WELCOME TO PUBLIC INFORMATION CENTRE #1

PICKERING AND AJAX DYKES REHABILITATION

Class Environmental Assessment Project

Agenda

PROJECT OVERVIEW

- Problem and Opportunity
- Project Background
- Data Collected
- Alternative Solutions
- Evaluation of Alternative Solutions
- Preliminary Preferred Alternative Solution

NEXT STEPS

Seeking your feedback on:

- Existing Conditions
- Alternative Solutions
- Evaluation Criteria
- Preliminary Preferred Alternative Solution
- Your input, issues and concerns

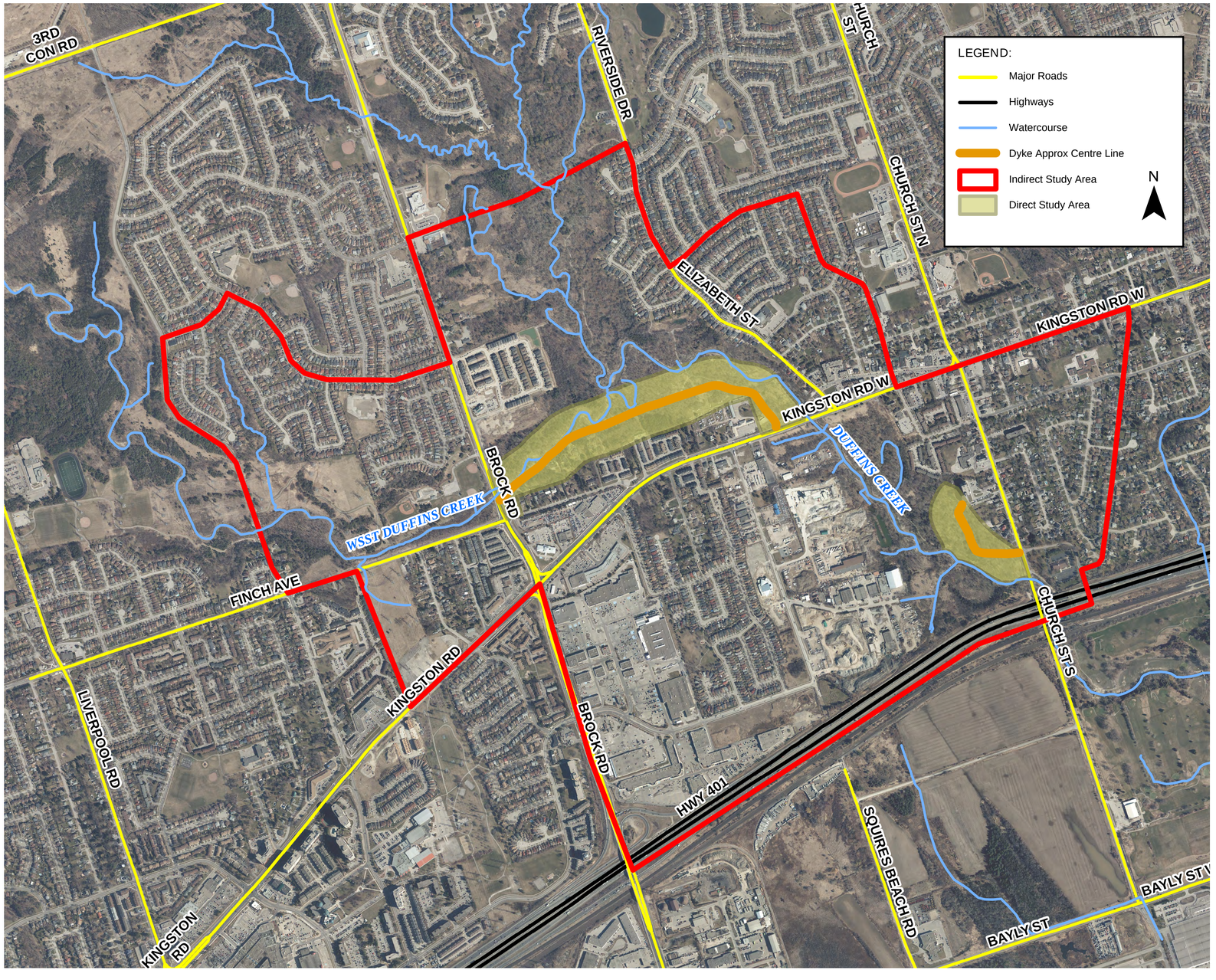
WHERE IS THE PROJECT?

DIRECT STUDY AREA

Valley lands within the limits of the flood control structures (dykes) and the area primarily impacted by construction access and/or routes.

INDIRECT STUDY AREA

Valley lands and local communities surrounding the dykes that may be impacted by remedial works within the Direct Study Area.

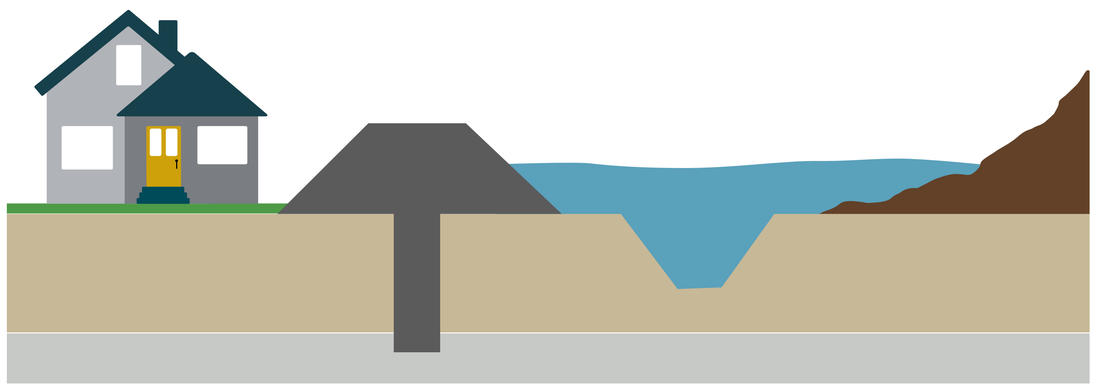


HISTORY OF FLOODING

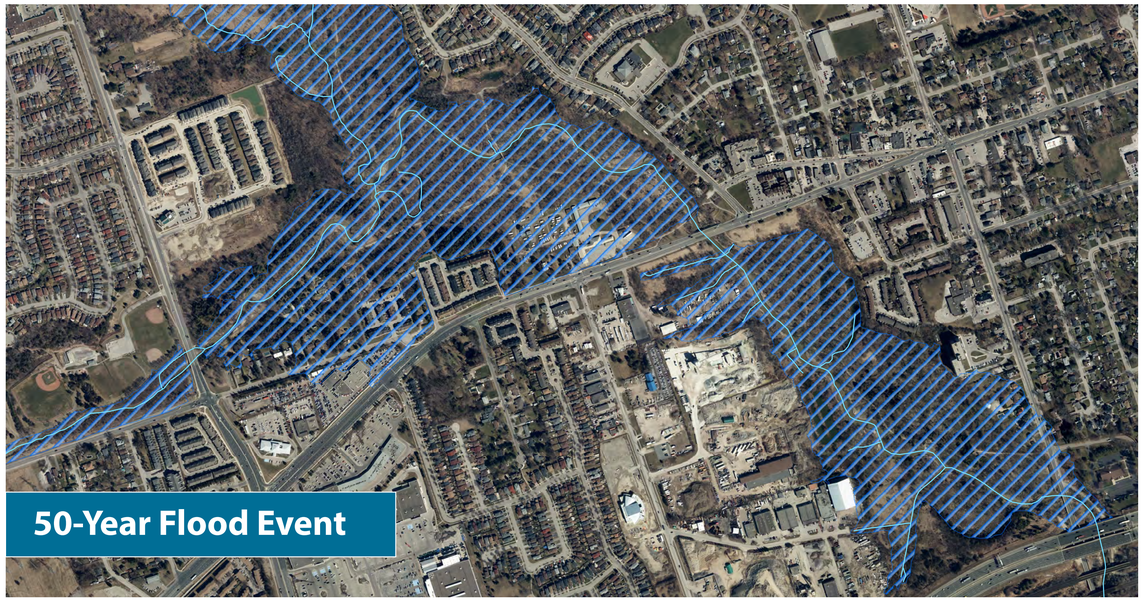
- Before the dykes were constructed the adjacent residential areas flooded frequently
- **1980's (approximately) Special Policy Area (SPA) Designation** for Village East and Notion Road Pickering Village communities
- **1984-1985 Pickering and Ajax Dykes constructed**
  Designed to provide flood protection for the communities up to the 500-year storm flood

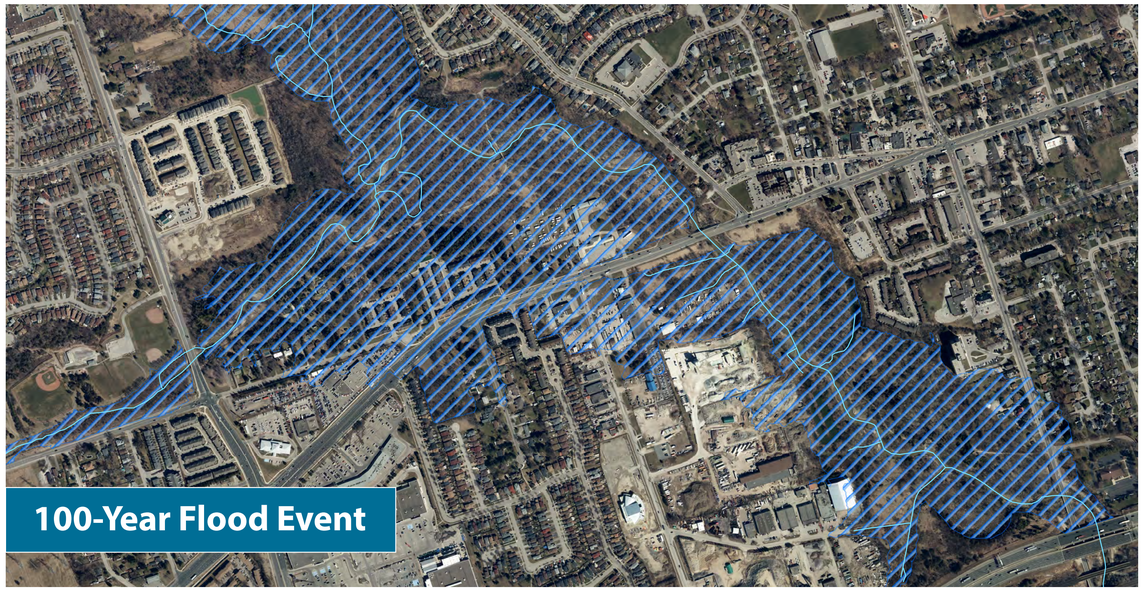
WHAT IS A DYKE?

A flood control dyke is a long wall or embankment built to prevent flooding from a river course.



POTENTIAL FLOOD EXTENT WITHOUT DYKES





FLOOD RISK 101

WHAT IS A FLOODPLAIN?

A floodplain is the area beside a watercourse that would be covered in water by a flood event.

WHAT IS A SPECIAL POLICY AREA (SPA)?

A Special Policy Area is a land use planning designation that acknowledges that there is already development in a flood vulnerable area and that only limited changes can be made to the development in the flood plain.

WHAT IS THE REGULATORY FLOOD?

The Regulatory flood is the extent of flooding that would occur if a storm the size of Hurricane Hazel (the largest storm on record in southern Ontario) falls over an area.

WHAT IS THE PROBLEM AND OPPORTUNITY?

THE PROBLEM

- **The dykes are at risk of failure**
  - The dykes do not meet the current engineering design standards
  - Significant erosion of the creek banks in areas adjacent to the Pickering Dyke
  - Other issues
    - *Tree growth and root systems compromising integrity*
    - *Narrow crest width limits access for maintenance*

Narrow dyke crest and tree growth on dyke.

Creek bank erosion repair.

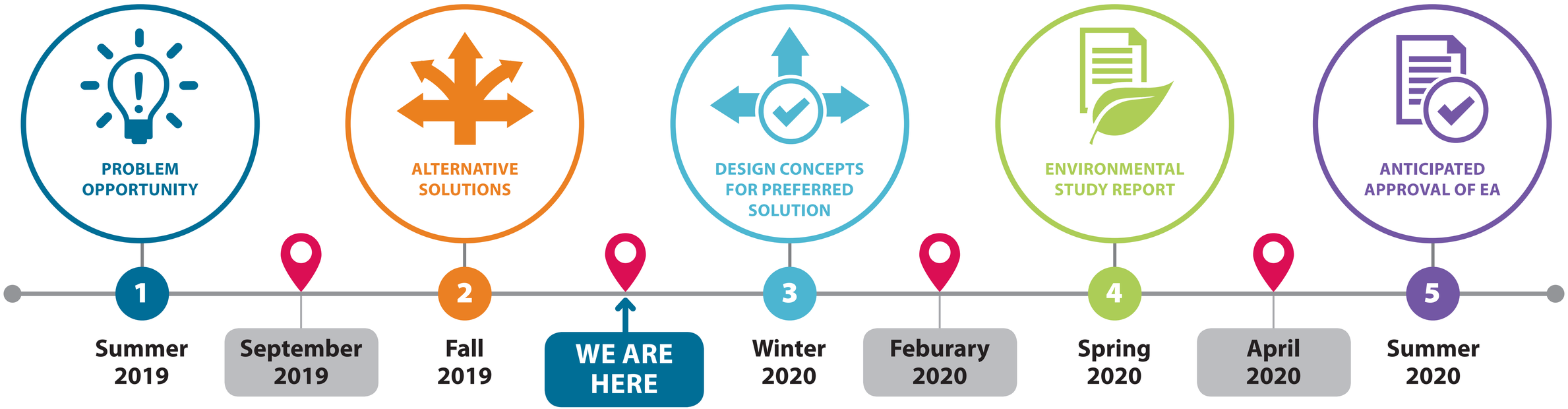
THE OPPORTUNITY

- **Meet current design standards**
  - Ensure performance of flood protection at the current crest levels at minimum.
    - *Pickering Dyke: 100-year storm flood event*
    - *Ajax Dyke: 50-year storm flood event*
- **Protect the dykes against channel bank erosion**
- **Enhance the natural environment**
- **Allow for future improvements**
  - Flexibility to increase level of flood protection in the future

THE CLASS ENVIRONMENTAL ASSESSMENT PROCESS

Conservation Ontario Class Environmental Assessment

PUBLIC CONSULTATION



The Pickering and Ajax Dykes Rehabilitation Project is following the Class EA process for Remedial Flood and Erosion Control Projects outlined by Conservation Ontario.

The Class EA process has five phases that must be completed

There are many opportunities for the **PUBLIC TO CONSULT** with the Study Team throughout the process

BASELINE CONDITIONS INVENTORY

Inventory of existing conditions within the indirect study area was undertaken. This included the compilation of all available information as well as additional field studies.

GEOTECHNICAL INVESTIGATION AND ANALYSIS

- Confirmed existing dyke and sub-surface soil conditions
- Stability and seepage

BUILT ENVIRONMENT

- Utilities and drainage infrastructure
- Close proximity to residential properties

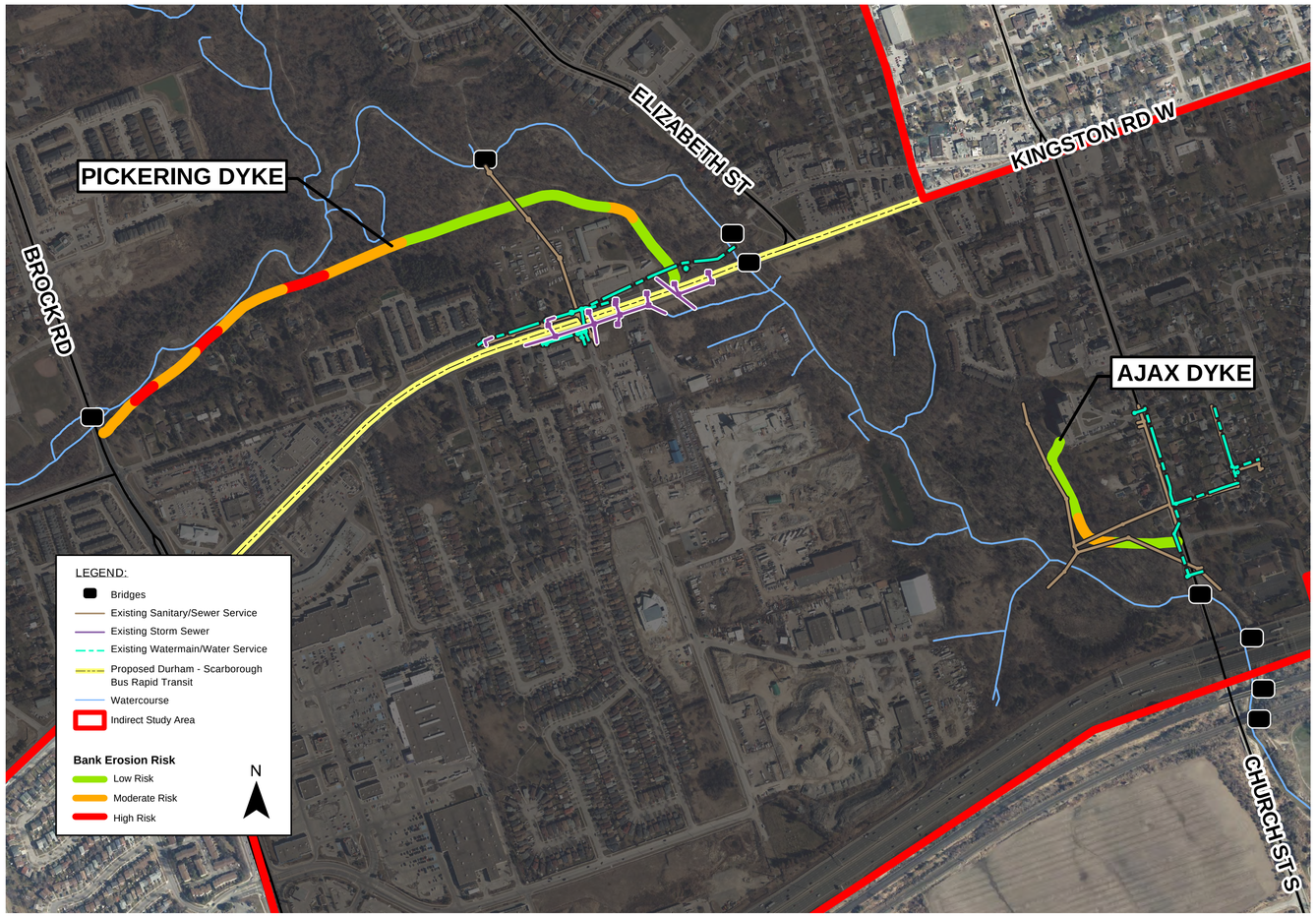
FLUVIAL GEOMORPHOLOGICAL INVESTIGATION

- Determined channel erosion risks to dykes

FLOODING MECHANISMS

- Dykes are circumvented during the 500-year storm flood

BASELINE CONDITIONS - BUILT ENVIRONMENT



Utilities and drainage infrastructure

BASELINE CONDITIONS INVENTORY

Inventory of existing conditions within the indirect study area was undertaken. This included the compilation of all available information as well as additional field studies.

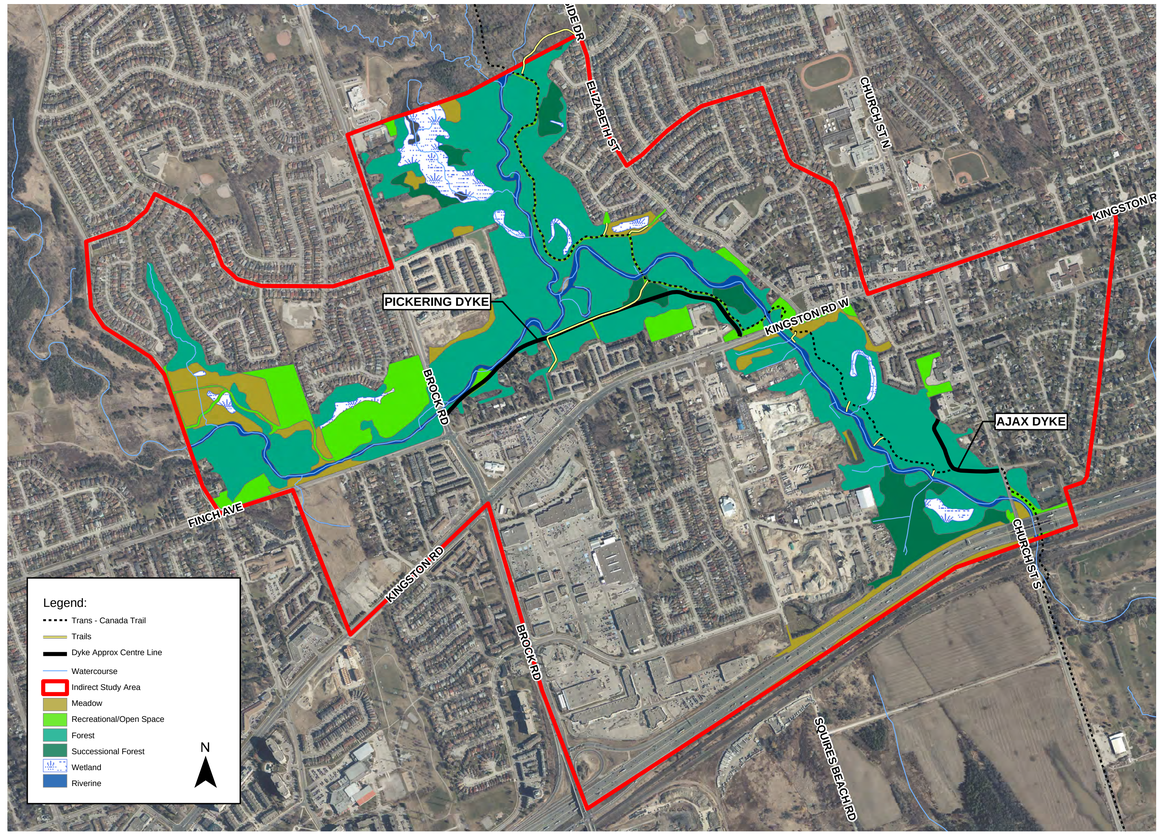
NATURAL ENVIRONMENT

- The valley lands provide a link between Lake Ontario and the Greenbelt Plan area north of Pickering/Ajax
- Field inventories of flora, fauna and aquatic species
- Endangered Species and multiple Species of Special Concern are present

SOCIOECONOMIC & CULTURAL ENVIRONMENT

- Special Policy Area & Regulatory Floodplain
- Trails and adjacent roads
- Residential, commercial, industrial, institutional and park lands
- Potential for archaeological resources. Further assessment required before digging.

BASELINE CONDITIONS - NATURAL AND SOCIOECONOMIC ENVIRONMENTS



Baby Snapping Turtle

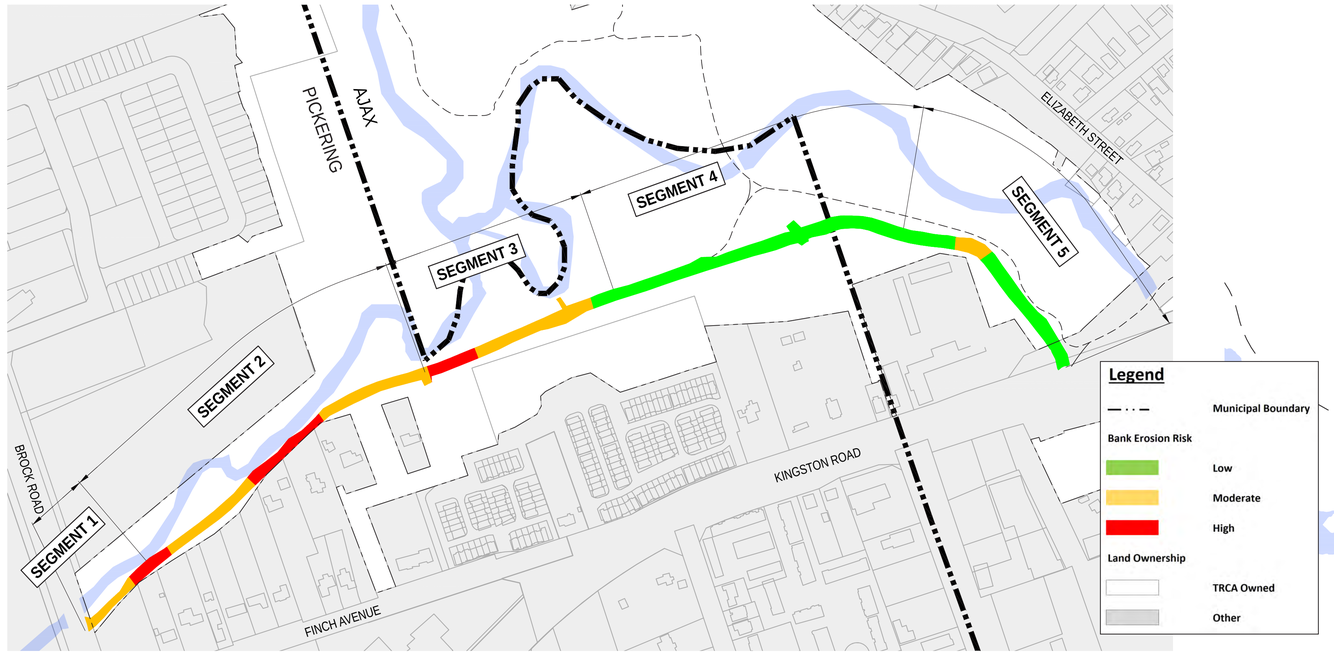
Trails

Eastern Wood Peewee

DYKE SEGMENTS

- Dykes were divided into segments based on unique characteristics of the dyke and surrounding area
- Segmentation allows for a solution unique to each segment

PICKERING DYKE



NOTABLE CONDITIONS

- Does not meet engineering standards.
- Space limitations – property impacts
- Channel erosion
- Excessive vegetation
- Trail
- Utilities
- Protected terrestrial and aquatic species

AJAX DYKE

NOTABLE CONDITIONS

- Does not meet engineering standards.
- Excessive vegetation
- Trail
- Utilities
- Protected terrestrial and aquatic species

FLOODING MECHANISMS

500-year storm flood protection is not feasible with just the dykes. The dykes are circumvented by flooding of low ground areas.

100 YEAR STORM EVENT

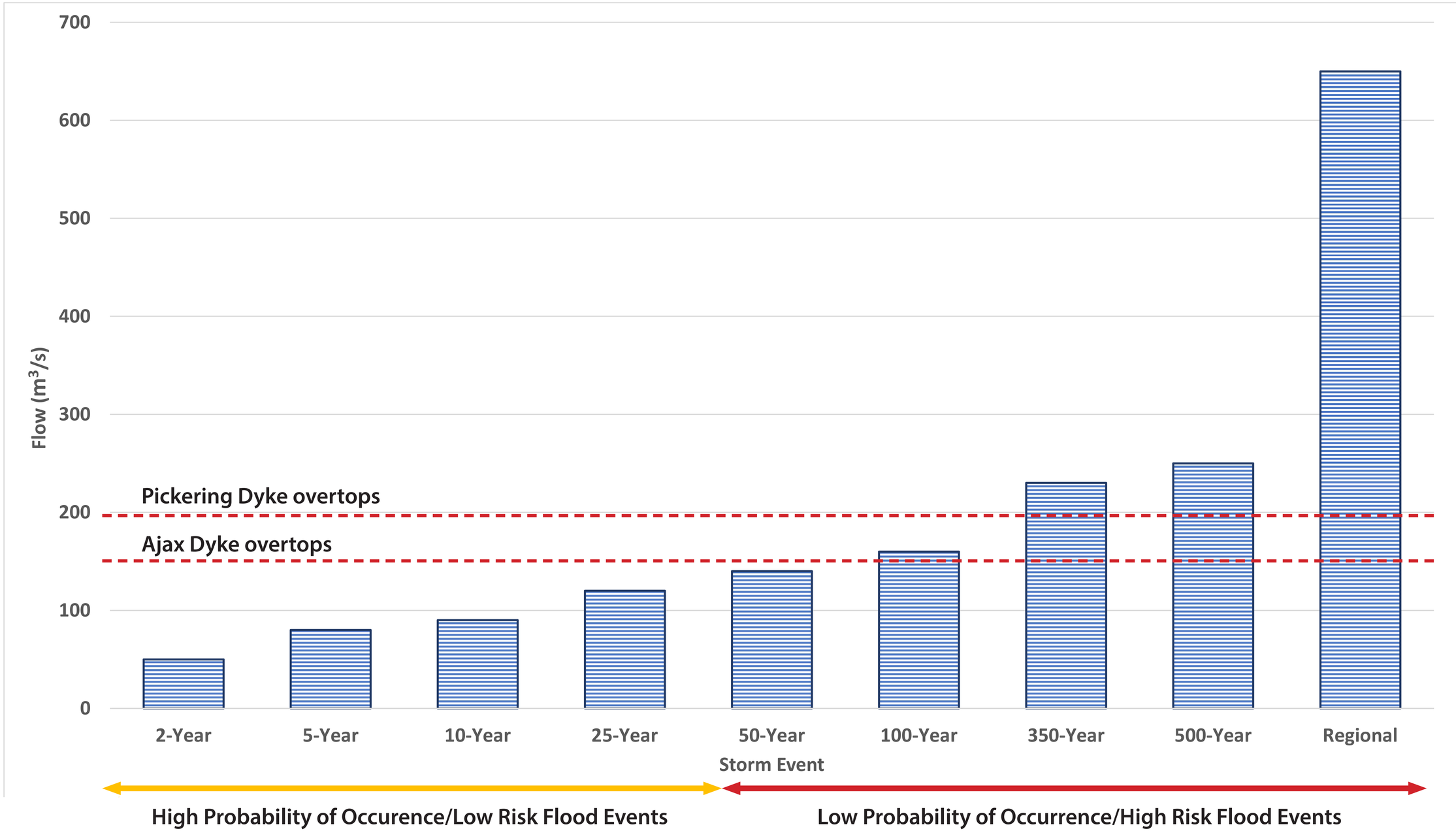
- Ajax Dyke overtops
- Spills in multiple low areas, impacting commercial and industrial properties

500 YEAR STORM EVENT

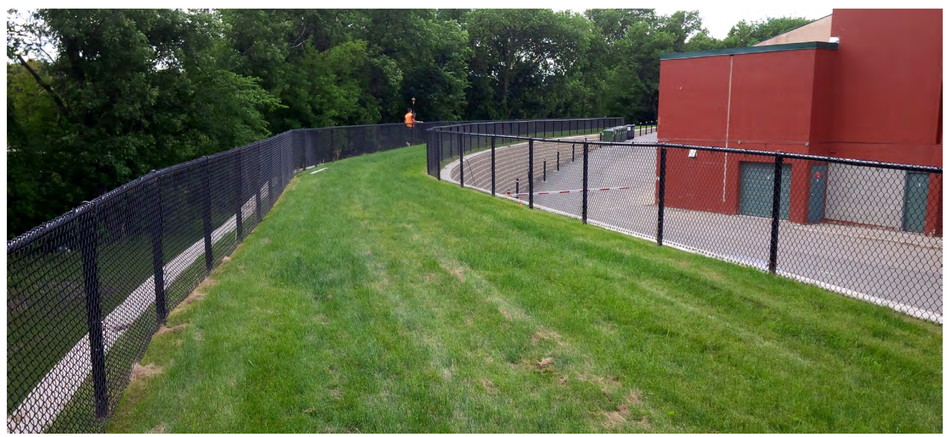
- Pickering Dyke and Ajax Dyke overtop
- Spills in multiple low areas, impacting residential, commercial and industrial properties

= spilling into low lying areas **= spilling due to overtopping of dyke**

FLOOD PROBABILITY VS RISK



WHAT ARE ALTERNATIVE SOLUTIONS?



ALTERNATIVE SOLUTIONS
are different ways to reduce flood risk to life and property.

Alternative Solutions must:

- Provide at minimum, the level of flood protection associated with the current dyke crest elevations
- Meet current engineering standards
- Include the Do-Nothing alternative

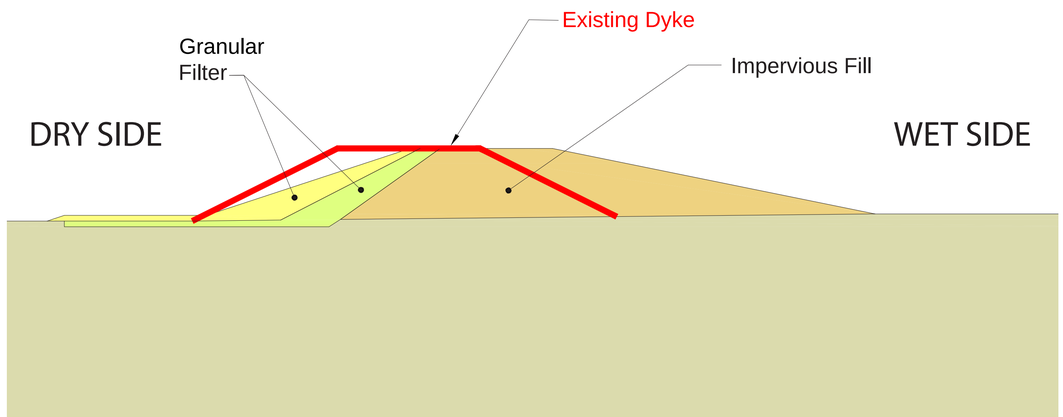
This project will not change current limitations on development. The Special Policy Area designation and planning permit requirements will remain in effect.

PRELIMINARY ALTERNATIVE SOLUTIONS

1 ‘Soft’ Engineering Solution (Embankment)

Rehabilitation of the existing flood protection structure with a softer, more natural looking, stable berm.

Example: earth embankment with stable slopes.

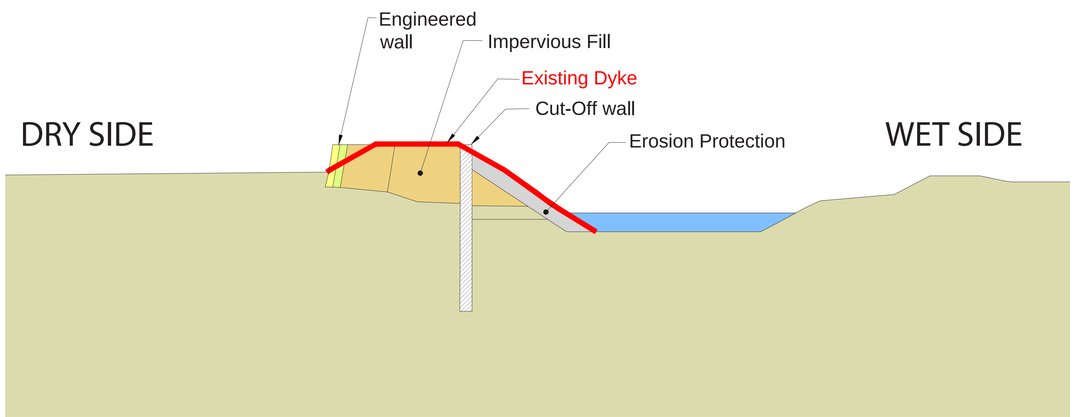


Example Cross-Section (not the exact solution)

2 ‘Hard’ Engineering Solution (Structural)

Rehabilitation of the existing flood protection structure with a highly engineered structural solution.

Example: retaining walls and/or seepage-cutoff methods.



Example Cross-Section (not the exact solution)

PRELIMINARY ALTERNATIVE SOLUTIONS

3 Do "Nothing"

Does not mitigate current risk of flooding that would occur during a dyke failure.

Ongoing repair works required as conditions degrade.

Impacts of a dyke failure included in evaluation.

4 Removal of Vegetation on Existing Flood Protection Structure

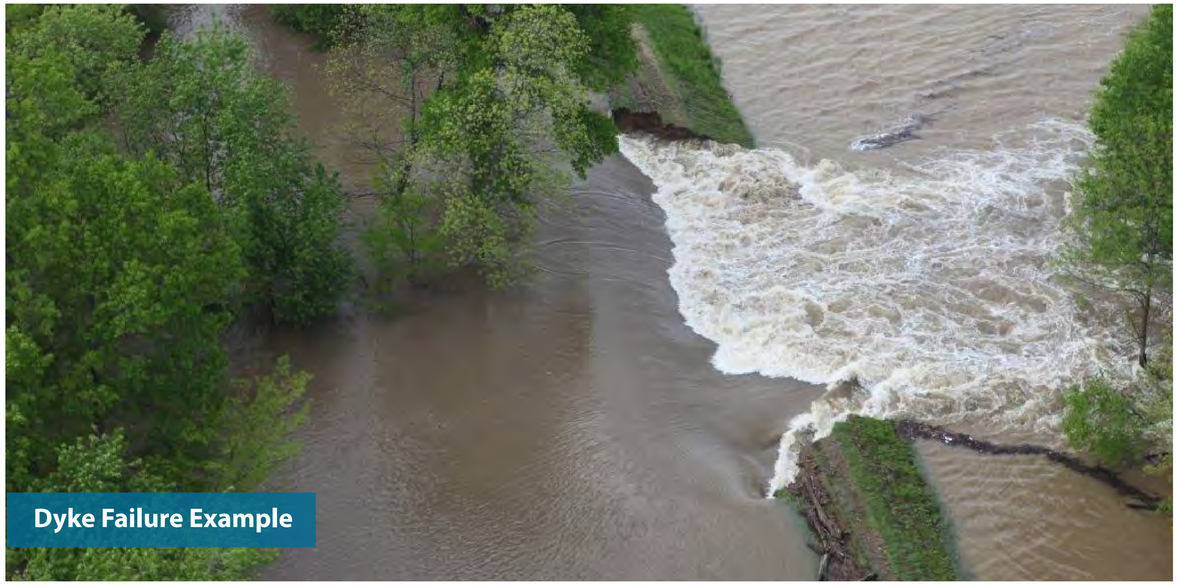
Rehabilitation of the existing flood protection structure by the removal of all vegetation within the limits of the dykes.

However, this does not meet current engineering design standards.

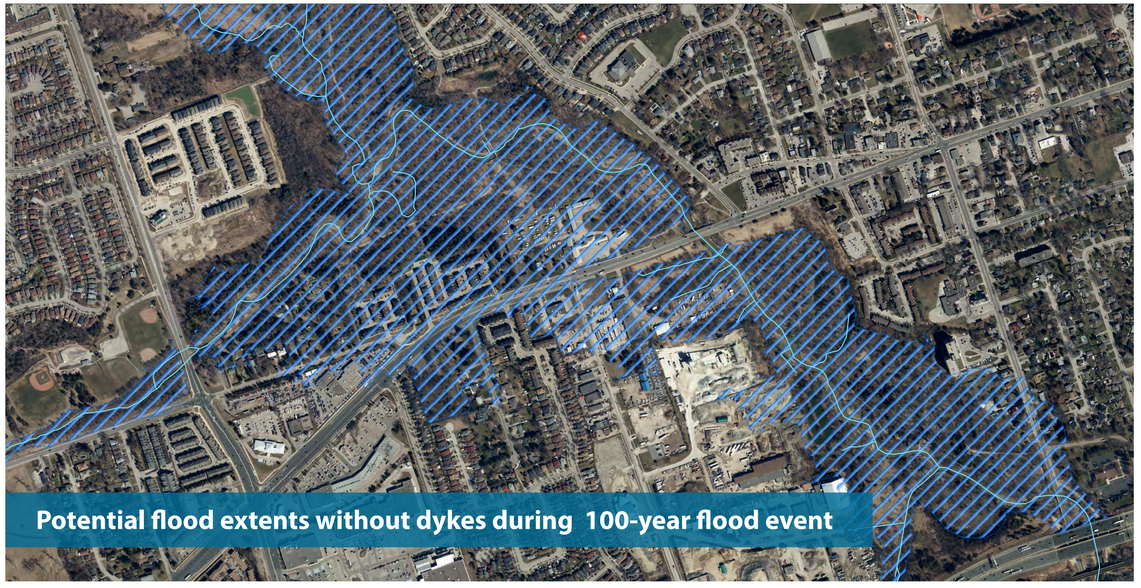
5 Removal of Existing Flood Protection Structure

Decommissioning and removal of the existing flood protection structure.

However, this does not provide flood protection.



Dyke Failure Example



Potential flood extents without dykes during 100-year flood event

SCREENING OF ALTERNATIVE SOLUTIONS

Alternative solutions were screened to determine if they could address the problem and objective of project. Those that could not were dropped from further consideration.

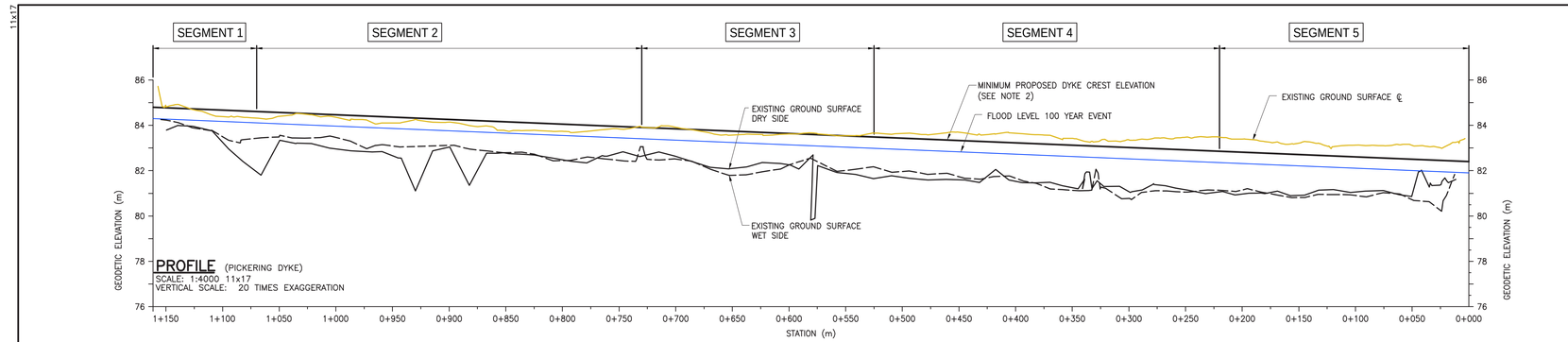
SCREENING QUESTIONS

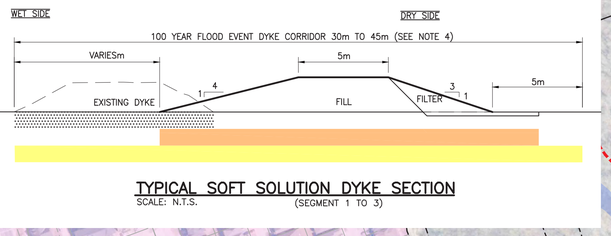
1. Does this alternative ensure the performance of flood protection at the current crest levels, at minimum?
2. Does it meet current engineering design standards?

ALTERNATIVE SOLUTIONS	ANSWER TO SCREENING QUESTIONS	
	Pickering Dyke	Ajax Dyke
1a. 'Soft' Engineering Solution – 50 storm year event	No	Yes
1b. 'Soft' Engineering Solution –100 storm year event	Yes	Yes
1c. 'Soft' Engineering Solution –500 storm year event	No	No
2a. 'Hard' Engineering Solution – 50 storm year event	No	Yes
2b. 'Hard' Engineering Solution –100 storm year event	Yes	Yes
2c. 'Hard' Engineering Solution –500 storm year event	No	No
3. Do Nothing Alternative	No	No
4. Removal of Vegetation on Existing Flood Protection Structure	No	No
5. Removal of Existing Flood Protection Structure	No	No

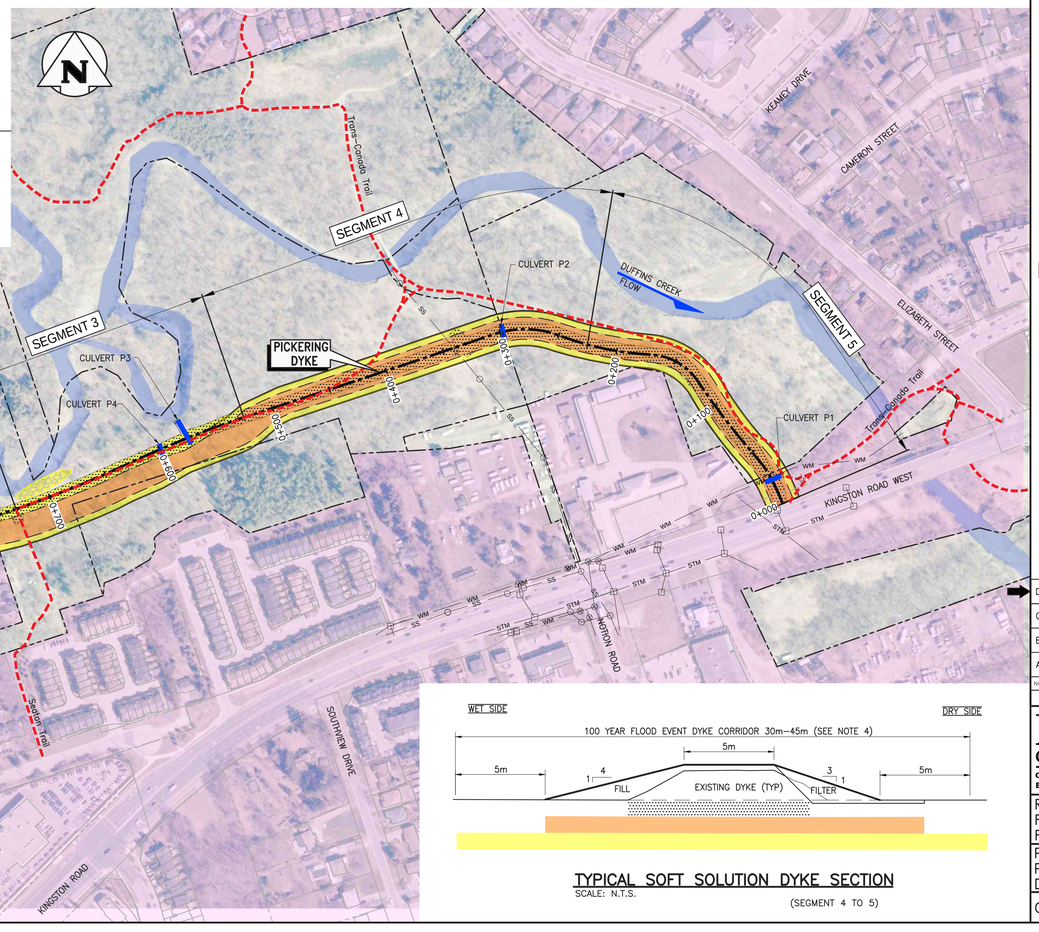
CONCEPTUAL DYKE REHABILITATION PLAN

- PICKERING DYKE 'SOFT' ENGINEERING SOLUTION





TYPICAL SOFT SOLUTION DYKE SECTION
SCALE: N.T.S. (SEGMENT 1 TO 3)



TYPICAL SOFT SOLUTION DYKE SECTION
SCALE: N.T.S. (SEGMENT 4 TO 5)

LEGEND:

- EXISITNG CONTROL VALVE
- EXISITNG SANITARY/STORM MANHOLE
- EXISTING HYDRANT
- EXISITNG CATCH BASIN
- SS — EXISTING SANITARY/SEWER SERVICE
- STM — EXISTING STORM SEWER
- WM — EXISITNG WATERMAIN/WATER SERVICE
- PROPERTY LINE
- TRAIL
- EXISTING CULVERT/DRAINAGE FEATURE
- EXISTING DYKE CENTRE LINE STATIONING
- PROPERTY NOT OWNED BY TRCA
- EXISTING DEGRADED RIPRAP (SEE NOTE 1)
- EXISTING DYKE FOOTPRINT
- NEW DYKE FOOTPRINT
- ASSUMED CONSTRUCTION DISTURBANCE FOOTPRINT (SEE NOTE 3)

NOTES:

1. APPROXIMATE DEGRADED RIPRAP LOCATION BASED ON VALDOR MARCH 2018 DYKE LEVEL OF SERVICE AND REHABILITATION REPORT PICKERING/AJAX SPA'S.
2. BASED ON 1:100 YEAR DESIGN EVENT PLUS 0.5m FREEBOARD.
3. CONSTRUCTION DISTURBANCE FOOTPRINT ASSUMES 5m DISTURBANCE BEYOND NEW DYKE TOES.
4. DISTURBED CORRIDOR WILL VARY DEPENDING ON IF RELOCATION IS REQUIRED FROM EDGE OF BANK. DISTURBED CORRIDOR MAY VARY FROM 30m TO 45m (ESTIMATED USING TYPICAL CROSS SECTIONS).
5. 10% DESIGN CONCEPT. TO BE REFINED IN SUBSEQUENT PROJECT PHASES.

50 0 50 100 150m
SCALE: 1:4000 (11"x17")

NO.	YY/MM/DD	DESCRIPTION	ISSUED BY	CHECK BY
D	19/10/10	ISSUED FOR CLC MEETING #2	CMR	BPA
C	19/09/26	RE-ISSUED FOR INFORMATION	CMR	BPA
B	19/09/24	RE-ISSUED FOR INFORMATION	CMR	BPA
A	19/09/18	ISSUED FOR INFORMATION	CMR	BPA

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS

Toronto and Region Conservation Authority

REMEDIAL FLOOD AND EROSION CONTROL PROJECTS FOR THE REHABILITATION OF THE PICKERING AND AJAX FLOOD CONTROL DYKES, ONTARIO

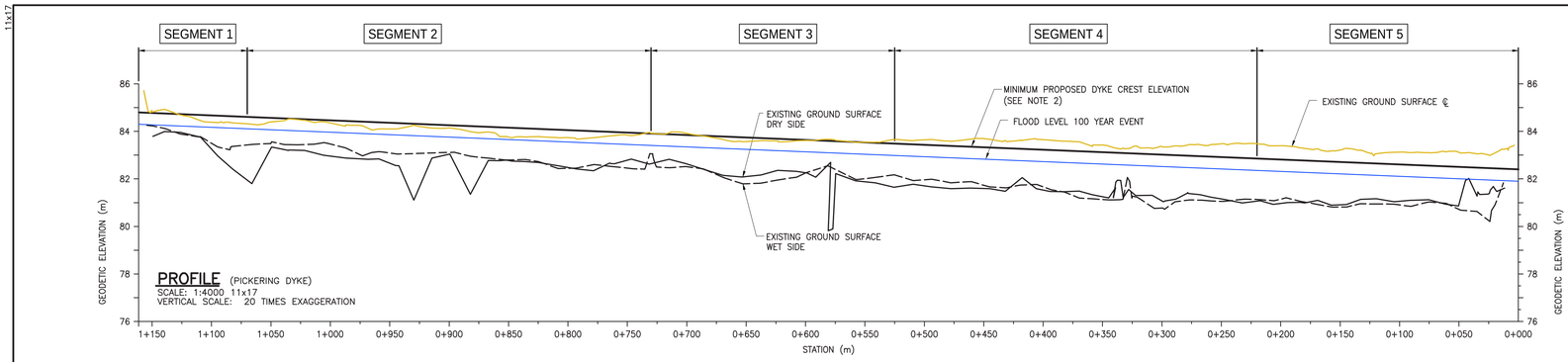
PICKERING DYKE 100 YEAR FLOOD EVENT PROPOSED ENGINEERED SOFT SOLUTION DYKE FOOTPRINT

OCTOBER 2019 | SKETCH 09 | REV. D

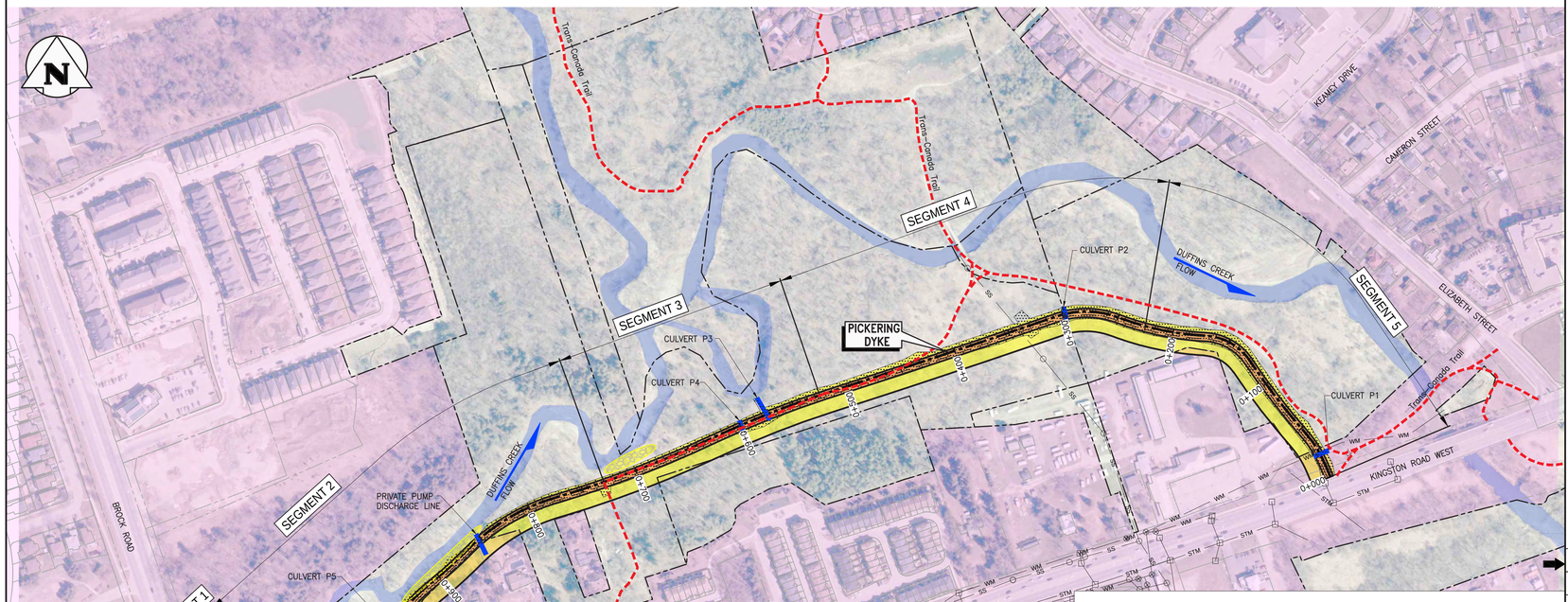
Filename: \\192.168.0.226\v--data\Projects\2019\19-2939-003\Dwg\Gen\Sketches\19-2939-003_SK09 - Tab:ReviD Plotted By: Pdeffner 19/10/11 [Fri 9:40am] 11"x17" PLOT SCALE: 1 = 2'

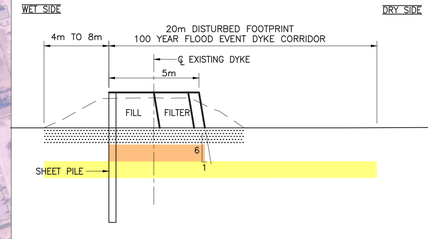
CONCEPTUAL DYKE REHABILITATION PLAN

- PICKERING DYKE 'HARD' ENGINEERING SOLUTION



PROFILE (PICKERING DYKE)
SCALE: 1:4000 11x17
VERTICAL SCALE: 20 TIMES EXAGGERATION





TYPICAL HARD SOLUTION DYKE SECTION
SCALE: N.T.S.
(SEGMENT 1 TO 5)

LEGEND:

- EXISITNG CONTROL VALVE
- EXISITNG SANITARY/STORM MANHOLE
- EXISTING HYDRANT
- EXISITNG CATCH BASIN
- SS — EXISTING SANITARY/SEWER SERVICE
- STM — EXISTING STORM SEWER
- WM — EXISITNG WATERMAIN/WATER SERVICE
- PROPERTY LINE
- TRAIL
- EXISTING CULVERT/DRAINAGE FEATURE
- EXISTING DYKE CENTRE LINE STATIONING
- PROPERTY NOT OWNED BY TRCA
- EXISTING DEGRADED RIPRAP (SEE NOTE 1)
- EXISTING DYKE FOOTPRINT
- NEW DYKE FOOTPRINT
- ASSUMED CONSTRUCTION DISTURBANCE FOOTPRINT (SEE NOTE 3)

NOTES:

1. APPROXIMATE DEGRADED RIPRAP LOCATION BASED ON VALDOR MARCH 2018 DYKE LEVEL OF SERVICE AND REHABILITATION REPORT PICKERING/AJAX SPA'S.
2. BASED ON 1:100 YEAR DESIGN EVENT PLUS 0.5m FREEBOARD.
3. FINAL CONFIGURATION OF FILTER TO BE DETERMINED IN DETAILED DESIGN.
4. 10% DESIGN CONCEPT. TO BE REFINED IN SUBSEQUENT PROJECT PHASES.

50 0 50 100 150m
SCALE: 1:4000 (11"x17")

NO.	YY/MM/DD	DESCRIPTION	ISSUED BY	CHECK BY
D	19/10/10	ISSUED FOR CLC MEETING #2	CMR	BPA
C	19/09/26	RE-ISSUED FOR INFORMATION	CMR	BPA
B	19/09/24	RE-ISSUED FOR INFORMATION	CMR	BPA
A	19/09/18	ISSUED FOR INFORMATION	CMR	BPA

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS
Toronto and Region Conservation Authority

REMEDIAL FLOOD AND EROSION CONTROL PROJECTS FOR THE REHABILITATION OF THE PICKERING AND AJAX FLOOD CONTROL DYKES, ONTARIO

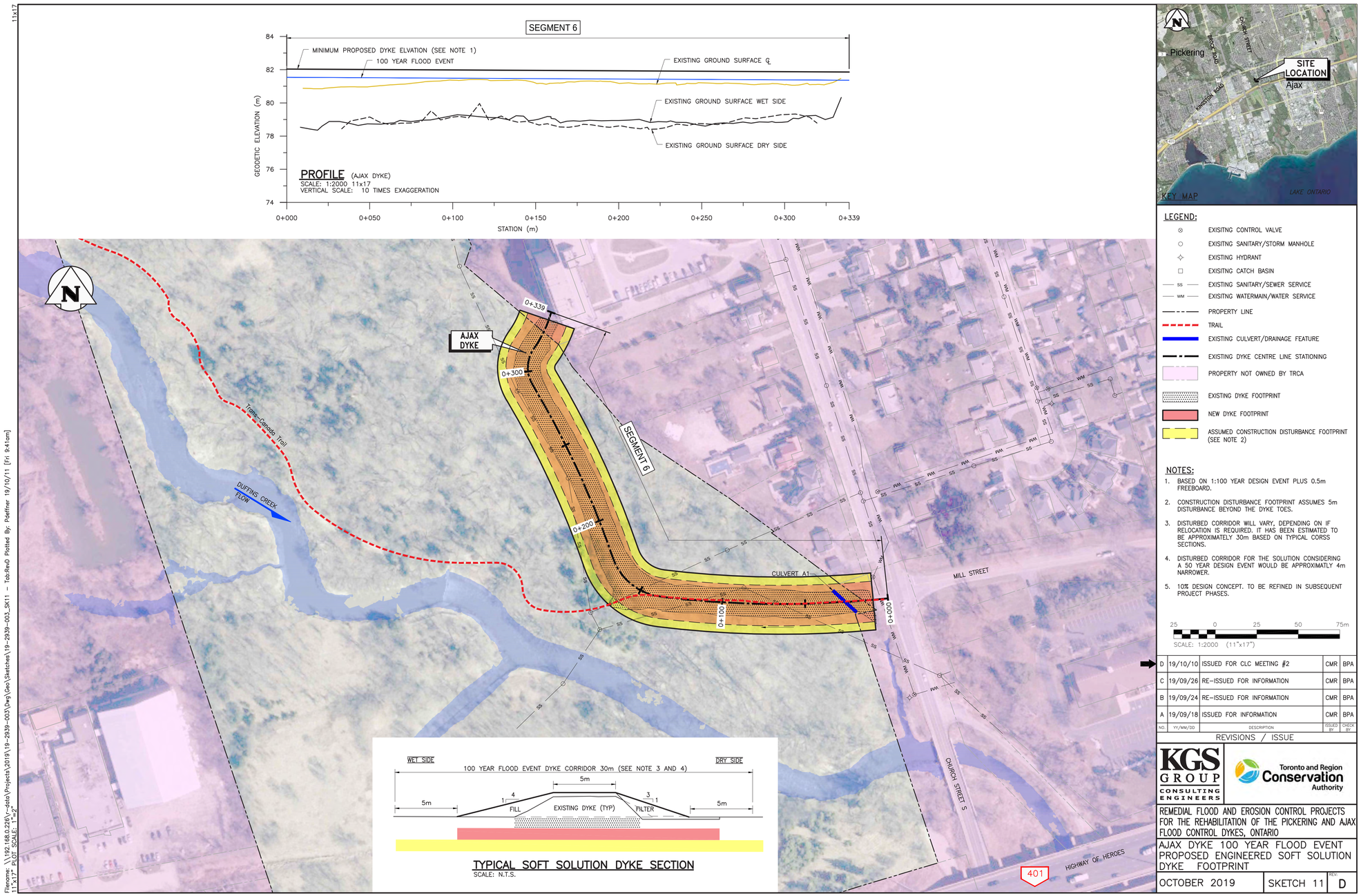
PICKERING DYKE 100 YEAR FLOOD EVENT PROPOSED ENGINEERED HARD SOLUTION DYKE FOOTPRINT

OCTOBER 2019 | SKETCH 10 | REV: D

Filename: \\192.168.0.226\r-data\Projects\2019\19-2939-003\Dwg\Geo\Sketches\19-2939-003_SK10 - Tab:RevD Plotted By: Pdeffner 19/10/11 [Fri 9:40am]
11"x17" PLOT SCALE: 1"=2"

CONCEPTUAL DYKE REHABILITATION PLAN

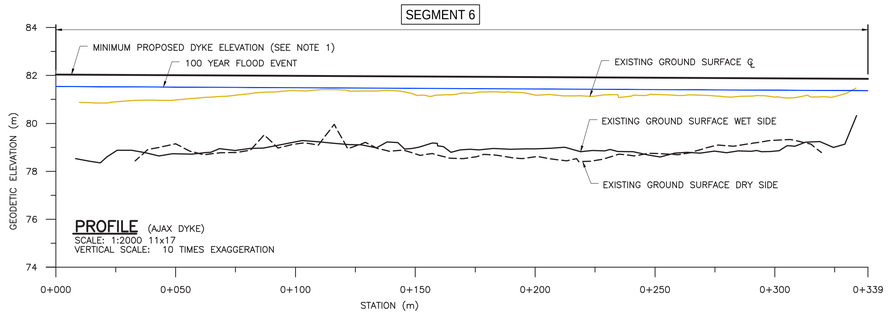
- AJAX DYKE 'SOFT' ENGINEERING SOLUTION

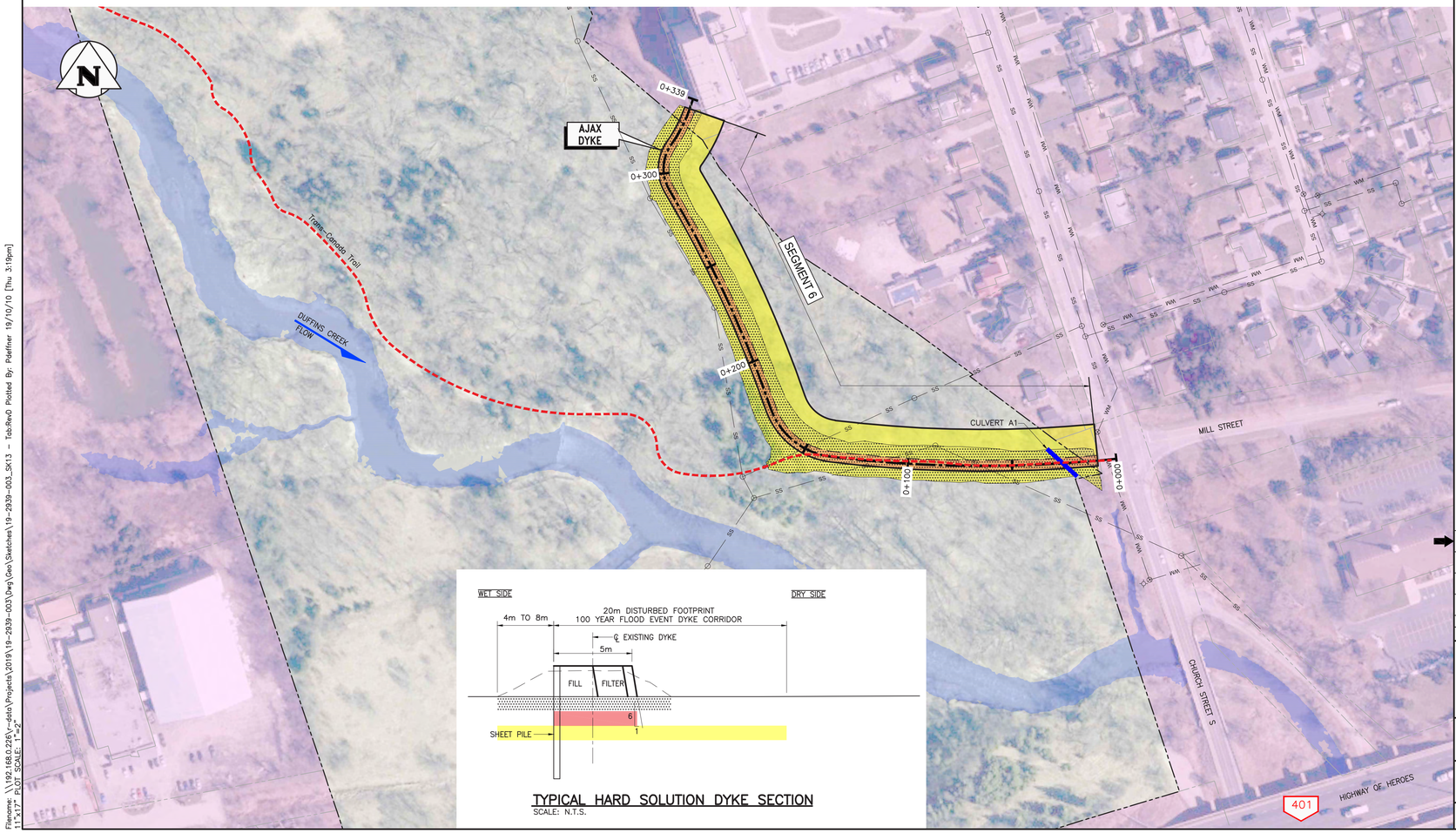


CONCEPTUAL DYKE REHABILITATION PLAN

- AJAX DYKE 'HARD' ENGINEERING SOLUTION

11x17





LEGEND:

- EXISITNG CONTROL VALVE
- EXISITNG SANITARY/STORM MANHOLE
- EXISTING HYDRANT
- EXISITNG CATCH BASIN
- SS — EXISTING SANITARY/SEWER SERVICE
- WM — EXISITNG WATERMAIN/WATER SERVICE
- PROPERTY LINE
- TRAIL
- EXISTING CULVERT/DRAINAGE FEATURE
- EXISTING DYKE CENTRE LINE STATIONING
- PROPERTY NOT OWNED BY TRCA
- EXISTING DYKE FOOTPRINT
- NEW DYKE FOOTPRINT
- ASSUMED CONSTRUCTION DISTURBANCE FOOTPRINT (SEE NOTE 2)

NOTES:

1. BASED ON 1:100 YEAR DESIGN EVENT PLUS 0.5m FREEBOARD.
2. THIS DRAWING HAS BEEN BASED ON A DYKE SOLUTION CONSIDERING A 100 YEAR EVENT. THE DISTURBED AREA FOR A DYKE SOLUTION CONSIDERING A 50 YEAR EVENT WOULD BE ESSENTIALLY THE SAME.
3. 10% DESIGN CONCEPT. TO BE REFINED IN SUBSQUENT PROJECT PHASES.

25 0 25 50 75m
SCALE: 1:2000 (11"x17")

NO.	YY/MM/DD	DESCRIPTION	ISSUED BY	CHECK BY
D	19/10/10	ISSUED FOR CLC MEETING #2	CMR	BPA
C	19/09/26	RE-ISSUED FOR INFORMATION	CMR	BPA
B	19/09/24	RE-ISSUED FOR INFORMATION	CMR	BPA
A	19/09/18	ISSUED FOR INFORMATION	CMR	BPA

REVISIONS / ISSUE

KGS GROUP CONSULTING ENGINEERS

Toronto and Region Conservation Authority

REMEDIAL FLOOD AND EROSION CONTROL PROJECTS FOR THE REHABILITATION OF THE PICKERING AND AJAX FLOOD CONTROL DYKES, ONTARIO

AJAX DYKE 100 YEAR FLOOD EVENT PROPOSED ENGINEERED HARD SOLUTION DYKE FOOTPRINT

OCTOBER 2019 | SKETCH 13 | REV. D

Filename: \\192.168.0.226\c-data\Projects\2019\19-2939-003\Dwg\Geo\Sketches\19-2939-003_SK13 - TabRevD Plotted By: pdelfiner 19/10/10 [Thu 3:19pm]
11"x17" PLOT SCALE: 1"=2"

HOW WILL WE CHOOSE THE BEST OPTION?

PRELIMINARY EVALUATION CRITERIA

NATURAL ENVIRONMENT

- Removal, disturbance or enhancement of terrestrial habitat
- Removal, disturbance or enhancement of aquatic habitat

SOCIAL ENVIRONMENT

- Mitigation of flood risk due to dyke failure
- Removal or disturbance to private and public property
- Effects on public recreational spaces
- Disruption caused by construction activities
- Effects to servicing, utilities and infrastructure
- Removal or disturbance of archaeological resources

TECHNICAL

- Compliance with current engineering design criteria for target flood protection level
- Compliance with provincial policies, regulations and guidelines
- Allows for future enhancement to a higher level of protection
- Construction constraints and complexities

COST

- Capital cost
- Operations and maintenance cost
- Cost associated with flood damages

This criteria was used to evaluate the Alternative Solutions

ASSUMPTIONS

Special Policy Area (SPA)

All Alternative Solutions will not change current limitations on development.

Erosion Control

All Alternative Solutions will require channel erosion control along the channel bank within the western portion of the Pickering Dyke.

Construction Conditions

All Alternative Solutions will require full reconstruction of the dykes. Areas of disturbance adjacent to the footprint of the alternatives have been assumed based on typical construction methods.

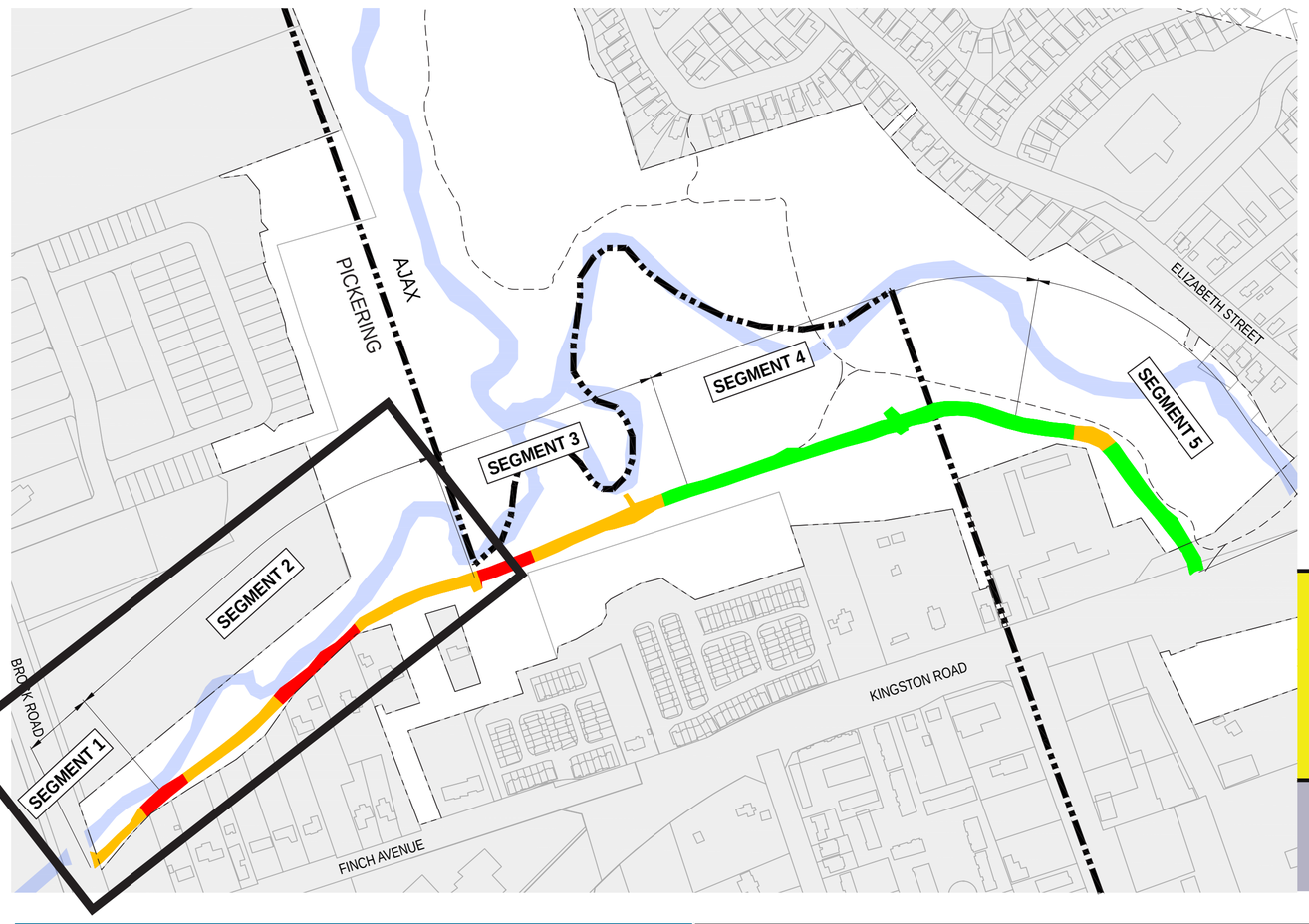
Natural Environment

All Alternative Solutions will include restoration plans. These will be assessed during the next phase of the study.

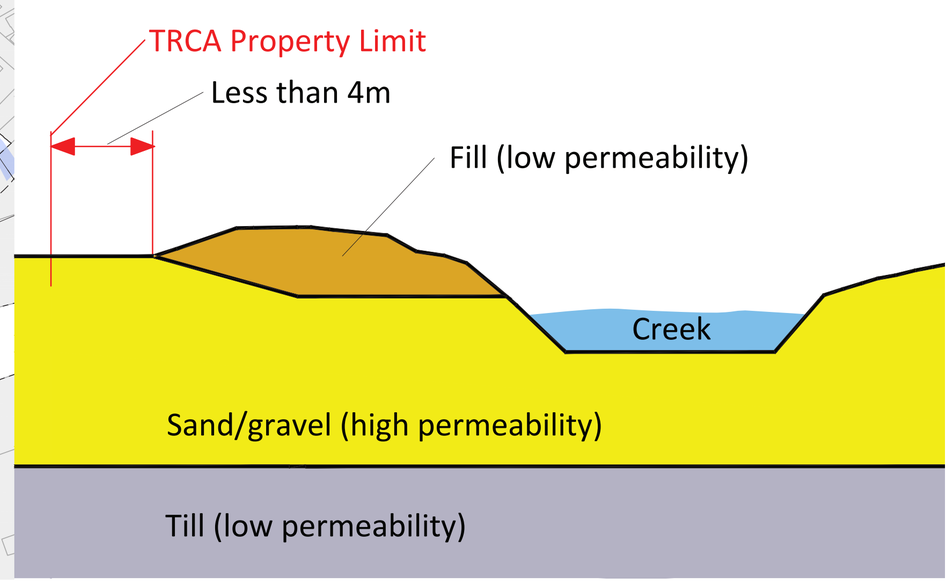
Infrastructure Changes

All Alternative Solutions will require modification to existing trails and surface drainage infrastructure. Effects on underground utilities varies for the different Alternative Solutions.

EVALUATED ALTERNATIVE SOLUTIONS



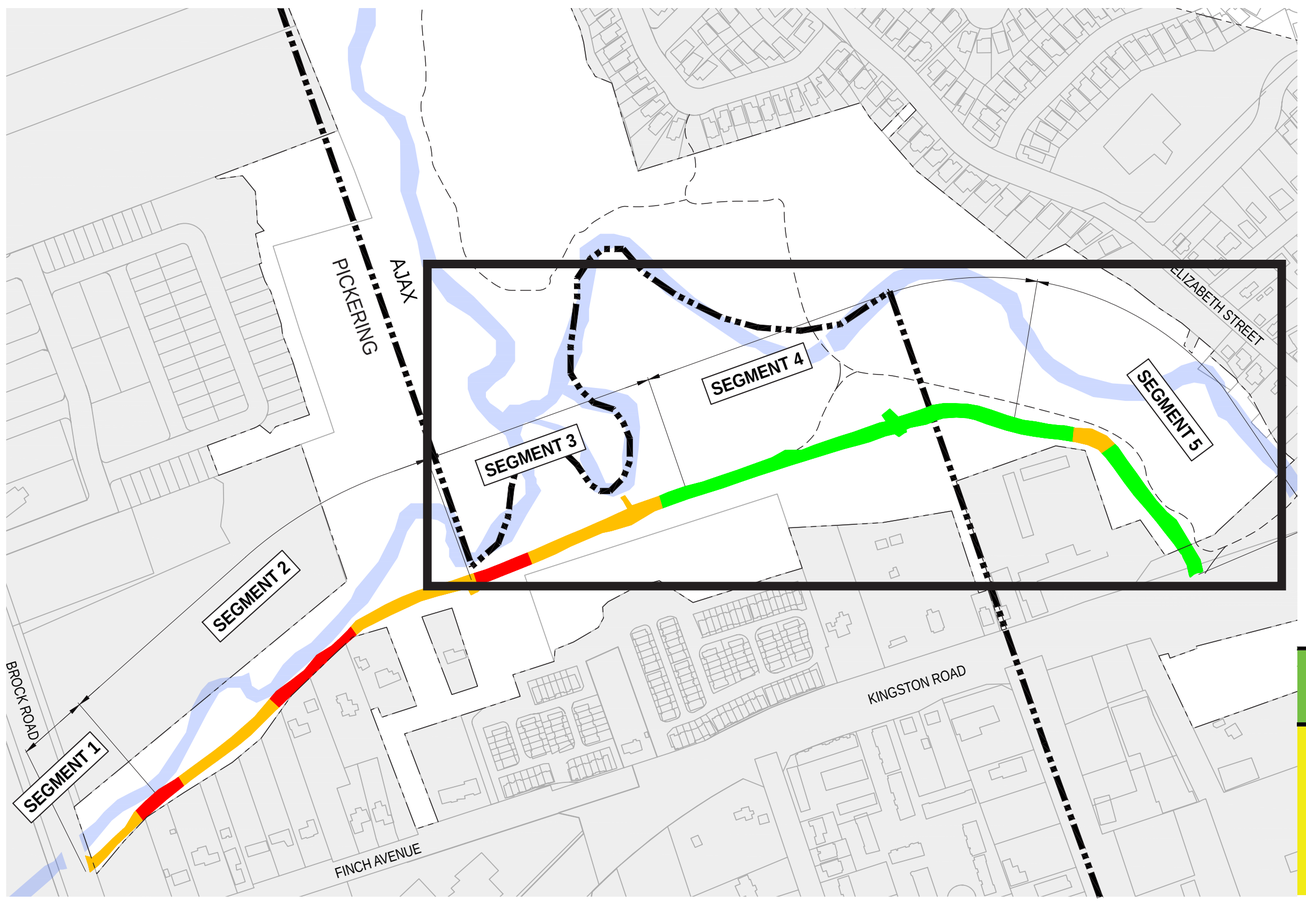
CROSS-SECTION OF EXISTING DYKE



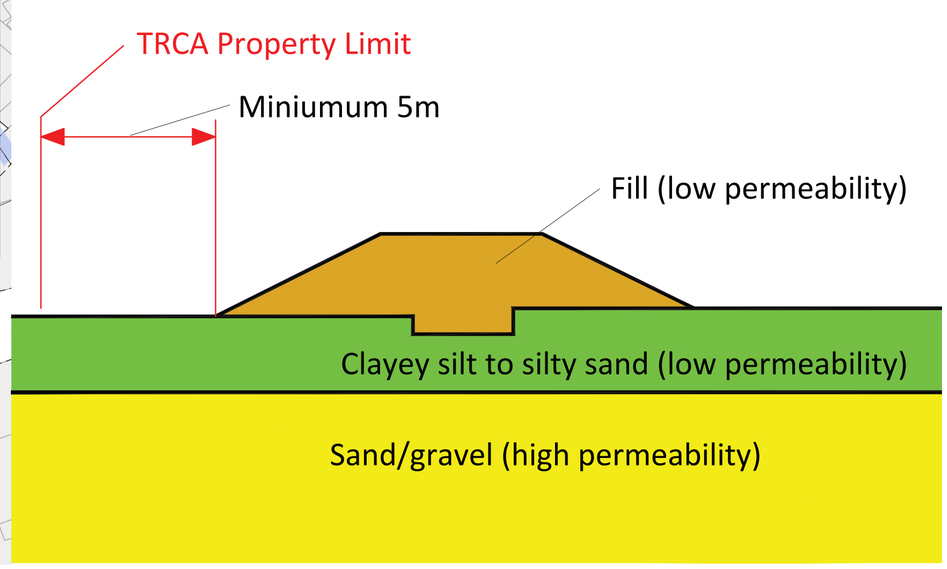
	ADVANTAGES	DISADVANTAGES
1. 'Soft' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • Can enhance public access • **Lower capital cost**	• **Requires private land acquisition** • Construction disturbance • **Largest disturbance area**; effects terrestrial and potential archaeological resources
2. 'Hard' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • Can enhance public access • Reduces impact to surroundings and **minimizes private land acquisition**	• **Higher capital cost** • Construction disturbance • Disturbance to archaeological resources • More complex construction
3. "Do Nothing" Alternative	• No property acquisitions required • No immediate construction disturbance	• **Does not address dyke deficiencies** - Bank erosion - **Risk to life and property** - Public recreational spaces vulnerable • Ongoing repair works required

EVALUATED ALTERNATIVE SOLUTIONS

PICKERING DYKE SEGMENTS 3, 4 and 5



CROSS-SECTION OF EXISTING DYKE

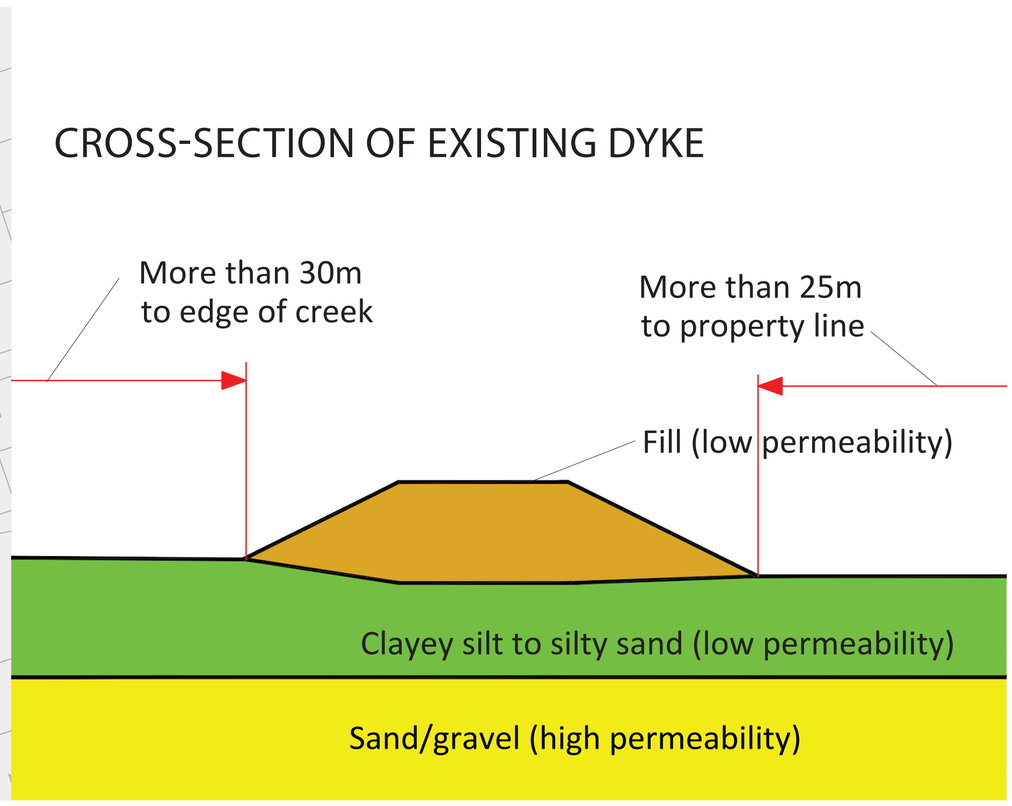


	ADVANTAGES	DISADVANTAGES
1. 'Soft' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • No property acquisitions required • **Lower capital cost**	• Construction disturbance • **Largest disturbance area**; effects terrestrial and potential archaeological resources
2. 'Hard' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • No property acquisitions required	• **Higher capital cost** • Construction disturbance • Disturbance to archaeological and terrestrial resources • More complex construction • **Interaction with underground utilities**
3. "Do Nothing" Alternative	• No property acquisitions required • No immediate construction disturbance	• **Does not address dyke deficiencies** - Bank erosion - **Risk to life and property** - Public recreational spaces vulnerable • Ongoing repair works required

EVALUATED ALTERNATIVE SOLUTIONS

AJAX DYKE SEGMENT 6

CROSS-SECTION OF EXISTING DYKE

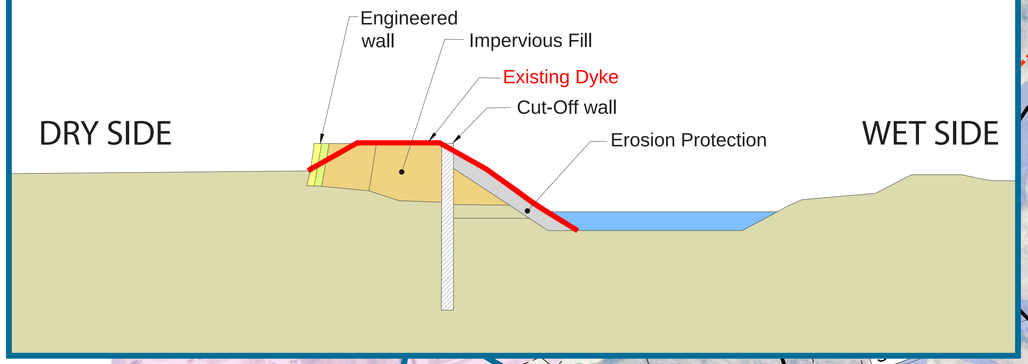


	ADVANTAGES	DISADVANTAGES
1a. 'Soft' Engineering Solution - 50 Year Storm Event	• Addresses dyke deficiencies • **Lowest capital cost**	• **Large disturbance area**; effects terrestrial and potential archaeological resources
1b. 'Soft' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • **Highest level of flood protection** • **Low capital cost**	• **Largest disturbance area**; effects terrestrial and potential archaeological resources
2a. 'Hard' Engineering Solution - 50 Year Storm Event	• Addresses dyke deficiencies • Reduced impacts to vegetation communities	• **Higher construction cost** • Construction disturbance • Moderate disturbance area; effects terrestrial and potential archaeological resources • More complex construction and **interaction with underground utilities**
2b. 'Hard' Engineering Solution - 100 Year Storm Event	• Addresses dyke deficiencies • **Highest level of flood protection** • Reduced impacts to vegetation communities	• **Highest construction cost** • Construction disturbance • Moderate disturbance area; effects terrestrial and potential archaeological resources • More complex construction and **Interaction with underground utilities**
3. "Do Nothing" Alternative	• No property acquisitions required • No immediate construction disturbance	• **Does not address dyke deficiencies** - **Risk to life and property** - Public recreational spaces vulnerable • Ongoing repair works required

PRELIMINARY PREFERRED ALTERNATIVE SOLUTION

PICKERING DYKE

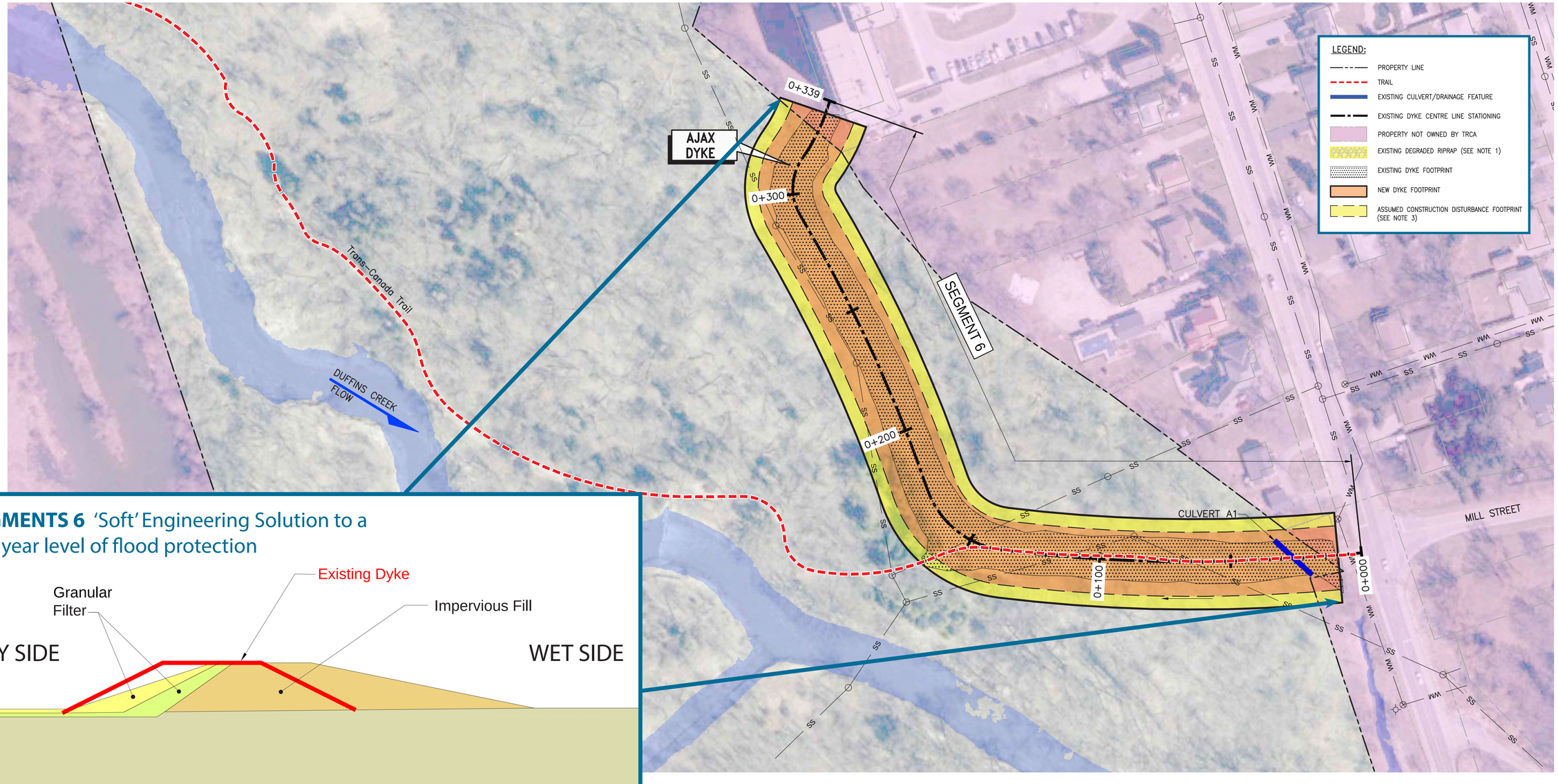
SEGMENTS 1 AND 2: 'Hard' Engineering Solution to a 100 year level of flood protection



SEGMENTS 3, 4 AND 5: 'Soft' Engineering Solution to a 100 year level of flood protection

PRELIMINARY PREFERRED ALTERNATIVE SOLUTION

AJAX DYKE



SEGMENTS 6 'Soft' Engineering Solution to a 100 year level of flood protection

NEXT STEPS

Next Stage of the Environmental Assessment will include the following:

Refine Evaluation and selection of the Preferred Alterative Solution based on feedback received tonight.

Develop Alternative Design Concepts which includes:

- Refining the Preferred Alternative Solution to minimize impacts.
- More detailed consideration of changes to infrastructure including underground utilities.
- More detailed modeling to refine design of flood protection works to withstand flooding
- Refining of dyke location to minimize impacts and costs.

Alternative Design Concepts and evaluation criteria will be brought back to the public for comment in February 2020.

On-going consultation with agencies, landowners and other stakeholders

THANK YOU

We appreciate the time you have taken to learn more about the Pickering and Ajax Dykes Rehabilitation EA. Your input is important for the success of the EA process. Please provide your input.

HOW TO STAY CONNECTED:

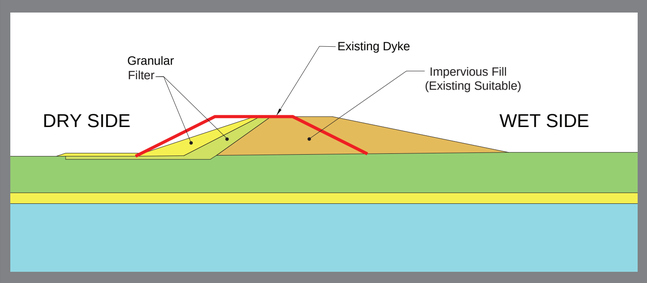
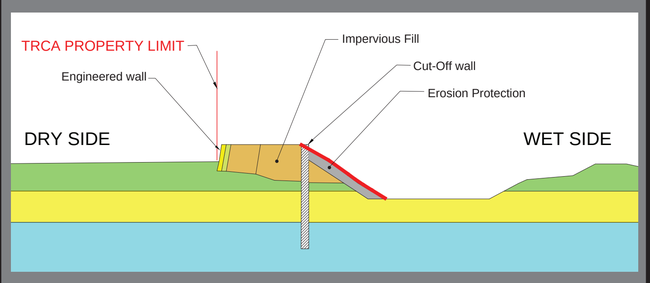
- Next PIC meeting: February 2020
- Send us your comments or questions. Email us at **PADR@trca.ca**
- **Join our mailing list** – leave us your email or mailing address if you would like to be keep up to date as the study progresses

Contact the Project Team with any additional comments or questions at any time:

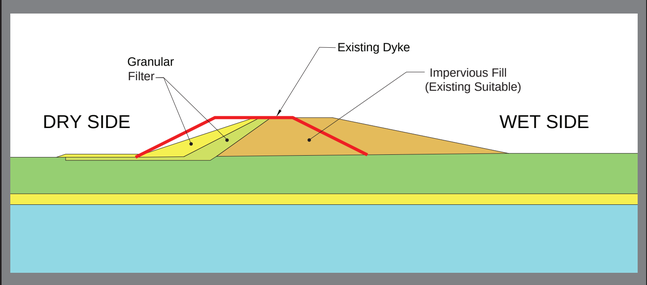
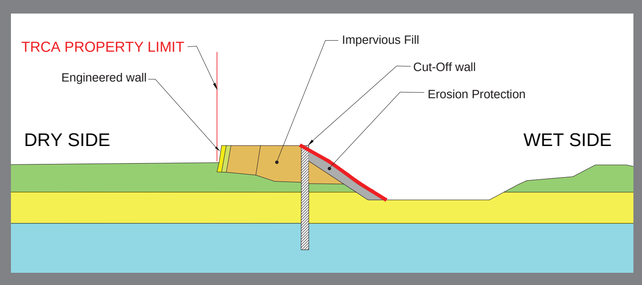
PADR EA Project Coordinator
Email: **PADR@trca.ca**
www.trca.ca/PADR
PHONE: 416-661-6600 ext. 5948
Toronto and Region Conservation Authority
101 Exchange Avenue, Vaughan ON

SUMMARY EVALUATION OF ALTERNATIVE SOLUTIONS

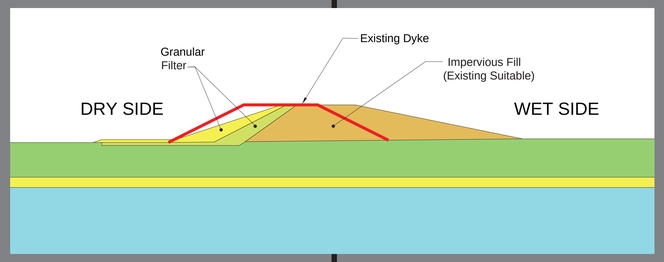
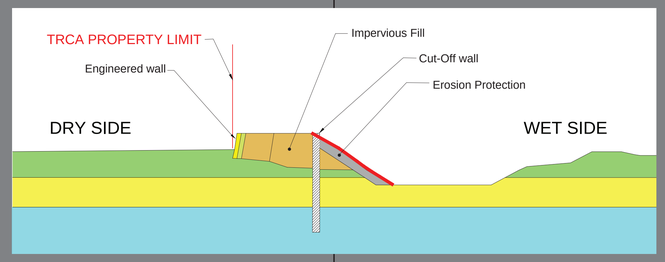
SEGMENTS 1 AND 2 – PICKERING DYKE

EVALUATION CRITERIA	**ALTERNATIVE 1:** 'SOFT' ENGINEERING SOLUTION – 100 Y	**ALTERNATIVE 2:** 'HARD' ENGINEERING SOLUTION - 100 Y	**ALTERNATIVE 3:** DO-NOTHING
			
SOCIAL ENVIRONMENT			
Mitigation of flood risk due to dyke failure	• Mitigates flood risk by addressing slope stability and seepage deficiencies	• Mitigates flood risk by addressing slope stability and seepage deficiencies	• Dyke deficiencies remain • Risk of impact to several properties and people's safety
Removal or disturbance to private and public property	• Requires potential easements or acquisitions of private properties	• No permanent impact to private property but temporary disturbance during construction • Potential need for long-term maintenance easement	• No immediate impacts to private or public property • Potential for moderate property damage associated with dyke failure
Effects on public recreational spaces	• Temporary disturbance to informal trail • Opportunities for permanent trail improvements	• Temporary disturbance to informal trail • Opportunities for permanent trail improvements	• Does not enhance public recreational spaces • Moderate impacts if dyke fails
Disruption caused by construction activities	• Disturbance within and outside of existing dyke footprint • Typical temporary construction impacts (dust, noise, vibration, etc.)	• Disturbance within and outside of existing dyke footprint • Typical temporary construction impacts (dust, noise, vibration, etc.)	• No immediate construction impacts • Increased need for future repair work with associated construction disturbance
Effects to servicing, utilities, and infrastructure	• Potential unknown private utilities could be impacted	• Potential unknown private utilities could be impacted	• No impact on servicing and utilities • Dyke failure would flood roads and could cause damages
Removal or disturbance of archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• No disturbance or removal of potential archaeological resources
SUMMARY	LEAST PREFERRED	MOST PREFERRED	MODERATELY PREFERRED
NATURAL ENVIRONMENT			
Removal, disturbance, or enhancement of terrestrial habitat	• Established vegetation within and outside of the dyke footprint would be disturbed • Larger disturbance area than the 'hard' engineering solution	• Established vegetation within and outside of the dyke footprint would be disturbed • Smaller disturbance area than the 'soft' engineering solution	• No immediate disturbance from construction • Dyke failure could result in localized disturbance and habitat loss
Removal, disturbance, or enhancement of aquatic habitat	• Temporary disruption of creek banks due to construction • Opportunities for fish habitat and riparian enhancement	• Temporary disruption of creek banks due to construction • Opportunities for fish habitat and riparian enhancement	• No immediate disturbance from construction • Risk of channel bank erosion persists • Dyke failure could cause localized disturbance and send debris and sediment into the creek
SUMMARY	LEAST PREFERRED	MOST PREFERRED	MODERATELY PREFERRED
TECHNICAL ENVIRONMENT			
Compliant with current engineering design criteria for target flood protection level	• Provides target flood protection level (100 year) and satisfies all engineering design criteria	• Provides target flood protection level (100 year) and satisfies all engineering design criteria	• Current dyke does not satisfy engineering design criteria • Risk of dyke failure remains
Compliant with provincial, policies, regulations, and guidelines	• Satisfies LRIA slope stability and seepage requirements	• Satisfies LRIA slope stability and seepage requirements	• Does not satisfy LRIA slope stability safety factors
Allows for future enhancement to a higher level of protection	• Allows for future upgrades to a higher level of protection	• Allows for upgrades to a higher level of protection; more complex as structural modifications would be needed	• Dykes in their current state do not satisfy engineering standards, and do not provide opportunity for enhancement
Construction constraints and complexities	• Allows for future upgrades to a higher level of protection	• More complex construction operation, including cranes and pile driving hammers than for the 'soft' engineering solution	• Moderate potential for significant future repairs • Repairs could be more complex due to access restrictions
SUMMARY	MOST PREFERRED	MODERATELY PREFERRED	LEAST PREFERRED
COST			
Capital cost	• Moderate construction costs • Greatest amount of property easements or acquisitions needed resting in significant cost	• Highest construction cost • Lesser amount of property easements or acquisitions needed	• No immediate construction costs, however future repair costs • No additional property needed
Cost of flood damages	• Lower potential flood damage costs	• Lower potential flood damage costs	• Higher potential flood damage costs
Operations and maintenance cost	• Regular inspection and maintenance required • Higher slope maintenance costs than the 'hard' engineering solution	• Regular inspection and maintenance required • Lowest slope maintenance costs	• Regular inspection and maintenance required • Highest potential costs associated with dyke repair
SUMMARY	MODERATELY PREFERRED	MOST PREFERRED	LEAST PREFERRED
OVERALL	**MODERATELY PREFERRED**	**MOST PREFERRED**	**LEAST PREFERRED**

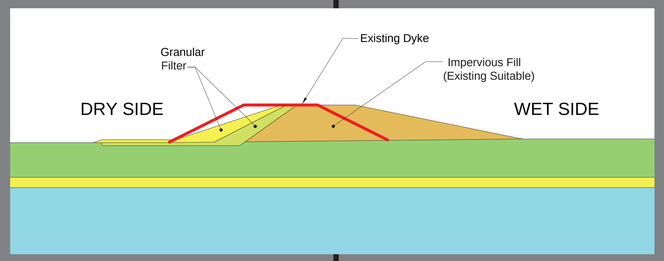
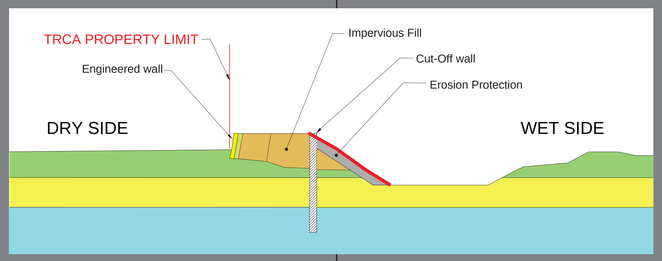
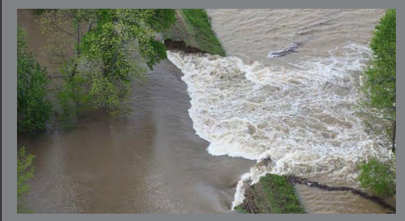
SUMMARY EVALUATION OF ALTERNATIVE SOLUTIONS
SEGMENTS 3, 4 AND 5 – PICKERING DYKE

EVALUATION CRITERIA	**ALTERNATIVE 1:** 'SOFT' ENGINEERING SOLUTION – 100 Y	**ALTERNATIVE 2:** 'HARD' ENGINEERING SOLUTION - 100 Y	**ALTERNATIVE 3:** DO-NOTHING
			
SOCIAL ENVIRONMENT			
Mitigation of flood risk due to dyke failure	• Mitigates flood risk by addressing slope stability and seepage deficiencies	• Mitigates flood risk by addressing slope stability and seepage deficiencies	• Dyke deficiencies remain • Risk of impact to several properties and people's safety
Removal or disturbance to private and public property	• Avoids impacts to private property due to available space	• Avoids impacts to private property due to available space	• No immediate impacts to private or public property • Potential for moderate property damage associated with dyke failure
Effects on public recreational spaces	• Temporary disturbance to trail during construction • Opportunities for permanent trail improvements	• Temporary disturbance to trail during construction • Opportunities for permanent trail improvements	• Does not enhance public recreational spaces • Moderate impacts if dyke fails
Disruption caused by construction activities	• Disturbance within and outside of existing dyke footprint • Typical temporary construction impacts (dust, noise, vibration, etc.)	• Disturbance within and outside of existing dyke footprint • Typical temporary construction impacts (dust, noise, vibration, etc.)	• No immediate construction impacts • Increased need for future repair work with associated construction disturbance
Effects to servicing, utilities, and infrastructure	• Due to shallower excavation there would be less opportunity for conflict with underground utilities than for the 'hard' engineering solution	• Deep sheet pile solution introduces more potential for conflict with underground utilities but these can be resolved as part of the design of the solution • Design complexity to accommodate surface drainage	• No impact on servicing and utilities • Dyke failure would flood roads and could cause damages
Removal or disturbance of archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• No disturbance or removal of potential archaeological resources
SUMMARY	MODERATELY PREFERRED	MODERATELY PREFERRED	LEAST PREFERRED
NATURAL ENVIRONMENT			
Removal, disturbance, or enhancement of terrestrial habitat	• Established vegetation within and outside of the dyke footprint would be disturbed • Larger disturbance area than the 'hard' engineering solution	• Established vegetation within and outside of the dyke footprint would be disturbed • Smaller disturbance area than the 'soft' engineering solution	• No immediate disturbance from construction • Dyke failure could result in localized disturbance and habitat loss
Removal, disturbance, or enhancement of aquatic habitat	• Dyke is farther away from the creek • Minimal impacts to aquatic habitat	• Dyke is farther away from the creek • Minimal impacts to aquatic habitat	• Risk of channel bank erosion persists on a limited section of the creek
SUMMARY	LEAST PREFERRED	MODERATELY PREFERRED	MOST PREFERRED
TECHNICAL ENVIRONMENT			
Compliant with current engineering design criteria for target flood protection level	• Provides target flood protection level (100 year) and satisfies all engineering design criteria	• Provides target flood protection level (100 year) and satisfies all engineering design criteria	• Current dyke does not satisfy engineering design criteria; risk of failure remains
Compliant with provincial, policies, regulations, and guidelines	• Satisfies LRIA slope stability and seepage requirements	• Satisfies LRIA slope stability and seepage requirements	• Does not satisfy LRIA slope stability safety factors
Allows for future enhancement to a higher level of protection	• Allows for future upgrades to a higher level of protection	• Allows for upgrades to a higher level of protection; more complex as structural modifications would be needed	• Dykes in their current state do not satisfy engineering standards and do not provide opportunity for enhancement
Construction constraints and complexities	• Standard equipment and construction methods required	• More complex construction operation, including cranes and pile driving hammers than for the 'soft' engineering solution	• Moderate potential for significant future repairs
SUMMARY	MOST PREFERRED	MODERATELY PREFERRED	LEAST PREFERRED
COST			
Capital cost	• Moderate construction costs	• Highest construction cost	• No immediate construction costs, however future repair costs
Cost of flood damages	• Lower potential flood damage costs	• Lower potential flood damage costs	• Higher potential flood damage costs
Operations and maintenance cost	• Regular inspection and maintenance required • Higher slope maintenance costs	• Regular inspection and maintenance required • Lowest slope maintenance costs	• Regular inspection and maintenance required • Highest potential costs associated with dyke repair
SUMMARY	MOST PREFERRED	MODERATELY PREFERRED	LEAST PREFERRED
OVERALL	**MOST PREFERRED**	**MODERATELY PREFERRED**	**LEAST PREFERRED**

SUMMARY EVALUATION OF ALTERNATIVE SOLUTIONS – SEGMENT 6 - AJAX DYKE

EVALUATION CRITERIA	ALTERNATIVE 1a: 'SOFT' ENGINEERING SOLUTION – 50 Y	ALTERNATIVE 1b: 'SOFT' ENGINEERING SOLUTION – 100 Y	ALTERNATIVE 2a: 'HARD' ENGINEERING SOLUTION - 50 Y	ALTERNATIVE 2b: 'HARD' ENGINEERING SOLUTION - 100 Y	ALTERNATIVE 3: DO-NOTHING
					
NATURAL ENVIRONMENT					
Removal, disturbance or enhancement of terrestrial habitat	• Established vegetation would be disturbed on a larger area than the 'hard' engineering solutions. • Disturbance area is narrower than for 100 year 'soft' engineering solution	• Established vegetation would be disturbed on a larger area than the 'hard' engineering solutions	• Established vegetation would be disturbed on a smaller area than the 'soft' engineering solutions	• Established vegetation would be disturbed on a smaller area than the 'soft' engineering solutions	• No immediate disturbance from construction; • Dyke failure could result in disturbance and habitat loss
Removal, disturbance or enhancement of a quatic habitat	• Dyke is farther away from the creek. Minimal impacts to aquatic habitat.	• Dyke is farther away from the creek. Minimal impacts to aquatic habitat.	• Dyke is farther away from the creek. Minimal impacts to aquatic habitat.	• Dyke is farther away from the creek. Minimal impacts to aquatic habitat.	• Minimal or no impact on aquatic habitat.
SUMMARY	**LEAST PREFERRED**	**LEAST PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**MOST PREFERRED**
TECHNICAL ENVIRONMENT					
Compliant with current engineering design criteria for target flood protection level	• Provides target flood protection level (100 year) and satisfies all engineering design criteria.	• Provides target flood protection level (100 year) and satisfies all engineering design criteria.	• Provides target flood protection level (50 year) and satisfies all engineering design criteria.	• Provides target flood protection level (50 year) and satisfies all engineering design criteria.	• Current dyke does not satisfy engineering design criteria; risk of dyke failure remains.
Compliant with provincial, policies, regulations and guidelines	• Satisfies LRIA slope stability and seepage requirements.	• Satisfies LRIA slope stability and seepage requirements.	• Satisfies LRIA slope stability and seepage requirements.	• Satisfies LRIA slope stability and seepage requirements.	• Does not satisfy LRIA slope stability safety factors.
Allows for future enhancement to a higher level of protection	• Allows for future upgrades to a higher level of protection.	• Allows for future upgrades to a higher level of protection.	• Allows for upgrades to a higher level of protection. • More complex as structural modifications would be needed.	• Allows for upgrades to a higher level of protection. • More complex as structural modifications would be needed.	• Dykes in their current state do not satisfy engineering standards and do not provide opportunity for enhancement.
Construction constraints and complexities	• Standard equipment and construction methods required	• Standard equipment and construction methods required.	• More complex construction operation, including cranes and pile driving hammers than for the 'soft' engineering solutions.	• More complex construction operation, including cranes and pile driving hammers, than for the 'soft' engineering solutions.	• Moderate potential for significant future repairs. • Repairs could be more complex due to access restrictions.
SUMMARY	**MOST PREFERRED**	**MOST PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**LEAST PREFERRED**
OVERALL	**MODERATELY PREFERRED**	**MOST PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**LEAST PREFERRED**

SUMMARY EVALUATION OF ALTERNATIVE SOLUTIONS – SEGMENT 6 - AJAX DYKE

EVALUATION CRITERIA	ALTERNATIVE 1a: 'SOFT' ENGINEERING SOLUTION – 50 Y	ALTERNATIVE 1b: 'SOFT' ENGINEERING SOLUTION – 100 Y	ALTERNATIVE 2a: 'HARD' ENGINEERING SOLUTION - 50 Y	ALTERNATIVE 2b: 'HARD' ENGINEERING SOLUTION - 100 Y	ALTERNATIVE 3: DO-NOTHING
					
SOCIAL ENVIRONMENT					
Mitigation of flood risk due to dyke failure	• Mitigates flood risk (up to 50 year event) by addressing slope stability and seepage deficiencies • Flood protection level is less than for the 100 yr solutions	• Mitigates flood risk (up to 100 year event) by addressing slope stability and seepage deficiencies • Flood protection level is more than for the 50 yr solutions	• Mitigates flood risk (up to 50 year event) by addressing slope stability and seepage deficiencies • Flood protection level is less than for the 100 yr solutions	• Mitigates flood risk (up to 100 year event) by addressing slope stability and seepage deficiencies • Flood protection level is more than for the 50 yr solutions	• Dyke deficiencies remain. • Risk of impact to several properties and people's safety.
Removal or disturbance to private and public property	• Minimal impact to private property at ends of dyke	• Minimal impact to private property at ends of dyke	• Minimal impact to private property at ends of dyke	• Minimal impact to private property at ends of dyke	• No immediate impacts to private or public property. • Potential for property damage associated with dyke failure.
Effects on public recreational spaces	• Temporary disturbance to trail during construction. • Opportunities for permanent trail improvements.	• Temporary disturbance to trail during construction. • Opportunities for permanent trail improvements.	• Temporary disturbance to trail during construction. • Opportunities for permanent trail improvements.	• Temporary disturbance to trail during construction. • Opportunities for permanent trail improvements.	• Does not enhance public recreational spaces. • Moderate impacts if dyke fails
Disruption caused by construction activities	• Will cause disturbance within and outside of existing dyke footprint • Typical disruptions associated with construction (dust, noise, vibration, etc.)	• Will cause disturbance within and outside of existing dyke footprint; largest disturbance footprint of all solutions • Typical disruptions associated with construction (dust, noise, vibration, etc.)	• Will cause disturbance within and outside of existing dyke footprint, however on a narrower footprint than the 'soft' engineering solutions • Typical disruptions associated with construction (dust, noise, vibration, etc.)	• Will cause disturbance within and outside of existing dyke footprint, however on a narrower footprint than the 'soft' engineering solutions • Typical disruptions associated with construction (dust, noise, vibration, etc.)	• No immediate construction impacts. • Increase need for future repair work with associated construction disturbance.
Effects to servicing, utilities and infrastructure	• Due to shallower excavation there would be less opportunity for conflict with underground utilities than for the 'hard' engineering solutions	• Due to shallower excavation there would be less opportunity for conflict with underground utilities than for the 'hard' engineering solution	• Deep sheet pile solution introduces more potential for conflict with underground utilities but these can be resolved as part of the design of the solution	• Deep sheet pile solution introduces more potential for conflict with underground utilities but these can be resolved as part of the design of the solution	• No impact on servicing and utilities. • Dyke failure would flood roads and could cause damages.
Removal or disturbance of archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• Poses potential for removal or disturbance of potential archaeological resources	• No disturbance or removal of potential archaeological resources
SUMMARY	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**LEAST PREFERRED**
COST					
Capital cost	• Moderate construction costs and less costly than the corresponding 'soft' 100 year solution	• Moderate construction costs, but more costly than the corresponding 'soft' 50 year solution	• Higher construction cost than 'soft' engineering solutions	• Highest construction cost	• No immediate construction costs, but greater future repair costs.
Cost of flood damages	• Lower potential flood damage costs (however higher than corresponding 100 year solution)	• Lowest flood damage costs	• Lower potential flood damage costs (however higher than corresponding 100 year solution)	• Lowest flood damage costs	• Highest flood damage costs
Operations and maintenance cost	• Regular inspection and maintenance required; highest slope maintenance costs	• Regular inspection and maintenance required; highest slope maintenance costs	• Regular inspection and maintenance required; lowest slope maintenance costs	• Regular inspection and maintenance required; lowest slope maintenance costs	• Regular inspection and maintenance required. • Highest potential costs associated with dyke repair.
SUMMARY	**MODERATELY PREFERRED**	**MOST PREFERRED**	**MODERATELY PREFERRED**	**MODERATELY PREFERRED**	**LEAST PREFERRED**