

Water Supply and Demand Projections in Northern New Castle County through 2050

Draft October 11, 2021

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1. Introduction

The purpose of this report is to update projections of water supply and demand in northern New Castle County, Delaware through 2050. This report updates projections through 2020 published in the 8th Report to the Governor and General Assembly regarding the progress of the Delaware Water Supply Coordinating Council (WSSC) in June 2006 and the 13th Report published in June 2018 (www.wrc.udel.edu).

2. Water Storage

Through the efforts of the WSSC, water purveyors in northern New Castle County have developed over 2 billion gallons (bg) in reserve water supplies since the drought of 1999 to provide a healthy surplus of supply to meet peak demands during the next drought and provide a reserve to meet economic development in Delaware (Table 1). These reserve water supplies ("A" list) are designed to provide sufficient capacity during a period of 75 days of climatological, streamflow and groundwater conditions similar to those that prevailed in northern New Castle County during the drought emergency of 2002 and based on projected peak water demands.

Table 1. Water supply developed since the drought of 1999 in northern New Castle County, Delaware.

Sponsor	Project	Capacity (mg)
Artesian Water Company	New Wells North of C&D Canal	405
Artesian Water Company	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
		2,052

3. Population

The Delaware Population Consortium (2020) projected that the population in northern New Castle County, Delaware, Delaware (north of the C&D Canal) increased by 2.2% or 0.5% per year from 486,299 in 2010 to 496,981 in 2020 with projections to 495,053 by 2030 and 475,196 by 2050 (Table 2). Northern New Castle County is nearing full build-out, therefore population increases are projected to be low or marginally decrease. Water demands in the future are projected based on 0.5% per year increase in population for northern New Castle County from 2010 to 2020 (Delaware Population Consortium 2020).

Table 2. Projected population in New Castle County through 2050
(Delaware Population Consortium 2020)

Year	NCC Population		Northern NCC Population		Southern NCC Population	
	Pop.	%	Pop.	%	Pop.	%
2010	538,753	0.0%	486,299	0.0%	52,454	0.0%
2020	558,863	3.7%	496,981	2.2%	61,882	18.0%
2030	566,642	1.4%	495,053	-0.4%	71,589	15.7%
2040	571,198	0.8%	489,902	-1.0%	81,296	13.6%
2050	566,198	-0.9%	475,196	-3.0%	91,002	11.9%

4. Water Demand

Water demand as recorded during 2020 by the 5 water purveyors in northern New Castle County was below normal and ranged between 49 and 66 mgd (Figure 1).

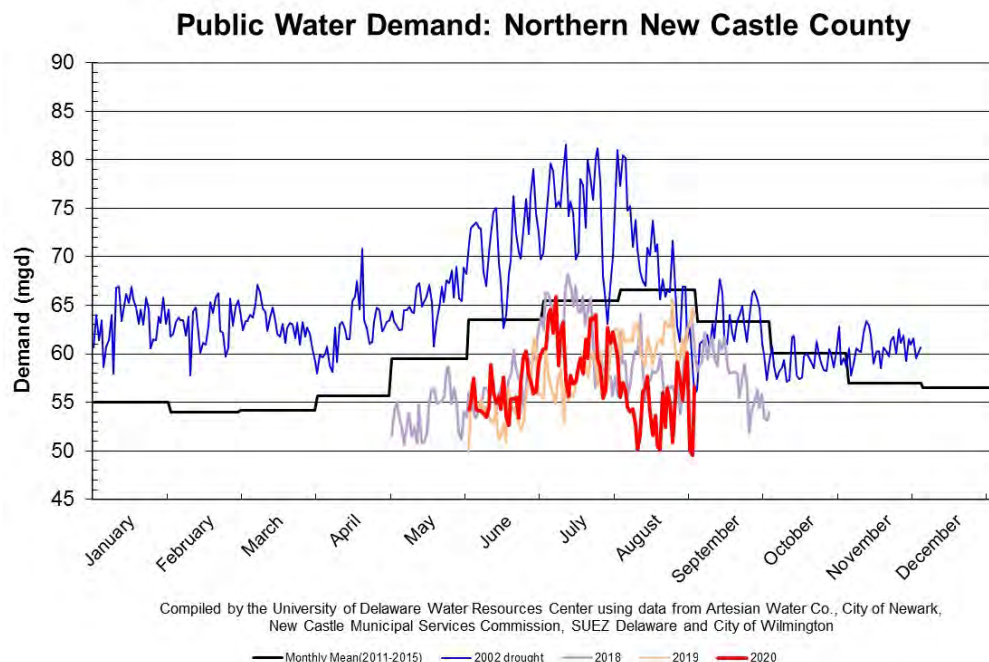


Figure 1. Water demand (2020 recorded in northern New Castle County, Delaware

With completion of water supply projects (over 2 billion gallons) since the drought of 1999, the WSCC has updated water supply/demand projections for northern New Castle County through 2030 and this report extends these projections through 2050. The 2020 demands were recorded as reported by the water purveyors (Table 3. The 2021 base demands are selected as the maximum monthly water demand recorded for each purveyor for the 5-year period from 2016 through 2020 (Table 2). Water demands are projected from 60.8 mgd recorded in 2020 to 64.7 mgd in 2021, 66.0 mgd in 2025, 67.7 mgd in 2030 and 74.8 mgd by 2050 (Figure 2 and Table 4).

Table 3. Maximum monthly water demand projections for northern New Castle County (2020, 2021 and 2024)

Water Purveyor	2020 Demand (mgd)	2021 Base Demand (mgd)	2024 Proj. Demand (mgd)
Wilmington	17.4	18.4	18.7
Artesian Water Co.	20.8	21.0	21.3
SUEZ DE	18.6	21.2	21.5
Newark	3.5	3.8	3.9
New Castle MSC	0.5	0.6	0.6
Total	60.8	65.0	66.0

Table 4. Maximum monthly water demand (mgd) in northern New Castle County, Delaware through 2050

Purveyor	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040	2045	2050
Wilmington	17.2	18.4	17.0	17.6	18.3	17.4	18.4	18.5	18.6	18.7	18.8	19.2	19.7	20.2	20.7	21.3
Artesian Water	19.2	19.3	18.6	20.0	21.0	20.8	21	21.1	21.2	21.3	21.4	22.0	22.5	23.1	23.7	24.3
SUEZ DE	20.4	18.9	18.1	21.2	18.2	18.6	21.2	21.3	21.4	21.5	21.6	22.2	22.7	23.3	23.9	24.5
Newark	3.5	3.8	3.3	3.5	3.5	3.5	3.8	3.8	3.8	3.9	3.9	4.0	4.1	4.2	4.3	4.4
New Castle MSC	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Total (mgd)	60.8	61.0	57.5	62.8	61.5	60.8	65.0	65.3	65.7	66.0	66.3	68.0	69.7	71.5	73.3	75.1

Base 2021 demand from peak maximum monthly demand during 5-year period 2016-2020. Projected 2024 demands based on 0.5% annual population growth for New Castle County (Delaware Population Consortium Oct. 2020).

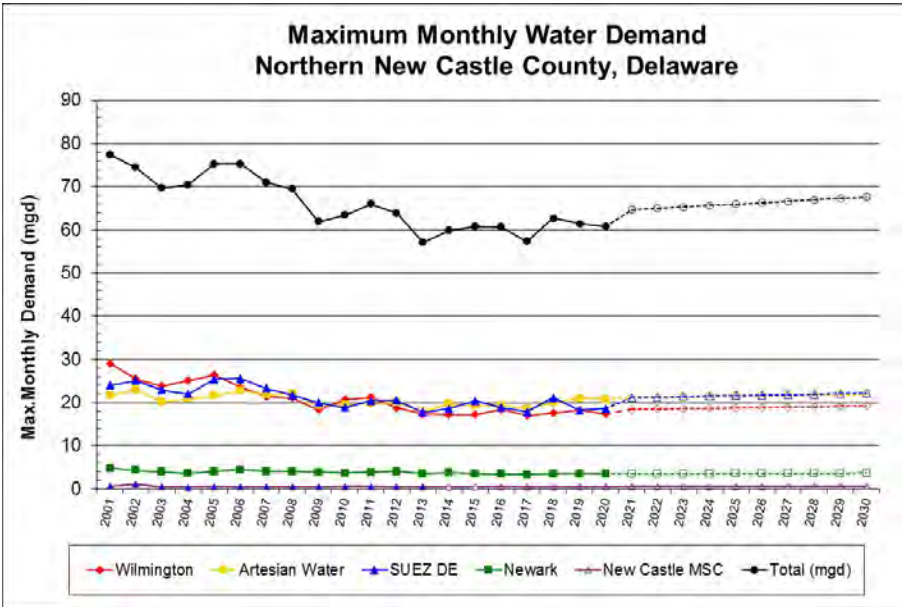


Figure 2. Maximum monthly water demands in northern New Castle County
Projected demands through 2030 based on 0.5% annual population growth for New Castle County
(Delaware Population Consortium, Oct 2020).

A logarithmic regression from 2001-2016 shows that per capita water demand in northern New Castle County has declined from a high of 165 gpcd in 2001 to 125 gpcd by 2015 and is projected to decline and level off to near 120 gpcd by 2030 depending on the trend (Figure 3). The decline in per capita water demand is thought to occur from a variety of factors including growing water conservation ethic by consumers, conservation water rates, rehabilitation of leaking water mains, and maturation of neighborhoods that require less lawn watering. Since per capita water demand is declining and population is projected to level off and decline somewhat the projected water demands in northern New Castle County through 2050 are conservative.

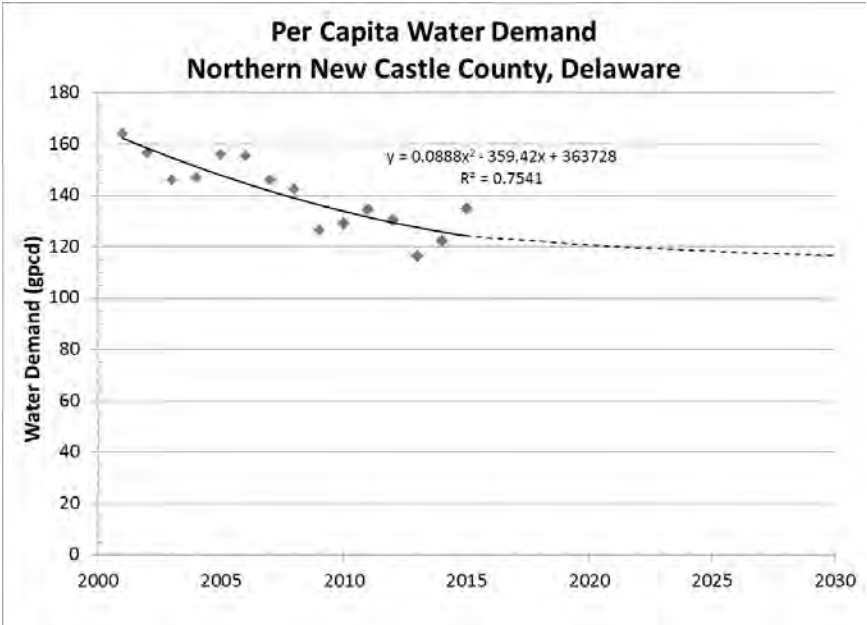


Figure 3. Per capita water demand in northern New Castle County

5. Water Supply and Demand Projections

Water supply and water demands in northern New Castle County are estimated assuming low stream flows likely to occur after 75 days similar to those that occurred in northern New Castle County during the drought emergency of 2002 and based on peak water demands forecast for the population through 2050. In the December 2002 Fifth Report to the Governor and General Assembly, the WSCC decided to plan future water supplies for a 75-day dry period as recorded during the severe drought of 2002. The projections incorporate regulatory standards imposed by the DRBC and DNREC where White Clay Creek at Stanton (SUEZ Delaware) is under a chloride (250 ppm) and 1-foot depth of flow minimum bypass standard and White Clay Creek at Newark has a 7Q10 minimum passby flow standard of 14 mgd. The 7Q10 is the low flow likely to occur for 7 days in a row once every 10 years. The City of Newark has 7.8 mgd production capacity after building two projects that brought an additional 1.0 mgd online by the end of 2020. In 2015, New Castle Municipal Services Commission (MSC) developed a new well (Cross Roads) that raises available supply to 2.3 mgd with a DRBC allocation of 1.6 mgd. By 2050, water supply is projected to exceed demand in northern New Castle County by a surplus of 28.4 mgd or 2,130 mg during a 75-day drought period (Tables 5 and 6).

Table 5. Water supply and demands (mgd) in Northern New Castle County projected through 2030

Purveyor	2020			2030			2050		
	Supply	Max Monthly Demand	Surplus/ Deficit +/-	Supply	Max Monthly Demand	Surplus/ Deficit +/-	Supply	Max Monthly Demand	Surplus/ Deficit +/-
Wilmington	38.3	17.4	20.9	38.3	19.2	19.1	38.3	21.3	17.0
Brandywine Creek	15.0			15.0			15.0		
Hoopes Reservoir	21.3			21.3			21.3		
Raise Hoopes Res.									
Artesian Water	29.0	20.8	8.2	29.0	22.0	20.8	29.0	24.3	20.8
Groundwater	24.3			24.3			24.3		
CWA Interconn.	3.0			3.0			3.0		
ASR	1.7			1.7			1.7		
SUEZ Delaware	26.8	18.6	8.2	26.8	22.2	4.6	26.8	24.5	2.3
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		
Newark	7.8	3.5	4.3	7.8	4.0	3.8	7.8	4.4	3.4
White Clay WTP	0.0			0.0			0.0		
Newark Reservoir	4.0			4.0			4.0		
Groundwater	3.8			3.8			3.8		
New Castle MSC	1.6	0.6	1.0	1.6	0.6	1.0	1.6	0.7	0.9
Subtotal	103.5	60.9	42.6	103.5	68.0	49.3	103.5	75.2	44.4

Assumptions of Table 5: Water supply available during 2002 drought emergency conditions (75 days) with then existing regulatory condition:

- No minimum instream flow standards in effect along the Brandywine Creek at Wilmington.
- Minimum flow standard based on chloride level (250 ppm) and 1-foot minimum tidal flow depth along White Clay Creek at Stanton, 7Q10 passby in effect on White Clay Creek at Newark (14 mgd). The 7Q10 is the low flow likely to occur for 7 days in a row once every 10 years.
- Groundwater supplies are determined as permitted by DRBC and DNREC allocation permits.
- Low streamflows observed during 2002 drought emergency: Brandywine Creek = 21 mgd (8/21/02). White Clay Creek at Stanton (w/o Hoopes Reservoir Releases) = 6.8 mgd (8/15/02).
- Maximum monthly demands recorded by water suppliers for 2020 base year, projected to 2030 and 2050 as recorded by Delaware Population Consortium (2020) with increase 0.5% per year as recorded from 2010 to 2020.
- Maximum monthly demands for base year 2020 as recorded during 5-year period (2016-2020).
- The City of Newark has 7.8 mgd production capacity after bringing an additional 1.0 mgd wells by the end of 2020.

- Useable capacity Hoopes Reservoir = 1950 mg over 75 days (26.0 mgd).
- Useable capacity Newark Reservoir = 300 mg over 75 days (4 mgd).
- SUEZ DE Tidal Capture Structure (TCS) provides 14 mgd plus 5.3 mgd from incoming tide 18 hours/day with 1-foot min. depth in creek. Hoopes Reservoir release reduces chlorides below 250 ppm at TCS during low flow (< 17 mgd). Contract with Wilmington provides up to 200 mg from Hoopes Reservoir to SUEZ (2.7 mgd over 75-day drought).
- Transfers from Chester Water Authority (CWA) accounted for as per Water Supply Self Sufficiency Act of 2003.

Table 6. Water supply and demand projections for northern New Castle County through 2050

Year	Supply (mgd)	Demand (mgd)	Surplus	
			(mgd)	(mg) ¹
2020	103.5	60.8	42.7	3,202
2030	103.5	68.0	35.5	2,662
2040	103.5	71.5	32.0	2,400
2050	103.5	75.1	28.4	2,130

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

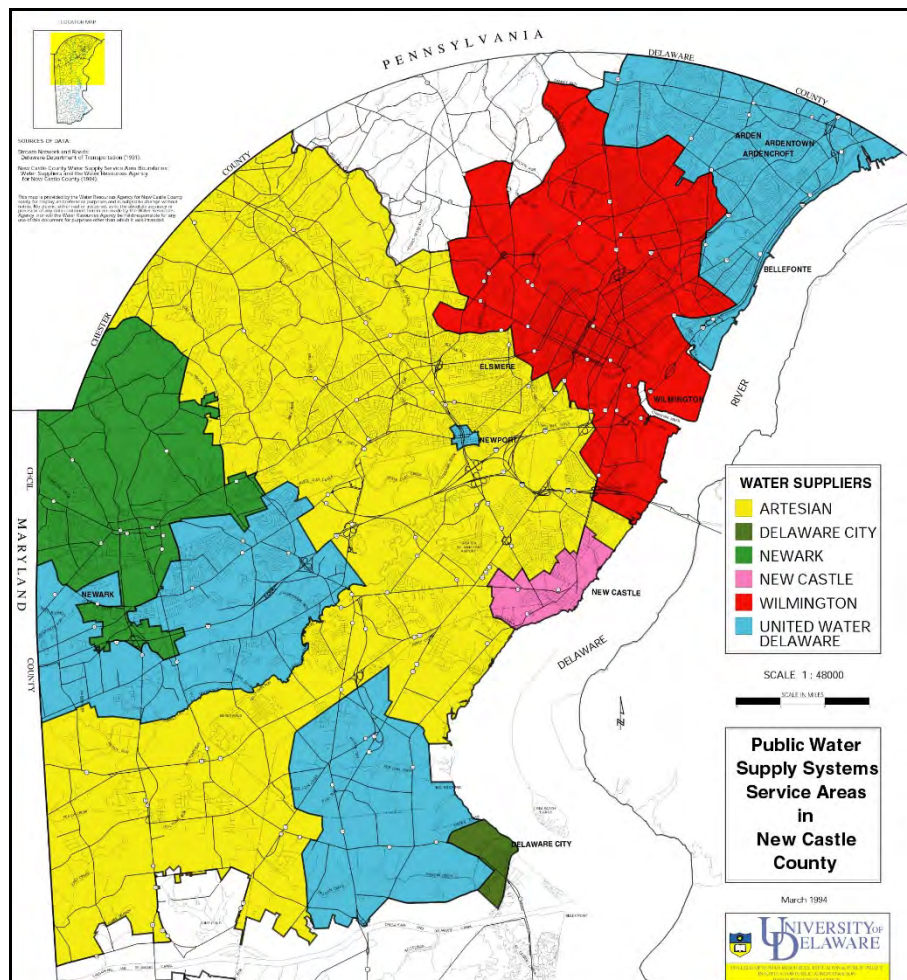


Figure 4. Public water supply service areas in New Castle County