

**WELCOME**

**Lowland Dyking Stakeholder Annual Meeting**

January 18, 2023

# Agenda

- Meeting History
- Special Guests
- Staff Introductions
- Posters
- Staff Presentations
  - Flood Control Video
  - Operations Updates, Q&A
  - Drainage Planning Updates, Q&A
  - Coastal Flood Adaptation and DMAF Project Update, Q&A
- Staff available for individual questions after meeting
- Presentation slides will be available at

[www.surrey.ca/services-payments/water-drainage-sewer/flood-control-prevention](http://www.surrey.ca/services-payments/water-drainage-sewer/flood-control-prevention)

# Lowland Flood Control Overview Video



# Lowland Dyking Stakeholder Annual Meeting

## January 18, 2023

### 2022 Works

- Mowing Program
- Flood Box Program
- Sea Dam Maintenance
- Ditch Maintenance
- Surrey Lake Silt Trap
- Upper Serpentine Silt Trap
- Construction (Dyke Upgrades)
- Irrigation

### 2023 Works

- Mowing Program
- Flood Box Program
- Sea Dam Maintenance
- Ditch Maintenance
- Surrey Lake Silt Trap
- Upper Serpentine Silt Trap
- Construction (Dyke Upgrades)
- Irrigation
- Tree Removal
- Dyke Biannual Survey

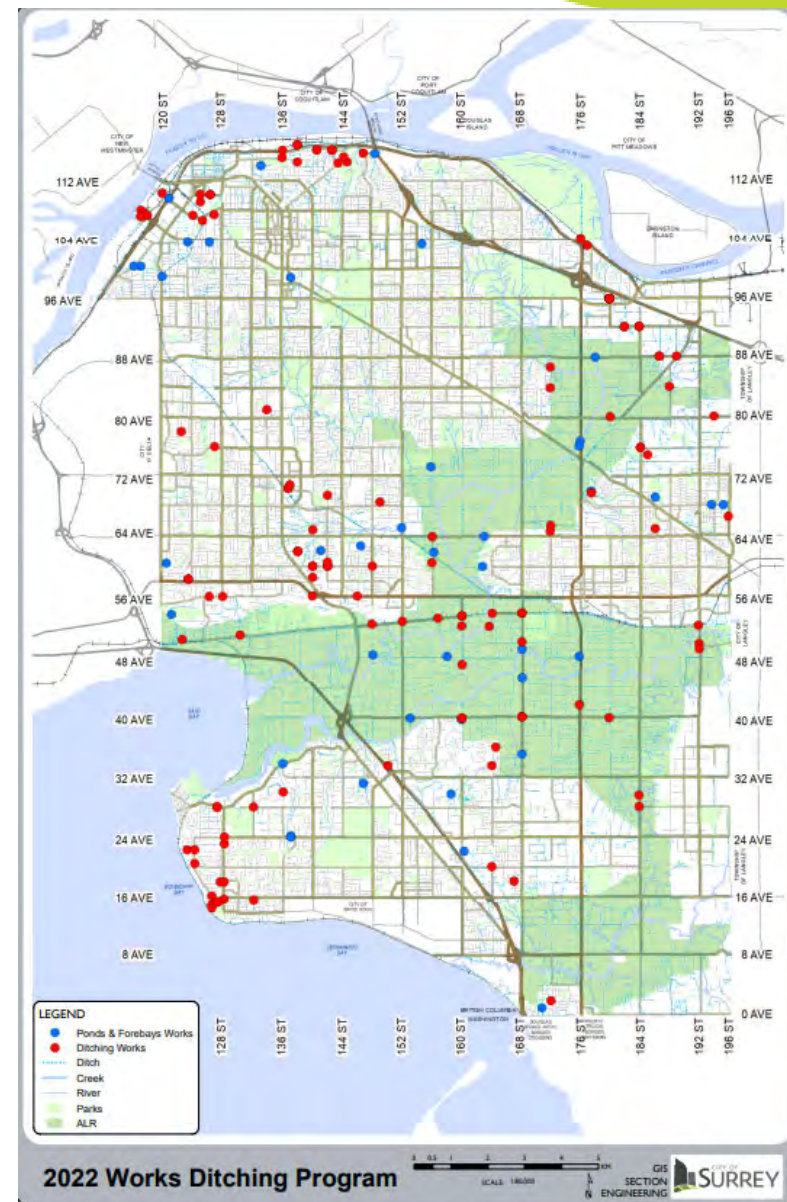
## 2022 Sea Dam Maintenance Program

- Replaced one sea dam gate on the Serpentine;
- Diver inspected sea dams in September;
- Crack sealing completed at both sea dams.



## 2022 Ditch Maintenance

- 18,000 metric tonnes, (3,000 truck loads) of ditch material disposed offsite
- Cleaning of Ditches
  - 27,500 metres completed
- Cleaning of Forebays (13 completed) and Detention Ponds (8 completed)



## 2022 Silt Removal

As part of our inspection efforts, the south end of Surrey Lake silt trap and the Upper Serpentine silt trap were identified as requiring cleaning. We subsequently cleaned by end of September.

Upper Serpentine



Surrey Lake



## 2022 Flood Box Maintenance Program

- Completed maintenance on flood boxes;
- Flood box marking program

Before Maintenance



After Maintenance





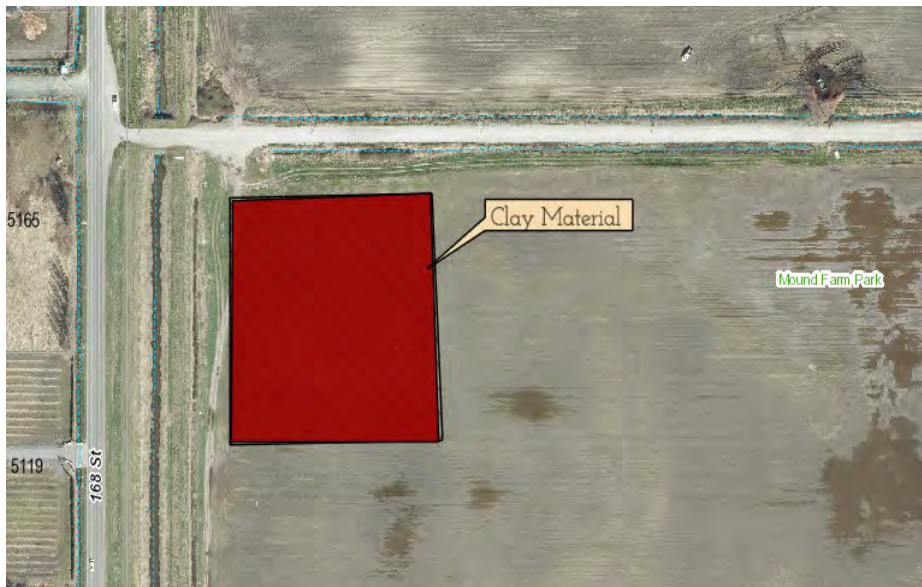
# 2022 Construction Program

## *Flood Box Replacements*

- Completed 6 floodboxes

## *Dyke Construction*

- Mound Farm Stockpile
- Dyke Upgrades



## 2022 Construction Program

### *Dyke Construction*

- Upper Serpentine Dyke Improvements (88 Avenue and 176 Street)

### Spillway Improvements

- Fry's Corner (Fraser Hwy and 176 Street)



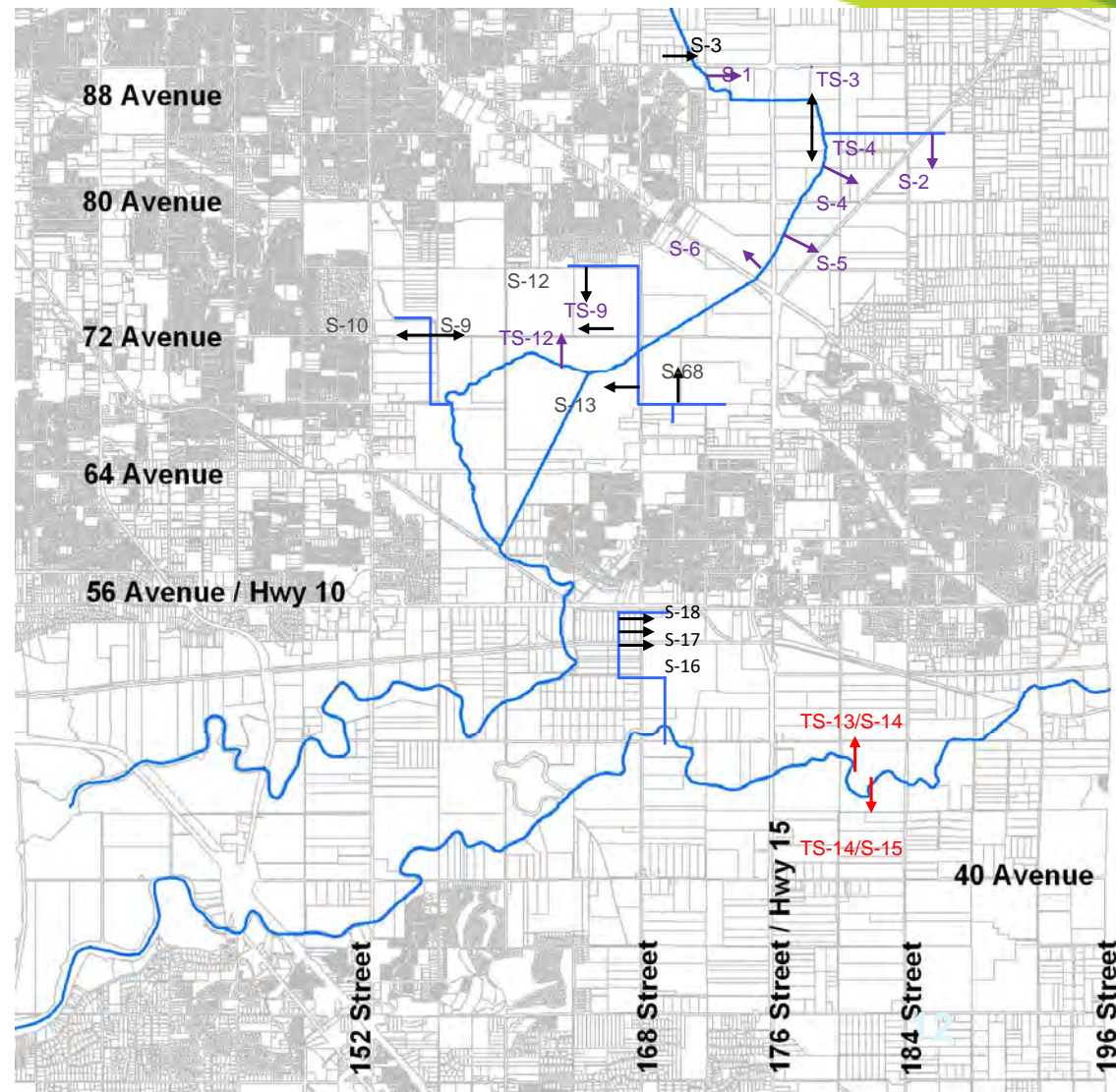
## 2022 Irrigation

Maintained irrigation operations in the three irrigation service areas of Erickson, Burroughs and Old Logging Ditch.



# Serpentine and Nicomekl SPILLWAY OVERVIEW

- Spillways necessary for the integrity of the dyke network
- Locations based on historical flooding and allow all areas to benefit from extensive dyke upgrades
- 10 spillways raised in 2021/22 (purple)
- 2 spillways to be adjusted to ultimate height in future (red arrows)
- Remaining temporary spillways are above the 15 year return level and will be removed as adjacent dyke is topped up for settlement



## 2022 Pumps and Controls

**Pumps and Controls maintains all PRVs, Water Pump Stations, Sanitary Lift Stations and Drainage Pump Stations**

**For Drainage, we maintain**

- **31 Drainage Station**
- **8 Drainage Monitor Station**



## 2022 Pumps and Controls Maintenance

All stations are monitored on our SCADA system. Some of the data we get include:

- Hydro Failures
- Alarms
- Ditch and River Levels
- Flows
- Security
- Pump statuses
- Pump Runtimes
- Power issues
- Trash Rack Blockages

## 2022 Pumps and Controls Maintenance



## 2022 Pumps and Controls Maintenance

In 2022, some of the maintenance items include:

- 109 Electrical Inspections
- 83 Mechanical Inspections
- 36 Pump Repairs/Overhauls
- 44 Flow System Inspections
- 121 Demand Repairs
- 21 Gearbox Repairs
- 452 Alarm responses
- 978 Operational inspections for Trash rack Clearings and Grounds maintenance

Questions: Vic Liu, Manager Pumps and Controls

[vwliu@surrey.ca](mailto:vwliu@surrey.ca)

(604) 590-7214



## Annual Rainfall Accumulations

Year	Annual Rainfall (mm)
<b>2009</b>	<b>1,326.8</b>
2010	1,475.5
2011	1,326.5
2012	1,494.0
2013	1,204.0
2014	1,440.0
2015	1,276.0
2016	1,377.0
2017	1,388.0
2018	1,327.0
2019	1,145.0
2020	1,610.0
<b>2021</b>	<b>1,551.0</b>
2022	1,290.0
58 Year Average	1,309.3

### Spillway Activation Hours

2008-2009 = 127

2021-2022 = 36

## Proposed 2023 Flood Box Program

For our 2023 Flood box program:

- Continue our maintenance program;
- Improve access to flood boxes using step structures;
- Continue flood box marking program;
- Boat inspection and further assets will be inventoried;
- Continue to build inventory of replacement parts;
- Continue flood box replacement program.



## Proposed 2023 Sea Dam Maintenance

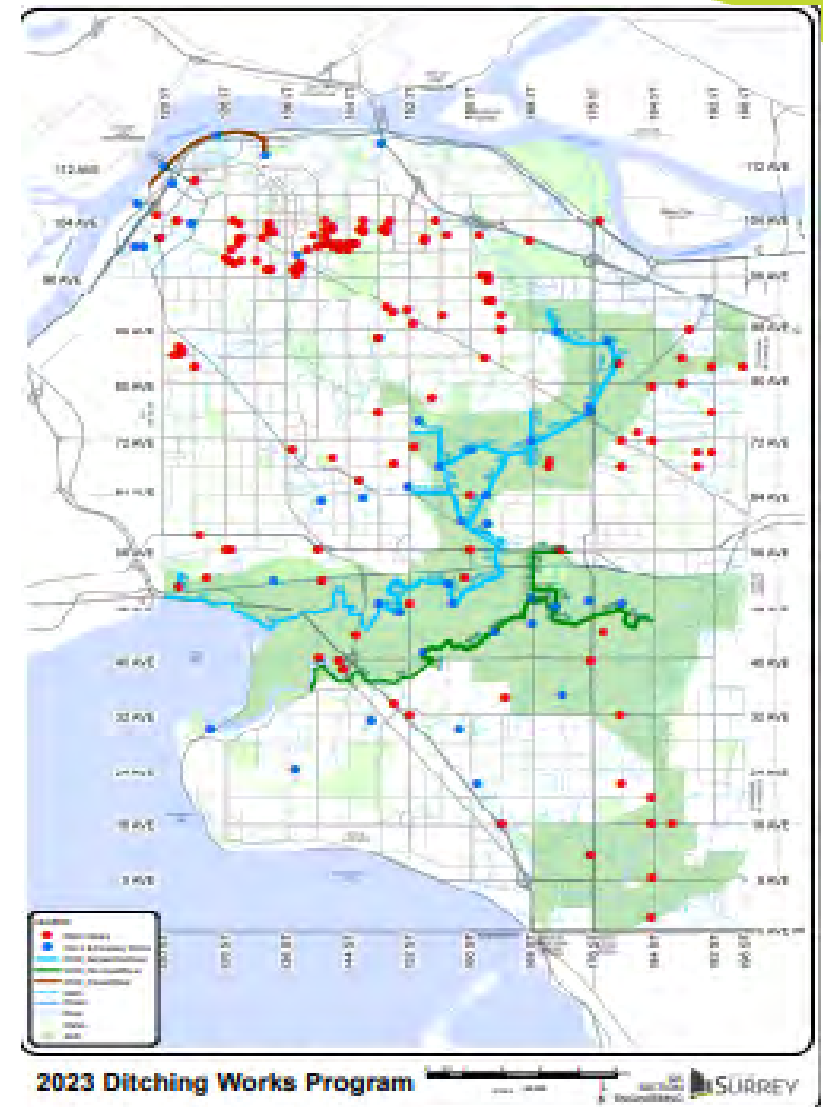
- Initiate an annual gate restoration program;
- Diver Inspection;
- Complete works as per inspection.



## Proposed 2023 Ditch Maintenance

Important part of our program is side casting.

- Cleaning of Ditches
- Cleaning of Forebays and Detention Ponds



## 2023 Mowing & Tree Removal Programs

- Mow approximately 100 kms.
- Continue tree removal as required.



# Dyke Biannual Survey

We will complete a survey of all dyke crests, excluding private dykes.



## 2023 Goals: Summary

- Mowing approximately 100 kms of dykes and tree removal;
- Continue flood box improvements;
- Replace one sea dam gate;
- Complete ditching ;
- Monitor Upper Serpentine silt trap and Surrey lake silt trap;
- Complete Irrigation Activities as required.

**Questions?**



# Drainage Planning

- Drainage Servicing in the Lowlands
  - Level of Service
  - Strategic Plan
- Functional Plans
  - Implementation Status
  - Future Updates
- Fill Impacts on Floodplain Storage

# City's Drainage Policy



Convey Minor System Flows  
(5-Year Event)



Convey Major System Flows  
(100-Year Event)



Provide Stormwater Detention



Follow ARDSA Criteria (Lowlands)

### **Dormant Period**

(November 1 – February 28)

- Remove runoff from the 10-year, 5-day storm within 5 days

### **Growing Period**

(March 1 – October 31)

- Remove runoff from the 10-year, 2-day storm within 2 days

### **Between Storm Events**

- Maintain base flow in channels at 1.2m below field elevation

## Recent Storm Events

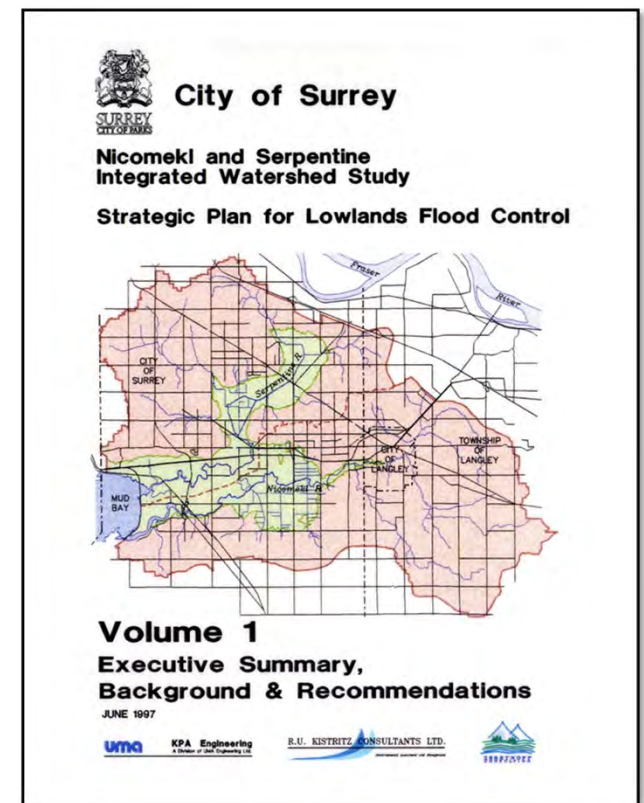
- Amount of rain, timing and tides and antecedent conditions all impact degree of flooding
- Staff review and analyze storms against detailed information recorded at pump stations, field observations/photos and service requests
  - Aerial photos collected during significant events
- Past 2 winters had large storms causing lowland flooding
- Winter 2021/22: three large back-to-back storms (atmospheric rivers)
  - Each storm had a break from intense rain for at least 5 days
  - Aerial Photos collected at end of rainfall and after 5 days
  - Largest storm was 4% greater than the ARDSA Event
- Winter 2022/23 single large event was 12% smaller than ARDSA but coincided with King Tides

### Summary:

ARDSA Winter Event:	172.3mm
Nov 15-17 2021 Rain:	178.9mm Peak tide: 2.02m
Dec 23-27 2022 Rain:	151.4mm Peak tide: 2.51m

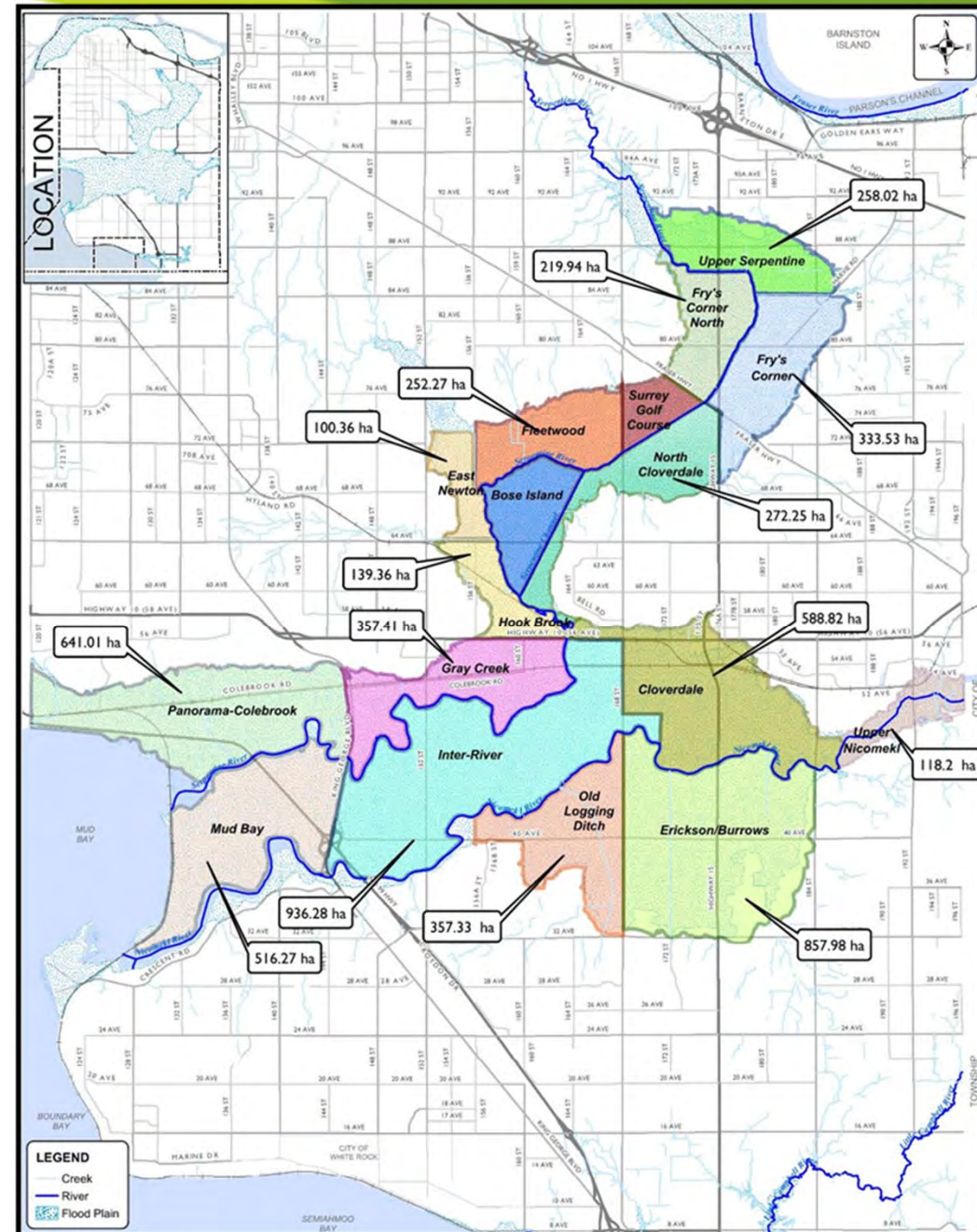
# Nicomekl & Serpentine Integrated Watershed Study Strategic Plan for Lowlands Flood Control (1997)

- Overarching Strategic Plan for Nicomekl and Serpentine lowlands
- Comprehensive flood control strategy
  - Dykes designed for 200-year event
  - Controlled overtopping at spillways at 15-year event
- Level of service – ARDSA



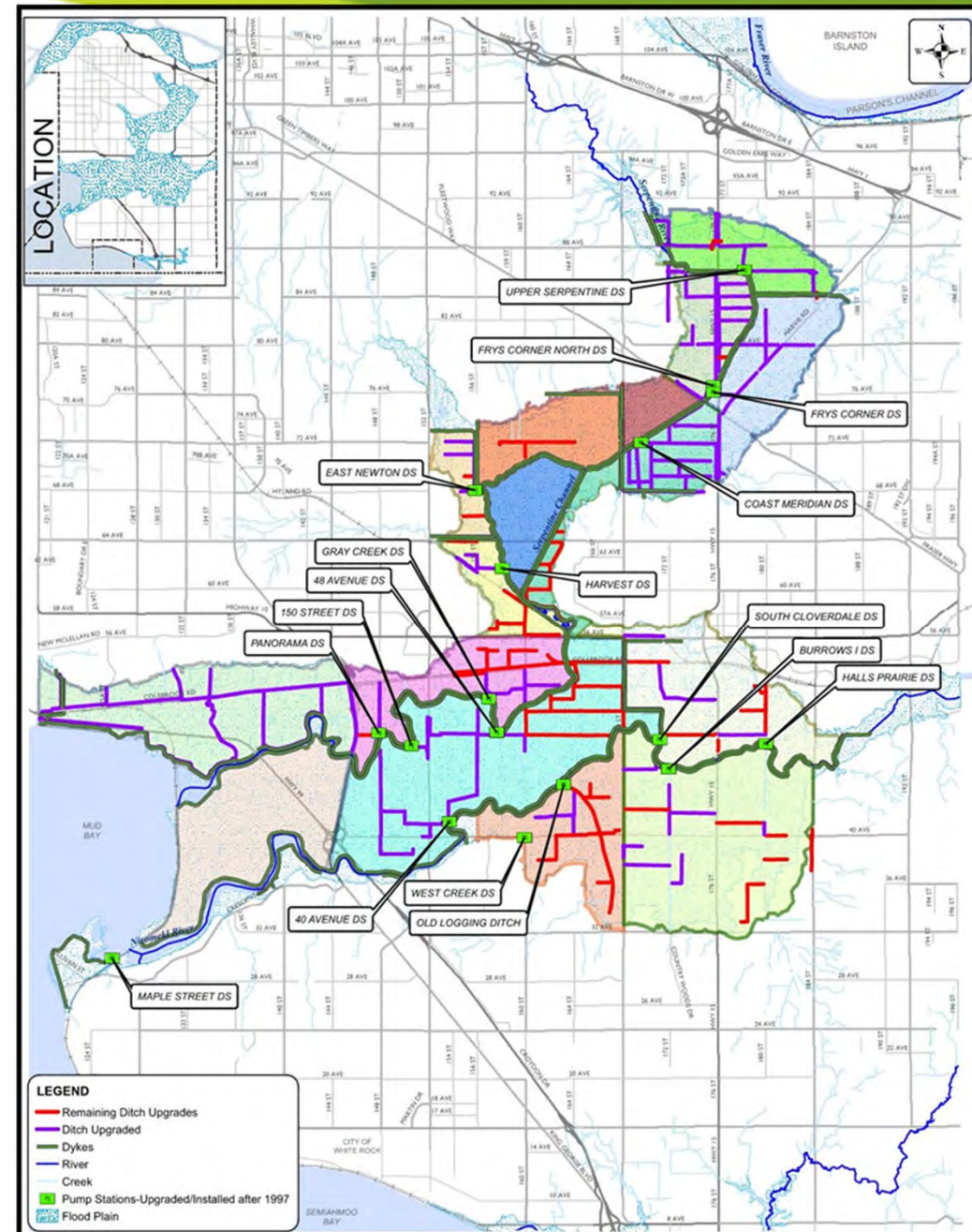
# Functional Plans

- Developed for individual sub-catchments to advance Lowland Strategy implementation
- Functional Plans identified:
  - Required drainage improvements
  - Implementation strategy (including costs)
  - Property requirements



# Functional Plans

- Majority of Functional Plan recommended works have been completed
- Outstanding works:
  - Pump stations (new / upgrade)
  - Conveyance network (new / upgrade)
  - Dyke raising
  - Spillway removal and raising
  - Formalization of Upper Nicomekl flood storage area
- Drainage improvement works implemented to date has supported bringing approximately 210 ha of fallow land into production since 1997



# Functional Plans

- Implementation challenges:
  - Isolated dyke failures
  - Elevation constraints at bridges
  - Shortage of suitable dyke material
  - Statutory right-of-way acquisitions
  - Increased land valuation
  - Ownership and associated land use changes
  - Land subsidence



- Future Updates:
  - Refresh the Lowland Strategic Plan (2023/2024)
  - Update the Erickson / Burrows Functional Plan (2023)
  - Pump Station Condition Assessment (underway)



# Filling in the Floodplain

- Lowlands drainage system relies on floodplain storage activation during times of high river flow
- Spillways along the dyke activate at a 15-year rainfall event
- Filling activities within the floodplain reduces the storage capacity of the floodplain area and can lead to more frequent and severe flooding in the lowlands
- Staff are seeing an increase in unpermitted soil deposits in the floodplain



## Filling in the Floodplain

- Soil removals and deposits are regulated under Surrey's Soil Conservation and Protection By-law No. 16389
- Soil removals and deposits require a Soil Permit before the work is done
- Some exemptions apply (see bylaw on City's website for details)

Soil Bylaw questions? Want to report a Soil Violation? Contact Lance Thompson, [LGThompson@surrey.ca](mailto:LGThompson@surrey.ca) or (604) 591-4736



## Questions?

Troy Jeklin, Superintendent, Dyking, Ditching and Irrigation  
Operations [TWJeklin@surrey.ca](mailto:TWJeklin@surrey.ca) (604) 590-7245

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Samantha Ward, Drainage Planning Manager  
[SWard@surrey.ca](mailto:SWard@surrey.ca) (604) 591-4326

# Coastal Flood Adaptation Strategy Implementation

## STUDY AREAS



- Proactive process started in 2016 to reduce climate change-driven coastal flood risk now and into the future (1 metre of sea level by 2100)
- Range of strategic actions were developed to help the City's coastal communities become more resilient to the challenges
- Council endorsed final strategy on November 4, 2019 (Corporate Report No. R212)
- City received a \$77 M grant in 2019 to implement priority projects set out in CFAS through the federal Disaster Mitigation and Adaptation Fund (DMAF)

# DMAF Status Update




- 1) Overview
- 2) DMAF Projects Completed
- 3) DMAF Projects Under Construction
- 4) DMAF Projects Under Design
- 5) DMAF Environmental Assessment Underway

# DMAF Projects Overview



#	Component	Asset Type
1	Colebrook Dyke Upgrades	Coastal Dyke
2	Colebrook Drainage Pump Station Replacement	Drainage Pump Station
3	Sea Dam – Serpentine River	Sea Dam (drainage and irrigation)
4	152 St Road Upgrades and Raising	Transportation Network
5	Nicomekl Riverfront Park - Phase 1	Flood Storage
6	King George Boulevard Bridge and Nicomekl River Sea Dam Replacement	Arterial Bridge
7	Crescent Beach Storm Sewer System Upgrades - Perforated Piping	Flood Protection
8	Dyking - Lower reaches of Nicomekl and Serpentine	Flood Protection
9	Serpentine SRY Rail Link Bridge Replacement and Dyking	Flood Protection
10	Burrows Drainage Pump Station Upgrade	Drainage Pump Station
11	Stewart Farm Sanitary Pump Station Coastal Flood Proofing	Sanitary Sewer Network
12	Campbell River Pedestrian and Emergency Access Bridge Replacement	Transportation Network
13	Foreshore Enhancements	Flood Control

**Hazard Mitigation**

 = flood    = seismic    = drought

\* Second Location in Delta between 88 and 95 St on Boundary Bay

# **DMAF Status Update**

Completed DMAF Projects:

- 1) Burrows Pump Station Upgrades (2022)
- 2) Southern Railway of BC Serpentine Bridge (2020)
- 3) Stewart Farm Pump Station Upgrades (2020)

# Burrows Pump Station Completed (2022)





# Southern Railway Bridge Completed (2020)



# Stewart Farm Pump Station Completed (2020)



# DMAF Status Update

## DMAF Projects Under Construction:

- 1) Colebrook Dyke
- 2) Mud Bay Park Dyke
- 3) King George Blvd Nicomekl Bridge
- 4) Crescent Beach
- 5) Colebrook Pump Station

## DMAF Projects out for Tender (2023 Construction Start):

- 1) 152 St Road Upgrades
- 2) Living Dyke (Pilot Phase)

# Under Construction Colebrook Dyke



# Under Construction Mud Bay Park Dyke (Part of Colebrook Dyke)



# Under Construction King George Blvd Nicomekl Bridge



# Under Construction Crescent Beach Storm Sewer



# Under Construction Colebrook Pump Station





# Out of Tender Living Dyke Pilot

Pilot Construction (2023)



Monitoring and Adaptive Management (2023-2026)



# Out for Tender 152 St Road Upgrades



# Upcoming Projects

DMAF Projects in Lowlands under Design

- 1) Nicomekl Sea Dam Replacement
- 2) Serpentine Sea Dam Replacement
- 3) Nicomekl Riverfront Park
- 4) Living Dyke Project Phase 2 and Environmental Assessment

# Environmental Assessment Required for Living Dyke Phase 2



- Major projects required to be assessed by BC's Environmental Assessment Office (EAO) for potential environmental, social, economic, health and cultural effects
- EAO requires projects to “seek consensus” with participating Indigenous governments
- First City led project to trigger a BCEAO review



You are invited to attend the BC EAO  
In-person Open House:

Date: Thu, Jan 26, 2023

Time: 3:00 pm – 6:00 pm

Location: Surrey City Hall,  
Community Room (13450, 104 Ave)

You are invited to attend the BC EAO  
Virtual Presentation and Q&A:

Date: Wed, Feb 1, 2023

Time: 12:00-1:30 pm

Register for Zoom Meeting at  
<http://gov.bc.ca/EAOPublicComments>



## DMAF Questions?

General Enquiries

[coastal@surrey.ca](mailto:coastal@surrey.ca)

(604)591-4146

DMAF Enquiry	Project Supervisor Contact
Dyking, Bridges and Roadworks	Tindi Sekhon <a href="mailto:thsekhon@surrey.ca">thsekhon@surrey.ca</a> (604) 591-4765
Sea Dams	Akber Pabani <a href="mailto:akber.pabani@surrey.ca">akber.pabani@surrey.ca</a> (604) 591-4401
Parks	Mickey Sjoquist <a href="mailto:mickella.sjoquist@surrey.ca">mickella.sjoquist@surrey.ca</a> (604) 592-7033
Environmental Assessment	Miriam Marshall <a href="mailto:miriam.marshall@surrey.ca">miriam.marshall@surrey.ca</a> (604) 598-5830

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## Thank You

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