The N-EWN Knowledge Series

A Continuing Education Series about Engineering With Nature ®

Streamlined Success: Delivering Fish Passage in Complex Urban Systems

Jonathan Scheibly
Principal Water Resources Engineer

Sandra Nelson
Principal Aquatic Biologist

Gwen Macdonald
Senior Project Manager

Stantec

Fish passage restoration is a cornerstone of aquatic ecosystem conservation and resilience. Restoring access to historic habitats supports healthy fish populations and benefits entire riverine and marine ecosystems, vital to biodiversity and the revitalization of commercial and recreational fisheries, which in turn creates jobs and increases ecological and economic resilience in rivers that run through local communities. This presentation demonstrates Stantec's expertise in restoring fish passage and aquatic connectivity through innovative, nature-based solutions. By addressing complex technical, ecological, and regulatory challenges, our multidisciplinary teams deliver sustainable river restoration projects that benefit both fish populations and critical infrastructure. Our approach integrates thoughtful yet efficient planning, strategic engagement, adaptive design, effective construction, and collaboration with local communities interested in achieving lasting ecological and social outcomes. Featured case studies across North America showcase a practical pathway to overcome hurdles and move beyond planning to construct effective, long-lasting solutions that reconnect miles of river habitat, restore healthy fish populations, and benefit both ecosystems and the built environment.

Save the date!

Upcoming webinars will take place the 3rd Thursday of the month.

Jan 15
12:30pm ET

Jonathan Scheibly, Sandra Nelson, and Gwen Macdonald, Stantec
Streamlined Success: Delivering Fish Passage in Complex Urban Systems

Feb 19
12:30pm ET

Tom Klein, Waterfront Alliance
WEDG® Waterfront Edge Design Guidelines

Mar 19
12:30pm ET

Quirijn Lodder and Evelien Brand, Dutch Ministry of Infrastructure and Water Management
Nourishing the Dutch Coast to Mitigate Coastal Erosion and Adapt to Sea Level Rise

Register here: https://bit.ly/3gR9ADL **or scan:**

1 Continuing Education Credit (CEC) is available to attendees

Recorded webinars posted online at:
https://n-ewn.org/resources/n-ewn-knowledge-seminars/

Presented by:

NETWORK FOR ENGINEERING WITH NATURE · LimnoTech · UNIVERSITY OF GEORGIA · ERDC

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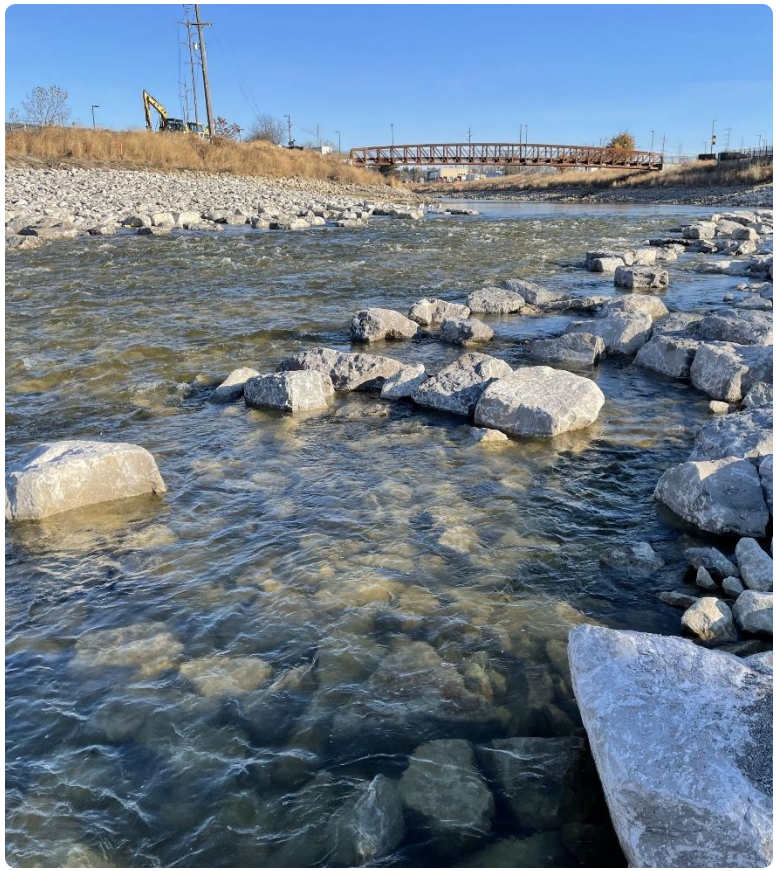
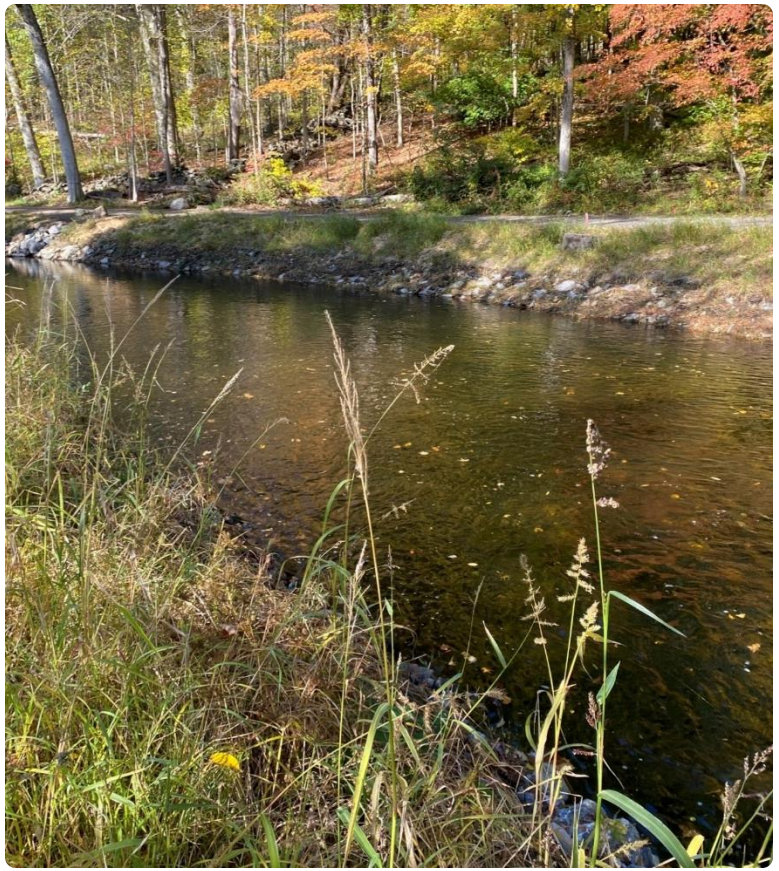
Key Restoration Projects



FLINT RIVER, MICHIGAN

SUMGAS CREEK, BRITISH COLUMBIA



STRONG POND DAM, CONNECTICUT

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Flint River Restoration

N-EWN WEBINAR | JANUARY 15, 2026


Project Extents
Courtesy Google Earth


0 65 130 mi
0 100 200 km
CANADA
MICHIGAN
Flint
OHIO
INDIANA
© Encyclopædia Britannica, Inc.

Project Objectives

1. Flood risk reduction
2. Provide fish passage
3. Improve boater passage
4. Naturalize river morphology and flow regime
5. Create/improve in-river habitat
6. Support adjacent park improvements, including access

Rendering Courtesy
Wade Trim, Inc.

Project Challenges

1. Existing flood infrastructure
2. Adjacent properties
3. Sediment dredge and cap project
4. Funding gaps
5. Unknown conditions


Project Extents
Hamilton Dam
Courtesy Google Earth
Harriet St
Industrial Ave
Wilberforce Dr
Spellman Dr
Loyola Dr
Vanderbilt Dr
Sagnaw St
Ave C
Ave B
Ave A
Williams St
Columbia Dr
James P Cole Blvd
E Boulevard Dr
Nelson St
Martin Luther King Ave
7th Ave
Lyon St
Louisa St
Ford J McCree Dr
E 5th Ave
Flint River
Mason St
ARRIAGE TOWN
Harrison St
W Water St
Beach St
E Kearsley St
Chavez Dr
Crapo St
Poplar St
475

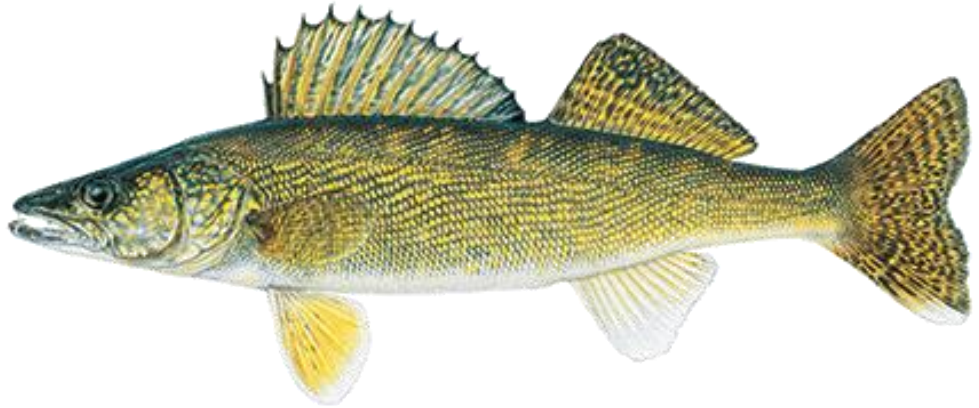
Hamilton Dam – Background

Hamilton Dam – 2010

Hamilton Dam – 2024

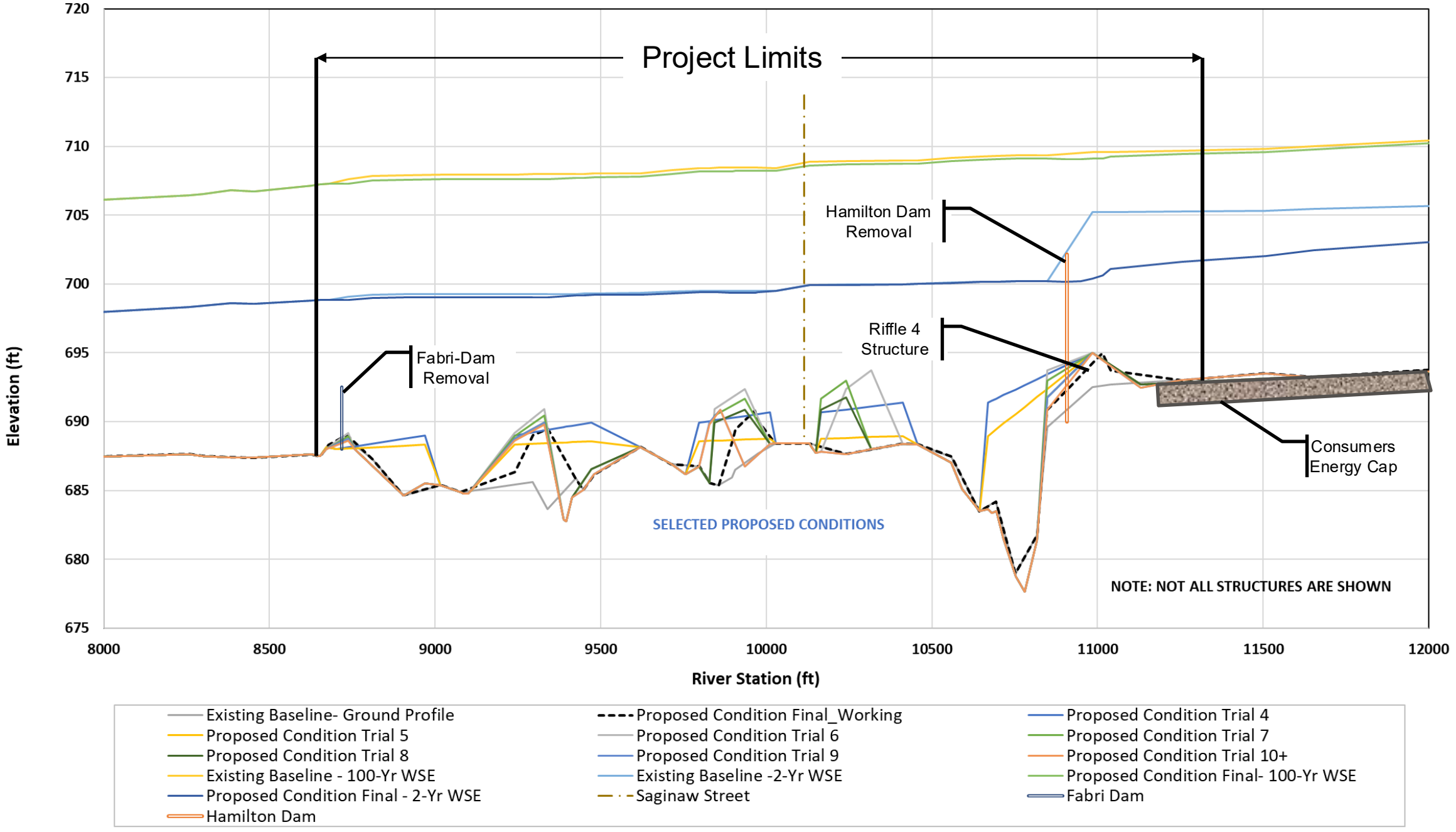
Fish Passage

1. Target species included walleye and lake sturgeon.
2. Allow for fish movement during low flow and spring spawning.
3. Opens ~25 miles of potential habitat

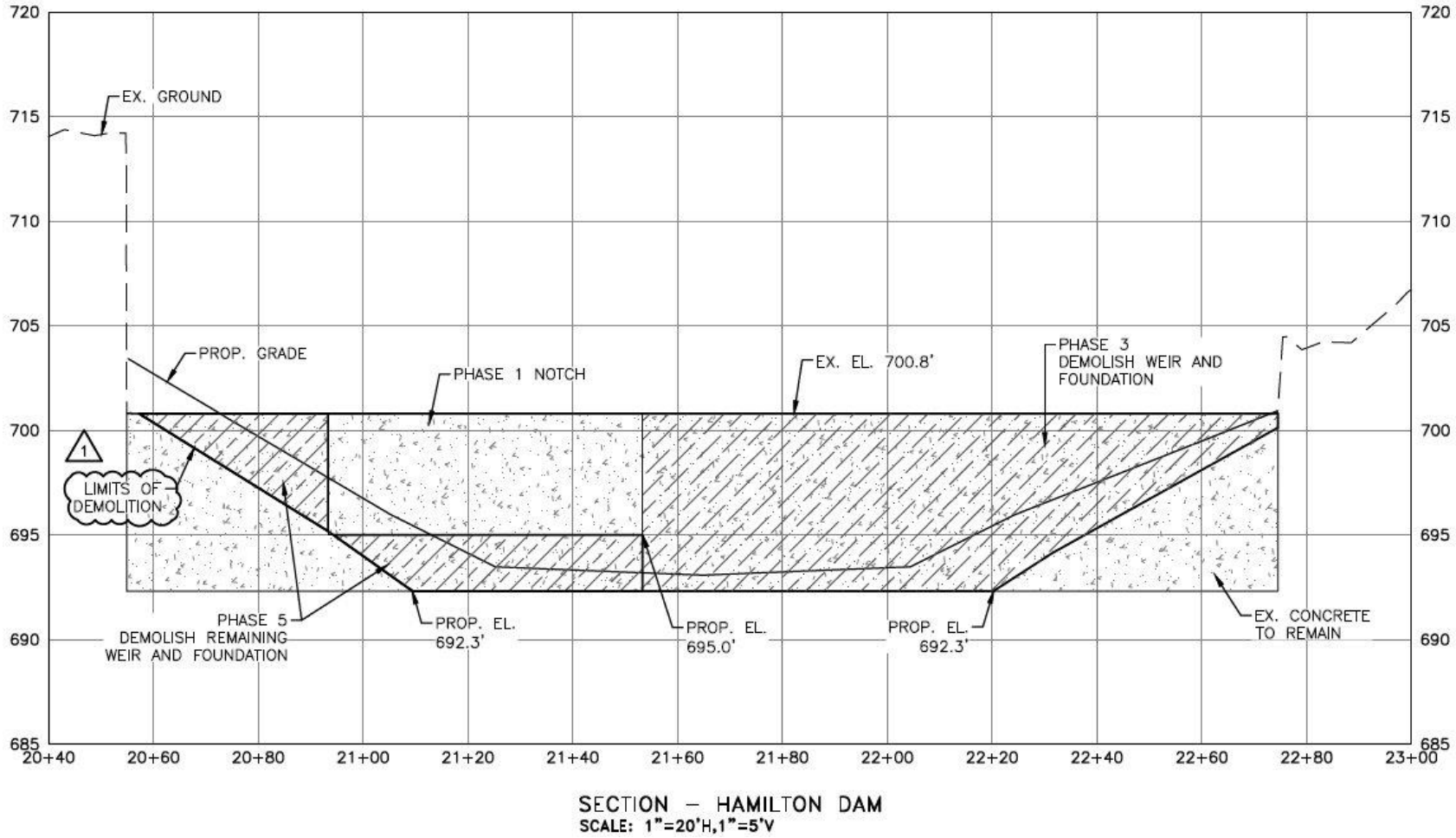


Walleye, *Sander vitreus*

Lake Sturgeon, *Acipenser fulvescens*


Project Limits
Hamilton Dam Removal
Riffle 4 Structure
Fabri-Dam Removal
Consumers Energy Cap
SELECTED PROPOSED CONDITIONS
NOTE: NOT ALL STRUCTURES ARE SHOWN
Elevation (ft)
720
715
710
705
700
695
690
685
680
675
8000
8500
9000
9500
10000
10500
11000
11500
12000
River Station (ft)
Existing Baseline- Ground Profile
Proposed Condition Final_Working
Proposed Condition Trial 4
Proposed Condition Trial 5
Proposed Condition Trial 6
Proposed Condition Trial 7
Proposed Condition Trial 8
Proposed Condition Trial 9
Proposed Condition Trial 10+
Existing Baseline - 100-Yr WSE
Existing Baseline -2-Yr WSE
Proposed Condition Final- 100-Yr WSE
Proposed Condition Final - 2-Yr WSE
Saginaw Street
Fabri Dam
Hamilton Dam

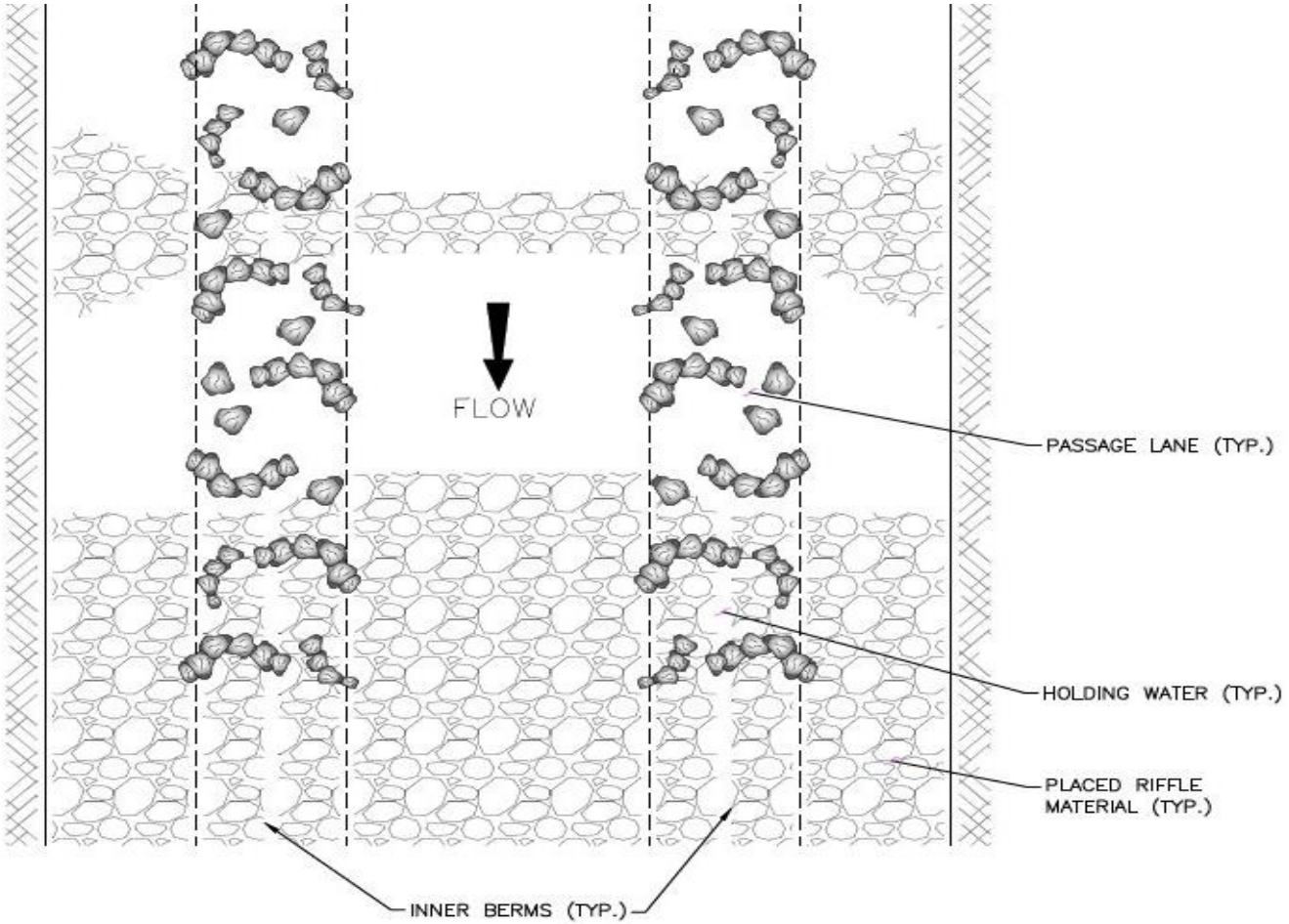
Hamilton Dam Removal: Section



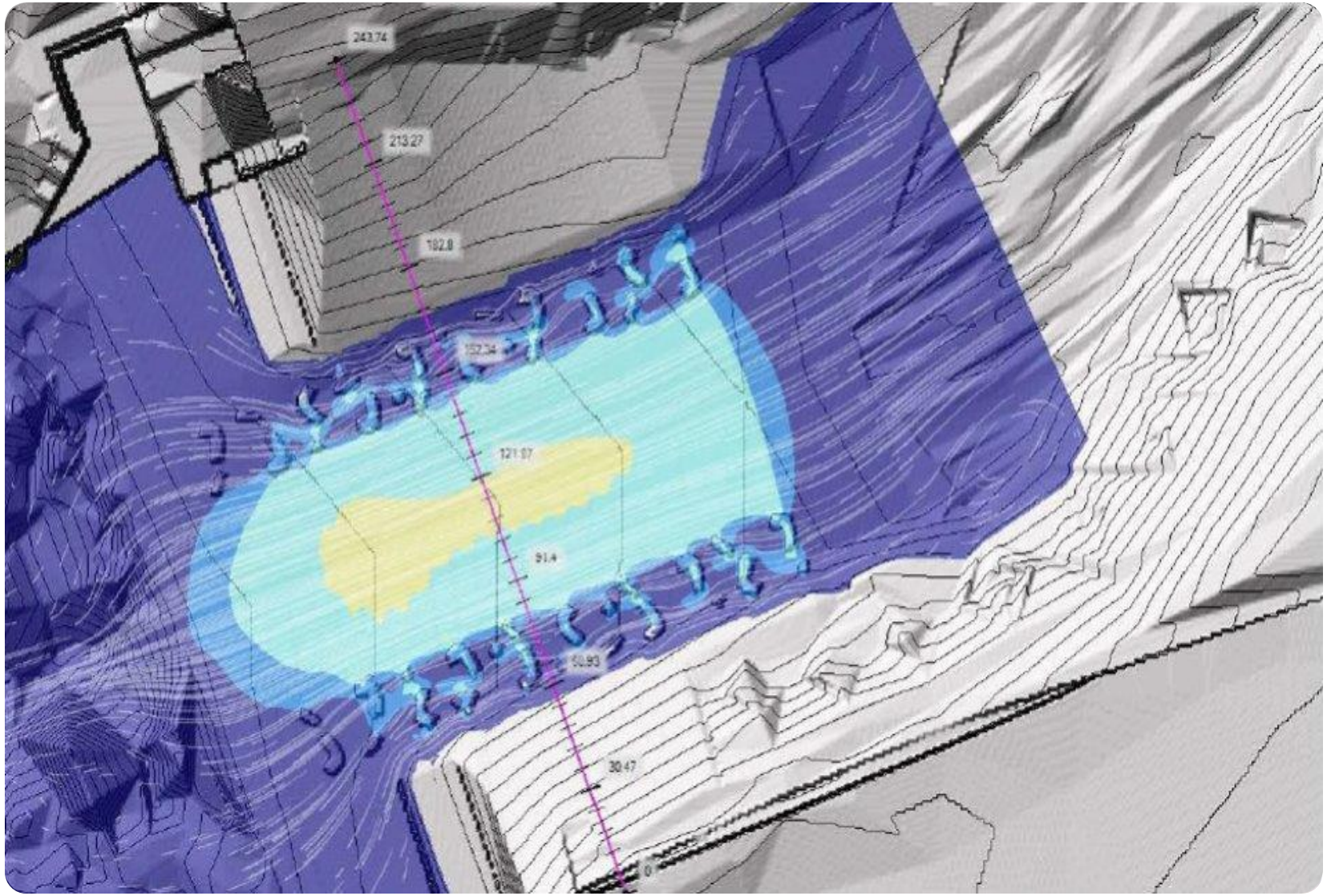
SECTION – HAMILTON DAM
SCALE: 1"=20'H,1"=5'V

Fish Passage Structures

- Allow for fish movement during low flow (192-CFS) and spring spawning (650-CFS)
- Avg. velocities <3-ft/sec, reduce areas of >5-ft/sec
- Provide fish passage lanes

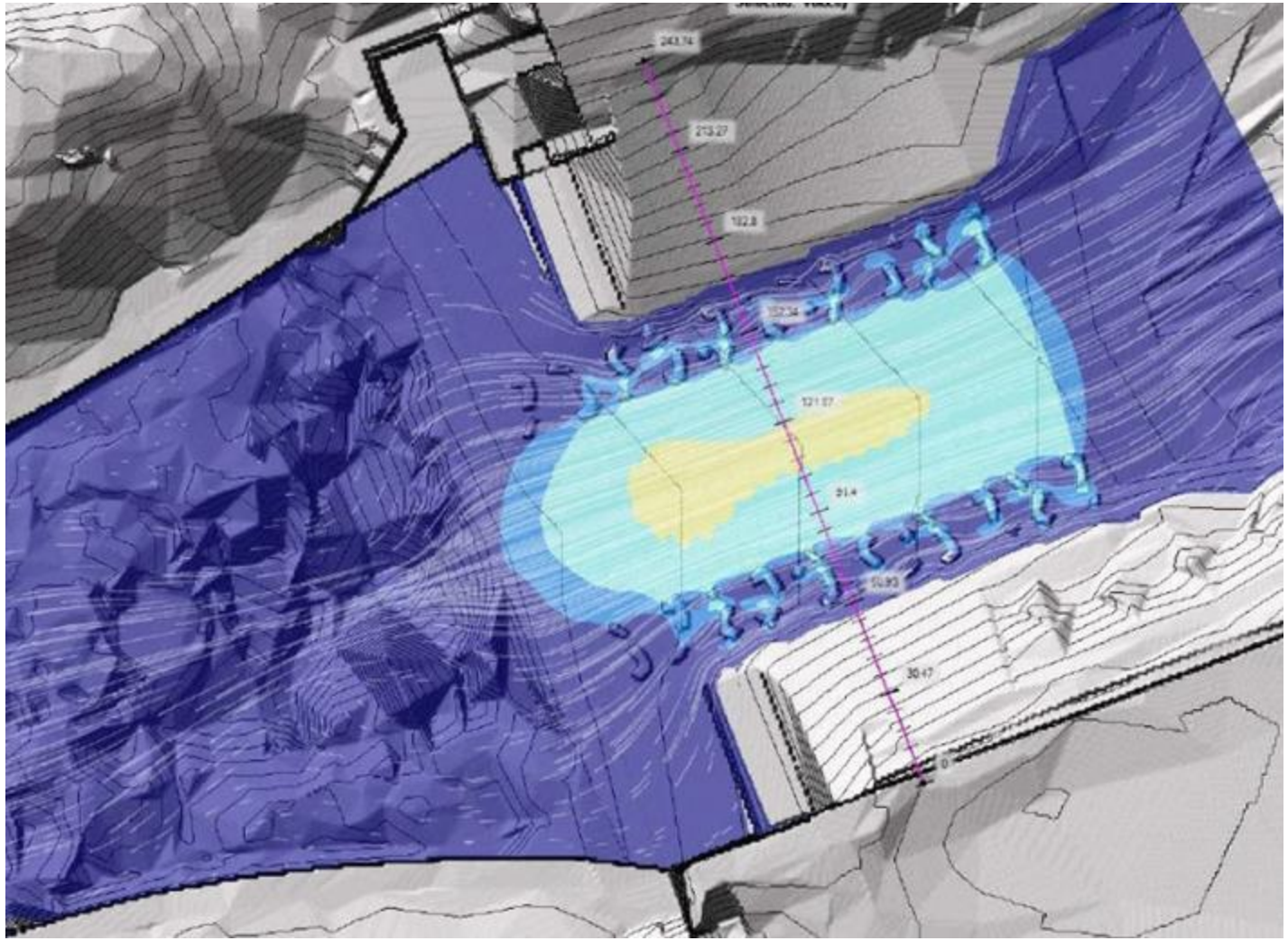


Fish Passage Evaluation



Construction Sequence: September – December 2024

Riffle 4: Plan Form



Post Construction Performance

2024 & 2025 geomorphic assessments

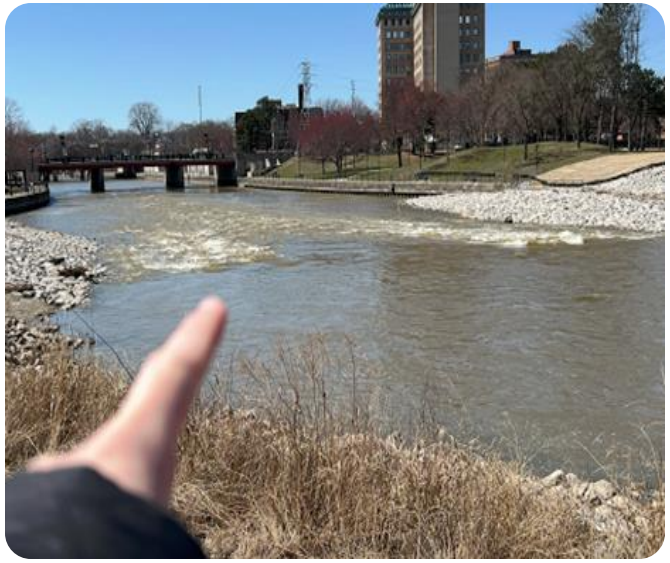
- Stable, within construction tolerances
- Sediment transport

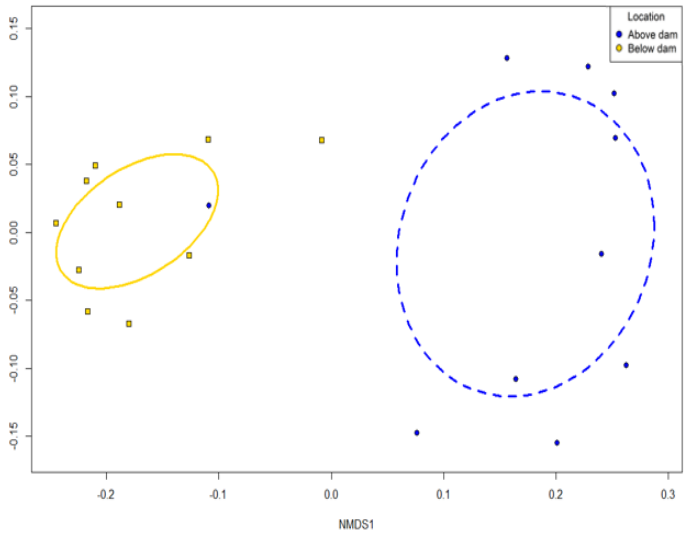
April 2025 UM Flint Sampling:

- Spawning male walleye caught U/S of former dam location
- Upstream smallmouth migration into constructed habitat
- Small-bodied lithophilic spawning documented in constructed riffle

Future Fisheries Work:

- Presence/absence & taxonomic diversity surveys
- Functional assemblage surveys





Photos and Data Courtesy
Dr. Heather Dawson,
UM Flint

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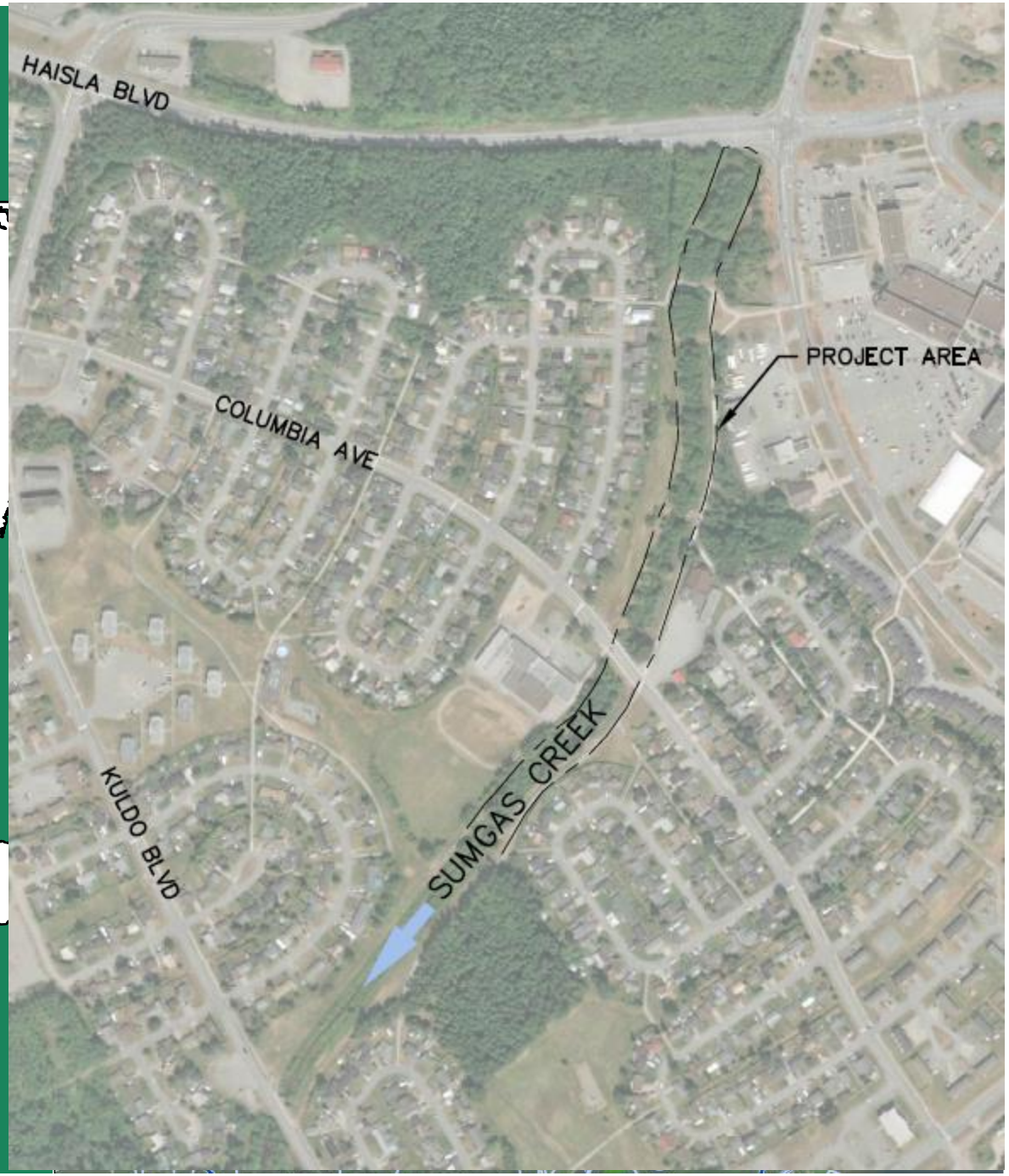
Sumgas Creek Restoration

Turning “Uh Oh” into “Woo Hoo”

Urban stormwater management at its best

Sumgas Creek, Kitimat

- 6.6 km long
- 3rd order tributary to Kitimat River
- Distinct floodplain, middle, and headwater reaches

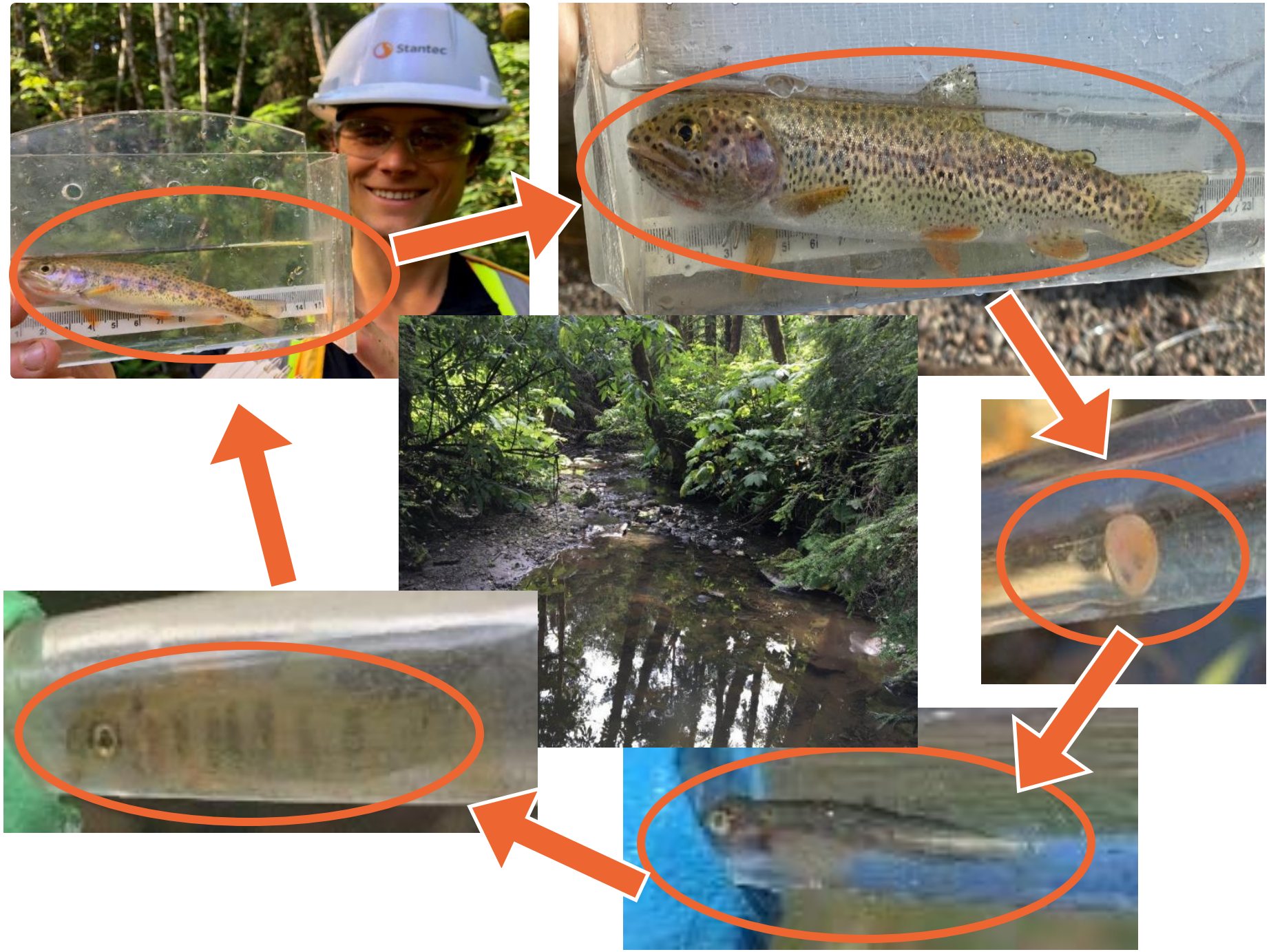


Impassable

- Eight weirs
- Culverted road crossings
- Salmon on Kitimat River floodplain
- Coho salmon (*Oncorhynchus kisutch*)
- Pink salmon (*O. gorbuscha*)

Isolated Coastal Cutthroat Trout

- *Oncorhynchus clarkii clarkii*
- Blue-listed (Special Concern) in British Columbia
- Flexible life history
  - Resident or migratory
  - Size at maturity varies with habitat

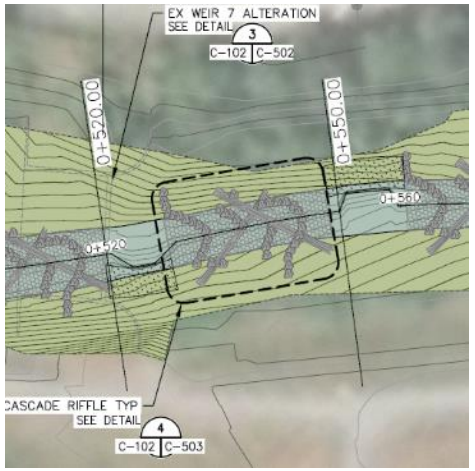


Get ready, get set…

2019

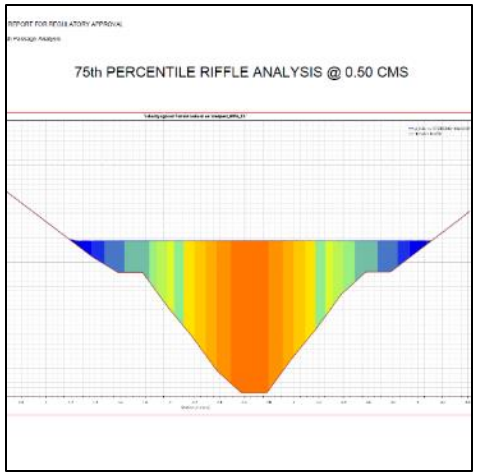
Baseline

- Biology
- Hydrology
- Survey



2020-2021

- Design (Preliminary, 30%, 60%)
- Hydraulic Model
- Engagement (DFO, Haisla Nation, District of Kitimat)



2022

- Permitting (incl. FAA)
- Geotech Assessment
- IFT Design
- Fish passage modelling
- Phase I & II ESA

2023

Construction!

- Need every low-flow minute…


Concrete Sill

Uh oh…

Too many redds!

Egg Salvage

Wait… you're going to do what??

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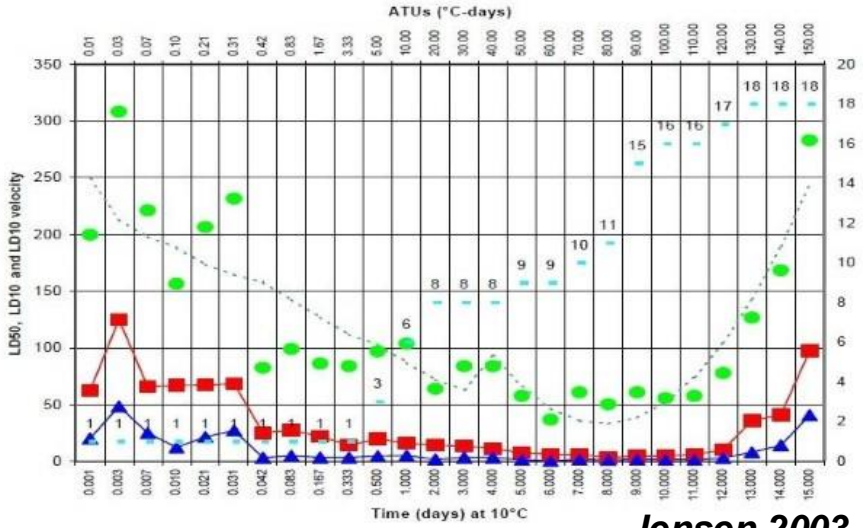
Where and When

- Used temperature data from our upstream logger and a new logger in the cleared area
- Calculated accumulated thermal units for each redd
- Excavated the redds by hand
- Incubated the eggs in Jordan-Scott incubation boxes upstream

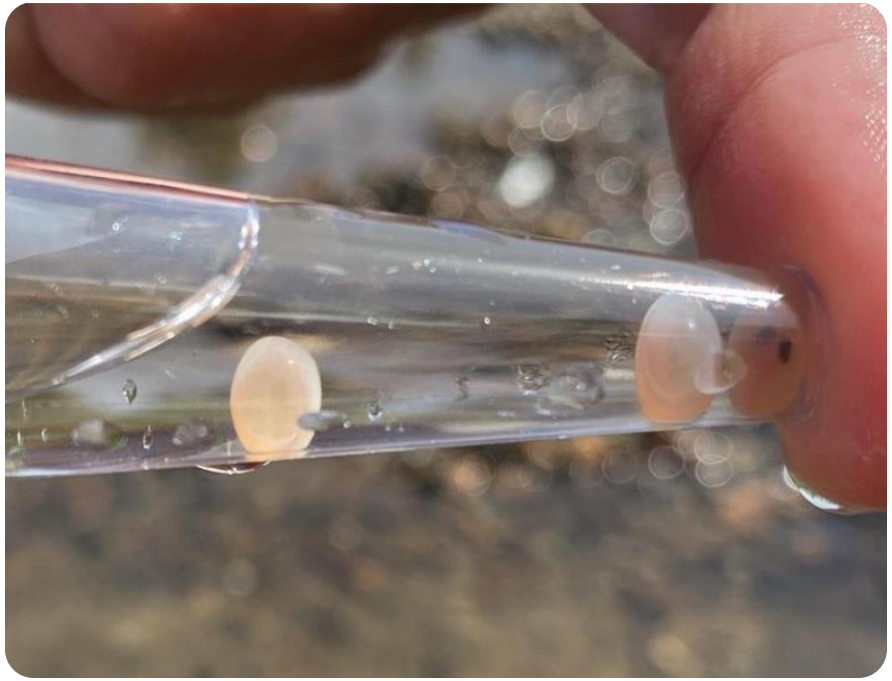


Jensen 2003

Results

Salvages and Excavations

- **Salvaged 13 redds**
  - 2 empty (test redds)
  - 7 with eggs
  - 4 with eggs and alevins
- **Excavated 34 redds** after expected emergence (confirm not active)
  - **14 empty**
    - Greater proportion than test redds—some may have had 100% survival and emergence
  - **20 had dead eggs**



90%

Overall survival of incubated eggs

Range by redd: 79% to 100%

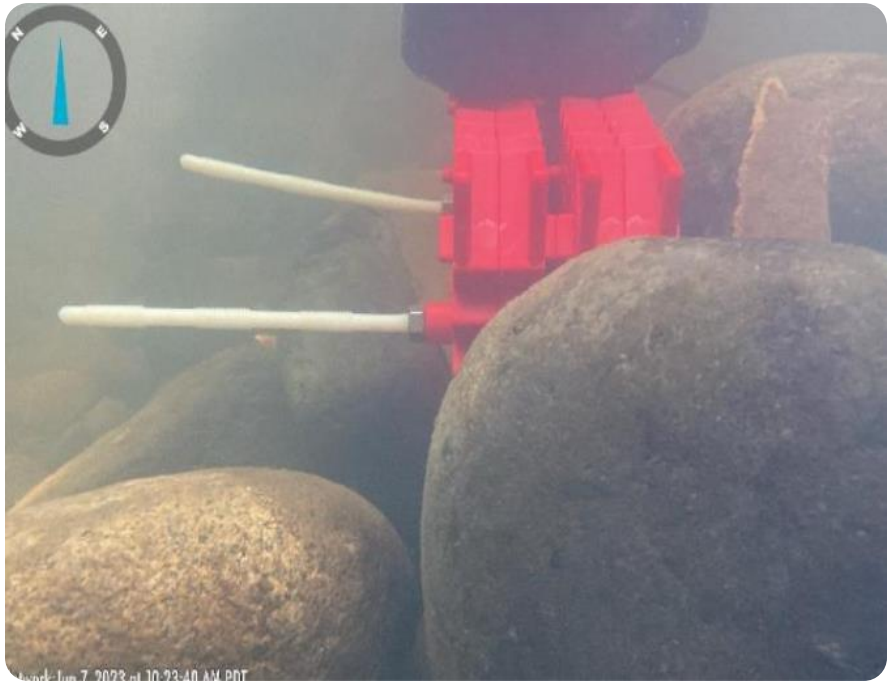
Keys to Success

Address Mortality Sources: Egg stress

- Mechanical
- Temperature
- Light

Incubator (Jordan-Scotty)

- Loss
- Sedimentation
- Fungus
- Freezing/drying



Onward to Construction


June 8, 2023


August 12, 2023


August 18, 2023


September 26, 2023

Woo Hoo!

Achievement unlocked!


Emily Thomas, WSP

Woo Hoo!

Coho salmon spawned in the Sumgas Creek headwaters for the first time in 70 years…

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Strong Pond Dam Removal

Restoring Fish Passage in the Norwalk River while Protecting Critical Infrastructure

N-EWN WEBINAR | JANUARY 15, 2026

Take me to the river

Dam →

Ancient History

2010 Design

Primary Objective

1. “provide fish passage”

Secondary Objectives

1. Remove contaminated sediment
2. Prevent piping of fine-grained material from railroad embankment
3. Reinforce the railroad embankment
4. Minimize disturbance
5. Stabilize the river grade
6. Make newly created channel as stable as upstream and downstream channel using rounded rock
7. Create a new floodplain
8. Minimize pollution during construction

Goals, Objectives, and Criteria

2019 Basis of Design

Primary Goals

1. **Volitional fish passage**
2. Remove a public safety hazard
3. Reconnect ecosystem services between the riverine and estuarine environments
4. Restore natural biotic and abiotic fluxes to enhance the aquatic ecosystem

Secondary Goals

1. Minimize long-term site maintenance costs
2. Provide opportunities to enhance educational opportunities and public recreation

Design Objectives and Criteria

1. **Protect the existing railroad embankment**
2. Support development of a more natural channel morphology
3. Minimize disturbance to the upstream channel
4. Minimize the potential for uncontrolled release of sediment
5. **Reduce Project construction costs relative to the 2010 NRCS Design**

Design Objectives – 2019 Basis of Design

2010 - 2019 What Changed?

2010 NRCS Design

Primary Objective

1. Provide fish passage

Secondary Objectives

1. Remove contaminated sediment
2. Prevent piping of fine-grained material from railroad embankment
3. Reinforce the railroad embankment
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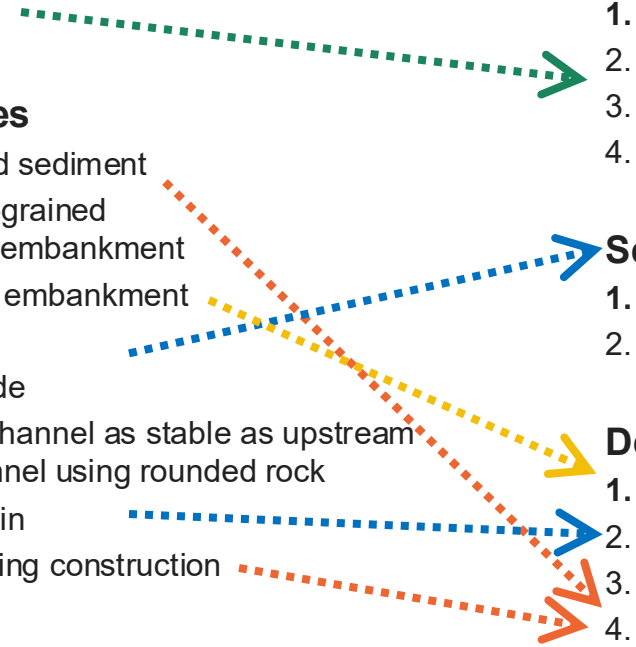

2019 Basis of Design

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1. **Provide volitional fish passage**
2. Remove a public safety hazard
3. Reconnect ecosystem services between the riverine and estuarine environments
4. Restore natural biotic and abiotic fluxes to enhance the aquatic ecosystem

Secondary Goals

1. **Minimize long-term site maintenance costs**
2. Provide opportunities to enhance **education and public recreation**

Design Objectives and Criteria

1. **Protect the existing railroad embankment**
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Infrastructure

Train in vain

The Big Issue: Railroad Embankment

Previous Approach to Infrastructure Dependencies

- Part of the dam removal project
- Armor, armor, armor

Evolved Approach *(opportunity?)*

- The dam wasn't constructed to protect the railroad
- Identify responsibilities and collaborate
- Address infrastructure as part of the dam removal process

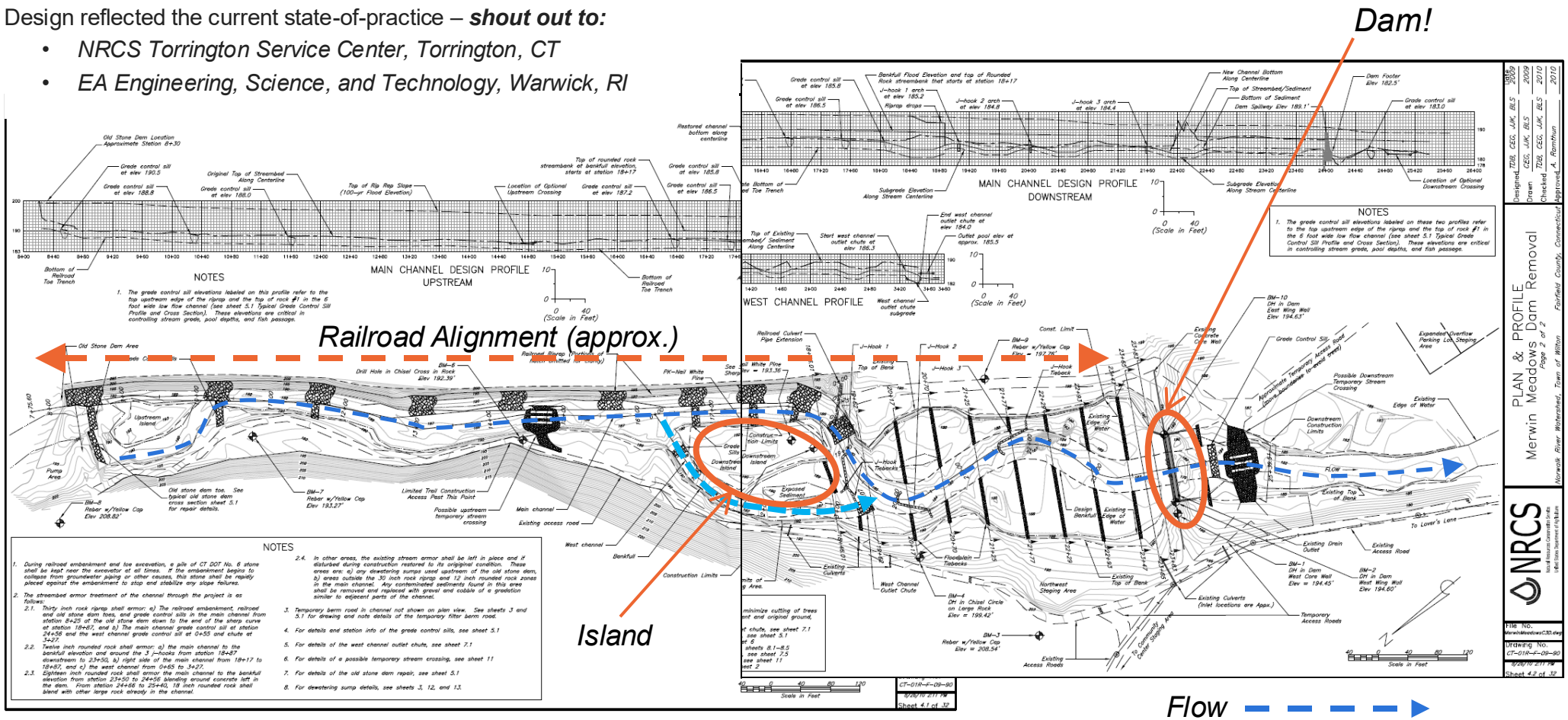
Railroad Embankment

Montage from Plan Sheet Nos. 4.1 and 4.2 of 32 from 2010 NRCS Plan Set

You can't move the railroad… So, why not the river?

Design reflected the current state-of-practice – ***shout out to:***

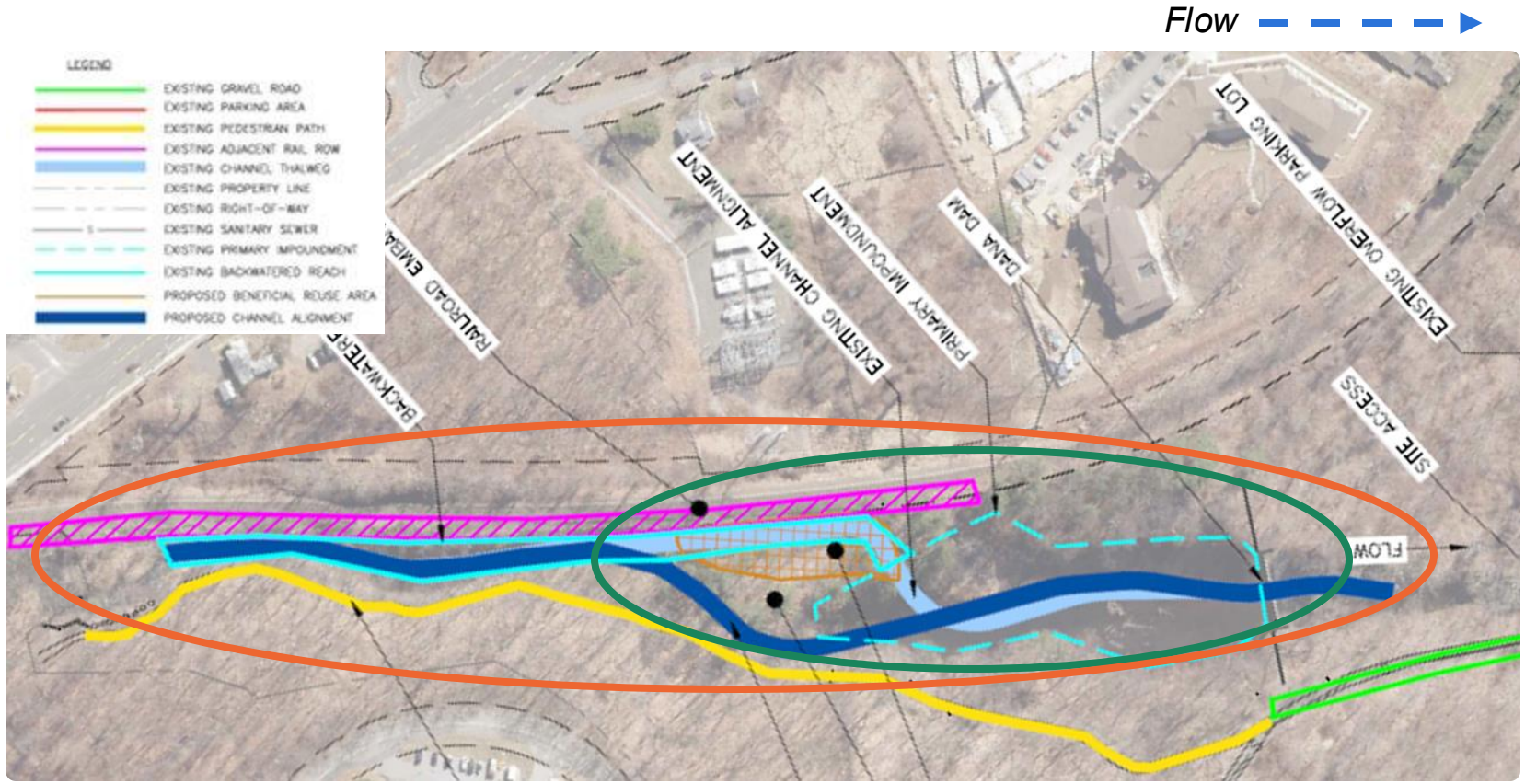
- *NRCS Torrington Service Center, Torrington, CT*
- *EA Engineering, Science, and Technology, Warwick, RI*



Railroad Embankment

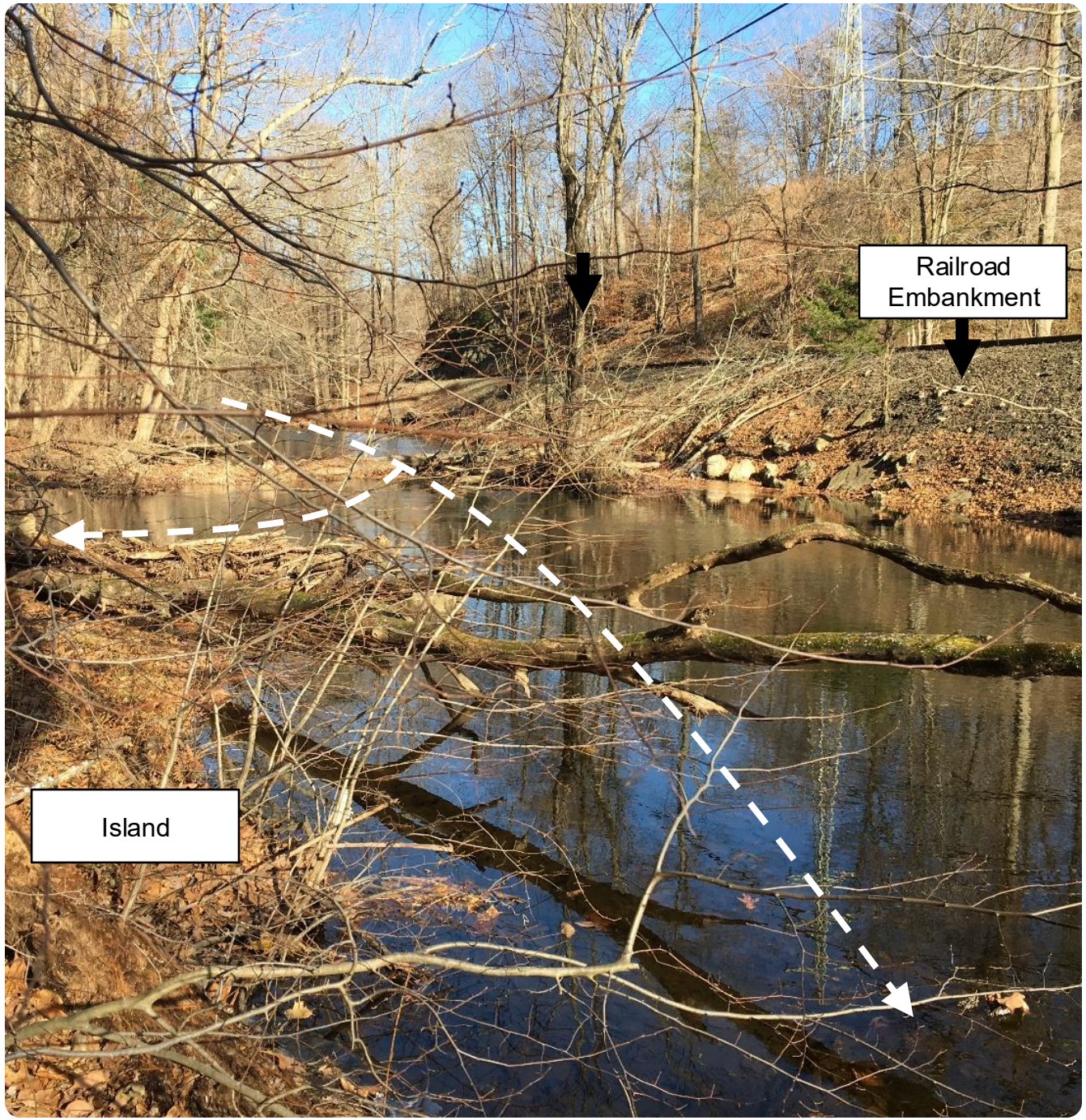
You can't move the railroad… So, why not the river?

- ~1,000 ft of railroad embankment along the river with…
- ~300 ft of embankment along the primary channel adjacent to an (anthropogenic) island
- CTDOT actively working on remedial actions



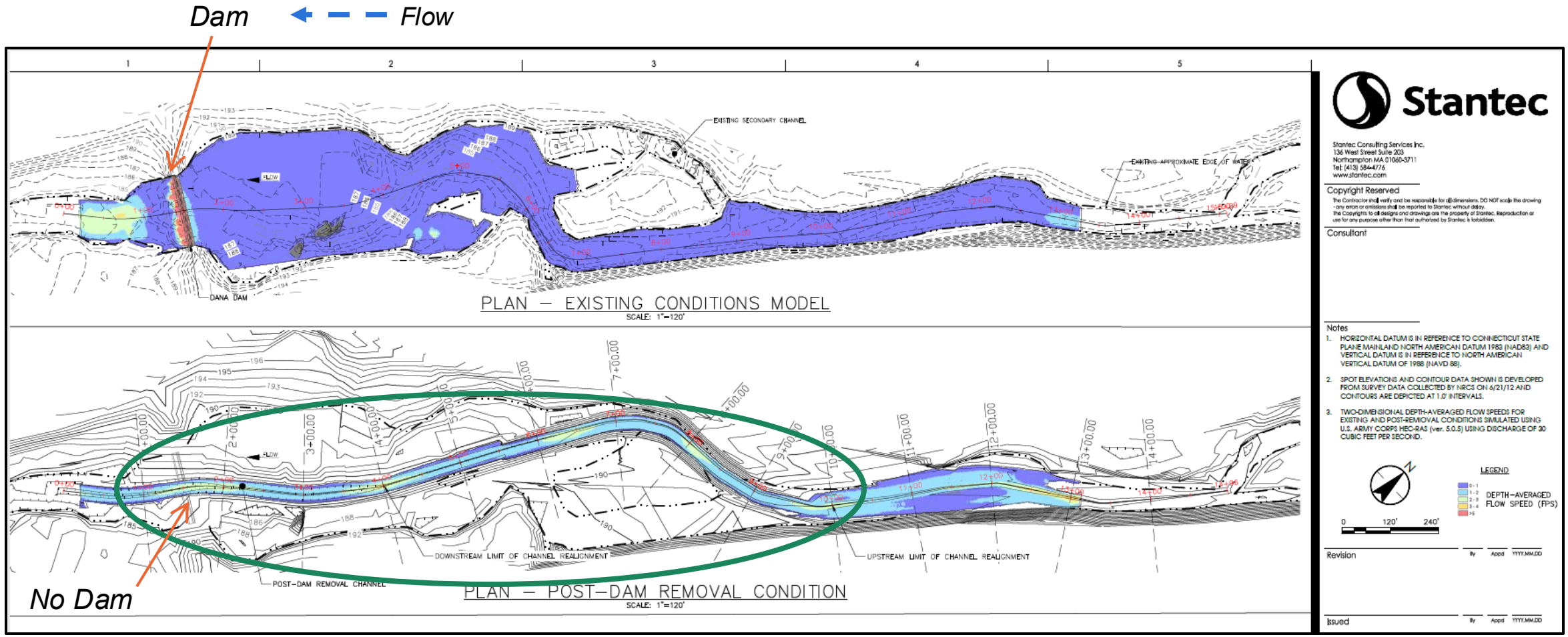
Conceptual Design Elements

1. Proposed extent of dam removal
2. Proposed channel alignment
3. Aquatic organism passage
4. Protection of railroad embankment
5. Sediment management
6. Changes to regulated natural resources
7. Construction access & staging
8. Construction-phase water & sediment management



Realignment of the Norwalk River

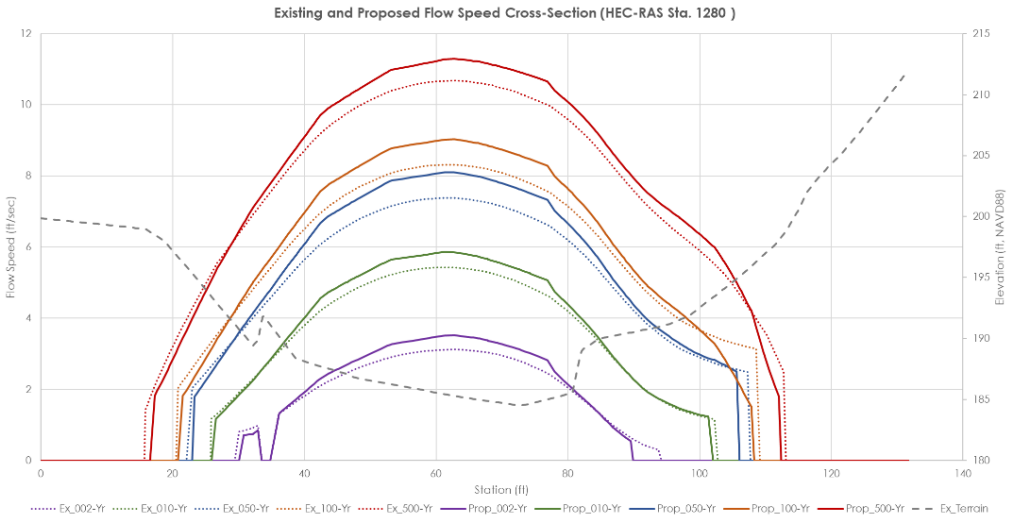
- Move ~300 ft of river away from the railroad embankment
- "Hydraulic Similitude" upstream from the project limits

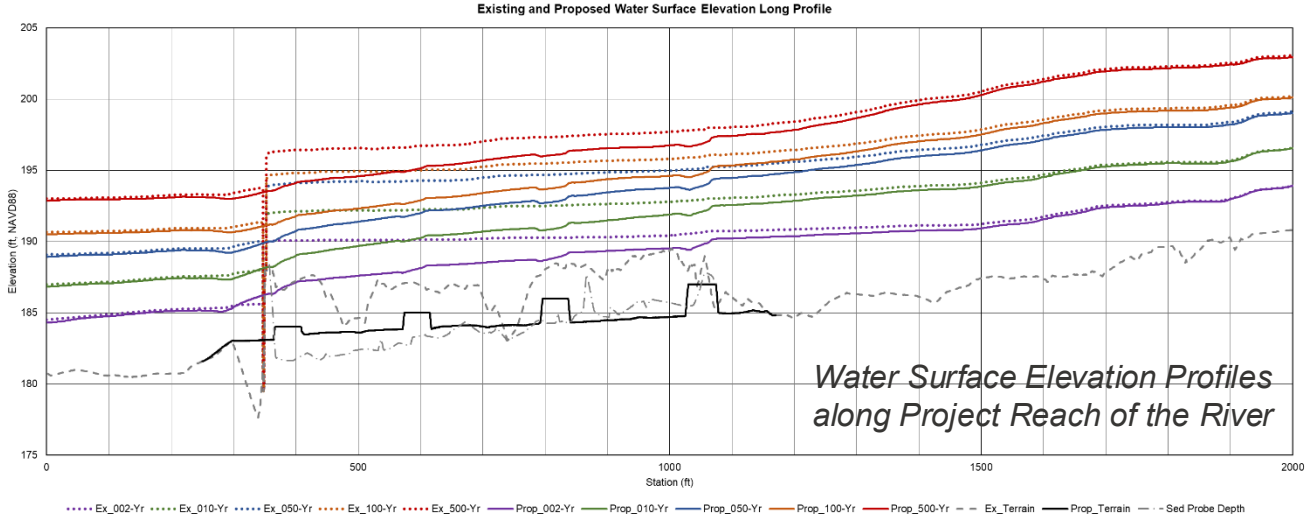


Key Element: "Hydraulic Similitude"

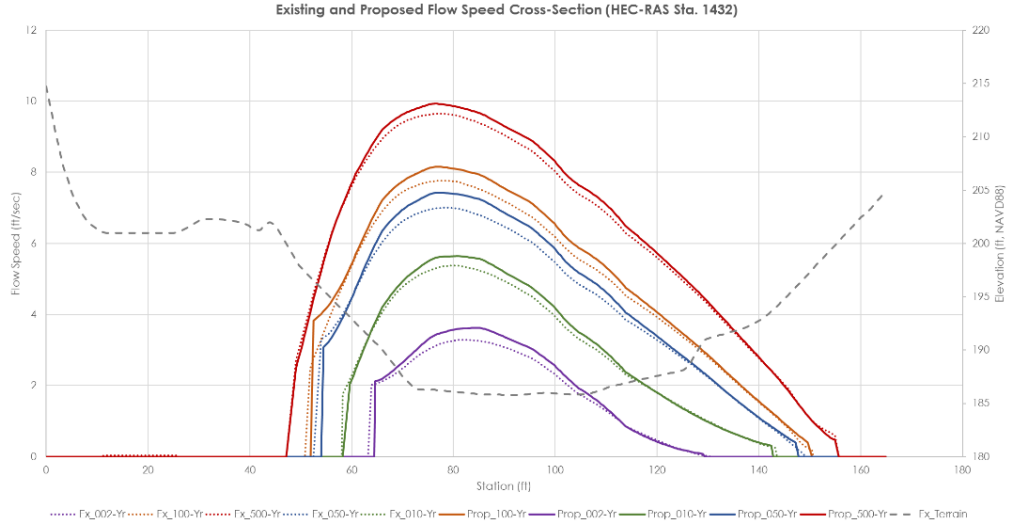
It means "*Don't change conditions along the railroad embankment*"

Flow Speeds Sections along Embankment



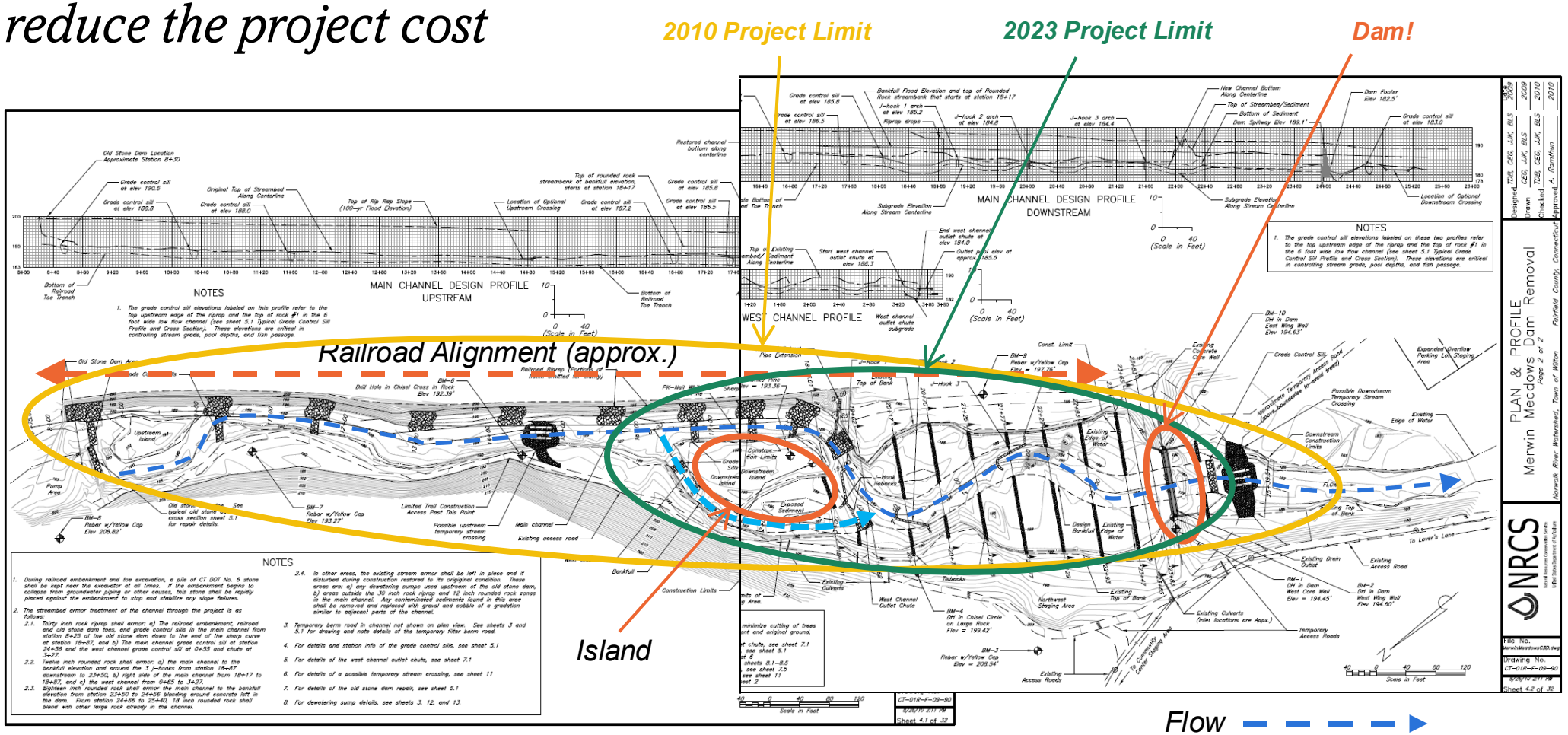


Water Surface Elevation Profiles along Project Reach of the River



Montage from Plan Sheet Nos. 4.1 and 4.2 of 32 from 2010 NRCS Plan Set

Addressing constraints – *Reducing the project extents will likely reduce the project cost*



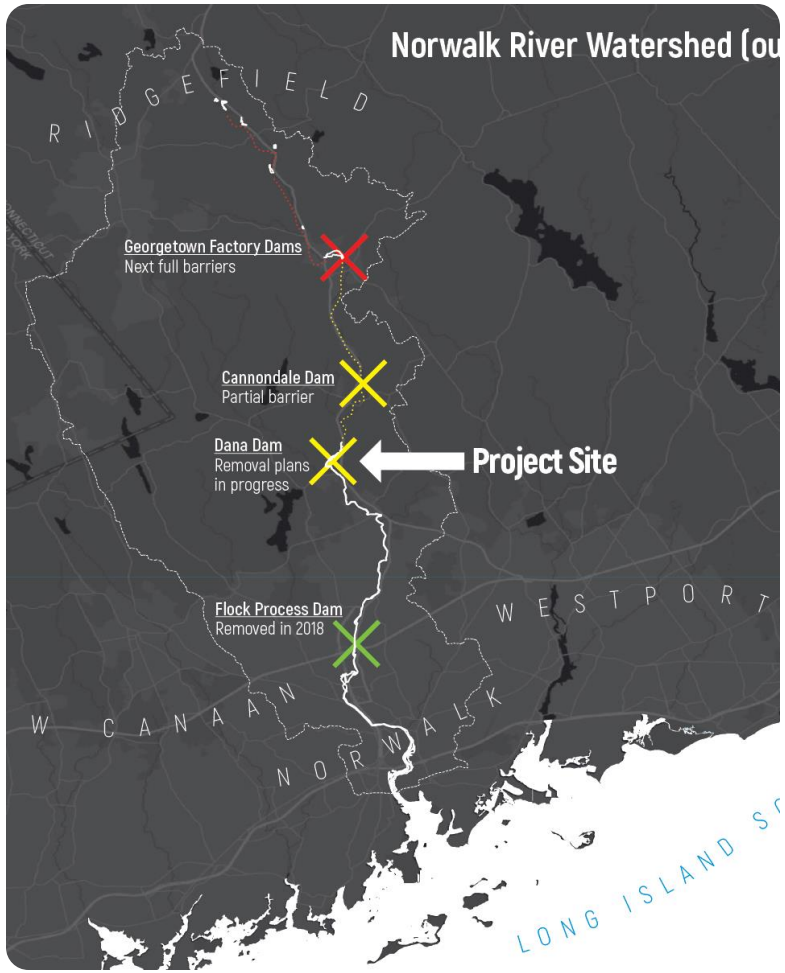
Vision

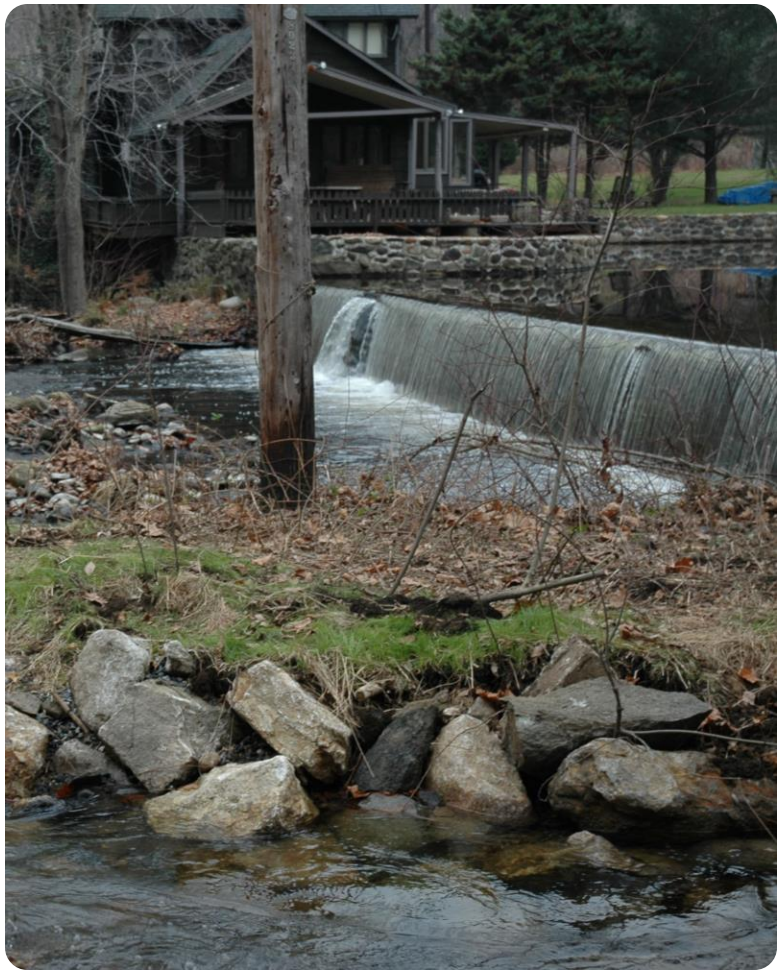
Putting the Pieces Together

Putting the Pieces Together – Results

What's next?

1. Cannondale **2.** Gilbert & Bennett **3.** Railroad alignment – let's keep going

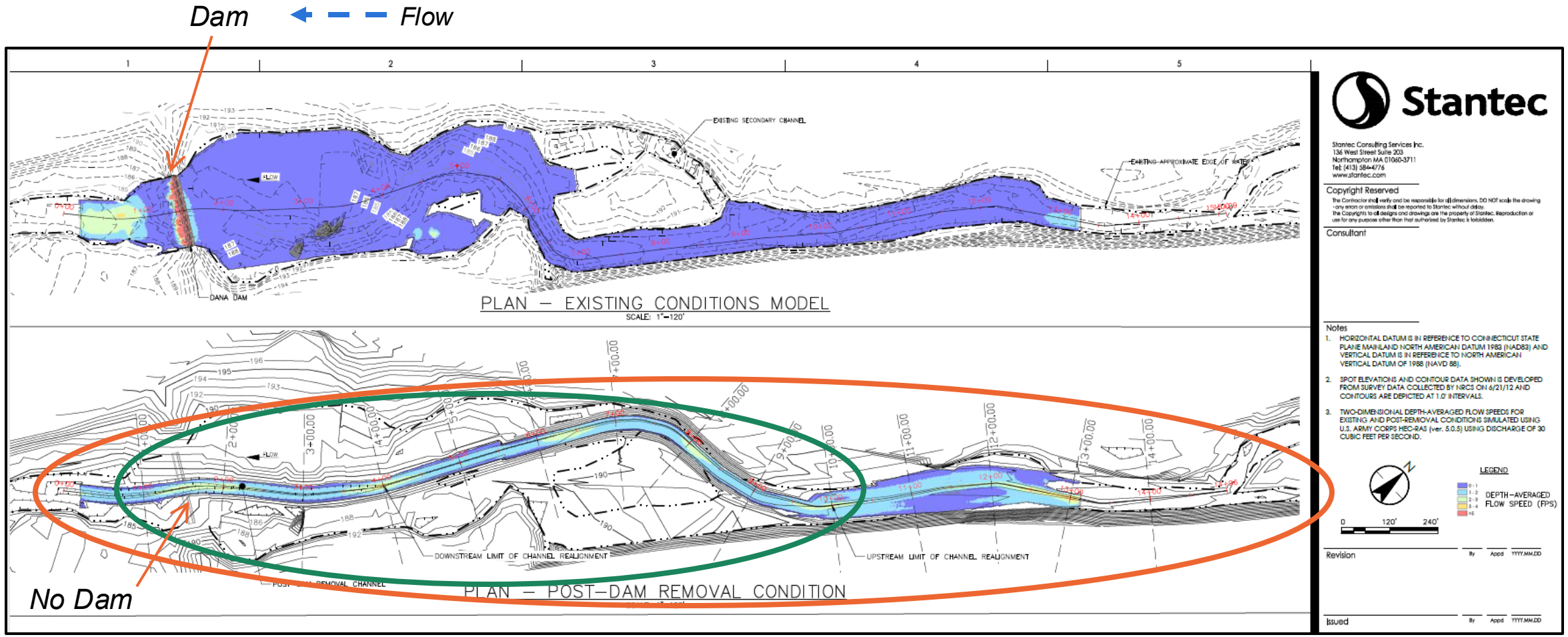




Realignment of the Norwalk River – *let's keep going*

- Move ~300 ft of river away from the railroad embankment
- "Hydraulic Similitude" upstream from the Project limit of work

"Hydraulic Similitude" upstream from the Project limit of work



Key Takeaways

Stop, collaborate, listen

- **Flint River (Michigan):** The team is everyone who comes into contact with your project, so LISTEN to your collaborators…all of them.
- **Sumgas Creek (British Columbia):** Lean on the creativity of your multi-disciplinary team and boldly take your ideas to clients and regulators.
- **Strong Pond Dam (Connecticut):** Listen to the needs of partners and collaborators and jump at the opportunity to provide co-benefits.
    - Learn from your successes as well as your mistakes: how do we repeat what went right?

Stantec

Thank you

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