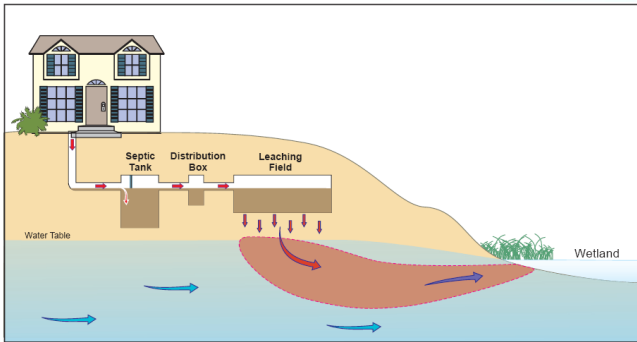


Achieving Higher Density Development In Areas Without Sewer/Water Service



Smart Growth / Smart Energy Toolkit



The Problem

- Many smart growth techniques rely upon higher-density, clustered development.
- Challenges to achieving this type of development pattern in rural areas often include wastewater treatment and disposal constraints, especially for on-site systems.

See MassDEP's website: www.mass.gov/dep/water/laws/regulati.htm

Statutes, Regulations & Policies Governing Wastewater

- Regulations
 - 310 CMR 15.000, Title 5
 - 314 CMR 5.00, Groundwater Discharge Permits
- Policies
 - Wastewater Reuse Policy
 - Nutrient Loading Approach
 - Private Sewage Treatment Plant Policy
 - TMDLs
 - Local Health Regulations

➔ See MassDEP's website: www.mass.gov/dep/water/laws/regulati.htm

Wastewater Disposal

- Title 5
 - $< 10,000$ gallons per day (gpd)
 - Less than 90 bedrooms
- Groundwater Discharge Permit
 - $\geq 10,000$ gpd
 - Approximately 90 bedrooms

Wastewater Design Flow (Title 5)

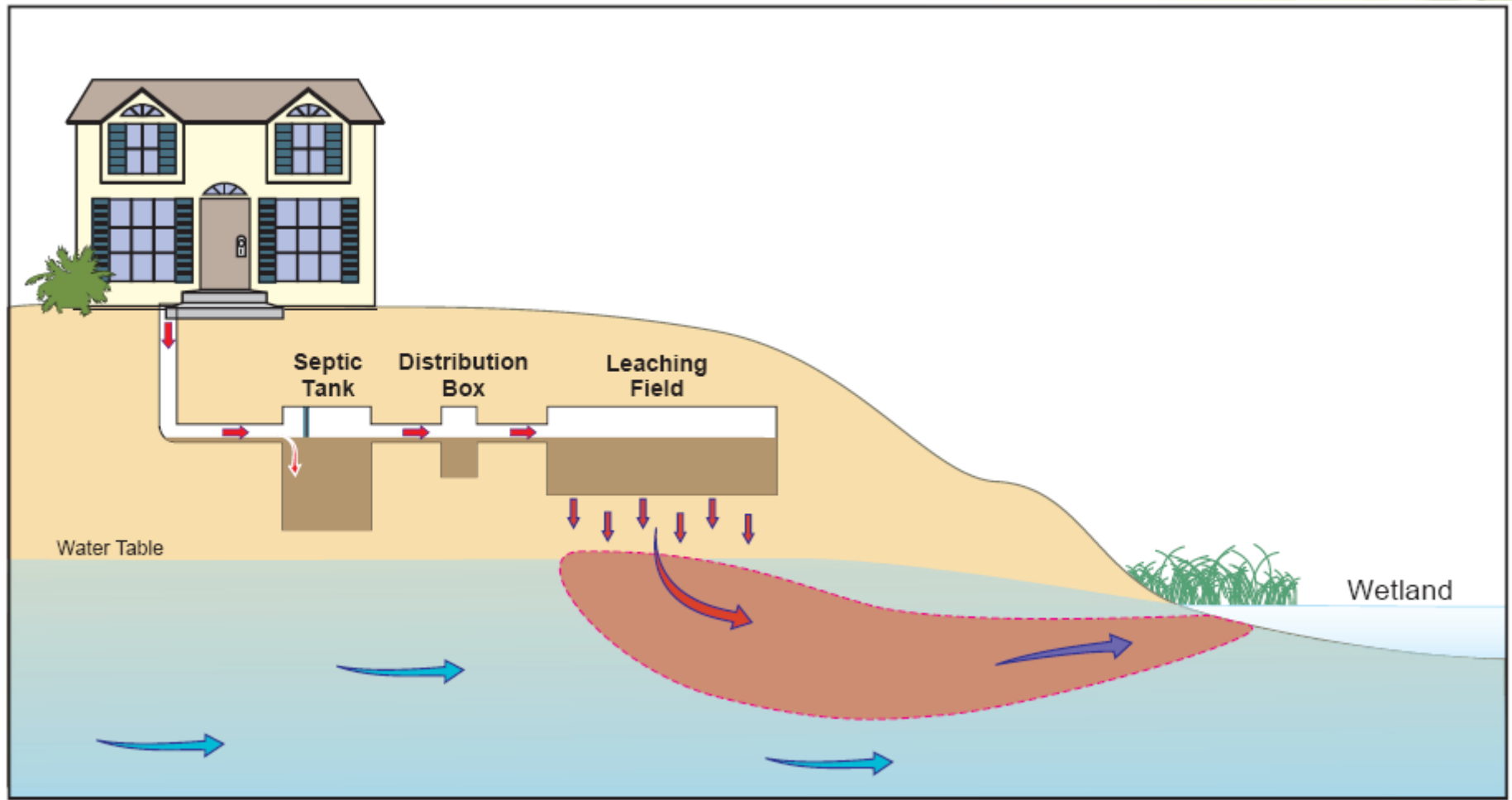
- Residential: 110 gpd per bedroom
 - 4-bedroom house: 440 gpd
 - thirty 3-bedroom homes: 9900 gpd
- Office building: 75 gpd per 1,000 sf
- Restaurants: 35 gpd per seat

Groundwater Discharge Permit Program > 10,000 gpd

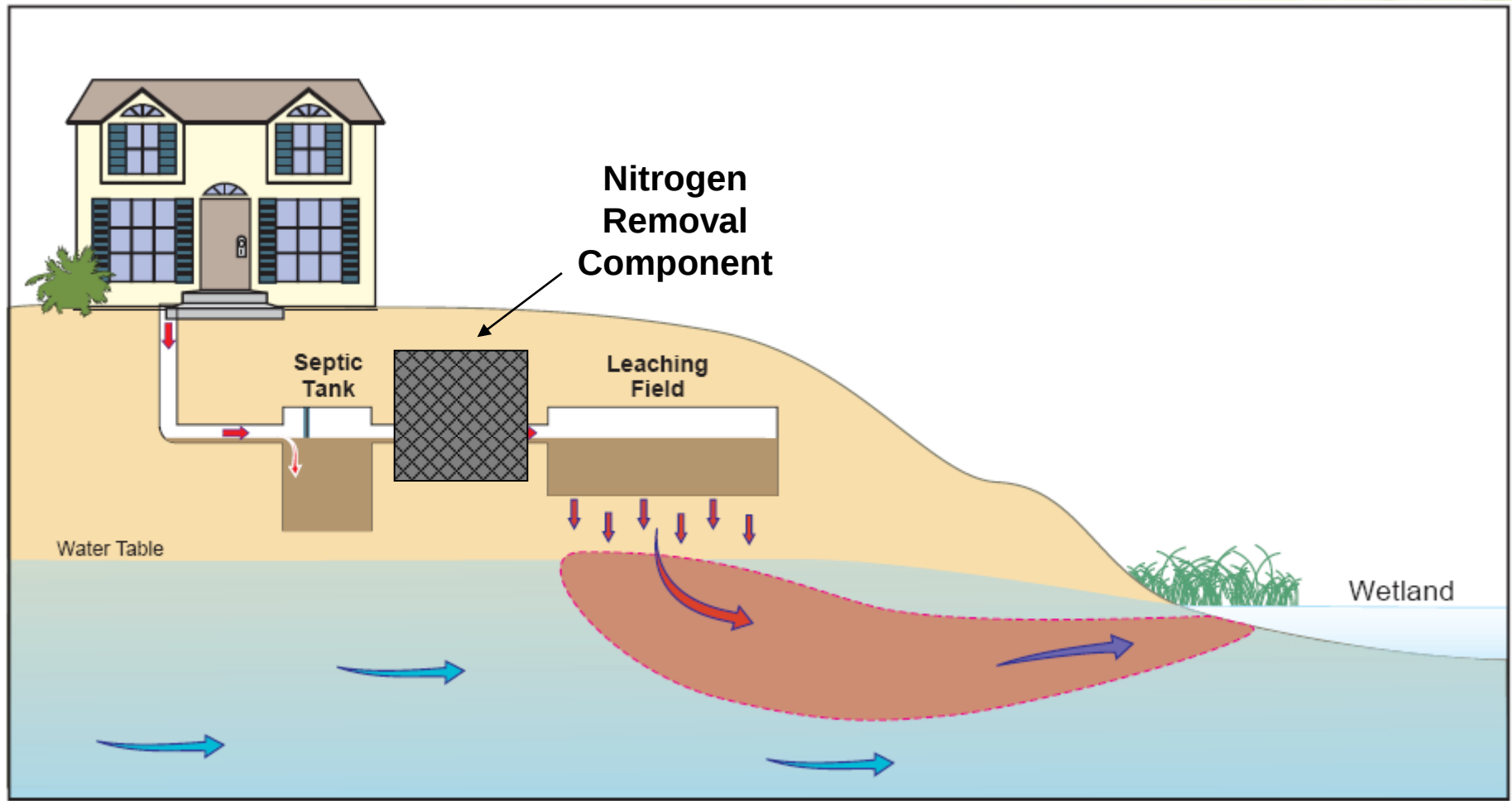
- Allows greater density in nitrogen sensitive areas
- Advanced Treatment Requirements (sewage treatment plant)
- Requires water quality monitoring of effluent and wells
- Operation & Maintenance requirements
- Staffing by certified operators
- Ownership responsibilities
- Financial considerations

Wastewater Options

- Title 5 Conventional Septic System
- Innovative & Alternative (I&A) Systems
- Shared Systems
- Sewage Treatment Plants



Conventional Title 5 System

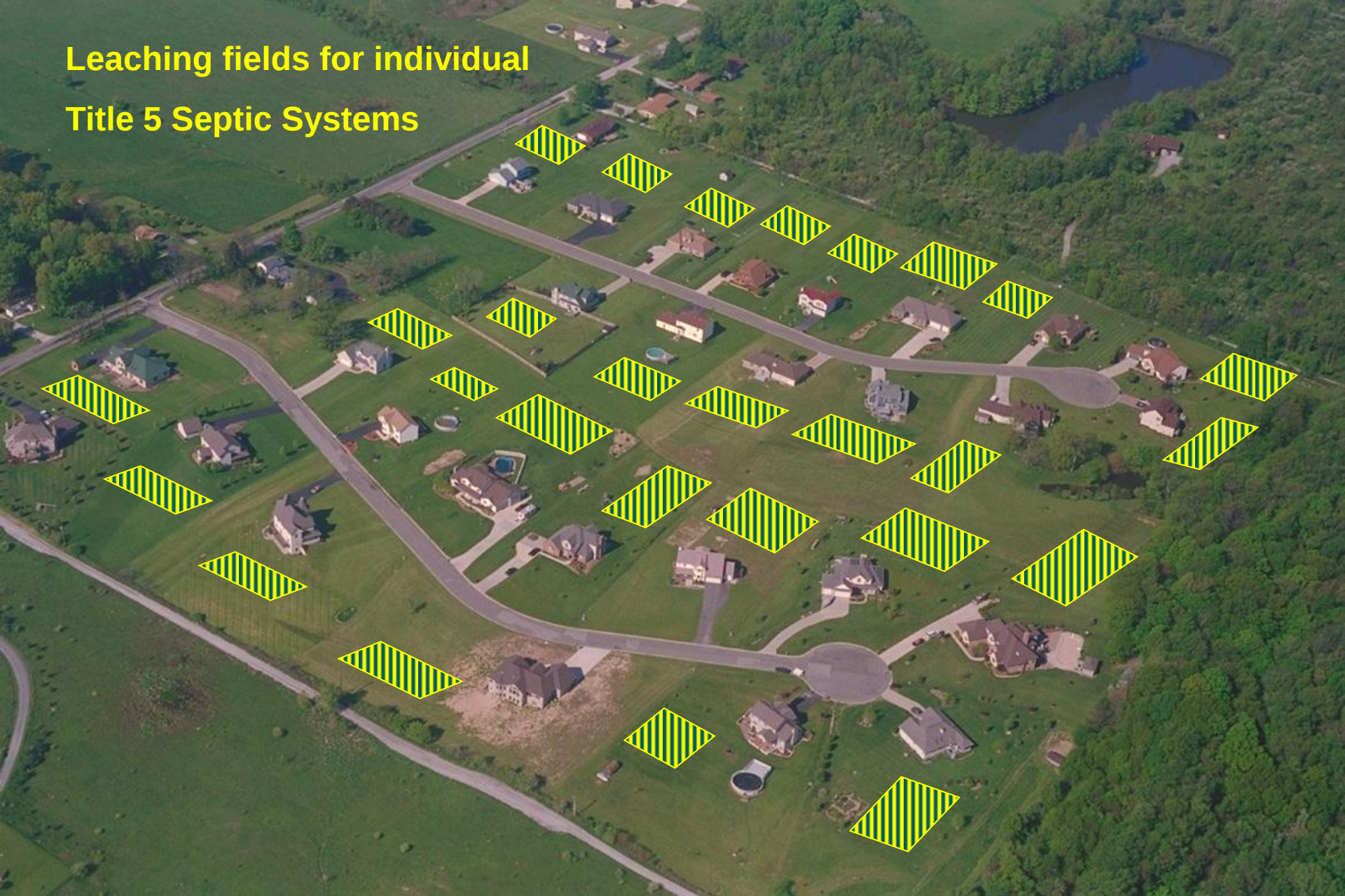


I/A Title 5 System

Shared System - New Construction

- Supports cluster development
- Maintain 50% open space (or what your bylaw/ordinance requires)
- System requires inspection every three years
- Could allow a denser development
- Users responsible for operation & maintenance construction

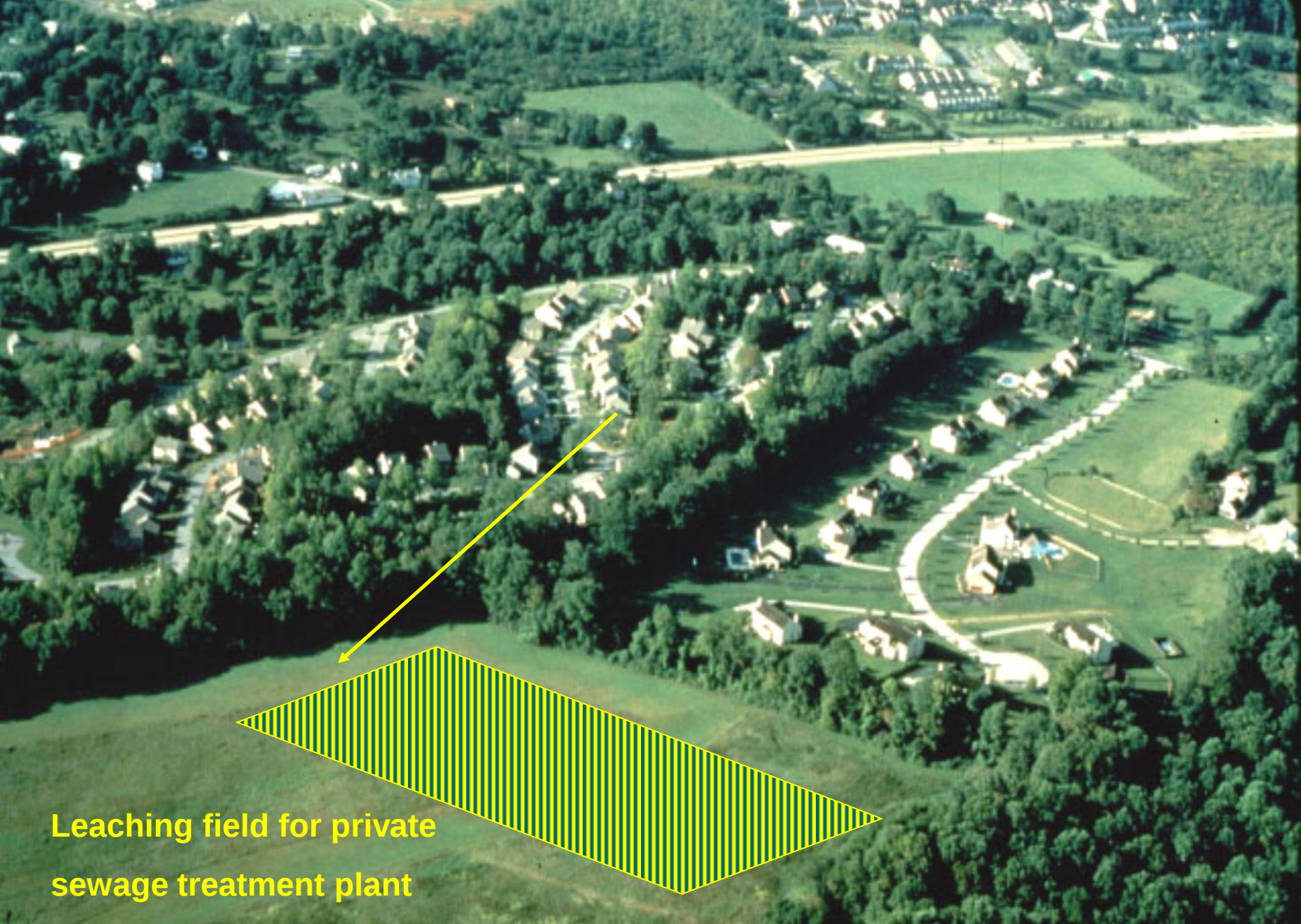
Leaching fields for individual Title 5 Septic Systems





**Leaching field for shared septic
system serving multiple homes**

Open Space Residential Design Subdivision



**Leaching field for private
sewage treatment plant**

Wastewater Treatment & Smart Growth

1. Develop a Comprehensive Wastewater Management Plan
2. Identify Larger Projects as Anchor Opportunities
3. Identify and Procure Sources of Public Funding
4. Use Innovative Financing Mechanisms
5. Provide Density Incentives Where Appropriate
6. Be Aware of TMDL Programs and Nitrogen Sensitive Areas in Your Community

Wastewater Management Costs

	Construction Costs	Operation & Maintenance Costs
Standard Title V Systems	\$5000 - \$10,000 per dwelling unit	\$100 - \$200 per year
Innovative and Alternative Systems	\$13,000 - \$18,000	\$500 - \$1000 for an individual home \$150 - \$200 per home for a shared system
Private Sewage Treatment Plants	\$30,000 - \$60,000 per dwelling unit	\$700 - \$1,000 per year, per unit

Case Studies

- Carmody™ I/A Tracking System, Barnstable County
- Partridgeberry Place, Ipswich
- The Pinehills, Plymouth

Carmody™ I/A Tracking System, Barnstable County

- Developed by the Barnstable County Department of Health & Environment (BCDHE)
- Innovative / Alternative (I/A) systems are particularly important on Cape Cod, where many embayments are already nutrient-sensitive.



Carmody™ I/A Tracking System, Barnstable County (continued)

Increased Development → Increase in Septic Systems →

Increase in wastewater discharge and associated nutrients →

Nutrient loading to groundwater, coastal estuaries, embayments, freshwater ponds, and streams →

Poor water quality, changes and deterioration of wildlife habitat, threat to certain species.



Carmody™ I/A Tracking System, Barnstable County (continued)

- Tracks construction, maintenance, and monitoring results of I/A systems within 14 of the 15 Towns
- Automatic tracking and compliance notification once system is manually entered into database.
- Also being used to evaluate functionality of different I/A systems.

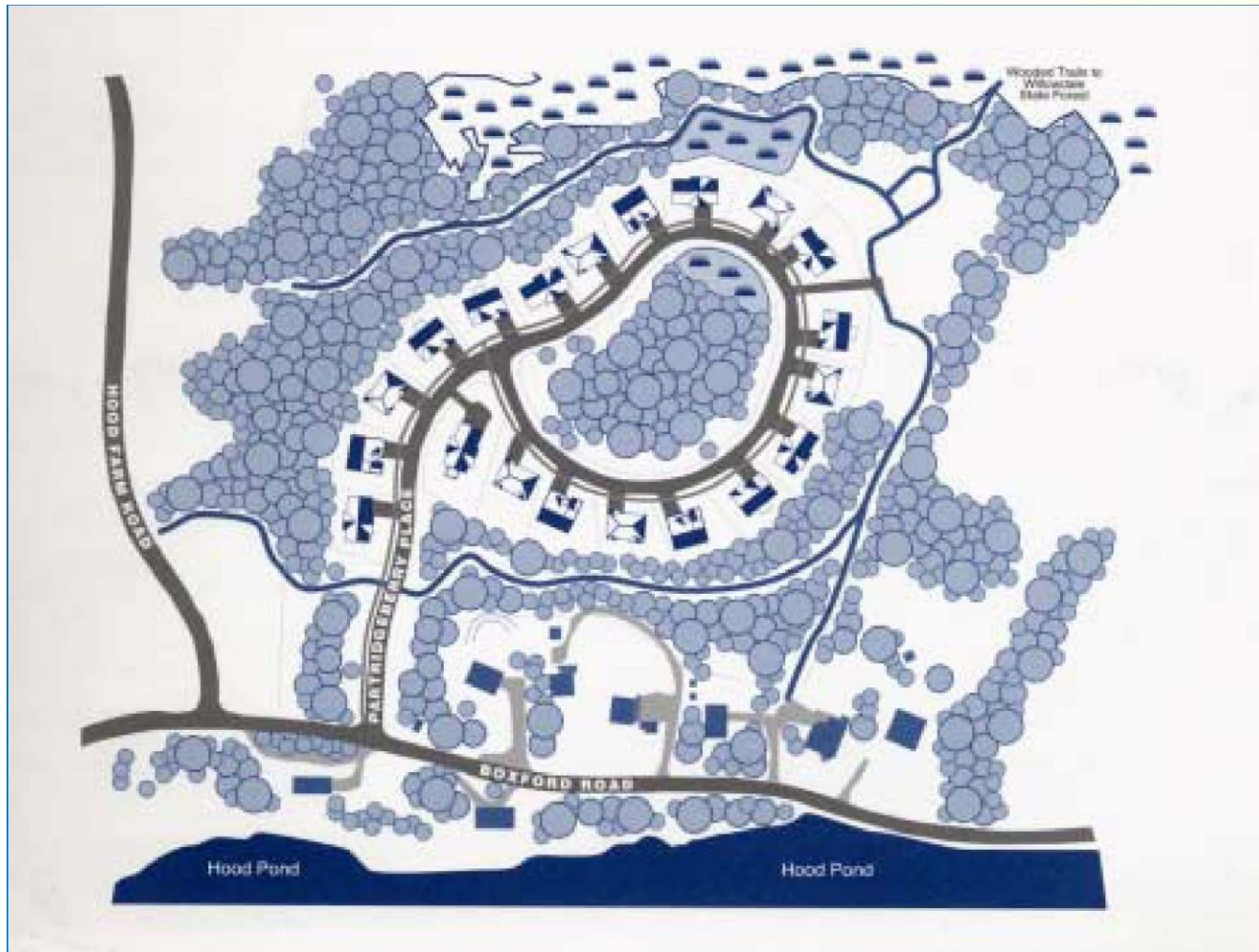


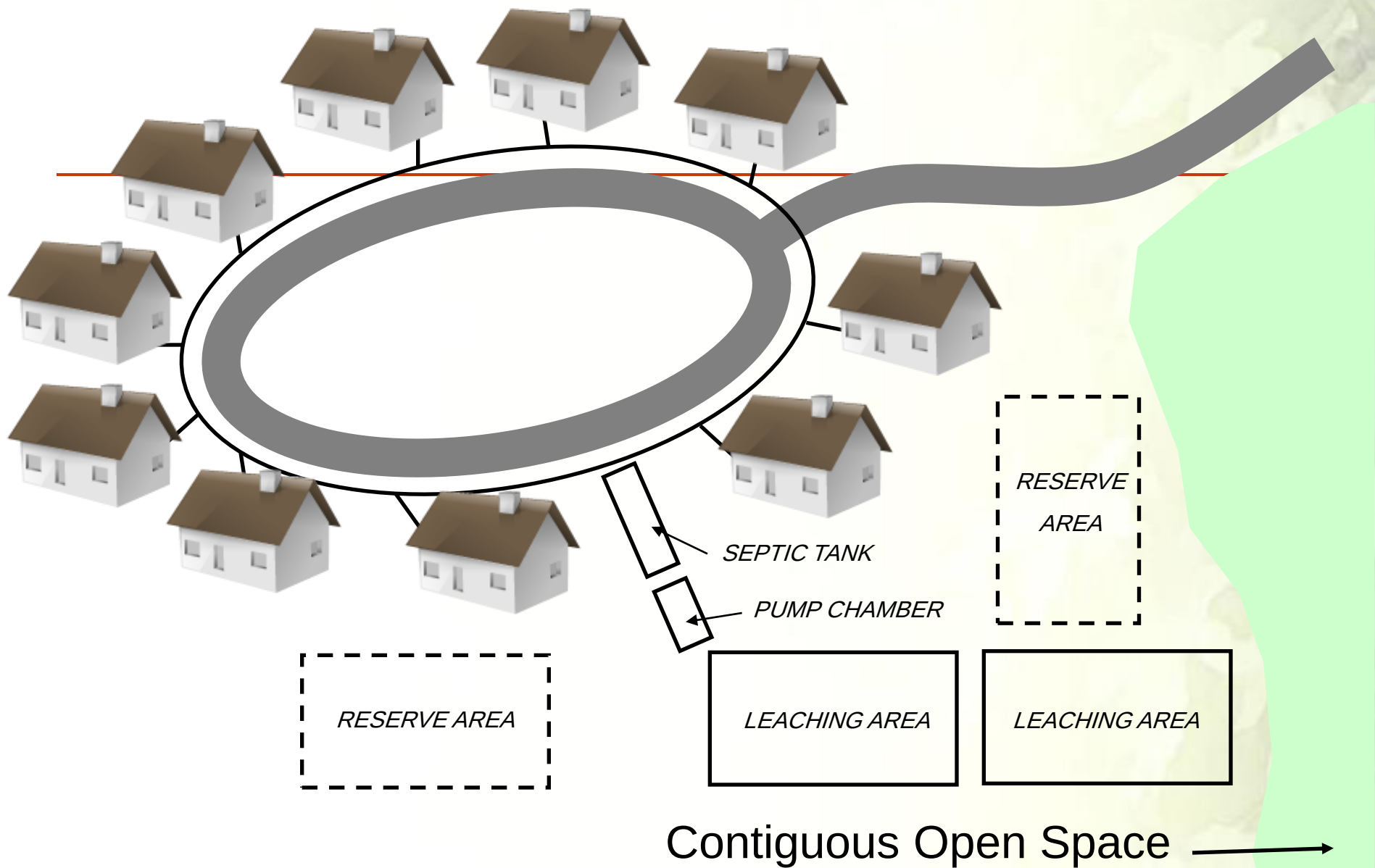
Partridgeberry Place, Ipswich

- Developed by Martins Companies
- Small-scale OSRD / LID development
- DCR Demonstration Grant – model development
- 20 residential units on 38 ac
- 74% (28 acres) preserved as contiguous open space
- Utilized shared septic system



Partridgeberry Place, Ipswich (continued)





**Image not drawn to scale*

Partridgeberry Place, Ipswich (continued)

- Shared Septic System
 - Design flow: 8,800 gpd
 - 27,000 gallon septic tank
 - 13,000 gallon pump chamber
 - Two standard Title 5 leaching fields
- Homeowners Association responsible for maintaining.
- Monitored and checked quarterly by Clearwater Industries of Ipswich

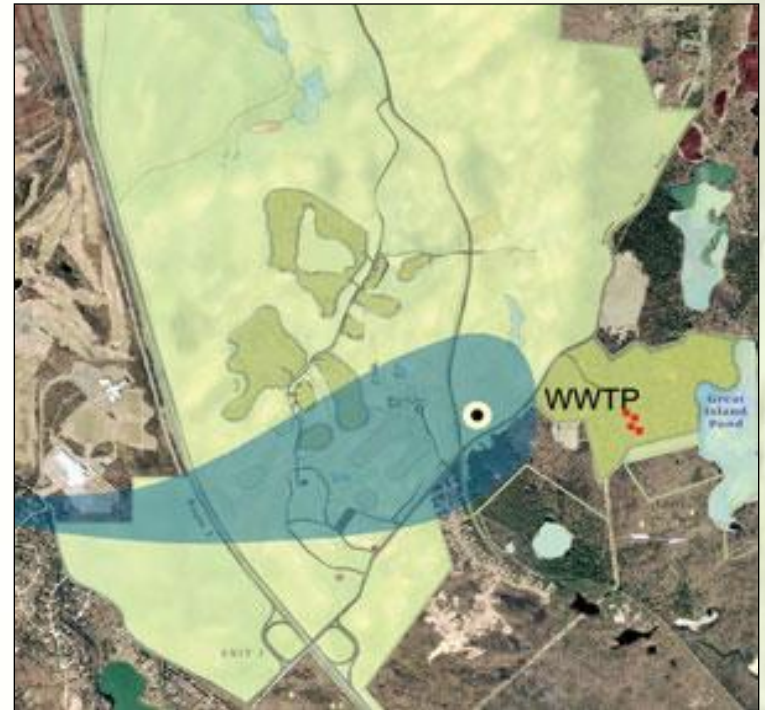
The Pinehills, Plymouth

- Open-space mixed-use development (OSMUD)
- No pre-existing public wastewater services.
- Private sewage treatment plant enabled densities of up to eight residential units per acre in clusters surrounded by open space.



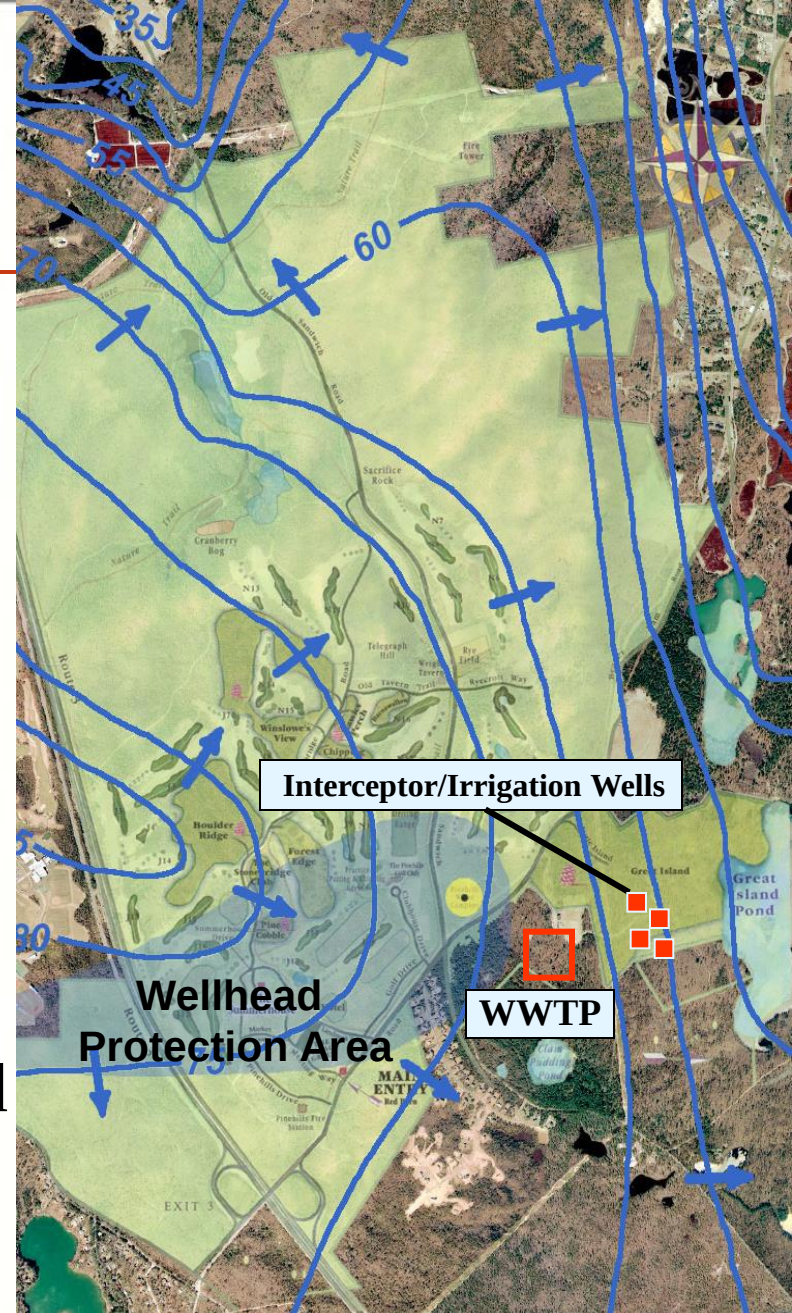
The Pinehills, Plymouth (cont.)

- State-of-the-art treatment facility carefully sited hydrologically downgradient of the drinking water supply site.
- Water re-use for golf course irrigation.
- Reduces the demand on the drinking water supply as well as required fertilizer applications.



The Pinehills, Plymouth (cont.)

- Wastewater treatment facility
 - Max. daily flow: 215,800 gpd
 - Average flow: 140,000 gpd
 - Annual nitrogen load: 4,260 lbs
 - Five disposal beds
- Golf course irrigated from well downgradient from disposal beds
- Influent monitored monthly
- Groundwater monitoring wells tested for potential contaminants with varying frequencies.



Conclusions

- In areas without existing public sewer service, there are options to achieve higher density development.
- The options include shared septic systems, innovative & alternative systems, and small sewage treatment plants.
- Shared systems allow for clustering of development with one common septic disposal field.
- Innovative & alternative systems and small sewage treatment plants allow for increased densities and reduced pollutant (nutrient) loads.
- As densities increase, these options become more cost effective.

Additional Information and Links

- Massachusetts Title V regulations:
<http://www.mass.gov/dep/water/laws/regulati.htm#t5regs>
- Massachusetts Groundwater Discharge Permit regulation:
<http://www.mass.gov/dep/service/regulations/310cmr15.pdf>
- Wastewater reuse policy:
<http://www.mass.gov/dep/about/organization/aboutbrp.htm#reuse>
- National Small Flows Clearing House: <http://www.nesc.wvu.edu/nsfc/>
- Block Island, RI: A Sample Wastewater Management Program
http://www.uri.edu/ce/wq/RESOURCES/wastewater/RI_Towns/BIGHP.htm
- Orange County, NC: Sample Wastewater Management Program
<http://www.co.orange.nc.us/envhlth/eseptic.htm>
- Innovative Alternative technologies approved in Massachusetts:
<http://mass.gov/dep/water/wastewater/techsum.htm>