Town of Summerfield

Fire Water Supply Study

NORTH CAROLINA PROFESSIONAL SEAL 18097 ENGINEER JOHN C. GREY

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THE WOOTEN COMPANY
License F-0115

John C. Grey, PE

ACKNOWLEDGEMENT

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ABBREVIATIONS

DOT	Department of Transportation
gpd	Gallons per Day
gpm	Gallons per Minute
HWY	Highway
I	Interstate
MG	Million Gallons
MGD	Million Gallons per Day
NC	North Carolina
psi	Pounds per Square Inch
US	United States

I. Introduction

The Town of Summerfield is located in northwestern Guilford County in the piedmont area of central North Carolina. The Town has experienced a large population increase over the past 20 years, with the current population of over 11,000. Summerfield does not have a public water system, so several developments in and around the Town of Summerfield have private water systems operated by private companies such as Aqua America. Many of the homes and structures in Summerfield are larger than typical homes found in North Carolina. There are 1,200 structures out of 3,533 greater than 3,000 square feet in size. The Fire District uses local ponds for a large amount of its source for water to fight fires. Over the last several years, some ponds have dried up, been abandoned, or access to the pond has been limited. Larger structures, increased population, lack of a public water system and loss of fire water supply points have raised concerns with the Summerfield Fire District regarding adequate water supply for fighting fires.

The Summerfield Fire District was established in May of 1951. The fire district encompasses approximately 47 square miles total. Approximately 26 square miles of the fire district is located within the Town of Summerfield limits. Historically water supply points (ponds/lakes) have been used to provide water for fighting fires. As the Town has developed and water supply points have been lost, the Summerfield Fire District has had to adapt. Water supply sources are no longer available for Town use due to factors such as development, road improvements and larger fire equipment. This study considers options to provide additional fire water supply for the Town of Summerfield. Specific fire water supply sources that we considered in this report are:

- Small tanks at strategic locations in town
- Centrally located ground storage tank
- Centrally located elevated tank
- Centrally located elevated tank with lines and fire hydrants to serve key corridors
- Connection to existing water system
- Use of existing Summerfield Elementary tank

Tank/hydrant locations were determined with the help of Summerfield Fire Chief and Summerfield Administration. The evaluated locations are shown on the Tank/Hydrant Locations Project Map in

Appendix 1. There were six lot locations selected for consideration. The Town of Summerfield owns one of these locations which is a centrally located lot (Northern Gordon tract), approximately 13 acres in size, situated on the northwest corner of the intersection of Oak Ridge Road and US Hwy 220, and containing 4 existing wells. Property would have to be purchased at the other 5 proposed locations being considered for small tanks which include the following intersections:

- Oak Ridge Road and Henson Forest Road
- Scalesville Road and Windspray Drive
- Lake Brandt Road and Hwy 150
- Strader Road and Hwy 150
- Stanley Huff Road and Bunch Road

Water could be supplied by wells or by connection to another water system. Guilford County Health Department was consulted about wells in the Summerfield area. Health Department staff indicated wells in the Summerfield area vary in flow from one quart per minute to as much as 200 gallons per minute (gpm). The selected sites were discussed and health department staff indicated flows above 10 gpm should be realized. Electrical resistance could be utilized to locate the best potential well location on a site. According to the Health Department one developer used electrical resistance to locate a well in Summerfield that produced 92 gpm at a depth of 140 feet. Hydrogeologist services could also be utilized to choose the best potential well site locations before buying any property. The Health Department indicated there is a well behind the Summerfield Community Center that has elevated levels of a pollutant in the water. This well is flowing 196 gpm but is not currently being used due to the level of pollutants. However, this well could be used for fire water supply if desired by the Town.

II. Water Supply Options

A. Small Tanks at Strategic Locations

Various scenarios were evaluated for small tanks to contain fire supply water for the Town of Summerfield. These tanks can be located at any location around town, but the Town would have to purchase property for the tank sites. The tank sites will include the tank, a well for water supply, site work, yard piping and electrical for the well pump. The tank site could also include a diesel driven pump capable of 1,000 gpm at the rate of 40 psi which was requested by the Fire District. There are various

different styles and types of tanks that could be installed on these sites including: larger diameter and shorter height above ground tank, smaller diameter and taller height above ground tank possibly without a pump, or as a buried tank with a pump. Smaller above ground tanks would blend better into surrounding areas with the use of landscaping or building a structure around the tank. The below ground option is another way to keep the tanks out of sight of the public, however, there would still be controls and minor structures above grade that would be visible.

A reconditioned tank option was considered to reduce initial costs. One negative to using a reconditioned tank is the available inventory at a given time will affect the cost, so they are hard for us to estimate. Also the Town may not be able to locate five of the exact same reconditioned tanks at a desired time.

For the underground tank option rock excavation could greatly influence the cost on installation of the tank. For purposes of this study rock excavation has not been included. If the option to install tanks below ground is chosen it would be recommended to perform soil borings prior to purchasing lots to ensure there is no rock onsite. This could be performed by using an auger to drill in multiple locations to the depths required for tank installation. Prices for the options considered are in Tables 1-5 below. Originally 30,000 gallons was decided to be the minimum small tank capacity (Table 4 and 5), but an option for 40,000 (Table 2) and 50,000 (Table 1) gallons was included in pricing.

Table 1

50,000 Gallon Tank, Ground

Carbon Steel, 24.62' diameter, 15.99 ' height

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$5,300	$5,300
2	Tank Materials and Accessories	LS	1	$40,140	$40,140
3	Tank Installation	LS	1	$23,230	$23,230
4	Freight	LS	1	$2,600	$2,600
5	Immersion Heater	LS	1	$4,440	$4,440
6	Tank Insulation	LS	1	$31,140	$31,140
7	Foundation Design	LS	1	$2,500	$2,500
8	Fencing	LS	1	$7,000	$7,000
9	Lot Purchase and Site Work	LS	1	$50,000	$50,000
10	Well and Yard Piping for Water Supply	LS	1	$10,000	$10,000
11	Electrical	LS	1	$5,000	$5,000
				Total	**$181,350**

Table 2

40,000 Gallon Tank, Ground

Carbon Steel, 24.62' diameter, 12.95 ' height

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$5,100	$5,100
2	Tank Materials and Accessories	LS	1	$36,820	$36,820
3	Tank Installation	LS	1	$20,080	$20,080
4	Freight	LS	1	$2,600	$2,600
5	Immersion Heater	LS	1	$4,440	$4,440
6	Tank Insulation	LS	1	$29,910	$29,910
7	Foundation Design	LS	1	$2,500	$2,500
8	Fencing	LS	1	$7,000	$7,000
9	Lot Purchase and Site Work	LS	1	$50,000	$50,000
10	Well and Yard Piping for Water Supply	LS	1	$10,000	$10,000
11	Electrical	LS	1	$5,000	$5,000
				Total	**$173,450**

Table 3

1,000 GPM Pump @ 40 PSI, Diesel Fire Pump in a Pump House

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$4,500	$4,500
2	1,000 GPM Pump and Pump House	LS	1	$150,000	$150,000
				Total	**$154,500**

Table 4

30,000 Gallon Underground Tank, 1000 GPM Vertical Turbine, Pump House

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$8,800	$8,800
2	30,000 Gallon Tank, Pump and Pump House	LS	1	$225,000	$225,000
3	Lot Purchase and Site Work	LS	1	$50,000	$50,000
4	Well and Yard Piping for Water Supply	LS	1	$10,000	$10,000
5	Electrical	LS	1	$8,000	$8,000
				Total	**$301,800**

Table 5

30,000 Gallon Ground Storage Tank, Reconditioned

approximately 12' Diameter, 34' Height, with pad, delivered and set up, McLean Tank*
estimated 5 to be $300,000, assuming $60,000 each

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$3,800	$3,800
2	30,000 Gallon Tank	LS	1	$60,000	$60,000
3	Lot Purchase and Site Work	LS	1	$50,000	$50,000
4	Fencing	LS	1	$7,000	$7,000
5	Well and Yard Piping for Water Supply	LS	1	$10,000	$10,000
				Total	**$130,800**

*McLean Tank estimated 5 tanks to be $300,000, so we assumed $60,000 each

Advantages associated with placing smaller tanks around town are:

- it would allow the Town to install the tank sites at any desired location
- tanks could be placed on a schedule as the Town could afford each tank
- smaller ground or buried tanks can be disguised with landscaping or blended into the surrounding environment much easier than larger or elevated tanks
- reduced amount of capital input is needed at the beginning

Some disadvantages to this option are:

- the Town must purchase property for each location
- if pumps are installed on the tanks they will need to be maintained and operated periodically
- electricity would be required at each site for power supply to the well that fills the tank with water

B. Centrally Located Ground Storage Tank

The lot (Northern Gordon tract) located on the northwest corner of Oak Ridge Road and US Hwy 220 that is owned by the Town of Summerfield presents a great central location for a larger tank to be located. This site is convenient to most places in town. The lot is approximately 13 acres and currently has four wells which could be utilized to fill the tank. A ground storage tank on this lot could be paired with the same diesel driven pump from the previous Option A. The Town might be able to use a ground

storage tank without a pump but the tank would need to be tall and there would be an amount of wasted volume that could not be used as the tank nears empty. Tank sizes considered for this option include 75,000 gallons and 100,000 gallons. A reconditioned tank of 200,000 gallons was also considered to provide a larger tank at a lower cost. Prices for the options are presented in Tables 6-8 below.

Table 6

75,000 Gallon Ground Storage Tank

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$10,900	$10,900
2	75,000 Gallon Tank	LS	1	$289,000	$289,000
3	Valve Vaults	LS	1	$20,000	$20,000
4	Yard Piping	LS	1	$10,000	$10,000
5	Site Work	LS	1	$20,000	$20,000
6	Fencing	LS	1	$10,000	$10,000
7	Electrical	LS	1	$5,000	$5,000
8	Well Pumps & Improvements	LS	1	$10,000	$10,000
				Total	**$374,900**

Table 7

100,000 Gallon Ground Storage Tank

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$12,600	$12,600
2	100,000 Gallon Tank	LS	1	$346,000	$346,000
3	Valve Vaults	LS	1	$20,000	$20,000
4	Yard Piping	LS	1	$10,000	$10,000
5	Site Work	LS	1	$20,000	$20,000
6	Fencing	LS	1	$10,000	$10,000
7	Electrical	LS	1	$5,000	$5,000
8	Well Pumps & Improvements	LS	1	$10,000	$10,000
				Total	**$433,600**

Table 8

200,000 Gallon Ground Storage Tank, reconditioned

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$9,800	$9,800
2	200,000 gallon Tank	LS	1	$250,000	$250,000
3	Valve Vaults	LS	1	$20,000	$20,000
4	Yard Piping	LS	1	$10,000	$10,000
5	Site Work	LS	1	$20,000	$20,000
6	Fencing	LS	1	$10,000	$10,000
7	Electrical	LS	1	$5,000	$5,000
8	Well Pumps & Improvements	LS	1	$10,000	$10,000
				Total	**$334,800**

Placing a larger ground tank on the centrally located lot owned by the Town of Summerfield offers many benefits for fire water supply such as:

- the lot currently has four wells on the site
- large ground storage tanks could be more easily camouflaged into the surrounding area when compared to an elevated tank

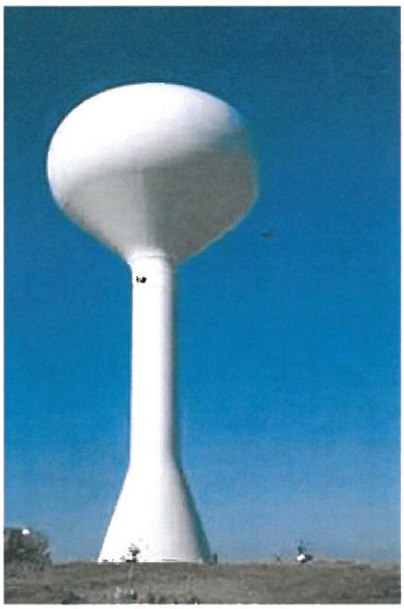
As with the smaller tanks if a pump is installed in conjunction with the large ground tank the pump will require periodic maintenance and operation. Electrical service would need to be provided to run the well pumps. A disadvantage to this option is it only provides one new location for the Fire District to obtain fire water.

C. Centrally Located Elevated Tank

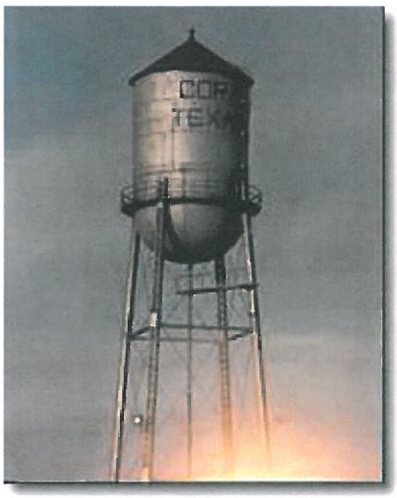
Another option considered for fire water supply is locating an elevated tank on the centrally located lot the Town owns (Northern Gordon tract). Placing an elevated tank at this location presents the Town with opportunities in addition to fire water supply. One big advantage of the elevated tank is there would be no need for a fire pump. Multiple fire connection points could be installed at the base of the tank to load multiple fire trucks at one time, if desired. The elevated tank gives the Town the ability to lease space on the tank to communication/radio companies for antennas to generate income for the Town. Another benefit to installing an elevated tank is the Town of Summerfield could use the tank for a water system should they ever decide to install a potable water system.

There are many styles of elevated tanks the Town could consider for installation (see the following pictures for samples of some of the styles of elevated water storage tanks)

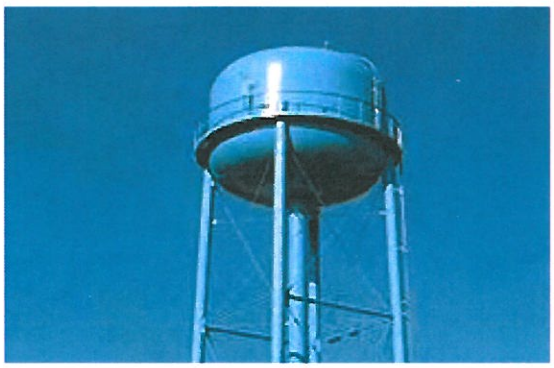
Composite Tank



Pedesphere Tanks



Old Style "Witches Hat" Legged Tank



Multi-Column "Legged" Tank

For the purpose of this study an Old Style "Witches Hat" style elevated tank was quoted for budgeting purposes. This style was chosen to give a more traditional and historic look for the Town. There are other styles of elevated tanks that could be installed at a lesser price if the Town so desired.

The four wells on the Town lot would be utilized to fill the tank. The well pumps would need to be larger to pump the water to the higher elevation. A disadvantage of this option is it only provides one new location for the Fire District to obtain fire water. Elevated tank sizes of 75,000 gallons and 100,000 gallons were considered. Budgets for these options are presented in Tables 9 and 10 below.

Table 9

75,000 Gallon Multi Column Elevated Tank

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$17,800	$17,800
2	75,000 gallon Tank	LS	1	$544,000	$544,000
3	Valve Vaults	LS	1	$20,000	$20,000
4	Yard Piping	LS	1	$10,000	$10,000
5	Site Work	LS	1	$20,000	$20,000
6	Fencing	LS	1	$11,000	$11,000
7	Electrical	LS	1	$5,000	$5,000
8	Well Pumps & Improvements	LS	1	$15,000	$15,000
				Total	**$642,800**

Table 10

100,000 Gallon Multi Column Elevated Tank

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$20,100	$20,100
2	100,000 gallon Tank	LS	1	$589,000	$589,000
3	Valve Vaults	LS	1	$20,000	$20,000
4	Yard Piping	LS	1	$10,000	$10,000
5	Site Work	LS	1	$20,000	$20,000
6	Fencing	LS	1	$10,000	$11,000
7	Electrical	LS	1	$5,000	$5,000
8	Well Pumps & Improvements	LS	1	$15,000	$15,000
				Total	**$690,100**

D. Centrally Located Elevated Tank with Lines and Fire Hydrants to Serve Key Corridors

If the Town placed an elevated tank at a central location, lines could be extended to desired locations around town for fire hydrants. Typically when a water line is installed, fire hydrants are placed at intervals of approximately 1,000 feet apart within city limits and 2,000 feet apart in outlying areas. However, for this option fire hydrants were only placed at the locations selected in Option A for tank locations. The elevated tank was located at the Town's central lot (Northern Gordon tract) and water mains were extended to each location. These lines could be converted to create a potable water system and offer water service to residents and businesses in the Town of Summerfield if desired in the future. A disadvantage to this option is the well capacities are unknown and may not be sufficient to support this type of a fire-supply system. Before proceeding with this option, we recommend hiring a well driller to test the wells and provide information on the capacities of each well. Budget numbers for the elevated tank are as discussed above in Option C. Below in Table 11 is a cost opinion for these lines and fire hydrants as well as the additional cost for fire hydrants to be placed at approximately 1,000 feet apart. The Town could increase this spacing and realize some cost savings. This option is shown on the Elevated Tank with Water Main and Fire Hydrants Map in Appendix 2.

Table 11

Water Lines to Hydrants at Proposed Locations

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$80,000	$80,000
2	8" Water Main	LF	53,000	$50	$2,650,000
3	Fire Hydrant Assembly	EA	6	$3,000	$18,000
				Total	**$2,748,000**
4	Additional Hydrants Assembly @ 1,000' Spacing	EA	49	$3,000	$147,000
				Total	**$2,895,000**

The option of installing an elevated tank with water lines to fire hydrants offers benefits as follows:

- lines could be installed in phases allowing the Town to budget what portion they would like to complete in the fiscal year
- lines could be mostly installed in road right-of-way and reduce private property purchase
- hydrants could be installed at desired locations during construction or could be added along the water main in the future

- commercial development could tie to the system to provide fire supply water for their development
- provides a good backbone for a potable water system should the Town ever decide to install one

Maintenance of the water mains, hydrants and tank would include: repair of leaks, tank cleaning and painting, exercising of fire hydrants and valves.

E. Connection to Existing Water System

For the previously described options, the proposed source of water is wells. Another potential source of water for the Town of Summerfield's fire supply water could be to connect to a neighboring water system. There are three possible connections the Town could consider when looking to connect to another system. Greensboro, Rockingham County and Stokesdale all have water systems near the Town of Summerfield. Rockingham County is closest to the Town of Summerfield, so for this Study we decided to use this source. We understand politics would be involved with the selection of the water source, so if the Town develops an agreement with another source, The Wooten Company could analyze the additional costs to make that connection. The connection to Rockingham County water system would consist of an extension of the Rockingham System, meter vault, backflow prevention device and extension of water line to a desired location within the Town of Summerfield.

With the I-73 improvements, Rockingham County is looking to extend their water system west along US Hwy 158 to the intersection of US Hwy 220 and then north along US Hwy 220 to Madison to complete a loop of their current system. This extension of the Rockingham County water system brings it to within 7,000 linear feet of the Town of Summerfield limits along US Hwy 220 and approximately 14,000 linear feet from the Town's central lot (Northern Gordon tract). The water main from Rockingham County to Summerfield is shown in Appendix 3. Rockingham County also has plans for a potential water line to extend south into Summerfield along US Hwy 220 from the intersection of US Hwy 220 and US Hwy 158 to Oak Ridge Road. The Town should have a discussion with Rockingham County regarding this line extension. The following Table 12 presents the cost for water service to be extended from Rockingham County at the intersection of US Hwy 220 and US Hwy 158 to the Town's centrally located lot at the intersection of Oak Ridge Road and US Hwy 220.

Table 12

Water Supply from Rockingham County

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$22,400	$22,400
2	8" Water Main	LF	14,265	$50	$713,250
3	Connection to Rockingham County Line	EA	1	$3,500	$3,500
4	Meter Vault	EA	1	$30,000	$30,000
				Total	**$769,150**

It is possible that a larger diameter line could be installed from Rockingham County's system to the Town of Summerfield eliminating the need for an elevated tank in Summerfield. The larger diameter lines would reduce pressure loss along the length of the pipe. Further investigation of Rockingham water system pressures would have to be completed to determine if this option would be feasible. This option does require more up front financial commitment, but eliminates the concerns of having tanks within the Town of Summerfield. Another benefit by having only water mains and not installing tanks is a lower maintenance cost due to eliminating pumps and tank maintenance. Table 13 below depicts the cost difference associated with a larger line size from Rockingham County to Summerfield's centrally located lot (Northern Gordon tract). These numbers are for comparison only and would need to be revisited if the Town decides to investigate more into this option.

Table 13

Larger Size Water Supply from Rockingham County

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total
1	Mobilization	LS	3%	$43,800	$43,800
2	16" Water Main	LF	14,265	$100	$1,426,500
3	Connection to Rockingham County Line	EA	1	$3,500	$3,500
4	Meter Vault	EA	1	$30,000	$30,000
				Total	**$1,503,800**

F. Use of Existing Summerfield Elementary 72,000 Gallon Tank

Summerfield Elementary located on Centerfield Road has a 72,000 gallon ground level water storage tank. The understanding from the Fire District and the Town is that half of the tank volume is available to provide water for firefighting to the Fire District. The Fire District tested the flow from the tank, but was not able to obtain sufficient flow to fill the tanker truck as quickly as needed. A fire pump exists on the system, but it did not activate when the Fire District performed their flow test. Additional

information on the fire pump should be obtained to determine if the fire pump is connected in a way to provide the performance needed to properly fill the tanker truck. It may be necessary for piping to be reconfigured, control wiring to be modified, or an additional fire pump to be installed to make this volume of water usable for the Fire District. Table 3 above provides the cost opinion for installation of a fire pump if this is necessary.

III. Conclusion

This study evaluated options for the Town of Summerfield to supply water to be used by the Fire District to provide fire protection services. Each option was shown with multiple cost opinions and associated advantages and disadvantages. The following is a Life Cycle Cost Analysis on the options. Some options had more than one possible combination of tank sizes and pumps. For the purpose of this report one combination was chosen for each option. The combinations evaluated in the Life Cycle Cost Analysis are: Option A – 50,000 gallon ground tank and fire pump at multiple locations; Option B – 100,000 gallon ground tank and fire pump at central location; Option C – 100,000 gallon elevated tank at central location; Option D – 100,000 gallon elevated tank at central location and water lines to fire hydrants at key locations; Option E – Connection to Rockingham County system with larger main to Summerfield and water lines to fire hydrants at key locations and no tanks. Option F was not considered below because this water is currently available and only further investigation and a possible small investment would be needed to make the water an existing option for fire water supply. The following Table 14 summarizes the Life Cycle Cost Analysis of possible additional fire water supplies described above.

Table 14

Life Cycle Cost Analysis

Discount rate (i) =	1.20%	Use "real" discount rate taken from Appendix C of OMB circular A-94: http://www.whitehouse.gov/omb/circulars_a094/a94_appx-c
Number of Years (n)	20	The planning period is recommended to be 20 years.

	Option A	Option B	Option C	Option D	Option E
	50k tank and Fire Pump at 6 locations see App 1 Map	100k Grnd Level Tank and Fire Pump at one Central Location	100k Elevated Tank at one Central Location	100k Elevated Tank with Lines and 6 FHs (see App 2 Map)	Connection to Rock. Co. & Water Lines to Hydrants, no tank, 6 FHs (see App 3 Map)
Initial Capital Costs (C)=	$ 2,015,100.00	$ 588,100.00	$ 690,100.00	$ 3,438,100.00	$ 4,251,800.00
Annual Operation and Maintenance Costs (O&M) =	$ 70,000.00	$ 16,000.00	$ 17,000.00	$ 20,000.00	$ 10,000.00
Future Salvage Value (S)* =	$ 544,050.00	$ 216,800.00	$ 345,050.00	$ 1,993,850.00	$ 2,551,080.00
Present Worth of (n) years of Operations & Maintenance =	$ 1,238,110.84	$ 282,996.76	$ 300,684.06	$ 353,745.95	$ 176,872.98
Present Worth of (n) year Future Salvage Value =	$ 428,576.71	$ 170,784.73	$ 271,813.97	$ 1,570,660.18	$ 2,009,619.46
Net Present Value (Cost) =	**$ 2,824,634.13**	**$ 700,312.04**	**$ 718,970.09**	**$ 2,221,185.78**	**$ 2,419,053.52**

* Future Salvage Value Estimations

	Item	Years of Life Expectancy	Number of Units	Capital Cost Per Unit	Salvage Value
Option A	Tank	40	6	$ 181,350.00	$ 544,050.00
	Pump	20	6	$ 154,500.00	$ -
				Total Salvage Value for Option A=	**$ 544,050.00**
Option B	Tank	40	1	$ 433,600.00	$ 216,800.00
	Pump	20	1	$ 154,500.00	$ -
				Total Salvage Value for Option B =	**$ 216,800.00**
Option C	Tank	40	1	$ 690,100.00	$ 345,050.00
				Total Salvage Value for Option C =	**$ 345,050.00**
Option D	Tank	40	1	$ 690,100.00	$ 345,050.00
	Lines	50	1	$ 2,748,000.00	$ 1,648,800.00
				Total Salvage Value for Option D =	**$ 1,993,850.00**
Option E	16" Main	50	1	$ 1,503,800.00	$ 902,280.00
	8" Lines	50	1	$ 2,748,000.00	$ 1,648,800.00
				Total Salvage Value for Option E =	**$ 2,551,080.00**

The options selected in the Life Cycle Cost Analysis were also rated for Non-Monetary Factors. Scores of 1 to 10 were placed on various different factors, with 1 being least desirable and 10 being most desirable. Looking at options from a non-monetary standpoint can sometimes help make the difficult decision of narrowing down options easier. Table 15 below presents the Non-Monetary Factor Rating for the options.

Table 15

Non-Monetary Factors Matrix Rating System (1=Least Desirable; 10 = Most Desirable)

	Option A	Option B	Option C	Option D	Option E
	50k tank and Fire Pump at 6 locations see App 1 Map	100k Grnd Level Tank and Fire Pump at one Central Location	100k Elevated Tank at one Central Location	100k Elevated Tank with Lines and 6 FHs (see App 2 Map)	Connection to Rock. Co. & Water Lines to Hydrants, no tank, 6 FHs (see App 3 Map)
Sustainability Considerations	6	6	9	9	10
Training Requirements	7	7	10	10	10
Permit Issues (NC DOT)	8	10	10	8	8
Community Objections	8	5	4	4	10
Land Availability	4	10	10	10	10
O&M	5	5	8	8	10
Totals	**38**	**43**	**51**	**49**	**58**

Based on the information provided above, the least expensive option is placing either a ground level storage tank or elevated storage tank (Options B or C) at the Town's property at the intersection of Oak Ridge Road and US Hwy 220 (Northern Gordon tract). However, this option only provides the Fire District with one new source of fire water.

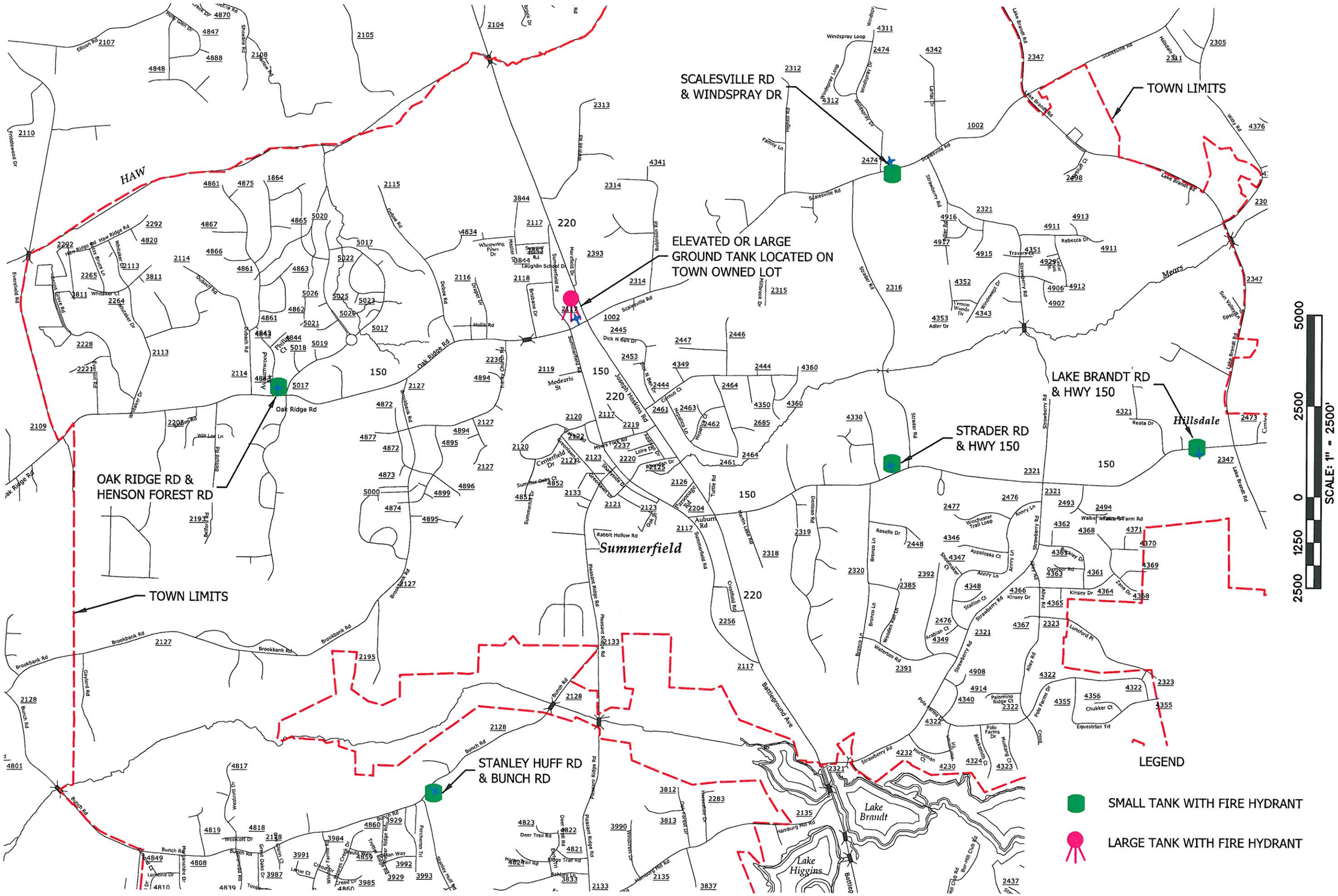
Installing a water line from Rockingham County (Option E) that can support fire flows without an elevated tank scored best in the non-monetary factors matrix; however, Option E is the 4th most expensive option.

One way to approach Option D or E is to phase the work. For Option D: Phase 1 could be to install the elevated tank with the existing wells being the water supply (essentially Option C). Then in the future install sections of the line work associated with Option D until the system is constructed. If the wells do not provide adequate water supply, a line could be extended to Rockingham County as described in Table 12.

For Option E, Phase 1 could be to connect to Rockingham County water system and extend to the Town's centrally located lot, Northern Gordon tract, (cost in Table 13). This would provide one fire supply point, unless additional fire hydrants were installed along the way. Then in the future extend as

desired to the other locations for fire hydrants as shown on the map in Appendix 3 and priced in Table 13.

The Wooten Company appreciates this opportunity to provide this information to the Town of Summerfield. We would be happy to meet with the Town to discuss the results of this study. We also are willing to provide additional information on the findings or investigate another option if desired by the Town.



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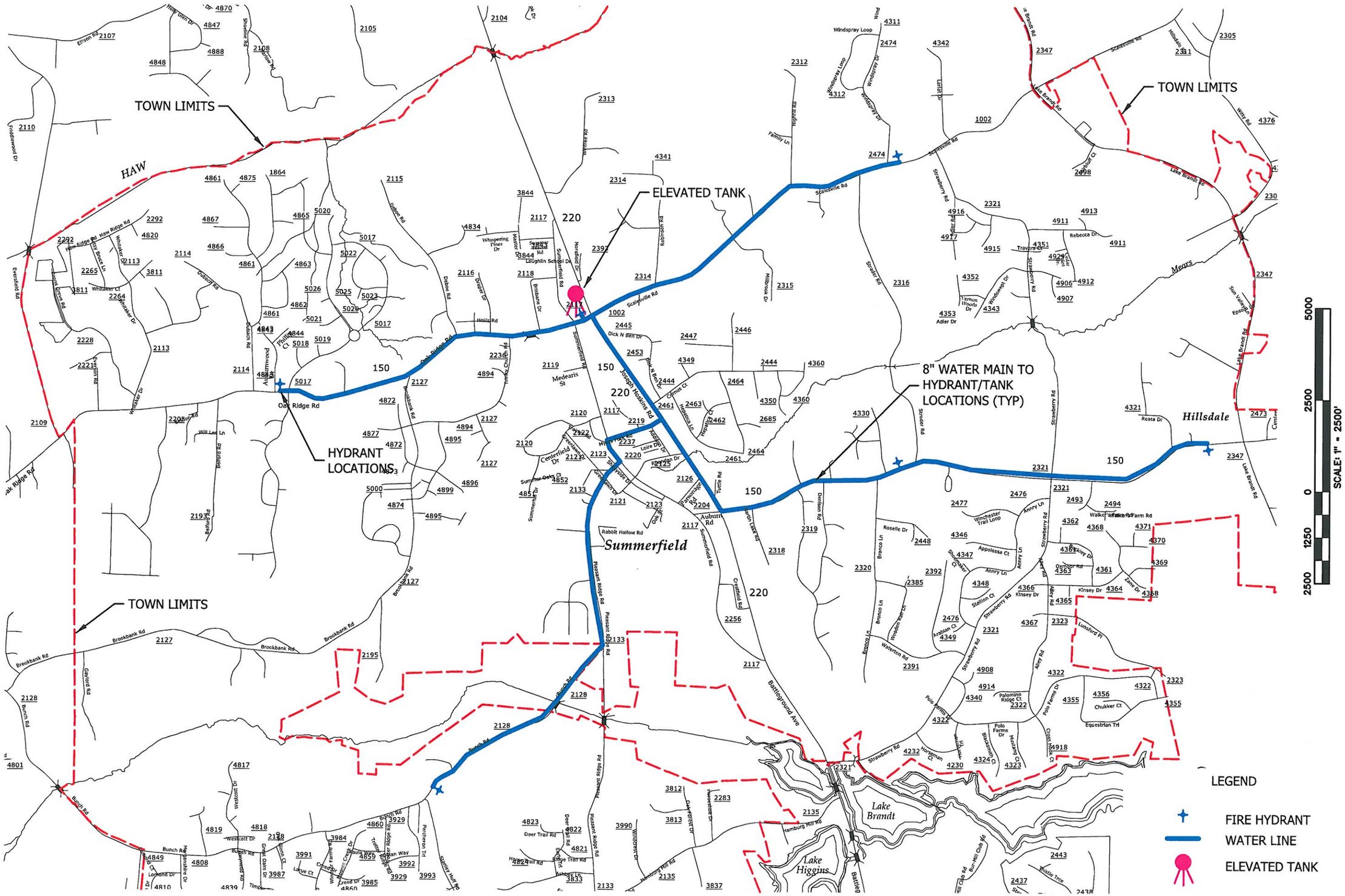
GUILFORD COUNTY
TOWN OF SUMMERFIELD
NORTH CAROLINA
FIRE WATER SUPPLY STUDY

APPENDIX 1

TANK/HYDRANT LOCATIONS PROJECT MAP

DATE: APRIL 2016
PROJECT NO.: 3277 - A

DESIGNED BY: RSF
DRAWN BY: RSF
CHECKED BY: JCG
SCALE: AS NOTED



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TOWN OF SUMMERFIELD
GUILFORD COUNTY NORTH CAROLINA

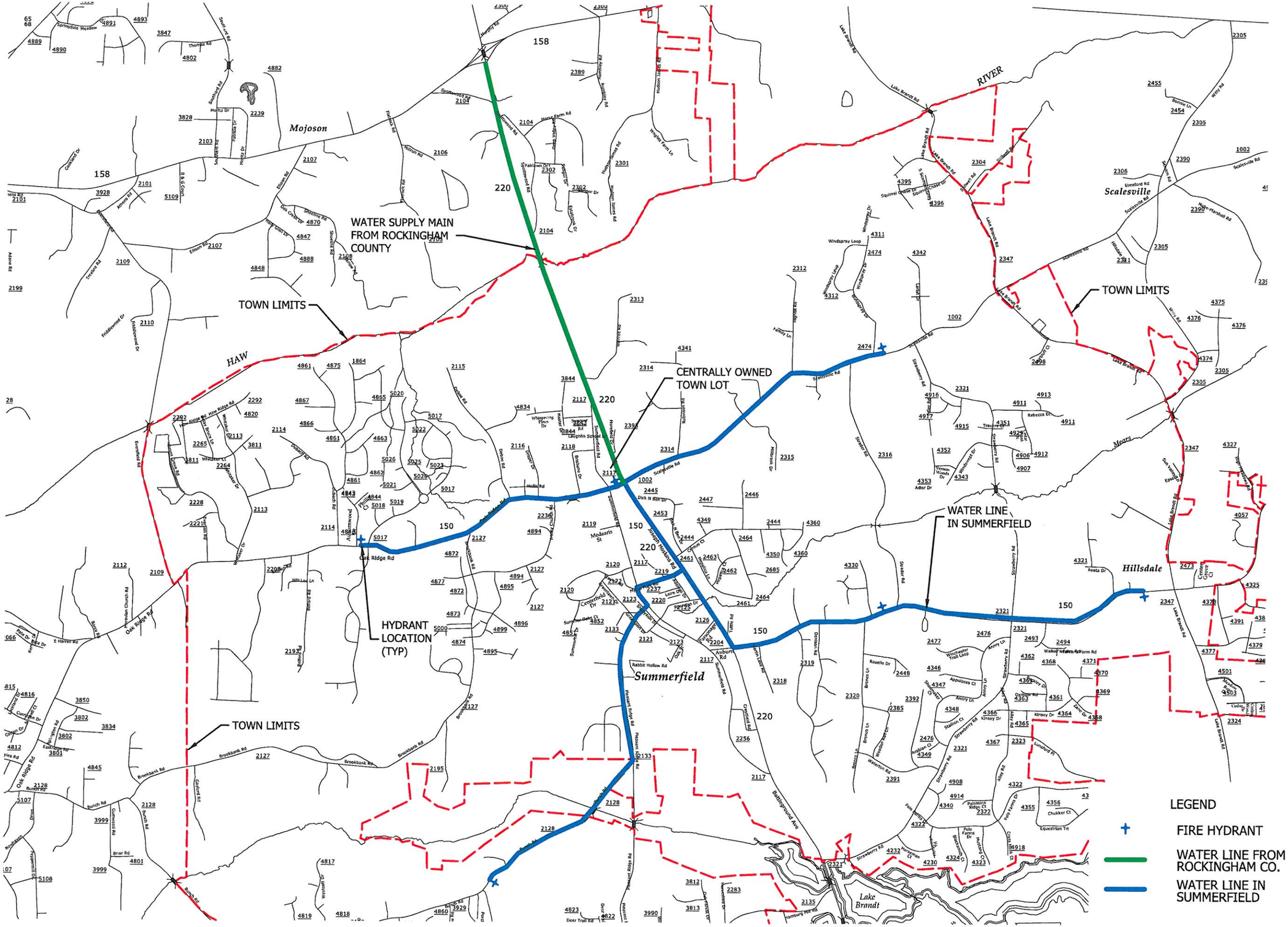
FIRE WATER SUPPLY STUDY

APPENDIX 2

ELEVATED TANK WITH WATER MAIN & FIRE HYDRANTS

DATE: APRIL 2016
PROJECT NO.: 3277 - A

DESIGNED BY: RSF
DRAWN BY: RSF
CHECKED BY: JCG
SCALE: AS NOTED



SCALE: 1" = 3000'

3000 1500 0 3000 6000

LEGEND

FIRE HYDRANT

WATER LINE FROM ROCKINGHAM CO.

WATER LINE IN SUMMERFIELD

THE WOOTEN COMPANY

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GUILFORD COUNTY

TOWN OF SUMMERFIELD NORTH CAROLINA

FIRE WATER SUPPLY STUDY

APPENDIX 3

WATER SUPPLY MAIN FROM ROCKINGHAM COUNTY

DATE: APRIL 2016

PROJECT NO.: 3277 - A

DESIGNED BY: RSF

DRAWN BY: RSF

CHECKED BY: JCG

SCALE: AS NOTED