Barnstable WRAC

Wastewater Planning Update

Department of Public Works

May 17, 2017

WRAC Proposed Timeline

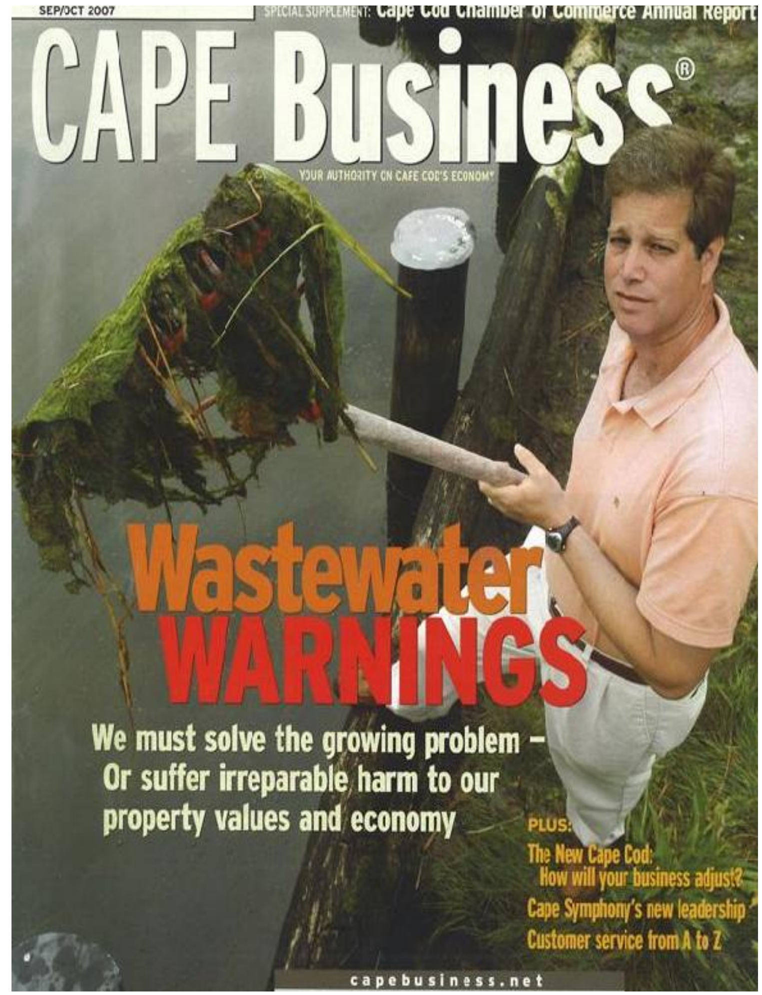
- ✓ *June 2016 – Complete Bookends*
- ✓ *Fall 2016*
  - ✓ *Complete Gap filling*
  - ✓ *Complete GIS Mapping Layers*
- ✓ ***Winter 2016 through Spring 2017 - Plan Construction***
- *Summer 2017 – Complete Draft Plan*
- *Fall 2017 – Financial Subcommittee efforts*
- *Winter 2017/18 – Update Town Council on Draft Plan*
- *Winter and Spring 2018 – Public Outreach and Feedback*
- *Summer 2018 update plan*
- *Fall 2018 – Present "Final Draft" Plan to Town Council*
- *Winter 2018 - Submit Final Draft to CCC and Regulatory Agencies for review*

Outline

- Problem Statement
- Nontraditional Solutions
- Traditional Solutions
- WPCF Limitations
- Phasing
- Costs
- Next Steps
- Discussion

The Problem

- *Wastewater issues*
  - *Impaired Embayments*
  - *Groundwater quality concerns*
  - *Pond water quality concerns*
  - *Failing/expensive septic systems*
  - *Economic development requirements*
  - *New flood zones*
  - *Regulatory requirements*



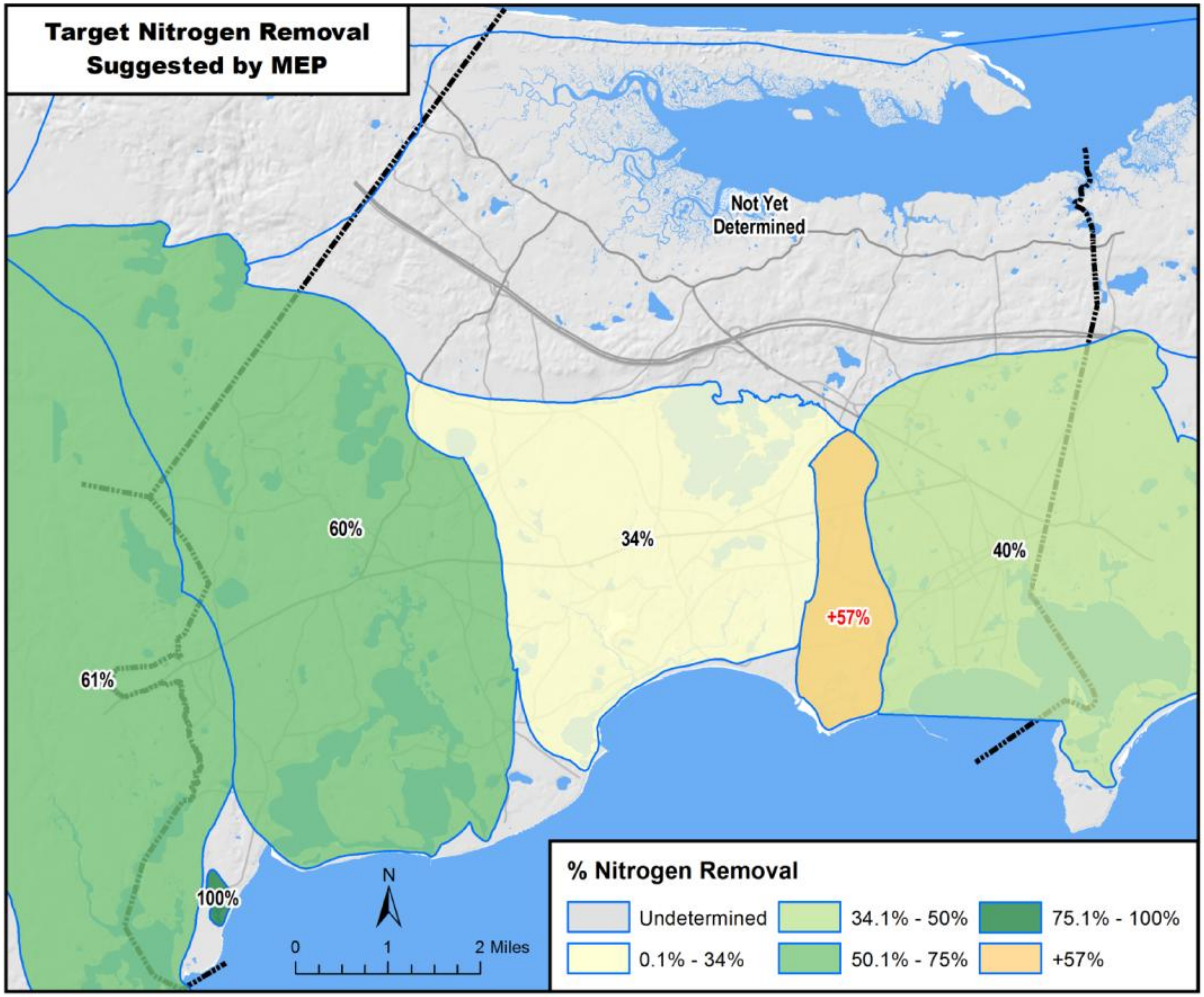
Primary Regulation

- *Massachusetts Estuaries Program (MEP)*
- *Collaboration between*
  - *Massachusetts DEP*
  - *UMASS-Dartmouth, School for Marine Science and Technology ("SMAST").*
- *Watershed/estuary model*
  - *predicts water quality changes resulting from land use decision*

Primary Regulation

- DEP develops **TMDLs**
  - Total Maximum Daily Loads
  - Max pollutant a water body can receive and still meet water quality standards
  - "pollutant budget"
- Eelgrass is the sentinel species
- Cape Divided by watersheds
  - Not geo-political boundaries

Average N Removal by Watershed



Subembayment N Removal

SubEmbayment by Watershed	Total Attenuated Controllable N Load (from Barnstable) (kg/yr)	Target (kg/yr)	N Load Reduction Required (by Barnstable) (kg/yr)	% N Reduction Required
Barnstable Harbor Watershed				
Barnstable Harbor*	29,963	27,418	7,491	25%
Centerville River Watershed				
Centerville River East	19,236	9,022	10,214	53%
Centerville River West	3,004	3,454	0	0%
East Bay	2,863	3,149	0	0%
Scudder Bay	16,235	19,208	0	0%
Lewis Bay Watershed				
Halls Creek	7,317	13,236	0	0%
Hyannis Inner Harbor	5,722	2,716	4,098	72%
Lewis Bay	3,613	3,527	2,737	76%
Mill Creek	2,085	8,154	660	32%
Snows Creek	3,535	5,925	0	0%
Stewarts Creek	18,725	15,186	0	0%
Popponesset Bay Watershed				
Pinquickset Cove	344	277	67	19%
Popponesset Bay	221	664	0	0%
Shoestring Bay	4,115	7,194	1,829	44%
Three Bays Watershed				
Cotuit Bay	7,683	8,153	0	0%
North Bay	9,064	1,631	7,445	82%
Princes Cove	3,935	792	3,205	81%
Princes Cove Channel	2,088	281	1,807	87%
Seapuit River	969	1,375	0	0%
Warrens Cove	8,666	7,582	2,518	29%
West Bay	5,460	5,829	0	0%
Rushy Marsh Pond Watershed				
Rushy Marsh Pond	78	34	44	56%
Parkers River Watershed				
Upper Parkers River	20	3,061	11	55%

** = Assumed*

CCC Table

The Plan Needs…

- *Multiple solutions working together*
  - *Title V Systems*
  - *Traditional Solutions (sewers)*
  - *Non Traditional Solutions (aquaculture, PRBs, dredging, alternative toilets, etc.)*
  - *Management Controls (zoning, local regulations)*
- *Leverage Adaptive management*
  - *Phase Solutions*

Two Macro Approaches

- *Source Reduction*
  - *Management Controls (Zoning)*
  - *Alternative toilets*
  - *Fertilizer Reduction Ordinance*
  - *Collect and Treat*
    - *Collect Wastewater*
    - *Convey Wastewater*
    - *Treat Wastewater*
    - *Dispose of wastewater*
- *In-situ Treatment*
  - *Address N within the environment*

Fundamental Question

"On which properties is a traditional (Title V) on-site wastewater system an adequate means of providing for the Town's sanitation and environmental protection, and on which properties is it not?"

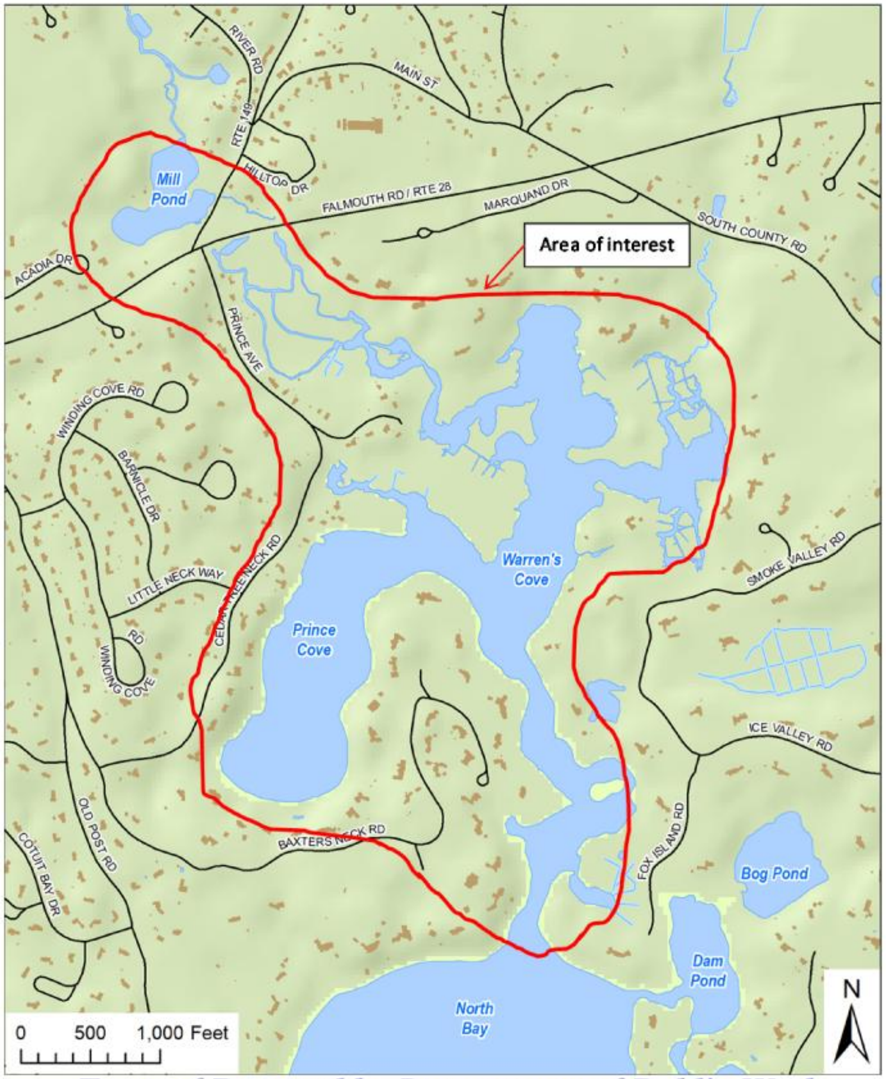
Nontraditional Solutions

Nontraditional Solutions – Focus on Three Bays

TEAM

- James Crocker, Town Councilor, Precinct 5
- Dr. Brian Howes, School of Marine Science and Technology, U.Mass. Dartmouth
- Zenas Crocker, Executive Director, Three Bays Preservation, Inc.
- Scott Horsley, Water Resources Consultant
- Dan Santos, Director, Barnstable DPW
- Rob Steen, Assistant Director, Barnstable DPW

Focus Area – Three Bays



Town of Barnstable, Department of Public Works

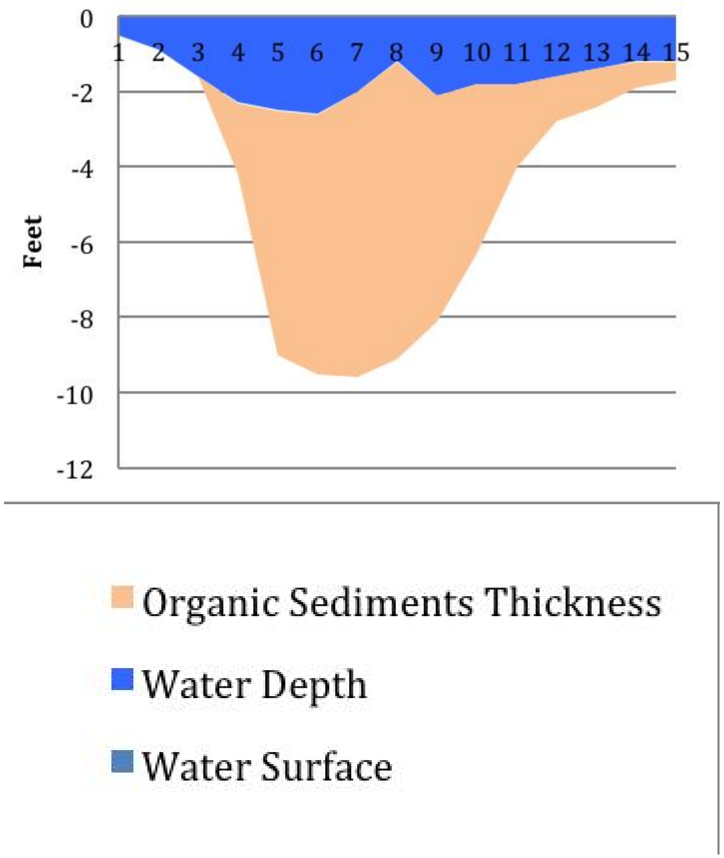
Focus Area – Three Bays

Four major components to help remove nitrogen using nontraditional methods.

- *Mill Pond*
- *Abandoned freshwater cranberry bogs*
- *Warren's Cove*
- *Stormwater collection and disposal along the river*

Mill Pond

- ***The Issue:***
  - *Mill Pond is full of silt and debris – 9 feet thick in places*
  - *In 20 years nitrogen removal capacity has declined from 20% to 10%*
  - *Healthy ponds = 30% to 50%*
  - *If 50% restored, estimated remove over 2,200 kg/year of additional nitrogen*
- ***The Solution:***
  - *Dredge to its original depths (sand layer) and perimeter*
  - *Estimated 60,000 CYs of material (to be confirmed)*
  - *Pond depths restored to approximately 8 feet in the deepest areas*



Abandon Bogs

- ***The Issue***:
  - *Potential locations for freshwater nontraditional solutions including floating wetlands.*
- ***The Solution:***
  - *208 plan estimated that floating wetlands can remove 8-15% of the nitrogen they encounter.*

Warrens Cove

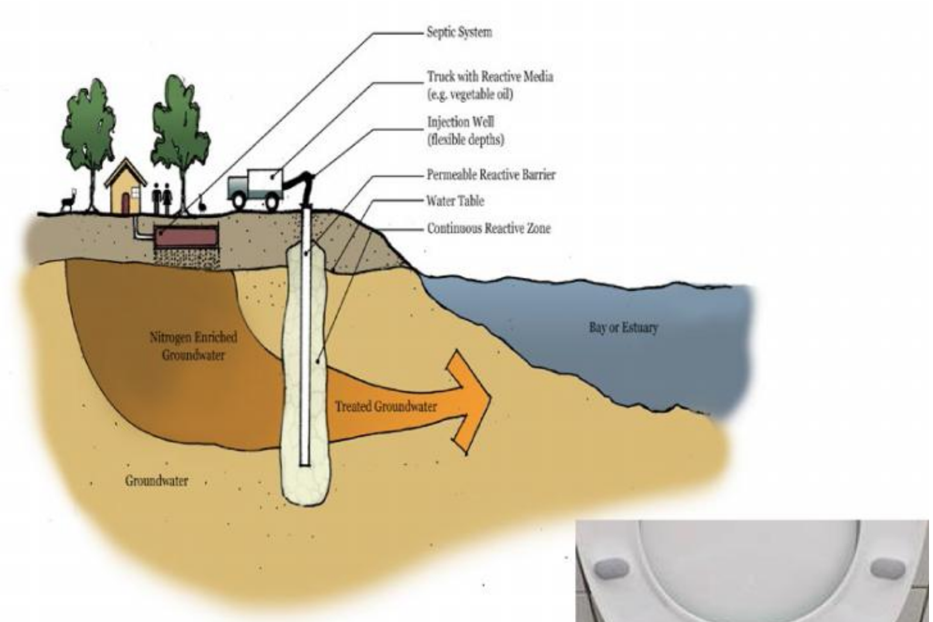
- *The Issue:*
  - *Warrens Cove has silted in, currently not appropriate for aquaculture.*
  - *Has potential to be an ideal spot to serve as a nursery for aquaculture farms*
  - *The product could then be relocated to aquaculture farms in the lower bays*
- *The Solution:*
  - *Dredging Warrens Cove back to a sandy bottom*
  - *Establish aquaculture nurseries*
  - *The Cape Cod Commission has estimated that aquaculture beds/floating racks can remove 8-15% of the nitrogen they encounter*

Stormwater

- *The Issue:*
  - *Stormwater systems are in various states of repair*
- *The Solution:*
  - *A comprehensive survey identifying those that need repair, or replacement.*
  - *Identify new systems/BMP needed to protect water quality*
  - *Credit for work already done*
    - *Cotuit Town Dock, etc.*

Other Nontraditional Opportunities

- *PRBs*
  - *EPA Demonstration Project*
    - *Prince Cove Area*
- *Alternative Toilets*
  - *Prince Cove*
  - *Cape Cod Academy*



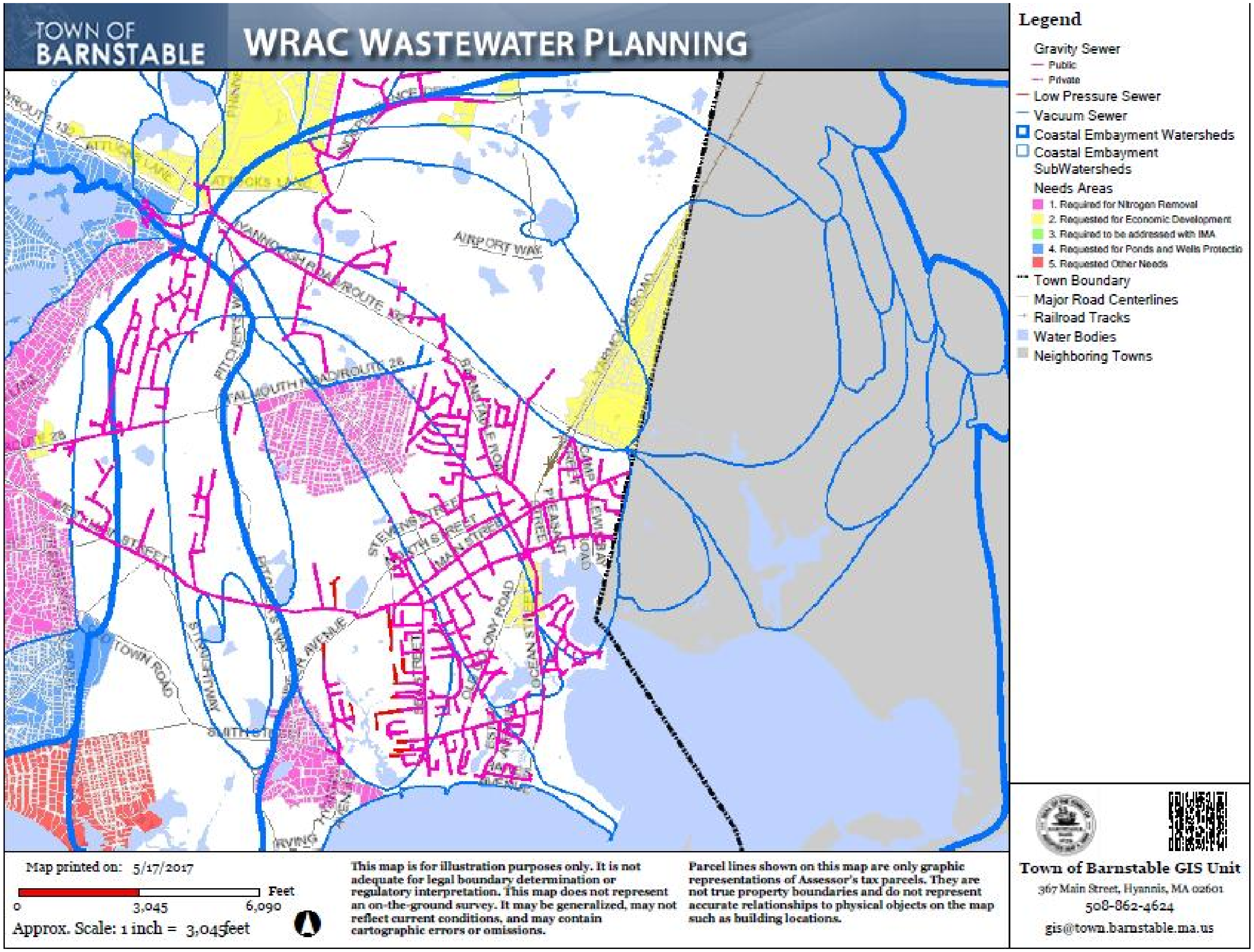
Traditional Solutions

Traditional Solutions

TEAM

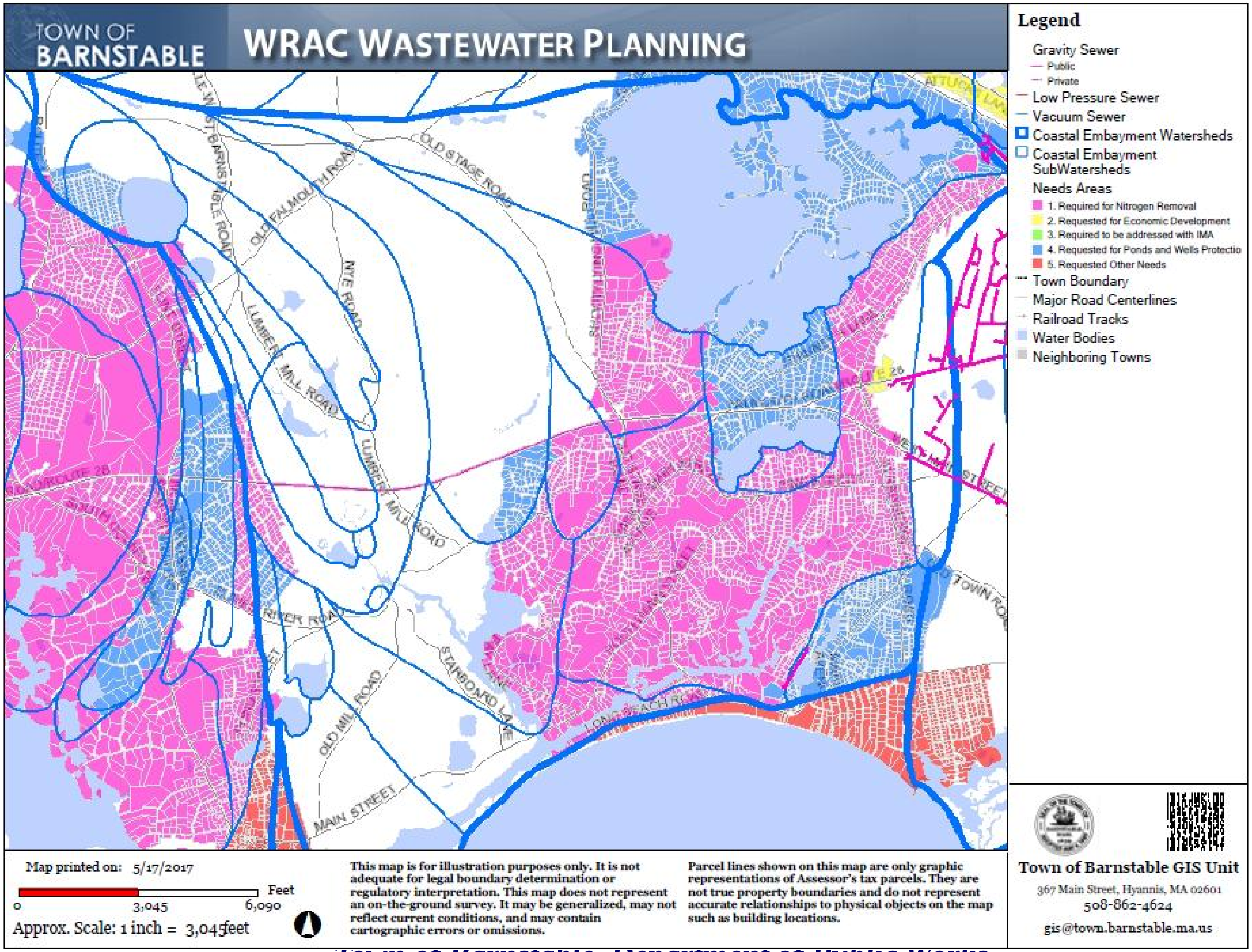
- Lindsey Counsell, WRAC Chair
- Brian Dudley, DEP
- Amanda Ruggiero, Assistant Town Engineer
- James Benoit, GIS Manager
- Andy Boule, Division Supervisor Water Pollution Control Division
- Dr. Dale Saad, Senior Project Manager
- Casey Scrima, Intern for Wastewater Affairs
- Dan Santos, Director
- Rob Steen, Assistant Director

Lewis Bay

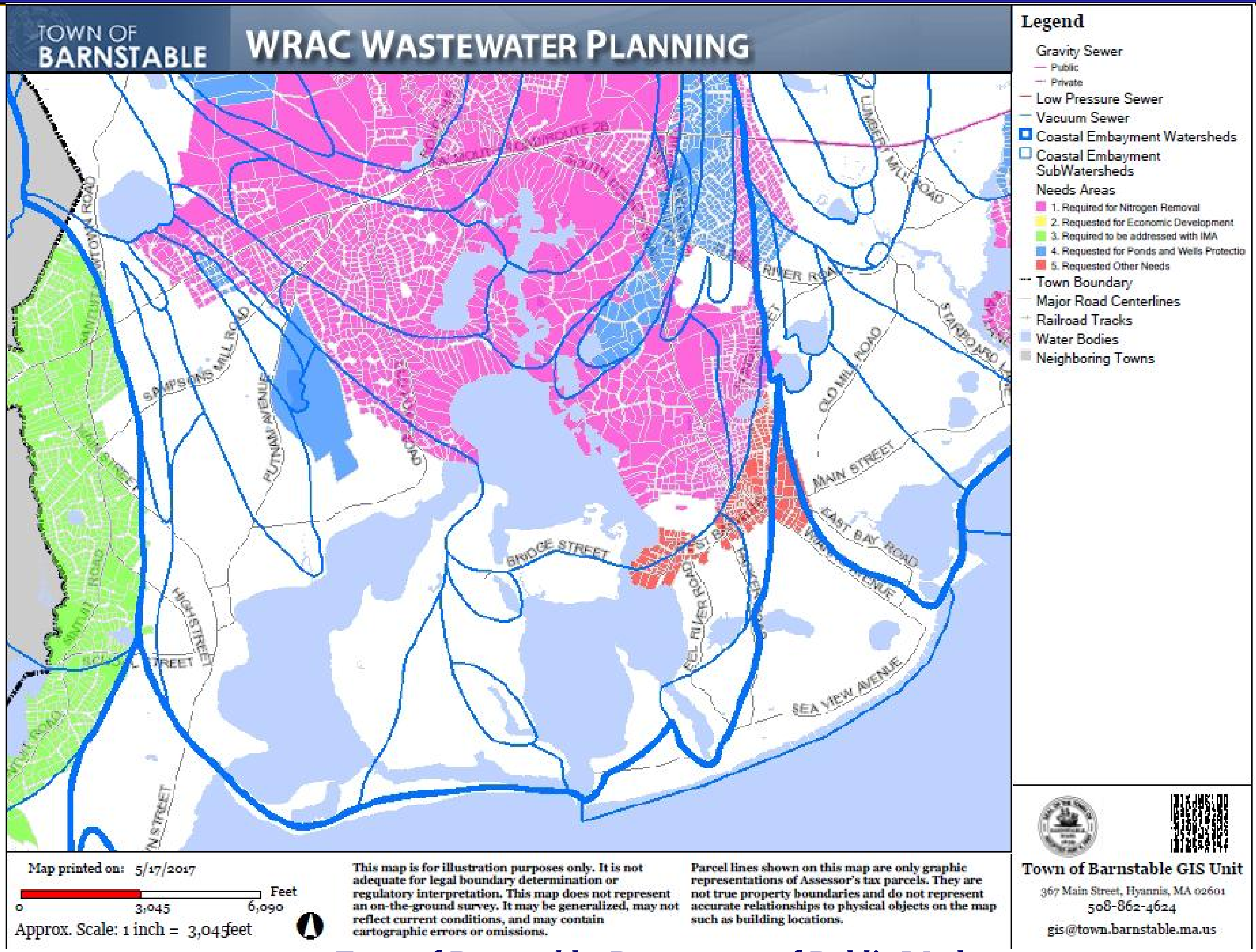


TOWN OF BARNSTABLE
WRAC WASTEWATER PLANNING
Legend
Gravity Sewer
Public
Private
Low Pressure Sewer
Vacuum Sewer
Coastal Embayment Watersheds
Coastal Embayment SubWatersheds
Needs Areas
1. Required for Nitrogen Removal
2. Requested for Economic Development
3. Required to be addressed with IMA
4. Requested for Ponds and Wells Protectio
5. Requested Other Needs
Town Boundary
Major Road Centerlines
Railroad Tracks
Water Bodies
Neighboring Towns
AIRPORT WAY
ROUTE 132
FALMOUTH ROAD/ROUTE 28
MAIN STREET
STEVENS STREET
SOUTH STREET
SMITH STREET
Map printed on: 5/17/2017
Feet
0 3,045 6,090
Approx. Scale: 1 inch = 3,045feet
This map is for illustration purposes only. It is not adequate for legal boundary determination or regulatory interpretation. This map does not represent an on-the-ground survey. It may be generalized, may not reflect current conditions, and may contain cartographic errors or omissions.
Parcel lines shown on this map are only graphic representations of Assessor's tax parcels. They are not true property boundaries and do not represent accurate relationships to physical objects on the map such as building locations.
Town of Barnstable GIS Unit
367 Main Street, Hyannis, MA 02601
508-862-4624
gis@town.barnstable.ma.us

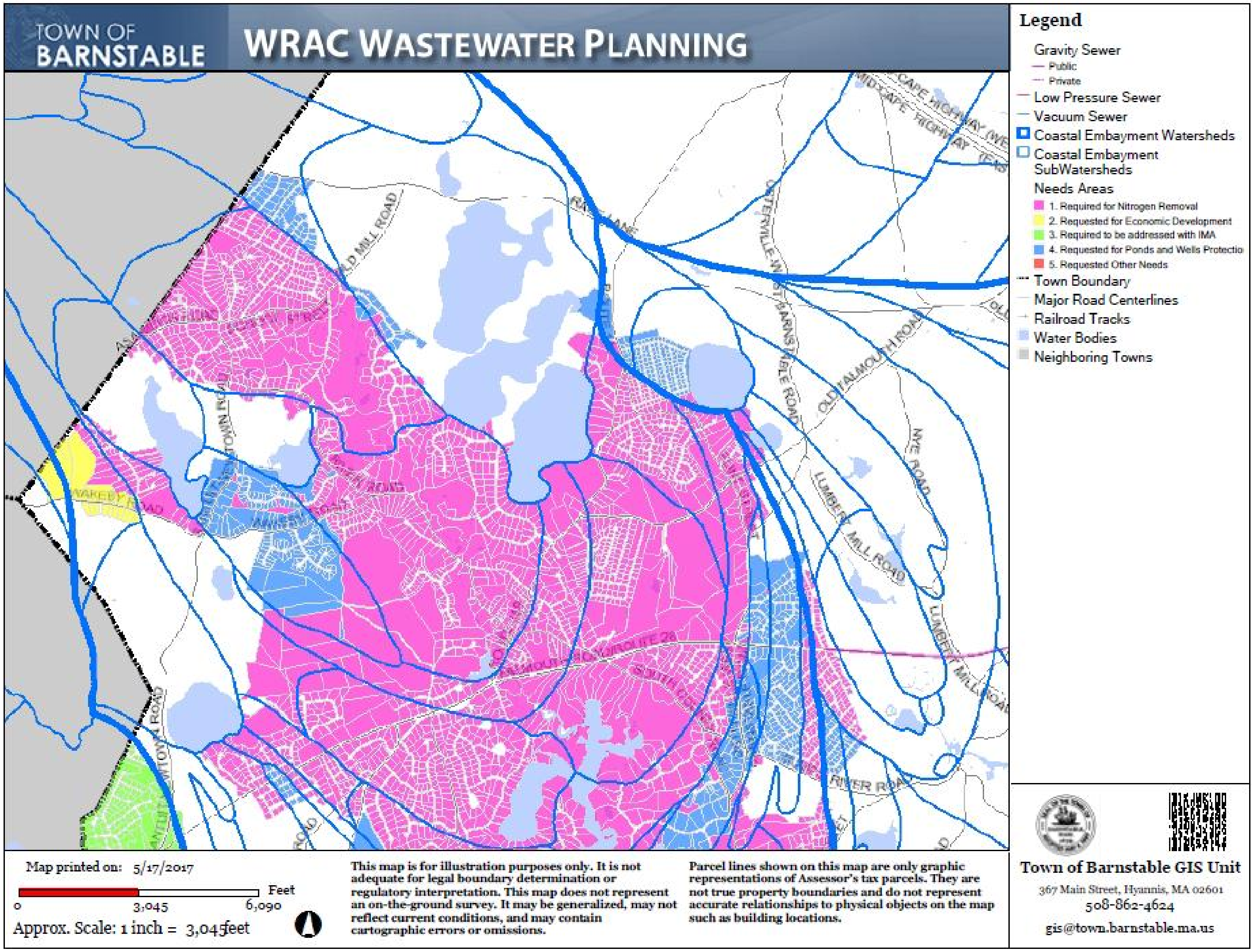
Centerville River



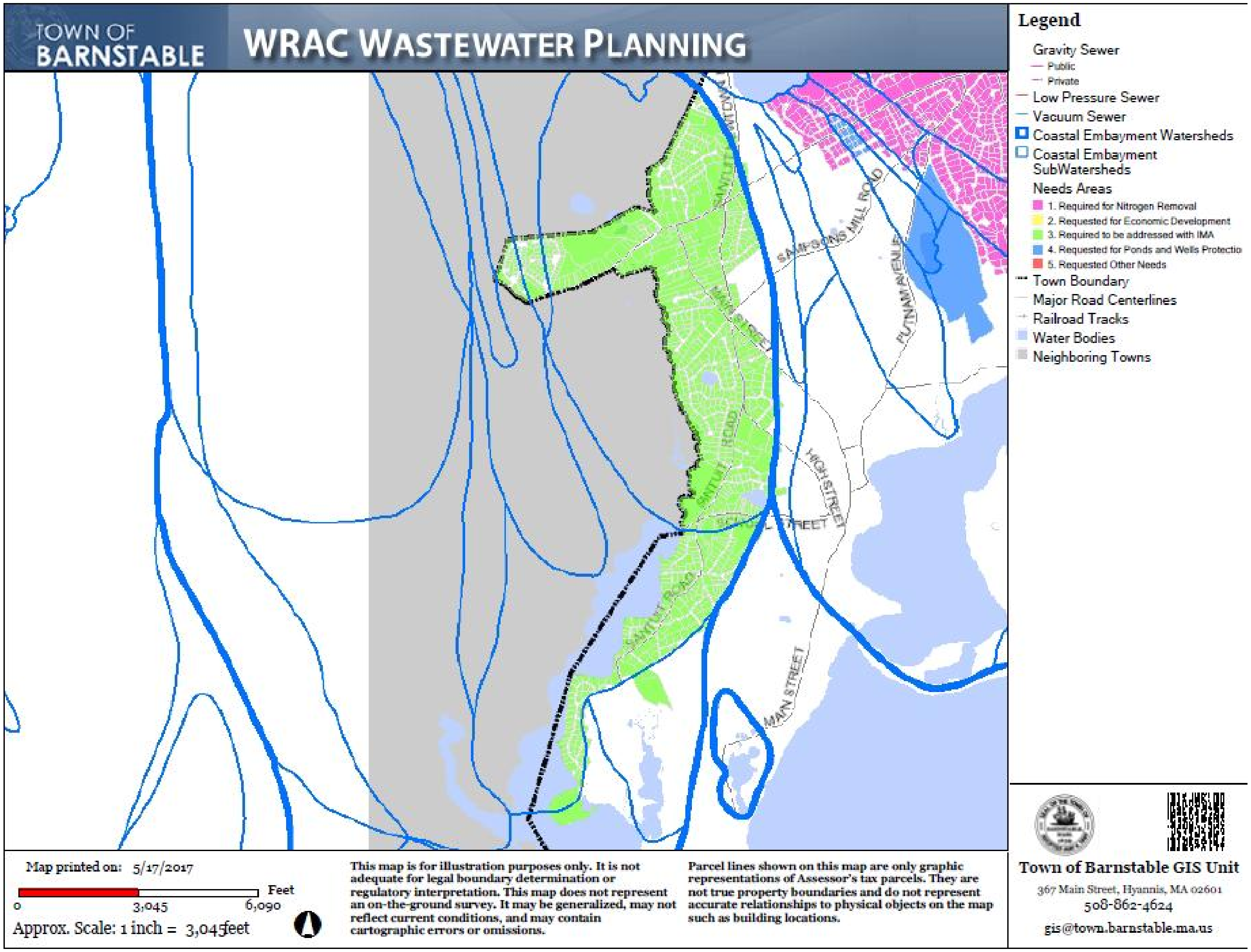
Three Bays - Lower



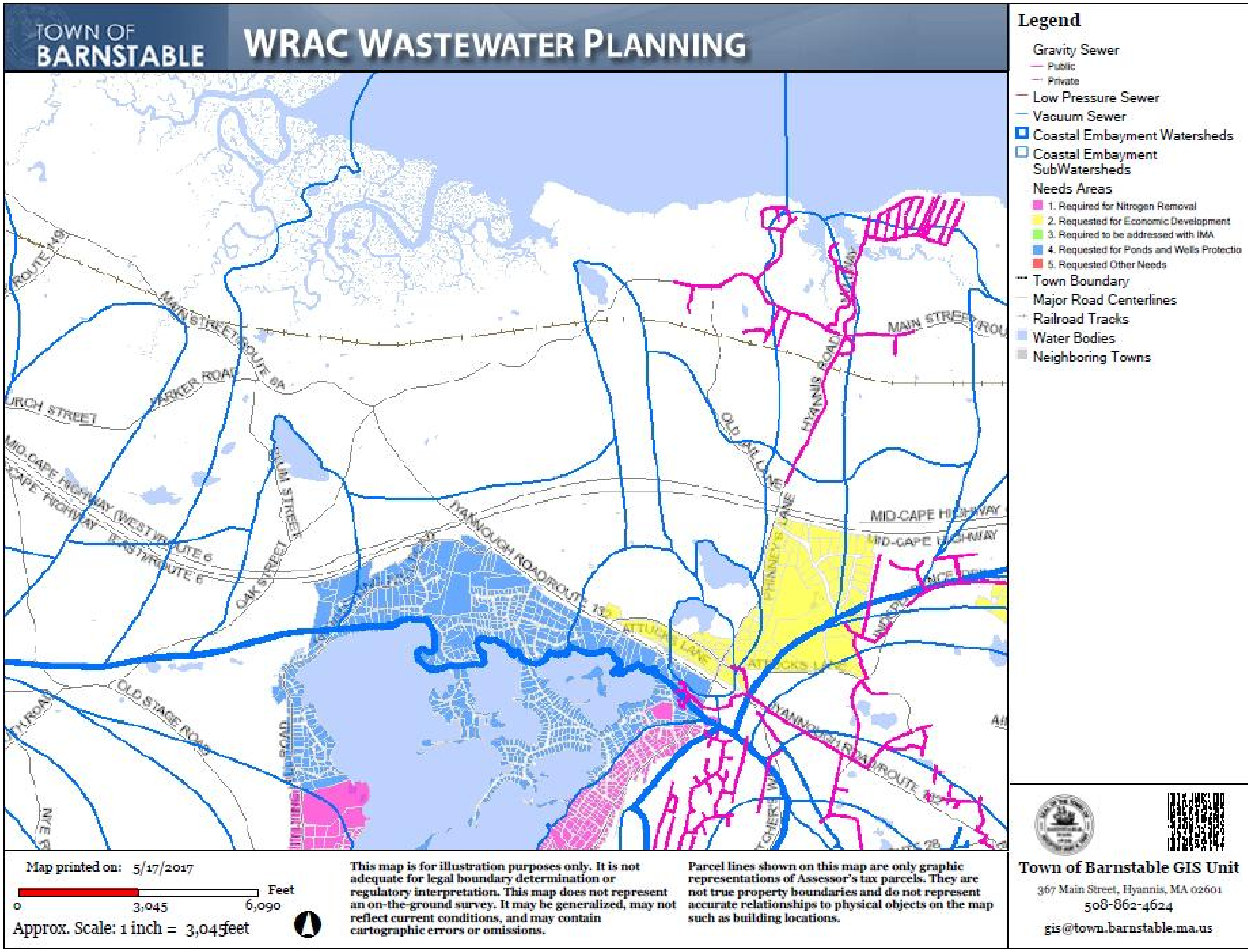
Three Bays - Upper



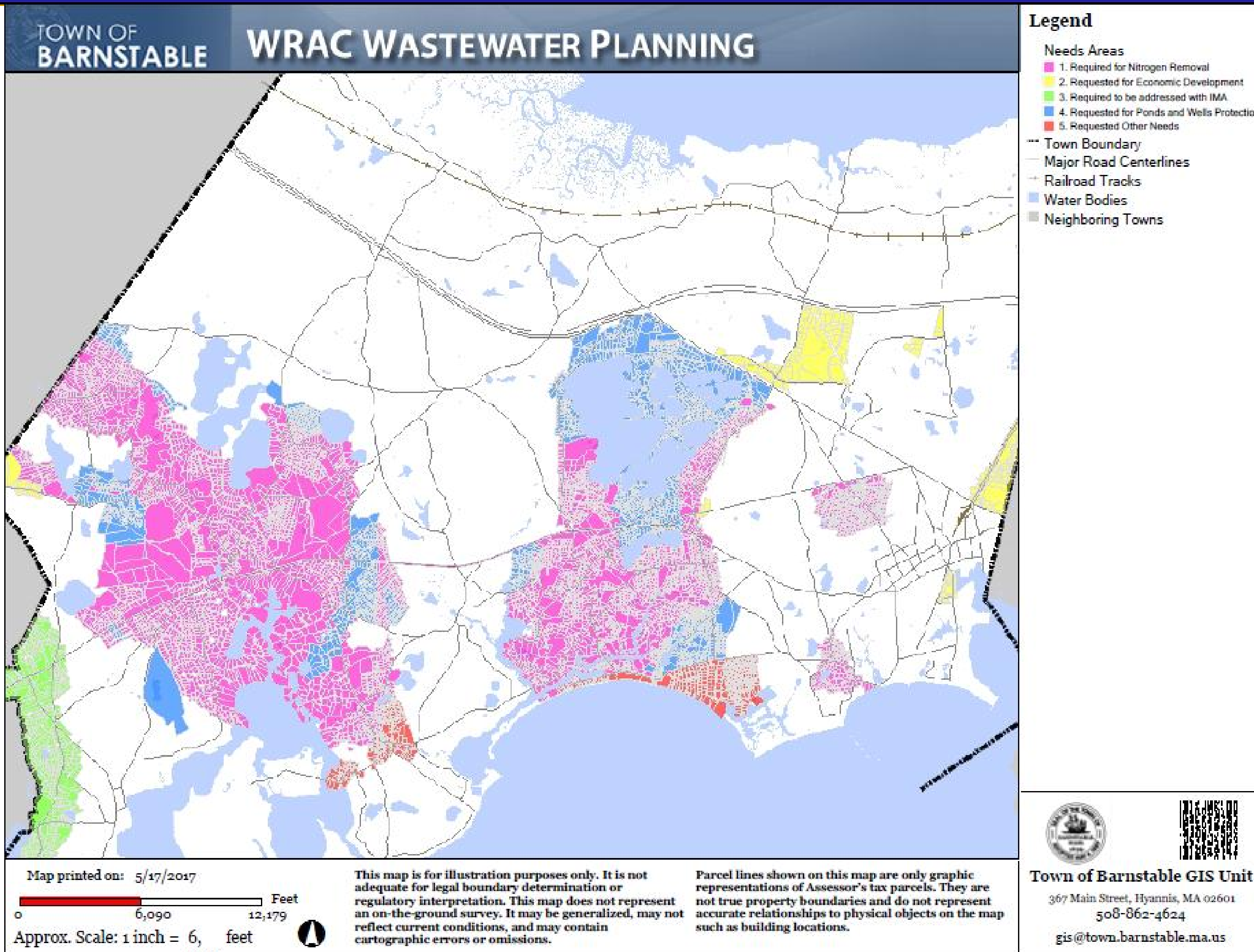
Popponessent Bay



Barnstable Harbor



Total View



TOWN OF BARNSTABLE
WRAC WASTEWATER PLANNING
Legend
Needs Areas
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5. Requested Other Needs
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Other Traditional Opportunities

- *Credit for the fertilizer control regulations*
- *Relocation of public water supply*
  - *Better protected sites*
  - *Eliminates difficult Zone IIs*
  - *Reuse of the current well sites*
- *Zoning opportunities*
  - *Potential infill control*
  - *New growth control*
  - *Types of growth control*

WPCF Capacity

- *Existing treatment limit ~ 4.2 MGD*
- ***Onsite disposal limit ~ 3.0 MGD***
- *Biowin modeling*
- *More in-depth disposal study*

Component	Flow Conditions	Capacity (MGD)
Parshall Flumes	Minimum Flow	0.6
	Peak Hour	15.6
Aerated Grit Chamber	Peak Hour	20.0
Primary Clarifiers	Maximum Month	6.8
	Peak Hour	17.0
Aeration Tanks	Maximum Month	4.2
Secondary Clarifiers	Maximum Month	4.4
	Maximum Day	4.7
	Peak Hour	7.1
Chlorination Facilities	Peak Hour	13.8
Sand Infiltration Beds	Maximum Month	6.0

WPCF Existing Flows

Flow Component	Sewage (MGD)	Septage (MGD)	Total (MGD)	Time of Occurance
Average Daily Flow	1.54	0.03	1.57	March 1 2012 - Feb 28 2017
Maximum Daily Flow	2.20	0.12	2.32	July 4, 2014
Minimum Daily Flow	0.88	0.00	0.88	January 24 2015
Peak Hour	4.92	N/A	4.92	July 1, 2015
Maximum Month	1.97	0.05	2.02	July 20 - Aug 18 2012
Minimum Month	1.24	0.01	1.25	Jan 18 - Feb 17 2015

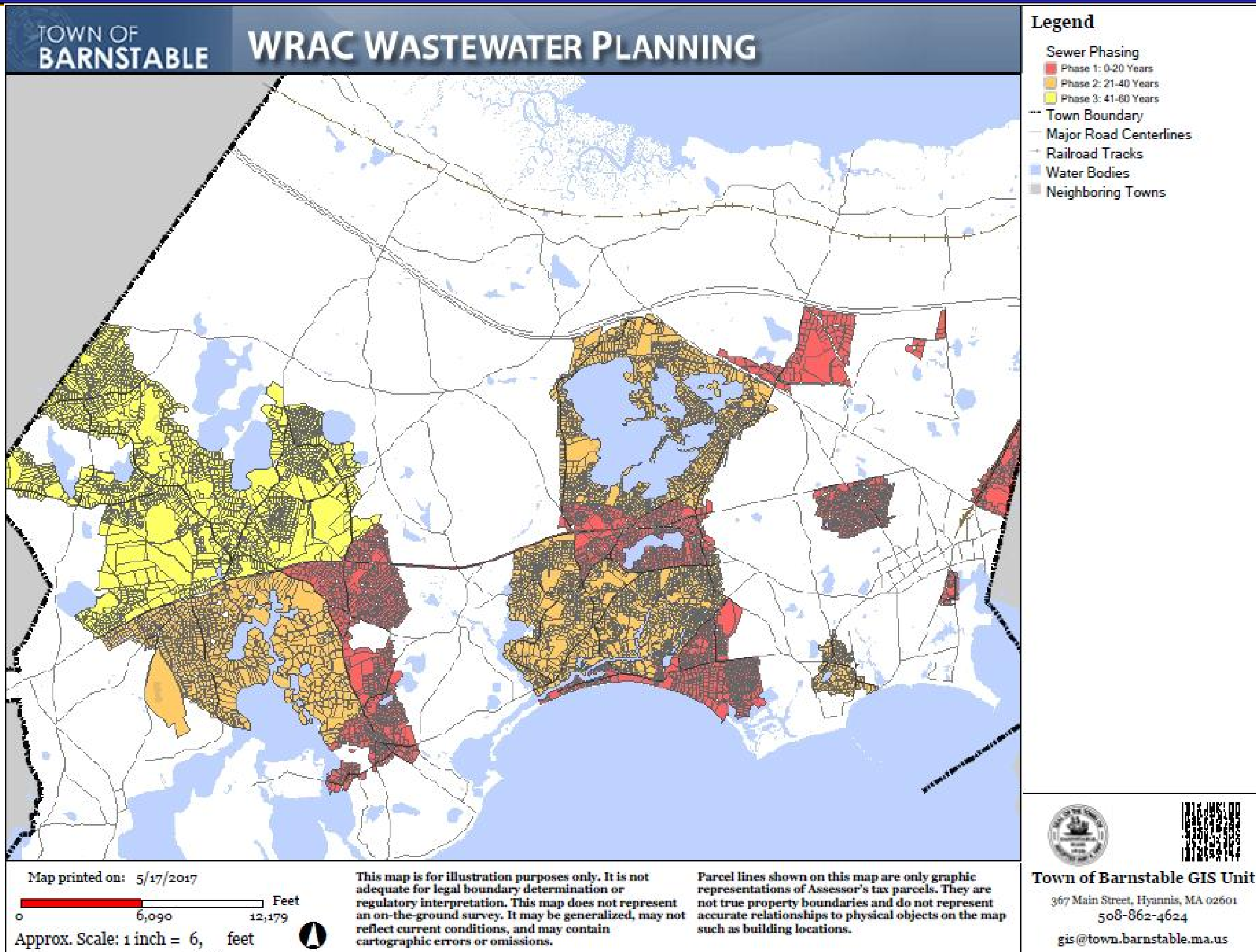
- *Therefore ~ 1-2 MGD of treatment capacity*
- *~ 1 MGD of disposal capacity*
- *Some of this is already spoken for*

Phasing

Phasing Plan

- *Three 20-Year Phases*
  - *Phase I – Years 0-20*
  - *Phase 2 – Years 20-40*
  - *Year 3 – Years 40 -60*

Phasing Plan



Phase Statistics

Item	Phase 1 (0-20 Years)	Phase 2 (20-40 Years)	Phase 3 (40-60 Years)	Total
WW Captured (GPD)	637,000	740,000	326,000	1,703,000
Load N Removed (kg/year)	21,400	26,700	11,800	59,900
Number of Parcels Affected	3,176	3,781	1,925	8,882
Road Miles	62	66	38	166
% N Removed	41%	30%	29%	100%

- *Very conservative - No credit for nontraditional solutions*
  - *Installed in Phase I*
  - *Monitored throughout Phase I and II*
  - *Ideally will enable avoidance of Phase III via Adaptive Management*

Costs

Cost Estimate Assumptions

- *Developed a per mile collection system cost estimate*
  - *Assumptions*
    - *One pump station for every 2 miles sewers*
    - *One mile FM for every pump station*
    - *Average pipe size is 10 inch diameter*
    - *Gravity Service to ROW = 1,060*
    - *Minimal bridge crossing*
    - *Four foot diameter SMH every 300 feet, age depth 6 feet*
    - *No Storm Drain as part of this project*
    - *10 test pits per mile (~1 every 500 feet)*
    - *Pave full width, 30 foot width assumed, 1.5 inch top coat, 2.5 inch binder*
    - *1,000 feet of waterline per mile needs to be disturbed*
    - *Five foot sidewalk reconstructed, 1 side, 1/3 of mile*
    - *Curb reset or replaced for 1/4 of the mile, both sides = 2,640 ft curbing per mile*
    - *Package Pump Station "neighborhood" sized*
    - *$25,000 traffic control allowance*
    - *$15,000 electrical allowance*
    - *5% construction contingency*
    - *20% technical services*
    - *10% land acquisition*
  - ***Results $2.7M/mile***
- *Cost for plant upgrade assumed at 30% collection system costs*

Potential Costs/Phase

- *Very rough, planning level cost estimate*
- *Predicated on a large number of assumptions*
- *Nontraditional Solution costs not included*

Item	Phase 1 (0-20 Years)	Phase 2 (20-40 Years)	Phase 3 (40-60 Years)	Total
Road Miles	62	66	38	
Cost per Mile	$2,700,000	$2,700,000	$2,700,000	
Collection System Costs ($)	$167,400,000	$178,200,000	$102,600,000	
Assumed WPCF Cost %	0.00%	30.00%	30.00%	
Assumed WPCF Cost ($)	$0	$53,460,000	$30,780,000	
Total Cost:	$167,400,000	$231,660,000	$133,380,000	$532,440,000

All costs in 2017 dollars

Next Steps

- *June – August,*
  - *WRAC reviews*
    - *Technical Solutions*
    - *Phasing*
  - *Financial Subcommittee*
    - *Craft the financial plan*
  - *DPW*
    - *Submit draft plan to MEP for modeling and confirmation of removals*
    - *Continue to develop the Nontraditional Solutions and costs*
    - *Start to write background document*
- *September, WRAC approves the plan*
- *October – November,*
  - *WRAC, develop public outreach plan*
  - *DPW*
    - *Update modeling if required*
    - *Start discussions with regulatory agencies*
    - *Continue background document*
    - *Begin preliminary design efforts*
- *December presentation to Town Council - (workshop?)*
- *January - August 2018 Public Outreach*
- *Fall 2018 – Present "Final Draft" Plan to Town Council*
- *Winter 2018 - Submit Final Draft to CCC and Regulatory Agencies*

Special Thanks

- *Amanda Ruggiero, Assistant Town Engineer*
- *James Benoit, GIS Manager*
- *Casey Scrima, Intern for Wastewater Affairs*

Discussion?