

# Capital Improvement Plan

Fiscal Years  
2019 – 2023

ADOPTED  
June 2018



Crozet Finished  
Water  
Pump Station



Wholesale  
Master  
Metering



Odor Control



Granular Activated Carbon



Odor Control



Rivanna Water & Sewer Authority  
695 Moores Creek Lane, Charlottesville, Virginia 22902

<b>I.</b>	<b>INTRODUCTION</b>	2
<b>II.</b>	<b>FINANCIAL SUMMARY BY CATEGORY</b>	4
<b>III.</b>	<b>PROJECT DETAILS</b>	7
	Completed Projects	8
	Urban Water	
	Community Water Supply Plan	12
	Observatory WTP and Ragged Mountain/Sugar Hollow Reservoir System	15
	Finished Water Storage/Transmission	18
	South Rivanna Water System	23
	Non-Urban Water	
	Crozet Water System	25
	Scottsville Water System	29
	Urban Wastewater	
	Wastewater Interceptors/Pumping Stations	31
	Moores Creek Advanced Water Resource Recovery Facility	35
	Non-Urban Wastewater	
	Scottsville Wastewater System	40
	Glenmore Wastewater System	42
	All Systems	44
<b>IV.</b>	<b>APPENDIXES</b>	
	CIP Financial Summary	47
	Water System Summary	51
	Wastewater System Summary	52

## Introduction

The Capital Improvement Plan (CIP) for Fiscal Years 2019-2023 has been prepared as a strategic and financially responsible plan for the Rivanna Water and Sewer Authority (RWSA) to complete major infrastructure construction projects. The projects included in the CIP are necessary to achieve the RWSA's core mission of providing safe, high-quality drinking water and environmentally responsible wastewater treatment services for the City of Charlottesville and the Albemarle County Service Authority (ACSA). The CIP is a 5-year planning document which provides an estimated budget and schedule for projects as they advance through the design and construction process.

The infrastructure requirements of the Capital Improvement Plan are developed through our Asset Management and Master Planning programs to address water and wastewater capacity demands, regulatory mandates and rehabilitation needs. Each year, these projects are reviewed and prioritized by the RWSA management team and brought forth for review by the Board of Directors.

During the past year, several capital projects were very near completion or are no longer needed, and as such are being removed from the 2019-2023 CIP. These projects account for approximately \$38.5 million or 28.3% of FY 17-21 CIP. These projects include:

- Ragged Mountain Reservoir to Observatory WTP Pipeline Condition Assessment
- Stillhouse Tank Repairs and System Improvements
- Rt. 29 Pipeline – VDOT Betterment (Rt. 29 & Berkmar)
- South Rivanna WTP Leaf Screen
- South Rivanna WTP Filter Press Rehabilitation
- Scottsville WTP High Service Pump Station Upgrade
- Rivanna Pump Station and Tunnel
- Crozet Interceptor Pump Station Automatic Bar Screens
- Moores Creek AWWRF Administration Building Repairs

The total 5-year 2019-2023 CIP is approximately \$153.9 million, with the previous expenditures on active projects totaling approximately \$34.0 million, leaving a net proposed 5-year projected expenditure of \$119.9 million.

There are several new projects added to the CIP this year, with a total estimated expenditures of \$23.31 million from 2019-2023, including:

- Ragged Mountain Reservoir to Observatory WTP Raw Water Line (\$4.1 million)
- Ragged Mountain Reservoir to Observatory WTP Pump Station (\$2.4 million)
- Water Demand Projection and Safe Yield Study (\$0.1 million)
- South Fork Rivanna River Crossing and North Rivanna Transmission Main (\$5.3 million)
- Rt. 29 Pump Station (\$2.3 million)
- Urban Finished Water System Master Plan (\$0.15 million)

- Maury Hill Branch Sewer Upgrade (\$0.29 million)
- Crozet Interceptor Pump Station Rehabilitation (\$0.53 million)
- Engineering and Administration Building (\$3.0 million)
- MCAWRRRF Digester Sludge Storage Improvements (\$0.265 million)
- MCAWRRRF Aluminum Slide Gate Replacement (\$0.470 million)
- Moores Creek AWRRF Facility Master Plan (\$0.1 million)
- Moores Creek AWRRF Mechanical Thickeners (\$1.2 million)
- Scottsville WRRF Grinder and Air Control Improvements (\$0.1 million)
- Glenmore WRRF Secondary Clarifier Coating (\$0.05 million)
- Information Technology Enhancement for Asset Management (\$0.5 million)
- Security Enhancements (\$2.4 million)

There are a few projects where the proposed budgets have been modified based on the anticipated project requirements and necessitate funding adjustments. The projects with changes include:

- Observatory WTP Improvements (\$10.0 million existing / \$18.63 million proposed)
- Interconnect Lower Sugar Hollow and Ragged Mountain Raw Water Mains (\$0.225 million existing / \$0.331 million proposed)
- Sugar Hollow to Ragged Mountain Reservoir Transfer Flow Meter (\$0.150 million existing / \$0.315 million proposed)
- Wholesale Water Master Metering (\$3.6 million existing / \$3.2 million proposed)
- Avon to Pantops Water Main (\$5.5 million existing / \$13.2 million proposed)
- South Rivanna Hydropower Plant Decommissioning (\$1.0 million existing / \$0.4 million proposed)
- South Rivanna WTP Improvements (\$5.43 million existing / \$7.5 million proposed)
- Beaver Creek Dam Alteration (\$6.07 million existing / \$14.93 million proposed)
- Crozet WTP Expansion (\$0.25 million existing / \$6.9 million proposed)
- Interceptor and Manhole Repair (\$1.34 million existing / \$1.94 million proposed)
- Crozet Flow Equalization Tank (\$3.75 million existing / \$3.3 million proposed)
- Moores Creek AWRRF Odor Control Phase 2 (\$10.1 million existing / \$11.1 million proposed)

**FINANCIAL SUMMARY**

**MAJOR SYSTEM CATEGORIES**

## FINANCIAL SUMMARY

### Major System Categories – Water

System Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
<b>Urban Water (UW)</b>										
Community Water Supply Plan	\$2,432,558	\$6,398,442	\$565,249	\$275,000	\$870,000	\$1,420,751	\$1,853,000	\$3,847,000	\$8,831,000	\$25,254
Observatory WTP & Ragged Mountain/Sugar Hollow Reservoir System	\$11,315,000	\$8,901,000	\$1,479,198	\$1,870,000	\$4,128,000	\$8,871,000	\$3,867,802		\$20,216,000	\$1,042,198
Finished Water Storage/Distribution	\$36,245,494	\$15,190,000	\$30,050,494	\$1,770,000	\$2,001,000	\$8,067,000	\$8,830,000	\$717,000	\$51,435,494	\$21,028,805
South & North Fork Rivanna Water System	\$6,430,442	\$1,469,558	\$302,332	\$691,668	\$2,411,000	\$4,398,000	\$97,000		\$7,900,000	\$82,332
Security & Technology		\$1,450,000	\$25,000	\$210,000	\$660,000	\$555,000			\$1,450,000	
<b>Subtotal (UW)</b>	<b>\$56,423,494</b>	<b>\$33,409,000</b>	<b>\$32,422,273</b>	<b>\$4,816,668</b>	<b>\$10,070,000</b>	<b>\$23,311,751</b>	<b>\$14,647,802</b>	<b>\$4,564,000</b>	<b>\$89,832,494</b>	<b>\$22,178,589</b>
<b>Non-Urban Water (NUW)</b>										
Crozet Water System	\$13,839,390	\$15,509,000	\$7,058,095	\$4,084,000	\$5,056,181	\$2,307,000	\$8,584,000	\$2,259,114	\$29,348,390	\$3,285,369
Scottsville Water System	\$1,615,000		\$1,615,000						\$1,615,000	\$1,216,510
<b>Subtotal (NUW)</b>	<b>\$15,454,390</b>	<b>\$15,509,000</b>	<b>\$8,673,095</b>	<b>\$4,084,000</b>	<b>\$5,056,181</b>	<b>\$2,307,000</b>	<b>\$8,584,000</b>	<b>\$2,259,114</b>	<b>\$30,963,390</b>	<b>\$4,501,879</b>
<b>WATER TOTAL</b>	<b>\$71,877,884</b>	<b>\$48,918,000</b>	<b>\$41,095,368</b>	<b>\$8,900,668</b>	<b>\$15,126,181</b>	<b>\$25,618,751</b>	<b>\$23,231,802</b>	<b>\$6,823,114</b>	<b>\$120,795,884</b>	<b>\$26,680,468</b>

## FINANCIAL SUMMARY

### Major System Categories – Wastewater

System Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
Urban Wastewater (UWW)										
Wastewater Interceptors and Pumping Stations	\$13,095,324	(\$1,214,324)	\$1,610,945	\$2,187,000	\$3,053,385	\$3,672,670	\$822,000	\$535,000	\$11,881,000	\$342,401
Moores Creek AWWRF	\$13,513,000	\$6,051,151	\$13,513,000	\$1,751,151	\$215,000	\$1,210,000	\$1,375,000	\$1,500,000	\$19,564,151	\$6,944,485
Security & Technology		\$1,450,000	\$25,000	\$210,000	\$660,000	\$555,000			\$1,450,000	
<b>Subtotal (UWW)</b>	\$26,608,324	\$6,286,827	\$15,148,945	\$4,148,151	\$3,928,385	\$5,437,670	\$2,197,000	\$2,035,000	\$32,895,151	\$7,286,886
Non-Urban Wastewater (NUWW)										
Scottsville WRRF		\$100,000			\$30,000	\$70,000			\$100,000	
Glenmore WRRF	\$61,000	\$50,000		\$25,000	\$25,000	\$61,000			\$111,000	
<b>Subtotal (NUWW)</b>	\$61,000	\$150,000		\$25,000	\$55,000	\$131,000			\$211,000	
<b>WASTEWATER TOTAL</b>	\$26,669,324	\$6,436,827	\$15,148,945	\$4,173,151	\$3,983,385	\$5,568,670	\$2,197,000	\$2,035,000	\$33,106,151	\$7,286,886
<b>TOTAL</b>	\$98,547,208	\$55,354,827	\$56,244,313	\$12,973,819	\$19,109,566	\$31,287,421	\$25,428,802	\$8,858,114	\$153,902,035	\$33,967,349

## **PROJECT DETAILS**

Page	8	<b>Completed Projects</b>
Page	12	<b>Urban Water</b>
Page	25	<b>Non-Urban Water</b>
Page	31	<b>Urban Wastewater</b>
Page	40	<b>Non-Urban Wastewater</b>
Page	44	<b>All Systems</b>



## Completed Projects

During fiscal years 2017 and 2018, several capital improvement projects were completed, were advanced to the final phases of close-out, or were determined to be no longer necessary. As such they will be removed from consideration in future planning documents. Presented in the table below are the twelve (12) completed projects, pertinent information on the adopted budgets, as well as the projected final costs and any anticipated savings. There was a total completed projects cost savings of \$1.8 million.

4. Ragged Mountain Reservoir to Observatory Water Treatment Plant Pipeline Condition Assessment: The 18-inch Ragged Mountain and Lower Sugar Hollow raw water pipelines run in parallel to each other from the Ragged Mountain Reservoir to the Observatory Water Treatment Plant. These pipelines are constructed mostly of cast iron and are 109 and 71 years old, respectively. Originally an assessment was planned to update information on the condition of these pipelines and aid in planning for future conveyance of raw water from Ragged Mountain to the urban areas. This project included using non-destructive acoustic technologies to identify existing leaks and remaining pipe wall thickness as well as to determine the remaining service of these pipelines. Due to the addition of replacement pipe in the CIP, this project is no longer required.
  
11. Stillhouse Tank Repairs and System Improvements: The Stillhouse Mountain pressure zone currently has one ground storage tank with a capacity of 0.70 million gallons. This project focused on structural improvements and interior painting, consisting of removal and replacement of the tank roof rafters, repainting of the tank interior, and other ancillary items. The project budget included design, bid-phase services, construction, and construction administration and inspection services. Construction of the tank improvements were completed fall of 2016.
  
14. Rt. 29 Pipeline – VDOT Betterment (Rt. 29 & Berkmar): The VDOT Rt. 29 Solutions projects include widening of Rt. 29 (Seminole Trail) from a four-lane divided highway to a six-lane divided highway from Polo Grounds to Town Center Drive at Hollymead Town Center. Improvement of this 1.8-mile-long section required relocation of RWSA's existing 12-inch cast iron water main for the entire length of the project. RWSA had previously identified through master planning that a 24-inch water main will be needed from the South Rivanna Water Treatment Plant to Hollymead Town Center to meet future water demands. This project included the betterment cost to have VDOT and its Design-Build Contractor relocate the existing 12-inch water main as a 24-inch water main as well as funds to construct a section of 24-inch waterline adjacent to the new Berkmar Drive Extension for future use. Construction began in December 2016 and was completed in summer 2017. This project also includes funding for an update to the Airport Zone Study report by Michael Baker International to reassess future water system needs and update cost estimates for the North Rivanna Service Area.
  
17. South Fork Water Treatment Plant Leaf Screen: At the South Rivanna Water Treatment Plant, the raw water pump station and intake are integral to the dam and abutments. Water flows through a bar screen and then a mechanical band screen (leaf screen) into the raw water

pump station wet well. The existing leaf screen was original to the 1964-1965 construction. Historically, the mechanical screen has been quite reliable, but recently had allowed significant debris to enter and damage the raw water pumps. An evaluation of the leaf screen determined that it has reached the end of its service life and needed to be replaced. Likewise, a detailed alternative analysis determined that the most cost-effective approach is to fabricate and install a replacement mechanical band screen. Design of a replacement leaf screen began in June 2016 and construction was completed in July 2017.

18. South Fork Water Treatment Plant Filter Press Rehabilitation: The South Rivanna Water Treatment Plant belt press is used to dewater sludge removed from the water treatment train. The current belt press has been in continuous operation since 1992. This project was to perform a complete factory overhaul to ensure reliable service and to preempt potential future mechanical failures. The project was completed in June 2017.
23. Crozet Ground Storage Tank Repairs and Upgrades: The 500,000-gallon Crozet Ground Storage Tank serves as the wet well for the finished water pumps at the Crozet Water Treatment Plant as well as one of two water storage tanks in the Crozet Service Area. A routine inspection of the Crozet Tank in April of 2012 revealed several deformed roof rafters, indicating the potential for structural deficiency. An in-depth structural inspection was performed in January 2013 and a list of recommended roof repairs provided. In addition to the structural repairs and other ancillary work, the project also included repainting of the tank interior and installation of an active mixing system to improve system-wide water quality by increasing circulation and minimizing tank stratification. The project budget included consultant services for design and bidding of necessary roof repairs and other ancillary items, as well as construction, construction administration, and inspection services. Construction of the tank improvements began in the spring of 2016 and was completed in the summer of 2016.
24. Crozet Water Treatment Plant - Miscellaneous Repairs: Staff identified several repairs needed within the Crozet water system within the next two years. These items have been consolidated into a single project and include new stem guides, valves and trash racks at the raw water pump station, a new backwash supply pump, a new overflow pipe for the backwash tank, and new walkways and handrails. The work anticipated within this project has been combined into the Crozet WTP upgrade project and therefore is no longer needed as a separate project.
29. Scottsville High Service Pump Station Upgrades: Currently, the high service pumps at the Scottsville water treatment plant pump water to the RWSA Scottsville Storage Tank and then an ACSA booster station pumps water to the ACSA tank, which serves the majority of the Scottsville service area. This project was to evaluate and replace the high service pumps at the Scottsville WTP so that water can be pumped directly from the WTP to the ACSA tank, eliminating the need for the ACSA booster pump station and the RWSA Scottsville Storage Tank. Based on preliminary feedback from ACSA, this project has been eliminated from further consideration and the correct configuration will remain.
31. Rivanna Pump Station and Tunnel: Pumping capacity between the Rivanna Interceptor in Riverview Park and the Moores Creek Advanced Water Resource Recovery Facility required expansion for wet weather peak flow, from a capacity of 24.5 mgd to a firm capacity of 53

mgd in accordance with RWSA's DEQ Consent Order. Following a lengthy public process and study of alternatives, the RWSA Board selected to move forward with a final design in December 2011. The project included construction of approximately 1,620 linear feet of a tunnel with a tunnel-boring machine which will connect the existing Rivanna Interceptor in Riverview Park to a new pump station located on the RWSA MCAWRRF property. The final design included pumps capable of delivering a peak pumping rate equivalent to 53 mgd, electrical gear, influent grinders, self-cleaning wet well, air collection for odor control, back-up power generation, SCADA control and integration, tie-ins to the existing systems, site and permitting work, storage building demolition and electrical relocation work, as well as architectural, structural and mechanical systems. The existing pump station at the entrance to Riverview Park was demolished once the new pump station and tunnel were complete and in service. Construction began in March 2014 and was completed in late summer 2017.

35. Crozet Interceptor Pump Station Automatic Bar Screens: There are currently two automatic bar screens at Crozet Pump Station No. 4. These units were original to the pump station which was constructed in the mid-1980s. Prior to 2014, one of the units was operational, with the second unit no longer serviceable. The first screen was replaced as part of the CIP in 2014. This project involved replacement of the second unit in summer 2017.
  
38. Moore's Creek AWWRF Administration Building Repairs: The RWSA Administration Building was constructed in 1978 as part of the Moore's Creek wastewater treatment facility, with the addition of an elevator and office space in 1995. Over the past several years there have been several significant building maintenance issues. As a result, in October 2012, staff commissioned an architectural, mechanical, electrical, and plumbing evaluation of the building, which identified several near, mid, and long-term repair needs. This project included the replacement of the entire roof with a standing seam aluminum material, gutter and downspout replacement, electrical circuit mapping and rewiring, window replacement, and building exterior painting which have been capitalized via completed projects.

## Completed Projects

		Five-Year Capital Program			
No.	Project Description	Adopted Budget 3/2017	Previous Expenditures (7/1/2017)	Final Projected Costs	Savings
4	Ragged Mountain Reservoir to Observatory Water Treatment Plant Pipeline Condition	\$285,000			\$285,000
11	Stillhouse Tank Repairs and System Improvements	\$600,000	\$51,397	\$362,466	\$237,534
14	Rt. 29 Pipeline - VDOT Betterment (Rt. 29 & Berkmar)	\$2,900,000	\$1,714,749	\$2,600,000	\$300,000
17	South Fork Water Treatment Plant Leaf Screen	\$471,000		\$432,086	\$38,914
18	South Fork Water Treatment Plant Filter Press Rehabilitation	\$150,000		\$165,242	(\$15,242)
23	Crozet Ground Storage Tank Repairs and Upgrades	\$351,610	\$30,922	\$315,739	\$35,871
24	Crozet Water Treatment Plant Miscellaneous Repairs	\$105,890			\$105,890
29	Scottsville High Service Pump Station Upgrades	\$100,000			\$100,000
31	Rivanna Pump Station and Tunnel	\$32,200,000	\$30,040,496	\$31,500,000	\$700,000
35	Crozet Interceptor Pump Station Automatic Bar Screens	\$75,000		\$75,000	
38	Moores Creek AWWRF Administration Building Repairs	\$84,746		\$38,591	\$46,155
<b>TOTAL</b>		\$37,323,246	\$31,837,564	\$35,489,124	\$1,834,122

CIP 17-21 Total	CIP 17-21 Completed	CIP 19-23 Remaining	CIP 19-23 New Funding	CIP 19-23 New Total
\$135,870,454	(\$37,323,246)	\$98,547,208	\$55,354,827	\$153,902,035

## Community Water Supply Plan

The Community Water Supply Plan represents the program developed with substantial community input to fulfill RWSA's contractual obligation to the City of Charlottesville (City) and the Albemarle County Service Authority (ACSA) to provide adequate drinking water for their future needs. An initiative started in 2003 to find a long-term solution that could achieve both local support and meet federal and state requirements. After multiple community meetings, updates with local officials, and frequent consultations with federal and state agencies, local support was obtained to apply for federal and state permits to expand the Ragged Mountain Reservoir and build a future pipeline between the South Rivanna and Ragged Mountain Reservoirs, with stream and wetlands mitigation to be provided through property in the Buck Mountain Creek area and property adjacent to a lower reach of Moores Creek near its confluence with the Rivanna River. Federal and state permits were granted in 2008, and amended in 2011.

The first phase of this long-term program centered around the expansion of the Ragged Mountain Reservoir, a project that would simultaneously address a legal obligation to correct safety deficiencies on the existing site. Through a combination of technical investigations, engineering evaluations, and continued public discussion, a decision was reached in February 2011 through the City Council and Board of Supervisors to build the new dam as an earthen dam, with the initial phase raising the reservoir pool height by 30 feet. The decision also outlined an objective of the further pursuit of water conservation through the City and ACSA, and the pursuit of opportunities for dredging of the South Rivanna Reservoir, with the second phase of reservoir expansion in the future as necessary.

### Project Descriptions:

1. South Rivanna Reservoir to Ragged Mountain Reservoir Water Line Right-of-Way: The approved 50-year Community Water Supply Plan includes the future construction of a new raw water pipeline from the South Rivanna River to the Ragged Mountain Reservoir. This new pipeline will replace the Upper Sugar Hollow Pipeline along an alternative alignment to increase raw water transfer capacity in the Urban Water System. The preliminary route for the pipeline followed the proposed Route 29 Charlottesville Bypass; however, the Bypass project was suspended by VDOT in 2014, requiring a more detailed routing study for the future pipeline. This project includes a routing study, preliminary design and preparation of easement documents, and acquisition of water line easements along the approved route. Prior expenditures covered a review of the 2009 conceptual design that was requested by the Board.
2. South Rivanna Reservoir Dredging: The South Rivanna Reservoir stores raw water for treatment at the South Rivanna Water Treatment Plant and in the future, is proposed to provide water for transfer to the enlarged Ragged Mountain Reservoir. River flow into the reservoir is from a drainage area, almost entirely within Albemarle County, of approximately 259 square miles. Soil erosion from natural events, from land use in the agricultural area, from land disturbances in the developed areas, and from re-suspension of flood plain deposits created during the 19th century (stream bank erosion), are likely the causes of sediment becoming trapped within the reservoir. The initial design of the reservoir anticipated the accumulation of

these sediments, and a significant portion of the total storage volume was designated for this purpose. Currently the sediment stored does not exceed the available capacity.

The January 2012 Ragged Mountain Dam Project Agreement outlines that “the City and ACSA agree to direct, and RWSA agrees, to perform such dredging projects at the South Fork Rivanna Reservoir as may be specified jointly by the City and ACSA pursuant to the Water Cost Allocation Agreement.” The Cost Allocation Agreement stipulates that target maintenance dredging shall be performed, and that the dredging be market driven, cost effective, and opportunistic and shall not exceed \$3.5M. In 2012 and 2013, RWSA, via the Public-Private Education Facilities and Infrastructure Act (PPEA) process, solicited proposals to provide maintenance dredging. In July 2013, the one qualified PPEA proposer withdrew its proposal, citing difficulties in obtaining necessary land agreements.

Future Board decisions on the project contracting approach will dictate the next steps. This project remains in the CIP as the fulfillment of a contractual obligation from the January 2012 Ragged Mountain Dam Cost Allocation Agreement, and RWSA counsel has offered an opinion that consent to amend the Agreement from the City and ACSA is required before the RWSA Board amend or cancel the project.

3. Ragged Mountain Reservoir to Observatory Water Treatment Plant Raw Water Line: Raw water is transferred from the Ragged Mountain Reservoir (RMR) to the Observatory Water Treatment Plant by way of two 18-inch cast iron pipelines, which have been in service for more than 110 and 70 years respectively. The increased frequency of emergency repairs and expanded maintenance requirements are one impetus for replacing these pipelines. The proposed water line will be able to reliably transfer water to the expanded Observatory plant, which will have the capacity to treat 10-12 million gallons per day (mgd). The new pipeline is expected to be constructed of 36-inch ductile iron and will be on the order of 14,000 feet in length. The opportunity to integrate the Observatory WTP raw water supply line with the proposed South Rivanna Reservoir to RMR raw water main project is currently being investigated as part of the approved 50-year Community Water Supply Plan.
4. Ragged Mountain Reservoir to Observatory Raw Water Pump Station: The Ragged Mountain Reservoir (RMR) to Observatory WTP raw water pump station is planned to replace the existing Stadium Road and Royal pump stations, which in part have exceeded their design lives or will require significant upgrades with the Observatory WTP expansion. The pump station will pump up to 10 mgd to the Observatory WTP. Integration of the new pump station with the planned South Rivanna Reservoir (SRR) to RMR pipeline is being considered in the interest of improved operational and cost efficiencies. An integrated pump station would also include the capacity to transfer up to 16 million gallons per day (mgd) of raw water from RMR back to the SRR WTP. The location of this pump station will be recommended as part of the SRR to RMR raw water main preliminary engineering study, which is currently under way.

## Community Water Supply Plan

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year						
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
1	South Rivanna Reservoir to Ragged Mountain Reservoir Water Line Right-of-Way	\$2,295,000		\$565,249	\$275,000	\$870,000	\$584,751			\$2,295,000	\$25,249
2	Rivanna Reservoir Dredging	\$137,558	(\$127,558)				\$10,000			\$10,000	
3	Ragged Mountain Reservoir to Observatory Water Treatment Plant Raw Water Line		\$4,116,000				\$426,000	\$1,453,000	\$2,237,000	\$4,116,000	
4	Ragged Mountain Reservoir to Observatory Raw Water Pump Station		\$2,410,000				\$400,000	\$400,000	\$1,610,000	\$2,410,000	
	<b>TOTAL</b>	<b>\$2,432,558</b>	<b>\$6,398,442</b>	<b>\$565,249</b>	<b>\$275,000</b>	<b>\$870,000</b>	<b>\$1,420,751</b>	<b>\$1,853,000</b>	<b>\$3,847,000</b>	<b>\$8,831,000</b>	<b>\$25,249</b>

## **Observatory WTP and Ragged Mountain/Sugar Hollow Reservoir System**

The Observatory Water Treatment Plant (WTP) and Ragged Mountain/Sugar Hollow Reservoir System is comprised of the water treatment facility on Observatory Mountain and the associated raw water infrastructure that stores and conveys source water to the plant. The raw water storage system includes the new Ragged Mountain Dam (constructed in 2014, with a useable raw water storage capacity of 1.5 billion gallons) and the Sugar Hollow Dam (originally constructed in 1947, upgraded in 1999 and downstream discharge improvements completed in September 2014, with a useable raw water storage capacity of 339 million gallons as updated by a 2015 bathymetric survey). The system also includes 17.6 miles of 18-inch raw water cast-iron mains, originally installed in 1908, 1922, and 1946. The Sugar Hollow Raw Water Main historically conveyed water from the Sugar Hollow Dam to the Observatory Water Treatment Plant, however, as a result of the New Ragged Mountain Dam project, the main now discharges directly into Ragged Mountain Reservoir. The remaining downstream section of the Sugar Hollow main now conveys raw water from the Ragged Mountain Reservoir to the treatment plant. The line crosses the Mechums River (where an abandoned pumping station is sited) on its way to Ragged Mountain Reservoir, and eventually passes through the Royal Pumping Station and terminates at the Observatory WTP. The Ragged Mountain Raw Water Main conveys water from the Ragged Mountain Reservoir through the Stadium Road Pumping Station and terminates at the Observatory Water Treatment Plant.

### **Project Descriptions:**

5. Observatory Water Treatment Plant Improvements: The Observatory Water Treatment Plant is the oldest of the three urban plants. Early planning for the Community Water Supply envisioned that the plant would undergo a wholesale upgrade. This upgrade will concentrate on specific improvements to critical elements, identified by a Needs Assessment Study as improvements to the flocculators, filters, sedimentation basins, and chemical feed facilities to enhance future reliability. In addition, the existing reinforced concrete flume, which conveys treated water from the sedimentation basins to the filters, is in need of repair or possible replacement. Also, old piping control valves will be replaced and modernized, as well as upgrading electrical and SCADA control systems.

The Observatory Water Treatment Plant was originally constructed in the mid-1950s. Since that time very little has been replaced or upgraded at the facility. The sixty-year-old facility has much of the original equipment that is inefficient, prone to unexpected failure, and does not have readily accessible replacement parts. A portion of the project was completed in the 2016-2017 fiscal year. The flocculator systems were completely upgraded with new mechanical and electrical equipment, including variable speed motor drives for optimum efficiency. The upgraded flocculators have been in service since May 2017.

In addition to providing needed equipment upgrades, the existing plant will also be considered for an upgrade in capacity. Upgrading the plant capacity during the proposed construction project may be economically feasible and beneficial. In order to determine the feasibility of a capacity upgrade, it will be necessary to thoroughly study all aspects of the treatment plant process, including raw water and finished water conveyance to and from the plant. This analysis will be performed in a detailed Preliminary Engineering Report (PER) as part of the



initial engineering for the project. Current funding assumes a future 10 million gallon a day capacity.

It should be noted that the Observatory Water Treatment Plant is sited on land leased to RWSA by the University of Virginia. The terms of the existing lease expire on April 17, 2021. Prior to construction of the remaining improvements, the terms of a new lease may be needed with RWSA and the University as participants. The new lease is currently under negotiation.

6. Interconnect Lower Sugar Hollow and Ragged Mountain Raw Water Mains: The two 18-inch water mains that supply water from Ragged Mountain Reservoir to Observatory Water Treatment Plant are 72 and 110 years old, respectively. The mains are interconnected at the top of the Ragged Mountain Dam, with one serving the 1920's Royal Pump Station and the other serving the more modern Stadium Road Pump Station. Both pump stations provide water to the Observatory Water Treatment Plant. This project will interconnect the two raw water lines near the Rt. 29/Fontaine Avenue interchange, which will provide improved reliability and operability during raw water line maintenance or repairs prior to the anticipated construction and completion of the new replacement line.
7. Sugar Hollow to Ragged Mountain Reservoir Transfer Flow Meter: The Sugar Hollow raw waterline is an 18-inch diameter cast iron pipeline which conveys water from Sugar Hollow Reservoir to Ragged Mountain Reservoir. The pipe discharges directly into the Ragged Mountain Reservoir is used to supplement inflow. Currently, the control valve to regulate flow between the two reservoirs is located near the old Gatekeeper's House at Sugar Hollow dam. The valve is a manual gate valve which requires RWSA staff to travel to the Sugar Hollow dam in order to operate it. In addition, there is currently no flow meter equipment in place to monitor and record flow transferred between the two reservoirs. This project proposes to install a new 18-inch flow meter, a modulating control valve, and new power and SCADA control wiring, to provide the means to regulate the flow between the two reservoirs. The new equipment will allow remote operation via SCADA from the RWSA water treatment plants. This project will allow RWSA staff to efficiently and remotely maintain the two reservoirs at optimal levels. In addition to this work, an old 18-inch diameter gate valve will be replaced or repaired, two abandoned out-buildings and a house will be demolished and removed.
8. Sugar Hollow Dam – Rubber Crest Gate Replacement & Intake Tower Repairs: In 1998 the Sugar Hollow Dam underwent a significant upgrade to improve structural stability and spillway capacity. The original metal spillway gates were replaced with a manufactured five-foot-high inflatable rubber dam that is bolted to the existing concrete structure. This rubber dam allows for the normal storage of water in the reservoir with the ability to be lowered during extreme storm events. The rubber dam has an approximate service life of twenty years and is therefore now due for replacement. The aging intake tower structure will be inspected and evaluated. Recommended repairs may include issues relating to the intake gate valves and tower walls, including repair or replacement of intake trash racks, and sealing/grouting of minor concrete wall cracks.

## Observatory Water Treatment Plant and Ragged Mountain/Sugar Hollow Reservoir System

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year						
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
5	Observatory Water Treatment Plant Improvements	\$10,000,000	\$8,630,000	\$1,207,198	\$1,441,000	\$3,655,000	\$8,459,000	\$3,867,802		\$18,630,000	\$1,042,198
6	Interconnect Lower Sugar Hollow and Ragged Mountain Raw Water	\$225,000	\$106,000	\$91,000	\$240,000					\$331,000	
7	Sugar Hollow to Ragged Mountain Reservoir Transfer Flow Meter	\$150,000	\$165,000	\$181,000	\$134,000					\$315,000	
8	Sugar Hollow Dam - Rubber Crest Gate Replacement & Intake	\$940,000			\$55,000	\$473,000	\$412,000			\$940,000	
	TOTAL	\$11,315,000	\$8,901,000	\$1,479,198	\$1,870,000	\$4,128,000	\$8,871,000	\$3,867,802	\$0	\$20,216,000	\$1,042,198

## **Finished Water Storage/Transmission – Urban System**

The urban finished water storage and transmission system serves to provide transmission of treated water from the three RWSA water plants (Observatory, South Rivanna, and North Rivanna Rivanna) to the distribution networks of the Albemarle County Service Authority, the City of Charlottesville, and the University of Virginia. The system includes approximately 40 miles of pipeline, six water storage tanks: Avon Street (2 MG), Pantops (5 MG), Piney Mountain. (0.7 MG), Stillhouse (0.7 MG), Observatory (3 MG), and Lewis Mountain (0.5 MG), and the Alderman Road and Stillhouse pumping stations.

### **Project Descriptions:**

9. Rt. 29 Pump Station Site Acquisition: This project provided site acquisition for a new Rt. 29 Pump Station and Storage Tank to be built at a later time in the general area south of Airport Road and north of Hollymead Towncenter on TMP No. 32-41 as identified in the Albemarle County Comprehensive Plan. The future pump station and tank, along with a new transmission pipeline between the proposed pump station and the South Rivanna Water Treatment Plant, will provide an interconnection between the areas presently served by the South Rivanna Water Treatment Plant and the North Rivanna Water Treatment Plant. The interconnection is needed for redundancy of service in the event of an emergency, during drought conditions, and to adequately serve the growing needs of the 29 area generally north of the Forest Lakes subdivision. Multiple meetings and negotiations took place with the property's land owner in an effort to acquire the needed property. The negotiations were not successful, and the property was acquired through condemnation proceedings authorized at the May 2017 RWSA Board Meeting. Final legal proceedings are anticipated to be completed by the end of FY 2018.
10. Valve Repair - Replacement (Phase 2): Isolation valves are critical for normal operation of the water distribution system and timely emergency response to water main breaks. Staff continuously review results from an ongoing valve exercising and condition assessment program. This project will replace the highest-priority valves that are identified during the condition assessment as not operable and not repairable.
11. Urban Water Granular Activated Carbon and Water Treatment Improvements: The U.S. Environmental Protection Agency (EPA) regulates maximum contaminant levels (MCL) for total trihalomethanes (THMs) and haloacetic acids (HAAs) in drinking water under the Disinfectant/Disinfection Byproducts Rule (D/DBPR). In the early 1990s Stage 1 of the rule was implemented and RWSA, ACSA and the City of Charlottesville are in compliance with Stage 1. Stage 2 of the D/DBPR was to be effective for the Urban distribution system in October 2012, but the three agencies obtained a two-year extension that shifted the implementation to October 2014. The Stage 2 D/DBPR involved a major change in how THM and HAA levels are calculated and is more stringent than the Stage 1 requirements. A study concluded that complete compliance with the Stage 2 D/DBPR cannot be met consistently with minor modification of existing processes but would instead require significant capital improvements.

In July 2012, the Board decided to pursue the installation of Granular Activated Carbon (GAC) contactors to achieve Stage 2 D/DBPR compliance in the Urban System. The GAC will adsorb

organic matter from the water, thereby reducing the precursors to THMs and HAAs. As decided by the Board in December 2013, the GAC systems have been sized at a lower capacity than the current rated plant capacities (the “Hybrid GAC” approach). The GAC contactors are expected to be on-line and operational by the end of 2017, after the EPA-mandated compliance date. For the interim, a Risk Reduction Plan was developed, outlining interim methods to reduce trace natural organic matter from the source water thereby reducing DBPs. This project budget includes \$631,000 to fund the capital needs of the Risk Reduction Plan. The plan includes installation of Powder Activated Carbon (PAC) feed systems at various treatment plants. The PAC treatment is adequate treatment for the new regulations in the interim time period before GAC completion. The PAC systems were completed in 2015, and are currently in operation as needed.

Also included in the Urban Water GAC project are various improvements at the South Rivanna WTP including construction of additional clearwell storage, replacement of the lime feed system, upgrades to the filter underdrains and backwash system, replacement of the filter media, sound attenuation and ventilation improvements for the high service pump station, installation of a variable frequency drive for the raw water pump station, installation of a new raw water flow meter and several improvements to the residuals management facilities. Included in the Urban Water GAC project are various improvements at the North Rivanna WTP including new filter control valves, new pump control valves, new filter sludge removal equipment, new electrical system upgrades throughout the plant, and the installation of a surge relief mechanism. The final site included in this project is the Observatory WTP with various improvements such as a new chlorine contact tank, improved potable water service piping to the filter building and upgraded finished water discharge piping. Construction of the projects started in late 2015 and will be complete mid-2018.

12. Wholesale Water Master Metering: The January 2012 Water Cost Allocation Agreement designated how the City of Charlottesville (City) and ACSA share in the financing of the New Ragged Mountain Dam project. Within the agreement is a general provision developed by the ACSA and City to enhance measurement of the water usage by each of the distribution agencies. In an effort to meet this obligation, the RWSA Board of Directors authorized staff in August of 2012 to complete an engineering study on metering plan alternatives. The study identified several alternatives for a metering plan based on combinations of metering and estimating methodologies. A Jurisdictional Approach was recommended which included installation of water meters at locations at the City/county corporate boundary plus one meter at each of the three urban water treatment plants. At its September 2013 meeting the Board directed that staff proceed with the Jurisdictional Coverage Approach. The final design includes 25 remote meter locations plus the three finished water flow meters at the water treatment plants. This project budget includes preliminary and final project design, right-of-way acquisition and negotiations, legal fees and permitting, bid-phase services, construction, and construction administration and inspection services. Construction of the 25 remote meter locations began in early 2016 and is expected to be completed in mid-2018. The three finished water flow meters were installed in 2015 as part of the Urban Water Granular Activated Carbon Project.

13. Piney Mountain Tank Rehabilitation: The 700,000-gallon Piney Mountain Tank serves the North Rivanna pressure band. A routine inspection of the Piney Mountain Tank revealed several deformed roof rafters, indicating the potential for structural deficiency. An in-depth structural inspection was performed and a list of recommended roof repairs provided. This project includes consultant services for design and bidding of necessary roof repairs and other ancillary items, as well as construction, construction administration, and inspection services. Long term plans for the Rt. 29 service area include the modification or elimination of this facility. The current recommended improvements are needed to maintain the existing tank in service for at least the next 10 years.
14. Avon to Pantops Water Main: The southern half of the Urban Area water system is currently served by the Avon Street and Pantops storage tanks. The Avon Street tank is hydraulically well connected to the Observatory Water Treatment Plant while the Pantops tank is well connected to the South Rivanna Water Treatment Plant. The hydraulic connectivity between the two tanks, however, is less than desired, creating operational challenges and reducing system flexibility. In 1987, the City and ASCA developed the Southern Loop Agreement, outlining project phasing and cost allocations, as envisioned at the time. The first two phases of the project were constructed shortly thereafter. The third phase, known as the “Eastern Branch” is the subject of the current project. The initial funding for this project is to prepare an updated routing study and Preliminary Engineering Report to identify the scope, phasing, route and cost of the project, and a consultant has been selected for this work to begin in fall 2017. Additional funding is to perform design, easement acquisition and to begin construction.
15. Water Demand Projection and Safe Yield Study: In January 2012, the City of Charlottesville, Albemarle County Service Authority, and RWSA entered into the Ragged Mountain Dam Project Agreement. Within the agreement are provisions to monitor the bathymetric capacity of the Urban water reservoirs as well as a requirement to conduct reoccurring demand analysis, demand forecasting and safe yield evaluations. The bathymetric survey of the South Rivanna Reservoir and the Ragged Mountain Reservoir are currently funded in the FY2019 O&M Budget. Subsequent to collecting the reservoir survey data, this study will evaluate and calculate current and future demands and present safe yield. Per the project agreement, these analyses shall be completed by calendar year 2020.
16. South Rivanna River Crossing and North Rivanna Transmission Main: RWSA has previously identified through master planning that a 24-inch water main will be needed from the South Rivanna Water Treatment Plant (SRWTP) to Hollymead Town Center to meet future water demands. Two segments of this water main were constructed as part of the VDOT Rt. 29 Solutions projects, including approximately 10,000 LF of 24-inch water main along Rt. 29 and 600 LF of 24-inch water main along the new Berkmar Drive Extension, behind the Kohl’s department store. To complete the connection between the SRWTP and the Airport Road Pump Station Site, RWSA plans to construct a new river crossing at the South Fork Rivanna River and two “gap” sections of 24-inch water main between the already completed sections. Much of the new water main route is within VDOT right-of-way; however, acquisition of right-of-way will be required at the river crossing and on the Kohl’s Property at Hollymead Town

Center. This project includes funding for construction as well as engineering design, easement acquisition, bid-phase services, and construction administration and inspection services.

17. Rt. 29 Pump Station: The Rt. 29 Pipeline and Pump Station master plan was developed in 2007 and originally envisioned a multi-faceted project that reliably connected the North and South Rivanna pressure bands; reduced excessive operating pressures, and developed a new Airport pressure zone to serve the highest elevations near the Airport and Hollymead Town Center. The master plan is currently being updated to reflect the changes in the system and demands since 2007. This project, along with project 15 above will provide a reliable and redundant finished water supply to the North Rivanna area. The proposed pump station will be able to serve system demands at both the current high pressure and a future low pressure condition. These facilities will also lead to future phase implementation which will include a storage tank and the creation of the Airport pressure zone.
  
18. Finished Water System Master Plan: As identified in the 2107 Strategic Plan, the Authority has a goal to plan, deliver and maintain dependable infrastructure in a financially responsible manner. Staff has identified asset master planning as a priority strategy to improve overall system development. There are asset classes where comprehensive and ongoing plans exist or are in development (e.g. wastewater collection, raw water supply, Crozet water, etc.). In the case of the urban finished water system, many of the previously identified projects are in design or construction. As such, staff have identified a need to develop a current and ongoing finished water master plan.

## Finished Water Storage/Transmission – Urban System

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year						
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
9	Rt. 29 Pump Station Site Acquisition	\$1,220,000		\$1,220,000						\$1,220,000	\$466,416
10	Valve Repair - Replacement (Phase 2)	\$500,000		\$250,000	\$250,000					\$500,000	
11	Urban Water GAC and Water Treatment Plant Improvements	\$24,925,494		\$24,925,494						\$24,925,494	\$18,292,018
12	Wholesale Water Master Metering	\$3,600,000	(\$400,000)	\$3,200,000						\$3,200,000	\$2,270,371
13	Piney Mountain Tank Rehabilitation	\$500,000		\$280,000	\$220,000					\$500,000	
14	Avon to Pantops Water Main	\$5,500,000	\$7,700,000	\$175,000	\$1,200,000	\$1,800,000	\$5,400,000	\$4,625,000		\$13,200,000	
15	Water Demand Projection and Safe Yield Study		\$100,000		\$100,000					\$100,000	
16	South Fork Rivanna River Crossing and North Rivanna Transmission		\$5,340,000				\$843,000	\$3,930,000	\$567,000	\$5,340,000	
17	Rt. 29 Pump Station		\$2,300,000			\$201,000	\$1,824,000	\$275,000		\$2,300,000	
18	Finished Water System Master Plan		\$150,000						\$150,000	\$150,000	
	<b>TOTAL</b>	<b>\$36,245,494</b>	<b>\$15,190,000</b>	<b>\$30,050,494</b>	<b>\$1,770,000</b>	<b>\$2,001,000</b>	<b>\$8,067,000</b>	<b>\$8,830,000</b>	<b>\$717,000</b>	<b>\$51,435,494</b>	<b>\$21,028,805</b>

## South Rivanna Water System

The South Rivanna Water System is comprised of the source water, storage, conveyance and treatment infrastructure currently serving the urban area from the South Fork Rivanna River. The system includes the South Fork Rivanna Reservoir and Dam (built in 1966). The Dam is co-located with the raw water intake and pump station, as well as a small hydroelectric generation facility. The source water from the South Rivanna Reservoir is treated at the South Rivanna treatment plant (12-mgd rated capacity).

### Project Descriptions:

19. South Rivanna Hydropower Plant Decommissioning: The South Fork Hydropower Plant is a small hydroelectric generating facility constructed in 1987. The plant has historically operated intermittently, as river flows allow. The generated power is used at the South Rivanna Water Treatment Plant, thereby reducing power purchased off the electric grid. During an effort to troubleshoot and repair the turbine, a large rain and lightning event caused unexpected flooding into the facility. Insurance paid damages to more recent improvements, but not the pre-existing needs to repair the turbine. Engineering investigations in 2013 associated with the failed mechanical equipment and flood event confirmed the need for further disassembly and inspection of the turbine shaft and blade linkages from a remote factory location.

Due to the complexity of possible rehabilitation, the associated Federal Energy Regulatory Commission (FERC) dam permitting, and the numerous variables in the economic analysis, proposals were solicited from national hydropower experts to initiate a feasibility study to determine the cost effectiveness of rehabilitating the hydropower plant while making sure to account for FERC-related costs and issues. The feasibility study was completed in May 2016 and determined that rehabilitation of the facility had a small likelihood for a positive return on investment. This conclusion was brought to the Board of Directors along with a recommendation to initiate the surrender of the exemption to licensure and decommission the facility. The Board approved this recommendation and staff has begun the exemption surrender process. The budget includes regulatory support as well as physical improvements such as removing defunct electrical components, sealing the penstock and the turbine.

20. South Rivanna Water Treatment Plant Improvements: The South Rivanna Water Treatment Plant is currently undergoing significant upgrades as part of the Urban Granular Activated Carbon project. Several other significant needs have also been identified and have been assembled into a single project within this Capital Plan. The projects identified herein include an expansion of the coagulant storage facilities; installation of additional filters to meet firm capacity needs; the addition of a second variable frequency drive at the Raw Water Pump Station; the relocation for the electrical gear from a sub terrain location at the Sludge Pumping Station, a new building on site for additional office, lab, control room and storage space, and improvements to storm sewers to accept allowable WTP discharges. Currently this facility operates at 80-90% of capacity and the identified upgrades will improve reliability and resiliency, particularly at higher flow rates.



## South Rivanna Water System

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
19	South Rivanna Hydropower Plant Decommissioning	\$1,000,000	(\$600,000)	\$167,332	\$232,668					\$400,000	\$82,332
20	South Rivanna Water Treatment Plan Improvements	\$5,430,442	\$2,069,558	\$135,000	\$459,000	\$2,411,000	\$4,398,000	\$97,000		\$7,500,000	
	<b>TOTAL</b>	<b>\$6,430,442</b>	<b>\$1,469,558</b>	<b>\$302,332</b>	<b>\$691,668</b>	<b>\$2,411,000</b>	<b>\$4,398,000</b>	<b>\$97,000</b>	<b>\$0</b>	<b>\$7,900,000</b>	<b>\$82,332</b>

## Crozet Water System

The Crozet Water System includes the source water, raw water conveyance, finished water treatment, transmission and storage infrastructure for the Crozet community in western Albemarle County. The source water for this system is the Beaver Creek Reservoir and Garnett Dam which was built in 1964 with a current useable storage capacity of 521 million gallons. Raw water is treated at the Crozet Water Treatment Plant (1.0 mgd rated capacity) and provides finished water to the Albemarle County Service Authority. The system includes the Crozet Elevated (Waterball) Tank (0.05 MG) for water treatment plant backwash; the Crozet Ground Storage Tank (0.5 MG) and pump station, and the Buck's Elbow Storage Tank (2.0 MG).

### Project Descriptions:

21. Beaver Creek Dam Alteration: From 2008-2014 the Virginia Department of Conservation and Recreation (DCR) adopted revised *Impounding Structures Regulation* which imposed new, more rigorous, evaluations of dams within the Commonwealth. As a result, the Beaver Creek Dam has been reclassified as a high hazard dam, thereby requiring a higher spillway design storm criteria. The higher design storm cannot be accommodated with the existing structure, and will require future modifications. Subsequently the Virginia Soil and Water Conservation Board adopted a new Probable Maximum Precipitation (PMP) Study on December 9, 2015. In March 2016, DCR published guidance documents on implementing the new PMP Study. This project includes investigation, preliminary design, public outreach, permitting, easement acquisition, final design, and construction of the anticipated modifications. Also included in this project are a new relocated raw water pump station, intake and oxygenation system. A revised Preliminary Engineering Report is due to DCR by June 2018.
22. Buck's Elbow & Crozet Waterball Tank Painting: The two million-gallon Bucks Elbow Ground Storage Tank provides finished water storage for the Crozet Area while the 50,000 gallon Crozet Waterball Tank serves as filter backwash storage at the Crozet Water Treatment Plant. Routine inspections of these tanks in 2012 indicated that the tanks would require recoating by 2020. The project includes recoating the interior and top-coating the exterior of both tanks as well as installation of an active mixing system at the Bucks Elbow Tank to decrease stratification and improve overall water quality in the Crozet area. Minor repairs and improvements to both tanks will also be included in this work. This project includes consultant services for design of project specifications, as well as construction, construction administration, and inspection services. Construction of the tank improvements are expected to begin in the spring of 2020.
23. Crozet Water Granular Activated Carbon and Water Treatment Improvements: The U.S. Environmental Protection Agency regulates maximum contaminant levels (MCL) for total trihalomethanes (THMs) and haloacetic acids (HAAs) in drinking water under the Disinfectant/Disinfection Byproducts Rule (D/DBPR). In the early 1990s Stage 1 of the rule was implemented and RWSA and ACSA are in compliance with Stage 1. Stage 2 of the D/DBPR would normally be effective for the Crozet distribution system in November 2014; however, a two-year extension was granted by Virginia Department of Health and Stage 2 became effective for Crozet in November 2016. The Stage 2 D/DBPR involved a major change in how THM and HAA levels are calculated and is more stringent than the Stage 1

requirements. A study concluded that complete compliance with the Stage 2 D/DBPR cannot be continuously met with minor modification of existing processes (water production facilities combined with ASCA distribution system) but would instead require significant capital improvements.

For the Crozet water system, installation of granular activated carbon (GAC) contactor units was selected due to the start/stop operation of the water treatment plant and the relatively higher water age in the distribution system. The GAC will adsorb organic matter from the water, thereby reducing the precursors to THMs and HAAs. Included in the Crozet WTP GAC project are various improvements including upgrade of the chlorine feed system to a modern hypochlorite feed system, as well as replacing the existing fluoride and corrosion inhibitor chemical feed systems. The new chemical feed systems will be housed in additional rooms in the proposed GAC contactor building. This new location will also allow for shorter chemical feed lines. Construction of the project started in 2016.

24. Crozet Water Treatment Plant Expansion: The Crozet water treatment system is currently permitted and rated to supply up to 1.0 million gallons per day (mgd) of water to the ASCA distribution system. Over the past several years, average day usage of water has increased steadily, with maximum day demand approaching plant capacity. The current lease agreement with ASCA for land at this facility stipulates that a 5-year notice must be given prior to altering or terminating the lease. As such, it is imperative that RWSA begin evaluating how a future plant expansion would be accomplished and any impacts on the ASCA lease. In addition, much of the existing plant systems are the same as when the plant was constructed in the 1960's.

Expanding the plant capacity at Crozet WTP would require a new Virginia Department of Environmental Quality Water Withdrawal Permit, and could include possible stream release requirements. In order to fully analyze all aspects of the design required for this project, and honor plant upgrade notification requirements to ASCA, select elements of the preliminary design have been completed. These elements include a Preliminary Engineering Report (PER), plant field testing, and preliminary permitting work and coordination with pertinent regulators. The results of the PER state that the current treatment plant can be upgraded, and the capacity increased, through installation of newer, and more technologically advanced equipment into the existing footprint of the filter plant. Upgrading the system within the existing plant footprint would not impact the existing ASCA lease at the property. Proposed work will include preliminary/final design, bidding and construction of several upgraded treatment plant systems including general building rehabilitation, filter improvements, sedimentation expansion and improvements, chemical feed improvements, flocculator expansion, alum storage/containment improvements and waste sludge handling and removal improvements.

25. Crozet Water Treatment Plant Finished Water Pump Station: As noted in the above project description, the Crozet water treatment facilities will require an expansion to secure future needs of the Crozet community. The Finished Water Pump Station is the final step in the treatment and conveyance process. The Crozet Pump Station is original to the plant and has numerous design and operational impediments or challenges that severely limit its operational reliability. A new pump station at the site is required for both current and future service needs.

The project includes evaluation, permitting, design, construction and construction management.

26. Drinking Water Infrastructure Plan: The Crozet drinking water service area continues to see expanded growth, and recent discussions with Albemarle County and Albemarle County Service Authority (ACSA) personnel have confirmed that recent growth trends indicate that water use demands in Crozet are on the rise. While some projects are currently underway to address the immediate needs in Crozet, RWSA staff has concluded that it is pertinent to develop a comprehensive mid and long-range plan for the entire water system, including analysis of water supply, treatment, distribution, storage and raw water conveyance. The project will evaluate and analyze all of these parameters, and develop a Drinking Water Infrastructure Plan for the Crozet Service Area's water supply and distribution needs and recommended improvements for the next 50-year design period (Year 2070).

## Crozet Water System

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/17)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
21	Beaver Creek Dam Alteration	\$6,071,000	\$8,859,000	\$294,886	\$660,000	\$970,000	\$2,162,000	\$8,584,000	\$2,259,114	\$14,930,000	\$133,886
22	Buck's Elbow & Crozet Waterball Tank Painting	\$1,200,000			\$60,000	\$995,000	\$145,000			\$1,200,000	
23	Crozet Water GAC and Water Treatment Improvements	\$3,418,390		\$3,418,390						\$3,418,390	\$2,665,401
24	Crozet Water Treatment Plant Expansion	\$250,000	\$6,650,000	\$528,819	\$3,280,000	\$3,091,181				\$6,900,000	\$90,419
25	Crozet Water Treatment Plant - Finished Water Pump Station	\$2,600,000		\$2,542,000	\$58,000					\$2,600,000	\$395,663
26	Drinking Water Infrastructure Plan	\$300,000		\$274,000	\$26,000					\$300,000	
	<b>TOTAL</b>	<b>\$13,839,390</b>	<b>\$15,509,000</b>	<b>\$7,058,095</b>	<b>\$4,084,000</b>	<b>\$5,056,181</b>	<b>\$2,307,000</b>	<b>\$8,584,000</b>	<b>\$2,259,114</b>	<b>\$29,348,390</b>	<b>\$3,285,369</b>

## Scottsville Water System

The Scottsville Water System is comprised of the raw water conveyance, finished water treatment, transmission and storage infrastructure for the Town of Scottsville in southern Albemarle County. The source water for this system is the Totier Creek Intake, and the backup supply is the Totier Creek Reservoir, which was built in 1971 with a current useable capacity of 182 million gallons. Raw water is treated at the Scottsville Water Treatment Plant (0.25 mgd rated capacity) and provides finished water to the Albemarle County Service Authority. The system includes the Scottsville Storage Tank (0.25 MG).

### Project Description:

27. Scottsville Water Granular Activated Carbon: The U.S. Environmental Protection Agency regulates maximum contaminant levels (MCL) for total trihalomethanes (THMs) and haloacetic acids (HAAs) in drinking water under the Disinfectant/Disinfection Byproducts Rule (D/DBPR). In the early 1990s Stage 1 of the rule was implemented and RWSA and ACSA are in compliance with Stage 1. Stage 2 of the D/DBPR was effective for the Scottsville distribution system in November 2014. The Stage 2 D/DBPR involved a major change in how THM and HAA levels are calculated and are more stringent than the Stage 1 requirements. After a study, it was concluded that complete compliance with the Stage 2 D/DBPR cannot consistently be met with minor modification of existing processes (water production facilities combined with ASCA distribution system) but would instead require significant capital improvements.

For the Scottsville water system, installation of granular activated carbon (GAC) contactor units was selected due to the start/stop operation of the water treatment plant and the higher water age in the distribution system. The GAC will adsorb organic matter from the water, thereby reducing the precursors to THMs and HAAs. Construction on the project started in 2016.

## Scottsville Water System

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
27	Scottsville Water Granular Activated Carbon	\$1,615,000		\$1,615,000						\$1,615,000	\$1,216,510
	<b>TOTAL</b>	\$1,615,000	\$0	\$1,615,000	\$0	\$0	\$0	\$0	\$0	\$1,615,000	\$1,216,510

## Wastewater Interceptors/Pumping Stations

The RWSA wastewater interceptors and pumping stations serve to convey wastewater from the collection systems of the City of Charlottesville and Albemarle County Service Authority to the Moores Creek Advanced Water Resource Recovery Facility (MCAWRRF). This grouping includes: the Crozet Interceptor and four associated pumping stations; the Moores Creek Interceptor and Relief Sewer; the Morey Creek, Maury Hills, Powell Creek, Meadow Creek, Schenks Branch, Woodbrook and Rivanna Interceptors; as well as the Albemarle-Berkley Interceptor and associated Albemarle Pumping Station. Also included in this system are the two primary pump stations into the MCAWRRF, the Rivanna and Moores Creek Pump Stations.

### Project Descriptions:

28. Upper Schenks Branch Interceptor: The Schenks Branch Interceptor is located in the eastern part of the City of Charlottesville and ties into the Meadowcreek Interceptor. The interceptor was constructed in the mid-1950s of 21-inch clay and concrete pipe. The existing interceptor is undersized to serve present and future wet weather flows as determined by the City, and is to be upgraded to 30-inch pipe. The Upper Schenks Branch Interceptor consists of two sections along McIntire Road. Both of these sections have been designed with the first phase of this project located in the City's Schenks Branch Greenway, completed in early 2016. The second phase of the Upper Schenks Interceptor will be replaced by RWSA in coordination with the City of Charlottesville's sewer upgrades once easement negotiations with Albemarle County are complete (or the City authorizes the second phase project be constructed under McIntire Road). Project costs include design, permitting, easement acquisition, construction, construction observation/administration by the engineering consultant; and project contingencies.
29. Interceptor Sewer and Manhole Repair: This project is used to conduct assessment of various interceptors as well as rehabilitation of interceptors that do not have a separate CIP project. Planned projects include condition assessments and assumed rehabilitation of the Morey Creek Interceptor and Powell Creek Interceptor as well as rehabilitation efforts identified for the Moores Creek Interceptor and the Moores Creek Relief Interceptor that have been identified from previous condition assessment efforts. A sewer rehabilitation contract has been developed under this project as well which will procure a dedicated contractor for all rehabilitation work. This project will also provide an allowance in budgeted funds to carry out future repairs. The intent of this project is to complete a condition assessment of all RWSA interceptors (except those replaced during the period with new pipe) and perform as-needed rehabilitation work by the end of 2020. Such periodic assessments of all sewer pipe reflects industry best practices and the maintenance expectations of federal and state regulators as a part of avoiding sanitary sewer overflows.
30. Crozet Interceptor Sewer and Manhole Repairs: The Crozet Interceptor is located in western Albemarle County and serves the Crozet area. Flow metering indicated that the interceptor experienced substantial inflow and infiltration and requires rehabilitation. In order to minimize future infrastructure improvements, ACSA and RWSA have agreed to aggressively rehabilitate this interceptor and the sewers that flow to the interceptor. The initial phase of rehabilitation to repair defects in manholes and pipelines contributing to the inflow and infiltration in the



interceptor upstream of Crozet Pump Station No. 4 has been completed. The current budget accounts for condition assessment work and assumed rehabilitation needs for the lower portions of the interceptor. While wet weather flows have moderately improved based on the initial phase of work, the ACSA and RWSA continue to investigate and remediate deficiencies along the entire interceptor.

31. Crozet Flow Equalization Tank: Rehabilitation work in the RWSA and ACSA sewer systems is on-going to meet the I&I reduction goals in the Crozet Interceptor. This is based on the flow metering and modeling results of the Comprehensive Sanitary Sewer Model & Study conducted in 2006 and as part of the Crozet Interceptor CIP project. The results of the 2006 study were updated in 2016 to evaluate I/I reduction goals and future capital project needs. The need to proceed with construction of a flow equalization tank in the Crozet area was confirmed as a result of this study update, which will take into account recent flow monitoring data that had been collected following previous I/I reduction efforts. Based on those results, a preliminary engineering evaluation of a flow equalization tank upstream of Crozet Pump Station No. 4 has begun. Progressing into the preliminary engineering phase of the flow equalization tank is necessary to ensure that the facility can be sited, designed, permitted, constructed and ready for operation by 2020 in order to meet the two-year storm flow targets. The budget for this project includes estimates for the preliminary engineering, final design, property acquisition, legal assistance, construction costs and construction management services.
32. Crozet Interceptor Pump Station Bypass Isolation Valves: There are four pump stations located in the Crozet Interceptor system that help convey the flow from the Crozet area into the Morey Creek Interceptor and the rest of the urban collection system. These pump stations were constructed in the 1980s and provided no means of isolating each pump station from its downstream force main. This condition complicates maintenance-related activities as each time a pump station component needs to be serviced or replaced, the volume of wastewater within the force main must be addressed at the pump station as it drains back to the wet well. In addition, the Crozet Interceptor Pump Stations also have limited storage within their wet wells, and any reduction of down time as a result of dealing with the impacts of no isolation valves, decreases the amount of time available to work on the equipment. In order to alleviate this condition, temporary valves called “line stops” will be temporarily installed on the force mains downstream of the pump stations to allow enough time for a new isolation valve to be installed. This isolation valve location will provide the maximum amount of down time available based on current system conditions for future pump station maintenance activities. While line stops are in place, bypass connections will also be provided at each pump station. These will allow staff the option of bringing in bypass pumps for more significant pump station shutdowns required for maintenance activities or repairs that the isolation valves alone cannot account for. Design services for this project were initiated in August 2017 with completion of construction anticipated for summer 2018.
33. Maury Hill Branch Sewer Upgrade: Based on the sewer study performed by Greeley and Hansen in 2016, the Maury Hill Branch Sewer was targeted for capacity upgrades around 2020. This project would include an upgrade from 8-inch diameter sewer to 12-inch diameter sewer

along with all new manholes. Moving forward with this project would supersede other anticipated rehabilitation work on this interceptor that would be necessary otherwise.

34. Crozet Interceptor Pump Station Rehabilitation: The Crozet Interceptor Pump Stations were constructed in the 1980's and many of the components are still original. This project would include the replacement of pumps and valves at Pump Station 2 in order to improve pumping capabilities at this location and provide spare parts for the pumps at Pump Station 1. It would also include roof replacements at all four pump stations, siding replacement for the wet well enclosure at Pump Station 3, and installation of a new water well at Pump Station 3.

## Urban Wastewater Interceptors/Pumping Stations

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
28	Upper Schenks Branch Interceptor	\$6,667,935	(\$2,182,935)	\$20,000		\$128,000	\$3,515,000	\$822,000		\$4,485,000	
29	Interceptor Sewer and Manhole Repair	\$1,337,389	\$603,611	\$496,330	\$592,000	\$695,000	\$157,670			\$1,941,000	\$124,330
30	Crozet Interceptor Sewer and Manhole Repairs	\$625,000		\$252,615	\$142,000	\$230,385				\$625,000	\$180,715
31	Crozet Flow Equalization Tank	\$3,745,000	(\$445,000)	\$238,000	\$1,062,000	\$2,000,000				\$3,300,000	\$37,356
32	Crozet Interceptor Pump Stations Bypass Isolation Valves	\$720,000		\$604,000	\$116,000					\$720,000	
33	Maury Hill Branch Sewer Replacement		\$285,000						\$285,000	\$285,000	
34	Crozet Interceptor Pump Station Rehabilitation		\$525,000		\$275,000				\$250,000	\$525,000	
	<b>TOTAL</b>	<b>\$13,095,324</b>	<b>(\$1,214,324)</b>	<b>\$1,610,945</b>	<b>\$2,187,000</b>	<b>\$3,053,385</b>	<b>\$3,672,670</b>	<b>\$822,000</b>	<b>\$535,000</b>	<b>\$11,881,000</b>	<b>\$342,401</b>

## **Moores Creek Advanced Water Resource Recovery Facility**

The Moores Creek Advanced Water Resource Recovery Facility (MCAWRRF) is the largest wastewater treatment facility within the RWSA system. The plant was originally constructed in 1958 and upgraded and expanded in 1981 and 1982, and currently has a rated capacity of 15 mgd. From 2009 thru 2012 the facility was upgraded to provide enhanced nutrient removal, and increased wet weather pumping and treatment capacity. This site includes the infrastructure for the wastewater treatment process as well as the RWSA administration facilities.

### **Project Descriptions:**

35. Bridge Repairs: The bridge crossing Moores Creek located at the Advanced Water Resource Recovery Facility was constructed in the early 1980s. In late 2011, staff commissioned a detailed inspection of the bridge. The inspection results indicated that the bridge was in good condition, but required maintenance repairs to assure continued safe operation. This work includes sealing the expansion joints, scupper installation to drain the bridge deck, repairs to the steel plate girders and their bearings, catwalk and steel corrosion repair and repainting, and minor concrete repair. This work will be completed by the spring of 2018 in conjunction with the Moores Creek Odor Control Improvements project.
  
36. Odor Control Phase 2: As part of the implementation of the next phase of the 2007 Odor Control Master Plan at the MCAWRRF, operations audits were performed, liquid and vapor phase sampling was conducted, and a computerized dispersion model was developed from 2013 to 2014. Recommendations for odor control improvements that would significantly control odors from traveling beyond the MCAWRRF fence line were presented to the RWSA Board of Directors in December 2014 and the CIP project for \$9.33M was approved at the January 2015 Meeting. The budget was later increased to \$9.85M. The final design for odor control improvements includes covering the head works and screening channels, installing grit facilities, constructing a bypass line through one equalization basin, covering the primary clarifiers, building additional odor scrubbing facilities to treat the foul air from the covered sources, removing the post-digestion clarifiers from service, modifying the handling, hauling and storage of bio solids, cleaning the equalization basins and holding ponds, and coating the interior of the digesters. The design for the Odor Control Improvements Project was completed in November 2015. An award of construction contract and associated engineering construction administration and inspection occurred in April 2016. Construction of the Odor Control project has been very challenging with many change orders needed to address unforeseen circumstances, and therefore, additional funding has been requested for contingency funding. Final project completion is expected in spring 2018. The digester coating project was bid in August 2017 and the bids were much higher than anticipated, accounting for an additional project need in excess of \$1M. The basin cleaning project will be managed by RWSA staff through a separate contract anticipated in summer 2018.
  
37. Roof Replacements: The majority of the buildings at the Moores Creek Advanced Water Resource Recovery Facility were constructed in 1981 and 1982 during a major expansion of the existing treatment plant. All buildings constructed at that time were built with a metal roof system. In 2014, deficiencies were identified in the roof at the Administration Building and

the roof was replaced. The materials of the original roof at the Administration Building are the same as the roof material on the other buildings. Likewise, many of the buildings have started to experience leaks and structural deficiencies. As a result, the purpose of this project is to replace the roof systems at the following buildings at the Moores Creek AWRRF: Blower Building, Moores Creek Pump Station, Sludge Pump Station No. 2, Maintenance Building 1, and Maintenance Building 2, Sludge Pumping Building, Primary Pump Building, and the Effluent Pump Building. Design of these improvements began in March 2017 with completion of construction anticipated for May 2018.

38. Second Centrifuge: The Moores Creek AWRRF currently operates a high-speed centrifuge to process and dewater digested bio solids from the treatment process. The centrifuge was constructed during the 2009-2012 Nutrient Upgrade project and served to replace an older plate and frame filter press operation (which was removed during installation of the centrifuge), with a second plate and frame press serving as backup. An evaluation of the remaining filter press concluded that extensive repairs would be required to maintain this as a backup dewatering system and the repairs would not be cost-effective as purchasing a second centrifuge. Without the utility of the second press the facility does not have a redundant process, and thus during planned or emergency outages a portable back-up unit must be rented or leased. A second centrifuge will allow for continued bio solids dewatering during planned or emergency repairs to one of the two centrifuges, for higher-rate processing by operating both units simultaneously during other periods (thus saving on staff time), and for better maintenance of proper solids flow through the plant.
39. Engineering and Administration Building: RWSA currently has its administrative headquarters in two buildings on the grounds of the Moores Creek Advanced Water Resource Recovery Facility. The two-story Administration Building was constructed in the early 1980's and houses offices, IT server space, meeting space and a full service laboratory. The second building is a series of four trailers installed in between 2003-2010 that house the engineering department. The Administration building is located at the head of the wastewater treatment plant and is surrounded by underground piping and process functions that may conflict with existing parking and/or the building in a future plant expansion. There is currently a need to house additional staff; increase office and meeting space; plan for the replacement of the trailers; bring the IT server workrooms to modern standards; provide classroom space for education outreach. Staff is procuring a consultant to perform a space needs analysis and provide recommendations on how to address future building needs.
40. Digester Sludge Storage Improvements: With the second centrifuge installation almost complete, additional capacity for storage of digested sludge would provide the Authority operational flexibility it does not currently have. Additionally, the sole sludge storage tank at the MCAWRRF was constructed in 1959 of reinforced concrete and is in need of repairs. This project would convert one of the three existing anaerobic digesters into a sludge storage tank through piping modifications, and would provide redundancy to the existing sludge storage tank so it can be removed from service, cleaned, inspected, and repaired with minimal impact to the existing sludge dewatering operations. The piping configuration would also allow flexibility for the anaerobic digester to be used as either an anaerobic digester or sludge storage tank as needed for operations. The scope of work would include piping modifications,

hydraulic improvements, tank safety improvements such as handrail and lights, and structural improvements to the existing sludge storage tank roof.

41. Aluminum Slide Gate Replacement: Several large aluminum slide gates are located at the influent side of the Moores Creek Pump Station. These gates allow staff to stop or divert flow to perform maintenance activities. After repeated attempts to access and repair the gates, it is now necessary to replace and modify the gate arrangement. The replacement includes new gates for greater flexibility and resiliency as well as significant flow bypass pumping. Likewise there are several gates at the Ultraviolet disinfection facility that leak water, causing a reduced capacity of the facility. Replacement of these gates will restore the process to full capacity.
42. Moores Creek AWRRF Master Plan: The majority of the Moores Creek Water Resource Recovery Facility was constructed in the early 1980's. At the time, the plant layout was develop with space held open for future process expansion. With the Enhanced Nutrient Removal (ENR) project in 2009, the operation and layout of the plant was fundamentally altered, as needed to meet the new regulation. The project did anticipate the need for future expansion and some of the processes have readily available space. However, a full expansion plan was not developed at the time. As identified in the 2107 Strategic Plan, the Authority has a goal to plan, deliver and maintain dependable infrastructure in a financially responsible manner. Staff has identified asset master planning as a priority strategy to improve overall system development. As such, this project will serve to evaluate and plan for future space and process needs to accommodate capacity expansion and/or anticipated regulatory changes.
43. Mechanical Thickener: During the design of the Moores Creek AWRRF Phase 2 Odor Control project, the consultants conducted a detailed evaluation of all facility odor sources. One of the key sources identified, was the post-digestion clarifiers. These clarifiers are two round open-topped tanks of digested wastewater sludge, located on the north side of the plant. During the ENR upgrade, the characteristics of the post-aeration sludge changed. This change has led to less predictable sludge handing through the existing gravity thickeners. This change in the post-aeration sludge characteristics has made obtaining a clear thickener overflow more difficult without chemical addition. Removing the post-digestion clarifiers from service combined with solids carryover from the existing gravity thickeners create a number of downstream consequences in primary clarification, sludge digestion and solids dewatering. Removing these facilities from service reduces the sludge thickness and therefore the plant's ability to adequately process it. This project includes the design and installation of a mechanical thickener prior to digestion that will increase plant solids processing reliability and capacity.
44. Radio Upgrades: The regional 800 MHz Public Safety Communication System, in which the Rivanna Water and Sewer Authority participates to provide internal and emergency radio communication, is expected to reach the end of its service life in 2018. Because of technology changes (software and hardware) the Charlottesville-UVA-Albemarle County Emergency Communications Center (ECC) will need to upgrade or replace the system to keep it useable. This project plans for the upgrade or replacement of major technology components and equipment of the existing system include: electronic components at all tower sites and the

prime site at the ECC facility; new console equipment at the regional ECC; equipment such as tower site generators and UPS systems; an additional tower site (to improve service in southern Albemarle County); microwave backbone; and replacement of the system recording facilities. The project will take 24 months to complete and will be completed in Fiscal Year 2018. RWSA is being apportioned a part of the \$18.8M project cost proportionately based on the number of radios (2.4% of the total project cost). In addition to this assessment from the ECC, the Authority will also be required to undertake programming upgrades to its fleet of stationary, mobile, and portable radios.

## Moores Creek Advanced Water Resource Recovery Facility

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
35	Bridge Repairs	\$330,000		\$330,000						\$330,000	\$37,391
36	Odor Control Phase 2	\$10,108,000	\$1,016,151	\$10,108,000	\$1,016,151					\$11,124,151	\$6,669,061
37	Roof Replacements	\$1,264,000		\$1,264,000						\$1,264,000	\$61,492
38	Second Centrifuge	\$1,290,000		\$1,290,000						\$1,290,000	\$172,974
39	Engineering and Administration Building		\$3,000,000			\$65,000	\$60,000	\$1,375,000	\$1,500,000	\$3,000,000	
40	Digester Sludge Storage Improvements		\$265,000		\$265,000					\$265,000	
41	Aluminum Slide Gate Replacements		\$470,000		\$470,000					\$470,000	
42	Moores Creek AWWRF Master Plan		\$100,000			\$50,000	\$50,000			\$100,000	
43	Mechanical Thickener		\$1,200,000			\$100,000	\$1,100,000			\$1,200,000	
44	Radio Upgrades	\$521,000		\$521,000						\$521,000	\$3,567
	<b>TOTAL</b>	<b>\$13,513,000</b>	<b>\$6,051,151</b>	<b>\$13,513,000</b>	<b>\$1,751,151</b>	<b>\$215,000</b>	<b>\$1,210,000</b>	<b>\$1,375,000</b>	<b>\$1,500,000</b>	<b>\$19,564,151</b>	<b>\$6,944,485</b>



## **Scottsville Wastewater System**

The Scottsville Wastewater System includes the influent pumping station, the water resource recovery facility constructed in 1983, and the historical treatment lagoon (now incorporated into the plant operation). The water resource recovery facility has a rated capacity of 0.2 mgd.

### **Project Descriptions:**

45. Grinder and Air Control Improvements: Currently the influent raw water pump station does not have a means to prevent large material from impacting the pumps, resulting in frequent clogging and maintenance. The space within the pump station is very limited and therefore does not allow for screening. This project will design and install an inline grinder within the influent pump channel. In addition, this project will evaluate methods to automate air control for the biological treatment process. The current method of air control produces inconsistent results, adversely impacting treatment and operations.

## Scottsville Water Resource Recovery Facility

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
45	Grinder and Air Control Improvements		\$100,000			\$30,000	\$70,000			\$100,000	
	TOTAL	\$0	\$100,000	\$0	\$0	\$30,000	\$70,000	\$0	\$0	\$100,000	\$0

## **Glenmore Wastewater System**

The 0.381-mgd water resource recovery facility, located within the Glenmore subdivision, is operated by RWSA. The facility includes an influent pumping station located immediately adjacent to the treatment facility.

### **Project Descriptions:**

46. Influent Pump & VFD Addition: The Glenmore WRRF is predicted to see additional dry and wet weather flows as construction within the service area continues. Future wet weather flows will require higher influent pumping capacity and an additional pump and electrical variable frequency drive will be required to maintain firm capacity.
47. Secondary Clarifier Coating: The secondary clarifiers at the Glenmore facility were painted over 10-years ago. The clarifier environment is a particularly harsh environment subject to corrosive gasses, grit abrasion and mechanical wear. Based on observations by operations staff, the coating system is in need of replacement to prevent deterioration and failure of the underlying metal superstructure. This project includes the cleaning and full coating of the clarifier.

## Glenmore Water Resource Recovery Facility

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
46	Influent Pump & VFD Addition	\$61,000					\$61,000			\$61,000	
47	Secondary Clarifier Coating		\$50,000		\$25,000	\$25,000				\$50,000	
	<b>TOTAL</b>	\$61,000	\$50,000	\$0	\$25,000	\$25,000	\$61,000	\$0	\$0	\$111,000	\$0

## All Systems

### Project Descriptions:

48. Information Technology Enhancement (Asset Management): Asset management is the practice of managing our infrastructure to minimize the total cost of owning and operating these assets while providing desired service levels. In doing so, it is used to make sure planned maintenance activities take place and that capital assets are replaced, repaired or upgraded at the right time, while ensuring that the money necessary to perform those activities is available. The Rivanna Water and Sewer Authority (RWSA) has some components of an asset management program in place (i.e. GIS, work order system), but has identified the need to further develop the program as part of our Strategic Planning process. In order to continue to build the program, a consultant will be procured to assist with a three-phase process that will include facilitation and development of an asset management strategic plan, development and management of a pilot study where the results of the strategic plan will be applied to a specific class of assets, and assistance through a full implementation process. As part of this three-phase process, the consultant will also assist RWSA with the procurement of a software package to facilitate the overall program.
  
49. Security Enhancements: As required by the federal Bioterrorism Act of 2002, water utilities must conduct vulnerability assessments (VA) and have emergency response plans. Rivanna Water and Sewer Authority (RWSA) recently completed a VA of our water system in collaboration with other regional partners and identified a number of security improvements that could be applied to both our water system and our wastewater system. The purpose of this project will be to install security improvements at RWSA facilities including additional security gate and fencing components, vehicle bollards, facility signage, camera system enhancements, additional security lighting, intrusion detection systems, door and window hardening, installation of industrial strength locks, communication technology and cable hardening, and an enhanced access control program.

## All Systems

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
48	Information Technology Enhancement (Asset Management)		\$500,000	\$50,000	\$250,000	\$200,000				\$500,000	
49	Security Enhancements		\$2,400,000		\$170,000	\$1,120,000	\$1,110,000			\$2,400,000	
	TOTAL	\$0	\$2,900,000	\$50,000	\$420,000	\$1,320,000	\$1,110,000	\$0	\$0	\$2,900,000	\$0

**APPENDICES**

**CIP Financial Summary**

**Water System Summary**

**Wastewater System Summary**

## CIP Financial Summary

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
1	South Rivanna Reservoir to Ragged Mountain Reservoir	\$2,295,000		\$565,249	\$275,000	\$870,000	\$584,751			\$2,295,000	\$25,249
2	Rivanna Reservoir Dredging	\$137,558	(\$127,558)				\$10,000			\$10,000	
3	Ragged Mountain Reservoir to Observatory Water		\$4,116,000				\$426,000	\$1,453,000	\$2,237,000	\$4,116,000	
4	Ragged Mountain Reservoir to Observatory Raw Water		\$2,410,000				\$400,000	\$400,000	\$1,610,000	\$2,410,000	
5	Observatory Water Treatment Plant Improvements	\$10,000,000	\$8,630,000	\$1,207,198	\$1,441,000	\$3,655,000	\$8,459,000	\$3,867,802		\$18,630,000	\$1,042,198
6	Interconnect Lower Sugar Hollow and Ragged Mountain Raw	\$225,000	\$106,000	\$91,000	\$240,000					\$331,000	
7	Sugar Hollow to Ragged Mountain Reservoir Transfer Flow Meter	\$150,000	\$165,000	\$181,000	\$134,000					\$315,000	
8	Sugar Hollow Dam - Rubber Crest Gate Replacement & Intake	\$940,000			\$55,000	\$473,000	\$412,000			\$940,000	
9	Rt. 29 Pump Station Site Acquisition	\$1,220,000		\$1,220,000						\$1,220,000	\$466,416
10	Valve Repair - Replacement (Phase 2)	\$500,000		\$250,000	\$250,000					\$500,000	
11	Urban Water Granular Activated Carbon and Water Treatment	\$24,925,494		\$24,925,494						\$24,925,494	\$18,292,018
12	Wholesale Water Master Metering	\$3,600,000	(\$400,000)	\$3,200,000						\$3,200,000	\$2,270,371
13	Piney Mountain Tank Rehabilitation	\$500,000		\$280,000	\$220,000					\$500,000	



## CIP Financial Summary (Continued)

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
14	Avon to Pantops Water Main	\$5,500,000	\$7,700,000	\$175,000	\$1,200,000	\$1,800,000	\$5,400,000	\$4,625,000		\$13,200,000	
15	Water Demand Projection and Safe Yield Study		\$100,000		\$100,000					\$100,000	
16	South Fork Rivanna River Crossing and North Rivanna		\$5,340,000				\$843,000	\$3,930,000	\$567,000	\$5,340,000	
17	Rt. 29 / Airport Road Pump Station		\$2,300,000			\$201,000	\$1,824,000	\$275,000		\$2,300,000	
18	Finished Water System Master Plan		\$150,000						\$150,000	\$150,000	
19	South Fork Rivanna Hydropower Plant Decommissioning	\$1,000,000	(\$600,000)	\$167,332	\$232,668					\$400,000	\$82,332
20	South Fork Water Treatment Plan Improvements	\$5,430,442	\$2,069,558	\$135,000	\$459,000	\$2,411,000	\$4,398,000	\$97,000		\$7,500,000	
21	Beaver Creek Dam Alteration	\$6,071,000	\$8,859,000	\$294,886	\$660,000	\$970,000	\$2,162,000	\$8,584,000	\$2,259,114	\$14,930,000	\$133,886
22	Buck's Elbow Tank & Crozet Waterball Painting	\$1,200,000			\$60,000	\$995,000	\$145,000			\$1,200,000	
23	Crozet Water GAC and Water Treatment Improvements	\$3,418,390		\$3,418,390						\$3,418,390	\$2,665,401
24	Crozet Water Treatment Plant Expansion	\$250,000	\$6,650,000	\$528,819	\$3,280,000	\$3,091,181				\$6,900,000	\$90,419
25	Crozet Water Treatment Plant Finished Water Pump Station	\$2,600,000		\$2,542,000	\$58,000					\$2,600,000	\$395,663

## CIP Financial Summary (Continued)

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
26	Drinking Water Infrastructure Plan	\$300,000		\$274,000	\$26,000					\$300,000	
27	Scottsville Water Granular Activated Carbon	1,615,000		1,615,000						1,615,000	1,216,510
28	Upper Schenks Branch Interceptor	\$6,667,935	(\$2,182,935)	\$20,000		\$128,000	\$3,515,000	\$822,000		\$4,485,000	
29	Interceptor Sewer and Manhole Repair	\$1,337,389	\$603,611	\$496,330	\$592,000	\$695,000	\$157,670			\$1,941,000	\$124,330
30	Crozet Interceptor Sewer and Manhole Repairs	\$625,000		\$252,615	\$142,000	\$230,385				\$625,000	\$180,715
31	Crozet Flow Equalization Tank	\$3,745,000	(\$445,000)	\$238,000	\$1,062,000	\$2,000,000				\$3,300,000	\$37,356
32	Crozet Interceptor Pump Station Bypass Isolation Valves	\$720,000		\$604,000	\$116,000					\$720,000	
33	Maury Hill Branch Sewer Replacement		\$285,000						\$285,000	\$285,000	
34	Crozet Interceptor Pump Station Rebuilds		\$525,000		\$275,000				\$250,000	\$525,000	
35	Bridge Repairs	\$330,000		\$330,000						\$330,000	\$37,391
36	Moore's Creek AWWRF Odor Control Phase 2	\$10,108,000	\$1,016,151	\$10,108,000	\$1,016,151					\$11,124,151	\$6,669,061
37	Moore's Creek AWWRF Roof Replacements	\$1,264,000		\$1,264,000						\$1,264,000	\$61,492

## CIP Financial Summary (Continued)

Proj. No.	Project Description	Five-Year Capital Program			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress (Prev. Expenses 6/30/2017)
		Current CIP Adopted 3/2017	Proposed Changes	Current Capital Budget	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023		
38	Moores Creek AWRRF Second Centrifuge	\$1,290,000		\$1,290,000						\$1,290,000	\$172,974
39	Engineering and Administration Building		\$3,000,000			\$65,000	\$60,000	\$1,375,000	\$1,500,000	\$3,000,000	
40	Digester Sludge Improvements		\$265,000		\$265,000					\$265,000	
41	Aluminum Slide Gate Replacements		\$470,000		\$470,000					\$470,000	
42	MCAWRRF Master Plan		\$100,000			\$50,000	\$50,000			\$100,000	
43	Mechanical Thickener		\$1,200,000			\$100,000	\$1,100,000			\$1,200,000	
44	Radio Upgrades	\$521,000		\$521,000						\$521,000	\$3,567
45	Grinder and Air Control Improvements		\$100,000			\$30,000	\$70,000			\$100,000	
46	Influent Pump & VFD Addition	\$61,000					\$61,000			\$61,000	
47	Secondary Clarifier Coating		\$50,000		\$25,000	\$25,000				\$50,000	
48	Information Technology Enhancement (Asset Management)		\$500,000	\$50,000	\$250,000	\$200,000				\$500,000	
49	Security Enhancements		\$2,400,000		\$170,000	\$1,120,000	\$1,110,000			\$2,400,000	
<b>Total</b>		\$98,547,208	\$55,354,827	\$56,244,313	\$12,973,819	\$19,109,566	\$31,287,421	\$25,428,802	\$8,858,114	\$153,902,035	\$33,967,349

# Water System Summary

Urban Water System	Summary		Current Capital Budget	Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes		FY19	FY20	FY21	FY22	FY23		
<b>PROJECT COSTS</b>										
Community Water Supply Plan	\$ 2,432,558	\$ 6,398,442	\$ 565,249	\$ 275,000	\$ 870,000	\$ 1,420,751	\$ 1,853,000	\$ 3,847,000	\$ 8,831,000	\$ 25,249
Observatory WTP/Ragged Mtn/Sugar Hollow Systems	11,600,000	8,616,000	1,479,198	1,870,000	4,128,000	8,871,000	3,867,802	-	20,216,000	1,042,198
Finished Water Storage/Distribution - Urban System	39,745,494	11,690,000	30,050,494	1,670,000	2,001,000	8,167,000	8,830,000	717,000	51,435,494	21,028,805
South & North Fork Rivanna WTP and Reservoir System	7,051,442	848,558	302,332	691,668	2,411,000	4,398,000	97,000	-	7,900,000	82,332
Security & Asset Management	-	1,450,000	25,000	210,000	660,000	555,000	-	-	1,450,000	-
<b>Total Projects Urban Water Systems</b>	<b>\$ 60,829,494</b>	<b>\$ 29,003,000</b>	<b>\$ 32,422,273</b>	<b>\$ 4,716,668</b>	<b>\$ 10,070,000</b>	<b>\$ 23,411,751</b>	<b>\$ 14,647,802</b>	<b>\$ 4,564,000</b>	<b>\$ 89,832,494</b>	<b>\$ 22,178,584</b>
Completed or Closed Projects	\$ (4,406,000)	\$ (4,406,000)								
<b>Adjusted</b>	<b>\$ 56,423,494</b>	<b>\$ 33,409,000</b>								
<b>FUNDING SOURCES URBAN SYSTEM - TO DATE</b>										
Work-in-Progress			\$ 22,178,584	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 22,178,584	
Debt Proceeds Available 2015B			6,363,105						6,363,105	
Capital Cash Fund Designated			3,880,584						3,880,584	
<b>SUBTOTAL</b>			<b>32,422,273</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>32,422,273</b>	
<b>FUNDING SOURCES URBAN SYSTEM - NEEDS</b>										
Future Cash reserve transfer to Capital Fund				\$ 1,000,000	\$ 1,000,000	\$ 250,000	\$ -	\$ -	\$ 2,250,000	
New Debt Needed			-	3,716,668	9,070,000	23,161,751	14,647,802	4,564,000	55,160,221	
<b>SUBTOTAL</b>			<b>-</b>	<b>4,716,668</b>	<b>10,070,000</b>	<b>23,411,751</b>	<b>14,647,802</b>	<b>4,564,000</b>	<b>57,410,221</b>	
<b>TOTAL URBAN WATER FUNDING</b>			<b>\$ 32,422,273</b>	<b>\$ 4,716,668</b>	<b>\$ 10,070,000</b>	<b>\$ 23,411,751</b>	<b>\$ 14,647,802</b>	<b>\$ 4,564,000</b>	<b>\$ 89,832,494</b>	
<b>Estimated Bond Issues</b>					<b>\$12,786,700</b>		<b>\$42,373,600</b>			

Non-Urban Water System	Summary		Current Capital Budget	Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes		FY19	FY20	FY21	FY22	FY23		
<b>PROJECT COSTS</b>										
Crozet Water System	\$ 14,296,890	\$ 15,051,500	\$ 7,058,095	\$ 4,084,000	\$ 5,056,181	\$ 2,307,000	\$ 8,584,000	\$ 2,259,114	\$ 29,348,390	\$ 3,285,369
Scottsville Water System	1,715,000	(100,000)	1,615,000	-	-	-	-	-	1,615,000	1,216,510
<b>Total Rural Water Systems</b>	<b>\$ 16,011,890</b>	<b>\$ 14,951,500</b>	<b>\$ 8,673,095</b>	<b>\$ 4,084,000</b>	<b>\$ 5,056,181</b>	<b>\$ 2,307,000</b>	<b>\$ 8,584,000</b>	<b>\$ 2,259,114</b>	<b>\$ 30,963,390</b>	<b>\$ 4,501,879</b>
Completed or Closed Projects	\$ (557,500)	\$ (557,500)								
<b>Adjusted Current CIP</b>	<b>\$ 15,454,390</b>	<b>\$ 15,509,000</b>								
<b>Non-URBAN FUNDING SOURCES</b>										
Work in Progress			\$ 4,502,000	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 4,502,000	
Debt Proceeds 2012A/2015A Bond			1,269,200						1,269,200	
Future Cash reserve transfer to Capital Fund			-	400,000					400,000	
New Debt Needed			2,901,895	3,684,000	5,056,181	2,307,000	8,584,000	2,259,114	24,792,190	
<b>TOTAL NON-URBAN WATER FUNDING</b>			<b>\$ 8,673,095</b>	<b>\$ 4,084,000</b>	<b>\$ 5,056,181</b>	<b>\$ 2,307,000</b>	<b>\$ 8,584,000</b>	<b>\$ 2,259,114</b>	<b>\$ 30,963,390</b>	
<b>Estimated Bond Issues</b>				<b>\$11,642,100</b>			<b>\$13,150,100</b>			

## Wastewater System Summary

Urban Wastewater System	Summary			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes	Current Capital Budget	FY19	FY20	FY21	FY22	FY23		
<b>PROJECT COSTS</b>										
Wastewater Interceptor/Pumping Stations	\$ 45,370,324	\$ (33,489,324)	\$ 1,610,945	\$ 2,187,000	\$ 3,053,385	\$ 3,672,670	\$ 822,000	\$ 535,000	\$ 11,881,000	\$ 342,401
Moore's Creek WWTP	13,597,746	5,966,405	13,513,000	1,751,151	215,000	1,210,000	1,375,000	1,500,000	19,564,151	6,944,485
Security & Asset Management	-	1,450,000	25,000	210,000	660,000	555,000	-	-	1,450,000	-
<b>Total Urban Wastewater Systems</b>	<b>\$ 58,968,070</b>	<b>\$ (26,072,919)</b>	<b>\$ 15,148,945</b>	<b>\$ 4,148,151</b>	<b>\$ 3,928,385</b>	<b>\$ 5,437,670</b>	<b>\$ 2,197,000</b>	<b>\$ 2,035,000</b>	<b>\$ 32,895,151</b>	<b>\$ 7,286,886</b>
Completed or Closed Projects	\$ (32,359,746)	\$ (32,359,746)								
<b>Adjusted Current CIP</b>	<b>\$ 26,608,324</b>	<b>\$ 6,286,827</b>								
<b>FUNDING SOURCES URBAN SYSTEM - IN PLACE</b>										
Work-in-Progress			\$ 7,286,886	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 7,286,886	
Debt Proceeds - 2016			3,598,000	-	-	-	-	-	3,598,000	
Capital Cash on hand			3,822,000	-	-	-	-	-	3,822,000	
<b>SUBTOTAL</b>			<b>14,706,886</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>14,706,886</b>	
<b>FUNDING SOURCES URBAN SYSTEM - NEEDS</b>										
Future Cash Reserves			\$ -	\$ 750,000	\$ 500,000	\$ -	\$ -	\$ -	\$ 1,250,000	
New Debt Needed			442,059	\$ 3,398,151	3,428,385	5,437,670	2,197,000	2,035,000	16,938,265	
<b>SUBTOTAL</b>			<b>442,059</b>	<b>\$ 4,148,151</b>	<b>3,928,385</b>	<b>5,437,670</b>	<b>2,197,000</b>	<b>2,035,000</b>	<b>18,188,265</b>	
<b>TOTAL URBAN WASTEWATER FUNDING</b>			<b>\$ 15,148,945</b>	<b>\$ 4,148,151</b>	<b>\$ 3,928,385</b>	<b>\$ 5,437,670</b>	<b>\$ 2,197,000</b>	<b>\$ 2,035,000</b>	<b>\$ 32,895,151</b>	
<b>Estimated Bond Issues</b>					<b>\$ 7,268,600</b>		<b>\$ 9,669,700</b>			

52

Non-Urban Wastewater System	Summary			Projected Future Expenses by Year					Recommended CIP	Work-in-Progress
	Current CIP	Proposed Changes	Current Capital Budget	FY19	FY20	FY21	FY22	FY23		
<b>PROJECT COSTS</b>										
Glenmore WWTP	\$ 61,000	\$ 50,000	\$ -	\$ 25,000	\$ 25,000	\$ 61,000	\$ -	\$ -	\$ 111,000	\$ -
Scottsville WWTP	-	100,000	-	-	30,000	70,000	-	-	100,000	-
<b>Total Rural Wastewater Systems</b>	<b>\$ 61,000</b>	<b>\$ 150,000</b>	<b>\$ -</b>	<b>\$ 25,000</b>	<b>\$ 55,000</b>	<b>\$ 131,000</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 211,000</b>	<b>\$ -</b>
<b>FUNDING SOURCES RURAL SYSTEM - NEEDS</b>										
Future Cash Reserve			\$ -	\$ 25,000	\$ 55,000	131,000			211,000	
<b>TOTAL RURAL WASTEWATER FUNDING</b>			<b>\$ -</b>	<b>\$ 25,000</b>	<b>\$ 55,000</b>	<b>\$ 131,000</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 211,000</b>	
<b>Estimated Bond Issues</b>			<b>\$ -</b>		<b>\$ -</b>					

	<b>2019 - 2023 Adopted <u>CIP</u></b>	<b>2017-2021 Adopted <u>CIP</u></b>	<b><u>Change \$</u></b>
<b><u>Project Cost</u></b>			
Urban Water Projects	\$ 89,832,485	\$ 60,829,494	\$ 29,002,991
Urban Wastewater Projects	32,895,150	58,968,070	(26,072,920)
Non-Urban Projects	31,174,400	16,072,890	15,101,510
<b>Total Project Cost Estimates</b>	<b><u>\$ 153,902,035</u></b>	<b><u>\$ 135,870,454</u></b>	<b><u>\$ 18,031,581</u></b>
<b><u>Funding in place</u></b>			
Work-in-Progress (paid for)	\$ 33,967,484	\$ 37,841,713	(3,874,229)
Debt Proceeds Used	11,230,305	41,251,626	(30,021,321)
Cash-Capital Available	7,702,584	9,682,421	(1,979,837)
	<u>\$ 52,900,373</u>	<u>\$ 88,775,760</u>	<u>\$ (35,875,387)</u>
<b><u>Financing Needs</u></b>			
Possible Future Reserves	\$ 4,111,000	7,830,344	(3,719,344)
New Debt	96,890,662	39,264,350	57,626,312
	<u>\$ 101,001,662</u>	<u>\$ 47,094,694</u>	<u>\$ 53,906,968</u>
<b>Total Funding</b>	<b><u>\$ 153,902,035</u></b>	<b><u>\$ 135,870,454</u></b>	<b><u>\$ 18,031,581</u></b>
Percentage of funding in place	34.4%	65.3%	
Ratio of debt to expense	92.3%	87.1%	
Ratio of cash to expense	7.7%	12.9%	

Detail by Major Systems	<b>Total Adopted CIP</b>	<b>Urban Water Projects</b>	<b>Urban Wastewater Projects</b>	<b>Water Non-Urban Projects</b>	<b>Wastewater Non-Urban Projects</b>
<b><u>Project Cost</u></b>					
Urban Water Projects	\$ 89,832,485	\$ 89,832,485	\$ -	\$ -	\$ -
Urban Wastewater Projects	32,895,150	-	32,895,150	-	-
Non-Urban Projects	31,174,400	-	-	30,963,400	211,000
<b>Total Project Cost Estimates</b>	<b>\$ 153,902,035</b>	<b>\$ 89,832,485</b>	<b>\$ 32,895,150</b>	<b>\$ 30,963,400</b>	<b>\$ 211,000</b>
<b><u>Funding in place</u></b>					
Work-in-Progress (paid for)	\$ 33,967,484	\$ 22,178,584	\$ 7,286,900	\$ 4,502,000	\$ -
Debt Proceeds available	11,230,305	6,363,105	3,598,000	1,269,200	-
Cash-Capital Available	7,702,584	3,880,584	3,822,000	-	-
	\$ 52,900,373	\$ 32,422,273	\$ 14,706,900	\$ 5,771,200	\$ -
<b><u>Financing Needs</u></b>					
Possible Future Reserves	\$ 4,111,000	2,250,000	1,250,000	400,000	211,000
New Debt	96,890,662	55,160,212	16,938,250	24,792,200	-
	\$ 101,001,662	\$ 57,410,212	\$ 18,188,250	\$ 25,192,200	\$ 211,000
<b>Total Funding</b>	<b>\$ 153,902,035</b>	<b>\$ 89,832,485</b>	<b>\$ 32,895,150</b>	<b>\$ 30,963,400</b>	<b>\$ 211,000</b>
Percentage of funding in place	34.4%	36.1%	44.7%	18.6%	0.0%
Ratio of debt to expense	92.3%	68.5%	62.4%	84.2%	0.0%
Ratio of cash to expense	7.7%	6.8%	15.4%	1.3%	100.0%

	<u>Urban Water</u>	<u>Urban Wastewater</u>	<u>Non-Urban</u>	<u>Total</u>
Current Adopted CIP 2017 - 2021	\$ 60,829,494	\$ 58,968,070	\$ 16,072,890	\$ 135,870,454
<u>Changes:</u>				
Completed or Closed Projects	(4,406,000)	(32,359,746)	(557,500)	(37,323,246)
Adjustments on existing Projects	17,543,000	(1,008,173)	15,509,000	32,043,827
New Projects	<u>15,866,000</u>	<u>5,845,000</u>	<u>1,600,000</u>	<u>23,311,000</u>
Total Changes	29,003,000	(27,522,919)	16,551,500	18,031,581
Total Adopted CIP 2019 - 2023	\$ 89,832,494	\$ 31,445,151	\$ 32,624,390	\$ 153,902,050



Rivanna Water and Sewer Authority  
 CIP 2019-2023  
 Summary Information - Adopted 6/26/2018

6/11/2018

5-YEAR CIP CHARGE ANALYSIS ESTIMATES
---

**Note - this fixed rate (charge) analysis is intended to show the effect of the draft CIP on the current adopted debt service charges. It is meant to provide a comparison of the next five years. It is not setting fixed rates for the next 5 years.**

	Annual Debt Service <u>FY 2018</u>	Current Charge Debt Service <u>FY 2018</u> <small>Per Month</small>	<u>FY 2019</u> <small>Per Month</small>	<u>FY 2020</u> <small>Per Month</small>	<u>FY 2021</u> <small>Per Month</small>	<u>FY 2022</u> <small>Per Month</small>	<u>FY 2023</u> <small>Per Month</small>	<u>Total</u> <small>Per Month</small>
<b>URBAN WATER</b>								
<b>CITY</b>								
Urban Water - Current Adopted	1,920,500	\$ 160,039						
Monthly DS Growth Charge (additional)			\$ 20,969	\$ 22,375	\$ 22,375	\$ 22,375	\$ 22,375	\$ 110,469
New Charge estimate			\$ 181,008	\$ 203,383	\$ 225,758	\$ 248,133	\$ 270,508	\$ 270,508
Annual percentage change			13.1%	12.4%	11.0%	9.9%	9.0%	
Total percentage change								69.0%
<b>ACSA</b>								
Urban Water - Current Adopted	3,425,300	\$ 285,439						
Monthly DS Growth Charge (additional)			\$ 22,159	\$ 28,000	\$ 28,000	\$ 28,000	\$ 28,000	\$ 134,159
New Rate estimate			\$ 307,598	\$ 335,598	\$ 363,598	\$ 391,598	\$ 419,598	\$ 419,598
Annual percentage change			7.8%	9.1%	8.3%	7.7%	7.2%	
Total percentage change								47.0%
<b>URBAN WASTEWATER</b>								
<b>CITY</b>								
Urban WWater - Current Adopted	4,714,100	\$ 392,841						
Monthly DS Growth Charge (additional)			\$ 15,420	\$ 20,790	\$ 12,460	\$ 12,460	\$ 12,460	\$ 73,590
New Rate estimate			\$ 408,261	\$ 429,051	\$ 441,511	\$ 453,971	\$ 466,431	\$ 466,431
Annual percentage change			3.9%	5.1%	2.9%	2.8%	2.7%	
Total percentage change								18.7%
<b>ACSA</b>								
Urban WWater - Current Adopted	2,670,600	\$ 222,550						
Monthly DS Growth Charge (additional)			\$ 23,760	\$ 20,240	\$ 10,340	\$ 10,340	\$ 10,340	\$ 75,020
New Rate estimate			\$ 246,308	\$ 266,548	\$ 276,888	\$ 287,228	\$ 297,568	\$ 297,570
Annual percentage change			10.7%	8.2%	3.9%	3.7%	3.6%	
Total percentage change								33.7%

Rivanna Water and Sewer Authority  
 CIP 2019-2023  
 Summary Information - Adopted 6/26/2018

6/11/2018

**Non-Urban Rate Impacts**

(all rates are monthly)

		<u>Current Charges</u>	<u>Monthly Increase</u>					<u>Total</u>	<u>5-Year Avg. Annual Increase</u>
			<u>FY 2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>		
Crozet Water	Operations	\$ 76,278							
	Debt Service	57,623							
		<u>\$ 133,901</u>	\$ 25,768	\$ 25,768	\$ 25,768	\$ 25,768	\$ 25,768	\$ 128,840	\$ 25,768
			19.2%	19.2%	19.2%	19.2%	19.2%	96.2%	
Scottsville Water	Operations	34,353							
	Debt Service	10,787							
		<u>\$ 45,140</u>	143	143	144	144	145	\$ 719	\$ 144
			0.3%	0.3%	0.3%	0.3%	0.3%	1.6%	
Glenmore Wastewater	Operations	29,362							
	Debt Service	132							
		<u>\$ 29,494</u>	122	\$ 122	\$ 123	\$ 123	\$ 123	\$ 613	\$ 123
			0.4%	0.1%	0.1%	0.1%	0.1%	0.5%	
Scottsville Wastewater	Operations	23,724							
	Debt Service	686							
		<u>\$ 24,410</u>	99	\$ 99	\$ 100	\$ 100	\$ 100	\$ 498	\$ 100
			0.4%	0.4%	0.4%	0.4%	0.4%	2.0%	
<b>All Non-Urban Rate Centers Monthly</b>		<u>\$ 163,717</u>							
		<u>\$ 69,228</u>							
		<u>\$ 232,945</u>	\$ 26,132	\$ 26,132	\$ 26,135	\$ 26,135	\$ 26,136	\$ 130,670	\$ 26,134
			11.2%	11.2%	11.2%	11.2%	11.2%	56.1%	11.2%

Summary of Charges - Annually							
	<u>Current FY2018</u>	<u>FY 2019</u>	<u>FY 2020</u>	<u>FY 2021</u>	<u>FY 2022</u>	<u>FY 2023</u>	<u>Total</u>
Annual Additional Revenue Needs	\$ 2,795,340	\$ 313,588	\$ 313,584	\$ 313,620	\$ 313,620	\$ 313,632	\$ 1,568,044
Total Annual Charge for Debt Service		\$ 3,108,928	\$ 3,422,512	\$ 3,736,132	\$ 4,049,752	\$ 4,363,384	\$ 4,363,384
		11.2%	10.1%	9.2%	8.4%	7.7%	56.1%

		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>City of Charlottesville</b>								
<b>Urban Water</b>								
Operating Rate	Per 1000 gal.	1.833	1.969	2.070	2.174	2.282	2.396	2.516
	% Change		7.4%	5.1%	5.0%	5.0%	5.0%	5.0%
Debt Service Charge	Per month	\$ 162,968	\$ 160,039	181,008	203,383	225,758	248,133	270,508
			-1.8%	13.1%	12.4%	11.0%	9.9%	9.0%
Revenue Requirements:								
Operating Rate Revenue	Annual	\$ 3,270,700	\$ 3,514,200	\$ 3,590,700	\$ 3,770,235	\$ 3,958,747	\$ 4,156,684	\$ 4,364,518
Debt Service Revenues	Annual	1,955,600	1,920,500	2,172,100	2,440,596	2,709,096	2,977,596	3,246,096
Total		<b>\$ 5,226,300</b>	<b>\$ 5,434,700</b>	<b>\$ 5,762,800</b>	<b>\$ 6,210,831</b>	<b>\$ 6,667,843</b>	<b>\$ 7,134,280</b>	<b>\$ 7,610,614</b>
	\$ Change		\$ 208,400	\$ 328,100	\$ 448,031	\$ 457,012	\$ 466,437	\$ 476,334
	% Change		4.0%	6.0%	7.8%	7.4%	7.0%	6.7%
<b>Urban Wastewater</b>								
Operating Rate	Per 1000 gal.	1.835	1.951	2.146	2.253	2.366	2.484	2.608
	% Change		6.3%	10.0%	5.0%	5.0%	5.0%	5.0%
Debt Service Charge	Per month	\$ 369,037	\$ 392,841	408,261	429,051	441,511	453,971	466,431
			6.5%	3.9%	5.1%	2.9%	2.8%	2.7%
Revenue Requirements:								
Operating Rate Revenue	Annual	\$ 3,267,300	\$ 3,540,600	\$ 3,678,900	\$ 3,862,845	\$ 4,055,987	\$ 4,258,787	\$ 4,471,726
Debt Service Revenues	Annual	4,428,400	4,714,100	4,899,100	5,148,612	5,298,132	5,447,652	5,597,172
Total		<b>\$ 7,695,700</b>	<b>\$ 8,254,700</b>	<b>\$ 8,578,000</b>	<b>\$ 9,011,457</b>	<b>\$ 9,354,119</b>	<b>\$ 9,706,439</b>	<b>\$ 10,068,898</b>
	\$ Change		\$ 559,000	\$ 323,300	\$ 433,457	\$ 342,662	\$ 352,319	\$ 362,459
	% Change		7.3%	3.9%	5.1%	3.8%	3.8%	3.7%
<b>Total City All Revenues</b>								
		<b>\$ 12,922,000</b>	<b>\$ 13,689,400</b>	<b>\$ 14,340,800</b>	<b>\$ 15,222,288</b>	<b>\$ 16,021,962</b>	<b>\$ 16,840,719</b>	<b>\$ 17,679,512</b>
	\$ Change		\$ 767,400	\$ 651,400	\$ 881,488	\$ 799,674	\$ 818,757	\$ 838,794
	% Change		5.9%	4.8%	6.1%	5.3%	5.1%	5.0%

		FY 2017	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>ACSA Charges From RWSA</b>								
<b>Urban Water</b>								
Operating Rate	Per 1000 gal.	1.833	1.969	2.070	2.174	2.282	2.396	2.516
	% Change		7.4%	5.1%	5.0%	5.0%	5.0%	5.0%
Debt Service Charge	Per month	\$ 284,031	\$ 285,439	307,598	335,598	363,598	391,598	419,598
			0.5%	7.8%	9.1%	8.3%	7.7%	7.2%
Revenue Requirements:								
Operating Rate Revenue	Annual	\$ 3,019,100	\$ 3,243,900	\$ 3,449,900	\$ 3,622,395	\$ 3,803,515	\$ 3,993,690	\$ 4,193,375
Debt Service Revenues	Annual	3,408,400	3,425,300	3,691,200	4,027,180	4,363,180	4,699,180	5,035,180
Total		<b>\$ 6,427,500</b>	<b>\$ 6,669,200</b>	<b>\$ 7,141,100</b>	<b>\$ 7,649,575</b>	<b>\$ 8,166,695</b>	<b>\$ 8,692,870</b>	<b>\$ 9,228,555</b>
	\$ Change		\$ 241,700	\$ 471,900	\$ 508,475	\$ 517,120	\$ 526,176	\$ 535,685
	% Change		3.8%	7.1%	7.1%	6.8%	6.4%	6.2%
<b>Urban Wastewater</b>								
Operating Rate	Per 1000 gal.	1.835	1.951	2.146	2.253	2.366	2.484	2.608
	% Change		6.3%	10.0%	5.0%	5.0%	5.0%	5.0%
Debt Service Charge	Per month	\$ 222,280	\$ 222,550	246,308	266,548	276,888	287,228	297,568
			0.1%	10.7%	8.2%	3.9%	3.7%	3.6%
Revenue Requirements:								
Operating Rate Revenue	Annual	\$ 3,015,900	\$ 3,139,800	\$ 3,534,600	\$ 3,711,330	\$ 3,896,897	\$ 4,091,741	\$ 4,296,328
Debt Service Revenues	Annual	2,667,400	2,670,600	2,955,700	3,198,580	3,322,660	3,446,740	3,570,820
Total		<b>\$ 5,683,300</b>	<b>\$ 5,810,400</b>	<b>\$ 6,490,300</b>	<b>\$ 6,909,910</b>	<b>\$ 7,219,557</b>	<b>\$ 7,538,481</b>	<b>\$ 7,867,148</b>
	\$ Change		\$ 127,100	\$ 679,900	\$ 419,610	\$ 309,647	\$ 318,925	\$ 328,667
	% Change		2.2%	11.7%	6.5%	4.5%	4.4%	4.4%
<b>Non-Urban Rate Centers</b>								
Operating Rate Revenue	Annual	\$ 1,877,100	\$ 1,964,600	2,066,200	2,169,510	2,277,986	2,391,885	2,511,479
Debt Service Revenues	Annual	716,900	830,700	1,134,400	1,429,400	1,724,400	2,019,400	2,314,400
Total		<b>\$ 2,594,000</b>	<b>\$ 2,795,300</b>	<b>\$ 3,200,600</b>	<b>\$ 3,598,910</b>	<b>\$ 4,002,386</b>	<b>\$ 4,411,285</b>	<b>\$ 4,825,879</b>
				\$ 405,300	\$ 398,310	\$ 403,476	\$ 408,899	\$ 414,594
				14.5%	12.4%	11.2%	10.2%	9.4%
<b>Total ACSA All Revenues</b>								
		<b>\$ 14,704,800</b>	<b>\$ 15,274,900</b>	<b>\$ 16,832,000</b>	<b>\$ 18,158,395</b>	<b>\$ 19,388,637</b>	<b>\$ 20,642,637</b>	<b>\$ 21,921,582</b>
	\$ Change		\$ 570,100	\$ 1,557,100	\$ 1,326,395	\$ 1,230,242	\$ 1,254,000	\$ 1,278,946
	% Change		3.9%	10.2%	7.9%	6.8%	6.5%	6.2%