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5.0 PROJECTED WATER DEMAND INFORMATION

As population in the Region increases so will the demand for water. By examining past trends, current conditions, and future projections, a plan can be developed to prepare for future water demands. As required by the Regulations, an analysis of population growth and water demand projections is detailed in the following section of the Plan. Projections of future water demand for the Region are based on existing data from municipalities and population and employment projections from the U.S. Census Bureau and the Virginia Employment Commission (VEC), respectively.

5.1 Population Data

5.1.1 Historical Population and Growth Trends

Past population trends provide a good starting point when estimating future growth and water demands. The U.S. Census Bureau provides historical data for counties and cities only; therefore, it was assumed that the towns in the region have the same rate of change in population as their respective county. The historical population and decennial growth rate percentage for each jurisdiction over the past 40 years is presented in Tables 5.1.1A and 5.1.1B, respectively.

Table 5.1.1A: Historical Population by Jurisdiction

Jurisdiction	Census 1960	Census 1970	Census 1980	Census 1990	Census 2000
Henry County	40,335	50,901	57,654	56,942	57,930
Patrick County	15,282	15,282	17,647	17,473	19,407
Pittsylvania County	58,296	58,789	66,147	55,655	61,745
City of Danville	46,577	46,391	45,642	53,056	48,411
City of Martinsville	18,798	19,653	18,149	16,162	15,416

Table 5.1.1B: Historical Population Growth Rate Percent by Jurisdiction

Jurisdiction	1960-1970	1970-1980	1980-1990	1990-2000	Average
Henry County	26.20	13.27	-1.23	1.74	9.99
Patrick County	0.00	15.48	-0.99	11.07	6.39
Pittsylvania County	0.85	12.52	-15.86	10.94	2.11
City of Danville	-0.40	-1.61	16.24	-8.75	1.37
City of Martinsville	4.55	-7.65	-10.95	-4.62	-4.67

5.1.2 Current Population and Future Population Projections

The current population by jurisdiction based on the U.S. Census Bureau is presented in Table 5.1.2A. Please note that the county populations do not include the towns within their respective county.

Table 5.1.2A: Summary of Population in WPPDC Region Based on 2000 Census

Name of Locality	Population
Patrick County	18,446
Henry County	57,155
Pittsylvania County	57,874
City of Danville	48,411
City of Martinsville	15,416
Town of Chatham	1,338
Town of Gretna	1,257
Town of Hurt	1,276
Town of Ridgeway	775
Town of Stuart	961
Total Population for Region	202,909

The percent change in population for each county was determined by comparing the population in the year 2000 (U.S. Census Bureau) and the estimated population in 2030 (Virginia Employment Commission). Once the percent change in population was determined for each county and city, the percentage was used to project the population through 2060. Please note that the U.S. Census Bureau only provides information for counties and cities; therefore, it was assumed that the average annual percent change in population for the towns was the same as

their respective county. Future population projections through 2060 are presented in Table 5.1.2B.

Table 5.1.2B: Projected Population and Growth Rate by Jurisdiction

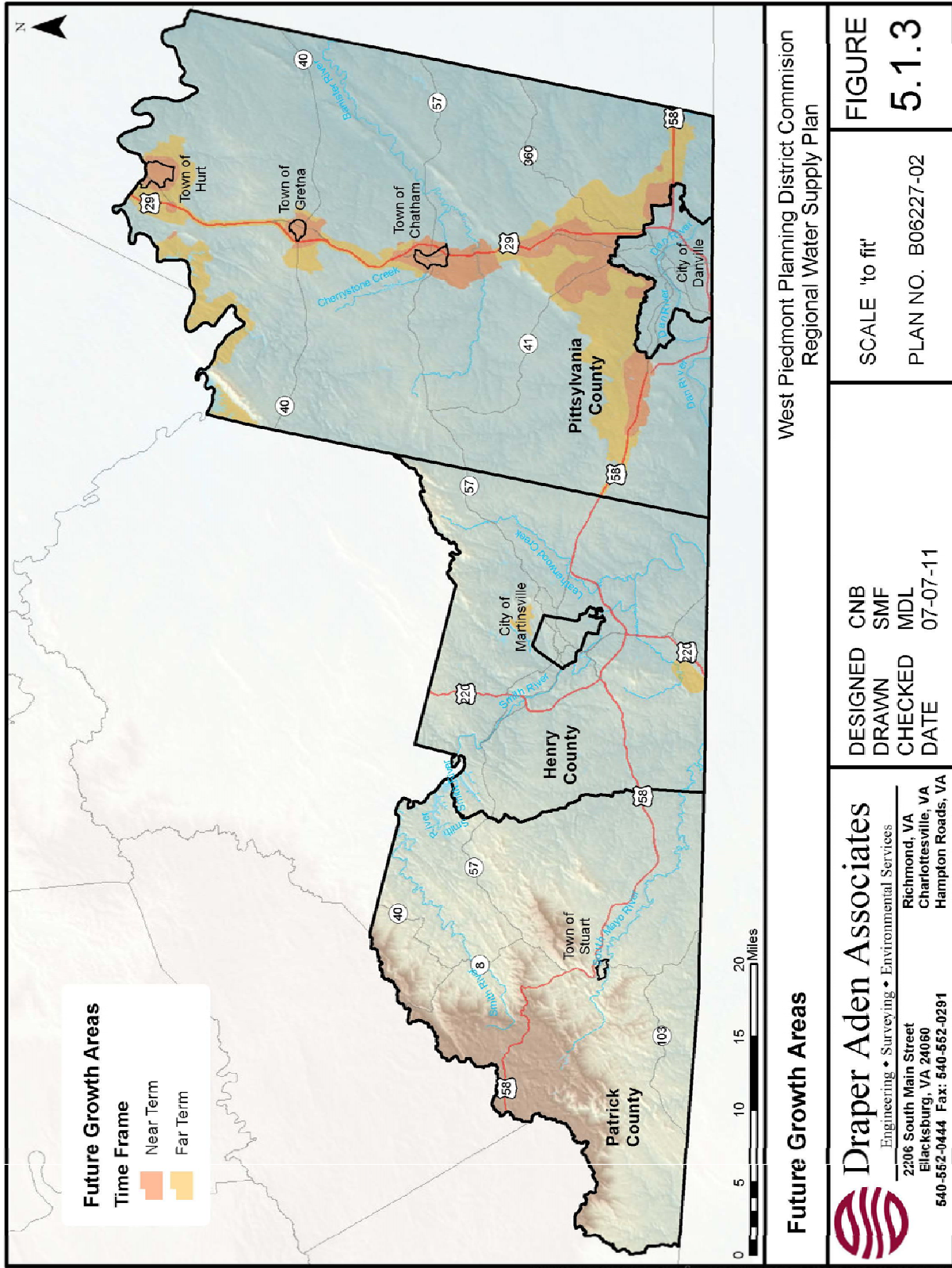
Jurisdiction	2000	2010	2020	2030	2040	2050	2060	Annual Growth %
Henry County	57,930	57,930	57,930	57,930	57,930	57,930	57,930	0.00
Patrick County	19,407	19,407	19,407	19,407	19,407	19,407	19,407	0.00
Pittsylvania County	61,814	62,503	63,200	63,905	64,618	65,339	66,068	0.111
City of Danville	48,411	48,411	48,411	48,411	48,411	48,411	48,411	0.00
City of Martinsville	15,416	15,416	15,416	15,416	15,416	15,416	15,416	0.00

The counties of Henry and Patrick and the cities of Danville and Martinsville are projected to decrease in population. However, a zero percent annual growth was used in the demand projections for these jurisdictions.

5.1.3 Future Growth

The WPPDC planning group recognizes the importance of communication between the water utilities in the region and the planning staff for each jurisdiction. As part of the planning process, discussions with county planning staff to review comprehensive plans and discuss future growth in an effort to make sure the areas the planning staff identified as potential growth areas were the same areas the water utilities identified as future growth and expansion areas. These future growth areas were compared to existing infrastructure, which will aid both the water utilities and planning in evaluating growth areas. By working together, the water utilities and planning staff will be able to determine whether infrastructure expansion is needed and feasible as well as determine areas where it may be difficult to expand infrastructure and where alternative water sources will need to be evaluated. A map showing future growth areas in the region is presented as Figure 5.1.3.

Figure 5.1.3: Map Showing Future Growth Areas in the Region



5.2 Demand Projection Methodology

The annual percent change in population for each jurisdiction was determined by comparing the population in the year 2000 (U.S. Census Bureau) and the estimated population in 2030 (VEC). Once the percent change in population was determined, that percentage was used to project the population through the year 2060. The percent change in population was then used to project water demand by applying it to water demands that are influenced by changes in population such as residential demand. For jurisdictions where a population decrease was anticipated, a projection of zero growth was assumed.

For demand categories that are more influenced by changes in employment, such as commercial and industrial demands, the annual projected average percent change in employment (per the VEC) was used.

5.2.1 Public Community Water Systems

Population estimates within the planning area served by each existing community water system were supplied by the jurisdiction or VDH. The current total demand was provided by the jurisdiction or VDEQ. In addition, the jurisdiction provided water demand disaggregated into the following categories of use when available:

- Residential
- Commercial, institutional and light industrial
- Heavy Industrial
- Military
- Water used in water production processes
- Unaccounted for water losses
- Sales to other community water systems
- Other

When the jurisdiction did not provide disaggregate information, assumptions were made in order to calculate the demand for each category and are presented in more detail in the demand projections calculations in Appendix D.

In order to project the demand for public community water systems, the average annual percent change in population from 2000 to 2030 was applied to the residential demand. Then the Commercial, institutional, industrial, military, production process, unaccounted-for-water, sales

and other demand projections were established by applying the annual average percent change in employment from 2002 to 2012 to the current demand for each category. The annual average percent change in employment was applied since these categories are more likely influenced by changes in employment.

For each town it was assumed that the residential demand increased at the same rate of the annual average percent change in population. When calculating the annual average percent change in population for a town, it was assumed that the town's population will increase at the same rate as the respective county since the U.S. Census Bureau does not provide data for towns. In addition, it was assumed that towns have the same rate of change in employment as their respective county.

Once the demands were projected through 2060 in each category, all of the demands are summed to give the total annual average demand for each public water system. The peak monthly demand and the average monthly demand were provided by each jurisdiction and used to calculate a peaking factor. The peaking factor was then applied to the annual average demand and projected through 2060. When the locality did not provide the peak monthly demand, a peaking factor of 1.2 was assumed.

To account for the unanticipated arrival of unique large demand users (e.g., a bottling plant like Coca-Cola, which uses approximately 135 MG), it will be assumed that a new bottling plant will begin operation every ten years until 2060.

5.2.2 Private Community Water Systems

In order to project the future demands for private community water systems the annual average percent change in population was applied to the total demand from all of the private community systems in each jurisdiction. Since these water systems are serving a community, it is assumed that the growth in these areas will be the same as the percent change in population for the jurisdiction.

5.2.3 Self-supplied, non-agricultural greater than 300,000 gallons per month

In order to project the future demands for self-supplied, non-agricultural users the annual average percent change in employment was applied to the total demand from each of these users for each jurisdiction.

5.2.4 Self –Supplied, agricultural users using greater than 300,000 gallons of water per month

Information on individual agricultural users using greater than 300,000 gallons of water per month was very limited or unavailable. Agricultural information for each county was collected from the USDA NASS 2002 Census of Agriculture. General information on livestock (e.g., number of head of cattle) and crops (e.g., type of crop planted) was available and was used to make a general estimate of water used by self-supplied, agricultural users in the region. Agriculture in the region is not expected to increase in the future and in many areas of the region will likely decrease as growth occurs. To be conservative agricultural projections were maintained at the current rate throughout the planning period.

5.2.5 Self-supplied, individual well users using less than 300,000 gallons of water per month

To determine an estimate of residences and businesses that are self-supplied and served by individual groundwater wells withdrawing less than 300,000 gallons per month, the population served by both public and private community water systems was determined. Population served by public community water systems was provided by the jurisdiction or VDH. Population served by private community water systems was provided by VDH. The total population for each jurisdiction was provided by the 2000 U.S. Census Bureau.

A summary of the population served by individual wells by jurisdiction is included in Table 5.2.5. The population served by individual wells was estimated by subtracting the population served by public and private community water systems from the total population. It is important to note that the total county populations do not include the towns within the respective county. In addition, many of the towns serve areas in their respective county that are outside the city/town limits. The population served by the respective public community water system outside the city/town limits and in the respective county is included in the ‘Population Served by Public CWS’ for the respective county. For example, the total population for the Town of Chatham in 2000 was approximately 1,338 people. The Town of Chatham public community

water system serves approximately 2,500 people. The additional 1,162 people served by the Town of Chatham public community water system are located in Pittsylvania County and were included in the ‘Population Served by Public CWS’ for Pittsylvania County in Table 5.2.5.

Table 5.2.5: Estimated Population Served by Individual Residential Wells by Jurisdiction

Jurisdiction	Total Population	Population Served by Public CWS	Estimated Population Served by Private CWS	Estimated Population Served by Individual Wells
Henry County*	57,155	31,501	472	25,182
Patrick County*	18,446	0	110	18,336
Pittsylvania County*	57,874	16,136	461	41,277
City of Danville	48,411	46,988	0	1,423
City of Martinsville**	15,416	15,416	0	0
Town of Chatham***	1,338	1,338	0	0
Town of Gretna***	1,257	1,257	0	0
Town of Hurt***	1,276	1,276	0	0
Town of Ridgeway	775	775	0	0
Town of Stuart	961	921	0	40
Total	202,909	115,652	1,175	86,082

* Total county population does not include the towns within the respective county.

**The City of Martinsville serves portions of Henry County. The population served by the City of Martinsville in Henry County is included in the 'Population Served by Public CWS' for Henry County.

***The towns of Chatham, Gretna, and Hurt serve portions of Pittsylvania County. The population served by each town in Pittsylvania County is included in the 'Population Served by Public CWS' for Pittsylvania County.

Water used by self-supplied, individual well users was estimated based on the assumption of 75 gallons of water per day per person. Future demands were then projected by applying the average annual percent change in population for each jurisdiction.

5.3 Amendments to Methodology

5.3.1 Henry County

Henry County’s population is expected to decrease; therefore, it was assumed demand projections based on population will remain constant.

In addition, the unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for Henry County.

5.3.2 Patrick County

Patrick County's population is expected to decrease; therefore, it was assumed demand projections based on population will remain constant.

In addition, the unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for Patrick County.

5.3.3 Pittsylvania County

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for Pittsylvania County.

5.3.4 City of Danville

The City of Danville's population is expected to decrease; therefore, it was assumed demand projections based on population will remain constant.

In addition, the unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the City of Danville.

5.3.5 City of Martinsville

The City of Martinsville's population is expected to decrease; therefore, it was assumed demand projections based on population will remain constant. In addition, it was assumed that the City of Martinsville's water sales will remain constant.

5.3.6 Town of Chatham

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Chatham.

5.3.7 Town of Gretna

Based on information provided by the Town of Gretna on February 18, 2009, the projected future increase in sales demand was estimated as follows:

- ◆ From 2006 through 2010, the annual average percent change in employment of 0.907% was used; and
- ◆ From 2011 through 2060, annual rate of 5.68% was used to account for the implementation of the following projects:
 - 140 acre expansion of the Gretna Industrial Park – estimated increase in annual flow of approximately 51 MG by 2060
 - Water service extensions by the PCSA west along Route 40 and west of Route 29 bypass – estimated increase in annual flow of approximately 45 MG by 2060.

In addition, the unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Gretna.

5.3.8 Town of Hurt

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Hurt.

5.3.9 Town of Stuart

Patrick County's population is expected to decrease; therefore, it was assumed demand projections based on population will remain constant.

The unanticipated arrival of a unique large demand user (e.g., a bottling plant like Coca-Cola) was not included in the projections for the Town of Stuart.

5.4 Projected Water Demand Results

5.4.1 WPPDC

The total projected demand for each jurisdiction through 2060 is presented in Table 5.4.1.

Table 5.4.1: Total Projected Water Demand by Jurisdiction

Jurisdiction	Total Projected Demand for WPPDC (MG/Year)					
	2010	2020	2030	2040	2050	2060
Henry County*	2,723	2,811	2,908	3,014	3,129	3,256
Patrick County	979	998	1,019	1,041	1,066	1,094
Pittsylvania County	4,286	4,302	4,318	4,335	4,352	4,369
City of Danville	2,695	2,868	3,058	3,265	3,491	3,739
City of Martinsville	853	1,019	1,187	1,359	1,534	1,713
Town of Chatham	154	161	168	176	184	193
Town of Gretna	76	84	95	114	144	193
Town of Hurt	37	38	39	41	43	44
Town of Stuart	115	118	122	126	129	134

*Town of Ridgeway included in Henry County projections.

5.4.2 Henry County

The projected water demands for the public community water systems in Henry County are presented in Figure 5.4.2A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Henry County are presented in Figure 5.4.2B. The total projected water demand for Henry County is presented in Figure 5.4.2C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.2A: Henry County Annual Average Public Water Demand Projections

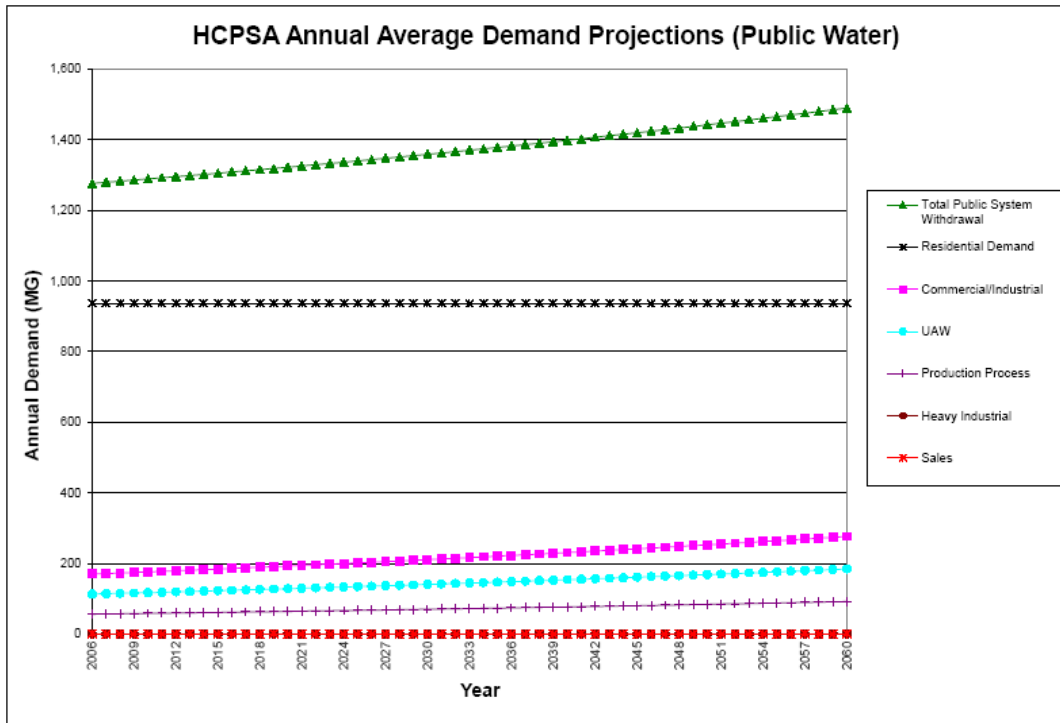


Figure 5.4.2B: Henry County Annual Average Non-Public Water Demand Projections

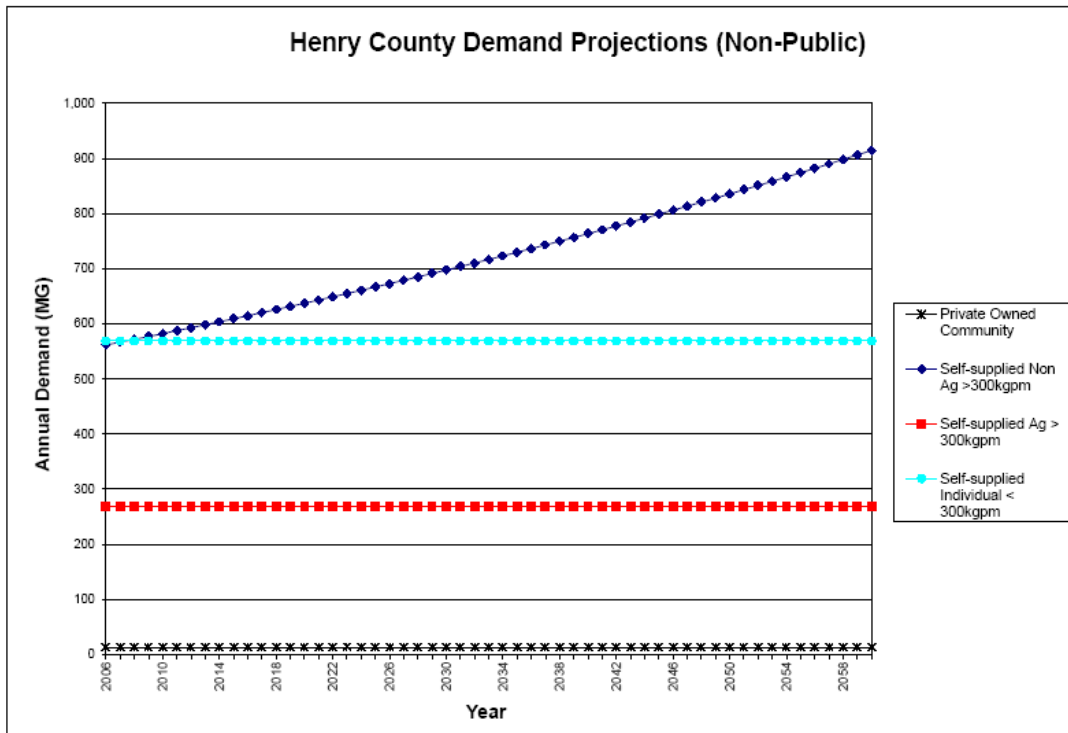
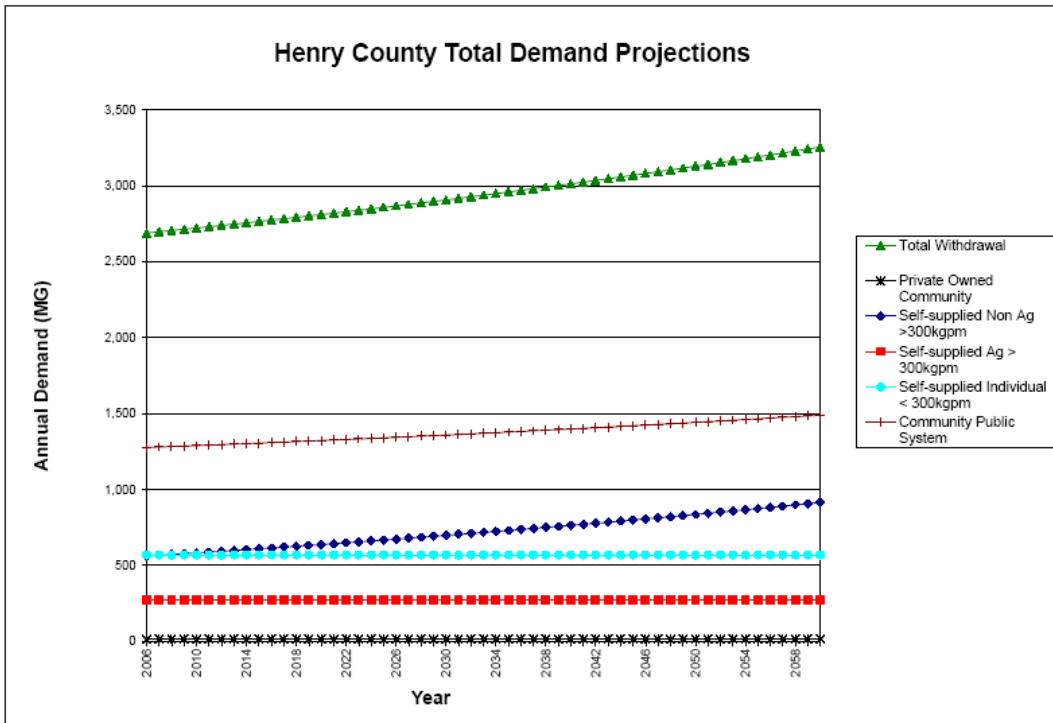


Figure 5.4.2C: Henry County Annual Total Demand Projections



5.4.3 Patrick County

The projected water demands for the public community water systems in Patrick County are presented in Figure 5.4.3A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Patrick County are presented in Figure 5.4.3B. The total projected water demand for Patrick County is presented in Figure 5.4.3C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.3A: Patrick County Annual Average Public Water Demand Projections

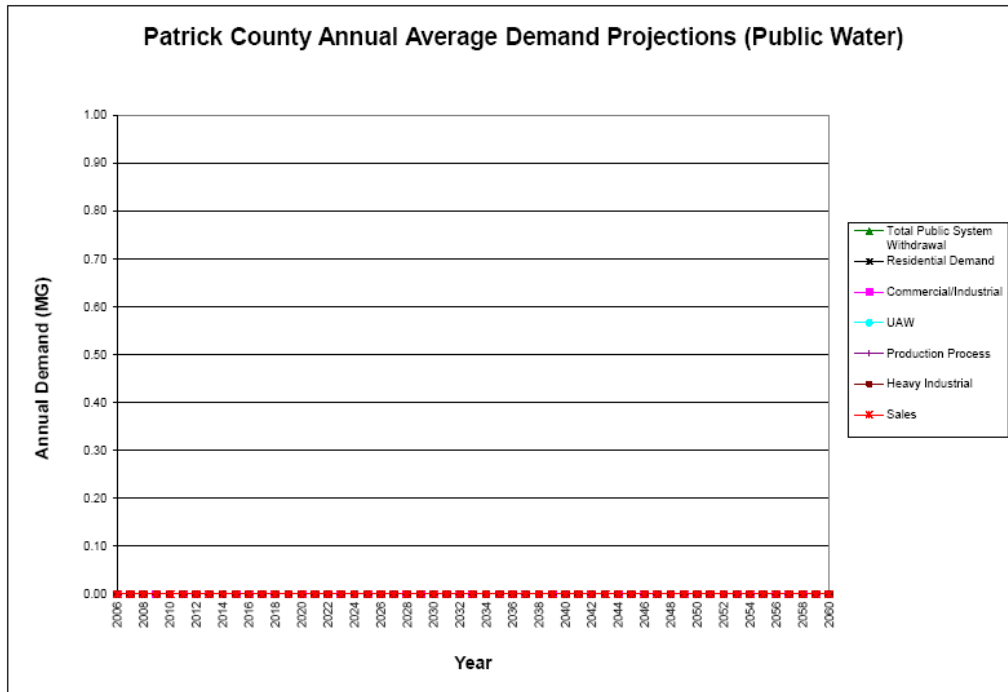


Figure 5.4.3B: Patrick County Annual Average Non-Public Water Demand Projections

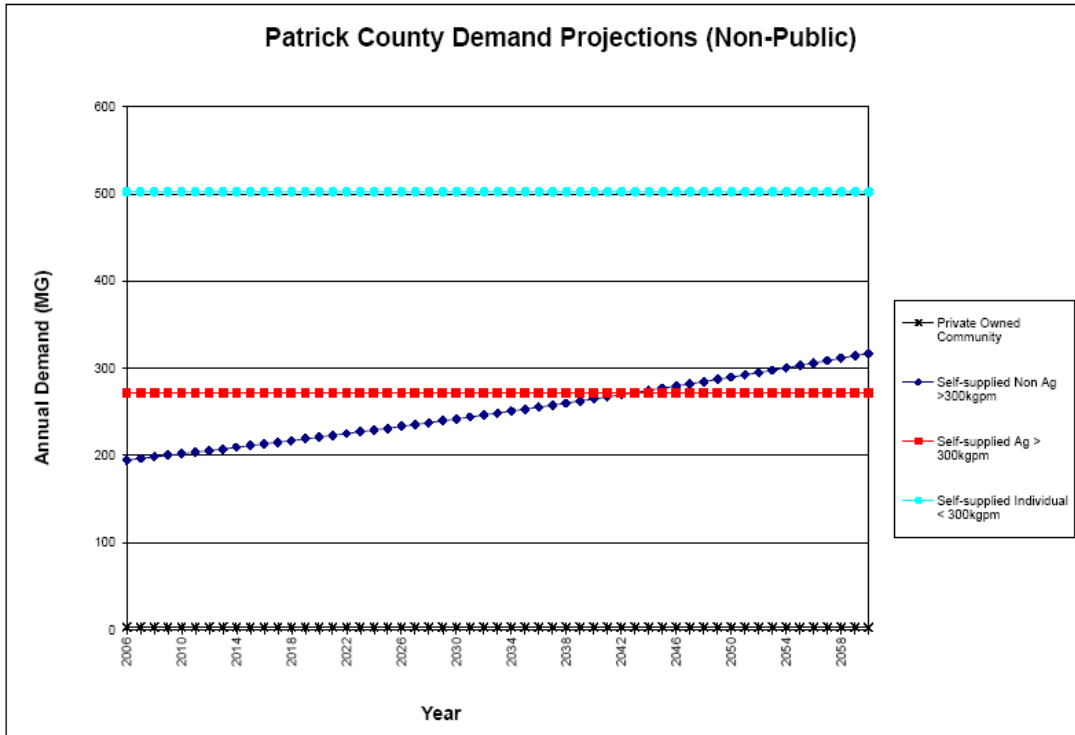
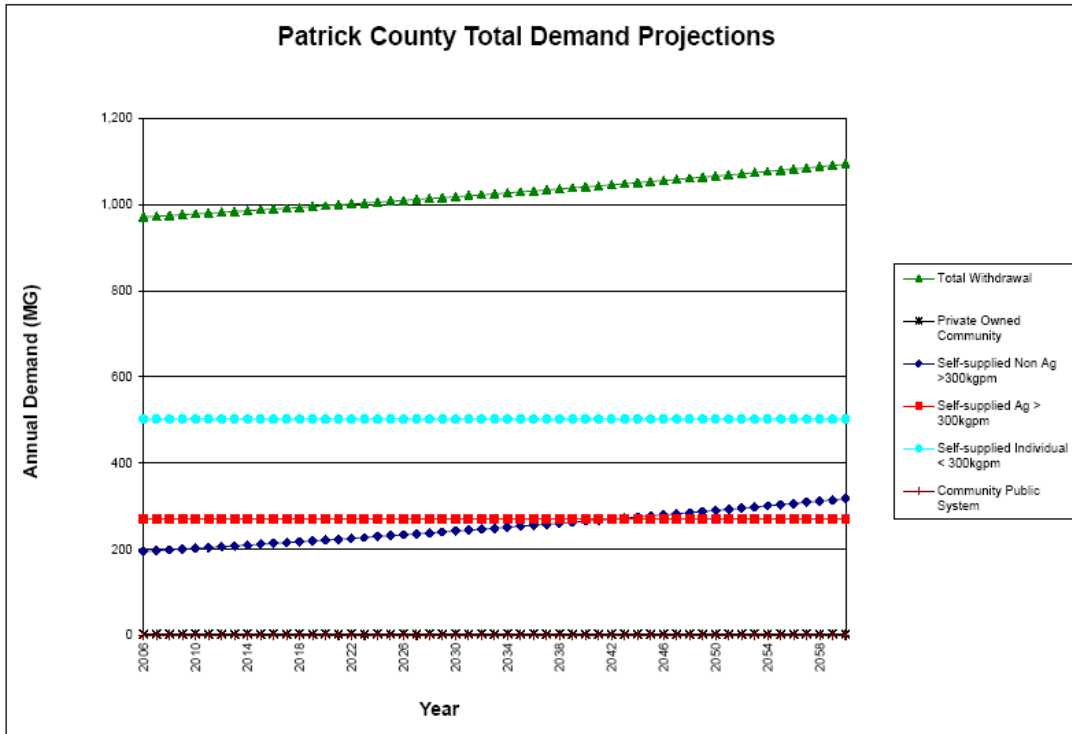


Figure 5.4.3C: Patrick County Annual Total Demand Projections



5.4.4 Pittsylvania County

The projected water demands for the public community water systems in Pittsylvania County are presented in Figure 5.4.4A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in Pittsylvania County are presented in Figure 5.4.4B. The total projected water demand for Pittsylvania County is presented in Figure 5.4.4C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.4A: Pittsylvania County Annual Average Public Water Demand Projections

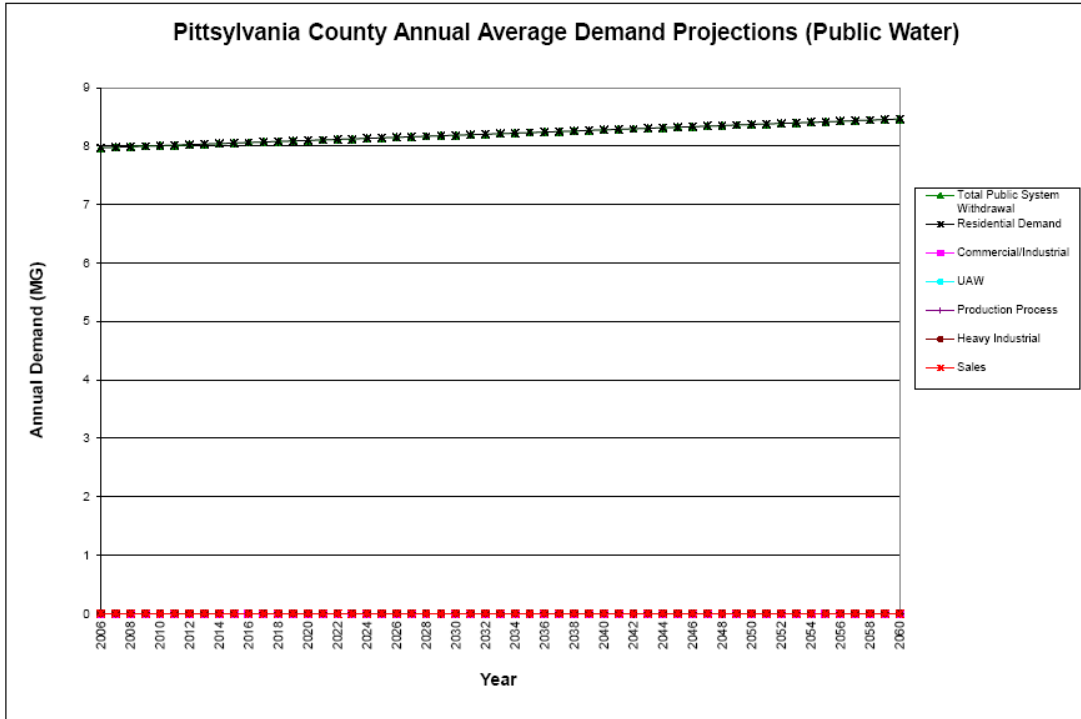


Figure 5.4.4B: Pittsylvania County Annual Average Non-Public Water Demand Projections

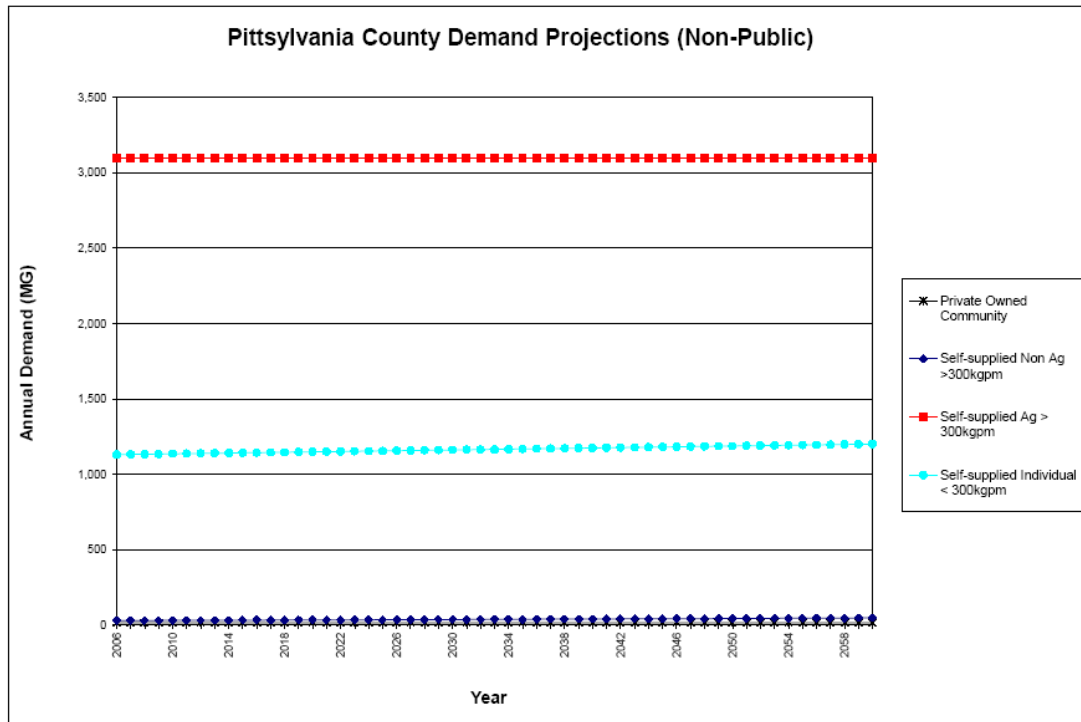
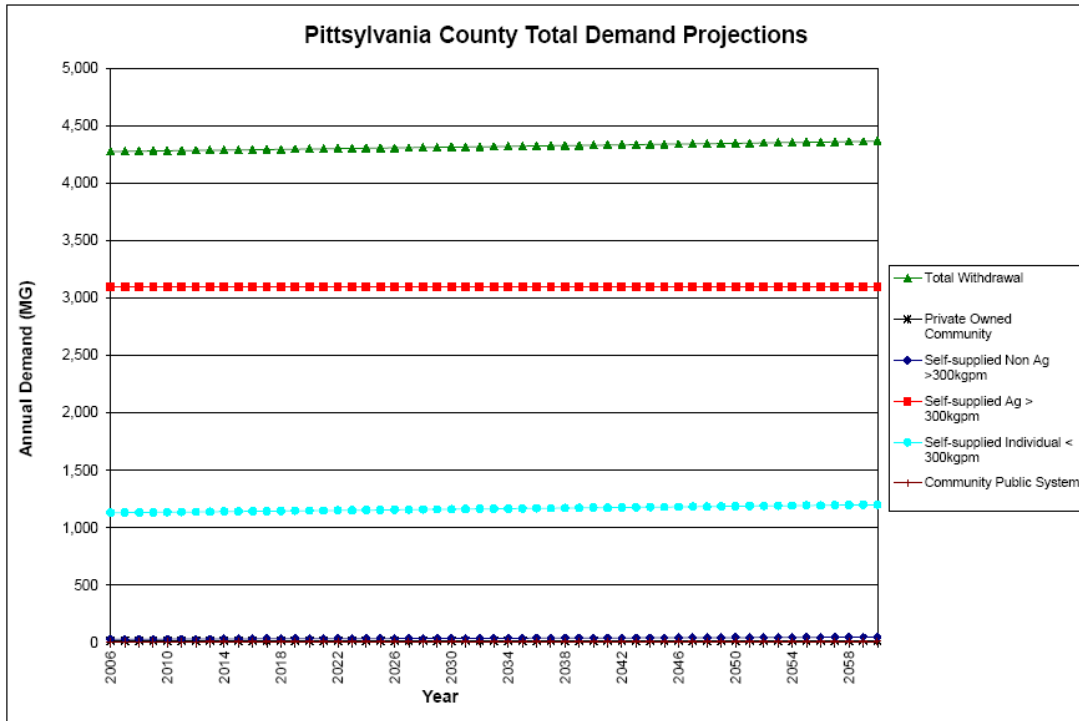


Figure 5.4.4C: Pittsylvania County Annual Total Demand Projections



5.4.5 City of Danville

The projected water demands for the public community water systems in the City of Danville are presented in Figure 5.4.5A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the City of Danville are presented in Figure 5.4.5B. The total projected water demand for the City of Danville is presented in Figure 5.4.5C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.5A: The City of Danville Annual Average Public Water Demand Projections

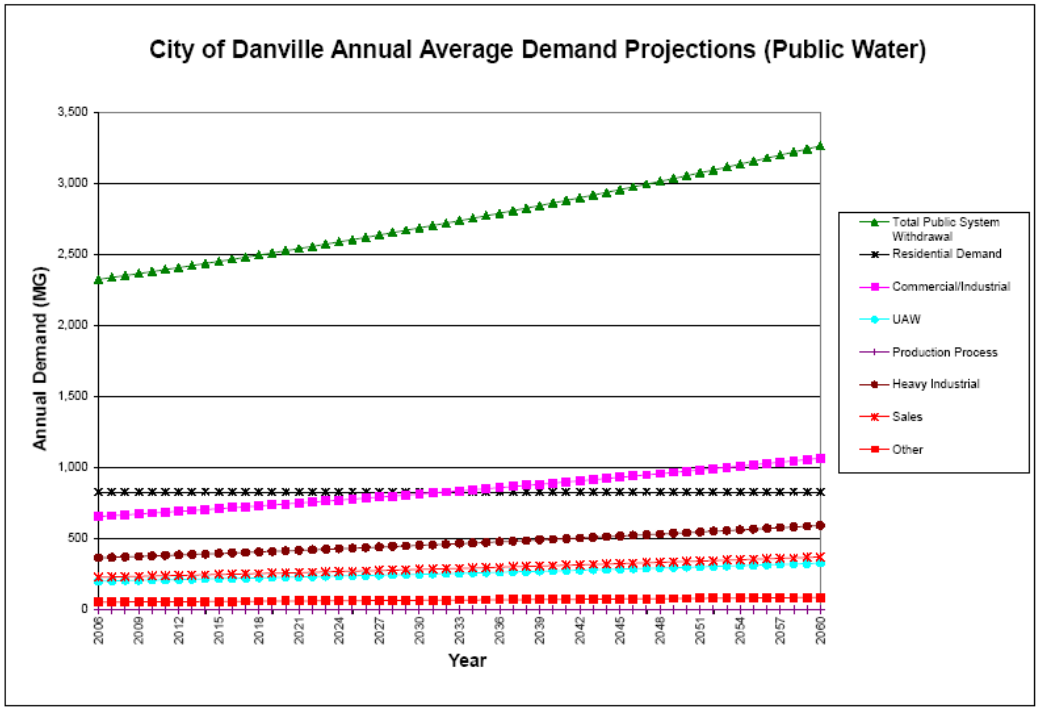


Figure 5.4.5B: The City of Danville Annual Average Non-Public Water Demand Projections

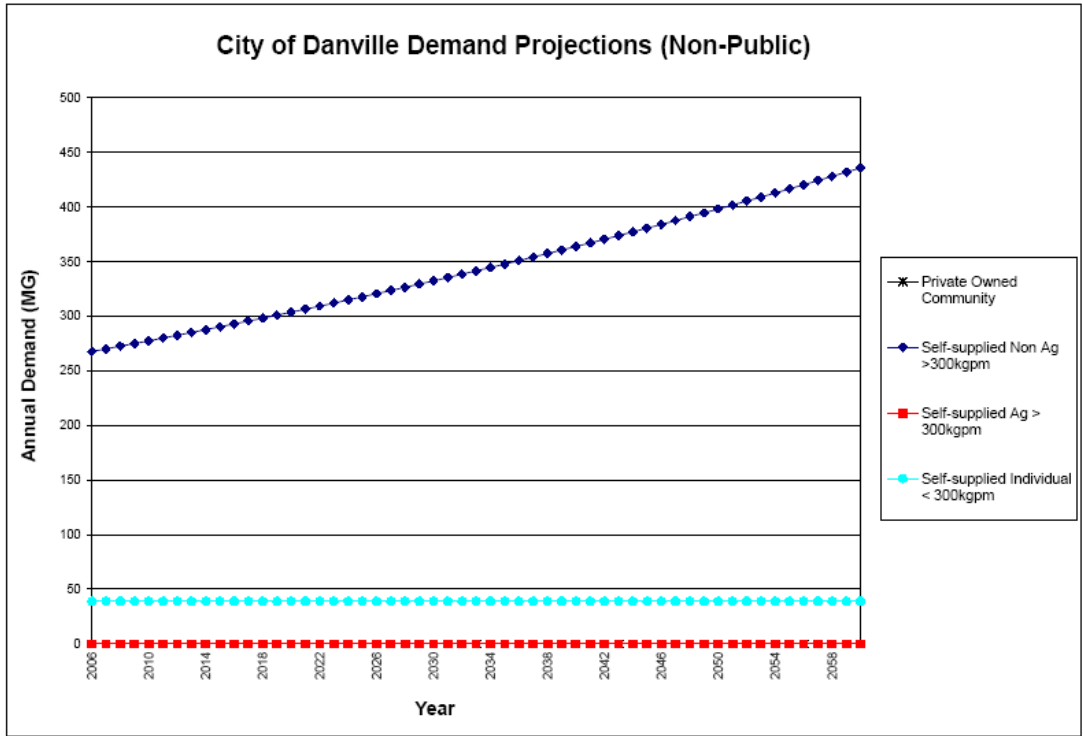
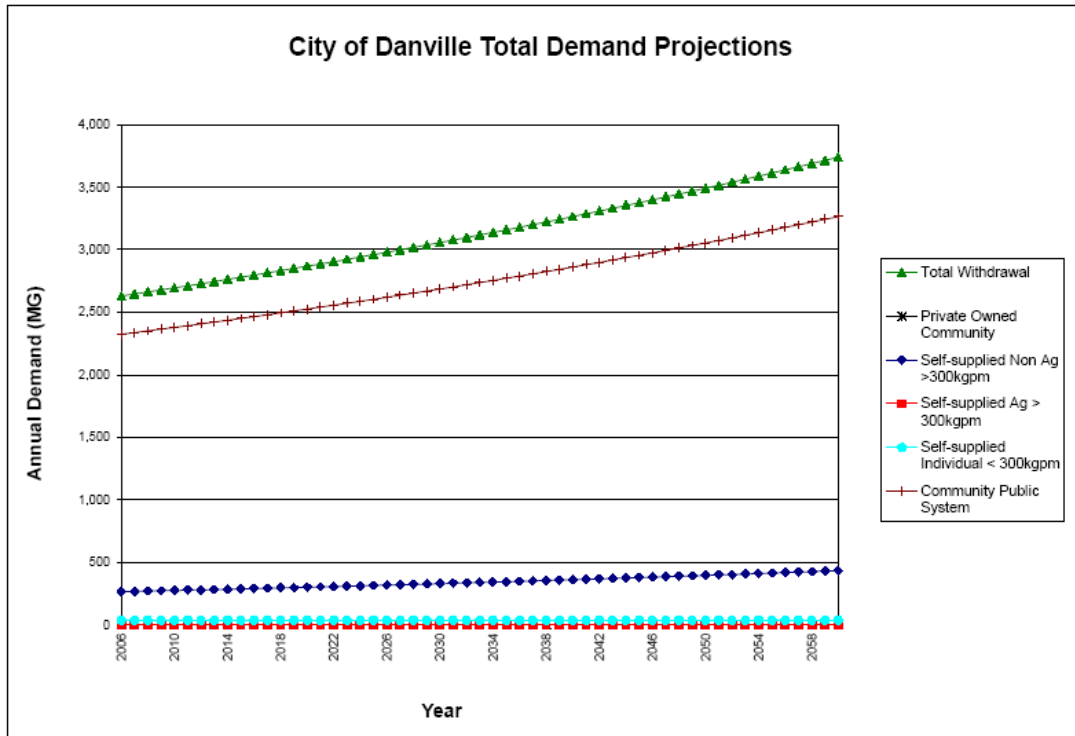


Figure 5.4.5C: The City of Danville Annual Total Demand Projections



5.4.6 City of Martinsville

The projected water demands for the public community water systems in the City of Martinsville are presented in Figure 5.4.6A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the City of Martinsville are presented in Figure 5.4.6B. The total projected water demand for the City of Martinsville is presented in Figure 5.4.6C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.6A: The City of Martinsville Annual Average Public Water Demand Projections

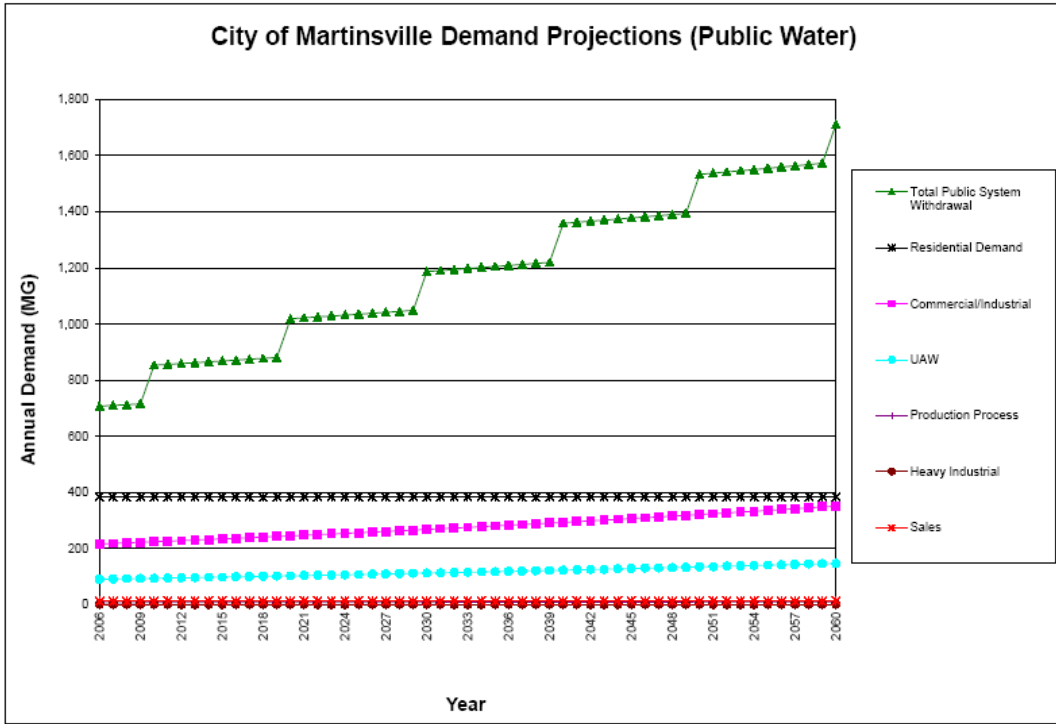


Figure 5.4.6B: The City of Martinsville Annual Average Non-Public Water Demand Projections

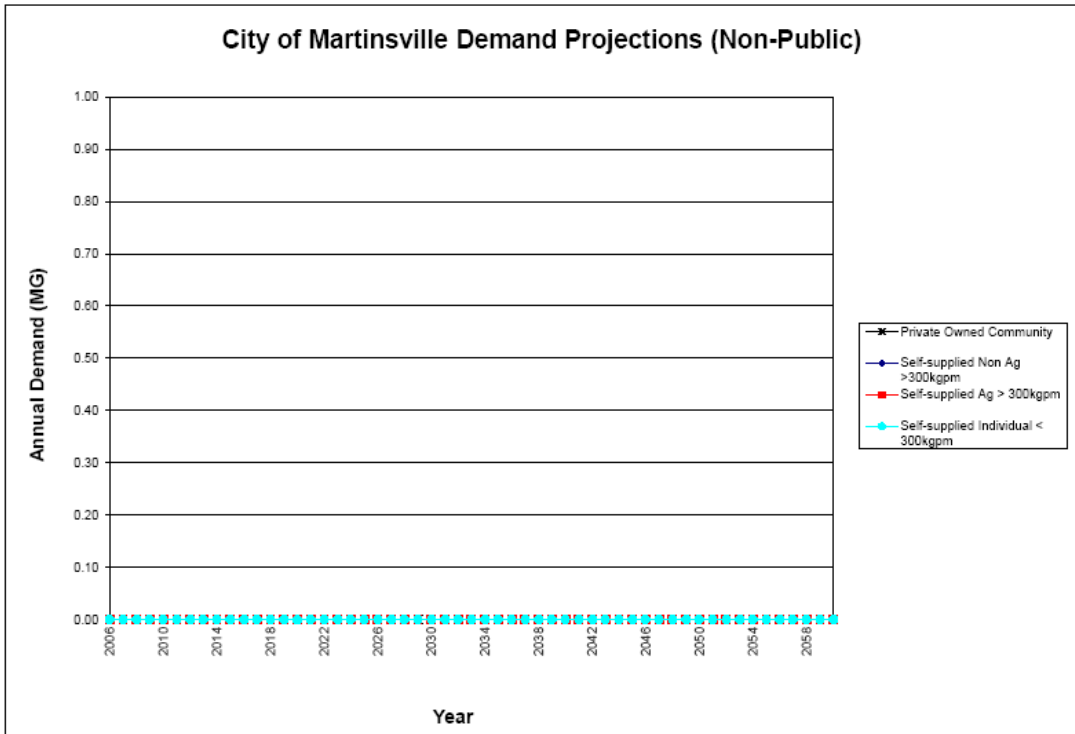
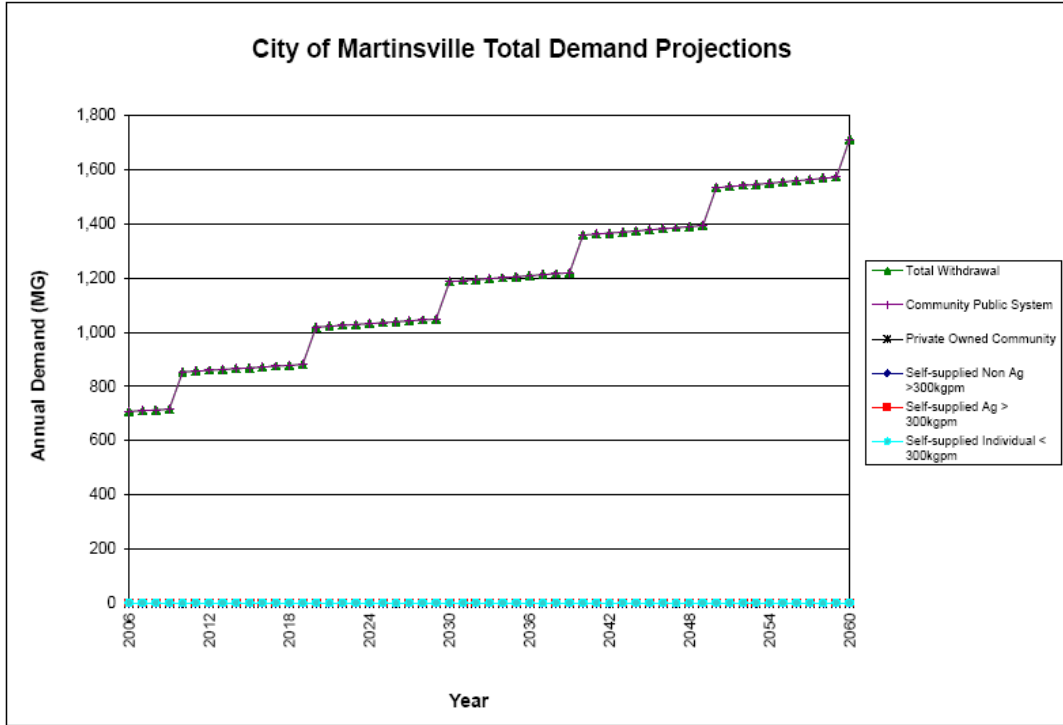


Figure 5.4.6C: The City of Martinsville Annual Total Demand Projections



5.4.7 Town of Chatham

The projected water demands for the public community water systems in the Town of Chatham are presented in Figure 5.4.7A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Chatham are presented in Figure 5.4.7B. The total projected water demand for the Town of Chatham is presented in Figure 5.4.7C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.7A: The Town of Chatham Annual Average Public Water Demand Projections

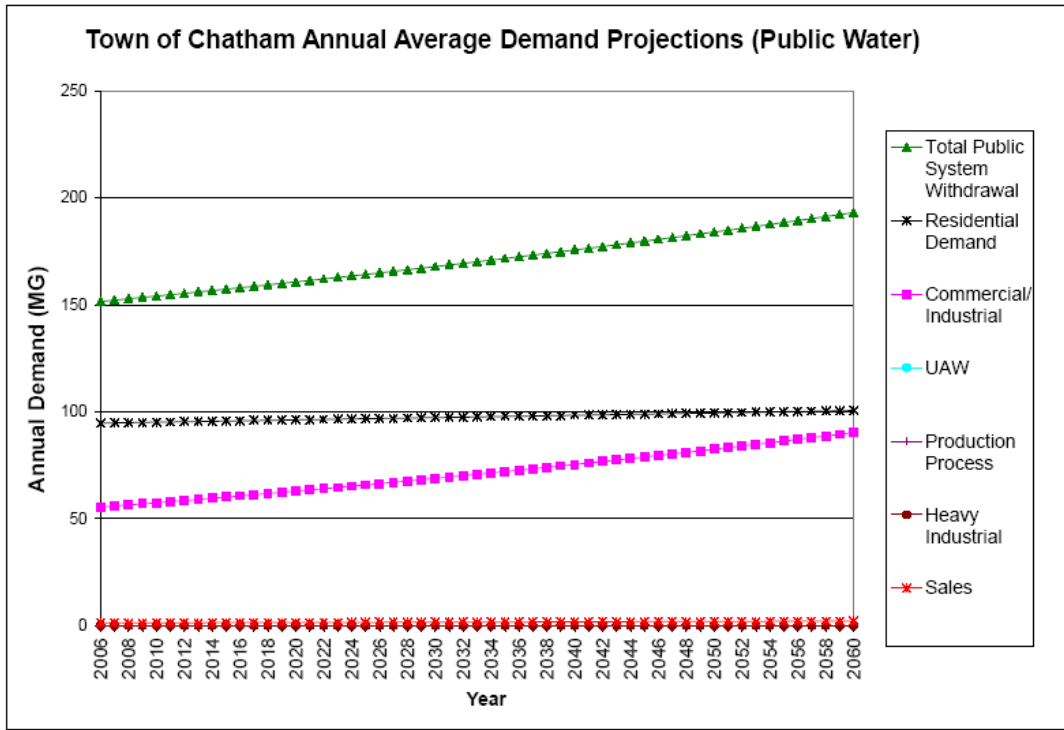


Figure 5.4.7B: The Town of Chatham Annual Average Non-Public Water Demand Projections

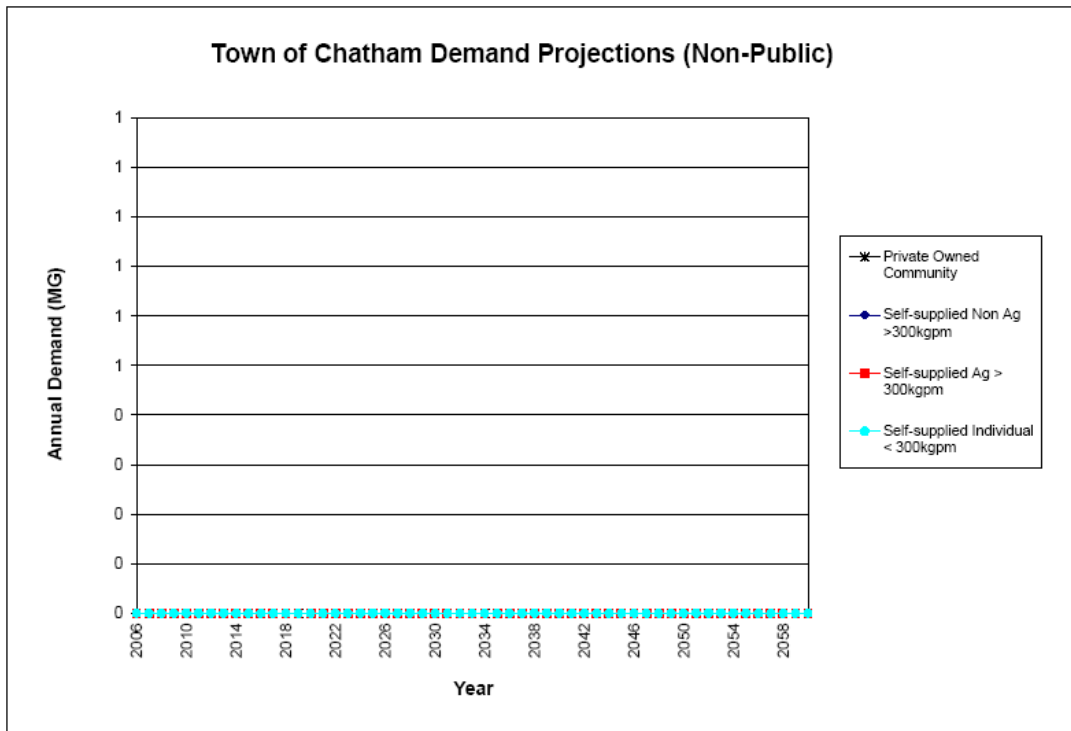
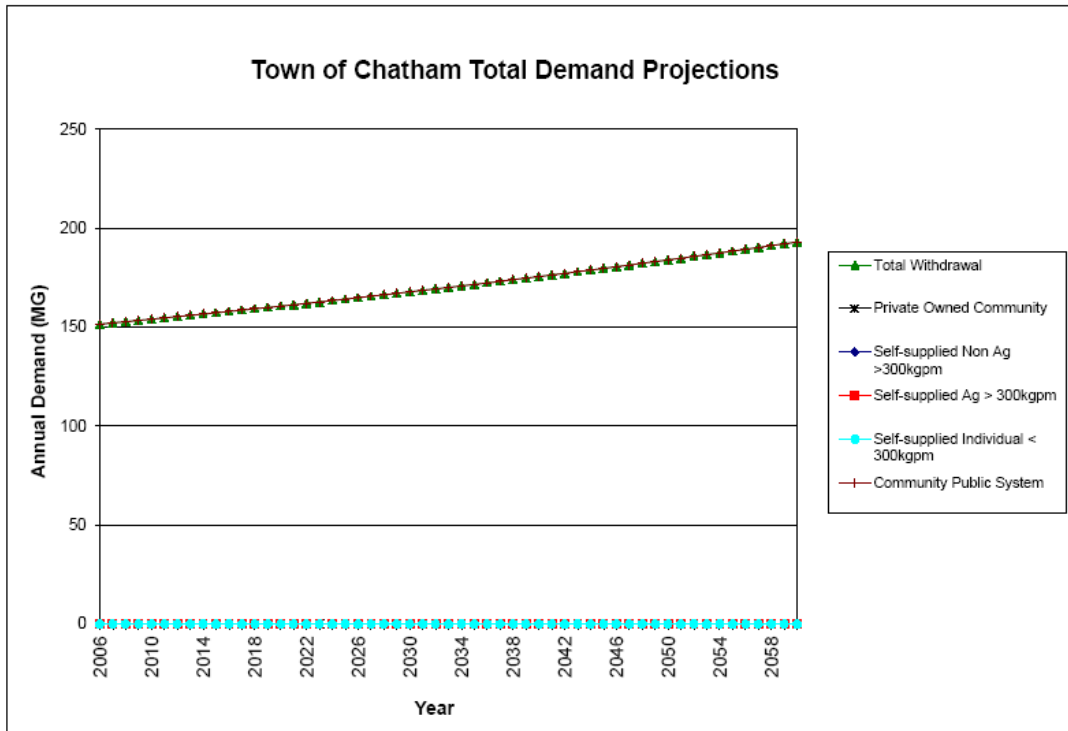


Figure 5.4.7C: The Town of Chatham Annual Total Demand Projections



5.4.8 Town of Gretna

The projected water demands for the public community water systems in the Town of Gretna are presented in Figure 5.4.8A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Gretna are presented in Figure 5.4.8B. The total projected water demand for the Town of Gretna is presented in Figure 5.4.8C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.8A: The Town of Gretna Annual Average Public Water Demand Projections

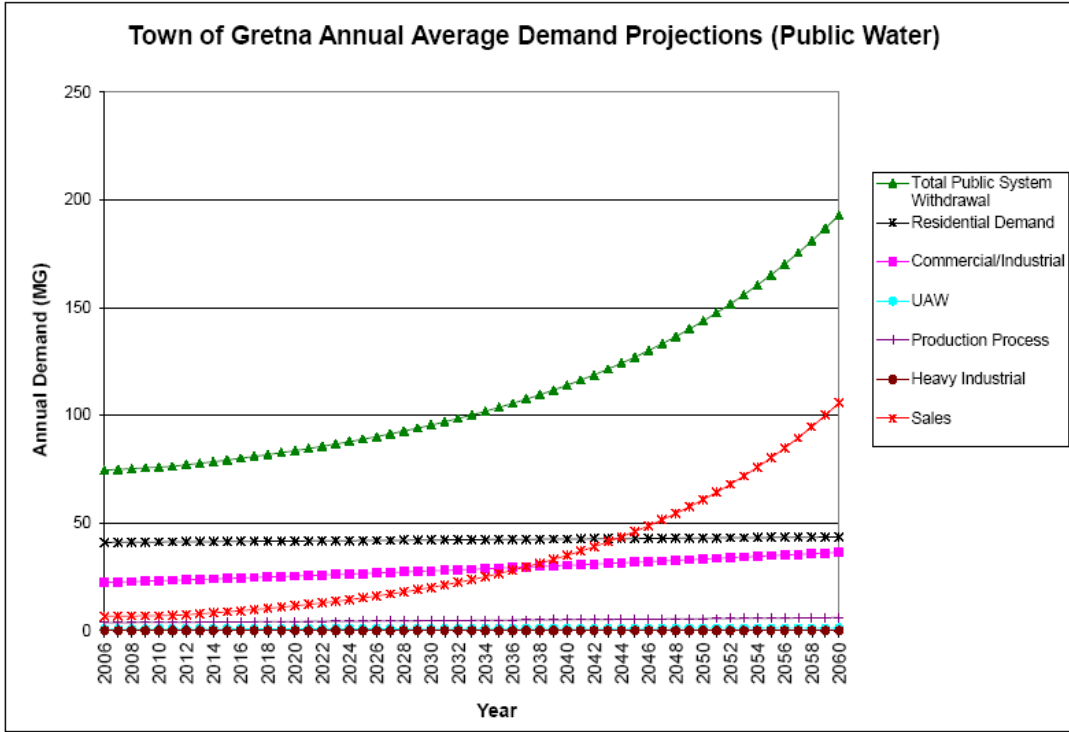


Figure 5.4.8B: The Town of Gretna Annual Average Non-Public Water Demand Projections

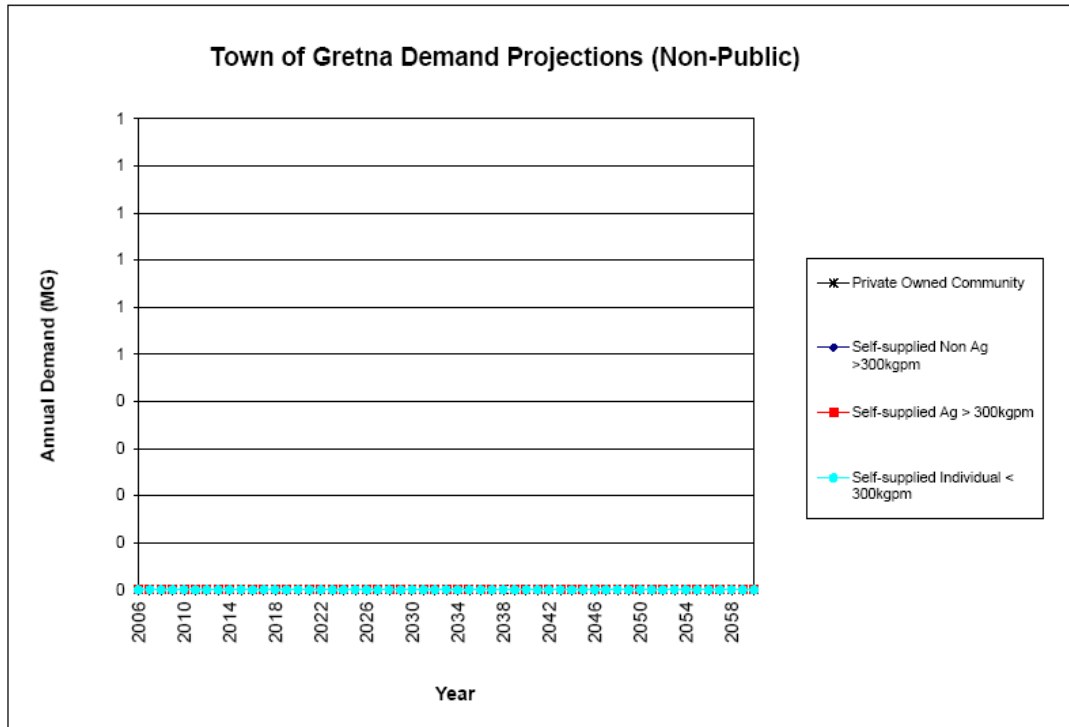
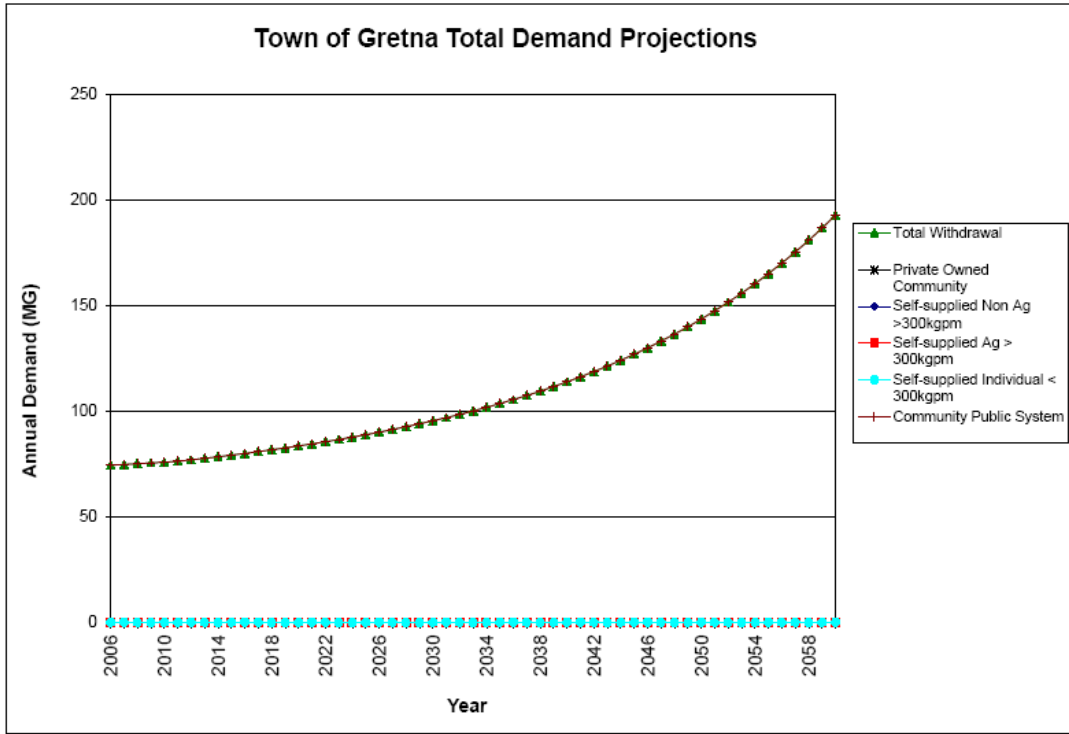


Figure 5.4.8C: The Town of Gretna Annual Total Demand Projections



5.4.9 Town of Hurt

The projected water demands for the public community water systems in the Town of Hurt are presented in Figure 5.4.9A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Hurt are presented in Figure 5.4.9B. The total projected water demand for the Town of Hurt is presented in Figure 5.4.9C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.9A: The Town of Hurt Annual Average Public Water Demand Projections

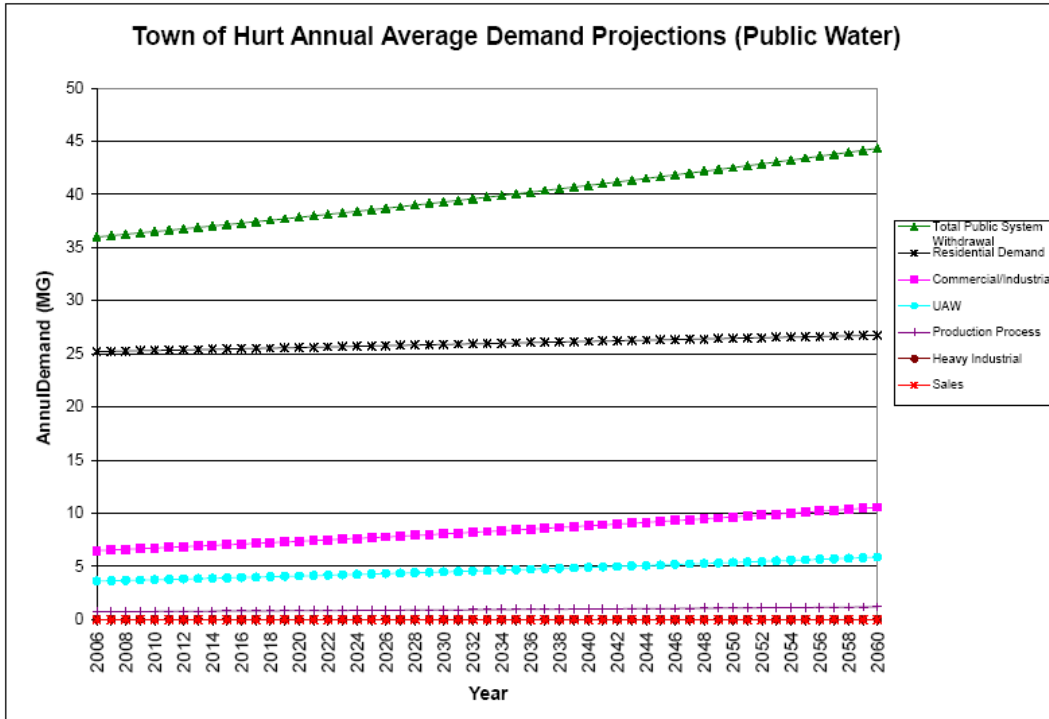


Figure 5.4.9B: The Town of Hurt Annual Average Non-Public Water Demand Projections

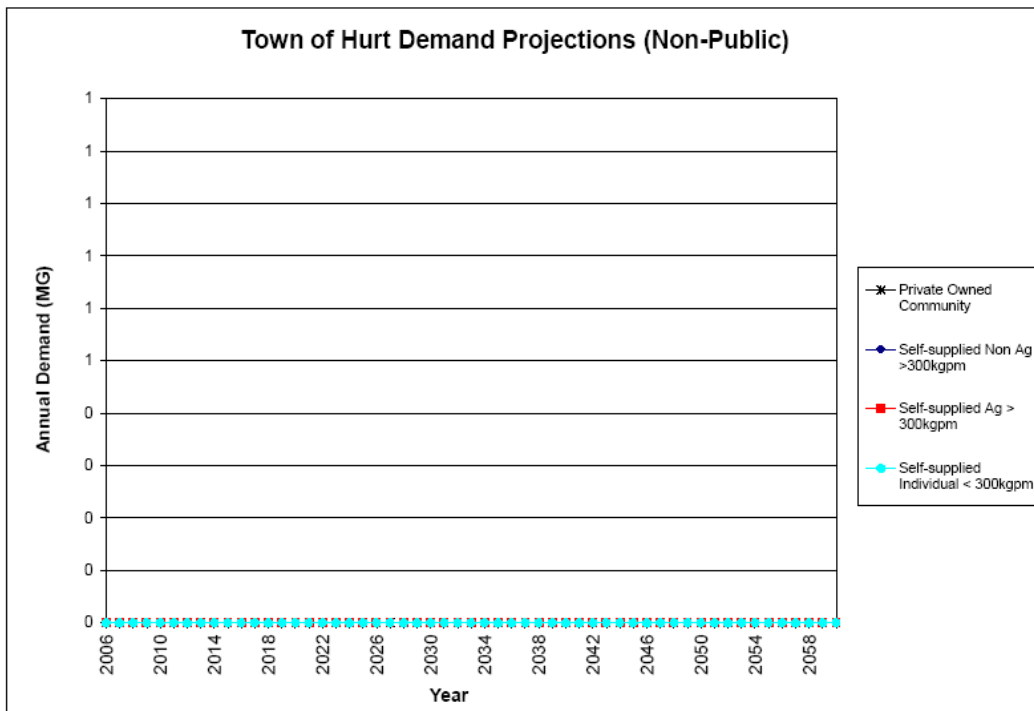
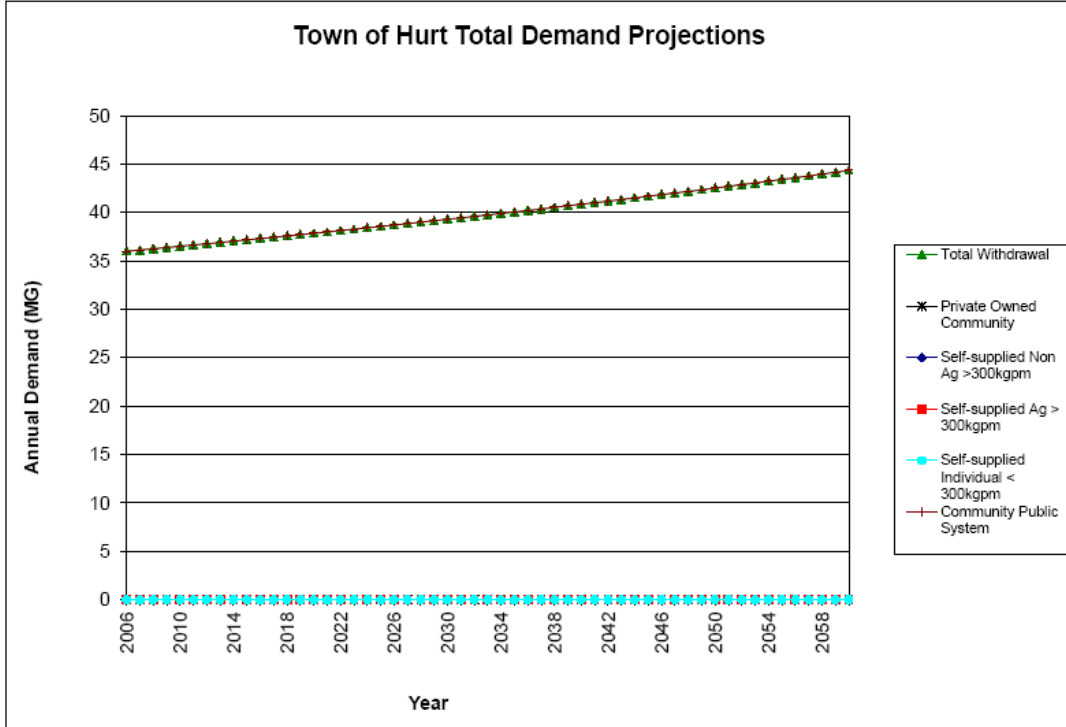


Figure 5.4.9C: The Town of Hurt Annual Total Demand Projections



5.4.10 Town of Stuart

The projected water demands for the public community water systems in the Town of Stuart are presented in Figure 5.4.10A. The projected water demands for the private community water systems; self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells in the Town of Stuart are presented in Figure 5.4.10B. The total projected water demand for the Town of Stuart is presented in Figure 5.4.10C. Please refer to Appendix D for calculations on the estimated population, annual average water demand, monthly peak water demand, and annual average demand disaggregated into appropriate categories of use for each community water system. In addition, calculations for the self-supplied, non-agricultural users; self-supplied, agricultural users; and self-supplied users using individual groundwater wells are included in Appendix D.

Figure 5.4.10A: The Town of Stuart Annual Average Public Water Demand Projections

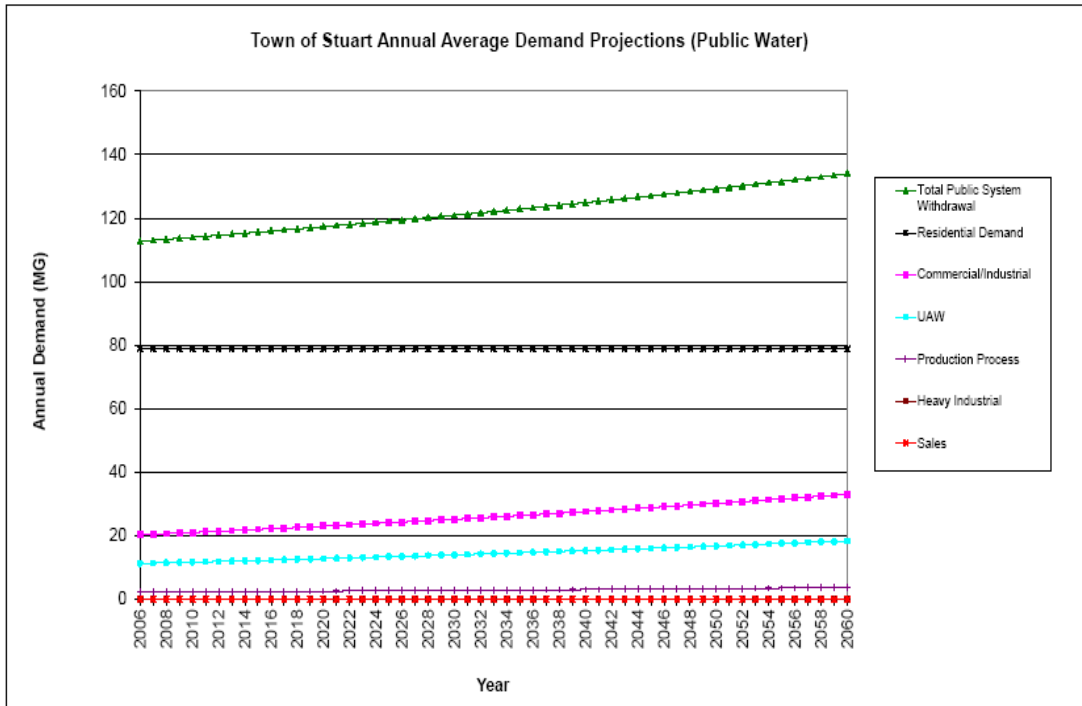


Figure 5.4.10B: The Town of Stuart Annual Average Non-Public Water Demand Projections

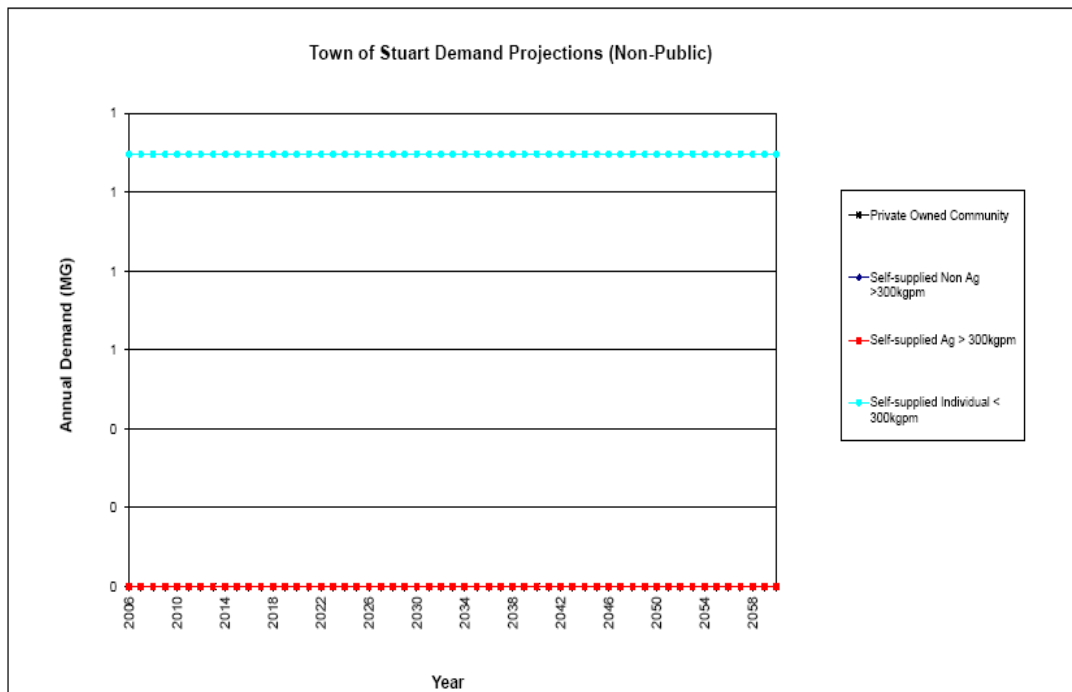
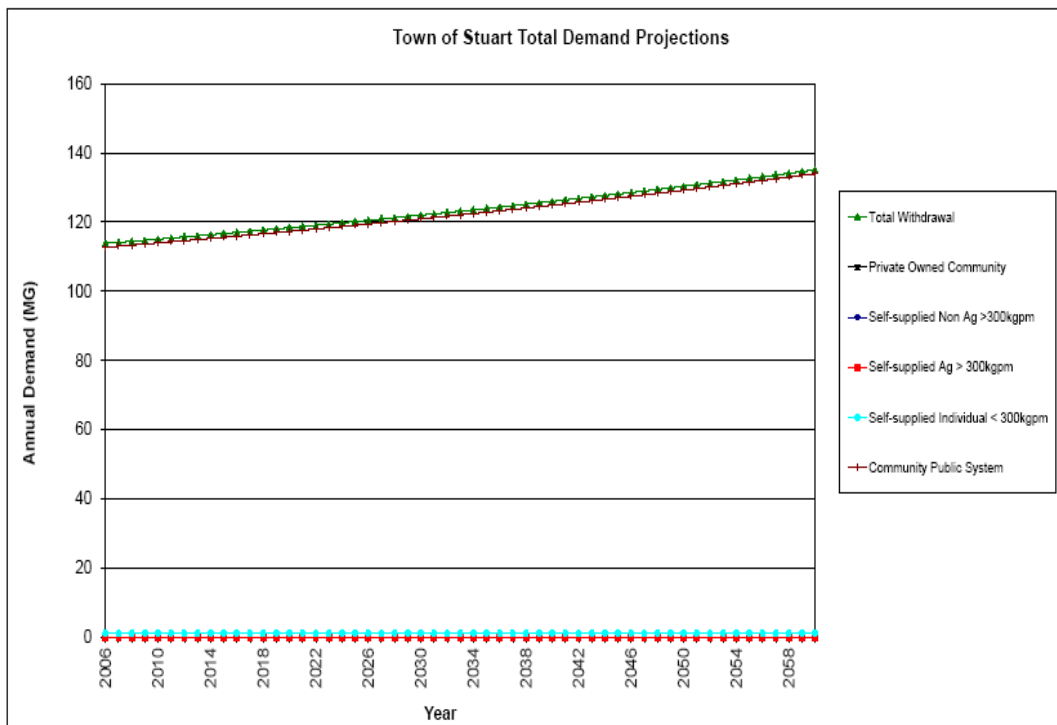


Figure 5.4.10C: The Town of Stuart Annual Total Demand Projections



5.5 Cumulative demand, use conflict, or in-stream flow information

At the time of preparation of this Plan, information on cumulative demands, use conflict, or in-stream flow information developed pursuant to 9 VAC 25-780-140G is not available. The state-wide integrated Water Supply Plan has not been prepared by VDEQ, for which analysis will be required to determine above information.