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Dana Dam Removal (aka Strong Pond Dam)

Norwalk River – Merwin Meadows Park, Wilton, CT

CONNECTICUT ASSOCIATION OF WETLAND SCIENTISTS

2024 ANNUAL MEETING

March 7, 2024

Alex Krofta

Ecological Restoration Projects Manager

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Save the Sound leads environmental action in the Long Island Sound region. We fight climate change, save endangered lands, protect the Sound and its rivers, and work with nature to restore ecosystems.

Pollution Monitoring

Legal Action

Legislative Advocacy

Ecological Restoration

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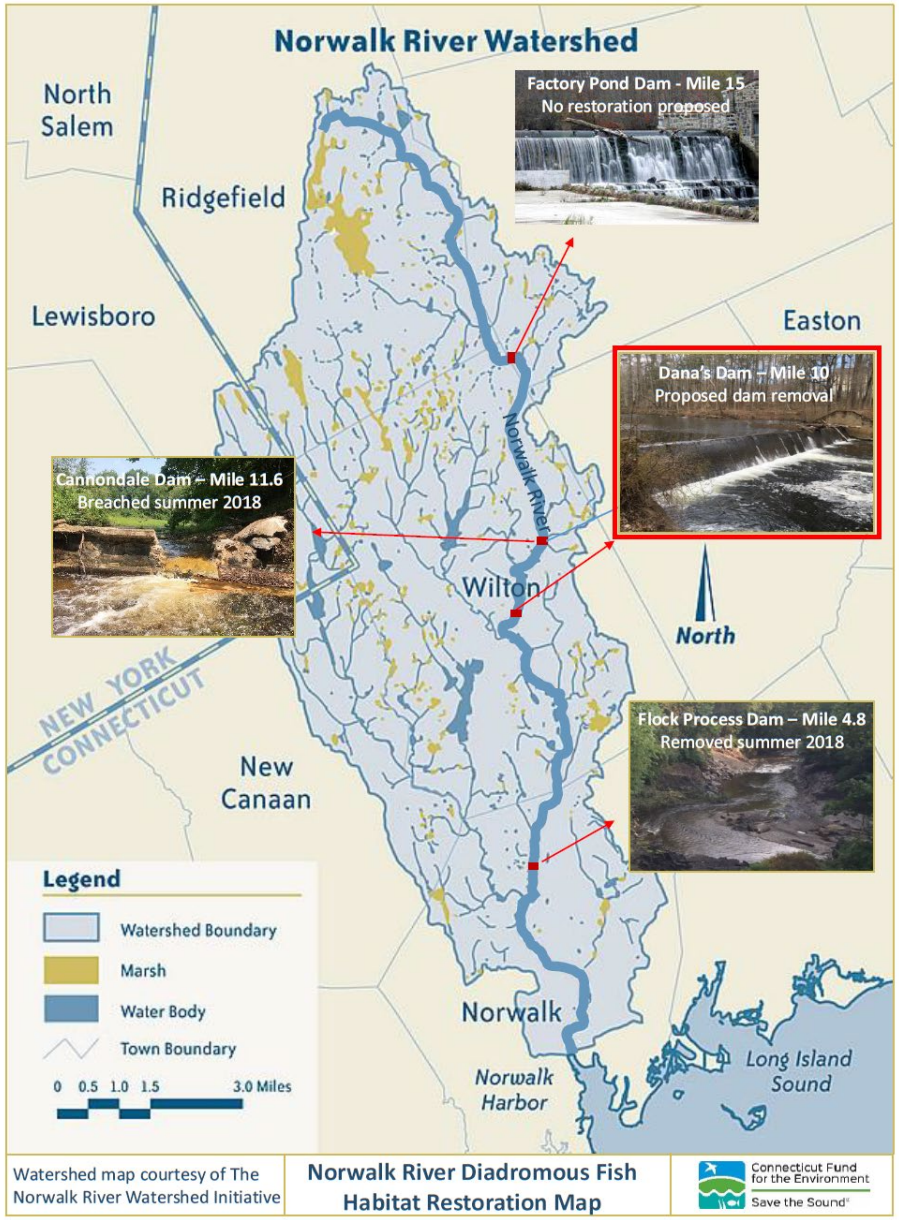
Norwalk River Watershed Context



Previous dam removals

- Flock Process Dam 2018 (downstream)
- Cannondale Dam 2018 (breach, stabilized - upstream)

Dana Dam removed

- +5 upstream mainstem miles of habitat (approx)
- +5 upstream tributary miles of habitat (approx)
- = 20+ miles of connected river habitat to Long Island Sound

Social Context

- Trout Unlimited, NRWA, Wilton, and other local advocates
- CT DEEP, EPA, NFWF, USFWS, Richardson Fnd, generous private donors

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Dana Dam Removal Design: bird's-eye view

BEFORE:

- 1.5 acre impoundment
- Slow-moving run-of-river, <1'–6' depths
- Small upstream island
- Primary channel along railroad embankment
- Wetlands: mostly open water, with aquatic bed, riverine emergent, scrub-shrub wetlands

AFTER:

- Single-thread channel, realigned away from RR
- Pools (2'-4' depths) and "riffles"
- Wetlands: net loss, ***but*** creating/retaining riverine emergent, emergent, scrub-shrub
- New riparian buffer: 1.08 acre

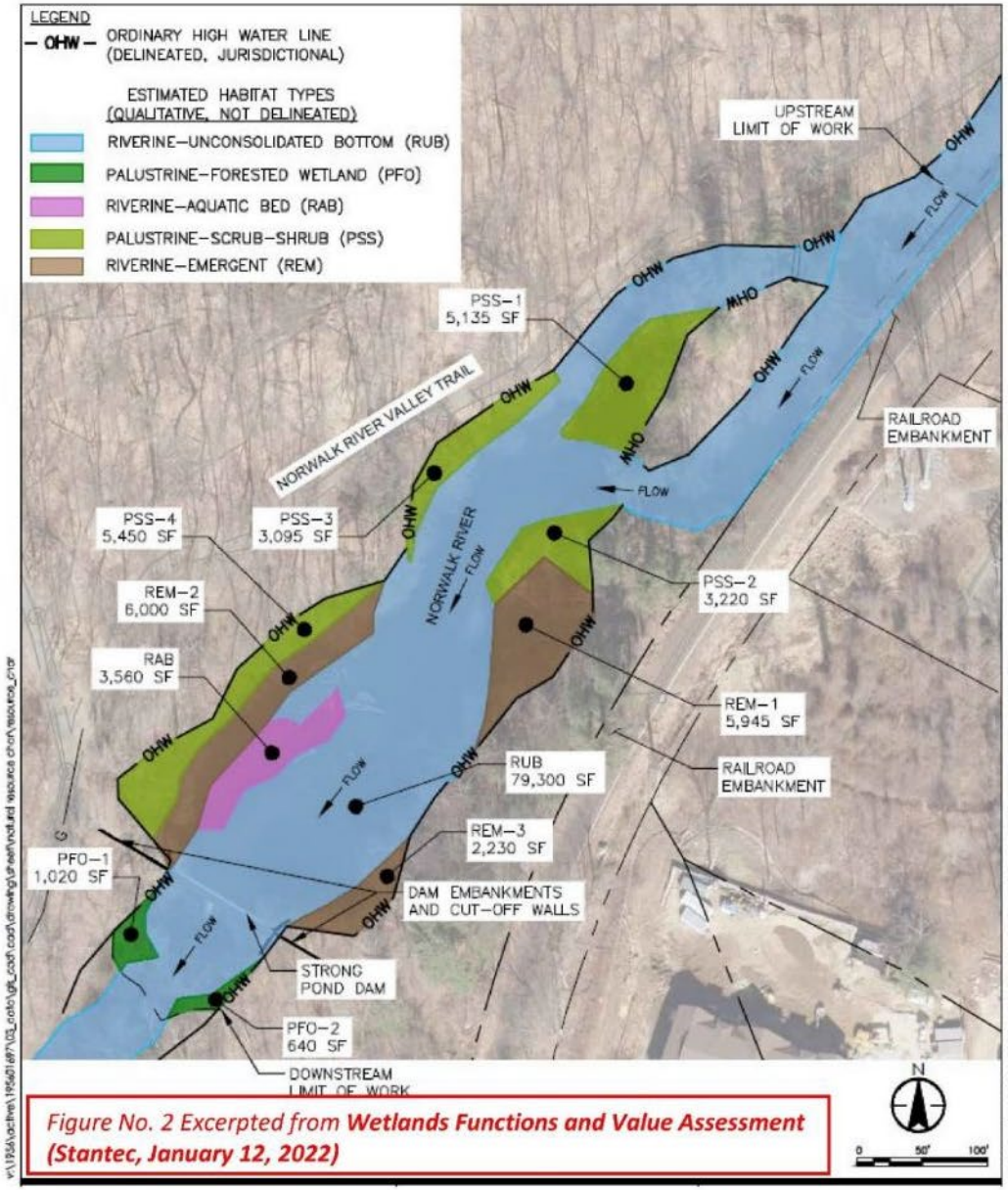

*Figure No. 2 Excerpted from **Wetlands Functions and Value Assessment** (Stantec, January 12, 2022)*

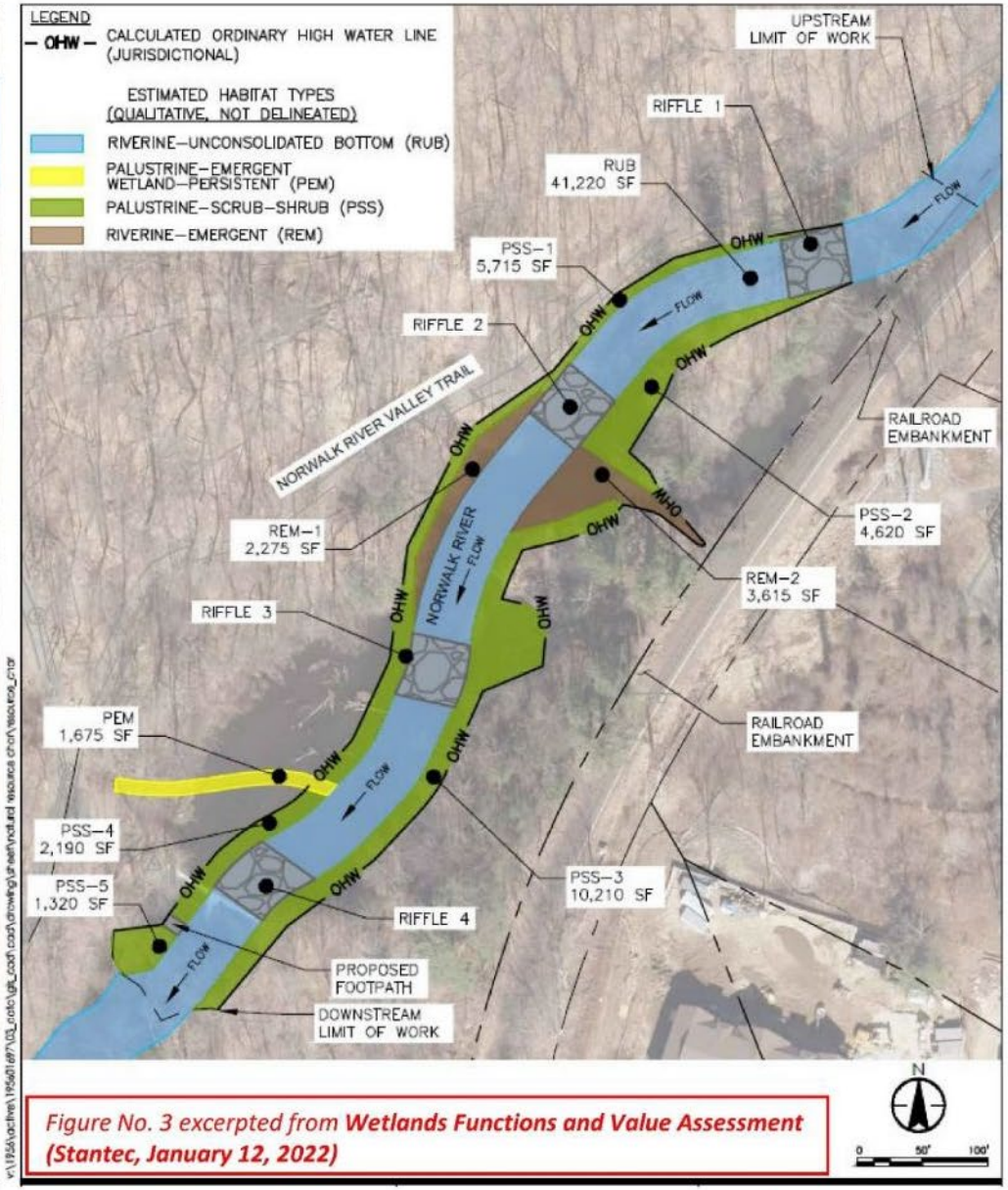

*Figure No. 3 excerpted from **Wetlands Functions and Value Assessment** (Stantec, January 12, 2022)*

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Dam Removal Design: longitudinal profile

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Dam Removal Design: active v passive restoration?

1940s construction

- Excavation of the existing channel to create a wider, deeper "pond" for recreation.
- Placement of fill / boulder retaining walls, disconnecting the natural floodplain.

→ *Needed to reconstruct channel banks, streambed, floodplains*

1941 Dam/Impoundment Construction Plans (detail):

Original plans for the dam and impoundment depict a heavily-disturbed riverine ecosystem. In addition to construction of Strong Pond Dam, the plans included excavation within the impoundment, placement of fill in floodplain areas, and artificial, boulder-armored banks. All of these modification are observable on site today. The result is an over-widened impoundment filled with accumulated sediment, reduced floodplain connectivity, and loss of the natural (or "legacy") channel banks and streambed substrate.

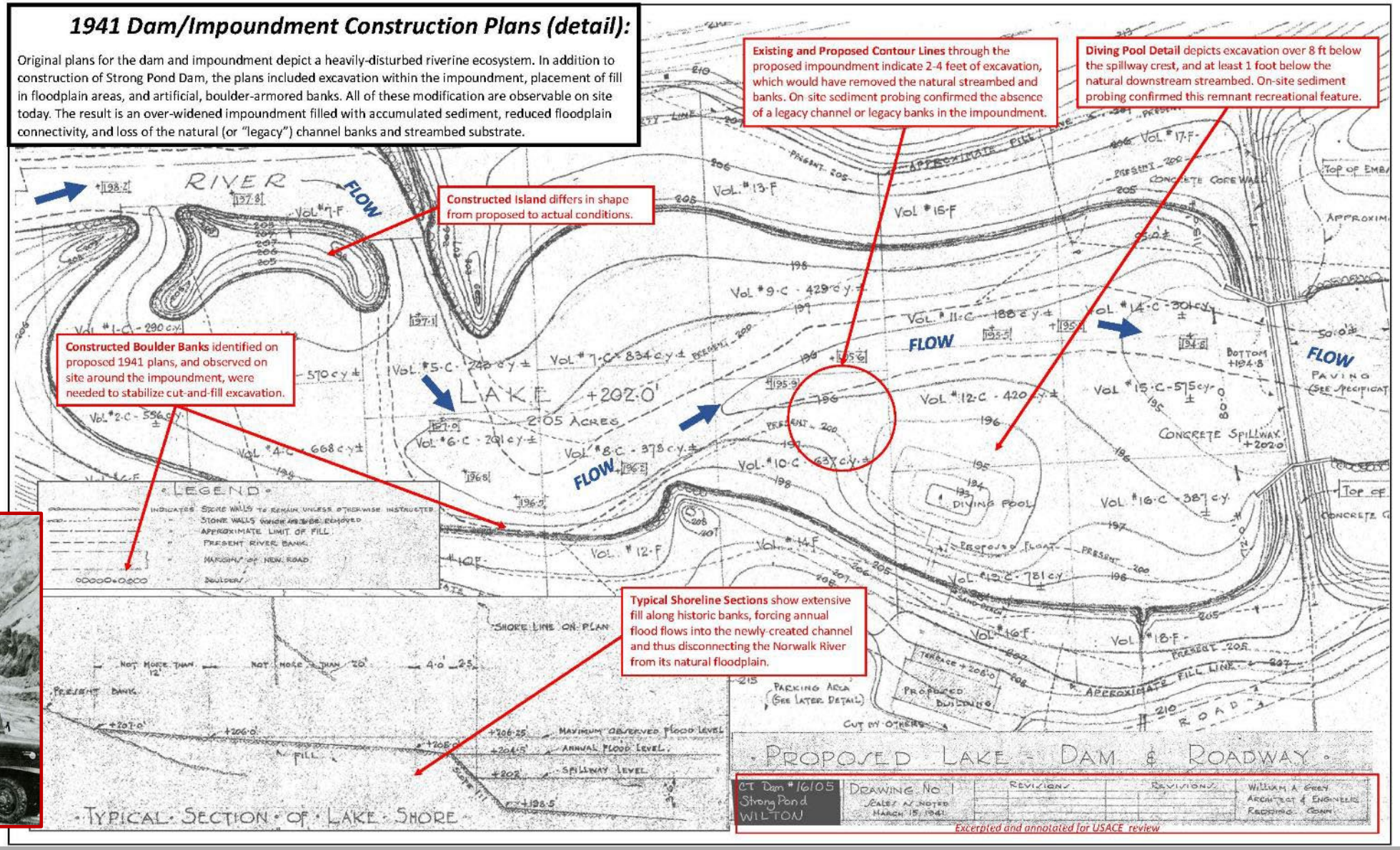
Existing and Proposed Contour Lines through the proposed impoundment indicate 2-4 feet of excavation, which would have removed the natural streambed and banks. On site sediment probing confirmed the absence of a legacy channel or legacy banks in the impoundment.

Diving Pool Detail depicts excavation over 8 ft below the spillway crest, and at least 1 foot below the natural downstream streambed. On-site sediment probing confirmed this remnant recreational feature.

Constructed Island differs in shape from proposed to actual conditions.

Constructed Boulder Banks identified on proposed 1941 plans, and observed on site around the impoundment, were needed to stabilize cut-and-fill excavation.

Typical Shoreline Sections show extensive fill along historic banks, forcing annual flood flows into the newly-created channel and thus disconnecting the Norwalk River from its natural floodplain.



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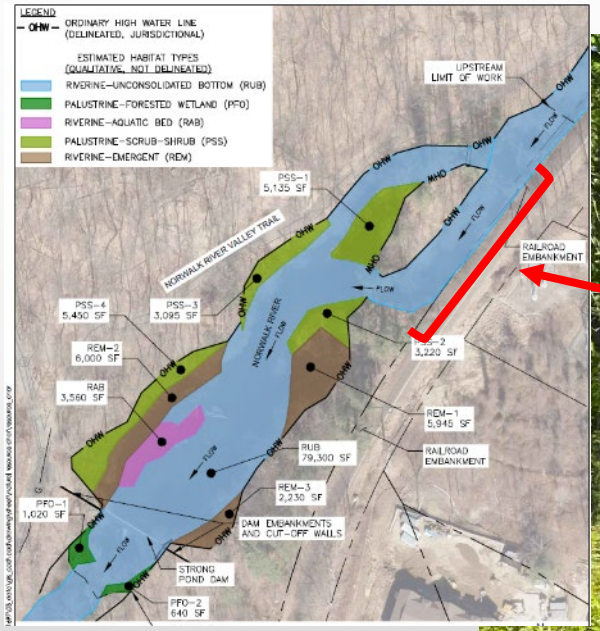
Dam Removal Design: active v passive restoration?



Adjacent Infrastructure:

- Cannot endanger RR embankment.
- Natural channel migration NOT acceptable or safe.

→ *Need a stable stream channel, engineered for all possible flows.*

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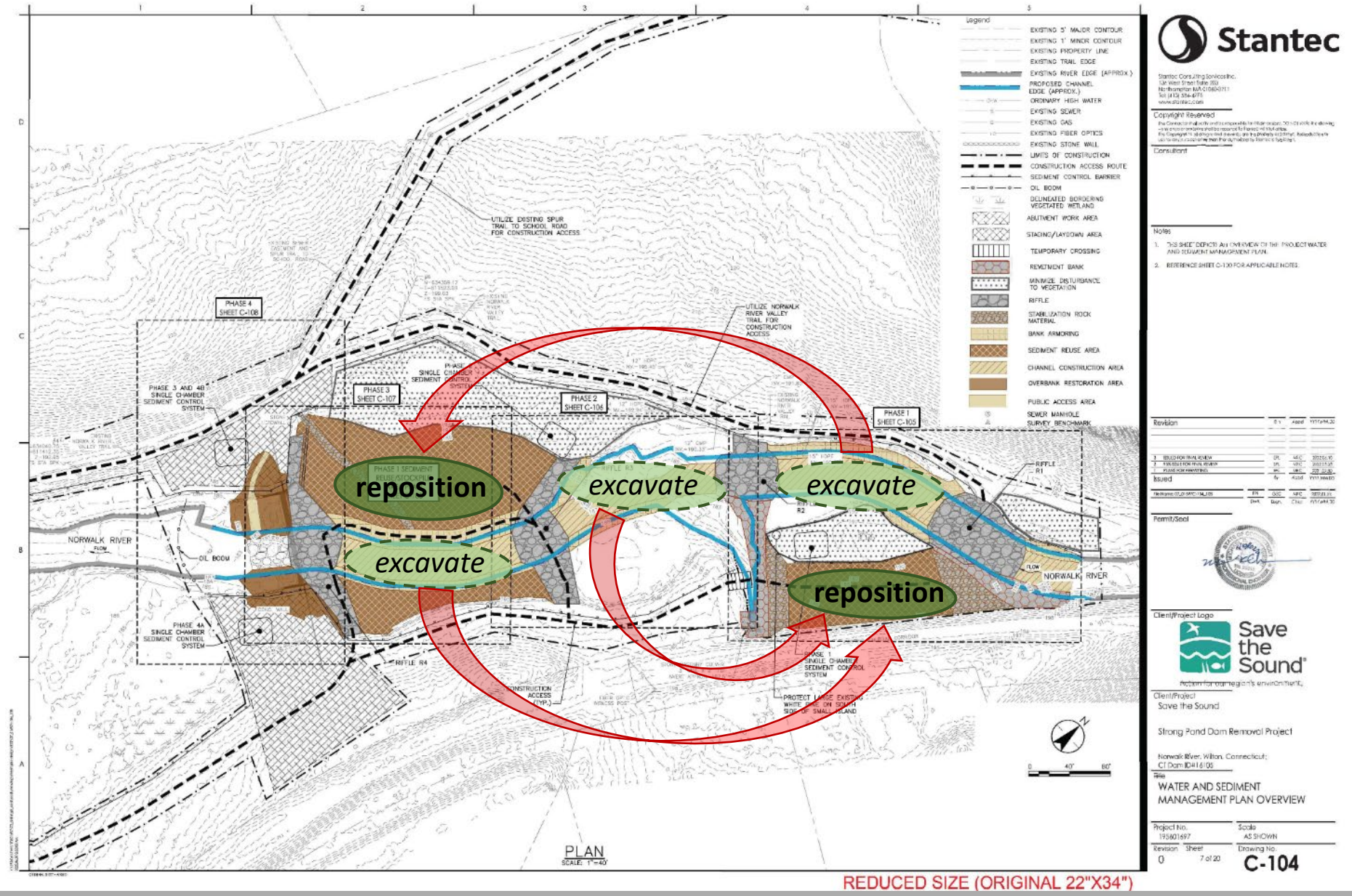
Dam Removal Plan: sediment management

- **Alternative 1** - Off-Site Disposal of Sediment
- **Alternative 2** - Segregate Sediment with Limited Off-Site Disposal
- **Alternative 3** - On-Site Sediment Management
- **Alternative 4** - Administrative Management Plan and Restricted Access

→ *"<u>Repositioned</u>" - contained, stabilized, covered with topsoil and native vegetation. About 500 cubic yards.*



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Dana Dam Removal Design: bank armoring

- Rip-rap type banks for channel stability
- Void space filled with topsoil
- Planted with native seed
- Planted with native shrub "live stakes"
- "habitat boulders" in channel for physical complexity
- Banks left unarmored when possible.

Description of Proposed Channel Bank Types:

Strong Pond Dam Removal plans call for stream **channel reconstruction** in the former impoundment where excavation removed the natural streambed and banks in 1941, and **channel realignment** to divert the Norwalk River away from the straightened, armored railroad embankment.

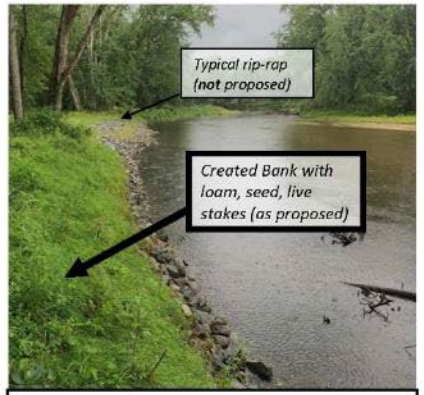
Revetment Bank: necessary for channel realignment, Revetment Banks divert flows away from the Channel Closure Area.

Stabilization Rock Material: a horizontal layer of stone/loam topsoil placed over reused sediments in Channel Closure Area.

Bank Armoring: necessary to reconstruct the channel where "legacy" stream channel and banks were excavated in 1941.

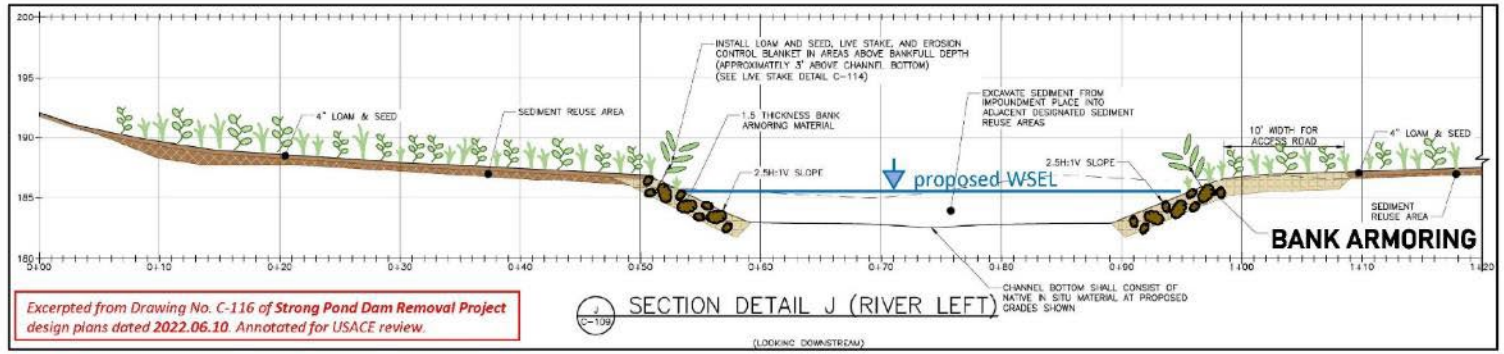
EXAMPLE: Channel Bank Reconstruction at Hyde Pond Dam Removal, Mystic, CT:

A previous dam removal project employing a reconstructed rock bank with loam, native seed, live stakes, and erosion control blanket as specified in Strong Pond Dam Removal design plans. Photos (above) and vegetation monitoring demonstrate successful, native-dominant revegetation established following construction *(Note billboard in background → as reference)*. Restored bank appears and functions as a continuous, naturally-vegetated riparian corridor.



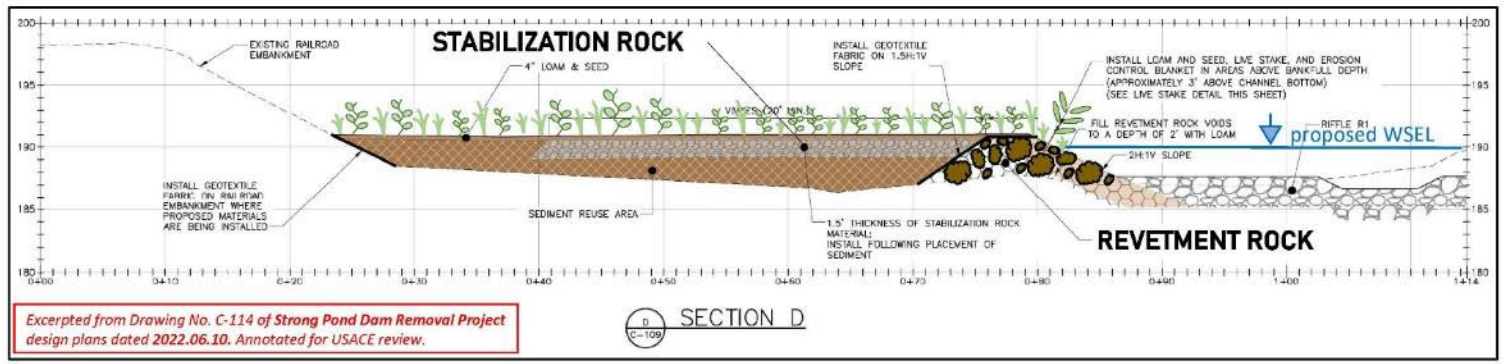
EXAMPLE: Pipeline protection project, Lancaster, NH:

Comparison of typical rip-rap bank treatment, and vegetated bank creation as proposed in Strong Pond Dam Removal design plans. A typical rip-rap bank (photo, rear) was required by site owners for maintenance purposes. The planted bank section (photo, front) is shown after one growing season, fully vegetated.



*Excerpted from Drawing No. C-116 of **Strong Pond Dam Removal Project** design plans dated **2022.06.10**. Annotated for USACE review.*

SECTION DETAIL J (RIVER LEFT)



*Excerpted from Drawing No. C-114 of **Strong Pond Dam Removal Project** design plans dated **2022.06.10**. Annotated for USACE review.*

SECTION D

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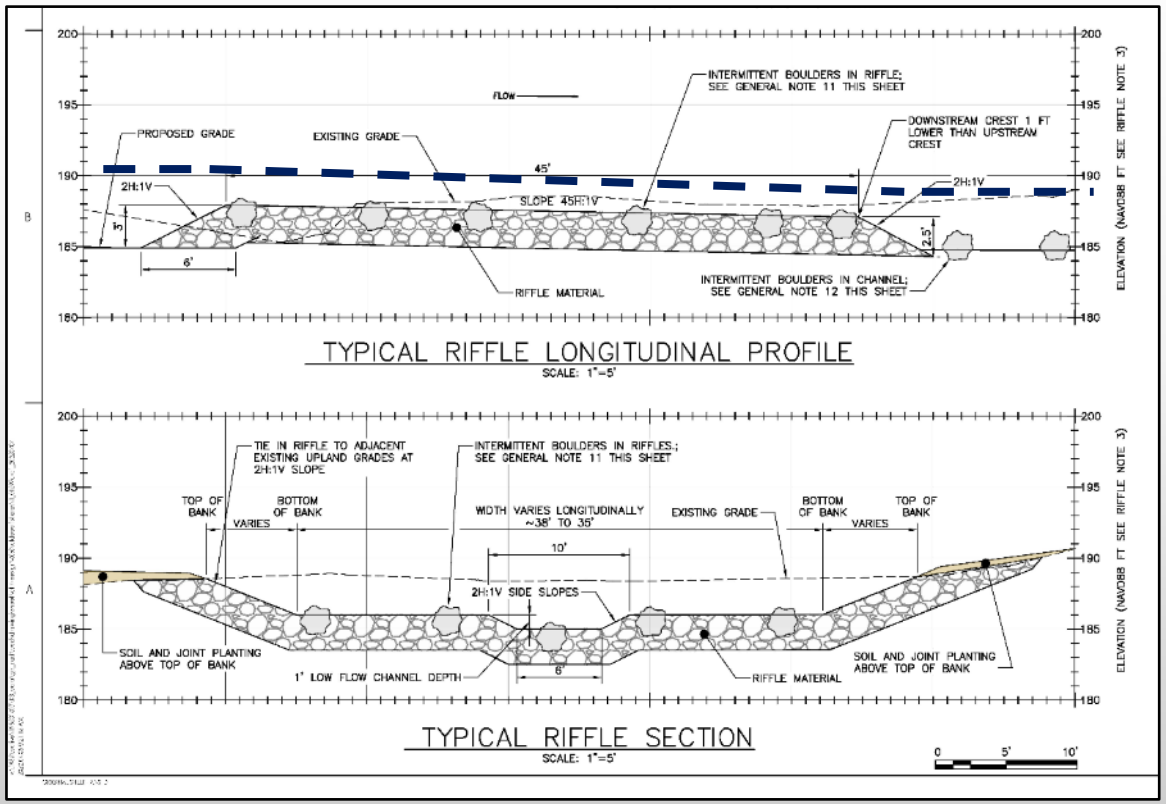
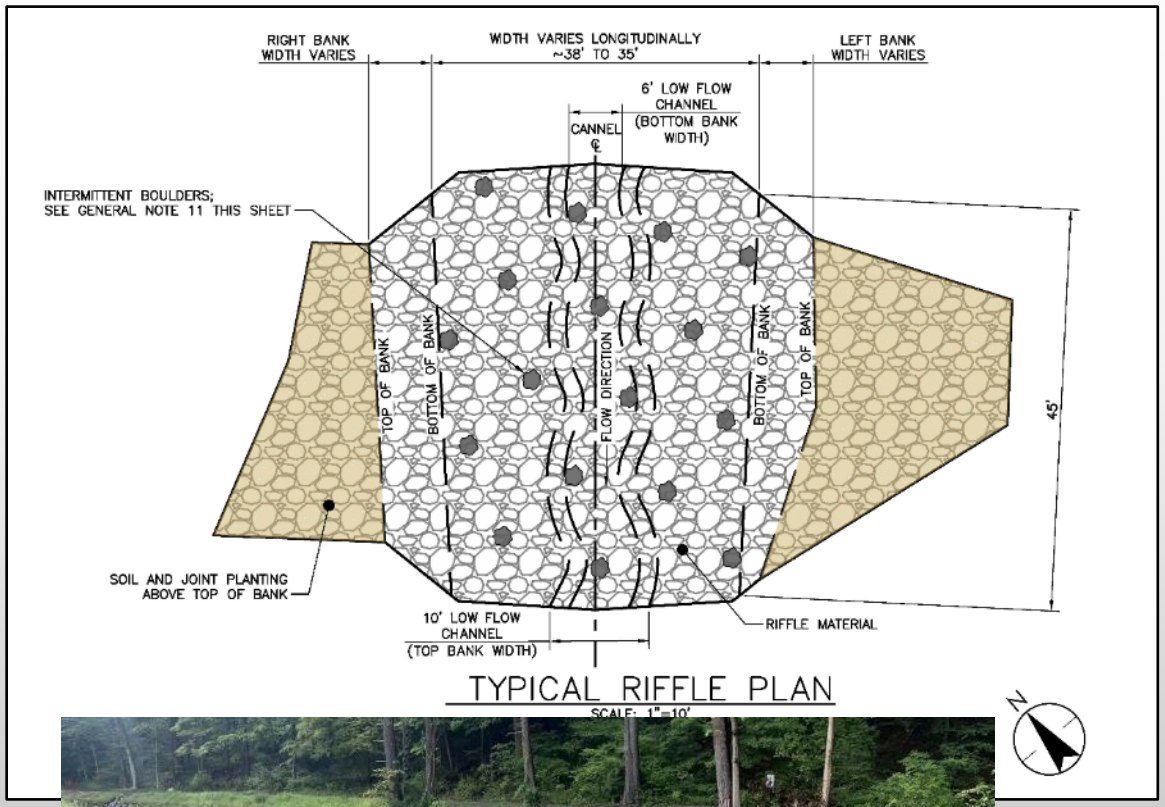
Dam Removal Design: engineered riffles





- A large, sloped, rocky "ramp" or "step"
- Habitat boulders for physical/flow complexity
- Low-flow channel for passage
- Looks like a natural rapid or cascade feature

→ *not meant to migrate like a natural riffle*

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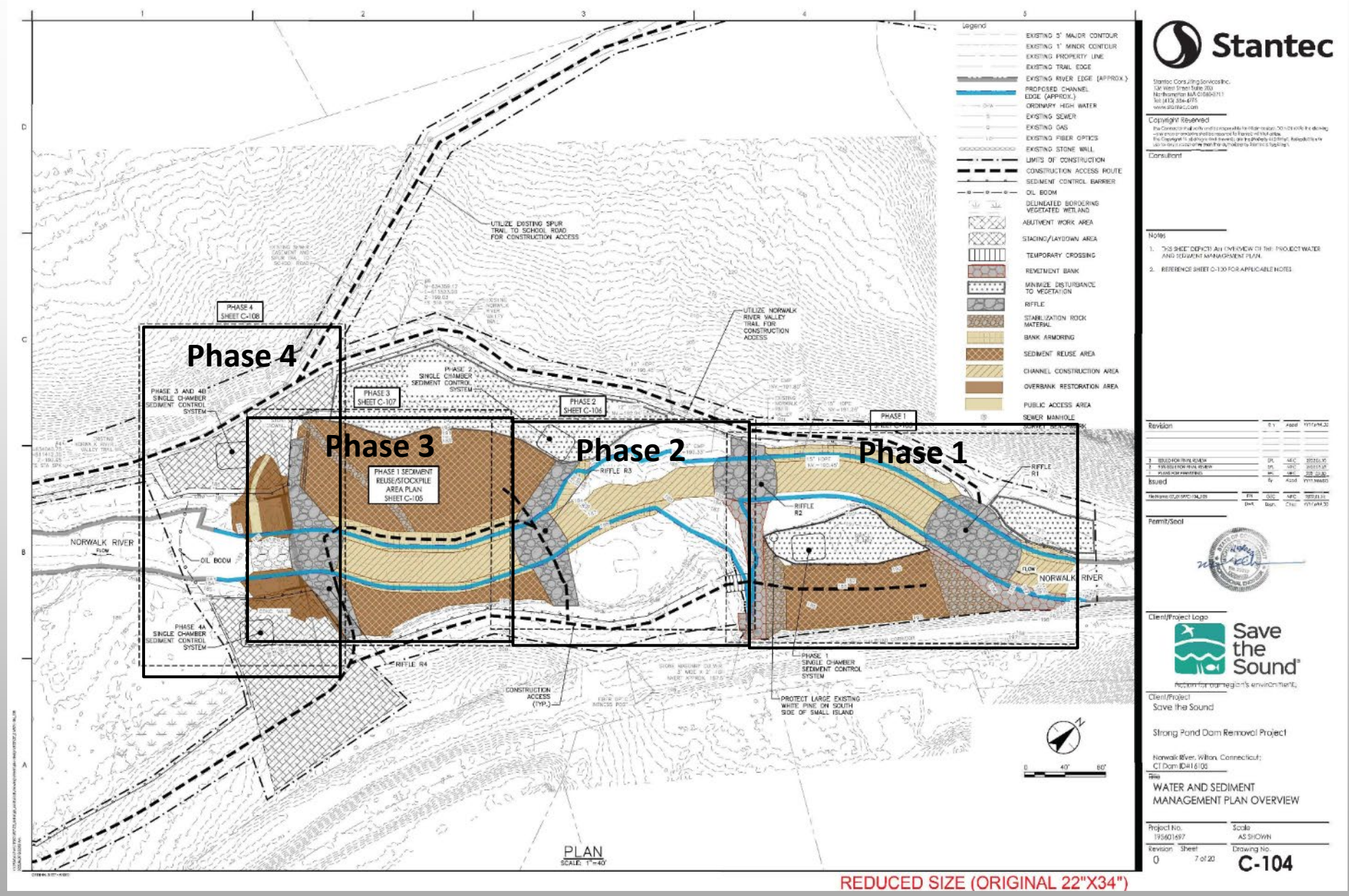
Dam Removal Plan: construction phasing

- **Phases 1:** dewatering the impoundment, excavation of the new channel, repositioning sediment to the floodplain, building banks and riffles.
- **Phase 2:** constructing the Channel Closure Area, diverting flow to the new channel, excavating the channel, building banks and riffles.
- **Phase 3:** excavating the channel, filling the Channel Closure Area, grading the new floodplain areas, building banks and riffles.
- **Phase 4:** demolition and removal of the concrete dam, final grading, building banks and riffles.

Continuous: water management, erosion & sedimentation controls, public access management, rock/soil deliveries….



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Construction: water management

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Construction: excavation / repositioning

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Construction: installing rock features

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Construction: demolition!

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Construction: site restoration

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Dam Dana Removal: project timeline

	2019	2020	2021	2022	2023
Concept Design/Feasibility					
Site Studies and Analysis					
30% design					
60% design					
100% designs					
Construction Specs					
Railroad Review and Permitting					
CT DEEP Permitting					
Army Corps Permitting					
Site Preparation Activities					
Construction					
Fundraising and Reporting					
Stakeholder/Partner Coordination					

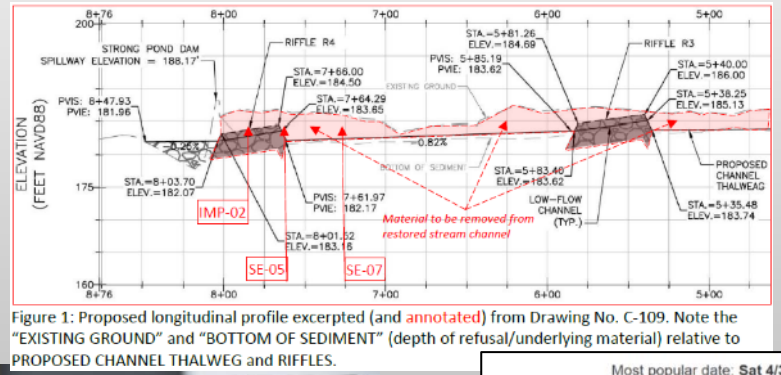
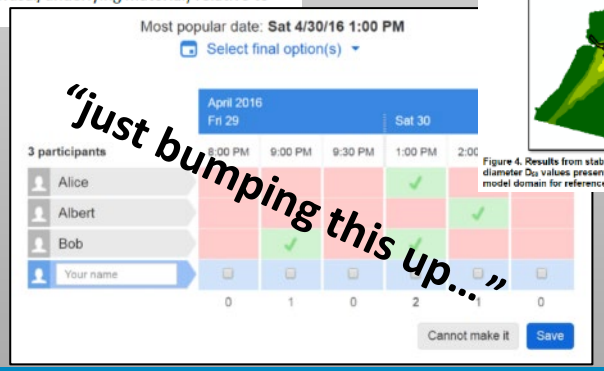
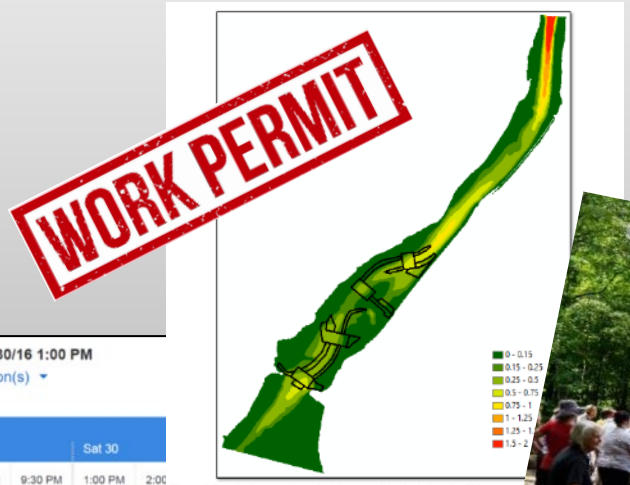


Figure 1: Proposed longitudinal profile excerpted (and annotated) from Drawing No. C-109. Note the "EXISTING GROUND" and "BOTTOM OF SEDIMENT" (depth of refusal/underlying material) relative to PROPOSED CHANNEL THALWEG and RIFFLES.



"just bumping this up..."



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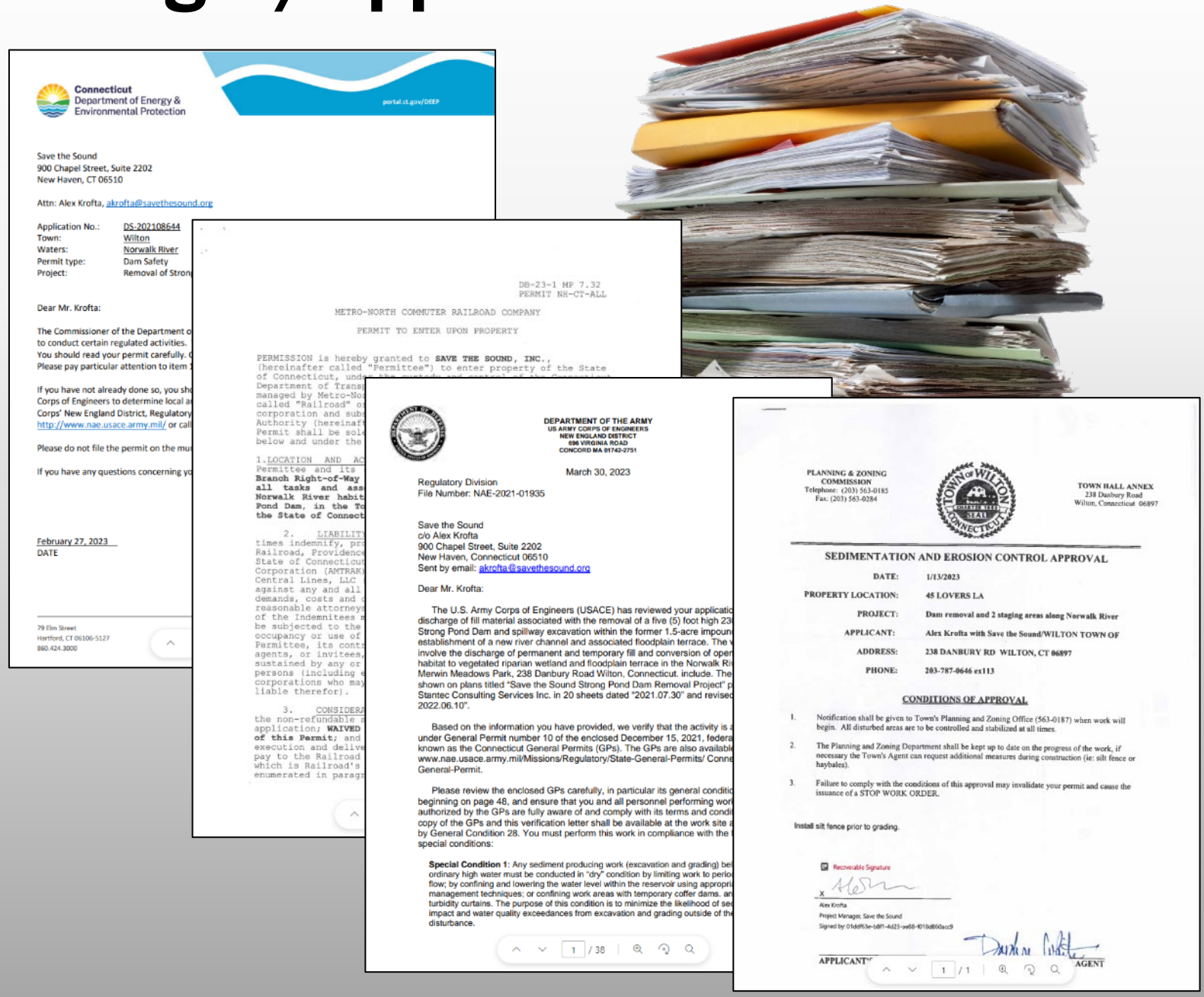
Challenges/Opportunities: PERMITS!

- **Four (4) separate permits:** CT DEEP Dam Safety, US Army Corps GP10, Metro North "Entry Permit," municipal E&S
- **Restoration-specific processes:** i.e. vegetated rock banks reviewed as "Stream channel reconstruction, relocation, realignment, and stream bed modification" under USACE General Permit 10. AQUATIC HABITAT RESTORATION, ESTABLISHMENT & ENHANCEMENT ACTIVITIES.
- **Communicating with your regulators…** Each permit is a multi-layered review process. Find out what info is important for your project and how best to communicate it. ***This is a collaboration with subject experts.***



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Challenges/Opportunities: Railroad!

- **Timelines:** could have easily been a no-go (insert train-related metaphor)
- **Requirements:** additional complicated insurance, force account ($) for flaggers
- **Communication:** talking to the range of people involved with different aspects of review and oversight (Engineering, Property, Operations, others)

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Challenges/Opportunities: Construction!

- “Hybrid” Oversight: project engineer and Save the Sound shared oversight duties – this led to complications
- Expert Contractor: extensive dam removal experience
- Construction contract management “specialist” on the team: this is a complicated task with lots of details… try it at your own risk
- Standing Meetings: with project team, stakeholders, funders, regulators…. when done well, this eliminates surprises and helps roll with contingencies

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Challenges/Opportunities: Town Park!

- Liability: highly sensitive to legal/financial/public-perception liability
- VERY Public: hundreds of users daily on the NRVT, safety and aesthetics are critical
- Memorandum of Agreement: critical tool for navigating the relationship between site owner, project manager, engineer, contractor
- Resources and Expertise: Town staff, equipment, facilities
- VERY public: immense opportunity to educate/engage

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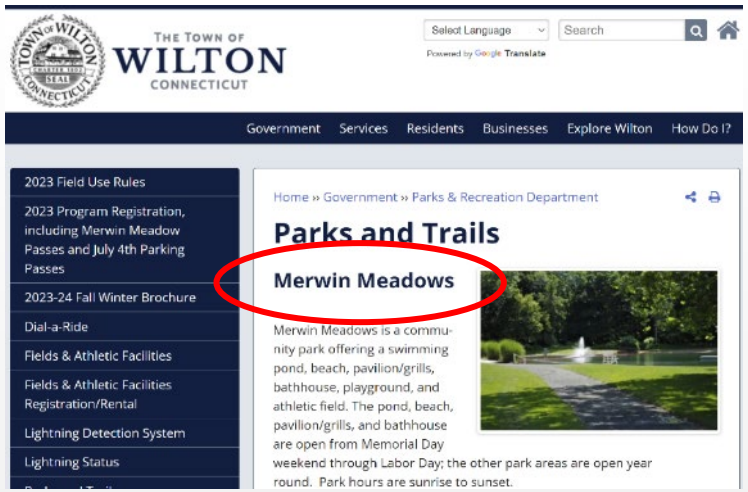
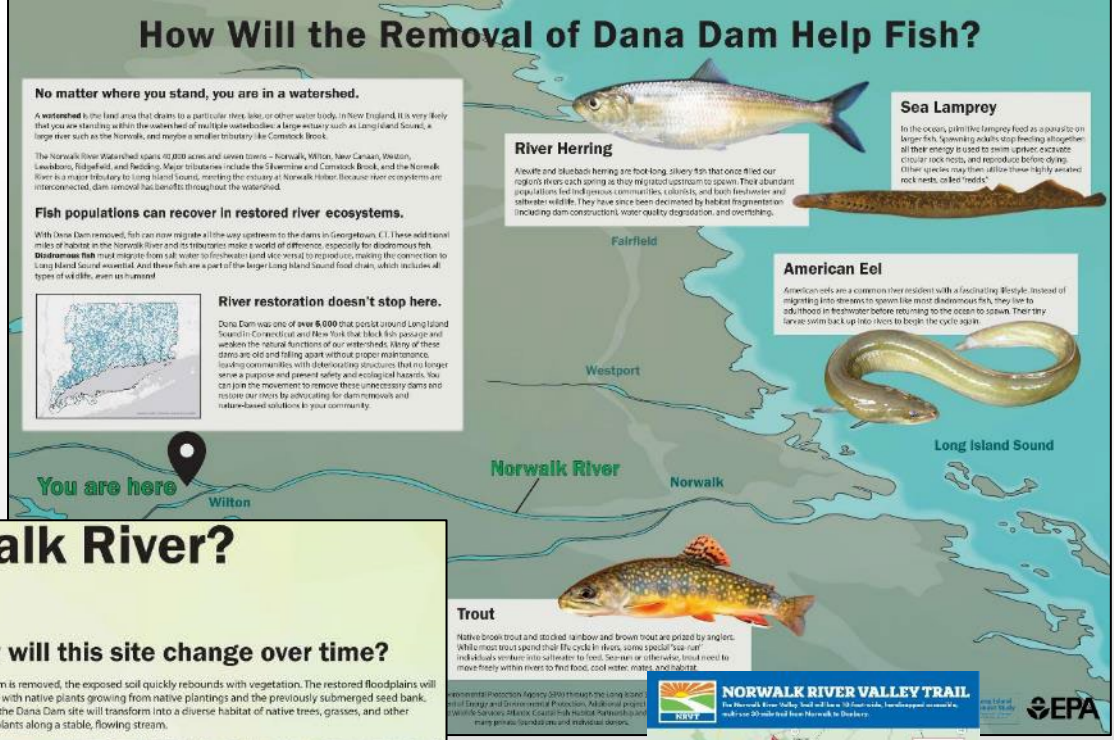
- ***VERY public:***
  immense opportunity to educate/engage





How Has Removing Dana Dam Restored the Norwalk River?

Historical dams leave a legacy of environmental harm.

For 80 years Dana Dam, or Strong Pond Dam, was located here on the Norwalk River. Charles Dana built the dam in the early 1940s to create an ice-skating and swimming pond which was enjoyed by the local youth and their families. At only about six feet tall, the dam had an ecological impact disproportionate to its size. It slowed water flow, increased water temperatures, submerged the natural floodplain of the river, and acted as a barrier to fish and other wildlife. As other dams on the Norwalk River were removed, Dana Dam became the first barrier upstream of Long Island Sound to migratory fish such as alewife, blueback herring, and sea lamprey in their search for suitable habitat to lay eggs and replenish their populations.

Dana Dam was removed to restore river function.

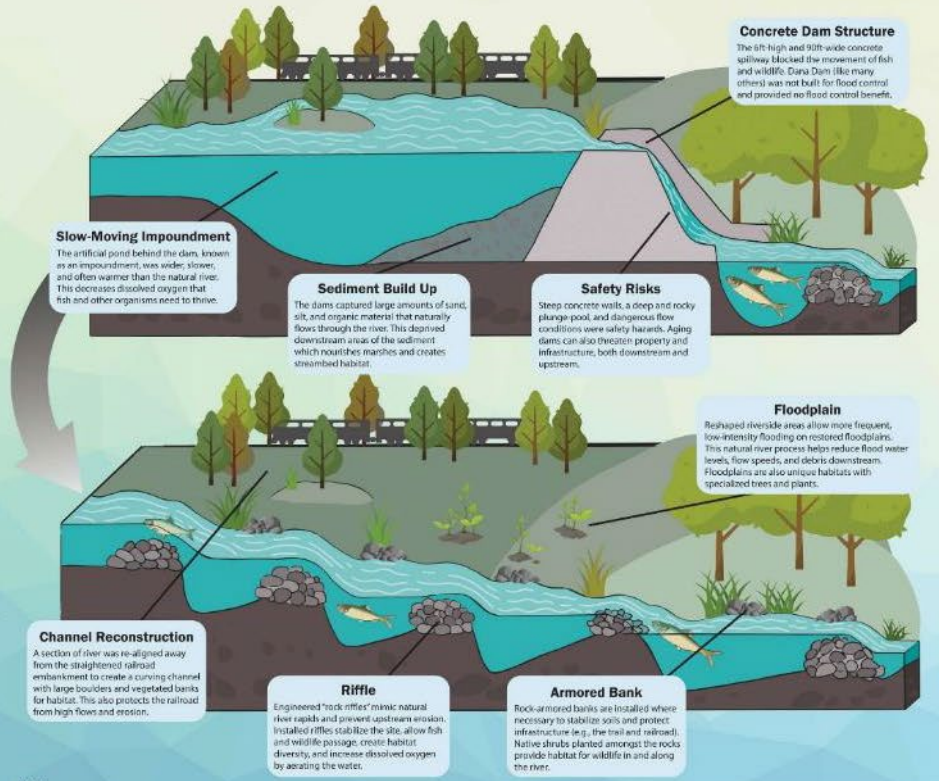
At the turn of the 21st century, local restoration and conservation organizations began advocating for the removal of the dam. Between 2018 and 2023, project partners led by Save the Sound came together to remove the structure. Accumulated sediment was excavated, the upstream channel was realigned away from the railroad embankment, the banks were stabilized with rock, engineered riffles were installed, and—at last—the dam was removed. To learn more about the history and future of this project, visit www.savethesound.org.

The removal reconnected critical miles of upstream habitat on the Norwalk River.

Removing dams contributes to the riverine functions that support multiple species and ecosystems. The removal of Dana Dam converted what was once stagnant water in the former impoundment back into a free-flowing river that transports sediments downstream, contributing to streambed habitat and sustaining critical coastal marshes. Fish and wildlife not only have a healthier river habitat but can also access upstream breeding and feeding grounds in the Norwalk River which they relied on before the dams were built.

Removing Dana Dam and surrounding habitat increased the community's resilience to storms and flooding.

As storms increase in both frequency and intensity, aging dams are at increased risk of failing, and may also exacerbate flooding. Dam removals decrease the liability for the dam owner associated with public safety, dam failure, flood risk, or damage to essential infrastructure downstream or adjacent to the river such as the railroad along the Norwalk River here. The removal of the dam makes the Norwalk River safer for recreational activities and more resilient in the face of climate change.



How will this site change over time?

When a dam is removed, the exposed soil quickly rebounds with vegetation. The restored floodplains will repopulate with native plants growing from native plantings and the previously submerged seed bank. Over time, the Dana Dam site will transform into a diverse habitat of native trees, grasses, and other flowering plants along a stable, flowing stream.


The original structure of Dana Dam before the removal


Dana Dam actively being removed


The site directly after the dam was removed


The Norwalk River flowing freely six weeks after removal

River restoration doesn't stop here.

Dana Dam was one of **over 5,000** that persist around Long Island Sound in Connecticut and New York that block fish passage and weaken the natural functions of our watersheds. Many of these dams are old and falling apart without proper maintenance, leaving communities with deteriorating structures that no longer serve a purpose and present safety and ecological hazards. You can join the movement to remove these unnecessary dams and restore our rivers by advocating for dam removals and nature-based solutions in your community.

Save the Sound
TROUT UNLIMITED

Funding for this project was provided by the U.S. Environmental Protection Agency (EPA) through the Long Island Sound Study and the Bipartisan Infrastructure Law, and was administered by the Connecticut Department of Energy and Environmental Protection. Additional project funding was provided by Congressionally directed spending administered by the EPA, the U.S. Fish and Wildlife Service's Atlantic Coastal Fish Habitat Partnership and National Fish Passage Program, and the generosity of many private foundations and individual donors.

Long Island Sound Study
EPA

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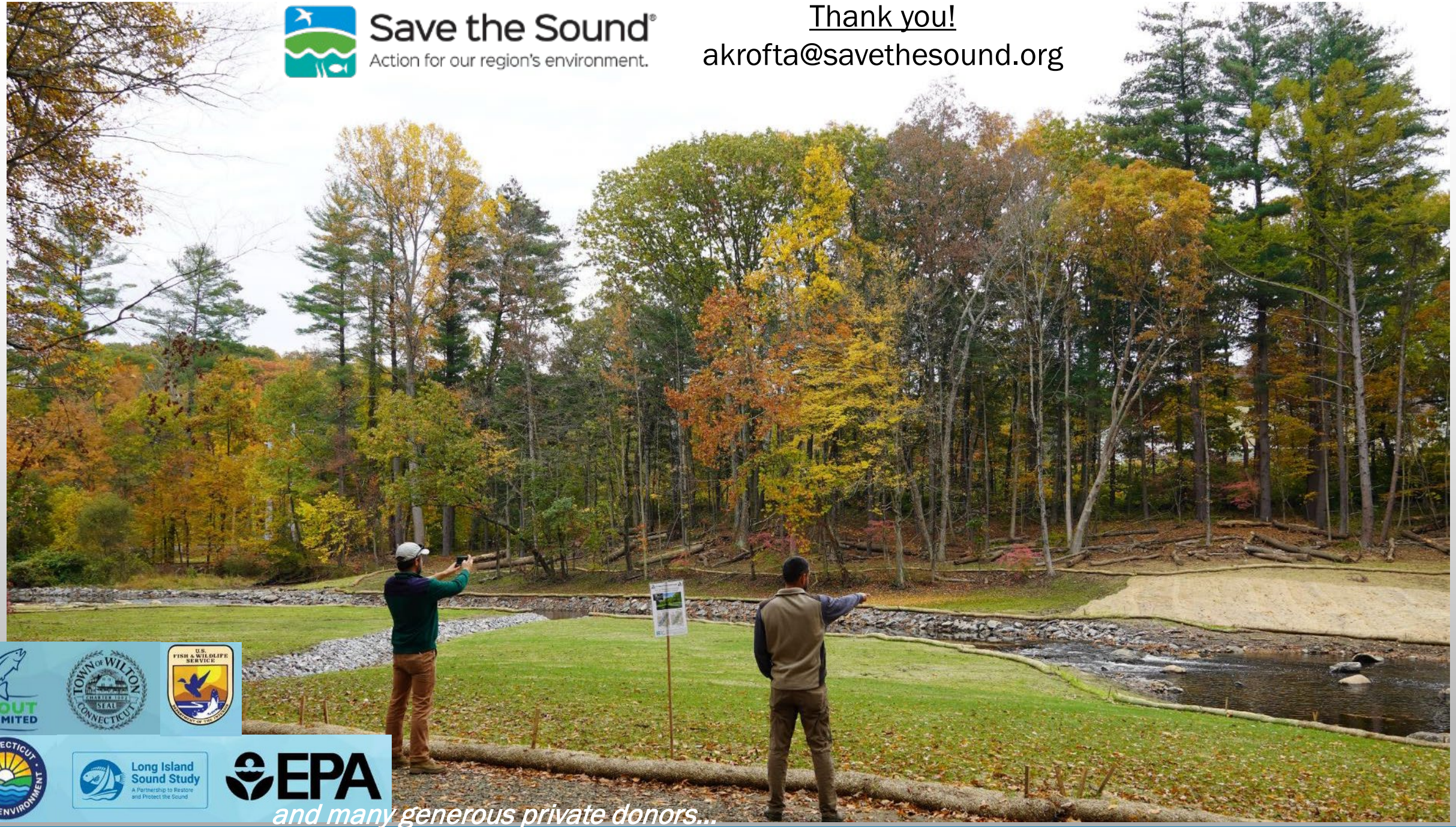
Thank you!

akrofta@savethesound.org



and many generous private donors…

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Dana Dam Removal Design: wetlands

Aquatic Resources:

Removal of a dam inherently changes the existing aquatic resources on a site. For the proposed Strong Pond Dam Removal, a proactive restoration project, the aquatic resource impacts (primarily, loss of an unnatural open-water impoundment) are offset by benefits to the site (restored pool-riffle channel, floodplain connectivity) and benefits to the Norwalk River watershed ecosystem (upstream diadromous fish passage, natural fluvial processes/sediment dynamics).

Jurisdictional aquatic resource areas at the project site are delineated below the Ordinary High Water Mark (OHW) as described and depicted in the *Federal and State Wetland Delineation, Strong Pond Dam Removal* memo (Stantec, July 1, 2021). Indirect and Fill Impacts are described and quantified in the APPLICATION IMPACT SUMMARY table below.

Existing and proposed habitat types (estimated) within the aquatic resource areas are described in the Wetlands Functions and Value Assessment (Stantec, January 12, 2022) and maps/table attached here.

APPLICATION IMPACT SUMMARY

DIRECT PROJECT IMPACTS FROM FILL[1]								
	PERMANENT FILL			TEMPORARY FILL			INDIRECT IMPACT TO AQUATIC RESOURCES[2]	
Wetland/ Feature ID	Area Filled (SF)	Purpose of Fill and Type of Fill	Amount of Fill (CY)	Area Filled (SF)	Purpose of Fill and Type of Fill	Amount of Fill (CY)	Area of Impact (SF)	Type of Impact
Strong Pond Dam Removal project site: i.e. all areas waterward of the delineated OHW line[3]	18,899	Constructed grade-control riffle (boulder rock)	1,750	247	Water Handling coffer dams (sand bag)	46	69,172	(dewatering, realignment, excavation)[5]
	3,236	Sediment Reuse Area stabilization (rock cobble)	180					
	13,478	Reconstructed channel bank (boulder rock)	998					
	2,719	Channel realignment revetment (boulder rock)	453					
	7,844	Floodplain restoration planting area (top soil)	145					
TOTALS	46,176		3,526	247		46	69,172	

Total Resource Area Impacts (SF):	115,595
Total New/Converted Resource Areas[4] (SF):	72,840
Permanent Resource Area Impact/Loss (SF):	42,755

[1] Federal jurisdictional boundary in inland waters is the ordinary high-water mark extended to include any adjacent wetland.
[2] Indirect and secondary impacts including areas drained, graded or altered that do not include the discharge of permanent or temporary fill below OHW
[3] Label your wetland area impacts so that they correlate with the labeling on the project plan and federal wetland delineation datasheets/environmental report
[4] New/Converted Resource Areas include reconstructed channel and all additional aquatic resource areas below estimated OHW under proposed post-removal conditions.
[5] Post-removal site restoration activities (non-fill) include permanent impoundment dewatering; excavation and repositioning/grading of sediment; and channel realignment.

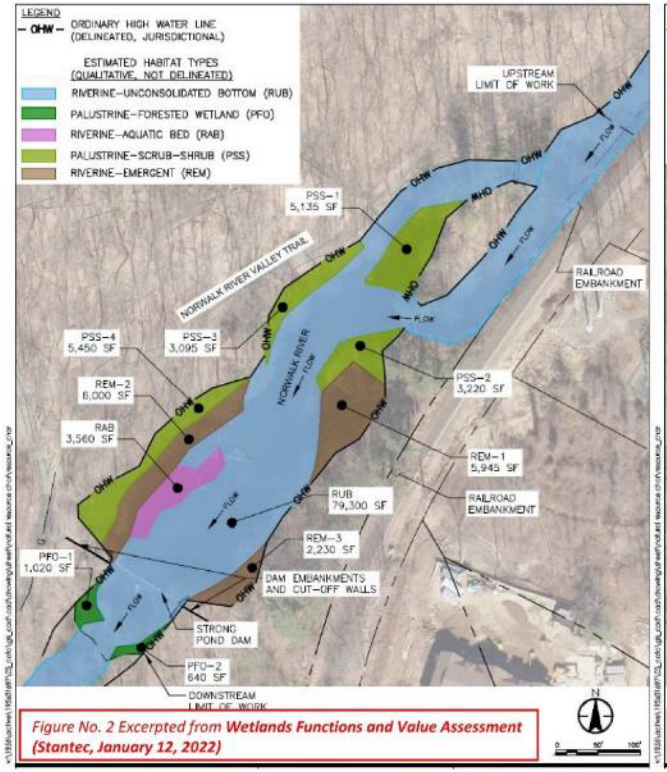

*Figure No. 2 Excerpted from **Wetlands Functions and Value Assessment (Stantec, January 12, 2022)***

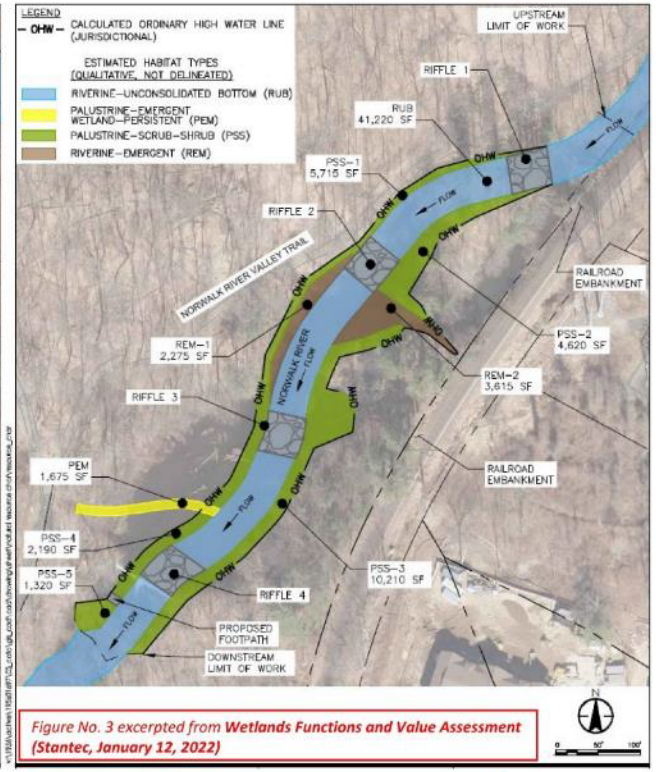

*Figure No. 3 excerpted from **Wetlands Functions and Value Assessment (Stantec, January 12, 2022)***

Estimated Habitat Types:

Existing and proposed habitat types were estimated according to *Classification of Wetlands and Deep-water Habitats of the US* (Cowardin, 1979). These classifications are qualitative (non-jurisdictional), based on aerial photos and on-site observations.

Proposed conditions include a diversity of aquatic resource habitat types and restored upstream connectivity. Dewatering of the unnatural, over-widened impoundment (RUB) accounts for 38,080 SF of impacts, or nearly 90% of permanent impacts. Newly-created RUB habitat will consist of a more complex restored pool-riffle channel, riverine emergent (REM) habitat will decrease in extent but persist, scrub-shrub (PSS) will increase in extent, and palustrine emergent (PEM) will be established.

*Table 1 excerpted from **Wetlands Functions and Value Assessment (Stantec, January 12, 2022)***

EXISTING WETLAND CLASSIFICATION AREAS													
Existing Wetland Classification Areas	RUB		REM		RAB		PFO		PSS		PEM		Total Area (SF)
	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	
	1	79,300	1	5,945	1	3,560	1	1,020	1	5,135	-	-	
	-	-	2	6,000	-	-	2	640	2	3,220	-	-	
	-	-	3	2,230	-	-	-	-	3	3,095	-	-	
	-	-	-	-	-	-	-	-	4	5,450	-	-	
	-	-	-	-	-	-	-	-	-	-	-	-	
Totals (SF)	79,300		14,175		3,560		1,660		16,900		-		115,595
% of Total	69%		12%		3%		1%		15%		0%		100%
PROPOSED WETLAND CLASSIFICATION AREAS													
Proposed Wetland Classification Areas	RUB		REM		RAB		PFO		PSS		PEM		Total Area (SF)
	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	ID	Area (SF)	
	1	41,220	1	2,275	-	-	-	-	1	5,715	1	1,675	
	-	-	2	3,615	-	-	-	-	2	4,620	-	-	
	-	-	-		-	-	-	-	3	10,210	-	-	
	-	-	-		-	-	-	-	4	2,190	-	-	
	-	-	-		-	-	-	-	5	1,320	-	-	
Totals (SF)	41,220		5,890		-		-		24,055		1,675		72,840
% of Total	57%		8%		0%		0%		33%		2%		100%
NET CHANGES (Estimated - Existing)													
Net Changes	RUB		REM		RAB		PFO		PSS		PEM		Total Change (SF)
Change (SF)	-38,080		-8,285		-3,560		-1,660		7,155		1,675		-42,755