Stantec

Peel Region

Bridges (and more) Over Troubled Water:

Region-Scale Erosion Hazard Screening to Support Municipal Asset Management

8th Conference on Natural Channel Systems | June 8-10, 2026

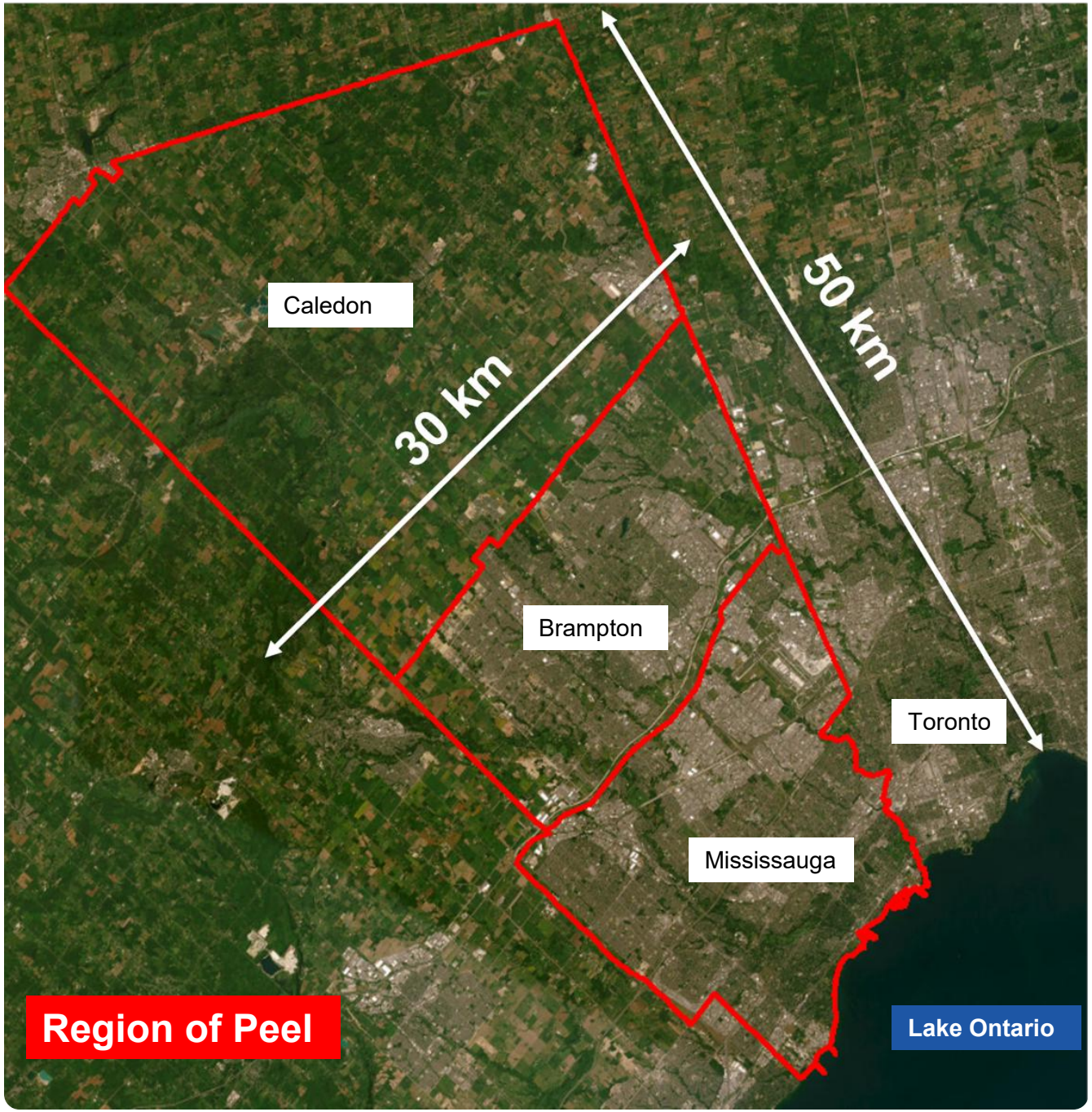
Andrew Doherty, P.Eng.

Topics

1. Background Region of Peel – Asset Management and Erosion Risks
2. Riverine Erosion Assessment Methodology
3. Results and Recommendations

Region of Peel – Quick Facts

- Municipality in the Greater Toronto Area
- Consists of City of Mississauga, City of Brampton and the Town of Caledon
- Current population of 1.5 million, expected to reach 2.3 million by 2051



Background

- Starting point: The Region of Peel undertook a multi-criteria risk assessment for maintenance holes.
- Across the region, what are the riverine erosion risks that maintenance holes and valve chamber infrastructure are exposed to?

Objective

- Assess region-wide erosion risks:
  - 56,000 maintenance holes
  - 7,860 valve chambers
- Inform recommendations on mitigation and monitoring

Infrastructure in Floodplains

- Historical trend of settlements developing along waterways
- Typically flat landscapes
- Transportation, trains, roads, boats
- Fertile lands for agriculture
- Shallow constant downward gradient
    - Gravity-fed infrastructure

An Altered Hydrological Landscape

Development pressures are changing rivers and floodplains

- Increased impervious area
- Decreased attenuation

Flashier catchments with higher peak flows that come faster

- Channels struggling to adapt, resulting in more rapid degradation, erosion, widening
- Constrained, armoured, or heavily modified channels are less able to adapt to pressures

Geomorphological Landscape

Watercourses are dynamic features for the landscape

- Channel degradation, erosion, and widening
- Constrained, armoured, or heavily modified channels are less able to adapt to pressures
- Increased erosion risk of outflanking, channel cut-offs, undercutting, bulk failure of banks and near-channel areas
- Exposed infrastructure can influence or exacerbate channel dysfunction and erosion

Infrastructure in the Floodplain

Infrastructure in the floodplain

+ Altered hydrology

+ Dynamic watercourses

- Erosion along roadways and properties
- Exposed maintenance holes
- Perched pipelines

Region-wide Erosion Assessment

Starting Point

56,000 maintenance holes and 7,860 valve chambers

Methodology

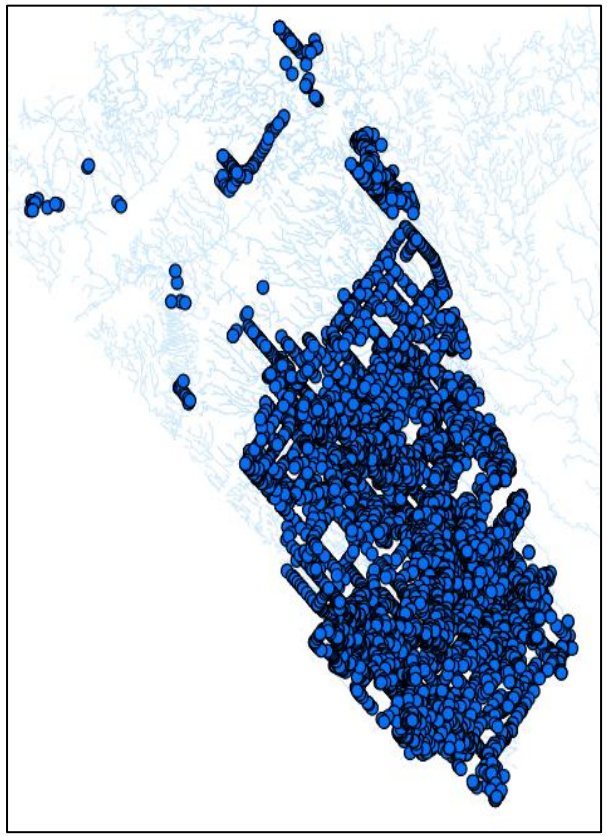
- Preliminary Screening
- Desktop Analysis
- Site-investigations based on result of the desktop study
- Recommendations: mitigate erosion, monitor erosion, do nothing

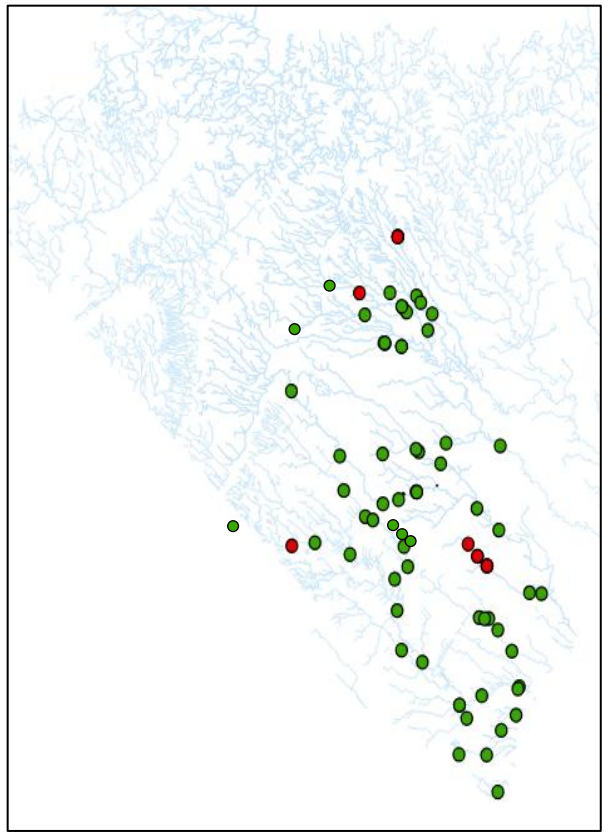
Preliminary Screening

Using GIS data to screen infrastructure

- Located within a regulated floodplain
- Within 30 m of a watercourse
- Not located within a roadway

Infrastructure	Total Number	Screened Out After Prelim Screening	At Potential Risk of Riverine Erosion
MHs	56,600	52,920	3,680
VCs	7,860	6,785	1,075





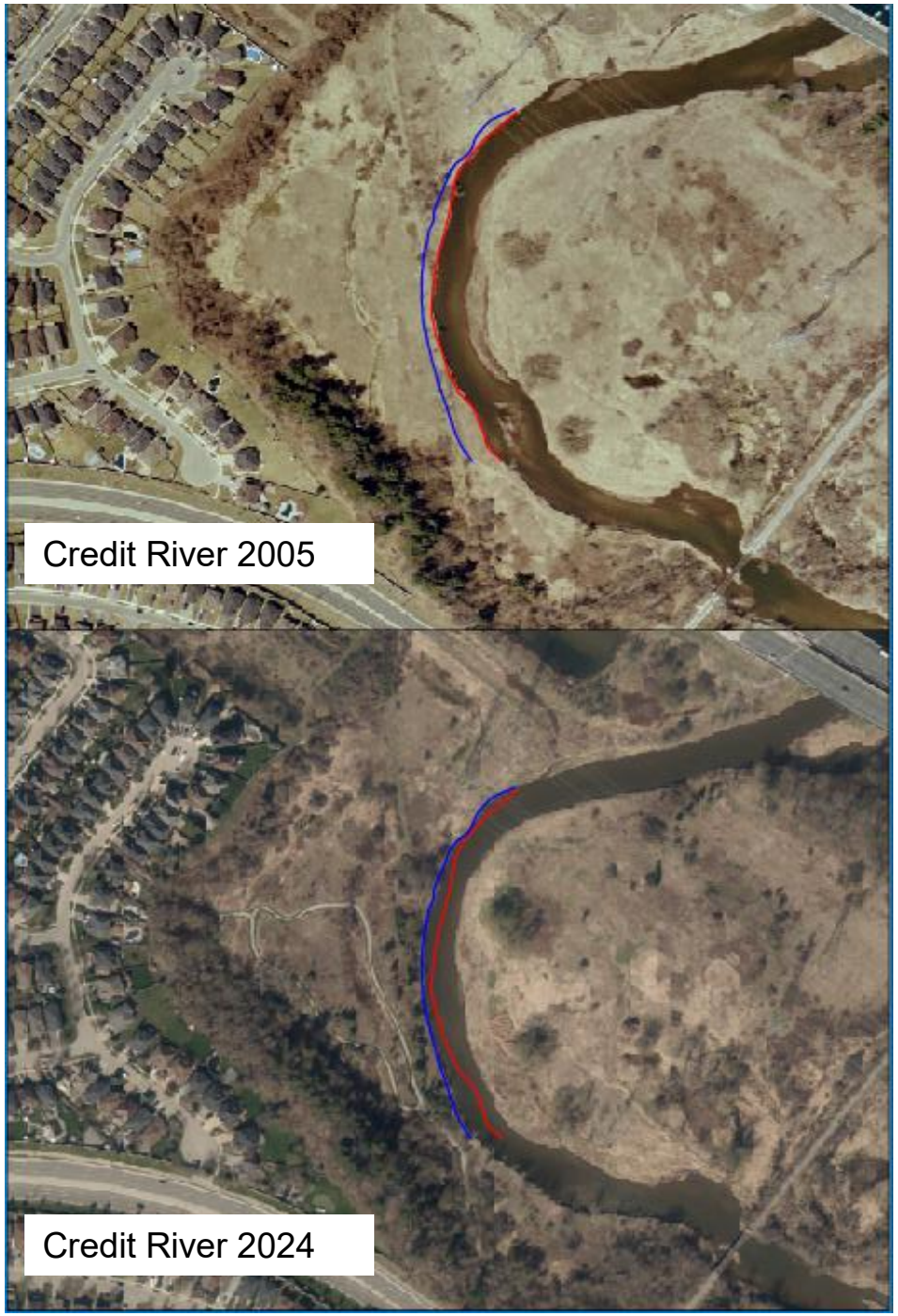
Legend:

All VCs

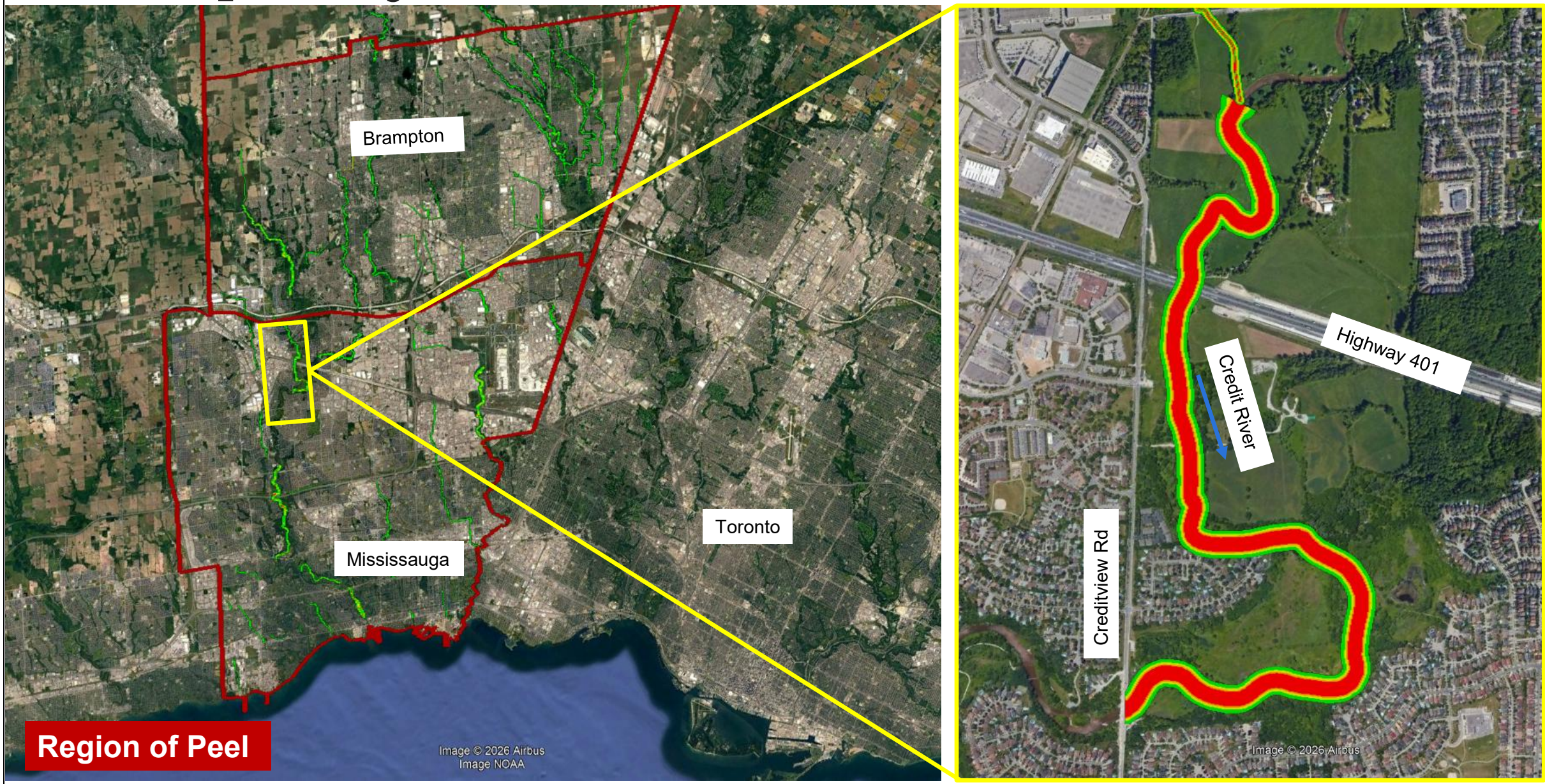
VCs at Risk

Desktop Analysis

- Delineated watercourses across the region into reaches
- Measured river migration rates per reach using georectified orthographic imagery
- Delineated erosion hazard zones using migration rates

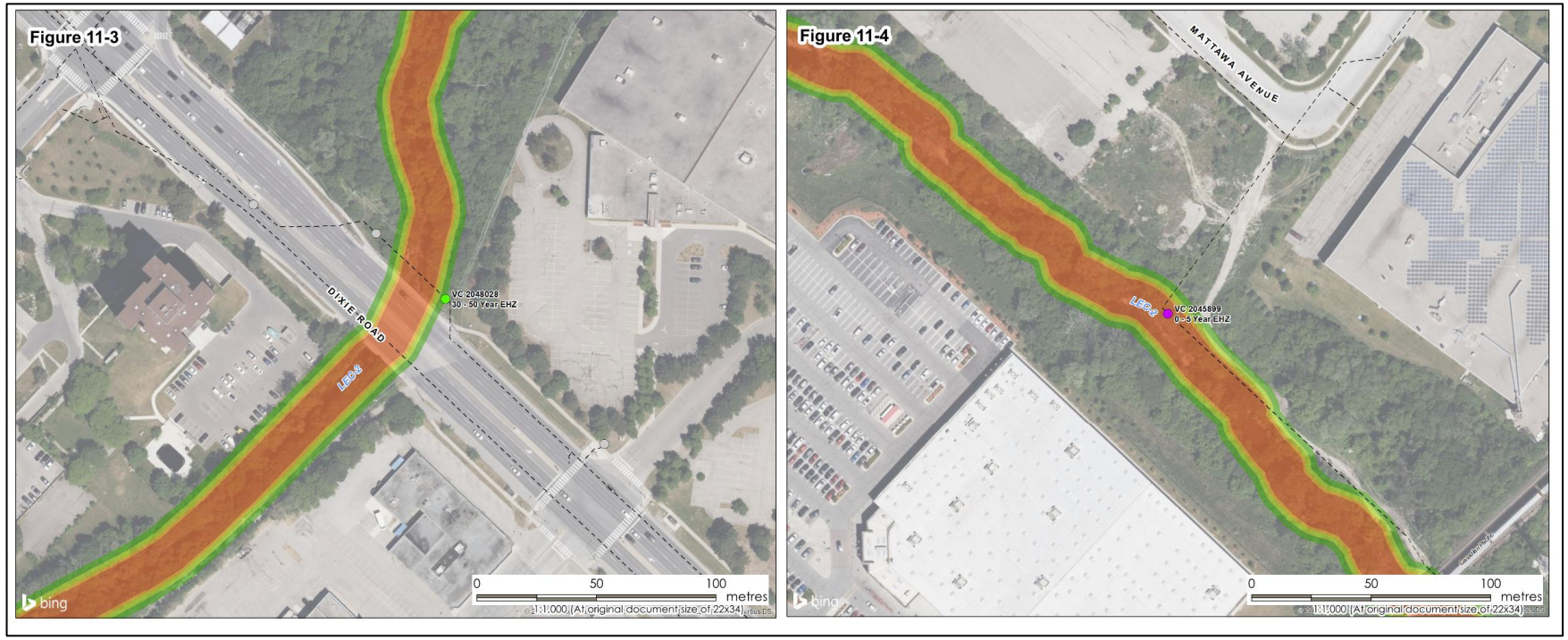


Desktop Analysis



Desktop Analysis

Infrastructure	Total Number	Screened Out After Prelim Screening	At Potential Risk of Riverine Erosion	Erosion Hazard Zone
MHs	56,600	52,920	3,680	548
VCs	7,860	6,785	1,075	66



Site Specific Assessment

- Site visits to high-priority sites
- Document indicators of erosion and instability
- Results of field assessment inform recommendations

Infrastructure	Total Number	Screened Out After Prelim Screening	At Potential Risk of Riverine Erosion	Erosion Hazard Zone	Site Assessments
MHs	56,600	52,920	3,680	548	44
VCs	7,860	6,785	1,075	66	33

Recommendations

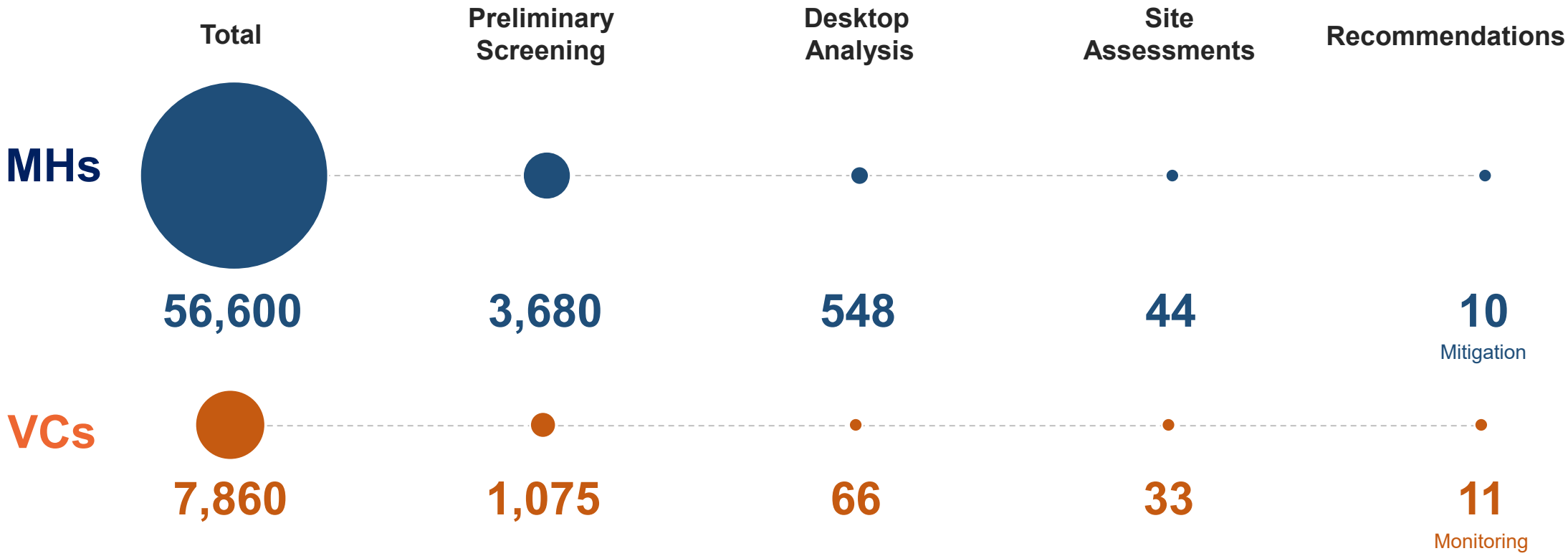
Assessed 56,000 maintenance holes

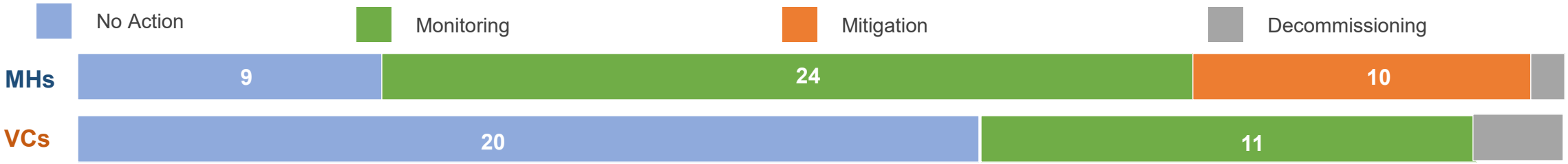
- mitigation recommended for 10 MHs
- monitoring recommended for 24 MHs

Assessed 7,860 valve chambers

- monitoring recommended for 11 VCs
- decommissioning planned for 2 VCs

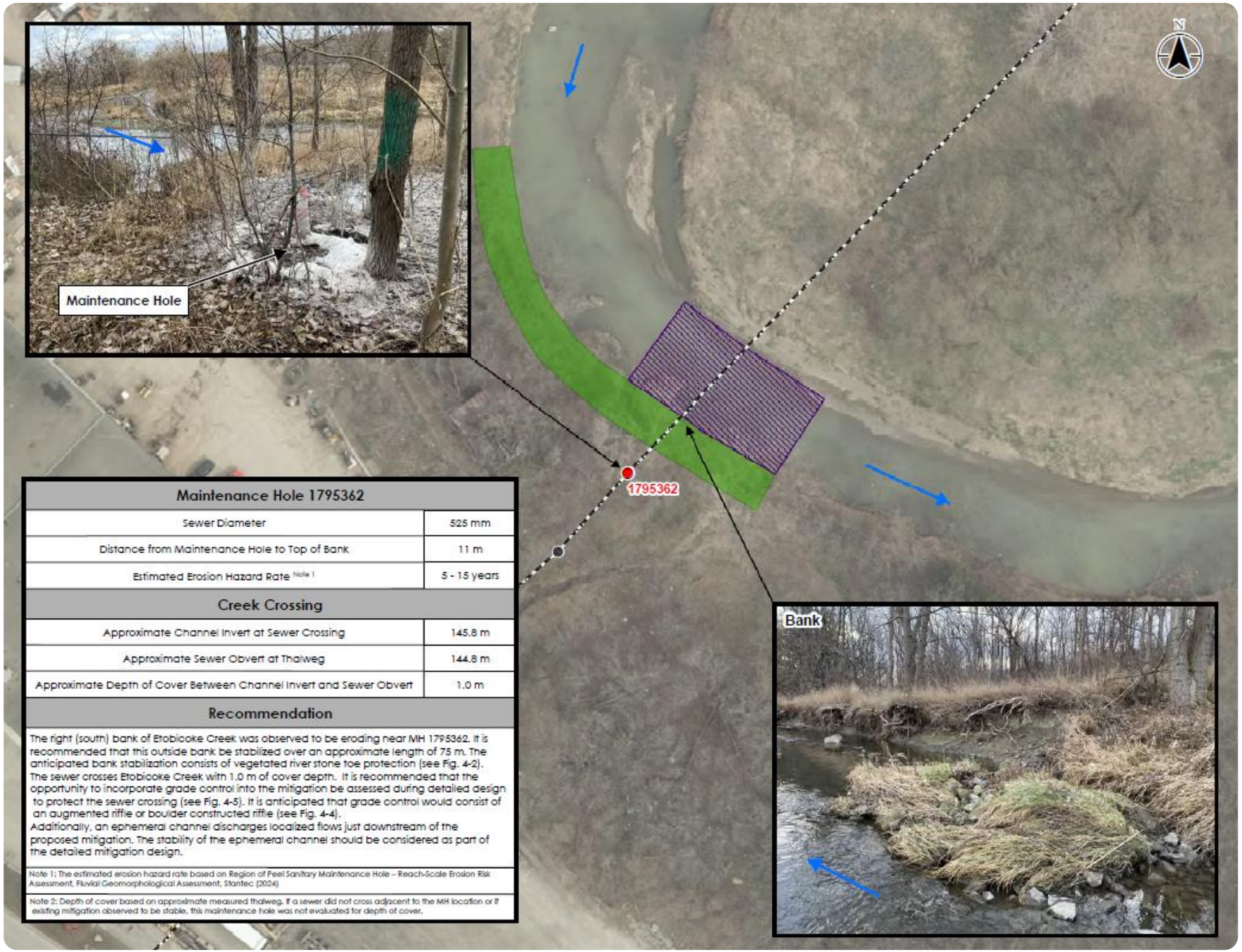
Outcomes


Total
Preliminary Screening
Desktop Analysis
Site Assessments
Recommendations
MHs
56,600
3,680
548
44
10
Mitigation
VCs
7,860
1,075
66
33
11
Monitoring


No Action
Monitoring
Mitigation
Decommissioning
MHs
9
24
10
VCs
20
11

Conceptual Designs

- Support erosion mitigation planning



Maintenance Hole 1795362	
Sewer Diameter	525 mm
Distance from Maintenance Hole to Top of Bank	11 m
Estimated Erosion Hazard Rate [Note 1]	5 - 15 years
Creek Crossing	
Approximate Channel Invert at Sewer Crossing	145.8 m
Approximate Sewer Obvert at Thalweg	144.8 m
Approximate Depth of Cover Between Channel Invert and Sewer Obvert	1.0 m

Recommendation

The right (south) bank of Etobicoke Creek was observed to be eroding near MH 1795362. It is recommended that this outside bank be stabilized over an approximate length of 75 m. The anticipated bank stabilization consists of vegetated river stone toe protection (see Fig. 4-2).
The sewer crosses Etobicoke Creek with 1.0 m of cover depth. It is recommended that the opportunity to incorporate grade control into the mitigation be assessed during detailed design to protect the sewer crossing (see Fig. 4-5). It is anticipated that grade control would consist of an augmented riffle or boulder constructed riffle (see Fig. 4-4).
Additionally, an ephemeral channel discharges localized flows just downstream of the proposed mitigation. The stability of the ephemeral channel should be considered as part of the detailed mitigation design.

Note 1: The estimated erosion hazard rate based on Region of Peel Sanitary Maintenance Hole – Reach-Scale Erosion Risk Assessment, Fluvial Geomorphological Assessment, Stantec (2024)

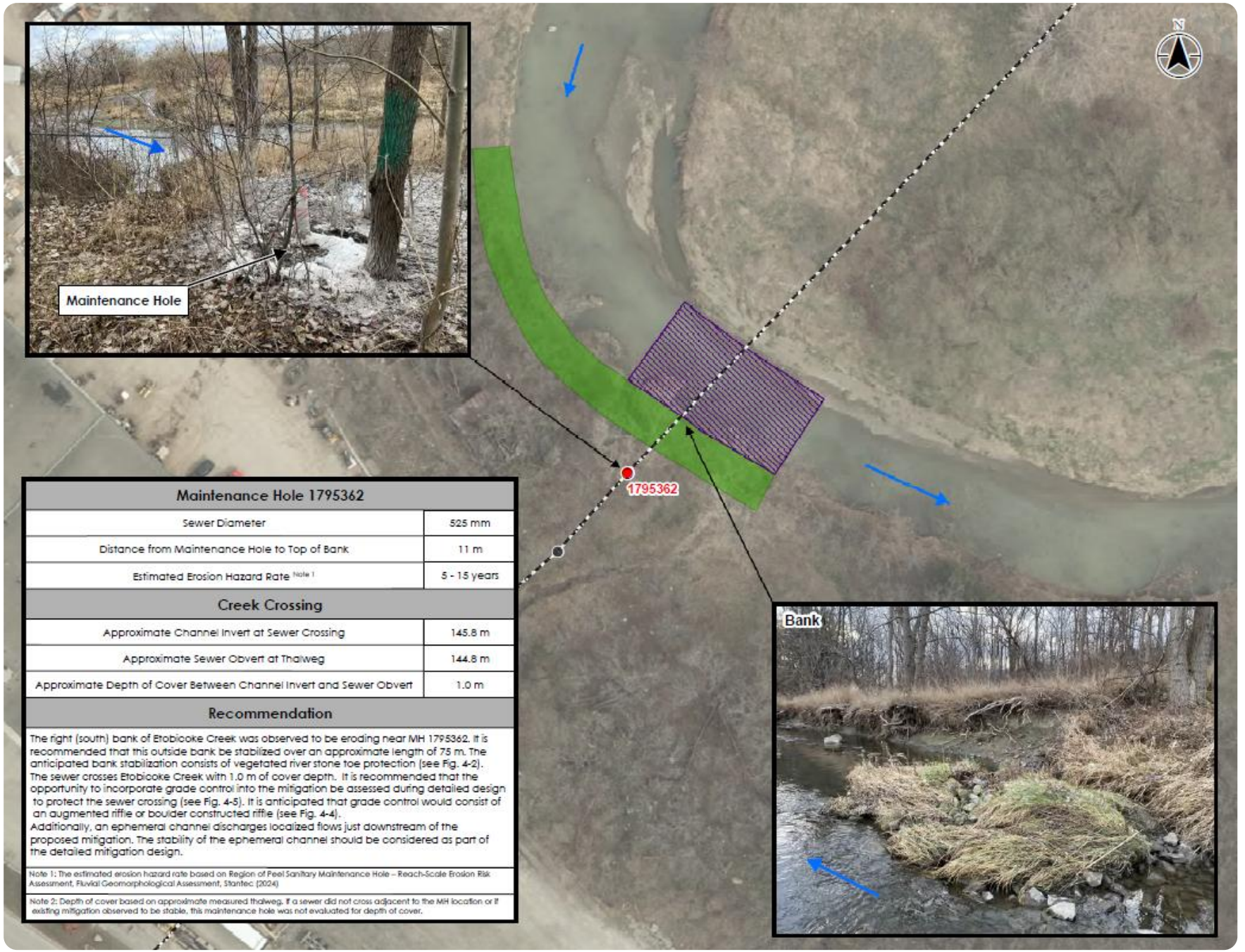
Note 2: Depth of cover based on approximate measured thalweg. If a sewer did not cross adjacent to the MH location or if existing mitigation observed to be stable, this maintenance hole was not evaluated for depth of cover.

Exposed MH

- Assessment identified MH high risk of erosion
- Shortly after high flow event caused erosion
- Emergency works required to protect infrastructure and environmental

Conceptual Designs

- Conceptual designs were developed for the 10 MH locations where erosion mitigation was recommended
- Designs included wood debris toe protection, vegetated riverstone, vegetated bank protection, constructed riffles, and boulder sill tie-in



Maintenance Hole 1795362	
Sewer Diameter	525 mm
Distance from Maintenance Hole to Top of Bank	11 m
Estimated Erosion Hazard Rate [Note 1]	5 - 15 years
Creek Crossing	
Approximate Channel Invert at Sewer Crossing	145.8 m
Approximate Sewer Obvert at Thalweg	144.8 m
Approximate Depth of Cover Between Channel Invert and Sewer Obvert	1.0 m

Recommendation

The right (south) bank of Etobicoke Creek was observed to be eroding near MH 1795362. It is recommended that this outside bank be stabilized over an approximate length of 75 m. The anticipated bank stabilization consists of vegetated river stone toe protection (see Fig. 4-2).
The sewer crosses Etobicoke Creek with 1.0 m of cover depth. It is recommended that the opportunity to incorporate grade control into the mitigation be assessed during detailed design to protect the sewer crossing (see Fig. 4-5). It is anticipated that grade control would consist of an augmented riffle or boulder constructed riffle (see Fig. 4-4).
Additionally, an ephemeral channel discharges localized flows just downstream of the proposed mitigation. The stability of the ephemeral channel should be considered as part of the detailed mitigation design.

Note 1: The estimated erosion hazard rate based on Region of Peel Sanitary Maintenance Hole – Reach-Scale Erosion Risk Assessment, Fluvial Geomorphological Assessment, Stantec (2024)

Note 2: Depth of cover based on approximate measured thalweg. If a sewer did not cross adjacent to the MH location or if existing mitigation observed to be stable, this maintenance hole was not evaluated for depth of cover.

Thank you!

Stantec

Conclusions

- Multi-disciplinary project and a proactive approach to prioritize, manage, maintain, monitor, and repair critical service infrastructure over a large spatial scale
- Highlights the importance evaluating external factors such as river migration which can cause buried infrastructure to become inaccessible
- Maintains the integrity of the sanitary infrastructure, public safety and the local environment and is transferable to any municipality’s infrastructure