MASSACHUSETTS' FIRST DESALINATION FACILITY:

Monitoring and Mitigating for Potential Impacts

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METCALF & EDDY | AECOM

Presentation Outline

- Status of drinking water supply in Southeastern Massachusetts /need for desalination
- Project background: Taunton River Desalination Plant (TRDP) Project
- Environmental Concerns
- Mitigation and Monitoring Programs
- Preliminary Results of 2006 Vegetation Monitoring
- Conclusions

Status of Drinking Water Supply in Southeastern Massachusetts

- Southeast MA facing chronic water shortages
- City of Brockton particularly water starved dating back to the 1800s
- Conservation measures maximized
- Other water supply alternatives (freshwater diversions, groundwater sources) rejected by regulatory authorities
- Desalination satisfies existing and projected water demands, and relieves stressed ground and surface water bodies

Taunton River Desalination Plant (TRDP) Project Background

- *Project Proponent:* Aquaria Water LLC, a joint venture project by Inima USA and Bluestone Energy
- Metcalf & Eddy, Inc. designed the treatment plant, provided permitting, mitigation, and monitoring services
- First desalination facility in Massachusetts
- Planning for the TRDP has been ongoing since 1994

Taunton River Desalination Plant (TRDP) Project Background (cont.)

Pilot Plant – Ultra-filtration Unit

- Withdrawal of brackish water from the Taunton River to produce 5.0 MGD; expandable to 10.0 MGD
- State-of-the art ultra-filtration followed by reverse osmosis
- TDRP will operate in desalination mode when salinity > 5ppt (July – November)
- 16-mile, 20-inch diameter transmission pipeline through five communities
- Three-season pilot program to verify technology proposed
- Design and permitting efforts received substantial scrutiny

Taunton River Desalination Plant
Project Site Overview

Environmental Concerns

- Effects of brine discharge on water quality and aquatic resources
  - Salt wedge movement upstream in estuary; potential localized toxicity
- Impacts from withdrawal on aquatic resources in Taunton River
  - **Entrainment**- The incorporation of fish, eggs, and larvae entering a water treatment system
  - **Impingement**- The entrapment of organisms on exclusionary screening device
- Direct impacts to wetlands
- Presence of a MA endangered plant species

Aquatic Species

Wetlands

Long's Bitter-cress

Monitoring Program and Mitigation

- Water Quality
- Fisheries
- Vegetation

Water Quality Monitoring

River Water Quality

- Salinity (TDS)
- pH
- Temperature
- Conductivity
- Dissolved Oxygen
- Turbidity

Treatment Plant Water Quality

- Salinity (TDS)
- pH
- Temperature

Fisheries Monitoring Program

Baseline Fisheries Monitoring

In-River Sampling for One Full Year Prior to Operation:

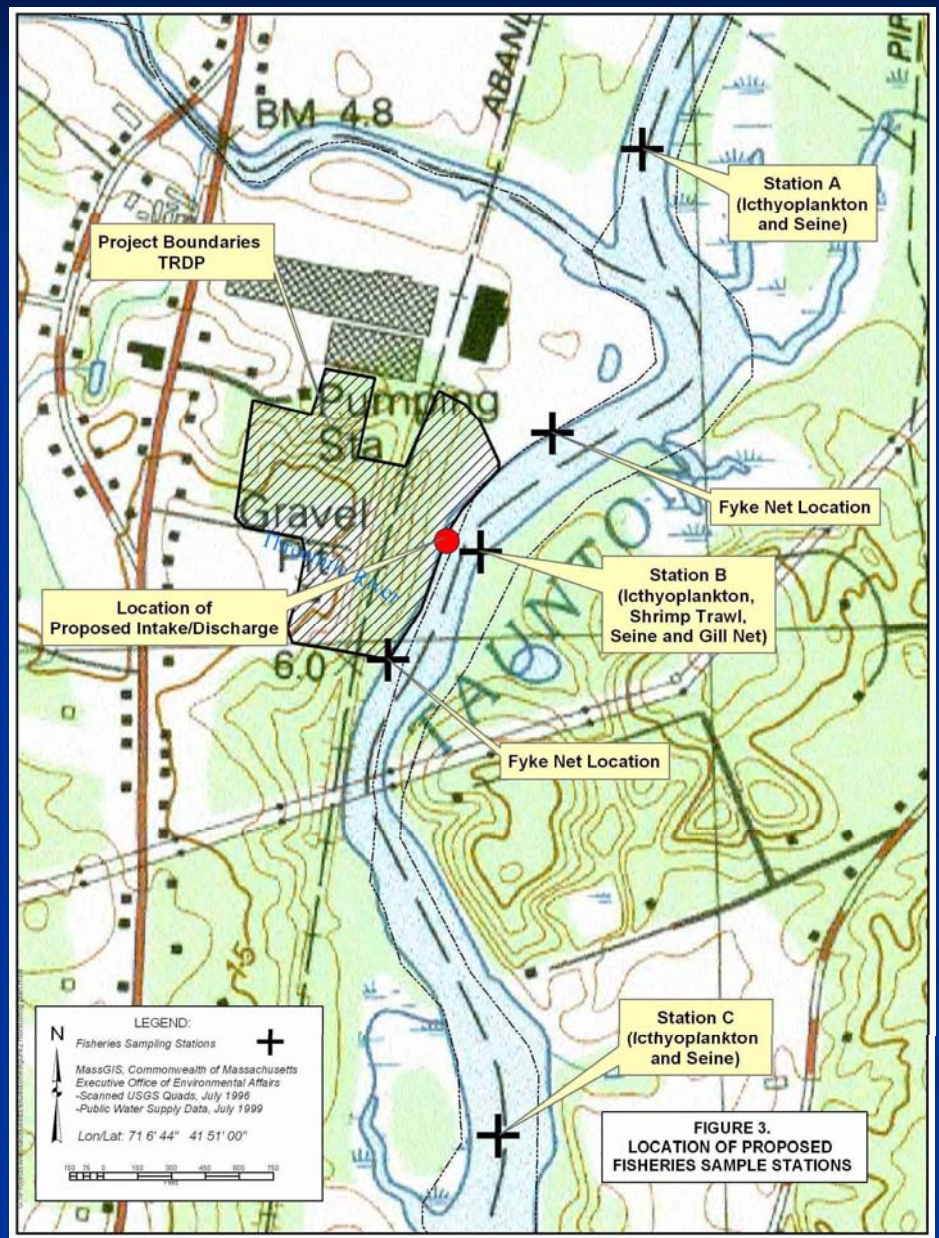
- Juvenile and adult finfish populations (Seine, Gill net, Fyke net, Trawl survey)
- Icthyoplankton (plankton tows)

Operational Fisheries Monitoring

Minimum of One Full Year During Operation:

- ***Goal:*** determine effectiveness of exclusionary devices
- Achieve at least 80% reduction in entrainment
- In-river sampling (identical to baseline sampling program)
- Model adult equivalent mortality
- Reports submitted to MA DMF on a monthly/yearly basis

Fisheries Monitoring Sampling Locations



Vegetation Mitigation and Monitoring

Vegetation Mitigation

- Construction of Wetland Replication Area
- Relocation of Long's Bitter-cress
- Extensive mapping of Long's Bitter-cress in Taunton River watershed

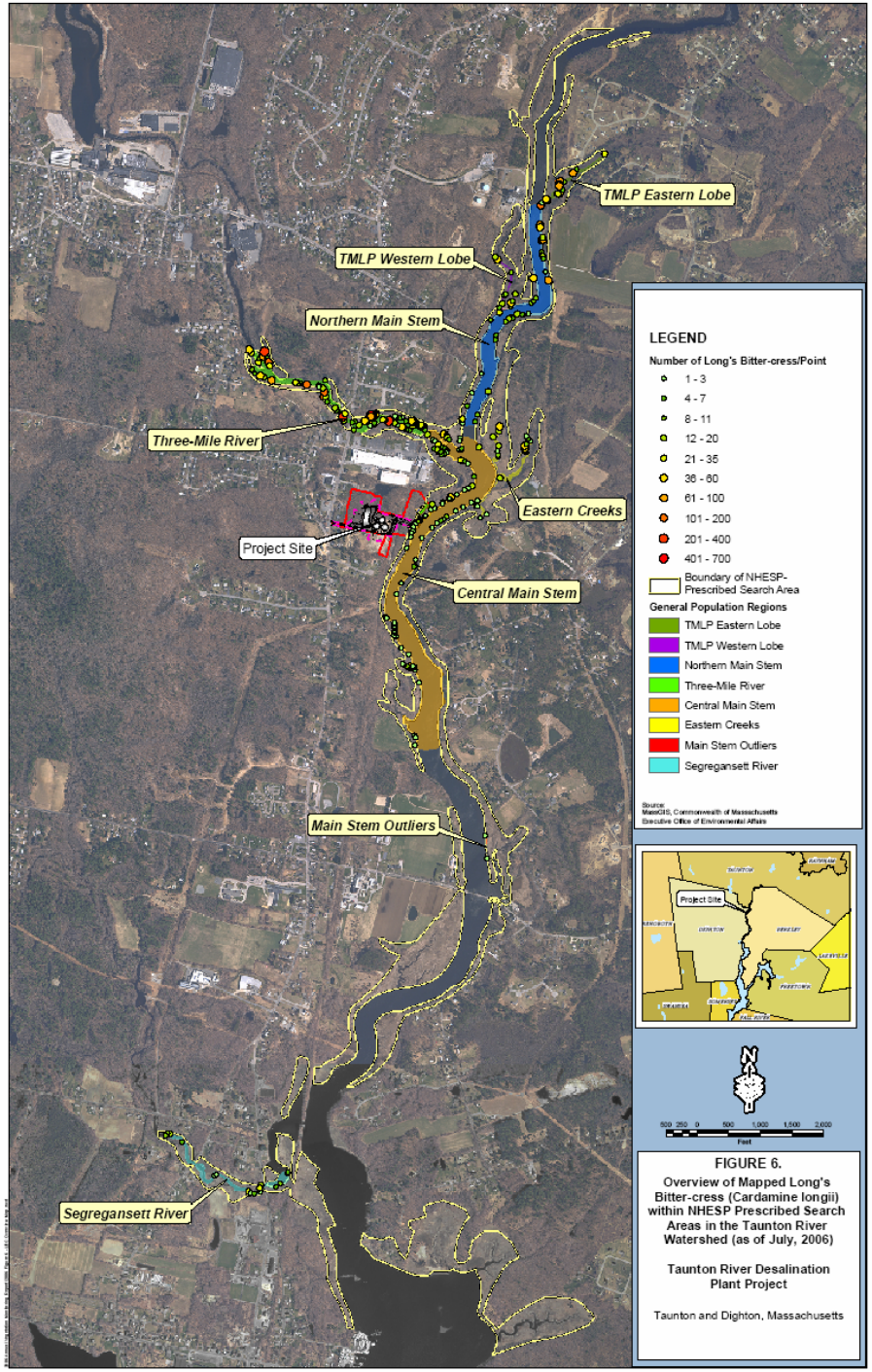
Vegetation Monitoring

- Monitoring of Wetland Replication Area
- Monitoring of relocated Long's Bitter-cress
- Long-term monitoring of vegetation and water quality parameters at the two largest populations of Long's Bitter-cress

Construction of Wetland Replication Area

Relocation and Monitoring of Long's Bitter-cress *(Cardamine longii)*

Long's Bitter-cress *(Cardamine longii)* Population Mapping



- Search area prescribed by MA NHESP
- Search area included more than 11 linear miles (18 km) of shoreline and 270 acres (110 ha) of adjacent wetlands
- More than 7,000 Long's Bitter-cress mapped
- Eight population areas demarcated

Summary of Selected Long's Bitter-cress Population Parameters

Population Area Name	***Approximate Number of Mapped Plants Per Population***	***Range of Light Levels***	***Range in Slope***	***Range in Aspect***	***Range in Soil Moisture Regime****	***Percent Soil Organic Matter***
TMLP Eastern Lobe	634	Shaded to Open	5-85%	Primarily SE and NW	Mesic to inundated	14.3%
TMLP Western Lobe	235	Shaded to Open	30-90%	Primarily E and W	Mesic to inundated	**33%**
Northern Main Stem	839	Shaded to Open	5-90%	Primarily SE and W	Mesic to inundated	3.6%
Three-Mile River	**4,238**	Shaded to Filtered	5-90%	Primarily N and S	Mesic to inundated	4.4%
Eastern Creeks	299	Shaded to Open	10-80%	Varied	Mesic to inundated	15%
Central Main Stem	632	Shaded to Open	5-90%	Varied	Mesic to inundated	9.5%
Main Stem Outliers	**2**	Shaded in morning, Open in afternoon	50-90%	Exclusively W	Mesic to inundated	15.1%
Segregansett River	138	Filtered to Open	50-70%	Varied	Mesic to inundated	**2.5%**
Total =	**7,017**					

Typical Long's Bitter-cress Habitat

Long-term Monitoring of the Two Largest Long's Bitter-cress Populations

- Salinity and turbidity monitoring

- Vegetation plot monitoring

Preliminary Results of September 2006 Long-Term Vegetation Monitoring

Parameter	*Three-Mile River Plot #1*	*Northern Main Stem Plot #1*	*Northern Main Stem Plot #2*
Number of Plants Sampled Per Plot	50	46	4
General Light Levels	Shaded	Filtered in AM, Open in PM	Open
Vertical Distance Below Mean Annual High Water	0.5 meters	0.6 meters	1.0 meters
Mean Plant Diameter	5.2 cm	6.8 cm	8.5 cm
Mean Plant Height	3.1 cm	6.8 cm	7.0 cm
Mean Vigor Rating	4	4	4
Percentage of Plot with *C. longii* in Flower	8%	26%	50%
Percentage of Plot with *C. longii* in Fruit	10%	41%	75%
Percentage of *C. longii* in plot with evidence of herbivory or disease	0%	0%	0%

Conclusions

- Water supply shortages a chronic problem in Southeastern Massachusetts
- Desalination determined to be most feasible option
- TRDP Project was the subject of intense review
- Monitoring program ongoing
- Baseline data collection in progress

Acknowledgements

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Questions ?