

Muddy Creek Culvert Replacement Wetland Restoration Project

March 8, 2012 Cape Cod Water Resources Restoration Project

















Agenda

- Introductions and Background
- Review of Field Study Findings
 - Resource and Water Quality Assessments
 - Alternative Conceptual Designs/Costs
- Next Steps
- Questions and Answers









Background

- 2003 06 Studies of Alternatives to Improve Ecological Health - Chatham CWMP
- 2005 Bacterial TMDL for Muddy Creek Reductions in Bacterial Load
- 2006 Total Nitrogen TMDLs Call for Reductions in Existing Watershed Nitrogen Loads
 - 100% in Lower Muddy Creek
 - 75% in Upper Muddy Creek

2006 - 08

- N8 Resource Assessment to Evaluate Ecological & Hydrodynamic Responses to Reinstalling a Water Control Structure in the Muddy Creek Dike
 - Provided Baseline Data for Tidal Conditions and Wetlands









Background

- 2008 Request Priority Project Status Under MA Wetlands Restoration Program for Culvert Widening Study
- 2009 Hydrodynamic Modeling to Determine Optimal Replacement Culvert Size (24 ft.)
- 2010 Water Quality Modeling to Assess Impacts of Installing 24-foot Wide Culvert
- 2010 11 Muddy Creek Chosen as a "Priority Project" Under the Cape Cod Water Resources Restoration Project

CCWRPP Funding Provided to Study Resource Impacts and Design Concepts for 24 ft. Culvert









Project Study Outline

- Topographic and Wetland Survey
- Subsurface Borings and Geotechnical Study
- Natural Resource Assessments
 - Vegetative Communities
 - Migratory and Resident Fisheries
 - Shellfisheries

- Bacterial Water Quality Modeling and Assessment
- Replacement Structure Alternatives Evaluation







Topographic and Wetland Survey

- Detailed Survey of Project Area
 - Topographic and Bathymetric Survey
 - Located Buried Utilities
 - Mapped Upstream Wetland Areas
 - Wetland Flagging

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 Identified Existing Structures Along Muddy Creek







Vegetative Community Assessment

- Established 20 Vegetative Monitoring Transects
 - Baseline Condition for Future Monitoring
 - Quantitative Assessment of Community Composition at Each Transect
- Identified and Characterized
 Vegetative Communities
 - Invasive Species Stands (Common Reed Narrow Leaved Cattail)
 - Estuarine/Intertidal Salt and Brackish/Freshwater Marshes
 - Palustrine Shrub and Red Maple Swamps
 - Pitch Pine/Oak Forested Wetlands











Migratory and Resident Fisheries Assessment

- Primary Fish Species
 - River Herring (Alewife)
 - American Eel
 - White Perch
 - Blue Crab
- Identified and Assessed Existing Passage Barriers and Degraded Habitat
 - Route 28 Culvert
 - Shallow Depths at Remnant Dike Locations (Former Cranberry Bogs)
 - Culvert from Minister's Pond
 - Seasonal Algal Blooms









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Shellfish Habitat Assessment

- Established Four Monitoring Transects
 - Baseline Condition for Future Monitoring
 - Quantitative Assessment of Shellfish
 Numbers and Sizes at Each Transect
- Assessed Current and Historic Habitat
 - Former Commercial Harvests for Soft-Shelled Clams and Quahogs
 - Limited Harvesting Due Excessive Bacteria Levels
 - "Prohibited" Upstream of Route 28
 - "Conditionally Approved" Downstream of Route 28



Map Source: Microsoft Pictometry Bird's Eye











Anticipated Wetland Community Changes

- Long-Term Restoration Benefits
 - Increased Salinity and Tidal Range
 - Reduction of Invasive Stands -Improved Biodiversity
 - Expansion of Tidal Mud Flats and Low Marsh Communities
 - New and Expanded Brackish and High Marsh Communities
- Short-term Construction Impacts
 - Impacts Limited to Immediate
 Vicinity of Existing Culvert
 - Tidal Flow to Muddy Creek to be Maintained Throughout Construction















Anticipated Fish/Shellfish Habitat Changes

- Long-Term Restoration Benefits
 - Larger Channel Opening Will Improve
 Fish Passage Opportunities
 - Reduced Velocities, More Light
 - Increased Water Depths Upstream
 - Increased Tidal Exchange Will Improve
 Water and Habitat Quality
 - Reduced Severity/Extent of Algal Blooms
 - Reduced Organic Sediment Load to Shellfish Beds
- Short-term Construction Impacts
 - Temporary Water Bypass Channel
 - Temporary Impacts to Shellfish Beds











Nitrogen/Bacteria Water Quality Modeling

- Reviewed Existing Water Quality
 Data and Previous Modeling Studies
 - MA Division of Marine Fisheries, Dept. of Public Health, Pleasant Bay Alliance, Massachusetts Estuaries Program
- Current/Previous Modeling Findings
 - Nitrogen and Bacteria Levels Would be Reduced in Muddy Creek
 - Further Reductions Required to Meet Values Under Future Full-Buildout Conditions
 - No Significant Effect on Pleasant Bay Water Quality
 - No Negative Impacts to Beaches or Shellfish Beds Identified











Replacement Structure Design Evaluation

- Concrete Box Culvert
 - Highest Cost
 - Largest Wetland Impact Area During Construction
- Short-Span Concrete Bridges
 - Moderate Cost and Wetland Impact Area During Construction
- Long Span Concrete Bridges
 - Lowest Cost
 - Smallest Wetland Impact Area During Construction















Recommended Replacement Structure

- Single Span Concrete
 Bridge
 - Open Channel Provides Safest Recreational Boating Passage
 - Estimated \$3.3M Cost (Design & Construction)













Next Steps

- Study information Presented to Towns of Chatham and Harwich for Consideration
- Placeholder for Engineering Design/Permitting Funding Pending Project Approval
- If Project Proceeds:

- Final Design and Permitting
- Bidding and Construction



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Questions and Answers

The Project Report Can be Obtained from the Following Websites:

<u>www.pleasantbay.org</u>

www.chatham-ma.gov

www.town.harwich.ma.us







