

October 2014

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**Phase I Scoping Study**

**Emergency Access Road with  
West Main Street Water and Sewer  
Extensions for  
Town of Richmond, Vermont**



10/2/14

**FINAL  
DRAFT**

*Prepared for:*

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EMERGENCY ACCESS ROAD WITH  
WEST MAIN STREET WATER AND SEWER  
EXTENSIONS FOR  
TOWN OF RICHMOND, VERMONT

OCTOBER 2014

TABLE OF CONTENTS

	<u>PAGE NO.</u>
1.0 INTRODUCTION .....	1
2.0 STUDY AREA .....	2
2.1 Boundaries .....	2
2.2 Zoning and Land Use.....	2
2.3 Property Owner Surveys.....	2
3.0 NEW SCHOOL EMERGENCY ACCESS ROAD.....	3
3.1 General.....	3
4.0 EXISTING WATER SYSTEM ANALYSIS .....	3
4.1 General.....	3
4.2 Water System Uncommitted Reserve Capacity.....	4
4.3 Existing and Future Water System Demands .....	5
4.4 Water System Hydraulic Analysis.....	6
4.5 Waterline Extension Alternative.....	7
5.0 EXISTING SEWER SYSTEM ANALYSIS.....	7
5.1 WWTF Uncommitted Reserve Capacity .....	7
5.2 Existing and Future Wastewater Flows .....	9
5.3 Middle School Pump Station and Forcemain .....	11
5.4 Existing Gravity Sewer System Capacity .....	11
5.5 Sewerline Extension Alternatives.....	12
6.0 COST ESTIMATES .....	15
6.1 Construction Cost Estimates.....	15
6.2 Total Project Cost Estimates.....	16
6.3 Revenue Analysis for Existing Use .....	17
6.4 Alternatives for Debt Financing .....	18

## 1.0 INTRODUCTION

The Town of Richmond hired Green Mountain Engineering, Inc. to perform a Phase I Scoping Study for a water/sewer extension in the West Main Street area of town and new emergency access drive for the Middle and Elementary school.

The proposed project includes numerous stake holders including, but not limited to:

- The Reaps (new owners of the Willis Parcel);
- The Town of Richmond;
- The Chittenden East Supervisory Union (CESU);
- The Richmond Land Trust, which is purchasing a portion of the Reap property for conservation, and;
- Land and business owners along West Main Street

The project is broken into in two major phases, project scope determination and final design/permitting. This initial project scoping phase (Phase 1), culminating in this letter report to be reviewed and approved by the Town, outlines the scope, probable construction and total project costs and a timeline for design and construction of the project. Major components of this phase include the immediate requirements of the Reaps as they develop their lands, determining the service area expansion limits including the type and number of new service connections within the area, and agreement on the location and type of access drive to be constructed. The Final Design and Permitting Phase (Phase 2) work will then be based on the design parameters agreed to in the Scoping Phase.

This initial project scoping phase (Phase 1) consists of the following work:

- a. Coordination and Meetings with Stakeholders
- b. Determine expanded Service Area.
- c. Determine most likely termination points for utilities at the school/Jericho Road area.
- d. Determine the Reap property development requirements and integrate with the water and sewer service expansion to West Main Street.
- e. Determine location and materials of construction for new access road.
- f. Desktop analysis of existing receiving sewer capacities.

- g. Update Water System Hydraulic analysis with proposed service area.
- h. Provide preliminary probable construction costs for agreed project scope.
- i. Develop updated time line for final design and permit phase.

## **2.0 STUDY AREA**

### **2.1 Boundaries**

The study area is the area of West Main Street designated as the Gateway Commercial District as shown on Figure 1 (Location Map) and Figure 2 (Zoning Map) in Appendix A. The project also includes an emergency access drive for the Middle and Elementary schools.

### **2.2 Zoning and Land Use**

The Gateway Commercial District is designated to allow for commercial uses in an area that has importance as a scenic entrance to the Town of Richmond. There are various allowed and conditional uses as specified in the zoning regulations. Currently water supply and wastewater disposal in the area are both served by on-site individual systems. The zoning regulations allow for 1/3 acres lots for properties served by municipal water and sewer and 1 acre lots for those not served by municipal water and sewer.

### **2.3 Property Owner Survey**

The Town of Richmond sent out a survey/questionnaire to all property owners within the Gateway Commercial District. At the time of this Draft Report, six (6) surveys were returned. All six surveys returned were in favor of the water and wastewater utility extension. See Appendix B for a copy of the surveys.

### **3.0 NEW SCHOOL EMERGENCY ACCESS ROAD**

#### **3.1 General**

The access road is intended to be an emergency egress only road which would be normally gated off. The proposed road is delineated Option D in the Site Plan- Alternative Access Study by Krebs and Lansing. The access road will go through the Reap development then along the east side of the development near the Interstate 89 property line and parallel the interstate, cross the proposed Vermont Land Trust property near Interstate 89, and enter the school property in the back parking lot. The road will be gated after the Reap development and at the school parking lot. The location of the road is shown on Figure No. 3 in Appendix A. The Reaps will be responsible for building the road from Route 2 through their proposed development to a point approximately at the bend in the road near the back lot with Interstate 89. The school will be responsible from this point to the middle school.

The road will be a gravel road with a roadway width of 16 feet (16' travel way with 2' shoulders). There will be a significant amount of fill required to construct the road. For the purpose of this study, a maximum grade of 12% was assumed. Increasing this value would result in less fill required.

### **4.0 EXISTING WATER SYSTEM ANALYSIS**

#### **4.1 General**

An evaluation of the capacity of the Town of Richmond water system to supply water to the proposed study area was conducted. The following information is evaluated in this section:

- Water System Uncommitted Reserve Capacity
- Existing and Proposed Water System Demands
- Water System Hydraulic Analysis

An 8" PVC water line extension from the existing 8" water line at the middle school was assumed. Eight inch is the minimum size line in order to provide a hydrant with fire flow per the State of Vermont, Water Supply Rules.

## 4.2 Water System Uncommitted Reserve Capacity

The uncommitted reserve capacity of the water system is calculated by present average daily flow and the committed allocations for water connections from the water system average daily flow capacity. The water system average daily flow capacity is 130,000 gallons per day (gpd) based on the soon to be upgraded storage tank capacity. The present average daily flow is 80,000 gpd.

Table 1 summarizes the committed allocations for water services which have not yet been connected. This information was obtained from the Town officials.

**Table 1  
Unconnected Committed  
Water Allocated Flows**

Applicant	Unconnected Committed Water Allocated Flows (gpd)
Creamery (32 accts x 450 gpd)	14,400
Four Residences (4 accts x 450 gpd)	1,800
<b>Total Unconnected Committed Water Allocations</b>	<b>16,200</b>

Table 2 summarizes the water system uncommitted reserve capacity allocation.

**Table 2  
Water System Uncommitted  
Reserve Capacity Allocation**

Description	Flow (gpd)
Design Average Daily Flow	130,000
- Present Average Daily Flow	80,000
- Unconnected Committed Water Allocated Flows	16,200
<b>= Water System Uncommitted Reserve Capacity</b>	<b>33,800</b>
Percent of Permitted Flow	26%

### 4.3 Existing and Future Water System Demands

Water flow projections were developed using the State of Vermont, Water Supply Rule, Chapter 21. Water flow demands for residential and apartment units were developed based on the number of bedrooms. An average daily demand flow of 150 gpd per bedroom is required by the rules. For this study, it is assumed that each residence averages three (3) bedrooms. Therefore, the average daily demand flow for each residential unit is 450 gpd. Water demand flow projections for businesses and other non-residential properties were developed using Table A2-1 of the Rules. Table 3 provides a summary of the water system average demands for the existing properties.

**Table 3  
Existing Water System Flow Demand**

User Type	Quantity	Flow Basis	Average Daily Flow (gpd)
Residences	8	450 gpd/unit	3,600
Chiropractor Office	3	35 gpd/staff	105
	16	10 gpd/patient	160
Crate Escape	2	15 gpd/staff	30
Office Building	12	15 gpd/staff	180
Day Care	30	15 gpd/staff & child	450
Reap Office Building	42	15 gpd/staff	630
<b>Total Existing Flow Demand</b>	-	-	<b>5,155</b>

Future water system demands were estimated based on existing demand together with projected development and build out. Table 4 provides a summary of the future estimated water system average demands.

**Table 4  
Future Water System Flow Demand**

<b>User Type</b>	<b>Quantity</b>	<b>Flow Basis</b>	<b>Average Daily Flow (gpd)</b>
Existing Demand			5,155
Future Demands Residential	12	450 gpd/unit	5,400
Reap Development New Office Building	51	15 gpd/staff	765
Preschool/Day Care	30	15 gpd/staff & child	450
Barn Conversion	1	Set Aside	800
<b>Total Future Demand</b>			<b>12,570</b>

The existing flow demand of 5,155 gpd and future flow demand of 12,570 gpd are less than the water system uncommitted reserve capacity of 33,800 gpd.

#### **4.4 Water System Hydraulic Analysis**

A hydraulic analysis of the Town of Richmond's water system was conducted using HydroCad® to evaluate the adequacy of the system including a water line extension for West Main Street. For the purpose of this report, a 3,100 l.f. extension with hydrants located at the Reap parcel and at the north end of the Gateway District was assumed. The analysis was performed to determine the system pressures for both average use and for different fire flow situations. Analysis was performed for the existing water system using the existing reservoir and also for when the new reservoir is in service.

Table 5 provides a summary of the water system hydraulic analysis. The State of Vermont, Water Supply Rules require a minimum pressure of 20 psi under all conditions of flow. The Town has a maximum pressure requirement of 100 psi before installing a pressure reducing valve. As shown in Table 5, the new 8" water line meets all of the pressure requirements except the pressure at the end hydrant under 1,500 gpm fire flow using the existing reservoir. Therefore, the new reservoir would need to be in operation before installing a hydrant at the end of the Gateway District.

**Table 5  
Summary of Water System Hydraulic Analysis**

<b>Condition</b>	<b>Pressure At Reap Hydrant (psi)</b>	<b>Pressure At End Hydrant (psi)</b>
<b>Existing Reservoir</b>		
50 yr. Max Day Demand	74.0	72.2
500 gpm Fire Flow @ Reap	68.9	67.2
500 gpm Fire Flow @ End	68.9	64.5
1,500 gpm Fire Flow @ Reap	35.8	34.1
1,500 gpm Fire Flow @ End	35.8	13.5
<b>New Reservoir</b>		
50 yr. Max Day Demand	92.1	90.4
500 gpm Fire Flow @ Reap	87.0	85.3
500 gpm Fire Flow @ End	87.0	82.0
1,500 gpm Fire Flow @ Reap	54.1	52.1
1,500 gpm Fire Flow @ End	54.1	31.7

#### **4.5 Water System Extension Alternative**

Because the minimum size waterline as required by the State is 8" in order to provide fire protection and an 8" pipe provides adequate flows for the future water demand and fire protection, the water extension alternative includes an 8" PVC waterline extending from the school to the end of the Gateway District. There would be two fire hydrants. One near the Reap property and one at the end of the Gateway District.

### **5.0 EXISTING SEWER SYSTEM ANALYSIS**

#### **5.1 WWTF Uncommitted Reserve Capacity**

The uncommitted reserve capacity of the Wastewater Treatment Facility (WWTF) is calculated by subtracting both the 12-month annual average daily flow and the committed allocations for sewer connections from the permitted capacity. The WWTF permitted capacity is 222,000 gallons per day (gpd). The 12-month annual average daily flow from August 2013 through July 2014 is 70,167 gpd as summarized in Table 6. This is calculated based on the monthly average flows as reported on the WWTF WR-43 monthly reports.

**Table 6**  
**WWTF 12-Month Annual Average Daily Flow**

<b>Month/Year</b>	<b>Average Daily Flow (gpd)</b>
August 2013	65,000
September 2013	67,000
October 2013	61,000
November 2013	59,000
December 2013	61,000
January 2014	72,000
February 2014	61,000
March 2014	71,000
April 2014	97,000
May 2014	77,000
June 2014	78,000
July 2014	73,000
<b>12-Month Average</b>	<b>70,167</b>

Table 7 summarizes the committed allocations for sewer connections which have not yet been connected. This information was obtained from the Town officials.

**Table 7**  
**Unconnected Committed Sewer Allocated Flows**

<b>Applicant</b>	<b>Unconnected Committed Sewer Allocated Flows (gpd)</b>
Creamery (32 accts x 210 gpd)	6,720
Four Residences (4 accts x 210 gpd)	840
<b>Total Unconnected Committed Sewer Allocations</b>	<b>7,560</b>

Table 8 summarizes the WWTF uncommitted sewer reserve capacity allocation.

**Table 8**

**WWTF 12-Month Annual Average Daily Flow Unconnected Committed  
Sewer Allocated Flows**

<b>Description</b>	<b>Flow (gpd)</b>
WWTF Permitted Capacity	222,000
- 12-Month Annual Average Daily Flow	70,167
- Unconnected Committed Sewer Allocated Flows	7,560
<b>= WWTF Uncommitted Reserve Capacity</b>	<b>144,273</b>
Percent of Permitted Flow	65%

**5.2 Existing and Future Wastewater Flows**

Wastewater flow projections were developed using the State of Vermont, Environmental Protection Rules (EPR), Chapter 1, dated September 29, 2007. Water flow demands for residential and apartment units were developed based on the number of living units. A living unit is defined as a single family home, apartment, or mobile home. A design flow of 210 gpd per living unit is used for wastewater without regard to the number of bedrooms. Wastewater flow projections for businesses and other non-residential properties were developed using Table 2 of the Rules. Sewerline infiltration was estimated for gravity sewerlines using 300 gal/in. pipe/dia/mile/day, as required by the rules. Infiltration is not accounted for in pressure pipes (forcemains and grinder low pressure sewers). Table 9 provides a summary of the water system average demands for the existing properties.

**Table 9  
Existing Wastewater Flow**

<b>User Type</b>	<b>Quantity</b>	<b>Flow Basis</b>	<b>Average Daily Flow (gpd)</b>
Residences	8	210 gpd/unit	1,680
Chiropractor Office	3	35 gpd/staff	105
	16	10 gpd/patient	160
Doggie Day Care	2	15 gpd/staff	30
Office Building	12	15 gpd/staff	180
Day Care	30	15 gpd/staff & child	450
Reap Office Building	42	15 gpd/staff	630
Infiltration	3	300 gpd/in-mi	900
<b>Total Existing Wastewater Flow</b>	-	-	4,135

Future wastewater flows were estimated based on existing flows along with projected development and build out. Table 10 provides a summary of the future estimated wastewater system average demands.

**Table 10  
Future Water System Flow Demand**

<b>User Type</b>	<b>Quantity</b>	<b>Flow Basis</b>	<b>Average Daily Flow (gpd)</b>
Existing Flow			4,135
Future Demands			
Residential	19	210 gpd/unit	3,990
Reap Development			
New Office Building	51	15 gpd/staff	765
Preschool/Day Care	30	15 gpd/staff & child	450
Barn Conversion	1	Set Aside	800
Infiltration	5	300 gpd/in-mi	1,500
<b>Total Future Demand</b>			11,640

The existing flow demand of 4,135 gpd and future flow demand of 11,640 gpd are less than the water system uncommitted reserve capacity of 144,273 gpd.

### **5.3 Middle School Wastewater Pump Station and Forcemain**

Two alternatives were considered for wastewater collection and transmission to the existing gravity sewer system. One alternative evaluated was to pump the wastewater from West Main Street to the middle school wastewater pump station located in the northwestern corner of the school, which in turn pumps wastewater through an existing forcemain to the “B” line gravity sewer on Jericho Road. The middle school wastewater pump station consists of a 4 ft diameter wet well, and a steel dry well consisting of two (2) 500 gpm vertical centrifugal pumps and valves. The forcemain is a 4” cast iron and runs along the roadway on the northern side of the school. Although the pumps are adequate for the school and wastewater flow from the West Main Street sewer extension, the school’s 4 ft diameter wet well is undersized for its current use. There is not enough storage capacity to meet the required 4 hours of storage in the event of a power outage. The wet well would need to be expanded to accommodate operating capacity and storage. This upgrade would result in increased project costs, therefore, it was determined that connecting to the school’s pump station is not viable.

A second alternative was a connection to the school’s existing forcemain utilizing a valve structure and a solids handling pump station and forcemain from below, on West Main Street. This would save a significant amount of forcemain pipe in order to run to the Jericho Road gravity sewer. It was determined that utilization of grinder pumps from this location was not feasible because of the size of the pumps needed to maintain a minimum of 3 feet per second velocity in the forcemain.

### **5.4 Existing Gravity Sewer System Capacity**

The capacity of the Town of Richmond’s gravity sewer from the manhole on Jericho Road along the “B” line sewer to the Wastewater Treatment Facility was also evaluated for this project. The gravity sewer was evaluated manhole to manhole using the as-built drawings prepared by Webster-Martin, Inc. dated 1971. A program named FlowMaster® was used to evaluate the full flow capacity of the gravity sewers. The pipe diameter, pipe type, and slope was entered into the program for each segment of pipe. Based on the inputs, the program calculated the full flow capacity in millions of gallons per day. The program uses several factors to calculate full flow capacity including roughness of the pipe, geometric

configuration (cross-section and length), and slope. The Continuity Equation and the Manning Equation for steady-state flow are used by the program to calculate the flow in a sewer pipe:

Continuity Equation:  $Q = V \times A$

Where:

Q = peak flow, cubic feet per second (cfs).

V = velocity, feet per second (fps).

A = cross-sectional area of pipe, square feet (sf).

Manning Equation:  $V = (1.486 \times R^{2/3} \times S^{1/2})/n$

Where:

V = velocity, fps.

n = Manning's coefficient of friction.

R = hydraulic radius (area divided by wetted perimeter), feet.

S = slope of pipe, feet per foot.

Table 11 provides a summary of the full flow capacity of the existing sewerline. As shown on Table 11, the gravity sewerline has significant capacity available above the treatment plant capacity, with the exception of the segment between manholes 12 – 13 on Depot Street. The as-built drawing indicated that this pipe segment was laid level. A field verification should be made of the actual pipe slope. Other than the segment between manholes 12 -13, the gravity sewer has capacity to handle the sewer extension.

**Table 11**

**Existing Gravity Sewer System Capacity**

<b>Pipeline Segment</b>	<b>Diameter (in.)</b>	<b>Type</b>	<b>Slope (%)</b>	<b>Segment Full Flow Capacity (MGD)</b>
32A - 32	8	AC	0.0040	440
32 - 31	8	AC	0.0040	440
31 - 30	8	AC	0.0563	1,653
30 - 29	8	AC	0.0043	457
29 - 28	8	AC	0.0040	440
28 - 27	8	AC	0.0040	440
27 - 26	8	AC	0.0103	707
26 - 25	8	AC	0.0040	440
25 - 24	8	AC	0.0152	859
24 - 23	8	AC	0.1551	2,744
23 - 22	8	AC	0.0040	440
22 - 21	8	AC	0.2308	3,347
21 - 20	8	AC	0.0580	1,678
20 - 19A	8	AC	0.0040	440
19A - 19	8	AC	0.0040	440
19 - 18	8	AC	0.0040	440
18 - 17	8	AC	0.0040	440
17 - 16	8	AC	0.0040	440
16 - 15	8	AC	0.0124	776
15 - 13	8	AC	0.0277	1,159
13 - 12	10	AC	0.0000	0.00
12 - 11	10	AC	0.0028	668
11 - 10	10	AC	0.0280	2,114
10 - 9	10	AC	0.0097	1,244
9 - 8	10	AC	0.0239	1,953
8 - 7	10	AC	0.0072	1,071
7 - 2	10	AC	0.0022	592
2 - 1	12	AC	0.0022	963

MGD= Million Gallons per Day

**5.5 Sewerline Extension Alternatives**

Two (2) sewerline extension alternatives were evaluated including:

- **Alternative No. 1: 8" gravity sewer along Route 2 with a municipal pump station near the reap property.** The pump station would then pump the sewage through a 4" forcemain and connect into the middle School forcemain which connects to the gravity sewer on Jericho Road.

- **Alternative No. 2: A 3” grinder pump low pressure sewer along route 2.** Each home owner would be responsible for providing a grinder pump station and connection to the low pressure sewer main. The property owners would also be responsible for their own electrical costs. After evaluating the forcemain connection, it was determined that the grinder pump forcemain should not be connected to the school’s 4” forcemain. A 3” forcemain is typically the largest diameter for grinder pump system without needing significant horsepower pumps in order to maintain scouring velocities. Three alternatives for connection were evaluated including running a parallel forcemain to Jericho Road, upgrading the school’s pump station with an expanded wet well and emergency storage, and upgrading the schools pump station with an expanded wet well and an emergency generator. The costs for each alternative is provided in Table 12.

**Table 12  
Grinder Pump Connection Alternatives  
Opinion of Probable Construction Cost**

<b>Alternative</b>	<b>Construction Cost ENR 9750 2014</b>
Connection to Expanded School Wet Well & Emergency Storage	<b>\$66,000</b>
Connection to Expanded School Wet Well & Emergency Generator	<b>\$80,000</b>
Parallel 3” Low Pressure Sewer	<b>\$66,000</b>

Because the costs of the parallel low pressure sewer and expanded school wet well and emergency storage were the lowest, either of these alternatives could be chosen. Expanding the wet well and emergency storage at the school will also help alleviate the undersized wet well problem at the middle school. Connecting to the middle school pump station would increase O&M costs for the Town especially electrical costs. The parallel sewer would decrease electrical costs for the users and may prevent odors at the school.

## 6.0 OPINION OF PROBABLE COSTS

### 6.1 Opinion of Probable Construction Cost

Opinions of probable construction costs were developed for the access road, water extension and wastewater alternatives. Prior to development of the construction cost estimates, quantity take-offs were completed to establish unit quantities for projected project unit price bid items. Construction costs were generated using unit price bids on recent construction projects in the area. The construction costs are based on the assumption that work will be performed by an independent general contractor. The construction costs also include a 10% contingency.

Detailed opinion of probable construction costs for each project item are provided in Appendix C. Because it is not known when each of these projects will occur, current and future projected construction cost estimates were developed using the Engineering News Record (ENR) Construction Cost Index (CCI). Current 2014 construction cost estimates (ENR 9750) were developed by adjusting the unit price items from similar jobs to today's dollars using a ratio of ENR values. Estimates for future ENR values were developed by graphing the last ten (10) years of ENR values and projecting a best fit line into the future and estimating the future ENR values. Construction cost estimates were then projected out for the next three (3) years to 2015, 2016 and 2017.

Table 13 provides a summary of the opinion of probable construction costs for the years 2014 (ENR 9750), 2015 (ENR 9800), 2016 (ENR 10000), and 2017 (ENR 10200).

**Table 13  
Opinion of Probable Construction Cost**

Project	Opinion of Probable Construction Cost			
	ENR 9750 2014	ENR 9800 2015	ENR 10000 2016	ENR 10200 2017
<b>School Emergency Access Road</b>	<b>\$1,083,000</b>	<b>\$1,089,000</b>	<b>\$1,111,000</b>	<b>\$1,133,000</b>
<b>8" Waterline Extension</b>				
School to West Main Street (Reap Property)	\$191,000	\$192,000	\$195,000	\$199,000
Reap Property to Gateway District Border	<u>\$289,000</u>	<u>\$290,000</u>	<u>\$296,000</u>	<u>\$302,000</u>
<b>Total</b>	<b>\$480,000</b>	<b>\$482,000</b>	<b>\$491,000</b>	<b>\$501,000</b>
<b>Sewer Extension Alternatives</b>				
<b>Gravity Sewer/Pump Station/Forcemain</b>				
Sewer Pump Station & 4" Forcemain Reap Property to School	\$379,000	\$381,000	\$389,000	\$396,000
8" Gravity Sewer- Reap Property to Gateway District Border	<u>\$195,000</u>	<u>\$196,000</u>	<u>\$200,000</u>	<u>\$204,000</u>
<b>Total</b>	<b>\$574,000</b>	<b>\$577,000</b>	<b>\$589,000</b>	<b>\$600,000</b>
<b>3" Low Pressure Sewer Grinder Pump Forcemain</b>				
Reap Property to School	\$170,000	\$171,000	\$174,000	\$178,000
Reap Property to Gateway District Border	<u>\$139,000</u>	<u>\$140,000</u>	<u>\$143,000</u>	<u>\$146,000</u>
<b>Total</b>	<b>\$309,000</b>	<b>\$311,000</b>	<b>\$317,000</b>	<b>\$324,000</b>

## 6.2 Total Project Cost Estimates

Total project costs include construction, final design, and construction engineering costs. Table 14 provides a summary of the total project cost estimates for the 2014 (ENR 9750), 2015 (ENR 9800), 2016 (ENR 10000), and 2017 (ENR 10200). Final design and construction engineering service cost estimates are based on the State of Vermont, Facility Engineering Division, Engineering Services Curve formulas. These costs do not include land acquisition, advertisement or legal fees.

**Table 14  
Total Project Cost Estimate Summary**

Project	Construction Cost Estimate			
	ENR 9750 2014	ENR 9800 2015	ENR 10000 2016	ENR 10200 2017
<b>School Emergency Access Road</b>				
Construction	\$1,083,000	\$1,089,000	\$1,111,000	\$1,133,000
Final Design	\$73,000	\$74,000	\$75,000	\$76,000
Construction Engineering	<u>\$134,000</u>	<u>\$135,000</u>	<u>\$136,000</u>	<u>\$137,000</u>
<b>Total</b>	<b>\$1,290,000</b>	<b>\$1,298,000</b>	<b>\$1,322,000</b>	<b>\$1,346,000</b>
<b>8" Waterline Extension</b>				
<b>School to West Main Street (Reap Property)</b>				
Construction	\$191,000	\$192,000	\$195,000	\$199,000
Final Design	\$15,000	\$15,000	\$16,000	\$16,000
Construction Engineering	<u>\$28,000</u>	<u>\$28,000</u>	<u>\$29,000</u>	<u>\$29,000</u>
<b>Subtotal</b>	<b>\$234,000</b>	<b>\$235,000</b>	<b>\$240,000</b>	<b>\$244,000</b>
<b>Reap Property to Gateway District Border</b>				
Construction	\$289,000	\$290,000	\$296,000	\$302,000
Final Design	\$22,000	\$22,000	\$23,000	\$23,000
Construction Engineering	<u>\$40,000</u>	<u>\$40,000</u>	<u>\$41,000</u>	<u>\$41,000</u>
<b>Subtotal</b>	<b>\$351,000</b>	<b>\$352,000</b>	<b>\$360,000</b>	<b>\$366,000</b>
<b>Total</b>	<b>\$585,000</b>	<b>\$587,000</b>	<b>\$600,000</b>	<b>\$610,000</b>
<b>Sewer Extension Alternatives</b>				
<b>Gravity Sewer/Pump Station/Forcemain</b>				
<b>Sewer Pump Station &amp; 4" Forcemain Reap Property to School</b>				
Construction	\$379,000	\$381,000	\$389,000	\$396,000
Final Design	\$28,000	\$28,000	\$29,000	\$29,000
Construction Engineering	<u>\$51,000</u>	<u>\$52,000</u>	<u>\$52,000</u>	<u>\$53,000</u>
<b>Subtotal</b>	<b>\$458,000</b>	<b>\$461,000</b>	<b>\$470,000</b>	<b>\$478,000</b>
<b>8" Gravity Sewer- Reap Property to Gateway District Border</b>				
Construction	\$195,000	\$196,000	\$200,000	\$204,000
Final Design	\$15,000	\$15,000	\$15,000	\$16,000
Construction Engineering	<u>\$28,000</u>	<u>\$29,000</u>	<u>\$29,000</u>	<u>\$30,000</u>
<b>Subtotal</b>	<b>\$238,000</b>	<b>\$240,000</b>	<b>\$244,000</b>	<b>\$250,000</b>
<b>Total</b>	<b>\$696,000</b>	<b>\$701,000</b>	<b>\$714,000</b>	<b>\$728,000</b>
<b>3" Low Pressure Sewer Grinder Pump Forcemain</b>				
<b>Reap Property to School</b>				
Construction	\$170,000	\$171,000	\$174,000	\$178,000
Final Design	\$14,000	\$14,000	\$14,000	\$14,000
Construction Engineering	<u>\$25,000</u>	<u>\$25,000</u>	<u>\$25,000</u>	<u>\$26,000</u>
<b>Subtotal</b>	<b>\$209,000</b>	<b>\$210,000</b>	<b>\$213,000</b>	<b>\$218,000</b>
<b>Reap Property to Gateway District Border</b>				
Construction	\$139,000	\$140,000	\$143,000	\$146,000
Final Design	\$12,000	\$12,000	\$12,000	\$12,000
Construction Engineering	<u>\$21,000</u>	<u>\$21,000</u>	<u>\$22,000</u>	<u>\$22,000</u>
<b>Subtotal</b>	<b>\$172,000</b>	<b>\$173,000</b>	<b>\$177,000</b>	<b>\$180,000</b>
<b>Total</b>	<b>\$381,000</b>	<b>\$383,000</b>	<b>\$390,000</b>	<b>\$398,000</b>

### 6.3 Revenue Analysis for Existing Use

Table 15 provides an estimate of the expected revenue generated by user fees for existing uses if water service was extended to the Gateway District.

**Table 15**  
**Expected Water Revenue**

<b>User &amp; Rate Type</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Annual Revenue</b>
Residential				
Base Rate	8	Units	\$130.64/Unit	\$1,045
Use Rate	1,314,000	Gallons	\$10.43/1,000 Gal	\$13,705
Commercial & Governmental				
Base Rate	5	Units	\$381.00/Unit	\$1,905
Use Rate	567,577	Gallons	\$9.77/1,000 Gal	\$5,5445
<b>Total</b>				<b>\$22,199</b>

Table 15 provides an estimate of the expected revenue generated by user fees for existing uses if wastewater service was extended to the Gateway District.

**Table 16**  
**Expected Wastewater Revenue**

<b>User &amp; Rate Type</b>	<b>Quantity</b>	<b>Units</b>	<b>Unit Cost</b>	<b>Annual Revenue</b>
Residential				
Base Rate	8	Units	\$174.55/Unit	\$1,397
Use Rate	1,314,000	Gallons	\$14.13/1,000 Gal	\$18,557
Commercial & Governmental				
Base Rate	5	Units	\$519.98/Unit	\$2,600
Use Rate	567,577	Gallons	\$13.00/1,000 Gal	\$7,379
<b>Total</b>				<b>\$29,933</b>

#### 6.4 Alternatives for Debt Financing

The proposed emergency access road for the school would be a school project. Therefore, alternatives for debt financing for the access road is not evaluated in this report. Several alternative for debt financing of the water and sewer extensions are evaluated and include the following:

- Gateway District Property Owner Pay for Entire Cost Up Front by Parcel
- Gateway District Property Owners Pay for Entire Cost as Part of a Municipal Loan
- Entire System Users (including new Users) Pay as Part of a Municipal Loan

Table 17 provides a summary of the cost per parcel if the Gateway District property owners pay for the entire costs up front.

**Table 17**  
**Gateway District per Parcel Up Front Cost**

<b>Project</b>	<b>Total Project Cost</b>	<b>Number of Parcels</b>	<b>Parcel Cost</b>
Water Extension	\$585,000	13	\$45,000
Sewer Extension	\$381,000	13	\$29,307
<b>Total</b>			<b>\$74,307</b>

Table 18 provides a summary of the cost per parcel if the Gateway District property owners pay for the entire costs as part of a 20 year SRF municipal loan.

**Table 18**  
**Gateway District per Parcel Annual Loan Cost**

<b>Project</b>	<b>Total Project Cost</b>	<b>Annual Payment<sup>1</sup></b>	<b>Number of Parcels</b>	<b>Annual Parcel Cost</b>
Water Extension	\$585,000	\$35,779 <sup>1</sup>	13	\$2,752
Sewer Extension	\$381,000	\$22,037 <sup>2</sup>	13	\$1,695
<b>Total</b>				<b>\$4,447</b>

Note:

1. CWSRF Loan, 2% for 20 years (\$61,10/yr/1,000 borrowed)
2. Vermont Bond Bank Loan 4% for 30 years (\$57.84/yr/1,000 borrowed)

Table 19 provides a summary of the cost if the entire system users, including the Gateway District property owners, pay for the debt retirement costs as part of a 20 year SRF municipal loan.

**Table 19**  
**Entire System per User Annual Loan Cost**

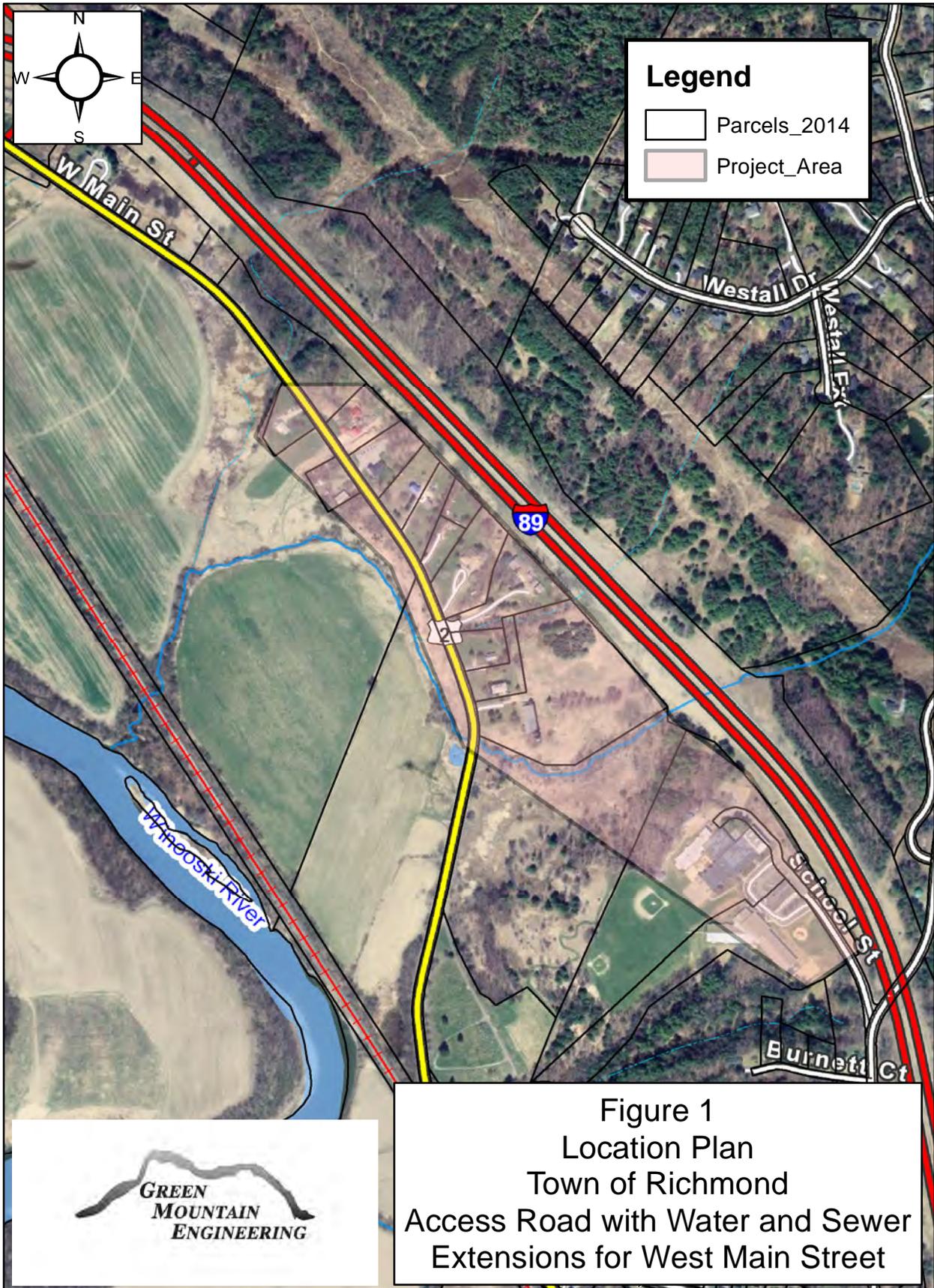
<b>Project</b>	<b>Total Project Cost</b>	<b>Annual Payment<sup>1</sup></b>	<b>Number of Users</b>	<b>Annual User Cost</b>
Water Extension	\$585,000	\$35,779 <sup>1</sup>	486	\$73
Sewer Extension	\$381,000	\$22,037 <sup>2</sup>	486	\$45
<b>Total</b>				<b>\$118</b>

Note:

1. CWSRF Loan, 2% for 20 years (\$61,10/yr/1,000 borrowed)
2. Vermont Bond Bank Loan 4% for 30 years (\$57.84/yr/1,000 borrowed)

## **APPENDIX A**

### **FIGURES**



# Zoning District Map Richmond, Vermont

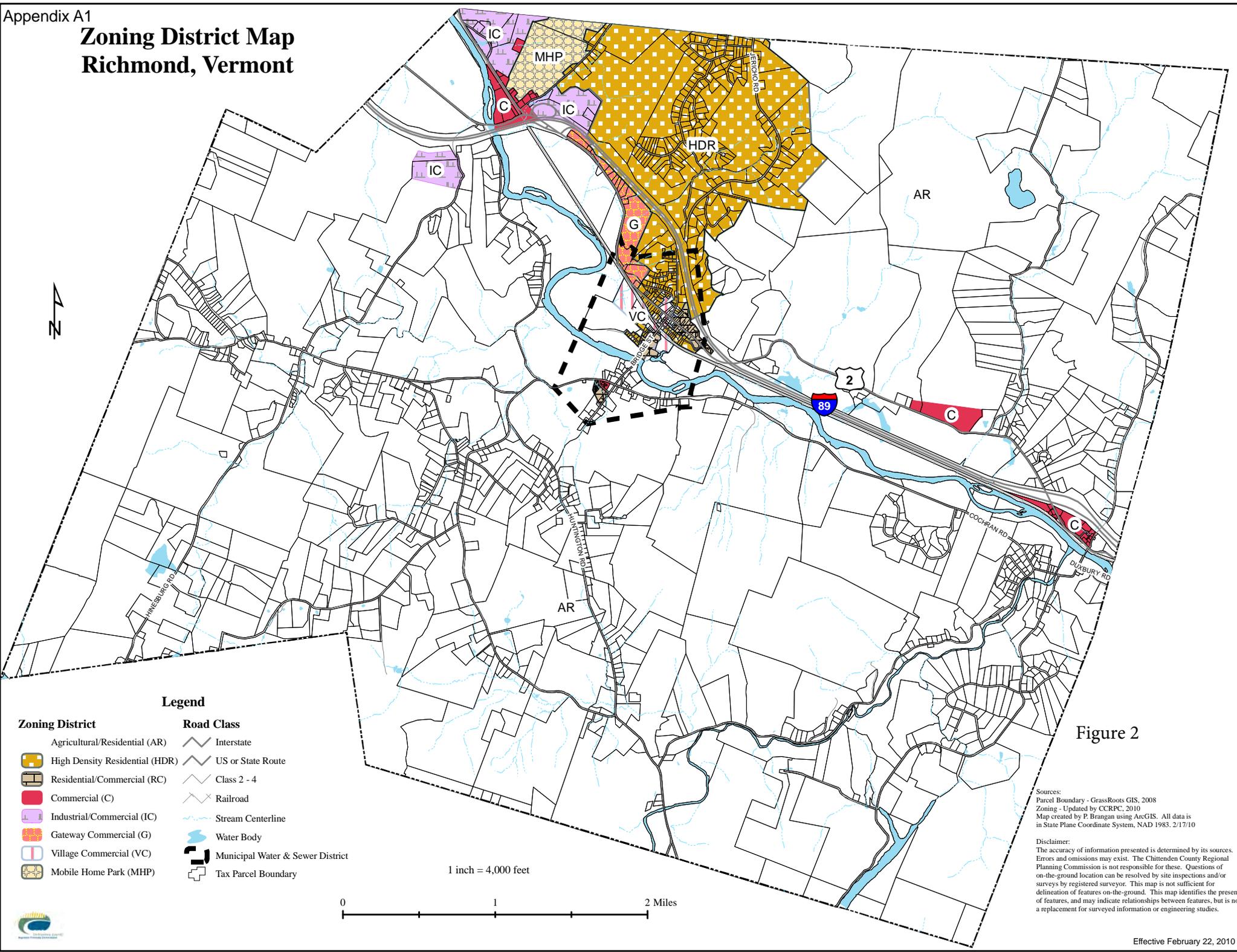


Figure 2

Sources:  
 Parcel Boundary - GrassRoots GIS, 2008  
 Zoning - Updated by CCRPC, 2010  
 Map created by P. Brangan using ArcGIS. All data is in State Plane Coordinate System, NAD 1983. 2/17/10

Disclaimer:  
 The accuracy of information presented is determined by its sources. Errors and omissions may exist. The Chittenden County Regional Planning Commission is not responsible for these. Questions of on-the-ground location can be resolved by site inspections and/or surveys by registered surveyor. This map is not sufficient for delineation of features on-the-ground. This map identifies the presence of features, and may indicate relationships between features, but is not a replacement for surveyed information or engineering studies.



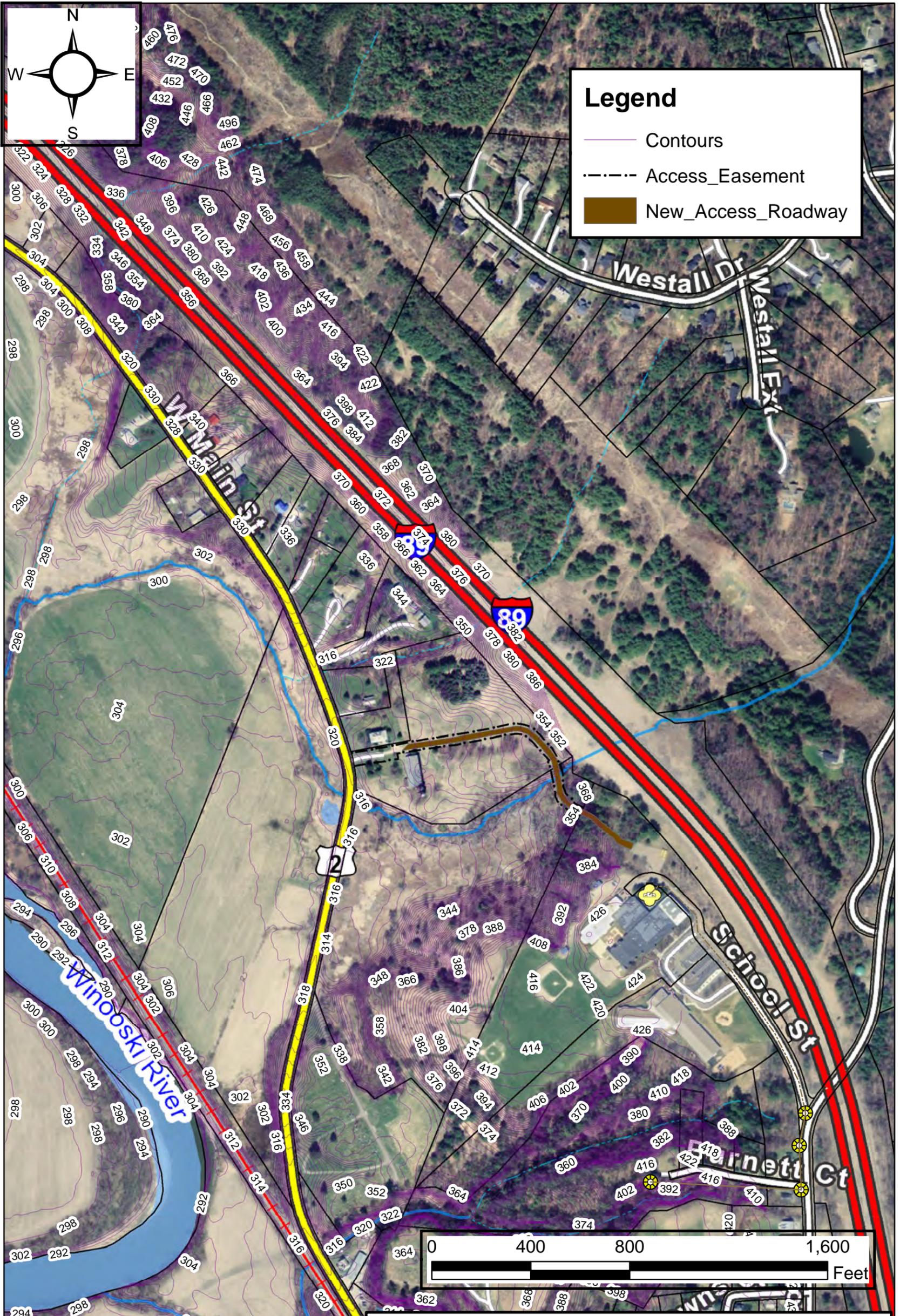
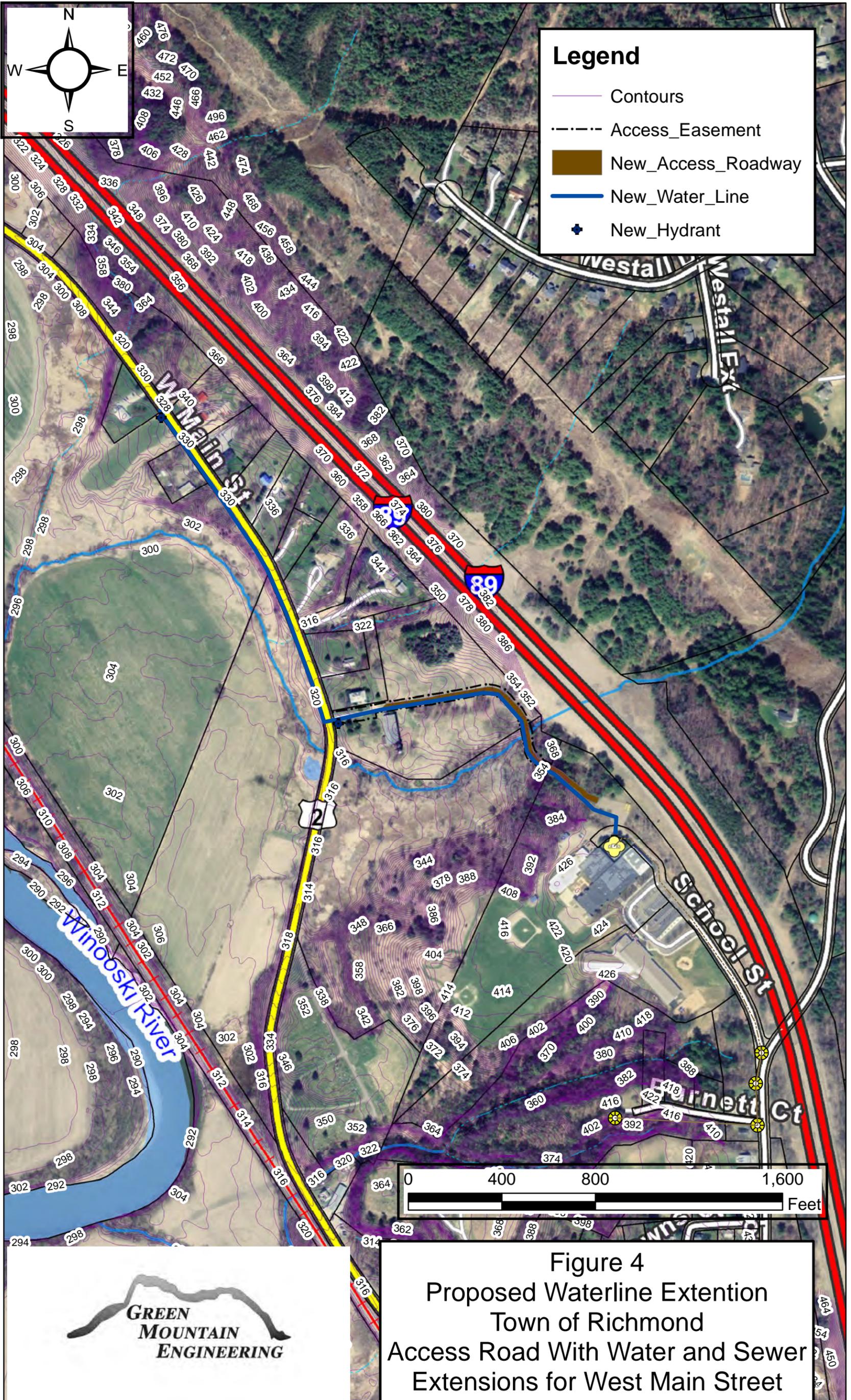
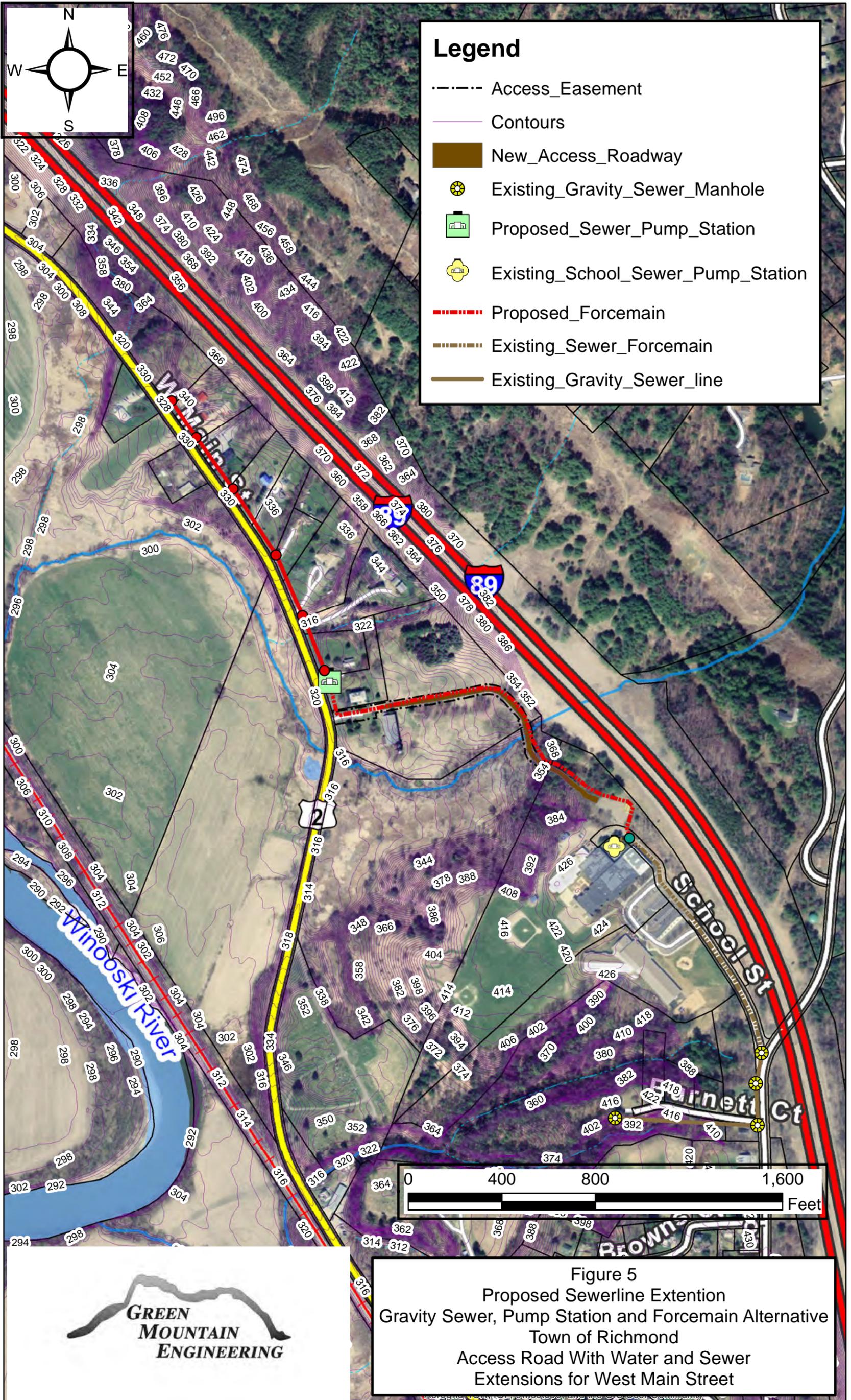


Figure 3  
 Proposed School Emergency Access Road  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street

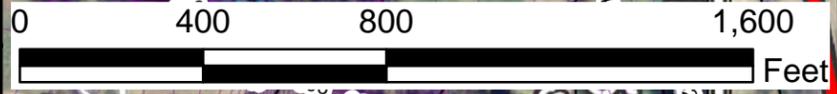
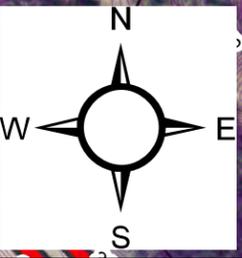




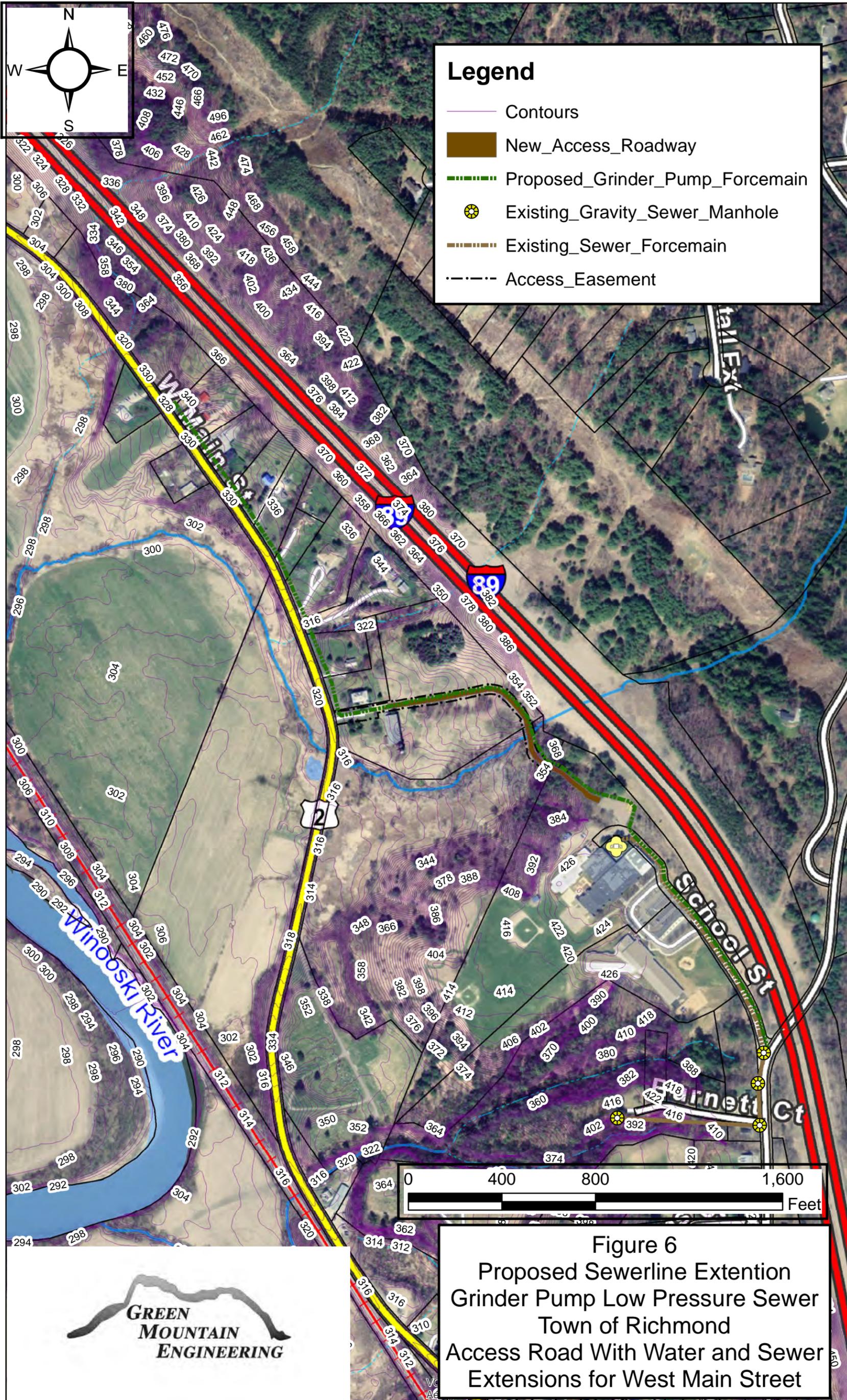


**Legend**

- Access\_Easement
- Contours
- New\_Access\_Roadway
- ⊙ Existing\_Gravity\_Sewer\_Manhole
- 🏠 Proposed\_Sewer\_Pump\_Station
- 🏫 Existing\_School\_Sewer\_Pump\_Station
- ▬ Proposed\_Forcemain
- ▬ Existing\_Sewer\_Forcemain
- ▬ Existing\_Gravity\_Sewer\_line



**Figure 5**  
 Proposed Sewerline Extension  
 Gravity Sewer, Pump Station and Forcemain Alternative  
 Town of Richmond  
 Access Road With Water and Sewer  
 Extensions for West Main Street



## **APPENDIX B**

### **PROPERTY OWNER SURVEYS**

Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Peter Mumford Phone: 434-2239  
Address: PO Box 99x  
Richmond VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units 6)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location 932 W. MAIN ST

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_

No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

*Yes Testin has determined there is not a ~~pa~~ back-up location*

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)     Yes     No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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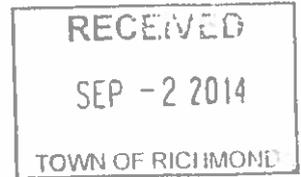
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Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477



Service Area Expansion Survey

Chris Parron @ 1012 W main  
also shares the same intentions.  
His # is 999-8185

1. (OPTIONAL)

Name: Mike Stronach  
Address: 1014 W Main St

Phone: 802-999-8502

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units 2)
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)
- Multi-Family Residential (Indicate number of units 9) 3, 3-unit buildings
- Commercial
- Agricultural
- Other (Specify \_\_\_\_\_)
- Unsure
- None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well
- Shallow Dug Well
- Cistern
- Bottled Water
- Other (explain) \_\_\_\_\_

No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield
- Mound system
- Other (explain)
- No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, Zoning allows for 1 ~~property~~ <sup>building</sup> per 1 acre, with town wastewater it allows for 1 building per 1/3 acre.

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

Would like to add residential housing, but limited with current water/sewer hookups.

Thanks!

Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: Robert + Jay Reap Phone: 434-4993  
Address: 840 West Main St. (mail PO Box 442)  
Richmond, VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal \_\_\_ or Year Round \_\_\_)  
 Multi-Family Residential (Indicate number of units \_\_\_)  
 Commercial  
 Agricultural  
 Other (Specify \_\_\_\_\_)  
 Unsure  
 None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) \_\_\_\_\_  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, greatly so.

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7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)      Yes      No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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Richmond Water Resources Department  
PO Box 285, Richmond, VT 05477

Service Area Expansion Survey

1. (OPTIONAL)

Name: TAMMYSCHRY Phone: 802 373-6546  
Address: 1108 WEST MAIN ST  
RICHMOND, VT 05477

2. Type of User (Check One)

- Single Family Residential (Seasonal  or Year Round   
 Multi-Family Residential (Indicate number of units   
 Commercial  
 Agricultural  
 Other (Specify )

3. What are your future plans for this property? (Check one)

- Single Family Residential (Seasonal  or Year Round   
 Multi-Family Residential (Indicate number of units   
 Commercial  
 Agricultural  
 Other (Specify )  
 Unsure  
 None, it will stay as it is

3. Location

Place an **X** on the attached map to indicate your approximate location. This information will be used to determine where expansion is feasible. (If you do not know where to put the **X**, make sure your Richmond street address is above).

4. What is your present source of water? (Check all that apply)

- Drilled Well  
 Shallow Dug Well  
 Cistern  
 Bottled Water  
 Other (explain) shared well on adjacent property  
 No water used at present (vacant lot for example)

5. What is your present form of wastewater disposal? (Check all that apply)

- Leachfield  
 Mound system  
 Other (explain)  
 No wastewater used at present (vacant lot for example)

6. Does your current wastewater disposal system limit your development potential? If so, how?

Yes, we can not expand our business ~~with~~  
with the current septic system nor is  
there adequate appropriate soil for an  
adequate upgrade

7. Would you be willing to connect to the system by paying the required connection and allocation fees and becoming a paying permanent member of the system?

(Check One)  Yes  No

8. If this questionnaire does not address your present or future needs, please explain, or use this space to ask questions.

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## **APPENDIX C**

### **DETAILED CONSTRUCTION COST ESTIMATES**

## TABLE C-1

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study  
Emergency Access Road

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Clearing and Grubbing	1	Acre	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Common Fill Subgrade	27,900	CY	\$28	\$781,200	\$785,206	\$801,231	\$817,255
90" CMP Culvert	150	EA.	\$350	\$52,500	\$52,769	\$53,846	\$54,923
15" CMP Culvert	40	L.F.	\$80	\$3,200	\$3,216	\$3,282	\$3,348
12" Gravel Subbase	400	C.Y.	\$28	\$11,200	\$11,257	\$11,487	\$11,717
6" Fine Crushed Gravel Surface	200	C.Y.	\$30	\$6,000	\$6,031	\$6,154	\$6,277
Geotextile Fabric	1,200	S.Y.	\$2	\$2,400	\$2,412	\$2,462	\$2,511
Topsoil	800	C.Y.	\$25	\$20,000	\$20,103	\$20,513	\$20,923
Seeding, Fertilizer and Liming	1.5	Acre	\$1,000	\$1,500	\$1,508	\$1,538	\$1,569
Mulching	1.5	Acre	\$1,000	\$1,500	\$1,508	\$1,538	\$1,569
Silt Fence	800	L.F.	\$4	\$2,800	\$2,814	\$2,872	\$2,929
Rock Check Dams	6	EA.	\$175	\$1,050	\$1,055	\$1,077	\$1,098
Site Prep and Miscellaneous (8%)	1	L.S.	\$71,468	\$71,468	\$71,835	\$73,301	\$74,767
Contingency (10%)	1	L.S.	\$96,482	\$96,482	\$96,977	\$98,956	\$100,935
Contractor's Bonds (2%)	1	L.S.	\$21,226	\$21,226	\$21,335	\$21,770	\$22,206
<b>Subtotal</b>				<b>\$1,082,526</b>	<b>\$1,088,077</b>	<b>\$1,110,283</b>	<b>\$1,132,489</b>
<b>USE</b>				<b>\$1,083,000</b>	<b>\$1,089,000</b>	<b>\$1,111,000</b>	<b>\$1,133,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-2 CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study  
Water Line Extension- School to West Main Street

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WATER SYSTEM</b>							
8" Diameter PVC Water Main	1,500	L.F.	\$80	\$120,000	\$120,615	\$123,077	\$125,538
3/4" Diameter HDPE House Service	44	L.F.	\$42	\$1,848	\$1,857	\$1,895	\$1,933
1" Diameter HDPE House Service	21	L.F.	\$50	\$1,050	\$1,055	\$1,077	\$1,098
Existing Waterline Connections	1	EA.	\$2,500	\$2,500	\$2,513	\$2,564	\$2,615
8" Gate Valve	1	EA.	\$1,300	\$1,300	\$1,307	\$1,333	\$1,360
3/4" Curb Stops and Boxes	1	EA.	\$200	\$200	\$201	\$205	\$209
3/4" Corporation Stops	1	EA.	\$300	\$300	\$302	\$308	\$314
1" Curb Stops and Boxes	2	EA.	\$350	\$700	\$704	\$718	\$732
1" Corporation Stops	2	EA.	\$350	\$700	\$704	\$718	\$732
Fire Hydrant Branch Connection	1	EA.	\$4,250	\$4,250	\$4,272	\$4,359	\$4,446
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	10	S.Y.	\$60	\$600	\$603	\$615	\$628
Traffic Control	0	L.S.	\$0	\$0	\$0	\$0	\$0
Site Prep and Miscellaneous (8%)	1	L.S.	\$12,552	\$12,552	\$12,616	\$12,874	\$13,131
Contingency (10%)	1	L.S.	\$16,945	\$16,945	\$17,032	\$17,379	\$17,727
Contractor's Bonds (2%)	1	L.S.	\$3,728	\$3,728	\$3,747	\$3,823	\$3,900
<b>Subtotal</b>				<b>\$190,123</b>	<b>\$191,098</b>	<b>\$194,998</b>	<b>\$198,898</b>
<b>USE</b>				<b>\$191,000</b>	<b>\$192,000</b>	<b>\$195,000</b>	<b>\$199,000</b>

**Notes:**

- 1 The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR® Engineering News Record Construction Cost Index.

**TABLE C-3****OPINION OF PROBABLE  
CONSTRUCTION COST**

Town of Richmond

West Main Street- Access Road with Water &amp; Sewer Extensions

Phase I Scoping Study

Water Line Extension- Reap Property to Gateway District Border

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost
<b>WATER SYSTEM</b>							
8" Diameter PVC Water Main	1,600	L.F.	\$80	\$128,000	\$128,656	\$131,282	\$133,908
20" Jack & Bore Steel Sleeve	50	L.F.	\$800	\$40,000	\$40,205	\$41,026	\$41,846
3/4" Diameter HDPE House Service Boring	308	L.F.	\$42	\$12,936	\$13,002	\$13,268	\$13,533
1" Diameter HDPE House Service Boring	220	L.F.	\$50	\$11,000	\$11,056	\$11,282	\$11,508
Existing Waterline Connections	0	EA.	\$2,500	\$0	\$0	\$0	\$0
8" Gate Valve	1	EA.	\$1,300	\$1,300	\$1,307	\$1,333	\$1,360
3/4" Curb Stops and Boxes	7	EA.	\$200	\$1,400	\$1,407	\$1,436	\$1,465
3/4" Corporation Stops	7	EA.	\$300	\$2,100	\$2,111	\$2,154	\$2,197
1" Curb Stops and Boxes	5	EA.	\$350	\$1,750	\$1,759	\$1,795	\$1,831
1" Corporation Stops	5	EA.	\$350	\$1,750	\$1,759	\$1,795	\$1,831
Fire Hydrant Branch Connection	1	EA.	\$4,250	\$4,250	\$4,272	\$4,359	\$4,446
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0	\$0
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Site Prep and Miscellaneous (8%)	1	L.S.	\$19,035	\$19,035	\$19,132	\$19,523	\$19,913
Contingency (10%)	1	L.S.	\$25,697	\$25,697	\$25,829	\$26,356	\$26,883
Contractor's Bonds (2%)	1	L.S.	\$5,653	\$5,653	\$5,682	\$5,798	\$5,914
			<b>Subtotal</b>	<b>\$288,321</b>	<b>\$289,800</b>	<b>\$295,714</b>	<b>\$301,628</b>
			<b>USE</b>	<b>\$289,000</b>	<b>\$290,000</b>	<b>\$296,000</b>	<b>\$302,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-4

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study  
Sewer Pump Station & 4" Forcemain- School to Reap Property

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
4" Diameter HDPE Forcemain	1,500	L.F.	\$50	\$75,000	\$75,385	\$76,923	\$78,462
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205	\$8,369
5' Diameter Valve Manhole	1	EA.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Rigid Trench Insulation	200	S.F.	\$2	\$400	\$402	\$410	\$418
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	10	S.Y.	\$60	\$600	\$603	\$615	\$628
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Pump Station	1	L.S.	\$200,000	\$200,000	\$201,026	\$205,128	\$209,231
Site Prep and Miscellaneous (8%)	1	L.S.	\$10,164	\$10,164	\$10,216	\$10,425	\$10,633
Contingency (10%)	1	L.S.	\$33,721	\$33,721	\$33,894	\$34,586	\$35,278
Contractor's Bonds (2%)	1	L.S.	\$7,419	\$7,419	\$7,457	\$7,609	\$7,761
<b>Subtotal</b>				<b>\$378,354</b>	<b>\$380,294</b>	<b>\$388,055</b>	<b>\$395,817</b>
<b>USE</b>				<b>\$379,000</b>	<b>\$381,000</b>	<b>\$389,000</b>	<b>\$396,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-5

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study  
8" Gravity Sewer- Reap Property to Gateway District Boarder

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
8" PVC Gravity Sewer	1,600	L.F.	\$60	\$96,000	\$96,492	\$98,462	\$100,431
4' Diameter Manholes	6	EA.	\$3,500	\$21,000	\$21,108	\$21,538	\$21,969
8" x 4" Service Wye	7	EA.	\$100	\$700	\$704	\$718	\$732
8" x 6" Sewer Service	7	EA.	\$150	\$1,050	\$1,055	\$1,077	\$1,098
4" Sewer Service	70	L.F.	\$50	\$3,500	\$3,518	\$3,590	\$3,662
6" Sewer Service	70	L.F.	\$53	\$3,710	\$3,729	\$3,805	\$3,881
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,231	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$513	\$523
Erosion Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Dust Control	2	Ton	\$500	\$1,000	\$1,005	\$1,026	\$1,046
Permanent Trench Pavement Repair	20	S.Y.	\$60	\$1,200	\$1,206	\$1,231	\$1,255
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256	\$10,462
Site Prep and Miscellaneous (8%)	1	L.S.	\$12,817	\$12,817	\$12,883	\$13,145	\$13,408
Contingency (10%)	1	L.S.	\$17,303	\$17,303	\$17,391	\$17,746	\$18,101
Contractor's Bonds (2%)	1	L.S.	\$3,807	\$3,807	\$3,826	\$3,904	\$3,982
<b>Subtotal</b>				<b>\$194,136</b>	<b>\$195,132</b>	<b>\$199,114</b>	<b>\$203,096</b>
<b>USE</b>				<b>\$195,000</b>	<b>\$196,000</b>	<b>\$200,000</b>	<b>\$204,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.

2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-6

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study

3" Low Pressure Grinder Pump Forcemain- School to Reap Property

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	2,600	L.F.	\$42	\$109,200	\$109,760	\$112,000.00	\$114,240
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369
1 1/2" LPS Service	63	L.F.	\$35	\$2,205	\$2,216	\$2,261.54	\$2,307
1 1/2" Curb Stops and Boxes	3	EA.	\$250	\$750	\$754	\$769.23	\$785
Core Existing Manhole	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564.10	\$2,615
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,230.77	\$1,255
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410.26	\$6,538
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641.03	\$1,674
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$512.82	\$523
Erosion Control	1	L.S.	\$2,500	\$2,500	\$2,513	\$2,564.10	\$2,615
Dust Control	1	Ton	\$500	\$250	\$251	\$256.41	\$262
Permanent Trench Pavement Repair	20	S.Y.	\$60	\$1,200	\$1,206	\$1,230.77	\$1,255
Traffic Control	1	L.S.	\$2,000	\$2,000	\$2,010	\$2,051.28	\$2,092
Site Prep and Miscellaneous (8%)	1	L.S.	\$11,172	\$11,172	\$11,230	\$11,458.87	\$11,688
Contingency (10%)	1	L.S.	\$15,083	\$15,083	\$15,160	\$15,469.48	\$15,779
Contractor's Bonds (2%)	1	L.S.	\$3,318	\$3,318	\$3,335	\$3,403.28	\$3,471
<b>Subtotal</b>				<b>\$169,228</b>	<b>\$170,096</b>	<b>\$173,568</b>	<b>\$177,039</b>
<b>USE</b>				<b>\$170,000</b>	<b>\$171,000</b>	<b>\$174,000</b>	<b>\$178,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.

2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-7

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study

3" Low Pressure Grinder Pump Force-main- Reap Property to Gateway District Boundary

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	1,600	L.F.	\$42	\$67,200	\$67,545	\$68,923.08	\$70,301.54
5' Diameter Air Release Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369.23
5' Diameter Cleanout Manhole	1	EA.	\$8,000	\$8,000	\$8,041	\$8,205.13	\$8,369.23
1 1/2" LPS Service	110	L.F.	\$35	\$3,850	\$3,870	\$3,948.72	\$4,027.69
1 1/2" Curb Stops and Boxes	11	EA.	\$250	\$2,750	\$2,764	\$2,820.51	\$2,876.92
Class "B" Concrete	10	C.Y.	\$250	\$2,500	\$2,513	\$2,564.10	\$2,615.38
Miscellaneous Extra Excavation	50	C.Y.	\$24	\$1,200	\$1,206	\$1,230.77	\$1,255.38
Below-Grade Rock Removal (pipelines)	50	C.Y.	\$125	\$6,250	\$6,282	\$6,410.26	\$6,538.46
Replacement of Unsuitable Material	50	C.Y.	\$32	\$1,600	\$1,608	\$1,641.03	\$1,673.85
Boulder Excavation	10	C.Y.	\$50	\$500	\$503	\$512.82	\$523.08
Erosion Control	1	L.S.	\$2,500	\$2,500	\$2,513	\$2,564.10	\$2,615.38
Dust Control	1	Ton	\$500	\$250	\$251	\$256.41	\$261.54
Permanent Trench Pavement Repair	0	S.Y.	\$60	\$0	\$0	\$0.00	\$0.00
Traffic Control	1	L.S.	\$10,000	\$10,000	\$10,051	\$10,256.41	\$10,461.54
Site Prep and Miscellaneous (8%)	1	L.S.	\$9,168	\$9,168	\$9,215	\$9,403.08	\$9,591.14
Contingency (10%)	1	L.S.	\$12,377	\$12,377	\$12,440	\$12,694.15	\$12,948.04
Contractor's Bonds (2%)	1	L.S.	\$2,723	\$2,723	\$2,737	\$2,792.71	\$2,848.57
<b>Subtotal</b>				<b>\$138,868</b>	<b>\$139,580</b>	<b>\$142,428</b>	<b>\$145,277</b>
<b>USE</b>				<b>\$139,000</b>	<b>\$140,000</b>	<b>\$143,000</b>	<b>\$146,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.

2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-8

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study

Upgraded Middle School Pump Station (Wet Well and Emergency Storage)

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Demo Existing 4' Diameter Wetwell	1	LS	\$4,000	\$4,000	\$4,021	\$4,103	\$4,185
New 8' Diameter Wet Well	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New 6,000 Gallon Emergency Storage Tank	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New Electrical Service	1	L.S.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
8" PVC Sewerline	40	L.F.	\$80	\$3,200	\$3,216	\$3,282	\$3,348
Topsoil	30	C.Y.	\$25	\$750	\$754	\$769	\$785
Seeding, Fertilizer and Liming	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Mulching	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Silt Fence	100	L.F.	\$4	\$350	\$352	\$359	\$366
Site Prep and Miscellaneous (8%)	1	L.S.	\$4,344	\$4,344	\$4,366	\$4,455	\$4,544
Contingency (10%)	1	L.S.	\$5,864	\$5,864	\$5,894	\$6,015	\$6,135
Contractor's Bonds (2%)	1	L.S.	\$1,290	\$1,290	\$1,297	\$1,323	\$1,350
<b>Subtotal</b>				<b>\$65,799</b>	<b>\$66,136</b>	<b>\$67,486</b>	<b>\$68,835</b>
<b>USE</b>				<b>\$66,000</b>	<b>\$67,000</b>	<b>\$68,000</b>	<b>\$69,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR = Engineering News Record Construction Cost Index.

## TABLE C-9

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond

West Main Street- Access Road with Water & Sewer Extensions

Phase I Scoping Study

Upgraded Middle School Pump Station (Wet Well and Emergency Storage)

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014	2014	2015	2016	2017
			Unit Price	Total Cost	Total Cost	Total Cost	Total Cost
<b>EMERGENCY ACCESS ROAD</b>							
Demo Existing 4' Diameter Wetwell	1	LS	\$4,000	\$4,000	\$4,021	\$4,103	\$4,185
New 8' Diameter Wet Well	1	EA.	\$15,000	\$15,000	\$15,077	\$15,385	\$15,692
New Emergency Generator	1	EA.	\$30,000	\$30,000	\$30,154	\$30,769	\$31,385
New Electrical Service	1	L.S.	\$12,000	\$12,000	\$12,062	\$12,308	\$12,554
8" PVC Sewerline	30	L.F.	\$80	\$2,400	\$2,412	\$2,462	\$2,511
Topsoil	20	C.Y.	\$25	\$500	\$503	\$513	\$523
Seeding, Fertilizer and Liming	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Mulching	0.5	Acre	\$1,000	\$500	\$503	\$513	\$523
Silt Fence	100	L.F.	\$4	\$350	\$352	\$359	\$366
Site Prep and Miscellaneous (8%)	1	L.S.	\$5,220	\$5,220	\$5,247	\$5,354	\$5,461
Contingency (10%)	1	L.S.	\$7,047	\$7,047	\$7,083	\$7,228	\$7,372
Contractor's Bonds (2%)	1	L.S.	\$1,550	\$1,550	\$1,558	\$1,590	\$1,622
<b>Subtotal</b>				<b>\$79,067</b>	<b>\$79,473</b>	<b>\$81,095</b>	<b>\$82,717</b>
<b>USE</b>				<b>\$80,000</b>	<b>\$80,000</b>	<b>\$82,000</b>	<b>\$83,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR® Engineering News Record Construction Cost Index.

## TABLE C-10

# OPINION OF PROBABLE CONSTRUCTION COST

Town of Richmond  
West Main Street- Access Road with Water & Sewer Extensions  
Phase I Scoping Study  
3" Low Pressure Grinder Pump Forcemain Parallel School's Forcemain

Description	Quantity	Units	ENR 9,750	ENR 9,750	ENR 9,800	ENR 10,000	ENR 10,200
			2014 Unit Price	2014 Total Cost	2015 Total Cost	2016 Total Cost	2017 Total Cost
<b>WASTEWATER SYSTEM</b>							
3" HDPE LPS	1,200	L.F.	\$42	\$50,400	\$50,658	\$51,692.31	\$52,726.15
Core Manhole	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569.23
Permanent Trench Pavement Repair	6	S.Y.	\$60	\$360	\$362	\$369.23	\$376.62
Traffic Control	1	L.S.	\$1,500	\$1,500	\$1,508	\$1,538.46	\$1,569.23
Site Prep and Miscellaneous (8%)	1	L.S.	\$4,301	\$4,301	\$4,323	\$4,411.08	\$4,499.30
Contingency (10%)	1	L.S.	\$5,806	\$5,806	\$5,836	\$5,954.95	\$6,074.05
Contractor's Bonds (2%)	1	L.S.	\$1,277	\$1,277	\$1,284	\$1,310.09	\$1,336.29
<b>Subtotal</b>				<b>\$65,144</b>	<b>\$65,478</b>	<b>\$66,815</b>	<b>\$68,151</b>
<b>USE</b>				<b>\$66,000</b>	<b>\$66,000</b>	<b>\$67,000</b>	<b>\$69,000</b>

**Notes:**

1. The construction cost estimates are based on preliminary phase estimates only. More detailed costs shall be developed during Final Design Phase Engineering based on actual design quantities.
2. ENR = Engineering News Record Construction Cost Index.