

**VERMONT**  
**Department of Environmental Conservation**  
**Dam Safety Program**



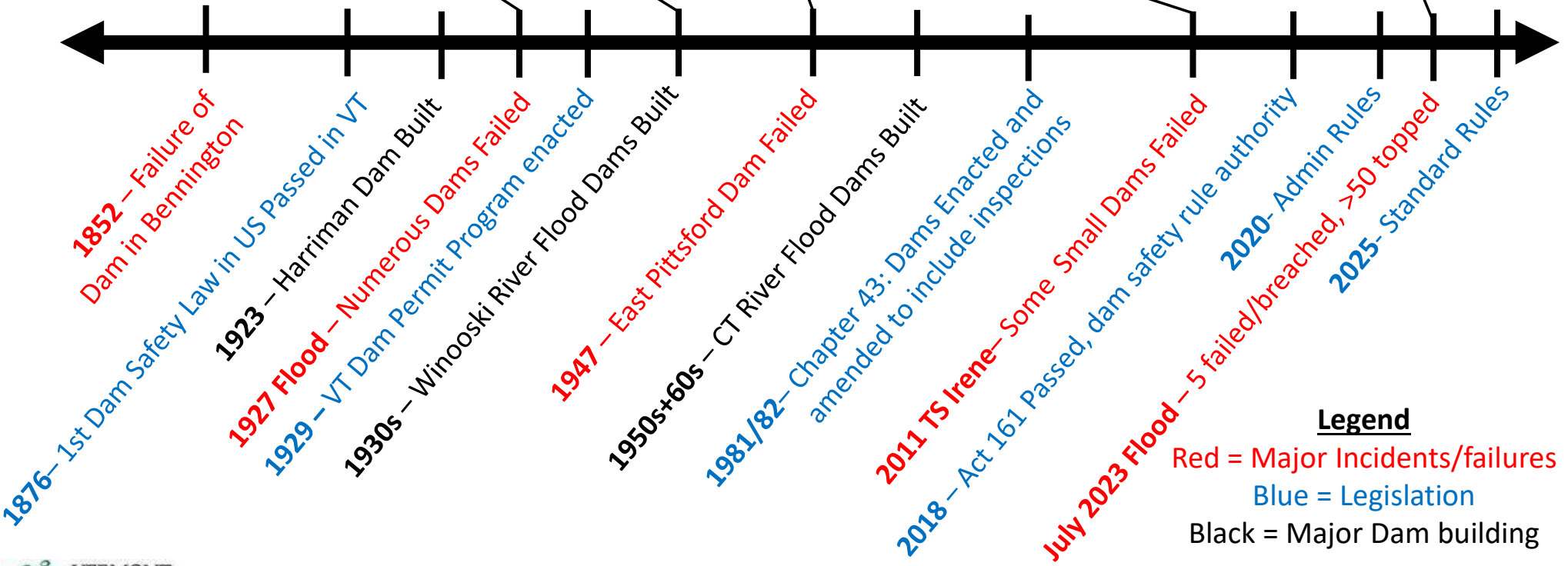
*Waterbury Dam*

**Senate Natural Resources and Energy Hearing**

**December 5, 2023**

Ben Green, PE  
Dam Safety Engineer  
VTDEC Dam Safety Program

# Brief History of Vermont Dams and Dam Safety



**Legend**  
 Red = Major Incidents/failures  
 Blue = Legislation  
 Black = Major Dam building



# Brief Program Overview

- Located in the Water Investment Division (WID) within VTDEC
- "The mission of the Vermont Dam Safety Program is to reduce risks to life, property, and the environment from dam incidents and dam failure through effective communication, education, regulation, and dam ownership"
- RESPONSIBILITIES:
  - dam regulation
  - dam ownership
  - lands management
- CURRENT STAFFING:
  - (2) licensed engineer
  - (2) staff engineers
  - (1) program administrator/analyst
  - Summer Temporary (pending funding)
- STATUTE/RULES:
  - 10 V.S.A Chapter 43: Dams, Non-federal, non-power dams (Rules in development)
- DAM OWNERSHIP: 14 dams including the (3) Winooski River Flood Control Dams.



Silver Lake Dam

# Hazard Potential Classifications

- Potential for loss of life, property losses, lifeline losses, or environmental losses due to a dam failure or incident.

<b>Classification<sup>1</sup></b>	<b>Direct Loss of Life</b>	<b>Property Losses</b>	<b>Lifeline Losses</b>	<b>Environmental Losses</b>
<b>HIGH</b>	Probable or Certain (one or more) (extensive downstream residential, commercial, or industrial development)	Not considered for this classification	Not considered for this classification	Not considered for this classification
<b>SIGNIFICANT</b>	None expected	Major or extensive public and private facilities	Disruption of essential or critical facilities and access	Major or extensive mitigation required or impossible to mitigate
<b>LOW</b>	None expected	Private agricultural lands, equipment and isolated non-occupied buildings, non-major roads.	No disruption of services – repairs are cosmetic or rapidly repairable damage	Minimal incremental damage
<b>MINIMAL</b>	Same as LOW hazard, above			

1) Categories are based on overall dam performance and do not apply to appurtenances.

- Independent of condition rating of the dam.



# Vermont Dam Inventory / Natural Resources Atlas

- Contains ~1,119 records (active and historic sites)
- ~992 under jurisdiction of VTDEC (Non-Power, Non-Federal)  
**44 HIGH, 133 SIGNIFICANT, 252 LOW, 563 MINIMAL or not rated**
- ~21 PUC (Hydropower pre-1935)  
**4 HIGH, 4 SIGNIFICANT, 13 LOW, 1 not rated**
- ~82 FERC (Power post-1935)  
**15 HIGH, 7 SIGNIFICANT, 46 LOW, 14 MINIMAL or not rated**
- ~24 other dams are under jurisdiction of Federal Government (USACE, National Park Service, US Forest Service, etc.)

VERMONT OFFICIAL STATE WEBSITE  
AGENCY OF NATURAL RESOURCES  
**DAMSINVENTORY**

HOME DAMS PERMITS CONTACTS MAINTENANCE LOGINS

View Dams Record

Edit Close Tools

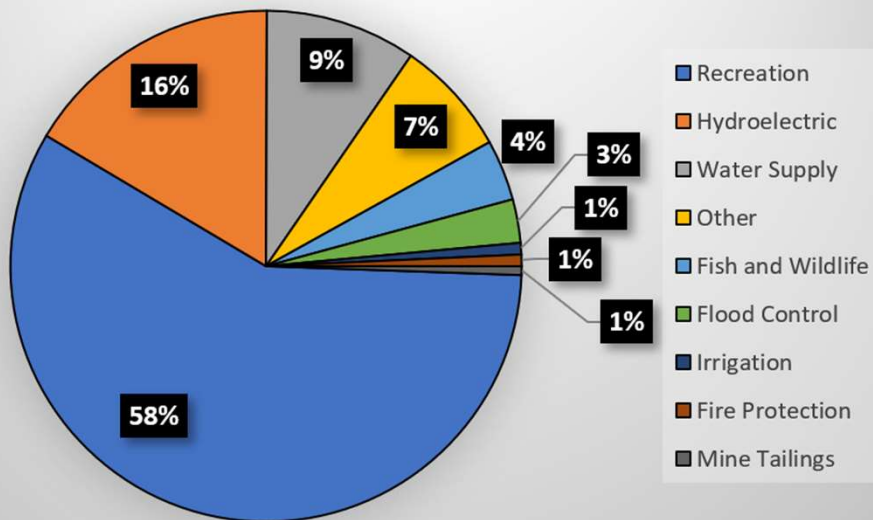
Names/Location	Contacts	Permits	Reservoir	Dam	Construction/Reconstruction
StateID:	226.01				
Dam Type:	RE				
Construction Type:	Zoned Earthfill				
Core:	IEK				
Foundation:	RSK				
Low Level Outlet:					
Length:	2130.0				
Height (feet):	187.0				
Upstream Height (feet):	145				
Structural Height (feet):	187				
Hydraulic Height (feet):	183				
Maximum Discharge (cfs):	84000				
Principal Spillway:					
Principal Spillway Design Capacity (cfs):					
Principal Spillway Maximum Capacity (cfs):					
Auxiliary Spillway:					
Auxiliary Spillway Design Capacity (cfs):					

Copyright © 2017

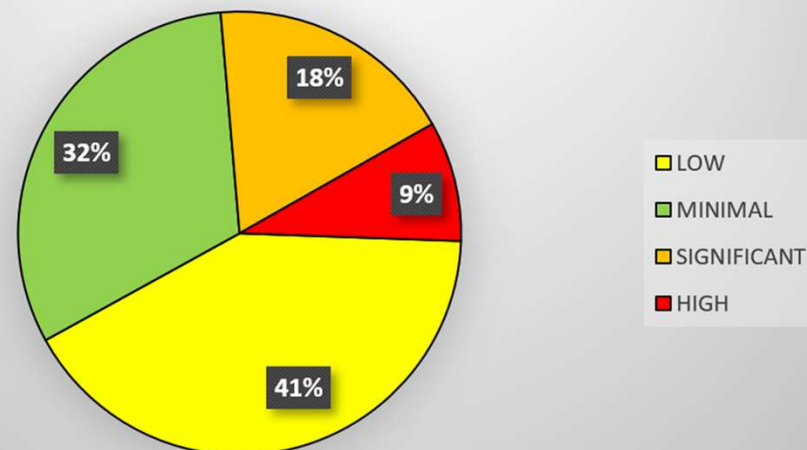


# Vermont Dam Inventory / Natural Resources Atlas Continued

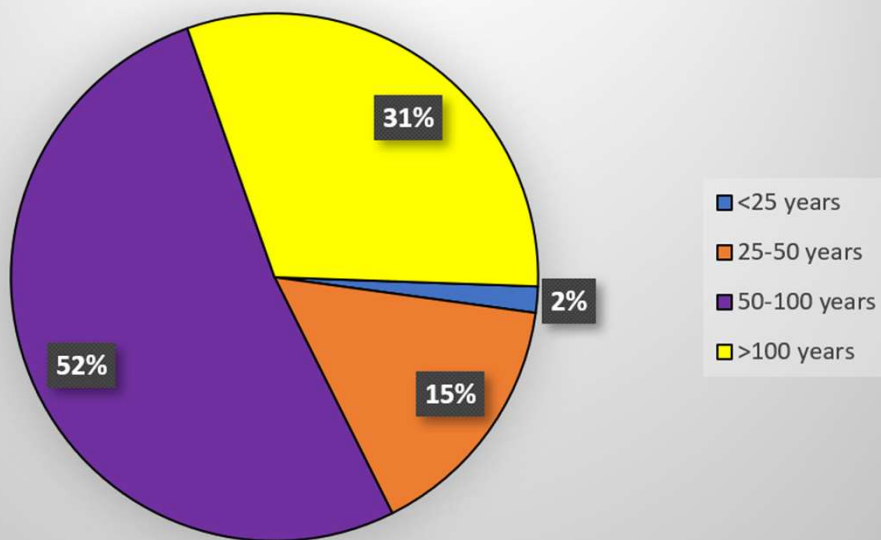
## VT Dams - Purposes



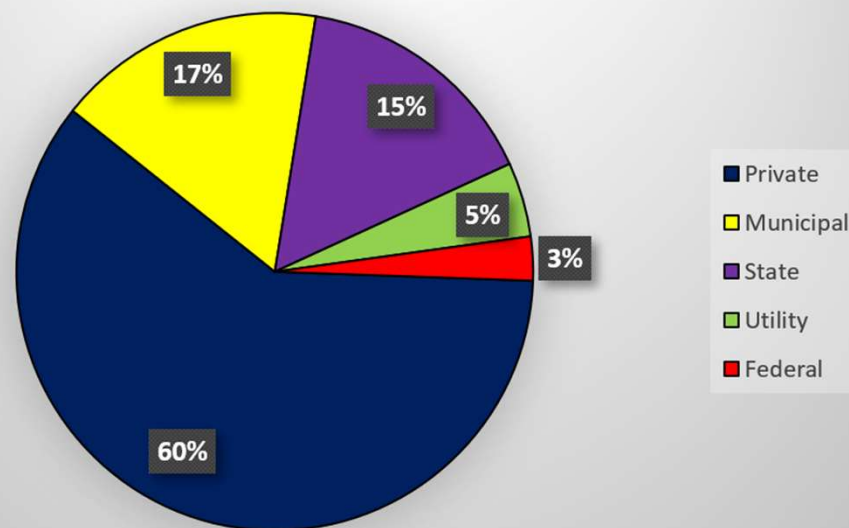
## VT Dams - Hazard Potential Classification



## VT Dams - Age



## VT Dams - Ownership Type

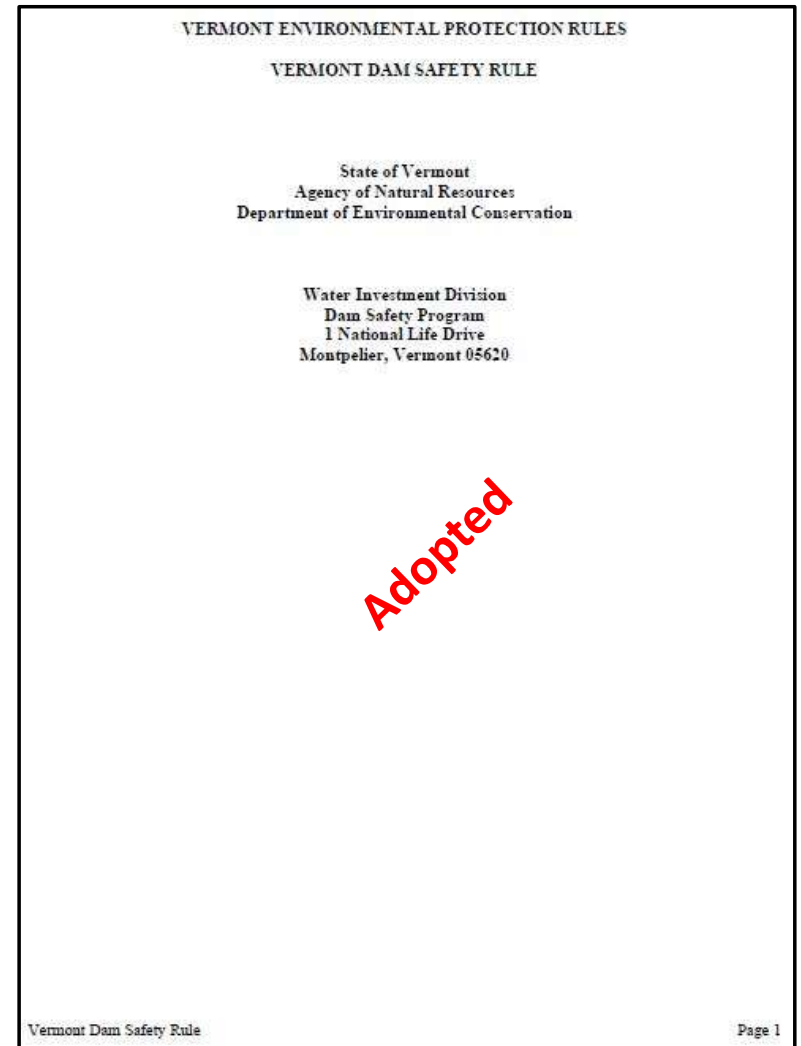




# Regulatory – Key Initiative

## Rulemaking – Act 161 of 2018

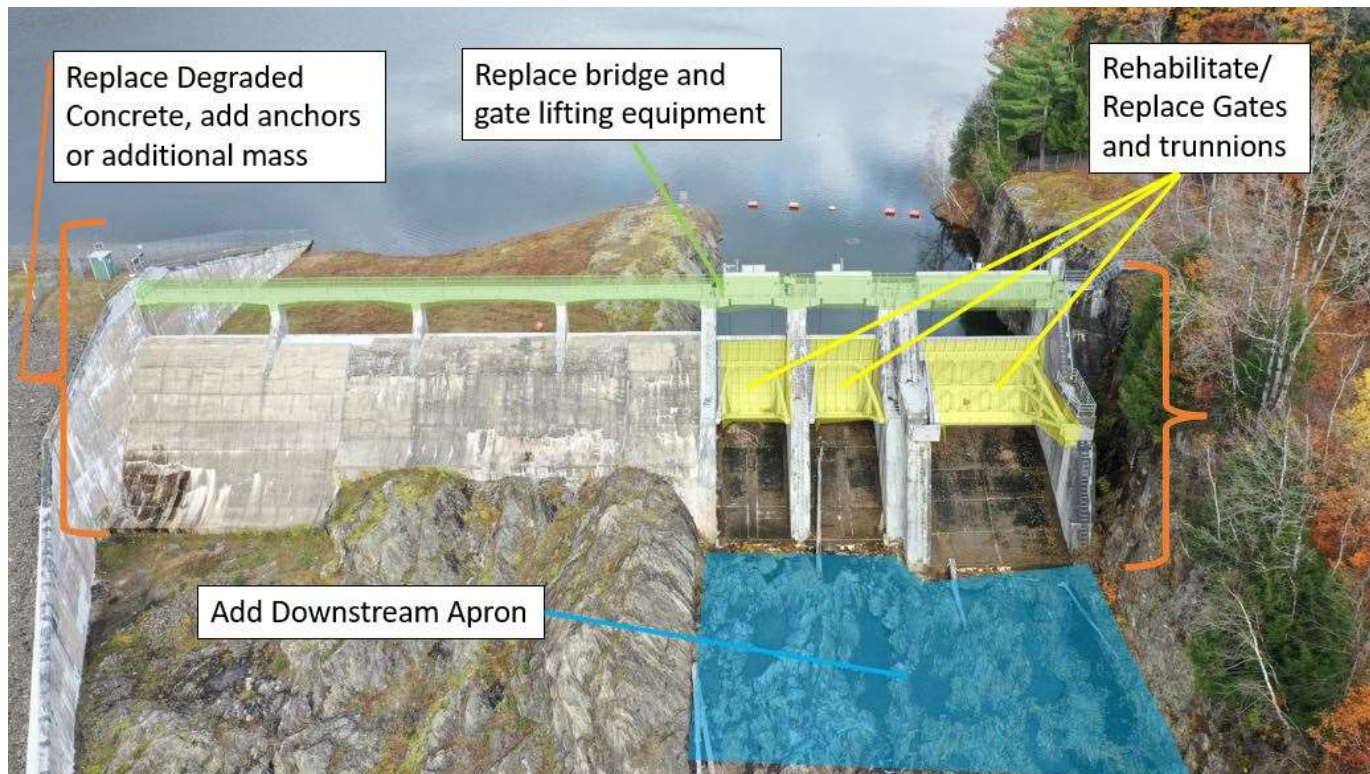
- Phase I, Administrative Rules adopted
- Phase II, Standards Rules in development
  - Siting, design, construction, alteration
  - Operation & Maintenance
  - Inspection, monitoring, record keeping, reporting
  - Repair or removal
  - Application for authorization
  - EAP requirements and guidance
- Extension to July 1, 2025 being pursued



## Dam Ownership – Key Initiative

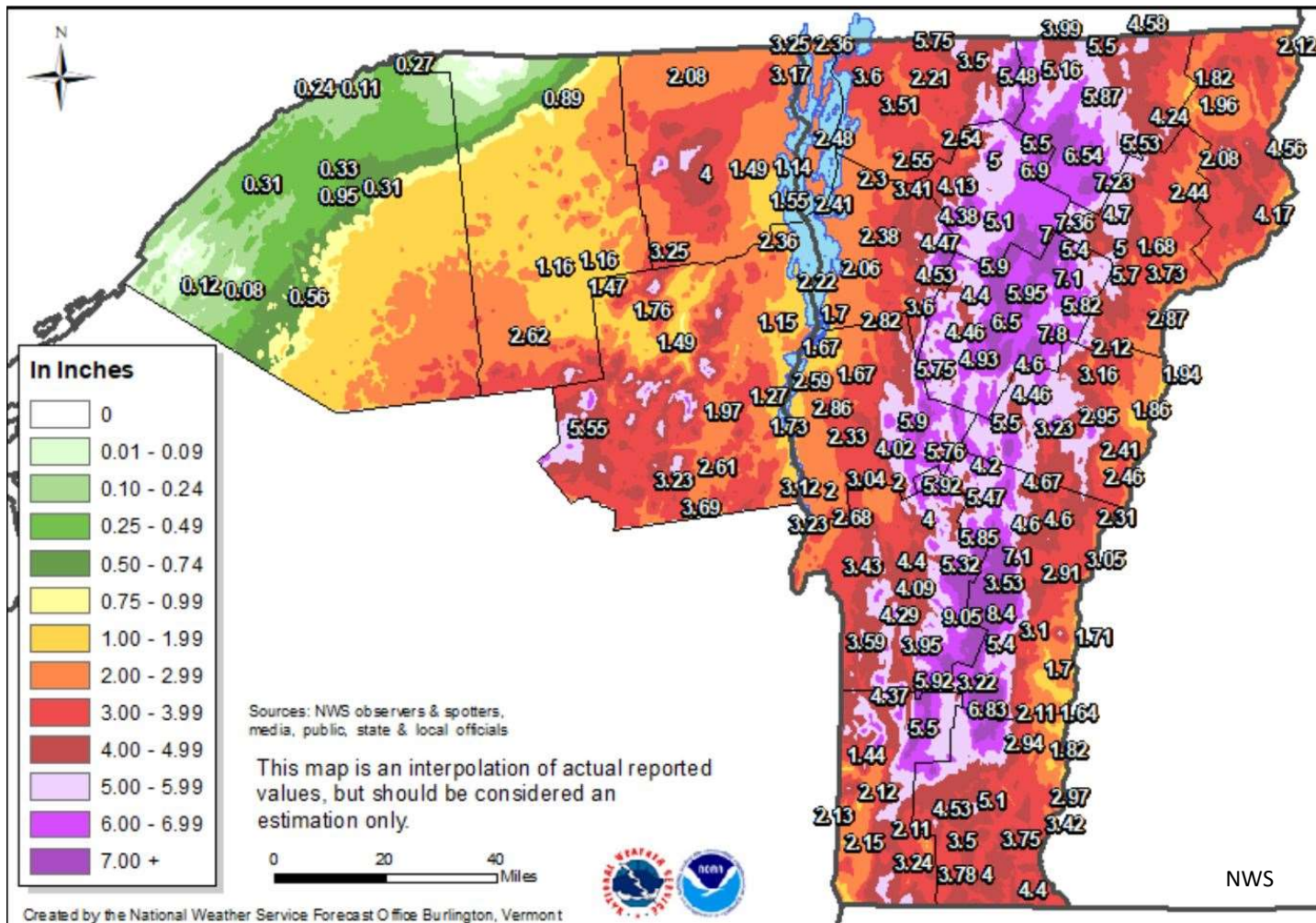
# Waterbury Dam - Spillway Replacement Project

- In 2000s Radial Arm Flood Gate jamming, leading to Flood load restrictions on gates
- Section 1177, WIIN 2016 Funding, \$70-100M Project, US Army Corps New England
- General Assembly has allocated match needed for up to \$60M in Federal Funds
- Improvements to gates, concrete spillways, bridge, lifting equipment, discharge channel
- Mod. Study ~2023/2024, Design ~2025/2026, Construction ~2027/2028
- <https://dec.vermont.gov/water-investment/dam-safety/dec-owned-dams/waterbury-dam-spillway-project>





# Overview of July 2023 Flood Event on Vermont's Dams



- Wide ranging rainfall of 3 to 9 inches
- Highest rainfall total in Calais, Vermont (9.2 inches) and 4 to 8 common along the Green Mountains
- July 9, Declared State of Emergency
- July 14, Federal Declaration of Major Disaster

# Overview of July 2023 Flood Event on ANR-owned dams

## *Winooski River Flood Control Dam Performance*

- Wrightsville, P-El. 684.15 (10" below aux., ~50' above normal), **1<sup>st</sup> Pool-of-Record**
- East Barre, P-El. 1,153.3 (11.7' below aux., ~28' above normal), **1<sup>st</sup> Pool-of-Record**
- Waterbury, P-El. 604.33 (6.5' below action, ~15' above normal), **4<sup>th</sup> Pool-of-Record**
  
- Continual Storm Monitoring
- On-the-fly inundation mapping and emergency coordination
- Post-Event Inspections, August 2  
Inspections with USACE
- Post –Event Tunnel Inspections at  
Wrightsville & East Barre
- Request for USACE Support for Study  
of Wrightsville and East Barre
- Waterbury Dam Interim Risk  
Reduction

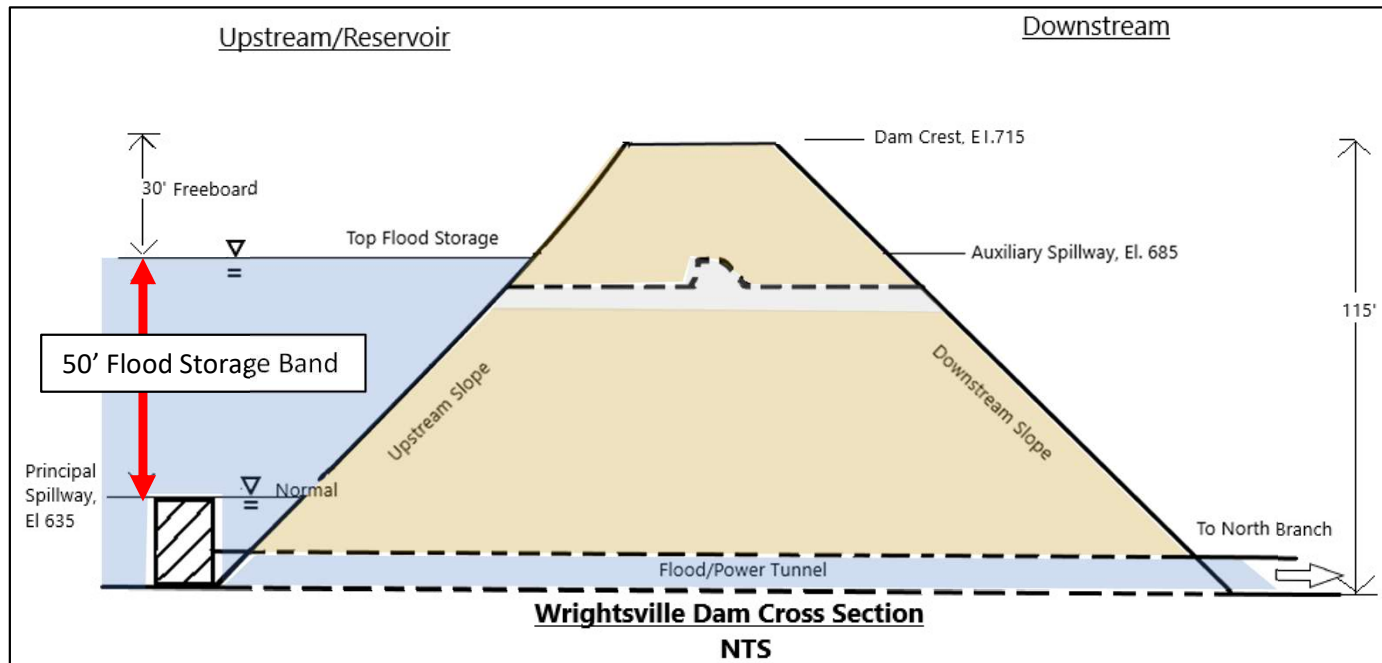




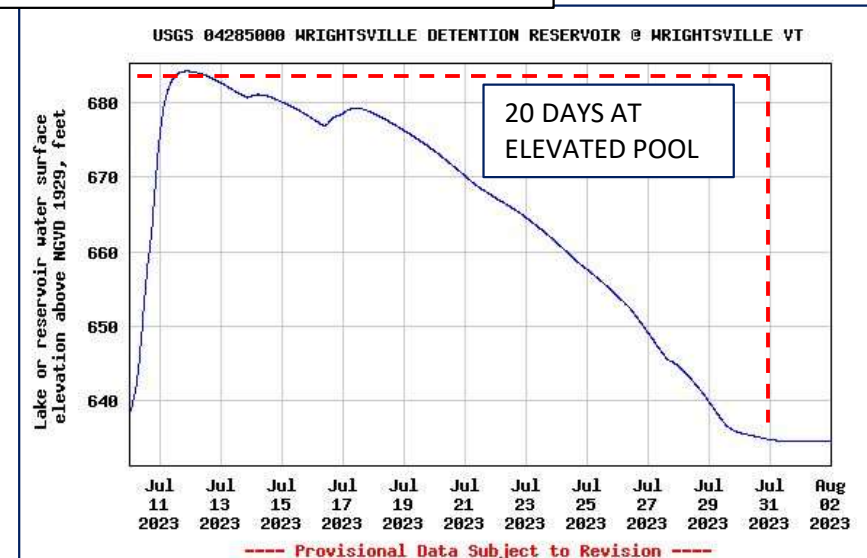
# Overview of July 2023 Flood Event on ANR-owned dams

## Wrightsville Dam Performance

- Wrightsville, P-El. 684.15 (10" below aux., ~50' above normal), 1<sup>st</sup> Pool-of-Record



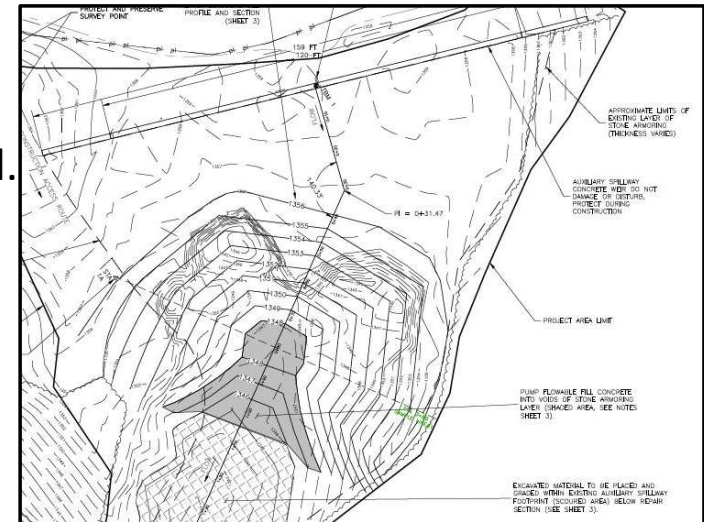
- 50' flood storage pool nearly full.
- 30' freeboard, full flood pool to dam crest.
- At risk of activating aux. spillway, flooding along North Branch to the Winooski River.
- Request for USACE Support to evaluate feasibility of improved operational flexibility



# Overview of July 2023 Flood Event on ANR-owned dams

## *Other DEC, FPR, and F&W Dam Performance*

- DEC-Owned (3 of 14)
  - Minor erosion near spillway at Noyes Pond Dam
  - Waterbury Dam – center gate and bridge (pre-existing but flood control related)
  - Wrightsville Dam
    - Right spillway wall mortar damage/stone missing.
    - Minor scouring of concrete tunnel at upstream end.
    - Operational Flexibility Feasibility Study.
- FPR-Owned (5 of 15)
  - Minor erosion, leakage, and debris issues.
- F&W Owned (17 of 76):
  - Gale Meadows Dam, major Aux. Spillway erosion
  - Others minor erosion, leakage, debris issues.



Gale Meadows Dam Aux. S/W damage and temp. repair



# Overview of July 2023 Flood Event on Regulated Dams

## *DSP Actions:*

### RAPID INSPECTIONS

- Rapid Inspection of 390 Non-Power, Non-Federal Dams
- Emergency Management Assistance Compact (EMAC) supported with staff from NY Power Authority, NY Dam Safety, and MA Office of Dam Safety

### FOLLOWUP INSPECTIONS

- Inspection of 65 Non-Power, Non-Federal Dams flagged as part of Rapid Inspection.
- 5 FAILED/BREACHED DAMS (**2 SIGN**, **3 LOW** HAZARD POTENTIAL)



Hands Mill Dam, Washington, SIGN Hazard



South Woodbury Pond Dam, Woodbury, SIGN Hazard



# Overview of July 2023 Flood Event on Regulated Dams

## *DSP Actions Continued:*



**Quinn Lower Dam, Wallingford, LOW Hazard**



**Clarks Sawmill Dam, Cabot, LOW Hazard**



**Lyons Pond Dam, Peru, LOW Hazard**



**Dow Pond Dam, Middlebury, SIGN Hazard**



# Overview of July 2023 Flood Event on Regulated Dams

## *DSP Actions Continued:*

### ONGOING REGULATORY WORK

- 5 FAILED/BREACHED DAMS (**2 SIGN**, **3 LOW**)
- <50 dams with notable damage
- ~57 dams were overtopped
- Working through ~50 dams with storm damage
- Emergency Action Plans, Temporary Repairs, increased monitoring, Risk reduction measures at ~8 dams and counting.

### CURSORY COST ESTIMATES OF DAMAGES

- Est. costs of maintenance, temp. stabilization, & compliance (not necessarily storm damage).
- Storm Maintenance, ~\$600k
- Temporary Stabilization, ~\$1M
- Compliance Costs, ~\$60 M

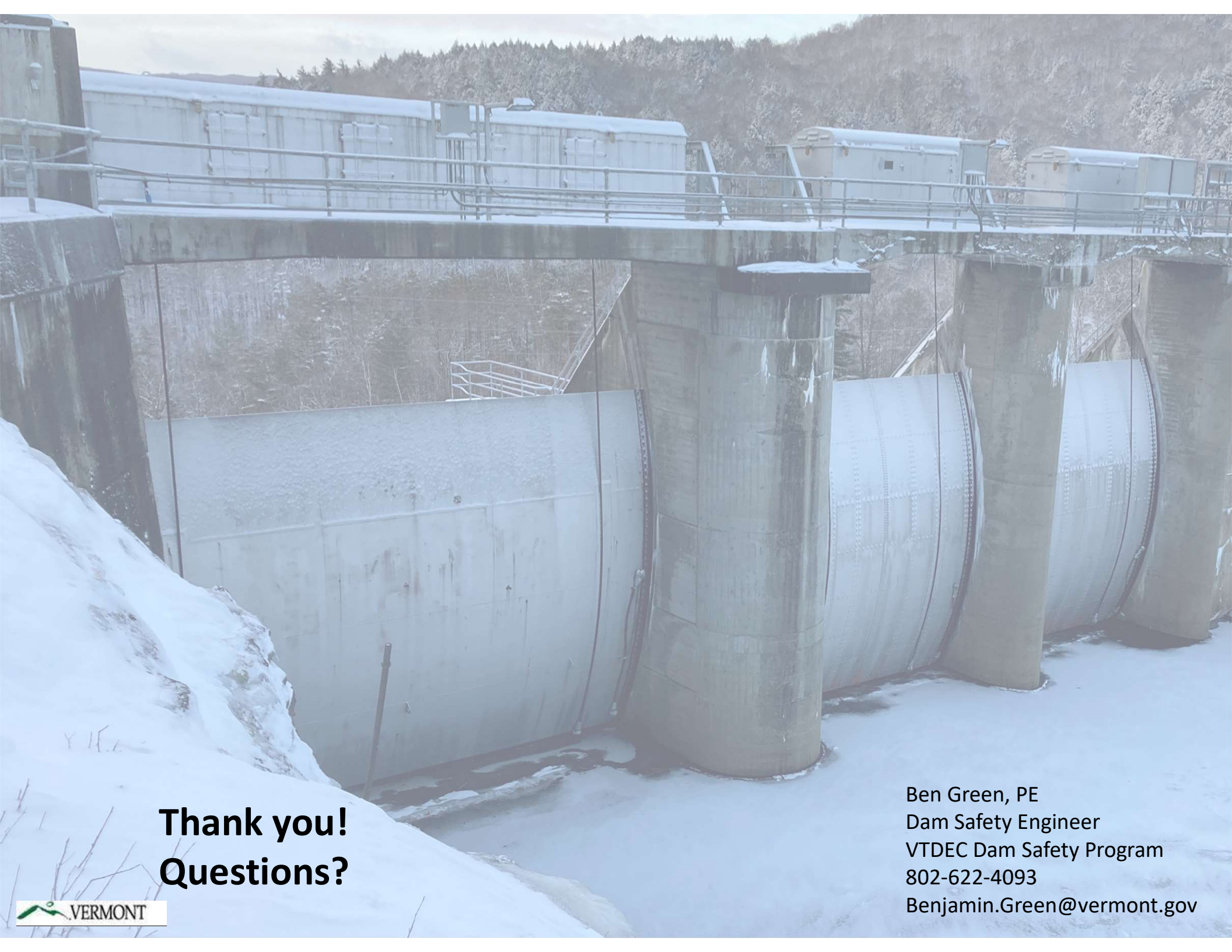


East Calais Mill Dam, East Calais, SIGN Hazard



Vatters Dam, Northfield, SIGN Hazard





**Thank you!  
Questions?**

Ben Green, PE  
Dam Safety Engineer  
VTDEC Dam Safety Program  
802-622-4093  
[Benjamin.Green@vermont.gov](mailto:Benjamin.Green@vermont.gov)