Orange Water and Sewer Authority
OWASA is Carrboro-Chapel Hill's not-for-profit public service agency
delivering high quality water, wastewater, and reclaimed water services.

Agenda
Virtual Work Session of the OWASA Board of Directors
Thursday, August 13, 2020, 6:00 P.M.

Due to COVID-19 public health concerns, the Orange Water and Sewer Authority (OWASA) Board of Directors is conducting this meeting virtually utilizing Microsoft Teams software. Board Members, General Counsel and staff will be participating in the meeting remotely.

The Board of Directors appreciates and invites the public to attend and observe its virtual meetings online. Public comment is invited via written materials, ideally submitted at least two days in advance of the meeting to the Board of Directors by sending an email to board_and_leadership@owasa.org or via US Postal Service (Clerk to the Board, 400 Jones Ferry Road, Carrboro, NC 27510). Public comments are also invited during the Board Meeting via telephone, and you will need to be available to call-in during the meeting. Please contact the Clerk to the Board at aorbich@owasa.org or 919-537-4217 to make arrangements by 3:00 p.m. the day of the meeting.

Public speakers are encouraged to organize their remarks for delivery within a four-minute time frame allowed each speaker, unless otherwise determined by the Board of Directors.

The Board may take action on any item on the agenda.

Announcements

a. Announcements by the Chair
   - Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.
   - Update on July 16, 2020 Climate Council Meeting
   - Update on July 30, 2020 Executive Committee Meeting

b. Announcements by Board Members
   - Wednesday, August 26, 2020 Virtual Human Resources Committee Meeting at 5:00 p.m. to Discuss Internships and Apprenticeships, with Focus on Minority Participation (Jody Eimers)

c. Announcements by Staff

d. Additional Comments, Suggestions, and Information Items by Board Members (Chair)

Consent Agenda

Action

1. Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for Federal and/or State Assistance and Represent the Organization in All Dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management (Stephen Winters)
2. Minutes of the June 25, 2020 Virtual Meeting of the Board of Directors (Andrea Orbich)
3. Minutes of the July 9, 2020 Virtual Work Session of the Board of Directors (Andrea Orbich)

Regular Agenda

Discussion

4. Update on OWASA's COVID-19 Information and Discussion by the Board (Todd Taylor/Mary Tiger)
5. Long-Range Water Supply Plan (LRWSP)
    a. Background Information (Todd Taylor)
    b. Evaluation of Supply and Demand Management Alternatives for the LRWSP (Ruth Rouse)
6. Onboarding Program Update for OWASA's New Executive Director (Todd Taylor)
7. Review Board Work Schedule
    a. Request(s) by Board Committees, Board Members and Staff (Ray DuBose)
    b. August 27, 2020 Board Meeting (Todd Taylor)
    c. September 10, 2020 Work Session (Todd Taylor)
    d. 12 Month Board Meeting Schedule (Todd Taylor)
    e. Pending Key Staff Action Items (Todd Taylor)

Summary of Work Session Items

8. Executive Director will summarize the key staff action items from the Work Session

Closed Session

9. The Board of Directors will Meet in Closed Session for the Purpose of Discussing a Personnel Matter, as provided in N.C. General Statutes 143.318.11(6) (Jody Eimers)

Agenda Item 1:

Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for Federal and/or State Assistance and Represent the Organization in All Dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management

Purpose:

In order to receive financial assistance from the impact of the COVID-19 pandemic, the Federal Emergency Management Agency (FEMA) and the North Carolina Division of Emergency Management require that an application process be completed, and that individuals be designated as OWASA's primary and secondary agents, authorized to act severally, to execute and file applications and represent the organization in all dealings with FEMA and the NC Division of Emergency Management.

Background:

In March 2020, the COVID-19 virus began impacting our service area. Orange County has been approved to receive individual and public financial assistance; public assistance means government agencies like OWASA may apply for financial reimbursement from FEMA. We anticipate expenses eligible for reimbursement will include the cost of personal protective equipment, enhanced cleaning of OWASA buildings, and perhaps others.

To be enable OWASA to work with FEMA, the Board must pass a resolution authorizing agents to work with federal and state organizations on OWASA's behalf. The approved resolution along with additional information must be filed with FEMA.

A resolution designating Stephen Winters, Director of Finance and Customer Service, and Kelly Satterfield, Finance and Procurement Manager, as OWASA's primary and secondary agents, respectively, is provided for Board approval.

Action Requested:

Approve Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for Federal and/or State Assistance and Represent the Organization in All Dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management

Information:

- Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for Federal and/or State Assistance and Represent the Organization in All Dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management

Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for Federal and/or State Assistance and Represent the Organization in All Dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management

Whereas, the Orange Water and Sewer Authority is expending funds to deal with the impact of the COVID-19 pandemic; and

Whereas, staff has begun working with federal and state agencies to document expenditures and receive disaster relief; and

Whereas, the Federal Emergency Management Agency requires that OWASA designate a primary and secondary agent to execute and file applications and represent OWASA in all dealings with the State of North Carolina and the Federal Emergency Management Agency.

Now, Therefore, Bet It Resolved by the Board of Directors of Orange Water and Sewer Authority:

1. That Stephen Winters, Director of Finance and Customer Service, and Kelly Satterfield, Finance and Procurement Manager are hereby authorized to execute and file applications for public assistance on behalf of Orange Water and Sewer Authority for the purpose of obtaining certain state and federal financial assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, (Public Law 93-288 as amended) or as otherwise available.

2. That the above-named agents are authorized to represent and act for Orange Water and Sewer Authority in all dealings with the State of North Carolina and the Federal Emergency Management Agency for all matters pertaining to such disaster assistance required by the grant agreements and the assurances listed in Attachments B.

3. That the above-named agents are authorized to act severally.

This the 13th day of August 2020

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Raymond E. DuBose, P.E., Chair

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Jo Leslie Eimers, Secretary

ATTACHMENT B

ASSURANCES-CONSTRUCTION PROGRAMS

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0042), Washington DC 20503

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the Awarding Agency. Further, certain Federal assistance awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance, and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of the project costs) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the assistance; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will not dispose of, modify the use of, or change the terms of the real property title, or other interest in the site and facilities without permission and instructions from the awarding agency. Will record the Federal interest in the title of real property in accordance with awarding agency directives and will include a covenant in the title of real property acquired in whole or in part with Federal assistance funds to assure non-discrimination during the useful life of the project.
4. Will comply by the requirements of the assistance awarding agency with regard to the drafting, review and approval of construction plans and specifications.
5. Will provide and maintain competent and adequate engineering supervision at the construction site to ensure that the complete work conforms with the approved plans and specifications and will furnish progress reports and such other information as may be required by the assistance awarding agency or State.
6. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
7. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
8. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§ 4728-2763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
9. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. § 4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
10. Will comply with all Federal statures relating to non-discrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§ 1681, 1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§ 523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§ 290dd-3 and 290ee-3), as amended relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. § 3601 et seq.), as amended relating to nondiscrimination in the sale, rental, or financing of housing; (I) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

11. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal and federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
12. Will comply with the provisions of the Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.
13. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S. C. §§ 276a to 276a-7), the Copeland Act (40 U.S.C. § 276c and 18 U.S.C. § 874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 327-333) regarding labor standards for federally-assisted construction subagreements.
14. Will comply with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L.93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.
15. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) elevation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. § 1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. § 7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
16. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. § 1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
17. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. § 469a-1 et seq.).
18. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
19. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
APPLICANT ORGANIZATION	DATE SUBMITTED
Orange Water and Sewer Authority	Jul 7, 2020

Orange Water and Sewer Authority

Virtual Meeting of the Board of Directors

June 25, 2020

The Board of Directors of the Orange Water and Sewer Authority (OWASA) held its duly noticed regular meeting all by virtual means in accordance with law, on Thursday, June 25, 2020, at 6:00 p.m. utilizing Microsoft Teams software.

Board Members present: Raymond (Ray) DuBose (Chair), Bruce Boehm (Secretary), Yinka Ayankoya, Jody Eimers, Robert Morgan, John N. Morris and Bruce Runberg. Board Member absent: Ruchir Vora (Vice Chair).

OWASA staff present: Mary Darr, Monica Dodson, Jesse DuClau, Robert Epting, Esq. (Epting and Hackney), Stephanie Glasgow, Blake Hodge, Ed Kerwin, Ken Loflin, Andrea Orbich, Dan Przybyl, Kelly Satterfield, Todd Taylor, Mary Tiger, Stephen Winters and Richard Wyatt.

Others present: Meg Holton (UNC Water Resources Manager) and Ben Poulson (UNC Associate Director of Energy Services) and John Young.

Motions

1. Robert Morgan made a motion to approve the Minutes of the May 28, 2020 Virtual Public Hearing and Meeting of the Board of Directors, second by Jody Eimers and was unanimously approved.

2. Robert Morgan made a motion to approve the Minutes of the June 11, 2020 Virtual Closed Session of the Board of Directors for the purpose of Discussing a Confidential Personnel Matter; second by Jody Eimers and was unanimously approved.

3. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Amending the Fiscal Year 2020 Annual Budget. Motion by Bruce Boehm, second by Bruce Runberg and unanimously approved.

4. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Appointing Todd Taylor to Succeed Ed Kerwin as Executive Director. Motion by John Morris, second by Jody Eimers and the Resolution passed with a vote of seven to one with Yinka Ayankoya opposed.

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Announcements

Ray DuBose announced that due to COVID-19 public health concerns, the OWASA Board of Directors held this meeting virtually utilizing Microsoft Teams software. Mr. DuBose stated that Board Members and staff participated in the meeting remotely.

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Mr. DuBose asked if any Board Member knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight to disclose the same at this time; none were disclosed.

Mr. DuBose announced that on June 24, 2020 the Chapel Hill Town Council appointed Deanie Anyangwe to fill the vacant seat of John Cooley. Ms. Anyangwe's appointment will be effective through June 30, 2021.

Mr. DuBose announced he attended a virtual Orange County Climate Council Meeting on June 18, 2020. The Council received reports from the climate action reporting, communications, and policy committees. Mr. DuBose noted the discussion included officer succession, a public event in September and Executive Order 143 which address the disproportionate impact of COVID-19 on communities of color.

Petitions and Requests

Ray DuBose said no petitions or requests were received from the public.

Mr. DuBose requested the Board consider allowing public comment at every virtual Board meeting; the Board agreed to do so.

Mr. DuBose asked for petitions and requests from the staff; none were received.

Item One: 12 Month Board Meeting Schedule

The Board received this as an information item.

Item Two: Minutes

Robert Morgan made a motion to approve the Minutes of the May 28, 2020 Virtual Public Hearing and Meeting of the Board of Directors, second by Jody Eimers and the Motion was unanimously approved. Please see Motion 1.

Item Three: Minutes

Robert Morgan made a motion to approve the Minutes of the June 11, 2020 Virtual Closed Session of the Board of Directors for the purpose of Discussing a Confidential Personnel Matter; second by Jody Eimers and the Motion was unanimously approved. Please see Motion 2.

Item Four: Update on OWASA's COVID-19 Response and Discussion by the Board

Ed Kerwin, Executive Director, reported that on June 24, 2020, the Governor extended North Carolina's Phase 2 of the 3-Phase Pandemic Response plan for at least three more weeks (July 17, 2020) and that a statewide face covering in public mandate is now in effect.

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Item Five: Fiscal Year 2020 Annual Budget Amendment

Stephen Winters, Director of Finance and Customer Service, provided a brief verbal introduction this item and requested the Board approved an amendment to the Fiscal Year 2020 Budget. Mr. Winters said the amendment will reallocate $1.2 million from the Capital Improvements Program to the operating budget to offset a shortfall in water and sewer revenue resulting from the COVID-19 pandemic.

Bruce Boehm made a motion to approve the resolution, second by Bruce Runberg and the Resolution was unanimously approved. Please see Motion 3.

Item Six: Resolution Appointing Todd Taylor to Succeed Ed Kerwin as Executive Director

Ray DuBose expressed appreciation and thanked the Board for its active and thoughtful involvement in the process to recruit, assess and select OWASA's next Executive Director. He noted that the Board provided routine updates on its selection process at regular Board meetings since July 2019 and held two Special Meetings of the Board, the first to interview and select a consultant to conduct the Executive Director assessment; and the second to discuss the recruitment and selection process, recruitment profile and desired management and leadership characteristics for the next Executive Director. The Board directed the consultant to recruit nationally, including a robust process to reach minority candidates consistent with OWASA's Diversity and Inclusion Program.

In December 2019, the Board agreed Mr. DuBose would send a letter to the local governments to update them on the selection process and invite the Chapel Hill and Carrboro Mayors and Orange County Chair's suggestions on the key attributes the Board should seek in the next Executive Director. Mr. DuBose said he followed-up this letter with telephone calls to the Mayors/Chair and provided a summary of the conversation to the Board.

Mr. DuBose said the consultant prepared a draft recruitment profile which was reviewed by the Board, and at the end of January 2020, the consultant began the Executive Director recruitment process. On March 10, 2020, the Board met in Closed Session to receive a confidential report from the consultant on potential candidates and targeted interviews with the top candidates in April 2020. The Board's Human Resources (HR) Committee met virtually on April 2, 2020, to discuss logistics for virtual interviews and then in Closed Session discussed interview questions for the Board's consideration. On April 24 and 25, 2020, the Board held confidential virtual interviews with the top six candidates and following the Board's deliberations, identified the top two candidates for further consideration.

Mr. DuBose said the assessment process included a consultant-facilitated virtual meeting with the top candidate and Managers from Orange County, Chapel Hill, and Hillsborough (the Carrboro Town Manager was expected to participate but canceled); the consultant provided a summary of this meeting to the Board.

Mr. DuBose said the Board met in Closed Session on May 14, May 28, and June 11, 2020 to discuss the candidates and their alignment with the Board's expectations. On June 11th, the

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Board reached consensus to offer the position to Todd Taylor, OWASA's General Manager of Operations. Mr. DuBose said he met with Mr. Taylor on June 12, 2020 and Mr. Taylor accepted the job offer and agreed to begin serving as OWASA's Executive Director on July 6, 2020.

Following the Board's approval of the Resolution Appointing Todd Taylor to Succeed Ed Kerwin as Executive Director, staff will issue a public notice on June 26, 2020 of Mr. Taylor's new role for the OWASA team.

Yinka Ayankoya requested her statement to the Board be included for the record, "More than once, I have been reminded that my vote on this resolution will be noted in public record for all time. Therefore, to make myself clear, and for the record, this is my statement. We, members of the OWASA Board are appointed by elected officials and representatives of the community who use the services of OWASA. I joined the OWASA Board in 2016. I was appointed to the Board by the Town of Carrboro. I served on the Executive Committee for two years; being Chair last year. I have voiced these reservations and concerns to my fellow Board Members on numerous occasions, so nothing in my statement should be a surprise to them. My vote has nothing to do with the selected candidate. Let me say that again, my vote has nothing to do with the selected candidate. I am voting against and speaking out about the lack of transparency in the recruiting and selection of the next Executive Director of OWASA. Throughout the process, changes were made to the agreed upon lines of action with regards to next steps after the initial interview dealing with meetings, assessments, and additional interviews. The required advance notice was not provided when decisions were to be made. The Board did not make contingency, alternative or backup planning. We failed to maintain a viable candidate pool. The Board did not provide opportunity for most elected officials to provide feedback or for larger stakeholders or the community to participate and be engaged in the decisions once interviews began. When I raised concerns, I was ignored or met with dismissive comments. And finally, I take my appointment to the OWASA Board seriously. I serve on behalf of Carrboro citizens and all users of OWASA services and I attempt to represent community needs to the best of my ability. We are all human and we all make mistakes. We must be willing to do what is right and not what is expedient. Thank you."

John Morris made a motion to approve the resolution, second by Jody Eimers and the Resolution passed with a vote of six to one with Yinka Ayankoya opposed. Please see Motion 4.

Mr. Taylor expressed appreciation and thanked the Board for its support and trust in his leadership and abilities to lead OWASA as a progressive, agile, and resilient utility.

Ed Kerwin extended his best wishes and congratulations to Mr. Taylor on his new role as OWASA's next Executive Director. Mr. Kerwin also congratulated the Board on its thorough selection process.

Item Seven: Executive Director's Summary of Key Staff Action Items from the Meeting

Ed Kerwin noted the following items for staff follow-up:

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- Update future virtual Board agendas indicating public comment is available via telephone during Board meetings.
- Provide public notice the Board appointed Todd Taylor to Succeed Ed Kerwin as Executive Director.
- Agenda items for Board's July 9, 2020 Virtual Work Session:
    - Resolutions Honoring the Outstanding Service of Ed Kerwin
    - Consideration of a conservation easement in the Cane Creek Watershed
    - Update on COVID-19
    - Update on OWASA's Diversity and Inclusion Program
    - Update on a successful completion on an EPA compliance review

The Board meeting was adjourned at 6:38 p.m.

Respectfully submitted by:

Andrea Orbich
Executive Assistant/Clerk to the Board

Attachments

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Orange Water and Sewer Authority

Virtual Meeting of the Board of Directors

July 9, 2020

The Board of Directors of the Orange Water and Sewer Authority (OWASA) held its duly noticed regular work session all by virtual means in accordance with law, on Thursday, July 9, 2020, at 6:00 p.m. utilizing Microsoft Teams software.

Board Members present: Raymond (Ray) DuBose (Chair), Bruce Boehm (Vice Chair), Jody Eimers (Secretary), Yinka Ayankoya, Robert Morgan, John N. Morris, Bruce Runberg and Ruchir Vora.

OWASA staff present: Denise Battle, Mary Darr, Monica Dodson, Jesse DuClau, Robert Epting, Esq. (Epting and Hackney), Stephanie Glasgow, Blake Hodge, Robin Jacobs (Epting and Hackney), Ed Kerwin, Addison McDonough, Andrea Orbich, Dan Przybyl, Ruth Rouse, Kelly Satterfield, Todd Taylor, Stephen Winters and Richard Wyatt.

Others present: Barbara Foushee (Carrboro Mayor Pro Tem), Meg Holton (UNC Water Resources Manager) and Damon Seils (Carrboro Council Member).

Motions

1. Bruce Boehm made a motion to approve the Minutes of the June 11, 2020, Virtual Work Session of the Board of Directors; second by Bruce Runberg and unanimously approved.

2. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Honoring the Outstanding Service of Ed Kerwin to the Carrboro, Chapel Hill and Orange County Community. Motion by Robert Morgan, second by Bruce Boehm and unanimously approved.

3. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Renaming Orange Water and Sewer Authority Training Room in the Operations Center to the Ed Kerwin Team Room. Motion by John Morris, second by Bruce Boehm and unanimously approved.

4. Bruce Runberg made a motion to authorize staff and General Counsel to draft the legal documents to protect riparian buffers on Matt and Suzanne Case's land and on Clearwind Farm, LLC land in exchange for the use of a trail on OWASA land; second by Robert Morgan and unanimously approved.

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Announcements

Ray DuBose announced that due to COVID-19 public health concerns and in compliance with local governments "stay at home" orders, the OWASA Board of Directors held the work session virtually utilizing Microsoft Teams software.

Mr. DuBose asked if any Board Member knew of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight to disclose the same at this time; none were disclosed.

Mr. DuBose welcomed Todd Taylor in his new role as Executive Director, effective July 6, 2020.

Mr. DuBose announced that Chapel Hill Appointee, Deanie Anyangwe, declined her appointment as an OWASA Board Member.

Mr. DuBose announced the following updates to the Standing Committees of the Board of Directors for Fiscal Year 2021:

- Natural Resources and Technical Services: Bruce Boehm (Chair) and members Ruchir Vora, Jody Eimers and John Morris.
- Human Resources: Jody Eimers (Chair) and members Yinka Ayankoya, Bob Morgan and John Morris.
- Community Engagement: Yinka Ayankoya (Chair) and members are Jody Eimers, Bob Morgan and Bruce Runberg.
- Finance: Bruce Runberg (Chair) and members are Ruchir Vora, Bruce Boehm and Yinka Ayankoya.

Mr. DuBose encouraged all Board Members to attend all Committee Meetings.

Item One: Quarterly Report on Attendance at Board and Committee Meetings

The Board accepted this as an information item.

Item Two: Minutes

Bruce Boehm made a motion to approve the Minutes of the June 11, 2020, Virtual Work Session of the Board of Directors; second by Bruce Runberg and unanimously approved. Please see Motion 1.

Item Three: Honoring the Outstanding Service of Ed Kerwin

The Board expressed sincere appreciation and respect to Ed Kerwin for his outstanding service as OWASA's Executive Director for 24 years and approved two resolutions in his honor.

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Robert Morgan read aloud the Resolution Honoring the Outstanding Service of Ed Kerwin to the Carrboro, Chapel Hill and Orange County Community.

Robert Morgan made a motion to approve the Resolution Honoring the Outstanding Service of Ed Kerwin to the Carrboro, Chapel Hill and Orange County Community; second by Bruce Boehm and unanimously approved. Please see Motion 2.

Bruce Boehm read aloud the Resolution Renaming the Orange Water and Sewer Authority Training Room in the Operations Center to the Ed Kerwin Team Room.

John Morris made a motion to approve the Resolution Renaming the Orange Water and Sewer Authority Training Room in the Operations Center to the Ed Kerwin Team Room; second by Bruce Boehm and unanimously approved. Please see Motion 3.

Ed Kerwin expressed his deep appreciation and gratitude to the Board and staff.

Item Four: Potential Conservation Easement on Private Land in the Cane Creek Reservoir Watershed

Ruth Rouse, Planning and Development Manager, provided an overview of a potential conservation easement on private land owned by Matt and Suzanne Case in the Cane Creek Watershed which will provide for expanded, permanently protected buffers along a stream running through private land near Cane Creek Reservoir.

Bruce Boehm suggested a revision to include approximately 300-foot easement on a 16-acre track of the Case's land to protect and improve long-term water quality of Cane Creek.

Ms. Rouse noted this area of the Case's farm is not part of the proposed conservation easement, and there is an existing horse farm on that portion of the land.

Bruce Runberg made a motion to authorize staff and General Counsel to draft the legal documents to protect riparian buffers on Matt and Suzanne Case's land and on Clearwind Farm, LLC land in exchange for the use of a trail on OWASA land; second by Robert Morgan and unanimously approved. Please see Motion 4.

Item Five: Update on OWASA's Agreement with U.S. Environmental Protection Agency

The Board received an update from Robin Jacobs, General Counsel, regarding OWASA's compliance agreement with the U.S. Environmental Protection Agency (EPA). OWASA has received grants from the EPA in the past and as such is subject to review by the EPA of its compliance with various federal laws and regulations. Ms. Jacobs reported that Stephanie Glasgow, Director of Human Resources and Safety, is OWASA's Nondiscrimination Compliance Officer and this information is posted on the website. Ms. Glasgow will attend a monthly employee staff meeting in each department to inform employees about how to tell someone outside the organization who believes they have been discriminated against by OWASA how to get assistance they need.

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Item Six: Update on OWASA's COVID-19 Response and Discussion by the Board

Todd Taylor, Executive Director, said staff continues to take proactive measures to ensure the community is provided with high-quality and reliable water, wastewater, and reclaimed water services during the COVID-19 pandemic.

Stephen Winters, Director of Finance and Customer Service, said the Governors Executive Order 124, to suspend service cut offs for nonpayment for customers who are unable to pay during this pandemic, is set to expire on July 29, 2020. Staff plans to communicate with OWASA customers who are past due on their bills, they will be automatically offered to an extended payment plan over 12-months, and staff will work with customers as needed to achieve compliance and payment.

Item Seven: Diversity and Inclusion (D&I) Program Update (January – June 2020)

Todd Taylor, Executive Director, provided a brief overview of this item and talked about how diversity and inclusion has positively impacted him in a personal and professional way.

Stephanie Glasgow, Director of Human Resources and Safety, reviewed the D&I Program schedule from January through June 2020 and announced that *NC Currents* (the official publication of the NC section of the American Water Works Association-Water Environment Federation) will feature OWASA's D&I Program in its fall magazine edition. Ms. Glasgow said Monica Dodson, Wastewater Treatment and Biosolids Recycling Manager, will provide a presentation on OWASA's D&I Program at the annual 2020 Water Environment Federation's Technical Exhibition and Conference national conference.

Denise Battle, Customer Service Manager, provided an update on: OWASA's Welcome Team; an informal meeting with Black supervisors to discuss recent events regarding social justice; and the voluntary open forums in June to discuss the tragic death of George Floyd.

Addison McDonough, Business Systems Analyst, provided an update on: activities of the Diversity Resource Group; how employees are staying connected during the COVID-19 pandemic that included; 15-minute virtual Daily Grind; walking challenge; and space for employees to share various non-work related photos.

Barbara Foushee (Carrboro Mayor Pro Tem/former OWASA Board Member) expressed concern that the selection process for the Executive Director was not transparent enough and more public communication was needed. Ms. Foushee asked that OWASA take the time to be specific and intentional regarding the hiring of the next General Manager of Operations and any other upper management position that may come open to further seek diversity in OWASA's workforce.

Damon Seils (Carrboro Council Member) expressed appreciation for OWASA's update on the D&I program and appreciated Ms. Foushee's comments. Mr. Seils also expressed concern that the selection process for the Executive Director was not transparent enough and that the pool of applicants wasn't diverse, a wider net could have been cast to encourage diversity.

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Yinka Ayankoya expressed appreciation to staff for their presentation and thanked Ms. Foushee and Mr. Seils for their comments.

Ray DuBose expressed appreciation and thanked staff for the presentation, leadership and the sensitivity shown to employees.

Item Eight: Review Board Work Schedule

The Board agreed that staff will provide a report on local governments' paid holidays and any recent actions or intentions to modify schedules as well as provide a recommendation to the Board on a possible 12th paid holiday for employees.

The Board agreed to schedule an Executive Committee meeting the last week of July 2020 and a doodle poll for dates in August 2020 will be sent to schedule a Human Resources Committee meeting.

The Board agreed to cancel the July 23, 2020 Board meeting.

The Board agreed to add an item to the August 13, 2020 agenda regarding designating OWASA's primary and secondary agents and authorizing them to execute and file applications for Federal and/or State assistance and represent the organization in all dealings with Federal Emergency Management Agency and the North Carolina Division of Emergency Management.

Item Nine: Summary of Work Session Items

Todd Taylor noted the following items for staff follow-up:

- Provide a report on local governments' paid holidays and any recent actions or intentions to modify their work schedules, and a recommendation to the Board at a future Board meeting on a possible 12th paid holiday for employees, possibly to celebrate June 19 the Juneteenth holiday.

The Board meeting adjourned at 7:36 p.m.

Respectfully submitted by:

Andrea Orbich
Executive Assistant/Clerk to the Board

Attachments

DRAFT

Agenda Item 4:

Update on OWASA's COVID-19 Information and Discussion by the Board

Purpose:

To provide the Board of Directors and public an update on OWASA's response to COVID-19 to ensure we continue to provide the Carrboro and Chapel Hill communities with high-quality and reliable water, wastewater, and reclaimed water services during the pandemic.

Staff will provide a verbal update on activities since July 9, 2020.

Action Needed:

Discussion and questions by the Board of Directors.

Agenda Item 5:

Long-Range Water Supply Plan (LRWSP)

a. Background Information
b. Evaluation of Supply and Demand Management Alternatives for the LRWSP

Purpose:

To provide a brief project history and a summary of the supply and demand management alternatives evaluated, receive feedback from the Board of Directors on that information, begin to eliminate alternatives from further consideration for this update of the Long-Range Water Supply Plan (LRWSP), and receive guidance from the Board on modifying OWASA's Drought Response Operating Protocol (DROP) to increase the resiliency of OWASA's existing water supply.

Background:

The LRWSP is our roadmap to ensure we have a reliable, high-quality supply of water for the community through 2070. In 2013, the Board identified updating our 2010 Plan as a strategic initiative that would reflect current trends in water use by our customers, incorporate recently developed projections of growth and development in our service area, and investigate the best available information about potential options we can consider for meeting future demands and enhancing the reliability and resiliency of our essential water supply. Attachment 1 includes a timeline of Board discussion and action regarding the LRWSP over the past seven years.

The key steps to complete the LRWSP are shown in Figure 1.

Figure 1: Key Steps to Complete the LRWSP



The Board of Directors selected the final supply and demand management alternatives to evaluate for the LRWSP update in September 2019 and included the following list of alternatives:

Supply Alternatives

- Alternative 1: Jordan Lake: Full partner in new intake and Water Treatment Plant (WTP) on western side of Jordan Lake
- Alternative 2: Jordan Lake: Continue with mutual aid agreements (staff considers this part of our baseline analysis)
- Alternative 3: Jordan Lake: New agreements with Cary and Apex in which OWASA would pay an annual fee to guarantee access to allocation
- Alternative 4: Jordan Lake: Agreement with other Western Intake Partners who build new intake and WTP on western side of Jordan Lake to guarantee access to allocation
- Alternative 5: Shallow Quarry: Access with existing pumping infrastructure (this option is underway and planned for completion in mid-2030's based on recommendations in the 2010 LRWSP, and staff consider this part of our baseline analysis).
- Alternative 6: Deep Quarry: Access with new pumping infrastructure
- Alternative 7: Indirect Potable Reuse with return from the Mason Farm Wastewater Treatment Plant (WWTP) to
    a. New pretreatment mixing basin near the Quarry Reservoir
    b. Quarry Reservoir
- Alternative 8: Indirect Potable Reuse with return from Mason Farm WWTP to University Lake
- Alternative 9: Direct Potable Reuse returning additionally treated wastewater from Mason Farm WWTP to the drinking water distribution system

Demand Side Strategies

- Alternative 10: Reclaimed Water Extension to UNC Cogeneration Facility
- Alternative 11: Reclaimed Water Extension on UNC Campus (Dual-plumbing)
- Alternative 12: On-site Wastewater Treatment and Re-Use
- Alternative 13: Robust OWASA Water Efficiency Program that Considers a Suite of Initiatives

Summary of Alternatives Analysis:

Staff evaluated each of the supply and demand management alternatives against the social, environmental, and economic goals established and approved by the Board in November 2016, which serve as the guiding principles for evaluating the alternatives. Generally, these goals included the following criteria:

- Social – the social impacts include whether the source meets our long-term water supply needs; the impact on the diversity of our water supply; permit requirements and legality;

whether the alternative requires a partnership; and impacts on the community during construction or operation of the source.

- Environmental – this includes impacts on energy use, greenhouse gas emissions, and streams and wetlands. In general, the greater the amount of new infrastructure needed, the greater the impacts. However, in order to permit any of the alternatives, many of the impacts would need to be minimized through planning and design and then mitigated.
- Financial – staff evaluated the capital costs in 2020 dollars and the life cycle costs (capital and operating/maintenance costs) of each alternative.

As summarized above, staff considers our existing mutual aid agreements and the planned expansion of the shallow Quarry Reservoir alternative as part of our baseline supply and assumed these two options would remain in our existing and planned supply portfolio. Therefore, all other alternatives should be viewed as an addition to this baseline supply. Further details on the alternatives are provided in Attachments 2, 3 and 4; summary tables of the alternatives against the social, environmental, and financial goals are included in Attachment 4, Appendix 2.

Demand management strategies seek to reduce the demands on our raw water supply. There is no individual or collective group of demand management strategies that, if pursued further, would prevent the need for additional supply in the long-run. We recommend that demand management through water conservation, water efficiency, and reclaimed water use remain a key value of the organization and that we commit to consider strategies as they avail themselves. Strategies that are cost-effective will be considered in a water conservation program that will be included as an appendix to the LRWSP. We recommend that water stewardship continue to be a key message in our community engagement and affordability outreach efforts. A summary of the analysis of demand management alternatives against the social, environmental, and financial goals is provided in the second table in Attachment 4, Appendix 2.

There are three major suites of supply alternatives that staff evaluated:

1. Jordan Lake options
2. Quarry Reservoir options
3. Potable reuse options

Partnering with other utilities to guarantee access to our Jordan Lake allocation was a recommendation in the 2010 LRWSP. While OWASA has a very low risk of water supply shortfalls under most circumstances over the next couple of decades, we do have one major vulnerability. Given the relatively small drainage area of the Cane Creek Reservoir watershed, which currently provides the majority of our water storage, we are vulnerable to long and severe droughts. Cane Creek Reservoir could take over a year to refill following a drought depending on weather patterns. If this occurs, our water supply is at risk. While historic weather conditions indicate the risk is low, the risk may increase as weather patterns become more variable with climate change. Jordan Lake provides an additional, highly reliable source of water and improves the diversity of our water supply; some of the Jordan Lake options also provide treatment capacity redundancy to our Jones Ferry Road WTP. At least one of the Jordan Lake options

involves significant capital investment but is less expensive than other options. Thus, staff recommend that Jordan Lake options warrant further consideration. For further details, see the first summary table in Attachment 4, Appendix 2.

The Deep Quarry Reservoir option does not diversify OWASA's water supply and still leaves the community vulnerable to an extended drought or back-to-back droughts. This is particularly true since the Quarry Reservoir has very little drainage area and will need to be refilled with water from Cane Creek Reservoir when it is drawn down. In addition, the Deep Quarry alternative is higher cost than the Jordan Lake alternatives. Thus, staff does not recommend that we pursue the Deep Quarry Reservoir option further. For further details, see the first summary table in Attachment 4, Appendix 2.

During the Strategic Planning process and during the early stages of the LRWSP, the OWASA Board made it clear that it wanted to evaluate potable reuse options. The indirect potable reuse options to return water to a pretreatment mixing basin and to the Quarry Reservoir are cost-prohibitive and have an uncertain permitting process. Indirect potable reuse with a return to University Lake is currently not legal in North Carolina. Direct potable reuse appears cost-effective, provides diversity of our water supply, and provides redundancy to OWASA's Jones Ferry Road WTP, but it is currently not legal in North Carolina. Thus, staff does not recommend that we pursue indirect and direct potable reuse options further. For further details, see the first summary table in Attachment 4, Appendix 2.

Drought Response Operating Protocol:

OWASA's DROP places self-imposed constraints on our ability to use water from Jordan Lake. This policy states that OWASA cannot access its Jordan Lake allocation until we reach a Stage 1 water shortage as outlined in our Water Shortage Response Plan. This internal policy limits the effectiveness of each of the Jordan Lake alternatives. For the alternatives where OWASA would participate in the Western Intake and WTP, OWASA would be making a significant investment in resources that we would only be able to access or use during extreme water shortages. For the alternatives in which we are continuing the use of mutual aid agreements or developing new agreements, we are limiting the conditions under which we can purchase water from our neighboring utilities.

Staff recommends that the Board authorize staff to develop a process to remove the limiting provisions of the DROP and incorporate the portions of the DROP that are beneficial into our Water Shortage Response Plan which we would share at an upcoming Board meeting. If the Board chooses not to modify the DROP, staff recommends that we not pursue any of the Jordan Lake options other than to maintain our mutual aid agreements. The Board should also recognize that using only our mutual aid agreements increases the probability that the North Carolina Environmental Management Commission will reduce or rescind our allocation of water from

Jordan Lake. The lake may be fully allocated in the next round of allocation requests, and the EMC may consider capital investments in infrastructure when determining future allocations.

Staff Recommendation and Action Needed:

Staff recommends the following:

- We move forward with the process to modify the DROP to allow for earlier access to Jordan Lake and increase near-term water supply resiliency and the viability of any Jordan Lake alternative.
- For this update to the LRWSP, we further consider alternatives to access our allocation of water from Jordan Lake; following community engagement, the final LRWSP identifying the preferred alternative to access the allocation should be presented to the Board for review and approval.
- As part of a Water Conservation Plan that would be an appendix to the LRWSP, we further consider cost-effective demand management strategies as part of a robust water efficiency program.

If the Board concurs with these recommendations, staff envisions the following next steps:

- Develop method to remove the limitations in DROP and incorporate DROP into the Water Shortage Response Plan and provide that information to the Board at a future date;
- Develop a community engagement strategy to obtain feedback from key stakeholders on the alternatives analysis, obtain feedback on the use of Jordan Lake as a water supply, and obtain feedback on proposed modifications to the DROP; and
- Identify dates to discuss the proposed method to modify DROP and the community engagement strategy with the Board on the 12-month calendar.

If the Board concurs with these recommendations, we recommend the Board authorize staff to proceed with two separate motions: one regarding DROP and if the DROP motion passes, one regarding the LRWSP. Draft motion language for both items follows:

> *Motion to authorize staff to proceed to develop a process to modify the DROP for future consideration by the Board.*
>
> *Motion to authorize staff to continue to evaluate alternatives to guarantee access to our Jordan Lake allocation.*

Information:

Attachment 1: Timeline of Key Events and Decisions Regarding OWASA's Update to the Long-Range Water Supply Plan – this document summarizes Board discussions and decisions regarding the LRWSP.

Attachment 2: Summary of Water Demands, Current Supply, Uncertainty, and Supply and Demand Management Alternatives – this document summarizes Attachments 3-5.

Attachment 3: Background on OWASA's Water Supplies – this document briefly describes OWASA's existing locally controlled water supplies.

Attachment 4: Evaluation of Supply and Demand Management Alternatives – this document provides more details on each alternative and their social, environmental, and financial impacts. Appendix 1 of the attachment includes summary tables of the financial impacts of each alternative, and Appendix 2 contains summary tables of the social, environmental, and financial impacts of each alternative.

Attachment 5: Yield of OWASA's Water Supply Reservoirs – this document provides background on the assumptions used to estimate the yield of OWASA's water supply reservoirs and an uncertainty analysis around three key assumptions in the yield estimate.

Attachment 6: Regional Water Supply, Interconnections, and OWASA's Mutual Aid Agreements – this document includes information regarding the Triangle Water Supply Partnership, the Triangle Regional Water Supply Plan, regional interconnections and monitoring, and the outlook of the region's future water supply. OWASA's mutual aid agreements are included as appendices to this document.

Attachment 1: Timeline of Key Events and Decisions Regarding OWASA's Update to the Long-Range Water Supply Plan

March 13, 2014 – OWASA Board of Directors (Board) adopts its Strategic Plan in which Strategic Initiative 1 was to "provide reliable and high-quality supply of water for the next 50 years". One of the key actions identified was to Update Long-Range Water Supply Plan to include:

- Desired level of service and water supply resiliency
- Supply and demand projections to incorporate best information from land use/growth management plans, University plans, climate change impact information, etc.
- Evaluation of supply and demand management alternatives, including but not limited to: Jordan Lake as emergency supply; conservation and water use efficiency; expanded use of reclaimed water (including direct and indirect); quarry reservoir; etc.
- Preferred mix of supply and demand management alternatives required to meet level-of-service objectives.

March 27, 2014 – Board approved a charter for the Long-Range Water Supply Plan. This document included a project vision, goals and objectives, a table of tasks, and goals for community engagement. The goals and objectives served to guide future information and decisions by the Board; the charter noted that these could be modified as we learned more throughout the process. The charter goals and objectives are copied here:

1. **Social Performance:** Our operations and facilities affect the well-being of the people, businesses, institutions and the community we serve. We will address the needs of and enhance our relationships with our customers, the whole community, our employees, the local governments and other public agencies that we work with.
    a. Annual average-day raw water demand does not exceed the reliable capacity of OWASA's existing and planned water supply sources. This could be achieved through a mix of supply and demand management alternatives.
    b. Our plan will include contingency measures for meeting water demands if and when an extreme event (such as an exceedance of the 2001-02 drought of record or sudden loss of water supply storage capacity) is projected to cause us to drawdown our remaining supply to 20 percent or less of total storage.
    c. We will maintain a diverse and resilient portfolio of water supply and demand management strategies so we are positioned to meet the community's water needs as we face increasing uncertainty in the future.
    d. Selected water supply strategies must enable us to meet all applicable drinking water-related standards.
    e. Mandatory water use restrictions and associated drought rate surcharges will not be implemented more frequently than once in ## years on average.
    f. In any given year, mandatory water use restrictions will not be in place more than ## percent of the year.
    g. The community is engaged in the development of the LRWSP such that OWASA understands and reflects the community's values in the selected mix of supply and demand management options.

    h. Key stakeholders are involved in evaluating and implementing demand management strategies.
    i. Water supply and demand management strategies are evaluated against their impacts on the community. These include but are not limited to impacts to landowners, recreation, and transportation.
2. **Environmental Performance:** We will pursue strategies that help us preserve natural resources; maintain or restore natural systems; conserve energy, water, and other natural resources; minimize waste and pollution emissions, and reduce our environmental impacts.
    a. Water supply and demand management alternatives are evaluated against their relative projected energy use and greenhouse gas emissions.
    b. Water supply and demand management alternatives are evaluated against their relative impacts on streams, wetlands, groundwater, air quality, habitat, and other environmental considerations.
    c. The selected set of water supply and demand management strategies will be environmentally acceptable to the community and regulatory agencies.
3. **Financial Performance** The economic well-being of our customers and our community depend upon our ability to ensure high quality and reliable water services at an acceptable financial cost.
    a. Water supply and demand management alternatives are evaluated against their relative life cycle financial costs (capital and operating and maintenance costs).
    b. The selected set of water supply and demand management strategies represents a reasonable balance of financial considerations with our social and environmental performance objectives.

February 12, 2015 – Board approved a Community Engagement Plan (CEP) for the LRWSP.

September 22, 2016 – An overview of the work completed on the LRWSP to date was provided. We also obtained Board approval to send local governing Boards information regarding the LRWSP.

November 10, 2016 – the Board approved goals and objectives for the LRWSP based on the goals and objectives included in the charter. Based on similar methods being used for other OWASA projects where the Board was evaluating multiple alternatives, staff proposed including summary tables that were shaded to identify acceptable and unacceptable alternatives against the criteria established in the goals and objectives. The agenda package requested the Board approve proceeding with soliciting public feedback on the goals and objectives in accordance with the CEP. The Board felt that customers were most interested in (1) how much water we had, (2) how much water we would need, and (3) what are the potential ways we could fill that need. See the meeting minutes.

November 17, 2016 – Background information on the LRWSP was provided in the Assembly of Governments meeting agenda package as an Information Item in accordance with discussion from the September 22, 2016 Board meeting.

September 28, 2017 – An update on the LRWSP was presented to the Board.

November 15, 2018 – Staff presented draft water projections to the Board that were developed based on growth projections provided by the local governments. The Board approved the overall method and requested that staff work with our engineering consultant to perform an uncertainty analysis around the demand projections.

March 14, 2019- Staff presented final water demand projections, which were approved by the Board.

September 12, 2019 – The Board approved the staff recommended final supply and demand management strategies that would be evaluated in the LRWSP; staff described the process used to identify that strategies that included public input.

November 14, 2019 – Staff presented an update on the schedule and process to update the LRWSP.

December 12, 2019 – Staff presented a preliminary evaluation of our water supply risk based on our engineering consultant's modeling analysis.

January 30,2020 – Staff presented details regarding the supply and demand management alternatives being evaluating in the LRWSP at this special meeting of the Board.

August 13, 2020 – Staff will present their technical evaluation of the supply and demand management alternatives.

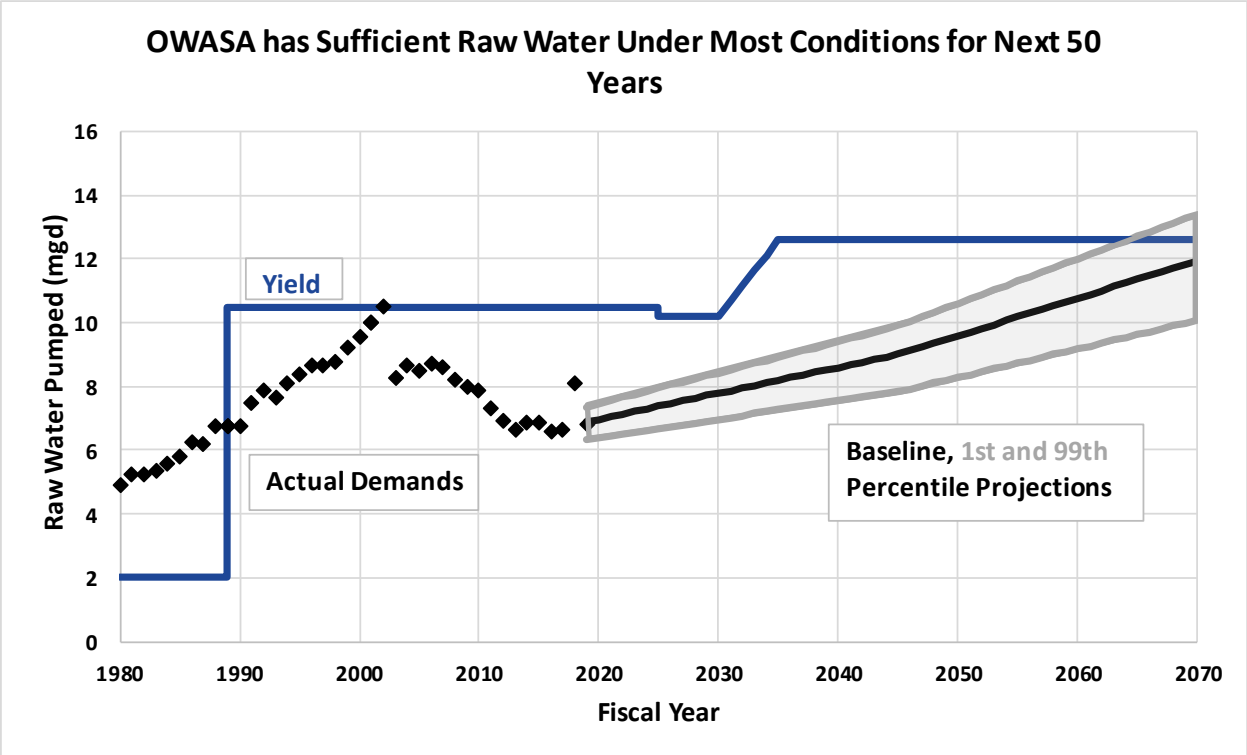
Attachment 2: Summary of Water Demands, Current Supply, Uncertainty, and Supply and Demand Management Alternatives

This document provides background information on OWASA's 5-year demand projections, briefly describes the uncertainty in both our demand projections and estimated yield of our reservoirs, and summarizes the evaluation of supply and demand management alternatives. More details on the evaluation of alternatives are found in Attachment 4, and more details on the yield of OWASA's existing supplies are in Attachment 5.

Projected Demands and Estimated Yield:

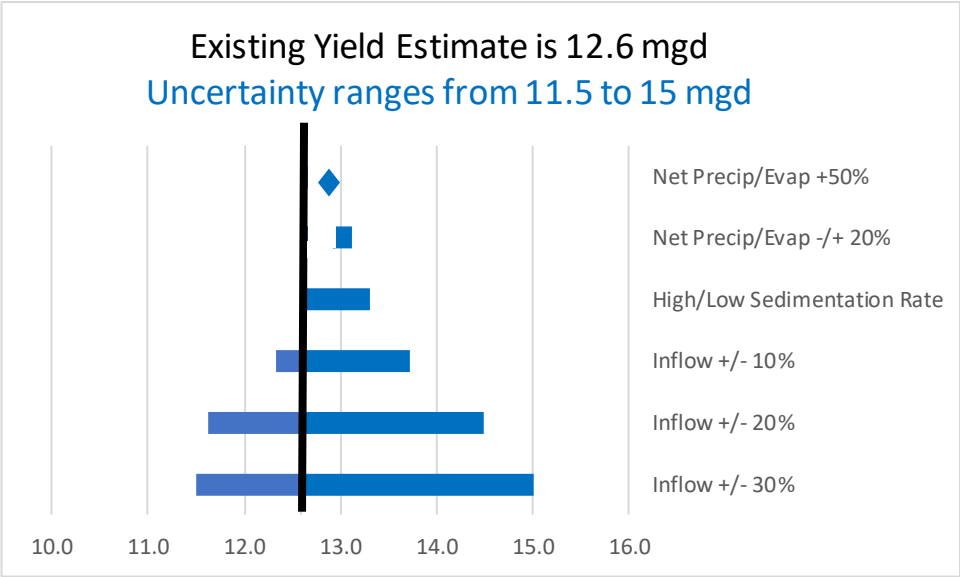
At its March 14, 2019 meeting, the Board of Directors reviewed and approved a set of long-range (through 2070) water demand projections for the update of the LRWSP that account for the uncertainty in those projections (Figure 1).

Figure 1: Water Demand Projections and Estimated Yield



At the January 30, 2020 special meeting, the Board requested that staff also provide information regarding uncertainty in the amount of water (yield) that our reservoirs provide. Hazen and Sawyer subsequently performed a sensitivity analysis on three main assumptions in our yield calculation: (1) inflow to the reservoir, (2) evaporation from our reservoirs, and (3) the rate of sedimentation or amount of storage in our reservoirs. Attachment 5 provides additional details on that sensitivity analysis. Figure 2 illustrates the uncertainty around our estimated yield.

Figure 2: Uncertainty Around OWASA's Estimated Yield



Note: The uncertainty bars are not centered on our current estimated yield since Hazen used less conservative sedimentation rates for the uncertainty analysis than used in our existing yield analysis. Our existing yield analysis used higher sedimentation rates based on data collected in University Lake in 1989; the updated sedimentation rates used for the uncertainty analysis are based on recent studies on City of Durham's water supply reservoirs. Attachment 5 contains additional details.

Figures 1 and 2 illustrate that under most circumstances, OWASA has a very low risk of a water supply shortfall for at least two to three decades into the future. If our lowest projected yield based on the sensitivity analysis is assumed, OWASA has enough water under our baseline demands until the early 2060s and until the mid-2050's under 99 percent of the modeled demand scenarios.

Our estimated yield is most sensitive to the estimated inflow into the reservoir and least sensitive to the net precipitation/evaporation rate. OWASA's model used to estimate yield is based on a 94-year period of record (1925-2019) of gaging station data (additional details in Attachment 5). It is uncertain how that 94 years will compare hydrologically to future years, particularly with the hydrologic variability predicted with climate change.

Supply and Demand Management Alternatives:

The Board of Directors selected supply and demand management alternatives to evaluate for the LRWSP in September 2019. Attachment 3 contains background information on OWASA's existing water supplies, and Attachment 4 contains more detailed information on each of the alternatives and their social, environmental, and financial impacts. Summary information is provided below.

Supply: Jordan Lake Alternatives

The four Jordan Lake alternatives are summarized below:

- **Alternative 1 – Full Partner in New Intake and WTP on Western Side of Jordan Lake –** OWASA would partner with the Western Intake Partners (WIP) (currently City of Durham, Town of Pittsboro, and Chatham County) on a new water supply intake, water treatment plant, and major transmission lines on the western side of Jordan Lake. This alternative guarantees access to our Jordan Lake allocation whenever it is needed, improves the diversity of our water supply, and is one of the only alternatives which provides redundancy to our water treatment process. However, there is a high capital cost associated with the alternative. The long-term cost per gallon of water received is more cost-effective than other options, and staff recommend we continue to evaluate this alternative in partnership with the WIP. As described below, it is important to also modify the Drought Response Operating Protocol (DROP) or the cost of this option is not warranted.
- **Alternative 2 – Continue with Mutual Aid Agreements** - This is our existing baseline condition. Under this alternative, OWASA would access its Jordan Lake allocation using its mutual aid agreements with the Town of Cary and City of Durham. This alternative does not guarantee access to our allocation and has us at highest risk of having our allocation reduced or rescinded during the next round of allocations. However, there is no capital cost associated with this alternative. Modifying the Drought Response Operating Protocol (DROP) would increase our ability to access the allocation with mutual aid agreements. Staff recommends that we continue our mutual aid agreements, update them before they expire, and work to modify the DROP.
- **Alternative 3 – Develop New Agreement with Town of Cary to Guarantee Access to Jordan Water** – Under this alternative, OWASA would develop a new agreement with the Town of Cary to guarantee withdrawal and treatment of a certain amount of water on an annual basis. In recognizing that our Triangle water utilities are more interconnected than ever before, the Town of Cary wishes to operate within the provisions of existing mutual aid agreements to ensure maximum flexibility in their ability to provide assistance to all area utilities as circumstances may dictate. This option is therefore not feasible at this time.
- **Alternative 4 – Develop Agreement with WIP to Guarantee Access to Jordan Lake Water** – OWASA would develop an agreement with the WIP to guarantee capacity in the proposed intake and water treatment plant on the western side of Jordan Lake. This agreement would guarantee a certain amount of water on an annual basis in return for payment from OWASA. At this time there is insufficient information available to determine planning level details on this option. However, it could potentially be a more cost-effective means to access our Jordan Lake allocation on a guaranteed basis than Alternative 1. Staff recommends that we continue to work with the WIP to evaluate this alternative further. It is important to modify the DROP or this alternative would not be as effective as it would without the DROP in place.

OWASA's DROP places self-imposed constraints on our ability to use water from Jordan Lake. This policy states that OWASA cannot access its Jordan Lake allocation until we reach a Stage 1

water shortage as outlined in our Water Shortage Response Plan. This internal policy limits the effectiveness of each of the Jordan Lake alternatives. For the alternatives where OWASA would participate in the Western Intake and WTP, OWASA would be making a significant investment in resources that we would only be able to access or use during extreme water shortages. For the alternatives in which we are continuing the use of mutual aid agreements or developing new agreements, we are limiting the conditions under which we can purchase water from our neighboring utilities.

While OWASA has sufficient water supply under most circumstances over the next couple of decades as shown in Figure 1, we do have one major vulnerability. Given the relatively small drainage area of the Cane Creek Reservoir watershed which provides the majority of our water storage, we are vulnerable to long and severe droughts and back-to-back droughts. Cane Creek Reservoir could take over a year to refill following a drought depending on weather patterns. If this occurs, our water supply is at risk. While historic weather conditions indicate the risk is low, the risk may increase as weather patterns become more variable with climate change.

Given this risk, staff recommends that the Board authorize staff to develop a process to modify the DROP that we share at an upcoming meeting. If the Board chooses not to modify the DROP, staff recommends that we not pursue any of the Jordan Lake options other than to maintain our mutual aid agreements. The Board should also recognize that using only our mutual aid agreements, increases the probability that the North Carolina Environmental Management Commission will reduce or rescind our allocation of water from Jordan Lake. The lake will likely be fully allocated in the next round of allocation requests, and the EMC may consider capital investments in infrastructure when determining future allocations.

Table 1 includes a comparison of the Jordan Lake alternatives; a more detailed table is found in Attachment 4, Appendix 2. The colors in Tables 1-5 have the following meanings:

White – this is our existing baseline condition

Grey – information unknown or not applicable to that alternative

Green – staff believes this is an acceptable impact or condition

Yellow – staff believes this impact is potentially unacceptable or may require a higher level of effort to make this impact acceptable

Red – staff believes this impact is unacceptable

Table 1: Comparison of Jordan Lake Supply Alternatives

	Alt 1: Full Partner in Proposed Western Intake and WTP	Alt 2: Continue with Mutual Aid Agreements	Alt 3: Develop New Agreement with Town of Cary to Guarantee Access to Jordan Lake	Alt 4: Agreement with other Western Intake Partners to Guarantee Access to Jordan Lake
Impact on Yield, Diversity of Supply, and Resilience	Guaranteed access to JL allocation (5 mgd yield) whenever needed; improves diversity of water supply and water treatment plant; benefits of this alternative reduced if DROP not modified	No guaranteed access to Jordan Lake; since no plans/capital investment to permanently access allocation, greatest chance it would be reduced or rescinded in future allocation rounds	Town of Cary has indicated they would like to provide water to utility(ies) in greatest need, and this option not available at this time.	Guaranteed access to JL allocation (5 mgd yield), but OWASA has less control over when it could receive water.
Legality, Policy, and Permit Requirements	Many federal, state, and local permits required, but known process. Need to modify internal DROP policy	No permits. Modifying DROP would enable us to access allocation under wider range of conditions	No permits, but new Agreements needed with Cary, Apex, and City of Durham (to wheel water)	Other Partners would follow same permit process as Alternative 1
Partnerships and Local Control	Requires partnership with other members of WIP (currently City of Durham, Town of Pittsboro, Chatham County)	Requires continued partnerships and mutual aid agreements with Town of Cary and City of Durham	Requires continued partnership with Town of Cary and City of Durham	Requires partnership with other members of WIP
Cost	High capital cost, but acceptable NPC per gallon of yield and gallon supplied (Note: high capital cost provides redundancy to WTP)	No capital cost; pay Cary lowest single family residential rate /1000 gallons	Unknown.	Unknown. Would need to be lower than Alternative 1 or OWASA would not participate in this manner

Supply: Quarry Reservoir Alternatives

Two Quarry Reservoir supply alternatives were evaluated; more details are provided in Attachment 4:

- Alternative 5 – Shallow Quarry – access with existing pumping infrastructure. This is the alternative selected in the 2010 LRWSP and considered the future baseline alternative. This alternative requires minimal capital investment, and the additional supply in this alternative is included in our estimated future yield. Staff recommend that we continue to move forward with this option.
- Alternative 5 – Deep Quarry – deeper quarry depths would be accessed with new pumping infrastructure. This option has high capital cost, particularly when evaluated against the marginal additional supply it provides over the shallow option. One option we had Hazen evaluate was whether it is potentially feasible to access the deep Quarry Reservoir on a temporary basis during an extended drought. A high-level analysis indicates that this is potentially feasible and would not require high levels of capital expense to access the deep quarry storage on a limited basis. Further investigation in partnership with Martin Marietta is needed to determine if this is feasible operationally over the long-term. Staff recommends that we no longer evaluate accessing deep storage on a permanent basis, but that we do work with Martin Marietta to identify measures that would be needed to potentially access the storage on a temporary basis during droughts.

Table 2 summarizes the two Quarry Reservoir alternatives; a more detailed table is found in Attachment 4, Appendix 2.

Table 2: Comparison of Quarry Reservoir Supply Alternatives

	Alt 5: Shallow Quarry	Alt 6: Deep Quarry
Impact on Yield, Diversity of Supply, and Resilience	2.1 mgd (accounted for future yield). Does not meet 90th percentile 2070 raw water needs and does not improve diversity of OWASA water supply	3.4 mgd; does not improve diversity of OWASA water supply
Legality, Policy, and Permit Requirements	Will require some permits, but familiar process	Will require some permits, but familiar process
Partnerships and Local Control	OWASA has full control over alternative	OWASA has full control over alternative
Cost	Low capital cost and NPC	High capital cost and NPC, particularly in terms of additional yield provided

Supply: Indirect and Direct Potable Reuse Alternatives

OWASA evaluated the use of reclaimed water (RCW) for drinking (potable) water uses. As used in our LRWSP, indirect potable reuse (IPR) involves mixing RCW in an environmental buffer prior to being treated at the Jones Ferry Road WTP; direct potable reuse (DPR) involves further treating the reclaimed water at the Mason Farm WWTP and then pumping it directly into our water distribution system. Potable reuse alternatives evaluated are summarized below; more details are provided in Attachment 4:

- **Alternative 7a: IPR with Pretreatment Mixing Basin near Quarry Reservoir** – this alternative was developed to meet the requirements of a general statute which allows for indirect potable reuse. Reclaimed water from the Mason Farm WWTP would be pumped to a new pretreatment mixing basin near the Quarry Reservoir. This water would be mixed with water from Cane Creek Reservoir in accordance with the statute. The capital cost of this option is higher than the capital cost of the Jordan Lake alternatives; there is also an unknown permit process associated with this alternative. Staff recommend that we do not evaluate this alternative further.
- **Alternative 7b: IPR with Return to Quarry Reservoir** – This alternative is similar to Alternative 7a, but water from the Mason Farm WWTP is pumped to the Quarry Reservoir. This alternative may not meet the requirements of the general statute and would require an arduous permit process. This cost of this alternative is higher than the Jordan Lake alternatives. Staff recommend that we do not evaluate this option further.
- **Alternative 8: IPR with Return to University Lake** – Reclaimed water from the Mason Farm WWTP is returned to University Lake. This alternative is not currently legal in North Carolina. This alternative was deemed early on to be less feasible than Alternatives 7a and 7b and was not fully evaluated. Staff recommend that we do not evaluate further for this update to the LRWSP, but it may be an option that is further evaluated in future updates of the Plan.
- **Alternative 9: DPR** – two methods of treating the reclaimed water were identified: (1) use of carbon (generally preferred since typically lower capital and operating/maintenance costs) and (2) reverse osmosis – may be required to removed total dissolved solids. This option is not currently legal in North Carolina. However, it is the only option other than Alternative 1 that provides redundancy to our treatment plant. While it has high capital costs associated with it; its levelized costs are more reasonable. Staff recommend that we do not evaluate this alternative further for this LRWSP, but should continue to evaluate it in future updates of the Plan.

Table 3 summarizes these alternatives; a more detailed table in provided in Attachment 4, Appendix 2.

Table 3: Comparison of Indirect and Direct Potable Reuse Alternatives

	Alt 7a: IPR with Return to Pretreatment Mixing Basin	Alt 7b: IPR with Return to Quarry Reservoir	Alt 8: IPR with Return to University Lake	Alt 9: DPR
Impact on Yield, Diversity of Supply, and Resilience	Need to verify potential 4 mgd through modeling; improves diversity of our water supply	Need to verify potential 4 mgd through modeling; improves diversity of our water supply	Need to verify potential 4 mgd through modeling; improves diversity of our water supply	4 mgd; improves diversity of our water supply. Also provides redundancy to our WTP
Legality, Policy, and Permit Requirements	Probably legal, but WS-II watershed makes questionable; permit process not yet done in NC	May not be legal given WS-II designation and existing use of QR as water supply; permit process not yet done in NC	Not currently legal in NC	Not currently legal in NC
Partnerships and Local Control	OWASA has full control over alternative	OWASA has full control over alternative	OWASA has full control over alternative	OWASA has full control over alternative
Cost	Very high capital and NPC; high cost per gallons use and gallons yield supplied	Very high capital and NPC; high cost per gallons use and gallons yield supplied	Not calculated. Based on historic data, water goes over University Lake Dam approximately 1/3 of time so option would not be used approx. 1/3 of the time	High capital cost, but acceptable NPC and NPC per gallons of water used and gallons yield supplied. High capital cost also provide redundancy to our WTP

Demand Management: Reclaimed Water Alternatives

After years of collaboration, UNC began using reclaimed water in 2009. Ten years later, UNC's use of reclaimed water reduced potable water demand by over 9 percent, with a daily average of 0.72 mgd. Increasing the use of reclaimed water (either produced by OWASA at the Mason Farm Wastewater Treatment Plant or on-site) would effectively decrease the demand of potable water. Through research and an extensive stakeholder engagement process, OWASA staff identified three potentially viable strategies to evaluate as part of the LRWSP. These three alternatives are summarized below. (At the September 12, 2019 meeting, the OWASA Board received and discussed the process used to identify viable demand management alternatives.)

- **Alternative 10: Reclaimed Water to UNC Cogeneration Facilities** – Although the Cogeneration facility represents the single largest current use of potable water on UNC-CH's campus, we do not recommend that this alternative be evaluated further due to the technical challenges (and costs) associated with this strategy, as well as UNC's concerns regarding water quality.

- **Alternative 11: Expanded Reclaimed Water Use at UNC Main Campus –** This alternative would not save enough water to make it worthwhile for OWASA to invest capital funds to extend the line**.** As is our current practice, we recommend that we continue to work with UNC to identify opportunities for increasing use of RCW when it is in the best interest of UNC, as well as OWASA.

- **Alternative 12: Onsite Wastewater Treatment and Reuse** – Without specific development(s) partners in this alternative, it would be difficult to pursue. Moreover, the cost to incentivize this offer would not be a cost-effective strategy, nor would it provide enough water savings to significantly delay a supply side strategy. We recommend that we do not actively pursue this option, but we would support it if a developer expressed interest.

Table 4: Reclaimed Water Alternatives

	Alt 10: RCW to UNC Cogeneration Facilities	Alt 11: Expand RCW Use at UNC Main Campus	Alt 12: Onsite Wastewater Treatment and Reuse
Estimated Water Saved	0.21 mgd	0.055 mgd	0.15 mgd
Legality, Policy, and Permit Requirements	UNC would need to modify its permit and does not support this option	UNC would need to modify its RCW permit for new uses of RCW such as toilet flushing in dormatories	Legal, but may be issues with review and approval of plans at local level
Partnerships and Local Control	UNC has concerns that RCW will cause corrosion and scaling, waste stream disposal concerns, and space constraints	Ongoing partnership with UNC	Partnership with development community and local governments required
Cost	Very high cost per gallon of water saved	Capital cost reasonable, but very high life cycle cost per gallon saved	High capital and life cycle costs per gallon saved

Demand Management: Robust Water Efficiency Program

Based on research and stakeholder engagement, OWASA staff identified a series of programmatic demand management strategies that, collectively, had potential to reduce water demand to a degree that could delay or prevent the need for additional supply. Although envisioned as one collective program, OWASA staff evaluated each strategy individually to assess its potential impact on demand and cost-effectiveness.

The following summarizes staff's recommendation regarding each individual strategy, as well as the collective suite:

- **Alternative 13a: Unit Submetering and WaterSense Installation –** Multi-family development is projected to be a significant area of water use growth in our area, and sub-metering will help to ensure that the users of water within those developments are aware. Based on our research, many new developments are already installing sub-meters, and so this requirement would only influence a small subset of new development. Given that, it is not recommended as a long-range water supply strategy, but rather as a consideration in a more general water conservation program.
- **Alternative 13b: Water Efficiency Design Assistance and Conservation-Oriented System Development Fee** – Rather than a regulatory requirement, this alternative would act more as a customer service enhancement to encourage more efficient development. Given the relative minor impact on daily water use and uncertainty regarding uptake, we recommend that this strategy be considered as part of a larger water conservation program, but not the Long-Range Water Supply Plan.
- **Alternative 13c: On-bill Financing for Water Efficient Fixtures –** Given that through natural matriculation, there are minimal opportunities for water efficient upgrades, this alternative is not projected to have a significant impact on daily demand, nor is it a cost-effective strategy. We do not recommend that this alternative be considered further.
- **Alternative 13d: Minimize Need for System Flushing for Water Quality Purposes –** Given the capital costs associated with this alternative, we do not recommend proceeding with further evaluation on this alternative.

Table 5: Robust Water Efficiency Program Alternatives

	Alt 13A: Unit Submetering and Water Sense Installation	Alt 13B: Water Efficiency Design Assistance and Cons-Oriented SDF	Alt 13C: On-bill Financing for Water Efficient Fixtures	Alt 13D: Minimize Need for System Flushing
Estimated Water Saved	0.17 mgd	0.23 mgd	0.026 mgd	0.05 mgd
Legality, Policy, and Permit Requirements	Legal concerns on whether OWASA or Towns can require WaterSense technology	Likely legal; need to consider our cost-of-service requirement if modify SDF	Likely legal; need research into legal authority to offer tariff-based program where debt stays with premise and not tenant	No legal or permitting concerns
Partnerships and Local Control	Partnership with local governments	Partnership with development community	OWASA has full control over this alternative	OWASA has full control over this alternative
Cost	No capital cost; fairly cost effective cost per gallon saved	No capital cost; fairly cost effective cost per gallon saved	Very high life cycle cost per gallon of water saved	Very high capital and life cycle cost per gallon of water saved

Collectively, this suite of strategies would reduce average day demands by about 0.5 MGD in 2070. As ongoing programs, they would require operating budget to support and maintain. Because many of these alternatives address new development, the longer that we wait to enact these programs, the less potential water savings are available.

In sum, there is no individual or collective group of demand management strategies that, if pursued further, would prevent the need for additional supply in the long-run. In other words, given the existing water stewardship of our area, demand management will not meet the long-range water supply needs in the future. The community has made significant investment and commitment to water efficiency and those rewards are being realized today in granting us the time to strategically consider additional supply options.

Based on our analysis and engagement with the community, we recommend that demand management through water conservation, water efficiency, and reclaimed water use remain a key value of the organization and that we commit to analyze strategies as they avail themselves. We recommend that water stewardship be a key message in our community engagement and affordability outreach efforts.

We propose that OWASA's past, current, and planned efforts be summarized in a Water Conservation Plan that will serve as an Appendix to the Long-Range Water Supply Plan. Those

alternatives that were identified to be cost-effective (Alternatives 13a and 13b) will be considered in this Plan for the Board and community's future consideration.

OWASA's Risk of Mandatory Water Restrictions with Current Planned and Additional Supply

OWASA's Water Shortage Response Plan (WSRP) includes triggers based on the water supply storage (percent full of reservoir system) and water demand conditions. Each response stage has a corresponding set of voluntary or mandatory water use restrictions, and water rate surcharges apply when specified triggers are reached. An advisory does not result in mandatory water use restrictions or surcharges; voluntary conservation only occurs during an advisory. Drought surcharges begin to apply at water shortage stage 1 and they become higher with each subsequent water shortage stage; thus water shortages impact the affordability of OWASA's water. Appendix 1 in Attachment 5 contains additional details on OWASA's drought surcharges and the restrictions at each water shortage level.

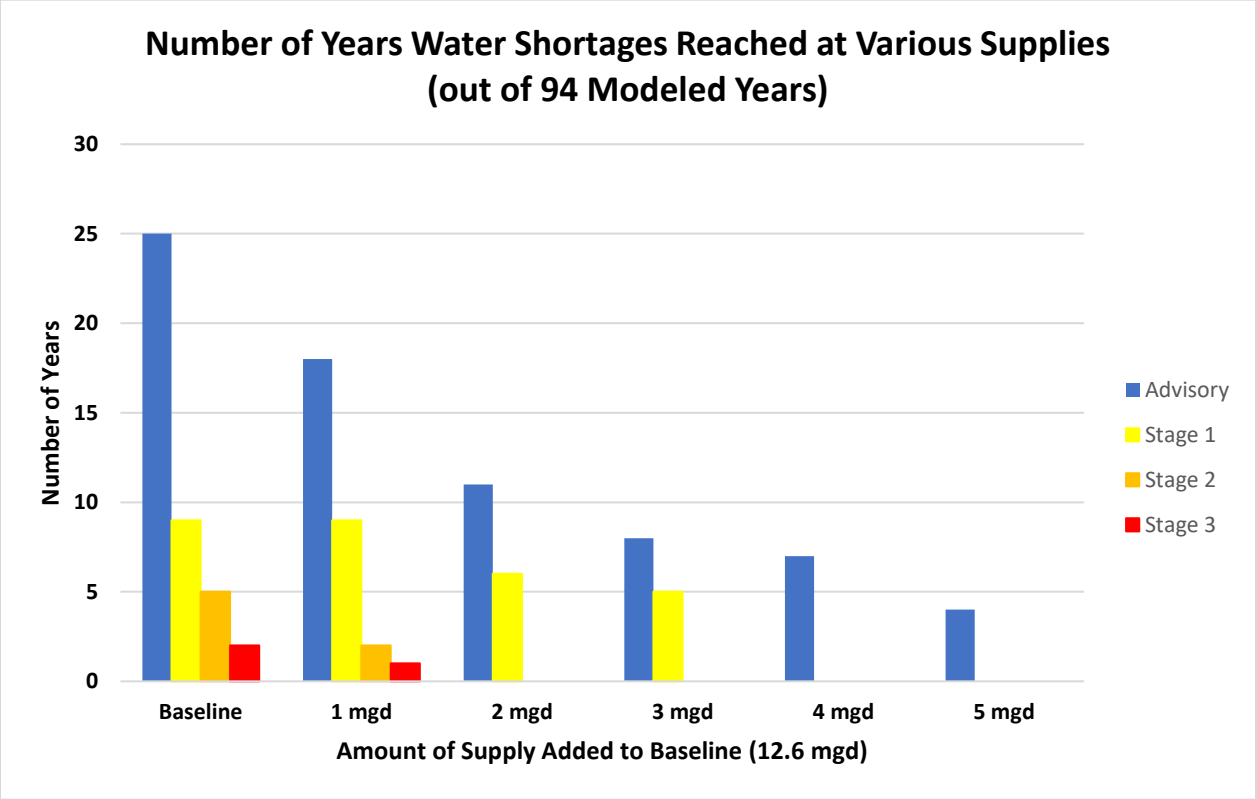
Entering into stages of drought have an impact on economic viability and service affordability. The potential economic impact of water use restrictions and drought surcharges should be carefully weighed against the capital cost of increased water supply.

To evaluate how different levels of new supply would impact OWASA's long-term risk of hitting various water shortage stages, Hazen and Sawyer ran OWASA's reservoir optimization model at 2070 demands and with adding 1, 2, 3, 4, and 5 mgd of supply. All model runs included the following assumptions:

- Run over the hydrologic period of record included in the model (1926-2019); if future hydrologic patterns change significantly from those in the model, the system performance will deviate from the results presented in this section.
- Assumes that our WSRP applies and certain reductions in raw water demand are achieved at each water shortage stage.
- Assumes 2070 Baseline Water Demands (12 mgd).
- Assumes OWASA moves forward with the shallow Quarry Reservoir option.

Figure 3 summarizes the results.

Figure 3: Modeling Results Showing Frequency of Years Different Water Shortage Stages Reached in 2070 with Different Levels of Additional Supply



The results indicate that when 4 mgd of additional supply is added to our planned supplies at baseline 2070 demands, we never experience a stage 1 water shortage where mandatory restrictions and drought surcharges would apply. Thus, adding 4 to 5 mgd may result in greater capital spending than warranted. Depending on the Board's comfort with the modeling assumptions, and the frequency of water shortages, the Board could consider lower thresholds of additional supply, which would reduce the capital expenses on some of the alternatives. The greatest potential impact of this would be on the Jordan Lake alternatives that include the new intake and WTP on the western side of Jordan Lake. However, it should also be noted that other Partners in the western intake and WTP could also be evaluating the amount of capacity they need in the new plant and intake which will impact the cost of those alternatives. Modifying the amount supplied would have minimal impact on the deep Quarry Reservoir alternative and the indirect potable reuse options, which were sized to meet the requirements of current legislation.

Staff Recommendation and Action Needed:

Staff recommends the following:

- We move forward with the process to modify the DROP to allow for earlier access to Jordan Lake and increase near-term water supply resiliency and the viability of any Jordan Lake alternative.

- For this update to the LRWSP, we further consider alternatives to access our allocation of water from Jordan Lake; following community engagement, the final LRWSP identifying the preferred alternative to access the allocation should be presented to the Board for review and approval.
- As part of a Water Conservation Plan that would be an appendix to the LRWSP, we further consider cost-effective demand management strategies as part of a robust water efficiency program.

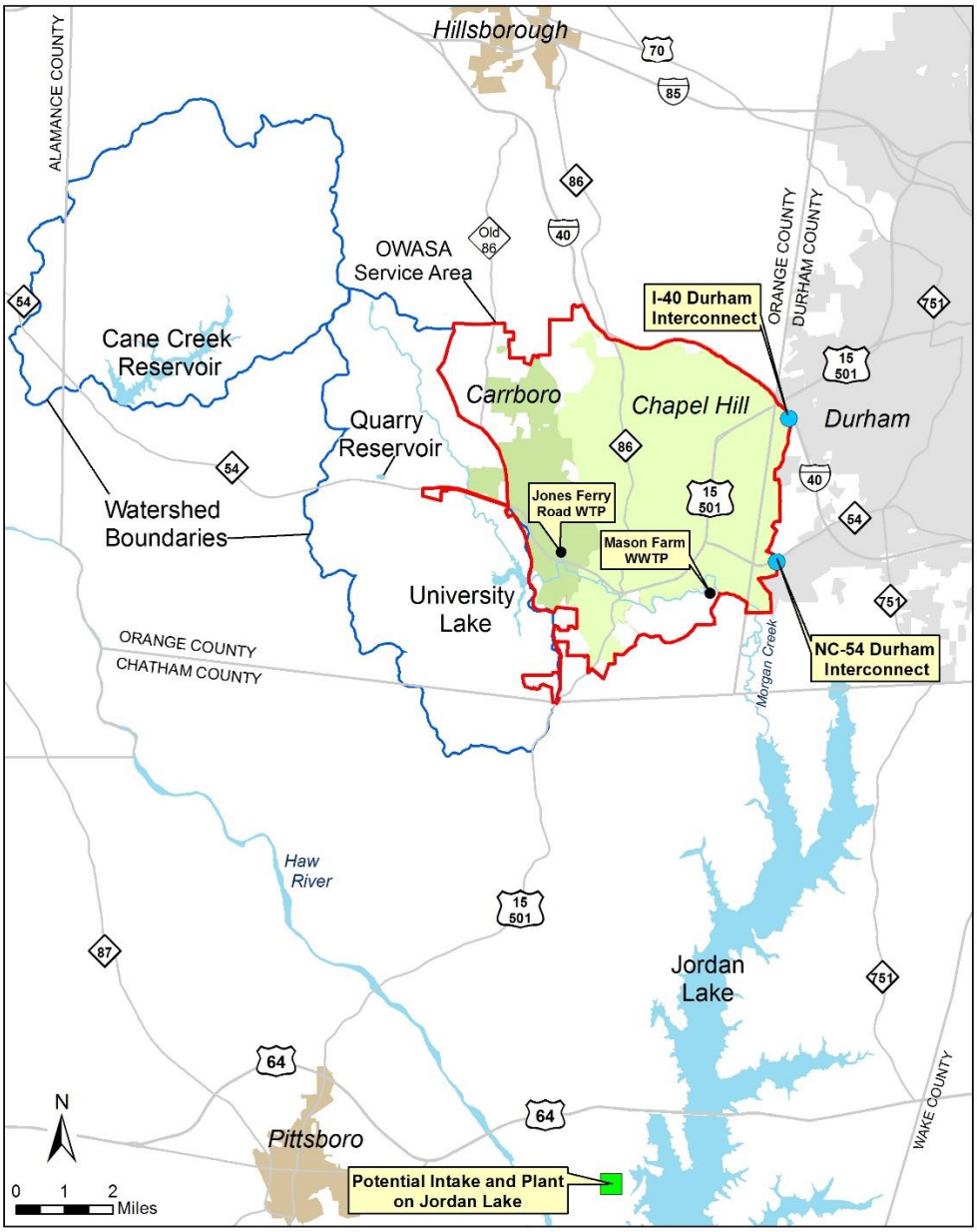
If the Board concurs with these recommendations, staff envisions the following next steps:

- Develop method to remove the limitations in DROP and incorporate DROP into the Water Shortage Response Plan and provide that information to the Board at a future date;
- Develop a community engagement strategy to obtain feedback from key stakeholders on the alternatives analysis, obtain feedback on the use of Jordan Lake as a water supply, and obtain feedback on proposed modifications to the DROP; and
- Identify dates to discuss the proposed method to modify DROP and the community engagement strategy with the Board on the 12-month calendar.

Attachment 3: Background on OWASA's Water Supplies

OWASA's existing water supply sources include Cane Creek Reservoir, University Lake, and the Quarry Reservoir. In addition, OWASA has an allocation of water from Jordan Lake, which it can access through its mutual aid agreements with the Town of Cary and City of Durham. Figure 1 illustrates the location of these water supply sources along with the location of our Jones Ferry Road Water Treatment Plant (WTP) and Mason Farm Wastewater Treatment Plant (WWTP). The treatment plants are referenced in several of the alternatives included in this agenda package.

Figure 1: OWASA Water Supply Sources



Water from Cane Creek Reservoir can be pumped directly to the WTP or to the Quarry Reservoir where it is stored for later use. Water from University Lake can be pumped to the WTP. Water from the Quarry Reservoir can be pumped to the WTP or into Phils Creek, which is near the Quarry Reservoir and flows to University Lake.

Cane Creek Reservoir

Cane Creek Reservoir was created by OWASA and filled in 1989. It stores approximately 3 billion gallons of water from its 32 square mile watershed.

University Lake

University Lake was created by the University of North Carolina in 1932. The Lake is still owned by UNC and leased to OWASA. It stores approximately 450 million gallons of water from its 30 square mile watershed.

Quarry Reservoir

The existing Quarry Reservoir was acquired in 1979 to supplement our water supply during operational emergencies and droughts. The Quarry Reservoir holds approximately 200 million gallons of water. It has little watershed and thus may need to be filled with water from Cane Creek Reservoir after extended use. OWASA purchased additional land around the existing Quarry Reservoir in 2000, which it leases to American Stone/Martin Marietta for royalty payments. Approvals were obtained in 2001 to expand American Stone/Martin Marietta's quarrying operations in the direction of OWASA's Quarry Reservoir. Mining operations must cease by December 31, 2030; the final stage of the mining operation will be to connect OWASA's existing Quarry Reservoir with the much larger quarry pit that will exist in 2030. OWASA's land around the existing Quarry Reservoir and the active mining operation are shown in Figure 2.

Figure 2: Existing Quarry Reservoir and Active Quarry Operation



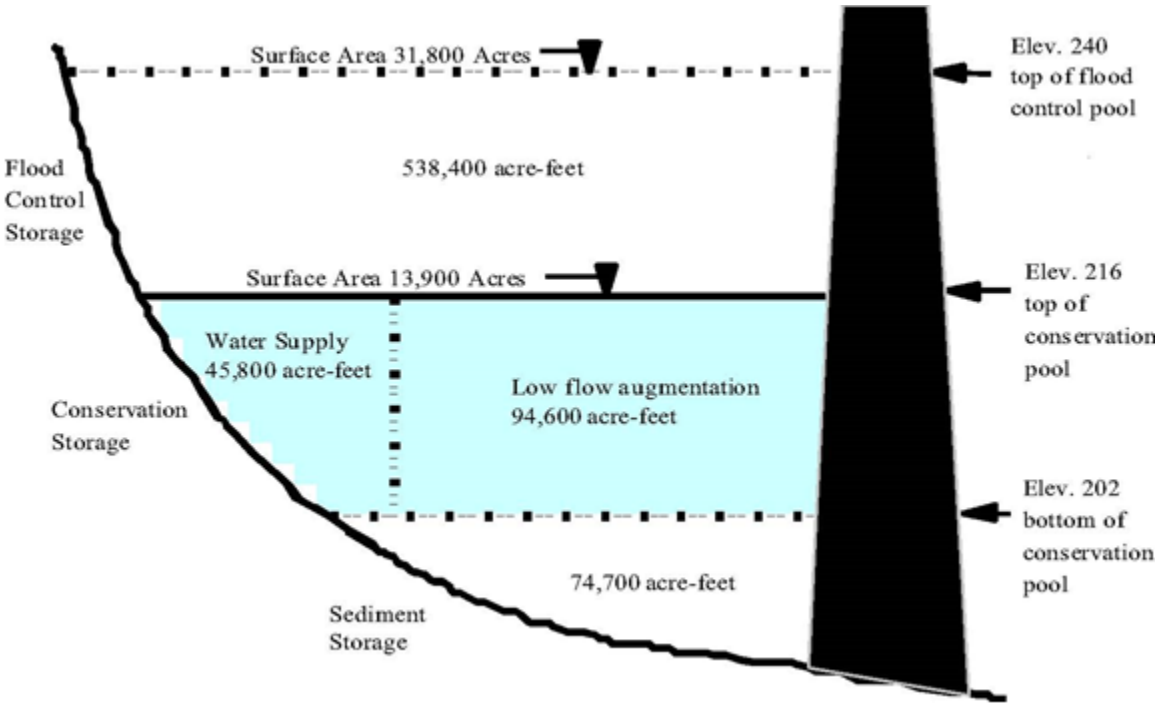
Jordan Lake

Jordan Lake is a federally constructed and owned multi-purpose reservoir filled in 1982 and operated by the US Army Corps of Engineers for flood control, water supply, recreation, and downstream water quality. The lake's storage volume is divided into operational pools to meet the various functions of the reservoir as illustrated in Figure 3. The water supply pool stores approximately 45,800 acre-feet (approx. 15 billion gallons) of water when full.

The State of North Carolina has been assigned the entire water supply pool and is authorized by state law to allocate the water supply storage to local governments. The State estimates that each percentage of water supply volume is equivalent to approximately 1 million gallons per day (mgd) of water. OWASA holds an allocation of 5 percent of the water supply pool and can therefore obtain approximately 5 mgd of water from this allocation.

The first round of allocations was made in 1988, and a total of four rounds of allocations have occurred. At this time, 91.2 percent of the water supply pool has been allocated. A fifth round of allocations would occur upon request of an allocation application from a local government in accordance with 15A NCAC 02G .0500.

Figure 3: Jordan Lake Operational Pools



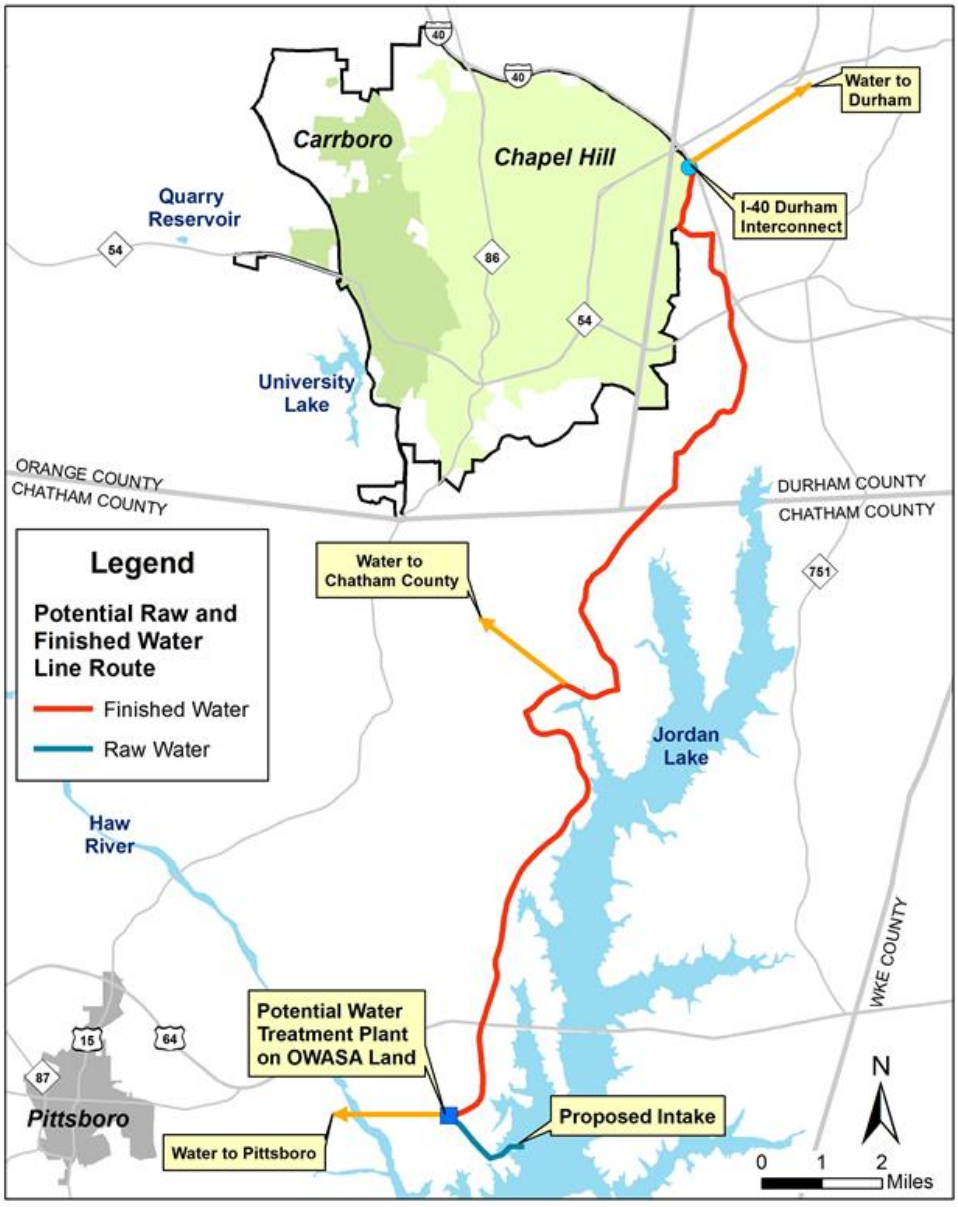
The Towns of Cary and Apex own and operate the only water supply intake on Jordan Lake. OWASA can purchase drinking water from Cary and Apex using its allocation and mutual aid agreements. If the Towns have adequate water to meet their own needs, they will send it to OWASA through interconnections between the Town of Cary and City of Durham. The City of Durham would then transfer the water to OWASA through its interconnections with us at I-40 and/or Highway 54 as shown on Figure 1.

OWASA's Drought Response Operating Protocol (DROP) places locally-imposed constraints on our ability to use water from Jordan Lake. This policy states that OWASA cannot access its Jordan Lake allocation until we have hit the line for a Stage 1 water shortage as outlined in our Water Shortage Response Plan. If OWASA could proactively use its Jordan Lake allocation during non-peak demand periods when other utilities may not need to access their Jordan Lake allocations through the Cary/Apex water supply system, we would reduce our risk of facing water shortages through our mutual aid agreements. The DROP also restricts when we could obtain water from Jordan Lake even if we had ownership in a proposed new intake and WTP on the lake.

Attachment 4: Evaluation of Supply and Demand Management Alternatives

Alternative 1: Jordan Lake – Full Partner in New Intake and WTP on Western Side of Jordan Lake

Under this alternative, OWASA would access its Jordan Lake allocation by partnering with the City of Durham, Town of Pittsboro, and Chatham County on a new water supply intake, water treatment plant, and major transmission mains on the western side of Jordan Lake. Hazen completed a study entitled "Jordan Lake Partnership Western Intake Feasibility Study" in 2014 that serves as the basis for this alternative. Hazen provided updated costs from that study for this analysis. The following map illustrates this alternative.



How much water does this alternative provide?

As summarized in other alternatives concerning Jordan Lake, OWASA's allocation provides a yield of approximately 5 mgd. This alternative assumes that OWASA would invest in an initial 2 mgd of capacity in the plant and 5 mgd when it was expanded in approximately 2060. By being a full partner in a new intake and water treatment plant (WTP), we would have a very high level of assurance that we could access our allocation whenever it is needed, at an amount generally proportionate to the level of our investment in the new facilities at Jordan Lake.

What are the environmental impacts of this alternative?

A new water supply intake, water treatment plant, and drinking water conveyance facilities would be constructed under this alternative. Since this alternative includes constructing a new intake in a lake and the associated pipeline will need to cross several streams, it will impact wetlands and streams. Given the long pipeline, this alternative also has the potential to impact important wildlife habitat areas. All impacts would be mitigated in accordance with federal and state requirements. It should be noted that the intake, plant, and majority of transmission lines are shared with the other partners. Thus, these environmental impacts would occur regardless of OWASA's participation in the project.

As with any of our alternatives, there would also be increased energy use associated with treatment and conveyance; due to the long transport distances and advanced treatment processes involved, these energy costs would be higher than for most other alternatives.

What are the social impacts of this alternative?

Constructing the WTP and transmission lines would temporarily impact neighboring landowners with noise, traffic, and dust; public lands owned by the North Carolina Wildlife Resources Commission and the US Army Corps of Engineers would also be impacted. Given the length of the drinking water main, this alternative would impact a number of property owners; again these impacts will likely occur even if OWASA did not participate in the western intake and plant since the majority of the pipeline would be shared with the City of Durham under this alternative.

This alternative ensures permanent access to our Jordan Lake allocation, and provides a high level of reliability and resiliency to extended drought or to any operational emergency that could cause one of our reservoirs to be offline. It reduces the risk, severity and duration of future water shortages and use restrictions we might impose on our customers; however, the high cost we incur to implement this alternative would require a significant increase in our customers' water bills.

What permits, regulations, or partnerships are needed for this alternative?

OWASA would partner with City of Durham, Town of Pittsboro, and Chatham County on this alternative and would not have full control of this alternative. An interlocal agreement (ILA) exists between these entities that outlines cost sharing for doing preliminary permitting and

determining a governance structure. The partners have selected HDR Engineering to manage these early activities. The ILA specifies that each partner can choose to participate or not in each individual study; the ILA also outlines how a partner can make up the costs should it choose to participate at a later date. A new ILA would be needed for construction of the facilities.

Many permits would be needed to implement this alternative. Major permits include:

- Easement from US Army Corps of Engineers to access Jordan Lake across their land
- Environmental assessment or environmental impact statement that complies with the National Environmental Policy Act (NEPA) and the North Carolina Environmental Policy Act (SEPA)
- USACE Section 401/404 permits for impacts to streams and wetlands
- Erosion and sediment control permits
- Stormwater permits
- Encroachment agreements with NCDOT and potentially others
- State permits for the construction and operation of the intake, treatment plant, and associated pipelines
- Other local permits

Are there any technical considerations with this alternative?

While Jordan Lake meets water quality criteria for drinking water supplies, it is impaired due to nutrient loading in the watershed. The proposed water treatment plant is assumed to include advanced drinking water treatment processes to help improve taste and odor, reduce disinfection by-products, and remove algal toxins and some emerging contaminants of concern.

Are there other uncertainties or risks associated with this alternative?

One of the uncertainties of this alternative regards the governance of an intake and treatment plant shared by multiple entities. The governance structure could be as simple as an interlocal agreement, but could also result in a new entity, such as a new water authority. This is an early study identified by the City of Durham, Town of Pittsboro, Chatham County, and OWASA that is needed to move this partnership forward.

The costs estimated to evaluate this alternative assumes that each of the Partners participates at the flows identified in the 2014 study by Hazen. If any Partners modified their flow capacity in the plant and related facilities, the cost estimates would change; if other Partners reduced their capacity requirements and buy-in levels, OWASA's cost share would be proportionately higher. Conversely, if they increased their flows and buy-in levels, OWASA's cost share would likely be lower due to economies of scale for this project.

OWASA has one WTP, which is a single point of failure. While the risk of it needing to be offline for an extended period is low, this alternative provides increased reliability and redundancy for OWASA's treatment processes. It also provides additional water treatment capacity.

A new intake and regional WTP on the west side of Jordan Lake will also help reduce regional risk to extended drought or operational emergencies. There is currently only one intake on Jordan Lake and therefore access to Jordan Lake currently has a single point of failure. A second intake and plant would help assure regional reliability and resilience.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Yield of Project (OWASA only)	2 mgd initially; 5 mgd in approx. 2060
2020 Capital Cost Estimate	$21.5 million (based on 2 mgd plant capacity and 5 mgd intake and piping capacity) $37.0 M (for full 5 mgd)
2020 Cost per GPD of Additional Yield	$10.76 /gpd of yield (based on 2 mgd) $7.41 /gpd of yield (based on 5 mgd)
Net Present Cost of Alternative (Assumes Construction begins in 2027 and implementation in 2029)	$33.9 million (includes full capacity of 5 mgd)
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$0.65 /1,000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$2.51 /1,000 gallons actually supplied

What is the timing of this alternative?

For cost purposes, it is assumed that construction would begin on this alternative in 2027, and the alternative would be available for use in 2031. Realistically, it may be further into the future before this alternative is available.

Alternative 2: Jordan Lake – Continue with Mutual Aid Agreements

Under this alternative, OWASA would access its Jordan Lake allocation as it currently can through its mutual aid agreements. The Towns of Apex and Cary jointly own the only water supply intake on Jordan Lake; they would treat the water at their water treatment plant (WTP) and send the water through Cary's interconnections with the City of Durham, and Durham would then send the water to OWASA through our interconnections.

How much water does this alternative provide?

OWASA's allocation of water is 5 percent of the water supply pool, which is estimated to provide approximately 5 mgd of water. Under our mutual aid agreements, the Town of Cary would only provide water to us if it did not interfere with their ability to meet their own customer needs. If we were in a regional drought, and other utilities needed water more than OWASA, the Town of Cary would likely opt to give higher priority to these other utilities.

What are the environmental impacts of this alternative?

No new infrastructure is needed for this alternative, therefore, the only expected environmental impact is the incremental increase in energy use (and associated carbon footprint) associated with pumping water from the Town of Cary to OWASA, which would partially be offset by reductions in pumping and production from our own system.

What are the social impacts of this alternative?

Since there is no construction needed, there are no impacts to private property, traffic, noise, or recreation areas. This alternative does not increase the diversity, reliability or resiliency of our raw water supplies as this is our existing condition, and it does not guarantee access to our Jordan Lake allocation. Therefore, it has the potential for our customers to face more frequent mandatory restrictions and the associated impact on affordability related to surcharges during extended drought.

What permits, regulations, or partnerships are needed for this alternative?

No state or federal permits or legislation changes are needed for this alternative. This alternative requires partnership with neighboring utilities, and OWASA has little control in this alternative.

Are there any technical considerations with this alternative?

As referenced above, a key technical consideration is that the capacity of the Cary - Durham interconnection is likely to limit the amount of water we can obtain from Jordan Lake during a major extended drought that also affects Durham and other nearby utilities. The capacity of the Cary-Apex WTP could also impact our ability to receive water in the future.

Are there other uncertainties or risks associated with this alternative?

A key risk is that during a severe drought, we may not be able to obtain the amount of water we need when we need it because of the limited capacity of this regional interconnection. The short-

term risk of this is low, but the long-term risk could potentially be high. This alternative does not improve the diversity of OWASA's water supply sources if we cannot access Jordan Lake when needed.

The other risk associated with this alternative is that during future rounds of allocating water storage from Jordan Lake, OWASA has a higher risk of having their allocation reduced or rescinded if we have not used the allocation or provided funding to guarantee access to the allocation.

What is the cost to implement this alternative?

There are no capital costs associated with this alternative. Operating and maintenance costs include: (a) the costs to operate and maintain our water system interconnections, (b) the charges we must pay to Cary to withdraw, treat, and pump our Jordan Lake water; and (c) the charges we must pay Durham for transferring that water to us through its system. Our mutual aid agreement with the Town of Cary summarizes that we would pay the Town of Cary at a rate equivalent to their lowest tier single family residential rate (currently $4.74 per thousand gallons).

What is the timing of this alternative?

This alternative is how OWASA currently operates. Improvements could be made to it by updating the Drought Response Operating Protocol at the direction of the Board.

Alternative 3: Jordan Lake – Develop New Agreement with Towns of Cary and Apex to Guarantee Access to Jordan Lake Water

OWASA would develop a new agreement with the Towns of Cary and Apex to guarantee withdrawal and treatment of a certain amount of water from Jordan Lake on an annual basis in return for payment from OWASA. Cary/Apex would not need to meet that guaranteed amount on a daily basis; rather, water could be provided at a higher daily rate when demands on the Cary/Apex Water Treatment Plant (WTP) are low. As in Alternative 2, this alternative would convey water from Cary through the Durham water system and to OWASA through existing interconnections. OWASA would also develop an agreement with Durham which would outline how we would compensate them for allowing our Jordan Lake water to be conveyed through the Durham water system.

How much water does this alternative provide?

The amount of water this alternative provides would depend on the agreed-upon guaranteed capacity. Theoretically, it could provide up to the amount approved in our Jordan Lake water allocation (~5 mgd), but the actual amount would likely be lower given capacity constraints of the existing interconnections and potentially at the Cary/Apex WTP.

What are the environmental impacts of this alternative?

No new infrastructure is needed for this alternative, therefore, the only expected environmental impact is the incremental increase in energy use (and associated carbon footprint) associated with pumping water from the Town of Cary to OWASA, which would be partially offset by reductions in pumping and production in our system. If improvements were made to interconnections, there could be other minor construction-related environmental impacts associated with this alternative.

What are the social impacts of this alternative?

Since little or no construction is assumed to be needed, this alternative would have little or no impacts to private property, traffic, noise, or recreation areas.

What permits, regulations, or partnerships are needed for this alternative?

This alternative would require partnerships with the Towns of Cary and Apex and City of Durham, and OWASA would not have full control in it. No state or federal permits or legislation changes are needed for this alternative.

Are there any technical considerations with this alternative?

Similar to Alternative 2, a key technical consideration is that the capacity of the existing Cary - Durham interconnection is likely to limit the amount of water we can obtain from Jordan Lake during a major extended drought that also affects Durham and other nearby utilities. The capacity of the Cary-Apex WTP could also impact our ability to receive water in the future.

Are there other uncertainties or risks associated with this alternative?

Interconnections of drinking water systems and mutual aid agreements among water utilities are critically important for both planned (scheduled system maintenance) and unplanned events (severe droughts or operational emergencies). OWASA and the Town of Cary and City of Durham have been trusted partners in mutual aid agreements for many years. While our existing mutual aid agreements have not "guaranteed" assistance under all circumstances, we know we can count on the Town of Cary and City of Durham for assistance when needed.

In recognizing that our Triangle area water utilities are more interconnected than ever before, the Town of Cary wishes to operate within the provisions of existing mutual aid agreements as opposed to adopting a "guaranteed" supply option to ensure their ability to provide assistance to OWASA and other area utilities as circumstances may dictate.

Thus, at this time, this alternative is not available.

What is the cost to implement this alternative?

Staff from the Towns of Cary and Apex have advised that they wish to continue to operate within the provisions of existing mutual aid agreements rather than establish new agreements which guarantee capacity. Staff did not work with those towns to develop costs for this alternative.

Alternative 4: Jordan Lake – Develop Agreement with Western Intake Partners to Guarantee Access to Jordan Lake Water

OWASA would develop an agreement with the likely partners in the proposed Jordan Lake Western Intake and Water Treatment Plant (City of Durham, Town of Pittsboro, and Chatham County). This agreement would guarantee a certain amount of water on an annual basis from the proposed facilities in return for payment from OWASA. The Western Intake Partners (WIP) would not need to meet that guaranteed amount on a daily basis; rather, water could be provided at a higher daily rate when demands on the intake, treatment plant, and related facilities are low. Existing interconnections with the City of Durham would be used to transfer the water.

How much water does this alternative provide?

The amount of water this alternative provides would depend on the agreed upon guaranteed capacity. Theoretically, it could provide up to 5 mgd based on our allocation, but could be limited to less than that depending on the available, unused capacity of the WIP's facilities.

What are the environmental impacts of this alternative?

Assuming that the WIP would develop a new intake, water treatment plant (WTP), and major regional water transmission mains regardless of whether OWASA participated, there would be no new OWASA infrastructure associated with this alternative. Therefore, the only expected environmental impact from OWASA is the incremental increase in energy use (and associated carbon footprint) associated with pumping water from the new plant to OWASA. (Note: Impacts of the overall plant and infrastructure owned by others would be similar to those under Alternative 1). If improvements were made to the interconnections between the City of Durham and OWASA, there could be other minor construction-related environmental impacts associated with this alternative.

What are the social impacts of this alternative?

Since there is no construction needed, there are no impacts to private property, traffic, noise, or recreation areas. Implementation of this alternative is expected to reduce the impacts of future droughts on OWASA customers, but it would likely result in a noticeable increase in the cost of water we provide to our customers.

What permits, regulations, or partnerships are needed for this alternative?

This alternative would require partnerships with the WIP, and OWASA would not have full control of this alternative. No state or federal permits or legislation changes are needed for this alternative.

Are there any technical considerations with this alternative?

A key technical consideration is that the capacity of the proposed intake, water plant, and/or transmission lines could limit the amount of water we could receive during a major extended

drought that impacts the region. Since OWASA would not be a full partner in this alternative, we would have less input into the design of the plant and its operation.

Are there other uncertainties or risks associated with this alternative?

This alternative does provide a permanent reduction in risk since we would be guaranteed capacity on an annual basis.

The cost of the proposed Jordan Lake West water system facilities is expected to be high for each of the WIPs. If OWASA does not participate as a full partner, it could reduce the economic feasibility of those facilities for the WIPs and increase the likelihood that they would pursue other alternatives. Staff believe that there will be a plant and intake on the west side of Jordan Lake, but there is considerable uncertainty regarding the timing, capacity, and cost of those new facilities.

What is the cost to implement this alternative?

Once the timing, scope, capacity, and costs of the new Jordan Lake West facilities are more certain, OWASA would work with the Western Intake Partners to develop a cost methodology that would be beneficial to all parties. The costs of this alternative are highly speculative at this time. The costs would need to be less than Alternative 1 (full partner in WIP) or it would not be beneficial to OWASA to pursue this option.

What is the timing of this alternative?

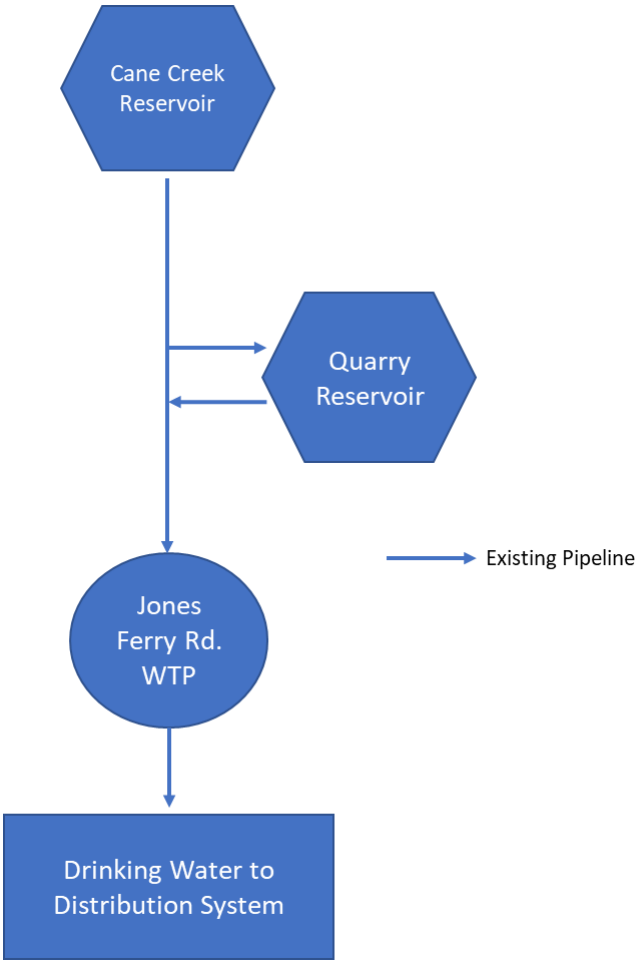
The new plant and intake is planned for the early 2030s.

Alternative 5: Shallow Quarry Reservoir

This alternative involves: (a) the cessation of rock quarrying by December 2030 at the existing American Stone Company/Martin Marietta rock quarry which is located on land owned by OWASA; (b) conversion of that quarry to a new water supply reservoir; (c) connection of the new quarry pit to the existing small Quarry Reservoir during the final stages of quarrying; (d) continued use of the existing raw water pumps and intake piping located at the Quarry Reservoir, and (e) no increase in the water transfer capacities of the pumps and pipeline we use to refill the Quarry Reservoir from Cane Creek Reservoir.

The existing pumping facilities at the Quarry Reservoir enable withdrawal of water down to a maximum depth of 100 feet.

This alternative is illustrated in the schematic below.



How much water does this alternative provide?

American Stone/Martin Marietta is contractually required to extract rock at a rate that will result in at least 2.2 billion gallons (BG) of total storage by the end of 2030. Between 1.3 and 1.9 BG of this storage could be accessed using existing Quarry Reservoir pumping facilities.

Assuming that existing pumps and transmission facilities from Cane Creek Reservoir are used to refill the Quarry Reservoir, the shallow Quarry Reservoir alternative is conservatively estimated to provide an estimated yield of 2.1 mgd, assuming the historical drought-of-record.

What are the environmental impacts of this alternative?

Since the only anticipated construction would be to install emergency generators on-site in case of power failure, the primary anticipated impact of this alternative would be the increased energy use associated with pumping.

What are the social impacts of this alternative?

The generator construction would result in some temporary impacts to traffic and noise; the generators would also create noise when exercised or run during power outages. However, those noise impacts are expected to be minimal since the generator will have sound attenuation.

What permits, regulations, or partnerships are needed for this alternative?

The Division of Water Resources may require reclassifying the Quarry Reservoir watershed as critical area. The critical area of our watersheds is defined as any area draining to the reservoir and within ½ mile of it at full pool elevation. More stringent development standards are required in the critical area. Since OWASA owns the land draining to the Quarry Reservoir (need to verify through site visit), this should be straight-forward, but would require a classification change. OWASA will perform microbial monitoring on the expanded Quarry Reservoir as soon as it is put into service; additional monitoring may be required by the North Carolina Public Water Supply Section. Orange County would also require some local construction permits for the generator including erosion and sediment control and stormwater permits.

Are there any technical considerations with this alternative?

There are potential treatability issues with the Quarry Reservoir, as it has very low suspended-solids concentrations. Some suspended solids are needed for our treatment plant coagulation and settling processes to work properly. Other potential treatment issues include the cold temperature and high alkalinity of the water. OWASA plans to blend the Quarry Reservoir water with Cane Creek Reservoir and/or University Lake water which will help address these treatment issues. OWASA also has the ability to pump water from the Quarry Reservoir to Phils Creek where it later enters University Lake and mixes there.

Our agreement with American Stone/Martin Marietta requires them to excavate a passageway between OWASA's existing Quarry Reservoir and the active quarry. OWASA could also opt to tunnel between the two pits with valves which would provide more flexibility in how the Quarry

was operated and potentially use the existing Quarry Reservoir as a pretreatment mixing basin for reclaimed water as identified in Alternative 7B. OWASA would need to cover the cost if it decided it wanted to proceed with this connection alternative.

Are there other uncertainties or risks associated with this alternative?

This alternative does increase our available water supply by increasing storage so it decreases our risk of water supply shortages. However, it does not add a new raw water supply and improve the diversity of our water supply. We could get temporary pumps to access deep storage under an extended drought to help alleviate long-term risk.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

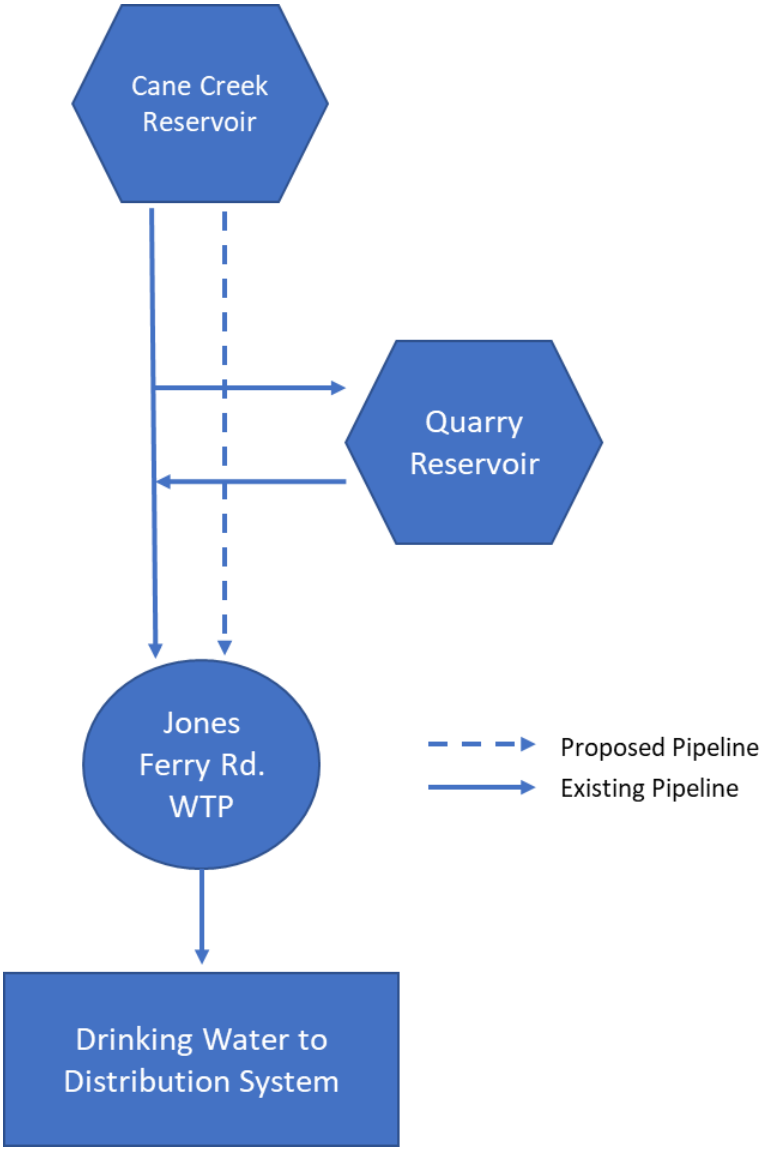
Estimated Yield of Project	2.1 mgd
2020 Capital Cost Estimate	$0.3 million
2020 Cost per GPD of Additional Yield	$0.14 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2030 and implementation in 2030)	$2.4 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$0.07 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$0.18 /1,000 gallons actually supplied

What is the timing of this alternative?

For the basis of the cost analyses, we assumed this alternative would be available for use in 2032; the Quarry Reservoir may not yet be full. We conservatively estimate the Quarry Reservoir would be full in 2035.

Alternative 6: Deep Quarry Reservoir

This alternative is similar to Alternative 5 (Shallow Quarry Reservoir), but also includes installation of: (a) a new Quarry Reservoir pump station (including standby power generation) to access water from a maximum depth of 220 feet; (b) a 30-inch parallel transmission main from Cane Creek Reservoir to the Quarry Reservoir; (c) a 24-inch parallel main from the Quarry Reservoir to the Jones Ferry Road WTP; and (d) a larger raw water pump station at Cane Creek Reservoir. The schematic below illustrates this alternative.



How much water does this alternative provide?

This alternative is conservatively estimated to provide 2.2 billion gallons of accessible storage, and an estimated yield of 3.4 mgd. The incremental increase in yield above the Shallow Quarry Reservoir is about 1.3 mgd.

What are the environmental impacts of this alternative?

This alternative would have temporary adverse environmental impacts associated with construction of the new pumping and transmission facilities. A small number of stream crossings and area of wetland disturbance would need to be mitigated; however, construction would be located along existing disturbed road right-of-way and within the fence line of OWASA's existing Quarry Reservoir and Cane Creek Reservoir. This alternative would use greater amounts of energy for pumping from deeper depths than the shallow Quarry Reservoir alternative.

What are the social impacts of this alternative?

There would be temporary construction impacts to traffic and noise. This alternative would also temporarily impact some private property parcels along the road right-of-way, as well as the Cane Creek Reservoir recreation area.

What permits, regulations, or partnerships are needed for this alternative?

The Division of Water Resources may require reclassifying the Quarry Reservoir watershed as critical area as described in the shallow Quarry Reservoir alternative. Since OWASA owns the land draining to the Quarry Reservoir (need to verify through site visit), this should be straight-forward, but would require a classification change. OWASA will perform microbial monitoring on the expanded Quarry Reservoir as soon as it is put into service; additional monitoring may be required by the North Carolina Public Water Supply Section. Orange County would also require some local construction permits including erosion and sediment control and stormwater permits.

Are there any technical considerations with this alternative?

There are potential treatability issues with the Quarry Reservoir, as it has very low suspended-solids concentrations. Some suspended solids are needed for our treatment plant coagulation and settling processes to work properly. Other potential treatment issues include the cold temperature and high alkalinity of the water. OWASA plans to blend the Quarry Reservoir water with Cane Creek Reservoir and/or University Lake water which will help address these treatment issues. OWASA also has the ability to pump water from the Quarry Reservoir to Phils Creek where it later enters University Lake and mixes there.

OWASA's agreement with Martin Marietta requires them to excavate a passageway between OWASA's existing Quarry Reservoir and the active quarry. OWASA could also opt to tunnel between the two pits and install control valves which would provide more flexibility in how the Quarry is operated and potentially allow the existing Quarry Reservoir to be used as a pretreatment mixing basin for reclaimed water as identified in Alternative 7B. OWASA would need to cover the cost if it decided it wanted to proceed with this connection alternative.

Are there other uncertainties or risks associated with this alternative?

This alternative does increase our available water supply so it decreases our risk of water supply shortages. However, it does not improve the diversity of our raw water supplies, which could make us vulnerable to extended droughts in the long-term.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Yield of Project	3.4 mgd
2020 Capital Cost Estimate	$77.3 million
2020 Cost per GPD of Additional Yield	$22.74 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2030 and implementation in 2033)	$65.5 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$1.39 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$5.01 /1,000 gallons actually supplied

To increase reliability and redundancy of our water treatment and delivery system, OWASA may choose to add the parallel piping included in these costs whether or not this alternative is pursued.

If you look at the marginal yield of this alternative (the 1.3 mgd beyond that provided by the shallow Quarry Reservoir), the net present cost is $3.08 per 1,000 gallons of additional yield as compared to $1.29 shown in the table above.

If OWASA chose to add the parallel piping outside of this project, the costs of this project would be lower and summarized in the table below. These transmission project improvements are not currently in the existing capital improvement program.

Estimated Yield of Project	3.4 mgd
2020 Capital Cost Estimate	$35.8 million
2020 Cost per GPD of Additional Yield	$10.53 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2030 and implementation in 2033)	$31.0 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$0.66 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$2.37 /1,000 gallons actually supplied

What is the timing of this alternative?

For the basis of the cost analyses, we assumed this alternative would be available for use in 2033 when construction is estimated to be complete. However, the Quarry Reservoir may not be full

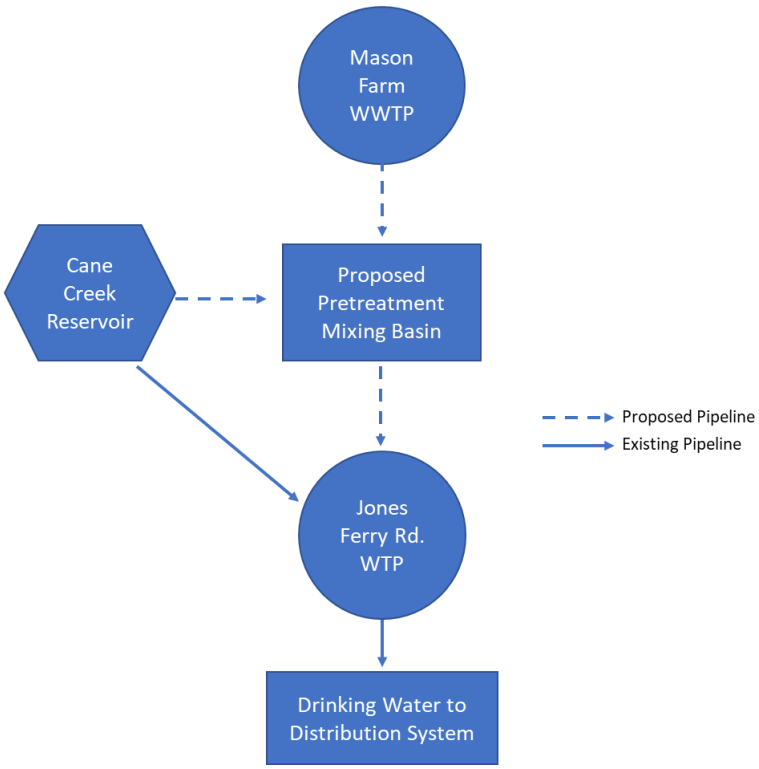
at that time, but we conservatively estimate the Quarry Reservoir would be full in 2035. The exact date will depend on weather conditions after quarrying operations cease in December 2030.

Alternative 7A: Indirect Potable Reuse with Pretreatment Mixing Basin near Quarry Reservoir

This alternative includes the planning, design, construction, and operation of facilities needed to enable highly treated reclaimed water (RCW) from OWASA's Mason Farm WWTP to be used to supplement raw water supply from water supply reservoirs in accordance with North Carolina Session Law 2014-113. Facility designs, operating arrangements, and associated costs reflect this statute, and include construction and operation of:

- Reclaimed water pumping facilities at the WWTP;
- A new pretreatment mixing basin sized to hold a minimum of 5 days storage based on the capacity of the WTP (e.g., OWASA's WTP capacity is 20 mgd, and a pretreatment mixing basin for OWASA would need to hold 100 million gallons); the law allows 20 percent of the volume of water treated to be reclaimed water;
- Pumping facilities at the pretreatment mixing basin; and
- New pipelines to convey water
    - from the WWTP to the new mixing basin assumed to be located near the Quarry Reservoir,
    - from Cane Creek Reservoir to the pretreatment mixing basin, and
    - from the pretreatment mixing basin to the Jones Ferry Road WTP

The following schematic illustrates this alternative.



How much water does this alternative provide?

Based on the statute's allowance that 20 percent of the water could be reclaimed water and our WTP capacity of 20 mgd, staff assumed this alternative would provide 4 mgd of additional water supply (20% of 20 mgd). Additional water supply in excess of 4 mgd could be available depending on the availability of RCW at the Mason Farm WWTP and the sizing of the pretreatment mixing basin. Less water could also be available based on availability of water from Cane Creek Reservoir for mixing; additional modeling would be needed to better estimate the yield of this alternative.

What are the environmental impacts of this alternative?

This alternative would result in impacts to streams and potentially wetlands associated with the pipeline infrastructure and construction of the pretreatment mixing basin described above. The pumping infrastructure would result in increased energy use and corresponding carbon emissions compared to existing conditions. The diversion of RCW from the Mason Farm WWTP to the pretreatment mixing basins would reduce surface water discharges to Morgan Creek and ultimately Jordan Lake. This would result in lower nutrient loading to Morgan Creek, but could also adversely impact the downstream habitat if discharges from the WWTP are reduced too much.

What are the social impacts of this alternative?

This alternative has several potential social impacts including:

- Potential private landowner's loss of land required for the pretreatment mixing basin if adequate space is not available on OWASA land;
- Noise and traffic impacts during construction; and
- Customer perception that indirect potable reuse will pose a threat to public health.

What permits, regulations, or partnerships are needed for this alternative?

While the general statute allows for indirect potable reuse with engineered storage and other conditions, associated regulations have not yet been developed and an indirect potable reuse system has not yet been permitted in North Carolina. One potential regulatory concern is that the proposed pretreatment mixing basin would be located in the University Lake watershed, which is classified as WS-II waters, but treated wastewater discharges are not allowed in WS-II watersheds. It is unclear if the North Carolina Division of Water Resources would use this designation to prohibit OWASA from constructing the proposed basin within the University Lake watershed, even if other regulatory requirements were met.

Prior to implementing any changes to our RCW treatment or distribution system, and/or to our intended designated uses of that water, we must apply for and receive State approval of modifications to our RCW system operating permit.

Local permits from the Town of Chapel Hill, Town of Carrboro, and Orange County would be needed for construction. These would include stormwater and erosion and sediment control.

Are there any technical considerations with this alternative?

The main technical considerations with this alternative are whether additional RCW treatment is needed prior to blending in the pretreatment mixing basin and/or whether additional treatment is needed at the Jones Ferry WTP with the use of the blended source water

Enhanced RCW treatment would be required before being allowed to blend in the mixing basin if the RCW did not meet the most stringent RCW requirements currently required by law. The Environmental Management Commission could establish more stringent RCW standards for potable reuse applications in the future. We anticipate that OWASA's RCW meets current regulations based on our monitoring data and treatment processes. However, there are two parameters with limits required under current law that OWASA does not monitor for; a 2005 study indicates that we would likely meet these limits, but additional monitoring would be required.

Treatment enhancements would be needed at the Jones Ferry WTP if the finished water produced from the use of the blended source water did not comply with all State and federal laws for the provision of safe drinking water. Treatment enhancements at the Jones Ferry WTP are not expected to be needed based on Mason Farm WWTP RCW quality, blending with conventional source water in the pretreatment mixing basin, and existing treatment barriers at the Jones Ferry WTP.

If additional treatment were needed, the capital and operating costs and environmental impacts associated with this alternative would increase.

Are there other uncertainties or risks associated with this alternative?

In the absence of regulations to accompany North Carolina Session Law 2014-113 and a lack of previously permitted indirect potable reuse facilities in North Carolina, OWASA's pursuit of this alternative would be an uncertain path.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Yield of Project	4 mgd
2020 Capital Cost Estimate	$105.9 million
2020 Cost per GPD of Additional Yield	$26.48 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2050 and implementation in 2052)	$36.9 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$1.33 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$4.12 /1,000 gallons actually supplied

What is the timing of this alternative?

For purposes of the cost analysis, we assumed that construction on this alternative would begin in 2050 and would be placed in service in 2052.

Alternative 7B: Indirect Potable Reuse with Return to Quarry Reservoir

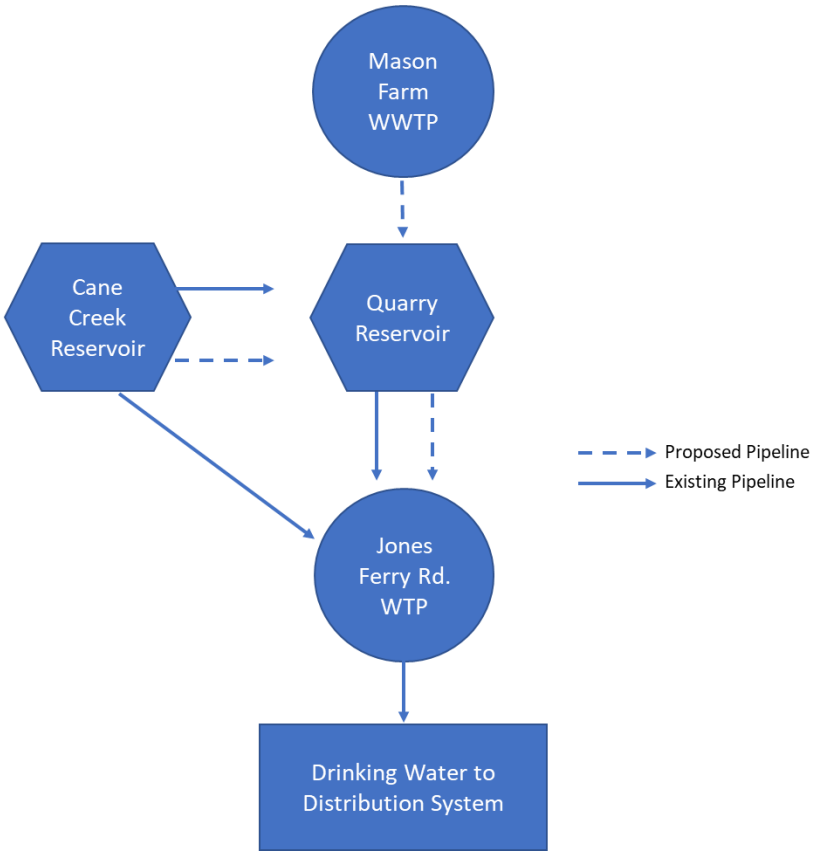
This alternative is similar to Alternative 7A, but we assume that reclaimed water (RCW) from the Mason Farm WWTP is pumped to the Quarry Reservoir for blending with surface water supplies, as opposed to a new pretreatment mixing basin. The blending of existing surface water supplies with reclaimed water in the Quarry Reservoir would allow for source water augmentation via beneficial reuse, enable reclaimed water dilution, and provide the opportunity to detect, react to, and fix any issues with Mason Farm WWTP RCW prior to its delivery to the Jones Ferry Road WTP without the need for construction of a new, large pretreatment mixing basin.

This scenario assumes construction of the following infrastructure:

1. RCW pumping facilities at the WWTP;
2. The following pipelines:
    a. From WWTP to Quarry Reservoir
    b. From Cane Creek Reservoir to Quarry Reservoir
    c. From Quarry Reservoir to Jones Ferry Road WTP
3. A new intake and pumping facility at the Quarry Reservoir
4. An isolation tunnel and valve between the existing Quarry Reservoir and the area currently being quarried
5. A pump station capacity upgrade at the Cane Creek Reservoir

The existing Quarry Reservoir is large enough to meet the requirements of North Carolina Session Law 2014-113 (i.e., five days of storage with reclaimed water being no more than 20 percent of stored volume) assuming the input of 4 mgd of reclaimed water.

The following schematic illustrates this alternative.



How much water does this alternative provide?

This alternative would provide approximately 4 mgd of additional water supply. Additional water supply in excess of 4 mgd may be made available depending on the availability of reclaimed water at the Mason Farm WWTP and the sizing of conveyance infrastructure. Less water could be available depending on the amount of water available to blend from Cane Creek Reservoir; additional modeling would be needed to verify the amount of water this alternative can provide.

What are the environmental impacts of this alternative?

This alternative would require construction of pumping facilities at the Mason Farm WWTP, intake and pumping at the Quarry Reservoir, and piping infrastructure described above. There would be some impacts to streams and wetlands, largely in road rights-of-way. The pipelines from Cane Creek Reservoir to the Quarry Reservoir and from the Quarry Reservoir to the WTP would parallel existing pipelines. Pumping would result in increased energy use and associated carbon footprint.

Additionally, the diversion of reclaimed water from the Mason Farm WWTP to Quarry Reservoir for increased withdrawals would reduce surface water discharges to Morgan Creek and ultimately to Jordan Lake. This would result in lower nutrient loading to Morgan Creek, but

could also adversely impact the downstream aquatic habitat if discharges from the WWTP are reduced too much.

What are the social impacts of this alternative?

The social impacts of this alternative would be similar to the other indirect potable reuse options and include the following:

- Noise and traffic impacts during construction;
- Impacts to property along pipeline construction corridors; and
- Customer perception that indirect potable reuse will pose a threat to public health.

What permits, regulations, or partnerships are needed for this alternative?

North Carolina General Statutes allow indirect potable reuse with engineered storage and other conditions; however, associated regulations have not yet been developed and an indirect potable reuse system has not yet been permitted in North Carolina. While the Quarry Reservoir is not specifically listed on the DWR's stream classification list, they may state that it is hydraulically connected and thus cannot be used as a pretreatment mixing basin. The University Lake watershed, which includes the Quarry Reservoir, is classified as a WS-II (water supply II), which means that it is highly protected, and wastewater discharges are not allowed. It is unclear whether DWR would use the WS-II classification to prohibit OWASA from discharging reclaimed water to the Quarry Reservoir.

Prior to implementing any changes to our RCW treatment or distribution system, and/or to our intended designated uses of that water, we must apply for and receive State approval of modifications to our RCW system operating permit.

Local permits from the Town of Chapel Hill, Town of Carrboro, and Orange County would be needed for construction. These would include stormwater and erosion and sediment control.

Are there any technical considerations with this alternative?

The main technical considerations with this alternative are whether additional reclaimed water treatment is needed prior to blending in Quarry Reservoir and/or whether additional treatment is needed at the Jones Ferry WTP with the use of the blended source water.

Enhanced RCW treatment would be required before being allowed to blend in the Quarry Reservoir if the RCW did not meet the most stringent RCW requirements currently required by law. The Environmental Management Commission could also establish more stringent RCW standards for potable reuse applications. We anticipate that OWASA's RCW meets current regulations based on our monitoring data and treatment processes. However, there are two parameters with limits required under current law that OWASA does not monitor for; a 2005 study indicates that we would likely meet these limits, but additional monitoring would be required.

Treatment enhancements would be needed at the Jones Ferry WTP if the finished water produced from the use of the blended source water did not comply with all State and federal laws for the provision of safe drinking water. Treatment enhancements at the Jones Ferry WTP are not expected to be needed based on Mason Farm WWTP RCW quality, blending with conventional source water in the Quarry Reservoir, and existing treatment barriers at the Jones Ferry WTP.

If additional treatment were needed, the capital and operating costs and environmental impacts associated with this alternative would increase.

Are there other uncertainties or risks associated with this alternative?

In the absence of regulations to accompany North Carolina Session Law 2014-113 and a lack of previously permitted indirect potable reuse facilities in North Carolina, OWASA's pursuit of this alternative would be an uncertain path.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Yield of Project	4 mgd
2020 Capital Cost Estimate	$100.9 million
2020 Cost per GPD of Additional Yield	$25.23 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2050 and implementation in 2052)	$36.1 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$1.30 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$4.03 /1,000 gallons actually supplied

What is the timing of this alternative?

For purposes of the cost analysis, we assumed that construction on this alternative would begin in 2050 and would be placed in service in 2052.

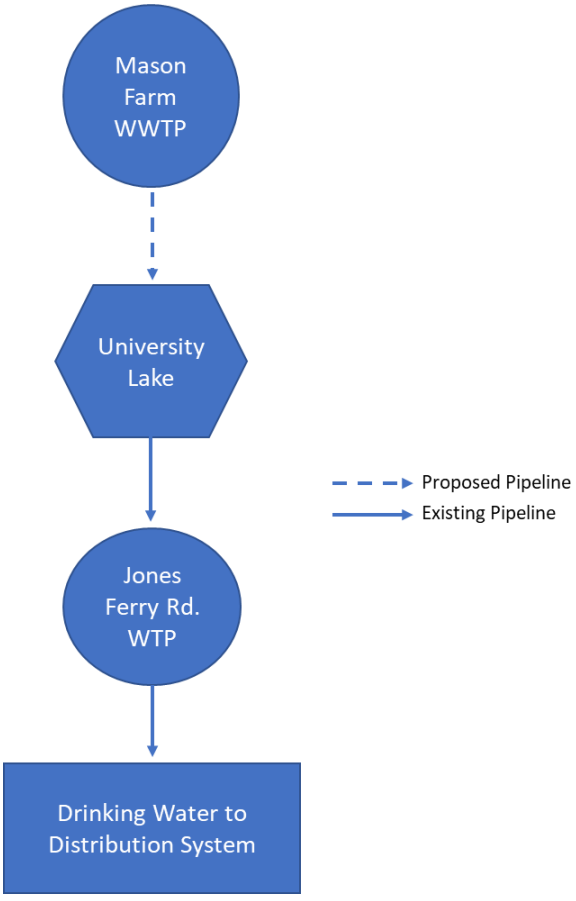
Alternative 8: Indirect Potable Reuse with Return to University Lake

This alternative involves supplementing the supply of water available from University Lake by pumping highly treated reclaimed water (RCW) from the Mason Farm WWTP to the lake. This alternative would require design, installation, and operation and maintenance of:

(a) a new RCW transmission main from the WWTP to University Lake; and
(b) a new RCW pump station at the WWTP.

Staff did not have Hazen evaluate this alternative since the previously unidentified alternative to return reclaimed water to a new pretreatment basin was more viable from a regulatory and economic perspective. If the Board would like this alternative fully evaluated, we can have Hazen complete that task.

This alternative is illustrated in the following schematic.



How much water does this alternative provide?

Staff did not fully evaluate the amount of water this alternative could provide since it is only viable when water is not flowing over University Lake Dam. University Lake has a storage capacity of about 450 million gallons and a drainage area of about 30 square miles. This is a

relatively small storage volume for the watershed size; thus University Lake fills fairly quickly after rain events. The historic record from January 2000 to October 2019 indicates that water is flowing over the dam approximately 34 percent of the time, and this time period includes two major droughts, including the drought of record. (Note: this analysis did not include data from the period January 2018 to April 2019 since water was being pumped out of University Lake for work on the flashboards). Thus, a reclaimed water system that includes University Lake could not be used approximately 1/3 of the time.

What are the environmental impacts of this alternative?

This alternative would result in impacts to streams and potentially wetlands associated with the pipeline infrastructure described above. The pumping infrastructure would result in increased energy use and corresponding carbon emissions. The diversion of RCW from the Mason Farm WWTP to the pretreatment mixing basins would reduce surface water discharges to Morgan Creek, but increase them to University Lake. This would result in higher nutrient loading to University Lake, but lower loading downstream of University Lake (lake would attenuate some of the loading). This alternative could also adversely impact the downstream habitat if discharges from the WWTP to Morgan Creek are reduced too much.

What are the social impacts of this alternative?

The social impacts of this alternative would be similar to the other indirect potable reuse alternatives and include the following:

- Noise and traffic impacts during construction;
- Property impacts in the pipeline construction corridor; and
- Customer perception that indirect potable reuse will pose a threat to public health;

What permits, regulations, or partnerships are needed for this alternative?

This alternative is not currently legal in North Carolina. If discharging reclaimed water directly to a water supply reservoir became legal, it still may not be allowed within University Lake. University Lake is classified as a WS-II (water supply II), which means that it is highly protected, and wastewater discharges are not allowed. DWR likely would not allow the discharge of reclaimed water into University Lake.

Prior to implementing any changes to our RCW treatment or distribution system, and/or to our intended designated uses of that water, we must apply for and receive State approval of modifications to our RCW system operating permit.

Local permits from the Town of Carrboro would be needed for construction. These would include stormwater and erosion and sediment control.

Are there any technical considerations with this alternative?

The main technical considerations with this alternative are whether additional reclaimed water treatment is needed prior to blending in University Lake and/or whether additional treatment is needed at the Jones Ferry WTP with the use of the blended source water.

Enhanced RCW treatment would be required before being allowed to blend in University Lake if the RCW did not meet the most stringent RCW requirements currently required by law. The Environmental Management Commission could also establish more stringent RCW standards for potable reuse applications. We anticipate that OWASA's RCW meets current regulations based on our monitoring data and treatment processes. However, there are two parameters with limits required under current law that OWASA does not monitor for; a 2005 study indicates that we would likely meet these limits, but additional monitoring would be required.

Treatment enhancements would be needed at the Jones Ferry WTP if the finished water produced from the use of the blended source water did not comply with all State and federal laws for the provision of safe drinking water. Treatment enhancements at the Jones Ferry WTP are not expected to be needed based on Mason Farm WWTP RCW quality, blending with conventional source water in University Lake, and existing treatment barriers at the Jones Ferry WTP.

If additional treatment were needed, the capital and operating costs and environmental impacts associated with this alternative would increase.

Are there other uncertainties or risks associated with this alternative?

In the absence of regulations to accompany North Carolina Session Law 2014-113 and a lack of previously permitted indirect potable reuse facilities in North Carolina, OWASA's pursuit of this alternative would be an uncertain path.

What is the cost to implement this alternative?

The costs to implement this alternative have not been calculated.

What is the timing of this alternative?

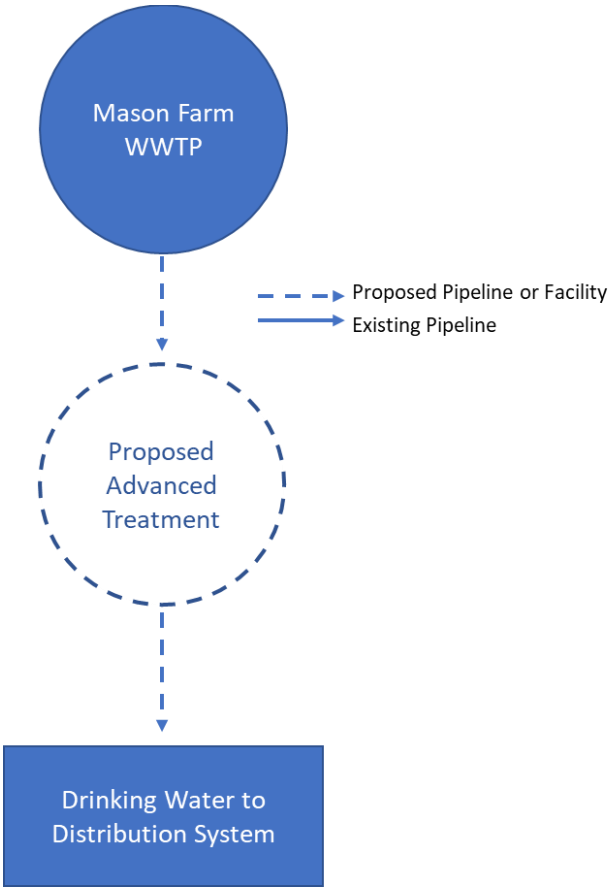
This alternative could be implemented in approximately 2050 if laws were modified to make it legally feasible.

Alternative 9: Direct Potable Reuse

This alternative includes the advanced treatment of reclaimed water (RCW) at the Mason Farm WWTP so it can be directly delivered into our drinking water distribution system. To enable this, we assumed the following facilities would be required:

- Advanced treatment of OWASA's RCW; two treatment processes were evaluated:
  - Reverse osmosis (RO) – generally required if total dissolved solids (TDS) removal is required
  - Activated carbon – generally preferred if TDS removal is not required as there are lower capital and operations and maintenance costs than RO; also has lower environmental impacts than RO;
- Purchase of approximately 2 acres of land near the WWTP to site the advanced treatment;
- 0.5 million gallon storage tank;
- New pump station at the WWTP; and
- New pipeline to connect to a water main near the WWTP

This alternative is illustrated in the schematic below.



How much water does this alternative provide?

Staff sized the infrastructure for this alternative to provide 4 mgd of additional water supply so it would be comparable to the indirect potable discharge alternatives. Additional water supply in excess of 4 mgd may be made available depending on the availability of RCW at the Mason Farm WWTP and the capacity of the advanced treatment system.

What are the environmental impacts of this alternative?

This alternative involves extensive construction and depending on facility siting, it could impact some streams and wetlands. The WWTP and surrounding area are in floodplains so some impacts would occur to floodplains as well. The advanced treatment would require increased energy and result in higher carbon emissions; the pumping associated with this alternative would likely be offset by reduced pumping at the Jones Ferry Road WTP.

If RO treatment is needed for enhanced removal of TDS and/or to meet other water quality requirements, energy usage and greenhouse gas emissions will be more substantial. RO treatment generates greater volumes of more concentrated waste streams, and those will be more difficult and costly to manage. These waste streams are difficult to dispose due to high TDS content. For OWASA's situation, the most practical solution to dispose of concentrated RO waste is to discharge it to our WWTP system if the flow can be sufficiently diluted by other wastewater to avoid disruptions to the conveyance and treatment processes (e.g., corrosion, impaired wastewater treatment, surface water discharge compliance issues).

Additionally, the diversion of substantial volumes of advanced treated RCW from the Mason Farm WWTP to the distribution system would reduce or potentially eliminate surface water discharges to Morgan Creek and ultimately Jordan Lake. Reduced effluent discharge could benefit the receiving water by reducing the associated loading of nutrients. However, reduced discharges could also adversely impact downstream wildlife habitat.

What are the social impacts of this alternative?

This alternative requires OWASA to purchase approximately 2 acres of land. This alternative would result in temporary impacts from construction to traffic and noise and may impact private property owners along the pipeline.

The other social impact is the potential negative view of customers using RCW for drinking water purposes. Public acceptance of this alternative may be more of a challenge than other proposed potable reuse alternatives due to the lack of a pretreatment mixing basin and/or environmental buffer (e.g., Quarry Reservoir); however, ongoing potable reuse projects across the United States highlight the potential for public acceptance of direct potable reuse with purposeful, proactive outreach.

What permits, regulations, or partnerships are needed for this alternative?

This alternative is not currently legal in North Carolina. However, existing and ongoing potable reuse regulations, guidelines, demonstration projects, and full-scale systems across the United States support the technical feasibility of this alternative. If and when this alternative becomes legal in North Carolina, state permits would be needed to use highly treated RCW as a new water supply source.

Permits to address development in the floodplain would be needed along with local permits for stormwater and erosion and sediment control.

Are there any technical considerations with this alternative?

The main technical considerations with this alternative are the treatment, water quality, and engineered storage requirements that must be met in order for highly treated RCW to be directly used for finished water augmentation. In all cases where potable reuse is practiced, an integrated multi-barrier approach is required to manage the risk to public health and ensure that microorganisms and other contaminants are removed and/or reduced to safe drinking water levels.

This alternative is assumed to include three hours of engineered storage for finished water (4 mgd x 1 day/24 hours x 3 hours = 0.5 MG) prior to delivery into the drinking water system. Engineered storage provides response time to identify treatment failures, implement appropriate actions, and a final monitoring point where the water quality can be validated for potable reuse before being introduced into drinking water. If additional storage was required, the costs to implement this alternative would increase.

Finally, there is inadequate space available at the WWTP to accommodate a normal configuration of the required treatment and storage facilities for this strategy. (The space not currently built upon is planned to be used under the WWTP facility masterplan.) Additionally, most of the land near the WWTP is owned by UNC, and has already been developed for their purposes. It might be possible to overcome this land limitation by stacking (building up, not out) the required facilities; however, this would be very expensive.

Are there other uncertainties or risks associated with this alternative?

This alternative would reduce some of OWASA's water supply risks as it:

1. Provides a second treatment plant for the production of water;
2. Further diversifies OWASA's water supply sources; and
3. Provides assurance of meeting water supply needs during extended drought conditions.

What is the cost to implement this alternative?

The cost to implement this alternative depends on whether RO-based treatment or activated carbon-based treatment can be used. The 2020 capital costs, 2020 levelized costs, and net

present costs factoring in current federal guidance regarding discount rates and inflation for each treatment method are presented in the tables below.

RO-Based Treatment

Estimated Yield of Project	4 mgd
2020 Capital Cost Estimate	$59.4 million
2020 Cost per GPD of Additional Yield	$14.85 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2050 and implementation in 2052)	$31.4 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$1.13 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$3.51 /1,000 gallons actually supplied

Activated Carbon-Based Treatment

Estimated Yield of Project	4 mgd
2020 Capital Cost Estimate	$46.0 million
2020 Cost per GPD of Additional Yield	$11.50 /gpd of yield
Net Present Cost of Alternative (Assumes Construction begins in 2050 and implementation in 2052)	$18.0 million
Net Present Levelized Cost of Alternative ($/1000 gallons of yield)	$0.65 /1000 gallons of yield
Net Present Levelized Cost of Project ($/1,000 gallons of demand actually met over 50-year planning horizon	$2.01 /1,000 gallons actually supplied

What is the timing of this alternative?

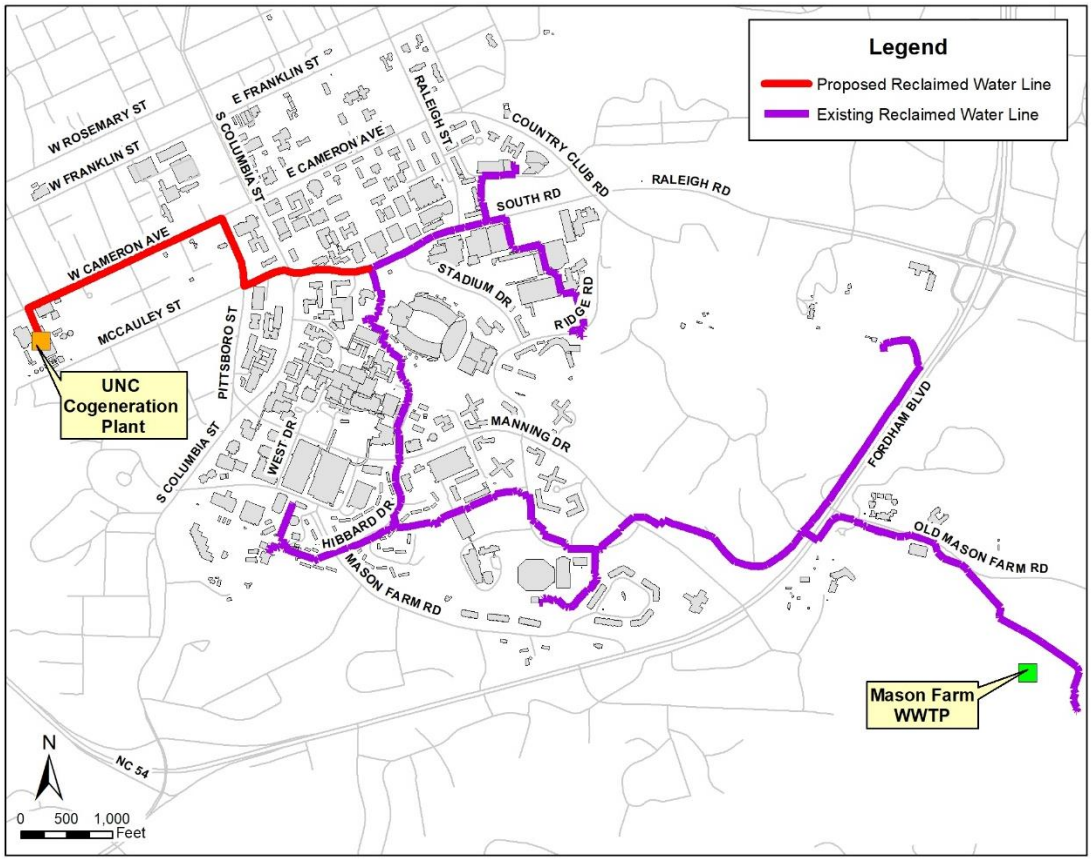
For purposes of the cost analysis, we assumed that construction on this alternative would begin in 2050 and would be placed in service in 2052.

Alternative 10: Demand Management - Reclaimed Water to UNC Cogeneration Facility

This alternative involves installation and operation and maintenance of new infrastructure that enables UNC to use reclaimed water (RCW) instead of drinking water for certain purposes at UNC's Cogeneration (Cogen) facility. The main required infrastructure improvements are:

1. A RCW main that runs from the western edge of the main campus to the Cogen plant on West Cameron Avenue, and
2. A new RCW polishing treatment facility at the Cogen facility (microfiltration and reverse osmosis) to ensure that water has a total dissolved solids level that is at least as good as the OWASA drinking water now used as make-up water in the Cogen cooling towers and boilers.

This alternative is illustrated in the map below.



How much water savings does this alternative provide?

UNC staff stated that they currently use approximately 100 million gallons (MG) of drinking water per year at the Cogen facility; approximately 75 percent of this water is used in the boilers and 25 percent is used in cooling towers. UNC plans to implement new technology which will

decrease the amount of water needed in the cooling towers. Assuming that new technology is in place, this RCW alternative is assumed to offset the need for drinking water by approximately 75 MG per year (0.2 mgd).

What are the environmental impacts of this alternative?

The RCW piping needed for this alternative would be located within existing road rights-of-ways and/or utility corridors; therefore, it would have minimal impact on streams and wetlands. This alternative would result in a slight reduction in the amount of effluent discharged to Morgan Creek from the Mason Farm WWTP, which can benefit the receiving water by reducing the associated loading of nutrients. However, reduced discharges could adversely impact the receiving water if flow augmentation is needed to support downstream aquatic habitat.

The additional treatment of RCW at the Cogen facility, as well as boiler and cooling tower operations at the Cogen facility, will result in the production of a highly concentrated waste stream that would be returned to the Mason Farm WWTP via the sanitary sewer system.

The delivery of reclaimed water from Mason Farm WWTP to the Cogen facility and more intensive treatment at the Cogen facility will result in increased energy use and associated greenhouse gas emissions than the existing Morgan Creek discharge strategy. However, the use of reclaimed water for Cogen facility operations will save treatment and pumping energy use at the Jones Ferry Road WTP.

What are the social impacts of this alternative?

The UNC Cogen facility generates and distributes steam used for heating, domestic hot water, sterilization, and other purposes, thus making it critical to the maintenance of UNC's daily operations. Staff at UNC have several concerns about the use of reclaimed water at the Cogen facilities; they already have to treat OWASA's drinking water to a higher level in order to be able to use it in the boilers, and there is a larger technical risk burden associated with the use of reclaimed water from a treatment perspective. In addition, the reclaimed water system has multiple single points of failure; potable water would still be needed as back up.

The increased use of reclaimed water does offset drinking water needs, which may defer the need to expand OWASA's drinking water facilities and decrease the frequency and/or duration of mandatory water shortage restrictions.

What permits, regulations, or partnerships are needed for this alternative?

This alternative would require an enhancement of our existing RCW partnership with UNC. While UNC has been open to using RCW in its chilled water facilities and for non-potable uses, Energy Services staff has expressed many concerns about using RCW at the Cogen facility. Concerns regarding the use of RCW at the Cogen facility include increased corrosion and scaling potential, intensified treatment requirements, the need to manage a new waste stream if membrane treatment is implemented to facilitate RCW use, and the limited available space at the

facility. Nevertheless, RCW use at cogeneration facilities has been successfully practiced in other parts of the country.

A State permit would be required for extension of the RCW system to the Cogen facility, and our RCW operating permit would need to be amended to allow use of RCW at the Cogen facility. A State permit would also be required if the on-site treatment system at the Cogen facility results in a discharge of process wastewaters to a receiving stream.

Construction permits would be required from the Town of Chapel Hill which would include erosion and sediment control and stormwater permits.

Are there any technical considerations with this alternative?

Some types of treatment technology that would meet UNC's needs produce highly concentrated effluent that then needs to be discharged. It is assumed this discharge would be to OWASA's wastewater collection system; assurances would be needed that the highly concentrated waste would not upset our treatment system or cause corrosion in the collection system. Alternatively, the waste could be discharged to a creek, but would require additional treatment from UNC to discharge the wastewater. Treatment technologies also require a lot of water, which would offset the limited gains achieved in reducing potable water demand from this alternative.

There is also limited space at the Cogen facility to install the additional treatment system that would enable RCW use. The proposed treatment system is expected to occupy approximately 7,000 square feet, including chemical storage, membrane cleaning, and post-treatment equipment. It could potentially be located on-site at the Cogen facility, but a detailed understanding of available space to make this determination is absent at this time.

Are there other uncertainties or risks associated with this alternative?

RCW alkalinity levels are expected to increase when OWASA commences operation of the Mason Farm WWTP filters in denitrification mode. This could require enhanced levels of treatment, and higher capital and operating costs than has been assumed for this alternative.

This alternative does not improve the diversity of OWASA's water supply portfolio.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Yield of Project	0.2 mgd
2020 Capital Cost Estimate	$13.2 million
2020 Cost per gpd of Water Savings	$66.00 /gpd of water saved
Net Present Cost of Alternative (Assumes Construction begins in 2030 and implementation in 2032)	$17.9 million
Net Present Levelized Cost of Alternative ($/1000 gallons of water savings)	$5.99 /1000 gallons of water saved

What is the timing of this alternative?

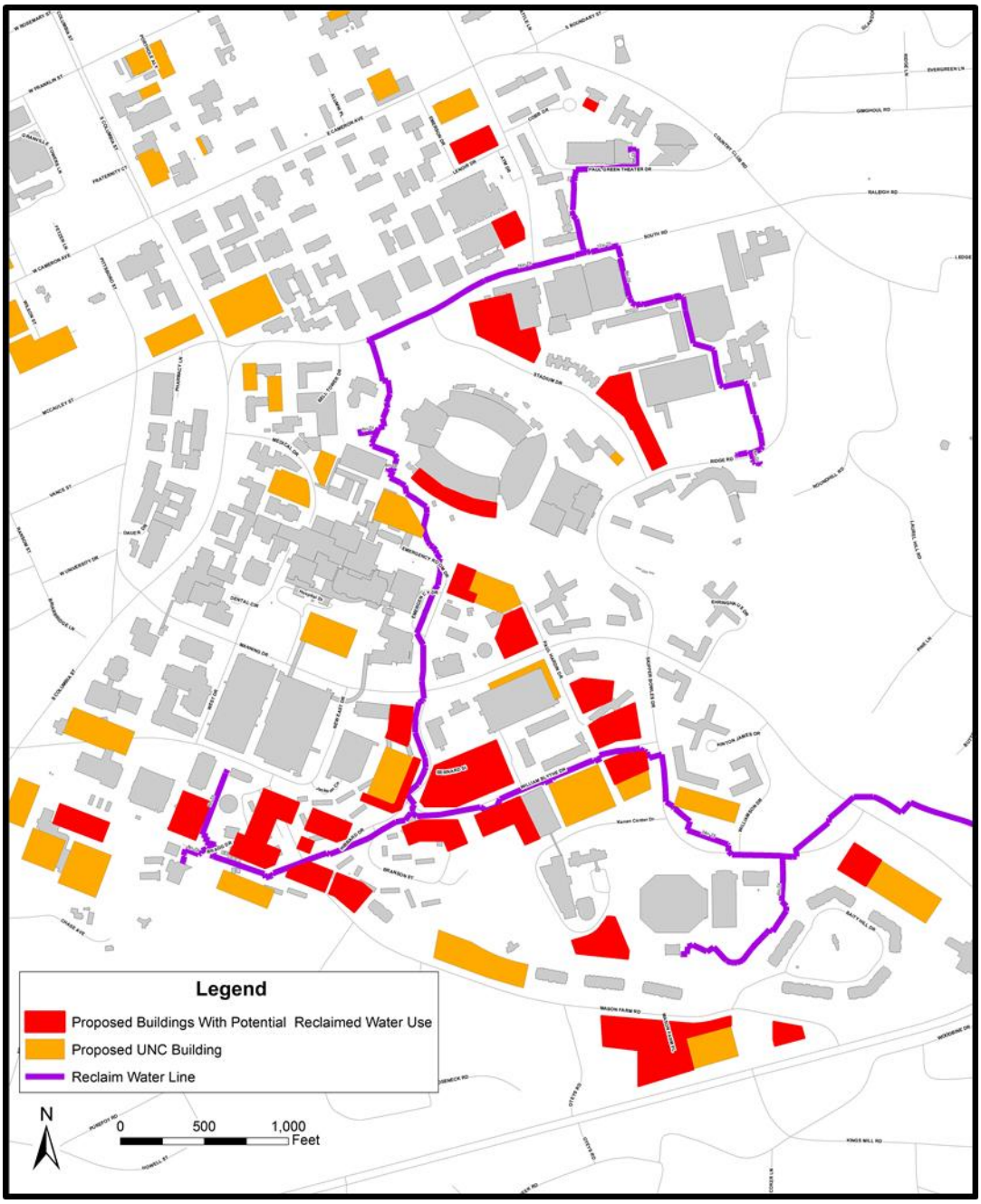
For cost purposes, it was assumed construction would begin on this alternative in 2030 and be operational in 2032.

Alternative 11: Demand Management - Expanded Use of Reclaimed Water on UNC Main Campus

This alternative involves expanding the use of reclaimed water (RCW) on UNC-Chapel Hill's main campus to offset the demand for drinking water that would otherwise be required to meet non-drinking water needs in certain new buildings that are envisioned in the University's recently updated Master Plan. For the purpose of this alternative, we concluded that more than 25 planned buildings are expected to be within 500 feet of the existing RCW distribution system.

We assumed that of those buildings, ones planned for the "near-term" would be built between 2020 and 2024; ones identified for the "mid-term" would be built between 2025 and 2029; and ones planned for the "long-term" would be built between 2030 and 2034. We then simply assumed that associated capital costs and demand increases would be spread uniformly throughout each five-year period. The total length of new RCW mains and/or service lines assumed to be required for this alternative is slightly more than one mile. No expansion of OWASA's RCW storage tank, pumps, and transmission mains from the WWTP are expected to be required.

The proposed buildings within 500 feet of the existing RCW system and could potentially be served by RCW are shown in the map below. (Note: UNC is evaluating extending portions of the RCW piping. If they move forward with expanding the RCW system, there is the potential to provide RCW to additional future buildings on campus).



How much water savings does this alternative provide?

We estimate that implementation of this alternative has the potential to reduce drinking water demands by about 0.055 million gallons per day (mgd) once all of the new buildings are in service and connected to the RCW system.

To develop this preliminary planning-level estimate, we first looked at billed water use factors (gallons used per day per 1,000 square feet of building space) for different categories of existing University buildings. We applied those water use factors to the planned new buildings and made

the following two key assumptions about the percentage of average daily water use expected to be used for toilet flushing.

- 25 percent of water use could be met by RCW in dormitories and laboratories
- 75 percent of water use could be met by RCW in classroom buildings

We consider our water savings estimate to be high, as it will likely not be cost-effective for UNC to connect each of these planned buildings to the reclaimed water system.

What are the environmental impacts of this alternative?

Much of the new RCW piping would likely be located within developed portions of campus and within existing (or planned) road rights-of-way and/or utility corridors. Therefore, the adverse impacts of construction on the environment are expected to be minimal.

Increased use of RCW from the Mason Farm WWTP would result in reductions in mass load discharges of nutrients to Morgan Creek and Jordan Lake. Those benefits would be offset somewhat by the reduced instream flows that would occur if more RCW is diverted away from WWTP discharge.

Reclaimed water has a lower energy intensity (energy required per 1,000 gallons) than drinking water; therefore, implementation of this alternative would provide some energy savings when compared to the assumption that drinking water will be used to meet all of the water demands in these buildings.

What are the social impacts of this alternative?

RCW pipeline construction work will cause temporary noise and traffic impacts.

Increased use of RCW would reduce OWASA's drinking water sales volumes, which in turn would likely require offsetting water rate adjustments to ensure revenue sufficiency. With the small predicted use of reclaimed water in this alternative, the rate impacts are likely small.

Using reclaimed water could delay the need to expand OWASA's raw water supply and drinking water infrastructure; it could also reduce our future drought risks, and the frequency and/or duration of mandatory water shortages. Given the small amount of water saved under this alternative, the likelihood of this alternative reducing the frequency of mandatory water shortages on its own is low.

What permits, regulations, or partnerships are needed for this alternative?

This alternative would build on our successful RCW system partnership with UNC. UNC's general practice is to dual-plumb its new buildings for non-drinking water (such as harvested rainwater and RCW), but has found that it is often cost-prohibitive to connect buildings to the infrastructure. State permits would be required for future extensions of the RCW distribution system, and for authorization to use RCW in buildings not currently covered under existing permits.

UNC does not use RCW or other non-potable water for toilet flushing in residence halls, so State approval will be required for that expanded beneficial use of RCW.

Are there any technical considerations with this alternative?

The RCW distribution system mains were sized to meet the anticipated build-out of the main campus, so adequate capacity should be available to meet most, if not all, of the projected additional RCW demands assumed for this alternative. Modeling may be required to determine if any RCW lines need to be replaced or paralleled to support this alternative. This would result in either additional cost of this alternative or reduced demand for reclaimed water, which would increase the normalized cost ($/mgd) of demand for this alternative.

Are there other uncertainties or risks associated with this alternative?

There is uncertainty as to the specific restrictions and requirements the State may place on the potential use of RCW in residence halls. This uncertainty is an important factor, as about 20% of the assumed new RCW demand is for toilet flushing in residence halls.

If any RCW lines need to be replaced or paralleled to support this alternative, the cost could increase substantially. If the projected RCW demand is lower than assumed, then the unit costs for this alternative would increase.

This alternative would provide some resiliency and reliability benefits, but it would not further diversify OWASA's water supply portfolio. This alternative by itself does not meet OWASA's long-term water supply needs.

What is the cost to implement this alternative?

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Water Savings of Project	0.055 mgd
2020 Capital Cost Estimate	$1.7 million
2020 Cost per gpd of Water Savings	$30.90 /gpd of water saved
Net Present Cost of Alternative (Assumes Begins in 2020 and all connections complete by 2035)	$0.97 million
Net Present Levelized Cost of Project ($/1,000 gallons of water saved over 50-year planning horizon	$1.11 /1,000 gallons actually supplied

The only operating and maintenance costs are for the variable costs of RCW treatment and pumping, but those are more than offset by the corresponding savings in the variable costs for treatment and pumping drinking water that would have otherwise been required to meet toilet flushing demands.

The cost analysis assumes that OWASA does not provide the University any financial incentives or support for implementation of this alternative.

What is the timing of this alternative?

It was assumed this alternative would be implemented over a 15-year period beginning in 2020.

Alternative 12: Demand Management - On-Site Non-Potable Water Treatment and Reuse

An increasingly important strategy for reducing drinking water demands is to collect, treat, and recycle – and reuse – non-potable water (NPW) to meet certain non-drinking uses, such as toilet flushing, cooling tower make-up, and irrigation. OWASA's reclaimed water system that serves the University of North Carolina at Chapel Hill is an example of a large-scale, centralized reuse system.

An alternative to centralized reuse systems is the implementation of NPW reuse systems at the building or major development scale. There are a number of examples where small-scale, decentralized water reuse systems are being used to meet non-drinking water demands. These systems have very small footprints and can be located in small areas such as the basements in large, high-rise, mixed-use buildings.

On-site reuse systems typically have several common components: (a) pipes for the collection of wastewater and/or other NPW sources from the various points of generation within the building or development; (b) a storage tank where the NPW is held for treatment; (c) a treatment system that reliably produces water suitable for the intended non-drinking water uses within the building or development; (d) pumps and pipes to convey the reuse water to the point of end use; and (e) automated monitoring and control systems.

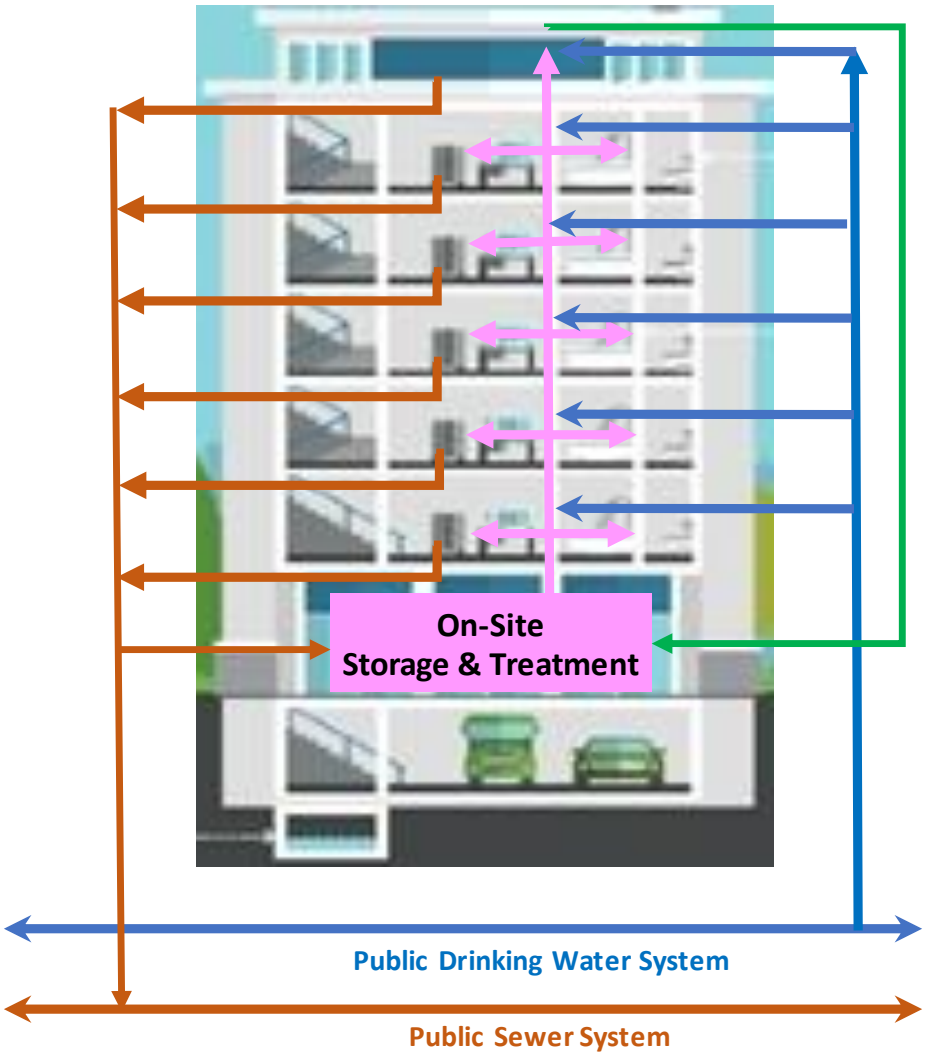
For our evaluation, we assumed that the NPW reuse treatment system would include membrane bioreactor (MBR) technology followed by ultraviolet light (UV) disinfection and ozone or chlorination. This would provide a high level of treatment needed to support a wide range of end uses.

Well-designed systems also include multiple redundancy and reliability measures, such as dual treatment trains and influent storage for handling flows during temporary system shut-downs.

A figure illustrating the piping and treatment needed for onsite RCW is included on the following page.

How much water savings does this alternative provide?

To evaluate this strategy, we developed a hypothetical scenario in which on-site wastewater and NPW treatment and reuse systems are assumed to be developed for four major mixed-use developments in designated growth areas in our service area. The four projects are assumed to have a combined non-residential building area of about 2.74 million square feet, include slightly more than 1,600 multi-family dwelling units, and have a total average-day water demand of about 0.36 million gallons per day (mgd), assuming no reuse on-site.



Blackwater/Graywater ***(Shown in orange)***

- Blackwater *(toilets, dishwashers, etc.)*
- Graywater *(tubs/showers, clothes washers, bathroom sinks, etc.)*

Other Sources ***(Shown in green)***

- Cooling Towers, Condensate Water
- Rainwater, Stormwater

Dual Plumbing System Required

(Purple pipe for recycled water)

Typical Treatment Systems

- On-site (package-type)
- Membrane bioreactors (MBR)
- UV + Ozone disinfection
- Flow equalization tank
- Standby power
- Solids management needed
- *Type of treatment system dependent on quality of supply sources and end use water quality requirements*

Image adapted from "On-Site Non-Potable Reuse Practice Guide" (2018)

We assumed that on-site NPW reuse can offset about 43%, or 0.154 mgd, of the combined non-drinking water demands of these four hypothetical developments. The first project is assumed to begin in 2025, while the fourth one is assumed to begin in 2035. Each development project and its associated water demands are assumed to increase linearly over a 10-year period, at which time the project reaches build-out.

What are the environmental impacts of this alternative?

NPW recycling offers several important environmental benefits. By reducing drinking water demands, it can help defer the need for expansion of OWASA's water supply system. It offers similar benefits for the community's wastewater system, as it reduces the volume of wastewater that must be collected, transported and treated at the wastewater treatment plant. Depending on the system design and treatment technology used, on-site recycling may lower the greenhouse gas emissions associated with meeting water and wastewater service demands at the site. If harvested rainwater/stormwater is used to meet on-site water needs, that would reduce the flow and velocity of stormwater water runoff from the site, and could also reduce non-point source pollutant loads, such as nitrogen and phosphorus.

What are the social impacts of this alternative?

Project developers and end users are likely to have concerns about the performance, reliability, safety, operational requirements, and noise and odors associated with on-site water reuse systems, especially ones that treat and recycle wastewater. Nearby neighbors and downstream stakeholders may be concerned about the potential for malfunctions and accidental discharges of wastewater. These concerns could result in greater opposition to this alternative compared to alternatives that do not involve wastewater treatment and reuse.

Given the expected high capital and operating and maintenance costs of the technology, and the technical expertise required to operate and maintain these systems, it is unlikely that developers would choose to implement this technology unless significant incentives were available.

This strategy would reduce water and sewer gallons billed and associated revenues unless there is an offsetting rate adjustment by OWASA. This would impact water and sewer rates and charges for OWASA customers. While this is not a "cost increase" it is a cost consideration that will affect all OWASA customers.

What permits, regulations, or partnerships are needed for this alternative?

North Carolina laws and regulations allow on-site wastewater/NPW treatment and reuse for non-potable uses, provided adequate safeguards are in place. There may be issues with review and approval of project plans and development approvals at the local level. Implementation of this strategy will require the support of developers, architects, and engineers, as well as local and state regulatory agencies.

Are there any technical considerations with this alternative?

There are many technical considerations with this option. Buildings and developments with on-site NPW reuse systems would need to be connected to the OWASA water and wastewater systems to provide drinking water and to serve as a back-up in the event of a system malfunction or failure.

Arrangements would need to be made to properly dispose of the waste solids produced during the treatment process.

Qualified and experienced technical staff will be required to ensure safe and reliable operation of on-site reuse systems. Technical staff are typically hired by the project owner/developer, or provided under service contracts with consulting firms or private utility companies that operate such systems on a fee-for-service basis.

Are there other uncertainties or risks associated with this alternative?

Some uncertainties include the potential for changes to the regulatory framework and applicable monitoring and treatment requirements; the availability of trained professionals to operate and maintain these systems; and the level to which key parties will accept and implement on-site reuse systems. Capital and operating and maintenance cost experience is limited, so actual costs may vary considerably from the estimates we have based our analysis on. With the emergence of new treatment technologies, there is uncertainty regarding the long-term reliability and performance of those technologies.

What is the cost to implement this alternative?

Guidance manuals and case studies have indicated that there is a wide range of engineering design and construction costs for on-site wastewater treatment and reuse systems, and that there are economies-of-scale in construction and operation of these systems. For our evaluation, we assumed a range from about $16 per gallon per day (gpd) of capacity for the largest system to $24/gpd for the smallest system (includes engineering design, permitting, and site work). We also factored in that additional costs would be incurred to install dual-plumbing systems within the buildings served by the assumed systems. Based on available cost guidance, we assumed that the incremental costs to install dual-plumbing lines for on-site reuse would be 10% of the plumbing system installation for the building(s) served by the reuse system.

We assumed that operating and maintenance costs would range from about $3.75 for the largest systems, to $12.25 per thousand gallons for the smallest system. In our cost evaluation, we factored in that this scenario would reduce OWASA's direct variable costs for water and sewer treatment.

The 2020 capital costs, 2020 levelized costs, and net present costs factoring in current federal guidance regarding discount rates and inflation are presented in the table below.

Estimated Water Savings of Project for 2020 Capital Cost	0.154 mgd
2020 Capital Cost Estimate	$4.5 million
2020 Cost per GPD of Water Saved	$29.22 /gpd of water saved
Net Present Cost of Alternative	$8.8 million
Net Present Levelized Cost of Project ($/1,000 gallons of water saved over 50-year planning horizon	$4.18 /1,000 gallons actually supplied

What is the timing to implement this alternative?

As described above, the first project is assumed to begin in 2025 and the fourth one in 2035; all projects would require 10 years to achieve build-out.

Alternative 13A: Demand Management: Unit Sub-Metering and WaterSense Installation

For various reasons of practicality and economics, apartment buildings, mixed-use developments, and strip malls are typically master-metered for water use. In some cases, individual tenants of units never see a water bill. (i.e. The water bill is covered with rent payments.) In other cases, the property owner takes it upon themselves to sub-meter water use for individual units and rebill tenants for their water use.

Submetering programs are intended to more equitably distribute the costs of water and sewer services among residents and tenants by creating a more direct link between the amount of water used and the amount they are billed for that use. The resulting increase in information available to residents and tenants then enables them to make better decisions about their own consumption patterns. Research shows that metered customers use 15-20% less water than non-metered customers.

Retrofitting existing buildings with sub-metering can be difficult and require meter reading inside an individual unit, which can be costly. It is much easier to install sub-meters in new construction. Given the projected growth of multi-family and mixed-use developments in our service area, this initiative was identified to have water savings potential and would be relatively easy and cost-effective to implement. This strategy is considered as a regulatory initiative focused on new multi-family and non-residential customers coupled with a co-requirement for the installation of high efficiency fixtures (i.e. WaterSense fixtures). In pairing these two requirements (rather than just relying on sub-metering), we help to avoid putting an increased burden of high water costs on tenants.

How much water does this alternative save?

Sub-metering: Even in the absence of a requirement for sub-metering, an increasing number of multi-family, master-metered (MFMM) customers are installing sub-meters on individual units. In 2016, approximately 33% of MFMM locations were submetering and rebilling for water service. That increased to 43% in 2019. In the past two years, four MFMM complexes have connected to OWASA's water system. Three of the four complexes are sub-metering and rebilling their tenants for water use. (The one that is not sub-metering is by far the smallest complex, serving only six units.)

Given this, we estimate that a sub-metering requirement would impact only 5% of new multi-family development (i.e. that 95% would have installed sub-metering without regulation). For those 5%, we estimate that sub-metering will reduce water use by 5%.

WaterSense: Based on past analysis, about 50% of new development is installing WaterSense appliances and fixtures (without regulation). Therefore, this requirement is only likely to impact about half of new development. For the half that would not have installed water efficient fixtures on their own, we estimate that this requirement would reduce water use by an additional 15% (based on WaterSense research).

We assume that through this requirement, we would reduce the water use of half of new development by an additional 15% (based on WaterSense research).

Given these assumptions, if implemented in 2021, this requirement would result in a reduction of projected average-day demand by about 40,000 gallons in 2035 and by about 169,000 gallons in 2070.

Cumulatively, over the next 50 years, this strategy would reduce water use by about 1.4 billion gallons. Waiting to implement the strategy would reduce the amount of average-day water savings.

What are the environmental impacts of this alternative?

Reducing demand for water can help defer the need for expansion of OWASA system capacities (and their associated environmental impacts) and reduce greenhouse gas emissions from the use of conventional energy sources to pump lake water, drinking water, wastewater, and treated wastewater.

What are the social impacts of this alternative?

Although requiring sub-metering of water burdens tenants with the direct responsibility for paying for water and sewer service, pairing a sub-metering requirement with the required installation of WaterSense appliances and fixtures should help reduce the cost-burden, ultimately leading to an overall decrease in the cost of living.

There would likely be resistance from the development community to the WaterSense component of this alternative.

What permits, regulations, or partnerships are needed for this alternative?

Making a requirement of this magnitude would require close partnership and collaboration with both Towns and the County. Additionally, there are legal questions and concerns over whether OWASA and/or the Towns have legal authority to require WaterSense technology for all development.

Are there any technical considerations with this alternative?

This alternative would require administrative oversight to ensure that requirements are met. On a property-specific basis, there may be some unanticipated, minor challenges to installing WaterSense. The States of California, Texas, and Georgia have water efficiency requirements regarding fixtures, as does New York City. These regions would be good markets to research in setting up such a requirement.

Although not technical, this program would require administrative oversight to ensure compliance with the regulation.

Are there other uncertainties or risks associated with this alternative?

Yes, we assume a natural level of water conservation and efficiency in our demand forecasts. This strategy assumes water savings above those projections. Moreover, it is not guaranteed that sub-metering and the installation of WaterSense fixtures will automatically result in reduced water demand, although research indicates its effectiveness.

However, given that this particular strategy would come in the form of a requirement, there is some increased assurance of participation (above a voluntary program).

Ongoing monitoring and performance measurement would be critical to ensure that we were achieving the level of savings that we expected.

What is the cost to implement this alternative?

Much of the cost of this strategy would come in the upfront costs of establishing it in partnership with the local governing bodies, developers, and other stakeholders. It would likely require 50% of an FTE in the first year of establishment. Beyond that, we projected the costs to be in maintaining and monitoring the requirement (at 20% of an FTE). Given this assumption, the net present cost of the programming is $387,000, with a levelized cost of $0.27/total thousand gallons (saved) over 50 years.

It is important to note that these costs do not account for the additional costs to developers to install submetering and WaterSense fixtures.

This alternative would result in less revenue from usage charges collected from new multi-family customers. We estimate that the reduced usage charges would be about $12 million over the next 50 years (average of a little over $230,000 per year).

Summary

50-year Net Present Cost at 3.6% discount rate	$0.4 million
Levelized Net Present Cost Per Thousand Gallons Saved	$0.27 /1000 gal saved
Impact on Average Day Demand in 2035	0.042 mgd
Impact on Average Day Demand in 2070	0.169 mgd

Alternative 13B: Demand Management: Water Efficiency Design Assistance (With Potential for Conservation-Oriented System Development Fee)

Under this alternative, OWASA would provide (as a service) individualized, design review assistance for new developments. Currently, OWASA's development review program accepts developers' proposed water-use requirements with minimal discussion of water-saving technologies and approaches. The focus of this potential service would be to encourage non-residential and multi-family developments to consider water-saving technologies that would not otherwise have been considered or fully evaluated from a benefit-cost perspective. Providing this design assistance as a service (rather than a regulatory, prescriptive approach for specific technologies) would allow for the consideration of new technology and innovative approaches.

This service could be complemented by a system development fee (SDF) structure that further incentivizes water-use efficiency beyond the current SDF structure. Currently, OWASA's SDFs for non-residential and multi-family developments are based on meter size. Meter size based SDFs are easy to administer and allow OWASA to charge for the infrastructure needed to provide the maximum amount of water a customer could possibly use. However, this approach does not give developers an incentive to build more efficiently unless they are on the cusp of needing a smaller meter size. A more tailored system development fee has the potential to provide an incentive to developers to invest in water-efficient technology that achieves marginal water savings.

For purposes of this analysis, we did not explore details of the design of a water conservation-oriented system development fee, but rather simply considered the concept as a complementary strategy to water efficiency design assistance. These types of fee structures have been researched and implemented by some water utilities in Western US, where water rights are also part of up-front connection costs.

How much water does this alternative save?

As with other voluntary, demand side management approaches, it can be difficult to accurately project the volume of water savings (equivalent water supply yield) expected from this strategy. For a high-level estimate, we can look to research which has found that buildings certified under the Leadership in Energy and Environmental Design (LEED) program use 11% less water than similar non-LEED buildings. LEED's certification is technology-agnostic, based solely on potential water savings above and beyond base design.

If we assume that we could achieve a 5% reduction on water use for all new non-residential and multi-family starting in 2021, this strategy would reduce the average-day water demands of new development by 56,000 gallons by 2035 and by about 230,000 gallons by 2070.

Cumulatively, over the next 50 years, this strategy would reduce water use by about 1.9 billion gallons. Waiting to implement the strategy would reduce the amount of average-day water savings.

What are the environmental impacts of this alternative?

Reducing demand for water can help defer the need for expansion of OWASA system capacities (and their associated environmental impacts) and reduce greenhouse gas emissions from the use of conventional energy sources to pump lake water, drinking water, wastewater, and treated wastewater.

What are the social impacts of this alternative?

This strategy would enhance our engagement with the community and provide a service to our customers. For an individual customer, a reduction in water demand can help to reduce the cost of water and sewer service. On an aggregate level, if reduced water demand can result in the delay or prevention of a multi-million-dollar capital expansion, it helps to keep rates low for all customers.

If a conservation-oriented SDF structure was implemented as a complementary strategy, revised SDFs could potentially present equity challenges between the developer and the tenant. For example, if a developer designs a water-efficient building and pays a reduced SDF, but the building actually uses more water than designed, the tenants may be asked to make the cost-of-service financially whole, long after the developer has left. Developers would be incentivized to err on the side of lower projected demands, exacerbating future equity issues. It would be important to consider these equity issues in the design of the water conservation-oriented SDF.

What permits, regulations, or partnerships are needed for this alternative?

No state or federal permits or legislation changes are needed for OWASA to provide water efficiency design assistance as a service. Developers, engineers, and architects would need to be willing to partner with OWASA on water efficiency design reviews very early on in the development review process.

OWASA's SDFs must be designed to reflect and recover the cost to provide capacity for new development. Upon consultation, OWASA's rate consultant did not see immediate legal issues with a water conservation-oriented SDF, but it would be important to consider our cost-of-service requirement if modifying the SDF.

Are there any technical considerations with this alternative?

Although not technical, a water conservation-oriented SDF may require administrative oversight to ensure that water demands are similar to those projected.

Are there other uncertainties or risks associated with this alternative?

Water savings associated with this demand management strategy are based on an educated guess from national data. A more thorough review of recent development in the OWASA service area

to estimate how much water savings could have been achieved from development modifications of actual development would help to make better projections.

As a voluntary program, there are uncertainties in program participation. Ongoing monitoring and performance measurement would be critical to ensure that we were achieving the level of savings that we expected.

What is the cost to implement this alternative?

Costs associated with this alternative include approximately 50% of an FTE at an annual cost of $60,000 in 2020 dollars. These costs would be slightly offset by a reduction in the direct viable costs OWASA incurs for water and wastewater treatment. Based on these high-level assumptions, the total net present cost of this strategy is $2.0 million, with a levelized cost of $1.02/total thousand gallons (saved) over 50 years.

It is important to note that these costs do not take into account the additional costs to developers to design and build more water-efficient structures. Some of these costs could potentially be offset by a reduced SDF.

This alternative would result in less revenue collected from the benefiting customers, both in SDFs and usage charges. Given that the design of an alternative SDF has not been modeled yet, we can only project out the reduced revenue from usage charges to be $15 million over the next 50 years (average of a little over $300,000 per year).

Summary

50-Year Net Present Cost at 3.6% discount rate	$2.0 million
Levelized Net Present Cost Per Thousand Gallons Saved	$1.02 /1000 gal saved
Impact on Average Day Demand in 2035	0.057 mgd
Impact on Average Day Demand in 2070	0.23 mgd

Alternative 13C: Demand Management: On-Bill Financing for Investments in Water Efficient Toilets and Other Water Use Efficiency Investments

Although many older inefficient water fixtures in homes have largely been replaced since water efficiency standards were increased by federal law in 1994, water efficient technology remains out-of-reach for some low-income households. This can create quite a conundrum as water rates rise to cover capital and operating costs of the utility. Low-income households can be left behind with significantly higher bills than their neighbors. Moreover, local businesses with limited access to capital may struggle to prioritize water efficiency over other business costs.

On-bill financing programs for efficiency upgrades are being implemented across the country in the energy sector, and in the water sector to a lesser degree. Through these programs, utilities loan customers the upfront costs of efficiency upgrades. The loan is paid back through additional charges on the utility bill for a given building. If structured with a long enough term, an on-bill financing program for water efficiency upgrades can result in an immediate decrease in a customer's monthly bill (i.e. loan repayment cost is less than the water bill savings from lower water use). Internally, it would be established as a revolving loan program with minimal capital required.

How much water does this alternative save?

As with other voluntary, demand side management approaches, it can be difficult to project an accurate estimate of expected water savings (or equivalent yield). This strategy will only be applicable to existing customers. Using the analytical platform on the utility-side of the Agua Vista web portal, we estimate that approximately 2,370 single-family homes would save water by upgrading their toilets to a high-efficiency toilet. Given that this is the largest impact for water-use savings, this was the only metric that we used to calculate water savings.

This program could also be extended to existing multi-family and non-residential customers. For purposes of this high-level analysis, we assumed that 10% of existing multi-family and non-residential customers are potential candidates for water efficiency upgrades (approximately 72 multi-family customers and 115 commercial customers).

If we assume that 2% of the potential candidates would naturally upgrade without a water efficiency loan, that 1% of the remaining candidates would participate in an on-bill loan program, and that the program would end in 2035, this strategy would reduce average-day water demands of existing single family residential customers by an estimated 26,000 gallons, an extremely small percentage of projected average-day water demands in 2035. If OWASA stopped issuing loans after 2035, these average day demand reductions would likely be sustained in 2070.

Programmatic Assumptions

	Single Family Residential	Multi-Family Residential	Non-Residential
Participations rates	17-24 homes per year	1 complex per year	1 business per year
Total number of loans provided (2020-2035)	327 homes	16 complexes	16 businesses
Average loan amount	$500	$10,000	$10,000

Over the course of the 50-year planning period, this strategy would result in 1.1 million fewer gallons of water being used.

What are the environmental impacts of this alternative?

Reducing demand for water can help defer the need for expansion of OWASA system capacities (and their associated environmental impacts) and reduce greenhouse gas emissions from the use of conventional energy sources to pump lake water, drinking water, wastewater, and treated wastewater.

What are the social impacts of this alternative?

This strategy would enhance our engagement with the community and provide a service to our customers. Moreover, this program could serve as a communication platform that would encourage some customers to conduct water efficiency retrofits without a loan.

An on-bill finance program has the potential to incentivize landlords to upgrade toilets to high-efficiency toilets because the cost of repayment will fall to the tenant who will directly benefit from the water savings.

For an individual customer, a reduction in water demand can help lower the cost of water and sewer service, thereby making it more affordable.

What permits, regulations, or partnerships are needed for this alternative?

No state or federal permits or legislation changes are needed for OWASA to provide water efficiency design assistance as a service. More research is needed into the legal authority to offer a tariff-based program through which the debt stays with the premise and not the tenant (as has been offered by the Roanoke Electric Membership Cooperation in eastern NC).

Are there any technical considerations with this alternative?

Although not technical, this program would require administrative oversight.

Are there other uncertainties or risks associated with this alternative?

Yes, as a voluntary program, there are uncertainties in program participation. Water savings associated with this demand management strategy are down-scaled from participation and

default rates of energy efficiency on-bill programs, which may not directly translate to a water-related program. Loan programs are typically more attractive to middle-income customers.

Ongoing monitoring and performance measurement would be critical to ensure that we were achieving the level of savings that we expected.

What is the cost to implement this alternative?

Costs associated with this alternative include approximately 20% of an FTE at an annual cost of $24,000 in 2020 dollars. These costs would be slightly offset by a reduction in the cost of water and wastewater treatment. Ultimately, the cost of the loans would be paid back with a modest interest rate to cover an estimated default rate of 3%. (Energy efficiency on-bill programs have experienced relatively low default rates because of the ramifications of non-payment.)

Based on these high-level assumptions, the total net present cost of this strategy is $284,000, with a levelized cost of $248/ 1,000 gallons (saved) over 50 years.

This alternative would result in less revenue from usage charges collected from benefitting customers. We estimate that the reduced usage charges would be about $3.5 million over the next 50 years (an average of $71,000 per year).

Summary

50-Year Net Present Cost at 3.6% Discount Rate	$0.284 million
Levelized Net Present Cost Per Thousand Gallons Saved	$248 /1000 gal saved
Impact on Average Day Demand in 2035	0.026 mgd
Impact on Average Day Demand in 2070	0.026 mgd

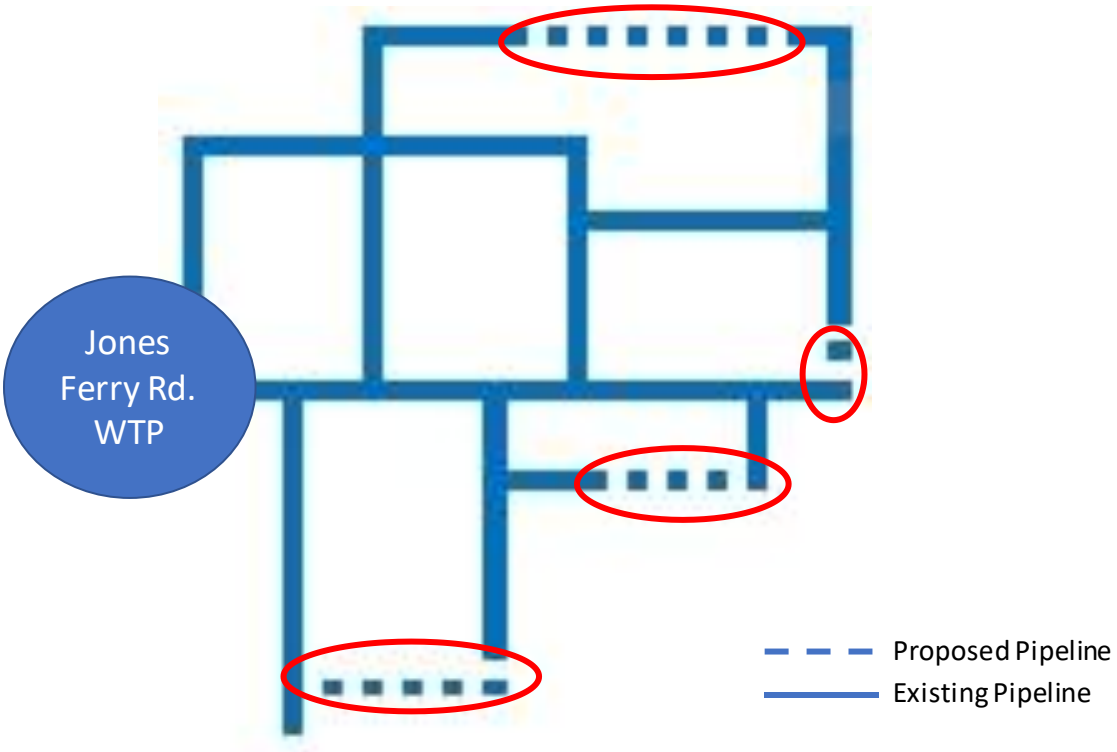
Alternative 13D: Demand Management: Minimize Need for System Flushing for Water Quality Purposes

In order to maintain high levels of water quality, OWASA flushes about 20 million gallons of treated drinking water from the distribution system each year. In particular, there are certain regions of the system where low water flow results in "stale" water (e.g. dead-end lines). Given our current infrastructure, our practice of flushing these lines is critical to ensuring that our customers' drinking water is safe and high quality.

In this demand management strategy, we evaluated opportunities to connect dead-end lines back to the distribution system in order to minimize the need for system flushing and to reduce large lines going to areas of low demand. Based on technical feasibility, four of the eight active flushing devices were identified as potential candidates to connect or replace water lines that would effectively remove the need for system flushing.

It is important to note that our ongoing and standard approach to system development is to proactively minimize the need for and occurrence of system flushing. As development occurs throughout our service area, we look for opportunities to minimize and reduce distribution system dead-ends. This is especially important in areas where daily water demands are relatively low but the water mains have been considerably sized to meet fire flow requirements.

The schematic below illustrates dead-end lines (areas circled in red without existing pipeline) that could be looped (with proposed pipeline shown as dashed lines) to save water by reducing flushing requirements.



How much water does this alternative save?

We estimate that in removing the need for regular system flushing at four potential sites, we would reduce average-day demands by about 47,000 gallons. Cumulatively, over the next 50 years, it would reduce water use by 837 million gallons.

What are the environmental impacts of this alternative?

Reducing water demand can help defer the need for expansion of OWASA system capacities (and their associated environmental impacts) and reduce greenhouse gas emissions from the use of conventional energy sources to pump lake water and drinking water. Given that this water is flushed onto the ground and not into the sanitary sewer, there would be no wastewater savings from this alternative.

Although we take great precaution to de-chlorinate and slow the flow of system-flushed water, reducing system flushing would reduce (i.e. benefit) stormwater runoff.

What are the social impacts of this alternative?

In the short-term, there would be modest negative social impacts associated with construction of the looping water line (i.e. road closures, boil water advisories).

There is a public perception benefit in reducing system flushing. An average person that sees system flushing will view it as wasted water. In reducing the amount that is required to flush, we reduce the occurrence of this potentially negative public perception.

What permits, regulations, or partnerships are needed for this alternative?

Implementation of new water lines to eliminate dead-end lines will require approval of necessary water main improvements; however, we will not likely face any major permitting obstacles.

Are there any technical considerations with this alternative?

System-looping options that were technically challenging or not possible were not considered in this evaluation. Options not considered included those that would have to run across a dam and options that would require a significant amount of installation work on private property.

The four options considered are technically feasible at varying levels of cost.

Are there other uncertainties or risks associated with this alternative?

No major uncertainties or risk associated with this alternative.

What is the cost to implement this alternative?

The cost to install each of the four connecting water lines will vary considerably depending on several factors, such as length and size of pipe, site conditions, road repaving required, etc.

Including design, construction, and all related project costs, the estimated unit cost of these four projects ranges from $250 to $775 per lineal foot.

Based on OWASA staff's preliminary engineering analysis, the estimated total cost to design and install the 8,800 feet of water line required to reduce the need for flushing would be $6.2 million in 2020. When savings from reduced water treatment costs are factored in, the total net present cost of this alternative is $5.7 million, with a levelized cost of $6.78/total thousand gallons over 50 years.

There is no associated lost revenue to this alternative, as these system flushing points are owned and operated by OWASA, and we do not charge for water used for ongoing flushing needed to maintain water quality.

Summary

Estimated Water Savings of Project	0.047 mgd
2020 Capital Cost Estimate	$6.2 million
2020 Cost per GPD of Water Savings	$132 /gpd
50-Year Net Present Cost at 3.6% Discount Rate	$5.7 million
Levelized Net Present Cost Per Thousand Gallons Saved	$6.78 /1000 gal saved
Impact on Average Day Demand in 2035	0.047 mgd
Impact on Average Day Demand in 2070	0.047 mgd

Appendix 1: Cost Summary Tables and Definitions/Descriptions of Information Summarized in Them

Summary of Supply Alternatives

Assumed Estimated Yield of Project (MGD) – the amount of water (in millions of gallons per day) that the alternative is expected to be able to reliably provide over the course of the year once it is placed in service.

Capital Costs in 2020 $

Project Design and Construction (Million $) – the current estimated total cost to design and construct the alternative, assuming we were building it in 2020. (To calculate the Net Present Cost of alternative assumed to be built in the future, we escalate the project construction cost to account for inflation, then discount those costs back to 2020 dollars.)

$ Per GPD of Additional Yield Provided – the Project Design and Construction Cost divided by the Assumed Estimated Yield of the Project provides the unit capital cost per gallon per day of yield provided.

Year Construction Begins – assumed year in which we begin to build the project. For the Net Present Cost analysis, we escalate the current cost estimate to account for future inflation between now and when the project is built.

Year Initially On-Line – assumed year when the alternative begins to supply water.

Net Present Cost (Million $) – the total Net Present Cost of all capital, operating and maintenance, and major rehabilitation and replacement costs assumed to be incurred for the alternative through 2070. The Net Present Cost is determined by adjusting the annual stream of all costs and cost savings to account for future inflation, then discounting those future dollars back to 2020 to account for the time value of money.

For our analyses, we used a capital and operating and maintenance cost escalation factor of 2.1% per year, and a discount rate of 3.6% per year. This is consistent with the U.S. office of Management and Budget's guidance for 2019. The Net Present Cost is sometimes referred to as the Life-Cycle Cost.

Net Present Levelized Cost $

Per 1,000 Gallons of Yield – the Net Present Cost of the alternative divided by the additional yield the alternative provides for the duration of the planning horizon, reported in $/1,000 gallons per day.

Per 1,000 Gallons Projected to be Supplied – the Net Present Cost of the alternative divided by the amount of water demand assumed to actually be met by the alternative, reported in $/1,000 gallons per day.

Assumed Average-Day Use (MGD)

When System Comes On-Line – amount of water demand the alternative is expected to actually meet when it is placed in service (in million gallons per day)

2070 – amount of water demand the alternative is expected to meet in 2070, assuming our Baseline projection (in million gallons per day)

Summary of Demand Management Alternatives

Estimated 2070 Water Savings of Project (MGD) – the amount of water savings (in millions of gallons per day) that the alternative is assumed to be able to provide by 2070. For reclaimed water (RCW) alternatives, the values shown represent the amount of drinking water demand that would be offset by RCW. For water efficiency program alternatives, the values shown indicate how much water savings the strategy is expected to provide in 2070.

Capital Costs in 2020 $ (Does not apply to certain demand management alternatives)

Project Design and Construction (Million $) – the current estimated total cost to design and construct the alternative, assuming we were building it in 2020. (To calculate the Net Present Cost of alternative assumed to be built in the future, we escalate the project construction cost to account for inflation, then discount those costs back to 2020 dollars.)

$ Per GPD of Water Savings Provided – the Project Design and Construction Cost divided by the Estimated 2070 Water Savings of the Project provides the unit capital cost per gallon per day of water savings.

Year Construction or Program Begins – assumed year in which we begin to build the project or implement the demand management program.

Year Initially On-Line – assumed year when the alternative begins to reduce drinking water demands.

Net Present Cost (Million $) – the total Net Present Cost of all capital, operating and maintenance, major rehabilitation and replacement costs, and other costs assumed to be incurred for the alternative through 2070. The Net Present Cost is determined by adjusting the annual stream of all costs and cost savings to account for future inflation, then discounting those future dollars back to 2020 to account for the time value of money.

For our analyses, we used a capital and operating and maintenance cost escalation factor of 2.1% per year, and a discount rate of 3.6% per year. This is consistent with the U.S. office of Management and Budget's guidance for 2019. The Net Present Cost is sometimes referred to as the Life-Cycle Cost.

Net Present Levelized Cost Per 1,000 Gallons of Projected to be Saved – the Net Present Cost of the alternative divided by the additional water savings the alternative provides for the duration of the planning horizon, reported in $/1,000 gallons per day.

Assumed Average-Day Savings (MGD)

Initial Year – amount of water demand the alternative is expected to actually meet or save when it is placed in service (in million gallons per day)

2070 – amount of water demand the alternative is expected to meet or save in 2070, assuming our Baseline projection (in million gallons per day)

Net Revenue Effect Assuming 2070 Savings and 2020 Rates – assuming the alternative was fully in place today, and assuming our 2020 water and sewer rates, this is the amount of commodity charge revenues that would be affected, thereby requiring offsetting rate increases and/or cost reduction measures.

Cost Summary Tables of Alternatives

SUMMARY OF SUPPLY ALTERNATIVES

Alt #	Name	Assumed Estimated Yield of Project (MGD)	Capital Cost in 2020 $		Year Construction Begins	Year Initially On-Line	Net Present Cost (Million $)	Net Present Levelized Costs $		Assumed Average-Day Use (MGD)	
			Project Design and Construction (Million $)	$ Per GPD of Additional Yield Provided				Per 1,000 Gallons of Yield	Per 1,000 Gallons Projected to be Supplied	When System Initially Comes On-Line	2070
1	Jordan Lake - Full Partner in New Intake and WTP on West Side	Phase 1: 2 Phase 2: 5	$21.5 (Ph 1) $37.0 (Ph 1,2)	$10.76 (Ph 1) $7.41 (Ph 2)	2027	2031	$33.9	$0.65	$2.51	0.22	1.6
2	Jordan Lake - Continue with Mutual Aid Agreements	*THIS ALTERNATIVE MAINTAINS OUR EXISTING LEVEL OF WATER SUPPLY. WATER PRICE OUTLINED IN MUTUAL AID AGREEMENTS. THEREFORE, A FINANCIAL ANALYSIS WAS NOT COMPLETED FOR THIS ALTERNATIVE.*									
3	Jordan Lake - Develop New Agreement with Town of Cary to Guarantee Access	*A FINANCIAL ANALYSIS WAS NOT COMPLETED FOR THIS ALTERNATIVE SINCE CARY STAFF HAS ADVISED THEY WOULD LIKE TO OPERATE WITHIN PROVISIONS OF EXISTING MUTUAL AID AGREEMENTS AT THIS TIME.*									
4	Jordan Lake - Develop Agreement with Western Intake Partners to Guarantee Access	*A FINANCIAL ANALYSIS WAS NOT COMPLETED FOR THIS ALTERNATIVE. AS THE POTENTIAL PARTNERS ON THE WESTERN INTAKE AND WATER PLANT AT JORDAN LAKE ARE IN THE EARLY STAGES OF CONSIDERING THEIR RESPECTIVE PARTICIPATION LEVELS, RELATED COSTS, AND GOVERNING STRUCTURE AND CONTRACTUAL PROVISIONS.*									
5	Shallow Quarry Reservoir	2.1	$0.3	$0.14	2030	2032	$2.4	$0.07	$0.18	0.25	1.6
6	Deep Quarry Reservoir	3.4	$77.3 (w/trans)	$22.74	2030	2033	$65.5	$1.39	$5.01	0.29	1.6
		3.4	$35.8 (no trans)	$10.53	2030	2033	$31.0	$0.66	$2.37	0.29	1.6
7A	Indirect Potable Reuse - New Pretreatment Mixing Basin	4	$105.9	$26.48	2050	2052	$36.9	$1.33	$4.12	0.98	1.6
7B	Indirect Potable Reuse - Storage and Mixing in Quarry Reservoir	4	$100.9	$25.23	2050	2052	$36.1	$1.30	$4.03	0.98	1.6
8	Indirect Potable Reuse with Return to University Lake	*A FINANCIAL ANALYSIS WAS NOT COMPLETED FOR THIS ALTERNATIVE, SINCE ALTERNATIVE 7A (AND POSSIBLY 7B) IS MORE VIABLE FROM A REGULATORY AND ECONOMIC PERSPECTIVE.*									
9 - C	Direct Potable Reuse - Carbon-Based Treatment	4	$46.0	$11.50	2050	2052	$18.0	$0.65	$2.01	0.98	1.6
9 - RO	Direct Potable Reuse - MF/RO Treatment	4	$59.4	$14.85	2050	2052	$31.4	$1.13	$3.51	0.98	1.6

Cost Summary Tables of Alternatives

SUMMARY OF DEMAND MANAGEMENT ALTERNATIVES *(Note: Capital costs do not apply to some options.)*

Alt #	Name	Estimated 2070 Water Savings of Project (MGD)	Capital Cost in 2020 $		Year Construction or Program Begins	Year Initially On-Line	Net Present Cost (Millions)	Net Present Levelized Costs Per 1,000 Gallons Projected to be Saved	Assumed Average-Day Savings (MGD)		Net Revenue Effect Assuming 2070 Savings and 2020 Rates (Millions)
			Project Design and Construction (Millions)	Per GPD of Savings Provided					Initial Year	2070	
10	Reclaimed Water Use at UNC Cogeneration Facility	0.2	$13.2	$66	2030	2032	$17.9	$5.99	0.21	0.21	($0.42) *
11	Reclaimed Water Use for Toilet Flushing in New UNC Buildings	0.055	$1.7	$31	2020	2020	$1.0	$1.11	0.003	0.055	($0.11) *
12	On-Site Wastewater and NPW Treatment and Reuse	0.154	$4.5	$29	2025	2026	$8.8	$4.18	0.006	0.154	($0.68)
13A	Unit Sub-Metering and WaterSense Installation	0.17	*Operating Program*	*N/A*	2020	2021	$0.4	$0.27	0.000	0.17	($0.73)
13B	Water Efficiency Design Assistance	0.23	*Operating Program*	*N/A*	2020	2021	$2.0	$1.02	0.004	0.23	($0.98)
13C	On-Bill Financing Program for Investments in Water Efficiency	0.03	*Operating Program*	*N/A*	2020	2021	$0.3	$248	0.001	0.03	($0.11)
13D	Minimize System Flushing	0.047	$6.2	$132	2021	2021	$5.7	$6.78	0.047	0.047	N/A **

** Only water commodity charge revenue reductions apply to Alternatives 10 and 11.*

*** Water used for system flushing is non-revenue water; therefore, no revenue reductions apply.*

Appendix 2: Summary of Evaluation of Supply and Demand Management Alternatives Against their Goals

TABLE 1. RELATIVE COMPARISON OF WATER SUPPLY OPTIONS AGAINST EVALUATION CRITERIA

Key to Cell Shading:	UNACCEPTABLE	POTENTIALLY UNACCEPTABLE/HIGHER LEVEL OF EFFORT NEEDED TO MAKE ACCEPTABLE	ACCEPTABLE	UNKNOWN OR NOT APPLICABLE	BASELINE (CURRENT CONDITIONS OR PLANNED SUPPLY)

		Jordan Lake Options			Quarry Options		Indirect Potable Reuse Options			Direct Potable Reuse
	EVALUATION CRITERIA	Alt 1: Jordan Lake - Full Partner in Proposed Western Intake and WTP	Alt 2: Jordan Lake - Continue with Mutual Aid Agreements	Alt 4: Jordan Lake - Agreement with Other Western Intake Partners to Guarantee Access to Allocation	Alt 5: Shallow Quarry	Alt 6: Deep Quarry	Alt 7a: Indirect Potable Reuse with Return to new Offline Storage Reservoir	Alt 7b: Indirect Potable Reuse with Return from WWTP to Quarry Reservoir	Alt 8: Indirect Potable Reuse with return from WWTP to University Lake	Alt 9: Direct Potable Reuse
SOCIAL PERFORMANCE	Estimated Yield	5 mgd; cost analysis assumes Phase I provides 2 mgd, and Phase II provides 5 mgd	5 mgd; greatest risk of having allocation rescinded during future allocation rounds since no plans/capital investment to permanently access allocation	5 mgd	2.1 mgd - already accounted for in our future yield estimates; does not meet 90th percentile 2070 raw water needs	3.4 mgd (2.1 mgd already accounted for in our future yield estimates); need improved transmission capacity to obtain this yield	4 mgd (need to verify with modeling)	4 mgd (need to verify with modeling)	4 mgd (need to verify with modeling; amount very uncertain given that water flows over UL dam 1/3 time)	4 mgd
	Impact on portfolio's diversity and resilience	Guaranteed access to Jordan lake allocation whenever we need it. Also provides diversity in treatment plants. Benefits of this alternative are reduced if DROP not modified.	Same as existing - may be vulnerable during new drought of record or back-to-back droughts; Risk would be reduced if could use water during non-drought periods - would need to modify DROP. Circumstances of other utilities will impact whether we can get water.	Guaranteed access to JL allocation, but OWASA has less control over when it could receive water. May be limited during low demand periods. Benefits of this alternative are reduced if DROP not modified.	Does not improvide diversity of our water supply.	Does not improve diversity of our water supply; meets our 50-year water supply needs.	Since wastewater will always be available, increases our diversity and resilience	Since wastewater will always be available, increases our diversity and resilience	Since wastewater will always be available, increases our diversity and resilience	Since wastewater will always be available, increases our diversity and resilience. Also provides diversity in treatment plants.
	Does strategy enable us to meet all applicable drinking water-related standards and other public health regulatory requirements?	Yes - proposed treatment plant design includes advanced technology to address organics, algae, and multiple forms of disinfection	Yes - Cary's WTP (currently only intake on Jordan Lake) includes advanced treatment; does not include UV disinfection. When future western intake on lake, would get from Durham - new plant will also meet drinking water requirements.	Yes - proposed treatment plant design includes advanced technology to address organics, algae, and multiple forms of disinfection	Yes - low solids makes water difficult to treat so will be mixed with water from CCR or UL	Yes - low solids makes water difficult to treat so will be mixed with water from CCR or UL	Yes. Additional treatment may be required at WWTP or WTP, which would impact costs.	Yes. Additional treatment may be required at WWTP or WTP, which would impact costs. May be reluctance from customers to use reclaimed water for drinking, but since mixed, likely lower reluctance than direct potable reuse.	Yes. Additional treatment may be required at WWTP or WTP, which would impact costs. May be reluctance from customers to use reclaimed water for drinking, but since mixed, likely lower reluctance than direct potable reuse.	Yes. Additional treatment required at WWTP.
	Water Use Restrictions	Lowest risk to needing water use restrictions once new facilities online (2030s)	Since no guarantee we can access water when needed, greatest risk to increasing frequency of water use restrictions and associated impact on affordability from drought surcharges	Low risk to needing water use restrictions once new facilities online (2030s)	Low risk to needing water use restrictions once new facilities online (mid -2030s); higher risk near 2070 which could impact affordability through drought surcharges	Low risk to needing water use restrictions once new facilities online (mid -2030s); higher risk near 2070	Will reduce risk of restrictions compared to current situation, but additional modeling needed to verify yield.	Will reduce risk of restrictions compared to current situation, but additional modeling needed to verify yield.	Will reduce risk of restrictions compared to current situation, but additional modeling needed to verify yield.	Very low risk of water use restrictions
	Legality in NC and policy and permit requirements	Yes, would need to modify internal DROP policy; many federal, local, and state permits needed but familiar process. OWASA does not have full control over this option.	No new permits or policies needed; may wish to modify local policies (DROP) so can use under wider range of conditions.	Yes; would need to modify internal DROP policy; other WIP would need many federal, state, and local permits. OWASA has less control than Alternative 1 under this option.	Yes - will need some permits from NCDWR and other federal, state and local agencies, but familiar process	Yes - will need some permits from NCDWR and other federal, state and local agencies, but familiar process	Probably legal; since WS-II watershed, the legality is questionable and permit process has not been done in NC and likely arduous.	May not be legal - Class WS-II designation of UL watershed and existing use of QR as water supply may preclude this; permit process would be arduous	This alternative is not currently legal in NC	This alternative is not currently legal in NC
	Partnerships and Local Control	Requires partnership with other members of WIP (currently City of Durham, Town of Pittsboro, Chatham County). OWASA has limited control.	Requires continued partnerships and mutual aid agreements with Town of Cary and City of Durham	Requires partnership with other members of WIP (currently City of Durham, Town of Pittsboro, Chatham County). OWASA has limited control.	OWASA has full control over this alternative.	OWASA has full control over this alternative.	OWASA has full control over this alternative.	OWASA has full control over this alternative.	OWASA has full control over this alternative.	OWASA has full control over this alternative.
	Impacts on community inside and/or outside of service area	Temporary construction impacts with noise, traffic, dust. Impacts to lands managed by NCWRC and USACE around Jordan Lake; over 30 different owners of parcels crossed by transmission main (shared facilities with other Partners).	No new infrastructure so no impacts on human environment	Temporary construction impacts with noise, traffic, dust. Impacts to lands managed by NCWRC and USACE around Jordan Lake; over 30 different owners of parcels crossed by transmission main (other Partners would own facilities).	Temporary construction impacts from adding generator on traffic and noise; temporary noise impacts when exercise or operate generator, but sound attenuation would minimize impact	Temporary construction impacts to noise and traffic; temporary construction impact to private properties in road ROW and Cane Creek Recreation Area (will not impact recreation itself at CCR).	New pipeline may impact approximately 30 private property owners; construction results in temporary impacts to traffic, noise, dust. May be reluctance from customers to use reclaimed water for drinking, but since mixed, likely lower reluctance than direct potable reuse.	New pipeline may impact approximately 30 private property owners; construction results in temporary impacts to traffic, noise, dust. May be reluctance from customers to use reclaimed water for drinking, but since mixed, likely lower reluctance than direct potable reuse.	Temporary construction impacts from noise, traffic, dust; private property impacts along pipeline corridor. May be reluctance from customers to use reclaimed water for drinking, but since mixed, likely lower reluctance than direct potable reuse.	Need additional land for this alternative; shorter pipelines so fewer impacts to private property; temporary construction impacts to traffic, noise, dust. Highest reluctance from customers.
ENVIRONMENTAL PERFORMANCE	Energy use and greenhouse gas emissions	Higher energy use from treatment and pumping facilities	Low - pumping from Cary/Apex WTP to OWASA; somewhat offset by reductions in treatment and pumping at OWASA facilities	Incremental increase in pumping from new WTP to OWASA	Energy associated with pumping water from Quarry and treating it at WTP	High energy use associated with pumping from deeper depths of Quarry Reservoir	Impacts to pump water from WWTP to pretreatment mixing basin and then to WTP; treatment at WTP	Impacts to pump water from WWTP to Quarry Reservoir and then to WTP; treatment at WTP	Pumping infrastructure will increase energy use	Less pumping than other alternatives, but if RO needed, could have higher energy footprint
	Impacts on streams, wetlands, groundwater	Impacts almost 2 acres of wetlands and requires over 30 stream crossings (shared facilities with other Partners)	None	Other Partners' infrastructure impacts almost 2 acres of wetland and requires over 30 stream crossings	None - should be able to site generator such that we can avoid impacts	Less than 0.1 acres of wetlands and fewer than 10 stream crossings (in same corridor as existing pipeline)	Based on siting assumptions of pretreatment mixing basin, impact less than 1 acre of wetlands and cross at least 25 streams; reduced downstream flows on Morgan Creek; reduced nutrient loading to Morgan Creek	Depending on pipeline route, impact less than 1 acre of wetlands and cross at least 25 streams; reduced downstream flows to Morgan Creek; reduced nutrieng loading to Morgan Creek	Pipeline route would cross streams and wetlands; nutrient loading into University Lake; reduced downstream flows on Morgan Creek	Construction at Mason Farm WWTP in floodplain; one potential stream crossing
FINANCIAL PERFORMANCE	Capital cost in 2020 dollars	$21.5 M (based on 2 mgd plant capacity and 5 mgd intake/pipeline capacity $37.0 M (based on 5 mgd ultimate capacity	$0	Unknown - too early in planning process for WIP; since new plant, may need to contribute to capital costs, but would be less than Alternative 1	$300,000	$77.3 M with transmission $35.8 w/o transmission	$105.9M	$100.9 M	Not calculated	$46.0 M (Carbon) $59.4 (RO)
	2020 Capital cost per gpd of additional yield	$10.76 (2 mgd) $7.41 (5 mgd)	$0	Unknown - too early in planning process for WIP; since new plant, may need to contribute to capital costs, but would be less than Alternative 1	$0.14	$22.74 (w/ transmission) $10.53 (w/o transmission)	$26.48	$25.23	Not calculated	$11.50 (Carbon) $14.85 (RO)
	Net Present Cost of Alternative	$33.9 M	N/A	Unknown	$2.4 M	$65.5 M (w/transmission) $31.0 (w/o transmission)	$36.9 M	$36.1 M	Not calculated	$18.0 M (Carbon) $31.4 M (RO)
	Levelized cost /1000 gallons yield (/1000 gallons water supplied)	$0.65 /1000 gal yield ($2.51 /1000 gal supplied)	N/A (Town of Cary lowest single famility residential rate ($4.74 /1000 gal); if used more frequently, may need to pay Durham fee to wheel water)	Unknown	$0.07 /1000 gal of yield ($0.18 /1000 gal supplied)	$1.39 /1000 gal yield (w/trans) ($5.01 /1000 gal supplied (w/trans)) $0.66 /1000 gal yield (w/o trans) ($2.37 /1000 gal supplied (w/o trans))	$1.33 /1000 gal of yield ($4.12 /1000 gal supplied)	$1.30 /1000 gal yield ($4.03 /1000 gal supplied)	Not calculated	$0.65 /1000 gal yield (Carbon) ($2.01 /1000 gal supplied (Carbon)) $1.13 /1000 gal yield (RO) ($3.51 /1000 gal supplied (RO))
STAFF RECOMMENDATION	Staff Recommendation	Continue to evaluate; move forward to modify DROP. Note that this alternative also provides redundancy to WTP, and costs for most other options do not provide that.	Continue with mutual aid agreements and update them as they expire; move forward to modify DROP to improve their effectiveness.	Continue to evaluate; move forward to modify DROP	Move forward with this option as outlined in 2010 LRWSP	Work with Martin Marietta to identify measures to access on temporary basis. No longer evaluate permanent access to deep storage.	Do not evaluate further	Do not evaluate further	Do not evaluate further for this LRWSP. However, track legality and identify opportunities to work with other utilities to work with General Assembly to modify laws. Continue to evaluate in future updates of LRWSP	Do not evaluate further for this LRWSP. However, track legality and identify opportunities to work with other utilities to work with General Assembly to modify laws. Continue to evaluate in future updates of LRWSP. Note that this alternative also provides redundancy to WTP, and costs to other options do not provide that.

TABLE 2. RELATIVE COMPARISON OF DEMAND SIDE MANAGEMENT OPTIONS AGAINST EVALUATION CRITERIA

Key to Cell Shading:	UNACCEPTABLE	POTENTIALLY UNACCEPTABLE/HIGHER LEVEL OF EFFORT NEEDED TO MAKE ACCEPTABLE	ACCEPTABLE	UNKNOWN OR NOT APPLICABLE	BASELINE

		Increase RCW Use at UNC		Non-UNC RCW Use	Robust OWASA Water Efficiency Program			
EVALUATION CRITERIA		**Alt. 10: Reclaimed Water to UNC Cogeneration Facilities**	**Alt 11: Expanded Reclaimed Water Use at UNC Main Campus**	**Alt. 12: Onsite Wastewater Treatment and Reuse**	**Alt. 13A: Unit Submetering and Water Sense Installation**	**Alt. 13B: Water Efficiency Design Assistance and Conservation-Oriented System Development Fee (SDF)**	**Alt 13C: On-bill Financing for Water Efficient Fixtures**	**Alt 13D: Minimize Need for System Flushing for Water Quality Purposes**
SOCIAL PERFORMANCE	Estimated Water Saved	0.21 mgd (UNC has indicated that technology changing; may not reduce this amount of water in future)	0.055 mgd	0.15 mgd	0.17 mgd	0.23 mgd	0.026 mgd	0.05 mgd
	Impact on portfolio's diversity and resilience	Helps reduce peaking at WTP; reduces reliance on potable water. Potable water still needed as backup. Does not improve diversity of OWASA's supply and treatment system.	Minor impact	May slightly defer need to expand OWASA's treatment plant capacities	May slightly defer need to expand OWASA's treatment plant capacities	May slightly defer need to expand OWASA's treatment plant capacities	Minor impacts on resilience of water supply given low water savings	Minor impacts on resilience of water supply given low water savings
	Does strategy enable us to meet all applicable drinking water-related standards and other public health regulatory requirements?	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Water Use Restrictions	Since can reduce water at peak times, could help reduce frequency of water use restrictions	No major impact on water use restrictions due to limited amount of water saved	Likley low impact on frequency of restrictions since developers would likely not implement this alternative without significant incentives and relatively low water savings	Lower per capita water useage may slightly delay or reduce time in water use restrictions	Lower per capita water useage may slightly delay or reduce time in water use restrictions	Lower per capita water useage would likely delay or reduce time in water use restrictions	Lower per capita water useage would likely delay or reduce time in water use restrictions
	Legality in NC and policy and permit requirements	Legal in NC. UNC has several concerns about this alternative and would need to buy into the alternative before it could move forward; require amending UNC permit	Yes; would require amending UNC's reclaimed water permit with NCDWR	Yes; may be issues with review and approval of plans at local level	Legal concerns whether OWASA and/or Towns could require WaterSense technology for new development	Likely; need to consider our cost-of-service requirement if modify system development fee	Likely; need additional research into legal authority to offer tariff-based program where debt stays with premise and not tenant	Yes
	Partnerships and Local Control	Ongoing partnership with UNC required. UNC does not support this alternative due to concern that use of RCW will cause corrosion and scaling and potential issues with disposing of waste stream. Also concern about space requirements for additional treatment.	Ongoing Partnership with UNC required.	Partnership with development community and local governments required.	Partnership with local governments required.	Partnership with development community required.	OWASA has full control over this alternative.	OWASA has full control over this alternative.
	Impacts on community	Temporary construction impacts to traffic and noise; may be insufficient space at Cogen facility for additional treatment needed.	Temporary construction impacts of traffic, noise, and dust - likely combined with other UNC construction activities	Needs careful planning to ensure reliability, safety, noise and odor thresholds are met.	Minor reduction in cost-of-living for tenants; Likely resistence from development community	May reduce rates for individual customers; if developer designs efficient building and pays reduced SDF, but if building uses more water, tenants may need to pay	May reduce rates for individual customers; enhanced engagement with community; may incentivize landlords to upgrade toilets	Temporary construction impacts to loop waterlines; reduces public perception that OWASA is "wasting" water
ENVIRONMENTAL PERFORMANCE	Energy use and greenhouse gas emissions	Energy and carbon emissions from pumping at WWTP to Cogen facility; energy for additional treatment at Cogen facility.	Overall lower energy use from treatment and pumping when compared to using potable water	May have lower energy use for treatment and pumping onsite than traditional treatment	Reduced energy to pump lake water, drinking water, and wastewater; reduced energy related to treatment	Reduced energy to pump lake water, drinking water, and wastewater; reduced energy related to treatment	Reduced energy to pump lake water, drinking water, and wastewater; reduced energy related to treatment	Reduced energy to pump lake water, drinking water, and wastewater; reduced energy related to treatment
	Impacts on streams, wetlands, groundwater	Waste stream from additonal treatment must discharge to stream or into OWASA's collection system; Reduces nutrient loading to Morgan Creek and Jordan Lake; reduced flows in Morgan Creek	Minor reduction in nutrient loading to Morgan Creek and Jordan Lake; minor reduction in flow to Morgan Creek	Slightly reduces flow to WWTP and nutrient loading to Morgan Creek and Jordan Lake; slightly reduces flows to Morgan Creek	Slightly reduces flow to WWTP and nutrients to Morgan Creek and Jordan Lake; slightly reduces flow in Morgan Creek	Slightly reduces flow to WWTP and nutrients to Morgan Creek and Jordan Lake; slightly reduces flow in Morgan Creek	Minimal impact from flow reduction	Reduce discharge of chlorinated/dechlorinated water on ground
FINANCIAL PERFORMANCE	Capital cost in 2020 dollars	$13.2 M	$1.7 M	$4.5 M	$0 (Operating Program)	$0 (Operating Program)	$0 (Operating Program)	$6.2 M
	2020 Capital cost per gpd of additional yield	$66.00	$30.90	$29.22	N/A	N/A	N/A	$132
	Relative life-cycle costs	$17.9 M	$0.97 M	$8.8 M (does not include costs to developers nor reduced revenue associated with demand loss)	$0.4 M (does not include costs to developers nor reduced revenue associated with demand loss)	$2.0 M (does not include costs to developers nor reduced revenue associated with demand loss)	$0.3 M (does not include reduced revenue associated with demand loss)	$5.7 M
	Levelized cost /1000 gallons water saved	$5.99 /1000 gal saved	$1.11 /1000 gal saved	$4.18 /1000 gal saved	$0.27 /1000 gal saved	$1.02 /1000 gal saved	$248 /1000 gal saved	$6.78 /1000 gal saved
Staff Recommendation	Staff Recommendation	Do not evaluate this option further	Work with UNC to identify opportunities for increasing use of RCW when cost-effective	Not actively pursue this option, but support if developer wanted to implement and conditions warranted	Potentially evaluate this option further	Potentially evaluate this alternative further	Do not evaluate this alternative further	Given low volumes of water saved for capital cost, do not pursue this option

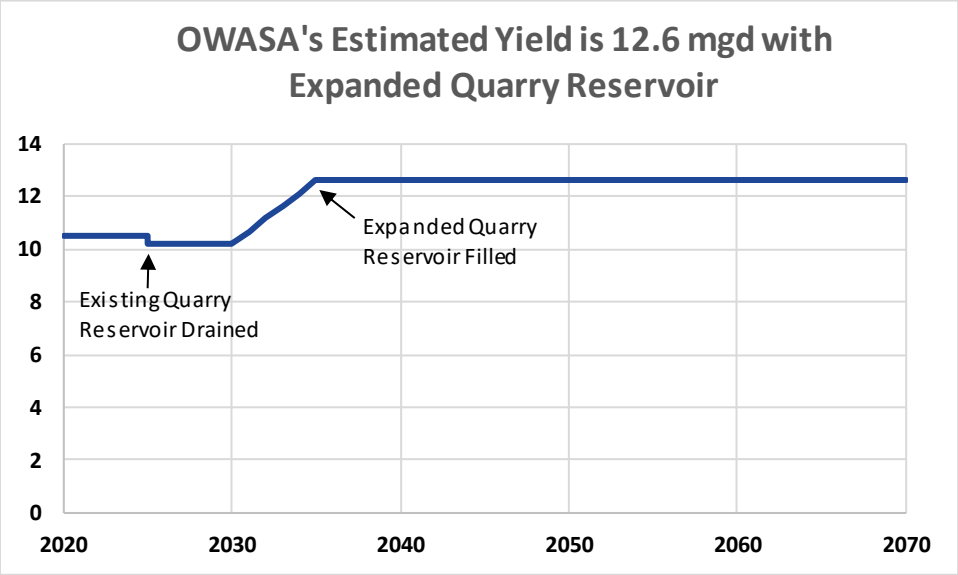
Attachment 5: Yield of OWASA's Water Supply Reservoirs

This document provides an overview of the assumptions used to estimate the yield of OWASA's locally controlled water supply reservoirs: Cane Creek Reservoir, University Lake, and the Quarry Reservoir. It provides information regarding the assumptions used to estimate yield, the results of a sensitivity analysis on three of those assumptions, and information on our risk of water shortage under different scenarios.

OWASA's Yield

OWASA's current estimated yield is 10.5 mgd. In approximately 2025, the existing Quarry Reservoir will be drained and joined to an active mining site to make one large Quarry Reservoir. The expanded Quarry Reservoir will be filled with water from Cane Creek Reservoir, and it is conservatively estimated that it will be full in approximately 2035. With the expanded Quarry Reservoir online, the estimated yield is 12.6 mgd. Figure 1 illustrates OWASA's estimated yield over time.

Figure 1: OWASA's Estimated Yield



Yield Definition

Yield is the amount of water that a reservoir(s) can provide during some designated period of drought. Yield is typically expressed in million gallons per day (mgd) of supply that can be provided throughout the year without depleting the reservoirs or drawing them down below established targets.

OWASA's yield calculation is based on a mass balance approach in which the storage of water on any given day is equal to the storage at the end of the previous day plus water input to our reservoirs minus water output from the reservoirs.

Water inputs include:

- Precipitation
- Streamflow and runoff into our water supply reservoir watersheds

Water outputs include:

- Evaporation from the reservoirs
- Water pumped to the Jones Ferry Road Water Treatment Plant (WTP)
- Water released or sent over the dams (Note: OWASA can control the flow of water out of Cane Creek Reservoir by modifying the gates. Releases must comply with our federal permit for the reservoir. We have no ability to control outflow from University Lake, and there are no mandatory downstream release requirements from University Lake).

Each of these variables impacts the yield calculation.

Assumptions in OWASA's Yield Calculation

Key assumptions in OWASA's yield calculation include:

- Drought of record – our yield calculation is based on the 2001-02 record drought (if a new drought of record occurs, our estimated yield will be lower).
- Active (useable) storage – our yield calculation is based on the amount of water we can access from our water supply intakes. Our yield calculation assumes only the volume of lake water we can withdraw water from, and we also assume a certain amount of that active storage is continually lost to sedimentation across the reservoir bottom.
- Reserve storage – our yield calculation is conservative because it reflects our operating target of maintaining an emergency storage reserve of 20 percent. This reserve is intended to buy us some time to implement extreme emergency supply augmentation measures (such as the temporary Haw River withdrawal option). Assuming current average annual demands of 7 mgd, our 20 percent reserve storage would last approximately 100 days assuming no additional inflow to our reservoirs.
- Optimal reservoir operation – our WTP staff follow supply optimization operating protocols to guide decisions about which reservoir (or reservoirs) to withdraw from during given lake level conditions. Water quality conditions, planned or unplanned reservoir maintenance activities and capital improvements, and other factors may prevent us from optimizing yield. As a result, this assumption in our yield estimate may overstate our actual yield. Staff anticipates that the deviation from the estimated yield will generally be small unless we deviate from the operating protocols well into a drought.

Uncertainty Factors in OWASA's Yield Calculation

Key factors surrounding the uncertainty of our yield estimate include:

- Streamflow records – Our yield and reservoir optimization model is based on a 94+ year period of record from USGS stream flow gaging stations. Table 1 summarizes the gages used to develop OWASA's yield estimate:

Table 1: Summary of Gages Used to Estimate OWASA's Yield

Gage	Location	Period of Record
Cane Creek near Teer (No. 02096846)	Cane Creek approx. 2500 feet downstream of dam	Oct. 1, 1959 – Oct 9, 1973
Cane Creek near Orange Grove (No. 02096850)	Cane Creek at Buckhorn Road just upstream of reservoir	Nov. 1, 1988 – Present
Flat River at Bahama (No. 02085500)	Lake Michie Watershed (north of Durham and located outside of OWASA's watersheds)	Aug. 1, 1925 – Present

  Because there are relatively short periods of flow record for Cane Creek, the gage at the Flat River was used to supplement the available data and develop assumed flows for missing flow records. Flow correlations were developed for the Flat River and Cane Creek gages for the overlapping periods of record and enabled us to make reasonable statistical approximations for flow into all of our reservoirs over the 94-year period of record. While correlating stream flows is a common practice, it is a source of uncertainty.
- Flow records have measurement errors and spatial limitations and may not be representative of long-term historical flows.
- Estimates of storage volume – Potential errors in storage volume estimates include (1) the accuracy of the original survey data, and (2) the rate of sedimentation.
- Climate change – climate change will impact watershed and reservoir hydrology and evapo-transpiration rates. The majority of global climate change models indicate that the southeast will receive approximately the same or more rainfall on an average basis, but we will have more frequent high flow events. Some of those models also indicate there will be more intense droughts. Higher temperatures will result in higher evaporation rates from our reservoirs. Global climate models are not clear on how the corresponding increase in temperature and evaporation and increased stream flows will affect water supply. There is some evidence that impacts on water supply may be minor, but staff also recognizes that a new drought of record or drought with a very different signature (e.g., how quickly drought comes on, how long it lasts, the type of rainfall pattern which ends drought, etc.) than we have seen in the past would impact our estimated yield.

Sensitivity Analysis of our Estimated Yield

Hazen and Sawyer completed a sensitivity analysis around the following three parameters:

- Hydrology (stream flow and runoff into our water supply reservoirs)
- Net evaporation (evaporation minus precipitation) from lake surfaces
- Sedimentation rates into reservoirs

Under a sensitivity analysis, each of the parameters is modified one at a time and compared against a baseline run. Figure 2 and Table 2 summarize the results of the uncertainty analysis. The remainder of this section provides additional details on selecting the range for each of the parameters modified in the analysis. Based on the ranges selected for each parameter, the model is most sensitive to changes in future inflow and least sensitive to future changes in the net evaporation rate.

Figure 2: Uncertainty Around OWASA's Estimated Yield

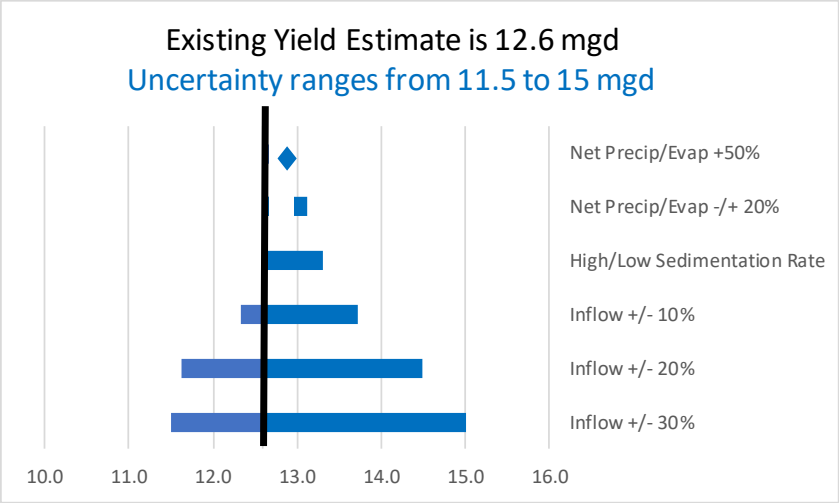


Table 2: Results of Sensitivity Analysis

Yield Summary - Updated sedimentation rates base case							
Scenario	Inflow Change	Net Evap. Change	University Lake Capacity (MG)	Cane Creek Reservoir Capacity (MG)	Quarry Reservoir Capacity (MG)	**Yield (MGD)**	% Change in Yield
Baseline		0%	411	2780	1500	**13.03**	
Inflow -30%	-30%	0%	411	2780	1500	11.50	-11.7%
Inflow -20%	-20%	0%	411	2780	1500	11.63	-10.7%
Inflow- 10%	-10%	0%	411	2780	1500	12.34	-5.3%
Inflow +10%	10%	0%	411	2780	1500	13.72	5.3%
Inflow +20%	20%	0%	411	2780	1500	14.49	11.2%
Inflow +30%	30%	0%	411	2780	1500	15.01	15.2%
Net Precip/Evap -20%	0%	-20%	411	2780	1500	13.13	0.8%
Net Precip/Evap +20%	0%	20%	411	2780	1500	12.94	-0.7%
Net Precip/Evap +50%	0%	50%	411	2780	1500	12.83	-1.5%
Sedimentation - High Rate	0%	0%	324	2639	1500	12.61	-3.2%
Sedimentation - Low Rate	0%	0%	473	2868	1500	13.31	2.1%

Hydrology (Inflow to Reservoir)

Since climate change models indicate that average rainfall in our area may be slightly higher than historic averages, but may come with more frequent storms, six runs of the yield model were completed that differed from baseline assumptions: Uniform adjustments of -30%, -20%, -10%, +10%, +20%, and +30% were made to all streamflow inputs to the reservoirs.

Net Evaporation Rate

Since climate change models are more in agreement on increasing temperatures and therefore evaporation rates, the modifications to the net evaporation rate were skewed toward hotter temperatures and higher net evaporation. The following three runs were completed: -20%, +20%, and +50%.

Storage Volume/Sedimentation Rates

Hazen and Sawyer fully reviewed available data to estimate storage volumes and sedimentation rates of OWASA's reservoirs. OWASA's existing model assumed a sedimentation rate of 0.23 ac-ft/yr/sq mi, and this estimated rate may likely be conservatively high for current watershed land cover conditions. The North Carolina Water Resources Research Institute (WRRI) funded a study in 1989 of University Lake's available storage and found that University Lake had a total storage volume of 588 million gallons (MG), and a usable storage volume (above intake) of 488 MG (Bisese and Paull, 1994). Bisese and Paul estimated the sedimentation rate of University Lake of 0.26 acre-feet/yr/sq mile by comparing the 1989 storage volume to estimated volume

based on topography prior to it being impounded. No bathymetric studies have been completed on University Lake since 1989, and no bathymetric studies have been completed on Cane Creek Reservoir since it was impounded (gates closed in December 1988; reservoir full in March 1989).

Reservoirs tend to have higher sedimentation rates after they are initially impounded and the rate then decreases. In addition, changes in erosion and sediment control practices, riparian buffer requirements, funding for agricultural best management practices, and stormwater management requirements and practices over the past few decades also likely result in lower sedimentation rates. The City of Durham recently completed sedimentation studies for Lake Michie and Little River Reservoir, their two local water supply reservoirs. Lake Michie is a similar age as University Lake, and the U.S. Geological Survey (USGS) studied its sedimentation rates in the early 1990s (Weaver, 1994). The USGS study estimated the sedimentation rate of Lake Michie as 0.23 ac-ft/yr/sq mi, similar to the sedimentation rate estimated for University Lake (0.26 ac-ft/yr/sq mi). The recent study completed by Durham resulted in an estimated sedimentation rate of 0.065 ac-ft/yr/sq mi for 1991 to present.

Little River Reservoir has similar land use as Cane Creek Reservoir and was impounded around the same time as Cane Creek Reservoir; preliminary results of the recent study indicate a sedimentation rate of approximately 0.34 ac-ft/yr/sq mi since impoundment. However, based on results of sedimentation studies on other reservoirs, the calculated rate may be high and reflect an overestimate of the original storage volume. For example, Jordan Lake's sedimentation rate from 1990-1997 was estimated at 0.01 ac-ft/yr/sq mi. While Jordan Lake has a much larger drainage area, it was impounded in the early 1980s and is of similar age as Little River Reservoir and Cane Creek Reservoir.

Based on available data, Hazen and Sawyer selected different sedimentation rates for University Lake and Cane Creek Reservoir from 1989 to 2020 but applied the same future sedimentation rate to each. These rates are summarized in Tables 3 and 4 and were used for the purpose of conducting the sensitivity analysis on available reservoir storage.

Table 3: Sedimentation Rates used for University Lake

University Lake Storage and Sedimentation Sensitivity Parameters			
1989 Total Storage	588 MG[1]		
1989 Usable Storage	488 MG		
Drainage Area	29.9 mi^2		
Sediment period / rate	Low Rate	Baseline Rate	High Rate
1989 - 2020	0.02 ac-ft/yr/mi^2	0.10 ac-ft/yr/mi^2	0.15 ac-ft/yr/mi^2
2020 - 2070	0.02 ac-ft/yr/mi^2	0.10 ac-ft/yr/mi^2	0.25 ac-ft/yr/mi^2
2020 Usable Storage	482 MG	460 MG	446 MG
2070 Usable Storage	473 MG	411 MG	324 MG

[1] – Bisese and Paull, WRRI, 1994

Table 4: Sedimentation Rates used for Cane Creek Reservoir

Cane Creek Reservoir Storage and Sedimentation Sensitivity Parameters			
1988 Total Storage	3009 MG		
1988 Usable Storage	2909 MG		
Drainage Area	31.4 mi^2		
Sediment period / rate	Low Rate	Baseline Rate	High Rate
1988 - 2020	0.10 ac-ft/yr/mi^2	0.25 ac-ft/yr/mi^2	0.45 ac-ft/yr/mi^2
2020 - 2070	0.02 ac-ft/yr/mi^2	0.10 ac-ft/yr/mi^2	0.25 ac-ft/yr/mi^2
2020 Usable Storage	2877 MG	2828 MG	2763 MG
2070 Usable Storage	2867 MG	2777 MG	2635 MG

OWASA's Risk of Mandatory Water Restrictions with Current Local Supplies

OWASA has a state-approved Water Shortage Response Plan (WSRP) that was developed in accordance with North Carolina General Statute 143-355(l) and North Carolina Administrative Code 15A NCAC 02E .0607. Our WSRP includes triggers based on the water supply storage (percent full of reservoir system) and water demand conditions. Each response stage has a corresponding set of voluntary or mandatory water use restrictions, and water rate surcharges apply when specified triggers are reached (Appendix 1).

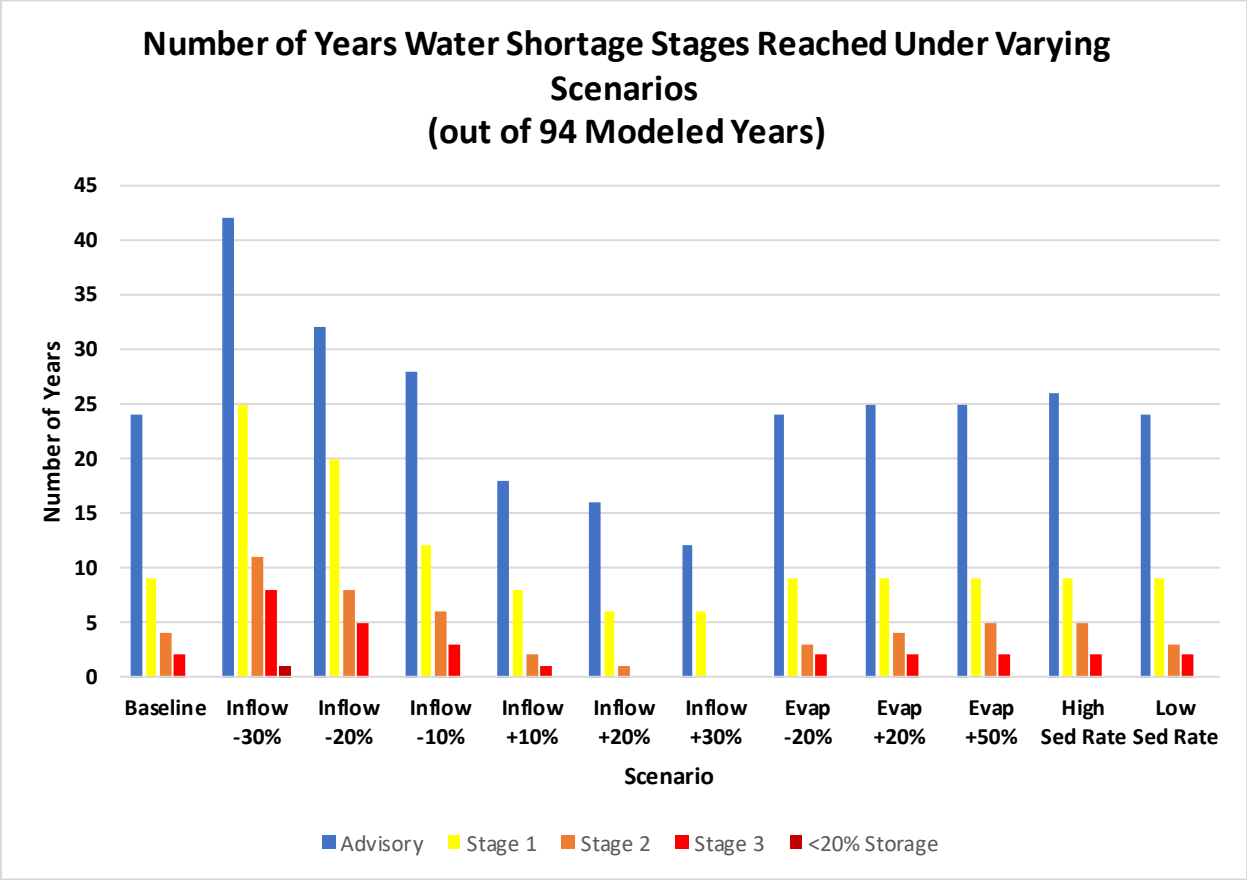
Increased yield results in reduced frequencies of mandatory water shortage stages. Water shortages have the potential to impact customers economically through the drought surcharges. It also negatively impacts businesses that use water (e.g., vehicle and power washing businesses).

Hazen and Sawyer ran OWASA's reservoir optimization model to estimate the likelihood of entering each of the WSRP stages. The modeling is based on the following:

- Run over the hydrologic period of record included in the model (1926-2019); if future hydrologic patterns change significantly from those in the model, the system performance will deviate from the results in Figures 3 and 4.
- Assumes Shallow Quarry storage access in the Quarry Reservoir (1500 MG)
- Assumes that our WSRP applies and certain reductions in raw water demand are achieved at each water shortage stage.
- Assumes 2070 Baseline Water Demands (12 mgd)
- Assumes the updated sedimentation rates used for the sensitivity analysis.

The results of the analysis are shown in Figure 3. It should be noted that OWASA's goal is to always maintain a minimum of 20% usable storage. The only scenario which did not achieve this goal occurred when inflows to the reservoir were reduced by 30%, a really conservative estimate. Under that scenario, a minimum storage of 17% occurred, and occurred in 1 of the 94 modeled years and lasted three weeks. The results are similar to the sensitivity analysis in that the greatest changes to risk occur with changes to the projected inflows to the reservoir system.

Figure 3: Number of Years Various Water Shortages Stages Occurred Under Different Inflow, Evaporation, and Sedimentation Rates



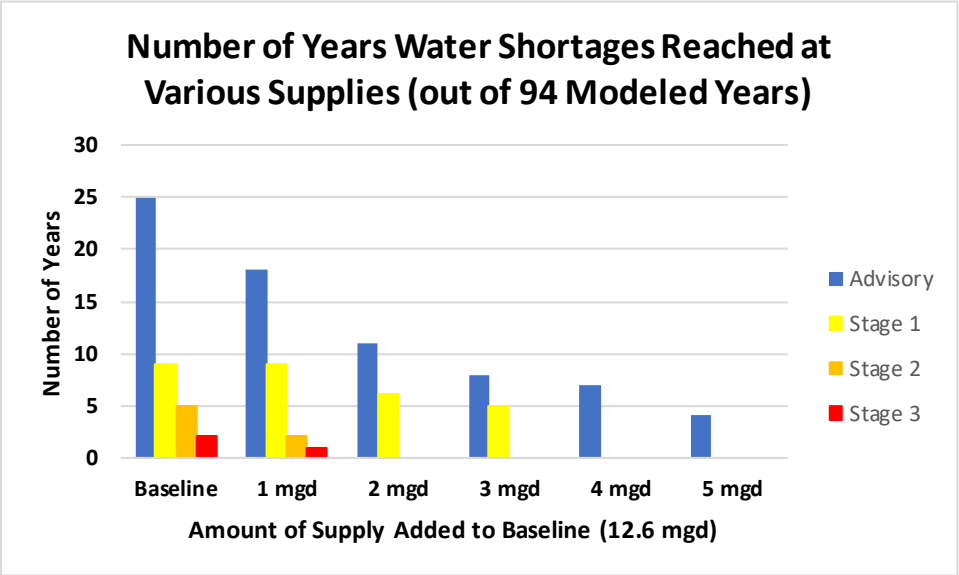
How Additional Supply Changes Risk

To evaluate how different levels of new supply would impact OWASA's long-term risk of hitting various water shortage stages, Hazen and Sawyer ran OWASA's reservoir optimization model at 2070 demands and with adding 1, 2, 3, 4, and 5 mgd of supply. All model runs included the following assumptions:

- Run over the hydrologic period of record included in the model (1926-2019); if future hydrologic patterns change significantly from those in the model, the system performance will deviate from the results in Table 6.
- Assumes that our WSRP applies and certain reductions in raw water demand are achieved at each water shortage stage.
- Assumes Shallow Quarry storage access in the Quarry Reservoir (1500 MG)
- Assumes 2070 Baseline Water Demands (12 mgd).
- Assumes OWASA moves forward with the shallow Quarry Reservoir option, and the sedimentation rates used to estimate our baseline yield (12.6 mgd).

The results indicate that under all scenarios OWASA's reservoir storage never drops below 20%. With additional supplies of 4 and 5 mgd, OWASA never reaches a Stage 1 water shortage. Figure 4 summarizes the results.

Figure 4: Results of Risk Modeling Assuming Different Levels of New Supply



References

Bisese, James A. and Charles K. Paull. 1994. *Sedimentation in University Lake, Orange County, North Carolina*. Water Resources Research Institute of the University of North Carolina.

Weaver, J. Curtis. 1994. Sediment Characteristics and Sedimentation Rates in Lake Michie, Durham County, North Carolina, 1990-92. U.S. Geological Survey Water-Resources Investigations Report 94-4123.

Summary of Conservation Standards and Water Rate Surcharges

SUMMARY OF KEY CONSERVATION STANDARDS FOR OWASA DRINKING WATER *

Effective June, 2009

Water Use	Year-Round	Stage 1	Stage 2	Stage 3	Emergency
Spray Irrigation of **Turf / Grass** (on designated days of the week as noted)	3 days per week, up to 1 inch per week, 6 pm - 10 am only ** Odd Addresses: Tu/Th/Sat Even Addresses: Sun/W/F	1 day per week, up to 1/2 inch per week, 6 pm - 10 am only ** Odd Addresses: Tues. Even Addresses: Thurs.	X**	X**	X
Spray Irrigation of **Non-Turf Plant Materials** (on designated days of the week as noted)	3 days per week, up to 1 inch per week, 6 pm - 10 am only ** Odd Addresses: Tu/Th/Sat Even Addresses: Sun/W/F	3 days per week, up to 1 inch per week, 6 pm - 10 am only ** Odd Addresses: Tu/Th/Sat Even Addresses: Sun/W/F	1 day per week, up to 1/2 inch per week, 6 pm - 10 am only ** Odd Addresses: Tues. Even Addresses: Thurs.	X***	X
Drip irrigation, underground drip emitters, soaker hose, hand-watering, and other non-spray methods allowed *at any time* or frequency	✓	✓	✓	✓	X
Washing of Building Exteriors **Before Painting**	✓	✓	✓	X	X
General Cleaning of Building Exteriors, Paved Areas, Etc.	✓	✓	X	X	X
Filling, Refilling, or Topping Off Ornamental Ponds, Fountains, etc.	✓	✓	X	X	X
Vehicle Washing	✓	✓	Only at commercial or institutional facilities where at least 50% of the water is being recycled, or is from a non-potable source or well	X	X
Filling, Refilling, or Topping Off of Swimming Pools and Backyard-Scale Facilities to Support Wildlife	✓	✓	✓	✓	X
Flushing or Pressure Testing New Water Lines	✓	✓	✓	✓	Only if captured and returned to system

Year-Round Requirements, Regardless of Water Shortage Condition

> Automatic controllers and rainfall or soil moisture sensors required on all irrigation systems
> "Wasteful" water use* prohibited at all times
> Water leaks must be repaired within 10 days of discovery and/or notification by OWASA
> Water may be served in restaurants and other dining facilities only at customer's request
> Hotel/motel linens may only be changed upon customer changeover, every 5 days, or upon customer request

Symbols and Notes

* *For the actual text of OWASA's Water Conservations Standards, please use the following link:* https://www.owasa.org/wp-content/uploads/2020/05/Water-Conservation-Standards.pdf

✓ *Water use is allowed.*

X *Water use is not allowed.*

** *Restrictions may not apply to public purpose athletic fields, recreational fields, or public purpose botanical sites operated in compliance with OWASA-approved Water Conservation Plans.*

*** *Restrictions may not apply to public purpose botanical sites operated in compliance with OWASA-approved Water Conservation Plans.*

WATER RATE SURCHARGES IN DECLARED WATER SHORTAGES

Individually-Metered Residential						**Multi-family Master-metered Residential**	**Non-Residential and Irrigation-Only**
Block:	Res. Block 1	Res. Block 2	Res. Block 3	Res. Block 4	Res. Block 5		
Use Level: (gallons)	1,000 to 2,000	3,000 to 5,000	6,000 to 10,000	11,000 to 15,000	16,000 and up		
Stage 1	No surcharge	No surcharge	1.25 times normal Block 3 rate	1.5 times normal Block 4 rate	2 times normal Block 5 rate	1.15 times year-round rate	1.15 times seasonal and irrigation-only rate
Stage 2	No surcharge	1.25 times normal Block 2 rate	1.5 times normal Block 3 rate	2 times normal Block 4 rate	3 times normal Block 5 rate	1.25 times year-round rate	1.25 times seasonal and irrigation-only rate
Stage 3 and Emergency	No surcharge	1.5 times normal Block 2 rate	2 times normal Block 3 rate	3 times normal Block 4 rate	4 times normal Block 5 rate	1.5 times year-round rate	1.5 times seasonal and irrigation-only rate

Calculating OWASA's Water Rates With Water Shortage Surcharges in Effect

Based on the water rates in effect as of October 1, 2019 (and which will be revised at the discretion of the OWASA Board of Directors), here are a couple illustrations of how OWASA's water rates change when water rate surcharges are in effect.

Example 1: The Block 3 water rate for individually-metered residences is $8.39 per 1,000 gallons of water use (use between 6,000 and 10,000 gallons). When the Stage 1 water rate surcharge is in effect, the Block 3 rate would increase to $10.4875 per 1,000 gallons (an increase of 25%).

Example 2: The Peak Season (May – September) water rate for all non-residential and non-irrigation customers is $8.47 per 1,000 gallons of water use. Under Stage 3 surcharges, the Peak Season water rate would increase to $12.705 per 1,000 gallons (an increase of 50%).

Attachment 6: Regional Water Supply, Interconnections, and OWASA's Mutual Aid Agreements

OWASA and other Triangle utilities have been working together on regional water supply planning efforts. These efforts have better prepared the region for the next drought as well as planned and unplanned events that may impact regional supply. This paper summarizes some of these regional planning efforts, identifies regional and OWASA interconnections, and includes a summary of OWASA's mutual aid agreements.

Triangle Regional Water Supply Plan

OWASA and twelve other local governments (Town of Apex, Town of Cary, Chatham County, City of Durham, Town of Hillsborough, Town of Holly Springs, Town of Morrisville, Orange County, Town of Pittsboro, City of Raleigh (also provides water and sewer services to six other local governments in Wake County), City of Sanford, and Wake County) formed the Jordan Lake Partnership (JLP) and worked collaboratively to develop the Triangle Regional Water Supply Plan (TRWSP, finalized in October 2014). This Plan estimated the Partners' projected water supply needs through 2060 and evaluated different supply sources to meet those needs. (Note: OWASA's water demands in the 2014 TRWSP were identical to those included in our 2010 LRWSP; all partner demand projections were peer reviewed). Figure 1 summarizes the Partners' demand projections and supplies in existence at the time the plan was finalized.

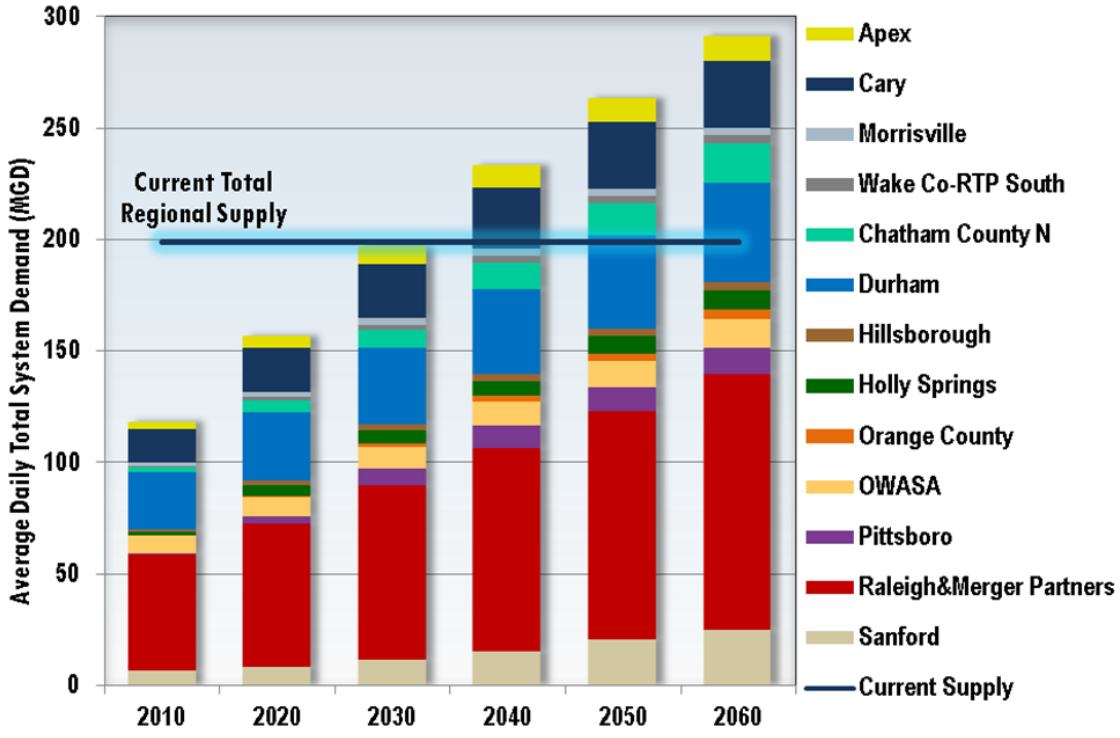


Figure 1: Regional Demand Projections and Current Supplies

Figure reproduced from Triangle Regional Water Supply Plan

Figure 1 illustrates that the region would not meet its future supply needs beginning in approximately 2030; by 2060 the TRWSP shows the regional will need approximately 95 mgd of additional supply. Many of the communities involved in TRWSP had already evaluated water supply options in earlier planning efforts. The TRWSP used these existing studies as a foundation. The Partners evaluated several different alternatives to meet demands which were evaluated against their ability to meet 2060 demands, costs, environmental impacts, and regulatory complexity. The Partners selected an alternative which included additional allocations from Jordan Lake as well as other supplies such as expanded river withdrawals, expanded reservoirs/quarries, and purchases. The combination of increasing allocations from Jordan Lake and other future water supplies meets the 2060 water needs for the Triangle Region.

Table 1 summarizes the allocations each Partner had at the time the TRWSP was completed (Round 3), the recommended Round 4 allocation, and the needed allocation in 2060. The NC Environmental Management Commission approved each Partners' requested Round 4 allocation in March 2017. Allocation applications are based on a 30-year need.

Table 1: TRWSP Recommended Jordan Lake Allocations (Percent of Water Supply Pool; each percent is approximately 1 mgd)

Partner	Round 3 Allocation (in effect in 2014 when TRWSP completed)	TRWSP Recommended Allocations	
		Total 2045 Need (Round 4 Allocation Basis; all Partner Round 4 allocations approved in March 2017)	Total 2060 Need (Future Round 5)
Apex	8.5	10.6	11.6
Cary	23.5	28.6	29.8
Morrisville	3.5	3.5	3.6
Wake County (RTP South)	3.5	3.5	3.5
Chatham County - N	6	13	18.2
Durham	10	16.5	16.5
OWASA	5	5	5
Orange County	1	1.5	2
Holly Springs	2	2	2.2
Hillsborough	0	1	1
Pittsboro	0	6	6
Raleigh & Merger Partners	0	0	0
Sanford	0	0	0
TOTAL	**63**	**91.2**	**99.4**

Table 2 summarizes the TRWSP recommendations for water supply other than the Jordan Lake allocations.

Table 2: TRWSP Recommended Water Supply Sources other than Jordan Lake to meet 2060 Demands

Partner	Source Name	Basin	Type	Projected New Supply (MGD)
Hillsborough	W. Fork Eno Expansion	Neuse	Reservoir Expansion	1.2
Orange County	Purchase from Town of Mebane	Haw	Purchase	0.5 - 2.5
OWASA	Quarry Reservoir Expansion	Haw	Quarry Expansion	2.1
Pittsboro	Haw River - Increased Withdrawal	Haw	River Withdrawal	4.0
Raleigh	Exploring 4 options; must develop 3	Neuse	New Reservoir; Reallocation of Falls Lake Storage; Neuse River Withdrawal; Quarry	41.1
Sanford	Cape Fear River - Increased Withdrawal	Cape Fear	River Withdrawal	12.8
TOTAL	All New Sources			61.7-63.7

Table reproduced from Triangle Regional Water Supply Plan

Note: US Army Corps of Engineers approved the reallocation of Falls Lake storage in 2019, providing approximately 22 mgd of additional yield to Raleigh. West Fork Eno Expansion is currently under construction.

Since the TRWSP was completed, the Partners have formed the Triangle Water Supply Partnership (TWP); the City of Sanford and Wake County are not participating in the partnership, but Harnett County and Johnston County have become members. The TWP recognizes that the TRWSP has uncertainties which could impact the success of the plan which include: rate of population growth, water efficiency and conservation practices, laws and regulations, and climate variability. Thus, one of the future projects is to update the TRWSP to check the assumptions and incorporate the needs of the two new Partners.

Since the TRWSP was completed, many of the Partners have updated or begun the process to update their individual water supply Plans. For the communities who have updated demand projections, some resulted in lower growth rates in water demands than used in the TRWSP (similar to OWASA); these lower growth rates were due to lower unit demands (demand per residence or square foot of commercial space). The communities where higher growth rates in demands occurred were largely due to higher development rates than anticipated when the TRWSP was completed; these communities have also largely observed lower unit demands.

Regional and OWASA Interconnections

Besides updating the Triangle Regional Water Supply Plan, the TWP has identified studies and projects to improve the reliability and resilience of the region's water supply – both from a long-term outlook and to prepare for short, unplanned emergencies. One of the first studies that the TWP will undertake is to update the Interconnection Model developed by the JLP. This model was developed to evaluate the capacities of existing and planned interconnections between the partners and identify needed improvements to meet current and 2060 needs. The TWP recently selected Hazen and Sawyer to update the model through a competitive qualifications-based process; the updated model will incorporate major changes in water distribution infrastructure and the infrastructure of the new partners.

Figure 2 illustrates how water can be moved between the different partners. The TWP plans to use the model to help develop strategies for use during drought as well as unplanned emergencies to help assure that the region could provide water to any partner if they had a major line break or supply offline. The models used as a basis for the TRWSP update and the updated interconnection model will also be used for regional drought management planning.

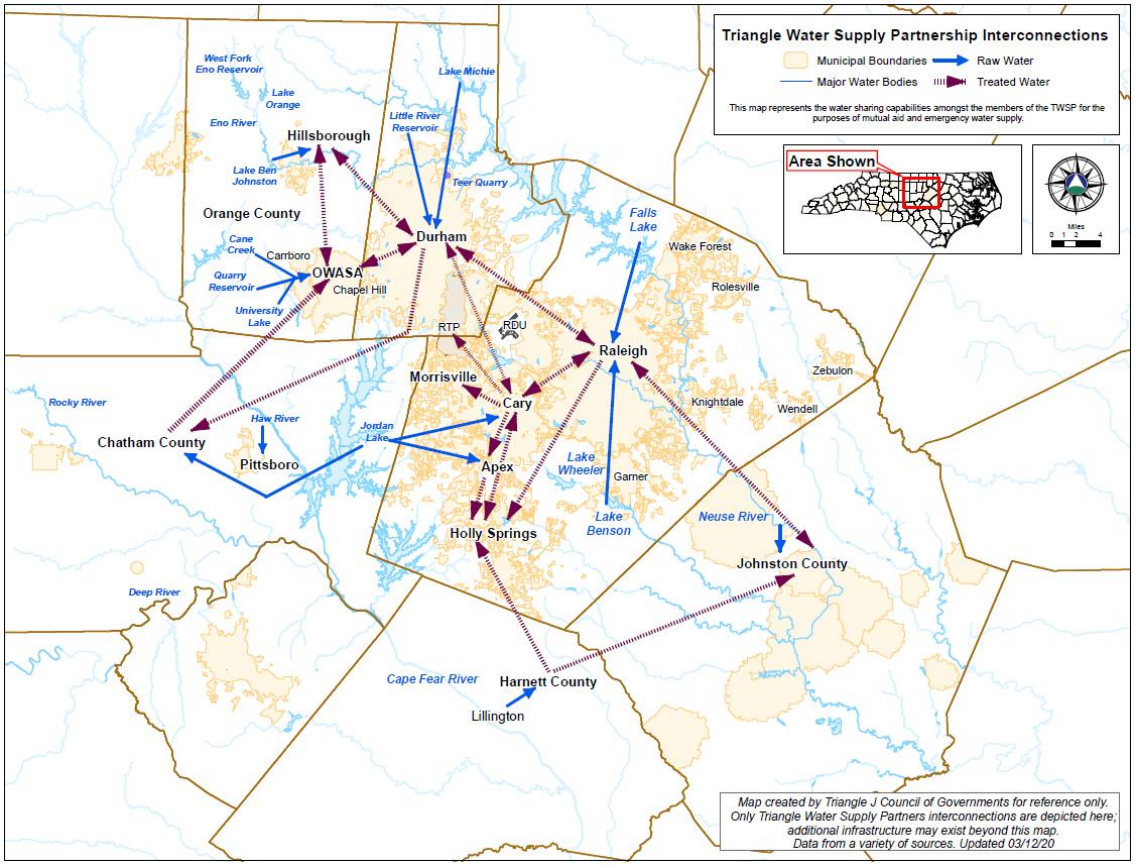


Figure 2: Triangle Water Supply Partnership Interconnections

Figure created by Triangle J Council of Governments on behalf of TWP

As shown in Figures 2 and 3, OWASA has interconnections with the City of Durham, Town of Hillsborough, and Chatham County. OWASA has used these interconnections during operational emergencies and droughts; we also regularly used interconnections with the City of Durham to obtain water prior to Cane Creek Reservoir coming online in 1989. Figure 4 illustrates that we have adequate interconnection capacity to meet our current supply needs during an operational emergency. It should be noted that the amount of water we could receive through our interconnections will also depend on our partners' treatment and supply capacity.

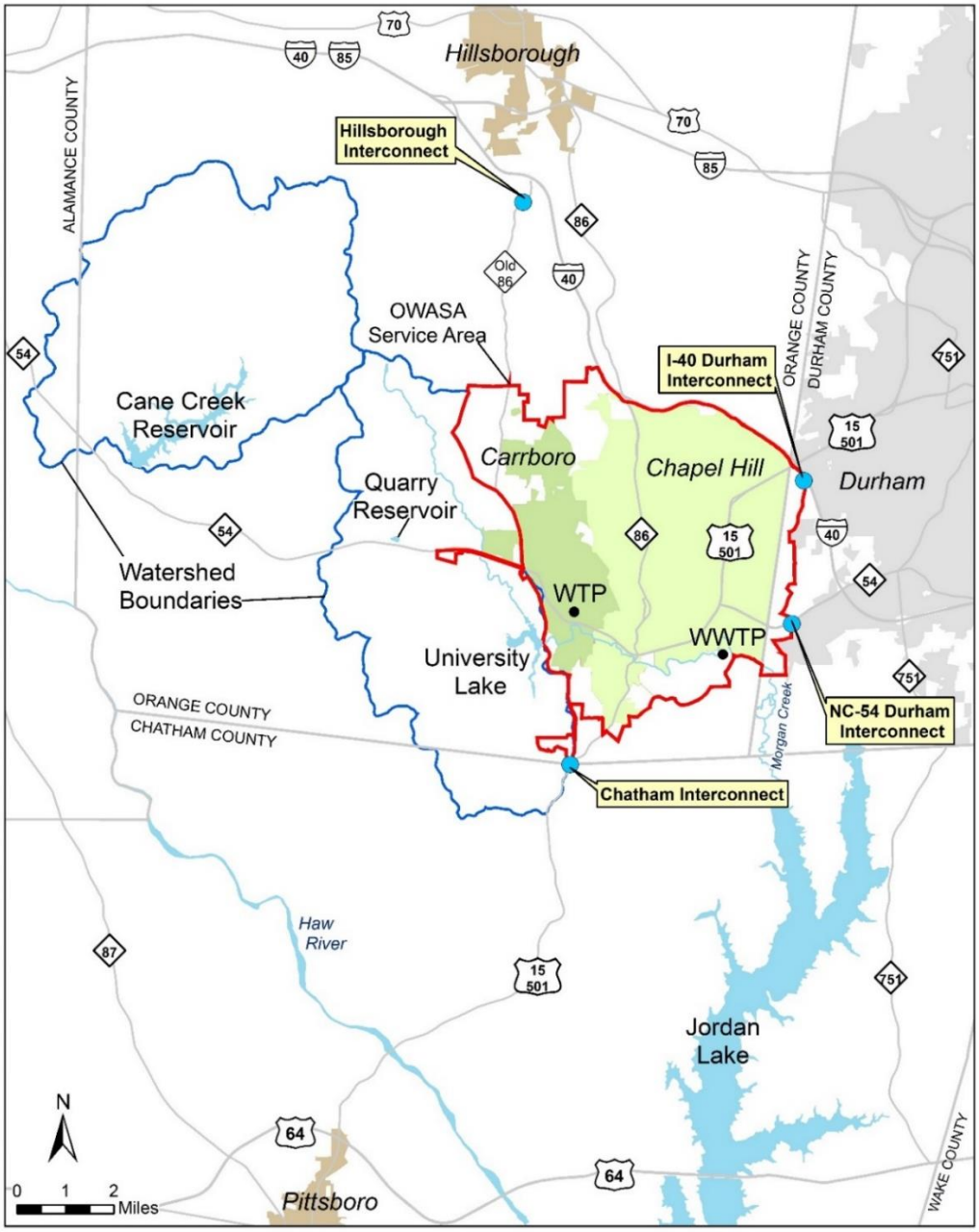


Figure 3: OWASA Interconnections

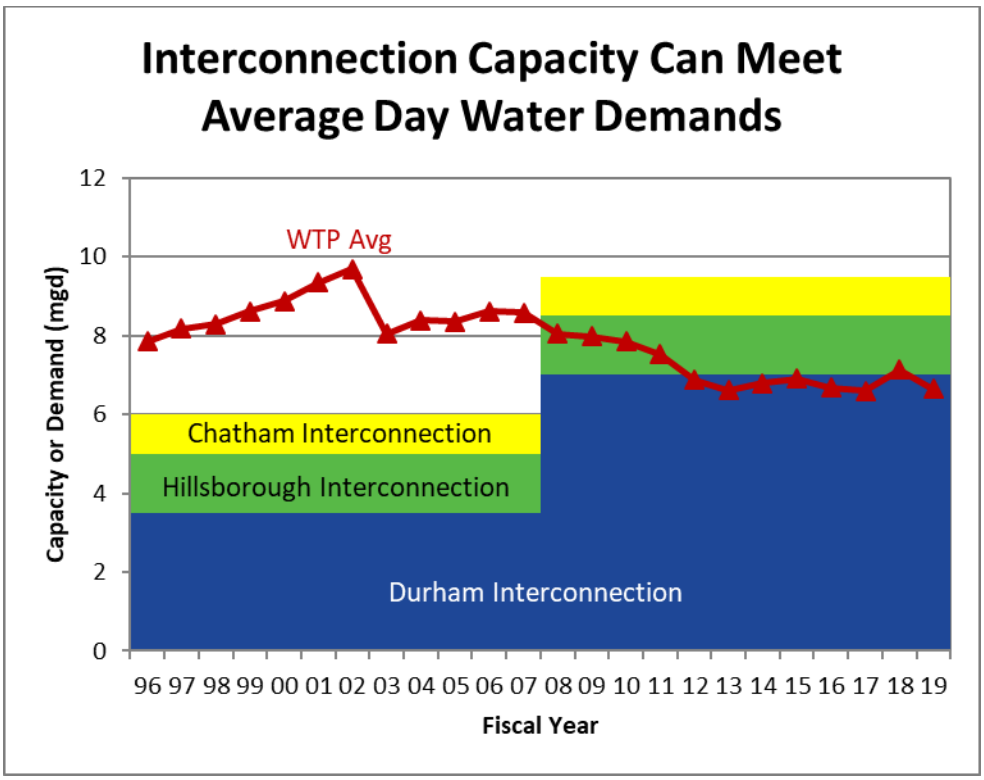


Figure 4: OWASA Interconnection Capacity and Average Day Water Production

OWASA'S Mutual Aid Agreements

OWASA has mutual aid agreements with the City of Durham and Towns of Hillsborough and Cary (Appendix 1). These agreements outline the intention of each party to provide the other party water during operational emergencies and extended droughts. The agreements outline the provisions to request water and payment terms. The agreements stipulate that the seller (or utility providing the water) has the authority to determine whether it can meet the requestor's water needs. The agreements also do not limit the ability of any utility to provide water to another party. Thus, none of the agreements guarantee access to water.

The mutual aid agreements with the Town of Cary and City of Durham are the mechanism by which OWASA can currently access its Jordan Lake allocation. The Towns of Cary and Apex own the only water intake structure on Jordan Lake; they would treat Jordan Lake water at their plant and send drinking water to OWASA through their interconnections with the City of Durham. Durham would then convey the water to OWASA through our interconnections. Figure 5 illustrates the locations of these interconnections.

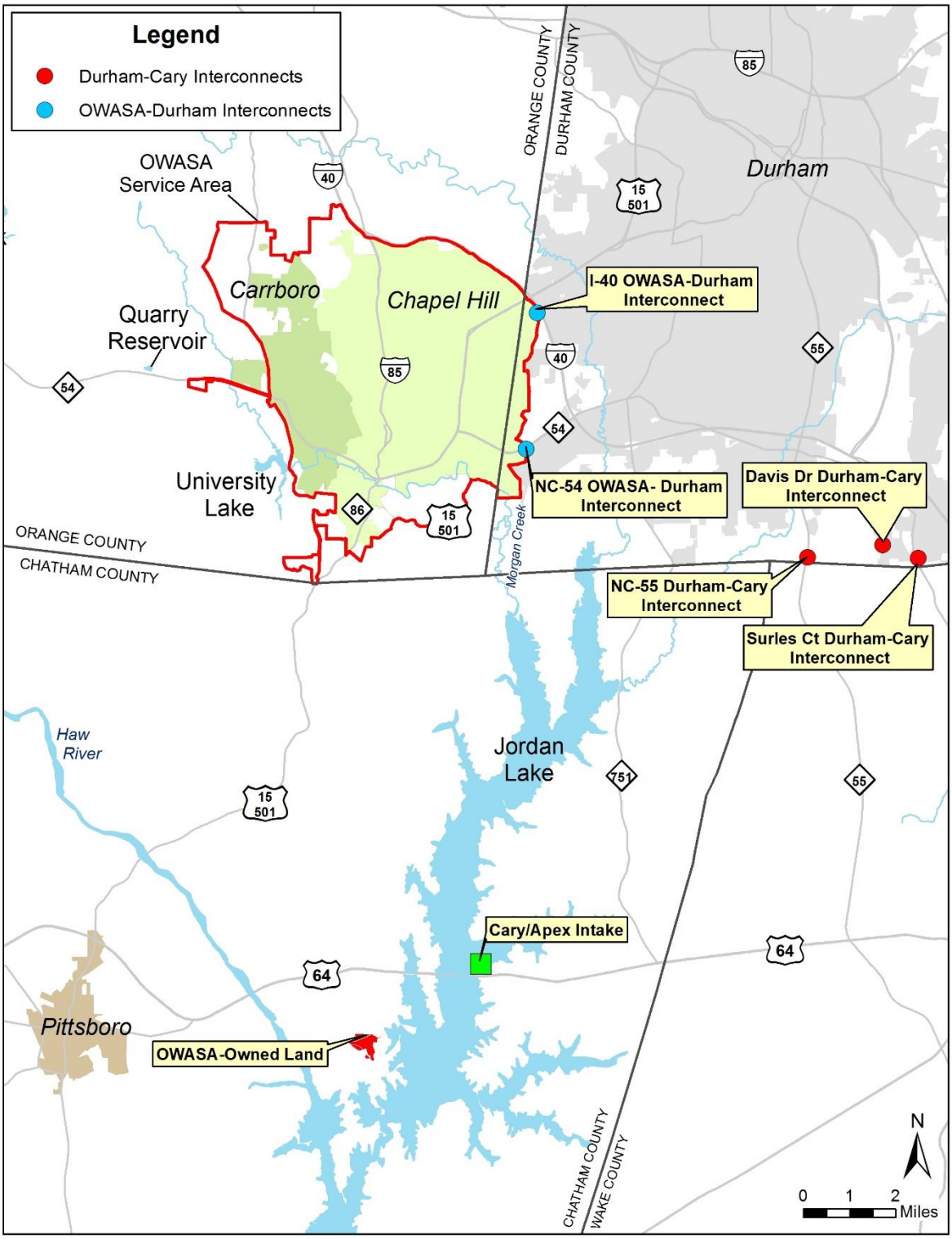


Figure 5: Locations of Cary/Durham and Durham/OWASA Interconnections

During an extended regional drought, other utilities may also need water from their Jordan Lake allocation, and it may be difficult for Cary and Apex to supply all requests for water. During the 2007-08 drought, the Jordan Lake water supply pool was 89 percent full. However, since Cary/Apex have the only intake on Jordan Lake and have direct interconnections with the City of Durham, City of Raleigh, and the Town of Holly Springs (see Figure 2), the capacity of their treatment plant could impact how much water they can provide to neighboring utilities. (Note: the Town of Cary also provides water service to the Town of Morrisville, the Wake County portion of Research Triangle Park, and the Raleigh-Durham International Airport).

Regional Water Supply Research

OWASA has long recognized that there are limits to the amount of water Cary can provide during a drought and the need to make good use of this regional resource. OWASA partnered with the City of Durham and Town of Cary to have Greg Characklis (Professor, UNC Department of Environmental Science and Engineering, and Director of UNC Center on Financial Risk in Environmental Systems) conduct a study to determine how the region could work together to optimize use of Jordan Lake given current infrastructure limitations. This work has since been expanded to include the City of Raleigh and researchers from Cornell University who specialize in decision analytics, uncertainty analysis, and data visualization.

Professor Characklis' team's modeling scenarios evaluate the impact of water transfers (purchases), conservation, and holding emergency financial reserves on the reliability of water supply, frequency of restrictions, and financial impacts on communities. The highest reliability occurs when all three strategies (purchasing water, conservation, and emergency reserves) are in place. His work emphasizes the value of purchasing water through Cary early in a drought as an important strategy in maximizing use of the Jordan Lake water resources for all regional partners. Waiting longer requires greater treatment and conveyance capacity to achieve the same level of benefit. Dr. Characklis' work is ongoing.

Future Regional Water Supply Challenges and Outlook

One of the biggest challenges the region is facing is continuing to meet the water needs for an expanding population. Jordan Lake will likely be fully allocated during the next round of allocations, and new water supplies will be needed. OWASA and other utilities in the region have evaluated new water supply reservoirs, purchasing water from neighboring utilities, and obtaining water from more distant supplies such as Kerr Lake. Developing new water supplies and obtaining water from distant supplies would likely entail lengthy permit processes and require high levels of capital investment.

The region's utilities have experienced lower unit demands (gallons per connection per day) for water since the 2007-08 drought, and these lower unit demands help extend the life of our current water supplies. However, the lower demands also raise questions about how much demands could be further reduced during our next drought. Because of the regional planning that has been accomplished that is described earlier in this document, the region is much better prepared for drought than it was in 2007-08. However, climate variability increases the

challenge of estimating the likelihood that a drought similar to ones we have experienced in the past or worse ones will occur.

The uncertainties that lie in individual plans and the TRWSP could also pose future challenges depending on how those uncertainties play out. These uncertainties include the following:

- Demand projections – our demand projections are based on numerous assumptions that are themselves subject to uncertainty. Some of the key uncertainties contained in the projections relate to the rate of population growth, the water use intensity of future development, and whether and how the water use intensity of existing development will shift in the future. If growth occurs faster than anticipated or new growth has higher water needs than planned (i.e., a new industry comes to the area that has higher water needs), the region may be more vulnerable to water shortages.
- Yield estimates –yield is dependent on climatic factors (hydrology, temperature, and evaporation) and storage. Climate models predict that it will be hotter, and evaporation rates will be higher. Collectively they also indicate that we will receive similar or possibly greater amounts of precipitation, but that rainfall will be distributed in larger, more intense storms. The intervening periods between high precipitation events leave room for the possibility that our region will also experience more severe droughts. New droughts of record would result in lower water supply yields. While data indicate that sediment loading rates have decreased over the second half of the twentieth century and early part of the twenty-first century, climate and/or land cover shifts could increase them again. With precipitation coming in the form of more intense storms, sedimentation could increase in the future. Furthermore, future regulations or permit requirements that modify reservoir release requirements to meet downstream habitat or other needs could also impact yields of reservoirs.

There are also behaviors and technologies that will positively influence water supply management. These include:

- Water efficiency and conservation practices – many of our customers are already in the habit of practicing water saving behaviors. Over time, more customers may change practices, particularly regarding outdoor watering. Drought tolerant landscapes may become the norm. Much of the new development in the region is higher density, mixed use. These types of development tend to use less water than single family residential development. Furthermore, water fixtures and devices in the marketplace are steadily improving water use efficiency and as these devices replace older water fixtures and devices overall efficiency is likely to continue to improve.
- Reclaimed water – direct and indirect potable reuse are used on a more frequent basis across the world and nation. In time, North Carolina will likely enact laws and regulations that make all types of potable reuse legal and more cost-effective.

While we cannot predict how these unknown factors will play out in the future, we can plan for different scenarios, both individually and with our regional partners. Planning for an unknown

future reduces the risk of being surprised by a future event and may enable us to respond more quickly and effectively when problems arise.

AGREEMENT BETWEEN ORANGE WATER AND SEWER AUTHORITY AND THE CITY OF DURHAM REGARDING MUTUAL AID FOR WATER SUPPLY

This agreement ("this Agreement") is made, dated, and entered into this 14th day of December, 2009, by and between the Orange Water and Sewer Authority ("OWASA") , a North Carolina body politic and corporate, and the City of Durham ("Durham"), a North Carolina municipal corporation.

BACKGROUND. OWASA and Durham are parties to the following agreement, which expires on August 26, 2009: *Agreement Extending Term of Agreement Providing for Sale of Purchase of Water*, dated -----, 2008, which amended the *Agreement Extending Term of Agreement Providing for Sale and Purchase of Water* dated, April 21, 2005, which amended Amendment No. 1 to *Agreement between OWASA and Durham Establishing Conditions for the Purchase of Water*, dated July 30, 2003.

1. Statutory Authority. This Agreement is made pursuant to authority in NCGS sections 160A-461,160A-318 and 160A-322.

2. Purposes of this Agreement. This Agreement is intended to make arrangements for OWASA and Durham to continue to assist each other in meeting the water needs of their citizens and other local governments. It is also intended to make arrangements for OWASA and Durham to provide mutual support through the sale or exchange of water to each other, both in the normal course of operating and in the event of a water supply emergency in either parties' service area. It is also intended to establish terms for the purchase of water by either Unit; and provide for other related matters.

3. Definitions. The following definitions apply to this Agreement except where the context does not allow.

Term or expression	*Meaning or usage*
"Buyer"	The utility that is buying water
"Conveyor"	The utility that is conveying water from the Seller to the Buyer, in instances when movement of water through a party that is neither the Seller nor Buyer is required.
"Customers"	Retail customers and wholesale water customers as set forth in other interlocal agreements.
"deficient quantity"	refers to supplying less water than requested or required
"Designated Representative"	The individual named in writing from time to time by Durham and OWASA respectively to carry out functions specified in this Agreement. A Unit may name more than one Designated Representative with authority to so act
"facilities"	equipment, fixtures, and structures for the transmission of water, including lines, mains, meters, pumps, and valves
"include," "including,"	include, including, etc. without limitation

etc.	
"person"	Includes natural persons, firms, companies, associations, partnerships, trusts, corporations, governmental agencies and units, and other legal entities
"Seller"	The utility providing treated water
"Service Area"	This is defined in Section 5 (Water and Sewer Service Areas).
"sewer"	sanitary sewer
"shall"	is mandatory
"third party"	any person other than OWASA and Durham
"Unit"	OWASA or Durham
"water"	potable water.
"water shortage"	Any period of time when either Unit has reached one or more triggers for action as defined in that Unit's Water Shortage Response Plan, current and as may be amended in the future.

4. Duration. This Agreement shall take effect at 12:01 AM on January 1, 2010 and remain in effect until midnight on June 30, 2029. The governing body of each Unit has determined that duration to be reasonable.

5. Water and Sewer Service Areas.

(a) The annexation boundary line established between Durham and the Town of Chapel Hill by the consent judgment (File No. 85 CVS 03109, Durham County Superior Court), and which Durham and OWASA previously agreed to follow, is hereby reaffirmed and will hereafter continue to serve as the boundary between Durham's and OWASA's Service Areas, and the area lying on Durham's side of the said boundary shall hereafter be deemed to be within Durham's Service Area. The area on the Town of Chapel Hill's side of the said boundary is within OWASA's Service Area.

(b) Realignments, adjustments or extensions of the said service area boundary may be made upon mutual agreement of Durham and OWASA. In particular, if the annexation boundary between Durham and the Town of Chapel Hill is revised, the Service Area boundary may also be revised.

(c) This Agreement shall supersede all previous agreements between Durham and parties to which OWASA may be a successor in interest as the same may have pertained to such service area boundaries.

(d) The parties also understand and agree that OWASA is a party to a Service Area Boundary Agreement dated December 3, 2001 with Orange County and the Towns of Carrboro and Chapel Hill, and that that Agreement contains certain restrictions on OWASA's sale or purchase of water to or from outside Orange County, and that this Agreement is made subject to any limitations that may be imposed under that Service Area Boundary Agreement.

6. One Unit is Buyer and the other Unit is Seller.

(a) Whenever either Unit, through its Designated Representative, notifies the other Unit that it desires to buy water and states the Amount Requested, the notified Unit shall sell the Amount Requested to the requesting Unit, subject to subsection (c). The Amount Requested shall be stated in units of millions of gallons per day and shall not exceed the lesser of (i) the amount of water that can be supplied by the Seller, or (ii) the amount of water that can be passed through the interconnection infrastructure. The notification may be oral but shall be followed up promptly with a written verification (email or letter) pursuant to Section 17 (Notice).

(b) The water may be supplied by direct interconnection between the Units' systems, or if agreed to by the Units, by or through one or more third party Conveyors. In the latter case, the Units recognize that appropriate agreements with the appropriate third party(s) will be needed.

(c) The Seller shall use its best efforts to supply the Amount Requested provided, however, the Seller's ability to provide water to Seller's Customers shall not be compromised, nor shall Seller be obligated to furnish such an amount of water to Buyer such that unsatisfactory pressure, pressure fluctuation, or other hydraulic conditions are created for Seller or Seller's Customers. The determination of the availability or maximum quantity of water available to be furnished to the Buyer shall be within the sole discretion of the Seller. Section 14 (Right to Suspend or Reduce Supply of Water) addresses the right of the Seller to supply less than the Amount Requested.

(d) The Buyer shall pay the Seller for the water that is supplied. Section 11 (Water Charges and Billing) addresses payment matters.

(e) Because OWASA and Durham are both subject to interbasin transfer regulations, NCGS 143-215.22G, .22H and/or .22I, may come into effect when water is supplied or conveyed. Neither Unit has any obligation to supply or convey water to the other if so doing could cause exceedance of the Seller's maximum interbasin transfer allowance, whether such maximum is specified in a certificate issued under NCGS 143-215.22L by the Environmental Management Commission (or any successor to the Commission), or specified by applicable statute to have the effect of such a certificate.

7. One Unit is Buyer or Seller and the other Unit is Conveyor.

(a) When a Unit (the "Requesting Unit"), through its Designated Representative, sends a notice to the other Unit pursuant to Section 17 (Notice) requesting that the other Unit act as a Conveyor (the "Conveyor Unit"), the latter Unit shall act as Conveyor subject to the terms in this Section 7 and other applicable provisions of this Agreement. The Requesting Unit may be the Seller of the water to a third party or it may be the Buyer of the water from a third party. There may be one or more additional Conveyors for any of these transactions. For instance, in one transaction, OWASA may be the Seller, Durham and two other third parties may be Conveyors, and another third party may be the Buyer.

(b) This Agreement does not require the Conveyor Unit to spend money or use other resources of the Unit to make connections or otherwise change its facilities to accommodate any interconnection to facilitate the transmission.

(c) If water is supplied to a Conveyor Unit and if the Buyer/Seller Unit has stated an amount of water that it intends the Conveyor to transmit to or from a third party, it is agreed that the Conveyor Unit shall use its best efforts to transmit an amount that closely approximates the stated amount, but only if: (i) the quality of the water is satisfactory; (ii) the conveyance does not negatively impact the Conveyor Unit's water service to its customers; (iii) the Buyer/Seller Unit is in compliance with the terms of its contract with the Conveyor Unit, including payment; and (iv) the Buyer/Seller Unit has the appropriate water sales agreement(s) in place with any other third party(s) participating in the sale, purchase, or conveyance of the water.

(d) Nothing in this Agreement requires the Conveyor Unit to pay for the water.

(e) Except to the extent that the Conveyor Unit is paid for the costs of conveying the water by a third party, the Buyer/Seller Unit shall pay the Conveyor Unit for the costs of conveying of the water, which may include pumping, valve operation, meter-reading, flushing, treatment, and administration of the transmission. Section 11 (Water Charges and Billing) addresses payment matters.

8. Both units seek to buy water simultaneously from another Seller.

(a) In instances in which OWASA and Durham both need supplemental water at the same time from a third party Seller (e.g., the Town of Cary or the Town of Hillsborough), OWASA and/or Durham will be simultaneously acting as both Buyer and Conveyor Units. In circumstances where the total amount of water sought by OWASA plus Durham exceeds the amount of water available from the third party Seller – due to that Seller's own limitations; limited transmission capacity of the inter-connected conveyance system; or other constraints – then OWASA and Durham agree to equally reduce their respective purchase by the same percentage as the Seller must reduce its total supply being provided to both parties (for example, if OWASA and Durham (as Buyer Units) should request 4 mgd and 6 mgd, respectively from the Town of Cary, but Cary can only provide a total of 5 mgd, then OWASA's and Durham's respective purchases would be equally reduced by 50%). As Conveyor Units, both Durham and OWASA hereby agree to convey that portion of water to the other even if their own supplemental water needs are not being fully met.

9. Installation, ownership and maintenance of facilities.

(a) (i) FIGURE 1 shows interconnection points and meter locations between the OWASA and Durham water systems, and their ownership, all as of July 31, 2009.

(ii) This Agreement does not prohibit either Unit from installing facilities within the Service Area of the other Unit (as a limited exception to the Service Area restrictions in Section 5) for the purpose of providing water and/or sewer service to the installing Unit's customers. These facilities shall not be used to serve customers located within the other Unit's Service Area, except by written agreement between OWASA and Durham. The Durham City Manager has authority to make such agreements on behalf of Durham, and the OWASA

Executive Director shall approve such agreements on behalf of OWASA. Such written agreements are intended solely to allow for extremely limited Service or temporary Service, and shall not be construed or implied to alter the boundary line, which may be altered only pursuant to written agreement as allowed by other provisions of this Agreement. The facilities installed pursuant to this Section 9 are subject to subsection (b).

(b) Durham shall be responsible for the operation and maintenance of the meter located within the interconnection facilities that supply water to OWASA. OWASA shall be responsible for the operation and maintenance of the meter located within the interconnection facilities that supply water to Durham. The ownership and maintenance of any bi-directional meter that could serve either OWASA or Durham will be as agreed in a supplemental operational agreement between the Units. The Durham City Manager has authority to make such supplemental agreements on behalf of Durham, and the OWASA Executive Director has authority to make such supplemental agreements on behalf of OWASA. Said supplemental agreements shall ensure that the ownership and maintenance arrangements promote the most economical and efficient operation of the interconnection facilities.

10. Water Use Restrictions. During any time that a Unit has water use restrictions in effect and is supplying water as Seller to the other Unit as Buyer pursuant to this Agreement, the Seller may request that the Buyer impose water use restrictions at least equal to those being imposed by the Seller, or at least equal to those that would be imposed by the Seller if the Buyer's Service Area were undergoing water shortage conditions similar to those in the Seller's Service Area. If the Buyer does not comply with such request, the Seller may withhold some or all of the Amount Requested until such restrictions are placed into effect. The water use restrictions referred to in this section include year-round water conservation measures as well as voluntary or mandatory water use restrictions implemented during a declared water shortage.

11. Water Charges and Billing.

(a) Rate. Each Unit's Base Rate shall be defined as the base or lowest tier single-family residential rate for locations within the Unit's corporate limits in effect at the time the water service is furnished. If a Unit changes its rate structure so that it no longer has a rate that is a base or lowest tier single-family residential rate, the lowest rate that is applied to most residential households in the Unit's corporate limits will be deemed to be its base single-family residential rate. For purposes of that determination, a household is the person being billed for water.

(i) The price that either Unit as Buyer shall pay the other Unit as Seller shall be the Seller's Base Rate.

(ii) The price that either Unit as Buyer/Seller shall pay the other Unit as Conveyor shall be 5 percent of the Conveyor's Base Rate.

(b) Billing when one Unit is Buyer and the other Unit is Seller.

(i) The Net Balance is defined as the net amount of water, in gallons, on the last day of the month, supplied from one Unit to the other under this Agreement since the last invoice was paid by either Unit. Purchases and sales shall be offset against each other in order to calculate the Net

Balance. A Unit is a "debtor" when it has a positive Net Balance of purchased water from the other Unit. A Unit is the Invoicing Unit when it has a positive Net Balance of sold water to the other Unit.

(ii) The Invoicing Unit shall have the option to request water from the Unit that is the debtor in order to reduce the Net Balance, instead of invoicing the Unit that is the debtor, unless the Net Balance would result in an invoice that is greater than $300,000 or the invoice is for the period ending June 30. Such request for water will be made in writing by the Invoicing Unit and agreed to in writing by the debtor Unit, and shall not be subject to Subsection (d).

(iii) If the Invoicing Unit elects to invoice the debtor Unit, the invoice will be based on the Net Balance of water transferred pursuant to this Agreement, and the debtor Unit will be the Invoiced Unit.

(c) Billing when one Unit is Buyer or Seller and the other Unit is Conveyor. The Buyer/Seller Unit is the Invoiced Unit and the Conveyor Unit is the Invoicing Unit.

(d) Payment. The Invoiced Unit shall pay the Invoicing Unit pursuant to this Agreement. The Invoicing Unit shall invoice on a monthly basis, except as provided in subsection (b) above. The Invoicing Unit shall add a late payment fee of one (1.00%) percent per month to the amount due for any payment made more than 30 days after the billing date.

12. Intermittent Water Sales. OWASA and Durham recognize that, from time to time, because of changes in operation, installation of facilities, emergencies, or problems, each Unit may need to buy water, even though the Unit is acting expeditiously to take care of the situation. Under these circumstances, the Durham City Manager has authority to make agreements to sell or to buy water on behalf of Durham, and the OWASA Executive Director has authority to make agreements to sell or to buy water on behalf of OWASA. The authority of the respective manager or executive director to make those agreements applies only to the extent that the manager or executive director of the Buyer Unit finds that the circumstances described in the first sentence of this Section apply. No such agreement may authorize the furnishing of water for a period greater than one year.

13. Determination of Quantity Supplied. The amount of water a Unit as Seller supplies to a Unit as Buyer for which the Buyer shall pay the Seller shall be measured by the Seller's meter located at or near the interconnection point between the Seller's and Buyer's systems. The Seller shall read the meter daily, in order to support the potential for interbasin transfer reporting requirements, and promptly report the readings to the Buyer. When one Unit acts as Buyer or Seller and the other Unit acts as Conveyor, the Buyer/Seller Unit is responsible for making sure the daily quantity of water conveyed is reported to the Conveyor. The Conveyor Unit may also meter the amount of water conveyed and may base invoices on that amount pursuant to Section 11 (Water Charges and Billing).

14. Right to Suspend or Reduce Supply of Water.
(a) A Unit acting as Seller may withhold, reduce, or suspend the supply of Seller Unit's water in the event of emergencies, water shortages, equipment problems, or other events or conditions that the Seller Unit determines reduce either the amount of water available for sale or the Seller

Unit's ability to supply such water. In the event the water being transferred by the Seller Unit originates from the Buyer Unit's water supply allocation from Jordan Lake, Seller may withhold or suspend the supply of water being transferred to the Buyer Unit only for reasons other than water shortage.

(b) A Unit acting as Seller may suspend supplying water to the Buyer as long as the Buyer is in breach of its obligation to pay the Seller for water.

(c) A Unit acting as Conveyor may withhold, reduce, or suspend the transmission of water in the event of emergencies, equipment problems, or other events or conditions that the Conveyor Unit determines reduce the Conveyor Unit's ability to transmit such water.

(d) A Unit acting as Seller or Buyer in a transaction where the other Unit is acting as Conveyor may withhold, suspend, or terminate supplying water at any time without liability to the Unit acting as Conveyor for such suspension or termination.

(e) A Unit acting as Buyer may require the Unit acting as Seller to withhold, reduce, or suspend supplying water in the event of emergencies, water shortages, equipment problems, or other events or conditions that the Buyer Unit determines reduce the amount of water needed by the Buyer or the Buyer Unit's ability to receive the water.

15. Regulatory Compliance.

(a) Seller Unit responsible for treatment of water; Buyer Unit responsible for approvals and compliance. A Unit that sells water to the other understands that the Buyer Unit is not expected to treat the water before it is consumed by the Buyer Unit's customers. When a Unit as Seller supplies water to the other Unit as Buyer, the Seller shall secure, or cause to be secured, all necessary Federal and State approvals and shall comply with all applicable Federal and State regulations, laws, orders, statutes, ordinances, codes, and rules relating to the quality and treatment of the water.

(b) Buyer Unit responsible for transfer. When a Unit as Seller supplies water to the other Unit as Buyer, the Buyer shall secure, or cause to be secured, all necessary Federal and State approvals and shall comply with all applicable Federal and State regulations, laws, orders, statutes, ordinances, codes, and rules relating to the conveyance of the water.

(c) Unit as Conveyor may require assurances. When a Unit as Buyer or Seller requests the other Unit to act as Conveyor, the Conveyor Unit may require the requesting Unit or the third party Seller or Buyer to secure, or cause to be secured, all necessary Federal and State approvals and to comply with all applicable Federal and State regulations, laws, orders, statutes, ordinances, codes, and rules relating to the transfer of the water. If the prospective Conveyor Unit does not obtain assurances relating to this subsection that it finds to be satisfactory, it may refuse to act as Conveyor.

16. No third party beneficiaries. This Agreement is intended for the benefit of OWASA and Durham and not any other person or entity.

17. Notice.

(a) Unless otherwise stated in this Agreement, all notices referred to in this Agreement shall be in writing and shall be given either by personal delivery, email, fax, or certified United States mail, return receipt requested, addressed as follows:

To Durham:
Director of Water Management
City of Durham
101 City Hall Plaza
Durham, NC 27701
The fax number is (919) 560-4479.
If the sender uses email, the sender is responsible for ascertaining the name and email address of the then-current director. At the time of the making of this Agreement, email to the director is to be addressed to don.greeley@durhamnc.gov

To OWASA:
Executive Director
OWASA
400 Jones Ferry Road
Carrboro, North Carolina 27510
The fax number is (919) 968-4464
If the sender uses email, the sender is responsible for ascertaining the name and email address of the then-current director. At the time of the making of this Agreement, email to the director is to be addressed to ekerwin@owasa.org or alternate jgreene@owasa.org

(b) Change of Address. Date Notice Deemed Given. A change of address, fax number, or person to receive notice may be made by either Unit by notice given to the other Unit. A notice shall be deemed given at the time of actual delivery, if it is personally delivered or sent by email or fax, unless the sender's email system or fax indicates that the email or fax was not received. If the notice is sent by United States mail, it shall be deemed given upon the third calendar day following the day on which it is deposited with the United States Postal Service or upon actual delivery, whichever first occurs.

18. Appointment of Personnel. The Durham city manager shall designate persons to carry out Durham's obligations under this Agreement. The OWASA Executive Director shall designate persons to carry out OWASA's obligations under this Agreement.

19. Forum and venue. Unless the Units otherwise agree, the sole forum and venue for all litigation arising out of this Agreement shall be in the county of the Unit named as defendant, in the North Carolina General Court of Justice. The Durham City Manager has authority to make such agreements on behalf of Durham, and the OWASA Executive Director has authority to make such agreements on behalf of OWASA.

20. Principles of Interpretation. In this Agreement, unless the context requires otherwise: (a)

References to statutes or regulations include all statutory or regulatory provisions consolidating, amending, or replacing the statute or regulation, as adopted from time to time. References to contracts and agreements shall be deemed to include all amendments to them, as adopted from time to time. (b) References to a "Section" or "section" shall mean a section of this Agreement. (c) Titles of sections and paragraphs in this Agreement are for convenience only, and shall not be construed to affect the meaning of this Agreement.

21. Amendments. Entire Agreement. A modification of this Agreement is not valid unless signed by both Units and otherwise in accordance with requirements of law. Further, a modification is not enforceable against Durham unless the City Manager or a deputy or assistant City Manager signs it for Durham. A modification is not enforceable against OWASA unless the Executive Director or other authorized representative of OWASA signs it for OWASA.

22. Termination. This Agreement may be terminated by written agreement of both Units. Either Unit may terminate this Agreement because of substantial breach of this Agreement by the other Unit provided that the terminating Unit has given 90 days' written notice to the breaching Unit and the breaching Unit has not cured the breach during that period. Either Unit may terminate this Agreement without cause provided that the terminating Unit has given 180 days' written notice. This Section does not limit the rights to enforce this Agreement through any other action or remedy. Whether this Agreement terminates as provided in Section 4 (Duration) or earlier, it is agreed that on termination, all obligations that are still executory on both sides are discharged but any right based on prior breach or performance survives.

23. Exhibits. Attached to and hereby made a part of this Agreement is the following: Figure 1 (1 page).

IN WITNESS WHEREOF, the parties have authorized this AGREEMENT to be executed and attested by their undersigned officer, to be effective from and after January 1, 2010.

CITY OF DURHAM

1/11/10

ATTEST:

City Clerk

1-13-10

SEAL

ORANGE WATER AND SEWER AUTHORITY

ATTEST:

SEAL

ORANGE WATER AND SEWER AUTHORITY CORPORATE 1975 SEAL ORANGE COUNTY, N.C.

NORTH CAROLINA
ORANGE COUNTY

I, Rita W. Jones, Notary Public in and for the above named County and State, do here certify that Ed Kerwin, Executive Director of the ORANGE WATER AND SEWER AUTHORITY, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

This the 15th day of December, 2009.

Notary Public Rita W. Jones

My commission expires Oct. 27, 2011.

RITA W JONES
NOTARY
***
PUBLIC
ALAMANCE COUNTY, N.C.

NORTH CAROLINA
DURHAM COUNTY

I, Tonette Amos, a Notary Public in and for said County and State, certify that D. Ann Gray personally appeared before me this day, and acknowledged that he/she is _____ City Clerk of the CITY OF DURHAM, a municipal corporation, and that by authority duly given and as the act of the City, the foregoing contract was signed in it corporate name by its _____ City Manager, sealed with its corporate seal, and attested by himself/herself as its said City Clerk or Deputy City Clerk.

This the 13th day of Jan, ~~2009~~ 2010,

Notary Public Tonette Amos

TONETTE AMOS
NOTARY PUBLIC
DURHAM COUNTY, N.C.
My Commission Expires 7-17-2012.

My commission expires _____.

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

This the 7th day of JAN, 2010

CITY OF DURHAM FINANCE OFFICER

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

This the 15th day of DEC, 2009.

ORANGE WATER AND SEWER AUTHORITY
FINANCE OFFICER

This Agreement is approved as to form and legality.

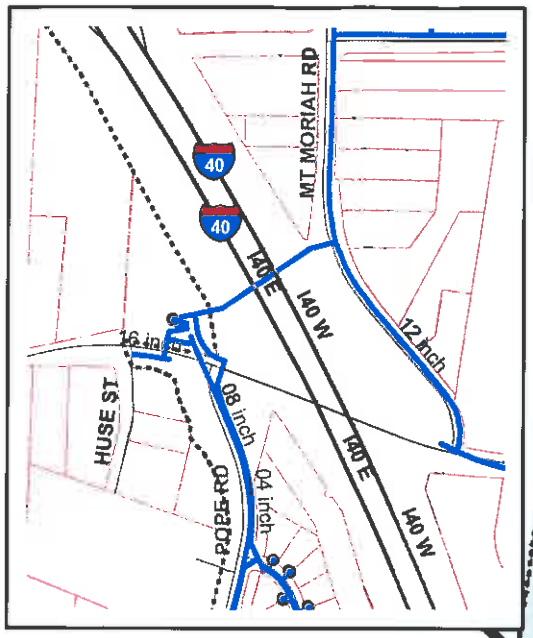
Robert Epting, General Counsel for OWASA

12 - 14 - 09
Date

_____, City Attorney, City of Durham

Date

DURHAM/OWASA SERVICE BOUNDARY FIGURE - 1



METER LOCATION

751
CORNWALLIS RD.
70
15/501
DURHAM COUNTY
Inter-Connection And Meter Location
ORANGE COUNTY
OWASA Service Area Boundary
40
54
40
Durham Service Area Boundary
CHATHAM COUNTY

LEGEND
Highways
Durham/OWASA Service Boundary Line
Parcels
Durham County

DURHAM 1869

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W E
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AGREEMENT BETWEEN ORANGE WATER AND SEWER AUTHORITY AND THE CITY OF DURHAM REGARDING MUTUAL AID FOR WATER SUPPLY

AGREEMENT BETWEEN ORANGE WATER AND SEWER AUTHORITY AND THE TOWN OF CARY REGARDING MUTUAL AID FOR WATER SUPPLY

This agreement ("this Agreement") is made, dated, and entered into on December 14, 2009, by and between the Orange Water and Sewer Authority ("OWASA"), a North Carolina body politic and corporate, organized and operating as a water and sewer authority pursuant to Chapter 162A of the North Carolina General Statutes, 400 Jones Ferry Road, Carrboro, NC 27510, and the Town of Cary ("Cary"), a North Carolina municipal corporation, 316 N. Academy Street, Cary, North Carolina.

BACKGROUND. While the OWASA and Cary water service areas are not adjacent and their systems are not directly connected, they are both connected to the City of Durham water system; also, OWASA is connected to the Chatham County water system and Cary is adjacent to the Chatham County service area. OWASA and the City of Durham are in the process of considering and entering into the "Agreement Between Orange Water And Sewer Authority And The City Of Durham Regarding Mutual Aid For Water Supply," which will provide for the sale, purchase, and/or conveyance, of potable water through existing system interconnections located on Highway 54 near the Durham/Chapel Hill town limits and on Old Chapel Hill Road near its intersection with Pope Road. Cary and the City of Durham are parties to the "Agreement Between Cary and Durham Respecting Mutual Aid for Water Supply and Delineating Water and Sewer Service Areas" dated March 31, 2009 which provides for the sale, purchase, and/or conveyance of potable water through existing and planned system interconnections located at Highway 55 near Kit Creek Road, Davis Drive near Page Road, and Highway 54 near Page Road. OWASA has a 5 million gallon per day water supply allocation from Jordan Lake's water supply pool. The Town of Cary owns, along with the Town of Apex, and operates a raw water intake and the Cary/Apex Water Treatment Facility (CAWTP) located on Jordan Lake.

1. Statutory Authority. This Agreement is made pursuant to authority in NCGS sections 160A-461,160A-318 and 160A-322.

2. Purposes of this Agreement. This Agreement makes provision for OWASA and Cary to assist each other in meeting the water needs of their customers. It also provides arrangements through which OWASA and Cary will provide each other mutual support through the sale or exchange of water, both in the normal course of operating and in the event of a water supply emergency in either parties' service area. It also establishes terms for the purchase of water by either Unit; and provides for other related matters.

3. Definitions. The following definitions apply to this Agreement except where the context does not allow.

Term or expression	*Meaning or usage*
"Buyer"	The Unit that is buying water
"Conveyor"	The Unit that is conveying water from the Seller to the Buyer, in instances when movement of water through a party that is neither the Seller nor Buyer is required.
"Customers"	Retail customers and wholesale water customers as set forth in other interlocal agreements.
"deficient quantity"	Refers to supplying less water than requested or required
"Designated Representative"	The individual named in writing from time to time by Cary to act for Cary and OWASA to act for OWASA to carry out functions specified in this Agreement. A Unit may name more than one Designated Representative with authority to act for it.
"facilities"	Equipment, fixtures, and structures for the transmission of water, including lines, mains, meters, pumps, and valves
"include," "including," etc.	Include, including, etc. without limitation
"person"	Includes natural persons, firms, companies, associations, partnerships, trusts, corporations, governmental agencies and units, and other legal entities
"Seller"	The Unit providing treated water
"Service Area"	The geographical area within which a Unit is authorized by law, or by contract, to provide water service to individual water customer accounts.
"sewer"	Sanitary sewer
"shall"	Is mandatory
"third party"	Any person other than OWASA and Cary
"Unit"	OWASA or Cary
"water"	Potable drinking water.
"water shortage"	Any period of time during which either Unit has reached one or more triggers for action as defined in that Unit's Water Shortage Response Plan, current and as may be amended in the future.

4. Duration. This Agreement shall take effect at 12:01 AM on January 1, 2010 and remain in effect until midnight on June 30, 2029.

5. Water and Sewer Service Areas. The parties understand and agree that OWASA is a party to a Service Area Boundary Agreement dated December 3, 2001 with Orange County and the Towns of Carrboro and Chapel Hill, and that that Agreement contains certain restrictions on OWASA's sale or purchase of water to or from outside Orange County, and that this Agreement is made subject to any limitations that may be imposed under that Service Area Boundary Agreement.

6. One Unit is Buyer and the other Unit is Seller.

(a) Whenever either Unit, through its Designated Representative, notifies the other Unit that it desires to buy water and states the Amount Requested, the notified Unit shall sell the Amount Requested to the requesting Unit, subject to subsection (c). The Amount Requested shall be stated in units of millions of gallons per day and shall not exceed the lesser of (i) the amount of water that can be supplied by the Seller, or (ii) the amount of water that can be passed through the interconnection infrastructure. The notification may be oral but shall be followed up promptly with a written verification (email or letter) pursuant to Section 17 (Notice).

(b) Since the two Units' systems are not directly connected, the water will be supplied through one or more third party Conveyors. The Units recognize that appropriate agreements with the appropriate third party(s) must be in place before any water can be supplied pursuant to this agreement. Both Units acknowledge that the amount of water the Seller can supply to the Buyer may be limited by the provisions of either or both Units' agreements with the Conveyor(s).

(c) The Seller shall use its best efforts to supply the Amount Requested provided, however, the Seller's ability to provide water to Seller's Customers within its service area shall not be compromised, nor shall Seller be obligated to furnish such an amount of water to Buyer such that unsatisfactory pressure, pressure fluctuation, or other hydraulic conditions are created for Seller or Seller's Customers. Further, when Cary is the Seller, nothing in this Agreement is intended to or shall require Cary to violate any provision of the Cary-Apex Interlocal Agreement, including but not limited to provisions regarding Apex's rights and ability to receive water from the Cary/Apex Water Treatment Facility. The determination of the availability and maximum quantity of water available to be sold and transferred to the Buyer shall be within the sole discretion of the Seller. Section 13 (Right to Suspend or Reduce Supply of Water) addresses the right of the Seller to supply less than the Amount Requested.

(d) The Buyer shall pay the Seller for the water that is supplied in accordance with the provisions of Section 10, (Water Charges and Billing), herein.

(e) Interbasin transfer regulations, NCGS 143-215.22G, .22H and/or .22I, may come into effect when water is supplied or conveyed. Neither Unit has any obligation to supply or convey water to the other if so doing would cause exceedance of the Seller's maximum interbasin transfer allowance, whether such maximum is specified in a certificate issued under NCGS 143-215.22L by the Environmental Management Commission (or any successor to the Commission), or specified by applicable statute to have the effect of such a certificate. Provided, the amount of water sold to OWASA is less than or equal to OWASA's Jordan Lake allocation, it shall not be deemed subject to this provision, since use of that allocation to supply water for use by OWASA does not involve any interbasin transfer.

(f) In circumstances where the total amount of water sought by the Buyer unit and other third party(s) from the Seller exceeds the amount of water available from the Seller – due to that Seller's own limitations; limited transmission capacity of the inter-connected conveyance

system; or other constraints – then OWASA and Cary agree that the Seller will determine how much to reduce the supply being provided to each party .For example, if OWASA and Durham (as Buyer Unit and third party buyer) should request 4 mgd and 6 mgd, respectively from the Town of Cary, but Cary can only provide a total of 5 mgd, then Cary would determine how much the respective purchases would be reduced.

7. Both Units seek to buy water simultaneously from another Seller.

(a) In circumstances where the total amount of water sought by OWASA plus Cary exceeds the amount of water available from the third party Seller – due to that Seller's own limitations; limited transmission capacity of the inter-connected conveyance system; or other constraints – then OWASA and Cary agree that each shall equally reduce their respective purchase by the same percentage as the Seller must reduce its total supply being provided to both parties (for example, if OWASA and Cary (as Buyer Units) should request 4 mgd and 6 mgd, respectively from the City of Durham, but Durham can only provide a total of 5 mgd, then OWASA's and Cary's respective purchases would be equally reduced by 50%, such that OWASA would be able to purchase 2 MGD and Cary would be able to purchase 3 MGD).

(b) The parties may reduce their respective purchases using a method other than that specified in Section 7(a) by written mutual agreement. The Cary Town Manager has authority to make such agreement on behalf of Cary, and the OWASA Executive Director shall approve such agreement on behalf of OWASA.

8. Installation, ownership and maintenance of facilities.

(a) This Agreement does not prohibit either Unit from installing facilities within the Service Area of the other Unit for the purpose of providing for transmission of water to the installing Unit's customers. The Cary Town Manager has authority to make such agreements on behalf of Cary, and the OWASA Executive Director shall approve such agreements on behalf of OWASA.

(b) The ownership and maintenance of any meter on the interconnections that could serve another Unit will be as agreed in a supplemental operational agreement between the Units. The Cary Town Manager has authority to make such supplemental agreements on behalf of Cary, and the OWASA Executive Director has authority to make such supplemental agreements on behalf of OWASA. Said supplemental agreements shall ensure that the ownership and maintenance arrangements promote the most economical and efficient operation of the interconnection facilities.

9. Water Use Restrictions. During any time that a Unit has water use restrictions in effect and is supplying water as Seller to the other Unit as Buyer pursuant to this Agreement, the Seller may request that the Buyer impose water use restrictions at least equal to those being imposed by the Seller, or at least equal to those that would be imposed by the Seller if the Buyer's Service Area were undergoing water shortage conditions similar to those in the Seller's Service Area. If the Buyer does not comply with such request, the Seller may withhold some or all of the Amount

Requested until such restrictions are placed into effect. The water use restrictions referred to in this section include year-round water conservation measures as well as voluntary or mandatory water use restrictions implemented during a water shortage.

10. Water Charges and Billing.

(a) Rate. Each Unit's Base Rate shall be defined as the base or lowest tier single-family residential rate for locations within the Unit's service area in effect at the time the water service is furnished. If a Unit changes its rate structure so that it no longer has a rate that is a base or lowest tier single-family residential rate, the lowest rate that is applied to most residential households in the Unit's service area will be deemed to be its base single-family residential rate. For purposes of that determination, a household is the person being billed for water. The price that either Unit as Buyer shall pay the other Unit as Seller shall be the Seller's Base Rate.

(b) Billing when one Unit is Buyer and the other Unit is Seller.

(i) The Net Balance is defined as the net amount of water, in gallons, on the last day of the month, supplied from one Unit to the other under this Agreement since the last invoice was paid by either Unit. Purchases and sales shall be offset against each other in order to calculate the Net Balance. A Unit is a "debtor" when it has a positive Net Balance of purchased water from the other Unit. A Unit is the Invoicing Unit when it has a positive Net Balance of sold water to the other Unit.

(ii) With consent of the debtor Unit, the Invoicing Unit shall have the option to request water from the Unit that is the debtor in order to reduce the Net Balance, instead of invoicing the Unit that is the debtor, unless the Net Balance would result in an invoice that is greater than $300,000 or the invoice is for the period ending June 30. Such request for water will be made in writing by the Invoicing Unit and agreed to in writing by the debtor Unit, and shall not be subject to Subsection (c).

(iii) When the Invoicing Unit elects to invoice the debtor Unit, the invoice will be based on the Net Balance of water transferred pursuant to this Agreement, and the debtor Unit will be the Invoiced Unit.

(c) Payment. The Invoiced Unit shall pay the Invoicing Unit pursuant to this Agreement. The Invoicing Unit shall invoice on a monthly basis, except as provided in subsection (b) above. The Invoicing Unit shall add a late payment fee of one (1.00%) percent per month to the amount due for any payment made more than 30 days after the billing date. The Invoicing Unit shall have the right to refuse further sales to the Debtor Unit at any time the Debtor Unit is more than thirty days in arrears in payment.

11. Intermittent Water Sales. OWASA and Cary recognize that, from time to time, because of changes in operation, installation of facilities, emergencies, or problems, each Unit may need to buy water, even though the Unit is acting expeditiously to take care of the situation. Under these circumstances, the Cary Town Manager has authority to make agreements to sell or to buy water

on behalf of Cary, and the OWASA Executive Director has authority to make agreements to sell or to buy water on behalf of OWASA. The authority of the respective manager or executive director to make those agreements applies only to the extent that the manager or executive director of the Buyer Unit finds that the circumstances described in the first sentence of this Section apply. No such agreement may authorize the furnishing of water for a period greater than one year.

12. Determination of Quantity Supplied. The amount of water a Unit as Seller supplies to a Unit as Buyer for which the Buyer shall pay the Seller shall be measured by the Seller's meter located at or near the interconnection point(s) with the Conveyor. The Seller shall read the meter daily, in order to support the potential for interbasin transfer reporting requirements, and it shall likewise report the quantities transferred on a daily basis to the Buyer and to Conveyor(s) as applicable.

13. Right to Suspend or Reduce Supply of Water.

(a) A Unit acting as Seller may withhold, reduce, or suspend the supply of water in the event of emergencies, water shortages, equipment problems, or other events or conditions that the Seller determines reduce either the amount of water available for sale or the Seller's ability to supply such water. In the event the water being delivered by the Seller originates from the Buyer's water supply allocation from Jordan Lake, Seller may withhold or suspend the supply of water being transferred to the Buyer Unit only for reasons other than water shortage.

(b) A Unit acting as Seller may suspend supplying water to the Buyer if the Buyer is in breach of its obligation to pay the Seller for water.

(c) A Unit acting as Buyer may require the Unit acting as Seller to withhold, reduce, or suspend supplying water in the event of emergencies, water shortages, equipment problems, or other events or conditions that the Buyer Unit determines reduce the amount of water needed by the Buyer or the Buyer Unit's ability to receive the water.

14. Regulatory Compliance.

(a) Seller Unit responsible for treatment of water; Buyer Unit responsible for approvals and compliance. The Seller Unit shall treat the water being sold to the Buyer Unit so that it meets or exceeds all applicable drinking water standards at the point where the water exits the Seller's system. The Buyer Unit shall be responsible for securing and compliance with all necessary Federal and State approvals and shall comply with all applicable Federal and State regulations, laws, orders, statutes, ordinances, codes, and rules relating to the sale and public use of the water supplied and sold by the Selling Unit after it leaves the Seller's system.

(b) Buyer Unit responsible for transfer. When a Unit as Seller supplies water to the other Unit as Buyer, the Buyer shall secure, or cause to be secured, all necessary Federal and State approvals and shall comply with all applicable Federal and State regulations, laws, orders, statutes, ordinances, codes, and rules relating to the conveyance of the water.

15. Cary-Apex Interlocal Agreement. Cary represents that (i) the Town of Apex ("Apex") is a tenant-in-common with Cary in the Cary/Apex Water Treatment Facility upon terms set forth is an interlocal agreement between Cary and Apex dated April 26, 1988 and subsequently amended August 1, 1995 ("Cary-Apex Interlocal Agreement"), which addresses the ownership, operation and maintenance of the Cary-Apex Water Treatment Plant and (ii) the Cary-Apex Interlocal Agreement provides that Apex's approval is required before Cary may sell water to another political subdivision.

Nothing in this Agreement is intended to or shall require Cary to violate any provision of the Cary-Apex Interlocal Agreement, including provisions regarding Apex's rights and ability to receive water from the Cary-Apex Water Treatment Facility. This Agreement shall not be effective unless approved by Apex as evidenced by Apex's signature below.

Cary and OWASA acknowledge that an approval of this Agreement by Apex does not constitute an approval of any additional agreement between Cary and OWASA.

16. No third party beneficiaries. This Agreement is intended for the benefit of OWASA and Cary and not any other person or entity.

17. Notice

(a) Unless otherwise stated in this Agreement, all notices referred to in this Agreement shall be in writing and shall be given either by personal delivery, email, fax, or certified United States mail, return receipt requested, addressed as follows:

To Cary:
Public Works and Utilities Director
Town of Cary
Department of Public Works and Utilities
P.O. Box 8005
Cary, NC 27512-8005
The fax number is (919) 469-4304
If the sender uses email, the sender is responsible for ascertaining the name and email address of the then-current director. At the time of the making of this Agreement, email to the director is to be addressed to steve.brown@townofcary.org or alternate leila.goodwin@townofcary.org

To OWASA:
Executive Director
OWASA
400 Jones Ferry Road
Carrboro, North Carolina 27510
The fax number is (919) 968-4464
If the sender uses email, the sender is responsible for ascertaining the name and email address of the then-current director. At the time of the making of this Agreement, email to the director is to be addressed to ekerwin@owasa.org or alternate jgreene@owasa.org

(b) Change of Address. Date Notice Deemed Given. A change of address, fax number, or person to receive notice may be made by either Unit by notice given to the other Unit. A notice shall be deemed given at the time of actual delivery, if it is personally delivered or sent by email or fax, unless the sender's email system or fax indicates that the email or fax was not received. If the notice is sent by United States mail, it shall be deemed given upon the third calendar day following the day on which it is deposited with the United States Postal Service or upon actual delivery, whichever first occurs.

18. Appointment of Personnel. The Cary Town Manager shall designate persons to carry out Cary's obligations under this Agreement. The OWASA Executive Director shall designate persons to carry out OWASA's obligations under this Agreement.

19. Forum and venue. Unless the Units otherwise agree, the sole forum and venue for all litigation arising out of this Agreement shall be in the county of the Unit named as defendant, in the North Carolina General Court of Justice. The Cary Town Manager has authority to make such agreements on behalf of Cary, and the OWASA Executive Director has authority to make such agreements on behalf of OWASA.

20. Principles of Interpretation. In this Agreement, unless the context requires otherwise: (a) References to statutes or regulations include all statutory or regulatory provisions consolidating, amending, or replacing the statute or regulation, as adopted from time to time. (b) References to contracts and agreements shall be deemed to include all amendments to them, as adopted from time to time. (c) References to a "Section" or "section" shall mean a section of this Agreement. (d) Titles of sections and paragraphs in this Agreement are for convenience only, and shall not be construed to affect the meaning of this Agreement.

21. Amendments. Entire Agreement. A modification of this Agreement is not valid unless signed by both Units and otherwise in accordance with requirements of law. Further, a modification is not enforceable against Cary unless the Town Manager or a deputy or assistant Town Manager signs it for Cary. A modification is not enforceable against OWASA unless the Executive Director or other authorized representative of OWASA signs it for OWASA.

22. Termination. This Agreement may be terminated by written agreement of both Units. Either Unit may terminate this Agreement because of substantial breach of this Agreement by the other Unit provided that the terminating Unit has given 90 days' written notice to the breaching Unit and the breaching Unit has not cured the breach during that period. Either Unit may terminate this Agreement without cause provided that the terminating Unit has given 180 days' written notice. This Section does not limit the rights to enforce this Agreement through any other action or remedy. Whether this Agreement terminates as provided in Section 4 (Duration) or earlier, it is agreed that on termination, all obligations that are still executory on both sides are discharged but any right based on prior breach or performance survives.

IN WITNESS WHEREOF, the parties have authorized this AGREEMENT to be executed and attested by their undersigned officer, to be effective from and after January 1, 2010.

ORANGE WATER AND SEWER AUTHORITY:

Ed Kerwin
Executive Director

NORTH CAROLINA
ORANGE COUNTY

I, ANDREA OCBIOA, Notary Public in and for the above named Chatham County and State, do here certify that Ed Kerwin, Executive Director of the ORANGE WATER AND SEWER AUTHORITY, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

This the 15th day of December, 2009.

Notary Public

My commission expires 10-04-2011.

ANDREA OCBIOA NOTARY PUBLIC CHATHAM COUNTY, NC

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

This the 15th day of DECEMBER, 2009.

ORANGE WATER AND SEWER AUTHORITY

Stephen Winters
Director of Finance and Customer Service

This Agreement is approved as to form and legality.

Robert Epting, General Counsel for OWASA

12-16-09
Date

ATTEST:

Karen C. Gray
~~Sue Rowland~~ Karen C. Gray
~~Town Clerk~~ Deputy Town Clerk

SEAL

TOWN OF CARY:

Benjamin T. Shivar
Town Manager

NORTH CAROLINA
WAKE COUNTY

I, Donna Carpenelli Torrisi, a Notary Public in and for said County and State, certify that ~~Sue~~ Karen C. Gray ~~Rowland~~ personally appeared before me this day, and acknowledged that she is Deputy Town Clerk of the TOWN OF CARY, a municipal corporation, and that by authority duly given and as the act of the Town, the foregoing contract was signed in its corporate name by Benjamin T. Shivar, Town Manager, sealed with its corporate seal, and attested by herself as its said Deputy Town Clerk.

This the 23 day of November, 2009.

Notary Public Donna Carpenelli Torrisi

My commission expires 6/26/2010.

DONNA CARPENELLI TORRISI
Notary Public, North Carolina
Wake County
My Commission Expires
6/26/2010

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

This the 2 day of November 2009.

TOWN OF CARY

Michelle Brooks for K. Mills
Karen Mills
Finance Director

The Town of Apex executes this Agreement, as required by the Cary-Apex Interlocal Agreement, for the purpose of evidencing that it approves of the Town of Cary's entering into this agreement, and that the Town of Apex consents to any water sales by Cary to OWASA as provided hereunder:

ATTEST:

Georgia A. Evangelist

Georgia Evangelist
Town Clerk

SEAL

TOWN OF APEX:

Bruce A. Radford
Town Manager

NORTH CAROLINA
WAKE COUNTY

I, Deborah H. Judd, a Notary Public in and for said County and State, certify that Georgia Evangelist personally appeared before me this day, and acknowledged that she is the Town Clerk of the TOWN OF APEX, a municipal corporation, and that by authority duly given and as the act of the Town, the foregoing contract was signed in its corporate name by Bruce A. Radford, Town Manager, sealed with its corporate seal, and attested by himself/herself as its said Apex Town Clerk.

This the 26th day of October, 2009.

Notary Public Deborah H. Judd
Deborah H. Judd

My commission expires June 20, 2012.

AGREEMENT FOR THE SALE AND TRANSFER OF SUPPLEMENTAL DRINKING WATER SUPPLY BETWEEN ORANGE WATER AND SEWER AUTHORITY AND THE TOWN OF HILLSBOROUGH

NORTH CAROLINA
ORANGE COUNTY

THIS AGREEMENT, made and entered into and executed in duplicate originals, this the 16th day of February, 1988, by and between Orange Water and Sewer Authority, a public body politic and corporate, organized and existing under the provisions of Chapter 162A of the North Carolina General Statutes, with its principal office in Carrboro, North Carolina, hereinafter referred to as "AUTHORITY," and the TOWN OF HILLSBOROUGH, hereinafter referred to as "TOWN."

WITNESSETH:

WHEREAS, the AUTHORITY owns and operates a water supply, treatment and distribution system, which includes a Water Treatment Facility classified as Class A by the Department of Human Resources, and said facilities serve the Town of Chapel Hill, Town of Carrboro and surrounding areas in southeastern Orange County; and

WHEREAS, the TOWN owns and operates a water supply, treatment and distribution system, which includes a Water Treatment Facility classified as Class A by the Department of Human Resources, and said facilities serve the TOWN and surrounding areas in central Orange County; and

WHEREAS, the TOWN and AUTHORITY are authorized under N.C. General Statutes to enter into agreements for the joint operation and provision of water and wastewater facilities and services; and

WHEREAS, the AUTHORITY and TOWN desire to obtain additional drinking water supplies and share existing and future supplies at such time as sufficient capacity may be available to meet the needs of their respective customers during water shortage emergencies, including but not limited to those caused by treatment plant outages, power failures, water main breaks, major fires, supply contamination, or extended droughts; and

WHEREAS, in 1978, at its own expense, the AUTHORITY constructed a water system interconnection consisting of a 16-inch water main, booster pump station and flow measurement station connecting the AUTHORITY's water distribution system with the TOWN's water distribution system; and

WHEREAS, the AUTHORITY entered into agreements with the TOWN on August 26, 1977 and with Orange County on August 1, 1977 providing for the release of supplemental raw water supply from Lake Orange and subsequent treatment by the TOWN for delivery to the AUTHORITY through the AUTHORITY's water system interconnection; and the parties hereto acknowledge the continuing validity of the said County agreement and wish to supersede the previous agreement between the TOWN and the AUTHORITY by this Agreement; and

WHEREAS, in October, 1986 the TOWN and Orange County requested the AUTHORITY to provide a supplemental supply of drinking water to the TOWN during water supply emergencies, and the AUTHORITY wishes to provide assistance to the TOWN; and

WHEREAS, the AUTHORITY has completed construction of the finished water booster pumping facility which is necessary to permit the transfer of finished water by the AUTHORITY to the TOWN through the AUTHORITY's existing water system interconnection with the TOWN.

NOW, THEREFORE, the governing bodies of the parties hereto have determined that the public health, safety and welfare will be served and benefited by their cooperation, mutual undertakings and agreement as hereinafter set out; and, in consideration of the benefits, assistance and mutual obligations to be received and performed by the parties hereunder, and especially in consideration of making a cooperative effort to alleviate the hardship and the threat to public health, safety and welfare caused by limitations of supply capacity, drought and other water supply emergencies, the TOWN and AUTHORITY, for themselves, their successors and assigns, do mutually agree as follows:

1. This Agreement shall be effective as of the date first above written and shall continue in full force and effect unless terminated as herein provided, for an Original Term of five (5) years therefrom.

(a) This Agreement shall continue for successive terms of one year each after the Original Term unless cancelled or terminated by either party as provided herein.

(b) Either party may terminate this Agreement as of the end of any current term by mailing written notice thereof by registered mail, return receipt requested, to the other not later than ninety (90) days prior to the end of such current term. This Agreement may also be terminated unilaterally by either party if the applicable charges for water or other charges, as provided herein, are not paid in accordance with the terms and conditions of this Agreement.

2. (a) The parties agree that upon request of either party (hereafter referred to as "Purchaser"), the other party (hereafter referred to as "Seller") shall endeavor to deliver treated water to the Purchaser in the manner prescribed by this Agreement. Upon written request from the Purchaser and upon determination by the Seller that it has adequate water supply capacity from its own or other resources, the Seller will deliver to the Purchaser a quantity of treated water as hereinafter defined. Such water will be delivered to the Purchaser at the existing metered interconnection, as hereinafter defined, of the water system of the Seller with the water system of the Purchaser. The quantity of water delivered shall be metered at such point.

(b) The quantity of water provided by the Seller to the Purchaser shall, at the point of interconnection, meet the applicable purity standards of the State of North Carolina and the Federal Government; however, each party shall be responsible for the quality of water within its own water distribution system.

3. The AUTHORITY's Executive Director or his designate shall administer requests for water on a day to day basis and the AUTHORITY agrees to notify the TOWN in writing as to what person or persons have been so designated. The TOWN's Administrator or his designate shall administer requests for water on a day to day basis and the TOWN agrees to notify the AUTHORITY in writing as to what person or persons have been so designated.

4. (a) The quantity of water, if any, available from the Seller to the Purchaser or the ability of the Seller's system to transfer finished water to the Purchaser shall be determined by the Seller, in its sole discretion at the time of the request, in light of the following factors: a) the amount of raw water in existing or future water supplies at such time as they are available; b) present water demand, including demands under normal or emergency conditions; c) the amount of water available for purchase from other water purveyors; d) water filtration capacity; and e) water distribution mains, pumps, facilities and capacities and operating constraints thereto.

(b) The AUTHORITY fully expects that upon completion of the AUTHORITY's Cane Creek Reservoir project and the Jones Ferry Road Water Plant expansion project the AUTHORITY will be able to provide a maximum of 2 million gallons of water per day to the TOWN during the Original Term of this Agreement.

5. The Purchaser agrees to provide written notification to the Seller when water purchases from the Seller are no longer needed. Upon request by the Seller, during the period in which the Seller is providing water under this Agreement, the Purchaser shall impose water use restrictions for its customers at least equal to those imposed by the Seller. The Seller may make the provision of water to the Purchaser contingent upon such water use restrictions being imposed in the Purchaser's service area.

6. It is mutually understood and agreed that the rates and charges for water provided by one party to the other, and any changes or revisions thereof, shall be fair and reasonable. The charge for the water the Seller provides to the Purchaser pursuant to the provisions of Paragraph 4 of this Agreement shall be the Seller's direct and indirect cost of such water and shall be based on the unit costs of all expenses incurred to produce water, including but not limited to the costs of: energy and electricity; chemicals; materials; testing; maintenance; insurance; taxes; depreciation; debt service; salaries and benefits of employees directly involved in the operation of the Seller's water treatment plant and system, water purchases from other water purveyors; and other direct and indirect costs normally incurred in the supply, treatment, and distribution process and incremental costs of pertinent administrative services; provided, however, that in the event the Seller is purchasing finished water from another system during any part of the time it is also providing water to the Purchaser, the Seller may impose an additional reasonable surcharge applicable to water sales to the Purchaser. Said surcharge shall permit the Seller to adjust the water rate to reflect the actual cost of providing water to the Purchaser.

7. The charge for water provided by the AUTHORITY to the TOWN, excluding applicable surcharges, shall not exceed seventy-five percent (75%) of the rate charged by the AUTHORITY within its service area. At the inception of this Agreement, the charge shall be $1.26 per 1,000 gallons of water for water obained from the AUTHORITY's supplies. The charge for water provided by the TOWN to the AUTHORITY, excluding applicable surcharges, shall not exceed 75% of the rate established in Section 14-37(a) of the TOWN's water and sewer ordinance, or subsequent related revisions thereto. For the purpose of this Agreement, the AUTHORITY shall be charged at the rates applicable to customers within the TOWN's corporate limits. At the inception of this Agreement, the charge for water the Town provides to the AUTHORITY shall be $0.98 per 1,000 gallons. Either party may, in its sole discretion and upon thirty (30) days written notice to the other party, revise the rates and charges applicable to water sales to the other party, in accordance with increases in the components of treating and providing water to the other party. Water charges shall apply to all water used, including that necessary for flushing of interconnection lines.

8. Not later than the tenth (10th) day of each month, the Seller shall furnish to the Purchaser an itemized statement of the amount of water and charges for such water furnished during the preceding month. The Purchaser shall make said payment in full not later than the thirtieth (30th) day of each month for water purchased during the previous month.

9. The point of delivery of water transferred under the provisions herein shall be at the terminus of the AUTHORITY's 16-inch water main located in State Road 1193 in the vicinity of the Southern Railway overpass.

10. Upon the execution and delivery of this Agreement and without the necessity for execution and delivery of any additional written instrument of transfer, the TOWN shall transfer to the AUTHORITY, at no expense to the AUTHORITY, the water meter, meter vault, valves and appurtenances located at the point at which the the AUTHORITY's 16-inch water main connects to the terminus of the TOWN'S 16-inch water main.

11. Maintenance of the AUTHORITY's existing and improved water system interconnection, including the booster pump stations, associated flow measurement equipment, and improvements described in Paragraph 10 of this Agreement shall be performed by the AUTHORITY. The cost of said maintenance shall be included in the determination of the charges for water as provided in Paragraph 6 above. The AUTHORITY shall be responsible for maintenance of complete and accurate flow records with the same being furnished to the TOWN. The TOWN shall, upon reasonable notice, have access to such flow records and flow measurement facilities for the purpose of taking readings and checking the same for accuracy.

12. The TOWN and the AUTHORITY agree and covenant to budget and authorize the payment of appropriate funds for the administration and execution of this Agreement and to take whatever action is necessary to make all payments and disbursements pursuant to the terms of this Agreement.

13. The parties to this Agreement shall not be responsible or liable in any way for any interruption or discontinuance of the delivery of water or services or fluctuations or failures in pressures or rate of flow from one party to the other.

14. This Agreement does not preclude either party from providing treated water through its water system to any other party.

15. The terms and conditions of this Agreement shall be subordinate to the provisions of the AUTHORITY's Bond Order dated March 7, 1985 and all other applicable legal and regulatory requirements, the provisions and conditions of which shall control in the instance of any conflict therebetween. If any of the terms and conditions of this Agreement are determined to be null and void, the remaining portion of this Agreement shall nevertheless remain in full force and effect except that in the instance either party shall have the option, upon reasonable notice to the other, of declaring the entire remaining provisions of the Agreement to be terminated, null and void.

16. This Agreement may be amended from time to time by written amendment duly authorized and executed on behalf of the parties with the formality and prerequisites as are applicable to the execution of this Agreement.

17. This Agreement constitutes the entire agreement between the parties relating to the provision of services to and for the TOWN by the AUTHORITY and supersedes all prior negotiations, representations and agreements relating in any way to the sale and transfer of water between the TOWN and the AUTHORITY, including that agreement dated August 26, 1977, between the parties.

18. Any litigation arising out of this Agreement shall be determined in Orange County Superior Court.

IN TESTIMONY WHEREOF, the undersigned Mayor of the Town of Hillsborough, North Carolina, and the Executive Director of Orange Water and Sewer Authority, each having been duly authorized by Resolution of the respective governing boards to execute this Agreement, have duly executed this Agreement for and on behalf of the TOWN and the AUTHORITY to evidence the undertakings entered into as hereinabove shown in particular. The respective official seals of the TOWN and the AUTHORITY have been affixed hereto by authority of the respective governing bodies, all as of the day and year first above written.

ORANGE WATER AND SEWER AUTHORITY

W E Dillingham
Executive Director

ATTEST:

W. L. Adkins Jr.
Secretary-Treasurer

TOWN OF HILLSBOROUGH

Fred B. Cole
Mayor

ATTEST:

Agatha Johnson
Town Clerk

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

2/16/88
Date

Agatha Johnson
Finance Officer
Town of Hillsborough

January 29, 1988
Date

Janie Friedland
Acting Finance Officer
Orange Water and Sewer Authority

This document is hereby approved as to form and legality.

1-29-88
Date

Counsel to the Authority

Agenda Item 6:

Onboarding Program Update for OWASA's New Executive Director

Purpose:

Provide the Board of Directors a progress update on the Onboarding Program approved by the Board on May 14, 2020, to ensure a smooth and effective transition of leadership and successful integration.

Action Needed:

Discussion and direction by the Board of Directors to the Executive Director regarding pending onboarding tasks.

Information:

- Updated Onboarding Program Tasks for OWASA's New Executive Director dated August 6, 2020.

Board of Directors (BOD)

Item #	Task	Proposed Actions	Description	Task Lead	Task Support	Timing
1	Finalize BOD onboarding tasks	Completed - no further action	The BOD discusses and agrees in an open Regular or Special meeting on the BOD's tasks, roles and responsibilities for onboarding. The BOD may decide to provide the new ED suggested assignments prior to assuming responsible charge (view prior BOD/Committee meetings, review documents, etc.).	Board Chair or designee	Board Members as assigned by Board Chair or BOD. Additional assistance may be requested of staff and/or consultant(s).	Prior to new ED hire date
2	Adopt Resolution appointing new ED	Completed - no further action	BOD adopts Resolution in an open Regular or Special meeting, appointing new ED and setting the effective date on which he/she assumes full responsible charge.	Board Chair	Robert Epting, Andrea Orbich	Soon after BOD selects new ED
3	Board announcement on the hiring of new ED	Completed - no further action	BOD provides formal announcement to staff, key stakeholders and the public of the hiring of the new ED. Following the announcement, a formal introduction may be desired.	Board Chair	OWASA staff as requested	Prior to or immediately following adoption of Resolution appointing new ED
4	**Get-to-know-you Event**	**Delete task due to COVID-19 restrictions and we all know each other well.**	**BOD hosts a social event with new ED for the sole purpose of "getting to know you". Since no OWASA business will be discussed, this is not an open meeting (COVID-19 permitting).**	**Board Chair or designee**	**OWASA staff as requested**	**First 30 days**
5	**Onboarding meeting(s)**	**Added to the 08-13-2020 BOD work session agenda following the discussion with the Executive Committee in July meeting.**	**BOD meets with new ED in an open Regular or Special meeting to discuss onboarding items. This may be done over the course of several meetings. Topics may include: communications, roles and responsibilities, organizational culture, expectations, and pending key staff action items.**	**Board Chair or designee**	**OWASA staff and Robert Epting as requested. Consultant facilitation if desired.**	**First 30-90 days**
6	**Performance review/ feedback**	**Recommend adding these items to the 8-27-2020 regular meeting and the 9-10-2020 work session agendas. Will add to the agendas for review by the BOD at the 8-13-2020 work session.**	**BOD meets in Closed Session without ED to discuss and agree on the performance feedback to be provided to ED. BOD meets in Closed Session with the ED to provide and receive feedback. The effectiveness of the onboarding process can be discussed in these meetings.**	**Board Chair or designee**	**None expected**	**TBD. Every 30-60 days may be useful for the first year. In the future, every six months. Past practice has been to schedule mid-year review in April and full-year review in October which is in alignment with reviews for all employees.**
7	**Approve ED Key Focus Areas**	**The BOD has tentatively scheduled an item titled "Discuss Work Plan for New ED" for the 9-10-2020 work session. Schedule to review and approve work plan will be proposed following this meeting.**	**Past practice is the ED proposes his/her annual work plan of "Key Focus Areas" in an open Regular or Special meeting following his/her annual performance review by the BOD. After discussions with ED, the BOD adopts Key Focus Areas for ED.**	**ED, Board Chair or designee**	**ED**	**TBD**

Staff

Item #	Task	Proposed Action	Description	Task Lead	Task Support	Timing
1	Initial one-on-one meetings with ED's Direct Reports	Completed - no further action	Initial one-on-one meetings with all ED's direct reports.	ED Direct Reports (Andrea Orbich; Mary Tiger; Mary Darr; Dan Przybyl; Stephanie Glasgow; Stephen Winters; Todd Taylor)	Andrea Orbich	First week
2	Departmental Briefings	Completed - no further action	Meetings with each department and their employees for an overview of departmental function, responsibilities, operations and performance. Provide ED suggested reading.	Department Directors	Other staff as needed	First month
3	Emergency Preparedness and Response	Completed - no further action	Review emergency preparedness and response procedures and protocols.	General Manager of Operations	Staff as needed	First month
4	Tour facilities and assets	Completed - no further action	Tour all OWASA facilities and assets.	Department Directors or designees	Staff as needed	30-60 days
5	Current and pending key initiatives, opportunities, challenges and strategic direction.	Completed - no further action	Review and discuss current and pending key initiatives, opportunities, challenges and strategic direction. Discuss priorities, roles, responsibilities and resource needs. When scheduling, priority given to urgent matters which may required ED and/or BOD guidance and support.	Department Directors	Staff as needed	30-60 days

Update on Onboarding Tasks for OWASA's New Executive Director (ED)

Attachment 3
August 6, 2020

General Counsel

Item #	Task	Proposed Action	Description	Task Lead	Task Support	Timing
1	OWASA and Community Overview	Completed - no further action	Provide history and outlook on OWASA and community values.	Robert Epting	Robin Jacobs	First month
2	Review key laws, contracts, policies, procedures and risk management.	Completed - no further action	Provide overview of key laws, contracts (Sale & Purchase Agreements; bond orders; Chapter 162 A; Water and Sewer Management, Planning and Boundary Agreement; etc.), policies, procedures, governance, and risk management. Provide outlook when applicable.	Robert Epting	Robin Jacobs and staff as needed	30-60 days
3	Review General Counsel Opinion letters.	Completed - no further action	Provide overview of General Counsel Opinion letters and their implications on the organization.	Robert Epting	Robin Jacobs and staff as needed	30-60 days

Update on Onboarding Tasks for OWASA's New Executive Director (ED)

Attachment 4
August 6, 2020

Ed Kerwin

Item #	Task	Proposed Action	Description	Task Lead	Task Support	Timing
1	Welcome and Introductions	Completed - no further action	In coordination with BOD, welcome new ED and introduce direct reports, General Counsel and other staff. Host "all employees" meeting with new ED.	Ed Kerwin	Andrea Orbich and other staff as needed	First day
2	Strategic Direction Overview	Completed - no further action	Provide history and outlook on OWASA's culture and performance. Discuss working with the staff and BOD on stragetic direction. Discuss strategic direction, challenges and opportunities. Provide overview of possible future action items for new ED's consideration.	Ed Kerwin	Input from staff	First week
3	Introduction to Key Stakeholders	Completed - no further action	Arrange and accompany new ED in individual meetings with key stakeholders (Town and County Managers; senior UNC/UNC Hospital officials, area utility Directors; community and business leaders, etc.). Discuss importance and value of key relationships.	Ed Kerwin	Andrea Orbich to schedule	First two weeks
4	Regional, Service Area and Community Overview	Completed - no further action	Discuss key information about OWASA's service area, rural Orange County, area water utilities and resources, and the community at large.	Ed Kerwin	NA	First two weeks
5	Brief on Key High-Priority Issues with Staff	Completed - no further action	With appropriate staff, provide brief on high priority issues where new ED will benefit learning the perspectives of outgoing ED. This is in addition to issue briefings staff will provide new ED.	Ed Kerwin	Assigned by Ed Kerwin	First two weeks
6	Executive Director Calendar Review	Completed - no further action	Review existing ED calendar of meeting events and tasks.	Ed Kerwin	Andrea Orbich	First two weeks
7	Provide Information and Support as Requested	Completed - no further action	Be responsive to requests for information and support requested by new ED.	Ed Kerwin	NA	First two weeks

Agenda Item 7:

Review Board Work Schedule

Purpose:

a) Request(s) by Board Committees, Board Members, Counsel and Staff
b) August 27, 2020 Virtual Board Meeting
c) September 10, 2020 Virtual Board Work Session
d) Review 12 Month Board Meeting Schedule
e) Review Pending Key Staff Action Items

Information:

- Draft agenda for the Virtual August 27, 2020 meeting
- Draft agenda for the Virtual September 10, 2020 meeting
- 12 Month Board Meeting Schedule
- Pending Key Staff Action Items from Board Meetings

Agenda
Virtual Meeting of the OWASA Board of Directors
Thursday, August 27, 2020, 6:00 P.M.

Due to COVID-19 public health concerns, the Orange Water and Sewer Authority (OWASA) Board of Directors is conducting this meeting virtually utilizing Microsoft Teams software. Board Members, General Counsel and staff will be participating in the meeting remotely.

The Board of Directors appreciates and invites the public to attend and observe its virtual meetings online. Public comment is invited via written materials, ideally submitted at least two days in advance of the meeting to the Board of Directors by sending an email to board_and_leadership@owasa.org or via US Postal Service (Clerk to the Board, 400 Jones Ferry Road, Carrboro, NC 27510). Public comments are also invited during the Board Meeting via telephone, and members of the public will need to be available to call-in during the meeting. Please contact the Clerk to the Board at aorbich@owasa.org or 919-537-4217 to make arrangements by 3:00 p.m. the day of the meeting.

Public speakers are encouraged to organize their remarks for delivery within a four-minute time frame allowed each speaker, unless otherwise determined by the Board of Directors. The Board may take action on any item on the agenda.

Announcements

a. Announcements by the Chair
   - Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.

b. Announcements by Board Members

c. Announcements by Staff
   - Update on the August 26, 2020 Human Resources Committee Meeting (Jody Eimers)

d. Additional Comments, Suggestions, and Information Items by Board Members (Ray DuBose)

Petitions and Requests

1. Public
2. Board
3. Staff

Consent Agenda

Information and Reports

1. 12 Month Board Meeting Schedule (Todd Taylor)

Regular Agenda

Information and Reports

2. Update on OWASA's COVID-19 Information and Discussion by the Board (Todd Taylor)
3. Capital Improvements Program Semiannual Report (Vishnu Gangadharan)
4. Preliminary Financial Report for the Twelve-Month Period Ended June 30, 2020 (Stephen Winters)

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Summary of Board Meeting Action Items

5. Executive Director will summarize the key staff action items from the Board Meeting and note significant items for discussion and/or action expected at the next meeting

Closed Session

6. The Board of Directors will Meet in Closed Session for the Purpose of Discussing Two Personnel Matters, as provided in N.C. General Statutes 143.318.11(6) (Jody Eimers)

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Agenda
Virtual Work Session of the OWASA Board of Directors
Thursday, September 10, 2020, 6:00 P.M.

Due to COVID-19 public health concerns, the Orange Water and Sewer Authority (OWASA) Board of Directors is conducting this meeting virtually utilizing Microsoft Teams software. Board Members, General Counsel and staff will be participating in the meeting remotely.

The Board of Directors appreciates and invites the public to attend and observe its virtual meetings online. Public comment is invited via written materials, ideally submitted at least two days in advance of the meeting to the Board of Directors by sending an email to board_and_leadership@owasa.org or via US Postal Service (Clerk to the Board, 400 Jones Ferry Road, Carrboro, NC 27510). Public comments are also invited during the Board Meeting via telephone, and you will need to be available to call-in during the meeting. Please contact the Clerk to the Board at aorbich@owasa.org or 919-537-4217 to make arrangements by 3:00 p.m. the day of the meeting.

Public speakers are encouraged to organize their remarks for delivery within a four-minute time frame allowed each speaker, unless otherwise determined by the Board of Directors. The Board may take action on any item on the agenda.

Announcements

a. Announcements by the Chair
   - Any Board Member who knows of a conflict of interest or potential conflict of interest with respect to any item on the agenda tonight is asked to disclose the same at this time.

b. Announcements by Board Members
c. Announcements by Staff
d. Additional Comments, Suggestions, and Information Items by Board Members (Chair)

Consent Agenda

Information and Reports

1. Annual Report on Disposal of Surplus Personal Property (Kelly Satterfield)

Action

2. Minutes of the August 13, 2020 Virtual Work Session of the Board of Directors (Andrea Orbich)

Regular Agenda

Discussion and Action

3. Consideration of Juneteenth as a Paid Holiday (Stephanie Glasgow)

Discussion

4. Diversity and Inclusion Program Progress Report and Equal Employment Opportunity/ Affirmative Action Report for Fiscal Year 2020 (Stephanie Glasgow)

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5. Update on OWASA's COVID-19 Information and Discussion by the Board (Todd Taylor)
6. Review Proposed Work Plan for New Executive Director (Todd Taylor)
7. Review Board Work Schedule
    a. Request(s) by Board Committees, Board Members and Staff (Ray DuBose)
    b. September 24, 2020 Board Meeting (Todd Taylor)
    c. October 8, 2020 Work Session (Todd Taylor)
    d. 12 Month Board Meeting Schedule (Todd Taylor)
    e. Pending Key Staff Action Items (Todd Taylor)
    f. Action Items Recurring Every 3 to 5+ Years (Todd Taylor)

Summary of Work Session Items

8. Executive Director will summarize the key staff action items from the Work Session

Closed Session

9. The Board of Directors will Meet in Closed Session for the Purpose of Discussing a Personnel Matter, as provided in N.C. General Statutes 143.318.11(6) (Jody Eimers)

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OWASA Board of Directors – 12 Month Board Meeting Schedule (August 7, 2020)

Month	Board Meetings		Committee Meetings & Other Board Items
	Work Session	Business Meeting	
August 2020	Resolution Designating OWASA's Primary and Secondary Agents and Authorizing Them to Execute and File Applications for FEMA or State Assistance and Represent the Organization in All Dealings with FEMA and the NCDEM COVID-19 Update **Discuss LRWSP Supply & Demand Management Alternatives** Onboarding Program Update for New ED CS – Prepare for GC Annual Review ↻ (Virtual Meeting) 8/13/2020	COVID-19 Update Preliminary 12 Month Financial Report ↻ CIP Semiannual Report ↻ CS – GC Annual Review ↻ CS – ED Performance Review/Feedback (w/o ED) (Virtual Meeting) 8/27/2020	*HR Committee Meeting (8-26-2020)*
September 2020	EEO/Affirmative Action Report and D&I Update ↻ Annual Report on Disposal of Surplus Personal Property ↻ Consideration of Juneteenth Paid Holiday Update on COVID-19 Discuss Work Plan for New ED CS – ED Performance Review/Feedback (w/ ED) (Virtual Meeting) 9/10/2020	Annual Report and Financial Audit ↻ **Forest Management Update** Update on the Water Main Prioritization Model (Tentative) Discuss Process to Update the Strategic Plan Approve General Counsel Engagement ↻ (Annual Meeting of BOD) 9/24/2020	
October 2020	**Strategic Trends Report** ↻ Award the WWTP Fermenter Improvements Construction Contract 10/8/2020	Q1 Financial Report ↻ Reliability and Resiliency Improvements Update 10/22/2020	
November 2020	**Annual Update of the Energy Management Plan** ↻ (Tentative) Response to Petition to Modify WSMPBA Boundary 11/12/2020	*Holiday – no meeting*	*Possible welcome of new Board member(s)*
December 2020	TBD 12/10/2020	*Holiday – no meeting*	
January 2021	Appoint Audit Firm ↻ Employee Health and Dental Insurance Update for FY 22 ↻ Affordability Outreach Program Update ↻ D&I Update ↻ 1/14/2021	Annual Lakes Recreation Report ↻ CIP Semiannual Report ↻ Q2 Financial Report ↻ Discuss FY 22 Budget Calendar, Planning Assumptions, and New Budget Format ↻ 1/28/2021	
February 2021	Department Managers FY 22 Budget Presentations CS – Prepare for GC Interim Review ↻ 2/11/2021	CS – GC Interim Review ↻ 2/25/2021	
March 2021	FY 22 Draft Budget and Rates ↻ 3/11/2021	Set Date for Public Hearings – FY 22 Budget & Rates ↻ 3/25/2021	
April 2021	Review Employee Health and Dental Insurance Renewals ↻ FY 22 Draft Budget and Rate Adjustment ↻ BOD Eligible for Nominations to Election as Board Officers (include Officer descriptions) 4/8/2021	Q3 Financial Report ↻ FY22 Draft Budget and Rates Adjustment Information and Authorize Staff to Publish Proposed Rates 4/22/2021	

OWASA Board of Directors – 12 Month Board Meeting Schedule (August 7, 2020)

Month	Board Meetings		Committee Meetings & Other Board Items
	Work Session	Business Meeting	
May 2021	Approve Employee Health and Dental Insurance Renewals ↻ FY22 Draft Budget (if needed) ↻ 5/13/2021	Public Hearings – FY 22 Budget and Rates ↻ 5/27/2021	
June 2021	Approve FY 22 Budget and Rates ↻ Election of Officers ↻ 6/10/2021	TBD 6/24/2021	
July 2021	D&I Update 7/8/2021	TBD 7/22/2021	

New schedule for new ED Performance Reviews – TBD.

The 12 Month Board Meeting Schedule shows Strategic Plan initiatives and other priority efforts that the Board and staff plan to give greatest consideration to during the next twelve months. The schedule also shows major recurring agenda items that require Board action, or items that have been scheduled in response to the Board's prior standing request. This schedule does not show all the items the Board may consider in a work session or business meeting. It also does not reflect meetings at which the Board will discuss and act on the update of the Strategic Plan.

The 12 Month Board Meeting Schedule will be reviewed and updated at each monthly work session and may also be discussed and updated at the Board's business meetings.

In addition to the initiatives shown in this schedule, staff will be working on other Strategic Plan and organizational priorities that are not expected to require major additional discussion with the Board except as part of budget deliberations.

The schedule implies that the following Strategic Plan initiatives would be addressed beyond the 12-month period. The Board may conclude that one or more of the following initiatives are higher priority. The schedule will be revised as needed to reflect the Board's priorities, and any additional initiatives that the Board may decide to address.

- Development of a plan and policy framework for OWASA lands is considered a longer-term priority. The NRTS Committee discussed this issue in September 2017 and determined it was lower priority than Forest Management.
- Water Conservation Plan will be prepared concurrent with update of the Long-Range Water Supply Plan.
- Update of Strategic Plan. On October 24, 2019, the Board and staff agreed to begin updating the Strategic Plan in FY 2021.

The OWASA Board determines which topics it wants to explore as a full Board (potentially in a work session format) and which topics it wants to assign to Board committees or committee chairs for further analysis and development of recommendations. Board also determines priorities and desired timeframes for addressing topics. Committee meetings will be updated on the schedule routinely.

Abbreviations Used in Draft Schedule:

↻	Recurring agenda item (generally these are "required" items)	BOD	Board of Directors
AV/AMI	Agua Vista/Advanced Metering Infrastructure	CE	Community Engagement
BOCC	Board of County Commissioners	CEP	Community Engagement Plan
		CHTC	Chapel Hill Town Council

OWASA Board of Directors – 12 Month Board Meeting Schedule (August 7, 2020)

CIP	Capital Improvements Program
COLA	Cost of Labor Adjustment
CS	Closed Session of the Board
CTC	Carrboro Town Council
CY	Calendar Year
D&I	Diversity and Inclusion
ED	Executive Director
EEO	Equal Employment Opportunity
EPA	Environmental Protection Agency
FY	Fiscal Year
GC	General Counsel
HR	Human Resources
JLP	Jordan Lake Partnership
KPI	Key Performance Indicator
LRWSP	Long-Range Water Supply Plan
MOA	Memorandum of Agreement
MWBE	Minority/Women-owned Business Enterprises
MST	Mountains-to-Sea Trail
MFMM	Multi-Family Master Meter
NCDOT	North Carolina Department of Transportation
NRTS	Natural Resources and Technical Services
OC	Orange County
Q	Quarter
RFP	Request for Proposals
SRF	State Revolving Fund
SOW	Scope of Work
TBD	To Be Determined
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Pending Key Staff Action Items from Board Meetings

No.	Date	Action Item	Target Board Meeting Date	Person(s) Responsible	Status
1.	7-9-2020	Provide a report on local governments' paid holidays and any recent actions or intentions to modify their schedules. Facilitate Board discussion and provide a recommendation from staff.	9-10-2020	Glasgow	Complete
2.	6-11-2020	Schedule HR Committee Meeting to discuss summer internships and apprenticeships, with focus on minority participation.	NA	Glasgow	Complete – HR Committee meeting scheduled for 8-26-2020.
3.	6-11-2020	Schedule routine assessments for the Board of Directors.	TBD	DuBose Orbich	
4.	6-11-2020	Update description of Board Member duties and responsibilities used for Board Member recruitment purposes. Share update with Board for comment before providing to local governments.	NA	Orbich	Completed; e-mail sent on 7-10-2020 for Board feedback; finalized & distributed to local government Clerks on 7-28-2020.
5.	2-27-2020	*Respond to P.M. Dubbeling, PLLC, on behalf of Frank Baumgartner and Rachel Sumney, requesting a change to the Water and Sewer Management, Planning and Boundary Agreement.	11-12-2020	Rouse	E-mail sent to Board on 3-5-2020. The process is delayed due to COVID-19. Since this is in TOCH jurisdiction, they have lead. TOCH staff are preparing item to present to their Council on October 28, 2020 (tentative). After Council takes action, OWASA staff will bring back to Board, tentatively scheduled for 11-12-2020