Updates to the Water Supply Plan

Hampton Roads Planning District Commission

Updated March 2021

HAMPTON ROADS PDC
PLANNING DISTRICT COMMISSION

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Executive Summary

In 2011, the Hampton Roads Regional Water Supply Plan was prepared pursuant to the State Water Control Law Section 62.1-44.15 and 62.1-44.38:1 of the Code of Virginia and the State Water Control Board implementing regulations, 9 VAC 25-780, which establishes the planning process and criteria that local governments must use in the development of local or regional water supply plans.

The Hampton Roads Regional Water Supply Plan includes the Cities of Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg, the Counties of Gloucester, Isle of Wight, James City, Southampton, Surry, and York, and the Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor.

The original plan includes the following elements: description of existing water sources; description of existing water use; assessment of projected water demand; statement of need; alternatives analysis to address projected deficits in water supplies; and descriptions of water management and drought response actions.

In 2018, the Hampton Roads Planning District Commission (HRPDC) collected updated data from municipal utilities about public water supply systems' projected demand and supply. The data is organized by subregion (Figure 1), as in the original Water Supply Plan. The subregions are:

> **Peninsula sub-region**: Cities of Hampton, Newport News, Poquoson, and Williamsburg; and Counties of Gloucester, James City, and York.
>
> **Southside sub-region:** Cities of Chesapeake, Norfolk, Portsmouth, Suffolk, and Virginia Beach.
>
> **Western Tidewater sub-region:** City of Franklin; Counties of Isle of Wight, Southampton, and Surry; and Towns of Boykins, Branchville, Capron, Claremont, Courtland, Dendron, Ivor, Newsoms, Smithfield, Surry, and Windsor.

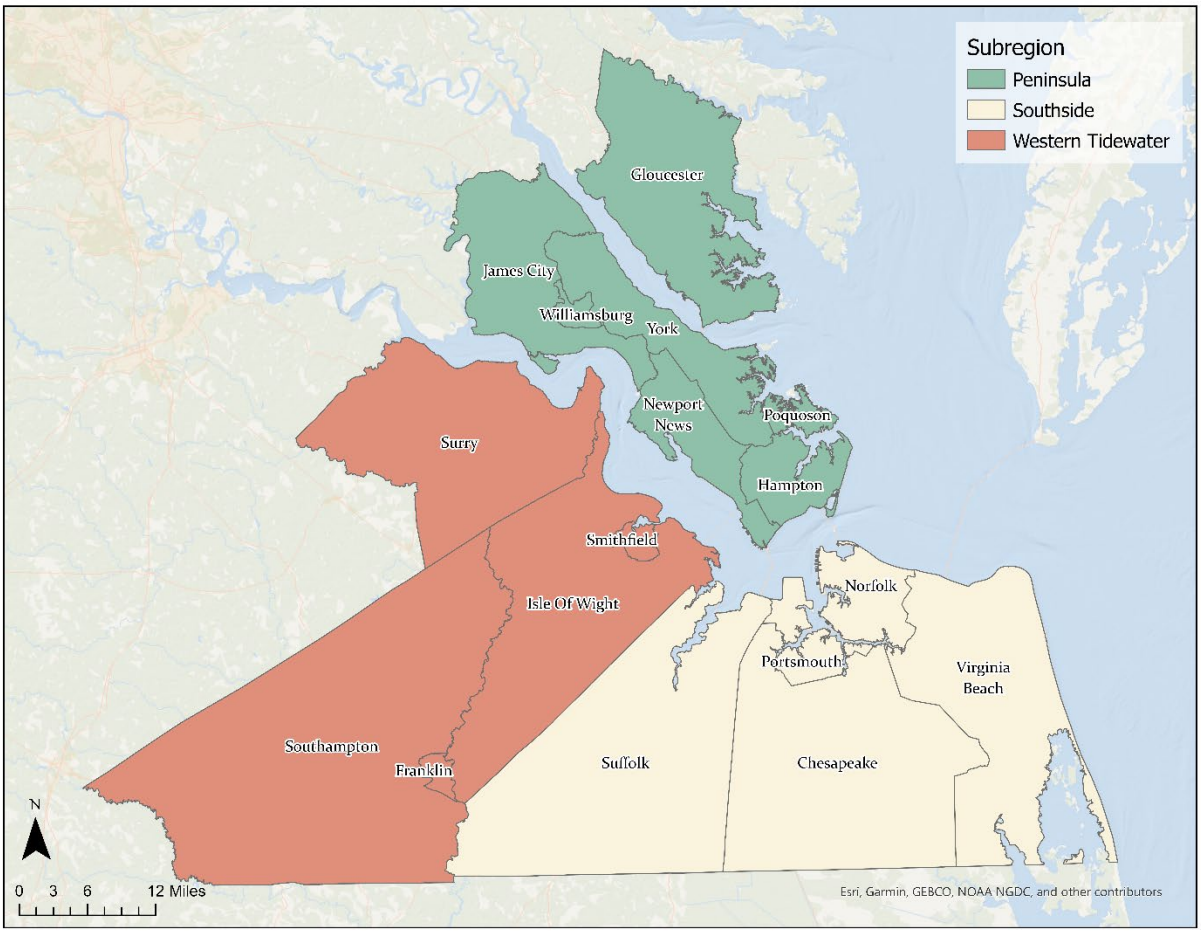


Figure 1. Subregions of Hampton Roads Virginia. Subregions include Peninsula, Southside, and Western Tidewater

Demand Projections

Updated demand projections were calculated using per capita water use, updated population projections, and plans to expand service areas (Figure 2). One of the main factors that resulted in the change in demand projections was a decline in per capita water use (Figure 3). Although not all utilities saw the same change in per capita water use, all utilities have seen a similar industry trend.

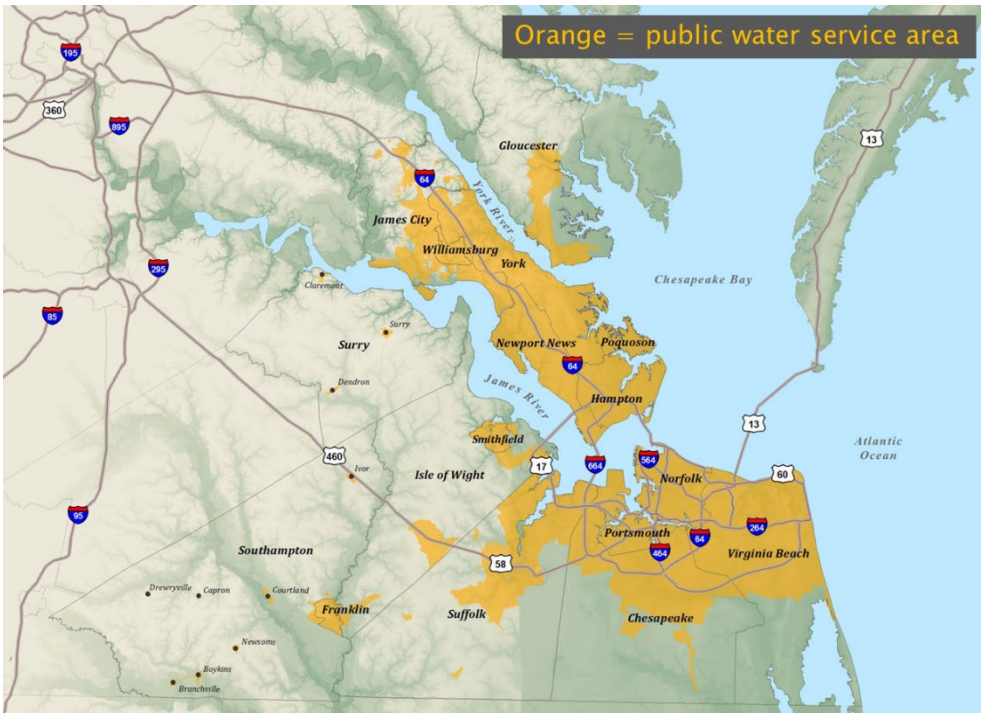


Figure 2. Public Water Service Areas across Hampton Roads.

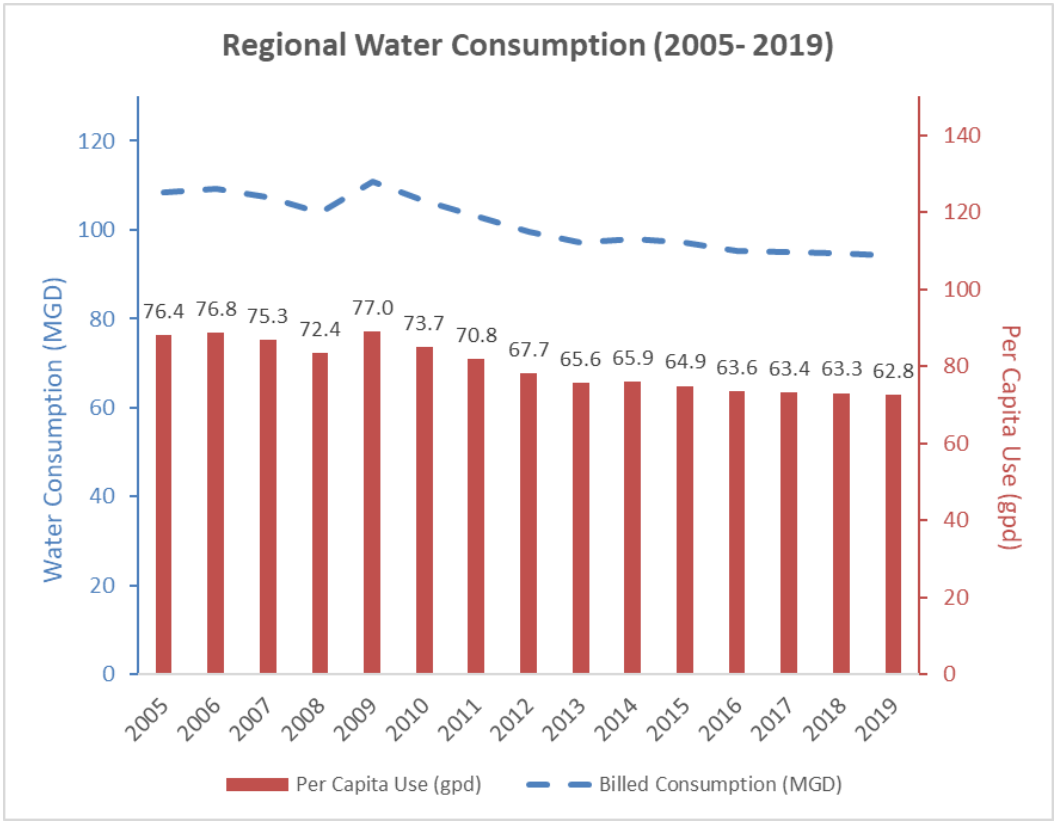


Figure 3. Regional Water Consumption (blue) and per capita use (red) from 2005-2019. The regional trends show a general decrease in water use.

Supply Projections

Supply projections are based on both surface water and groundwater studies. The supply projections based on surface water studies from the utilities generally did not change between the original Water Supply Plan and the updated plan. As part of the efforts to protect groundwater sources within the Eastern Virginia Groundwater Management Area, the Virginia Department of Environmental Quality cut groundwater permits for the fourteen largest groundwater permit holders, the majority of which fall within Hampton Roads (Figure 4). Several groundwater permits were revised to a drought augmentation permit. Drought augmentation permits allow for full capacity use during a qualifying event.

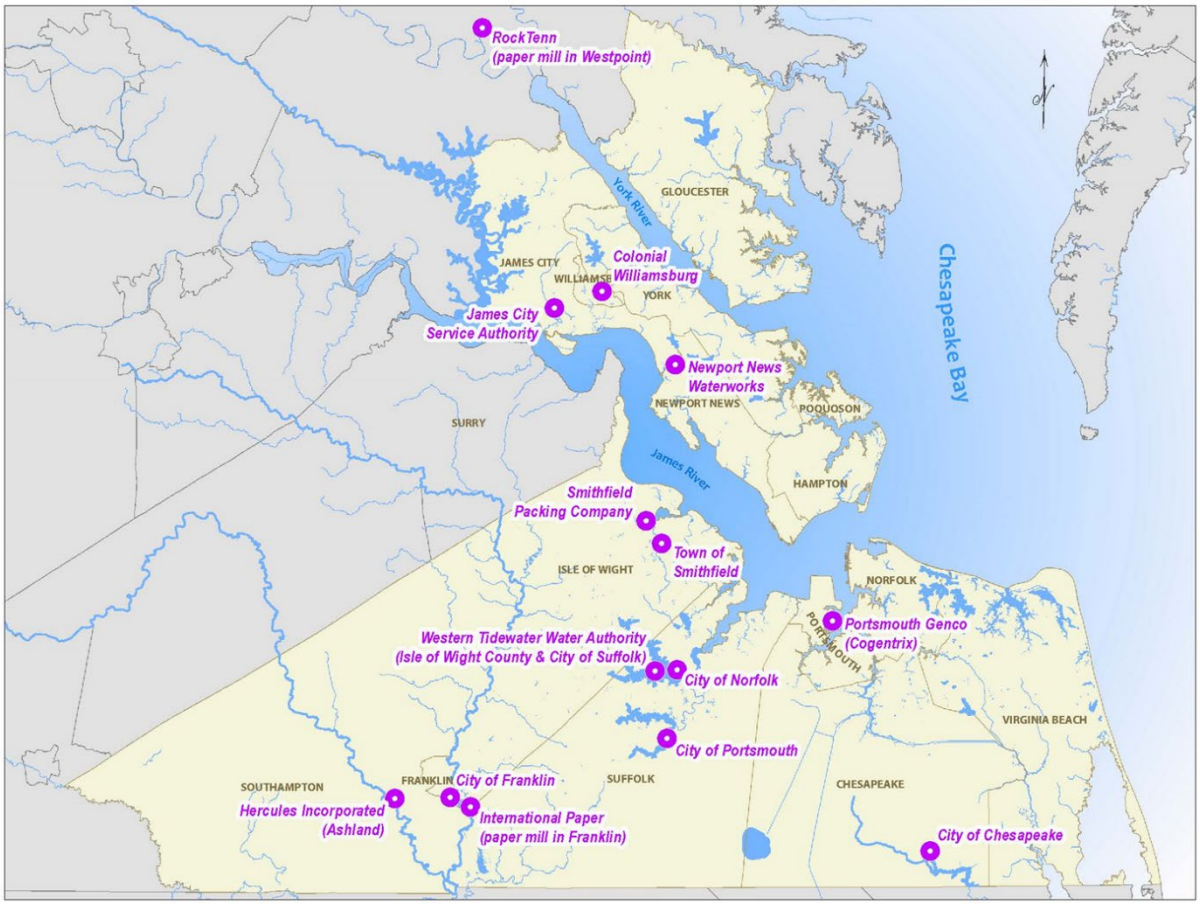


Figure 4. Map showing the location of the fourteen largest groundwater permits in the Eastern Virginia Groundwater Management Area.

Part 1: Regional Finished Water Supply and Demand Projections

Comparisons between supply and demand forecasts are needed to assess the adequacy and resiliency of water supplies, both on a regional and local basis. This analysis will serve as a guide to investment, resource sharing and protections. All sub- regions and the entire Hampton Roads region have supplies that exceed demand for the planning horizon. The difference between supply and demand projections are adequate to address uncertainties in projections and climate change impacts.

Table 1. Regional Supply Projections

SUPPLY	Year (Original Water Supply Plan)			Year (2018 Update)		
	2020	2030	2040	2020	2030	2040
Southside Supply	192.9	192.1	187.7	194.6	193.9	190.4
Western Tidewater Supply	7.8	8.9	9.9	4.8	6.3	7.4
Southside/Western Tidewater Supply	**200.7**	**201**	**197.6**	**199.4**	**200.2**	**197.8**
Peninsula Supply	**74.5**	**74.5**	**74.5**	**74.8**	**74.8**	**74.8**
Total Supply	**275.2**	**275.5**	**272.1**	**274.2**	**275.0**	**272.6**

Table 2. Regional Demand Projections

DEMAND	Year (Original Water Supply Plan)			Year (2018 Data Call)		
	2020	2030	2040	2020	2030	2040
Southside Demand	98.9	106.4	118.2	91.9	97.7	100.7
Western Tidewater Demand	4.1	5.4	7.1	3.8	7.0	8.4
Southside/Western Tidewater Demand	**103**	**111.8**	**125.3**	**95.7**	**104.7**	**109.1**
Peninsula Demand	**58.4**	**63.6**	**69.4**	**46.4**	**48.8**	**50.7**
Total Demand	**161.4**	**175.4**	**194.7**	**142.1**	**153.5**	**159.8**

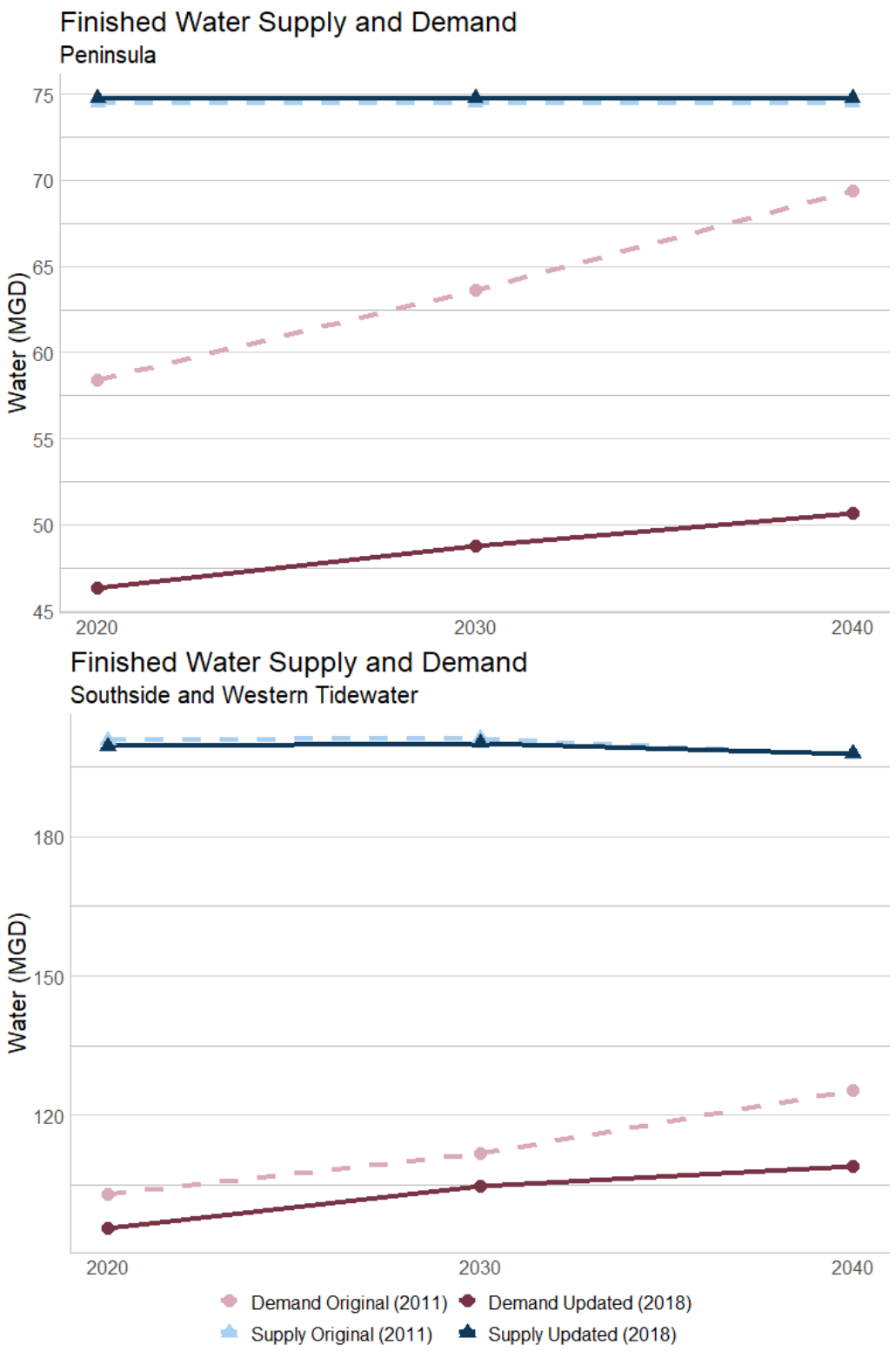


Figure 5. Regional Demand and Supply Projections for the Southside/Western Tidewater (top) and Peninsula (bottom). The Water Supply Plan projections were taken from the Regional Water Supply Plan (2011); the updated projections were gathered from the Directors of Utilities Committee (2018).

Part 2: Locality Profiles

Subregion: Southside

City of Chesapeake

A) WATER SALES:

Chesapeake purchases water from the following:

- Finished water purchased from Norfolk (2020 – 2040: 2.01 MGD); serves the South Norfolk System
- Finished water purchased from Portsmouth (2020: 3 MGD, 2030: 2 MGD, 2040: 2 MGD); serves the Western Branch System
- Raw water purchased from Norfolk (2020 – 2040: 7 MGD); serves the Northwest River System in addition to surface water and groundwater that is owned by Chesapeake

B) DEMAND PROJECTIONS:

Demand projections considered the population served throughout the entire city, including areas served by purchased water.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	252,396	294,839	315,340
Percent Served by PWS	89.8%	89.8%	89.8%
Total Population Served	226,652	264,765	283,175
Average per Capita Water Use (gallons)	70.79	70.79	70.79
Finished Water Demand (MGD)	**15.84**	**17.56**	**18.88**
Water Supply Plan Projections (2011)			
Population Projection	282,566	325,045	367,524
Percent Served by PWS (WSP Plan)	89%	89%	89%
Total Population Served	251,484	289,290	327,096
Average per Capita Water Use (gallons)	97	97	97
Finished Water Demand (MGD)	**24.93**	**28.061**	**31.73**

C) SUPPLY PROJECTIONS:

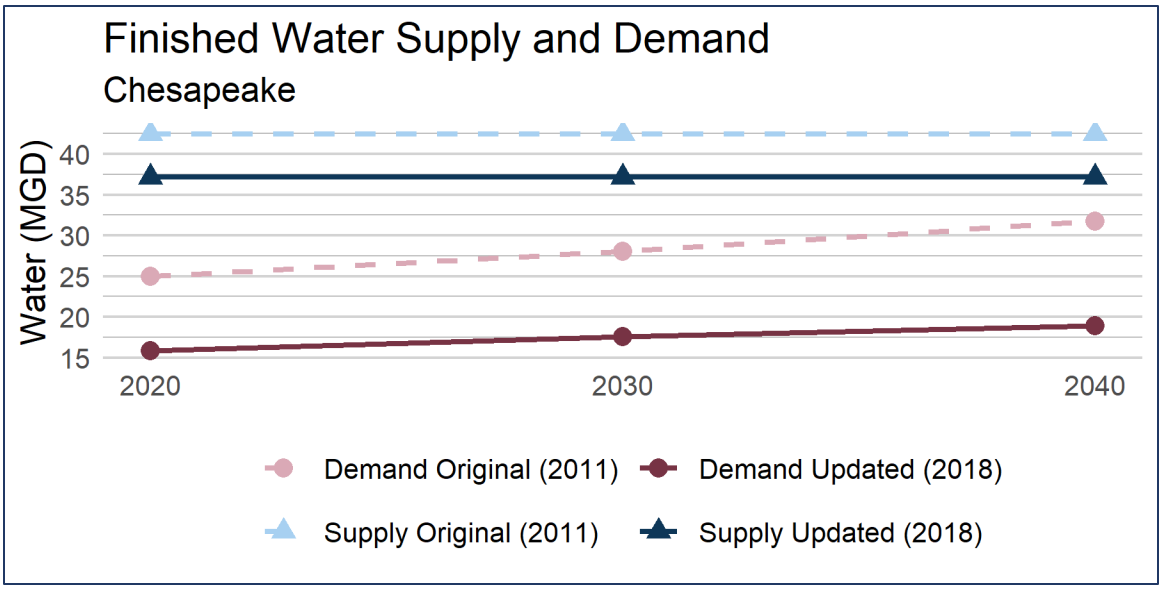
Supply projections do not include the tiers built into Chesapeake's groundwater permit (2020-2040: 3.5 MGD), which allow for additional withdrawal limits in addition to the base limit of 3.5 MGD as follows:

- Up to 10 MGD of temporary allocations (for qualifying events)
- System Expansion:
    - Williams Farm Tract: up to 2.14 MGD for 5 years; 1.07 MGD after 5 years
    - Other location: up to 2.14 MG for 3 years; 1.07 MGD after 3 years
- If the City of Chesapeake acquires one or more water systems with existing permitted groundwater withdrawals, the permittee's total permitted groundwater withdrawal will be increased by the volume of the permitted withdrawal of the acquired entity.
- May withdraw up to 3 MGD from cumulative volume stored via ASR.

City of Chesapeake (cont.)

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Northwest River Intake (treated at Lake Gaston treatment plant)	30% loss to Reverse Osmosis	10.0	7.0	10.0	7.0	10.0	7.0
Northwest River wells (treated at Lake Gaston treatment plant)	30% loss to Reverse Osmosis	2.0	1.4	2.0	1.4	2.0	1.4
Western Branch wells	Internal system losses	1.5	1.44	1.5	1.44	1.5	1.44
Any combination of wells for qualifying event	30% loss to Reverse Osmosis	10	7	10	7	10	7
Raw water purchase from Norfolk (Northwest River System; treated at Lake Gaston treatment plant)	10% loss to Ultra Filtration and other production processes	7	6.3	7	6.3	7	6.3
1/6 share of Lake Gaston (treated at Lake Gaston treatment plant)	10% loss	10.0	9.0	10.0	9.0	10.0	9.0
Finished Water purchase from Norfolk (South Norfolk System)			2.01		2.01		2.01
Finished Water purchase from Portsmouth			3		2		2
Total Supply (MGD)		**40.5**	**37.15**	**40.5**	**37.15**	**40.5**	**37.15**
WSP Supply (2011)							
Northwest River Intake	30% loss to Reverse Osmosis	10.0	7.0	10.0	7.0	10.0	7.0
Northwest River wells	30% loss to Reverse Osmosis	5.0	3.5	5.0	3.5	5.0	3.5
Western Branch wells	Internal system losses	6.0	5.5	6.0	5.5	6.0	5.5

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Raw water purchase from Norfolk (Northwest River System)	15% loss to Ultra Filtration and other production processes	7	5.95	7	5.95	7	5.95
1/6 share of Lake Gaston	15% loss	10.0	8.5	10.0	8.5	10.0	8.5
Finished Water purchase from Norfolk (South Norfolk System)			7		7		7
Finished Water purchase from Portsmouth			5.0		5.0		5.0
Total Supply (MGD)		**50**	**42.45**	**50**	**42.45**	**50**	**42.45**



City of Norfolk

A) WATER SALES:

Norfolk sells water to the following localities:

- Chesapeake: 2020-2040: 2.01 MGD finished water; 2020-2040: 7 MGD raw water
- Suffolk: 2020: 4.5 MGD, 2030: 8.25 MGD, 2040: 11.25 MGD raw water
- Isle of Wight: 2020: 1.5 MGD, 2030: 2.75 MGD, 2040: 3.75 MGD raw water
- Portsmouth: 10 MGD raw water under drought conditions if available

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system within the City of Norfolk. Norfolk's sales to military installations outside of Norfolk were included because the demands are not included in the host city/county's projections. However, water sales to Chesapeake, Virginia Beach, Suffolk, Isle of Wight, and Portsmouth were not included in the table below because the localities included the demand satisfied by the sales in their own demand projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	249,687	258,954	263,430
Percent Served by PWS	100%	100%	100%
Total Population Served	249,687	258,954	263,430
Average per Capita Water Use (gallons)	88	88	88
Finished Water Demand (MGD) in Norfolk	**21.97**	**22.79**	**23.18**
Sales to Military Installations outside of Norfolk (MGD)	5	5	5
Total finished demand	**26.97**	**27.79**	**28.18**
Water Supply Plan Projections (2011)			
Population Projection	238,236	239,780	241,333
Percent Served by PWS (WSP Plan)	100%	100%	100%
Total Population Served	238,236	239,780	241,333
Average per Capita Water Use (gallons)	80	80	80
Finished Water Demand (MGD) in Norfolk	**19.06**	**19.18**	**19.31**
Sales to Military Installations outside of Norfolk (MGD)	1	1	1
Total finished demand (MGD)	**20.06**	**20.18**	**20.31**

C) SUPPLY PROJECTIONS:

Water sales to Chesapeake, Suffolk and Isle of Wight were deducted from the Supply Projections shown below. Raw water sales to Chesapeake, Suffolk and Isle of Wight were deducted from the raw water yield of the Intown and Western Reservoirs, Blackwater and Nottoway River intakes before calculating the finished water yield. The finished water sale to Chesapeake was deducted from the finished water yield. The following sale was not included in the supply projections below:

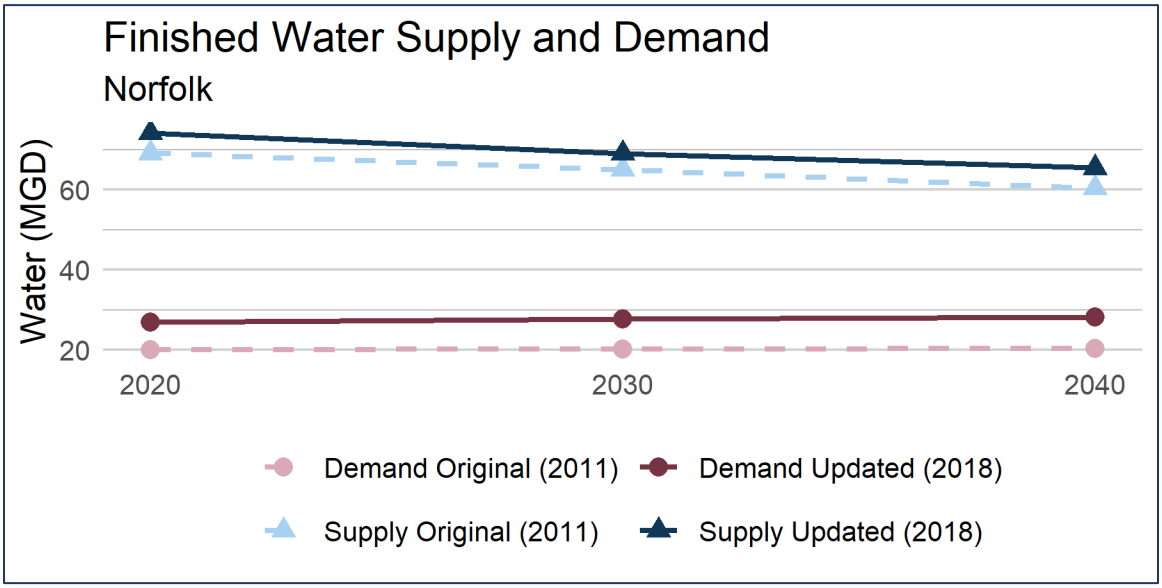
- Portsmouth: 10 MGD raw water under drought conditions

City of Norfolk (cont.)

Source Description	Water Loss Description	2020		2030		2040	
		Raw Water (MGD)	Finished Water (MGD)	Raw Water (MGD)	Finished Water (MGD)	Raw Water (MGD)	Finished Water (MGD)
Updated Supply (2018)							
Intown and Western Reservoirs, Blackwater and Nottoway River intakes, Suffolk wells	3.3% loss in transmission and 0.8 MGD loss in production processes	92.5	76.1	92.5	71.0	92.5	67.4
Raw Water Sold to Chesapeake		-7		-7		-7	
Raw Water Sold to Suffolk		-4.5		-8.5		-11.25	
Raw Water Sold to Isle of Wight		-1.5		-2.75		-3.75	
Finished Water sold to Chesapeake			-2.01		-2.01		-2.01
Total Supply (MGD)		**79.5**	**74.1**	**74.25**	**68.99**	**70.5**	**65.39**
WSP Supply (2011)							
Intown and Western Reservoirs, Blackwater and Nottoway River intakes, Suffolk wells	3.3% loss in transmission and 0.8 MGD loss in production processes	92.5	76.1	92.5	71.0	92.5	67.4
Raw water sold to Chesapeake		-7		-7		-7	
Raw Water Sold to Suffolk		-4.5		-8.5		-11.25	
Raw Water Sold to Isle of Wight		-1.5		-2.75		-3.75	
Finished Water sold to Chesapeake			-7		-7		-7
Total Supply (MGD)		**79.5**	**69.1**	**74.25**	**65**	**70.5**	**60.4**

City of Norfolk (cont.)

The supply projections in the graph do not include Norfolk's contractual obligations to sell water to Portsmouth (10 MGD raw water under drought conditions).



City of Portsmouth

A) WATER SALES:

Portsmouth sells water to the following:

- Finished water sales to Suffolk (2020-2040: 2.56 MGD)
- Finished water sales to Chesapeake (2020: 3 MGD, 2030-2040: 2 MGD)

Portsmouth purchases water from the following:

- Purchase water from Norfolk under drought conditions (up to 10 MGD).

B) DEMAND PROJECTIONS:

Demand projections considered the population served throughout the entire city. Demand projections do not include finished water sales to Suffolk and Chesapeake because they have included the demand satisfied by the sales in their own demand projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	96,423	97,293	97,714
Percent Served by PWS	100%	100%	100%
Total Population Served	96,423	97,293	97,714
Average per Capita Water Use (gallons)	118	118	118
Finished Water Demand (MGD) in Portsmouth	**11.44**	**11.46**	**11.46**
Water Supply Plan Projections (2011)			
Population Projection	101,576	103,656	105,779
Percent Served by PWS (WSP Plan)	100%	100%	100%
Total Population Served	101,576	103,656	105,779
Average per Capita Water Use (gallons)	112	112	112
Finished Water Demand (MGD)	**11.38**	**11.61**	**11.85**

City of Portsmouth (cont.)

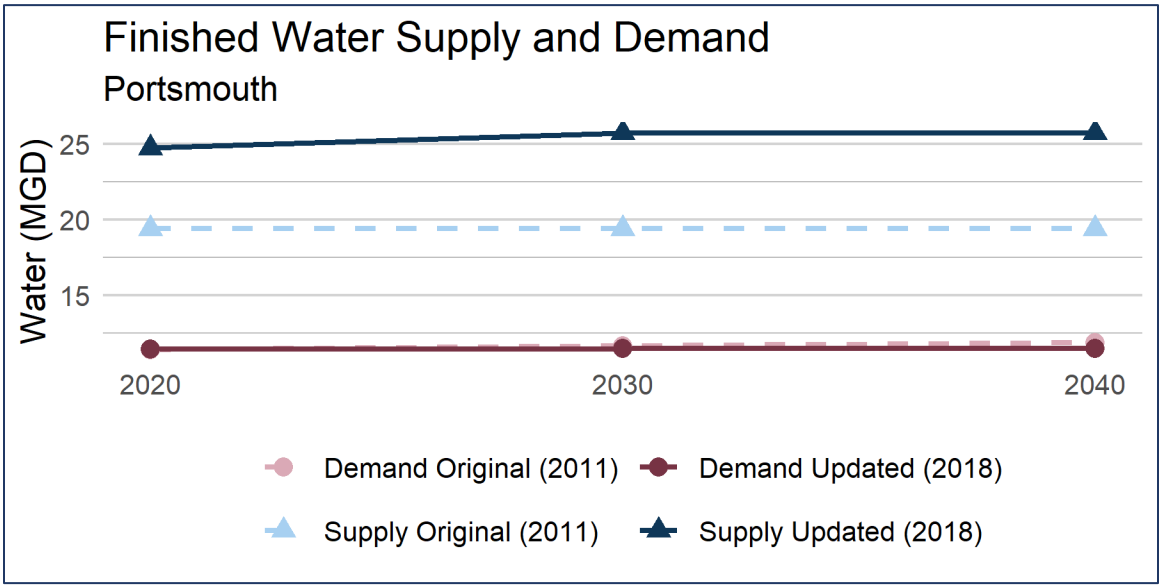
C) SUPPLY PROJECTIONS:

Supply projections include Portsmouth's drought wells permit which can withdraw up to an additional 10.33 MGD during qualifying events. Additionally, supply projections do not include the contract with Norfolk to buy water under drought conditions (up to 10 MGD). Finished water sales to Chesapeake and Suffolk were deducted from the finished water supply.

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Production wells (5.0 MGD) and Speights Run, Lake Kilby, Lake Cohoon, Lake Meade (19.1 MGD)	12.2% Losses in Production Processes	24.1	21.2	24.1	21.2	24.1	21.2
Drought Emergency relief Wells	12.2% Losses in Production Processes	10.33	9.1	10.33	9.1	10.33	9.1
Finished Water Sold to Chesapeake			-3		-2		-2
Finished Water Sold to Suffolk			-2.56		-2.56		-2.56
Total Supply (MGD)		**34.43**	**24.74**	**34.43**	**25.74**	**34.43**	**25.74**
WSP Supply (2011)							
Production wells (5.4 MGD) and Speights Run, Lake Kilby, Lake Cohoon, Lake Meade (19.1 MGD)	12.2% Losses in Production Processes	24.5	21.5	24.5	21.5	24.5	21.5
Drought Emergency Relief Wells	12.2% Losses in Production Processes	6.22	5.46	6.22	5.46	6.22	5.46
Finished Water Sold to Chesapeake			-5		-5		-5
Finished Water Sold to Suffolk			-2.56		-2.56		-2.56
Total Supply (MGD)		**30.72**	**19.4**	**30.72**	**19.4**	**30.72**	**19.4**

City of Portsmouth (cont.)

The graph reflects both the demands within the City of Portsmouth and their sales of finished water to Chesapeake (2020: 3 MGD, 2030-2040: 2 MGD) and Suffolk (2020-2040: 2.56 MGD).



Suffolk

A) WATER SALES:

Suffolk purchases water from the following:

- The Western Tidewater Authority (WTWA) has a contract to purchase raw water from Norfolk (2020: 6 MGD, 2030: 11 MGD, 2040: 15 MGD). Suffolk, as a member of the WTWA is entitled to 75% of the water purchased (2020: 4.5 MGD, 2030: 8.25 MGD, 2040: 11.25 MGD). However, Suffolk also treats the 25% of the purchased water for Isle of Wight County.
- Finished water from Suffolk (2020: 2.56 MGD, 2030: 2.56 MGD, 2040: 2.56 MGD)

B) DEMAND PROJECTIONS:

Demand projections considered the projected population that would be served by the public water supply system, including expansions (in 2020 and 2040) to the public water system and the portion of Suffolk served by Portsmouth.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	97,615	118,615	128,759
Percent Served by PWS	85%	90%	95%
Total Population Served	82,973	106,754	122,321
Average per Capita Water Use (gallons)	75	75	75
Finished Water Demand (MGD)	**6.22**	**8.01**	**9.17**
Water Supply Plan Projections (2011)			
Population Projection	105,491	136,898	186,808
Percent Served by PWS (WSP Plan)	83%	86%	98%
Total Population Served	87,558	117,732	183,072
Average per Capita Water Use (gallons)	103	103	103
Finished Water Demand (MGD)	**9.02**	**12.1**	**18.86**

C) SUPPLY PROJECTIONS:

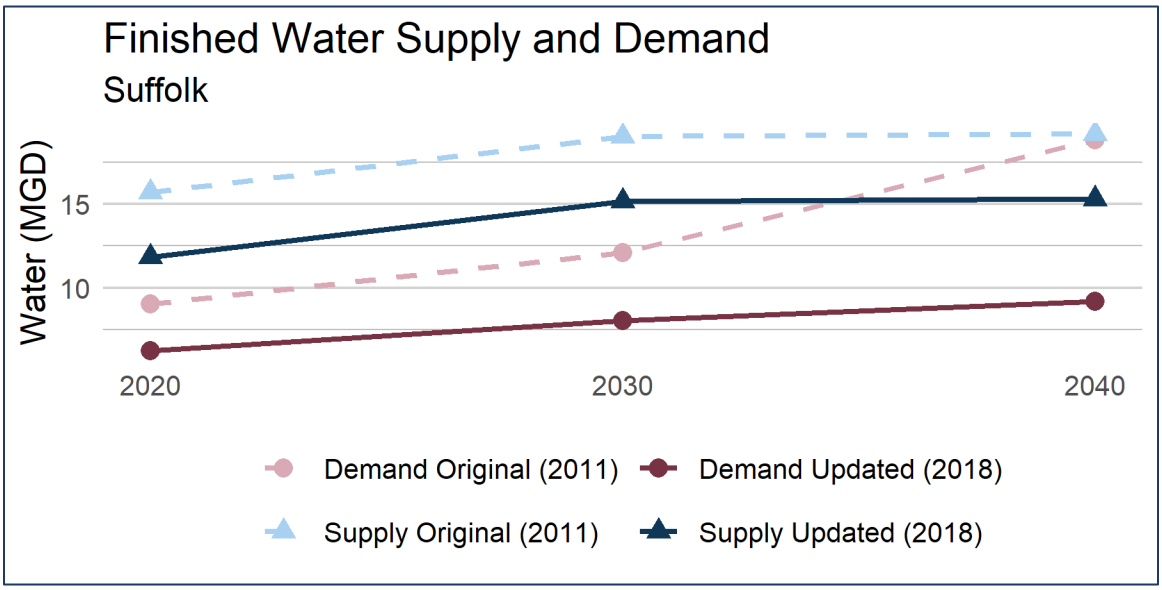
The supply projections include the raw water purchased from Norfolk. Suffolk also treats the 25% of the purchased water for Isle of Wight County. This amount is included in the table below as a finished water deduction. Additionally, supply projections include Western Tidewater Water Authority's groundwater permit, but does not include the tiers built into the permit. The groundwater permit allows for the following tiered expansions:

- Tier 1: 2.4 MGD; a temporary withdrawal increase for the period of time that the Robert G. House Water Treatment Plan will be taken offline for planned rehabilitation
- Tier 2: 2.4 MGD; requires the completion of Suffolk Route 10 water transmission main extension in Suffolk to the Isle of Wight County interconnect location
- Tier 3: 1 MGD; requires the completion of the Route 460 transmission main in Suffolk to the Isle of Wight County interconnect location

Suffolk (cont.)

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Crumps Mill Pond, Lone Star Lakes	3% loss	1.2	1.16	1.2	1.16	1.2	1.16
WTWA wells - EDR, Reids Ferry, Crittenden	7% loss to EDR	3.5	3.26	3.5	3.26	3.5	3.26
WTWA Fluoride well		0.70	0.70	0.70	0.70	0.70	0.70
~~**Holland wells**~~	-	~~0.00~~	~~0.00~~	~~0.00~~	~~0.00~~	~~0.00~~	~~0.00~~
Whaleyville wells		0.10	0.1	0.10	0.1	0.10	0.1
Raw Water Purchase from Norfolk	10% loss (per contract)	6	5.4	11	9.9	15	13.5
Finished Water Purchase from Portsmouth			2.56		2.56		2.56
Finished Water Sale to Isle of Wight			-1.35		-2.5		-3.4
Total Supply (MGD)		**11.5**	**11.83**	**16.5**	**15.18**	**20.5**	**15.32**
WSP Supply (2011)							
Crumps Mill Pond, Lone Star Lakes	3% loss	1.2	1.16	1.2	1.16	1.2	1.16
WTWA wells - EDR, Reids Ferry, Crittenden	7% loss to EDR	7.64	7.11	7.64	7.11	7.64	7.11
WTWA Fluoride well		0.70	0.70	0.70	0.70	0.70	0.70
Holland wells		0.04	0.04	0.04	0.04	0.04	0.04
Whaleyville wells		0.10	0.10	0.10	0.10	0.10	0.10
Raw Water Purchase from Norfolk	10% loss (per contract)	6	5.4	11	9.9	15	13.5
Finished Water Purchase from Portsmouth			2.56		2.56		2.56
Finished Water Sale to Isle of Wight			-1.35		-2.5		-3.4
Total Supply (MGD)		**15.68**	**15.72**	**20.68**	**19.07**	**24.68**	**19.21**

Suffolk (cont.)



Virginia Beach

A) WATER SALES:

Virginia Beach purchases water from the following:

- Norfolk: treats and wheels Lake Gaston water; in 2019 entered contract for 10 MGD of raw water (this is not included as the contract started after the 2018 update)

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system.

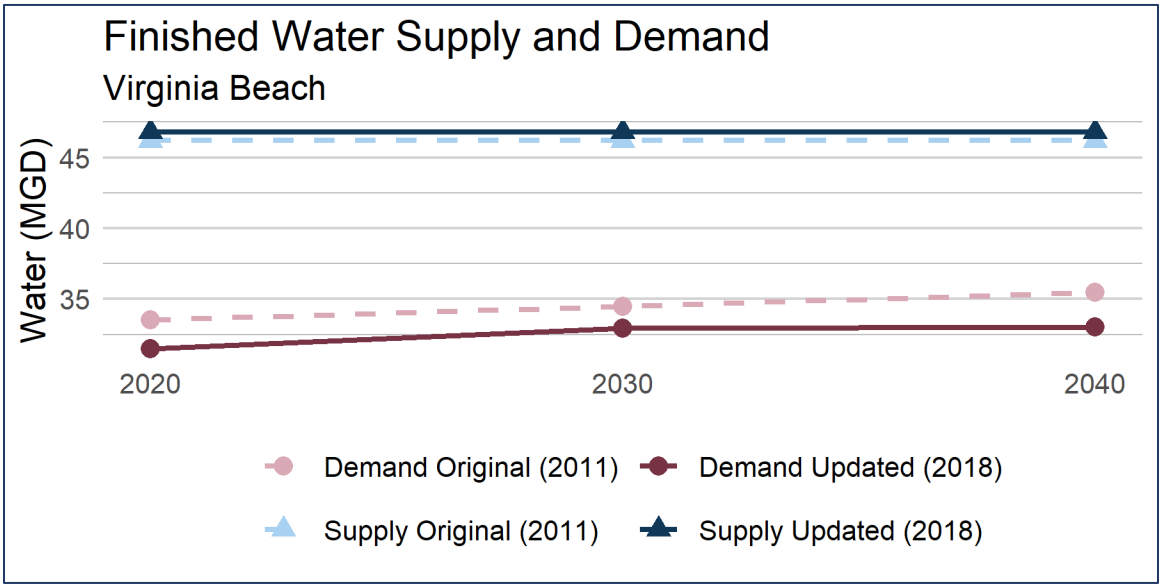
	2020	2030	2040
Updated Projections (2018)			
Population Projection	463,742	499,784	517,193
Percent Served by PWS	97%	97%	97%
Total Population Served	449,830	484,790	501,677
Average per Capita Water Use (gallons)	70	68	66
Finished Water Demand (MGD)	**31.49**	**32.92**	**33.04**
Water Supply Plan Projections (2011)			
Population Projection	437,492	450,015	462,897
Percent Served by PWS (WSP Plan)	97%	97%	97%
Total Population Served	424,367	436,515	449,010
Average per Capita Water Use (gallons)	79	79	79
Finished Water Demand (MGD)	**33.53**	**34.49**	**35.47**

Virginia Beach (cont.)

C) SUPPLY PROJECTIONS:

Supply projections includes the contract (2018) with Norfolk to treat and wheel Lake Gaston Water but does not include the 10 MGD raw water purchase from Norfolk since the contract was signed after the 2018 update.

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Stumpy Lake - Norfolk wheels	Transmission and production losses	2	1.8	2	1.8	2	1.8
Lake Gaston - Norfolk wheels	Transmission and production losses	50	45	50	45	50	45
Total Supply (MGD)		**52**	**46.8**	**52**	**46.8**	**52**	**46.8**
WSP Supply (2011)							
Stumpy Lake - Norfolk wheels	Transmission and production losses	1.3	**1.2**	1.3	**1.2**	1.3	**1.2**
Lake Gaston - Norfolk wheels	Transmission and production losses	50	**45**	50	**45**	50	**45**
Total Supply (MGD)		**51.3**	**46.2**	**51.3**	**46.2**	**51.3**	**46.2**



Subregion: Western Tidewater

City of Franklin

A) WATER SALES:

Franklin sells water to the following:

- Finished water sale to Isle of Wight (2020-2040: 0.13 MGD)

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system within the City of Franklin. Franklin has a contract in place to sell 0.13 MGD finished water to Isle of Wight, this contract is not included in the demand projects because it is included in the buyer's projections.

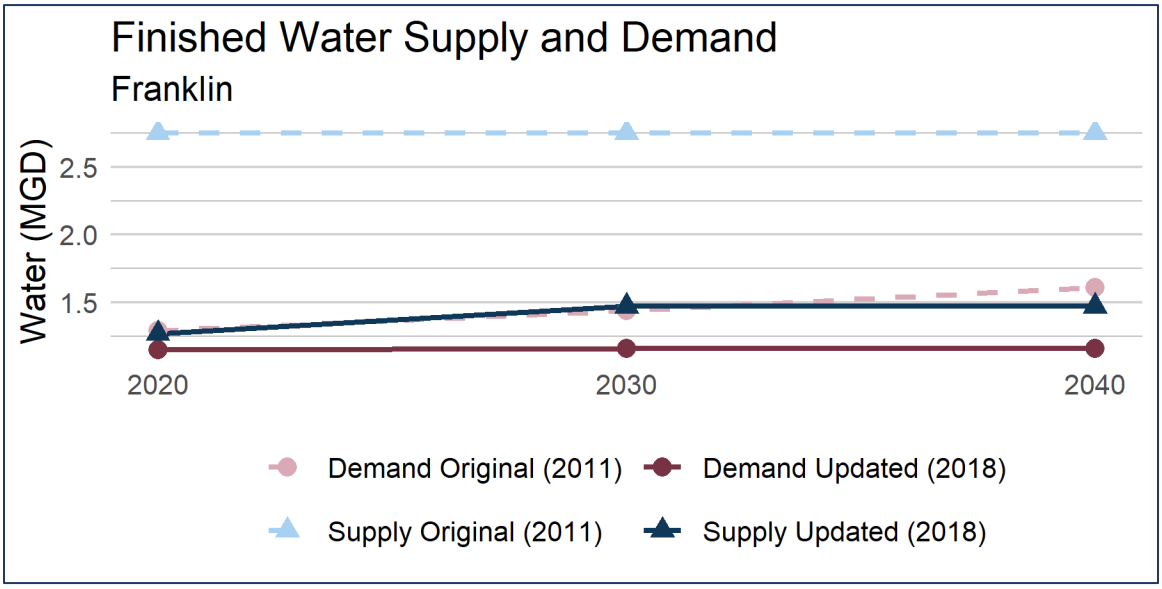
	2020	2030	2040
Updated Projections (2018)			
Population Projection	8,621	8,706	8,748
Percent Served by PWS	100%	100%	100%
Total Population Served	8,621	8,706	8,748
Average per Capita Water Use (gallons)	133	133	133
Finished Water Demand (MGD)	**1.15**	**1.16**	**1.16**
Water Supply Plan Projections (2011)			
Population Projection	9,687	10,813	12,071
Percent Served by PWS (WSP Plan)	100%	100%	100%
Total Population Served	9,687	10,813	12,071
Average per Capita Water Use (gallons)	133	133	133
Finished Water Demand (MGD)	**1.29**	**1.44**	**1.61**

C) SUPPLY PROJECTIONS:

Franklin's groundwater permit allows for additional withdrawals if certain conditions are met, the supply projections below includes these permit tiers/expansions (2020: 1.4 MGD, 2030-2040: 1.6 MGD) and finished water sale to Isle of Wight. An increase in permitted withdrawals (additional 1.6 MGD) is triggered if the sum of withdrawals from the Potomac Aquifer over the previous 12 months and the increase in demand anticipated with the upcoming 12 months are projected to exceed 1.26 MGD (or 90% of the permitted withdrawal). An additional 0.2 MGD (included below) will be permitted to be withdrawn annually from groundwater wells developed in bedrock.

City of Franklin (cont.)

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Franklin wells		1.4	1.4	1.6	1.6	1.6	1.6
Finished Water Sale to Isle of Wight			-0.13		-0.13		-0.13
Total Supply (MGD)		**1.4**	**1.27**	**1.6**	**1.47**	**1.6**	**1.47**
WSP Supply (2011)							
Franklin wells		2.88	2.88	2.88	2.88	2.88	2.88
Finished Water Sale to Isle of Wight			-0.13		-0.13		-0.13
Total Supply (MGD)		**2.88**	**2.75**	**2.88**	**2.75**	**2.88**	**2.75**



Isle of Wight County

A) WATER SALES:

Isle of Wight purchases water from the following:

- As a member of the Western Tidewater Authority (WTWA), Isle of Wight has a contract to purchase raw water from Norfolk (2020: 1.5 MGD, 2030: 2.75 MGD, 2040: 3.75 MGD); this water is treated by Suffolk before being delivered to Isle of Wight County. The finished water amount is included in the table below
- Franklin: 0.13 MGD Finished Water
- Windsor: 0.22 MGD Finished Water
- Smithfield: treated water is sold on an as needed basis provided that Smithfield has sufficient capacity

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system.

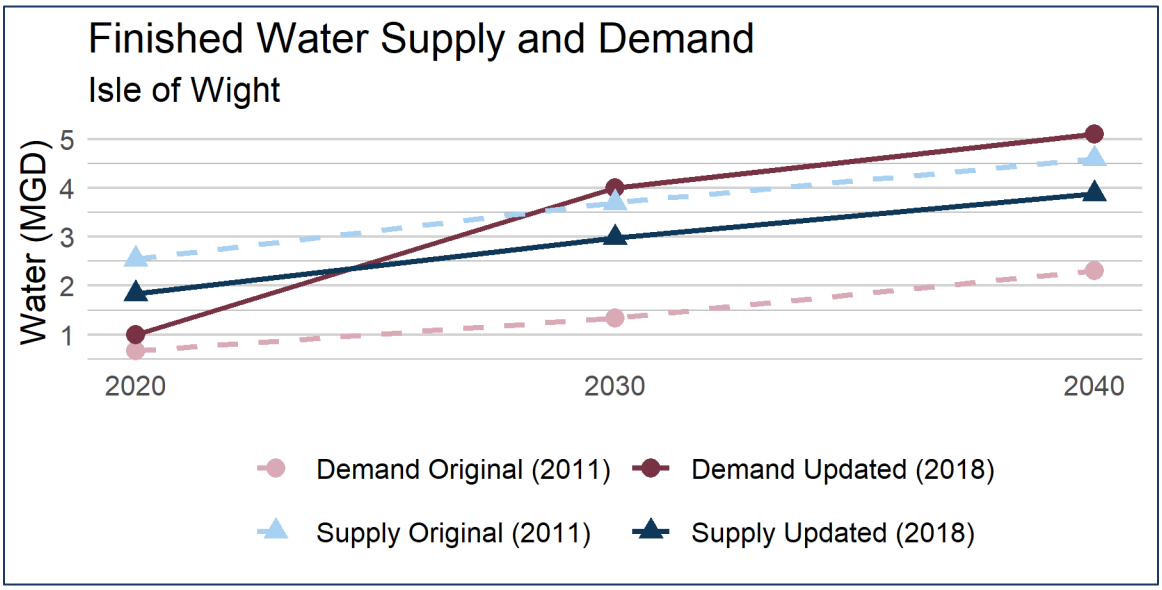
	2020	2030	2040
Updated Projections (2018)			
Population Projection	30,910	38,893	42,459
Percent Served by PWS	-	-	-
Total Population Served	-	-	-
Average per Capita Water Use (gallon)	-	-	-
Finished Water Demand (MGD)	**1**	**4.0**	**5.10**
Water Supply Plan Projections (2011)			
Population Projection	12,920	20,936	31,008
Percent Served by PWS	39%	48%	56%
Total Population Served	5,039	10,049	17,364
Average per Capita Water Use (gallons)	133	133	133
Finished Water Demand (MGD)	**0.67**	**1.34**	**2.31**

C) SUPPLY PROJECTIONS:

Water purchased from Smithfield is not included in the supply below. Additionally, Western Tidewater's groundwater permit allows for additional withdrawals as an emergency backup, the supply projections below do not include this additional capacity.

Isle of Wight County (cont.)

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Wells for 4 (GW permits) stand-alone CWS owned by county		0.13	0.13	0.13	0.13	0.13	0.13
~~**GW permit for Camptown DSD**~~	~~est. 30% loss to RO~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~	~~0~~
Purchase finished water from WTWA (treated by Suffolk)			1.35		2.5		3.4
Purchase finished water from Franklin			0.13		0.13		0.13
Purchase finished water from Windsor			0.22		0.22		0.22
Total Supply (MGD)		**0.13**	**1.83**	**0.13**	**2.98**	**0.13**	**3.88**
WSP Supply (2011)							
Wells for 4 (GW permits) stand-alone CWS owned by county		0.16	0.16	0.16	0.16	0.16	0.16
GW permit for Camptown DSD	est. 30% loss to RO	0.98	0.68	0.98	0.68	0.98	0.68
Purchase finished water from WTWA (treated by Suffolk)			1.35		2.5		3.4
Purchase finished water from Franklin			0.13		0.13		0.13
Purchase finished water from Windsor			0.22		0.22		0.22
Total Supply (MGD)		**1.14**	**2.54**	**1.14**	**3.69**	**1.14**	**4.59**


Finished Water Supply and Demand
Isle of Wight
Water (MGD)
5
4
3
2
1
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

Smithfield

A) WATER SALES

Smithfield sells finished water to Isle of Wight on an as needed basis provided Smithfield has sufficient capacity.

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system. Smithfield has a contract in place to sell finished water to Isle of Wight on an as needed basis provided Smithfield has sufficient capacity, this contract is not included in the demand projects because it is included in the buyer's projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	8,546	11,186	13,826
Percent Served by PWS	98%	98%	98%
Total Population Served	8,375	10,962	13,549
Average per Capita Water Use (gallon)	90	90	90
Finished Water Demand (MGD)	**0.75**	**0.99**	**1.22**
Water Supply Plan Projections (2011)			
Population Projection	10,431	12,972	16,162
Percent Served by PWS	98%	98%	98%
Total Population Served	10,222	12,713	15,839
Average per Capita Water Use (gallons)	141	141	141
Finished Water Demand (MGD)	**1.44**	**1.79**	**2.23**

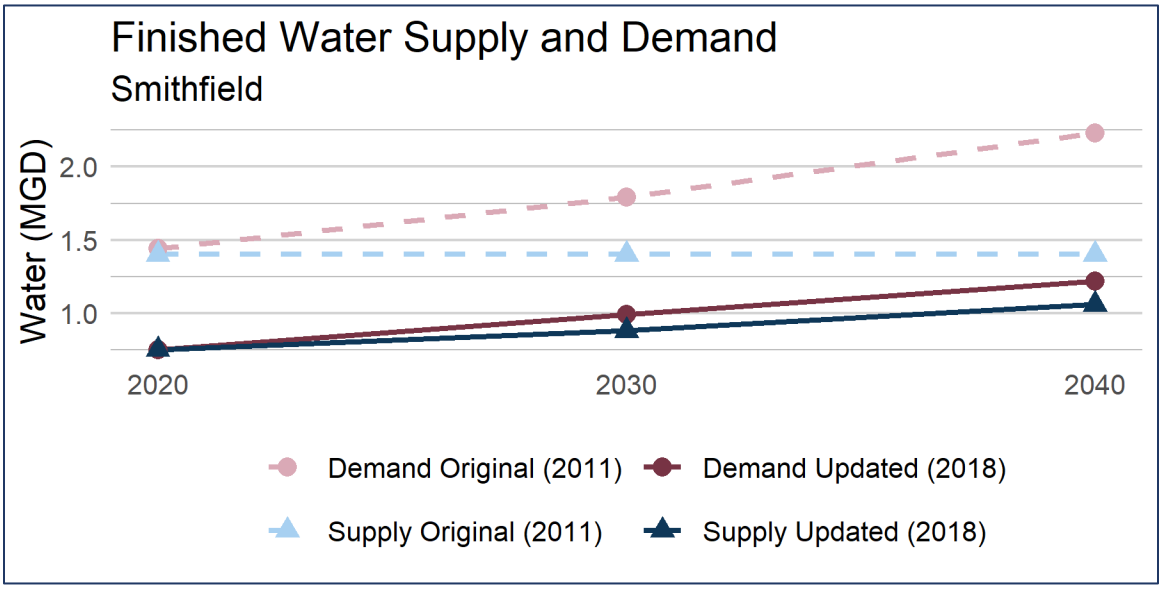
C) SUPPLY PROJECTIONS:

Smithfield has a contract in place to sell finished water to Isle of Wight on an as needed basis provided Smithfield has sufficient capacity, this contract is not included in the supply projections.

		2020		2030		2040	
Source Description	**Water Loss Description**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**
Updated Supply (2018)							
Smithfield Wells	13% Loss RO	0.85	0.75	0.99	0.88	1.22	1.06
Total Supply (MGD)		**0.85**	**0.75**	**0.99**	**0.88**	**1.22**	**1.06**
WSP Supply (2011)							
Smithfield Wells		1.4	1.4	1.4	1.4	1.4	1.4
Total Supply (MGD)		**1.4**	**1.4**	**1.4**	**1.4**	**1.4**	**1.4**

Smithfield (cont.)

The demand projections in the graph do not include Smithfield's contractual obligations to sell water to Isle of Wight.



Southampton County

A) WATER SALES:

None

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system. Southampton County includes projections for Towns of Boykins, Branchville, and Newsoms. The Towns of Capron, Courtland and Ivor have their own public water supply system, demand projections are included in their own projections.

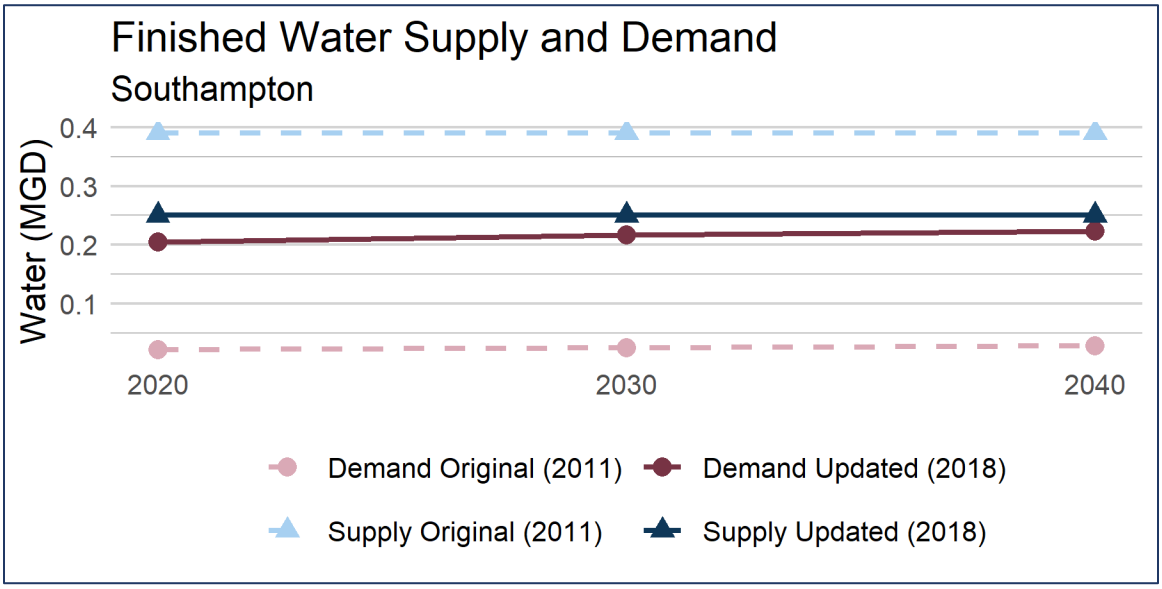
	2020	2030	2040
Updated Projections (2018)			
Population Projection	18,549	19,642	20,170
Percent Served by PWS	9%	9%	9%
Total Population Served	1,669	1,768	1,815
Average per Capita Water Use (gallon)	123	123	123
Finished Water Demand (MGD)	**0.21**	**0.22**	**0.22**
Water Supply Plan Projections (2011)			
Population Projection	22,119	25,437	27,253
Percent Served by PWS	9%	9%	9%
Total Population Served	1,991	2,289	2,452
Average per Capita Water Use (gallons)	123	123	123
Finished Water Demand (MGD)	**0.25**	**0.28**	**0.30**

Southampton County (cont.)

C) SUPPLY PROJECTIONS:

Southampton County includes projections for Towns of Boykins, Branchville, and Newsoms. The supply projections for the Towns of Capron and Ivor are included under their own projections.

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Newsoms wells		0.063	0.063	0.063	0.063	0.063	0.063
Boykins-Branchville wells		0.15	0.15	0.15	0.15	0.15	0.15
Drewryville wells		0.016	0.016	0.016	0.016	0.016	0.016
Edgehill wells		0.024	0.024	0.024	0.024	0.024	0.024
Total Supply (MGD)		**0.25**	**0.25**	**0.25**	**0.25**	**0.25**	**0.25**
WSP Supply (2011)							
Newsoms wells		0.09	0.09	0.09	0.16	0.16	0.16
Boykins-Branchville wells		0.24	0.24	0.24	0.68	0.98	0.68
Drewryville wells		0.02	0.02	0.02	2.5		3.4
Edgehill wells		0.04	0.04	0.04	0.13		0.13
Total Supply (MGD)		**0.39**	**0.39**	**0.39**	**0.39**	**0.39**	**0.39**



Town of Capron

A) WATER SALES:

None

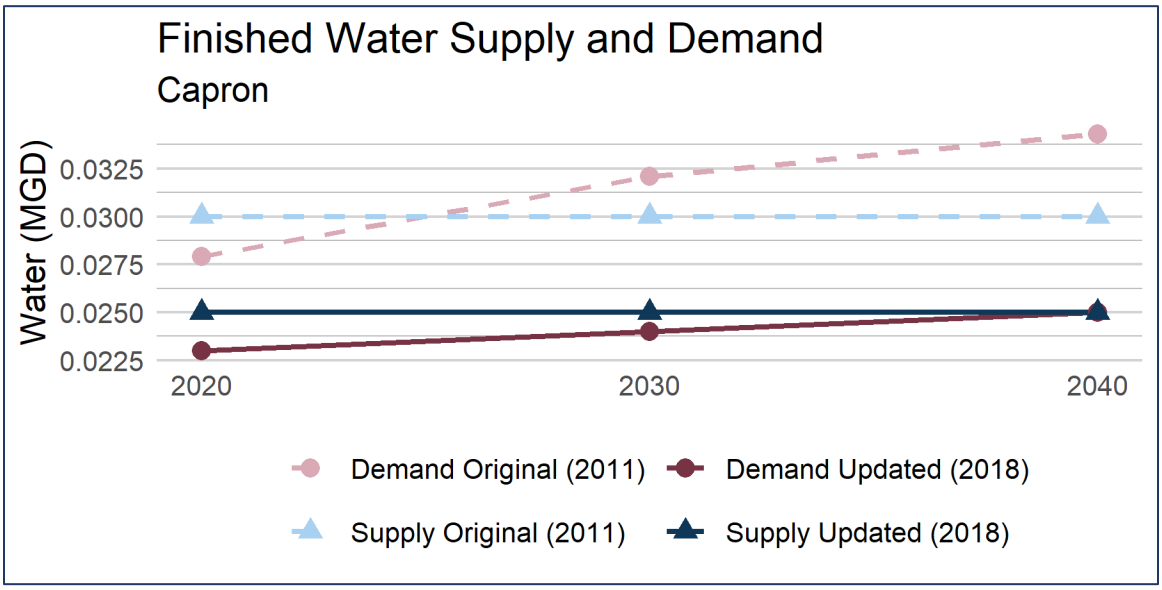
B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system within the Town of Capron. This information is based on their groundwater permit. Total population served and percent served by PWS is calculated using Southampton County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Southampton County)	18,549	19,642	20,170
Percent Served by PWS	1%	1%	1%
Total Population Served	185	196	202
Average per Capita Water Use (gallons)	126	126	126
Finished Water Demand (MGD)	**0.023**	**0.025**	**0.025**
Water Supply Plan Projections (2011)			
Population Projection (Southampton County)	22,119	25,437	27,253
Percent Served by PWS	1%	1%	1%
Total Population Served	221	254	273
Average per Capita Water Use (gallons)	126	126	126
Finished Water Demand (MGD)	**0.028**	**0.032**	**0.034**

C) SUPPLY PROJECTIONS:

		2020		2030		2040	
Source Description	**Water Loss Description**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**
Updated Supply (2018)							
Capron Wells		0.025	0.025	0.025	0.025	0.025	0.025
Total Supply (MGD)		**0.025**	**0.025**	**0.025**	**0.025**	**0.025**	**0.025**
WSP Supply (2011)							
Capron Wells		0.03	0.03	0.03	0.03	0.03	0.03
Total Supply (MGD)		**0.03**	**0.03**	**0.03**	**0.03**	**0.03**	**0.03**


Finished Water Supply and Demand
Capron
Water (MGD)
0.0325
0.0300
0.0275
0.0250
0.0225
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

A) WATER SALES:

None

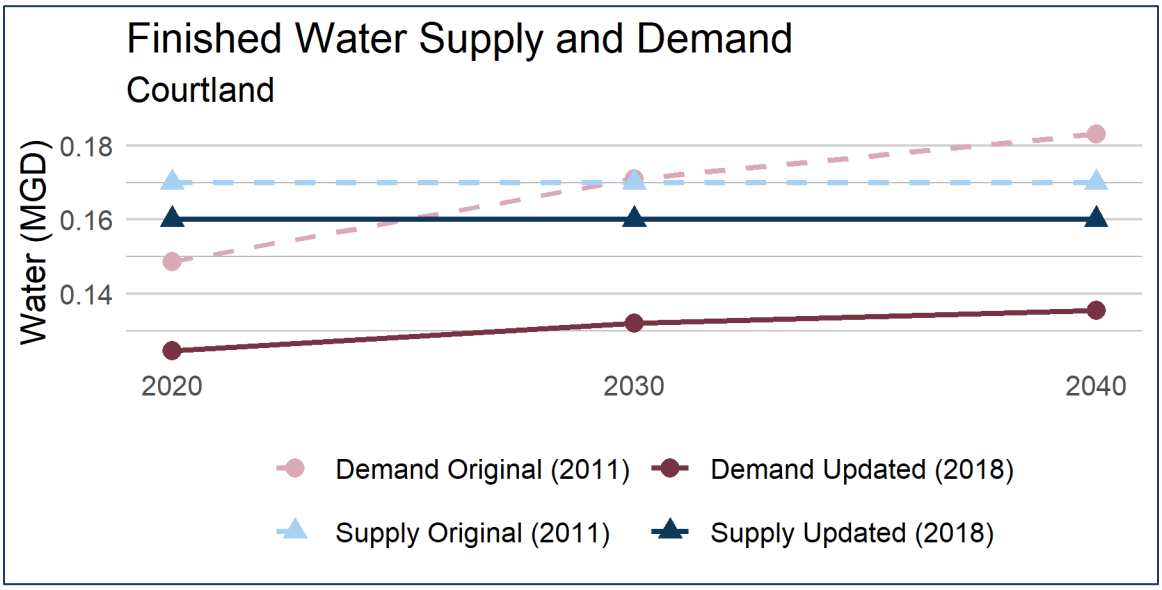
B) DEMAND PROJECTIONS:

Demand projections considered the projected population that would be served by the public water supply system. Total population served and percent served by PWS is calculated using Southampton County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Southampton County)	18,549	19,642	20,170
Percent Served by PWS	6%	6%	6%
Total Population Served	1,113	1,179	1,210
Average per Capita Water Use (gallons)	112	112	112
Finished Water Demand (MGD)	**0.12**	**0.13**	**0.14**
Water Supply Plan Projections (2011)			
Population Projection (Southampton County)	22,119	25,437	27,253
Percent Served by PWS	6%	6%	6%
Total Population Served	1,327	1,526	1,635
Average per Capita Water Use (gallons)	112	112	112
Finished Water Demand (MGD)	**0.15**	**0.17**	**0.18**

C) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Courtland wells		0.16	0.16	0.16	0.16	0.16	0.16
Total Supply (MGD)		**0.16**	**0.16**	**0.16**	**0.16**	**0.16**	**0.16**
WSP Supply (2011)							
Courtland wells		0.17	0.17	0.17	0.17	0.17	0.17
Total Supply (MGD)		**0.17**	**0.17**	**0.17**	**0.17**	**0.17**	**0.17**


Finished Water Supply and Demand
Courtland
Water (MGD)
0.18
0.16
0.14
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

Town of Ivor

A) WATER SALES:

None

B) DEMAND PROJECTIONS:

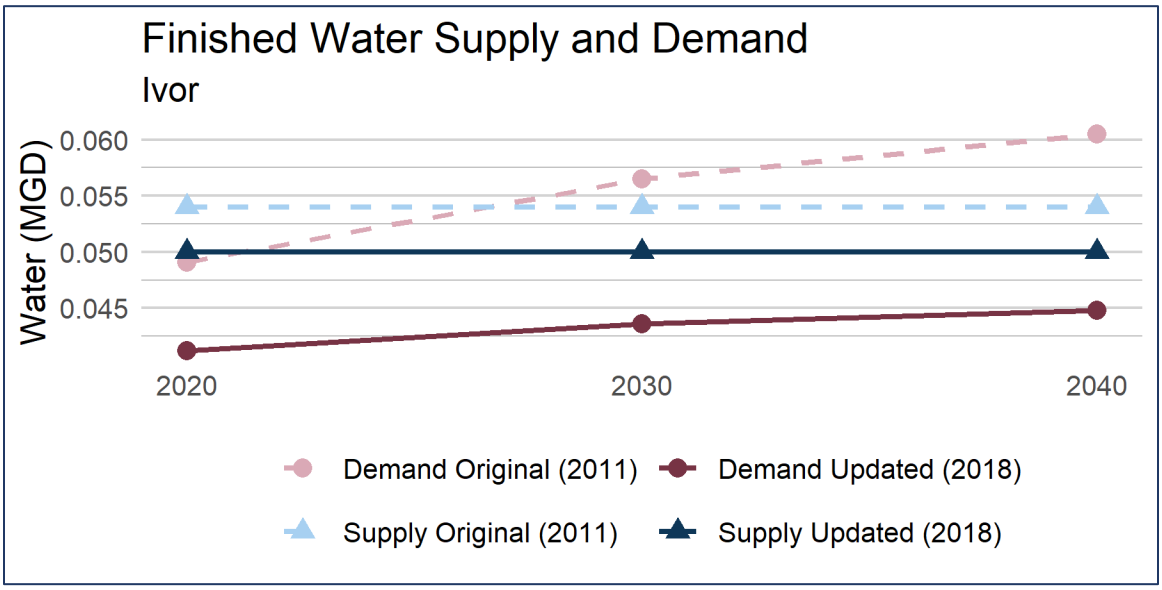
Demand Projections considered the projected population that would be served by the public water supply system within the Town of Ivor. This information is based on their groundwater permit. Total population served and percent served by PWS is calculated using Southampton County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Southampton County)	18,549	19,642	20,170
Percent Served by PWS	2%	2%	2%
Total Population Served	371	393	403
Average per Capita Water Use (gallons)	111	111	111
Finished Water Demand (MGD)	**0.041**	**0.043**	**0.044**
Water Supply Plan Projections (2011)			
Population Projection (Southampton County)	22,119	25,437	27,253
Percent Served by PWS	2%	2%	2%
Total Population Served	442	509	545
Average per Capita Water Use (gallons)	111	111	111
Finished Water Demand (MGD)	**0.049**	**0.057**	**0.061**

C) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Ivor wells		0.054	0.054	0.054	0.054	0.054	0.054
Total Supply (MGD)		**0.054**	**0.054**	**0.054**	**0.054**	**0.054**	**0.054**
WSP Supply (2011)							
Ivor wells		0.05	0.05	0.05	0.05	0.05	0.05
Total Supply (MGD)		**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**

Town of Ivor (cont.)



Surry County

Surry County includes the Towns of Claremont, Dendron, and Surry. Surry County does not own a public water system, but the three towns within the county each own a public water system. The remainder of the county is served by privately owned wells.

Town of Claremont

A) WATER SALES:

None

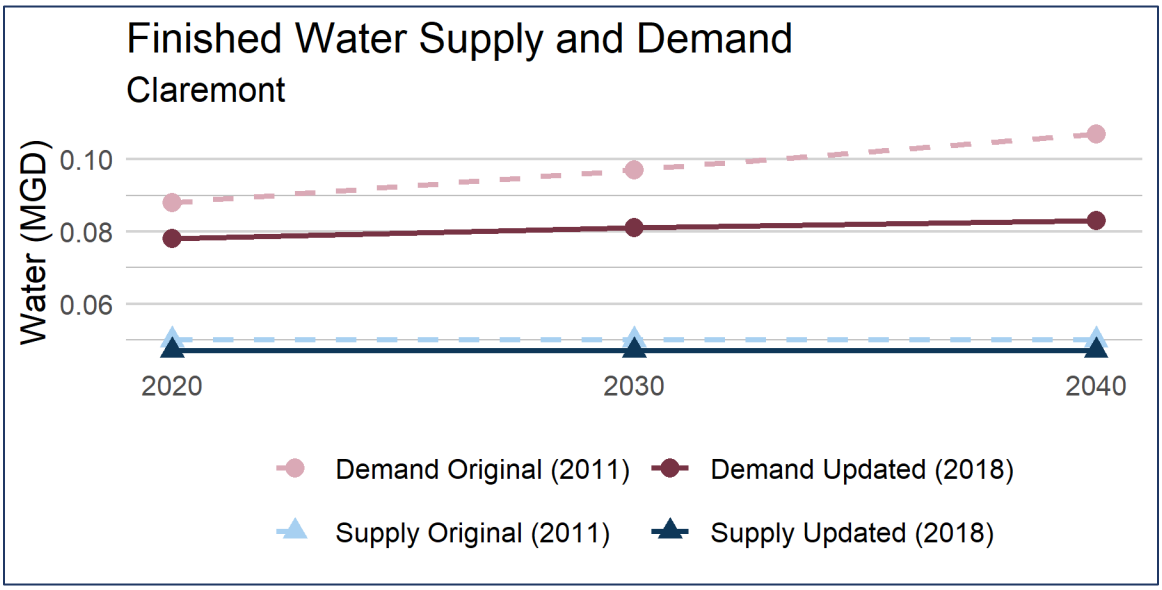
B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system within the Town of Claremont. Total population served and percent served by PWS is calculated using Surry County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Surry County)	6,841	7,190	7,359
Percent Served by PWS	11%	11%	11%
Total Population Served	753	791	809
Average per Capita Water Use (gallons)	103	103	103
Finished Water Demand (MGD)	**0.077**	**0.081**	**0.083**
Water Supply Plan Projections (2011)			
Population Projection (Surry County)	7,810	8,574	9,412
Percent Served by PWS	11%	11%	11%
Total Population Served	859	943	1,035
Average per Capita Water Use (gallons)	103	103	103
Finished Water Demand (MGD)	**0.088**	**0.097**	**0.107**

B) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Claremont wells		0.047	0.047	0.047	0.047	0.047	0.047
Total Supply (MGD)		**0.047**	**0.047**	**0.047**	**0.047**	**0.047**	**0.047**
WSP Supply (2011)							
Claremont wells		0.05	0.05	0.05	0.05	0.05	0.05
Total Supply (MGD)		**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**


Finished Water Supply and Demand
Claremont
Water (MGD)
0.10
0.08
0.06
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

Town of Dendron

A) WATER SALES:

None

B) DEMAND PROJECTIONS:

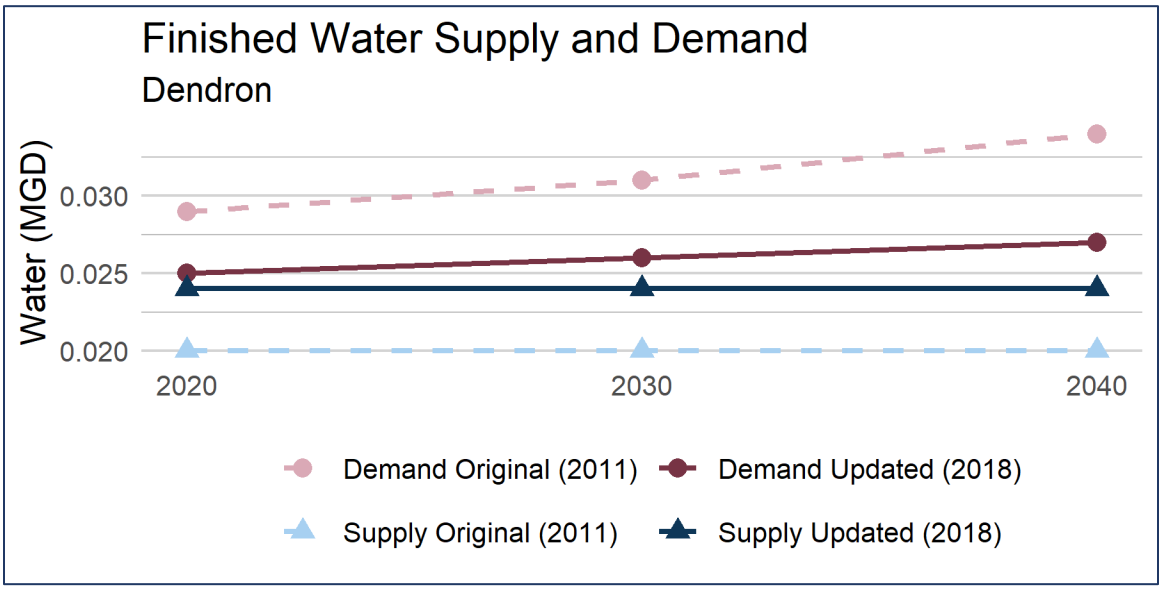
Demand Projections considered the projected population that would be served by the public water supply system. Total population served and percent served by PWS is calculated using Surry County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Surry County)	6,841	7,190	7,359
Percent Served by PWS	5%	5%	5%
Total Population Served	342	360	368
Average per Capita Water Use (gallons)	73	73	73
Finished Water Demand (MGD)	**0.025**	**0.026**	**0.027**
Water Supply Plan Projections (2011)			
Population Projection (Surry County)	7,810	8,574	9,412
Percent Served by PWS	5%	5%	5%
Total Population Served	391	429	471
Average per Capita Water Use (gallons)	73	73	73
Finished Water Demand (MGD)	**0.029**	**.031**	**0.034**

C) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Dendron wells		0.024	0.024	0.024	0.024	0.024	0.024
Total Supply (MGD)		**0.024**	**0.024**	**0.024**	**0.024**	**0.024**	**0.024**
WSP Supply (2011)							
Dendron wells		0.02	0.02	0.02	0.02	0.02	0.02
Total Supply (MGD)		**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**

Town of Dendron (cont.)



Town of Surry

A) WATER SALES:

None

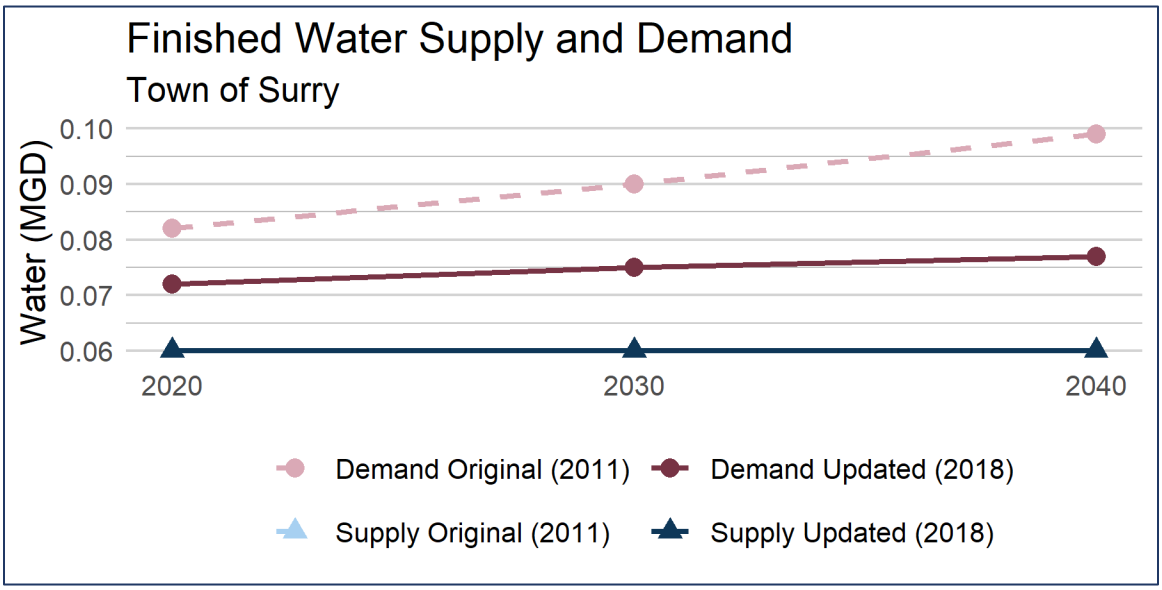
B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system. Total population served and percent served by PWS is calculated using Surry County's population projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Surry County)	6,841	7,190	7,359
Percent Served by PWS	10%	10%	10%
Total Population Served	684	719	736
Average per Capita Water Use (gallons)	105	105	105
Finished Water Demand (MGD)	**0.07**	**0.08**	**0.08**
Water Supply Plan Projections (2011)			
Population Projection (Surry County)	7,810	8,574	9,412
Percent Served by PWS	10%	10%	10%
Total Population Served	781	857	941
Average per Capita Water Use (gallons)	105	105	105
Finished Water Demand (MGD)	**.082**	**0.090**	**0.099**

C) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Town of Surry wells		0.06	0.06	0.06	0.06	0.06	0.06
Total Supply (MGD)		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**
WSP Supply (2011)							
Dendron wells		0.06	0.06	0.06	0.06	0.06	0.06
Total Supply (MGD)		**0.06**	**0.06**	**0.06**	**0.06**	**0.06**	**0.06**


Finished Water Supply and Demand
Town of Surry
Water (MGD)
0.10
0.09
0.08
0.07
0.06
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

Windsor

A) WATER SALES:

Windsor sells water to the following:

- Finished water sale to Isle of Wight (2020-2040: 0.22 MGD)

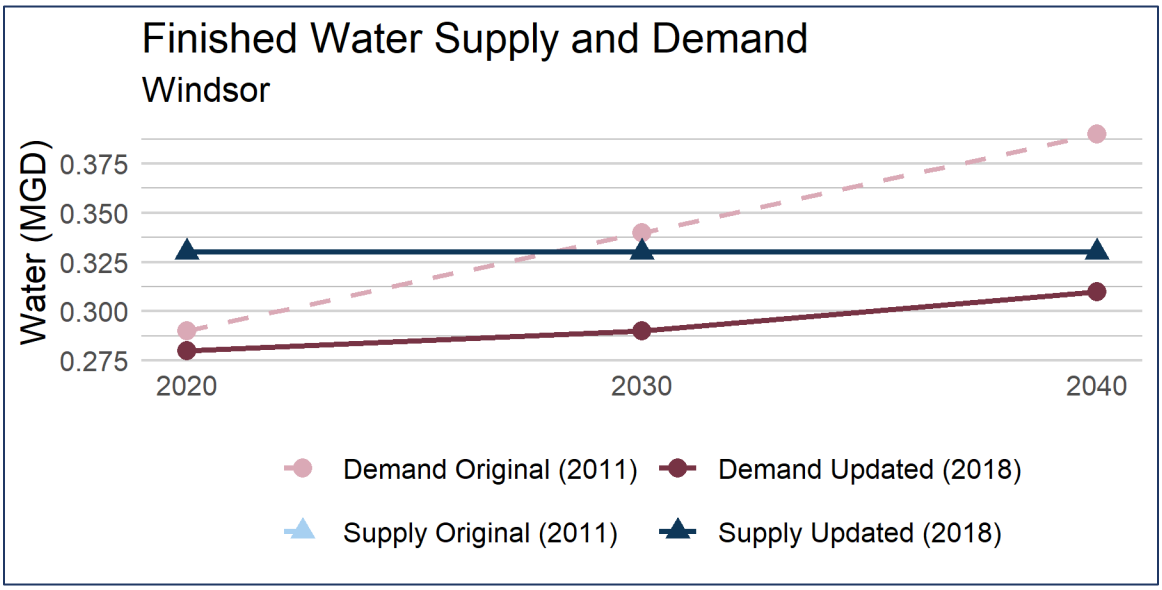
B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the public water supply system. Windsor has a contract in place to sell 0.22 MGD finished water to Isle of Wight, this contract is not included in the demand projects because it is included in the buyer's projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	2,778	2,934	3,099
Percent Served by PWS	98%	98%	98%
Total Population Served	2,722	2,875	3,037
Average per Capita Water Use (gallons)	102	102	102
Finished Water Demand (MGD)	**0.28**	**0.29**	**0.31**
Water Supply Plan Projections (2011)			
Population Projection	2,921	3,390	3,934
Percent Served by PWS	98%	98%	98%
Total Population Served	2,863	3,322	3,855
Average per Capita Water Use (gallons)	102	102	102
Finished Water Demand (MGD)	**0.29**	**0.34**	**0.39**

C) SUPPLY PROJECTIONS:

		2020		2030		2040	
Source Description	**Water Loss Description**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**
Updated Supply (2018)							
Windsor Wells		0.54	0.54	0.54	0.54	0.54	0.54
Sale Finished Water to Isle of Wight			-0.22		-0.22		-0.22
Total Supply (MGD)		**0.54**	**0.33**	**0.54**	**0.33**	**0.54**	**0.33**
WSP Supply (2011)							
Windsor wells		0.54	0.54	0.54	0.54	0.54	0.54
Sale Finished Water to Isle of Wight			-0.22		-0.22		-0.22
Total Supply (MGD)		**0.54**	**0.33**	**0.54**	**0.33**	**0.54**	**0.33**


Finished Water Supply and Demand
Windsor
Water (MGD)
0.375
0.350
0.325
0.300
0.275
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)

Subregion: Peninsula

Gloucester County

A) WATER SALES:

None

B) DEMAND PROJECTIONS:

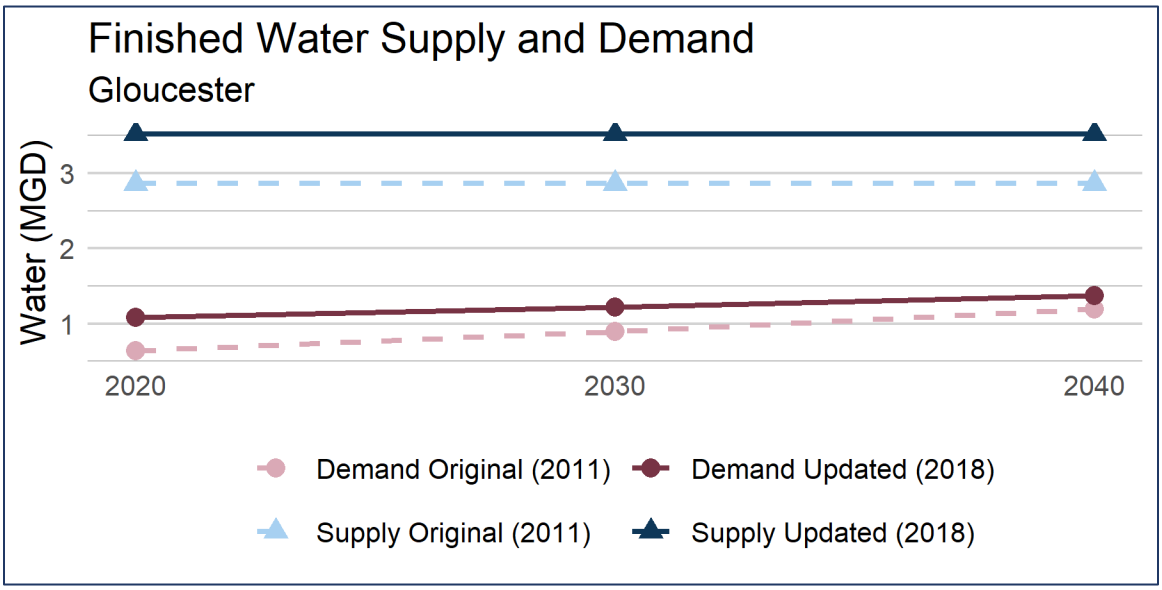
Demand Projections considered the projected population that would be served by the public water supply system within Gloucester County.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	37,902	39,051	40,200
Percent Served by PWS	42%	45%	48%
Total Population Served	15,919	17,573	19,296
Average per Capita Water Use (gallons)	68	68	68
Finished Water Demand (MGD)	**1.08**	**1.22**	**1.37**
Water Supply Plan Projections (2011)			
Population Projection	18,551	23,689	29,675
Percent Served by PWS	42%	46%	49%
Total Population Served	7,791	10,897	14,541
Average per Capita Water Use (gallons)	82	82	82
Finished Water Demand (MGD)	**0.639**	**0.894**	**1.192**

C) SUPPLY PROJECTIONS:

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Beaverdam reservoir	9% loss	2.0	1.82	2.0	1.82	2.0	1.82
Gloucester wells	15% loss to RO	2.0	1.7	2.0	1.7	2.0	1.7
Total Supply (MGD)		**4**	**3.52**	**4**	**3.52**	**4**	**3.52**
WSP Supply (2011)							
Beaverdam reservoir	10% loss	2	1.8	2	1.8	2	1.8
Gloucester wells	15% loss to RO	1.252	1.06	1.252	1.06	1.252	1.06
Total Supply (MGD)		**3.25**	**2.86**	**3.25**	**2.86**	**3.25**	**2.86**

Gloucester (cont.)



James City County

A) WATER SALES:

James City County has the ability to purchase water from the following:

- Finished water from Newport News Waterworks (up to 2 MGD)

B) DEMAND PROJECTIONS:

Demand Projections considered the projected population that would be served by the James City Service Authority (JCSA). A small portion of James City County is served by Newport News Waterworks, the population served and projected demands for that portion are not included in the table below. Instead, they are included under Newport News Waterworks' demand projections.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	80,591	103,365	117,980
Percent Served by PWS	70%	65%	65%
Total Population Served	56,414	67,187	76,687
Average per Capita Water Use (gallons)	80.3	80.3	80.3
Finished Water Demand (MGD)	**4.53**	**5.39**	**6.15**
Water Supply Plan Projections (2011)			
Population Projection	63,370	81,401	103,908
Percent Served by PWS	79%	81%	83%
Total Population Served	50,062	65,935	86,224
Average per Capita Water Use (gallons)	106	106	106
Finished Water Demand (MGD)	**5.31**	**6.99**	**9.14**

C) SUPPLY PROJECTIONS:

Supply projections include James City County's groundwater permit, including the tiers built into the permit (2020-2040: 6.02 MGD). These groundwater tiers are authorized upon written certification to DEQ that demands have exceeded the supply available in the previous tier. The tiers allow for the following maximum annual withdrawals:

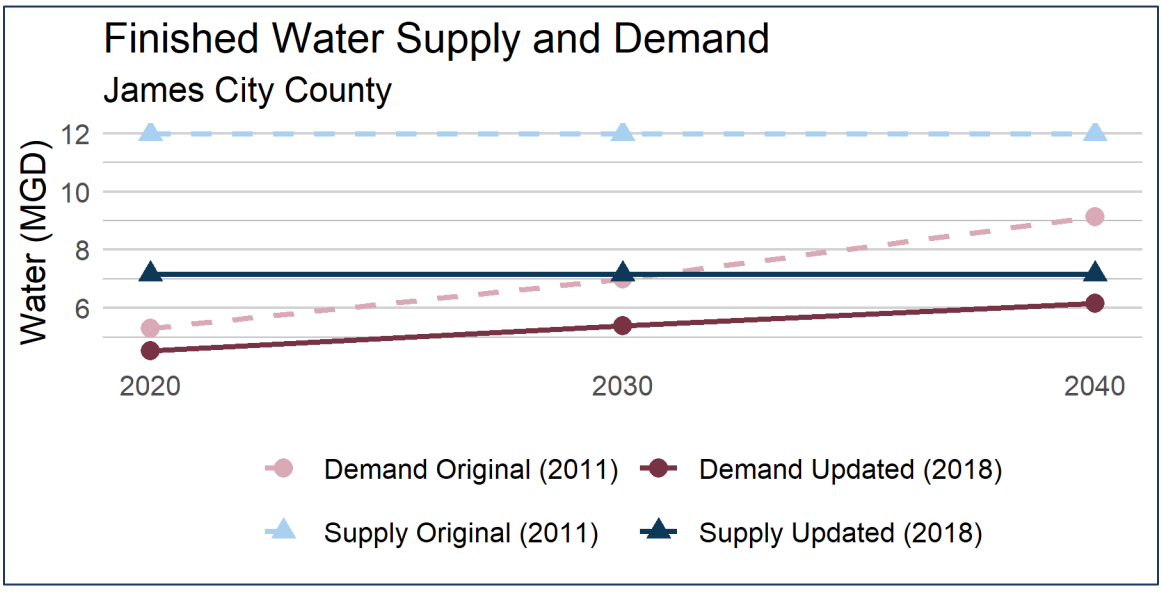
- Tier I (effective 2017): 6.02 MGD
- Tier II: 6.4 MGD
- Tier III: 7.4 MGD
- Tier IV: 8.4 MGD

The tier expansions are not included in the projections below. Supply projections also include the contract to purchase finished water from Newport News Waterworks (up to 2 MGD) but does not include the planned Chickahominy River Intake (to be built 2028-2032, supplying up to 16.95 MGD).

James City County (cont.)

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Updated Supply (2018)							
Central system wells (6.02 MGD) and 5 smaller systems (0.1 MGD)	20% loss from 4.8 MGD	6.12	5.16	6.12	5.16	6.12	5.16
Finished water purchase from NNWW (up to 2 MGD)			2		2		2
Total Supply (MGD)		**6.12**	**7.16**	**6.12**	**7.16**	**6.12**	**7.16**
WSP Supply (2011)							
Central system wells and 7 smaller systems	20% loss from 4.8 MGD	8.94	7.98	8.94	7.98	8.94	7.98
Finished water purchase from Newport News (up to an annual average of 4 MGD)			4		4		4
Total Supply (MGD)		**8.94**	**11.98**	**8.94**	**11.98**	**8.94**	**11.98**

The planned Chickahominy River Intake (to be built 2028-2032, supplying up to 16.95 MGD) is not included in the supply projections.



Newport News Waterworks

A) WATER SALES:

Newport News Waterworks sells water to the following:

- Raw water sale to Williamsburg (2020-2040: 2 MGD)
- Finished water sale to James City Service Authority (2020-2040: 2MGD)

B) DEMAND PROJECTIONS:

Newport News Waterworks provides direct service to customers in City of Newport News, City of Hampton, a portion of James City County, City of Poquoson, and York County. Demand Projections considered the projected population that would be served by the public water supply system within the localities that Newport News Waterworks serves directly. Water sales are not included in the demand projections because they are included in the host localities demand projections. The population projections for the service area within James City County only include the two census tracts that Newport News serves. All other census tracts are included under James City County.

	2020	2030	2040
Updated Projections (2018)			
Population Projection (Newport News)	184,216	187,475	189,567
Percent Served by PWS (Newport News)	100%	100%	100%
Population Served by PWS (Newport News)	184,216	187,475	189,567
Population Projection (Hampton)	137,746	138,575	139,107
Percent Served by PWS (Hampton)	100%	100%	100%
Population Served by PWS (Hampton)	137,746	138,575	139,107
Population Projection (Two census tracts in James City County served by Newport News)	10,421	10,910	11,428
Percent Served by PWS (Two census tracts in James City County served by Newport News)	79%	81%	83%
Population Served by PWS (Two census tracts in James City County served by Newport News)	8,233	8,837	9,485
Population Projection (Poquoson)	12,339	12,508	12,617
Percent Served by PWS (Poquoson)	100%	100%	100%
Population Served by PWS (Poquoson)	12,339	12,508	12,617
Population Projection (York County)	71,153	79,535	84,915
Percent Served by PWS (York County)	96%	97%	98%
Population Served by PWS (York County)	68,307	77,149	83,217
Total Population Served	410,841	423,531	431,838
Average per Capita Water Use (gallons)	93	93	93
Finished Water Demand (MGD)	**38.2**	**39.5**	**40.4**
Water Supply Plan Projections (2011)			
Population Projection (Newport News)	197,082	209,093	221,836
Percent Served by PWS (Newport News)	100%	100%	100%
Population Served by PWS (Newport News)	197,082	209,093	221,836
Population Projection (Hampton)	150,137	153,382	156,698
Percent Served by PWS (Hampton)	100%	100%	100%
Population Served by PWS (Hampton)	150,137	153,382	156,698

Population Projection (Two census tracts in James City County served by Newport News)	-	-	-
Percent Served by PWS (Two census tracts in James City County served by Newport News)	-	-	-
Population Served by PWS (Two census tracts in James City County served by Newport News)	-	-	-
Population Projection (Poquoson)	13,333	14,504	15,777
Percent Served by PWS (Poquoson)	100%	100%	100%
Population Served by PWS (Poquoson)	13,333	14,504	15,777
Population Projection (York County)	71,762	81,802	93,238
Percent Served by PWS (York County)	96%	97%	98%
Population Served by PWS (York County)	68,892	79,348	91,374
Total Population Served	429,444	456,327	485,685
Average per Capita Water Use (gallons)	112	112	112
Finished Water Demand (MGD)	**48.1**	**51.1**	**54.4**

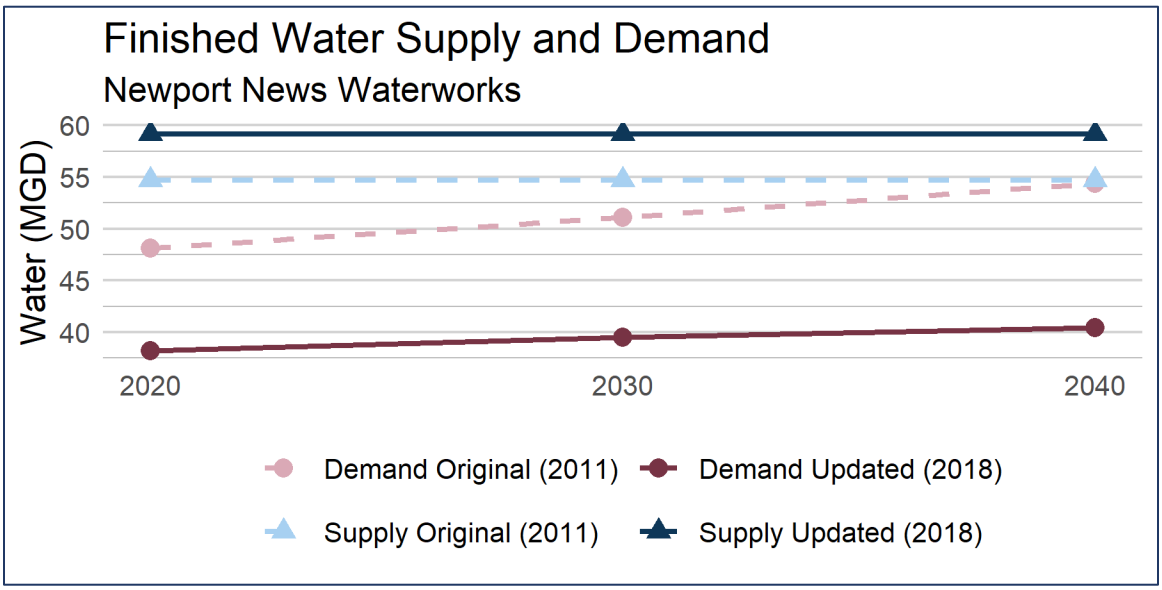
Newport News City (cont.)

C) SUPPLY PROJECTIONS:

The supply projections include sales to other localities. The raw water sale to Williamsburg (2020-2040: 2 MGD) is deducted from the raw water yield of the five reservoirs and Chickahominy River intake before calculating finished water yield. Finished water sales (2020-2040: 2 MGD) to James City Service Authority was deducted from the finished water yield. During a qualifying event, the brackish well is available for full capacity use (7 MGD). The groundwater permit for the Lightfoot wells was renewed for 1MGD.

Source Description	Water Loss Description	2020		2030		2040	
		Raw Water (MGD)	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**	**Raw Water (MGD)**	**Finished Water (MGD)**
Updated Supply (2018)							
Five reservoirs and Chickahominy River intake	1% production losses from surface water sources	57	54.45	57	54.45	57	54.45
Raw Water sale to Williamsburg (up to 2 MGD)	Deducted from raw water yield above before calculating finished yield	-2		-2		-2	
Brackish Drought Well (average use is 2.96 MGD; during a qualifying event = 7MGD)	20% RO loss	7	5.7	7	5.7	7	5.7
Lightfoot wells		1	1	1	1	1	1
Finished water sale to JCSA (up to 2 MGD)			-2		-2		-2
Total Supply (MGD)		**63**	**59.15**	**63**	**59.15**	**63**	**59.15**
WSP Supply (2011)							
Five reservoirs, Chickahominy River intake	1% production losses from surface water sources	55	52.47	55	52.47	55	52.47
Raw Water sale to Williamsburg (up to and annual average of 2 MGD)	Deducted from raw water yield above before calculating finished yield	-2		-2		-2	
Brackish Drought Well	20% RO	7	5.6	7	5.6	7	5.6

Source Description	Water Loss Description	2020 Raw Water (MGD)	2020 Finished Water (MGD)	2030 Raw Water (MGD)	2030 Finished Water (MGD)	2040 Raw Water (MGD)	2040 Finished Water (MGD)
Lightfoot wells		0.63	0.63	0.63	0.63	0.63	0.63
Finished water sale to JCSA (up to an annual average of 4 MGD)			-4		-4		-4
Total Supply (MGD)		**60.63**	**54.7**	**60.63**	**54.7**	**60.63**	**54.7**



Williamsburg

A) WATER SALES:

Williamsburg purchases water from the following:

- Raw water purchase from Newport News (2020-2040: 2 MGD)

B) DEMAND PROJECTIONS:

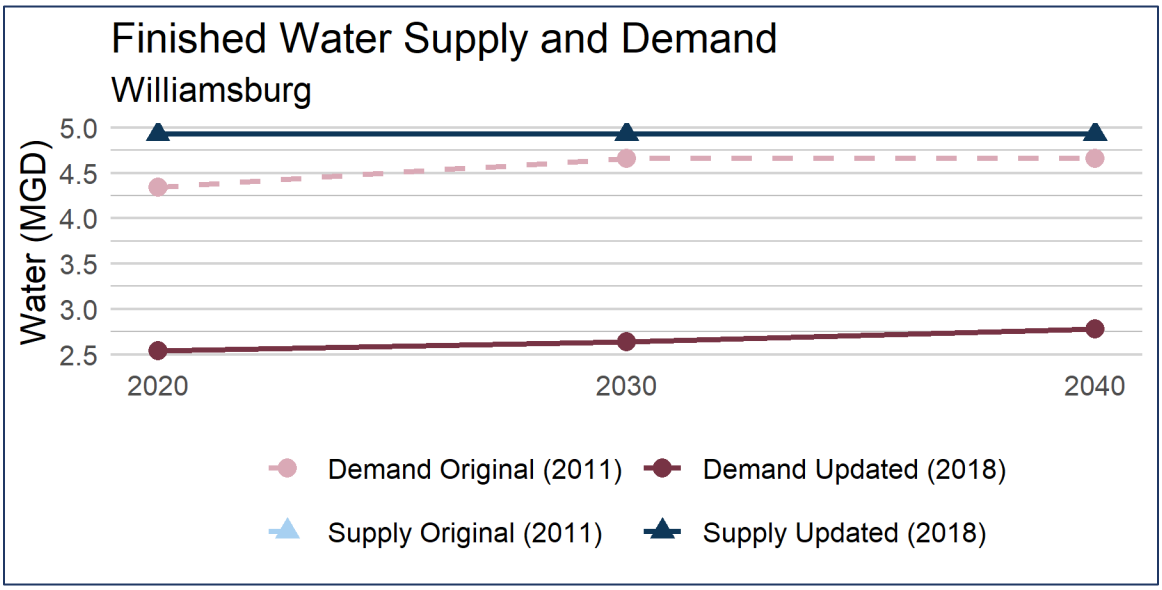
Demand Projections considered the projected population that would be served by the public water supply system within the City of Williamsburg.

	2020	2030	2040
Updated Projections (2018)			
Population Projection	15,860	17,267	18,171
Percent Served by PWS	100%	100%	100%
Total Population Served	15,860	17,267	18,171
Average per Capita Water Use (gallons)	153	153	153
Finished Water Demand (MGD)	**2.54**	**2.64**	**2.78**
Water Supply Plan Projections (2011)			
Population Projection	17,700	19,000	19,000
Percent Served by PWS	100%	100%	100%
Total Population Served	17,700	19,000	19,000
Average per Capita Water Use (gallons)	245	245	245
Finished Water Demand (MGD)	**4.34**	**4.66**	**4.66**

C) SUPPLY PROJECTIONS:

Supply projections include raw water purchase from Newport News Waterworks (2020-2040: 2 MGD).

Source Description	Water Loss Description	2020		2030		2040	
		Raw Water (MGD)	Finished Water (MGD)	Raw Water (MGD)	Finished Water (MGD)	Raw Water (MGD)	Finished Water (MGD)
Updated Supply (2018)							
Waller Mill reservoir, wells, and raw water purchase from NNWW (up to 2020-2040: 2 MGD)	4% production losses	5.14	4.93	5.14	4.93	5.14	4.93
Total Supply (MGD)		**5.14**	**4.93**	**5.14**	**4.93**	**5.14**	**4.93**
WSP Supply (2011)							
Waller Mill reservoir, wells, and raw water purchase from NNWW (up to 2 MGD)	4% production losses	5.14	4.93	5.14	4.93	5.14	4.93
Total Supply (MGD)		**5.14**	**4.93**	**5.14**	**4.93**	**5.14**	**4.93**


Finished Water Supply and Demand
Williamsburg
Water (MGD)
5.0
4.5
4.0
3.5
3.0
2.5
2020
2030
2040
Demand Original (2011)
Demand Updated (2018)
Supply Original (2011)
Supply Updated (2018)