



## Water and Sewer System Growth and Capacity Evaluation

Prepared for:



Town of Warrenton, Virginia

Final Report

April, 2015

WR&A Work Order No:  
18535-000

Prepared by:  
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## 1. Executive Summary

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Whitman, Requardt and Associates, LLP (WRA) was tasked to update the Growth and Capacity Evaluation Report for the Town's water and sewer systems. Updated residential and commercial account data along with meter flow data from the WTP and WWTP was analyzed. The data was used to estimate the current and buildout water demands and sewer flows for areas where the Town has prior service commitments.

The current water system capacity is 2.046 MGD, which is based on a safe yield of 2.346 MGD (from the Warrenton and Airlie reservoirs, Wells #5 and #6), and an additional drought contingency reserve of 0.30 MGD. The buildout average water demand is 1.88 MGD. The current sewer system capacity of 2.375 MGD based on 95% average daily flow capacity of the WWTP which is permitted to treat 2.5 MGD. The buildout sewer flow is 2.65 MGD which exceeds the capacity of the existing WWTP. The current inflow and infiltration (I&I) in the system is estimated at 1.05 MGD. Assuming a 3% growth in both water demands and sewer flows, the buildout for water will reach 92% of the safe yield and drought contingency reserve in year 2028. The buildout for sewer will reach 95% of the average daily flow capacity at WWTP in year 2024. The analysis and recommendations from the report are summarized below:

- The buildout Average Water demand with current assets is at 92% of the allowable water demand capacity based on the safe yield and drought contingency reserve of 2.04 MGD. This percentage can be lowered to 80% if the drought contingency reserve limit is removed. In addition, if Well #3 and #4 are brought online, this can be lowered even further to 71%.
- The Town needs to develop a policy to meet additional water commitments by revisiting the drought contingency reserve. The recommendations presented in the 2010 strategic water supply plan of reactivating Well #3 and #4 as a treated source or reservoir recharge, and evaluating the potential and practicality of adding capacity to the Warrenton reservoir should also be investigated.
- The buildout average sewer flows will reach 106% of the WWTP capacity. DEQ requires an upgrade plan when flows exceed 95% of the rated capacity, 2.375 MGD, for three consecutive months.
- To create flow capacity in the sewer system for the current customers, inflow and infiltration should be continuously investigated and corrected. Permanent flow meters should be installed at key locations in the system. The Town should set a goal to reduce the current I&I in 2-3 years and reduce it by 0.3 MGD. The Town has been conducting a flow monitoring study for the past 8 months. The study needs to be continued and expanded.
- A comprehensive evaluation of the WWTP upgrade is recommended to investigate opportunities to create additional capacity as a contingency if I&I reduction goals cannot be met and possible accommodation of additional sewer commitments.
- New developments without prior water and sewer commitments will increase buildout demands and flows and require system capacity improvements.
- The Town should develop contingency plans for future re-zonings, changes to water and sewer usage patterns, regulatory changes or other system changes.

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## 2. Purpose

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The Town of Warrenton (Town) requested Whitman, Requardt and Associates, LLP (WR&A) to review and update the Growth and Capacity Evaluation for the Town's water and sewer systems. Prior evaluations were completed in 2002, 2006 and 2009 by WR&A, and this report follows the same general outline. The scope of this evaluation includes:

- Update existing residential and commercial demands and flows based on billing records and treatment plant records for water and sewer.
- Identify and update proposed development plans in which the Town has committed to providing water and sewer services.
- Update areas within Town with undeveloped lots and project water and wastewater flows for these areas.
- Confirm the estimate of potential water and sewer service commitments in the surrounding County.
- Develop capacity projections based on existing and future use for water and sewer.

Estimates of potential water and sewer demand are based on the development of vacant lots according to their current zoning, typically determined with no consideration of potential topographic or geographic restrictions (steep slopes, flood plains, etc...). The exception is a limited number of parcels with existing staff knowledge of preliminary site analysis.

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## 3. Existing Water Demands, Sewer Flows, I&I and Planning Flows

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The Town of Warrenton serves an estimated 4,808 water accounts as of December 2014. The highest consecutive 5-year average daily water demand is 1.31 MGD based on the production records from 2005-2009. A maximum day water demand peaking factor of 1.5 was determined from water records, which corresponds to a peak day of 1.96 MGD. The 5-year average daily water demand is slightly lower than past reports, which is due to a combination of slow economy, water conservation, water saving fixtures and some accounts that have gone dormant. A summary of the average day demands and growth from recent years is provided in **Table 1**.

**Table 1**  
**Water System Growth - 2004 through 2014**

Year	Avg. Daily Production (MGD)	Annual Growth	No. of Customers	Customer Annual Growth
2004	1.28	5.87%	4,178	5.67%
2005	1.30	1.84%	4,455	6.63%
2006	1.31	0.35%	4,577	2.74%
2007	1.39	6.22%	4,652	1.64%
2008	1.27	-8.18%	4,686	0.73%
2009	1.28	0.66%	4,726	0.85%
2010	1.29	0.95%	4,724	-0.04%
2011	1.27	-2.22%	4,747	0.49%
2012	1.19	-5.73%	4,776	0.61%
2013	1.17	-1.47%	4,803	0.57%
2014	1.17	0.08	4808	0.10%
<b>Average</b>	<b>1.31 (2005-2009)</b>			<b>3.44%</b>

The Town serves an estimated 4,368 sewer accounts as of December 2014. The consecutive 5-year average daily flow is 1.67 MGD based on flow records from 2007-2011. Flow records for the past three years were not included in the analysis due to unusual amount of I&I experienced by the sewer system due to intense wet weather. I&I is currently being investigated by the Town. Table 2 lists the flow records at the WWTP.

**Table 2**  
**Wastewater System Growth - 2004 through 2014**

Year	Avg. Daily Flow (MGD)	Flow Annual Growth	Annual Rainfall (Inches)	No. of Customers	Customer Annual Growth
2004	1.64	-18.76%	39	3,723	6.55%
2005	1.60	-2.65%	45	4,009	7.68%
2006	1.67	4.83%	46	4,127	2.94%
2007	1.63	-2.78%	27	4,202	1.82%
2008	1.62	-0.21%	44	4,233	0.74%
2009	1.67	3.06%	49	4,253	0.47%
2010	1.66	-0.56%	39	4,280	0.63%
2011	1.76	5.86%	46	4,303	0.54%
2012	1.67	-5.28%	36	4,332	0.67%
2013	2.03	21.66%	52	4,366	0.78%
2014	2.01	-0.99%	51.6	4368	0.05%
<b>Average</b>	<b>1.67 (2007-2011)</b>				<b>2.91%</b>

For planning purposes, inflow and infiltration (I&I) estimation is very essential. The yearly average of wastewater flow cannot be used. In order to estimate I&I the wastewater/water differentials for three consecutive months have to be analyzed.



The wastewater flow includes both customer sewage (base flow) and I&I. The methodology, which has been utilized, calculates the sewer base flow from the percentage of sewer customers and the flow returning to the wastewater. Approximately 90 percent of water customers are also sewer system customers, and approximately 90 percent of the water delivered returns to the sewer system from each location. The planning flow is then calculated as the base flow plus an allowance for I&I of 1.05 MGD. These calculations are presented in **Appendix G**. I&I allowance was calculated in 2011 based on flow records.

Based on the Average Water Demand, the calculated Average Daily Base sewage base flow is therefore 1.06 MGD. These calculations are presented in **Appendix G**. Using the inflow/infiltration (I/I) flow of 1.05 MGD the current planning average monthly sewage flow is 2.11 MGD.

<b>Planning Water Demand</b>	<b>1.31 MGD</b>
Sewer Customers %	90%
Water to Sewer %	90%
Base Flow	1.06 MGD
I&I	1.05 MGD
<b>Planning Wastewater Flow</b>	<b>2.11 MGD</b>

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#### 4. Existing System Capacity

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The Town's water system permit issued by VDH includes a review of treatment capacity, storage and source of supply capacity. The Town's limiting long range issue is source of supply. The Town's water supplies include two surface water impoundments, Warrenton and Airlie Reservoirs, which have a combined safe yield of 2.27 MGD as determined in 1992 by the State Water Control Board [now the Department of Environmental Quality (DEQ)]. Two groundwater wells #5 and #6 provide an additional 0.076 MGD, which do not require filtration at the WTP for a subtotal of 2.346 MGD. Two additional groundwater wells #3 and #4 are currently not operational, but the Town is in the process of reactivation. The Town of Warrenton has designated 0.30 MGD of the safe yield for drought reserve bringing the total available safe yield to 2.046 MGD.

The Town's water plant has a rated treatment capacity of 3.0 MGD but the source is limited to 2.046 MGD due to safe yield and drought reserve requirements. VDH requires the Owner to develop contract documents when the waterworks reaches its rated capacity of 80% for three consecutive months. The Town's wastewater treatment plant has a permitted capacity of 2.5 MGD. DEQ requires an upgrade plan when wastewater flows exceed 95% of the rated capacity, 2.375 MGD, for three consecutive months.

#### Planning Limits for the Warrenton System

Water Demand Capacity	2.046 MGD
Wastewater Flow Capacity	2.375 MGD

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## 5. Projected Water & Sewer System Demands

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The future demands for water and sewer were projected based upon current development plans and potential development within the area served by the Town. The potential residential development was based on existing zoning and densities. Unit water demands were applied to each lot at the rate of 300 gpd per equivalent residential connection (ERC) used for residential demands and 700 gpd per acre used for commercial, industrial and public/semi-public properties. Base wastewater flows were estimated at 90% of these water demand amounts, yielding 270 gpd per ERC and 630 gpd per acre commercial properties. These unit flows are consistent with prior projections.

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### Unit Flow Demands

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Water Residential	300 gpd/ERC
Water Commercial	700 gpd/Acre
Wastewater Residential	270 gpd/ERC
Wastewater Commercial	630 gpd/Acre

The potential development in the committed water and sewer service areas were classified in to two main categories, In-Town Properties and Out of Town Commitment Properties. The In-Town section was further broken into two subcategories, Undeveloped Lots and Potential Redevelopment Lots. The following figures list the future demands for each category of development. The corresponding appendices include the data and the demand/flow calculations for the individual properties shown on each figure.

**Figure 1** - Properties that are either under construction, have an approved site plan, or are currently submitted and are under review.

**Figure 2** - In-Town Undeveloped Properties.

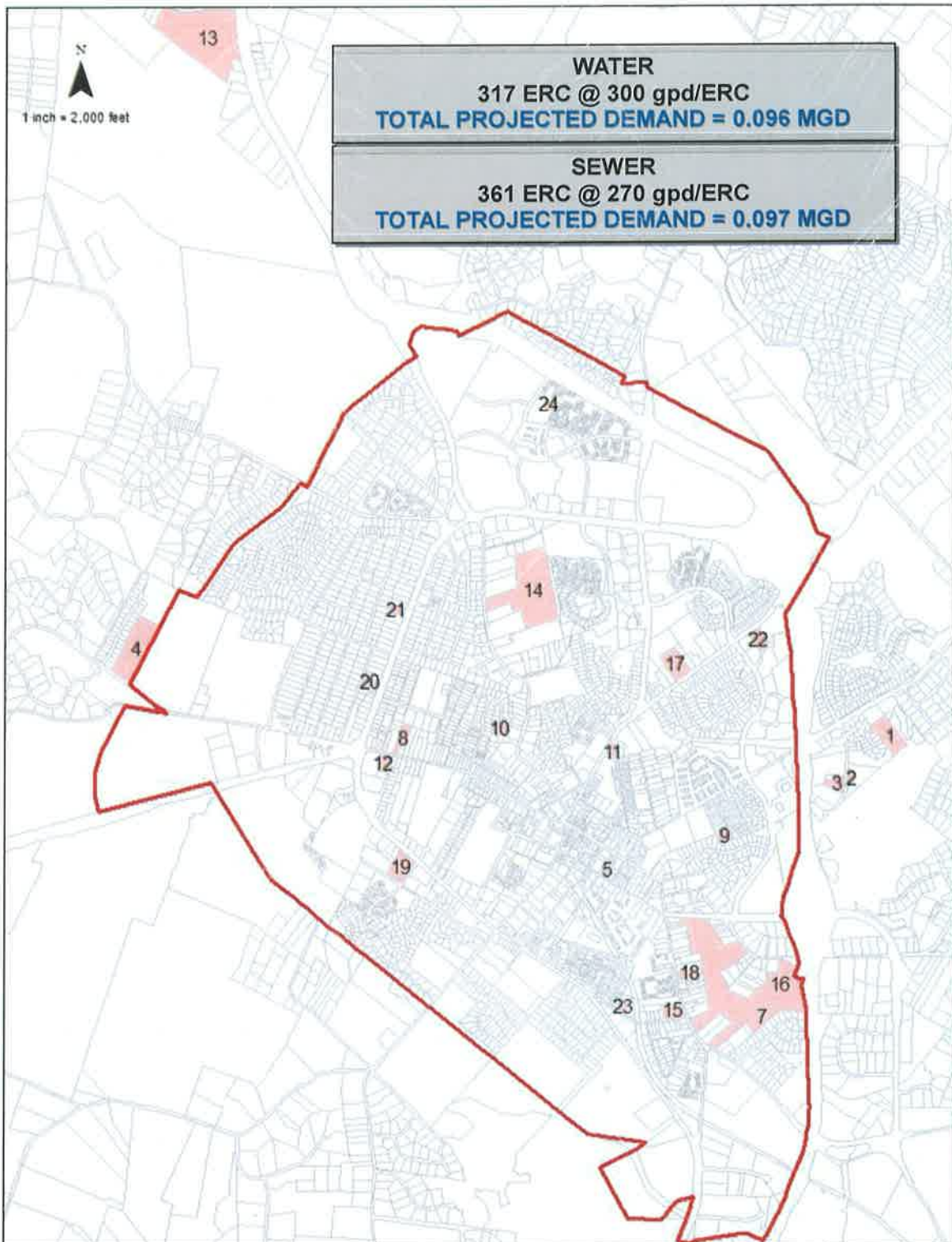
**Figure 3** - Potential Redevelopment Properties within the Town

**Figure 4** - Out of Town Water Commitment Properties

**Figure 5** - Out of Town Sewer Commitment Properties



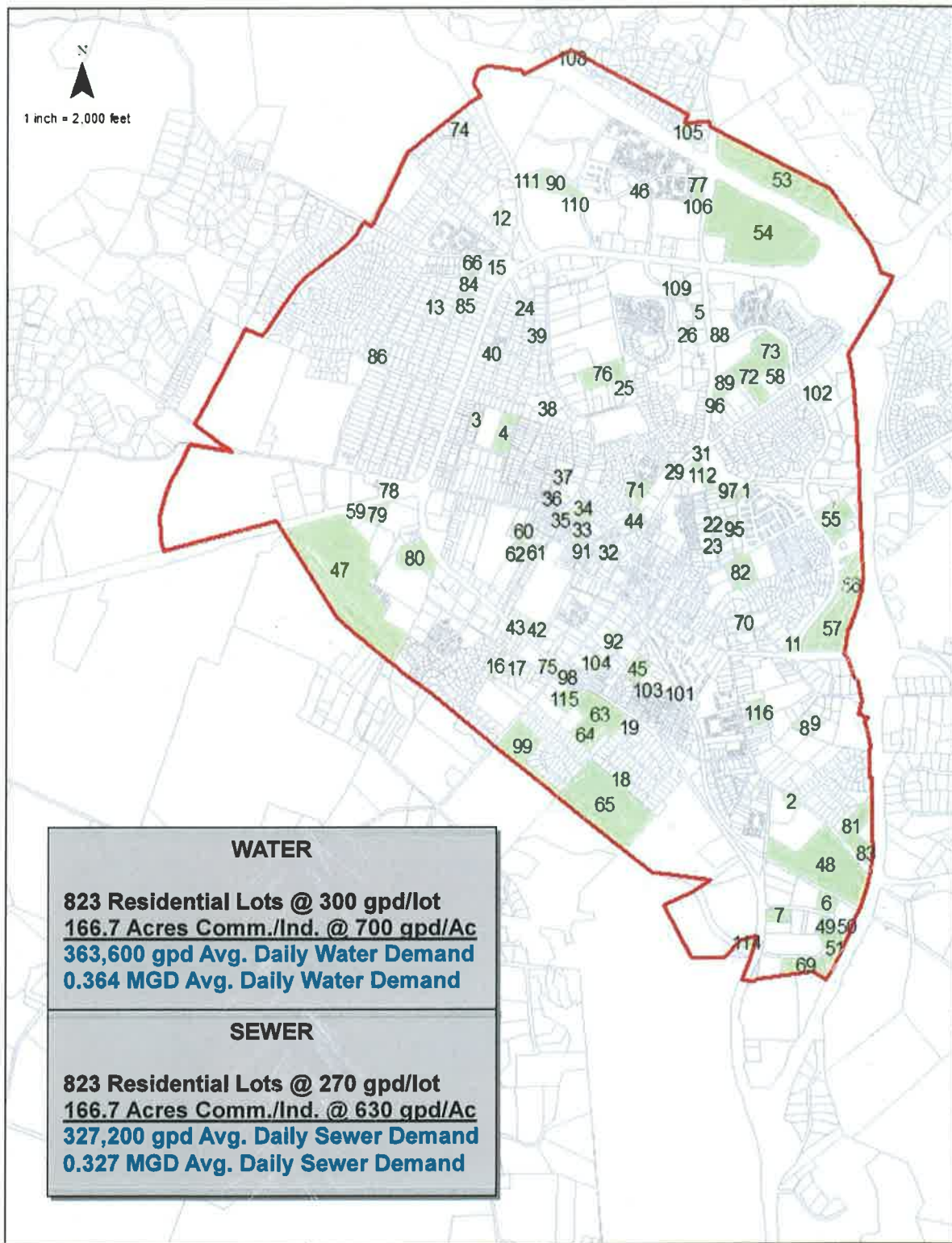
Figure 1  
2015 Site Plans Approved or Under Review



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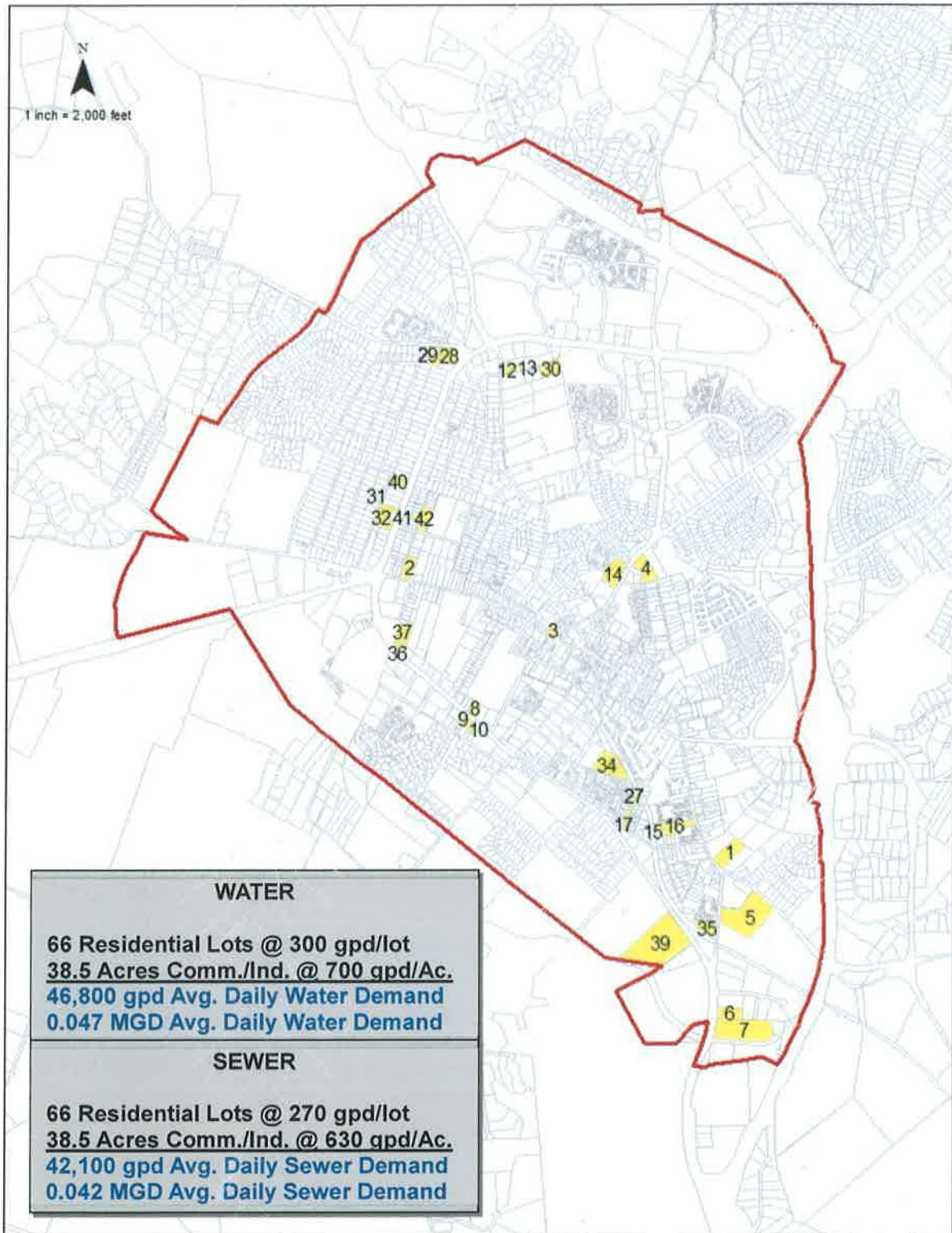
Baltimore, MD • Georgetown, DE • Wilmington, DE • Ellsworth, ME • Philadelphia, PA • Pittsburgh, PA • York, PA • Houston, TX  
Blacksburg, VA • Fairfax, VA • Fredericksburg, VA • Lynchburg, VA • Newport News, VA • Richmond, VA • Virginia Beach, VA

Figure 2  
2015 In-Town Undeveloped Properties

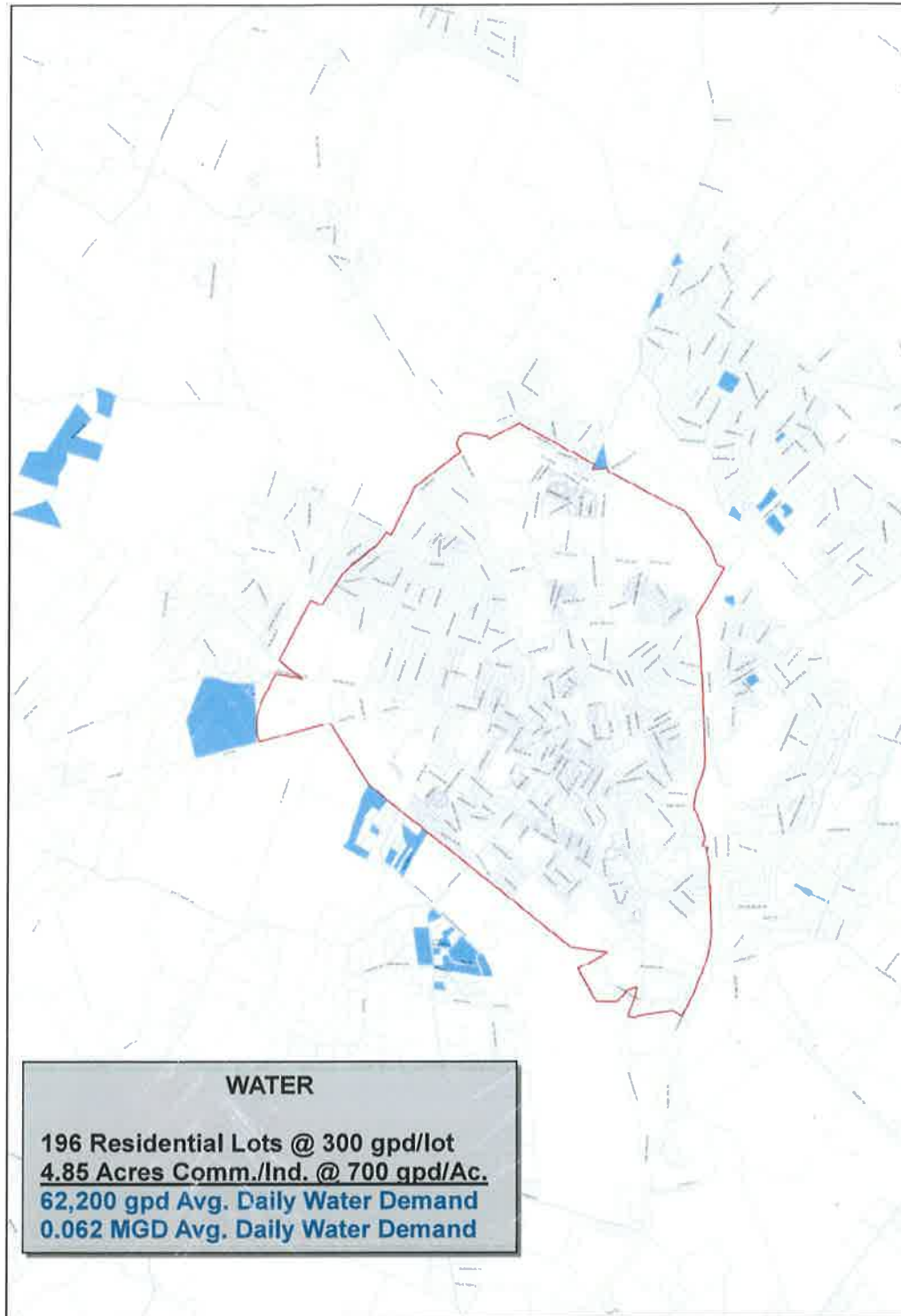




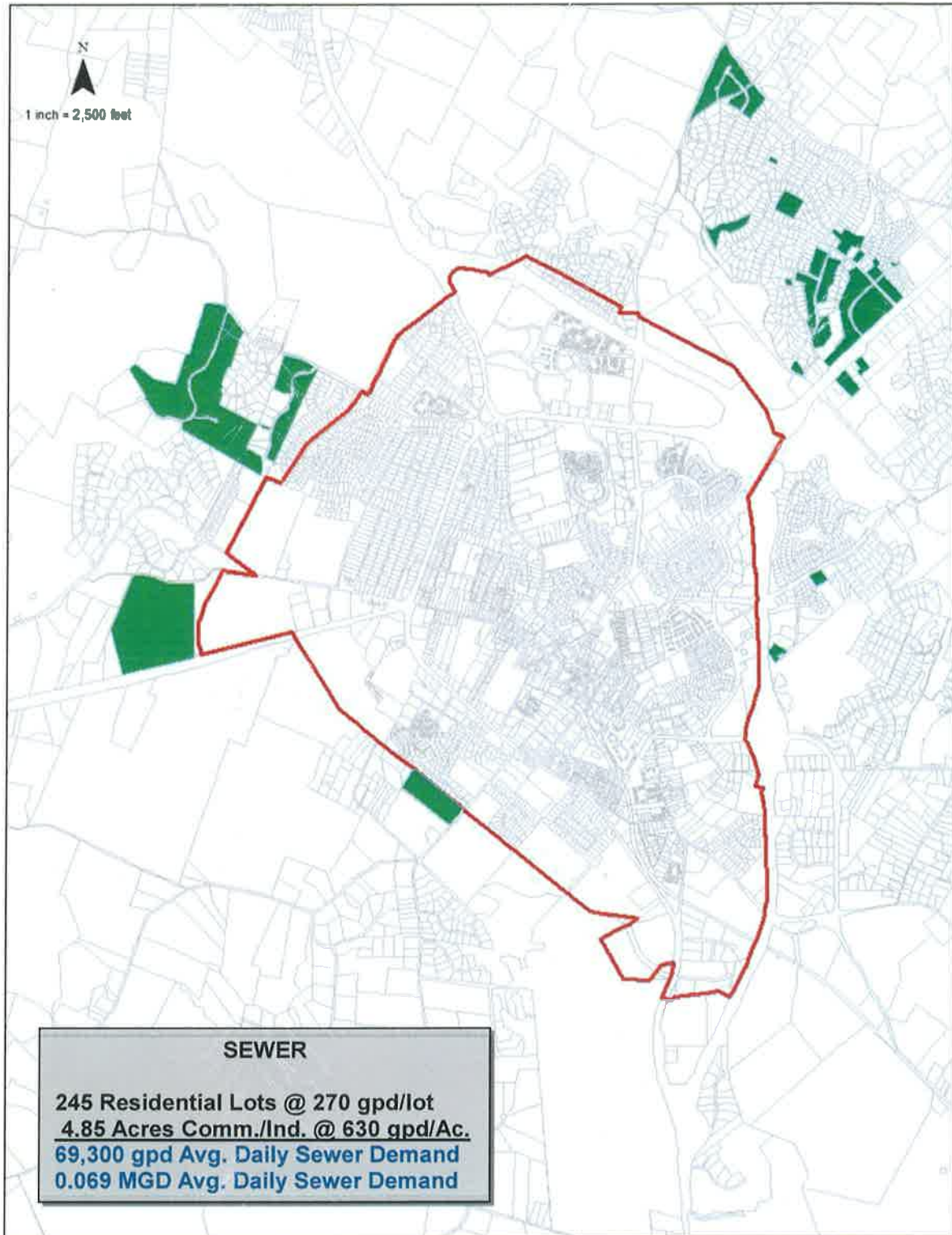
**Figure 3**  
**2015 Redevelopment Potential**



**Figure 4**  
**2015 Out of Town Potential Water Customers**



**Figure 5**  
**2015 Out of Town Potential Sewer Customers**





At buildout of the committed water service area, the projected average daily water demand is 1.88 MGD which is at approximately 92% of the safe yield and drought reserve capacity of the available water resources. The maximum day water demand is 2.83 MGD. The components of the total demand at buildout are summarized in **Table 3**. Detailed calculations are presented in **Appendix F**.

**Table 3**  
**Projected Buildout Water System Demands**

Review Area	Water Demand (gpd)
Currently proposed development	96,000
In Town - Vacant Lot Development	363,600
In Town - Redevelopment Potential	46,800
County - Unserviced Lots Within Commitment Area	62,200
<b>Buildout Estimated Additional Water Demand</b>	<b>568,600</b>
Current Average Day Demand	1,309,432
<b>Buildout Estimated Water Demand</b>	<b>1,878,032</b>
Available Safe Yield (Average Day from Sources)	2,046,667

At buildout of the committed sewer service area, the projected average monthly wastewater flow is 2.65 MGD which exceeds the 95% ADF flow capacity to 106% of the WWTP capacity. The components of the total sewage flow at buildout are summarized in **Table 4**. Detailed calculations are presented in **Appendix G**.

**Table 4**  
**Projected Buildout Sewer System Flows**

Review Area	Sewer Flow (gpd)
Currently proposed development	97,470
In Town - Vacant Lot Development	327,200
In Town - Redevelopment Potential	42,100
County - Unserviced Lots Within Commitment Area	69,300
<b>Buildout Estimated Additional Sewer Demand</b>	<b>536,070</b>
Current Average Day Demand	2,110,640
<b>Buildout Estimated Sewer Demand</b>	<b>2,646,710</b>
WWTP Capacity (95% ADF)	2,375,000

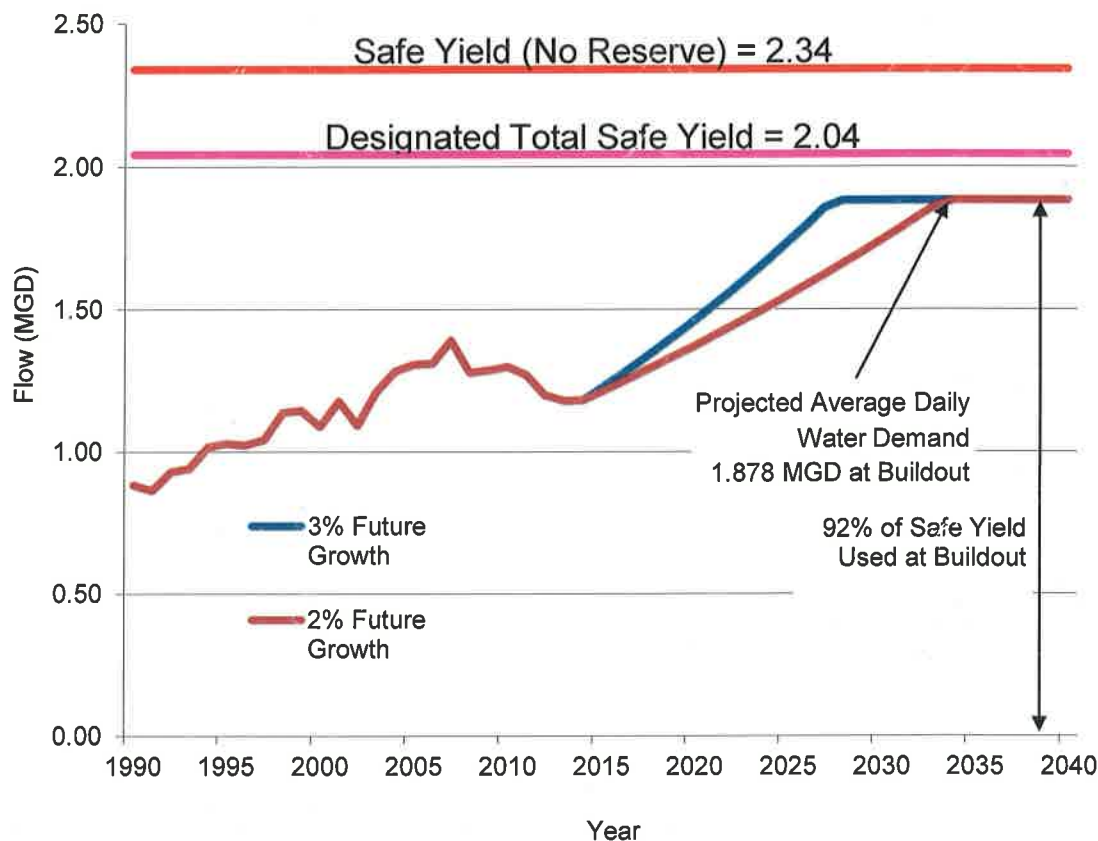


## 6. Growth Projections

The Town of Warrenton system accounts were growing in the early 2000's at over 5% per year. The recent growth has slowed considerably as the economy has slowed. Future growth has been estimated in the range of long term growth rates for the Town at 2% and 3% annually. Actual growth rates will vary and may change the year of buildout, however the projected buildout demands or flows will not change.

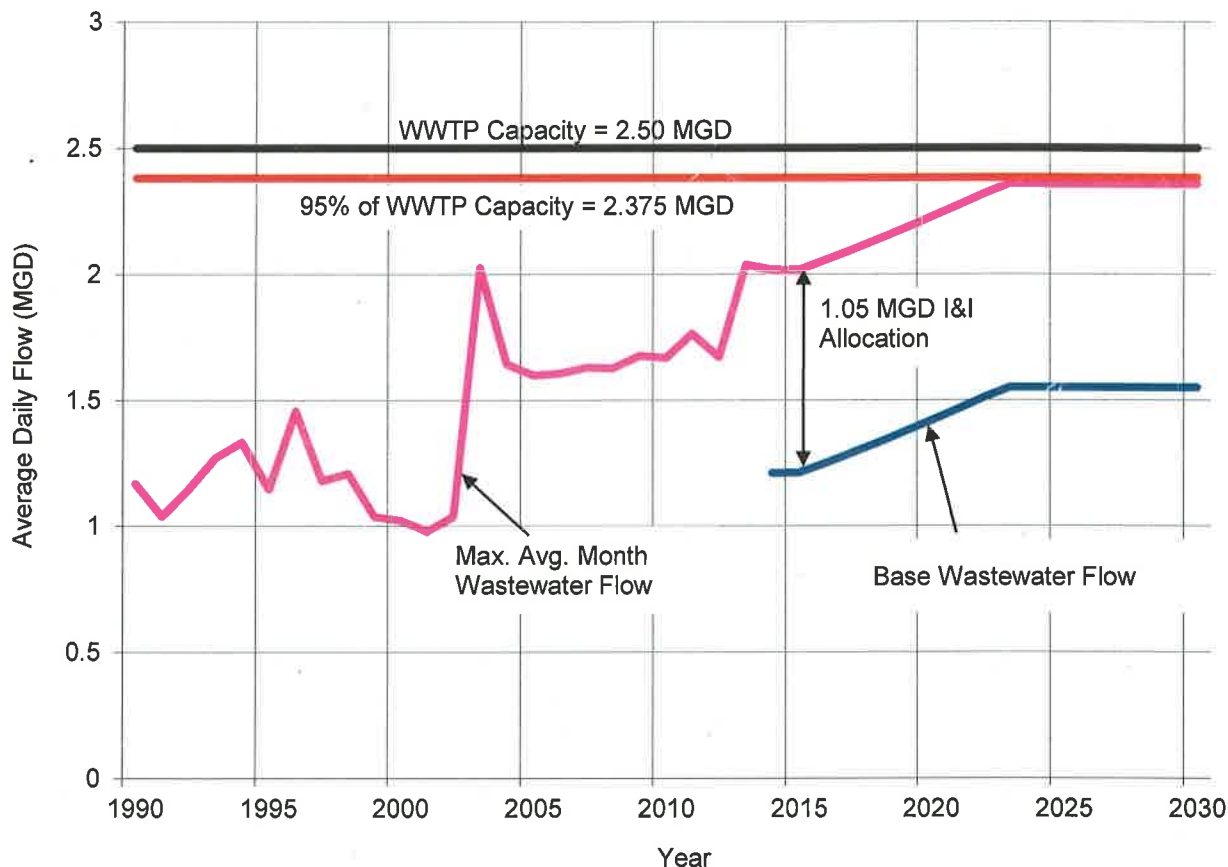
For this analysis, assuming buildout at 92% of the safe yield and drought contingency reserve (i.e. 1.878 MGD), the Town will reach the buildout water system demand in 2028 at 3% growth and 2033 at 2% growth. This is shown in **Figure 6** below.

**Figure 6**  
**Water System Growth and Safe Yield**



Sewer flows are projected to reach buildout in 2024 at a 3% growth rate. **Figure 7** illustrates the projected sewer system growth in average daily and maximum month demands. For this analysis, buildout is assumed to be just below the 95% percent capacity limit of the WWTP (i.e. 2.375 MGD).

**Figure 7  
Wastewater Flow Projections**



## 7. Additional Considerations

The capacity analysis for water takes into account the combined safe yield from all sources and its reduction due to drought contingency reserve limits. The combined safe yield of the available water sources is currently at 2.346 MGD which is reduced to 2.046 MGD due to the drought contingency reserve of 0.30 MGD instituted by the Town. For planning purposes, this drought contingency has been viewed as an additional level of protection. It is a reserve that can be utilized if the Town is willing to take that risk. If utilized, the average day demand would account for only 80% of the safe yield capacity of the available water resources.

Additionally, Well #3 and Well #4 have been out of service due to the presence of radio-nuclides which present a separate set of operational and treatment challenges. These wells can be brought online to provide an additional 0.315 MGD to the water system. The Town has the option to treat this water at the

source or divert it to the treatment plant, since the treatment plant has the capacity to treat this additional source. If considered this could boost the safe yield and drought contingency reserves from 2.04 MGD to 2.361 MGD (80%) or 2.661 MGD (i.e. 71%) if the drought contingency reserve requirement is eliminated.

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## 8. Summary Analysis and Recommendations

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### Water:

- The buildout Average Water demand with current assets is at 92% of the allowable water demand capacity based on the safe yield and drought contingency reserve of 2.04 MGD. This percentage can be lowered to 80% if the drought contingency reserve limit is removed. In addition, if Well #3 and #4 are brought online, this can be lowered even further to 71%.
- The Town needs to develop a policy to meet additional water commitments by revisiting the drought contingency reserve. The recommendations presented in the 2010 strategic water supply plan of reactivating Well #3 and #4 as a treated source or reservoir recharge, and evaluating the potential and practicality of adding capacity to the Warrenton reservoir should also be investigated.

### Sewer

- The buildout average sewer flows will reach 106% of the WWTP capacity. DEQ requires an upgrade plan when flows exceed 95% of the rated capacity, 2.375 MGD, for three consecutive months.
- To create flow capacity in the sewer system for the current customers, inflow and infiltration should be continuously investigated and corrected. Permanent flow meters should be installed at key locations in the system. The Town should set a goal to reduce the current I&I in 2-3 years and reduce it by 0.3 MGD. The Town has been conducting a flow monitoring study for the past 8 months. The study needs to be continued and expanded.
- A comprehensive evaluation of the WWTP upgrade is recommended to investigate opportunities to create additional capacity as a contingency if I&I reduction goals cannot be met and possible accommodation of additional sewer commitments.

### General

- New developments without prior water and sewer commitments will increase buildout demands and flows and require system capacity improvements.
- The Town should develop contingency plans for future re-zonings, changes to water and sewer usage patterns, regulatory changes or other system changes.

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- Appendix A:** Properties that are either under construction, have an approved site plan, or are currently submitted and are under review.
- Appendix B:** In-Town Undeveloped Properties.
- Appendix C:** Potential Redevelopment Properties within the Town
- Appendix D:** Out of Town Water Commitment Properties
- Appendix E:** Out of Town Sewer Commitment Properties
- Appendix F:** Water Capacity Calculations
- Appendix G:** Sewer Capacity Calculations

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**Warrenton Water and Sewer Capacity Review**  
 Approved Site Plans and Master Plans

Appendix A

As of Feb 2015

remaining

INDEX REF	SUBDIVISION		UNITS		NOTES			ERCs
	SUBDIVISION	LOCATION	Status	Acres	Parcel	UNITS	Zoned	
13	Fletcherville	17 NORTH	SEWER ONLY PENDING FORCE	26	6975-77-6763	44 PENDING	V	44
17	Harway	Old Alex Pike	Site plan under review.	4	6984-56-8449	7 5/8" METERS	R-10	7
4	Stonecrest	OLD WATERLOO	Stone Crest next to Stone Lea	10	6974-66-4890	17 lots remaining	R-2	17
5	J. Tucker	S 5TH STREET	RESIDENTIAL	0	6984-42-6930		1 CB	1
7	MONROE EST II	MEETZE RD		3	6984-70-2394		6 R-15	6
8	PENNINGTON GRO	WATERLOO ST		2	6984-15-1368		6 R-6-10	6
9	Habitat	Sterling Ct	1 vacant lot left	1			1 R-6	1
10	Brenda Ct	Brenda Ct	UNDER REVIEW	1			2 R-10	2
11	North Alex Pike	North & Alex Pike	Approved 7/21/08	1		9 potential left	CBD	9
12	Middleburg Bank	Waterloo St		1			1 C	1
15	Madison Square	Falmouth / Madison	Preliminary	2			15 RMF	15
16	War Crossing	Oliver City Rd	Preliminary	41			135 R-15	135
3	Millfield	Academy Hill	Site plan under review	2			4 R4P	4
14	Winchester Chase	Winchester		21			71 R-10	71
18	Falmouth Landing	Falmouth St		2	6984-61-0173		3	3
19	Fau H Med Of Bld	Veterans Dr		3	6984-12-0815	2" meter		8
20	Oak V Bnk lot	Broadview Ave		1	6984-06-5261	1 future		1
1	Millfield	Academy Hill	Site plan under review	5			16	16
2	Millfield	Academy Hill	Site plan under review	1			3	3
21	Advance A Parts	Broadview Ave	Site plan under review	1			2	2
22	Lnwvr ph2 lot6	Holiday Ct	Site plan under review	2			1	2
23	Nokesville Bldrs	Madison St	Building Permit process	1			2	2
24	War Manor additn	Hastings Ln	Site plan under review	1			1	5

SEWER ERC Total 361  
 WATER ERC Total 317

As of Feb 2015

Estimation of potential future water and sewer demands to be based on current zoning allowance.

	Zoning	Parcel #	Acreage	Prop. Units	Description
<b>Commercial &amp; Industrial</b>					
88	C	6984-57-5835	1.03		BLACKWELL / WLKR
15	C		1.50		Broadview Ave, Goal LC
26	C		0.66		North Hill Dr
40	C		0.45		Chappell St, Foley
110	C		0.27		Oak Springs Dr, Jefferson
111	C		0.86		Oak Springs Dr, Jefferson
3	C		0.54		Sullivan St
114	C		1.17		Alwington Blvd
44	CBD	6984-44-0404	1.85		SPRING LN
91	CBD	6984-34-1010	0.55		WATERLOO
29	CBD		0.15		John E Mann St, Cannon Prop
30	CBD		0.14		Alex Pike, Cannon Prop
32	CBD		0.04		Waterloo, Harris
45	CG	6984-41-1844	2.41		WASHINGTON ST
46	CL	6985-40-1125	0.43		FLETCHER/OAK SPR
109	CL	6984-48-8559	1.21	COMMERCIAL	ADJ TO RUBY TUES
90	CL	6985-20-8162	5.54		17 NORTH
5	CL		1.15		Blackwell Park
78	CO	6974-94-7967	0.28		551 FROST
<b>TOTAL COMMERCIAL</b>			<b>20.24</b>	<b>Acres</b>	
48	IG	6983-78-1685	26.88		INDUSTRIAL PARK/
49	IG	6983-77-3316	1.95		INDUSTRIAL PARK
50	IG	6983-77-6242	0.66		INDUSTRIAL P HIT
51	IG	6983-76-5917	1.95		INDUSTRIAL P. HI
69	IG	6983-66-9788	5.14	Flood Plain	INDUSTRIAL RD
52	IG	6983-66-9788	1.19		INDUSTRIAL RD
6	IG		2.27		Industrial Rd
102	IG	6984-76-3924	1.18		Holiday Ct LLC
7	IG		2.03		James Mad Hwy The War Ind Park
2	IG		0.98		Old Meetze Rd
53	IL	6985-60-4454	27.51		ROUTE 17 BY-PASS
54	IL	6984-69-2419	41.37		ROUTE 17 BY-PASS
55	IL	6984-74-7300	5.95		WALKER DRIVE
56	IL	6984-73-7494	8.54		WALKER DRIVE
57	IL	6984-72-3635	11.85		WALKER DRIVE
<b>TOTAL INDUSTRIAL</b>			<b>139.45</b>	<b>Acres</b>	
106	PSP	6985-50-1018	0.90		ARBOR CT
80	PSP	6984-03-2517	6.11	Steep Slope	W SHIRLEY
<b>TOTAL PSP, PD</b>			<b>7.01</b>	<b>Acres</b>	
<b>COMBINED COMMERCIAL / INDUSTRIAL / PSP =</b>			<b>166.71</b>	<b>Acres</b>	

**Warrenton Water and Sewer Capacity Review**  
 Undeveloped Properties Within Warrenton - Water and Sewer

**Residential**

61	R-10	6984-24-0072	0.80	3	WEST SHIRLEY
62	R-10	6984-13-9896	1.38	6	WEST SHIRLEY
63	R-10	6984-31-4162	8.66	38	EAST SHIRLEY
64	R-10	6984-30-1806	6.51	28	EAST SHIRLEY
65	R-10	6983-39-5536	28.66	44	OFF MONROE STREE
60	R-10	6984-24-0298	0.89	4	BEACH ST
76	R-10	6984-36-3976	6.49	28	345 WINCHESTER
47	R-10	6974-83-8762	54.11	236	211
59	R-10	6974-94-2535	1.09	5	211
79	R-10	6974-94-4431	2.02	9	500 HOSPITAL DR
96	R-10	6984-56-4337	0.79	3	BLACKWELL
89	R-10	6984-56-6816	4.22	18	BLACKWELL
72	R-10	6984-67-0049	6.81	30	BLACKWELL
73	R-10		6.77	31	COBBS HILL
58	R-10		1.32	6	COBBS HILL
103	R-10	6984-41-2563	0.19	1	WASHINGTON
100	R-10	6984-41-3560	0.18	1	WASHINGTON
101	R-10	6984-41-5434	0.15	1	175 LOCUST
18	R-10		0.30	1	Monroe St, Charles Garrett
19	R-10		0.12	1	Wilson St, William Ford
20	R-10		0.12	1	Wilson St, William Ford
24	R-10		0.43	2	Roebing St, 1st Christ Sci
25	R-10		0.47	2	Richards Dr, Jones Lindsay
31	R-10		0.11	0	Alex Pike, Fletcher
37	R-10		0.31	1	Brenda Ct, Flkeld
38	R-10		0.31	1	Orchard Ln, Autln
39	R-10		0.29	1	Roebing St, Kowalewski
4	R-10		3.90	17	Moser Rd, Methodist Church
112	R-10		2.05	9	High St, Benchoff
115	R-10		2.45	11	Legion Dr.
	<b>R-10</b>		<b>141.88</b>	<b>539.0</b>	
66	R-15	6984-18-2905	0.49	1	NORFOLK/BEARWALL
67	R-15	6984-18-3915	0.35	1	NORFOLK/BEARWALL
68	R-15	6984-18-2709	0.40	1	NORFOLK/BEARWALL
74	R-15	6985-01-9275	0.73	2	FOXCROFT
108	R-15	6985-22-9424	0.63	2	WILLOW CT
105	R-15	6985-41-9244	1.07	3	BLACKWELL RD
107	R-15	6984-18-1770	0.49	1	NORFOLK
84	R-15	6984-18-1640	0.46	1	NORFOLK
85	R-15	6984-18-0480	0.45	1	NORFOLK
86	R-15	6974-97-5360	0.45	1	GAY RD
99	R-15	6984-10-9599	9.48	28	CULPEPER
83	R-15	6983-88-0634	1.63	5	OLD MEETZE
81	R-15	6983-79-8068	6.07	18	OLD MEETZE
8	R-15		1.39	4	Old Mill Ln Dobson
9	R-15		0.45	1	Old Mill, FairFax Oliver
10	R-15		0.38	1	East Lee, Fairfax Dev Corp
11	R-15		0.41	1	East Lee, Fairfax Dev Corp
12	R-15		0.85	2	Fauquier Rd, TBC Corporation
13	R-15		0.22	1	Dover Rd, Kathryn Megby
14	R-15		0.22	1	Dover Rd, Patricia Short
16	R-15		1.28	4	Fisher Ln, Daniel Oconnoll
17	R-15		0.03	0	Fisher Ln, Festus James
	<b>R-15</b>		<b>27.94</b>	<b>80.0</b>	

**Warrenton Water and Sewer Capacity Review**  
 Undeveloped Properties Within Warrenton - Water and Sewer

Appendix B

Residential (continued)

94	R-4	6984-54-7426	0.54		6 BOUNDARY
	<b>R-4</b>		<b>0.54</b>	<b>6.0</b>	
82	R-6	6984-53-9508	5.10	37	
70	R-6	6984-52-9628	0.98	7	
97	R-6	6984-54-5995	0.78	6	
93	R-6	6984-54-6856	0.71	5	
95	R-6	6984-54-7371	0.76	6	
87	R-6	6984-34-0006	0.43	3	
21	R-6		0.16	1	High St, Dana Bowman
22	R-6		0.65	5	High St, Frost Family LLC
23	R-6		0.53	4	High St, Carey Ebert
27	R-6		0.16	1	Liberty St, Morris
28	R-6		0.20	1	Boundary Ln, Artico
33	R-6		0.60	4	N Chestnut, Maybach
34	R-6		0.62	5	Winchester, Maybach
35	R-6		0.24	2	Gaines St, Maybach
116	R-6		2.73	20	Falmouth st.
	<b>R-6</b>		<b>14.64</b>	<b>107.0</b>	
92	RMF	6984-32-6367	1.14	23	GREEN ST
104	RMF	6984-31-3979	0.85	17	GREEN
	<b>RMF</b>		<b>1.99</b>	<b>40.0</b>	
75	RO	6984-21-5963	0.89	4	W SHIRLEY
98	RO	6984-21-7785	0.65	3	E SHIRLEY
41	RO		0.44	2	Jackson St, Foley
42	RO		1.07	5	Keith St, Lindsey
43	RO		0.96	4	W Shirley, Frost Family
	<b>RO</b>		<b>4.01</b>	<b>18.0</b>	
71	RT	6984-44-0899	2.46	17	OFF CONWAY GROVE
77	RT		1.04	7	Blackwell Rd
36	RT		0.24	2	Winchester Mews, Heltzel
113	RT		0.22	2	Benner Dr
1	RT		0.65	5	Benner Dr
	<b>RT</b>		<b>4.61</b>	<b>33.0</b>	
<b>TOTAL POTENTIAL RESIDENTIAL =</b>			<b>823.00</b>		<b>Residential Units</b>

Town of Warrenton Zoning Definitions

CBD	Central Business District	R-15	Residential 15,000 SF
CG	Commercial General	R-10	Residential 10,000 SF
CL	Commercial Limited	R-6	Residential 6,000 SF
IG	Industrial General	RT	Residential Townhouse (7 Units/Ac)
IL	Industrial Limited	RMF	Residential Apartments (20 Units/Ac)
PSP	Public / Semi-Public	RO	Residential Office (Equiv. To R-10)
C	Commercial		

**Warrenton Water and Sewer Capacity Review**  
 Potential Redevelopment Properties Within Warrenton - Water and Sewer

As of February 2015

Estimation of potential future water and sewer demands to be based on current zoning allowance.

	Zoning	Parcel #	Acreage	Prop. Units	Description
<b>Commercial &amp; Industrial</b>					
8	CG	0750	0.92		W. Shirley Ave.
9	CG	8574	0.35		W. Shirley Ave.
10	CG	9433	0.41		W. Shirley Ave.
14	CB	6984-45-4167	2.88		ALEX PIKE & KING
28	CG		1.49		Broad v Bearflow
29	CG		1.12		Broad v Bearflow
31	CG		1.38		Broadview
32	CG		1.12		Broadview
33	CG		0.55		Broadview
34	CG		4.09		Washington
36	CG		0.64		Tolson
37	CG		1.66		
40	CG		0.71		Broadview Old Cecil's
41	CG		0.43		Broadview Backs Up to
3	CBD		0.57		Waterloo S Napoleons
	<b>TOTAL COMMERCIAL</b>		<b>18.32</b>	<b>Acres</b>	
5	IG	69-8183	9.72		Warrenton I. P. - Wire Rope
6	IG	5309	1.99		Warrenton I. P. - Car Dealer
7	IG	5171	8.51		Warrenton I. P. - Lumber Yard
35	IG		1.72		Mld County
1	IG		3.17		Falmouth S
	<b>TOTAL INDUSTRIAL</b>		<b>20.22</b>	<b>Acres</b>	
39	PSP	6983-48-7988	13.77		E. Shirley
	<b>COMBINED INDUSTRIAL, COMMERCIAL &amp; PSP =</b>		<b>38.54</b>	<b>Acres</b>	

**Warrenton Water and Sewer Capacity Review**

Potential Redevelopment Properties Within Warrenton - Water and Sewer

Residential

11	RO	0319	0.30	1	W. Shirley Ave. & Kelth St.
12	RO	5680	0.47	2	WINCHESTER ST
13	RO	7643	0.41	2	WINCHESTER ST
2	RO		1.71	7	Waterloo S
42	RO		1.55	7	Sullivan St, Joe Grimsle
16	RT	6984-50-4544	1.88	13	MADISON ST
15	R-10	6984-50-4544	0.71	3	MADISON ST
17	R-10	6984-40-6668	0.20	1	LINDEN
18	R-10	6984-40-6784	0.14	1	LINDEN
19	R-10	6984-40-7708	0.14	1	LINDEN
20	R-10	6984-40-7833	0.14	1	LINDEN
21	R-10	6984-40-7858	0.14	1	LINDEN
22	R-10	6984-40-7962	0.13	1	LINDEN
23	R-10	6984-40-7996	0.14	1	LINDEN
24	R-10	6984-41-8001	0.14	1	LINDEN
25	R-10	6984-41-8026	0.14	1	LINDEN
26	R-10	6984-41-8141	0.13	1	LINDEN
27	R-10	6984-41-8147	0.17	1	LINDEN
30	R-10		1.75	8	Winchester/Branch
4	R-10		2.74	12	High St, Benchoff

**TOTAL POTENTIAL RESIDENTIAL**

**66**

Town of Warrenton Zoning Definitions

CBD	Central Business District	R-10	Residential 10,000 SF
CG	Commercial General	R-6	Residential 6,000 SF
CL	Commercial Limited	RT	Residential Townhouse (7 Units/Ac)
IG	Industrial General	RMF	Residential Apartments (20 Units/Ac)
IL	Industrial Limited	RO	Residential Office (Equiv. To R-10)
R-15	Residential 15,000 SF	PSP	Public / Semi-Public



**Warrenton Water and Sewer Capacity Review**

Fauquier County Unserved Properties  
 Within Committed Service Area - Water

**WATER in County**

Warrenton has previously committed to providing water service to the following areas of Fauquier County currently not being serviced as of Feb 2015:

**Residential**

Zoning	Parcel #	Acreage	Prop. Units	Description
RC	-02-6474	13.30	1	View Tree Drive
RC	-01-2670	10.22	1	View Tree Drive
RC	6965-91-7314	10.00	1	View Tree Drive
RC	-7320	10.00	1	View Tree Drive
RC	-1976	10.00	1	View Tree Drive
RC	-13-6240	5.87	1	View Tree Drive
RC	6974-49-8614	10.00	2	Bear Wallow Drive
RC	6975-50-1279	12.86	2	Bear Wallow Drive
<b>RC Total</b>			<b>10</b>	<b>Units</b>

Zoning	Parcel #	Acreage	Prop. Units	Description
R-1	6974-68-5882	12.46	12	View Tree Turn
R-1	6974-82-9313	7.71	7	Shipmadilly Lane
R-1	6974-81-6805	1.00	1	Shipmadilly Lane
R-1	6974-81-4443	4.00	4	Shipmadilly Lane
R-1	6974-81-5012	1.00	1	Shipmadilly Lane
R-1	6974-80-7911	1.00	1	Shipmadilly Lane
R-1	6974-91-0515	1.00	1	Shipmadilly Lane
R-1	6974-90-4875	1.40	1	Shipmadilly Lane
R-1	6974-90-7841	1.74	1	Shipmadilly Lane
R-1	6974-90-8515	1.50	1	Shipmadilly Lane
R-1	6974-90-9738	1.13	1	Shipmadilly Lane
R-1	6984-01-1529	3.26	3	Shipmadilly Lane
R-1	6984-01-0284	4.09	4	Shipmadilly Lane
R-1	6984-01-3414	1.00	1	Shipmadilly Lane
R-1	6984-01-2102	0.40	1	Shipmadilly Lane
R-1	6984-95-2640	2.00	2	Academy Hill
R-1	6983-09-5283	1.87	1	Leeton Forest Road
R-1	6983-08-2787	2.50	2	Lee's Ridge Road
R-1	6983-08-3529	1.00	1	Lee's Ridge Road
R-1	6983-08-3338	1.00	1	Lee's Ridge Road
R-1	6983-08-3247	1.00	1	Lee's Ridge Road
R-1	6983-08-3170	2.18	2	Lee's Ridge Road
R-1	6983-07-3993	1.10	1	Lee's Ridge Road
R-1	6983-08-9796	1.17	1	Leeton Forest Road
R-1	6983-08-8427	1.00	1	Hunting Lane
R-1	6983-08-9488	1.00	1	Hunting Lane
R-1	6983-08-6285	1.00	1	Hunting Lane
R-1	6983-18-1204	1.00	1	Hunting Lane
R-1	6983-18-2344	1.00	1	Hunting Lane
R-1	6983-18-3552	1.00	1	Hunting Lane
R-1	6983-18-4365	1.00	1	Leeton Forest Road
R-1	6983-18-5257	1.00	1	Leeton Forest Road
R-1	6983-18-6177	1.00	1	Leeton Forest Road
R-1	6983-18-8087	1.00	1	Leeton Forest Road
R-1	6983-17-9942	1.00	1	Leeton Forest Road

**Warrenton Water and Sewer Capacity Review**

Fauquier County Unserved Properties  
 Within Committed Service Area - Water

R-1	6983-27-0719	1.00	1	Leeton Forest Road
R-1	6983-27-0654	1.00	1	Leeton Forest Road
R-1	6983-17-7780	1.00	1	Fox Trail
R-1	6983-17-6724	1.00	1	Fox Trail
R-1	6983-17-6977	1.00	1	Fox Trail
R-1	6983-18-4092	1.00	1	Fox Trail
R-1	6983-17-4786	1.00	1	Fox Trail
R-1	6983-17-3728	1.00	1	Fox Trail
R-1	6983-18-3066	1.00	1	Fox Trail
R-1	6983-18-2018	1.02	1	Fox Trail
R-1	6983-17-1880	1.00	1	Fox Trail
R-1	6983-17-0845	1.00	1	Fox Trail
R-1	6983-08-9050	1.00	1	Fox Trail
R-1	6983-07-7892	1.00	1	Lee's Ridge Road
R-1	6983-07-7321	1.35	1	Lee's Ridge Road
R-1	6985-51-1479	1.66	1	Blackwell Road
R-1	6985-51-1767	1.72	1	Blackwell Road
R-1	6985-23-9984	1.11	1	Manor House Drive
R-1	6975-70-0736		1	Bear Wallow Road
R-1	6975-70-0797	0.27	1	Bear Wallow Road
R-1	6975-70-4645	0.25	1	Bear Wallow Road
	6974-62-2223		45	Van Roijen
<b>R-1 Total</b>			<b>129</b>	<b>Units</b>
Zoning	Parcel #	Acreage	Prop. Units	Description
R-2	6985-80-7187	1.29	2	Hunton St.
R-2	6985-90-1007	1.96	3	Warrenton Church of Christ
R-2	6985-90-2124	0.87	1	Warrenton Church of Christ
R-2	6985-90-4299	0.67	1	Warrenton Church of Christ
R-2	6985-90-5480	0.69	1	Warrenton Church of Christ
R-2	6985-90-6591	0.70	1	Warrenton Church of Christ
R-2	6985-90-7682	0.70	1	Warrenton Church of Christ
R-2	6985-90-8760	0.70	1	Warrenton Church of Christ
R-2	6995-01-3113	0.70	1	Lee Hwy Access Road
R-2	6974-78-6956	1.30	2	Foxview Drive
R-2	6985-65-6852		1	Blackwell Road
R-2	6985-66-7045	0.85	1	Blackwell Road
R-2	6985-77-2003	1.14	2	Blackwell Road
R-2	6985-76-8226		1	Airlie Road
<b>R-2 Total</b>			<b>19</b>	<b>Units</b>
Zoning	Parcel #	Acreage	Prop. Units	Description
R-4	6984-94-0653	5.46	15	Millfield Drive
R-4	6984-84-6403	1.78	7	Millfield Drive
R-4	6984-95-5265	5.03	15	Millfield Drive
<b>R-4 Total</b>			<b>37</b>	<b>Units</b>
Zoning	Parcel #	Acreage	Prop. Units	Description
V	6993-09-7817	1.25	1	Fox Haven Lane
<b>V Total</b>			<b>1</b>	<b>Unit</b>
<b>TOTAL RESIDENTIAL</b>			<b>196</b>	<b>Units</b>

**Warrenton Water and Sewer Capacity Review**

Fauquier County Unserved Properties  
Within Committed Service Area - Water

**Commercial**

Zoning	Parcel #	Acreage	Prop. Units	Description
C-2	6984-99-8855	3.30		Comfort Inn Dr
C-2	6995-00-2233	1.55		Comfort Inn Dr

**TOTAL COMMERCIAL            4.85    Acres**

**Public/Semi-Public**

Fauquier County Zoning Definitions

- R-1        Residential, 1 dwelling unit per acre
- R-2        Residential, 2 dwelling units per acre
- R-4        Residential, 4 dwelling units per acre
- RC        Rural, Conservation District
- V         Residential, Village District
- C-2       Commercial - Highway

**Warrenton Water and Sewer Capacity Review**

Fauquier County Unserved Properties  
 Within Committed Service Area - Sewer

**SEWER in County**

Warrenton has committed to providing sewer service to the following areas of Fauquier County currently not being serviced since Feb 2015:

Zoning	Parcel #	Acreeage	Prop. Units	Description
<b>Residential</b>				
RC	6974-49-8614	10.00	2	Bear Wallow Drive
RC	6975-50-1279	12.86	2	Bear Wallow Drive
RC	6974-59-3464	11.90	2	Bear Wallow Drive
RC	6975-50-6340	3.32	1	Bear Wallow Drive
RC	6975-50-7500	0.73	1	Bear Wallow Drive
RC	6975-50-8548	1.91	1	Bear Wallow Drive
RC	6975-50-9707	2.00	1	Bear Wallow Drive
RC	6975-50-9965	2.00	1	Bear Wallow Drive
RC	6975-61-0113	2.00	1	Bear Wallow Drive
RC	6975-61-0360	2.00	1	Bear Wallow Drive
RC	6975-61-1540	2.11	1	Bear Wallow Drive
<b>RC Total</b>			<b>14</b>	<b>Units</b>
Zoning	Parcel #	Acreeage	Prop. Units	Description
R-1	6975-61-3290	1.13	1	Bear Wallow Road
R-1	6975-61-4097	1.01	1	Bear Wallow Road
R-1	6975-60-6905		1	Bear Wallow Road
R-1	6975-60-3875	1.71	1	Bear Wallow Drive
R-1	6975-60-3687	1.45	1	Bear Wallow Drive
R-1	6975-60-3534	1.46	1	Bear Wallow Drive
R-1	6975-60-2377	1.91	1	Bear Wallow Drive
R-1	6975-60-1280	1.63	1	Bear Wallow Drive
R-1	6975-60-0055	2.81	1	Bear Wallow Drive
R-1	6974-59-9426	10.16	10	Bear Wallow Drive
R-1	6974-58-9824	10.07	10	Bear Wallow Drive
R-1	6974-68-5882	12.46	12	View Tree Turn
R-1	6984-84-3085	1.00	1	Millfield Drive - Church
R-1	6984-83-2993	1.00	1	Millfield Drive - Church
R-1	6984-95-2640	2.00	2	Academy Hill Road
R-1	6984-00-7961	12.26	12	Culpeper St.
R-1		2.90	2	Culpeper St.
R-1	4540	23.40	23	Culpeper St.
	6974-62-2223		45	Van Roijen
<b>R-1 Total</b>			<b>127</b>	<b>Units</b>

**Warrenton Water and Sewer Capacity Review**

Fauquier County Unserved Properties  
 Within Committed Service Area - Sewer

Zoning	Parcel #	Acreage	Prop. Units	Description
R-2	6975-70-7346	1.32	1	Bear Wallow Road
R-2	6975-80-0283	1.47	1	Bear Wallow Road
R-2	6975-70-8147		1	Foxview Drive
R-2	6975-70-6142	1.63	1	Foxview Drive
R-2	6974-89-0819	2.63	1	Foxview Drive
R-2	6974-79-6940	1.30	1	Foxview Drive
R-2	6974-79-6724	1.27	1	Foxview Drive
R-2	6974-79-9761	1.08	1	Foxview Drive
R-2	6974-79-9534	1.05	1	Foxview Drive
R-2	6974-79-8324	1.21	1	Foxview Drive
R-2	6974-79-6162	1.60	1	Foxview Drive
R-2	6974-78-6956	1.30	2	Foxview Drive
R-2	6974-78-5774	1.82	1	Foxview Drive
R-2	6974-78-4512	1.06	2	Foxview Drive
R-2	6974-78-3360	1.00	1	Foxview Drive
R-2	6974-68-9224	3.80	7	Foxview Drive
R-2			80	Warrenton Lakes
<b>R-2 Total</b>			<b>104</b>	<b>Units</b>

**TOTAL RESIDENTIAL 245 Units**

**Commercial**

Zoning	Parcel #	Acreage	Prop. Units	Description
C-2	6984-99-8855	3.30		Comfort Inn Dr
C-2	6995-00-2233	1.55		Comfort Inn Dr

**TOTAL COMMERCIAL 4.85 Acres**

Public/Semi-Public

Fauquier County Zoning Definitions

- R-1 Residential, 1 dwelling unit per acre
- R-2 Residential, 2 dwelling units per acre
- R-4 Residential, 4 dwelling units per acre
- RC Rural, Conservation District
- C-2 Commercial - Highway

**Warrenton Water and Sewer Capacity Review**  
 Projected Water System Demand Calculations

Appendix F

**Historic Water Production**

Year	ADF (MGD)	Annual Water Production Growth	Number of Customers	Annual Customer Growth
1990	879,851		2,634	
1991	860,597	-2.19%	2,674	1.52%
1992	925,499	7.54%	2,887	0.49%
1993	936,539	1.19%	2,708	0.71%
1994	1,012,281	8.09%	2,789	3.07%
1995	1,023,993	1.15%	2,821	1.15%
1996	1,018,918	-0.49%	2,800	2.45%
1997	1,037,978	1.87%	2,934	1.52%
1998	1,132,086	9.07%	3,025	3.10%
1999	1,139,682	0.67%	3,069	1.45%
2000	1,083,306	-4.95%	3,262	6.29%
2001	1,173,354	8.31%	3,479	6.65%
2002	1,088,300	-7.25%	3,717	6.84%
2003	1,206,455	10.89%	3,954	6.38%
2004	1,277,233	5.87%	4,178	5.67%
2005	1,300,766	1.84%	4,455	6.63%
2006	1,305,302	0.35%	4,577	2.74%
2007	1,386,492	6.22%	4,652	1.64%
2008	1,273,096	-8.18%	4,686	0.73%
2009	1,281,504	0.66%	4,726	0.85%
2010	1,293,735	0.95%	4,724	-0.04%
2011	1,265,019	-2.22%	4,747	0.49%
2012	1,192,536	-5.73%	4,776	0.61%
2013	1,175,027	-1.47%	4,803	0.57%
2014	1,176,015	0.08%	4,808	0.10%
<b>Avg. Annual Increase (1990 - 2014)</b>	<b>19,744</b>	<b>1.46%</b>	<b>91</b>	<b>3.44%</b>
Highest Average Daily Water Produced in 5 years =	<b>1,309,432 gpd (2005-2009)</b>			

**Warrenton Water and Sewer Capacity Review**  
 Projected Water System Demand Calculations

Appendix F

**Peaking Factor**

Based on the historic data, the peaking factor (Ave Day to Max Day) is 1.50  
 Potential Max Day Demand **1,964,148** gpd

**Surface Water Sources**

Warrenton has two water surface reservoirs, Warrenton and Airlee Reservoir.

Airlee Reservoir Safe Yield	1,160,000 gpd	
Warrenton Reservoir Safe Yield (downstream of Airlee)	1,140,000 gpd	
Combined Safe Yield Only	2,270,000 gpd	(sum total less due to seepage and evaporation)
Drought Reserve	300,000 gpd	
Available Safe Yield	1,970,000 gpd	

**Groundwater Water Sources**

Warrenton has two wells in service to supplement the surface water sources. These wells have been in continuous operation for many years with no

Well #3 Current Not Operational			
Well #4 Currently Not Operational			
Well #5 Current Operating Flow Rate =	1,500,000 gal/month =	50,000 gpd =	70 gpm (12 hr operation)
Well #6 Current Operating Flow Rate =	800,000 gal/month =	26,667 gpd =	38 gpm (12 hr operation)
Combined Well Flow Rate =	2,300,000 gal/month =	76,667 gpd	
<b>Current Combined Source Availability =</b>		<b>2,046,667 gpd</b>	

**Current WTP Capacity**

Current WTP Capacity = 3,000,000 gpd

**Warrenton Water and Sewer Capacity Review**  
 Projected Water System Demand Calculations

Appendix F

**Water Demand by Currently Proposed Developments**

Number of currently proposed ERC = 317 Units  
 Current Proposed Development 96,000 gpd (300 gpd/residence)

**Future Maximum Day Water Production**

Max. Avg. Daily Water Availability (Safe Yield) = 2,046,867 gpd (Surface and Groundwater)  
 Town AVG Yearly Water Use is currently at 1,309,432 gpd (2005-2008)

**Current Remaining Water System Capacity = 737,235 gpd**

**Estimated Buildout of Town & Ex. County Commitments**

<b>In Town - Vacant Lot Development</b>			
Residential Demands	246,900 gpd	823 Potential Residential Lots @	300 gpd/residence
Commercial/Industrial Demands	116,700 gpd	166.7 Acres Commercial/Industrial @	700 gpd/acre
<b>In Town - Redevelopment Potential</b>			
Residential Demands	19,800 gpd	66 Net Potential Residential Lots @	300 gpd/residence
Commercial/Industrial Demands	27,000 gpd	38.54 Acres Commercial/Industrial @	700 gpd/acre Increase
<b>County - Unserved Lots Within Commitment Area</b>			
Residential Demands	58,800 gpd	198 Potential Residential Lots @	300 gpd/residence
Commercial/Industrial Demands	3,400 gpd	4.85 Acres Commercial/Industrial @	700 gpd/acre

Subtotal - Additional Water Demand at Buildout = 472,800 gpd

**Total Estimated Average Water Demand at Buildout of Town & Committed County Area = 1,878,032 gpd** 92%

**Estimated Remaining Future Water Capacity = 168,635 gpd** Compared to Safe Yield

Max Day Peaking Factor = 1.5  
 Max Day Demand (Buildout) = 2,817,048 gpd  
 Min. Future WTP Capacity = 2,740,382 gpd (To serve only Buildout of Town & Committed County Areas) 91%  
 Optimized WTP Capacity = 3,000,000 gpd (Correlated with designated safe yield from all sources)



**Warronton Water and Sewer Capacity Review**  
 Projected Water System Demand Calculations

Appendix F

**Growth Projections**

Year	ADF (gallons)	ADF (MGD)	Annual Water Production Growth	Number of Customers	Annual Customer Growth
1990	879,851	0.88		2,834	
1991	880,587	0.88	-2.19%	2,874	1.52%
1992	925,499	0.93	7.54%	2,687	0.49%
1993	936,539	0.94	1.18%	2,708	0.71%
1994	1,012,281	1.01	8.09%	2,789	3.07%
1995	1,023,993	1.02	1.15%	2,821	1.15%
1996	1,018,918	1.02	-0.49%	2,890	2.45%
1997	1,037,978	1.04	1.87%	2,934	1.52%
1998	1,132,098	1.13	9.07%	3,025	3.10%
1999	1,139,882	1.14	0.67%	3,089	1.45%
2000	1,083,306	1.08	-4.95%	3,282	6.29%
2001	1,173,354	1.17	8.31%	3,479	6.65%
2002	1,086,300	1.09	-7.25%	3,717	6.84%
2003	1,206,455	1.21	10.88%	3,954	6.38%
2004	1,277,233	1.28	5.87%	4,176	5.67%
2005	1,300,766	1.30	1.84%	4,455	6.63%
2006	1,305,302	1.31	0.35%	4,577	2.74%
2007	1,386,492	1.39	6.22%	4,652	1.64%
2008	1,273,098	1.27	-8.18%	4,686	0.73%
2009	1,281,504	1.28	0.66%	4,726	0.85%
2010	1,283,735	1.29	0.95%	4,724	-0.04%
2011	1,285,019	1.27	-2.22%	4,747	0.49%
2012	1,192,538	1.19	-5.73%	4,776	0.61%
2013	1,175,027	1.18	-1.47%	4,803	0.57%
Current	1,178,015	1.18	0.08%	4,808	0.10%
Projected 2015	1,219,267	1.22	3.66%	4,952	3.00%
Projected 2016	1,243,857	1.26	3.66%	5,101	3.00%
Projected 2017	1,309,764	1.31	3.63%	5,254	3.00%
Projected 2018	1,357,049	1.36	3.61%	5,411	3.00%
Projected 2019	1,405,752	1.41	3.59%	5,574	3.00%
Projected 2020	1,455,916	1.46	3.57%	5,741	3.00%
Projected 2021	1,507,565	1.51	3.55%	5,913	3.00%
Projected 2022	1,560,804	1.56	3.53%	6,091	3.00%
Projected 2023	1,615,820	1.62	3.51%	6,273	3.00%
Projected 2024	1,672,080	1.67	3.49%	6,462	3.00%
Projected 2025	1,730,234	1.73	3.48%	6,655	3.00%
Projected 2026	1,790,133	1.79	3.46%	6,855	3.00%
Projected 2027	1,851,828	1.85	3.45%	7,061	3.00%
Projected 2028	1,878,032	1.88	1.42%	7,273	3.00%
Projected 2029	1,878,032	1.88	0.00%	7,491	3.00%
Projected 2030	1,878,032	1.88	0.00%	7,715	3.00%

BUILDOUT

**Warrenton Water and Sewer Capacity Review**  
 Projected Sewer System Demand Calculations

Appendix G

**Historic Sewer Flows**

As Sewage flows are greatly influenced by I/I into the system and water usage, these were analyzed to determine their impact.

Year	ADF (MGD)	Annual Growth	Number of Customers	Annual Customer Growth	Sewage/Water Customers Ratio	Sewage Treated/Water Produced Ratio	Annual Rainfall <small>* DuInches</small>
1990	1.17		2,229		85%	133%	45.93
1991	1.04	-11.17%	2,235	0.27%	84%	121%	38.33
1992	1.15	10.44%	2,249	0.63%	84%	124%	47.36
1993	1.27	10.68%	2,265	0.71%	84%	136%	45.50
1994	1.33	4.69%	2,344	3.49%	84%	132%	48.95
1995	1.15	-13.91%	2,376	1.37%	84%	112%	38.99
1996	1.46	26.94%	2,440	2.69%	84%	143%	53.97
1997	1.18	-18.98%	2,487	1.93%	85%	114%	41.04
1998	1.21	2.54%	2,574	3.50%	85%	107%	47.44
1999	1.04	-14.30%	2,701	4.93%	88%	91%	38.85
2000	1.02	-1.27%	2,815	4.22%	86%	94%	34.97
2001	0.98	-4.27%	3,028	7.57%	87%	84%	35.16 *
2002	1.04	5.95%	3,257	7.56%	88%	95%	38.12 *
2003	2.02	94.41%	3,494	7.28%	88%	167%	65.67 *
2004	1.64	-18.76%	3,723	6.55%	89%	128%	38.69 *
2005	1.60	-2.65%	4,009	7.68%	90%	123%	44.55 *
2006	1.60	0.51%	4,127	2.94%	90%	123%	45.97
2007	1.63	1.40%	4,202	1.82%	90%	117%	27.02
2008	1.62	-0.21%	4,233	0.74%	90%	128%	43.98
2009	1.67	3.06%	4,253	0.47%	90%	131%	48.61
2010	1.66	-0.56%	4,280	0.63%	91%	129%	39.1
2011	1.76	5.86%	4,303	0.54%	91%	139%	46.19
2012	1.67	-5.28%	4,332	0.67%	91%	140%	35.63
2013	2.03	21.66%	4,366	0.76%	91%	173%	52
2014	2.01	-0.99%	4,368	0.05%	91%	171%	51.6

Highest Average Daily Flow (2007-2011) = 1.67 MGD  
 Average Annual Customer Growth (1990 - 2014) = 2.88%

Annual Rainfall Avg. = 43.74 Inches

**Warrenton Water and Sewer Capacity Review**  
 Projected Sewer System Demand Calculations

Appendix G

Repairs to the sanitary sewer system are ongoing in an effort to reduce inflow/infiltration (I/I). Flow quantiles have been reduced in the past few years, although the effectiveness of the repairs is not fully known due to recent drought effects.

Not all water usage is directed to the sanitary sewer system as is apparent from data. The difference between the number of water and sewer customers was about 90%, with a sewer/water ratio of 90%. This yields a base sewer/water ratio of about 81%. We will use this ratio in determining the I/I differential. As the water/sewer customer ratio changes, so will the base sewage flow.

Wastewater Treatment Plant capacity is reviewed on a rolling average for three consecutive month periods and must not exceed 95% of rated capacity. Therefore, instead of using average yearly flow data, the highest adjusted sewer/water differentials for three consecutive months from 2004 to 2014 (i.e. February 2010) were determined and the lowest of the three months was used as a base maximum monthly average I/I amount. This I/I is then added to the estimated base sewage flow for determining the projected maximum monthly average sewage flow. It is to be noted that the data from the years 2012 to 2014 has not been included in this analysis due to an excessive amount of I&I related to unusual weather conditions.

April 2011 Highest 3-Month Average Sewage Flow =	2,099,606 gpd	
Apr 2011 Monthly Average Water Produced =	1,303,717 gpd	
Calculated Base Sewage Flow =	81% of Water Produced (90% S/W Customer Ratio and 90% S/W Flow Ratio)	
	1,056,011 gpd	
Base I/I Flow (for Max. Avg. Flow)	1,043,595 gpd	
(from 2011)		For Calcs Use
	1,050,000 gpd	

<b>Current Potential Sewer Max. Monthly ADF =</b>	<b>2,110,640 gpd (Using Current S/W Customer of 90% and 90% S/W Flow and Base I/I Flow)</b>
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**Future Wastewater Treatment Plant Capacity**

WWTP ADF Capacity =	2,500,000 gpd	
95% of WWTP ADF Capacity =	2,375,000	DEQ Requirement If flows are seen in the range for 3 consecutive months
<b>Current Remaining Sewer Capacity =</b>	<b>264,360 gpd</b>	

**Warrenton Water and Sewer Capacity Review**  
 Projected Sewer System Demand Calculations

Appendix G

**Currently proposed development**

Number of Currently Proposed ERC                      361  
 Current Demands (per ERC)                                      97,470 gpd

Estimated Buildout of Town

**In Town - Vacant Lot Development**

Residential Demands	222,200 gpd	823 Potential Residential Lots @	270 gpd/residence
Commercial/Industrial Demands	105,000 gpd	167 Acres Commercial/Industrial @	630 gpd/acre

**In Town - Redevelopment Potential**

Residential Demands	17,800 gpd	66 Net Potential Residential Lots @	270 gpd/residence
Commercial/Industrial Demands	24,300 gpd	39 Acres Commercial/Industrial @	630 gpd/acre increase

**County - Unserved Lots Within Commitment Area**

Residential Demands	66,200 gpd	245 Potential Residential Lots @	270 gpd/residence
Commercial/Industrial Demands	3,100 gpd	4.85 Acres Commercial/Industrial @	630 gpd/acre

Subtotal - Additional Wastewater at Buildout =                      438,600 gpd

<b>Total Est. Wastewater Generated at Buildout of Town &amp; Committed County Area =</b>	<b>2,646,710 gpd</b>
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Estimated Remaining Sewer Water Capacity =	-271,710 gpd	Compared to 95% ADF Capacity
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**Warrenton Water and Sewer Capacity Review**  
 Projected Sewer System Demand Calculations

Appendix G

**Growth Projections**

Year	ADF (gallons)	ADF (MGD)	Annual Wastewater Growth	Number of Customers	Annual Customer Growth	Capacity (MGD)	95% of Capacity
1990		1.17		2,229		2.5	2.375
1991		1.04		2,235		2.5	2.375
1992		1.15		2,249		2.5	2.375
1993		1.27		2,265		2.5	2.375
1994		1.33		2,344		2.5	2.375
1995		1.15		2,376		2.5	2.375
1996		1.46		2,440		2.5	2.375
1997		1.18		2,487		2.5	2.375
1998		1.21		2,574		2.5	2.375
1999		1.04		2,701		2.5	2.375
2000		1.02		2,815		2.5	2.375
2001		0.98		3,028		2.5	2.375
2002		1.04		3,257		2.5	2.375
2003		2.02		3,494		2.5	2.375
2004		1.64		3,723		2.5	2.375
2005		1.60		4,009		2.5	2.375
2006		1.60		4,127		2.5	2.375
2007		1.63		4,202		2.5	2.375
2008		1.62		4,233		2.5	2.375
2009		1.67		4,253		2.5	2.375
2010		1.66		4,280		2.5	2.375
2011		1.78		4,303		2.5	2.375
2012		1.67		4,332		2.5	2.375
2013		2.03		4,366		2.5	2.375
Current				4,368		2.5	2.375
Projected	2014	2,010,000	0.96	4,368	0.05%	2.5	2.375
Projected	2015	2,010,540	0.96	4,506	3.16%	2.5	2.375
Projected	2016	2,047,865	2.048	4,655	3.30%	2.5	2.375
Projected	2017	2,087,978	2.088	4,808	3.29%	2.5	2.375
Projected	2018	2,129,294	2.129	4,965	3.28%	2.5	2.375
Projected	2019	2,171,851	2.172	5,128	3.27%	2.5	2.375
Projected	2020	2,215,683	2.216	5,295	3.26%	2.5	2.375
Projected	2021	2,260,831	2.261	5,467	3.25%	2.5	2.375
Projected	2022	2,307,333	2.307	5,645	3.24%	2.5	2.375
Projected	2023	2,349,000	2.349	5,827	3.24%	2.5	2.375
Projected	2024	2,349,000	2.349	6,016	3.23%	2.5	2.375
Projected	2025	2,349,000	2.349	6,209	3.22%	2.5	2.375
Projected	2026	2,349,000	2.349	6,409	3.22%	2.5	2.375
Projected	2027	2,349,000	2.349	6,615	3.21%	2.5	2.375
Projected	2028	2,349,000	2.349	6,827	3.20%	2.5	2.375
Projected	2029	2,349,000	2.349	7,045	3.20%	2.5	2.375
Projected	2030	2,349,000	2.349	7,269	3.19%	2.5	2.375