



Water Supply and Demand Management

Town of Groton, MA

SWMI Grant Project BRP-2013-06

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Outline

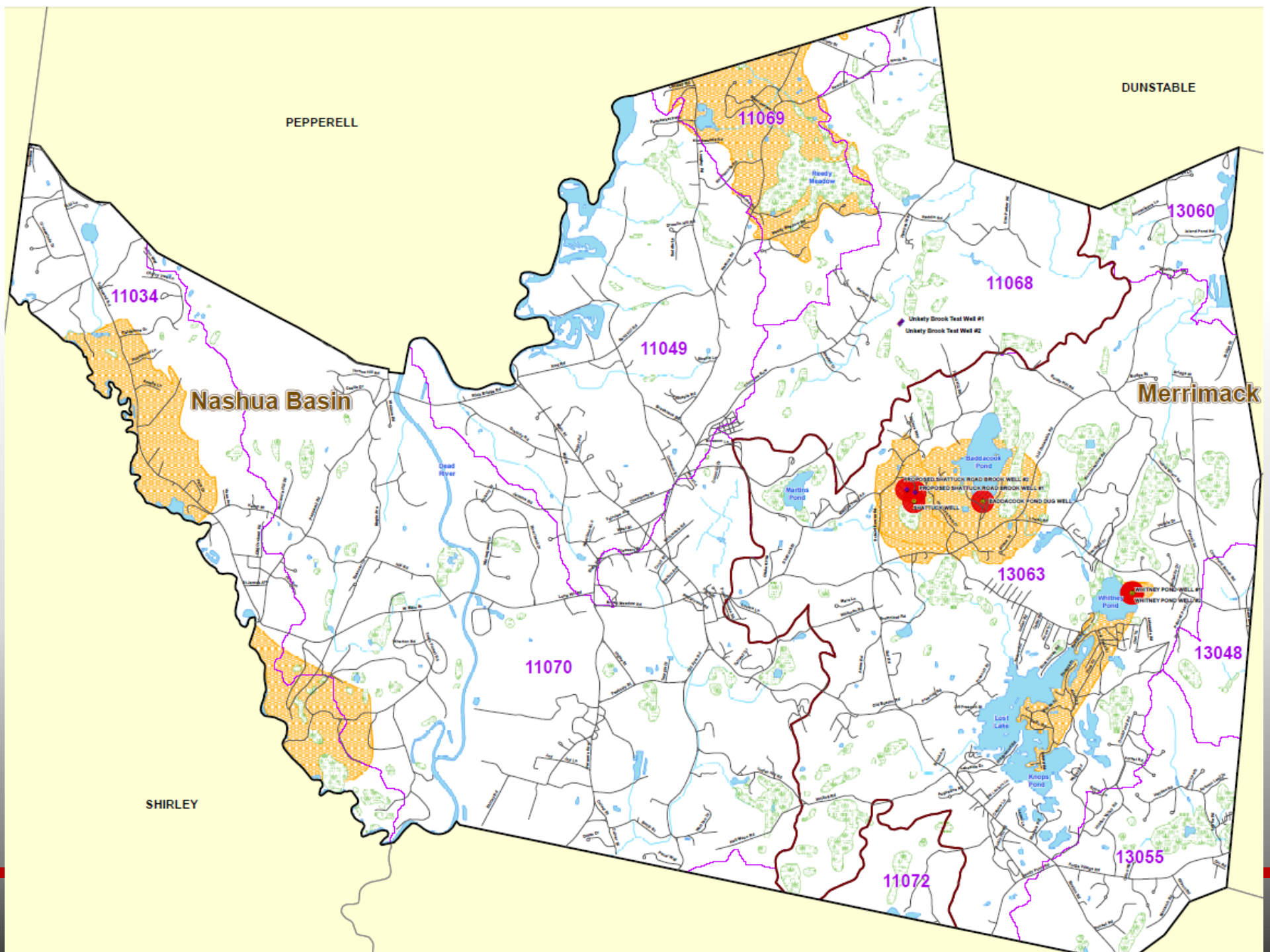
- Introduction
- Demand Management Options
- Supply Management Analysis
- Summary/Take-Aways



GWD's Water Supplies

Source	Existing or Future	Registered or Permitted	Basin	WMA Limits (mgd)	WMA Permit + Registration Annual Average (mgd)
Shattuck Well	Existing (Emergency)	Registered	Merrimack	0.217	0.547
Baddacook Pond Well	Existing	Registered	Merrimack		
Whitney Pond Well #1	Existing	Permitted	Merrimack	0.33	
Whitney Pond Well #2	Existing	Permitted	Merrimack		
Shattuck Road Well #1	Future	Permitted	Merrimack		
Shattuck Road Well #2	Future	Permitted	Merrimack		
Unkety Brook Well #1	Future	Permitted	Nashua	0.3*	
Unkety Brook Well #2	Future	Permitted	Nashua		

* may withdraw up to 0.3 mgd from these Nashua Basin sources, provided withdrawals from the Merrimack Basin sources are adjusted so as not to exceed an annual average of 0.547 mgd from both basins combined.



PEPPERELL

DUNSTABLE

11034

11069

13060

Nashua Basin

11049

11068

Merrimack

11070

13063

13048

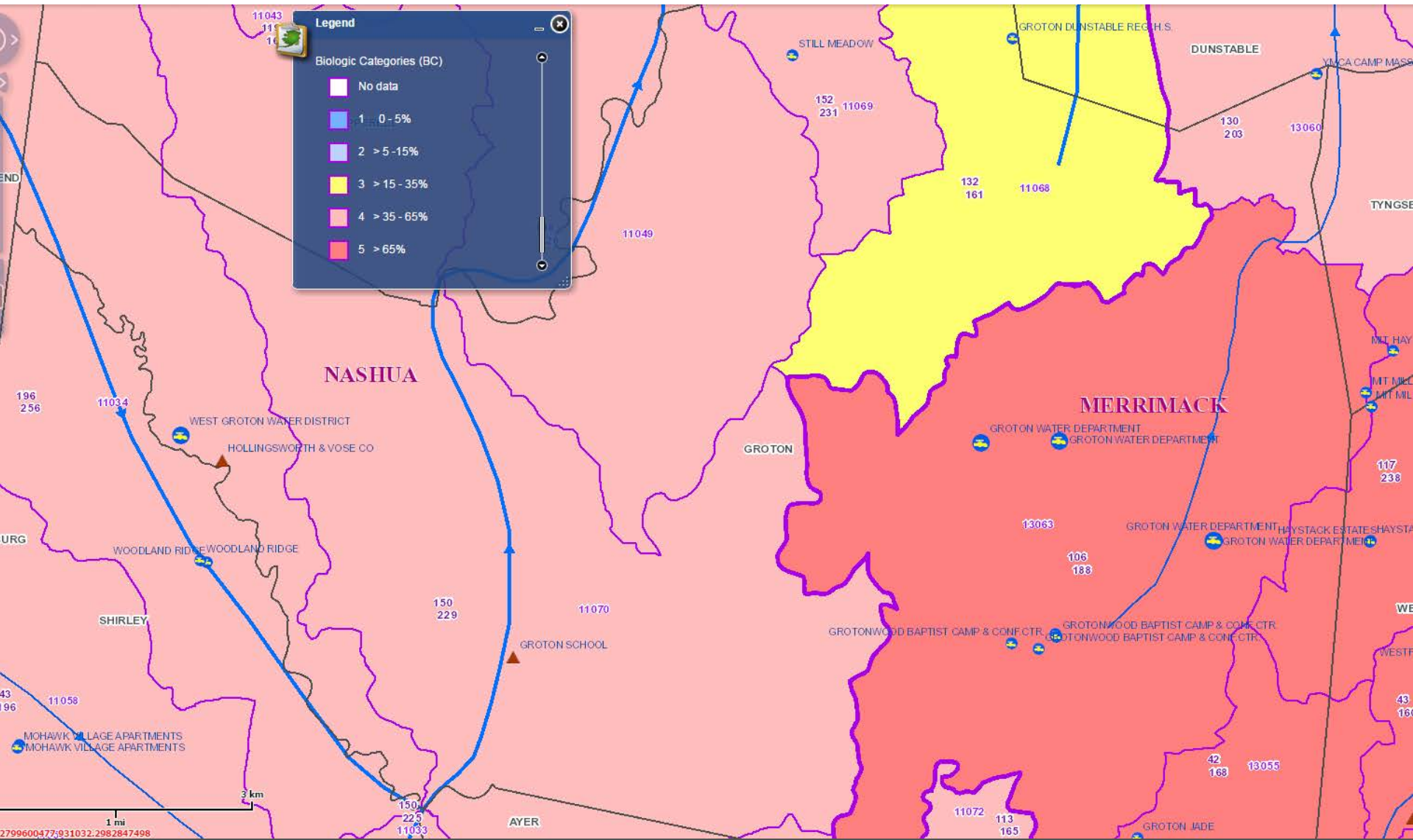
SHIRLEY

11072

13055

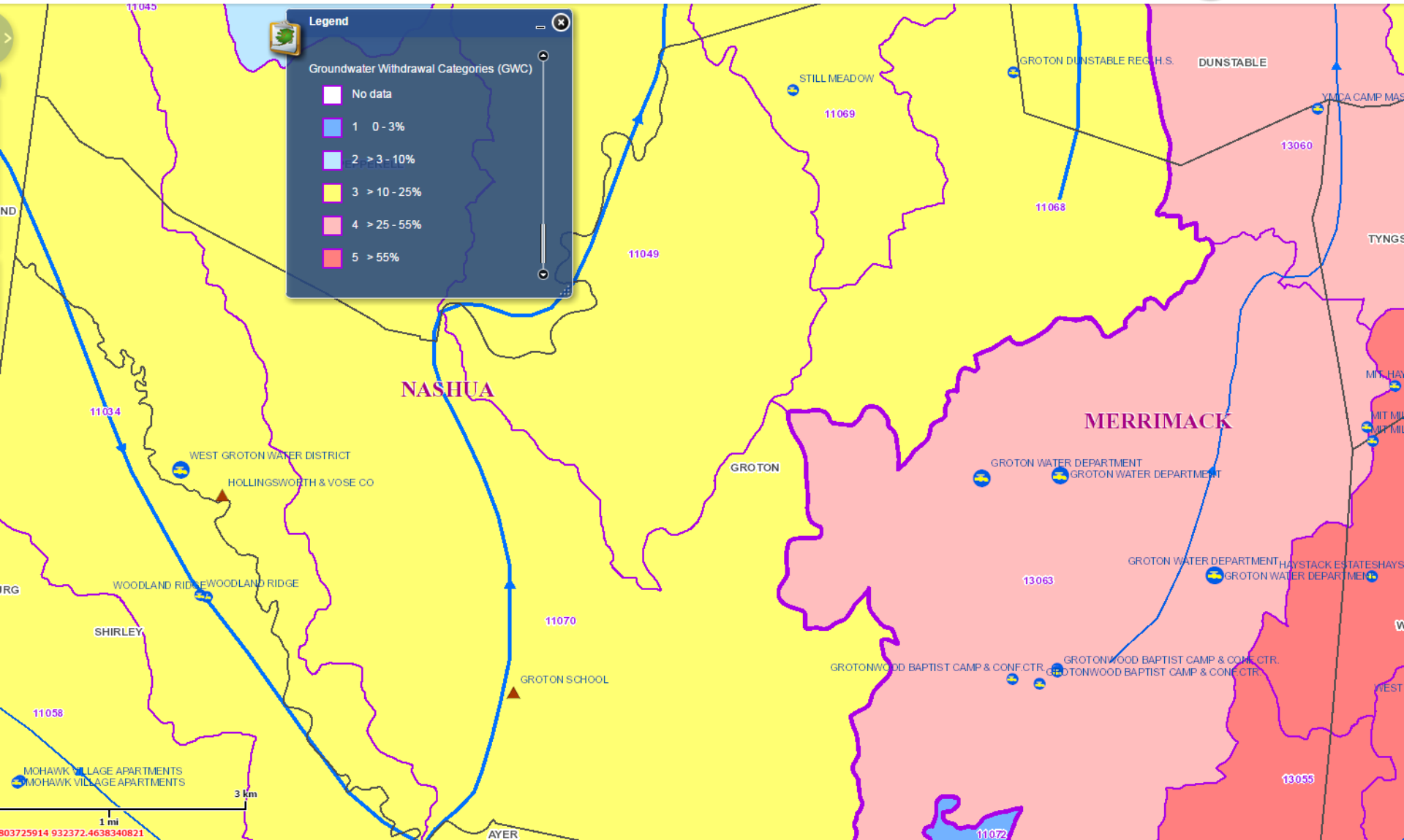


Groton Subbasins: Biological Categories



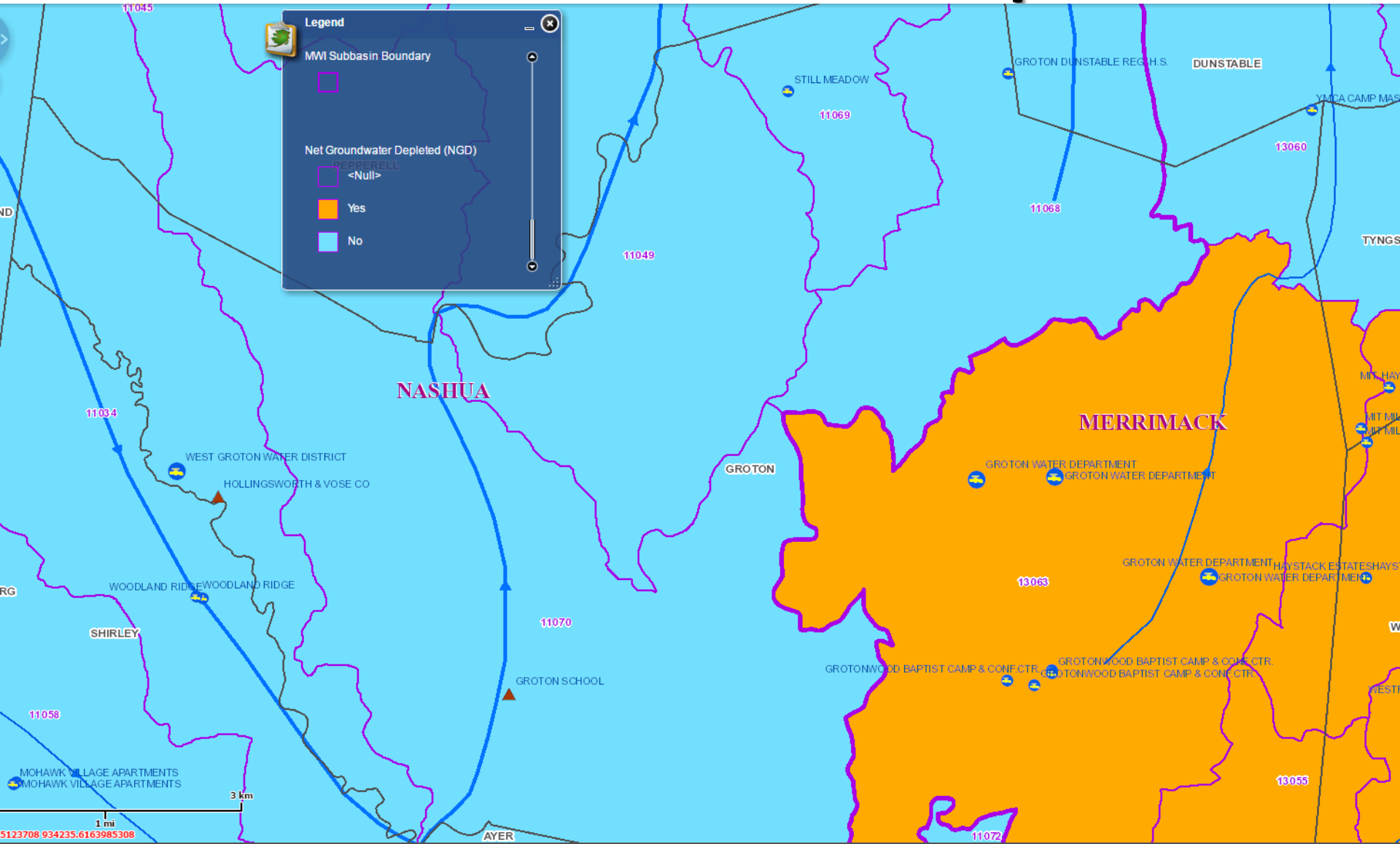


Groton Subbasins: Groundwater Withdrawal Categories





Groton Subbasins: Net Groundwater Depleted





GWD's Baselines

- Merrimack Baseline is 0.455 mgd.
 - Based on 2005 withdrawals plus 5%
 - Less than existing authorized withdrawal of 0.547
- Nashua Baseline is 0.0 mgd
 - New source in new basin, no previous withdrawals



GWD Demands

Compare Baseline to existing withdrawals:

	2009	2010	2011	2012	2013
Annual Average Withdrawal (mgd)	0.37	0.47	0.48	0.46	0.43

- 5-year average of 0.44 mgd
- 13 Development projects already permitted would add 0.12 mgd
- Together (0.56 mgd), withdrawals greater than Baseline (0.455 mgd), would need to be mitigated



SWMI General Components

- Standard Permit Conditions – all Permittees
 - Leak detection, metering, pricing, education, etc.
 - 10% UAW and 65 RGPCD
 - Outdoor Watering Restrictions
- Minimization – if have subbasins with Aug NGD $\geq 25\%$
 - Desktop Optimization
 - Surface Water Releases
 - Additional Water Conservation Measures
 - More Restrictive Outdoor Watering
- Mitigation – if withdrawals $>$ baseline
 - Direct or Indirect Measures
 - Reduced by Demand Management Measures – optional, encouraged
 - Reduced by Wastewater Returns
- Alternative Source Feasibility – if withdrawals cause backslide of BC or GWC



Unkety Brook Wells

- Withdrawals from a new basin (Baseline = 0 mgd)
- Will need to mitigate any withdrawals regardless of whether within baseline for the entire system
- Once in use, SWMI would also require:
 - Demonstration of no feasible alternative source available (0.04 mgd – backslide of BC)
 - Desktop optimization study and consultation with the State (CFR present)
 - Stream and wetland monitoring (in current permit)



Potential Mitigation Requirements and Demand Management Options



Calculating Groton's Mitigation Requirement

Step 1. Determine Withdrawal Request Over Baseline

- A request of 0.56 mgd is 0.107 mgd over baseline

Step 2. Estimate Savings through Additional Demand Management



Demand Management Measures Evaluated for GWD

- Higher Rates for Irrigation Meters
- **Expanded Outdoor Water Restrictions**
- Private Well Watering Restrictions
- Rebates
- Education/Outreach Program



Estimated Water Savings

Measure	MGD per year
10% Rate Increase for Irrigation Meters	0.001
Expanded Outdoor Watering Restrictions (May-Sept, 3-days/week – adds 4 weeks over current)	0.008
Expanded Outdoor Watering Restrictions (May-Sept, 2-days/week – reduces watering by 1 day/week)	0.023
Private Well Outdoor Watering Restrictions (May-Sept, 3-days/week)	0.04
Private Well Outdoor Watering Restrictions (May-Sept, 2-days/week)	0.06
25 Toilet Rebates	0.0008
50 Showerhead Rebates	0.0003
50 Faucet Rebates	0.0008
25 Washing Machine Rebates	0.0002
25 Dishwasher Rebates	0.00003
Education/Outreach Program	0.002



Two Outdoor Water Restrictions:

Potential Measure	MGD saved per year*
Expanded Outdoor Watering Restrictions May-Sept, 3-days/week – adds four additional weeks of restrictions over current	0.008
Expanded Outdoor Watering Restrictions May-Sept, 2-days/week – reduces watering by one day per week	0.023
Total:	0.031

*Estimated values per the Draft WMA Regulations, subject to change per consultation with MassDEP.



Calculating Groton's Mitigation Requirement

Step 1. Withdrawal Request Over Baseline

- 0.107 mgd

Step 2. Estimated Savings through Demand Management

- 0.031 mgd

Step 3. Determine Any Applicable Wastewater Adjustments



Calculating Groton's Mitigation Requirement

Step 3. Determine Any Applicable Wastewater Adjustments

- Adjustment are allowed for new demand served by septic systems
- 13 pending development projects, 10 of which are to be constructed in areas served by septic
- If septic systems are constructed in Merrimack Basin, adjustment could be 0.077 mgd
 - Calculated as average demand multiplied by 85% to account for 15% consumptive loss, in accordance with the Draft WMA Regulations



Calculating Groton's Mitigation Requirement

Step 4. Calculate Required Mitigation Volume

- = requested volume over baseline – the demand management estimated savings – wastewater adjustment
 - = $0.107 \text{ mgd} - 0.031 \text{ mgd} - 0.077 \text{ mgd} = -0.001$
 - Additional direct or indirect mitigation would not be needed
- Should consult with MassDEP regarding the water savings calculations for each of the demand management measures evaluated, as MassDEP will need to approve all final calculations.



Supply Management Analysis



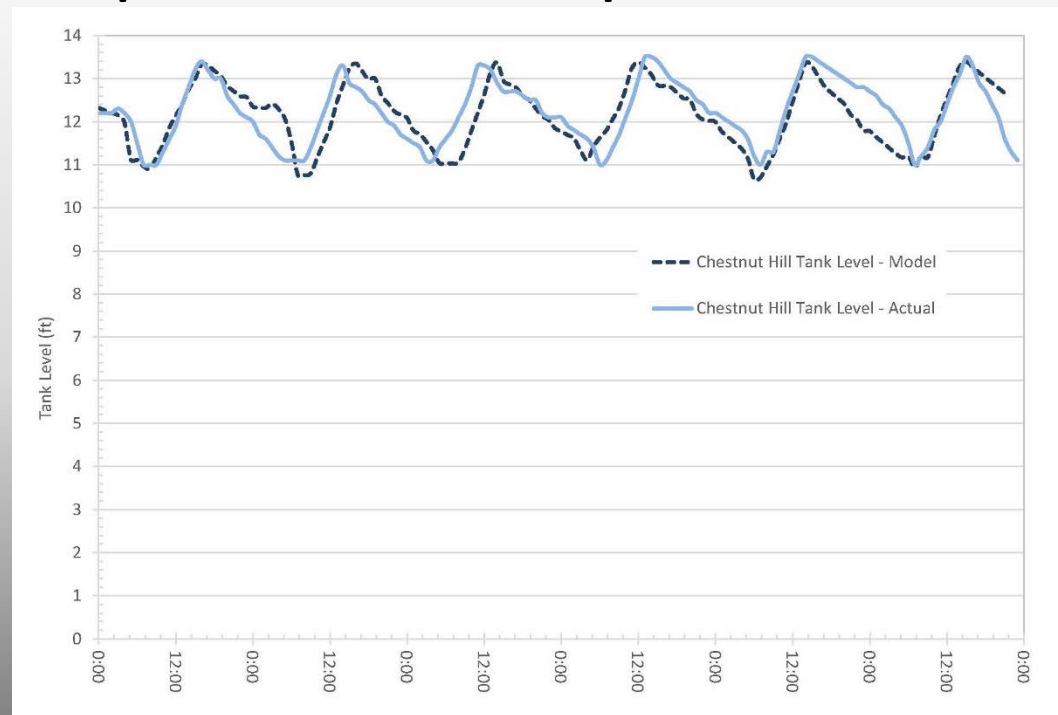
Supply Management

- Analysis done as part of the Minimization for a desktop optimization analysis
 - Updated hydraulic model
 - Evaluated system hydraulic operations
 - Considered impacts of other factors (water quality, cost to treat, permit restrictions)
 - Considered impacts of developing future sources
 - Identified means to streamline supply management operations



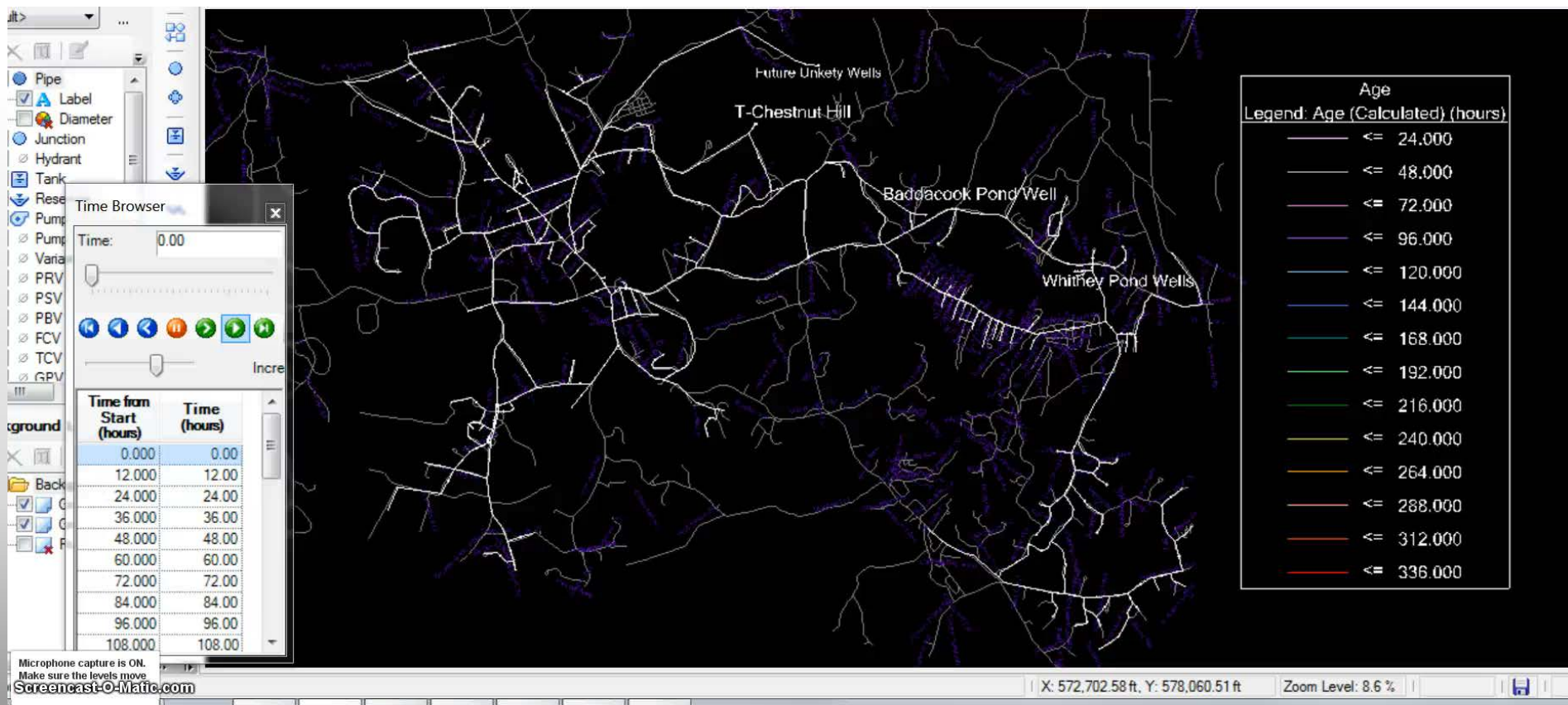
Hydraulic Model

- Updated to simulate extended day (original model only simulated a snap shot in time)
- Programmed for pumps to start/stop based on tank level
- Calibrated against actual tank levels and fire flow tests



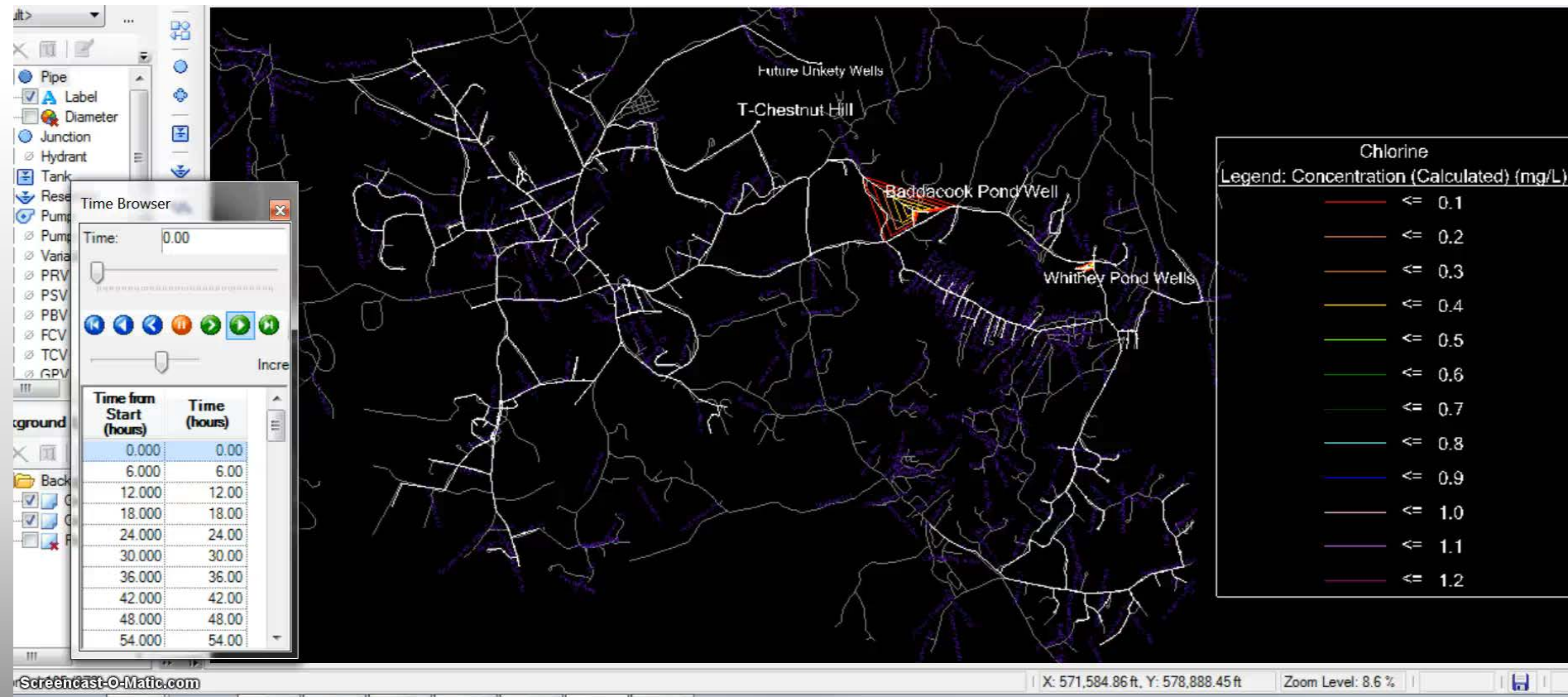


Water Age



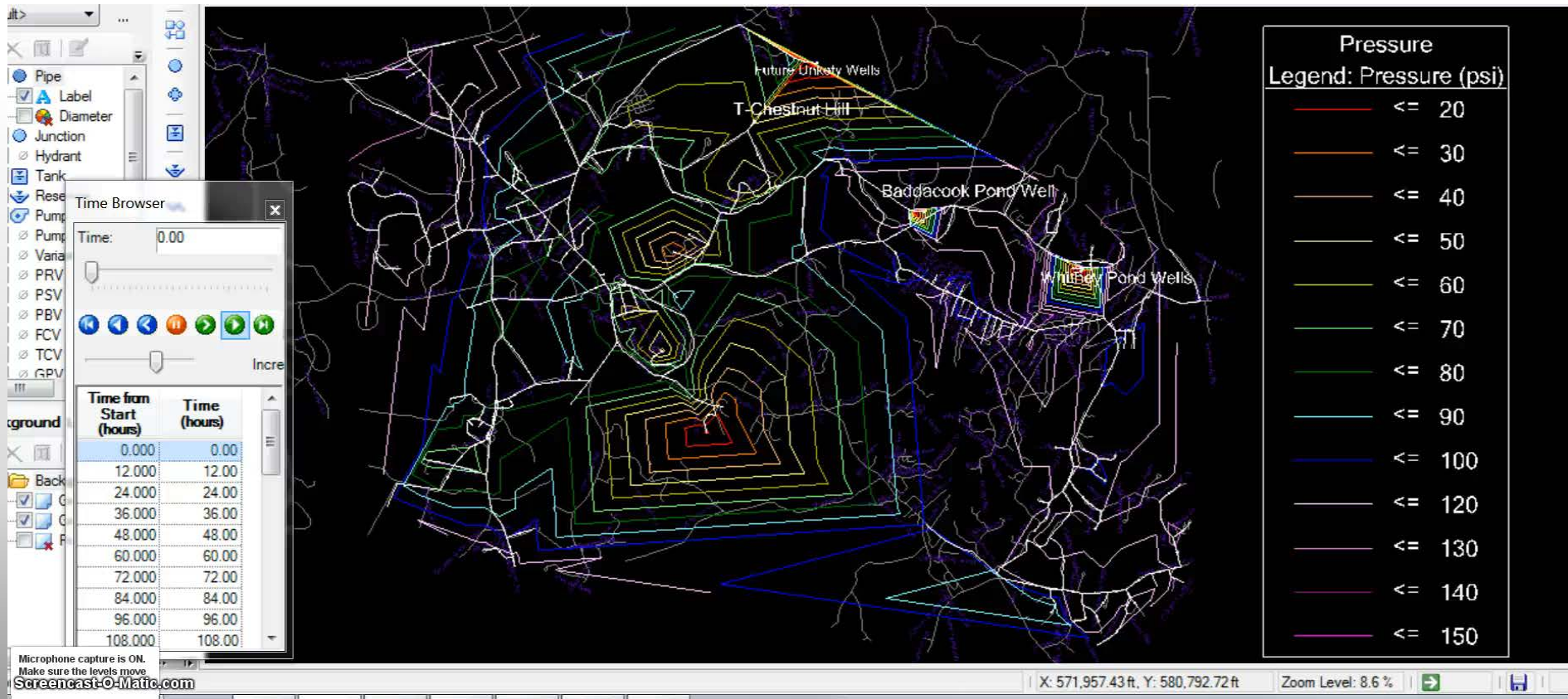


Residual Chlorine





Pressure





Supply Operation Analysis

- Hydraulics of water system similar with use of any of existing wells as lead source
- Future Unkety Wells will not substantially change system hydraulics
- Selection of lead source based on water quality, cost to treat and permit restrictions
 - Recommended the use of Baddacook Well as much as possible while staying within safe yield & registered withdrawal

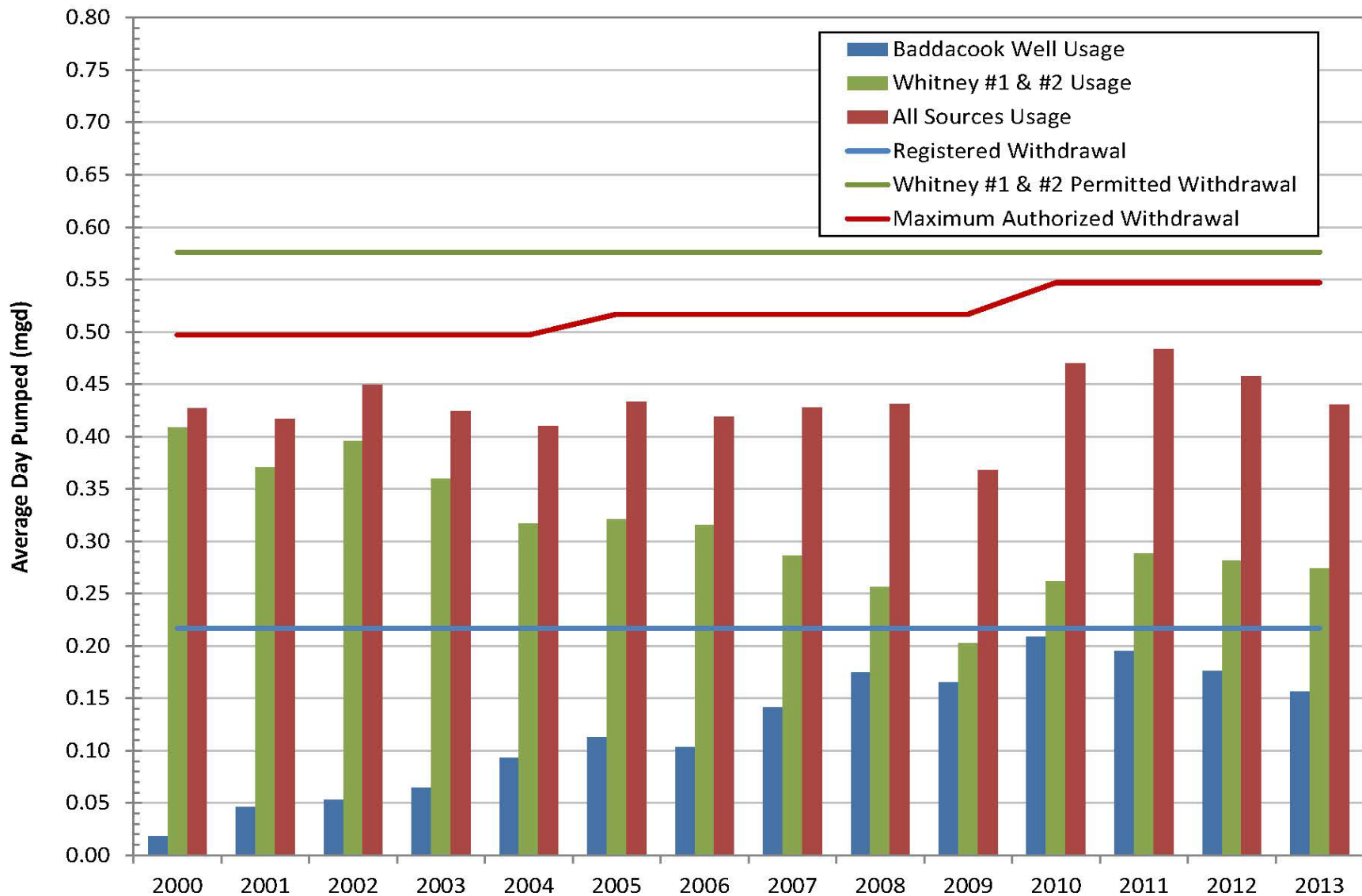


Operation Controls

- Need to keep Baddacook Well within registered withdrawal limit
- Pumps operate based on tank level
- Typical operation would be to have lead source first on and last off – but this would pump more than registered
- Modeled Baddacook Well as first on and first off
 - Help to maximize the use of the Baddacook Well, without pumping in excess of the registered authorized withdrawal, while allowing GWD to set a single pumping routine.

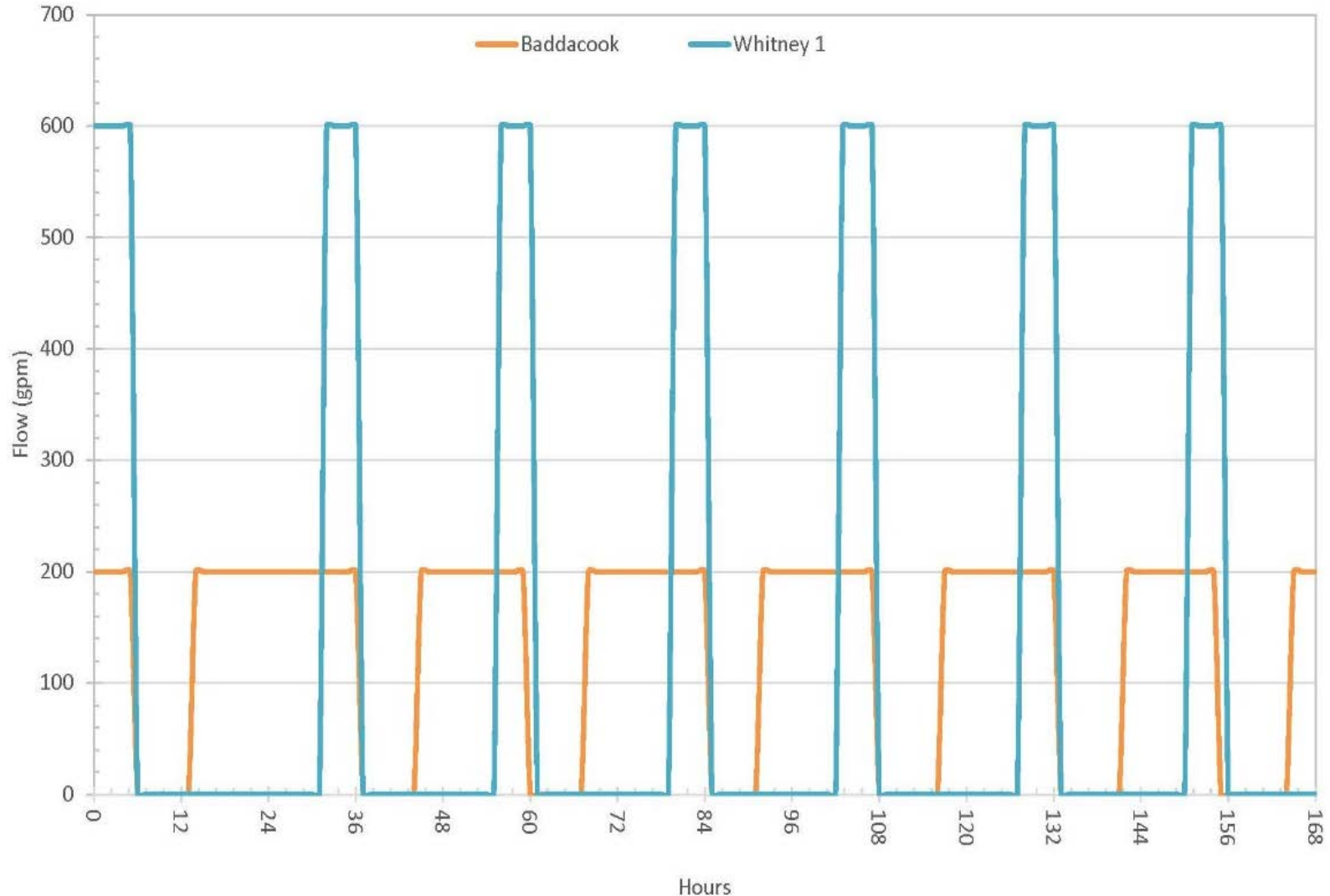


Average Day Pumped



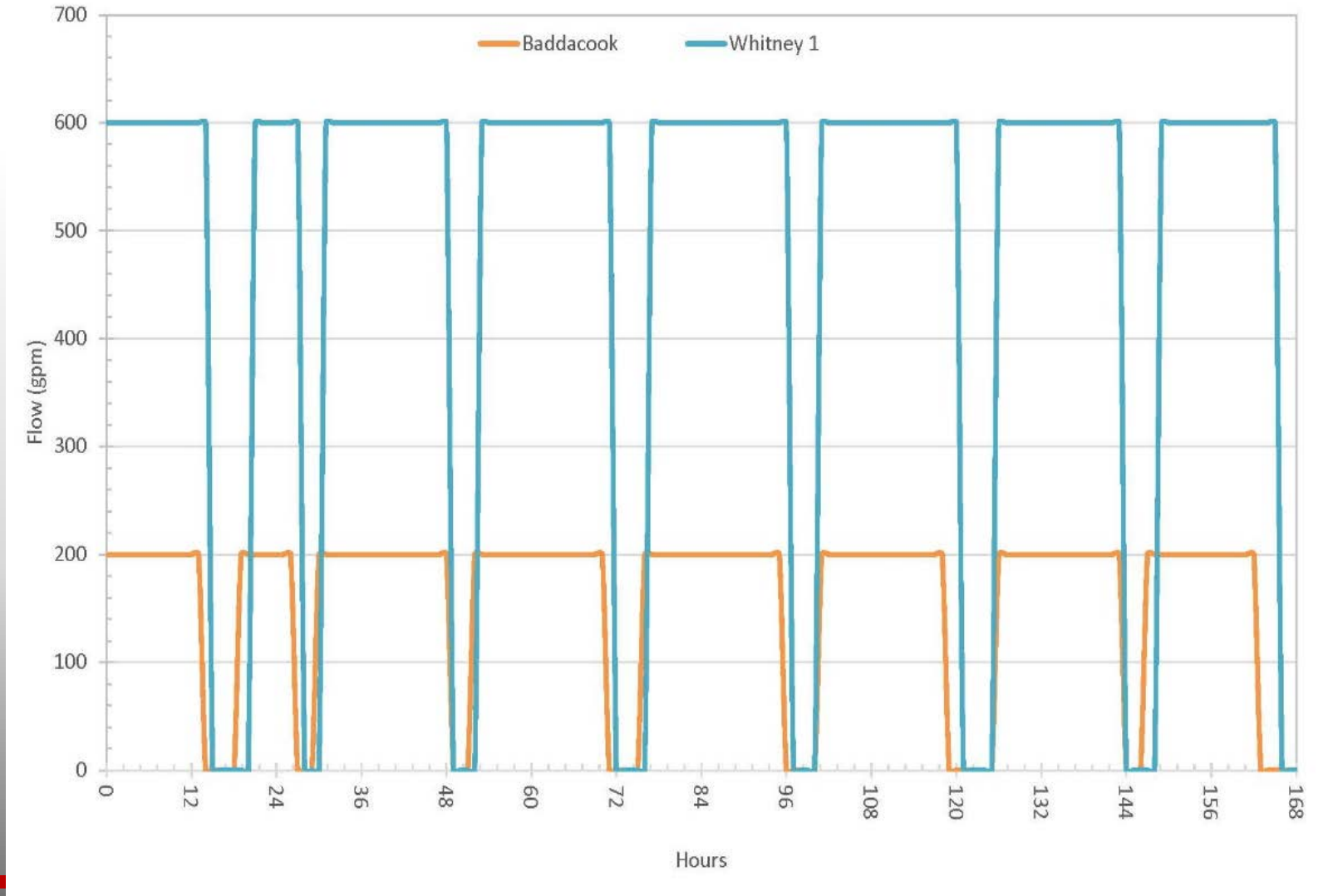


Winter Operation





Max Week Operation





Summary/Take-Aways



GWD SWMI Summary

- Implement Standard Permit Conditions:
 - Revise outdoor water use restriction
- Minimization - Develop a minimization plan:
 - desktop optimization analysis
 - Evaluation and implementation of additional conservation measures
 - Revised outdoor water use restriction
- Mitigation:
 - May require just a Demand Management Plan
 - If using direct or indirect mitigation – Mitigation Plan



Take-Aways for All Permittees

- Determine your withdrawal volume to be requested taking into account expected growth/development
- Know your subbasin characteristics
- Review Minimization Measures – what's feasible?
- If you have to Mitigate:
 - Determine demand management efforts you can implement
 - Identify potential mitigation measures



Questions?