

Delaware  
Water Supply Coordinating Council  
Report to the DRBC WMAC

West Trenton, NJ

Oct 24, 2017

Delaware DNREC  
Division of Water  
Dover, Del.

University of Delaware  
Water Resources Center  
Newark, Del.

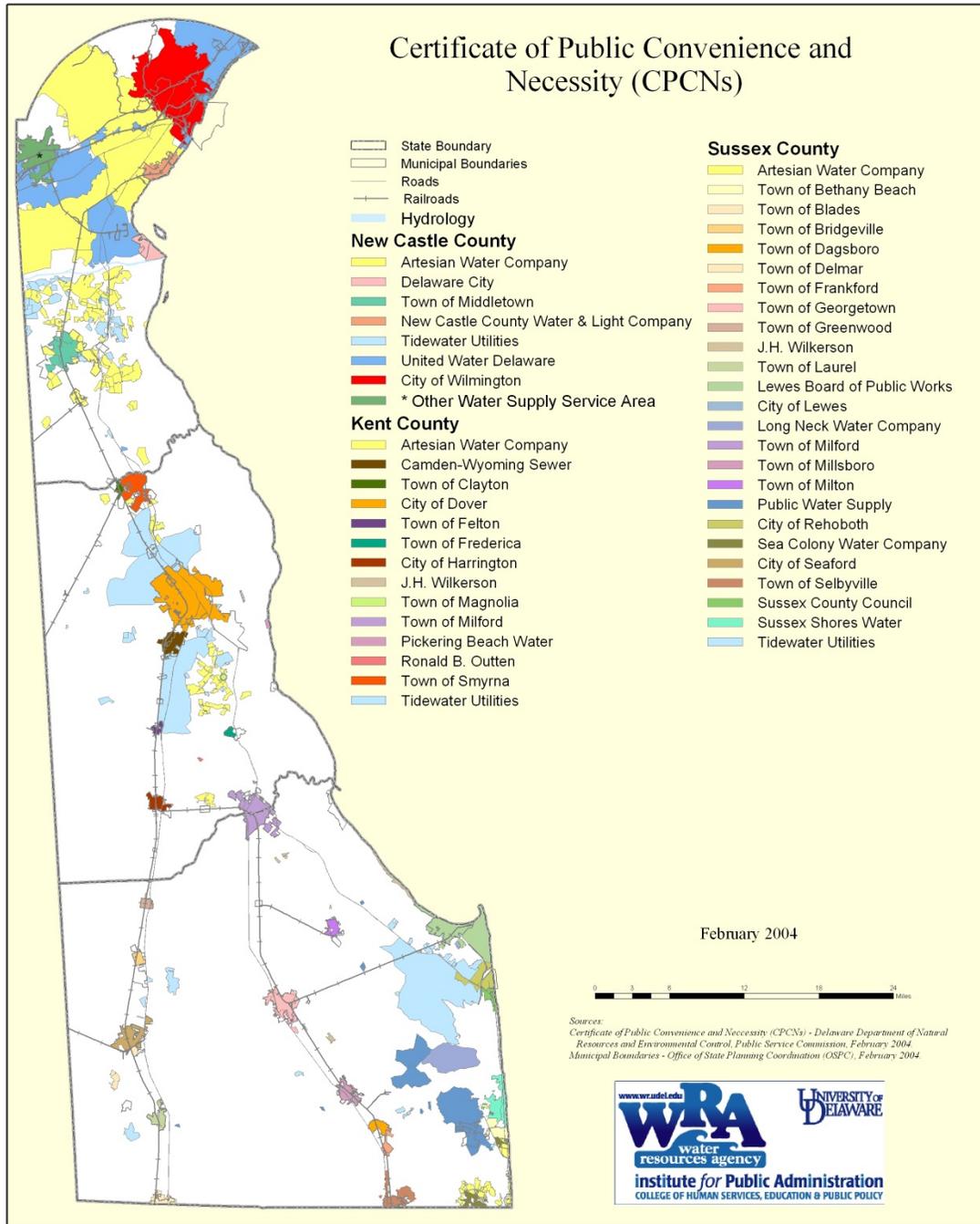
# Delaware Water Supply Coordinating Council

- In July 2000, Governor Carper signed HB 549 that formed the WSCC and designated Secretary of DNREC as Chair, DGS as technical advisor; and UD Water Resources Agency as “Temporary Water Master”.
- The WSCC is created by 26 Del. C. Sections 1305 - 1308 and 26 Del. C. Ch. 14.
- The 2003 law authorized the WSCC to publish water supply plans in Delaware.
- Since 2000, 13 plans have been submitted to the Governor and General Assembly
- In July 2014, Governor Markell signed amendments passed by 147<sup>th</sup> General Assembly that extended duties of the WSCC from Jan 1, 2016 to Jan 31, 2022.

## **By State law, the following members are appointed to the Delaware WSCC:**

- a. The Secretary of the Department of Natural Resources and Environmental Control or Secretary's designee
- b. The Secretary of the Department of Agriculture or the Secretary's designee
- c. The Executive Director of the Public Service Commission or the Executive Director's designee
- d. The Director of the Delaware Emergency Management Agency or the Director's designee
- e. The Director of the Division of Public Health or the Director's designee
- f. The Public Advocate or the Public Advocate's designee
- g. The Director of the Delaware Geological Survey or the Director's designee
- h. The Director of the Water Resources Agency at the University of Delaware or the Director's designee
- i. The Executive Director of the Delaware River Basin Commission or the Executive Director's designee
- j. A representative of the office of the Governor
- k. A representative of each of the governments of New Castle County, Kent County and Sussex County
- l. A representative of each public and private water utility serving New Castle County
- m. A representative of public water supply utilities from the Sussex County Association of Towns (SCAT)
- n. A representative of public water supply utilities of Kent County from the League of Local Governments
- o. A representative from the Delaware Rural Water Association
- p. A representative from the Delaware Chapter of the National Association of Water Companies
- q. One representative from Chambers of Commerce in New Castle County, Kent County and Sussex County
- r. A representative of the Delaware State Chamber of Commerce
- s. A representative of the New Castle County Chamber of Commerce
- t. A representative of the Delaware Nursery and Landscape Association
- u. A representative of the Delaware Grounds Management Association
- v. A representative of the Delaware State Golf Association
- w. A representative of the Delaware Nature Society
- x. A representative from the Delaware Farm Bureau
- y. A representative from the Center for Inland Bays
- z. The State Fire Marshal or the State Fire Marshal's designee
- aa. A representative from the Civic League of New Castle County
- bb. A representative from the Coalition of Natural Stream Valleys
- cc. The State Climatologist or State Climatologist's designee.

# Certificate of Public Convenience and Necessity (CPCNs)



# Northern New Castle County Delaware

**THIRTEENTH REPORT TO THE GOVERNOR AND GENERAL ASSEMBLY**

Regarding the Progress of the:

**DELAWARE WATER SUPPLY COORDINATING COUNCIL**

Water Supply and Demand Projections for Northern New Castle County through 2030

**Draft October 19, 2017**

Prepared by the:

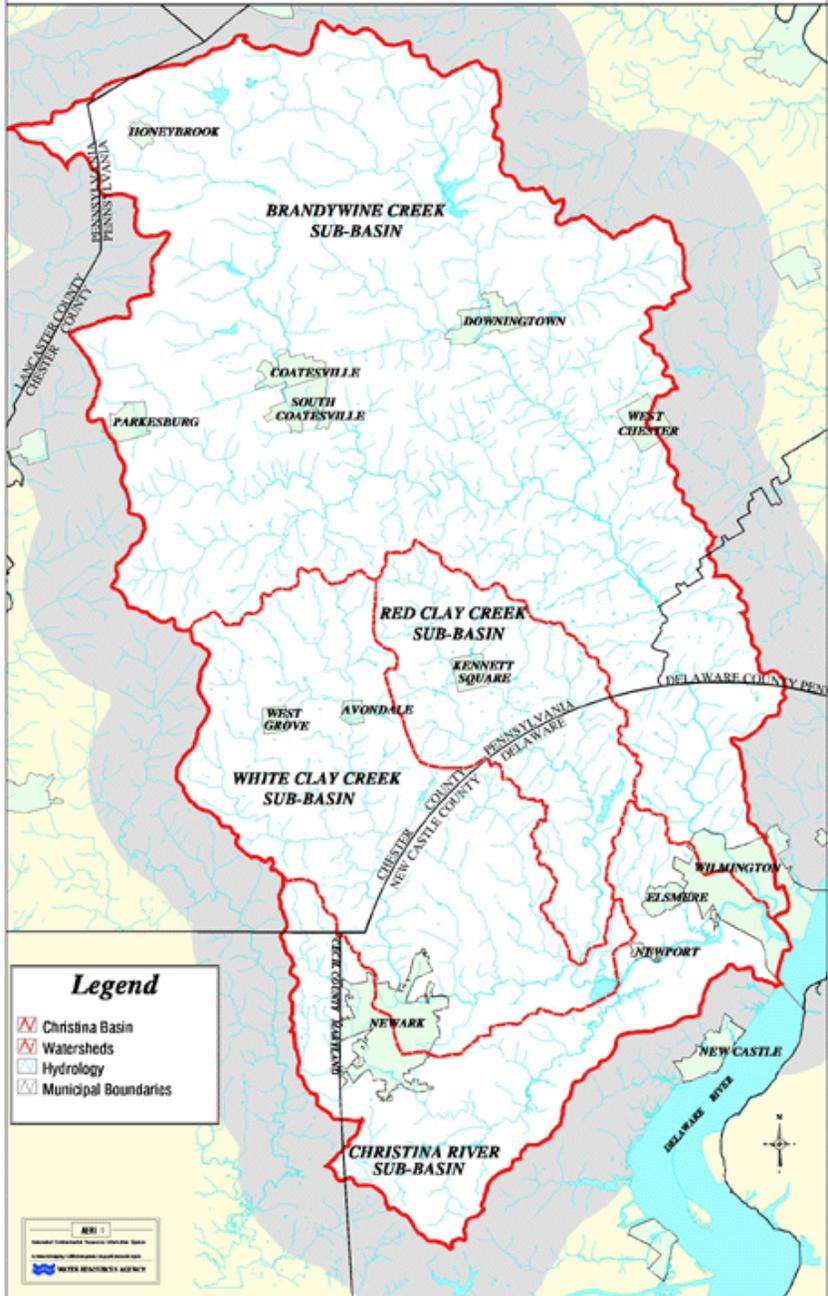
Delaware Department of Natural Resources and Environmental Control

Delaware Geological Survey

University of Delaware Water Resources Center

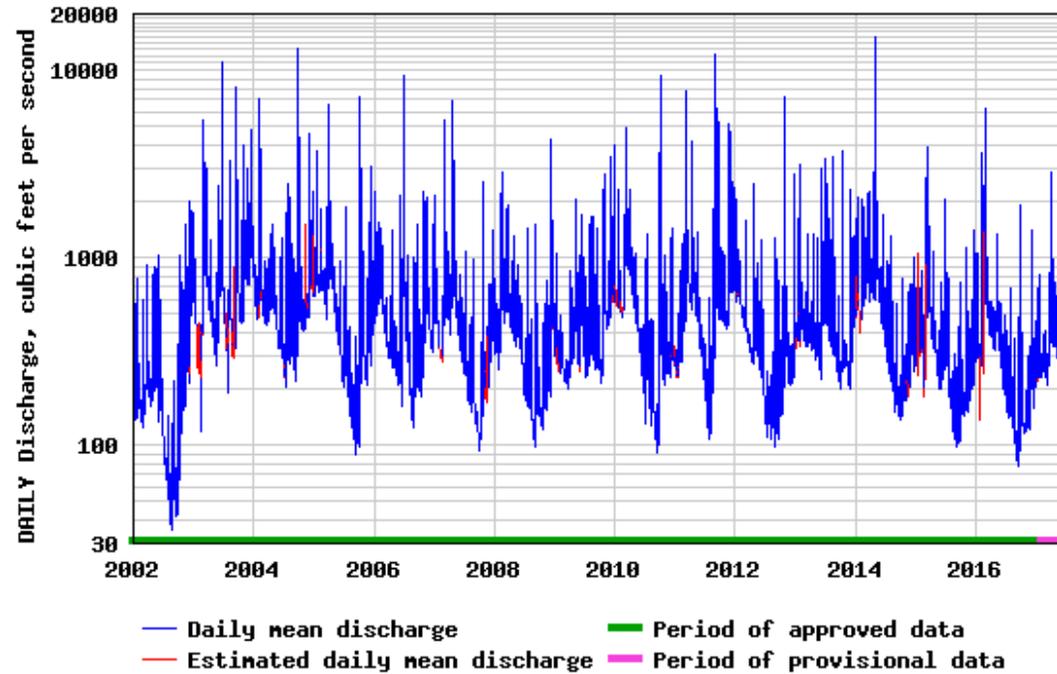


# Christina Basin Water Quality Management Strategy *Base Map*



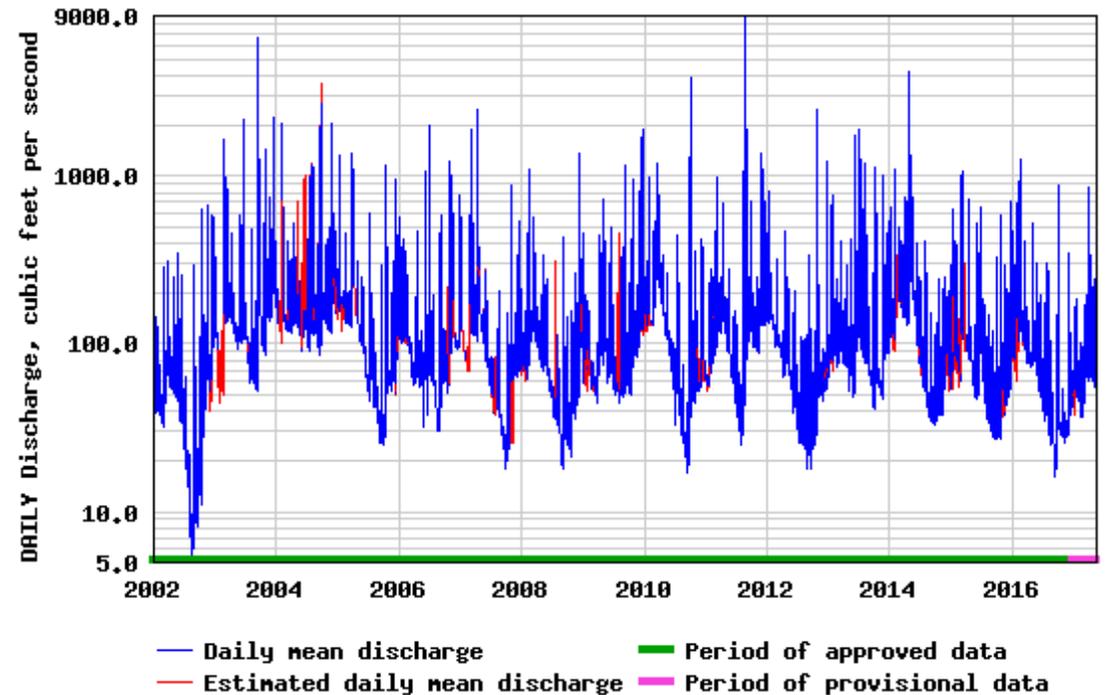
Nearly 75% of Delaware's water supply originates in the Brandywine Christina watershed and 2/3 of the watershed forms in the headwaters in Pennsylvania and Maryland.

USGS 01481500 BRANDYWINE CREEK AT WILMINGTON, DE



During fall 2016, the Brandywine Creek and White Clay Creek in northern Delaware recorded the lowest stream flows since the drought of 2002.

USGS 01479000 WHITE CLAY CREEK NEAR NEWARK, DE



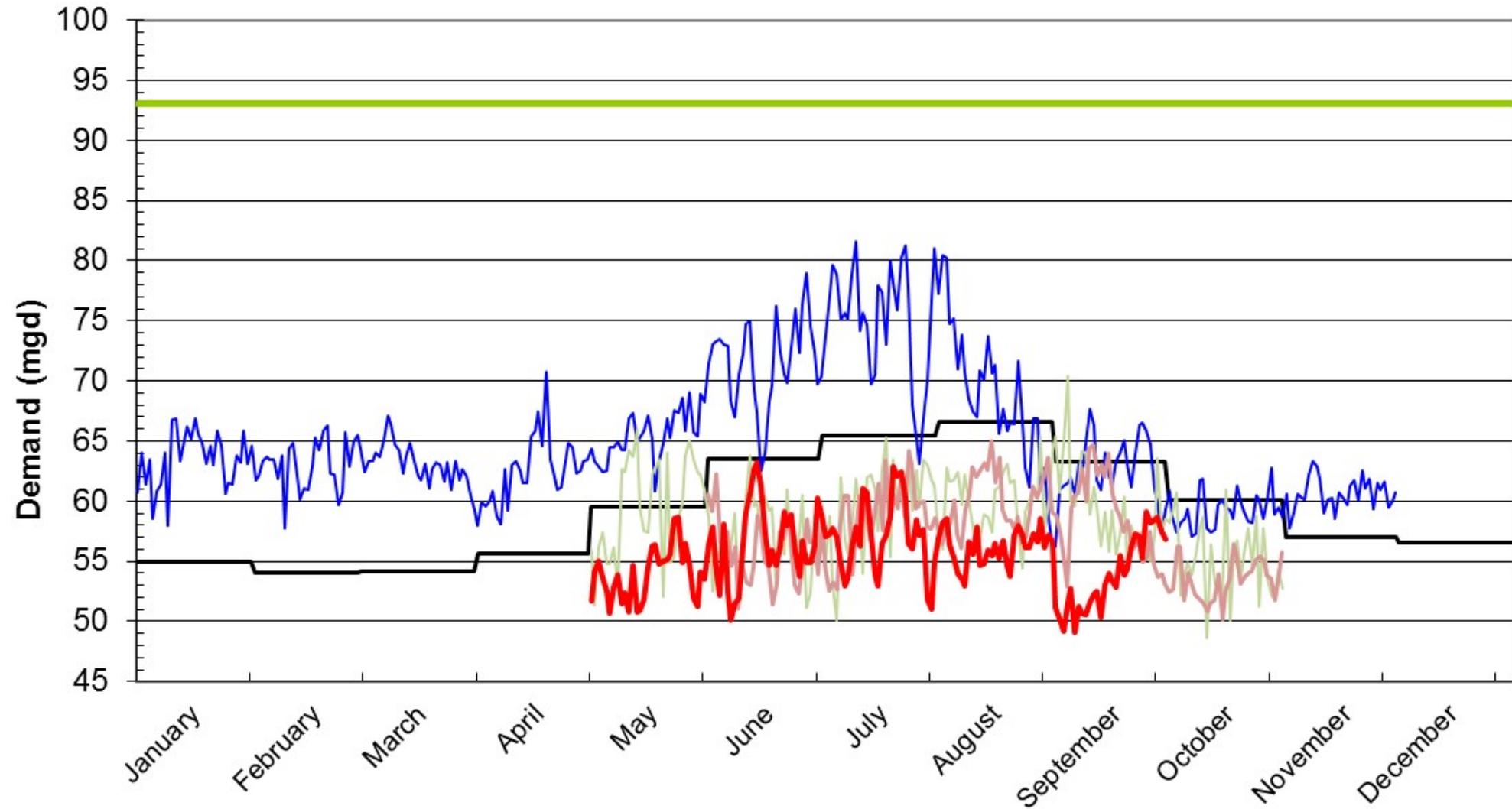
## Northern Delaware Drought Advisory Guidelines

Reported by the Drought Advisory Guidelines Subcommittee (DAGS), which is composed of the Delaware Department of Natural Resources and Environmental Control, Delaware Geological Survey, and University of Delaware Water Resources Agency with input from the water purveyors and representatives from the landscaping industry. These drought operating guidelines are designed to provide guidance to the Delaware Water Supply Coordinating Council (WSCC) and the Governor's Drought Advisory Committee (GDAC). Responsibility for providing technical guidance for a move up to or down from Drought Watch is with the WSCC. Responsibility for providing technical guidance for a move up to or down from Drought Warning or Emergency is with the GDAC. Final declaration of drought advisories rests with the Governor.

Indicators	Drought Watch Voluntary Conservation	Drought Warning Voluntary Conservation	Drought Emergency Mandatory Restrictions	Status Sept. 28, 2016
<b>Precipitation</b> Wilmington Airport 12-month	-6.00" to -8.99"	-9.00" to -11.99"	>-12.00"	-2.87" (deficit increased by 0.48")
<b>Precipitation</b> Wilmington Airport 6-month	-3.00" to -4.50"	-4.50" to- 6.00"	>-6.00"	-1.90" (deficit increased by 0.49")
<b>Brandywine Creek</b> (30-day moving avg)	85 mgd	70 mgd	48 mgd	75.5 mgd (flow increased by 2.9 mgd)
<b>White Clay Creek - Stanton</b> (30-day moving avg)	42 mgd	37 mgd	31 mgd	33.1 mgd (flow increased by 1.0 mgd)
<b>White Clay Creek - Newark</b> (30-day moving avg)	19 mgd	16 mgd	13 mgd	14.3 mgd (no change)
<b>Well Db24-18</b>	14 - 14.99 (fbls)	15 - 15.99 (fbls)	16 (fbls)	13.81 (fbls) (gw level declined by 0.44 ft)
<b>Water Conditions Index</b>	4.0-5.0	3.0-3.99	<3.00	4.35 (Index increased by .22)
<b>Chlorides</b>	WCC ≤ 37 mgd for 5 consecutive days at SUEZ Stanton Intake	Cl > 250 ppm for 3 days at Christina River at Newport	Cl > 250 ppm for 3 days at UWD Stanton Intake	Monitoring 512 ppm (Cl decreased by 163 ppm)
<b>Hoopes Reservoir</b> (City of Wilmington)	-10 ft (68% capacity)	-12 ft (64% capacity)	-15 ft (57% capacity)	-3.7 ft (9/19/2016)
<b>Newark Reservoir</b>	- 10 ft (70% capacity)	-17 ft (52% capacity)	-27 ft (28% capacity)	-11.0 ft (9/16/2016)

Monitored				
<b>Aquifer Storage and Recovery</b>	Monitor Status	Monitor Status	Monitor Status	SUEZ: .102mg (9/6/2016) AWC: 49 mg (9/19/2016)
<b>Octoraro Reservoir</b> (Chester Water Authority)	Monitor Status	Monitor Status	Monitor Status	
<b>Marsh Creek Reservoir</b>	Monitor Status	Monitor Status	Monitor Status	PA DCNR releasing ~7.8 mgd into Brandywine Creek
<b>Chlorides on the Delaware River 9/22/2016</b>	Monitor Status	Monitor Status	Monitor Status	Normal RM: 76 Current RM: 82 (Commodore Barry Bridge)
<b>DRBC Lower Basin Drought Criteria</b>	Monitor Status	Monitor Status	Monitor Status	
<b>NYC DRB Reservoirs</b> (DRBC 9/23/2016)	Monitor Status	Monitor Status	Monitor Status	Storage 180.3 bg or 63 bg above drought watch

# Public Water Demand: Northern New Castle County



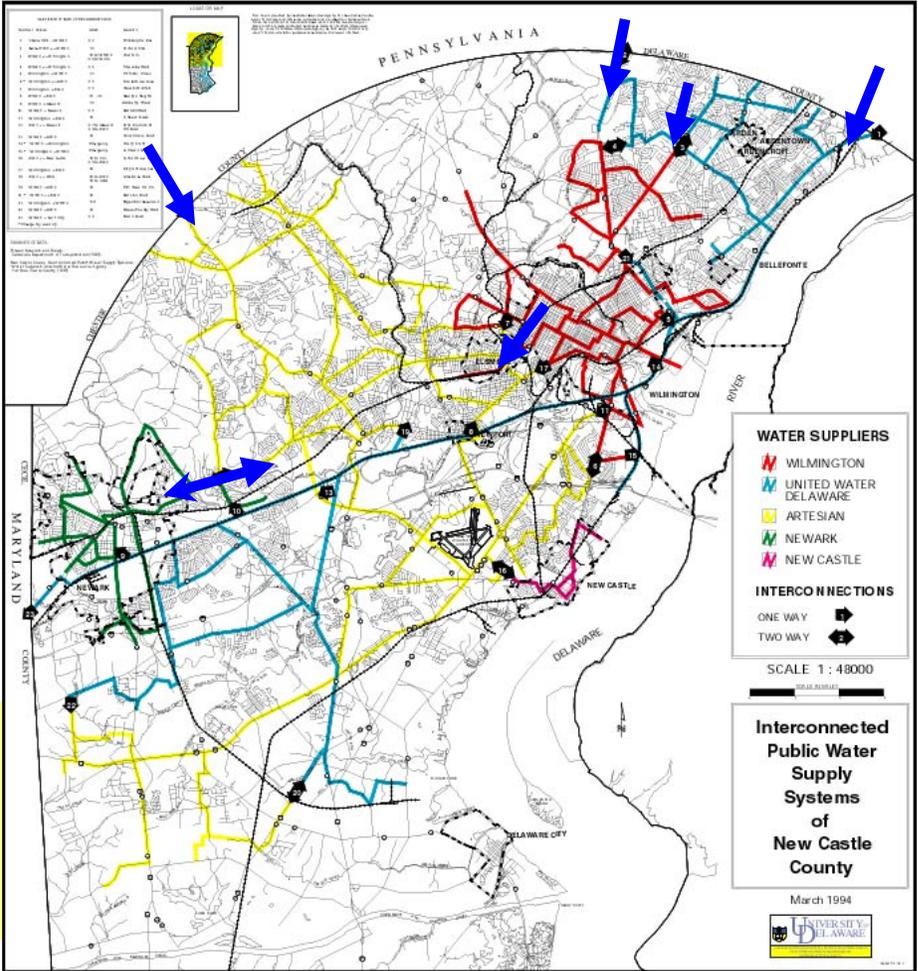
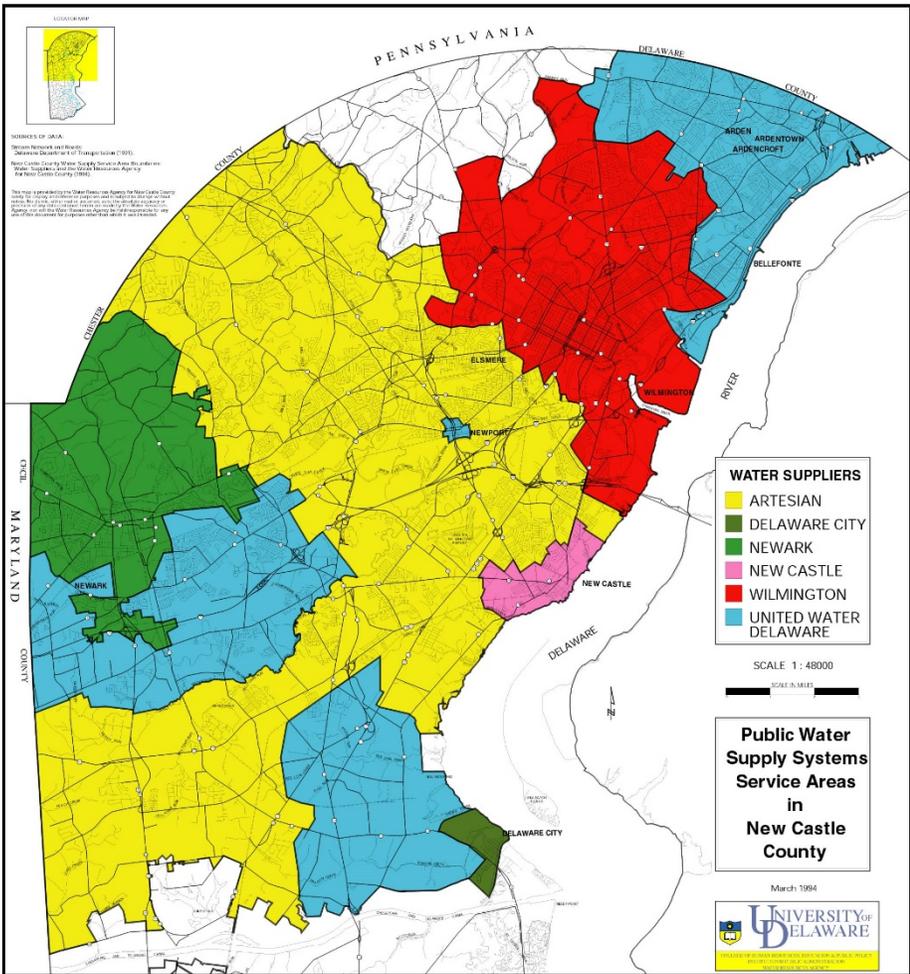
Compiled by the University of Delaware Water Resources Center using data from Artesian Water Co., City of Newark, New Castle Municipal Services Commission, SUEZ Delaware and City of Wilmington

— Historic Peak 1997    — Monthly Mean(2006-2010)    — 2002 drought    — 2015    — 2016    — 2017

## Water supply developed since the drought of 1999 in northern Delaware.

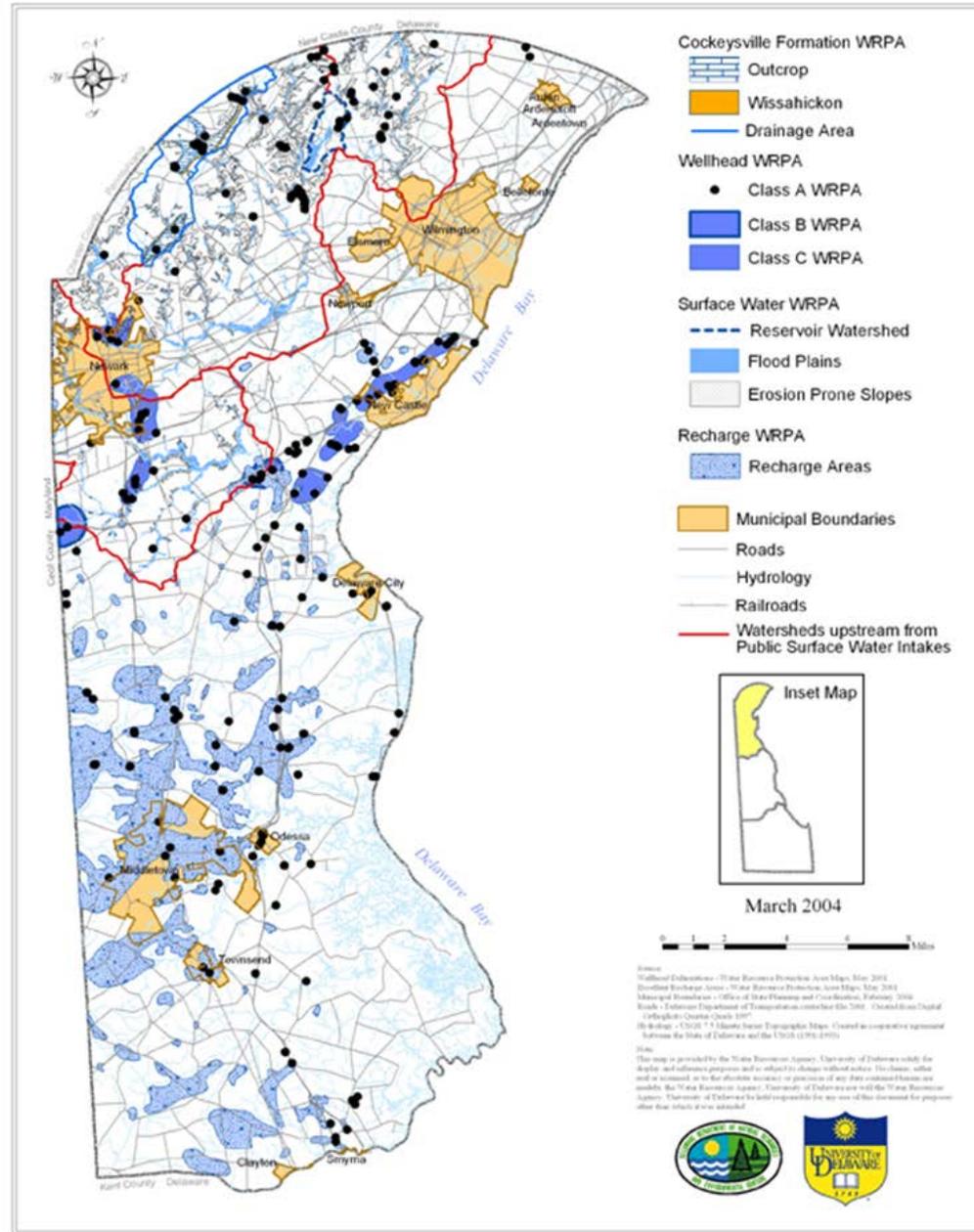
Sponsor	Project	Capacity (mg)
Artesian Water Co.	New Wells North of C&D Canal	405
Artesian Water Co.	Aquifer Storage and Recovery	130
City of Newark	Newark Reservoir	317
City of Newark	South Wellfield Iron Treatment Plant	75
SUEZ Delaware	Modify Tidal Capture Structure Plan	400
SUEZ Delaware	Aquifer Storage and Recovery	75
City of Wilmington	Hoopes Reservoir Deep Storage Plan	500
City of Wilmington	Raise Hoopes Reservoir Water Level by 2 ft	150
		<b>2,052</b>

# New Castle County Public Water Supply System Service Areas

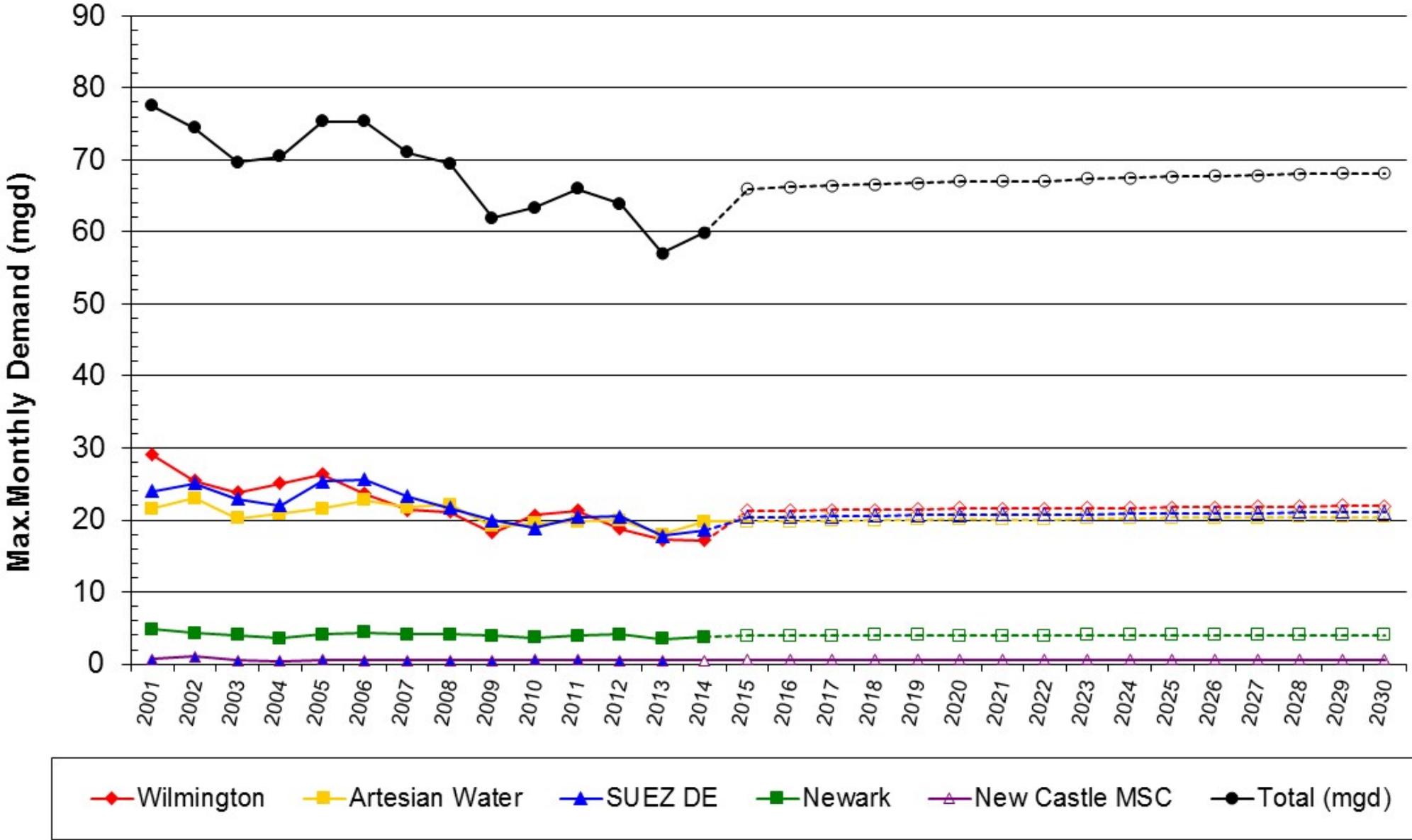


# New Castle County Public Water Supply System Interconnections

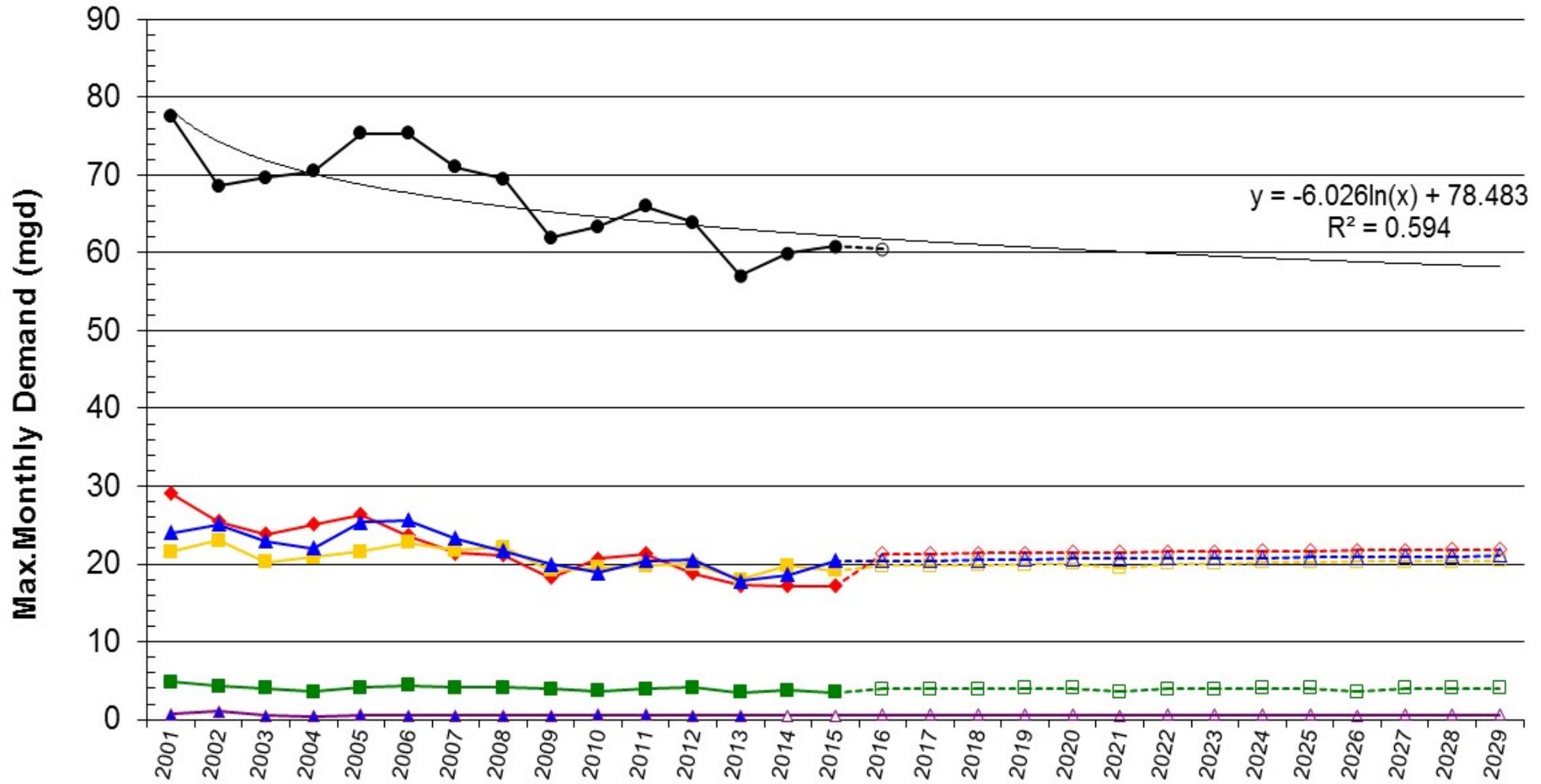
Figure 5.1. Public water supply wells and surface intake watersheds in New Castle County.



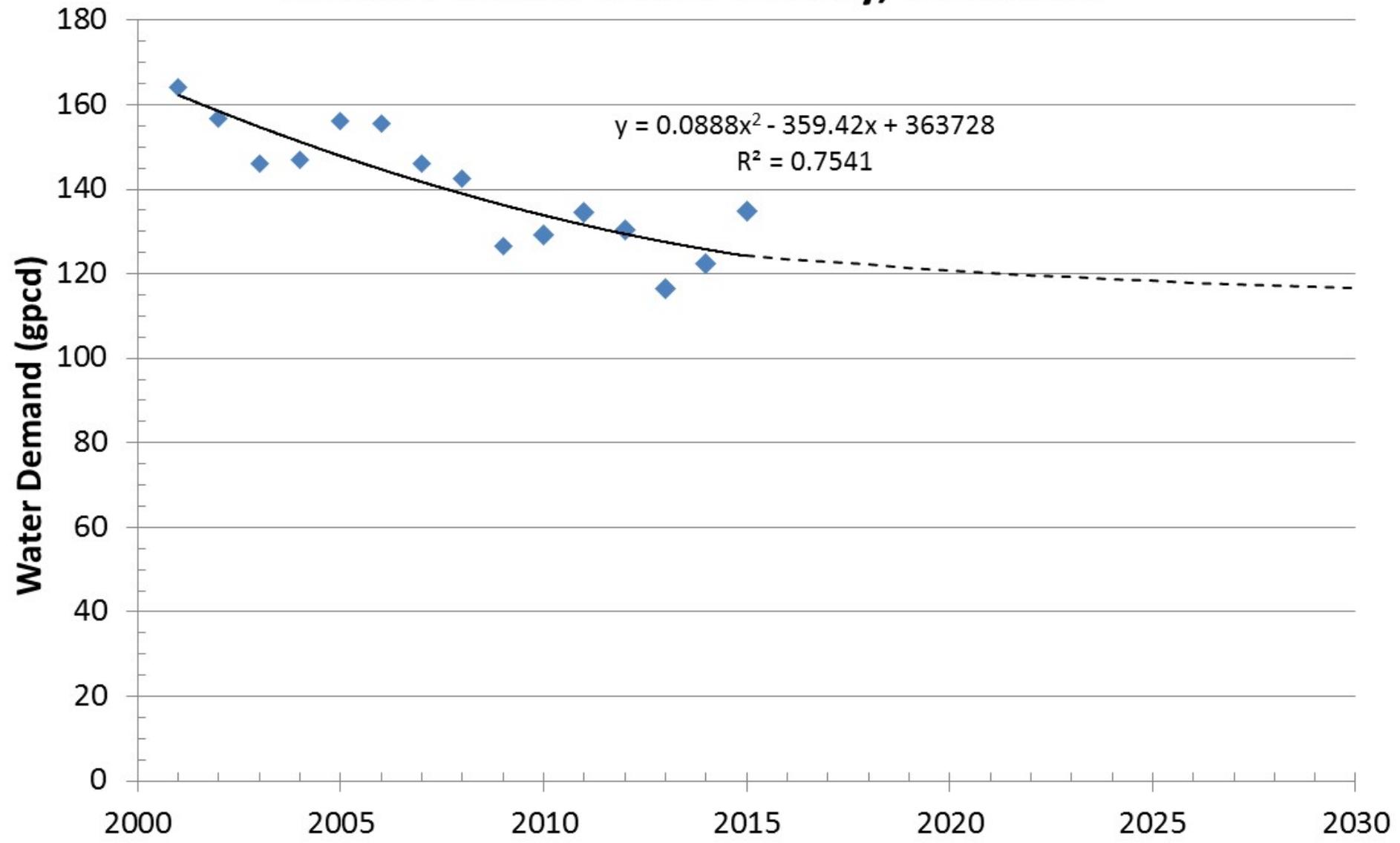
# Maximum Monthly Water Demand Northern New Castle County, Delaware



# Maximum Monthly Water Demand Northern New Castle County, Delaware



# Per Capita Water Demand Northern New Castle County, Delaware



**Table 5.** Water supply and demand projections for northern New Castle County through 2030

Year	Supply (mgd)	Demand (mgd)	Surplus	
			mgd	mg <sup>1</sup>
2015	102.6	66.0	36.6	2,745
2020	103.5	67.0	36.5	2,738
2030	103.5	68.1	35.4	2,655

1. Volume calculated assuming a 75-day drought period.

**Table 6. Water supply and demands (mgd) in Northern New Castle County projected through 2030**

Purveyor	2015			2020			2030		
	Supply	Max Monthly Demand	Surplus/ Deficit +/-	Supply	Max Monthly Demand	Surplus/ Deficit +/-	Supply	Max Monthly Demand	Surplus/ Deficit +/-
<b>Wilmington</b>	<b>38.3</b>	<b>21.3</b>	<b>17.0</b>	<b>38.3</b>	<b>21.6</b>	<b>16.7</b>	<b>38.3</b>	<b>22.0</b>	<b>16.3</b>
Brandywine Creek	15.0			15.0			15.0		
Hoopes Reservoir	21.3			21.3			21.3		
Raise Hoopes Res.	2.0								
<b>Artesian Water</b>	<b>29.0</b>	<b>19.8</b>	<b>9.2</b>	<b>29.0</b>	<b>20.1</b>	<b>8.9</b>	<b>29.0</b>	<b>20.4</b>	<b>8.6</b>
Groundwater	24.3			24.3			24.3		
CWA Interconn.	3.0			3.0			3.0		
ASR	1.7			1.7			1.7		
<b>SUEZ Delaware</b>	<b>26.8</b>	<b>20.4</b>	<b>6.4</b>	<b>26.8</b>	<b>20.7</b>	<b>6.1</b>	<b>26.8</b>	<b>21.1</b>	<b>5.7</b>
Stanton WTP	19.3			19.3			19.3		
Hoopes Contract	2.7			2.7			2.7		
Christiana WTP	3.0			3.0			3.0		
ASR	1.0			1.0			1.0		
CWA Interconn.	0.8			0.8			0.8		
<b>Newark</b>	<b>6.9</b>	<b>3.9</b>	<b>3.0</b>	<b>7.8</b>	<b>4.0</b>	<b>3.8</b>	<b>7.8</b>	<b>4.0</b>	<b>3.8</b>
White Clay WTP	0.0			0.0			0.0		
Newark Reservoir	4.0			4.0			4.0		
Groundwater	2.9			3.8			3.8		
<b>New Castle MSC</b>	<b>1.6</b>	<b>0.6</b>	<b>1.0</b>	<b>1.6</b>	<b>0.6</b>	<b>1.0</b>	<b>1.6</b>	<b>0.6</b>	<b>1.0</b>
<b>Subtotal</b>	<b>102.6</b>	<b>66.0</b>	<b>36.6</b>	<b>103.5</b>	<b>67.0</b>	<b>36.5</b>	<b>103.5</b>	<b>68.1</b>	<b>35.4</b>



Newark Reservoir filling with geomembrane, concrete, and rock liner system  
(Dec 2005)

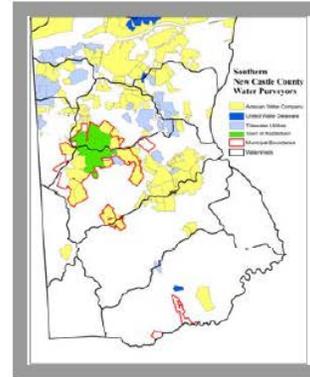
# Southern New Castle County Delaware

NINTH REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY

*Regarding the Progress of the*

**DELAWARE WATER SUPPLY COORDINATING COUNCIL**

*Estimates of Water Supply and Demand in Southern New Castle County through 2030*



*Final Report  
June 30, 2006*

*Prepared by the*

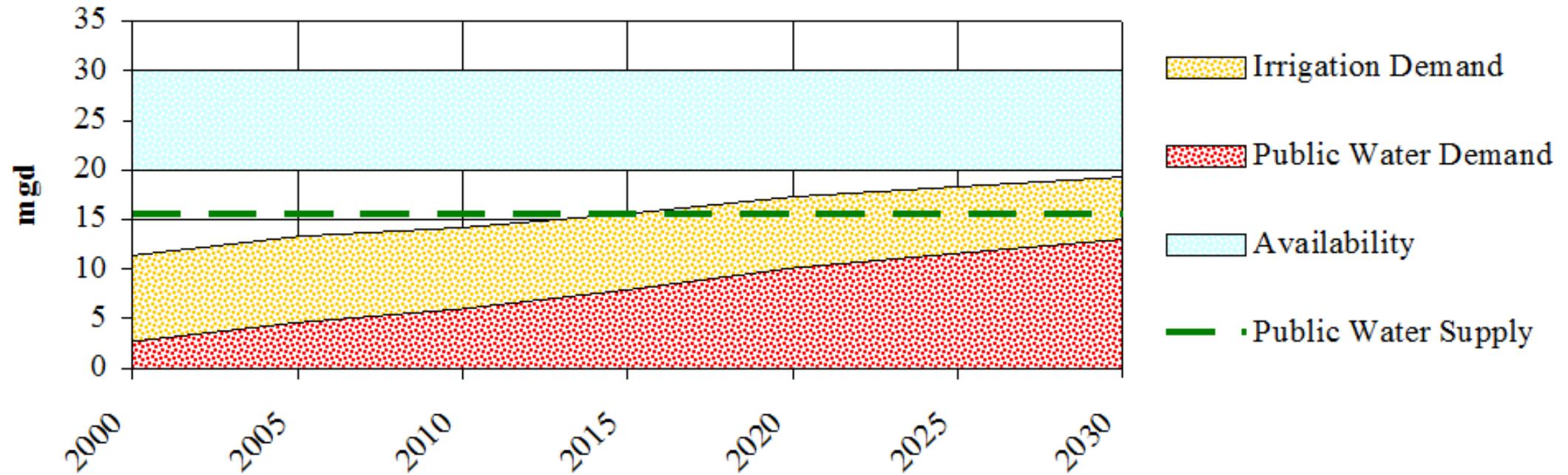
Delaware Department of Natural Resources and Environmental Control

Delaware Geological Survey

University of Delaware, College of Human Services, Education, and Public Policy  
Institute for Public Administration – Water Resources Agency



**Figure ES.1. Ground-water availability, currently allocated supply, and peak day public water and irrigation demand in southern New Castle County.**



**Table ES.1. Comparison of water supply and demand in southern New Castle County.**

Surplus/deficit calculations are based upon maximum daily supplies in accordance with current DNREC water allocation permits. Water purveyors will apply for additional allocations in the future.

<i>Water Purveyor</i>	<i>Current Max Daily Allocation (mgd)</i>	<i>2005 Peak Day Demand (mgd)</i>	<i>2005 Surplus / Deficit (mgd)</i>	<i>Current Max Daily Allocation (mgd)</i>	<i>2030 Peak Day Demand (mgd)</i>	<i>2030 Surplus / Deficit (mgd)</i>
Artesian Water Company	8.8	1.6	+ 7.2	8.8	5.0	+ 3.8
AWC: DE Correctional Center	2.1	0.2	+ 1.9	2.1	0.2	+ 1.9
Tidewater Utilities, Inc.	2.7	1.2	+ 1.5	2.7	3.7	- 1.0
Middletown	1.7	1.2	+ 0.5	1.7	3.7	- 2.0*
Mt. Pleasant and Cantwell	0.1	0.1	0.0	0.1	0.1	0.0
Self-Supplied	0.3	0.3	0.0	0.3	0.3	0.0
Subtotal Public Water Supply	15.7	4.6	+ 11.1	15.7	13.0	+ 2.7
Individual Wells	1.4	1.4	0.0	1.9	1.9	0.0
Total Potable Water	17.1	6.0	+ 11.1	17.6	14.9	+ 2.7
Agriculture/Golf Course Irrigation	10.0	8.7	+ 1.3	10.0	6.3	+ 3.7
Total	27.1	14.7	+12.4	27.6	21.2	+ 6.4

## Recommendations

Given that long term ground-water availability in southern New Castle County is estimated to be 20 to 30 mgd and the population may increase from 41,000 in 2005 to 96,000 people by 2030, the Delaware Water Supply Coordinating Council recommends the following approach to sustain the most efficient delivery of drinking water without overuse of a limited ground-water resource:

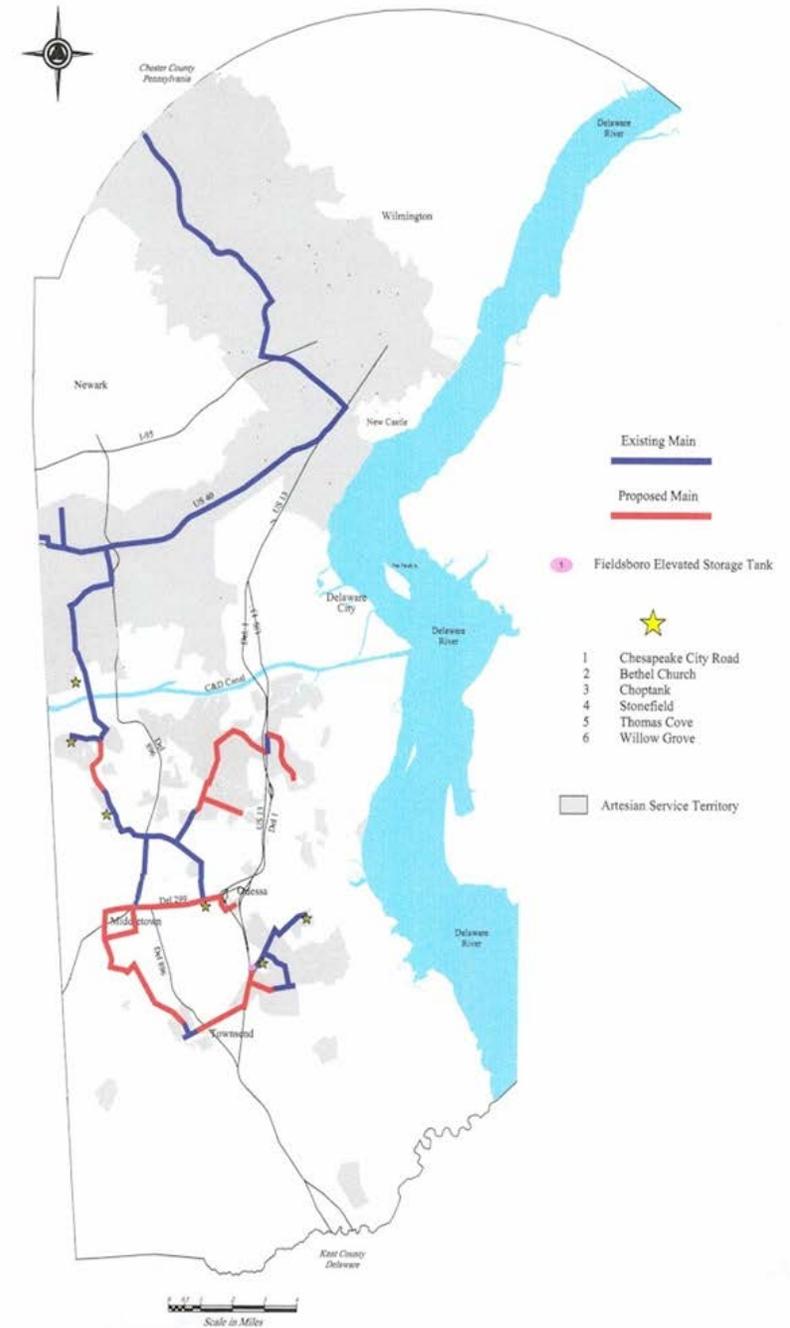
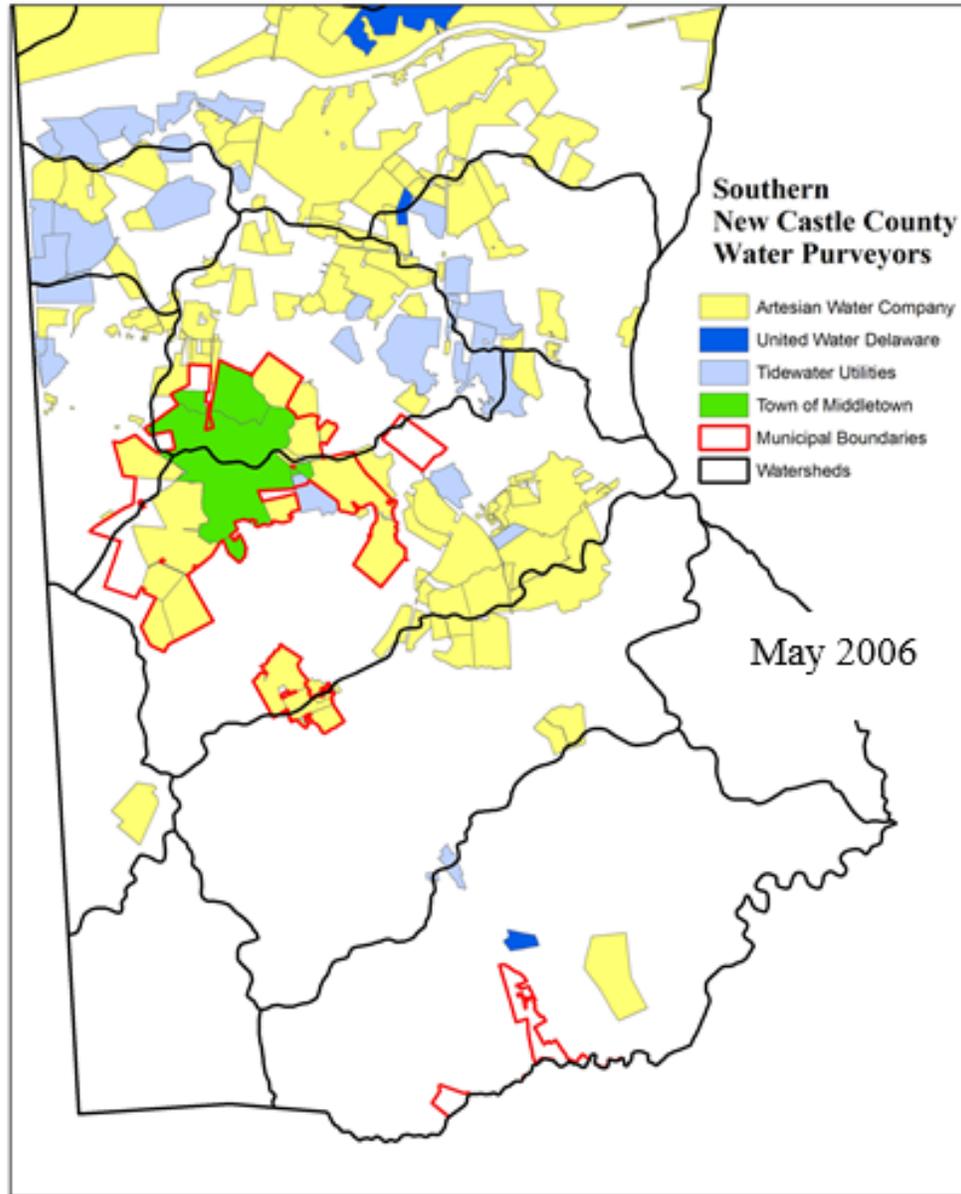
- 1. Periodic WSCC Updates:** By December 2010, the WSCC should update these supply and demand estimates in conjunction with the public water purveyors in southern New Castle County and include:
  - Estimates of supply and peak demand in comparison to ground-water availability.
  - A water supply service area map showing distribution mains and interconnections with other water purveyors, water treatment plants and water storage tanks, and boundaries of existing and proposed water supply CPCNs.
- 2. Ground-water Availability:** The WSCC should work with the DGS and DNREC to develop comprehensive programs to reevaluate both the long-term and short-term availability and sustainability of ground-water in southern New Castle and northern Kent Counties.
- 3. Peak Demands by 2030:** The projections indicate there is sufficient availability (20 to 30 mgd) to meet peak demands in 2030 from public water supply and agriculture/golf course irrigation uses in southern New Castle County provided: 1) DNREC updates the allocated irrigation well data base and 2) continues to monitor public water supply and agricultural wells during the summers to not diminish the capacity of irrigation wells by producers.

## **Recommendations (con't.)**

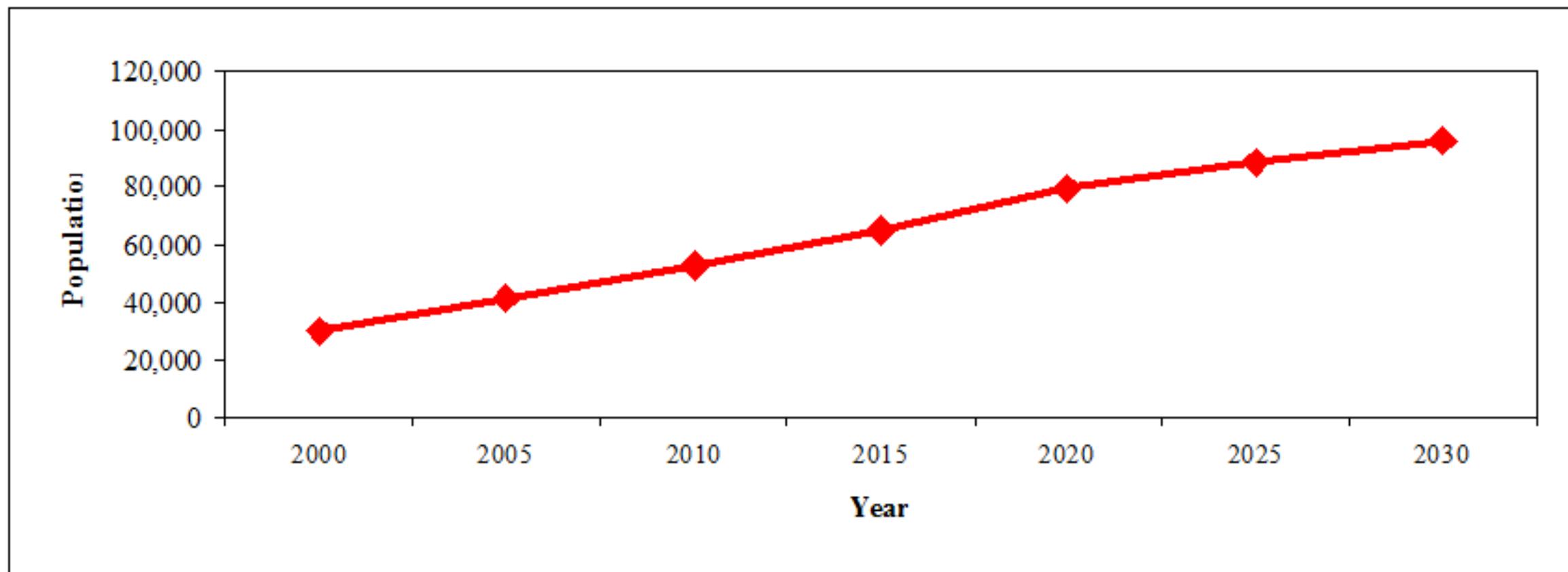
**4. Treated Wastewater for Irrigation Use:** The utilization of treated wastewater for irrigation, particularly irrigation of golf courses and agriculture, should be further encouraged by DNREC and the local governments in southern New Castle County.

**5. Water Supply CPCNs:** The Water Supply Coordinating Council (WSSCC) shall establish a subcommittee to review 26 Del Code Section 203C (Certificates of Public Convenience and Necessity for Water Utilities) to determine if legislative changes are needed to ensure that service territories are granted in a manner that considers water supply planning principles. The subcommittee shall consider water supply planning principles as part of its review, including but not limited to, long-term water supply sustainability and sufficiency; service and infrastructure cost effectiveness; sizing, location and optimization of service areas; and enhanced

**Figure 3.1. Public water supply franchise areas in southern New Castle County.**



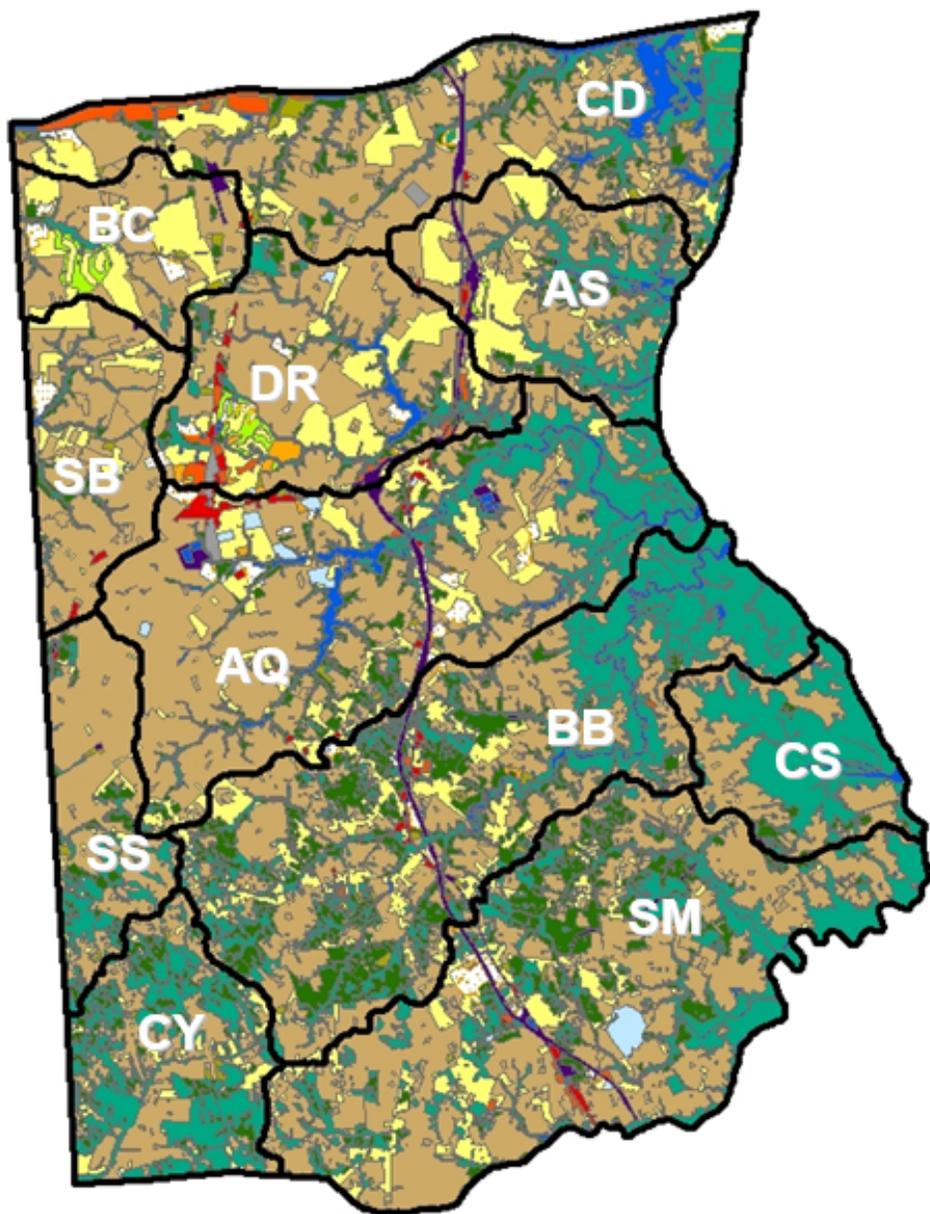
**Figure 2.2. Projected population growth in southern New Castle County.**



Source: Delaware Population Consortium, October 2005

**Figure 2.4. Southern New Castle County Watersheds**

<i>ID</i>	<i>Watershed</i>	<i>Area (sq. mi.)</i>
CD	C & D Canal	31
AS	Augustine Creek / Silver Run	12
DR	Drawyers Creek	15
AQ	Appoquinimink River	32
BB	Blackbird Creek	32
CS	Cedar Swamp	8
SM	Smyrna River	34
CY	Cypress Branch / Chester River	11
SS	Sassafras River	8
SB	Sandy Branch / Great Bohemia Creek	9
BC	Back Creek	7



**Figure 4.1. Generalized cross section extending from near Newark to southeastern New Castle County.**

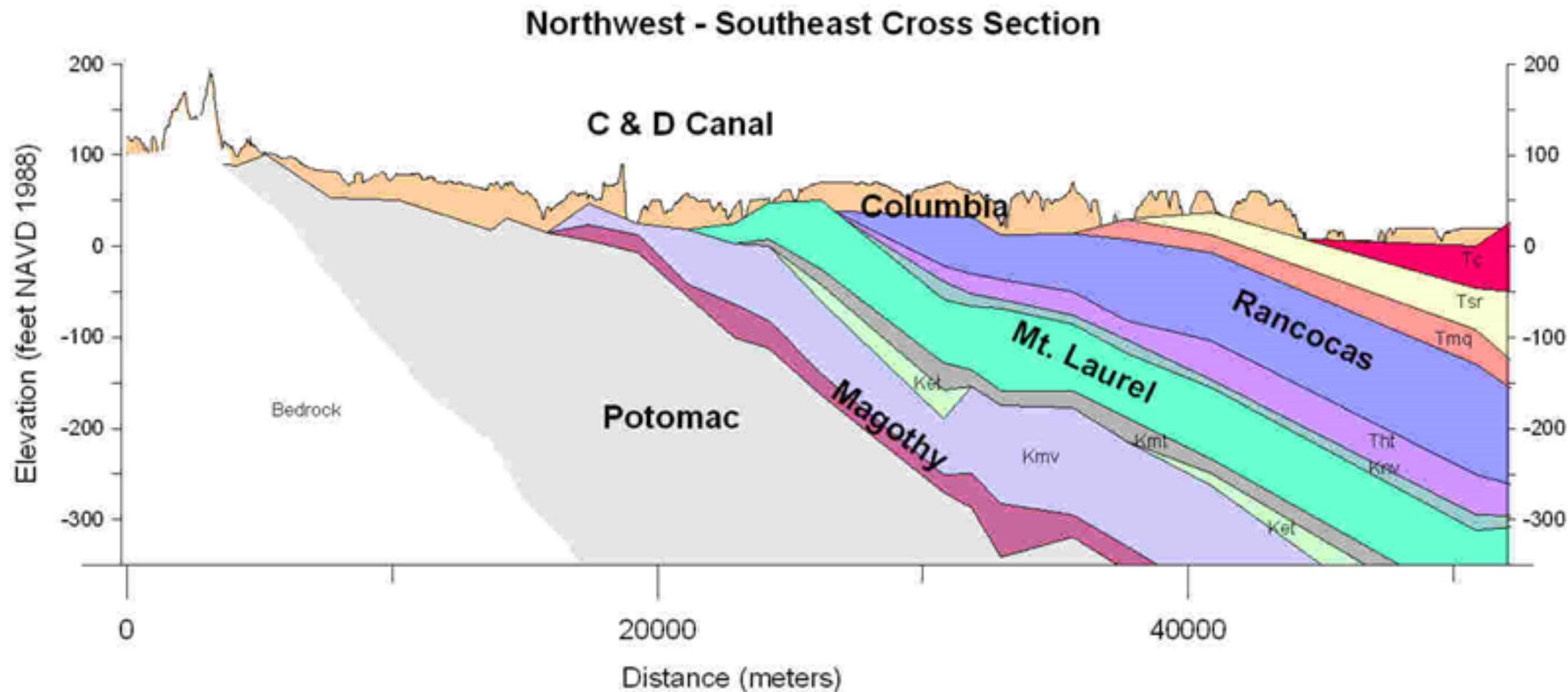
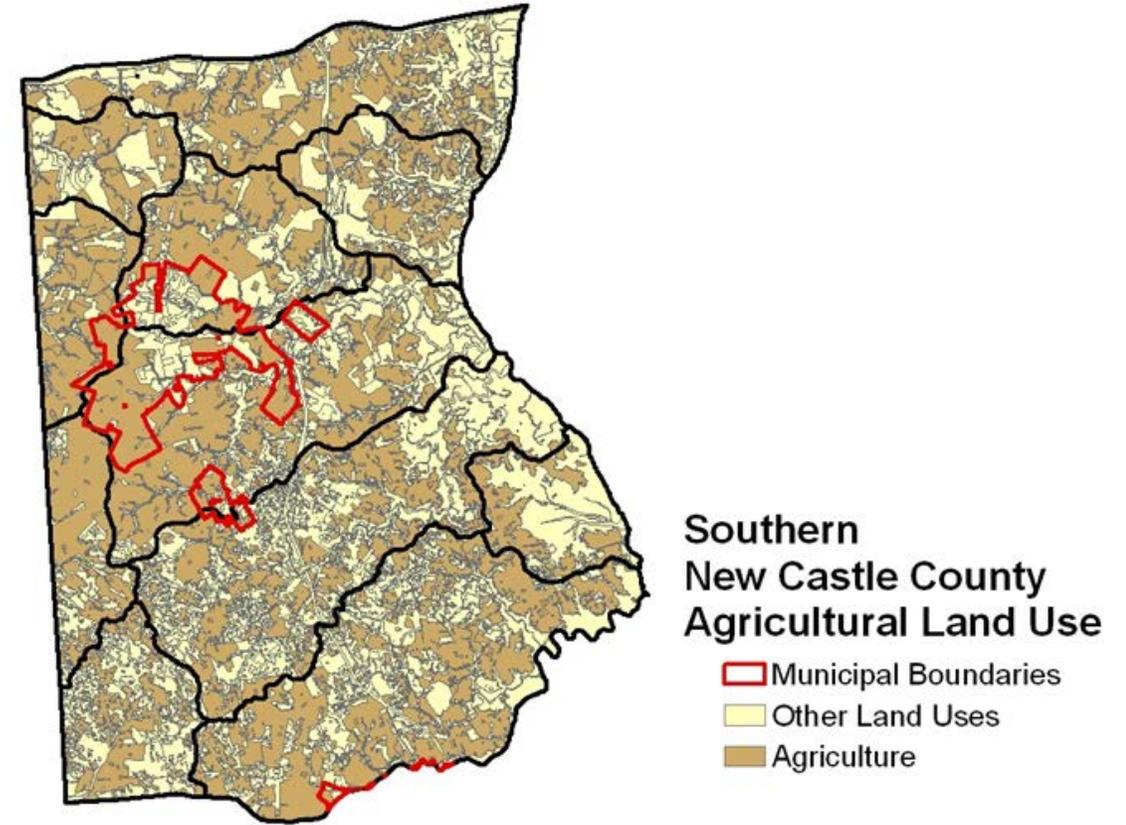
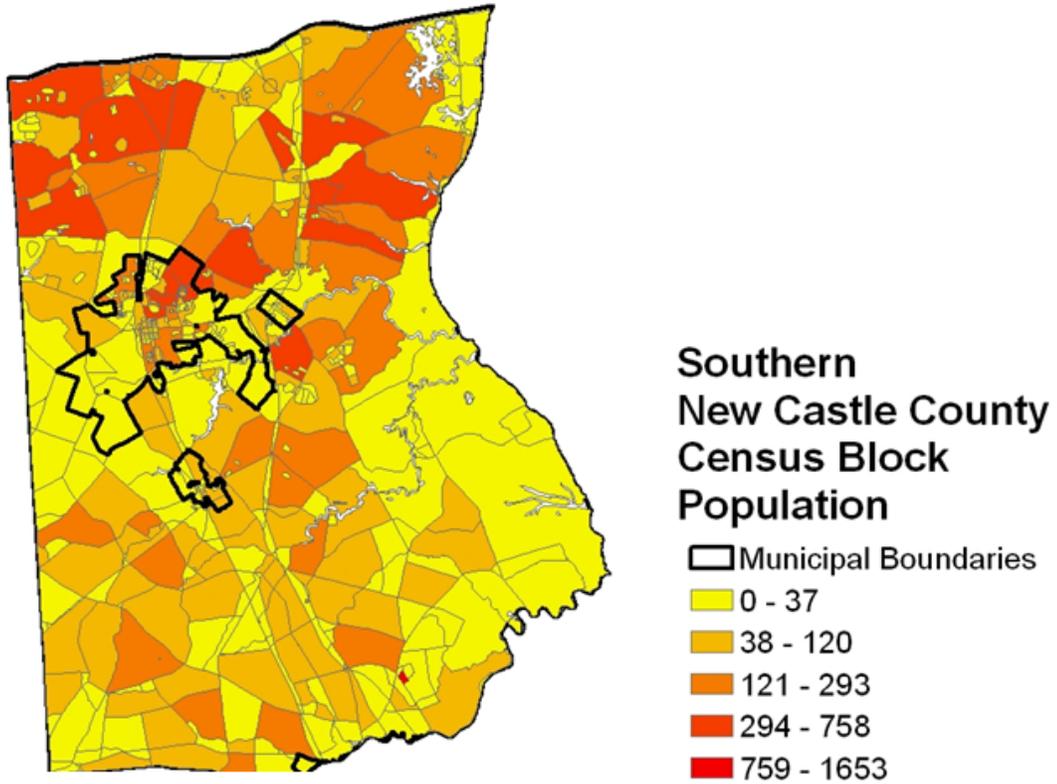


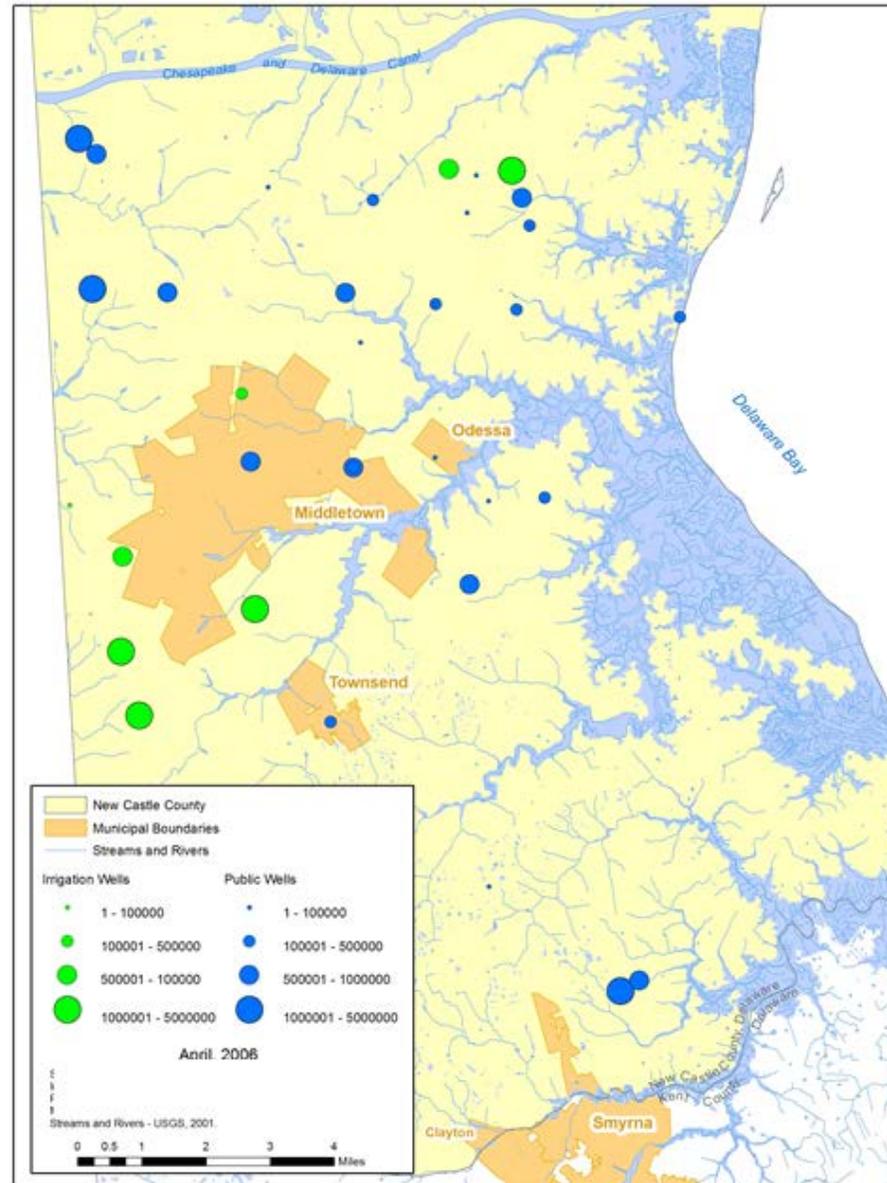
Figure 6.2. Southern New Castle County Census Block population, 2000.



**Table 7.2. Daily water demand in southern New Castle County by local governments, 2000-2030.**

<i>Year</i>	<i>2000</i>	<i>2005</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>2025</i>	<i>2030</i>
% Increase Total Population	0 %	39 %	29 %	22 %	22 %	11 %	8 %
Total Population	29,682	41,243	53,060	65,021	79,501	88,651	95,996
Less population individual wells	13,830	14,176	14,530	14,893	15,266	15,647	16,039
Less pop. in DE Correctional	1,653	1,653	1,653	1,653	1,653	1,653	1,653
Population public water supply	14,199	25,414	36,877	48,475	62,582	71,351	78,304
% Increase public water supply	0%	79%	45%	31%	29%	14%	10%
<i>Government</i>	<i>Peak Demand (mgd)</i>						
Unincorporated New Castle Co.	1.1	1.6	2.3	3.0	3.9	4.5	4.9
Middletown	1.0	1.8	2.6	3.4	4.4	5.0	5.5
Odessa	0.1	0.2	0.3	0.4	0.5	0.5	0.6
Townsend	0.2	0.4	0.5	0.7	0.9	1.0	1.1
Self-Supplied Non-Community Wells	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<b>Public Peak Daily Water Demand</b>	<b>2.7</b>	<b>4.3</b>	<b>6.0</b>	<b>7.8</b>	<b>10.0</b>	<b>11.3</b>	<b>12.4</b>
Individual Wells	1.3	1.4	1.5	1.6	1.7	1.8	1.9
DE Correctional Facility	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<b>Potable Peak Daily Demand</b>	<b>3.9</b>	<b>5.9</b>	<b>7.7</b>	<b>9.6</b>	<b>11.9</b>	<b>13.3</b>	<b>14.5</b>

**Figure 7.1. Public water supply and irrigation withdrawals in southern New Castle County (gallons per day).**



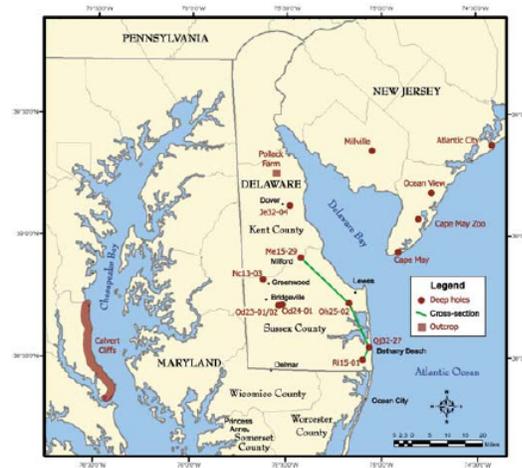
# Kent County and Sussex County Delaware

TWELFTH REPORT TO THE GOVERNOR AND GENERAL ASSEMBLY

*Regarding the Progress of the*

**DELAWARE WATER SUPPLY COORDINATING COUNCIL**

*Estimates of Water Supply & Demand for Kent County and Sussex County through 2030*



June 20, 2014

*Prepared by the*

Delaware Department of Natural Resources and Environmental Control  
Division of Water

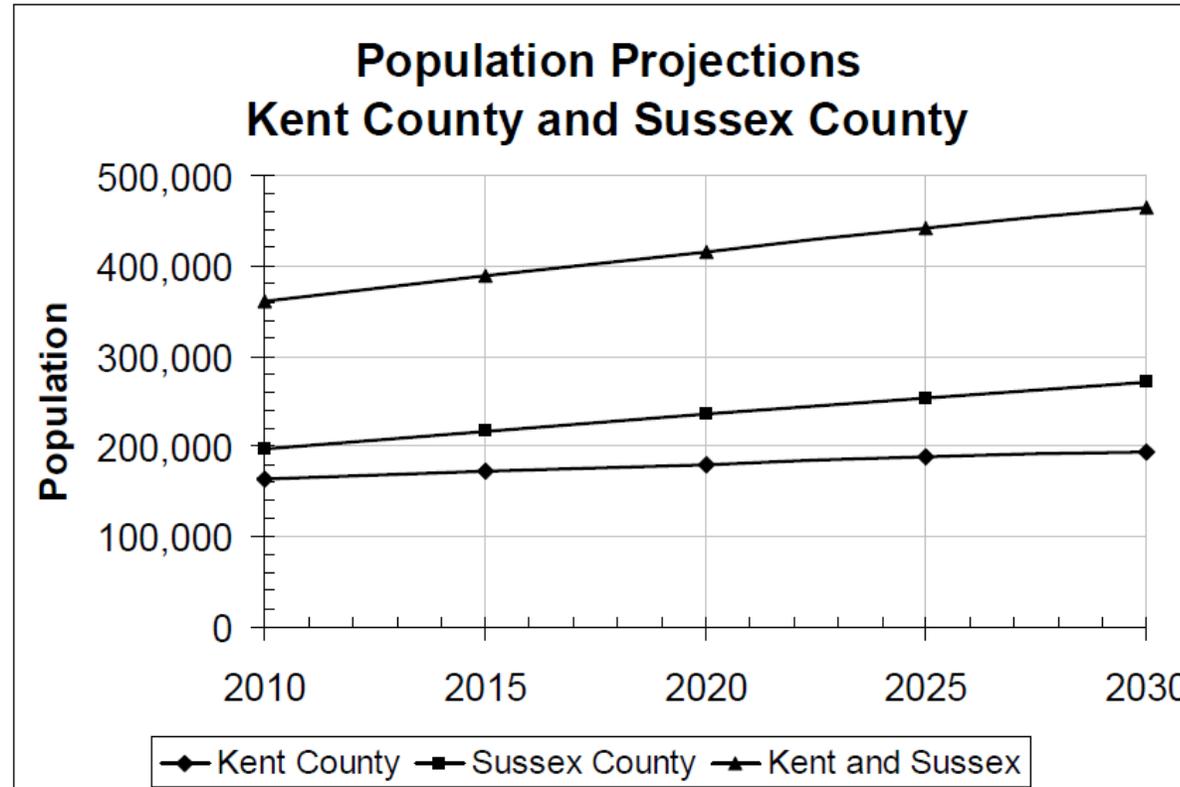
Delaware Geological Survey

University of Delaware  
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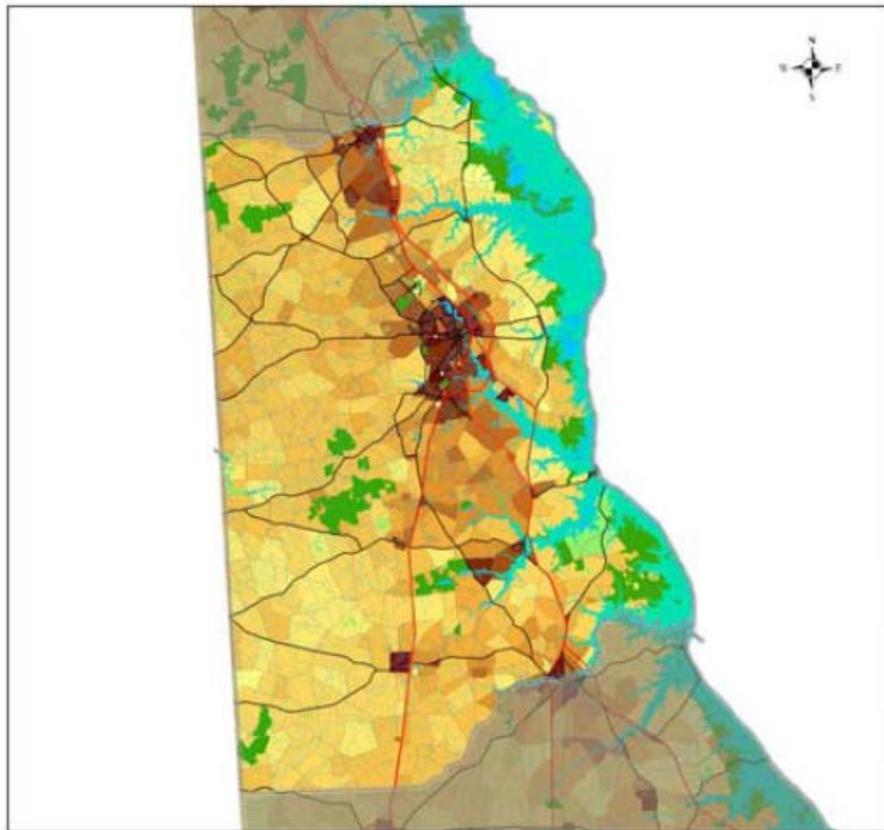


**Table 2.2.** Population projections in Kent County and Sussex County, 2010-2030  
(Delaware Population Consortium 2012)

	2010 (pop.)	2020 (pop.)	2030 (pop.)
Kent County	162,916	180,357	194,225
Sussex County	197,870	235,574	271,018
<b>Total</b>	<b>360,786</b>	<b>415,931</b>	<b>465,243</b>
		2010-2020 (%)	2010-2030 (%)
Kent County		11%	19%
Sussex County		19%	37%
<b>Total</b>		15%	29%



**Figure 2.2.** Population projections in Kent County and Sussex County, 2010-2030



### Kent County Population Density 2030

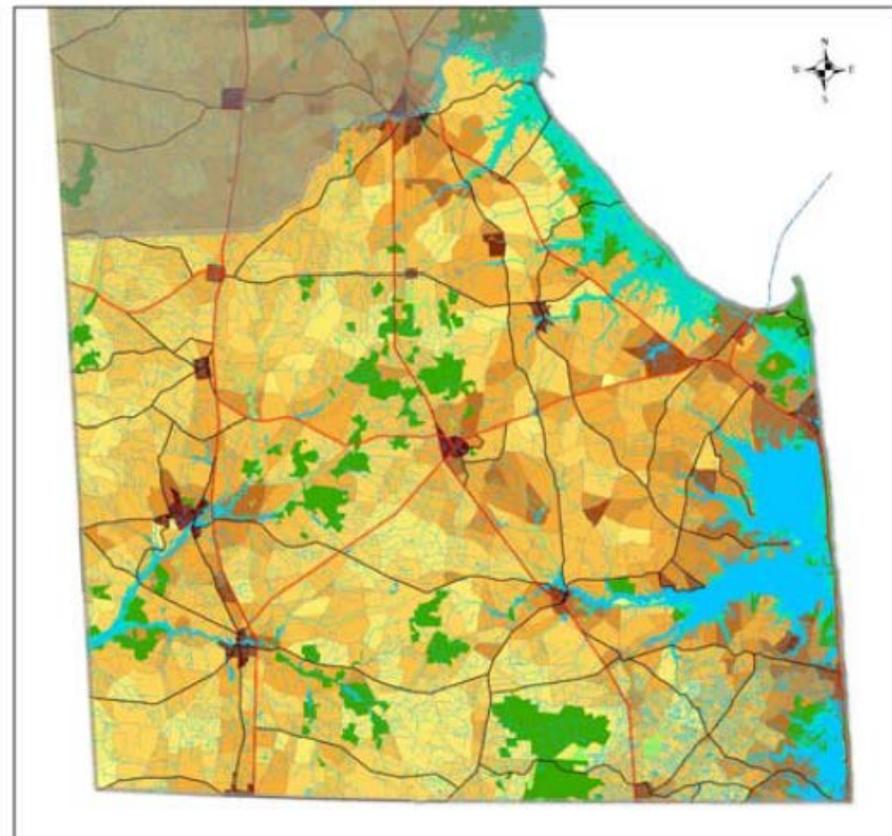
This map depicts population densities (people per square mile) by Modified Grid census unit.

Data are from the Delaware Population Consortium and the U.S. Census Bureau.

#### Pop. per Sq. Mi.

- 0 - 10.00
- 10.01 - 50.00
- 50.01 - 100.0
- 100.1 - 250.0
- 250.1 - 500.0
- 500.1 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3000
- 3001 - 20000
- Tidal Wetlands
- Non-tidal Wetlands
- Open Water
- Public Land

0 2 4 8  
Miles



### Sussex County Population Density 2030

This map depicts population densities (people per square mile) by Modified Grid census unit.

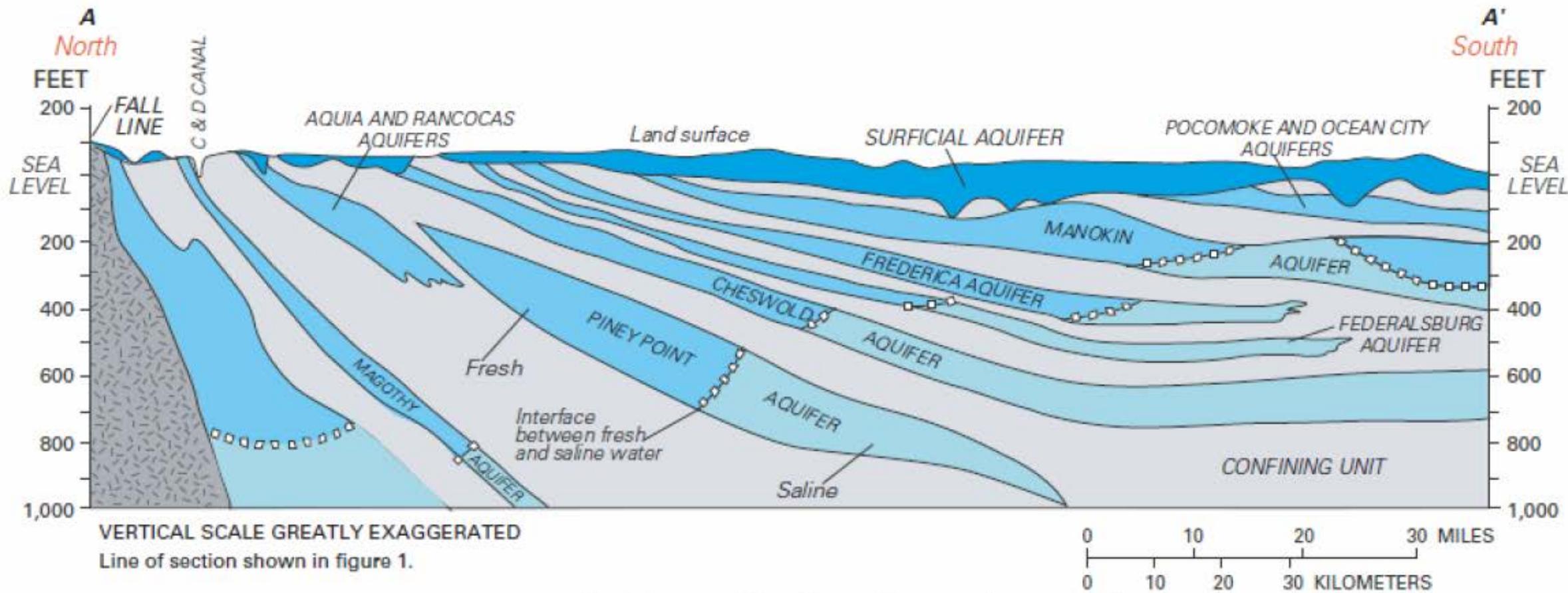
Data are from the Delaware Population Consortium and the U.S. Census Bureau.

#### Pop. per Sq. Mi.

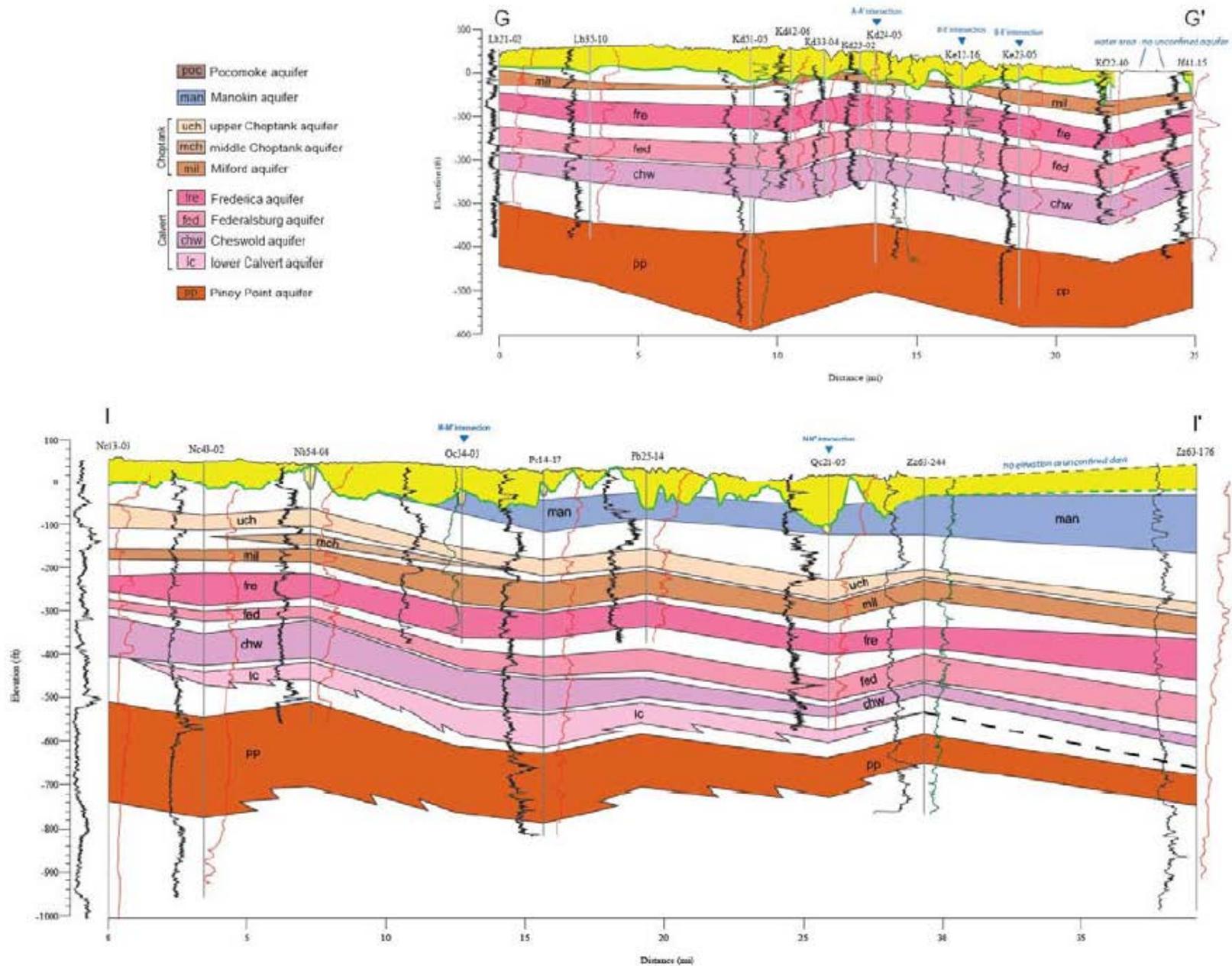
- 0 - 10.00
- 10.01 - 50.00
- 50.01 - 100.0
- 100.1 - 250.0
- 250.1 - 500.0
- 500.1 - 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 3000
- > 3000
- Tidal Wetlands
- Non-tidal Wetlands
- Open Water
- Public Land

0 2 4 8  
Miles

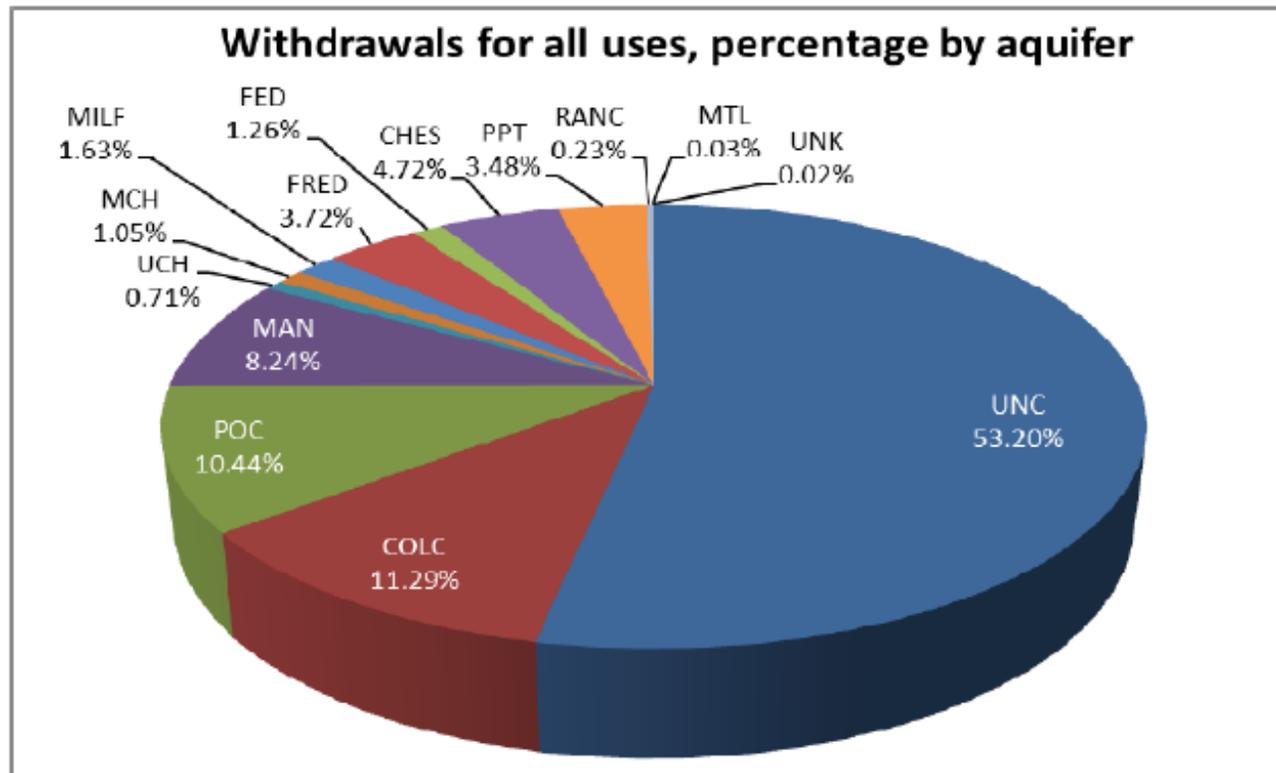




**Figure 4.** Coastal Plain aquifers in Delaware (DGS and USGS)



**Figure 3.1.** Typical geologic cross sections from Kent County (G-G') and Sussex County (I-I')



**Figure 3.4.** Groundwater withdrawals by aquifer in Kent and Sussex counties

Mount Laurel (MTL)  
 Rancocas (RAN)  
 Piney Point (PPT)  
 Lower Calvert (LCAL)  
 Cheswold (CHE)  
 Federalsburg (FED)  
 Frederica (FRE)

Milford (MIL)  
 Middle Choptank (MCH)  
 Upper Choptank (UCH)  
 Manokin (MAN)  
 Pocomoke (POC)  
 Confined Columbia (COLC)  
 Unconfined (UNC)

**Nitrogen:** High nitrogen levels above the 10 mg/l drinking water standard are thought to be a possible link to blue baby syndrome. Analysis of N levels in the shallow water table in Kent and Sussex counties indicate:

- 23% of wells in coastal Sussex County had nitrates above the 10 mg/l drinking water standard in 1991.
- One of 30 samples contained nitrite + nitrate above the 10 mg/l EPA drinking water standard in 2002.
- Nitrates were widespread in the surficial aquifer on the Delmarva Peninsula of Del., Md., and Va. in 2004.
- Nitrates were detected in 3 of 4 individual wells, 18% of wells exceeded the drinking water standard in 2008.
- Nitrogen levels have remained constant and did not increase or decrease between 2000 and 2008.

**Volatile Organic Compounds:** VOCs such as chloroform, tetrachloroethene, and methyl tert-butyl ether (MTBE) are suspected cancer-causing compounds detected in low levels but rarely above EPA drinking water standards.

- In 2002, 34 VOCs were detected in at least 1 of 30 wells. No wells exceeded EPA drinking water standards.
- In 2008, VOCs were detected in 75% of 200 shallow domestic wells. Just 2% of wells exceeded EPA standards.
- Just 7 of 31 VOCs had levels greater than 1 ug/l in 2010. All VOCs were below drinking water standards.

**Pesticides:** Low levels of pesticides were detected in Delaware shallow aquifers at detections less than EPA drinking water standards. Pesticides in high amounts above drinking water standards can be toxic to humans.

- Pesticides were detected in at least 1 of 30 samples in 2002, all less than EPA drinking water standards.
- Low levels of herbicides were detected in Delmarva Peninsula shallow aquifers in 2004.
- At least one pesticide was detected in 29 of 30 wells but levels did not exceed drinking water standards in 2010.

**Radionuclides:** Naturally occurring radon and radium are present at low levels in Delaware shallow groundwater that rarely exceed proposed EPA drinking water standards. High radon levels have been linked to lung cancer.

- Radon was detected in 10 wells in 2002. One well exceeded the proposed EPA standard of 300 picocuries/liter.
- Radium and radon were detected in 9 wells in 2010. No samples exceeded proposed EPA standards.

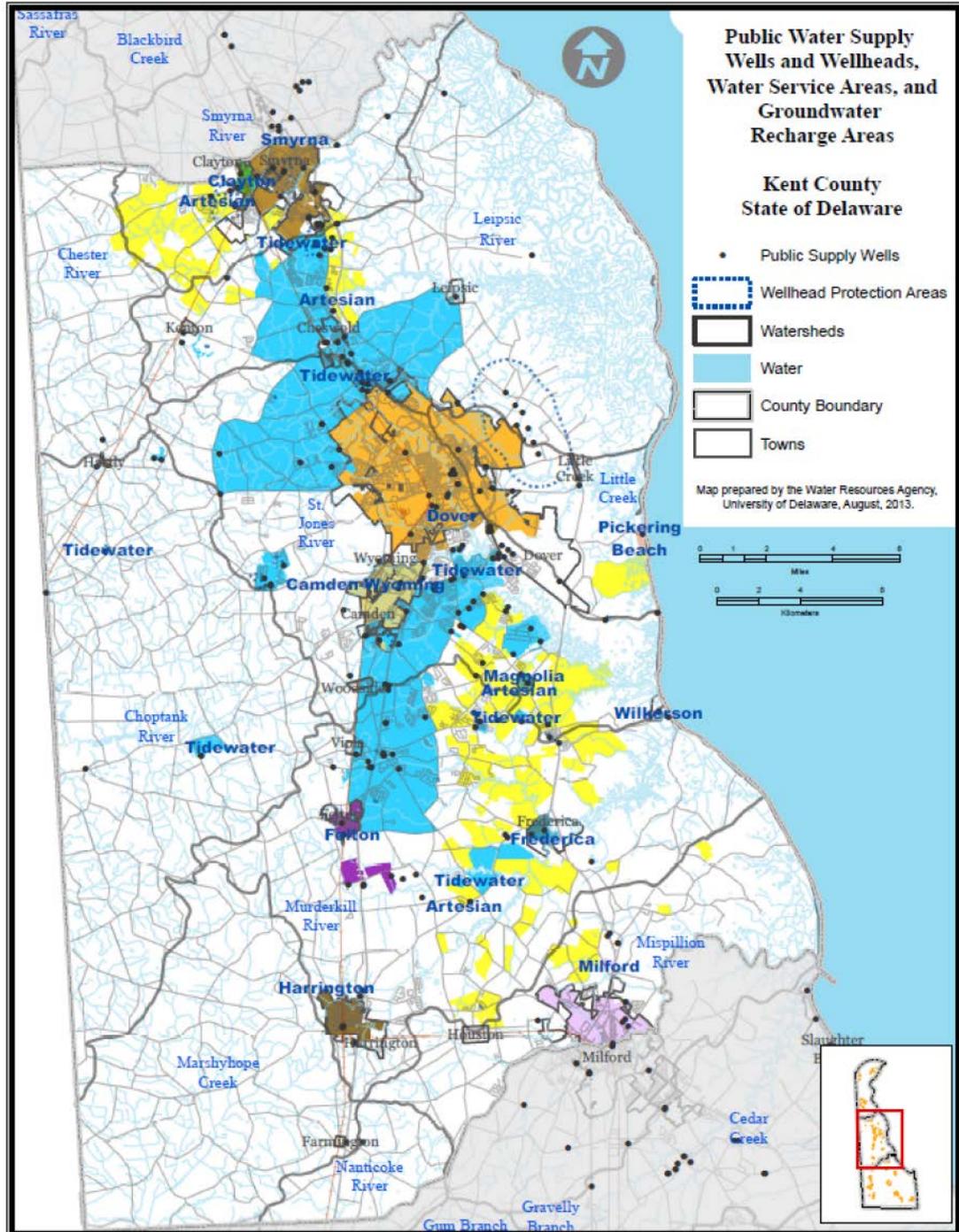
**Public Drinking Water Annual Compliance Report:** Of 486 public water systems, the Delaware Division of Public Health reported 15% of systems recorded a violation mostly due to high nitrate or bacteria levels in 2009.

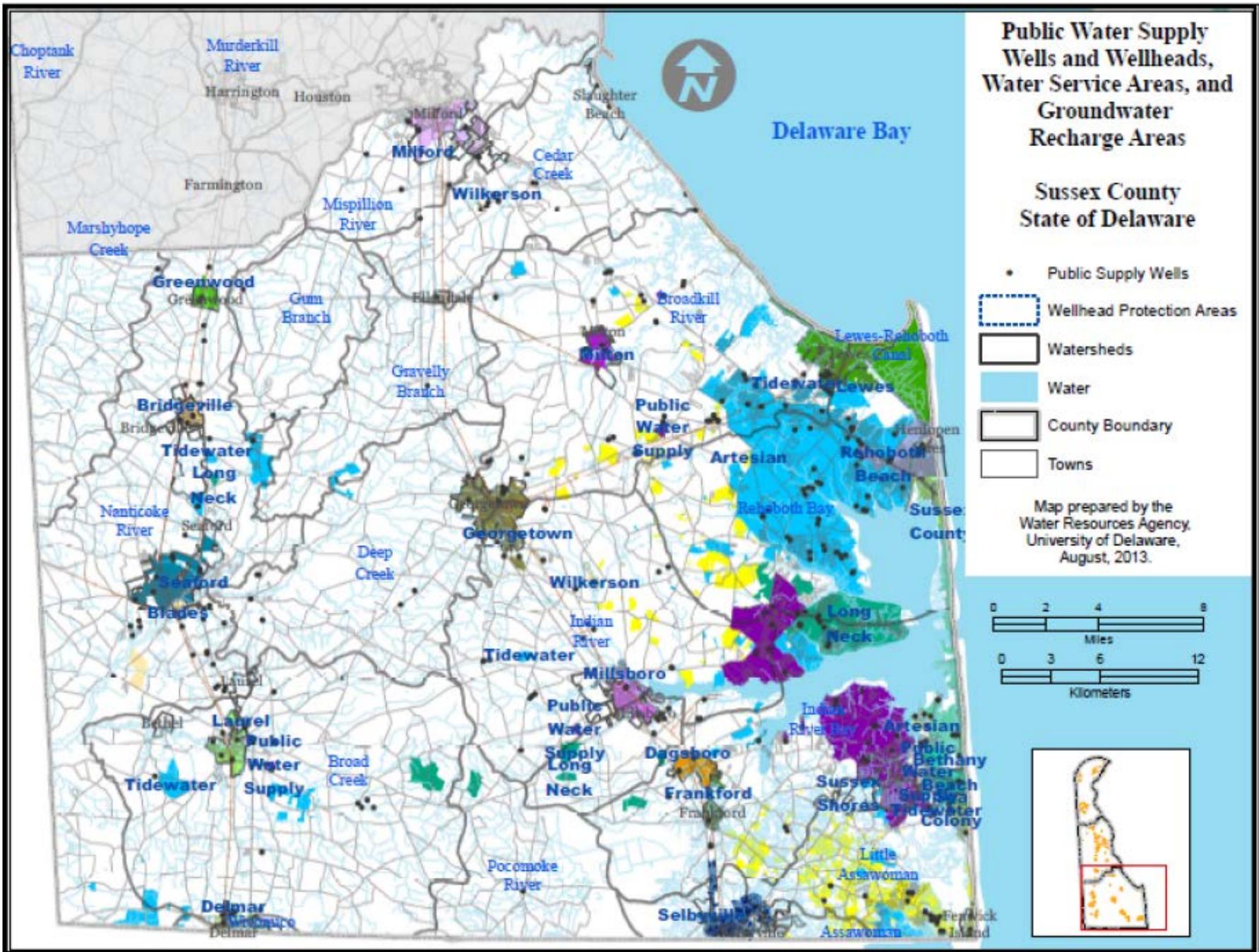
**Emerging Contaminants:** The EPA is considering setting drinking water standards on emerging contaminants such as drugs and personal care chemicals that have been detected in very low levels in surface water and groundwater. In 2008 and 2009, a report for the Delaware Division of Public Health found:

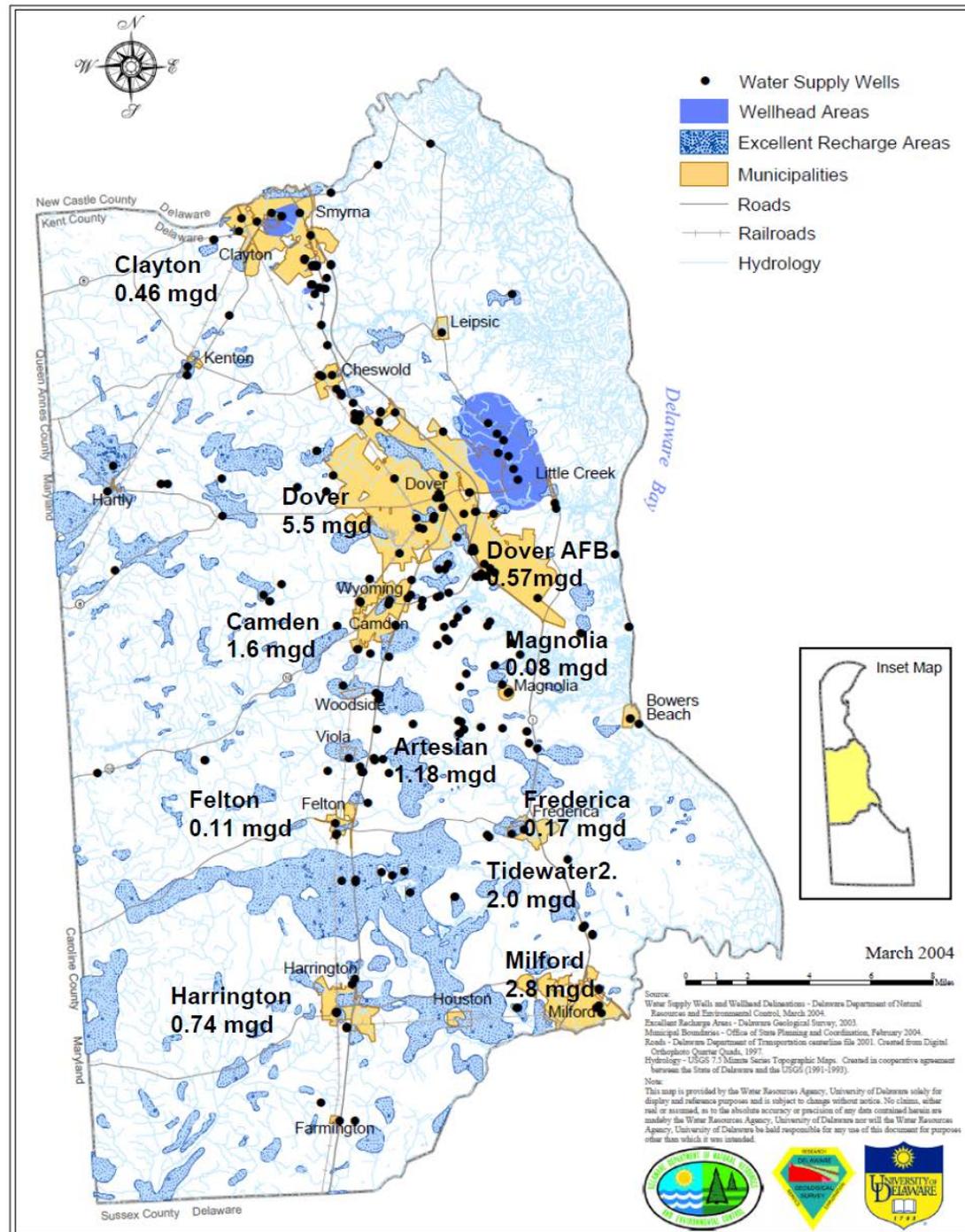
- 17 drugs and personal care chemicals were detected in 55% of public water supply systems.
- At least 17 different drugs were detected in 101 treated and untreated water supplies.
- At least 95 farm wells had detected 14 compounds.

**Source Water Protection:** In accordance with the Delaware Source Water Protection Law of 2001:

- Source water protection ordinances were adopted by 9 governments in Kent County: Smyrna, Cheswold, Dover, Wyoming, Camden, Frederica, Harrington, Milford, and Kent County, and 9 governments in Sussex County: Sussex County, Milford, Lewes, Bridgeville, Georgetown, Seaford, Millsboro, Laurel, and Selbyville.
- Clayton and Milton are currently developing their ordinances.
- Source water assessments at 65 public systems in Kent and Sussex counties indicate untreated water exceeded standards for iron and manganese in 20% of systems, VOCs in 3% of systems, and bacteria in 2% of systems.

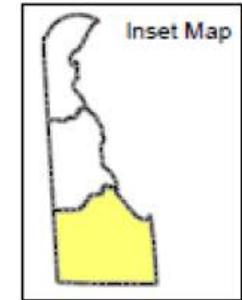








- Water Supply Wells
- Wellhead Areas
- Excellent Recharge Areas
- Municipalities
- Major Roads
- Hydrology
- Railroads

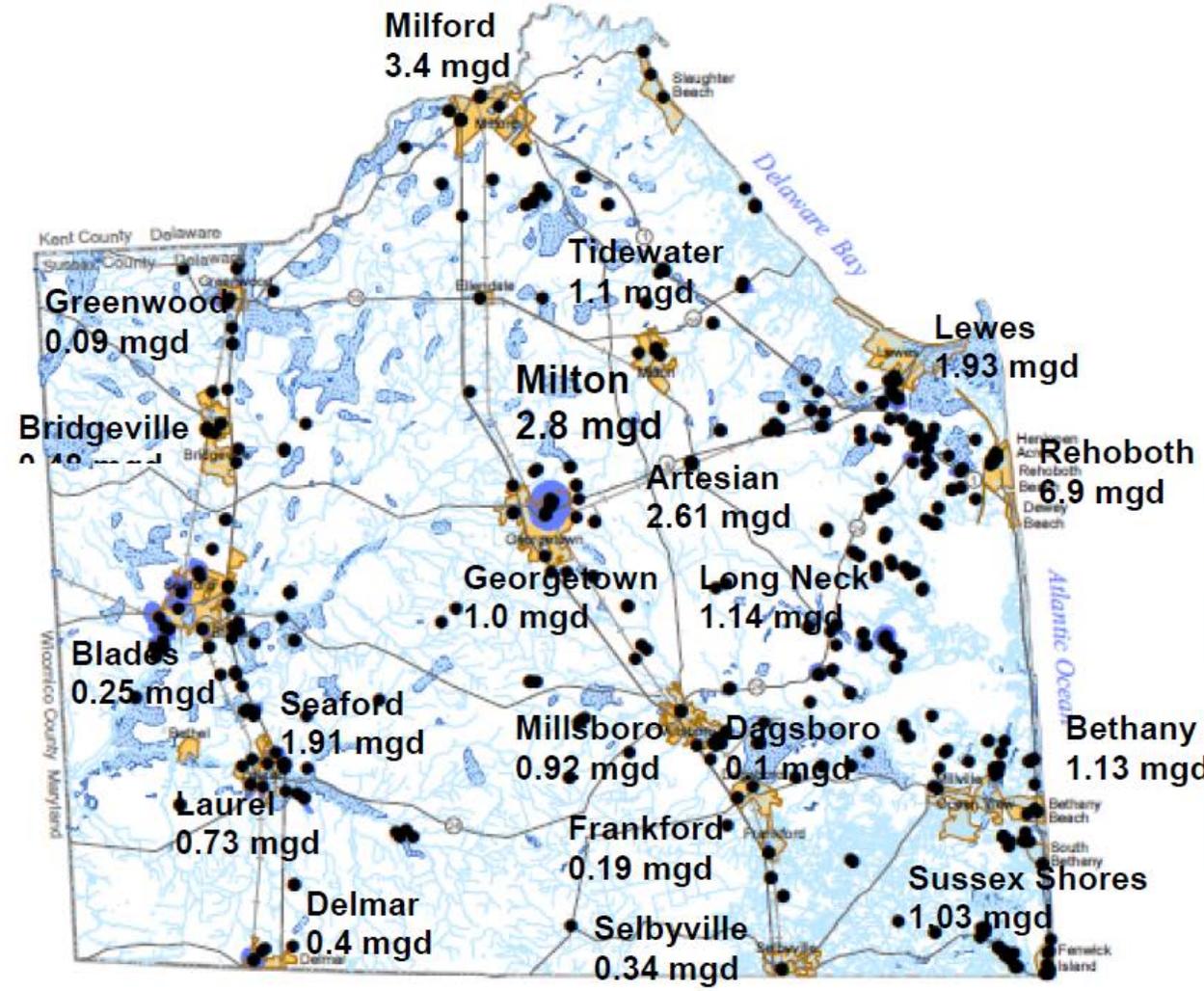


March 2004



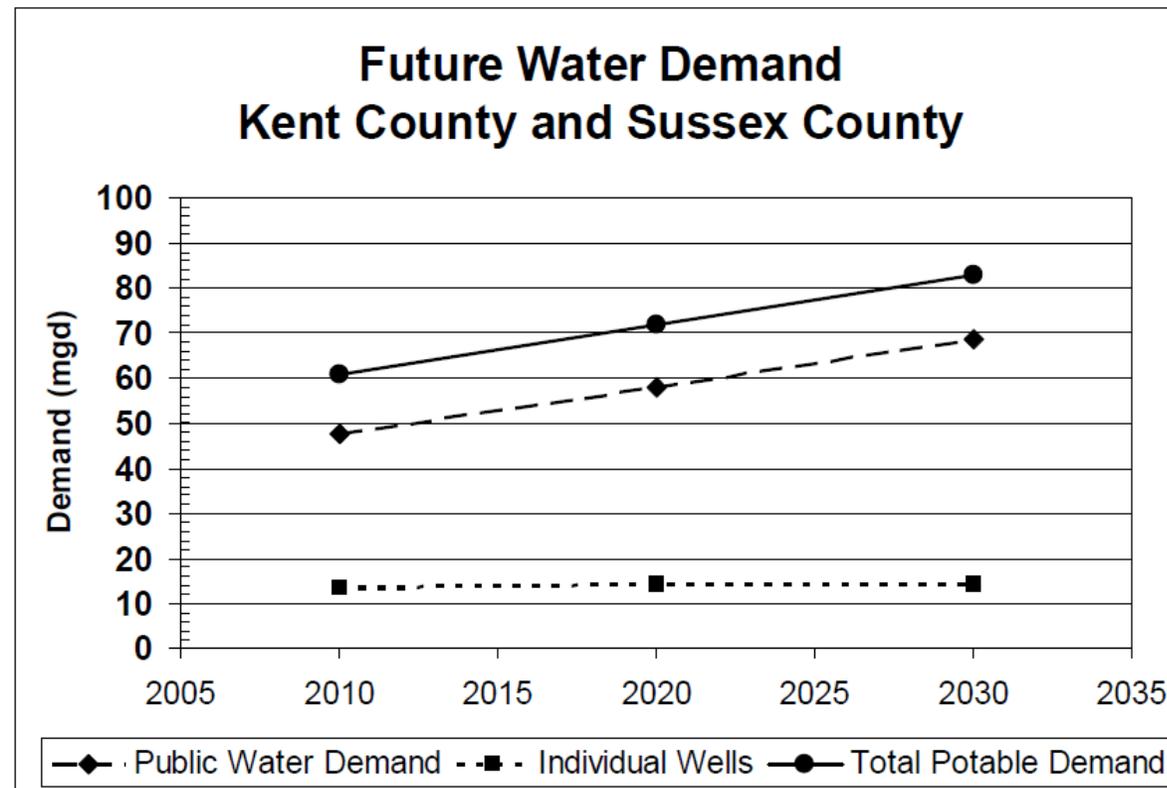
Source:  
Water Supply Wells and Wellhead Delineations - Delaware Department of Natural Resources and Environmental Control, Division of Water Resources, 2004.  
Excellent Recharge Areas - Delaware Geological Survey, 2003.  
Municipal Boundaries - Office of State Planning and Coordination, February 2004.  
Roads - Delaware Department of Transportation (centerline file 2001). Created from Digital Orthophoto Quarter Quads 1997.  
Hydrology - USGS 7.5 Minute Series Topographic Maps. Created in cooperative agreement between the State of Delaware and the USGS (1994-1997).

Note:  
This map is provided by the Water Resources Agency, University of Delaware solely for display and reference purposes and is subject to change without notice. No claims, either real or assumed, as to the absolute accuracy or precision of any data contained herein are made by the Water Resources Agency, University of Delaware nor will the Water Resources Agency, University of Delaware be held responsible for any use of this document for purposes other than which it was intended.



**Table 1.** Future potable water demand in Kent County and Sussex County, 2010-2030

County	2010	2020	2030
<b>Kent County</b>	<b>19.3</b>	<b>20.7</b>	<b>21.7</b>
Public Water Demand	15.4	16.5	17.4
Individual Wells	3.9	4.2	4.3
<b>Sussex County</b>	<b>41.7</b>	<b>51.3</b>	<b>61.3</b>
Public Water Demand	32.2	41.3	51.3
Individual Wells	9.5	10.0	10.0
<b>Kent County and Sussex County</b>	<b>61.0</b>	<b>72.1</b>	<b>83.0</b>
Public Water Demand	47.6	58.0	68.6
Individual Wells	13.4	14.1	14.4

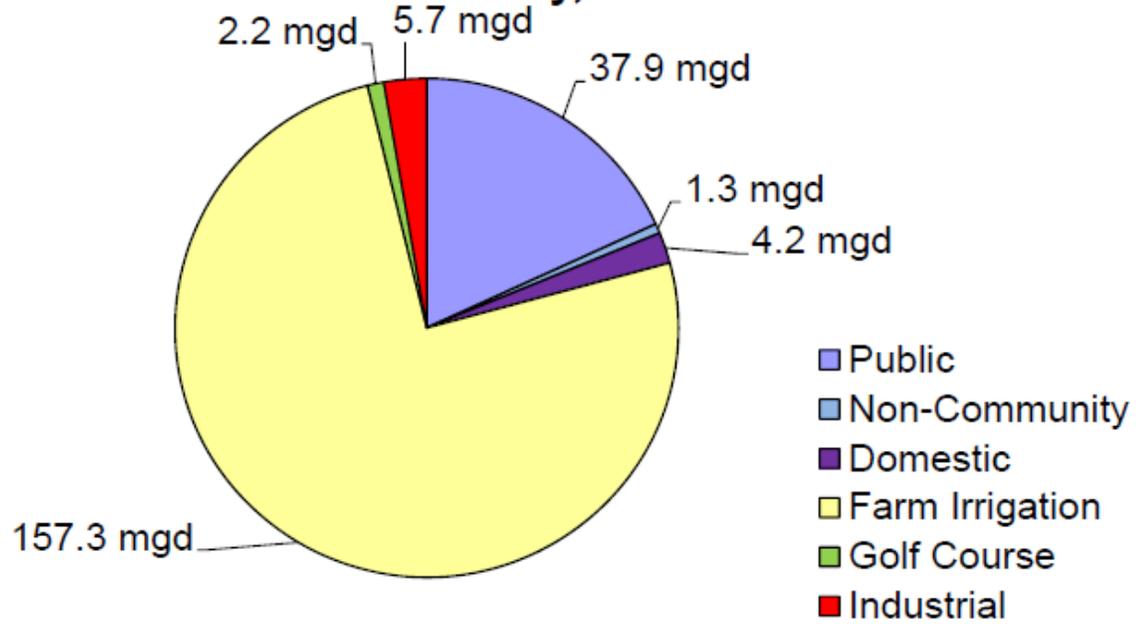


**Figure 6.** Existing and future water demands in Kent and Sussex counties, 2010-2030

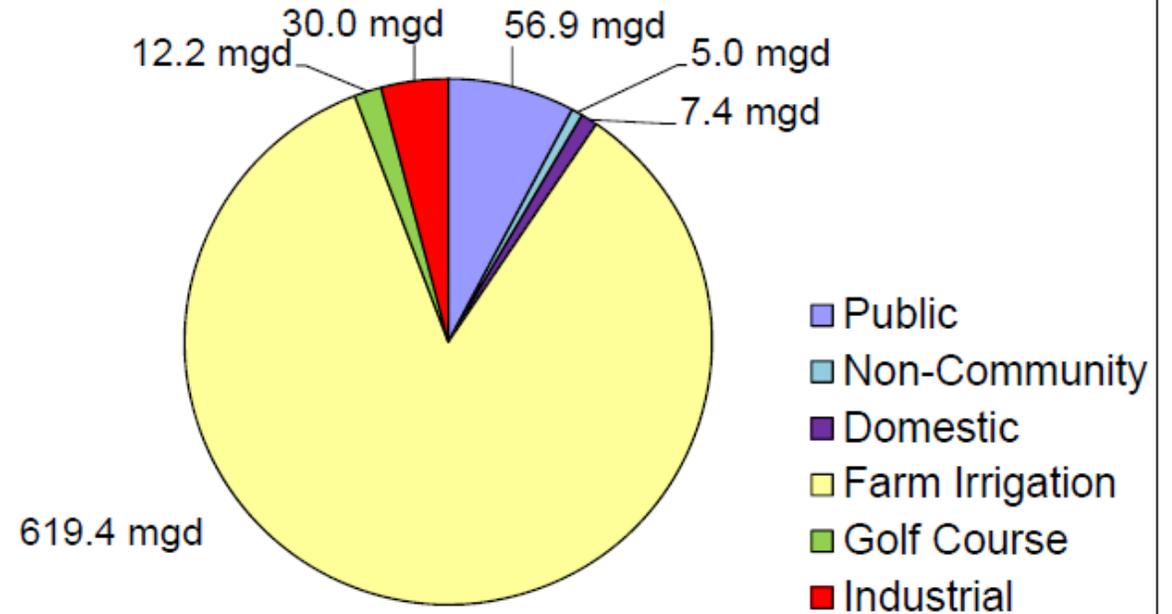
**Table 3.2.** Average annual withdrawals for the top 15 public water systems in southern Delaware

<b>System ID</b>	<b>System</b>	<b>Years</b>	<b>Average Pumping (gal)</b>	<b>Average Pumping (mgd)</b>
DE0000571	Dover Water	2004-2008	1,830,912,200	5.016
DE0000616	Milford Water Department	2004-2008	892,154,684	2.444
DE0000723	Rehoboth Water	2004-2008	540,782,618	1.482
DE0000991	Tidewater Utilities (Rehoboth District)	2004-2008	493,493,635	1.352
DE0000602	Lewes Water	2004-2008	434,809,660	1.191
DE0000246	Seaford Water	2004-2008	424,107,563	1.162
DE0000592	Georgetown Water	2004-2008	299,004,084	0.819
DE0000221	Tidewater Utilities (Bethany Bay)	2004-2008	278,816,464	0.764
DE0000124	Tidewater Utilities (Camden District)	2004-2008	254,066,103	0.696
DE0000657	Smyrna Water	2005-2008	243,811,000	0.668
DE00A0323	Artesian Water Co. (South Bethany)	2004-2008	205,408,380	0.563
DE0000625	Long Neck Water	2004-2008	202,452,480	0.555
DE0000833	Perdue (Georgetown)	2004-2008	196,947,060	0.540

### Water Supply Allocations Kent County, Delaware

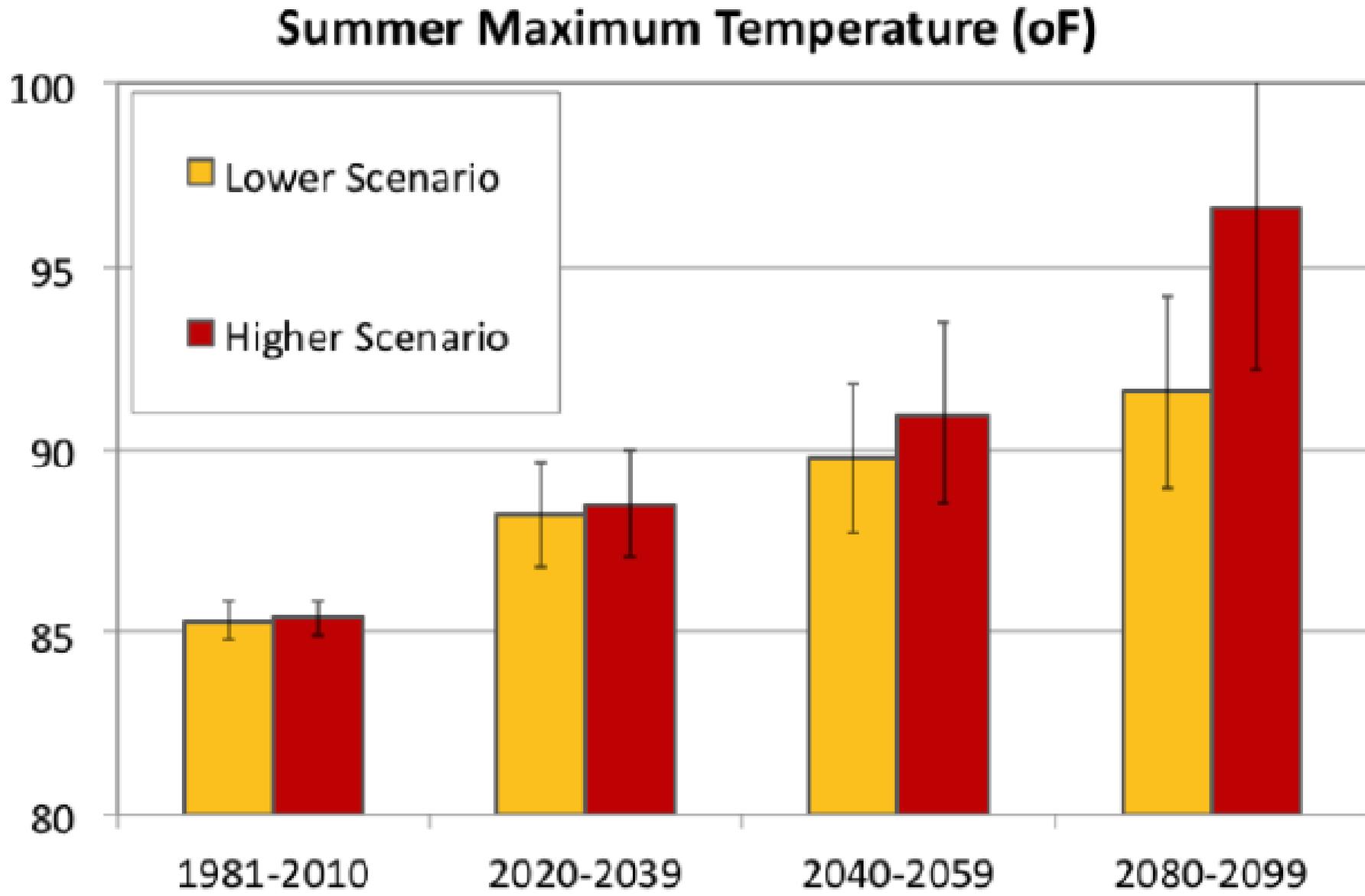


### Water Supply Allocations Sussex County, Delaware

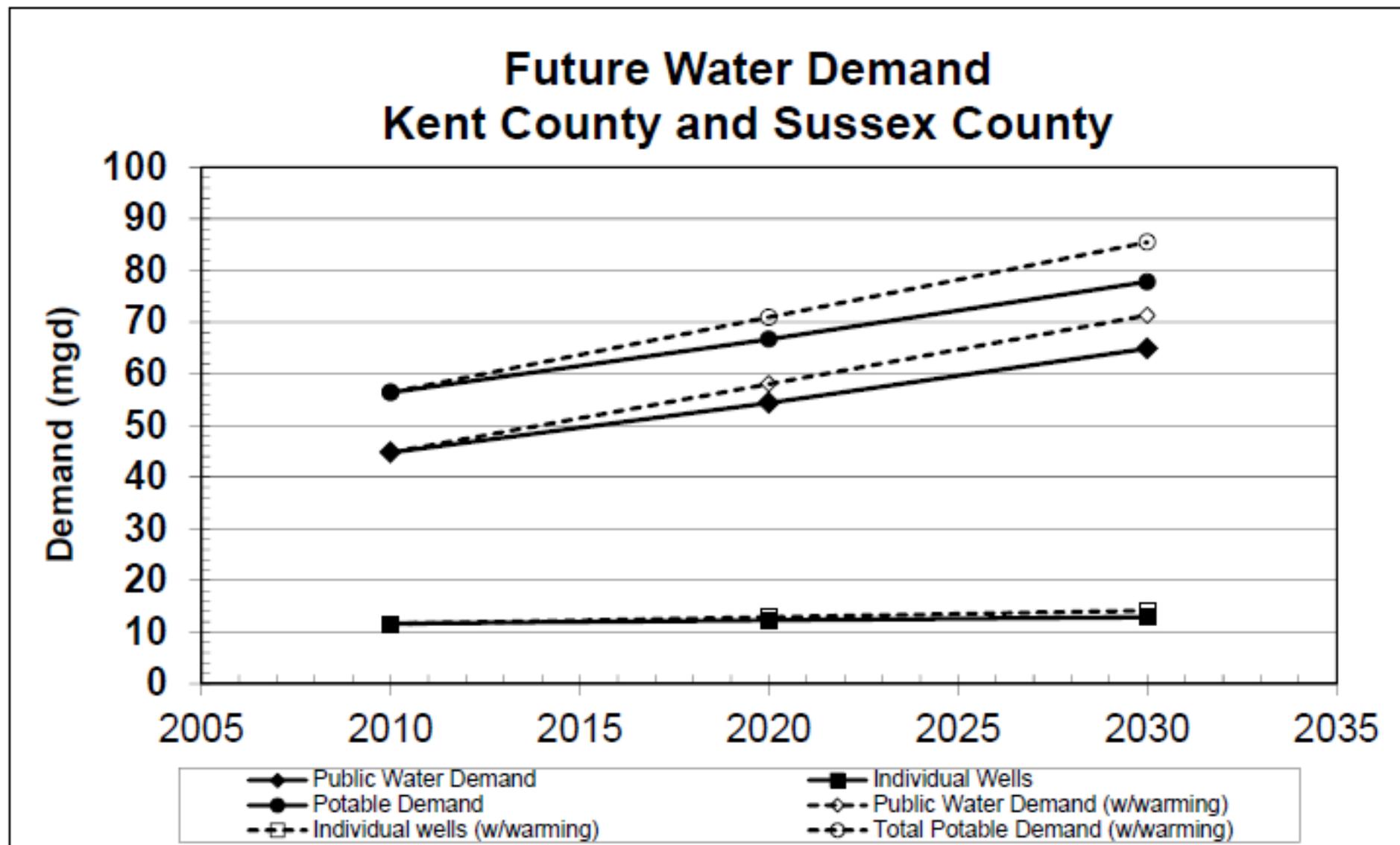


**Table 6.1.** Peak day water demand in Kent County and Sussex County, Delaware

<b>County</b>	<b>Use</b>	<b>Peak Day Demand (mgd)</b>
<b>Kent County</b>	Public Water	14.3
	Non-community	0.6
	Domestic Well	4.2
	Farm Irrigation	18.9
	Golf Course	2.2
	Industrial	1.3
<b>Sussex County</b>	Public Water	30.5
	Non-community	1.2
	Domestic Well	7.4
	Farm Irrigation	71.7
	Golf Course	12.2
	Industrial	5.6
<b>Total</b>	Public Water	44.8
	Non-community	1.8
	Domestic Well	11.6
	Farm Irrigation	90.8
	Golf Course	14.4
	Industrial	6.9



**Figure 6.4.** Change in summer maximum temperature in Delaware (DNREC 2014)



**Figure 6.5.** Future water demands with climate change in Kent and Sussex counties from 2010-2030

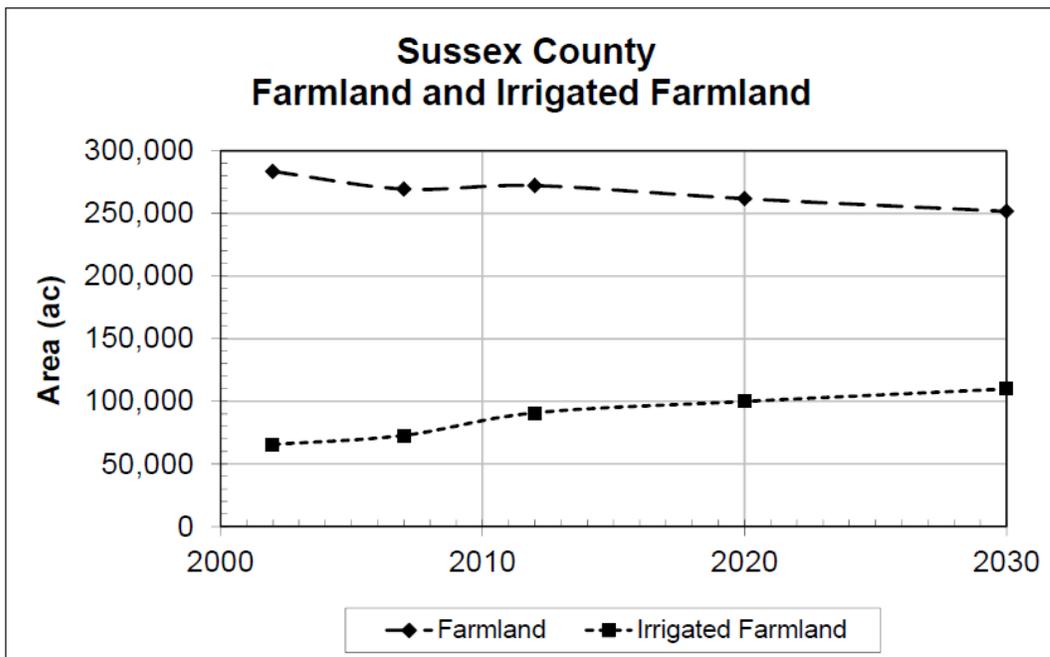
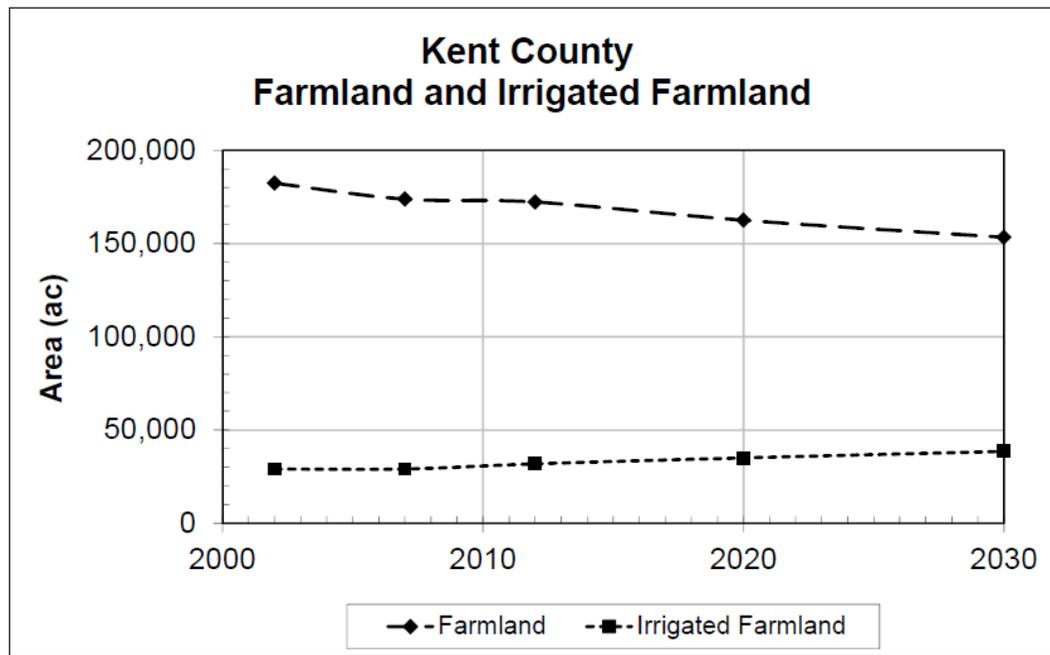
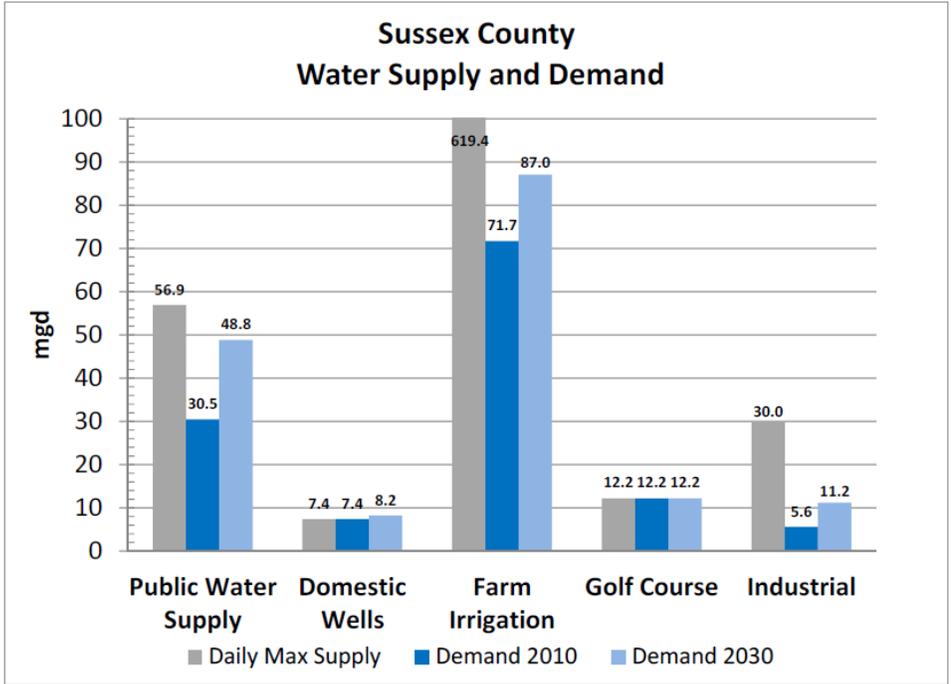
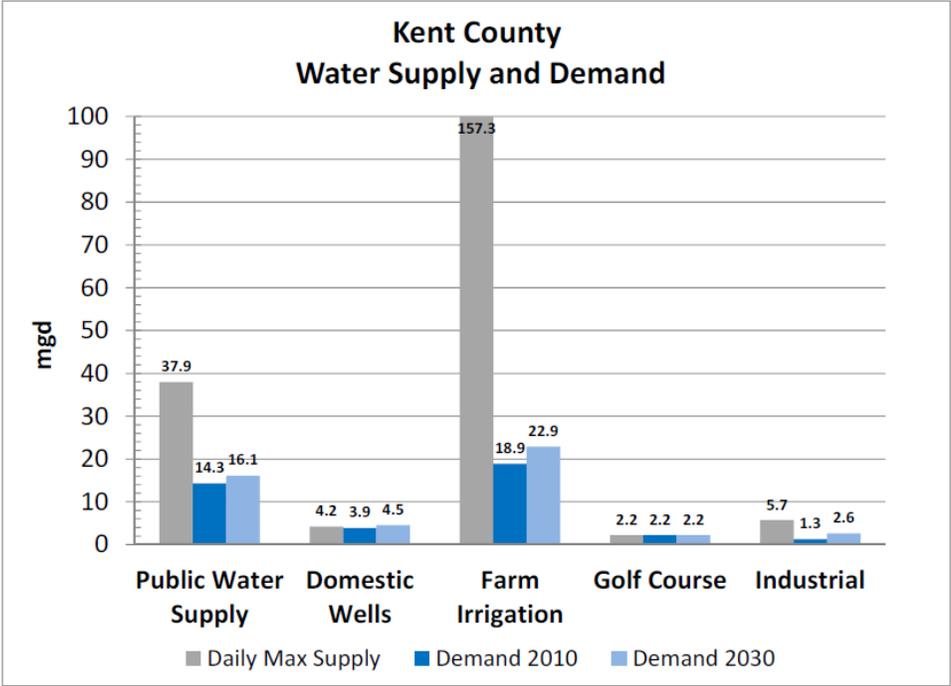


Figure 6.6. Farmland and irrigated farmland in Kent County and Sussex County (USDA 2004, 2009, 2014)

**Table 7.1.** Summary of water supply and demand in Kent County and Sussex County

<b>Water Use</b>	<b>Daily Maximum Allocation (mgd)</b>	<b>2010 Peak Day Demand (mgd)</b>	<b>2010 Surplus/ Deficit (mgd)</b>	<b>2030 Peak Day Demand (mgd)</b>	<b>2030 Surplus/ Deficit (mgd)</b>
<b>Kent County</b>					
Public Water Supply	37.9	14.3	23.6	16.1	21.8
Non-Community	1.3	0.5	0.8	0.6	0.7
Domestic Wells	4.2	3.9	0.3	4.5	-0.3
Farm Irrigation	157.3	18.9	138.4	22.9	134.4
Golf Course	2.2	2.2	0	2.2	0
Industrial	5.7	1.3	4.4	2.6	3.1
<b>Sussex County</b>					
Public Water Supply	56.9	30.5	26.4	48.8	8.1
Non-Community	5	1.5	3.5	2.4	2.6
Domestic Wells	7.4	7.4	0	8.2	-0.8
Farm Irrigation	619.4	71.7	547.7	87.0	532.4
Golf Course	12.2	12.2	0	12.2	0
Industrial	30.0	5.6	24.4	11.2	18.8



## Recommendations

- 1. Drought Operating Guidelines:** The Water Supply Coordinating Council should appoint a committee composed of the Delaware DNREC Division of Water, Delaware Department of Agriculture, University of Delaware Water Resources Agency, public water utilities, and green industry to assist the Delaware Geological Survey to develop drought operating guidelines for Kent County and Sussex County based on streamflow, groundwater, precipitation, soil moisture, irrigation.
- 2. Interconnected Water System:** The Water Supply Coordinating Council should work with the public water suppliers to encourage construction and mapping of interconnections between public water systems in Kent County and Sussex County.
- 3. Hazardous Substance Cleanup:** To focus on strategic cleanup of volatile organic contaminants (VOCs), pesticides, and emerging contaminants and improve groundwater quality in wellhead areas, the Water Supply Coordinating Council should appoint a member to participate in the Hazardous Substance Cleanup Act (HSCA) committee organized by the DNREC Div.on of Waste and Hazardous Substances and Department of Agriculture nutrient management and pesticide committees.
- 4. Groundwater Monitoring:** The State of Delaware should continue to fund and expand groundwater monitoring programs operated by the Delaware Geological Survey, Delaware DNREC, and Delaware Department of Agriculture for both water quantity and water quality. The key for monitoring water quantity is construction of new monitoring infrastructure and maintenance of existing monitoring infrastructure to meet changing water demand patterns. Two critical components to incorporate in water quality monitoring are having: (1) data collection and evaluation systems in place to recognize and respond to water quality threats and trends, and (2) a mechanism for state and local agencies to coordinate and prioritize data.
- 5. Climate Change:** The Delaware DNREC should enhance infrastructure for monitoring along the seacoast to detect salt water intrusion from coastal storm flooding or related to rising sea levels.
- 6. Groundwater Availability:** The DGS has developed a scope of work and budget needed to generate data needed by modern planning tools that better estimate groundwater availability for growing areas of Kent and eastern Sussex Counties. These plans follow the goals and objectives of the Southern New Castle-Northern Kent Counties project that is now nearing successful completion. Groundwater monitoring infrastructure is designed with a 20 to 30 year lifespan and will evaluate adequacy of water availability by aquifer, threats of saltwater intrusion, and other large-scale potable water quality concerns.

**7. Water Availability:** Key information related to DNREC regulations, policies, and permit conditions that should be addressed in future water availability reports include:

- Permit limits on drawdown by well and wellfield
- Special rules applied to areas that have experienced depletion, such as Dover area aquifers
- Summary of regulations, policies, and details of special cases for groundwater management zones.

**8. Water Supply/Demand Projections:** The Water Supply Coordinating Council should update water supply and demand projections for Kent County and Sussex County at five-year intervals beginning in 2022 to utilize population data from the 2020 U.S. Census.

**9. Peak Summer Demands:** Public water utilities in coastal communities should examine peak daily demand patterns, plan to develop new water supplies, and construct interconnections with adjacent water systems to anticipate high peaking factors due to the influx of summer visitors to the beach communities.

**10. Water Use Database:** The DNREC Division of Water should continue modernization of the state water use database and consolidation of datasets, with attention to issues identified in the recently completed Delaware Geological Survey Kent-Sussex Aquifer and Groundwater Study. This USGS Water Census initiative should be utilized to provide financial resources through grants to State water resource agencies to improve the availability and quality of water use data that they collect.

# Status of Source Water Protection Ordinances in Delaware

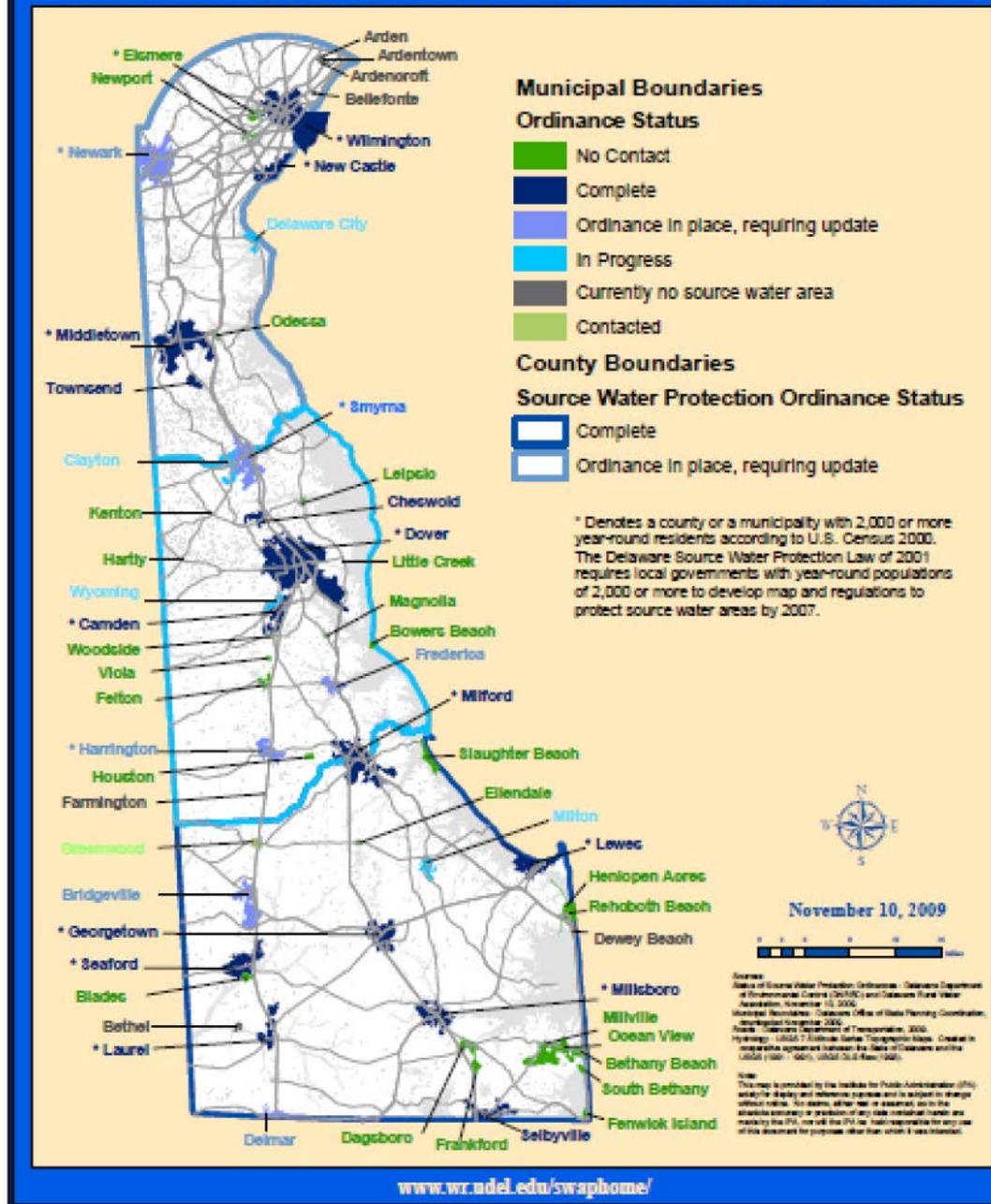


Figure 4.1. Status of source water protection ordinances in Delaware