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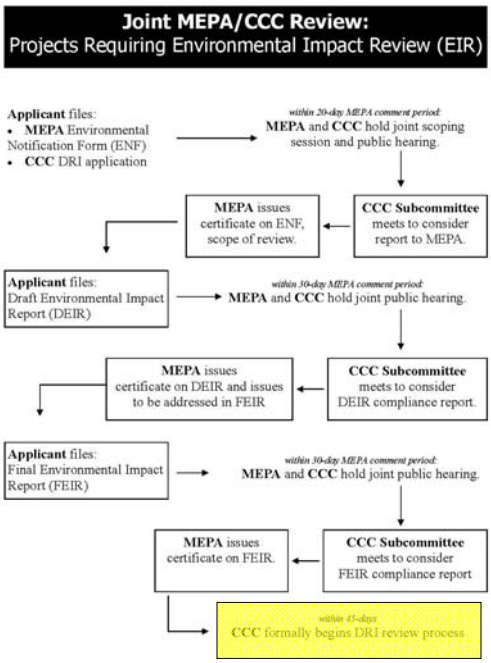
Water Resource Comments on Orleans Comprehensive Wastewater Management Plan / DRI

March 1, 2011
6 PM
Orleans Town Hall



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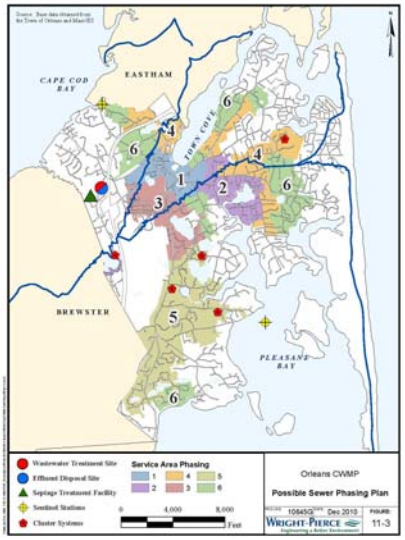
Joint MEPA / Cape Cod Commission DRI REVIEW

CWMP has demonstrated to MEPA's…satisfaction that the Town… has avoided, minimized and mitigated impacts to the maximum extent possible.

The project may proceed…

CWMP Summary

Sewer 53 % of the Town
(2600 properties)



640,000 gpd Annual Average

26% Residential Growth
8% Commercial Growth

Implemented over 15-20 years

Estimated Cost $150 Million

Property Tax Assessment 80%
Betterment 20%

Cost to Average Homeowner
~ $2,600/year

Water Resources Regional Policy Plan Goals

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Ensure sustainable supply of untreated, high-quality drinking water

Preserve/Restore the ecological integrity of marine/freshwater system

Encourage use of public and private sewage treatment facilities where appropriate

Provide adequate Stormwater management and treatment

WR3.1 Critical Nitrogen Load Standard for Development

In watersheds to estuaries/embayments where a critical nitrogen load has been determined, through either a Total Maximum Daily Load (TMDL), or a Massachusetts Estuaries Project-accepted technical report,

development and redevelopment shall not exceed the identified critical nitrogen loading standard for impact on marine ecosystems, ...

TMDLs are approved by the Massachusetts Department of Environmental Protection and the US Environmental Protection Agency.

WR3.2 Maintenance or Improvement of Nitrogen Loading

- In watersheds to estuaries/embayments where there are documented marine water quality problems ... development and redevelopment shall maintain or improve existing levels of nitrogen loading, ...

Percent Septic Nitrogen Removal

Pleasant Bay	-TMDL % Removal
Meetinghouse Pond	100%
Paw Wah Pond	75%
Pochet Neck	65%
Lonnies Pond	50%
The River	50%
Areys Pond	50%
Namequoit River	50%
Little Pleasant Bay	45%
Quanset Pond	50%
Pleasant Bay	50%

Northside Embayments –Draft MEP % Removal	
Rock Harbor	70%
Nauset Marsh – Estimated % Removal	
Nauset Marsh/Town Cove	55%

Excess Capacity over Existing Total Load-Draft MEP	
Namskaket Creek	261% Increase
Little Namskaket Creek	65 % Increase

WR3.3 Local Management Plans

- **... in watersheds with ... Commission-approved comprehensive wastewater management plans, nitrogen loading from development and redevelopment shall attain the nitrogen loading limit specified by the plan.**

Water Resources Goal – WR6: Public and Private Wastewater Treatment Facilities

- To encourage the use of public and private wastewater treatment facilities in appropriate areas where they will provide environmental or other public benefits and where they can be adequately managed and maintained.

WR6.2 Tertiary Treatment

- All public and private wastewater treatment facilities with greater than a design flow of 10,000 gallons per day shall be designed to achieve tertiary treatment with denitrification that meets a maximum 5-ppm total nitrogen effluent discharge standard…

WR6.3 Hydrologic Balance

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- **Sewage treatment facilities and their collection and discharge areas shall maintain the hydrologic balance of the aquifer and demonstrate that there are no negative ecological impacts to surface waters.**

Facility Siting

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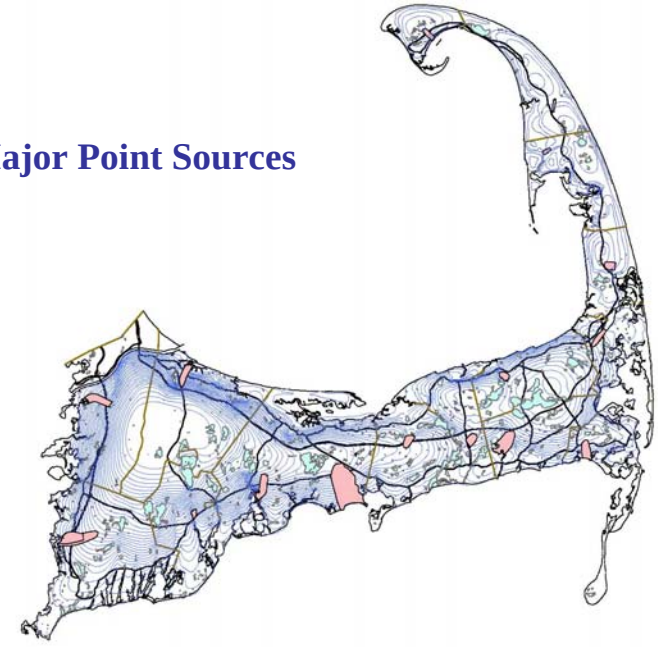
Major Point Sources



Comparative Flow and Nitrogen Load of Tri-Town and the Proposed WWTF

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	Annual Flow	Annual Nitrogen Load
TRI-TOWN	29,000 GPD	2637 lbs/Y
PROPOSED WWTF @ Initial Phases	470,000 GPD	4294 lbs/Y
PROPOSED WWTF @ Design	640,000 GPD	5848 lbs/Y

Does not account for hydrogeologic underflow

Conservative Assumptions and Hydrogeologic Uncertainty

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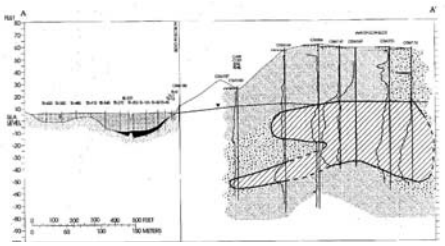
- Consultant Model indicates that 70% of effluent flow may discharge into Namskaket Creek

Flow	Namskaket	Little Namskaket	Cape Cod Bay
470,000	70%	7%	23%
640,000	67%	9%	24%

- USGS Studies indicate a larger percent of effluent flow passes beneath Marsh to Cape Cod Bay



Assimilative Capacity of Namskaket Creek

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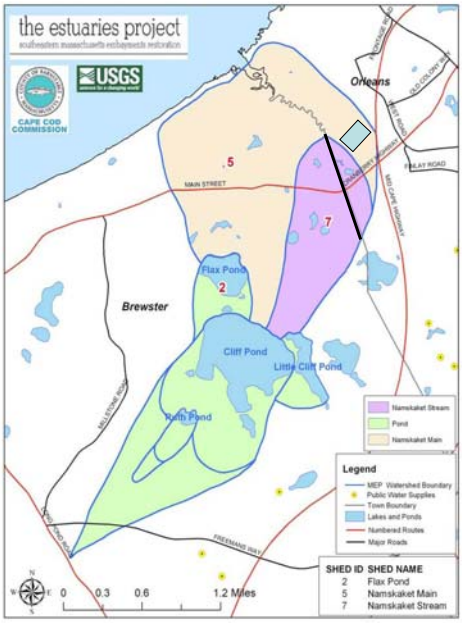
LOAD	Kg/d	Lbs/yr
Existing Attenuated	15.98	12,862
Buildout Attenuated	25.70	20,684
Namskaket Threshold Load	45.89	36,925
Buildout + WWTF Load	25.70 + 7.27 = 32.97	26,532



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Wastewater Flows Town Contribution

58% Brewster Residential
23% Orleans Residential
19% Orleans Commercial

Total Maximum Daily Loads and The MEP Project

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…(MEP) Linked modeling approach underwent significant review at the State (Mass DEP, CZM) and federal (USEPA) levels before being accepted and funded…

1. Watershed delineation
2. Nitrogen Loading
3. Hydrodynamic Model
4. Ecological Condition
5. Water Quality Model

Watershed Delineation

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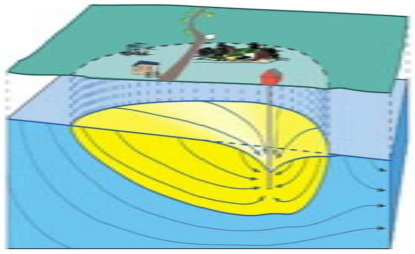
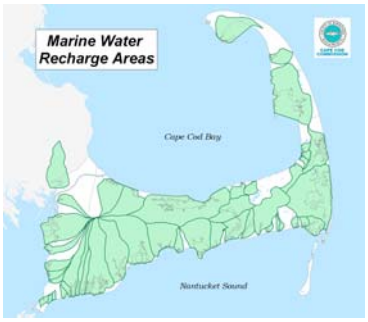
- Basis is the hydrogeologic methods used for Zone II wellhead protection.

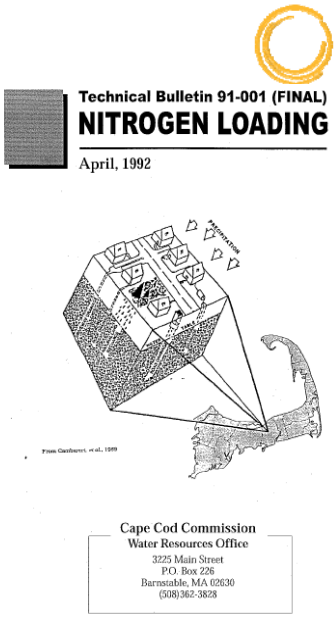


- MEP: Application of groundwater models and calibration to observed water table conditions and measured stream flow



Nitrogen loading

- 1970s Wellhead Protection to concern about the impacts of nitrogen loading from housing density to water quality in public and private drinking water wells.
- CCC-DRIs include nitrogen loading at the project level according to Technical Bulletin.
- MEP applies the same principles and many of the same conversion factors except at the watershed scale using water use.



Hydrodynamic Modeling

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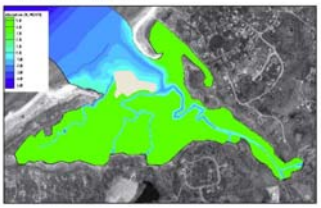
- **Physical modeling of tidal exchange based on observed tides and morphology**

MASSACHUSETTS ESTUARIES PROJECT

Plot of numerical grid used for hydrodynamic modeling of the Namskaket Creek system. Colored divisions indicate boundaries of different grid material types, as well as volumes used to compute flushing rates.



Depth contour plot of the numerical grid for Namskaket Creek showing 1-foot contour intervals relative to NGVD29.

Ecological Condition

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- **Based on 3 or more years of weekly summer water quality sampling, DCR eelgrass mapping, survey of benthic fauna and Flux**

Figure VI-1. Estuarine water quality monitoring station locations in the Namskaket Creek estuary system. Station labels correspond to those provided in Table VI-1.

Water quality model

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- **Puts it together to calibrate and derive water quality nitrogen concentrations**

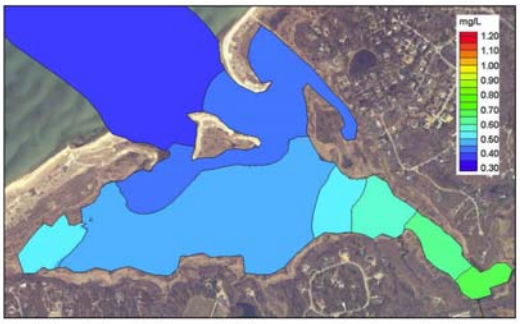

Figure VI-4. Contour plot of average total nitrogen concentrations from results of the present conditions loading scenario, for the Namskaket Creek system.

Woods Hole Group Peer Review Report (June 2009) on Pleasant Bay MEP

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- MEP is a high quality and necessary endeavor, and is conducted by qualified and experienced scientists, engineers, and planners.
- There is a need for action, both to address local concerns and to comply with Federal and State TMDL mandates
- The overall modeling approach is well conducted and the hydrodynamic model appears to be reasonably calibrated and verified.
- The MEP report for the Orleans portions Pleasant Bay represent a strong foundation for developing a course of action to develop and comply with site specific TMDL requirements,

Woods Hole Group Peer Review Report (June 2009) on Pleasant Bay MEP Recommendations

- encourage the Town to prepare for a phased wastewater facilities planning approach with incremental steps for complying with TMDL requirements
- A long-term commitment to ongoing water quality, benthic community, and eelgrass monitoring also should be made as the basis for compliance and demonstrating effectiveness.
- Depending upon how the estuarine system responds, future phases or plans for wastewater control could be modified.
- This is the essence of an adaptive management approach, which we recommend the Town pursue as part of its overall long term compliance strategy

REGULATORY STATUS

- **The MEP technical reports have been accepted by DEP and EPA as critical loads and have become the TMDLs which have been adopted by Barnstable County according to the Regional Policy Plan.**

Recommended DRI Conditions for consideration

- Recommend that the Town forward and include Nauset Marsh MEP Technical Document in revisions to the Preliminary Design
- Recommend that the Town include confirmatory modeling at the Preliminary Design to evaluate interim and ultimate water quality changes due to each sewer Phase
- Recommend that the Town expedite sewering for the Cedar Pond watershed if the need for nitrogen removal for Cedar Pond is identified in an updated MEP assessment of Rock Harbor.

Recommended Conditions

- Recommend that the town re-consider the merit of the proposed shared title 5 System to remove phosphorous from the upgradient side of Baker Pond subject to the CWMP Pond assessment
- Recommend that the Town continue monitoring fresh water conditions
- Recommend that the Town document the capacity of the Tri-town site with updated MEP and groundwater flow models
- Recommend that the Town continue cooperation on regional solutions.

Recommended Conditions

- Recommend that the Town conduct the review and design of the cluster system at the Preliminary Design so components of implementation can potentially occur in Phase 1.
- Recommend that the Town's Cluster Design evaluate expansion to achieve additional removal.
- Recommend that the Commission incorporate specific items of the Adaptive Management Plan as a scope attachment to the DRI decision.

End of Water Presentation

Conclusions: Findings for Approval

- **Section 7(c)(iii) of *Enabling Regulations***
- **Criteria for approval of DRIs**
  - Probable benefits greater than probable detriments
  - Consistent with Regional Policy Plan
  - Consistent w/Town's Local Comprehensive Plan
  - Consistent w/Local development bylaws
  - Consistent w/Districts of Critical Planning Concern (DCPC)
- **2/11/11 letter from George Meservey**
- **No DCPCs in Orleans - criteria not applicable**

END OF STAFF REPORT