

Highway 101 Twinning and Avon River Aboiteau Replacement & Causeway Upgrading

COMMUNITY LIAISON COMMITTEE (CLC)

PROJECT UPDATE

APRIL 6, 2022

Overview

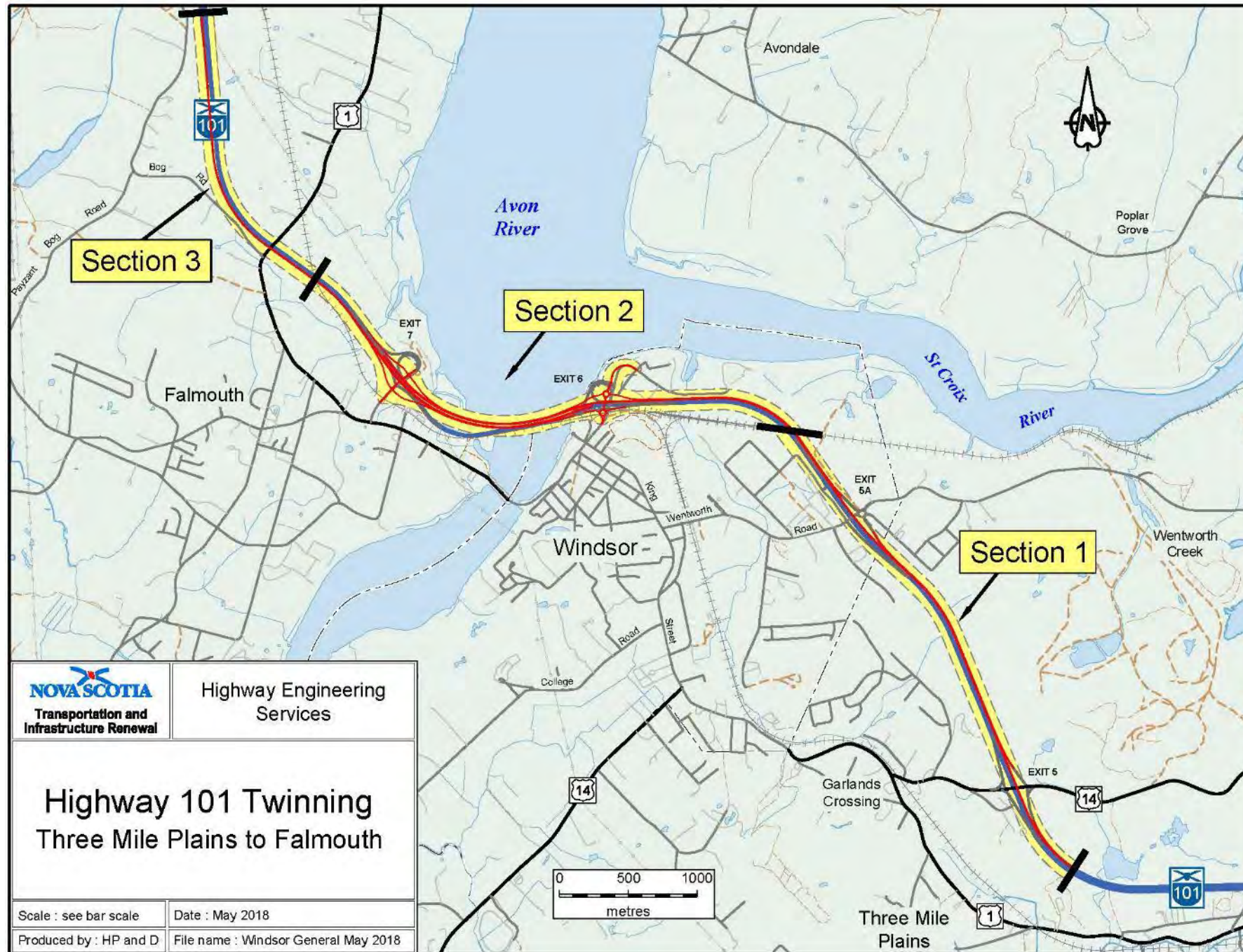
Presentation Outline:

- ▶ Highway 101 Twinning Update (NSDPW)
 - ▶ Project Update
- ▶ Avon River Aboiteau and Causeway Upgrade (NSDPW / CBCL)
 - ▶ Project Recap
 - ▶ Status Update
 - ▶ Design Update
 - ▶ Post Construction Monitoring Plan
 - ▶ Next Steps
- ▶ Questions / Discussion



Photo from van Proosdij (2018)

Highway 101 Twinning: Three Mile Plains to Falmouth



Highway 101 Twinning

Section 1: Three Mile Plains to Windsor Railway Crossing

- ▶ New westbound lanes and upgrading of eastbound lanes complete
 - open to fully divided traffic
- ▶ Construction and replacement of Exit 5 Trunk 14 overpass (EB & WB), Exit 5A Wentworth Road overpass (EB & WB) and Windsor Railway overpass are complete
- ▶ General clean-up and deficiencies to be completed this spring



HIGHWAY 101 LOOKING WEST NEAR EXIT 5



HIGHWAY 101 LOOKING EAST NEAR EXIT 5A



HIGHWAY 101 LOOKING WEST NEAR EXIT 5A

Highway 101 Twinning

Section 2A: Windsor Railway Crossing to Exit 6

- ▶ New westbound lanes subgrade (earthworks) and paving completed, opened to divided traffic
- ▶ Includes temporary transition from 4-lane divided to 2-lane/2-way traffic through Exit 6 approaching the causeway
- ▶ Municipal infrastructure crossing improvements complete
- ▶ Upgrading to eastbound lanes scheduled for fall 2022, spring 2023



HIGHWAY 101 LOOKING EAST TOWARD EXIT 5A



HIGHWAY 101 LOOKING WEST TOWARD EXIT 6



HIGHWAY 101 LOOKING EAST NEAR EXIT 6

Highway 101 Twinning

Section 2B: Exit 6 to Exit 7 (including causeway)

- ▶ Toe berm along causeway, wick drain installation and preload fill complete, expected to begin another stage of preload fill summer 2022
- ▶ Subgrade between Avon River & Exit 7 complete
- ▶ Widened and installed precast jersey barrier along the causeway as interim safety measure
- ▶ Exit 6 Interchange/Nesbitt Connector started expected completion fall 2023
- ▶ Exit 7 Interchange construction underway, expected completion fall 2022



HIGHWAY 101 AT EXIT 6 (UPPER WATER STREET)



HIGHWAY 101 LOOKING WEST ACROSS CAUSEWAY



HIGHWAY 101 LOOKING EAST TOWARD CAUSEWAY

Highway 101 Twinning

Section 3: Exit 7 to Existing Twinning (Falmouth)

- ▶ New eastbound lanes construction and paving complete
- ▶ New wildlife crossing structure is complete
- ▶ Extension to Elderkin Creek Box culvert and municipal infrastructure crossings complete
- ▶ Connection and tie-in of new eastbound lanes including upgrading westbound lanes expected to begin this fall, completion late 2022



HIGHWAY 101 AT EXIT 7 INTERCHANGE (FALMOUTH)



HIGHWAY 101 LOOKING EAST TOWARD EXIT 7



HIGHWAY 101 AT WILDLIFE CROSSING (FALMOUTH)



HIGHWAY 101 LOOKING WEST TO EXISTING TWINNING

Avon River Aboiteau and Causeway Upgrade

Project Recap

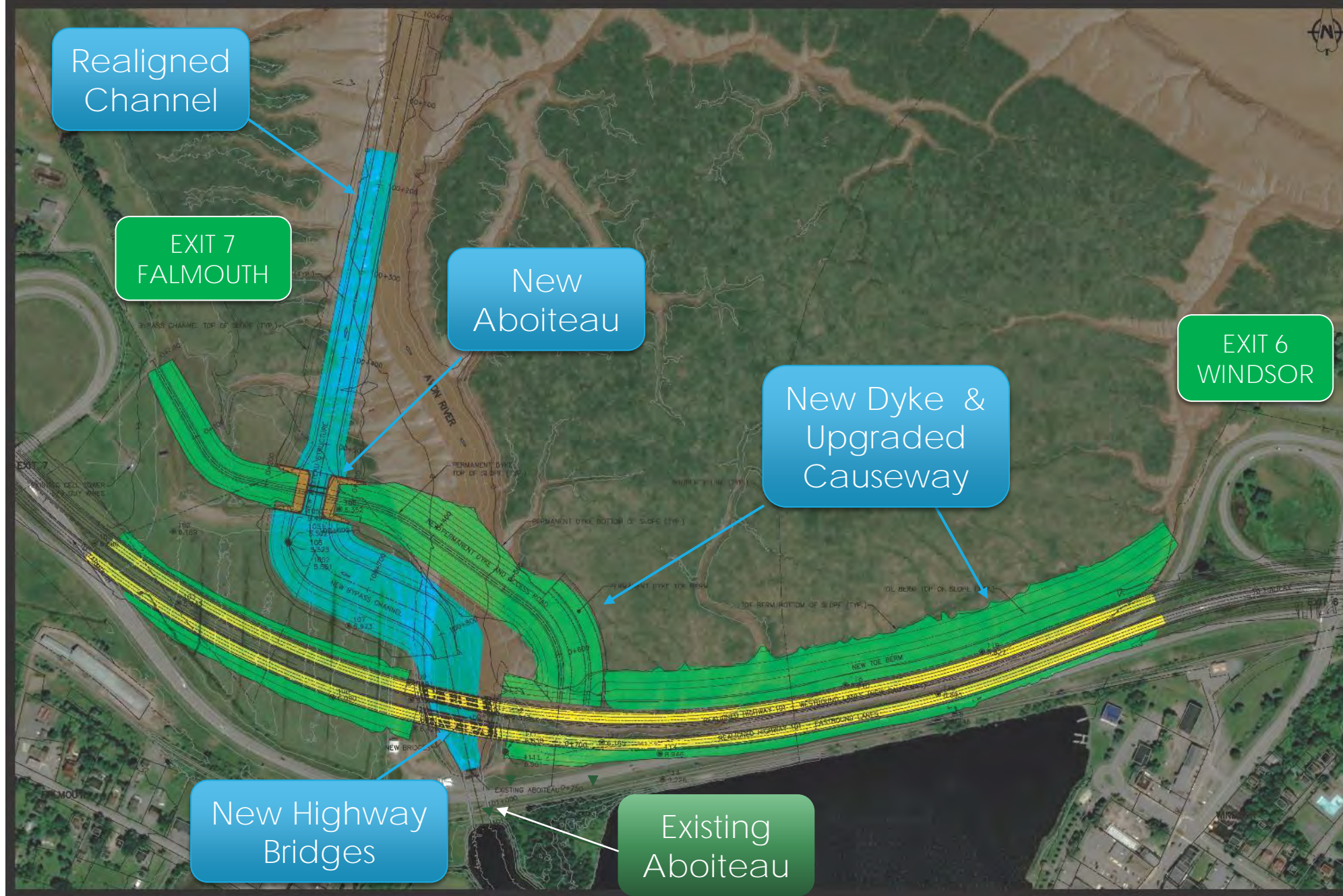
Primary Objectives:

- ▶ To improve public safety:
 - Enhanced flood protection & climate change resilience to protect against flood risks and vulnerability to sea level rise, coupled with the need to protect critical public infrastructure, communities, and valuable agricultural land
 - Improved highway safety through the completion of twinning Highway 101 across the Avon River, while also benefitting from the enhanced flood control system to protect the highway and associated bridges

Project Recap

Other Requirements:

- ▶ In addition to meeting the public safety objectives, the project must also satisfy several regulatory requirements:
 - Improved Fish Passage in compliance with the *Fisheries Act* (DFO) and Environmental Assessment conditions (NSECC), including consideration of potential impacts to asserted or established Mi'kmaq Aboriginal or treaty rights
 - Minimize environmental and societal impacts through obtaining applicable permits/authorizations and satisfying several EA terms and conditions





Project Recap

Design Approach:

- ▶ Flexible and adaptable solution that meets the needs of today, and the future
- ▶ Offers a wide range of functionality for both flood protection and fish passage, including a range of potential operating scenarios:

Freshwater Lake

- ▶ Freshwater lake was initially proposed to DFO in November 2020, but was deemed inadequate for fish passage

Brackish Lake Scenario

- ▶ Allows some tidal exchange while maintaining a consistent water level

Dampened Tidal Scenario

- ▶ Allows greater tidal exchange and more estuarine environment

Status Update

DFO *Fisheries Act* Authorization (FAA) Application:

- ▶ Original application submitted in November 2020 focused on Freshwater Lake operating scenario
- ▶ DFO responded in March 2021 that the application was incomplete / inadequate & requested additional information focused on other operating scenarios that included tidal exchange
- ▶ A Supplemental Information Package was submitted to DFO in August 2021
- ▶ Several meetings have taken place since August to review/discuss the information and subsequent analysis to address DFO's comments
- ▶ Further modelling and assessments are nearly complete to address DFO's latest comments and to provide confidence that the new aboiteau will function and accommodate fish appropriately

Status Update

Project Development:

- ▶ Extensive modelling/analysis has been conducted to improve the aboiteau design and address several comments
- ▶ Final Construction Drawings and supporting documents are all nearing completion with the intent of being construction ready later this spring:
 - ▶ Civil/Site Works (removals, temp. works, site grading, new dykes, new channel)
 - ▶ New Avon River Aboiteau Structure
 - ▶ New Control Building
 - ▶ New Highway 101 Bridges (eastbound and westbound)
 - ▶ Construction specifications and estimates
 - ▶ Other supporting construction documents

Design Update

Design Improvements to Address Fish Passage Concerns:

- ▶ Extensive modelling and analysis completed to refine the aboiteau design and provide effective pathways for fish passage, including:
 - ▶ Optimizing the design of the fishways and associated conditions for fish passage to maximize the ability for all fish species/life-stage expected to want passage
 - ▶ Addition of a dedicated Eel pass (for a range of Eel sizes) to provide an additional means of passage for this key species
 - ▶ Optimizing the design of the river channel at the entrances/exits of the fishways to provide safe/passable conditions and favourable attraction flows
 - ▶ Review of velocities within and near the aboiteau for various operating conditions to assess/optimize fish passage and attraction flows
 - ▶ Several complex hydrodynamic computer models of the entire facility, to provide highly detailed information to confirm expected conditions and quality of fish passage

Design Update

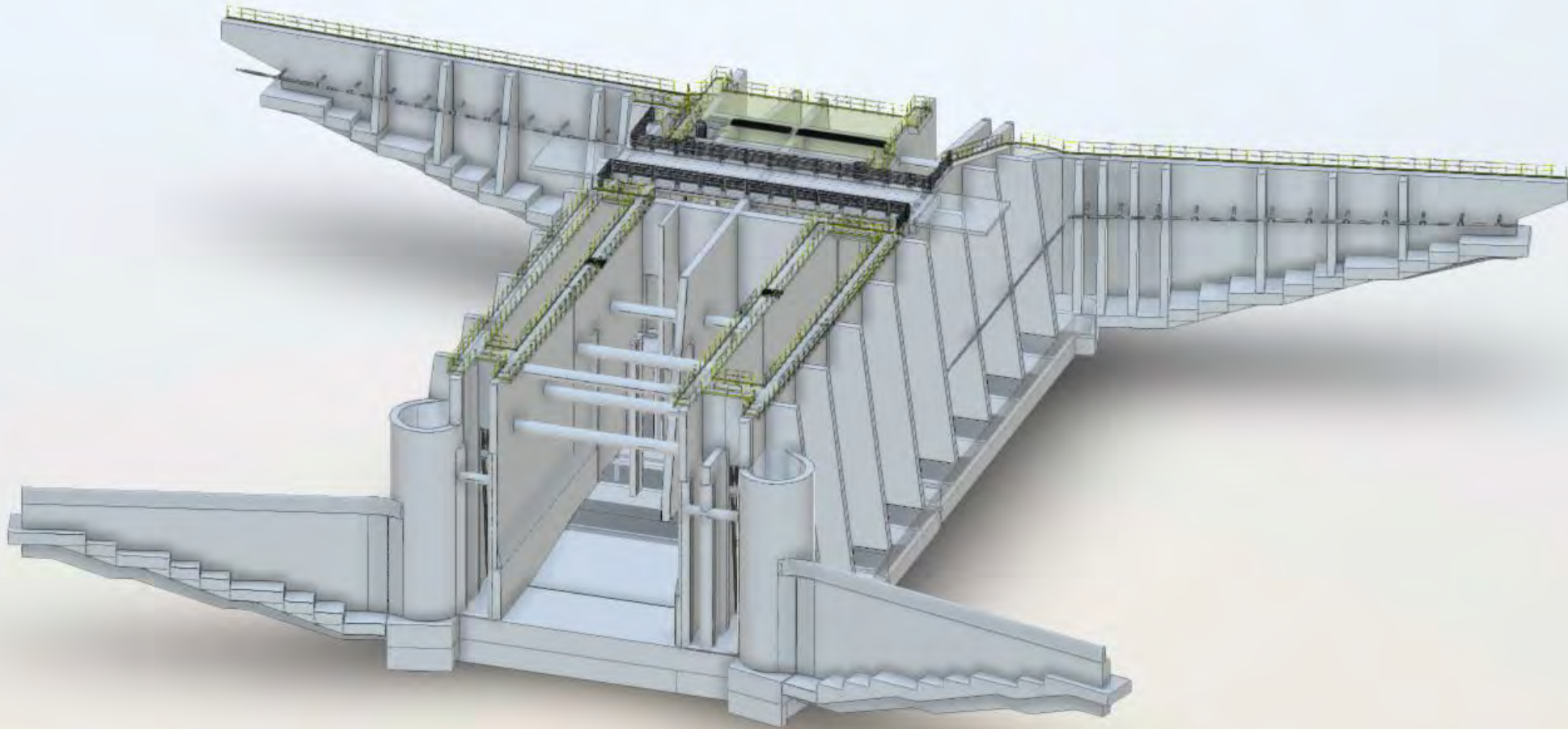
Design Improvements to Address Fish Passage Concerns:

- ▶ Improvements to Operations and Gate Functionality:
 - ▶ Operations of the facility (ie. Operating Scenarios) must ultimately satisfy regulatory requirements and mitigate flood risk
 - ▶ Based on feedback from DFO, focus on Operating Scenarios Involving Tidal Exchange (Brackish Lake and Dampened Tidal)
 - ▶ Modification of gate design for dampened tidal scenario to include a vertical slot type opening to provide passage at all water depths and to eliminate large pressure changes and strong water acceleration under gates that could potentially startle or harm fish

3D View of Proposed Structure

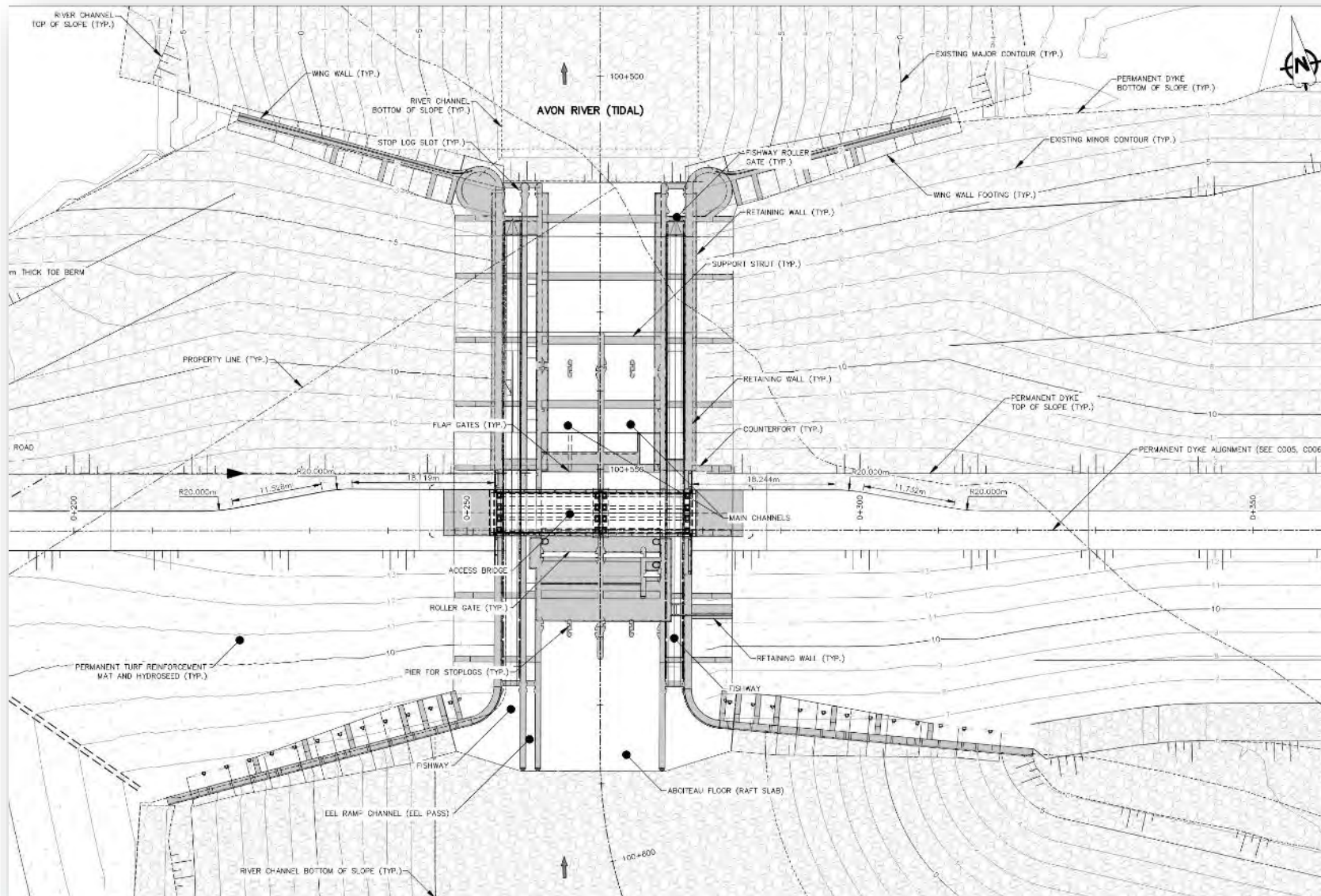
[Link to 3D model](#)

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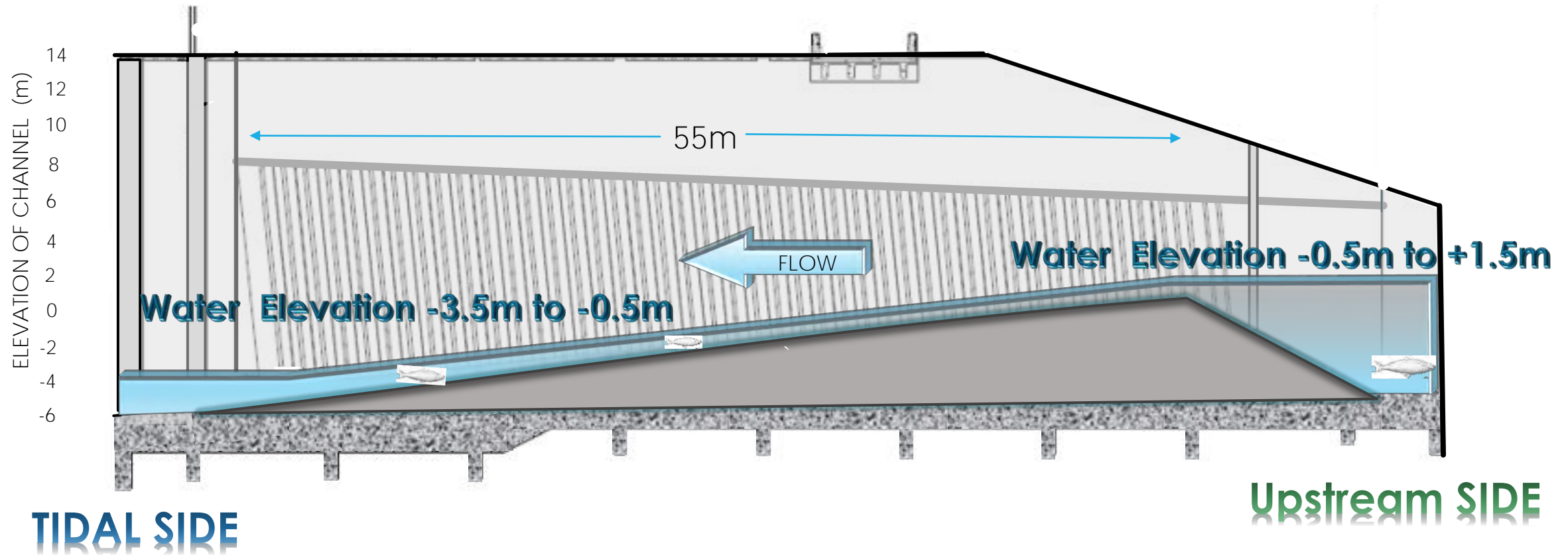
Aboiteau Site Plan

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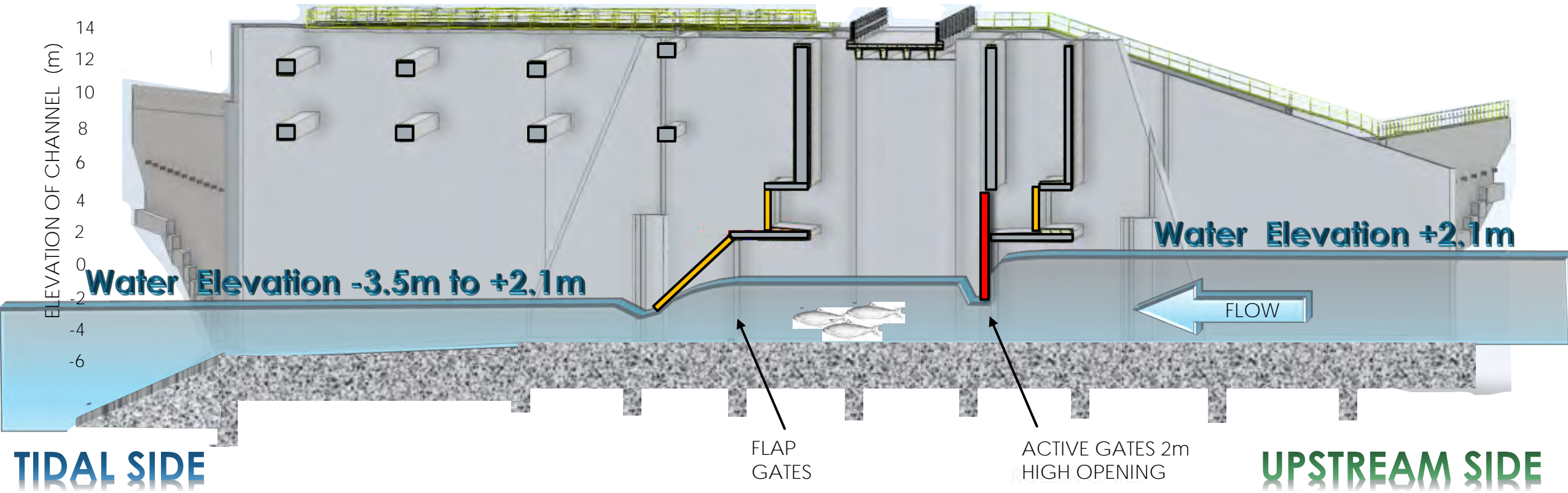
Dampened Tidal Scenario

2.1 Fishway - Low Rising Tide



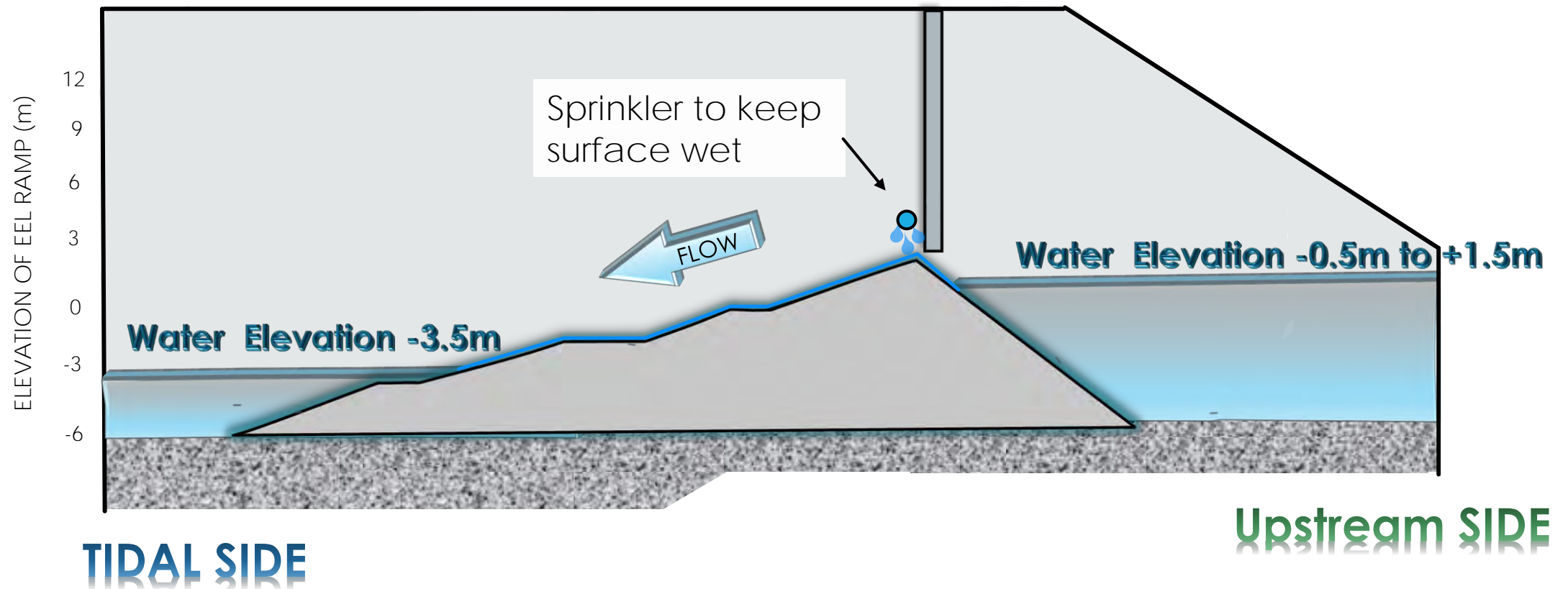
Brackish Lake Scenario

2.3 Channel 1 or 2 - Low Rising Tide



Dampened Lake Scenario

1.4 Eel Ramp – Low Tide



Design Update

Operations & Water Level Considerations:

- ▶ Dedicated fishways and eel pass are always open, except for maintenance or extreme storm events to maintain flood protection
- ▶ Brackish Lake Scenario
 - ▶ Allows some tidal exchange while maintaining a consistent water level (+2.1 m)
 - ▶ Equivalent to the historic target water level of Lake Pisiquid (+9 ft)
- ▶ Dampened Tidal Scenario
 - ▶ Allows greater tidal exchange and more estuarine environment
 - ▶ Fluctuates by approx. 2 m (from -0.5 at low tide to +1.5 m at high tide)
 - ▶ +1.5 m is equivalent to +7 ft (or 2 ft below historic lake level)

Brackish Lake Scenario



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Static Water Level Extent
Watershed Boundary

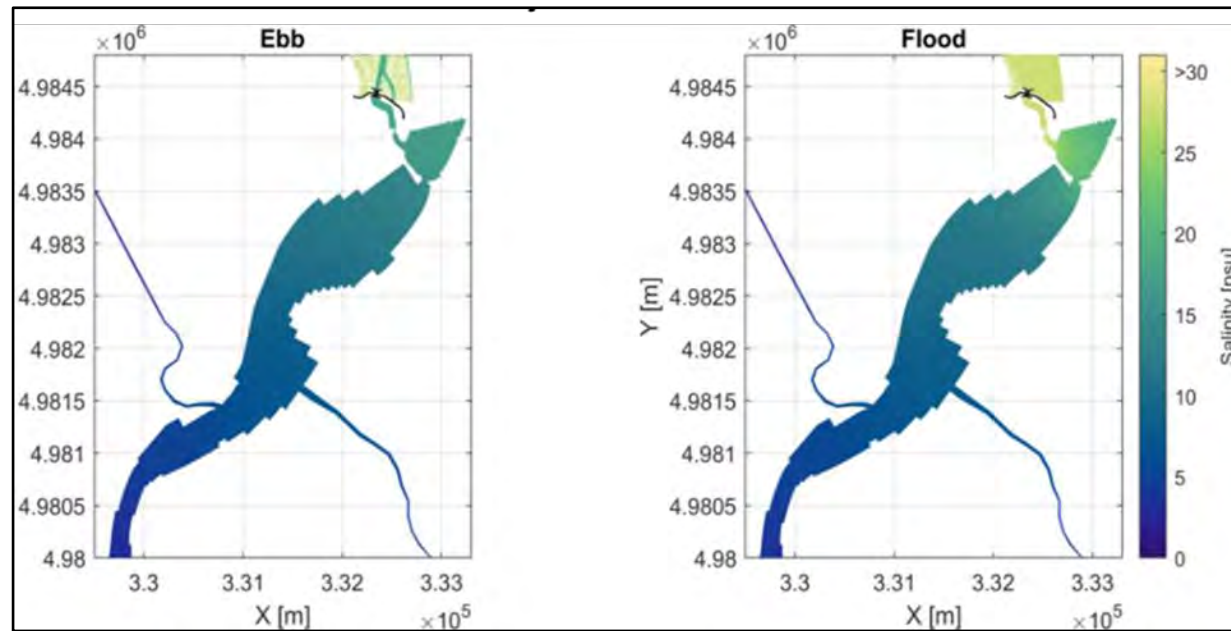
Static Water Level Extent
2.1 m
CGVD2013

Scale: 1:42,000

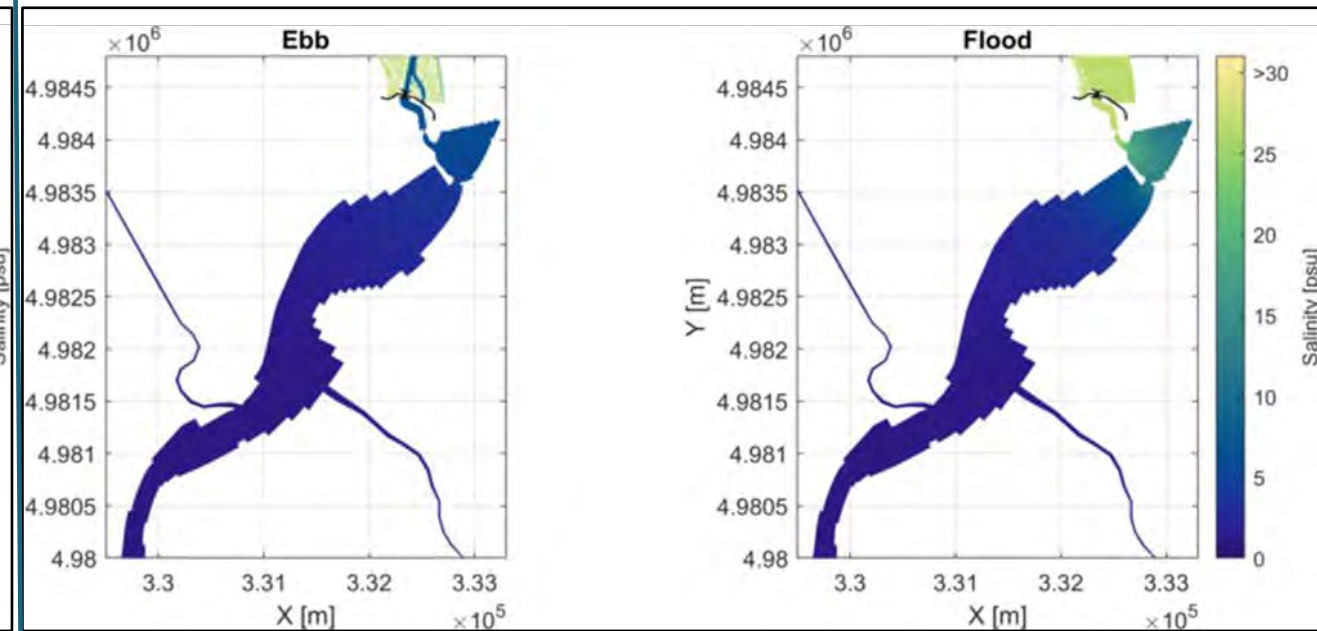
Brackish Lake – Salinity

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Salinity of Lake Pesaquid during a Dry Period (e.g. Summer and Fall)



Salinity of Lake Pesaquid during a Wet Period (e.g. Winter and Spring)



Dampened Tidal Scenario
(Low Tide)



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Static Water Level Extent
Watershed Boundary

Static Water Level Extent

-0.5 m
CGVD2013



Scale: 1:42,000

Dampened Tidal Scenario (High Tide)



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 Static Water Level Extent
 Watershed Boundary

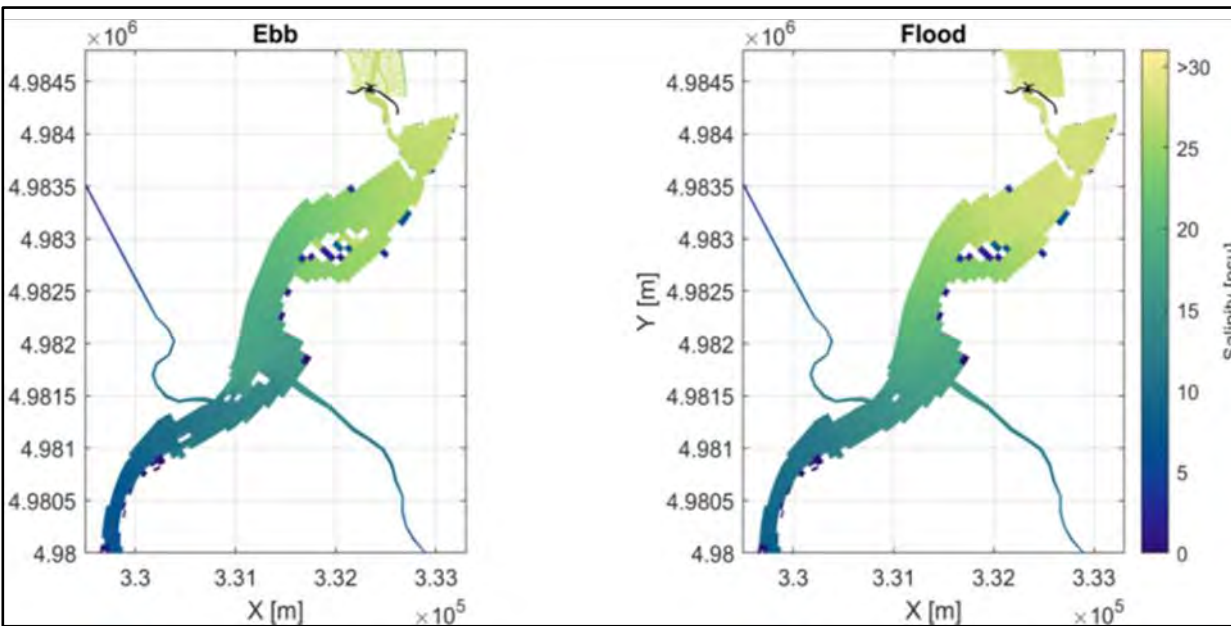
Static Water Level Extent
1.5 m
CGVD2013

Scale: 1:42,000

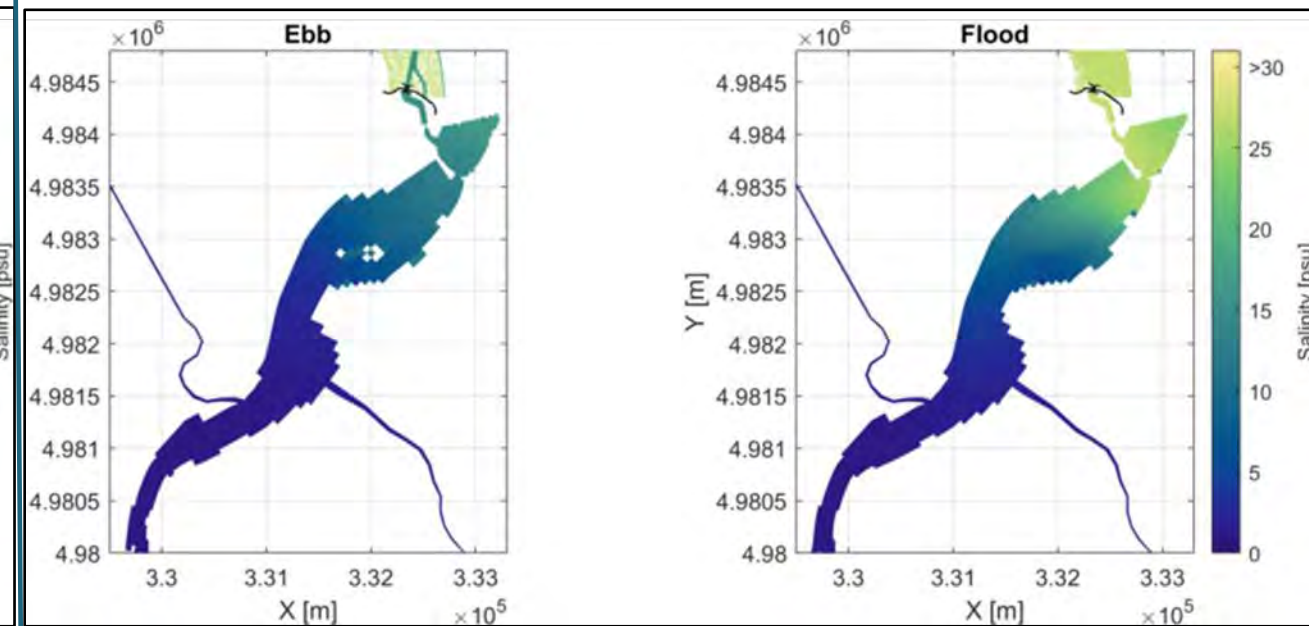
Dampened Tidal Estuary – Salinity

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Salinity of Lake Pesaquid during a Dry Period (e.g. Summer and Fall)

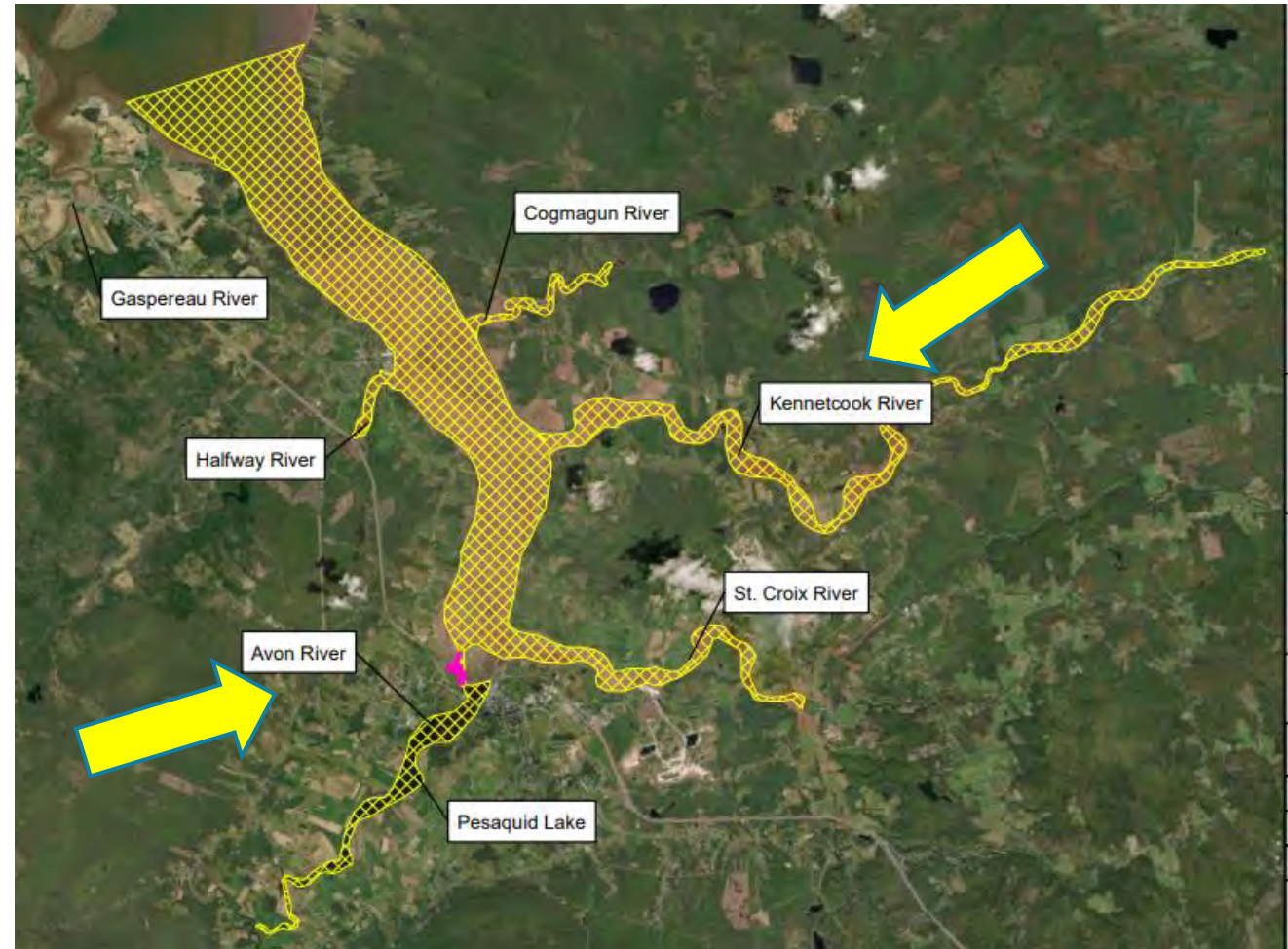


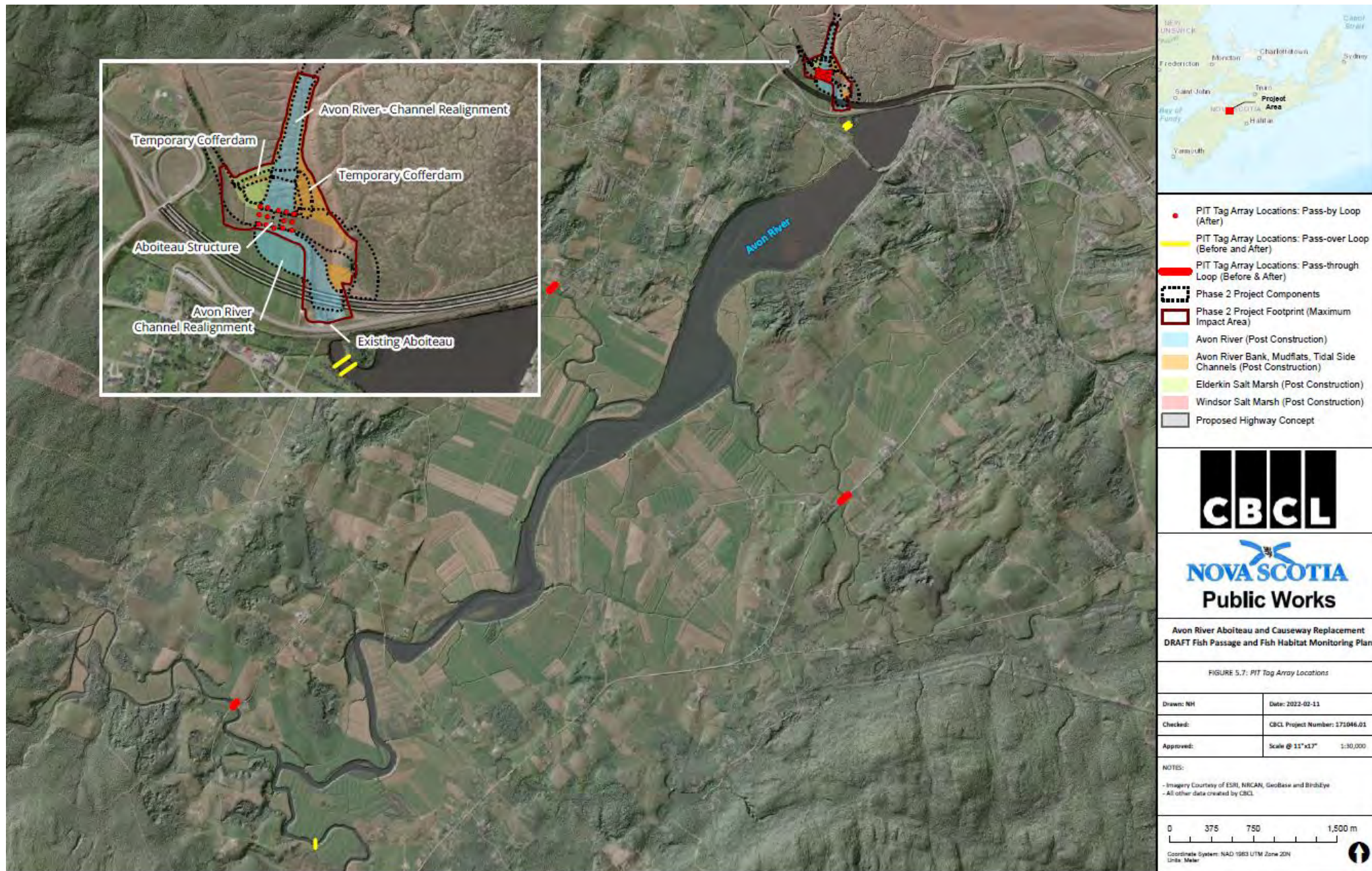
Salinity of Lake Pesaquid during a Wet Period (e.g. Winter and Spring)

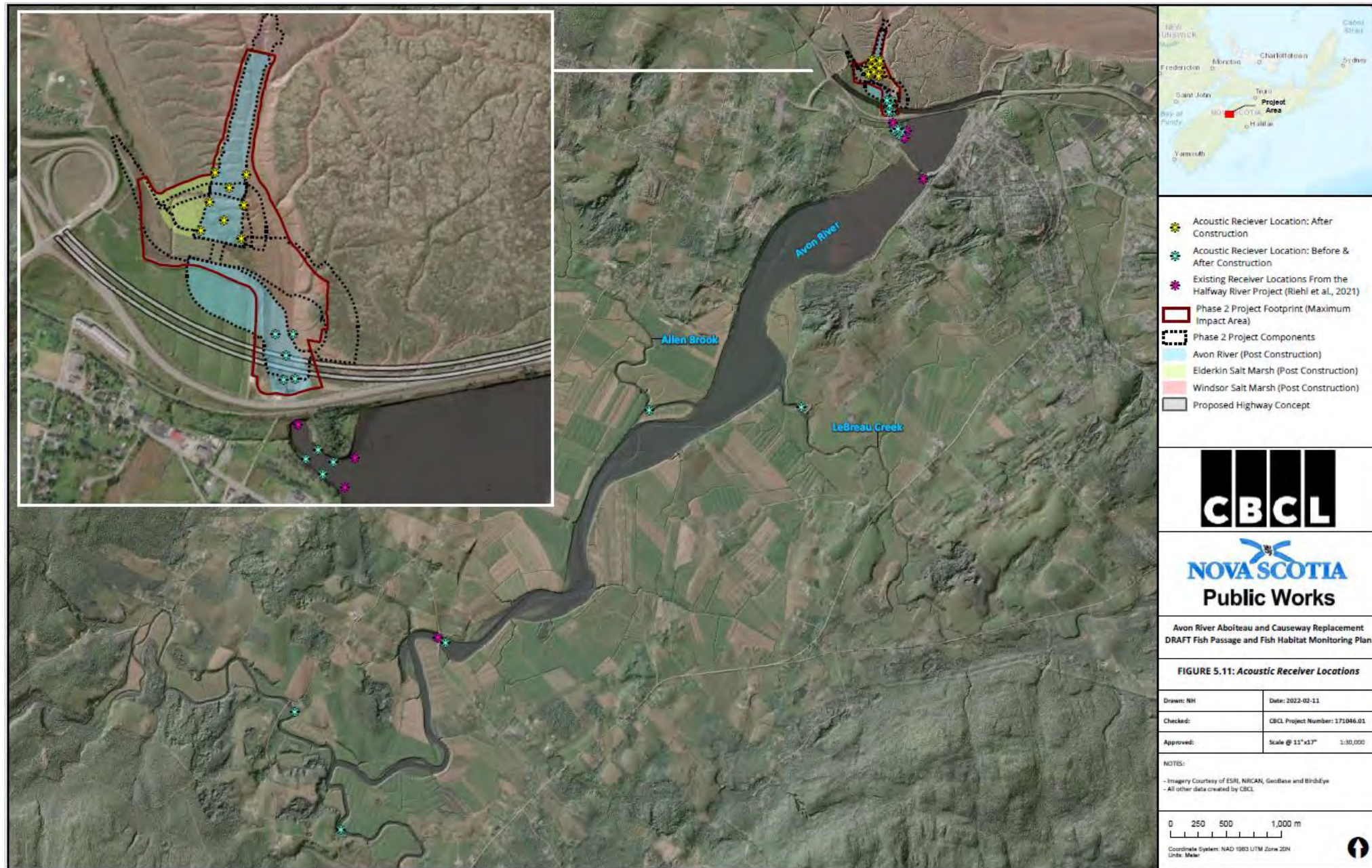


Post Construction Monitoring Plan

- ▶ Before-After Control-Impact Design (BACI)
 - ▶ Avon River (study river)
 - ▶ Kennetcook River
- ▶ Program Includes:
 - ▶ Fish Sampling Methods
 - ▶ PIT tags
 - ▶ Acoustic
 - ▶ CPUE
 - ▶ Water Quality
 - ▶ Salinity
 - ▶ TSS / Turbidity







Next Steps

- ▶ DFO Authorization: Submit Final Supplemental Modeling/Analysis Report & Revised Fish and Fish Habitat Monitoring Plan to DFO (April 2022)
 - ▶ Initiate 2-Year Pre-Construction Monitoring Program (Spring/Summer 2022)
 - ▶ Tender Ready for this Construction Season (Spring 2022)
 - ▶ DFO/Regulatory Approvals (TBD)
 - ▶ Construction (TBD - 2 to 3 years)
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- ▶ Continuing Consultation w/ Mi'kmaq (Ongoing)
 - ▶ Engagement w/ Community Liaison Committee (Ongoing)

Thank you

Questions?