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Water Conservation Plan Waldorf System

Project Number: 16-0675-006

Submitted to:
Charles County





Table of Contents

Conservation Planning Goals.....	1
System Profile	2
System Conditions.....	3
Climate and Water Availability.....	3
Infrastructure Conditions	4
System Demographics	4
Current Conservation Efforts.....	4
Demand Forecast	8
Planned Facilities.....	11
Identify Conservation Measures.....	19
Analyze Benefits and Cost.....	23
Analysis Assumptions	23
Updated Water Bills	23
Audits of Large-Volume Users	24
Distribute Retrofit Kits	24
Promotion of Landscape Efficiency.....	24
Select Conservation Measures	30
Updated Water Bills.....	30
Audits of Large Volume Users	30
Distribute Retrofit Kits.....	30
Landscape Efficiency	30
Integrate Resources and Modify Forecast.....	32
Modified Demand Forecast	32
Project-Specific Savings.....	32
Modifying Supply Forecasts	33
Revenue Effects.....	33
Present Implementation and Evaluation Strategy.....	37



CONSERVATION PLANNING GOALS

As part of developing a Water Conservation Plan, Charles County has established the following Water Conservation Goals to focus their efforts to evaluate water conservation measures:

1. Improve Drought and Emergency Preparedness

- a. The County is prioritizing water conservation in order to better prepare for future droughts and other emergency situations. By minimizing future demand, the County will be better positioned to continue meeting the needs of customers when resources are more limited.

In addition to water conservation, the County is developing an Emergency Response Plan for the Waldorf System which is required per America's Water Infrastructure Act (AWIA).

2. Maintenance Plans

- a. Ensuring proper maintenance on pertinent water equipment and ensuring that accurate readings are obtained from all water source and distribution meters will allow the County to analyze, reduce, and eliminate potential water loss and leaks. Implementing water conservation measures will reduce demands on existing equipment and provide the County with the information required to develop successful and cost-effective maintenance plan strategies. This will allow the County to continue to conduct the distribution system maintenance & inspections and collect critical system data that is necessary to meet water supply and conservation goals.

3. Resource Management

- a. Preservation of groundwater resources is a priority for the County. Future source developments will be focused primarily on surface water resources. Implementing water conservation measures will allow for minimizing reliance on groundwater.

4. Develop Public Outreach and Education Strategy

- a. Educating the public about the value of water is key to the success of any conservation measures. Many of the conservation measures analyzed as part of this Plan rely on public buy-in. The County understands that continued outreach and education is critical.

5. Investigate Water Re-use Strategies

- a. Expanding water re-use strategies presents significant opportunities for reducing potable water demand in the County. Continued evaluation of current and future activities is critical, and the County is committed to developing a strategy to explore and implement future re-use opportunities.



SYSTEM PROFILE

The Waldorf System in Charles County serves approximately 91,132 residents across a service area of 53 square miles. A total of 351 miles of water mains provide service to 31,928 residential service connections, 978 commercial service connections, 427 industrial service connections, and 53 public or governmental service connections.

Water supply to the Waldorf System comes primarily from groundwater sources. There are four (4) Water Appropriation and Use Permits which authorize the County to withdrawal and use an average of 5.705 MGD on a yearly basis. The parameters of these Permits are summarized in Table 1 below:

Permit No.	Aquifer	Yearly Withdrawal	Maximum Month Withdrawal	Wells (well capacity, gpm)
CH1970G009	Magothy	2.87 MGD	4.15 MGD	Billingsley Road (297 gpm) Cleveland Park (250 gpm) John Hanson (700 gpm) Mattawoman-Beantown (450 gpm) Pinefield (520 gpm) St. Charles (500 gpm) Towne Plaza (500 gpm) Westwood Drive 650 gpm)
CH1983G012(08)	Lower Patapsco	2.6 MGD	4.0 MGD	Billingsley Road (550 gpm) Cleveland Park (450 gpm) Smallwood West (550 gpm) Westwood Drive (610 gpm) White Oak (550 gpm)
CH1989G032(05)	Lower Patapsco	0.2 MGD	0.4 MGD	Bensville No. 1 (240 gpm) Bensville No. 2 (240 gpm)
CH1967G109(06)	Lower Patapsco	0.035 MGD	0.0525 MGD	Genevieve Drive (200 gpm)

Though withdrawal from the Magothy and Lower Patapsco aquifers is capped at 5.705 MGD (sum of yearly withdrawal allowances in Table 1) on an annual basis, the ability to meet surge demand exists. In any given month, the County is permitted to withdrawal a maximum of 8.6025 MGD (sum of maximum month withdrawal allowances in Table 1) and has the infrastructure in place to withdrawal 11.17 MGD (sum of well capacities in Table 1) on any single day.

In addition to groundwater, the Waldorf System is interconnected with WSSC Water, enabling up to 1.4 MGD of treated water to be purchased to supplement supply. When considering both permitted aquifer withdrawal and the interconnection with WSSC Water, the Waldorf System is currently permitted to supply



7.105 MGD on an annual basis, 10.0025 MGD in a single month, and up to 12.57 MGD on a single day, should demand require.

As of 2019, 60% of total water demand comes from residential sales, 34% of demand comes from non-residential sales, and 1% of demand comes from authorized use of nonaccount water. The remaining 5% of water usage is attributed to unauthorized use of nonaccount water, primarily water meter malfunctions and system leakage, which is far below industry standard.

Average-day demand currently accounts for 89% of permitted capacity on an annual basis. On any given day, the maximum-day and maximum-hour demands may exceed the annual permitted capacity. To meet these higher demands, the County has the infrastructure to supply 12.57 MGD and can provide an additional 9.15 MG from existing water storage tanks.

Water meter reading and billing occurs on a quarterly basis and utilizes a tiered rate structure for residential users and a flat rate for commercial and industrial users. Table 2 summarizes these rate structures:

Table 2: Water Use Rate Structures

Use Type	Rate Structure	Water Use	Rate per 1,000 gallons
Residential	Tiered	0 – 18,000 gallons	\$4.81
		18,001-24,000 gallons	\$9.62
		24,001 + gallons	\$14.43
Commercial/ Industrial	Flat	Any	\$5.73

A profile of the Waldorf System has been summarized in Worksheet 4-1.

SYSTEM CONDITIONS

There are a number of key system conditions in Waldorf which speak directly to the need to prioritize water conservation in Charles County. These system conditions are split into 3 distinct categories: Climate and Water Availability, Infrastructure Conditions, and System Demographics. A summary of conditions which affect the Waldorf System have been summarized in Worksheet 4-2 with additional details found below.

CLIMATE AND WATER AVAILABILITY

The Critical Supply Areas of the Waldorf System could be classified as “at risk” due to the limitations placed on aquifer withdrawals. Additionally, these aquifer withdrawal limitations reflect environmental constraints which must be considered while planning future water supply sources. Currently there are no significant water users competing for appropriation of the Magothy aquifer, but both the Town of La Plata and Waldorf have significant allocations from the Lower Patapsco aquifer. There are concerns competing water users could become an issue and reduce availability in the future.



Water quality for existing water sources is typically good; however, some potential well sites have had gross alpha and TDS concerns, which has caused those well sites to be abandoned. Additionally, the high iron content of existing water sources requires year-round flushing activities. Seasonal variations in climate cause typical concerns including variations in water use and the seasonal effects of water quality (disinfection byproducts).

INFRASTRUCTURE CONDITIONS

Charles County performs annual audits on water production and usage data to evaluate system conditions. Based on the 2018 & 2019 water audits, the Waldorf System experiences low water losses and leaks (4.75% per the 2019 Water Audit). Typically, there are not concerns of exceeding the safe yield of supply; however, wells that are taken out of service for regular maintenance activities limits available water supply redundancy and may put the system at risk.

The Waldorf water system falls within the Mattawoman Wastewater Treatment Plant (WWTP) Sewershed collection system which experiences significant levels of Rainfall Derived Inflow and Infiltration (RDII). Large storm events result in elevated flow rates to the WWTP that occasionally exceed permitted discharge and treatment capacity. Additionally, Charles County is currently engaged in providing reuse and recycle water to large scale users within the Waldorf System from the Mattawoman WWTP. However, the existing capacity to provide reuse water is almost entirely allocated to power plants. In order to expand this program and provide reuse water for new uses or customers, additional wastewater treatment capacity would need to be developed.

SYSTEM DEMOGRAPHICS

The Waldorf System's demographics are fairly typical for a service area of this size, with moderate annual population, economic, and demand growth. The per-capita water use is low with a residential average consumption of 120 gpd/DU and the maximum-daily demand peaking factor at a moderate 1.65. The system has some presence of large-volume reclaimed water users, including the CPV St. Charles Energy Center and Brandywine Power Project (formerly known as PANDA) power plants.

CURRENT CONSERVATION EFFORTS

Worksheet 4-3 includes a summary of the current conservation efforts implemented by Charles County in the Waldorf System.

Worksheet 4-1: Water System Profile

A SERVICE CHARACTERISTICS

1	Estimated service population	91,134
2	Estimated service area (square miles)	53.13
3	Miles of mains	351.34
4	Number of treatment plants	
5	Number of separate water systems	1
6	Interconnection with other systems	1

B ANNUAL WATER SUPPLY

		Annual Volume (gal)	Number of intakes or source points	Percent metered
7	Groundwater	2,082,325,000	16	100
8	Surface water			
9	Purchases: raw			
10	Purchases: treated	511,000,000	1	100
11	Total annual water supply	2,593,325,000	17	100

C SERVICE CONNECTIONS

		Connections	Water sales (gal)	Percent metered
12	Residential, single family	31,928	1,399,434,858	100
13	Residential, multi family			
14	Commercial	978	529,788,000	100
15	Industrial	427	222,478,900	100
16	Public or governmental	53	37,828,000	100
17	Wholesale			
18	Other			
19	Total connections	33,386	2,189,529,758	100

D WATER DEMAND

		Annual Volume (gal)	Percent of total	Per connection (gal)
20	Residential sales	1,399,434,858	60%	43,831
21	Nonresidential sales	790,094,900	34%	1,458
22	Wholesale sales			
23	Other sales			
24	Nonaccount water: authorized uses	24,870,000	1%	NA
25	Nonaccount water: unauthorized uses	104,701,000	5%	NA
26	Total system demand (total use)	2,319,100,758	100%	69,463

E AVERAGE & PEAK DEMAND

		Volume	Total supply capacity	Percent of total capacity
27	Average -day demand	6,353,701	7,105,000	89%
28	Maximum-day demand	10,483,606	12,570,000	83%
29	Maximum-hour demand	15,248,882	12,570,000	121%

F PRICING

		Rate structure	Metering frequency	Billing frequency
30	Residential rate	Tiered Rate	Quarterly	Quarterly
31	Nonresidential rate	Flat Rate	Quarterly	Quarterly
32	Other rate	N/A	N/A	N/A

G PLANNING

		Prepared a plan (Y/N)	Date	Filed with State (Y/N)
33	Capital, facility, or supply plan	Y	October 2018	N
34	Drought or emergency plan	Y	December 2021	N
35	Water conservation plan	Y	April 2022	N

Worksheet 4-2: Overview of System Conditions

A CLIMATE AND WATER AVAILABILITY							
1	Average precipitation	<input type="checkbox"/>	High	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	Low
2	Average temperatures	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
3	Critical supply areas	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	At risk	<input type="checkbox"/>	Yes
4	Competing water uses	<input type="checkbox"/>	No	<input type="checkbox"/>	Possibly	<input checked="" type="checkbox"/>	Yes
5	Environmental constraints	<input type="checkbox"/>	No	<input type="checkbox"/>	Possibly	<input checked="" type="checkbox"/>	Yes
6	Quality/quantity concerns	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	Possibly	<input type="checkbox"/>	Yes
7	Seasonal variations in climate	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
8	Instream flow problems	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>	Moderate	<input type="checkbox"/>	High
9	Shortage or emergency frequency	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>	Moderate	<input type="checkbox"/>	High

B INFRASTRUCTURE CONDITIONS							
10	Age of the system	<input type="checkbox"/>	Newer	<input checked="" type="checkbox"/>	Middle	<input type="checkbox"/>	Older
11	General Condition of the system	<input checked="" type="checkbox"/>	Good	<input type="checkbox"/>	Fair	<input type="checkbox"/>	Poor
12	Water losses and leaks	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>	Moderate	<input type="checkbox"/>	High
13	Unaccounted-for water	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>	Moderate	<input type="checkbox"/>	High
14	Safe yield of supply exceeded	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	At risk	<input type="checkbox"/>	Yes
15	Wastewater discharges exceeded	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	At risk	<input type="checkbox"/>	Yes
16	Wastewater capacity exceeded	<input type="checkbox"/>	No	<input checked="" type="checkbox"/>	At risk	<input type="checkbox"/>	Yes
17	Potential for recycling and reuse	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
18	Improvement plans	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
19	Anticipated investment	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High

C SYSTEM DEMOGRAPHICS							
20	Rate of population growth per year	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
21	Rate of demand growth per year	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
22	Rate of economic growth per year	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
23	Per capita water use (by class)	<input checked="" type="checkbox"/>	Low	<input type="checkbox"/>	Moderate	<input type="checkbox"/>	High
24	Ratio of peak to average demand	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High
25	Presence of large-volume users	<input type="checkbox"/>	Low	<input checked="" type="checkbox"/>	Moderate	<input type="checkbox"/>	High

D OTHER FACTORS							
26							
27							
28							

[a] Specific (quantified) benchmarks for these indicators may be provided by the state

Worksheet 4-3: Current Water Conservation Activities

Summarize the systems current water conservation activities/programs:

Charles County implements a robust metering program to aid in water conservation, including metering of source-water, service connections, and public use water. The County regularly monitors these meters to ensure customers are kept aware of their water use, as well as aid the County in analyzing water use and nonrevenue water losses. All meters are calibrated on an every other year to ensure accurate readings are obtained.

The County also works to ensure accurate water accounting can be performed, and implements programs to control system losses. Yearly water audits are performed to identify where losses occur, whether from leaks, theft, or other nonrevenue water losses. The County works to repair any leaks which are identified to minimize water losses. Pressure and system-wide flow monitoring data is readily available for ongoing monitoring and analysis of facilities and used for identifying leaks or breaks in the system. The County also monitors all tank levels to minimize overflows.

Charles County has designed and implemented a tiered rate structure to encourage water conservation by establishing higher rates for higher water consumers. The County's water audit breaks down usage by type of consumer, enabling analysis of types of usage which drive system costs during different seasons.

Additionally, the County has monitors and works to regulate pressure in their service area. A water reuse program has been implemented to provide water to the CPV St. Charles Energy Center and Brandywine Power Project. All water towers are also constantly monitored to detect and prevent overflows.

Water Conservation Measures	Approximate annual water savings (if known)	Implemented since (date)	Is continued implementation planned?
Source water metering	-		Yes
Service connection metering	-		Yes
Meter public use water	-		Yes
Fixed interval meter reading	-		Yes
Meter accuracy analysis	-		Yes
Calibrate Water Flow Meters	-		Yes
Account for water	-		Yes
Repair known leaks	-		Yes
Analysis of nonaccount water	-		Yes
Water system audit	-	2018	Yes
Automated sensors/telemetry	-		Yes
Cost-of-service accounting	-		Yes
User charges	-		Yes
Metered rates	-		Yes
Cost analysis	-		Yes
Nonpromotional rates	-	2010	Yes
Information available	-		Yes
School program	-		Yes
Public-education program	-		Yes
Systemwide pressure regulation	-		Yes
Tower Overflow Monitoring	-		Yes
Water Meter Monitoring	-		Yes
Water Reuse	-		Yes



DEMAND FORECAST

Charles County has utilized Worksheet 4-4 from USEPA's Water Conservation Plan Guidelines to prepare a demand forecast for the Waldorf System for 5-year, 10-year, and 20-year intervals. This forecast identifies the anticipated increase in residential demands, nonresidential demands, and nonaccount water usage.

Anticipated growth in nonaccount water usage is currently not included in County projects. As part of the annual water audit, the County tracks the following authorized nonaccount water categories:

- Water Main Flushing
- Sewer/Storm Drain Flushing
- Parks/Playgrounds/Swimming Pools
- Golf Courses
- Cemeteries, Road Medians, Schools
- Training/Fire Fighting
- Construction
- Storage Tank Drainage
- Sewer Plant Uses

These authorized nonaccount water categories account for approximately 1% of overall demand in the Waldorf System. Within this category, Water Main Flushing accounts for 73%, Training/Fire Fighting accounts for 11.5%, Storage Tank Drainage accounts for 7.5%, and the rest accounts for the remaining 8% of demand.

The County also tracks unauthorized nonaccount water as part of the annual water audit. Sources of this unauthorized nonaccount demand comes from leaks, storage overflow, theft, water meter inaccuracies, and other unknown sources. While the precise breakdown of this demand is challenging to track, the overall percentage of unauthorized nonaccount water has remained below 5% for the previous 3 water audit cycles (2017, 2018, and 2019).

For the purposes of this forecast, the County has assumed that nonaccount water demand grows at the same rate as overall demand, remaining constant at ~5% of total water demand.

As discussed on page 11, Charles County has planned facilities to increase available supply. In 2026, the County anticipates having an additional 3.6 MGD available through the interconnection with WSSC Water. Additionally, two new wells are being constructed which will supply an additional 1.08 MGD at max capacity, with completion estimated by 2023 (Waldorf Well #16r in 2022 and Waldorf Well #17 in 2023).

While developing this demand forecast, the County subjected each forecast to a sensitivity analysis. As described on Worksheet 4-1, residential demand accounts for approximately 60% of overall demand. Therefore, the accuracy of this forecast is critical to understanding how the overall demand in the Waldorf System will grow over the forecast period.



When analyzing the projected increase in residential water demand, one of the largest potential variables is projected population and job growth. The current projections for population and job growth is based on the County's 2015 TAZ (Traffic Area Zoning) analysis. Since their development in 2015, the realized population and job growth has lagged behind projections by 5-10 years. The effects of this are significant in that the demand projected within this Water Conservation Plan may be higher than actual demand. The County is currently developing an updated projection for population and job growth, but currently the 2015 TAZ projections are the best available resource. As updated projections are developed, this demand forecast will be updated accordingly.

Additionally, long-term effects of the COVID-19 pandemic may have impacts on both residential and commercial demand. During the pandemic, many employers allowed employees to work from home, resulting in an overall increase in residential demand per capita. Even after the pandemic has passed, many experts expect additional flexibility will be granted to employees to work from home. At this time, the County cannot accurately predict the degree to which this will impact residential and commercial water demand in the future and has therefore chosen to use the per capita demand of the current year to forecast the growth of demand. Charles County will closely monitor these changing trends over the next few years to better understand how water demand will be impacted. This demand forecast will be updated accordingly.

Performing a meaningful sensitivity analysis on nonaccount water growth is a more difficult task, with much of the water demand coming from unknown sources. Authorized nonaccount water is expected to remain relatively constant; however unauthorized nonaccount water demand has ranged from ~4% to ~5% of annual demand since 2017. Due to the relative stability of this figure, the County has elected to be conservative when approaching the forecast and indexed nonaccount water to 5% of overall demand.

Worksheet 4-4: Preliminary Water Demand Forecast [a]

		Current Year	5-year Forecast (2025)	10-year Forecast (2030)	20-year Forecast (2040)
A	RESIDENTIAL DEMAND				
1	Current annual water residential sales (total gallons)	1,399,434,858			
2	Current population served [b]	91,134			
3	Residential sales per capita (line 1 divided by line 2) [b]	15,355.82			
4	Projected population [b]		99,184.00	109,615.00	128,050.00
5	Projected annual residential water demand (line 3 multiplied by line 4)		1,523,051,817.67	1,683,228,393.63	1,966,312,966.33
B	NONRESIDENTIAL DEMAND [C]				
6	Current annual water nonresidential sales (total gallons)	790,094,900			
7	Current number of employees or jobs [c]	39,420.00			
8	Water use per employee or job (line 6 divided by line 7)	20,043.00			
9	Projected number of employees or jobs		42,240.00	45,385.00	51,345.00
10	Projected annual nonresidential water demand (line 8 multiplied by line 9)		846,616,148.55	909,651,370.79	1,029,107,626.60
C	NONACCOUNT WATER (WATER NOT SOLD TO CUSTOMERS)				
11	Current and forecast amount [d]	129,571,000	142,528,100.00	156,780,910.00	189,704,901.10
D	WATER SYSTEM TOTAL DEMAND				
12	Current total water demand (add lines 1,6, and 11)	2,319,100,758			
13	Projected total annual water demand (add lines 5, 10, and 11)		2,512,196,066.23	2,749,660,674.42	3,185,125,494.03
14	Adjustments to forecast (+ or -)		0	0	0
15	Current (line 12) and adjusted total annual water demand forecast (add lines 13 and 14) [e]	2,319,100,758	2,512,196,066.23	2,749,660,674.42	3,185,125,494.03
16	Current and projected annual supply capacity [f]	2,593,325,000	2,775,825,000.00	4,089,825,000.00	4,089,825,000.00
17	Difference between total use and total supply capacity (+ or -) (subtract line 12 from line 15)	274,224,242	263,628,934	1,340,164,326	904,699,506
E	AVERAGE-DAY AND MAXIMUM-DAY DEMAND				
18	Average-day demand (line 15 divided by 365)	6,353,700.71	6,882,728.95	7,533,316.92	8,726,371.22
19	Current maximum-day demand	10,483,606			
20	Maximum-day to average-day demand ratio (line 19 divided by line 18)	1.65			
21	Projected maximum-day demand line 18 multiplied by line 20 for all forecast years)		11,356,502.77	12,429,972.91	14,398,512.51
22	Adjustment to maximum-day demand forecast [e]		0	0	0
23	Current (line 19) and adjusted maximum day demand forecast (add lines 21 and 22)	10,483,606.17	11,356,502.77	12,429,972.91	14,398,512.51
24	Daily supply capacity (divide line 16 by 365)	7,105,000.00	7,605,000.00	11,205,000.00	11,205,000.00
25	Ratio of maximum-day demand to daily supply capacity (divide line 23 by line 24)	1.48	1.49	1.11	1.29

[a] Separate forecasts should be prepared for large-volume users

[b] Planners can choose to use service connections or households instead of population and per-connection water use instead of per-capita water use
Explanatory variables other than employees or jobs can be used as appropriate. The forecast should be disaggregated by sector of water use to the greatest extent possible (for example, commercial and industrial water use and nonaccount water) and a qualitative sensitivity analysis ("what if") should be performed for each sector's forecast.

[c] Please provide an explanation of the forecast of nonaccount water, including all relevant assumptions

[d] Please provide an explanation of adjustments to your forecasts, including all relevant assumptions

[e] Supply capacity should take into account available supplies (permits), treatment capacity, and distribution system capacity and reflect the practical total supply capacity of the system, including purchased water.

[f]



PLANNED FACILITIES

Charles County currently has supply-side improvements planned for installation over the 20-year planning horizon of this Plan. These planned facilities are the following:

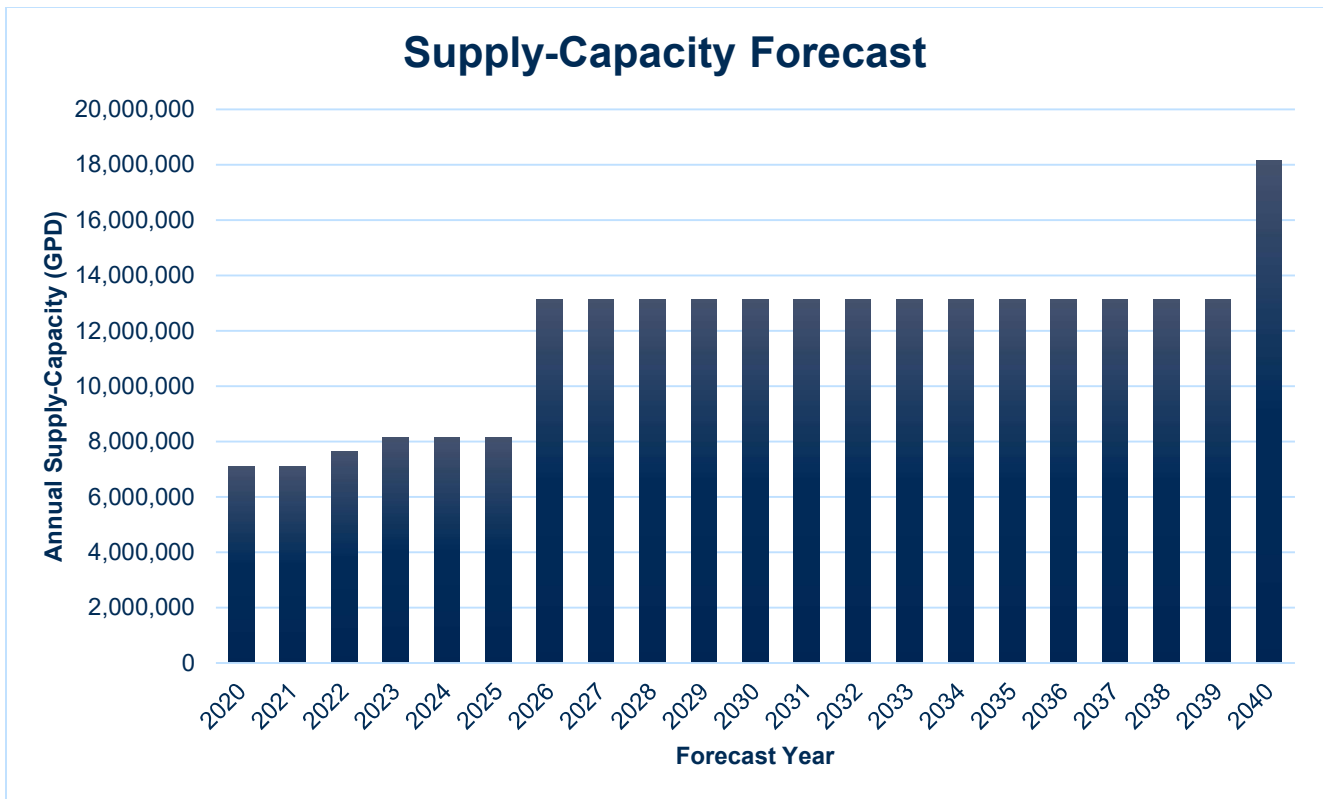
- **WSSC Interconnection (Route 301)** – Increase available supply by 5 MGD in 2026
- **Waldorf Well #16r (Magothy)** – Well capacity of 0.53 MGD in 2022
- **Waldorf Well #17 (Patuxent)** – Well capacity of 0.50 MGD in 2023
- **Waldorf Tower 6** – Tower capacity of 2 MG in 2023
- **Gleneagles Tower** – Tower capacity of 2 MG in 2024
- **Waldorf Fire House Tower** – Tower capacity of 1 MG in 2024
- **Potomac Surface Water Treatment Plant** – Treatment capacity of 5 MGD in 2040

Worksheets 4-5(a) through 4-5(d) describe the planned facilities, including the proposed capacity, timeframe, type of project, need for project, and funding sources. The “Start Date” specified on Worksheet 4-5 represents the start of planning/design while the “End Date” represents the estimated date of construction completion.

Worksheet 4-6 has been used to estimate the incremental supply cost for the County, factoring in expected annual operating costs. This approximate cost per gallon of additional supply will be used later in the Plan to calculate savings which result from implementation of conservation measures.

Factoring in costs for installing additional wells, a new surface water treatment plant, an additional interconnection with WSSC, and construction of new storage facilities, the incremental supply cost is estimated to be \$0.37 per gallon of additional supply. Of this, \$0.36 per gallon is attributed directly to treated water storage intended to meet maximum-day capacity with the remaining \$0.0076 per gallon attributed to the wells, surface water treatment plant, and WSSC interconnection.

Worksheet 4-7 has been used to create the Preliminary Supply-Capacity Forecast graph below. To be consistent with the supply capacity calculated on Worksheet 4-1 and 4-4, supply from treated water storage facilities has not been included. Although these storage facilities can add to available supply on individual days, they are not a source of supply themselves and must be filled from existing supply sources.



Worksheet 4-5a: Anticipated Improvements and Additions

Describe planned improvements and additions:

Charles County will be adding an additional interconnection with WSSC Water near Route 301 to increase available water by 5 MGD. Substantial water infrastructure upgrades are necessary to prepare the Waldorf system for this increased supply.

Describe time frame for planned improvements and additions (years):

Completion of upgrades are expected to occur by 2026.

Type of Project	Improvement	Addition	Start date	End date
Source of supply		X	2021	2026
Water treatment facilities				
Treated water storage				
Major transmission lines		X	2021	2026
Other:				

Need for Project(s) (Check all that apply)		Notes
Enhance compliance with regulations		
Replace older equipment or facilities		
Meet average-day demand	X	
Meet maximum-day demand	X	
Meet future growth needs	X	
Other:		

Funding		Interest rate
Cost of Financing	\$ 40,571,053.58	-
Overall cost of capital [if known]	\$ 55,206,000.00	-

Water Purchases		
Anticipated future water purchases	5,000,000	(gallons per year)
Cost of water purchases	\$ 0.00489	(dollars per gallon)

Worksheet 4-5b: Anticipated Improvements and Additions

Describe planned improvements and additions:

Charles County has three planned water towers within the planning horizon: the Waldorf Fire House Tower, the Gleneagles Tower, and Waldorf Tower #6.

The Waldorf Fire House Tower (2 MG) is intended to provide fire storage volume and additional storage in the system. The Gleneagles Tower (2 MG) is intended to provide additional fire storage and resolve low-pressure issues in the area. Waldorf Tower #6 (2 MG) is intended to provide storage to supplement peak demand and provide additional fire storage.

Describe time frame for planned improvements and additions (years):

The Waldorf Fire House Tower is expected to be in service in 2024. The Gleneagles Tower is expected to be in service in 2024. Waldorf Tower #6 is expected to be in service in 2023.

Type of Project	Improvement	Addition	Start date	End date
Source of supply				
Water treatment facilities				
<u>Treated water storage:</u>				
Waldorf Fire House Tower		X	2022	2024
Gleneagles Tower		X	2021	2024
Waldorf Tower #6		X	2019	2023
Major transmission lines				
Other:				

Need for Project(s) (Check all that apply)		Notes
Enhance compliance with regulations	X	All three towers
Replace older equipment or facilities	X	Waldorf Fire House Tower ONLY
Meet average-day demand	X	All three towers
Meet maximum-day demand	X	All three towers
Meet future growth needs	X	All three towers
Other:		

Funding		Interest rate
<u>Cost of Financing:</u>		
Waldorf Fire House Tower	\$2,209,907.48	
Gleneagles Tower	\$2,186,865.79	
Waldorf Tower #6	\$4,304,257.40	-
<u>Overall cost of capital [if known]:</u>		
Waldorf Fire House Tower	\$6,330,000.00	
Gleneagles Tower	\$6,264,000.00	
Waldorf Tower #6	\$12,329,000.00	-

Water Purchases

Anticipated future water purchases	N/A	(gallons per year)
Cost of water purchases	N/A	(dollars per gallon)

Worksheet 4-5c: Anticipated Improvements and Additions

Describe planned improvements and additions:

Charles County has two wells currently under construction: Waldorf Well #16r and Waldorf Well #17.

Waldorf Well #16r (400 gpm) is being constructed to replace an out of service well and is intended to address water system reliability. This well will draw from the Magothy aquifer and will result in a 0.53 MGD increase in annual permitted withdrawals.

Waldorf Well #17 (350 gpm) is being constructed to address future water system demands. This well will draw from the Patuxent aquifer and is expected to result in a 0.5 MGD increase in annual permitted withdrawals.

Describe time frame for planned improvements and additions (years):

Waldorf Well #16r will be in service in 2022 and Waldorf Well #17 will be in service in 2023.

Type of Project	Improvement	Addition	Start date	End date
Source of supply				
Waldorf Well #16r		X	2019	2022
Waldorf Well #17		X	2021	2023
Water treatment facilities				
Treated water storage:				
Major transmission lines				
Other:				

Need for Project(s) (Check all that apply)		Notes
Enhance compliance with regulations	X	Both wells
Replace older equipment or facilities		
Meet average-day demand	X	Both wells
Meet maximum-day demand	X	Both wells
Meet future growth needs	X	Both wells
Other:		

Funding		Interest rate
Cost of Financing:		
Waldorf Well #16r	\$724,416.70	
Waldorf Well #17	\$1,416,016.55	-
Overall cost of capital [if known]:		
Waldorf Well #16r	\$2,075,000.00	
Waldorf Well #17	\$4,056,000.00	-

Water Purchases		
Anticipated future water purchases	N/A	(gallons per year)
Cost of water purchases	N/A	(dollars per gallon)

Worksheet 4-5d: Anticipated Improvements and Additions

Describe planned improvements and additions:

Charles County will be constructing a new 5-10 MGD surface water treatment plant. Project includes upsizing existing transmission main and construction of a new transmission main to convey treated water to Bryan's Road and Waldorf.

Describe time frame for planned improvements and additions (years):

Construction is expected to be completed by 2040.

Type of Project [a]	Improvement	Addition	Start date	End date
Source of supply		X	2022	2040
Water treatment facilities		X	2022	2040
Treated water storage				
Major transmission lines		X	2021	2026
Other:				

Need for Project(s) (Check all that apply)		Notes
Enhance compliance with regulations		
Replace older equipment or facilities		
Meet average-day demand		
Meet maximum-day demand		
Meet future growth needs	X	
Other:		

Funding		Interest rate
Cost of Financing	\$ 62,806,757.58	-
Overall cost of capital [if known]	\$ 179,902,000.00	-

Water Purchases		
Anticipated future water purchases	N/A	(gallons per year)
Cost of water purchases	N/A	(dollars per gallon)

Worksheet 4-6: Cost of Supply-Side Facilities

Line	Item	Facilities for meeting average day demand	Facilities for meeting maximum-day demand [a]			Water purchases needed to meet demand [b]	Estimate of simple incremental supply cost (\$/gallon)
		Source of water supply	Water treatment facilities	Treated water storage	Major transmission lines		
A	SUPPLY CAPACITY IN ANNUAL GALLONS [c]						
1	Current installed capacity or water purchases	2,082,325,000	-	7,750,000	-	511,000,000	
2	Planned improvements and additions	394,225,230	1,825,000,000	6,000,000	-	1,825,000,000	
3	Planned retirements	-	-	-	-	-	
4	Future installed capacity or purchases (line 1 plus line 2 less line 3)	2,476,550,230	1,825,000,000	13,750,000	-	2,336,000,000	
B	COST OF PLANNED IMPROVEMENTS AND ADDITIONS						
5	Approximate total cost of planned improvements and additions identified in line 2 (including financing costs)	\$ 8,271,433.25	\$ 242,708,757.58	\$ 33,624,030.67	\$ -	\$ 95,777,053.58	
6	Expected life of new facilities (years)	20	75	25	0	25	
7	Estimated annual capital costs (line 5 divided by line 6)	\$ 413,571.66	\$ 3,236,116.77	\$ 1,344,961.23	\$ -	\$ 3,831,082.14	
8	Estimated annual operating costs [d]	\$ 442,000.00	\$ 2,620,000.00	\$ 834,000.00	\$ -	\$ 178,000.00	
9	Estimated total annual costs (line 7 plus line 8) [e]	\$ 855,571.66	\$ 5,856,116.77	\$ 2,178,961.23	\$ -	\$ 4,009,082.14	
10	Per unit cost of new facilities (line 9 divided by line 2)	\$ 0.00	\$ 0.00	\$ 0.36	\$ -	\$ 0.00	
11	Simple incremental supply cost (add all entries from line 10)						\$ 0.37

[a] Additional facilities or capital equipment can be included as appropriate

[b] The plan should indicate whether purchases are needed to meet average-day or maximum-day demand or both

[c] Planners should select a reasonable planning horizon for supply facilities and use the same time frame for all facilities

[d] Annual variable operating cost (including energy, chemicals, and water purchases)

[e] This calculation of simplified value does not include a discount rate, and escalation rate, or an adjustment for inflation. This analysis can also be extended to include the incremental cost of wastewater collection and treatment.

Worksheet 4-7: Preliminary Supply-Capacity Forecast

Year	Additions (GPD)	Retirements	Total supply capacity for the system (GPD)
2020			7,105,000
2021	-	-	7,105,000
2022	530,000	-	7,635,000
2023	504,032	-	8,139,032
2024	-	-	8,139,032
2025	-	-	8,139,032
2026	5,000,000	-	13,139,032
2027	-	-	13,139,032
2028	-	-	13,139,032
2029	-	-	13,139,032
2030	-	-	13,139,032
2031	-	-	13,139,032
2032	-	-	13,139,032
2033	-	-	13,139,032
2034	-	-	13,139,032
2035	-	-	13,139,032
2036	-	-	13,139,032
2037	-	-	13,139,032
2038	-	-	13,139,032
2039	-	-	13,139,032
2040	5,000,000	-	18,139,032

Additional Supply Sources:

2022 - Waldorf Well #16r/26

2023 - Waldorf Well #17

2026 - WSSC Interconnection (Route 301)

2040 - Potomac Surface Water Treatment Plant



IDENTIFY CONSERVATION MEASURES

The County has used Worksheet 4-8 to identify the Level 1 and Level 2 conservation measures which are currently implemented, planned to be implemented, or are not currently planned for implementation. The measures shown in italics and the Level 3 measures on Worksheet 4-8 are not required for the Intermediate Guidelines and while considered, were not included in the evaluation at this time.

Each conservation measure not currently implemented or planned for implementation by the County has been subjected to a preliminary evaluation for their applicability to the Waldorf System. The Level 1 Measures listed below are not currently implemented or planned for implementation:

- Leak Detection and Repair Strategy
- Understandable Water Bill
- Informative Water Bill
- Water-Bill Inserts

Charles County does not have a proactive Leak Detection and Repair Strategy. Analysis of previous water audits shows water loss due to leaks is estimated at less than 1% of overall demand with an unaccounted for water demand of nearly 5% of total demand. Additionally, analysis of the County's system shows average pipe age is only 25 years. At this time the County does not plan to implement a leak detection and repair strategy due to the low occurrence of leaks and the young age of the system. This position will be re-evaluated annually upon completion of the water audit and analysis of unaccounted for water demand.

Charles County's current water bill (shown in **Appendix A**) does not provide customers with detailed information regarding their water use and does not act as a tool for water conservation. Further analysis of the potential for implementation of Understandable & Informative Water Bill and Water-Bill Inserts will be performed on page 22 of this Plan.

The Level 2 Measures below are not currently implemented or planned for implementation:

- Audits of Large-Volume Users
- Large-Landscape Audits
- Retrofit Kits Available
- Promotion of Landscape Efficiency
- Landscape Planning and Renovation

The County will perform further analysis of the following measures on page 22 of this Plan: Audits of Large-Volume Users, Distribute Retrofit Kits (Level 3 Measure), and Promotion of Landscape Efficiency. Further analysis will not be performed on Large-Landscape Audits and Landscape Planning and Renovation due to low overall demand from irrigation and large-landscape sources. However, Audits of Large-Volume Users will incorporate analysis of landscaping practices in the evaluation.



The County understands modifying the existing rate structure may provide opportunities for water conservation. However, before moving forward with such a change, the County must understand who would be economically affected. The County has requested funding for fiscal year 2023 to perform a detailed water and sewer rate study. Once the County has reached a full understanding of how customers would be affected by a modified rate structure, the potential water savings advantage of that change will be analyzed.

Worksheet 4-8: Checklist of Conservation Measures [a]

Measure [a]	Already Implemented	Plan to Implement	Comments [b]
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LEVEL 1 MEASURES

Universal Metering [B]

Source water metering	X		
Service connection metering	X		
Meter public-use water	X		
Fixed-interval meter reading	X		
Meter-accuracy analysis	X		
<i>Test, calibrate, repair, and replace meters</i>			

Water Accounting and Loss Control [A]

Account for water	X		
Repair known leaks	X		
Analysis of nonaccount water	X		
Water system audit	X		
Leak detection and repair strategy			No program is currently in place to proactively detect and repair leaks.
Automated sensors/telemetry	X		
<i>Loss-prevention program</i>			

Costing and Pricing [B]

Cost-of-service accounting	X		
User charges	X		
Metered rates	X		
Cost analysis	X		
Nonpromotional rates	X		
<i>Advanced pricing methods</i>			

Information and Education [B]

Understandable water bill			Current bill is not structured such that charges are easily understandable
Information available	X		
Informative water bill			Current bill is not informative; no data is provided of current use against historical use or similar users
Water-bill inserts			No inserts are provided with current water bill
School program	X		
Public-education program	X		
<i>Workshops</i>			
<i>Advisory committee</i>			

LEVEL 2 MEASURES

Water-Use Audits [B]

Audits of large-volume users			Audits of large-volume users is not currently done
Large-landscape audits			Large-landscape audits are not curently done
<i>Selective end-use audits</i>			

Retrofits [B]

Retrofit kits available			Retrofit kits are not currently available
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<i>Distribution of retrofit kits</i>			Retrofit kits are not currently distributed
<i>Targeted programs</i>			

Pressure Management [A]

Systemwide pressure regulation	X		
<i>Selective use of pressure-reducing valves</i>			

Landscape Efficiency [P]

Promotion of landscape efficiency			No program is in place to promote landscape efficiency
Landscape planning and renovation			No program is in place to renovate existing landscape
<i>Selective irrigation submetering</i>			
<i>Irrigation management</i>			

LEVEL 3 MEASURES

Replacements and Promotions [B]

<i>Rebates and incentives (nonresidential)</i>			
<i>Rebates and incentives (residential)</i>			
<i>Promotion of new technologies</i>			

Reuse and Recycling [B]

<i>Industrial applications</i>			
<i>Large-volume irrigation applications</i>			
<i>Selective residential applications</i>			

Water-Use Regulation [B]

<i>Water-use standards and regulations</i>			
<i>Requirements for new developments</i>			

Integrated Resource Management [B]

<i>Supply-side technologies</i>			
<i>Demand-side technologies</i>			



ANALYZE BENEFITS AND COST

To analyze the measures identified on page 19, the County has grouped the conservation measures into the following groups:

1. Updated Water Bills
 - a. Includes analysis of: Understandable Water Bill, Informative Water Bill, and Water Bill Inserts
2. Audits of Large-Volume Users
3. Distribute Retrofit Kits
4. Promotion of Landscape Efficiency

Worksheet 4-9 has been used to analyze the benefits and cost of each of the groups listed above. For these analyses, the incremental supply cost of treated water storage facilities (\$0.36 per gallon) was removed from consideration. Each group of conservation measures listed above is expected to primarily impact average day demand, and these storage facilities are for peak demand only. Therefore, an incremental supply cost of \$0.0076 per gallon was used in the analysis.

ANALYSIS ASSUMPTIONS

The following assumptions were made for each group of conservation measures.

Updated Water Bills

- The County is currently developing an overhaul to their overall financial system at a cost of \$2 million. The financial system overhaul is also expected to require an additional maintenance cost of \$200,000 per year. These changes include updates beyond the Department of Public Works and water bills and are expected to take 5 years to implement. The County anticipates approximately 1% of these costs could be reasonably attributed to updating water bills; therefore, the following costs have been used for developing this bill:
 - o Development Cost: \$20,000
 - o Annual Maintenance Cost: \$2,000
- Additional material costs of approximately \$70,000 per year are anticipated. This covers printing costs and additional postage associated with these bills.
- The County will make a concerted effort to encourage customers to opt into eBills instead of mailed paper bills. Over the 15 year implementation period, the County anticipates 50% of all bills will be delivered electronically.
- The County anticipates that a 1% reduction in residential demand could reasonably be seen as a direct result of updated water bills.



Audits of Large-Volume Users

- The County anticipates typical high-volume users would be reluctant to participate in an auditing program and is therefore limiting the scope of these audits to schools in the Waldorf area. 19 schools were identified for inclusion in analysis of this measure.
- Typical max-day demand scenarios occur during the summer months while schools are closed; therefore, savings realized from these audits would primarily impact average day demand.
- Audit Cost: \$10,000 per audit (consultant performs audit)
- Two audits can be performed per year
- Anticipated 2% reduction in water consumption to be realized following each audit

Distribute Retrofit Kits

- The County plans to distribute 1,000 retrofit kits annually. These kits will be distributed to users with the highest demand.
- Pre-made retrofit kits will be purchased at a cost of \$15.99 per kit. These kits include a low flow showerhead, two sink aerators, toilet displacement device, and other devices, and result in an anticipated savings of 26 gpd per kit.
- A delivery service will be used to deliver these kits to residents at an estimated cost of \$25 per kit.
- It is estimated that 50% of kits delivered to users will be installed.
- An average of 1 labor hour per week over the life of the measure (20 years) will be required to purchase kits, identify customers to which kits will be distributed, and perform other tasks associated with this measure

Promotion of Landscape Efficiency

- No facilities which could include landscape efficiency design considerations are anticipated to be constructed or reviewed by the County over the next 20 years
- Typical max-day demand scenarios occur during hot summer months; therefore, this conservation measure would primarily impact max-day demand.
- It is estimated that 200 hours of labor would be required to update design codes and standards at a loaded hourly rate of \$48.70 (\$100,000 annual salary)

The results of the cost and benefits analysis summarized on Worksheet 4-10 show that both Updated Water Bills and Distribute Retrofit Kits have positive net benefits while Audits of High-Volume Users and Promotion of Landscape Efficiency have negative net benefits.

Worksheet 4-9a: Analysis of Each Conservation Measure or Group of Measures

Describe conservation measure:

This conservation measure involves developing an understandable and informative water bill to send to customers in order to help them better understand how much water they are using and the cost of the water they use. The current water bill shows total volume of water used, the dates the meter was read, and the total bill amount. No additional information is provided.

In order to encourage water conservation, the bill will include the following information:

- A breakdown of water use by rate tier so customer better understands their charges
- Side-by-side comparisons of water use during the current billing cycle to previous cycles, as well as the same cycle from the previous year
- Comparisons of water use to efficient neighbors and all neighbors
- Inclusion of inserts which include tips for home conservation specific to seasonal water demand considerations

Typical water savings from the measure:

Number of planned installations:

N/A

Anticipated life span for the measures (years):

17

The measure is designed to reduce:

X	Average-day demand
	Maximum-day demand
	Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	COST OF THE CONSERVATION MEASURE [a]	Per unit [b]	Total cost of the measure
1	Materials	N/A	\$ 1,047,450.00
2	Labor	N/A	\$ -
3	Rebates or other payments	N/A	\$ -
4	Marketing and advertising		\$ -
5	Administration		\$ -
6	Consulting or contracting		\$ 50,000.00
7	Other		\$ -
8	Total program costs for the life of the measure (add lines 1 through 7) [c]		\$ 1,097,450.00
B	ESTIMATED SAVINGS		
9	Number of units to be installed [d]		N/A
10	Estimated annual water savings per unit in gallons [e]		N/A
11	Total estimated annual savings for the measure in gallons (multiply line 9 by line 10)		15,964,000
12	Expected life span for the measure in years		15
13	Total life span estimated savings for the measure in gallons (multiply line 11 by line 12)		239,460,000
C	ANALYSIS OF COST EFFECTIVENESS		Amount (per gallon)
14	Cost of water saved by the measure (line 8 divided by line 13)		\$ 0.005
15	Simple incremental cost of water supply [f]		\$ 0.0076
16	Cost comparison (line 15 less line 14)		\$ 0.0030
D	NET BENEFIT CONSERVATION		Amount
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		\$ 1,814,112.92
18	Net value of water saved by each measure (line 17 less line 8)		\$ 716,662.92

This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure, but measures can be combined if the jointly produce water savings

[a]

Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure, in which case total program water savings and costs for the measure can be used.

[b]

[c]

Include all recurring operation and maintenance costs over the life of the measure.

[d]

Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[e]

For example, water savings per retrofit. See Appendix B for benchmarks and sample calculations. Leave blank if unit values do not apply.

[f]

From Worksheet 4-6, line 11.

Worksheet 4-9b: Analysis of Each Conservation Measure or Group of Measures

Describe conservation measure:

This conservation measure involves performing audits of high-volume users (limited to schools) in the Waldorf system. This audit will require close coordination with these users and allow for in-depth analysis of their water usage tendencies and will include analysis of their irrigation practices as applicable.

Typical water savings from the measure:

Number of planned installations: N/A
 Anticipated life span for the measures (years): 20 +

The measure is designed to reduce:

X	Average-day demand
	Maximum-day demand
	Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	COST OF THE CONSERVATION MEASURE [a]	Per unit [b]	Total cost of the measure
1	Materials	N/A	\$ -
2	Labor	N/A	\$ -
3	Rebates or other payments	N/A	\$ -
4	Marketing and advertising		\$ -
5	Administration		\$ -
6	Consulting or contracting		\$ 190,000.00
7	Other		\$ -
8	Total program costs for the life of the measure (add lines 1 through 7) [c]		\$ 190,000.00
B	ESTIMATED SAVINGS		
9	Number of units to be installed [d]		N/A
10	Estimated annual water savings per unit in gallons [e]		N/A
11	Total estimated annual savings for the measure in gallons (multiply line 9 by line 10)		353,413.00
12	Expected life span for the measure in years		20
13	Total life span estimated savings for the measure in gallons (multiply line 11 by line 12)		7,068,260.00
C	ANALYSIS OF COST EFFECTIVENESS		Amount (per gallon)
14	Cost of water saved by the measure (line 8 divided by line 13)		\$ 0.027
15	Simple incremental cost of water supply [f]		\$ 0.0076
16	Cost comparison (line 15 less line 14)		\$ (0.02)
D	NET BENEFIT CONSERVATION		Amount
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		\$ 53,548.07
18	Net value of water saved by each measure (line 17 less line 8)		\$ (136,451.93)

This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure, but measures can be combined if the jointly produce water savings

- [a] produce water savings
- [b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure, in which case total program water savings and costs for the measure can be used.
- [c] Include all recurring operation and maintenance costs over the life of the measure.
- [d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.
- [e] For example, water savings per retrofit. See Appendix B for benchmarks and sample calculations. Leave blank if unit values do not apply.
- [f] From Worksheet 4-6, line 11.

Worksheet 4-9c: Analysis of Each Conservation Measure or Group of Measures

Describe conservation measure:

The County will distribute 1,000 retrofit kits annually to residential consumers with the highest demand. Additionally, the County will send retrofit kits to residential consumers upon request. Marketing efforts will be made to ensure all consumers are made aware of the availability of these kits.

These kits are purchased pre-made for \$15.99 each and include the following major items: low flow showerhead, two sink aerators, and a toilet displacement device. Each kit will result in savings of 26 gpd. The County anticipates that 50% of distributed kits will be installed and result in a reduction in demand.

Typical water savings from the measure:

Number of planned installations:

1000 annually

Anticipated life span for the measures (years):

17

The measure is designed to reduce:

X	Average-day demand
	Maximum-day demand
	Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	COST OF THE CONSERVATION MEASURE [a]	Per unit [b]	Total cost of the measure
1	Materials	\$ 15.99	\$ 288,139.80
2	Labor		\$ -
3	Rebates or other payments		\$ -
4	Marketing and advertising		\$ -
5	Administration		\$ 163,461.54
6	Consulting or contracting	\$ 25.00	\$ 425,000.00
7	Other		\$ -
8	Total program costs for the life of the measure (add lines 1 through 7) [c]		\$ 876,601.34
B	ESTIMATED SAVINGS		
9	Number of units to be installed [d]		500
10	Estimated annual water savings per unit in gallons [e]		9,490
11	Total estimated annual savings for the measure in gallons (multiply line 9 by line 10)		4,745,000
12	Expected life span for the measure in years		17
13	Total life span estimated savings for the measure in gallons (multiply line 11 by line 12)		725,985,000
C	ANALYSIS OF COST EFFECTIVENESS		Amount (per gallon)
14	Cost of water saved by the measure (line 8 divided by line 13)		\$ 0.001
15	Simple incremental cost of water supply [f]		\$ 0.0076
16	Cost comparison (line 15 less line 14)		\$ 0.01
D	NET BENEFIT CONSERVATION		Amount
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		\$ 5,499,953.10
18	Net value of water saved by each measure (line 17 less line 8)		\$ 4,623,351.76

This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. A separate analysis should be performed for each conservation measure, but measures can be combined if the jointly produce water savings

[a] produce water savings

Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure, in which case total program water savings and costs for the measure can be used.

[b] water savings and costs for the measure can be used.

[c] Include all recurring operation and maintenance costs over the life of the measure.

Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.

[d] blank if unit values do not apply.

[e] For example, water savings per retrofit. See Appendix B for benchmarks and sample calculations. Leave blank if unit values do not apply.

[f] From Worksheet 4-6, line 11.

Worksheet 4-9d: Analysis of Each Conservation Measure or Group of Measures

Describe conservation measure:

The County will update design codes and standards to promote landscape efficiency into new projects such as public parks, building grounds, and golf courses. This includes updated standards for efficient irrigation, use of lower water demand plants, mulching, soil improvement, and other principals of xeriscaping.

Typical water savings from the measure:

Number of planned installations: N/A
 Anticipated life span for the measures (years): 20 +

The measure is designed to reduce:

	Average-day demand
X	Maximum-day demand
	Both average-day and maximum-day demand

Line	Item	Amount	Amount
A	COST OF THE CONSERVATION MEASURE [a]	Per unit [b]	Total cost of the measure
1	Materials		\$ -
2	Labor		\$ 9,740.00
3	Rebates or other payments		\$ -
4	Marketing and advertising		\$ -
5	Administration		\$ -
6	Consulting or contracting		\$ -
7	Other		\$ -
8	Total program costs for the life of the measure (add lines 1 through 7) [c]		\$ 9,740.00
B	ESTIMATED SAVINGS		
9	Number of units to be installed [d]		0
10	Estimated annual water savings per unit in gallons [e]		30,000
11	Total estimated annual savings for the measure in gallons (multiply line 9 by line 10)		-
12	Expected life span for the measure in years		0
13	Total life span estimated savings for the measure in gallons (multiply line 11 by line 12)		-
C	ANALYSIS OF COST EFFECTIVENESS		Amount (per gallon)
14	Cost of water saved by the measure (line 8 divided by line 13)		\$ -
15	Simple incremental cost of water supply [f]		\$ 0.3707
16	Cost comparison (line 15 less line 14)		\$ 0.3707
D	NET BENEFIT CONSERVATION		Amount
17	Estimated value of water saved by the measure based on incremental supply cost (line 13 multiplied by line 15)		0
18	Net value of water saved by each measure (line 17 less line 8)		\$ (9,740.00)

This analysis is used to aid the comparison and selection of measures. Planners will estimate actual effects of conservation on planned capital facilities in Section 8. Aseparate analysis should be performed for each conservation measure, but measures can be combined if the jointly produce water savings

- [a] produce water savings
- [b] Examples of a unit are a toilet, a retrofit kit, and an audit. A unit estimate may not be appropriate for each measure, in which case total program water savings and costs for the measure can be used.
- [c] Include all recurring operation and maintenance costs over the life of the measure.
- [d] Units can be individual product units (such as toilets) or groups of products (such as household retrofits), as long as the analysis is consistent. Leave blank if unit values do not apply.
- [e] For example, water savings per retrofit. See Appendix B for benchmarks and sample calculations. Leave blank if unit values do not apply.
- [f] From Worksheet 4-6, line 11.

Worksheet 4-10: Comparison of Benefits and Costs of the Conservation Measures

Line	Conservation Measure [a]	Total program cost for the measure [b]	Anticipated annual water savings in gallons [c]	Cost of water saved by the measure (\$/gallon) [d]	Net benefit of implementing the measure(s) [e]
1	Water Bill Updates	\$ 1,097,450.00	15,964,000	\$ 0.0046	\$ 716,662.92
2	Audits of Large-Volume Users	\$ 190,000.00	353,413	\$ 0.0269	\$ (136,451.93)
3	Distributing Retrofit Kits	\$ 876,601.34	4,745,000	\$ 0.0012	\$ 4,623,351.76
4	Landscape Efficiency	\$ 9,740.00	-	\$ -	\$ (9,740.00)
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

- [a] Combined measures that produce joint conservation savings should be treated as one measure to avoid duplicate counting
- [b] From Worksheet 4-9, line 8
- [c] From Worksheet 4-9, line 11
- [d] From Worksheet 4-9, line 14
- [e] From Worksheet 4-9, line 18. This estimate of net benefit does not consider societal benefits and costs.



SELECT CONSERVATION MEASURES

Following analysis of the costs and benefits of each Conservation Measure or group of Measures, the County has determined that the following measures are likely to be cost-effective:

- Updated Water Bills
- Distribute Retrofit Kits

Worksheet 4-11 summarizes the primary criteria for selection or rejection as well as the estimated reduction in average-day and maximum-day demand.

However, the County has identified additional criteria for consideration for each measure. These criteria are summarized below:

UPDATED WATER BILLS

The Cost-Benefit analysis is the primary criteria for selection of this measure, resulting in a **net benefit of \$716,663** over the 20-year planning horizon. However, the County has considered additional criteria when evaluating the efficacy of this measure, including ongoing plans to make changes to the financial and billing system. These planned changes provide an opportunity to update the water bills in ways to promote water conservation and understanding of the value of water.

AUDITS OF LARGE VOLUME USERS

The Cost-Benefit analysis is the primary criteria for rejection of this measure, resulting in a **net loss of \$136,452** over the 20-year planning horizon. The County has also considered the limited annual water savings of this measure (353,413 annual gallons). This measure will be considered for analysis during future Plan updates.

DISTRIBUTE RETROFIT KITS

The Cost-Benefit analysis is the primary criteria for selection of this measure, resulting in a **net benefit of \$4,623,352** over the 20-year planning horizon. Additional criteria for consideration include relative ease of implementation and the potential for additional water savings to be realized if more than the assumed 50% of distributed retrofit kits are installed.

LANDSCAPE EFFICIENCY

The Cost-Benefit analysis is the primary criteria for rejection of this measure, resulting in a **net loss of \$9,740** over the 20-year planning horizon. Additionally, due to the lack of any anticipated construction projects that would be affected by an updated standard, the County would not anticipate realizing any reduction in water consumption by implementing this measure.

Worksheet 4-11: Selection of Conservation Measures and Estimate of Water

Line	Measure	Selected (Y/N)	Primary criteria for selecting or rejecting the conservation measure for implementation	Estimated reduction in demand for selected measures (gallons per day) [a]	
				Average-day demand	Maximum-day demand
1	Water Bill Updates	Y	The cost-benefit analysis shows significant advantages to updating the County's water bill.	43,737	72,166
2	Audits of Large-Volume Users	N	Following an analysis of the costs and benefits, it has been determined that this measure would cost more to implement than the County would see in savings. Therefore, this measure has not been selected for implementation.	N/A	N/A
3	Distributing Retrofit Kits	Y	The cost-benefit analysis shows significant advantages to distributing retrofit kits to consumers with the highest demand.	13,000	21,450
4	Landscape Efficiency	N	No new facilities are expected to be constructed over the planning horizon; therefore this measure will not result in any water savings.	N/A	N/A
5	Leak Detection and Repair Strategy	N	Water audits show that loss due to leaks is negligible. Additionally, the piping infrastructure in the Waldorf System has an average age of 25 years. Additional analysis will be performed on this measure if future audits show more substantial losses due to leaks.	N/A	N/A

[a] Based on Worksheet 4-9, line 11. Planners will need to convert estimates of annual water savings to estimates of reductions in average-day and maximum-day demand for each measure or group of measures.



INTEGRATE RESOURCES AND MODIFY FORECAST

To integrate the estimated savings from the selected conservation measures into the demand forecast, additional analysis was required to assess the per-connection impact of the demand reduction.

MODIFIED DEMAND FORECAST

When analyzing the selected measures (Updated Water Bills and Distribute Retrofit Kits) and looking to future impacts, the estimated demand reduction will increase as the population increases. The projected population increase for the 20-year planning horizon as listed on Worksheet 4-4 is shown below:

Current Year	2025	2030	2040
91,134	99,184	109,615	128,050

The estimated reduction in average-day and maximum-day demand listed on Worksheet 4-11 is based on the current population and must be adjusted to reflect population growth. The reduction in demand listed on Worksheet 4-12 reflects this growth.

PROJECT-SPECIFIC SAVINGS

Following an evaluation of planned supply additions over the 20-year planning horizon, the County has determined that no planned facilities can be eliminated, downsized, or postponed. Though the supply-capacity of the County outpaces demand, the County has concerns regarding the water quality of the Patapsco wells. The detection of high levels of gross alpha has occurred at previous wells, resulting in abandonment of well sites. The County has determined the additional capacity gained through the Route 301 Interconnection with WSSC must be maintained to mitigate the risks associated with the Patapsco aquifer.

However, planned purchases from WSSC through both the existing interconnection and the planned Route 301 interconnection can be reduced according to the anticipated reduction in demand. While the available capacity won't be impacted, costs to the County will decrease according to the contract rate for water purchases and associated operating costs. As seen on Worksheet 4-13, the total projected savings from 2022 to 2040 (period of time where conservation measures will be implemented) is \$2,285,594, or \$126,977 annually.

Moving forward, the County will continue to explore avenues for scaling back or eliminating future planned projects as demand projections allow.



MODIFYING SUPPLY FORECASTS

The County does not anticipate eliminating, downsizing, or postponing any planned facilities as a result of the selected conservation measures, so no modifications to the supply forecast will occur. Worksheet 4-14 shows the updated supply forecast.

REVENUE EFFECTS

The decrease in demand is not expected to significantly impact revenue. The County estimates the total reduction will amount to approximately \$288,891 annually. However, much of this revenue loss is offset by the projected savings of \$126,977. The County does not anticipate the need to implement any strategies to address these impacts to revenue.

The County will continue assessing potential revenue effects as development and implementation of the selected conservation measures moves forward.

Worksheet 4-12: Modified Demand Forecast

Line	Item	Current Year	Year 5	Year 10	Year 20
1	Average-day demand before conservation (gal) [a]	6,353,701	6,882,728.95	7,533,317	8,726,371.22
2	Reduction in average-day demand (gal) [b]		61,749	68,243	79,720
3	Average-day demand after conservation (gal) (line 1 less line 2)		6,820,980.19	7,465,074.15	8,646,651.41
4	Maximum-day demand before conservation (gal) [a]	10,483,606	11,356,502.77	12,429,972.91	14,398,512.51
5	Reduction in maximum-day demand (gal) [b]		101,885	112,601	131,538
6	Maximum-day demand after conservation (gal) (line 4 less line 5)		11,254,617.31	12,317,372.35	14,266,974.83
7	Ratio maximum-day to average-day demand before conservation (line 4 divided by line 1)	1.65	1.650	1.650	1.650
8	Ratio maximum-day to average-day demand after conservation (line 6 divided by line 3)		1.650	1.650	1.650

[a] From Worksheet 4-4, line 6

[b] Based on Worksheet 4-11

Worksheet 4-13: Project-Specific Savings

DESCRIPTION OF PROJECT

Describe the supply-side project(s):

The Route 301 Interconnection with WSSC is intended to supply additional capacity to the County to meet projected demand. This additional capacity also mitigates the risks of water quality issues with wells affecting the County's ability to meet demand.

Project was scheduled to begin:	2026	
Purpose of the Project:		Improvement
	X	Addition
The project is designed to meet:	X	Average-day demand
		Maximum-day demand
Type of project:		Source of supply
		Water treatment facilities
		Treated water storage
		Major transmission lines
	X	Purchased water
		Other

CHANGES TO PROJECT

Line	Item	Project supply capacity (daily gallons)	Project Costs	
			Total capital costs (\$)	Total operating costs (\$)
A	CAPITAL PROJECT IS ELIMINATED			
1	Original Project			
2	Savings from elimination (equals line 1)			
B	CAPITAL PROJECT IS DOWNSIZED			
3	Original project			
4	Downsized project			
5	Saving from downsizing (line 3 less line 4)			
C	CAPITAL PROJECT IS POSTPONED			
6	Present value of original project			
7	Present value of postponed project			
8	Savings from postponement (line 6 less line 7)			
D	NEED FOR PURCHASED WATER IS REDUCED [c]			
9	Original estimate of purchases (over planning horizon)	458,445,163.69		\$ 44,714.10
10	Revised estimate of purchases (can be "0")	0		\$ -
11	Savings from reduced purchases (line 9 less line 10)	\$ 2,240,879.96		\$ 44,714.10

Worksheet 4-14: Modified Supply Forecast and Estimated Total Savings

MODIFIED SUPPLY FORECAST

Line	Item	Current Year	Year 5	Year 10	Year 20
A	Forecast Supply Capacity (Daily)				
1	Supply capacity before conservation program (gal) [a]	7,105,000	8,139,032	13,139,032	18,139,032
2	Planned reduction in supply capacity (gal) [b]		0	0	0
3	Supply capacity after conservation (gal) (line 1 less line 2)		8,139,032	13,139,032	18,139,032
B	Capacity Reserve				
4	Supply capacity less demand (gal) (line 3 less line 3 on Worksheet 4-12)		1,318,052	5,673,958	9,492,381

ESTIMATED TOTAL SAVINGS

Line	Item	Supply capacity (daily gallons)	Project Costs	
			Total capital costs (\$)	Total operating costs (\$)
C	Total Estimated Savings from Changes to Supply Projects [c]			
1	Cost of supply projects before conservation	11,080,069	\$ 346,757,244.41	\$ 3,240,000.00
2	Cost of supply projects after conservation	11,080,069	\$ 346,757,244.41	\$ 999,120.04
3	Savings (line 1 less line 2)	0	\$ -	\$ 2,240,879.96
D	Total Estimated Savings from Reduced Operating Costs at Existing Facilities [d]			
4	Operating costs before conservation	-		\$ 4,074,000.00
5	Operating costs after conservation	-		\$ 4,029,285.90
6	Savings (line 4 less line 5)	-		\$ 44,714.10
E	Conservation Program Costs			Total program costs (\$)
7	Total cost of implementing selected conservation measures [e]			\$ (311,542.73)

[a] From Worksheet 4-7

[b] Based on Worksheet(s) 4-13

[c] Based on Worksheet(s) 4-13

[d] Based on annual variable operating cost (including energy, chemicals, and water purchases).

[e] Based on Worksheet 4-10



PRESENT IMPLEMENTATION AND EVALUATION STRATEGY

The County has developed a plan for implementation of the selected water conservation measures and assigned specific deadlines for required actions to ensure the measures are implemented on schedule. These milestones and deadlines are summarized on Worksheet 4-15.

Additionally, the County has also developed an implementation strategy, including a plan for public involvement, a plan for monitoring and evaluation, and a plan for updates and revisions. These items are summarized on Worksheet 4-16.

Worksheet 4-15: Implementation Schedule for Measures

Line	Measure	Required action	Beginning date	Completion date	Notes
1	Updated Water Bills	Update Financial Software	7/1/2021	12/1/2023	Currently, the Financial and HR parts of the software are getting updated. After their completion, an update for Billing software will be initiated
		Payment Platform Rollout (electronic version of bill update to customers)	1/1/2022	3/1/2022	The County recently signed up to deploy a new payment platform from Paymentus. It will expand ebilling for the County and credit/debit card activity for water/sewer customers.
		Discuss conservation measure with Billing Department	12/1/2023	6/1/2024	Buy-in is required from Billing Office in order to move forward with implementation of the conservation measure.
		PGM and DPW will hold a workshop with Media Services	6/1/2024	12/1/2024	County Staff will determine what data should be included on the updated bill to best communicate water usage to customers. Customer outreach may be involved. A plan will be developed to encourage customers to opt into paperless billing
		Begin sending updated bill to customers (printed version)	12/1/2024	9/1/2025	Work with Billing to add updates to bill and send to customers
		Reach out to customers via survey on County's water billing website to determine usefulness of new bill and possible improvement suggestions	9/1/2025	12/1/2025	Customers will have an opportunity to provide input on the updated water bill
2	Distribute Retrofit Kits	Identify vendors for purchase of kits	10/22/2022	12/22/2022	Possible vendors include NRG Inc, Conserv-A-Store, and Conservation Mart
		Identify vendors to handle mailing	1/1/2023	3/1/2023	
		Develop list of customers to mail kits to	10/22/2022	3/1/2023	Analyze residential demand data to target highest-volume users for mailing retrofit kits
		Distribute kits	4/1/2023	6/1/2023	
		Evaluate process and feedback from customers	7/1/2023	9/1/2023	
		Incorporate feedback from customers	10/1/2023	12/1/2023	
		Evaluate actual reduction in demand	1/1/2024	3/1/2024	Program may be modified depending on reduced demand
3					
4					
5					

Worksheet 4-16: Implementation Strategy

A. PUBLIC INVOLVEMENT

Describe plan for public involvement:

The County will survey the public to assess the implementation of the water conservation measures. This includes feedback on the information included on bills and the efficacy of the conservation kits mailed out (specifically if residents are installing the kits or are only using specific pieces).

The County will regularly post updates regarding progress towards water conservation goals to ensure the community is informed and is part of the process.

B. MONITORING AND EVALUATION

Describe plan for monitoring and evaluation:

For water bill updates, the County will monitor overall usage and collect feedback from customers regarding the information included on the bill. The County will modify the bill according to customer feedback to will enable them to make better decisions about their water usage.

For retrofit kit distribution, the County will monitor the usage of customers who receive retrofit kits to evaluate the efficacy of the measure. This data will be used to better target distribution of these kits in the future.

Describe plan to collect water demand data:

As the County moves forward with implementation of these conservation measures, specific attention will be paid to availability of demand data and where additional detail would be helpful for evaluation of measures. Additionally, the County will assess whether more detailed data is needed to better assess trends in nonaccount water demand.

C. PLAN UPDATES

Describe plan for updates and revisions:

The County will review the Plan annually to determine where updates and revisions are required. When updates are made, the County will re-evaluate rejected conservation measures.

D. ADOPTION OF THE PLAN

Date plan completed:

Date plan approved:

Approved by [governing body]:

Signature: _____

Appendix A

Account #

XXXXXXXXXXXX

Due Date

3/02/22

Amount Due

439.03

After Due Date

482.94

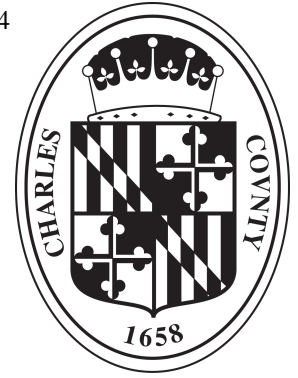
Service Address

JOHN DOE
123 EXAMPLE RD

Charles County Government

Baltimore Street
P.O. Box 1630, La Plata, MD 20646-1630

Utility Bill for Water and Sewer



Please make checks payable to Charles Co. Government

Please detach this portion and return with payment. Thank you.

1/31/22

Current Billing

Water 173.16
Sewer 240.72
Acct fee 10.15
Bay fee 15.00

Service Address
123 EXAMPLE RD

Read Dates	Days	Previous	Current	Usage
10/19/21 - 1/21/22	94	472000	498000	26000

Account #

XXXXXXXXXXXX

*** ONLINE BILL REPRINT ***

Service Period

10/20/21 to 1/21/22

Previous Balance

427.99

Payments by credit cards are now accepted. Call toll-free 1-800-692-6828 or visit our website at www.charlescountymd.gov/pay. Allow 3 business days for credit card payments to be posted. Payment date is the date we receive your payment. Service will be interrupted if we do not receive your payment within 10 days from the due date. A Night Depository box is available at the Government Building for after hour payments only. A fee of \$35 for each returned check will be charged to the account.

Penalties

0.00

For customer service during business hours (8:00 a.m. - 4:30 p.m. Monday thru Friday) please call the Dept. of Fiscal & Administrative Services at 301-645-0624 or 301-870-2542. Emergency service is available 24 hours a day, seven days a week. For emergency service call the Dept. of Utilities at 301-609-7400.
Disconnect for nonpayment is not considered an emergency.

Adjustments

0.00

Payments Received

427.99-

Balance at Billing:

0.00

Current Charges

439.03

Balance Due

439.03

Due Date

3/02/22

After Due Date

482.94

Account #

XXXXXXXXXXXX