

KEY TO MAP

| | | |
|--|--|----------------|
| 500-Year Flood Boundary | | ZONE B |
| 100-Year Flood Boundary | | ZONE A1 |
| Zone Designations* | | ZONE A5 |
| 100-Year Flood Boundary | | ZONE B |
| 500-Year Flood Boundary | | |
| Base Flood Elevation Line With Elevation In Feet** | | 513 |
| Base Flood Elevation In Feet Where Uniform Within Zone** | | (EL 987) |
| Elevation Reference Mark | | RM7x |
| Zone D Boundary | | |
| River Mile | | •M1.5 |

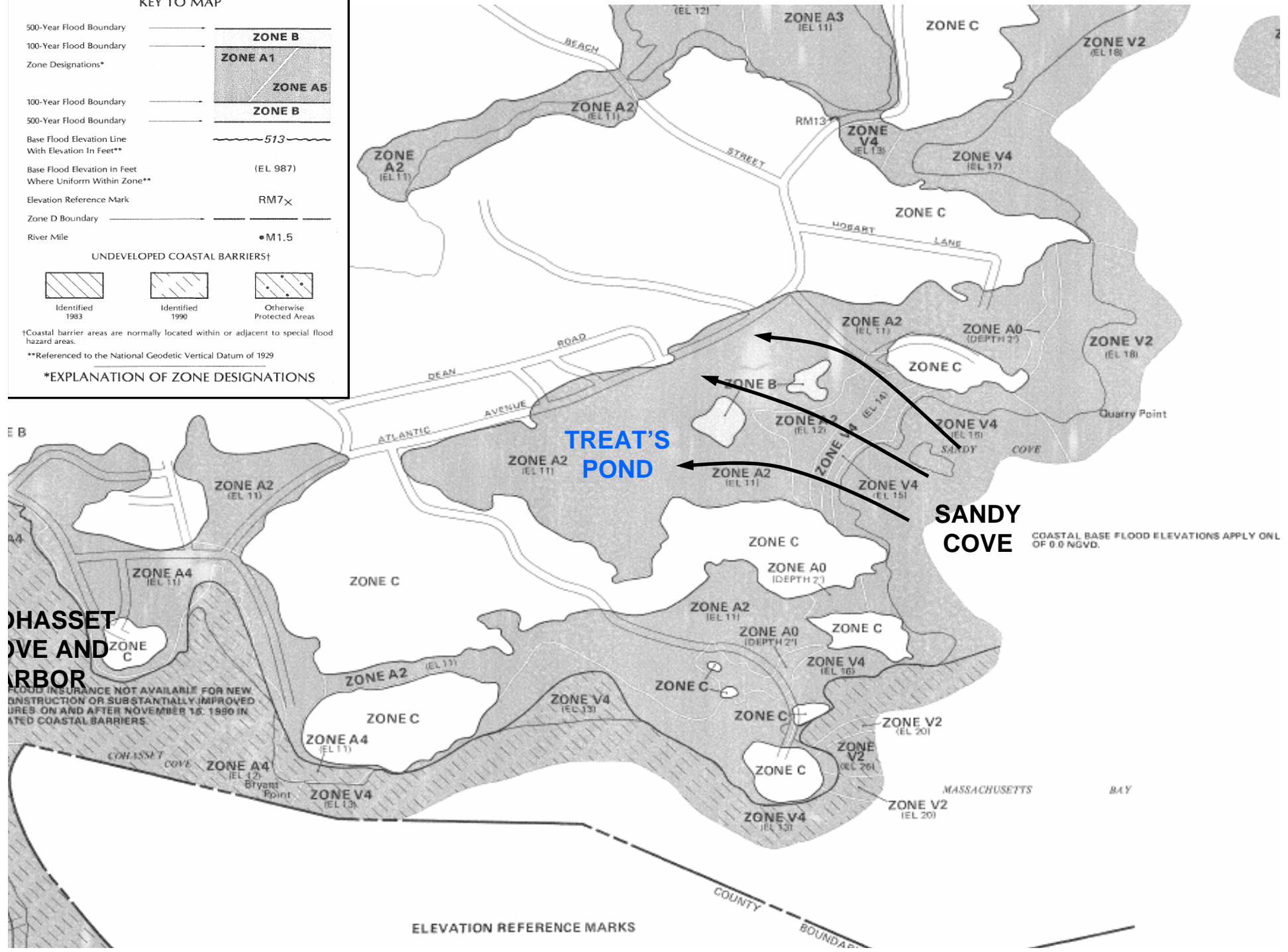
UNDEVELOPED COASTAL BARRIERS†

| | | |
|-----------------|-----------------|---------------------------|
| | | |
| Identified 1983 | Identified 1990 | Otherwise Protected Areas |

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

**Referenced to the National Geodetic Vertical Datum of 1929

***EXPLANATION OF ZONE DESIGNATIONS**



COASTAL BASE FLOOD ELEVATIONS APPLY ONLY OF 0.0 NGVD.

FLOOD INSURANCE NOT AVAILABLE FOR NEW CONSTRUCTION OR SUBSTANTIALLY IMPROVED STRUCTURES ON AND AFTER NOVEMBER 16, 1980 IN UNDEVELOPED COASTAL BARRIERS

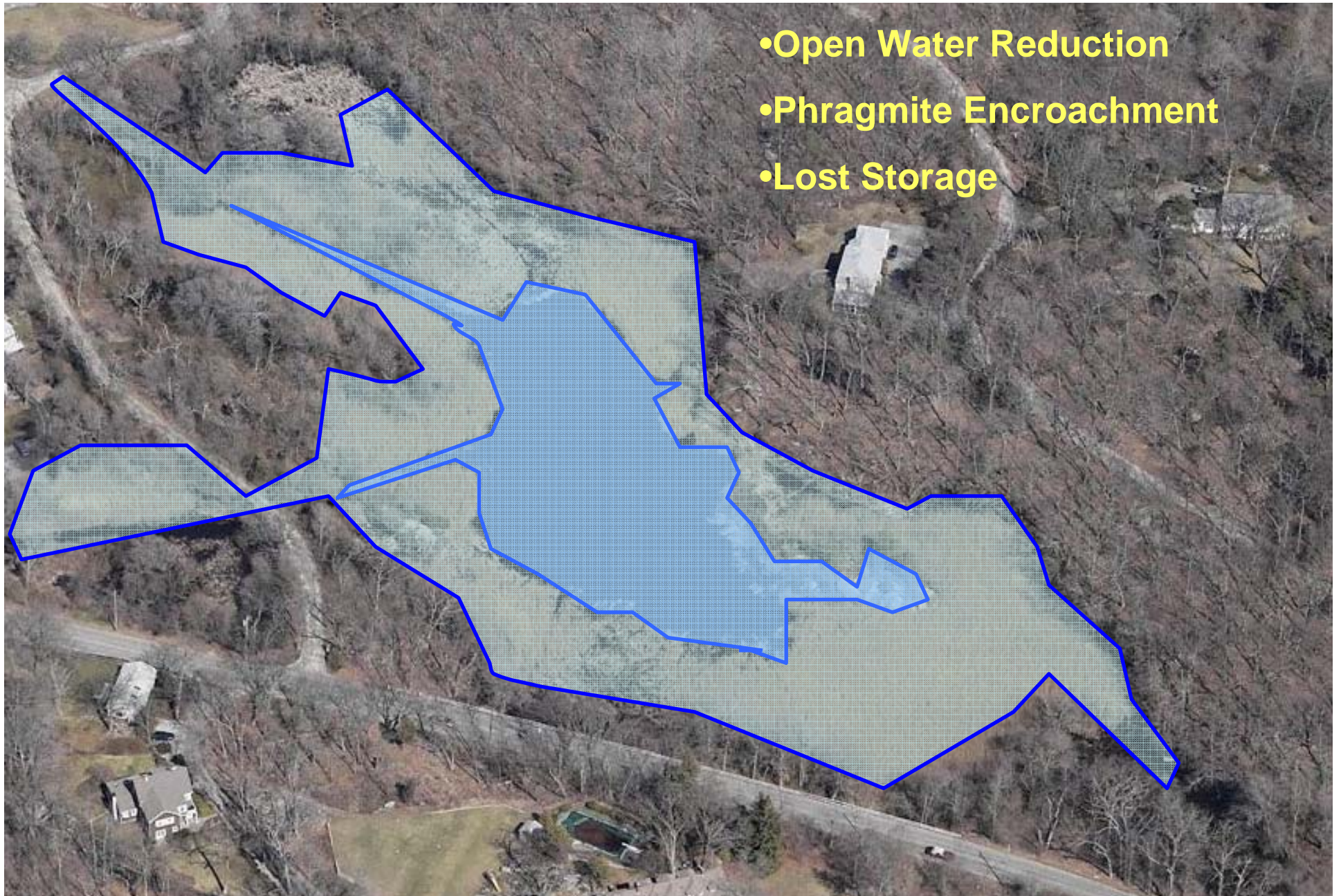
ELEVATION REFERENCE MARKS

COUNTY BOUNDARY

More Recent Factors Worsening Flood Conditions

- Increased impervious area creating an increase volume of stormwater runoff and less infiltration
- Reduced watershed infiltration and storage
- Recent intensity of storms, significant rainfall over short durations
- Reduced outfall hydraulics
(Piped outfall buried below beach sands)
- Reduced Treat's Pond and watershed storage
(Sediment, Phragmites, construction related land filling)
- **Sea Level Rise continues**
(26 cm in last 100 years, 50 cm (20") in next 100 years)

Treat's Pond



Treat's Pond Phragmite Control and Salt Marsh Reclamation

- Phragmites accumulate sediment in root systems causing a loss in storage and allow further encroachment into the pond
- Phragmites hinder flow through the pond and propagate additional debris which can outlet systems
- Phragmites provide little environmental benefit to ecosystem
- Federal and State grant support may be limited in future
- Costs of control could be significant depending on methods permitted, ranging from \$800K to \$2M

Previous Studies of Relevance (USACE)





Treat's Pond Ecosystem Restoration Project

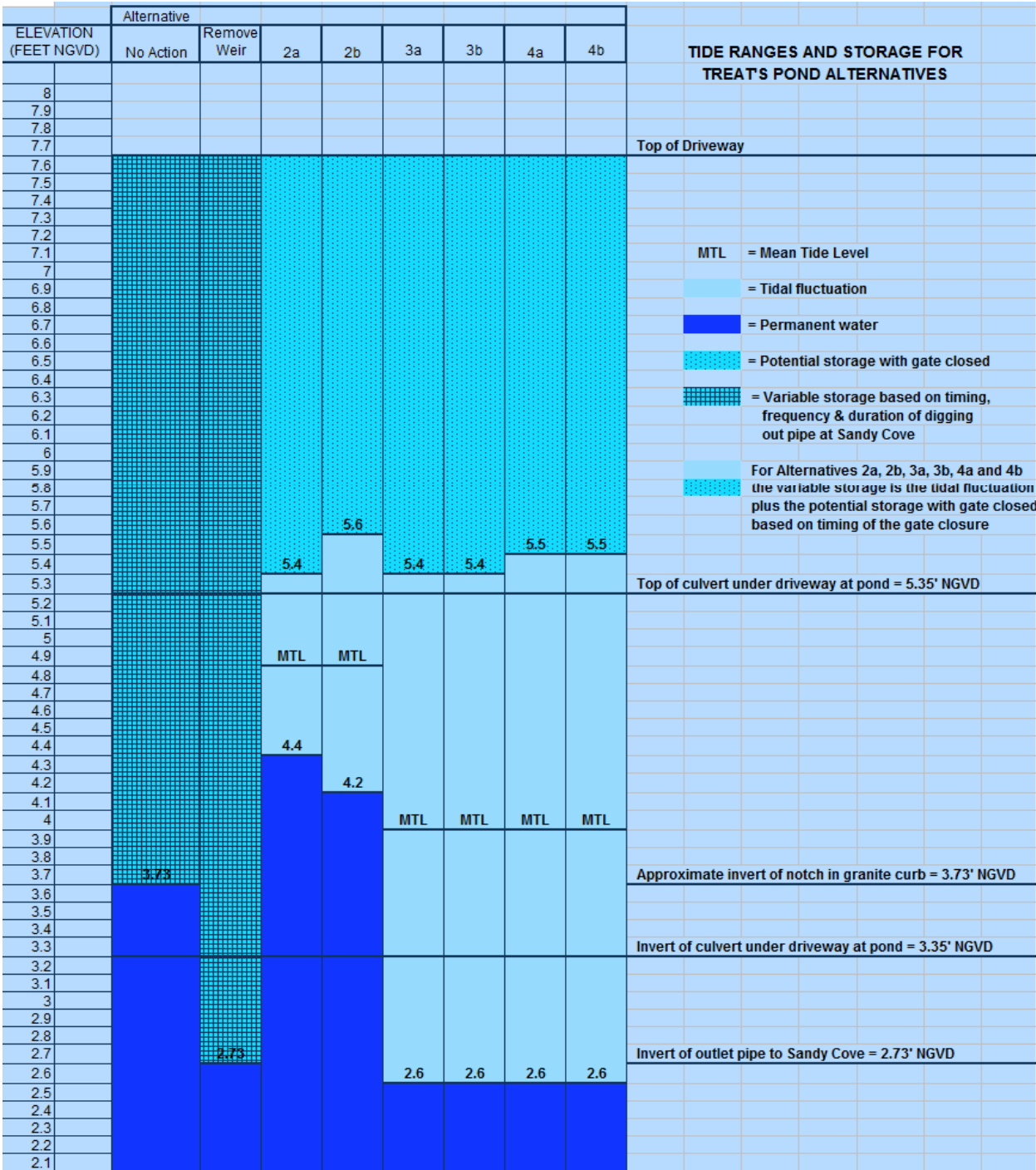
United States Army Corps of Engineers
New England District

Project Purpose

- Restore aquatic resources in Treat's Pond
 - Restore degraded salt marsh
 - Restore benthic habitats
 - Restore open water habitats



USACE Tidal Exchange Estimates for Reclamation Alternatives





Bacteria Standards - Recreation

| Bacteria Type | Applicability | Geomean Standard Counts/ 100 ml | Maximum Allowed Counts/100 ml |
|-----------------------|-----------------------|--|--------------------------------------|
| Fecal Coliform | Old Standard | 200 | 400 |
| E. Coli | New Freshwater | 126 | 235 |
| Enterococci | New Marine | 35 | 104 |



Bacteria Standards - Shellfish

| Bacteria Type | Applicability | Geomean Standard (Counts/ 100 ml) | Maximum Allowed (Counts/100 ml) |
|-----------------------|-------------------------|--|--|
| Fecal Coliform | Approved areas | 14 | Less than 10% of samples greater than 43 |
| Fecal Coliform | Restricted areas | 88 | Less than 10% of samples greater than 260 |



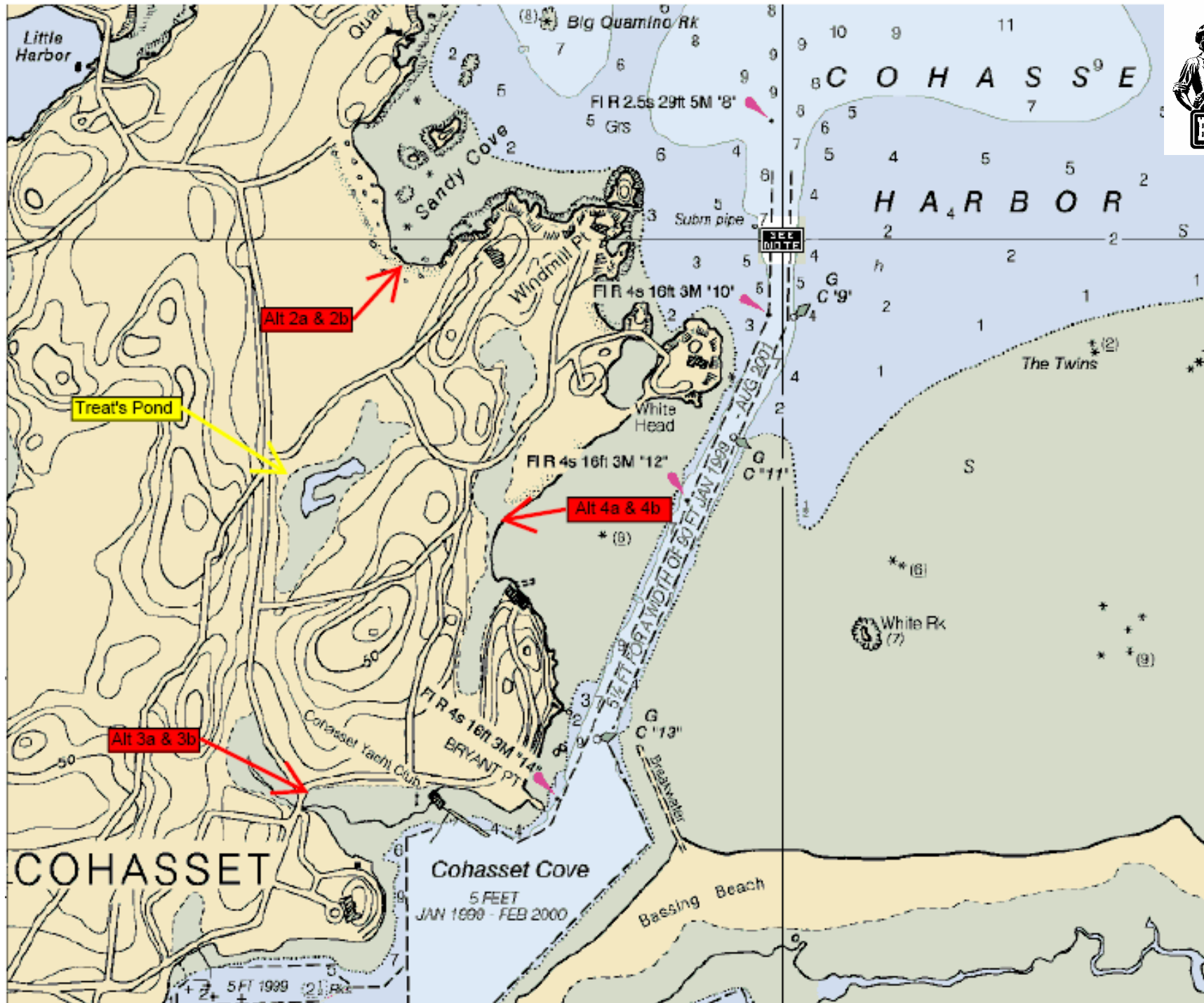
Sampling Data – Treat's Pond

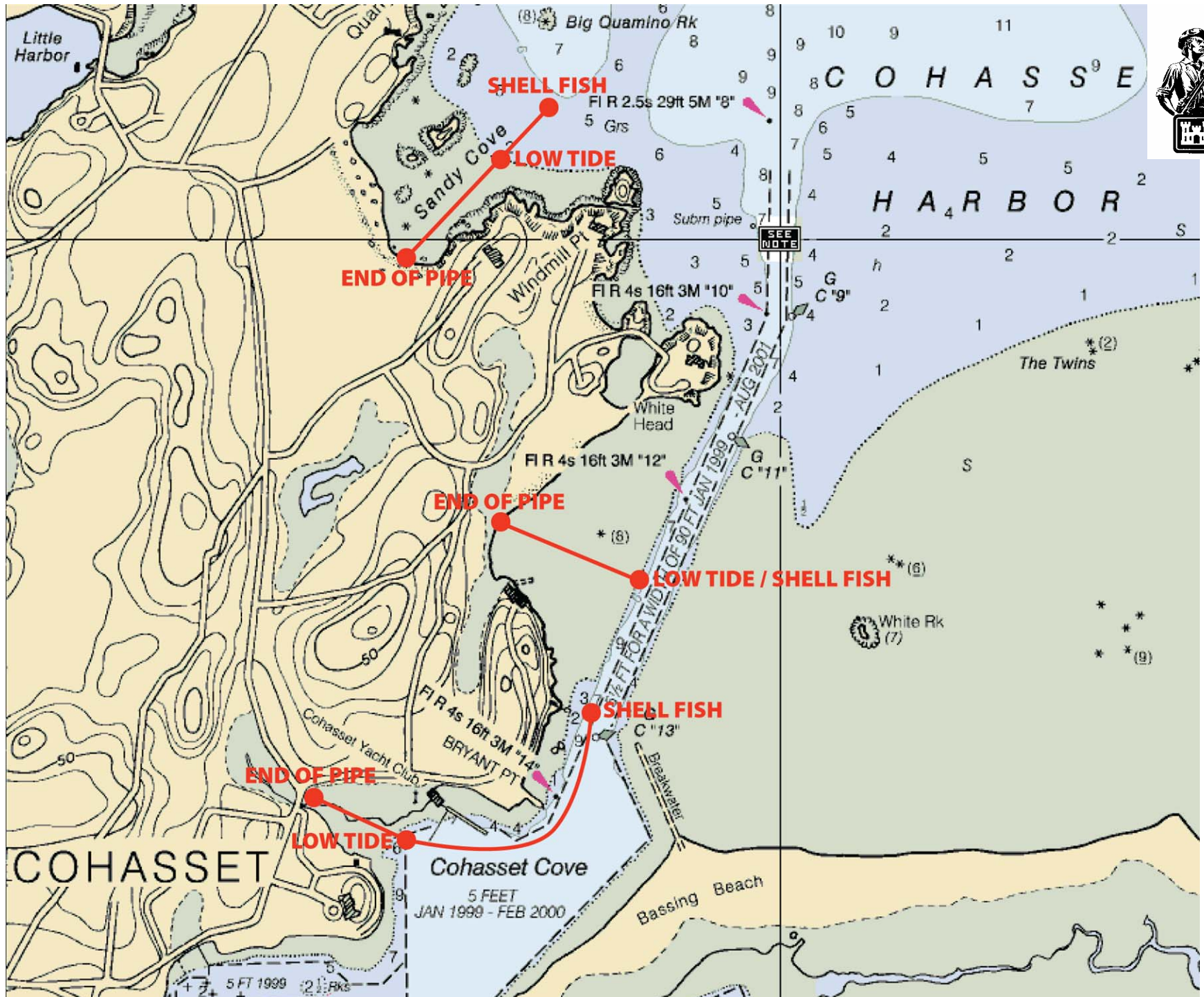
| Location | Dry-weather Enterococci (counts/100 ml) | Wet-weather Enterococci (counts/100 ml) |
|-------------------------|--|--|
| Inflow to pond | NA | >2,000 |
| Pond | 10-170 | 8800 |
| Outflow to beach | 116-620 (?) | No data |

Sampling Data Enterococci - 2006



| | Standard | Sandy Cove | Inner Harbor | Outer Harbor |
|---|----------|------------|--------------|--------------|
| 2006 Geomean (Season) (Counts/100 ml) | 35 | 3 | 22 | No data |







USACE Findings

- **No action – Bacteria concentrations in the pond and at current discharge point will continue to exceed standards during both dry and wet weather**
- **During dry weather, the discharge from Treat's Pond may contribute to exceedence of the bacteria standard in the ocean within 50 feet of the discharge point.**
- **During wet weather, the discharge from Treat's Pond and the ocean near the discharge point will likely exceed bacteria standard for recreation.**
- **During wet weather, shellfish beds near Sandy Cove and the Outer Harbor may have a increase in bacteria counts because of the proximity of the discharge point to the beds.**

Sampling Data – Treat's Pond

| Location | Dry-weather Enterococci (counts/100 ml) | Wet-weather Enterococci (counts/100 ml) |
|------------------|---|---|
| Inflow to pond | No data | >2,000 |
| Pond | 10-170 (3 SAMPLES) | 8800 (1 SAMPLES) |
| Outflow to beach | 116-620 (2 SAMPLES) | No data |

**NEED FOR
ADDITIONAL TESTING**

ADDITIONAL WATER QUALITY TESTING

(DRY AND WET WEATHER)



WATERSHED IMPROVEMENTS AND RECOMMENDATIONS

WATERSHED FACTORS AFFECTING RUNOFF DETERMINATION

- **SIZE (69 ± acres)**
- **SHAPE**
- **TOPOGRAPHY (Average land slope)**
- **GEOLOGY (Soil and bedrock)**
- **SURFACE COVER**
- **INITIAL SOIL MOISTURE**
- **SEASONAL LIMITATIONS (FROST, SNOW COVER, VEGETATIVE UPTAKE RATES, HIGH GROUNDWATER CONDITIONS, ETC.)**

Existing Peak Rate of Runoff Into Treat's Pond from adjoining watershed

| | |
|------------------------------|-----------|
| 2 year frequency storm..... | 26.1 cfs |
| 5 year frequency storm..... | 44.1cfs |
| 10 year frequency storm..... | 61.8 cfs |
| 25 year frequency storm..... | 78.2 cfs |
| 50 year frequency storm..... | 95.3 cfs |
| 100 year frequency storm.... | 110.3 cfs |

Estimated Capacity of surcharged 24" Outfall Pipe < 30 cfs

Existing Volume of Runoff

2 year frequency storm.....0.28 MCF

5 year frequency storm.....0.45 MCF

10 year frequency storm.....0.61 MCF

25 year frequency storm.....0.76 MCF

50 year frequency storm.....0.91 MCF

100 year frequency storm.....1.04 MCF

•Available Volume in Treat's Pond

At Elevation 7 NGVD.....0.53 MCF (no flooding)

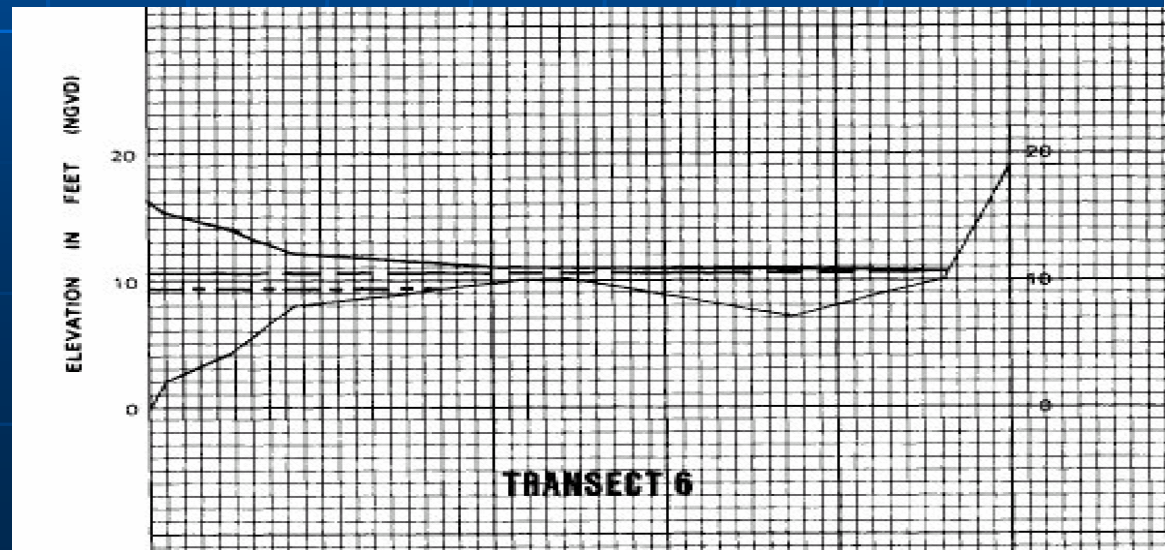
At Elevation 8 NGVD.....0.71 MCF (drive flooding)

Sandy Cove

Approximate Stillwater Elevations

- 2 year frequency storm.....8.0 NGVD (est.)
- 5 year frequency storm.....8.5 NGVD (est.)
- 10 year frequency storm.....9.1 NGVD
- 25 year frequency storm.....9.6 NGVD (est.)
- 50 year frequency storm.....10.0 NGVD
- 100 year frequency storm.....10.3 NGVD

**Maximum Elevation
Prior to Surge into
Treat's Pond
Elevation 8.5 NGVD**



Flood Prevention Options

1. Increase Storage and Infiltration

2. Divert Flow

3. Provide Increase Outfall Capacity

4. Outfall Pumping