Scituate Reservoir Dam Water Storage and Fish Passage Improvements Project

January 15, 2019 Public Meeting

Project Team

TETRA TECH

CORONA ENVIRONMENTAL CONSULTING

TOWN OF SCITUATE MASSACHUSETTS INCORPORATED 1636 SATUIT

NSRWA nsrwa.org

MassBays NATIONAL ESTUARY PROGRAM

Project Goals

Increase Scituate's Drought Resiliency

Provide adequate seasonal stream flow for native aquatic species

Effectively operate fish ladders to restore the herring run

Previous Studies 2011 - 2017

- 2011 Water Evaluation and Planning (WEAP) modeling
  Leads to streamflow releases, irrigation restrictions

- 2012 Preliminary Assessment
  Id Reservoir options; OOB fishway repair design

- 2013 Reservoir and Fish Ladder Improvement Feasibility Study
  Investigated feasibility/impacts of raising reservoir
  Repaired Old Oaken Bucket fish ladder

- 2014 Preliminary Reservoir and Fish Ladder Design (30%)

- 2017 60% Design and Initial Permitting

2018-2019 – 90 % Design and Permitting

- Environmental Impact Report
- 90% Design Drawings and Specifications
- Permit Applications
- Operating and Maintenance Manual

Future Phase - Bid and Construction

- Bid Requirements
- 100% Design Drawings and Specifications
- Construction and As-built Drawings

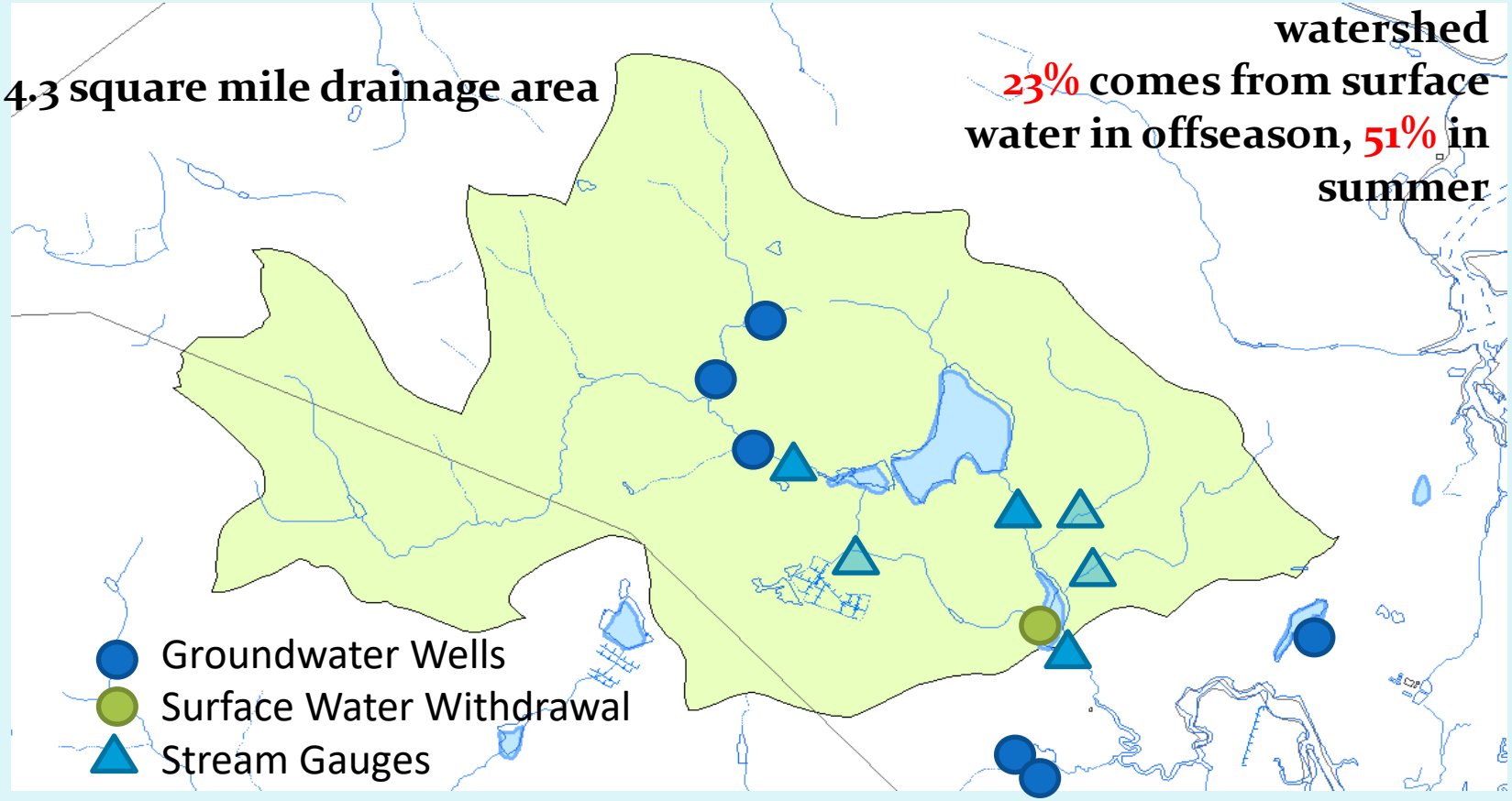
First Herring Brook Watershed and Water Supply

Current avg. winter demand is 1.26 mgd
Unrestricted summer demand in past has been up to ~2x

~73% of water supply for Scituate comes from the First Herring Brook watershed

4.3 square mile drainage area

23% comes from surface water in offseason, 51% in summer



Proposed Reservoir Dam Modifications

Raise maximum normal pond levels to El. 40.4 ft

- 1.5 ft above existing spillway crest (El. 38.9 ft)
- 23% increase in storage capacity; 108.8 ac-ft (35.4 million gallons)
- Same level as existing high water
- Minimal change in typical spring levels (12 inches ± above spillway crest)

Lower spillway crest 2.5 ft and install bottom-hinged gate

- No reduction in spillway capacity
- Automatic gate control from Water Treatment Plant

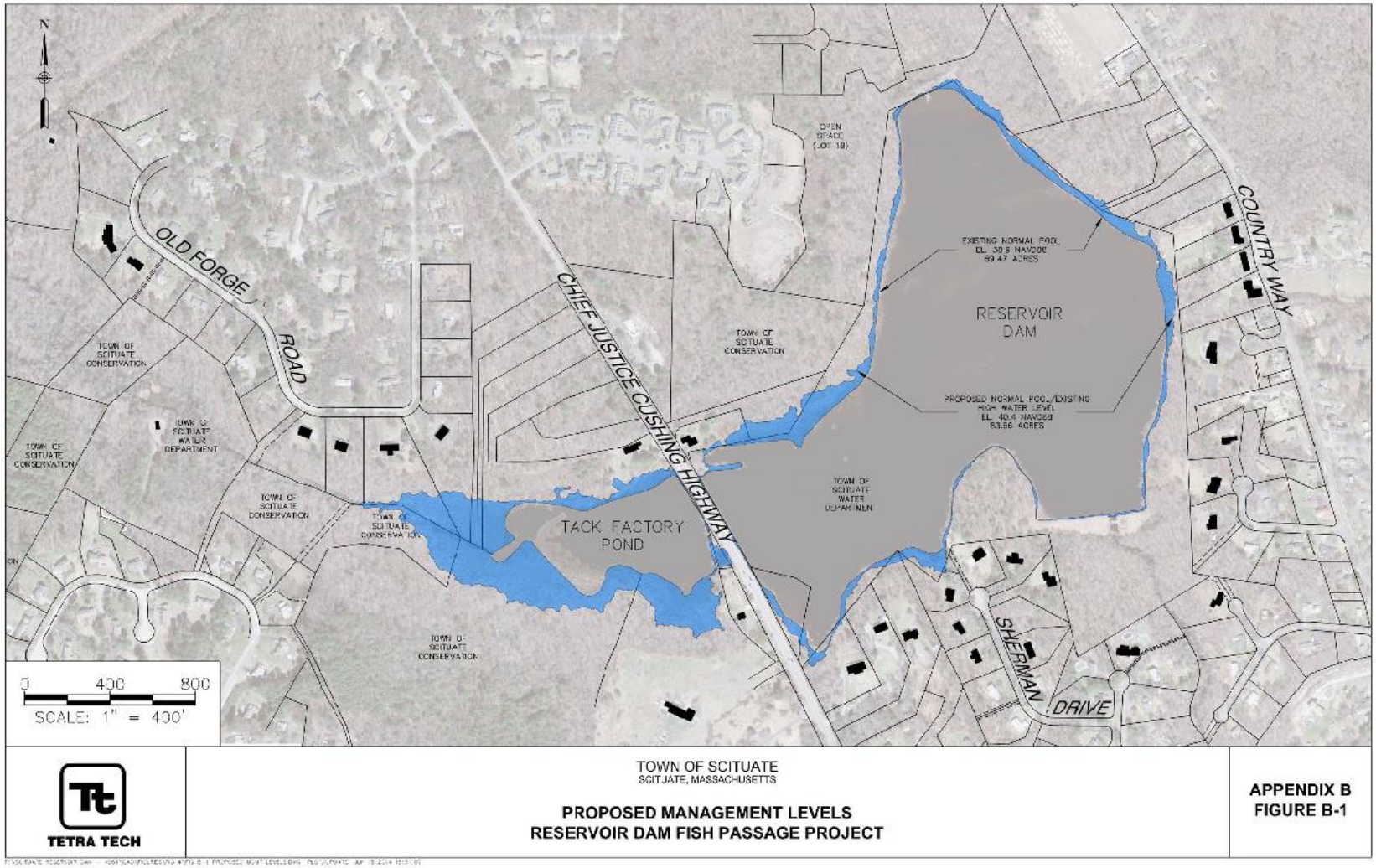
Modify existing fishway for downstream passage

- Install spillway bottom-hinged crest gates
- Lower fishway exit channel and install removable weirs
- Install low flow notches on fishway weirs

Fishway exit channel elevation: 3.9 ft below existing channel (El. 38.9 ft)

- Spring – El. 40.4 ft to El. 38.5 ft min. depending on inflow
- Fall – El. 37.2 ft to El. 36.4 ft min. depending on inflow

Reservoir Dam Impoundment Water Level



Spillway Modifications

Lower Spillway Crest

Spillway bottom hinged crest gate

Entrance channel improvements

Fishway Modifications

Fishway exit channel modifications

Fishway weir modifications

2017 Project Costs

	2017
Contractor Mob/Demob	$ 111,000
Temporary Construction Facilities	$ 31,000
Spillway Modifications	$ 704,000
Fishway Modifications	$ 239,000
Infrastructure Upgrades	$ 131,000
Subtotal	$1,216,000
Contingency	$ 122,000
Subtotal	$1,333,000
Design and Permitting	$ 353,000
Construction and Administration	$ 104,000
Total Project	$1,795,000

Funding from State Grants for this Project To Date

- 2013 - $68,180 (SWMI, DER)
- 2014 - $54,500 (SWMI)
- 2017 - $115, 250 (SWMI)
- 2018 - $227,309 (EEA Dam and Seawall)

Total state $ received $465,239

- Match from Scituate and parnters for these grants was ~20% with inkind

Proposed Operational Plan

- Reservoir normal pool elevation at 41.5 ft (1.5 above existing)
- Town water demand same as existing (~1.5 MGD annual average excluding Humarock)
- Reservoir fish ladder streamflow needs
- Aquatic habitat releases
- Outdoor water ban trigger
- Streamflow cutoff threshold
- Adaptive management tool will use weekly data on water supply status and drought condition plus any anomalies to provide guidance on streamflow release and demand management

WEAP Model Scenarios

- ***Baseline (Current Condition) Updates***
  1. Well 17 discharges to Old Oaken Bucket Pond instead of directly to water treatment plant
  2. 100,000 gallons per day less groundwater (more surface water) used on an annual average
- ***Well 17 Discharge Redirected to Tack Factory Pond,*** as planned by the Town
- ***Ice Pigging,*** which began in 2018 and is expected to continue into the foreseeable future.

Ice Pigging

- Ice pigging consists of using a controlled application of ice pellets in a watermain that has been temporarily removed from service to clean out material that has deposited over time. This material contributes to the discolored water you may have experienced.

Suez UK, www.youtube.com

Test of Ice Pigging on oil and sand contaminated pipeline

WEAP Model Scenarios (continued)

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- ***Alternate Stream Flow Cutoff Threshold*** captures 3 worst droughts, not just the drought of record
- ***Alternate Outdoor Water Ban Trigger*** level to balance impact on residents and environmental impacts
- ***Current & Future Reservoir Full Storage Elevations***

WEAP Model Scenarios

Table 5. 2019 WEAP Model Scenarios

Scenario Name	Reservoir Full Storage Elevation (ft.)	Water Ban Trigger *ft. below Reservoir full storage elevation*	Streamflow Cutoff Threshold *Reservoir water level elevation (ft.)*
Reservoir 40 IOP Baseline	40.0	4	8
2019 Updated Baseline 40-4-8	40.0	4	8
Ice Pigging 40-4-8	40.0	4	8
Well 17 Redirect 40-4-8	40.0	4	8
2019 Updated Baseline 40-4-5.5	40.0	4	5.5
Ice Pigging 40-4-5.5	40.0	4	5.5
Well 17 Redirect 40-4-5.5	40.0	4	5.5
2019 Updated Baseline 40-3-8	40.0	3	8
Ice Pigging 40-3-8	40.0	3	8
Well 17 Redirect 40-3-8	40.0	3	8
2019 Updated Baseline 40-3-5.5	40.0	3	5.5
Ice Pigging 40-3-5.5	40.0	3	5.5
Well 17 Redirect 40-3-5.5	40.0	3	5.5
Ice Pigging 41.5-4-8	41.5	4	8
Well 17 Redirect 41.5-4-8	41.5	4	8
Ice Pigging 41.5-4-5.5	41.5	4	5.5
Well 17 Redirect 41.5-4-5.5	41.5	4	5.5
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Ice Pigging 41.5-3-5.5	41.5	3	5.5
Well 17 Redirect 41.5-3-5.5	41.5	3	5.5

Scituate Water Conservation Plan 2016

Accomplishments to date

- Prohibited new connections of inground irrigation systems to the Town's water supply
- Used water rates and connection fees to improve system reinvestment
- Improved collaboration with the CPC and all other committees to protect water resources
- Water conservation tips circulated through Town emails and website
- Rain barrels available for purchase through the Town and WaterSmart

WaterSMART

Scituate - Artists Cindy McEachern and Jenna Reedy

Gardening GREEN EXPO

Do Your Part, Be

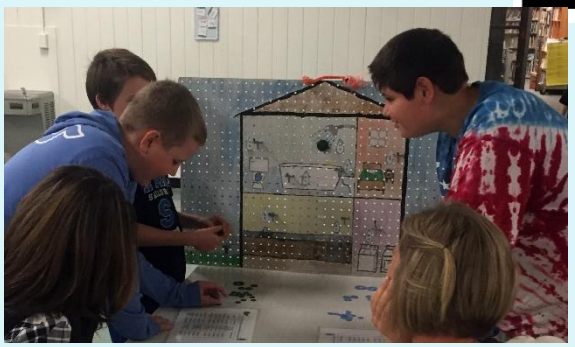
WaterSMART

Brought to you by the North and South Rivers Watershed Association and:

NSRWA

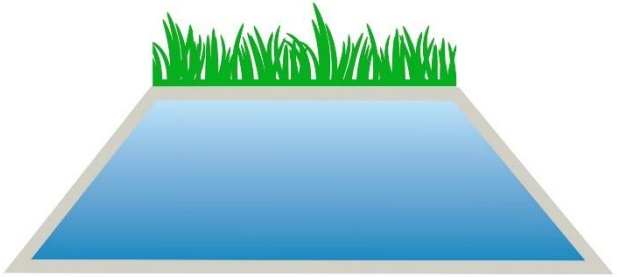
- Aquarion - Hull and Hingham
- Duxbury
- Hanover
- Kingston
- Marshfield
- Norwell
- Pembroke
- Scituate
- Weymouth

watersmartsouthshore.org



Did You Know?

Watering one inch of water on a one acre yard **consumes 26,000 gallons of water** or more than a standard 16' X 32' swimming pool!



Do your part, be WaterSMART

A message from WaterSmart South Shore and the NSRWA

NSRWA

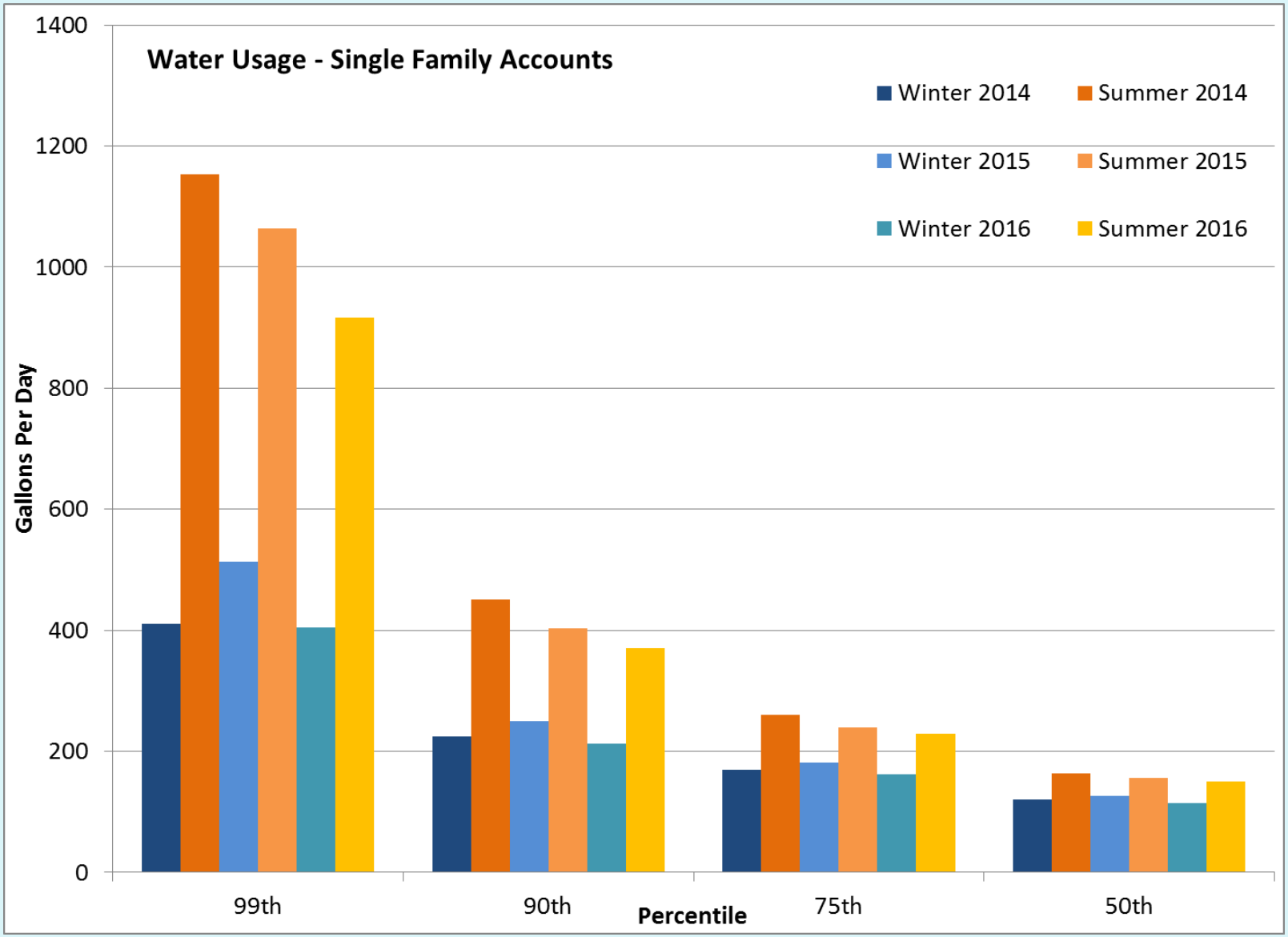
What's Next for Water Conservation?

- Continued education around brown water and all other water resource issues that face Scituate, Ongoing
- Encourage stronger enforcement of irrigation rules and restrictions, Ongoing
- Continue replacing water meters with smart meters that can be read on a more regular basis, Ongoing
- Require 1 water meter per unit for all new developments, Q1 2019

What's Next for Water Conservation?

- Present water offset policy to the Water Commissioners / Board of Selectmen, Q2 2019
- Create BMP's for school facilities, such as playing fields and parking lots, Q2 2019
- Water conservation event and tours of the Water Treatment Plant, Q2 2019
- Promote reuse of treated wastewater in new buildings, Q3 2019
- Require water efficient fixtures and waterwise landscaping to be incorporated into the design of public facilities, Q4 2019
- Obtain better information on summertime water demand and population increases to target conservation, 2019-2020?

Impacts of Outdoor Water Ban on Usage



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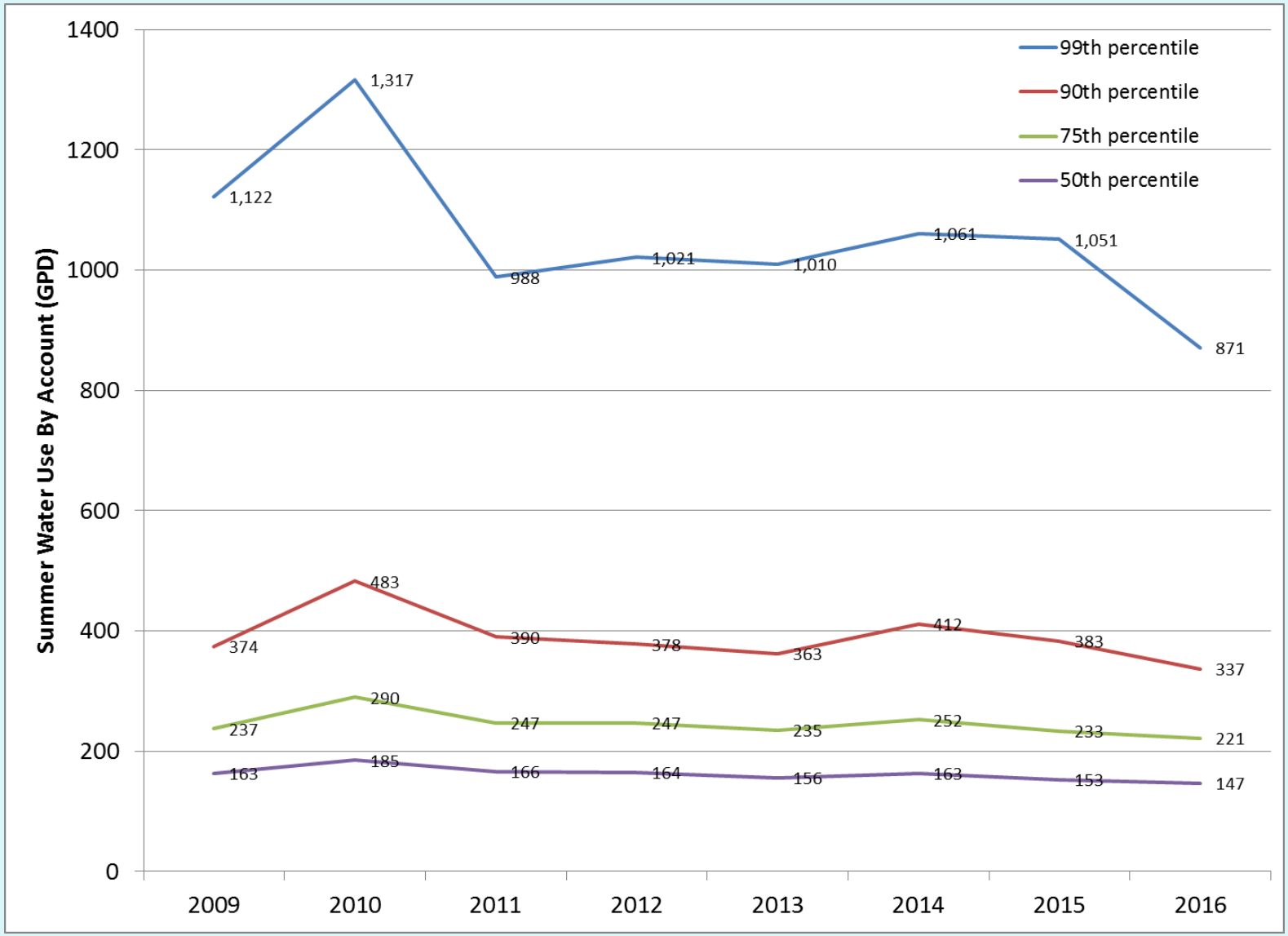


Water Supply Benefits of Additional Storage

- **Water supply storage increased 23%;** 108.8 ac-ft (28 days additional storage, or 35.4 million gallons)
- Same water supply delivered while providing **environmental flows for fish and stream habitat**
- **Greater resiliency to drought and emergencies** (fires, loss of groundwater well power)

Ecological Benefits

- Restores 70 acres of pond for alewife and American eel and access to stream habitat upstream of the reservoir for blueback herring

- Maintains reservoir at a more constant level provides more shoreline habitat for alewife:

  11,800 ft at El. 38.9 ft

  15,500 ft at El. 40.4 ft

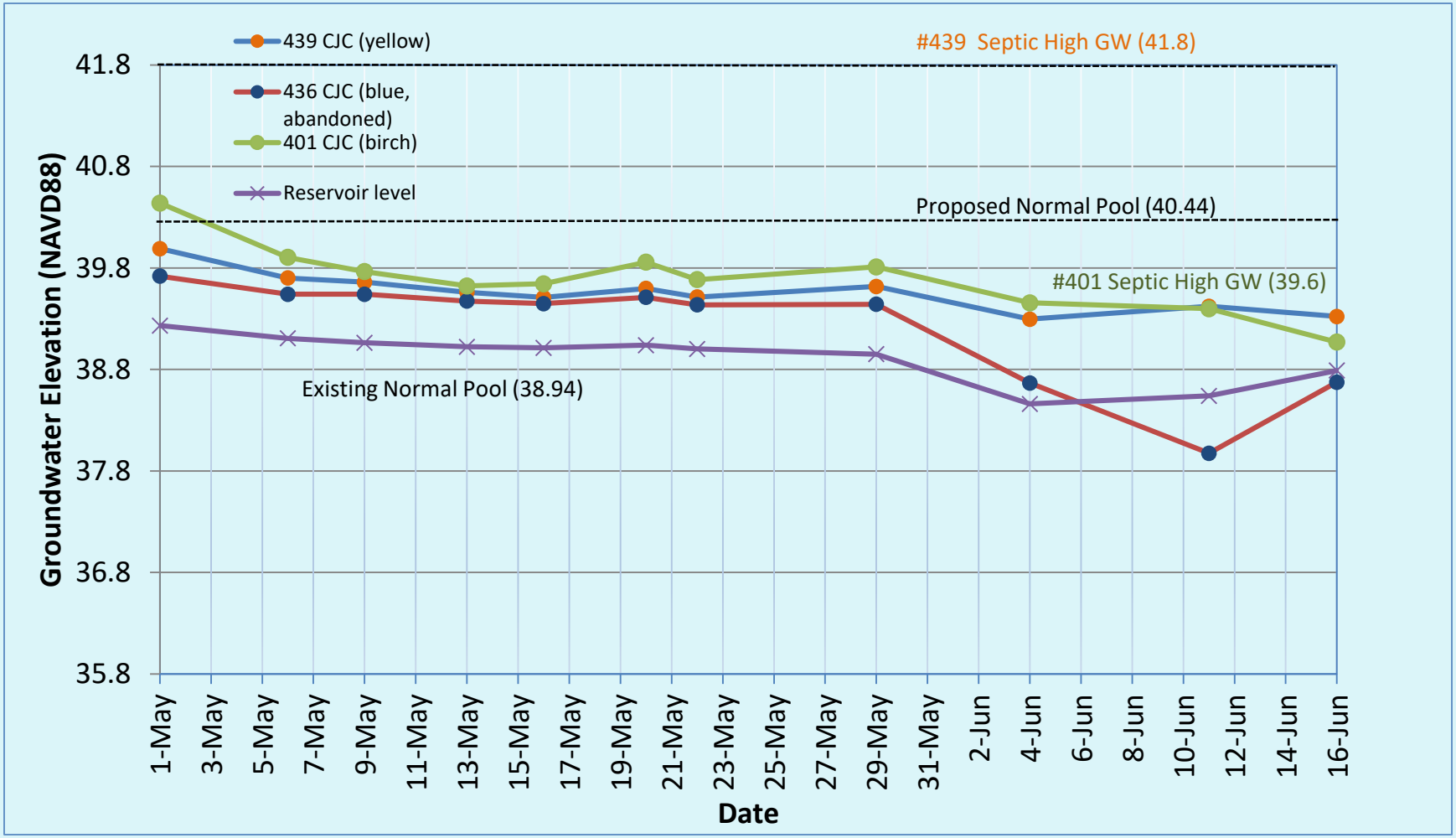
- Estimated median carrying capacity of Reservoir Dam impoundment is 25,000-30,000 alewife

DRAFT ENVIRONMENTAL IMPACT REPORT

- Certificate of the Secretary of Executive Office of Energy and Environmental Affairs (EOEEA #15711) based on review of Environment Notification Form (ENF)

- Mandatory Environmental Impact Report addressing:
  - Groundwater levels
  - Reservoir level increases on adjacent properties, CJCH, and wetlands vegetation
  - Update of Firm Yield Analysis
  - Spillway discharge capacity
  - Alternatives considered

2014 GROUNDWATER MEASUREMENTS



SHORELINE ASSESSMENT

- **Shoreline**

  No change in high water level El. 40.4 ft

- **Water Supply Protection District Buffer Zone**

  No change in Town's 150 ft Water Protection District

- **Septic Systems**

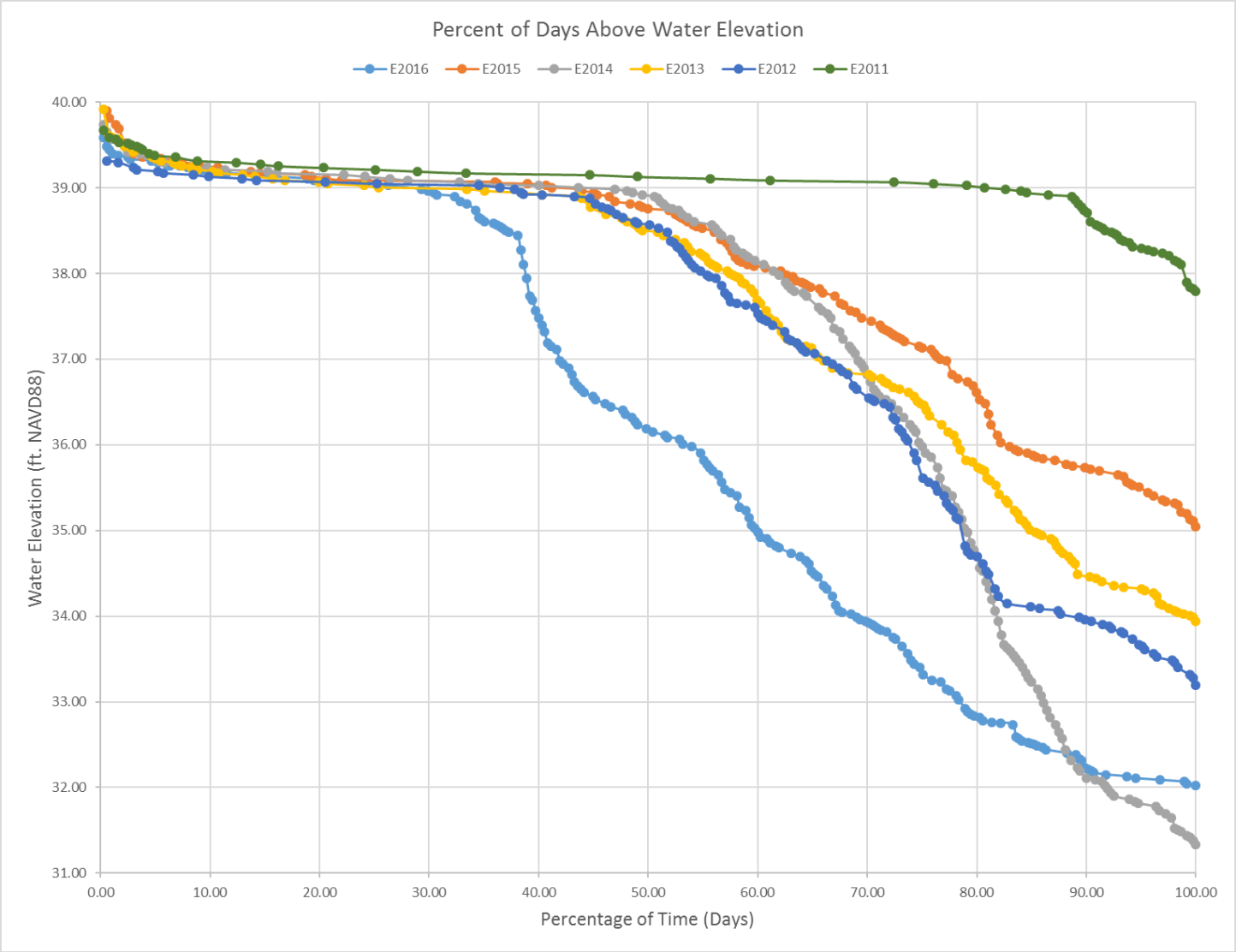
  Septic systems adjacent to reservoir currently meet DEP Title V regulations except one abandoned property;

  Monitoring indicates treatment systems properly functioning

- **Stormwater Management**

  Construct bioswale at end of Sherman Drive to treat road runoff discharging to reservoir

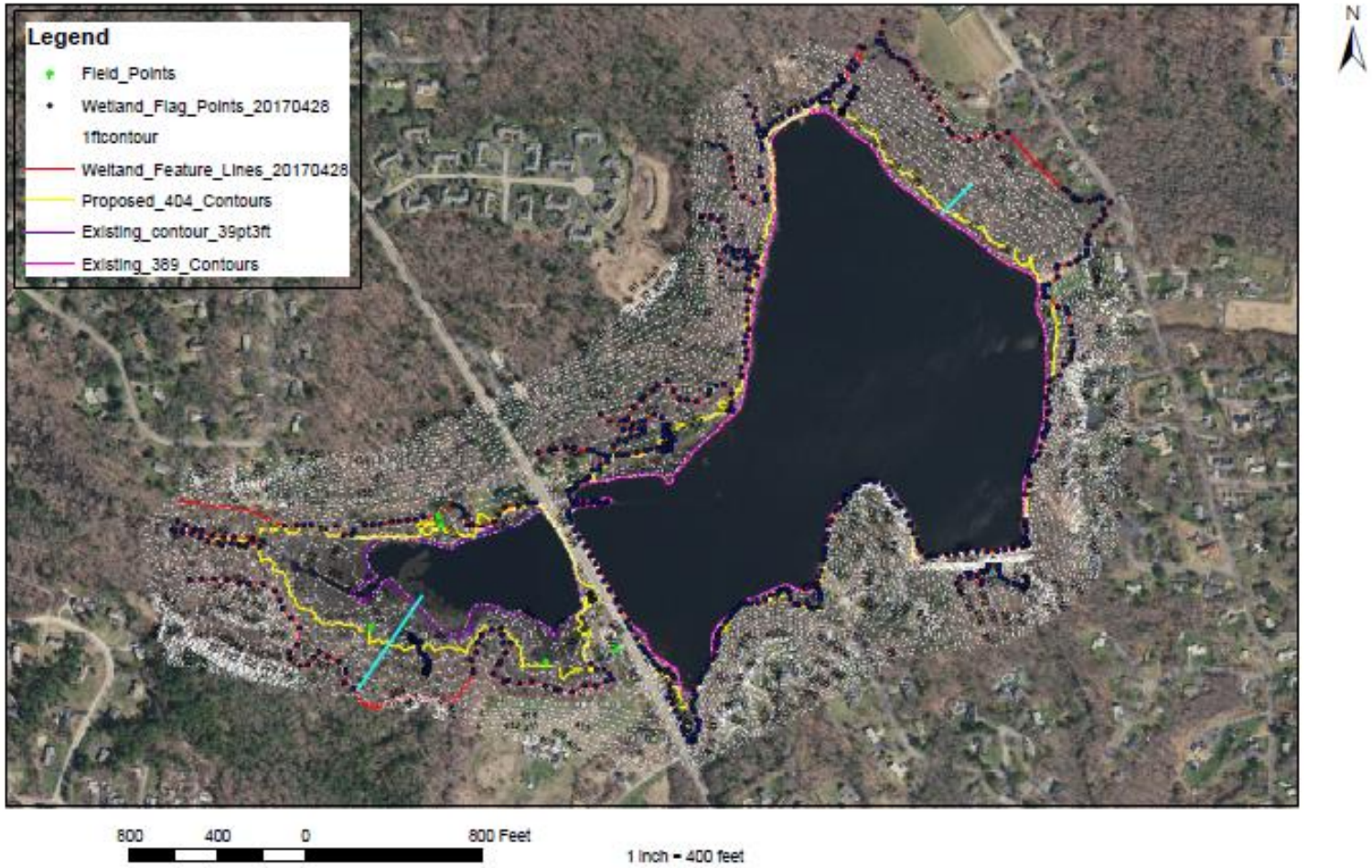
DPW RESERVOIR LEVEL MEASUREMENTS



2018 WETLANDS VEGETATION STUDY

- Met with DEP at Tack Factory Pond (10-10-18)
- Transects flagged and wetlands species identified in field (December 2018)
- Desktop study of wetlands plants characteristics
- Existing and proposed wet/dry cycles for wetland plants based on WEAP model

WETLANDS VEGETATION STUDY TRANSECTS



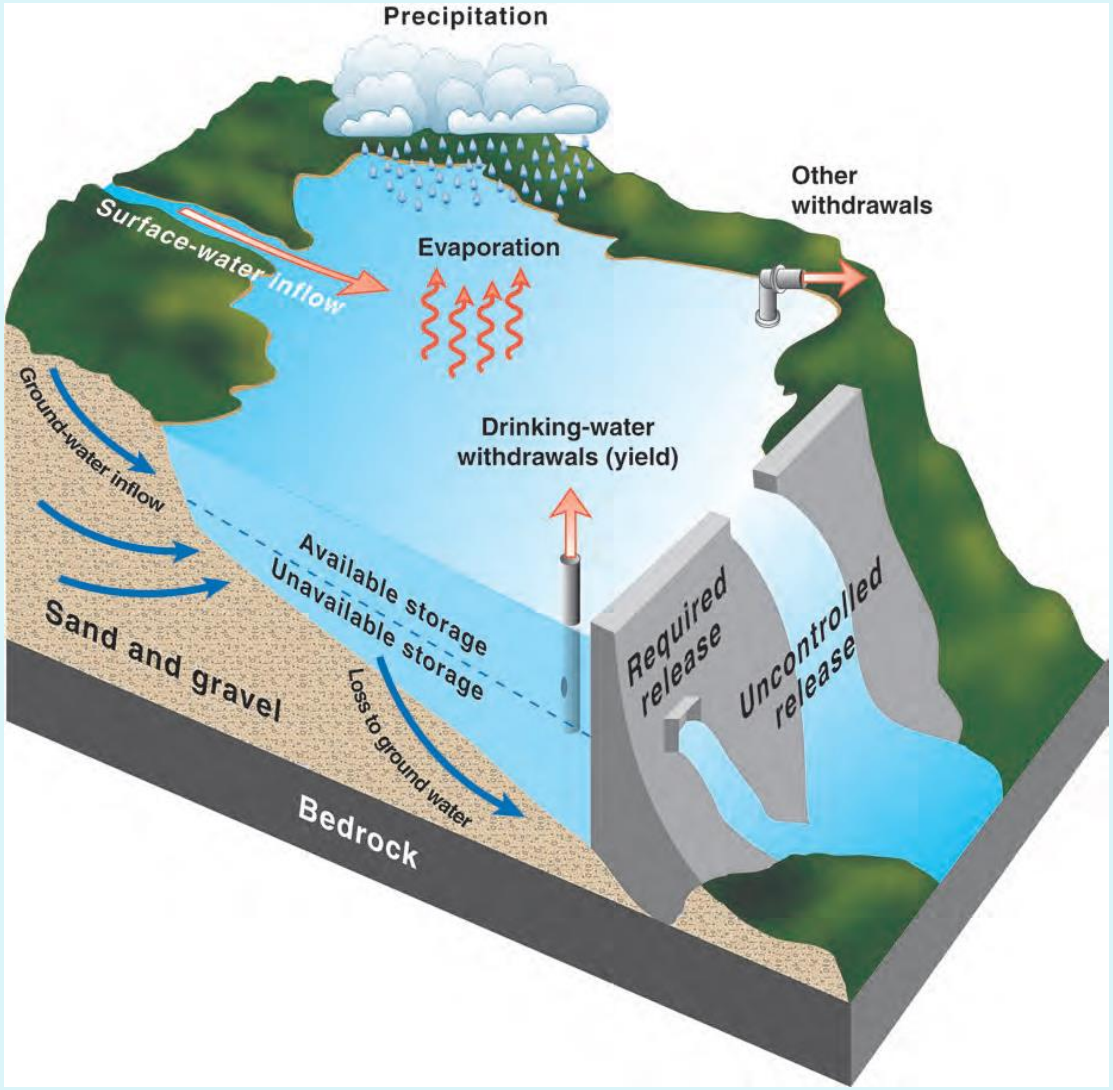
FIRM YIELD ANALYSIS

- "Refinement and Evaluation of the Massachusetts Firm-Yield Estimator Model Version 2.0" (SIR2011-5125) published by U.S. Geologic Survey

- Water Management Act (WMA) Amendment

- Firm Yield is maximum rate of water withdrawal for a reservoir

Water Sources and Losses to Reservoirs



HYDROLOGIC AND HYDRAULIC STUDY UPDATE

- Update U.S. Army Corp of Engineers' (USACE) Hydrologic Engineering Center (HEC) Hydrologic Modeling Software (HEC-HMS) model for watershed subbasins and Old Oaken Bucket
- Dam failure analysis
- Office Dam Safety (ODS) Permit

SHORELINE IMPROVEMENTS

Route 3A –

380 ft embankment erosion protection

Tack Factory Pond –

Raise gate and structure for access

PERMIT APPLICATIONS

- Chapter 91 RDA
- DEP Stormwater Management Consultation
- NMFS Fisheries consultation
- ODS EAP update
- ODS Dam Safety Permit
- DER Final Operational Plan Consultation
- DMF Fishway Permit
- DEP Section 401 Water Quality Certification
- USACE Section 404 Category 2 Permit
- DOT Access Permit and Consultation
- DEP WMA Permit Amendment

90% Design

- Update 60% design drawings
- Prepare construction specifications
- Access easements

Summary

- 90% design plans being worked on, permitting continuing
- Town must make spillway improvements at reservoir dam to comply with state standards for flood control
- Storage increased by ~35 million gallons or 28 days
- Estimated project cost is $1.8 million dollars, $350,000 expended, ~$1.4 million to complete.

Summary

- Restoring 70 acres of herring habitat by having enough water to run fish ladder effectively 97% of spring days and 79% of fall days (based on 2017 model)
- No new area surrounding the reservoir will be flooded
- We assumed similar water demand reductions as were obtained in 2016 drought (aka outdoor water ban 6% initial reduction and 25% reduction after enforcement and publicity in summertime demands).
- Need to implement town's water conservation plan to maintain current demand for this project to have all benefits

QUESTIONS ???

Next public outreach meeting – May 2019