Quonochontaug East Beach /Central Beach WHPA Assessment Results

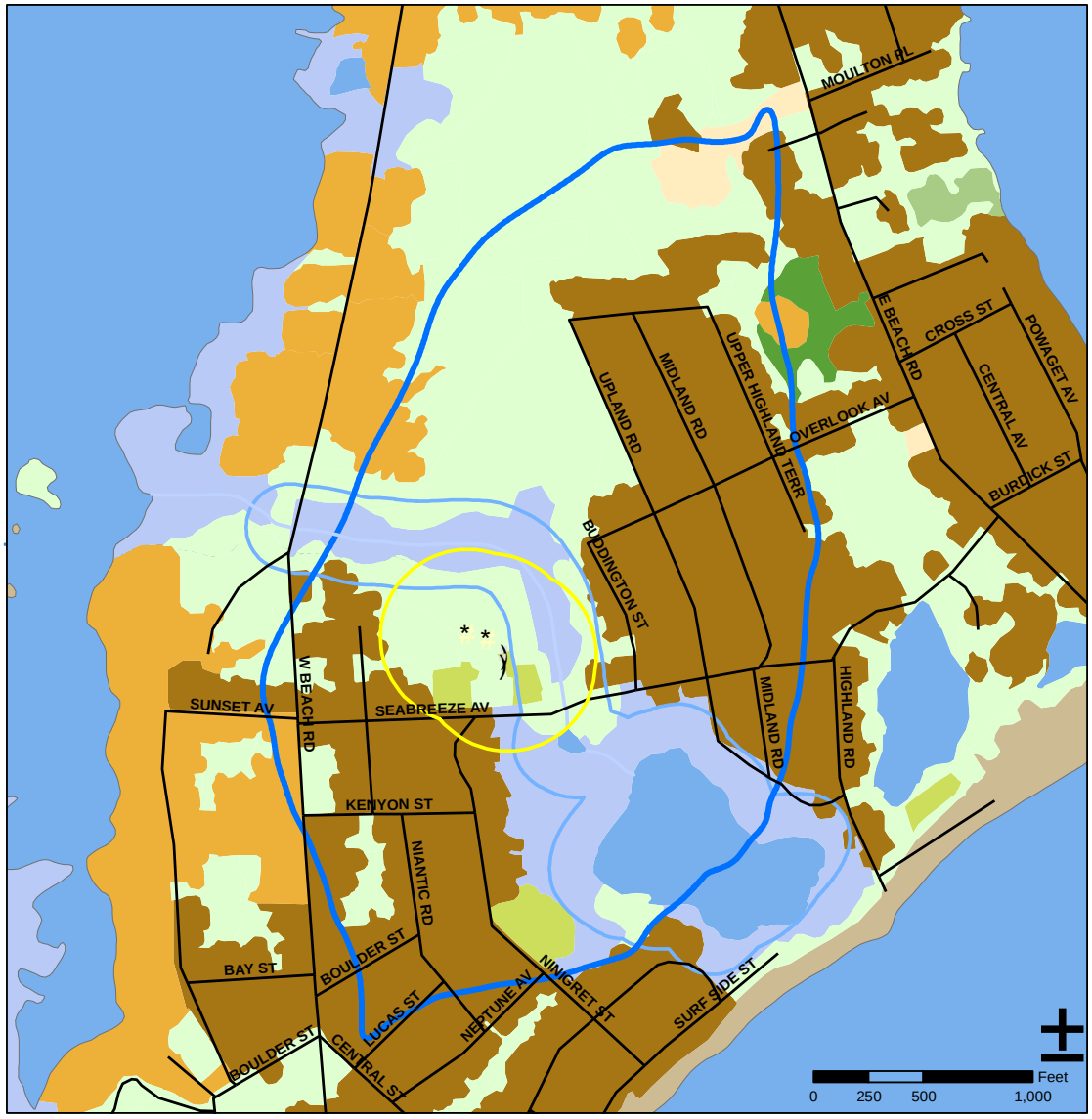
Lorraine Joubert

URI Nonpoint Education for Municipal Officials

Tel: 401-874-2138, ljoubert@uri.edu

THE UNIVERSITY OF RHODE ISLAND

COOPERATIVE EXTENSION RI NEMO



Streams (RIGIS: Streams5k)

200 ft. surface water buffer

Roads

RI HEALTH Central Beach/East Beach WHPA

400 ft. wellhead buffer

Wellhead (RI HEALTH Aug

* Central Beach Fire District

) Quonochontaug EBWA

Land Use Category

High - Medium High Density Residential

Medium - Medium Low Density Residential

Developed Recreation and Cemeteries

Idle Agriculture, Pasture and Power Lines

Cropland (tillable), Orchards, Groves, Nurseries & Confined Feeding Operations

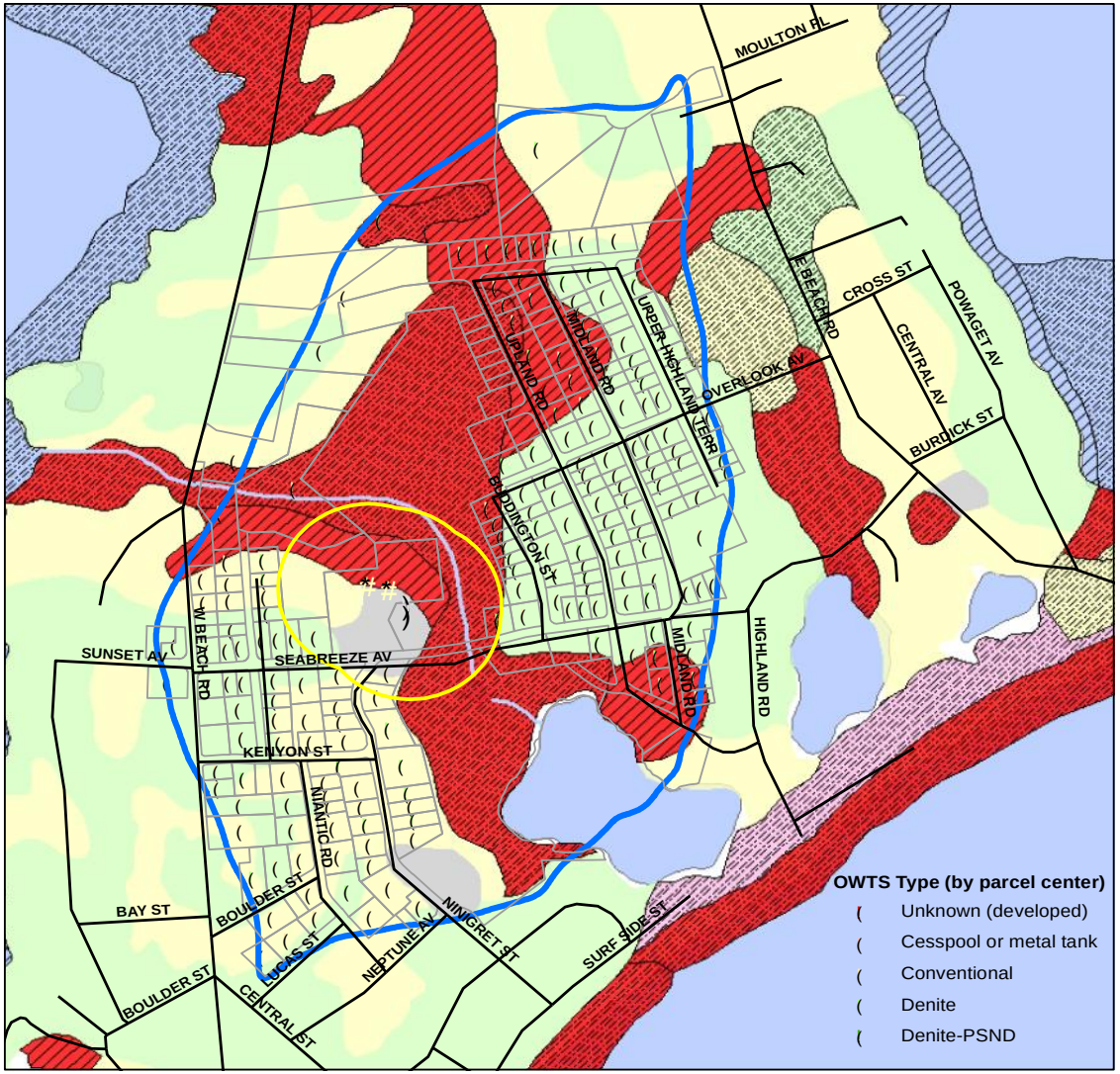
Forest, Forested Wetlands & Brushland

Beaches

Transitional Areas (urban open) & Vacant Land

Water

Wetland



400 ft. Wellhead Buffer

Parcels (Charlestown)

RI HEALTH Central Beach/East Beach WHPA

Streams (RIGIS: Streams5k)

Lakes, Ponds and Coastal waters

Excessively Permeable Soils

Densic Soils

Wellhead (RI HEALTH Aug 2013)

Central Beach Fire District

Quonochontaug EBWA

Hydrologic Soil Group, Water Table Depth (ft), Severe Constraints

A, > 6 ft.

B, >6 ft.

B, 1.5-3.5 ft

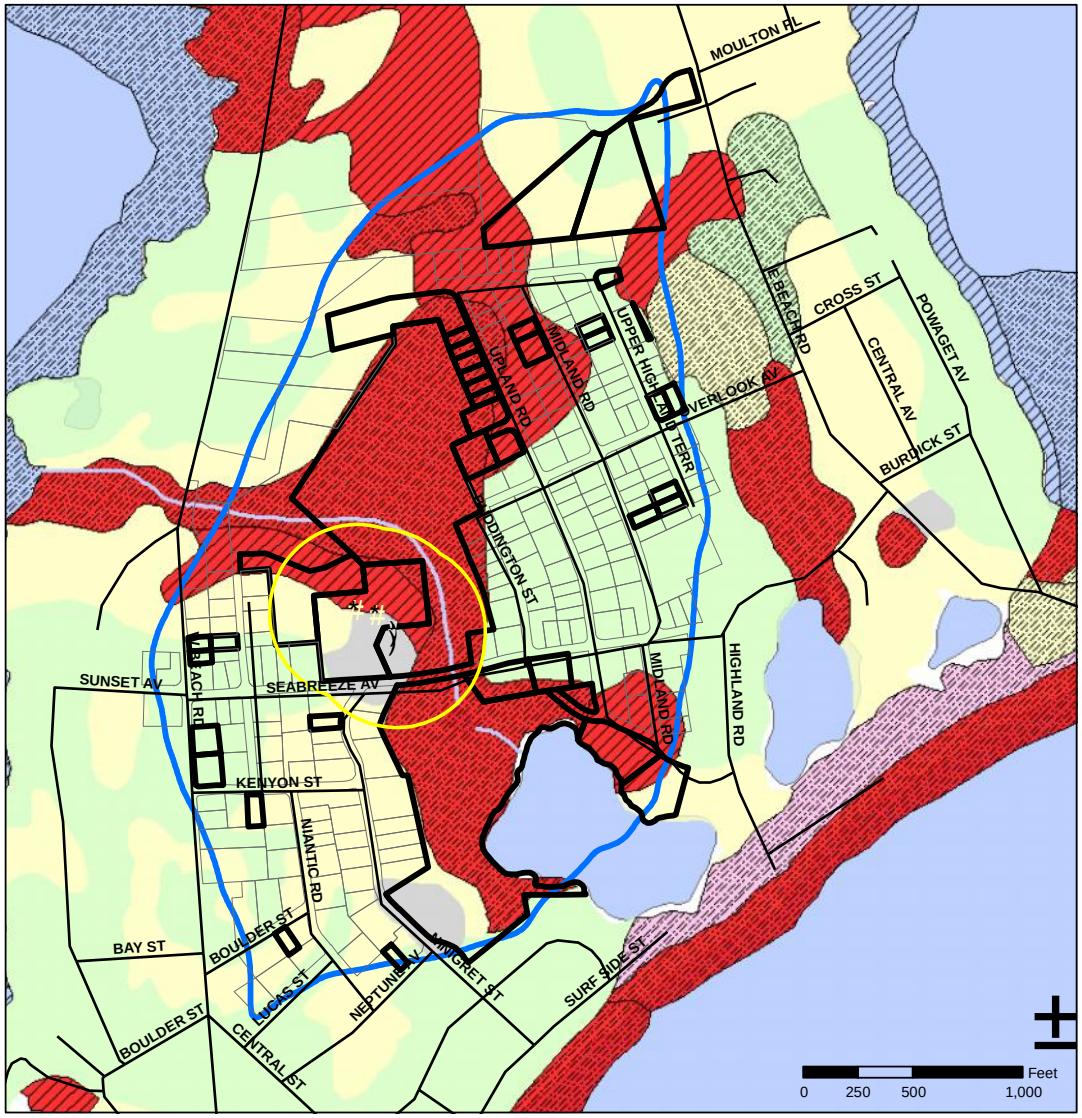
C, D, 0-1.5 ft., Hydric

Variable

0 250 500 1,000 Feet

Coordinate System: NAD 1983 StatePlane Rhode Island FIPS 3800 Feet Units: Foot US

Date: 6/5/2014



Lakes, Ponds and Coastal Waters

400 ft. Wellhead Buffer

RI HEALTH Central Beach/East Beach WHPA

Wellhead (RI HEALTH Aug

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Streams (RIGIS: Streams5k)

Excessively Permeable Soils

Densic Soils

Parcels (Charlestown)

Developed Lots

Undeveloped Lots

Hydrologic Soil Group, Water Table Depth (ft), Severe Constraints

A, > 6 ft.

B, >6 ft.

B, 1.5-3.5 ft

C, D, 0-1.5 ft., Hydric

Variable

Coordinate System: NAD 1983 StatePlane Rhode Island FIPS 3800 Feet Units: Foot US

Date: 6/5/2014

Groundwater Nitrate-N Loading Assumptions

Sources:

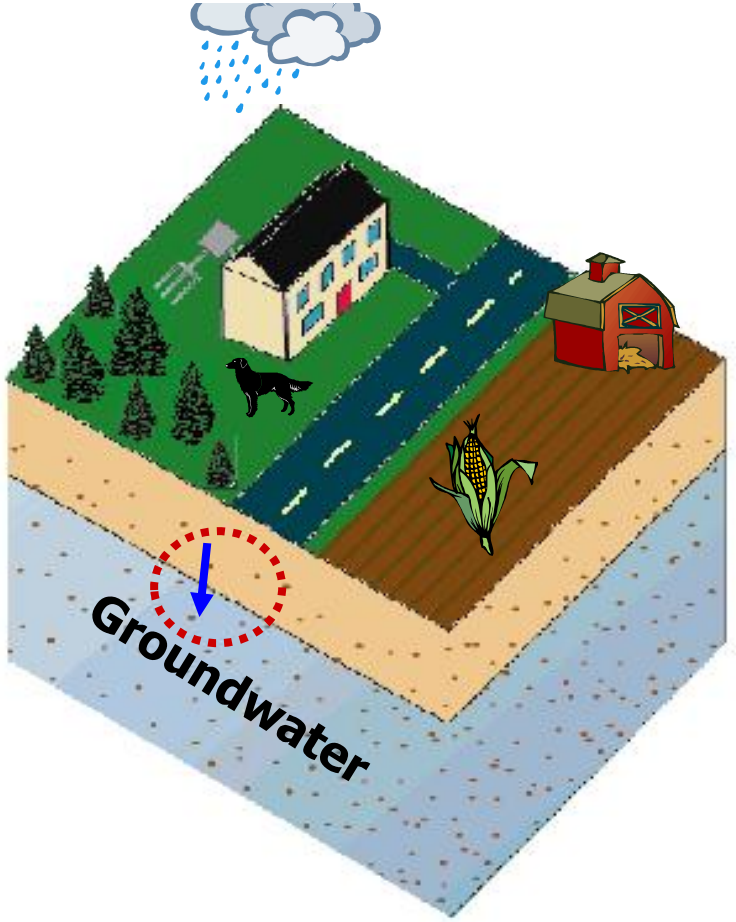
Septic System
7 lbs N/person/yr
85% Leaching

Pet Waste
0.41 lb
N/person/yr

Lawn Fertilizer
175 lbs N/ac/yr
6- 20% leaching

Tilled Cropland
175 - 215 lbs N/ac/yr, 20-30 % leaching

Forest and unfertilized Area
1.2 lbs N/ac/yr

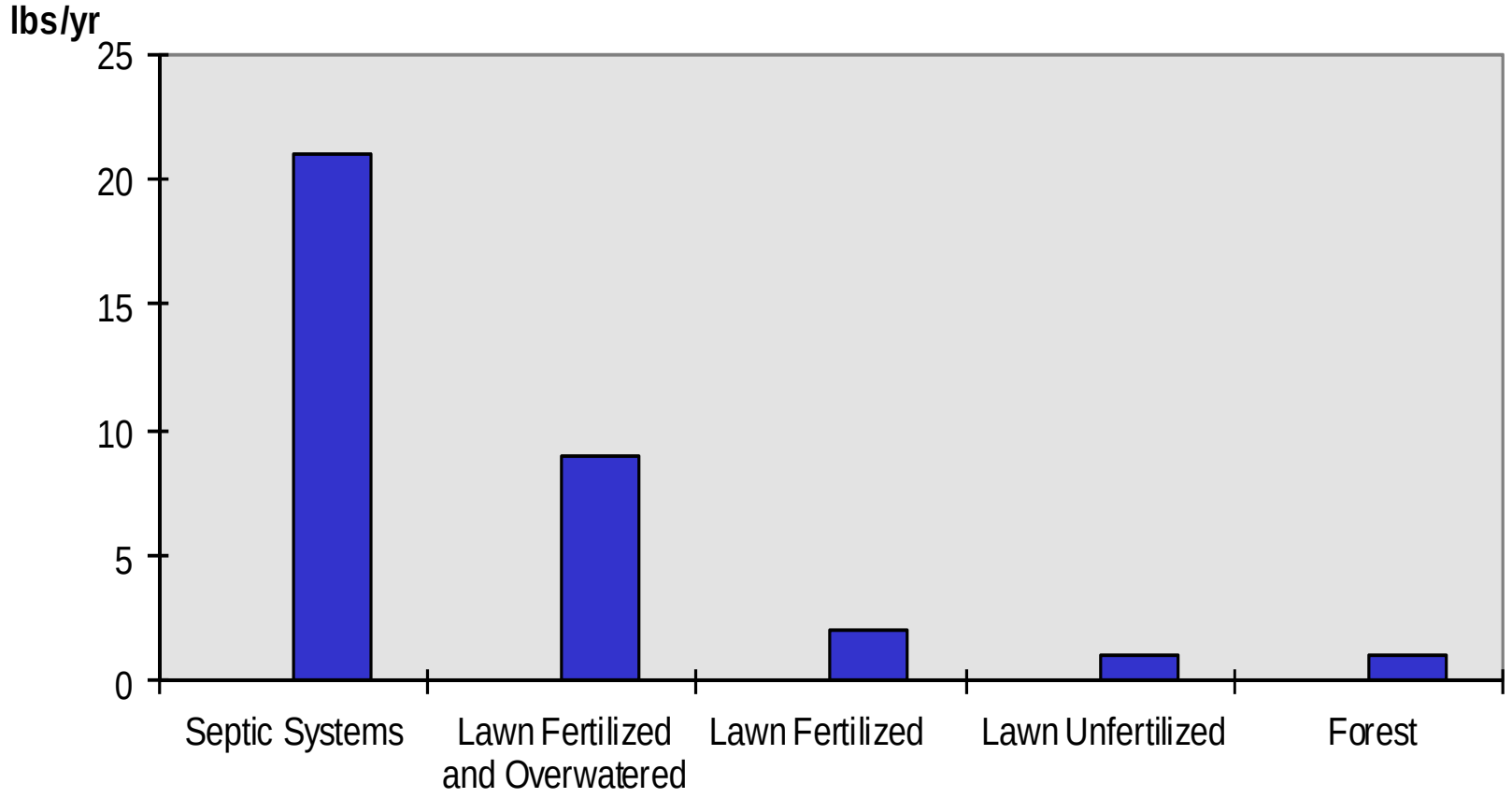


Atmospheric 8 lbs N/ac/yr

15% N leaching from forest rainfall.

100% N delivery to surface waters with rainfall on pavement.

Annual Losses of Nitrate-nitrogen to Groundwater from a 1-Acre Residential Lot



Source: Gold et al., 1990 and Morton et al, 1988.

1. Based on 3-bedroom house septic system with 1-acre.
2. Loss estimates based on 17,000 feet of lawn and forest.
3. Nitrogen application rate 5lbs./1000 sq. ft/yr; watered 1.5 inches/ week.
4. Nitrogen application rate 5lbs/1000 sq ft/ yr; watered 0.5 inches when dry.
5. Losses based on 17,000 sq ft of forest.

Number of Existing OWTS by Type and Assumptions for Nitrogen removal and effluent concentrations

System type	Removal rate (%)	Treated Effluent Conc. (mg N/L)	Number of OWTS
Cesspool/metal tank	0	46.0	1
Conventional system (including failing and substandard)	10	41.4	150
Denite - all adv treatment units and composting	10% then additional 50%	20.7	45
Denitrifying with PSND	10 % then additional 50% and then an additional 30 %	14.5	1
Holding tank	100	0.0	0
None or no data	10% (same as conventional)	41.4	1

Total OWTS	198
Vacant lots	41
Total lots	239

URI MANAGE Nutrient Model Results Compared to DEM method

Change evaluation	URI Method 3 persons/house occupancy	RIDEM OWTS calculations 2 persons /bedroom
	Nitrate N loading to groundwater (mg/L)	
None, current land use/OWTS	5.4	9.4
1. High maintenance lawn	5.8	NA
2. Upgrade all existing non-denitrifying OWTS to denitrifying systems	3.5	5.7
3. Build out to 4 bedrooms & upgrade/require all denitrifying OWTS	3.9	7.1
3. Build out to 2 bedrooms & upgrade/require all denitrifying OWTS	3.9	6.1

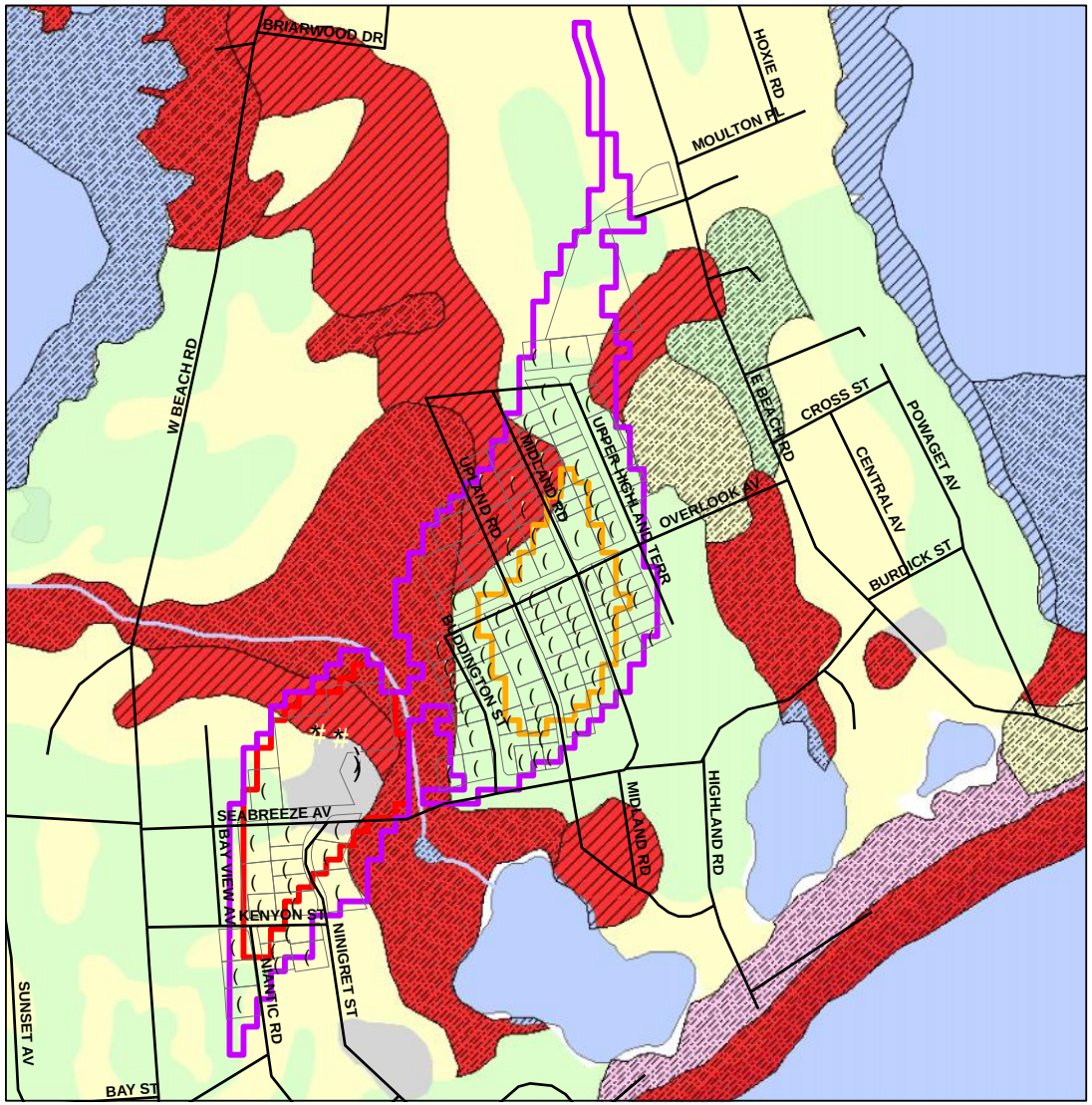
* Occupancy remains the same at 3 persons /du for the URI analyses. Parcel database indicates average 3.2 bedrooms/du in WHPA.

URI MANAGE Nutrient Model Results

Estimated concentration and % contribution of Nitrate-N from OWTS and Fertilizers

Change evaluation	URI Method 3 persons/house occupancy			
	NO3 (mg/L)	% OWTS	% Fertilizer	% Pets
None, current land use/OWTS	5.4	81%	9%	8%
1. High maintenance lawn	5.8	77%	14%	8%
2. Upgrade all existing non-denitrifying OWTS to denitrifying systems	3.5	71%	14%	13%
3. Build out to 4 bedrooms & upgrade/require all denitrifying OWTS*	3.9	75%	12%	11%
4. Build out to 2 bedrooms & upgrade/require all denitrifying OWTS*	3.9	*	*	*

* Occupancy remains the same at 3 persons /du for all analyses.
Parcel database indicates average 3.2 bedrooms/du in WHPA.



Streams (RIGIS: Streams5k)

Lakes, Ponds and Coastal waters

ROADS

Parcels (Charlestown GIS)

Entire Probablistic

North Probabilistic Area Greater 10%

South Probabilistic Area Greater 10%

Excessively Permeable Soil

Densic Soil

Hydrologic Soil Group, Water Table Depth (ft), Severe Constraints

A, > 6 ft.

B, >6 ft.

B, 1.5-3.5 ft

C, D, 0-1.5 ft., Hydric

Variable

OWTS Type (by parcel center)

Unknown (developed)

Cesspool or metal tank

Conventional

Denite

Denite-PSND

Feet

0 250 500 1,000

URI MANAGE Nutrient Model Results

Comparison of DEM WHPA vs Probabilistic Contributing Areas

CURRENT LAND USE /OWTS and HIGH MAINTENANCE LAWNS	URI Method 3 persons/house occupancy		
	NO3 (mg/L)	% OWTS	% Fertilizer
DEM WHPA	5.8	77%	14%
Entire Probabilistic Area (purple boundary)	7.9	879%	13%
Northern Probabilistic Area (orange boundary)	13.2	83%	10%
Southern Probabilistic Area (red boundary)	4.3	70%	21%

Management Recommendations

1. **Development Standards - Maintain infiltration, protect wetlands and hydric soils as N sinks.**

- **Limit % impervious cover based on lot size.**
- **Limit land clearing and lawn area as % of lot and/or max. area such as 5,000 sf.**
- **Establish stormwater treatment and infiltration standards > DEM (such as full 1 inch infil; treat RO from entire lot, not just impervious area)**
- **Require use of RI Soil Erosion and Sediment Control Handbook soil restoration standards. Consider use of the RI Stormwater Manual for difficult lots (not residential guidance).**

Management Recommendations

2. Wastewater Treatment

- **New OWTS, alterations and repairs:**
  - **Ensure OWTS is designed for denitrification.**
  - **Require use of pressurized shallow narrow drainfields (PSND) where suitable.**
- **New OWTS and alterations: Reduce future wastewater loading by limiting bedrooms and living area based on existing averages. Consider maximum N loading /lot area.**
- **Existing OWTS – phase in upgrade to denite systems based on location within 400 ft. radius and WHPA travel time.**

Management Recommendations

3. System Performance

- **New OWTS: require that new/updated systems be designed for monitoring, with data reported to the town OWTS database. Specify monitoring schedule such as 4/yr or 3 /yr for seasonal.**
- **Existing OWTS:**
  - **Require owner (via service provider) to report O&M activities, i.e. conditions found, problems encountered, actions taken at date of service and follow up.**
  - **Authorize the town to require monitoring where O&M reports indicate history of problems without timely follow-up and problem resolution.**

Management Recommendations

4. Water use and fertilizers

- **Prohibit or regulate irrigation wells (?)**
- **Prohibit use of fertilizers within the WHPA (?)**
- **Conduct intensive public education campaign**

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