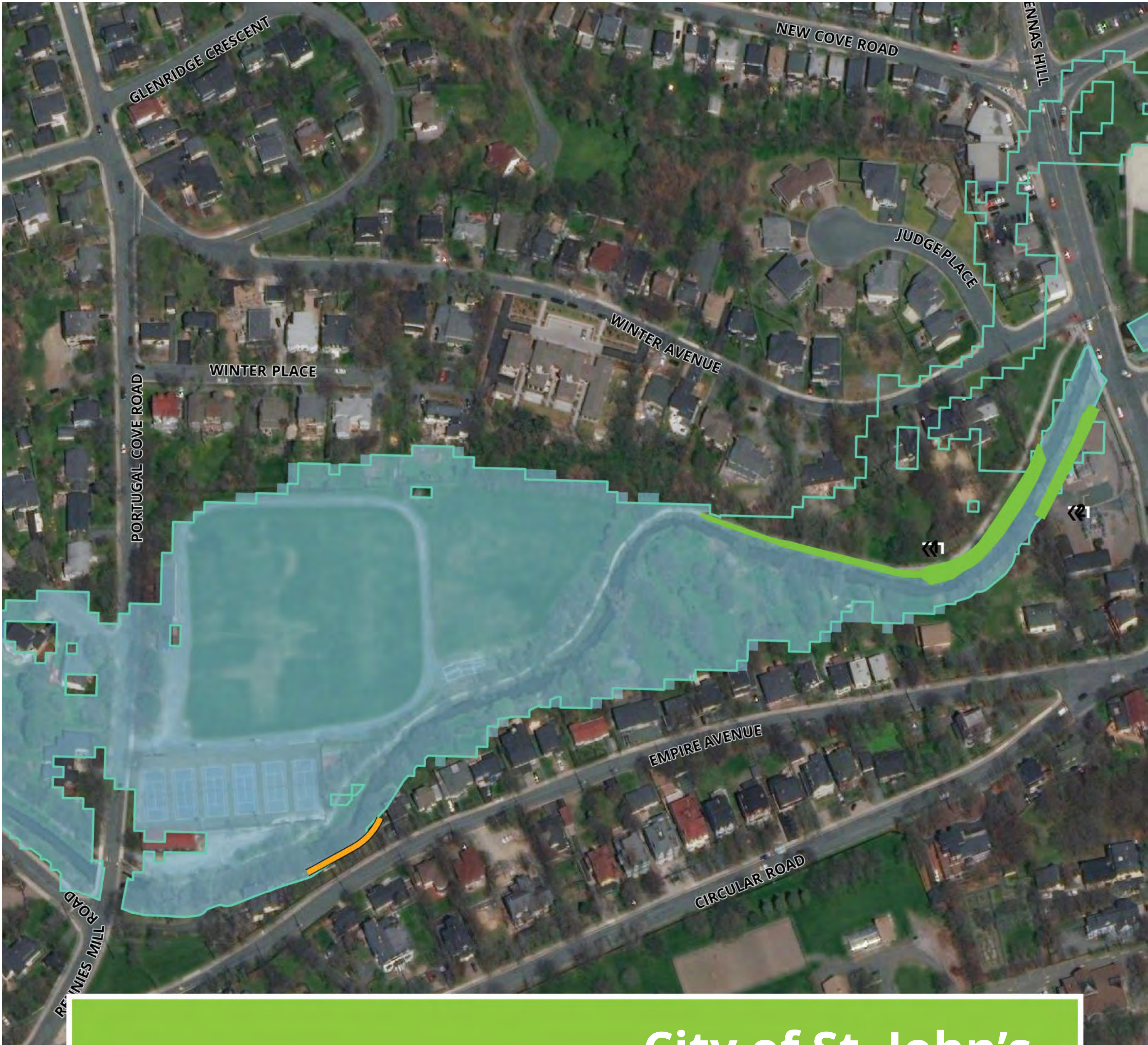


City of St. John's

Rennies River Flood Mitigation

Portugal Cove Road to Kings Bridge Road

Environmental Preview Report

CBCL

ST. JOHN'S

Project No. 213032 • September 2022

Memo

Date	01/19/2021
Memo to	Scott Winsor
Project name	Rennies River Flood Mitigation Environmental Assessment Registration Document
Subject	Rennies River Flood Mitigation - Winter Avenue
From	Jennifer Bursey
Copies to	Melissa Rutherford and Greg Sheppard

On December 10, 2020 the City of St. John's (City) requested that CBCL Limited (CBCL) examine the extent of flooding resulting from a 1:100 annual exceedance probability (AEP) climate change (CC) flood if berms are constructed between Kings Bridge Road and Portugal Cove Road. This scope of work builds on the analysis presented in the March 2, 2020 Report; therefore, the flood protection scenario presented in this memo is referred to as Scenario 9. Scenario 9 examines the following flood protection measures:

- Without Long Pond weir, with Health Sciences flood protection berms, and with flood protection berms along Rennies River between Kings Bridge Road and Portugal Cove Road.

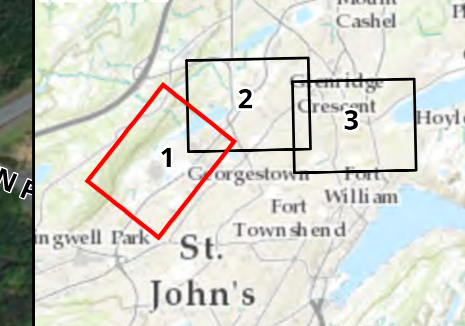
The analysis was carried out using the XSPWMM model created for the March 2, 2020 analysis. The flood protection berms upstream of Kings Bridge Road will consist of berms in the left (i.e. North) and right (i.e. South) river banks. The north berm as entered in the model, extends approximately 260 m upstream of Kings Bridge Road, and varies in height from approximately 0.1 m to 2.2 m. The south berm is shorter than the north berm, extending upstream from Kings Bridge Road roughly 58 m varying in height from 0.2 m to 0.5 m. The south berm will protect the electrical substation from flooding during a 1:100 AEP CC flood. The north berm will prevent flooding onto Winter Avenue and Kings Bridge Road, as well as onto the King George the V soccer field during flow corresponding to a 1:100 AEP CC event.

Flood protection berms were proposed for these locations during the RRCSWMP in 2014, as priority 2. The objective of the improvements proposed in the RRCSWMP were to protect all properties along Rennies River by containing flood levels in the channel. The Long Pond Weir was presented as priority 1, as constructing the weir first would reduce the flow downstream, thereby reducing the height of berms required downstream of Long Pond.

The City is moving through the Environmental Preview Report process for the Long Pond Weir. In the interim, the flood protection berms presented for this project will provide protection to the residential properties on Winter Avenue.

The expected floodplain for Scenario 9 is presented in Figure 1. As discussed in the September 17, 2019, report the model results indicated that Prince Philip Drive, north of the bridge at Rennies River is overtopped during the 1:100 AEP CC flow. To address flow over Prince Philip Drive, an earth berm could be constructed in the location indicated on Figure 1. The structure would be approximately 115 m long, and range in height up to approximately 0.6 m.

KEY MAP



LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Berm Conditions)
- HSC Berms

ST. JOHN'S

Rennies River Flood Mitigation: Winter Avenue

Figure 1:
1:100 AEP CC Health Sciences Berms & Berms Between Kings Bridge Road & Portugal Cove Road

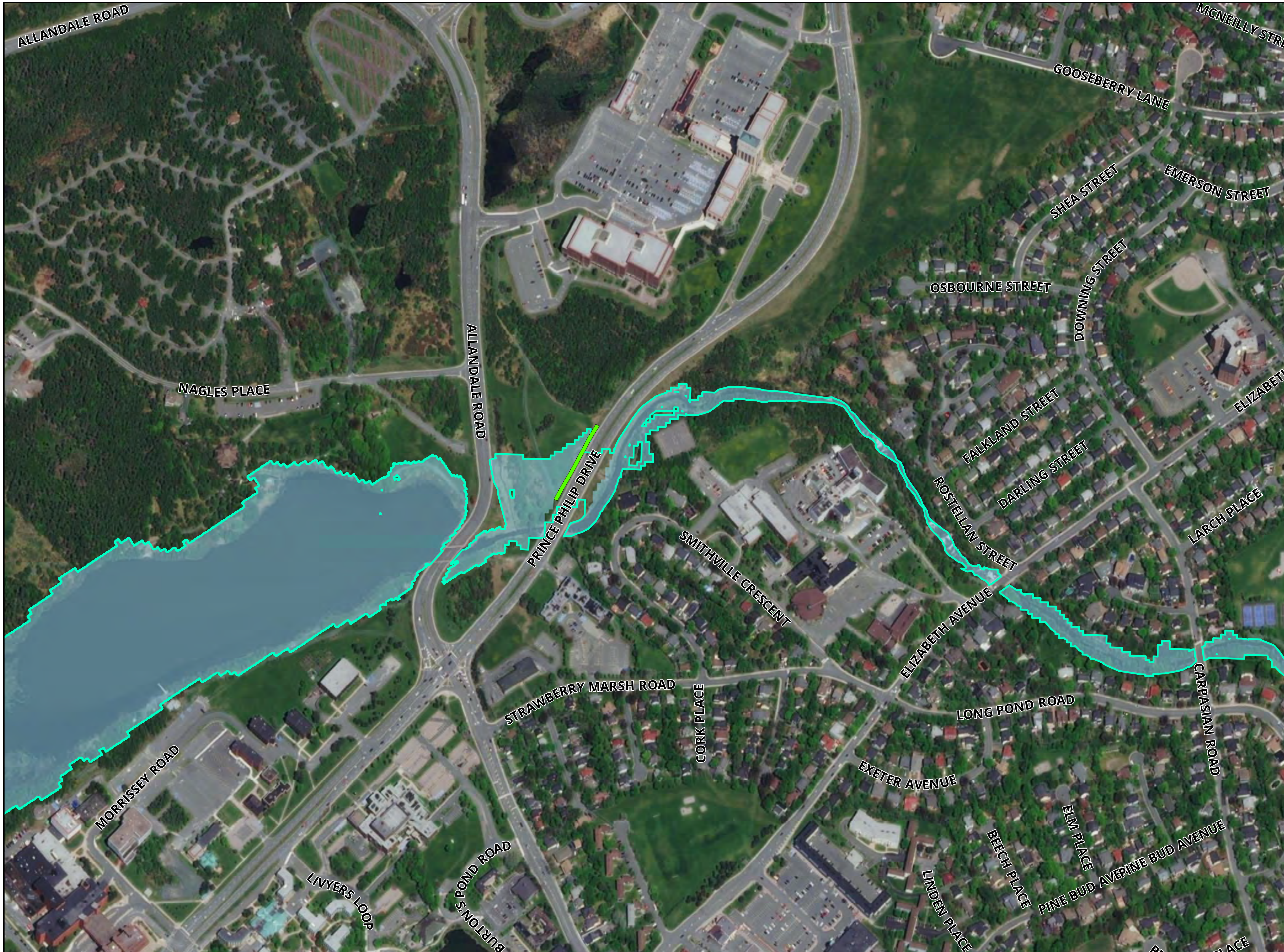
CBCL

Drawn: SF	Date: 2021-01-20
Checked: JB	Project #: 203063.00
Approved: GS	Scale @ 11"x17" : 1:4,600

Coordinate System: NAD 1983 UTM Zone 22N
Units: Meter

0 25 50 100 150 200 m

Path: Y:\St. John's\Data\Jobs\2020\203063.00 ENVIRONMENTAL ASSESSMENT - RENNIES RIVER\20 CAD\08 GIS\MXD\TECHNICAL MEMO\203063_FIGURE_1.mxd



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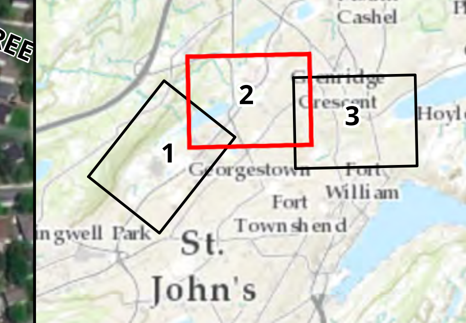


LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Berm Conditions)
- Proposed Earth Berm

ST. JOHN'S

Rennies River Flood Mitigation: Winter Avenue

Figure 1:
1:100 AEP CC Health Sciences Berms & Berms Between Kings Bridge Road & Portugal Cove Road

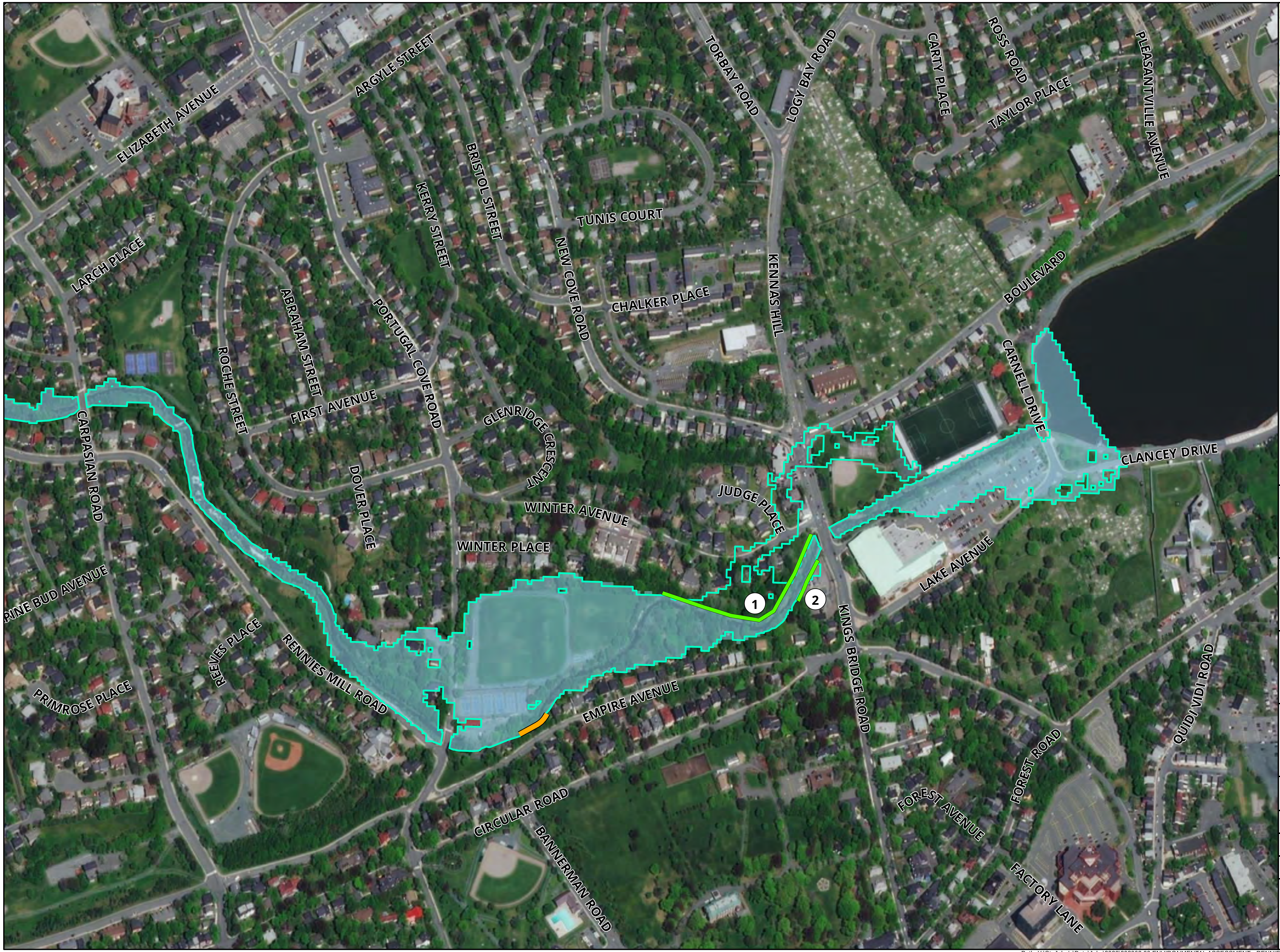
CBCL

Drawn: SF	Date: 2021-01-20
Checked: JB	Project #: 203063.00
Approved: GS	Scale @ 11"x17" : 1:4,600

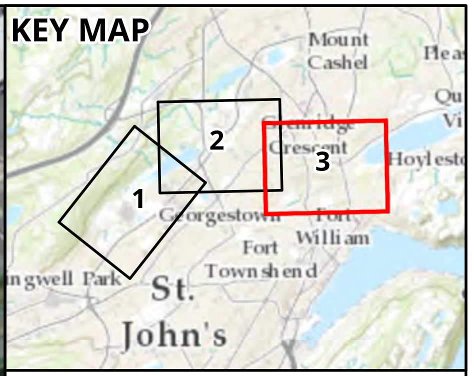
Coordinate System: NAD 1983 UTM Zone 22N
Units: Meter

0 25 50 100 150 200 m

Path: Y:\St. John's\Data\Jobs\2020\203063.00 ENVIRONMENTAL ASSESSMENT - RENNIES RIVER\20 CAD\08 GIS\MXD\TECHNICAL MEMO\203063_FIGURE_1.mxd



KEY MAP



LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Berm Conditions)
- Erosion Control Improvements
- Proposed Earth Berm

ST. JOHN'S

Rennies River Flood Mitigation: Winter Avenue

Figure 1:
1:100 AEP CC Health Sciences Berms & Berms Between Kings Bridge Road & Portugal Cove Road

CBCL

Page 3 of 3

Drawn: SF	Date: 2021-01-20
Checked: JB	Project #: 203063.00
Approved: GS	Scale @ 11"x17" : 1:4,600

Coordinate System: NAD 1983 UTM Zone 22N
Units: Meter

0 25 50 100 150 200 m

Path: Y:\St. John's\Data\Jobs\2020\203063.00 ENVIRONMENTAL ASSESSMENT - RENNIES RIVER\20 CAD\08 GIS\MXD\TECHNICAL MEMO\203063_FIGURE_1.mxd

CBCL Memo

Date	07/16/2021
Memo to	Department of Environment, Climate Change and Municipalities
Project name	Long Pond Flow Control Structure Environmental Assessment
Subject	Hydraulic Analysis
From	Jennifer Bursey
Copies to	Greg Sheppard

Topography

LiDAR collected between Wicklow Street and Quidi Vidi in 2017 was provided by the City of St. John's. Since the hydraulic model was developed using LiDAR collected in 2015 the two sets of elevation data were compared. The comparison focused on land areas near, and within, the delineated floodplains. The average elevation difference was 0.005m, with a standard deviation of approximately 0.21m. The majority (approximately 80%) of elevations differ in the range of -0.1 to 0.1m.

The *Federal Flood Mapping Guidelines Series - Federal Airborne LiDAR Data Acquisition Guideline Version 3.0*, issued by Natural Resources Canada in 2020 is intended to provide guidance to entities that require/collect LiDAR data. The guideline focuses on data quality and accuracy requirements. Minimum requirements for airborne LiDAR acquisition, with respect to the surface, include the following:

- Surfaces must be free from extensive flooding or inundation, snow cover and ice buildup on shoreline or land areas;
- Dry land surface condition is required; and
- Frost is acceptable.

It is noteworthy that the comparison of 2015 and 2017 LiDAR data includes wet areas, such as the following:

- Area bounded by Wicklow Street, Prince Philip Drive and Clinch Crescent west;
- Area bounded by Clinch Crescent west, Clinch Crescent east, Prince Philip Drive and the Health Sciences Centre;
- Along Learys Brook between Clinch Crescent east and Long Pond; and
- Learys Brook and Rennies River.

There has been limited development within the floodplain since 2015. Most notably is the construction of Memorial University of Newfoundland's Animal Resource Centre and Core Science Buildings. As well as the Health Sciences Centre (HSC) flood protection berm at the north side of Leary's Brook between Clinch Crescent west and Clinch Crescent east which was constructed in 2020. Construction of the HSC south berm commenced in June 2021 and will be completed during the 2021 construction season. These buildings and structures are not reflected in the 2017 LiDAR. However, they have been included in the hydraulic model as elevation features.

Hydrology

In 2014 CBCL completed the Rennies River Catchment Stormwater Management Plan (RRCSMP) Study for the City of St. John's. The study included hydrologic modelling of the catchment to determine flood flows for existing and future land uses, considering up-to-date rainfall data as well as rainfall representative of climate change conditions.

The hydrologic model was built using XPSWMM, a modelling software developed by XP Solutions that uses standard hydrological methods to estimate runoff flows in a watershed, and solves dynamic flow equations to calculate 1D flows through pipes, culverts, narrow channels, etc. The software also calculates 2D flows through floodplains, large bodies of water, wide bridges, etc.

For a detailed description of the RRCSMP model, the reader is referred to the RRCSMP report, available at:
http://www.stjohns.ca/sites/default/files/files/publication/Rennies%20River%20Catchment%20Stormwater%20Management%20Plan_0.pdf

Hydrographs corresponding to the 1:20 annual exceedance probability (AEP) climate change (CLC), 1:100 AEP CLC and 1:100 AEP CLC + 30% events were extracted from the hydrologic model at various locations along Rennies River. These hydrographs were simulated in the hydraulic model to estimate the floodplain corresponding to each event.

Hydraulics

Hydraulic modelling of Rennies River was performed using the stormwater modelling software, XPSWMM. The hydraulic model was used to estimate water levels in the river channel, through structures (i.e., culverts and bridges) along the river reach, and in the overbanks. The 1:20 and 1:100 AEP climate change floodplains for the existing condition of the river (i.e., without mitigative measures in place) were prepared during the RRCSMP and updated during 2020-2021 to include berms at the Health Sciences Centre, by CBCL. The floodplains demonstrate anticipated flooding impacts to adjacent lands.

Inputs consisted of river channel invert elevations, channel and floodplain roughness coefficients, LiDAR information, hydraulic structure dimensions and inflow hydrographs. The model structure is a 1D network representing the hydraulic structures and the channel (for the 2020-2021 update) nested within a 2D domain (grid) representing the floodplain. Hurricane Igor (September 2010) was used as the calibration event for the hydraulic model.

Existing Conditions

Floodplains for the 1:20 AEP CLC, 1:100 AEP CLC and 1:100 AEP CLC + 30% flow conditions for existing conditions were prepared and are presented in Figures 1 to 3 (Appendix A), respectively. The existing conditions include the flood protection berms at the Health Sciences Centre.

Long Pond Flow Control Structure

The Long Pond Flow Control Structure is proposed to be constructed at the outlet of Long Pond, downstream of Allandale Road Bridge, as illustrated in Drawing B-1 and B-2 (Appendix B).

The proposed flow control structure will consist of a 6m wide pre-cast concrete channel, with earthen berms in the left and right banks. The bottom of the concrete opening will be countersunk in Rennies River. Riprap will be placed along the bottom of the concrete opening to the existing river bottom elevation.

In June 2020 the City of St. John's received revised guidelines for an environmental preview report for the Long Pond flow control structure. The revised guidelines limited the maximum water elevation in Long Pond to 56.0m during a 1:100 AEP CLC + 30% flow. An opening of 6m was selected to achieve this design criteria. Floodplains for the 1:20 AEP CLC, 1:100 AEP CLC and 1:100 AEP CLC + 30% flow conditions with the flow control structure in place are presented in Figures 1 to 3 (Appendix A), respectively.

Ancillary Flood Protection

A hydraulic analysis for potential downstream improvements, conducted for the City of St. John's in 2020, revealed that an earth berm is required at Prince Philip Drive to prevent the road from overtopping during the 1:100 AEP CLC flow event. The location of this berm is illustrated on Drawing B-6 (Appendix B).

The hydraulic model prepared for this current analysis revealed the need for a berm near the National Research Council (NRC) building to prevent flooding during the 1:100 AEP CLC + 30% event with the flow control structure in place. This berm is illustrated on Drawing B-3 (Appendix B).

Further, the hydraulic model indicates that the 1:100 CLC + 30% flow event will result in road overtopping at Clinch Crescent east under existing conditions. With the construction of the flow control structure the water level in this area will increase slightly, as shown in Drawing B-4 (Appendix B). Given the importance of the Health Sciences Centre it is prudent to provide flood protection to its access. Therefore, a cast-in-place concrete wall is being proposed in this area to accommodate the 1:100 AEP CLC + 30% flow event. The location of this concrete wall is illustrated in Drawing B-5 (Appendix B).

The addition of the Long Pond flow control structure will result in water being temporarily stored in Long Pond during a flow event. Long Pond currently acts to attenuate flow, however, by restricting the outlet with the flow control structure the maximum water elevation in Long Pond during a flow event will be higher than existing. Table 1 illustrates the estimated maximum water elevations in Long Pond for the 1:20 AEP CLC, 1:100 AEP CLC and the 1:100 AEP CLC + 30% flows.

Table 1: Peak Water Levels in Long Pond

Flow Event	Water Elevation in Long Pond (m)	
	Existing Conditions	Post Flow Control Structure & Ancillary Flood Protection Construction
1:20 AEP CLC	54.7	54.8
1:100 AEP CLC	55.2	55.4
1:100 AEP CLC + 30%	55.4	56.0

Appendix A:

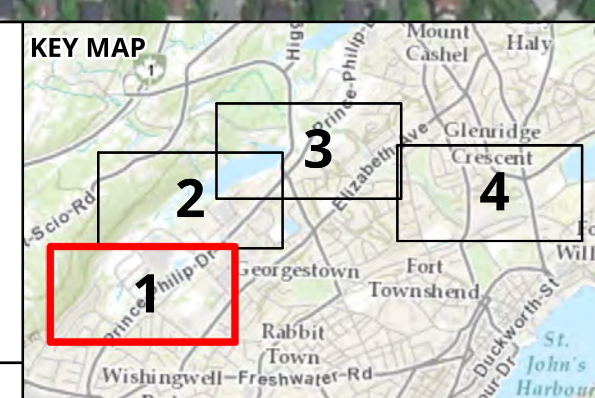
Floodplains

LEGEND

- 1:20 AEP Climate Change Boundaries (Existing Conditions)
- 1:20 AEP Climate Change Boundaries (Post Construction Conditions)
- Health Science Centre - North Berm (Constructed)
- Health Science Centre - South Berm (Under Construction)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
- Flooding extents are based on the floodplain delineation between Wicklow Street and Quid Vidi Lake

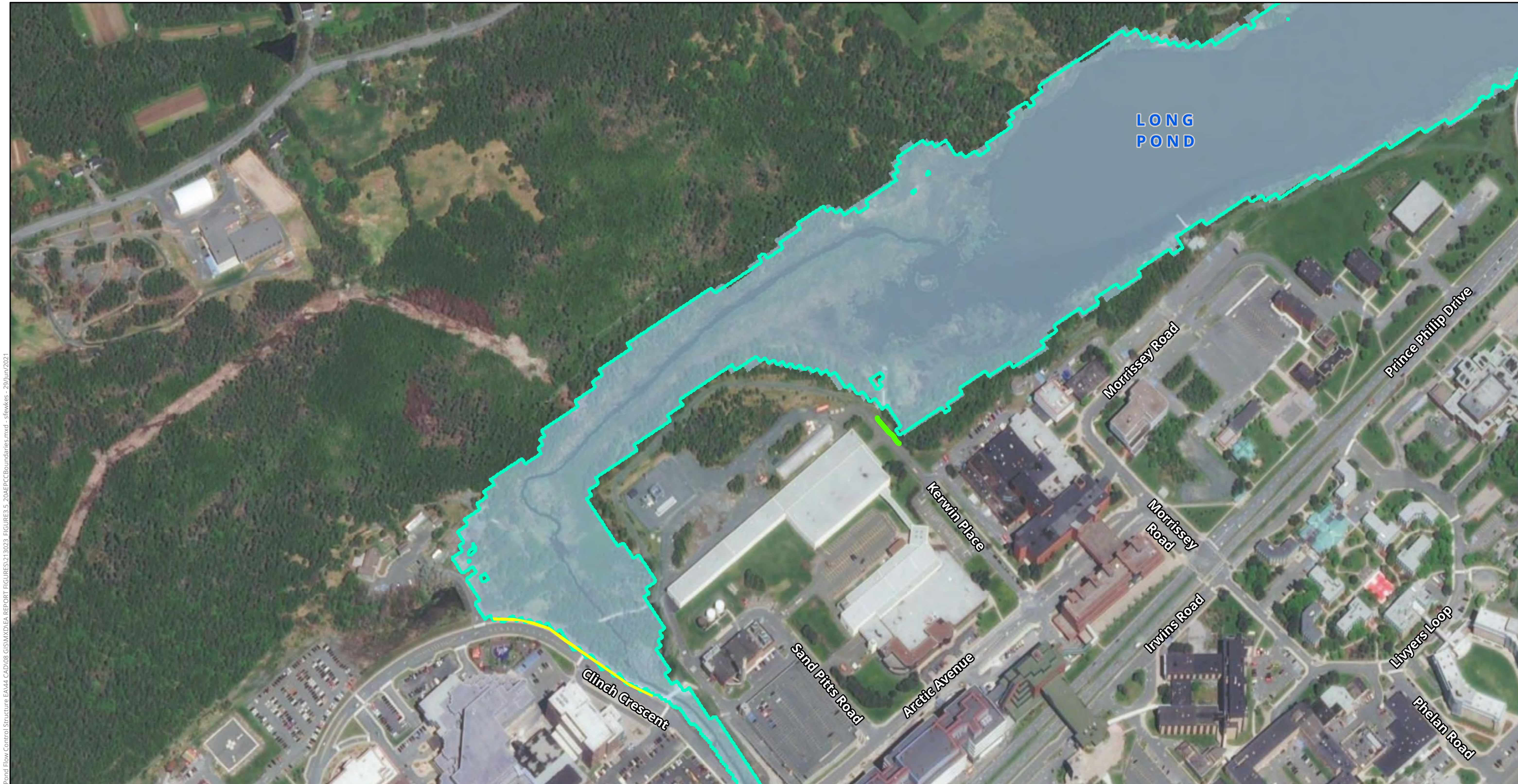
Datum: NAD83
Projection: UTM Zone 22N

ST. JOHN'S CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:20 AEP Climate Change Boundaries and Post Construction Conditions (Page 1 of 4)

PROJECT N°: 213023	FIGURE: 1 (1)
SCALE: 1:3,500	DATE: Jun 2021

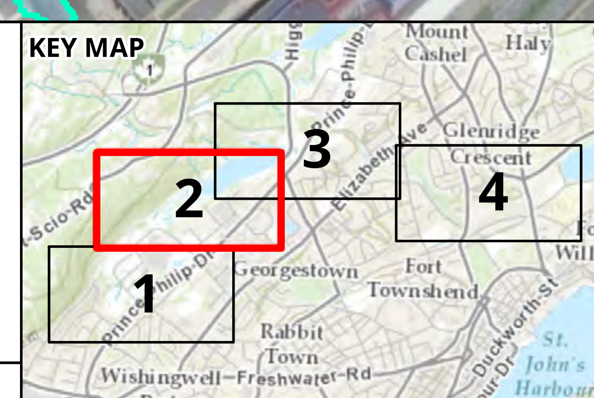


LEGEND

- 1:20 AEP Climate Change Boundaries (Existing Conditions)
- 1:20 AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Cast-In-Place Concrete Wall

0 80 160 320 480 640 Metres

KEY MAP



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Projection: UTM Zone 22N

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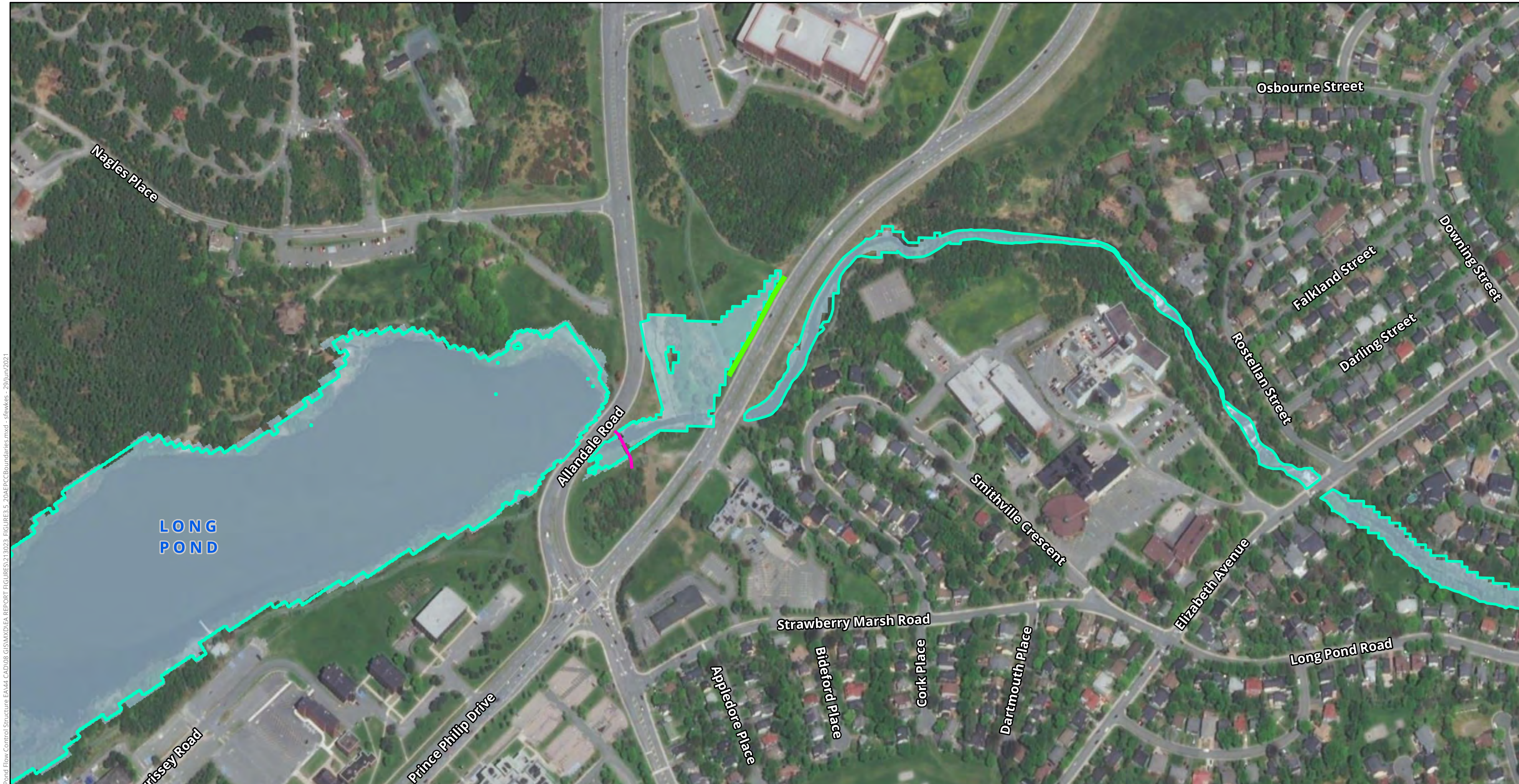
CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:20 AEP Climate Change Boundaries and Post Construction Conditions (Page 2 of 4)

PROJECT N°: 213023	FIGURE: 1 (2)
SCALE:1:3,500	DATE: Jun 2021

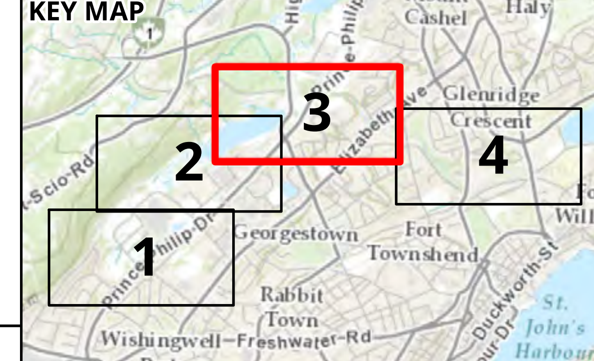


LEGEND

- 1:20 AEP Climate Change Boundaries (Existing Conditions)
- 1:20 AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Earth Berm With Concrete Opening

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

ST. JOHN'S CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:20 AEP Climate Change Boundaries and Post Construction Conditions (Page 3 of 4)

PROJECT N°: 213023	FIGURE: 1 (3)
SCALE: 1:3,500	DATE: Jun 2021

Document Path: Y:\St. John's\Data\Jobs\2021\213023.00 CSJ Long Pond Flow Control Structure EA\44 CAD\08 GIS\MXD\EA REPORT FIGURES\213023_FIGURE3.5_20AEPCCBoundaries.mxd - sfewkes - 29/Jun/2021

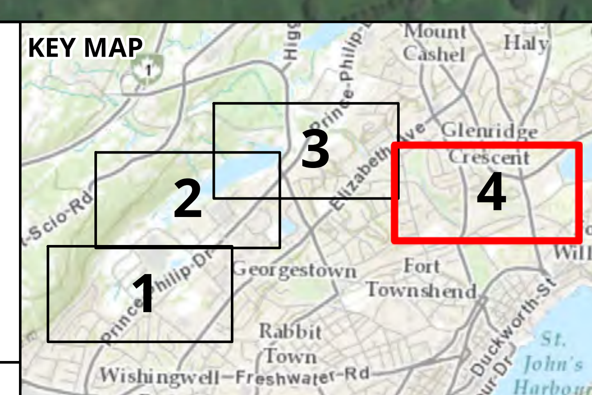
LEGEND

1:20 AEP Climate Change Boundaries (Existing Conditions)

1:20 AEP Climate Change Boundaries (Post Construction Conditions)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

ST. JOHN'S | CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:20 AEP Climate Change Boundaries and Post Construction Conditions (Page 4 of 4)

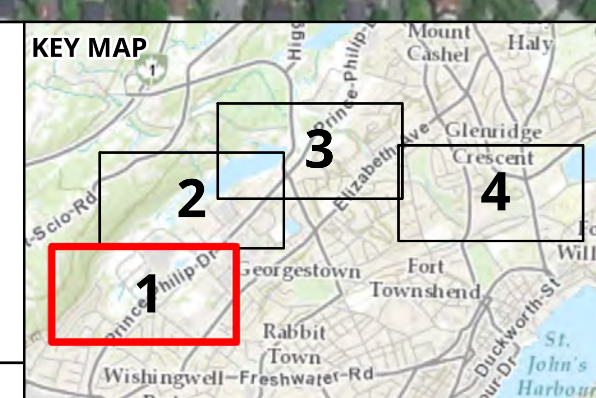
PROJECT N°: 213023	FIGURE: 1 (4)
SCALE:1:3,500	DATE: Jun 2021

LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Construction Conditions)
- Health Science Centre - North Berm (Constructed)
- Health Science Centre - South Berm (Under Construction)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 AEP Climate Change Boundaries and Post Construction Conditions (Page 1 of 4)

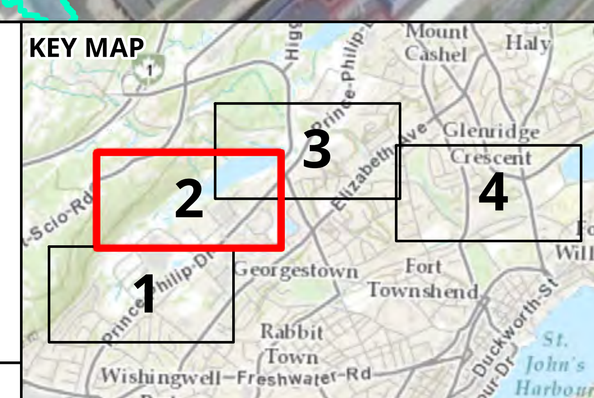
PROJECT N^{o}: 213023	FIGURE: 2 (1)
SCALE: 1:3,500	DATE: Jun 2021

LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Cast-In-Place Concrete Wall

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 AEP Climate Change Boundaries and Post Construction Conditions (Page 2 of 4)

PROJECT N°: 213023	FIGURE: 2 (2)
SCALE:1:3,500	DATE: Jun 2021

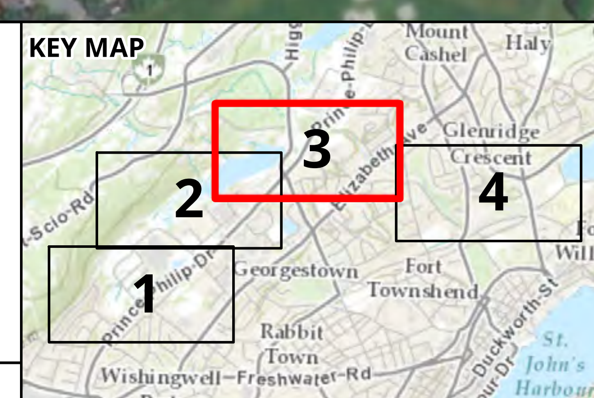
Document Path: Y:\St. John's\Data\Jobs\2021\213023.00 CSJ Long Pond Flow Control Structure EA\44 CAD\08 GIS\MXD\EA REPORT FIGURES\213023_FIGURE3.6_100AEPCCBoundaries.mxd - sfewkes - 29/Jun/2021

LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Earth Berm With Concrete Opening

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 AEP Climate Change Boundaries and Post Construction Conditions (Page 3 of 4)

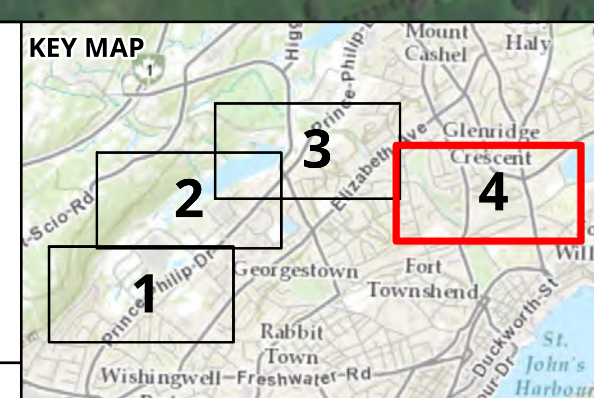
PROJECT N°: 213023	FIGURE: 2 (3)
SCALE: 1:3,500	DATE: Jun 2021

LEGEND

- 1:100 AEP Climate Change Boundaries (Existing Conditions)
- 1:100 AEP Climate Change Boundaries (Post Construction Conditions)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 AEP Climate Change Boundaries and Post Construction Conditions (Page 4 of 4)

PROJECT Nº: 213023	FIGURE: 2 (4)
SCALE:1:3,500	DATE: Jun 2021

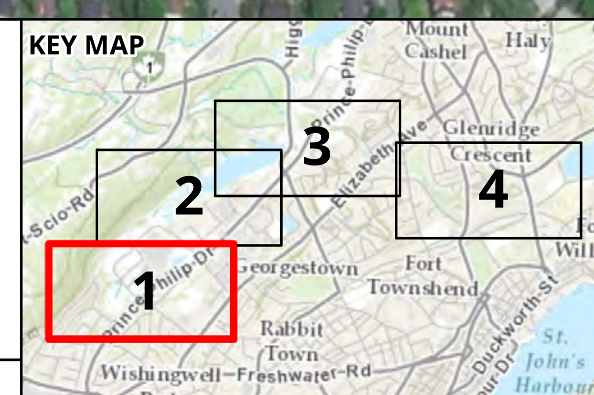
Document Path: Y:\St. John's\Data\Jobs\2021\213023.00 CSJ Long Pond Flow Control Structure EA\44 CAD\08 GIS\MXD\EA REPORT FIGURES\213023_FIGURE3.6_100AEPCCBoundaries.mxd - sfewkes - 29/Jun/2021

LEGEND

- 1:100 Plus 30% AEP Climate Change Boundaries (Existing Conditions)
- 1:100 Plus 30% AEP Climate Change Boundaries (Post Construction Conditions)
- Health Science Centre - North Berm (Constructed)
- Health Science Centre - South Berm (Under Construction)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 Plus 30% AEP Climate Change Boundaries and Post Construction Conditions (Page 1 of 4)

PROJECT N°: 213023	FIGURE: 3 (1)
SCALE: 1:3,500	DATE: Jun 2021

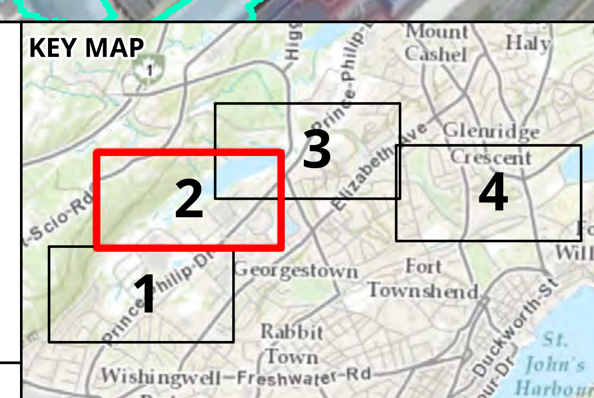
Document Path: Y:\St. John's\Data\Jobs\2021\213023.00 CSJ Long Pond Flow Control Structure EA\44 CAD\08 GIS\MXD\EA REPORT FIGURES\213023_FIGURE3.7_10030AEPCCBoundaries.mxd - sfewkes - 29/Jun/2021

LEGEND

- 1:100 Plus 30% AEP Climate Change Boundaries (Existing Conditions)
- 1:100 Plus 30% AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Cast-In-Place Concrete Wall

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
- Flooding extents are based on the floodplain delineation between Wicklow Street and Quid Vidi Lake

Datum: NAD83
Projection: UTM Zone 22N

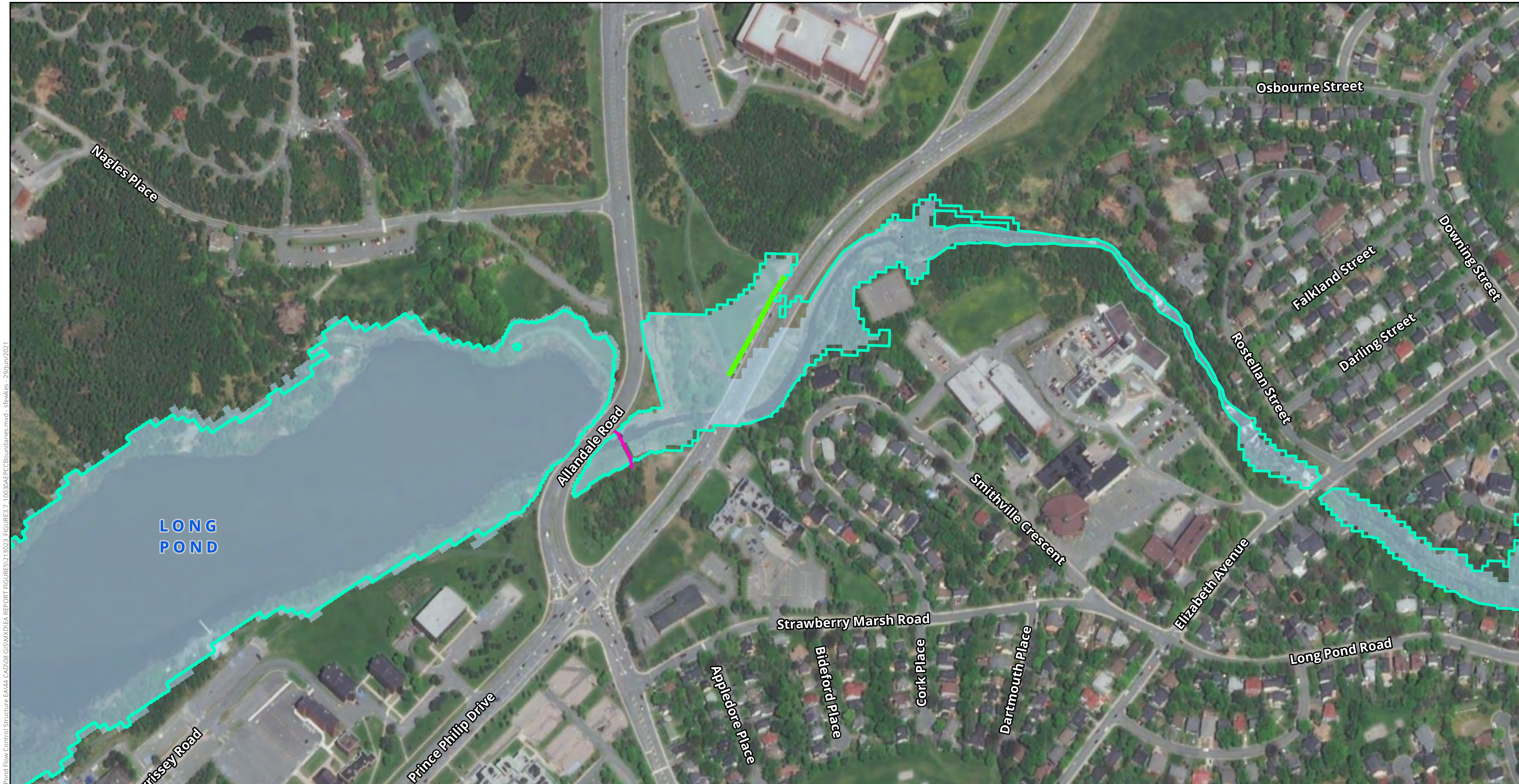
CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 Plus 30% AEP Climate Change Boundaries and Post Construction Conditions (Page 2 of 4)

PROJECT N^{o}: 213023	FIGURE: 3 (2)
SCALE:1:3,500	DATE: Jun 2021

Document Path: Y:\St. John's\Data\Jobs\2021\213023.00 CSJ Long Pond Flow Control Structure EA\44 CAD\08 GIS\MXD\EA REPORT FIGURES\213023_FIGURE3.7_10030AEPCCBoundaries.mxd - sfewkes - 29/Jun/2021

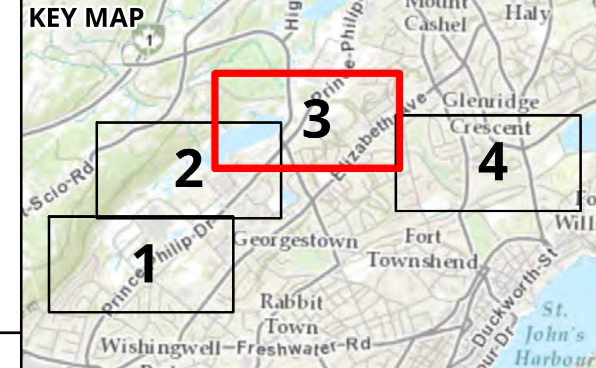


LEGEND

- 1:100 Plus 30% AEP Climate Change Boundaries (Existing Conditions)
- 1:100 Plus 30% AEP Climate Change Boundaries (Post Construction Conditions)
- Earth Berm
- Earth Berm With Concrete Opening

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
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Datum: NAD83
Projection: UTM Zone 22N

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 Plus 30% AEP Climate Change Boundaries and Post Construction Conditions (Page 3 of 4)

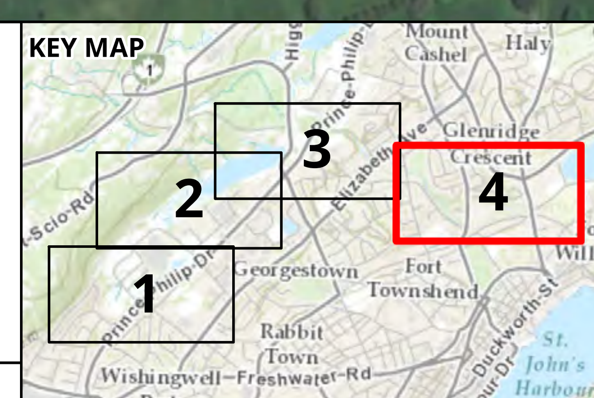
PROJECT N°: 213023	FIGURE: 3 (3)
SCALE: 1:3,500	DATE: Jun 2021

LEGEND

- 1:100 Plus 30% AEP Climate Change Boundaries (Existing Conditions)
- 1:100 Plus 30% AEP Climate Change Boundaries (Post Construction Conditions)

0 80 160 320 480 640 Metres

KEY MAP



NOTES:
- Flooding extents are based on the floodplain delineation between Wicklow Street and Quid Vidi Lake

Datum: NAD83
Projection: UTM Zone 22N

CBCL

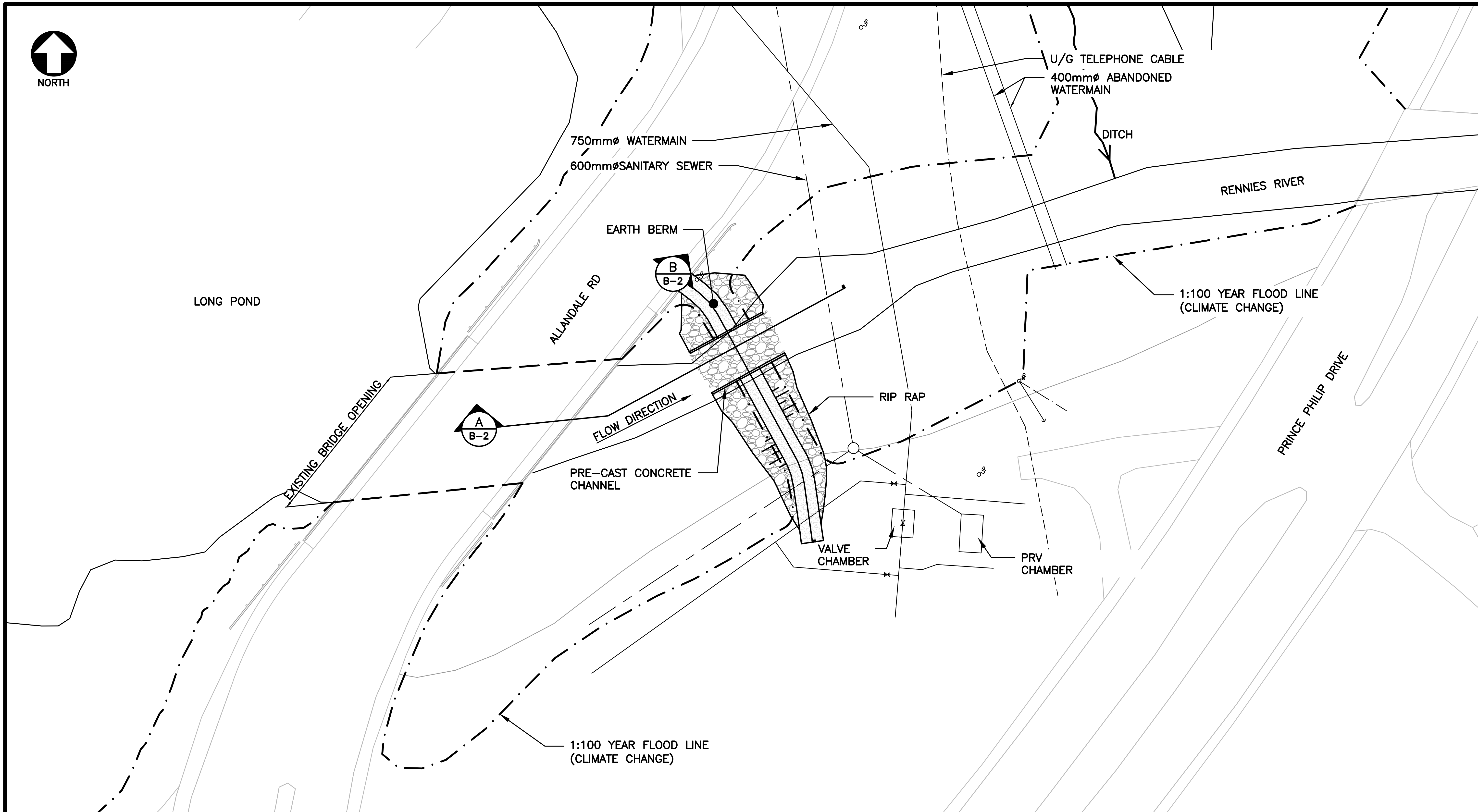
CSJ LONG POND FLOW CONTROL STRUCTURE EA

1:100 Plus 30% AEP Climate Change Boundaries and Post Construction Conditions (Page 4 of 4)

PROJECT N°: 213023	FIGURE: 3 (4)
SCALE:1:3,500	DATE: Jun 2021

Appendix B:

Drawings



CONTROL STRUCTURE PLAN

1:500

0 10.0 20.0 30.0 40.0 50.0m

1:500

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

CBCL

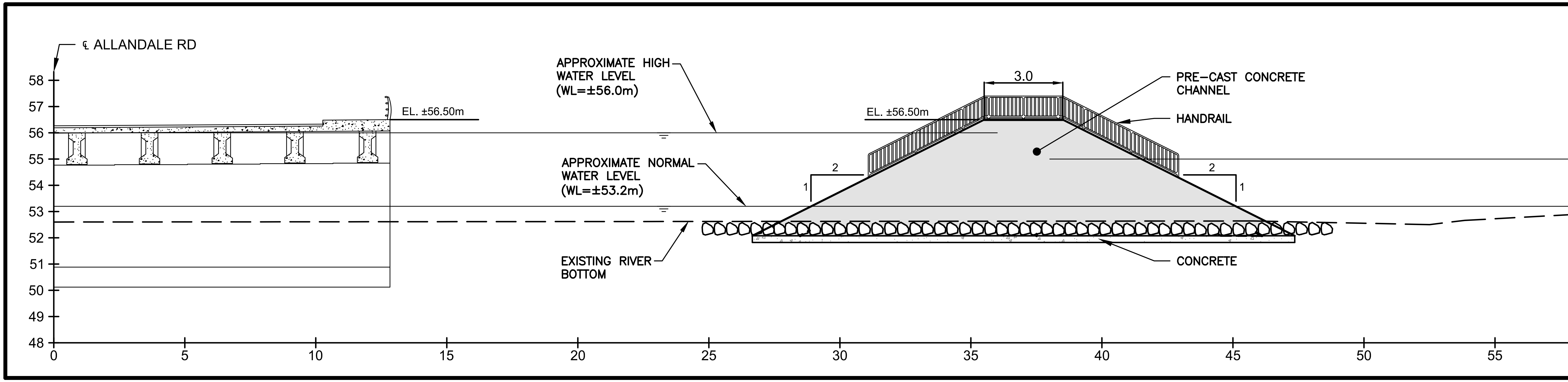
CSJ LONG POND FLOW CONTROL STRUCTURE EA

LONG POND FLOW CONTROL STRUCTURE PLAN

Drawing

B-1

DRAWING NAME: L:\JOBS\2021\213023.00 CSJ LONG POND FLOW CONTROL STRUCTURE EA\44 CAD\01 CIVIL\03 DRAWING SHEETS\213023.00-FIGURES B1-B2-JUNE 9 2021.DWG LAYOUT NAME: B-1 PLOT DATE:Friday, July 16, 2021 1:58:27 PM

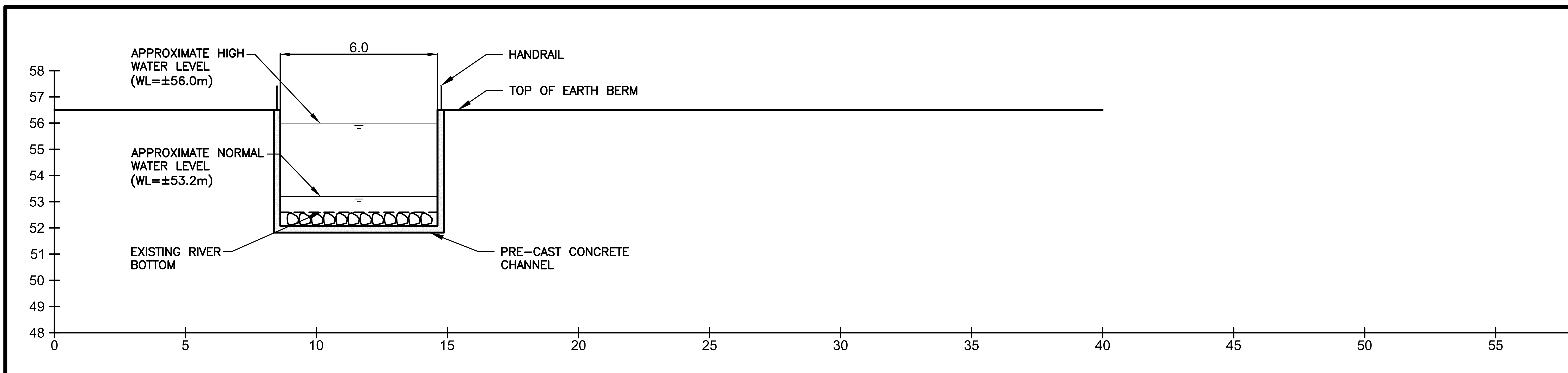


SECTION – A

1:150

0 3.0 6.0 9.0 12.0 15.0m

1:150



SECTION – B

1:150

0 3.0 6.0 9.0 12.0 15.0m

1:150

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

LONG POND FLOW CONTROL STRUCTURE SECTIONS

Drawing

B-2

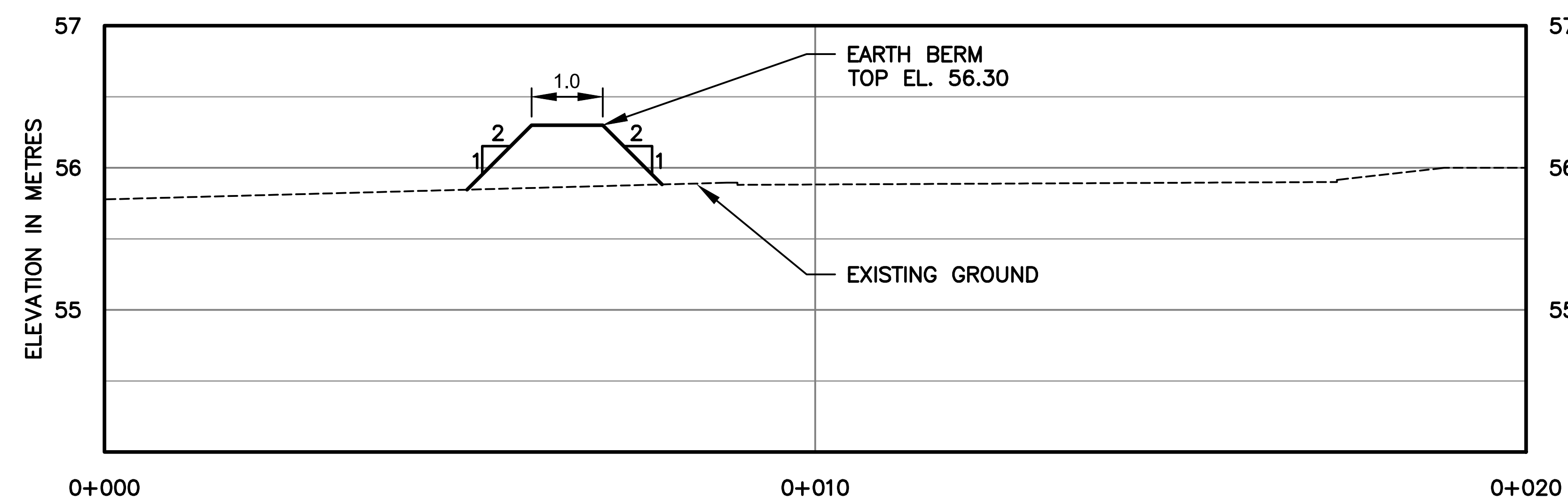
DRAWING NAME: L:\JOBS\2021\213023.00 CSJ LONG POND FLOW CONTROL STRUCTURE EA\44 CAD\01 CIVIL\03 DRAWING SHEETS\213023.00-FIGURES B3-B4-B5-B6-JUNE 17 2021.DWG LAYOUT NAME: B-3 PLOT DATE: Friday, July 16, 2021 2:00:52 PM QR

EARTH BERM PLAN

1:500

0 10.0 20.0 30.0 40.0 50.0m

1:500



SECTION – A

1:100 [H] 1:50 [V]

0 2.0 4.0 6.0 8.0 10.0m

1:100

0 1000 2000 3000 4000 5000mm

1:50

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

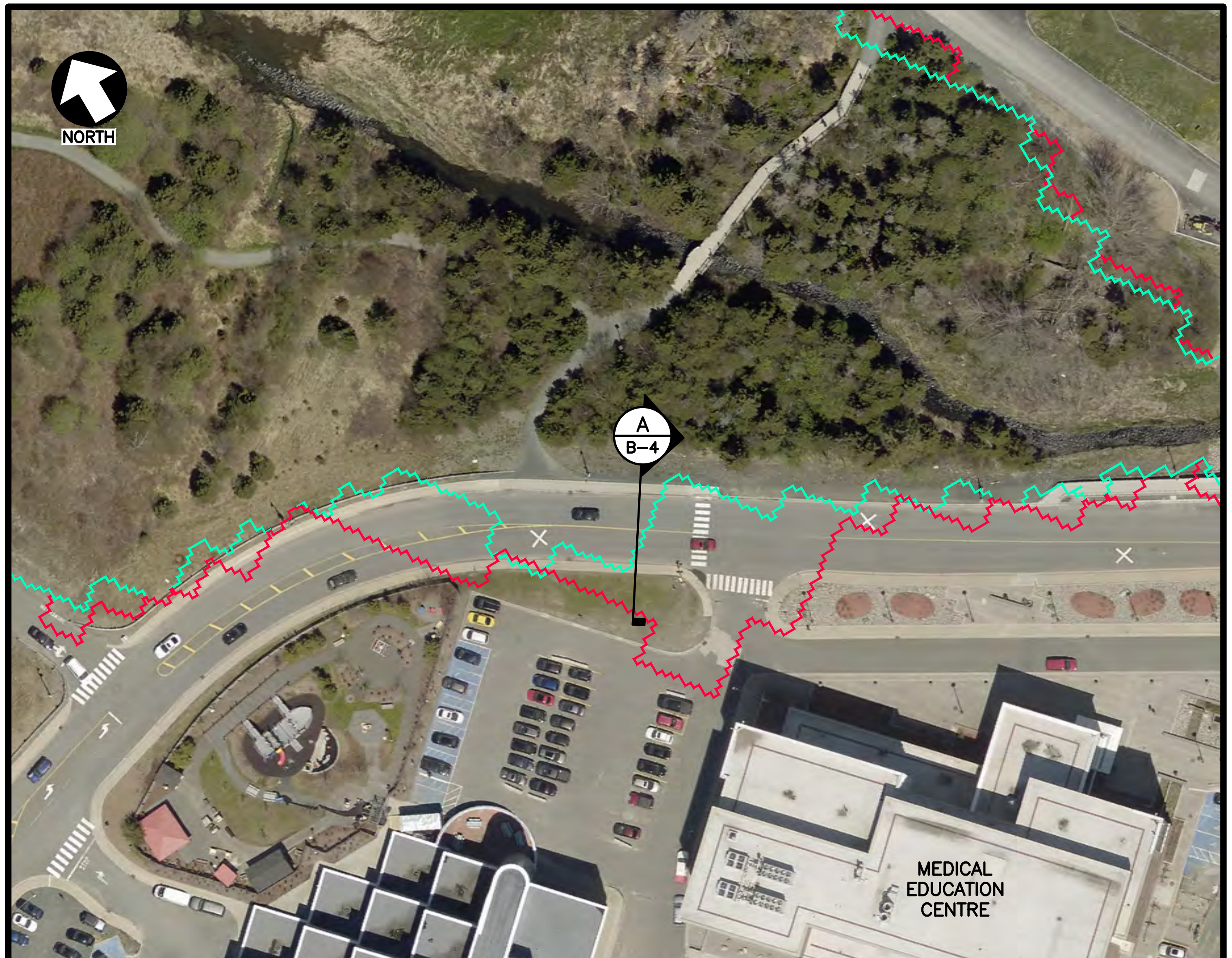
CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

NATIONAL RESEARCH COUNCIL OF CANADA EARTH BERM PLAN & SECTION

Drawing

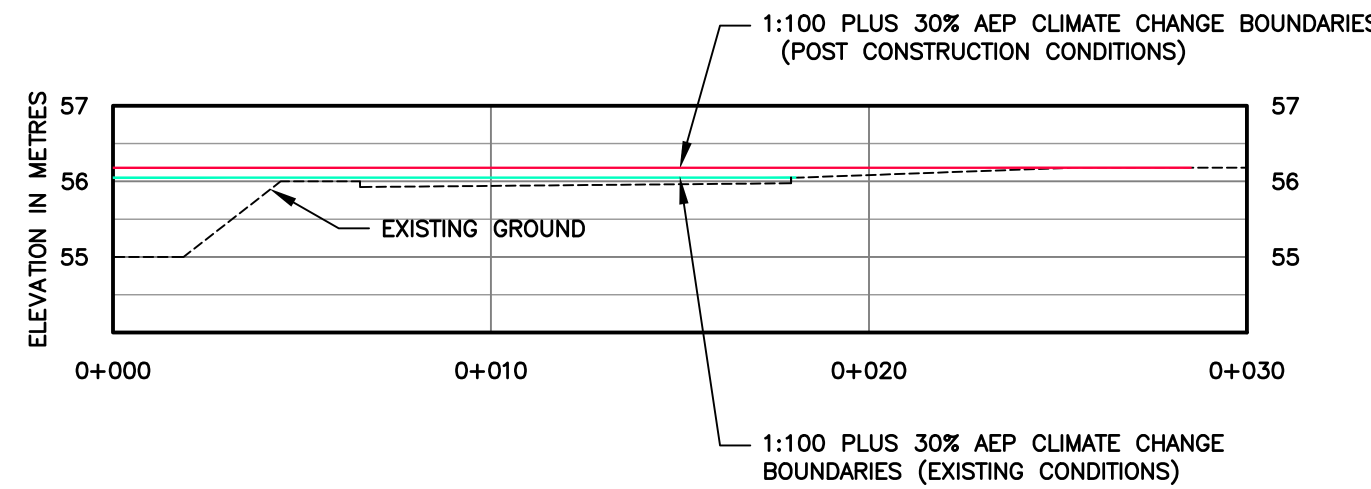
B-3



LEGEND:

1:100 PLUS 30% AEP CLIMATE CHANGE BOUNDARIES (EXISTING CONDITIONS)

1:100 PLUS 30% AEP CLIMATE CHANGE BOUNDARIES (POST CONSTRUCTION CONDITIONS)



CLINCH CRESCENT PLAN

1:1000

0 20 40 60 80 100m

1:1000

SECTION – A

1:200 [H] 1:100 [V]

0 4.0 8.0 12.0 16.0 20.0m

1:200

0 2.0 4.0 6.0 8.0 10.0m

1:100

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

CLINCH CRESCENT PLAN & SECTION

Drawing

B-4

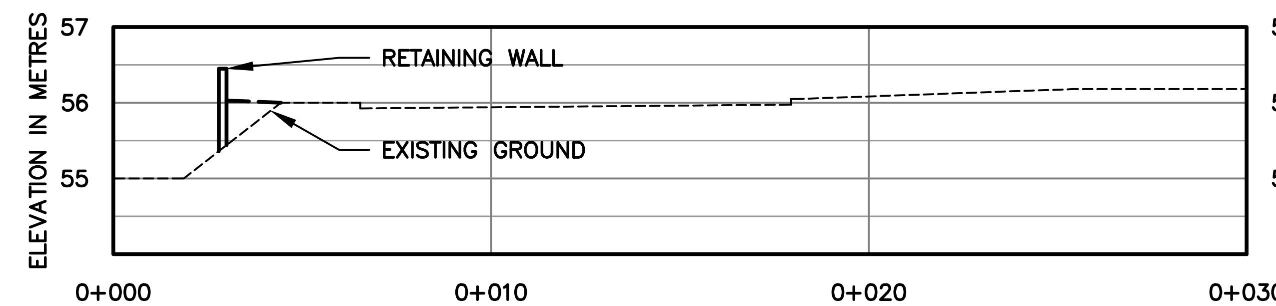
DRAWING NAME: L:\JOBS\2021\213023.00 CSJ LONG POND FLOW CONTROL STRUCTURE EA\44 CAD\01 CIVIL\03 DRAWING SHEETS\213023.00-FIGURES B3-B4-B5-B6-JUNE 17 2021.DWG LAYOUT NAME: B-4 PLOT DATE: Friday, July 16, 2021 2:25:56 PM OR

RETAINING WALL PLAN

1:1000

0 20 40 60 80 100m

1:1000



SECTION – A

1:200 [H] 1:100 [V]

0 4.0 8.0 12.0 16.0 20.0m

1:200

0 2.0 4.0 6.0 8.0 10.0m

1:100

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

CLINCH CRESCENT RETAINING WALL PLAN & SECTION

Drawing

B-5

DRAWING NAME: L:\JOBS\2021\213023.00 CSJ LONG POND FLOW CONTROL STRUCTURE EA\44 CAD\01 CIVIL\03 DRAWING SHEETS\213023.00-FIGURES B3-B4-B5-B6-JUNE 17 2021.DWG LAYOUT NAME: B-5 PLOT DATE:Friday, July 16, 2021 2:50:09 PM QR

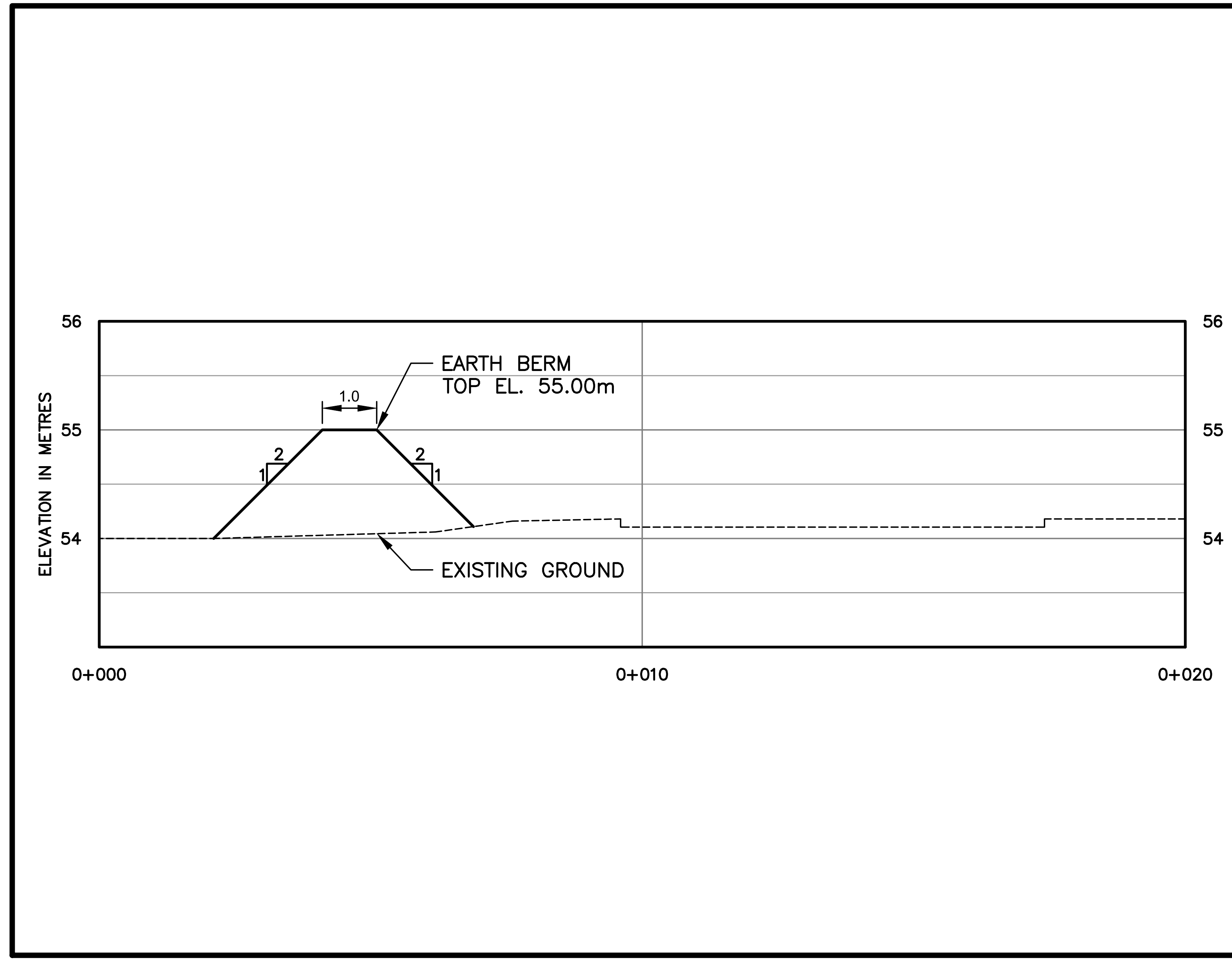
DRAWING NAME: L:\JOBS\2021\213023.00 CSJ LONG POND FLOW CONTROL STRUCTURE EA\44 CAD\01 CIVIL\03 DRAWING SHEETS\213023.00-FIGURES B3-B4-B5-B6-JUNE 17 2021.DWG LAYOUT NAME: B-6 PLOT DATE:Friday, July 16, 2021 2:30:29 PM DR

EARTH BERM PLAN

1:1000

0 20 40 60 80 100m

1:1000



SECTION – A

1:100 [H] 1:50 [V]

0 2.0 4.0 6.0 8.0 10.0m

1:100

0 1000 2000 3000 4000 5000mm

1:50

No.	Description

Date	Scale	Designed	Drawn	Checked	Approved	CBCL No.	Contract
JULY 2021	AS SHOWN	GES	DDG	JRB	-	213023.00	-

CBCL

CSJ LONG POND FLOW CONTROL STRUCTURE EA

PRINCE PHILIP DRIVE EARTH BERM PLAN & SECTION

Drawing

B-6