NHDES Dam Bureau

2023 BIA New Hampshire Environmental Regulatory Conference

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Chief Engineer

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Agenda

- ❑ What is a dam in NH?
- ❑ Dam Bureau Overview
- ❑ Dam Bureau Challenges
- ❑ Dam Bureau Solutions

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What is a dam in NH?

- RSA 482:2(II)(a) " Dam " means any artificial barrier, including appurtenant works, which impounds or diverts water and which has a height of 6 feet or more, or is located at the outlet of a great pond.
- High Hazard Dam –failure of the dam would result in probable loss of human life
- Significant Hazard Dam – failure would likely not result in loss of human life but would cause major economic damage (i.e. loss of State road)
- Low Hazard Dam – failure would likely not result in loss of human life but would cause minor economic damage (i.e. loss of town road)
- Non-Menace Dam – failure would not cause life loss or damages

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Dam Bureau Overview

Dam Safety and Inspection Section

Operations and Maintenance Section

Engineering and Construction Section

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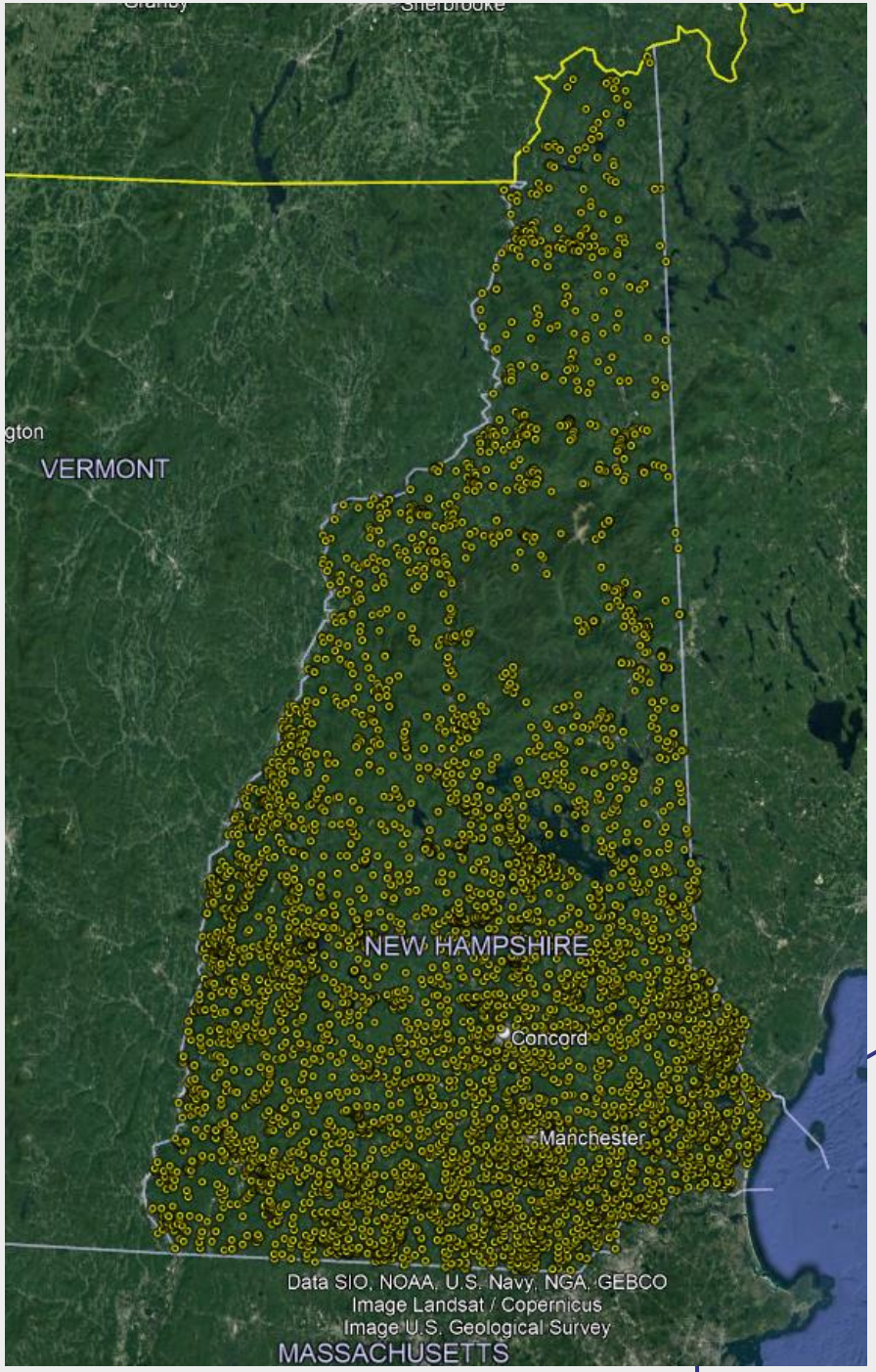
Dam Safety and Inspection Section

- Responsible for inspection of **over 2,600** privately and publicly owned dams. This includes routine inspections and construction inspections.
- Responsible for permitting of repairs on existing dams and permitting for new dam construction.



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Dam Safety and Inspection Section

- Works with dam owners to ensure dams are operated and maintained in proper working order and works with AG's office on enforcement actions
- Coordinates with Federal Energy Regulatory Commission (FERC) on hydropower inspections and projects

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Dam Safety and Inspection Section

- Works directly with NH Homeland Security and Emergency Management on dam related emergency response
- Responds to public inquiries into flood related issues and dam failure incidents

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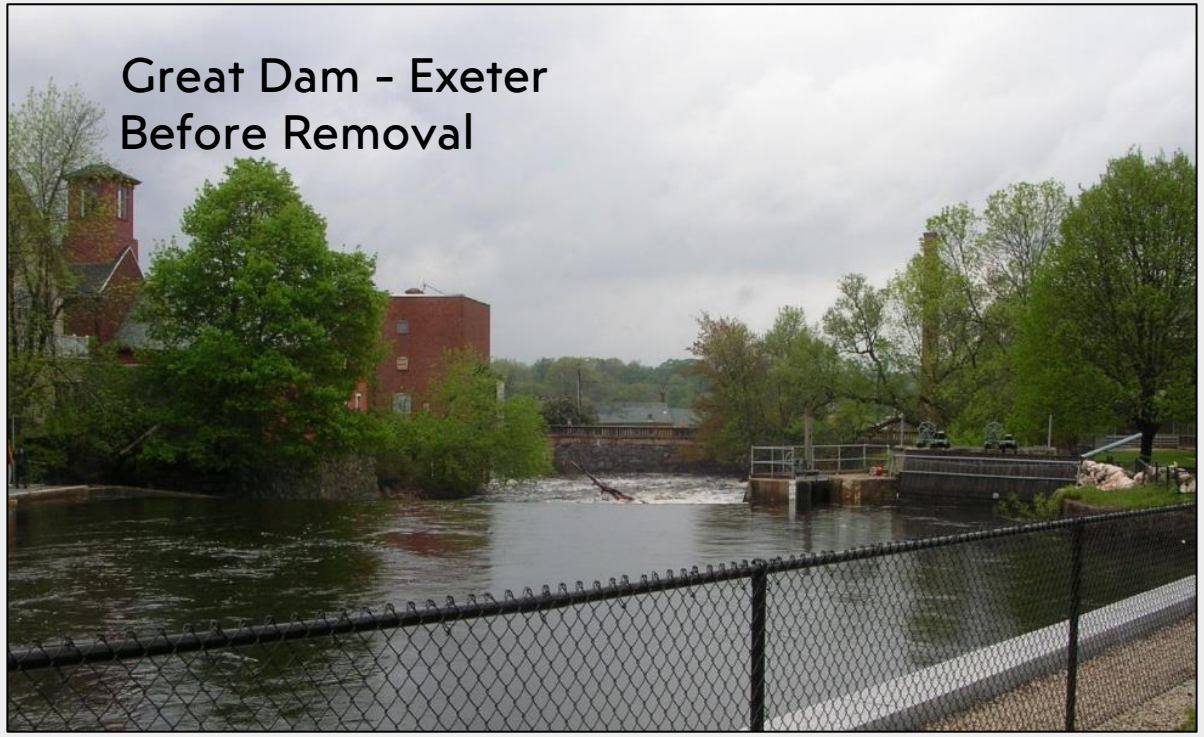
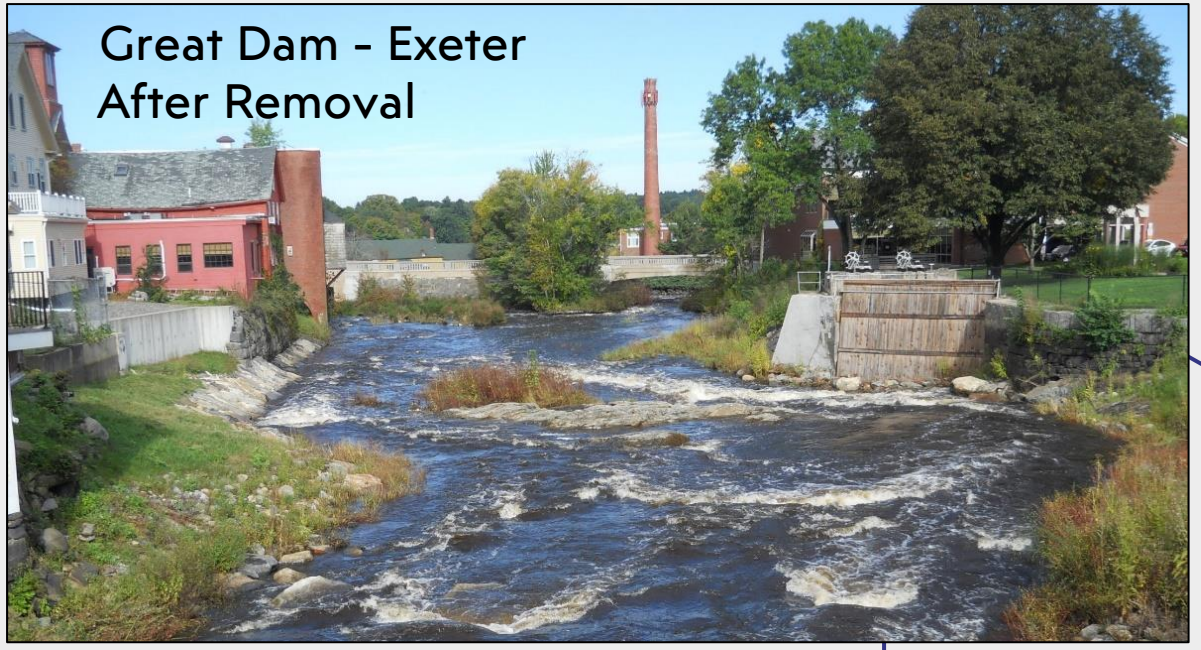
Dam Safety and Inspection Section

- Works with public and private dam owners on river restoration and dam removal projects
- Currently managing $5,850,000 of American Rescue Plan (ARPA) funds towards the rehabilitation of 9 high hazard municipally owned dams





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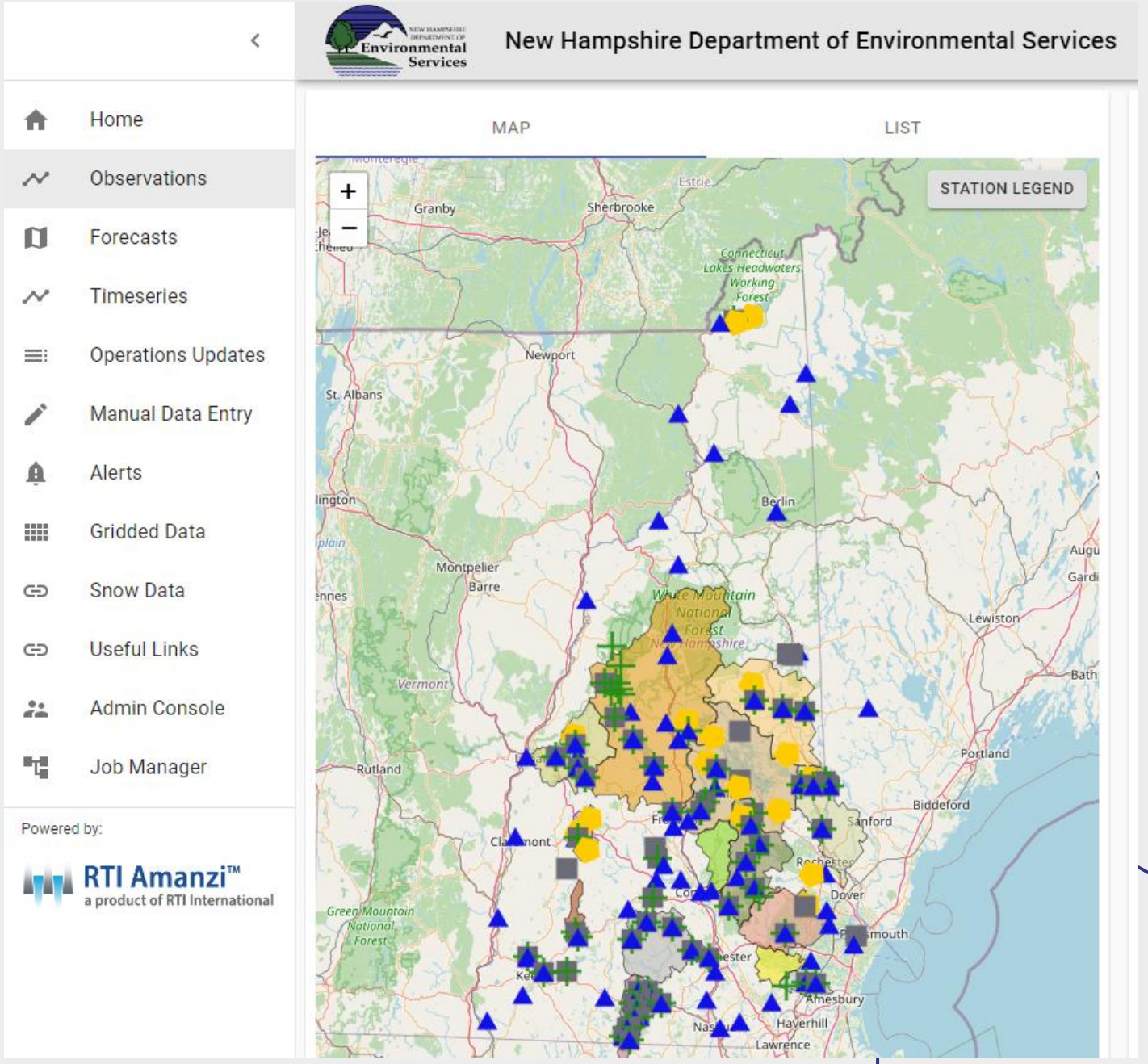
Operations and Maintenance Section

- Responsible for the operations and maintenance of **213 dams**.
- Responsible for maintaining dams and lake levels at the State's largest lakes (i.e., Lake Winnipesaukee, Lake Winnisquam, Squam Lake, Newfound Lake, Lake Sunapee, and Lake Ossipee)



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Operations and Maintenance Section

- Performs operations such as opening gates, pulling stoplogs and repairing flashboards.
- Along with routine maintenance such as mowing and brush cutting.

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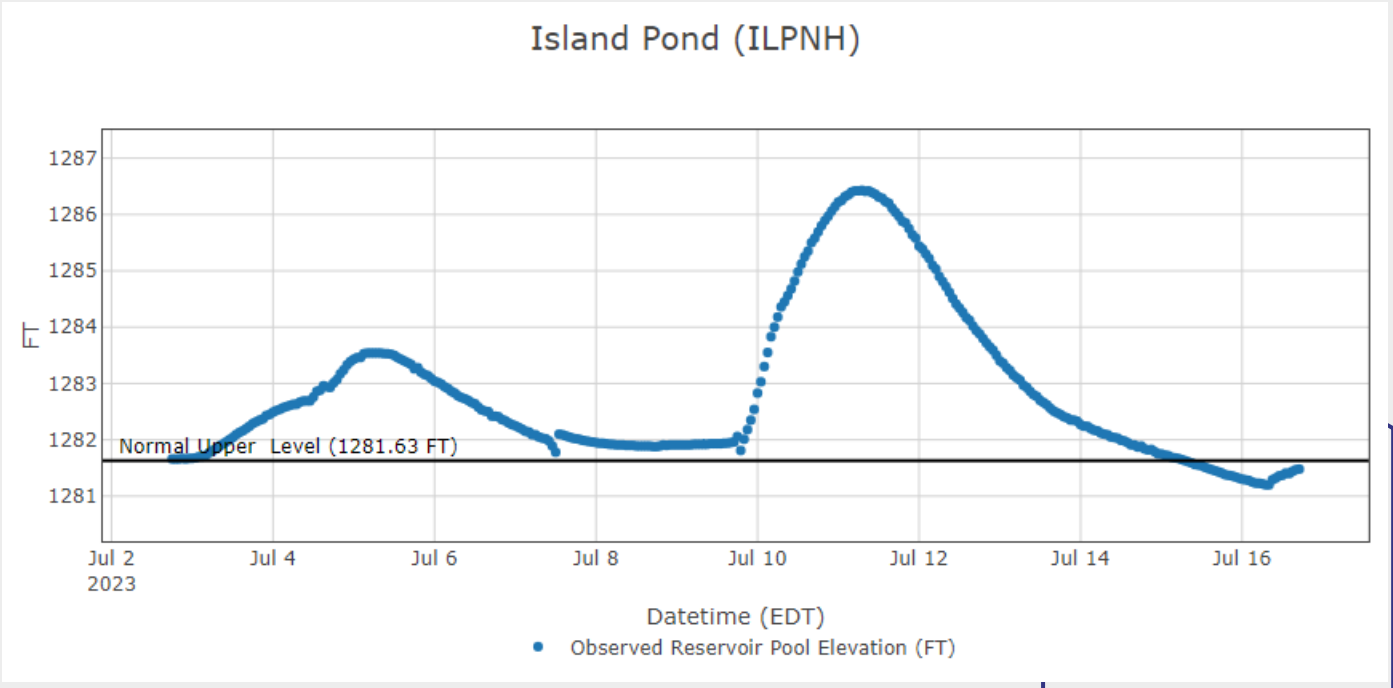
Operations and Maintenance Section

- Coordinates with private dam owners, communities and members of the public to reduce flooding impacts during high water events
- Manages 9 leases and 26 water user agreements with hydropower developers for the use of State-owned facilities for hydropower and water usage



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Operations and Maintenance Section

- Partners with USGS on a network of 27 river gauging stations throughout NH
- Provides real time lake level, temperature, precipitation and discharge data at 23 lakes in NH through the https://nhdes.rtiamanzi.org/ web platform.

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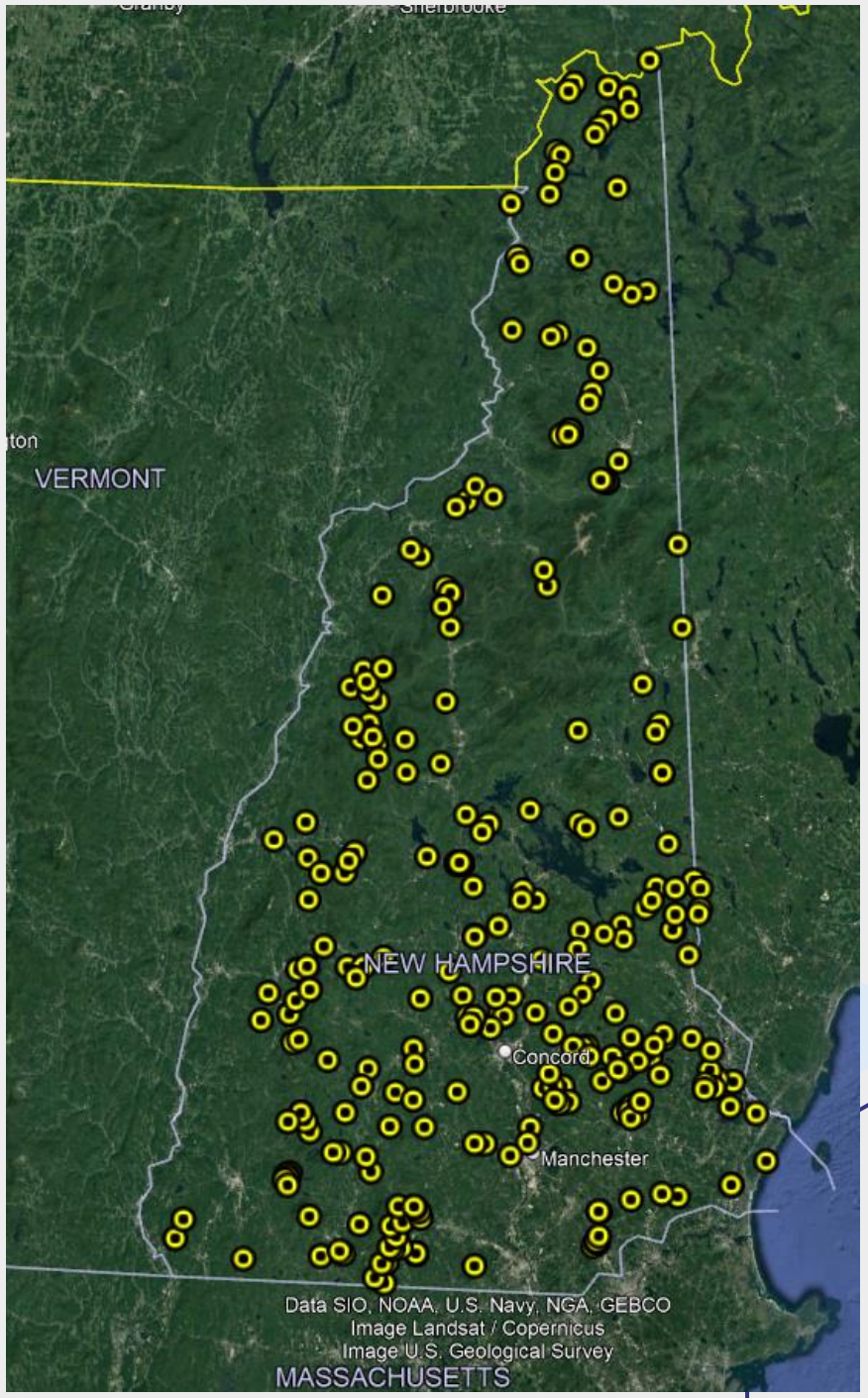
Engineering and Construction Section

- Responsible for major repairs and reconstruction of **275 dams**. This includes preparing and managing contacts, budget estimates and long-term schedules.
- Maintains ownership records and easements necessary for dam operations and repairs through the Land Management group.



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Engineering and Construction Section

- Oversees an in-house construction crew and design team for the repair and reconstruction of State-owned dams.
- Currently working on projects at Copps Pond Dam in Tuftonboro and Kilton Pond Dam in Grafton.

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Engineering and Construction Section

- Coordinates contracts with outside engineering firms and consultants on dam rehabilitation projects
- Currently managing $29,150,000 of ARPA funds towards the rehabilitation of State-owned dams

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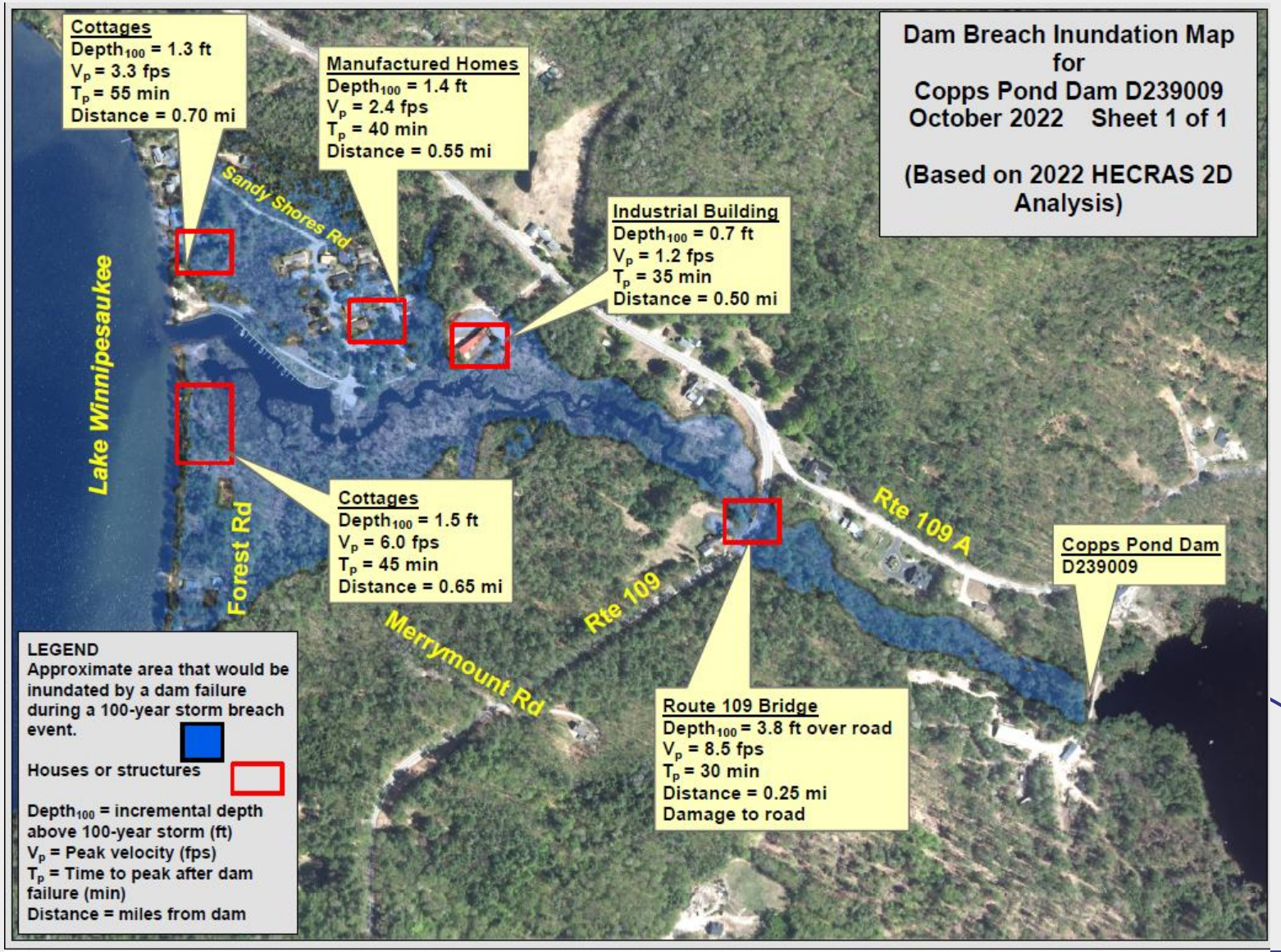
Engineering and Construction Section

- Prepares notification flow charts, emergency response procedures and inundation maps for Emergency Action Plans (EAP)s at 61 High and 32 Significant hazard dams.
- Reviews and updates plans in accordance with regulatory requirements



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Dam Bureau Challenges

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Age of State-owned dams

- The average age of the State-owned dams is over 100 years
- Numerous hydropower and State-owned dams have not seen major retrofits or rehabilitation in 40 to 50 years.

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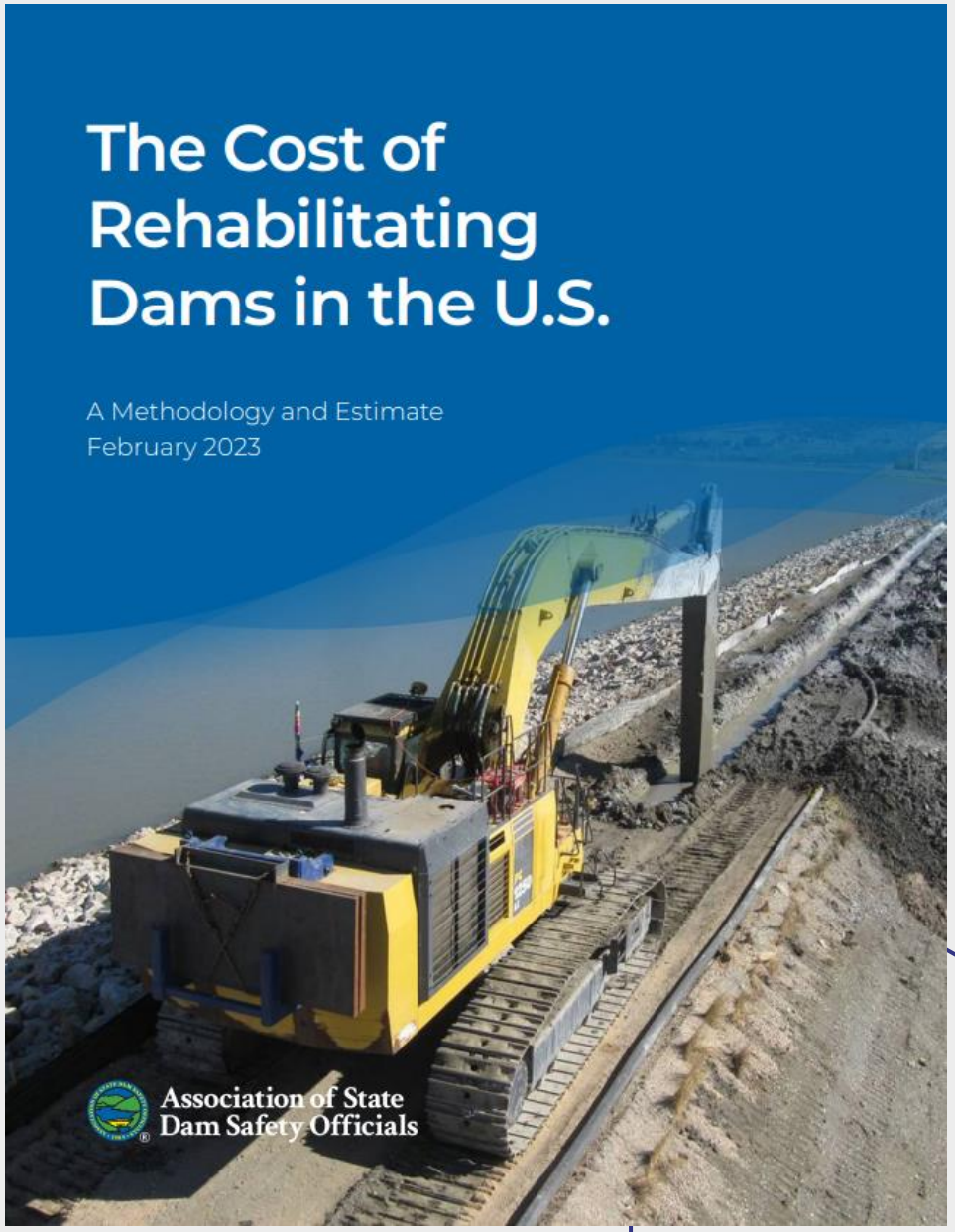
Rehabilitation cost of State-owned dams

- **61 High Hazard Dams**
- $300 million
- **32 Significant Hazard Dams**
- $54 million
- **90 Low Hazard Dams**
- $54 million
- **92 Non-Menace Hazard and Exempt Dams**
- $6 million
- **Total Approximate Cost = $414 million**



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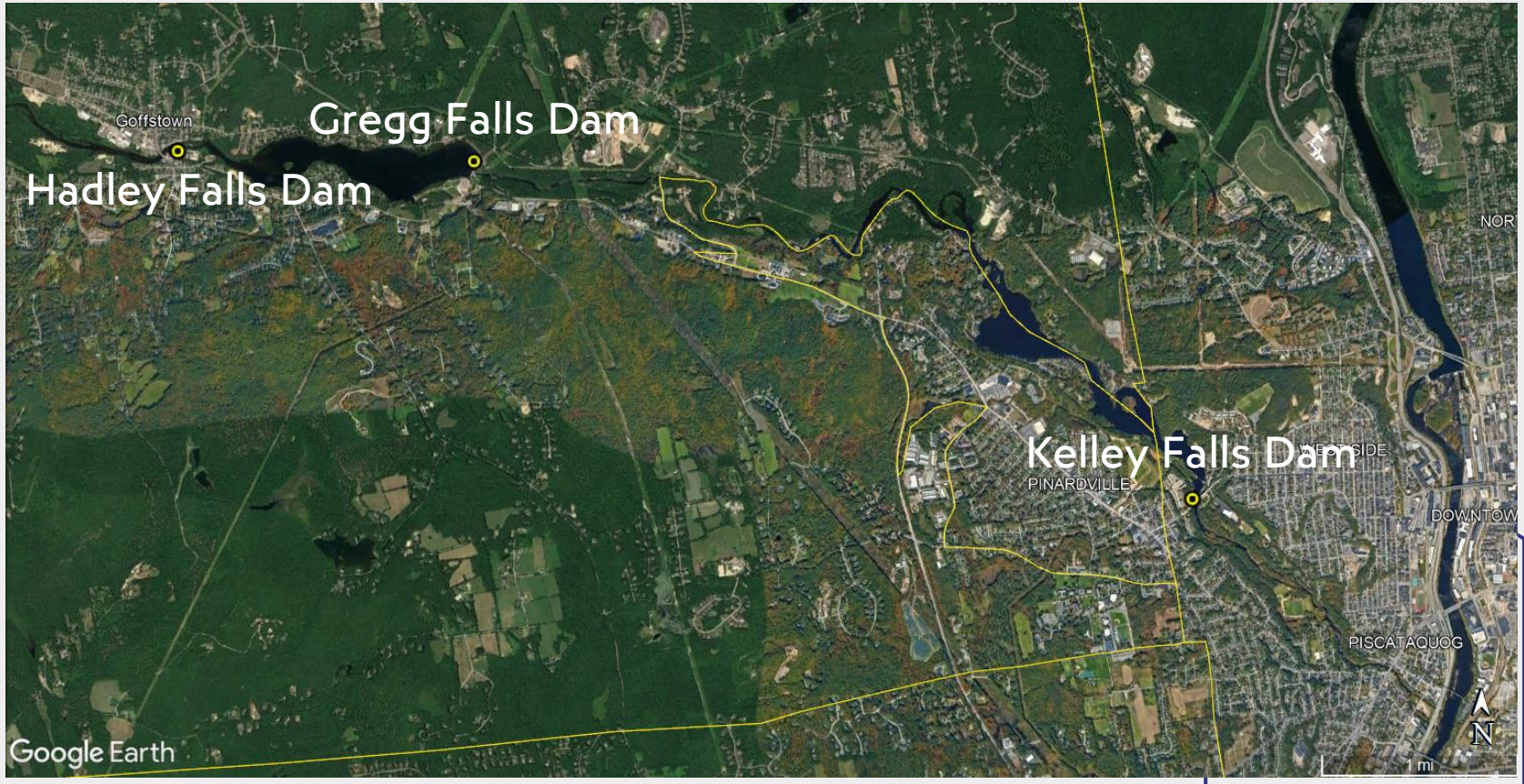
Rising Costs versus Revenue

- Many hydropower facilities in NH are going through FERC relicensing and at State-owned facilities the releasing process.
- Recent cost escalations to perform capital improvements and comply with FERC requirements
- Most hydro operators receive about 3 cents per kW/h while the average NH consumer pays about 24 cents per kW/h



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Change of Use

- Regardless of their original purpose, State-owned dams maintain impoundments providing recreational, flood control, water supply, and ecological benefits to residents, tourists, and waterfront property tax bases for municipalities.

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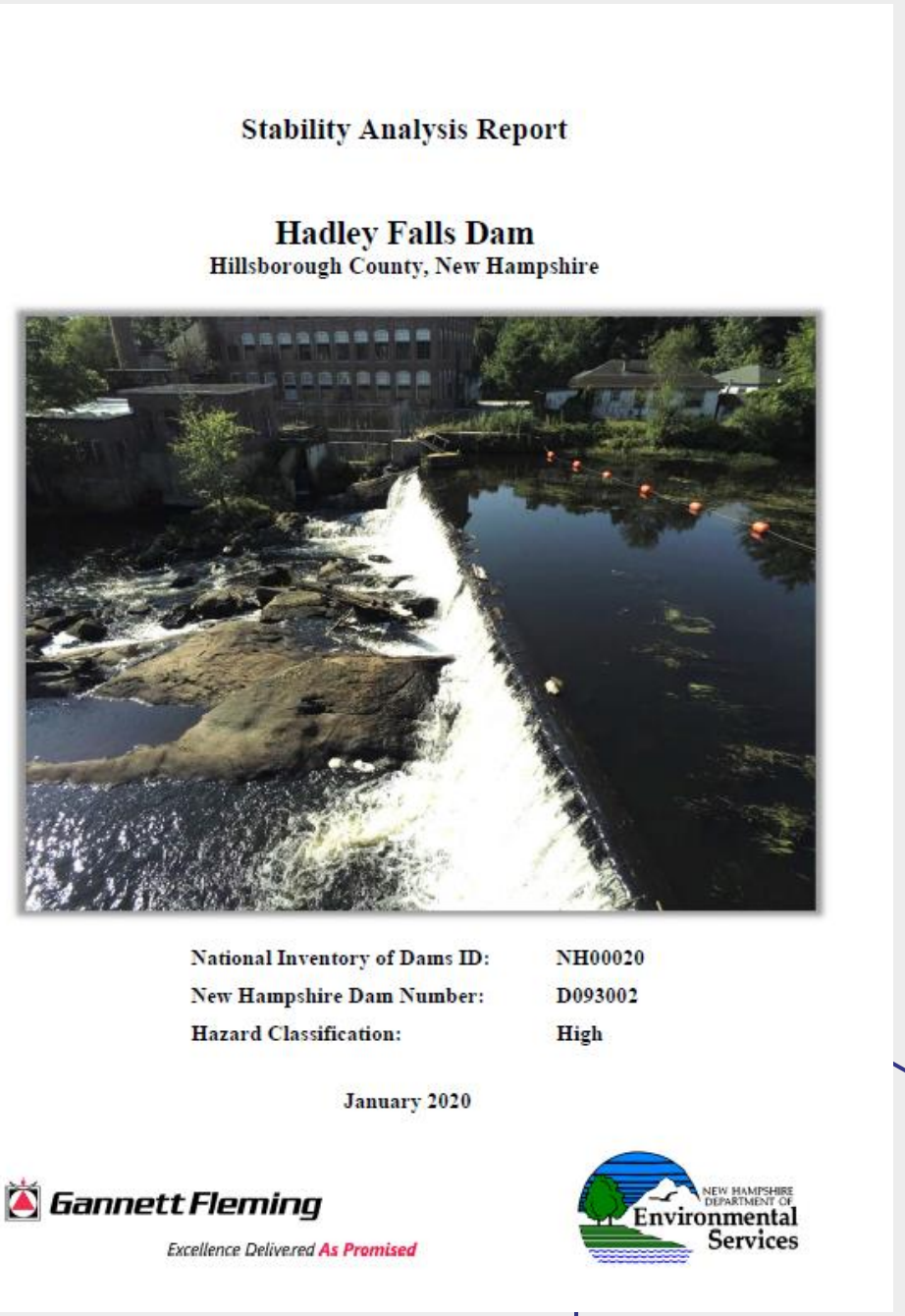
Improved Modeling of Dams

- Advancements in engineering tools are revealing previously unknown deficiencies at dam facilities, such as inadequate discharge capacity and structural instability

Table 6 – Summary of Sliding Factors of Safety

Section	Computed Factor of Safety Against Sliding			
	Case 1 Normal Pool	Case 2 Flood of Record	Case 3 100-Year Flood	Case 4 500-Year Flood
Allowable Sliding Factor of Safety	**3.0**	**1.0**[1]	**2.0**	**1.5**
Shear Strength (Φ = 48°, c=0 for spillway section; Φ = 45°, c=0 for training wall)				
Maximum Spillway Section	2.8	1.0	1.1	N/A (failed)
Training Wall	n/a[2]	1.3	1.9	N/A (failed)



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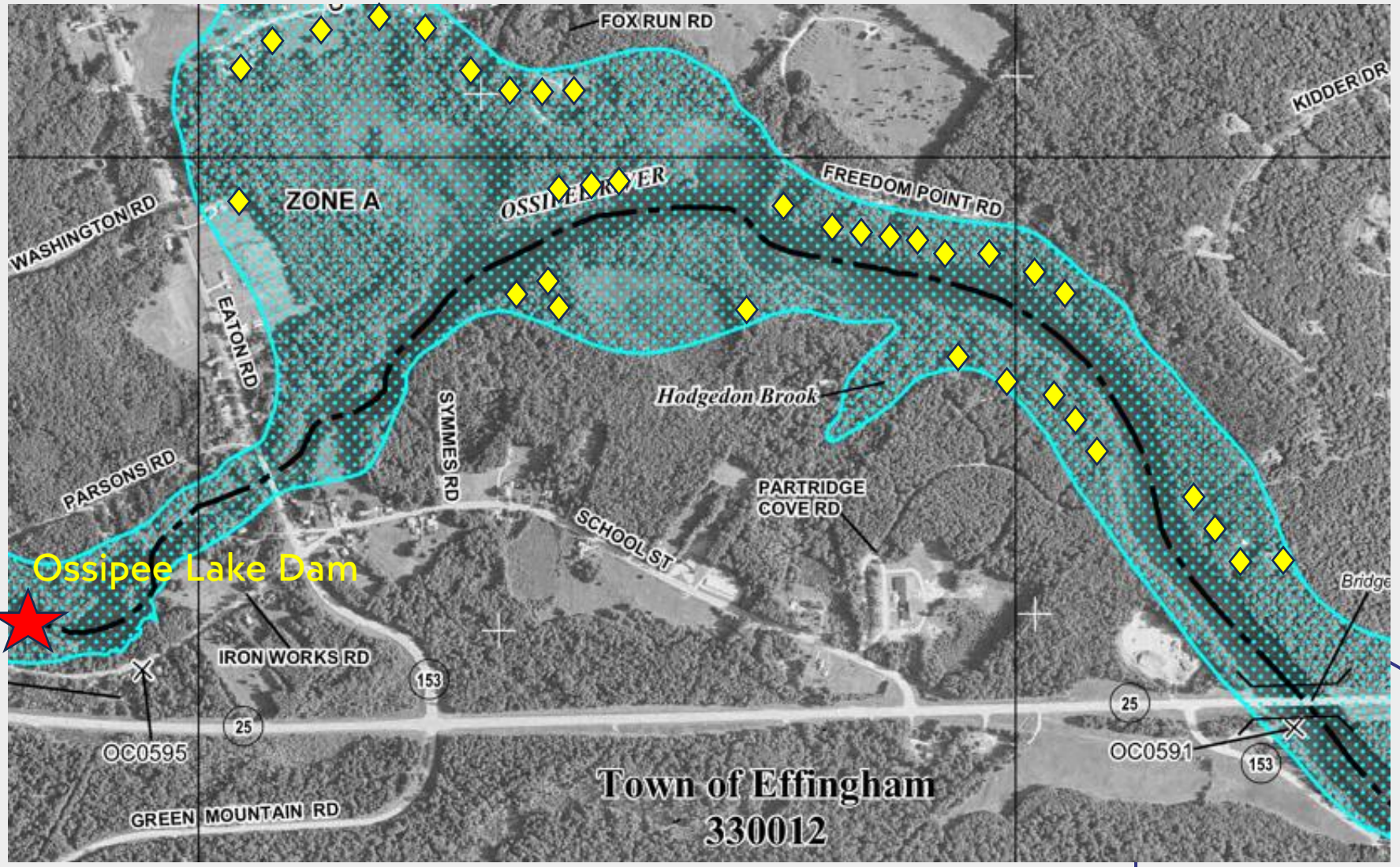
Hazard Creep

- 32 of the 61 State-owned high-hazard dams have been reclassified as such since 2004
- Development has increased the number of homes located in floodplains
- Creating hazard creep where dams built as low hazard are now high hazard



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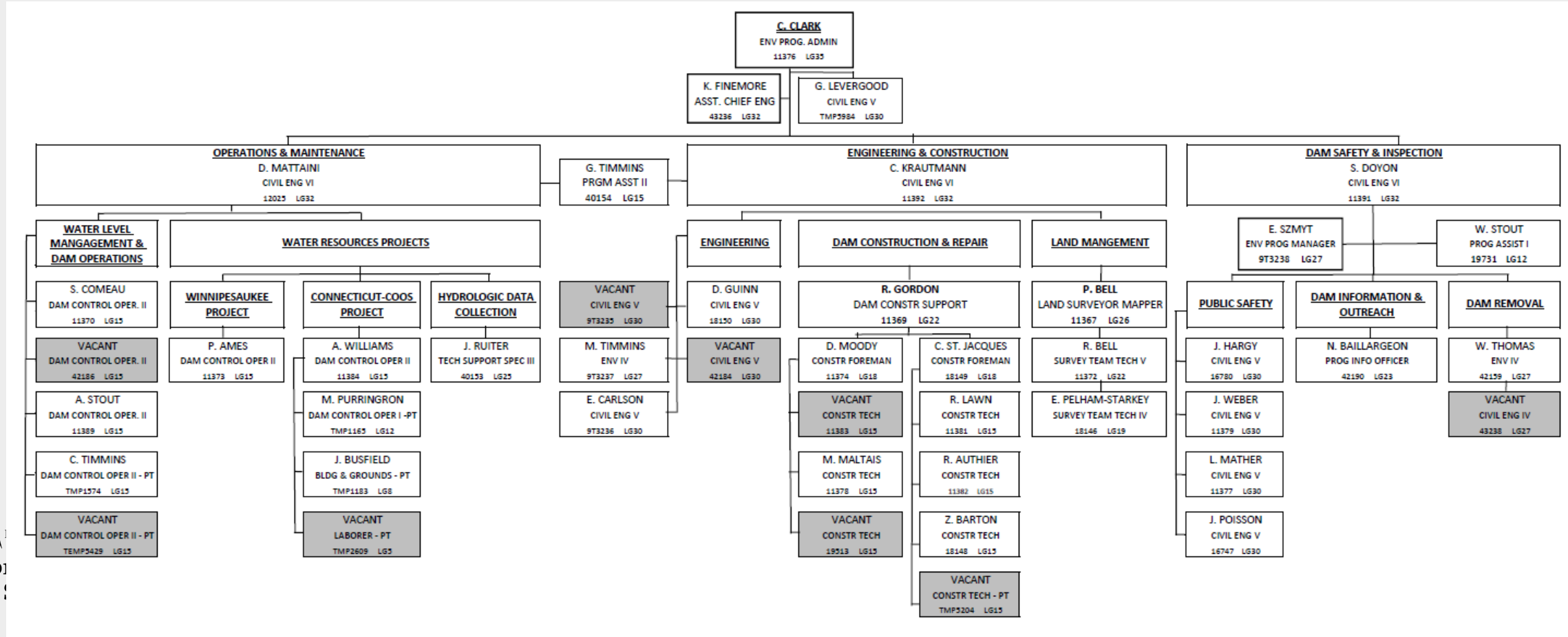
Staffing Challenges

- The NHDES Dam Bureau has 45 employees with 9 vacancies (20%), which creates difficulties in addressing expected operations at 213 dams, the repair needs at 275 dams and public safety at over 2,600 dams.



Dam Bureau Solutions

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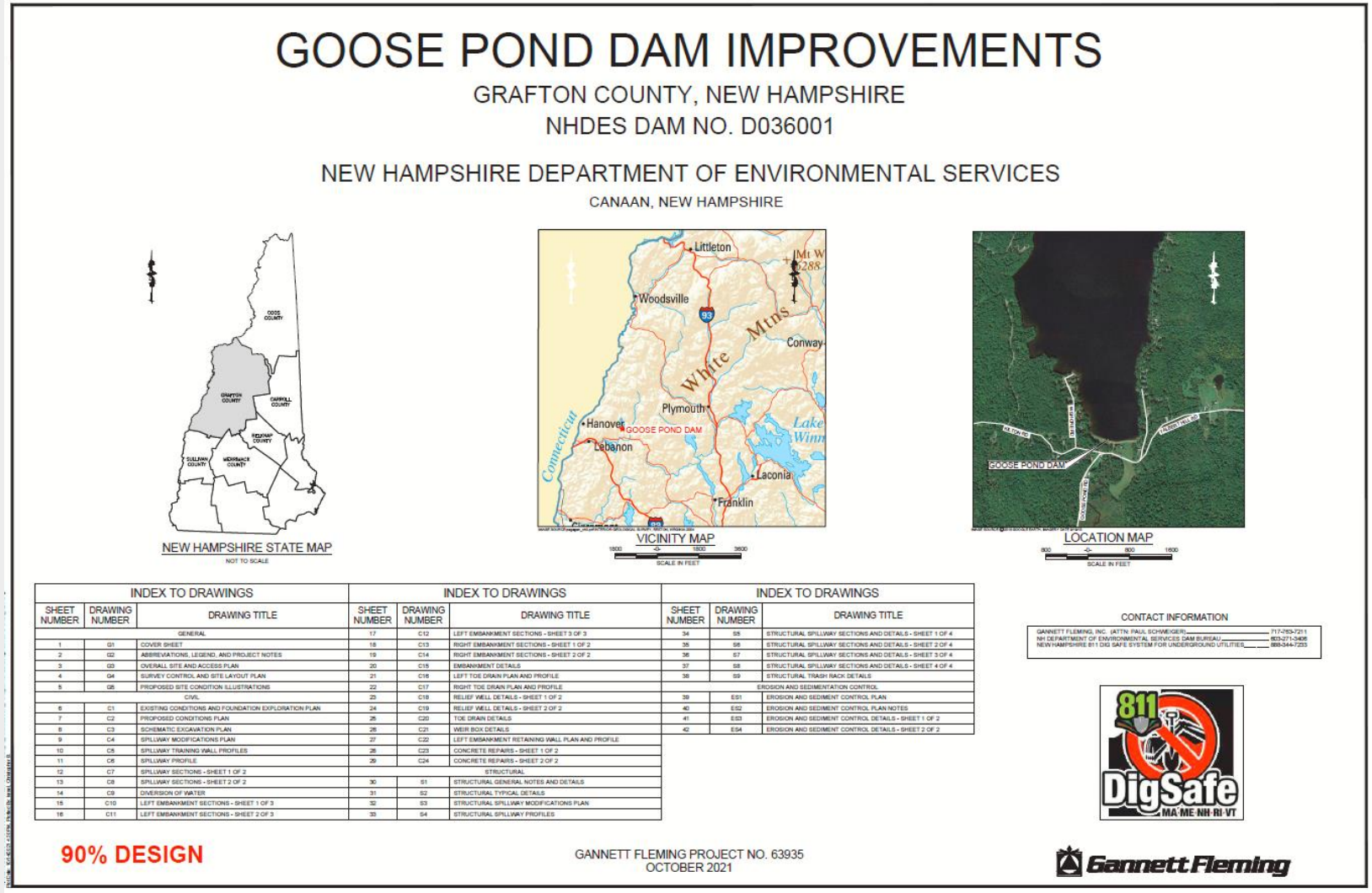
Funding Opportunities

- In 2022 the NHDES Dam Bureau received $35 million in ARPA funding from the Governor's Office for Emergency Relief and Recovery (GOFERR) for dam rehabilitation in NH
- FEMA's High Hazard Potential Dam Program
- NOAA's Restoring Fish Passage through Barrier Removal Program
- NRCS grants for rehabilitation of 24 flood control dams in NH



GOOSE POND DAM IMPROVEMENTS

GRAFTON COUNTY, NEW HAMPSHIRE

NHDES DAM NO. D036001

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

CANAAN, NEW HAMPSHIRE

NEW HAMPSHIRE STATE MAP

NOT TO SCALE

VICINITY MAP

SCALE IN FEET

LOCATION MAP

SCALE IN FEET

INDEX TO DRAWINGS			INDEX TO DRAWINGS			INDEX TO DRAWINGS		
SHEET NUMBER	DRAWING NUMBER	DRAWING TITLE	SHEET NUMBER	DRAWING NUMBER	DRAWING TITLE	SHEET NUMBER	DRAWING NUMBER	DRAWING TITLE
GENERAL			17	C12	LEFT EMBANKMENT SECTIONS - SHEET 3 OF 3	34	S5	STRUCTURAL SPILLWAY SECTIONS AND DETAILS - SHEET 1 OF 4
1	G1	COVER SHEET	18	C13	RIGHT EMBANKMENT SECTIONS - SHEET 1 OF 2	35	S6	STRUCTURAL SPILLWAY SECTIONS AND DETAILS - SHEET 2 OF 4
2	G2	ABBREVIATIONS, LEGEND, AND PROJECT NOTES	19	C14	RIGHT EMBANKMENT SECTIONS - SHEET 2 OF 2	36	S7	STRUCTURAL SPILLWAY SECTIONS AND DETAILS - SHEET 3 OF 4
3	G3	OVERALL SITE AND ACCESS PLAN	20	C15	EMBANKMENT DETAILS	37	S8	STRUCTURAL SPILLWAY SECTIONS AND DETAILS - SHEET 4 OF 4
4	G4	SURVEY CONTROL AND SITE LAYOUT PLAN	21	C16	LEFT TOE DRAIN PLAN AND PROFILE	38	S9	STRUCTURAL TRASH RACK DETAILS
5	G5	PROPOSED SITE CONDITION ILLUSTRATIONS	22	C17	RIGHT TOE DRAIN PLAN AND PROFILE	EROSION AND SEDIMENTATION CONTROL		
CIVIL			23	C18	RELIEF WELL DETAILS - SHEET 1 OF 2	39	ES1	EROSION AND SEDIMENT CONTROL PLAN
6	C1	EXISTING CONDITIONS AND FOUNDATION EXPLORATION PLAN	24	C19	RELIEF WELL DETAILS - SHEET 2 OF 2	40	ES2	EROSION AND SEDIMENT CONTROL PLAN NOTES
7	C2	PROPOSED CONDITIONS PLAN	25	C20	TOE DRAIN DETAILS	41	ES3	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 1 OF 2
8	C3	SCHEMATIC EXCAVATION PLAN	26	C21	WEIR BOX DETAILS	42	ES4	EROSION AND SEDIMENT CONTROL DETAILS - SHEET 2 OF 2
9	C4	SPILLWAY MODIFICATIONS PLAN	27	C22	LEFT EMBANKMENT RETAINING WALL PLAN AND PROFILE			
10	C5	SPILLWAY TRAINING WALL PROFILES	28	C23	CONCRETE REPAIRS - SHEET 1 OF 2			
11	C6	SPILLWAY PROFILE	29	C24	CONCRETE REPAIRS - SHEET 2 OF 2			
12	C7	SPILLWAY SECTIONS - SHEET 1 OF 2	STRUCTURAL					
13	C8	SPILLWAY SECTIONS - SHEET 2 OF 2	30	S1	STRUCTURAL GENERAL NOTES AND DETAILS			
14	C9	DIVERSION OF WATER	31	S2	STRUCTURAL TYPICAL DETAILS			
15	C10	LEFT EMBANKMENT SECTIONS - SHEET 1 OF 3	32	S3	STRUCTURAL SPILLWAY MODIFICATIONS PLAN			
16	C11	LEFT EMBANKMENT SECTIONS - SHEET 2 OF 3	33	S4	STRUCTURAL SPILLWAY PROFILES			

CONTACT INFORMATION

90% DESIGN

GANNETT FLEMING PROJECT NO. 63935
OCTOBER 2021

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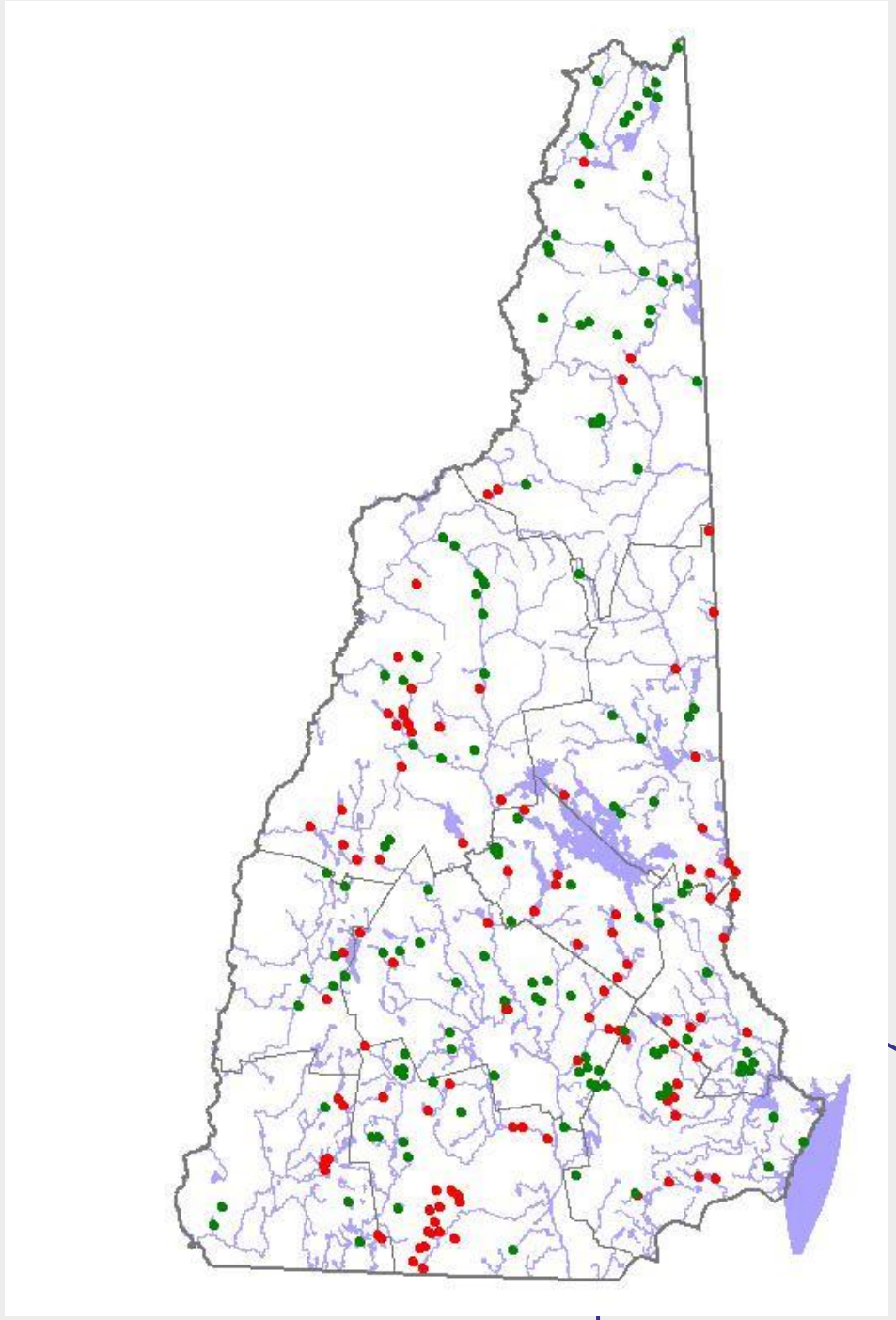
Asset Management

- Develop an asset management system to allow for better risk assessments to prioritize the 275 dams for rehabilitation and to generate future capital needs.
- Identify the dams that no longer meet their intended purpose and/or have no revenue source and develop options for the future of those facilities, including pursuing their removal or sale to interested parties.



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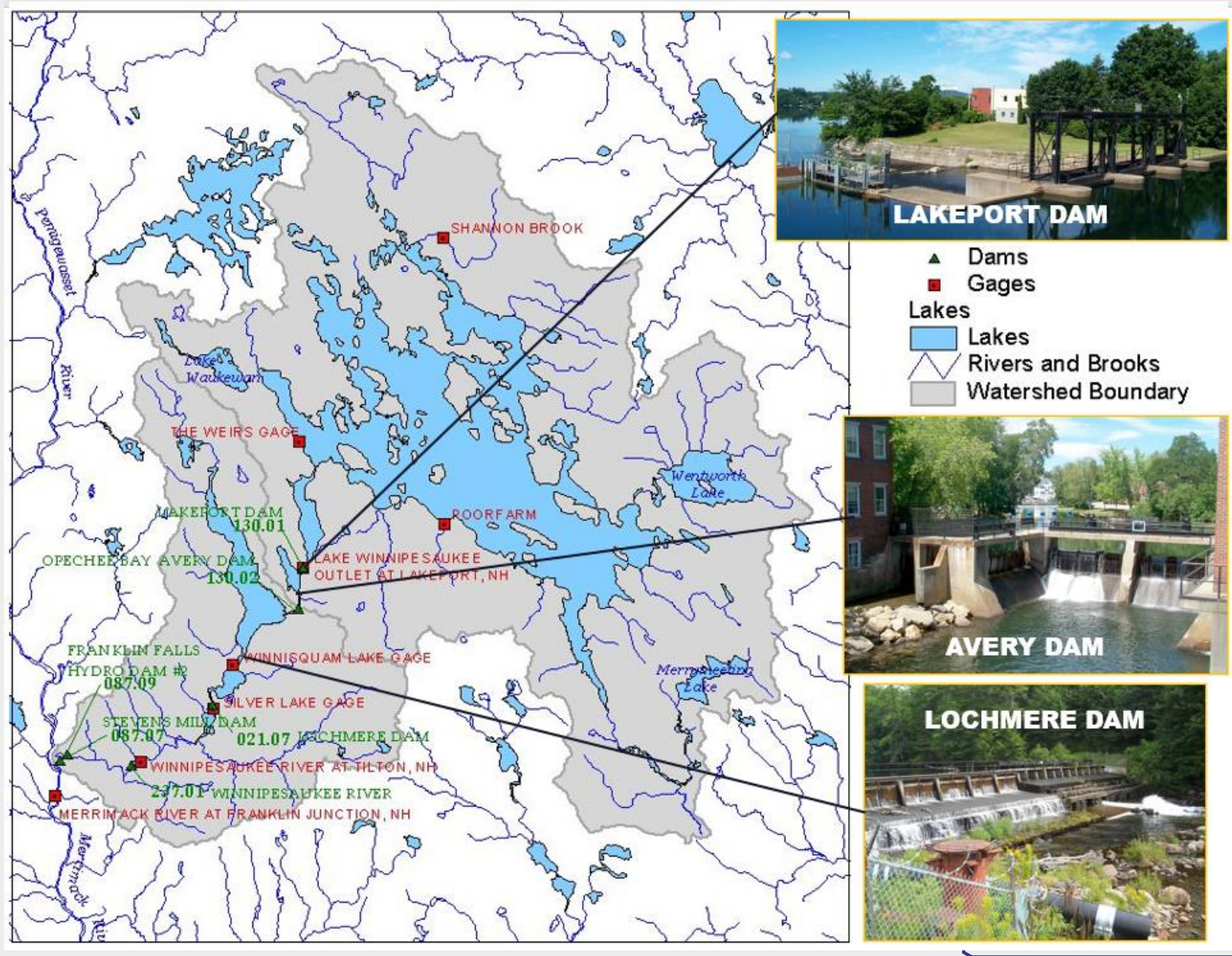
Basin wide approach

- Continue conducting hydrologic and hydraulic studies in NH watersheds to inform downstream planning, risk assessment, rehabilitation design, flood control and operations.
- Currently being done on the Merrymeeting, Suncook, Salmon Falls, and Winnipesaukee Rivers.



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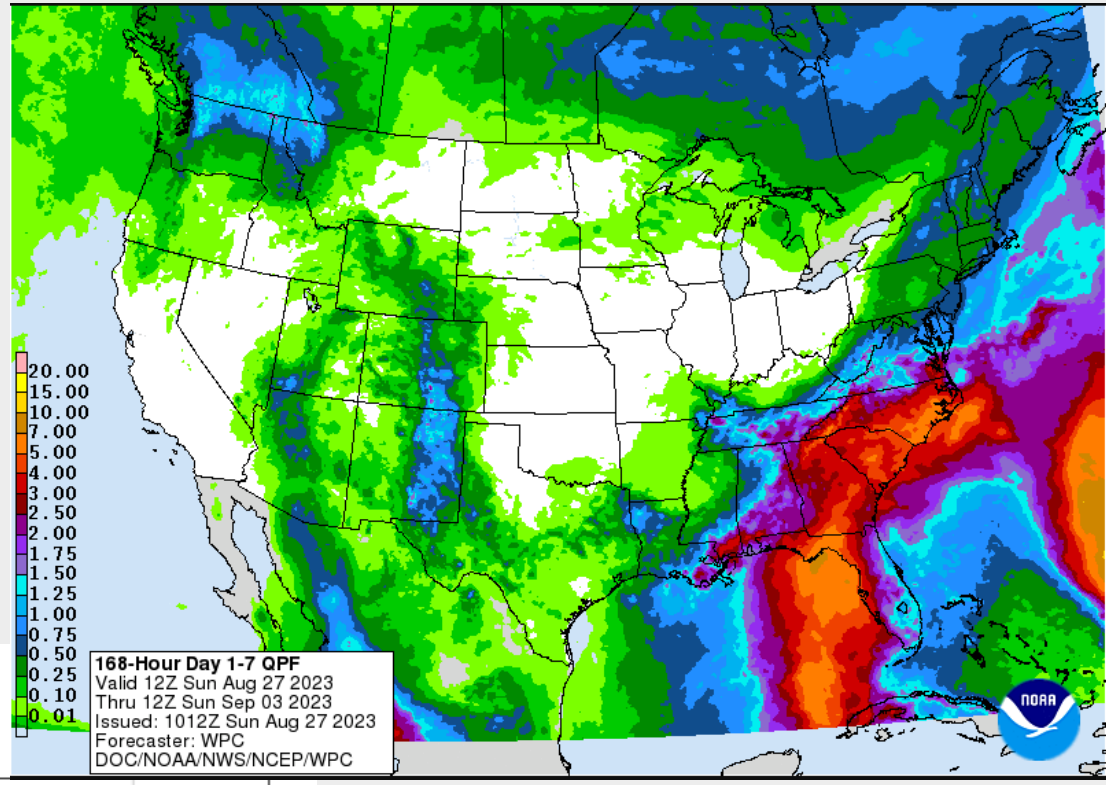
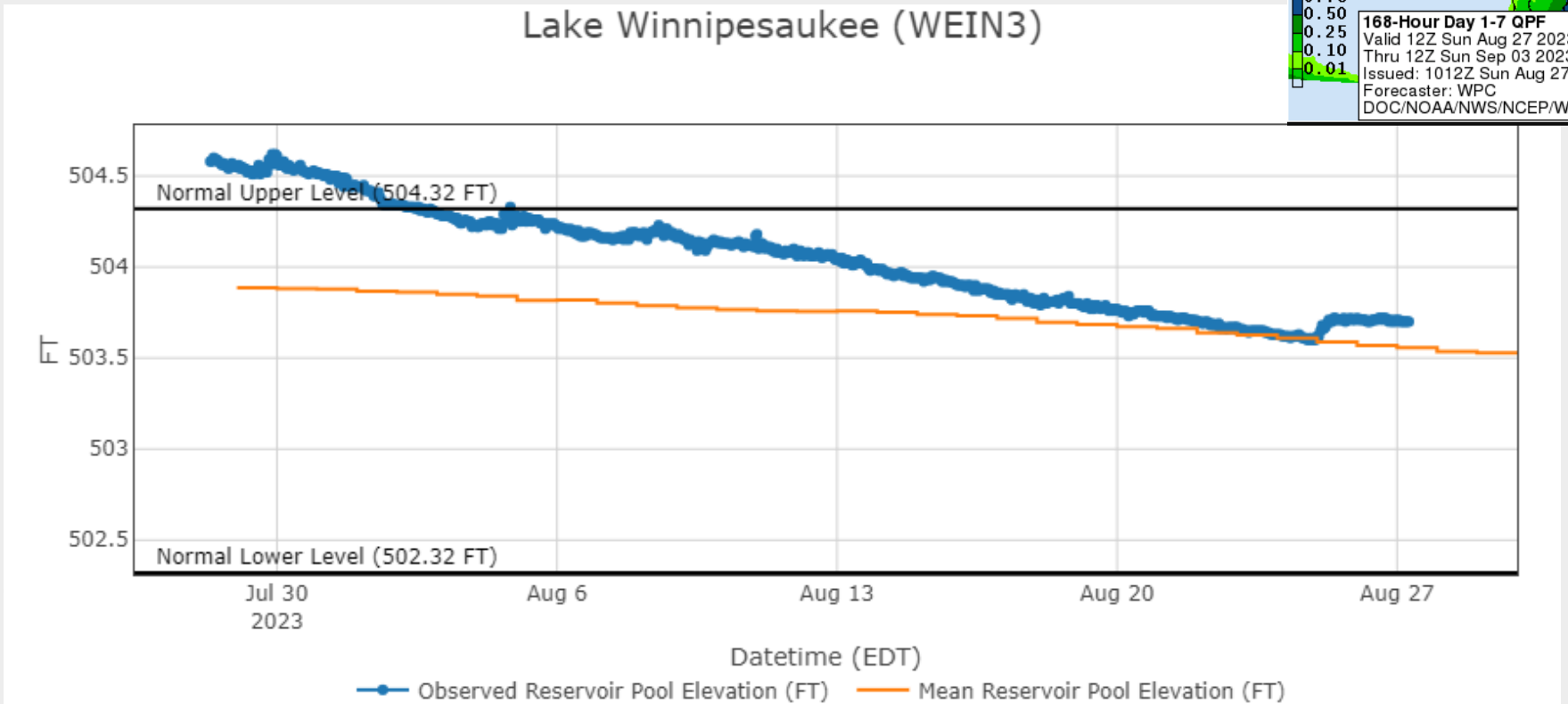
Improved Modeling

- Continue to improve the modeling of certain NH watersheds to provide the best possible management of dams and critical water resources using real time data.





Improved Operations

- Continue installing remotely operated gates when appropriate.
- Currently remote operations can occur at Ossipee Lake, Newfound Lake, Milton Three Ponds and Mascoma Lake dams. Pending at Highland Lake and Island Pond dams.

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Revising Administrative Rules

- Sections Env-Wr 100 through 900 of the NH Code of Administrative rules are the regulations by which dams in NH are regulated by NHDES.
- Rules are currently being reviewed and are being updated to match current design practices and data sources.

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New Construction and Operations Facility

- During late 2022 the Dam Bureau Construction and Repair group along with the Operations and Maintenance group moved into a new 23,000 square foot facility on Silk Farm Road in Concord.

NHDES Dam Bureau

- Continue ensuring public safety around and downstream of all dams in New Hampshire
- Continue ensuring that State-owned dams are managed to protect the recreational and natural resources upstream and downstream of the dams
- Continue seeking new sources of revenue to ensure State-owned dams remain sustainable

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Thank you

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603-271-1961

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