

## Thetford, Vermont

# Community Water Systems Assessment Report





## Agenda

1. Project Scope
2. Existing Water Systems Summaries
3. Community Growth and Development Review
4. Alternatives Analysis
5. Preliminary Opinion of Construction Costs
6. Recommendations / Options
7. Questions

# Project Scope

- Met with Town Officials and Water System Owners
- Summarize Existing Water Systems
- Perform Assessment of the Existing Water Systems
- Review System Compliance with Regulations
- Review Community Growth for Future Development
- Summarize Available Funding Sources
- Provide Recommendations
  - For existing systems to comply with regulations
  - To combine and/or expand systems
  - To support growth and community development
- Developed Preliminary Opinion of Costs for Recommended Improvements

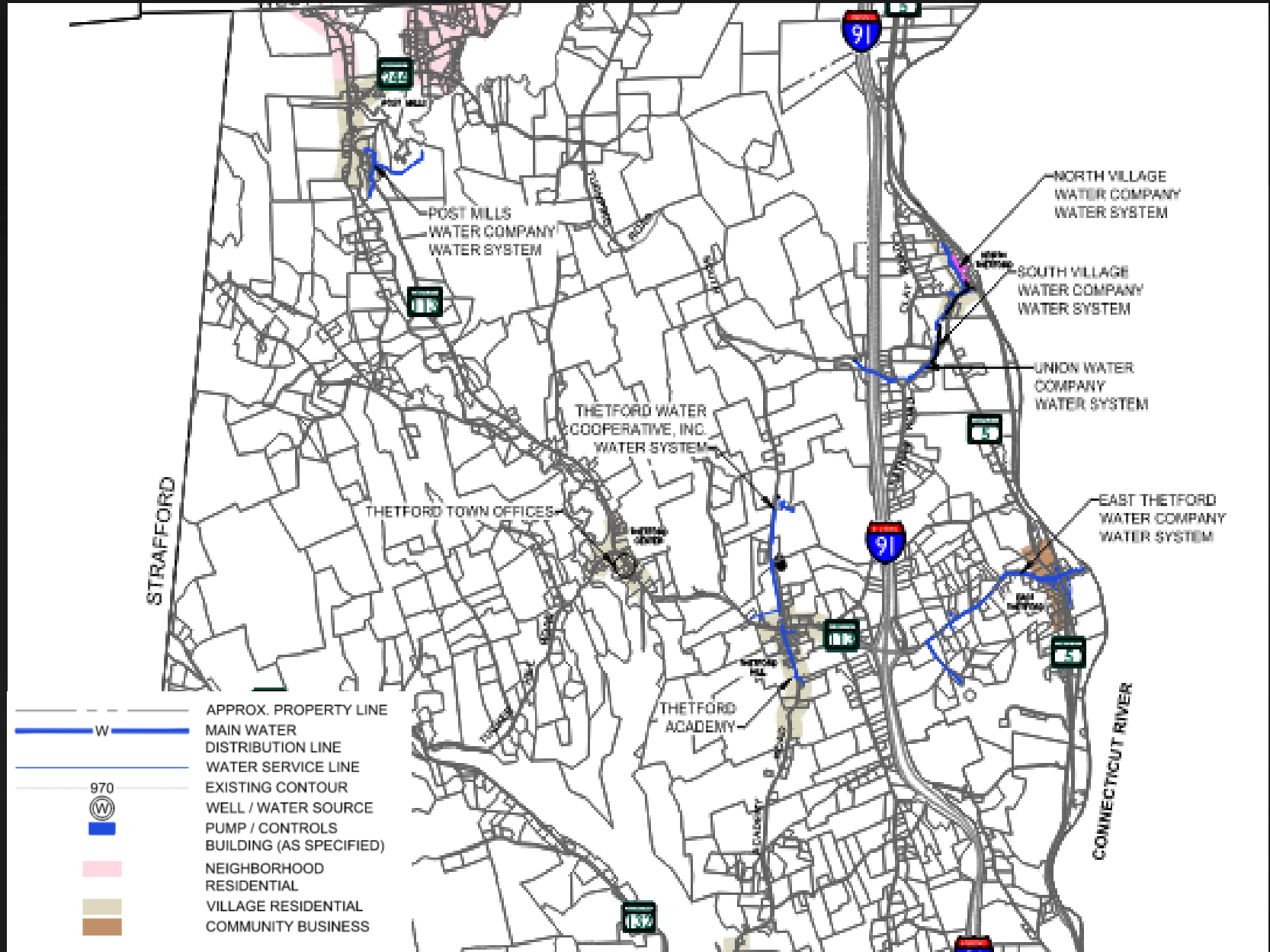


# Thetford Water Systems

- Post Mills Water Company
- Thetford Co-Op Inc. Water System
- North Village Water Company
- South Village Water Company
- Union Water Company
- East Thetford Water Company
  
- Thetford Academy
- Thetford Elementary School

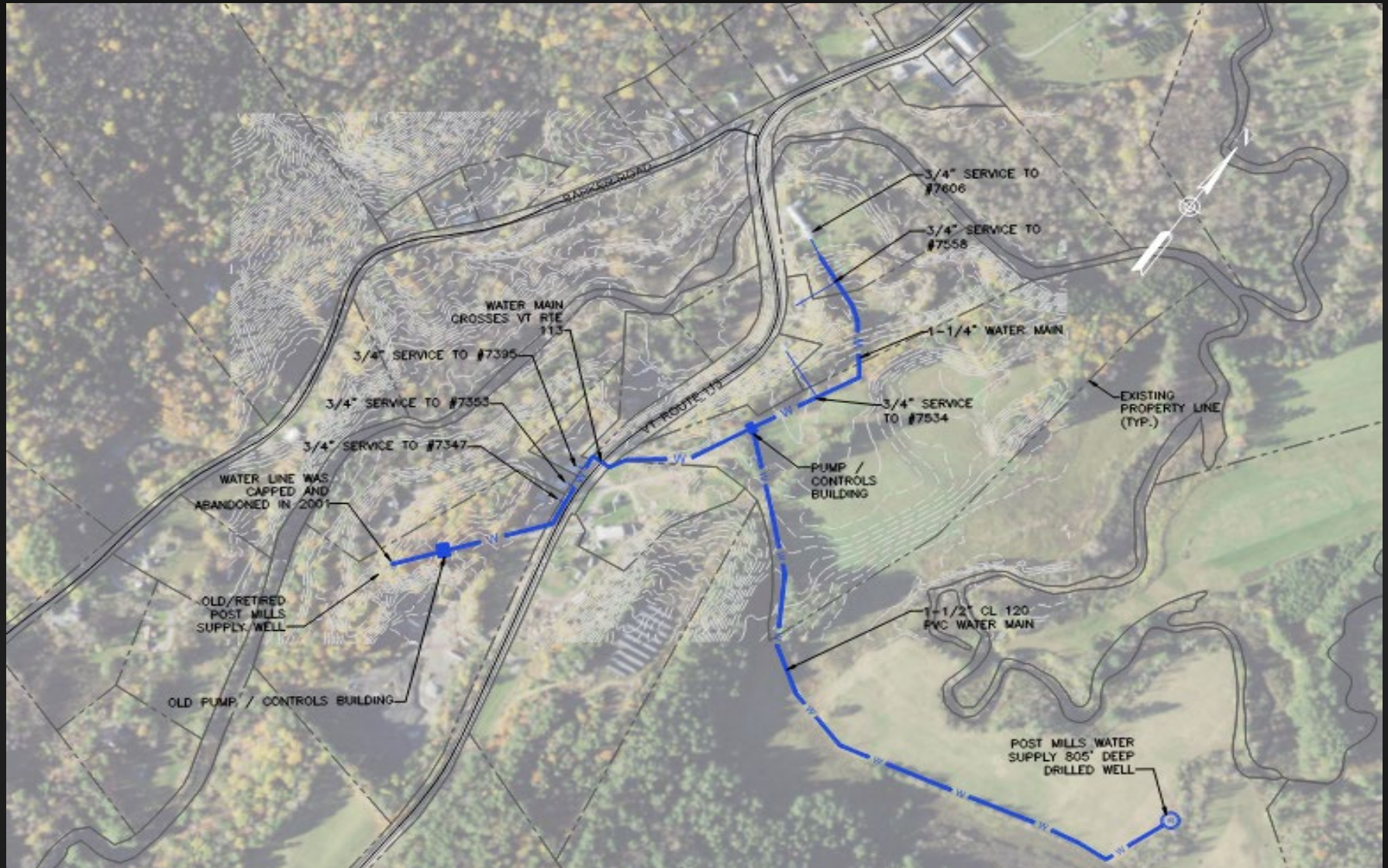


# Existing Thetford Water Systems

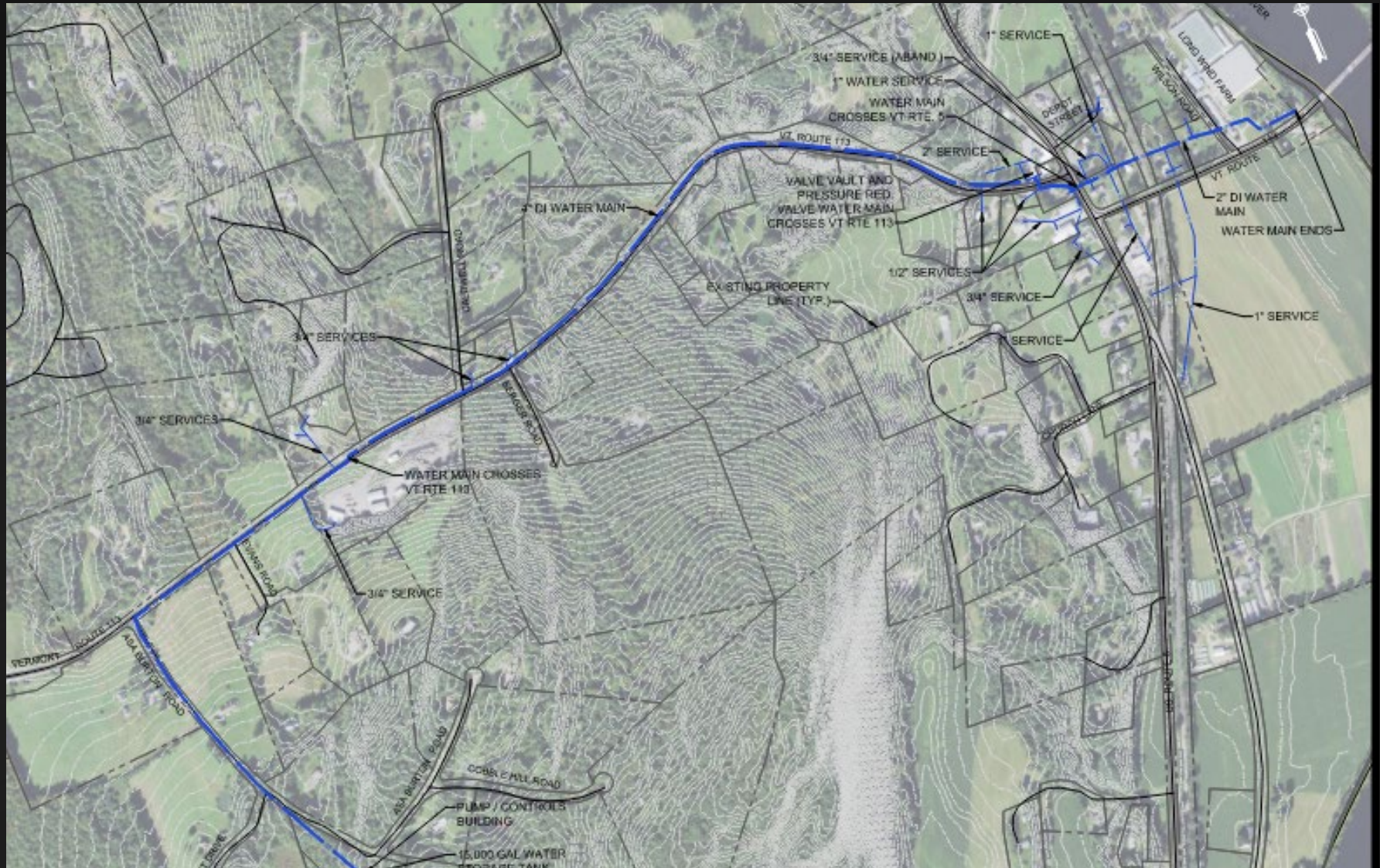




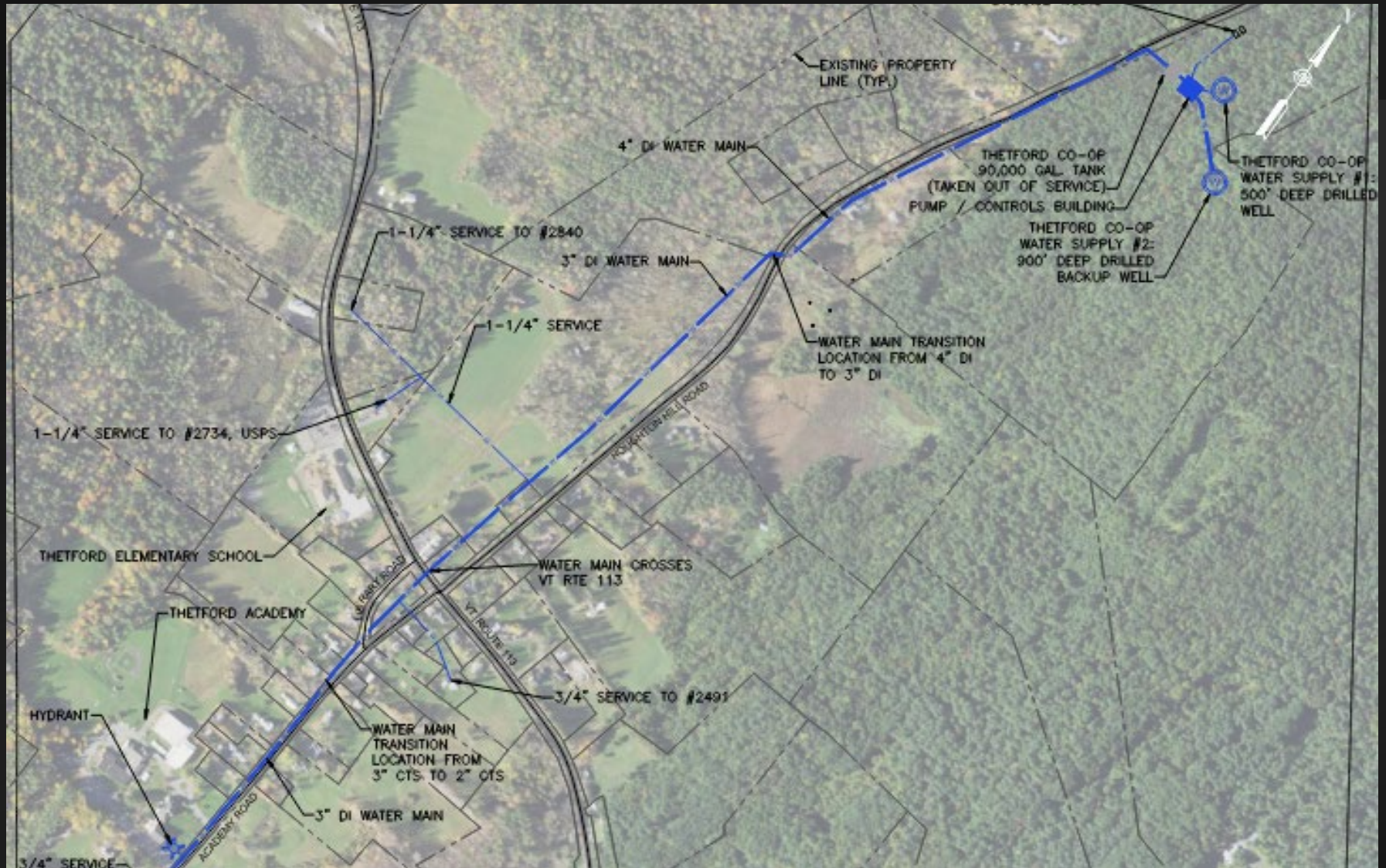
# Post Mills Water Company



# East Thetford Water Company



# Thetford Co-Op



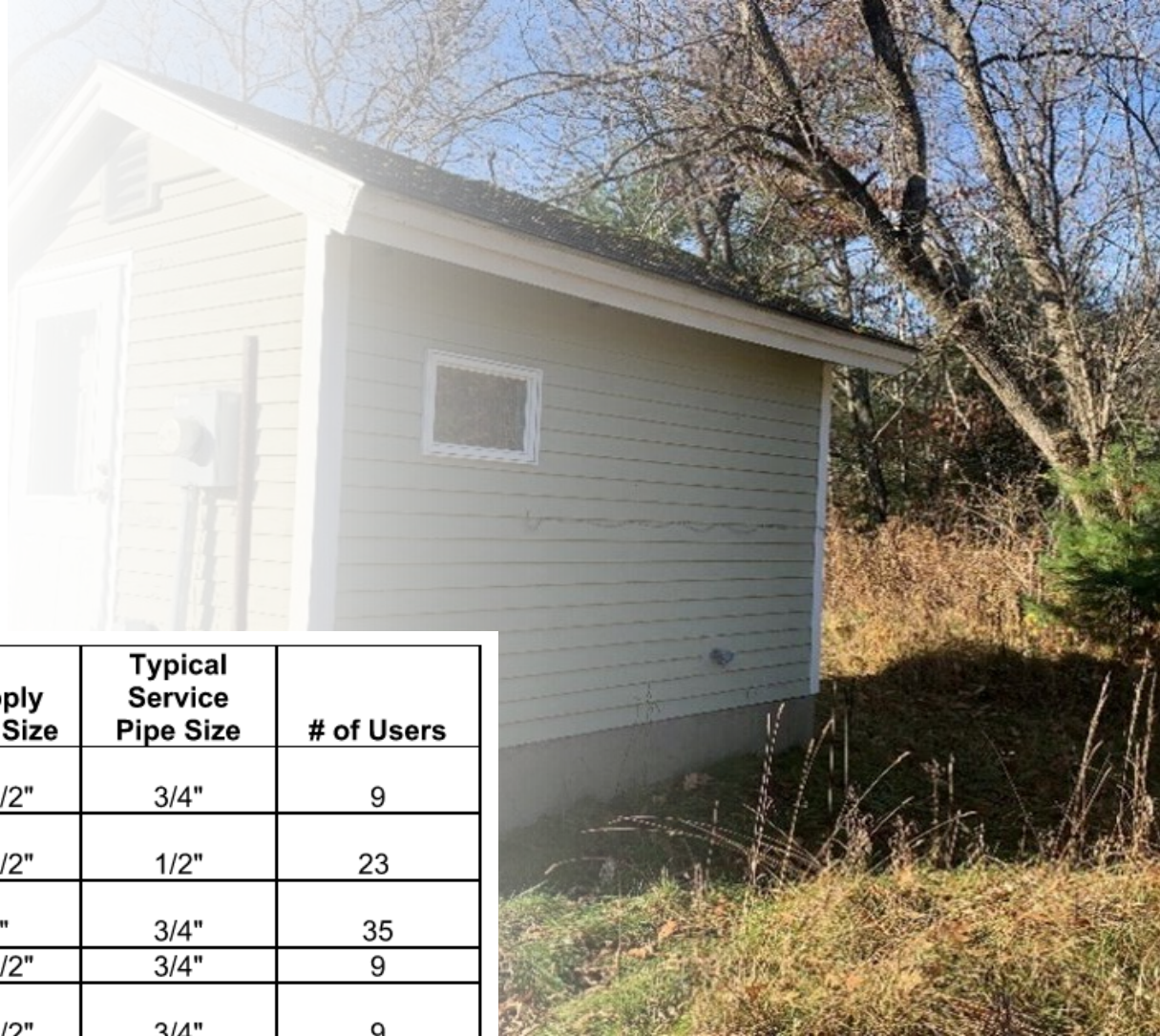
# Thetford Academy



# Thetford Elementary



# Summary of the Existing Water Systems



<b>System Name</b>	<b>Village Location</b>	<b>Supply Pipe Size</b>	<b>Typical Service Pipe Size</b>	<b># of Users</b>
Post Mills Water Association	Post Mills	1-1/2"	3/4"	9
Union Water Co.	North Thetford	1-1/2"	1/2"	23
East Thetford Water Co.	East Thetford	4"	3/4"	35
North Village Water Co.	North Village	1-1/2"	3/4"	9
South Village Water Co.	North Thetford	1-1/2"	3/4"	9
Thetford Water Co-Op.	Thetford Hill	4"	3/4"	41
<b>School Name</b>				
<i>Thetford Academy</i>	<i>Thetford Hill</i>	<i>2"</i>	<i>2"</i>	<i>400*Note#1</i>
<i>Thetford Elementary</i>	<i>Thetford Hill</i>	<i>2"</i>	<i>2"</i>	<i>300*Note#1</i>

\*note#1, the # of users for the schools represents the average daily persons at the school while in session and does not represent the number of users or associated demand as defined for the community water systems.

# Summary Of Existing Water Sources



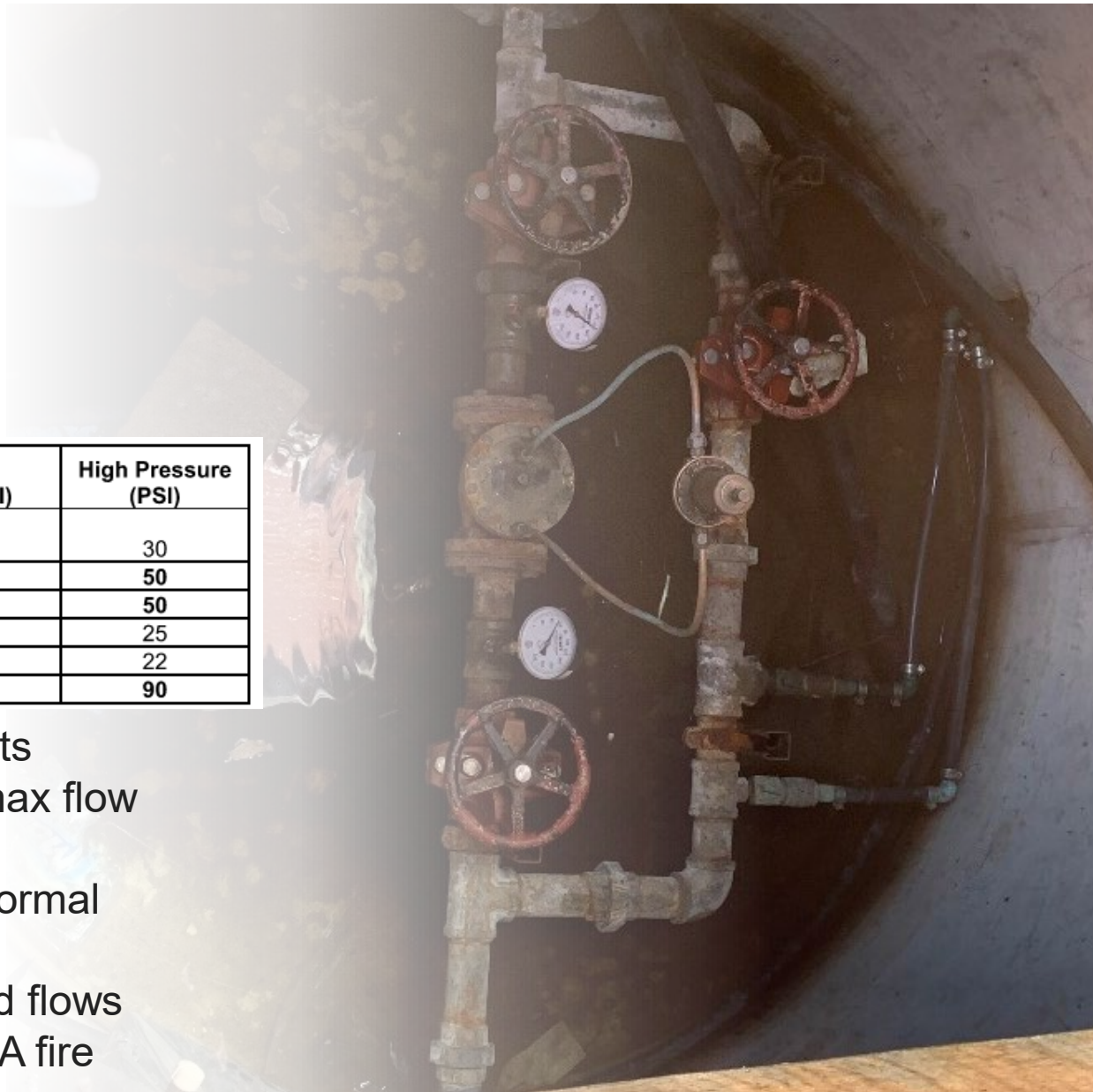
## SYSTEM WATER SOURCES

Post Mills Water Association	Union Water Company	East Thetford Water Co.	North Village Water Co.	South Village Water Co.	Thetford Water Co-Op
Drilled Well	Spring Fed Basin	Drilled Well	Drilled Well	Spring Fed Basin	Drilled Well

## Summary Of Existing Water System Pressures

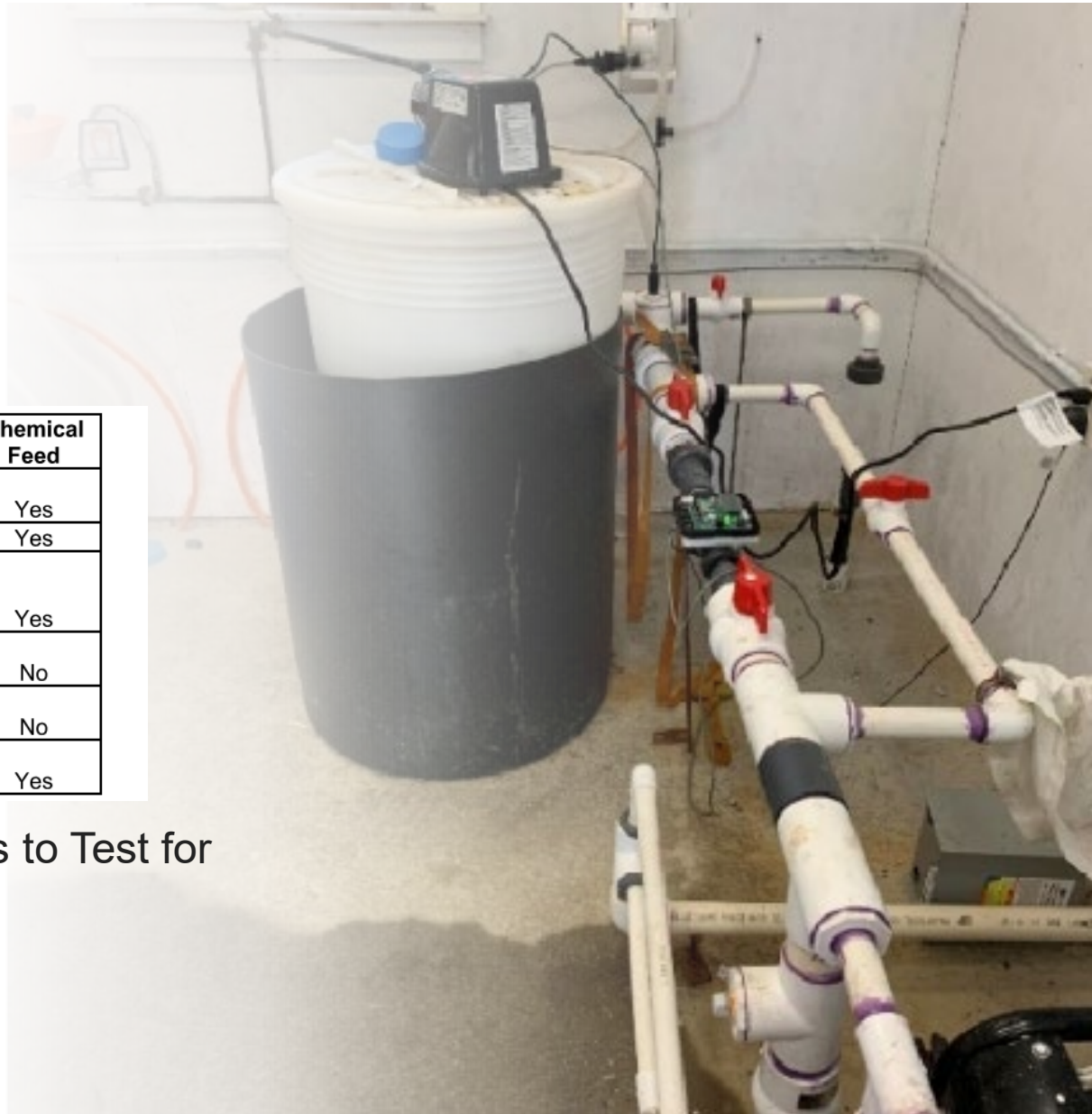
System Name	System Low Pressure (PSI)	High Pressure (PSI)
Post Mills Water Association	20	30
<b>Union Water Co.</b>	<b>20</b>	<b>50</b>
<b>East Thetford Water Co.</b>	<b>40</b>	<b>50</b>
North Village Water Co.	20	25
South Village Water Co.	15	22
<b>Thetford Water Co-Op.</b>	<b>43</b>	<b>90</b>

- Water Rule Requirements
  - Min 20 PSI under max flow conditions
  - Min 35 PSI under normal flow conditions
  - Higher pressure and flows for AWWA and NFPA fire conditions required



## Summary Of Existing Water System Treatment

System Name	Water Treatment Method	Chemical Feed
Post Mills Water Association	UV Purification	Yes
Union Water Co.	Chlorination	Yes
East Thetford Water Co.	Chlorination, pH Adjustment and Manganese Removal	Yes
North Village Water Co.	Sediment Filter	No
South Village Water Co.	Chlorination	No
Thetford Water Co-Op.	Chlorination	Yes



### Recommended Contaminates to Test for and Treat:

- E-Coli
- Bacteria
- Manganese
- P-FAS
- Arsenic
- Radon

## Fire Protection

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- Private Cisterns
  - Condition
  - Locations
  - Public Value
- Hydrants
- Minimum System Pressure
  - 20 PSI at all times
  - Minimum water main sizes
- Minimum Required Flows
  - 1,000 to 2,000 GPM
- Thetford Volunteer Fire Dept.
  - Thetford Hill
  - VT Rte 244
  - 1,500 Gal Tanker



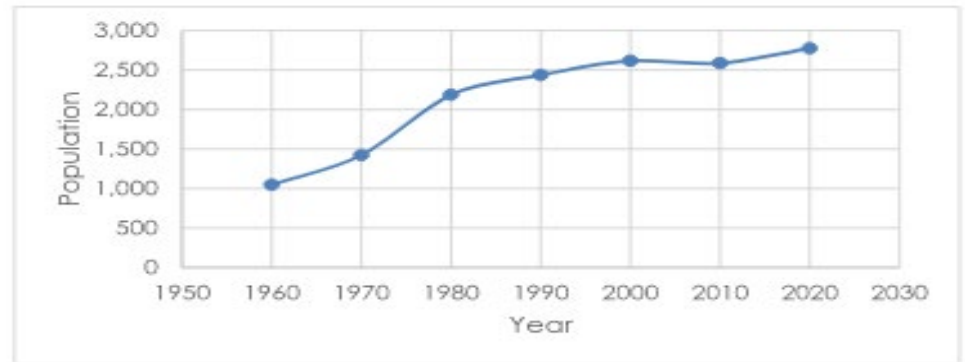
## Village Districts

- Thetford Hill
- Thetford Center
- East Thetford
- North Thetford
- Rices Mills
- Union Village
- Post Mills



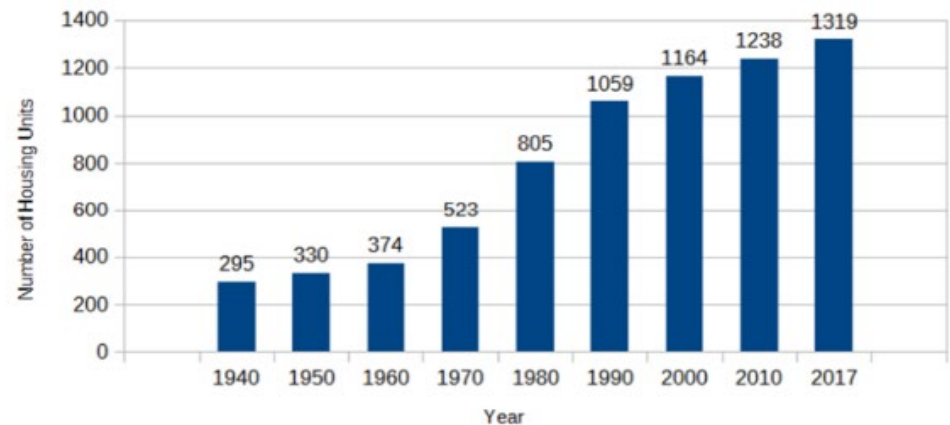
<b>Village</b>	<b>Water System</b>
Thetford Center	None
Thetford Hill	Thetford Water Co-Op.
East Thetford	East Thetford Water Co.
North Thetford	North Village Water Co. South Village Water Co. Union Water Co.
Rices Mills	None
Union Village	None
Post Mills	Post Mills Water Association

# Thetford Growth



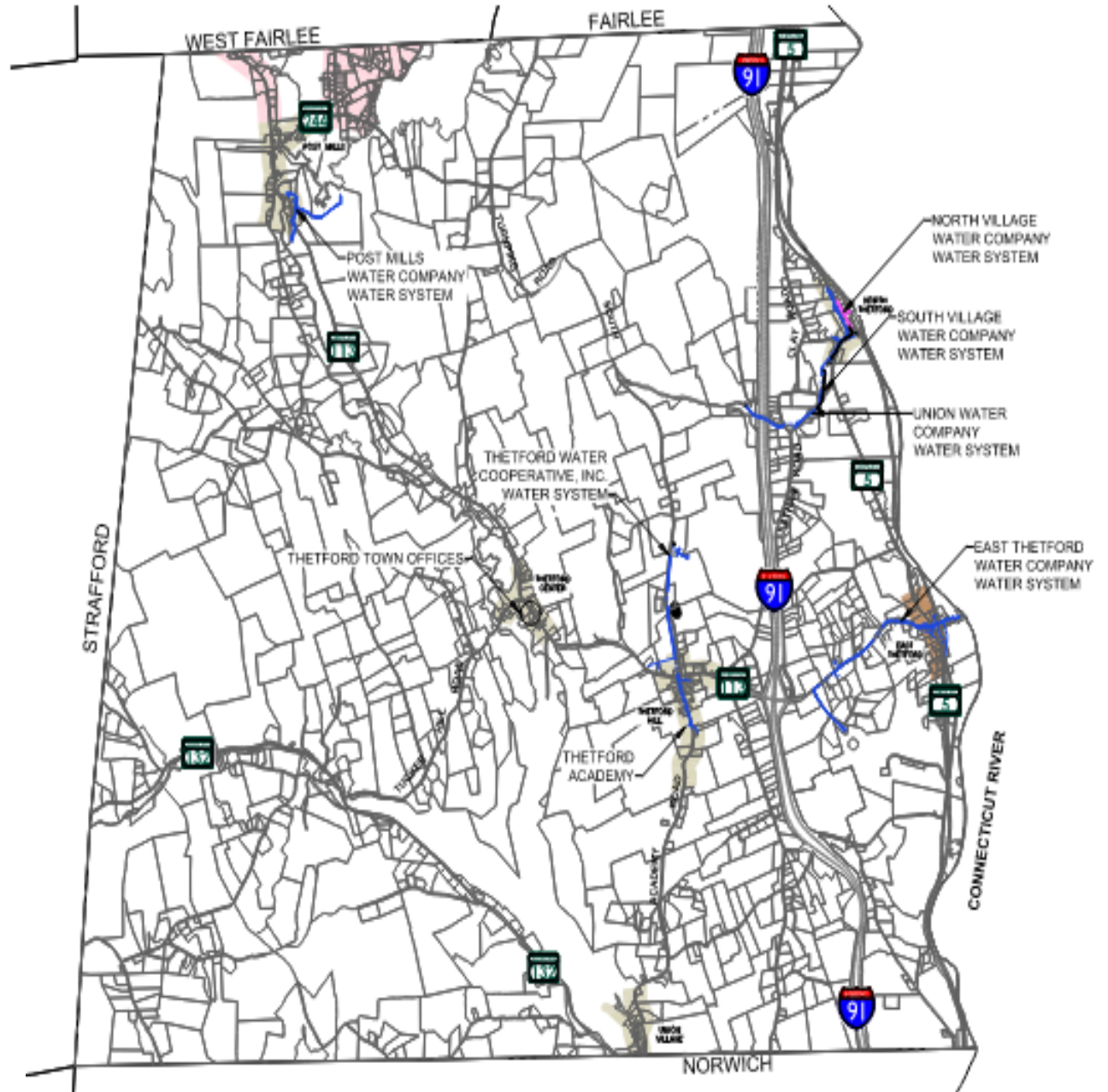
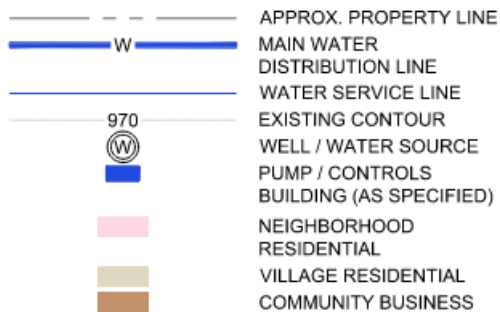
- Thetford Population Growth
- County Population Growth
- Vermont Population Growth
- Thetford Housing Unit Growth

Census Year	Population (Thetford)	Population (County)	Population (Vermont)
1990	2,438	26,149	529,474
2000	2,617	28,226	608,827
2010	2,588	28,936	625,741
2020	2,775	29,277	643,077
Annual Percent Growth from 1990 to 2020	0.45%	0.39%	0.69%



# Thetford Future Development

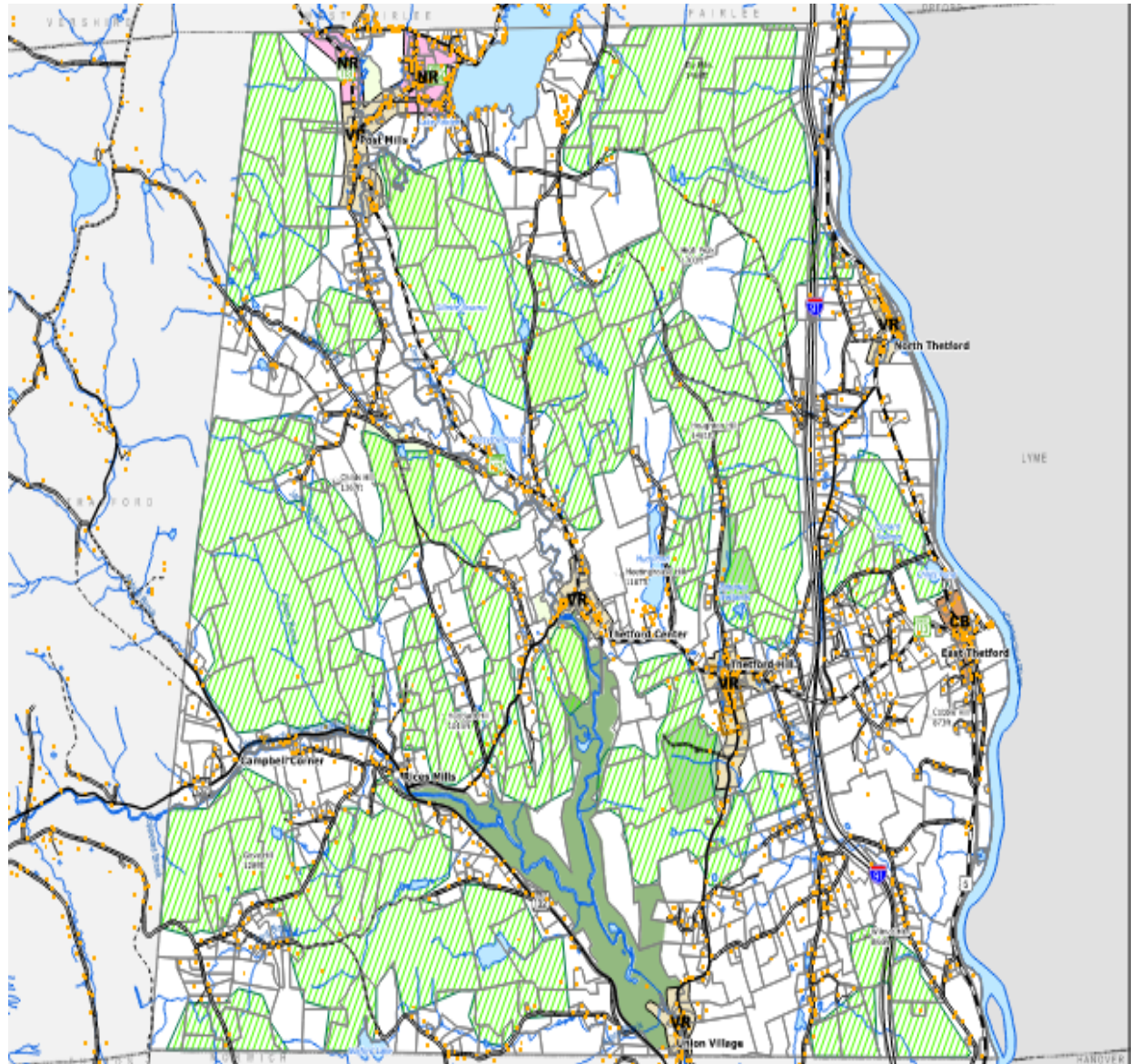
- Post Mills Village
- East Thetford
- North Thetford



# Thetford Future Development

- Post Mills Village
- East Thetford
- North Thetford

Expansion and  
Future Users



# Thetford Existing Water System Expansion

<b>System Name</b>	<b># of Existing Users</b>	<b>#Potential Additional Users Within Area</b>	<b>Total #Potential System Users w/o Expansion</b>	<b>Notes</b>
Post Mills Water Association	9	6	9	The system operator indicated that the existing system was at capacity.
<b>Union Water Company</b>	<b>23</b>	<b>10</b>	<b>33</b>	Additional users would only be approved by the State of Vermont with a replacement water source
<b>East Thetford Water Company</b>	<b>35</b>	<b>15</b>	<b>50</b>	Includes five (5) users that disconnected to the system and are now on private wells
North Village Water Company	8	0	8	The coverage area overlaps with Union Water and the existing system is not capable of adding additional users.
South Village Water Company	8	0	8	The coverage area overlaps with Union Water and the existing system is not capable of adding additional users.
<b>Thetford Water Cooperative</b>	<b>41</b>	<b>10</b>	<b>51</b>	Both schools are included in the future users.

# Regulations and Regulators

- Vermont Water Supply Rule
- EPA
- NFPA
- AWWA



## EPA Primary Drinking Water Contaminants

1. Micro-Organisms
2. Disinfectants
3. Disinfectant Byproducts
4. Inorganic Chemicals
5. Organic Chemicals
6. Radionuclides



## EPA Secondary Drinking Water Contaminants

<b>Contaminant</b>	<b>Secondary MCL</b>	<b>Noticeable Effects above the Secondary MCL</b>
Aluminum	0.05 to 0.2 mg/L*	colored water
Chloride	250 mg/L	salty taste
Color	15 color units	visible tint
Copper	1.0 mg/L	metallic taste; blue-green staining
Corrosivity	Non-corrosive	metallic taste; corroded pipes/ fixtures
Fluoride	2.0 mg/L	tooth discoloration
Foaming agents	0.5 mg/L	frothy, cloudy; bitter taste; odor
Iron	0.3 mg/L	rusty color; sediment; metallic taste; staining
Manganese	0.05 mg/L	black to brown color; black staining; bitter
Odor	3 TON	"Rotten egg", musty or chemical smell
pH	6.5 - 8.5	low pH: bitter metallic taste; corrosion high pH: slippery feel; soda taste; deposits
Silver	0.1 mg/L	skin discoloration; graying of eye whites
Sulfate	250 mg/L	salty taste
TDS	500 mg/L	hardness; deposits; colored water; staining; salty
Zinc	5 mg/L	metallic taste



## EPA Recently Identified Contaminates

1. PFAS
2. PFOS
3. PFHxS
4. PFBS
5. PFNA
6. HFPO
7. Manganese

<b>Compound</b>	<b>Proposed MCLG</b>	<b>Proposed MCL (enforceable levels)</b>
<i>PFOA</i>	<i>Zero</i>	<i>4.0 parts per trillion (also expressed as ng/L)</i>
<i>PFOS</i>	<i>Zero</i>	<i>4.0 ppt</i>
<i>PFNA</i>	<i>1.0 (unitless)</i>	<i>1.0 (unitless)</i>
<i>PFHxS</i>		
<i>PFBS</i>		
<i>HFPO-DA (commonly referred to as GenX Chemicals)</i>	<i>Hazard Index</i>	<i>Hazard Index</i>

# Funding Sources

- Rural Utilities Service Water and Environmental Programs (WEP)
- Drinking Water State Revolving Fund Program (SRF)
- State of Vermont CDBG Program
- American Rescue Plan Act (ARPA)

## Alternatives Analysis Future Water Supply Sources

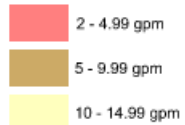
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- Fairlee Water Main Extension
- Connecticut River
- Other Water Bodies
- Rainwater Collection Systems
- Spring Fed Infiltration Basins
- Drilled Wells
  
- Aquifers
- Water Treatment



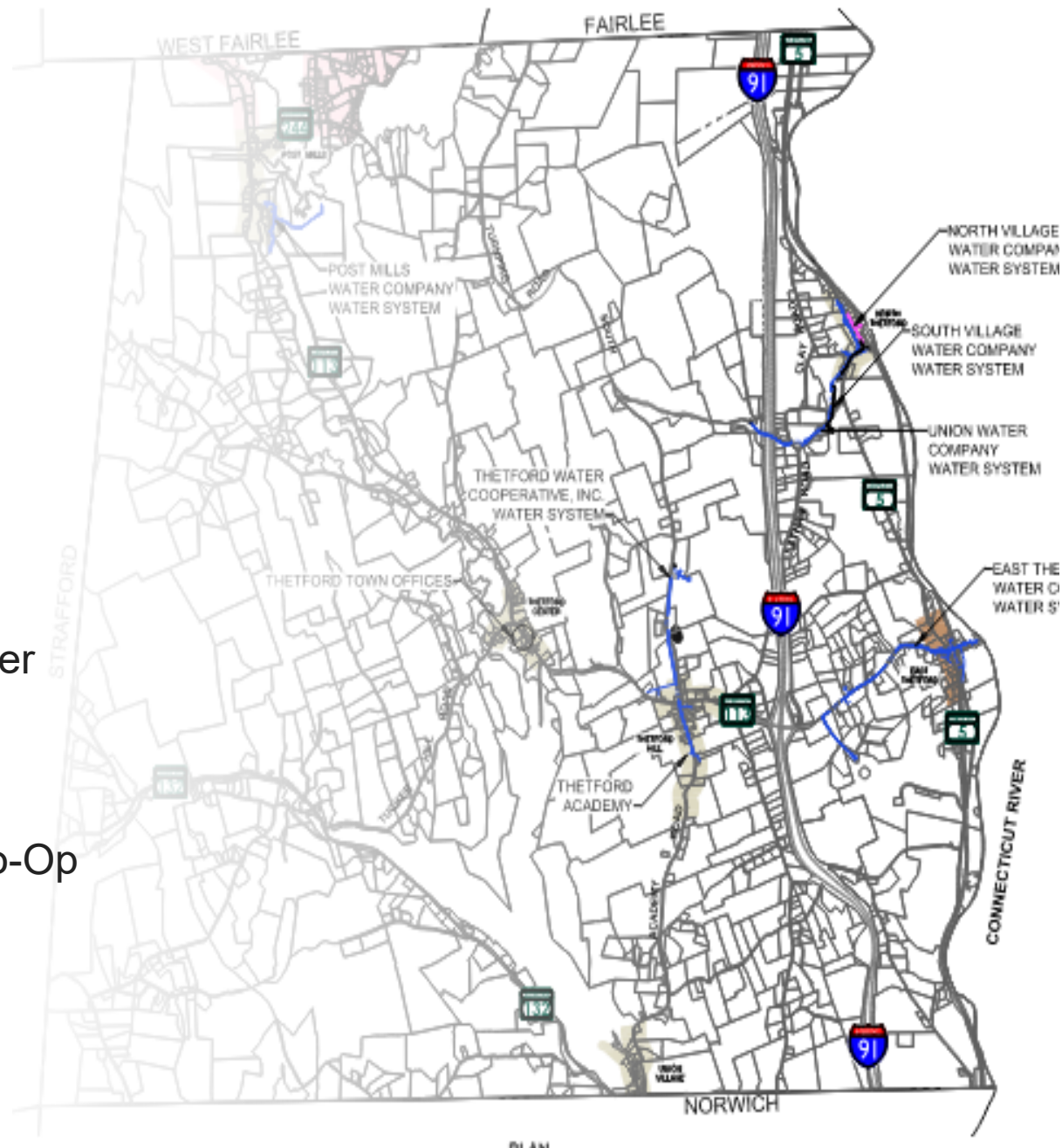
# Thetford Aquifers & Well Yield Rates

Mean yield of wells by bedrock unit (see Plate 4)



# Alternatives Analysis

- Combing and Expanding Existing Water Systems
  - Thetford Town Wide System
  - 3 North Thetford Water Systems
  - Thetford Hill
  - North Thetford, East Thetford, Thetford Co-Op
- New Systems
  - North Thetford
  - Post Mills



# Existing Water System Rates



<b>System Name</b>	<b># of Users</b>	<b>\$ Per User Per Year</b>	<b>Yearly Budget</b>
Post Mills Water Association	9	\$325	\$2,925
<b>Union Water Co.</b>	<b>23</b>	<b>\$750</b>	<b>\$17,250</b>
<b>East Thetford Water Co.</b>	<b>35</b>	<b>\$800</b>	<b>\$28,000</b>
North Village Water Co.	8	\$325	\$2,600
South Village Water Co.	8	\$300	\$2,400
<b>Thetford Water Co-Op.</b>	<b>41</b>	<b>\$450</b>	<b>\$18,450</b>

# Average Costs Per Added User

Pipe Size	Avg System Cost Per LF	Estimated Cost Per User Outside Village Districts
2" HDPE	\$75	\$52,500
4" DI CL52	\$145	\$101,500
6" DI CL52	\$175	\$122,500
8" DI CL52	\$225	\$157,500

Pipe Size	Avg System Cost Per LF	Estimated Cost Per User Within Village Districts
2" HDPE	\$75	\$18,750
4" DI CL52	\$145	\$36,250
6" DI CL52	\$175	\$43,750
8" DI CL52	\$225	\$56,250



# Preliminary Future Project Costs

Location	Approx. System Length	Construction Type	2023 Estimated Cost
Typical	50 feet	Water service replacement and cistern removal	\$12,000
Post Mills Water Main) (4"	3 miles	New water main, water supply and water treatment	\$6,400,000
Post Mills Water Main) (8"	3 miles	New water main, water supply and water treatment	\$8,900,000
Northeast Thetford Combined Systems (4" Water Main)	2 miles	New water main, water supply and water treatment to replace 3 existing systems	\$4,500,000
Northeast Thetford Combined Systems (8" Water Main)	2 miles	New water main, water supply and water treatment to replace 3 existing systems	\$6,500,000
Thetford Hill services to Thetford Acad. & Thetford Elem.	1/4 mile	Extend and expand water system to provide services to schools	\$1,000,000



# Recommendations: System Upgrade Options

- Perform sampling and testing in compliance with the Vermont Water Supply rule.
- Perform treatment in compliance with the Vermont Water Supply rule.
- Create a Thetford Water Advisory Committee.
- Perform detailed water capacity studies for Post Mills, Northeast Thetford and Thetford Hill.
- Test and treat PFAS contaminates
- Replace existing spring fed wells with drilled wells.
- Obtain and record formal easements for all water system infrastructure.
- Eliminate individual user water storage tanks (cisterns).
- Update the water system piping to provide a minimum of 35 PSI under normal flow and 20 PSI under peak flow conditions
- Perform an assessment of the fire ponds
- Provide new and replacement water system infrastructure designed to support future expansion and fire protection.

# Recommendations: Combining System Options

- Collaborate between water companies to determine direction for water system expansion or replacement.
- Design, permit and install necessary upgrades to the Thetford Co-Op to provide water services to the Academy and Elementary School.
- Combine/replace the existing Union, North Village and South Village water systems.
- Submit to funding agencies to advance preliminary grant and loan application funding for the desired projects.
- Town Ownership

# Recommendations: Potential Future Expansion Options

- Perform well yield studies to identify suitable water sources for expansion or system replacement.
- Develop preliminary engineering report, for the design of specific future (or expanded) water systems.
- Submit applications to the funding source(s) to be included on the priority list(s) for future funding.
- Obtain funding for infrastructure improvements and expansion.

# Next Steps

- Decide on preferred future or upgrades to existing water systems to support the Town.
- Perform detailed water capacity studies for Post Mills, Northeast Thetford and Thetford Hill.
- Develop a preliminary engineering report for design of specific future (or expanded/upgraded) water systems.
- Submit applications for funding based on preliminary engineering.
- Obtain funding for design and construction.

# QUESTIONS



Thetford, Vermont

## Community Water Systems Assessment Report

