Appomattox
River
Water
Authority

21300 Chesdin Rd. - S. Chesterfield, VA 23803 - Phone (804) 590-1145 - Fax (804) 590-9285

Appomattox River Water Authority

Regular Meeting of the Board of Directors

DATE: **September 13, 2018**

TIME: **2:00 PM**

LOCATION: **South Central Wastewater Authority**
Conference Room, Administration Building
900 Magazine Road
Petersburg, Virginia 23803

AGENDA

1. Call to Order/Roll Call
2. Approval of Minutes: Minutes of the Regular Board Meeting on August 16, 2018
3. Public Comment
4. Public Hearing on and Consideration of Proposed Amendments Related to the Direct Irrigation Withdrawal Policy
5. Executive Director's Report:
    - Reservoir Status Update for August/September 2018
    - Status Report: Ongoing Projects/Operations/Financials
    - Review of Raftelis Report: Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives
    - Review of 2012 & 2017 Bond Debt Service
6. Items from Counsel:
7. Other Items from Board Members/Staff Not on Agenda:
8. Closed Session
9. Adjourn

Cc: W. Dupler/George Hayes, Chesterfield
L. Lyons, Petersburg
W. Henley, Colonial Heights
F. Haltom, Prince George
R. Wilson, Dinwiddie Water Authority
A. Anderson, McGuire Woods

1. **Call to Order/Roll Call**

2. **Approval of Minutes: Minutes of the Regular Board Meeting on August 16, 2018.**

   Following are the Minutes of the Regular Board Meeting on August 16, 2018.

   Absent any corrections or revisions, we recommend approval of the minutes as submitted.

BOARD OF DIRECTORS MEETING

Appomattox River Water Authority
August 16, 2018 at 2:00 p.m.
Location: Appomattox River Water Authority
21300 Chesdin Road, South Chesterfield, Virginia 23803

PRESENT:
Percy Ashcraft, Chairman (Prince George)
Joseph Casey, Vice Chairman (Chesterfield)
Douglas Smith, (Colonial Heights)
Robert B. Wilson, (Alternate, Dinwiddie)
Aretha Ferrell-Benavides, (Petersburg)
George Hayes, (Alternate, Chesterfield)
Frank Haltom, (Alternate, Prince George)
Lionel Lyons, (Alternate, Petersburg)

ABSENT:
Kevin Massengill, Secretary/Treasurer (Alternate, Dinwiddie)
William Henley, (Alternate, Colonial Heights)
William Dupler, (Alternate, Chesterfield)

STAFF:
Robert C. Wichser, Executive Director, (ARWA & SCWWA)
James C. Gordon, Asst. Executive Director (ARWA & SCWWA)
Arthur Anderson, (McGuire Woods)
Melissa Wilkins, Accounting/Office manager (ARWA & SCWWA) Absent
Kathy Summerson, Administrative Assistant (SCWWA)

OTHERS:
Keith Boswell, Virginia's Gateway Region
Jeff Mincks, Chesterfield
Mike Wooden, Arcadis
Michael Campbell, Prince George Journal/Dinwiddie Monitor
Jeff Franklin, Chesterfield
Denny Morris, Crater Region Planning Comm.

Mr. Ashcraft, Chairman, called the meeting to order at 2:02 p.m.

1. Call to Order/Roll Call.

The roll was called.

2. Approval of Minutes: Minutes of the Regular Meeting of the Board on June 14, 2018

Upon a motion made by Dr. Casey and seconded by Ms. Ferrell-Benavides the following resolution was adopted:

RESOLVED, that the minutes of the Regular Meeting of the Board on June 14, 2018 are hereby approved:

For: 5 Against: 0 Abstain: 0

3. Public Comment

There were no public comments.

4. Recognition of 50 Years of American Water Works Association Membership and Service to the Water Industry

Mr. Ashcraft presented a plaque to ARWA that was given by the American Water Works Association (AWWA) for recognition of 50 years of AWWA Membership and ARWA's Service to the Water Industry.

5. Executive Director's Report:

- **Reservoir Status Update for July/August 2018**

  Dr. Wichser reported on the reservoir status update for July/August 2018. He stated that the excessive amount of rain entering our reservoir did impact water quality at times, particularly at the end of May going into June. He further stated due to the change related to the excess wet weather entering the reservoir, costs went up because of having to use more chemicals to treat the water.

- **Irrigation Withdrawal License Agreements**

  Dr. Wichser reported on the Irrigation Withdrawal License Agreements. He stated that starting back in 2008 the ARWA Board of Directors adopted a Resolution addressing withdrawal of water from the Chesdin Reservoir related to irrigation, which is included in the Board package. He further stated, in 2008 the Authority set the irrigation License Agreements based on five-year recurring renewals at the option of the ARWA Board. Dr. Wichser stated he wanted to remind this Board that no new irrigation systems installed after January 20, 2009 are permitted based on the Board's continuation of a moratorium. Dr. Wichser stated he has received phone calls from citizens on both sides of the reservoir asking if they can install irrigation systems, and the Authority's response is that a present moratorium on

the installation of irrigation withdrawals is still in effect. He further stated that at the end of December the present License Agreements end, and what we are requesting is approval by the Board for us to move forward in renewing the existing irrigation licenses for another five years. He stated we currently have a total of 57 presently active on the Chesterfield side and 39 on the Dinwiddie side.

Dr. Wichser stated Mr. Anderson alluded to the fact that we should schedule a public hearing before we move forward to update and invoice with the individuals holding existing irrigation licenses. He further stated we could schedule and advertise the public hearing to occur at the September Board meeting. He stated staff requests Board of Directors approval for ARWA to enter into the next five year "Additional Term" January 1, 2019 until January 1, 2024 related to the irrigation withdrawal License Agreements with the homeowners holding existing License Agreements, requesting a renewal fee of $343.92 for each transaction.

Mr. Ashcraft asked Mr. Anderson about the public hearing, and Mr. Anderson replied that he thought it was appropriate for the Board to authorize the Executive Director to contact license owners and see if there is any interest in renewing them. He commented that if there is interest, then you would have a public hearing probably in November. He stated what we really want to know now is that the Board will extend this term another five years, and we can get the documentation in place and a public hearing. Mr. Ashcraft asked what we were voting on at the conclusion of the public hearing, and Mr. Anderson answered that it would be the extension and the fees, which were negotiated back in 2008. He stated what we are asking is that the Board just continue with the fee as it's laid out in this Policy. He further stated as we will be getting a lot of requests to renew it for another five years, we will need a public hearing and finalize the vote. Dr. Casey stated he had no intention of pivoting from an Agreement that appears to be working. Mr. Wilson asked if there was a sunset clause and Mr. Anderson stated we have to revisit it every five years because of concerns with the reservoir level. The Board wished to retain the discretion to revisit this and staff has recommended that it continue. Dr. Casey referred to the implementation of conservation measures when there is a notice, and asked if the irrigation people get the notice first. Dr. Wichser stated that historically he doesn't have any information if that occurred in the past. He further stated that ARWA had entered voluntary conservation in 2012, but the Authority over the past six years had not needed to request and enter into mandatory conservation. Dr. Wichser stated if mandatory conservation was issued, he believes it would be an excellent idea to issue a letter to each of these irrigation systems withdrawing from Chesdin Reservoir to remind them that they must comply with the issued conservation stage as stated in their License Agreement. Dr. Casey stated when we enter mandatory we are all entering into it together, but are they mandatory first in the first line of defense, and Mr. Anderson stated they would abide by the same rules as everyone else.

Ms. Ferrell-Benavides left at 2:20 p.m. and Mr. Lyons, Alternate for Petersburg, took her place.

Mr. Ashcraft asked if someone calls and has a new home, what happens if they request to install a new irrigation system, and Dr. Wichser replied that last year he did receive a call from a citizen who built a new home and asked if an irrigation system could be installed, and he replied at this time the irrigation system could not be approved by the Authority due to the ongoing moratorium. Dr. Casey asked if there was a draft letter to please share it before it goes out.

Upon a motion made by Dr. Casey and seconded by Mr. Wilson the following resolution was adopted:

RESOLVED, that the Board approves for Staff to enter into the next five year "Additional Term" January 1, 2019 until January 1, 2024 related to the irrigation withdrawal License Agreements with the homeowners holding existing License Agreements is hereby approved:

For: 5 Against: 0 Abstain: 0

Upon a motion made by Mr. Smith and seconded by Dr. Casey the following resolution was adopted:

RESOLVED, that the Board approves for ARWA to notify the homeowners of the proposal that is before us and to properly advertise a public hearing on this document for September 13, 2018 Board meeting:

For: 5 Against: 0 Abstain: 0

- **Failure of ARWA Filter Number 28**

Dr. Wichser reported on the failure of ARWA Filter Number 28. He stated that ARWA has 32 filters, which takes the settled water and filters it. He further stated with the failure of Filter No. 28 there has been no impact on the quality of water or amount of water treated. Dr. Wichser stated the failure of the filter occurred on the night of June 11, 2018. He reported there was an uplifting of a large section of the underdrains. He stated that we are investigating why it occurred and what caused it. He further stated we immediately made contact for someone to undertake emergency repairs, with our Trust Engineer, WW Associates assisting us. He stated we contacted contractors on July 2, 2018 and there would be five companies working on the filter repair. He further stated that the repair costs presently total about

$156,000 with total cost expected to be in the $175,000 area. He stated that we filed an insurance claim with VML on August 8, 2018, on August 10, 2018 the claims adjuster stopped by. Dr. Wichser stated that on August 13, 2018 the insurance company's engineering consulting firm started their investigation and this week we have started preliminary repairs. He further stated the repair is not expected to be complete until mid to end of September. He stated Filter Number 28 was constructed in 2007 and the same failure occurred to a section of this same filter in 2010. He further stated the contractor who installed the parts came in and repaired it at that time at no cost. He stated again this time, the contractor from 2007 has been put on notice that there was another failure.

Mr. Ashcraft asked if a claim had been filed on the previous one, and Dr. Wichser replied it was repaired under warranty. Mr. Lyons asked if the insurance claim was covering all the costs talked about, and Dr. Wichser replied that he doesn't expect it would, as we are going back with an upgraded newer design. He further replied that the adjuster stated if they agree with it, that they would pay for it to be repaired to the extent that it was originally installed. He stated the difference would be expected to be about $25,000. Mr. Wilson asked how many filters were done at the same time and Dr. Wichser replied sixteen. Mr. Wilson asked why this is the only filter having problems and Dr. Wichser stated Filter No. 28 to date, was the only filter with grout failure. Mr. Gordon stated the 2010 failure was the back half and they repaired that, and this failure was the front half. Mr. Wilson asked if there was any indication to worry about the other fifteen, and Dr. Wichser stated that to-date nothing has failed in the others.

- **Status Reports: Ongoing Projects/Financials**

  Mr. Gordon reported on the Status Reports of Ongoing Projects/Operational/Financials.

6. Items from Counsel

- **Resolution Authorizing the Executive Director to Provide Emergency Services to Non-Participating Jurisdictions in the Event of a Local Water Emergency**

Mr. Anderson reported on the revised Resolution that was considered at the last Board meeting relating to provision of emergency water services. He stated he received some comments that were generally acceptable to everyone. Dr. Casey stated if this is approved, make sure we send it to Hopewell or others if it's applicable. Mr. Smith asked once the emergency goes into effect, and if we are providing assistance, will we go until the next meeting of the Board as there is not a specific time frame on this, and Mr. Anderson answered it would be the next scheduled regular meeting, but there is a provision in the By-Laws about special meetings, where the chairman and two members can call a meeting. Mr. Ashcraft asked if there was ever a time the Authority would be called upon to assist a private entity, and Dr. Wichser stated this present case was the catalyst as Virginia American Water is a private investor owned entity that provides one-hundred percent of the water to the City of Hopewell.

Upon a motion made by Mr. Wilson and seconded by Mr. Lyons the following resolution was adopted:

RESOLVED, that the Board approves the Resolution authorizing the Executive Director to provide emergency services to non-participating jurisdictions in the event of a local water emergency:

For: 5 Against: 0 Abstain: 0

7. Other Items from Board Members/Staff Not on Agenda

Dr. Wichser stated he just wanted to remind the Board that he has moved forward and scheduled Ted Cole of Davenport and Raftelis for the September 13, 2018 Board meeting for final review and questions related to their report. Mr. Smith thanked Dr. Wichser and Mr. Gordon for taking him on a tour of the ARWA and SCWWA facilities.

8. Closed Session

Mr. Anderson read the Resolution to go into Closed Session (attached).

Upon a motion made by Dr. Casey and seconded by Mr. Lyons, the Board went into Closed Session at 2:41 p.m.

For: 5 Against: 0 Abstain: 0

Upon a motion made by Mr. Lyons and seconded by Mr. Wilson, the Board came out of Closed Session at 4:06 p.m.

For: 5 Against: 0 Abstain: 0

Mr. Anderson read the Certification regarding the Closed Session and, upon a motion made by Mr. Lyons and seconded by Mr. Wilson, it was approved by a unanimous roll call vote (attached).

9. Adjourn

Upon a motion made by Mr. Lyons and seconded by Mr. Wilson the meeting was adjourned at 4:07 p.m.

The next Regular Meeting is scheduled for Thursday, September 13, 2018 at 2:00 p.m. at the South Central Wastewater Authority.

MINUTES APPROVED BY:

_____

Kevin Massengill
Secretary/Treasurer

CLOSED MEETING RESOLUTION
(Land Disposition)

APPOMATTOX RIVER WATER AUTHORITY

August 16, 2018

I move that we go into a closed meeting for discussion and consideration of the disposition by the Appomattox River Water Authority of publicly-held real property for a public purpose, specifically all of the real property of the Authority, where discussion in an open meeting would adversely affect the Authority's bargaining position and negotiating strategy as permitted by Section 2.2-3711A.3 of the Virginia Freedom of Information Act:

MOTION: Casey

SECOND: Lyons

VOTE

Ashcraft	Aye
Casey	Aye
Lyons	Aye
Smith	Aye
Wilson	Aye

ABSENT DURING VOTE: None.

ABSENT DURING CLOSED MEETING: None.

SESSION DATE: August 16, 2018

CERTIFICATION OF CLOSED MEETING

WHEREAS, the Board of the Appomattox River Water Authority (the "Authority") convened a closed meeting on August 16, 2018, pursuant to an affirmative recorded vote and in accordance with the provisions of the Virginia Freedom of Information Act; and

WHEREAS, Section 2.2-3712 of the Code of Virginia requires a certification by this Board that such closed meeting was conducted in conformity with Virginia law;

NOW THEREFORE, BE IT RESOLVED that the Board of the Authority hereby certifies that, to the best of each member's knowledge, (i) only public business matters lawfully exempted from open meeting requirements by the Virginia Freedom of Information Act were discussed in the closed meeting to which this certification resolution applies, and (ii) only such public business matters as were identified in the motion convening the closed meeting were heard, discussed or considered by the Board.

MOTION: Lyons

SECOND: Wilson

VOTE

Ashcraft	Aye
Casey	Aye
Lyons	Aye
Smith	Aye
Wilson	Aye

ABSENT DURING VOTE: None.

ABSENT DURING CLOSED MEETING: None.

3. Public Comment

The Guidelines for Public Comment are:

GUIDELINES FOR PUBLIC COMMENT AT SCWWA/ARWA BOARD OF DIRECTORS MEETINGS

If you wish to address the SCWWA/ARWA Board of Directors during the time allocated for public comment, please raise your hand or stand when the Chairman asks for public comments.

Members of the public requesting to speak will be recognized during the specific time designated on the meeting agenda for "Public Comment Period." Each person will be allowed to speak for up to three minutes.

When two or more individuals are present from the same group, it is recommended that the group designate a spokesperson to present its comments to the Board and the designated speaker can ask other members of the group to be recognized by raising their hand or standing. Each spokesperson for a group will be allowed to speak for up to five minutes.

During the Public Comment Period, the Board will attempt to hear all members of the public who wish to speak on a subject, but it must be recognized that on rare occasion presentations may have to be limited because of time constraints. If a previous speaker has articulated your position, it is recommended that you not fully repeat the comments and instead advise the Board of your agreement. The time allocated for speakers at public hearings are the same as for regular Board meeting, although the Board can allow exceptions at its discretion.

Speakers should keep in mind that Board of Directors meetings are formal proceedings and all comments are recorded on tape. For that reason, speakers are requested to speak from the podium and wait to be recognized by the Chairman. In order to give all speakers proper respect and courtesy, the Board requests that speakers follow the following guidelines:

- Wait at your seat until recognized by the Chairman;
- Come forward and state your full name and address. If speaking for a group, state your organizational affiliation;
- Address your comments to the Board as a whole;
- State your position clearly and succinctly and give facts and data to support your position;
- Summarize your key points and provide the Board with a written statement or supporting rationale, when possible;
- If you represent a group, you may ask others at the meeting to be recognized by raising their hand or standing;
- Be respectful and civil in all interactions at Board meetings;
- The Board may ask speakers questions or seek clarification, but recognize that Board meetings are not a forum for public debate; Board Members will not recognize comments made from the audience and ask that members of the audience not interrupt the comments of speakers and remain silent while others are speaking so that other members in the audience can hear the speaker;
- The Board will have the opportunity to address public comments after the Public Comment Period has been closed;
- At the request of the Chairman, the Executive Director may address public comments after the session has been closed as well; and
- As appropriate, staff will research questions by the public and respond through a report back to the Board at the next regular meeting of the full Board. It is suggested that citizens who have questions for the Board or staff submit those questions in advance of the meeting to permit the opportunity for some research before the meeting.

4. Public Hearing on and Consideration of Proposed Amendments Related to the Direct Irrigation Withdrawal Policy

- Following is the Amended and Restated Policy pertaining to Direct Irrigation Withdrawals from Lake Chesdin

APPOMATTOX RIVER WATER AUTHORITY

- RESOLUTION -

AMENDED AND RESTATED POLICY PERTAINING TO DIRECT IRRIGATION WITHDRAWALS FROM LAKE CHESDIN

Originally Adopted: November 20, 2008
First Amended and Restated: June 23, 2011
Second Amended and Restated: September 13, 2018

WHEREAS, the Appomattox River Water Authority ("ARWA") is the owner and manager of Lake Chesdin, a 3,100-acre reservoir located on the Appomattox River on the Chesterfield County and Dinwiddie County line that provides a drinking water supply to the Cities of Colonial Heights and Petersburg and the Counties of Chesterfield, Dinwiddie, and Prince George (the "Participating Jurisdictions");

WHEREAS, ARWA faces significant increases in demand for drinking water for all purposes throughout ARWA's service area;

WHEREAS, the Lake Chesdin area experienced extended droughts between 2001 and 2002 and in 2007 and 2010, which resulted in low lake levels and the imposition of mandatory water use restrictions for the first times in ARWA's history;

WHEREAS, lawn and garden irrigation may use thousands of gallons of water each day on just one landowner's property;

WHEREAS, in 2007 ARWA noted that a number of persons residing near Lake Chesdin had installed pumps, intake devices, and other equipment and taken other measures for the purpose of withdrawing water directly from Lake Chesdin for the purpose of lawn and garden irrigation ("Direct Irrigation Withdrawals"), and the potential existed for others to do the same as growth occurs around Lake Chesdin;

WHEREAS, none of the Direct Irrigation Withdrawals or pumps, intake devices, or other equipment for making Direct Irrigation Withdrawals ("Systems") had been approved previously by ARWA's Board of Directors (the "Board"), and, on November 2, 2007, the Board appointed a committee to review the issue of Direct Irrigation Withdrawals and to make recommendations pertaining to such activity (the "Committee");

WHEREAS, the Committee met and reported its recommendations to the Board at the Board's regular meeting on December 20, 2007, which the Board adopted by resolution on December 20, 2007;

WHEREAS, the Board authorized and directed the Committee to (1) draft an appropriate permit or license document in furtherance of its recommendations; (2) develop policies and

procedures for application for, and issuance of, such documents and for the collection and administration of the recommended fees;

WHEREAS, ARWA held a public hearing on the adoption of a proposed policy pertaining to Direct Irrigation Withdrawals on August 11, 2008, after notice of the public hearing was published once in a newspaper of general circulation in ARWA's service area;

WHEREAS, as agreed during the public hearing, the Committee met with a self-selected group of interested citizens on September 15, 2008 (the "Committee-Citizen Meeting");

WHEREAS, during the Board's September 18, 2008 regular meeting, the Board discussed the public hearing and the Committee-Citizen Meeting;

WHEREAS, the Board determined to schedule a second public hearing on a proposed policy pertaining to Direct Irrigation Withdrawals and held such public hearing on November 20, 2008, after notice of the public hearing was published twice in several newspapers of general circulation in ARWA's service area, and following the public hearing adopted a policy and guidance (the "Original Policy") for the approval of Direct Irrigation Withdrawal licenses ("Licenses");

WHEREAS, on June 23, 2011, ARWA's Executive Director recommended making certain minor changes to the Original Policy and the Board adopted the first amendment and restatement of the Original Policy (the "First Amended Policy");

WHEREAS, the term of the current Licenses for Direct Irrigation Withdrawals expires on December 31, 2018, and ARWA staff and counsel have recommended allowing the Licenses to be renewed for an additional five years, setting the license fee for the renewal term pursuant to the formula provided in the First Amended Policy (which was not changed from the Original Policy) and making certain conforming changes to the First Amended Policy; and

WHEREAS, the Board held a public hearing regarding the above-described recommendations on September 13, 2018, of which notice was published twice in several newspapers of general circulation in ARWA's service area;

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF THE APPOMATTOX RIVER WATER AUTHORITY THAT:

1. **Protection of Lake Chesdin for Public Drinking Water Supply**. The Board hereby finds and determines that this second amended and restated policy (the "Second Amended Policy") will further the public purposes for which ARWA was created, including without limitation the purposes of conserving, protecting and beneficially utilizing the surface water in Lake Chesdin to ensure the public welfare, safety, and health of the inhabitants of the Participating Jurisdictions who rely upon Lake Chesdin as a source of drinking water and enabling ARWA to obtain permits for additional water sources reasonably required to serve such inhabitants.

2. License Required for Continued Direct Irrigation Withdrawals. No Direct Irrigation Withdrawal shall occur except as authorized by the terms of a License Agreement, recommended by ARWA's Executive Director, approved by the Board, and executed by the Licensee (the "License Agreement"). The License Agreement shall be substantially in the form presented at this meeting, with such insertions, deletions, or other changes not inconsistent with this Second Amended Policy as may be approved by the Executive Director in his discretion.

3. Applications for Licenses for Renewal Term. Each Licensee existing as of September 13, 2018, who desires to renew his or her License shall submit an application to the Executive Director (the "Application"). The Application shall be substantially in the form presented at this meeting, with such insertions, deletions, or other changes as may be approved by the Executive Director in his discretion and not inconsistent with this Second Amended Policy. Applications must be received by the Executive Director by June 30, 2019.

4. Renewal Term. Regardless of when an application for a renewed License is received, the License, if granted, shall be for a term of five (5) years, commencing on January 1, 2019 and ending on December 31, 2024 (the "Renewal Term"), unless sooner terminated in accordance with the License Agreement.

5. License Fee. The fee for a License for the Renewal Term shall be three hundred forty-three dollars and ninety-two cents ($343.92), which was determined by adjusting the initial license fee of $300 set by the Original Policy for inflation based on the All Items Consumer Price Index for All Urban Consumers for the U.S. City Average (Current Series) for the period ended on September 1, 2018. The License Fee is payable immediately upon the issuance of a License for the Renewal Term.

6. Conservation. Each Licensee must agree to abide by irrigation and other water use restrictions imposed by the Participating Jurisdiction in which they live.

7. Health, Environmental, or Other Restrictions Required by Law or Governmental Entity. Each Licensee must agree to abide by all local, state, and federal laws and regulations now or hereafter in effect and applicable to his Direct Irrigation Withdrawal or System and that ARWA may, as Licensor, impose upon him or her, as Licensee, any health, environmental, or other restrictions required under local, state, or federal law or as may be required by any local, state, or federal governmental entities that regulate or provide assistance to ARWA, including restrictions imposed as a requirement to obtaining permits to construct improvements or enlargements of ARWA's water treatment and/or storage capacity. Each Licensee shall agree to not cause or permit the use, generation, storage, release, or disposal in, on, or about Lake Chesdin of any substances, materials, or wastes in violation of local, state, or federal law.

8. Current Parcel Ownership Required; Limitation on Number and Transferability of Licenses. A License for the Renewal Term may be granted only to a current Licensee as of September 13, 2018, who is also a current owner of a parcel of land fronting Lake Chesdin shown on the map attached as Exhibit A hereto and made a part hereof (each a "Parcel"). Licenses shall be limited to one per Parcel, regardless of whether a Parcel owner

subdivides or intends to subdivide his Parcel. Each Licensee may, with the prior written consent of ARWA, transfer his License to a single successor owner of his or her Parcel, but may not transfer, assign, divide, allocate, or distribute duplicates of his or her License among the successor owners of any subdivided portions of his or her Parcel, and any attempt on the part of a Licensee to do so may result in the immediate termination of the License by the Board, acting in its sole discretion.

9. System Limitations. Each Licensee's System shall originate from a single withdrawal point from Lake Chesdin, which has been identified by Licensee as part of his or her Application, and use a single pump or other intake device. Systems shall not: (i) have a pump capacity greater than 20 gallons per minute, (ii) have pumps or other intake devices located beyond the end of the Licensee's dock, pier, or bulkhead, or, in the absence of a dock, pier, or bulkhead, thirty (30) feet from the normal pool limit, and (iii) be used to pump or intake water for storage (i.e., all water removed from Lake Chesdin by Systems must be immediately applied to irrigation). Each Licensee may replace failing equipment that is part of his or her System with functioning equipment that is the same or, if the same equipment is not available, the functional equivalent of the failing equipment, but may not extend, expand, or otherwise improve his or her System or increase its ability to make Direct Irrigation Withdrawals.

10. Right to Enter, Inspect, and Remediate. Each Licensee shall grant ARWA and any of its duly authorized agents or representatives the rights (i) to enter, at reasonable times and under reasonable circumstances, his or her Parcel for the purposes of obtaining information about or conducting a survey or inspection of his or her System and its operation to ensure compliance with any laws, regulations, rules, permits, standards, or policies of ARWA and any applicable local, state, or federal government or governmental entity and (ii) to the extent permitted by law, to remove, dismantle, or otherwise remediate a noncompliant System or portion thereof after written notice of noncompliance has been given by ARWA to the Licensee, unless the Licensee has caused the System to become compliant, as determined by ARWA, within thirty (30) days after the notice was given.

11. Indemnity. Each Licensee shall defend, indemnify, and save harmless ARWA and its agents, employees, contractors, representatives, affiliates, and other related entities (the "Indemnitees" or an "Indemnitee") from and against any loss, claims, expenses (including reasonable attorney's fees), or damage incurred or suffered by an Indemnitee, by reasons directly or indirectly arising out of, caused (in whole or in part) by, or in any way connected with the Licensee's Direct Irrigation Withdrawal. ARWA shall have no responsibility, liability, or obligation with respect to any property of the Licensee at, in, or on Lake Chesdin, it being acknowledged and understood by the Licensee that the safety, security, and effects of any such property are the sole responsibility and risk of the Licensee.

12. Licensee Shall Have No Other Privileges or Any Right or Interest in ARWA Property. Each Licensee must agree that (i) the License shall be only a license to make Direct Irrigation Withdrawals in accordance with this Second Amended Policy and the terms of the License Agreement, and shall not be construed as granting any other privileges or any right or interest in Lake Chesdin or other ARWA property, (ii) he or she does not have and shall not claim at any time any right or interest of any kind or nature whatsoever in Lake Chesdin or other ARWA property by virtue of the License Agreement or the License, and (iii) the License is

personal to the Licensee, and except as may be provided pursuant to paragraph 8 of this Second Amended Policy, the privileges appurtenant thereto shall not inure to the successors and/or assigns of the Licensee.

13. Amendment of Second Amended Policy and Termination of License. (a) Each Licensee shall agree that the Board may, in its sole discretion, at any time or from time to time, unilaterally amend this Second Amended Policy and, as a result, the License, to the extent it is inconsistent with the amendments. Before the adoption of any amendment to this Second Amended Policy, the Board shall hold a public hearing regarding the proposed amendment, of which notice shall be published twice in one or more newspapers of general circulation in ARWA's service area. In addition, ARWA shall provide written notice of any amendment to this Second Amended Policy and the License to each Licensee within thirty (30) days of its adoption by the Board. Any notice to a Licensee pursuant to this Second Amended Policy shall be sent by first class U.S. mail to the address provided in the Application or such other address designated in writing to ARWA at the address provided in paragraph 20 of this Second Amended Policy.

(b) Any License, License Agreement, and the privileges created and conferred thereby on a Licensee are terminable at will by either the Board or the Licensee. Termination of the License, License Agreement, and the privileges shall occur immediately upon providing written notice to the other party. Upon termination, the Licensee shall proceed with diligence to remove his or her System at his or her sole expense.

(c) Notwithstanding the foregoing, before the Board amends this Second Amended Policy or terminates any License, the Board shall make a finding that such amendment or termination furthers the public purposes for which ARWA was created, including without limitation the conservation, protection, and beneficial utilization of the surface water in Lake Chesdin to ensure the public welfare, safety, and health of the inhabitants of the Participating Jurisdictions who rely upon Lake Chesdin as a source of drinking water and enabling ARWA to obtain permits for additional water sources reasonably required to serve such inhabitants.

(d) If an amendment of the Second Amended Policy results in the termination of a License and the privileges granted thereby, or if a License is directly terminated by the Board, the Board shall cause a pro rata portion of the License fee based on the months remaining in the Renewal Term to be returned to the affected Licensee.

14. Future Direct Irrigation Withdrawals. The moratorium on new Direct Irrigation Withdrawals, which has been effective since September 21, 2011, shall continue in full force and effect.

15. Unlicensed Direct Irrigation Withdrawals. All Direct Irrigation Withdrawals for which a License has not been granted, or for which a License has been terminated, shall cease, and all such Systems utilized for unlicensed Direct Irrigation Withdrawals shall be removed from Lake Chesdin at the sole expense of the owner.

16. Other Water Withdrawals Prohibited. Except as otherwise provided by this Policy, unless expressly approved by the Board, all other withdrawals from Lake Chesdin are prohibited.

17. Enforcement. The Executive Director is hereby authorized to engage counsel to undertake appropriate legal action on ARWA's behalf to enforce this Second Amended Policyor the terms of any License approved by the Board.

18. Golf Course Irrigation. ARWA has previously approved Direct Irrigation Withdrawals from Lake Chesdin for golf course irrigation at Lake Chesdin Golf Club. The Executive Director shall periodically review the agreement with Lake Chesdin Golfers' Club LLC and make recommendations to the Board for amending the conditions upon which that entity may continue to withdraw water from Lake Chesdin consistent with this Policy.

19. Conflict with Other Policies. This Second Amended Policy supersedes all prior policies pertaining to Direct Irrigation Withdrawals, if any.

20. Reports of Unauthorized Withdrawals. Anyone observing unauthorized withdrawals from Lake Chesdin can report it to ARWA's Executive Director at:

Appomattox River Water Authority
Executive Director
21300 Chesdin Road
Petersburg, Virginia 23803
Phone: (804) 590-1145

21. Effective Date. This Second Amended Policy shall take effect immediately.

5. Executive Director's Report:

- **Reservoir Status Update for August/September 2018**

- **Status Reports: Ongoing Projects, Operational, and Financial**

  Following are status reports concerning the Ongoing Projects, Operations, and Financials for the ARWA.

MEMORANDUM

TO: **APPOMATTOX RIVER WATER AUTHORITY BOARD OF DIRECTORS**

FROM: **ROBERT C. WICHSER, EXECUTIVE DIRECTOR**
JAMES C. GORDON, ASSISTANT EXECUTIVE DIRECTOR

SUBJECT: **STATUS REPORT – ON-GOING PROJECTS**

DATE: **SEPTEMBER 13, 2018**

The following projects are underway. This report includes sections on Capital projects and large replacement projects.

In-Plant Capital Projects:

- Construction is ongoing, predominantly at Raw Water Pump Station No. 1.
- Temporary power has been installed and new ductbank construction is ongoing.
- Sitework for the new switchgear building has also started.
- Shop drawings are being processed on a number equipment items.
- A construction meeting was held on September 5, 2018 at the ARWA.

MEMORANDUM

TO: **APPOMATTOX RIVER WATER AUTHORITY BOARD OF DIRECTORS**

FROM: **ROBERT C. WICHSER, EXECUTIVE DIRECTOR**
JAMES C. GORDON, ASST. EXECUTIVE DIRECTOR

SUBJECT: **OPERATING AND FINANCIAL STATUS REPORT**

DATE: **SEPTEMBER 13, 2018**

Operating Status Report

General:

- The next scheduled Board of Directors Meeting is **Thursday November 15, 2018** at the South Central Wastewater Authority at 2:00 pm.
- Representatives with the COV457 program are meeting with staff regarding the transition. The funds are currently available to staff and complete balance transfer should take place in early October.
- Work continues with our consultants to develop the Groundwater Monitoring Plan for submittal to DEQ.
- Staff has submitted the Filter 28 failure to VML. All indications are this will be considered a covered item.

Operations:

- Finished water met all permit requirements for the month of August. Copies of the VDH monitoring reports are available if anyone would like to see them.
- Staff is coordinating with K.L. Shane and Roberts Filter to have work performed on Filter 28 underdrain. The filter should be repaired and back in service by October.

Maintenance:

- Dropped outfall 005 to repair valve and tower.
- Coordinating work with the new welder/fabricator on the caustic feed system
- Works continues on replacing the transmission ARVs.

Instrumentation/IT:

- Working with our integrators to improve remote communications.
- Obtaining quotes for new flow meters on the caustic feed system.
- Working with maintenance to have the mag meter installed on the effluent line of filter 1.

Laboratory:

- Work continues on the Groundwater Monitoring Report for submittal to the DEQ. The report must be submit by September 28th.
- Monitoring Lake algal conditions.

Financial Status Report:

Following is the Executive Summary of the Monthly Financial Statement that includes the YTD Budget Performance and the Financial Statement for August 2018.

Appomattox River Water Authority-Balance Sheet

For Month Ending August 31, 2018

Assets			
Current Assets			
	Petty Cash	$	400
	SunTrust Operating Fund	$	2,107,443
	SunTrust Replacement Fund	$	-
	Total Unrestricted Cash	**$**	**2,107,843**
	Water Revenue	$	3,537,841
	Reserve Account	$	2,724,902
	Replacement Account	$	578,990
	Debt Service Reserve	$	1,066,426
	Bond Principal/Interest	$	2,010,549
	Bond Construction	$	12,453,964
	Total Restricted Cash	**$**	**22,372,672**
	Total Checking/Savings	**$**	**24,480,515**
	Accounts Receivable	**$**	**1,750**
	Other Current Assets	**$**	**12,599**
	Inventory	**$**	**160,010**
Total Current Assets		**$**	**24,654,874**
Fixed Assets			
	Land and Land Rights	$	1,290,685
	Water System	$	85,62[illegible]821
	Equipment	$	176,0[illegible]
	Hydro	$	[illegible],873
	Construction in Progress	$	303,082
	Accumulated Amortization	$	(34,175)
	Accumulated Depreciation	$	(47,059,529)
Total Fixed Assets		**$**	**41,637,425**
Other Assets			
	Pension	**$**	**111,168**
Total Assets		**$**	**66,403,467**
Liabilities & Equity			
Current Liabilities			
	Accounts Payable	$	275,005
	Retainage Payable	$	-
	Accrued Interest Payable	$	198,754
Total Current Liabilities		**$**	**473,759**
Long Term Liabilities			
	Pension	$	99,471
	Bonds Payable-2010	$	7,810,016
	Bonds Payable-2012	$	2,597,000
	Bonds Payable-2017	$	13,500,000
	Accrued Leave Payable	$	193,901
	Post Employment Benefit	$	107,038
Total Long-Term Liabilities		**$**	**24,307,426**
Total Liabilities		**$**	**24,781,185**
Equity			
	Retained Earnings	$	(3,167,475)
	Reserve for Operations	$	3,341,142
	Reserve for Water Revenue	$	5,991,639
	Reserve for Replacements	$	500,000
	Reserve for Bond Interest	$	198,754
	Reserve for Debt Service	$	2,142,022
	Reserve for Bond Principal	$	1,370,000
	Reserve for Reserve	$	2,602,136
	Fixed Assets, Net of Debt	$	30,696,880
	Net Income	$	(2,052,817)
Total Equity		$	41,622,282
Total Liabilities & Equity		**$**	**66,403,467**

Appomattox River Water Authority
YTD Income Statement for the period ending August 31, 2018

Water Rate Center	*Budget FY 18/19*	*Budget Year-to-Date*	*Actual Year-to-Date*	*YTD Budget vs. Actual*	*Variance Percentage*
Revenues and Expenses Summary					
Operating Budget vs. Actual					
Revenues					
Water Sales	$ 10,163,119	$ -	$ -	$ -	#DIV/0!
Misc. Revenue	$ 30,000	$ 5,000	$ 400	$ (4,600)	-92.00%
Total Operating Revenues	**$ 10,193,119**	**$ 5,000**	**$ 400**	**$ (4,600)**	**-92.00%**
Expenses					
Personnel Cost	$ 2,378,100	$ 396,350	$ 383,064	$ (13,286)	-3.35%
Contractual/Professional Services	$ 952,500	$ 163,417	$ 153,365	$ (10,051)	-6.15%
Utilities	$ 824,000	$ 137,333	$ 130,728	$ (6,605)	-4.81%
Communication/Postal/Freight	$ 39,200	$ 6,533	$ 5,778	$ (755)	-11.56%
Office/Lab/Purification Supplies	$ 101,000	$ 16,833	$ 16,686	$ (147)	-0.87%
Insurance	$ 90,000	$ 90,000	$ 85,8[illegible]	$ (4,196)	-4.66%
Lease/Rental Equipment	$ 20,000	$ 3,333	$ [illegible]652	$ 318	9.55%
Travel/Training/Dues	$ 51,400	$ 8,567	$ [illegible]49	$ (8,418)	-98.26%
Safety/Uniforms	$ 26,000	$ 4,333	$ 3,2[illegible]	$ (1,130)	-26.08%
Chemicals	$ 2,300,000	$ 383,333	$ [illegible],708	$ 25,374	6.62%
Repair/Maintenance Parts & Supplies	$ 330,000	$ 55,000	$ 42[illegible]25	$ (12,375)	-22.50%
Total Operating Expenses	**$ 7,112,200**	**$ 1,265,03[illegible]**	**$ [illegible],762**	**$ (31,271)**	**-2.47%**
Operating Suplus/(Deficit)	**$ 3,080,919**	**$ (1,260,[illegible]3)**	**$ (1,233,362)**	**$ 26,671**	**-2.12%**
Replacement Outlay Budget vs. Actual					
Machinery & Motors	$ 160,000	$ [illegible],667	$ 105,841	$ 79,174	296.90%
Instrumentation	$ -	$ -	$ -	$ -	#DIV/0!
SCADA	$ 50,000	$ 8,333	$ -	$ (8,333)	-100.00%
Computer Equipment	$ 10,[illegible]00	$ 1,667	$ -	$ (1,667)	-100.00%
Furniture/Fixtures	$ 6,000	$ 1,000	$ -	$ (1,000)	-100.00%
Motor Vehicles	$ 28,[illegible]00	$ 4,667	$ -	$ (4,667)	-100.00%
Special Studies	$ [illegible]00,0[illegible]	$ 66,667	$ -	$ (66,667)	-100.00%
Valve Replacement	$ [illegible],000	$ 8,333	$ -	$ (8,333)	-100.00%
Concrete	$ [illegible]5,000	$ 4,167	$ -	$ (4,167)	-100.00%
In-Plant Capital Upgrade	$ -	$ -	$ 780,966	$ 780,966	#DIV/0!
Chedin East Flow Meter	$ 40,000	$ 6,667	$ -	$ (6,667)	-100.00%
Replacement-Other	$ -	$ -	$ -	$ -	#DIV/0!
Total Capi[illegible]utlay	**$ 769,000**	**$ 128,167**	**$ 886,807**	**$ 758,640**	**591.92%**
Debt Service Budget vs. Actual					
Interest Income	**$ -**	**$ -**	**$ 67,553**	**$ 67,553**	**#DIV/0!**
Interest Jurisdictions (Income)	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**
Interest Expense	**$ -**	**$ -**	**$ -**	**$ -**	**#DIV/0!**
Principal Payments	**$ 2,142,225**	**$ 2,142,225**	**$ -**	**$ (2,142,225)**	**-100.00%**

- **Review of Raftelis Report: Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives**

  Following is a summary of the Raftelis Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives Report.

RAFTELIS

Summary of Preliminary Valuation of Water System Assets
and Review of Governance & Ownership Alternatives

REPORT PREPARED BY RAFTELIS / JANUARY 23, 2018

Appomattox River Water Authority

Valuation Assessment

THREE GENERALLY RECOGNIZED APPROACHES WERE USED TO VALUE SYSTEM ASSETS, (1) THE COST APPROACH, (2) THE INCOME APPROACH, AND (3) THE SALES COMPARISON APPROACH. A FOURTH APPROACH, THE RATE BASE APPROACH, WAS ALSO CONSIDERED.

The Cost Approach

- The Cost Approach is based on the principle of substitution. This principle states that a prudent buyer will not pay more for a property than the cost of acquiring a substitute property of equivalent value.

- The preliminary estimate of value of ARWA's water system assets under the cost approach was calculated by subtracting indexed depreciation from the replacement or reproduction cost estimates, and then adding the preliminary estimate of land value to this total.

- The preliminary value under this approach was estimated to be $115.0 million for the depreciable assets, plus $39.6 million for land and easements, for a total value estimate of $154.6 million.

The Income Approach

- The Income Approach is based on the premise that the value of a property is the present value of the future economic benefits of owning the property. This approach is relevant when the property being valued generates or is anticipated to generate net income, profits, or free cash flow to the owner.

- Over the long term, there are no net earnings or profits of the system that are returned to ARWA or its member jurisdictions. Therefore, we consider the income approach to valuation of the water system in this situation not applicable.

The Sales Comparison Approach

- The Sales Comparison Approach is used to estimate value by analyzing recent sales (or offering prices) or properties that are similar (i.e., comparable) to the subject property. If the sales comparisons are not exactly like the properties being valued, then the selling prices are adjusted to equate them to the characteristics of the properties being valued.

- Our analysis focused on comparable sales of water utility systems that were closed within five years of the valuation date of this report. Many of the water sales transactions that were identified involved the sale of very small retail water systems. None of the recent water system sales transactions were considered comparable to the ARWA facilities.

• A value comparison was made to the Cobbs Creek Reservoir and Dam project that was designed to provide Henrico County with 47 MGD of raw water capacity. A value comparison was made by calculating the cost per unit of capacity provided by the Cobbs Creek Reservoir to the capacity of the Chesdin Reservoir and Brasfield Dam, and an adjustment in unit value was made to reflect that the Cobbs Creek assets are new, whereas a portion of the useful life of the Chesdin Reservoir and Brasfield Dam has already been used.

• Using this method, the value of the Chesdin Reservoir and Brasfield Dam could be as high as $3.1 million per MGD of raw water supply capacity or approximately $220 million. Combining the OCLD value ($56.4 million) or the RCNLD value ($102.0 million) for the WTP and transmission system provides an estimate of total system value ranging from $276 million to $322 million.

The Rate Base Approach

• The Rate Base Approach reflects the general practice by regulated public utilities of using original cost, less depreciation (OCLD) value (with certain adjustments) as the rate base in which the investor-owned utility may recover its investment and can earn a rate of return on the unrecouped asset value or rate base. In general, in an acquisition, any excess in acquisition cost over OCLD is excluded from rate base, eliminating the opportunity for the buying entity to directly recoup its investment of this excess.

• The preliminary value estimate under this approach was calculated by subtracting depreciation from the original cost amounts, and then adding this preliminary estimate of land value to this total. The preliminary estimate of value under this approach was estimated to be $58,426,000 for the depreciable assets and $39,648,000 for the land, for a total estimated value of $98,074,000.

Based on our preliminary valuation assessment, the value of the ARWA water system is estimated to be in the range of $98.1 million and $321.8 million. This range is shown in Table 1 below.

Table 1 – Preliminary Valuation Estimate

Valuation Method	Low Range	High Range
Cost Approach	$154,624,000	
Income Approach	N/A	
Market Approach	$276,186,000	$321,774,000
Rate Base Approach	$98,074,000	
Preliminary Value Estimate Range	$98,074,000	$321,774,000

Governance & Ownership Alternatives Evaluation

THE GOVERNANCE & OWNERSHIP ALTERNATIVES EVALUATION AIMED TO ADDRESS SEVERAL ARWA CHALLENGES, INCLUDING THE FOLLOWING:

- Inability to Transfer Capacity Shares Among Member Jurisdictions
- Differing Interests Regarding System Expansion
- Capacity Limitations in the Transmission System
- Financing Challenges
- A Perception of Less Regional Cooperation and Control Issues

Several alternative models of governance and ownership were evaluated that could potentially address one or more of the identified challenges. These alternatives are summarized in the following.

Alternative 1.
Maintain Authority Model and Revise the Service Agreement or Change Voting.

- Allows ARWA to continue to own and operate the water system and provide treated water to member jurisdictions through amended/modified Service Agreements.
- Assumes modification of the existing Service Agreements to place an "ownership" right on water treatment plant capacity and allow for the transfer of ownership capacity.
- Assumes modification of the Agreements to include operating parameters associated with the delivery of water through the transmission system during peak use periods.
- Voting rights could be changed to alter the composition of the Board or to change the weight of each members' vote to more closely align with their capacity used.

Alternative 2.
Convert to a Municipal Model

- Modify ownership such that one municipality would have sole ownership of the water system and provide service to the other communities through Contractual Agreements.
- Would require dissolving ARWA and selling its assets to the purchasing municipality. A fair price for sale of the utility assets would need to be set and agreed to by each of the Board Members and their jurisdictions.
- This model could create an immediate influx of cash from the sale of ARWA assets for the non-purchasing municipalities.
- New Service Agreements would need to be implemented to address service standards across the system, detail how capacity would be expanded, allocated, and paid for, and include governance language to address dispute resolution procedures.

Alternative 3. Convert to a Hybrid Model

- ARWA maintains ownership and control over the raw water supply and the water treatment plant, but the transmission system assets are sold to one or more of the member jurisdictions. The Service Agreements between ARWA and its member jurisdictions for source of supply and treatment capacity would remain in effect.
- Transfer of transmission system ownership could allow the buyer and the other jurisdictions to negotiate separate transmission main service agreements that could clarify investment responsibilities related to the transmission system, as well as the establishment of operational parameters.
- Selling the transmission assets to one municipality would entail many of the same issues as complete sale of all assets of the system. However, because very little land would be transferred, and no supply or treatment assets would be included, coming to an agreement on an acquisition price could be somewhat easier.
- Establishing water rates for use of the transmission system could be accomplished using industry guidelines on rate setting for transmission main "wheeling rates" that involve recovery of the capital and operating costs of the transmission system.
- Does not address concern over the inability of member jurisdictions to agree on expanded capacity of the dam to allow the full water treatment plant capacity to be utilized.

To aid in the consideration of these issues, Table 2 identifies ARWA's existing ownership and governance challenges and provides a subjective analysis of how well each alternative ownership and governance option addresses them.

Table 2 – Existing Ownership and Governance Challenges

Existing Challenge	Alternative 1	Alternative 2	Alternative 3
Inability to Transfer WTP Capacity Shares Among Member Jurisdictions	**Yes** If adequately described in the Service Agreements.	**Yes** One municipality would control capacity and allocate it based on negotiated Service Agreements.	**No** Does not address WTP capacity issues, only transmission system.
Differing Interests Among the Member Jurisdictions Regarding System Expansion	**Partially** If adequately described in the Service Agreements or expressly excluded from Service Agreements and delegated to a vote through the bylaws or charter.	**Partially** Expansion provisions could be outlined in the Service Agreements or be left up to the discretion of the owning entity.	**Partially** Expansion provisions could be outlined in the Service Agreements for the transmission system only.
Capacity Limitations in the Transmission System	**Partially** If adequately described in the Service Agreements or expressly excluded from Service Agreements and delegated to a vote through the bylaws or charter.	**Yes** Capacity provisions could be outlined in the Service Agreements or be left up to the discretion of the owning entity.	**Yes** Capacity and service levels addressed in Service Agreements.
Financing Challenges Due to the Financial Condition of Petersburg	**Partially** If adequately described in the Service Agreements or expressly excluded from Service Agreements and delegated to a vote through the bylaws or charter.	**Yes** Credit rating would be based on the owning entity and not the other service jurisdictions; assumes good credit of the owner.	**Partially** Does not address financing challenges directly but may provide funds from sale to Petersburg to improve financial condition.
A Perception of Less Regional Cooperation and Control Issues	**Partially** New Service Agreements could foster cooperation or changes in voting could allow improved perceptions of equity between member jurisdictions.	**Partially** Some may gain control, while others may relinquish control; some of this could be addressed through the Service Agreements.	**Partially** Some of the control issues associated with the transmission system could be addressed.

- **Review of 2012 & 2017 Bond Debt Service**

  Following is a memo regarding the allocation of the 2012 and 2017 bond debt service in the current and prior budgets

DRAFT OF AUGUST 28, 2018

TO: **APPOMATTOX RIVER WATER AUTHORITY BOARD OF DIRECTORS**

FROM: **ROBERT C. WICHSER, EXECUTIVE DIRECTOR**
ARTHUR ANDERSON, McGUIREWOODS

DATE: **SEPTEMBER 13, 2018**

RE: **2012 BOND AND 2017 BOND DEBT SERVICE—INCLUDE IN BASE RATE VS. APPORTION BY PLANT ALLOCATION**

On August 7, 2018, Chesterfield County Utilities contacted Authority staff to question the funding mechanism that was being used to cover the annual debt service payments on both the 2012 $3.6M bond purchased by Carter Bank (the "2012 Bond") and the 2017 $13.5M bond purchased by U.S. Bank (the "2017 Bond"). Both the 2012 Bond and the 2017 Bond financed solely capital maintenance projects at the water treatment plant to enhance the plant's reliability—not to expand the plant's capacity. In the authorizing resolutions for both the 2012 Bond and the 2017 Bond the Authority Board determined that the financed projects were for "improvement costs" within the meaning of the existing Water Service Agreements between the Authority and each of the participating jurisdictions (the "Existing Agreements"). Hence, under the Existing Agreements the debt service on both the 2012 Bond and the 2017 Bond is to be covered by the Authority's annual budgeted "Base Rate." The Base Rate is a uniform per 1,000 gallon rate applied equally to all water purchases by each participating jurisdiction, which rate is based annually upon the total projected water usage for all participating jurisdictions for a given fiscal year such that funds generated from charging the Base Rate will be sufficient to pay for all of the costs associated with (a) the operation and maintenance of the Authority's water system, and (b) all improvement costs incurred by the Authority (including, for example, the debt service on the 2012 Bond and the 2017 Bond and any other bonds issued to finance improvement costs).[1, 2]

However, in the adopted FY 2019 budget the debt service for both the 2012 Bond and the 2017 Bond appear as separate line items apportioned to each participating jurisdiction by "plant allocation." Debt service on the 2012 Bond was apportioned by plant allocation in the FY 2016, 2017 and 2018 budgets, although in FY 2013, 2014 and 2015, the 2012 Bond debt service was included in the Base Rate. FY 2019 is the first year in which any charges are to be assessed to pay debt service on the 2017 Bond.

Why the switch to plant allocation?

In late 2013, the Authority and the participating jurisdictions began developing a new Water Service Agreement (the "Proposed Agreement"). One of the primary goals of the effort was to provide to each participating jurisdiction a fixed "ownership" right in the Authority's system capacity to facilitate planning for growth and to allow the purchase and sale of excess capacity. Each participating jurisdiction's initial ownership percentage (which staff has referred to as "plant allocation") would be equal to its current "Allocation of Total Capacity" under the Existing Agreements (that is, Chesterfield 69.31%, Colonial Heights 4.39%, Dinwiddie 6.75%, Petersburg 16.69% and Prince George 2.86%). Under the Proposed Agreement there would be a base rate, but it would not include any debt service. Rather, debt service for maintenance

projects of the kind financed by the 2012 Bond and the 2017 Bond would have been apportioned according to plant allocation. The reasoning was that "ownership" of plant allocation entails the payment of a fixed amount of maintenance project bond debt service corresponding to the percentage of ownership, regardless of actual water purchases.

Apparently, during the period of the development of the FY 2016 budget (mid-November 2014 to mid-December 2014), the 2012 Bond debt service was moved from the Base Rate to a plant allocation-based separate line item. Authority staff and counsel have not been able to confirm exactly when or in what form the staff got direction to prepare the FY 2016 budget as described above, but at the time it appeared reasonably likely that the Proposed Agreement would be approved, particularly because certain participating jurisdictions were eager to purchase and sell excess capacity.[3] The Authority presented the proposed FY 2016 budget to the Authority Board in January 2015 and in March 2015 the Authority advertised three FY 2016 budget options all three of which showed the 2012 Bond debt service as being covered by plant allocation. Ever since January of 2015 all of the Authority's budgets and the presentations and planning for the 2017 Bond have apportioned the debt service on the 2012 Bond and the 2017 Bond by plant allocation.

It is now apparent that the effort to develop the Proposed Agreement has ended. As such, Authority counsel has advised that (a) the debt service payments for the 2012 Bond for FY 2016, 2017 and 2018 be "trued-up" to reflect what each participating jurisdiction would have paid had the payments been included in the Base Rate and (b) the debt service for the 2012 Bond and the 2017 Bond be included in the Base Rate in the FY 2019 budget and future budgets as required by the Existing Agreements. To officially move to the plant allocation method would require the consent of the Authority Board and the governing bodies of all five member jurisdictions.

Fortunately, the financial impact of the "true-up" is relatively small and, since the participating jurisdictions have not yet been billed anything to cover the 2017 Bond debt service, there is ample time and leeway for the Authority to make the required adjustments.

The chart below illustrates the financial impacts related to the three years (FY 2016, 2017, and 2018) that the 2012 Bond debt service has been covered by plant allocation rather than included in the Base Rate.

		Chesterfield	Colonial Heights	Dinwiddie	Petersburg	Prince George
FY 15/16	Difference in Base Rate budget and Allocation budget	-$7,207	$4,832	-$8,750	$2,421	-$1,154
FY 16/17	Difference in Base Rate budget and Allocation budget	$4,119	$4,703	-$8,216	$207	-$979
FY 17/18	Difference in Base Rate budget and Allocation budget	$13,639	$4,593	-$7,345	$2,294	-$706
	Total Difference for member (Owe or ($ to be Refunded))	$10,551	$14,128	($24,312)	$4,922	($2,839)

NOTE: FY 2016, 2017, & 2018 difference between rates is based on actual flow numbers to calculate the base rate.

The next chart shows the effects on the FY 2019 budget related to the 2012 Bond and 2017 Bond debt service being met by plant allocation rather than the Base Rate and the expected financial impact of addressing the issue.

2012 and 2017 Debt - Base vs. Allocation Comparison Summary					
RATE COMPARISON					
	Chesterfield	**Colonial Heights**	**Dinwiddie**	**Petersburg**	**Prince George**
Revised with 2012 and 2017 Debt in Base	$0.9637	$0.9878	$1.4349	$0.9601	$1.3733
As Presently Billed	$0.9614	$0.9503	$1.5169	$0.9591	$1.4004
Rate Difference (Approved - Revised)	$0.0023	$0.0375	-$0.0820	$0.0010	-$0.0271
CASH COMPARISON					
	Chesterfield	**Colonial Heights**	**Dinwiddie**	**Petersburg**	**Prince George**
Revised with 2012 and 2017 Debt in Base	$6,948,518.7068	$613,342.2468	$616,400.3845	$1,650,399.3029	$334,458.5957
As Presently Billed	$6,931,691.9481	$590,064.6336	$651,623.9318	$1,648,676.1905	$341,062.5327
Rate Difference (Approved - Revised)	$16,826.76	$23,277.61	-$35,223.55	$1,723.11	-$6,603.94

Authority staff recommends that Authority Board authorize the publication of notice of public hearing to amend the FY 2019 budget to effect (a) the "true-up" related to the 2012 Bond debt service in FY 2016-2018 and (b) the change in the Base Rate for FY 2019. If approved at the November Board meeting, both the "true-up" and the Base Rate change would be reflected in the second quarter invoices to be issued to the participating jurisdictions in January 2019.

Recommended Motion: I move to authorize Authority staff to prepare and publish a notice of public hearing to be held on November 22, 2018, to consider amendments to the Authority's Fiscal Year 2019 budget to effect (a) the adjustments necessary to reflect the inclusion of the debt service payments on the 2012 Bond in the Authority's Base Rate for Fiscal Years 2016-2018 and (b) the inclusion of the debt service on both the 2012 Bond and the 2017 Bond in the Base Rate for Fiscal Year 2019.

[1]The Authority develops the total projected water usage from the average past five year flows that have been recorded from each participating jurisdiction's water demands.

[2]Under the Existing Agreements the Authority covers debt service on bonds issued to financing plant or system expansion through the "Expansion Rate."

[3]Authority staff has reviewed regular and special Board meeting minutes, Board meeting tapes and memorandums, and conversations we had with both Board members and the utility directors of the participating jurisdictions. Staff cannot confirm from written or recorded tape narrative why the change had occurred; however, what happened was that the conversion from servicing the 2012 bond debt from the base rate to plant allocation occurred and was continued over with the 2017 Bond debt servicing by plant allocation. What most likely occurred during these discussions with the then Board Chairman Tom Mattis (perhaps during a SCWWA meeting) stating that he did not want reserves to include bond payments or capital expenses. The thought at the time was that technically if the Bond payments are for maintenance

improvements, they should be included in the base rate which would be considered O&M expenses and would be part of the Reserve calculation. This would significantly increase the fiscal year budgets (especially due to the 2017 Bond). During the development of the FY 2016 budget, both the Board and the Utility Directors wanted to see what the individual rate and cost impact per member was for the Capital Program Plan and Reserve policy by including the debt service by Base Rate versus plant allocation. At the time it was decided that the fairest and cleanest way to proceed with the revenue calculation was to base the 2012 maintenance bond (and any future maintenance bonds) on plant allocation. The rationale behind this was that our members would have had an agreed upon allocation (everybody assumed that the Proposed Agreement would have already been accepted by March 2015), and maintenance items could then be based on plant allocation rather than on the base rate.

6. **Items from Counsel**

7. **Other Items from Board Members/Staff Not on Agenda:**

8. **Closed Session**

9. **Adjourn**

Appomattox River Water Authority

Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives

Report Date: January 23, 2018
Valuation Date: August 30, 2017

APPOMATTOX RIVER WATER AUTHORITY

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January 23, 2018

Board of Directors
Appomattox River Water Authority
21300 Chesdin Road
South Chesterfield, VA 23803

Subject: Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives

Dear Sirs and Madam:

Raftelis Financial Consultants, Inc. ("Raftelis") is pleased to provide this Preliminary Valuation of Water System Assets and Review of Governance & Ownership Alternatives Report ("Report") for the Appomattox River Water Authority (ARWA or the "Authority"). The purpose of this report is to assess the value of the Authority's water system and to help the Authority evaluate potential changes or enhancements to its governance and ownership structure to address the needs of the Authority and its members.

This report presents the results of Phase 1 of our evaluation and assessment. We have phased the work such that a preliminary range of values is developed in Phase 1 that can be used to inform the Authority and its members in its consideration of ownership and governance alternatives. Phase 1 includes a summary desktop valuation assessment in general accordance with the Uniform Standards of Professional Appraisal Practice ("USPAP") guidelines. This valuation assessment is limited and qualified as noted in the report. Phase 1 also includes the identification and review of potential governance and ownership alternatives that may be suited to address the objectives and challenges of the Authority and its members. Depending upon the desires of the Authority and its members, future phases of this work may include a more detailed valuation of assets or a more focused review and assessment of certain governance and ownership alternatives.

We look forward to discussing the results of the evaluation with you soon. In the meantime, should you have any questions regarding this report, or if we can be of any further assistance, please contact John Mastracchio at 518.391.8944 or by email at jmastracchio@raftelis.com or Seth Garrison at 207.303.0138 or by email at sgarrison@raftelis.com.

Sincerely,
RAFTELIS FINANCIAL CONSULTANTS, INC.

John M. Mastracchio, CFA
Vice President

Seth Garrison
Senior Manager

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1. Introduction

1.1 Purpose and Scope

The purpose of this report is to assess the value of the Appomattox River Water Authority ("ARWA" or "Authority") water system and to help the Authority and its Board of Directors evaluate potential changes or enhancements to its governance and ownership structure to address the needs of the Authority and its members.

This report presents the results of Phase 1 of our evaluation and assessment. We have phased the work such that a preliminary range of values is developed in Phase 1 that can be used to inform the Authority and its members in its consideration of ownership and governance alternatives. Phase 1 includes a summary desktop valuation assessment in general accordance with the Uniform Standards of Professional Appraisal Practice ("USPAP") guidelines. This valuation assessment is limited and qualified as noted in the report. Phase 1 also includes the identification and review of potential governance and ownership alternatives that may be suited to address the objectives and challenges of the Authority and its members. Depending upon the desires of the Authority and its members, future phases of this work may include a more detailed valuation of assets or a more focused review and assessment of certain governance and ownership alternatives.

1.2 Assumptions and Limiting Conditions

The preliminary valuation assessment results presented in this report are subject to the following assumptions and limiting conditions.

1. Financial, technical, governance, and ownership information associated with the Authority and its property and assets were provided by the Authority, its members, or its consultants and were assumed to be reliable. Other materials and information obtained from various public or private sources were also assumed to be reliable. We have not independently verified the accuracy of such information and accept no responsibility for the completeness or accuracy of any documents or information upon which this report is based.

2. Raftelis Financial Consultants, Inc. ("Raftelis") does not provide legal, accounting, auditing or engineering services, and assumes no responsibility for matters of this nature. It was assumed that any legal, accounting, and engineering information as provided are correct and reliable.

3. The valuation assessment was limited to the scope of work agreed upon between Raftelis, Davenport & Company, LLC. and the Authority. This included completion of a preliminary valuation assessment, which can be characterized as a preliminary desktop assessment, and preparation of this summary valuation report. We did not inspect the subject assets for their existence or condition. Rather, we relied on a review of annual maintenance inspection reports and other information provided by the Authority to assess asset condition. Raftelis

assumes that there are no conditions at the subject properties or facilities that would render the assets more or less valuable, except where noted in this report.

4. It is assumed that there are no federal, state, or local regulatory, building code, or zoning compliance issues concerning the assets that would significantly affect the value of the assets being assessed.

5. This valuation assessment was based on data and information provided as of the date of this report, and does not incorporate any facts or information which may have come into existence after the date of the report. Any additional information that is provided or received subsequent to the date of this report could have a material effect on the results and conclusions contained in this report. Any estimates or statements contained in this report are not predictions of the future and were created for the specific purpose of the valuation assessment.

6. The opinions and conclusions contained in this report are as of a specific date, for a specific use and purpose, and made under specific assumptions and limiting conditions. Raftelis makes no warranty, expressed or implied, with respect to the opinions and conclusions contained in this report.

2. Description of the Water System

The charter of the Appomattox River Water Authority was created by the State Corporation Commission on November 21, 1960 and by the State of Virginia General Assembly in March of 1962 under the Water & Sewer Authorities Act to provide adequate water supply to its members. Membership of the Authority is comprised of the municipal jurisdictions of City of Petersburg, the City of Colonial Heights, Chesterfield County, Dinwiddie County, and Prince George County.

The following is a brief description of the water system, including the raw water reservoir and dam, water treatment plant, and the transmission mains.

2.1 RAW WATER RESERVOIR

The raw water reservoir (Lake Chesdin) encompasses an area of 3,060 acres and has the capacity to presently store 9.3 billion gallons of water. The reliable service level (defined as a planning figure and represents the annual average demand above which a water provider will need additional capacity to avoid violating the specified reserve (60 days) or the acceptable frequency of invoking its drought management plan) of the reservoir is 67 (estimated for year 2030) to 71 (estimated for year 2014) million gallons per day ("MGD").[1] When the reservoir was constructed, ARWA purchased 5,872 acres of land for approximately $1.044 million, of which 3,100 acres were flooded and became Lake Chesdin.[2]

2.2 BRASFIELD DAM

Lake Chesdin was created by the construction of the George F. Brasfield Dam on the Appomattox River, approximately six miles west of Petersburg, Virginia. The Brasfield Dam is a concrete gravity dam that is 1,455 feet long and 54 feet high at its highest point, and has an 840 feet long spillway. The Brasfield Dam is presently regulated by a Federal Energy Regulatory Commission ("FERC") and its license held by Appomattox River Associates, LP. Construction of the dam was completed in 1967.

Raw water from the dam passes through a bar screen in the dam that prevents large debris from entering the dam area. Water then passes through a traveling screen that removes additional debris from the water. The water is then pumped to the Authority's water treatment plant ("WTP").

2.3 RAW WATER PUMP STATIONS AND PIPING

There are two raw water pump stations that convey water from the dam to the Authority's WTP. Raw Water Pump Station No. 1 has two pumps (P1 and P2) with a rated capacity of 7.5 MGD per pump. These pumps were originally installed in the 1960s and later replaced with new pumps in the early 1990s. However, the motors for the pumps are the original units from the 1960s. Three other pumps (P3, P4, and P5) were constructed in the 1980s with a rated capacity of 16 MGD. The pump station includes a traveling screen that provides for debris removal prior to pumping. The

[1] Based on HydroLogics 2014 modeling results.
[2] ARWA History, p.8.

screen is the original unit that was constructed in the 1960s[3] and has been rebuilt several time the most recent being in fiscal year 2017. Raw Water Pump Station No. 1 and the associated electrical system will be upgraded with the In-Plant Upgrades that are currently in design.

Raw Water Pump Station No. 2 was constructed with the most recent expansion and consists of five Raw Water Pumps (P20, P21, P22, P23 and P24). Three pumps (P20, P21, P24) are variable speed 10 MGD pump and two pumps (P22, P23) are constant speed 20 MGD pumps.

The pump stations convey water to the water treatment plant by a 42-inch and 54-inch water line. At the beginning of this water line, potassium permanganate can be added. Table 2-1 provides a summary of the raw water piping sizes and length.

Table 2-1: Raw Water Piping Sizes and Lengths

Line Size	Length (LF)
42”	2,264
48”	493
54”	2,515
60”	51
72”	706
Total Length	**6,029**

Information provided by WW Associates, August 24, 2017

2.4 WATER TREATMENT PLANT

The Authority’s WTP is a conventional filtration facility that has a capacity of 96 MGD minus 2 MGD reserved for internal use (filter backwashing, chemical carry water, etc.). The original plant was constructed with a capacity of 22 MGD, and was expanded to 46 MGD in 1983 and then to 96 MGD in 2003. The WTP consists of a rapid mixing chamber, ten flocculation basins, twelve settling basins, and thirty-two filters. Pretreatment involves pH adjustment with lime, alum for flocculation, and chlorine dioxide for pre-disinfection/oxidation. After filtration, chloramination for disinfection and sodium hydroxide for pH adjustment are added. Fluoride and an ortho-phosphate/ polyphosphate blend (phosphate) are also added.

Water enters the chemical building, where the water is metered and alum and chlorine dioxide are added. Lime is added, as needed, for pH adjustment. The water is then sent to one of ten flocculatation basins. All ten floc basins use horizontal paddles and over/under baffles. Polymer is added to the water during certain times of the year to aid in coagulation in these basins. Water is then conveyed into one of twelve settling basins to remove the floc.

The water then enters a filter building where there are 32 filters, 8 older filters with a capacity of MGD each, and 24 newer filters with a capacity of 3.0 MGD each. The water exits the filters, is

[3] Annual Maintenance Inspection Report for Appomattox River Water Authority, prepared by WW Associates, dated October 31, 2016.

collected in a header pipe system and conveyed into a 54-inch diameter pipe where sodium hydroxide, chlorine, phosphate, and fluoride is added. The water is mixed, and then conveyed into Clearwell #3 (5.5 million gallon (MG) storage) to achieve the required contact time. At Clearwell #3, the water is sampled, and "boost" chlorine and ammonia are added for chloramination and caustic can be added for additional pH adjustment. The water is then metered and conveyed to Clearwells #2 & #1 (5.5 MG and 1.0 MG storage). The water can then be sent out by gravity (up to 34 MGD) or pumped from the Clearwells #1 & #2 at the finished water pump stations.

An expansion of the water treatment plant occurred in 1983 and was completed in 1986. This expansion included:

- Constructing a 5.5 million gallon storage clearwell
- Plant capacity expansion of 24 MGD, from 22 MGD to 46 MGD
- Construction of two new flocculation basins, three sedimentation basins, eight additional filters, and a static mixer

A second expansion of the water treatment plant occurred in 2003 and was completed in 2006. The expansion included:

- Plant capacity expansion of 50 MGD, from 46 MGD to a capacity of 96 MGD
- The expansion consisted of additional flocculation basins tied to six sedimentation basins, and 16 new filters.
- A new chemical building and rapid mix basin
- A new air scour system was added for backwashing the filters
- Constructing Clearwell #3, a 5.5 million gallon storage clearwell

The total acres of the ARWA plant property is approximately 190 acres.[4] This property includes the following process buildings and facilities:

- Raw Water Switchgear Building
- Raw Pump Station No. 1
- Raw Pump Station No. 2
- Potassium Permanganate Building
- 2 kW Emergency Generator @ Dam and Enclosure
- Pre-Chemical Feed Building
- Maintenance Building (Offices and 7 bays)
- Flocculation Basins (10)
- Settling Basins (12)
- Lime / Alum / Rapid Mix Building
- Ammonia / Caustic Building
- Post Chemical Feed Building
- Filters (32)
- Clearwells (3)

[4] ARWA History, p.36, Composite Plat dated July 2, 1992.

- Sludge Lagoons (2)
- Chlorine Dioxide Chemical Storage and Generation/Feed Facility
- Finished Pump Station No. 1
- Finished Pump Station No. 2
- 1 kW emergency Generator @ treatment plant and enclosure (To be replaced with the In-Plant Upgrade)
- An administration building
- Laboratory
- A new pre-engineered warehouse (constructed in 2015)

2.5 FINISHED WATER PUMP STATIONS

There are two finished water pump stations. Finished Water Pump Station No. 1 was constructed as part of the original treatment plant in 1965. The pumps were upgraded during the 1983 expansion. As part of the second expansion of the system that occurred in 2003, a second finished water pump station was built on top of Clearwell #2. This pump station contains additional pumping capacity (including three 23 MGD pumps) and a new backwash pump. The finished water pump station consists of five pumps (three 16 MGD and two 8 MGD pumps) with a combined capacity of 64 MGD. The finished water pump station also includes a surface wash and backwash pump for cleaning the filters, and two pumps for providing domestic water to the plant and make up water for chemical feeds. Finished Water Pump Station No. 1 and the associated electrical system will be upgraded with the In-Plant Upgrades that are currently in design. The 1 kW Generator behind Finished Water Pump Station No. 1 is also included in the In-Plant Upgrade Project and will be upgraded to a 3 kW generator system.

Finished Water Pump Station No. 2 is located on top of Clearwell #2 and was constructed in 2006 as part of the second expansion. The pump station contains three 23 MGD pumps (two are variable speed) and a new backwash pump. Clearwell #2 also has another domestic pump (P15) that can be used for the plant and make up water for chemical feeds.

2.6 TRANSMISSION MAINS

Finished water is conveyed from the WTP via a 42-inch ductile iron water transmission main that conveys water to Matoaca. In Matoaca, the line splits into two 30-inch lines, one runs south serving Dinwiddie and Petersburg, and one runs north serving Colonial Heights, Chesterfield, and Prince George. The initial water lines for the Authority were built in 1967, including the following:

- A 42-inch water line from the WTP to Matoaca
- A 30-inch water line in Matoaca south across the Appomattox River to serve Petersburg and Dinwiddie.
- A 30-inch water line parallel to River Road from Matoaca to Ettrick, then along the CSX rail road into Colonial Heights at Lakeview School.

As part of the first expansion in 1983-1986, the following transmission lines were constructed:

- A 24-inch line from the Authority main a Branders Bridge Road to the Boulevard in Colonial Heights, then along Temple Avenue into Prince George. The line decreases to a 16" line near the Mall entrance and increases back to a 24" line on the bridge crossing the Appomattox River.
- In 1984, the Colonial Heights Boulevard was widened near Swift Creek, and a water line was relocated and increased from 24-inch to 36-inch from the north side of Swift Creek Bridget to approximately 1,000 feet south.

In 1997, a 36-inch water line was extended from Lakeview School through back streets and onto the Boulevard at the Sherwood Hills entrance and tying into the 36-inch connection completed as part of the 1984 road widening.

In 2007, a 24inch water line on Temple Avenue heading west to I-95 was relocated for about 800 ft. near a ramp project completed by VDOT.

The transmission mains include approximately sixty 30 ft. wide easements that total approximately 48.9 acres.[5]

A summary of the sizes and lengths of transmission main is provided in Table 2-2.

[5] Information provided by W&W Associates, September 8, 2017.

Table 2-2: Transmission Main Sizes and Lengths

Line Size (inches)	Length (LF)
6	65
8	139
12	620
16	3,370
18	21
24	15,542
30	39,225
36	6,888
42	13,080
48	186
54	2,091
60	106
72	1,739
84	745

Source: Information provided by WW Associates, August 24, 2017.

2.7 TRANSMISSION MAIN APPERTENCES

There are numerous valves and meters located along the transmission main to monitor and control water flow in the transmission system. There are 13 finished water meters used to register consumption by the users of the system. These are summarized in Table 2-3. A summary of the valves that exist in the transmission system is provided in Table 2-4.

Table 2-3: Finished Water Meters

Location
1. Petersburg
2. Dinwiddie on Ferndale Road
3. Dinwiddie for Chaparral Steel
4. Dinwiddie for Central State Hospital
5. Chesterfield @ Chesdin - Courthouse
6. Chesterfield @ Chesdin – Graves Road
7. Chesterfield @ Chesdin West
8. Chesterfield @ Matoaca Tank
9. Chesterfield @ Ettrick (not in use)
10. Chesterfield @ Ettrick – Matoaca (not in use)
11. Chesterfield @ Branders Bridge Rd (not in use)
12. Chesterfield @ Swift Creek
13. Colonial Heights @ Temple Ave.
14. Colonial Heights @ Lakeview
15. Prince George

Source: ARWA History document, p.30.

Table 2-4: Transmission System Valve Summary

Valves (inches)	Quantity
Air Release Valves	
1	1
2	1
3	23
Blow Off Valves	
8	1
16	3
18	2
24	7
30	9
36	4
42	15
48	7
54	11
60	2
72	1
84	7
Air Release / Vacuum Valves	
1	5
2	3
3	6
4	3
Gate Valves	
6	2
8	1
12	9
Tapping Valves	
6	1
12	1
24	1
30	1
36	2
Other	
30	1
36	2

Source: Information provided by WW Associates, August 24, 2017.

3. Valuation Methodology

The methods considered to value the ARWA assets were based on the premise of continued use of the assets for the purpose for which they were designed and acquired. The value estimate reflects the amount that may reasonably be expected for installed property in an exchange between a willing buyer and a willing seller, neither under any compulsion to buy or sell, and both fully aware of the relevant facts, including installation, as of a specific date.

There are three generally recognized approaches to the determination of value: the Cost Approach, the Income Approach, and the Sales Comparison Approach. These approaches are widely accepted by financial institutions, courts, government agencies, business, and society in general, and they are comprised of theoretical concepts and systematic methods. A fourth approach, the Rate Base Approach, was also considered. These approaches are described below:

3.1 Cost Approach

The Cost Approach is based on the principle of substitution. This principle states that a prudent buyer will not pay more for a property than the cost of acquiring a substitute property of equivalent value. The cost approach is considered in situations where a system has a large quantity of tangible assets associated with it, when a grouping of assets is not frequently traded in the market, and when the asset is considered unique, such as a "special purpose" or "specialty" asset. The ARWA water system is considered a unique asset.

Under the cost approach, the value of the assets is derived by subtracting the amount of depreciation from the replacement or reproduction cost of the assets. Depreciation in this context represents the loss in value caused by physical deterioration, functional obsolescence, and economic obsolescence. Replacement cost is the current cost of a similar new property having the nearest equivalent utility as the property being valued. Reproduction cost is the current cost of reproducing a new replica of the property being valued using the same or closely similar materials.[6]

There are several methods that are used to estimate the current cost of a property. The Detail Method, also known as the Summation Method, requires that current new cost be assigned to each individual component of an asset or property, and the system is itemized or detailed so that the sum of the components reflects the cost of the whole. The Trending Method is a method of estimating reproduction cost by indexing or trending historical cost to an estimate of current cost. As discussed in the next section, both methods were employed in valuing the Authority's water system.

3.2 Income Approach

The income approach is based on the premise that the value of a property is the present value of the future economic benefits of owning the property. The underlying principle in this approach is that buyers invest in assets with the expectation of receiving the anticipated future net income. This

[6] Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, American Society of Appraisers, Second Edition.

approach is relevant when that property being valued generates or is anticipated to generate net income, profits, or free cash flow to the owner.

3.3 Sales Comparison Approach

The sales comparison approach is used to estimate value by analyzing recent sales (or offering prices) of properties that are similar (i.e., comparable) to the subject property. If the sales comparisons are not exactly like the properties being valued, then the selling prices are adjusted to equate them to the characteristics of the properties being valued. Certain factors, such as the location, date of sale, physical characteristics, and technical and economic factors relating to the transaction are analyzed for their comparable uniqueness. The sales comparison approach is most reliable and applicable when there is an active market providing a sufficient number of sales of comparable properties that can be independently verified through reliable sources.

3.4 Rate Base Approach

The rate base approach reflects the general practice by regulated public utilities of using original cost less depreciation ("OCLD") value (with various adjustments) as the rate base in which the investor-owned utility may recover its investment and can earn a rate of return on the unrecouped asset value or rate base. Under most regulated ratemaking settings, rate base reflects the original cost of assets, which means the cost of an asset when first devoted to public service, rather than a purchase cost or acquisition cost in a sale or asset transfer. In general, in an acquisition, any excess in acquisition cost over OCLD is excluded from rate base eliminating the opportunity for the buying entity to directly recoup its investment of this excess.

This rate regulation by public utility commissions ("PUCs") prevent utilities from artificially inflating plant and equipment prices to increase returns, earn monopolistic profits and making customers, in essence, pay again for the same assets. Therefore, due to the rate regulation in a PUC regulatory environment, fair value is the product of the rate-making process, whereby the rules associated with rate regulation impact the value of the property which is being regulated. Furthermore, since OCLD value of the assets (with adjustments) comprise rate base in most situations, the rate base approach consists of valuing the assets at their original cost less depreciation.[7]

Rate regulation also has a used and useful concept, which is a rule that the cost of property must be removed from rate base whenever the property ceases to be of public service. Under the used and useful rule, the cost is thereby ignored, even if it has not been recouped by previous charges for service, because the property has ceased to have any value for its intended use. This is applicable for so called "stranded assets" such as a treatment plant that has a certain capacity which it cannot utilize due to limitations on influent flow rates or transmission/distribution limitations.

Other adjustments to rate base generally involve the inclusion of a working capital allowance and construction work in progress in rate base for rate-making purposes.

[7] Principles of Public Utility Rates, Public Utilities Reports, Inc., Second Edition.

4. Valuation

The preliminary value of the Authority's water system assets was estimated considering the four methods described in the previous section. The consideration of the use of these methods to the valuation of the ARWA Water System is described below. For those methods deemed to be applicable, a summary of the estimation of system value under the method is also provided.

4.1 Asset Valuation (Cost) Approach

The Authority's water system has a large quantity of tangible assets associated with it and the specific characteristics of raw water supply, water treatment, and transmission make the assets unique and dedicated for a special purpose of the delivery of wholesale water to the member jurisdictions of the Authority. Therefore, the asset valuation (cost) approach was deemed to be applicable for the valuation of the water system.

4.1.1 Valuation Steps

The steps that were completed to estimate the value of the water system under the cost approach were as follows:

1. Gather relevant information regarding the physical assets of the system and their use.
2. Determine which cost basis is most applicable to the assets being valued; reproduction cost or replacement cost.
3. Determine the best method of estimating the replacement or reproduction cost using either the "build up" method or the "trending method". Estimate the replacement or reproduction cost of the assets based on the appropriate method.
4. Estimate the amount of depreciation from the total cost of the improvements based on the assets physical deterioration, functional obsolescence, and economic obsolescence.
5. Subtract the estimated depreciation from the estimated replacement or reproduction cost to derive an estimate of the replacement or reproduction cost new less depreciation ("RCNLD") value.
6. Add the land value associated with the facilities to the estimated RCNLD value to derive the total estimated value of the assets.

4.1.2 Cost Basis and Estimating Methods

The cost basis that is most applicable to the assets being value is either the reproduction cost or the replacement cost. These terms are defined below for the purposes of this valuation assignment:

Reproduction Cost. Reproduction cost is the current cost of reproducing a new replica of the property being appraised using the same, or closely similar, materials.[8]

Replacement Cost. Replacement cost is the current cost of a similar or new property having the nearest equivalent utility as the property being appraised.[9]

Reproduction cost is commonly estimated based on the trending of original cost to current costs as of the date of the valuation. This method is dependent upon the accuracy and completeness of the historical cost information and the trending method that is utilized. To use this method, original cost and the date acquired must be available for the asset or group of assets. Based on the available information, the trending method was used for the water treatment plant, equipment, and rolling stock assets that were included on ARWA's fixed asset register, as well as the dam asset. These assets were trended utilizing the Handy Whitman index of Public Utility Construction Costs, published by Whitman, Requardt & Associates ("Handy-Whitman Index").

Replacement cost is commonly estimated using the "detailed" or "build up" method. Under this method, a cost is assigned to each individual component of an asset or property, and the property is itemized so that the sum of the components reflects the replacement cost new of the whole. This method relies upon obtaining unit pricing from cost estimating publications or from other recently bid or constructed projects, multiplying the unit price by the asset quantities, and summing the cost of each of the components. Based on the available information, the detailed method was used to estimate the transmission main components of the Authority's water system. In addition, a recent dam and reservoir construction project in the region (the Cobbs Creek Reservoir project), made this method suitable for valuing the Brasfield Dam.

Table 4-1 summarizes the cost approach that was utilized to value the various asset types associated with ARWA's water system.

Table 4-1: Cost Approach Used to Value Water System Asset Types

Asset Type	Replacement Cost	Reproduction Cost
Reservoir and Dam	x	x
Raw Water Pump Stations		x
Water Treatment Plant		x
Transmission Mains	x	
Vehicles and Equipment		x

[8]Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets," 2nd edition.
[9] Ibid.

4.1.3 Reproduction/Replacement Cost Estimates

4.1.3.1 Reservoir and Dam

The reproduction cost new of the Brasfield Dam was estimated by trending the original cost of the dam to the present, using the Handy-Whitman Index for source of supply related assets. The original cost of the dam was reported to be $3,610,000, which was based on ARWA historical annual financial reports and historical records regarding the awarded contract for bids to design and construct the dam. Using the trending method, the reproduction cost of the Brasfield Dam was estimated to be approximately $21,606,000. This estimate includes the raw water pumping facilities associated with the dam, but exclude the raw water transmission mains, whose values was ascertained separately.

The reproduction cost of the dam was compared to a replacement cost estimate based on a similar project in the region, which is the Cobbs Creek Dam and reservoir project in Cumberland County, Virginia. This project includes the development of a 14.8 billion gallon drinking water reservoir, a 3,850 ft. long and 160 ft. high main earthen dam, transfer piping, and a 150 MGD water pumping station and operations facility to provide an additional water source to Cumberland, Goochland, Powhatan, and Henrico counties in Virginia. This project is intended to transfer water from the James River to the Cobbs Creek storage reservoir, creating an off-site raw water storage facility. During high James River flows, the Cobbs Creek pump station will transfer water into the water storage reservoir via a pipeline. The Cobbs Creek pump station will pump this water back to the James River to meet minimum in-stream flows so that Henrico County can continue to withdraw water from the James River to produce potable drinking water. The project is currently under construction and is estimated to be completed in 2021 for a total cost of approximately $280 million. Additional details of this project are provided in Appendix B.

Bids for the construction of both a main dam and a saddle dam at Cobbs Creek were provided by Henrico County. This cost information was scaled to the size of the Brasfield Dam to estimate a current replacement cost for the Brasfield Dam. The low bid price among the firms proposing to construct the Cobbs Creek Dam was $64,326,000. Assuming construction administration and engineering costs of 20%, the total cost of the Cobbs Creek Dam was estimated to be $77,191,000. The cost per square foot of dam area was then calculated based on the low bid to construct the Cobbs Creek Dam and the associated square footage of the dam. The Cobbs Creek Main Dam is expected to be 3,850 feet long and 160 feet high with an area of approximately 616,000 square feet (3,850 feet × 160 feet). The Saddle Dam has a maximum height of 25 feet and was estimated to be approximately 25 percent of the length of the main dam or approximately 962 feet long, with an area of approximately 24,050 square feet (962 feet x 25 feet). Therefore, the cost per square foot of the dam was estimated to be $120.60 ($77,191,000 ÷ 640,050 SF) per square foot of dam area.

The Brasfield Dam is 1,455 feet in length and 54 feet high with an area of approximately 78,570 square feet. Using the cost per SF of dam area of $120.60, as calculated for the Cobbs Creek Dam, the replacement cost of the Brasfield Dam was estimated to be $8,291,000. This value is lower than the reproduction cost of the Brasfield Dam using the trending method. Furthermore, the Brasfield Dam is a concrete dam which is structurally superior, and typically costs more to construct than an

earthen dam, such as the Cobbs Creek dam. Therefore, the comparison of the Brasfield Dam reproduction cost with the construction cost of the Cobbs Creek dam indicates that the reproduction cost estimate for the Brasfield Dam, prepared using the trending method, is reasonable. However, further refinement of the dam value could be completed under a Phase 2 valuation assessment using the "build-up" method or using information from the current cost of other dam projects, if available.

The value of the land acquired for the ARWA facilities and reservoir was estimated by obtaining assessed value information from Chesterfield and Dinwiddie Counties, and comparing this information with recent vacant land sales in the area that were reported by Zillow.com. Chesterfield County provided assessed value information for the parcels of Chesdin Reservoir land that are in Chesterfield County. This includes a total of 1,848 acres of land, which have a current assessed value of $1,027,500, corresponding to an assessment per acre of $556. In addition, Dinwiddie County provided assessed value information for the parcels in Dinwiddie County. This includes a total of 1,229 acres, which have a current asset value of approximately $2,279,400, corresponding to an assessment per acre of $1,854. Dinwiddie County confirmed that the assessment value was not reflective of the fair market value of the land.

Recent land sales for properties of 5 acres and greater were researched using Zillow.com to estimate the fair market value of the land. A total of 17 properties of this size were identified in Chesterfield, South Chesterfield, Dinwiddie, Colonial Heights, and Petersburg that were sold since 2015. The weighted average price for these sales is $6,724 per acre. This land value was compared to the land cost incurred by Henrico County associated with the Cobbs Creek Reservoir and Dam project. For this project, there were 1,830 acres of land acquired at a total cost of $11,000,000, for a cost per acre of $6,011.

For the preliminary valuation assessment, we applied the cost per acre of $6,724 to the acreage associated with the ARWA land, which results in an estimated land value of approximately $39,484,000. Detailed information regarding land value is provided in Appendix C.

Note that Chesterfield County indicated in its comments to the draft version of this report that Chesterfield's Real Property Section estimated a price per acre of $2,650 using parcels ranging in size from 26 acres to 1,000 acres that were located along natural water courses. This estimate is significantly lower than the cost per acre obtained from Zillow.com and from Henrico County associated with the Cobbs Creek Reservoir and Dam project. Due to the broad range in potential value of the land, we recommend that land valuation be a focus of a Phase 2 valuation assessment.

4.1.3.2 Water Treatment Plant

Water treatment plant assets include (1) the infrastructure and process equipment assets placed in service as part of the initial construction of the plant in 1968, which are still in service, and (2) additional infrastructure and process equipment that was added as part of the two expansions projects described in Section 2, including Finished Water Pump Station No. 2, and (3) infrastructure and process equipment placed in service as part of repair and replacement work at the plant. The

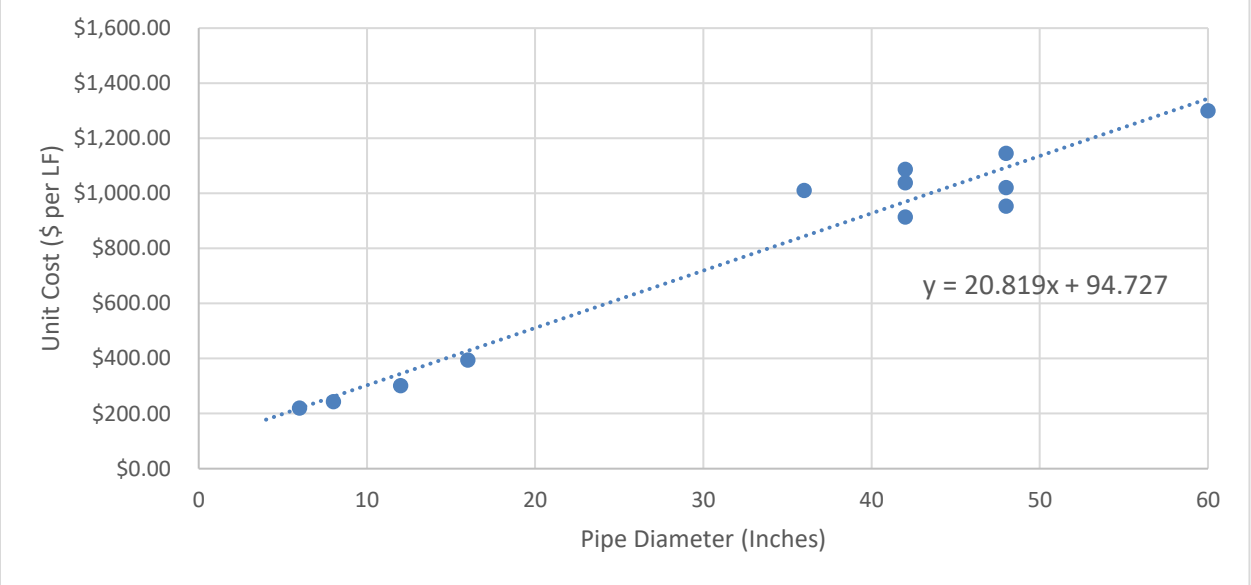
original cost of water treatment infrastructure and process equipment assets were provided by ARWA in its fixed asset register, and in its annual financial statements.

The reproduction cost of the water treatment plant assets and process equipment was determined by trending their original cost to the present using the Handy-Whitman index for structures and improvements and for large treatment plant equipment. Using this approach, the reproduction cost of water treatment plant infrastructure was estimated to be $129,733,000, while the reproduction cost of all process equipment was estimated to be $7,030,000.

4.1.3.3 Transmission Mains

The value of raw and finished water transmission main assets was determined using the replacement cost method and then adjusted for depreciation. Estimated transmission main cost data were obtained from cost estimates contained in the Capital Program Plan and Financial Analysis Report that was prepared for ARWA in December 2015[10] and other water main unit cost estimates. This report contained cost estimates for proposed ARWA transmission main projects including transmission main appurtenances to help meet future hydraulic demands at various locations within its system. In addition, estimated project costs for transmission main projects with varying pipe diameters for other systems were also analyzed. Using the transmission main unit cost information, a cost curve was developed to estimate the average replacement cost per linear foot for transmission mains for various pipe diameter sizes. The cost curve used to estimate the replacement cost of the transmission mains is shown in Figure 4-1.

Figure 4-1: Transmission Main Cost Curve



The replacement cost of the transmission mains was then estimated by multiplying the linear feet of transmission main pipe for each pipe diameter by the unit costs along the cost curve. This

[10] Capital Program Plan and Financial Analysis for the Appomattox River Water Authority, prepared by Hazen and W&W Associates, dated December 21, 2015.

resulted in a replacement cost value of approximately $64,699,000 for the finished water transmission mains, and $6,993,000 for the raw water transmission mains.

In addition to the acreage of land that ARWA owns, it also possesses approximately 48.9 acres of easements.[11] The easement value was estimated by applying a 0.5 factor to the land value per acre estimate. The 0.5 factor was based on a typical impact that the easement has on the use of a property.[12] The resulting preliminary value of the easements was estimated to be $164,000.

4.1.3.4 Equipment and Rolling Stock

Individual assets classified as equipment and rolling stock were included in the fixed asset register provided by ARWA and included items such as, generators, pumps, chromatography equipment, video surveillance and security related assets, laboratory equipment, actuators, and computers, communication, and IT related equipment. Assets classified as rolling stock included pick-up trucks and light-duty construction and maintenance vehicles, such as fork lifts, tractors, mowers, trailers, and plows. Equipment assets were valued by determining their reproduction cost by trending their purchase price to the present using the Handy-Whitman index for small treatment plant equipment, while rolling stock assets were valued by determining their reproduction cost by trending their purchase price to the present using the Consumer Price Index. Using these approaches, the reproduction cost was estimated to be approximately $1,139,000 for equipment assets and $429,000 for rolling stock.

4.1.4 Depreciation

Depreciation is the loss of value of an asset, compared with a new asset, that is caused by a combination of physical deterioration, functional obsolescence, and economic obsolescence.[13] Physical deterioration is the loss of value or usefulness of a property due to the "using up" or expiration of its useful life caused by wear and tear, deterioration, exposure to various elements, physical stresses, and similar factors. Functional obsolescence is the loss of value or usefulness of a property caused by inefficiencies or inadequacies of the property itself, when compared to a more efficient or less costly replacement property that new technology has developed. Economic obsolescence is the loss of value caused by factors external to the property, such as economics of the industry, passage of new legislation, changes in ordinances, reduced demand for the product, or similar factors.

Therefore, depreciation for the purposes of valuation differs from accounting definition of depreciation in that it measures value inferiority, rather than just a mathematical convention to amortize costs over time. As such, it is based on the judgement of the valuation analyst. For the purposes of this preliminary estimate of value, we relied upon a review of documents provided by ARWA describing the condition of the assets and their usefulness in providing water to the member jurisdictions, as well as estimates of the effective useful lives of the assets being valued. No site inspections or field verification of conditions were completed as part of this preliminary valuation

[11] Information provided by WW Associates, September 8, 2017.
[12] The Valuation of Easements, Right of Way, November/December 2014.
[13] Valuing Machinery and Equipment: The Fundamentals of Appraising Machinery and Technical Assets, 2nd edition.

effort. Such inspections were reserved for a future phase (Phase 2) of the valuation assignment. However, in preparing the depreciation estimates, we relied upon a review of condition and inspection reports that were provided by ARWA.[14]

The life expectancy of various components of the ARWA system were estimated from a review of the ARWA inspection reports, various published sources regarding typical life expectancy of water system assets, and engineering experience and judgement. A summary of the expected average service life of the assets that were used in the depreciation calculation is provided in Table 4-2. Details of the system assets acquisition date, current age, and estimated useful life are provided in Appendix A. Based on these estimates, the ratio of the asset's age to its estimated useful life was used to estimate asset depreciation (physical deterioration component).

No adjustments were made for functional or economic obsolescence in the preliminary estimate of value. However, a further discussion of functional obsolescence is provided in the conclusions section of the report.

Table 4-2: Cost Approach Used to Value Water System Asset Types

Asset Type	Life Expectancy (Years)
Dams	100
Water Treatment Plant Structures	50
Water Treatment Plan Process Equipment	20
Transmission Mains	80
Equipment	15
Rolling Stock	10

[14]Including the Annual Maintenance Inspection Reports for ARWA that were prepared by W&W Associates in 2015 and 2016.

4.1.5 Asset Valuation Under the Cost Approach

The preliminary estimate of value of ARWA's water system assets under the cost approach was calculated by subtracting indexed depreciation from the replacement or reproduction cost estimates, and then adding the preliminary estimate of land value to this total. The preliminary value under this approach was estimated to be $114,976,000 for the depreciable assets as summarized in Table 4-3, plus $39,648,000 for land and easements, for a total value estimate of $154,624,000. Based on a raw water capacity of 71 MGD, a water treatment plant capacity of 96 MGD, and transmission line capacity of 37.3 MGD for the 42-inch pipe diameter sections, the value per unit of capacity was estimated to be $0.742 million per MGD for the dam and reservoir (including raw water transmission lines), $0.760 million per MGD for the water treatment plant (including structures, process equipment, equipment, and rolling stock), and $0.778 million per MGD for the finished water transmission lines, or $2.279 million per MGD in total.[15] This corresponds to a weighted average unit cost of capacity $1.611 million per MGD.

Table 4-3: Depreciable Asset Value Under the Cost Approach

Asset Type	Replacement / Reproduction Cost New	Depreciation (Indexed)	Replacement Cost New Less Depreciation
Dam	$21,606,054	$11,255,194	$10,350,860
Raw Water Transmission Lines	6,992,813	4,343,926	2,648,887
Water Treatment Plant Structures	129,732,943	60,479,761	69,253,181
Water Treatment Plant Process Equipment	7,029,574	3,702,407	3,327,167
Equipment	1,138,681	812,599	326,082
Rolling Stock	429,046	378,119	50,927
Finished Water Transmission Lines	64,698,906	35,680,414	29,018,492
Total Depreciable Asset Value	$231,628,015	$116,652,419	$114,975,596
Land (Estimate)			39,648,000
Total Asset Value Under Cost Approach			**$154,624,000**

[15] Note that due to the different capacities of the raw water supply, water treatment plant, and transmission main components of the system, one cannot simply multiply the total unit cost of capacity by the amount of treatment capacity to be purchased/sold to derive a total value. Instead, the amount of water treatment capacity desired to be purchased/sold should be multiplied by the weighted unit cost of capacity, or should be proportioned to identify the corresponding capacity of each of the other components of the system to be purchased/sold, and then each capacity should be multiplied by the respective unit cost of capacity to determine the total value of capacity to be purchased/sold. For example, if the desired amount of water treatment capacity to be purchased/sold is 37.3 MGD or 38.85% of the total, then the corresponding value would be $60.1M, calculated as (38.85% x 71 MGD x $0.742M/MGD) + (37.3 MGD x $0.760M/MGD) + (38.85% x 37.3 MGD x $0.778M/MGD), or calculated as 37.3 MGD x $1.611 million/MGD.

4.2 Income Valuation Approach

The income approach is completed by preparing a forecast of cash flows of the entity being valued, including revenues, operating expenses, and capital expenditures over an extended period. The net income or earnings projected from these cash flows are then discounted to present value using an appropriate discount rate that accounts for the entity's cost of capital, as well as the risk and nature of the cash flows. A terminal value is estimated at the end of the forecast period and discounted to the present value. The sum of the present values of the projected cash flows and the terminal value equals the value of the system under the income approach.

The Authority receives revenues from the sale of water services to its five member jurisdictions. In addition, it receives a small amount of revenue from a share of the hydropower generated by the Brasfield Dam. Water service revenues come from the water rates paid by the member jurisdictions for the purchased water. Under the Service Agreements between the Authority and the participating jurisdictions, the Authority charges water rates that "provide fully for the operation and maintenance of the Authority's water system, as improved and expanded from time to time," and for the capital costs of improvements and expansions of the system. Furthermore, if the amounts collected for the capital cost of the expansion of the system in any given year are greater than the participating jurisdictions applicable expansion cost share, then in the following year, the difference is subtracted from the jurisdictions applicable cost share.[16] If revenues are in excess of expenses, the positive cashflow is credited back to the member jurisdictions, transferred to a reserve fund and used as an operating reserve (portion up to 180 days of cash), or is used for future capital maintenance and replacement expenditures. As a result, over the long-term, there are no net earnings or profits of the system that are returned to ARWA or its member jurisdictions. Therefore, we consider the income approach to valuation of the water system in this situation not applicable.

4.3 Sales Comparison (Market) Approach

The sales comparison approach is most reliable when there is an active market providing a sufficient number of sales of comparable property that can be independently verified through reliable sources. The sales comparison approach is generally not applicable or feasible when the subject property is unique or where there is not an active market.

Our analysis focused on comparable sales of water utility systems that were closed within five years of the valuation date of this report. Based on this research, we identified 21 water system transactions that were reported over the past five years. These are summarized in Appendix C. Many of the water sales transactions that were identified involved the sale of very small retail water systems. Only one sales transaction was identified that included a drinking water reservoir and dam. However, the system associated with this sales transaction consisted of four other raw water sources and a retail water distribution system. Therefore, none of the recent water system sales transaction were considered comparable to the ARWA facilities.

[16] Amendment to the 1964 Service Agreements Between Appomattox River Water Authority and Participating Jurisdictions.

While not a water system sales transaction, the Cobbs Creek Reservoir and Dam project currently under construction in Northern Cumberland County is a raw water supply project that is designed to provide Henrico County with 47 MGD of raw water capacity. The acquisition of this raw water source by Henrico County provides an additional data point on the potential value of the Chesdin Reservoir and Brasfield Dam from a market comparison perspective. As such, a value comparison was made by calculating the cost per unit of capacity provided by the Cobbs Creek Reservoir to the to the capacity of the Chesdin Reservoir and Brasfield Dam, and an adjustment in unit value was made to reflect that the Cobbs Creek assets are new, whereas a portion of the useful life of the Chesdin Reservoir and Brasfield Dam has already been used. This comparison is shown in Table 4-4, and indicates that one measure of the value of the Chesdin Reservoir and Brasfield Dam from a "market" approach could be as high as approximately $3.1 million per MGD of raw water supply capacity or approximately $220 million ($3.1 million x 71 MGD).

Table 4-4: Cobbs Creek Reservoir Unit Cost of Capacity

Description	Cobbs Creek Reservoir	ARWA Facilities
Land Area (Acres)	1,830	5,872
Storage Capacity (BG)	14.8	9.3
Capacity (MGD)	47	71
Dam Height (ft.)	160	55
Dam Length (ft.)	3,850	1,250
Pump Station (MGD)	150	64
Raw Water Pipeline Length (ft.)	2,700	6,029
Reservoir & Dam Cost ($M)	$118.2	
Other Facilities Construction ($M)	74.2	
Land ($M)	11.0	
Other Costs ($M)	76.6	
Total Est Project Cost ($M)	$280.0	
Total Cost Per Capacity ($M/MGD)[1]	$6.0	
ARWA Facilities % Depreciated		50%
Unit Cost Comparison ($M/MGD) Depreciated		$3.1

[1]Estimated project cost of $280M divided by raw water capacity of 47 MGD.

4.4 Rate Base Approach

The rate base approach involves estimating the original cost less depreciation, with adjustments for working capital, construction work in progress, and other adjustments. In addition, donated or developer contributed assets and assets constructed with grant funds are often subtracted from rate base, as these costs are not costs incurred to first devote the asset to public service. Therefore, the steps in the rate base approach are as follows:

1. Gather relevant information regarding the physical assets of the system and their use.
2. Research ARWA history for original cost information and compile the individual asset original cost and dates placed in service. If no or limited original cost information is available, gather date placed in service information for these assets and deflate the replacement or reproduction costs estimated under the Cost Approach to derive the estimated original cost of these assets.
3. Estimate the amount of depreciation from the total cost of the improvements based on the assets physical deterioration, functional obsolescence, and economic obsolescence.
4. Subtract the estimated depreciation from the estimated original cost to derive an estimate of the original cost less depreciation ("OCLD") value.
5. Adjust the OCLD value for donated or developer contributions, and grants received to pay for the assets.
6. Add the current land value associated with the facilities to the estimated OCLD value to derive the total estimated value of the assets under this approach.

4.4.1 Original Cost Estimates

4.4.1.1 Dams and Reservoir

The original cost of the Brasfield Dam was estimated to be $3,610,000, based on the awarded contract for bids for the construction of the dam plus other original dam and reservoir-related costs as reported in annual financial statements provided by ARWA.

4.4.1.2 Water Treatment Plant

Water treatment plant assets, including plant infrastructure, as well as process equipment, were included in the fixed asset register provided by ARWA. The original cost of these assets was obtained from the fixed asset register as the purchase price or acquisition cost of each asset. Using this information, the original cost of water treatment plant structures was $68,811,000, while the original cost of the plant's process equipment was estimated to be $4,907,000.

4.4.1.3 Transmission Mains

The original cost of transmission main assets was estimated by calculating their deflated reproduction cost. As discussed in Section 4.1.3.3 of this report, the reproduction cost of

transmission mains was estimated using a cost curve developed from various current construction cost estimates on transmission mains with varying pipe diameters. The current reproduction cost was deflated to the date the raw and finished water transmission mains were placed in service (1968, and 1985 for the 24-inch line from ARWA at Branders Bridge Road to the Boulevard in Colonial Heights and then to Prince George, and 2003 for the 36-inch line extending from Lakeview School to the Boulevard at the Sherwood Hills entrance) using the Handy-Whitman cost index for transmission related assets. Under this approach, the deflated reproduction cost of raw water transmission mains was calculated to be $814,000, while the deflated reproduction cost of finished water transmission mains was calculated to be $12,574,000.

4.4.1.4 Equipment and Rolling Stock

Equipment and rolling stock were included in the fixed asset register provided by ARWA. Therefore, the original cost of these assets was sourced from the fixed asset register as the purchase price or acquisition cost of each asset. The original cost of all equipment items was determined to be $754,000, while the original cost of assets classified as rolling stock was $336,000.

4.4.2 Depreciation

As described under the Cost Approach, depreciation was estimated using the Rate Base Approach based on a combination of physical deterioration, functional obsolescence, and economic obsolescence. The life expectancy of various components of the ARWA system were estimated from a review of ARWA inspection reports, various published sources regarding typical life expectancy of water system assets, and engineering experience and judgement. A summary of the expected average service life of the assets that were used in the depreciation calculation was provided in Table 4-2. Details of the system assets acquisition date, current age, and estimated useful life are provided in Appendix A. Based on these estimates, the ratio of the asset's age to its estimated useful life was used to estimate physical deterioration component of asset depreciation. No adjustments were made for functional or economic obsolescence in the preliminary estimate of value using the Rate Base Approach.

4.4.3 Other Adjustments

None of the assets comprising the ARWA system were identified as being funded with grant proceeds or contributed by a developer. Therefore, no adjustment was made to OCLD for grant funded projects or developer contributed facilities.

4.4.4 Asset Value Under the Rate Base Approach

The preliminary estimate of value of ARWA's water system assets under the Rate Base Approach was calculated by subtracting depreciation from the original cost amounts, and then adding the preliminary estimate of land value to this total. The preliminary estimate of value under this approach was estimated to be $58,426,000 for the depreciable assets as summarized in Table 4-5, and $39,648,000 for the land, for a total estimated value $98,074,000.

Table 4-5: OCLD Value of Depreciable Assets Under the Rate Base Approach

Asset Type	Original Cost	Accumulated Depreciation	Original Cost Less Depreciation
Dam	$3,609,697	$1,880,392	$1,729,306
Raw Water Transmission Lines	814,188	505,772	308,415
Water Treatment Plant Structures	68,810,844	22,536,580	46,274,264
Water Treatment Plant Process Equipment	4,906,551	2,089,973	2,816,578
Equipment	754,234	468,529	285,705
Rolling Stock	335,880	287,339	48,541
Finished Water Transmission Lines	12,574,176	5,610,738	6,963,439
Total Depreciable Asset Value	$91,805,571	$33,379,323	$58,426,248
Land (Estimate)			39,648,000
Total Value Under Rate Base Approach			**$98,074,000**

4.5 VALUATION CONCLUSIONS AND CONSIDERATIONS

4.5.1 Valuation Conclusions

The preliminary valuation assessment contained in this report examined the potential value of the ARWA water system and considered four methods of valuing the system. The results of the assessment of these four methods of valuing the system are summarized below:

1. Using the cost approach, the preliminary RCNLD value was estimated to be $154,624,000, corresponding to a value per unit of capacity of $0.742 million per MGD for the dam and reservoir, $0.760 million per MGD for the water treatment plant, and $0.778 million per MGD, and a total preliminary value per unit capacity of $2.279 million per MGD. This corresponds to a weighted average unit cost of capacity $1.611 million per MGD. Note that due to the different capacities of the raw water supply, water treatment plant, and transmission main components of the system, one cannot simply multiply the total unit cost of capacity by the amount of treatment capacity to be purchased/sold to derive a total value. Instead, the amount of water treatment capacity desired to be purchased/sold should be multiplied by the weighted unit cost of capacity, or should be proportioned to identify the corresponding capacity of each of the other components of the system to be purchased/sold, and then each capacity should be multiplied by the respective unit cost of capacity to determine the total value of capacity to be purchased/sold.
2. The income approach was considered but not used in the preliminary assessment of value since over the long-term, there are no net earnings or profits of the ARWA system that are returned to ARWA or its member municipalities.
3. Under the comparable sales approach, 21 water system transactions were identified that closed within five years of the date of this report. However, many of the water sales transactions that were identified involved the sale of very small retail water systems, and only one sales transaction was identified that included a drinking water reservoir and dam, but was coupled with several other water supply sources. Therefore, it was concluded that none of these sales transactions were comparable to the ARWA water system. However, while not a water system sales transaction, the acquisition of the Cobbs Creek Reservoir and Dam project currently under construction in Northern Cumberland County by Henrico County provides an indication of the intrinsic value of ARWA water system. This intrinsic value represents an estimate of the current cost to secure additional surface water reservoir potable water sources in the region. As such, a value estimate was made by calculating the cost per unit of capacity provided by the Cobbs Creek Reservoir and applying the unit cost of capacity to the to the capacity of the Chesdin Reservoir and Brasfield Dam. An adjustment in unit value was made to reflect that the Cobbs Creek assets are new, whereas a portion of the useful life of the Chesdin Reservoir and Brasfield Dam has already been used. This comparison resulted in an estimated value of the ARWA system of between $276 million to $322 million.
4. The preliminary estimate of value of ARWA's water system assets under the Rate Base or Original Cost Less Depreciation approach was estimated to be $98,074,000. The cost estimated under this approach may be considered lower end of value or the "floor value" for utility sales transactions involving investor-owned utilities in states such as Virginia that

use an original cost standard for rate base value. In other words, this value reflects the general practice by regulated public utilities of using original cost less depreciation for rate-setting and capital cost recovery purposes. Typically, when this type of rate regulation is in place, investor-owned utilities are generally constrained from recovering acquisition costs above the original cost less depreciation value. This estimate of value is less relevant for transactions that do not involve regulated investor-owned utilities.

Based on our preliminary valuation assessment, the value of the ARWA water system is estimated to be in the range of $98.1 million and $321.8 million. This range is summarized in Table 4-6.

Table 4-6: Preliminary Estimate of Value of the ARWA Water System

Valuation Method	Low Range	High Range
Cost Approach	$154,624,000	
Income Approach	N/A	
Market Approach[1]	$276,186,000	$321,774,000
Rate Base Approach	$98,074,000	
Preliminary Value Estimate Range	**$98,074,000**	**$321,774,000**

[1]Combines the reservoir and dam value of $219.8M from the Market Approach with the OCLD value of the WTP and transmission system ($56.4M) to derive the low range estimate, and adds the RCNLD value of the WTP and transmission system ($102.0M) to derive the high range estimate.

4.5.2 Other Considerations

The preliminary range of value estimate provided above is a broad range for several reasons. One reason for such a broad range is because there are several value perspectives that can be taken. On the high end of the value spectrum is the intrinsic or intangible value of the system, which considers the scarcity of comparable water resources and the potential cost associated with securing another water resource with similar utility within the region. However, since there was only one comparable system identified, the Cobbs Creek Reservoir, and because the facilities of the Cobbs Creek Reservoir project differ in size, location, design (e.g., earthen dam vs concrete dam) and function as compared to the ARWA system, this may make the market approach somewhat less applicable than the cost approach. On the low end of the value spectrum is the Rate Base Value method, which is a regulatory constrained value. This constraining of the value to the OCLD cost of the system is done under a rate regulatory environment to prevent investor-owned utilities from earning monopolistic profits and to protect the current customers and users of the system from having to pay significantly higher water rates simply because ownership of the water system has changed hands. Since it is not likely that an investor-owned utility will be involved in a possible sale of the ARWA system, this approach may be less applicable than the others.

Another reason for the broad range in values is that the preliminary valuation effort did not make any assumptions regarding limitations on the future water rates that would be imposed on the customers of the system following a potential acquisition. The resulting rates that customers of the system would need to pay following a potential acquisition would likely be affected by the acquisition price. Assuming that a buyer of the system would recover its acquisition cost from the users of the system over time, there is direct relationship between the acquisition price and future water rates. If the acquisition price is high, future water rate increases imposed on the customers of the system would need to be high to recover the acquisition costs. If the acquisition price is low, future water rates would be lower because there would be lower acquisition costs to recover in rates over time. Phase 2 of the valuation assessment could be completed to narrow the range of value by setting a limitation on future water rate increases and modeling the relationship between purchase price and future water rate adjustments.

The preliminary estimate of value presented above did not consider the proportion of the capacity of the system considered to be used and useful. In other words, the differing capacities of the components of the water system impact the usefulness of the entire system, and potentially its value. For example, the reliable service level of the reservoir is 67 to 71 MGD. The water treatment plant has a reported capacity of 96 MGD or 94 MGD minus the 2 MGD allocated to internal WTP usage. The transmission system is reported to have a hydraulic capacity of 37.3 MGD for 42-inch pipe diameter sections and 19 MGD for 30-inch pipe sections. Therefore, while the water treatment plant is capable of treating and delivering up to 94 MGD, it is limited by the capacities of the dam and transmission system. Since the reliable service level provided by the Chesdin Reservoir and Brassfield Dam is less than the treatment capacity of the water treatment plant, a portion of the water treatment plant's capacity (ranging from 25 to 29 MGD) is not currently able to be fully utilized. One way to adjust the preliminary assessment of value to reflect this would be to deduct from its value, (1) the lesser of the cost of the unutilized water treatment plant capacity, and (2) the

estimated cost to raise the Brasfield Dam to increase the reliable service level of the reservoir to a level that would allow for full utilization of the water treatment plant's capacity. These adjustments could be made to the preliminary valuation estimate in Phase 2 of the valuation assessment.

The preliminary estimate of value did not specifically consider the value of control of the system that would be gained if the entire system were to be sold to a single entity. This control premium could potentially be estimated with additional financial modeling under a Phase 2 valuation assessment.

5. GOVERNANCE AND OWNERSHIP ALTERNATIVES EVALUATION

5.1 INTRODUCTION

This section describes the significant governance and ownership challenges reported by ARWA Board members and identifies several alternatives to address them. The alternatives discussed in this section are contrasted with the existing ARWA model. The discussion in this section considers the preferences and opinions of individual ARWA Board members and select community officials from the member jurisdictions that were captured during interviews in August and September 2017 as part of this engagement.

Based on discussions that occurred during the interviews and our independent evaluation, the alternatives identified were narrowed down to three alternatives that we believe are the best fit to address the challenges that were articulated by those that were interviewed. Several alternatives were eliminated that were considered a poor fit in addressing the objectives and challenges, and those that were not of interest to any of the ARWA Board members during our discussions.

5.2 BACKGROUND

Since the creation of the Authority on November 21, 1960, ARWA has existed as an independent quasi-municipal entity governed by a five-member Board comprised of appointed representatives from the municipal jurisdictions that it serves. Per the Authority's Bylaws, each Board member has one vote and a majority of the members is required for passing most Authority actions. The exception are changes to the Authority's Articles of Incorporation and Service Agreements. These changes require unanimous agreement of the ARWA Board and of the governing boards of all five participating jurisdictions. The design of the Authority is such that regardless of the share of the capacity utilized by a participating jurisdiction, each has an equal voice and vote in decisions.

5.3 CHALLENGES AND OBJECTIVES

Representatives of the participating jurisdictions voiced several issues regarding the Authority's operation, service agreements, and the existing governance and ownership structure that were identified during the interview process. They included the following:

1. **Inability to Transfer Capacity Shares Among Member Jurisdictions -** The Authority's water treatment plant (WTP) has a rated treated water supply capacity of 96 MGD.[17] The member jurisdictions' share of capital costs is based on specified capacity allocations. The current capacity allocations for Chesterfield, Colonial Heights, Dinwiddie, Petersburg, and Prince George are 66.54 MGD, 4.21 MGD, 6.48 MGD, 16.02 MGD, and 2.75 MGD, respectively.[18] Some of the member jurisdictions may want to acquire additional capacity due to increasing water demands, whereas other member jurisdictions have more allocated

[17] The full 96 MGD of WTP capacity cannot be fully utilized due to raw water supply capacity limitations, as well as the limitations of the water transmission system.
[18] ARWA History, p.17.

capacity than currently needed now and in the foreseeable future. Under the current Service Agreements, there is no explicitly stated right of ownership to ARWA capacity by the member jurisdictions or ability to transfer capacity between members.

2. **Differing Interests Regarding System Expansion -** Varying population growth has created the situation where Chesterfield County uses more than half of the Authority's water production and several members use less than 10 percent. This disparity is projected to widen, based on growth estimates. Chesterfield County desires to increase the Authority's raw water capacity by raising the dam and making other system improvements to more fully utilize the existing WTP water treatment capacity. Some member jurisdictions feel they are provided with sufficient water capacity to meet their current and projected needs and do not want to pay the additional cost for capacity expansion, nor do they want their current capacity share to be diluted if the total system capacity is expanded. Given that each member jurisdiction has an equal vote over Authority matters, efforts to move forward with capacity expansion to meet the needs of some of the member jurisdictions have gained little traction. This has frustrated some Board members.
3. **Capacity Limitations in the Transmission System** - The hydraulic capacity of the transmission system is restricted, resulting in limitations on the amount of water that can be provided to some communities during periods of high demand. This issue is most prevalent where the transmission main splits to serve Colonial Heights, Prince George, and Chesterfield County at the Swift Creek meter pit along Branders Bridge Road. At this location, ARWA throttles the flow to Chesterfield County to maintain water pressure in the line that serves Colonial Heights.[19] While throttling has been practiced historically, it is reportedly creating mounting problems as Chesterfield County's water demands grows. The issue is compounded by the lack of specificity in the Service Agreements between the Authority and its member jurisdictions. The Service Agreements do not provide operating parameters associated with the delivery of treated water through the transmission system or how the transmission system should be operated to deliver water to each member jurisdiction. For example, elements such as minimum and maximum supplied pressure and peak flow limitations are not detailed in the service agreements. ARWA and the member jurisdictions have been operating on a "first come, first serve" basis in terms of transmission capacity.
4. **Financing Challenges** - Member jurisdictions have expressed concern over the ability of ARWA to borrow money at favorable terms due to the financial challenges experienced by the City of Petersburg. These concerns have hindered ARWA's ability to access low interest financing from the Commonwealth of Virginia (Virginia Resources Authority or "VRA") to pay for renewal of aging infrastructure and to make other capital improvements to the system. The VRA has asked that the other member jurisdictions formally express a "moral obligation" to cover Petersburg's portion of the debt in the event of a default. The other member jurisdictions are reluctant to provide such moral obligations.
5. **A Perception of Less Regional Cooperation and Control Issues**. Due to the previously mentioned challenges and issues, there has reportedly been a deterioration in the regional cooperation spirit between ARWA jurisdictions. Frustration was expressed by some Board

[19] According to the Capital Program Plan & Financial Analysis report prepared by WW Associates (p.1-5), the Branders Bridge pump station and tank is needed to address the water pressure and flow issues at this location.

representatives that ARWA is not fully meeting the needs of all member jurisdictions. In addition, there are concerns that smaller member jurisdictions with less financial resources could be negatively impacted if service agreements, governance or ownership changes are made. A significant concern is that Chesterfield County might exert control over economic development across the region if it were to acquire all the assets of the Authority. A growing divide on key issues is causing some Board members and their jurisdictions to question the existing governance and ownership situation. These issues and differing capacity development goals of the jurisdictions are the genesis of the governance and ownership options exploration.

The objective of this governance and ownership alternatives evaluation is to identify and screen alternatives that may have the advantage of addressing one or more of the challenges and issues identified above, while limiting the introduction of new concerns inherent in the alternatives.

5.4 GOVERNANCE AND OWNERSHIP ALTERNATIVES

There are many proven models of governance and ownership in Virginia and across the country for multijurisdictional utilities. These range from ownership by one municipality and sharing services through inter-municipal agreements, establishment of special districts and authorities, creation of lease arrangements, and hybrid approaches where portions of the system have different ownership and governance structures. Each of these governance and ownership models has strengths and weaknesses. Based on the interviews conducted with representatives from the member jurisdictions and senior staff of the Authority, several alternatives were identified that could address one or more of the identified challenges. These alternatives are described below.

5.4.1 Alternative 1 – Maintain Authority Model and Revise the Service Agreement or Change Voting

The first alternative is maintaining the current Authority model, whereby the Authority continues to own and operate the water system and provides treated water to the member jurisdictions through water service agreements. However, under this alternative, the existing water service agreements are modified to address the challenges and issues identified above.

This Authority model is well established and has more than a 50-year operating history at ARWA. The majority of the Board members indicate that they and/or their constituents fundamentally like the current AWRA governance and ownership model. Having an entity separate from the municipal governments in the region that is represented equally by the member jurisdictions is considered an ideal arrangement by many of the those interviewed by Raftelis.

Within the existing Authority model, there may be opportunities to make changes to service levels and capacity allocations, if desired by the Board members and their respective communities. These changes could include negotiating new service agreements, altering the composition of the Board or changing the weight of each members' vote to more closely align with capacity used. For example, the Board could decide with the endorsement of its jurisdictions that Chesterfield County should have additional ARWA Board seats or that voting rights should roughly align with allocated capacity. These types of voting arrangements are common in our experience at other quasi-municipal water utilities where one municipality has a significant share of system capacity or a disproportionate number of water customers. It is less common to require a unanimous vote of all the Board members and their jurisdiction, as is the case with ARWA, to change capacity allocations

and service levels. These actions are usually executed by a simple majority vote or in some cases by a supermajority. Many utilities comprised of multiple municipal jurisdictions intentionally designed their voting procedures to prevent a minority of Board members from blocking actions that are endorsed by the majority of members.

The design of the Authority makes it challenging to implement major service changes, unless there is universal agreement from member communities. This language is incorporated into the Service Agreements with each jurisdiction. If there was universal agreement, it would be possible to alter to the composition of the Authority's Board, modify the weighting of the decision-making power of each of the municipalities and readily amend service agreements. All of these options are possible without substantially changing the existing governance and ownership model.

Based on our discussions with Board members, it is apparent that several Board members are opposed to changing the composition of the Authority's Board or modifying the weighting or the decision-making power of each of the jurisdictions. It is unclear if the governing boards of their jurisdictions share their position, but as appointed officials it is assumed that there is alignment. Board members are reportedly willing to consider amending the Service Agreements. A proposed amendment to the Service Agreements (Amendment #4) was recently ratified by three of the five jurisdictions, but not by the other jurisdictions. The proposed amendment would have streamlined transferring capacity between communities.

The existing Service Agreements could be modified to place an "ownership" right on WTP capacity and allow for the transfer of ownership capacity between member jurisdictions. This agreement modification has already been formulated as the proposed service agreement Amendment #4. The Service Agreements could also be modified to specify the capacity shares and operating parameters associated with the delivery of water through the transmission system. This could include specifying equitable peak water demand limitations for each member jurisdiction along each segment of the main, specifying the share of future transmission main capacity in accordance with average day, and peak day capacity usage along each segment of the transmission main, and identifying when and how ARWA can control or limit water flows during peak demand periods.

The advantages and disadvantages of Alternative 1 are summarized in Table 5-1, and the potential ability of this alternative to address the identified issues and challenges is summarized in Table 5-2 and detailed below:

1. *Inability to Transfer WTP Capacity Shares Among Member Jurisdictions*. Amended water service agreements could include a provision to specify the right of ownership of the WTP capacity to the member jurisdiction, and the ability to transfer capacity between members.
2. *Differing Interests Among the Member Jurisdictions Regarding System Expansion.* Unless the bylaws and voting rights are changed, this alternative would likely do little to address the competing interests, control issues, and resulting Board gridlock. However, the ability to transfer capacity could alleviate the current capacity limitations that are experienced by Chesterfield County, potentially providing relief on a major issue. Changing voting rights from an equal vote approach to a proportional vote approach, based on capacity may exacerbate the control concerns expressed by some jurisdictional members.
3. *Capacity Limitations in the Transmission System.* This issue could be partially addressed under this alternative by adding provisions to the water service agreements specifying how hydraulic capacity along each segment of the transmission main will be allocated and paid

for. With the increased capacity issues, the "first come, first serve" policy may not be an effective policy any longer, and the Authority and its member jurisdictions could consider a "beneficial use" approach moving forward. In addition, a true-up analysis of the capital contributions made by each member jurisdiction as compared to the utilization of the transmission main capacity along each segment of transmission pipe could be done to allocate transmission main capacity and cost. The service agreement could then have a similar provision for transmission capacity "right of ownership" and the ability to transfer transmission capacity among the members. Furthermore, additional specificity could be added to the water Service Agreements as to the parameters associated with the delivery of treated water to the member jurisdictions through the transmission system and how the transmission system should be operated to deliver water to each member jurisdiction.

4. *Financing Challenges Due to the Financial Condition of Petersburg.* This challenge could be partially addressed if the ability is provided for the transfer of capacity shares among the member jurisdictions. Under this alternative, Petersburg could "sell" a portion of its unused capacity to another member jurisdiction, thereby providing upfront cash to Petersburg to help address its financial challenges and lowering its share and responsibility of the capital cost of the ARWA system. This could lessen the concern of the relatively poor financial condition of Petersburg by funding agencies, but would not likely eliminate this concern.

5. *A Perception of Less Regional Cooperation, and Control Issues.* This alternative could result in Chesterfield County increasing is capacity share of the ARWA facilities, but have no impact on its weighting of voting rights or decision making power. As a result, it would not likely address the control issues completely from the Chesterfield County perspective. However, if the member jurisdictions are able to "right size" their capacity shares associated the ARWA facilities and receive more overall benefit from the Authority, then perhaps it could improve the sense of regional cooperation among its members. Furthermore, under this alternative, the ultimate control over the water supply would remain with ARWA and its board. Therefore, this alternative would limit the potential concerns by some member jurisdictions over having one member receive control of economic development in the region because they have sole ownership of the water supply.

5.4.2 Alternative 2 – Convert to a Municipal Model

Some parties have expressed an interest in moving the Authority to a municipal governance and ownership model, where one municipality would have sole ownership of the water system and provide service to the other communities through contractual agreements. The municipal model has merits since one community, Chesterfield County, uses the bulk of the water produced by the Authority, and the County is projected to increase its water needs faster than the other member jurisdictions. Moving to this model would require dissolving the Authority and selling its assets to the purchasing municipality. If this were to occur, each of the member jurisdictions would need to negotiate a separate service agreement with the purchasing municipality. A fair price for sale of the utility assets would need to be set and agreed to by each of the Board members and their jurisdictions. This approach could create an immediate influx of cash from the sale of the ARWA assets for the non-purchasing member jurisdictions.

Several Board members indicated that moving the Authority to a municipal governance and ownership model is less desirable to them and their constituents, because it limits their control and future flexible to accommodate growth and it would give the municipality that purchases the

system the upper hand when it comes to economic development in the region. However, this issue may be addressed, at least partially, by a well-crafted service agreement. A well-crafted service agreement would have sections that address service standards across the system from source to transmission, detail how capacity would be expanded, allocated and paid for equitably for each facet of the system (source, WTP, transmission, etc.), and include governance language including dispute resolution procedures. The latter is missing from the current agreements and is creating further divisions among the member jurisdictions.

A major obstacle to this Alternative is coming to an agreement on the purchase price for the ARWA system that all the jurisdictions can agree is fair. In our experience, an acceptable purchase price can be heavily influenced by political and emotional factors. A fair acquisition price should consider many factors, including the valuation estimates, intangible value of the water supply in the region, and how an acquisition price may impact the price of water that the new owner could offer to cover its costs and the recoup its system acquisition costs. See Section 4 of this report for a more detailed discussion of these considerations.

Based on the interviews that were conducted, there is a strong interest from at least one of the member jurisdictions in selling the Authority's assets and converting to a municipal model. Other members expressed a combination of ambivalence and skepticism that an acceptable arrangement could be achieved under this alternative. However, the member jurisdictions that were interviewed appear willing to at least consider the idea. There are three critical elements that affect a potential conversion to a municipal model:

- **Establishing a "Fair" Acquisition Price** – The acquisition price paid to the other ARWA communities must be considered fair by all parties. Most of the communities do not consider being paid the book value of the assets fair. They believe that a premium should be paid, reflecting the operating value of the assets and a perceived loss of control. At least one community representative has expressed a desire to consider the opportunity costs associated with other water supply options in determining ARWA's value. Determining a fair acquisition price will likely include subjective considerations by each jurisdiction.
- **Acceptable Service Agreements** - The communities would require detailed service agreements with the acquiring municipality to ensure that water would be delivered with acceptable levels of service (quantity, pressure, quality, etc.) now and in the future. The agreements would need to provide provisions for cost sharing future upgrades and allowances for capacity growth.
- **Water Rate Stability** – Several Board members indicated that they would need agreements stating that rates would be maintained at current levels for a defined period without significant increases in rates. This could be difficult given regulatory uncertainties, the need or desire to recoup acquisition cost by the potential buyer, and other considerations.

The advantages and disadvantages of Alternative 2 are summarized in Table 5-1, and the potential ability of this alternative to address the identified issues and challenges is summarized below:

1. *Inability to Transfer WTP Capacity Shares Among Member Jurisdictions*. Under this alternative, ownership of system capacity would be transferred to a single municipality that would then likely enter into service agreements with the other member jurisdictions for the provision and sale of water to these municipalities. Therefore, this issue would be fully addressed by this alternative.

2. *Differing Interests Among the Member Jurisdictions Regarding System Expansion.* This alternative would convey control of system expansion decisions to a single municipality who would have the ability to make decisions regarding expanding system capacity based on its own needs and the needs of its customers of the system. Therefore, this issue could be fully addressed by this alternative from the Chesterfield County perspective, but would eliminate control over system expansion for the other members.
3. *Capacity Limitations in the Transmission System.* Under a single municipality ownership model, the owner would have the sole control over operation of the transmission system, and capacity expansion decisions, and operational performance requirements and water supply pricing could be established in the water service agreements between the owner and its customers. While there may be some concerns under this alternative regarding how a new owner of the system would provide adequate transmission system capacity, and at what price, to its customers, this issue could potentially be fully addressed by this alternative, but could eliminate control over operational and capital decisions for other members.
4. *Financing Challenges Due to the Financial Condition of Petersburg.* This challenge could be fully addressed by this alternative. If the purchaser of the water system has a very strong financial condition and credit rating, it would likely be able to secure financing for improvements of the water system at favorable terms. Furthermore, since under this alternative, and unlike the current ownership structure, Petersburg would not be directly responsible for securing the debt. While the financial condition of the customers of the system may be a factor in credit rating decisions, the issue with Petersburg's financial condition would likely be significantly mitigated from a credit perspective. Furthermore, Petersburg could "sell" its capacity share of the system, thereby providing upfront cash to Petersburg to help address its financial challenges.
5. *A Perception of Less Regional Cooperation, and Control Issues.* This issue is likely to be the most significant disadvantage associated with this alternative. Under sole ownership by single municipality, the other member jurisdictions would lose a significant amount of control over the decisions pertaining to the water system, as these members would become simply customers of the system. This would likely reduce the sense of regional cooperation that the Authority governance model offers. In addition, for this alternative to allow for a distribution of control among the customers of the system, provisions pertaining to operations, pricing, and other factors would need to be clearly specified in service agreements between the new owner and the customers of the system. Furthermore, regional cooperation concerns and concerns over the control of economic development are a significant concern under this alternative. However, these concerns may be able to be partially mitigated by the terms of new service agreements between the owner and customers of the system.

5.4.3 Alternative 3 – Convert to a Hybrid Model

One of the issues that is stimulating the exploration of alternative governance and ownership structures is the problem that Chesterfield County is reportedly having obtaining its allocated share of water in a manner that meets its operational needs. Based on discussions with ARWA staff and

municipal representatives from several jurisdictions, this is primarily due to transmission system limitations, although the limited ability to deliver raw water from the Brasfield Dam to the WTP has also been identified as an issue. We have reviewed the service agreements between the Authority and the member jurisdictions and noted that they are silent on service standards other than water quality and the total water supplied in a 24-hour period. There is no mention of minimum or maximum supply pressures and peak flow capacity per hour or per minute required to be delivered to the member jurisdictions. The lack of service parameters leaves to interpretation the standards by which water is delivered. If a member jurisdiction desires operational or capacity changes from the historical status quo that impacts another member jurisdiction, or that requires infrastructure investment, there is not an easy way to resolve these differences without complete agreement from the other members.

This alternative consists of the Authority maintaining ownership and control over the raw water supply and the WTP, but involves the sale and transfer of the transmission system assets to one or more of the member jurisdictions. This transfer of transmission system ownership could allow the buyer and the other jurisdictions to negotiate separate transmission main service agreements that could clarify investment responsibilities related to the transmission system, as well as establishment of operational parameters. It would also have the added benefit of providing some immediate cash to the member jurisdictions from the sale of the transmission system. Of course, the service agreements between ARWA and each of its members for WTP and source capacity would need to remain.

Under this alternative, new transmission system service agreements would need to be established between the owner and the customers of the transmission system. However, the water service agreements between ARWA and the member jurisdictions would be focused on the raw water and treatment portion of the system, standards of supply, and water rates. This agreement would not need to contain provisions regarding the capacity shares or allocations of future capital costs for the transmission mains. However, currently, there is no proportional “right of ownership” associated with the transmission system, and the transmission main capacity challenges that the member jurisdictions are currently struggling with, would need to be addressed in the new service agreements between the owner of the transmission system and its customers.

Many of the immediate issues causing disagreement between ARWA members surround the transmission system could be address by this alternative. However, note that this alternative does not address Chesterfield County’s concern over the inability to get ARWA to expand the capacity of the dam to allow the full WTP capacity to be utilized. Further, selling the transmission assets to one municipality would entail many of the same issues as the complete sale of all assets of the Authority. However, because very little land (if any) would be transferred and no supply or treatment assets, coming to agreement on an acquisition price could be somewhat easier. Establishing water rates for use of the transmission system could be accomplished in a relatively straight forward manner, since there are industry guidelines on rate setting for transmission main “wheeling” rates that involve recovery of the capital and operating costs of the transmission system. Service agreements would be needed to establish service standards, rates and the procedure for allocating costs.

The advantages and disadvantages of Alternative 3 are summarized in Table 5-1, and the potential ability of this alternative to address the identified issues and challenges is summarized below:

1. *Inability to Transfer WTP Capacity Shares Among Member Jurisdictions*. Under this alternative, ownership of WTP capacity and the inability to transfer WTP Capacity shares among member jurisdictions would remain a challenge. However, if the draft Amendment #4 of the water service agreement were ratified, it could address this issue independently from Alternative 3.
2. *Differing Interests Among the Member Jurisdictions Regarding System Expansion.* Unless the bylaws and voting rights were changed, this alternative would only partially address the differing interests regarding system expansion. If ownership of the transmission system were transferred to a single municipality, it could make unilateral decisions regarding capacity and operations. However, differing interests regarding raw water and WTP capacity would likely remain.
3. *Capacity Limitations in the Transmission System.* Under a single municipality ownership model, the owner would have the sole control over operation of the transmission system, and capacity expansion decisions. Operational performance requirements for the transmission system could be established in the water transmission agreements between the owner and its customers. While there may be some concerns under this alternative regarding how a new owner of the system would provide adequate transmission system capacity, and at what price, to its customers, this issue could be fully addressed by this alternative.
4. *Financing Challenges Due to the Financial Condition of Petersburg.* This challenge could be partially addressed by this alternative. Petersburg could be a recipient of a portion of the proceeds from the sale of the transmission system, thereby providing upfront cash to Petersburg to help address its financial challenges. However, under this alternative, the challenge that ARWA has experienced regarding the financing of WTP improvements would likely remain under this alternative, as lending agencies would likely continue to examine the financial condition of the member jurisdictions when assessing credit risk associated with ARWA financing.
5. *A Perception of Less Regional Cooperation, and Control Issues.* This alternative may provide a more balanced solution to the control issues because under this alternative, the control of the water system is split. The member jurisdictions would maintain joint control over raw water supplies and the WTP assets, but control over the transmission system would be transferred to a single municipality. Capital and operations decisions could be made unilaterally by the transmission owner, alleviating some of the concerns that Chesterfield County has raised regarding its inability to get favorable decisions passed by the ARWA board pertaining to transmission capacity and the throttling valve. The concerns that some member jurisdictions expressed over the potential for Chesterfield County to acquire control over the economic development in the region with the ownership of the water system would also be mitigated, as control over the raw water and WTP would remain with ARWA.

While the Hybrid Model does not address all the issues between the ARWA members, specifically the source and water treatment facility capacity issues, it may provide an improved vehicle to address operational problems with water conveyance. It would also allow communities that want to extend or divert their capacity allocation to different areas of their community to have a streamlined mechanism to achieve that goal by allowing them to build new assets. Finally, the

Hybrid Model may be a workable interim step between keeping the status quo under the existing model and pursuing the full sale of the Authority's assets to one municipality.

5.5 CONCLUSIONS

Each of the ownership and governance alternatives presented above addresses the set of issues and challenges that were identified to varying degrees. For example:

- The issue of the current inability of the member jurisdictions to transfer a portion of WTP capacity shares could be addressed by Alternative 1 if the water service agreements are modified, or Alternative 2 if the ownership of the water system is transferred to a single municipal owner.

- The issue of differing interests among the member jurisdictions regarding system expansion could be partially addressed by Alternative 1 if the water service agreements are modified to allow for capacity share transfers, fully addressed by Alternative 2 if the ownership of the water system is transferred to a single municipal owner, and partially addressed under Alternative 3 if the ownership of the transmission system is transferred to a single municipality.

- The issue of capacity limitations in the transmission system could be partially addressed under Alternative 1 by adding provisions to the water service agreements specifying how hydraulic capacity along each segment of the transmission main will be allocated and paid for. The service agreements could also be amended to have a similar provision for transmission capacity "right of ownership" and the ability to transfer transmission capacity among the members. The issue could be fully addressed by Alternatives 2 & 3 if the ownership of the water system or the transmission portion of the water system is transferred to a single municipal owner, although these alternatives would eliminate or significantly reduce control of the system by other member jurisdictions.

- The financing challenges associated with the financial condition of Petersburg could be partially addressed by Alternative 1 if an amended water service agreement allows for the transfer of capacity between the members and if Petersburg "sells" some of its unused capacity, thereby lowering its overall proportion of capital costs it is responsible for paying. Alternative 2 could fully address this challenge by eliminating the direct responsibility of debt repayment by Petersburg, and Alternative 3 could partially address this challenge for the same reasons as Alternative 1.

- The ability of the alternatives to address the issues surrounding control issues and perceptions of less regional cooperation can differ based on the perspectives taken. From Chesterfield County's perspective, we consider Alternative 2 to fully address the control issues, and Alternative 3 to partially address these issues. However, these alternatives may only heighten the concern and issues expressed by other member jurisdictions regarding the potential impacts to their control over economic development in the region, and from this perspective, Alternative 1 may best address this issue.

A tabular summary of the ability of the alternatives to address the identified challenges and issues is presented in Table 5-2. As stated previously, there is no best model or even a preferred model for utility governance and ownership. Each has advantages and disadvantages, and each could work for ARWA and the member jurisdictions if applied appropriately and equitably. However, the alternatives that are best able to address the issues and challenges in total depend upon the perspective that is taken and the relative importance or weighting that a stakeholder places on the identified issues and challenges.

To aid in the consideration of these alternatives, we have prepared Table 5-1, which provides a summary of the comparison of governance and ownership alternatives discussed in this section with advantages, disadvantages and considerations, and Table 5-2, which identified issues and challenges and provides a subjective analysis of how well each ownership and governance option outlined addresses them.

Table 5-1: Summary Comparison of Governance & Ownership Alternatives

Governance/Ownership Options	Unanimous Board and Jurisdiction Vote Required	State or Legislative Action Required	Advantages	Disadvantages	Considerations
Alternative 1 – Maintain Authority Model					
a. Maintain Existing Service Agreements	No	No	– No governance/ownership change required – Model is proven and well-understood by communities – No operational changes required; AWRA continues with existing plans for growth and renewal	– Unresolved service and capacity issues – Board voting does not align with capacity allocations – Credit worthiness of service communities impacts debt financing – Limited mechanisms to resolve Board/community differences on critical matters – Limited ability to transfer capacity between municipalities – Unresolved differences about sharing of some growth or service related capital costs	– Unclear levels of transmission service provision; currently unsatisfactory service for one or more communities – Board agreement required to fund future growth and expansion – Board voting does not align with capacity allocations; perceived inequities – Requires unanimous Board and community vote on significant changes – Reportedly supported by some Board members
b. Amend Service Agreements	Yes	No	– Could clarify transmission system service levels and/or capacity allocation issues – No governance/ownership change required – May facilitate easier transfer (sale) of capacity between municipalities	– Voting does not align with system capacity allocations – Credit worthiness of all service communities' impacts debt financing – Limited mechanisms to resolve Board/community differences of opinion on critical matters	– Requires unanimous Board and community vote on significant changes – Board voting does not align with capacity allocations; perceived equity issues by some parties – Board agreement required to plan for future growth and expansion

Governance/Ownership Options	Unanimous Board and Jurisdiction Vote Required	State or Legislative Action Required	Advantages	Disadvantages	Considerations
					– Supported by multiple Board members; recent amendment ratified by three communities
c. Modify Board composition or vote-weighting based on system capacity allocations	Yes	Yes	– Aligns voting weight with capacity allocation; perceived as more equitable by some parties – Could streamline and/or expedite decision making – May improve resolution of differences of opinion on difficult issues – May facilitate easier transfer (sale) of capacity between municipalities	– Creates a power discrepancy between Board members (communities); perceived as less equitable by some parties – Credit worthiness of all service communities' impacts ARWA debt financing	– Requires unanimous Board and community vote on significant changes – May require amended service agreements – Reportedly supported by at least one Board members
Alternative 2 – Convert to a Municipal Model (ARWA sells assets to one municipality)	Yes	Yes (ARWA would need to dissolve the existing legislative charter)	– Should clarify transmission system service levels and/or capacity allocation issues – Generates funds from sale of system assets – Credit worthiness of only one community impacts debt financing – Streamlined decision making by purchasing municipality – Greater control on investments and capacity by purchasing municipality – Could provide additional rate stability, depending on new service agreements	– Governance/ownership change required – Potential loss of control by non-purchasing municipalities – Water system no longer an independent regional resource – Concerns about growth and expansion ability by non-purchasing municipalities; potentially resolved under new service agreements	– Requires new service agreements – Requires unanimous Board and community vote – Must negotiate "fair" purchase value for assets – Questions about future water rates and rate setting; potentially resolved under new service agreements – Non-purchasing municipalities have minimal operations and governance involvement – Transfer of ARWA staff and assets to purchasing municipality required; perhaps a reduction in the workforce

Governance/Ownership Options	Unanimous Board and Jurisdiction Vote Required	State or Legislative Action Required	Advantages	Disadvantages	Considerations
					– Endorsed by at least one Board members/community and under consideration from others
Alternative 3 – Convert to a Hybrid Model (ARWA retains the source and treatment systems, but sell the transmission assets to one municipality)	Yes	Possible (ARWA may need to seek approval to sell its assets from the Commonwealth)	– Less complex valuation process than Options 2, because minimal land, no treatment and no water resources are included – Should clarify transmission system service levels and some capacity allocation issues – Generates funds from sale of transmission assets – Credit worthiness of only one community impacts debt financing of transmission system growth and renewal – Streamlined decision making on transmission system renewal and development – Greater control of investments and capacity by purchasing municipality – Potentially more transmission system operation flexibility for purchasing municipality; depending on service agreements	– Governance/ownership change required – Loss of control by non-purchasing municipalities on transmission system assets; capacity control is maintained	– Discussed with Board members – Alleviates ARWA from managing transmission system – Requires amended or separate service agreements for transmission of water – Transfer of assets and potentially ARWA staff to purchasing municipality required; perhaps a reduction in the workforce (ARWA may need to transfer any dedicated transmission system staff to the purchasing municipality, reassign them or let them go if they are no longer needed)

Table 5-2: Summary of the Ability of Governance & Ownership Alternatives to Address Existing Challenges

Existing Issue/Challenge	Alternative 1 Maintain Authority Model and Revise the Water Services Agreement or Change Voting	Alternative 2 Convert to a Municipal Model	Alternative 3 Convert to a Hybrid Model
Inability to Transfer WTP Capacity Shares Among Member Jurisdictions	**YES** Addresses transfer of capacity between jurisdictions, if described in the service agreements adequately	**YES** Addresses transfer (sale) of capacity between jurisdictions; one utility would control capacity and allocate it based on negotiated service agreements	**NO** Does not address WTP capacity issues; only transmission system
Differing Interests Among the Member Jurisdictions Regarding System Expansion	**Partially** Addresses capacity expansion, if described in the service agreements or expressly excluded from the service agreements and delegated to a vote of the ARWA Board through the bylaws or charter	**Partially** Expansion provisions could be outlined in the service agreements or left up to the discretion of the owning entity	**Partially** Expansion provisions could be outlined in the service agreements for transmission system only
Capacity Limitations in the Transmission System	**Partially** Could address capacity limitations, if described in the service agreements or expressly excluded from the service agreements and delegated to a vote of the ARWA Board through the bylaws or charter	**YES** Capacity provisions could be outlined in the service agreements or left up to the discretion of the owning entity	**YES** Capacity and service levels addressed in the service agreements
Financing Challenges Due to the Financial Condition of Petersburg	**Partially** Could address financial aspects, if described in the service agreements or expressly excluded from the service agreements and delegated to a vote of the ARWA Board through the bylaws or charter	**YES** Credit rating would be based on the owning entity and not the other service jurisdictions; assumes good credit of the owner	**Partially** Does not address financing challenges directly, but may provide funds from sale to Petersburg to improve financial condition
A Perception of Less Regional Cooperation, and Control Issues	**Partially** New service agreements could foster cooperation or changes in voting could allow more perceived equity between communities	**Partially** Some may gain control, while others may feel they are losing control; some of the control aspects could be addressed through the service agreements	**Partially** Some of the control issues associated with the transmission system may be addressed

APPENDIX A:

Fixed Asset Register

Appomattox River Water Authority
Fixed Asset Register

Line No.	Asset Description	Date Acquired	Life/Years	Cost or Basis	Ending Accumulated Depreciation	Net Book Value
	HYDRO:					
1	HYDRO	06/30/94	25.0	$ 34,873	$ 31,386	$ 3,487
	COMMUNICATIONS:					
2	COMM	06/30/86	10.0	$ 1,290	$ 1,290	$ -
3	COMM	06/30/86	10.0	1,840	1,840	-
4	COMM	06/30/86	10.0	963	963	-
5	COMM-ANTENNA	06/30/86	5.0	6,794	6,794	-
6	COMMUNICATIONS - EMERGE SYSTEMS INC	06/08/12	5.0	24,301	21,871	2,430
7	New phone system	10/16/12	5.0	6,299	4,409	1,890
8	TOTAL COMMUNICATIONS			$ 41,487	$ 37,168	$ 4,320
	EQUIPMENT:					
9	LAMINATION AND TEST KIT	06/30/85	10.0	$ 525	$ 525	$ -
10	16"X20"X"30" DRESSER	06/30/85	10.0	1,220	1,220	-
11	STEELE STEP LADDERS	06/30/85	10.0	908	908	-
12	ACQUIRED IN 1983 BOND ISSUE	03/30/86	10.0	20,161	20,161	-
13	CHECK WRITER	06/30/87	10.0	117	117	-
14	MICROSCOPE	06/30/90	10.0	2,733	2,733	-
15	WORK PLAT. AND LADDER	06/30/91	10.0	1,305	1,305	-
16	REFRIGERATOR	06/30/92	10.0	679	679	-
17	TRINOCULAR MICROSCOPE	02/15/94	10.0	3,925	3,925	-
18	EXE CART. AND REC.	12/30/93	7.0	2,755	2,755	-
19	Atomic Absorption - Lab	07/15/97	5.0	24,291	24,291	-
20	Gas Chromtograph	08/15/97	5.0	36,938	36,938	-
21	Polymer mixer	08/15/97	5.0	5,381	5,381	-
22	Turbidity meter - lab	12/15/97	5.0	1,690	1,690	-
23	Standby generator	07/01/02	5.0	20,783	20,783	-
24	Trane rooftop unit	01/01/03	10.0	8,000	8,000	-
25	Security entrance gate	02/01/04	10.0	31,975	31,975	-
26	Analyzer & sensor	07/15/09	5.0	2,377	2,377	-
27	Upgrade - Happy Hill & Petersburg	11/30/09	10.0	13,950	9,068	4,883
28	Gage Pressure trans	06/30/10	5.0	6,818	6,818	-
29	Video suriveillance system	09/15/09	15.0	21,519	9,325	12,194
30	120V Tower & EBM Tower	07/07/10	5.0	2,430	2,430	-
31	(10) 750VA APC SmartUPS	08/06/10	5.0	3,200	3,200	-
32	Quantum Backplane's and PC Cable	08/06/10	10.0	1,015	558	457
33	Orion Dual Star PH/ISE Meter	02/13/11	5.0	1,007	1,007	-
34	CPRD 96600 Model 5310C Laboratory TOC Analyzer	09/10/10	10.0	15,028	8,266	6,763
35	CPRD 34100-01 Model 900 ICR Standalone	09/10/10	10.0	2,728	1,501	1,228
36	Sealer, WQTS2X-115V	08/05/10	10.0	4,042	2,223	1,819
37	Installation of 618 Deionized Water System	03/24/11	5.0	1,415	1,415	-
38	EMERGE SYSTEMS SERVER, SOFTWARE, & HARDWARE INSTALLATION	04/03/12	5.0	53,200	47,880	5,320
39	AA-7000 Workstation	09/24/13	10.0	64,567	16,142	48,426
40	Tyco Security system (from CIP)	04/03/14	10.0	98,918	24,730	74,188
41	Panasonic 2 Ton Mini Split Heat Pump	02/26/14	10.0	5,662	1,416	4,247
42	Poly Processing 5400 Gal SAE Tank & Accessories	10/24/13	10.0	29,656	7,414	22,242
43	Watson Marlow 621 Duplex CC Assy incl pumpheads, detectors	06/23/14	10.0	9,275	2,319	6,956
44	Turbidity System	09/15/14	10.0	30,278	4,542	25,736
45	New Gate Controllers	09/24/14	5.0	29,000	8,700	20,300
46	Maintenance Shop Software System	04/16/15	5.0	6,640	1,992	4,648
47	Mixer Mount Replacement	10/29/14	10.0	7,250	1,088	6,163
48	Limotorque MX-a Electronic Actuator	06/11/15	10.0	7,727	1,159	6,568
49	Limotorue Electronic Actuator for Effluent Valve #12	02/12/16	10.0	7,069	353	6,715
50	Accusine Power Correction System for Rapid Mixer	05/09/16	10.0	39,826	1,991	37,835
51	Watson Marlow 621 Pump Assembly	06/14/16	10.0	7,465	373	7,092

Appomattox River Water Authority
Fixed Asset Register

Line No.	Asset Description	Date Acquired	Life/Years	Cost or Basis	Ending Accumulated Depreciation	Net Book Value
52	ADFM Box	08/18/15	10.0	6,970	349	6,622
53	Sensor - Hot Tap	08/18/15	10.0	5,970	299	5,672
54	Watson Marlow Tubing Pump	09/25/15	10.0	6,260	313	5,947
55	Ventilator - Finished Water Room	10/06/15	10.0	9,878	494	9,384
56	Limitorque Actuator for Effluent Valve #1	06/15/16	10.0	6,969	348	6,621
57	Limitorque Actuator for Effluent Valve #22	06/15/16	10.0	6,380	319	6,061
58	TOTAL EQUIPMENT			$ 677,874	$ 333,791	$ 344,084
	TRANSPORTATION/TRACTORS:					
59	ALUMINUM BOAT	03/30/87	5.0	$ 1,034	$ 1,034	$ -
60	NEW FORK LIFT (Yale 4000# capacity)	06/30/90	4.0	9,950	9,950	-
61	KUBOTA TRACTOR	06/30/91	4.0	6,670	6,670	-
62	KUBOTA TRACTOR	06/30/91	4.0	6,670	6,670	-
63	MASSEY FERG. TRACTOR	06/30/91	4.0	9,953	9,953	-
64	SICKLE Bar Attachment for Massey Ferg. Tractor	06/30/92	10.0	2,500	2,500	-
65	1998 GMC P/U, 1/2 ton, 4 W/D	03/13/98	5.0	17,807	17,807	-
66	GP 25 Caterpillar Lift Truck	08/15/97	5.0	19,535	19,535	-
67	Boat-Sweetwater Challenger SW-240ES	04/15/01	5.0	18,955	18,955	-
68	2001 Chevy S-10 P/U	05/15/01	5.0	15,708	15,708	-
69	KubotaTractor ZD21	07/01/02	5.0	8,595	8,595	-
70	GMC 3/4 ton 4w/d pickup (2500HD)	01/01/03	5.0	19,367	19,367	-
71	05 Ford Explorer(swapped w/ SCWWA for 07 Chevy Colorado)	03/15/07	5.0	13,277	13,277	-
72	07 Kubota zero turn mower zd21	02/28/07	7.0	9,224	9,224	-
73	00 Lull 8000lb Forklift Model844C	07/19/07	7.0	38,500	38,500	-
74	08 Chevy Silverado 2500 HD	04/30/08	5.0	19,800	19,800	-
75	2007 Chevrolet Silverado 2500HD 4WD	12/01/09	5.0	18,931	18,931	-
76	Forklift bucket	06/30/10	20.0	2,400	900	1,500
77	2012 Tracker/Trailer Model:1648SC	03/15/12	5.0	11,765	9,412	2,353
78	2012 Ford Transit Connect VIN#NM0LS6AN0CT078217	12/15/11	5.0	23,565	18,852	4,713
79	Snow Plow Meyer 2013	01/25/13	7.0	5,500	2,514	2,986
80	2014 GMC Sierra 2500HD 4WD - 1GT12ZCG2EF159392	01/31/14	5.0	29,178	12,922	16,256
81	2014 Toyota Super Cab VIN#5686	08/06/14	5.0	26,997	4,628	22,369
82	TOTAL TRANSPORTATION / TRACTORS			$ 335,880	$ 285,703	$ 50,177
	WATER SYSTEM:					
83	VARIOUS	06/30/80	50.0	$ 7,605,691	$ 7,225,297	$ 380,394
84	RELOCATION & INCREASED SIZE OF	06/30/89	50.0	116,678	64,173	52,505
85	REPLACEMENT OF FILTER CONTROLS	06/30/89	10.0	45,850	45,850	-
86	HYDRAULIC VALVE OPERATOR	06/30/89	10.0	7,866	7,866	-
87	VALVES	06/30/89	10.0	2,671	2,671	-
88	VALVES	06/30/90	10.0	1,600	1,600	-
89	VALVES	06/30/91	10.0	22,603	22,603	-
90	HEATING SYSTEM RENOVATIONS	06/30/91	20.0	38,444	38,444	-
91	SLUDGE LAGOON	06/30/92	35.0	945,140	654,847	290,293
92	MCC RELOCATION	06/30/92	20.0	84,076	84,076	-
93	BUILDING IMPROVEMENTS	06/30/92	20.0	5,114	5,114	-
94	ETTRICK CROSSING	06/30/92	20.0	1,400	1,400	-
95	CONTROLLER, MOTOR, & PUMP	06/30/92	10.0	1,060	1,060	-
96	ROOFS FOR PUMPS	06/30/92	10.0	5,600	5,600	-
97	TRANSMISSION METER	06/30/93	10.0	2,362	2,362	-
98	MODICON REPLACEMENT	06/30/93	10.0	1,027	1,027	-
99	TRANSMITTER	06/30/93	10.0	2,325	2,325	-
100	CHEMICAL FEEDERS	06/30/93	10.0	4,678	4,678	-
101	MOTOR REPLACEMENT	06/30/93	10.0	1,651	1,651	-
102	VALVE REPLACEMENT (1)	06/30/93	10/20/0	129,595	129,595	-

Appomattox River Water Authority
Fixed Asset Register

Line No.	Asset Description	Date Acquired	Life/Years	Cost or Basis	Ending Accumulated Depreciation	Net Book Value
103	FILTER / VALVE MEDIA REPLAC.	06/30/93	20.0	396,746	396,746	-
104	SLUDGE LAGOON	06/30/93	35.0	1,285,181	862,907	422,274
105	UTILITY BUILDING (expansion)	06/30/80	50.0	2,096,026	1,318,617	777,409
106	UTILITY SYSTEM (expansion)	06/30/80	50.0	8,870,032	5,410,720	3,459,312
107	FENCE	06/30/87	10.0	3,519	3,519	-
108	FENCE	06/30/87	10.0	1,812	1,812	-
109	FLOWMETER	06/30/87	10.0	3,083	3,083	-
110	TEMPLE AVENUE ADDITION	06/30/87	50.0	28,996	17,107	11,888
111	EQUIPMENT	06/30/87	10.0	3,878	3,878	-
112	LAGOON	06/30/87	10.0	143,243	143,243	-
113	FLOWMETERS	06/30/88	10.0	1,210	1,210	-
114	SWIFT CRK WATER LINE	06/30/90	10.0	838	838	-
115	TRASH RACKS FOR DAM INTAKE	08/31/93	10.0	5,827	5,827	-
116	VALVE REPLACEMENT	06/30/94	10.0	26,386	26,386	-
117	#14 PUMP	10/15/93	10.0	2,043	2,043	-
118	FLOWMETER	10/15/93	10.0	4,758	4,758	-
119	FILTER VALVE REPLACEMENT	10/29/93	10.0	2,205	2,205	-
120	Hypochlorite (formerly FLOURIDE) TANKS	06/30/94	10.0	13,640	13,640	-
121	TRANSMISSION VALVE REPLACEMENT	01/31/94	10.0	37,635	37,635	-
122	MODICON EQUIPMENT	02/15/94	10.0	5,000	5,000	-
123	SLUDGE LAGOON	06/30/94	35.0	104,222	67,897	36,325
124	DIGITAL WEIGHT INDICATOR	07/01/93	10.0	1,572	1,572	-
125	MOTOR CONTROLS	09/15/94	10.0	3,039	3,039	-
126	DIGITAL WEIGHT INDICATORS	11/15/94	10.0	1,459	1,459	-
127	LOD TRACK	11/30/94	10.0	2,810	2,810	-
128	COLUMN PIPE AND BOWL	06/30/95	10.0	47,929	47,929	-
129	WATER PUMP	03/31/95	10.0	4,379	4,379	-
130	ANALOG INPUT MODULE	06/15/95	10.0	1,283	1,283	-
131	SLUDGE LAGOON(incl 6/95 adj)	06/30/95	35.0	5,515	3,336	2,179
132	PUMP	08/15/94	10.0	4,598	4,598	-
133	DAM PUMP REPLACMENT	06/15/95	20.0	88,185	88,185	-
134	Motor control center replacement	06/15/97	10.0	101,481	101,481	-
135	Differential pressure cells replacement	08/15/96	10.0	13,261	13,261	-
136	Replacement door @ Filter 6/7	08/15/97	10.0	5,964	5,964	-
137	3 new doors and door closures	10/15/97	10.0	8,441	8,441	-
138	Drainfield addition to septic system	10/31/97	10.0	3,148	3,148	-
139	Chloramine/clearwell project (1)	06/22/98	25/50/39	2,569,521	1,591,785	977,736
140	Underground storage tanks replacement	06/30/99	25.0	229,634	156,151	73,483
141	New basement system-lab pure water sys	01/19/99	10.0	8,905	8,905	-
142	Controls-chloramination project-SCADA	06/15/00	10.0	15,000	15,000	-
143	Replacement water meters	01/01/00	25.0	46,608	31,693	14,915
144	SCADA-Turbidity Reporting. Sys.	01/01/02	10.0	25,000	25,000	-
145	CLEARWELL # 3 (1)	07/01/02	30/50/43	3,558,660	1,409,671	2,148,989
146	Variator-rpl. Floc drive	01/01/03	5.0	6,426	6,426	-
147	Toxicity meter/test kit	10/01/04	10.0	7,934	7,934	-
148	Swift Creek Meter Vault	06/30/06	30.0	423,348	148,172	275,176
149	Water Treat. Plant Expan, Phase2 (buildings & lines)-online as of 6/30/06 (1)	06/30/06	30/50/46.50	22,793,696	6,090,574	16,703,123
150	Water Treat. Plant Expan, Phase 2 (equipment)-online as of 6/30/06 (1)	06/30/06	10/20/16.50	11,206,201	8,676,316	2,529,885
151	Water Treat. Plant Expan, Phase 2 (buildings & lines) remaining asset (1)	06/30/07	30/50/47.50	6,316,479	1,457,223	4,859,256
152	Water Treat. Plant Expan, Phase 2 (equipment)-remaining asset (1)	06/30/07	10/20/17.50	3,105,408	2,018,515	1,086,893
153	700 SS gallon tank	03/01/08	25.0	37,050	12,597	24,453
154	Pre-engineered chlorine building	05/31/08	30.0	22,000	6,233	15,767
155	Limitorque L120 BIC electric actuator	10/31/07	10.0	5,387	4,256	1,131
156	Aanalyst 200	06/30/08	20.0	23,893	10,155	13,738
157	Vertical water pump	04/01/08	20.0	85,442	36,313	49,129
158	Roof replacement	05/01/09	20.0	173,004	64,877	108,127
159	Roof repair - final 2010	07/31/09	20.0	10,106	3,285	6,822
160	Reconditioned pump cost	04/30/10	25.0	64,422	16,750	47,673
161	Hypochlorite tank replacement	06/30/10	20.0	785,280	255,216	530,064

Appomattox River Water Authority
Fixed Asset Register

Line No.	Asset Description	Date Acquired	Life/Years	Cost or Basis	Ending Accumulated Depreciation	Net Book Value
162	P-17 VFD	11/13/09	15.0	26,381	10,992	15,389
163	Temple Ave Waterline Blowoff	06/30/07	50.0	17,853	3,392	14,461
164	P-4 Rebuilt	04/01/08	25.0	85,442	29,050	56,392
165	P-10 Rebuilt partial	11/01/07	15.0	3,422	1,882	1,540
166	P-10 Rebuilt partial	11/01/07	25.0	32,948	11,532	21,416
167	Mixer #1 Shaft & Blades	01/15/08	15.0	26,717	14,427	12,290
168	Replace Site Fencing	09/07/08	15.0	20,554	10,277	10,277
169	P-23 Rebuilt	08/16/08	25.0	38,629	11,975	26,654
170	P-22 Rebuilt	11/04/08	25.0	59,739	18,519	41,220
171	Honeywell 4" 8-Bolt Flanged Valve & Actuator	07/07/10	10.0	1,192	584	608
172	Rotork Model 1Q10 WT 43rpm	08/17/10	5.0	4,016	3,413	602
173	25HP Domestiv Water Pump Motor	11/15/10	20.0	2,251	619	1,632
174	Quantum Backplane & AC Input	04/07/11	10.0	1,224	673	551
175	P-2200 HP Rebuild	04/15/11	20.0	7,624	2,096	5,527
176	133 Cu. Ft. Torpedo Sand & 577 Cu. Ft. Filter Sand	08/12/10	50.0	9,897	1,089	8,808
177	Repl Material, Freight & Labor for replacement 12OV AC?	03/21/11	10.0	2,619	1,440	1,178
178	Infinity Underdrain & Aries Modules	07/08/10	50.0	77,432	8,518	68,914
179	Repair Fairbanks Morse Model 20 MC Vertical Pump	03/28/11	10.0	38,838	19,419	19,419
180	(2) 150HP Vertical Motors	06/15/11	20.0	19,915	5,477	14,438
181	DCWA/Mataoca RTU Panel Upgrade	10/30/10	20.0	16,495	4,536	11,959
182	Watson Marlow Pump, tubing, connector, & detector Kit	11/30/11	10.0	11,000	4,950	6,050
183	Bus differential system	06/19/12	10.0	12,659	5,697	6,963
184	Ammonia Building HVAC Improvements	06/30/12	25.0	163,433	29,418	134,015
185	Feasibility Study Rock Quarry for ARWA	06/30/12	25.0	67,995	12,239	55,756
186	Water resources Project Phase II	06/30/13	30.0	210,517	24,560	185,957
187	Laboratory Window Replacement	06/30/13	20.0	17,342	3,035	14,307
188	RPZ (Backflow Preventor) Relocation	06/30/13	30.0	134,695	15,714	118,981
189	Board Room Renovation	06/30/13	20.0	32,900	5,758	27,143
190	ARWA Floor Tunnel Repairs at Sendentary Basins	04/11/13	20.0	29,160	4,228	24,932
191	Actuator -limitorque	08/27/12	10.0	8,364	2,509	5,855
192	Rotork actuator	11/20/12	10.0	7,393	2,218	5,175
193	Pipeline clearing	04/05/13	30.0	30,800	3,593	27,207
194	Watson Marlow Model 720DUN/RE Pump	07/18/12	10.0	11,000	3,300	7,700
195	Limitorque electric actuator	10/11/12	10.0	5,852	1,756	4,096
196	Verticle Motor Repaired	07/31/13	5.0	7,400	4,070	3,330
197	Fairbanks Morse Vertical Pump Repair	10/24/12	5.0	31,845	17,515	14,330
198	Vertical Turbine Pump	12/31/12	10.0	44,521	13,356	31,165
199	Stormwater Chlorine leak repair	11/30/12	5.0	5,240	3,668	1,572
200	Dewater supports in one basin	03/20/13	10.0	8,700	3,045	5,655
201	Tubing	01/28/13	10.0	10,339	3,619	6,721
202	Vertical Motor	10/08/12	10.0	19,980	5,994	13,986
203	Streamgage for Appomattox at Rt 602	07/03/12	15.0	16,200	3,780	12,420
204	Ductile Iron Water Line	12/05/12	15.0	15,000	2,688	12,313
205	Sludge platforms	12/14/12	10.0	25,200	6,804	18,396
206	Stainless Steel Gutter	08/29/13	10.0	6,885	1,721	5,164
207	Complete Rebuild - Casepump Flowserve Model 300 LNNV-475	03/14/14	10.0	27,362	5,472	21,889
208	Aluminum Platform	03/20/14	15.0	7,000	840	6,160
209	Fire Hose Bumpers	03/31/14	15.0	7,750	1,292	6,458
210	Limitorque Mxa-10 Electric actuator	02/06/14	10.0	5,806	1,161	4,645
211	Raw River Water P-2	05/15/14	10.0	57,235	11,447	45,788
212	Drought Triggers & Modified Relesae (15 Year Permit) (from CIP)	08/30/13	15.0	30,065	5,011	25,054
213	5KV Switch (Replacement after Explosion) (from CIP)	10/31/13	25.0	153,352	16,869	136,483
214	5KV Switch (Replacement after Explosion) (from CIP)	12/31/13	15.0	183,601	27,540	156,061
215	Chlorine Dioxide System (from CIP)	08/30/13	25.0	892,428	89,243	803,185
216	Hydrofluorisilic Acid Tank (from CIP)	12/31/13	10.0	60,207	15,052	45,155
217	Dam Outlet / Outfall Repairs (from CIP)	11/15/13	15.0	197,766	32,961	164,805
218	Clariflac Platforms (From CIP)	07/15/13	25.0	67,500	6,750	60,750
219	Roof Improvements / Clearwell Membrane Roof (from CIP)	04/08/14	25.0	324,722	32,472	292,249

Appomattox River Water Authority
Fixed Asset Register

Line No.	Asset Description	Date Acquired	Life/Years	Cost or Basis	Ending Accumulated Depreciation	Net Book Value
220	Petersburg Meter Vault (from CIP)	02/12/14	25.0	347,591	34,759	312,832
221	Overhaul of Raw Water P-1	07/30/14	10.0	40,000	4,000	36,000
222	Dam Outlet / Outfall Repairs - Additional Costs (from CIP)	07/30/14	15.0	20,000	2,000	18,000
223	SCADA & Computer Server System Upgrades	06/30/15	15.0	538,056	53,806	484,250
224	Maintenance Warehouse	06/28/16	40.0	505,710	6,321	499,388
225	TOTAL WATER ASSETS			$ 78,767,935	$ 39,667,381	$ 39,100,554
226	TOTAL ASSETS			$ 79,858,050	$ 40,355,429	$ 39,502,621

UTILITY PLANT IN SERVICE

June 30, 1980

SCHEDULE 2
PAGE 1

	TOTAL TO JUNE 30, 1979	YEAR ENDED JUNE 30, 1980	TOTAL
LAND AND LAND RIGHTS			
Land surveying and topographic mapping	$ 83 633 20	$ -	$ 83 633 20
Land appraisal and acquisition	505 124 31	-	505 124 31
TOTAL - LAND AND LAND RIGHTS	$ 588 757 51	$ -	$ 588 757 51
WATER SYSTEM CONSTRUCTION			
Original issue discount on bonds	$ 136 000 00	$ -	$ 136 000 00
Engineering - Plans and specifications	245 700 47	-	245 700 47
Engineering - Land clearing	82 840 69	-	82 840 69
Engineering - Supervision and resident project representative	146 760 35	-	146 760 35
Engineering - Administration of subcontracts	9 221 55	-	9 221 55
Engineering - Extra services	65 094 76	10 848 17	75 942 93
Bid advertisements	729 10	-	729 10
Site and water testing	31 249 46	-	31 249 46
Contract - Filter plant	1 766 791 51	-	1 766 791 51
Contract - Dam	2 336 752 01	-	2 336 752 01
Contract - Pipelines	1 322 860 66	-	1 322 860 66
Contract - Roads	315 082 56	-	315 082 56
Contract - Reservoir clearing	618 244 42	-	618 244 42
Contract - Maintenance building	24 638 80	-	24 638 80
Contract - Fences	17 386 01	-	17 386 01
Contract - Emergency power system	77 427 94	-	77 427 94
Electrical substation relocation	30 314 00	-	30 314 00
Reservoir buoys and safety cables	3 140 56	-	3 140 56
Filter plant modifications	30 575 80	1 159 79	31 735 59
Gauging stations	1 001 20	-	1 001 20
Pumping and pipeline modifications and parts	40 782 80	-	40 782 80
Observation point and landscaping	4 892 30	-	4 892 30
Boat dock and ramp	3 074 11	-	3 074 11
TOTALS (Forward)	$7 310 561 06	$12 007 96	$7 322 569 02

UTILITY PLANT IN SERVICE

(Continued)

SCHEDULE 2
PAGE 2

	TOTAL TO JUNE 30, 1979	YEAR ENDED JUNE 30, 1980	TOTAL
TOTALS (Forwarded)	$7 310 561 06	$12 007 96	$7 322 569 02
WATER SYSTEM CONSTRUCTION (Continued)			
Spillway and clearwell drains	3 895 21	-	3 895 21
Reservoir aeration system	90 965 70	-	90 965 70
Filter plant waste water treatment facility	165 496 92	-	165 496 92
Damages	1 089 54	-	1 089 54
Miscellaneous costs	715 14	-	715 14
Supplies and chemicals	7 417 95	-	7 417 95
Electric power	677 76	-	677 76
Fuel oil	931 47	-	931 47
Forestry consultant	1 890 00	-	1 890 00
Legal fees - Bond counsel	20 855 55	-	20 855 55
Bond printing	3 695 82	-	3 695 82
Legal fees - General counsel	7 748 50	-	7 748 50
Accounting and auditing fees	5 125 00	-	5 125 00
Salaries and payroll taxes	25 864 03	-	25 864 03
Travel and meetings	4 032 47	-	4 032 47
Office rental	2 700 00	-	2 700 00
Telephone service	1 472 04	-	1 472 04
Trustees' commissions	5 375 31	-	5 375 31
Office supplies and expenses	2 811 23	-	2 811 23
Insurance	2 413 00	-	2 413 00
Utility building	3 156 85	-	3 156 85
Bacteriological laboratory	12 411 06	-	12 411 06
TOTAL - WATER SYSTEM CONSTRUCTION	$7 681 301 61	$12 007 96	$7 693 309 57
EQUIPMENT			
Mobile plant	$ 9 465 81	$ -	$ 9 465 81
Small tools	3 442 01	-	3 442 01
Transportation	27 652 04	5 804 00	33 456 04
Communications	4 889 73	-	4 889 73
Office furniture and fixtures	14 120 52	350 52	14 471 04
TOTAL - EQUIPMENT	$ 59 570 11	$ 6 154 52	$ 65 724 63
TOTAL - UTILITY PLANT IN SERVICE	$8 329 629 23	$18 162 48	$8 347 791 71

APPENDIX B:

Cobbs Creek Reservoir and Dam Project Details

Cumberland County

Cobbs Creek Reservoir Project

Overview

The need for a water supply has been assessed for communities along the James River including Cumberland, Henrico, and Powhatan counties. After the drought in 2002, the Virginia General Assembly, in agreement with the Governor, passed legislation which requires the Virginia Department of Environmental Quality to establish regulations that call for the formation of water supply plans for all localities in Virginia. Consistent with these planning efforts, the proposed Cobbs Creek Reservoir Project consists of building a pumped storage facility that supplies 14.8 billion gallons of water storage and is estimated to generate 47 million gallons per day. This water would be sent to the Reservoir from the James River at times when the water levels are sufficient. The Reservoir would serve as a dependable source for future water supply needs in Cumberland as well as Henrico, Goochland, and Powhatan. It would take the strain away from the James River during periods of drought.

What is a Reservoir?

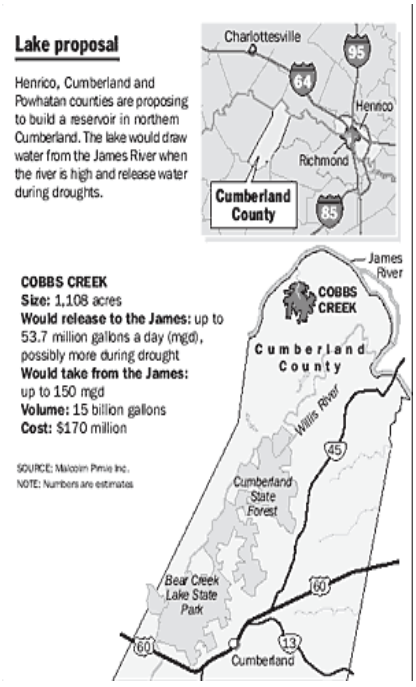
A reservoir is a storage chamber that contains water that will supply areas or communities during a drought and other times of need.

How was the location selected?

In the site selection process, alternatives were identified as ways to provide a water supply for Cumberland County. There was a screening process that observed the size of the proposed Reservoir, land uses, wetland areas, amount of disturbance to the environment, impact on transportation and the yield and cost. The area in Cumberland where the Reservoir would be placed was chosen after reviewing topographic maps of the County that showed the preferred storage capacity. The Reservoir will be located in the northern part of Cumberland County near Route 690 and Route 686 and south of the town of Columbia.

What other localities are involved in the Reservoir?

Henrico County and Powhatan County are partners with Cumberland in the Cobbs Creek reservoir project. Goochland County is also involved as they receive water from Henrico County. As a partner in the Reservoir project, each locality will receive an allocation of water for the needs of their community.



How will the Reservoir operate?

The Cobbs Creek Reservoir will be a pumped storage facility providing nearly 15 billion gallons of raw water storage. Raw water would be diverted to the reservoir from the James River when river flows are adequate. Reservoir withdrawals and/or controlled releases from reservoir storage would be made during drought and other periods when the river flows are inadequate to support regional demands and/or instream beneficial uses.

How will the water be allocated?

With a total of 47 million gallons of water available per day, the partnering localities have agreed to a proportional allocation based on needs of their respective communities. Cumberland County will have access to 7 million gallons per day. Henrico will have access to 30 million gallons per day and Powhatan will have rights to 10 million gallons per day.

How will the construction of the Reservoir affect local properties?

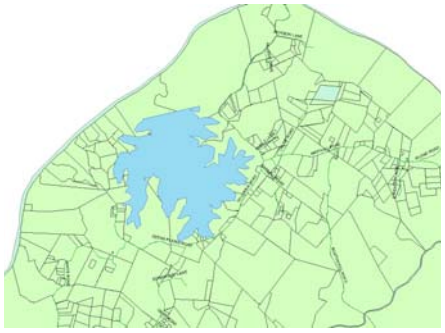
The land that will be used for the reservoir was inspected and there were a few houses and barns found on the site. The current use and status of each structure was identified. The locations of all the structures were visited and the flood pool elevation levels were estimated. All of the structures that were near the edge of the reservoir pool were found to be outside the projected maximum flood pool area.

Cumberland County
1 Courthouse Circle
Cumberland, VA 23040

Cobbs Creek Reservoir Project

How will the Reservoir benefit Cumberland?

The Reservoir will provide multiple benefits to Cumberland County. First, it will ensure a safe and adequate water supply for citizens, which is particularly important as water resources diminish over time. Second, the Reservoir will provide direct and indirect economic benefits to the County which will assist in providing necessary resources for citizens. Third, the Reservoir may provide new recreational opportunities to Cumberland County.



Will there be new development around the Reservoir?

Cumberland County, in conjunction with Virginia Tech and VCU, is undertaking a master planning process for the Reservoir. The 2 phase process will provide multiple opportunities for citizen input as the county plans for what, if any, development may occur within the vicinity of the Reservoir.

Will people be able to use the water for fishing or boating?

Recreational uses in and around the Reservoir will be determined as part of the master planning process.

How will the Reservoir be monitored?

Monitoring of the Reservoir will be determined at the time of the agreement between the partnering localities.

Will the Reservoir affect wildlife?

Cumberland County contacted the Virginia Department of Conservation and Recreation, Division of Natural Heritage for recorded documentation on the proposed reservoir area that might inhabit rare, threatened, or endangered plant and animal species. No species of concern were found in the projected area.

Where can I get more information on the Reservoir?

Department of Community Development
P.O. Box 110
Cumberland, VA 23040

Phone: 804-492-9175
Fax: 804-492-3708

www.cumberlandcounty.virginia.gov
www.econdev.vt.edu/CobbsCreek

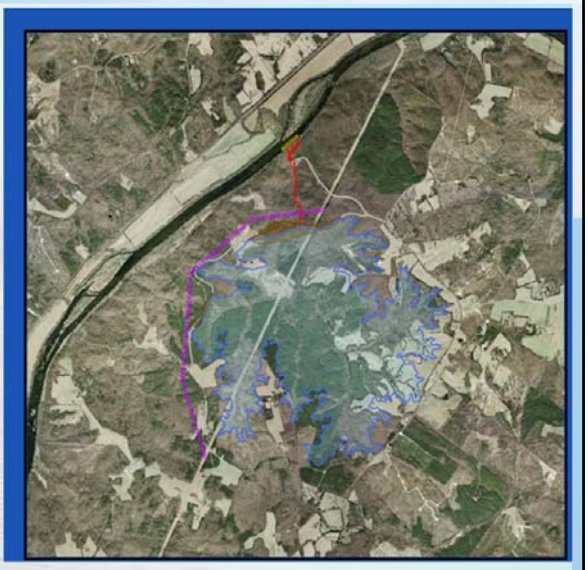
Cobbs Creek Regional Reservoir

Presentation to RRRC

November 18, 2014

Presentation Outline

- Reservoir Origin
- Negotiation and Permitting Timeline Highlights
- Reservoir Information
- Current and Future Activities
- Thoughts
- Reservoir Project Management and Schematics



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"At some point in time" – prior to September 2002

- Energy company and its legal representative met with Cumberland BOS to determine feasibility of natural gas plant in Cumberland.
- Project did not go forward as water supply (7 mgd needed) was not available
- Cumberland BOS member inquired on how to permit a water withdrawal
- Legal representative went to DEQ and meet with some interest groups concerned with low river flows, aquatic life, etc., and came up with idea of a side stream reservoir using the James River as a conduit to downstream users
- Through Cumberland County, Richmond and then Henrico approached to determine interest

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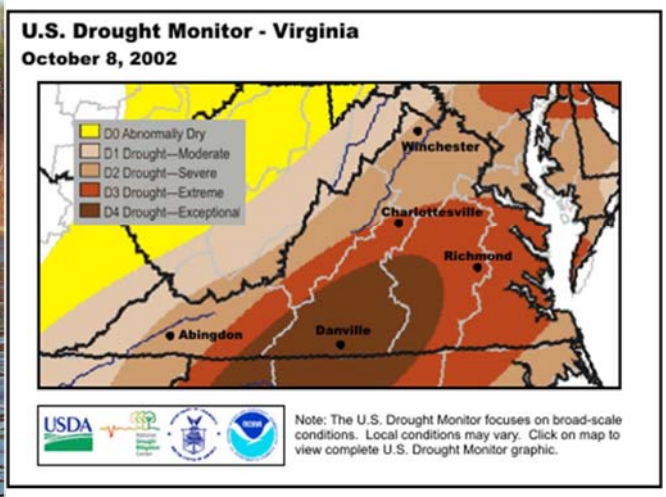
Major Drought Stimulates Planning



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Project Timeline Highlights

- 09/19/2002 – Cumberland, Henrico, DEQ, Malcolm Pirnie, Troutman Sanders met to discuss concept
- 08/27/2003 – Henrico commits $100,000 (previously Cumberland acquired $650,000 through Tobacco Commission and VDH)
- 12/20/2003 – Reservoir team meets with USACE
- 09/2004 – Powhatan as a potential team member
- 06/2004 to 01/2005 – Cumberland hosts 3 public meetings
- 04/2005 – Henrico and Powhatan BOS pass resolutions supporting the Cumberland County Reservoir Joint Permit Application

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Project Timeline Highlights

- 06/2005 – Draft Articles of Incorporation and Bylaws distributed for a three county authority
- 10/2006 – initial concept of Henrico as sole owner of project
- 10/2007 – USACE issues permit
- 12/2007 – Cumberland explores sole ownership of project
- 08/28/2008 – Cumberland introduces cost sharing MOU to be signed prior to reservoir project MOU
- 05/2009 – Henrico and Powhatan withdraw from project
- 07/24/2009 – DEQ letter to all 3 counties – Governor aware of impasse and offers his counselor as mediator

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Project Timeline Highlights

- 08-11/2009 – mediation
- 04/14/2010 – DEQ letter to Cumberland BOS stating DEQ's intent to terminate VWP Permit
- 07/2010 – Negotiations between Cumberland and Henrico result in a draft MOU with Henrico as sole owner, reimbursement to Cumberland for
  1) $2,104,646 in expended project costs
  2) $550,383 for wetlands mitigation bank costs
  3) Henrico's annual payment to Cumberland of $1,131,900 for 50 years (converts to PILT in 51st year)
- 08/2010 – Cumberland and Henrico BOS approve MOU

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Project Timeline Highlights

- 01/2011 – all permits transferred to Henrico
- 03/2011 – Arcadis begins engineering services for Henrico reservoir project
- 05/2011 – Henrico letters requesting property access sent to all Cumberland property owners for land surveying, archeological investigations and stream and wetland delineation.
- 06/2013 – SWCB approves Mitigation Plan
- 11/15/2013 – USACE approves Mitigation Plan
- 11/2014 – Henrico completes all land acquisition and easements (1830 acres, 22 property owners)

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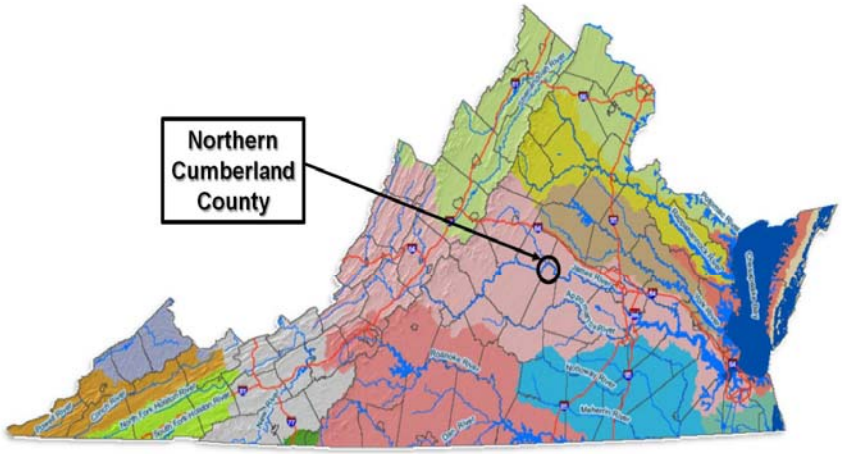
Cobbs Creek Reservoir Location



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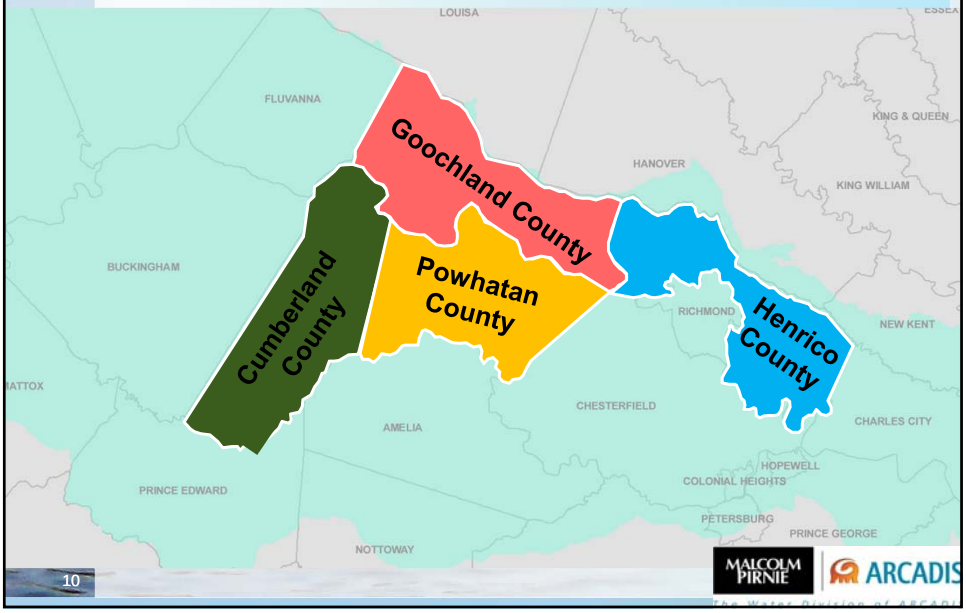
The Water Division of ARCADIS

Regional Water Supply Plan Submitted to DEQ November 2, 2011



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Importance of Cobbs Creek Reservoir

- Necessary for the future business and residential water supply needs for Henrico, Goochland , Powhatan and Cumberland counties
- Fulfills the requirements of the State Water Supply Plan
- Reduce environmental stress on James River during low flows through releases from reservoir

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2055 Water Supply Deficit

Henrico Demand*	-	110 MGD
Henrico Supply	-	80 MGD
Deficit	-	30 MGD

Powhatan Water Supply Need - 10 MGD

Cumberland Water Supply Need - 7 MGD

Total Water Supply Need 47 MGD

*includes Goochland

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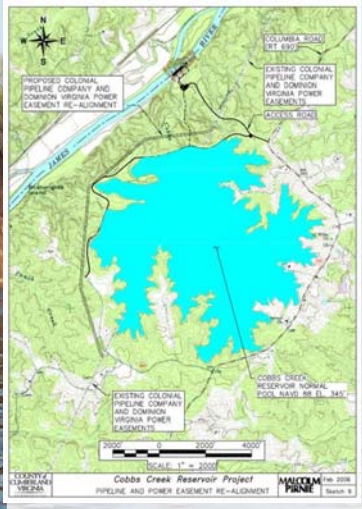
Project Features



- Multi-benefit project for partners:
  - Water supply
  - River flow augmentation
  - Cumberland Recreation
- 14.8 billion gallon reservoir
- 1,117-acre pool
- 150 mgd James River withdrawal capacity (withdrawals when River flows are adequate)
- Releases back to James River during designated low flow periods (June-November)

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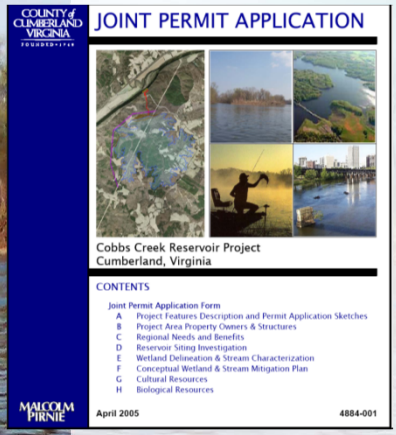
Permitting Phase Timeline



April 2005 – JPA filed

March 2006 – VMRC permit issued

October 2007 - VDEQ and USACE permits issued

July 2008 – Cumberland County stopped work efforts pending partner negotiations

August 2010 – Henrico and Cumberland counties approved MOU

2011 – all permits transferred to Henrico County

November 2012 – VDEQ permits modified to increase Henrico WTP intake by 30 MGD

November 2013 – USACE approves Mitigation Plan

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45 Miles of James River Flow Augmentation Benefits

Implementation Schedule

Major Work Elements	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Permit Compliance Plans											
Mitigation Program											
Colonial Pipeline/DVP Utility Relocations											
Property Acquisition											
Preliminary Engineering											
Detailed Design											
Construction											
Reservoir Filling											

Schedule uses fiscal years defined as July 1 to June 30, so FY 2012 = July 1, 2011 to June 30, 2012.

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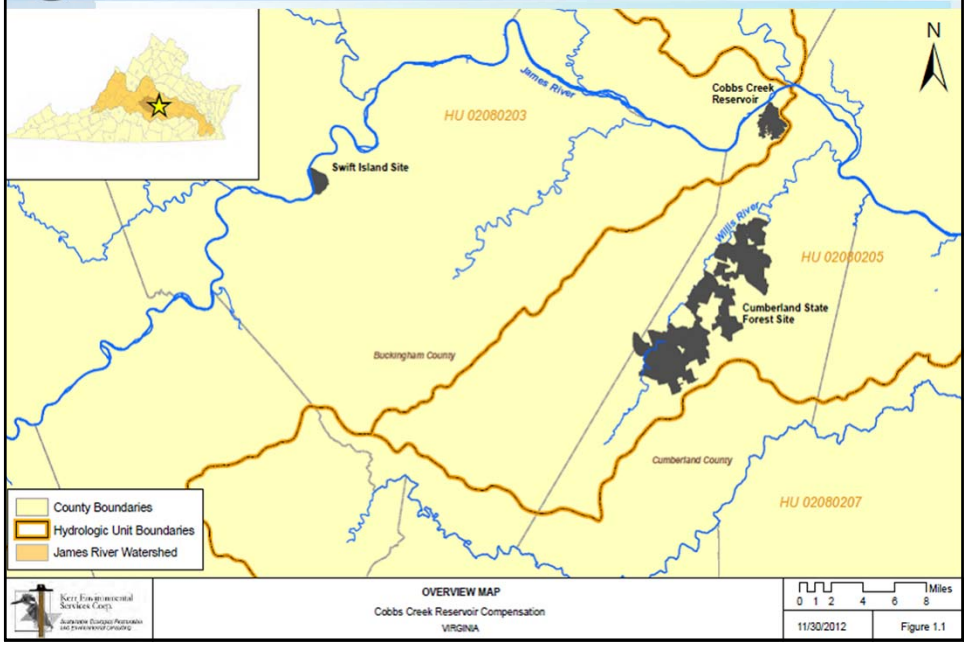
The Water Division of ARCADIS

Two mitigation sites: Swift Island and CSF



Project Status

- Reservoir construction inspection (Henrico) staffing plan approved - temporary and permanent positions
- Reservoir operations (Henrico) staffing plan under formulation
- Designs to relocate Colonial Pipeline petroleum pipes and DVP overhead power lines are 98% complete
- Design of reservoir intake structure, pump station and two dams is 90% complete

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Future Milestones

- Property acquisitions completed pending Henrico BOS approval for final two properties
- Clear the utility corridor, construct some facility roads and install some piping commencing summer, 2015
- Relocate petroleum and electric utilities in 2016
- Construction of reservoir facilities 2017 – 2021
- Reservoir full and ready for use by 2022

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Thoughts

- While the negotiations where arduous at times, the reservoir concept was sound and through the perseverance of local, state and regulatory parties, the outcome was successful
- Establishing Henrico DPU and Real Property staff as direct contacts with the impacted Cumberland property owners (one-on-one and in public meetings) was key to the property acquisition without condemnation
- The reservoir “team” (and later Henrico) had excellent legal and engineering firms that knew how to navigate the state and federal regulatory permitting process
- DEQ’s permit modification of an additional 30 mgd for Henrico WTF river withdrawal was the commitment needed for Henrico to expend further funds

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Project Staff

Bill Mawyer, Henrico DPU, Asst. Dir. Public Utilities

Ed Overmann, Henrico DPU, PM

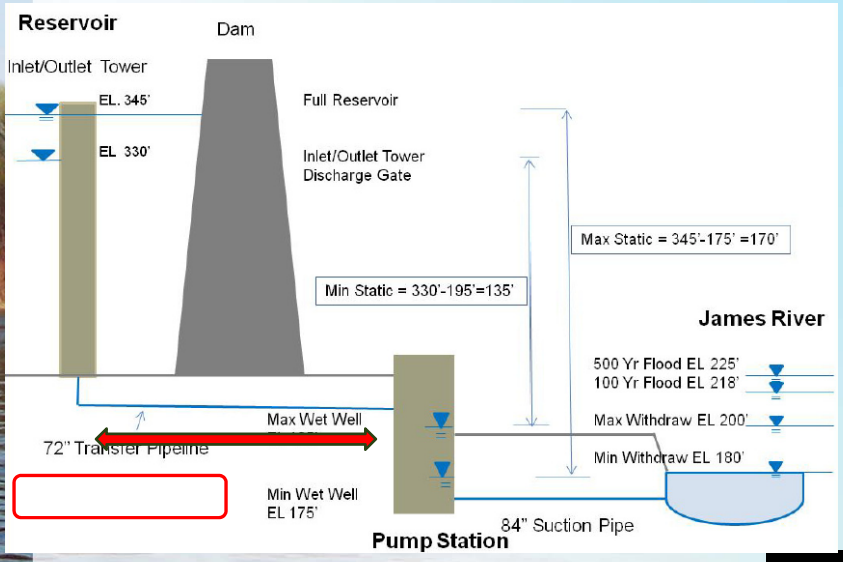
Paul Peterson, ARCADIS Engineering Team PM

Mark Landis, Schnabel PM

ARCADIS

Schnabel ENGINEERING

Pumping System Schematic



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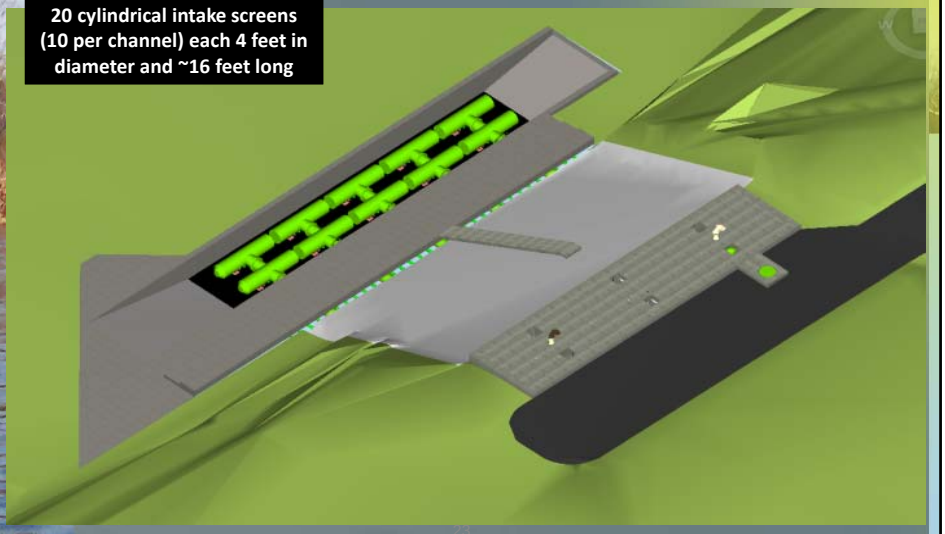
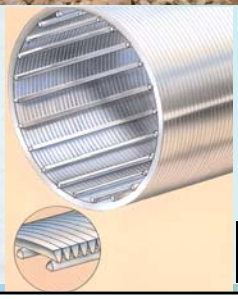
Screens and Screen Channel

20 cylindrical intake screens (10 per channel) each 4 feet in diameter and ~16 feet long



Similar Intakes Under Construction



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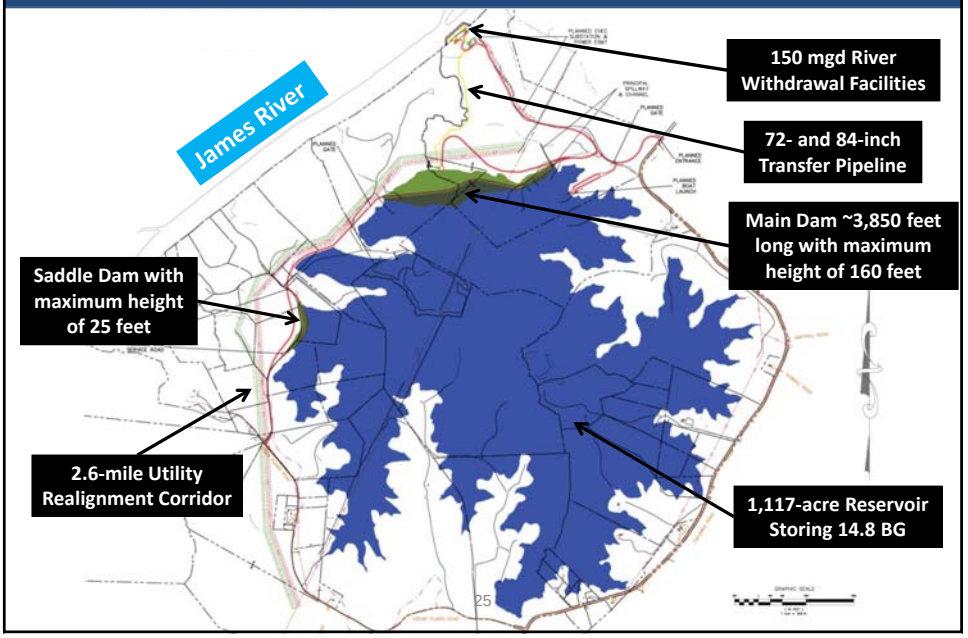
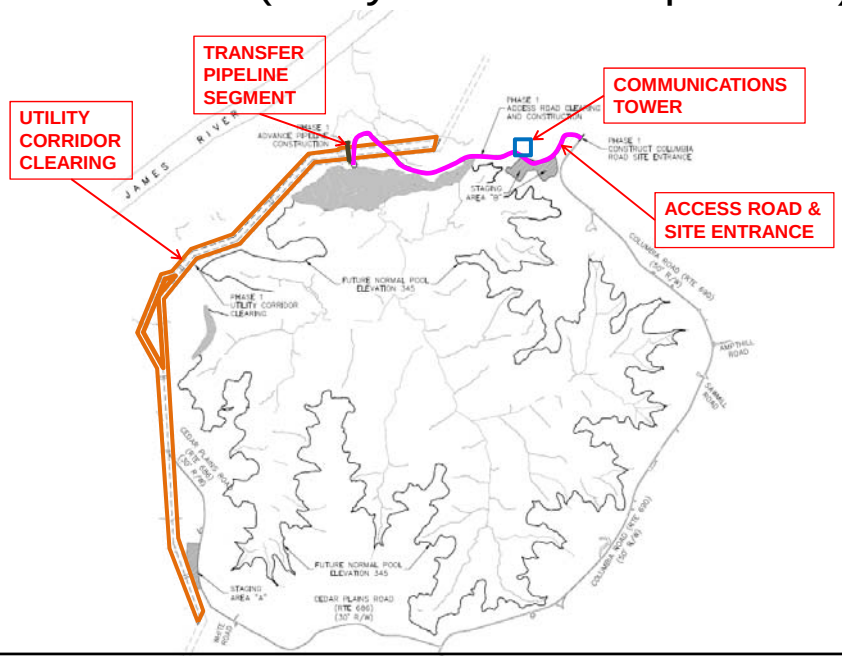
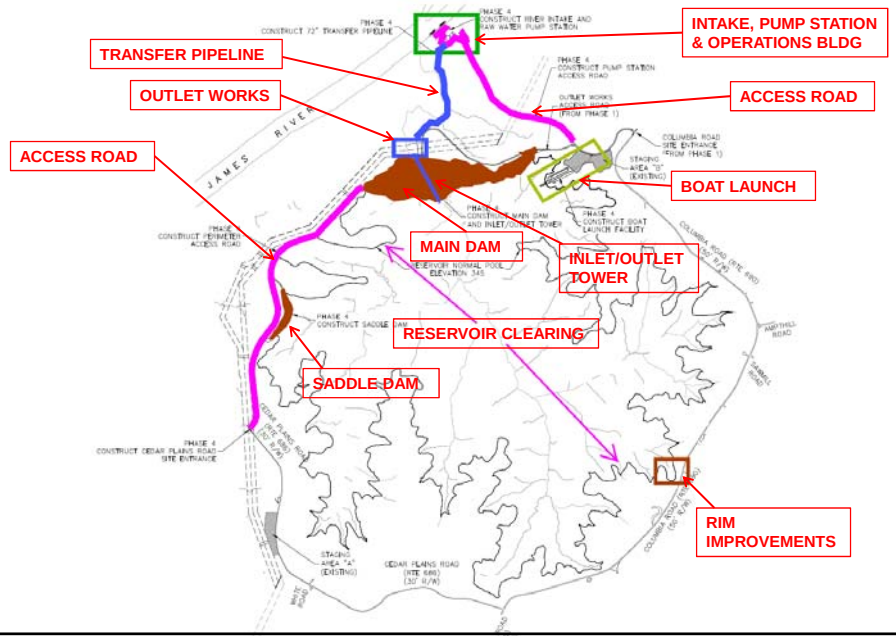
Project Features



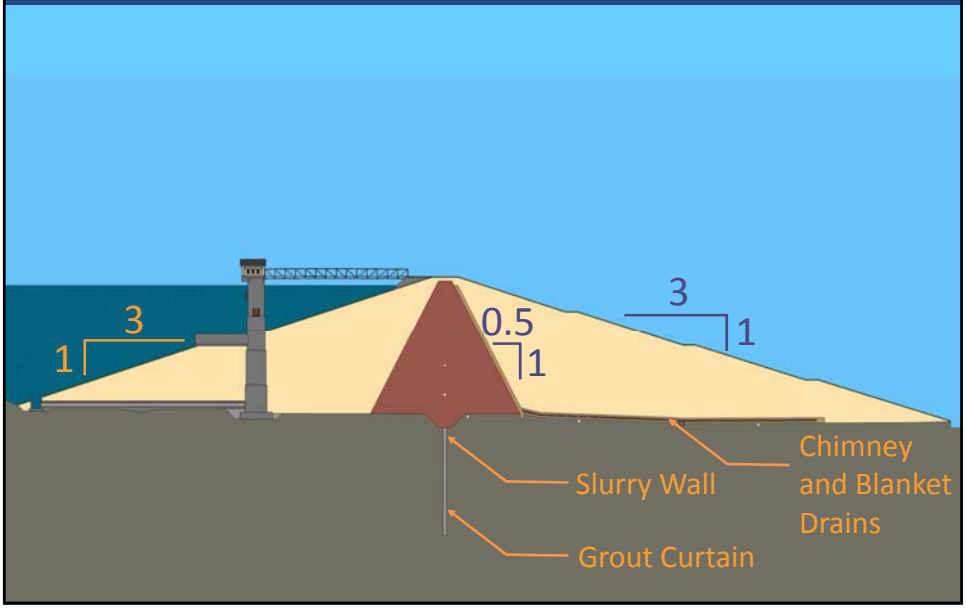
Contract #1 (Utility Corridor Preparation)



Contract #2 (Dam & Facilities)



Main Dam – Geometry & Seepage Control



Inlet/Outlet Tower Bridge

Main Dam and Public Boat Launch

Bid Request No. 16-1265-9CE Due Date: 03/02/2017 3:00 PM Open Date: 03/03/2017 3:00 PM Dept: Public Utilities	Cobbs Creek Reservoir Dam and Facilities Construction								
Created By: Angie Woodson Verified By: Carolyn Efford				Oscar Renda Contracting Inc./ Johnson Bros. Corporation, A Southland Company Roanoke, TX Renda/JBros Joint Venture		English Construction Company, Inc. Lynchburg, VA		Barnard Construction Company, Inc. Bozeman, MT	
Description	**Item No.**	**Qty**	**Unit**	**Unit Price**	**Total**	**Unit Price**	**Total**	**Unit Price**	**Total**
DAM CONSTRUCTION (A-N)									
Construction of Dam	A	1	LS	$ 85,047,308.00	$ 85,047,308.00	$ 68,168,000.00	$ 68,168,000.00	$ 45,000,000.00	$ 45,000,000.00
Unclassified Excavation	B	278,500	CY	$ 16.00	$ 4,456,000.00	$ 5.80	$ 1,615,300.00	$ 4.30	$ 1,197,550.00
Rock Excavation Main Dam	C	17,200	CY	$ 75.00	$ 1,290,000.00	$ 50.00	$ 860,000.00	$ 33.25	$ 571,900.00
Slurry Cut Off Wall	D	100,000	SF	$ 38.00	$ 3,800,000.00	$ 19.35	$ 1,935,000.00	$ 13.00	$ 1,300,000.00
Main Dam Foundation Preparation	E	22,000	SY	$ 20.00	$ 440,000.00	$ 10.00	$ 220,000.00	$ 22.00	$ 484,000.00
Backfill Concrete	F	3,500	CY	$ 385.00	$ 1,347,500.00	$ 337.00	$ 1,179,500.00	$ 230.00	$ 805,000.00
Overburden Drilling	G	5,200	LF	$ 79.00	$ 410,800.00	$ 49.00	$ 254,800.00	$ 46.00	$ 239,200.00
Rock Drilling Dam Foundation	H	34,000	LF	$ 32.00	$ 1,088,000.00	$ 20.00	$ 680,000.00	$ 18.50	$ 629,000.00
Dam Foundation Grouting	I	1,400	HRS	$ 1,313.00	$ 1,838,200.00	$ 814.00	$ 1,139,600.00	$ 755.00	$ 1,057,000.00
Dam Foundation Grouting Cement	J	7,200	BAGS	$ 30.00	$ 216,000.00	$ 19.00	$ 136,800.00	$ 17.30	$ 124,560.00
Main Dam & Select Dam Core Fill	K	555,500	CY	$ 17.00	$ 9,443,500.00	$ 12.65	$ 7,027,075.00	$ 5.30	$ 2,944,150.00
Main Dam & Select Dam Select Fill	L	2,800,000	CY	$ 18.00	$ 50,400,000.00	$ 5.70	$ 15,960,000.00	$ 3.50	$ 9,800,000.00
Main Dam Filter Sand	M	96,000	CY	$ 68.00	$ 6,528,000.00	$ 69.00	$ 6,624,000.00	$ 58.25	$ 5,592,000.00
Main Dam Filter Stone	N	18,600	CY	$ 115.00	$ 2,139,000.00	$ 89.00	$ 1,655,400.00	$ 88.00	$ 1,636,800.00

Bid Request No. 16-1265-9CE **Due Date: 03/02/2017 3:00 PM** **Open Date: 03/03/2017 3:00 PM** **Dept: Public Utilities**	**Cobbs Creek Reservoir Dam and Facilities Construction**								
				Oscar Renda Contracting Inc./ Johnson Bros. Corporation, A Southland Company Roanoke, TX Renda/JBros Joint Venture		**English Construction Company, Inc. Lynchburg, VA**		**Barnard Construction Company, Inc. Bozeman, MT**	
FACILITIES CONSTRUCTION (O-R)									
Facilities & Site Improvements	O	1	LS	$ 38,200,000.00	$ 38,200,000.00	$ 59,520,000.00	$ 59,520,000.00	$ 106,884,146.00	$ 106,884,146.00
Boat Launch Facility	P	1	LS	$ 1,650,000.00	$ 1,650,000.00	$ 978,500.00	$ 978,500.00	$ 1,000,000.00	$ 1,000,000.00
Rock Excavation Facilities	Q	18,000	CY	$ 60.00	$ 1,080,000.00	$ 70.00	$ 1,260,000.00	$ 38.50	$ 693,000.00
Overexcavation & Replacement of Unsuitable Soil Materials	R	1,000	CY	$ 25.00	$ 25,000.00	$ 100.00	$ 100,000.00	$ 12.00	$ 12,000.00
Total Bid Amount (Items A-R)					**$ 209,399,308.00**		**$ 169,313,975.00**		**$ 179,970,306.00**
Addendum No.1					Yes		Yes		Yes
Addendum No.2					Yes		Yes		Yes
Addendum No.3					Yes		Yes		Yes
Addendum No.4					Yes		Yes		Yes
Addendum No.5					Yes		Yes		Yes
Addendum No.6					Yes		Yes		Yes
Escrow					No		Yes		Yes
SCC							0054199-5		F1159625
Contractor's Qualification Statement					Yes		Yes		Yes
Business Located in the County					No		No		No
County License					Yes		Yes		No
Bid Bond					Yes		Yes		Yes

Bid Request No. 16-1265-9CE Due Date: 03/02/2017 3:00 PM Open Date: 03/03/2017 3:00 PM Dept: Public Utilities	Cobbs Creek Reservoir Dam and Facilities Construction								
				MEB General Contractors, Inc. Chesapeake, VA / Haymes Brothers Inc. Chatham, VA MEB Haymes Joint Venture LLC		Thalle Construction Company, Inc. Hillsborough, NC		Ragnar Benson, LLC, Loves Park, IL Dragados USA, Inc., New York, NY Joint Venture/Cobbs Creek Dam Contractors	
Description	**Item No.**	**Qty**	**Unit**	**Unit Price**	**Total**	**Unit Price**	**Total**	**Unit Price**	**Total**
DAM CONSTRUCTION (A-N)									
Construction of Dam	A	1	LS	$ 42,246,000.00	$ 42,246,000.00	$ 59,261,350.98	$ 59,261,350.98	$ 72,737,922.45	$ 72,737,922.45
Unclassified Excavation	B	278,500	CY	$ 2.62	$ 729,670.00	$ 3.00	$ 835,500.00	$ 3.60	$ 1,002,600.00
Rock Excavation Main Dam	C	17,200	CY	$ 10.10	$ 173,720.00	$ 30.00	$ 516,000.00	$ 57.00	$ 980,400.00
Slurry Cut Off Wall	D	100,000	SF	$ 18.56	$ 1,856,000.00	$ 22.30	$ 2,230,000.00	$ 31.30	$ 3,130,000.00
Main Dam Foundation Preparation	E	22,000	SY	$ 27.55	$ 606,100.00	$ 8.00	$ 176,000.00	$ 37.00	$ 814,000.00
Backfill Concrete	F	3,500	CY	$ 220.40	$ 771,400.00	$ 250.00	$ 875,000.00	$ 350.00	$ 1,225,000.00
Overburden Drilling	G	5,200	LF	$ 21.21	$ 110,292.00	$ 46.00	$ 239,200.00	$ 68.75	$ 357,500.00
Rock Drilling Dam Foundation	H	34,000	LF	$ 42.42	$ 1,442,280.00	$ 19.00	$ 646,000.00	$ 21.35	$ 725,900.00
Dam Foundation Grouting	I	1,400	HRS	$ 625.80	$ 876,120.00	$ 775.00	$ 1,085,000.00	$ 824.45	$ 1,154,230.00
Dam Foundation Grouting Cement	J	7,200	BAGS	$ 9.55	$ 68,760.00	$ 21.00	$ 151,200.00	$ 18.90	$ 136,080.00
Main Dam & Select Dam Core Fill	K	555,500	CY	$ 2.44	$ 1,355,420.00	$ 6.50	$ 3,610,750.00	$ 8.05	$ 4,471,775.00
Main Dam & Select Dam Select Fill	L	2,800,000	CY	$ 3.04	$ 8,512,000.00	$ 3.00	$ 8,400,000.00	$ 3.95	$ 11,060,000.00
Main Dam Filter Sand	M	96,000	CY	$ 51.00	$ 4,896,000.00	$ 60.00	$ 5,760,000.00	$ 54.65	$ 5,246,400.00
Main Dam Filter Stone	N	18,600	CY	$ 36.68	$ 682,248.00	$ 65.00	$ 1,209,000.00	$ 77.50	$ 1,441,500.00

Bid Request No. 16-1265-9CE **Due Date: 03/02/2017 3:00 PM** **Open Date: 03/03/2017 3:00 PM** **Dept: Public Utilities**	**Cobbs Creek Reservoir Dam and Facilities Construction**								
				MEB General Contractors, Inc. Chesapeake, VA / Haymes Brothers Inc. Chatham, VA MEB Haymes Joint Venture LLC		**Thalle Construction Company, Inc. Hillsborough, NC**		**Ragnar Benson, LLC, Loves Park, IL Dragados USA, Inc., New York, NY Joint Venture/Cobbs Creek Dam Contractors**	
FACILITIES CONSTRUCTION (O-R)									
Facilities & Site Improvements	O	1	LS	$ 71,797,057.00	$ 71,797,057.00	$ 53,512,000.00	$ 53,512,000.00	$ 64,063,714.36	$ 64,063,714.36
Boat Launch Facility	P	1	LS	$ 487,000.00	$ 487,000.00	$ 1,300,000.00	$ 1,300,000.00	$ 1,055,000.00	$ 1,055,000.00
Rock Excavation Facilities	Q	18,000	CY	$ 41.25	$ 742,500.00	$ 25.00	$ 450,000.00	$ 51.25	$ 922,500.00
Overexcavation & Replacement of Unsuitable Soil Materials	R	1,000	CY	$ 20.21	$ 20,210.00	$ 20.00	$ 20,000.00	$ 24.50	$ 24,500.00
Total Bid Amount (Items A-R)					**$ 137,372,777.00**		**$ 140,277,000.98**		**$ 170,549,021.81**
Addendum No.1					Yes		Yes		Yes
Addendum No.2					Yes		Yes		Yes
Addendum No.3					Yes		Yes		Yes
Addendum No.4					Yes		Yes		Yes
Addendum No.5					Yes		Yes		Yes
Addendum No.6					Yes		Yes		Yes
Escrow					Yes		No		No
SCC					S6649265		F1353988		Ragnar Benson LLC T0319311 Dragados USA, Inc. F1790874
Contractor's Qualification Statement					Yes		Yes		Yes
Business Located in the County					No		No		No
County License					Yes		No		No
Bid Bond					Yes		Yes		Yes

Bid Request No. 16-1265-9CE Due Date: 03/02/2017 3:00 PM Open Date: 03/03/2017 3:00 PM Dept: Public Utilities	Cobbs Creek Reservoir Dam and Facilities Construction								
				Balfour Beatty Infrastructure, Inc. Wilmington, NC					
Description	**Item No**	**Qty**	**Unit**	**Unit Price**	**Total**	**Unit Price**	**Total**	**Unit Price**	**Total**
DAM CONSTRUCTION (A-N)									
Construction of Dam	A	1	LS	$ 59,109,935.00	$ 59,109,935.00				
Unclassified Excavation	B	278,500	CY	$ 3.49	$ 971,965.00				
Rock Excavation Main Dam	C	17,200	CY	$ 40.00	$ 688,000.00				
Slurry Cut Off Wall	D	100,000	SF	$ 13.00	$ 1,300,000.00				
Main Dam Foundation Preparation	E	22,000	SY	$ 12.49	$ 274,780.00				
Backfill Concrete	F	3,500	CY	$ 275.00	$ 962,500.00				
Overburden Drilling	G	5,200	LF	$ 20.00	$ 104,000.00				
Rock Drilling Dam Foundation	H	34,000	LF	$ 40.00	$ 1,360,000.00				
Dam Foundation Grouting	I	1,400	HRS	$ 590.00	$ 826,000.00				
Dam Foundation Grouting Cement	J	7,200	BAGS	$ 9.00	$ 64,800.00				
Main Dam & Select Dam Core Fill	K	555,500	CY	$ 8.25	$ 4,582,875.00				
Main Dam & Select Dam Select Fill	L	2,800,000	CY	$ 3.81	$ 10,668,000.00				
Main Dam Filter Sand	M	96,000	CY	$ 59.15	$ 5,678,400.00				
Main Dam Filter Stone	N	18,600	CY	$ 111.55	$ 2,074,830.00				

Bid Request No. 16-1265-9CE **Due Date: 03/02/2017 3:00 PM** **Open Date: 03/03/2017 3:00 PM** **Dept: Public Utilities**	**Cobbs Creek Reservoir Dam and Facilities Construction**								
				Balfour Beatty Infrastructure, Inc. Wilmington, NC					
FACILITIES CONSTRUCTION (O-R)									
Facilities & Site Improvements	O	1	LS	$ 58,366,715.00	$ 58,366,715.00				
Boat Launch Facility	P	1	LS	$ 744,000.00	$ 744,000.00				
Rock Excavation Facilities	Q	18,000	CY	$ 62.90	$ 1,132,200.00				
Overexcavation & Replacement of Unsuitable Soil Materials	R	1,000	CY	$ 16.00	$ 16,000.00				
Total Bid Amount (Items A-R)					**$ 148,925,000.00**				
Addendum No.1					Yes				
Addendum No.2					Yes				
Addendum No.3					Yes				
Addendum No.4					Yes				
Addendum No.5					Yes				
Addendum No.6					Yes				
Escrow					No				
SCC					F1832205				
Contractor's Qualification Statement					Yes				
Business Located in the County					No				
County License					Yes				
Bid Bond					Yes				

APPENDIX C:

Land Value Supporting Data

Appomattox River Water Authority
Chesdin Reservoir Parcels in Chesterfield County

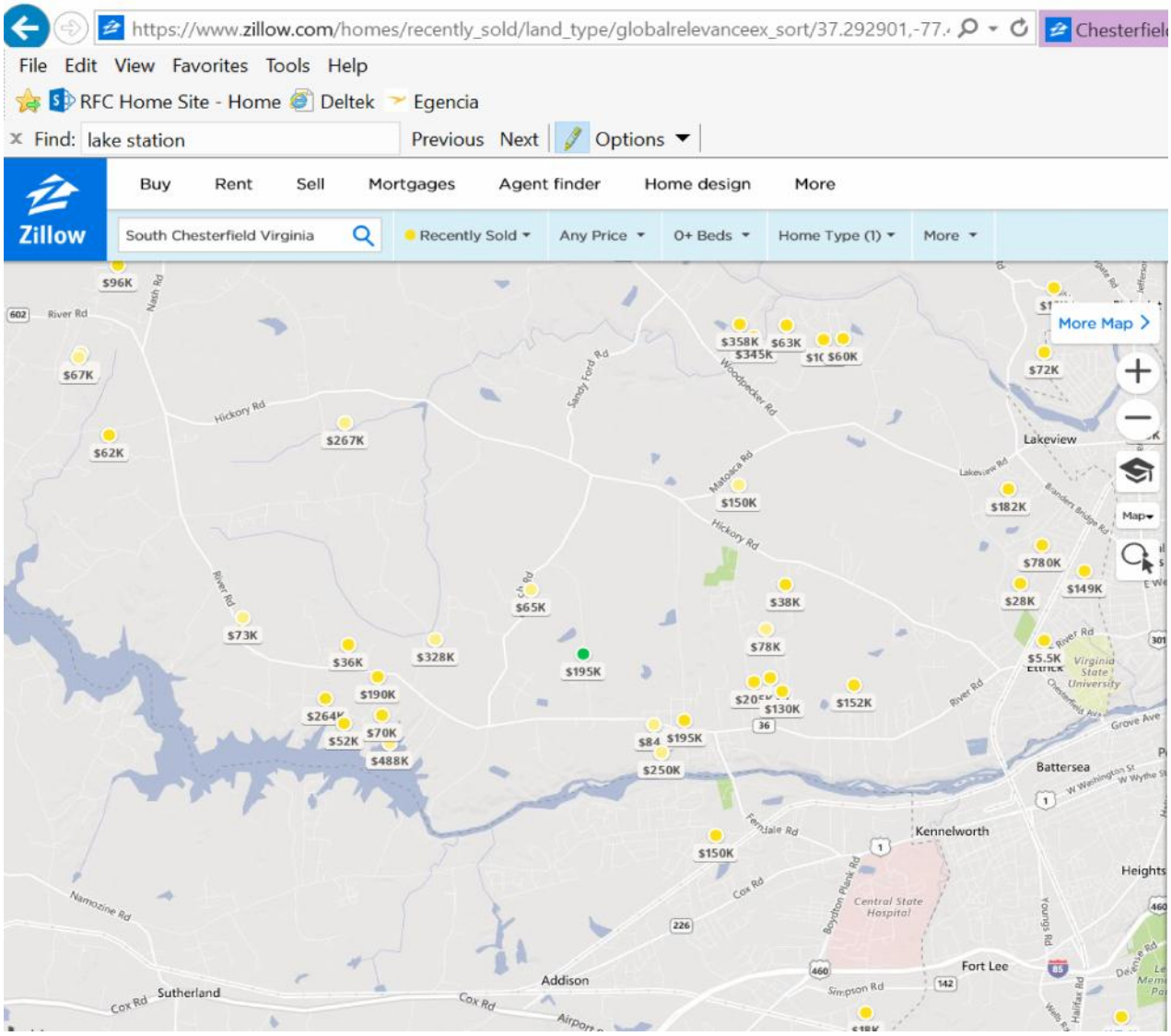
Property Identification Number	Acreage	Assessed Value
745 617 3023	42.7	$8,500
745 617 0807	3.0	$600
740 623 4965	210.8	$42,200
728 623 8542	290.8	$58,200
722 632 8231	236.0	$29,500
721 635 3035	31.3	$3,100
721 633 1158	181.3	$18,100
719 629 7912	84.5	$16,900
719 636 6657	1.2	$1,000
716 637 7828	7.2	$7,200
752 611 0681	473.3	$94,700
763 607 9564	7.4	$7,500
765 607 7957	4.0	$4,100
765 608 5314	20.9	$21,000
765 607 0435	37.0	$25,900
765 607 9438	0.6	$100
766 606 2383	20.2	$14,100
767 605 1733	16.3	$11,400
768 607 3333	52.5	$262,600
745 623 0740	5.9	$1,200
769 606 3870	49.1	$122,800
766 606 6326	4.4	$4,400
760 608 1163	0.8	$400
759 608 9051	1.5	$2,500
768 608 9349	65.3	$269,500
Total	1,847.8	$1,027,500

Chesdin Reservoir Parcels in Dinwiddie County

Tax Map/Tract	Acres	Assessed Value	
7-1F	-	60,000	
7-2C	17.40	696,000	
Tract 1 *	39.05	1,171,500	
Tract 10	114.25	34,275	
Tract 11	45.45	13,635	
Tract 12	134.53	40,359	
Tract 15 & 16	47.81	14,343	
Tract 18	149.45	44,835	
Tract 19	187.17	56,151	
Tract 20	6.16	1,848	
Tract 21	11.36	3,408	
Tract 22	159.32	47,796	
Tract 24	33.34	10,002	
Tract 25	82.00	24,600	
Tract 26	2.58	774	
Tract 27	75.04	22,512	DB 133/183
Tract 28	40.04	12,012	
Tract 29	6.94	2,082	
Tract 30	7.03	2,109	DB 135/312
Tract 31	9.18	2,754	
Tract 39	1.32	396	
Tract 50	23.65	7,095	
Tract 51	0.92	276	
Tract 52	0.57	171	
Tract 53	32.47	9,741	
Tract 54	2.52	756	
	1,229.55	2,279,430	

Recent Land Sales Transactions of 5 Acres or Greater from Zillow.com

Address	Type	Acrage	Date Sold	Price	Price Per Acre
21504 Sherry St, Petersburg	Lot	56.37	10/18/2016	$250,000	$4,435
6831 River Rd, South Chesterfiled	Lot	15.41	4/25/2016	$84,000	$5,451
9710 River Rd, South Chesterfield	Lot	4.97	4/24/2017	$73,000	$14,688
19501 Church Road, South Chesterfield	Lot	10.40	8/31/2015	$65,000	$6,250
6201 Matoaca Rd, South Chesterfield	Lot	19.12	9/6/2016	$150,000	$7,845
15517 Exter Mill Rd, Chesterfield	Lot	5.09	5/18/2017	$60,000	$11,788
15601 Exter Mill Rd, Chesterfield	Lot	5.00	8/14/2017	$67,000	$13,400
20126 Russwood Rd, South Chesterfield	Lot	9.85	12/7/2015	$78,000	$7,919
11200 Quaker Rd, Dinwiddie	Lot	29.30	3/2/2015	$60,000	$2,048
502 Fairmont Dr, Colonial Heights	Lot	17.20	8/21/2017	$72,000	$4,186
3124 Marobrith Dr, South Chesterfield	Lot	29.00	10/19/2016	$70,000	$2,414
8540 Reedy Branch Rd, Chesterfield	Lot	5.02	12/30/2015	$79,000	$15,737
13609 Branders Bridge Rd, Chesterfield	Lot	7.00	6/13/2016	$66,000	$9,429
12611 S. Chester Rd, Chester, VA	Lot	15.75	11/26/2014	$271,320	$17,227
9121 Beach Rd, Chesterfield, VA	Lot	9.00	7/13/2017	$100,000	$11,111
11955 River Road, Chesterfield, VA	Lot	8.00	1/12/2017	$80,000	$10,000
11631 Adventure Hill Ln, Chesterfield	Lot	20.00	3/22/2016	$166,500	$8,325
Average Price Per Acre					$8,956
Weighted Average Price Per Acre					$6,724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Battersea
Kennelworth
Heights
Fort Lee
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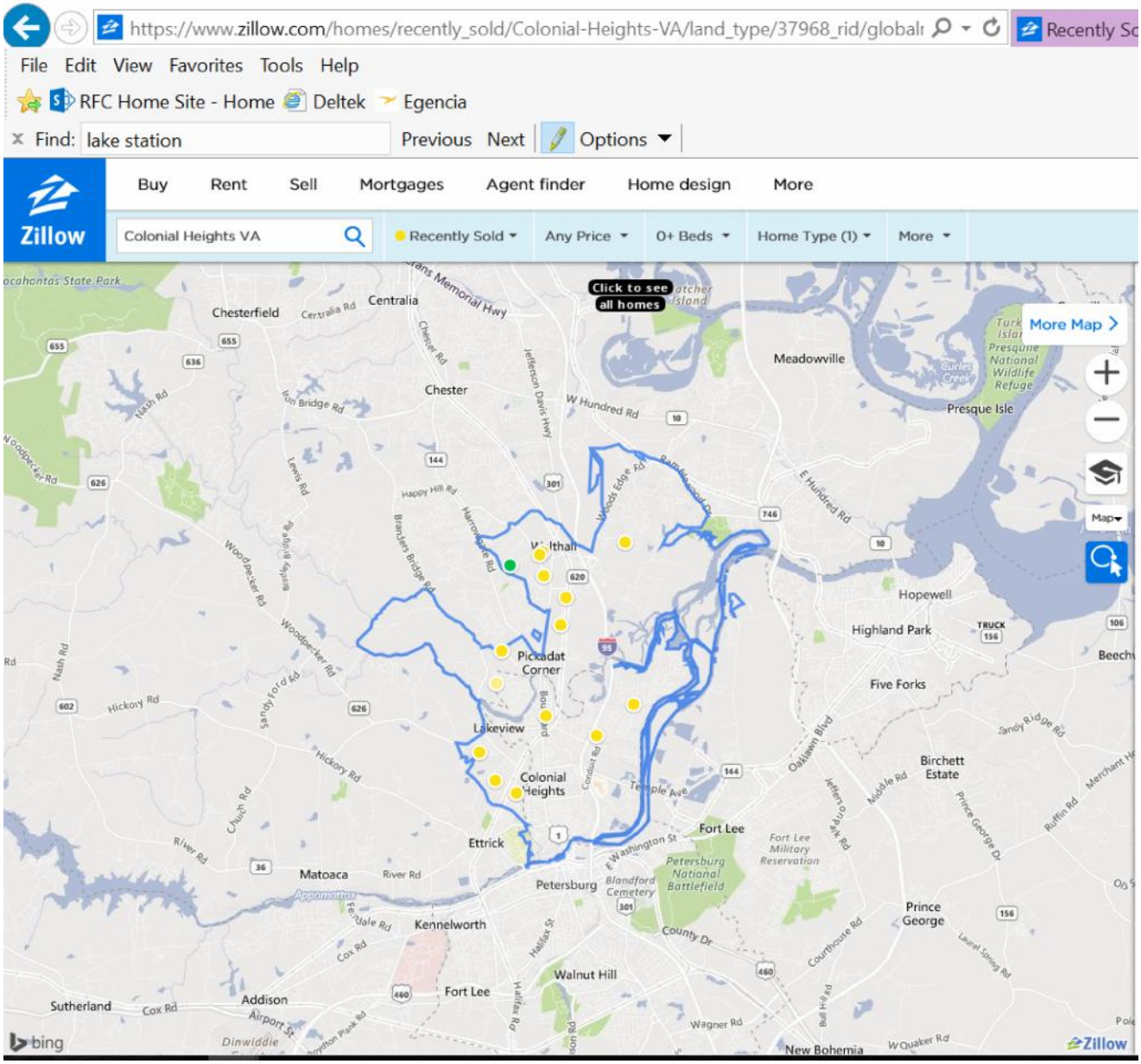
Sutherland
Central State Hospital
Virginia State University
River Rd
Hickory Rd
Cox Rd
Namozine Rd
Simpson Rd
Grove Ave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Any Price
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Home Type (1)
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Centralia
Chester
Meadowville
Presque Isle
Hopewell
Highland Park
Five Forks
Pickadat Corner
Lakeview
Colonial Heights
Ettrick
Matoaca
Petersburg
Fort Lee
Kennelworth
Walnut Hill
Sutherland
Addison
Birchett Estate
Prince George
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APPENDIX D:

Recent Water System Sales Transactions

Appomattox River Water Authority
Water System Sales Transactions

Line No.	Utility	Location	Description	Sale Date	Buyer	No. of Customers	Capacity	Sale Type	Sale Price	Unit Price per Customer	Unit Price per MGD	Comparable System (Yes / No)
1	American Suburban Utilities Water System	Greenwood, IN	Water System	9/21/2015	Indiana American Water	330	N/A	Investor-Owned to Investor-Owned	$140,000	$424	N/A	No
2	Avon Water Company	Avon, Farmington, and Simsbury, CT	Water System	7/1/2017	Connecticut Water Service, Inc.	4,800	N/A	Investor-Pwned to Investor-Owned	$40.1 million	$8,354	N/A	No
3	Beaver Dam Lake Water System	New Windsor and Cronwall, Orange County, NY	Water System	5/12/2017	New York American Water	154	N/A	Private to Investor-Owned	Not Disclosed	N/A	N/A	No
4	Bunker Hill Wastewater Company and Factoryville Bunker Hill Water Company	Factoryville Borough, Wyoming County, PA	Small Retail Water System	9/18/2015	Aqua Pennsylvania	300	N/A	Private to Investor-Owned	$135,000	$1,050	N/A	No
5	Heritage Village Water Company	Middlebury, Oxford, and Southbury CT	Water and Wastewater for Southbury - All Others Water Only	2/27/2017	Connecticut Water Service, Inc.	4,700	N/A	Private to Investor-Owned	$20.7 million	$2,688	N/A	No
6	Lake Station Water Department	Lake Station, IN	Retail Water System with Wells as Source Water	In Process	Indiana American Water	5,000	2 MGD	Municipal to Investor-Owned	$20.7 million	$4,140	$10,350,000	No
7	Milford Water Company	Milford, CT	Two WTP's and a Transmission and Distribution System	Pending	Town of Milford, MA	9,000	4 MGD	Private to Municipal	$63 million	$7,000	$15,750,000	No
8	Mountain Ridge Estates water system	Watauga County, NC	Small Retail Water System	2017	Aqua North Carolina	100	N/A	Municipal to Investor-Owned	$5,200	$52	N/A	No
9	Mountain Water Company (now Missoula Water)	Missoula, Montana	Retail System Served by Water Wells	6/22/2017	City of Missoula	23,016	N/A	Private to Municipal	$88.6 million	$3,849	N/A	No
10	Park Water Company	California, Montana	Two Water Distribution Systems	1/8/2016	Algonquin Power & Utilities, Corp.	73,500	45.5 MGD	Private to Investor-Owned	$327 million	$4,419	$7,190,060	No
11	Queen Shoals Public Service District Water System	Clay County, WV	Small Retail Water Distribution System	8/29/2017	West Virginia American Water	224	N/A	Municipal to Investor-Owned	$329,000	$1,469	N/A	No
12	Rosebrook Water Company, Inc.	Bow and Belmont, NH	Water Provided to Bow, Water and Sewer Provided to Belmont	2016	Abenaki Water	655	N/A	Private to Municipal	$400,000	$611	N/A	No
13	Shorelands Water Co.	Manmouth County, NJ	Water Distribution	4/3/2017	American Water	11,000	5.48 MGD	Private to Investor-Owned	$41 million	$3,727	$7,482,500	No
14	Spring Glen Lake Water Company	New Hampton, Sullivan County, NY	Water Supplier	7/7/2015	New York American Water	30	N/A	N/A	N/A	N/A	N/A	No

Appomattox River Water Authority
Water System Sales Transactions

Line No.	Utility	Location	Description	Sale Date	Buyer	No. of Customers	Capacity	Sale Type	Sale Price	Unit Price per Customer	Unit Price per MGD	Comparable System (Yes / No)
15	Superior Water Company, Inc.	Gilbertsville, PA	Five Small Retail Water Systems	9/17/2015	Aqua America, Inc.	3,868	N/A	Private to Investor Owned	$16.8 million	$4,343	N/A	No
16	Union Hill Water Supply Corporation	Henderson County, TX	Small Retail Water System	9/18/2015	Aqua Texas	500	N/A	Private to Investor-Owned	$356,000	$712	N/A	No
17	Venter Heights	King William County, VA	Small Retail Water System	9/18/2015	Aqua Virginia	400	N/A	Municipal to Investor-Owned	$85,000	$213	N/A	No
18	Water Works of Alamance County	Cary, NC	Small Retail Water System	9/18/2015	Aqua North Carolina	300	N/A	Municipal to Investor-Owned	$43,000	$143	N/A	No
19	Wintergreen Valley Utility Company, L.P.	Nelson County, VA	Small Retail Water and Sewer System	9/18/2015	Aqua Virginia	1,675	N/A	Municipal to Investor-owned	$537,950 (water portion)	$389	N/A	No
20	Woodson-Hensley Water Company	Woodson and Hensley, AK	Water Storage and Distribution System	9/30/2016	Liberty Utilities	453	N/A	Nonprofit to Investor-Owned	N/A	N/A	N/A	No