NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Merrymeeting Watershed Dams

SUMMARY OF FINDINGS

Corey Clark – NHDES Dam Bureau

June 2024 – Rapidan Dam - Minnesota

4 of 20 | This drone photo provided by AW Aerial shows a home as it teeters before partially collapsing into the Blue Earth River at the Rapidan Dam in Rapidan, Minn., Tuesday, June 25, 2024. (Andrew Weinzierl/AW Aerial via AP)

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

May 2020 – Edenville and Sanford Dams Michigan

An aerial photo from Friday, May 22 shows the aftermath of flooding at the Sanford Dam in Midland County.
Adam Ferman/For the Daily News

The dam's failure came after days of heavy rain. Courtesy @CRichnak

May 2019 – Lake Dunlap Dam - Texas

July 2023 – Forest Lake Dam
Winchester - Low

June 2023 – Fire Pond Dam
Newport – Non-Menace

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

July 2024 – Richey Dam
Littleton – Non-Menace

July 2017 – Weeks Crossing Pond Dam
Warren – Low

March 1996 – Bergeron Dam
Alton – Significant

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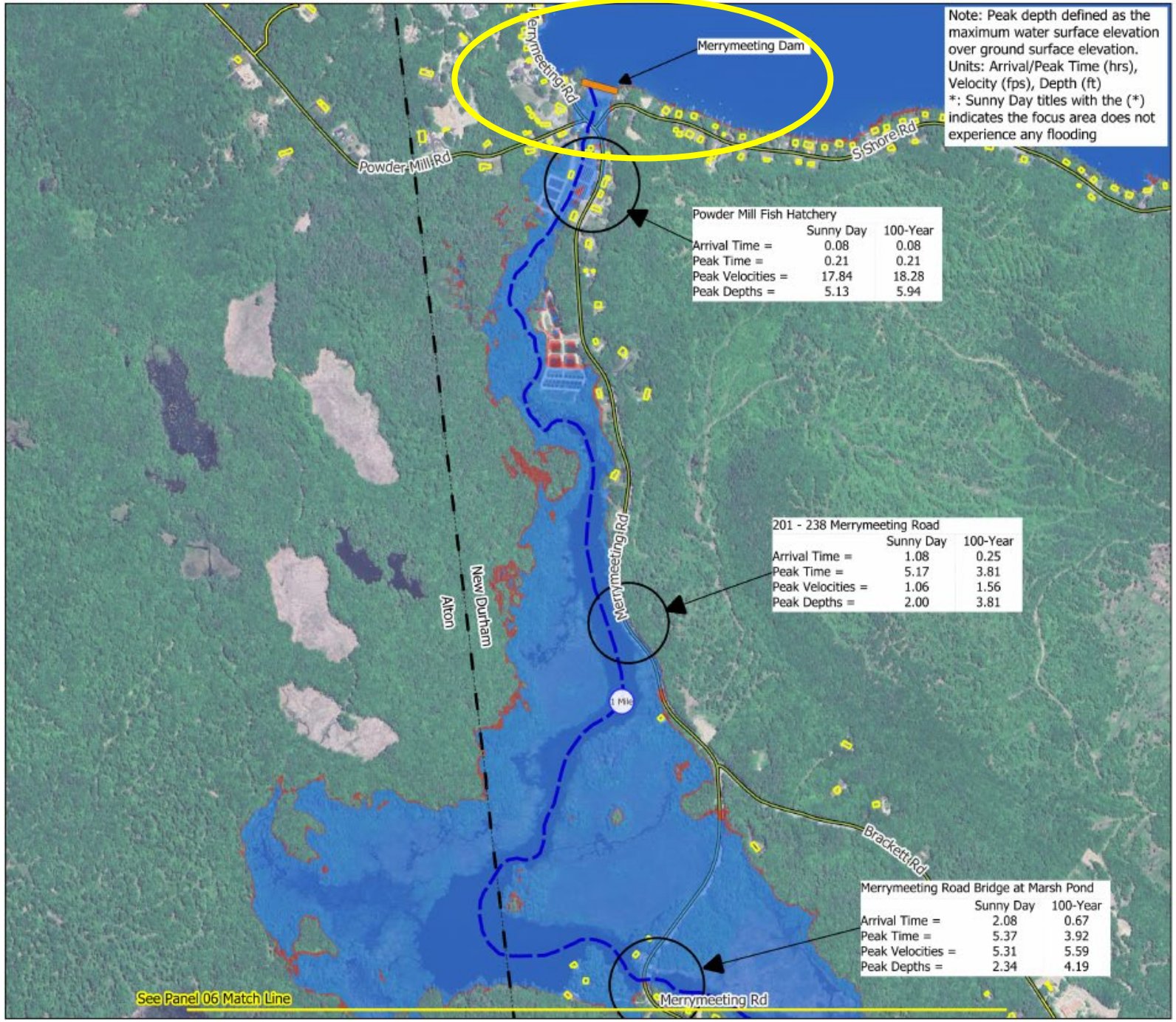
Merrymeeting Lake Dam

- Owner/Operator:
  - NH Fish and Game Department
  - NHDES Dam Bureau
- Hazard Classification: High
- Condition Rating: Poor
- Total Length: 285 ft
  - Spillway Length: 22 ft
- Maximum Height: 22 ft
- Purpose: Recreation
- Constructed in 1924
  - Reconstructed in 1969, and 1983



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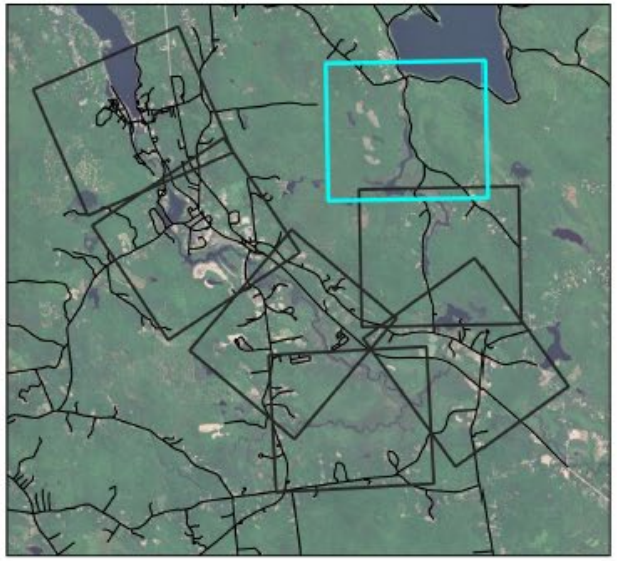

Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Merrymeeting)
- 100 Year Inundation (with Breach at Merrymeeting)
- Stream Centerline
- Milemarker
- Dam

Merrymeeting Dam Breach Inundation Map Set (1 of 7)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

HDR

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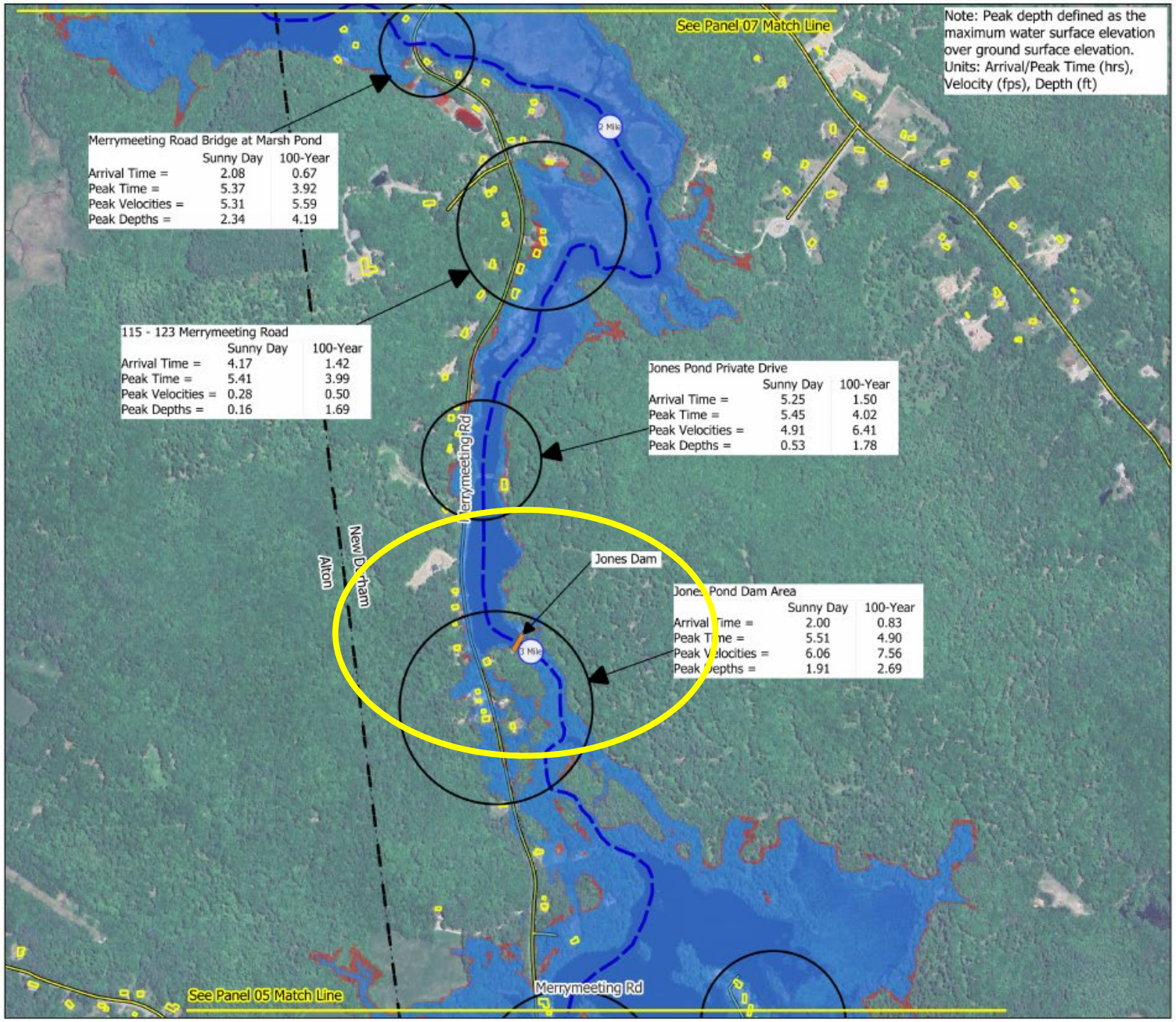

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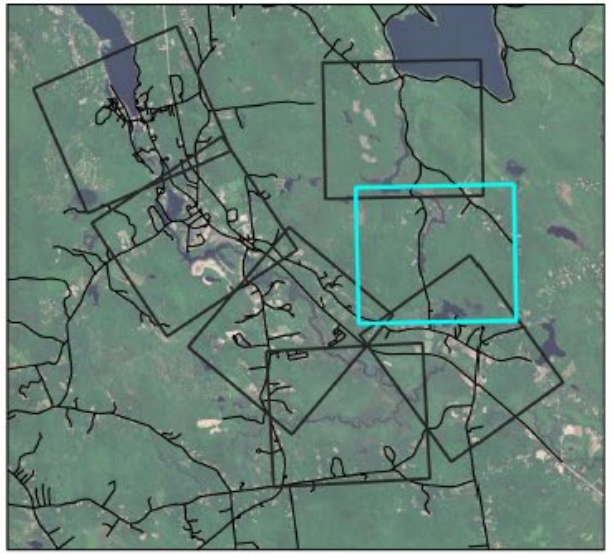

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Merrymeeting Dam Breach Inundation Map Set (2 of 7)

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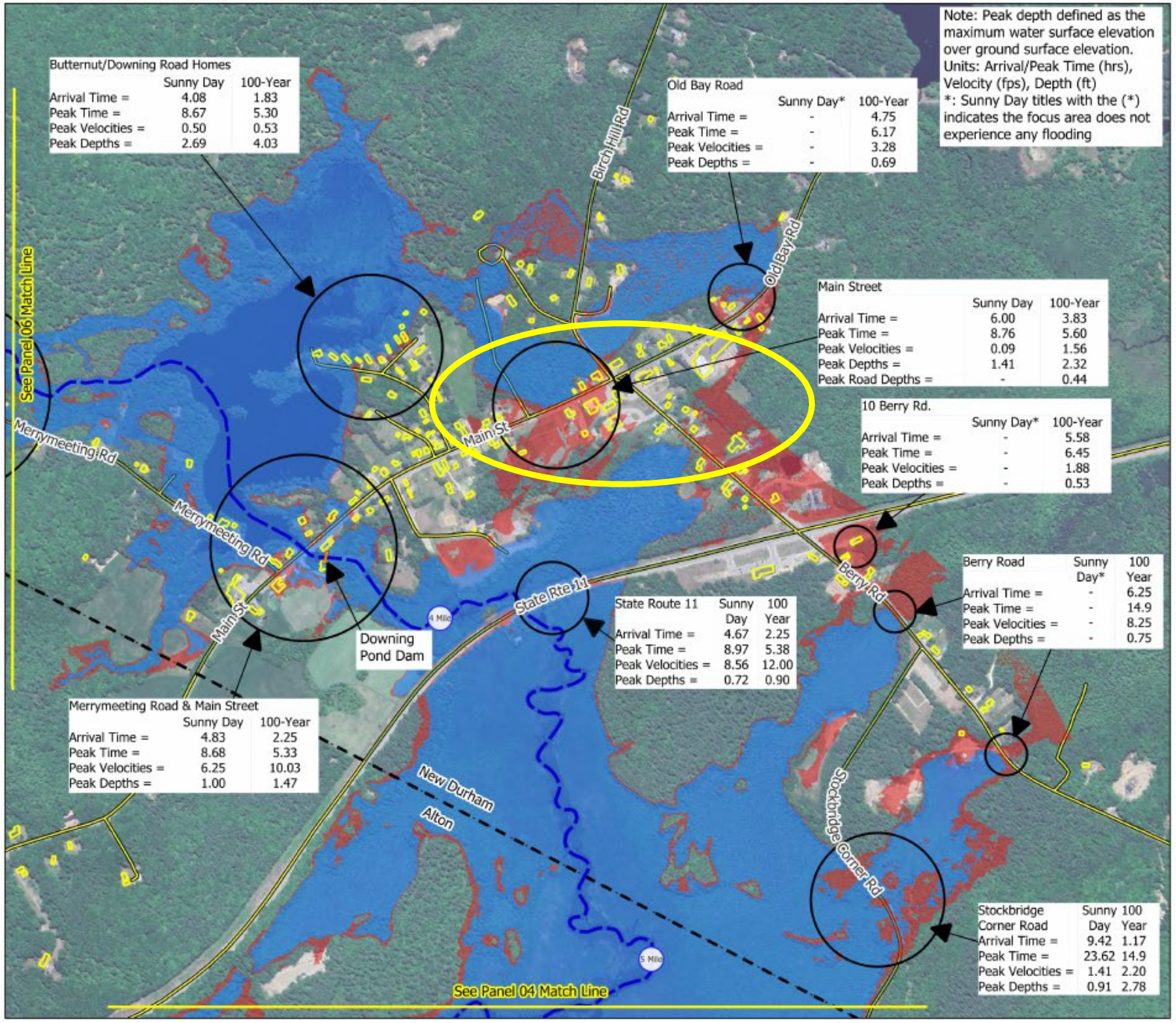

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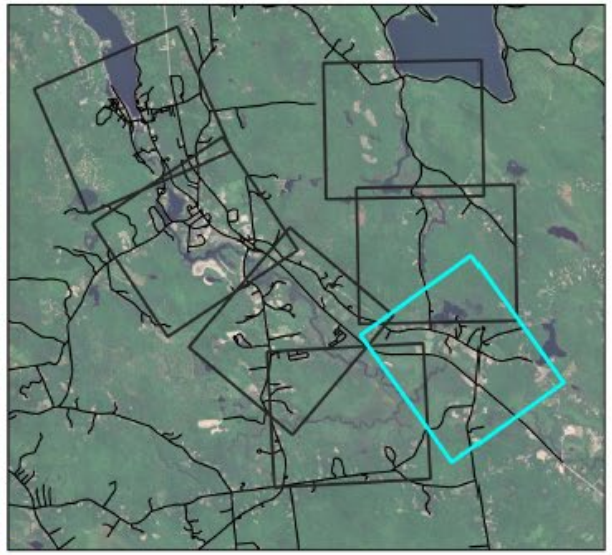

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Merrymeeting Dam Breach Inundation Map Set (3 of 7)

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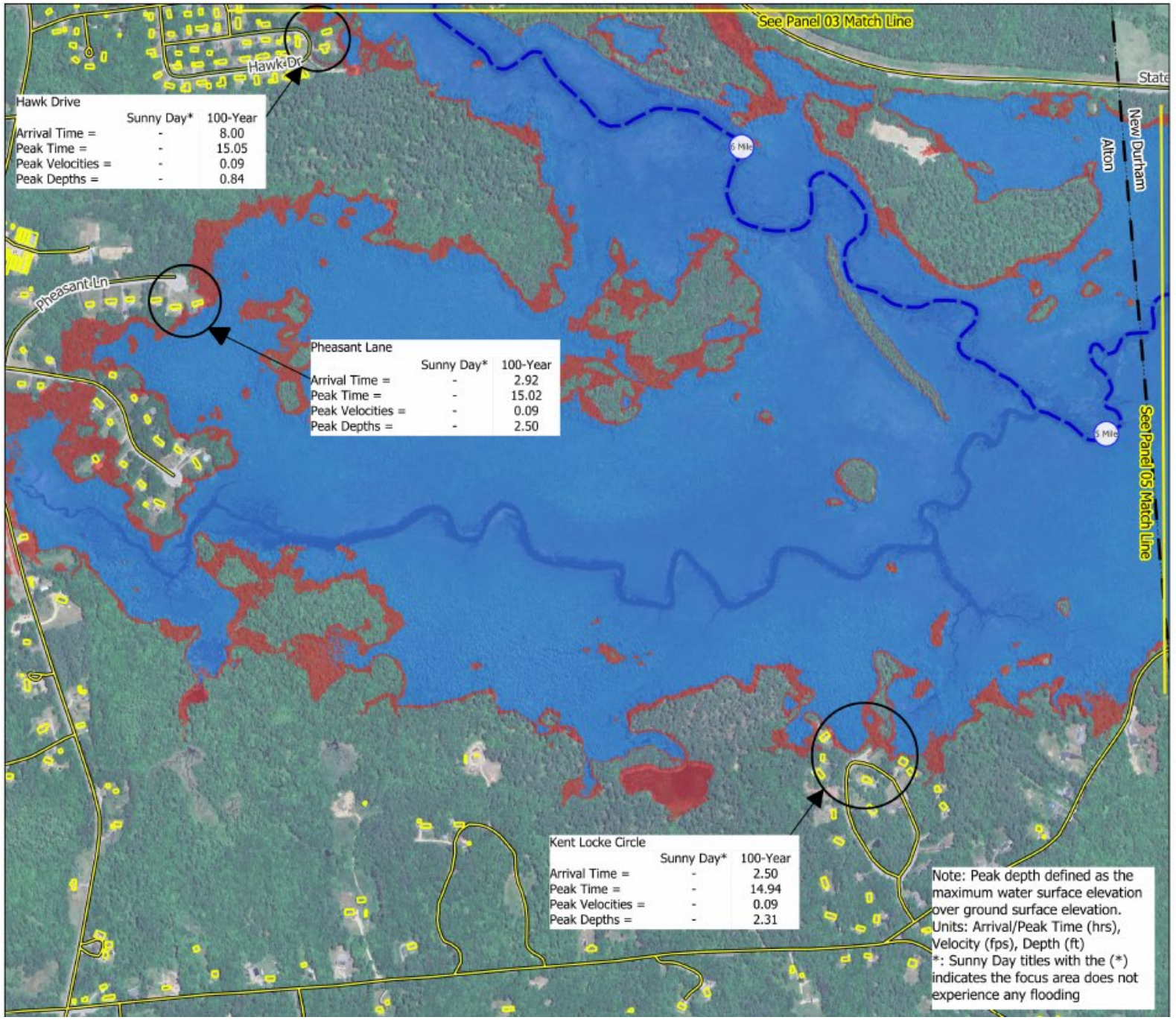

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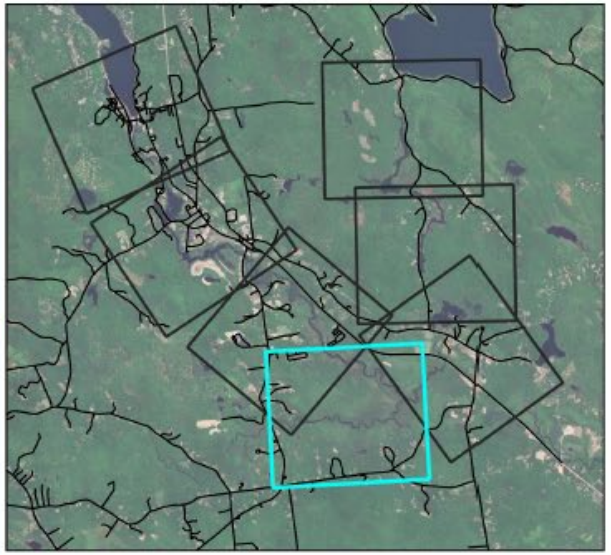

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- Milemarker
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Merrymeeting Dam Breach Inundation Map Set (4 of 7)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
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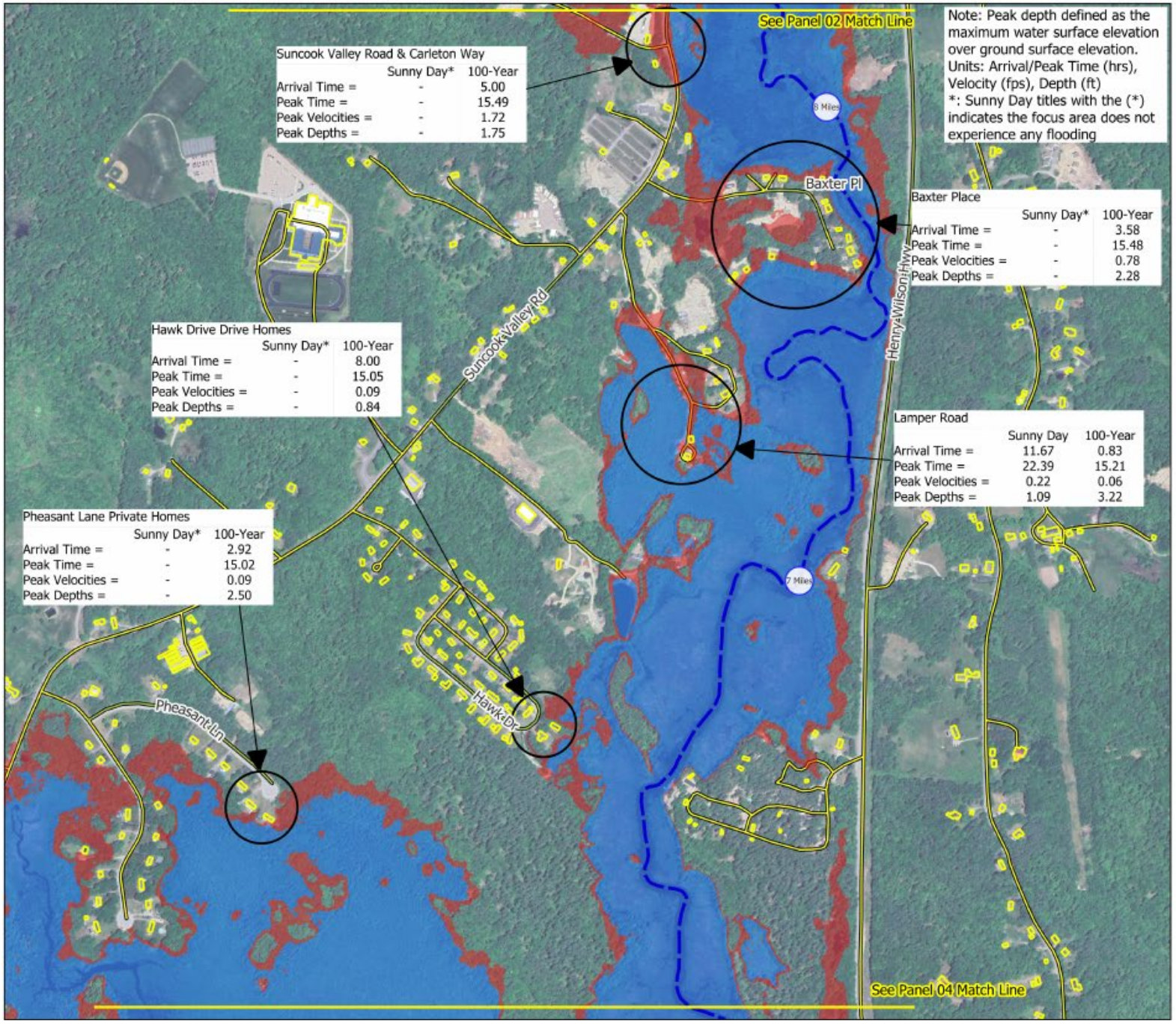

Index Map

Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Merrymeeting)
- 100 Year Inundation (with Breach at Merrymeeting)
- Stream Centerline - Alton
- Milemarker - Alton
- Dam

Merrymeeting Dam Breach Inundation Map Set (5 of 7)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

HDR

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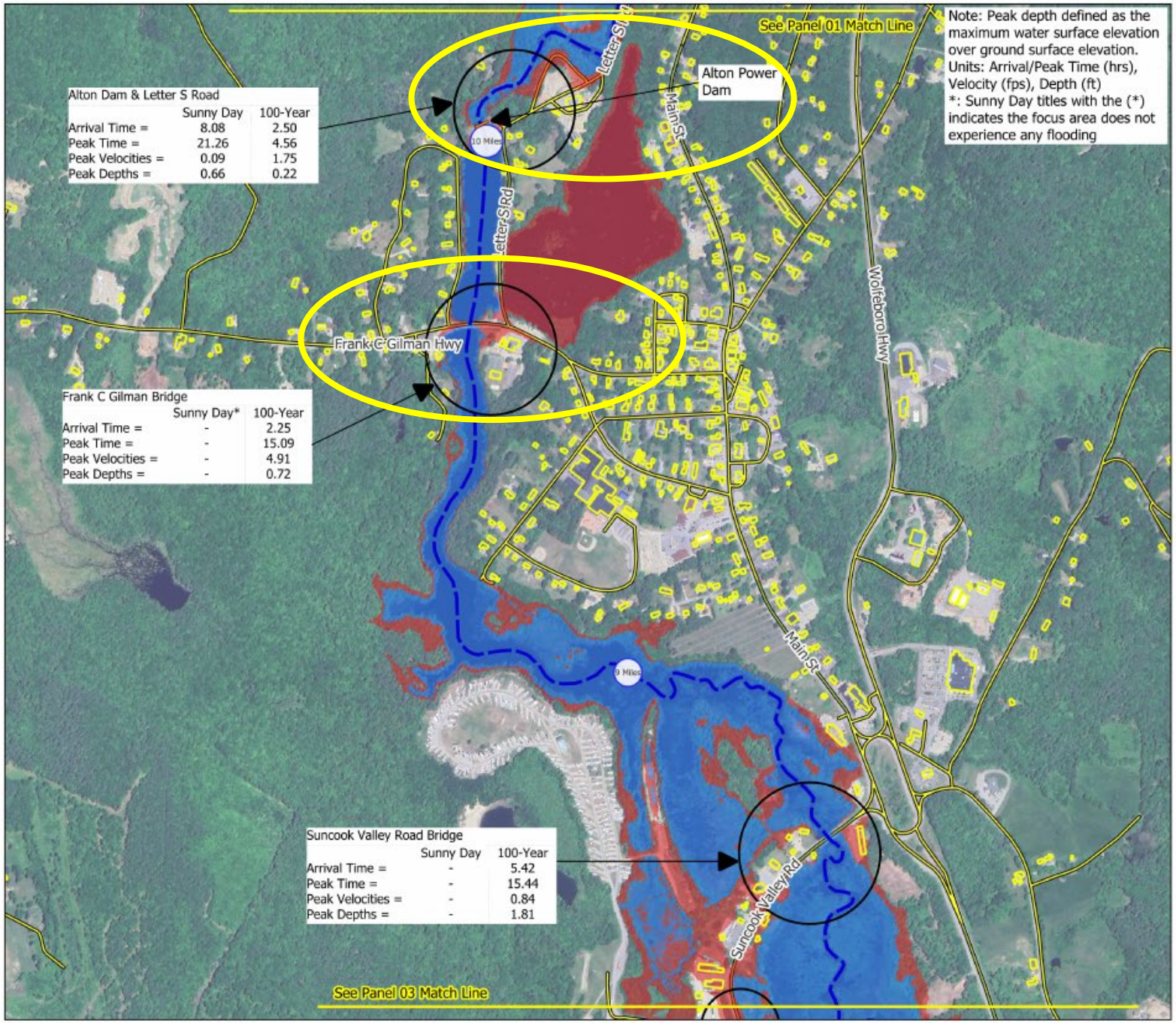

Index Map

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- Milemarker
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Merrymeeting Dam Breach Inundation Map Set (6 of 7)

0 750 ft

1 inch = 750 ft

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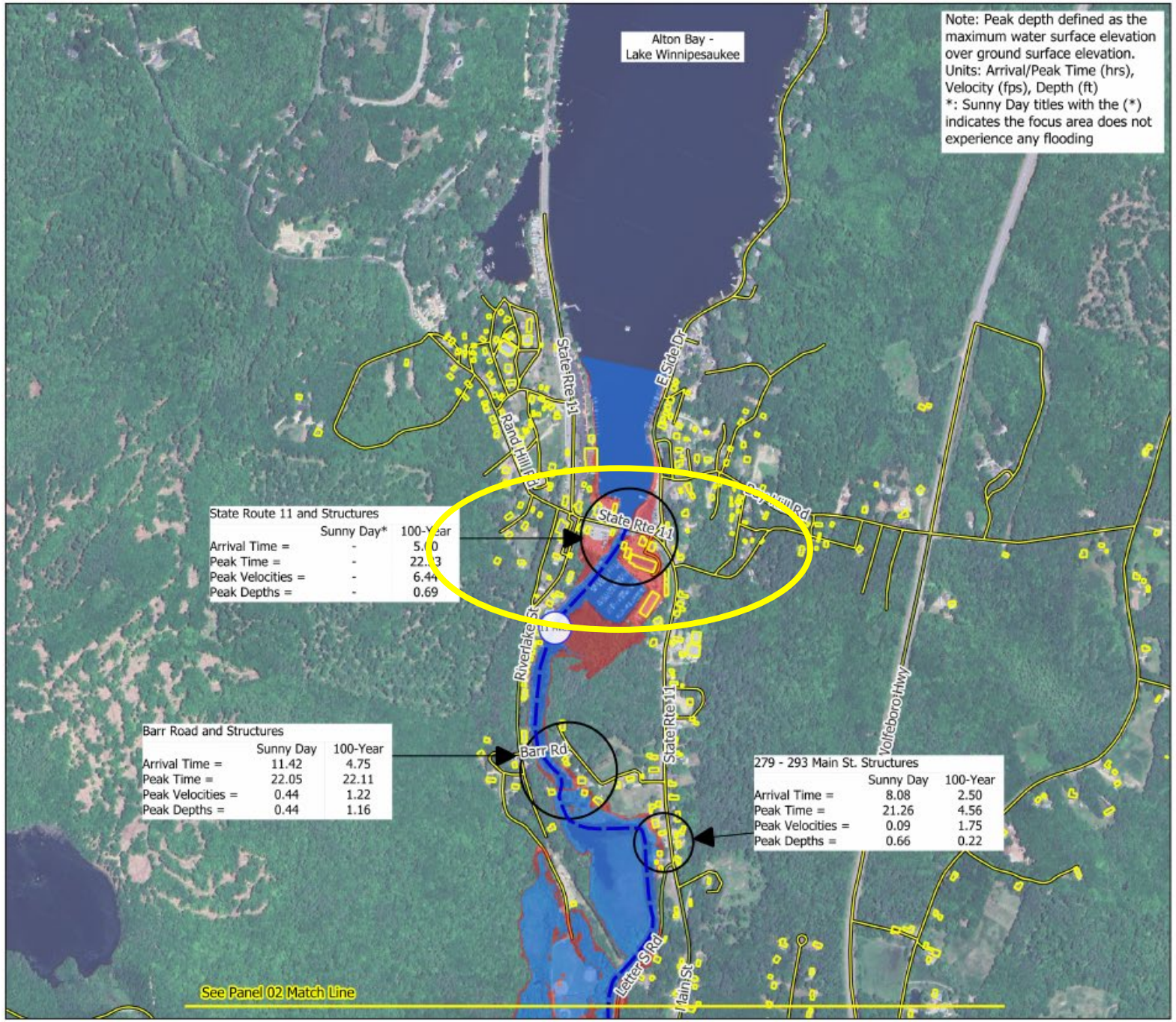

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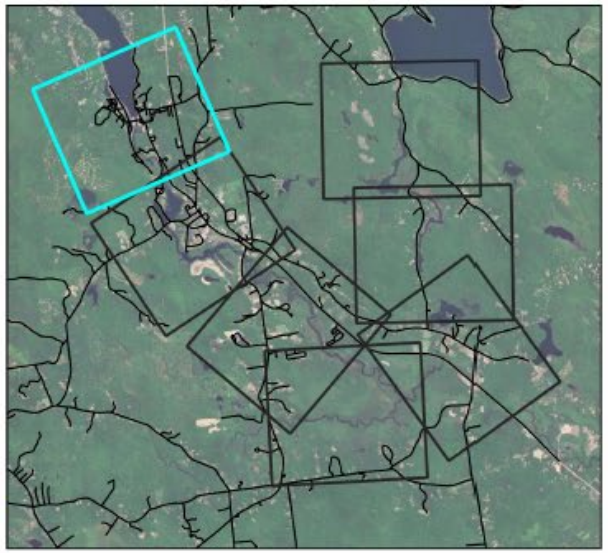

Legend

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- Stream Centerline
- Milemarker
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Merrymeeting Dam Breach Inundation Map Set (7 of 7)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

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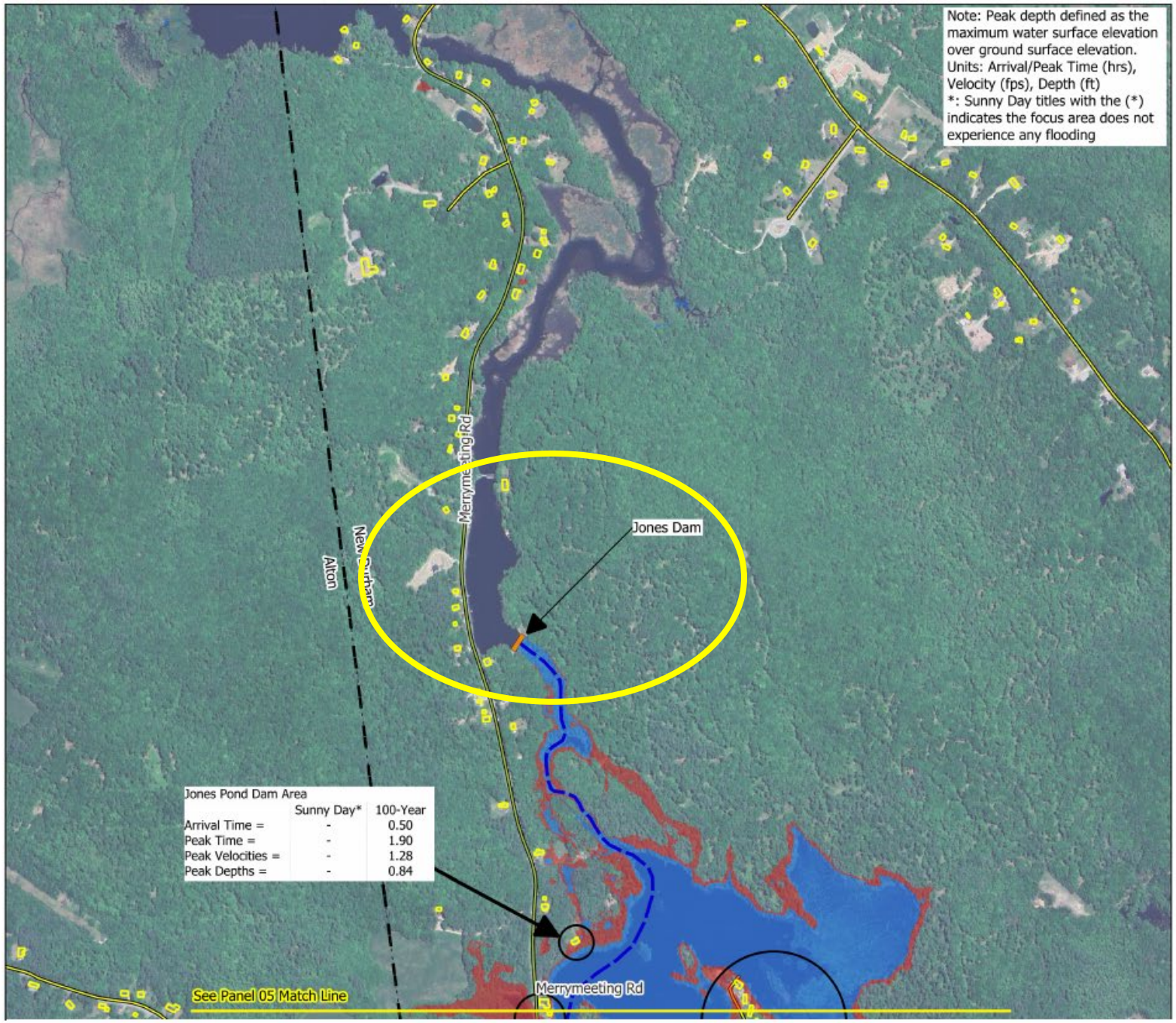
NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Jones Dam

- Owner/Operator:
  - NH Fish and Game Department
  - NHDES Dam Bureau
- Hazard Classification: High
- Condition: Poor
- Total Length: 210 ft
  - Spillway Length: 66 ft
- Maximum Height: 21 ft
- Purpose: Recreation
- Constructed in 1924
  - Reconstructed in 1986



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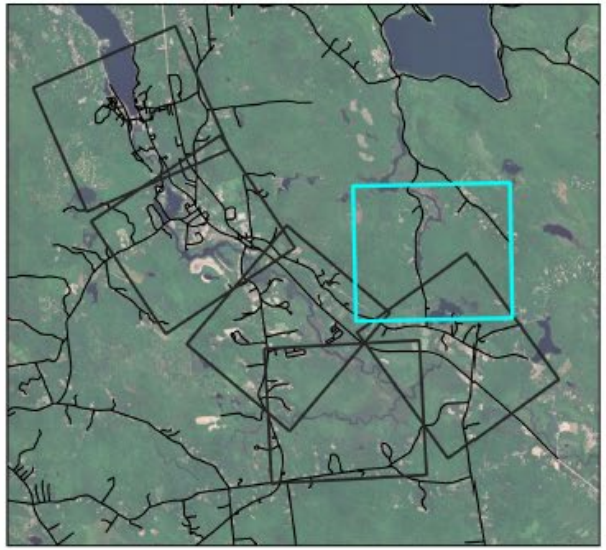


Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Jones)
- 100 Year Inundation (with Breach at Jones)
- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (1 of 6)

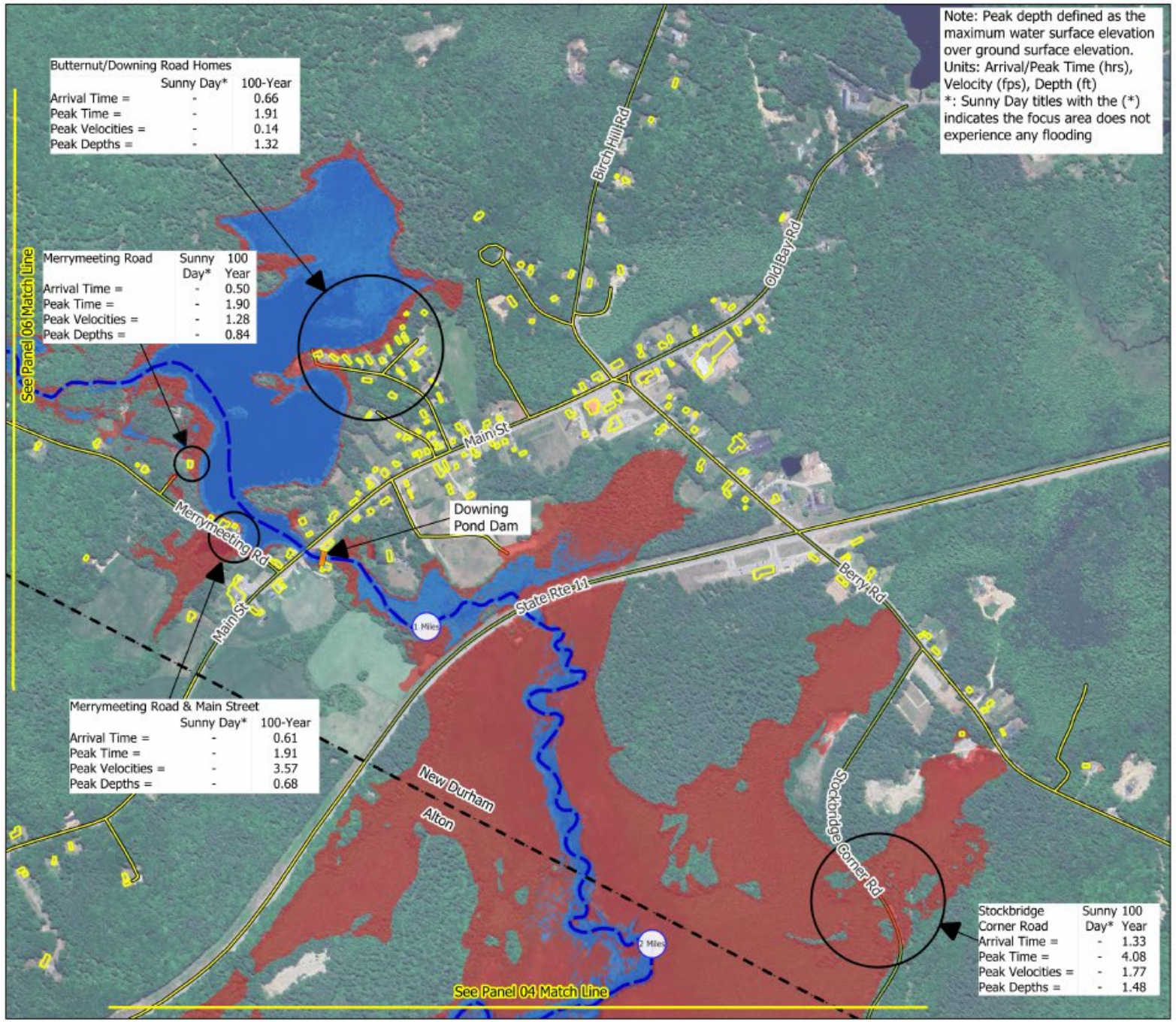
0 750 ft

1 inch = 750 ft

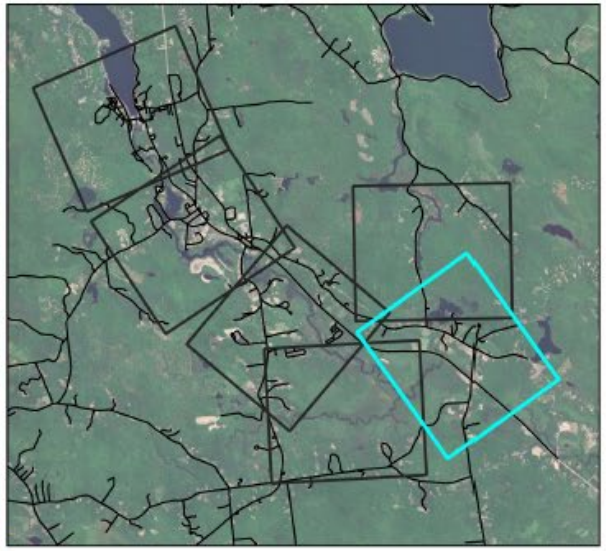
Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

HDR

NEW HAMPSHIRE DEPARTMENT OF Environmental Services



Index Map



Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Jones)
- 100 Year Inundation (with Breach at Jones)
- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (2 of 6)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

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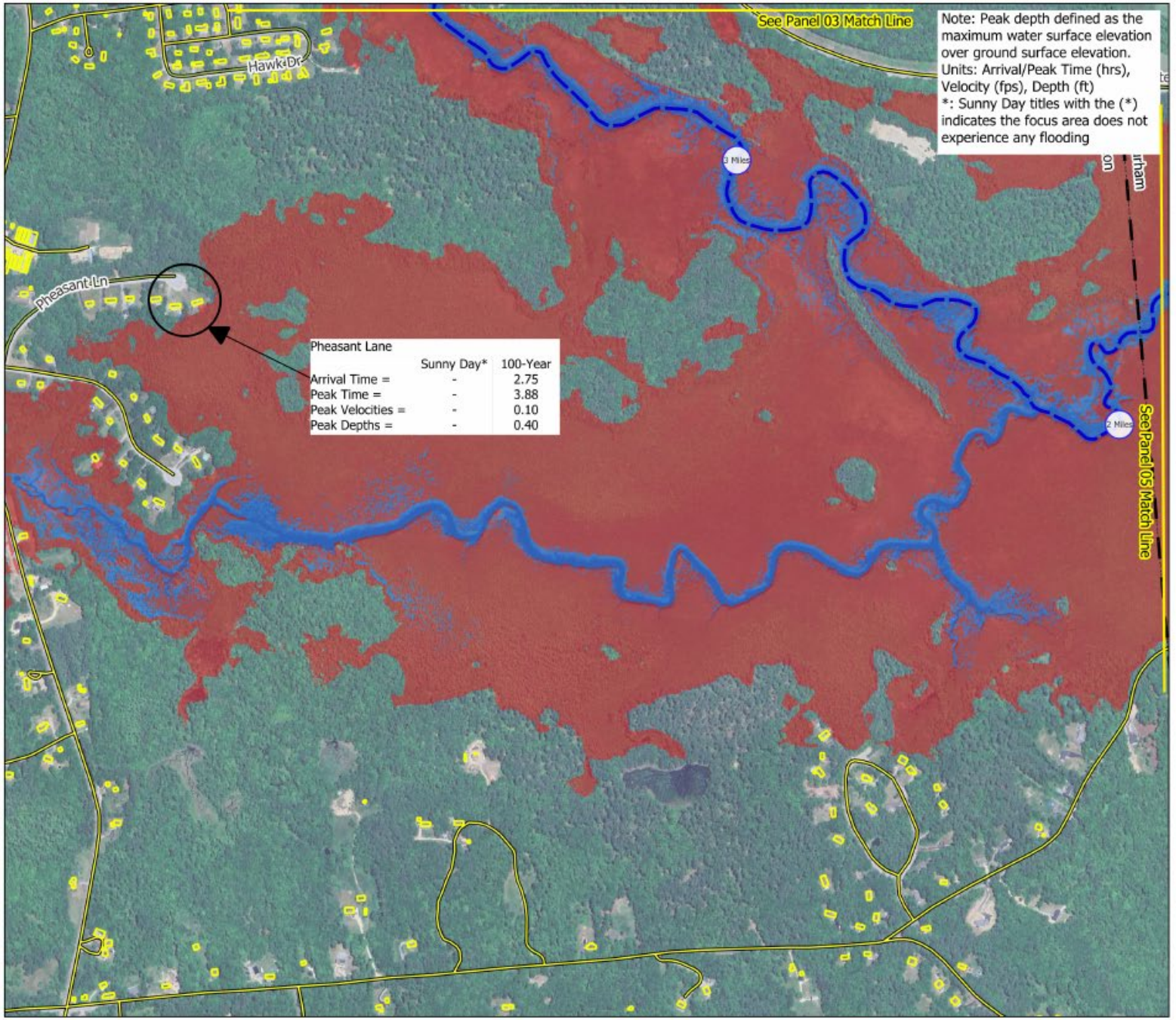

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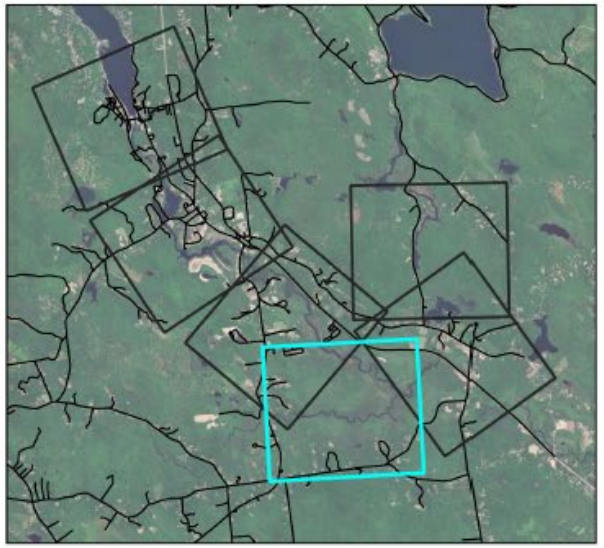

Legend

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- Roads
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- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (3 of 6)

0 750 ft

1 inch = 750 ft

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Map Approved On: (Insert Date)

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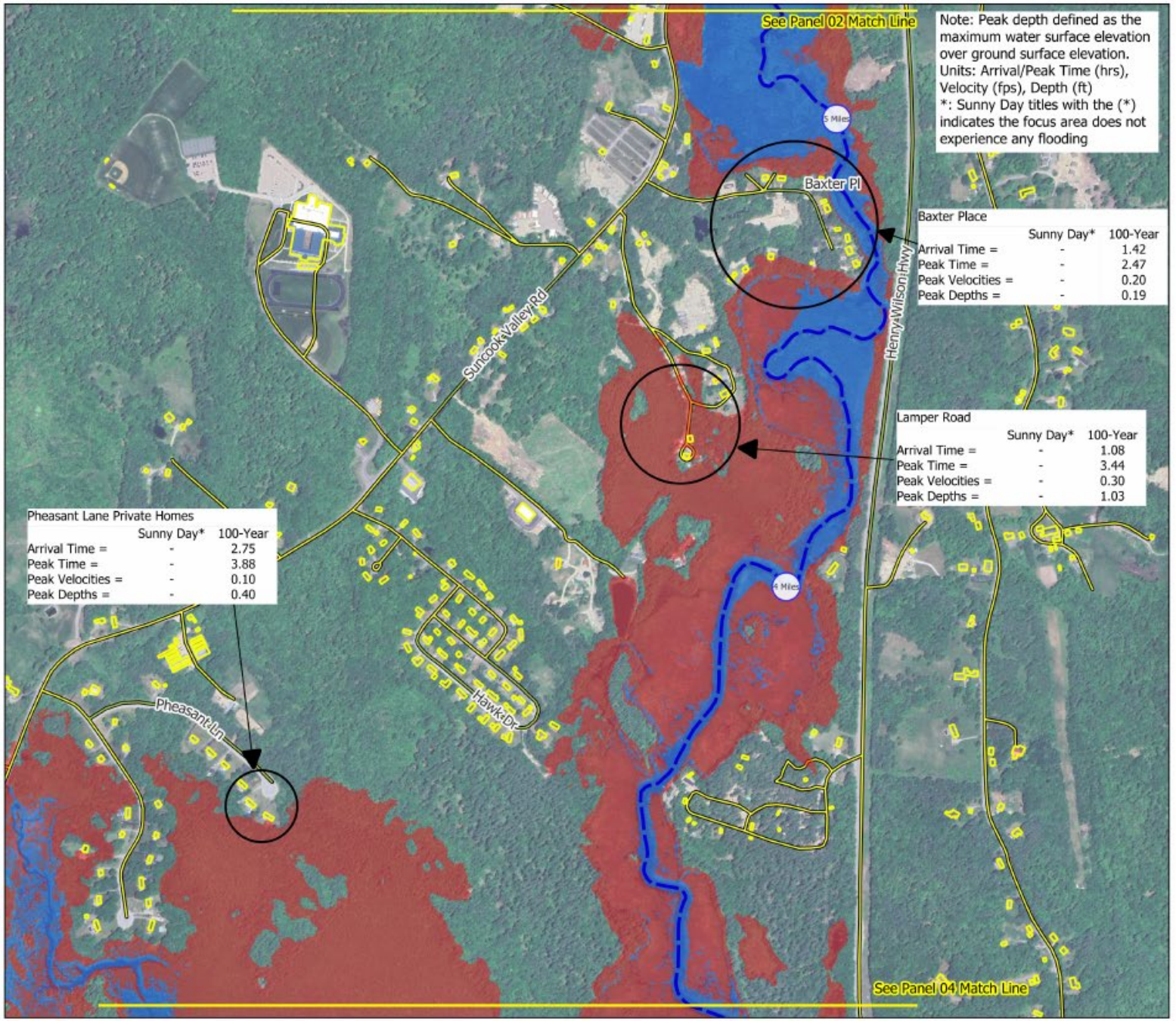

Index Map

Legend

- Town Boundary
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- Roads
- Sunny Day Inundation (with Breach at Jones)
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- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (4 of 6)

0 750 ft

1 inch = 750 ft

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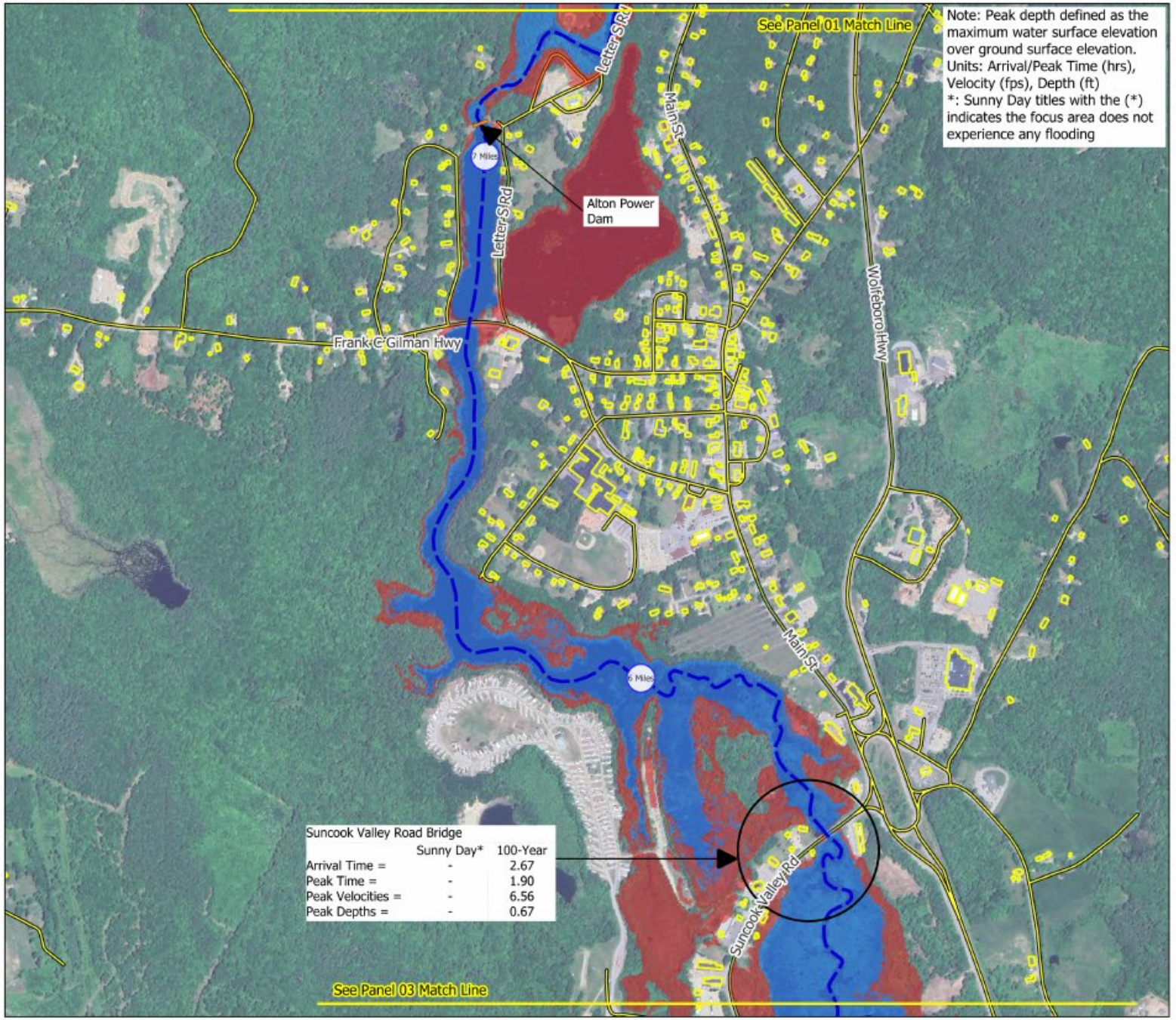

Index Map

Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Jones)
- 100 Year Inundation (with Breach at Jones)
- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (5 of 6)

0 750 ft

1 inch = 750 ft

Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

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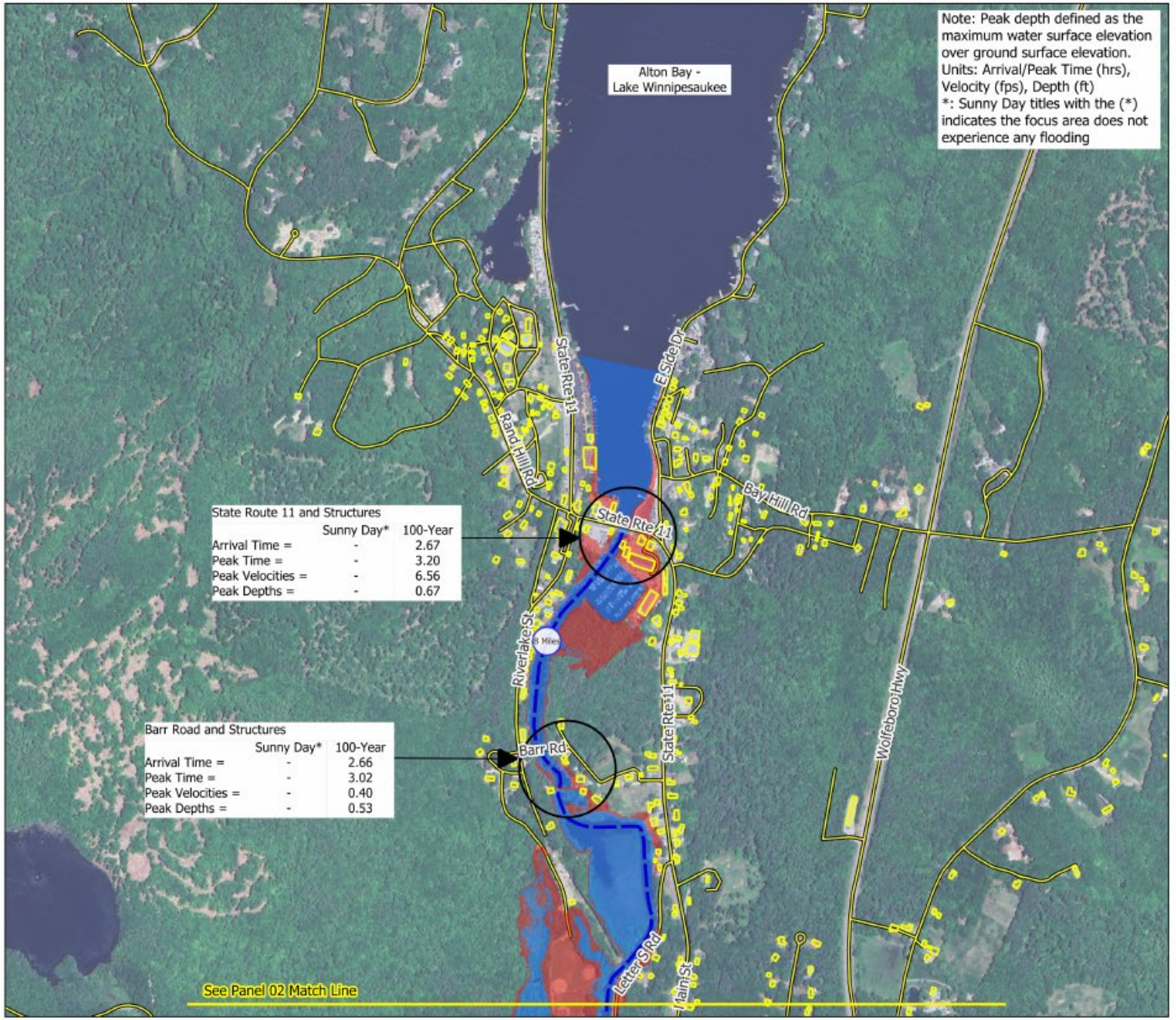

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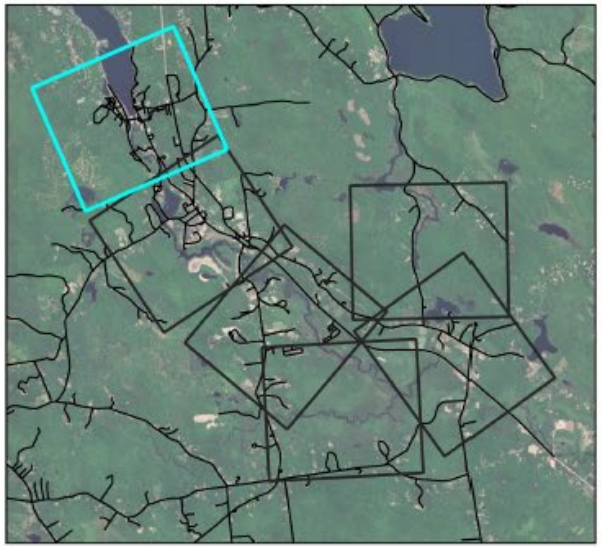


Legend

- Town Boundary
- Structures
- Roads
- Sunny Day Inundation (with Breach at Jones)
- 100 Year Inundation (with Breach at Jones)
- Stream Centerline
- Milemarker
- Dam

Jones Dam Breach Inundation Map Set (6 of 6)

0 750 ft

1 inch = 750 ft

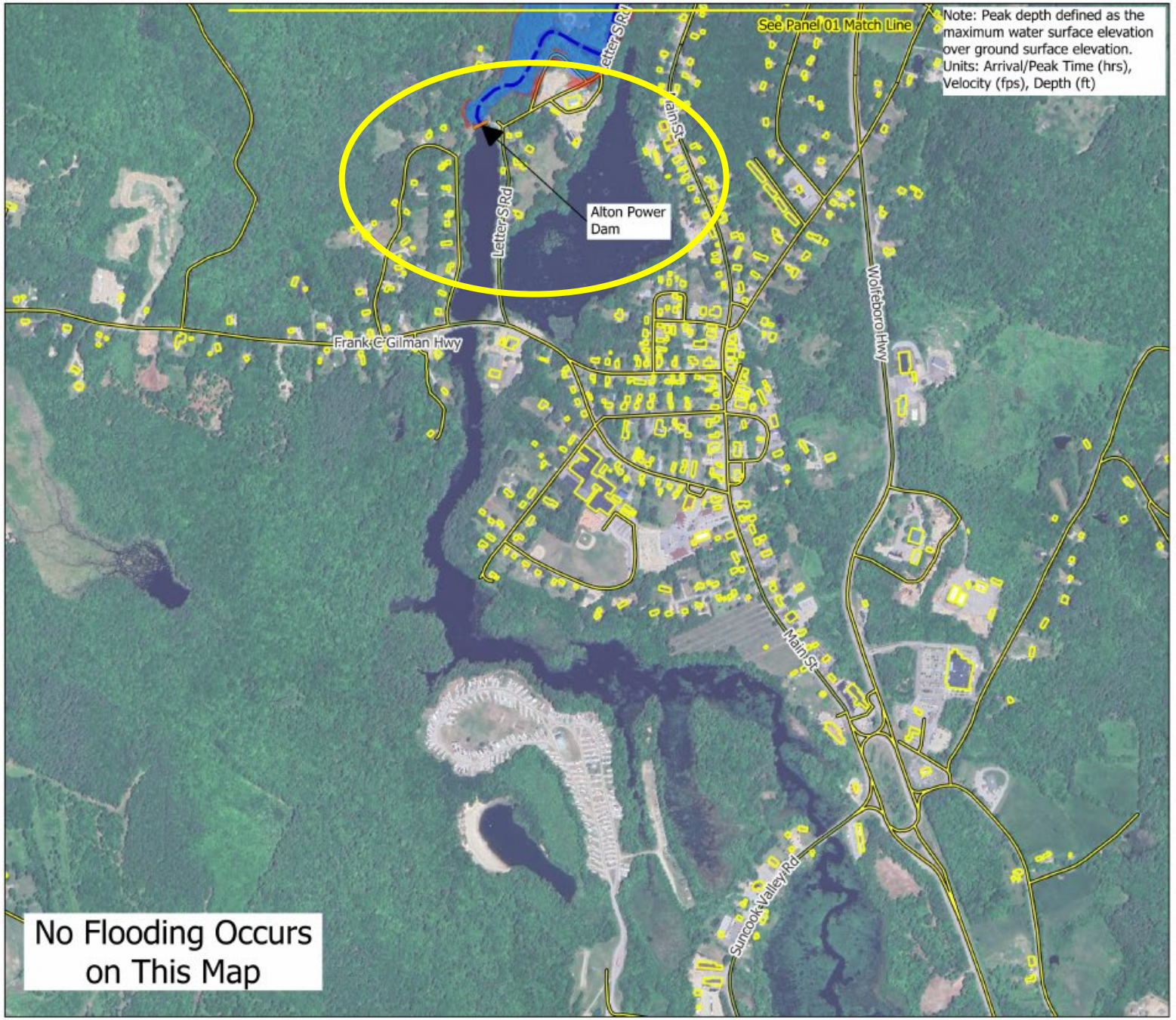
Map Prepared On: 9/15/2025
Map Approved On: (Insert Date)

HDR

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Alton Power Dam

- Owner/Operator:
  - NH Fish and Game Department
  - NHDES Dam Bureau
- Hazard Classification: High
- Condition: Poor
- Total Length: 190 ft
  - Spillway length: 80 ft
- Maximum Height: 16 ft
- Purpose: Recreation
- Constructed in 1923
  - Reconstructed in 1986



Index Map

Legend

- Town Boundary
- Structures
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- Sunny Day Inundation (with Breach at Alton Power)
- 100 Year Inundation (with Breach at Alton Power)
- Stream Centerline
- Milemarker
- Dam

Alton Power Dam Breach Inundation Map Set (1 of 2)

0 — 750 ft

1 inch = 750 ft

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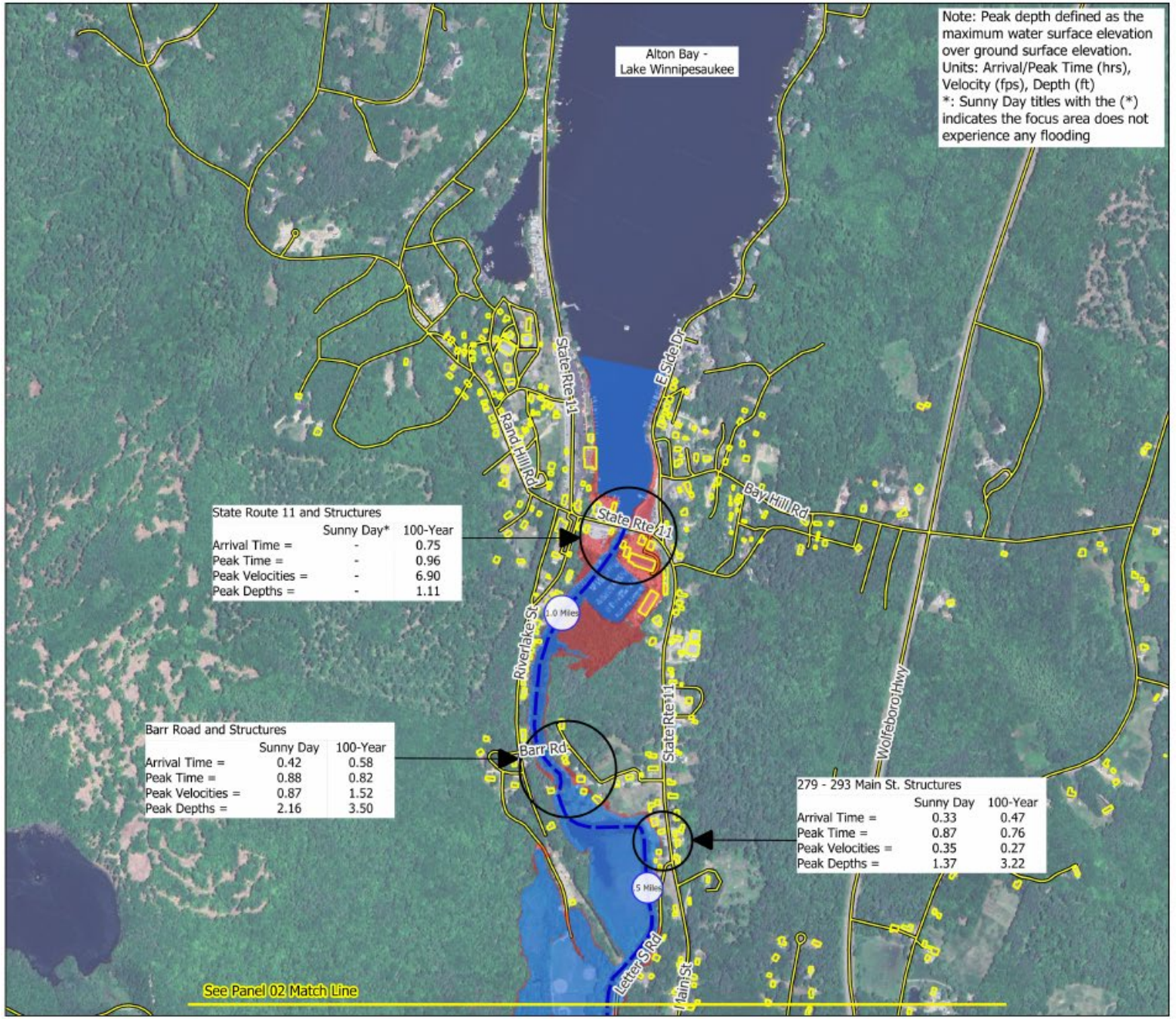

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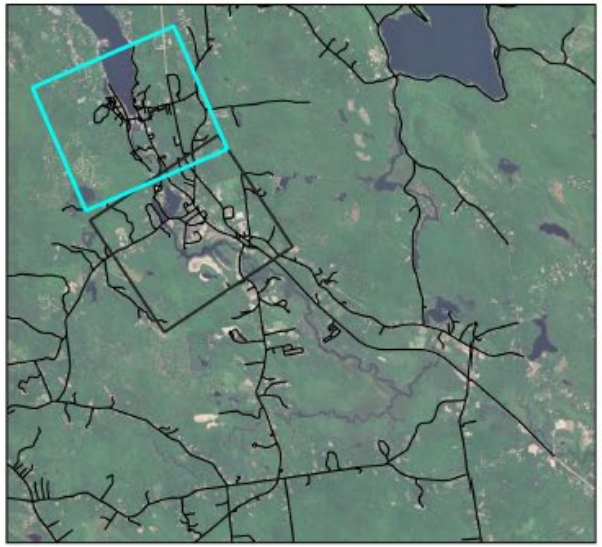

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Alton Power Dam Breach Inundation Map Set (2 of 2)

0 750 ft

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HDR

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Dam Safety Requirements

New Hampshire Department of Environmental Services Dam Bureau regulates the repair, reconstruction, maintenance and operation of existing dams.

All dam owners must comply with state regulations to ensure public safety.

Env-Wr 303.10 Discharge Capacity

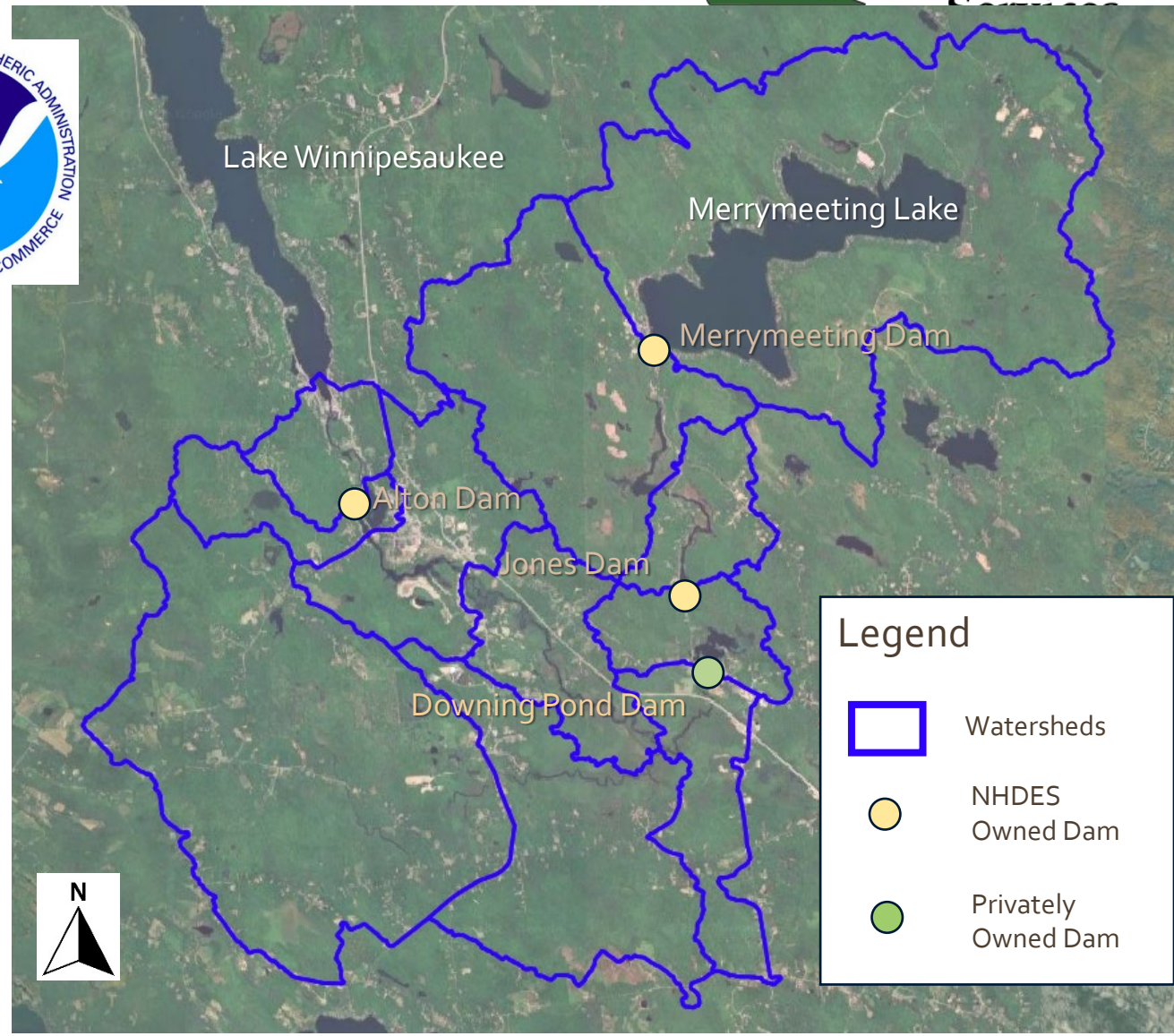
- All high hazard dams shall pass the 1,000-year design event with at least one foot of freeboard and without manual operations.

What is the “1,000-year design event”?

- The 1,000-year design event is the flood that has a has 0.1% percent chance of being equaled or exceeded in any given year.

How is the 1000-year design event determined?

- National Oceanic Atmospheric Administration (NOAA) provides rainfall estimates across the United States.
- At Merrymeeting Dam:
  - NOAA estimates the 1000-year event over 24-hours to be 10.90 inches of rain.
- This rainfall is then simulated in computer software across the watersheds to predict the discharge at each dam.



Hydrologic and Hydraulic Analyses Results

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

1000-Year Design Flood Results

Dam	Normal Water Surface Elevation	Top of Dam Elevation	Predicted Maximum Water Surface Elevation Behind Dam	Overtopping Depth (feet)	Overtopping Duration (hours)
Merrymeeting Lake Dam	648.5	650.4	650.9	0.6	24.0
Jones Dam (dike along Merrymeeting Rd)	585.4	586.4	587.7	1.3	9.0
Jones Dam (main dam)	585.4	587.6	587.7	0.2	N/A
Alton Power Dam	520.1	522.4	524.2	1.8	56.5

All dams overtop during the 1000-year event and do not meet NHDES requirements.

Geotechnical and Structural Analysis

- Slope Stability Analysis
  - 3 analysis sections, 1 from each dam
    - Merrymeeting Embankment
    - Jones Dam Left Embankment
    - Alton Power Dam Left embankment
- Gravity Stability Analysis
  - 3 Analysis section
    - 1 on Alton Dam
    - 2 on Jones Dam
      - Spillway Crest
      - Right Abutment

Slope Stability Loading Condition	Required Minimum Factor of Safety	Slope to be Analyzed
End of Construction Condition	1.3	Upstream and Downstream
Sudden Drawdown from Spillway Crest or Top of Flashboards	1.2	Upstream
Steady Seepage with Maximum Storage Pool	1.5	Upstream and Downstream
Steady Seepage with Surcharge Pool	1.4	Downstream
Earthquake (pseudo static analysis)	> 1.0	Upstream and Downstream

Gravity Stability Loading Condition	Minimum Required F.S. (Cohesion)	Minimum Required F.S. (No Cohesion)
I - Usual	3.0	1.5
II - Unusual	2.0	1.5
IIA – Unusual (ice)	2.0	1.5
III - Post Earthquake	1.3	1.3

Slope-Stability Analysis

- Guidance: NHDES/FERC Engineering Guidelines – Chapter 4

Loading Condition	Analysis	Calculated Factor of Safety		Minimum Factor of Safety	Slope to be Analyzed
		Upstream	Downstream		
Sudden Drawdown from Spillway Crest or Top of Flashboards	Merrymeeting		✓	1.2	Upstream
	Alton Power		✓		
	Jones		X		
Steady Seepage with Maximum Storage Pool	Merrymeeting	✓	✓	1.5	Upstream and Downstream
	Alton Power	✓	✓		
	Jones	✓	X		
Steady Seepage with Surcharge Pool	Merrymeeting		✓	1.4	Downstream
	Alton Power		✓		
	Jones		X		
Earthquake (pseudo-static analysis)	Merrymeeting	✓	✓	> 1.0	Upstream and Downstream
	Alton Power	✓	X		
	Jones	X	X		

"✓" = Meets Current Criteria "X" = Does Not Meet Minimum Criteria

Gravity Stability Analysis

- Guidance: NHDES/FERC Engineering Guidelines – Chapter 3

Loading Condition	Analysis	Calculated Factor of Safety (No Cohesion)		Minimum Required Factor of Safety
		With Flashboard	No Flashboard	
Normal Operating Condition (Usual)	Jones Spillway	X	✓	1.5
	Jones Right Abutment	✓	✓	
	Alton Power Spillway	X		
IDF (Unusual)	Jones Spillway	X	X	1.5
	Jones Right Abutment	✓	✓	
	Alton Power Spillway	X		
Normal Operating + Ice (Unusual)	Jones Spillway	X	X	1.5
	Jones Right Abutment	✓	✓	
	Alton Power Spillway	X		
Post Seismic	Jones Spillway	X	✓	1.3
	Jones Right Abutment	✓	✓	
	Alton Power Spillway	X		

"✓" = Meets Current Criteria "X" = Does Not Meet Minimum Criteria

Investigation and Assessment Results

Dam Name	H&H	Slope Stability	Sliding Stability
Merrymeeting Lake Dam	X	✓	N/A
Jones Dam	X	X	X*
Alton Power Dam	X	✓	X
* Jones Dam fails gravity stability requirements when the flashboards are added to the analysis			

"✓" = Meets Current Criteria "X" = Does Not Meet Minimum Criteria

Merrymeeting Dam

- Inadequate spillway capacity (0.6 ft overtopping, 24 hrs)
- Spillway founded on fill
- Aged low-level outlet pipe

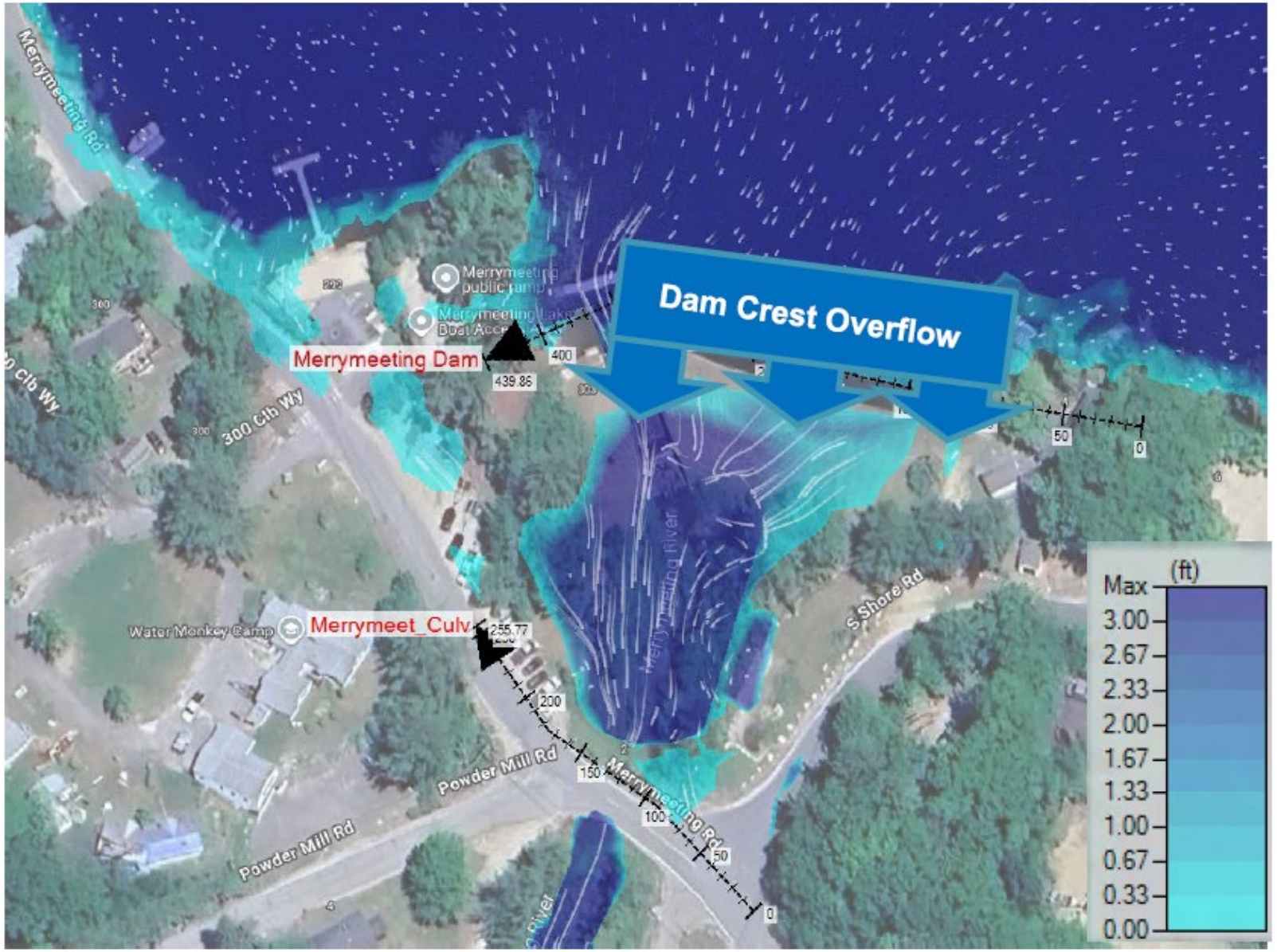


Figure 2-2: Merrymeeting Dam Overtopping Flow During 1000-Year Design Event.

Nottingham Lake Dam – April 16, 2007

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Services

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Services

Merrymeeting Lake Rehabilitation

- **Alternative M1—Overtopping Protection**

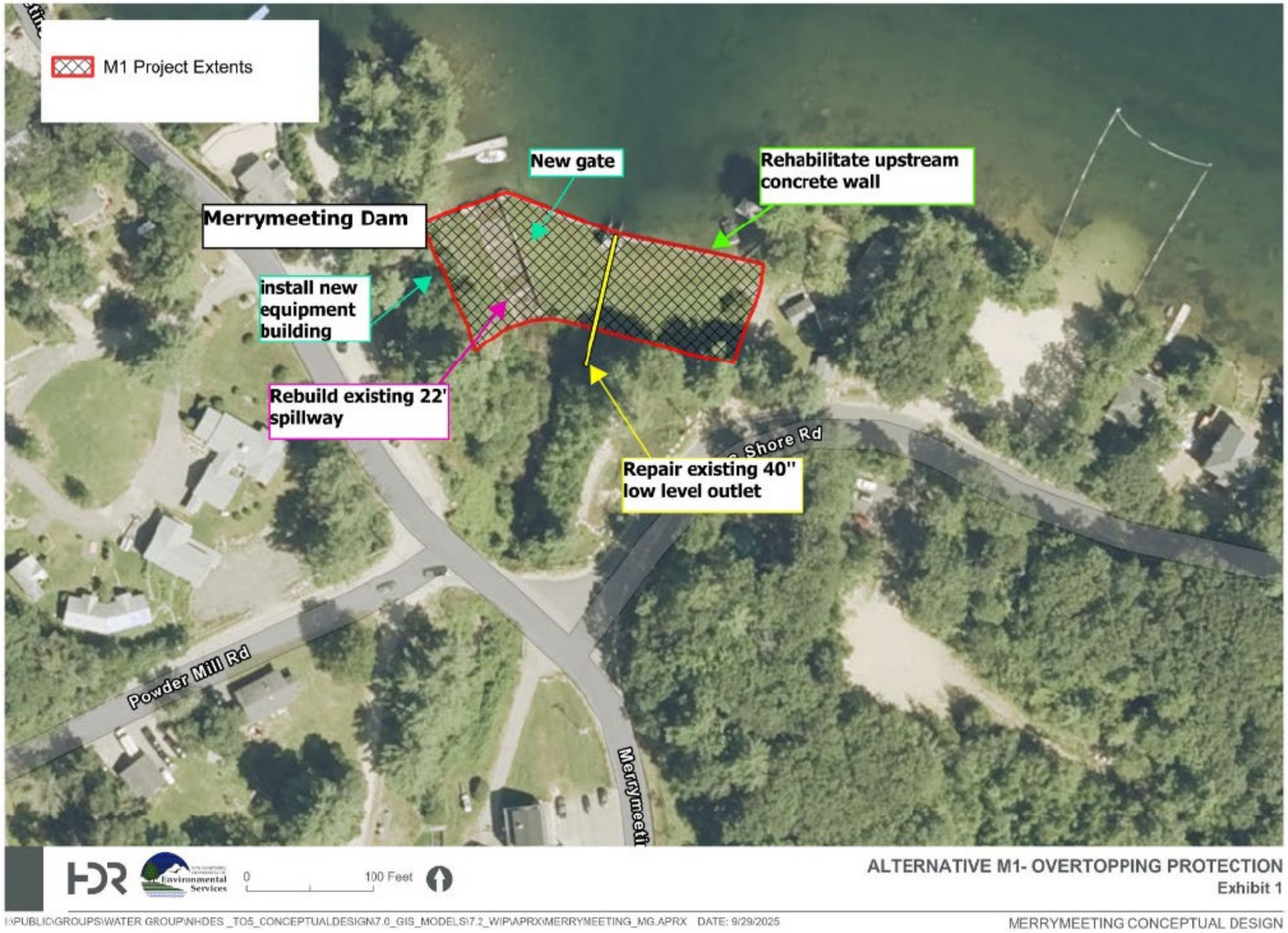

Figure 4-5: Alternative M1 Project Extents

Merrymeeting Lake Rehabilitation

- **Alternative M1—Overtopping Protection**

Merrymeeting Lake Rehabilitation

- **Alternative M2—Spillway Replacement**

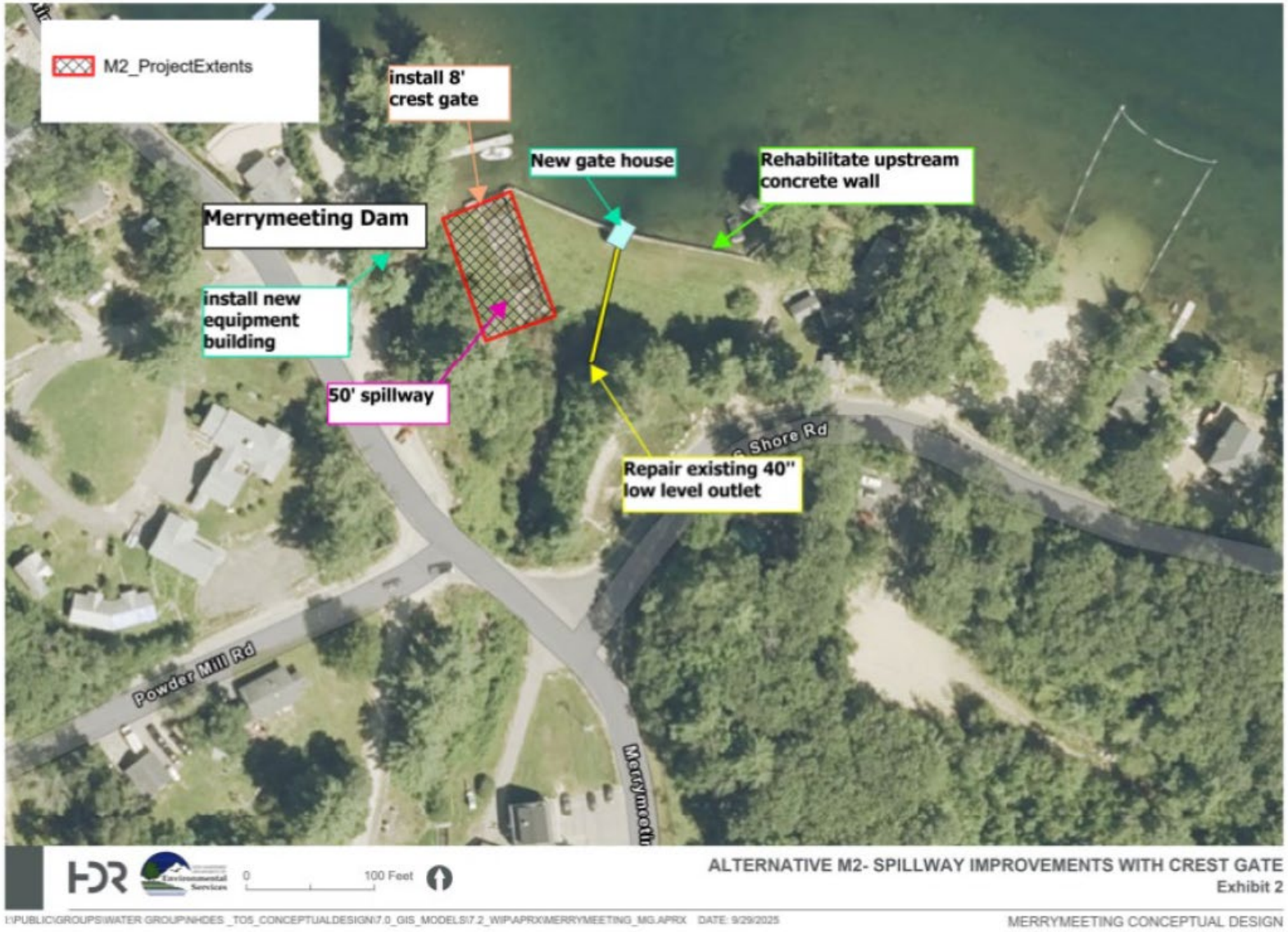

Figure 4-7: Alternative M-2 Project Extents

Merrymeeting Lake

- **Alternative M2—Spillway Replacement**

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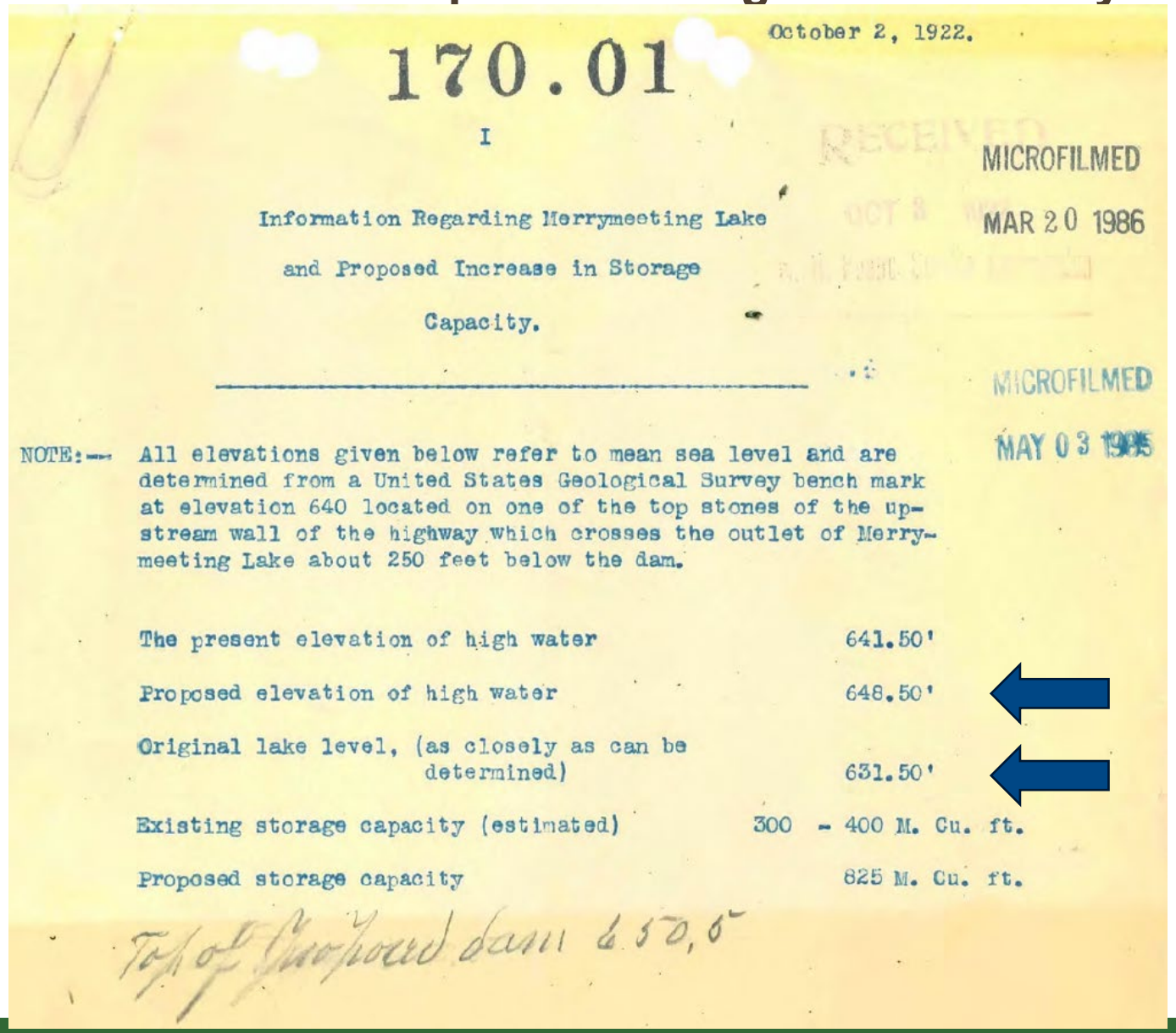
Merrymeeting Lake

- **Both Alternative M1 and M2 will require lowering the waterbody**



October 2, 1922.

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Information Regarding Merrymeeting Lake

and Proposed Increase in Storage

Capacity.

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NOTE:— All elevations given below refer to mean sea level and are determined from a United States Geological Survey bench mark at elevation 640 located on one of the top stones of the up-stream wall of the highway which crosses the outlet of Merry-meeting Lake about 250 feet below the dam.

The present elevation of high water	641.50'
Proposed elevation of high water	648.50'
Original lake level, (as closely as can be determined)	631.50'
Existing storage capacity (estimated)	300 - 400 M. Cu. ft.
Proposed storage capacity	825 M. Cu. ft.

Top of Spillboard dam 650.0'

Merrymeeting Lake

- **Both Alternative M1 and M2 will require lowering the waterbody**

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Jones Dam

- Inadequate spillway capacity (1.3 ft overtopping, 9 hrs)
- Fails slope stability (both sides)
- Fails gravity stability (especially with flashboards)
- Fails all three: hydraulic, slope, gravity

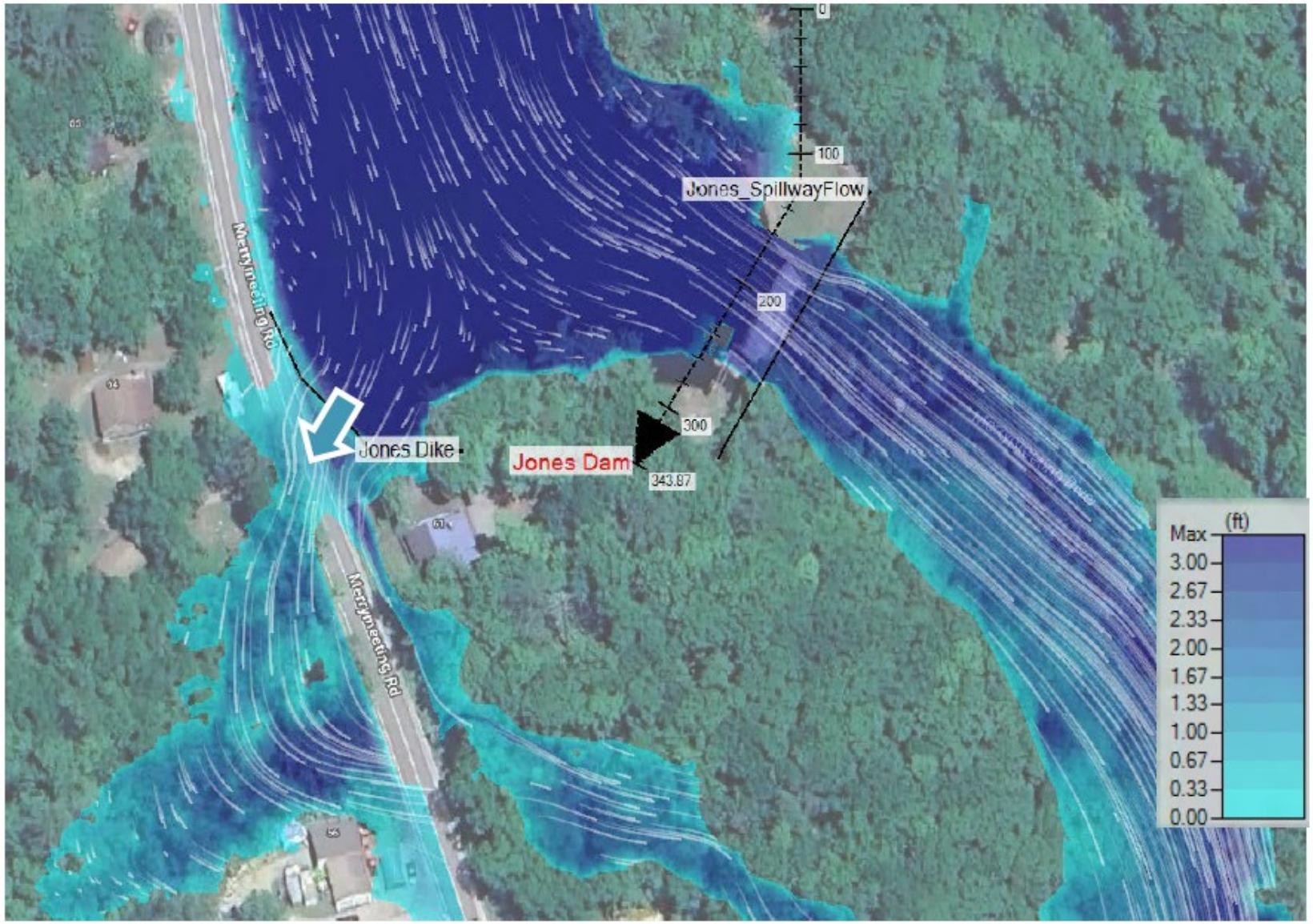

Figure 2-3: Jones Dam Overtopping Flow During 1000-Year Design Event.

Jones Pond Dam

- **Alternative J1 – Spillway Lowered**

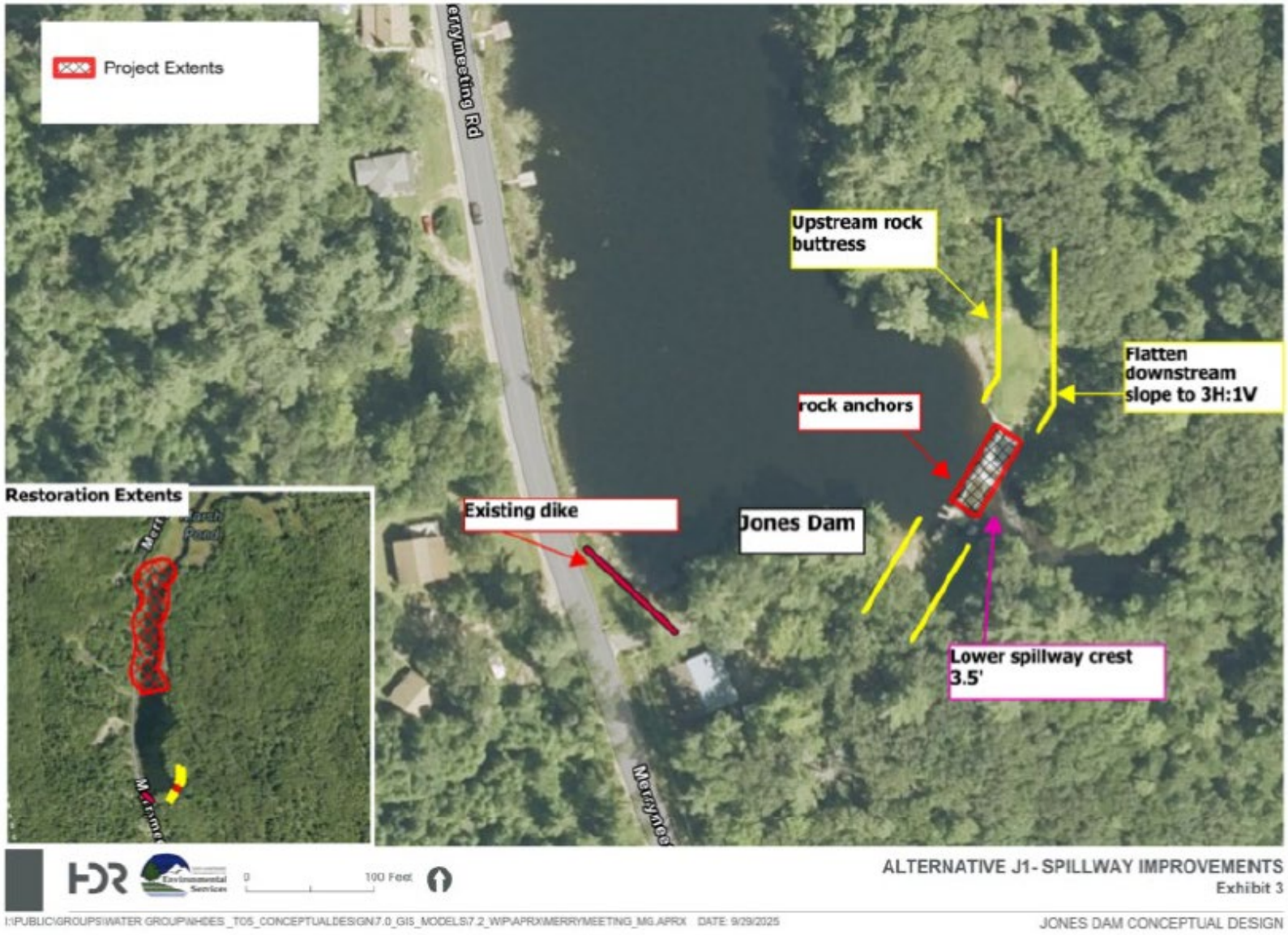

Figure 4-9: Alternative J1- Project Area and Stream Restoration Extents

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Permanent water surface lowered by 5.5ft from elevation with flashboards installed

Jones Pond Dam

- **Alternative J1 – Spillway Lowered**

Verney Mill Dam – Peterborough with spillway cut down

Jones Pond Dam

- **Alternative J2 – Crest Gate**

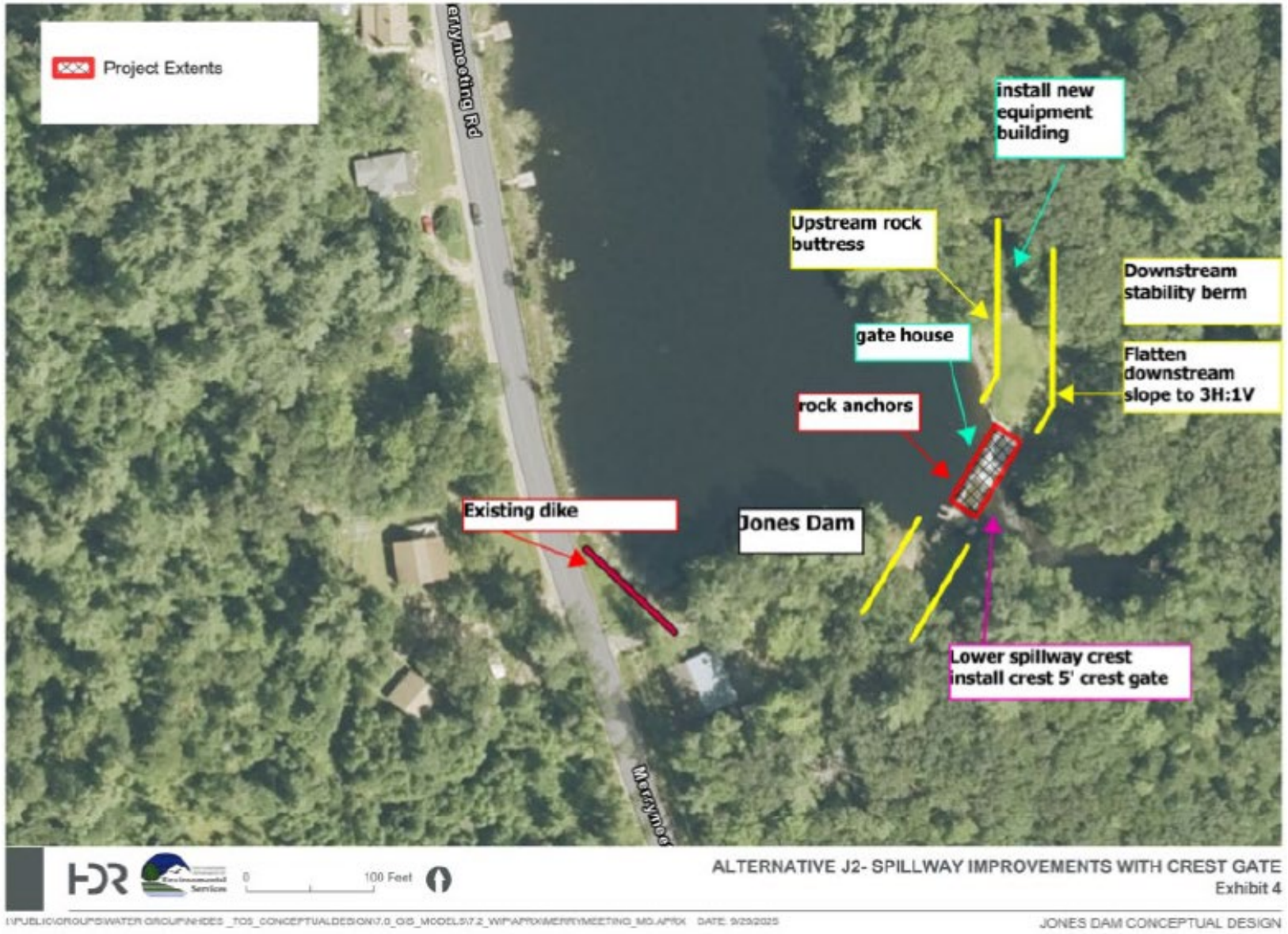

Figure 4-12: Alternative J2-Project Area

Jones Pond Dam

- **Alternative J3 – Dam Removal**

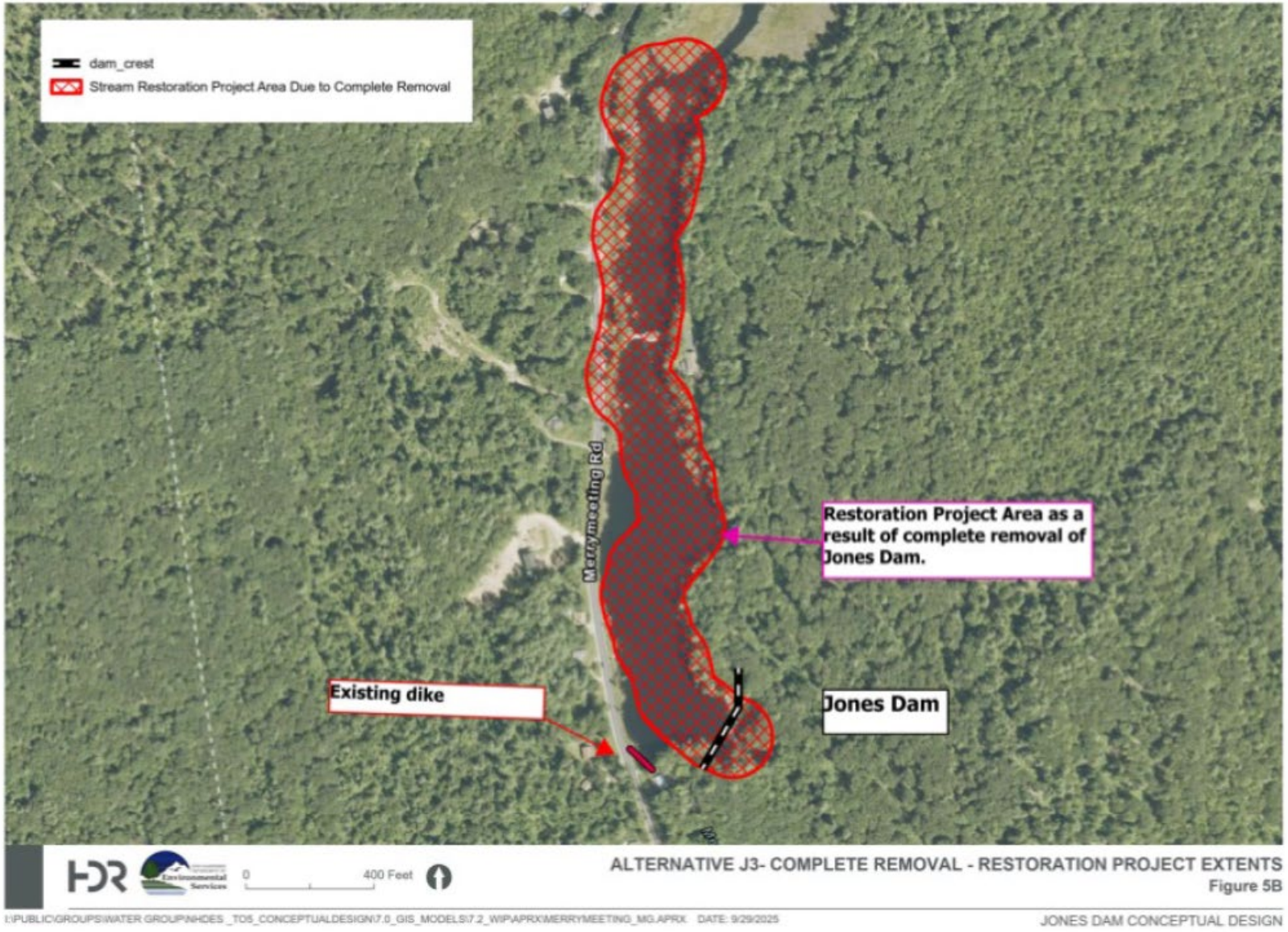

Figure 4-13: Alternative J3- Dam Removal Restoration Extents (Exhibit 5B in Appendix B:)

Jones Pond Dam

- **Alternative J3 – Dam Removal**

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Jones Pond Dam

- **Alternative J3 – Dam Removal**

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Jones Pond Dam

- **Alternative J3 – Dam Removal**

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Jones Pond Dam

- **Alternative J3 – Dam Removal**

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Upper Sawyer Mill Dam – Dover – 2020

South Branch Gale River Dam – Bethlehem – 2020

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Lower Peverly Brook Dam – Newington – 2021

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Kimball Brook Dam – North Stratford – 2024

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Washburn Mill Dam – Colebrook – 2024

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Alton Power Dam

- Inadequate spillway capacity (1.8 ft overtopping, 56.5 hrs)
- Fails gravity stability

Figure 2-4: Alton Power Dam Overtopping Flow During 1000-Year Design Event.

Alton Power Dam

- **Alternative A1 – Spillway Lowered**

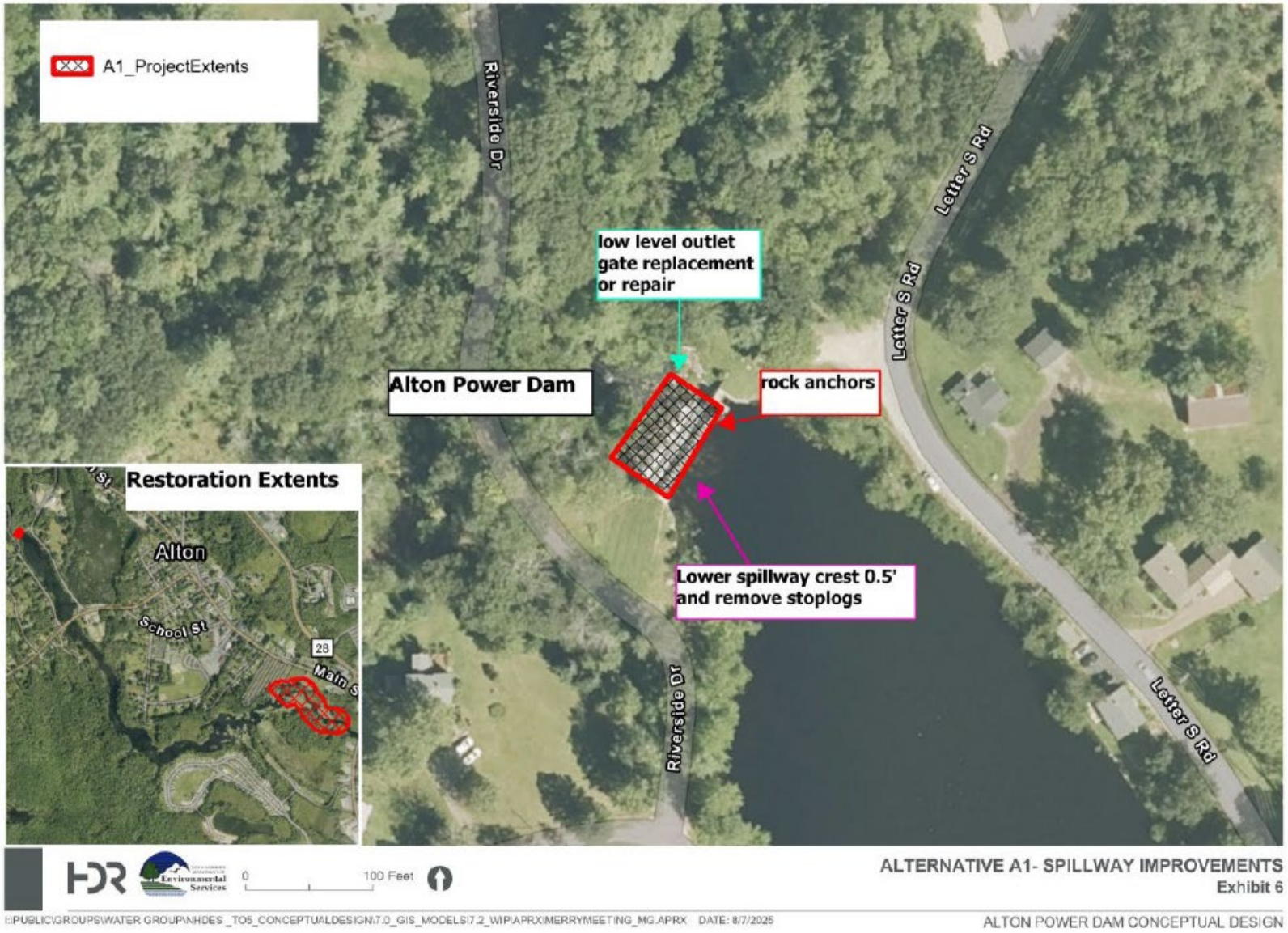

Figure 4-15: Alternative A1 Project Extents and Restoration Extents

Permanent water surface lowered by 3.5ft from elevation with stoplogs installed

Alton Power Dam

- **Alternative A2 – Crest Gate**

Figure 4-18: Alternative A2- Project Extents

Alton Power Dam

- **Alternative A3 – Dam Removal**

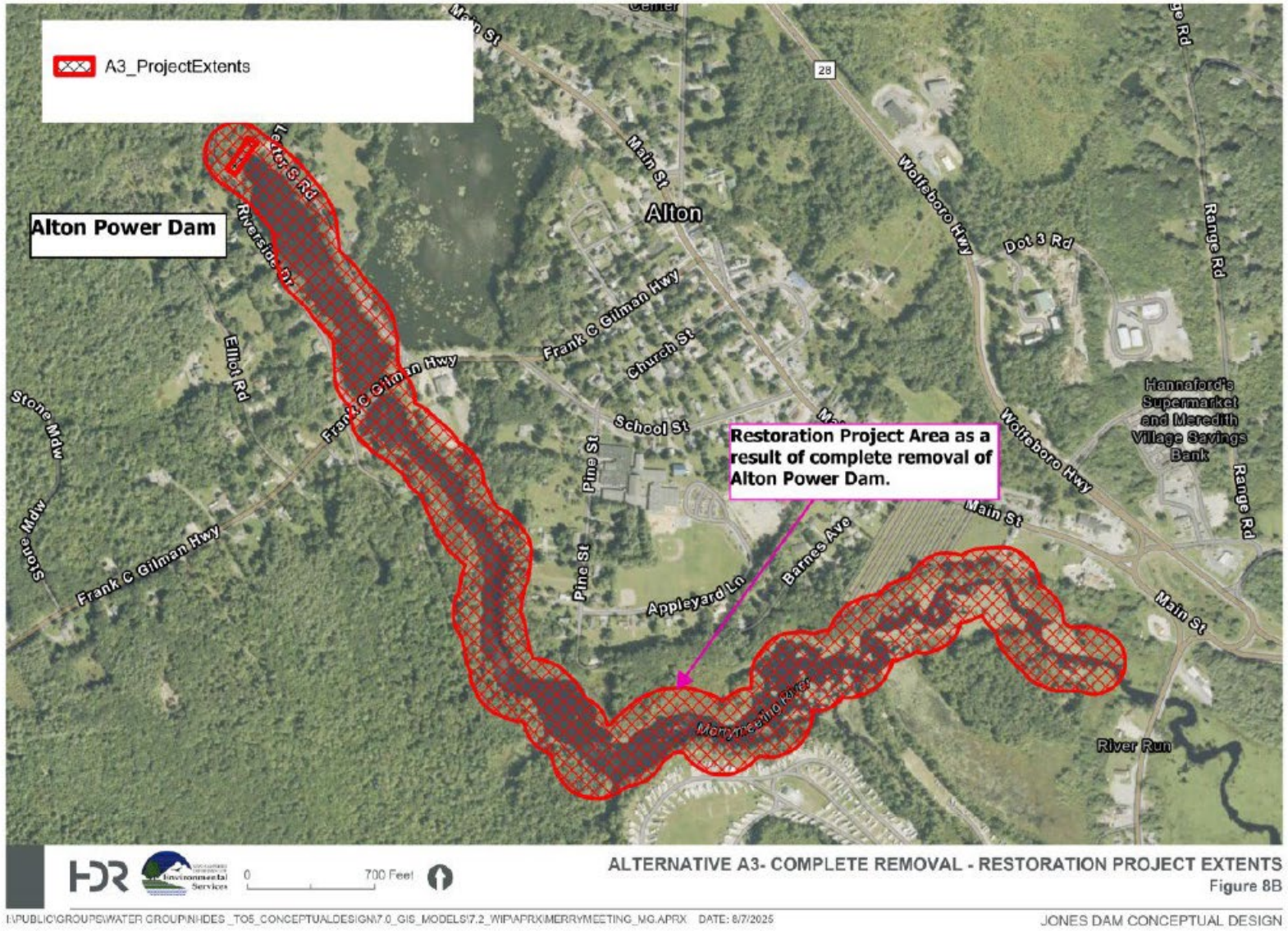

Figure 4-19: Alternative A3 Dam Removal Restoration Extents (Exhibit 8B in Appendix B:)

Alton Power Dam

- **Alternative A3 – Dam Removal**

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Alton Power Dam

- **Alternative A3 – Dam Removal**

Alton Power Dam

- **Alternative A3 – Dam Removal**

NEW HAMPSHIRE DEPARTMENT OF Environmental rvices

Old Box Culvert Under Road Separating Main Portion of Impoundment + Mill Pond - Only Outlet

BMM 9/84

Merrymeeting Dam

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Table 4-8: Merrymeeting Dam Summary of Alternatives

Alternative	Description	Lower Bound Cost	Upper Bound Cost
M1	Overtopping Protection and Rebuilt Spillway	$5,030,000	$5,800,000
M2	Widen Spillway with Crest Gate	$5,890,000	$6,790,000

Note: It is likely that as final design is developed cost estimates will rise

NHDES Dam Bureau suggests moving forward with alternative M2

Merrymeeting Dam

- **Alternative M2—Spillway Replacement**

Jones Dam

Table 4-9: Jones Dam Summary of Alternatives

Alternative	Description	Lower Bound Cost	Upper Bound Cost
J1	Lower Spillway	$1,950,000	$2,250,000
J2	Crest Gate	$5,120,000	$5,810,000
J3A	Full Removal with Full Restoration	$8,500,000	$9,810,000
J3B	Full Removal with Passive Restoration	$1,110,000	$1,280,000

NHDES Dam Bureau suggests moving forward with a mix of removal alternatives J3A and J3B – This cost will likely be between $2 million and $2.3 million

Jones Dam

- **Alternative J3 – Dam Removal**

Dam Removal Restoration Extents (Exhibit 5B in Appendix B:)

Alton Power Dam

Table 4-10: Alton Power Dam Summary of Alternatives

Alternative	Description	Lower Bound Cost	Upper Bound Cost
A1	Lower Spillway	$1,980,000	$2,280,000
A2	Crest Gate	$5,280,000	$6,100,000
A3A	Full Removal with Full Restoration	$16,060,000	$18,530,000
A3B	Full Removal with Passive Restoration	$860,000	$990,000

NHDES Dam Bureau suggests moving forward with a mix of removal alternatives A3A and A3B – This cost will likely be between $4.7 million and $5.5 million

Alton Power Dam

- **Alternative A3 – Dam Removal**

A3 Dam Removal Restoration Extents (Exhibit 8B in Appendix B:)

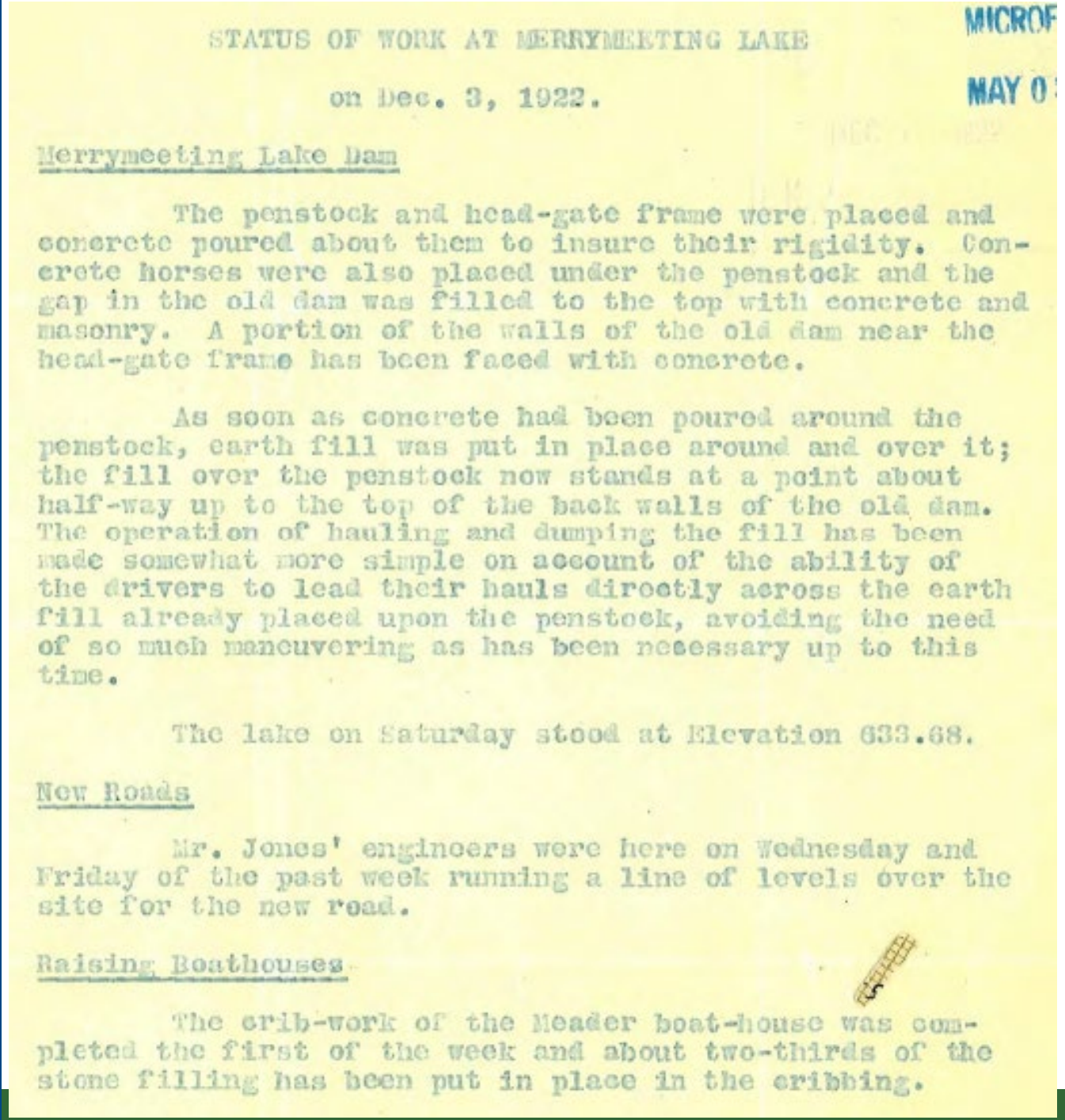
Merrymeeting River Dams

- Repair all dams to have existing or historic water surface elevation ~ $16.3 million and $18.7 million
- Repair Merrymeeting Lake Dam and remove Jones and Alton Power Dam ~ $12.6 million and $14.6 million
- *Note: Since pricing will likely rise for projects that include crest gate installation, repairing all dams will increase more than repairing Merrymeeting Dam and removing Jones Dam and Alton Power Dam*

Merrymeeting River Dams

- Development of final designs will be ongoing with plans, specifications and permits developed by end of 2027.
- Funding for the three dams would be requested as part of the fiscal year 2030/2031 budget.
- Earliest possible time for drawdown of Merrymeeting Lake would occur in the fall of 2030 with construction starting in the spring of 2031 and continuing into 2032 with refill occurring in 2032.
- Alton Power Dam and Jones Dam would likely be drawn down in coming years to start passive restoration process with full removals and river restoration occurring in 2031 or possibly sooner depending on available funding.

Note: These timeframes are dependent on final designs and meteorological conditions.



STATUS OF WORK AT MERRYMEETING LAKE

on Dec. 3, 1922.

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Merrymeeting Lake Dam

The penstock and head-gate frame were placed and concrete poured about them to insure their rigidity. Concrete horses were also placed under the penstock and the gap in the old dam was filled to the top with concrete and masonry. A portion of the walls of the old dam near the head-gate frame has been faced with concrete.

As soon as concrete had been poured around the penstock, earth fill was put in place around and over it; the fill over the penstock now stands at a point about half-way up to the top of the back walls of the old dam. The operation of hauling and dumping the fill has been made somewhat more simple on account of the ability of the drivers to lead their hauls directly across the earth fill already placed upon the penstock, avoiding the need of so much maneuvering as has been necessary up to this time.

The lake on Saturday stood at Elevation 633.68.

New Roads

Mr. Jones' engineers were here on Wednesday and Friday of the past week running a line of levels over the site for the new road.

Raising Boathouses

The crib-work of the Meader boat-house was completed the first of the week and about two-thirds of the stone filling has been put in place in the cribbing.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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