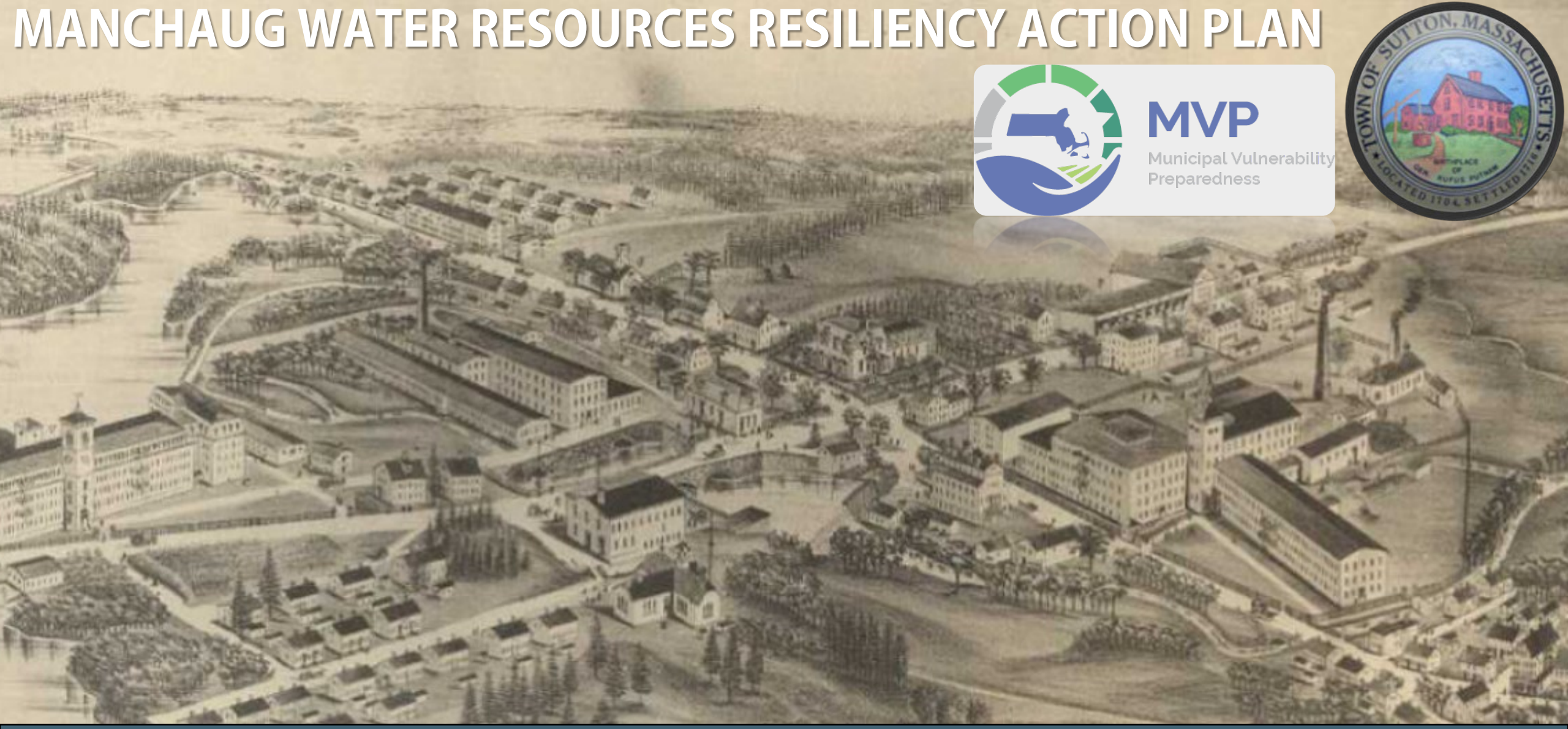
MANCHAUG WATER RESOURCES RESILIENCY ACTION PLAN



MVP
Municipal Vulnerability Preparedness

TOWN OF SUTTON, MASSACHUSETTS
LOCATED 1716 & SETTLED 1718

Third Public Meeting
"The Solutions"
April 27, 2023

CMRPC
Central Massachusetts Regional Planning Commission

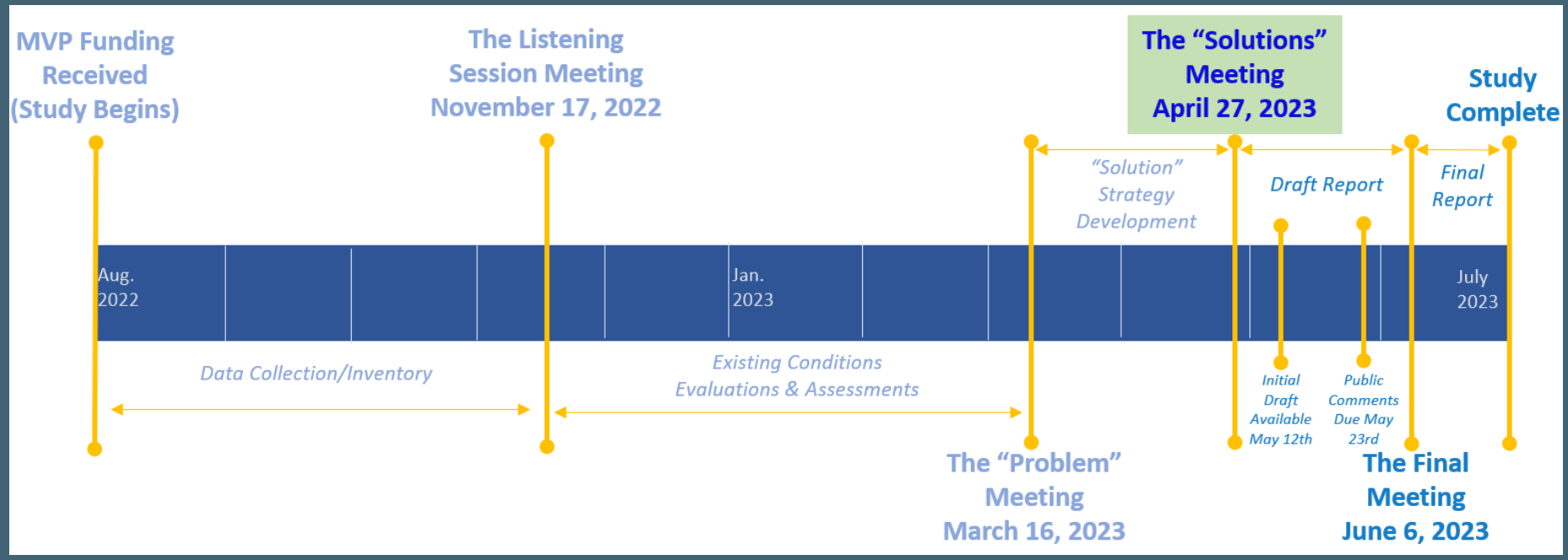
TRAVERSE
landscape architects

PARE
CORPORATION

Resiliency Action Plan Overview

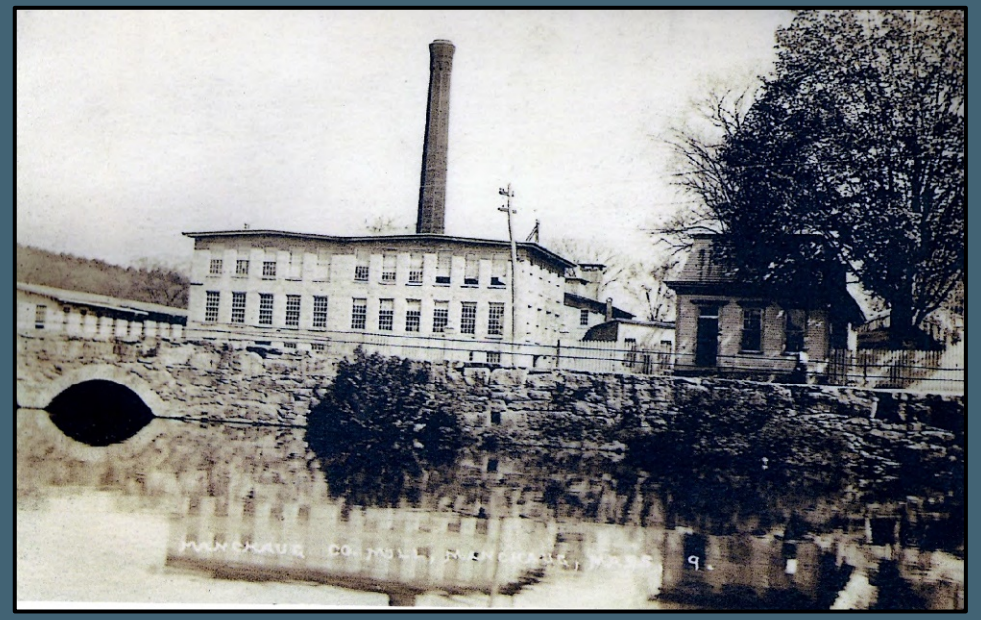
- General Scope: Resiliency Action Plan for the Mumford River/Dark Brook watershed & river corridor with a specific focus on the issue of flooding within Manchaug Village

- Scope & Schedule



The Solutions Meeting - Agenda

- Watershed-Wide “Solutions”
- Reach Specific “Solutions”
- Merge and Recap of “Solutions”
- Next Steps
- Discussion

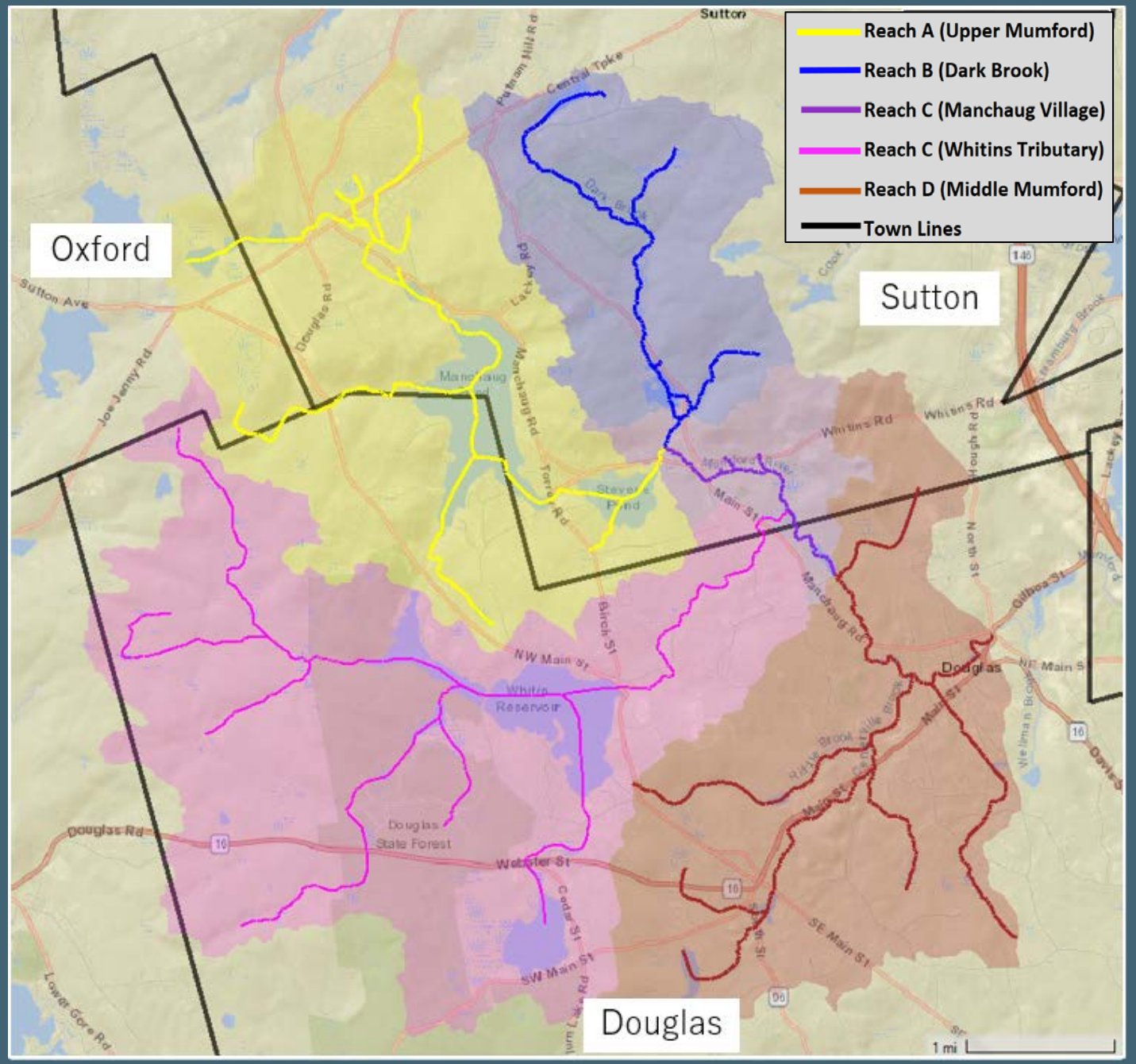


Watershed-Wide Solutions

- **Emergency Action Plan** – Watershed specific emergency action/response plan developed from the results of this study & intended to improve both public knowledge of the hazard (riverine flooding) as well as emergency preparedness & response to that hazard

- **Land Cover Interventions** - Policy & action aimed at maintaining & improving land cover conditions throughout the watershed

- **Beaver/River Maintenance** – Action to clear the watershed's rivers of beaver & debris dams at high risk/impact areas

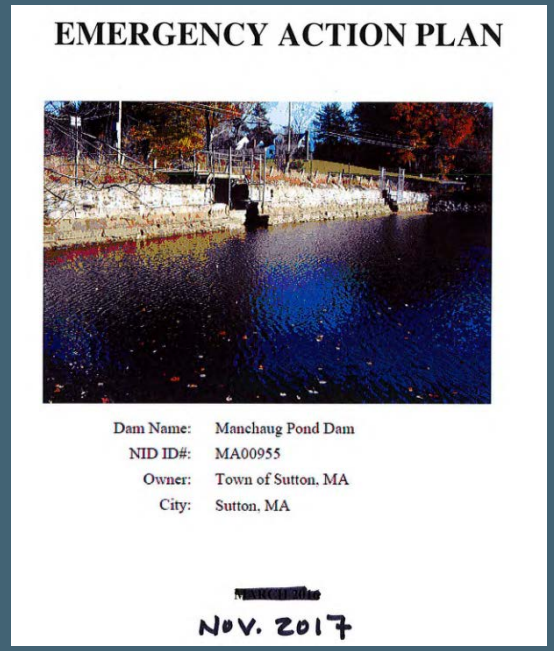


Watershed-Wide Solutions

Emergency Action Plan (EAP)

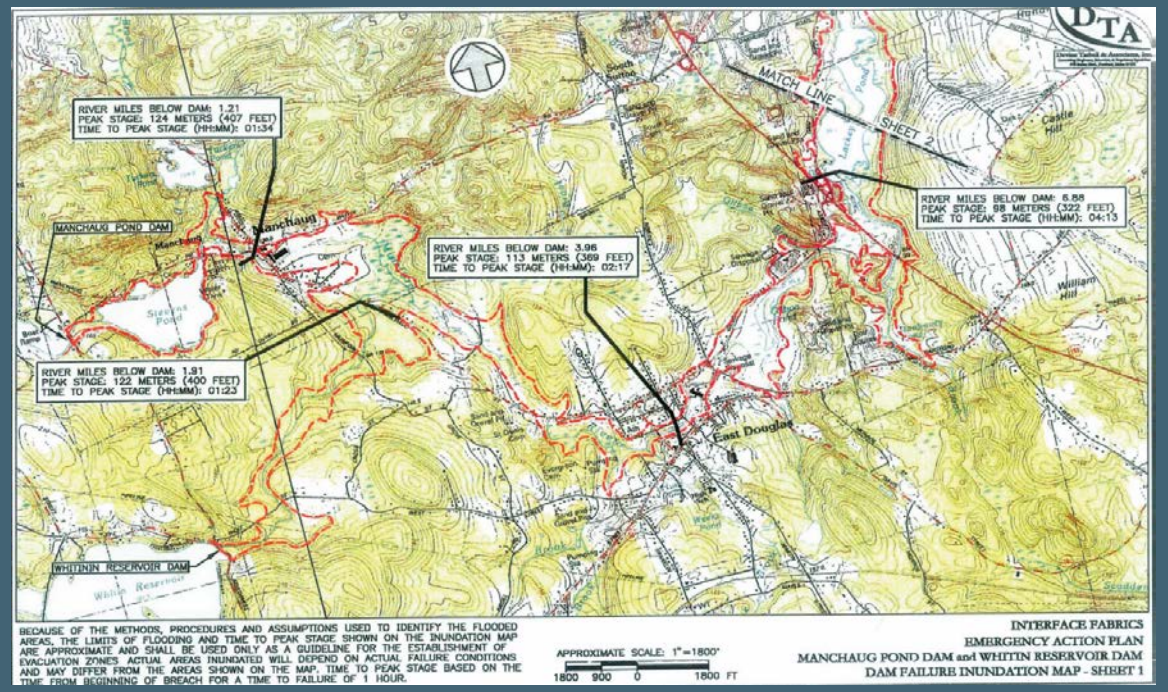
- **Current study has identified:**
  - Extent of riverine flooding (2”- 18” rain events)
  - Vulnerable assets
  - Triggering rain events
  - Failure potential & impacts of failure (Start)

- **Technical basis for watershed specific EAP for riverine flooding; an EAP that could improve:**
  - Knowledge of Risks
  - Preparedness & Warning
  - Preventive Action (Pre-Storm)
  - Emergency Response
  - Post Storm Recovery


EMERGENCY ACTION PLAN

Dam Name: Manchaug Pond Dam
NID ID#: MA00955
Owner: Town of Sutton, MA
City: Sutton, MA

[redacted]
NOV. 2017

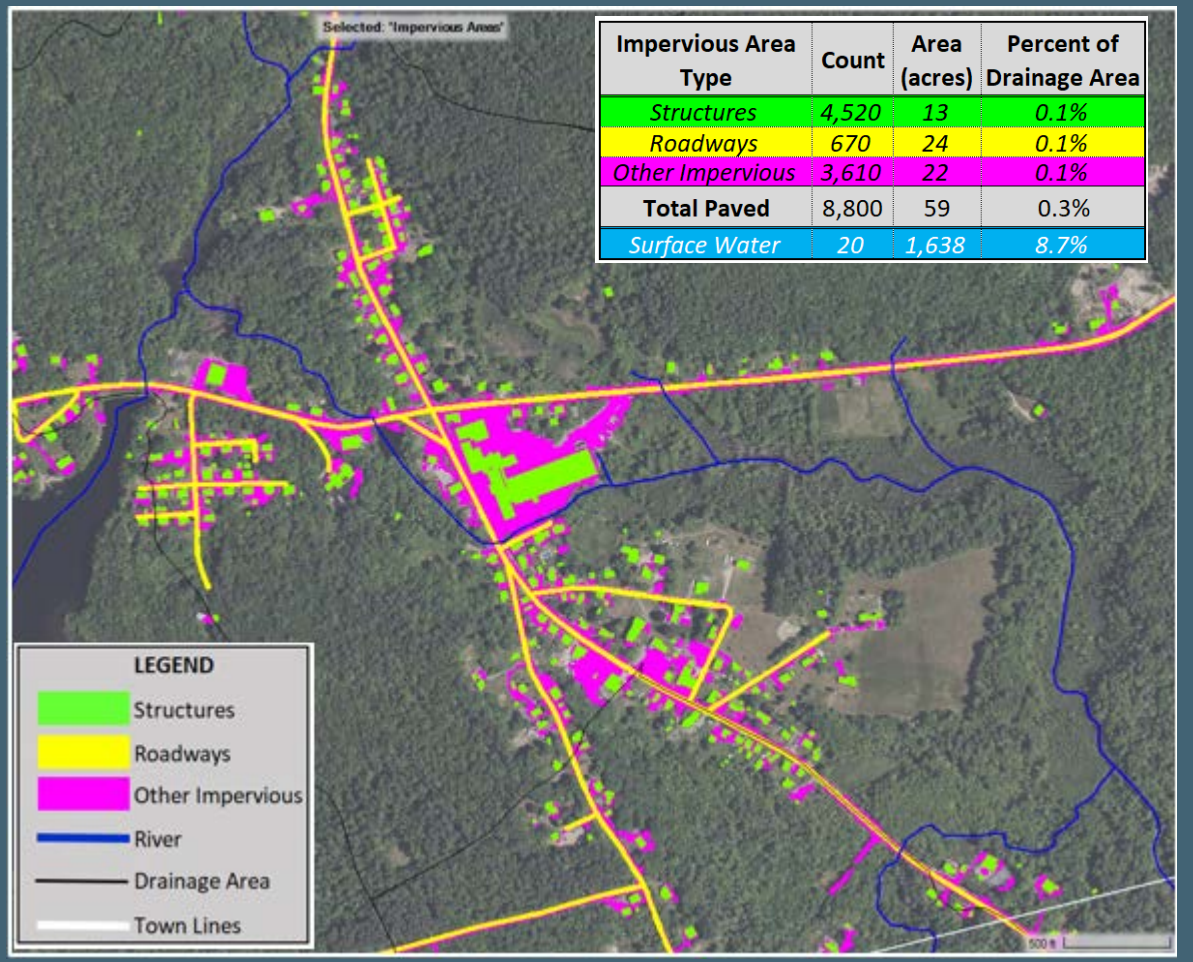


Watershed-Wide Solutions

Land Cover Interventions

- **Land Cover Preservation**: Preserving & enhancing vegetated areas (>90% of watershed currently)
- **Land Cover Conversion**: Converting impervious areas to pervious areas (<1% of watershed currently)
- **Green Stormwater Infrastructure (GSI)**: Installing GSI adjacent to impervious areas to collect & infiltrate its runoff. Potential GSI alternatives include:
  - Downspout Disconnection
  - Rainwater Harvesting
  - Rain Gardens
  - Bioswales
  - Planter Boxes
  - Permeable Pavement
  - Green Roofs

Watershed-Wide Solutions



Impervious Area Type	Count	Area (acres)	Percent of Drainage Area
Structures	*4,520*	*13*	*0.1%*
Roadways	*670*	*24*	*0.1%*
Other Impervious	*3,610*	*22*	*0.1%*
Total Paved	8,800	59	0.3%
Surface Water	*20*	*1,638*	*8.7%*

Beaver and River Maintenance (The Problem)

- **Problem**
  - Beaver & debris dams at numerous (15+) locations along the rivers in the watershed
- **Impacts**
  - Elevated river levels that could lead to flooding issues
  - Beaver and debris dams are prone to failure; Failure of these dams could generate notable flood waves that could lead to quick developing flooding issues
  - Degradation of some of the ecological & functional values of river & its floodplain

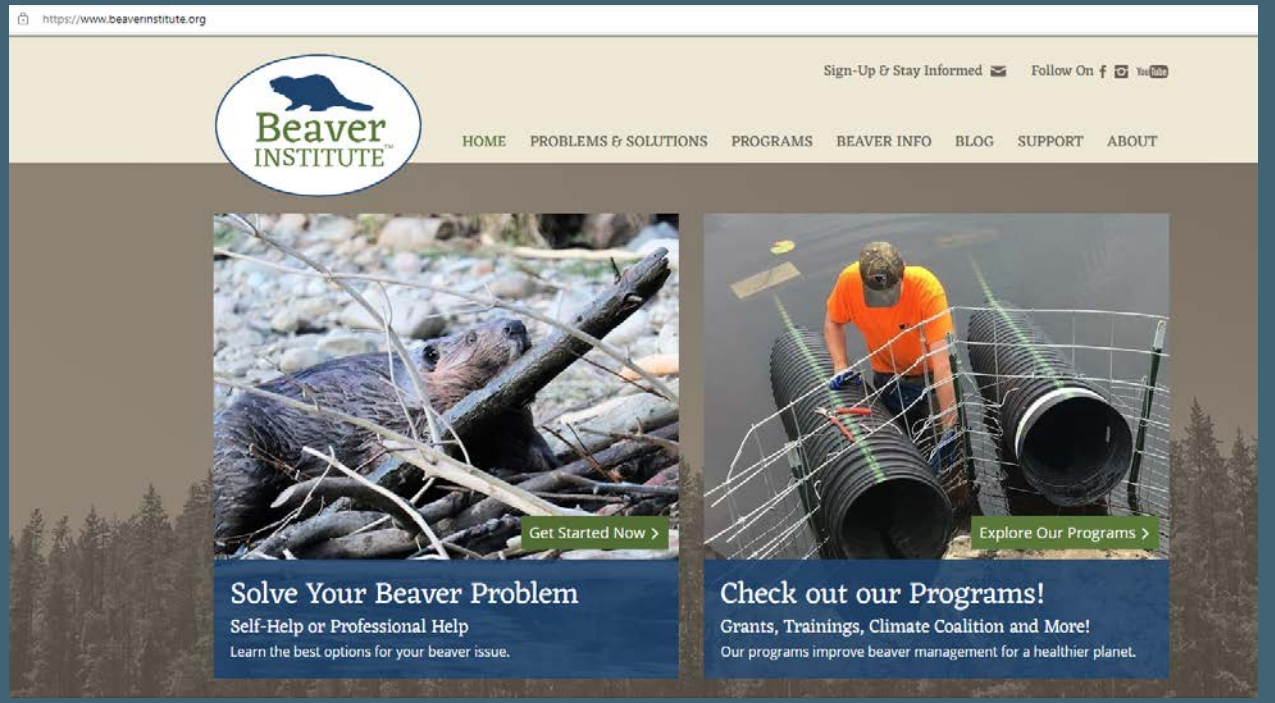
Watershed-Wide Solutions

Beaver and River Maintenance (The Solution)

Goal: Remove high risk/impact beaver/debris dams along the river to restore free flowing rivers while balancing the ecological benefit of naturally occurring processes.

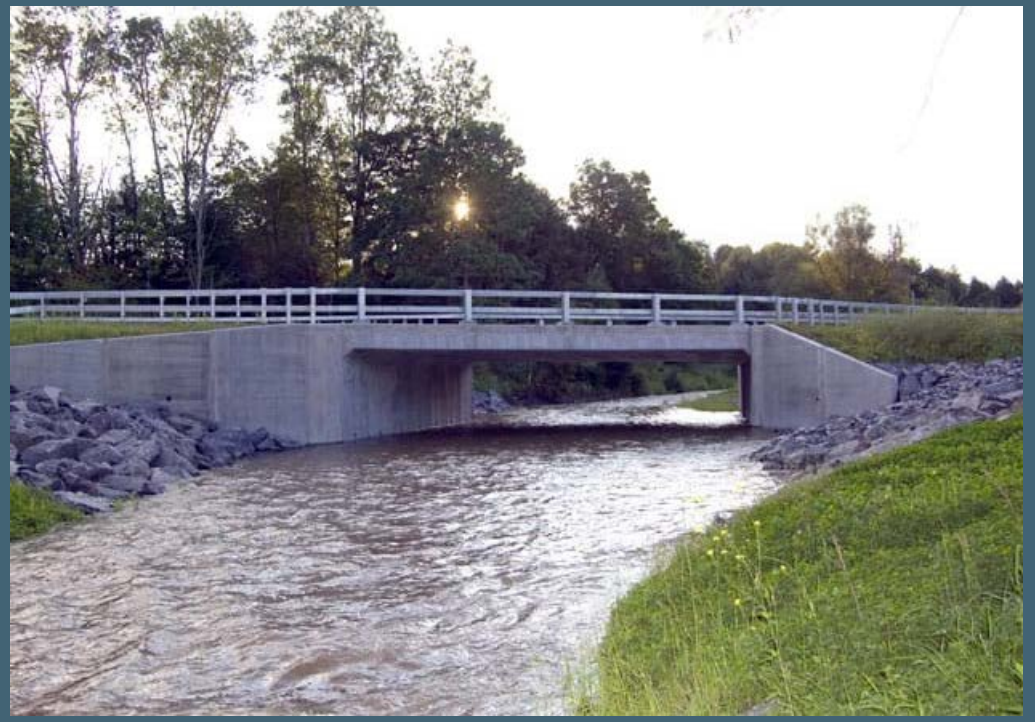
- **Relocate Beavers:** To less populated areas that would benefit from beaver activity
- **Remove/Modify Beaver Dams:** In high risk/impact areas along the river
- **Remove Debris:** Remove debris dams, fallen trees (in specific areas), other debris
- **Monitor & Maintain (M&M):** Recurrent M&M to limit the reoccurrence of beaver/debris dams in high risk/impact areas of the river

Watershed-Wide Solutions



Reach Specific Solutions

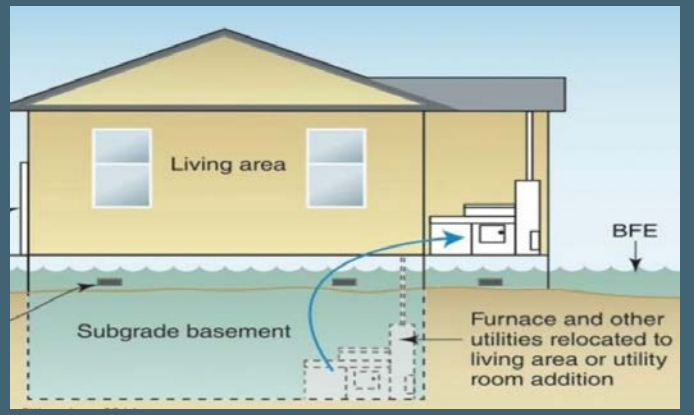
- **Recap of the problem for each reach**
- **Present solution strategies for each reach**
- **General strategies include:**
  - **<u>Modify Buildings</u>**
    - Reduce flood damage at individual buildings
  - **<u>Modify Dams</u>**
    - Comply with regulations, reduce failure potential, increase flood attenuation, lower flood elevations (upstream & downstream), improve ecosystem services (stream connectivity, fish/wildlife passage)
  - **<u>Remove Dams</u>**
    - Eliminate failure potential, lower flood elevations upstream, improve ecosystem services
  - **<u>Replace Roadway Crossings</u>**
    - Lower flood elevations upstream, reduce frequency of roadway overtopping (less damage & use limitations), reduce failure potential, improve ecosystem services

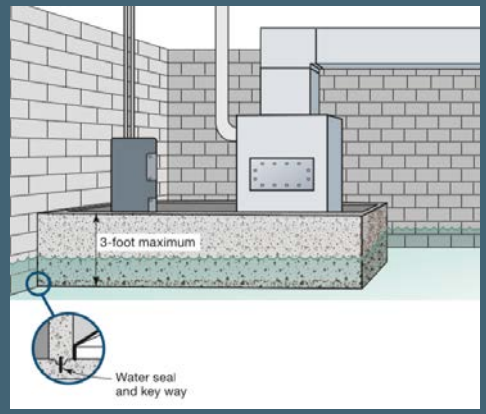


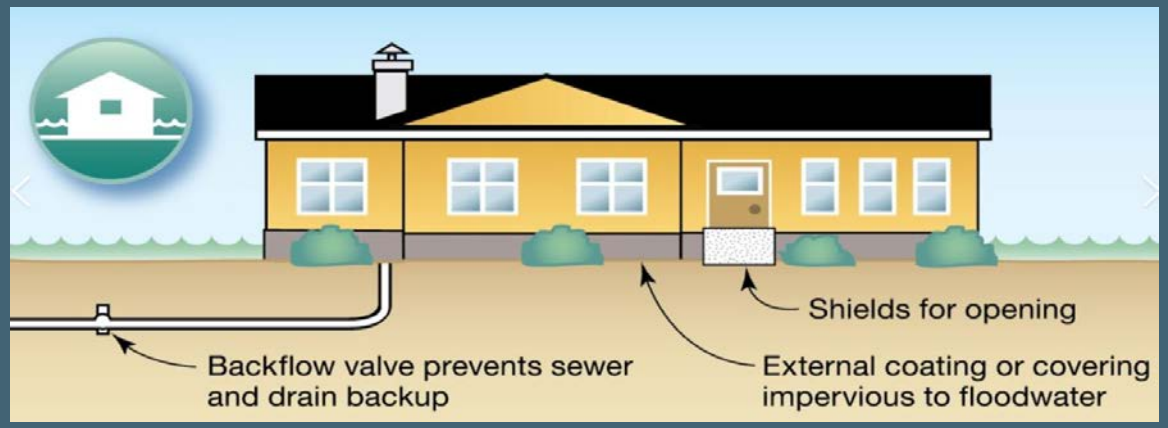
Reach Specific Solutions

Building Modifications

- **Sump Pumps:** Provide backup power for sump pumps; replace aging/ineffective systems
- **Wet Floodproofing:** Relocating/protecting utilities & content below flood elevations
- **Dry Floodproofing:** Structure improvements to limit entrance of flood waters
- **Elevation:** Raise first floor elevation (FFE) of structure above flood levels
- **Retreat:** Restore parcel to natural floodplain & relocate to a less flood prone area







Reach Specific Solutions

Reach A (Upper Mumford)

Model Results

Dams

- #9 Sutton Falls Pond Dam (SFPD)
- #10 Manchaug Pond Dam (MPD)
- #11 Stevens Pond Dam (SPD)

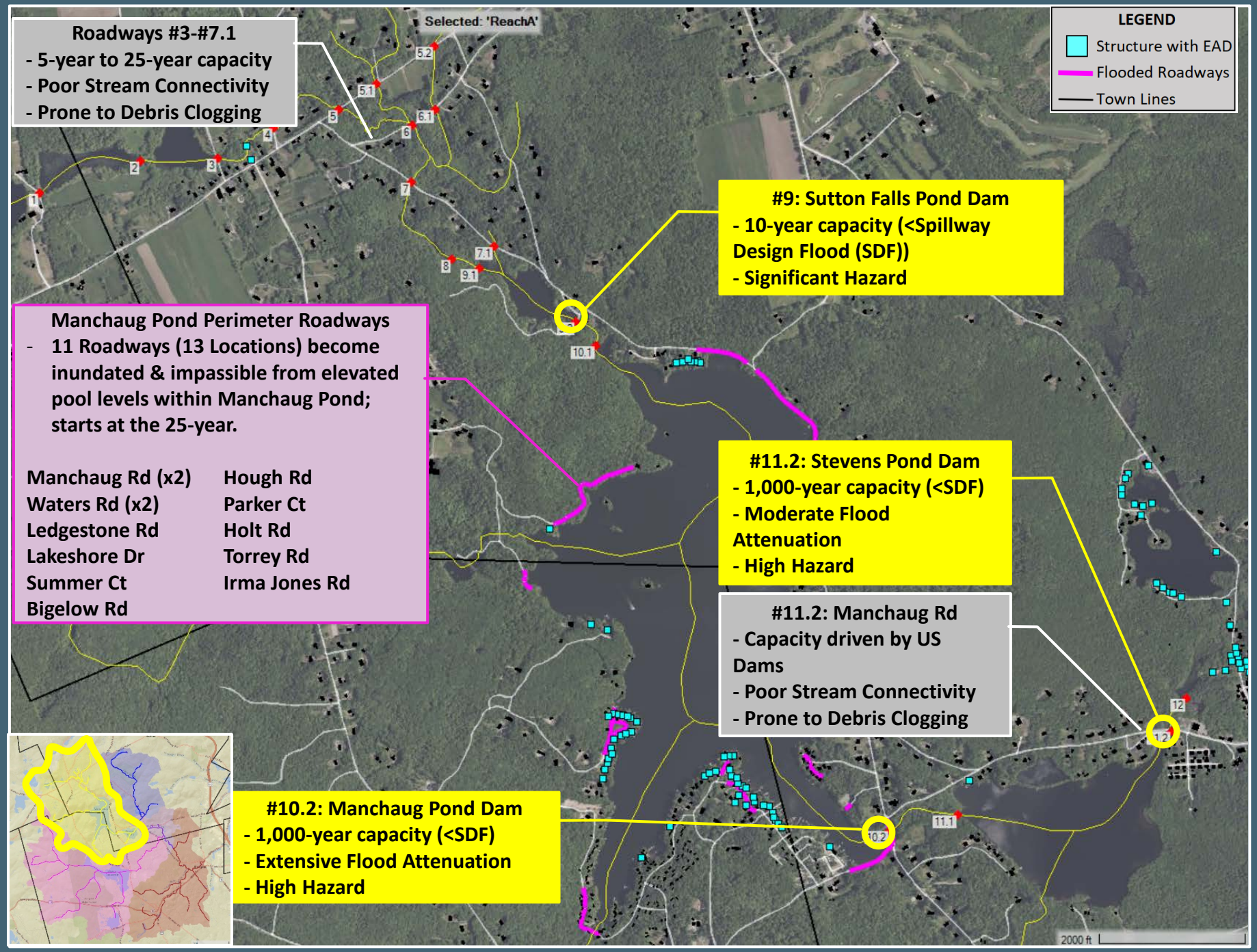
Roads

- All upstream (US) of Sutton Falls Pond Dam
- Manchaug Pond Perimeter
- Manchaug Road downstream (DS) of SPD

Buildings

- 58 with potential for Equivalent Annual Damage (EAD)
- 4 US of Manchaug Pond
- 53 along Manchaug Pond

Reach Specific Solutions



Reach A (Upper Mumford)

Solutions

Dam Modifications

- SFPD: From 10yr to 500
- MPD: From 1,000 to >1/2PMF
- SPD: From 1,000 to >1/2PMF

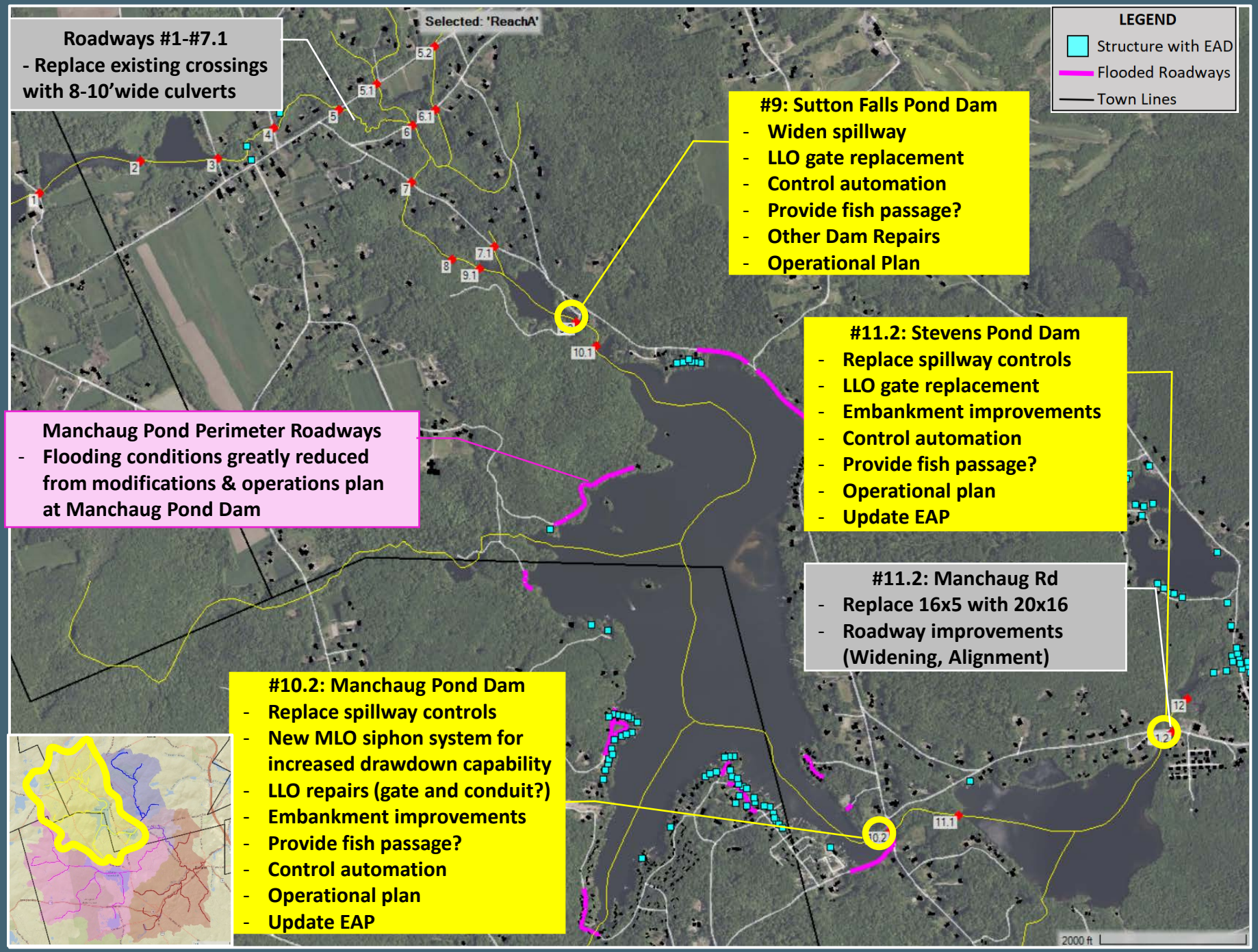
Culvert Replacements

- #1-#7.1: From 5-25 to 100
- MPP Roads
- #11.2: SPD Capacity

Buildings

- Modifications at most 58
- 55 along ponds benefit greatly from dam modifications
- 3 US greatly benefited by culvert replacements

Reach Specific Solutions



Reach A (Upper Mumford)

Manchaug Pond Dam Modifications

1. **Replace Spillway Controls:** Replace stop logs with 10’w x 4’h rotary/tainter gate; automate operations

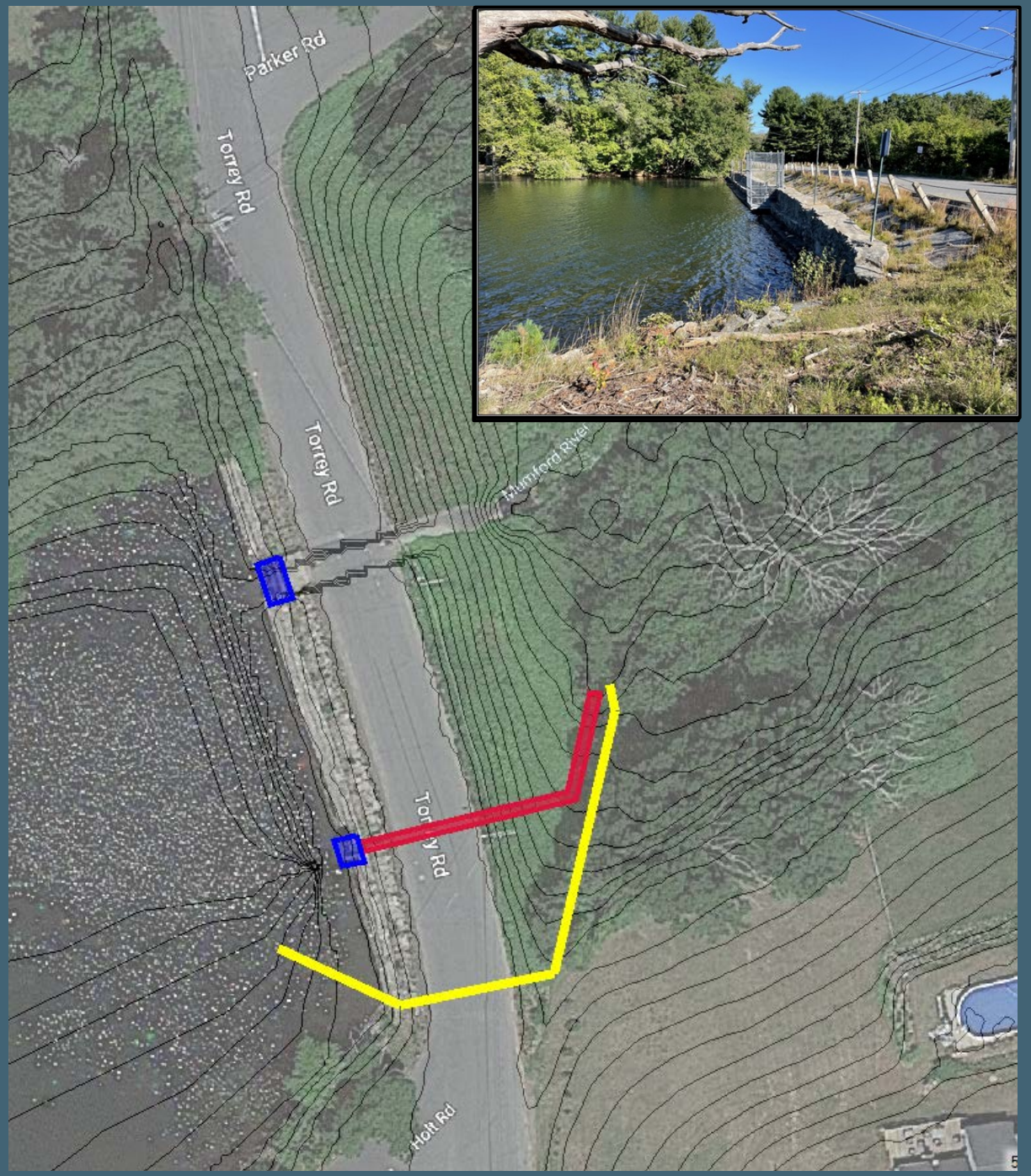
2. **Low Level Outlet (LLO) Controls:** Replace gate with 2’ square upward operating orifice gate; automate operations

3. **LLO Conduit:** Inspect conduit. If replacement is warranted, install a larger conduit

4. **Siphon System:** If new LLO conduit is not needed, install a siphon system to provide improved drawdown capacity; conceptually developed as three 18” diameter conduits at the right abutment

5. **Other Dam Repairs and Modifications:** If Needed

6. **Operational Plan:** Pre-storm (1/2 PMF) drawdown to El. 517 (~1.8’ below normal pool – El. 518.8); Other operational procedures to limit outflows & pool level rises



Reach Specific Solutions

Reach A (Upper Mumford)

Stevens Pond Dam Modifications

1. **Replace Spillway Controls:** Remove flash boards & top 2’ of concrete control section; replace with 16’w x 3’h rotary/tainter gate; automate operations
2. **Low Level Outlet (LLO) Controls:** Remove existing gate; Square DS end of conduit & install 3’ square upward operating orifice gate; automate operations
3. **Crest Elevation:** Establish a consistent crest elevation of El. 475 (Current mins El. 474.2)
4. **Embankment Improvements:** Upstream slope riprap, regrade crest & downstream slope, toe drain system, grass vegetation
5. **Other Dam Repairs and Modifications:** If Needed
6. **Operational Plan:** Pre-storm (1/2 PMF) drawdown to El. 467 (~2.5’ below normal pool – El. 469.5); Other operational procedures to limit outflows
7. **Manchaug Road Improvements:** Replace bridge, widen roadway, improve site distance

Reach Specific Solutions

Reach B (Dark Brook)

Model Results

Beaver Activity

- #12 & Other Areas

Dams

- #11.2 Upper Tucker Pond (UTP) South Dam
- #11.3 UTP East Dam

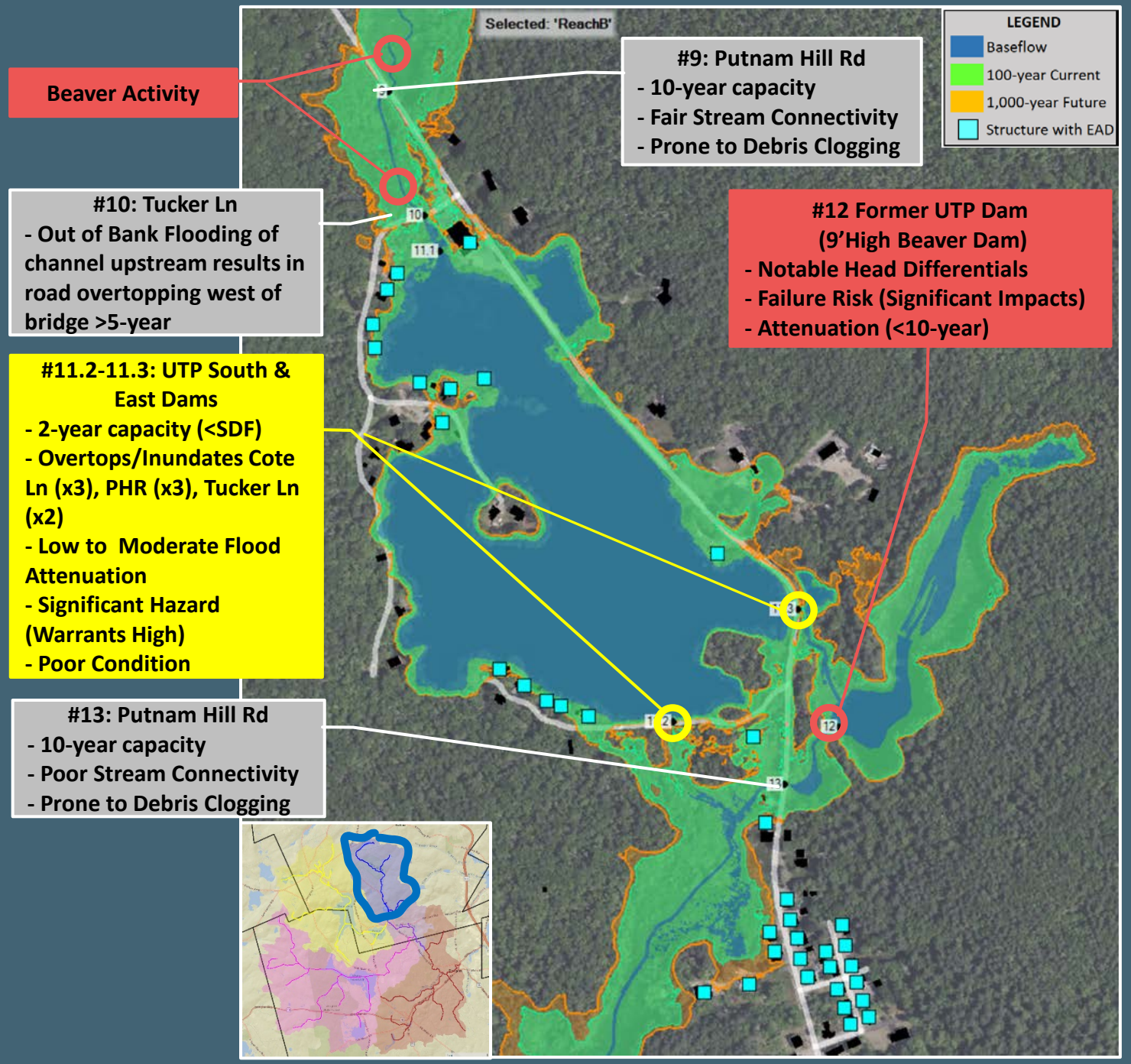
Roads

- Putnam Hill Road (5 locations)
- Tucker Lane (3 locations)
- Cote Lane (3 locations)

Buildings

- 37 with potential for EAD
- 15 along Upper Tucker Pond
- 11 downstream of UTP

Reach Specific Solutions



Reach B (Dark Brook)
Solutions

Reach Specific Solutions

Beaver/River M&M
- Previously Discussed; #12 Specifics

Dam Modifications
- UTPD: From 5yr to 1/2 PMF

Culvert Replacements
- PHR #9: From 25 to 100
- TL: From 5 to 100
- PHR#13: From 10 to 200

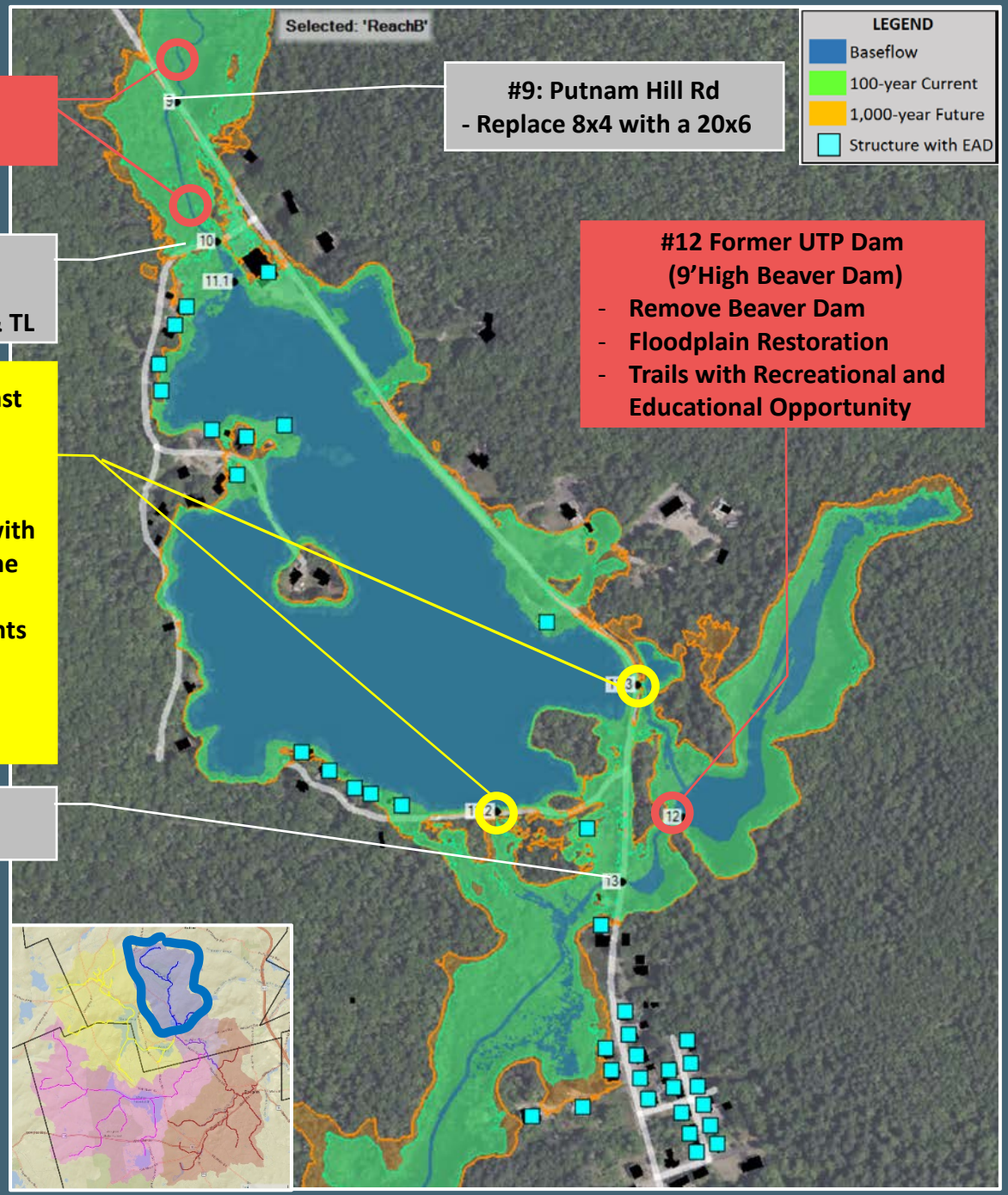
Building Modifications
- Modifications at most 37
- 15 along UTP greatly benefited by UTPD modifications
- 11 downstream of UTP greatly benefited by UTPD modifications, #12 & #13 improvements, & river/beaver M&M

Beaver Activity
- Beaver/River M&M

#10: Tucker Ln
- Channel and floodplain restoration between PHR & TL

#11.2-11.3: UTP South & East Dams
- Replace spillway and PHR crossing at East Dam
- Replace low-level outlet with new spillway and Cote Lane crossing at South Dam
- Embankment improvements
- Provide fish passage?
- Operational plan
- EAP

#13: Putnam Hill Rd
- Replace 4x4 with 20x6



#9: Putnam Hill Rd
- Replace 8x4 with a 20x6

#12 Former UTP Dam (9'High Beaver Dam)
- Remove Beaver Dam
- Floodplain Restoration
- Trails with Recreational and Educational Opportunity

Reach B (Dark Brook)

UTP East and South Dam Modifications

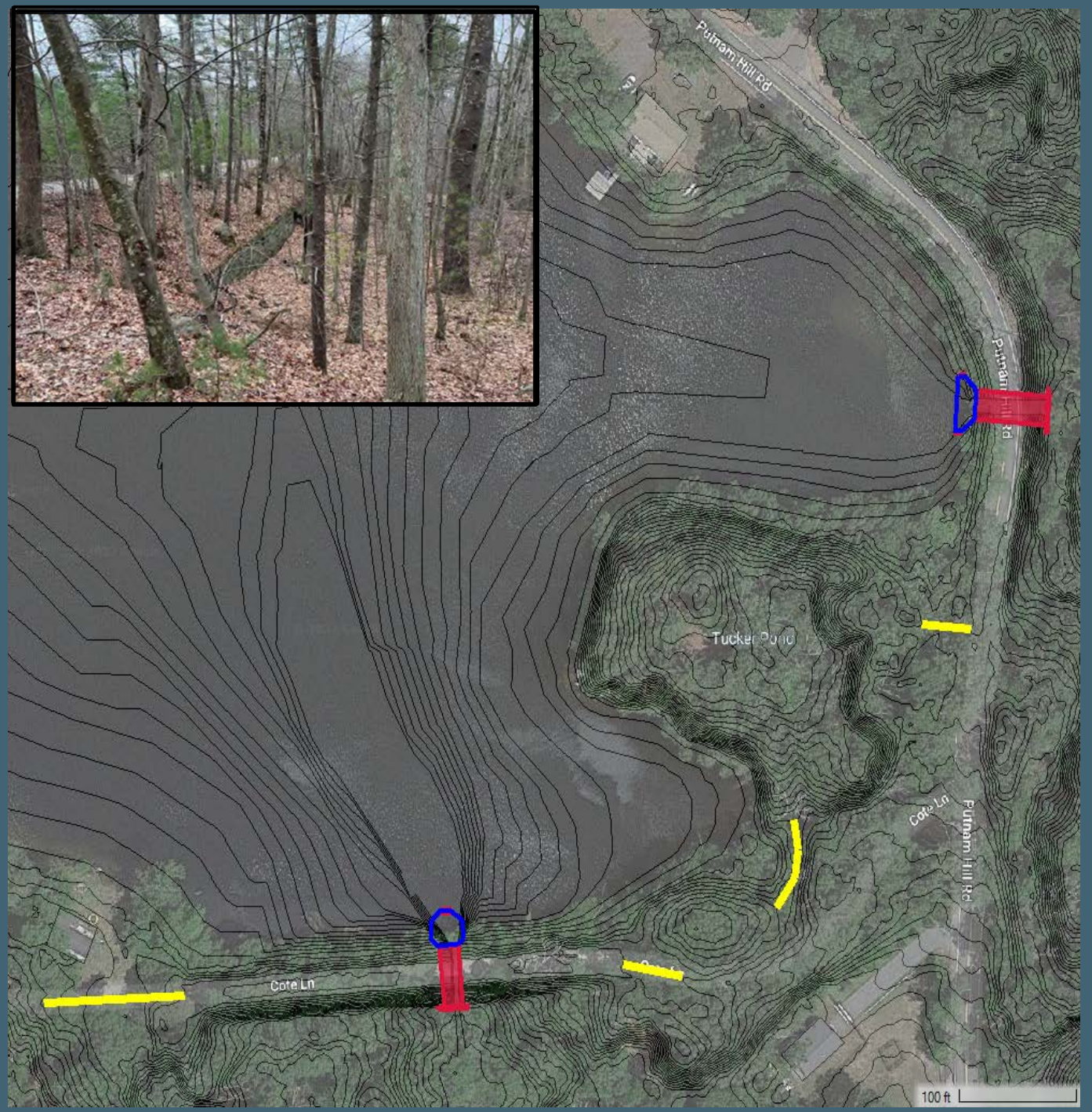
East Dam

1. **New Spillway:** 40’w x 15’d x 10’h trapezoidal concrete spillway
2. **Operations:** Two 4’w x 5’h MLO gates; automate operations
3. **Putnam Hill Road Crossing:** New 20’w x 12’h bridge
4. **Crest Elevation:** Regrade low RA area
5. **Embankment Improvements:** US slope riprap, DS slope riprap/veg, toe drain system/rock toe, grass vegetation

South Dam

1. **New Spillway:** 35’w x 35’d x 17’h octagon concrete spillway
2. **Operations:** One 2’ square LLO gate and one 8’w x 6’h MLO gate built into new spillway; automate operations
3. **Cote Lane Crossing:** New 14’ square concrete culvert
4. **Crest Elevation:** Regrade all low areas
5. **Embankment Improvements:** Sheetpile cutoff wall, US slope riprap, DS slope buttress, blanket & toe drain system, grass vegetation

Reach Specific Solutions



Reach C (Village)
Model Results

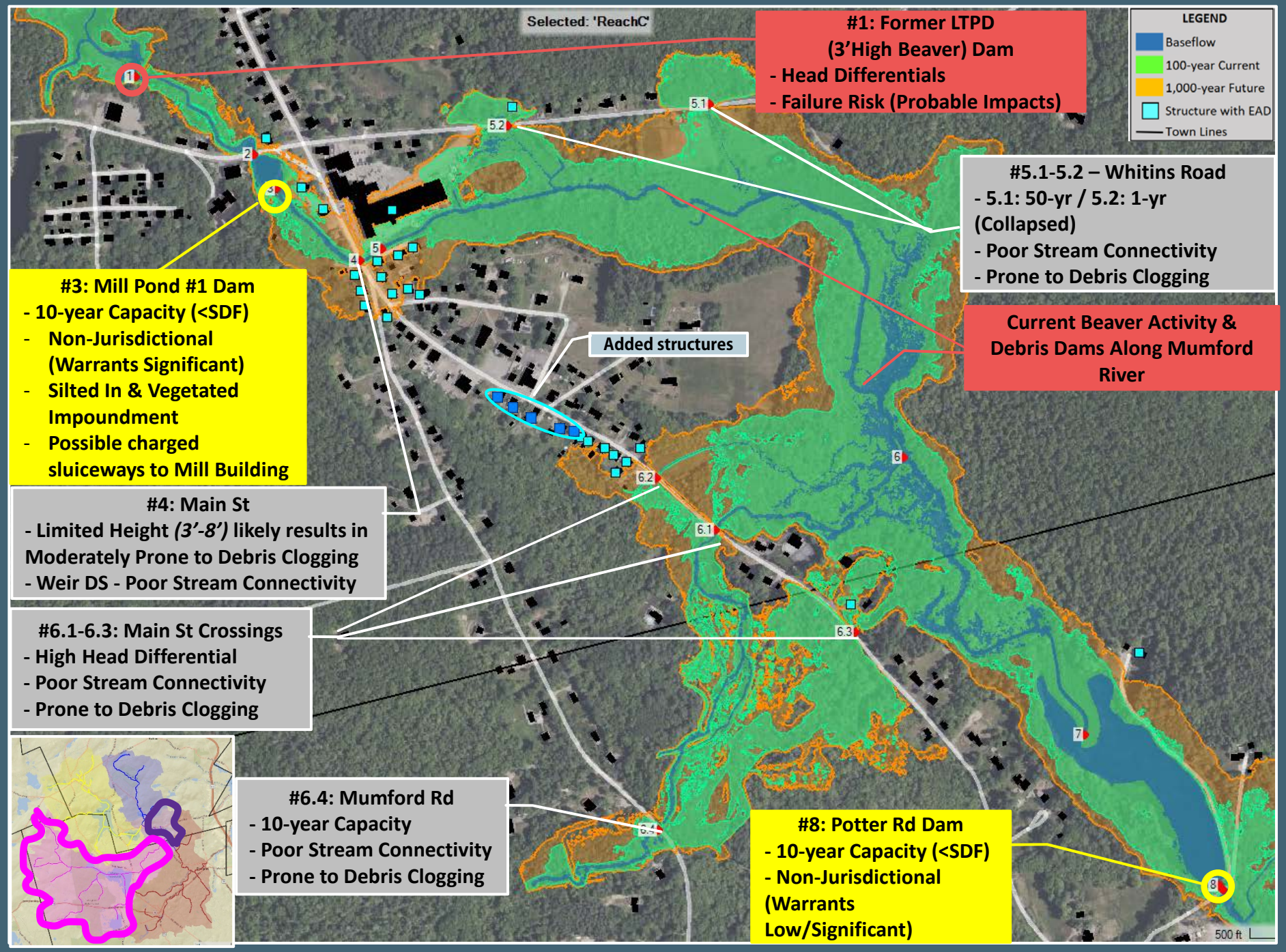
Beaver Activity
- #1 & Other Areas

Dams
- #3 Mill Pond Dam
- #8 Potter Road Dam

Roads
- #4 Main Street
- #9 Potter Road
- All 6 Tribs (3 Main Street, 2 Whitins Road, 1 Mumford Road)

Buildings
- 25 w/ potential for EAD
- + 5 from Mtg Input
- Mill Site #1

Reach Specific Solutions



Reach C (Village)
Solutions

Reach Specific Solutions

Beaver/River M&M

- Previously Discussed; #1, #4, & #5 Specifics

Dam Modifications

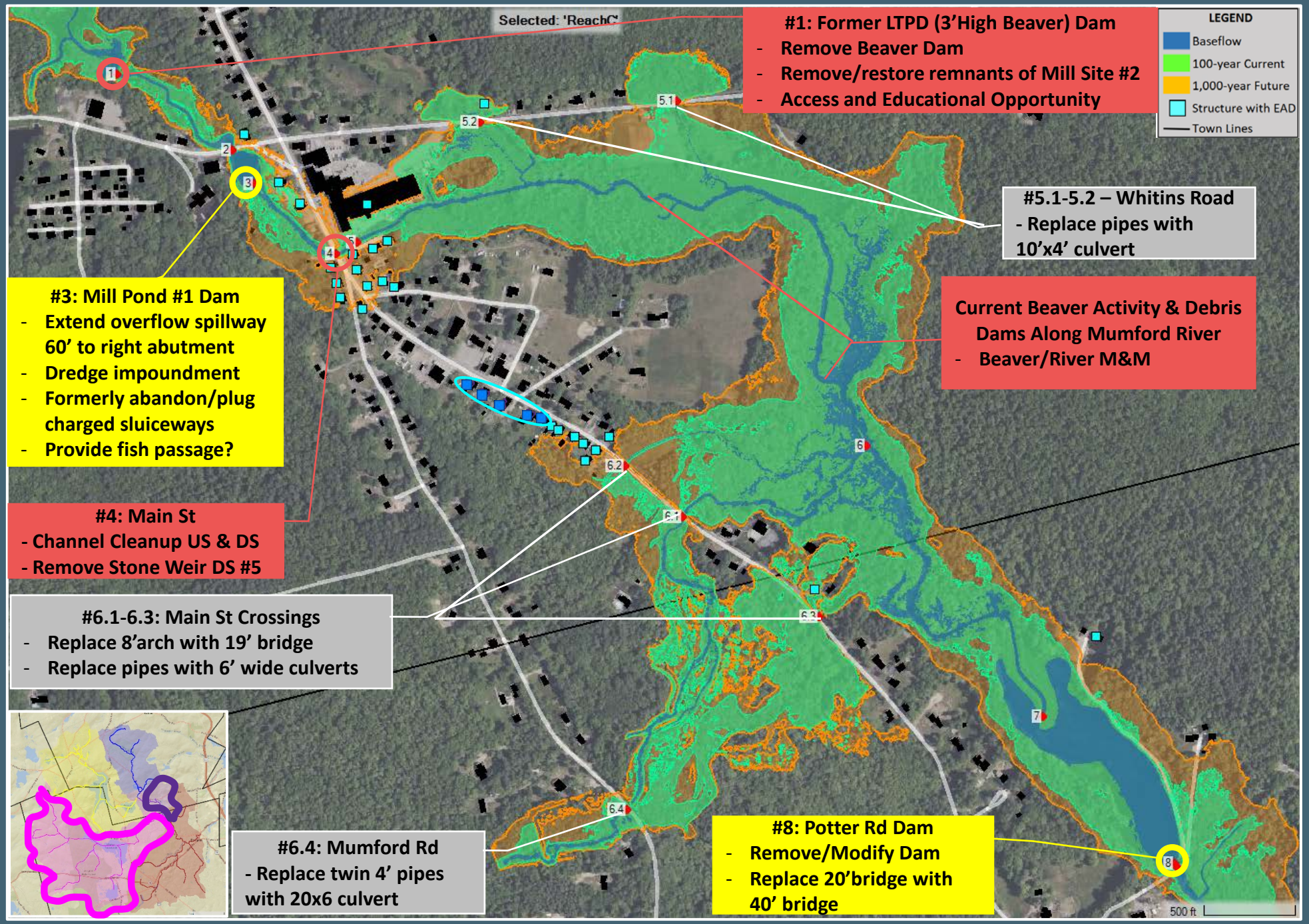
- #3: From 10 to 500
- #8: Removed / Modified

Culvert Replacements

- #5.1-5.2: From 1-50 to 1,000
- #6.1-6.3: From 50-200 to 1,000
- #6.4: From 10 to 500

Buildings

- Modifications at most 30



Reach C (Village)

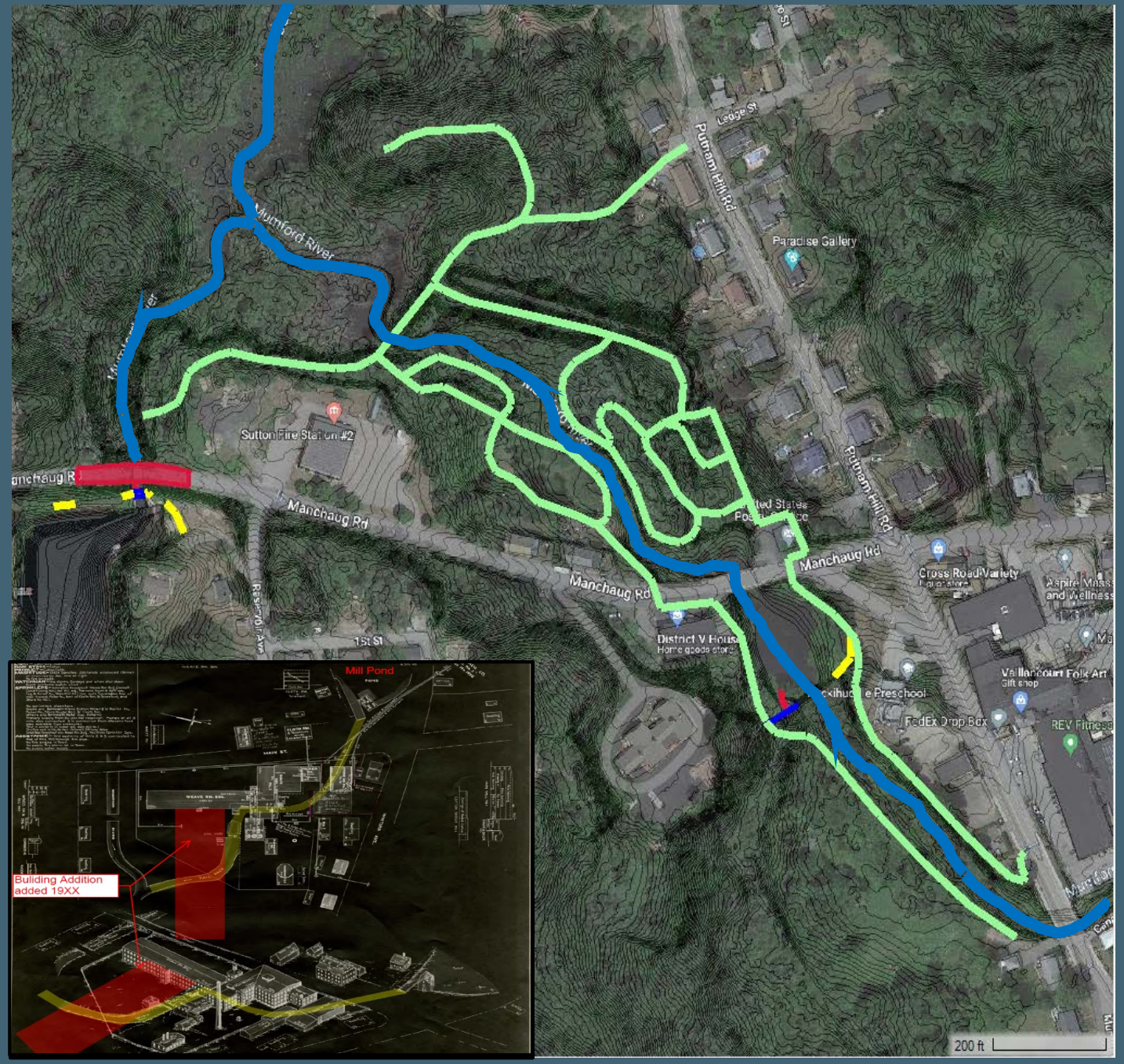
Mill Site Trails & Mill Pond Dam #1 Modifications

Mill Site Trails with Recreational, Educational, GSI

1. **Trails:** Establish trails with educational & recreational amenities throughout the historic mill sites
2. **Mill Site Restoration:** Restore certain features of Mill Sites #2 and #3 with educational amenities
3. **GSI:** Incorporate GSI along trails with educational amenities: Fire Station, Post Office, others

Mill Pond Dam #1 Modifications

1. **Extend "Waterfall Spillway":** Extend the waterfall spillway 60 feet right to the right abutment.
2. **Low Level Outlet (LLO) Controls:** Install new upward operating orifice gate; automate operations.
3. **Impoundment Dredging:** Dredge impoundment
4. **Abandon Sluiceway:** Formally plug/abandon sluiceway to Mill Building #1



Reach Specific Solutions

Reach D (Middle Mumford)

Model Results

Dams

- #5 Old Mill Pond Dam

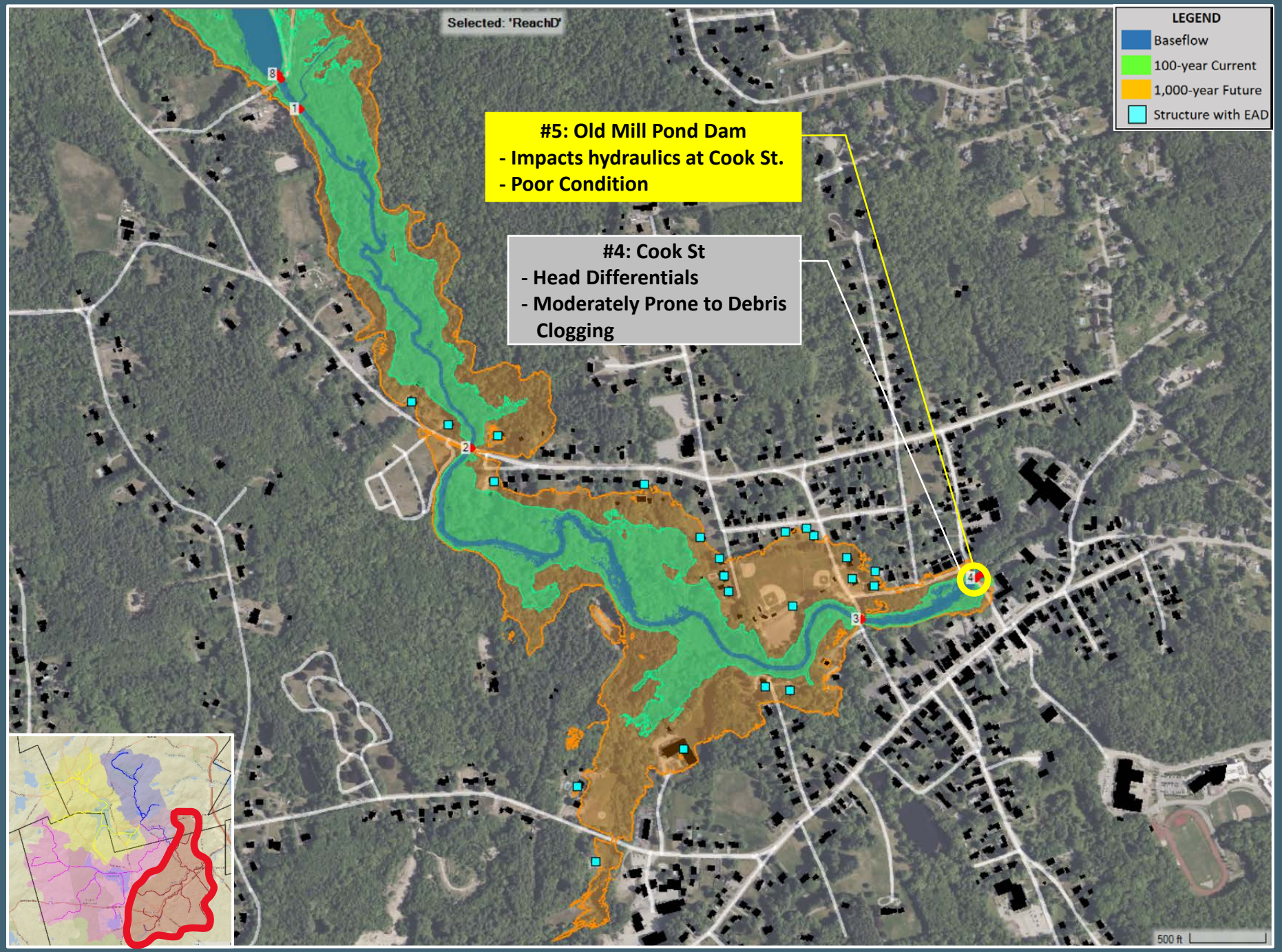
Roads

- #4 Cook Street

Buildings

- 22 with potential for EAD

Reach Specific Solutions



Merge and Recap of Solutions

Potential Flood Damage Reduction / Mitigation Solution Concepts - Mumford River & Dark Brook Watershed

#	Location				Action Item	Capacity - Current		Capacity - CCIPF		Estimate Range ($K's)		Potential Funding
	Reach	#	Name	Owner		EC	PC	EC	PC	Lower	Higher	
1	All	-	Watershed Wide	Private, Town, State	Emergency Action Plan	-	-	-	-	$ 50	$ 75	EOEEA, FEMA
2	All	-	Watershed Wide	Private, Town, State	Land Cover Preservation	-	-	-	-	$ 50	$ 150	EOEEA, FEMA
3	All	-	Watershed Wide	Private, Town, State	Land Cover Conversion	-	-	-	-	$ 200	$ 1,000	EOEEA, FEMA
4	All	-	Watershed Wide	Private, Town, State	Green Stormwater Infrastructure	-	-	-	-	$ 100	$ 5,000	EOEEA, FEMA
5	All	-	River Wide	Private, Town, State	Beaver Dam and River Debris Removal, Monitoring & Maintenance (M&M)	-	-	-	-	$ 750	$ 2,500	MADER, NOAA
6	A	-	Reach A Buildings	Private	Building Modifications (58EA)	1	-	1	-	$ 1,000	$ 2,500	FEMA
7	B	-	Reach B Buildings	Private	Building Modifications (37EA)	1	-	1	-	$ 500	$ 1,000	FEMA
8	C	-	Reach C Buildings	Private	Building Modifications (30EA)	10	-	5	-	$ 400	$ 800	FEMA
9	B	11.2&11.3	Upper Tucker Pond (UTP) East and South Dams	Private, State	Hazard Reclassification, Spillway Design Flood (SDF) Modifications & Operational Plan	5	>1/2 PMF	2	>1,000	$ 6,000	$ 9,000	EOEEA, FEMA
10	A	11.2	Stevens Pond Dam (SPD)	Town	SDF Modifications & Operational Plan	>1,000	>1/2 PMF	200	>1,000	$ 2,000	$ 3,000	EOEEA, FEMA
11	A	10.2	Manchaug Pond Dam (MPD)	Town	SDF Modifications & Operational Plan	>1,000	>1/2 PMF	500	>1,000	$ 1,500	$ 2,500	EOEEA, FEMA
12	B	13	Putnam Hill Road	State	Crossing Replacement	10	200	5	50	$ 1,500	$ 2,500	MADER
13	B	9	Putnam Hill Road	State	Crossing Replacement	25	100	10	25	$ 1,500	$ 2,500	MADER
14	B	10	Tucker Lane Channel	Private	Channel and Floodplain Regrading Upstream of Crossing	5	100	2	50	$ 500	$ 1,000	MADER, NOAA
15	A	1-7.1	Crossings US of SFPD	Town, Private	Crossing Replacements (11EA)	5-25	100	2-10	25-50	$ 6,000	$ 12,000	MADER
16	C	1	Mill #2 Site	Town, Private	Floodplain Restoration at Mill #2 Site	-	-	-	-	$ 500	$ 1,000	EOEEA, MADER
17	C	3	Mill Pond Dam #1	Private	Modifications at Mill Pond Dam #1	10	500	5	100	$ 1,000	$ 1,500	EOEEA
18	C	5	Channel Weir	Private	Remove Weir and Restore Channel	-	-	-	-	$ 50	$ 100	MADER, NOAA
19	A	9	Sutton Falls Pond Dam (SFPD)	Private	SDF Modifications & Operational Plan	10	500	5	100	$ 1,500	$ 2,500	EOEEA, FEMA
20	C	5.2	Whitins Road	Town	Crossing Replacement	1	>1,000	<1	1,000	$ 1,000	$ 1,500	MADER
21	C	5.1	Whitins Road	Town	Crossing Replacement	50	>1,000	25	1,000	$ 1,000	$ 1,500	MADER
22	C	6.1-6.3	Main Street	State	Crossing Replacements (3EA)	50-200	1,000	25-50	500	$ 2,500	$ 4,000	MADER
23	A	11.2	Manchaug Road	Town	Crossing Replacement	-	-	-	-	$ 2,500	$ 4,500	MassDOT, MADER
24	C	8-9	Potter Road Dam & Bridge	Town, Private	Dam Removal/Modification and Crossing Replacement	10	200	5	50	$ 2,000	$ 4,000	EOEEA, MADER, MassDOT
25	C	6.4	Mumford Street	Town	Crossing Replacement	10	500	5	100	$ 1,500	$ 2,500	MassDOT,MADER
26	D	-	Reach D Buildings	Private	Building Modifications (22EA)	200	-	50	-	$ 300	$ 500	FEMA
										$ 36	$ 69	$M's
										$ 35,900,000	$ 69,125,000	$

Channel / Ecosystem Restoration
Infrastructure Upgrade with Ecosystem Benefit
Dam Modifications
Structure Floodproofing

Next Steps:

- ❑ Refine solutions based upon feedback
- ❑ Resiliency Action Plan Report – Draft
  - Available to Public – May 22nd Target date
  - Public Comment Period Until – May 31st
- ❑ Select Board Meeting – Present Draft of Action Plan
  - June 6th, 6:00pm, Sutton Town Hall
- ❑ Resiliency Action Plan Report – Finalized
  - June 30th

Contact Information:

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Discussion