# Wachusett Reservoir
# Direct Discharge Remediation

*DCR Cooperative projects with MassDOT*

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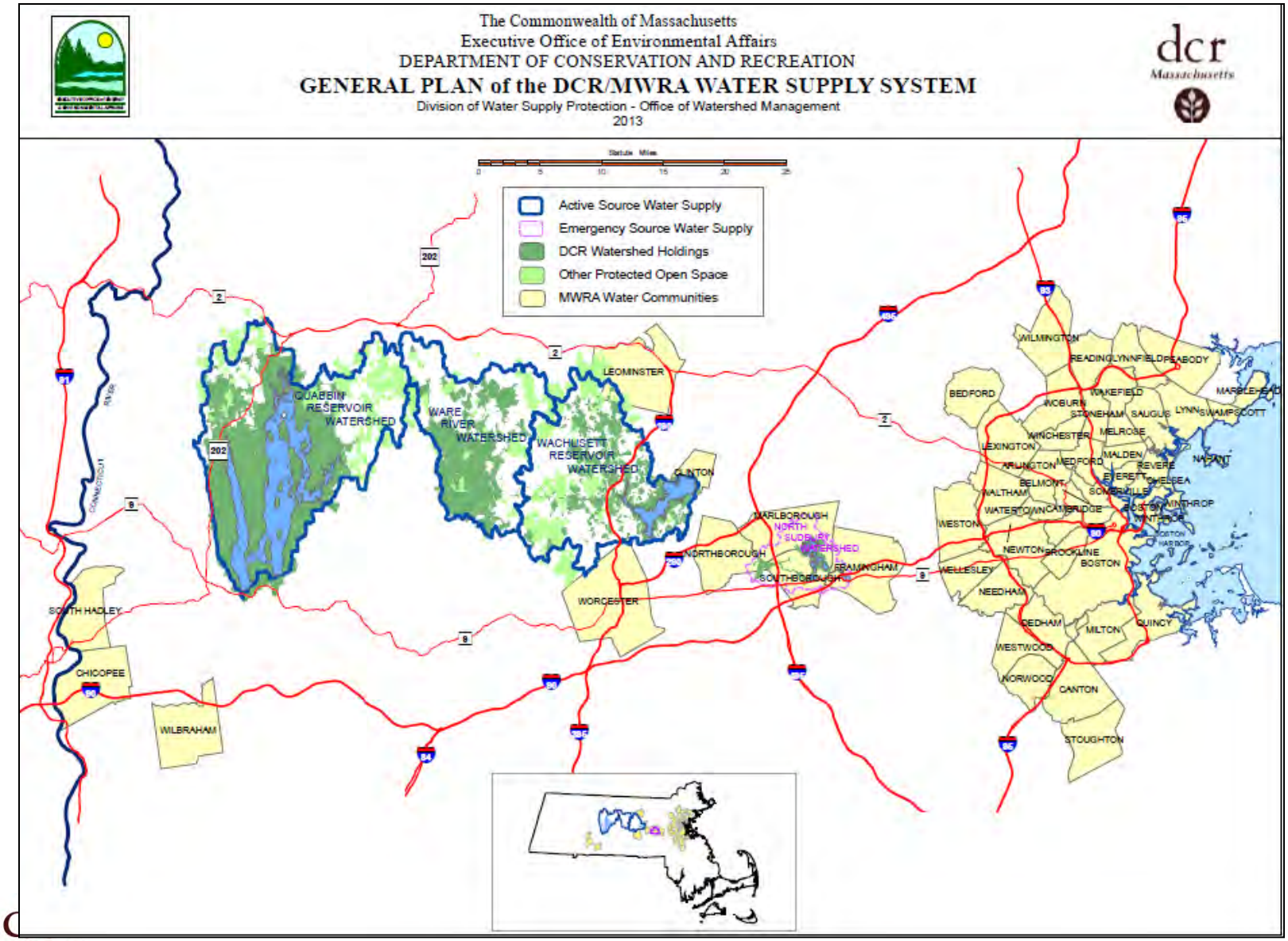


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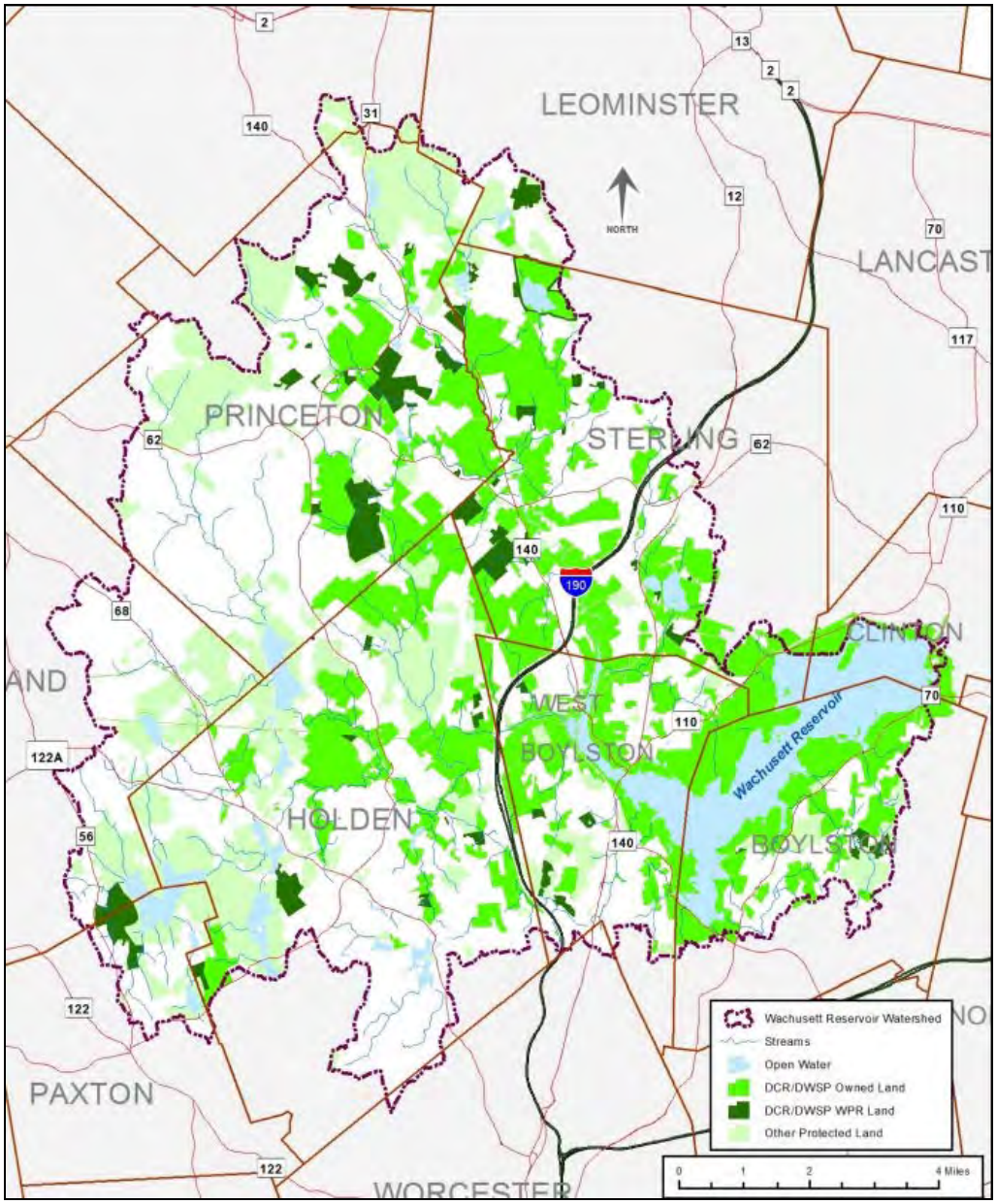
# Wachusett Watershed

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# DCR ongoing relationship with MassDOT

- Worked with DOT for many years
- Small Projects and retro fits to larger drainage projects

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# Smaller Projects

- Review of bridge reconstruction, drainage alterations
- Road resurfacing – opportunities for drainage improvements
- Guard rail replacements for increased security

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# Major Project

## Direct Discharges from State Highways into Wachusett Reservoir

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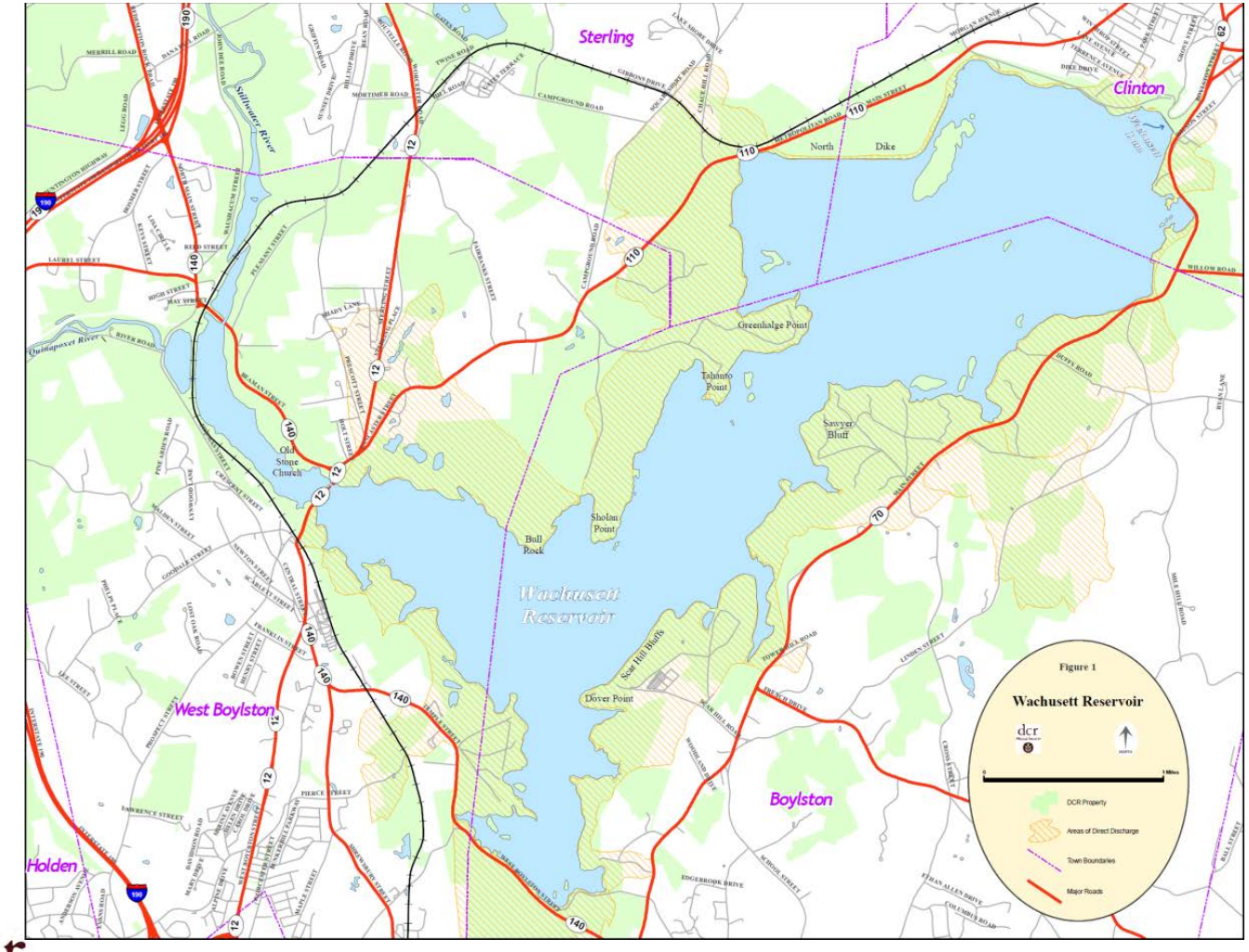
# Problem – Wachusett Reservoir is surrounded by major roads

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# Direct discharge

Location where runoff is directed to the reservoir, through a pipe or other structure

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# Water Quality Threat -Spills

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# Water Quality Threat -Stormwater

*Stormwater pollutants*

- *Bromide*
- *Cyanide*
- *Sodium, Calcium*
- *Chloride*
- *Sulphate*
- *Petroleum*
- *PCBs, pesticides*
- *Pathogenic bacteria*
- *Rubber*
- *Asbestos Particulates*
- *Nitrogen, Phosphorus*
- *Lead*
- *Zinc*
- *Iron*
- *Copper*
- *Cadmium*
- *Chromium*
- *Nickel*
- *Manganese*

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Stormwater runoff

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# DCR assessment (2008)

- 50 discharge locations
- Priority for treatment/removal
- Initial recommendations
- Rough cost estimate $2.7 million

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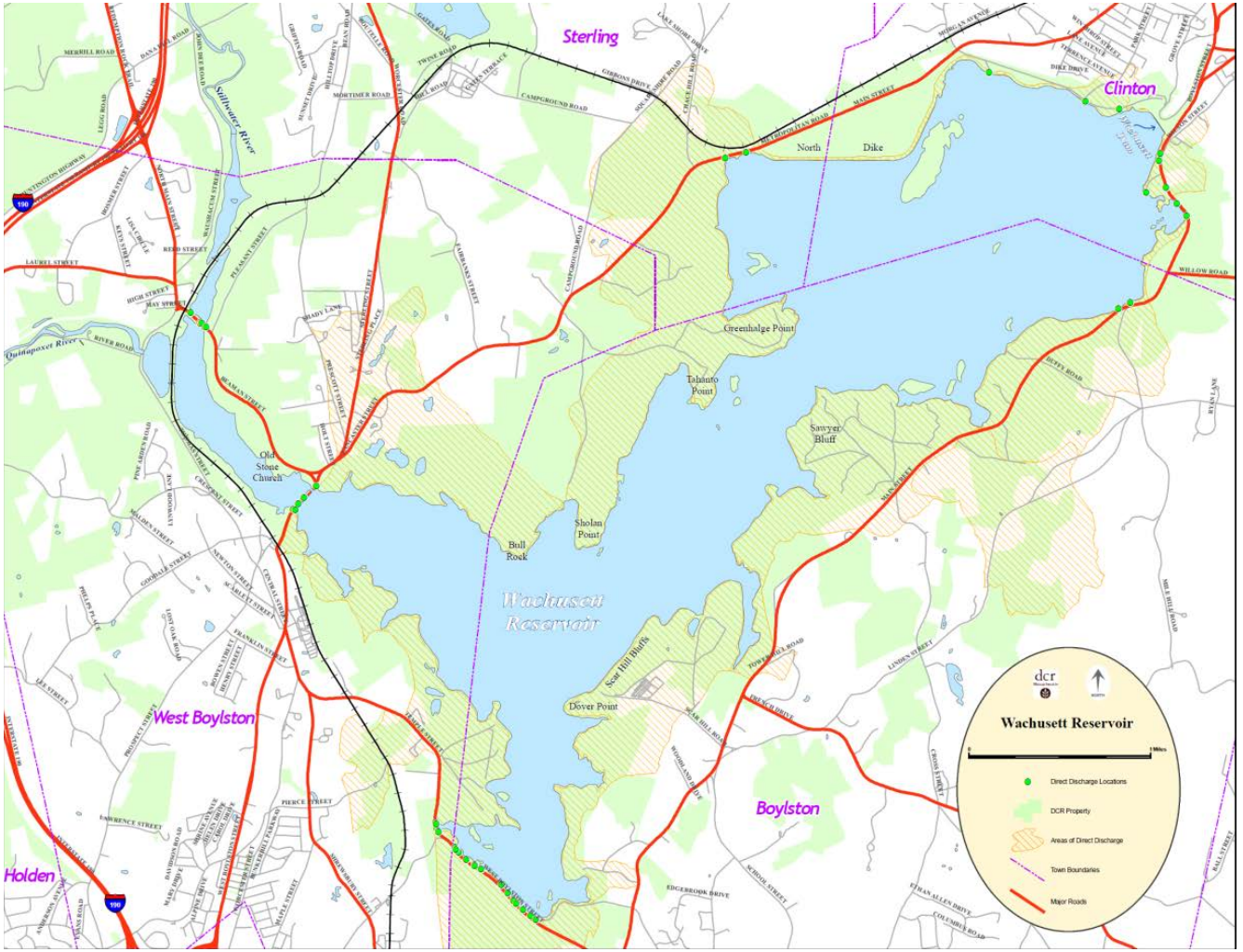
# 50 Direct Discharges surrounding the reservoir

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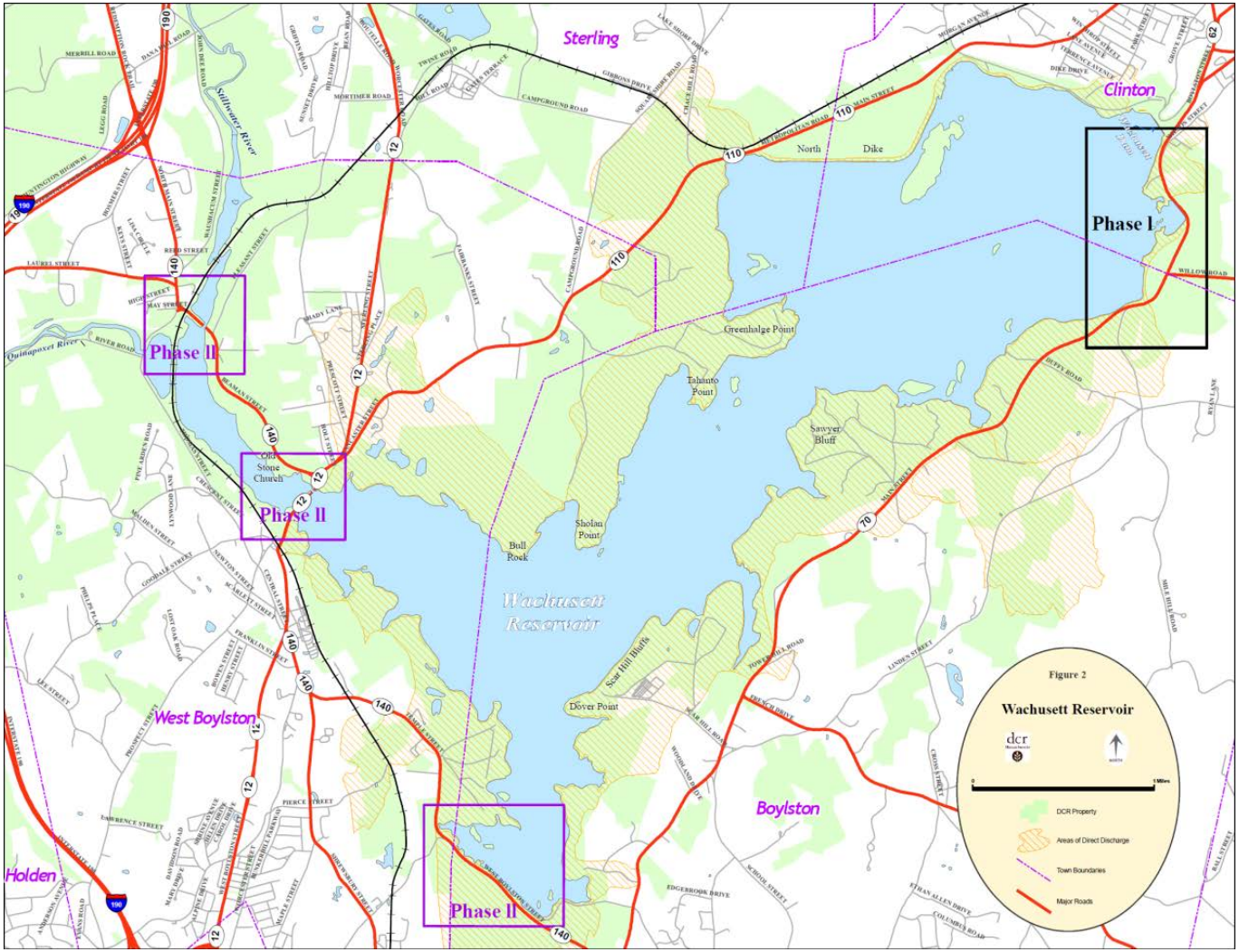
# Project Phases

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# Phase I

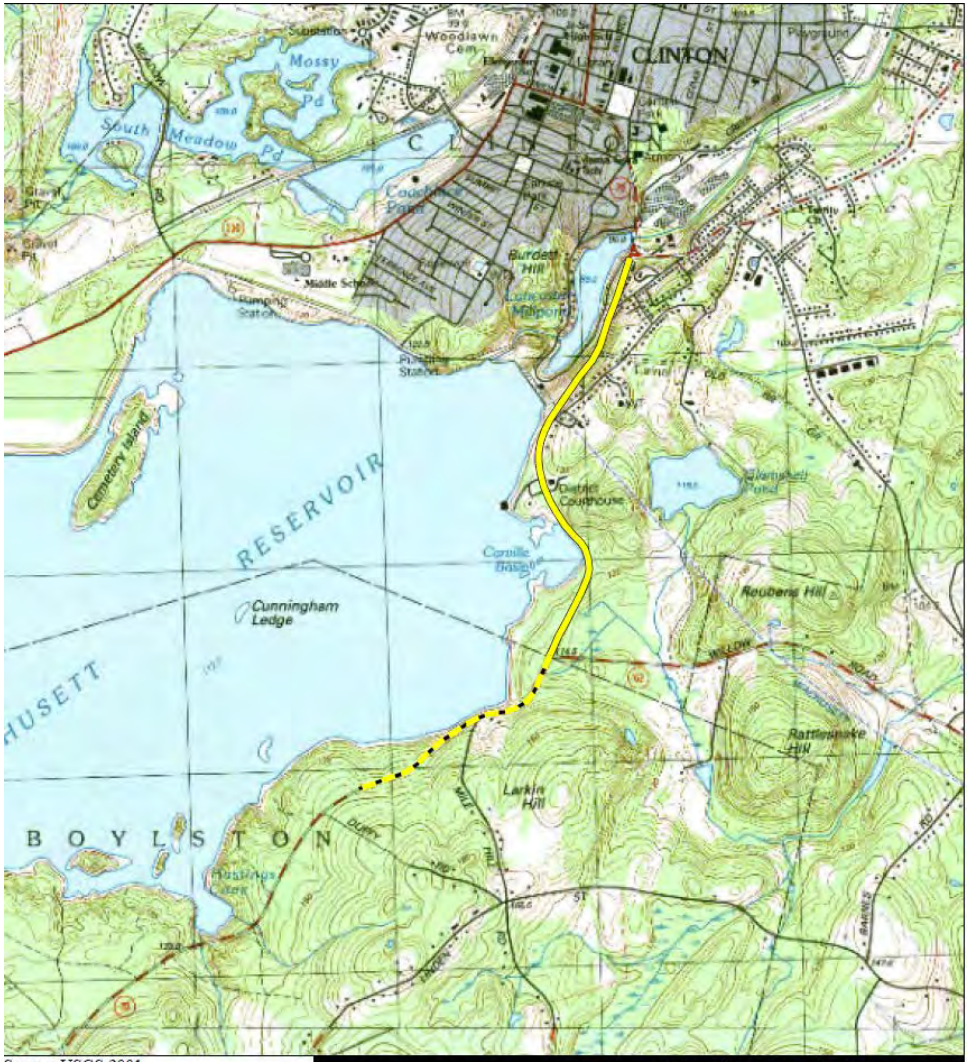


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FIGURE 1
Site Location Map

Discharge Elimination Project
Route 62 and 70
Clinton and Boylston, MA

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Project Areas Extended beyond watershed divide to dam entrance at bottom of hill to address drainage problems

# Phase I Stormwater Management *before* -
## Combined roadway and wooded area runoff

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# Phase I Stormwater Management *before*
# Direct Discharge to the Reservoir

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# Phase I Stormwater Management- *before*

-collected in basin prior adjacent to the reservoir

- discharge of stormwater to the reservoir via overland flow and groundwater discharge

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# Stormwater Management *before*

## Absence of roadway berm or curb

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# Stormwater Management *before*

Inadequate drainage infrastructure in the Wilson Street area

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# Stormwater Management *before*

Boylston Street in Clinton – steep section with inadequate drainage facilities

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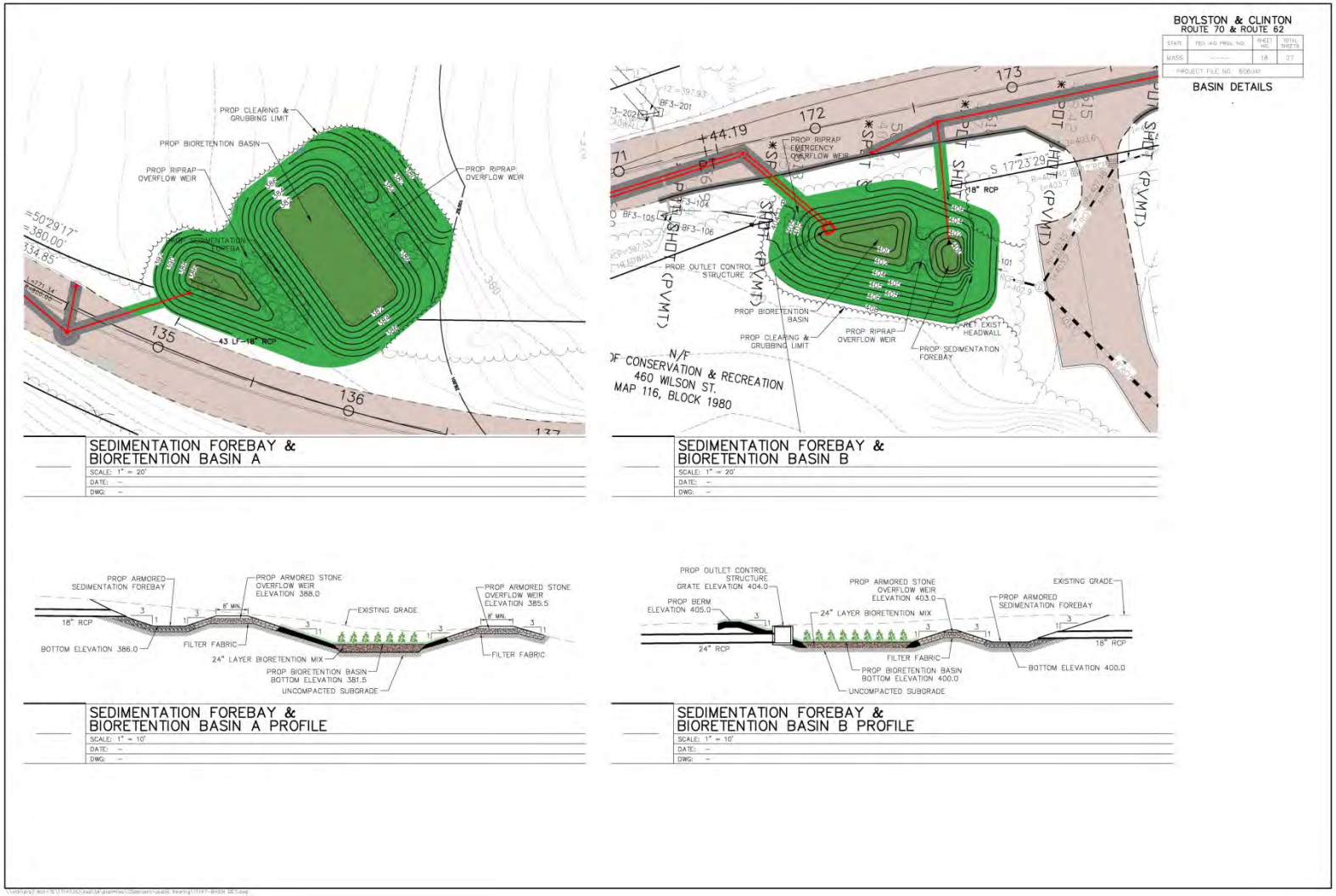
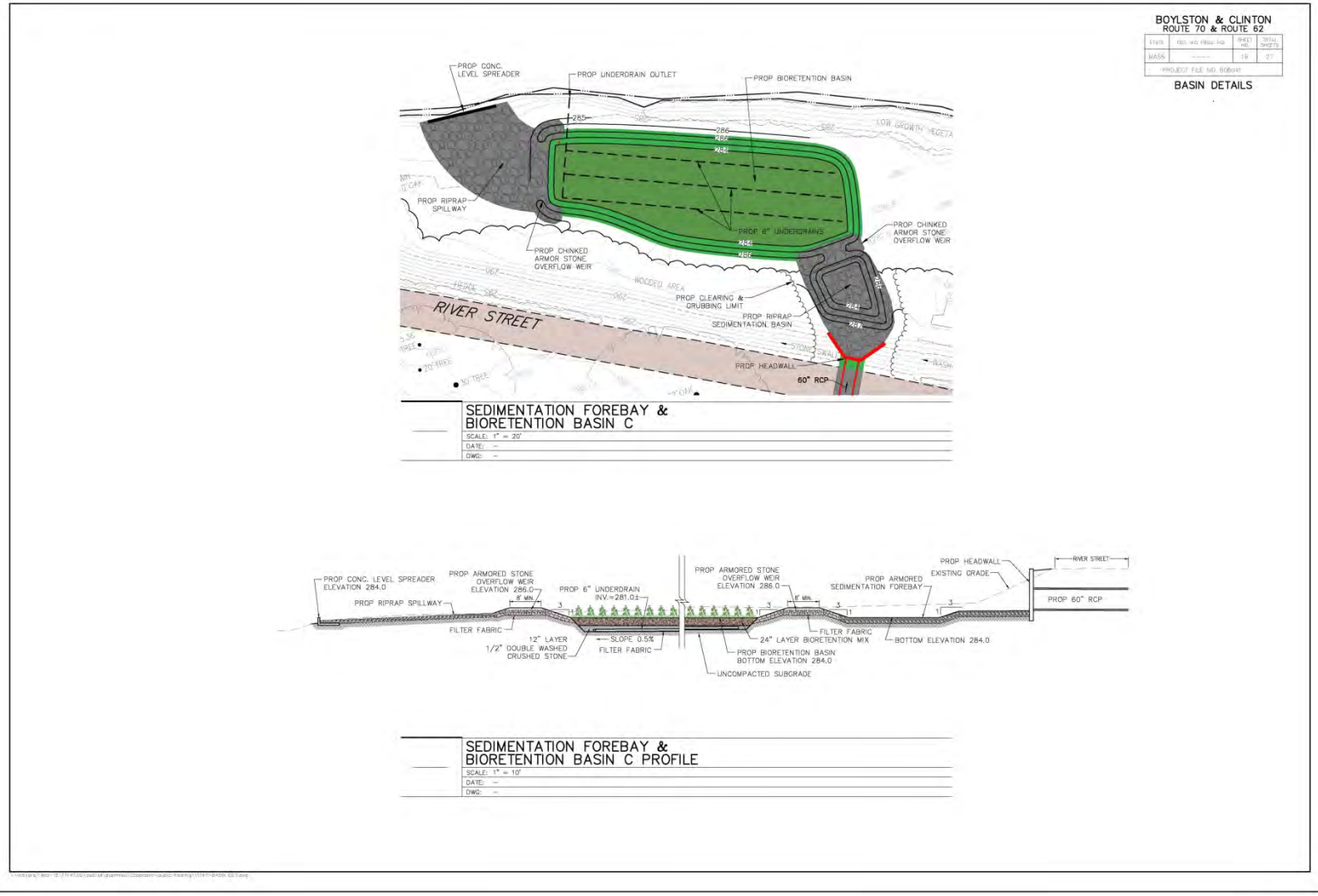
# Boylston & Clinton Bioretention Areas



# Clinton – Lower Bioretention Area



# Phase I Project

- Design $190K - DCR
- Construction - MassDOT
  - Estimated $2.3 M
  - Bid $1.9M (81% estimate)
  - Complete Fall 2012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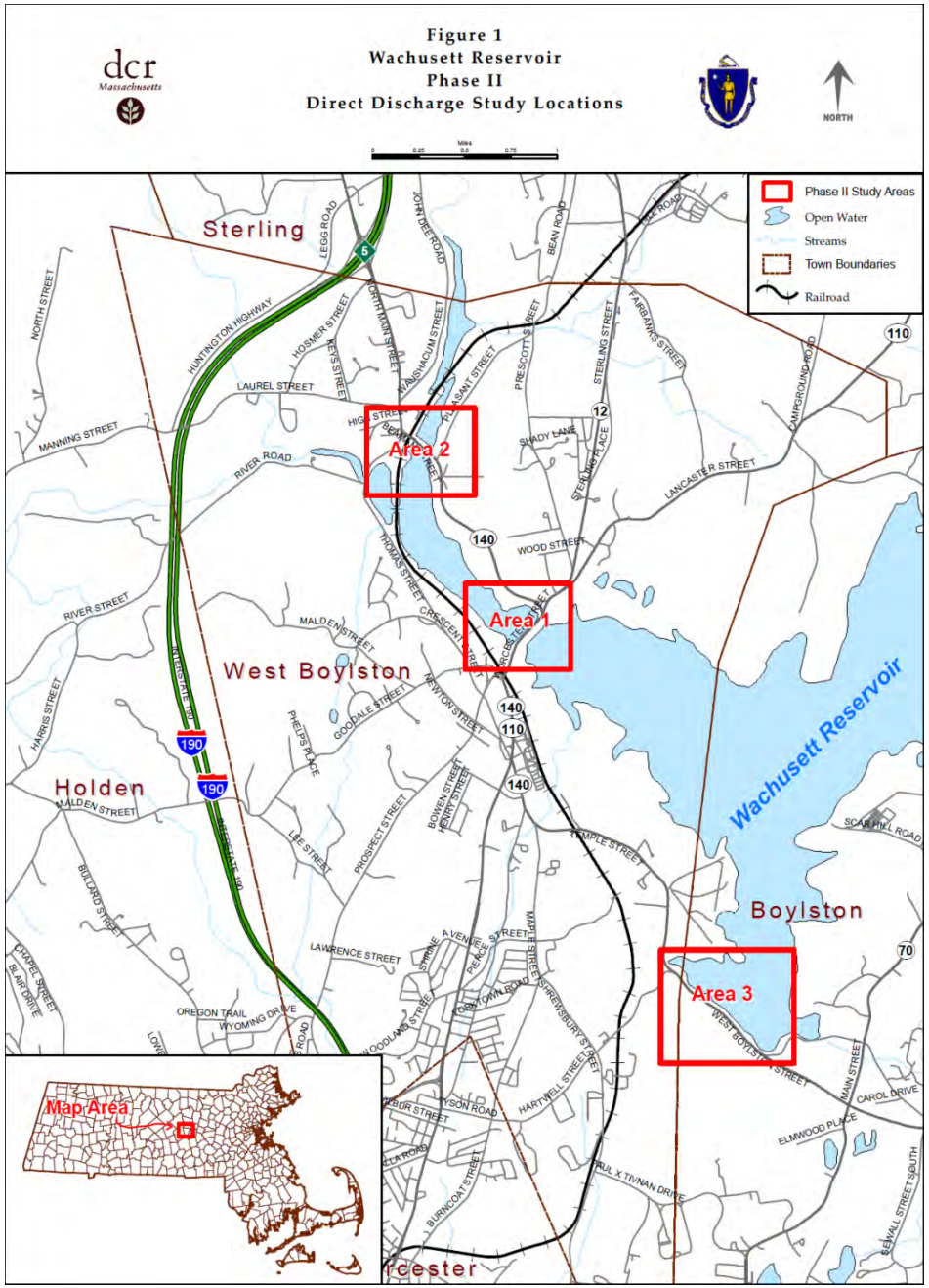
# Phase II Project

- DCR issued contract for conceptual drainage alternatives and recommendations ($38,000)
- Identify, assess, and develop cost estimates for scenarios that remove or treat storm water drainage and potential releases from 3 area
  - Multiple options for each site
- Rank



# Route 12/140 Causeway – Existing Conditions

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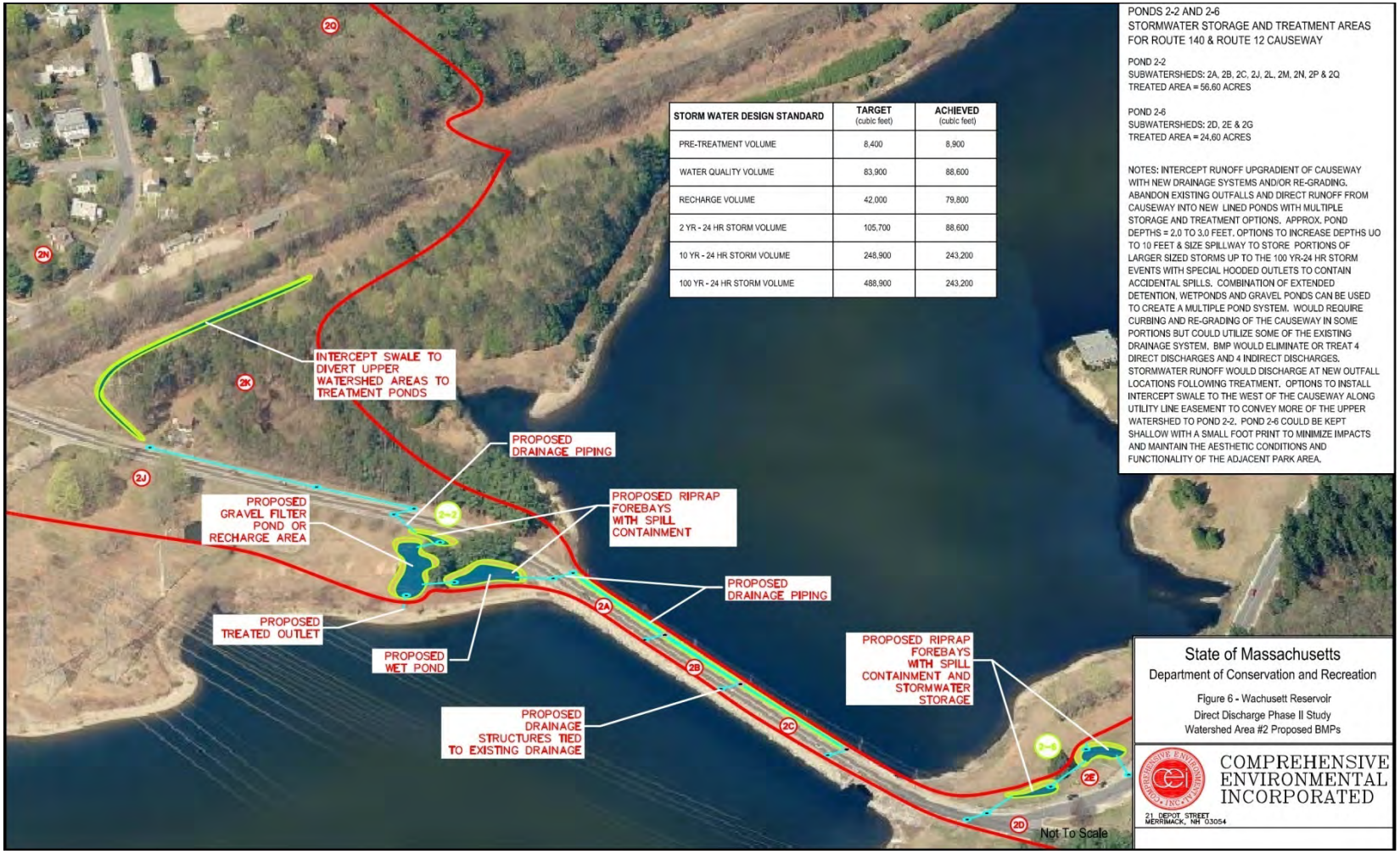
# Route 12/140 Causeway – Proposed

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# Beaman Street Bridge – Existing Conditions

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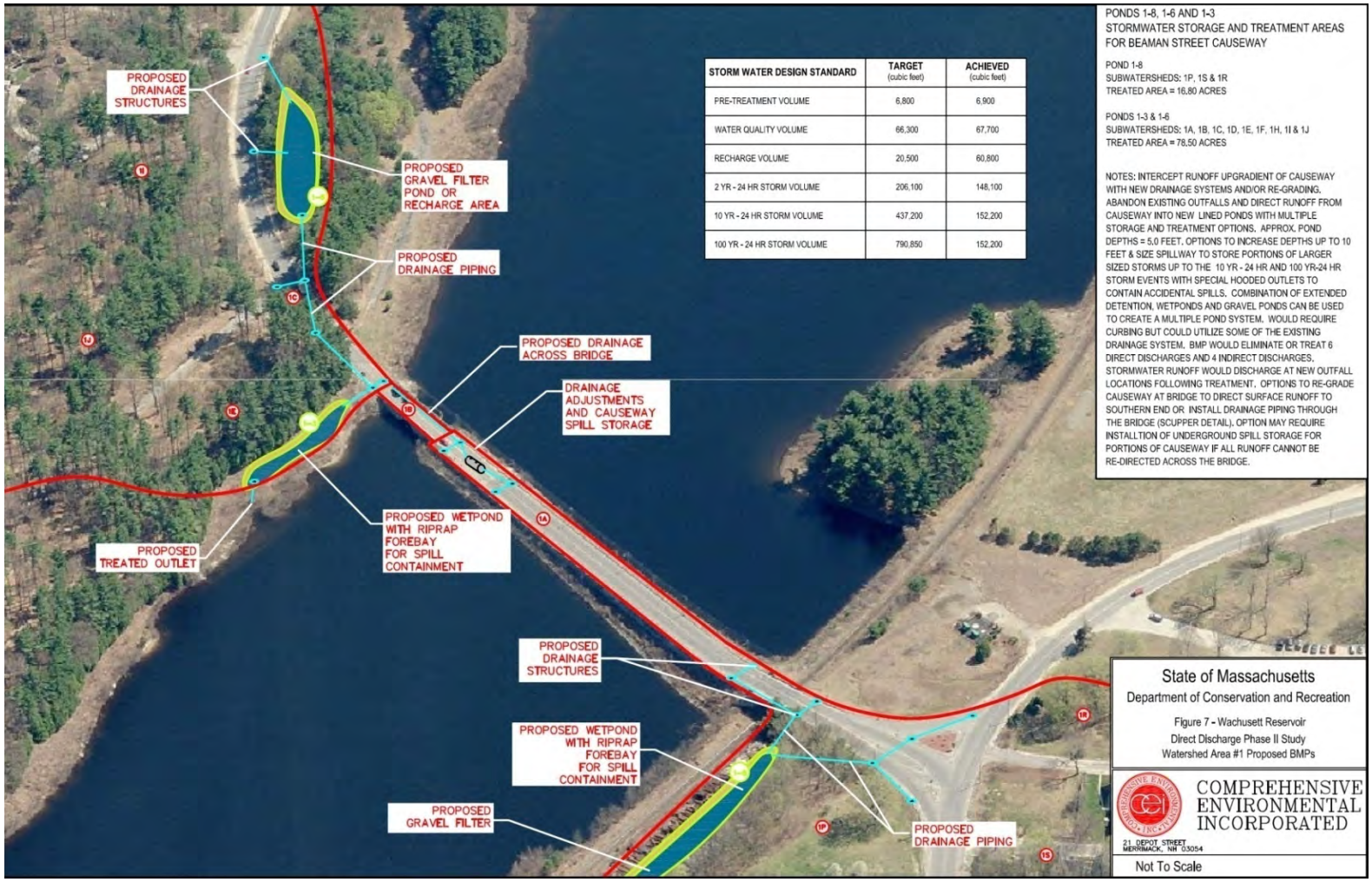
# Beaman St. Bridge - proposed




| STORM WATER DESIGN STANDARD | TARGET (cubic feet) | ACHIEVED (cubic feet) |
|---|---|---|
| PRE-TREATMENT VOLUME | 6,800 | 6,900 |
| WATER QUALITY VOLUME | 66,300 | 67,700 |
| RECHARGE VOLUME | 20,500 | 60,800 |
| 2 YR - 24 HR STORM VOLUME | 206,100 | 148,100 |
| 10 YR - 24 HR STORM VOLUME | 437,200 | 152,200 |
| 100 YR - 24 HR STORM VOLUME | 790,850 | 152,200 |

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# South Bay – Existing Conditions

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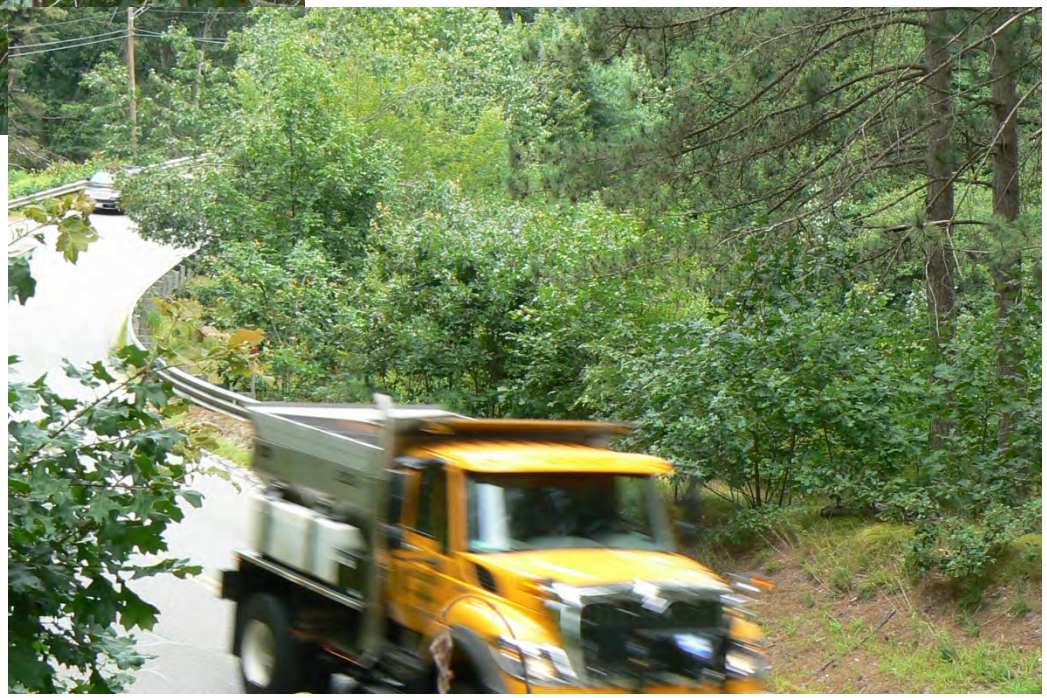
# South Bay
# Existing Conditions

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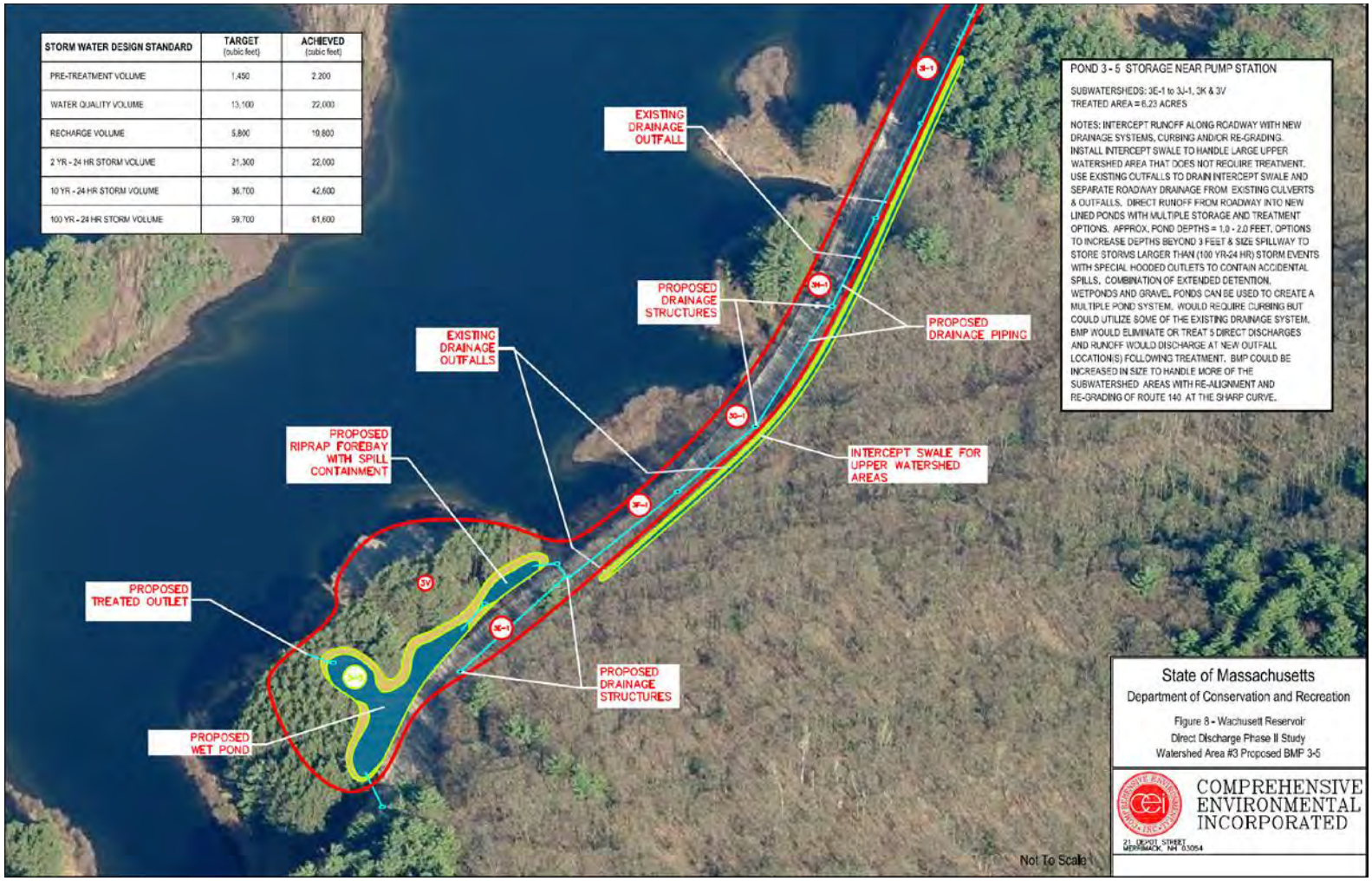
# South Bay – Proposed

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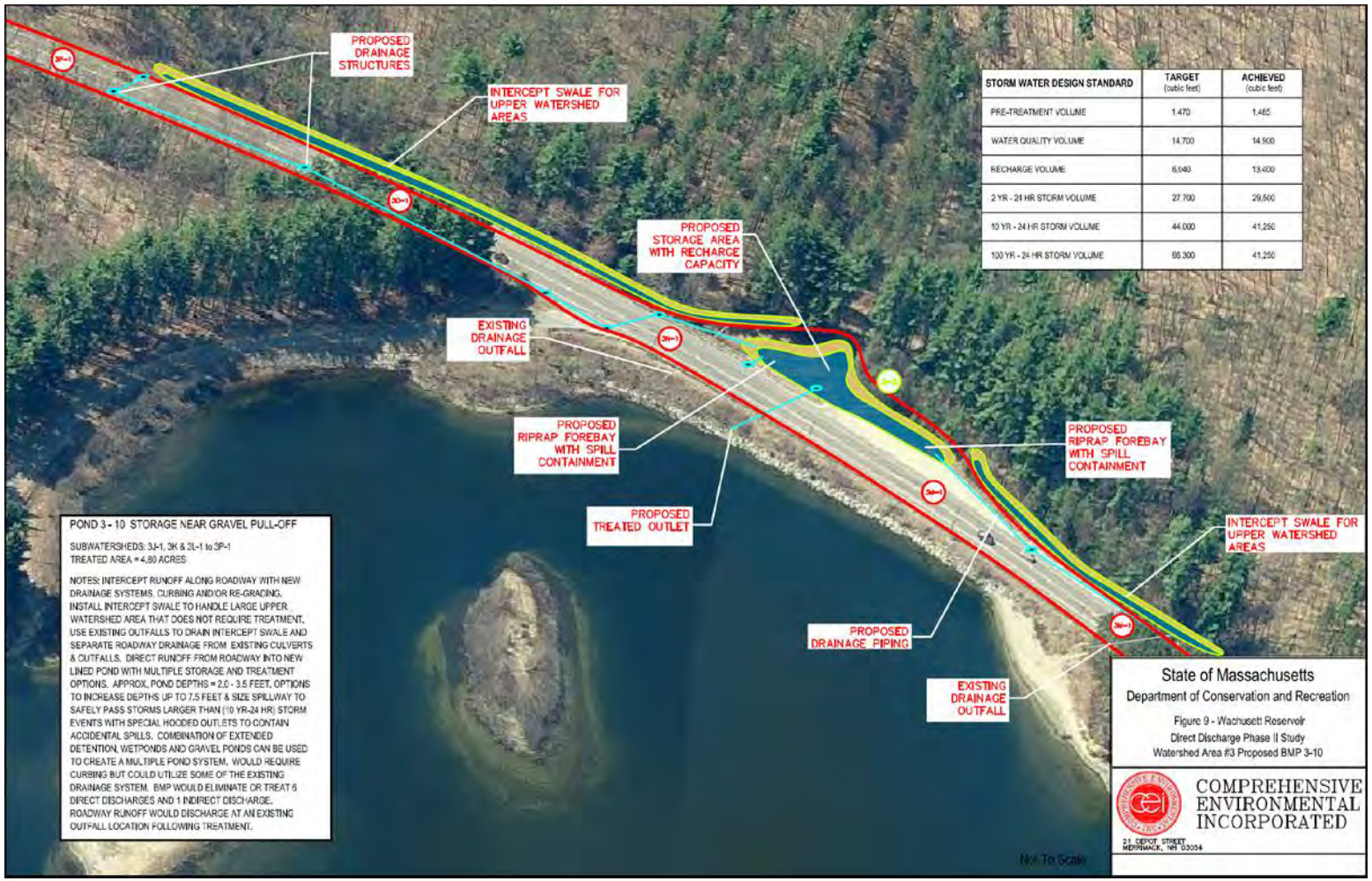
# South Bay – Proposed

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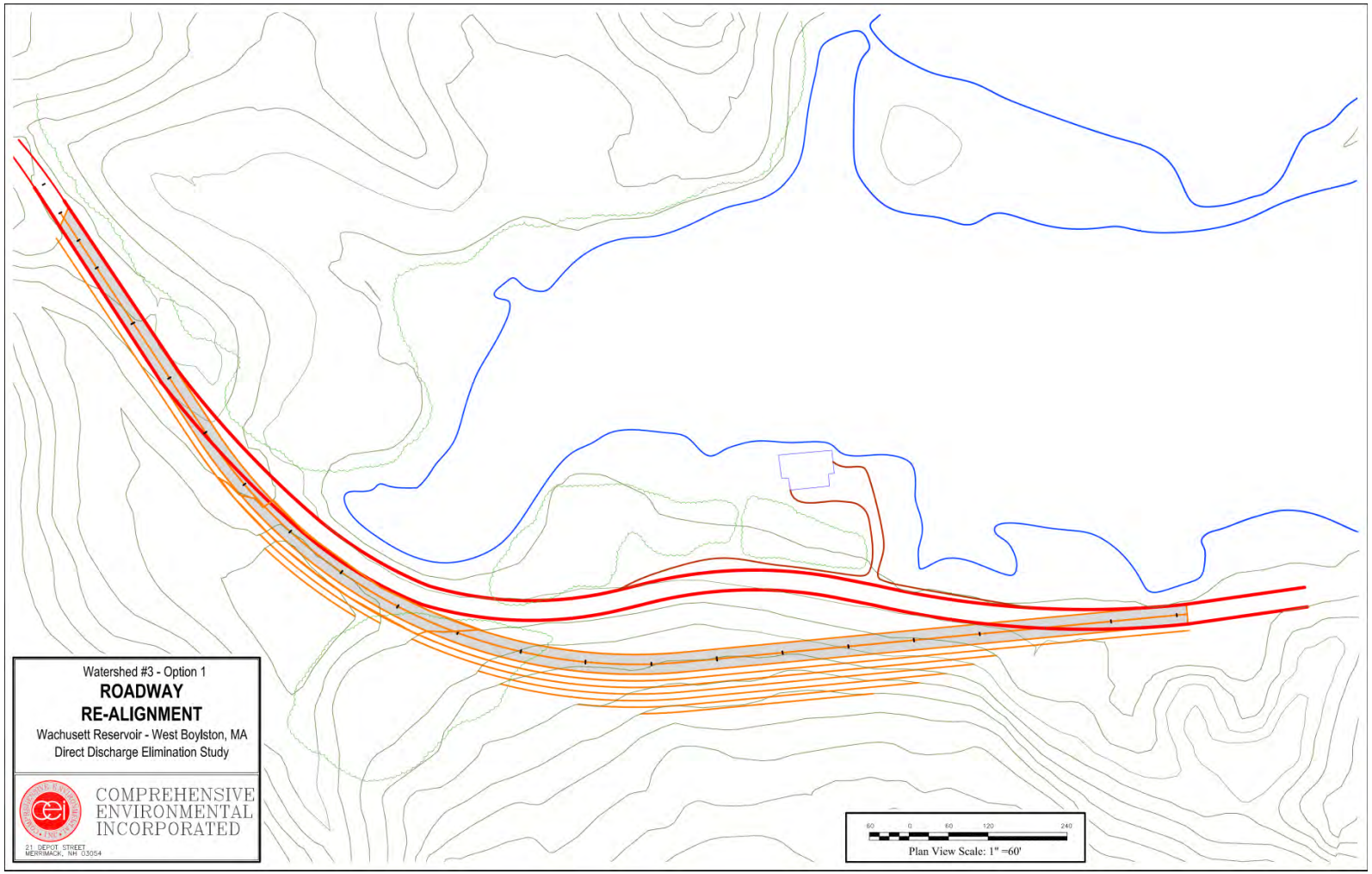
# South Bay – Proposed Road Re-alignment

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# Implementation Planning & Phasing – Cost Estimates

| | Cost | | | |
|---|---|---|---|---|
| | Design | Construction | Total | |
| Pond - Causeway (2-2) | | | $454,000 | |
| Pond – Causeway (2-6) | | | $164,000 | |
| TOTAL CAUSEWAY IMPROVEMENTS | | | | $614,000 |
| Pond Beaman St. Bridge (1-8) | | | $141,000 | |
| Pond NW end South Bay | | | $692,000 | |
| Feasibility/Engineering Study Bridge Redesign | $60,000 | | | |
| Feasibility/Engineering Study Road Realignment | $600,000 | | | |
| Bridge reconstruction | | $240,000 | $300,000 | |
| Road Realignment | | $2,400,000 | $3,000,000 | |
| Ponds – Beaman St (1-6, 1-3) | | | $341,000 | |
| Pond SE end of South Bay (3-10 | | | $356,000 | |
| TOTAL | | | $5,500,000 | |

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# Phase II Estimated - Spill Storage & Pollutant Removal

| BMP | Spill Vol. (cu ft) | TSS (#/yr) | TP (#/yr) | TN (#/yr) |
|---|---|---|---|---|
| Rt. 12/140 Causeway | 30,000 | 65,000 | 63 | 264 |
| Beaman St. Bridge | 30,000 | 50,500 | 27 | 214 |
| South Bay | 20,000 | 29,700 | 7 | 45 |
| TOTAL | | 145,200 | 97 | 523 |

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# Lessons Learned

- Communication is big
- Start early
- Look at small items that can be incorporated into projects already being planned
- Be creative (we allowed treatment to be built on our properties and assumed maintenance)

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# Questions?

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