

**City of Port Colborne  
Meeting to Consider Addendum**

**Date:** Tuesday, April 23, 2024  
**Time:** 5:00 pm  
**Location:** Council Chambers, 3rd Floor, City Hall  
66 Charlotte Street, Port Colborne

**Pages**

**4. Municipal Drain**

**4.1 Wignell Municipal Drain Meeting to Consider, 2024-85**

- \*a. Paul Marsh, P. Eng. EWA Engineering Inc., Wignell Drain Presentation**

**1**

# Wignell Drain Report

April 23, 2024 5:00 pm

Drainage Engineer: Paul C. Marsh, P.Eng. EWA Engineering Inc.

Drainage Superintendent: Alana VanderVeen, City of Port Colborne

# Agenda

- Introduction
- Wignell Watershed
  - Background
  - Scope of Work
    - Petition 4 request for outlet by Road Authority
- Design Basis
  - Drainage Needs
  - Design Storm & Hydrology and Hydraulics
- Constructed Works
  - 2007 Bank Erosion Works
  - Wignell Outlet Works
- Wignell Drain
  - Proposed Works
  - Cost Estimate
  - Assessment
- Summary – Q and A

# Introduction

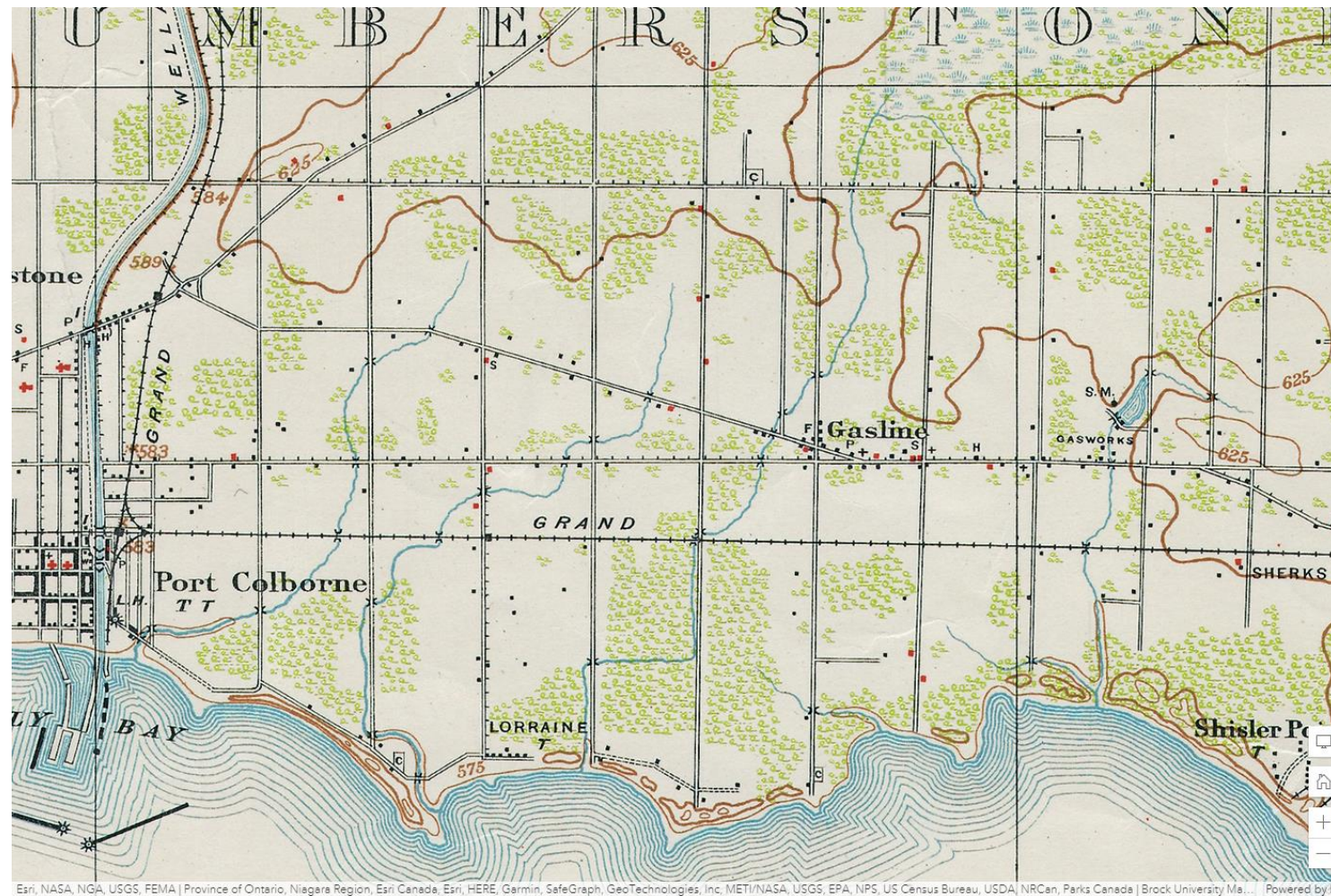


# Report History

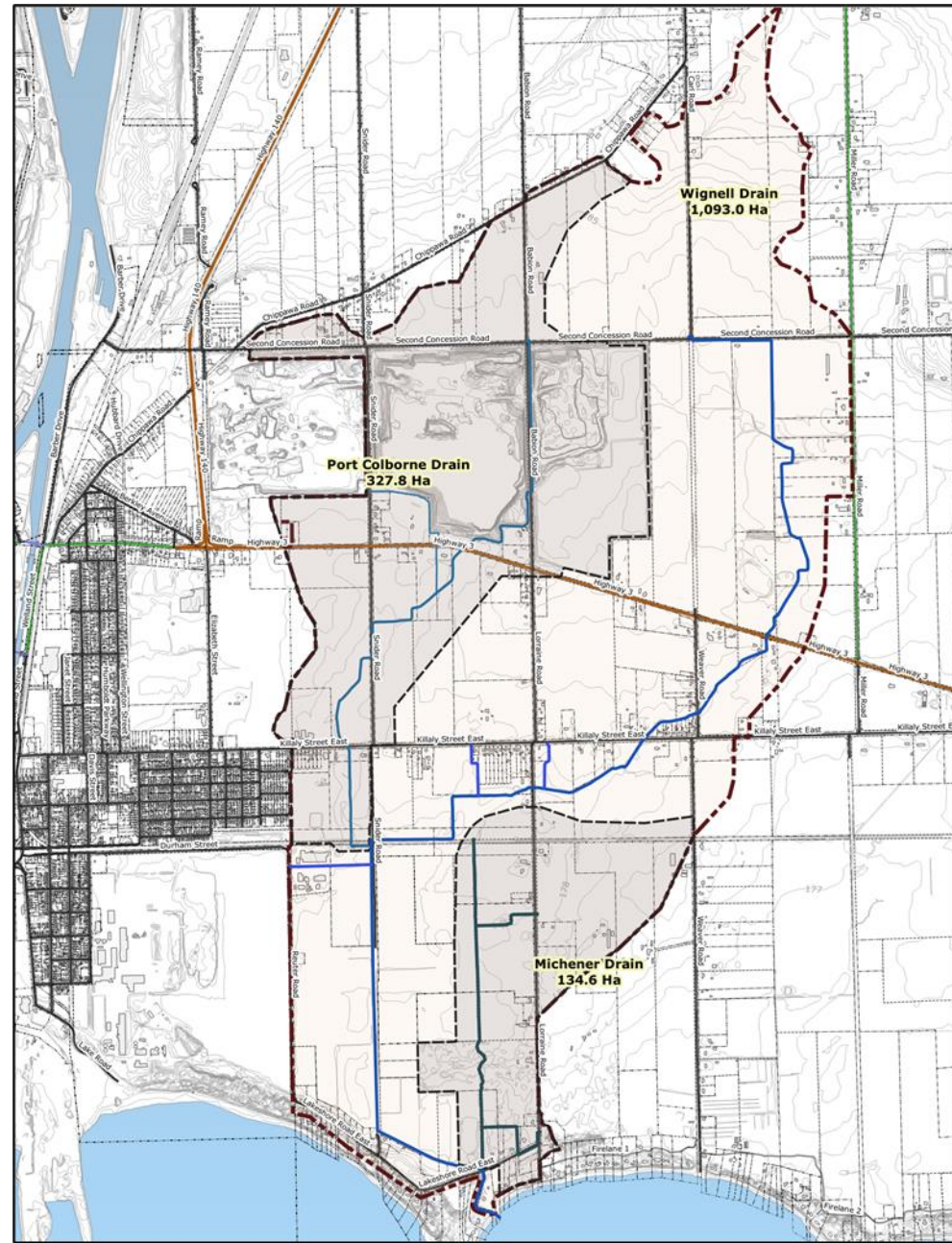
- Appointment of Drainage Engineer to prepare a Report
  - Wiebe Engineering
    - Started in 2003, ceased operations, 2008
  - Amec
    - Started in 2013, ceased working in drainage projects, 2017
  - EWA Engineering
    - Appointed in 2018.



# Wignell Watershed



Topo map 1910





# Drainage Studies

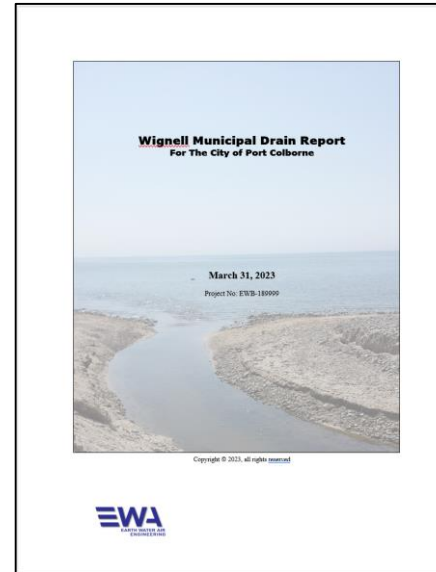
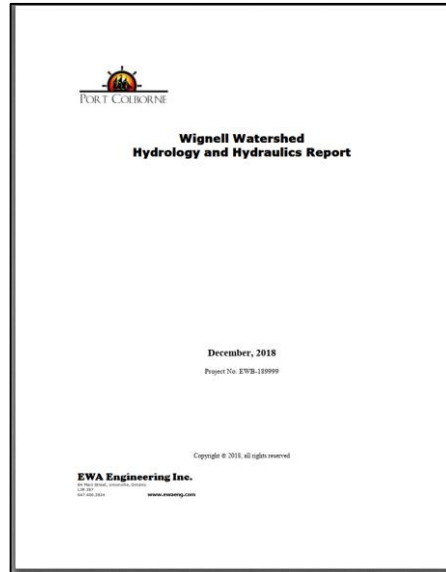
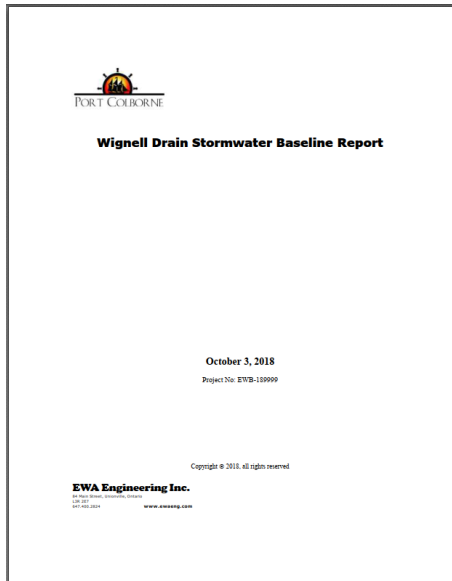
Wignell Drain  
Baseline Report  
October 23, 2018



Wignell Hydrology and  
Hydraulics Report  
December 7, 2018  
Updated December 17,  
2020

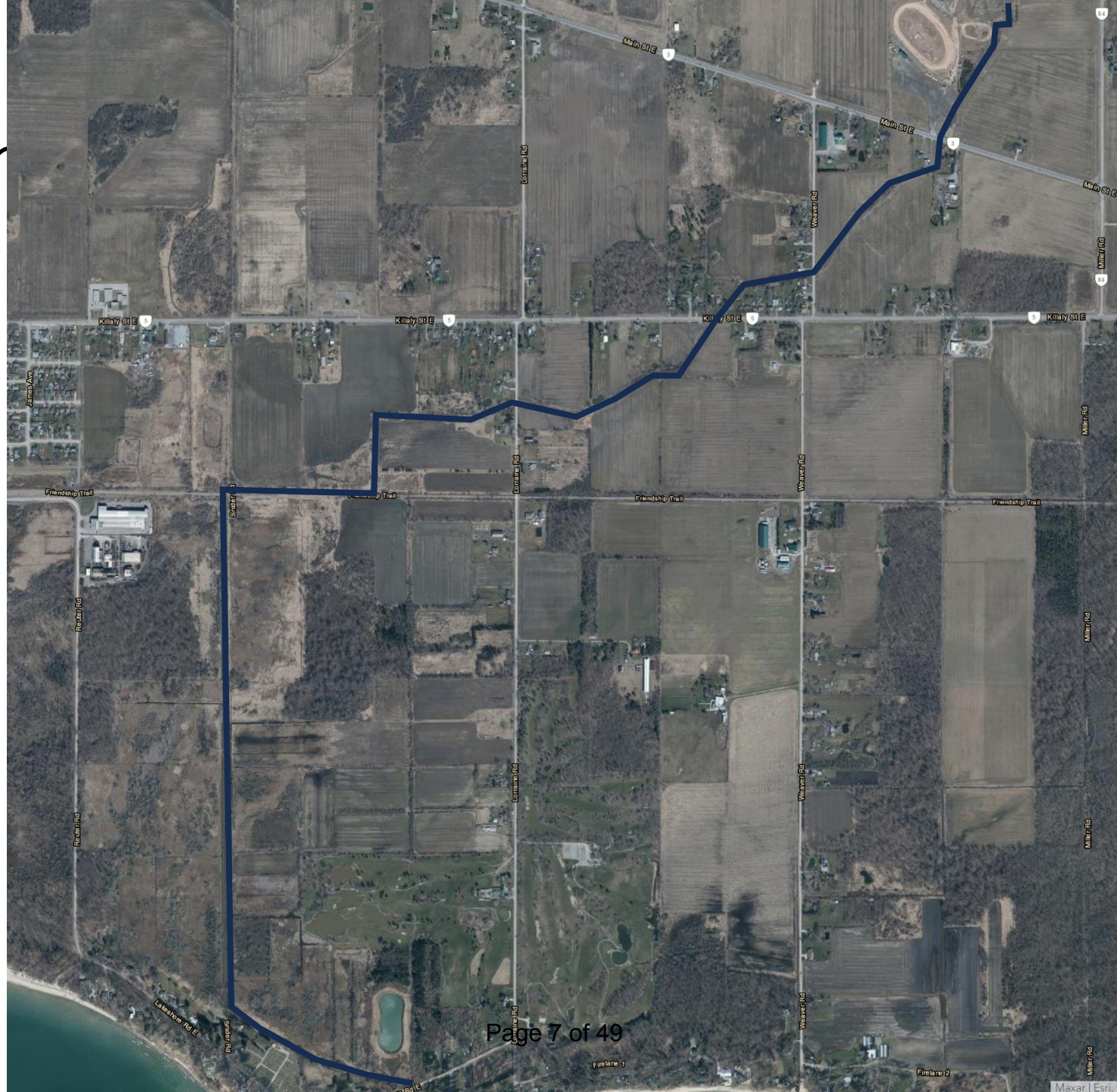


Wignell Municipal  
Drain Report  
IFR100 – Nov 5, 2021  
IFR101 – March 31, 2023  
IFR102 – February 9, 2024



# Watersh

1930  
To  
2020



Past Reports:

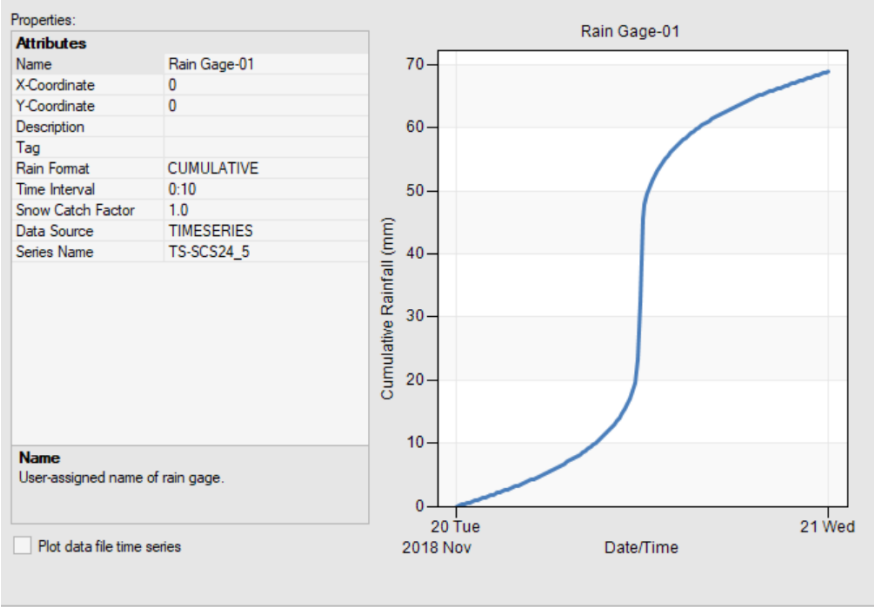
**CJ Clarke 1969**

Set lower  
reach of  
2067m @ 0%

**RVA 1979**

# Design Basis

# Design Storm

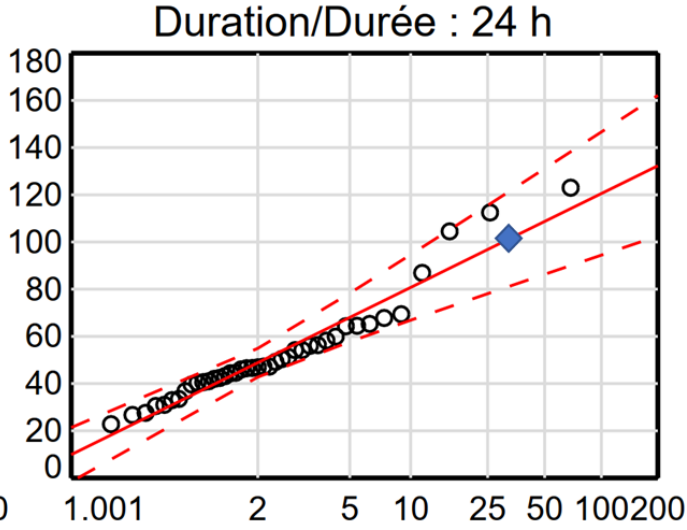
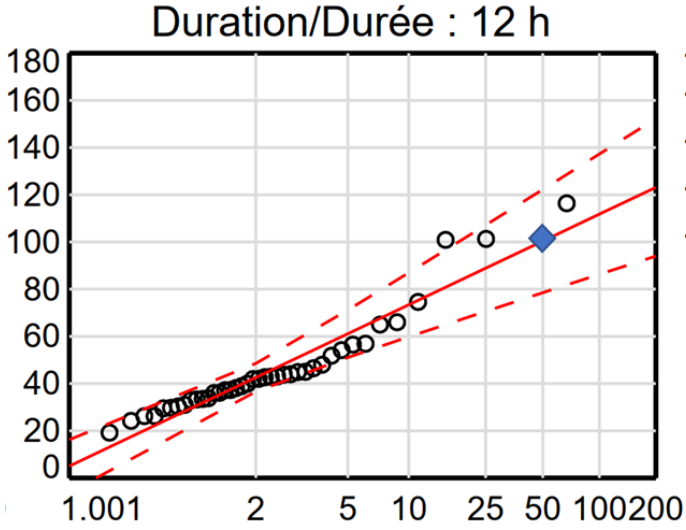
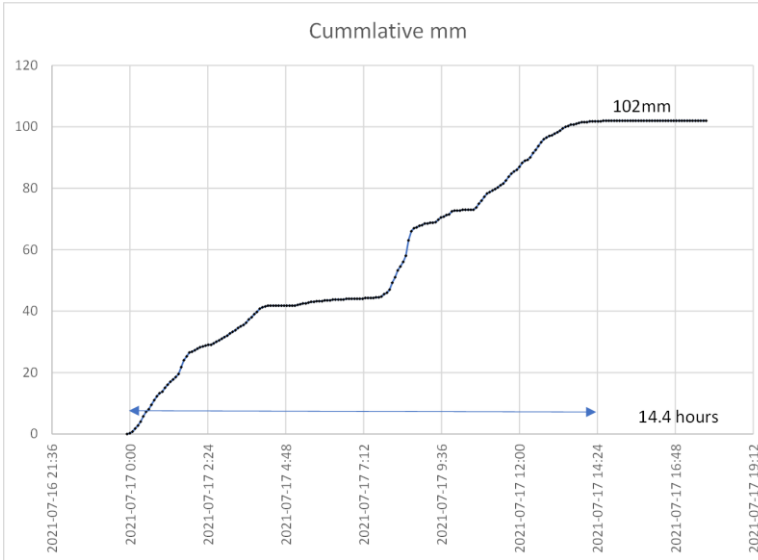
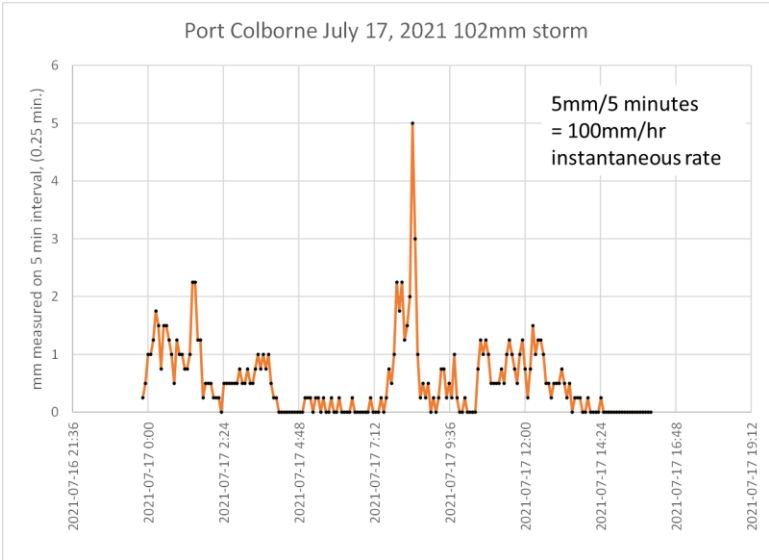


Design Storm	Probability return period	Volume, mm
SCS Type – 24 hour	1:2	49.8
	1:5	68.9
	1:10	81.5
	1:25	97.5
	1:50	109.3
	1:100	121.1
Chicago – 1 hour	1:5	48.2

A gauge operated by Michigan Sugar at the Mud Creek Club where the Snye outlets to Lake St. Clair recorded 9.44" in just 2 hours... Truly unbelievable.

Thanks, Jordan G.

# Actual Storm



riod/ Période de retour (years/années)

2021/03/26



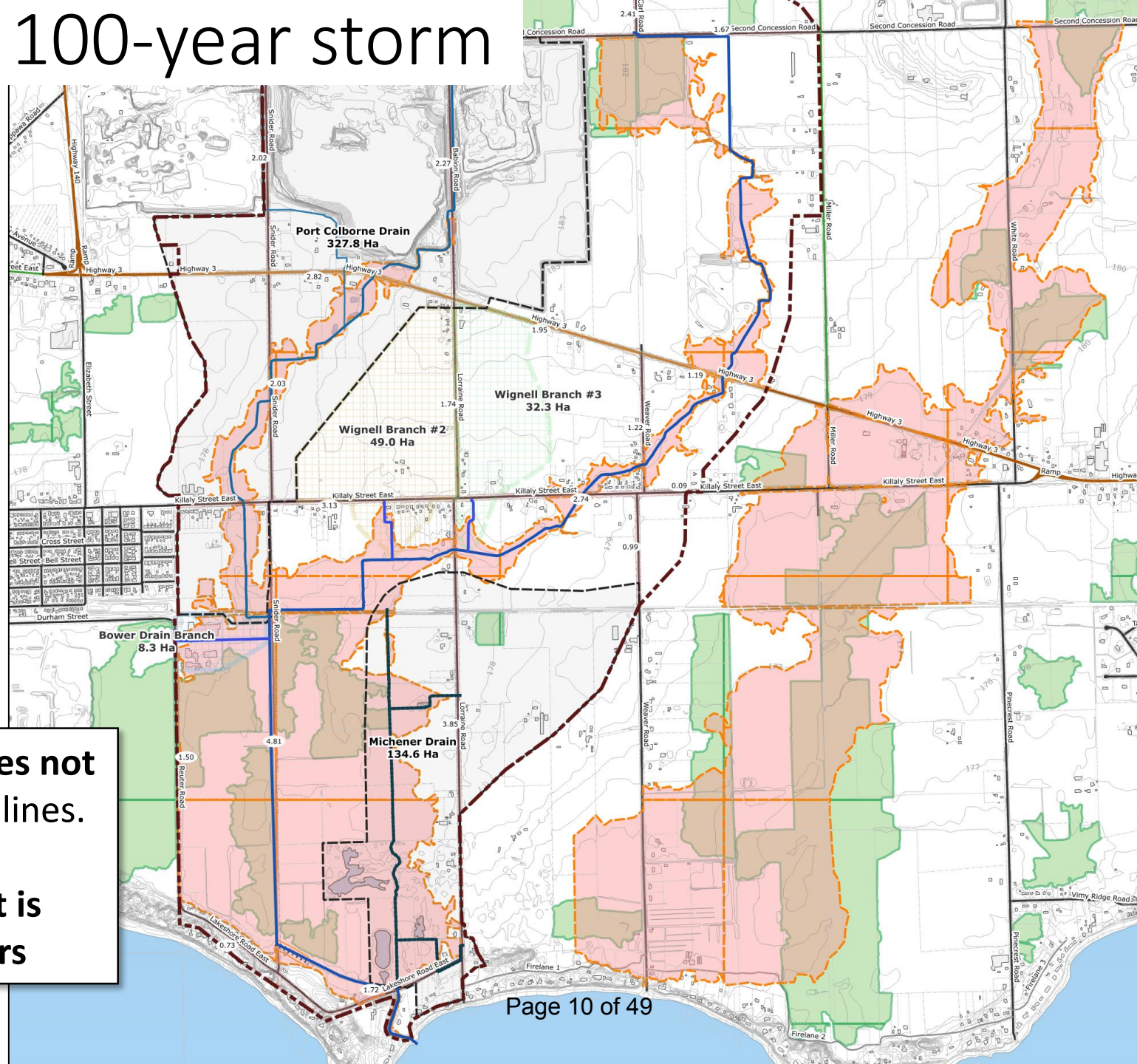


# Forecasted 100-year storm

121.4mm  
/ 24 hr

The Drain Report **does not**  
impact 100 yr flood lines.

The design target is  
68.9mm pr 24 hrs



# Previously Constructed Works

2006/2007 Bank Protection

Outlet Access



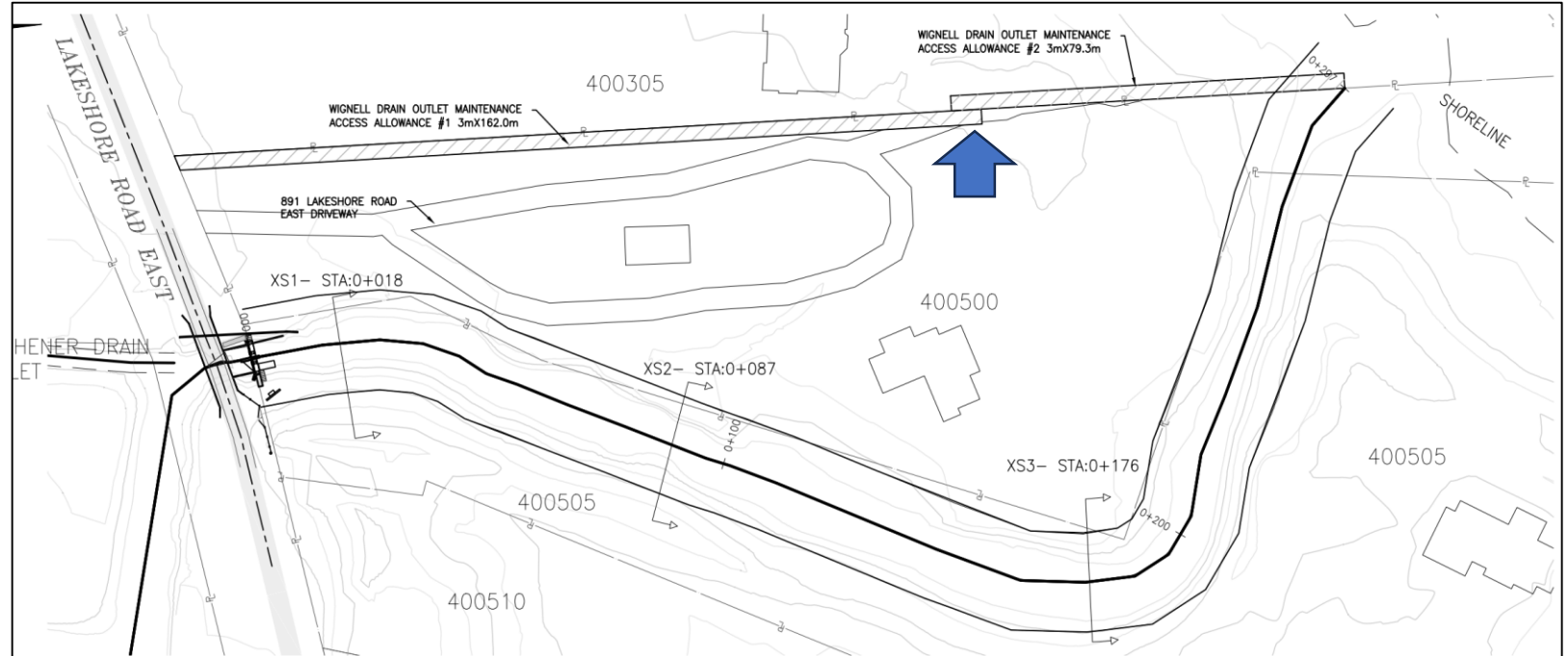
# Wignell Bank Erosion Protection 2006/2007

- Drainage Act – Section 124  
Emergency work
- 157m construction using  
concrete blocks on geotechnical  
designed foundation
- Requested by ARN 403800
- Built on ARN 403720
- 26.4m constructed on Snider Rd  
Right of Way (ROW)



# Wignell Outlet access lane

- Allowance for land taken.
- Gravel cost and construction



# Wignell Drain Proposed Works

Section 4 Petition requests

Section 78 Drain Improvements

Section 74 Maintenance

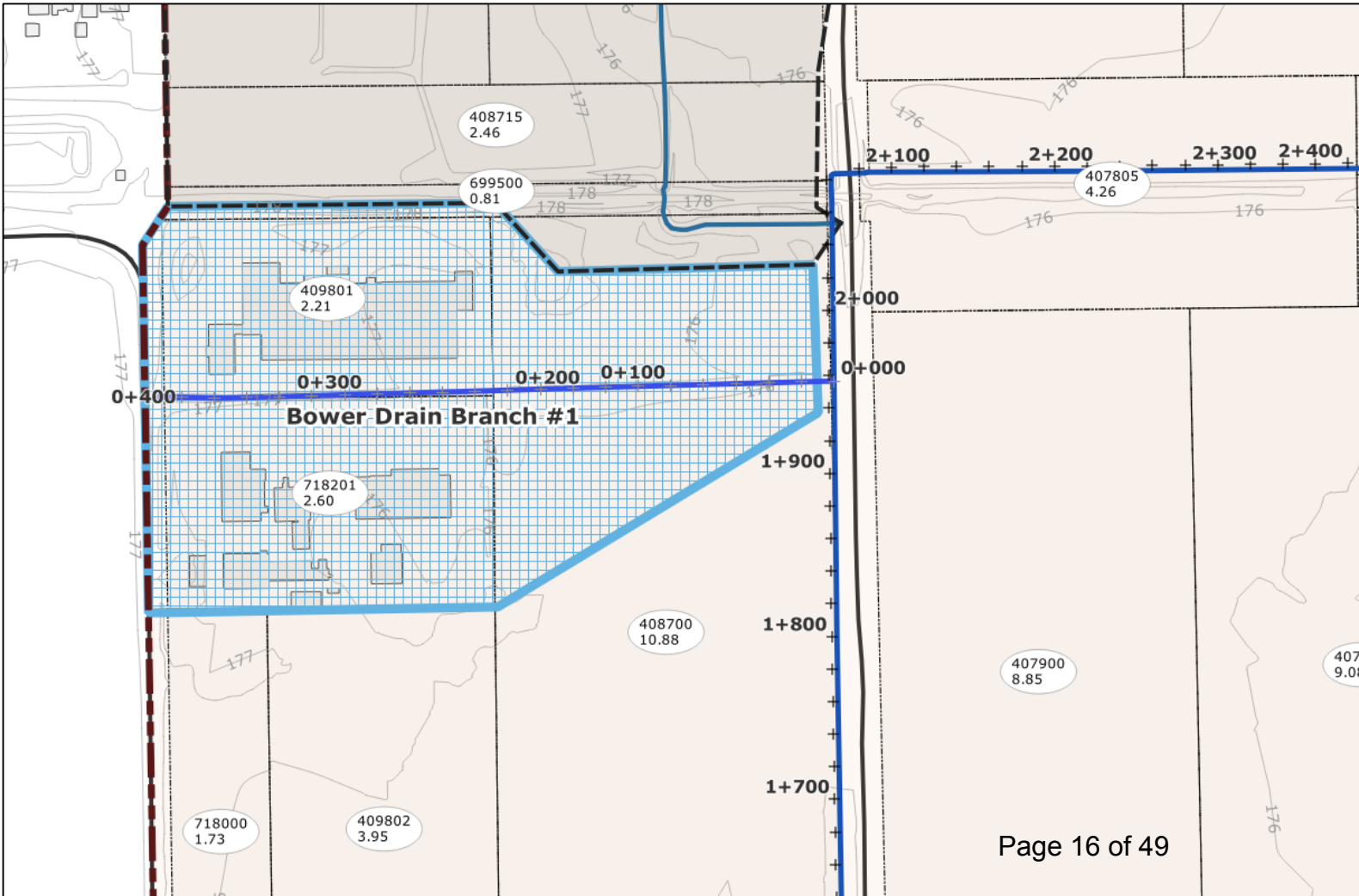
# Petition 4 Requests

Bower Drain

Wignell Branch #2

Wignell Branch #3

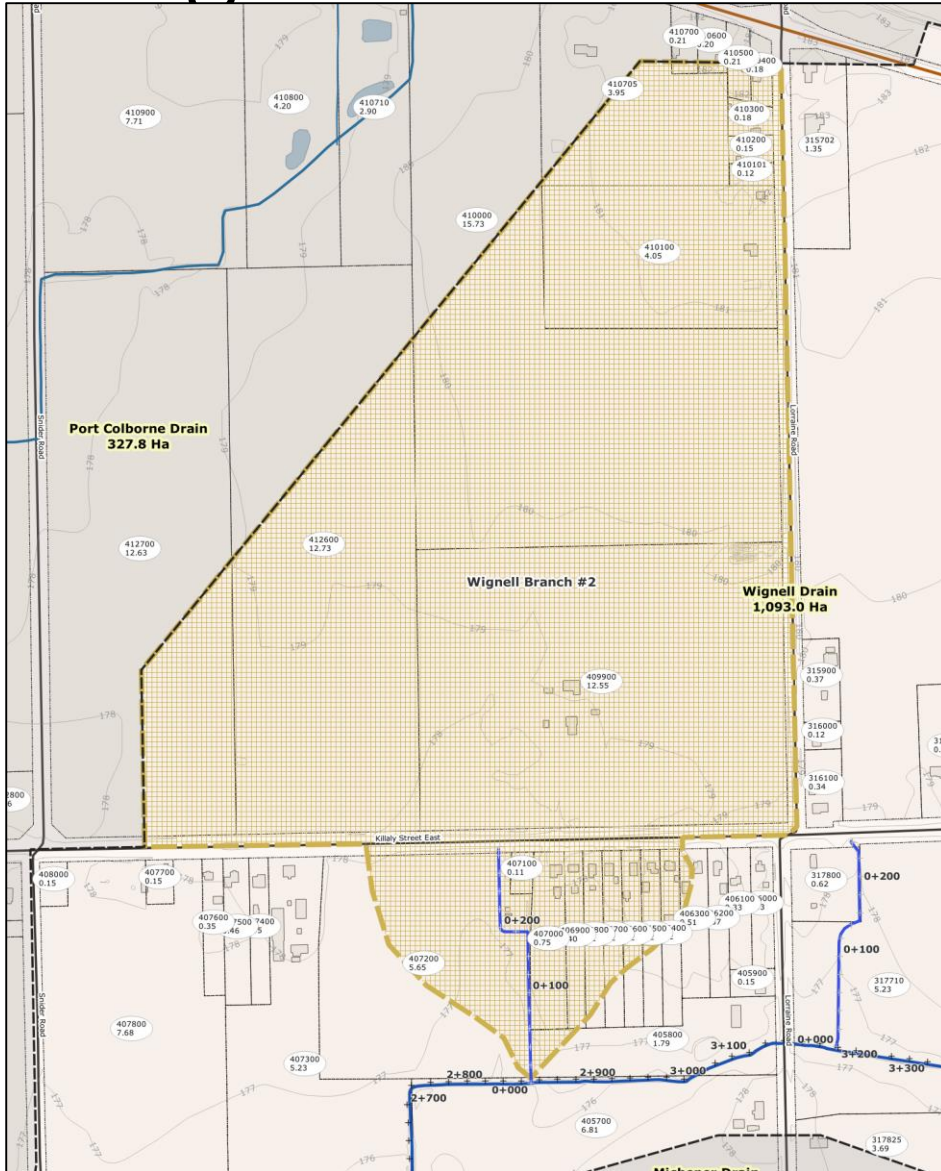
# Bower Drain



- Drain already existed.
- Including in the report confirms and names this as a municipal drain for future maintenance.

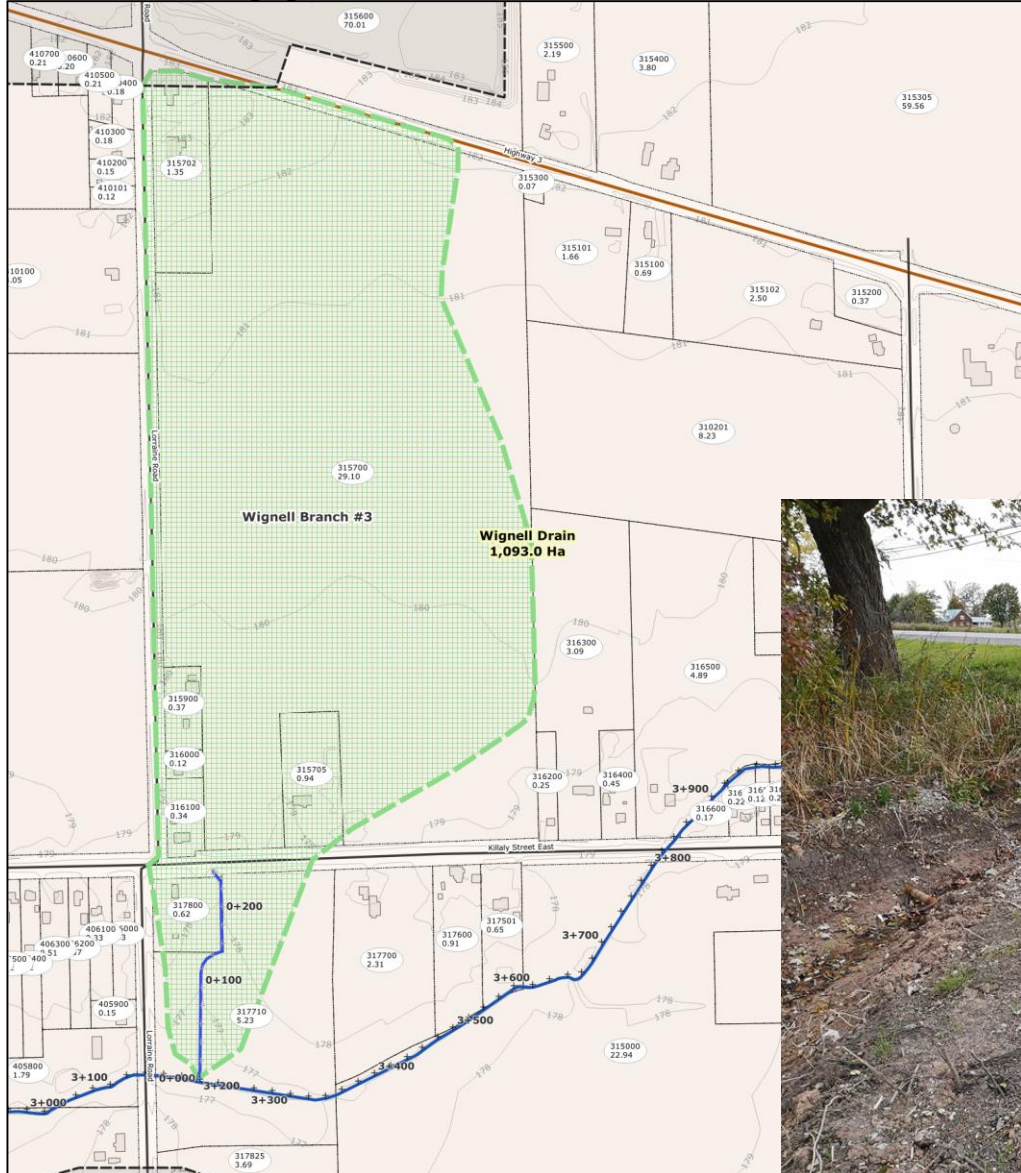


# Wignell Branch #2



- Existing private drain connection to Wignell Drain.
- CSP is close to the existing house.
- Road authority request for sufficient outlet becomes a municipal drain for future maintenance.

# Wignell Branch #3



- Existing private drain connection (PDC) to Wignell Drain.
- Road Authority request for sufficient outlet.



# Section 74 Maintenance

Channel Clearing and Cleaning to Grade line – STA 2+450 to 5+975

Channel Spot Maintenance – STA 0+010 to 2+450

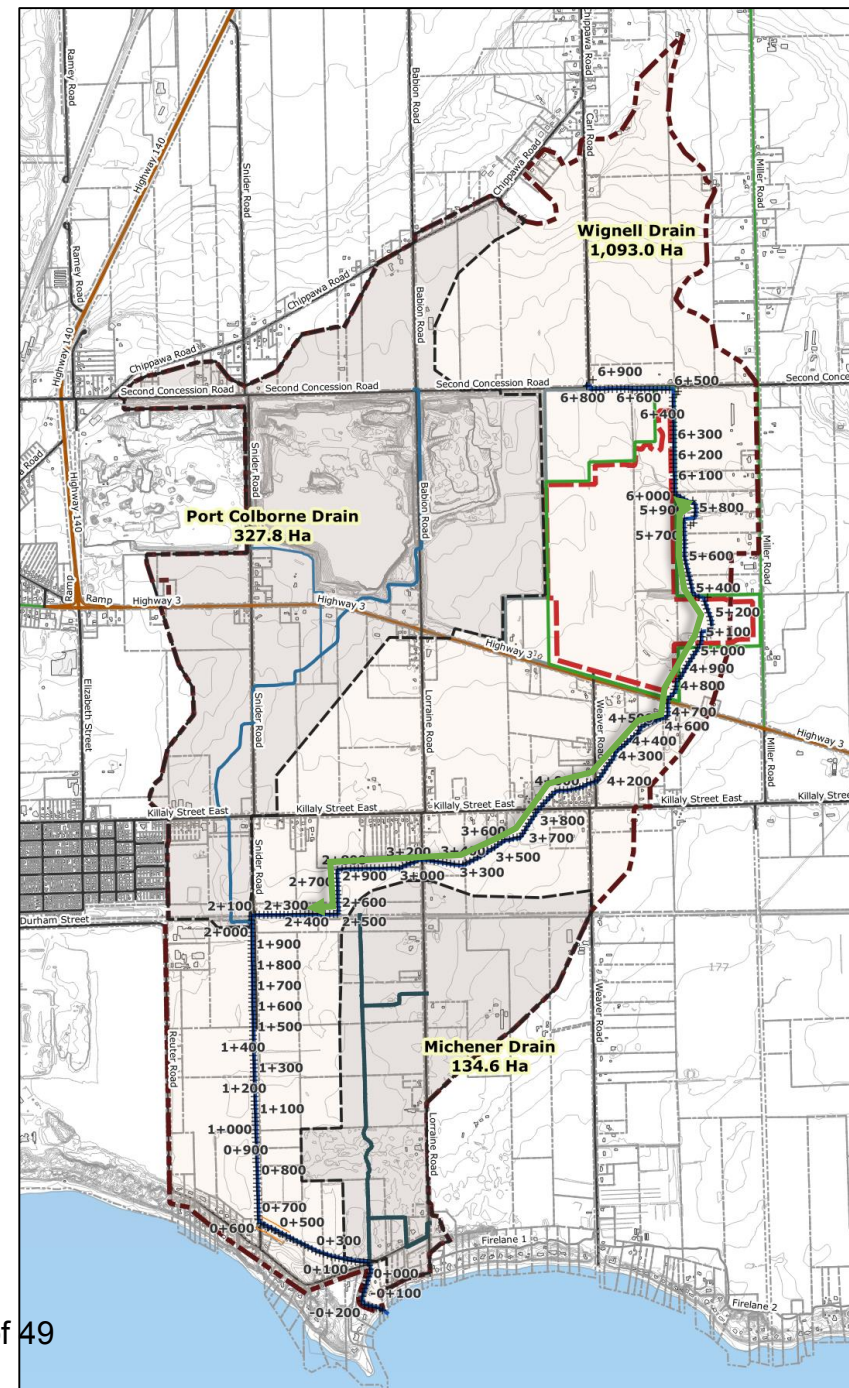


# Cleaning and clearing to grade

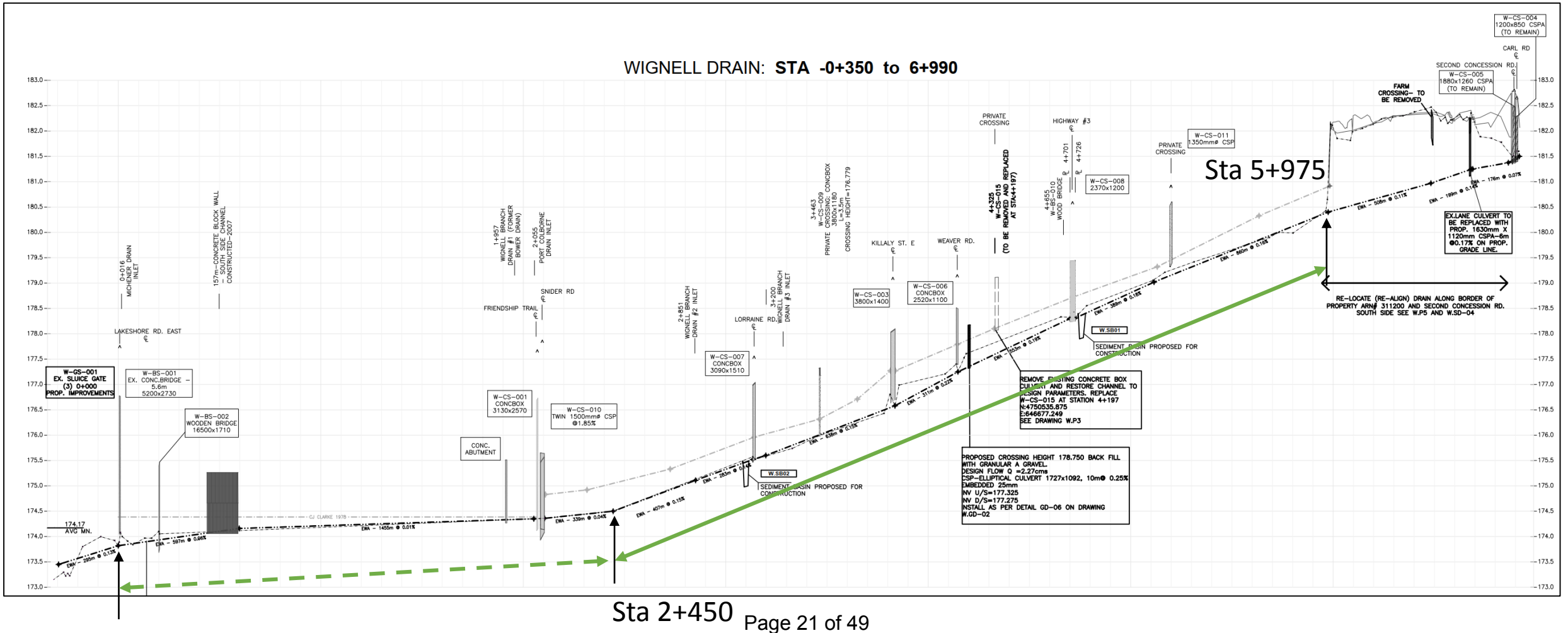
From Station 2+450 to Station 5+975

Minimal grade change; imperial to metric

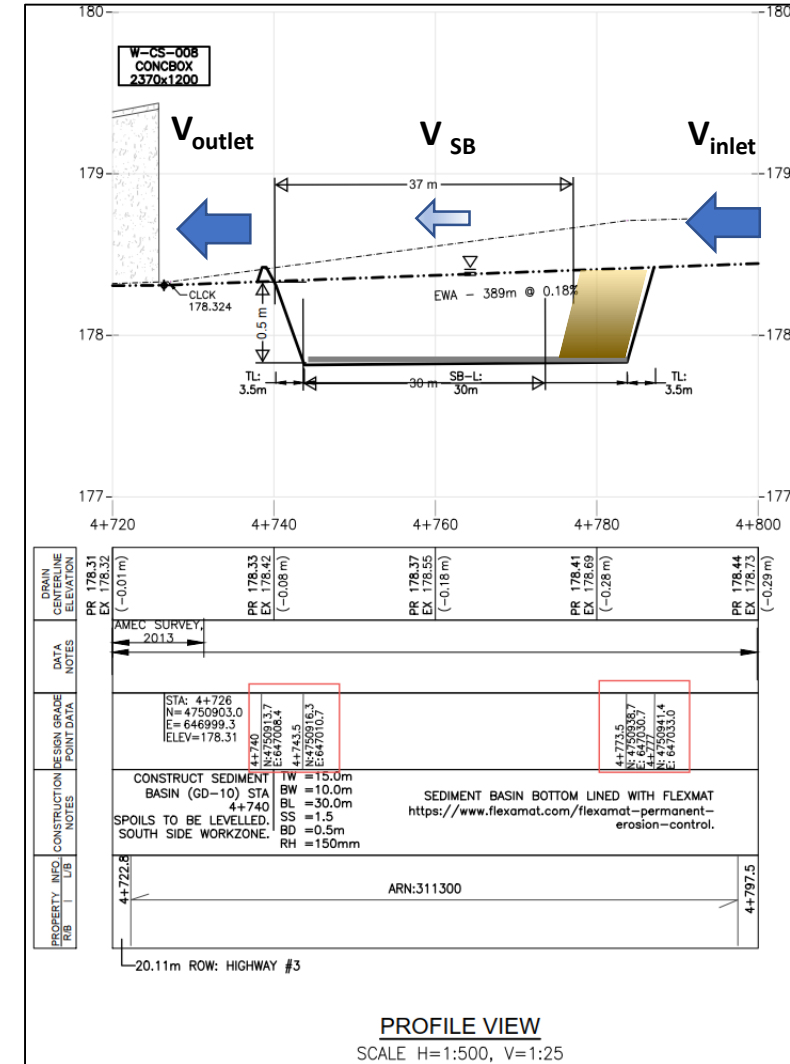
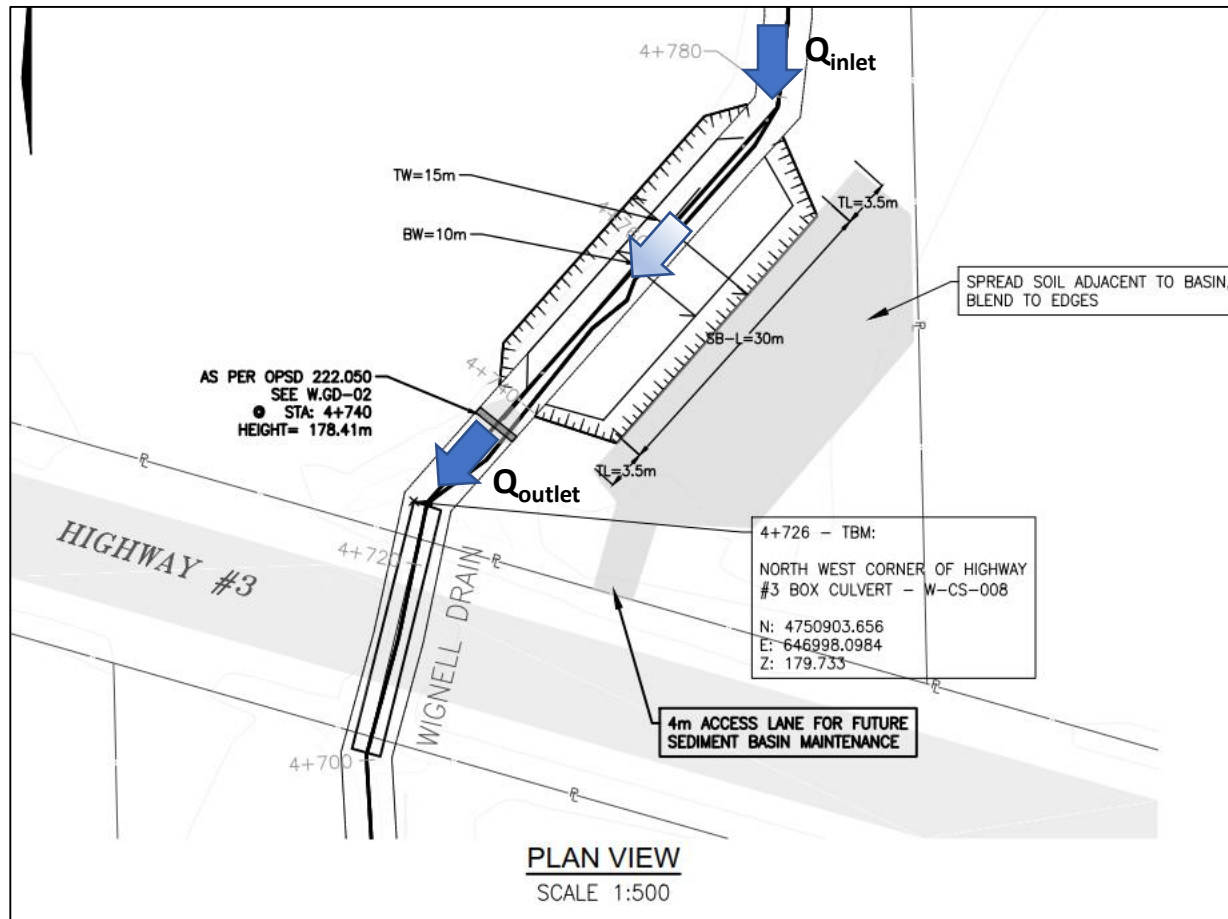
Vegetation removal to prevent obstructions.



# Maintenance



# Sediment Control



# Section 78 Improvements

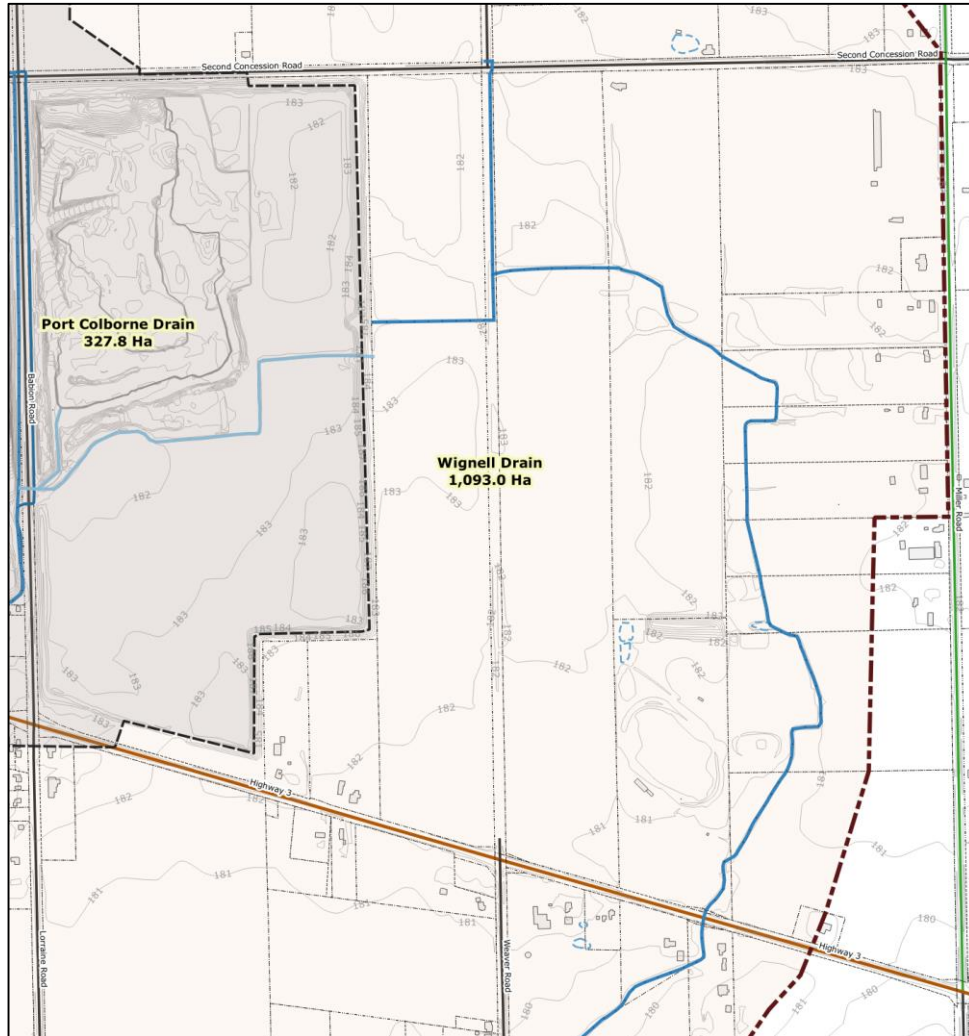
Bank Restoration and Improvement Program (BRIP)

Wignell Gate Automation

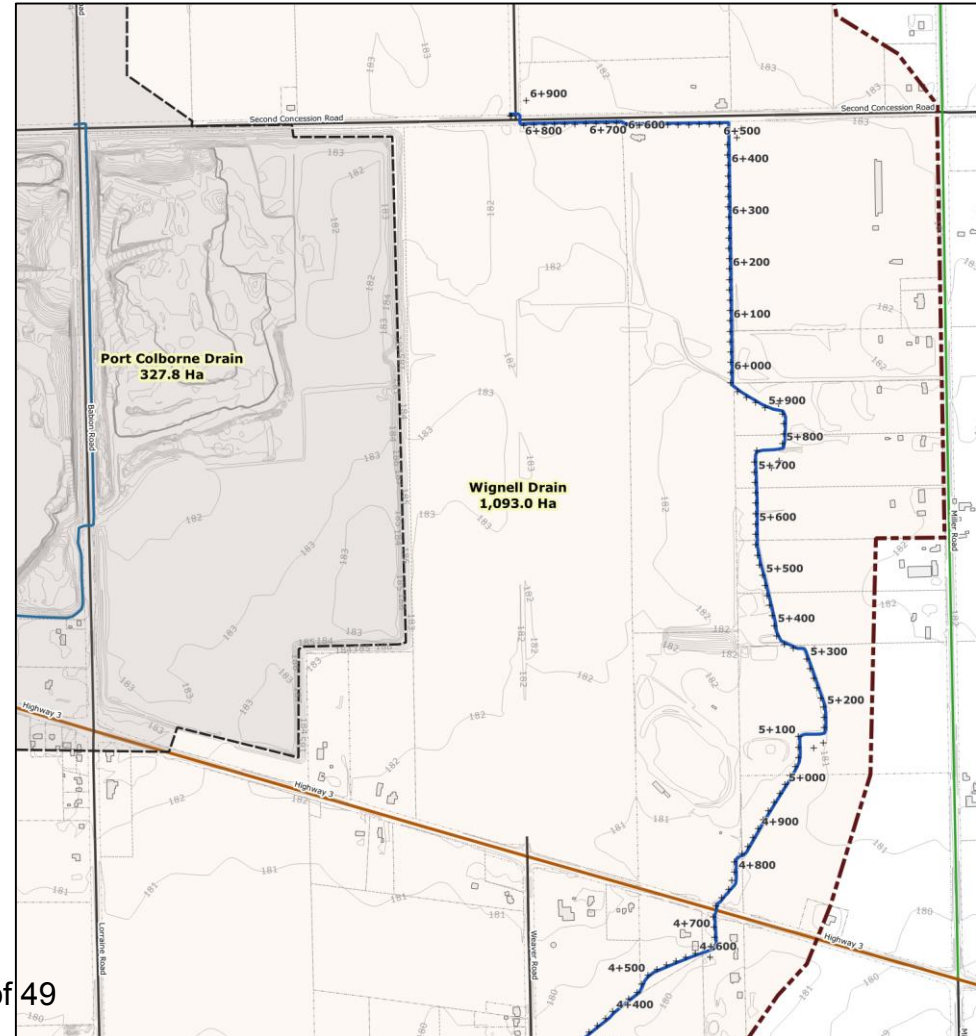


# Wignell Realignment

## Existing

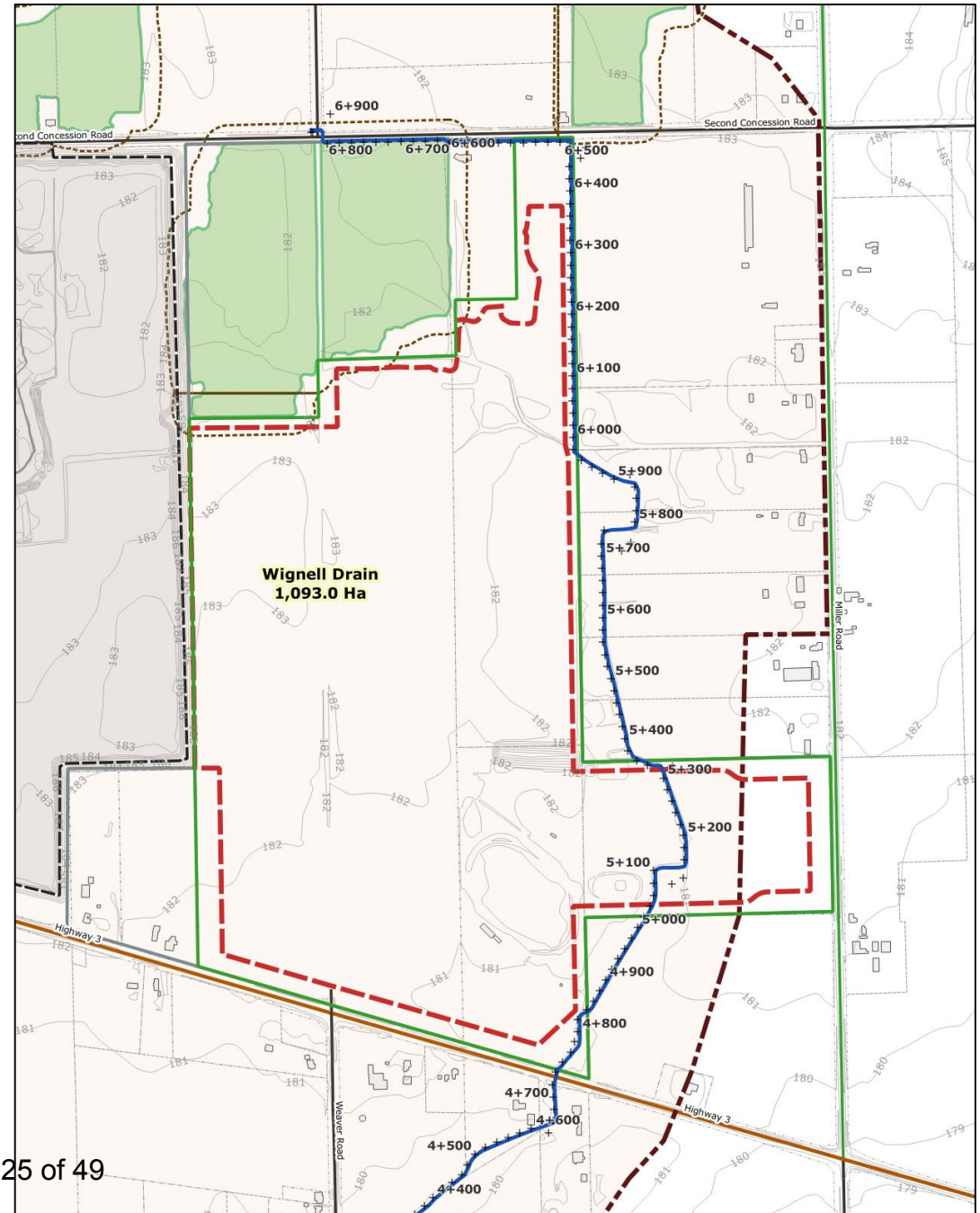


## Proposed



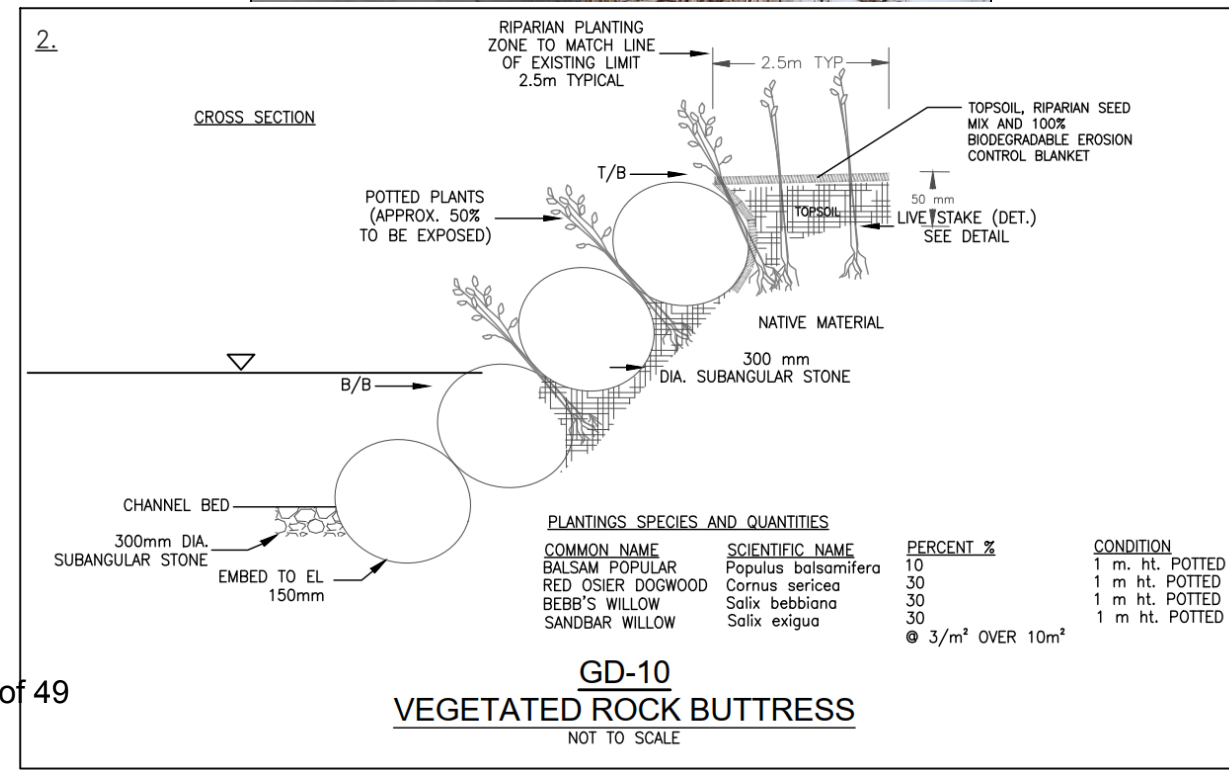
# PCQ

- Site Extension 3
  - Red dotted line is extraction limit
  - Green line is License Limit
- Includes Wetlands + 30m buffer



# Bank Restoration

- Natural Process
  - Erosion resulting in bank recession, loss of land
  - Channel widening, switching
  - Channel changes in alignment
- Engineering responses:
  - Hard approach – concrete block
  - Green Infrastructure – soft or biomimicry approach
  - Room for the river approach





# Example: Huron County cold water stream Drain





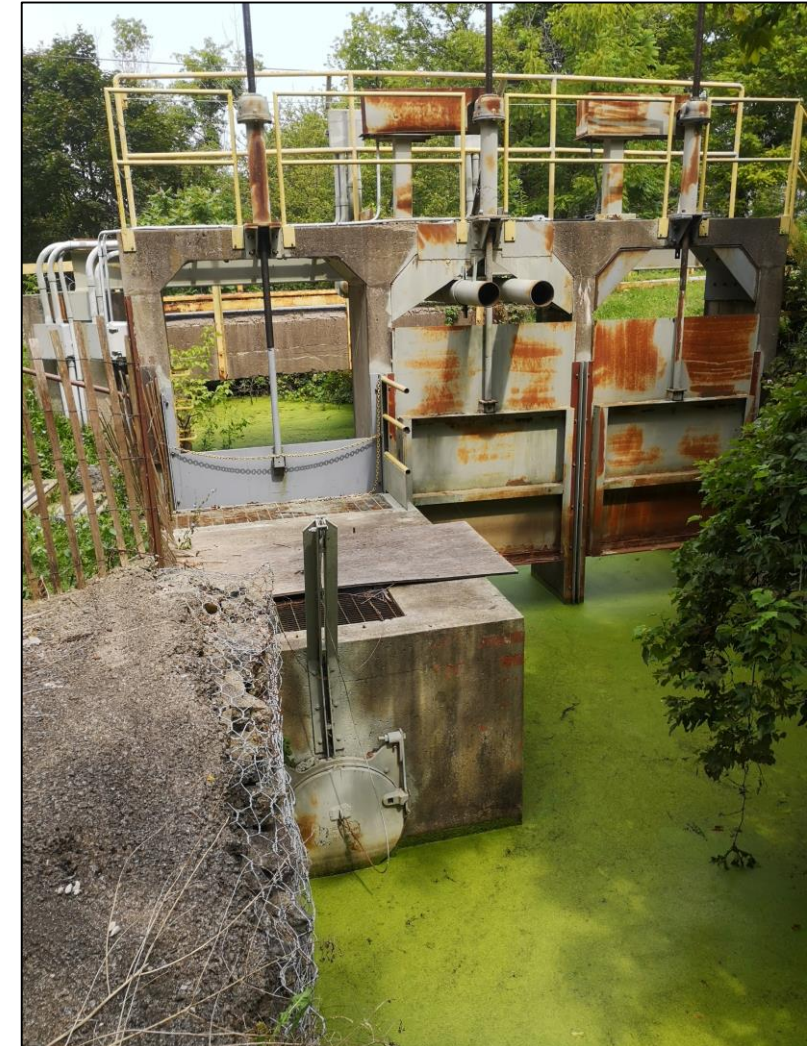
# Bank Restoration Improvement Program (BRIP) Implementation





# Wignell Gate Improvements

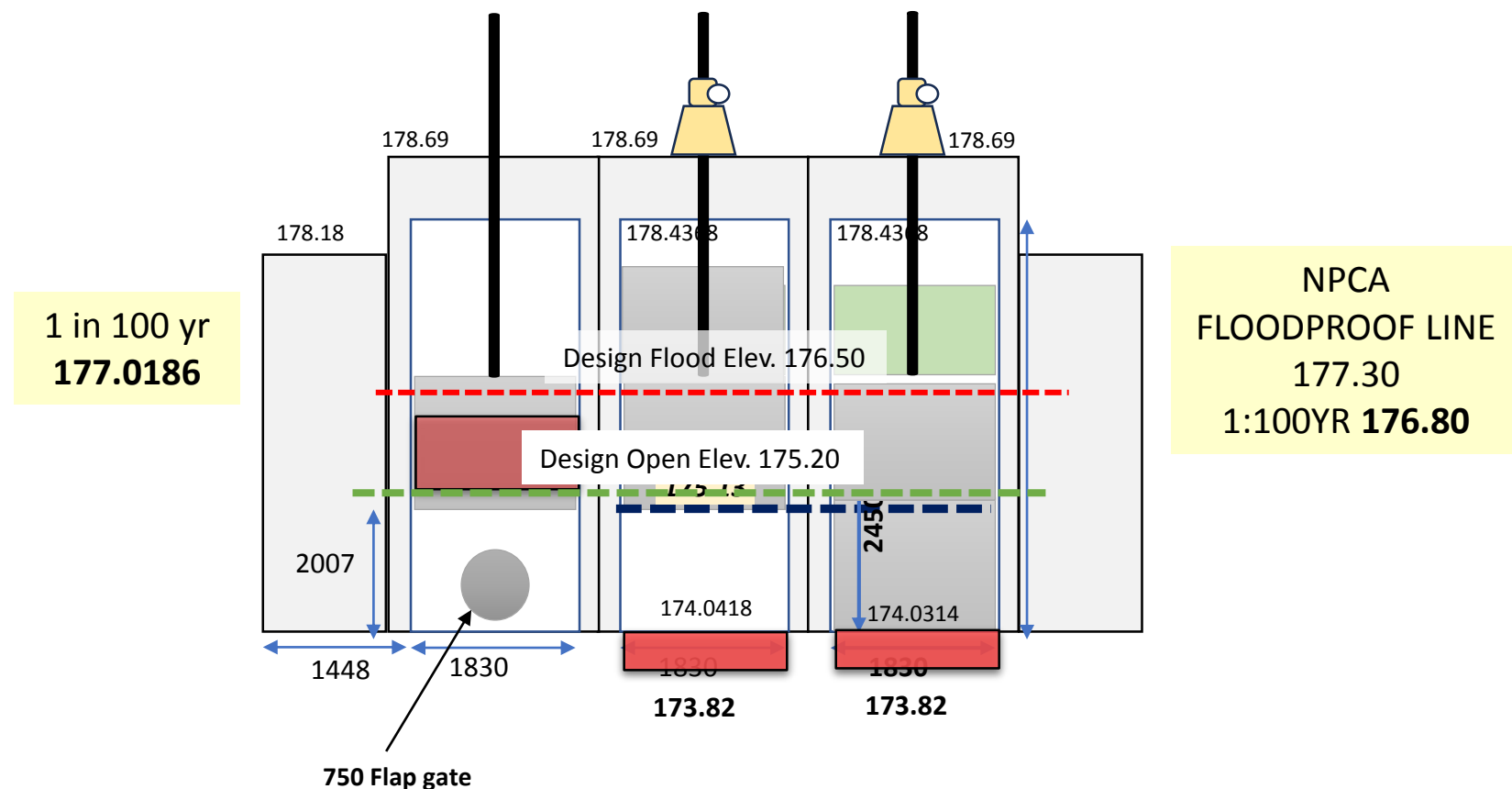
- Existing Gate Status
  - Gate mech. movement is working
  - Gate closed to predicted flood height – Faulty
  - Gate closed to seal against flood (bottom) – Faulty
  - Gate open to predicted flood elevation - Faulty
  - Gate movement – manual control / no remote operation, no limit on movement. Operator only
- Gate Performance is operator dependent
  - Response time target – 30 minutes





# Wignell Gate Deficiencies & Resolutions

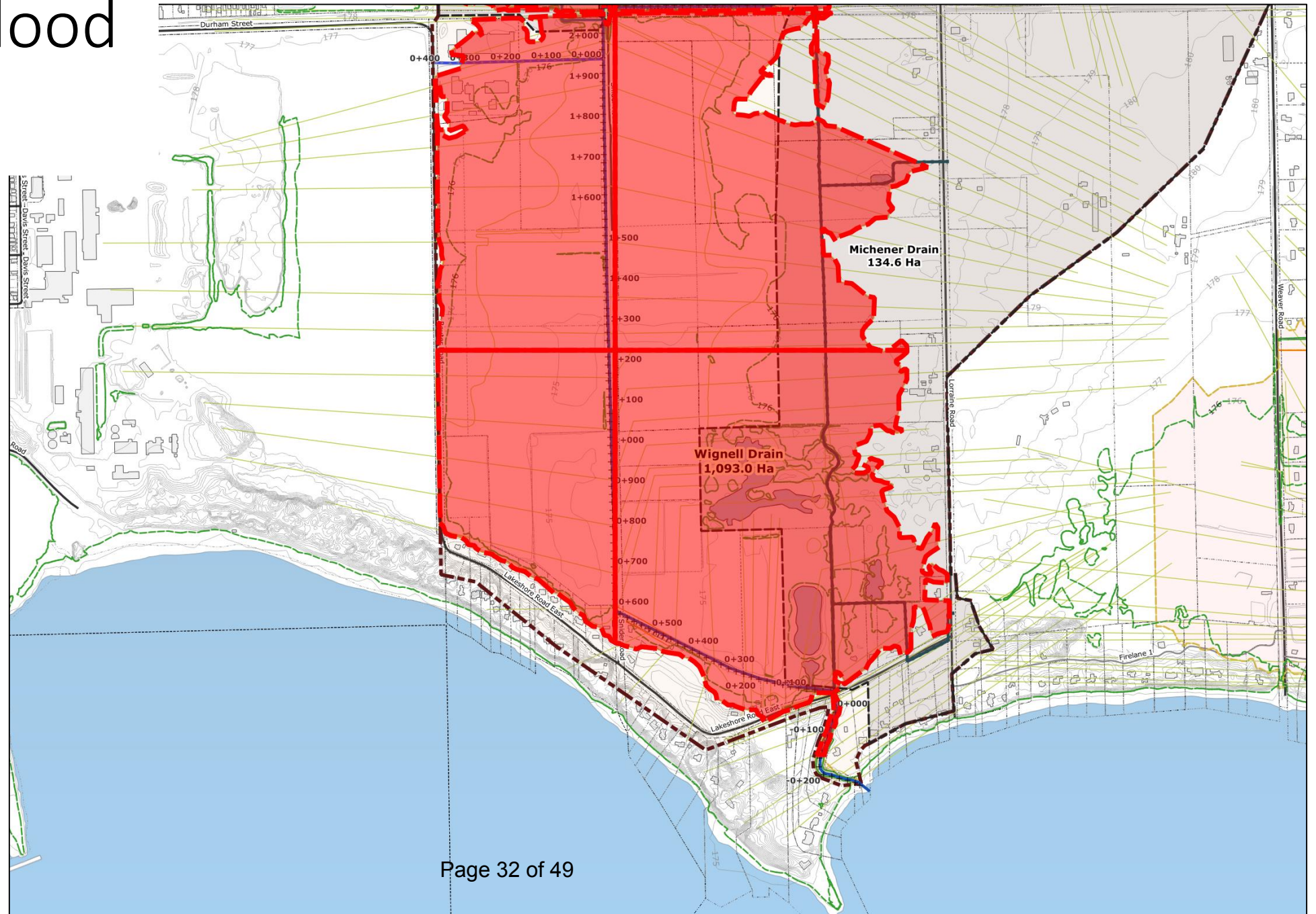
1. Gate close and seal to bottom of drain.
2. Gate close top at proposed flood elevation.
3. Gate open to max. height
4. Pump > Floodproof line





# Upstream Flood condition

- 1:100 year rain event

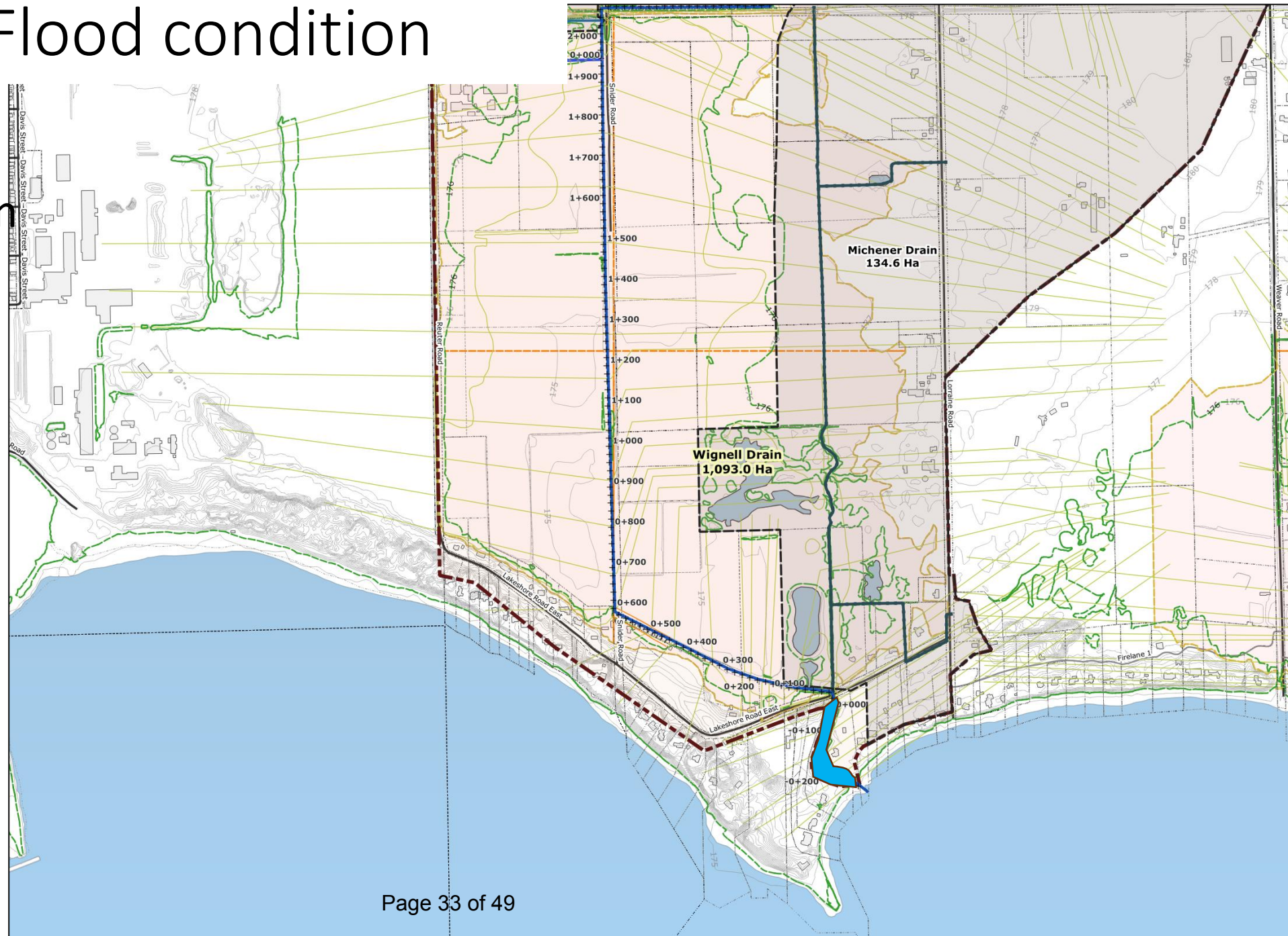




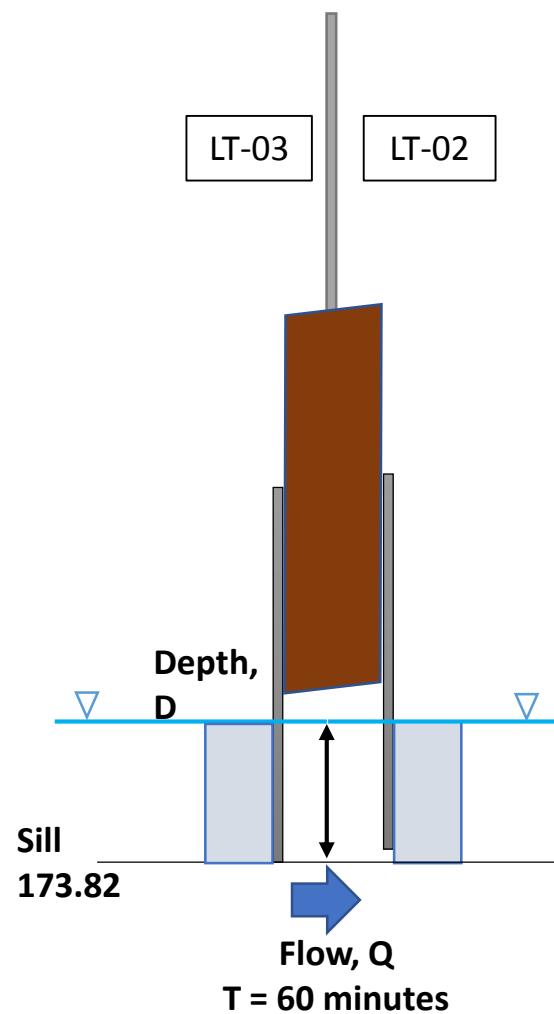
# Downstream Flood condition

- 1:100 year storm  
176.80m

Gate closed top  
176.50m



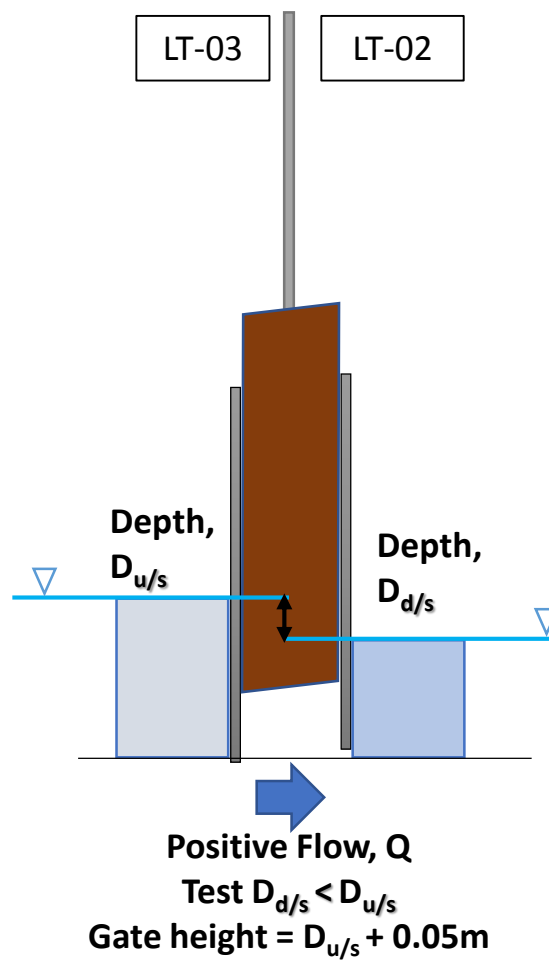
Initial position = open



Downstream Flow – Case 1



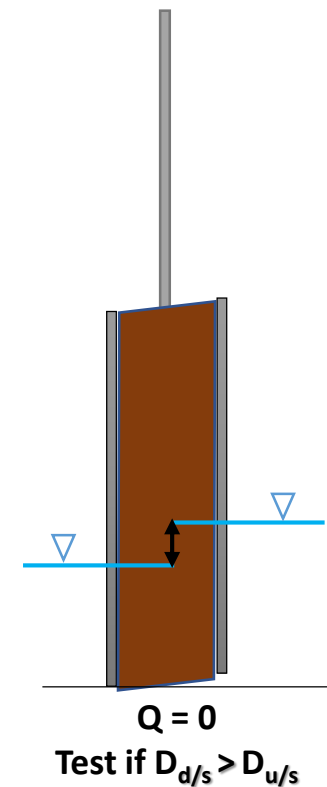
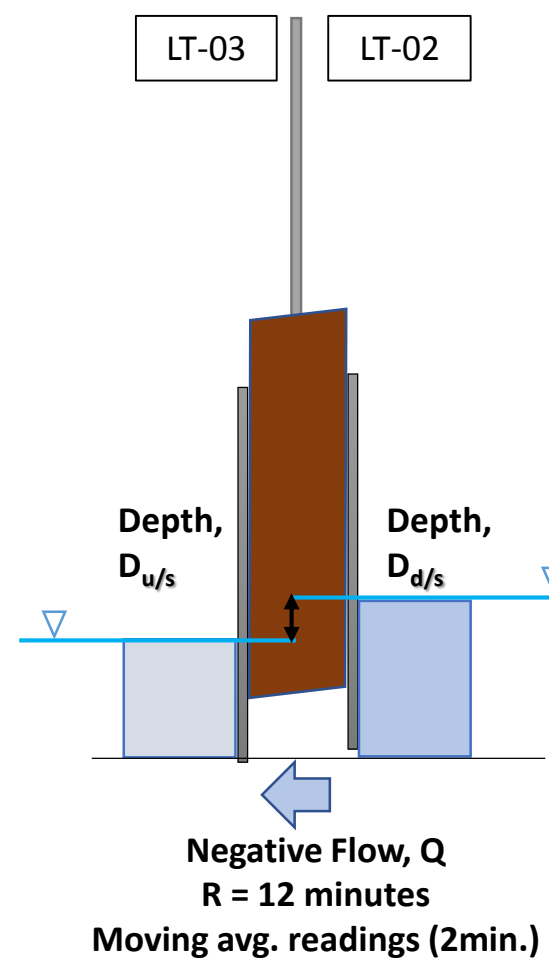
Action = **Open**



Lake Flow – Case 2



Action = **Close**



Test time interval,  $T =$

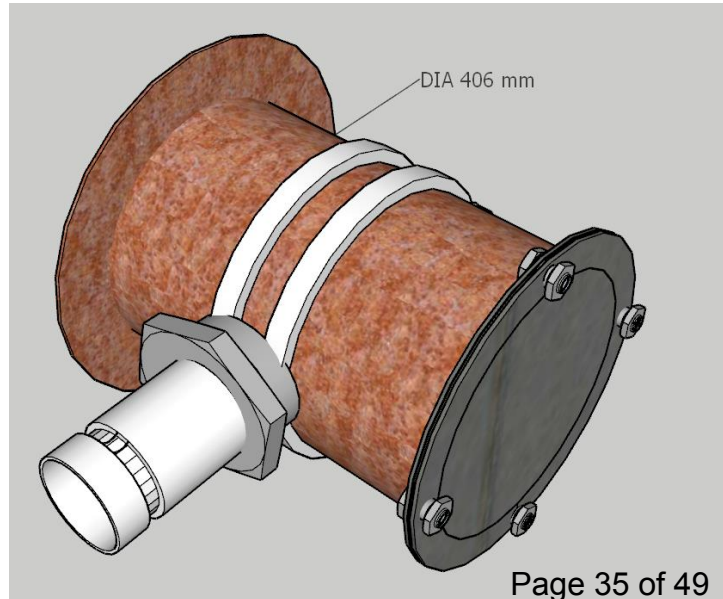
30 minutes

$R + 12 \text{ minute (5/hr)}$



# Wignell Pumping

- Existing vs Proposed Pumping Platforms
  1. In line submersible pumping
    - Abandon and remove all pipes and supports
  2. Wet well with electric centrifugal pump
    - Abandon in place without any removals.
  3. Temporary pumping to discharge pipe.
    - Improve and use on a requested / required basis.





# Gate Automation

**Before**



**After**



# Project Budget

# Wignell Project Budget

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## Estimated Cost of Construction

Construction Cost Estimate	\$748,896.50	
Construction Management Costs	\$68,259.18	
Contingency	\$149,779.30	
		<b>\$966,934.98</b>

## Previous Construction Works Completed but not Assessed

2007 Erosion Works - Bank Protection		
Construction	\$241,254.46	
construct a Wignell Access Lane	\$3,168.60	
		<b>\$244,423.06</b>

## Eligible Administration Costs

Administration Costs	\$363,712.21	
Administration Cost Allocations (debenture)	\$17,209.32	
incl. 2007 construction eng.	\$32,098.76	
		<b>\$413,020.28</b>

## Drain

## Allowances

\$17,899.84

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## Forecasted Total Costs

**\$1,642,278.16**

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# Administration and Engineering

## ADMINISTRATION

Debenture Interest - 2007 to 2017	\$29,827.92	\$17,209.32
Debenture Administrative Fee	\$ 6,065.29	\$3,499.39
HST on engineering		\$8,031.18

**\$28,739.89**

## ENGINEERING

Survey, Design, Plans, Engineer's Report and Assessment Schedule (Wiebe)*1		\$53,374.78
Survey, Design, Plans, Engineer's Report (AMEC)*2		\$19,370.41
Survey, Design, Plans, Engineer's Report and Assessment Schedule (EWA)		\$208,579.62
CofPC CAD Work 2020 - 2023		\$50,147.50
Tribunal Costs (not estimated and assumed to be zero)		\$0.00
Tendering, Contract Administration and Construction Inspection (estimated)		\$3,500.00

**\$334,972.32**

**\$363,712.21**



# Construction Cost Estimate

## Section 4: Petition for sufficient outlet

Bower Drain	\$ 2,565.00	
Wignell Branch Drain #2	\$ 5,432.00	
Wignell Branch Drain #3	\$ 16,030.00	
		\$ 24,027.00

## Section 74: Drain Maintenance

Wignell Gate Maintenance	\$ 15,600.00	
Interval 2: 2+450 to 5+978	\$ 135,842.00	
Interval 5: 0+000 to 2+450	\$ 61,250.00	
		\$ 212,692.00

## Section 78: Drain Improvements

Wignell Gate Structure Improvements	\$ 388,155.00	
Interval 1: 5+978 to 6+918	\$ 95,692.50	
Interval 4: 0+020 to 0+380	\$ 28,330.00	
		\$ 512,177.50

Construction Mgmt Wignell Drain	\$ 68,259.18	
Contingency Allowance, (20%)	\$ 149,779.30	

# Project Assessment

# Assessment Principles

## Allowances

- All land has the same valuation; \$ 22,000 per hectare (\$10,000 /acre)
- Land Taken for Drainage (Section 29)
  - Drain Top Width (Design)
- Land for Work Zones (Section 29)
  - Value is apportioned based on frequency of maintenance. (1 every 20 years)
- Damages (Section 30)
  - Only paid on crop damages or commercial impacts
  - No payment with restoration
  - No payment on trees removed for drainage. 2 trees for 1 replacement program to enhance tree canopy.

# Assessment Principles – Conversion

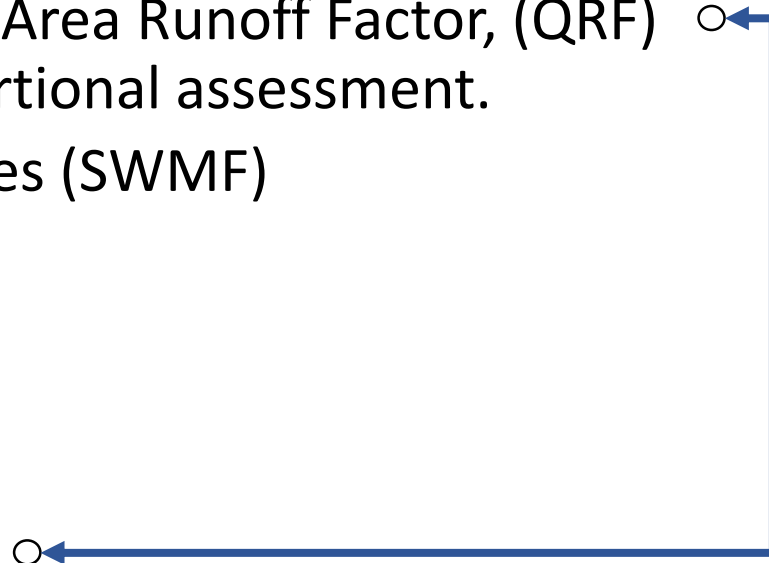
Allowances – cont.

- Section 31 – compensate owners for private drains incorporated into a municipal drain.
  - Branch Drains that are providing an outlet for Right of Way and upland drainage.
  - Private Drains to remain not included for compensation.
  - Valuation is based on construction cost to create today.
  - Value is adjusted to reflect drain condition and any improvements that are required.



# Assessment Principles – 2

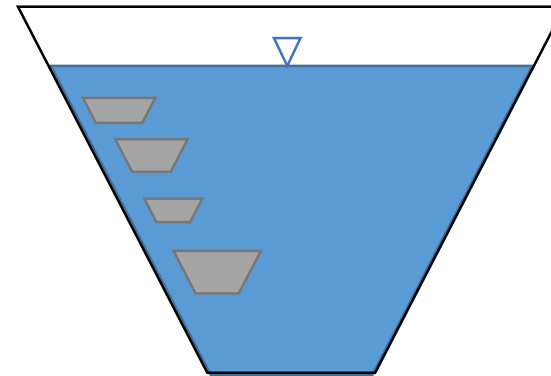
## Benefits

- Section 22 – Land improvement, Abutting Benefit
    - Benefit of open channel vs closed conduit
  - Section 23 – Outlet Liability, Outlet Benefit
    - Method of assessment is based on Equivalent Area Runoff Factor, (QRF) using basics of the Rational Method for proportional assessment.
    - Adjusted for Stormwater Management Features (SWMF)
  - Section 24 – Special Benefit
    - 50% of culvert cost of construction
  - Section 26 – Roads, Utilities
    - Assessment for contribution to drainage costs.
- 

# Section 23 assessment

- Property #1:
  - 25 Ha
  - Predominately Clay soil, Farm, C=30
- Property #2
  - 0.22 Ha
  - Residential, C=25
- Property #3
  - 22.2 Ha
  - Unused Farm, C=30

- Peak Flow is apportioned to each contributing property.

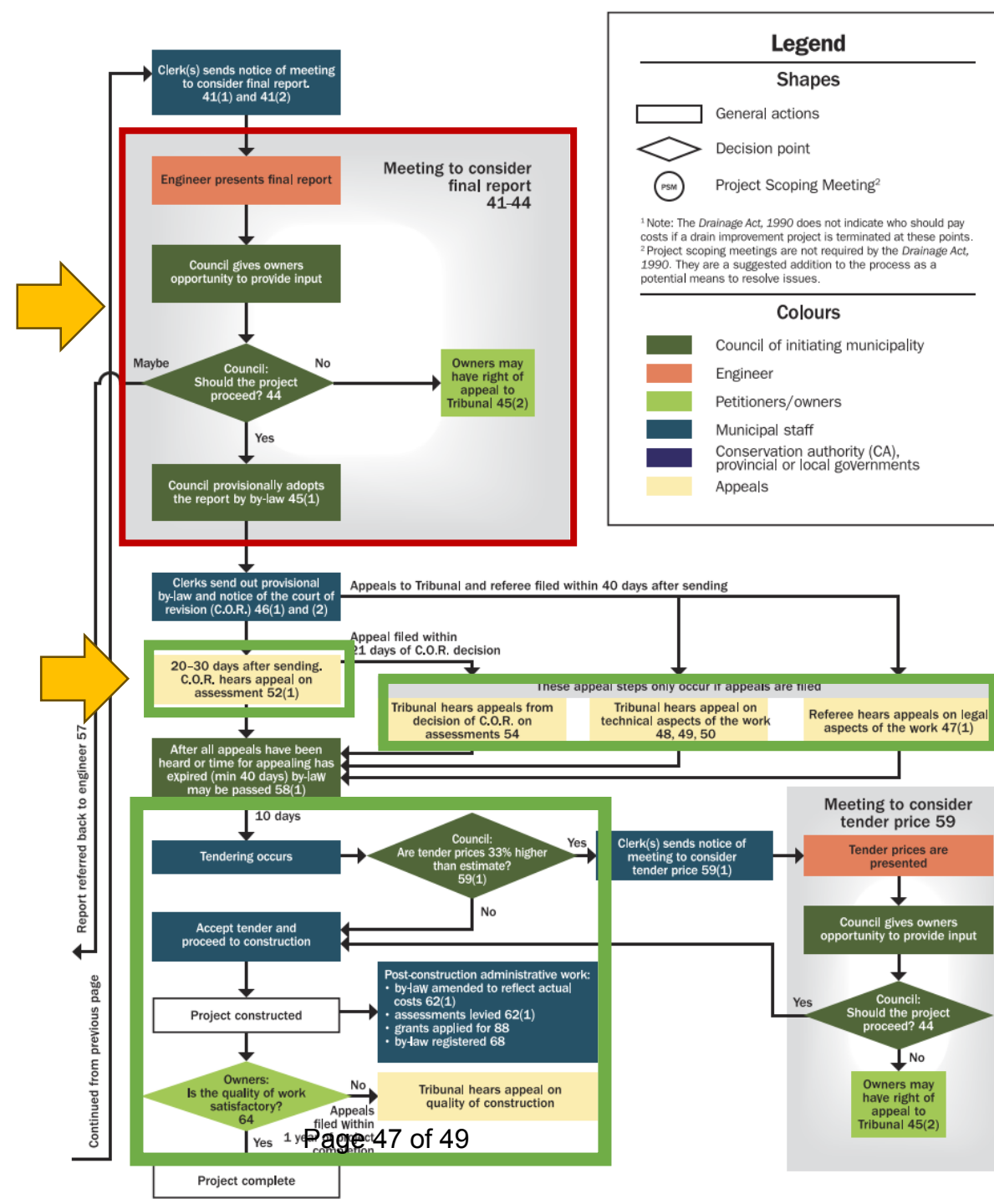


- $QRF = A \text{ (ha)} * C * I \text{ (mm)}$
- $QRF \text{ Ratio} = QRF \text{ P\#1} / QRF \text{ Total}$

# Wignell Drain Report Project Summary

- Past work from 2007 (concrete block wall) included in the assessment.
- Petition 4 request by road authority for Branch Drains (3)
- Section 74 work to clear existing Wignell Drain as maintenance
- Section 78 Drain Improvements:
  - Bank Restoration & Improvement Program (BRIP)
  - Drain re-alignment for PCQ expansion; 5+595 to 6+922
  - Sediment Basins (2)
  - Outlet Access reserve + Access Gravel Lane to outlet
  - Outlet Gate Improvement + automation with gate movement and portable pump deployment.
- Report prepared in compliance with the Drainage Act of Ontario

# What's next?





# Thank you

Project Questions?

