Water Asset Management Plan for

RANDOLPH CENTER WATER SYSTEM

RANDOLPH, VERMONT

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Submitted to:
Randolph Fire District #1
Vermont Technical College

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1 INTRODUCTION

The Randolph Center Water System funded this Asset Management Plan (AMP) for the water system using a forgivable Asset Management Planning Loan (WPL-302-1_0) from the State of Vermont Drink Water State Revolving Fund (DWSRF).

The Randolph Center Water System (WSID 5177) AMP is based on a comprehensive inventory of assets and survey of the distribution system, source, and storage facilities. Details for the assets such as model number, manufacturer and installation year was recorded and estimates of the remaining useful life and the estimated replacement costs were developed. A base map of the distribution system was developed in AutoCAD, with multiple drawing sheets to show details for individual streets and segments. Attributes were added to the distribution system components to create a Geographical Information System (GIS).

The Asset Management Plan development included creating spreadsheet databases for the source, tanks, vaults, and distribution system components. Using the input data, the AMP provides a prioritized list of improvements based on a risk assessment for each asset. The risk assessment, along with cost estimates, was used to generate Life Cycle Cost Reduction measures and a comprehensive financial plan for funding system improvements to address the highest risk assets.

The validity of conclusions made based on using this Asset Management Plan is directly related to the quality and accuracy of input data used in developing the asset inventory. Water system officials should review the asset inventory and assessments included in this Asset Management Plan on an annual basis and make any revisions necessary resulting from new information or water system improvement projects. Ideally, updates to the inventory should be made as new information becomes available to ensure accuracy of data and avoid potentially lost information.

2 EXISTING ASSETS

2.1 Water System Description

The Randolph Center Water System (RCWS) includes assets owned by two entities: Randolph Fire District No. 1 (FD) and Vermont Technical College (VTC). These assets are operated and maintained independently by the respective owners. The Fire District's main assets are its source of supply, its distribution system, and a 50,000 gallon storage allocation in VTC's 250,000 gallon storage tank. VTC's main assets are its source of supply, its distribution system, and its storage tank.

The VTC main campus buildings and the VTC Farm (on Water Street) are connected to the combined Fire District and the VTC water distribution system. However, VTC is not treated as a customer of the Fire District and VTC does not pay the Fire District for water service. The Fire District serves approximately 65 customers which are mostly located along Route 66, East Bethel Road, Water Street, and Ski Tow Road. The agreement between VTC and the FD is contained in a 1967 document, which is included in the Appendix.

2.1.1 Sources of Supply

There are two sources providing water for the Randolph Center Water System. The Fire District has a spring source and small collection box located approximately 400 feet south of Lake Champagne. The spring groundwater is piped to an adjacent pump station where it is disinfected with a hypochlorite solution prior to pumping into the distribution system.

The VTC source is a drilled well located at Penny Brook, approximately 0.3 miles east of the VTC campus. The Penny Brook Well pumps through a 4-inch ductile iron transmission pipe to the Orchard Treatment Vault, where sodium hypochlorite is added for disinfection ahead of a 24-inch diameter chlorine contact pipe. Vermont Technical College also owns two inactive wells (Hartness Well and Keenan Well) that are currently separated from the water system by an air gap.

2.1.2 Storage

The VTC 0.25 MG elevated steel storage tank is located approximately 0.25 miles south of the VTC Orchard Treatment Vault. The tank was constructed in 1969-1970 and went online June 13, 1970 to replace an underground reservoir that was located on the VTC campus. The FD pumps are operated to provide water to the system and fill the tank using a timed schedule of operation. The VTC well pump is operated based on tank level to refill the tank as needed.

2.1.3 Distribution

The FD and VTC distributions mains comprise a total of 4 miles of piping. The FD has a larger percentage of older piping than the VTC piping and consists of mostly ductile iron, asbestos-cement and PVC pipes. The VTC piping system is mostly (86%) constructed of ductile iron mains with some cast iron and asbestos-cement pipes. **Table 2-1** shows pipe sizes and materials for the FD piping system. **Table 2-2** provides detail for the VTC piping system.

Table 2-1: Fire District No. 1 Piping System Characteristics

	Pipe Length (ft) by Material						
Diameter (in)	**Ductile Iron**	**AC**	**Cast Iron**	**PVC**	**Galvanized Iron**	**Total Linear Feet**	**% of Total**
2	-	-	-	-	-	0	0%
3	46	-	-	-	-	46	0.5%
4	112	-	-	-	-	112	1.1%
6	2,567	3,459	-	1,523	-	7,549	76.0%
8	-	-	-	2,228	-	2,228	22.4%
Total LF	**2,725**	**3,459**	**0**	**3,751**	**0**	**9,935**	
Total %	**27.4%**	**34.8%**	**0.0%**	**37.8%**	**0%**		**100%**

Table 2-2: Vermont Technical College Piping Characteristics

	Pipe Length (ft) by Material						
Diameter (in)	**Ductile Iron**	**AC**	**Cast Iron**	**PVC**	**Galvanized Iron**	**Total Linear Feet**	**% of Total**
2	0				36	36	0.3%
3			7			7	0.1%
4	2,858		708			3,566	31.2%
6	3,374	275	562			4,211	36.9%
8	2,648					2,648	23.2%
12	863					863	7.6%
24	83					83	0.7%
Total LF	**9,826**	**275**	**1,277**	**0**	**36**	**11,414**	
Total %	**86.1%**	**2.4%**	**11.2%**	**0.0%**	**0.3%**		**100%**

Survey work was performed to locate above ground distribution system assets. This data was incorporated with information provided by the RCWS operators to develop updated CAD drawings of the water system. The Water System Base map drawings are contained in the Appendix. Some of the VTC curb stops were inaccessible and were not included in the survey data collection. In addition to obtaining this missing physical location information, it is recommended to complete field work to determine the cause of a hydraulic restriction on the VTC mains between the Hartness and Judd Buildings.

3 ASSET CONDITION AND RISK ASSESSMENT

3.1 Condition Assessment

After completing the base mapping update, conducting site visits to the various facilities and compiling data received from the RCWS operators, databases were created for RCWS piping, valves, hydrants, facilities (including tank, sources, and vaults) and for the Fire District services and curb stops. The databases are in spreadsheet format with table provided in the Appendix.

The assets were assessed to develop a Condition Rating value. The Condition Rating is a key factor in assigning Probability of Failure to assets. Items that are considered for assigning Condition Ratings may include the following:

- Age and estimated remaining useful life
- Hydraulic evaluations
- Leak detection surveys
- Visual inspection during repairs
- Video inspection of the pipeline interior
- Repair records and other local reports

As reviewed in the following sections, remaining useful life and hydraulic condition are the two primary factors for assessing condition. Local reports, including a 2017 leak detection survey, were also considered for the condition assessment. At the time of the AMP preparation, only the leak detection survey results were available. Any additional local reports may be used to adjust the condition assessments as they become available.

Based on the survey results, which are included in the Appendices with an email summary by William DeFlorio, leaks were detected on three service lines and at a gate valve. The leak detection results did not affect the condition ratings of pipe assets since the leaks are on services (which are not water system assets beyond the curb stop) and at one discrete location on a single pipe, P43-VTC, a 50 year old 4" diameter ductile iron pipe adjacent to Nutting Hall.

The numerical system used for assigning Condition Rating scores to pipes is shown in **Table 3-1**. The system is specific for the Randolph Center Water System. Additional parameters could be included in the system to account for deficiencies; however, the hydraulic evaluation results did not identify such additional parameters. Additional discussion of the system hydraulics is contained in Section 3.1.1.

Table 3-1: Condition Rating System

Condition Rating[1,3]	Condition Description	Roughness Coefficient (C Value)	Remaining Useful Life (Years)
1	Very Poor/Failed	<40	<5
2	Poor	40-80	5-10
3	Fair	80-100	10-20
4	Good	100-120	20-50
5	Excellent	120+	50-100

Notes:
1. Rating is based on an evaluation of asset under all categories, with the lowest rating selected.
2. Roughness Coefficient is based on data in the hydraulic model for the system. Roughness Coefficient is only evaluated if the pipe is a water main, i.e. not a service or hydrant lead.
3. Rating may be adjusted based on local knowledge of breaks, inoperable assets or other failed or highly deteriorated conditions.

Condition assessments for the pipe assets and the facilities (storage tank, vaults, and pump station) are included at the end of this section, in subsection 3.2.4, with complete tables showing risk assessment.

A condition rating for valves, hydrant, curb stops, and services is not given for most of the items, as the majority of information available for an assessment of these items is limited to age. Typically, these components would be replaced in conjunction with a water main replacement project. For example, a single valve would not be replaced only due to its age. However, if a valve or hydrant or other item is failed, it normally would be replaced as soon as feasible due to the deficient condition. If there are known characteristics that allow the condition to be rated, such as a leaking valve or inoperable hydrant, that information is added to the inventory spreadsheets.

3.1.1 Hydraulic Modeling and Analysis

A hydraulic model was constructed as part of this Asset Management Plan development to analyze system hydraulics and to identify any deficient areas of the distribution system. The computerized system model was developed using Bentley WaterGEMS© V8i hydraulic modeling software. The model was calibrated to field data using fire flow tests conducted in August 2019 by Dufresne Group with assistance from operators from the Fire District. The calibration report created for the model development and a summary of modeling results are in the Appendix.

The model was used to simulate conditions during various system demands including fire flows at various hydrants throughout the system. Fire flows of 500 gpm, which is the minimum value for systems that provide fire protection, were used for the base fire flow scenario. Although the majority of buildings on the VTC campus are protected with fire sprinklers, there some buildings that are not full protected with sprinkler systems and, therefore, fire flow requirements may be in excess of 500 gpm. Fire flows of 1,500 gpm were also simulated at the following locations:

- End of Water Street
- End of North Main Street
- End of South Main Street
- VTC at Judd Hall
- VTC between Morrill Hall and Greenhouse
- Morgan Orchards

The fire flows used for the evaluation are not necessarily Needed Fire Flows that would be calculated using Insurance Service Office (ISO) formula or similar determinations. The water system has no ISO reports with listed Needed Fire Flows.

The results of the modeling showed no hydraulic deficiencies during normal system demands with the current average daily demand of 52,000 gpd.

During conditions of maximum daily demand (78,500 gpd) in conjunction with fire flows[1] there are some pipes with high headloss. **Figure 3-1** shows pipes with high headloss, specifically over 6 ft/1,000 ft, with simulated fire flows of 500 gpm during maximum day demand. **Figure 3-2** shows high headloss pipes during maximum daily demand with 1,500 gpm fire flows.

The hydraulic results showing high headloss during fire flow conditions are not sufficient information to rank the high headloss pipes as deficient or in need of replacement. A complete hydraulic evaluation is necessary to develop recommendations for replacing water mains or completing other improvements to address hydraulic deficiencies. System improvements may be identified to resolve inadequate fire flows, but would not be recommended solely to eliminate high headloss conditions.

The Randolph Center Water Model Results memorandum dated February 11, 2020 (in the Appendix) describes an apparent restriction in the water main serving Judd Hall. The computer model represents the restriction as a low roughness coefficient (C Value) of 40, although the restriction could actually be caused by a partially closed valve. Additional field work is necessary to determine the cause of the hydraulic restriction. If it is determined the pipe is deteriorated with tuberculation on the inside, which would correspond to a low C value, the pipe should be replaced. In some cases, pipes with low C values can be rehabilitated by cleaning and lining but that is not a practical procedure for a small diameter pipe.

[1] Design flow is the more stringent of maximum hourly demand or maximum daily demand plus fire flow, as described in American Water Works Association Distribution System Requirements for Fire Protection Manual M31.

In addition to the hydraulic modeling analysis, the RCWS has identified some other areas that have the potential for being identified as system deficiencies. A Preliminary Engineering Report is recommended to evaluate the water system, identify deficiencies and assess alternatives for addressing any deficiencies. However, it is noteworthy that the 2020 Sanitary Survey completed by Drinking Water and Groundwater Protection Division (DWGPD) identified inadequate disinfection monitoring and a Permit to Operate application as the only significant deficiencies.

At the level of evaluation for this AMP, no deficiencies were identified for the distribution system. Adequate pressures are maintained, minimum fire flows are available and the dead end lines are provide with fire hydrants.

The RCWS has noted that some services present a system vulnerability in the event of failure due to their location below Route 66 and their extended length service customers on Ski Tow Road. While these services are not assets of the water system beyond the curb stop, it is prudent to monitor their condition and risk. Therefore, we have included the specific services of concern in the risk assessment for Fire District water mains.

The two sources of supply have no identified deficiencies compared to the Water Supply Rule requirements for source protection. As noted in the 2011 Permit to Operate "There are no reported land use activities occurring within 200 feet of either source and current water quality data indicates no evidence of drinking water contamination." However, the Fire District spring source does have a vulnerability since the Fire District does not own or control the 200-foot radius source isolation zone. The Fire District does not currently have an access agreement, which should be in place to ensure operation and maintenance can occur. The Fire District is working to secure an agreement.

The Permit to Operate also states that both permitted sources were determined to be not under the direct influence of surface water. There is no identified requirement to continuously disinfect or have the capabilities for continuous disinfection. However, the most recent Sanitary Survey identified that disinfection monitoring for the Spring Treatment Facility is inadequate and required sampling at a point after contact time is achieved.

The 2011 Permit to Operate states that both the Spring and Penny Brook Well have unknown yields. Pump capacities of both sources are listed as 50 gpm and 90 gpm respectively. This information differs from the December 20, 2018 Sanitary Survey form which lists a "driller's yield" of 128 gpm and a quarter of this amount, or a 32 gpm yield, for the Spring. The 2018 Sanitary Survey form lists a driller's yield of 70 gpm for Penny Brook Well.

The Water Supply Rule, Part 2.2.1 requires that "the source's ability to meet the average day demand is based on pumping 12 hours per day". For the Randolph Center Water

System, the average day demand of 52,000 gallons per day converts to 72 gpm for a 12 hour period. There is no identified capacity deficit for the system, as both sources are considered to be available to the water system. There is further discussion of the source yields under Section 3.2.3 Redundancy.

Figure 3-1: Headloss deficiencies for maximum day demand with 500 gpm fire flow.

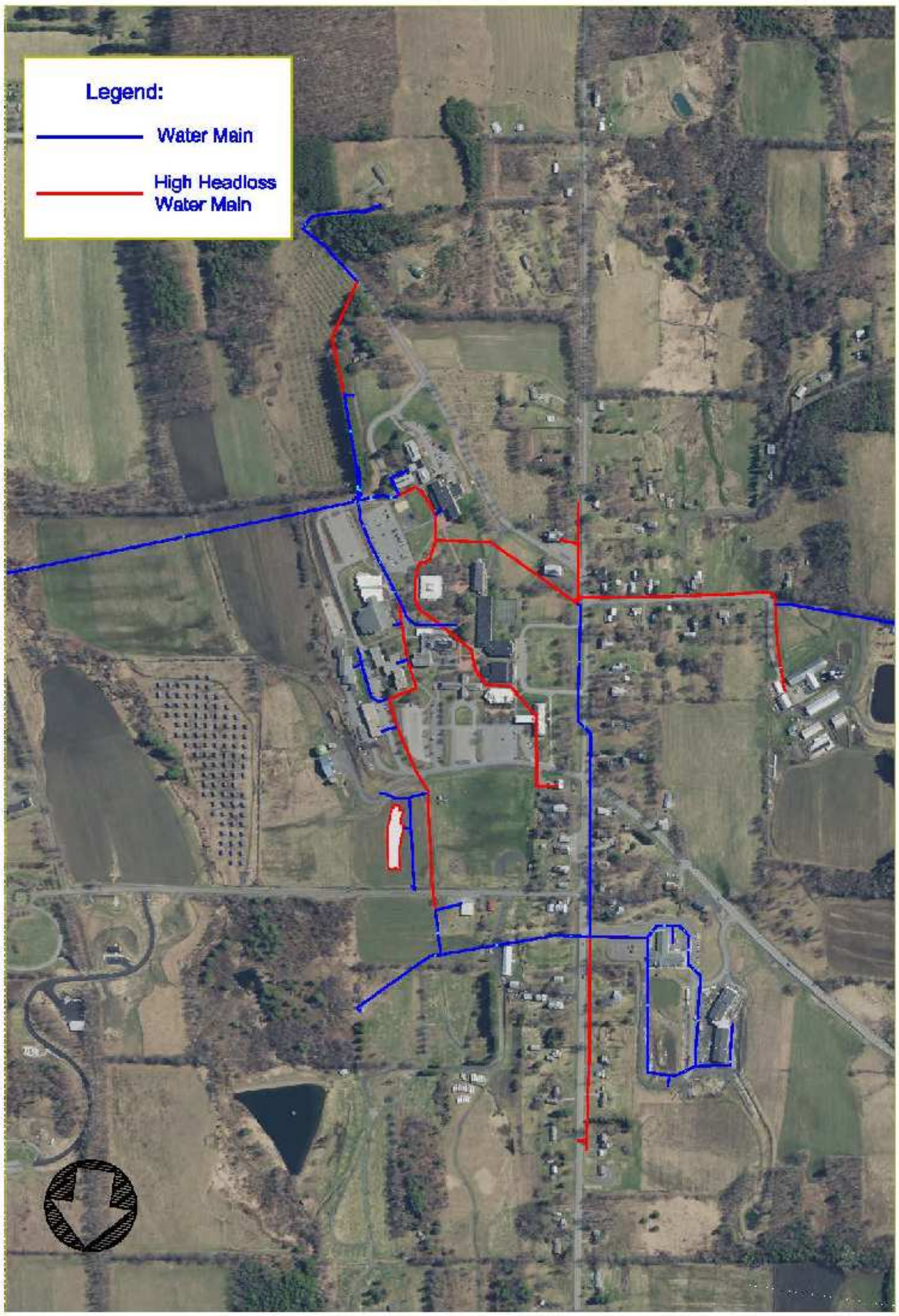
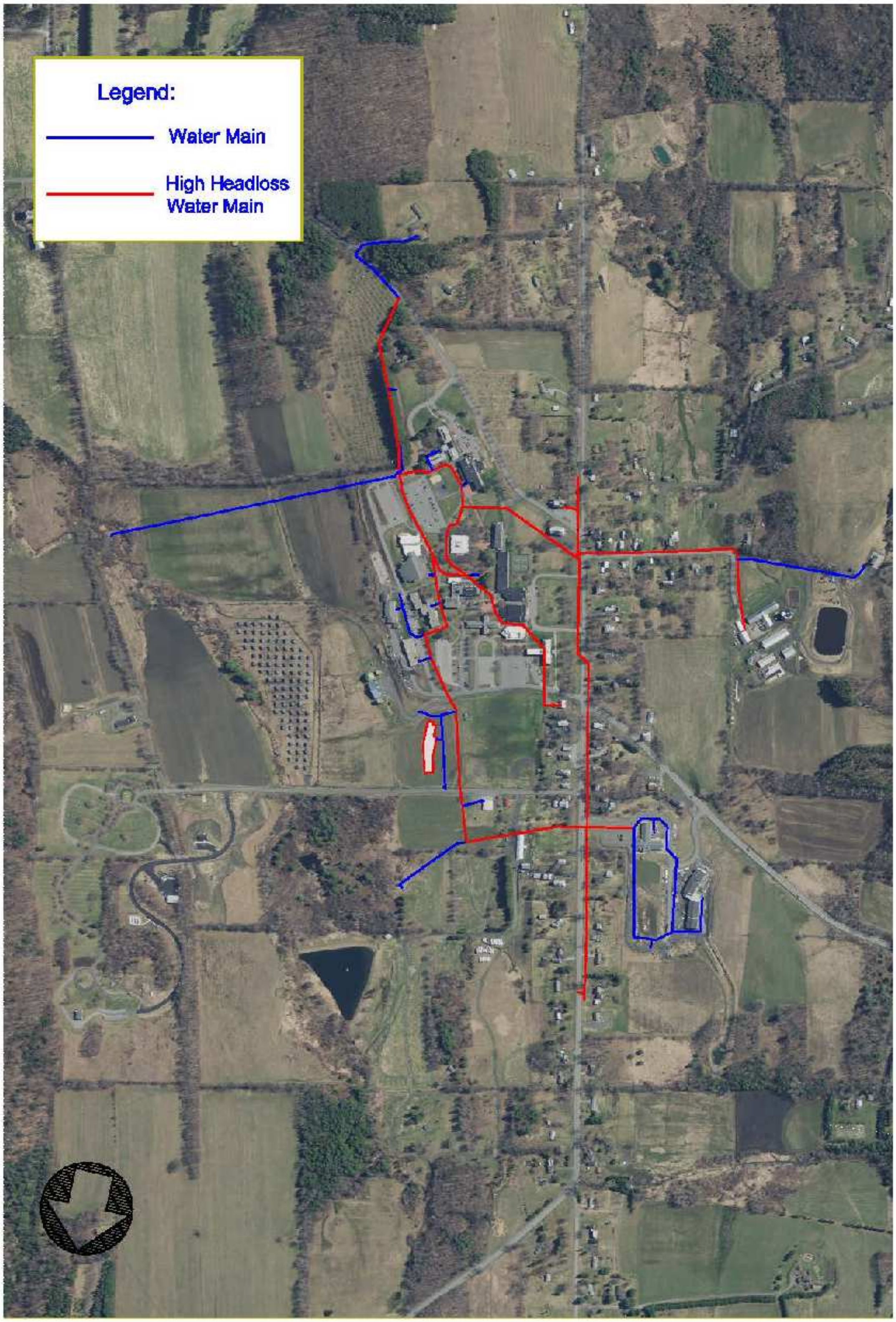


Figure 3- 2: Headloss deficiencies for maximum day demand with 1,500 gpm fire flow.



3.1.2 Estimated Remaining Useful Life

Remaining useful life is defined as being the estimated number of years an asset will function to an acceptable standard before warranting replacement. Pipe material is a factor in assigning the remaining life of the water mains since different pipe materials have different life spans. Remaining expected useful life of the distribution system piping for FD and VTC is summarized in **Table 3-2**. As shown, the asbestos-cement and galvanized piping is classified as beyond its useful life because the pipes are older than 50 years.

Table 3-2: Summary of Estimated Remaining Useful Life of FD and VTC Water Mains

	Pipe Material	Estimated Remaining Useful Life			
		>50 Years	20-50 Years	<20 Years	Beyond Useful Life (0 Years)
FD	Cast Iron	-	-	-	-
	Ductile Iron	21	2704	-	-
	PVC	3,751	-	-	-
	Asbestos Cement	-	-	1,000	2,458
	Galvanized	-	-		
	Total Length (ft.)	**3,772**	**2,704**	**1,000**	**2,458**
	% of Total	**38%**	**27%**	**10%**	**25%**
VTC	Cast Iron	771	506	-	-
	Ductile Iron	889	8938	-	-
	PVC	-	-	-	-
	Asbestos Cement	-	-	-	275
	Galvanized	-	-	-	36
	Total Length (ft.)	**1,660**	**9,444**	**0**	**311**
	% of Total	**15%**	**83%**	**0%**	**3%**

3.1.3 Summary of Condition Ratings

The condition ratings are utilized for the risk assessment, presented in Section 3.2, which is used to prioritize improvements. Although poor condition ratings do not automatically mean an asset is a high priority for replacement, the rating is a good indicator that the asset may be at high risk. Therefore, the lowest condition ratings are worth noting.

Condition ratings for water mains rated as 1 or Very Poor are summarized below:

Vermont Technical College Water Mains rated as Very Poor:

- 275 lf aged asbestos cement pipe
- 36 lf aged galvanized main
- 1,170 6" DI pipe and 510 lf 6" CI pipe with C value=40

Fire District #1 Water Mains rated as Very Poor:

- 3,460 lf aged asbestos cement pipe

3.2 Life Cycle Cost Analysis

Life cycle costing looks at the total cost of an asset over its entire useful life, from installation to replacement. By understanding the life cycle cost for each asset, officials can plan and budget for the replacement of an asset in addition to the typical maintenance expenses currently experienced.

The typical maintenance for a water distribution system includes flushing water mains, exercising valves and inspecting and exercising hydrants. Water storage, pumping and treatment systems require inspecting equipment and facilities as normal maintenance procedures.

Water systems can typically accomplish the majority of distribution system maintenance activities during flushing. The annual flushing includes all water mains in the system and requires the operators to check hydrants and operate valves and hydrants. Any deficiencies found during this process are noted for future repair or replacement. These maintenance activities are necessary for all water mains, valves and hydrants, regardless of age, and the cost of typical maintenance for each asset does not vary significantly based on size. As such, the cost of these maintenance activities is not broken out for each water main.

Another aspect of the life cycle cost is repairs. For example, a water system may expend 3 to 4 days, with costs of approximately $5,000, to repair a leaking water main in the water system. This includes the time it takes to locate the leak and make the repair, as well as the cost of the labor, equipment and materials needed. The cost of replacing water mains is $150-200/ft, depending on size of the main and surface restoration requirements. The cost of replacing an individual valve or hydrant is typically between $3,000 and $5,000.

The RCWS operators do not currently have a method of tracking maintenance or life cycle costs that is consistent for both VTC and the FD. The Fire District operators have compiled a list of repairs starting in 2016 that describes the time period, repair/upgrade work and cost. This same method could be used by VTC staff.

In order to create a system to track expenditures on existing assets, all operators should create a log of water main repairs, valve and hydrant repairs and replacements and equipment repairs and replacements. This log would include what the repair or replacement included, where it was located, what assets it affected, when it was performed and how much it cost. An example log is included in **Table 3-3**.

Table 3-3: Asset Expenditure Tracking Example

Asset ID	Location	Date	Cost	Repair/Replacement Details
V11	E. Bethel	March 1, 2018	$300	Replaced valve box cover
H10	Fire Station	June 1, 2017	$1,000	Repaired existing hydrant seal
P22	Furnace	May 1, 2017	$4,000	Repaired break in 4” DI

Note: This table is an example only and does not include real data.

This data will then be used to update condition assessments and risk assessments in the asset database and reprioritize the list of necessary improvement projects. Changes in the risk assessment may result in modifications to the capital plan. The database will be updated at least annually in order to provide the most accurate information for use in capital planning. As the operators begin using the life cycle cost tracking system, they may choose to revise the asset database update frequency based on the amount of data collected and how the database is being used.

3.2.1 Implementing LCCA

The systems used for life cycle cost analysis (LCCA) vary in complexity, but most commonly analysis is performed with asset management software. The LCCA system should track ongoing expenditures for assets and future costs associated with the asset. Future costs are the expected major expenses such as replacement of a section of distribution main, rehabilitation of a water storage tank and replacement of a pumping system. The general concept for life cycle cost analysis is that when cumulative expenses are equal to the replacement cost, the asset should be replaced. The more complex LCCA systems use the system inputs in comprehensive financial management strategies.

The asset inventory and analysis spreadsheets for the RCWS contain future costs for all assets, which are the replacement costs. With implementation of procedures to consistently track expenditures, as recommended and shown in the example of Table 3-3, the water system will have the tools for life cycle cost analysis. The water system should customize the analysis to fit their preference on the level of detail and grouping of assets for the LCCA. For example, it is logical to group water distribution components by street or area. In the example of a water main asset, the costs for ongoing repairs and maintenance of hydrants, piping, services and valves for a street are compared to replacing all of the water infrastructure with construction of a new water main.

The Randolph Center Water System should have the following minimum asset groups for the LCCA:

- Spring
- Penny Brook Well
- Spring Pump House

- Water Tank
- Connection Vault
- Meter Vault 1
- Meter Vault 2
- Orchard Treatment Vault
- Water Mains
    - East Bethel Rd
    - VT Route 66
    - Water St.
    - Furnace St.
    - Tom Wicker St.
    - Morey
    - Judd
    - Morrill
    - Nutting
    - Shape
    - Keenan
    - Facilities
    - Harness
    - Conant
    - Tank transmission
    - Autotech
    - Vael

The water system may choose to have additional assets for individual components and may choose to have long services as individual assets.

Once categories of tracking are defined, the water system would compare the O&M costs to the corresponding replacement cost to justify expenditures for replacement.

The water system has expressed that they prefer simple spreadsheets for the AMP rather than using a software program for the AMP. For a very small system, EPA recommends using a simple method for budgeting for future rehabilitation and replacement work. The EPA budgeting worksheet example, provided on the following pages, does not include O&M costs.

EPA previously provided a software solution for small systems asset management, Check Up Program for Small Systems (CUPSS). With the discontinuance of CUPSS in 2020, EPA no longer provides a free solution for Asset Management Programs for small systems. However, EPA provides other asset management tools and resources of varying usefulness. After reviewing the EPA Reference Guide for Asset Management Tools, the West Virginia Dept. of Health and Human Resources Infrastructure and Capacity Development tools are recommended for use by the Randolph Center Water System.

EPA Example Budget for Small Systems

Budgeting for Rehabilitation and Replacement of Assets: Completed Example

Asset	Activity	Cost	Years Until Action Needed	Reserve Required Each Year
Chlorinator	Replace unit	$2,000	3	$667
Administrative Building (roof)	Repair roof	$1,500	1	$1,500
Hydropneumatic Tank	Replace unit	$300	13	$23
Computer	Replace unit	$1,000	4	$250
			Total per year	$2,440

The West Virginia tools and spreadsheet templates are accessible at the following link: http://www.wvdhhr.org/oehs/eed/iandcd/Asset_management.asp

The following spreadsheet is an example for tracking O&M costs and comparing to replacement costs to determine actions.

System Name	Water PSD	Projected Major Repair/Rehab	$100,000
Asset Name	Jones Street Tank TK-2	Additional Life Attained	10
Original Cost	$300,000	Original Estimated Useful Life	40
Year Installed	2000	Useful Life Expires	2050
Replacement Cost Estimate	$366,275	Inflation Factor	0.40%
		Projected O&M Costs At End of Life	$352,700

Each asset will have its own worksheet indicating the complete O&M costs associated with its life cycle costs till the end of its useful life. The pale yellow cells are formulas and should not be changed. The future inflation factor default is 0.4% but can be changed by the system. The replacement cost is estimated based on the inflation factor and estimated useful life years. If a major rehabilitation can be performed to extend the useful life it can be added here.

Year	O&M Activities Actual & Planned	O&M Cost	Cumulative O&M Cost	Action To Do With Proper O&M	Useful Life
Before 2016	$100,000 Painting//Rehab, cleaning in & out in 2010; $50,000 repaired side wall due to bullet holes in 2015	$150,000	$150,000	Continue To Repair	Continue To Use
2016	$400 Extra labor due to malfunctioning valve; $1,300 to replace valve	$1,700	$151,700	Continue To Repair	Continue To Use
2017			$151,700	Continue To Repair	Continue To Use
2018			$151,700	Continue To Repair	Continue To Use
2019			$151,700	Continue To Repair	Continue To Use
2020			$151,700	Continue To Repair	Continue To Use
2021			$151,700	Continue To Repair	Continue To Use
2022			$151,700	Continue To Repair	Continue To Use
2023	$100,000 Painting//Rehab in & ou	$100,000	$251,700	Continue To Repair	Continue To Use
2024			$251,700	Continue To Repair	Continue To Use
2025			$251,700	Continue To Repair	Continue To Use
2026			$251,700	Continue To Repair	Continue To Use
2027			$251,700	Continue To Repair	Continue To Use
2028			$251,700	Continue To Repair	Continue To Use
2029			$251,700	Continue To Repair	Continue To Use
2030	$31,000 Painting outside only	$31,000	$282,700	Continue To Repair	Continue To Use
2031			$282,700	Continue To Repair	Continue To Use
2032			$282,700	Continue To Repair	Continue To Use
2033			$282,700	Continue To Repair	Continue To Use
2034			$282,700	Continue To Repair	Continue To Use
2035			$282,700	Continue To Repair	Continue To Use
2036			$282,700	Continue To Repair	Continue To Use
2037			$282,700	Continue To Repair	Continue To Use
2038			$282,700	Continue To Repair	Continue To Use
2039			$282,700	Continue To Repair	Continue To Use
2040	$70,000 Exterior painting	$70,000	$352,700	Continue To Repair	Continue To Use
2041			$352,700	Continue To Repair	Continue To Use
2042			$352,700	Continue To Repair	Continue To Use
2043			$352,700	Continue To Repair	Continue To Use
2044			$352,700	Continue To Repair	Continue To Use
2045			$352,700	Continue To Repair	Continue To Use
2046			$352,700	Continue To Repair	Continue To Use
2047			$352,700	Continue To Repair	Continue To Use
2048			$352,700	Continue To Repair	Continue To Use
2049			$352,700	Continue To Repair	Continue To Use
2050			$352,700	Continue To Repair	End of Useful Life
2051			$352,700	Continue To Repair	End of Useful Life
2052			$352,700	Continue To Repair	End of Useful Life
2053			$352,700	Continue To Repair	End of Useful Life
2054			$352,700	Continue To Repair	End of Useful Life
2055			$352,700	Continue To Repair	End of Useful Life
	Total Expenses	$352,700			

This section should contain all the past and future O&M activities for this asset. It should be populated a few years after the expected useful life. Key activities can be documented in this section. Unplanned major expenses should be added as they occur. Only the annual O&M Cost in column I should be input as a total cost for that year. The cumulative O&M Cost column is a formula to evaluate the life cycle cost of the asset.
You must keep all the assets in the same Year sequence as shown in column A to be able to evaluate the O&M LTFP Costs worksheet.

The Action To Do With Proper O&M column and the Useful Life column are calculated based on the useful life data in lines 1 through 6. The Action To Do With Proper O&M column will show "Continue to Repair" until the expenses of the asset equal the replacement cost. Once that cost has been exceeded the cell will show a replacement date. As a secondary check on the asset life, the useful life column will show "Continue to Use" until the useful life is reached. Keep in mind that these estimates are predictions and can be adjusted if additional life can be increased if exceptional maintenance has preserved the asset.

3.3 Risk Assessment

A risk assessment was conducted to identify the highest priority assets, as those assets that are most likely to fail and have significant consequences in the event of failure. The Asset Management methodology uses the asset's Consequence of Failure (COF) and Probability of Failure (POF) to develop risk ratings. Probability of Failure is directly related to the Condition Ratings reviewed in Section 3.1.

The Risk Factor is determined using the following equation:

$$Risk = COF * R * POF$$

where:

COF = Consequence of Failure
R = Redundancy
POF = Probability of Failure

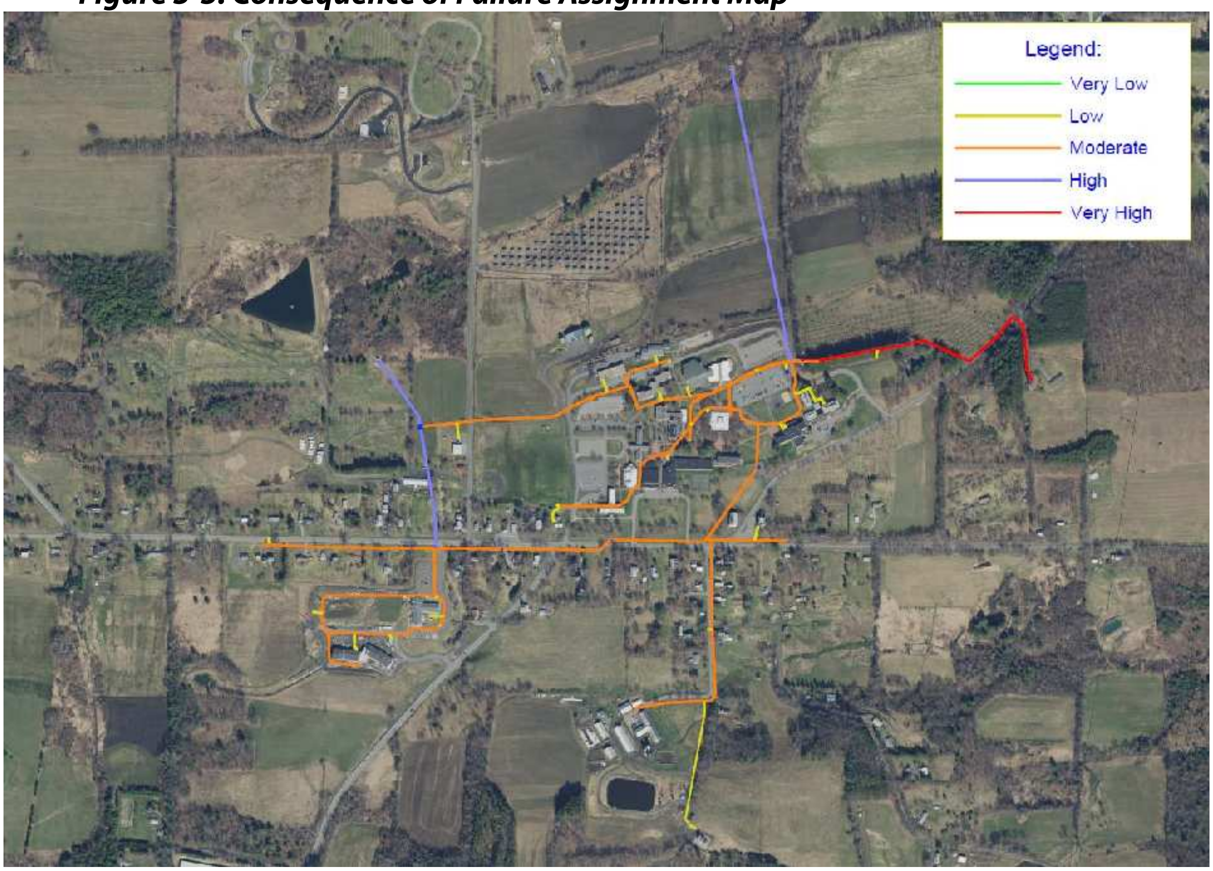
3.3.1 CONSEQUENCE OF FAILURE (COF)

The Consequence of Failure is a value from 1 to 5 assigned to each asset, with 1 representing a Very Low consequence of failure and 5 representing a Very High consequence of failure.

The Randolph Center Water System operates only one storage tank, which is critical to system operation. The consequence of failure of the tank or the tank transmission main is Very High or 5. The source transmission mains have a lower COF rating of 4, considering there is not a single source and the tank provides storage to meet system demands for a limited time.

In comparison to storage and source, failure of water distribution system individual components may impact customers in discrete locations and are generally not as critical to the operation of the entire system. The assigned COF for most pipes is 3. Hydrant leads and other short segments serving few customers have COF values of 1. **Figure 3-3** shows a map of the water distribution system with the assigned COF values.

Figure 3-3: Consequence of Failure Assignment Map



3.3.2 Redundancy

Redundancy is a value used to adjust Consequence of Failure of assets. Values are assigned based on the following table.

Amount of Redundancy	Redundancy Factor
None	1
25%	0.9
50%	0.7
75%	0.5
100%	0.4
150%	0.3
200%	0.25

The yield of the two sources compared to system demand was considered in assigning redundancy factors. The Water Supply Rule, Part 2.2.1 requires that "the source's ability to meet the average day demand is based on pumping 12 hours per day". For the Randolph Center Water System, the average day demand of 52,000 gallons per day converts to 72 gpm for a 12 hour period. Compared to a yield of 32 to 50 gpm for the Fire District Spring and 70 gpm for the Penny Brook Well, neither source by itself meets the criteria, although the Penny Brook Well is very close. It is noted that the range of values for the Fire District Spring are provided since the yield has not been definitively established.

If the Spring was not available, the Penny Brook Well could provide the average day demand for the system in 12.4 hours. This is close to 100% redundancy for the Spring, so a factor of 0.4 was assigned to the Spring.

If the Penny Brook Well was not available, the Spring provides about 50% redundancy, therefore a factor of 0.7 was assigned to the source.

3.3.3 Probability of Failure (POF)

The probability of failure values ranges from 1, for low probability of failure, to 5, for high probability of failure. The POF value quantifies an asset's reliability, or how likely a particular asset is to fail, and is primarily dependent on Condition Rating. For example, a low Condition Rating will result in a high Probably of Failure.

3.3.4 Risk Factors

The risk factors range from 1 to 15. A low risk asset is a new asset in excellent condition with redundancy. A high-risk asset is need of immediate or short-term replacement.

A risk factor of 10 or above is considered High Risk. A risk factor from 5-10 is considered Moderate Risk. Risk factors below 5 are considered low risk. **Tables 3-4 to 3-6** show the risk assessments. Assets highlighted with grey represent assets with a remaining expected useful life of 10 years or less. **Figure 3-4** shows the location of the high risk water mains.

Figure 3-4: High Risk Water Mains

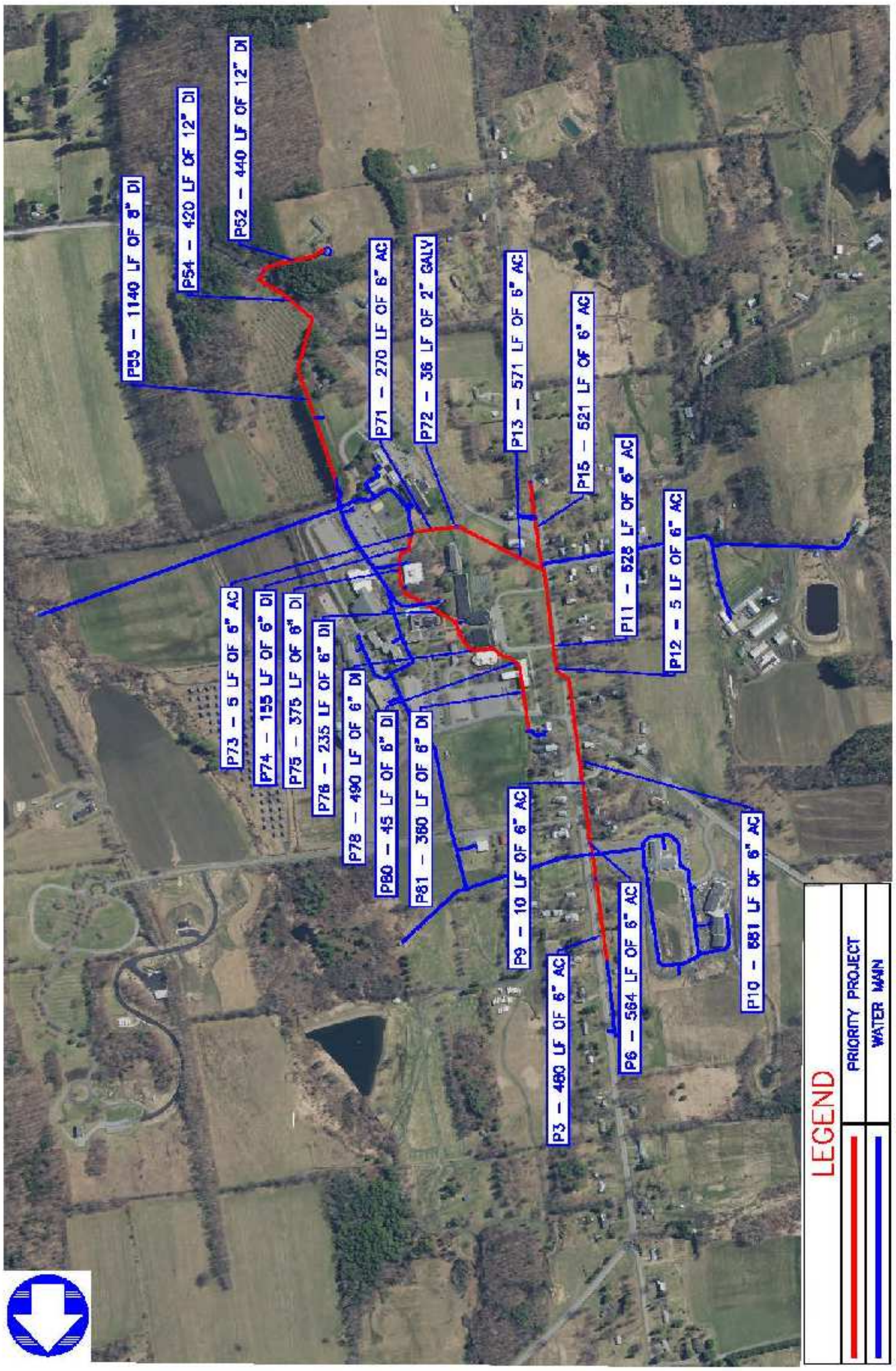


Table 3-4: Water Main Risk Assessment (FD)

Name	Owner	Street	Material	Diameter (Inches)	Year Installed	Age	HW C-Value	Remaining Expected Life	Condition	POF	COF	Redundancy	Risk
P6	FD	VT-66	AC	6	1957	64	150	0	1	5	3	1	15
P10	FD	VT-66	AC	6	1950	71	150	0	1	5	3	1	15
P11	FD	E BETHEL	AC	6	1942	79	150	0	1	5	3	1	15
P13	FD	MV TO V12	AC	6	1942	79	155	0	1	5	3	1	15
P3	FD	VT-66	AC	6	1975	46	150	4	1	5	3	1	15
P15	FD	E BETHEL	AC	6	1972	49	150	1	1	5	3	1	15
P9	FD	VT-66	AC	6	1957	64	0	0	1	5	2	1	10
P12	FD	E BETHEL	AC	6	1942	79	0	0	1	5	2	1	10
P7	FD	PS TO VT-66	PVC	6	1977	44	140	56	5	1	5	1	5
P2	FD	VT-66	DI	3	1994	27	120	73	4	2	2	1	4
P16	FD	E BETHEL	DI	4	1981	40	120	60	4	2	2	1	4
P8	FD	TOM WICKER	PVC	8	2014	7	130	93	5	1	3	1	3
P91	FD	WATER	DI	6	1981	40	130	60	5	1	3	1	3
P27	FD	TOM WICKER	PVC	8	2015	6	130	94	5	1	3	1	3
P28	FD	TOM WICKER	PVC	8	2015	6	130	94	5	1	3	1	3
P29	FD	TOM WICKER	PVC	6	2015	6	130	94	5	1	3	1	3
P1	FD	VT-66	DI	6	1995	26	130	74	5	1	2	1	2
P19	FD	WATER	DI	6	1981	40	0	60	5	1	2	1	2
P4	FD	VT-66	DI	6	1996	25	0	75	5	1	2	1	2
P5	FD	VT-66	DI	6	1996	25	0	75	5	1	2	1	2
P17	FD	WATER	DI	6	1981	40	150	60	5	1	2	1	2
P18	FD	WATER	DI	6	1981	40	0	60	5	1	2	1	2
P19	FD	WATER	DI	6	1981	40	130	60	5	1	2	1	2
P21	FD	FURNACE	DI	6	1993	28	130	72	5	1	2	1	2
P22	FD	FURNACE	DI	4	1993	28	130	72	5	1	2	1	2
P24	FD	TOM WICKER	PVC	6	2015	6	0	94	5	1	2	1	2
P25	FD	TOM WICKER	PVC	8	2015	6	130	94	5	1	2	1	2
P26	FD	TOM WICKER	PVC	6	2015	6	130	94	5	1	2	1	2
P30	FD	TOM WICKER	PVC	6	2015	6	0	94	5	1	2	1	2
P31	FD	TOM WICKER	PVC	6	2015	6	0	94	5	1	2	1	2
P32	FD	TOM WICKER	PVC	6	2015	6	0	94	5	1	2	1	2
P33	FD	TOM WICKER	PVC	6	2015	6	130	94	5	1	2	1	2
P34	FD	TOM WICKER	PVC	6	2015	6	0	94	5	1	2	1	2
P84	FD	E BETHEL	PVC	6	2018	3	0	97	5	1	2	1	2
WS VT-66 1970'S	FD	VT-66	CU	VARIES	1970'S	51	0	0	1	5	3	1	15
WS VT-66 1980'S	FD	VT-66	CU	VARIES	1980'S	41	0	9	2	4	3	1	12
WS VT-66 1990'S	FD	VT-66	CU	VARIES	1990'S	31	0	19	3	3	3	1	9
WS SKI TOW 1970'S	FD	SKI TOW	PE	VARIES	1970'S	51	0	9	2	4	3	1	12
WS SKI TOW 1980'S	FD	SKI TOW	PE	VARIES	1980'S	41	0	19	3	3	3	1	9
WS SKI TOW 2010'S	FD	SKI TOW	PE	VARIES	2010'S	2	0	58	5	1	3	1	3

Table 3-5: Water Main Risk Assessment (VTC)

Name	Owner	Street	Material	Diameter (Inches)	Year Installed	Age	Remaining Expected Useful Life	Condition	POF	COF	Redundancy	Risk
P71	VTC	MOREY	AC	6	1940	81	0	1	5	3	1	15
P74	VTC	HARTNESS	DI	6	1981	40	60	1	5	3	1	15
P75	VTC	HARTNESS	DI	6	1981	40	60	1	5	3	1	15
P76	VTC	MORRILL	DI	6	1971	50	50	1	5	3	1	15
P78	VTC	JUDD	CI	6	1950	71	29	1	5	3	1	15
P80	VTC	OLD DORM	DI	6	1981	40	60	1	5	3	1	15
P81	VTC	OLD DORM	DI	6	2003	18	82	1	5	3	1	15
P52	VTC	TANK	DI	12	1971	50	50	4	2	5	1	10
P54	VTC	TANK	DI	12	1971	50	50	4	2	5	1	10
P55	VTC	ORCHARD PIT	DI	8	1971	50	50	4	2	5	1	10
P72	VTC	METER CHAMBER 2	GALV	2	1968	53	0	1	5	2	1	10
P73	VTC	MOREY	AC	6	1940	81	0	1	5	2	1	10
P48	VTC	PENNY BROOK WELL	DI	4	1971	50	50	4	2	4	1	8
P40	VTC	NUTTING	DI	6	1971	50	50	4	2	3	1	6
P42	VTC	SHAPE	DI	6	1971	50	50	4	2	3	1	6
P45	VTC	AUTOTECH	DI	8	2007	14	86	4	2	3	1	6
P50	VTC	ORCHARD PIT	DI	24	1971	50	50	4	2	3	1	6
P60	VTC	SHAPE	DI	8	1971	50	50	4	2	3	1	6
P61	VTC	SHAPE	DI	8	1971	50	50	4	2	3	1	6
P66	VTC	KEENAN	DI	8	1971	50	50	4	2	3	1	6
P85	VTC	ORCHARD PIT	CI	4	1971	50	50	4	2	3	1	6
P86	VTC	ORCHARD PIT	CI	4	1971	50	50	4	2	3	1	6
P88	VTC	SHAPE	CI	4	1971	50	50	4	2	3	1	6
P41	VTC	NUTTING	DI	6	1971	50	50	4	2	2	1	4
P43	VTC	NUTTING	DI	4	1971	50	50	4	2	2	1	4
P49	VTC	ORCHARD PIT	DI	4	1971	50	50	4	2	2	1	4
P51	VTC	ORCHARD PIT	DI	4	1971	50	50	4	2	2	1	4
P53	VTC	TANK	DI	6	1971	50	50	4	2	2	1	4
P56	VTC	ORCHARD PIT	DI	6	1971	50	50	4	2	2	1	4
P57	VTC	ORCHARD PIT	DI	8	1971	50	50	4	2	2	1	4
P58	VTC	ORCHARD PIT	DI	6	1971	50	50	4	2	2	1	4
P59	VTC	ORCHARD PIT	DI	6	1971	50	50	4	2	2	1	4
P62	VTC	SHAPE	DI	6	1971	50	50	4	2	2	1	4
P63	VTC	MORRILL	DI	6	1971	50	50	4	2	2	1	4
P64	VTC	GREEN	DI	6	1971	50	50	4	2	2	1	4
P65	VTC	MORRILL	DI	6	1971	50	50	4	2	2	1	4
P67	VTC	KEENAN	DI	6	1971	50	50	4	2	2	1	4
P77	VTC	MORRILL	CI	6	1955	66	34	4	2	2	1	4
P87	VTC	SHAPE	CI	4	1971	50	50	4	2	2	1	4
P89	VTC	SHAPE	CI	3	1971	50	50	4	2	2	1	4
P20	VTC	Valve Vault to VTC Mtr. Vault	DI	6	1993	28	72	5	1	3	1	3
P36	VTC	FACILITIES	DI	6	1994	27	73	5	1	3	1	3
P69	VTC	MOREY	DI	4	1981	40	60	5	1	3	1	3
P37	VTC	FACILITIES	DI	6	1972	49	51	5	1	2	1	2
P39	VTC	FACILITIES	DI	4	1972	49	51	5	1	2	1	2
P44	VTC	SHAPE	DI	6	1990	31	69	5	1	2	1	2
P46	VTC	AUTOTECH	DI	6	2007	14	86	5	1	2	1	2
P47	VTC	AUTOTECH	DI	6	2007	14	86	5	1	2	1	2
P68	VTC	KEENAN	DI	4	1981	40	60	5	1	2	1	2
P70	VTC	MOREY	DI	4	1981	40	60	5	1	2	1	2
P79	VTC	CONANT	DI	6	1981	40	60	5	1	2	1	2
P82	VTC	OLD DORM	DI	6	2003	18	82	5	1	2	1	2
P83	VTC	OLD DORM	DI	4	2003	18	82	5	1	2	1	2
P90	VTC	SHAPE	CI	6	1994	27	73	5	1	2	1	2
P92	VTC	VAEL	DI	6	2019	2	98	5	1	2	1	2
P93	VTC	VAEL	DI	6	2019	2	98	5	1	2	1	2
P94	VTC	VAEL	DI	6	2019	2	98	5	1	2	1	2
P95	VTC	VAEL	DI	6	2019	2	98	5	1	2	1	2
P96	VTC	FIRE TOWER	PVC	6	2005	16	84	5	1	2	1	2
P38	VTC	FACILITIES	DI	6	1972	49	51	5	1	1	1	1

Table 3-6: Vaults, Sources, and Tanks Risk Assessment (VTC and FD)

Name	Owner	Location	Asset	Status	Installed	Condition	POF	COF	Redund	Risk	REUL
PH	FD	Pump House	Pump House	Active		3	3	4	1	12	10
PS1	FD	Pump House	Building	Active	1979	3	3	4	0.5	6	10
PS12	FD	Pump House	Chemical pump	Active	2015	4	2	4	0.5	4	10
PS13	FD	Pump House	Pump	Active	2020	5	1	4	0.5	2	20
PS14	FD	Pump House	Pump	Active	2020	5	1	4	0.5	2	20
PS15	FD	Pump House	Flow meter	Active	2017	4	2	2	0.75	3	10
PS16	FD	Pump House	Process piping, fittings, and valves	Active	2021	5	1	4	0.75	3	10
WT	VTC	Water Tank	Water Tank	Active	1970	4	2	5	1	10	10
WT1	VTC	Water Tank	Tower Tank	Active	1970	4	2	4	1	8	
WT12	VTC	Water Tank	Control panel	Active	1970	4	2	4	1	8	
M2	VTC	Meter Chamber #2	Vault	Active	1981	2	4	2	1	8	10
M22	VTC	Meter Chamber #2	Check valve	Active	1981	2	4	2	1	8	10
M23	VTC	Meter Chamber #2	Flow meter	Active	1981	3	3	2	1	6	10
M24	VTC	Meter Chamber #2	Flow meter	Active	1981	3	3	2	1	6	10
PBW	VTC	Penny Brook Well & Vault	Well and Vault	Active	1971	4	2	4	0.7	5.6	10
WP1	VTC	Penny Brook Well	Vault	Active		4	2	3	0.5	3	
WP2	VTC	Penny Brook Well	Electronic control	Active		4	2	4	0.5	4	
WP3	VTC	Penny Brook Well	Well head	Active		4	2	3	0.5	3	
M1	VTC	Meter Chamber #1	Vault	Active		2	4	1	1	4	
M12	VTC	Meter Chamber #1	Flow meter	Active		3	3	1	1	3	
M13	VTC	Meter Chamber #1	Flow meter	Active		3	3	1	1	3	
M14	VTC	Meter Chamber #1	Valve	Active		4	2	1	1	2	
CV1	FD	Connection Vault	Vault	Active	1995	4	2	2	1	4	25
HW	VTC	Hartness Well Vault	Well and Vault	Inactive	1950	1	5	1	0.4	2	
WH1	VTC	Hartness Well Vault	Vault	Inactive		2	4	1	0.5	2	
WH2	VTC	Hartness Well Vault	Flow meter	Inactive		1	5	1	0.5	2.5	
KW	VTC	Keenan Well Vault	Well and Vault	Inactive	1950	1	5	1	0.4	2	
WK1	VTC	Keenan Well Vault	Vault	Inactive		1	5	1	0.5	2.5	
WK2	VTC	Keenan Well Vault	Flow meter	Inactive		1	5	1	0.5	2.5	
OP	VTC	Orchard Treatment Vault	Treatment Vault	Active	1968	4	2	1	1	2	10
OP1	VTC	Orchard Vault	Vault	Active		4	2	1	1	2	
OP2	VTC	Orchard Vault	Chemical pump	Active		4	2	1	0.5	1	
OP3	VTC	Orchard Vault	Flow meter	Active	1968	4	2	1	1	2	10
SS1	FD	Spring House	Spring	Active	1942	4	2	2	0.4	1.6	20
SS2	FD	Spring piping	Piping	Active	2018	5	1	2	1	2	

3.4 Risk and Life Cycle Cost Reduction Measures

In general, risk and life cycle cost reduction measures focus on the highest risk assets, with capital planning developed to implement improvements and reduce the risks. However, other risk and cost reduction measures include activities such as updating policies and ordinances as well as following proactive maintenance procedures. Information on these topics is provided below. Capital Planning is presented separately in Section 4.

There is an existing Agreement between VTC and FD1 dated 1967, which is included in the Appendix. The agreement should be reviewed and revised as necessary to reflect current status and policies. The Fire District has a Water Ordinance effective May 21, 2014. This document should be reviewed and updated periodically.
Development of an adequate Operation and Maintenance (O&M) schedule is critical to maximizing the useful life of water system assets. If proper maintenance is not carried

out, premature asset failure can occur resulting in increased costs and expensive replacement projects required before an asset's expected useful life is reached.

There is an existing O&M manual for the FD water systems, dated December 1, 2007. A comprehensive O&M manual should be developed to include both VTC and FD1 systems.

Table 3-7 provides recommended schedules for O&M grouped by asset type.

Table 3-7: Schedules for O&M of Asset Types

Item Type	Task	Owner	Schedule	Reason
Water Pipes	Walk pipe sections to identify leaks	FD/VTC	Annual	Maintain water quality
	Review water supply records and usage data		Annual	Estimate system leakage
Hydrants	Flushing	FD/VTC	Bi-annual	Assure hydrant function; clean water mains
Valves	Exercise and turn-counting	FD/VTC	Annual	Assure valve function
Storage	Interior inspection	VTC	As required by Operating Permit	Monitor condition
	Exterior inspection		Continuous	Monitor condition
Water Treatment	Inspection of treatment equipment	FD/VTC	Continuous	Assure proper function; minimize chance of chemical leaks
Pumping	Inspect pump operation	FD	Continuous	Maintain pump efficiency
	Operation service by Technician	FD	Annual	Optimize pump efficiency and reduce electrical costs

4 CAPITAL IMPROVEMENT PLAN

4.1 Cost Estimates

Preliminary construction costs for addressing high risk assets have been prepared to form the basis for the budgeting and developing a capital improvement plan for the water system improvement projects. **Table 4-1** presents the construction costs for these projects. The estimated remaining useful life is also shown, as this should be considered when planning for the project scheduling and implementation. For example, ductile iron and cast iron water mains have significant life remaining and do not require replacement even though high risk. The exception would be any mains that are confirmed to be hydraulically deficient.

The water main projects include replacement of all valves, hydrants and curb stops in the project area.

Table 4-1: High Risk Assets Replacement Costs and Replacement Schedule for Short-Term Projects

Project Description		Remaining Expected Useful Life	Estimated Construction Costs		Condition	POF	COF	Risk	Replacement Year (Short Term Replacement Projects)
			VTC Assets	FD Assets					
Replace Water Tank		10	$ 2,100,000		4	2	5	10	2031
Replace Pump House		10		$ 68,000	3	3	4	12	2031
Pipe Replacements:									
P71, P 73 - 275 LF of 6" AC	**Morey**	**0**	**$ 62,000**		**1**	**5**	**3**	**15**	**2025**
P72 - 36 LF of 2" Galv	**Meter Chamber 2**	**0**	**$ 8,000**		**1**	**5**	**2**	**10**	**2025**
P74 - 155 LF of 6" DI	Hartness	60	$ 35,000		1	5	2	10	N/A
P75 - 375 LF of 6" DI	Harness	60	$ 84,000		1	5	3	15	N/A
P76 - 235 LF of 6" DI	Morrill	50	$ 54,000		1	5	3	15	N/A
P78 - 490 LF of 6" CI	Judd	29	$ 110,000		1	5	3	15	N/A
P80 - 45 LF of 6" DI	Old Dorm	60	$ 10,000		1	5	3	15	N/A
P81 - 360 LF of 6" DI	Old Dorm	82	$ 82,000		1	5	3	15	N/A
P52 - 440 LF of 12" DI	Tank transmission	50	$ 111,000		1	2	3	10	N/A
P54 - 420 LF of 12" DI	Tank transmission	50	$ 106,000		1	2	5	10	N/A
P55 - 1140 LF of 8" DI	Orchard Pit	50	$ 257,000		1	2	5	10	N/A
P6, P9 - 574 LF of 6" AC	**Rte 66**	**0**		**$ 129,000**	**1**	**5**	**3**	**15**	**2025**
P10 - 681 LF of 6" AC	**Rte 66**	**0**		**$ 154,000**	**1**	**5**	**3**	**15**	**2025**
P3 - 480 LF of 6" AC	**Rte 66**	**4**		**$ 108,000**	**1**	**5**	**3**	**15**	**2025**
P13 - 571 LF of 6" AC	**From Meter Vault**	**0**		**$ 129,000**	**1**	**5**	**3**	**15**	**2025**
P11, P12 - 633 LF of 6" AC	**E Bethel**	**0**		**$ 142,000**	**1**	**5**	**3**	**15**	**2025**
P15 - 521 LF of 6" AC	**E Bethel**	**1**		**$ 118,000**	**1**	**5**	**3**	**15**	**2025**
Total Pipe **Short Term Project Replacements**			$ 70,000	$ 780,000					

Notes:

1. The prices are based on manufacturers' quotes, RS Means pricing and bid tabulations for recent projects.
2. The estimates are made without the benefit of final design and actual costs may vary substantially.
3. Estimates for water main are based on a unit price of $225/ft for replacing piping with 8-inch diameter water main including hydrants, valve, services and pavement restoration.
4. The water storage tank estimate is based on a February 2020 quote of $1,700,000 from Statewide Aquastore for a 300,000 gallon glass fused to steel composite elevated storage

tank. An allowance of approximate $125,000 is included for demolition, minimal sitework, fencing, electrical/instrumentation and appurtenances and a 15% is added for contractor overhead and profit.

5. The pump station replacement cost includes a new below grade vault and new 10' x 10' wood frame building with reuse of the existing pumps.

The replacement costs for all assets are included in the Appendix, with a table each for Fire District mains, hydrants, valves, curb stops, and services, VTC mains, hydrants, and valves and other RCWS assets consisting of source, storage, metering and treatment components. The replacement costs in the tables are construction costs in the year 2020. Planning for improvement projects and developing budgets will require updating the construction costs to reflect prices at the time of planned construction and including of estimated project development costs for engineering design, contingencies and administrative costs. Project development costs are normally estimated as a percentage of construction cost. Typical values of these percentages are 23% for engineering, 15-25% for contingencies and 2% for legal/fiscal and administrative costs.

In addition to projects to improve existing assets, the Fire District and VTC have identified the need to plan for future source improvements. The following cost information is provided for future planning of source improvements:

1. The AMP project included developing a scope of work and cost estimates for assessing the spring yield by Lincoln Applied Geology. The scope with an estimate of approximately $60,000 for the work is included in the Appendix.

2. The cost for a new well source of supply is roughly estimated at $350,000-$600,000. There are many factors that influence well development and construction costs, such as existing and proposed access, power, treatment and monitoring characteristics. Therefore, this estimate should not be used for developing budgets. The source development process is necessary to determine a potential well site and estimate the cost for well construction.

3. VTC has existing wells that are not active due to water quality issues. The cost of implementing treatment varies substantially depending on the type of treatment required and the existing site characteristics. The cost for treatment including a building could be in the range of $300,00-$400,000. This estimate should not be used for developing budgets as it is unreliable without a detailed review of treatment requirements and a conceptual design.

4.2 Funding Strategies

Most water systems do not have the funds to finance the improvements locally and take on long-term debt to finance proposed infrastructure improvements. Alternatives for funding include:

- Vermont Municipal Bond Bank
- Drinking Water State Revolving Fund (DWSRF) program
- United States Department of Agriculture Rural Development (RD) water and wastewater grant/loan program.

The concepts and customer costs outlined in this section represent an interpretation of these different program requirements and should not be considered a guarantee of a grant/loan offer.

4.2.1 Municipal Bond Bank

The Vermont Municipal Bond Bank (VMBB) is a way to access low cost financing through the national municipal bond markets, usually for a maximum term of 30 years and interest rates around 3.5%. The VMBB does not charge an application fee or on-going loan fees and covers all costs associated with issuing the bond with the exception of the costs associated with the municipality's local bond counsel and the required accountant's financial statements.

When deciding if funding through VMBB is the best option for your system, it is important to understand that VMBB requires that municipalities obtain:

- legal opinions and loan documents generated by a preapproved bond counselor
- successful bond vote in compliance with Vermont statutes
- audit of the most recent fiscal year by a certified accountant

Financing with other funding programs will also involve the VMBB for interim financing.

4.2.2 Drinking Water State Revolving Fund (DWSRF)

The U.S. Environmental Protection Agency and the Vermont Agency of Natural Resources have developed a program to help local communities fund water projects. The DWSRF program offers low interest subsidized loans for projects that work to construct, upgrade or refurbish waterworks facilities.

The DWSRF program uses American Community Survey income data to evaluate affordability. In the absence of other MHI data for the water system, which could be obtained by an income survey, the funding agency will use data for the Town of Randolph. The 2017 Median Household Income (MHI) for Randolph is $55,882. Compared to the State MHI of $57,808, the Town is not classified as disadvantaged for the purpose of loan eligibility. The DWSRF program updates the MHI data every year and will be using the ACS 2018 data for the 2020 funding determinations.

The DWSRF loan interest rate and term are set after an evaluation of the project costs on the typical user or Equivalent Resident Unit (ERU). The DWSRF criteria is that the annual water system costs per ERU is at 1% of the MHI. The costs include all costs for operation/maintenance as well as principal and interest repayment costs for both existing and new debt.

Under the DWSRF program, the term is first adjusted from 20 years up to 30 years to attempt to reduce the water rate to the "target" level and if the resultant water rate is still above the "target water rate", the interest rate can be adjusted from 3% down to as little as 0%. Additional principal forgiveness may be an option to develop an affordable project.

4.2.3 USDA Rural Development

The United States Department of Agriculture (USDA) administers a loan and/or grant program for small communities to complete infrastructure improvement projects for drinking water, sanitary sewer, storm sewer, and solid waste collection.

The program disburses funds for projects based on a priority basis, which is determined by RD during the application process. Grant and loan eligibility criteria includes a target annual rate for a typical residential household (210 gpd consumption) of 1.5% of the MHI.

RD also uses MHI data from the 2010 American Community Survey, which lists the MHI as $49,226 and the State MHI as $55,307. Based on this comparison, it appears the system is eligible for grant funding.

Grant funds when available are disbursed on a graduated scale with applicants from small communities with low median household incomes receiving a higher percentage of grant funds. Grants generally range from 25% to 45% with the RD program. Receipt of additional grant funds from other sources reduces the RD grant amount and not the loan amount.

Low interest federally subsidized loans are available through RD loan funding and vary based on the household income of the community. RD does offer Vermont communities the option of finance terms up to 40 years for water projects. The three categories of loans available are as follows:

- Market Rate: 2.25% interest rate if the Median Household Income (MHI) equals or exceeds the current State non-metropolitan MHI.
- Intermediate Rate: 1.75% interest rate if the service area MHI is below the State MHI.
- Poverty Rate: 1.375% interest rate if the service area MHI is less than 80% of the State MHI and the project is needed to meet health or sanitary standards.

4.3 Cost Projections and Rate Effects

The Fire District has an operating budget as is standard practice for a water system. The VTC water operations does not include an income and expense-based budget as the VTC users are not directly paying for water. Instead, VTC carries a line item in the budget for $10,000 to cover contracted services. The costs for operation and maintenance of VTC water assets by VTC staff is not tracked separately from other VTC operations costs.

There are two budget projections developed within this section. The first scenario is based on current conditions. These budget projections are developed in **Table 4-2** for the Fire District only since VTC does not have a budget for their components of the water system.

To evaluate water rate adjustments necessary to fund the recommended improvements for the Fire District, we have assessed future expenses including long-term debt. The funding strategies reviewed herein are based on a $435,000 project to replace a portion of the aging 6" AC infrastructure. This is an example, and the Fire District may choose to fund a larger or smaller project, depending on the favorability of funding and local budgets. Other projects on the CIP list would be funded using the same strategy, with rates adjusted as necessary to provide sufficient revenue to repay construction loans.

We have projected the expenses for the Fire District water fund based on the 2020 budget and inflating expenses related to operation/maintenance items and administrative items at 3% per year. The proposed capital improvements are not anticipated to result in significant additional operating costs and the annual operating costs are anticipated to increase similar to the rate of inflation at about 3% per year.

Currently there is no existing debt cost. We have shown the annual cost of future debt based on a level payment plan that includes both interest and principal. The analysis was prepared assuming RD funding for the projects to address high risk asset replacement. The DWSRF program would have similar rate effects.

Table 4-2: Water Rate and Revenue Projections

WATER RATE AND REVENUE PROJECTIONS
RANDOLPH CENTER WATER SYSTEM - FIRE DISTRICT #1

		CURRENT BUDGET	PROPOSED BUDGET									
EXPENSE ITEM	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
O&M Costs		$31,415	$31,500	$32,445	$33,418	$34,421	$35,454	$36,517	$37,613	$38,741	$39,903	$41,100
Capital Costs:												
Capital Purchases												
Debt Service												
Annual Cost New Debt					$9,134	$9,134	$9,134	$9,134	$9,134	$9,134	$9,134	$9,134
Capital reserve contribution		$8,500	$8,500	$8,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500
Total Expenses		$39,915	$40,000	$40,945	$45,052	$46,055	$47,087	$48,151	$49,247	$50,375	$51,537	$52,734
Revenue for O&M and Existing Debt		$40,380	$40,000	$40,945	$35,918	$36,921	$37,954	$39,017	$40,113	$41,241	$42,403	$43,600
Additional Revenue for New Debt					$9,134	$9,134	$9,134	$9,134	$9,134	$9,134	$9,134	$9,134
Total Revenue		$40,380	$40,000	$40,945	$45,052	$46,055	$47,087	$48,151	$49,247	$50,375	$51,537	$52,734
% Rate Increase					10.0%							
Capital Reserve Acct Balance	$27,875	$36,375	$44,875	$53,375	$55,875	$58,375	$60,875	$63,375	$65,875	$68,375	$70,875	$73,375

Notes:
1. Values for 2020 are from the Fire District Annual Plan
2. O&M Costs are inflated at 3% per year. The inflation requires increasing revenue through rate increases unless the capital reserve contribution is decreased.
3. Cost of New Debt is based on a total project cost of $435,000, a 55% RD loan with a 2.25% interest rate and a term of 40 years, and a 45% grant.
4. The existing rate is approximately $400/yr for a typical user (210 gpd). A 10% rate increase corresponds to $440/yr.

4.3.1 FUTURE BUDGET PROJECTIONS

The Fire District has identified that they are operating with a budget that is based on volunteer efforts which reduce their expenses compared to a typical water system. They request a funding scenario that includes a non-volunteer O&M budget and revenue from the FD1 and VTC as separate contributions.

O&M budgets depend on the size and type of infrastructure within a water system. A value of $75,000 was assigned as an estimate for a non-volunteer O&M budget for a small system with minimal treatment requirements. The budget is included in a second budget scenario, shown in Table 4-3, which projects costs for a 20-year period.

Within the next 20 years, water main replacement is expected to replace AC pipes within the Fire District limits and on the VTC campus and to replace a short section of 2" galvanized steel pipe owned by VTC. The total construction cost of these water main replacements is estimated at $850,000 with a total project cost of $1,435,000 in 2025. Repayment of a loan for the water main project is shown in the year 2026 at about $28,000 per year. This is only an estimate and actual repayment amount will depend on available funding.

A second construction project is shown within the next 20 years for replacement of the VTC water tank. The construction cost of the tank replacement was estimated at $2,100,000 in 2021. Including 10 years of inflation and project development costs, the total project cost is estimated at $4.2 Million in 2031. Repayment of a loan, starting in 2032, is an additional cost of $81,000 per year for a total debt of about $108,000 per year.

Currently, the FD1 rate is $400 per year for a customer with an average usage of 210 gpd. If the FD1 rate increased to the target rate of 1% of the Median Household Income for Randolph Town, the rate would be $550 per year, an increase of 37.5%.

The 2020 FD1 budget was approximately $40,000 per year. If the rates are increased by 37.5%, this would translate to an increased revenue of $55,000 per year for the Fire District. The balance of the revenue, above that generated from Fire District customers, would be from VTC in order to balance the budget. The amount of rate increase for the Fire District customers and the details of the allocation of revenue between FD1 and VTC is an internal decision of the water system management and therefore is not shown in **Table 4-3**.

Table 4-3: Theoretical Future Budget 20 Year Plan

THEORETICAL 20 YEAR PROJECTION
WATER RATE AND REVENUE PROJECTIONS
RANDOLPH CENTER WATER SYSTEM

EXPENSE ITEM	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
O&M Costs	$75,000	$77,250	$79,568	$81,955	$84,413	$86,946	$89,554	$92,241	$95,008	$97,858	$100,794	$103,818	$106,932	$110,140	$113,444	$116,848	$120,353	$123,964	$127,682	$131,513
Capital Costs:																				
Capital Purchases										$91,500										
Debt Service																				
Annual Cost New Debt					**$27,602**	$27,602	$27,602	$27,602	$27,602	$27,602	**$108,387**	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387
Capital reserve contribution	$10,000	$10,300	$10,609	$10,927	$11,255	$11,593	$11,941	$12,299	$12,668	$13,048	$13,439	$13,842	$14,258	$14,685	$15,126	$15,580	$16,047	$16,528	$17,024	$17,535
Total Expenses	$85,000	$87,550	$90,177	$92,882	$123,270	$126,140	$129,096	$132,141	$135,277	$230,007	$222,620	$226,047	$229,577	$233,213	$236,957	$240,814	$244,787	$248,879	$253,094	$257,435
Revenue for O&M, Capital and Reserve	$85,000	$87,550	$90,177	$92,882	$95,668	$98,538	$101,494	$104,539	$107,675	$202,406	$114,233	$117,660	$121,190	$124,825	$128,570	$132,427	$136,400	$140,492	$144,707	$149,048
Additional Revenue for New Debt		$27,602	$0	$0	$27,602	$27,602	$27,602	$27,602	$27,602	$27,602	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387	$108,387
Total Revenue Required	$85,000	$115,152	$90,177	$92,882	$123,270	$126,140	$129,096	$132,141	$135,277	$230,007	$222,620	$226,047	$229,577	$233,213	$236,957	$240,814	$244,787	$248,879	$253,094	$257,435
Capital Reserve Acct Balance	$10,000	$20,300	$30,909	$41,836	$53,091	$64,684	$76,625	$88,923	$101,591	$23,139	$36,578	$50,420	$64,678	$79,363	$94,489	$110,069	$126,116	$142,644	$159,669	$177,204

Notes:

1. The O&M Cost 2022 amount is not from the existing FD1 and VTC budgets. The amount is an increase from the existing budgets, considering the operating budgets for a few other small systems as well as the volunteer nature of the FD1 operations and the limited O&M expense tracking by VTC, which both contribute to budgets that are atypically low.
2. O&M Costs and Capital Reserve contributions are inflated at 3% per year.
3. Cost of New Debt is based on a total project cost of $1,435,000 in 2025 and a total project cost of $4,200,000 in 2031, a 55% RD loan with a 1.75% interest rate and a term of 40 years, and a 45% grant.
4. The capital purchase in 2031 is for the FD1 pump station replacement, using a 3% inflation factor from the 2021 construction cost estimate of $68,000.

4.3.2 Reserve Budgeting for Rehabilitations and Replacements

The Life Cycle Cost Analysis section of this AMP discusses strategies and tools for implementation LCCA. The basic method of developing an annual reserve for future rehabilitation and replacement projects, described previously, should be followed to adequately plan for future expenditures. Without establishing and contributing to a reserve fund, there will not be adequate funds to address failing and deficient assets.

The EPA Example for Small Systems shows the method of determining required reserve amounts by dividing projected replacement costs by the number of years until the project occurs. The water system may not initially be able to contribute an amount that equals the total reserve amount, but this system can establish budget goals and a basis for pursuing funding for projects that cannot be paid for out of the reserve account.

Table 4-4 is a list of the calculated Annual Reserve amounts for all of the system's assets, with these exceptions: 1) inactive assets and 2) assets that are identified to be replaced under Short Term Replacement Projects. Table 4-4 is organized with the water mains listed first, in alphabetical order, in two groups for the VTC and FD assets. The two water main groups of assets are followed by the other assets consisting of vaults, meters, storage and source facilities. The system's valves, curb stops, services and hydrants are not included in Table 4-4 since the water main replacement costs include replacement of these items.

The total annual reserves shown in Table 4-4 are summarized below:

- $51,900 annual reserve to fund future replacement of VTC pipes
- $20,500 annual reserve to fund future replacement of FD pipes
- $20,500 annual reserve to fund future replacement of other VTC assets
- $2,900 annual reserve to fund future replacement of other FD assets

As noted above, a water system may not have enough revenue to contribute reserves amounts that match the total calculated requirements. The calculated reserves are provided for the water system's use in establishing budgets based on their existing and estimated future revenue. The theoretical budget shown in Table 4-3 has a reserve amount of only $10,000.

Table 4-4: Annual Reserve Calculations

Name	Owner	Street	Length	Material	Size	Installed Year	Replacement Year	Replacement Cost	Years to Replace	Annual Reserve
P46	VTC	AUTOTECH	47	DI	6	2007	2107	$10,495	86	$122
P47	VTC	AUTOTECH	8	DI	6	2007	2107	$1,717	86	$20
P45	VTC	AUTOTECH	366	DI	8	2007	2107	$82,404	86	$958
P79	VTC	CONANT	5	DI	6	1981	2081	$1,200	60	$20
P39	VTC	FACILITIES	84	DI	4	1972	2072	$18,951	51	$372
P37	VTC	FACILITIES	368	DI	6	1972	2072	$82,908	51	$1,626
P38	VTC	FACILITIES	12	DI	6	1972	2072	$2,776	51	$54
P36	VTC	FACILITIES	34	DI	6	1994	2094	$7,674	73	$105
P96	VTC	FIRE TOWER	850	DI	6	2005	2105	$191,250	84	$2,277
P64	VTC	GREEN	5	DI	6	1971	2071	$1,088	50	$22
P74	VTC	HARTNESS	153	DI	6	1981	2081	$34,317	60	$572
P75	VTC	HARTNESS	373	DI	6	1981	2081	$83,958	60	$1,399
P78	VTC	JUDD	487	CI	6	1950	2050	$109,572	29	$3,778
P68	VTC	KEENAN	194	DI	4	1981	2081	$43,743	60	$729
P67	VTC	KEENAN	7	DI	6	1971	2071	$1,546	50	$31
P66	VTC	KEENAN	221	DI	8	1971	2071	$49,694	50	$994
P72	VTC	METER CHAMBER 2	36	GALV	2	1968	2021	$8,100		
P69	VTC	MOREY	401	DI	4	1981	2081	$90,137	60	$1,502
P70	VTC	MOREY	42	DI	4	1981	2081	$9,402	60	$157
P71	VTC	MOREY	270	AC	6	1940	2021	$60,733		
P73	VTC	MOREY	5	AC	6	1940	2021	$1,147		
P77	VTC	MORRILL	19	CI	6	1955	2055	$4,248	34	$125
P76	VTC	MORRILL	236	DI	6	1971	2071	$53,161	50	$1,063
P63	VTC	MORRILL	2	DI	6	1971	2071	$557	50	$11
P65	VTC	MORRILL	8	DI	6	1971	2071	$1,734	50	$35
P43	VTC	NUTTING	62	DI	4	1971	2071	$13,925	50	$278
P40	VTC	NUTTING	149	DI	6	1971	2071	$33,446	50	$669
P41	VTC	NUTTING	9	DI	6	1971	2071	$2,096	50	$42
P83	VTC	OLD DORM	104	DI	4	2003	2103	$23,362	82	$285
P80	VTC	OLD DORM	44	DI	6	1981	2081	$9,821	60	$164
P81	VTC	OLD DORM	362	DI	6	2003	2103	$81,429	82	$993
P82	VTC	OLD DORM	3	DI	6	2003	2103	$570	82	$7
P49	VTC	ORCHARD PIT	11	DI	4	1971	2071	$2,559	50	$51
P51	VTC	ORCHARD PIT	6	DI	4	1971	2071	$1,278	50	$26
P85	VTC	ORCHARD PIT	21	CI	4	1971	2071	$4,743	50	$95
P86	VTC	ORCHARD PIT	282	CI	4	1971	2071	$63,433	50	$1,269
P58	VTC	ORCHARD PIT	53	DI	6	1971	2071	$11,900	50	$238
P56	VTC	ORCHARD PIT	14	DI	6	1971	2071	$3,052	50	$61
P59	VTC	ORCHARD PIT	13	DI	6	1971	2071	$2,843	50	$57
P55	VTC	ORCHARD PIT	1138	DI	8	1971	2071	$256,062	50	$5,121
P57	VTC	ORCHARD PIT	10	DI	8	1971	2071	$2,233	50	$45
P50	VTC	ORCHARD PIT	83	DI	24	1971	2071	$24,136	50	$483
P48	VTC	PENNY BROOK WELL	1954	DI	4	1971	2071	$439,746	50	$8,795
P89	VTC	SHAPE	7	CI	3	1971	2071	$1,601	50	$32
P87	VTC	SHAPE	7	CI	4	1971	2071	$1,604	50	$32
P88	VTC	SHAPE	398	CI	4	1971	2071	$89,443	50	$1,789
P42	VTC	SHAPE	298	DI	6	1971	2071	$67,043	50	$1,341
P62	VTC	SHAPE	13	DI	6	1971	2071	$3,006	50	$60
P44	VTC	SHAPE	44	DI	6	1990	2090	$9,941	69	$144
P90	VTC	SHAPE	56	CI	6	1994	2094	$12,614	73	$173
P61	VTC	SHAPE	688	DI	8	1971	2071	$154,814	50	$3,096
P60	VTC	SHAPE	225	DI	8	1971	2071	$50,645	50	$1,013
P53	VTC	TANK	4	DI	6	1971	2071	$1,006	50	$20
P52	VTC	TANK	442	DI	12	1971	2071	$110,377	50	$2,208
P54	VTC	TANK	421	DI	12	1971	2071	$105,314	50	$2,106
P92	VTC	VAEL	560	DI	6	2019	2119	$126,000	98	$1,286
P93	VTC	VAEL	154	DI	6	2019	2119	$34,650	98	$354
P94	VTC	VAEL	40	DI	6	2019	2119	$9,000	98	$92
P95	VTC	VAEL	16	DI	6	2019	2119	$3,600	98	$37
P20	VTC	Valve Vault to VTC Mtr. Vault	1111	DI	6	1993	2093	$249,867	72	$3,470
					TOTAL ANNUAL RESERVE FOR VTC PIPE REPLACEMENT					$51,902

Table 4-4: Annual Reserve Calculations

Name	Owner	Street	Length	Material	Size	Installed Year	Replacement Year	Replacement Cost	Years to Replace	Annual Reserve
P16	FD	E BETHEL	95	DI	4	1981	2081	$21,267	60	$354
P11	FD	E BETHEL	628	AC	6	1942	2021	$141,276		
P12	FD	E BETHEL	5	AC	6	1942	2021	$1,115		
P15	FD	E BETHEL	521	AC	6	1972	2022	$117,124		
P84	FD	E BETHEL	7	PVC	6	2018	2118	$1,670	97	$17
P22	FD	FURNACE	18	DI	4	1993	2093	$3,987	72	$55
P21	FD	FURNACE	140	DI	6	1993	2093	$31,473	72	$437
P13	FD	MV TO V12	571	AC	6	1942	2021	$128,438		
P7	FD	PS TO VT-66	1274	PVC	6	1977	2077	$286,744	56	$5,120
P26	FD	TOM WICKER	60	PVC	6	2015	2115	$13,551	94	$144
P29	FD	TOM WICKER	32	PVC	6	2015	2115	$7,296	94	$78
P33	FD	TOM WICKER	86	PVC	6	2015	2115	$19,240	94	$205
P24	FD	TOM WICKER	14	PVC	6	2015	2115	$3,096	94	$33
P30	FD	TOM WICKER	12	PVC	6	2015	2115	$2,664	94	$28
P31	FD	TOM WICKER	11	PVC	6	2015	2115	$2,496	94	$27
P32	FD	TOM WICKER	10	PVC	6	2015	2115	$2,355	94	$25
P34	FD	TOM WICKER	16	PVC	6	2015	2115	$3,573	94	$38
P8	FD	TOM WICKER	310	PVC	8	2014	2114	$69,746	93	$750
P23	G	TOM WICKER	799	PVC	8	2015	2115	$179,752	94	$1,912
P25	FD	TOM WICKER	4	PVC	8	2015	2115	$991	94	$11
P27	FD	TOM WICKER	141	PVC	8	2015	2115	$31,681	94	$337
P28	FD	TOM WICKER	974	PVC	8	2015	2115	$219,076	94	$2,331
P2	FD	VT-66	46	DI	3	1994	2094	$8,005	73	$110
P10	FD	VT-66	681	AC	6	1950	2021	$153,214		
P6	FD	VT-66	564	AC	6	1957	2021	$126,825		
P9	FD	VT-66	10	AC	6	1957	2021	$2,271		
P3	FD	VT-66	480	AC	6	1975	2025	$107,950		
P1	FD	VT-66	451	DI	6	1995	2095	$78,881	74	$1,066
P4	FD	VT-66	15	DI	6	1996	2096	$3,391	75	$45
P5	FD	VT-66	6	DI	6	1996	2096	$1,366	75	$18
P19	FD	WATER	546	DI	6	1981	2081	$122,898	60	$2,048
P91	FD	WATER	413	DI	6	1981	2081	$92,925	60	$1,549
P17	FD	WATER	982	DI	6	1981	2081	$220,950	60	$3,683
P18	FD	WATER	4	DI	6	1981	2081	$922	60	$15
P19	FD	WATER	10	DI	6	1981	2081	$2,192	60	$37
						TOTAL ANNUAL RESERVE FOR FD PIPE REPLACEMENT				**$20,473**
OP	VTC	Orchard Treatment Vault				1968	2041	$20,000	20	$1,000
PBW	VTC	Penny Brook Well & Vault				1971	2041	$350,000	20	$17,500
M1	VTC	Meter Chamber #1					2041	$20,000	20	$1,000
M2	VTC	Meter Chamber #2				1981	2041	$20,000	20	$1,000
WT	VTC	Water Tank				1971	2031	$2,100,000	10	
						TOTAL ANNUAL RESERVE FOR VTC OTHER ASSETS				**$20,500**
SS1	FD	Spring House				1979	2041	$50,000	20	$2,500
PH	FD	Pump House				1979	2031	$68,000	10	
CV1	FD	Connection Vault				1995	2046	$10,000	25	$400
						TOTAL ANNUAL RESERVE FOR FD OTHER ASSETS				**$2,900**

Notes:

The pipe databases are sorted by street, size and year. Not all pipe on a street has the same characteristic.

Shaded assets are Short Term Replacement Projects and not included in the Annual Reserve calculation.

5 ASSET MANAGEMENT TEAM AND LEVEL OF SERVICE GOALS

5.1 Asset Management Team

Vermont Technical College maintains a permanent maintenance staff which provides day-to-day operation of the water system. The Fire District is currently operated by volunteer staff and with contracted third-party operators.

The Asset Management Team consists of individuals who coordinate and implement the AMP. The Team does not need to include all representatives of the water system management and operating staff. However, the Randolph Center Water System Asset Management Team should include at least one representative from the Fire District and one representative from Vermont Technical College, since these two entities individually own the water system assets.

The Asset Management Team was developed with input from the water system representatives and consists of the team members listed below.

Table 5-1: Asset Management Team

Name	Title	Duties	Role and Qualifications
John Lens	System Manager, FD1	Committee Chair	• Knowledge of the current state of water system assets. • Ability to describe the costs and benefits of changes to infrastructure assets. • Experience with the current capital improvement plan and the operations and maintenance strategy.
Bill Deflorio	Treasurer, FD1	Treasurer	• Ability to implement new financing mechanisms (e.g., bonds, loans, and other debt instruments) and create dedicated reserve accounts.
John Lens	Engineer, FD1	System Operator	• Knowledge of the current state of water system assets
Bob Dileo	Accountant. FD1	Accountant	• Ability to help estimate the replacement cost of assets. • Knowledge of the existing financing strategy, potential financial resources and challenges, and the need for rate changes.
Ted Manazir	Facilities Director, VTC	System Manager	• Knowledge of the current state of water system assets. • Ability to describe the costs and benefits of changes to infrastructure assets. • Experience with the current capital improvement plan and the operations and maintenance strategy.

Name	Title	Duties	Role and Qualifications
David Race	Operator, VTC	System Operator	• Knowledge of the current state of water system assets
Dufresne Group	Consulting Engineer	Maintain water model and CAD files	• Knowledge of the current state of water system assets as provided by the water system • Knowledge of the software programs used for AMP

5.2 Level of Service Goals

The Asset Management Team is responsible for maintaining the Plan as well as setting and following Level of Service Goals. Level of Service Goals are presented below.

Table 5-2: Level of Service Goals

Level of Service Goal	Goal/Target Level	Data Needed to Measure Goal	Period of Measurement	Current Level	Goal Achievement	Personnel Needed
Public Health and Safety						
Meet State drinking water regulations 100% of the time. Refer to the VT Water Supply Rule, Subchapter 21-6 for Drinking Water Quality Requirements.	100%	Test results	Varies based on type of test – follow regs	No violations	Meeting Goal	Water Operator
Customer Service						
Operate and Maintain the Vermont Alert System, including at least an annual check of the system.	100%	Check of System	Annually	Functioning system	Meeting goals	Two assigned responsible parties
System Maintenance						
Follow State required operator training and continued education guidelines	Required number of hours per year	Proof of training/education time	Annually	Periodic training	Meeting goals	N/A
Water Loss Control						
Compare total metered water use to well and spring metered supply to quantify water loss and assess need for further study.	Quarterly	Well and spring records and meter readings	Quarterly	On schedule	N/A	Water Operator & Office Staff

APPENDICES

A	Inventory and Assessment Tables
B	Modeling Results
C	Lincoln Applied Geology Work Scope and Estimate
D	Inventory Schematics and Photos
E	1967 FD and VTC Agreement
F	Leak Detection Report
G	Historical Correspondence to FD Spring
H	2018 Sanitary Survey
I	Fire District Records
J	Water System Mapping

APPENDIX A INVENTORY AND ASSESSMENT TABLES

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN

FIRE DISTRICT PIPE

REPLACEMENT COSTS

Name	Owner	Street	Length	Material	Diameter (Inches)	Year Installed	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
P11	FD	E BETHEL	628	AC	6	1942	79	0	1	$141,276	
P12	FD	E BETHEL	5	AC	6	1942	79	0	1	$1,115	
P13	FD	MV TO V12	571	AC	6	1942	79	0	1	$128,438	
P10	FD	VT-66	681	AC	6	1950	71	0	1	$153,214	
P6	FD	VT-66	564	AC	6	1957	64	0	1	$126,825	
P9	FD	VT-66	10	AC	6	1957	64	0	1	$2,271	
P15	FD	E BETHEL	521	AC	6	1972	49	1	1	$117,124	
P3	FD	VT-66	480	AC	6	1975	46	4	1	$107,950	Replace AC with C900 PVC
P7	FD	PS TO VT-66	1,274	PVC	6	1977	44	56	5	$286,744	SDR 26 PVC Pipe (steel O.D.)
P16	FD	E BETHEL	95	DI	4	1981	40	60	4	$21,267	
P17	FD	WATER	982	DI	6	1981	40	60	5	$220,950	
P18	FD	WATER	4	DI	6	1981	40	60	5	$922	
P19	FD	WATER	10	DI	6	1981	40	60	5	$2,192	
P19	FD	WATER	546	DI	6	1981	40	60	5	$122,898	
P91	FD	WATER	413	DI	6	1981	40	60	5	$92,925	
P21	FD	FURNACE	140	DI	6	1993	28	72	5	$31,473	
P22	FD	FURNACE	18	DI	4	1993	28	72	5	$3,987	
P2	FD	VT-66	46	DI	3	1994	27	73	4	$8,005	Installed because of leak under road
P1	FD	VT-66	451	DI	6	1995	26	74	5	$78,881	Notes confirm 1995
P4	FD	VT-66	15	DI	6	1996	25	75	5	$3,391	Replaced hydrant using DI
P5	FD	VT-66	6	DI	6	1996	25	75	5	$1,366	
P8	FD	TOM WICKER	310	PVC	8	2014	7	93	5	$69,746	C900 PVC
P24	FD	TOM WICKER	14	PVC	6	2015	6	94	5	$3,096	C900 PVC
P25	FD	TOM WICKER	4	PVC	8	2015	6	94	5	$991	C900 PVC
P26	FD	TOM WICKER	60	PVC	6	2015	6	94	5	$13,551	C900 PVC
P27	FD	TOM WICKER	141	PVC	8	2015	6	94	5	$31,681	C900 PVC
P28	FD	TOM WICKER	974	PVC	8	2015	6	94	5	$219,076	C900 PVC
P29	FD	TOM WICKER	32	PVC	6	2015	6	94	5	$7,296	C900 PVC
P30	FD	TOM WICKER	12	PVC	6	2015	6	94	5	$2,664	C900 PVC
P31	FD	TOM WICKER	11	PVC	6	2015	6	94	5	$2,496	C900 PVC
P32	FD	TOM WICKER	10	PVC	6	2015	6	94	5	$2,355	C900 PVC
P33	FD	TOM WICKER	86	PVC	6	2015	6	94	5	$19,240	C900 PVC
P34	FD	TOM WICKER	16	PVC	6	2015	6	94	5	$3,573	C900 PVC
P84	FD	E BETHEL	7	PVC	6	2018	3	97	5	$1,670	C900 PVC

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
FIRE DISTRICT VALVES
REPLACEMENT COSTS

Name	Owner	Street	Type	Material	Kind	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
V1	FD	VT-66	HYD	DI	RS	6	1995	yes	26	24	G	$3,000	
V2	FD	VT-66	MAIN	DI	RS	6	1995	yes	26	24	G	$3,000	
V3	FD	VT-66	HYD	CI	DD	6	1974	yes	47	3	F	$3,000	
V4	FD	VT-66	MAIN	DI	RS	6	1996	yes	25	25	G	$3,000	
V5	FD	VT-66	HYD	DI	RS	6	1996	yes	25	25	G	$3,000	
V6	FD	VT-66	MAIN	CI	DD	6	1957	yes	64	0	P	$3,000	
V7	FD	VT-66	SERV	DI	RS	8	2016	yes	5	45	E	$3,000	
V8	FD	VT-66	TS&V	CI	DD	6	1979	yes	42	8	G	$3,000	
V9	FD	VT-66	HYD	CI	RS	6	1987	yes	34	16	G	$3,000	
V10	FD	VT-66	MAIN	CI	DD	6	1950	yes	71	0	P	$3,000	
V11	FD	E BETHEL	HYD	DI	RS	6	1997	yes	24	26	G	$3,000	
V12	FD	E BETHEL	MAIN	CI	DD	6	1943	yes	78	0	P	$3,000	
V13	FD	E BETHEL - WATER	MAIN	CI	DD	6	1981	yes	40	10	G	$3,000	
V14	FD	E BETHEL	HYD	CI	DD	6	1981	yes	40	10	G	$3,000	
V15	FD	E BETHEL	MAIN	CI	DD	6	1972	yes	49	1	G	$3,000	leaks by a little
V16	FD	E BETHEL	SERV	CI	RS	4	1990	yes	31	19	G	$3,000	
V17	FD	E BETHEL	HYD	DI	RS	6	2018	yes	3	47	G	$3,000	
V18	FD	WATER	MAIN	CI	DD	6	1981	yes	40	10	G	$3,000	
V19	FD	WATER	HYD	CI	DD	6	1981	yes	40	10	G	$3,000	
V20	FD	WATER	MAIN	CI	DD	6	1981	yes	40	10	G	$3,000	
V21	FD	WATER	HYD	CI	DD	6	1981	yes	40	10	G	$3,000	
V22	FD	FIRE STATION	HYD	DI	RS	6	1995	yes	26	24	G	$3,000	
V23	FD	FIRE STATION	SERV	DI	RS	4	1995	yes	26	24	G	$3,000	
V24	FD	FIRE STATION	SERV	DI	RS	6	1994	yes	27	23	G	$3,000	
V25	G	TOM WICKER	HYD	DI	RS	6	2015	yes	6	44	E	$3,000	
V26	G	TOM WICKER	MAIN	DI	RS	8	2015	yes	6	44	E	$3,000	
V27	G	TOM WICKER	SERV	DI	RS	6	2015	yes	6	44	E	$3,000	plugged for future use
V28	G	TOM WICKER	MAIN	DI	RS	8	2015	yes	6	44	E	$3,000	
V29	G	TOM WICKER	MAIN	DI	RS	8	2015	yes	6	44	E	$3,000	Tapping Sleeve & Valve

Name	Owner	Street	Type	Material	Kind	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
V30	G	TOM WICKER	SERV	DI	RS	6	2015	yes	6	44	E	$3,000	plugged for future use
V31	G	TOM WICKER	HYD	DI	RS	6	2015	yes	6	44	E	$3,000	Sprinkler to ILF
V85	G	TOM WICKER	HYD	DI	RS	6	2015	yes	6	44	E	$3,000	
V32	G	TOM WICKER	SERV	DI	RS	6	2015	yes	6	44	E	$3,000	
V33	G	TOM WICKER	HYD	DI	RS	6	2015	yes	6	44	E	$3,000	
V34	G	TOM WICKER	SERV	DI	RS	6	2015	yes	6	44	E	$3,000	Service for Menig
V35	G	TOM WICKER	HYD	DI	RS	6	2015	yes	6	44	E	$3,000	
V86	G	TOM WICKER	HYD	DI	RS	6	2016	yes	5	45	E	$3,000	
V87	G	TOM WICKER	SERV	DI	RS	4	2016	yes	5	45	E	$3,000	4" Domestic line off sprinkler
V88	G	TOM WICKER	MAIN	DI	RS	8	2014	yes	7	43	E	$3,000	Not shown (in front of Menig)
V36	G	VTC	MAIN			6	1940	yes	81	0	E	$3,000	
V37	G	VTC	MTR			2	1968	yes	53	-3	E	$3,000	
V80	FD	WATER	MAIN	CI	DD	6	1981	yes	40	10	G	$3,000	

Kind: DD=Double Disc; RS=Resilient Seat.

Dir. to Open: L = Left or Counter clockwise; R=Right or clockwise

Conditon: E = Excellent, G =Good, F = Fair, P = Poor, NF = Near failure

Condition and notes provided by Fire District

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
FIRE DISTRICT HYDRANTS
REPLACEMENT COSTS

Name	Owner	Street	Type	Year	Year Install	Dir. To Open	Valve Open Size	Line_Size	Serviecable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
H1	FD	VT-66	WATEROUS	1993	1995	L	5¼"	6	yes	28	22	VG	$4,500	
H2	FD	VT-66	MUELLER	1974	1975	L	4"	6	yes	47	3	F	$4,500	
H3	FD	VT-66	WATEROUS	1996	1996	L	5¼"	6	yes	25	25	VG	$4,500	
H4	FD	VT-66	AP SMITH	1987	1987	L	5¼"	6	yes	34	16	G	$4,500	
H5	FD	E BETHEL	AP SMITH	1977	1980	L	4⅝"	6	yes	44	6	G	$4,500	
H6	FD	E BETHEL	AP SMITH	1981	1981	L	5¼"	6	yes	40	10	G	$4,500	
H7	FD	E BETHEL	WATEROUS	2018	2018	L	5¼"	6	yes	3	47	E	$4,500	
H8	FD	WATER	AP SMITH	1981	1981	L	5¼"	6	yes	40	10	G	$4,500	
H9	FD	WATER	AP SMITH	1980	1981	L	5¼"	6	yes	41	9	G	$4,500	
H10	FD	FIRE STA	WATEROUS	1993	1995	L	5¼"	6	yes	28	22	VG	$4,500	
H11	G	TOM WICKER	WATEROUS*	2014	2015	L	5¼"	8	yes	7	43	E	$4,500	No drain hydrants-need to be pumped
H12	G	TOM WICKER	WATEROUS*	2014	2015	L	5¼"	8	yes	7	43	E	$4,500	No drain hydrants-need to be pumped
H13	G	TOM WICKER	WATEROUS*	2014	2015	L	5¼"	8	yes	7	43	E	$4,500	No drain hydrants-need to be pumped
H14	G	TOM WICKER	WATEROUS*	2008	2015	L	5¼"	8	yes	13	37	E	$4,500	No drain hydrants-need to be pumped
H15	G	TOM WICKER	WATEROUS*	2014	2015	L	5¼"	8	yes	7	43	E	$4,500	No drain hydrants-need to be pumped
H31	G	TOM WICKER	WATEROUS*	2014	2016	L	5¼"	8	yes	7	43	E	$4,500	No drain hydrants-need to be pumped

* Waterous hydrants manufactured starting in 2005 are made from all DI and use SS hardware and epoxy coated shoe for longer life.
Dir. to Open: L = Left or Counter clockwise; R=Right or clockwise
Condition: E = Excellent, VG = Very Good, G = Good, F = Fair, P = Poor
Notes, Year Installed and condition provided by Fire District

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
FIRE DISTRICT CURBSTOPS
REPLACEMENT COSTS

Name	Owner	Street	Number	Type	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
CS1	FD	VT-66	3322	Residential	3/4	1980	yes	41	9	G	$1,000	
CS2	FD	VT-66	3283	Residential	3/4	2005	yes	16	34	E	$1,000	
CS3	FD	VT-66	N/A	Residential	3/4	1994	yes	27	23	G	$1,000	
CS4	FD	VT-66	N/A	Residential	1.00	1994	yes	27	23	G	$3,000	Should be 1.5" opposite side
CS5	FD	VT-66	N/A	Residential	1.50	1994	yes	27	23	G	$3,000	
CS6	FD	VT-66	3280	Residential	3/4	1994	yes	27	23	G	$1,000	
CS7	FD	VT-66	3242	Residential	3/4	1994	yes	27	23	G	$1,000	
CS8	FD	VT-66	3247	Residential	3/4	1995	yes	26	24	G	$1,000	
CS9	FD	VT-66	3199	Residential	3/4	2002	yes	19	31	E	$1,000	
CS10	FD	VT-66	3204	Residential	3/4	1994	yes	27	23	G	$1,000	Off 1.5" PE line
CS11	FD	VT-66	3171	Residential	3/4	1975	yes	46	4	G	$1,000	
CS12	FD	VT-66	3164	Residential	3/4	2020	yes	1	49	E	$1,000	
CS14	FD	VT-66	3115	Residential	3/4	1950	yes	71	0	G	$1,000	
CS13	FD	VT-66	3116	Residential	3/4	1950	yes	71	0	F	$1,000	
CS15	FD	VT-66	3092	Residential	3/4	1950	yes	71	0	F	$1,000	
CS16	FD	VT-66	CAMPGND	Business	1.00	2017	yes	4	46	E	$3,000	
CS17	FD	FURNACE	3	Residential	3/4	1999	yes	22	28	G	$1,000	
CS18	FD	VT-66	N/A	Residential	1.00	1998	yes	23	27	F	$3,000	
CS19	FD	VT-66	2771	Residential	3/4	1950	yes	71	0	F	$1,000	Off private line
CS20	FD	TOM WICKER	215	Residential	3/4	1950	yes	71	0	F	$1,000	Off private line - garage for Gifford
CS21	FD	VT-66	3023	Residential	3/4	1950	yes	71	0	P	$1,000	
CS22	FD	VT-66	3001	Residential	3/4	1950	yes	71	0	G	$1,000	
CS25	FD	VT-66	2998	Residential	1.00	1950	yes	71	0	P	$3,000	
CS26	FD	VT-66	2998	Residential	3/4	1950	yes	71	0	E	$1,000	
CS27	FD	VT-66	2980	Residential	3/4	1950	yes	71	0	E	$1,000	
CS28	FD	VT-66	2964	Residential	3/4	1950	yes	71	0	E	$1,000	
CS24	FD	VT-66	2017	Residential	1.50	1950	yes	71	0	NF	$3,000	
CS23	FD	VT-66	N/A	Residential	1.50	1950	yes	71	0	E	$3,000	
CS29	FD	CT-66	2975	Residential	3/4	1950	yes	71	0	F	$1,000	
CS30	FD	VT-66	2947	Residential	3/4	1950	yes	71	0	F	$1,000	
CS31	FD	VT-66	2816	Residential	3/4	1950	yes	71	0	F	$1,000	

Name	Owner	Street	Number	Type	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
CS33	FD	VT-66	2869	Residential	3/4	1950	yes	71	0	F	$1,000	
CS32	FD	VT-66	2920	Residential	3/4	1950	yes	71	0	G	$1,000	
CS34	FD	E BETHEL	14	Residential	3/4	1950	yes	71	0	F	$1,000	
CS35	FD	E BETHEL	66	Residential	3/4	1950	yes	71	0	G	$1,000	
CS37	FD	E BETHEL	86	Residential	3/4	1950	yes	71	0	G	$1,000	
CS38	FD	E BETHEL	116	Residential	3/4	1950	yes	71	0	G	$1,000	
CS39	FD	E BETHEL	142	Residential	3/4	1950	yes	71	0	G	$1,000	
CS40	FD	WATER	22	Residential	3/4	1950	yes	71	0	G	$1,000	
CS41	FD	E BETHEL	SCHOOL	Residential	3/4	1950	yes	71	0	NF	$1,000	Abandoned
CS42	FD	E BETHEL										Discontinued
CS43	FD	E BETHEL	315	Residential	3/4		yes			E	$1,000	
CS44	FD	E BETHEL	N/A	Residential	1.50	2016	yes	5	45	E	$3,000	
CS45	FD	E BETHEL	274	Residential	3/4	2016	yes	5	45	E	$1,000	
CS46	FD	E BETHEL	312	Residential	3/4		yes			E	$1,000	
CS47	FD	E BETHEL	N/A	Residential	1.50	2016	yes	5	45	E	$3,000	
CS48	FD	SKI TOW	69	Residential	3/4		yes			E	$1,000	
CS49	FD	E BETHEL	359	Residential	3/4	2014	yes	7	43	E	$1,000	
CS50	FD	E BETHEL	359	Residential	3/4	2014	yes	7	43	E	$1,000	
CS51	FD	E BETHEL	368	Residential	3/4		yes			E	$1,000	
CS52	FD	WATER	21	Residential	3/4	1981	yes	40	10	G	$1,000	
CS53	FD	WATER	45	Residential	3/4	1981	yes	40	10	G	$1,000	
CS54	FD	WATER	44	Residential	3/4	1981	yes	40	10	G	$1,000	
CS55	FD	WATER	57	Residential	3/4	1981	yes	40	10	G	$1,000	
CS56	FD	WATER	62	Residential	3/4	1981	yes	40	10	G	$1,000	
CS57	FD	WATER	94	Residential	3/4	1981	yes	40	10	G	$1,000	
CS58	FD	WATER	103	Residential	3/4	1981	yes	40	10	G	$1,000	
CS59	FD	WATER		Residential	3/4	1981	yes	40	10	G	$1,000	
CS60	FD	WATER	142	Residential	3/4	1981	yes	40	10	G	$1,000	
CS61	FD	VT-66	2942	Residential	1.00	2017	yes	4	46	E	$3,000	Post Office - feed is from the store
CS62	FD	E BETHEL	204	Residential	3/4	2003	yes	18	32	G	$1,000	
CS63	FD	SKI TOW	155	Residential	3/4	1981	yes	40	10	F	$1,000	New 1" feed from Water St 2008
CS64	FD	SKI TOW	155	Residential	3/4	1981	yes	40	10	F	$1,000	New 1" feed from Water St 2009
CS65	FD	SKI TOW	275	Residential	3/4	1981	yes	40	10	F	$1,000	New 1" feed from Water St 2010
CS66	FD	SKI TOW	67	Residential	1.00	1985	yes	36	14	F	$3,000	Feeds from Water Street

Name	Owner	Street	Number	Type	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
CS67	FD	SKI TOW	143	Residential	1.00	2019	yes	2	48	E	$3,000	
CS68	FD	E BETHEL	209	Residential	3/4	2017	yes	4	46	E	$1,000	Old service has been discontinued
CS69	FD	WATER	177	Residential	3/4	1981	yes	40	10		$1,000	

Conditon: E = Excellent, G =Good, F = Fair, P = Poor, NF = Near failure

Condition provided by Fire District

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
FIRE DISTRICT SERVICE PIPES
REPLACEMENT COSTS

Name	Owner	Street	Number	Length	Size	Material	Year	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
WS1	FD	VT-66	3322	110	3/4	Cu	1980	41	9	G	$8,235	Some may be plastic
WS2	FD	VT-66	n/a	296	3/4	Cu	1995	26	24	G	$22,234	Don't know what this is? Lackard?
WS3	FD	VT-66	3283	137	3/4	Cu	1995	26	24	G	$10,275	CU to building
WS4	FD	VT-66	3280	136	3/4	Cu	1993	28	22	G	$10,164	CU to house
WS5	FD	VT-66	3242	84	3/4	Cu	1993	28	22	G	$6,309	CU to house
WS6	FD	VT-66	N/A	27	1.00	Cu	1993	28	22	G	$2,168	Under the road?
WS7	FD	VT-66	N/A	4	1 1/2	PE	1993	28	22	G	$327	
WS8	FD	VT-66	N/A	288	1 1/2	PE	1993	28	22	G	$23,014	Ends in front of 3204 VT-66
WS9	FD	VT-66	3247	80	3/4	Cu	1993	28	22	G	$5,980	CU to CS, PE to house
WS10	FD	VT-66	3199	71	3/4	Cu	1993	28	22	G	$5,325	CU to house
WS11	FD	VT-66	3204	90	3/4	Cu	1993	28	22	G	$6,716	CU to house
WS12	FD	VT-66	3171	59	3/4	Cu	1975	46	4	F	$4,409	CU to house
WS13	FD	VT-66	3164	147	3/4	Cu	1975	46	4	F	$11,049	CU to house
WS14	FD	VT-66	3116	130	3/4	Cu	1975	46	4	F	$9,750	CU to house
WS15	FD	VT-66	3115	56	3/4	Cu	1986	35	15	G	$4,200	CU to house
WS16	FD	VT-66	3092	138	3/4	Cu	1975	46	4	F	$10,350	CU to house
WS17	FD	VT-66	CAMPGND	455	1.00	PE	1975	46	4	E	$36,380	CU to house
WS18	FD	FURNACE	3	122	3/4	Cu	1999	22	28	G	$9,151	CU to house
WS19	FD	VT-66	N/A	520	1	PE	1998	23	27	G	$41,598	Line that feed Parmalee & Gifford garage?
WS20	FD	VT-66	2771	27	3/4	Cu	1998	23	27	G	$2,054	Probably PE to building
WS21	G	TOM WICKER	215	99	3/4	Cu	1981	40	10	F	$7,450	Probably PE to building
WS22	FD	VT-66	3026	120	3/4	Cu	1957	64	0	F	$8,990	
WS23	FD	VT-66	3001	53	3/4	Cu	1981	40	10	F	$3,941	
WS24	FD	VT-66	N/A	68	1.50	Cu	1957	64	0	NF	$5,429	Line under road to Floyds?
WS25	FD	VT-66	N/A	23	1	Cu	1957	64	0	F	$1,859	1" feed for Floyd's home and store?
WS26	FD	VT-66	2998	105	3/4	Cu	1957	64	0	F	$7,875	CU to house

Name	Owner	Street	Number	Length	Size	Material	Year	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
WS27	FD	VT-66	2980	36	3/4	Cu	1957	64	0	F	$2,709	
WS28	FD	VT-66	2964	59	3/4	Cu	1957	64	0	F	$4,452	
WS29	FD	VT-66	2975	54	3/4	Cu	1957	64	0	F	$4,050	
WS30	FD	VT-66	2947	53	3/4	Cu	1950	71	0	F	$3,975	
WS31	FD	VT-66	2816	360	3/4	Cu	1950	71	0	F	$27,000	This may be mostly plastic?
WS32	FD	VT-66	2920	127	3/4	Cu	1950	71	0	F	$9,525	
WS33	FD	VT-66	2869	55	3/4	Cu	1950	71	0	F	$4,125	
WS34	FD	E BETHEL	14	71	3/4	Cu	1950	71	0	F	$5,289	
WS35	FD	E BETHEL	66	101	3/4	Cu	1980	41	9	G	$7,575	CU to house
WS36	FD	E BETHEL	N/A	56	1 1/2	PE	2000	21	29	E	$4,480	Feeds 1" line WS37
WS37	FD	E BETHEL	N/A	301	1.00	PE	2000	21	29	E	$24,075	Feeds WS38-WS41
WS38	FD	E BETHEL	86	152	3/4	Cu	1943	78	0	E	$11,400	CU to house
WS39	FD	E BETHEL	116	121	3/4	Cu	1943	78	0	E	$9,075	CU to house
WS40	FD	E BETHEL	142	55	3/4	Cu	1943	78	0	E	$4,125	CU to house
WS41	FD	WATER	22	80	3/4	Cu	1943	78	0	E	$6,000	Fed from 1.5" VT-66, CU to house
WS42	FD	E BETHEL	SCHOOL	28	3/4	Cu	1972	49	1	NF	$2,070	Discontinued (4" DI)
WS43	FD	E BETHEL	CEMETERY	157	3/4	Cu	1972	49	1	F	$11,805	Ends at yard hydrant in cemetery
WS44	FD	E BETHEL	315	233	3/4	Cu	1972	49	1	G	$17,458	CU all the way
WS45	FD	E BETHEL	N/A	390	1 1/2	PE	2016	5	45	E	$31,218	feeds 5 residents
WS46	FD	E BETHEL	274	73	3/4	PE	2017	4	46	E	$5,475	PE to house
WS47	FD	E BETHEL	312	54	3/4	Cu	1972	49	1	G	$4,050	CU from CS to house
WS48	FD	SKI TOW	69	628	3/4	PE	1972	49	1	G	$47,071	
WS49	FD	E BETHEL	359	336	3/4	PE	2016	5	45	E	$25,200	
WS50	FD	E BETHEL	368	131	3/4	Cu	1972	49	1	G	$9,825	CU from CS to house
WS51	FD	WATER	21	6	3/4	Cu	1981	40	10	G	$444	CU to CS, plastic to house
WS52	FD	WATER	45	6	3/4	Cu	1981	40	10	G	$462	CU to house
WS53	FD	WATER	44	46	3/4	Cu	1981	40	10	G	$3,443	CU to CS, PE to House
WS54	FD	WATER	57	2	3/4	Cu	1981	40	10	G	$183	CU all the way

Name	Owner	Street	Number	Length	Size	Material	Year	Age	Remaining Expected Useful Life	Condition	Replacement Cost	Notes
WS55	FD	WATER	62	43	3/4	Cu	1981	40	10	G	$3,207	CU to CS, PE to House
WS56	FD	WATER	94	20	3/4	Cu	1981	40	10	G	$1,505	CU to CS, PE to House
WS57	FD	WATER	103	35	3/4	Cu	1981	40	10	G	$2,595	CU to house
WS58	FD	WATER	121	43	3/4	Cu	1981	40	10	G	$3,257	To valve pit, then 1" from there
WS59	FD	WATER	142	57	3/4	Cu	1981	40	10	G	$4,245	CU to house
WS60	FD	E BETHEL	204	118	3/4	Cu	1972	49	1	F	$8,850	PE to building
WS61	FD	SKI TOW	143	420	1.00	PE	2019	2	48	E	$33,600	See Map
WS62	FD	SKI TOW	67	328	1.00	PE	1985	36	14	G	$26,240	PE to house
WS63	FD	WATER	155/275	637	1.00	PE	2008	13	37	E	$50,960	Feeds 3 Lumbra properties on Ski Tow
WS64	FD	WATER	177	40	3/4	Cu	1981	40	10	G	$3,000	
WS65	FD	E BETHEL	209	29	3/4	PE	2017	4	46	E	$2,175	Church

Notes and Condition Provided by Fire District

Conditon: E = Excelletn, G =Good, F = Fair, P = Poor, NF = Near failure

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
VTC PIPES
REPLACEMENT COSTS

Name	Owner	Street	Length	Material	Diameter (Inches)	Year Installed	Age	Remaining Expected Useful Life	Replacement Cost
P71	VTC	MOREY	270	AC	6	1940	81		$60,733
P73	VTC	MOREY	5	AC	6	1940	81		$1,147
P72	VTC	METER CHAMBER 2	36	GALV	2	1968	53		$8,100
P78	VTC	JUDD	487	CI	6	1950	71	29	$109,572
P77	VTC	MORRILL	19	CI	6	1955	66	34	$4,248
P40	VTC	NUTTING	149	DI	6	1971	50	50	$33,446
P41	VTC	NUTTING	9	DI	6	1971	50	50	$2,096
P42	VTC	SHAPE	298	DI	6	1971	50	50	$67,043
P43	VTC	NUTTING	62	DI	4	1971	50	50	$13,925
P48	VTC	PENNY BROOK WELL	1,954	DI	4	1971	50	50	$439,746
P49	VTC	ORCHARD PIT	11	DI	4	1971	50	50	$2,559
P50	VTC	ORCHARD PIT	83	DI	24	1971	50	50	$24,136
P51	VTC	ORCHARD PIT	6	DI	4	1971	50	50	$1,278
P52	VTC	TANK	442	DI	12	1971	50	50	$110,377
P53	VTC	TANK	4	DI	6	1971	50	50	$1,006
P54	VTC	TANK	421	DI	12	1971	50	50	$105,314
P55	VTC	ORCHARD PIT	1,138	DI	8	1971	50	50	$256,062
P56	VTC	ORCHARD PIT	14	DI	6	1971	50	50	$3,052
P57	VTC	ORCHARD PIT	10	DI	8	1971	50	50	$2,233
P58	VTC	ORCHARD PIT	53	DI	6	1971	50	50	$11,900
P59	VTC	ORCHARD PIT	13	DI	6	1971	50	50	$2,843
P60	VTC	SHAPE	225	DI	8	1971	50	50	$50,645
P61	VTC	SHAPE	688	DI	8	1971	50	50	$154,814
P62	VTC	SHAPE	13	DI	6	1971	50	50	$3,006
P63	VTC	MORRILL	2	DI	6	1971	50	50	$557
P64	VTC	GREEN	5	DI	6	1971	50	50	$1,088

Name	Owner	Street	Length	Material	Diameter (Inches)	Year Installed	Age	Remaining Expected Useful Life	Replacement Cost
P65	VTC	MORRILL	8	DI	6	1971	50	50	$1,734
P66	VTC	KEENAN	221	DI	8	1971	50	50	$49,694
P67	VTC	KEENAN	7	DI	6	1971	50	50	$1,546
P76	VTC	MORRILL	236	DI	6	1971	50	50	$53,161
P85	VTC	ORCHARD PIT	21	CI	4	1971	50	50	$4,743
P86	VTC	ORCHARD PIT	282	CI	4	1971	50	50	$63,433
P87	VTC	SHAPE	7	CI	4	1971	50	50	$1,604
P88	VTC	SHAPE	398	CI	4	1971	50	50	$89,443
P89	VTC	SHAPE	7	CI	3	1971	50	50	$1,601
P37	VTC	FACILITIES	368	DI	6	1972	49	51	$82,908
P38	VTC	FACILITIES	12	DI	6	1972	49	51	$2,776
P39	VTC	FACILITIES	84	DI	4	1972	49	51	$18,951
P68	VTC	KEENAN	194	DI	4	1981	40	60	$43,743
P69	VTC	MOREY	401	DI	4	1981	40	60	$90,137
P70	VTC	MOREY	42	DI	4	1981	40	60	$9,402
P74	VTC	HARTNESS	153	DI	6	1981	40	60	$34,317
P75	VTC	HARTNESS	373	DI	6	1981	40	60	$83,958
P79	VTC	CONANT	5	DI	6	1981	40	60	$1,200
P80	VTC	OLD DORM	44	DI	6	1981	40	60	$9,821
P44	VTC	SHAPE	44	DI	6	1990	31	69	$9,941
P20	VTC	Valve Vault to VTC Mtr. Vault	1,111	DI	6	1993	28	72	$249,867
P36	VTC	FACILITIES	34	DI	6	1994	27	73	$7,674
P90	VTC	SHAPE	56	CI	6	1994	27	73	$12,614
P81	VTC	OLD DORM	362	DI	6	2003	18	82	$81,429
P82	VTC	OLD DORM	3	DI	6	2003	18	82	$570
P83	VTC	OLD DORM	104	DI	4	2003	18	82	$23,362
P96	VTC	FIRE TOWER	850	DI	6	2005	16	84	$191,250
P45	VTC	AUTOTECH	366	DI	8	2007	14	86	$82,404
P46	VTC	AUTOTECH	47	DI	6	2007	14	86	$10,495
P47	VTC	AUTOTECH	8	DI	6	2007	14	86	$1,717

Name	Owner	Street	Length	Material	Diameter (Inches)	Year Installed	Age	Remaining Expected Useful Life	Replacement Cost
P92	VTC	VAEL	560	DI	6	2019	2	98	$126,000
P93	VTC	VAEL	154	DI	6	2019	2	98	$34,650
P94	VTC	VAEL	40	DI	6	2019	2	98	$9,000
P95	VTC	VAEL	16	DI	6	2019	2	98	$3,600

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
VTC VALVES
REPLACEMENT COSTS

Name	Owner	Street	Type	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Replacement Cost
V36	VTC	FACILITIES	MAIN	6	1994	yes	27	23	$3,000
V37	VTC	FACILITIES	HYD	6	1972	yes	49	1	$3,000
V38	VTC	FACILITIES	SERV	4	1994	yes	27	23	$3,000
V39	VTC	NUTTING	MAIN	6	1971	yes	50	0	$3,000
V40	VTC	NUTTING	HYD	6	1971	yes	50	0	$3,000
V41	VTC	NUTTING	MAIN	6	1969	yes	52	0	$3,000
V42	VTC	NUTTING	SERV	4	1971	yes	50	0	$3,000
V43	VTC	SHAPE	SERV	6	1990	yes	31	19	$3,000
V44	VTC	SHAPE	MAIN	6	1969	yes	52	0	$3,000
V45	VTC	FACILITIES	MAIN	8	2007	yes	14	36	$3,000
V46	VTC	AUTOTECH	SERV	6	2007	yes	14	36	$3,000
V47	VTC	AUTOTECH	MAIN	8	2007	yes	14	36	$3,000
V48	VTC	AUTOTECH	HYD	6	2007	yes	14	36	$3,000
V49	VTC	ORCHARD PIT	MAIN	4	1971	yes	50	0	$3,000
V50	VTC	ORCHARD PIT	MAIN	4	1971	yes	50	0	$3,000
V51	VTC	TANK	HYD	6	1971	yes	50	0	$3,000
V52	VTC	TANK	MAIN	12	1971	yes	50	0	$3,000
V53	VTC	TANK	MAIN	8	1971	yes	50	0	$3,000
V54	VTC	ORCHARD PIT	HYD	6	1971	yes	50	0	$3,000
V55	VTC	ORCHARD PIT	SERV	8	1971	yes	50	0	$3,000
V57	VTC	ORCHARD PIT	HYD	6	1971	yes	50	0	$3,000
V58	VTC	ORCHARD PIT	HYD	6	1971	yes	50	0	$3,000
V59	VTC	ORCHARD PIT	MAIN	8	1971	yes	50	0	$3,000
V60	VTC	SHAPE	MAIN	8	1971	yes	50	0	$3,000
V61	VTC	SHAPE	HYD	6	1971	yes	50	0	$3,000
V62	VTC	SHAPE	HYD	6	1971	yes	50	0	$3,000
V63	VTC	GREEN	MAIN	6	1971	yes	50	0	$3,000
V64	VTC	GREEN	MAIN	6	1971	yes	50	0	$3,000
V65	VTC	KEENAN	MAIN	8	1971	yes	50	0	$3,000

Name	Owner	Street	Type	Size	Year	Serviceable	Age	Remaining Expected Useful Life	Replacement Cost
V66	VTC	KEENAN	HYD	6	1971	yes	50	0	$3,000
V67	VTC	KEENAN	SERV	4	1981	yes	40	10	$3,000
V68	VTC	MOREY	MAIN	6	1981	yes	40	10	$3,000
V69	VTC	METER CHAMBER 2	MTR	2	1968	yes	53	0	$3,000
V70	VTC	MOREY	HYD	6	1971	yes	50	0	$3,000
V71	VTC	MOREY	MAIN	6	1981	yes	40	10	$3,000
V72	VTC	HARTNESS	MAIN	6	1981	yes	40	10	$3,000
V73	VTC	HARTNESS	MAIN	6	1971	yes	50	0	$3,000
V74	VTC	MORRILL	HYD	6	1971	yes	50	0	$3,000
V75	VTC	CONANT	HYD	6	1981	yes	40	10	$3,000
V76	VTC	OLD DORM	MAIN	6	1981	yes	40	10	$3,000
V77	VTC	OLD DORM	MAIN	6	2003	yes	18	32	$3,000
V78	VTC	OLD DORM	HYD	6	2003	yes	18	32	$3,000
V79	VTC	OLD DORM	SERV	4	2003	yes	18	32	$3,000
V81	VTC	ORCHARD PIT	MAIN	4	1972	no	49	1	$3,000
V82	VTC	SHAPE	MAIN	4	1950	no	71	0	$3,000
V83	VTC	SHAPE	MAIN	4	1950	no	71	0	$3,000
V84	VTC	SHAPE	SERV	3	1971	no	50	0	$3,000
V85	VTC	MORRILL	SERV	2	1971	no	50	0	$3,000
V86	VTC	MOREY	SPRINK	4	1981	no	40	10	$3,000
V87	VTC	VAEL	TS&V	6	2019	yes	2	48	$3,000
V88	VTC	VAEL	HYD	6	2019	yes	2	48	$3,000
V89	VTC	VAEL	SERV	6	2019	yes	2	48	$3,000
V90	VTC	VAEL	HYD	6	2019	yes	2	48	$3,000
V91	VTC	VAEL	MAIN	6	2019	yes	2	48	$3,000

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
VTC HYDRANTS
REPLACEMENT COSTS

Name	Owner	Street	Type	Year	Line Size	Serviceable	Age	Remaining Expected Useful Life	Condition	Replacement Cost
H16	VTC	FACILITIES	KENNEDY	1972	6	yes	49	1	F	$4,500
H17	VTC	NUTTING	EDDY	1969	6	yes	52	0	E	$4,500
H18	VTC	AUTOTECH	WATEROUS*	2006	8	yes	15	35	E	$4,500
H19	VTC	WATER TOWER	WATEROUS*	2011	12	yes	10	40	E	$4,500
H20	VTC	HEADMASTER	KENNEDY	1967	8	yes	54	0	F	$4,500
H21	VTC	KEENAN	US PIPE	1997	8	yes	24	26	VG	$4,500
H22	VTC	KEENAN	WATEROUS*	2013	8	yes	8	42	E	$4,500
H23	VTC	SHAPE	KENNEDY	1967	8	yes	54	0	F	$4,500
H24	VTC	SHAPE	US PIPE	1983	8	yes	38	12	G	$4,500
H25	VTC	KEENAN	KENNEDY	1967	8	yes	54	0	F	$4,500
H26	VTC	MOREY	WATEROUS*	2009	8	yes	12	38	E	$4,500
H27	VTC	MORRILL	KENNEDY	1999	6	yes	22	28	VG	$4,500
H28	VTC	CONANT	KENNEDY	1955	6	yes	66	0	P	$4,500
H29	VTC	OLD DORM	KENNEDY	1998	6	yes	23	27	VG	$4,500
H30	VTC		WATEROUS	2003	6	yes	18	32	VG	$4,500
H32	VTC	VAEL		2019	6	yes	2	48	E	$4,500
H33	VTC	VAEL		2019	6	yes	2	48	E	$4,500
H34	VTC	WATER			6	yes			E	4500

* Waterous hydrants manufactured starting in 2005 are made from all DI and use SS hardware and epoxy coated shoe for longer life.
Condition: E = Excellent, VG = Very Good, G = Good, F = Fair, P = Poor

RANDOLPH CENTER WATER SYSTEM ASSET MANAGEMENT PLAN
VAULTS, TANKS AND SOURCES
REPLACEMENT COSTS

Name	Owner	Location	Asset	Status	Installed	REUL	Replacement Costs
HW	VTC	Hartness Well Vault	Well and Vault	Inactive	1950		$15,000
WH1	VTC	Hartness Well Vault	Vault	Inactive			
WH2	VTC	Hartness Well Vault	Flow meter	Inactive			
KW	VTC	Keenan Well Vault	Well and Vault	Inactive	1950		$15,000
WK1	VTC	Keenan Well Vault	Vault	Inactive			
WK2	VTC	Keenan Well Vault	Flow meter	Inactive			
OP	VTC	Orchard Treatment Vault	Treatment Vault	Active	1968	20	$20,000
OP1	VTC	Orchard Vault	Vault	Active			
OP2	VTC	Orchard Vault	Chemical pump	Active			
OP3	VTC	Orchard Vault	Flow meter	Active	1968	10	
PBW	VTC	Penny Brook Well & Vault	Well and Vault	Active	1971	20	$350,000
WP1	VTC	Penny Brook Well	Vault	Active			
WP2	VTC	Penny Brook Well	Electronic control	Active			
WP3	VTC	Penny Brook Well	Well head	Active			
M1	VTC	Meter Chamber #1	Vault	Active		20	$20,000
M12	VTC	Meter Chamber #1	Flow meter	Active			
M13	VTC	Meter Chamber #1	Flow meter	Active			
M14	VTC	Meter Chamber #1	Valve	Active			
M2	VTC	Meter Chamber #2	Vault	Active	1981	20	$20,000
M22	VTC	Meter Chamber #2	Check valve	Active	1981	10	
M23	VTC	Meter Chamber #2	Flow meter	Active	1981	10	
M24	VTC	Meter Chamber #2	Flow meter	Active	1981	10	
WT	VTC	Water Tank	Water Tank	Active	1970	10	$2,100,000
WT1	VTC	Water Tank	Tower Tank	Active	1970		
WT12	VTC	Water Tank	Control panel	Active	1970		
SS1	FD	Spring House	Spring	Active	1942	20	$50,000
SS2	FD	Spring piping	Piping	Active	2018	50	
PH	FD	Pump House	Pump House	Active		10	$68,000
PS1	FD	Pump House	Building	Active	1979	10	
PS12	FD	Pump House	Chemical pump	Active	2015	10	
PS13	FD	Pump House	Pump	Active	2020	20	
PS14	FD	Pump House	Pump	Active	2020	20	
PS15	FD	Pump House	Flow meter	Active	2017	10	
PS16	FD	Pump House	Process piping, fittings and valves	Active	2021	20	
CV1	FD	Connection Vault	Vault	Active	1995	25	$10,000

Randolph Center Water System
Asset Inventory
Vaults, Tanks, Pumps

Name	Owner	Location	Asset	Status	Make	Model	Serial	Installed	Size	Age	REUL	Condition	Condition	Notes
HW	VTC	Hartness Well Vault	Well and Vault	Inactive	n/a	n/a	n/a	1950	n/a	71	0	poor	1	
WH1	VTC	Hartness Well Vault	Vault	Inactive	Concrete	n/a	n/a		8'x8'x6'H			fair/poor	2	aluminum hatch
WH2	VTC	Hartness Well Vault	Flow meter	Inactive	Badger		10566813		1-1/2"			poor	1	not operational
KW	VTC	Keenan Well Vault	Well and Vault	Inactive	n/a	n/a	n/a	1950	n/a	71	0	poor	1	
WK1	VTC	Keenan Well Vault	Vault	Inactive	Concrete	n/a	n/a		8'x8'x7'H			poor	1	aluminum hatch
WK2	VTC	Keenan Well Vault	Flow meter	Inactive	Hersey		4755211		1-1/2"			poor	1	not operational
OP	VTC	Orchard Treatment Vault	Treatment Vault	Active	n/a	n/a	n/a	1968	n/a	53	10	good	4	
OP1	VTC	Orchard Vault	Vault	Active	Concrete	n/a	n/a		10'x11'x9'H			good	4	bulkhead doors with aluminum ladder
OP2	VTC	Orchard Vault	Chemical pump	Active	LMI-Milton Roy	P151-398SI	14093878840-1		1.0 GPH @ 110 PSI			good	4	
OP3	VTC	Orchard Vault	Flow meter	Active	Neptune	n/a	70263767	1968	2"	53	10	good	4	
PBW	VTC	Penny Brook Well & Vault	Well and Vault	Active	n/a	n/a	n/a	1971	n/a	50	10	good	4	
WP1	VTC	Penny Brook Well	Vault	Active	n/a	n/a	n/a		8'x6'x7'H			good	4	aluminum hatch
WP2	VTC	Penny Brook Well	Electronic control	Active	Franklin C.S.	n/a	n/a		n/a			good	4	
WP3	VTC	Penny Brook Well	Well head	Active	n/a	n/a	n/a					good	4	
M1	VTC	Meter Chamber #1	Vault	Active	Concrete	n/a	n/a		12'x8'x7'H			fair/poor	2	
M12	VTC	Meter Chamber #1	Flow meter	Active	Sensus	SR	48304201		2"			fair	3	"South Meter"
M13	VTC	Meter Chamber #1	Flow meter	Active	Sensus	W 2000			6"			fair	3	"Fire Meter"
M14	VTC	Meter Chamber #1	Valve	Active	Sensus	FireLine			6"			good	4	Fire flow valve
M2	VTC	Meter Chamber #2	Vault	Active	Concrete	n/a	n/a	1981	4'x7'x7'H	40	10	fair/poor	2	aluminum hatch
M22	VTC	Meter Chamber #2	Check valve	Active	FM	6806-B	illegible	1981	6"	40	10	fair/poor	2	
M23	VTC	Meter Chamber #2	Flow meter	Active	Sensus	Omni	75893321	1981	2"	40	10	good/fair	3	
M24	VTC	Meter Chamber #2	Flow meter	Active	Sensus	Omni	75893324	1981	2"	40	10	good/fair	3	fire flow bypass valve
WT	VTC	Water Tank	Water Tank	Active	Cor-Ten steel	Welded Hydropillar	n/a	1970	250,000 gallons	51	10	good	4	
WT1	VTC	Water Tank	Tower Tank	Active	Cor-Ten steel	Welded Hydropillar	n/a	1970	250,000 gallons	51		good	4	42' diameter
WT12	VTC	Water Tank	Control panel	Active	n/a	n/a	n/a	1970	n/a	51		good	4	Devar (svc. Provider)
SS1	FD	Spring House	Spring	Active	n/a	n/a	n/a	1942		79	20	good	4	
SS2	FD	Spring piping	Piping	Active				2018	2"	3	50	excellent	5	Dual pipes from spring to Pump house
PH	FD	Pump House	Pump House	Active	n/a	n/a	n/a		n/a	2021	10	fair	3	
PS1	FD	Pump House	Building	Active	Wood/concrete	n/a	n/a	1979	9'x11'x7'H	42	10	fair	3	Building in good cond/sub-level in very
PS12	FD	Pump House	Chemical pump	Active	ProMinent	Gala	2015234265	2015	0.37 GPH @ 263 psi	6	10	good	4	PN: 1051252
PS13	FD	Pump House	Pump	Active	dp Pumps	DPVF 10/6B	06/2020 1625610-1	2020	51 gpm @ 292.2 TDH	1	20	excellent	5	
PS14	FD	Pump House	Pump	Active	dp Pumps	DPVF 10/6B	06/2020 1654945-2	2020	51 gpm @ 292.2 TDH	1	20	excellent	5	
PS15	FD	Pump House	Flow meter	Active	Sensus	Omni T2	83003161	2017	1-1/2"	4	10	good	4	
PS16	FD	Pump House	Process piping, fittings, and valves	Active	-	-	-	2021	-	20	10	excellent	5	
CV1	FD	Connection Vault	Vault	Active	Concrete	n/a	n/a	1995		26	25	good	4	FD pump line to VTC Meter Vault

APPENDIX B MODELING RESULTS

WATER COMPUTER MODEL
CALIBRATION REPORT
RANDOLPH CENTER WATER SYSTEM
RANDOLPH CENTER, VERMONT
October 30, 2019

General

The Randolph Center Water System (RCWS) computerized water system model was developed using available information for the water system, provided by Randolph Fire District 1 (RFD1) and Vermont Technical College (VTC) officials, and additional field data obtained by Dufresne Group (DG). The procedures used for model calibration are described herein and a comparison of actual field conditions compared to calibrated model simulation results has been prepared.

Preliminary Model Development

The computerized water system model was developed using Bentley® WaterGEMS® V8i software using the following sources of information:

1. Drawings for water main projects on file with RFD1 and VTC.
2. General knowledge of the water system from RFD1 and VTC.
3. Field information obtained by Dufresne Group on August 22, 2019.

The water main drawing files provided by the RFD1 were used to review details of the system and assign attributes to the water mains including installation date, material, diameter, and source of information. Unfortunately, detailed plans are not available for every section of water main in the system. In addition, since some of the plans are design drawings, rather than record drawings, they cannot be relied on to accurately represent the constructed water mains. Any discrepancies between sources of information were resolved with RFD1 or VTC staff members and noted in the model.

Using existing U.S. Geologic Survey (USGS) topographic 1-foot contour data, approximate elevations were assigned to all junctions (or “nodes”) in the water model. A field survey was performed by DG to obtain elevations for water storage tanks, source building elevations, and hydrants used during field testing. This detailed elevation data was incorporated into the model.

Pump curves available from the manufacturer for the VTC well pump and the RFD1 spring pump station were assigned to the pumps in the water model.

Roughness coefficients, or “C-values”, were assigned to water mains based on age and material as determined from the available water system drawings and input from the Water Department staff. The initial C-values were set in the model based on the pipe characteristics as summarized in Table 1.

TABLE 1 INITIAL C-VALUE ASSIGNMENT RANDOLPH CENTER WATER SYSTEM RANDOLPH CENTER, VERMONT October 30, 2019	
Pipe Description (material, installation date)	C-Value
Cast Iron, unknown age	60
Cast Iron – Lined, any age	120
Ductile Iron, unknown age	120
Ductile Iron, 1960-1990	120
Ductile Iron, 1990 to present	130
PVC or Plastic, any age	140
Asbestos Cement (AC), any age	140

System flow rate information described in a December 20, 2018 Sanitary Survey was reviewed to create a base model to simulate an average day demand of 52,000 gallons per day (0.052 mgd). The total demand assigned and distributed equally to the computer junctions. This method of assigning demands distributes any system leakage or other unaccounted for water uniformly across the system, a common practice in water system computer modeling.

Water storage tank characteristics including diameter, floor elevation, and overflow elevation were initially obtained from tank construction plans and adjusted based on field information as described under the Field Data Collection section of this report.

Field Data Collection

The following information was obtained during a field survey performed by Dufresne Group on August 22, 2019, which included the use of traditional GPS methods:

- Finish floor at the RFD1 spring pump station.
- Floor elevation at the VTC well vault.
- Ground elevation at the VTC water storage tank.
- Elevation of hydrants used during field flow tests.

Field Testing:

Fire flow testing was conducted with the assistance of RFD1 and VTC officials on August 22, 2019 at 6 locations. The data obtained from the fire flow tests is summarized in Table 2. Fire flow locations are shown in Figure 1.

TABLE 2 DG FIRE FLOW TEST RESULTS RANDOLPH CENTER WATER SYSTEM RANDOLPH CENTER, VERMONT October 30, 2019				
Test No.	**Test Location**	**Static Pressure (psi)**	**Flow (gpm)**	**Residual Pressure (psi)**
1	Cross Country near Orchard	57	1,093	53
2	Water Street	77	929	38
3	Near Judd Building (VTC)	62	504	12
4	Near Nutting Building (VTC)	71	1,160	40
5	Main Street (north end)	64	781	29
6	Main Street (south end)	71	902	44

Notes:

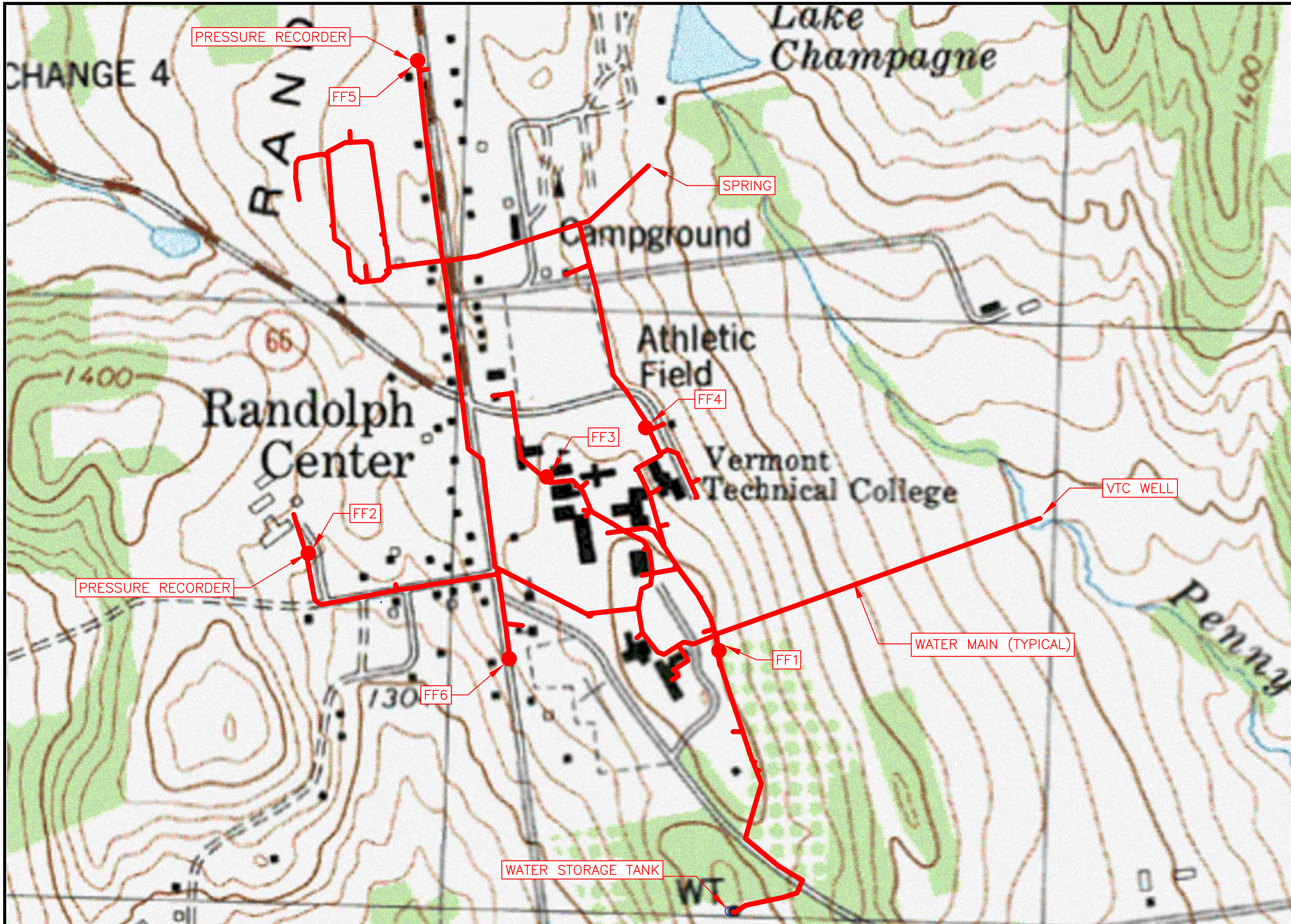
1. The listed results were recorded during field testing performed on August 22, 2019 by DG with the assistance of RFD1 and VTC staff..

Continuous Pressure Monitoring:

To supplement the flow test data, pressure recorders were used at three locations in the water system to monitor system pressure under normal conditions and during field work. The locations of the recorders are shown in Figure 1 and the data collected at each of the locations is shown in Figures 2 through 3. The locations are as follows:

- Water Street
- Main Street (north end)

The pressure data is reviewed under the calibration section of this report.



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Project #	4190019
Project Mgr.	BLB
Design	BLB
Drawn	KSM
Checked by	TPK
Date	OCTOBER 25, 2019
Scale	1"= 1000'
Approved by	BLB

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

FIELD TEST LOCATIONS

RANDOLPH CENTER, VT

1

DWG. NO. RCWS WATER SERVI

SHEET 1 OF 1

FILE: W:\CADD Files\Randolph VT\RCWS Asset Management Plan\RCWS WATER SERVICE AREA.dwg Oct 31, 2019 – 3:54pm

FIGURE 2
PRESSURE RECORDER DATA – WATER STREET
RANDOLPH CENTER WATER SYSTEM
RANDOLPH CENTER, VERMONT
October 30, 2019

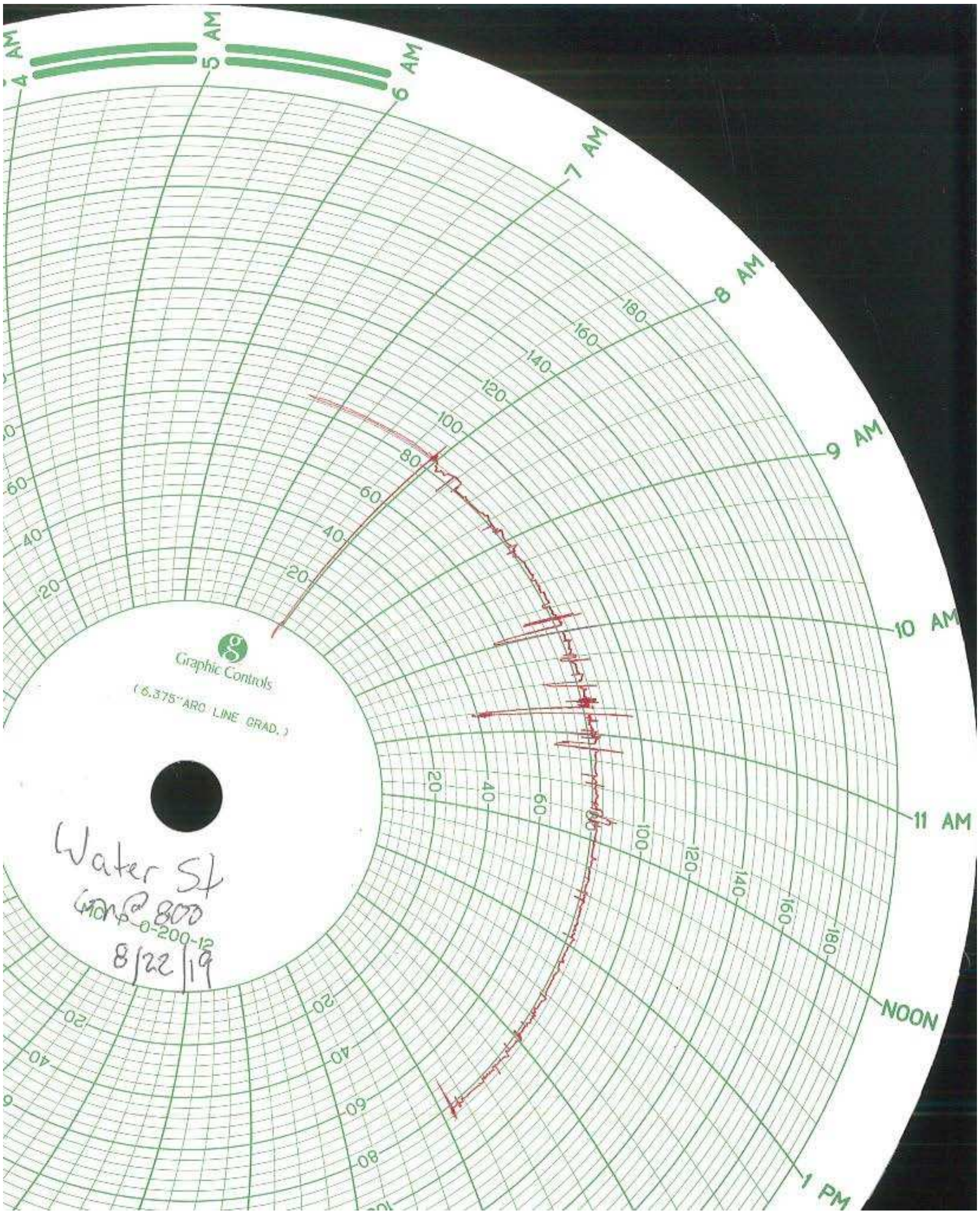
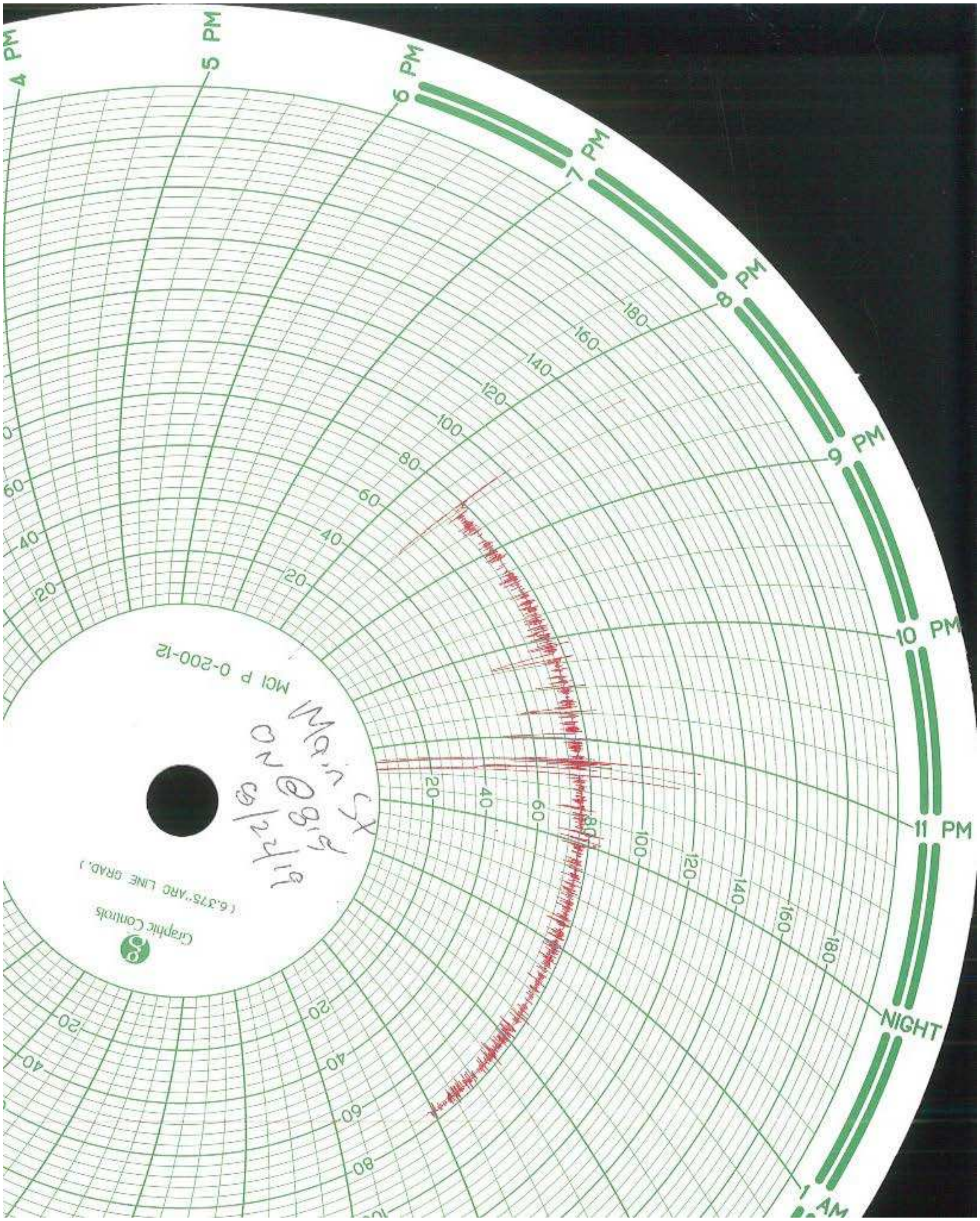


FIGURE 3
PRESSURE RECORDER DATA – MAIN STREET (NORTH END)
RANDOLPH CENTER WATER SYSTEM
RANDOLPH CENTER, VERMONT
October 30, 2019



Water Model Calibration

To calibrate the water model to field testing conditions, the base model conditions were revised to match actual system conditions during the testing, including system demand, tank levels, and pump on/off status.

System demand during the field flow testing closely matches the average system demand average for 2019. As such, the average daily demand for 2019 was used as the background demand condition for model calibration.

Locations of hydrants utilized for flow tests and pressure monitoring were represented in the computer model by a junction or “node” at the hydrant’s approximate physical location. Elevations were assigned based on DG field survey data for the respective hydrants.

For each flow test simulation, the measured flow was assigned to the representative junction(s) and the resulting pressure at the residual junction was compared to the actual residual pressure recording during a particular field test. If the model residual pressures did not agree to within 10% of the field results, pipeline C-values in selected areas were increased or decreased to reduce the difference in the model results compared to the field data. These steps were repeated for each field test. The process was iterative and required numerous fire flow re-simulations, as model modifications for a single data set potentially changed previous model results.

Generally, the water mains are shown to have C-values of 120 or above, except for the section of water main between the Hartness building and Judd building on the VTC campus. This existing 6-inch water main is shown as a ductile iron pipe on available mapping. However, the water model predicts a very low (40) C-value for this pipe, which is indicative of either a deteriorated cast iron water main or a partially closed valve.

Comparison of Results

The results of the model calibration are summarized in Table 3. As shown, static pressures for the model agree very closely with the pressures measured on June 26, 2018. The accuracy of residual hydraulic gradeline for the model compared to field results varies, with a difference of less than 5% (less than 1% in most cases).

Model results were also compared to pressures recorded by the three pressure recorders installed by DG during the field testing. Included as Figures 2 through 3 and presented previously, the data shows that during normal/non-fire flow conditions, the computer model indicates results that closely match the field data.

TABLE 3 COMPARISON OF FIELD DATA TO THE CALIBRATED WATER MODEL RANDOLPH CENTER WATER SYSTEM RANDOLPH CENTER, VERMONT October 30, 2019							
Fire Flow No.	**Location**	**Hydraulic Gradeline at Residual Hydrant (psi)**				**Field vs. Model % Difference**	
		Field Static	**Model Static**	**Field Residual**	**Model Residual**	**Static**	**Residual**
1	Cross Country near Orchard	1528.4	1527.2	1519.1	1517.2	0.0%	0.1%
2	Water Street	1525.2	1527.1	1435.1	1430.8	0.0%	0.3%
3	Near Judd Building (VTC)	1526.6	1527.1	1411.1	1416.6	0.0%	0.4%
4	Near Nutting	1528.3	1527.1	1456.7	1458.8	0.0%	0.1%
5	Main Street	1527.6	1527.1	1446.8	1448.4	0.0%	0.1%
6	Main Street (south end)	1526.3	1527.1	1463.9	1463.2	0.0%	0.0%

As recommended by the American Water Works Association (AWWA), calibration results are considered acceptable if the calculated hydraulic gradelines in the model are within 5 feet of the field results. Based on this criterion, the Randolph Center Water System model is calibrated to the data obtained on August 22, 2019 and as shown the model results are all within acceptable limits.

Memo

To: File

From: Tim Knapp, PE

Date: 2/11/2020

Re: Randolph Center Water Model Results

General:

A model of the water system was developed using Bentley Haestad Methods WaterGEMS® version V8i computer software. Available record drawings and other data provided by the Water Department were used to create the water model, including physical layout; elevations; tank geometry; pump characteristics; pipe diameter, roughness coefficient, age, and material; and system demands. The model was calibrated to field tests performed by Dufresne Group completed in 2019.

The following figures have been developed to depict the characteristics of the pipes within the water system based on the investigations made as part of the water model development:

- Figure 1 – Water Mains by Diameter
- Figure 2 – Water Mains by C-Value
- Figure 3 – Water Mains by Installation Date

<u>Water Service Area</u>:

A water system service area represents the land that can be serviced at acceptable pressure without boosted pressure zones. Delineation of the practical upper limits of the service area for the water system was determined by an evaluation of the topography of the region and the following minimum pressure criteria in accordance with the Vermont Water Supply Rule (WSR):

- 20 psi minimum pressure at ground level throughout the distribution system at all flow conditions.
- 35 psi minimum normal working pressure.

The upper limit of the service area is usually defined as the maximum elevation where the minimum working pressure (35 psi) is maintained. The static pressure is usually set by adjacent distribution storage tanks and depends on storage tank levels. Typically, a low tank level is assumed for defining the service area. The elevation corresponding to 35 psi (approximately 80 feet) below the lowest working level to allow for “active” storage tank level. Development above the elevation that corresponds to the defined service area limit is usually prohibited to ensure that users receive water at adequate pressures.

The overflow elevation of the existing water storage tank sets the hydraulic gradeline for all customers served by gravity flow from this tank and defines the topographic limits that can be served by the proposed water system without pumping. The limit of the areas that can be served by gravity, based on the tank low level criteria is elevation 1,440 ft, as described in Table 1 and shown in Figure 4.

TABLE 1
MAXIMUM SERVICE AREA ELEVATION

Item	Value
Maximum Hydraulic Gradeline	1,536 ft
Tank Level Fluctuation	-6.0 ft
Minimum Working Pressure (35± psi)	- 80 ft
Distribution Losses	-10 ft
Service Area Maximum Limit	1,440 ft

Notes:

1. The maximum hydraulic gradeline is set by the overflow elevation of the existing water storage tank
2. Tank level fluctuation is based on a low level of 6 ft in the water storage tank.
3. Minimum working pressure is defined by the Vermont Water Supply Rule.

Connection of future customers should be restricted to the 1,440 ft service area elevation. Customers above this elevation should not be serviced by the water system without use of municipal style water booster stations. As shown previously in Figure 4, all existing users are well below the 1,440 ft service area limit.

<u>Hydraulic Evaluation</u>:

The calibrated computer model was used to identify existing areas of inadequate pressure based on the Water Supply Rule criteria that a minimum pressure of 20 psi shall be maintained at all points under all conditions of flow and a minimum pressure of 35 psi under normal conditions. During average day (52,000 gpd) and maximum day (78,500 gpd) demand conditions, without a fire flow, there are no pressure problems.

The computer model was also used to simulate conditions during coincident flow (maximum day demand plus fire flow). For this simulation, a fire flow of 500 gpm was used, which represents the minimum needed fire flow required by the Water Supply Rule for systems providing fire protection. Figure 5 identifies the pipes which have high headloss (greater than 6 ft / 1,000 ft) during the coincident flow conditions.

Based on the water model, the lowest Available Fire Flow during the simulation is at the Judd building. As shown in Figure 6, the water model predicts that the available fire flow near the Judd Building is 475 gpm, while maintaining 20 psi in the distribution system. The NFPA practice for flow tests (NFPA 291) recommends rounding results to the nearest 50 gpm, for flows below 1,000 gpm. Therefore, this result does not indicate a deficiency compared to minimum Needed Fire Flow requirements.

Based on information provided by VTC officials, the water main between the Hartness and Judd buildings is a 6-inch ductile iron pipe installed in the 1980's. However, during the field work performed by Dufresne Group, a hydrant (H-27) dated 1950 was identified on this main. Further, the results of the field testing for this area of the water system shows that the C-value is about 40. A very low C-value is indicative of either severely tuberculated pipe or another pipe restriction, such as a closed valve.

Based on these results, we recommend that further field investigations be performed to confirm the condition of this main. The following work is recommended:

1. Verify the status of valves on the 6-inch water main between the Hartness and Judd Buildings as shown on Figure 7. For each of the valves identified, completely close, then open the valve and count the number of turns to verify that the valve is in a fully open condition. For a 6-inch valve, the number of turns is about 20 and for an 8-inch valve, the number of turns is about 26.

2. Perform a field C-value test as shown in Figure 8 to verify the internal roughness coefficient. This test will include closing valves isolate the water main section.

Based on the results of these additional field investigations, the water model and Asset Management Plan should be updated accordingly.

APPENDIX C LINCOLN APPLIED GEOLOGY WORK SCOPE AND ESTIMATE

Brian Baker

From: Steve Revell <SRevell@lagvt.com>
Sent: Thursday, October 24, 2019 8:42 AM
To: Naomi Johnson; Brian Baker
Subject: Randolph Fire District #1-Planning Documents
Attachments: Spring Yield Testing Work Scope & Cost.pdf

Naomi and Brian, As requested please find the Work Scope and Cost Estimate for a long term constant rate pump test which would be conducted in order to define the safe yield of the spring source serving the Fire District. The general work scope is for a 5 day(120 hour) pump test at a constant rate of 100 gpm or more. The 6 task work scope includes: the Source Testing Application preparation process, the potential 25 well monitoring well set-up and pre-test monitoring, conducting the 120 hour constant rate test, 48 hour pump test recovery and monitoring equipment retrieval, data compilation and data presentation, and reporting. Conducting a constant rate pump test of a spring of this type is a logistical nightmare because the test must be manned continuously and although continuously monitored with a pressure transducer, the 25 well monitoring network must be checked manually to ensure accurate interchangeable data is collected. The anticipated costs are high but not as high as having to pump the discharge back into the Fire District VTC water system. During my site visit with the water system operator Bill DeFlorio and the Prudential Committee Chair John Lens, I was assured that the discharge could go to waste because the VTC well and storage tank could support the demand during the pump test period.

Best, Steve

Stephen Revell, CPG
Lincoln Applied Geology, Inc.
163 Revell Drive
Lincoln, Vermont 05443
srevell@lagvt.com
Office: (802) 453-4384
Cell: (802) 349-8542

Randolph Fire District#1
Spring Yield Testing
Work Scope and Cost Estimate

Task 1 - Source Testing Application Preparation

- Pump Testing Plan & Protocols
- Location/Inspection of Monitoring Network
- Monitoring Network Notification & Permission
- Water Quality Testing Requirements
- Proposed Scope of Required Studies

Task 1 Subtotal = $5000

Task 2 - Monitoring Network Setup and 2 Day Pre-Test Monitoring

- 2 week pressure transducer rental for 25 transducers at $500 per transducer
- Installation including materials by subcontractor at $500 per well
- Oversight and assistance by LAG
- Meals

Task 2 Subtotal = $26,312

Task 3 – 120 Hour Constant Rate Pumping Test

- Pump, meter and valve setup and rental
- Manpower, continuous for 5 days by LAG
- Meals and mileage

Task 3 Subtotal = $14,549

Task 4 - Recovery Testing and Equipment Retrieval

- Manpower, continuous for 2 days by LAG
- Monitoring and equipment retrieval
- Meals and mileage

Task 4 Subtotal = $6,424.40

Task 5 - Data Analysis and Presentation

- Manpower
- Prepare spreadsheets, table and graphs
- Drafting
- Download all monitoring data

Task 5 Subtotal = $3400.00

Task 6 - Reporting- Preparation, Presentation and Meetings

- Manpower
- Drafting
- Final Analysis

Task 6 Subtotal = $3800.00

Task 1 -6 Total = $59,485.40

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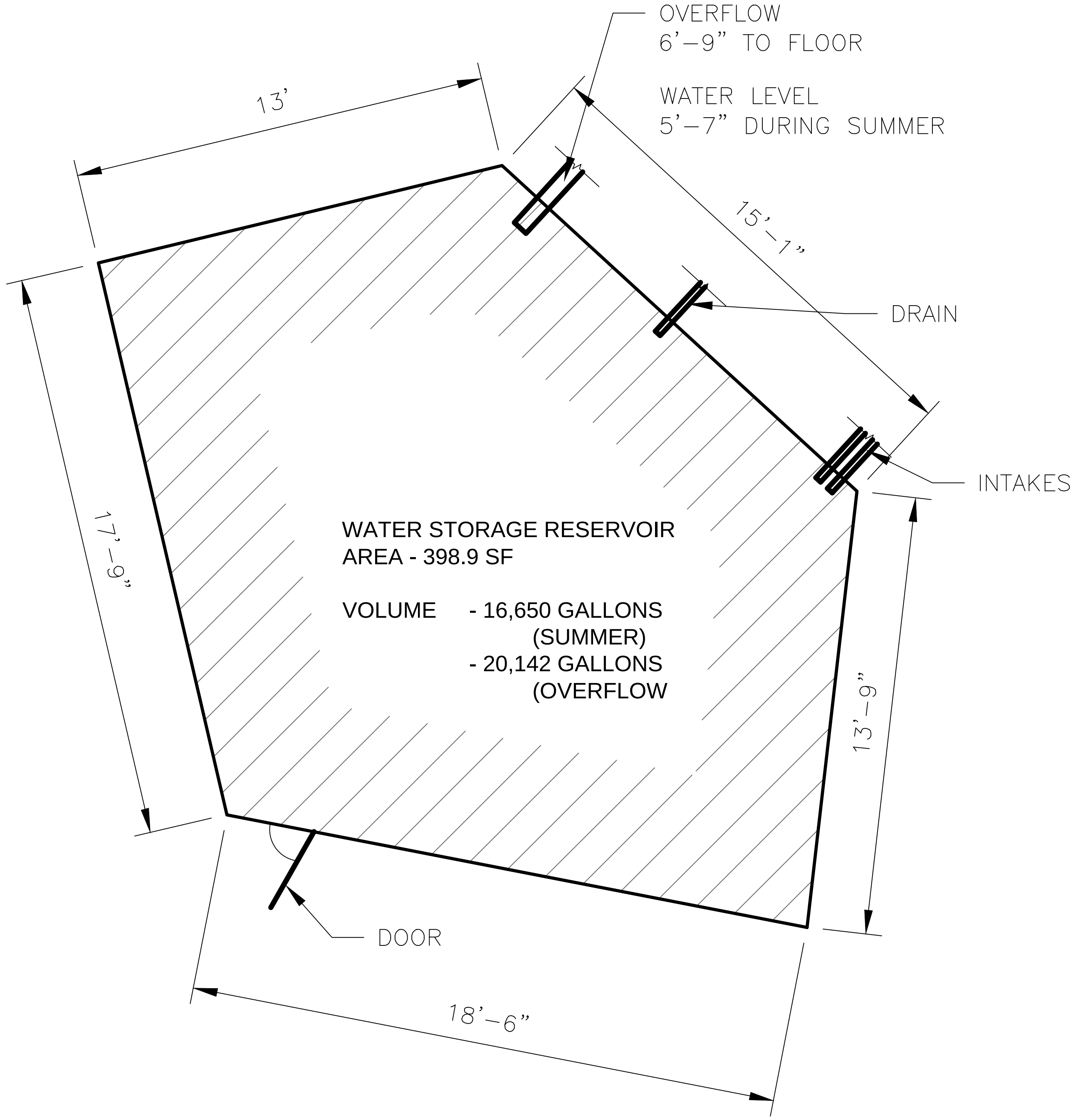
APPENDIX D INVENTORY SCHEMATICS AND PHOTOS



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RANDOLPH FIRE DISTRICT #1

WATER STORAGE RESERVOIR

FIELD MEASURMENTS

RANDOLPH CENTER, VERMONT

PROJECT NO. 000000

PROJECT MJR. ---

SCALE 1" = 5'-0"

DATE OCTOBER 2018

DRAWING NO. FIG 1

FILE: R:\Randolph VT\Randolph FD resevoir.dwg Oct 25, 2018 - 2:42pm

Inventory Photos

Spring & Pump House - PH

AE - 1 Fire District Pump House

AE - 1a Fire District Pump House

AE - 3 Fire District Spring Collection Box

AE - 4 Fire District Storage Shed

AE - 5 Fire District Pump No. 1

AE - 5a Pump No. 1 Tag

AE - 5b Pump No. 1 Tag

AE - 6 Pump No. 1 Tag

AE - 6a Pump No. 1 Tag

AE - 6b Pump No. 1 Tag

AE - 7 Day Tank

AE - 8 Chemical Pump

AE - 9 Level Control

AE - 10 Control Panel

AE - 11 Flow Meter

AE - 12 Control Panel

AE - 13 PumpTImer

AE - 14 Pump Control

AE - 15 Inlet Piping

AE - 16 Discharge Piping

AE - 17 Heating Units

AE - 18 Ladder to Lower Level

Connection Vault - CV

AE - 19 6" Valves (2 of 3)

AE - 19a 4" Valve

AE - 19b 6" Valve (3 of 3)

AE - 19c 6" Valves (2 of 3)

AE - 20 Valve Vault Access Hatch

Meter Chamber #1 – M1

AE- 21 Valves

AE- 22 Valves

AE- 23

AE- 24

AE- 25

AE- 26

AE- 27

AE- 28

AE- 30

AE- 31

AE- 32

AE- 33

AE- 34

AE- 35

AE- 36

AE- 37 Meter

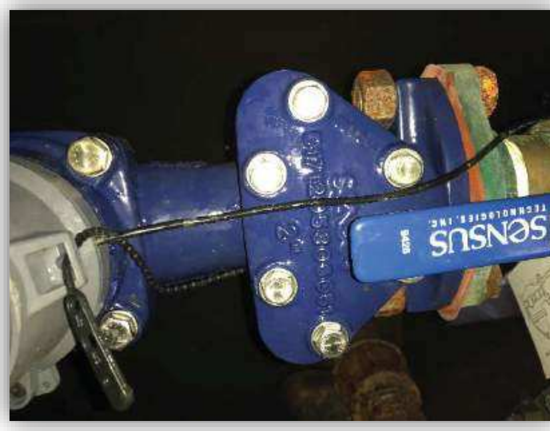
AE- 38 Meter

AE- 39 Meter

AE- 40 Meter

AE- 41 By-pass

AE- 42 Strainer



AE- 43 Strainer

AE- 44 Flow Meter

AE- 45 Flow Meter

AE- 46 Flow Meter

AE- 47 Flow Meter

AE- 48 Valves

AE- 49 Valves

AE- 50 Valves

AE- 51 Valves

Meter Pit #2 – M21

AE- 52 Meter

AE- 53 Meters

AE- 54 Meter Number

AE- 55 Meter

AE- 56 Flow Meter

AE- 57 Flow Meter

AE- 58 Flow Meter

AE- 59 Flow Meter

AE- 60 Flow Meter

AE- 61 Hatch

Penny Brook Well – PBW

AE- 62 Hatch and Panel

AE- 63 Valves

AE- 64 Electric Meter

AE- 65 Control Panel

AE- 66 Well

AE- 67 Pressure Gauge

AE- 68 Blow off valve

AE- 69 Blow off valve

AE- 70

AE- 71

AE- 72 Heater and panel

AE- 73 Heater and piping

AE- 74 Piping

AE- 75 Well

Orchard Treatment Vault - OP

AE- 76 Stairs

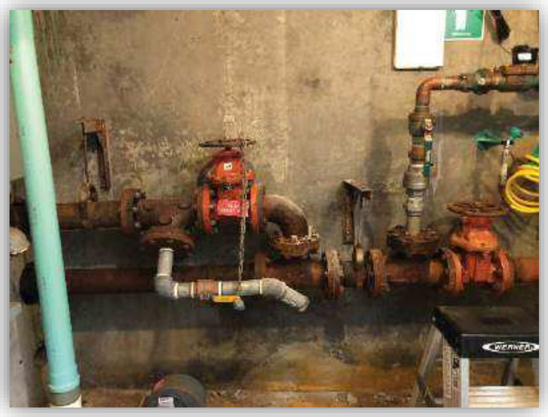
AE- 77 Day Tank

AE- 78 Day Tank

AE- 79 Chemical Pump

AE- 80

AE- 81 Piping



AE- 82 Piping

AE- 83 Piping

AE- 84 Flow Meter

AE- 85 Flow Meter

AE- 86 Flow Meter

AE- 87 Flange

AE- 88 Flange

AE- 89

AE- 90

AE- 91

AE- 92 Tee

AE- 93 Tee

AE- 94 Tee & Valve

AE- 95 Piping

AE- 96 Control Panel

AE- 97 Control Panel

AE- 98 Old Hatch

AE- 99 Blower/Ventilator

AE- 100 Motor tag

AE- 101 Blower Motor tag

AE- 102 Piping

AE- 103 Shelves

AE- 104 Panels

AE- 105 Stairs

Hartness Well - HW

AE- 106 Hatch

AE- 107 Well

AE- 108 Well Piping

AE- 109 Well Piping

AE- 110 Flow Meter

AE- 111 Flow Meter

AE- 112 Well Piping

AE- 113

Keenan Well – KW

AE- 114 Well Piping

AE- 115 Well

AE- 116 Well Piping

AE- 117 Sump

AE- 118 Conduit lines

AE- 119 Meter

AE- 120 Meter

AE- 121 Meter

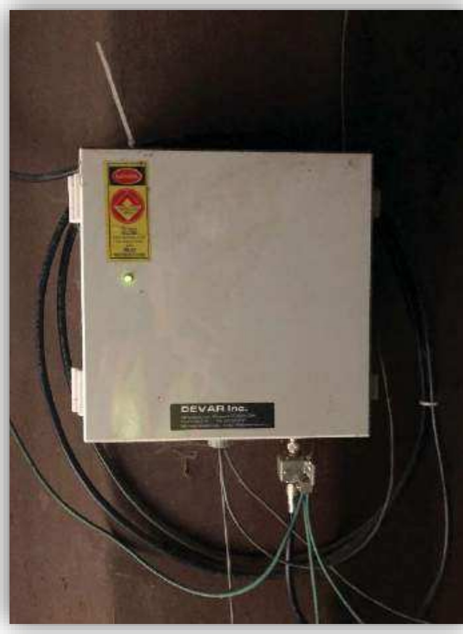
Water Tower – WT

AE- 122 Water Tower

AE- 123 Tower door

AE- 124 Insulated piping

AE- 125 Looking Up in Tower



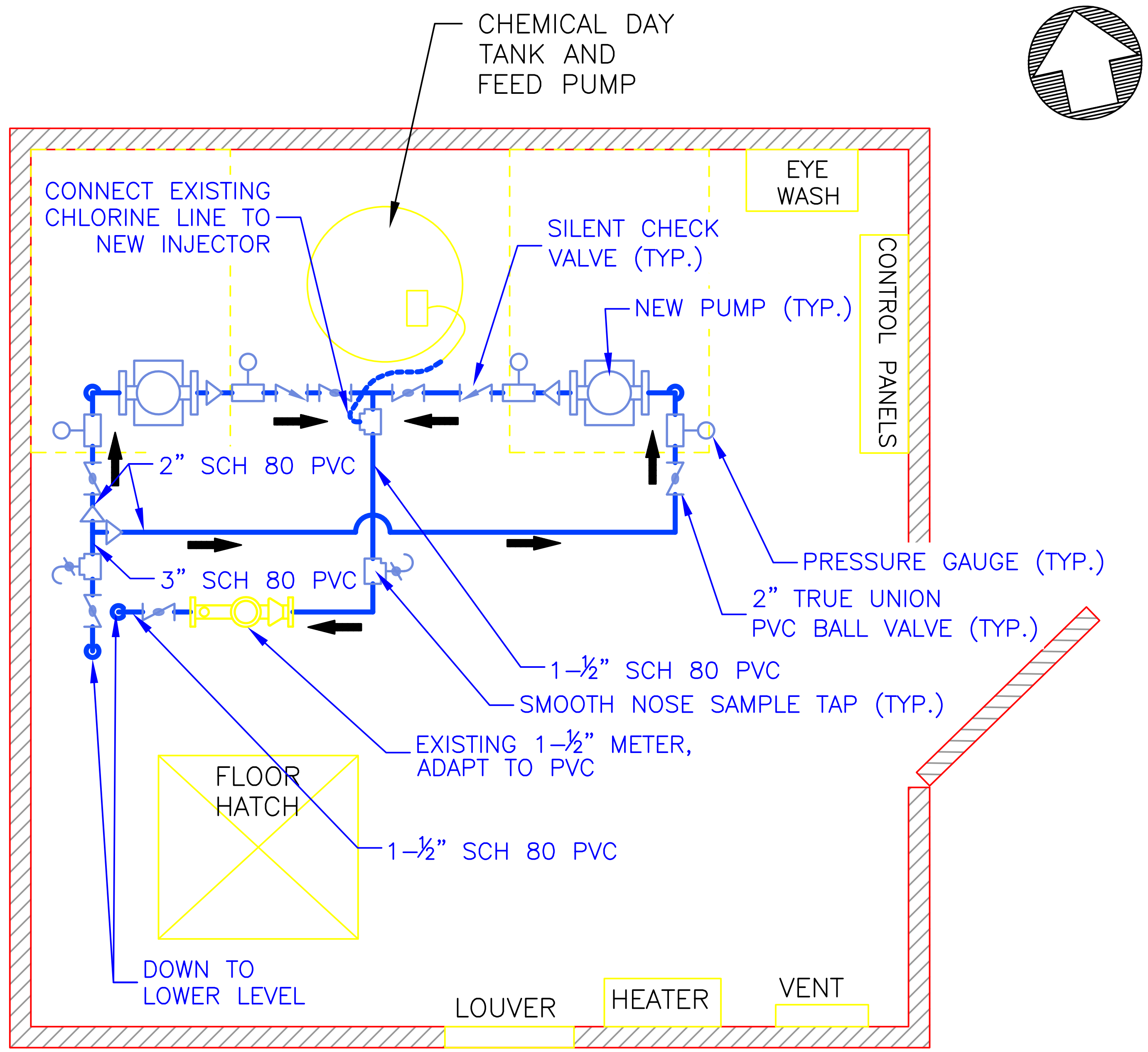
AE- 126 Insulated Piping

AE- 127 Control Box

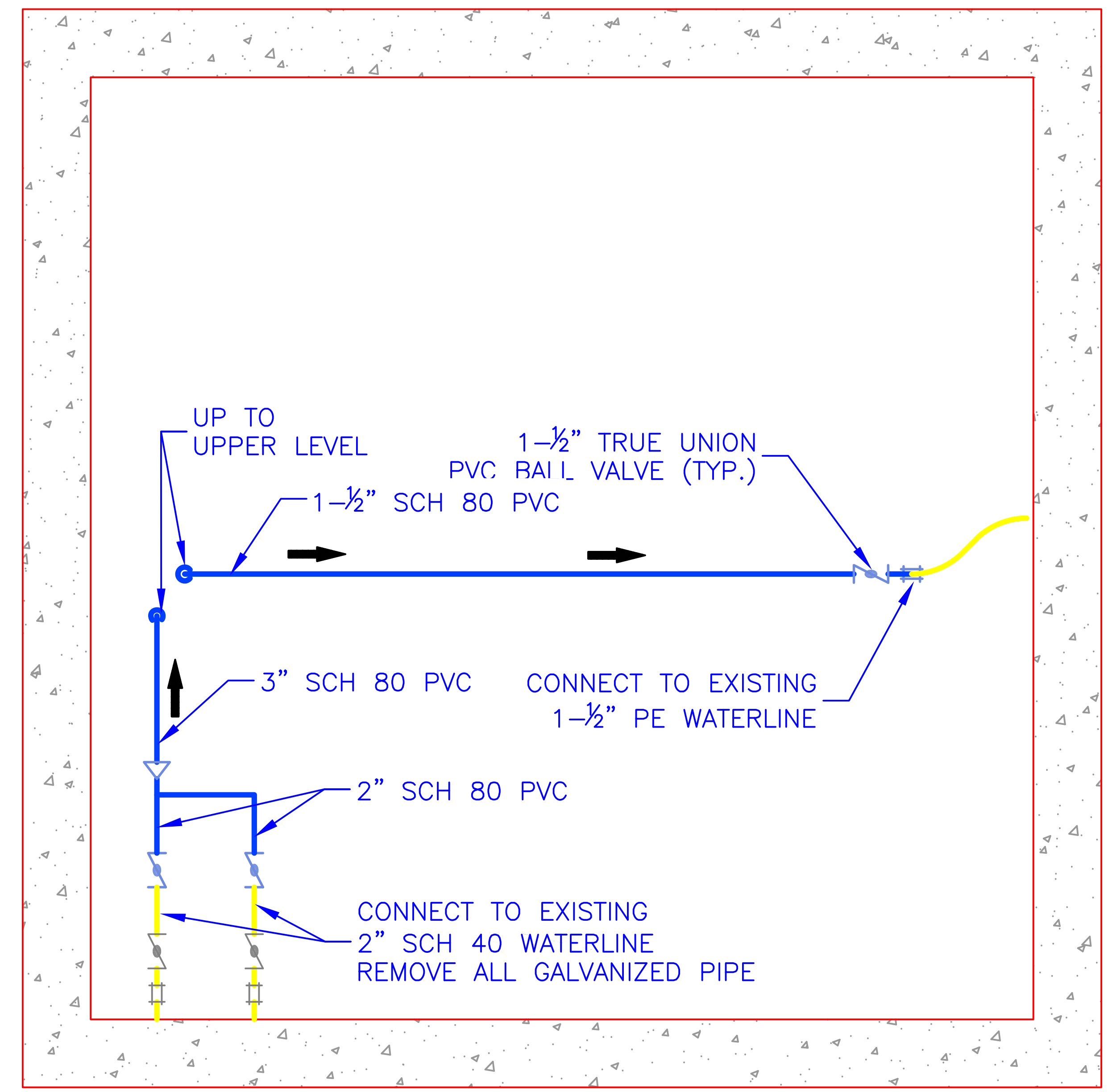
AE- 128 Tower Exterior

AE- 129 Tower Exterior

AE- 130 Water Tower



UPPER LEVEL



LOWER LEVEL

LEGEND

- BALL VALVE –
- CHECK VALVE –
- REDUCER –
- SAMPLE TAP –
- PRESSURE GAUGE –
- CHEMICAL INJECTOR –
- FLOW ARROW –

PUMP STATION PLAN

SCALE: 1/2" = 1'–0"

NOTES:

1. SAMPLE TAPS TO BE SMOOTH NOSE
2. ALL PRESSURE GAUGES TO BE LIQUID FILLED. SUCTION SIDE TO BE 0–30 PSI. DISCHARGE SIDE TO BE 0–200 PSI.
3. THE PIPING AND PUMPS ARE A SCHEMATIC REPRESENTATION AND NOT TO SCALE.

0 4 8 Feet

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Home page: www.dufresnegroup.com

Project #	41202017
Project Mgr.	BLB
Design	BLB
Drawn	BLB
Checked by	TPK
Date	OCT 2020
Scale	AS SHOWN
Approved by	

RANDOLPH FIRE DISTRICT #1

PUMP STATION LAYOUT
CONCEPTUAL SCHEMATIC

RANDOLPH CENTER, VERMONT

FIG. 1

DWG. NO. Schematic Drawings.dwg

SHEET 1 OF 1

APPENDIX E 1967 FD AND VTC AGREEMENT

An agreement made this 21 day of February, 1967, between VERMONT STATE COLLEGES, hereinafter called "Colleges" and FIRE DISTRICT NO. 1 in the Town of Randolph, Vermont, hereinafter aclled, "District".

WHEREAS, the District now owns a water storage facility and water system which is located on the Vermont Technical College campus at Randolph; and

WHEREAS, the Colleges wish to expand the Vrmont Technical College in the area now occupied by this District facility;

NOW THEREFORE, it is agreed between the parties as follows:

1. The Colleges will provied a new water storage facility at no cost to the District, which will serve both the District and Vermont Technical College, and which apart from the College requirements, will have a minimum capacity of fifty thousand (50,000) gallons;
2. The Colleges will provide a new water main of at least 6" diameter at no cost to the District, which will connect the new water storage facility to the District's own existing water main at the nearest feasible point;
3. The Colleges will provide metering facilities and valve arrangements such that the quantity of water flowing between the two systems may be determined. This will require metering the gallonage flowing from the new storage facility to the District and metering the gallonage flowing from the District source to the new storage facility;
4. The Colleges will provide, at no cost to the District, in the main or mains which the District now owns and operates, a pressure equal to or greater than that presently existing which is twelve (12) pounds per square inch.
5. The Colleges will provide and have installed new pumping equipment of equal or greater capacity for the District to replace existing pumping equipment if the existing equipment is not capable of meeting service requirements of the new system;
6. The Colleges will provide and have installed for theDistrict at the existing spring pump house, time clock and pressure control equipment for semi-automatic operation of thepumping equipment.
7. The Colleges agree that the water town will be located on theChadwick lot to be purchased by the Colleges.
8. The District will operate, maintain, improve as the situation may warrant, and be completely responsible for all parts of the water system outside of the Vermont Technical College property except (a) the storage facility; (b) the new main connecting the storage facility to the District's existing main; (c) such mains and laterals as exist or may be required to service Vermont Technical College;
9. The District will daily dump that quantity of water from the District owned source of supply to the storage facility which is equal to the requirements of the District's system.
10. The District will at all times maintain a reading on the meter measuring gallonage flowing from the District source to the new storage facility, of an amount within one hundred thousand (100,000) gallons of the coincident reading on the meter measuring the gallonage flowing from the new storage facility to the District;
11. The District shall at all times have the right to make full use of the new storage facility up to the aforementioned 50,000 gallon capacity; however, should the District at any time require additional storage capacity, such additional capacity shall be provided by the District;
12. The District shall grant to the Colleges any right, title or interest the District may have in its reservoir located on the Colleges' property;
13. Both parties agree to maintain their water supply systems and facilities in a safe operating condition;
14. Both parties agree to meet the sanitary requirements of the Department of Health, State of Vermont or other State or Federal Agencies having judisdiction;
15. Both parties agree to observe and adhere to recognize health standards in operating and maintaining the separate systems.
16. Both parties agree that any disagreement be submitted to arbitration in accordance with the rules of the American Arbitration Association, and the decision therefrom shall be final and binding on both parties.

APPENDIX F LEAK DETECTION REPORT

New England Water Distribution Services, LLC

Comprehensive Leak Detection Survey Report

Randolph Center, VT

Performed on 5/22/17 and 5/23/17

Summary of Survey

On Monday May 22, 2017 and Wednesday May 23, 2017 New England Water Distribution Services conducted and completed a water leak detection survey for the Randolph Center and Vermont Technical College. During this period of time the weather was cooperative. New England Water Distribution Services was able to complete the survey during daylight hours. All pinpointing was done during daytime hours.

New England Water Distribution Services by listening on all curb stops, meter pits, and blow offs. We identified three service leaks within Randolph Center and a gate valve leak at Vermont Technical College.

Total Leakage

- **Randolph Center - 20 GPM/ 28,800 GPD.**
- **Vermont Technical College - 6 GPM/ 8640 GPD.**

These water systems have excellent mapping with all valves, and curb stops accessible.

We look forward to working with you and your staff in the future. If you have any questions or need our services in the near future, please feel free to call at your convenience.

Leak Detection Survey Daily Report

Technician(s):	Randy Troupe	Date:	5/22/17		
Contractor:	New England Water Distribution Services LLC				
Survey Address:	Randolph Center & Vermont Technical College	City:	Randolph Center	State:	VT

Weather:	Cloudy Rain 48 degrees F wind 5-10 mph.
Miles Surveyed: (approximate)	10:30 am - 5:00 pm
Type of Pipe Surveyed:	Ductile Iron, Cast Iron, Copper, PVC, Transite.
Suspicious Areas:	None
Leaks Located:	2980 Vermont Rte 66 leak in the 1 1/2" copper service (11 GPM). 209 East Bethel Rd. First Congressional Church leak in the service line, curb stop will not turn, (4 GPM). 21 Water St. Service line leak (5 GPM) house side of the curb stop.
Leaks Pin-Pointed:	Same as Leaks Located
Additional Comments:	None

Technician(s):	Randy Troupe	Date:	5/23/17		
Contractor:	New England Water Distribution Services LLC				
Survey Address:	Randolph Center & Vermont Technical College	City:	Randolph Center	State:	VT

Weather:	Partly cloudy 68 degrees F wind 0-10 mph
Miles Surveyed: (approximate)	9:30 am - 4:00pm.
Type of Pipe Surveyed:	Ductile Iron, Cast Iron, Copper, PVC, Transite.
Suspicious Areas:	None
Leaks Located:	Vermont Technical College - Outside the Nutting building 6" gate valve leak (6 GPM).
Leaks Pin-Pointed:	Same as Leaks Located
Additional Comments:	None

Leak Detection Hydrant Report

Customer:	Randolph Center & Vermont Technical College	**Date:**	5/26/17

#(See below)	Leak Address	Hydrant	Leakage Amount: Gallons Per Minute (gpm)	Date Found	Date Pin-Pointed
	TOTAL Leakage Per Minute:	0.0 GPM			
	TOTAL Leakage Per Day:	0.0 GPD			

(gpm = Gallons Per Minute)
(gal = gallons)

Additional Comment:

Leak Detection Survey Final Report

Customer:	Randolph Center & Vermont Technical College	Date:	5/26/17

#(See below)	Leak Address	Type of Leak	Leakage Amount: Gallons Per Minute (gpm)	Date Found	Date Pin-Pointed
1	2980 Vermont Rt 66	Copper Service	11.0	5/22	5/22
2	209 East Bethel Rd. First Congressional Church	Service Line	4.0	5/22	5/22
3	21 Water St.	Service Line	5.0	5/22	5/22
4	Outside Nutting Building	Gate Valve	6.0	5/23	5/23
	TOTAL Leakage Per Minute:	26 GPM			
	TOTAL Leakage Per Day:	37,440 GPD			

(gpm = Gallons Per Minute)
(gal = gallons)

Additional Comment:

Leak Images

2980 Vermont Route 66

209 East Bethel Rd. First Congressional Church

21 Water St.

Outside Nutting Building

From:	William DeFlorio
To:	John Lens; Naomi Johnson
Cc:	Manazir, Theodore R.
Subject:	Re: Randolph Center AMP Revisions
Date:	Friday, January 15, 2021 11:20:36 AM
Attachments:	5177 Randolph Center Leak Detection Survey Report 2017.pdf Leak Detection Solicitation 2016.pdf

Naomi/John/Ted

The leak survey (paid for by the State) was conducted in May 2017. May 18th and 19th were spent in preparation for the survey by locating And marking curb stops, valve boxes etc. to make sure they were easy to find, accessible and operational and also completing the Leak Detection Survey Request Form (attached).

The result of the survey is that we found 3 service leaks, one that was leaking badly but had not surfaced until the day after the survey probably due to operating the curb stop. All 3 leaks were fixed or replaced over the summer. In addition to checking services we checked hydrants and valves and no leaks were detected on those. The major leak near Floyd's store took a day and a half to repair. The ground was so saturated that it required a lot of excavation to obtain a stable hole to work. This particular service served 2 residents, the store and the post office. Details of this are shown on our Base Map. The leak on the service to the church required the installation of a new service in a different location. We decided this route because the leak was somewhere under the red school parking lot or the So. Randolph Road. It would have been very difficult to pinpoint this and it would require major work to dig up the parking lot or S. Randolph Road. The last leak at the Squire residence turned out to be fairly minor. Please see and the leak detection survey report filled out by Randy Troupe of New England Water Distribution Services (also attached).

Bill

On January 14, 2021 at 9:33:10 PM, John Lens (johnelens@gmail.com) wrote:

> Hello Naomi,
> By way of cc's to Bill DeFlorio and Ted Manazir I am relaying your request for records on the leak inspection we did for the FD and the records Bill and Ted may have on breaks, repairs, and maintenance.
>
> Bill and Ted - I'm vaguely recalling talking about compiling these records but not recalling beyond that. Whatever you can relay to Naomi on this will help DG in understanding at least the recent record of conditions.
>
> Thanks,
> John
>
> On Thu, Jan 14, 2021 at 12:42 PM Naomi Johnson <njohnson@dufresnegroup.com> wrote:
>
> > John,
> >
> > As we revise the AMP, I have an area where your input is needed. Under the Condition Assessment, you noted that there is a 2017 leak detection evaluation and other data that may include visual inspections, repair and other records/reports and video inspection. I

do not see that we discussed this data during our meetings or that it was provided. If you have information that should be considered, please send it to me.

Thanks very much!

Naomi R. Johnson, *PE*

President

DUFRESNE GROUP
CONSULTING ENGINEERS

Dufresne Group

56 Main St, Suite 200| Springfield, VT 05156

Phone: 802.674.2904 | Fax: 802.674.2913 | Cell: 802.291.4733

njohnson@dufresnegroup.com

www.dufresnegroup.com

APPENDIX G HISTORICAL CORRESPONDENCE TO FD SPRING

LINCOLN
APPLIED GEOLOGY, INC.
ENVIRONMENTAL CONSULTANTS

July 14, 1995

Mr. John Bruno
Bruno Associates, Inc.
Route 4 - East, The Mill
Woodstock, Vermont 05091

RE: Step Drawdown Test of the Vermont Technical College/Randolph Center Fire District Spring With Conclusions and Recommendations

Dear Mr. Bruno:

Lincoln Applied Geology Inc. (LAG) has completed the analysis of the step drawdown test data that was collected by Tri-State Water from the abovementioned spring. The results of this analysis indicate that the Vermont Technical College (VTC)/Randolph Center Fire District (RCFD) spring is capable of supplying between 128 gallons per minute (gpm) and 184 gpm. This potential capacity is much greater than that calculated using a desktop analysis based on the drainage area tributary to the spring and a unitized 1Q20 flow value derived from a local gaged stream (i.e. Ayers Brook in Randolph). On the basis of this comparative analysis it is obvious that the spring behaves atypically and is not driven by surface water processes. In short, the spring is a true ground water source that should not be analyzed using surface water methods. In this regard, we believe that the course of action necessary to approve this spring and ultimately the system is to complete the necessary source testing application and conduct the appropriate well testing of the VTC/RCFD well first and obtain its maximum approved yield. Once this yield is known the spring can be tested in order to "make up" the difference between the well yield and the complete demand of the system. We recommend this course of action because if the difference is small between the well yield and total demand of the system a quick desktop analysis will only be required to approve the spring, instead of a prolonged constant rate pumping test that will be much more costly.

Step Drawdown Test

A 7 hour step drawdown test was conducted on the VTC/RCFD spring on June 23, 1995 by Tri-State Water Systems, Inc. The test was conducted by placing a pump capable of 260 gpm into the spring and pumping it for one hour periods at successively higher rates for a total 6 hour period (i.e. 6 steps). Following the completion of the sixth rate step, the pump was turned off and the spring was allowed to recover for one hour. During both the pumping and recovery periods the depth to water level within the spring was measured from a temporary measuring point at regular intervals to obtain information about the aquifer's response to pumping. The spring was pumped at 53

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gpm, 86 gpm, 128 gpm, 184 gpm, 236.6 gpm, and 255 gpm during the test.

A hydrograph showing the collected data is attached to this letter. A trend line was drawn through the 53 gpm, 86 gpm, 128 gpm, and 184 gpm pumping data to extrapolate long-term drawdown related to each.. These trend line extensions were then were used to calculate the drawdown in the spring after 187 days of continuous pumping. The 128 gpm pumping rate was found to be the most acceptable with a total drawdown of 3.59 feet after 187 days. When compared to a total available drawdown of 7.00 feet, it suggests that the spring may be capable of producing more than 128 gpm. The next higher pumping rate of 184 gpm resulted in a projected drawdown value below the bottom of the spring after 187 days. Data from the last two pumping rates (i.e. 236.6 and 255 gpm) was not evaluated because it absolutely indicated aquifer (spring) dewatering. On the basis of the trend line analysis, we believe that the optimum capacity of the spring is between 128 - 150 gpm.

A review of the Randolph Geologic Quadrangle Map shows that there is a formational boundary in the vicinity of this spring. This may be one explanation why the spring is so prolific. The response at the lower rates helps suggest that this spring is deep rooted and truly connected to the local and regional ground water system and is in no way connected to the surface water flow system of the area.

<u>Recommendations</u>

While we feel this spring is truly prolific and may be capable of supplying the entire demand of the VTC/RCFD system, the Water Supply Rule could make proving it both difficult and expensive. In this regard, we believe it prudent to test the VTC well first by preparing the necessary source testing application, and then conducting the necessary testing. Once an approved yield is obtained for the well, the additional yield required from the spring may be approved by performing a simple desktop analysis. If the desktop analysis does not show that the spring is capable of supplying the difference between the total demand of the system and the approved yield of the well, then a more formal pumping test on the spring will ultimately be required. The WSD will need to concur with our assessment that the spring behaves atypically and is truly connected to a deeply rooted local and regional ground water system. There is no question in my mind that I can get this concurrence, even if I have to get it through Ed Leonard.

<u>Costs</u>

Based on our joint discussions and the preceding recommendations you will

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need LAG costs to complete the source testing application, the supervision of all appropriate pump tests, the well analysis, and a water source evaluation summary report for the VTC/RCFD well. In this regard, please see Phase2, Task 2 - 5 related costs in our June 22, 1995 work scope and cost estimate for the potable supply development. These task are appropriate to perform all the necessary work for the VTC/RCFD well. Based on the results of the well testing we will submit another cost estimate to cover LAG costs to test and approve the spring.

If you have any questions, comments, or concerns with regard to this report please do not hesitate to call me or Rick Vandenberg at (802) 453-4384.

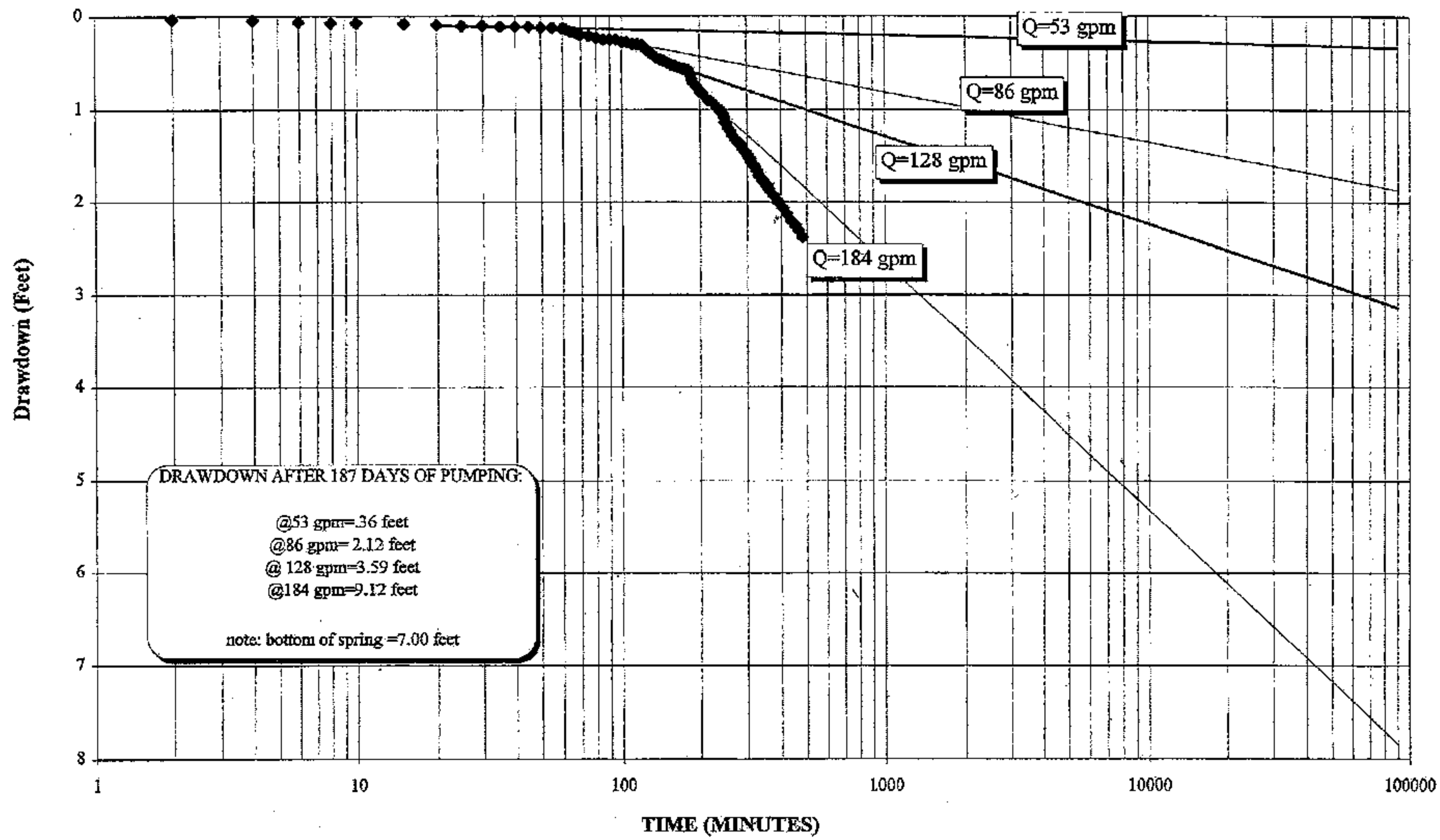
Sincerely yours,

Steve Revell
Sr. Hydrogeologist

SR/smk

Vermont Technical College and Randolph Center Fire District
Randolph Center, VT

Hydrograph of the Randolph Center Spring



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25
YEARS OF EXCELLENCE
LINCOLN APPLIED GEOLOGY, INC.

January 19, 2012

Mr. John Benson, PE
Dubois & King, Inc.
28 North Main Street
PO Box 339
Randolph, Vermont 05060

RE: Gifford Nursing Home Project, Gifford-Lafrance Property, Randolph Center – Water Availability Analysis

Dear John:

As requested, I've completed a two phase water availability analysis related to supplying the average and maximum daily demand required by the subject proposed Gifford Nursing Home to be located in Randolph Center, north and west of Route 66. The general location of the property and a general site plan of the property are shown on Figure 1. The two phases of the project included identifying on-site well sites that have the potential of supplying the required water demand and evaluating the possibility of connecting to the Randolph Center Fire District water system which supplies the Village of Randolph Center and Vermont Technical College (VTC).

Regarding the water demand of the project, you indicate a first phase average daily demand (ADD) of 6,000 gallons per day (gpd) and a possible "built out" demand of 16,000 gpd. This translates into a first phase maximum daily demand (MDD) of 8.3 gallons per minute (gpm) and a "built-out" MDD of 22.22 gpm. To determine the possibility and probability of siting a well capable of meeting this demand, the geology of the Randolph Center area was defined, a well yield probability analysis was conducted using well data from the area and an earth fracture analysis was conducted using aerial photography to identify potential zones of concentrated rock breakage (i.e. fracture zones or intersections of two or more fractures).

The geology of the Randolph Center area is reasonably well defined by both published and unpublished sources. The project area is mapped as being underlain by either or both the Gile Mountain and Waits River formations of Ordovician age (350-450 million years old). There is a generally described (vertical?) contact between the formations that runs north-south along the Route 66 ridge with the Gile Mountain to the west and the Waits River to the east. The Gile Mountain is described as a quartz-mica schist, garnetiferous phyllite, micaceous quartzite and minor siliceous marble; and the Waits River is described as a blue-gray recrystallized impure limestone, highly siliceous garniferous phyllite, tan quartzite, quartz-biotite schist and quartz-calcite schist. By virtue of their composition and mineralogy, both formations are understood to be reasonably brittle, fracture prone and capable of propagating earth fracture zones. The yield potential of a randomly placed well associated with these formations (in the project area) was evaluated utilizing published well data and by conducting a conservative well yield probability analysis. In this regard, 73 well reports were reviewed which are located in a 1-1.5 square mile area associated with Randolph Center. A tabulation of this data is shown in Table 1 which includes the well tag number, the well depth, the yield in gpm, the yield rank of the well and the probability of yield occurrence. It is important to understand that this is an analysis related to randomly placed, not scientifically placed wells associated with fractures or fracture intersections. The overall data set describes well yields ranging from 1 to 150 gpm, with an average yield of 22.8 gpm. It should be noted that there are many above average yields (greater than 20 gpm) within the data set which indirectly document the presence of some fracture zones in this area. Well depths range from 60' to 520', with an average depth of 195'. Utilizing the individual well yield data and their associated exceedance probability allows the well yield probability graph presented as Chart 1 to be constructed. The data is fitted with a best fit curve which translates into a formula that allows the probability of achieving a particular yield to be calculated. In this regard and conservatively, there is a 61% chance of achieving an 8.33 gpm yield and a 38% chance of achieving a 22.22 gpm yield. It is again important to understand, that these are yield probabilities for randomly placed wells, not scientifically placed wells on possible fracture zones and/or intersections.

Based on the fact that there are many wells in the area with >20 gpm yields and the probability of achieving an acceptable yield are encouraging, an earth fracture analysis was conducted to determine whether any potential well sites exist either on a perceived fracture or at an intersection of fractures. In this regard, two sets of readily available stereo aerial photographs (i.e. 1962 and 1974) were evaluated which indicated the presence of a few sets of southeast-northwest and southwest-northeast trending earth fracture traces (i.e. photo-lineations) with a couple of reasonable intersections located on the subject property.

In this regard, I've shown 2 potential well sites on the Figure 1 Site Plan along with predicted 200' x 400' to 600' well head protection zones. It is important to note that all the adjacent properties located upslope (east) of the subject property are single family residences, with a disposal area located behind each residence. Because the required MDD yield is >8 gpm, each proposed well site must be isolated from these disposal areas by a 2 year effluent travel time distance. I've briefly evaluated the travel time with the following inputs: distance (400'), head difference (20.4'), porosity (0.30), and hydraulic conductivity of a firm till (1.0 foot/day). Based on this very preliminary analysis, it would take ground water amended effluent +2,000 days to migrate 400'. So, preliminarily it looks like each well site is effectively isolated. The difficult part of this analysis is that a well will have to be drilled before accurate travel time inputs can truly be defined.

As we've discussed many times, the absolute solution is for the water demands of the project to be supplied by the Randolph Center Fire District water system that is sourced from both a drilled bedrock well and a spring. I spent some time with Scott Stewart of the Water Supply Division and Mike Regan of the Randolph Center Fire District developing an understanding of the spring source, water system demands and water source yields. I initiated this work with an inspection and general characterization of the spring. In this regard, I visited the spring on November 18, 2011 with Mike Regan and observed the spring, the spring impoundment, the pumping and chlorination vault and the spring overflow. The spring is a true bedrock spring which derives its yield from an upflowing bedrock related ground water system, not surface water. The impounded spring has upflow characteristics which lead to 6 to 7 feet of available water (above the spring opening) which results in the overflow of +/-50 gpm under pumping and non-pumping conditions. It's noteworthy to point out that the pump and chlorination vault is located 5'-6' below grade and shows visual evidence of the upward flow of ground water in the form of a small geyser or fountain associated with a crack in the floor.

The Spring contributes approximately 3,000 gpd to the Fire District system by the daily pumping of 50 gpm over a one hour time period. A very sensitive pressure transducer was installed in the Spring on December 2, 2011 for a week to monitor spring level fluctuation during pumping and non-pumping period. The water level record is shown on Chart 2. The overflow was approximately gauged at 50 gpm before setting the transducer and after removing the transducer. The water level record shows very minor (inches) of diurnal and barometric pressure change effects but no direct impacts related to the daily pumping of the spring for a one hour period at a 50 gpm rate. Needless to say, the spring appears to have a great deal of unused capacity with +6' of available drawdown and a 50 gpm overflow rate. As it turns out, on June 23, 1995 Lincoln Applied Geology, Inc. (LAG) conducted a step drawdown test on the spring at rates of 53, 86, 128, and 184 gpm. The test results are presented in a letter report that is attached. On the basis of this limited pumping of the spring, we (LAG) felt that it absolutely has a yield of at least 86 gpm and more realistically a yield of approximately 128 gpm based on a projected drawdown of 3.59' after 187 days of pumping versus an available drawdown of 7'.

I met with Scott Stewart, the Hydrogeologist from the Water Supply Division that oversees the Randolph Center Fire District water system. Scott generated the two attached Ground Water Source Forms for the District, one that describes the spring and one that defines the Langevin Farm or (Penny Brook) well which jointly source the subject system. As these forms indicate, the design capacity (permitted yield) of the spring and well is 50 gpm and 90 gpm, respectively for a total available yield of 140 gpm. We then reviewed the attached water usage table which describes 17 years of District water use on a monthly basis. Scott identified the highest water use of the

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period of record (which equates to 69 gpm) and the lowest use of the period of record (which equates to 29 gpm). Scott also indicated that the District has the capacity to supply the demand of the Nursing Home and recommended that the subject project should request a capacity to serve letter from the Fire District. The long and short of the matter is the Fire District has an available capacity or yield of 140 gpm. When the current demand of 69 gpm is compared with an available yield of 140 gpm, it is very apparent that there is approximately 70 gpm of capacity available for Randolph Center projects such as the Nursing Home, as well as capacity available for the future needs (i.e. expansions) of VTC. Assuming the MDD of 22.22 gpm required by the subject project is supplied by the Fire District system, this would result in a total Fire District usage of approximately 91 gpm, leaving approximately 49 gpm of capacity (yield) available for future use by the overall District.

Based upon both my analysis and Scott Stewart's input, I strongly recommend that a capacity to serve letter be requested from the Fire District for the built-out MDD of the Nursing Home of approximately 22 gpm. While there are several well sites located on the subject property that can theoretically generate the MDD of the project, there are no guarantees without investing in drilling, pump testing and well isolation analyses. The capacity of the Fire District System is a known fact which strongly suggests that the Nursing Home project should be connected to the system. The last attachment to this letter is a list of contacts for the Fire District.

If you have any questions, please feel free to contact me.

Very truly yours,
Lincoln Applied Geology

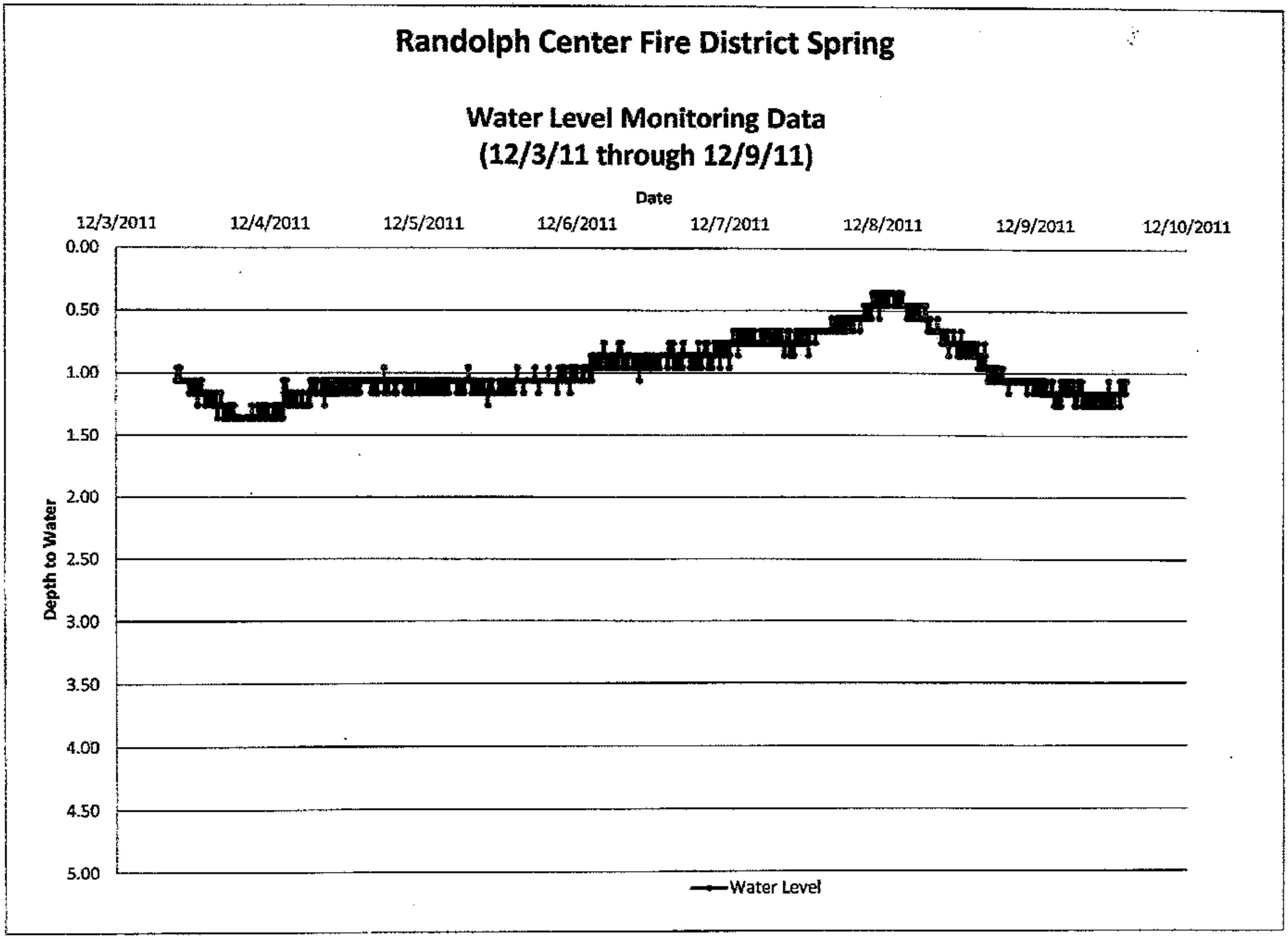
AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
CERTIFICATE NUMBER 6259
AIPG
STEPHEN REVELL
CERTIFIED PROFESSIONAL GEOLOGIST

Stephen Revell CPG
Senior Hydrogeologist

SR/SK:ih
cc: Theron Manning
Mike J. Regan
Scott Stewart

F:\CLIENTS\2011\11115\water availability analysis letter 01 19 12.docx

Chart 2



Randolph Center Fire District Spring
Water Level Monitoring Data
(12/3/11 through 12/9/11)
Date
12/3/2011
12/4/2011
12/5/2011
12/6/2011
12/7/2011
12/8/2011
12/9/2011
12/10/2011
Depth to Water
0.00
0.50
1.00
1.50
2.00
2.50
3.00
3.50
4.00
4.50
5.00
Water Level

APPENDIX H 2018 SANITARY SURVEY

Sanitary Survey

WSID: VT0005177 RANDOLPH CENTER WATER SYSTEM

User ID: Select...

Site Visit Info

Site Visit Date 12/20/2018 **System Notification Date** 1/16/2019

Comments

sanitary survey perfromed, both owners of the water system (Randolph Fire District 1 and Vermont Technical College) Represented the water System. Scott Beavers (P2 Envrionmental) and John Lens, prudential committee member, also attended this sanitary survey

Category Evaluation Summary

Source	Recommendation	**Water System Management**	Significant
Treatment	Recommendation	**Operator Compliance**	No Deficiencies
Distribution System	No Deficiencies	**Security**	No Deficiencies
Finished Water	Recommendation	**Financial**	No Deficiencies
Pump	No Deficiencies	**Other**	No Deficiencies
Monitoring Reporting	Minor		

Parties Present

Name	Role
SMART, PATRICK (DWGWPD)	Primary Surveyor
RAYMOND, TIM (DWGWPD)	Select...
BEAVERS, PATRICIA M (HOME)	Select...
MANAZIR, TED (HOME)	Select...
DEFLORIO, WILLIAM (HOME)	Select...
BEBEY, JONATHAN T (HOME)	Select...

Deficiencies

Deficiency

D726

Category Code Distribution **Severity Code** Recommended

Determination Date 12/11/2009 **Facility ID** DS001

Resolved Date

Comments:

Some hydrants on 6" lines. Requested Hydraulic analysis to assess hydrants on 6" lines.

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/11/2009	SNSV

Deficiency

M101 - No Permit to Operate

Category Code Management & Operation **Severity Code** Significant

Determination Date 12/20/2018 **Facility ID**

Resolved Date

Comments:

Both Randolph Fire Disttrict 1 and VTC are responsible for the operation of the water system, both entitites must apply for a permit to operate as co-permittees. Application received on 2/16/18, need additional information from the water system...

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

R250 - Monthly Reporting Inadequate

Category Code M&R
Determination Date 12/20/2018
Resolved Date

Severity Code Minor
Facility ID TP001

Comments:

system is not monitoring disinfectant residdual concentrations from a location following contact time and at or before the first custome

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

R250 - Monthly Reporting Inadequate

Category Code M&R
Determination Date 12/20/2018
Resolved Date

Severity Code Minor
Facility ID TP002

Comments:

system is not monitoring disinfectant residdual concentrations from a location following contact time and at or before the first customer.

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

M126 - Required Bacteriological Monitoring and Monitoring Plan

Category Code M&R
Determination Date 12/20/2018
Resolved Date

Severity Code Recommended
Facility ID DS001

Comments:

requested system provide updated information about distribution system, customers served by water system. Revisions to DBP-Stage 2 Sampling plan and RTCR Sampling Plan may be warranted, to be determined based on review of this requested information

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

R129 - Inadequate Water Quality Testing

Category Code M&R
Determination Date 12/20/2018
Resolved Date

Severity Code Recommended
Facility ID DS001

Comments:

Recommended water system consider installation and use of dedicated sample collection hydrants in distribution.

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

F176 - Tank Inspection

Category Code Finished Water Storage
Determination Date 12/20/2018
Resolved Date

Severity Code Recommended
Facility ID ST001

Comments:

tank is due for inspection in 2021, ten years following reconditioning performed in 2011

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

S075 - Unapproved Source

Category Code Source

Severity Code Recommended

Determination Date 12/20/2018

Facility ID WL004

Resolved Date

Comments:

WL004 is an emergency well, does contain an air-gapped connection to the water system. Water system reports this well is 'contaminated with NaCl' - recommend system physically separate well from water system.

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

Deficiency

R578 - Test Equipment Unavailable/Inadequate or Inadequate Testing Reagent

Category Code Management & Operation

Severity Code Recommended

Determination Date 12/20/2018

Facility ID

Resolved Date

Comments:

recommend system consider SCADA components to integrate operationm, control, and monitoring of system's pumping, source, storage, and treatment facilities.

Associated Site Visits

Site Visit Date	Site Visit Reason Code
12/20/2018	SNSV

System Info

System Name RANDOLPH CENTER WATER SYSTEM

System Type Community

Owner Type Local

Active Status Active

Operating Category 2

Activity Date 9/20/1989

Activity Reason Select...

Activity Comments

Memo Text System flow rates based on meter data from January to December 2014 as evaluated in the 2015 sanitary survey.

Connections

Connection Type	Meter Type	Number	Meter Size	Remove
Residential	Metered and Unmetered	68	0.000	☐

Service Areas

Service Area Type	Primary (Select One)	Remove
Other Transient Area	☐	☐
Recreation Area	☐	☐
Residential Area	☑	☐
School	☐	☐

System Flow Rates

Name	Rate	Unit	Remove
Average Daily Production (Depreciated)	52,000.000	GPD	☐
Max Daily Production	78,500.000	GPD	☐

System Indicators

Name	Indicator	Date	Remove

Required to Chlorinate	No	7/24/2012	☐
Continuously Chlorinating	Yes	12/11/2009	☐
Select...	Yes		☐

Population Served

Start Month	Start Day	End Month	End Day	Begin Date	End Date	Population Type	Count
1	1	12	31	3/1/2007		Residential	584
						Non-Transient	554

Facility Flows

Supplying Facility		Receiving Facility	Remove Flow
TP001	►	DS001	☐
TP002	►	DS001	☐
WL002	►	TP002	☐
WL001	►	PF001	☐
DS001	►	ST001	☐
PF001	►	TP001	☐
ST001	►	DS001	☐

Wells

Well Details

Name SPRING

Local Name NA

Facility ID WL001 | **Well ID** 0

Well Type Spring | **Water Type** Groundwater

Activity Active | **Activity Date** 1/1/1950

Activity Reason Select... | **Availability** Permanent

Activity Comment

Constructed Date 1/1/1950 | **Physical Mod Date**

Pump Type Centrifugal | **Pump Description** CENTRIFUGAL

TNC SWAP Status Select... | **TNC SWAP Date**

Well Cap | **Source Treatment** Treated

Direction

Well Comments Step test conducted up to 128 GPM/4 = 32 GPM yield. SPRING OPERATES BY TIME CLOCK; REDUNDANT PUMPS (2) AVAILABLE. (OVERFLOWS DURING PUMPING)

Casing Details

Casing ID	Casing Type	Casing Diameter (IN)	Casing Depth	Depth Units
CASE1	CONCRETE	0	0.0	FT

Screen Details

Screen ID	Screen Type	Screen Top (FT)	Screen Bottom (FT)	Lithology Type	Aquifer Type

Flows Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove
Pump Capacity	50.000	GPM	☐
Drillers Yield	128.000	GPM	☐

Measures

Measure Name	Measure Quantity	Measure Unit	Remove

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove

Emergency Power	NO		☐
GWUDISW Determination Done	YES	5/12/1994	☐
GWUDISW Exempt by Application	NO		☐
GWUDISW Testing Done	YES		☐
Source Protection Plan Original Date	YES	12/24/1997	☐
Source Protection Plan Update Date	YES	1/2/2019	☐

Well Details

Name	LANGEVIN FARM WELL/PENNY BROOK		
Local Name	NA		
Facility ID	WL002	**Well ID**	0
Well Type	Drilled	**Water Type**	Groundwater
Activity	Active	**Activity Date**	1/1/1964
Activity Reason	Select...	**Availability**	Permanent
Activity Comment			
Constructed Date	1/1/1964	**Physical Mod Date**	
Pump Type	Submersible	**Pump Description**	SUBMERSIBLE
TNC SWAP Status	Select...	**TNC SWAP Date**	
Well Cap		**Source Treatment**	Treated
Direction			
Well Comments	Meadow well 10/6/1995 memo: 96 hour discharge test at 70 gpm.		

Casing Details

Casing ID	Casing Type	Casing Diameter (IN)	Casing Depth	Depth Units
CASE1	STEEL	6	0.0	FT

Screen Details

Screen ID	Screen Type	Screen Top (FT)	Screen Bottom (FT)	Lithology Type	Aquifer Type

Flows Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove
Pump Capacity	90.000	GPM	☐
Drillers Yield	70.000	GPM	☐

Measures

Measure Name	Measure Quantity	Measure Unit	Remove
Depth at Completion	200.000	FT	☐
Well Diameter (Depreciated)	6.000	IN	☐

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	YES		☐
GWUDISW Determination Done	YES	12/8/1993	☐
GWUDISW Exempt by Application	YES		☐
Source Protection Plan Original Date	YES	12/24/1997	☐
Source Protection Plan Update Date	YES	1/2/2019	☐
Approved/Permitted	YES		☐

Well Details

Name	KEENAN WELL		
Local Name	ORCHARD WELL		
Facility ID	WL003	**Well ID**	0
Well Type	Drilled	**Water Type**	Groundwater

Activity	Inactive	**Activity Date**	1/1/1910
Activity Reason	Select...	**Availability**	Emergency
Activity Comment			
Constructed Date		**Physical Mod Date**	
Pump Type	Select...	**Pump Description**	STEEL
TNC SWAP Status	Select...	**TNC SWAP Date**	
Well Cap		**Source Treatment**	No Treatment
Direction			
Well Comments	PHYSICALLY CONNECTED TO SYSTEM '07 SURVE		

Casing Details

Casing ID	Casing Type	Casing Diameter (IN)	Casing Depth	Depth Units

Screen Details

Screen ID	Screen Type	Screen Top (FT)	Screen Bottom (FT)	Lithology Type	Aquifer Type

Flows Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove

Measures

Measure Name	Measure Quantity	Measure Unit	Remove

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐

Well Details

Name	LIBRARY WELL		
Local Name			
Facility ID	WL004	**Well ID**	0
Well Type	Drilled	**Water Type**	Groundwater
Activity	Inactive	**Activity Date**	1/1/1910
Activity Reason	Select...	**Availability**	Emergency
Activity Comment			
Constructed Date		**Physical Mod Date**	
Pump Type	Select...	**Pump Description**	STEEL
TNC SWAP Status	Select...	**TNC SWAP Date**	
Well Cap		**Source Treatment**	No Treatment
Direction			
Well Comments			

Casing Details

Casing ID	Casing Type	Casing Diameter (IN)	Casing Depth	Depth Units

Screen Details

Screen ID	Screen Type	Screen Top (FT)	Screen Bottom (FT)	Lithology Type	Aquifer Type

Flows Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove

Measures

Measure Name	Measure Quantity	Measure Unit	Remove

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐

Treatment Plants

Treatment Details

Name	TREATMENT PLANT 1- SPRING
Local Name	

Facility ID	TP001	**Water Type**	Groundwater
Activity	Active	**Activity Date**	1/1/1950
Activity Reason	Select...	**Availability**	Permanent
Activity Comment			
Constructed Date		**Physical Mod Date**	
Pump Type	Positive displacement	**Pump Description**	
Contact Time (min)	38	**Filter Type**	Select...
Contact Time Comments	2015 survey calculations: ~1300ft * 1.469 = 1944.8gal/50gpm = 38 minutes Old calculation: Contact time = (1203gal/204gpm) + (725gal/50gpm) = 20.4min		
Direction Text			

Treatment Units

Unit Name GENERIC UNIT **Unit Type** Generic Unit

Treatment Code	Remove
D421 - DISINFECTION - HYPOCHLORINATION, POST	☐

Measures

Measure Name	Measure Quantity	Measure Unit	Remove
Cl concentration for 4-log disinfection	0.200	Select...	☐

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐
Approved/Permitted	YES		☐

Treatment Details

Name	TREATMENT PLANT 2 - LANGEVIN/PENNYBROOK		
Local Name			
Facility ID	TP002	**Water Type**	Groundwater
Activity	Active	**Activity Date**	1/1/1964
Activity Reason	Select...	**Availability**	Permanent
Activity Comment			
Constructed Date		**Physical Mod Date**	
Pump Type	Positive displacement	**Pump Description**	
Contact Time (min)	19	**Filter Type**	Select...
Contact Time Comments	Contact time = pipe volume/pump capacity = 1692gal/90gpm = 18.8 minutes		
Direction Text			

Treatment Units

Unit Name GENERIC UNIT **Unit Type** Generic Unit

Treatment Code	Remove
D421 - DISINFECTION - HYPOCHLORINATION, POST	☐

Measures

Measure Name	Measure Quantity	Measure Unit	Remove
Cl concentration for 4-log disinfection	0.300	Select...	☐

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐
Approved/Permitted	YES		☐

Storage

Storage Details

Name

	VTC STORAGE TANK
Local Name	
Facility ID	ST001
Water Type	Groundwater
Storage Type	Ground
Construction Material	Steel
Coating Type	Approved paint
Activity	Active
Activity Date	1/1/1950
Activity Reason	Select...
Availability	Permanent
Activity Comment	GRAVITY
Constructed Date	1/1/1950
Physical Mod Date	
Pump Type	Select...
Pump Description	
Direction	
Storage Comments	Inspected/cleaned 2011

Flow Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove
Effective Volume	250,000.000	GAL	☐
Approved Design Capacity	250,000.000	GAL	☐

Measures

Measure Name	Measure Quantity	Measure Unit	Remove

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Covered Indicator	YES		☐
Pressurized Indicator	NO		☐
Altitude Valve Indicator	NO		☐
Emergency Power	NO		☐
Approved/Permitted	YES		☐

Other Facilities

Other Facility Details

Name	DISTRIBUTION SYSTEM
Local Name	
Facility Type	Distribution System
Facility ID	DS001
Water Type	Groundwater
Activity	Active
Activity Date	1/1/1910
Activity Reason	Select...
Availability	Permanent
Activity Comment	
Constructed Date	
Physical Mod Date	
Pump Type	Select...
Pump Description	
Directions	

Flow Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐
Approved/Permitted	YES		☐
AC Pipe	YES		☐
PB Pipe	NO		☐

Other Facility Details

Name	SPRING PUMP HOUSE
Local Name	

Facility Type	Pump Facility		
Facility ID	PF001	**Water Type**	Groundwater
Activity	Active	**Activity Date**	12/11/2009
Activity Reason	Select...	**Availability**	Permanent
Activity Comment	This Facility pumps water from the spring source (WL001) through treatment into the distribution system. This facility had been inactivated in the past by linking as a source pump. After consultation with Tim Raymond, it was determined that the Water System is better served looking at this facility as a booster pump station.		
Constructed Date		**Physical Mod Date**	
Pump Type	Select...	**Pump Description**	
Directions			

Flow Rates

Flow Rate Name	Flow Rate Quantity	Flow Rate Unit	Remove
Approved Design Capacity	50.000	GPM	☐

Indicators

Indicator Name	Indicator Value	Indicator Date	Remove
Emergency Power	NO		☐

APPENDIX I FIRE DISTRICT RECORDS

Part No.	Item	In Stock	Cost	Total Value
63117	0.75 -1.0 CTS PE Tube Cutter	1	$18.03	$18.03
	0.75" & 1" M-1 Drilling Machine w/Toolbox	1	$800.00	$800.00
52035	0.75" #7 DCBF Prev 1-3K L/C	34	$75.87	$2,579.58
	0.75" Adaptor Flare x MIP	1	$100.00	$100.00
	0.75" Ball Corp w/Comp. End Missing	1	$25.00	$25.00
47280 LF	0.75" Ball Valve IP	4	$55.19	$220.76
47250 Q LF	0.75" Ball Valve Quick x FEIP LF	2	$59.31	$118.62
	0.75" Ball Valve SW x SW w/Handle	1	$10.00	$10.00
	0.75" Brass Assembly	1	$50.00	$50.00
46390	0.75" Brass Insert x Insert Fitting	2	$10.00	$20.00
46400 LF	0.75" Brass Insert x MIP Fitting		$9.62	$0.00
	0.75" Compression x Compression Cplg	3	$30.00	$90.00
52070	0.75" CP Setter Qck JNT LF	64	$13.09	$837.76
	0.75" Cplg IPPJ x CPPJ	4	$28.00	$112.00
47450	0.75" Female Adaptor CPPJ x FEIP	6	$19.40	$116.40
47480	0.75" Male Adaptor COMP X MIP	4	$20.00	$80.00
46130	0.75" x 100' CTS Polyethylene Tubing	20	$0.28	$5.60
	0.75" x 6" Brass Nipple	4	$8.00	$32.00
54070	0.75" x 6" Leak Clamp 105	3	$15.00	$45.00
46020	0.75" x 60' Type K Copper Tubing	40	$3.25	$130.00
47165	0.75” Ball Corporation CC x Compression	3	$75.00	$225.00
47188 Q LF	0.75” Ball Corporation IP X Compression	4	$62.54	$250.16
47230 Q LF	0.75” Ball Valve Curb Stop w/Compression Ends	4	$101.21	$404.84
47460	0.75” Brass Adaptor IPPJ x FEIP	1		$0.00
47500	0.75” Brass Adaptor IPPJ x MIP	1		$0.00
47050	0.75” Brass Compression Adaptor x FEIP	1	$19.40	$19.40
47080 Q LF	0.75” Brass Compression Adaptor x MIP	4	$19.40	$77.60
47410 Q LF	0.75” Brass Compression Couplings 3/4”	2	$23.61	$47.22
47420	0.75” Brass IPPJ x IPPJ	1	$25.00	$25.00
47410	0.75” CPLG CPPJ x CPPJ	2	$30.00	$60.00
05-1763	0.75” Hose Connection Backflow Preventer	2	$8.47	$16.94
46132	0.75” x 200’ CTS Polyethylen Tubing	200	$0.28	$56.00
36124	0.75” x 4” Brass Nipple	1	$5.45	$5.45
36044 2	0.75” x 520” Teflon Tape	1	$2.78	$2.78
54080	0.75” x 6" DI Coupling 1.05-1.13	2	$45.00	$90.00
	1.0" Adaptor Comp. x MIP	3	$23.00	$69.00
47930 LF	1.0" Ball Valve IP Lead Free	1	$85.76	$85.76
46500	1.0" Brass Insert x MIP Fitting	2	$16.75	$33.50
	1.0" Coupling IPPJ x IPPJ	1		$0.00
	1.0" Cplg Comp. x MIP			$0.00
	1.0" Cplg CPPJ x CPPJ	1	$23.78	$23.78
48130 Q LF	1.0" Cplg Quick X FEIP	1	$22.96	$22.96
36208	1.0" x 12” Brass Nipple		$19.59	$0.00
	1.0" x 3/4" Brass Bushing	1	$5.00	$5.00
36279 LF	1.0" x 3/4" Brass Cplg LF		$7.93	$0.00
non-stock	1.0" x 3/4" IPPJ x CPPJ	1	$24.00	$24.00
54155	1.0" x 6" Compression Cplg Galvanized 1.32	2	$30.00	$60.00
	1.0" x 60’ PE CTS Tubing	40	$0.65	$26.00
46040	1.0" x 60’ Type K Copper Tubing	58	$4.76	$276.08
	1.0" x Close Brass Nipple	4	$5.00	$20.00
36190	1.0" x Close Brass Nipple		$3.14	$0.00

36199	1.0” x 4 Brass Nipple	1	$7.90	$7.90
46600 LF	1.25" Brass Insert x MIP Fitting	1	$16.84	$16.84
	1.5" Cplg. Quick x 3/4" MIP		$79.50	$0.00
46700 LF	1.5" Brass Insert x MIP Fittings	2	$22.65	$45.30
	1.5" Brass Threaded 90° Elbow	3	$5.00	$15.00
36431 LF	1.5" Brass Threaded Tee	1	$24.18	$24.18
49500	1.5" Sensus OMNI T2 Meter 100 CF	1	$962.93	$962.93
	1.5" x 1 1/4" Brass Threaded Cplg.		$10.00	$0.00
36485 LF	1.5" x 1" Brass Bushing	1	$8.74	$8.74
36437 LF	1.5" x 1" Brass Threaded Tee	1	$26.49	$26.49
36401	1.5" x 3" Brass Threaded Nipple	3	$9.10	$27.30
	1.5" x 6" Galvanized Nipple	1	$4.50	$4.50
48670 LF	1.5” Ball Curb FEIP Lead Free	1	$175.63	$175.63
48640 Q LF	1.5” Ball Curb Quick LF	0	$245.25	$0.00
	1.5” Ball Valve with handle IP	1	$100.00	$100.00
48750 Q LF	1.5” Cplg Quick x FEIP Lead Free	1	$66.72	$66.72
48746 Q LF	1.5” Cplg Quick x MIP Lead Free	1	$56.76	$56.76
non stock	1.5” FLG X IPPJ Lead Free	2	$97.13	$194.26
	1.5” gate valves	2	$60.00	$120.00
50305	1.5” Meter Gasket Flg	2	$3.07	$6.14
36494 LF	1.5” x 1.25” Brass Cplg LF		$17.75	$0.00
46170	1.5” x 100’ CTS Polyethylen Tubing		$0.93	$0.00
36488 LF	1.5” x 3.4” Brass Bushing		$9.62	$0.00
36440 LF	1.5” x 3/4” Brass Threadee Tee	1	$37.53	$37.53
36405	1.5” x 4” Brass Threaded Nipple	1	$13.43	$13.43
47785 Q LF	1” Ball Corp CCxQuick LF	0	$81.97	$0.00
47880 Q LF	1” Ball Curb Quick LF	0	$278.03	$0.00
36194	1” x 2” Brass Nipple		$3.87	$0.00
48180 Q LF	1” x 3/4” Cplg Quick x MIP LF		$17.08	$0.00
7037005	1/4” PR Tubing 1/4 x 3/16” PE	10	$1.12	$11.20
86588	12” Hack Saw	1	$51.35	$51.35
63183 3	14" Offset Pipe Wrench	1	$22.00	$22.00
	150A 3 Phoase Panel & Breakers	1	$1,332.00	$1,332.00
	165’ Fiberglass Tape	1	$25.00	$25.00
	2.5" X 50’ Mill Hose	2	$10.00	$20.00
86044	2" x 20' Rubber Suction Hose & Strainer	1	$150.00	$150.00
86080	2" x 50' PVC Discharge Hose w/quick cplgs	2	$58.00	$116.00
	2" x 50’ Mill Discharge Hose	1	$25.00	$25.00
	24" Pipe Wrench	1	$30.00	$30.00
91715	3” x 1000 Detectable Tape Water	2	$30.05	$60.10
91813	36” Grade Stakes	50	$0.58	$29.00
	48” Grade Stakes	12	$0.75	$9.00
52010	5/8" #1 Korner Horn L/C	33	$51.33	$1,693.89
52033	5/8" K-Horn Ball Valve 1-3K	25	$44.96	$1,124.00
50024	5/8" SRII ECR Meter 100CF	2	$141.13	$282.26
52035	5/8” K-Horn Dual Check Valve	33	$75.87	$2,503.71
53510	5/8” Valve Handle STR SS	25	$4.85	$121.25
50315	5/8” x 2 1/2” Plated B&N	4	$1.90	$7.60
	6" DI Pipe Coupling 6.86-7.20 x 7.15-7.35	1	$90.00	$90.00
	6" DI Pipe Coupling 6.90-7.10 (blue)	1	$90.00	$90.00
	6" DI Pipe Coupling Black End Rings	2	$10.00	$20.00
	6" DI Pipe Yellow End Rings, with gaskets	2	$10.00	$20.00

55937 RM	6" x 12" SS Repair Clamp with 3/4 CC outlet	1	$178.75	$178.75
56106 RM	6” 202N Saddle 1 CC 663-760	0	$93.06	$0.00
	6” Double Strap Saddle Nylon Ctd. 3/4" IP	3	$75.00	$225.00
	6” Extended Range DI Coupling 6.60-7.20	2	$180.00	$360.00
	6” GripRing Accessory Pack	2	$5.00	$10.00
44164 1	6” MJ DI Grip Ring Accessory Pack	1	$44.61	$44.61
39336 3	6” MJ DI RS Valve OL	0	$607.88	$0.00
	6” MJ DI Solid Cap	1		$0.00
	6” PVC Class 150 Pressure Pipe	20	$6.50	$130.00
	6” Single Strap Nylon Ctd Saddle 3/4" IP	2	$75.00	$150.00
55745	6” x 12” SS Repair Clamp 6.84-7.24	1	$158.00	$158.00
	6” x 2” MJ DI Tapped Cap	1	$46.61	$46.61
	6” x 2” MJ DI Tapped Plug			$0.00
33375 600D	6”x 6” MJ DI Hydrant Tee		$118.73	$0.00
	8’ Valve Box Wrench	1	$120.00	$120.00
63279	Adjustable Hydrant Wrench (16”)	1		$0.00
1035446	Back pressure valve repair kit	1	$76.03	$76.03
	Brass Fitting Assembly	1	$15.00	$15.00
48731	Chlorine Injection Nozzles	6	$62.00	$372.00
77382	Chlorine Injection Nozzles Tubing Connectors	6	$9.40	$56.40
	Chlorine storage tank	1	$250.00	$250.00
	Clow Eddy Hydrant	1		$0.00
63135	Copper Tubing Cutter	1	$20.00	$20.00
	Copper Tubing Cutter	1	$25.00	$25.00
	DeWalt Compact Reciprocating Saw	1	$232.14	$232.14
	DeWalt Reciprocating 4” Saw Blades	5	$1.57	$7.85
	DeZurick Silent Check Valves	2	$287.00	$574.00
	DeZurik APCO Silent Check Valves Wafter Style	2	$274.00	$548.00
	Direct Vent Wall Furnace	1	$915.00	$915.00
63233 5	Dual Socket Ratchet Wrench 3/4 & 7/8	1	$45.00	$45.00
50063	ECR Touchpad	1	$8.78	$8.78
	Electric Wall Heater	1	$385.90	$385.90
	Exhaust Fan	1	$84.95	$84.95
91379	Flagging Tape - Blue	3	$3.84	$11.52
	Flagging Tape - Red	0	$3.84	$0.00
91373	Flagging Tape - White	2	$3.84	$7.68
	Flagging Tape - Yellow	1	$3.84	$3.84
	Galvanized Insert x MIP Adaptor 1.5”	2	$6.50	$13.00
	Galvanized Piping	1	$1,000.00	$1,000.00
41002	Galvanized Spring Hydrant Flags			$0.00
	Galvanized Threaded Coupling 1.5”	2	$5.00	$10.00
	Hach Chlorine Color Test Kit	1	$60.00	$60.00
	Hach Pocket Colorimeter II	1	$432.00	$432.00
	Hand operated drum pump	1	$15.71	$15.71
	Honda WDP20X Diaphragm Pump	1	$1,200.00	$1,200.00
	Hose faucets	2	$20.00	$40.00
	Hydrant Diffuser with flow gauge	1		$0.00
	Hydrant - 2 1/2" x 2" Control Valve	1	$50.00	$50.00
	Hydrant - A.P. Smith	0		$0.00
	Hydrant - Mueller			$0.00
	Hydrant - Reflective Spring Flags	5	$14.99	$74.95
	Hydrant - Smith Hydrant Repair Kit	1	$175.95	$175.95

	Hydrant - Waterous Pacer	0	$2,400.00	$0.00
	Hydrant - Waterous Repair Kits	2	$125.00	$250.00
	Hydrant - Waterous Seat Removal Wrench	1	$125.00	$125.00
	Hydrant Lubricating Oil	1		$0.00
	Intermatic Time Clock 7 Day Program	1	$279.00	$279.00
	Liquid filled pressure gauge	5	$25.00	$125.00
	MarCell Monitoring Device		$248.00	$0.00
50324 9	Meter Display Unit (MDU)	0	$107.81	$0.00
50069	Meter Wire 3-22ga	50	$0.30	$15.00
	Metrotech 880B Metal Locator	1	$795.00	$795.00
	Milwaukee Reciprocating Saw Blades	5	$3.39	$16.95
	Miscellaneous	1	$20.00	$20.00
	Motor Starter	1	$355.00	$355.00
	Myers 2-Stage Centrifugal Pump	0	$1,200.00	$0.00
	Neatmaster Ultrasonic Pest Repellent	0	$20.99	$0.00
817065	PM Connecto, set sing. 6x4 PCB	1	$4.50	$4.50
1001064	PM Discharge Valve: 1/4” x 3/16”, BT4B1	1	$31.19	$31.19
	Portable Eye/Face Wash	1	$678.00	$678.00
817050	PR Connector Set 1/4”x3/16”, PVC	2	$9.36	$18.72
1000246	PR Diaphragm 1000246	1	$32.62	$32.62
1009445	Prominent back pressure valve (new)	0	$178.00	$0.00
1009445	Prominent back pressure valve (old)	1	$100.00	$100.00
	Prominent Chlorine Metering Pump	0	$985.80	$0.00
GMP 2010-58	Pump DPV 10/6 B. with 5HP Motor	2	$2,271.60	$4,543.20
	Pump House	1	$10,000.00	$10,000.00
	Pump House Ladder	1	$600.00	$600.00
	Pump Station Pipe, ball valves, fittings, supports	1	$1,350.00	$1,350.00
	Quickbooks Pro 2017	1	$211.00	$211.00
	Red Warning Light	1	$75.00	$75.00
63188	Reed Torque Wrench w/ 5/16" Socket	1	$50.94	$50.94
	Reflective Safety Vests	2	$10.00	$20.00
45415	Service Box 4 1/2-5 1/2	2	$26.94	$53.88
45425 2	Service Box 5 1/2 - 6 1/2 w/plug cover	2	$37.96	$75.92
45420	Service Box 5' -6'	1	$27.15	$27.15
	Service Box Cover 2-Hole	4	$9.00	$36.00
45370	Service Box Cover Plug Cover	4	$9.04	$36.16
45372	Service Box Cover Repair with 1 bolt	2	$11.34	$22.68
45600	Service Box Extension 12”	4	$10.67	$42.68
45605	Service Box Extension 18”	1	$12.21	$12.21
45610	Service Box Extension 24””	1	$14.37	$14.37
45594	Service Box Extension 3"	5	$5.00	$25.00
45595	Service Box Extension 6"	5	$8.00	$40.00
45597	Service Box Extension 9”	2	$9.09	$18.18
45565	Service Box Foot Piece	0	$15.94	$0.00
45486	Service Box Rod 1/2” x 36” SS	4	$17.91	$71.64
45490	Service Box Rod 9/16" x 36"	4	$12.47	$49.88
	Service Box Wrench 5’0”	2	$55.00	$110.00
	Shelving and brackets	1	$673.00	$673.00
91431	Spray Paint - Blue	1	$4.90	$4.90
91427	Spray Paint - White	1	$4.90	$4.90
50616 22	SR II Bottom Plate	6	$8.33	$49.98
51106	SR II ECR Register 100 cf	0	$61.15	$0.00

46285	SS Clamps 1.25”	10	$0.85	$8.50
46290	SS Clamps 1.5”	25	$0.85	$21.25
46280	SS Clamps 1”	10	$0.63	$6.30
46275	SS Clamps 3/4”	10	$0.63	$6.30
48910	SS Inserts for CTS Plastic 1 1/2"	2	$2.29	$4.58
48330	SS Inserts for CTS Plastic 1"	5	$2.13	$10.65
47730	SS Inserts for CTS Plastic 3/4”	13	$2.00	$26.00
	Storage Shed	1	$2,200.00	$2,200.00
	Toshiba Satellite C655D Laptop Computer	1	$455.79	$455.79
50282 2	Touchreader Visual Unit 3096	1	$541.26	$541.26
91550 1	Traffic Cones	9	$20.00	$180.00
7358223	Tubing Adapters	2	$39.77	$79.54
45125	Valve Box Base		$65.00	$0.00
45044 600	Valve Box Complete	2	$108.72	$217.44
45005 600	Valve Box Cover	1	$15.00	$15.00
45070	Valve Box Top	0		$0.00

Randolph Fire District #1 Installations 1950-1991

(From minutes and Wes Herwig's diaries. Wes served the Fire District from 1951 to 1991)

July 11, 1939:

A motion was made that the Prudential Committee obtain some definite plans for an adequate and workable water system and for financing same. The motion passed.

Sept. 12, 1939:

It was voted to accept as a working basis the plan laid out some time ago for the hydraulic company by Mr. Miller, Engineer for the village of Randolph. Discussion followed and it was voted to have Mr. Miller to find out what the present quotations are for the pipe and other materials and ascertain how long the quotations would be good.

Sept 20, 1939:

Mr. Miller reported that 4" cast iron pipe cost 59¢ a foot and 6" 85¢ a foot. The estimates for the required quantity of pipe for 4" was $2,635 and $4,700 for 6".

Sept. 27, 1939:

Discussion at length on water system, amount water rams are pumping (200 gph) and also putting in an electric pump. Also discussion on different ways to finance the installation.

May 1941:

A recess in the business was taken to see a movie presented by Mr. Adams of the Johns Manville Co. showing the manufacture and advantages of Transite pipe.

A motion was made and seconded and passed unanimously to carry out the plans that have been made to install and adequate water system.

May 1942:

Mr. Prescott reported on the amounts borrowed by the Prudential Committee and how it was spent. Mr. Hodgdon (engineer) reported on progress made to date on building the <u>reservoir, digging ditch and laying pipe</u>.

May 1943:

Mr. Hodgdon reported on what work had been done on laying pipes etc.

May 1946:

Considerable discussion on methods and means of improving service. A motion passed that each house connection be cut down to ½" somewhere between the house and the main. The motion to hold in effect until water system thoroughly installed with reservoir, hydrants and adequate water for all.

May 1947:

Much discussion was held on advisability of completing the water system as planned and recommended to Prudential Committee that if possible to get labor and materials they need to go ahead with the plans.

Nov. 1947:

New construction has cost $3,969 with $23.45 unpaid. The Prudential Committee presented a 20 year plan for liquidating the cost of the system.

<1950:

6" AC Transite pipe from its connection at the Fire District reservoir (long gone) to a spot approximately across from John Len's house was already installed prior to Wes Herwig moving to the Center in 1950. Will research to see if more information can be found regarding when it was put in.

1950:

Wes notes in his diary that they started digging for installation of 6" AC pipe from where it ended prior to 1950 to a point across from the store where there is a hydrant. It was noted it took a long time (several months) because there was a lot of ledge in front of the Herwig and Pember houses.

May 1951:

Total cost of laying pipe and installing hydrant was $1,836.95.

May 1952:

It was reported that no major work was done this past year. Just necessary repairs.

May 1954:

The extension of the main with hydrant at north end of the village was discussed. Motion was made and carried that the Prudential Committee and engineer prepare an estimate of cost of the project and present it to a meeting of Fire District sometime within a month from now.

May 1955:

It was voted to hold up any extension to the north end of the village until after legislature closes to see what the State is going to do about increasing the water supply then call a special meeting to decide what action the Fire District wishes to take.

May 1956:

A motion was made and passed that a special meeting of the Fire District be called at the discretion of the Prudential Committee sometime before July to consider the extension to the North end of the district.

June 1956:

The Prudential Committee proposed that 420' of 6" Transite pipe be laid from the present hydrant (across from Floyd's store) and end with a hydrant. From there 450' of 1.5" plastic pipe will be laid. A motion was made and voted on with 11 in favor and 3 not. The motion passed.

1957:

The Fire District borrowed $1,500 dollars to extend the 6" AC line to the North. Work started on July 11 and was finished by mid August. I think this line picked up where the 6" line installed in 1950 ended across from the store and extended to where the mill stone monument is now. From there they ran 1 1/2 plastic north for a ways as he mentions getting the plastic line past Vorse so they could fill in her driveway.

In November they installed 1 1/2" plastic down Water Street as Mrs. Clough's spring had run dry. Mrs. Clough lived in the house near the end now owned by Wilson.

1962:

1 1/2" plastic line was continue north along Route 66 by Milt Gill (he built many the homes north of Trask place) so he could supply water to two houses.

1964:

The Fire District was experiencing a lot of leaks on the pump line from the spring to Main Street. I think it was plastic pipe only rated for 100 psi. In August it was voted to borrow $2,000 to replace pump line with 2" galvanized. That was installed by the end of August. (this was later replaced by plastic tubing)

1967:

In February is was voted to approve an agreement with VTC to give up the Fire District reservoir in exchange for sharing a new high tank.

1968:

A water leak was discovered near the corner of Rte 66 and E. Bethel Road. There was a crack in the 6" AC at a point where the new sewer line was put under it in 1967.

That same year the reservoir (old) went dry and it was found that a new pump supplied by VTC was not pumping well so they switched to the old pump and it began to recover.

1969:

The new water tower under construction was nearing completion.

1970:

Wes mentions that the 70 lb. water pressure was turned on today which I'm assuming means that they switched over from the old reservoirs to the new water tower. Apparently some pressure reducing valves were installed before this (some of them where put right at the main (buried) to protect the resident's service pipes)

1971:

Voted to buy 2" plastic pipe to replace the galvanized line that was installed in 1964 as it was badly corroded. In November the digging started to install the new plastic line. Construction was completed by the end of the month.

1972:

Work was done on the spring reservoir to patch leaks and cracks and to improve the drainage around it to help prevent contamination and loss of water.

In October construction started on installing approx. 500' of 6" AC Transite pipe and a hydrant south past the red schoolhouse. Bill DeFlorio was put in charge. Connection was made to the existing 6" line using a tapping sleeve (poured) and valve. A 10" steel sleeve was put in across the S. Randolph Road to run the new 6" through. Work was completed in early November.

1974:

Work was done at the spring including installing a <u>gate valve to on the drain line</u> for the spring. At the annual meeting it was voted to borrow up to $25,000 to finish the AC Transite line to the north, replacing the 1 1/2" plastic. (I believe this extended the line from where they had left off in 1957 near the mill stone).

1975:

In July work started on the 6" Transite line extension from the hydrant near the mill stone to the hydrant in front of Ladieus (Clark's in 2018 - 3171 VT RTE 66). Hiram Salls, Walt Palmer and Bill DeFlorio worked on it. The project cost about $5,000 for 500' of main. Approx. $10 a foot. The site was all cleaned up by September.

1977:

In August it was voted to proceed with the project of putting a n ew 6" PVC line in from the spring to Main Street. 1300' of 6" PVC pipe was delivered in October and the work started shortly after. On Nov. 14th Prescott came to make the tap to connect the new 6" line to the 6" main line on Route 66.

1978:

3-phase power was put in for the pump house and work was done on a new building as well as piping, controls etc. Bob Norton was the engineer and Ashline Electric did the work. The total of the work was $19,000+ (I don't know if this included the 6" pipe installed the previous year or just the pump house) The college pitched in $3,048 as their share of the cost.

1979:

Bill took the hydrant apart in front of Ladieu's (Clark's) as it had not been working for a long time and found a big piece of wood wedged in the valve. In October the hydrant had to be dug as it was leaking. Had to dig it again in November as it apparently wouldn't stay together. The hydrant was removed and reinstalled but it still leaked at one of the fittings (push joint instead of MJ. Bill finally went to Montpelier and got some kind of clamp/ring and it finally stopped the leak. A new thrust block was put in using 560 lbs. of concrete. It should be noted that this hydrant was a used hydrant that they obtained somewhere.

1980:

Hydrant across from Herwigs was hit and broken by an out of control car in February. A new hydrant was purchased and Larry Pickett installed it. There was 28" of frost. The hydrant job cost about $2,000. Went to see lawyer about trying to recoup some of the cost from the person that broke it.

Proposal by VTC and the State to install a new 6" line down Water Street to insure and adequate supply of water to the farm. Water service was extended to the Lackard property by Larry Pickett.

1981:

A tap was made to connect new 1" line to the Garden Center owned by Morris LaFrance (now Parmelee).

In July construction began on the new 6" ductile iron water line down Water Street. The contractor was Munson Earth Moving. Construction was complete by end of the month. A new service to Carol Lalumia's house was installed by Hiram Salls. In Dec. VTC proposed buy a new backup pump for the Fire District so that we could supply them water in an emergency. This would have been the second pump installed that is still in service 37 years later.

1982:

New backup pump, supplied by VTC installed at the pump house. In August the water tower had to be drained because of a big gasket was leaking. It had been out of service for 6 weeks while the interior was being painted.

1990:

Voted to have Herb Sargent put new roof structure on the springhouse (28 years ago) for no more than $7,000.

1991:

Wes Herwig retired at the annual meeting after 40 years on the Fire District.

1993:

VTC installed new 6" DI line from our spring line to their facility. A new valve vault was installed half way up the line so that the flow could be controlled.

The Fire District decided at the same time to install 400' of 6" Class 350 DI water pipe, using the same contractor. It started at the hydrant in front of Clarks (3171 VT RTE 66) to a little past Alice LaFrance's home (now Wang) replacing the 1-1/2" plastic there that was leaking from time to time. We also installed a 3" DI sleeve under the road to feed 3 houses. Installed about 300' (to just past Stokes home) of 1 1/2' PE (160 psi) pipe thus eliminating services under the highway that would eventually present problems. The pipe was capped at the end and could be extended north or south in the future. Installed about 100' of 6" DI to fire house with a hydrant and a 4" feed into the building so they could fill their trucks)

More may be added to this after review of clerk's notes and treasurer's reports.

Randolph Fire District #1
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Water System Construction

- 1941-1942± — Installed 1300' of 6" Transite (AC) pipe from reservoir (no longer in existence) to Sta.13+00 to approximately the front lawn of what was known as the Wooster place (66 E. Bethel Road). Cost of this project was $2,643.44.
- 1947-1948 — A reservoir (no longer in existence) was constructed on Fire District property close to where the current VTC library is. They also installed 2 hydrants (probably on the 6" line installed earlier). Cost for this project was $4,271.49
- 1950 — 600' of 6" Transite pipe was installed from where the line left off in 1942 to a new hydrant across from the general store. Total cost was $1838.95.
- 1957 — 550' of 6" Transite pipe was installed from where the line ended in 1950 to a point between the LaFrance and Vorse properties where a hydrant was installed (approx. 3093 VT RTE 66). Additionally 1200' of 1-1/2" plastic pipe was installed from the spring to the 6" main to replace the existing pipe. 350' of 1-1/2" plastic was installed from the end of the new main ending at the edge of the lawn at the Hunt residence (3171 VT RTE 66). Total cost was $2,245.99
- 1961 — The 1-1/2" plastic line was extended another 200' to provide water service to 2 new houses being built by Milt Gill.
- 1962 — The 1-1/2" was again extended further north to provide service for another new house. The distance is not mentioned. The cost of the extensions in 1961 & 1962 may have been installed and paid for by the builder, Milt Gill.
- 1964 — It was voted to borrow $2,000 to replace the pump line that was just installed in 1957 as it developed many leaks. 1200' of 2" galvanized pipe was installed (by 1971 this line also had to be replaced as it corroded badly). Total cost of this project not known.
- 1966 — Discussions began for VTC to install the water tower. In 1967 an agreement between the Fire District and VTC/State was written. This was voted on and approved February 1967.
- 1969 — Construction of the 250,000 gallon water tower was completed in August. The water pressure in the Fire District went form 15 psi to 70 psi (avg.). Pressure reducing valves were installed on the resident's service pipe where it connected to the main to minimize the damage this new higher pressure might cause. The Fire District was granted the right to 50,000 gallons in the tower. It was June of 1970 before the connection to the new tower was completed.
- 1971 — The 2" galvanized pump line installed in 1964 needed to be replaced again as the 2" galvanized pipe was corroding badly. It was replaced with plastic pipe. Cost unknown.
- 1972 — 515' of 6" Transite pipe was installed along with 2 gate valves and a hydrant. A 31' 7" 10" steel sleeve was installed across the road and the 6" pipe run inside it. Pipe, fittings, valves, hydrant cost $1,403.51. Plumbing expense (hitching up services) $175; Digging & filling $764.70; Labor $526.39 and truck hire $35 for a total of for all was $3,315 after credits etc. Work on the spring and pump house also done this year which included sealing cracks, replacing supports, painting, new door on pump house, new electric heater as well as excavation work for a total cost of $630.96.
- 1974 — Voters approved the prudential committee to borrow up to $25,000 from FHA to replace old plastic lines with 1500' of new 6" transite pipe and install 2 new hydrants. FHA denied the loan and the fire district borrowed $9,000 from Randolph National Bank at very low interest for 10 years. Work began later that year to install pipe on the northern end of the system. A valve and piping to drain the spring was installed on May 20th. This replaced a wood plug that was put in some time and had swelled so much it was impossible to remove it from the inside.

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- 1975 — 500' of 6" transite installed from where it left off in 1971 to a hydrant just before Ladieu's driveway (now Clark's). Cost for everything was about $5,000.
- 1977 — 1300' of 6" PVC Class 160 pipe was installed to replace the corroding galvanized pipe installed in 1964. The pipe runs from the pump house to the 6" main near Paul LaFrances (where nursing home now sits). Plans begun on a new pump house, concrete work and a new pump. The college gave $3,248 towards building a new pumping station. Estimated cost for entire project was $15,000. A fence around the entire area was proposed but never done.
- 1978 — Work was done to build new pump house with a new pump. Engineered by Bob Norton. At the annual meeting Bob Norton reported on the project saying an additional $5,000 was needed finish the project. Work done to date was the new 6" waterline from pump house to street, new pump house building, and a new pump at approx. cost of $11,000. The final cost for everything was a little over $19,000.
- 1980 — New water line down Water St. proposed by the State in order to get adequate water supply to the farm.
- 1981 — The Fire District boundaries were enlarged to include the property of Mrs. Marie Lackard. Also added was the VTC farmstead and farm manager's residence. The hydrant in front of the old dorm was broken when a student lost control of his vehicle and hit the hydrant. Cost of new hydrant and fittings was $1,117.91.
- 1982 — VTC offered to pay for a new backup pump at the pump house. The pump cost $1,301.95. The agreement with VTC was that the Fire District pump water in the event that their pump or spring fails. VTC would pay the extra electrical cost. The agreement was for 12 years from date of signing (Jan. 1983) at which time the equipment will be considered obsolete.
- This ended the book of reports from 1939 to 1982.

2019 Inventory of Fire District Customer's Components

Name Last	Name First	Meter	Meter Assembly	Dual Check Valve	Pres. Reducer	Expansion Tank	Town Meter	Other
Bailey	Charles & Annette (Gae)	✓	✓	✓	✓	✓	☐	PRV owner installed
Blessing	Calvin & Patricia	✓	✓	✓	☐	✓	☐	Already had PRV
Bradford/Dean	Robert & Dana	✓	✓	✓	☐	✓	☐	Already had PRV
Campbell	Cark & Sheryl	☐	☐	☐	☐	☐	✓	Town Meter
Clark	Maurice & Susan	✓	✓	✓	☐	✓	☐	Did not want PRV
Daniel	George	✓	✓	✓	☐	✓	☐	Had Parmalee install tank
Daniel	George	✓	✓	✓	☐	✓	☐	Had Parmalee install tank
DeFlorio	William & Trudy	✓	✓	✓	✓	✓	☐	All owner installed
DiLeo	Robert & Carolyn	✓	✓	✓	✓	✓	☐	Verified
Doering	Kevin & Ellen	☐	☐	☐	☐	☐	✓	Town Meter
Doss	John & Carol	☐	☐	☐	☐	☐	✓	Town Meter
Dowd	William & Jacqueline	✓	✓	✓	✓	✓	☐	Verified
Drake	Joshua & Ashley	✓	✓	✓	✓	✓	☐	Already had tank and PRV
Dupras	Carol	☐	☐	☐	☐	☐	✓	Town meter
Dupras	Carol	☐	☐	☐	☐	☐	✓	Town meter
Emmons	Aaron	✓	✓	✓	✓	✓	☐	Already had PRV
Farnham	David & Diana	☐	☐	☐	☐	☐	✓	Town meter
First Congregational		☐	☐	☐	☐	☐	☐	No Meter Installed
Floyd (home)	Albert	☐	☐	☐	☐	☐	✓	Town Meter
Floyd (P.O.)	Albert	☐	☐	☐	☐	☐	☐	Water supplied from store
Floyd (store)	Albert	☐	☐	☐	☐	☐	✓	Town Meter
Gallo	Shanon	✓	✓	✓	✓	✓	☐	Already had Tank per Shanon
Gifford Garage		☐	☐	☐	☐	☐	☐	Customer Owned
Gifford (ILF)		☐	☐	☐	☐	☐	☐	Customer Owned
Gifford (Menig)		☐	☐	☐	☐	☐	☐	Customer Owned
Jensen	Ted	☐	☐	☐	☐	☐	✓	Town Meter
Kerle	Jean	✓	✓	✓	☐	✓	☐	Already had PRV
Klink	Arthur & Rebecca	✓	✓	✓	☐	✓	☐	Already had PRV
Knippler	Dr. Arthur	✓	✓	✓	✓	✓	☐	All previously installed
Lackard	Valentia	☐	☐	☐	☐	☐	☐	No Meter Installed
LaLumia	Catherine	☐	☐	☐	☐	☐	☐	Town Meter
LaLumia	Daniel	✓	✓	✓	☐	✓	☐	Did not want PRV
Lens	John & Barb	✓	✓	✓	✓	✓	☐	Owner installed
Lu	Rui Ling & Zhi Biao	☐	☐	☐	☐	☐	✓	Town Meter
Lumbra	Home	✓	✓	✓	✓	✓	☐	Verified by Carolyn
Lumbra	Rental	✓	✓	✓	✓	✓	☐	Verified by Carolyn
Lumbra	Trailer	✓	✓	✓	✓	✓	☐	Verified by Carolyn
Mather	Ann	☐	☐	☐	☐	☐	✓	Town Meter
Meaney	Barbara	✓	✓	✓	✓	✓	☐	
Mitroff	Scott & Glenda	☐	☐	☐	☐	☐	✓	Town Meter
Mowery	Danielle	✓	✓	✓	✓	✓	☐	Verified
Parker	Judith	✓	✓	✓	✓	✓	✓	Installed by Parmalee
Parmalee	Joel & Patricia	☐	☐	☐	☐	☐	☐	Town Meter
Paul	Peter	✓	✓	✓	✓	✓	☐	Verifed
Randolph Ctr. Fire Ass.	Tim Angell	☐	☐	☐	☐	☐	☐	No Meter
Shappell	Mary	✓	✓	✓	✓	✓	☐	
Squire	Charles & Brenda	☐	☐	☐	☐	☐	✓	Town Meter
Squire	Dorothy	✓	✓	✓	✓	✓	☐	Verified
Squire	Richard & Carol	✓	✓	✓	☐	☐	☐	PR & Exp. Tank owner installed
St. Denis	Andre & Amy	✓	✓	✓	✓	✓	☐	Had tank, Gillespie installed second one
Stokes	Edward & Margaret	✓	✓	✓	☐	✓	☐	
Trask	Krystal	✓	✓	✓	☐	✓	☐	
Wang	Chengjun	✓	✓	✓	✓	✓	☐	
Wheatley	Lynford & Jill	✓	✓	✓	✓	✓	☐	Verified
Wilson	George & Cynthia	✓	✓	✓	☐	✓	☐	Unable to verify
Young	Erin	✓	✓	✓	☐	☐	☐	Owner installed PRV & tank

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List of Repairs/Upgrades since 2016

2016 - 2017:

July ....Installed 500' of new 1½" pipe on the southern end of the system. Approx. cost $6,335
Sept. ....Replaced service to Barbara Meany due to leaking under road. Approx. cost $2,350
Oct. ....Replaced old ladder in pump house with steel safety ladder. Approx. cost $545

2017 - 2018:

April............Built storage bins and racks to organize Fire District supplies. Approx. cost $673
May ....Located all shutoffs in system and repaired boxes where needed. Approx. cost $350
May ....Purchased cut off saw for above work. Cost $257
May ....Leak survey completed. Found 3 leaks. Survey was free, my labor was $125
May ....Major leak fixed near Floyd's store. 1½ days, 3 men. Approx. cost $2,450
June ....Replaced 1½" meter in pump house that was not working. Approx. cost $1,100
June ....Repaired leak at C. Squire found during survey. Approx. cost $745
Aug.............Emmons, connect new pipe to main. Approx. cost $50. Emmons did digging and paid for material.
Aug.............Purchased 32 water meters, setters, valves etc. from EJ Prescott. Approx. cost $12,000±
Sept ....Hired Gillespie P&H to install new meters. Approx. cost $9,300
Sept ....Repaired leak on pump house piping. Approx. cost $55
Oct. ....Replaced leaking church service with new service. Approx. cost $2,172
Oct. ....Replaced leaking shutoff for campground. Approx. cost $1,400

2018 - 2019:

Jan ....Replaced broken pump with pump in inventory. Approx. cost $860
Jan ....Purchased and replaced non-working back pressure valve at pump house. Cost $600
Apr..............Purchased and installed power and temperature monitor at pump house. Cost $345
July/Aug.....Hydrant and valve exercise and maintenance. Approx. cost $760
Aug.............Replaced electric heater in pump house. Labor & materials were approx. $435
Oct. ....Major work at spring/pump house to replace lines from spring to PS. Approx. cost $6,500
Nov.............Hired Gillespie P&H to install expansion tanks and pressure reducing valves in the homes that meters were installed due to problems with thermal expansion. Approx. cost $4,800
Nov.............Purchased new hydrant, valve, tee and other fittings. Cost $3,967
Nov.............Worked with Pickett's to replaced hydrant, valve & fittings. Approx. cost. $3,335
Dec.............Cost of removing, repairing and installing failed pump at pump house. $2,380
Dec.............Dead River replaced propane lines, added tank, emergency repair of heater. $1,060

2019 - 2020:

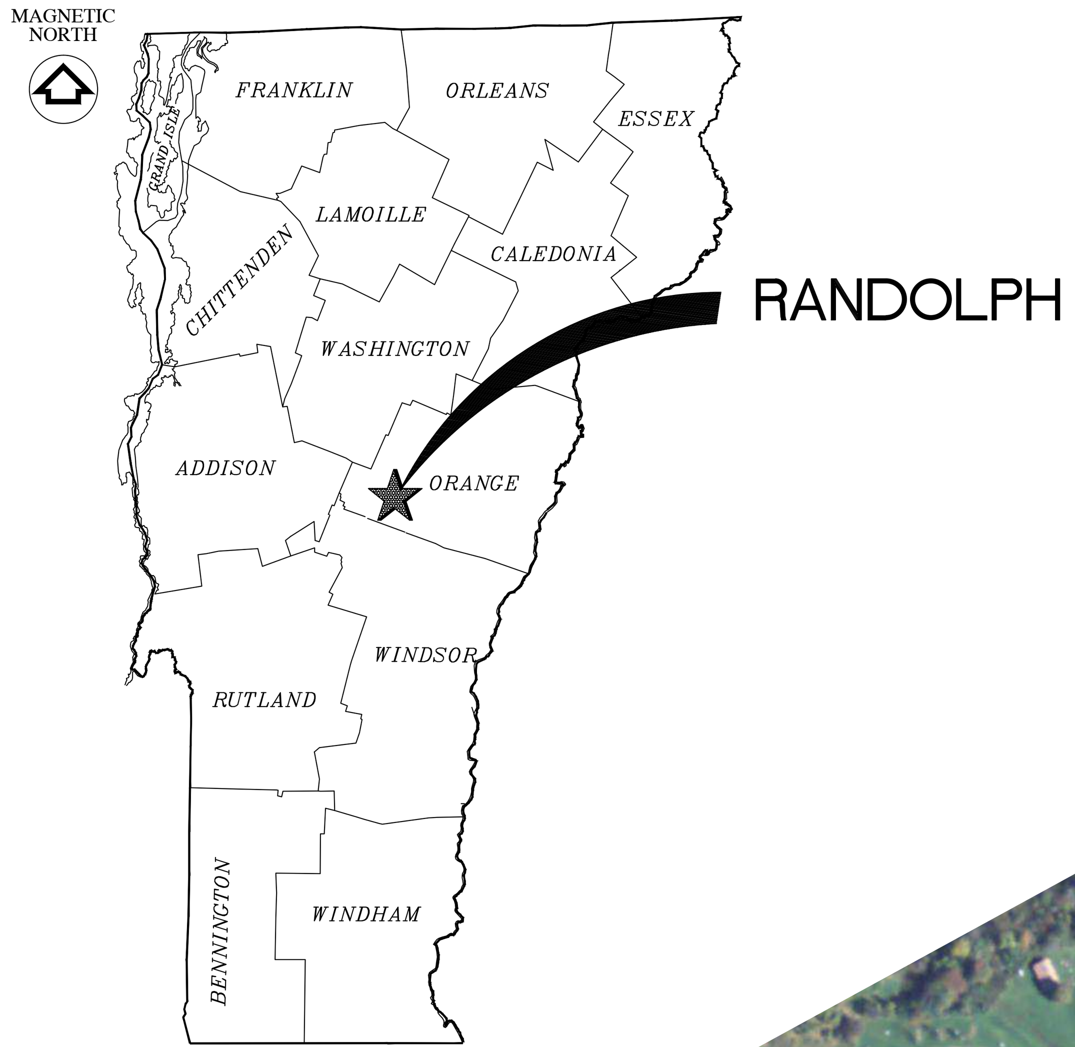
Apr..............Replaced leaking valve and exhaust fan motor at pump house. Approx. cost $310
2019 ....Most maintenance work was deferred as the Fire District was developing an Asset Management Plan to help prioritize what work needed to be done in the future.

2020 - 2021:

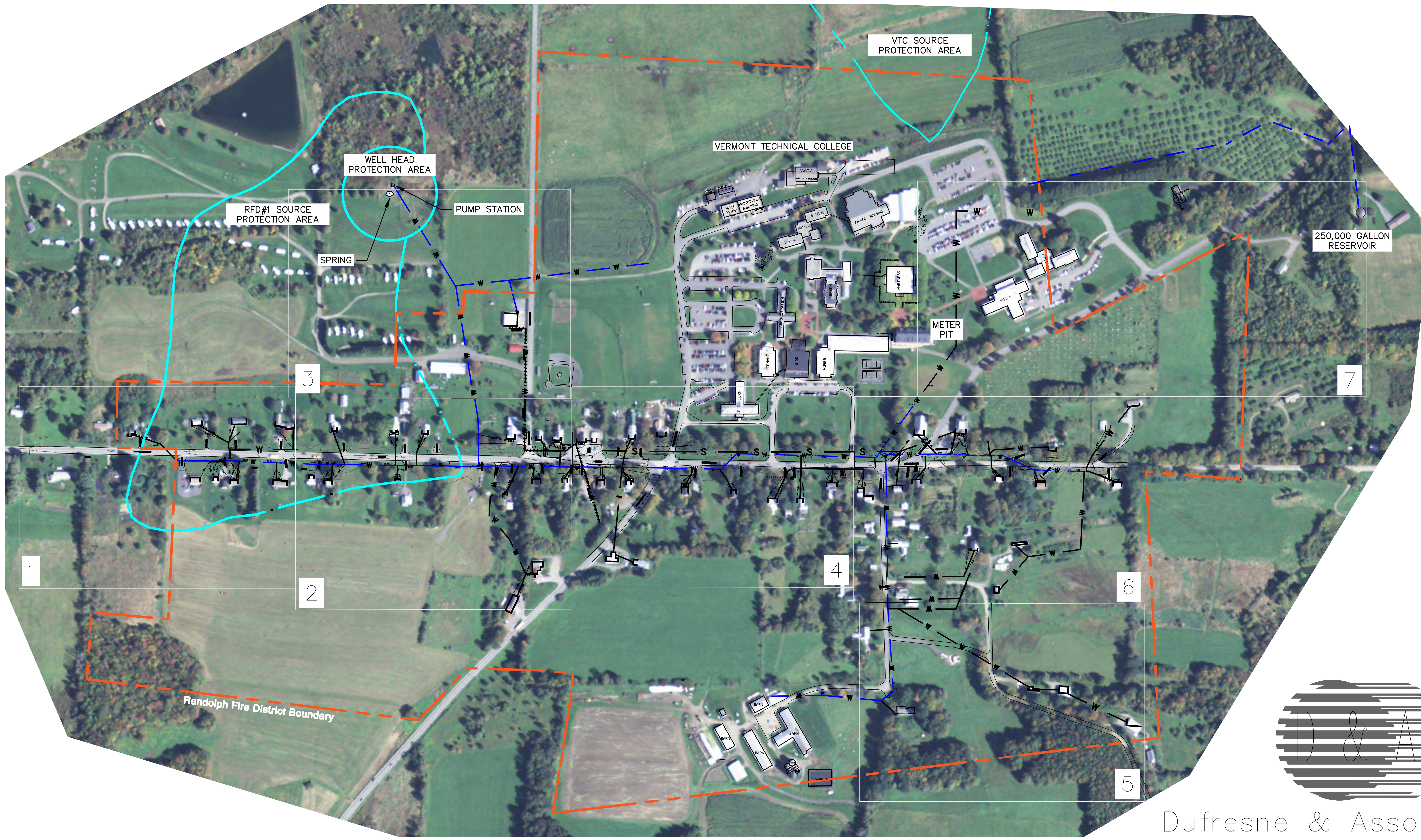
August........Repaired leak in service to Wheatley residence. Approx. cost $715
Nov.............Purchased 2 new pumps for PS from Champlin Assoc. Cost $4,543
Dec.............Hired Laramie Water Resources to install pumps. $1,350
Dec.............Purchased pipe, fittings & valves to replace old pipe in PS from a few different vendors. Cost $1,850
Jan. ....Hired Randolph P&H to install new pipe, valves etc. in pump station. $5,839
Mar.............Hired Harmony Electric to upgrade electrical system in pump house including new panel, pump controller etc. Cost $5,382

APPENDIX J WATER SYSTEM MAPPING

RANDOLPH FIRE DISTRICT #1
WATER SYSTEMS BASE MAPS
RANDOLPH CENTER, VERMONT
NOVEMBER 27, 2007



LOCATION MAP



SHEET INDEX

GRAPHIC SCALE

250 0 125 250 500 1000

(IN FEET)
1 inch = 250 ft.

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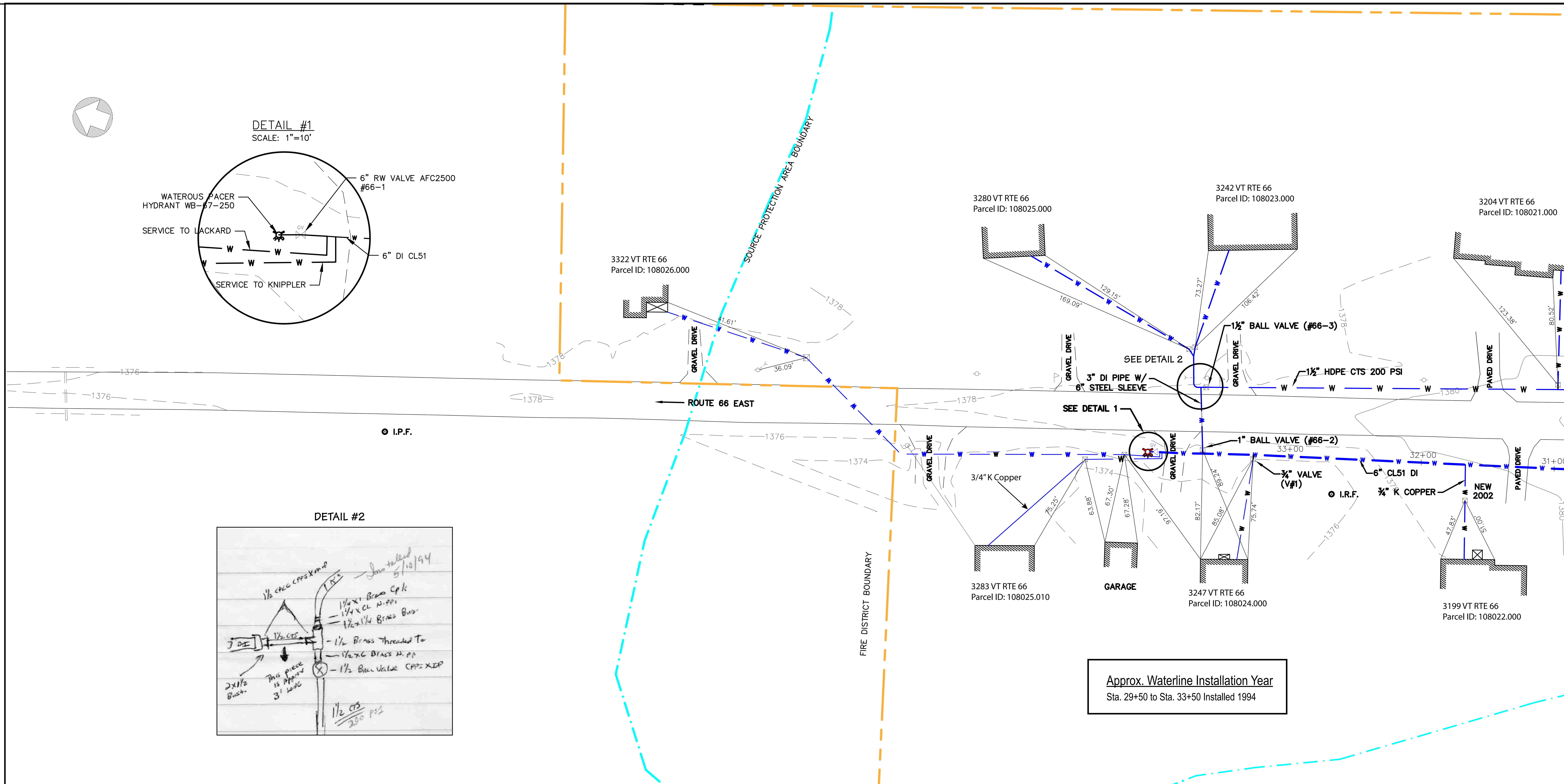

LEGEND

EXISTING:
MAJOR CONTOUR
MINOR CONTOUR
WATER MAIN PIPE
BUILDING/STRUCTURE OUTLINE
PAVED ROAD OUTLINE
GRAVEL ROAD OUTLINE
RIGHT OF WAY
STONE WALL
GAURD RAIL
WOOD FENCE
SIGNS
IRON ROD/PIN
FIRE HYDRANT
WATER SHUTOFF VALVE
MONUMENT
UTILITY POLE/GUY WIRE
MAIL BOX
I.R.F. IRON ROD FOUND
I.P.F. IRON PIPE FOUND
WATER SHUT OFF
EDGE OF FIRE DISTRICT
WELL HEAD PROTECTION AREA

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS.
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

VALVE LIST

VALVE NUMBER	VALVE TYPE
#66–1	6" RW VALVE AFC2500
#66–2	1" BALL VALVE
#66–3	1½" BALL VALVE

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions: 1/2017 by Bill DeFlorio

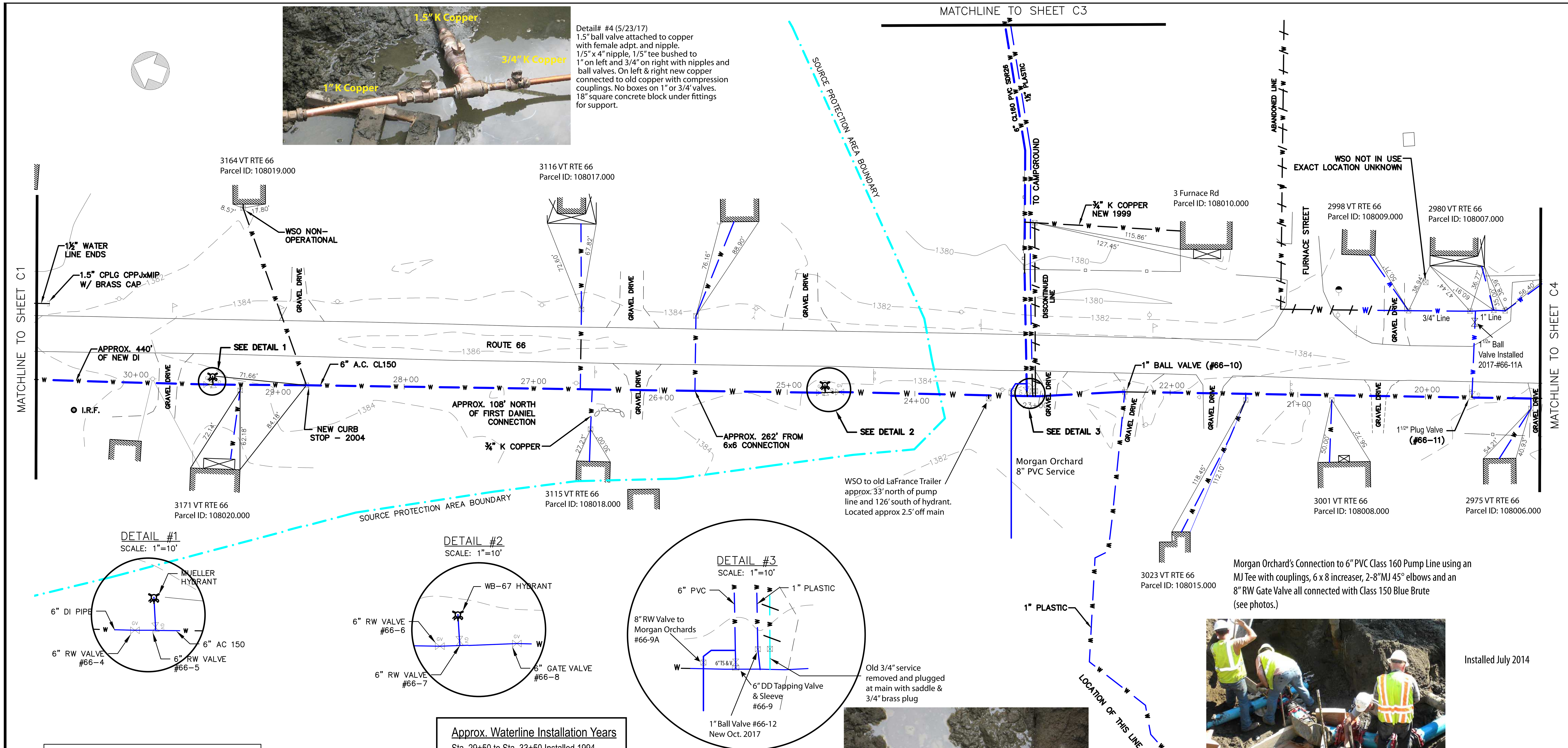
RANDOLPH FIRE DISTRICT # 1

WATER SYSTEM BASE MAP ROUTE 66

RANDOLPH, VERMONT

C1

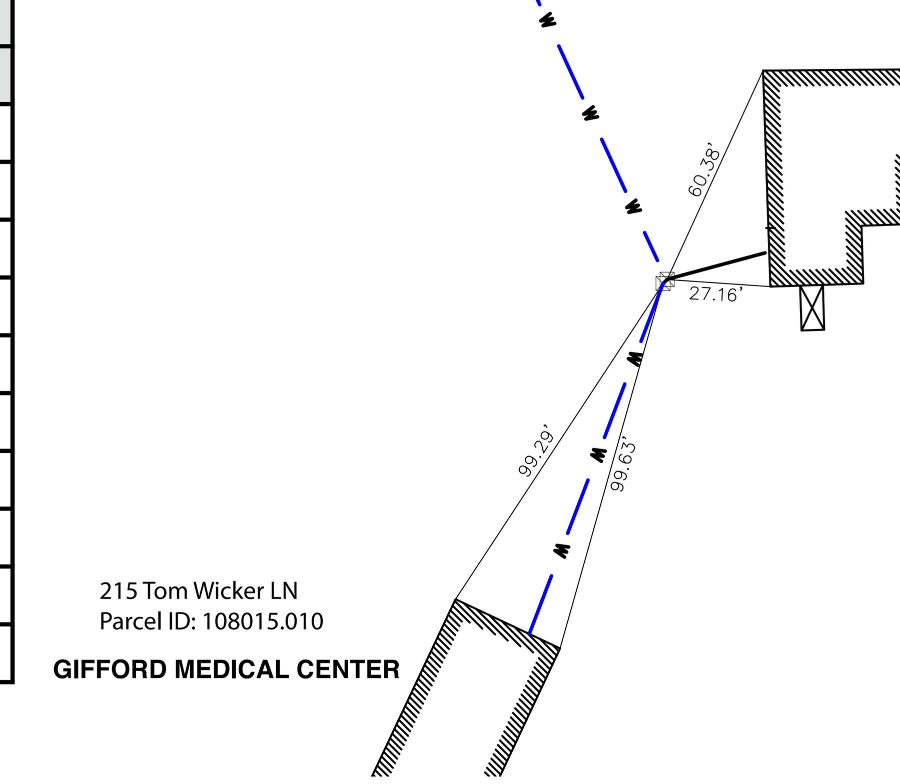
DWG. NO. 417005SV02



Approx. Waterline Installation Years

Sta. 29+50 to Sta. 33+50 Installed 1994
Sta. 24+80 to Sta. 29+50 Installed 1971
Sta. 19+00 to Sta. 24+50 Installed 1957

Installed July 2014



LEGEND

EXISTING:	
———	MAJOR CONTOUR
– – – –	MINOR CONTOUR
— w —	WATER MAIN PIPE
//////	BUILDING/STRUCTURE OUTLINE
———	PAVED ROAD OUTLINE
— —	GRAVEL ROAD OUTLINE
– · · –	RIGHT OF WAY
○○○○○	STONE WALL
–o–o–	GAURD RAIL
–o–o–	WOOD FENCE
STOP	SIGNS
○	IRON ROD/PIN
	FIRE HYDRANT
⊠	WATER SHUTOFF VALVE
⊡	MONUMENT
	UTILITY POLE/GUY WIRE
△	MAIL BOX
⊙ I.R.F.	IRON ROD FOUND
⊙ I.P.F.	IRON PIPE FOUND
⊠	WATER SHUT OFF
	EDGE OF FIRE DISTRICT
– · – · –	WELL HEAD PROTECTION AREA

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
Ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS.
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.
4. LOCATION OF PARMALEE AND PALMER HOMES IS NOT ACCURATE.

VALVE LIST

VALVE #	VALVE TYPE
#66 – 4	6" RW Valve
#66 – 5	6" RW Valve
#66 – 6	6" RW Valve
#66 – 7	6" RW Valve
#66 – 8	6" DD GATE Valve
#66 – 9	6" DD GATE Valve
#66 – 9A	8" RW Valve
#66 – 10	1" BALL VALVE
#66 – 11	1½" PLUG STYLE VALVE
#66 – 11A	1½" BALL VALVE

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:

RANDOLPH FIRE DISTRICT #1

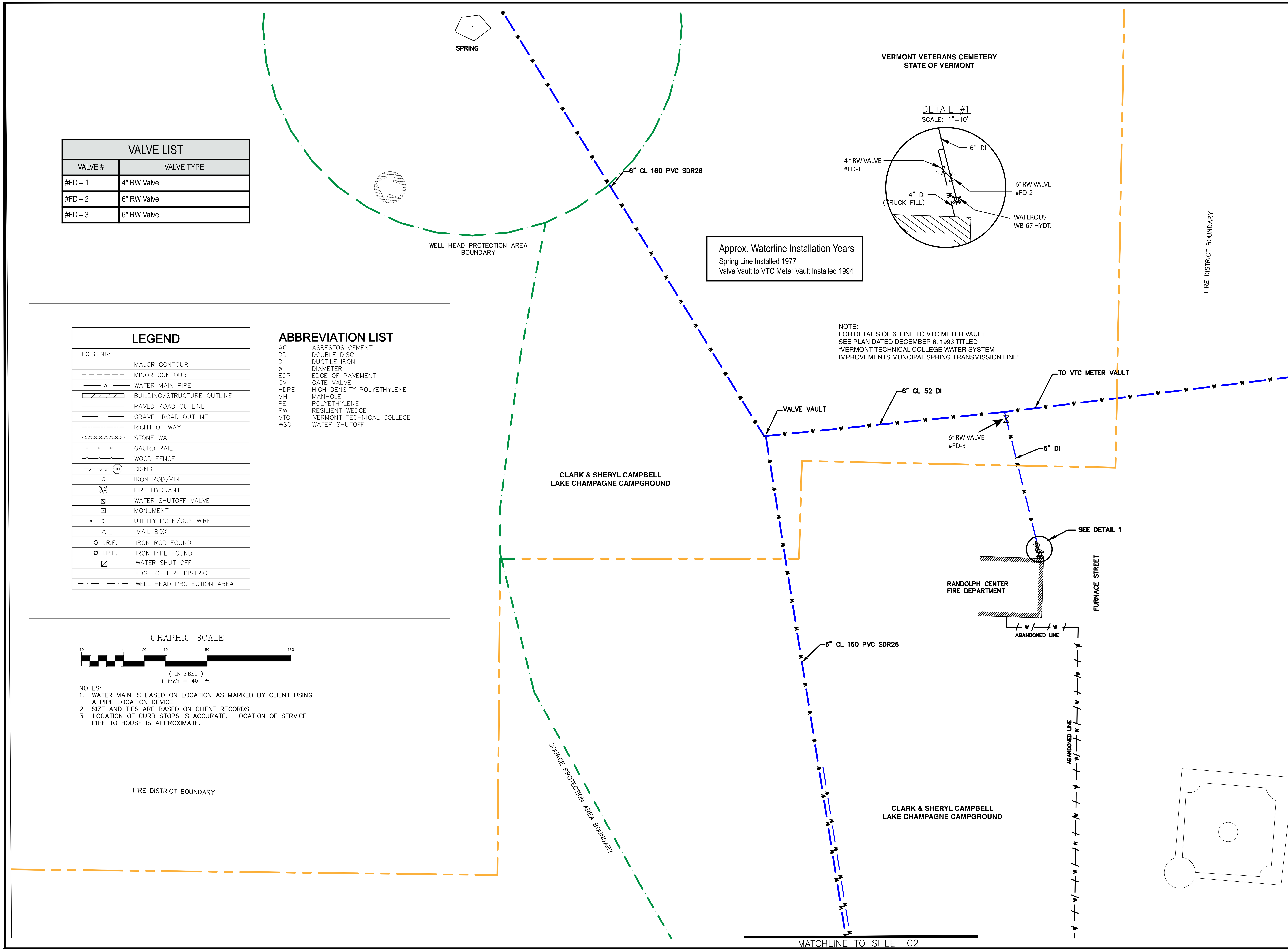
WATER SYSTEM BASE MAP ROUTE 66 (CONTINUED)

RANDOLPH, VERMONT

C2

DWG. NO. 417005SV02

SHEET 2 OF 7



VALVE LIST

VALVE #	VALVE TYPE
#FD – 1	4" RW Valve
#FD – 2	6" RW Valve
#FD – 3	6" RW Valve

LEGEND

EXISTING:

- MAJOR CONTOUR
- MINOR CONTOUR
- WATER MAIN PIPE
- BUILDING/STRUCTURE OUTLINE
- PAVED ROAD OUTLINE
- GRAVEL ROAD OUTLINE
- RIGHT OF WAY
- STONE WALL
- GAURD RAIL
- WOOD FENCE
- SIGNS
- IRON ROD/PIN
- FIRE HYDRANT
- WATER SHUTOFF VALVE
- MONUMENT
- UTILITY POLE/GUY WIRE
- MAIL BOX
- I.R.F. IRON ROD FOUND
- I.P.F. IRON PIPE FOUND
- WATER SHUT OFF
- EDGE OF FIRE DISTRICT
- WELL HEAD PROTECTION AREA

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS.
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:
REVISED JAN 2017

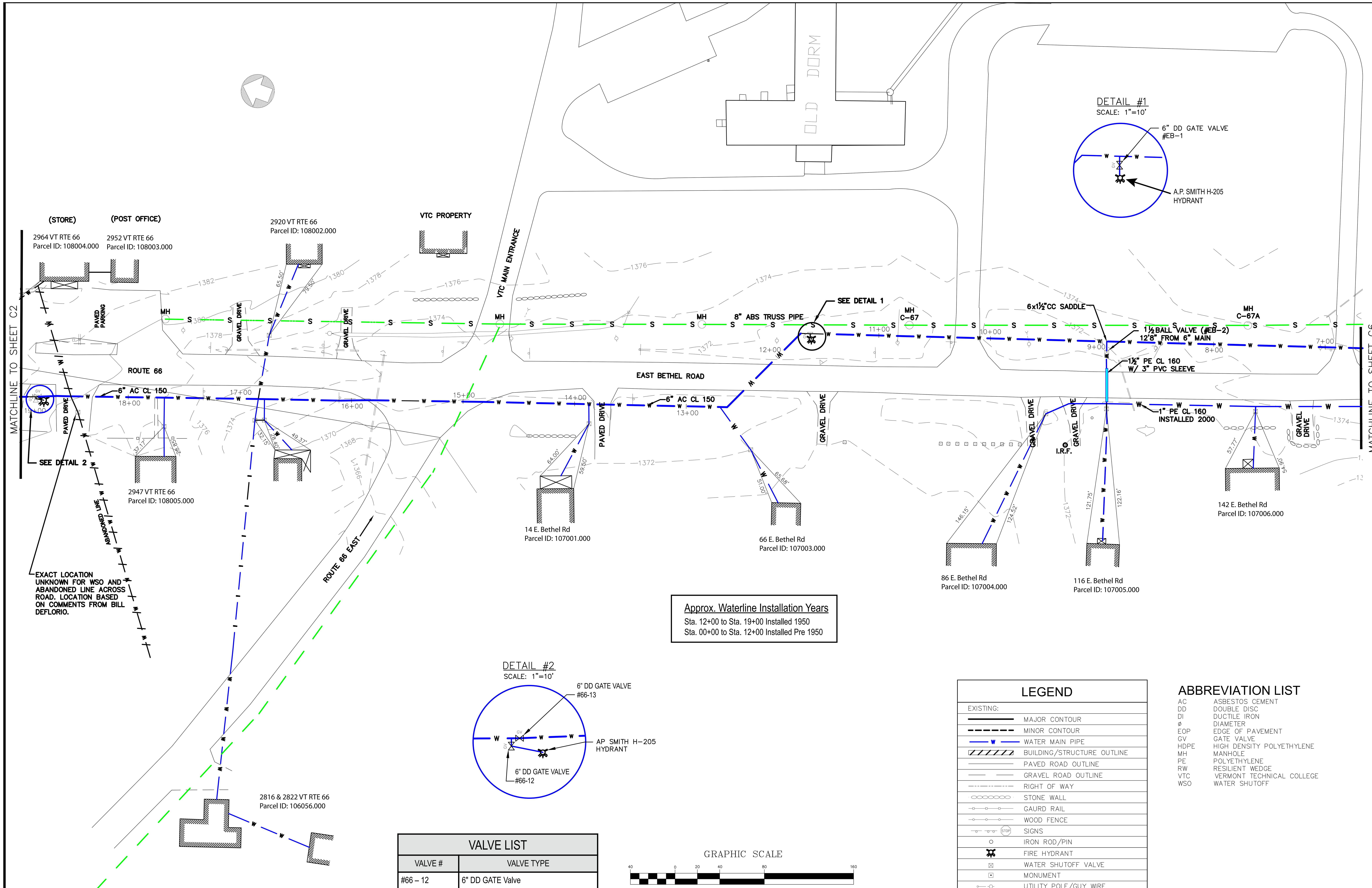
RANDOLPH FIRE DISTRICT #1

WATER SYSTEM BASE MAP
FIRE DEPARTEMENT

RANDOLPH, VERMONT

C3

DWG. NO. 417005SV02



Approx. Waterline Installation Years

Sta. 12+00 to Sta. 19+00 Installed 1950

Sta. 00+00 to Sta. 12+00 Installed Pre 1950

VALVE LIST

VALVE #	VALVE TYPE
#66 – 12	6" DD GATE Valve
#66 – 13	6" DD GATE Valve
#EB – 1	6" DD GATE Valve
#EB – 2	1½" BALL VALVE

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS.
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.

LEGEND

EXISTING:

	MAJOR CONTOUR
	MINOR CONTOUR
	WATER MAIN PIPE
	BUILDING/STRUCTURE OUTLINE
	PAVED ROAD OUTLINE
	GRAVEL ROAD OUTLINE
	RIGHT OF WAY
	STONE WALL
	GAURD RAIL
	WOOD FENCE
	SIGNS
	IRON ROD/PIN
	FIRE HYDRANT
	WATER SHUTOFF VALVE
	MONUMENT
	UTILITY POLE/GUY WIRE
	MAIL BOX
I.R.F.	IRON ROD FOUND
I.P.F.	IRON PIPE FOUND
	WATER SHUT OFF
	EDGE OF FIRE DISTRICT
	WELL HEAD PROTECTION AREA

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:

1/30/2017 by Bill DeFlorio

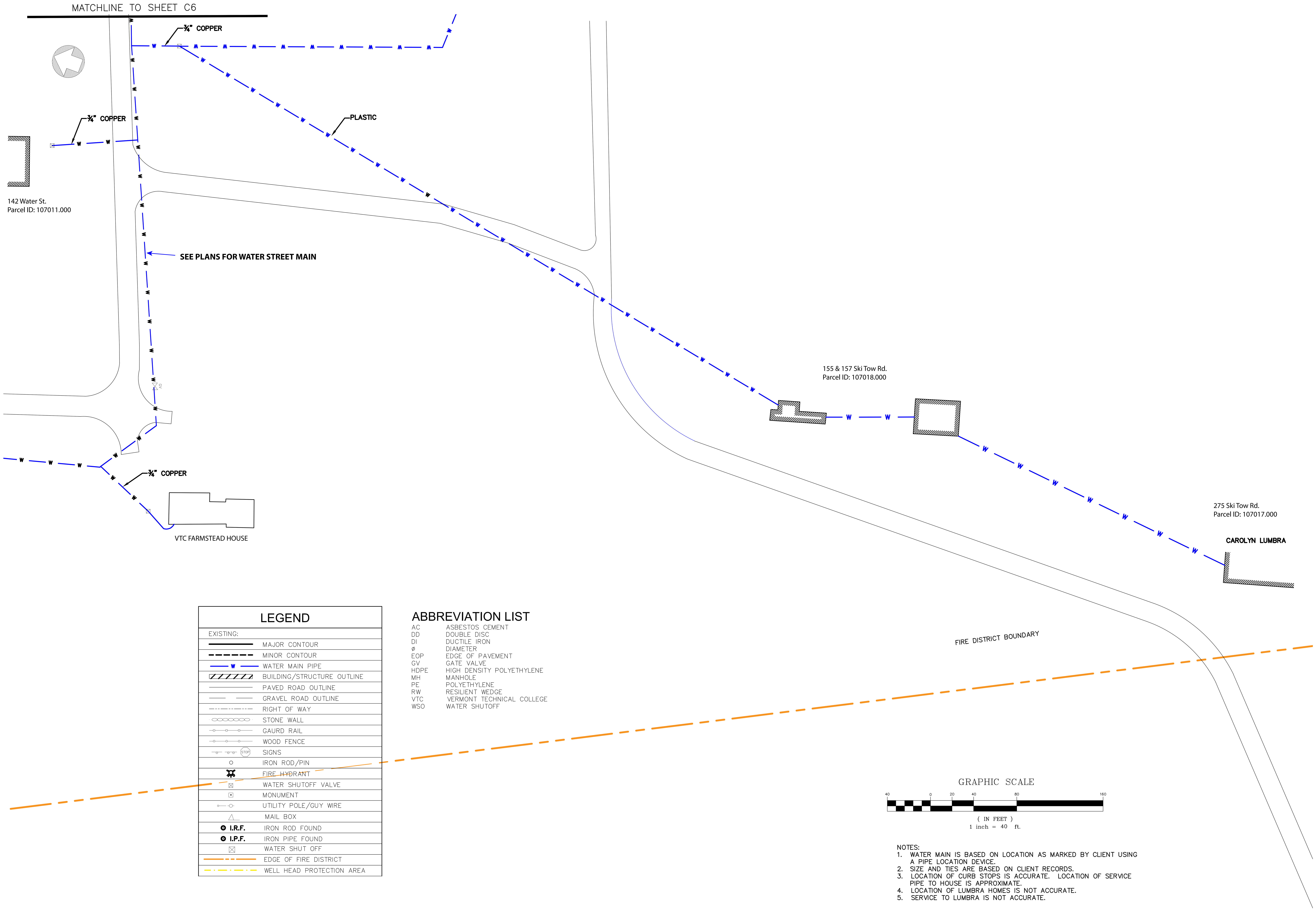
RANDOLPH FIRE DISTRICT #1

WATER SYSTEM BASE MAP EAST BETHEL ROAD

RANDOLPH, VERMONT

C4

DWG. NO. 417005SV02



LEGEND

EXISTING:	
	MAJOR CONTOUR
	MINOR CONTOUR
W	WATER MAIN PIPE
	BUILDING/STRUCTURE OUTLINE
	PAVED ROAD OUTLINE
	GRAVEL ROAD OUTLINE
	RIGHT OF WAY
	STONE WALL
	GAURD RAIL
	WOOD FENCE
STOP	SIGNS
	IRON ROD/PIN
	FIRE HYDRANT
	WATER SHUTOFF VALVE
	MONUMENT
	UTILITY POLE/GUY WIRE
	MAIL BOX
I.R.F.	IRON ROD FOUND
I.P.F.	IRON PIPE FOUND
	WATER SHUT OFF
	EDGE OF FIRE DISTRICT
	WELL HEAD PROTECTION AREA

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS.
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.
4. LOCATION OF LUMBRA HOMES IS NOT ACCURATE.
5. SERVICE TO LUMBRA IS NOT ACCURATE.

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:

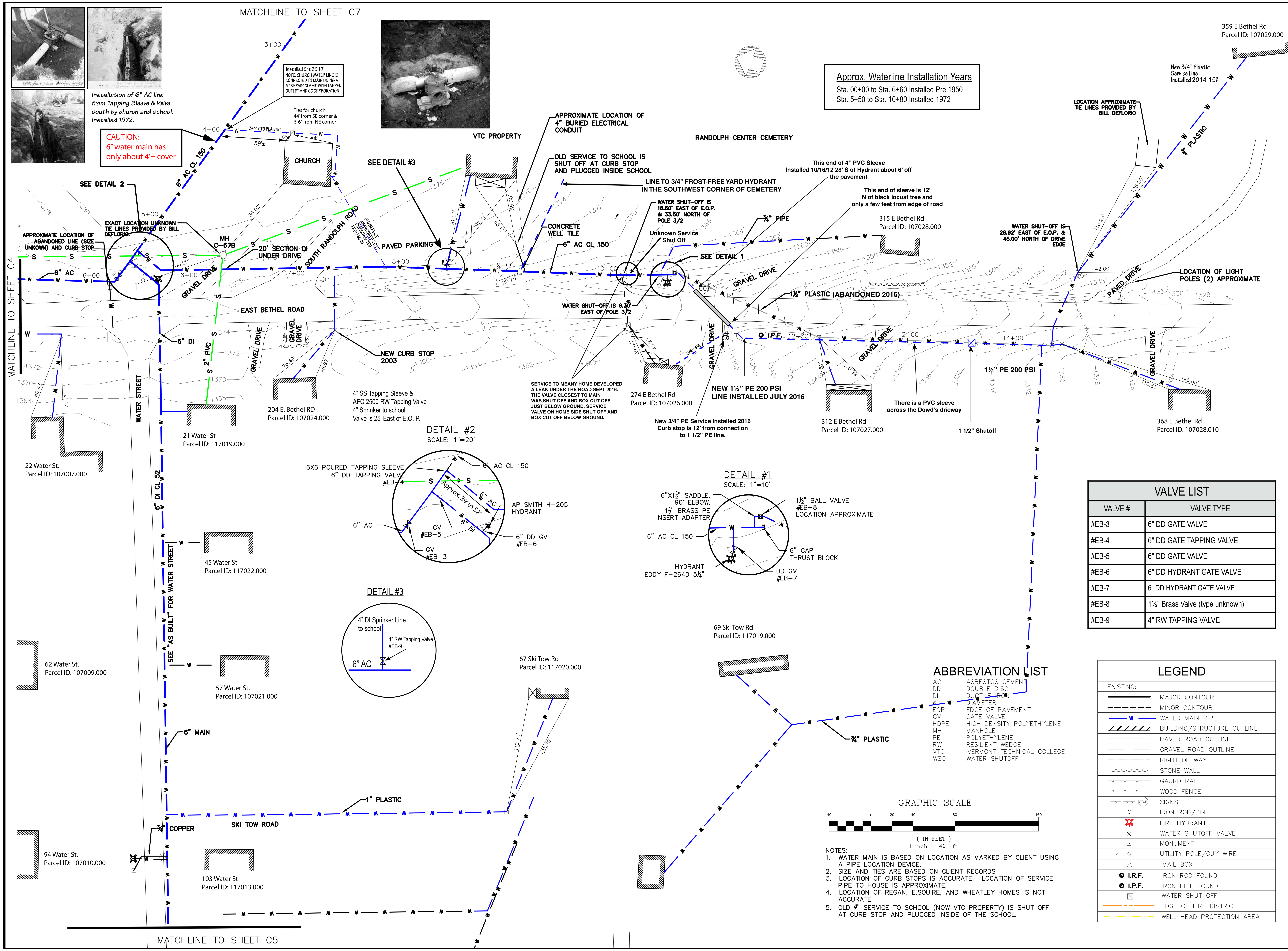
RANDOLPH FIRE DISTRICT #1

WATER SYSTEM BASE MAP LUMBRA PROPERTIES

RANDOLPH, VERMONT

C5

DWG. NO. 417005SV02



Approx. Waterline Installation Years

Sta. 00+00 to Sta. 6+60 Installed Pre 1950
Sta. 5+50 to Sta. 10+80 Installed 1972

VALVE LIST

VALVE #	VALVE TYPE
#EB-3	6" DD GATE VALVE
#EB-4	6" DD GATE TAPPING VALVE
#EB-5	6" DD GATE VALVE
#EB-6	6" DD HYDRANT GATE VALVE
#EB-7	6" DD HYDRANT GATE VALVE
#EB-8	1½" Brass Valve (type unknown)
#EB-9	4" RW TAPPING VALVE

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
Ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

LEGEND

EXISTING:

- MAJOR CONTOUR
- MINOR CONTOUR
- WATER MAIN PIPE
- BUILDING/STRUCTURE OUTLINE
- PAVED ROAD OUTLINE
- GRAVEL ROAD OUTLINE
- RIGHT OF WAY
- STONE WALL
- GAURD RAIL
- WOOD FENCE
- SIGNS
- IRON ROD/PIN
- FIRE HYDRANT
- WATER SHUTOFF VALVE
- MONUMENT
- UTILITY POLE/GUY WIRE
- MAIL BOX
- I.R.F. IRON ROD FOUND
- I.P.F. IRON PIPE FOUND
- WATER SHUT OFF
- EDGE OF FIRE DISTRICT
- WELL HEAD PROTECTION AREA

NOTES:

1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.
4. LOCATION OF REGAN, E.SQUIRE, AND WHEATLEY HOMES IS NOT ACCURATE.
5. OLD ¾" SERVICE TO SCHOOL (NOW VTC PROPERTY) IS SHUT OFF AT CURB STOP AND PLUGGED INSIDE OF THE SCHOOL.

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:

Jan 2017 by Bill DeFlorio

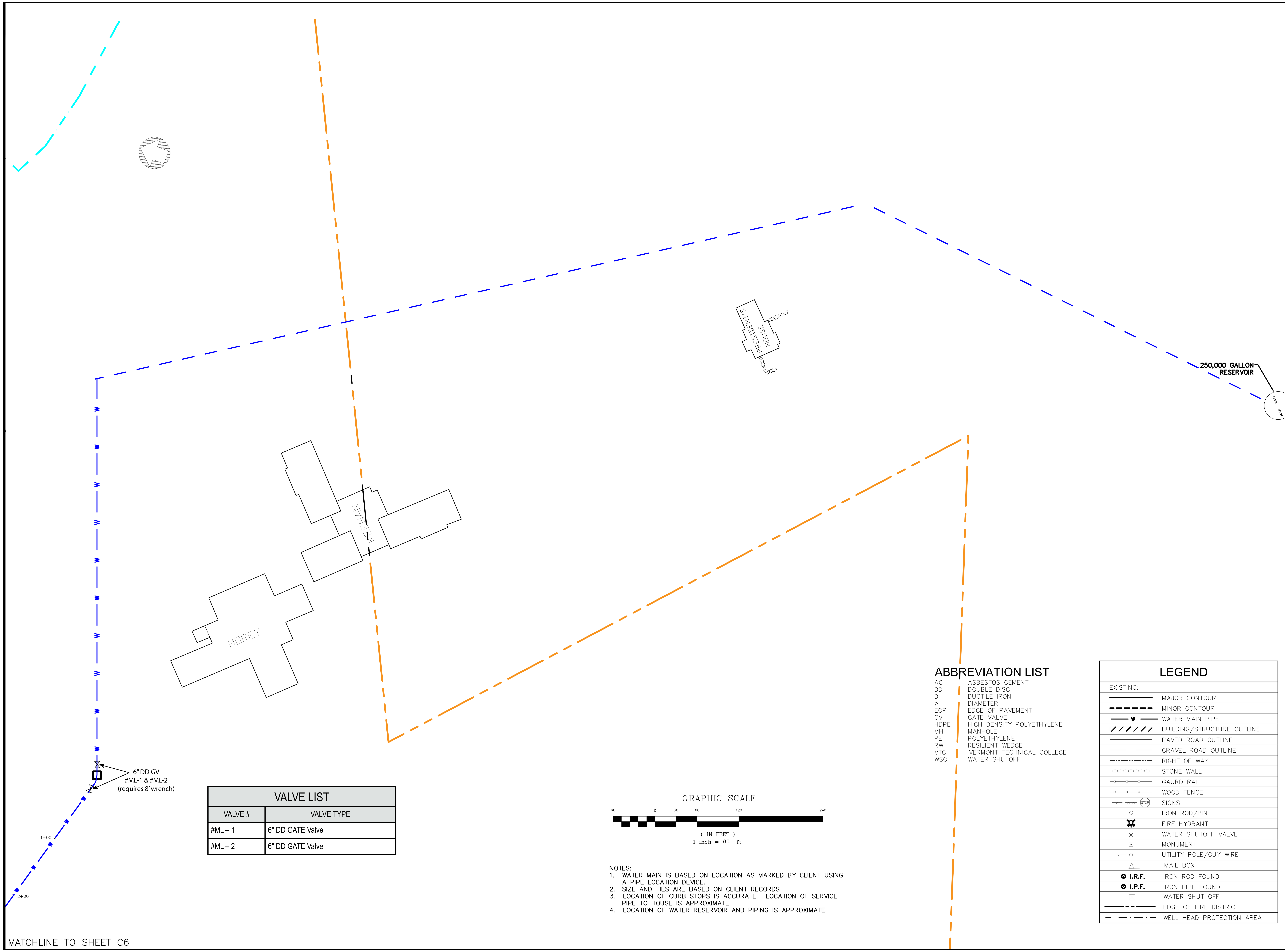
RANDOLPH FIRE DISTRICT #1

WATER SYSTEM BASE MAP
EAST BETHEL ROAD (CONTINUED)

RANDOLPH, VERMONT

C6

DWG. NO. 417005SV02



VALVE LIST

VALVE #	VALVE TYPE
#ML – 1	6" DD GATE Valve
#ML – 2	6" DD GATE Valve

GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

NOTES:
1. WATER MAIN IS BASED ON LOCATION AS MARKED BY CLIENT USING A PIPE LOCATION DEVICE.
2. SIZE AND TIES ARE BASED ON CLIENT RECORDS
3. LOCATION OF CURB STOPS IS ACCURATE. LOCATION OF SERVICE PIPE TO HOUSE IS APPROXIMATE.
4. LOCATION OF WATER RESERVOIR AND PIPING IS APPROXIMATE.

ABBREVIATION LIST

AC	ASBESTOS CEMENT
DD	DOUBLE DISC
DI	DUCTILE IRON
ø	DIAMETER
EOP	EDGE OF PAVEMENT
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
MH	MANHOLE
PE	POLYETHYLENE
RW	RESILIENT WEDGE
VTC	VERMONT TECHNICAL COLLEGE
WSO	WATER SHUTOFF

LEGEND

EXISTING:

- MAJOR CONTOUR
- MINOR CONTOUR
- WATER MAIN PIPE
- BUILDING/STRUCTURE OUTLINE
- PAVED ROAD OUTLINE
- GRAVEL ROAD OUTLINE
- RIGHT OF WAY
- STONE WALL
- GAURD RAIL
- WOOD FENCE
- SIGNS
- IRON ROD/PIN
- FIRE HYDRANT
- WATER SHUTOFF VALVE
- MONUMENT
- UTILITY POLE/GUY WIRE
- MAIL BOX
- I.R.F. IRON ROD FOUND
- I.P.F. IRON PIPE FOUND
- WATER SHUT OFF
- EDGE OF FIRE DISTRICT
- WELL HEAD PROTECTION AREA

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Project #	417005.1
Project Mgr.	R.E. DUFRESNE
Design	MARK WALKER
Drawn	CML
Checked by	R.E. DUFRESNE
Date	SEPTEMBER, 2007
Scale	AS SHOWN
Approved by	R.E. DUFRESNE

Revisions:

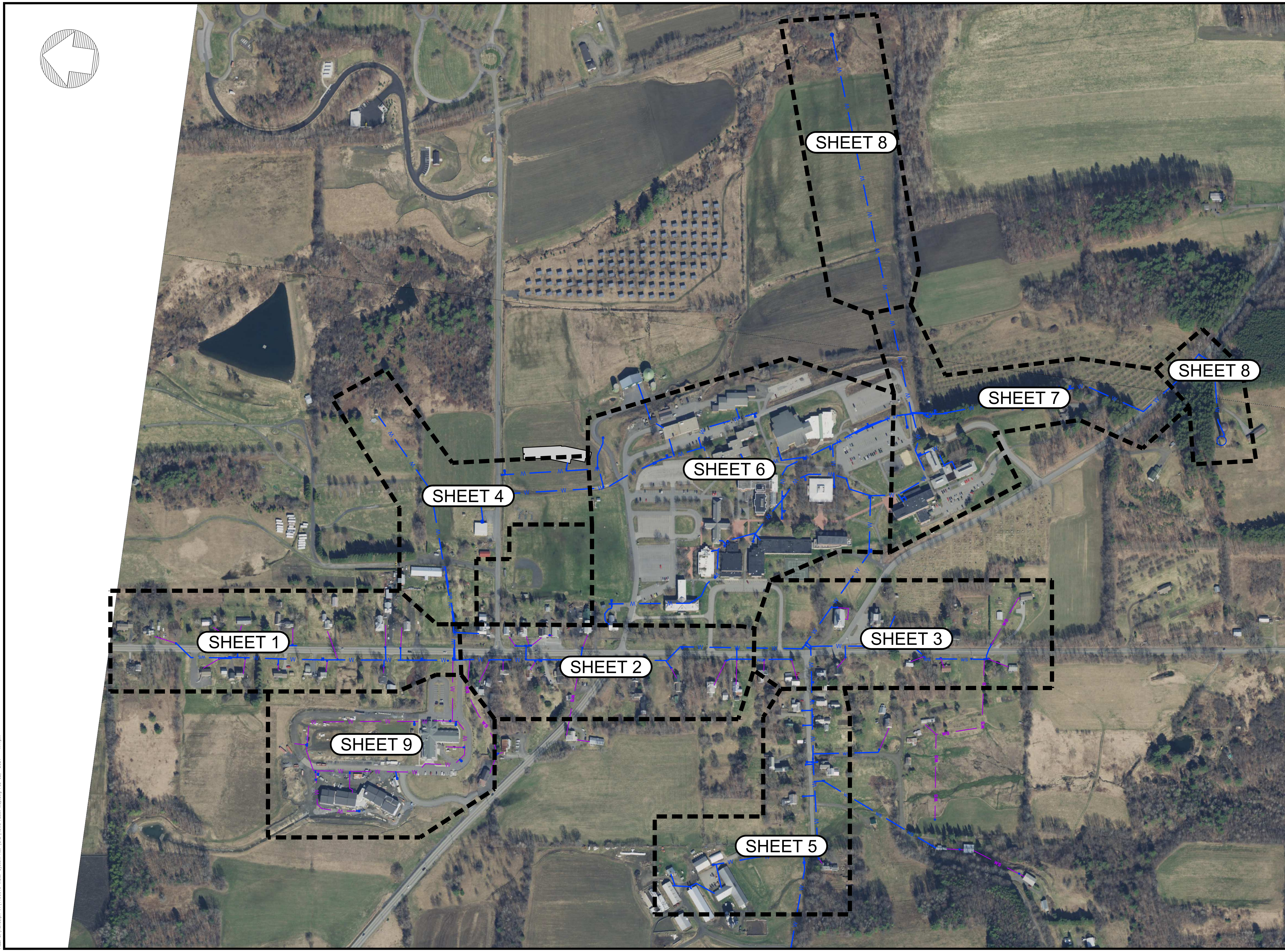
RANDOLPH FIRE DISTRICT #1

WATER SYSTEM BASE MAP RESERVOIR TANK

RANDOLPH, VERMONT

C7

DWG. NO. 417005SV02



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Manchester, VT • Tel: (802) 768-8291 Fax: (802) 768-8315
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REVISIONS

DATE	COMMENTS	BY

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

OVERALL MAP INDEX

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 200'

C1

SHEET 1 OF 10

FILE: B:\Randolph VT\4190019 Water System AMP\CAD\RCWS Asset Map.dwg Feb 02, 2021 - 1:17pm

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REVISIONS

DATE	COMMENTS	BY

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #1

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C2

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REVISIONS

DATE	COMMENTS	BY

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #2

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C3

SHEET 3 OF 10

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REVISIONS

DATE	COMMENTS	BY

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #3

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C4

SHEET 4 OF 10

PUMP STATION DETAIL
SCALE: NOT TO SCALE

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REVISIONS

DATE	COMMENTS	BY

RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #4

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C5

SHEET 5 OF 10

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RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

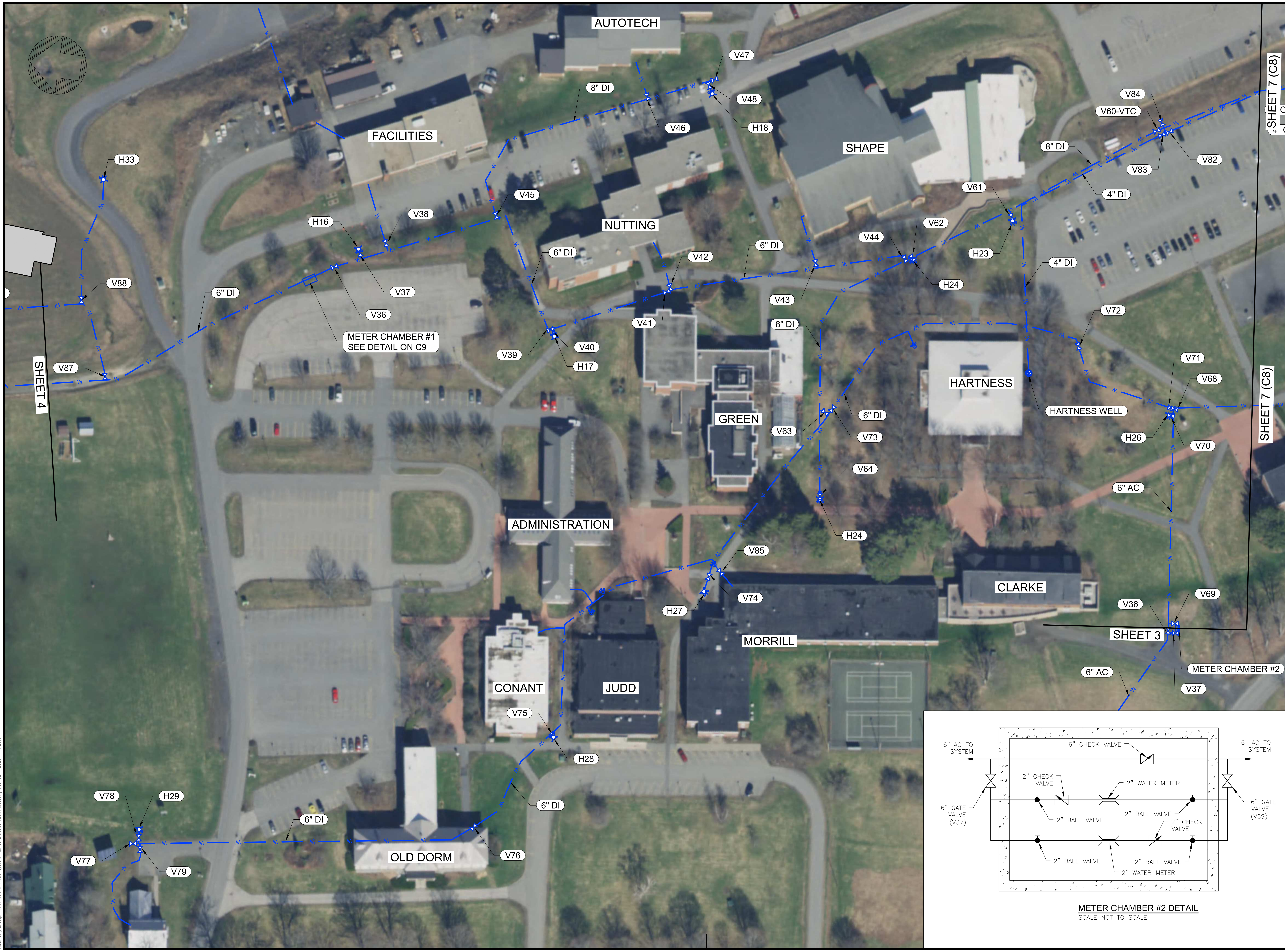
SHEET #5

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C6

SHEET 6 OF 10



METER CHAMBER #2 DETAIL

SCALE: NOT TO SCALE

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RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #6

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C7

FILE: B:\Randolph VT\4190019 Water System AMP\CAD\RCWS Asset Map.dwg Feb 02, 2021 - 1:21pm

ORCHARD PIT DETAIL
SCALE: NOT TO SCALE

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RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

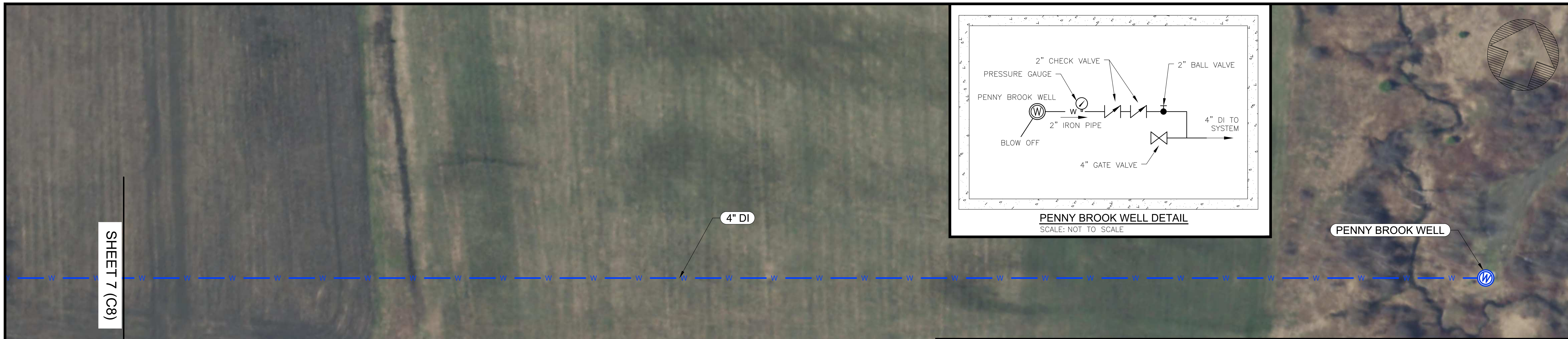
SHEET #7

RANDOLPH CENTER, VERMONT

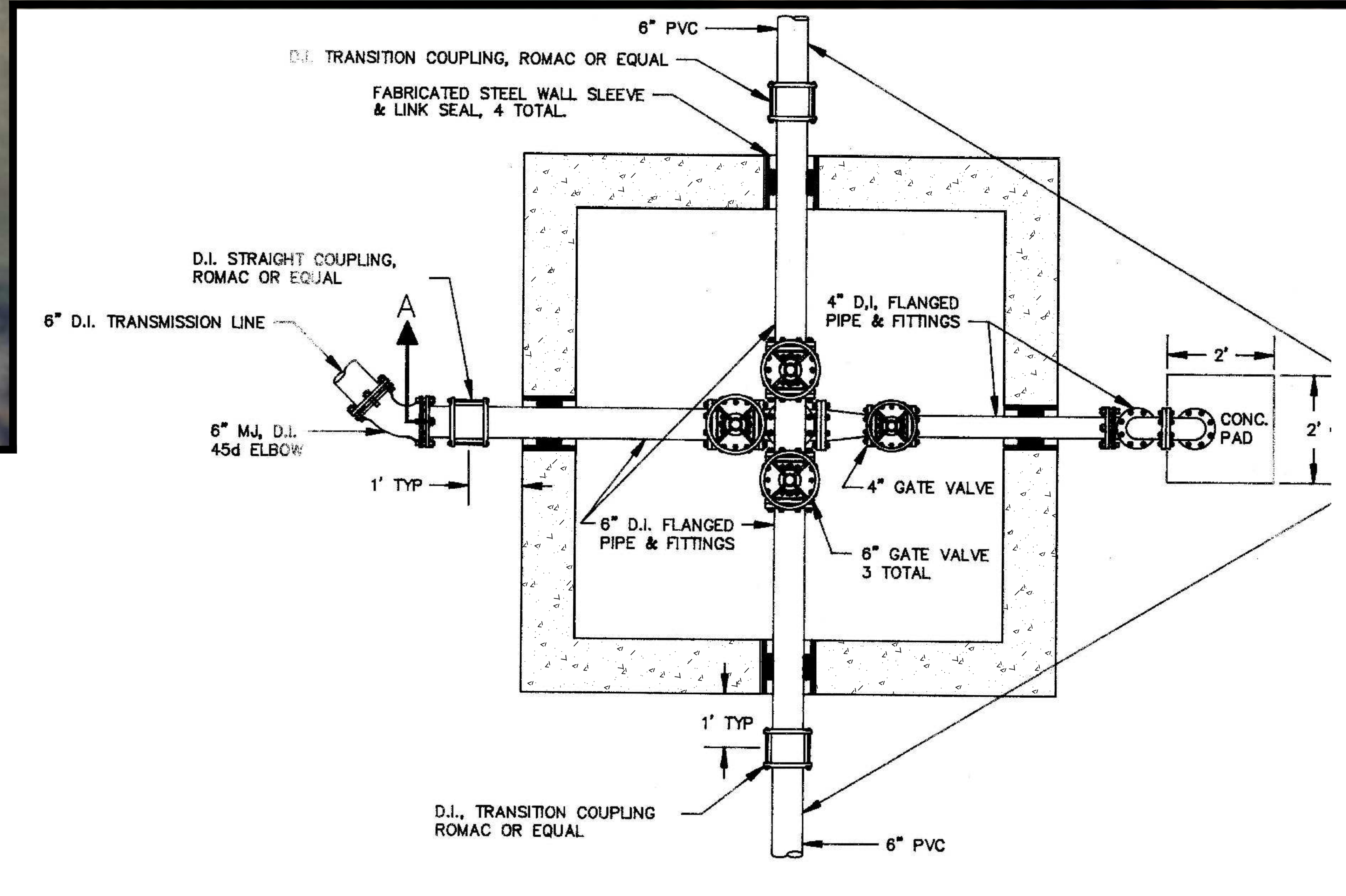
Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C8

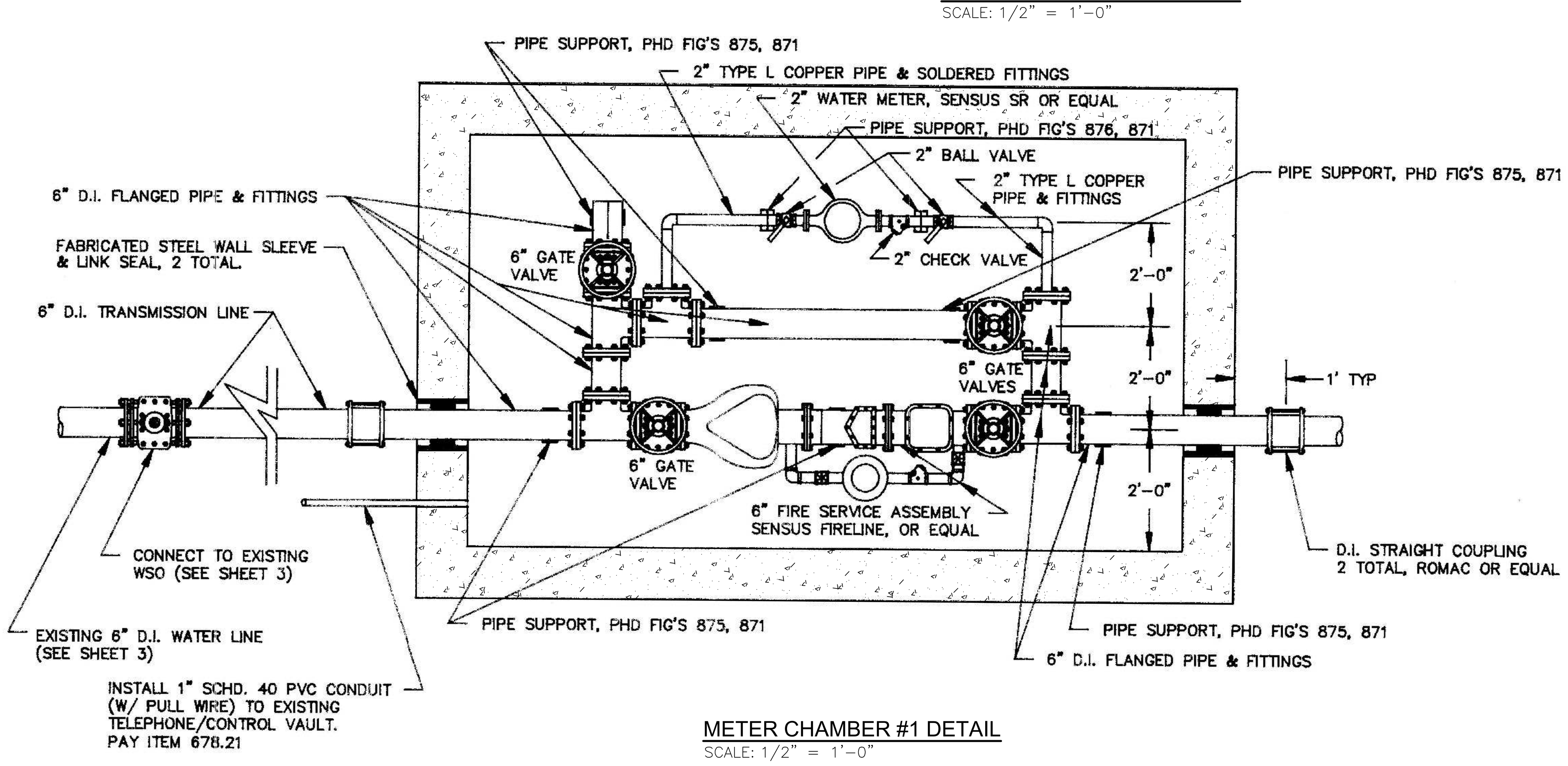
FILE: B:\Randolph VT\4190019 Water System AMP\CAD\RCWS Asset Map.dwg Feb 02, 2021 - 1:22pm



PENNY BROOK WELL DETAIL
SCALE: NOT TO SCALE



CONNECTION VAULT DETAIL
SCALE: 1/2" = 1'-0"



METER CHAMBER #1 DETAIL
SCALE: 1/2" = 1'-0"

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RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SHEET #8

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C9

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RANDOLPH CENTER WATER SYSTEM
ASSET MANAGEMENT PLAN

SITE PLAN #9

RANDOLPH CENTER, VERMONT

Project #	4190019
Project Mgr.	B.L. BAKER
Design by	
Drawn by	B.L. BAKER
Reviewed by	N.R. JOHNSON
Approved by	
Date	OCTOBER 25, 2019
Scale	1" = 50'

C10

SHEET 10 OF 10