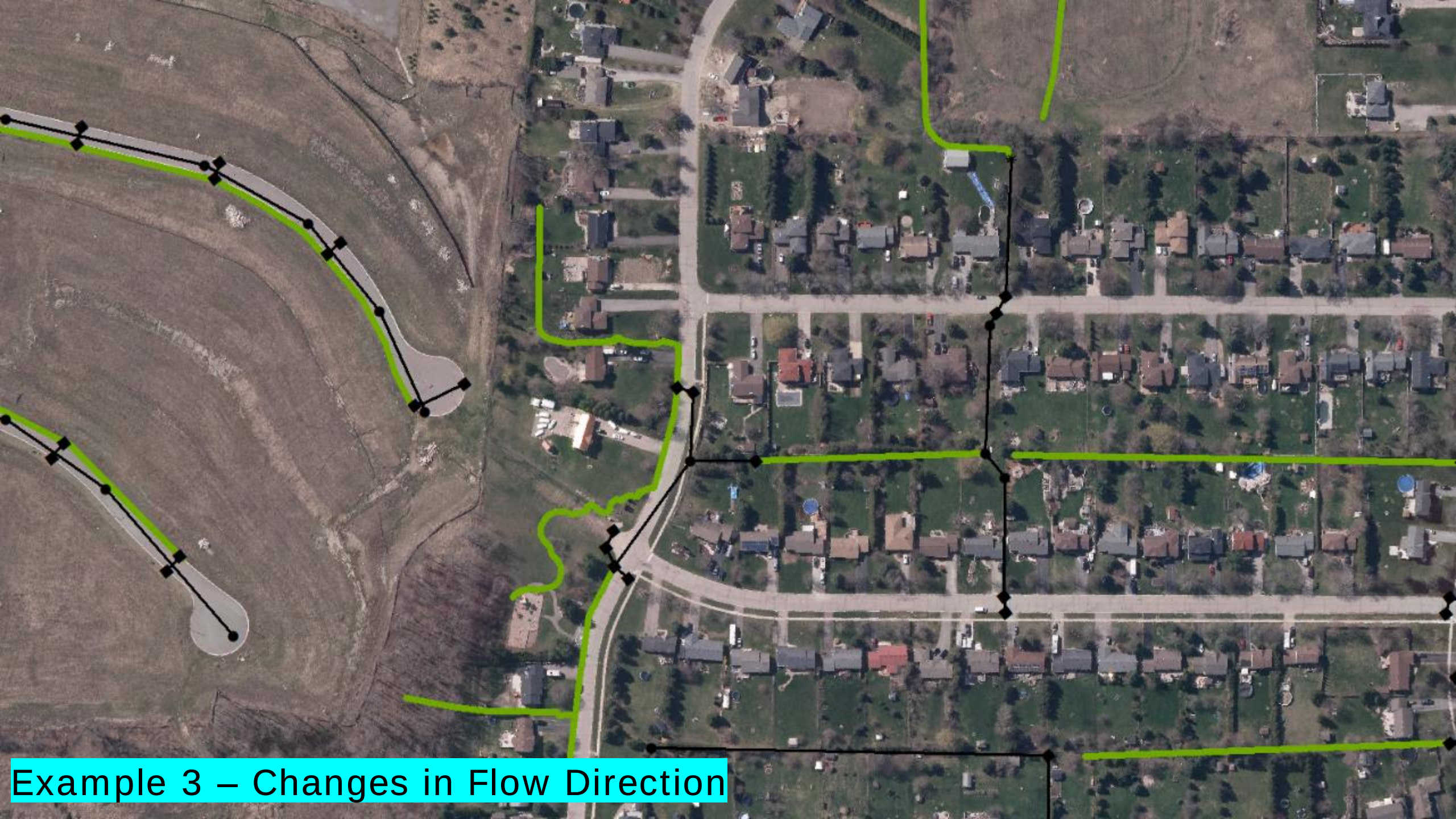

Major System
Catchbasins, sewers, and culverts are assumed to be inundated during major storm events.



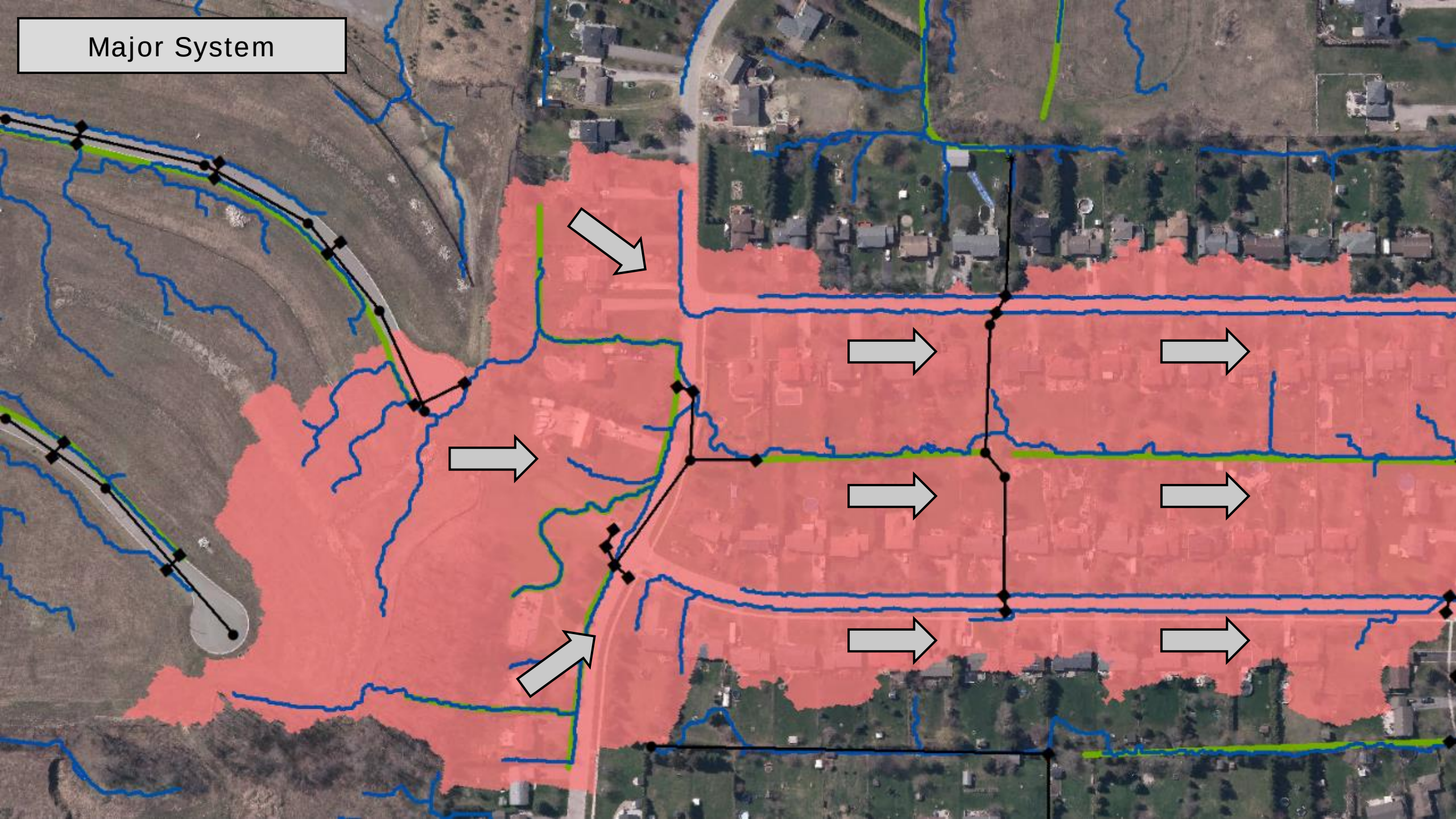
Example 2 – Need for Drainage Plans

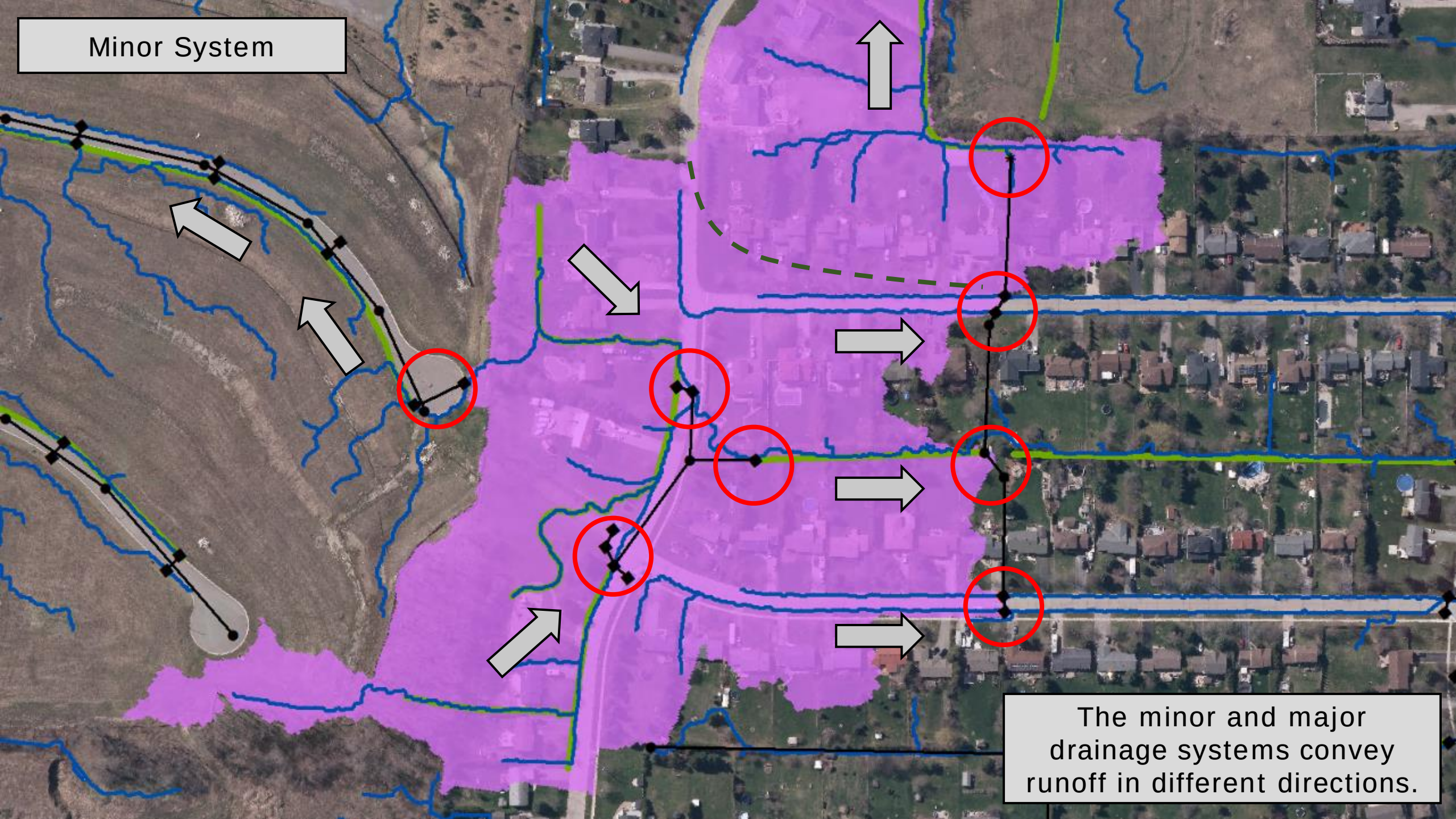

Drainage areas identified in drawings inform delineations
COURT
CARROLL
DRIVE
BRAWTON
Block 38
Block 43
C. N. R.
·92ha
0·40
0·91ha
0·40
0·60ha
0·40
·124ha
0·75
PARK
BLOCK 61
DARROWBY
CRES.
Corrugated metal pipe (600 mm) not identified in shapefiles provided

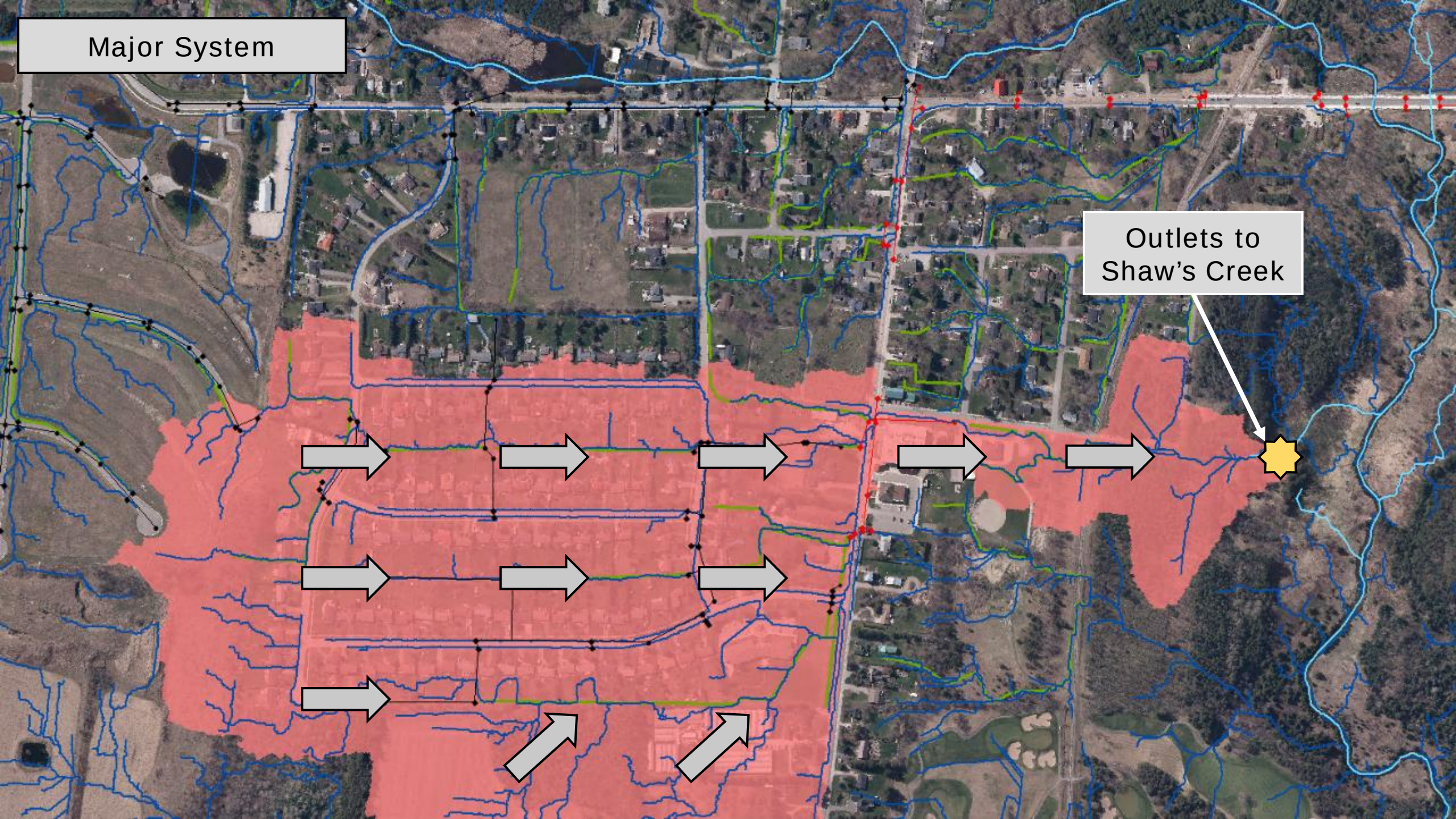

Minor System

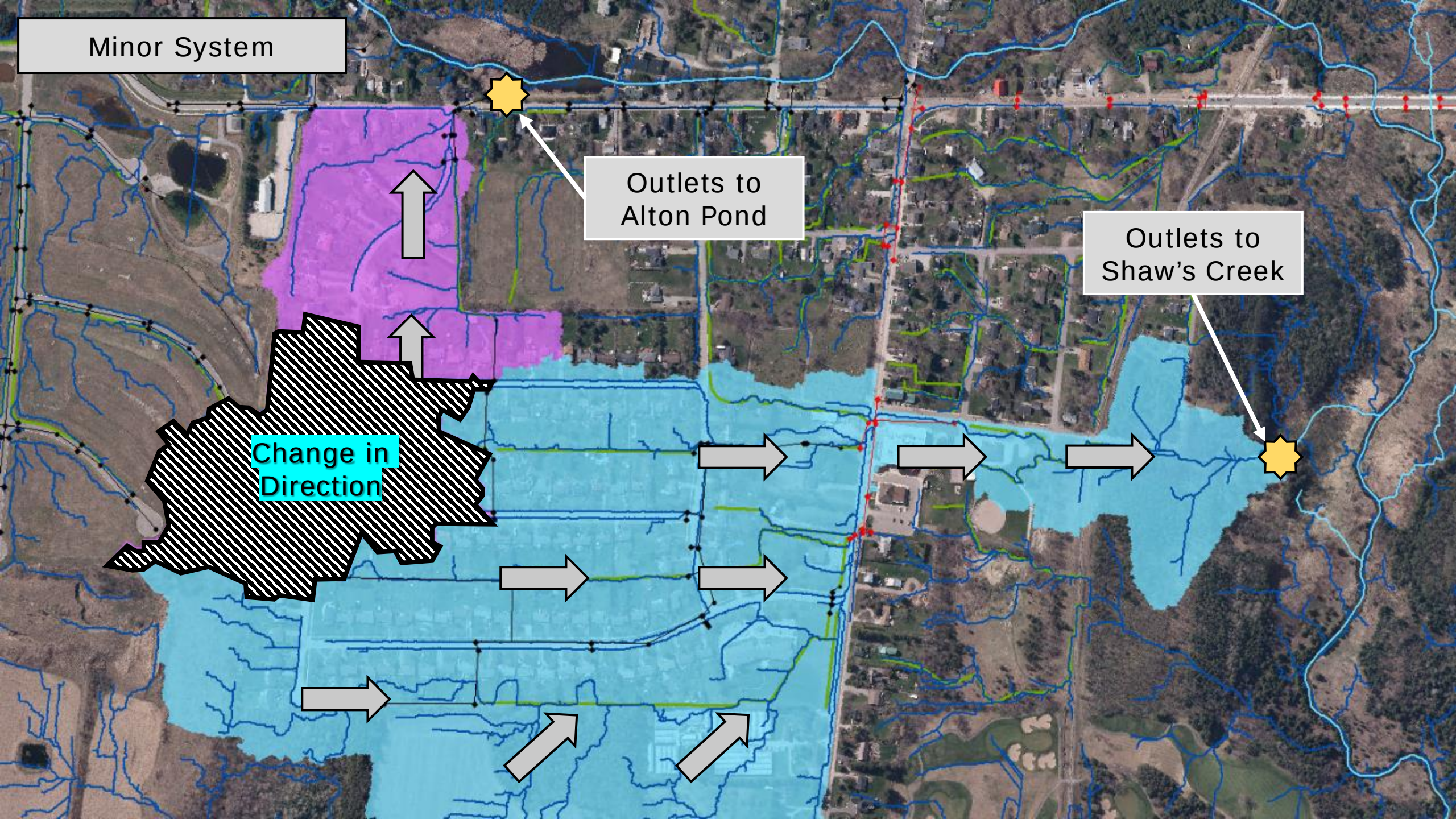


Example 3 – Changes in Flow Direction


Major System


Minor System
The minor and major drainage systems convey runoff in different directions.


Major System
Outlets to Shaw's Creek


Minor System
Outlets to Alton Pond
Outlets to Shaw's Creek
Change in Direction

Geo-referencing drainage plans can help incorporate information from drawings into delineation.

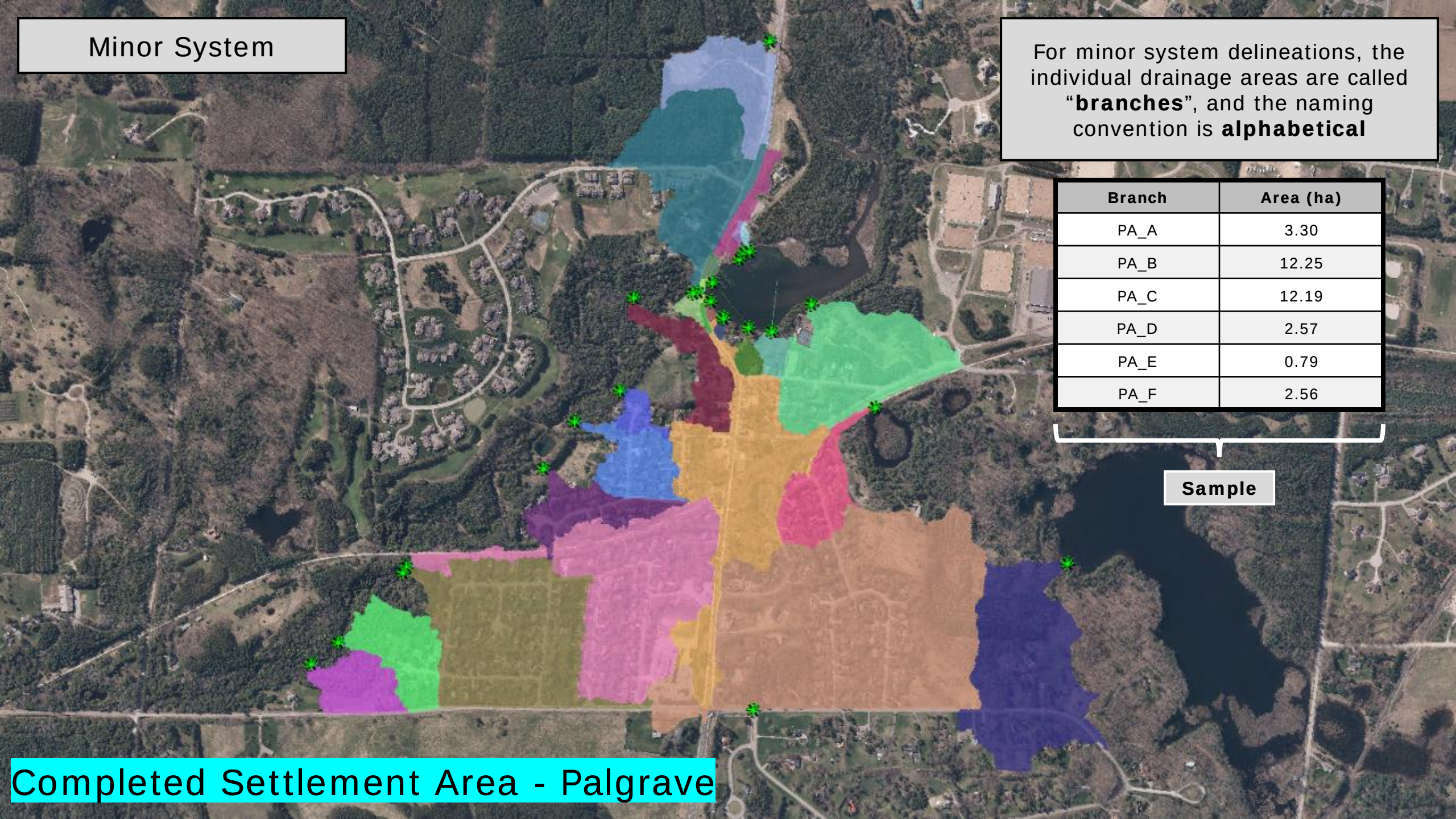
Results

Minor System

For minor system delineations, the individual drainage areas are called "**branches**", and the naming convention is **alphabetical**

Branch	Area (ha)
PA_A	3.30
PA_B	12.25
PA_C	12.19
PA_D	2.57
PA_E	0.79
PA_F	2.56

Sample



Completed Settlement Area - Palgrave

Major System

For major system delineations, the individual drainage areas are called "**subcatchments**", and the naming convention is **"AA1, AA2, AA3,..."**

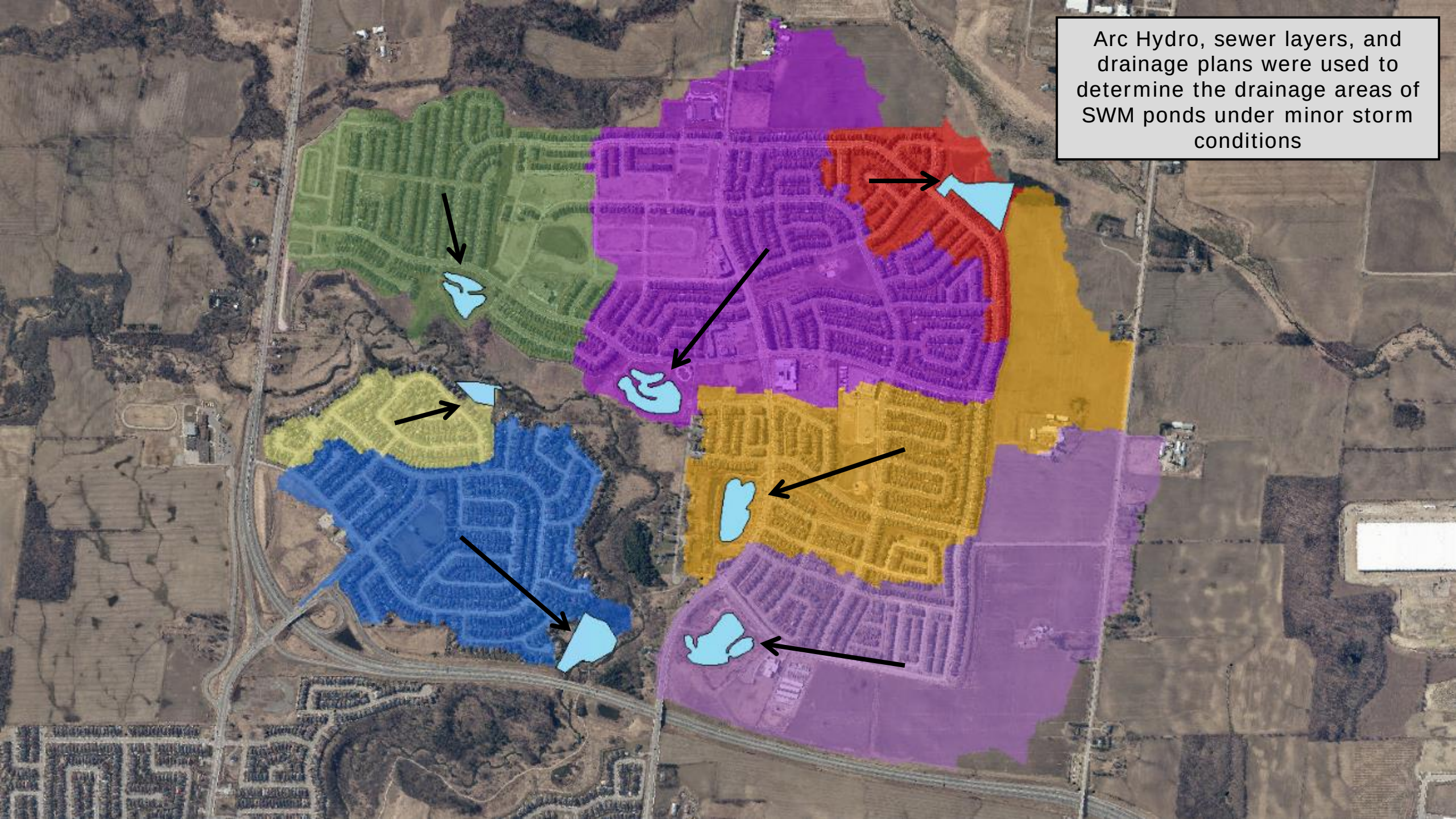
Subcatchment	Area (ha)
PA_AA1	3.30
PA_AA2	2.28
PA_AA3	11.22
PA_AA4	0.82
PA_AA5	15.13
PA_AA6	3.22

Sample

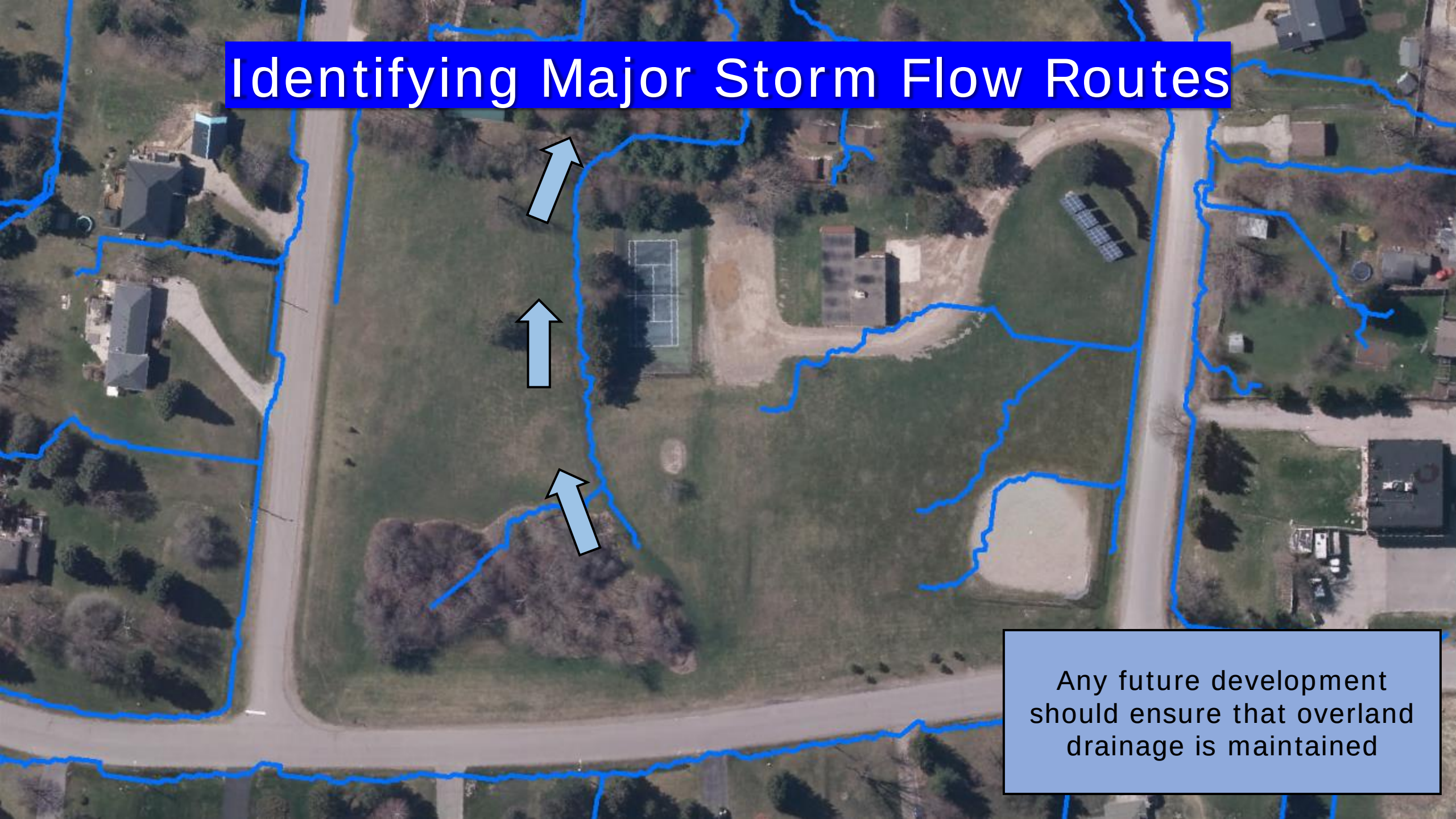
Other Potential Outcomes

- SWM Master Plan Development
- Site Plan Applications and Building Permit Review
- Overland Flow Route Maintenance
- Investigating Drainage Complaints
- Points of Interest


Pond Drainage Areas

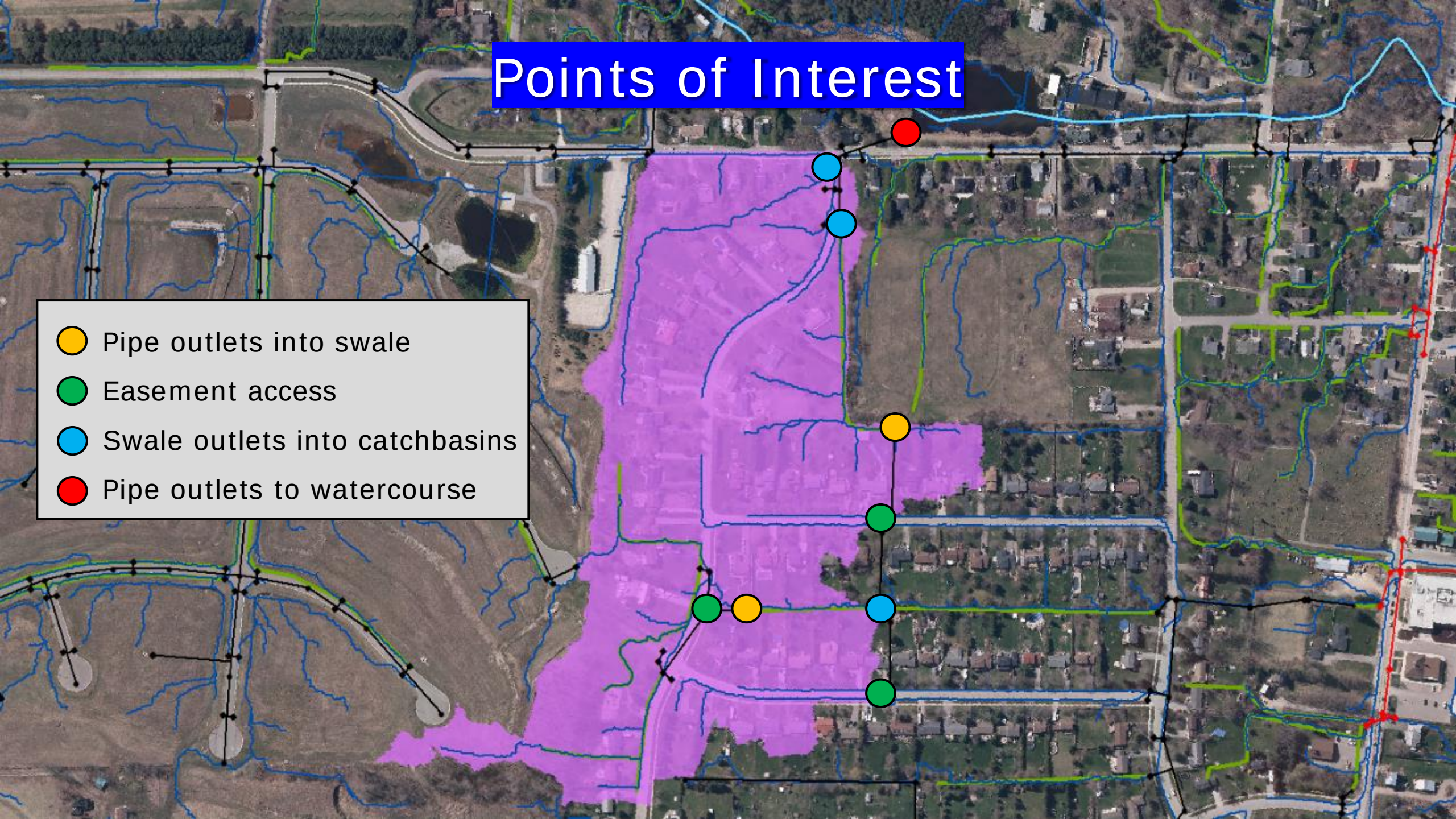

Arc Hydro, sewer layers, and drainage plans were used to determine the drainage areas of SWM ponds under minor storm conditions

Identifying Major Storm Flow Routes

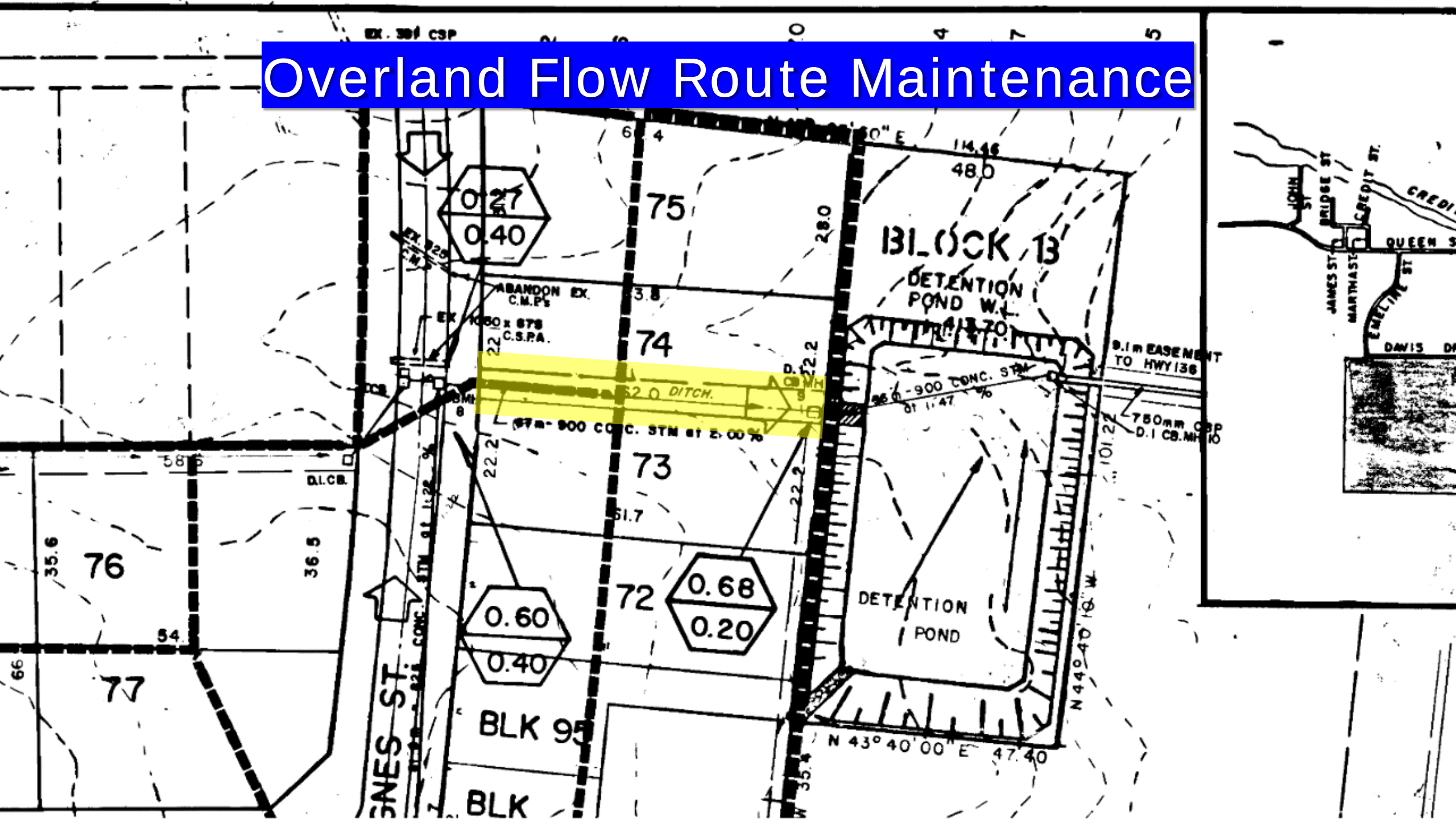


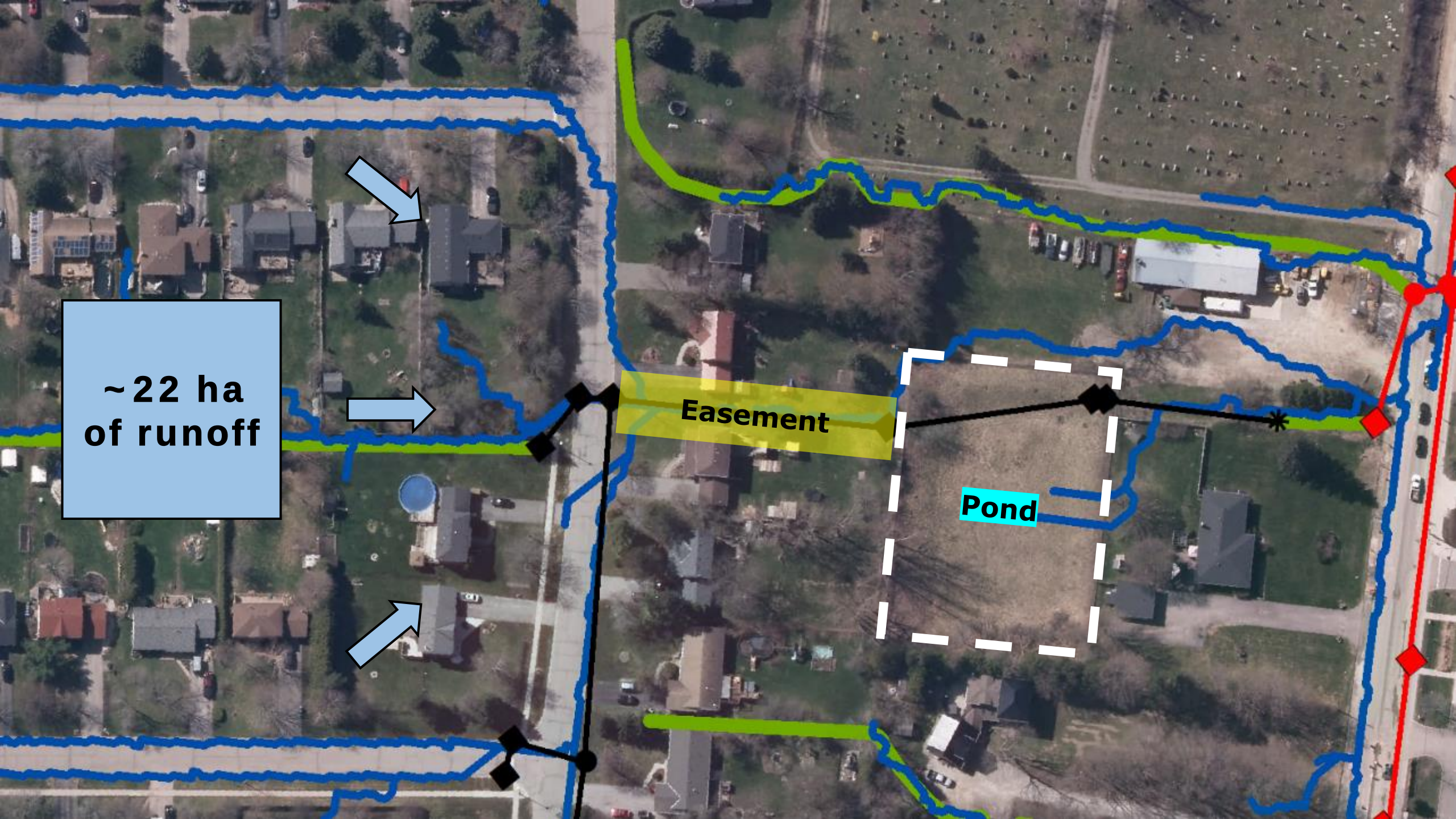
Any future development should ensure that overland drainage is maintained

Points of Interest



Overland Flow Route Maintenance




~22 ha
of runoff
Easement
Pond


Blocking this overland flow route could cause significant drainage issues

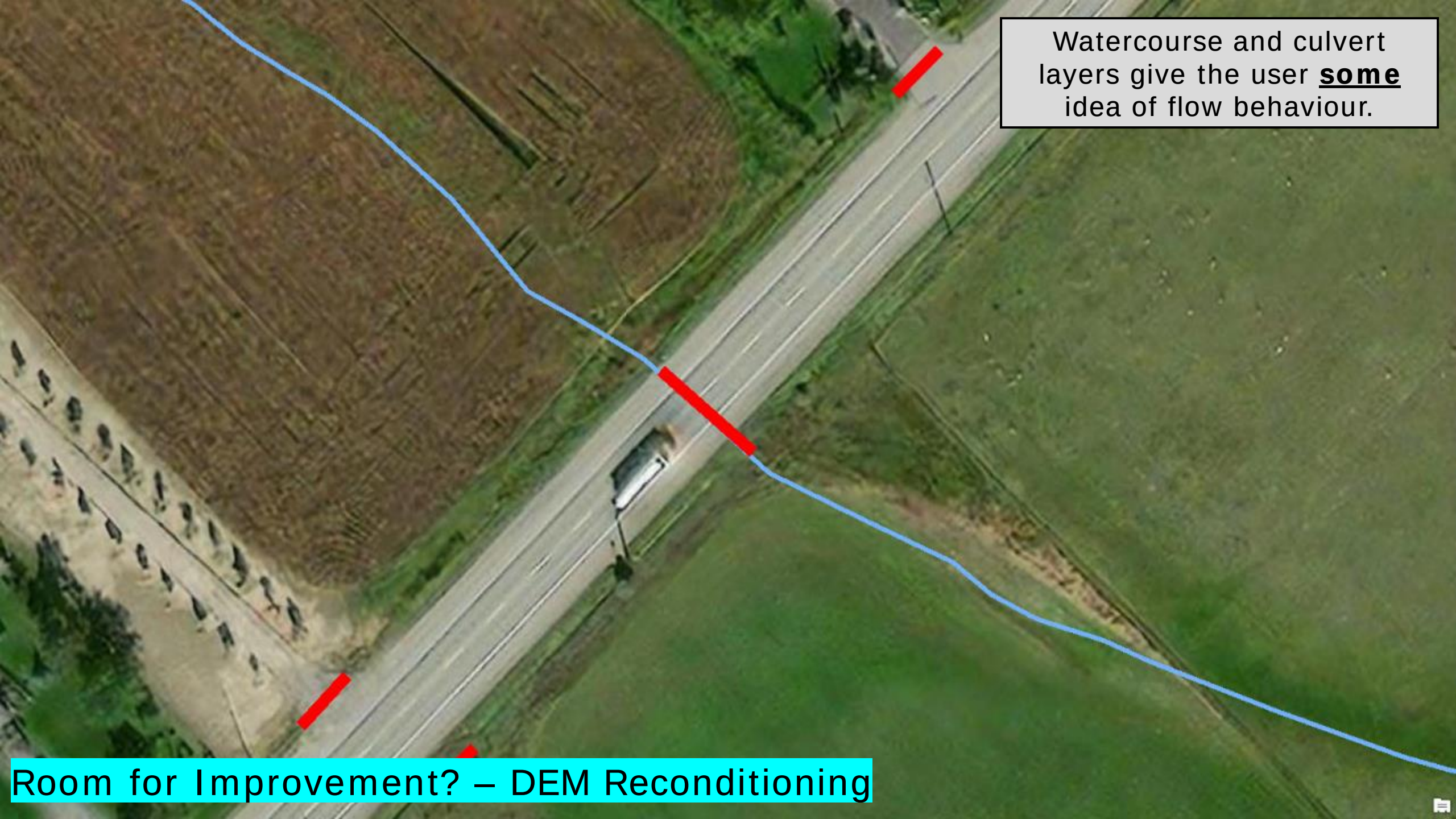
Significant Surface Inlet Inspections

Catchbasin
covered with apples

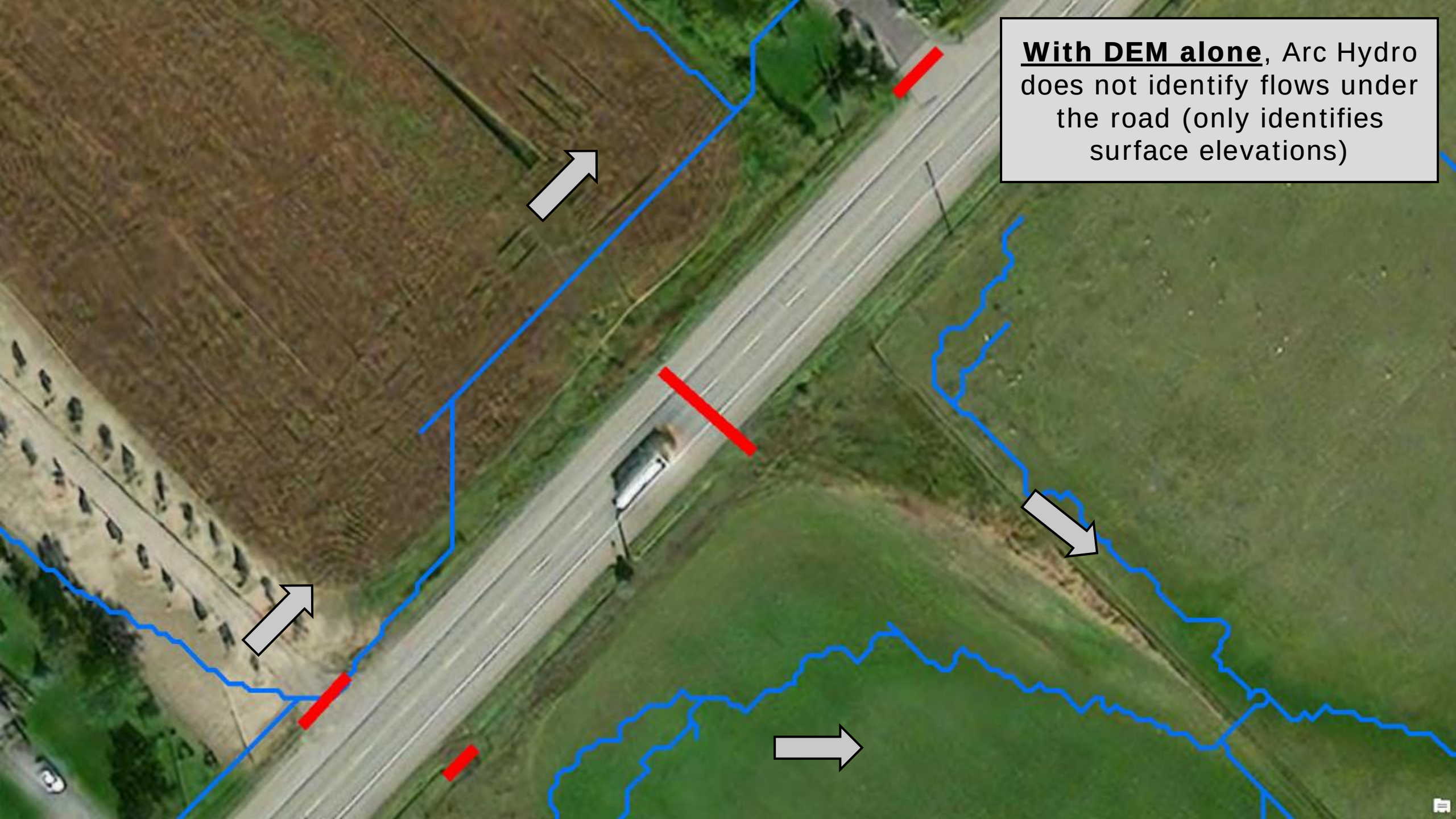
Catchbasin
covered with filter fabric

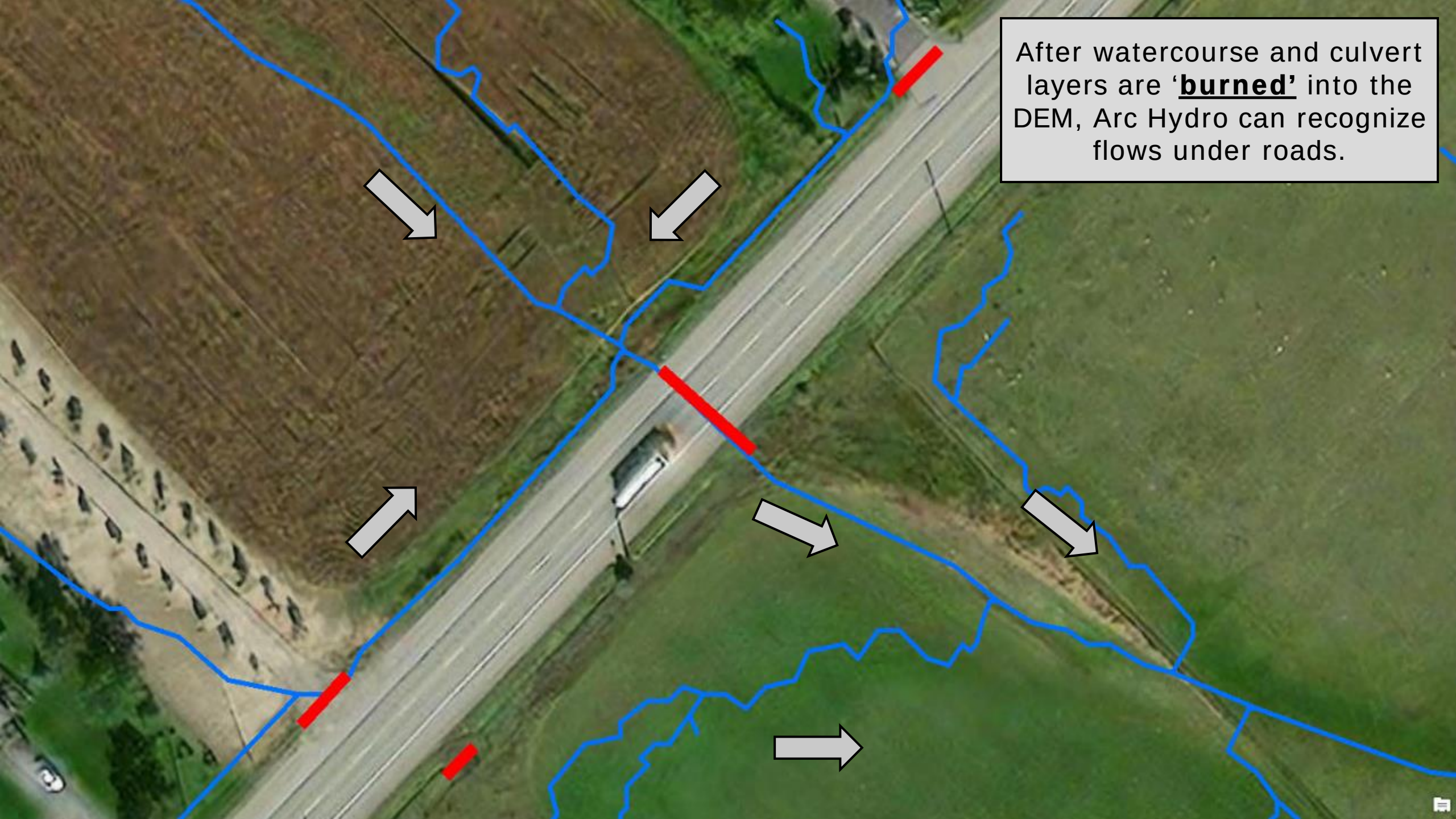
Catchbasin
choked with watercress

Other Considerations



Room for Improvement? – DEM Reconditioning


With DEM alone, Arc Hydro does not identify flows under the road (only identifies surface elevations)


After watercourse and culvert layers are ‘**burned’** into the DEM, Arc Hydro can recognize flows under roads.

Thank You

For more information:

Contact

James Cowan
(437) 221-8519
james.cowan@cvc.ca

SOURCE TO STREAM 2023 Conference

Canada's Premier Stormwater and Erosion and Sediment Control Conference

Thank you to our sponsors!

EXECUTIVE SPONSORS

CULTEC

Canadian Society for Civil Engineering / Société canadienne de génie civil

ADS – Our reason is water.™

CUPOLEX® ENGINEERING SOLUTIONS INC.

ENVIROPOD™

York Region

filtrexx® CANADA SUSTAINABLE TECHNOLOGIES – let nature do it.®

DICORP – DOWN TO EARTH BUSINESS

GEO MORPHIX™

Hydro International

NEXT STORM

Greck

Sustainable Technologies EVALUATION PROGRAM

OPPORTUNITIES SPONSOR

AECOM

MEDIA SPONSORS

WATER CANADA

HOSTS

Presented by:

Toronto and Region Conservation Authority

In association with:

Lake Simcoe Region conservation authority

Credit Valley Conservation – inspired by nature