Public Information Meeting

Wastewater Master Plan - 201 Facilities Plan Update

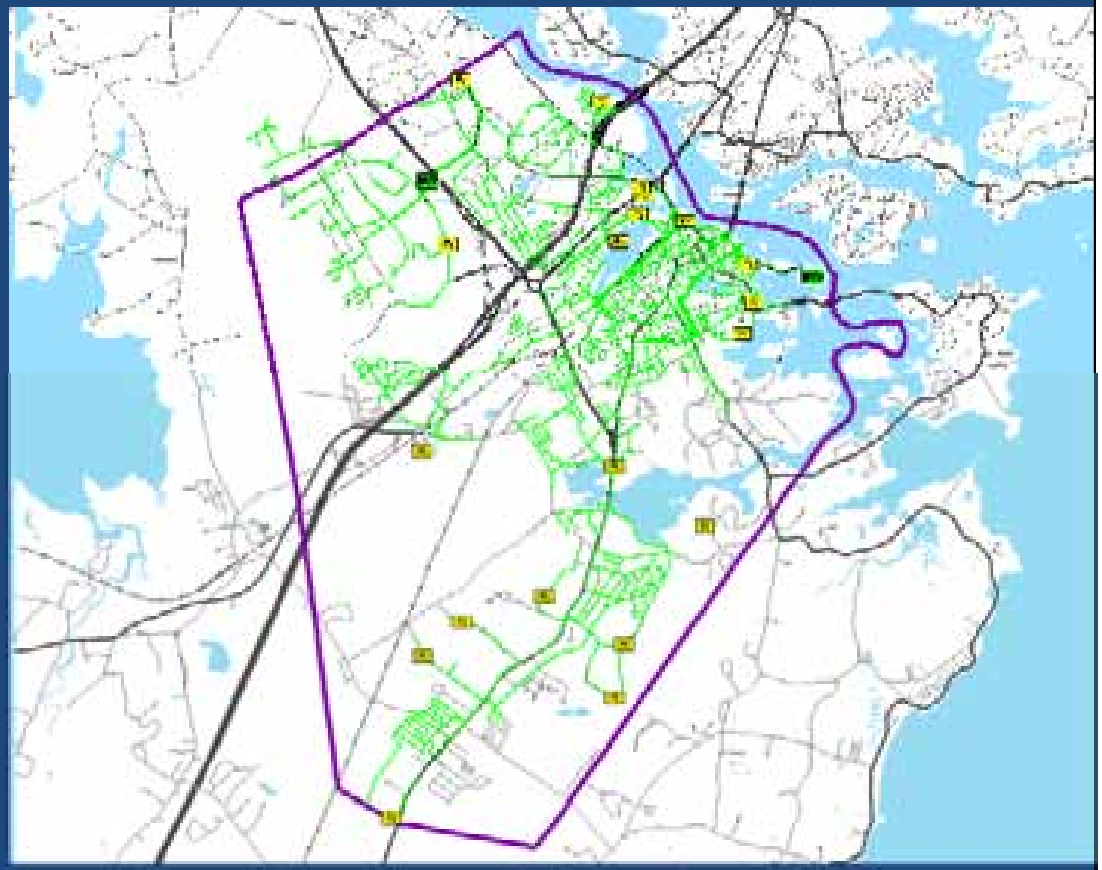
June 23, 2010

Agenda

- Introduction
  - Background
  - Completed Projects
  - Projects Concurrent with the WMP
- Wastewater Master Plan
  - Master Planning Process
  - Preferred Alternative
  - Plan of Action
  - Variables Moving Forward
- Proposed Numeric Nitrogen Criteria for Great Bay Estuary

The Portsmouth Wastewater System Overview

- Two WWTF
- ~ 115 miles of Collection System
- Urban area is Combined Stormwater and Sanitary Flow
- 20 pumping Stations
- 3 Combined Sewer Overflows (CSOs)



Commitment to Environmental Protection

- **LEED Facilities**
- Recent updates of City Ordinances
- Ongoing green infrastructure projects visible throughout the City

City LEED Buildings

Commitment to Environmental Protection

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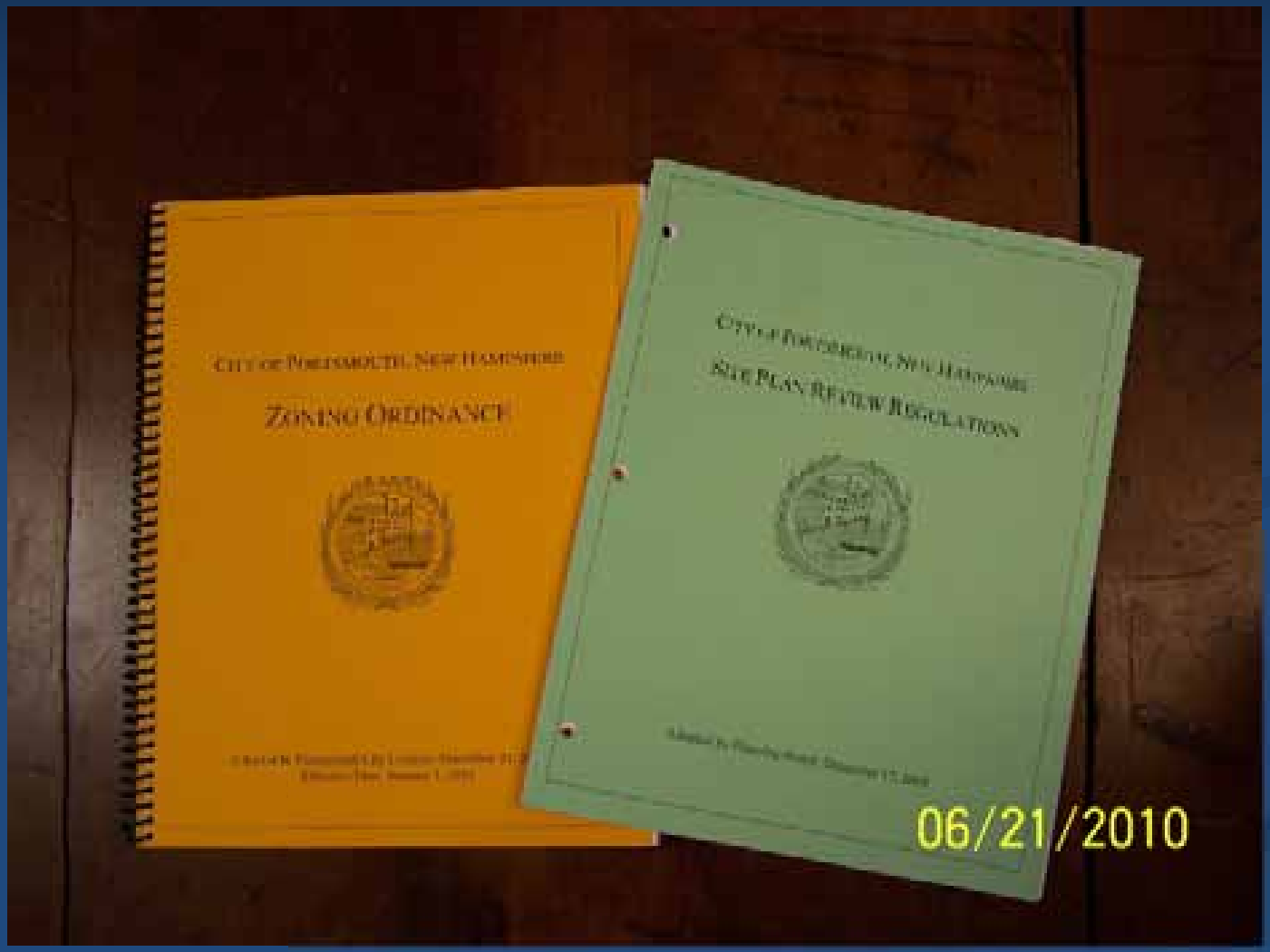
City Ordinances



Commitment to Environmental Protection

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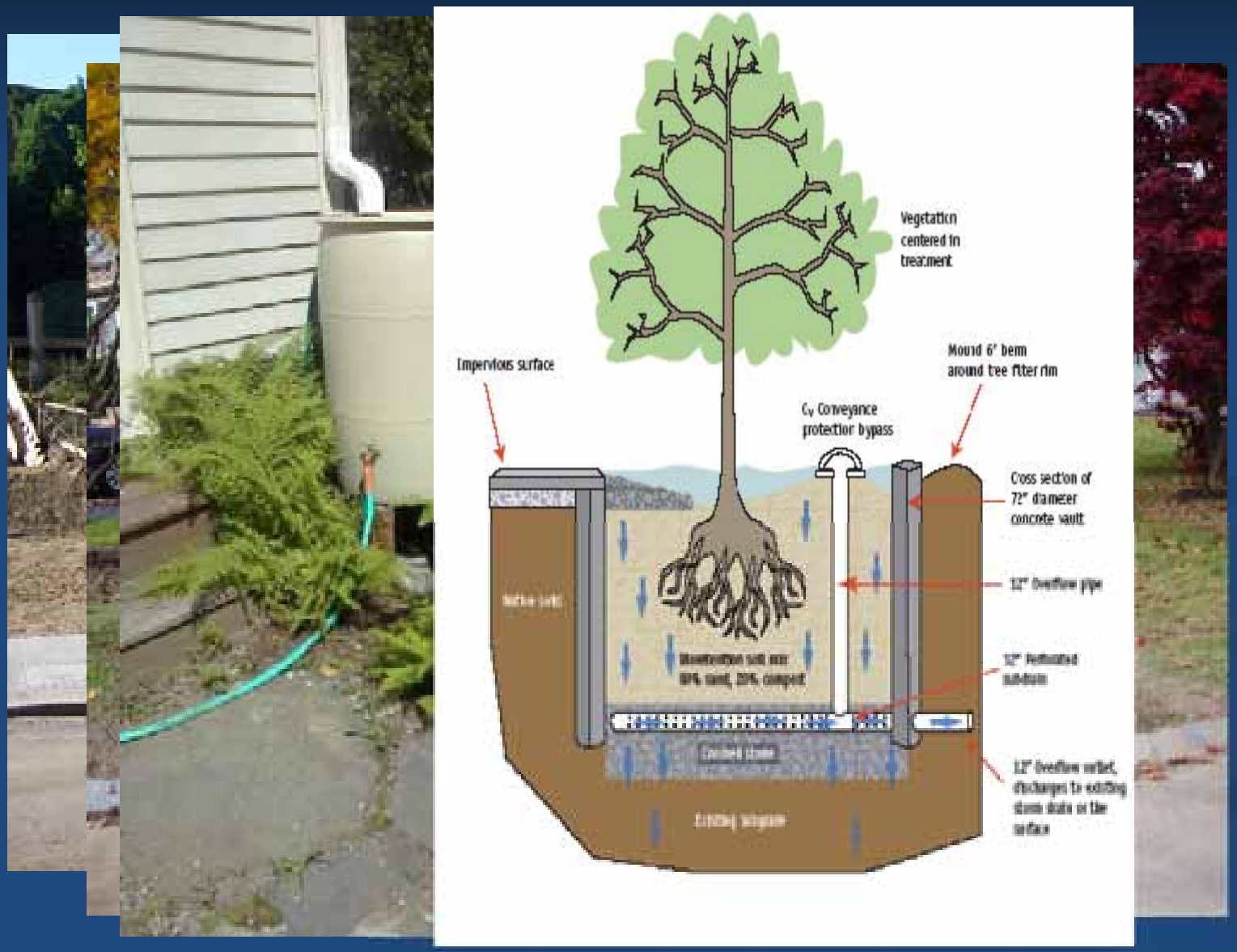
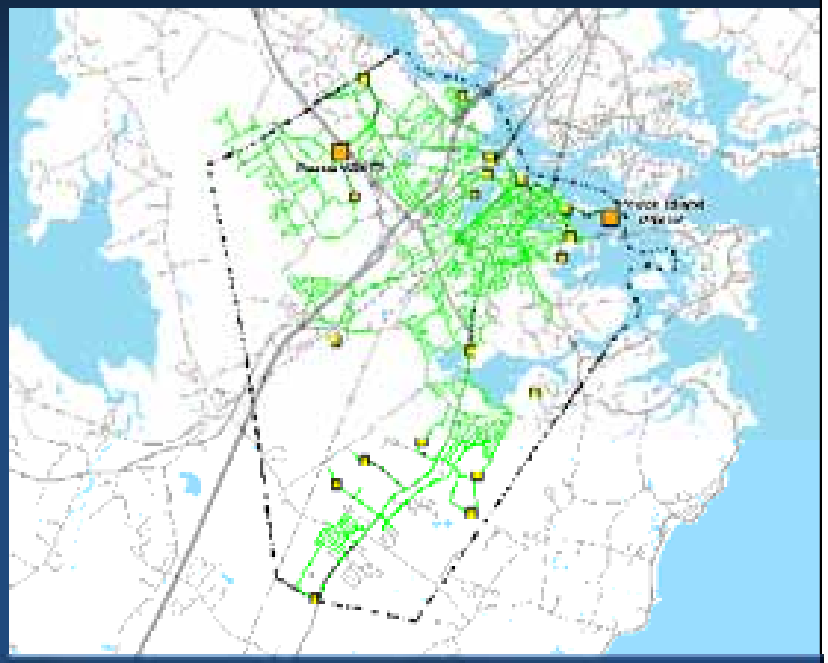
Green Infrastructure



Projects Completed Since 1997 (over $25M)



- Peirce Island Bridge Forcemain
- Essex Sheffield Separation
- Thaxter Fells Separation
- Pannaway Manor Separation
- Brickbox Cleaning
- Brackett Road Sewer Extension
- Peirce Island WWTP Improvements
- Mechanic Street Pumping Station Upgrade
- Route One Sewer Improvements
- Upper Court Street (LTCP)
- South Mill Pond Area - Contract 1 (LTCP)

Projects Completed Since 1997 (con't)

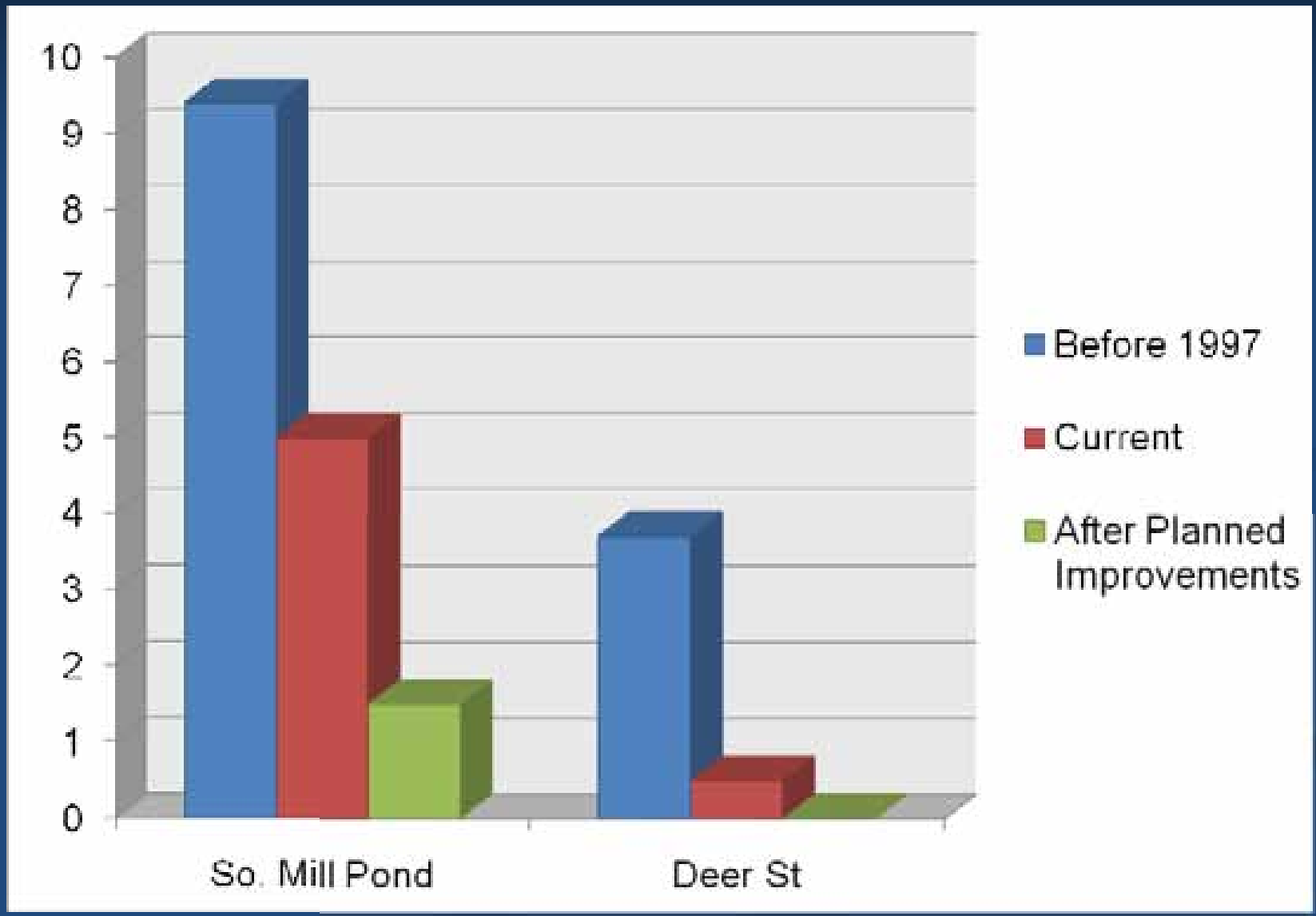
- South Street Sewer Separation
- Pease Interceptor Upgrade
- Lafayette Road Pumping Station Upgrade
- SCADA System Upgrade
- Gosling Road Pumping Station Upgrade
- Dennett Street Sewer Separation
- Pleasant Point Sewer Extension
- Lower Court Street (LTCP)
- Deer Street Pumping Station (LTCP)
- Borthwick Avenue Sewer (LTCP)


09/20/2004

Pumps nearly half of City's wastewater

Deer Street Pumping Station Upgrade

Estimated Typical Year CSO Volumes Discharged



Projects Concurrent with Master Plan (over $15M)

- Bartlett Street – Under Construction
- State Street – Under Construction
- Lincoln Area 3A – Construction Starts Summer 2010
- Cass Street Area – Under Design
- Evaluating interim measures to control nitrogen and total suspended solids which can be implemented within the current NPDES Permit cycle – On-going

WASTEWATER MASTER PLAN


Permit Limits
Affordability
Sustainability
Public Input
Technology
Wastewater Flows
Regulatory Input
Site Selection
Master Planning
Complex Decision Making Process

EPA Approved WMP Scope of Work

1. Define Study Parameters TM1
2. Regulatory Requirements Review TM2
3. Flow and Load Forecasting TM3
4. Collection System Evaluation TM4
5. Alternatives Evaluation TM5
6. Develop Funding Strategies
7. Develop Implementation Schedule
8. Prepare the WMP Document
9. Update Wastewater Treatment Facilities Plan
10. Update CSO LTCP
11. Develop Public / Regulatory Participation Program
12. Project Management
14. Supplemental Work Plan-Interim Measures

Completed

WMP Report
Draft
Submitted
Revisions
On-going

On-going

Completed

Master Planning Process
201 Facilities Plan

- Iterative planning process reduces complexity
- Start at the 30,000 foot level and work down as information becomes available
- Findings evolve as the planning process progresses
- Value Engineering by Third Party
- Public and regulatory input throughout process intended to reduce re-evaluations and re-work

Final Alternatives

- Phased Expansion of Pease WWTF – Redirection of all the City's sanitary flow over time to an incremental expansion of the existing SBR secondary process at Pease

- Peirce Island WWTF Upgrade - Upgrade of the existing Peirce Island chemically enhanced primary treatment (CEPT) system to an Membrane Biological Reactor (MBR) secondary process with nutrient removal

Final Alternatives Evaluation

- The Master Plan Alternatives Considered
  - Impact the City's collection system
  - CSO abatement program
  - Impact to the environment
  - Economic impacts
  - Cultural impacts

Life Cycle Cost Comparison

Scenario	Capital ($M)	Present Value O&M (5% , 20 yrs, $M)	Life Cycle Cost ($M)
TN 8			
Peirce Island	**$78.6**	**$59.3**	**$137.9**
Pease	**$66.2**	**$56.7**	**$122.9**
TN 3			
Peirce Island	**$86.2**	**$68.7**	**$154.9**
Pease	**$86.4**	**$57.4**	**$143.8**

Preferred Alternative Selection Process

- The WMP team used a decision matrix evaluation to select a preferred alternative
- Evaluation criteria were developed based on the environmental, cultural and economic goals for the WMP
- A ranking scale was used to determine how well each alternative satisfied the evaluation criteria

Preferred Alternative

- Upgrade Pease WWTF
  - Phased expansion
  - Use the existing Pease WWTF outfall location

Expansion of Pease to a 7.9 mgd WWTF

Plan of Action

- 2010 –
  - Complete VE
  - Final Review by Council
  - Submit Final Report to EPA
  - Consent Decree Negotiations
- 2011-2013
  - Complete targeted sewer separation
  - Wastewater Characterization
  - Permitting
  - WWTF Conceptual Design
  - Pilot Emerging Technology

Plan of Action cont.

- 2014-2016
  - Post construction monitoring plan for sewer separation
  - Design of phased program
  - Final design of first phase
  - Preliminary design of additional phases
- 2015-2017
  - Deer Street Modifications
  - New Force Main to Pease
  - Reroute a portion of Peirce Island flow to existing Pease capacity
- 2018-2020
  - Add 3rd SBR basin
  - Reroute additional Peirce Island flow to Pease

Plan of Action cont.

- 2021-2022
  - Add 4th SBR basin
  - Reroute additional Peirce Island flow to Pease
- 2023-2025
  - Add 5th and 6th SBR basins
  - Reroute additional flow to Pease
  - Build Mechanic Street dry weather pump station
  - Marcy Street Area Debottlenecking
- 2026-2028
  - Add final SBR basins (if necessary)
  - Reroute all Peirce Island sanitary flow to Pease
  - Retrofit Peirce Island as wet-weather only facility

Variables Moving Forward

- Final Value Engineering Review
- Affordability Analysis
- Ability to Phase Construction
- Potential Restriction of the Pease WWTF Outfall
- Nutrient Permit Limit Unknown

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Value Engineering

- Opportunity for review draft recommendations prior to submission of final report
- Potential cost savings

Variables Moving Forward

- Final Value Engineering Review
- **Affordability Analysis**
- Ability to Phase Construction
- Potential Restriction of the Pease WWTF Outfall
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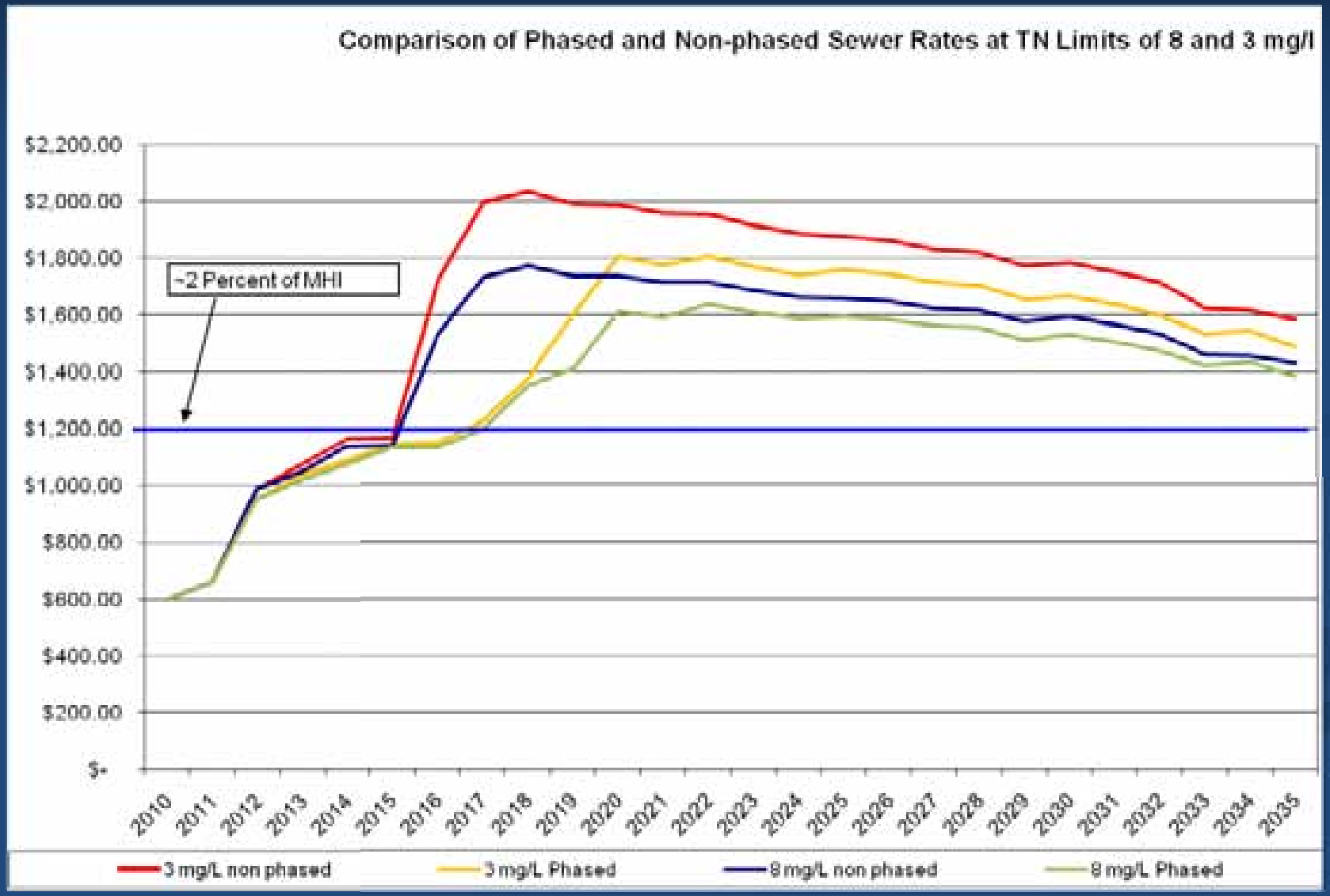
User Rate Impact Comparison at TN Limits of 3 and 8 mg/l



Variables Moving Forward

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- Affordability Analysis
- **Ability to Phase Construction**
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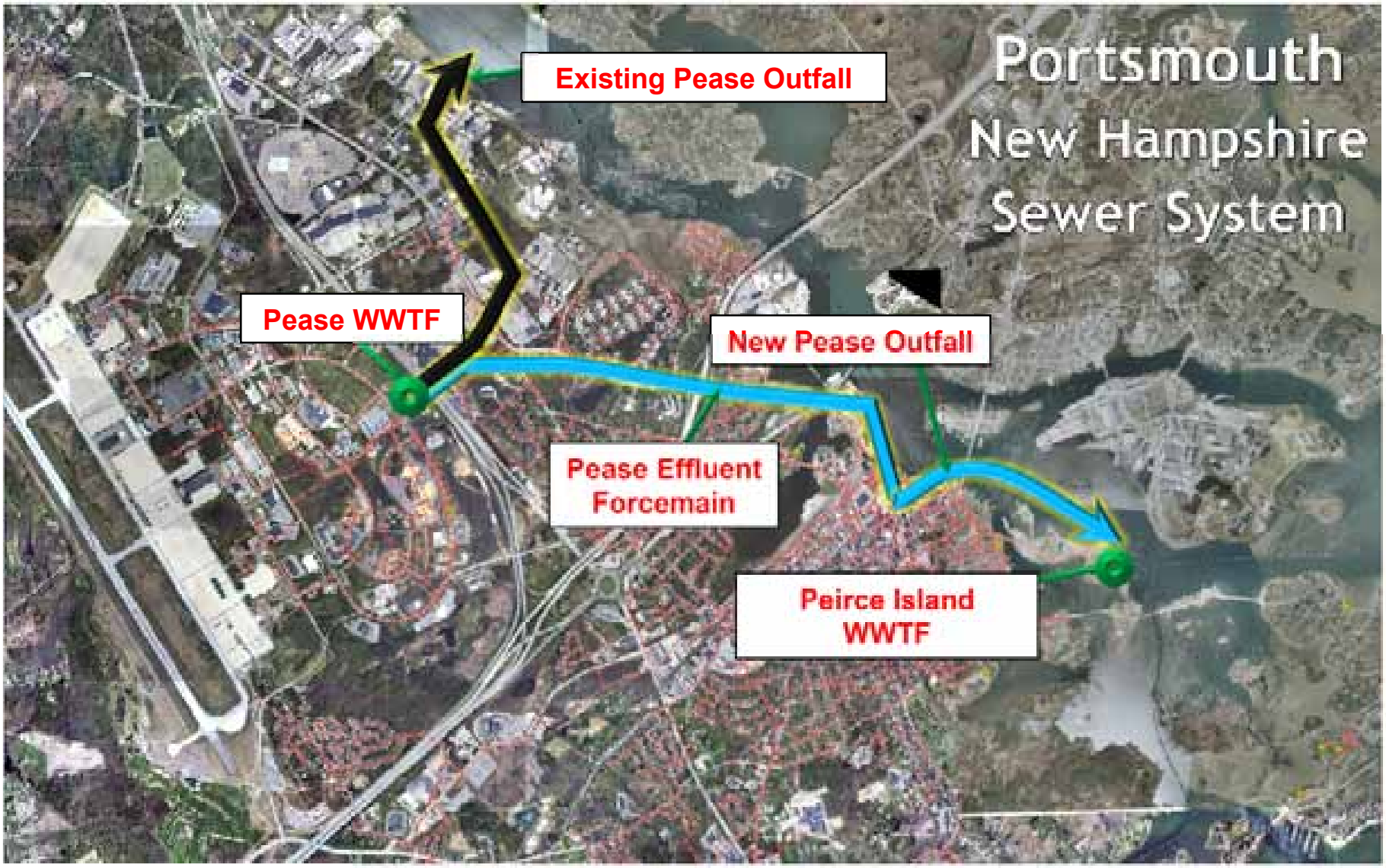
Benefits of Phased Construction Approach

- Allows City to continue with sewer separation program (LTCP) and measure its affect on wastewater flows
- Allows for continued evaluation of emerging technologies which may reduce project costs
- Construction period is spread over time reducing the magnitude of rate increases

Variables Moving Forward

- Final Value Engineering Review
- Affordability Analysis
- Ability to Phase Construction
- **Potential Restriction of the Pease WWTF Outfall**
- Nutrient Permit Limit Unknown

Effluent Pumping to Peirce Island WWTF



Variables Moving Forward

- Final Value Engineering Review
- Affordability Analysis
- Ability to Phase Construction
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- **Nutrient Permit Limit Unknown**

Proposed Numeric Nitrogen Criteria for Great Bay Estuary

Why are Nutrients Important

- Phosphorus and Nitrogen
- Phosphorus is the limiting nutrient in freshwater systems.
- Nitrogen is the limiting nutrient in tidal systems.
- Excess nutrients can lead to Eutrophication
  - Algae blooms deplete oxygen, which can stress marine life.

Nutrients Regulatory Framework

- State Develops Water Quality Standards
- State Develops Numeric Nutrient Criteria
- State Determines if Water Body meets Water Quality Standards (303d list)
- EPA issues NPDES permits that regulate WWTFs

Nutrient Regulation

- National Issue
  - EPA Initiatives
- Chesapeake Bay / Long Island Sound
- Other State Issues
  - Massachusetts
  - Pennsylvania
  - Florida
  - Colorado
  - Kansas

Ass'n of State and Interstate Water Pollution Control Administrators Letter to EPA (July 18, 2007)

"Many States are ***failing to find a strong linkage*** between the EPA recommended cause variables (N and P) and response variables ... These problems can only lead to miscues in impairment identification and ***misdirection of scarce management and implementation resources***."

Focus of State Program

- State Believes Nutrients causing excessive plant growth in the Bay and Tidal Rivers
- Believes light penetration is limiting eelgrass growth due to turbidity
- State believes controlling TN will reduce turbidity and allow eelgrass restoration

Proposed Numeric Nitrogen Criteria for Great Bay Estuary

- Primary Contact, Algae
- Aquatic Life Support, Dissolved Oxygen
- Aquatic Life – Eelgrass
- Macro Algae

Concerns With State Proposed Approach

Technical Deficiencies

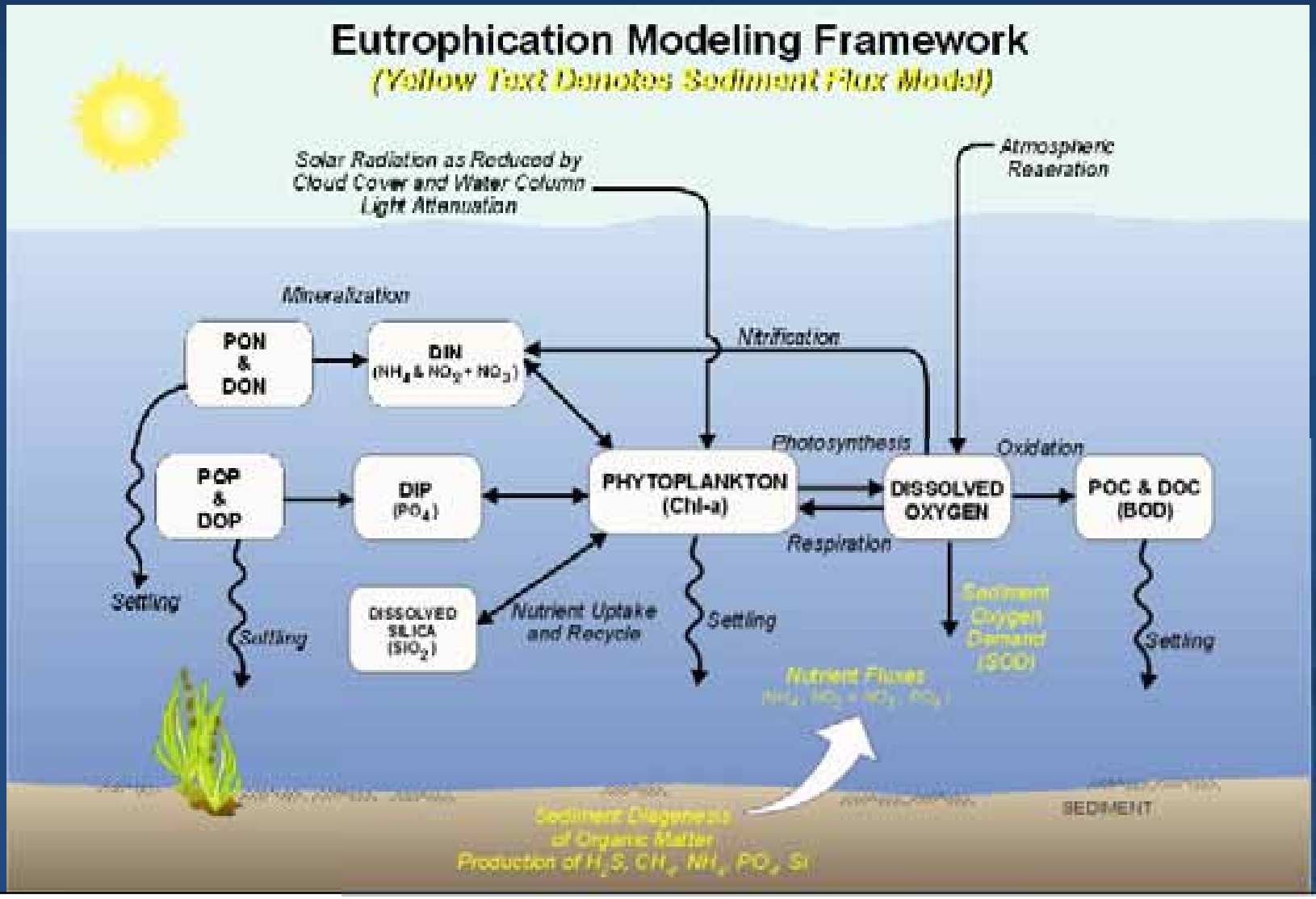
- Stringent TN Regulation without “cause and effect” demonstration (SAB Report)
- Available data indicate TN control likely ineffective in protecting bay resources
- High social and economic cost of compliance with little likelihood of success
- Alternative programs likely to be more effective

Science Advisory Board Conclusions

- In order to be scientifically defensible, empirical methods must take into consideration the influence of other variables. …The statistical methods in the Guidance require ***careful consideration of confounding variables before being used as predictive tools***. … Without such information, nutrient criteria… may be ***highly inaccurate***.

- ***Without a mechanistic understanding and a clear causative link*** between nutrient levels and impairment, there is ***no assurance*** that managing for particular nutrient levels ***will lead to the desired outcome***.

Overview of Water Quality Model Kinetics



Factors Affecting Water Column Light Extinction (Kd)

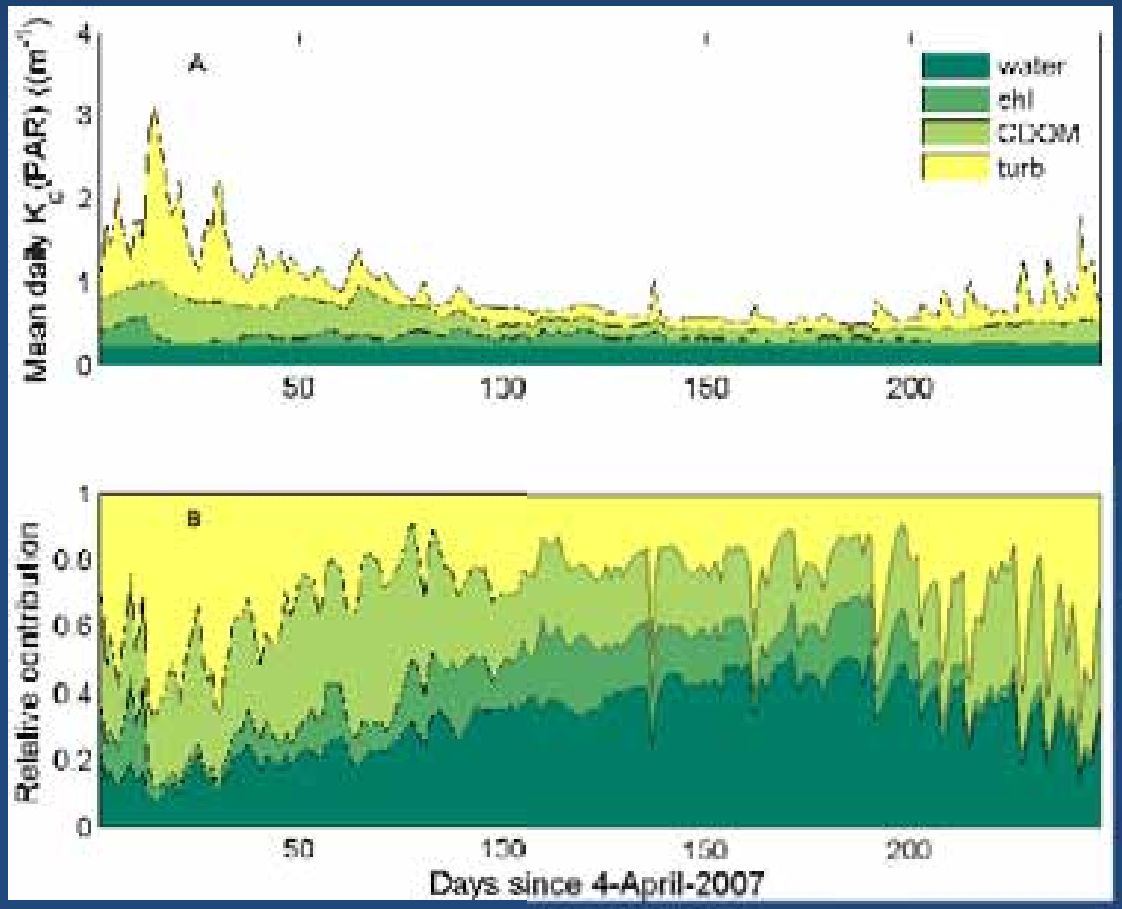
- Background Water
- Phytoplankton + Detritus (chla)
- Non-Algal Solids (NAS)
- Color (CDOM)

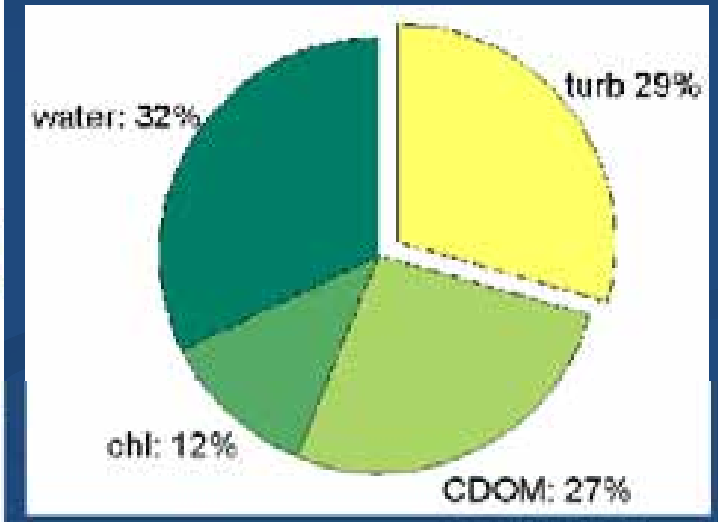
Therefore:

$$Kd = a + b*chla + c*NAS + d*CDOM$$

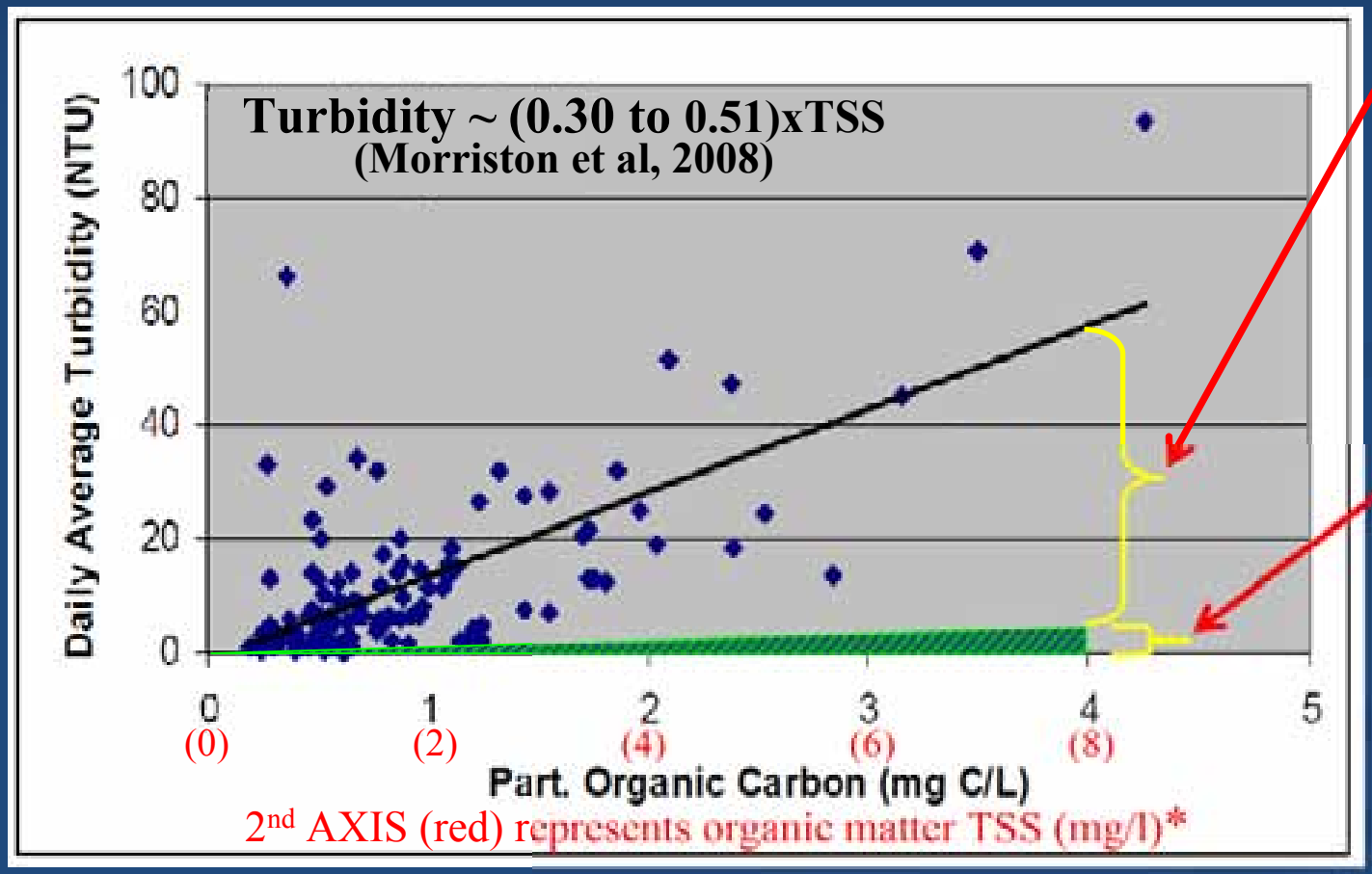
Contributions to Kd (PAR) measured at the Great Bay Buoy

(From Morriston et al, 2008)





Measured Daily Average Turbidity vs. Particulate Organic Carbon (2000-2007)

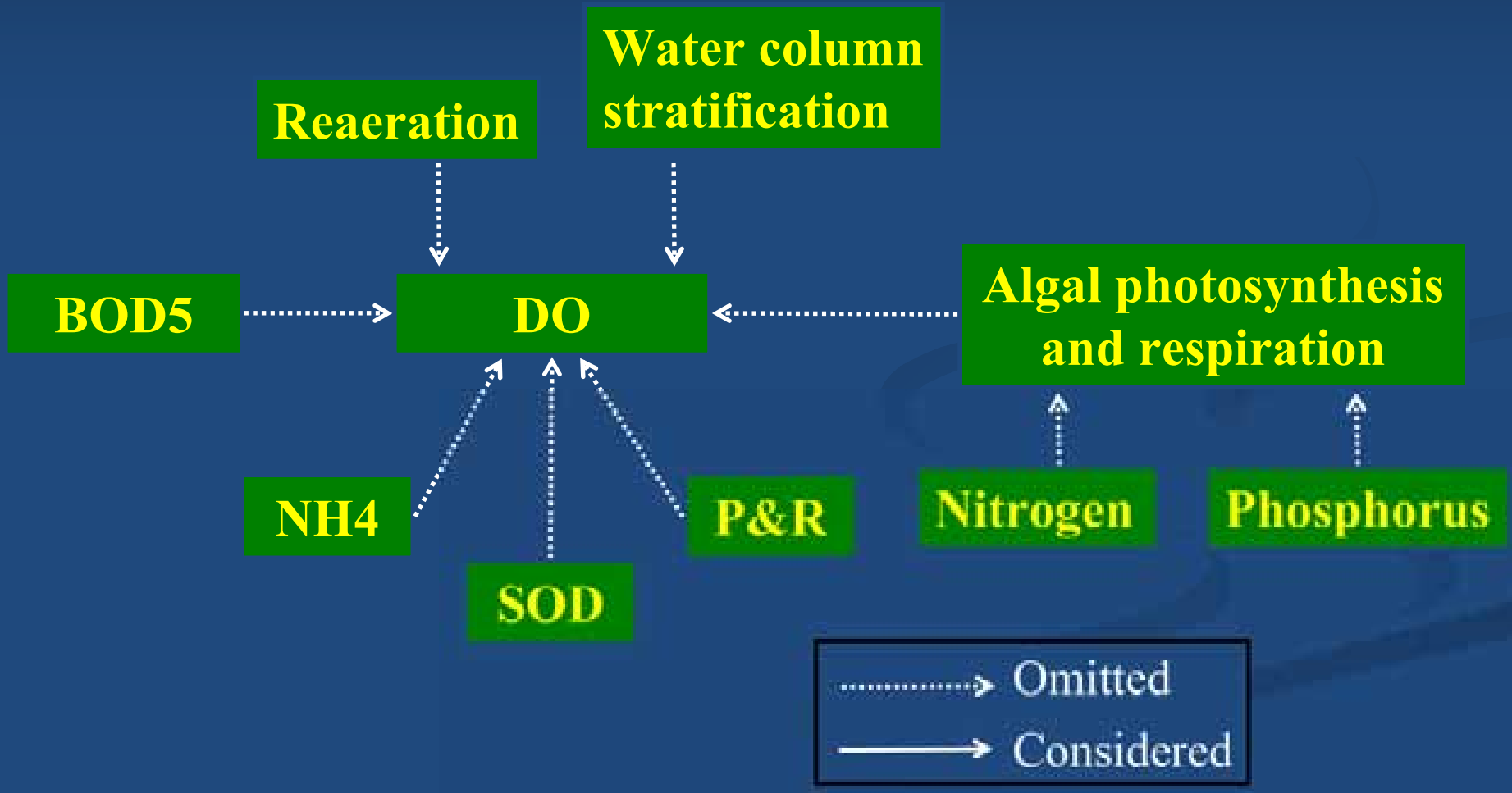


Estimated inorganic matter turbidity

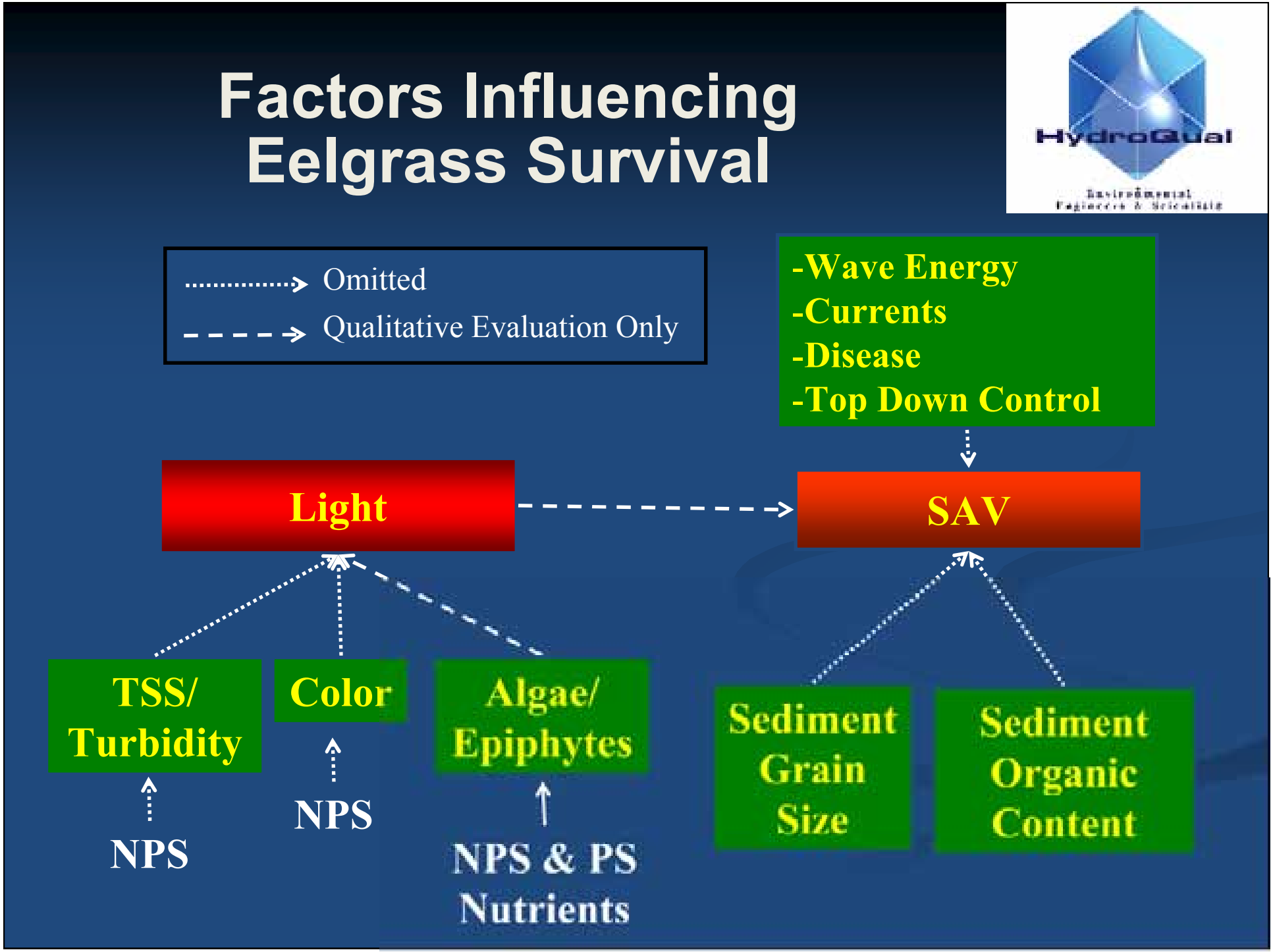
Estimated organic matter turbidity

* Assuming POM=50% Carbon

Factors Influencing Water Column Dissolved Oxygen

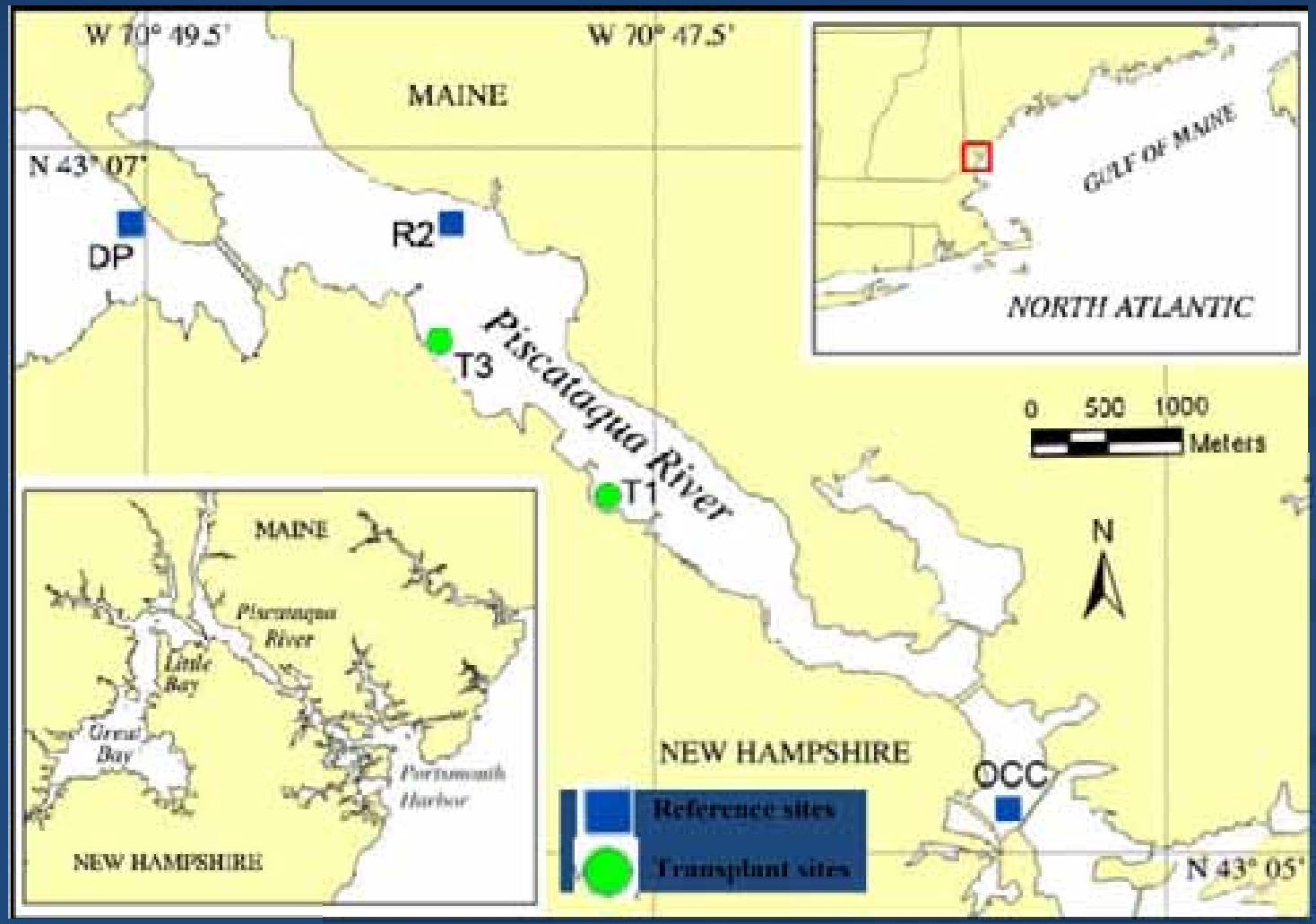


Factors Influencing Eelgrass Survival



NHPA Eelgrass Monitoring Sites within the Piscataqua River and Little Bay

(Nora T. Beem & Frederick T. Short, 2009)



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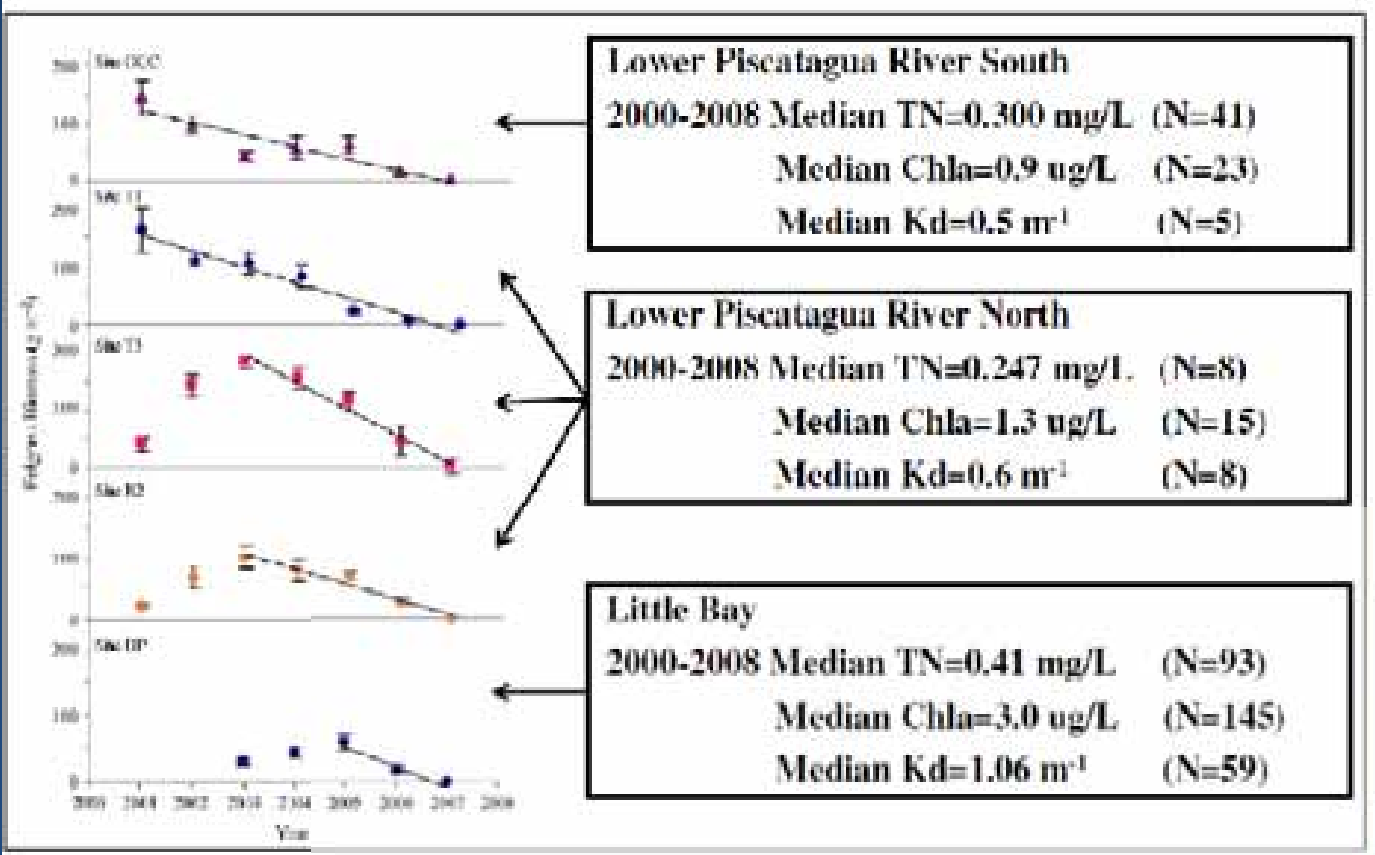
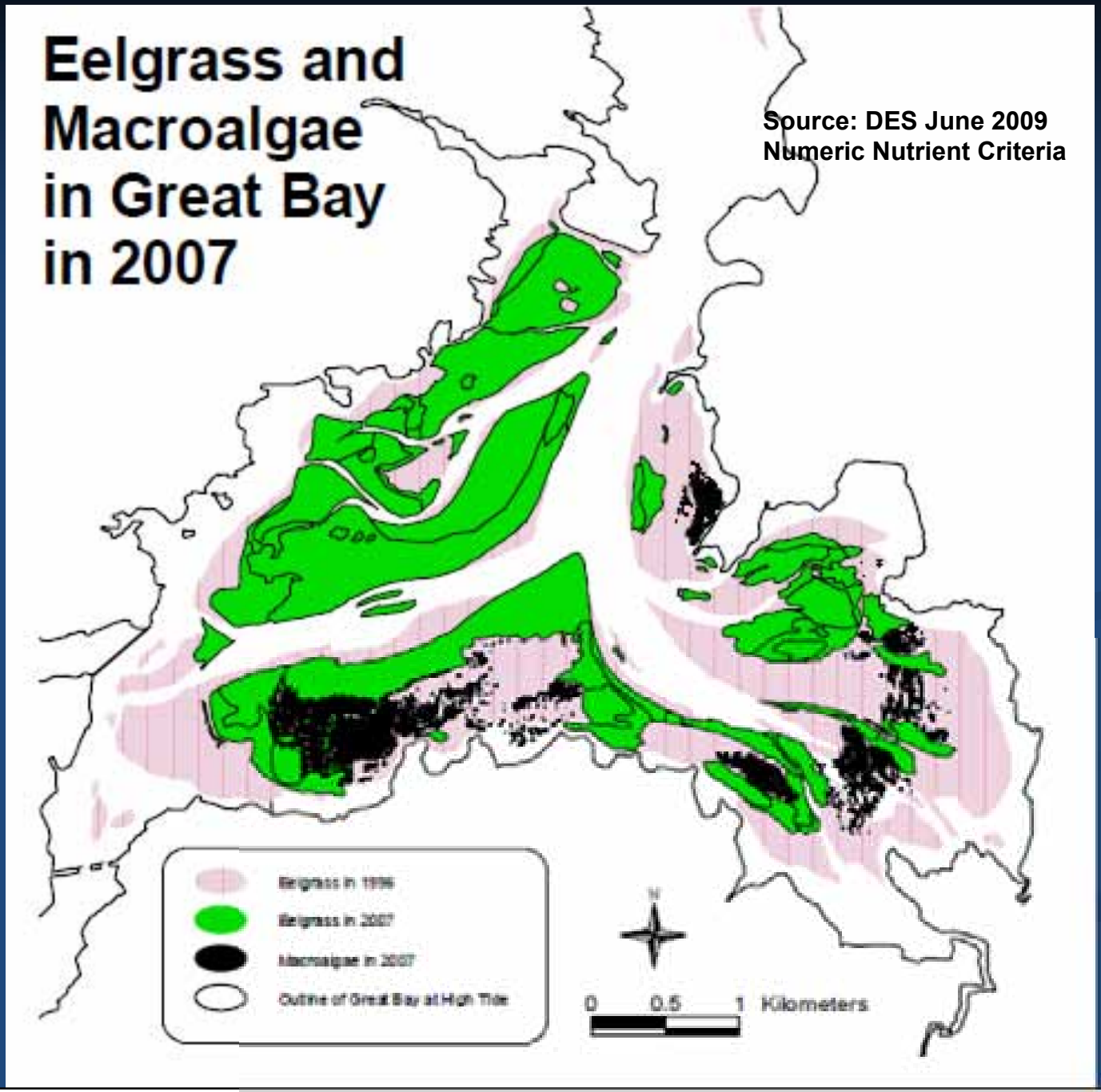


Figure 9. NHPA Eelgrass Monitoring Sites within the Piscataqua River and Little Bay (N. Beem & F. Short, 2009)

Missing Analyses

- Confirm TN concentrations control phytoplankton growth
- Demonstrate that a reduction in median phytoplankton concentration will occur and improve light penetration
- Demonstrate TN reduction is required to address non-algal turbidity
- Assessment of other factors that may explain or control the available light for submerged aquatic vegetation
- Confirm that eelgrass losses are tied to TN increases
- Show that the Chl ‘a’ levels in the estuary arms is cause of low DO
- Confirm that sediment oxygen demand was not the cause of DO depletion occurring in the estuary arms.
- Show that increased Chl ‘a’ levels in estuary arms resulted from growth in the saline and not fresh water sections of the watershed.

Eelgrass and Macroalgae in Great Bay in 2007



Source: DES June 2009 Numeric Nutrient Criteria


33
151
108

Reality of Situation

- Complex System does not lend itself to simple analysis (LIS, Chesapeake Bay)
- Numerous factors Impact eelgrass population
- Nitrogen not primary factor affecting eelgrass losses
- Hard thinking, additional data collection and more diverse restoration efforts will be necessary

Regulatory Initiative

- April 9th Letter to EPA and DES from Dover, Durham, Exeter, Newmarket, Portsmouth, and Rochester
  - Open Peer Review of Nutrient Criteria
  - Formal Rule Making prior to adoption of Nutrient Criteria
  - Demonstrate cause and effect for nitrogen limits
- May 17th DES Response Letter
  - EPA's review is adequate no further effort needed
  - Communities will have opportunity to comment before adoption

Long-term Great Bay Restoration Strategy

- Utilize Existing Infrastructure to Maximum
- Promote Regional Cooperation
  - Coalition of Wastewater Communities
  - Southeast Watershed Alliance
  - Leverage Financial Resources
- Plan for Necessary WWTF and Stormwater Upgrades
- Concurrently Perform Additional Science
  - Hydrodynamic Modeling
  - Sampling to Improve Data Sets
- Investigate Supplemental Environmental Projects
  - UNH Shellfish Bioextraction Pilot
  - Eelgrass Replanting

Conclusion

- Proven commitment to and experience with environmental protection
- Completed and ongoing wastewater infrastructure improvements totaling $40M
- Committed to scientifically based, cost effective, community minded solutions
- City continues to move forward to meet its water quality commitments
- Actively engaged in regional environmental programs