



**NORTH CAROLINA
PUBLIC STAFF
UTILITIES COMMISSION**

May 26, 2020

Ms. Kimberley A. Campbell, Chief Clerk
North Carolina Utilities Commission
4325 Mail Service Center
Raleigh, North Carolina 27699-4300

Re: Docket No. W-218, Sub 526 – Application for General Rate Increase

Dear Ms. Campbell:

In connection with the above-referenced dockets, I transmit herewith for filing on behalf of the Public Staff the testimony and exhibits of Lindsey Q. Darden, Utilities Engineer, Water, Sewer, and Telephone Division.

By copy of this letter, we are forwarding copies to all parties of record.

Sincerely,

/s/ Megan Jost
Staff Attorney
megan.jost@psncuc.nc.gov

MJ/cla

Attachment(s)

Executive Director
(919) 733-2435

Communications
(919) 733-5610

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(919) 733-2267

Legal
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(919) 733-7766

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(919) 733-2267

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May 26 2020

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. W-218, SUB 526

In the Matter of)	TESTIMONY OF
Application of Aqua North Carolina, Inc.,)	LINDSAY DARDEN
202 MacKenan Court, Cary, North)	PUBLIC STAFF – NORTH
Carolina, 27511, for Authority to Adjust)	CAROLINA UTILITIES
and Increase Rates for Water and)	COMMISSION
Sewer Utility Service in All Service)	
Areas in North Carolina)	

**AQUA NORTH CAROLINA, INC.
DOCKET NO. W-218, SUB 526**

**TESTIMONY OF LINDSAY DARDEN
ON BEHALF OF THE PUBLIC STAFF –
NORTH CAROLINA UTILITIES COMMISSION**

MAY 26, 2020

1 **Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND**
2 **PRESENT POSITION.**

3 A. My name is Lindsay Darden. My business address is 430 North
4 Salisbury Street, Dobbs Building, Raleigh, North Carolina. I am an
5 engineer with the Water, Sewer, and Telephone Division of the
6 Public Staff – North Carolina Utilities Commission (Public Staff).

7 **Q. BRIEFLY STATE YOUR QUALIFICATIONS AND DUTIES.**

8 A. I graduated from North Carolina State University, earning a Bachelor
9 of Science Degree in Civil Engineering. I am a licensed Professional
10 Engineer (PE - State of North Carolina #042110). I am also certified as
11 a B-Well Operator (#130281) by the North Carolina Water Treatment
12 Facility Operators Certification Board. I worked for the North Carolina
13 Department of Environmental Quality (DEQ), Public Water Supply
14 Section for four years prior to joining the Public Staff in December
15 2016. Prior to working for DEQ, I worked for Smith Gardner, an
16 engineering consulting firm.

1 **Q. WHAT ARE YOUR DUTIES IN YOUR PRESENT POSITION?**

2 A. My duties with the Public Staff are to monitor the operations of
3 regulated water and wastewater utilities with regard to rates and
4 service. The activities associated with these duties include conducting
5 field investigations to review, evaluate, and recommend changes in the
6 design, construction, and operations of regulated water and
7 wastewater utilities; presenting expert testimony in formal hearings;
8 and presenting information, data, and recommendations to the North
9 Carolina Utilities Commission (Commission).

10 **Q. BRIEFLY EXPLAIN THE SCOPE OF YOUR INVESTIGATION**
11 **REGARDING THIS RATE INCREASE APPLICATION.**

12 A. On December 31, 2019, Aqua North Carolina, Inc. (Aqua or Company),
13 filed an application with the Commission, in Docket No. W-218, Sub
14 526, seeking authority to increase its rates for providing water and
15 wastewater utility service in all of its service areas in North Carolina.
16 My areas of investigation in this proceeding have been the review of
17 company records and the review of Department of Environmental
18 Quality (DEQ) records. I have also assisted the Public Staff
19 Accounting Division with the review of the following expenses:
20 Sludge Hauling, Contract Services – Engineering, Contract Services
21 – Other, Contract Services – Lab Testing, and Purchased Water.

1 **Q. HAVE YOU INSPECTED AQUA’S WATER AND SEWER**
2 **SYSTEMS?**

3 A. No, due to the COVID-19 outbreak and the "stay at home" order
4 issued by North Carolina Governor, Roy Cooper, the Public Staff was
5 unable to conduct site visits prior to the filing of its testimony. If
6 necessary, the Public Staff will conduct site visits when the public
7 witness hearings are rescheduled. Those hearings were originally
8 scheduled to take place in April 2020, but were postponed until
9 further order of the Commission in response to the COVID-19
10 outbreak and Governor Cooper’s “stay at home” order.

11 **EXPENSES**

12 **Q. HAVE YOU RECOMMENDED ANY ADJUSTMENTS TO**
13 **EXPENSES RELATED TO AQUA’S WATER AND WASTEWATER**
14 **OPERATIONS?**

15 A. Yes, I have provided Public Staff witness Windley Henry with
16 recommended adjustments to expenses related to sludge hauling,
17 contractual services – engineering, contractual services – other,
18 contractual services – lab testing, and purchased water.

19 **SLUDGE HAULING EXPENSE**

20 The sludge hauling expense contained in the Company’s application
21 includes the test year booked expenses and a pro forma adjustment

1 to the ANC Sewer rate entity. The pro forma adjustment reflects a
2 price increase for sludge hauling in the Denver area of the Central
3 region of ANC Sewer. In order to investigate the Company's
4 requested sludge hauling expense I reviewed the historical sludge
5 hauling quantity and expense data provided by Aqua in response to
6 Public Staff Data Request No. 7.

7 The sludge hauling level recommended by the Public Staff is based
8 on a three-year average of data from December 2016 through
9 November 2019. This is the time period for which the Company
10 provided the most current sludge hauling records in response to
11 Public Staff Data Request No. 7. The use of a three-year average is
12 appropriate because it properly accounts for system maintenance
13 requirements that can cause the quantity of sludge hauled to vary
14 from year to year. Examples of system maintenance requirements
15 are the need to pump out digesters, clarifiers, or equalization tanks
16 or to clean ponds, all of which could cause a temporary increase in
17 the quantity of sludge hauled. By basing its sludge hauling
18 recommendation on a three-year average of data from December
19 2016 through November 2019, the Public Staff has appropriately
20 accounted not only for routine sludge hauling, but also for variations
21 caused by system maintenance requirements.

1 A three-year average is also appropriate because sludge hauling
2 levels fluctuate periodically and three years is the typical period of
3 time used when analyzing expenses or performing other calculations
4 that are impacted by periodic fluctuations. For example,
5 transportation fuel cost expense calculations and the billing analysis
6 (i.e., usage levels) use three-year averages in order to ensure that
7 periodic fluctuations are not over or under emphasized. Similarly, the
8 use of a three-year average when calculating sludge hauling levels
9 ensures that periodic fluctuations, such as fluctuations due to
10 general system maintenance are, given appropriate weight in the
11 analysis.

12 For the reasons explained above, a three-year average has been
13 used to evaluate the sludge hauling expenses in rate cases filed by
14 other utility companies including Carolina Water Service, Inc. of
15 North Carolina and Scientific Water and Sewerage Corporation. The
16 Public Staff's use of a three-year average in this case is consistent
17 with its practice those cases.

18 While the Public Staff generally advocates the use of a three-year
19 average to evaluate sludge hauling expenses, it also recognizes that
20 certain site-specific factors may require the three-year average to be
21 adjusted. For this reason, the Public Staff reviewed additions and
22 removals of wastewater treatment plants (WWTPs), other

1 construction projects, and/or changes in operations, and made
2 appropriate adjustments to its recommendation based on these
3 factors. These adjustments are described below.

4 Two WWTPs, The Legacy and Westfall WWTPs located in the
5 Central region of the ANC Sewer rate entity, started producing
6 sludge in April 2018 and October 2017, respectively. In order to
7 adjust the three-year average to account for the addition of these two
8 plants, the Public Staff first calculated the average monthly sludge
9 hauling quantities for the plants based on available historical data.
10 This average was then added to the sludge hauling quantities for the
11 months during the three-year average period when the two plants
12 were not yet in operation. This adjustment to the historical data
13 accurately incorporates the addition of The Legacy and Westfall
14 WWTPs into the three-year average calculation for the ANC Sewer
15 rate entity.

16 In the response to Public Staff Data Request No. 79, Question 1, the
17 Company described significant operational changes that occurred
18 starting in April 2017 at The Cape WWTP, which is in Aqua's
19 Fairways Sewer rate entity. In April 2017, the Dolphin Bay WWTP
20 was retired and the effluent was rerouted to The Cape WWTP. At the
21 same time, a new equalization basin was brought online which
22 increased the flow at the plant. The rerouting of the Dolphin Bay

1 WWTP and equalization basin addition, combined with customer
2 growth in 2018 and 2019, resulted in an increase in the average
3 monthly quantity of sludge hauled at The Cape WWTP. Furthermore,
4 construction activities associated with plant modifications and
5 expansion at The Cape WWTP are currently underway and are
6 expected to continue through 2021.

7 The Public Staff's analysis of the past three years of sludge hauling
8 quantity data for the Fairways region shows a consistent increase in
9 sludge hauling quantities with the test year monthly sludge hauling
10 average being significantly higher than the three-year average.
11 Based on the magnitude and duration of the increase, the three-year
12 average does not accurately represent the expected sludge hauling
13 quantity going forward. For this reason, the Public Staff recommends
14 that an exception be made to its recommended three-year analysis
15 and that the test year average sludge hauling quantity instead be
16 used to determine the expected cost of sludge hauling for the
17 Fairways region.

18 Based on the foregoing analysis of sludge hauling levels and the
19 current sludge hauling pricing derived from invoices provided by
20 Aqua, the Public Staff recommends the following sludge expense
21 levels:

1		<u>Aqua</u>	<u>Public Staff</u>
2		<u>Application</u>	<u>Recommendation</u>
3	ANC Sewer	\$ 604,775	\$ 590,239
4	Fairways Sewer	\$ 170,439	\$ 169,995

5 My calculations are shown in **Darden Exhibit 1**.

6 **CONTRACTUAL SERVICES – ENGINEERING**

7 I reviewed Aqua’s expenses for Contractual Services – Engineering
8 for water and wastewater operations based on invoices and
9 documentation provided by the Company. Based on my review, I
10 agree that the following expense levels requested by the Company
11 in its application accurately reflect expected expense levels going
12 forward:

13		<u>Total Expense</u>
14	ANC Water	\$ 9,986
15	ANC Sewer	\$ 11,385
16	Brookwood Water	\$ 966
17	Fairways Water	\$ 323
18	Fairways Sewer	\$ 207

19 **CONTRACTUAL SERVICES – OTHER**

20 I reviewed Aqua’s Contractual Services - Other expenses for both
21 water and wastewater operations. Aqua filed several pro forma
22 adjustments to the Contractual Services – Other expense as part of

1 its application. Based on my investigation, I agree with the following
2 pro forma adjustments:

3		<u>Pro forma Amount</u>
4	Test Year AU/GL Corrections	\$ 0 ¹
5	Governors Club Increase	\$ 7,255
6	Information Technology (IT) Charge Analysis	\$ 34,512
7	Impact of 2109/2020 Postage Increase	\$ 8,365
8	US Infrastructure Company (USIC) Charges	
9	for Quarter 4 2018	\$ 22,369
10	Water Remediation Treatment (WRT) Unit 2019 Costs	\$ 1,677
11	Allocation of 9001 Testing	\$ (12,425)
12	Johnston County Transmission and Distribution (T&D)	\$ 27,257

13 The NC Temporary Labor Removal pro forma adjustment was
14 reviewed by Public Staff Accounting and is addressed in the
15 testimony of Public Staff witness Lynn Feasel.

16 The Company adjusted US Infrastructure Company (USIC) Charges
17 for Quarter 4 2018. In Adjustment # B3-m, the Company states that
18 the adjustment was made because charges were over accrued in
19 September 2018, causing the Quarter 4 2018 amounts to be short.
20 Typically, expenses are not adjusted for over accruals outside the
21 test year in order to avoid an understated test year amount. Likewise,

¹ Multiple adjustments across different rate entities net to \$0

1 expenses are typically not adjusted for under accruals outside the
2 test year in order to avoid an overstated test year amount. An
3 understated test year amount would result in the Company not
4 recovering the full cost of the expense, and an overstated amount
5 would result in customers paying inflated rates. In the present case,
6 Aqua provided updated expense data through March 2020. The
7 Public Staff compared the test year monthly average for the pro
8 forma adjusted amount and non-adjusted amount to the trailing 12
9 months average and to the monthly average calculated for May 2018
10 through March 2020. After review and comparison of the additional
11 data, the Public Staff determined that the pro forma adjusted amount
12 is reasonable and accepts the USIC Charges for Q4 2018 pro forma
13 adjustment amount. While the Public Staff finds the amount of the
14 pro forma adjustment to be reasonable, for the reasons explained
15 above, it disagrees with the methodology underlying the adjustment
16 (i.e., adjusting for over accruals outside the test year in order to avoid
17 an understated test year amount) and therefore recommends that
18 the adjustment not be precedential.

19 Pump Maintenance

20 The GL Account "736400 SW-Contract Services-Other-Pump
21 Maintenance" includes the expenses associated with sewer main
22 jetting and sewer line maintenance. Aqua is required to complete

1 jetting for 10% of the gravity sewer mains of all wastewater systems
2 annually. In Public Staff Data Request No. 83, Question 4, the Public
3 Staff asked the Company to identify the invoices and amounts of any
4 expenses other than jetting costs that had been booked to this
5 account. The Company's response stated in part, "Certain sewer line
6 maintenance expenses beyond just the main jetting services are also
7 included in that account as more fully described in column H of the
8 jetting log attached hereto." Based on the Company's response, I
9 totaled all amounts from Column H that did not include jetting in the
10 work description and determined that \$5,727 for ANC Sewer and
11 \$16,639 for Fairways Sewer was for sewer line maintenance and not
12 jetting expense.

13 Although the Company is required to complete jetting for 10% of the
14 gravity sewer mains annually, in some circumstances additional
15 jetting is reasonable and necessary. In Public Staff Data Request No.
16 6, Question 4, the Public Staff asked the company to provide the
17 DEQ collection system permit or other documentation supporting the
18 100% jetting of applicable systems. The Company's response
19 included two systems that require 100% jetting: Emerald Plantation
20 and Grande Villas. The Company's response also stated as follows:

21 The larger NCDEQ Aqua permitted collection systems
22 are not specifically required to clean 100% of the lines
23 for compliance with cleaning; however, the overarching
24 requirement for all collection systems is that discharge

1 from these systems is not permitted. Aqua recognizes
2 that some of our systems have greater cleaning
3 frequency requirements to prevent sanitary sewer
4 overflows due to terracotta (vitrified clay pipe) sewer
5 lines with root intrusion, or fats, oil and grease build-up
6 rates due to customer usage. Lastly, some systems are
7 small and partially cleaning those systems is an
8 inefficient process.

9 The Company did not specify to which systems these exceptions to
10 the 10% jetting requirement would apply. Therefore, to complete the
11 jetting analysis, I assumed that the systems the Company identified
12 in the W-218, Sub 497, rate case as being 100% jetted, were
13 required to be 100% jetted during the test period for the present rate
14 case due to the reasons that Aqua cited in its response to Public
15 Data Request No. 6, Question 4. Adding the systems I identified as
16 requiring 100% jetting to the remaining systems, which require 10%
17 jetting, results in 14% overall jetting. Based on my calculations, the
18 actual jetting rate during the test period was 17%.

19 I calculated a reasonable jetting cost based on the total length of
20 gravity sewer for each region and the jetting goal of 10%, with the
21 exception of the systems described above that require 100% jetting.
22 I calculated the expected cost based on current pricing verified by
23 Company invoices. I then added the sewer line maintenance
24 expenses in the amounts of \$5,727 for ANC Sewer and \$16,639 for
25 Fairways Sewer to the calculated jetting costs for the respective
26 systems to determine the total expense for the Pump Maintenance

1 account. Based on this analysis, the Public Staff recommends the
2 following expense levels for Contractual Services – Other – Pump
3 Maintenance:

4		<u>Aqua</u>	<u>Public Staff</u>
5		<u>Application</u>	<u>Recommendation</u>
6	ANC Sewer	\$ 157,720	\$ 139,054
7	Fairways Sewer	\$ 30,574	\$ 32,269

8 My calculations are shown in **Darden Exhibit 2.**

9 **CONTRACTUAL SERVICES – LAB TESTING EXPENSES**

10 I reviewed Aqua’s Contractual Services – Lab Testing expenses,
11 which are also referred to as water and wastewater testing expenses.
12 The Public Staff’s analysis for testing expenses reflects the most
13 current testing requirements, changes to the number or frequency of
14 each test, and current testing costs, represented over the required
15 frequency (monthly, annually, and every three, six, or nine years) for
16 each test. The Company included documentation for compliance
17 sampling and process sampling, which is also referred to as
18 operational testing.

19 For compliance sampling, the types of compliance tests that must be
20 performed and the testing frequency are determined by DEQ
21 compliance standards for the Safe Drinking Water Act for each water

1 system, and by DEQ wastewater permits for each wastewater
2 system. For operational testing, the types of tests, frequencies, and
3 thresholds are determined by the Company.

4 Aqua provided the Public Staff with the compliance testing frequency
5 schedule for each water and wastewater system. Using this
6 information, I calculated the water and wastewater testing expense as
7 the Public Staff customarily has, using current testing schedules going
8 forward, amortizing the expense over the number of years
9 corresponding to the testing frequencies for the various tests, and
10 using the current unit costs for the tests.

11 Aqua also provided the Public Staff with operational testing data,
12 including invoices and records, for various types of operational testing.
13 The types of operational testing include, but are not limited to,
14 additional sampling for iron and manganese beyond the required
15 compliance testing, per- and polyfluoroalkyl substances (PFAS)
16 sampling, Notice of Deficiency monitoring sampling, and wastewater
17 process sampling.

18 Aqua's total per books expenses appear to be reasonable levels of
19 expense and are largely consistent with the expense levels I
20 calculated using the Public Staff's customary method. Therefore, the
21 Public Staff agrees with the amounts provided by Aqua for the water
22 testing expense listed below:

1		<u>Total Expense</u>
2	ANC Water	\$ 681,418
3	Brookwood Water	\$ 65,937
4	Fairways Water	\$ 19,827

5 The Public Staff does not agree with the Company's applied for
6 wastewater testing expense due to its addition to the total wastewater
7 testing amounts of the following percentage increases as an incidental
8 costs:

9		<u>Incidental Increase</u>
10	Central Area	2.5%
11	Denver Area	2.5%
12	Kernersville Area	5%
13	Wilmington Area	5%

14 The Public Staff's recommended amount includes all compliance and
15 operational testing provided by the Company and has been updated
16 for price changes. I am not aware of any justification for the incidental
17 costs added by the Company and they were therefore removed from
18 my calculation to accurately reflect the actual amount spent on
19 wastewater testing.

20 While I disagree with the Company's addition of the incidental costs, I
21 do not take issue with any other aspect of the Company's applied for
22 wastewater lab testing expenses. I verified the frequency of the

1 compliance testing and the current testing pricing. Furthermore, the
2 process sampling or operational testing provided by Aqua for each
3 system appears to be reasonable. Based on this analysis, the Public
4 Staff recommends the following for wastewater lab testing expenses:

5		<u>Aqua</u>	<u>Public Staff</u>
6		<u>Application</u>	<u>Recommendation</u>
7	ANC Sewer	\$ 293,263	\$ 281,394
8	Fairways Sewer	\$ 14,853	\$ 13,848

9 My calculations are shown in **Darden Exhibit 3**.

10 **PURCHASED WATER**

11 **Q. PLEASE DESCRIBE YOUR INVESTIGATION OF AQUA'S**
12 **PURCHASED WATER EXPENSES.**

13 A. I reviewed Aqua's expenses for purchased water for both the ANC
14 Water and Brookwood Water rate entities using data provided by
15 Aqua for the gallons purchased from third party providers and the
16 gallons billed to Aqua customers for each purchased water system.
17 In its application, Aqua proposed a pro forma adjustment to update
18 the pricing of the purchased water systems to the most up-to-date
19 rates. While the Public Staff agrees that the purchased water
20 expense should be calculated using the most up-to-date, known
21 rates, the Public Staff finds the total purchased water expense level
22 filed in Exhibit B3-b to its application in the amount of \$2,114,412 to

1 be excessive. The Public Staff instead recommends a total purchased
2 water expense level of \$2,052,045 which it calculated using the total
3 gallons purchased (adjusted for water loss, if applicable) from the
4 invoices provided by the Company and the most up-to-date rates. In
5 the following section, I discuss my review of Aqua's purchased water
6 expenses in more detail and provide the Public Staff's response to the
7 Company's testimony regarding Current Annual Real Losses (CARL)
8 and water audits.

9 Purchased Water Expense Update

10 In its purchased water expense update filed on April 21, 2020, Aqua
11 requested an additional Item 18 adjustment in the amount of
12 \$43,431.57. Aqua stated the adjustment was made to reflect the
13 impact of a proposed July 2020 rate increase for Johnston County
14 purchased water accounts. The proposed rate increase is pending
15 approval by the Johnston County Board of Commissioners. The Public
16 Staff does not support this adjustment because the rate change has
17 not yet been approved by the Johnston County Board of
18 Commissioners and the adjustment is therefore not known and
19 measurable.

Appropriate Water Loss Standard

Aqua proposes that CARL be used to “prioritize the Company’s water systems for water leak reduction improvement plans and efforts that are needed,” as stated by Company witness Pearce on page 5, lines 1 through 4, of his direct testimony. Referencing the American Water Works Association (AWWA) Manual of Water Supply Practices M36, Water Audits and Loss Control Programs, witness Pearce states on page 3, line 19, through page 4, line 2, of his direct testimony, “The AWWA WLCC [Water Loss Control Committee] recommends that water utilities should routinely compile water audit data on an annual basis as a standard business practice. This serves as the fundamental activity to promote efficient management of water in the drinking water sector.” The Public Staff agrees with the Company that the CARL and water audits are beneficial tools for monitoring and addressing water loss issues and supports the Company’s use of CARL and water audits for the detailed analysis of water systems. Furthermore, the Public Staff does not take issue with the Company’s payment during the test year of \$20,215 to Kunkel Water Efficiency Consulting (KWECC) to validate the Company’s water loss audits. Because the data produced by KWECC has the potential to help Aqua improve operational practices to address and minimize water loss, the Public Staff agrees with the Company’s request to include this cost as a capitalized expense. However, based on the Company’s response to Public Staff Data

1 Request No. 15, Question 7, it is the Public Staff's understanding that
2 consulting services will not be needed for every water loss audit and
3 that future water loss audits would be completed by Aqua staff.

4 While water audits can help the Company to quantify and categorize
5 the source of water loss that occurs in a system, the fact that water
6 loss can be quantified and attributed to specific sources, such as
7 flushing or line breaks, does not necessarily mean that the quantified
8 amount is appropriate to be recovered in rates from customers.

9 Use of the CARL and water loss audits as a substitute for a standard
10 of water loss is also problematic because they rely heavily on
11 potentially inaccurate estimates to calculate apparent water loss. To
12 determine the CARL, values for variables such as customer meter
13 inaccuracies and systematic data handling errors must be inputted in
14 the AWWA water audit report worksheet to complete the calculations.

15 **Darden Exhibit 4** is an example of an AWWA water audit report
16 worksheet. If a metered value is unavailable, the worksheet instructs
17 the user to provide an estimated value and indicate the user's
18 confidence in the accuracy of that estimated value. These values are
19 used to calculate apparent (measurable) water losses, which are then
20 deducted from total water losses to determine the CARL value.
21 Because the values used to calculate apparent water losses are
22 typically difficult to measure and accurately quantify, apparent water

1 losses calculated using these estimates may have varying levels of
2 accuracy. This is reflected in the Water Audit Data Validity Score of 53
3 out of 100 shown on page two of **Darden Exhibit 4**. For this additional
4 reason, CARL values should not serve as a substitute for a standard
5 level of water loss in the determination of a recoverable water loss
6 expense level.

7 Finally, the CARL and water loss audits do not provide a water loss
8 limit or objective for the Company to work to achieve, and then maintain
9 or improve upon. Without a water loss limit or objective, there is no
10 financial incentive for the Company to address the underlying issues
11 contributing to water loss. The Commission addressed this issue in its
12 Order Approving Partial Settlement Agreement and Stipulation,
13 Granting Partial Rate Increase, and Requiring Customer Notice issued
14 on December 18, 2018, in Docket No. W-218, Sub (Sub 497 Order).
15 Specifically, on page 116 of the Sub 497 Order, the Commission stated
16 as follows:

17 [T]he Commission finds that it is in the best interest of
18 both Aqua NC and its customers for the Company to be
19 mindful of an acceptable standard of water loss as its
20 monitors its water losses from period to period. The
21 Commission is of the opinion that with an established
22 water loss standard in place, Aqua NC will more
23 aggressively seek to investigate water losses and will
24 strive to identify the cause(s), and make the necessary
25 corrections, if applicable, more expeditiously.

1 While water loss percentages have decreased for some of the
2 Company's purchased water systems as compared to the W-218, Sub
3 497, rate case, many water loss percentages have remained
4 substantially the same or have increased. Therefore, the Public Staff
5 believes that a standard of water loss is still needed in order to
6 incentivize the Company to identify and resolve the causes of water
7 loss. The Public Staff also notes that, absent a limit on the allowable
8 level of water loss, customers may be paying both the cost of excessive
9 water loss and the cost of any capital investments to reduce the
10 excessive water loss. The Public Staff asserts that this is not
11 appropriate for ongoing cost recovery.

12 The Public Staff asserts that the appropriate standard of water loss for
13 use in this proceeding is 15%. This level is consistent with the AWWA's
14 recommendation that action should be taken when water loss is 15%
15 or greater. It is also consistent with the Commission's finding and
16 conclusion on page 117 of the Sub 497 Order that 15% was a
17 reasonable and appropriate amount of recoverable water loss for use
18 in the rate case proceeding and would "encompass[] reasonable levels
19 of necessary operational flushing, flushing due to compliance issues,
20 and leaks; and also encourage[] the Company to monitor and address
21 water losses." While Company witness Pearce disagrees in his direct
22 testimony with the 15% allowable water loss advocated by the Public

1 Staff and approved by the Commission in the W-218, Sub 497, rate
2 case, he fails to suggest an alternative level of allowable water loss.

3 Site-Specific Factors Contributing to Water Loss

4 On page 4, lines 8 through 11, of his direct testimony, Aqua witness
5 Pearce states, “[f]or a system water loss analysis, a number of factors
6 should be analyzed, including flushing, fire department hydrant testing,
7 unauthorized consumption, customer metering inaccuracies inherent
8 in the meter, and distribution system leaks.” In the W-218, Sub 497,
9 rate case and in this rate case, the Public Staff considered known and
10 measurable factors that can contribute to water loss and analyzed
11 each system that exceeded the allowable 15% water loss threshold to
12 determine whether the allowable water loss quantity should be
13 adjusted. As part of this analysis, the Public Staff served the Company
14 with its Data Request No. 4, Question 1, which asked, “If the water
15 losses during the test year exceed 15% or there is a calculated surplus
16 for any systems, please provide a detailed explanation for the loss or
17 surplus including the root cause, actions taken, and planned actions.”
18 The Company’s response described the water loss audits conducted
19 by KVEC and an acoustic survey conducted at Chapel Ridge, but did
20 not provide system specific data on quantifiable sources of water loss.
21 Therefore, the Public Staff submitted several follow-up data requests
22 in order to obtain system specific water loss data from the Company

1 necessary to complete the Public Staff's system specific water loss
2 analysis.

3 In response to Public Staff Data Request No. 100, Question 1, Aqua
4 provided the total amount of flushing recorded for each purchased
5 water system. The Public Staff reviewed the flushing amounts for the
6 purchased water systems that exceeded the 15% allowable water loss.
7 Of the 10 purchased water providers for which Aqua exceeded the
8 15% allowable water loss, only 5 had flushing amounts recorded by
9 Aqua in the test year. Table 1 below includes the total amount of
10 flushing in the test year, including fire department flushing², the total
11 amount of water loss, and the percentage of the water loss attributed
12 to flushing for those five providers.

13 **Table 1**

Provider	TY Flushing Total (gallons)	TY Water Loss (gallons)	Flushing as a % of Water Loss
City of Hickory	58,000	1,208,292	4.8%
City of Mount Airy	18,600	1,363,800	1.4%
Davidson Water	43,218	2,116,040	2.0%
Town of Forest City	900	557,400	0.2%
Town of Pittsboro	487,868	7,216,500	6.8%

² The Chapel Ridge purchased water system, supplied by the Town of Pittsboro, is Aqua's only system that includes fire department flushing.

1 Due to the low percentage of water loss attributable to flushing, the
2 Public Staff determined that an adjustment to the 15% allowable water
3 loss amount was not appropriate for any of the purchased water
4 systems. For these specific systems, the amount of flushing that
5 occurred during the test year was reasonable and allowed for the
6 recovery of other sources of water loss within the 15% allowable water
7 loss amount.

8 In response to Public Staff Data Request No. 100, Question 4, Aqua
9 provided a record of all the distribution system repair and replacement
10 projects completed during the test year. Also in response to Public Staff
11 Data Request 100, Question 4, Aqua estimated that for all purchase
12 water systems a total of 952,678 gallons were lost due to main breaks
13 and leaks that were repaired during the test year. For reference, the
14 Company reported 53,250,159 gallons of total water loss during the
15 test year.³

16 When a main break or leak is repaired, the system no longer
17 experiences water loss caused by that known main break or leak. The
18 Company recovers all project costs associated with the repair of a main

³ For reference, the U.S. Geological Survey (USGS) illustrates, “A good-sized bath holds 40 gallons, so a million gallons would be 25,000 baths. . . .”

Available at https://www.usgs.gov/special-topic/water-science-school/science/a-million-gallons-water-how-much-it?qt-science_center_objects=0#qt-science_center_objects (last visited May 21, 2020)

1 break or leak either as a maintenance and repair expense or as a
2 capitalized replacement. Although customers should not have to
3 continue to pay for water loss that occurred in the test year due to main
4 breaks and leaks have been repaired, main breaks and leaks are
5 unfortunate but expected phenomena in water systems and will
6 inevitably occur going forward and will result in new water loss. Due to
7 the expectation that new main breaks and leaks will occur, and
8 because it is difficult to accurately estimate the amount of water loss
9 caused by main breaks and leaks, the Public Staff believes the amount
10 of water Aqua estimates it lost due to main breaks repaired during the
11 test year is a reasonable estimate of water loss due to main breaks
12 and leaks going forward. Therefore, the Public Staff does not
13 recommend an adjustment to remove from the gallons purchased the
14 952,678 gallons Aqua estimates were lost due to main breaks repaired
15 during the test year.

16 Cost Benefit Analysis

17 In addition to the recoverable water loss expense, the Company
18 seeks the recovery of capital project expenses to study system
19 specific water loss and address various aspects of water loss. For
20 example, the Company spent \$135,236 on leak detection and
21 engineering consulting services to study and address water loss at
22 the Chapel Ridge purchased water system. Before capital projects

1 such as this are undertaken, a cost-benefit analysis is necessary to
2 determine whether the cost of the project is reasonable in relation to
3 the water loss it seeks to address. Undertaking an expensive capital
4 project in order to eliminate a small amount of water loss may not be
5 prudent. Therefore, it is reasonable to expect the Company to
6 evaluate whether projects to address water loss are cost beneficial
7 before undertaking them.

8 A good example of such a project is the District Metered Area pilot
9 installation for Chapel Ridge which the Company described in its
10 response to Public Staff Data Request No. 15, Question 5, as
11 follows:

12 During the Chapel Ridge acoustic survey, twenty-four
13 customer leaks were discovered on the customer's
14 side of the meter. These leaks were small and did not
15 register on the nutating disk meters. As an option,
16 Aqua is considering the installation of meters with
17 improved abilities to measure low flows for systems like
18 Chapel Ridge. The peer-reviewed journal article,
19 Sumrak et al. – available at
20 <http://dx.doi.org/10.5942/jawwa.2016.108.0069>,
21 provides data on the relative accuracy of nutating disk
22 meters as compared to electronic meters. At flows
23 below 1/8 gallon per minute, the nutating disk meters
24 skewed the meter readings to below AWWA standards
25 for accuracy. If the installed meters are reading only
26 ninety percent of actual for the 24 low flow customer
27 leaks, this would equate to 157,680 gallons per year or
28 \$2,159 per year. These 24 meters were reading zero
29 consumption due to these customer side leaks which
30 could be estimated to be 1/16 gallon per minute leaks.
31 This would equate to 788,400 gallons per year or
32 \$10,793 per year.

The article states the electronic meters tested measured within AWWA standards at the low flowrates. It must be noted that the electronic meters are significantly more expensive than conventional nutating disk meters, and the battery life has not been proven. However, if the additional recoverable capital expense reduces the utilities exposure to “expense reductions” then it may be necessary to install meters with greater ability to measure low flowrates.

The Company describes the cost of water loss due small leaks on the customer's side of the meters. Aqua states that the cost of this water loss is \$2,159 per year if the meters are reading ninety percent of the actual, and \$10,793 if the meters are reading zero percent of the flow. The Public Staff was not given pricing information for the electronic meters but, according to the Company, they "are significantly more expensive than conventional nutating disk meters." The Public Staff opposes increasing the cost of service to customers with capital projects that are not expected to be equally or more than offset by a reduction in water loss expense or improvements in water quality and/or reliability.

Public Staff Recommendation

Based on the analysis of the Company's purchased water expenses described above, the Public Staff recommends a 15% allowable amount of water loss in this rate case. The Public Staff believes, as the Commission noted in the Sub 497 Order, that this level of allowable water loss "encompasses reasonable levels of necessary

operational flushing, flushing due to compliance issues, and leaks; and also encourages the Company to monitor and address water losses.”

While the Public Staff recognizes that it is sometimes appropriate to adjust the allowable level of water loss for system specific circumstances, the Public Staff did not identify any such circumstances based on the information provided by the Company in response to Public Staff data requests. Based on the Public Staff’s recommended 15% allowable water loss, I calculated reductions in the quantity of water purchased from the 10 third-party providers as follows:

Table 2

Provider	Test Year Units ⁴ (kgal.)	Water Loss ⁵	PS Adjusted Units ⁶ (kgal.)
City of Asheville	1,304	26%	1,134
City of Hickory	5,029	24%	4,496
City of Mount Airy	5,365	25%	4,707
City of Morganton	5,831	16%	5,758
City of Newton	1,117	30%	921
Davidson Water	8,085	26%	7,022
Hendersonville Water	12,290	24%	10,976
Town of Forest City	2,469	23%	2,249
Town of Pittsboro	32,565	22%	29,822
Town of Spruce Pines	2,433	25%	2,135

⁴ The quantities are per Aqua’s rate case filing W-1, Item 10, Exhibit B3-b-1.

⁵ Calculated by comparing the gallons sold to gallons purchased in Exhibit B3-b-1.

⁶ Calculated quantity of purchased water allowing a maximum of 15% water loss.

1 The calculations of the reduced purchased water quantities and
2 expenses are shown in **Darden Exhibit 5**. Based on my calculations,
3 the Public Staff recommends the following Purchased Water
4 expenses:

5		<u>Aqua</u>	<u>Public Staff</u>
6		<u>Application</u>	<u>Recommendation</u>
7	ANC Water	\$ 1,850,078	\$ 1,787,711
8	Brookwood Water	\$ 264,334	\$ 264,334

9 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

10 A. Yes, it does.

Aqua North Carolina
Docket No. W-218, Sub 526
Test Year Ending September 30, 2019

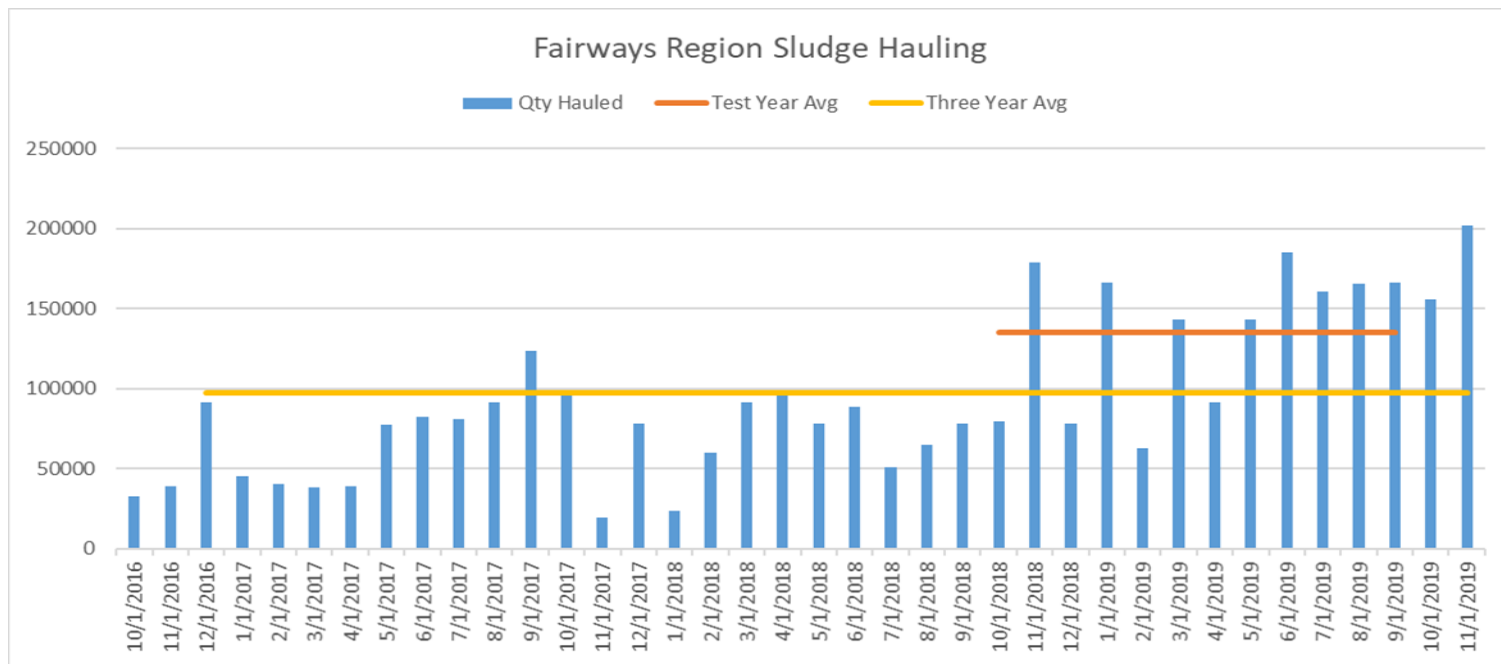
Darden
Exhibit No. 1
Page 1 of 2

Sludge Hauling Expense

<u>Region</u>	<u>Average</u>	<u>Dates</u>	<u>Avg Monthly Qty Hauled (gallons)</u>	<u>Cost/Month¹</u>	<u>Avg Cost/Year</u>
Central ²	3 Yr	12/16-11/19	416,091	\$35,368	\$424,413
Denver	3 Yr	12/16-11/19	52,854	\$7,070	\$84,837
Kernersville	3 Yr	12/16-11/19	33,711	\$3,430	\$41,161
Fayetteville	3 Yr	12/16-11/19	8,996	\$900	\$10,795
Wilmington	3 Yr	12/16-11/19	23,042	\$2,419	\$29,033
TOTAL ANC	3 Yr	12/16-11/19	534,694	\$49,187	\$590,239
FAIRWAYS	3 Yr	12/16-11/19	97,625	\$10,251	\$123,007.56
	Test Yr	10/18-9/19	134,917	\$14,166	\$169,995

Notes:

1. Denver and Kernersville regions pricing based on % of test year pricing for different vendor pricing in region.
2. Updated with The Legacy & Westfall WWTP amounts



Aqua North Carolina
Docket No. W-218, Sub 526
Test Year Ending September 30, 2019

Darden
Exhibit No. 2
Page 1 of 1

Jetting/Pump Maintenance Adjustment for Contract Services - Other

ANC	<u>Gravity</u> <u>Sewer (ft)</u>	<u>100%</u> <u>Systems (ft)</u>	<u>TY Jetted</u> <u>Length¹</u>	<u>TY Jetted</u> <u>Cost¹</u>	<u>TY %</u>	<u>Calculated</u> <u>Jet Goal²</u>	<u>Jet</u> <u>Goal %</u>	<u>Average</u> <u>Unit Cost³</u>	<u>Goal Cost</u>	<u>Sewer Line</u> <u>Maintenance⁴</u>	<u>Total</u> <u>Expense⁵</u>
Central	375,330	19,010	69,848	\$69,090	19%	54,642	15%	\$0.99	\$54,096	\$975	\$55,071
Denver	193,171	13,855	37,283	\$37,283	19%	31,787	16%	\$1.00	\$31,787	\$2,520	\$34,307
Kernersville	242,649	7,441	29,873	\$29,873	12%	30,962	13%	\$1.00	\$30,962		\$30,962
Fayetteville	74,000	0	10,739	\$10,202	15%	7,400	10%	\$0.95	\$7,030		\$7,030
Wilmington	57,128	3,950	10,885	\$11,093	19%	9,268	16%	\$1.02	\$9,453	\$2,232	\$11,685
			Total:	\$157,541				Total:	\$133,327	\$5,727	\$139,054
<u>Coastal</u>											
Fairways	144,723	0	29,762	\$32,279	21%	14,472	10%	\$1.08	\$15,630	\$16,639	\$32,269
<u>Total NC</u>	1,087,001	44,256	188,390	\$189,820	17%	148,530	14%		\$148,957	\$22,366	\$171,323

Notes:

1. Amounts provided by Aqua in Jetting Log as response to DR 83 Q2.
2. Calculated Jet Goal = 10% of Gravity Sewer Length (ft) + 100% System Length (ft)
3. Average Unit Cost = TY Jetted Cost/TY Jetted Length
4. Sewer Line Maintenance determined based on Aqua's response to DR 83 Q4.
5. Total Expense = Jetting Goal Cost + Sewer Line Maintenance

Wastewater Lab Testing Expenses

Region: Central Area - ANC				
	Compliance Testing	Sludge Analysis	Process Samples	Lab Testing
Name of Facility	\$/Month	(Annual)	(Annual)	\$/Year
Avocet	\$272.37	\$339.00	\$580.00	\$4,187.40
Barclay Downs	\$278.20	\$339.00	\$580.00	\$4,257.40
Beachwood	\$379.70	\$339.00	\$580.00	\$5,475.40
Briarwood Farms	\$320.70	\$339.00	\$580.00	\$4,428.40
Carolina Meadows	\$515.40	\$339.00	\$840.00	\$7,024.80
Chapel Ridge	\$665.40	\$339.00	\$580.00	\$8,903.80
Cole Park Plaza	\$544.90	\$339.00	\$1,516.00	\$8,393.80
Colvard Farms	\$144.00	\$339.00	\$580.00	\$2,647.00
Crooked Creek	\$371.70	\$339.00	\$340.00	\$5,139.40
Cross Creek MHP	\$510.00	\$339.00	\$340.00	\$6,799.00
Governors Club	\$622.68	\$339.00	\$580.00	\$8,391.16
Hassentree	\$645.36	\$339.00	\$580.00	\$8,663.32
Hawthorne	\$371.70	\$339.00	\$764.00	\$5,563.40
Lake Ridge Aero	\$320.70	\$339.00	\$580.00	\$4,767.40
Mallard Crossing	\$529.11	\$339.00	\$580.00	\$7,268.32
Neuse Colony	\$1,049.20	\$339.00	\$1,092.00	\$14,021.40
Neuse River Village	\$312.70	\$339.00	\$580.00	\$4,671.40
Tradewinds	\$371.70	\$339.00	\$360.00	\$5,159.40
The Legacy	\$101.00	\$339.00	\$220.00	\$1,771.00
Preserve at Jordan	\$131.75	\$339.00	\$580.00	\$2,500.00
Westfall	\$524.67	\$339.00	\$580.00	\$7,215.00
Wildwood Green	\$490.07	\$339.00	\$720.00	\$6,939.80
WW Testing at Water Sites				\$3,469.15
Totals	\$8,847.33	\$7,458.00	\$13,732.00	\$130,827.15

Region: Coastal - ANC				
	Lab Testing	Sludge Analysis	Process Samples	Lab Testing
Name of Facility	\$/Month	(Annual)	(Annual)	\$/Year
Avendale	\$201.15	\$357.00	\$253.00	\$3,023.80
Castlebay	\$310.65	\$357.00	\$609.00	\$4,693.80
Cannonsgate	\$1,121.75	\$357.00	\$65.00	\$13,882.96
Emerald Plantation	\$287.50		\$768.00	\$4,218.00
Grand Villas	\$172.50		\$508.00	\$2,578.00
Sterling Farms	\$473.71	\$357.00	\$508.00	\$6,549.52
Monthly Pick Up Fee ²	\$130.00			\$1,560.00
Totals	\$2,697.26	\$1,428.00	\$2,711.00	\$36,506.08

Wastewater Lab Testing Expenses

Region: Denver - ANC				
Name of Facility	Lab Testing \$/Month	Sludge Analysis (Annual)	Process Samples (Annual)	Lab Testing \$/Year
Alexander Island	\$164.91	\$339.00	\$423.20	\$2,741.06
Bridgeport	\$164.91	\$339.00	\$292.80	\$2,610.66
Brights Creek	\$260.00	\$339.00	\$214.80	\$3,673.80
Country Valley	\$264.35	\$339.00	\$345.20	\$3,856.34
Country Woods East	\$631.40	\$339.00	\$1,045.20	\$8,961.00
Diamond Head	\$421.32	\$339.00	\$1,041.60	\$6,436.38
Harbor Estates	\$421.32	\$339.00	\$345.20	\$5,739.98
Killians	\$249.91	\$339.00	\$448.80	\$3,786.66
Mallard Head	\$164.91	\$339.00	\$341.60	\$2,659.46
Pine Valley	\$163.40	\$339.00	\$345.20	\$2,645.00
River Park (Hwy 150)	\$298.90	\$339.00	\$645.20	\$4,571.00
Spinnaker Bay	\$140.99	\$339.00	\$345.20	\$2,376.02
Willowbrook	\$140.99	\$339.00	\$345.20	\$2,376.02
Windemere	\$163.40	\$339.00	\$345.20	\$2,645.00
Pickup Fee (monthly)	\$260.00			\$3,120.00
Totals	\$3,910.67	\$4,746.00	\$6,524.40	\$58,198.38

Region: Kernersville - ANC				
Name of Facility	Lab Testing \$/Month	Sludge Analysis (Annual)	Process Samples (Annual)	Lab Testing \$/Year
Briarwood	\$222.24	\$339.00	\$391.20	\$3,397.02
Forest Ridge	\$174.91	\$339.00	\$391.20	\$2,829.06
Frye Bridge	\$174.91	\$339.00	\$391.20	\$2,829.06
Greystone	\$256.32	\$339.00	\$391.20	\$3,806.06
Melbille Heights	\$174.91	\$339.00	\$391.20	\$2,829.06
Mikkola Hts	\$174.91	\$339.00	\$391.20	\$2,829.06
Olde Beau	\$356.26	\$339.00	\$391.20	\$5,005.26
Penman Heights	\$140.99	\$339.00	\$391.20	\$2,422.02
Salem Glen	\$150.99	\$339.00	\$391.20	\$2,542.02
Salem Quarters	\$174.91	\$339.00	\$391.20	\$2,829.06
Spring Creek	\$174.91	\$339.00	\$391.20	\$2,829.06
Willow Creek	\$204.91	\$339.00	\$391.20	\$3,189.06
Wellesley Place	\$174.91	\$339.00	\$391.20	\$2,829.06
Pickup fee (monthly)	\$325.00			\$3,900.00
WW Testing at Water Sites				\$4,452.00
Totals	\$2,881.02	\$4,407.00	\$5,085.60	\$48,516.86

Wastewater Lab Testing Expenses

Region:

Fayetteville - ANC

Name of Facility	Lab Testing \$/Month	Sludge Analysis (Annual)	Process Samples (Annual)	Lab Testing \$/Year
Woodlake	\$438.81	\$1,000.00	\$1,080.00	\$7,345.72
Totals	\$438.81	\$1,000.00	\$1,080.00	\$7,345.72

Region:

Fairways

Name of Facility	Lab Testing \$/Month	Sludge Analysis (Annual)	Process Samples (Annual)	Lab Testing \$/Year
Beau Rivage	\$426.00	\$357.00	\$1,697.00	\$7,166.00
The Cape	\$391.50	\$357.00	\$67.00	\$5,122.00
Monthly Pick Up Fee ²	\$130.00			\$1,560.00
Totals	\$947.50	\$714.00	\$1,764.00	\$13,848.00

2. Monthly Pick Up Fee split between Coastal - ANC & Fairways

Grand Total:	Annual Amount
ANC Sewer	\$281,394
Fairways Sewer	\$13,848

AWWA Free Water Audit Software v5.0

American Water Works Association Copyright © 2011. All Rights Reserved.

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	Julie Black		
Email Address:	JABlack@aquaaamerica.com		
Telephone Ext.:	610-645-1132		
Name of City / Utility:	Aqua America		
City/Town/Municipality:	Twin Creeks		
State / Province:	North Carolina (NC)		
Country:			
Year:	2018	Calendar Year	
Start Date:	Enter MM/YY numeric format		
End Date:	Enter MM/YY numeric format		
Audit Preparation Date:	6/27/2019		
Volume Reporting Units:	Million gallons (US)		
PWSID / Other ID:	Asheville Twin Creeks - NC0111		

The following guidance will help you complete the Audit

All audit data are entered on the **Reporting Worksheet**

	Value can be entered by user
	Value calculated based on input data
	These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions

The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet

Enter the required data on this worksheet to calculate the water balance and data grading

Comments

Enter comments to explain how values were calculated or to document data sources

Performance Indicators

Review the performance indicators to evaluate the results of the audit

Water Balance

The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard

A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix

Presents the possible grading options for each input component of the audit

Service Connection Diagram

Diagrams depicting possible customer service connection line configurations

Definitions

Use this sheet to understand the terms used in the audit process

Loss Control Planning

Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits

Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements

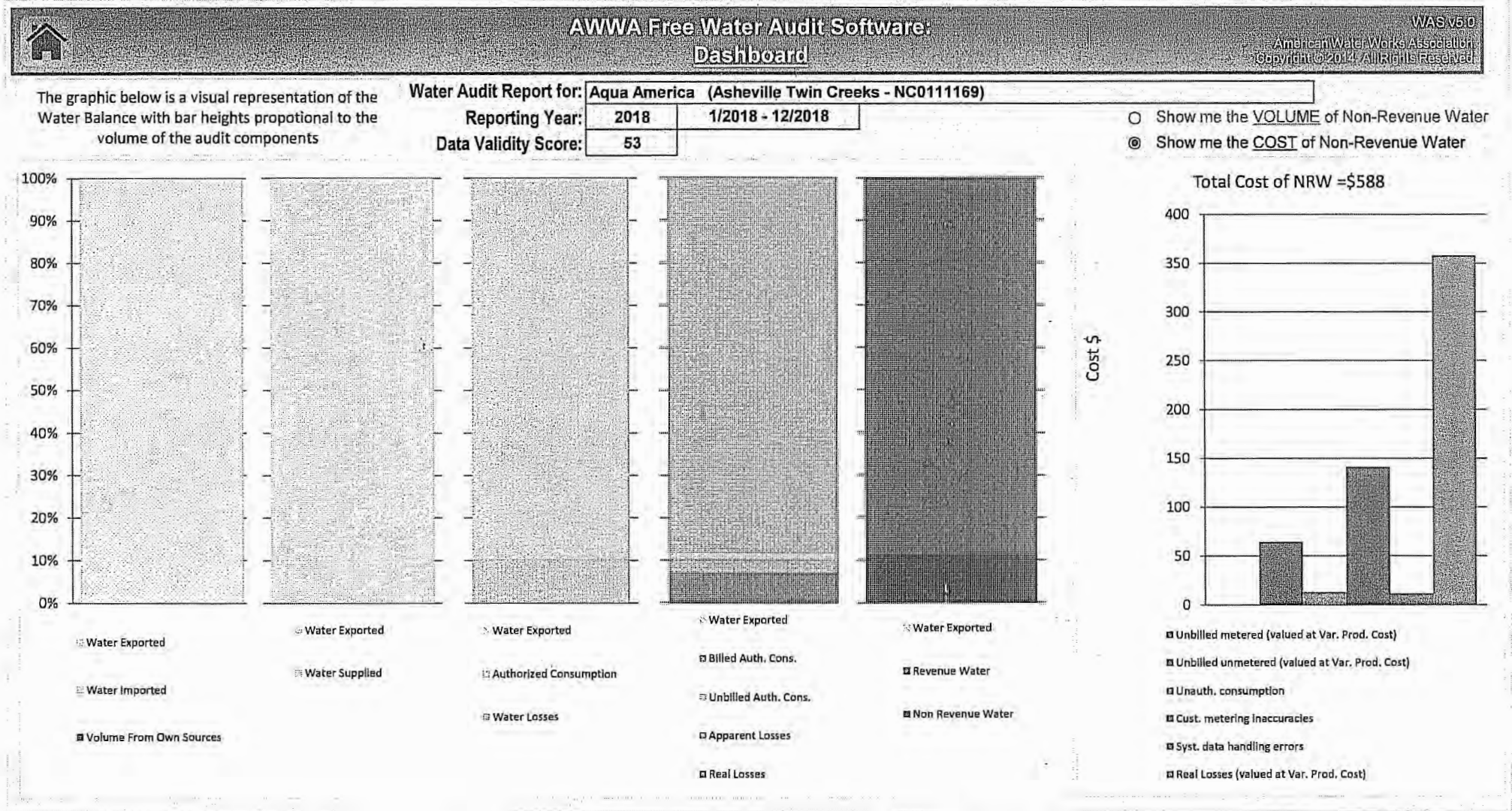
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software Reporting Worksheet																														
Click to access definition Click to add a comment		Water Audit Report for: Aqua America (Asheville Twin Creeks - NC0111169) Reporting Year: 2018 1/2018 - 12/2018																												
<p>Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades</p> <p style="text-align: center;">All volumes to be entered as: MILLION GALLONS (US) PER YEAR</p>																														
<p>To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.</p>																														
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <p>WATER SUPPLIED</p> <p style="text-align: center;">← Enter grading in column 'E' and 'J' →</p> <table style="width: 100%;"> <tr> <td>Volume from own sources:</td> <td><input type="text" value="2"/></td> <td>MG/Yr</td> </tr> <tr> <td>Water imported:</td> <td><input type="text" value="2"/></td> <td>1.208 MG/Yr</td> </tr> <tr> <td>Water exported:</td> <td><input type="text" value="2"/></td> <td>MG/Yr</td> </tr> </table> <p style="text-align: right;">WATER SUPPLIED: <input type="text" value="1.208"/> MG/Yr</p> </div> <div style="width: 35%;"> <p>Master Meter and Supply Error Adjustments</p> <table style="width: 100%;"> <tr> <th>Pcnt:</th> <th>Value:</th> <th>MG/Yr</th> </tr> <tr> <td><input type="text" value="1.25%"/></td> <td><input type="text" value="0"/></td> <td>MG/Yr</td> </tr> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/></td> <td>MG/Yr</td> </tr> <tr> <td><input type="text" value="0"/></td> <td><input type="text" value="0"/></td> <td>MG/Yr</td> </tr> </table> <p>Enter negative % or value for under-registration Enter positive % or value for over-registration</p> </div> </div>										Volume from own sources:	<input type="text" value="2"/>	MG/Yr	Water imported:	<input type="text" value="2"/>	1.208 MG/Yr	Water exported:	<input type="text" value="2"/>	MG/Yr	Pcnt:	Value:	MG/Yr	<input type="text" value="1.25%"/>	<input type="text" value="0"/>	MG/Yr	<input type="text" value="0"/>	<input type="text" value="0"/>	MG/Yr	<input type="text" value="0"/>	<input type="text" value="0"/>	MG/Yr
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Unbilled metered:	<input type="text" value="5"/>	0.000 MG/Yr																												
Unbilled unmetered:	<input type="text" value="7"/>	0.015 MG/Yr																												
<p>WATER LOSSES (Water Supplied - Authorized Consumption) <input type="text" value="0.123"/> MG/Yr</p> <p>Apparent Losses</p> <p>Unauthorized consumption: <input type="text" value="0.003"/> MG/Yr</p> <p>Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed</p> <p>Customer metering inaccuracies: <input type="text" value="6"/> <input type="text" value="0.033"/> MG/Yr</p> <p>Systematic data handling errors: <input type="text" value="7"/> <input type="text" value="0.003"/> MG/Yr</p> <p>Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed</p> <p>Apparent Losses: <input type="text" value="0.039"/> MG/Yr</p>																														
<p>Real Losses (Current Annual Real Losses or CARL)</p> <p>Real Losses = Water Losses - Apparent Losses: <input type="text" value="0.084"/> MG/Yr</p> <p>WATER LOSSES: <input type="text" value="0.123"/> MG/Yr</p>																														
<p>NON-REVENUE WATER</p> <p>NON-REVENUE WATER: <input type="text" value="0.138"/> MG/Yr</p> <p>= Water Losses + Unbilled Metered + Unbilled Unmetered</p>																														
<p>SYSTEM DATA</p> <p>Length of mains: <input type="text" value="8"/> <input type="text" value="0.9"/> miles</p> <p>Number of active AND inactive service connections: <input type="text" value="8"/> <input type="text" value="27"/></p> <p>Service connection density: <input type="text" value="27"/> conn./mile main</p> <p>Are customer meters typically located at the curbside or property line? <input type="text" value="Yes"/> (length of service line, beyond the property boundary, that is the responsibility of the utility)</p> <p>Average length of customer service line: <input type="text" value="27"/> (length of service line, beyond the property boundary, that is the responsibility of the utility)</p> <p>Average length of customer service line has been set to zero and a data grading score of 10 has been applied</p> <p>Average operating pressure: <input type="text" value="2"/> <input type="text" value="55.0"/> psi</p>																														
<p>COST DATA</p> <p>Total annual cost of operating water system: <input type="text" value="7"/> <input type="text" value="\$7,536"/> \$/Year</p> <p>Customer retail unit cost (applied to Apparent Losses): <input type="text" value="10"/> <input type="text" value="\$4.26"/> \$/1000 gallons (US)</p> <p>Variable production cost (applied to Real Losses): <input type="text" value="10"/> <input type="text" value="\$4,260.00"/> \$/Million gallons <input type="checkbox"/> Use Customer Retail Unit Cost to value real losses</p> <p>Retail costs are less than (or equal to) production costs; please review and correct if necessary</p>																														
<p>WATER AUDIT DATA VALIDITY SCORE:</p> <p style="text-align: center;">*** YOUR SCORE IS: 53 out of 100 ***</p> <p>A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score</p>																														
<p>PRIORITY AREAS FOR ATTENTION:</p> <p>Based on the information provided, audit accuracy can be improved by addressing the following components:</p> <ol style="list-style-type: none"> 1: Water imported 2: Billed metered 3: Customer metering inaccuracies 																														

AWWA Free Water Audit Software: System Attributes and Performance Indicators		WAS v5.0 American Water Works Association Copyright © 2014. All Rights Reserved		
Water Audit Report for: Aqua America (Asheville Twin Creeks - NC0111169)				
Reporting Year: 2018 1/2018 - 12/2018				
*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 53 out of 100 ***				
System Attributes:				
	Apparent Losses:	0.039 MG/Yr		
	+ Real Losses:	0.084 MG/Yr		
	= Water Losses:	0.123 MG/Yr		
	Unavoidable Annual Real Losses (UARL):	See limits in definition MG/Yr		
	Annual cost of Apparent Losses:	\$165		
	Annual cost of Real Losses:	\$358		
		Valued at Variable Production Cost Return to Reporting Worksheet to change this assumption		
Performance Indicators:				
Financial:	{	Non-revenue water as percent by volume of Water Supplied:	11.4%	
		Non-revenue water as percent by cost of operating system:	7.8%	Real Losses valued at Variable Production Cost
Operational Efficiency:	{	Apparent Losses per service connection per day:	3.94	gallons/connection/day
		Real Losses per service connection per day:	N/A	gallons/connection/day
		Real Losses per length of main per day*:	256.05	gallons/mile/day
		Real Losses per service connection per day per psi pressure:	N/A	gallons/connection/day/psi
		From Above, Real Losses = Current Annual Real Losses (CARL):	0.08	million gallons/year
		Infrastructure Leakage Index (ILI) [CARL/UARL]:		
* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline				

AWWA Free Water Audit Software: <u>Water Balance</u>							WAS v5.0
							American Water Works Association
Water Audit Report for:		Aqua America (Asheville Twin Creeks - NC0111169)					
Reporting Year:		2018		1/2018 - 12/2018			
Data Validity Score:		53					
Own Sources (Adjusted for known errors) 0.000	System Input 1.208	Water Exported 0.000	Billed Water Exported				Revenue Water 0.000
		Authorized Consumption 1.085	Billed Authorized Consumption 1.070	Billed Metered Consumption (water exported is removed) 1.070		Revenue Water 1.070	
			Billed Unmetered Consumption 0.000				
			Unbilled Authorized Consumption 0.015	Unbilled Metered Consumption 0.000		Non-Revenue Water (NRW) 0.138	
				Unbilled Unmetered Consumption 0.015			
		Water Losses 0.123	Apparent Losses 0.039	Unauthorized Consumption 0.003			
				Customer Metering Inaccuracies 0.033			
				Systematic Data Handling Errors 0.003			
				Leakage on Transmission and/or Distribution Mains Not broken down			
		Real Losses 0.084	Leakage and Overflows at Utility's Storage Tanks Not broken down				
Leakage on Service Connections Not broken down							
Water Imported 1.208							



Purchased Water Adjustment for Current Rates

Rate Entity	Region	Bulk Provider	Total Gallons Purchased	Total Gallons Sold	Loss (gallons)	Actual Loss (%)	P.S. ¹ Allowable Loss (%)	Loss at 15% (gallons)	Sold Plus 15% Loss (gallons)	Total Expense
ANC	Cary	Chatham Co Utilities	21,293,000	18,937,700	2,355,300	11.06				\$ 170,324.00
ANC	Cary	Johnston County	213,666,120	194,060,000	19,606,120	9.18				\$ 572,215.22
ANC	Cary	Town of Fuquay Varina	3,093,100	2,945,000	148,100	4.79				\$ 16,114.09
ANC	Cary	Town of Pittsboro	32,565,000	25,348,500	7,216,500	22.16	15	4,473,265	29,821,765	\$ 407,663.52
ANC	Cary	Warren County	485,000	452,700	32,300	6.66				\$ 2,725.00
ANC	Denver	Charlotte-Mecklenburg	35,873,486	34,711,200	1,162,286	3.24				\$ 103,962.44
ANC	Denver	City of Asheville	1,303,851	964,300	339,551	26.04	15	170,171	1,134,471	\$ 6,818.51
ANC	Denver	City of Belmont	4,653,500	3,962,400	691,100	14.85				\$ 61,483.87
ANC	Denver	City of Concord	3,438,000	2,048,100	1,389,900	40.43	15	361,429	2,409,529	\$ 13,259.47
ANC	Denver	City of Gastonia	8,988,200	8,455,200	533,000	5.93				\$ 59,818.81
ANC	Denver	City of Hickory	5,029,492	3,821,200	1,208,292	24.02	15	674,329	4,495,529	\$ 28,288.20
ANC	Denver	City of Lincolnton*	2,879,140	5,716,500						\$ 26,877.69
ANC	Denver	City of Morganton	5,831,280	4,894,100	937,180	16.07	15	863,665	5,757,765	\$ 15,795.85
ANC	Denver	City of Newton	1,116,500	783,000	333,500	29.87	15	138,176	921,176	\$ 3,233.50
ANC	Denver	Hendersonville Water	12,289,500	9,329,600	2,959,900	24.08	15	1,646,400	10,976,000	\$ 38,805.24
ANC	Denver	Iredell Water Corp	1,144,000	1,022,600	121,400	10.61				\$ 4,491.20
ANC	Denver	Iredell Water Corp*	100	4,800,900						\$ 144.38
ANC	Denver	Lincoln County*	704,470	2,651,700						\$ 4,556.75
ANC	Denver	Town of Forest City	2,468,800	1,911,400	557,400	22.58	15	337,306	2,248,706	\$ 12,847.27
ANC	Denver	Town of Forest City*	-	4,214,900						\$ -
ANC	Denver	Town of Harrisburg*	147,000	1,430,900						\$ 1,257.02
ANC	Denver	Town of Mooresville*	9,153,100	11,474,300						\$ 18,629.46
ANC	Denver	Town of Spruce Pines	2,433,000	1,814,400	618,600	25.43	15	320,188	2,134,588	\$ 13,030.08
ANC	Fayetteville	Harnett County Utilities	39,508,640	35,104,000	4,404,640	11.15				\$ 109,438.93

Purchased Water Adjustment for Current Rates

Rate Entity	Region	Bulk Provider	Total Gallons Purchased	Total Gallons Sold	Loss (gallons)	Actual Loss (%)	P.S. ¹ Allowable Loss (%)	Loss at 15% (gallons)	Sold Plus 15% Loss (gallons)	Total Expense
ANC	Kernersville	City of Archdale	1,672,700	1,574,900	97,800	5.85				\$ 16,178.43
ANC	Kernersville	City of Mount Airy	5,365,000	4,001,200	1,363,800	25.42	15	706,094	4,707,294	\$ 37,899.28
ANC	Kernersville	Davidson Water	8,085,140	5,969,100	2,116,040	26.17	15	1,053,371	7,022,471	\$ 41,853.00
Brookwood	Fayetteville	PWC	86,182,550	81,109,100	5,073,450	5.89				\$ 250,989.44
Brookwood	Fayetteville	PWC - Colony Village*	-	3,520,100						\$ 2,578.50
Brookwood	Fayetteville	PWC - Stoney Point*	10	11,202,700						\$ 1,274.34
Brookwood	Fayetteville	Town of Linden	1,818,300	1,834,300	(16,000)	(0.88)				\$ 9,491.53
										\$ 2,052,045.02

Notes:

*Indicates Partial Purchase water system

1. The Public Staff determines an appropriate amount of water loss based on system specific criteria, such as geographical location, unusual circumstances, etc. For the systems shown above, the standard allowable water loss is 15%.