



Investigation of District Package Treatment Plants

West Newbury Board of Selectmen

September 26, 2018



Agenda

- Project Goals
- Process to Date
- Sewage Treatment Options
- Implications for West Newbury
- Next Steps
- Discussion



Project Goals



Sewage Treatment and Downtowns

- Growth in many small towns in Massachusetts is constrained by the use of individual septic systems
- These systems also have implications for public health and surface water quality if the systems fail
- The goal of this planning project, sponsored by the Massachusetts Downtown Initiative of the Department of Housing and Community Development, is to look at the implications of sewage treatment options for small towns, using West Newbury as a case study
- The final report identifies options for the Town to consider; it does not recommend one course of action over another



Process to Date



Working Group Meetings

- July 27
 - Introduction to study process
 - Discussion of West Newbury's needs, possibilities, and concerns
- September 29
 - General information about sewage treatments – systems, management, financing, operating structures
 - Specific information about West Newbury and the potential implications
 - Resources and case studies for review
- December 4, 2017
 - Discussion of build-out scenarios and options
- Spring 2018: Draft Report and Comments



Sewage Treatment Options



Why Evaluate Sewage Treatment Options?

- Constraint on economic development in the Town Center
 - Difficulty/inability to replace systems that fail
 - Title V-compliant systems may prohibit/make certain uses more difficult
 - Land used for leach fields is land that cannot be used for buildings, parking, or amenities
- Constraint on additional housing in the Town Center
 - Title V-compliant systems limit density
 - Land is devoted to septic systems rather than buildings

Sewage Management: Health and Environment

- Why control the disposal of sewage?
 - Prevention of disease in humans and animals
 - Protection of aquatic and animal habitats
 - Protect water quality for swimmers, boaters, fishermen, shellfish

Massachusetts Regulatory Context

- State Environmental Code, Title 5 (310 CMR 15.00)
- Groundwater Discharge Permit Regulations (314 CMR 5.00)
- 10,000 gallons per day as regulatory threshold

Massachusetts Regulatory Context

- **State Environmental Code, Title 5 (310 CMR 15.00)**
 - Systems with design flows less than 10,000 gallons per day
 - 10,000 gallons = ~ 30 3-bedroom units or 200,000 square feet of retail space
 - Two types:
 - Individual houses or commercial properties
 - Shared or cluster systems up to 20-30 residences
 - Administered by the Board of Health
 - Setbacks from wetlands and waterways, soil requirements and depth to groundwater requirements
 - Innovative/Alternative Septic Technologies

Massachusetts Regulatory Context

- Groundwater Discharge Permit Regulations (314 CMR 5.00)
 - Systems with design flows of 10,000 gallons per day or more
 - Administered by the Massachusetts Department of Environmental Protection (MassDEP)
 - Must comply with MassDEP's guidelines for design of the treatment facilities
 - Subsurface soils, groundwater flow, downgradient impacts (including drinking water supplies and coastal embayments)
 - Density determined by local zoning/subdivision controls rather than septic system

Individual Solution vs. Shared Solution

- Shared
 - Shared/Cluster System (Title 5)
 - Wastewater Treatment Plants (Groundwater Discharge Permit)

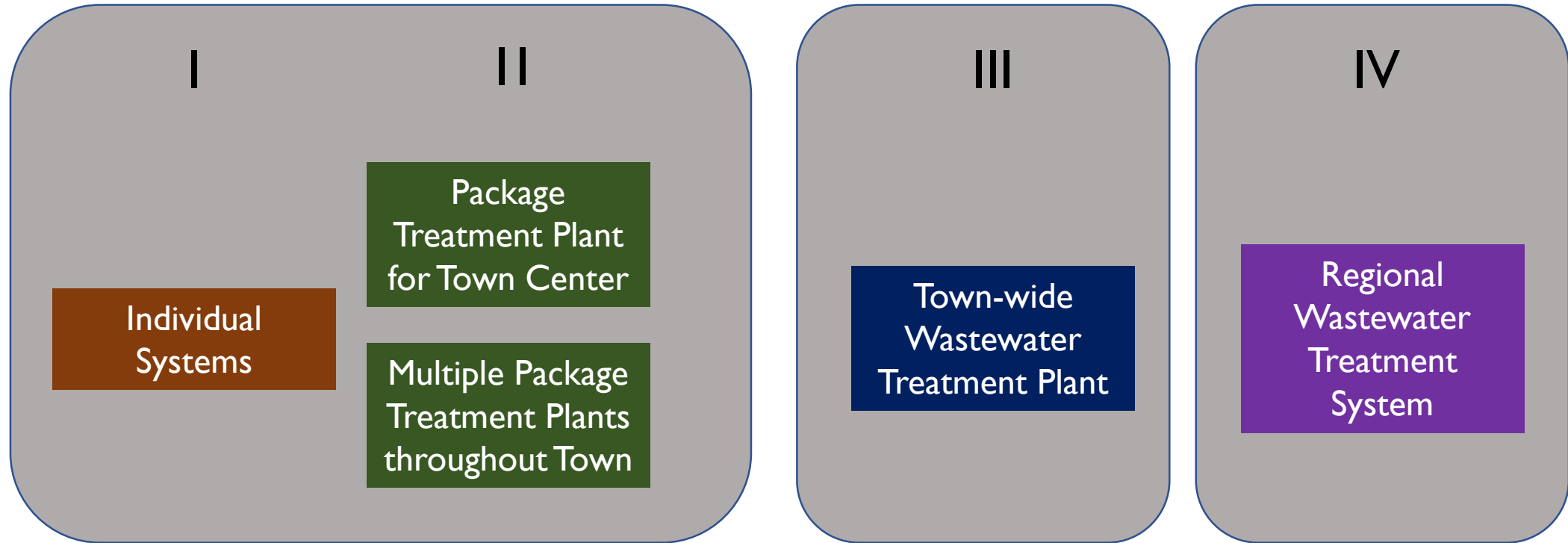
Individual Solution vs. Shared Solution

- Shared/Cluster Systems (Title 5)
 - Can upgrade existing or support new construction
 - Used in cluster developments or higher-density areas
 - Approved by Board of Health and submitted to MassDEP for review
 - Traditional septic system shared by two or more adjacent properties
 - Each lot must be able to support its own system;
 - Requirement does not apply to cluster developments that meet Chapter 40A, Section 9

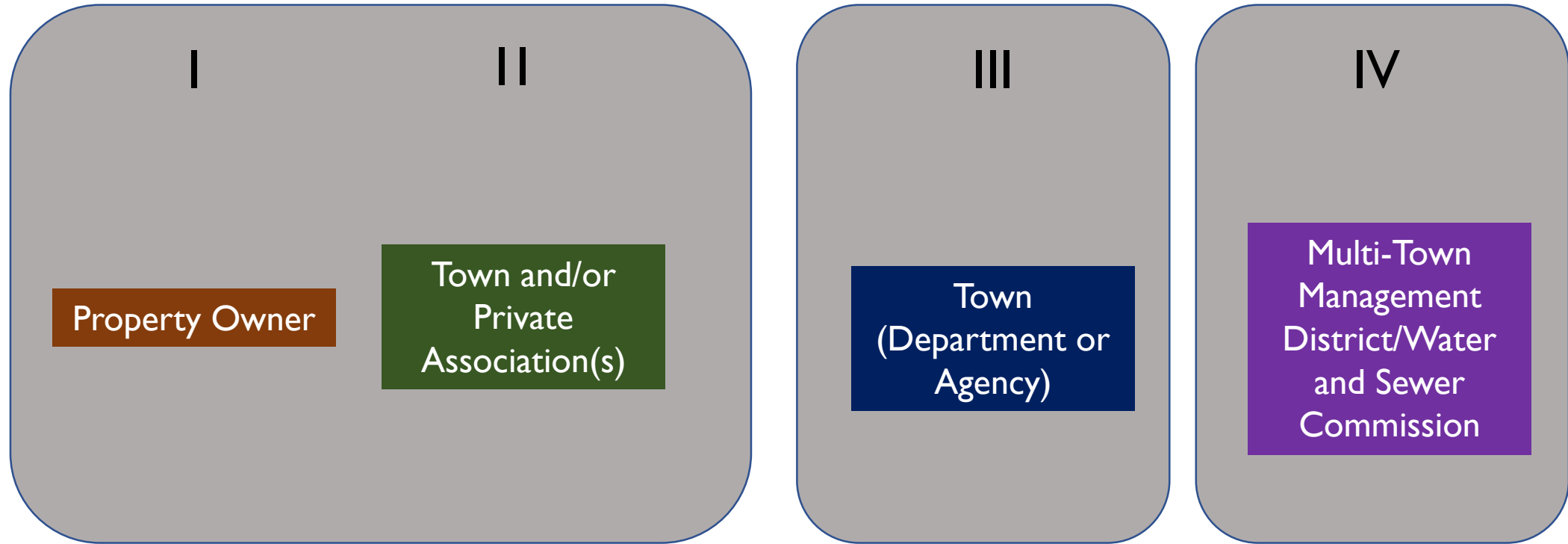
Individual Solution vs. Shared Solution

- Shared Wastewater Treatment Plants (Groundwater Discharge Permit)
 - Stricter standards for nitrogen, suspended solids, and biological oxygen
 - Cost and site constraints
 - Higher number of users
 - Reduces costs per user
 - Increases chance of conflict with constraints
 - Water permeation into ground (soils, ledge)
 - Downgradient effects (wells, wetlands, surface waters)

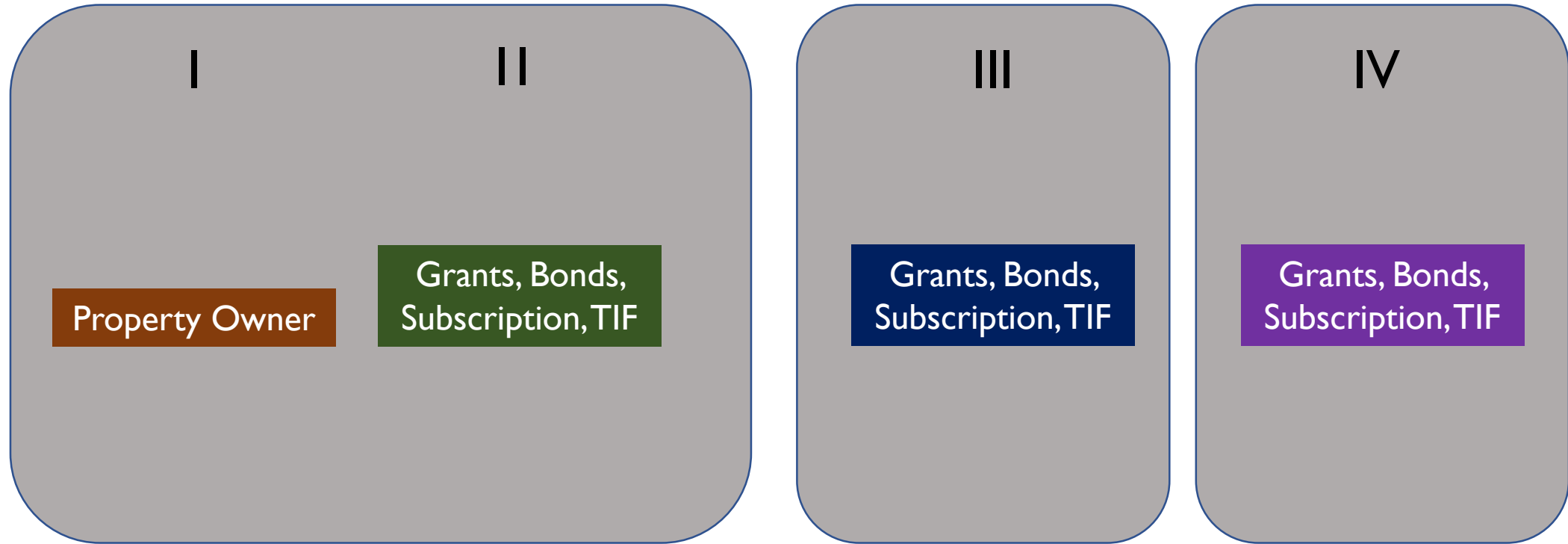
System Options: Organizational Types



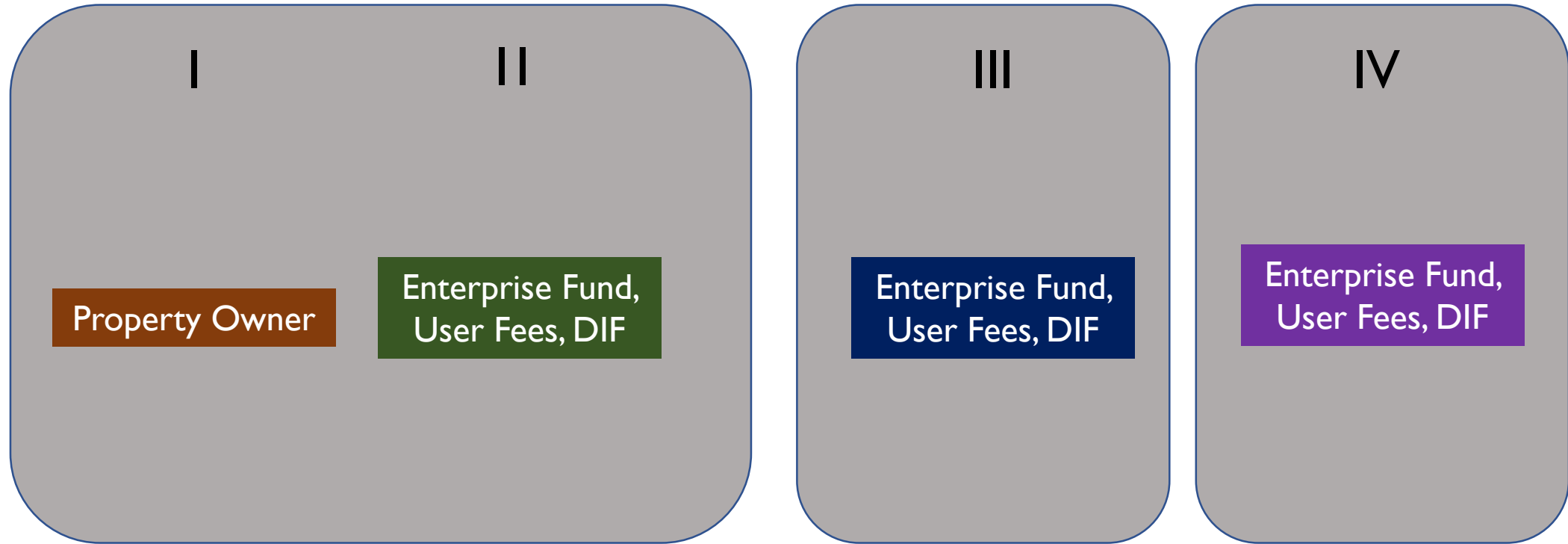
System Options: Operating Agency



System Options: Capital Funding Sources

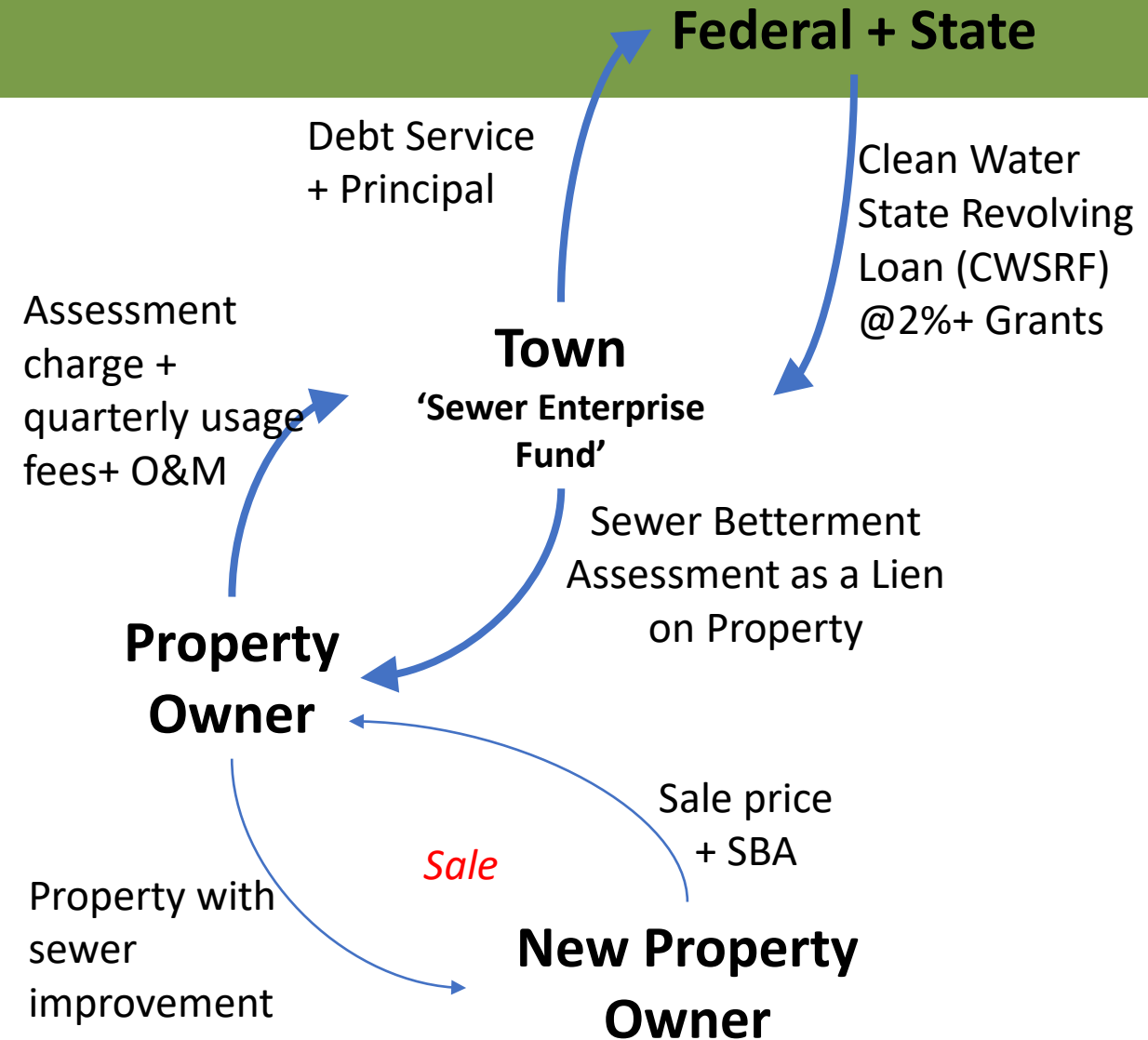


System Options: Operating Funding Sources



Methods of Financing

- Sewer Betterment Assessment Based on Sewer Betterment Unit (SBU)
 - 1 Single family as a – 1 SBU
 - 2 family unit – 2 SBUs and so on
- Property owners pay the Assessment regardless of they connect or not
- Capacity is reserved for future connection and property owners are legally entitled to connect

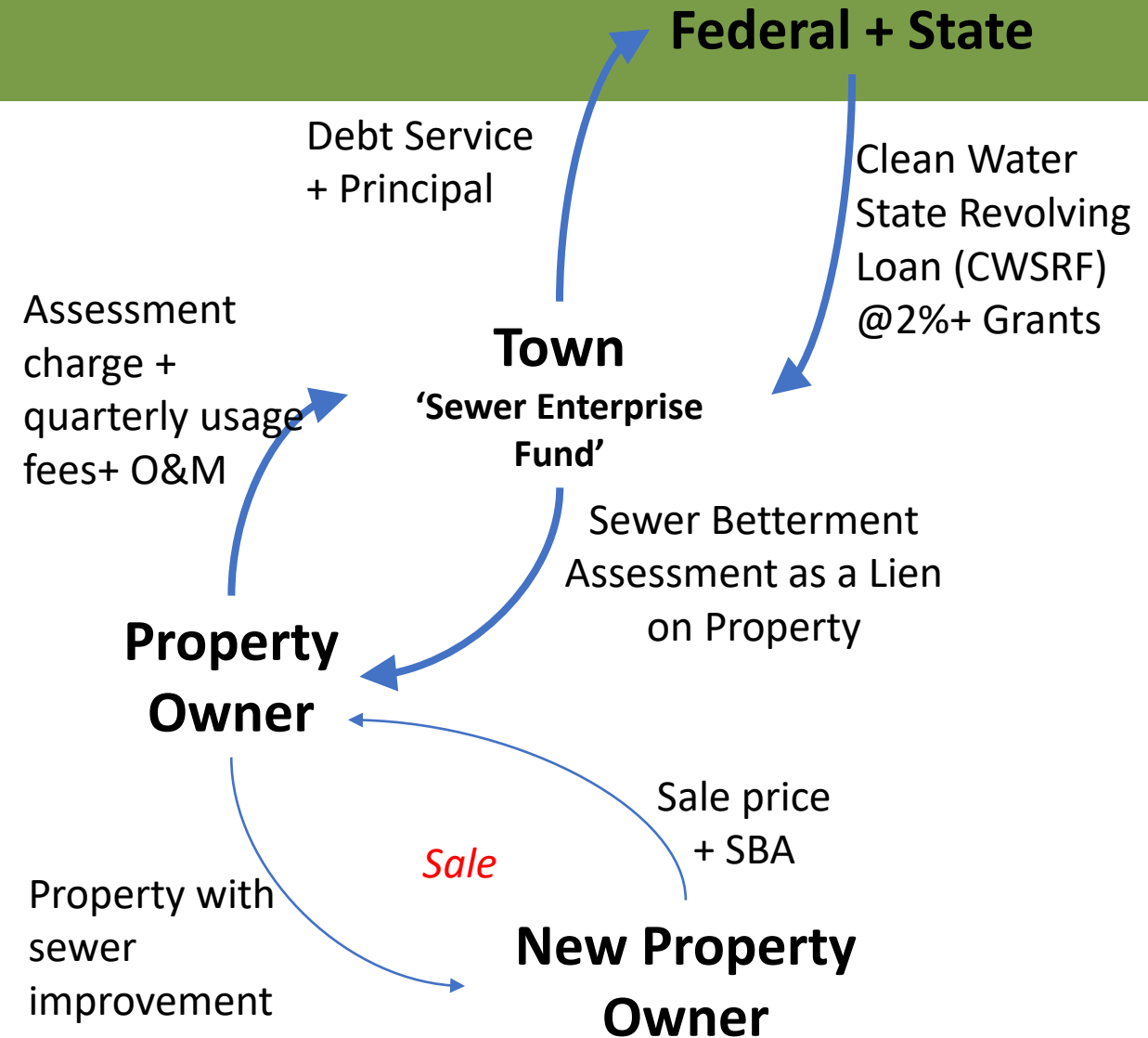


Methods of Financing

- **Sewer Betterment Assessment calculation**

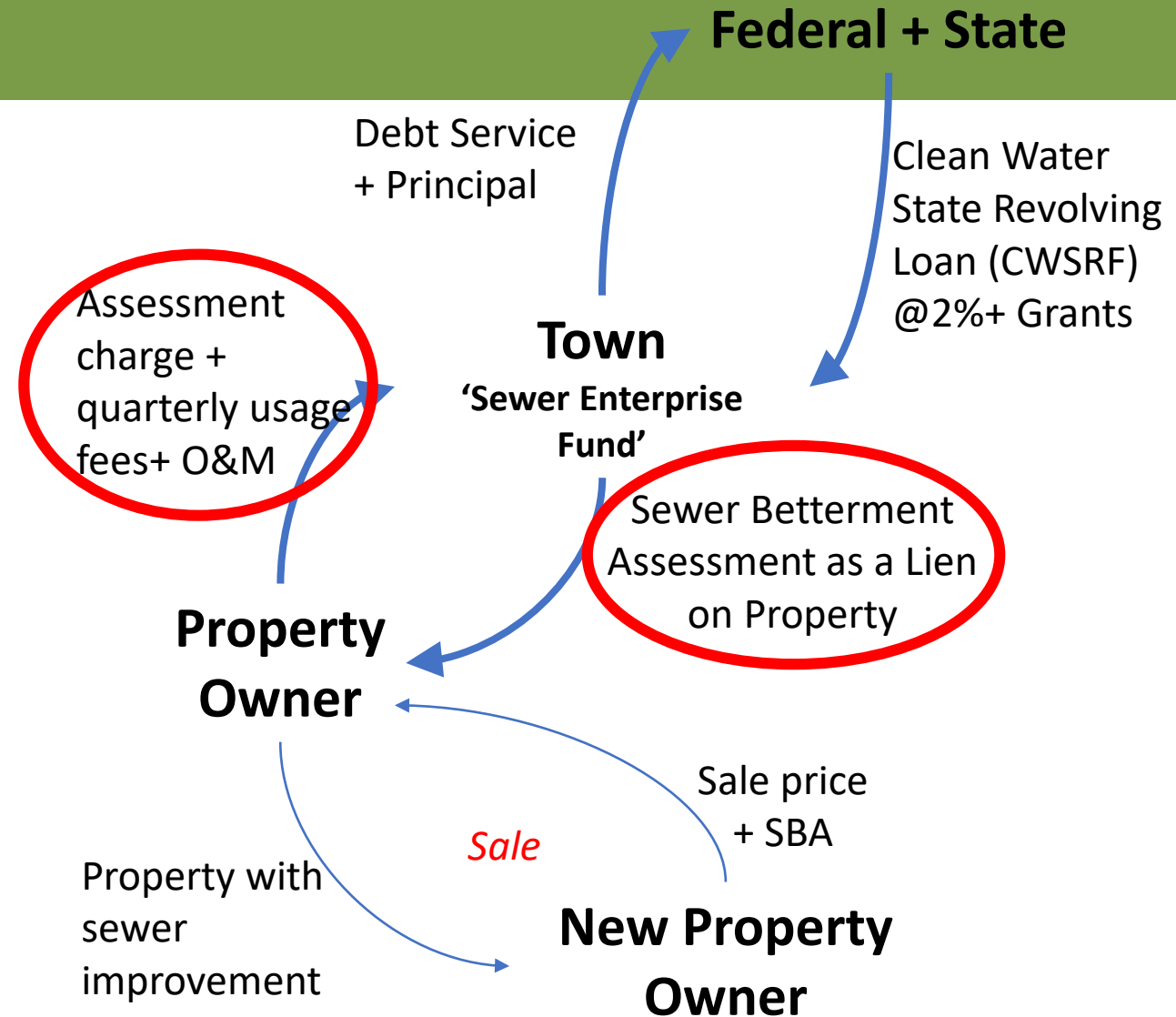
$$\text{Assessment} = \frac{\text{Local share of total allocated sewer project cost (excluding grants)}}{\text{Total number of Sewer units (SBUs)}}$$

- Higher the number of sewer units lower the assessment
- Commercial SBU = $\frac{\text{Water usage(gpd)}}{\text{Quantity of water flow expected from a single family residential}}$
- Undeveloped lot SBU based on maximum number of units allowed based on zoning



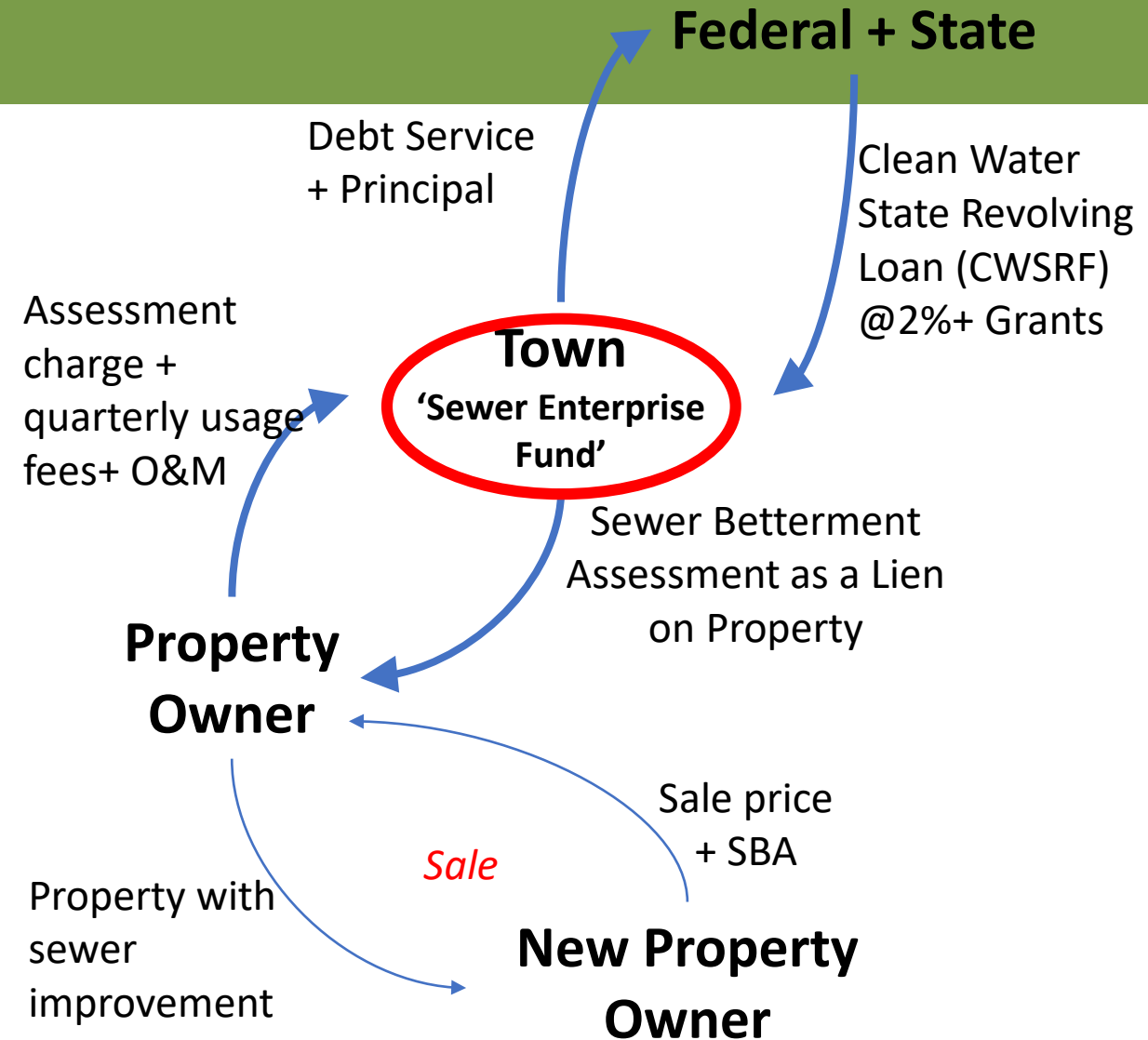
Methods of Financing

- Sewer Betterment Assessment as a municipal lien on property
- 50% charge early in construction phase
- Remaining 50% after completion of the sewer work
- Pay in lump sum or amortize over 20 to 30 years
 - Amortization – pay blended rate interest of 2% of SRF loan + Market rate loan for other expenses
 - Constant over 30 year period



Sewer Enterprise Fund

- Sewer Enterprise Fund as a mechanism to deal with everything related to sewers
- All funds related to sewers managed in Sewer Enterprise Fund
- Assessment, quarterly usage charges
- Construction cost, operations and management costs



Potential Financing

- District Improvement Financing (DIF)
- Community Action Development Program (CDAG)
- MassWorks (formerly PWED)
- Town Bond
- Tax Increment Financing (TIF)
- Chapter 40R
- Privately owned by multiple users

Estimated Construction Costs

- Individual Standard (Title V): \$5,000-\$10,000 per dwelling unit
- Individual Alternative (Title V): \$13,000-\$18,000 per dwelling unit
- Shared (Title V): \$5,000-\$10,000 per dwelling unit
- Shared (Groundwater Discharge Permit): \$30,000-\$60,000 per dwelling unit
 - Cost per unit reduced in a village setting
 - Cost per unit reduced as number of units connected increases

Average Capital Costs (Land and Construction)

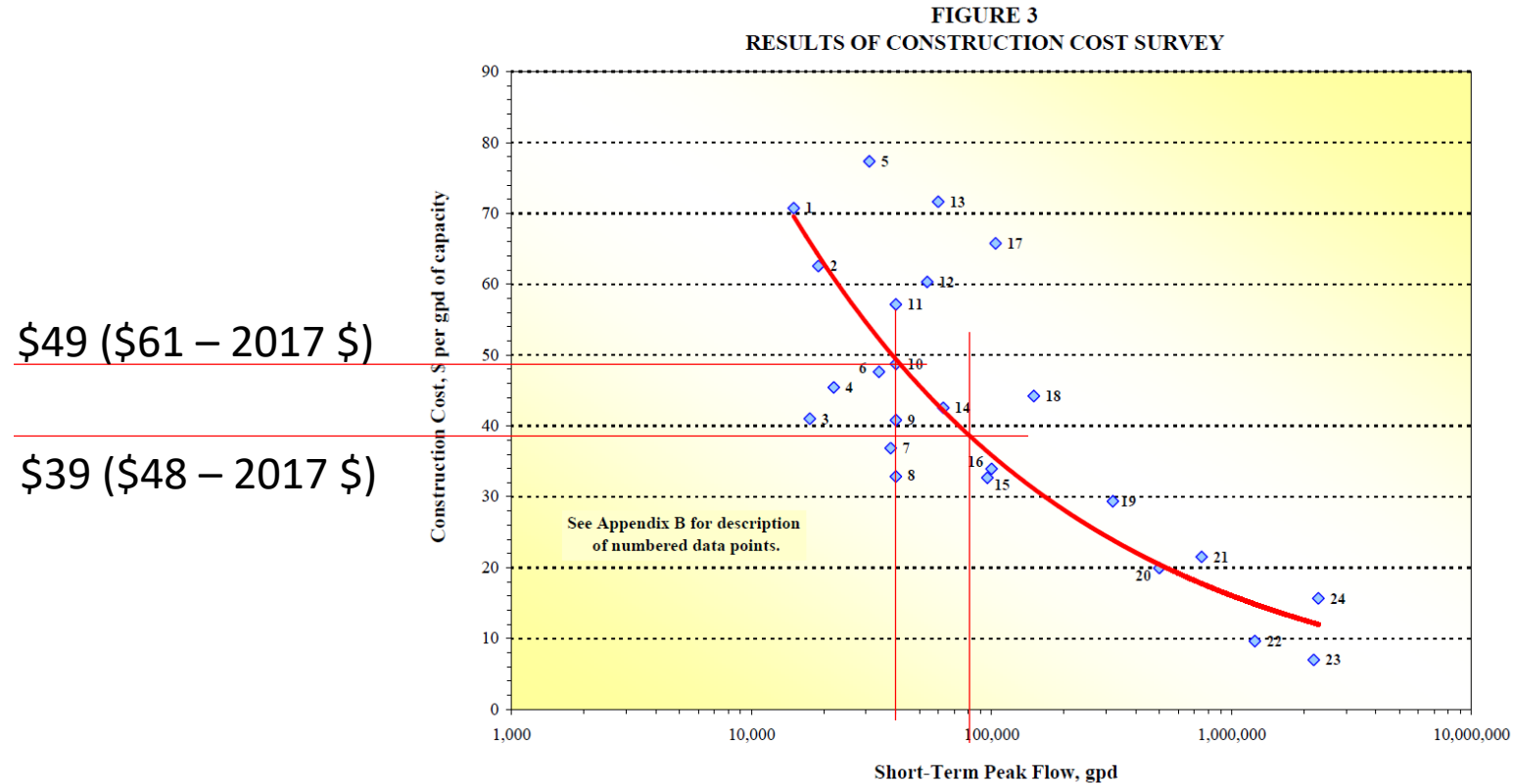
CAPACITY	UNIT CONSTRUCTION COST (PER GPD OF CAPACITY)		COST FOR TOTAL CAPACITY (2017)
	2010*	2017**	
10,000 gpd	\$70	\$87	\$870,000
100,000 gpd	\$35	\$44	\$4,400,000
1,000,000 gpd	\$17	\$21	\$21,000,000

*ENR Construction Cost Index of 8600

** ENR Construction Cost Index of 10692

Source: Barnstable County Wastewater Cost Task Force, *Comparison of Costs for Wastewater Management Systems Applicable To Cape Cod: Guidance to Cape Cod Towns Undertaking Comprehensive Wastewater Management Planning*, April 2010

Construction Costs: \$ per gpd of Capacity



Source: Barnstable County Wastewater Cost Task Force, *Comparison of Costs for Wastewater Management Systems Applicable To Cape Cod: Guidance to Cape Cod Towns Undertaking Comprehensive Wastewater Management Planning*, April 2010 (ENR Construction Cost Index of 8600)

Average Operations and Maintenance Costs

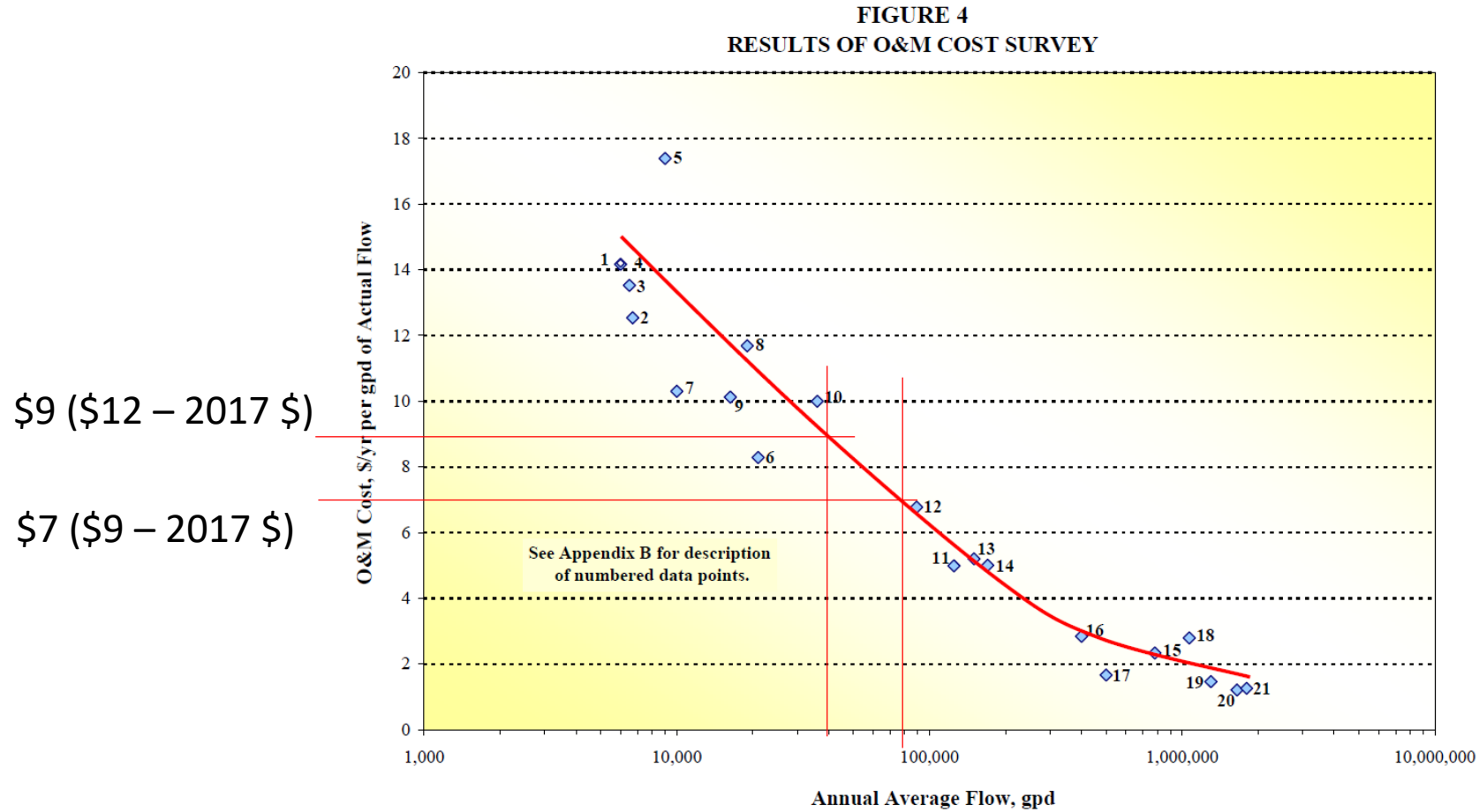
CAPACITY	UNIT O&M COST (PER GPD OF CAPACITY)	
	2010*	2017**
10,000 gpd	\$13	\$17
100,000 gpd	\$5	\$7
1,000,000 gpd	\$2	\$3

*ENR Construction Cost Index of 8600

** ENR Construction Cost Index of 10692

Source: Barnstable County Wastewater Cost Task Force, *Comparison of Costs for Wastewater Management Systems Applicable To Cape Cod: Guidance to Cape Cod Towns Undertaking Comprehensive Wastewater Management Planning*, April 2010

O&M Costs: \$/Yr gpd of Actual Flow



Source: Barnstable County Wastewater Cost Task Force, *Comparison of Costs for Wastewater Management Systems Applicable To Cape Cod: Guidance to Cape Cod Towns Undertaking Comprehensive Wastewater Management Planning*, April 2010 (ENR Construction Cost Index of 8600)

2016 Combined Retail Water & Sewer Community Charge Comparisons (Consumption at 120 HCF = 90 kgal)

-
- | City | 2010 Median Income (Blue) | 2012 Median Income (Yellow) |
|---------------------------|---------------------------|-----------------------------|
| Arlington (W/S)* | \$600 | \$1,200 |
| Ashland (S) | \$500 | \$1,900 |
| Bedford (S/partial W) | \$700 | \$1,900 |
| Belmont (W/S) | \$800 | \$2,400 |
| Boston (W/S) | \$600 | \$1,300 |
| Braintree (S) | \$500 | \$1,300 |
| Brookline (W/S) | \$600 | \$1,700 |
| Burlington (S) | \$200 | \$500 |
| Cambridge (S/partial W) | \$400 | \$1,500 |
| Canton (S/partial W) | \$600 | \$1,600 |
| Chelsea (W/S) | \$500 | \$1,500 |
| Chicopee (W) | \$400 | \$1,200 |
| Clinton (W/S) | \$300 | \$500 |
| Dedham (S/partial W) | \$600 | \$1,500 |
| Everett (W/S) | \$300 | \$1,000 |
| Framingham (W/S) | \$700 | \$1,700 |
| Hingham (S) | \$900 | \$2,100 |
| Holbrook (S) | \$600 | \$1,300 |
| Leominster (partial W) | \$400 | \$1,000 |
| Lexington (W/S) | \$600 | \$1,500 |
| Lynn (partial W) | \$400 | \$1,200 |
| Malden (W/S) | \$500 | \$1,300 |
| Marblehead (W) | \$600 | \$1,700 |
| Marlborough (partial W) | \$800 | \$1,700 |
| Medford (W/S) | \$800 | \$1,700 |
| Melrose (W/S) | \$900 | \$2,300 |
| Milton (W/S) | \$800 | \$2,100 |
| Nahant (W)* | \$800 | \$1,900 |
| Natick (S) | \$300 | \$1,300 |
| Needham (S/partial W) | \$500 | \$1,600 |
| Newton (W/S) | \$700 | \$2,100 |
| Northborough (partial W) | \$600 | \$1,700 |
| Nonwood (W/S) | \$600 | \$1,300 |
| Peabody (partial W) | \$300 | \$600 |
| Quincy (W/S) | \$700 | \$1,900 |
| Randolph (S) | \$600 | \$1,500 |
| Reading (W/S) | \$1,200 | \$2,400 |
| Revere (W/S) | \$400 | \$1,900 |
| Saugus (W) | \$600 | \$1,000 |
| Somerville (W/S) | \$600 | \$1,800 |
| Stoneham (W/S) | \$700 | \$1,800 |
| Stoughton (S/partial W) | \$500 | \$1,700 |
| Swampscott (W) | \$800 | \$1,500 |
| Wakefield (S/partial W) | \$600 | \$1,800 |
| Walpole (S) | \$500 | \$1,500 |
| Waltham (W/S) | \$400 | \$1,200 |
| Watertown (W/S) | \$500 | \$1,500 |
| Wellesley (S/partial W) | \$500 | \$1,500 |
| Westwood (S/partial W) | \$600 | \$1,300 |
| Weymouth (S) | \$600 | \$1,700 |
| Wilbraham (W) | \$500 | \$1,000 |
| Wilmington (S/partial W) | \$400 | \$1,100 |
| Winchester (S/partial W)* | \$300 | \$600 |
| Winthrop (W/S) | \$800 | \$2,100 |
| Woburn (S/partial W) | \$200 | \$500 |
| Worcester (partial W) | \$400 | \$1,100 |

Source: MWRA Advisory Board; 2016 Water and Sewer Retail Rate Survey

Sewer System vs. Septic System

■ Centralized Sewer System

- Can be paid over a 30 year period
- Potential gain in property value
- Shared responsibility for discharge quality
- Required regular maintenance programs

■ Individual Septic System

- Upfront replacement costs
- Age and condition of system may have an impact on sale of property
- Replacement and failure will require mounding, variances
- Maintenance is responsibility of owner

Next Steps: Massachusetts Smart Growth Toolkit

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

Comprehensive Wastewater Management Plan

1. Maps of growth centers, preservation lands and transitional areas between the two;
2. A detailed discussion of the types of wastewater management strategies applicable to the community's housing, environmental, fiscal and commerce-related goals;
3. A discussion of the different densities of development that will occur within and surrounding identified growth centers;
4. An examination of the community's administrative capacity with regard to permitting innovative systems and/or establishing wastewater authorities;
5. Cost estimates associated with construction, permitting, design, administration and maintenance of any intended public facilities;
6. Identification of any existing bylaws or regulations that would conflict with the intended wastewater strategies; and
7. Identification of any public funding opportunities associated with infrastructure development or financing.

Case Studies

- Bourne, MA: Evaluation of downtown system
https://www.townofbourne.com/sites/bournema/files/file/file/2012_july_final_ver.pdf
- Hubbardston, MA: Evaluation of Water and Sewer Systems
http://www.mrpc.org/sites/montachusetttrpc/files/file/file/hubbardston_water_sewer_feasibility_study.pdf
- Littleton, MA: Community Water and Energy Resource Center (CWERC)
<https://www.mma.org/littleton-works-toward-nation%E2%80%99s-first-%E2%80%98smart-sewer%E2%80%99-treatment-plant-0>
http://www.littletonma.org/filestorage/19733/19771/20414/LittletonCommonSmartSewer_PublicInfoSession.pdf

Resources

- Massachusetts Smart Growth/Smart Energy Toolkit
http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-ww.html
- A Massachusetts Guide to Needs Assessment and Evaluation of Decentralized Wastewater Treatment Alternatives
www.mass.gov/eea/docs/dep/water/wastewater/w-thru-z/wwtrplan.doc
- EPA Wastewater Technology Fact Sheet: Package Plants
https://www3.epa.gov/npdes/pubs/package_plant.pdf
- Wastewater Treatment Plants (Massachusetts EEA)
<http://www.mass.gov/eea/agencies/massdep/water/wastewater/wastewater-treatment-plants.html>

September 28, 2017

DHCD | West Newbury: Investigation of District Package Treatment Plants



Implications for West Newbury



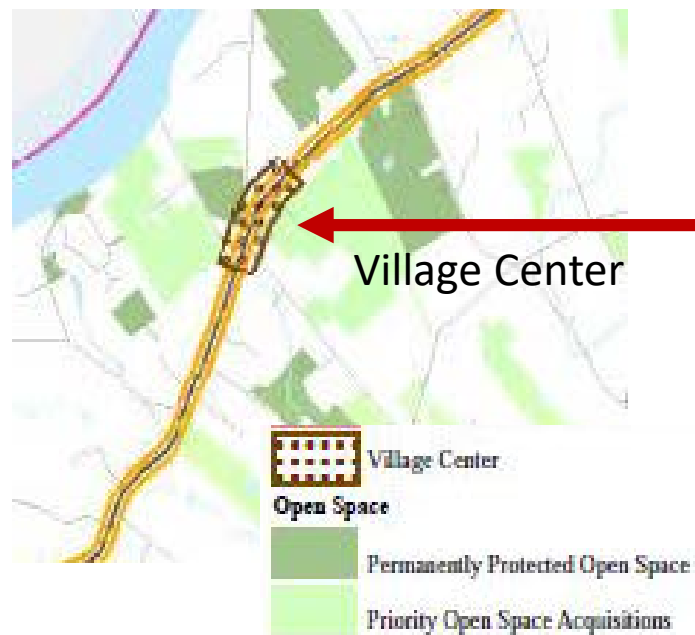
Why Evaluate Sewage Treatment Options in West Newbury?

- Constraint on economic development in the Town Center
 - Difficulty/inability to replace systems that fail
 - Title V-compliant systems may prohibit/make certain uses more difficult
 - Land used for leach fields is land that cannot be used for buildings or parking
- Constraint on additional housing in the Town Center
 - Title V-compliant systems limit density
 - land is devoted to septic systems rather than buildings

Economic Development

APPENDIX A CONTINUED

Merrimack Valley Priority Growth Strategy

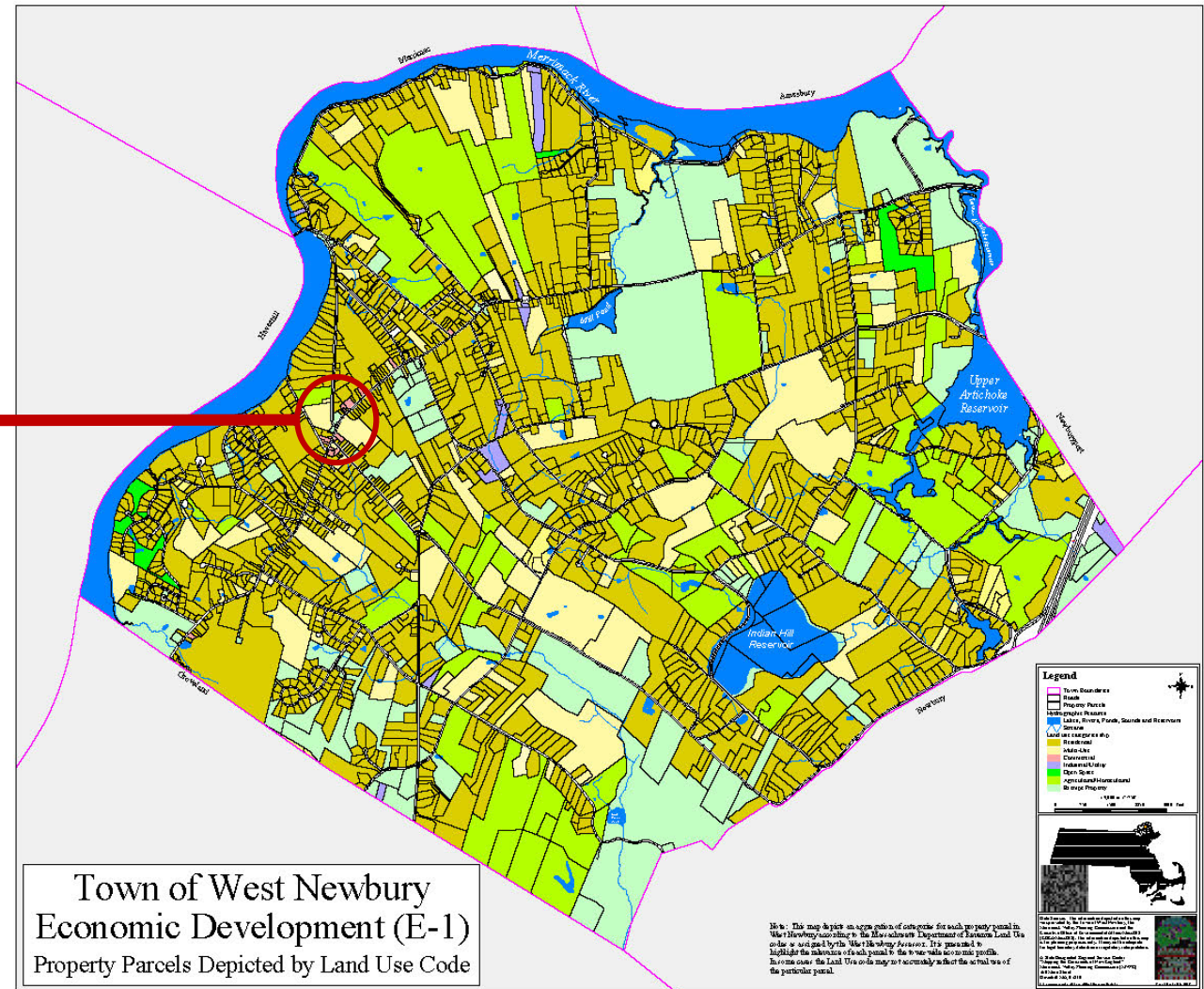


Source: Merrimack Valley Priority Growth Strategy

Economic Development (E-I)

Town of West Newbury
Community Development
Plan, June 2004

Proposed Town Center
Development

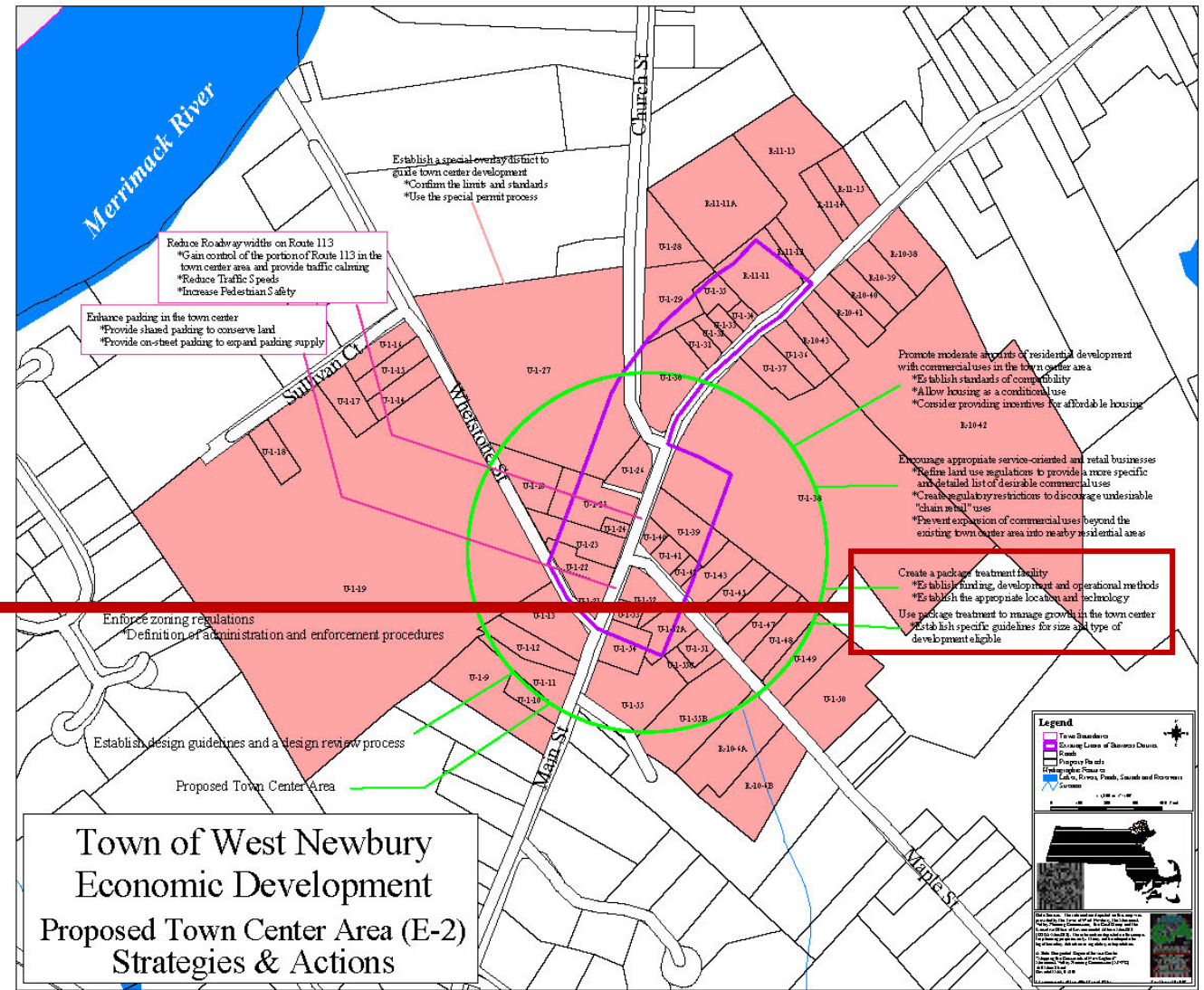


Source: Town of West Newbury Community Development Plan, June 2004

Economic Development (E-2)

Proposed Town Center Development

- Create a package treatment facility
 - Establish funding, development, and operational methods
 - Establish the appropriate location and technology
- Use package treatment to manage growth in the town center
 - Establish specific guidelines for size and type of development eligible



Source: Town of West Newbury Community Development Plan, June 2004

Economic Development (E-2)

- Proposed Town Center Development
 - Establish a special overlay district to guide town center development
 - Promote moderate amounts of residential development with commercial uses in the town center area
 - Encourage appropriate service-oriented and retail businesses
 - Reduce roadway widths on Route 113
 - Enhance parking in the town center
 - Enforce zoning regulations
 - Establish design guidelines and a design review process

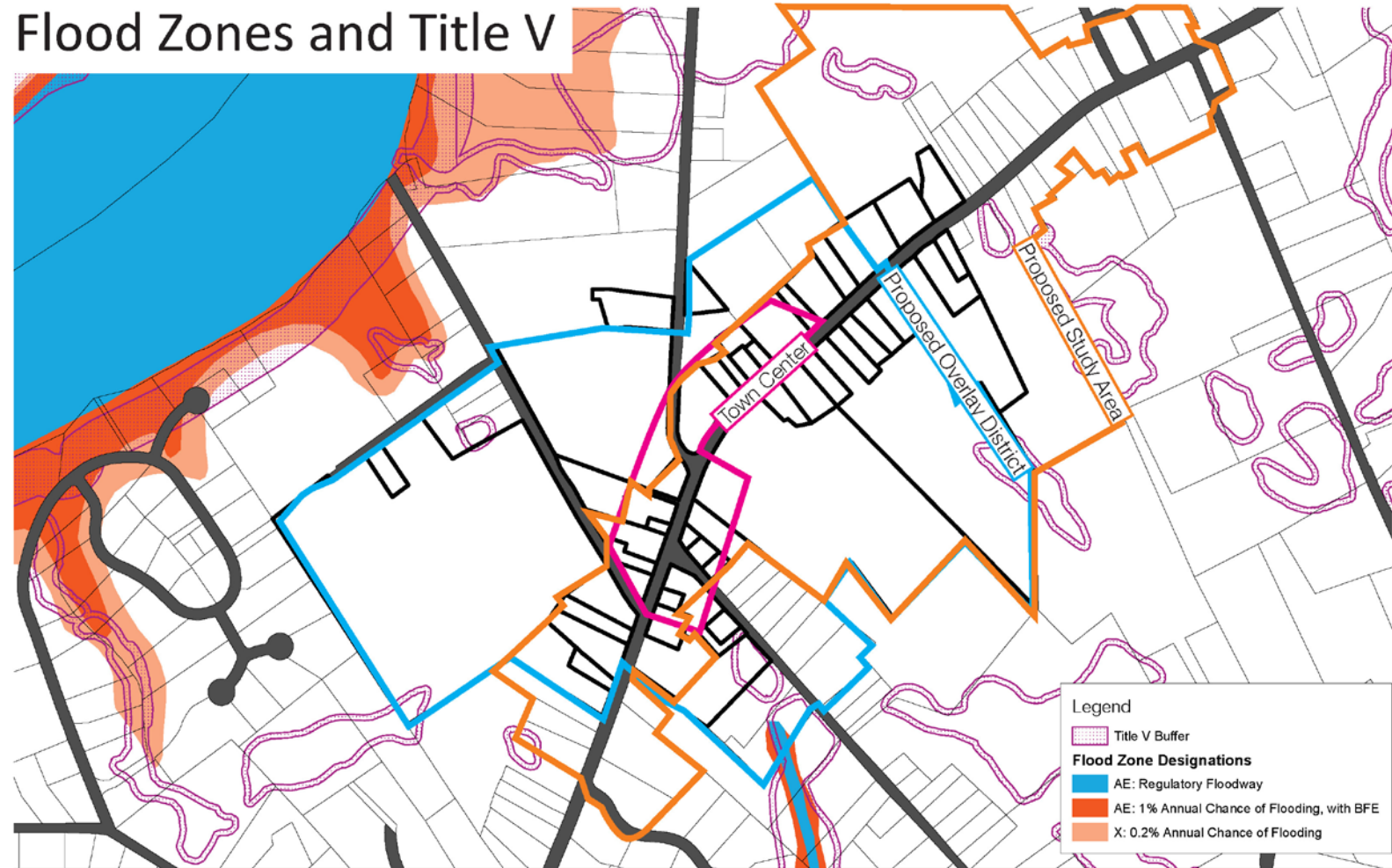
Impacts on System Choice: Site Constraints

- Title 5: Merrimack River will require a TMDL
 - (303(d) List, draft *Massachusetts Year 2016 Integrated List of Waters*, June 2017, page 187)
- Soils
- Ledge
- Water Table

Site Constraints

- Flood Zones
- Title 5

Flood Zones and Title V

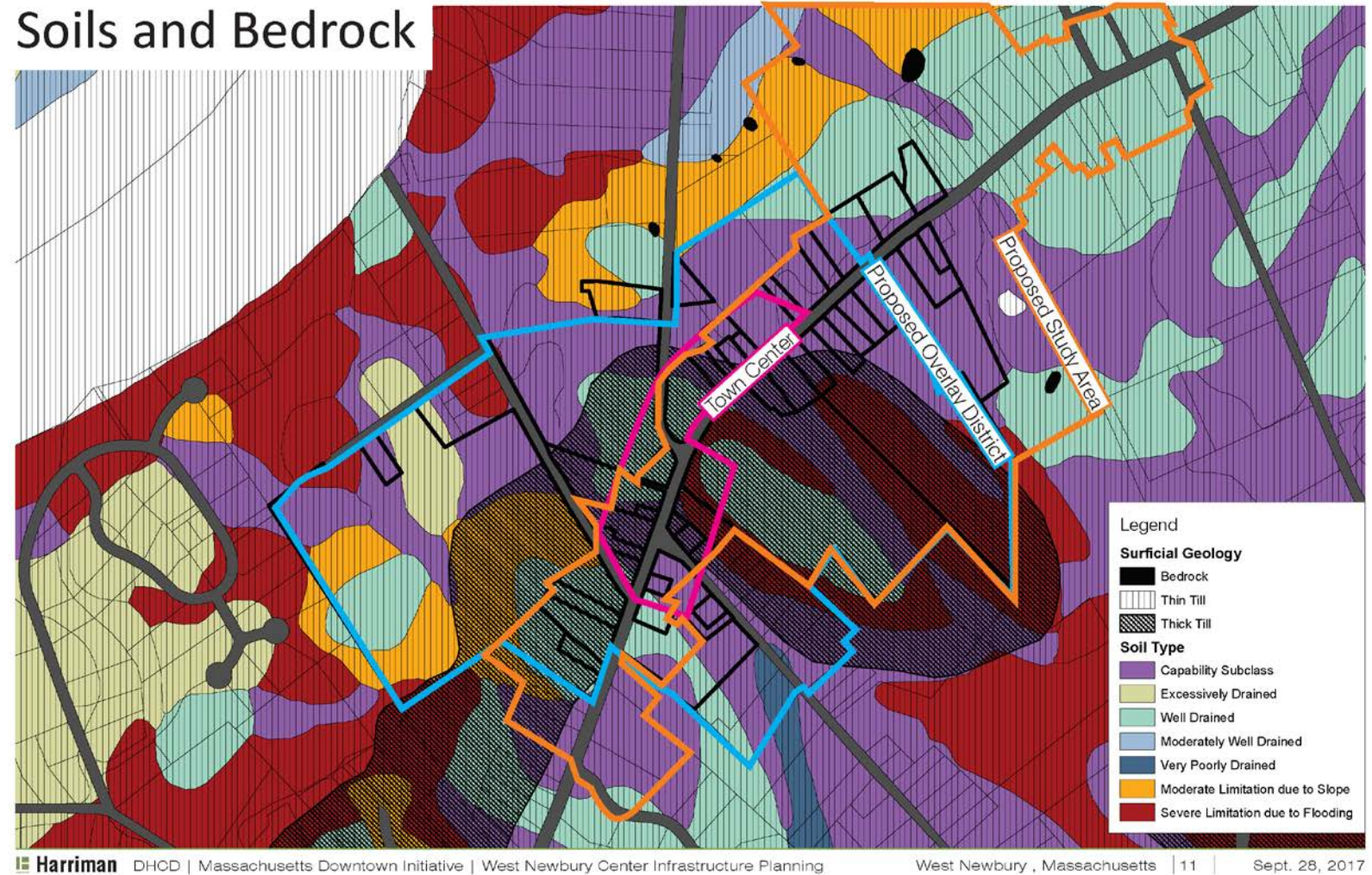


Harriman DHCD | Massachusetts Downtown Initiative | West Newbury Center Infrastructure Planning

West Newbury, Massachusetts | 10 | Sept. 28, 2017

Site Constraints

- Soils and Bedrock
- Ledge



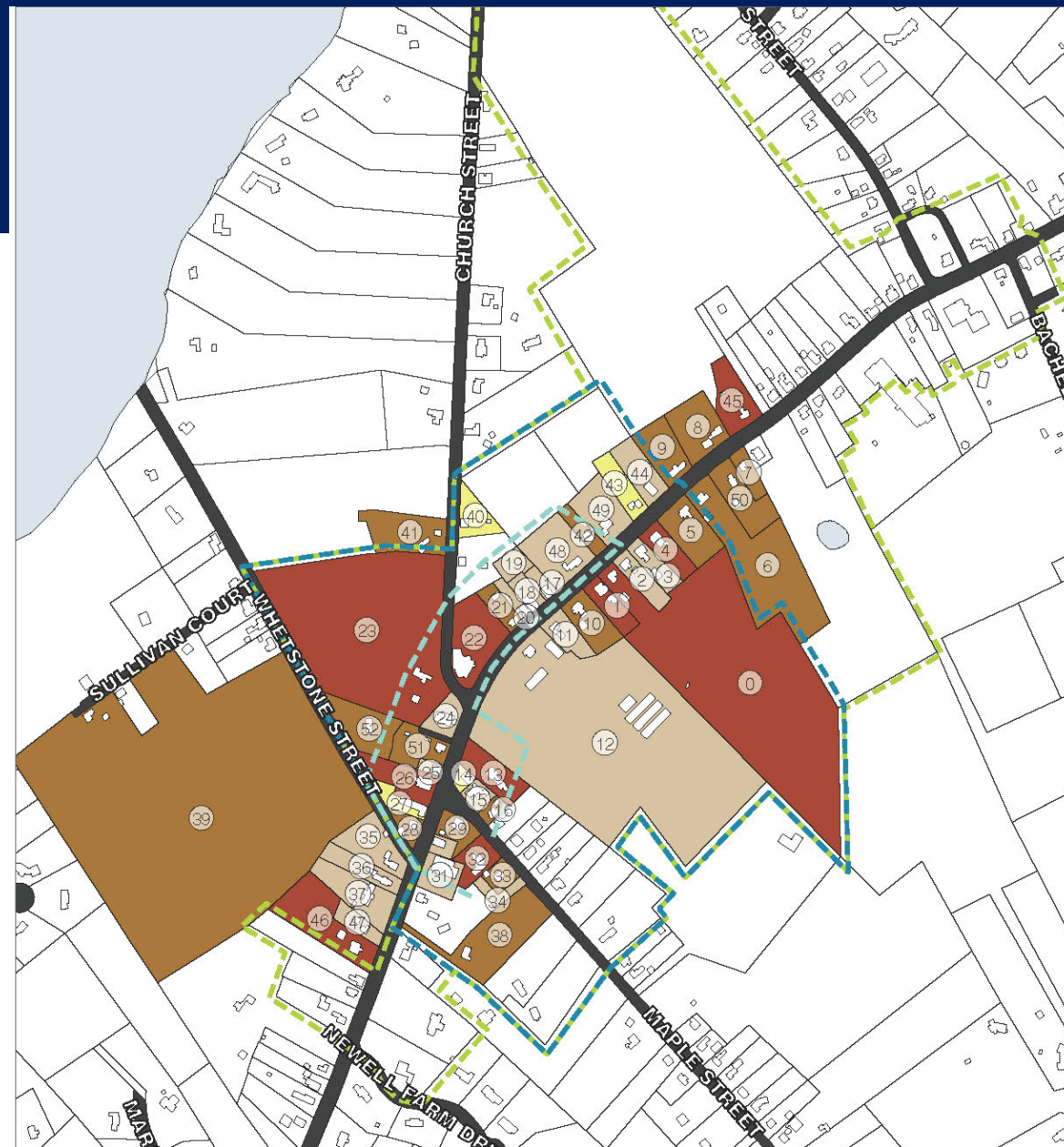
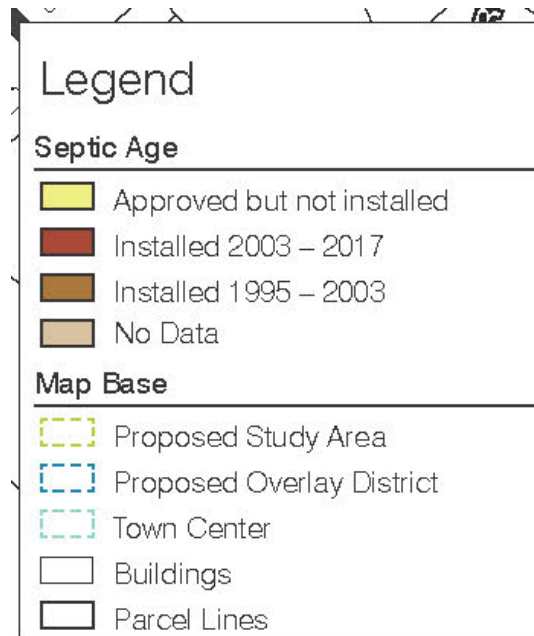
Impacts on System Choice: Who Connects?

EXISTING USES WITHIN THE TOWN CENTER	
Food: West Newbury Pizza; West Newbury Food Mart	Office: West Newbury Insurance; Winfield Crossings
Retail: Excentrique	Farm: Dunn's Farm
Services: United State Postal Service; Haverhill Bank; West Newbury Barber Shop; Thom Child and Family Services; Pentucket Area Early Intervention	
Community Church of St. Ann; West Newbury Congregational Church	Auto Main Street Auto; Pearson Automotive
Residential: Single-Family	
PROPOSED ADDITIONAL USES	
Food: Café, Bakery	Office
Residential: Apartments/Condos	
PROPOSED ADDITIONAL USES: OSRP SURVEY	
Downtown with restaurants, businesses, gathering spaces	
Small restaurant, services	
Restaurant/café/coffee shop	

Who Connects?

Age of Current Septic Systems

(Source: West Newbury Board of Health)



Potential Boundaries

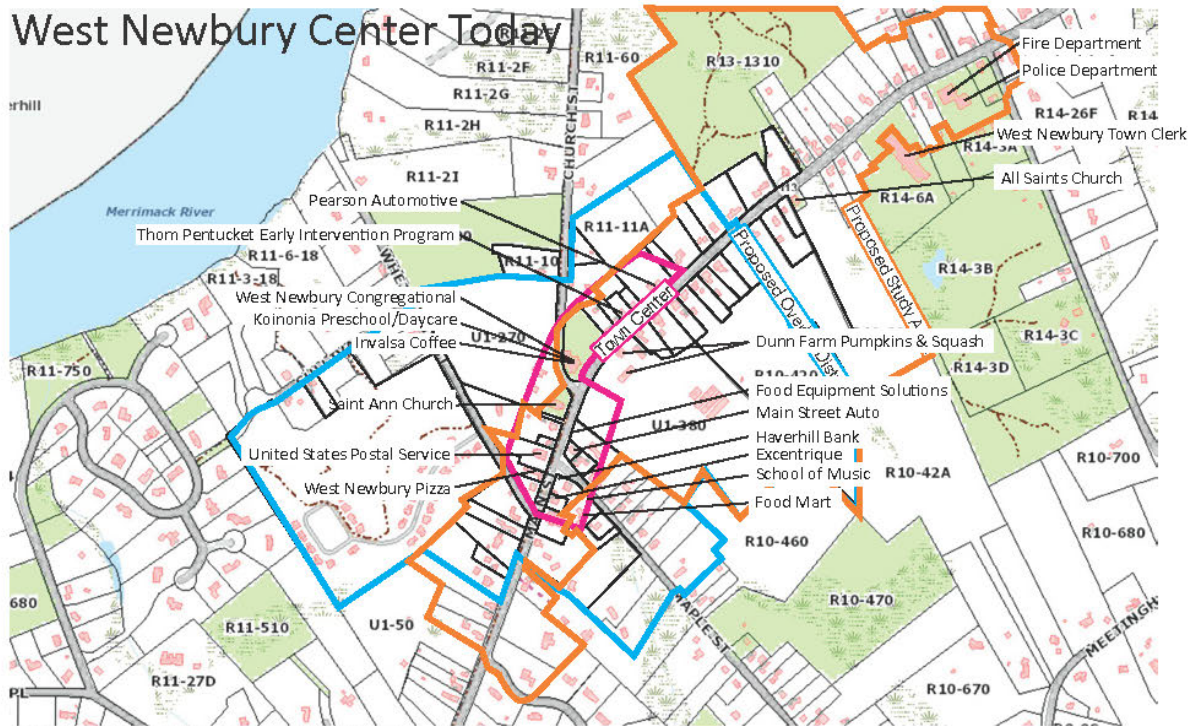


FIGURE 7: EXISTING USES IN TOWN CENTER

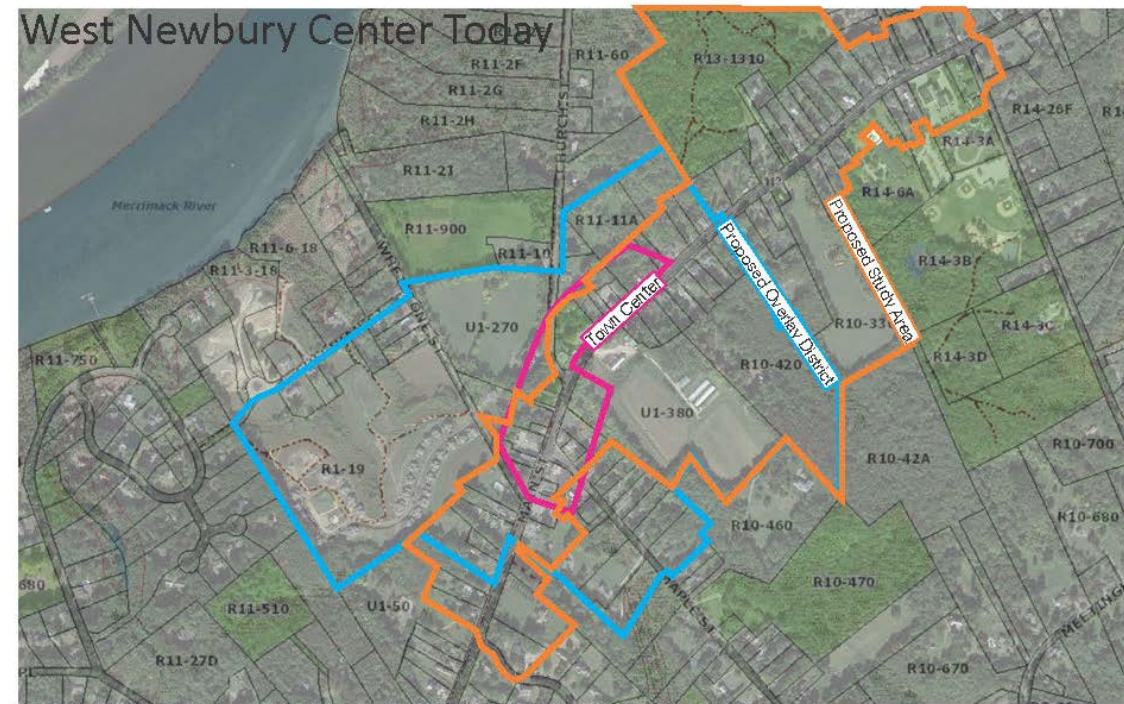


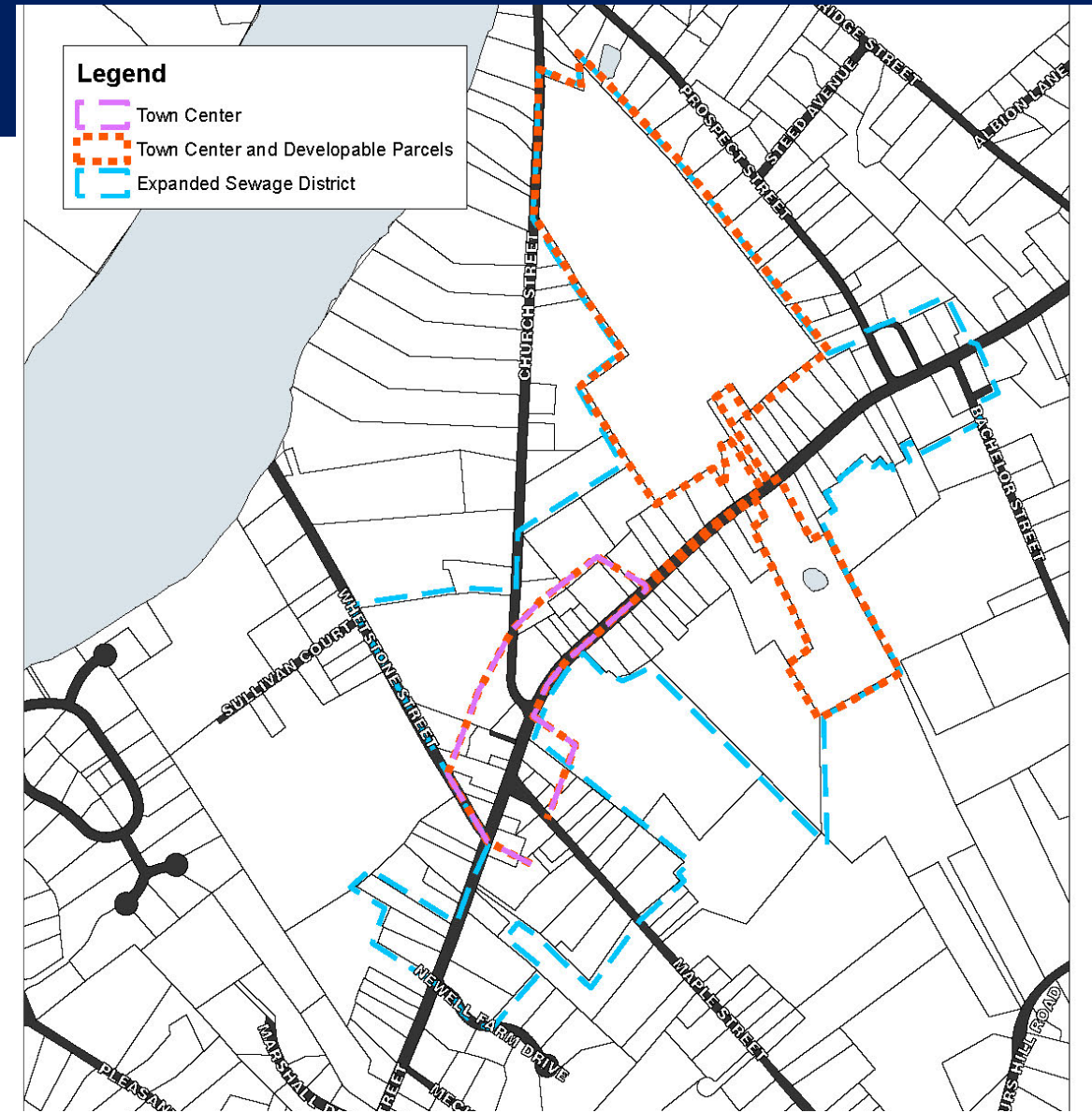
FIGURE 3: BOUNDARIES OF PREVIOUS PLANNING EFFORTS AND INITIAL STUDY AREA



Build Out Analysis

Four Geographic Areas

- **Scenario A1:**
 - Existing Town Center as service area
- **Scenario A2**
 - Mixed-Use Town Center
- **Scenario B1**
 - Expanded Town Center (Mullen Woods and Dunn's Farm)
- **Scenario B2**
 - Expanded Mixed-Use Town Center (Mullen Woods and Dunn's Farm)



Method 1: Estimating the Current and Future Flows

- Actual usage values wherever possible
- For everything else, usage was estimated by pairing property descriptions with the most relevant Title V Criteria and its corresponding Design Flow
- Any assumption moved towards greater estimated use, e.g. Single-Family homes were assumed to have 4 bedrooms (440 GPD), rather than three (330 GPD).

Sample Pairings (Assessor = Title V)

- Single Family Residential = Family Dwelling, Single (110 GPD per Bedroom, min. flow: 330 GPD)
- Developable Residential Land = Family Dwelling, Multiple (110 GPD per Bedroom, min. flow: 330 GPD)
- Medical Office Building = Doctor's Office (250 GPD per Doctor)
- Auto Repair Facilities = Service Station, No Gas (150 GPD per Bay)

Methods 2 and 3: Alternative GPD Scenarios

- Previous summary made conservative assumptions. For example:
 - Four bedrooms per household (440 GPD), rather than three (330 GPD)
 - Mullen Woods: 12 SF Starter Homes at 3,960 GPD, rather than 20 age-restricted condominiums at 3,000 GPD
- Two more GPD scenarios:
 - Minimum standards
 - Average daily indoor per household water use

Method 2: Minimum Standards Usage Scenario

- All households are assumed to have three bedrooms (330 GPD), rather than four (440 GPD).
- Mullen Woods is developed into 20 age-restricted condominiums (3,000 GPD).
- Mixed use conversions still use 530 GPD (330 GPD for residential and 200 GPD for small retail).

Method 3: Average daily indoor per household water use

- All households are assumed to use 60 gallons per bedroom per day (rather than the State minimum of 110) and all households are assumed to have three bedrooms (180 GPD), rather than four (240 GPD). 60 gallons per day is the typical daily use of a person in a single-family home (Residential End Uses of Water, V2, April 2016).
- Mullen Woods is developed into 20 age-restricted condominiums but using 60 gallons per bedroom per day (2,520 GPD).
- Mixed use conversions still use 530 GPD (330 GPD for residential and 200 GPD for small retail).

Method I

TOTALS (GPD)	SCENARIO A1: EXISTING TOWN CENTER	SCENARIO A2: MIXED-USE TOWN CENTER	SCENARIO B1: EXPANDED TOWN CENTER	SCENARIO B2: EXPANDED MIXED-USE TOWN CENTER
Parcels	20	20	23	89
Betterment Units	24	31	236	318
Usage Flow (gpd)	8,881	10,281	100,841	136,005

Cluster System

Shared Wastewater Treatment Plant (>10,000 gpd)

Cluster system: Serves nearby properties with an aggregate flow less than 10,000 gallons per day (gpd), roughly equivalent to 30 three-bedroom homes.

Satellite system: Serves an area of a town with an aggregate flow greater than 10,000 gpd (and thus requiring a DEP groundwater discharge permit), and as much as 300,000 gpd.

Methods 2 and 3

2
3

TOTALS (GPD)	SCENARIO A1: EXISTING TOWN CENTER	SCENARIO A2: MIXED-USE TOWN CENTER	SCENARIO B1: EXPANDED TOWN CENTER	SCENARIO B2: EXPANDED MIXED-USE TOWN CENTER
Parcels	20	20	23	89
Betterment Units	24	31	236	318
Usage Flow (gpd)	8,881	10,281	100,841	136,005
Minimum Standards	8,881	10,281	77,881	105,455
Average daily indoor use	8,881	10,281	47,131	64,625
Cluster System		Shared Wastewater Treatment Plant (>10,000 gpd)		

Cluster system: Serves nearby properties with an aggregate flow less than 10,000 gallons per day (gpd), roughly equivalent to 30 three-bedroom homes.
Satellite system: Serves an area of a town with an aggregate flow greater than 10,000 gpd (and thus requiring a DEP groundwater discharge permit), and as much as 300,000 gpd.

Potential Next Steps for West Newbury

- Community conversation (use materials from this process)
- Develop a market demand analysis, including an evaluation of the susceptibility of certain parcels to change their existing use
- Develop a Comprehensive Wastewater Management Plan
- Determine who connects now; who connects in the future
- Evaluate options for sewage treatment, sites, financing mechanisms, regulatory changes (if necessary)



Discussion

