ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

Agenda
Meeting of the OWASA Board of Directors
Thursday, October 26, 2017, 7:00 P.M.
Chapel Hill Town Hall

In compliance with the "Americans with Disabilities Act," interpreter services are available with five days prior notice. If you need this assistance, please contact the Clerk to the Board at 919-537-4217 or aorbich@owasa.org.

The Board of Directors appreciates and invites the public to attend and observe its meetings. Public comment is invited either by petition upon topics not on the Board's agenda, or by comments upon items appearing on the Board's agenda. Speakers are invited to submit more detailed comments via written materials, ideally submitted at least three days in advance of the meeting to the Clerk to the Board via email or US Postal Service (aorbich@owasa.org/400 Jones Ferry Road, Carrboro, NC 27510).

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.

Announcements

1. Announcements by the Chair
   A. 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.
2. Announcements by Board Members
   A. Update on the October 18, 2017 Human Resources Committee Meeting (Barbara Foushee)
   B. Human Resources Committee will meet on November 16, 2017 at 5:30 p.m. in the OWASA Boardroom to Continue Discussion on Employee Compensation and Benefits (Barbara Foushee)
3. Announcements by Staff
   A. OWASA Employee Service Awards (Ed Kerwin)
   B. Update on the October 21, 2017 Open House at the Cane Creek Reservoir (Ed Kerwin)
   C. Public Invited to the Open House at OWASA's Jones Ferry Road Campus on November 4, 2017 from 9:00 a.m. until 1:00 p.m. (Ed Kerwin)

Petitions and Requests

1. Public
2. Board
3. Staff

Consent Agenda

Information and Reports

1. 12 Month Board Meeting Schedule (Robert Morgan/Ed Kerwin)
2. Quarterly Attendance at Board and Committee Meetings (Andrea Orbich)

Action

3. Resolution Approving Sole Source Procurement of Odor Control Equipment for the Rogerson Drive Pump Station (Simon Lobdell)
4. Minutes of the September 28, 2017 Annual Meeting of the Board of Directors (Andrea Orbich)
5. Minutes of the September 28, 2017 Closed Session of the Board of Directors for the Purpose of Discussing a Personnel Matter (Barbara Foushee)
6. Minutes of the October 12, 2017 Work Session of the Board of Directors (Andrea Orbich)

Regular Agenda

Discussion and Action

7. Manual Read Option for Advanced Metering Infrastructure (Stephen Winters)
8. Process for Periodic Review of Fluoridation (Ed Kerwin)

Discussion

9. Administration of Strategic Plan:
   A. Annual Review and Update of Strategic Trends and Utility Planning Issues (Ruth Rouse)
   B. Strategic Plan Progress Report (Ed Kerwin)

Information and Reports

10. Financial Report for the Three Month Period Ended September 30, 2017 (Stephen Winters)

Summary of Board Meeting Action Items

11. Executive Director will summarize the key action items from the Board meeting and note significant items for discussion and/or action expected at the next meeting

Closed Session

12. The Board of Directors will convene in a Closed Session for the Purpose of Discussing a Personnel Matter (Barbara Foushee)

OWASA Board of Directors – 12 Month Board Meeting Schedule (October 20, 2017)

Month	Board Meetings		Committee & Other Meetings and Reports
	Work Session	Business Meeting	
October 2017	***Discuss AMI Policies*** Discussion of impact on MFMM rate change Discuss Televising Board Meetings 10/12/2017	Sole Source Procurement of Odor Control Equipment for the Rogerson Drive Pump Station Process for Periodic review of Fluoridation ***Approve AMI Manual Read Policy*** Strategic Trends Report and Strategic Plan Update and Progress Report ( ) Q1 Financial Report ( ) CS – ED Review 10/26/2017 ( )	*Human Resources Committee Meeting (10/18/17)* *Open House at Cane Creek (10-21-2017)*
November 2017	Review and Approve New Safety Manager Position Discuss and Consider Approval of Revisions to Parental Leave Policy Discuss Financial Reserves Policy CS – ED Review ( ) 11/9/2017	*Holiday - no meeting*	*Open House at Jones Ferry Road Complex (11-4-2017)* *Human Resources Committee Meeting (11/16/17)* *Finance Committee Meeting (TBD)* *NRTS Committee Meeting (TBD)*
December 2017	***Discuss LRWSP – Demands & Yield*** Award the Rogerson Drive Pump Station Phase 2 Contract Appoint Audit Firm ( ) Discuss Employee Compensation for current FY (Tentative) Status of Action Items on Communications during Emergencies (Tentative) Discuss Service Availability Fees regarding new State Law (Tentative) Discuss/Approve ED Key Focus Areas 12/14/2017	*Holiday - no meeting*	
January 2018	FY 19 Budget Calendar and Assumptions ( ) Employee Health and Dental Insurance Update ( ) (Tentative) Discuss revisions to Retiree Health Insurance and 457 Deferred Compensation Discuss KPI Trends Affordability Outreach Program Update CY 17 Biosolids Report ( ) 1/11/2018	Annual Lakes Recreation Report (regular agenda) ( ) Q2 Financial Report ( ) CIP Semiannual Report ( ) 1/25/2018	
February 2018	Energy Management Plan Update Diversity and Inclusion Progress Report Sole Source Procurement of WWTP Solids Thickening Equipment Award the WWTP Intermediate Pump Station Rehabilitation Contract CS - General Counsel Interim Review ( ) 2/8/2018	CS - General Counsel Interim Review ( ) 2/22/2018	
March 2018	FY 19 Draft Budget & Rates ( ) Set date for Public Hearings – FY 19 Budget & Rates ( ) CS - ED Interim Review ( ) 3/8/2018	FY 19 Draft Budget & Rates ( ) CS – ED Interim Review ( ) 3/22/2018	

Current and Pending Key Projects and Stages – in ***bold italics***

OWASA Board of Directors – 12 Month Board Meeting Schedule (October 20, 2017)

April 2018	Review Employee Health and Dental Insurance Renewal () Award the Galvanized Water Main Replacement Contract FY 19 Draft Budget and Rates () Authorize staff to publish proposed rates () Appointment of the Nominating Committee () 4/12/2018	Q3 Financial Report () 4/26/2018	
May 2018	Discuss Employee Health and Dental Insurance Renewal () Discuss Employee Merit Pay for FY 19 () ***Discuss Community Engagement Plan for Forestry Management*** 5/10/2018	Public Hearings – FY 19 Budget and Rates () Approve Employee Health and Dental Insurance Renewal () 5/24/2018	
June 2018	Approve FY 19 Budget and Rates () Election of Officers () 6/14/2018	TBD 6/28/2018	
July 2018	Discuss KPI Trends 7/12/2018	TBD 7/26/2018	
August 2018	(Tentative) Discuss AMI Policies (other than manual read) CS – General Counsel Review () 8/9/2018	Preliminary 12 Month Financial Report () CIP Semiannual Report () EEO/Affirmative Action Report () CS – General Counsel Review () 8/23/2018	
September 2018	EEO/Affirmative Action Report () Annual Report on Disposal of Surplus Personal Property () CS – General Counsel Review () 9/13/2018	Annual Report and Financial Audit () Approve General Counsel Engagement () CS – ED Review () 9/27/2017	

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 Forestry Management. Staff will develop a Community Engagement Plan for Forestry Management by June 2018, and currently plan to present a draft in May 2018.
- Improve effectiveness as a learning organization is considered a longer-term priority.
- Water Conservation Plan will be prepared concurrent with update of the Long-Range Water Supply Plan.

OWASA Board of Directors – 12 Month Board Meeting Schedule (October 20, 2017)

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.

OWASA Board of Directors – 12 Month Board Meeting Schedule (October 20, 2017)

Abbreviations Used in Draft Schedule:

( )	Recurring agenda item (generally these are "required" items)
AMI	Advanced Metering Infrastructure
CE	Community Engagement
CEP	Community Engagement Plan
CIP	Capital Improvements Program
COLA	Cost of Labor Adjustment
CS	Closed Session of the Board
CY	Calendar Year
ED	Executive Director
FY	Fiscal Year
JLP	Jordan Lake Partnership
LRWSP	Long-Range Water Supply Plan
MST	Mountains-to-Sea Trail
MFMM	Multi-Family Master Meter
NRTS	Natural Resources and Technical Services
Q	Quarter
SOW	Scope of Work
TBD	To Be Determined
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Current and Pending Key Projects and Stages

Project	Strategic Initiative	Project Lead	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	June-18	July-18	Aug-18	Sep-18
AMI	6	Taylor	AMI Policies											
Total Compensation Study		Glasgow	*Schedule To Be Determined*											
LRWSP	1	Rouse			Demand & Yield									
Energy Plan	5	Tiger												

Stages	Committee Discussion	Feasibility Study	Board Review	Community Engagement	Action	Procurement	Implementation

ORANGE WATER AND SEWER AUTHORITY - QUARTERLY REPORT

ATTENDANCE AT BOARD AND COMMITTEE MEETINGS

BOARD OF DIRECTORS	JULY 2017	AUGUST 2017	SEPTEMBER 2017
ROBERT MORGAN, CHAIR	July 12 EC (Meeting) July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
HEATHER PAYNE, VICE CHAIR	July 12 EC (Meeting) July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
YINKA AYANKOYA, SECRETARY	July 12 EC (Meeting) July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
JEFF DANNER	July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Absent) August 24 Board (Canceled)	September 14 WS (Meeting) September 28 Annual (Absent)
RAY DUBOSE	July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
BARBARA M. FOUSHEE	July 12 EC (Meeting) July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 28 Annual (Meeting)
JOHN N. MORRIS	July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
RUCHIR VORA	July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Absent)

OCTOBER 26, 2017

BOARD OF DIRECTORS	JULY 2017	AUGUST 2017	SEPTEMBER 2017
JOHN A. YOUNG	July 13 WS (Canceled) July 27 Board (Canceled)	August 10 WS (Meeting) August 24 Board (Canceled)	September 14 WS (Meeting) September 26 NRTS (Meeting) September 28 Annual (Meeting)
TOTAL MEETINGS HELD:	**1**	**1**	**3**

Board – Board of Directors
NRTS – Natural Resources and Technical Services Committee
EC – Executive Committee
WS – Work Session

AGENDA ITEM

- Resolution Approving Sole Source Procurement of Odor Control Equipment for the Rogerson Drive Pump Station

PURPOSE

- To request Board approval for OWASA staff to proceed with a sole source procurement (meaning there will be no competitive bidding) of the Peacemaker Odor Control System by Syneco Systems, Inc.

BACKGROUND

- The Rogerson Drive Pump Station is OWASA's largest wastewater pump station and is in the midst of a two-phased capital project to upgrade many components of the station. Odor control equipment will be installed with the second phase of work, which is in the final stages of design. Due to the difficulty in accessing this site, an odor control system that needs limited maintenance is highly desirable, in addition to cost and performance considerations.

- OWASA's consulting engineer, McKim and Creed, has extensively evaluated the advantages and disadvantages of alternative odor control systems for this project.

- Following the evaluation, OWASA has determined that because the unit is competitively priced, lower maintenance and has the least life cycle cost of similar technologies, the Peacemaker System is preferred over other technologies.

- Syneco Systems, Inc. is the only practical and proven source for a Peacemaker equivalent odor control system capable of meeting OWASA's needs.

- Pursuant to GS 143-129, the OWASA Board of Directors must approve purchases made through the sole source process prior to the award of the contract.

STAFF RECOMMENDATION

- Staff recommends that the Board of Directors adopt the attached resolution of the sole source procurement of the Peacemaker System from Syneco Systems, Inc. for the Rogerson Drive Wastewater Pumping Station, and authorizes and directs the Executive Director to proceed to negotiate and successfully conclude said purchase upon approval of OWASA's General Counsel.

ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

TO: Board of Directors

THROUGH: Ed Kerwin

FROM: Simon Lobdell

DATE: October 20, 2017

SUBJECT: Resolution Approving Sole Source Procurement of Odor Control Equipment for the Rogerson Drive Pump Station

This memorandum provides information and requests Board approval to allow OWASA staff to proceed with a sole source procurement (meaning there will be no competitive bidding) of the Peacemaker Odor Control System by Syneco Systems, Inc.

Background

The Rogerson Drive Pump Station is OWASA's largest wastewater pump station and is in the midst of a two-phased capital project to upgrade many components of the station. The first phase, which is already under construction, includes the installation of grinders in the pump station which are expected to increase odor generated at the station. The first phase also includes installation of new Variable Frequency Drives (VFDs) and lighting improvements. Odor control equipment will be installed with the second phase of work, which is in the final stages of design. Due to the difficulty in accessing this site, an odor control system that needs limited maintenance is highly desirable, in addition to cost and performance considerations.

Discussion

The attached technical memorandum reviewed various odor control systems to meet our needs. The systems considered include a biologically active media system that requires a number of mechanical and chemical injection components to maintain, a large passive system called a biofilter, a carbon adsorption system, and a dry chemical scrubber system (Peacemaker) which uses a proprietary media. The biologically active system and the passive biofilter system are both large, expensive and require significant maintenance and monitoring. The carbon media system is effective but, in comparison with the Peacemaker, requires significantly more frequent media replacement.

The Peacemaker system recommended by our consulting engineer uses a patented media to effectively reduce odors but with significantly longer life spans for the media and subsequently less maintenance. In addition to its performance, the Peacemaker has a smaller footprint, uses less energy, and is less expensive from a life cycle perspective than the other alternatives. The

Peacemaker has no direct competitors identified by our consultant and there are no alternatives to their media. OWASA's staff and consultant have visited sites with similar sized Peacemaker units and have confirmed that the units are effective at removing odors and the stated design life is realistic.

The Peacemaker uses a fundamentally different process than its closest competitor, the carbon-based system, because it relies on a consumable reagent that is impregnated in the media rather than an adsorption process. Adsorption of odor causing compounds by activated carbon works by capturing the odor causing chemicals and retaining them. Once the media is fully coated it cannot prevent escape of any further noxious compounds. This limits the lifespan of the carbon-based material such that increasing life requires more volume and mass of material than if the odor compounds were consumed by a reactive media. The Peacemaker system relies on a chemically impregnated media that actually consumes the gaseous odor causing compounds and converts them to non-noxious water-soluble compounds. This leads to a longer lifespan for the same volume and mass of media because its service life is primarily limited by the amount of reagent that can be impregnated in the Peacemaker media. The Peacemaker uses a final layer of activated carbon to "polish" the vapors it treats; however, the majority of the odor removal occurs in the reactive media. This is what allows for the smaller, longer lived and competitively priced system that fits in the same footprint.

The consultant's summary of present worth analysis and the recommended alternative is identified below in an extract from page 34 of the technical memorandum (Attachment 1).

Alternative	Capital Cost	Annual O&M Cost	Present Worth Value
Ecoverde One (1) Biofilter	$597,750*	$31,400	$946,871*
Evoqua One (1) Biofilter	$931,875**	$37,450	$1,348,263**
Evoqua Two (2) Biofilters	$687,500	$36,200	$1,089,990
Evoqua Two (2) Carbon Filters	$482,750	$75,870	$1,326,311
Syneco 12x12 Chemical Scrubber "Peacemaker"	$568,967*	$32,800	$933,654*
Syneco 10x7 Chemical Scrubbers "Peacemaker"	$442,800*	$32,500	$804,151*

The evaluation found that Peacemaker holds an advantage over the three conventional systems analyzed due to significantly lower maintenance costs. Syneco Systems is the only manufacturer of the solid reactive media based system for wastewater applications in the United States. OWASA has confirmed that the consultant has no business relationship with the manufacturer and after thorough review, OWASA staff supports the consultant's recommended option for a sole source procurement.

For this reason, and to ensure a fair and stable bid, staff requests the Board authorize sole sourcing of the Peacemaker odor control system, which will allow direct negotiation of system purchase with the vendor. If the Board concurs with this approach, staff will finalize negotiations for a scope of supply with Syneco Systems and will enter into a purchase contract for the initial administrative costs; the remainder of the negotiated scope of supply will be assigned to the general contractor for the second phase of the project. The second phase of work, in addition to odor control improvements, includes critical electrical and auxiliary system rehabilitation and will be bid in the next few months.

CONCLUSION

The State of North Carolina allows sole source purchases when:

(1) performance or price competition are not available;
(2) a needed product is available from only one source of supply; or
(3) standardization or compatibility is the overriding consideration.

The State also requires that a contract that is made under this sole source exception be approved by that organization's governing board. Based on the information provided above, we believe that criteria (1) and (2) above are clearly met and we request the Board's adoption of the attached resolution to execute a sole source procurement of the Peacemaker odor control system.

Please let me know if you have any questions or comments.

Respectfully submitted,

Simon Lobdell
Utilities Engineer

Attachment 1 – Resolution for Sole Source Procurement
Attachment 2 – Odor Control - Final Technical Memorandum
Attachment 3 – Sole Source certification from Engineer

RESOLUTION OF ORANGE WATER AND SEWER AUTHORITY DECLARING ITS INTENTION TO EXECUTE A SOLE SOURCE PROCUREMENT OF THE PEACEMAKER ODOR CONTROL SYSTEM BY SYNECO SYSTEMS FOR ODOR CONTROL AT THE ROGERSON DRIVE WASTEWATER PUMPING STATION

WHEREAS, Orange Water and Sewer Authority (OWASA) is a political subdivision of, and is organized and existing under the laws of the State of North Carolina; and

WHEREAS, State of North Carolina General Statute (GS) 143-129 (Procedure for letting of public contracts) allows a governing board to approve purchases of apparatus, supplies, materials or equipment through a non-competitive, or "sole source," process when: (i) performance or price competition are not available; (ii) a needed product is available from only one source of supply; or (iii) standardization or compatibility is the overriding consideration; and

WHEREAS, OWASA plans to design and install a new odor control system at the Rogerson Drive Wastewater Pumping Station; and

WHEREAS, OWASA's consulting engineer, McKim and Creed, has extensively evaluated the advantages and disadvantages of alternative odor control systems for this project; and

WHEREAS, following the evaluation, OWASA has determined that because the unit is competitively priced, lower maintenance and has the least life cycle cost of similar technologies, the Peacemaker System is preferred over other technologies; and

WHEREAS, Syneco Systems, Inc. is the only practical and proven source for a Peacemaker equivalent odor control system capable of meeting OWASA's needs; and

WHEREAS, pursuant to GS 143-129, the OWASA Board of Directors must approve purchases made through the sole source process prior to the award of the contract;

NOW, THEREFORE, BE IT RESOLVED:

1. That following extensive evaluation of the advantages and disadvantages of alternative odor control technologies, the OWASA Board of Directors, based on guidance from staff and its consulting engineer, McKim and Creed, has concluded that the Peacemaker Odor Control System by Syneco Systems, Inc. is best suited to meet OWASA's needs for a new odor control system at the Rogerson Drive Wastewater Pumping Station because it has extensive advantages over other odor control systems, including but not limited to lower capital and operating costs, and lower overall life cycle costs.

2. That the Board of Directors has concluded that a sole source procurement approach is appropriate because:

(i) Odor Control system is needed considering the specific circumstances at the Rogerson Drive Wastewater Pumping Station; and
(ii) There is only one practical source for Peacemaker System that has been proven in the water and sewer industry in the United States.

3. That the Board of Directors hereby approves the sole source procurement of the Peacemaker System from Syneco Systems, Inc. for the Rogerson Drive Wastewater Pumping Station, and authorizes and directs the Executive Director to proceed to negotiate and successfully conclude said purchase upon approval of OWASA's General Counsel.

4. This resolution shall take effect immediately upon its passage.

Adopted this the 26th day of October, 2017.

_____
Robert Morgan, Chair

ATTEST:

_____
Yinka Ayankoya, Secretary

FINAL TECHNICAL MEMORANDUM

TO: **Simon Lobdell, PE, Utilities Engineer**
Orange Water and Sewer Authority
400 Jones Ferry Rd
Carrboro, NC 27510

DATE: **August 3, 2017 (revised September 1, 2017, October 11, 2017)**

FROM: **Ben Latino, PE, Project Manager**
Chuck Riley, PE, Sr. Project Engineer
Joshua Powell, EIT, Engineer Intern

SUBJECT: **M&C Project 01519-0043 – Rogerson Drive Pump Station Odor Control Preliminary Alternatives Evaluation**

Purpose

The following evaluation was performed by McKim & Creed on the request of OWASA to evaluate alternatives to control odor and corrosion at the existing Rogerson Drive Sanitary Sewer Pump Station. As part of this evaluation, OWASA requested that McKim & Creed solely utilize the available H_2S monitoring data collected over a two (2) week period in December 2016 for the purposes of evaluation of alternatives and sizing of equipment. In addition, OWASA has requested that odor control alternatives be limited to consideration of atmospheric abatement in lieu of controlling production of H_2S within the incoming wastewater. Viable alternatives were also limited to those which would result in a total project cost on the order of $500,000 – 700,000.

1 Introduction

The Orange Water and Sewer Authority (OWASA) owns and operates the 18 MGD Rogerson Drive sanitary sewer pump station. The pump station currently collects flow from Bolin Creek, Booker Creek and Little Creek service areas and pumps flows to the Mason Farm Wastewater Treatment Plant for treatment and discharge to Morgan Creek or to serve as reclaimed water to the University of North Carolina. Historically, average daily flows for the pump station are approximately 4-5 MGD.

The Rogerson Drive Pump Station is currently undergoing significant upgrades to increase operating flexibility and reliability through the installation of grinders, the addition of variable frequency drives (VFDs), a new motor control center (MCC), upgraded instrumentation and controls, HVAC and lighting. At this time, OWASA has expressed interest in evaluating odor control requirements for the pump station to be incorporated into the current project for consideration. McKim & Creed was contracted to perform an evaluation of the existing pump station odor control systems and the existing data on hydrogen sulfide (H_2S) monitoring which was collected by Cape Fear Water Solutions (Dublin, NC) over a two week period during December 2016. Additional ambient H_2S monitoring data from within the open channels was obtained by McKim & Creed from Evoqua for a period from May 27, 2017 to June 9, 2017.

A site visit was conducted on June 23, 2017 between McKim & Creed and Rod Dail at the pump station to allow the Engineer to collect data from the existing odor control equipment, observe operating conditions and existing layout of the pump station and equipment and discuss historic details of odor observation, control and system maintenance.

Existing equipment consists of two (2) biofilter units. It was noted that the existing filters and associated appurtenances have not been properly maintained. Current filters have significant deterioration of the media as the media has not been maintained or replaced within the last 7+ years. At this time there is no media within the filter serving the Influent Boxes and Screening Channel and approximately 60% media remaining for the system serving the wetwells.

A number of additional concerns were noted during this meeting which should be of consideration during selection of odor control methods:

1. Water supply lines going to the existing filters have been damaged multiple times due to freezing temperatures and will require repair as needed to support the odor control system if supplemental water supply is required.

2. It was communicated by the maintenance staff that the Rogerson Drive Pump Station previously utilized hydrogen peroxide (H_2O_2) as a liquid chemical feed system to control system odor by oxidizing incoming H_2S within the influent wastewater. This was abandoned due to high chemical supply cost and evidence that chemical addition was not always effective.

3. Maintenance personnel expressed concern that the largest maintenance item for reliability in his experience would be the blower system. Therefore, any ventilation equipment will need to be evaluated for reliability as part of any recommendation.

2 Pump Station Odor Evaluation

Historically, OWASA has observed malodorous conditions at the Rogerson Drive Pump Station in addition to effects of secondary corrosion caused by off-gassing of H_2S from the influent wastewater. Corrosion has been exhibited within the pump station in the forms of degradation of concrete within the wetwells; oxidation of support steel for walkway grating and hatches; and corrosion of ventilation and generator equipment which has been exposed to extracted gases from within the pump station due to contaminated air flows. In addition, historical corrosion of the downstream force main and gravity sewer entering the wastewater treatment plant has been severe enough to result in collapse of the sewer line which required expedited, unplanned emergency repair.

Corrosion is primarily the result of the oxidation of H_2S to sulfuric acid (H_2SO_4) within the humid conditions within the pump station head space. The primary mechanism for H_2S induced corrosion includes three steps:

1. Under anaerobic conditions (oxygen deficient), anaerobic bacteria within the wastewater reduce dissolved SO_4^{2-} to H_2S through metabolic processes.

$$SO_4^{2-} + organic\ matter + anaerobic\ bacteria \rightarrow H_2S + H_2O + CO_2$$

2. H_2S is a relatively insoluble gas and will readily volatilize at high rates through contact with the atmosphere. In sewers which are partially flowing full, H_2S partitions from the wastewater into the air of the head space proportionally to the concentration within the wastewater as a function of Henry's Law (i.e., higher H_2S concentrations within the wastewater results in higher H_2S concentrations within

the air). The kinetics of this reaction proceeding to equilibrium are primarily controlled by differentials in concentration between the wastewater and air, elevated temperatures and higher rates of mixing/turbulence between the air and wastewater.

$$C_{H_2S,air} = \alpha_{H_2S} * C_{H_2S,wastewater}$$

3. Under the third step, the gaseous H_2S from the headspace in the sewer/pump station partitions H_2S into moisture layers on damp surfaces within the system. Due to the very high surface area/liquid volume ratio of the moisture on the wet surface, H_2S can partition onto these surfaces at a much higher concentration than that within the wastewater due to kinetics proceeding to equilibrium much faster. In addition to H_2S partitioning onto the wet surface, O_2 also partitions into the surface moisture, resulting in the formation of aerobic conditions which are conducive to oxidizing the reduced H_2S back to H_2SO_4 and subsequent corrosion of the surface due to exposure to more concentrated sulfuric acid.

$$H_2S + O_2 + aerobic\ bacteria \rightarrow H_2SO_4$$

Two approaches can be utilized to minimize the occurrence of H_2S generation and/or limiting corrosion. These include limiting the concentration of H_2S within the wastewater or limiting the concentration of H_2S within the atmosphere.

Primary systems for limiting H_2S concentrations within the wastewater include:

- Aeration of the wastewater to increase DO to maintain aerobic conditions
- Chemical addition to oxidize H_2S within the wastewater to SO_4^{2-}
- Chemical precipitation of H_2S to $S_{2(solids)}$
- pH augmentation to convert H_2S to HS^- and S^{2-} which are not volatile

Treatment of atmospheric H_2S typically includes:

- Dilution through increased ventilation of the headspace
- Biological oxidation
- Chemical oxidation

- Physical absorption/adsorption by activated carbon or other reactive media

As noted above, this evaluation shall be limited to alternatives which address atmospheric H_2S only as per the request of OWASA.

Historical sampling has indicated aqueous phase H_2S concentrations of 5 mg/L within the influent wastewater. In addition, ambient air monitoring showed average H_2S concentrations of approximately 6 mg/L within the screening area and 75 mg/L with spikes up to 470 mg/L within the confined spaces of the pump station. Diffusion kinetics shows that it could be possible for atmospheric H_2S concentrations to reach as high as 1,200 mg/L at equilibrium under these operating conditions (20 ^oC and 1 atm). However, it is not likely for this to occur due to ventilation of the headspace within the pump station. At the observed concentrations, exposure can cause respiratory track irritation after 1 hour (50 ppm); drowsiness and eye damage after 15-30 minutes (100 ppm); temporary loss of smell (100-150 ppm); and collapse within 5 minutes with death after 30-60 minutes (500 ppm). To minimize atmospheric concentrations of H_2S within the headspace to create a safer working environment and minimize corrosion, increased ventilation will be necessary. Properly sized ventilation systems which continuously remove H_2S from the enclosed space have been shown to reduce corrosion rates by 90% or more.

To determine ventilation needs for the pump station, a numerical model was developed to estimate the required ventilation rate which would provide adequate control of atmospheric H_2S concentrations within the headspace of the Rogerson Drive Pump Station and ultimately reduce rates of observed corrosion. The pump station was separated into two ventilation zones. Each zone will need to be connected adequately to minimize short circuiting of air flow (i.e., maintain completely mixed atmospheric conditions). Zone #1 includes Influent Chambers #1 and #2 and the Screenings Chamber. Zone #2 includes Wet Wells #1 and #2. Head space volumes were estimated based on average water surface levels provided by OWASA. Zones #1 and #2 were estimated to have headspace volumes of approximately 14,458 ft^3 and 14,891 ft^3, respectively.

A mass balance on H_2S within each zone was prepared to include initial concentrations of H_2S within the headspace at *t(0)*, estimated rate of volatility of H_2S from the influent wastewater to the head space and discharge of H_2S from the head space via the ventilation system. For the purpose of this evaluation, the system was assumed to be completely mixed and ventilation occurred through pulling clean outside air into the confined space (i.e., H_2S concentrations were assumed to be non-detect in the dilution air). Operation of a ventilation system would need to be sized to be greater than the rate at which H_2S is

volatilizing into the head space and also to reduce initial atmospheric H_2S concentrations to low levels within a reasonable time frame to be effective at reducing atmospheric H_2S within the head space with the primary goals to include limiting personnel exposure related concerns and corrosion of equipment and structural components within the pump station and secondary goals to reduce odor within the pump station and surrounding area.

It should be noted that a review of the operational data provided and record drawings indicates that the incoming interceptors are atmospherically connected to the headspace of the pump station influent chambers at normal water levels as the incoming interceptors are not completely submerged. This will negatively impact efficiency of the ventilation system to reduce H_2S concentrations within the headspace as it is likely that the ventilation system will also pull a significant quantity of H_2S contaminated air from within the sewer. However, accurately determining the magnitude of additional H_2S loading from the upstream sewers is beyond the scope of this report and would be computationally difficult to quantify accurately.

It is anticipated that air loading from the sewer will likely have H_2S concentrations in the range of 5 – 10 ppm based on limited available data obtained from Evoqua which was collected within the screening chamber of the pump station. The general approach to minimize pulling in of sewer gases from the influent sewers would be to minimize headloss in the ventilation system as this would allow a larger fraction of air pulled into the pump station from clean, outside sources. Minimizing upstream sources allowing air to be taken in along the interceptors would also minimize air flow pulled from the sewer. It is anticipated that sources of air intake along the sewers entering the pump station may be significantly low due to the need to protect the system from I/I in the flood prone area, further assisting in minimizing of air flows coming into the pump station from the sewer.

For the purposes of this evaluation, it was estimated that it would be desirable to reduce H_2S concentrations from 100 ppm (average peak conditions) to below the odor detection threshold of H_2S gas which has also been shown to be effective at controlling corrosion. The odor detection threshold for H_2S is estimated to be 0.01 to 1.5 mg/L. For the purposes of this evaluation, the odor detection threshold was assumed to be 0.3 mg/L. Modeling results estimated that the ventilation system would need to provide for ***at least 6 air exchanges* per hour** (ACH) within the headspace to provide adequate removal of H_2S to minimize personnel exposure and the rate of corrosion within the structure. This equates to ventilation rates of at least 1,434 CFM and 1,474 CFM for Zones #1 and #2, respectively. Modeling Results are shown below in ***Figures 1 and 2***.

Figure 1 *– Ventilation Modeling Results Zone #1 ($[H_2S]_0$ = 100 mg/L, F = 1,434 CFM, ACH = 6.0 hr^{-1}, $[H_2S]_{60}$ = 0.3 mg/L)*

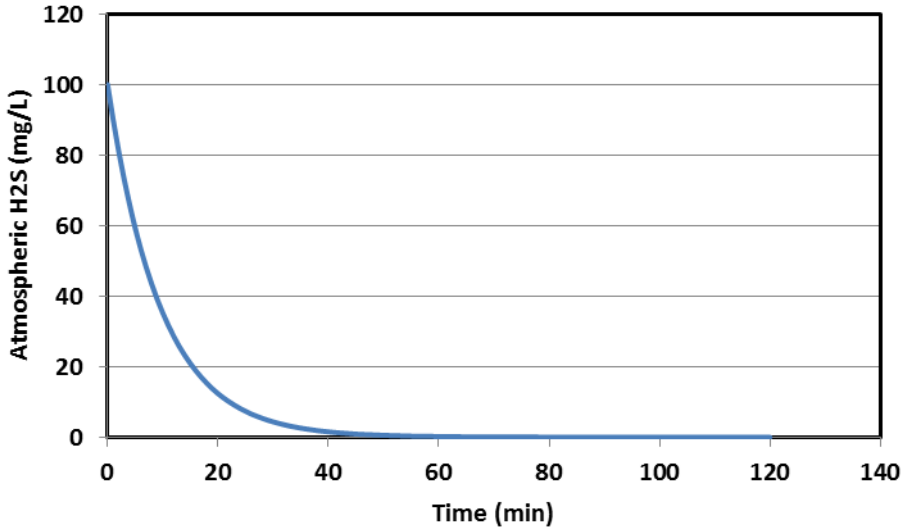
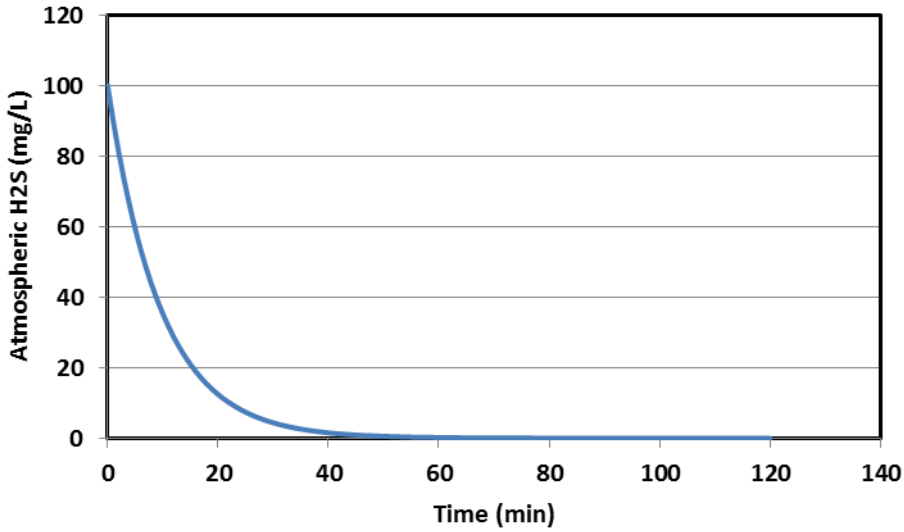


Figure 2 *– Ventilation Modeling Results Zone #2 ($[H_2S]_0$ = 100 mg/L, F = 1,474 CFM, ACH = 5.9 hr^{-1}, $[H_2S]_{60}$ = 0.3 mg/L)*



Once air has been ventilated from the structure, it will be necessary to provide treatment of the air to minimize the concentration of odorous compounds utilizing treatment processes such as biological oxidation utilizing biofiltration, absorption by carbon filters or chemical oxidation utilizing dry chemical scrubber systems.

3 Odor Control Alternatives Evaluation

OWASA has indicated that its goal is to provide an odor control system which minimizes odors at the pump station property boundary and also removes H_2S from ambient air within the pump station to reduce potential for corrosion of concrete structures. The preferred system will include such factors as ease of maintenance, flood proofing, local availability of support and parts, and reduction of odor during typical flow scenarios. OWASA has indicated a budget of approximately $500,000 to $700,000 for an odor control system. Therefore, systems such as on-site ozone/hydroxyl ion generation that are anticipated to exceed available funds will not be evaluated under the scope of this study. Evaluation of odor control strategies will be limited to the following:

1. Rehabilitation of the existing biofilter system
2. Installation of a new biofilter system
3. Installation of a carbon filter system
4. Installation of a dry air chemical scrubber system

3.1 Cape Fear Water Solutions Proposal

As part of the evaluation of the Rogerson Drive Pump Station, OWASA provided a proposal from Cape Fear Water Solutions for a chemical abatement program to reduce H_2S at the Rogerson Drive Pump Station. The system included chemical feed pumps to be installed at the Rogerson Drive Pump Station and upstream at the Countryside Pump Station. A proprietary chemical (Sulfa-trox) would be sold to OWASA as part of a regular maintenance contract to be fed at a rate of 15 to 30 gallons per day at a cost of $2.28/gallon. Estimated annual cost would be approximately $18,725. It was assumed that all equipment and maintenance would be performed by the Vendor and energy costs for chemical feed pumps would be negligible. It was determined that this alternative does not meet the operating requirements as requested by OWASA as this alternative includes chemical augmentation of the wastewater that has historically not been effective at

controlling odors at the Rogerson Drive Pump Station. Therefore, this alternative was not considered further in this evaluation. However, if in the event OWASA chooses to evaluate chemical augmentation of the wastewater as a viable alternative in the future, additional investigation will be necessary to determine the feasibility of chemical feed effectiveness and costs associated with this application. To perform a comprehensive evaluation of chemical feed alternatives would require the completion of an additional sampling campaign to detail the wastewater chemistry and variations in composition.

3.2 Evaluation of Existing Biofilter Equipment

Biofiltration equipment has proven very successful at minimizing odors within collection systems and treatment plants. Biofilters consist of a contained system with support media to allow growth of biological microorganisms within the system. The biofilter system also includes provision of organic material to supply a carbon source to the biological growth process. Nutrients and alkalinity are also required for these systems and usually provided as part of the media or supplemented through a chemical feed system when not readily available in the water supplied to the system. Over time the growth media will degrade and will require replacement. Typical support materials can include perlite, Styrofoam pellets, wood chips, bark, compost and a variety of ceramic and plastic materials.

A supply of water is also necessary to maintain moisture on the media. The layer of moisture and high surface area/volume ratio of the filter media allows for high levels of absorption/adsorption of H_2S from the air passed through the media. The absorbed H_2S is biologically oxidized by a culture of amoeba, protozoa and fungi which are cultivated on the media surface. The oxidized SO_4^{2-} is drained from the system and back to the sewer for passage to the treatment plant. It is necessary to provide adequate moisture content within the filter media to support growth of organisms and flush out the oxidized sulfuric acid to maintain acceptable pH within the filter media. It is highly critical that pH be regularly monitored and operations adjusted to maintain the pH within the specified acceptable range of the system to avoid process upset and loss of treatment capacity.

The current odor control system at the Rogerson Drive Pump Station consists of two biofilters originally provided by Bio-Reaction Industries, LLC. The installed biofilters have historically proven to be ineffective at reducing odors and corrosion at the Pump Station. Therefore, operation of the existing biofilters has been abandoned.

One filter is installed to pull air from Zone #1 at a rate of approximately 53 CFM. The second filter is installed to pull air from Zone #2 at a rate of approximately 215 CFM. As

noted in the previous Section, required ventilation rates to control corrosion and to be effective at reducing atmospheric H_2S concentrations within Zones #1 and #2 were estimated to be approximately 1,434 CFM and 1,474 CFM, respectively. Similar modeling of the ventilation of H_2S from the head space within Zones #1 and #2 were performed utilizing the ventilation rates of the existing equipment. Results are shown in ***Figures 3 and 4*** for Zones #1 and #2, respectively.

Figure 3 *– Ventilation Modeling Results Zone #1 ($[H_2S]_0$ = 100 mg/L, F = 53 CFM, ACH = 0.2 hr^{-1}, $[H_2S]_{60}$ = 80.8 mg/L)*

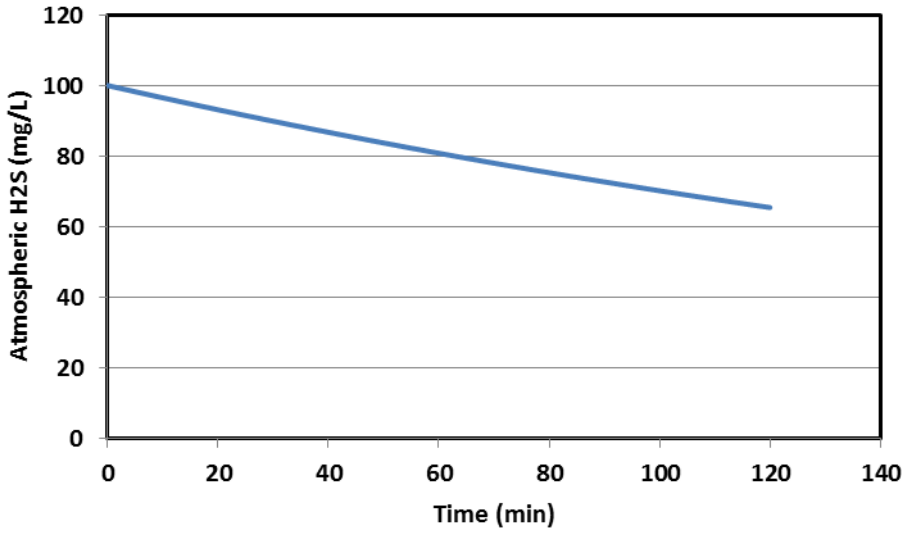
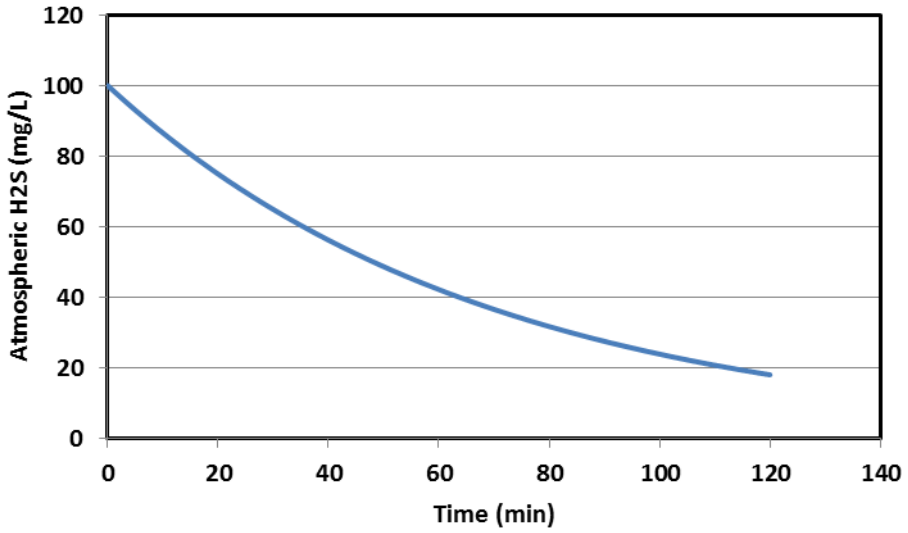


Figure 4 *– Ventilation Modeling Results Zone #2 ($[H_2S]_0$ = 100 mg/L, F = 215 CFM, ACH = 0.9 hr^{-1}, $[H_2S]_{60}$ = 42.2 mg/L)*



Comparison of these results to the calculated required ventilation rates shows that the calculated required ventilation rate for corrosion control is significantly higher than the ventilation rate of the existing equipment. Therefore, the existing ventilation system does not have the capacity to adequately reduce atmospheric H_2S concentrations low enough within a reasonable time period to protect the system from corrosion. To address this limitation, the compressor could theoretically be upsized to increase the ventilation rate and bring down the atmospheric concentration of H_2S within the head space. However, evaluation of existing biofilter air flow loading capacity will be required to determine the feasibility of increasing air flow rate to the existing filters.

Sizing of a biofilter for odor control applications is primarily a function of three (3) independent variables. These variables are air flow rate (cfm), porosity of the filter media (ft^3/ft^3) and residence time within the filter (sec). The system filter media volume is controlled by the below equation.

$$V_{filter\ media} = \frac{t_{Residence} * F}{\alpha}$$

Typical values for residence time within a biofilter odor control system range from 15 to 60 seconds to remove odor causing compounds with the higher limit of this range necessary to remove difficult to treat organic odorous compounds. Porosity of media within the filter varies by manufacturer and typically ranges from 0.35 to 0.5.

For initial evaluation of the existing biofilters, typical conservative textbook values will be utilized ($t_{Residence} \approx 30$ sec, $\alpha \approx 0.45$) and a general assumption that odor is primarily caused by H_2S and not by more difficult to remove organic compounds. Based on these values, it is estimated that 1,593 ft^3 and 1,638 ft^3 of filter media would be required for adequate treatment of Zones #1 and #2, respectively. This exceeds the available volume within the existing biofilters by approximately an order of magnitude. Therefore, it is not feasible to repurpose the existing biofilters to achieve sufficient treatment of H_2S to reduce rates of corrosion or odor at the pump station. Due to this limitation, this alternative was not considered further in this evaluation.

3.3 New Biofilter Equipment

In lieu of repurposing the existing biofilter equipment due to its inability to meet necessary odor control/ventilation requirements, replacement of the existing equipment shall be evaluated. Two (2) vendors have been contacted to evaluate biofilter equipment requirements and budgetary costs for a system with adequate capacity to provide odor control and corrosion protection at the Rogerson Drive Pump Station. Vendors included Ecoverde and Evoqua who both have established representative networks, resources and comparable installations within the surrounding service area. For this evaluation, two (2) biofilter alternatives were evaluated:

1. Utilize one (1) unit for ***both*** ventilation Zones #1 and #2 for a total of one (1) biofilter unit

2. Utilize one (1) unit for ***each*** ventilation zone individually for a total of two (2) biofilter units

3.3.1 Ecoverde Biofilter System (One (1) Biofilter Unit for Both Zones)

Ecoverde (Tempe, AZ) has provided a proposal on a modular biofilter system. The system can be incorporated into a smaller footprint by utilizing a system which has a modular vertical construction method. The modules have a 10 ft diameter base. The system selected for this application would pull air from both Zones #1 and #2 utilizing a single blower with air flow directed into the biofilter unit consisting of four (4) vertically stacked modules with a total system height of approximately 22 ft.

Maintenance of the system primarily includes weekly monitoring of system operation and performance including regular monitoring of system operating pH and all necessary adjustments made. The biological system will require supplemental water, nutrient

supplies and three phase power. Another benefit of this system is long anticipated service life of the synthetic filter media (15 years). Therefore, media maintenance costs will be lower for this unit compared to other alternatives.

As outside air will be pulled into the pump station via the ventilation system to reduce H_2S concentration within the headspace of Zones #1 and #2, a heater will need to be provided on the biofilter unit to ensure adequate air temperature loading to the biological process during winter operation.

Capital Costs were estimated to be approximately **$597,750**. A breakdown is included in ***Table 1***. Annual Operations and Maintenance Costs were estimated to be approximately **$31,400**. A breakdown of operating and maintenance costs is included in ***Table 2***.

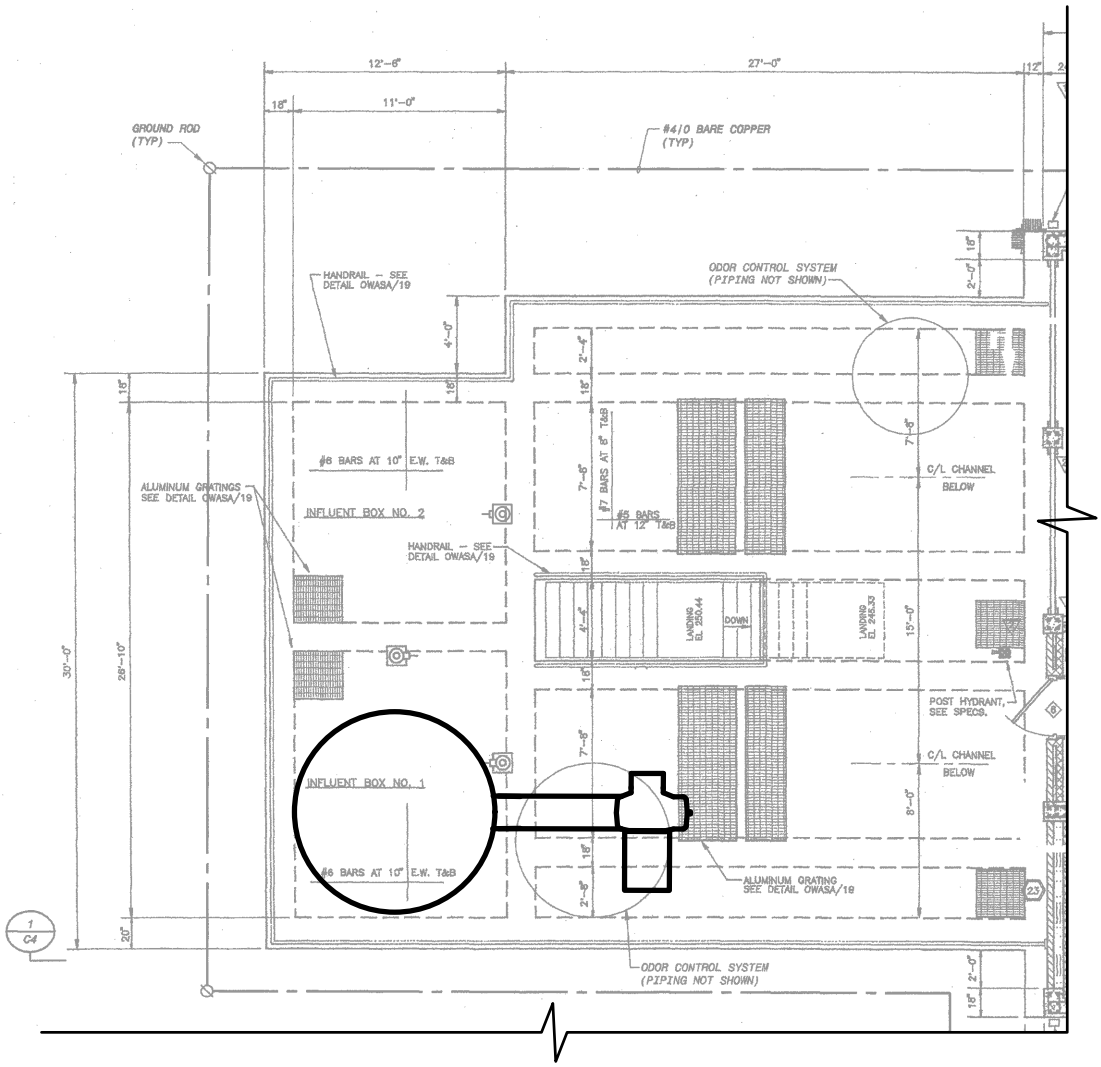
In addition, a general arrangement of the equipment was generated to determine the feasibility of placing the proposed equipment on the existing structure. ***Figure 3.3.1 – 1*** shows general arrangement of the biofilter and adjacent blower which will be required to pull air from Zones #1 and #2. Based on the general arrangement, the proposed biofilter equipment exceeds the available footprint for equipment on the existing structure. Installation of this equipment will require significant structural modifications (i.e., additional cantilevered slabs and potentially columns and footers) to be performed on the existing structure ***which are not reflected in the cost estimates***. Detailed structural evaluation/modification is beyond the scope of this study and therefore has not been detailed further.

Table 1 *– Ecoverde Biofilter Unit Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Ecoverde Biofilter Unit					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$20,000	1	$20,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	Biofilter Equipment	LS	$124,000	1	$124,000
5	Biofilter Equipment Installation	LS	$74,400	1	$74,400
6	Ventilation Upgrades	LS	$80,000	1	$80,000
7	Air Heater	LS	$25,000	1	$35,000
8	Water Line Repair	LS	$35,000	1	$35,000
9	Chemical Feed/Storage	LS	$35,000	1	$35,000
10	Electrical and Controls	LS	$54,800	1	$54,800
11	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$478,200
				Construction Contingency (25%) =	$119,550
				Total Construction =	**$597,750**

Table 2 *– Ecoverde Biofilter Unit Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Ecoverde Biofilter Unit	
Description	**Cost**
Chemical	$3,000
Labor	$5,200
Maintenance	$6,200
Electrical	$12,000
Media Replacement	$5,000
	$31,400



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ROGERSON DRIVE LIFT STATION
IMPROVEMENTS PHASE II

ODOR CONTROL SYSTEM
ECO-VERDE EG-10.4

FIG 3.3.1-1

3.3.2 Evoqua Biofilter System

In addition to the Ecoverde biofilter system, an evaluation was performed on equipment provided by Evoqua. Evoqua has an established network of vendors, suppliers and installations within the region of comparable size. For the Rogerson Drive Pump Station, Evoqua has recommended utilizing the Zabocs® Biological Odor Control System.

The Zabocs® biofilter utilizes two layers of media within a fiberglass reinforced plastic tank to provide for treatment of odorous gases. The first layer consists of Evoqua's Bioglass media which is a porous inorganic media made of silicon dioxide which is resistant to sulfuric acid produced within the reactor resulting in a longer anticipated media operating life. The Bioglass® media provides a support for biological growth within the reactor for H_2S oxidizing bacteria. The second layer consists of an activated carbon media. The layer of activated carbon media is provided to remove other harder to remove inorganic and organic odor compounds. This is necessary as the residence time within the biological filter is sufficiently low where it is not likely that biological treatment of these odor compounds will occur. However, if requested, the activated carbon media layer can be eliminated and additional Bioglass® may be provided to minimize media replacement costs. However, this comes at a cost of reducing the ability of the equipment to remove odor causing compounds other than H_2S. In addition, odor breakthrough from the system will be more prevalent during system startup or biological system upset as the carbon media provides an additional, reliable adsorption mechanism to remove odor compounds which are not adequately treated by the biological system.

As noted above, operation of the biological filter system will require the provision of supplemental nutrients and process water. The biological system will also require a higher level of monitoring and maintenance due to the need to maintain conditions adequate for biological growth. This is primarily moisture, pH, temperature and nutrient feed rates.

Both biofilter units will also require provision of heating of the influent air being fed to the biofilters to protect the biological process during colder winter periods as the ventilation system will be designed to pull outside air into the pump station to dilute H_2S concentrations and therefore will see a significant drop in air temperatures during winter operations which would be detrimental to a biological process.

3.3.2.1 Evoqua Biofilter System (One (1) Biofilter Unit)

Evoqua has provided a proposal to allow utilization of a single Zabocs® 7020 unit to handle odor control at the Rogerson Drive Pump Station. This unit would pull air from both Zones #1 and #2 utilizing a VFD equipped fan. Air flows will be forced up through the two media layers and vented through the top of the odor control unit after treatment.

The equipment costs for providing a single biofilter in lieu of providing two (2) units is significant. However, the footprint of the single unit is too large to reasonably fit on the existing structure and would require the construction of an additional structure to support the equipment above the flood plain. Due to the additional structural cost which is thought to be quite significant, it is not recommended that this alternative be investigated further. If further pursuit of this alternative is requested, a detailed structural evaluation will be required to further refine structural requirements in addition to estimating structural costs. The below cost estimates assume a structural cost of $200,000. However, it is likely that this cost could increase significantly due to the site working conditions.

Capital Costs were estimated to be approximately **$931,875**. A breakdown is included in ***Table 3***, below. Annual Operations and Maintenance Costs were estimated to be approximately **$37,450**. A breakdown of operating and maintenance costs is included in ***Table 4***.

***Table 3** – Zabocs® 7020 Biofilter Unit Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Evoqua Zabocs 7020 Biofilter System					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$30,000	1	$30,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	Evoqua Zabocs 7020 Biofilter Unit	EA	$165,000	1	$165,000
5	Evoqua Zabocs 7020 Biofilter Unit Installation	EA	$82,500	1	$82,500
6	Odor Control Structure	LS	$200,000	1	$200,000
7	Ventilation Upgrades	LS	$80,000	1	$80,000
8	Air Heater	LS	$35,000	1	$35,000
9	Water Line Repair	LS	$35,000	1	$35,000
10	Chemical Feed/Storage	LS	$35,000	1	$35,000
11	Electrical and Controls	LS	$63,000	1	$63,000
12	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$745,500
				Construction Contingency (25%) =	$186,375
				Total Construction =	**$931,875**

***Table 4** – Zabocs® 7020 Biofilter Unit Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Evoqua Zabocs 7020 Biofilter System	
Description	**Cost**
Chemical	$3,000
Labor	$5,200
Maintenance	$8,250
Electrical	$9,000
Media Replacement	$12,000
	$37,450

3.3.2.2 Evoqua Biofilter System (Two (2) Biofilter Units)

As an alternate proposal, Evoqua provided a system consisting of two (2) Zabocs® 7010 biofilter units. Each unit will pull air from Zones #1 and #2 independently. Operation and maintenance of the 7010 units are as presented in the previous sections.

The 7010 units are provided with a significantly smaller system footprint which allows for potential to install equipment on the existing structure but will require significant structural modification of the structure (i.e., additional cantilevered sections, columns and footers as necessary) which was beyond the scope of this study. Therefore, these modifications were not evaluated further. Layout of the equipment on the existing structure is as shown in ***Figure 3.3.2.2 – 1,*** below.

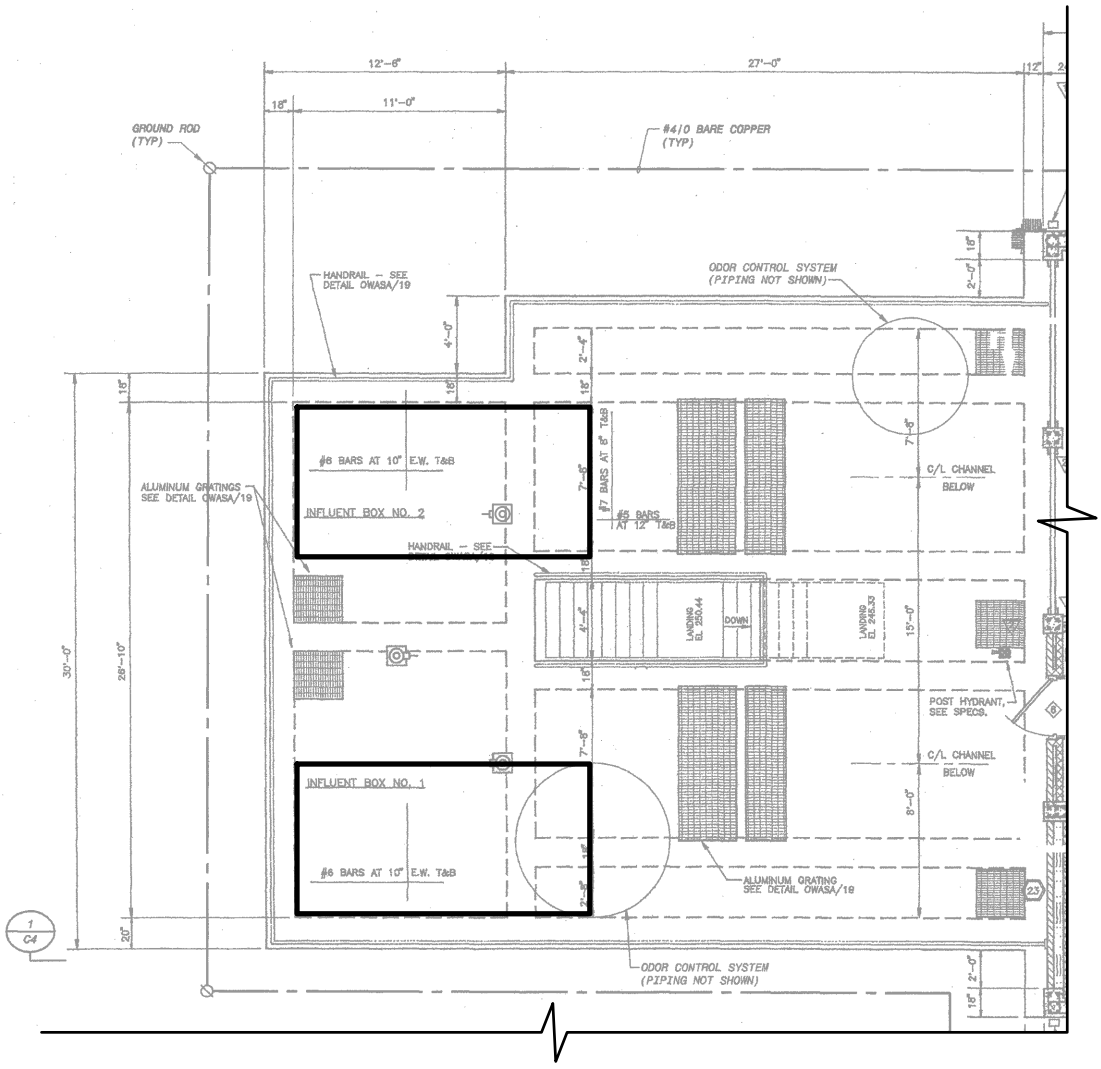
Initial Capital Costs (***excluding structural modification costs***) were estimated to be approximately **$748,750**. A breakdown is included in ***Table 5***, below. Annual Operations and Maintenance Costs were estimated to be approximately **$39,200**. A breakdown of operating and maintenance costs is included in ***Table 6***.

***Table 5** – Zabocs® 7010 Biofilter Units Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Evoqua Zabocs 7010 Biofilter System					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$20,000	1	$20,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	Evoqua Zabocs 7010 Biofilter Unit	EA	$110,000	2	$220,000
5	Evoqua Zabocs 7010 Biofilter Unit Installation	EA	$55,000	2	$110,000
6	Ventilation Upgrades	LS	$55,000	1	$55,000
7	Air Heater	LS	$35,000	1	$35,000
8	Water Line Repair	LS	$35,000	1	$35,000
9	Chemical Feed/Storage	LS	$35,000	1	$35,000
10	Electrical and Controls	LS	$69,000	1	$69,000
11	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$599,000
				Construction Contingency (25%) =	$149,750
				Total Construction =	**$748,750**

***Table 6** – Zabocs® 7010 Biofilter Units Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Evoqua Zabocs 7010 Biofilter System	
Description	**Cost**
Chemical	$3,000
Labor	$5,200
Maintenance	$11,000
Electrical	$8,000
Media Replacement	$12,000
	$39,200



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ROGERSON DRIVE LIFT STATION
IMPROVEMENTS PHASE II

ODOR CONTROL SYSTEM EG-10.4
EVOQUA ZB-7010

FIG 3.3.2.2-1

3.4 Carbon Filter Equipment

Carbon filters have historically been utilized for odor control applications due to their ability to quickly treat a broad range of odor causing compounds effectively (typically removing 99.9% of all incoming contaminants) with minimal resources and moving parts. Carbon filters utilize a granular activated carbon media which has been generated by a pyrolysis process which chars organic materials such as almond, coconut and walnut hulls. Activated carbon utilizes a physical absorption mechanism to remove organic and inorganic odor compounds within the airflow and binds them to the carbon media. As the media absorbs compounds, the finite capacity of the media is decreased and ultimately completely utilized. Once media has been completely utilized, odor breakthrough will occur and require media replacement. Under limited applications, media regeneration may be cost effectively performed to reduce operating cost. Historically, carbon filters have been cost effective in wastewater applications when treating low odor loading applications with H_2S concentrations typically below 5 ppm.

In general, carbon filters consist of a canister system filled with a granular activated carbon (GAC) media which receives odorous gases from within the pump station headspace. Air is pulled through the media utilizing forced air ventilation. As the air passes through the carbon media, odor compounds and other organics are absorbed into the media. However, carbon filters absorb organic odors and hydrocarbons preferentially over H_2S. Therefore, the presence of hydrocarbons can directly affect the efficiency of H_2S removal. If hydrocarbons comprise a significant enough portion of the odorous airflow, the carbon media will remove only the organic compounds, leaving behind H_2S odors to breakthrough. Therefore, it is essential when evaluating a large carbon filter installation targeting H_2S removal to quantify concentrations of volatile hydrocarbons and other competing gases to better determine system performance, media life and ultimately operating cost of the system. Currently, this data is not available for the Rogerson Drive pump station and therefore cannot be evaluated. However, due to the source of the incoming wastewater, volatile hydrocarbons are not anticipated to comprise a significant portion of the headspace composition. Other organic gases present within wastewater pump stations may provide for significant loading to the carbon media in addition to H_2S and should be considered further in the event carbon filters are selected. For the purpose of this study, it will be assumed that competing reactions will be negligible.

3.4.1 Ecoverde Carbon Filters

Ecoverde Technologies was contacted and requested to propose an odor control system for the Rogerson Drive Pump Station to ensure treatment of all ventilated air from the

pump station ventilation system discharge. The carbon filter system consists of providing two (2) Ecoverde EG-CVS Carbon Absorption Systems. Each unit provides approximately 123 ft^3 of high capacity H_2S carbon media within a fiberglass reinforced plastic tank. Each tank has a diameter of 7′2″ and 6′ tall. The odor control system is anticipated to fit on the existing structural slab with minimal structural modification. Each tank is fed air from the headspace by a dedicated blower to be connected to the site ductwork. The most significant maintenance issue with carbon filters within this installation is the anticipated media replacement frequency. At the probable H_2S mass loading rate estimated above, it is anticipated that carbon media will need to be replaced within the Ecoverde carbon filters approximately every 4 months at a cost of approximately $20,640.

Capital costs are estimated to be approximately **$482,750.** A breakdown is included in ***Table 7***, below. Annual Operations and Maintenance Costs were estimated to be approximately **$75,870**. A breakdown of operating and maintenance costs is included in ***Table 8***. Due to the excessive media replacement frequency and associated cost, it is not recommended that a carbon filter system be utilized in this application and has been dismissed without further consideration.

Table 7 *– EcoVerde EG-CVS Carbon Absorption System Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Ecoverde EG-CVS Carbon Filter Units					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$20,000	1	$20,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	Carbon Filter Equipment	LS	$69,500	2	$139,000
5	Carbon Filter Equipment Installation	LS	$41,700	2	$83,400
6	Ventilation Upgrades	LS	$80,000	1	$80,000
7	Electrical and Controls	LS	$43,800	1	$43,800
8	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$386,200
				Construction Contingency (25%) =	$96,550
				Total Construction =	**$482,750**

Table 8 *– EcoVerde EG-CVS Carbon Absorption System Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Ecoverde EG-CVS Carbon Filter Units	
Description	**Cost**
Labor	$5,200
Maintenance	$4,170
Electrical	$4,500
Media Replacement	$62,000
	$75,870

3.4.2 Evoqua Carbon Filters

In addition to the Ecoverde carbon filter system, requests were made to Evoqua to provide proposals for a two (2) unit carbon system. Communication was made with Evoqua on 9/1/17 to discuss the feasibility of utilizing carbon filters to treat odor at the Rogerson Drive Pump Station. Concern was expressed by Evoqua on the feasibility of utilizing carbon filters at this location due to the H_2S loadings anticipated. Initial estimates by Evoqua noted that carbon media replacement would likely occur approximately every 2 to 4 months based on the available data at a cost of approximately $10,000 for each change. Therefore, Evoqua did not prepare a proposal for equipment for this application.

Due to the similar technology of the carbon filter media associated with the Evoqua and Ecoverde systems and other carbon filter technology, it is anticipated that the media replacement frequency and associated costs are likely to make carbon filter technology cost prohibitive for this installation when compared to other odor control systems.

3.5 Dry Chemical Air Scrubber Equipment

As an alternative to biological oxidation of atmospheric H_2S and other odor causing compounds, a dry chemical air scrubber system has been evaluated for this installation. Dry air scrubbers have many benefits over biological systems. Sizing of chemical scrubber systems can be performed with lower total media volume as the residence time required for treatment utilizing chemical scrubbers can be significantly lower than that of biological scrubber systems. In addition, chemical scrubber systems do not rely on biological processes which are more prone to upset due to changes in operating conditions including pH, temperature, loading and moisture conditions. Dry chemical scrubbers eliminate the need to provide supplemental water supplies to the filter or the need to provide supplemental alkalinity or nutrients in the form of chemical feed systems, reducing existing O&M issues with freezing/damage to exposed water lines. In addition, the chemical scrubber systems do not require a supplemental heat source to heat the air flow going to the filter during cold periods as would be required by biological systems evaluated under this application.

Chemical scrubbers utilize a chemical reaction mechanism to chemically remove H_2S from the air by either oxidizing or precipitating H_2S from the airflow depending on the media type installed within the unit. This is a highly reliable system with minimal maintenance concerns or occurrence of upset and limited startup periods which are typically extended in biological systems. As H_2S in the fouled air is forced into the chemical scrubber, H_2S and other odor causing compounds get oxidized or precipitated by the chemical scrubber media. Over time, the capacity of the chemical scrubber media is decreased. Once available capacity of the media has been completely utilized, odor breakthrough will occur. The most significant maintenance item for a chemical scrubber system is the regular replacement of the media as its treatment capacity is exhausted. The frequency of media replacement is a function of H_2S mass loading to the chemical scrubber. As higher air flows and concentrations of H_2S are experienced at the system, the rate at which media capacity is utilized will increase proportionally. However, properly sized systems utilized in applications with similar air flow rates as required at the Rogerson Drive Pump Station on average see media last for 2-4 years before replacement needs to occur. In addition, this application will dilute H_2S loading to the chemical scrubber by pulling clean outside air into the filter, significantly reducing the H_2S mass loading to the unit. Therefore, it would be anticipated that the life of the chemical media would significantly surpass the noted 2-4 operating life within this application and may see media life in excess of 5 years.

The system selected for this evaluation is the Peacemaker dry air scrubber system as manufactured by Syneco Systems, Inc. (Chanhassen, Minnesota). The system pulls ventilated air from the head space within the pump station and into a foul air intake. The air is passed through a stack of filter media. Syneco has developed two (2) media systems each consisting of two (2) layers of media within the scrubber. The systems consist of an Oxidizing/Polishing media and a Converting/Polishing media. The Oxidizing/Polishing media system consists of the below two (2) layers:

1. Layer 1 – Oxidizing Media – chlorine dioxide – When odorous air is passed through the ClO_2 layer, H_2S reacts with the ClO_2 to oxidize H_2S to SO_4^{2-} which precipitates out of the airflow as a salt.

2. Layer 2 - Countervailant® Polishing Media – This proprietary activated carbon media contains a significant concentration of positive charged sites. Most of the organic odorous compounds are highly negatively charged ions which can be readily removed from the airflow utilizing the polishing Countervailant media through charge attraction and absorption.

The Converting/Polishing media system consists of the below two (2) layers:

1. Layer 1 – "Persnickety" Converting Media – polymeric amine – The Converting media consists of a diatomaceous earth material which has been treated with a patented amine solution which is absorbed into the earth. The amine solution reacts with H_2S and mercaptans to form water-soluble and non-volatile poly sulfides that are ready biodegradable.

2. Layer 2 - Countervailant® Polishing Media – This proprietary activated carbon media contains a significant concentration of positive charged sites. Most of the organic odorous compounds are highly negatively charged ions which can be readily removed from the airflow utilizing the polishing Countervailant media through charge attraction and absorption.

In general, the two (2) media systems offered are designed to remove more than 99% of H_2S loading within Layer 1 with the remainder of odor compounds removed in Layer 2. This provides for an efficient use of the carbon based Polishing media compared to a system utilizing only carbon media. The media system is selected for each application by the manufacturer based on H_2S loading requirements.

The Oxidizing media reacts extremely quickly with H_2S for removal, but has a lower capacity for treatment compared to the Converting media. The Oxidizing media is recommended for applications where H_2S loading is relatively low. The quicker reaction kinetics results in a smaller filter volume for a higher air flow rate for systems utilizing the Oxidizing/Polishing media compared to systems utilizing the Converting/Polishing media. Alternatively, the Converting/Polishing media requires a longer filter residence time than the Oxidizing/Polishing media to treat a specified airflow. However, the Converting/Polishing media has a significantly higher capacity for treating H_2S. Therefore, the Converting/Polishing media is specified where higher rates of H_2S loading are experienced. Syneco has recommended utilizing the Converting/Polishing media for the Rogerson Drive PS after reviewing the available H_2S monitoring data.

The Peacemaker chemical scrubber system only requires provision of 3 phase power to operate the ventilation fan for the system which is a top mounted unit installed on the filter media canister, decreasing total system footprint. This can result in a more reliable compressor system as corrosion of the compressor and accessories is not of a significant concern as the air passing through the unit has been treated by the scrubber unit resulting in only clean air contacting the compressor equipment. The chemical scrubber system has historically reported H_2S removal efficiencies greater than 99% in most applications.

When replacement of the media is required, a vacuum truck system can be utilized to remove the exhausted media from the scrubber vessel and disposed. Typically, the characteristics of the utilized media allows for it to be disposed of within a municipal landfill without the additional costs associated with disposal within a hazardous waste landfill. Replacement media is brought to site utilizing Super Sacks. The media can then be installed into the scrubber utilizing a hopper and vacuum truck.

3.5.1 Syneco Dry Chemical Scrubber (One (1) Scrubber Unit)

Syneco Systems provided a proposal for provision of a single dry chemical scrubber system which allows for treatment of the air volume coming off of both Zones #1 and #2. This unit would be a custom 12x12 system and have the ability to contain a larger volume of media within the containment (i.e., higher treatment capacity) than a system containing two (2) smaller units. With the increased media capacity within the system, it is anticipated that media replacement will only occur every 5+ years based on anticipated loading conditions.

A layout of the equipment is overlaid on the existing structure as shown in ***Figure 3.5.1 – 1***. As currently shown, the single unit conflicts with existing equipment and possibly

grating on the existing slab. Therefore, it is likely that significant structural modification of the existing structure will be required to maintain equipment clearances. This may include provision of additional cantilevered sections with additional columns and footers as necessary to support the shifted equipment. A detailed structural evaluation is beyond the scope of this study and therefore has not been performed. Required structural modifications are likely to be significant and would impact initial capital costs. These impacts have not been evaluated and are not reflected in the below capital costs. In the event additional evaluation of this alternative is requested, a detailed structural evaluation shall be required to quantify all necessary structural modifications.

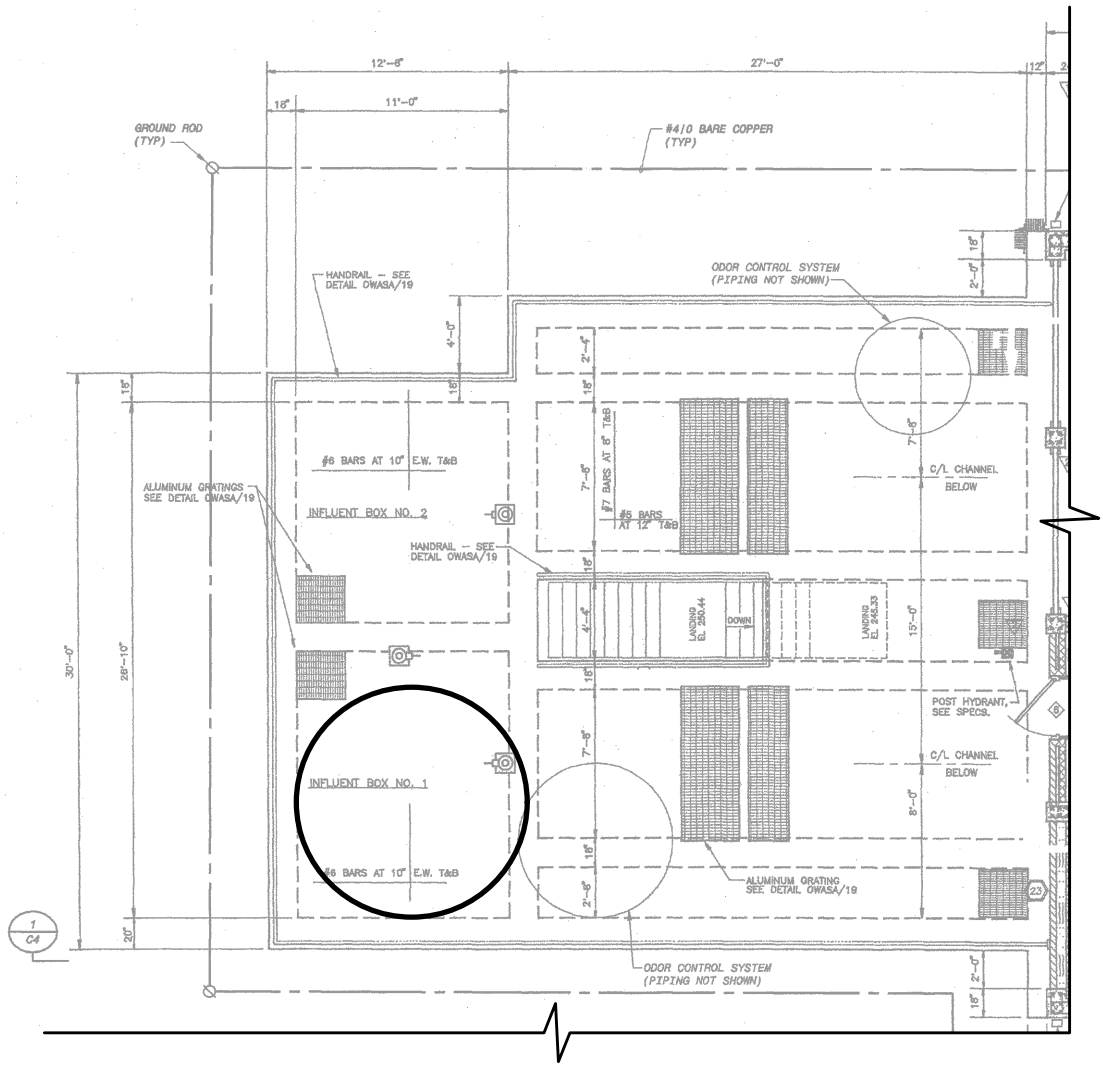
Initial capital costs are anticipated to be **$568,967**. A breakdown of costs can be seen below in ***Table 9***. Annual operations and maintenance costs are anticipated to be **$32,800** per year. A breakdown is provided in ***Table 10*** below.

Table 9 *– Syneco 12x12 Dry Chemical Scrubber Unit Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Syneco 12x12 Dry Chemical Scrubber Unit					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$20,000	1	$20,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	10x7 Dry Chemical Scrubber Unit	EA	$199,478	1	$199,478
5	10x7 Dry Chemical Scrubber Unit Installation	EA	$79,800	1	$79,800
6	Ventilation Upgrades	LS	$80,000	1	$80,000
7	Electrical and Controls	LS	$55,896	1	$55,896
8	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$455,174
				Construction Contingency (25%) =	$113,793
				Total Construction =	**$568,967**

Table 10 *– Syneco 12x12 Dry Chemical Scrubber Unit Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Syneco 12x12 Dry Chemical Scrubber Unit	
Description	**Cost**
Labor	$1,300
Maintenance	$6,000
Electrical	$3,500
Media Replacement	$22,000
	$32,800



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Raleigh North Carolina

ROGERSON DRIVE LIFT STATION
IMPROVEMENTS PHASE II

ODOR CONTROL SYSTEM
PEACEMAKER 12x12 CHICAGO BLOWER

FIG 3.5.1-1

3.5.2 Syneco Dry Chemical Scrubber (Two (2) Scrubber Units)

As an alternate proposal, Syneco has proposed a system which consists of two (2) standard 10x7 units in lieu of the single 12x12 custom unit. Each 10x7 unit would pull air from Zones #1 and #2 independently. Benefits of this system over the 12x12 unit include provision of standard equipment which is dedicated to each Zone for more effective ventilation of each Zone. Each unit also includes a smaller footprint which would allow for easier placement on the existing structure. However, the two (2) filter system includes a net smaller volume of media than the 12x12 unit. Therefore, replacement of media would occur more frequently (approximately every 4 to 5 years based on provided loading data and anticipated mode of operation).

A layout of the proposed equipment is overlaid on the existing structure as shown in ***Figure 3.5.2 – 1***. As shown in the Figure, there may be conflicts between the proposed equipment and adjacent railing and valves which may require modification during design. In addition, it may be necessary to provide some additional cantilevered walkways around equipment on the southwest of the structure. However, detailed evaluation of modifications to the existing structure was beyond the scope of this evaluation and was not quantified. However, it is generally thought that the required modifications for this alternative would be significantly lower than the other alternatives evaluated under this study and therefore would be accomplished at the lowest capital cost. ***As capital costs for structural modifications were not quantified, and have not been included within the below capital cost estimates***.

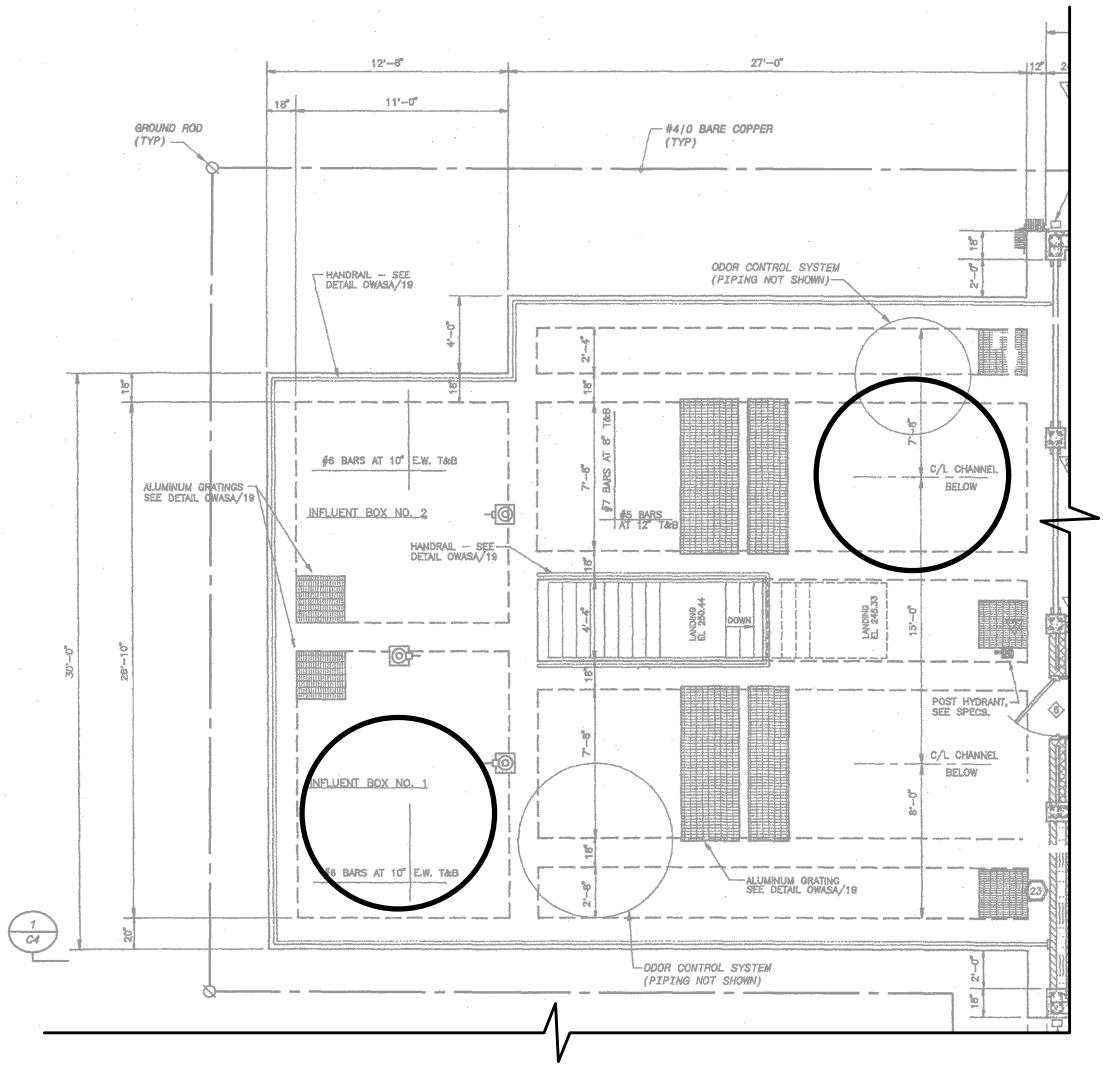
Initial Capital Costs are anticipated to be **$442,800**. A breakdown of these costs can be found in ***Table 11***. Annual Operations and Maintenance Costs are anticipated to be **$32,500**. A breakdown in O&M costs can be found in ***Table 12***.

Table 11 *– Syneco 10x7 Dry Chemical Scrubber Units Capital Cost Opinion*

Rogerson Drive Odor Control System Evaluation					
Syneco 10x7 Dry Chemical Scrubber Unit					
Line	**Description**	**Unit**	**Unit Cost**	**Unit Quantities**	**Cost**
1	Mobilization	LS	$20,000	1	$20,000
2	E&S	LS	$5,000	1	$5,000
3	Demolition of Existing Equipment	LS	$10,000	1	$10,000
4	10x7 Dry Chemical Scrubber Unit	EA	$77,575	2	$155,150
5	10x7 Dry Chemical Scrubber Unit Installation	EA	$31,030	2	$62,060
6	Ventilation Upgrades	LS	$55,000	1	$55,000
7	Electrical and Controls	LS	$42,030	1	$42,030
8	Site Restoration	LS	$5,000	1	$5,000
				Construction Sub-Total =	$354,240
				Construction Contingency (25%) =	$88,560
				Total Construction =	**$442,800**

Table 12 *– Syneco 10x7 Dry Chemical Scrubber Units Annual Operations and Maintenance Cost Opinion*

Rogerson Drive Odor Control System Evaluation	
Syneco 10x7 Dry Chemical Scrubber Unit	
Description	**Cost**
Labor	$1,300
Maintenance	$4,700
Electrical	$4,500
Media Replacement	$22,000
	$32,500



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ROGERSON DRIVE LIFT STATION
IMPROVEMENTS PHASE II

ODOR CONTROL SYSTEM
PEACEMAKER 10x7 VBW-9 FAN

FIG 3.5.2-1

4 Present Worth Cost Analysis of Alternatives

The probable capital costs, annual operation and maintenance costs, and the calculated Present Worth value of the odor control alternatives are summarized in **Table 11**. Present Worth Analysis was performed over a 15 year period and at an estimated 4% annual compounding interest rate.

Table 13 – *Summary of Present Worth Analysis*

Alternative	Capital Cost	Annual O&M Cost	Present Worth Value
Ecoverde One (1) Biofilter	$597,750*	$31,400	$946,871*
Evoqua One (1) Biofilter	$931,875**	$37,450	$1,348,263**
Evoqua Two (2) Biofilters	$687,500	$36,200	$1,089,990
Evoqua Two (2) Carbon Filters	$482,750	$75,870	$1,326,311
Syneco 12x12 Chemical Scrubber "Peacemaker"	$568,967*	$32,800	$933,654*
Syneco 10x7 Chemical Scrubbers "Peacemaker"	$442,800*	$32,500	$804,151*

*NO CAPTIAL COST FOR REQUIRED STRUCTURAL MODIFICATIONS INCLUDED
**CAPTIAL COSTS FOR ADDITIONAL ODOR CONTROL STRUCTURE INCLUDED AT $200,000

5 Conclusions and Recommendations

Based on the results of this evaluation, McKim & Creed offers the following general comments and recommendations:

1. Review of site conditions did not reveal an immediate and significant malodorous concern at the Rogerson Drive Pump Station. However, due to observations at the pump station and feedback from the operating staff, H_2S induced secondary corrosion was quite significant within confined spaces where atmospheric H_2S has been measured well in excess of 450 ppm.

2. To address these concerns, McKim & Creed recommends a significant increase in head space ventilation within the confined spaces of the pump station to minimize H_2S concentrations within the head space. It was determined that ventilation systems should be sized to provide at least 6 ACH of clean air from the pump station exterior.

3. While odor does not appear to be a current issue of significant concern at the pump station site, increased ventilation from the confined head space has the potential to generate additional sources of odor. Therefore, McKim & Creed recommends in addition to improved ventilation, that all ventilated air be treated to control the release of odorous compounds to the pump station vicinity.

4. Treatment of the odorous air can be performed utilizing either biological oxidation or chemical precipitation. Systems of both types have been identified which would work for this particular application. Carbon adsorption was also evaluated but does not appear to be a viable solution due to the excessive frequency and cost associated with media replacement when compared to other odor control solutions.

5. Based on the overall goals required by this project in addition to the desire to minimize operations and maintenance costs and labor, McKim & Creed recommends utilizing a two (2) unit dry air chemical scrubber system which was shown to have the lowest initial capital costs, lowest structural modification requirements of all systems evaluated and lowest annual O&M cost. Operationally, the dry chemical scrubber unit requires no supplemental chemicals or water supplies; no supplemental heating of inlet air or extended start up phases. In addition, the chemical filter media provides for immediate treatment of odor compounds on contact producing more efficient odor removal rates, significantly lower filter residence times and therefore a smaller filter media volume required

for the treatment application. This results in a smaller footprint/height which allows for increased access to equipment to be installed on the existing slab (with some possible minor structural modifications) and reduced operations effort for maintenance and media replacement.

6. Trade-offs for the dry chemical scrubber system include more frequent media replacements and higher cost of media material compared to a biological system. However, use of this system provides benefits which primarily include lowest initial capital and annual O&M costs and present worth value, increased system operational reliability and simplified regular operations and controls.

7. Included within the Appendix of this report is a list of References provided by Syneco Systems for municipalities who utilize the Peacemaker Dry Chemical Scrubber system on lift station, force main and headworks installations. These references include the City of Charlotte who has been utilizing Dry Chemical Scrubbers on their lift stations exclusively since about 2002 and the Town of Clayton.

APPENDIX

neco Systems, Inc. 7945 Stone Creek Drive,
Suite 50
Chanhassen, MN 55317
Tele: 952-927-9215
Fax: 952-927-9224
E-mail: sales@synecosystems.com

Syneco Reference List:

Contact:	**Dave Keller**
Title:	**Wastewater**
Plant:	**City of Buffalo Wastewater Treatment Plant**
Address:	**212 Central Avenue**
City, State, Zip:	**Buffalo, MN 55313**
Office:	**763-682-1182**
Cell:	**612-859-7949**
Application:	**Headworks at WWTP using 4x4 Peacemaker**

Contact:	**Tom Sopp**
Title:	**Assistant Superintendent**
Plant:	**Moorhead Wastewater Treatment Facility**
Address:	**2121 28th Street North**
City, State, Zip:	**Moorhead, MN 56560**
Office:	**218-299-5384**
Cell:	**701-238-2307**
Application:	**Pump Station #1 using 5x5 Peacemaker**

Contact:	**Stuart Rosenberger**
Title:	**Lift Station Manager**
Plant:	**Charlotte Water**
Address:	**4100 West Tyvola Road**
City, State, Zip:	**Charlotte, NC 28208**
Office:	**704-432-4376**
Cell:	**704-400-2941**
Application:	**Multiple Lift Stations using Peacemakers of Different Sizes**

Contact:	**Steve Whitehead**
Title:	
Plant:	**Metro Water Reclamation District - Chicago**
Address:	**100 East Erie Street**
City, State, Zip:	**Chicago, IL 60611**
Office:	**847-568-8329**
Cell:	
Application:	**Lift Station using 10x7 Peacemaker Manhole Scrubbers installed throughout District**

Contact:	**Jeff Hudson**
Plant:	**Clark County Water Reclamation District**
Address:	**5857 East Flamingo Road**
City, State, Zip:	**Las Vegas, NV 89122**
Office:	**702-668-8355**
Application:	**1 Mile Pipeline along the Las Vegas Strip using Two 10x7 Peacemakers**

Contact:	**Clark Moskop**
Plant:	**Fountain Hills Sanitary District**
Address:	**16941 East Pepperwood Circle**
City, State, Zip:	**Fountain Hills, AZ 85268-2901**
Office:	**480-837-9444**
Application:	**Decentralized WWTP**

Contact:	**Terry Lauritsen**
Title:	**Director of Engineering and Water Utilities**
Plant:	**City of Bartlesville**
Address:	**401 South Johnstone Avenue**
City, State, Zip:	**Bartlesville, OK 74003**
Office:	**918-338-4107**

Attachment 3 Sole Source certification from Engineer

McKIM&CREED

ENGINEERS
SURVEYORS
PLANNERS

October 18, 2017 M&C 1519-0042 (10)

Mr. Simon Lobdell, P.E.
Utilities Engineer
Orange Water and Sewer Authority
400 Jones Ferry Road
Carrboro, North Carolina 27510

RE: Recommendation for Sole-source Procurement of Syneco Systems, Inc. Peacemaker Dry Air Scrubber Odor Control System

Dear Mr. Lobdell:

As part of the Rogerson Drive Pump Station Upgrade project, McKim & Creed performed an evaluation of potential odor control technologies to address OWASA concerns for potential odors and corrosive gases in connection with the typical operation of the wastewater pump station and the future addition of electric grinders in the influent channels. This evaluation resulted in the recommendation to sole-source procure a Peacemaker dry scrubber odor control system and converting/polishing media as manufactured by Syneco Systems, Inc.

Background

OWASA contracted McKim & Creed, Inc. to design upgrades to the Rogerson Drive Pump Station. Phase 1 upgrades are currently being constructed and include the removal of existing manual bar racks with electric grinders. OWASA has expressed concern with existing odors as well as the potential for odors in connection with the additional turbulence caused by the electric grinders.

McKim & Creed performed an evaluation of potential odor control systems and provided a technical memorandum of findings (final dated October 11, 2017). This evaluation evaluated several odor control systems, including biofilters, carbon filters, and dry air chemical scrubbers.

Odor Control System Recommendation

Based on the overall goals required by this project, McKim & Creed recommended utilizing a two (2) unit, Peacemaker dry air chemical scrubber system with converting/polishing media as manufactured by Syneco Systems, Inc. This option was shown to have the lowest initial capital costs, lowest

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structural modification requirements of all systems evaluated, and lowest annual O&M cost. Operationally, the dry chemical scrubber unit requires no supplemental chemicals or water supplies; no supplemental heating of inlet air or extended start up phases. In addition, the chemical filter media provides for immediate treatment of odor compounds on contact producing more efficient odor removal rates, significantly lower filter residence times and therefore a smaller filter media volume required for the treatment application. This results in a smaller footprint/height which allows for increased access to equipment to be installed on the existing slab (with some possible minor structural modifications) and reduced operations effort for maintenance and media replacement.

OWASA and McKim & Creed contacted local references at Town of Clayton and Charlotte Water and performed a site visit to the Town of Clayton to observe the Peacemaker system and further interview the Wastewater Treatment Plant Superintendent concerning operations and maintenance. The media is patented and manufactured by Syneco Systems, Inc. No other systems or companies were available that offered an equal or like kind product to the Syneco Systems. Inc. product.

The State of North Carolina allows sole source procurement when: (1) performance or price competition are not available; (2) a needed product is available from only one source of supply; or (3) standardization or compatibility is the overriding consideration. The State also requires that a contract that is made under this sole source exception be approved by that organization's governing board. We believe that criteria (1) and (2) above are met and recommend that OWASA's Board approve proceeding with this sole source procurement action.

Should you have any questions, please do not hesitate to email me at blatino@mckimcreed.com or call me at 919-233-8091.

Sincerely,

McKIM & CREED, INC.

Ben R. Latino, Jr., PE
Sr. Project Manager

S:\1519\0043\10-Comm\11-Comm with Client\2017.10.18 Lobdell_Odor Control Sole Source Letter.docx

Orange Water and Sewer Authority

Annual Meeting of the Board of Directors

September 28, 2017

The Board of Directors of the Orange Water and Sewer Authority (OWASA) held its annual meeting on Thursday, September 28, 2017 at 7:00 p.m. in the Council Chamber at Chapel Hill Town Hall, 405 Martin Luther King Jr. Boulevard, Chapel Hill.

Board Members present: Robert Morgan (Chair), Heather Payne (Vice Chair), Yinka Ayankoya (Secretary), Ray DuBose, John Morris and John A. Young. Board Member absent: Jeff Danner and Ruchir Vora.

OWASA staff present: Mary Darr, Robert Epting (Epting and Hackney), Greg Feller, Vishnu Gangadharan, Glorija Gladney, Robin Jacobs (Epting and Hackney), Ed Kerwin, Andrea Orbich, Dustin Rhodes, Ruth Rouse, Kelly Satterfield, Todd Taylor and Stephen Winters.

Others present: Marty Adams, Daria Barazandeh, Alex Boerner (Indy Week), Alice Boyle, Isabel Calingaert, Eleanor Dillon, River Gladney, Meg Holton (Water, Sewer and Reclaimed Water Coordinator, UNC), Micah Intrator, Martha Kelder, Negest Kinte, Shannon McClellan, Ben Poulson (Associate Director of Energy Services, UNC), Sharon Reese, Josephine B. Slade, Marcela Slade, Lisa Stauffer, Tana Hartman Thorn, Claire Viadro, Lamont Wilkins, Amy Weiss, Sarah Willets (Indy Week) and Curtis Williams.

There being a quorum present, Chair Robert Morgan called the meeting to order.

* * * * * * * * *

Motions

1. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Awarding a Construction Contract for the Brandywine Road Water Main Replacement Improvements Project. (Motion by Yinka Ayankoya, second by Heather Payne and unanimously approved.)

2. Yinka Ayankoya made a Motion to approve the Minutes of the September 14, 2017 Work Session of the Board of Directors; second by Heather Payne and unanimously approved.

3. Yinka Ayankoya made a Motion to approve the Minutes of the September 14, 2017 Closed Session of the Board of Directors; second by Heather Payne and unanimously approved.

4. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Awarding a Construction Contract for the Administration Building Heating, Ventilation, and Air Conditioning Replacement Project. (Motion by John Young, second by Ray DuBose and unanimously approved.)

5. BE IT RESOLVED THAT the Board of Directors of the Orange Water and Sewer Authority adopts the Resolution Reappointing the Firm of Epting and Hackney as General Counsel to the

Orange Water and Sewer Authority. (Motion by Heater Payne, second by Yinka Ayankoya and unanimously approved.)

6. John Morris made a motion that the Board of Directors convened in a Closed Session in the First Floor Conference Room for the purpose of discussing a personnel matter; second by Barbara Foushee and unanimously approved.

* * * * * * * * *

Announcements

Robert Morgan said 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 at this time; none were disclosed.

Committee Meetings

John Young said that the Natural Resources and Technical Services (NRTS) Committee met on September 26, 2017 to discuss two items: a potential biogas-to-energy project; and whether an evaluation of OWASA land should be completed to determine if any OWASA land could be sold. Mr. Young said that after receiving an update from staff on the biogas-to-energy project, the NRTS Committee unanimously decided it would reconvene in November 2017 to discuss this topic after staff gathers additional information from a national workshop and from other North Carolina utilities with similar projects. The Committee also received an overview of OWASA owned land and discussed options regarding the types of evaluations that could be done to see if any land could be sold. The NRTS Committee unanimously agreed to recommend delaying the analysis until progress is made on forest management practices and without objection, the Board concurred that no action is needed at this time.

Heather Payne said that the Chapel Hill Town Council's OWASA Committee and the Chapel Hill Appointees to the OWASA Board of Directors will meet on October 5, 2017, at 8:00 a.m. in the OWASA Boardroom. Chapel Hill Mayor Pam Hemminger plans to attend this meeting to discuss OWASA fees for new service and what options/constraints OWASA may have regarding these fees as it pertains to their affordable housing initiatives and other community purposes.

Barbara Foushee said that the Human Resources Committee will meet on Wednesday, October 18, 2017 at 6:00 p.m. in OWASA's Boardroom to discuss employee benefits.

Annual Report for July 2016 through June 2017 on Collection, Treatment and Recycling of Wastewater and Biosolids

Todd Taylor said that staff distributed an annual report to accountholders on the operation of the wastewater collection and treatment systems and on the treatment and recycling of biosolids. This report was also distributed to local officials and media, and posted on OWASA's website. The key takeaway from the report was that OWASA continued to surpass the treated wastewater quality standards for the Mason Farm Wastewater Treatment Plant (WWTP). Mr. Taylor expressed appreciation to staff for their hard work to exceed goals at the WWTP.

Item One: Presentation of Annual Report

In presenting OWASA's Annual Report for Fiscal Year (FY) 2017, Ed Kerwin, Executive Director, stated that OWASA is a community owned utility providing water, sewer and reclaimed water service to the Carrboro and Chapel Hill community. Mr. Kerwin said that OWASA has the important responsibility to effectively manage and maintain all the resources, facilities and infrastructure that the community depends on around the clock for high-quality and reliable service.

OWASA has about 800 miles of water and wastewater pipe, enough to go from here to Chicago. With every investment, it is essential to make smart investments in our infrastructure. Mr. Kerwin said that OWASA invests about 50 cents of every revenue dollar into infrastructure. He noted that some projects, such as the ongoing water main replacement work on Hillsborough Street, can be disruptive and OWASA appreciates the community's patience and understanding.

Mr. Kerwin noted that progress has been made to further reduce energy use and work will continue. He said that OWASA's new Agua Vista program, the Advanced Metering Infrastructure project, is underway and he highlighted the important benefits it brings the community in identifying leaks and conserving water as well as eliminating the need to manually read meters. Once Agua Vista is fully implemented throughout the service area, customers will have on-line access that will enable them to monitor their water consumption and set up automatic alerts that can notify them of unusual water-use. Mr. Kerwin said that the $5 to $6-million investment in the project does not require an increase in monthly rates and no employees will lose their job.

Stephen Winters, Director of Finance and Customer Service, said that the independent audit of OWASA's FY 2017 financial statements was performed by Martin, Starnes & Associates. The success of this audit is a testament to the entire OWASA team and is a positive reflection on the Finance and Customer Service staff. He introduced and thanked finance staff in the audience (Kelly Satterfield, Finance and Procurement Manager and Glorija Gladney, Financial Analysist) for their hard work and a job well done. Mr. Winters said that agenda information was updated to include a draft of OWASA's Comprehensive Annual Financial Report (CAFR). The CAFR will be finalized within the next few weeks.

Mr. Winters said OWASA is sustainable and well positioned for the future and the water supply is sufficient to meet the community's needs for the next 50 years under most circumstances. He said the community continues to do a great job of conserving water, which enhances the utility's sustainability. Mr. Winters said OWASA's financial condition is very good; there are sufficient reserves; financial performance goals are being met; OWASA holds a AA+ bond rating; and for the sixth year in a row, the annual budget was approved without an increase in monthly water and sewer rates.

Meg Blue, Audit Manager with Martin, Starnes & Associates, said OWASA received an unmodified opinion that the financial statements fairly present OWASA's financial position and results from operations. OWASA's CAFR can be relied upon by third parties, citizens, underwriters and bondholders. Ms. Blue stated that no significant deficiencies in internal control were identified.

The Board congratulated staff on a job well done.

Item Two: Petitions and Requests

Robert Morgan stated that the OWASA Board respects and appreciates comments received from individuals and organizations both, for and opposed to drinking water fluoridation. On September 14, 2017, the OWASA Board agreed to schedule an agenda item this fall to outline when and how the Board would next review fluoridation guidance from professional health organizations such as the US Centers for Disease Control and the Environmental Protection Agency, to also include public feedback. The Board asked staff to outline options, to include the possibility of a leadership role for a County-wide entity such as the Orange County Health Department.

Since the Board's discussion on September 14th, OWASA staff met with the Dr. Dorothy Cilenti, Interim Director of the Orange County Health Department and Dr. Cilenti is interested in considering a County-wide opportunity to discuss oral health and fluoridation in the next couple of years. The Board plans to discuss this topic on Thursday, October 26, 2017 at 7:00 p.m., in Council Chamber at Chapel Hill Town Hall and invites public comment.

Mr. Morgan noted that the Board determined on March 9, 2017, after reviewing considerable public input and reports from national, state, and local agencies that have the scientific data and expertise, and in some cases the statutory responsibility, to advise the public on health issues, that fluoridation of drinking water will be resumed and that the Board does not expect to revisit this decision in the near future. Mr. Morgan said OWASA staff reports that improvements to the fluoride feed system at the Jones Ferry Road Water Treatment Plant will be completed within the next week or so and that a news release will be issued in advance of resuming drinking water fluoridation.

John Young expressed appreciation to the public for joining the Board meeting tonight and sharing their views. Mr. Young said he would value the public's feedback tonight, especially for those individuals who are unable to attend the October 26th meeting, on how the OWASA Board should design the next review of fluoride.

Daria Barazandeh requested the Board look at the science of water fluoridation, the issue of informed consent, and that information regarding fluoride on OWASA's website have a fair and balanced view of fluoride.

Alice Boyle opposed fluoridating drinking water.

Amy Weiss stated she does not consent to fluoridating drinking water.

Lamont Wilkins opposed fluoridating drinking water.

Sharon Reese stated she does not consent to fluoridating drinking water.

Sharon McClellan opposed fluoridating drinking water.

Isabel Calingaert opposed fluoridating drinking water.

Marcela Slade stated she does not consent to fluoridating drinking water.

Micah Intrator said he was grateful for the open dialog on fluoride and opposed fluoridation of drinking water.

Curtis Williams shared a picture of hydro-fluorosilicic acid and said he does not give his consent to fluoridate drinking water.

Tana Hartman Thorn opposed fluoridation of drinking water

Josephine Slade opposed fluoridation of drinking water

Claire Viadro opposed fluoridation of drinking water.

The Board heard the petitions and took no action.

Item Three: 12 Month Board Meeting Schedule

The Board agreed to add to the schedule a Natural Resources and Technical Services Committee meeting to continue the discussion on biogas-to-energy options after staff has collected additional information.

Item Four: Resolution Awarding a Construction Contract for the Brandywine Road Water Main Replacement Project

Yinka Ayankoya made a motion to approve the resolution, second by Heather Payne and unanimously approved. Please see Motion No. 1 above.

Item Five: Minutes

Yinka Ayankoya made a motion to approve the Minutes of the September 14, 2017 Work Session of the Board of Directors; second by Heather Payne and unanimously approved. Please see Motion No. 2 above.

Item Six: Minutes

Yinka Ayankoya made a motion to approve the Minutes of the September 14, 2017 Closed Session of the Board of Directors; second by Heather Payne and unanimously approved. Please see Motion No. 3 above.

Item Seven: Long-Range Water Supply Plan

The Board received the status report on updating OWASA's Long-Range Water Supply Plan as an information item.

Item Eight: Resolution Awarding a Construction Contract for the Administration Building Heating, Ventilation, and Air Conditioning Replacement Project

The Board requested that staff continue to provide information on the analysis of alternatives in making recommendations to award contracts.

John Young made a motion to approve the resolution; second by Ray DuBose and unanimously approved. Please see Motion No. 4 above.

Item Nine: Resolution Reappointing the Firm of Epting and Hackney as General Counsel to the Orange Water and Sewer Authority

Heather Payne made a motion to approve the resolution; second by Yinka Ayankoya and unanimously approved. Please see Motion No. 5 above.

Item Ten: Executive Director Will Summarize the Key Action Items from the Board Meeting and Note Significant Items for Discussion and/or Action Expected at the Next Meeting

Ed Kerwin summarized the meeting as follows:

- Staff will add a Natural Resources and Technical Services Committee meeting to the 12 Month Board Meeting Schedule to continue the discussion on biogas options after staff has collected additional information; and
- October 12, 2017 Work Session will include the following items:
    - Proposed Near-Term Policies and Practices Related to the Rollout of Advanced Metering Infrastructure
    - Impact of Multi-Family Master-Metered Rate Change
    - Televising OWASA Board of Directors' Meetings.

Item Ten: Closed Session

John Morris made a motion that the Board of Directors convened in a Closed Session in the First Floor Conference Room for the purpose of discussing a personnel matter; second by Barbara Foushee and unanimously approved. Please see Motion No. 6 above.

The Board came out of closed session and the meeting was adjourned at 9:10 p.m.

Respectfully submitted,

Andrea Orbich
Executive Assistant/Clerk to the Board

Attachments

Orange Water and Sewer Authority

Closed Session of the Board of Directors

September 28, 2017

The Board of Directors of Orange Water and Sewer Authority met in Closed Session on Thursday, September 28, 2017, following the Board meeting.

Board Members present: Robert Morgan, Chair; Heather Payne, Vice Chair; Yinka Ayankoya, Secretary; Ray DuBose; Barbara M. Foushee; John N. Morris; and John A. Young. Board Members absent: Jeff Danner and Ruchir Vora.

Staff present: None.

****

ITEM ONE

The Board of Directors met in Closed Session without staff to evaluate the Executive Director's annual performance review.

No official action was taken at the meeting.

The meeting was adjourned at 9:10 p.m.

_____

Barbara Foushee, Chair
Human Resources Committee

Orange Water and Sewer Authority

Meeting of the Board of Directors

October 12, 2017

The Board of Directors of the Orange Water and Sewer Authority (OWASA) met in a work session on Thursday, October 12, 2017, at 6:00 p.m. in OWASA's Community Room, 400 Jones Ferry Road, Carrboro.

Board Members present: Robert Morgan (Chair), Heather Payne (Vice Chair), Yinka Ayankoya (Secretary), Ray DuBose, John N. Morris and John A. Young. Board Members absent: Jeff Danner, Barbara Foushee and Ruchir Vora.

OWASA staff present: Mary Darr, Robert Epting, Esq., (Epting and Hackney), Greg Feller, Howard Hardiman, Ed Kerwin, Andrea Orbich, Dan Przybyl, Ruth Rouse, Todd Taylor, Mary Tiger, Stephen Winters and Richard Wyatt.

Others present: Elizabeth Foley, Margaret Holton (UNC Water, Sewer and Reclaimed Water Coordinator), Ben Poulson (UNC Associate Director of Energy Services), C. Ahnie Rising, Natalie Sadler, Donald Schlenger (Schlenger and Associates), Carol Troutner, Claire Viadro and Robert Walsh.

Motions

1. Yinka Ayankoya made a motion to adjourn the work session, second by John Morris and unanimously approved.

* * * * * * *

Announcements

Robert Morgan 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.

Heather Payne said that the Chapel Hill appointees to the OWASA Board and Robert Morgan met on October 5th with Mayor Pam Hemminger, Chapel Hill Town Council's OWASA Committee members, Michael Parker and Maria Palmer, and Roger Stancil, Chapel Hill Town Manager. Information was provided on: OWASA's Advanced Metering Infrastructure, Agua Vista program; the Employee Diversity and Inclusion program; and a summary of OWASA's obligation to have cost-of-service rates and fees. Ms. Payne said this topic was discussed because the Town and other local officials are working on affordable housing initiatives.

Yinka Ayankoya said the Human Resources Committee will meet on October 18, 2017, at 6:30 p.m. instead of 6:00 p.m. in the OWASA Boardroom to discuss employee benefits.

Ms. Ayankoya also noted that she attended the Orange County Intergovernmental Parks Work Group (IPWG) meeting on October 11, 2017 regarding the Master Aging Plan & Outdoor Spaces and noted that a survey would be made available for feedback. The IPWG also provided an update on Trailways and Greenways.

Item One: Proposed Near-Term Policies and Practices Related to the Rollout of Advanced Metering Infrastructure (AMI)

Stephen Winters provided an overview of the proposed near-term policies and practices related to the rollout of AMI.

Elizabeth Foley, Carol Troutman, Clair Viadro and Natalie Sadler expressed support for an option to have their meters read manually rather have an AMI meter installed at their location and express concern that the proposed $45 monthly fee for an opt out option is excessive.

After discussion, the Board agreed to continue discussing this topic and possibly take action at the October 26, 2017 meeting. Additional information for this discussion will include an estimate of the cost to maintain and operate a second meter reading system for a possible opt out option.

Item Two: Impact of Multi-Family Master-Metered (MFMM) Rate Change

In Fiscal Year (FY) 2017, the Board approved a year-round water commodity rate for the MFMM customer class. The decision to change to a year-round rate was supported by analyses of water-use patterns of MFMM customers. Prior to the rate change, MFMM customers were subject to seasonal rates which are higher in the warmer months of May through September and lower during the rest of the year. Residents of MFMM properties typically have only indoor water-use and consumption does not change significantly from month-to-month. The twice-per-year seasonal rate change led to higher bills in some months even though the amount of water used by the customer did not change. The adoption of a year-round water commodity rate helps eliminate the confusion and budget challenges associated with seasonal rates.

The Board asked staff to report on the impact of the rate change on water consumption of the MFMM customer class. Staff presented a comparison of total annual water consumption by MFMM customers during the months of May through September for the last four fiscal years. Water consumption for the MFMM customer class declined each year, including FY 2017.

Item Three: Televising OWASA Board of Directors' Meeting

The Board agreed to broadcast its work sessions live on the second Thursday of most months via Microsoft Skype. Staff will provide a link for viewing the Skype broadcasts which will be posted to OWASA's website before meetings.

The Board requested that staff follow up with Mr. Braxton Foushee to thank him for his suggestion.

Item Four: Review Board Work Schedule

The Board agreed to schedule a Natural Resources and Technical Services Committee meeting to discuss drought preparations should the region experience a drought this fiscal year.

The Board agreed to schedule a future discussion about low-flow benchmarks to be used once Advanced Metering Infrastructure (AMI) is implemented.

The Board agreed to delay the discussion of strategic emergency communication action items until after Orange County's After Action Review has been completed.

The Board agreed to notify stakeholders that the Board will discuss and may take action including adoption of AMI policies at the October 26, 2017 Board meeting.

The Board agreed that the October 26, 2017, agenda item regarding the process for periodic review of drinking water fluoridation include information about the process the Durham County Department of Public Health and Durham City Council used to review fluoridation.

The Board agreed to schedule a Closed Session to discuss a personnel matter at the end of the November 9, 2017 work session.

Item Five: Executive Director Will Summarize the Key Staff Action Items from the Work Session

Ed Kerwin said items for staff follow-up are:

- Provide an estimate of the total cost to manually read meters for an Advanced Metering Infrastructure (AMI) should the Board agree that OWASA should provide an opt out option.
- Notify stakeholders that the Board will discuss and may take action including adoption of AMI policies at the October 26, 2017 meeting.
- Implement Microsoft Skype broadcast of Board Work Sessions and inform the public of the Board's decision; also inform Braxton Foushee and thank him for his suggestion.
- Schedule Natural Resources and Technical Services Committee meeting to discuss drought preparations and response before the end of 2017.
- Schedule future Board discussion about low-flow benchmarks to be used once AMI is implemented.
- Schedule the discussion of strategic emergency communication action items after completion of Orange County's After Action Review.

Yinka Ayankoya made a motion to adjourn the work session, second by John Morris and unanimously approved. Please see Motion 1 above.

The Board work session was adjourned at 7:45 p.m.

Respectfully submitted by:

Andrea Orbich
Executive Assistant/Clerk to the Board

Attachment

AGENDA ITEM

- Manual Read Option for Advanced Metering Infrastructure

PURPOSE

- To discuss and reach a decision on if and what option to offer customers who may elect to have their meters read manually by OWASA instead of by an AMI meter.

BACKGROUND

- After conducting a thorough feasibility study which included soliciting and collecting feedback and input from the public, the OWASA Board of Directors decided in the spring of 2016 that it is in the best interests of our customers to implement an AMI system.

- Implementing Agua Vista (OWASA's AMI system) gives OWASA many opportunities to improve efficiencies and customer service. To take advantage of the opportunities, changes to certain business practices and Board-approved policies need to be considered.

- A few customers have expressed concerns about information privacy and the health effects of radio frequency transmissions.

- The Board is considering options for a *Manual Read Charge* for reading meters manually once per month.

ACTION NEEDED

- Approve a resolution implementing a manual read option with fee or approve a motion to not offer a manual read option.

October 26, 2017

ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

To: Board of Directors

Through: Ed Kerwin

From: Stephen Winters, CPA

Date: October 20, 2017

Subject: Manual Read Option for Advanced Metering Infrastructure (AMI)

Purpose

To discuss and reach a decision on if and what option to offer customers who may elect to have their meters read manually by OWASA instead of by an AMI meter.

Background

After conducting a comprehensive feasibility study which included soliciting and collecting feedback and input from the public, the OWASA Board of Directors decided on March 26, 2016 that it is in the best interests of our customers to implement an AMI system.

Implementing OWASA's AMI system (now called Agua Vista) provides many opportunities to improve efficiencies and customer service. To take advantage of the opportunities, changes to certain business practices and Board-approved policies need to be considered.

We are scheduled to conduct a field readiness test beginning in late November 2017. This is an end-to-end test of the AMI implementation process beginning with notifying a customer that their meter will be upgraded and ending with producing a bill for water and sewer services. The test will include the installation of approximately 200 AMI meters.

As discussed at the October 12, 2017 Board Work Session, the only Board policy that needs to be addressed in advance of the field readiness test is a possible manual read option. Other policies can wait until the Agua Vista project nears completion.

Manual Read Option

Prior to, and at our October 12, 2017 Work Session, some customers expressed concerns about information privacy and the health effects of radio frequency transmissions. We respect the positions of those who have expressed concerns. The information below provides context to the radio frequency transmissions of OWASA's AMI meters and explains the key reasons for deciding to implement AMI for our community.

Information Privacy

In accord with North Carolina General Statutes, OWASA considers all individual consumption data to be private and exempt from public records requests. OWASA does not share this information with the public.

Consumption data transmitted over the AMI system is encrypted and data stored on servers is protected following industry best practices. The only data that will be communicated from AMI meters are encrypted meter readings and meter identification. No customer-identifiable information will be transmitted.

Health Effects of Radio Frequency Transmissions

OWASA's AMI meters will transmit a small fraction of the radio frequencies emitted by other common appliances (such as baby monitors, cordless and cellular telephones, etc.). The transmissions from our AMI meters occur once per day, use less than one watt of power, and take less than half of one second to complete. For context, the wireless modem in OWASA's Community Room transmits signals continuously using nine watts of power.

Radio frequency transmissions decrease as the distance from the device increases. The radio frequency exposure from a meter drops by a factor of 100 when you move from a distance of one foot to 10 feet away. OWASA meters are typically located outdoors near the curb. If the meter is 30 feet away, the radio frequency exposure drops by a factor of 900. For additional perspective on the radio frequency output of OWASA's AMI meters, please see the graphs in the Attachment. While OWASA does not dismiss the concerns about radio frequency transmissions, we believe the potential exposure is extremely limited.

Cost of Service

OWASA is governed by North Carolina General Statutes, agreements with the University of North Carolina and the Towns of Chapel Hill and Carrboro, and the contract (Bond Order) it has with its bondholders. Each of these prohibit OWASA from providing services for free and this prohibition must be considered in determining the fee for a manual read option. Figure 1 shows staff's estimate of the cost of operating and maintaining a system for reading meters manually. The cost per manually read meters depends on the number of customers requesting to have their meters read manually.

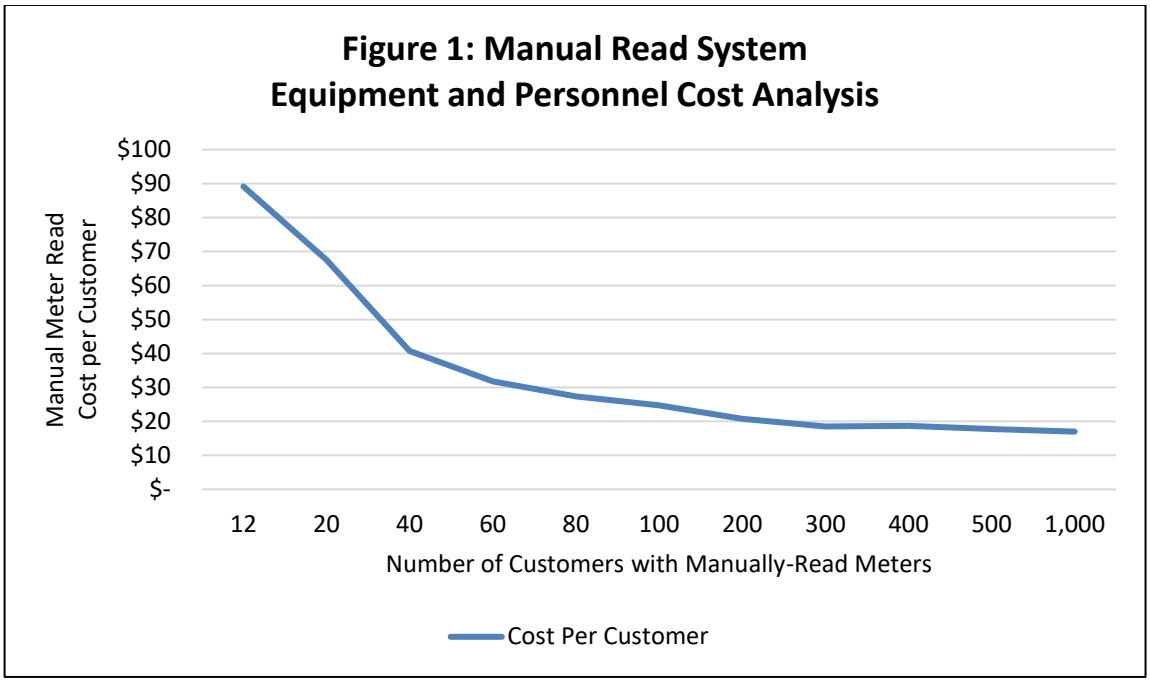
Options Related to Manually Reading Meters

To date, the Board has discussed the following manual read options:

1. No opt-out option offered (AMI meter would be a condition of service).
2. Manually read meters once-per-month for a cost-based fee of $45 per month. The $45 fee is based on the current cost-based charge for visiting a customer's location to initiate service for new accounts or to turn-on service after disconnection due to late-payment.
3. Manually read meters once-per-month for a fee of something other than $45 per month.

Cost of Maintaining a Second Meter Reading System

The Board asked staff to analyze the cost of maintaining a second meter reading system considering various assumptions as to how many customers may choose to opt-out. Figure 1 shows the results of this analysis.



The cost shown in the graph assumes that manual meter reading requires a Utility Mechanic to read meters through visual inspection and record them using existing manual read equipment. This analysis estimates that because manually read meters will be scattered throughout the service area, a Utility Mechanic will be able to read a maximum of 18 meters per day (about 20 minutes per) due to the driving time between meters.

It is important to note that this analysis does not capture the cost incurred due to the loss of efficiency associated with operating two separate systems and the declining rate of return on the AMI investment as more customers select manual reading.

Staff Recommendation

Consistent with OWASA's cost of service obligations, staff recommends offering a manual read option for a fee of no less than $45 per month. Like all of OWASA's rates, fees and charges, this manual read fee will be subject to future adjustments based on cost of service. Customers choosing a manual read option would not be eligible for leak notifications or emergency water loss adjustments. Staff's cost-based fee proposal would:

- recover a portion of the costs associated with operating a manual read system in parallel to AMI;
- provide an alternative for customers who may request to have their meters read manually; and
- maintain consistency in our application of cost of service based fees.

Action Requested

Should the Board decide to offer a manual read option, a resolution approving a manual read option with fee is provided for the Board's consideration. If the Board decides not to offer a manual read option, a draft of a motion is provided for the Board's consideration.

Stephen Winters, CPA
Director of Finance and Customer Service

Attachment

The following graph comes from a report published in April 2011 by the California Council on Science and Technology (CCST). It compares radio frequency power density levels of common devices. The "smart meters" referenced in this graph are electricity industry meters. This information is summarized on our website at http://owasa.org/radio-frequency.

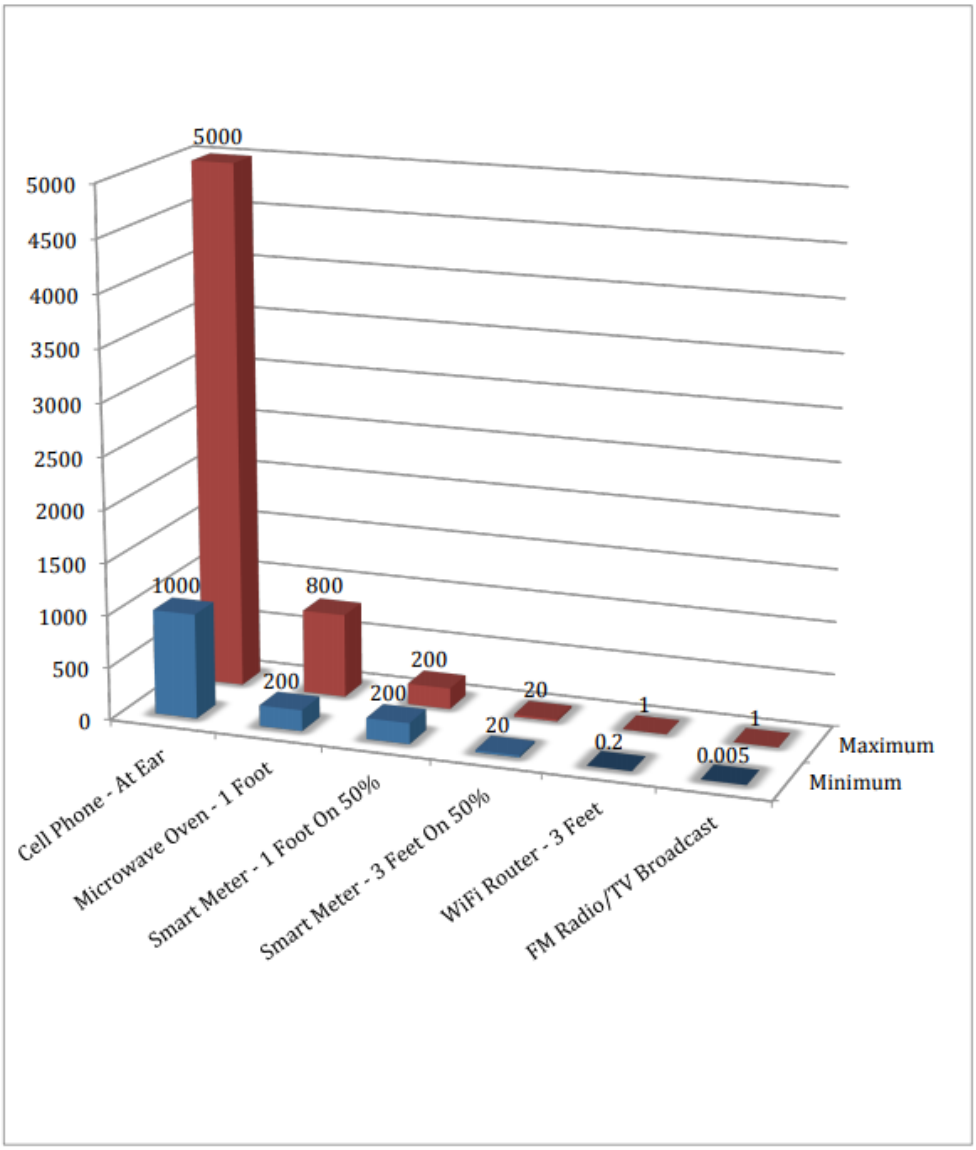
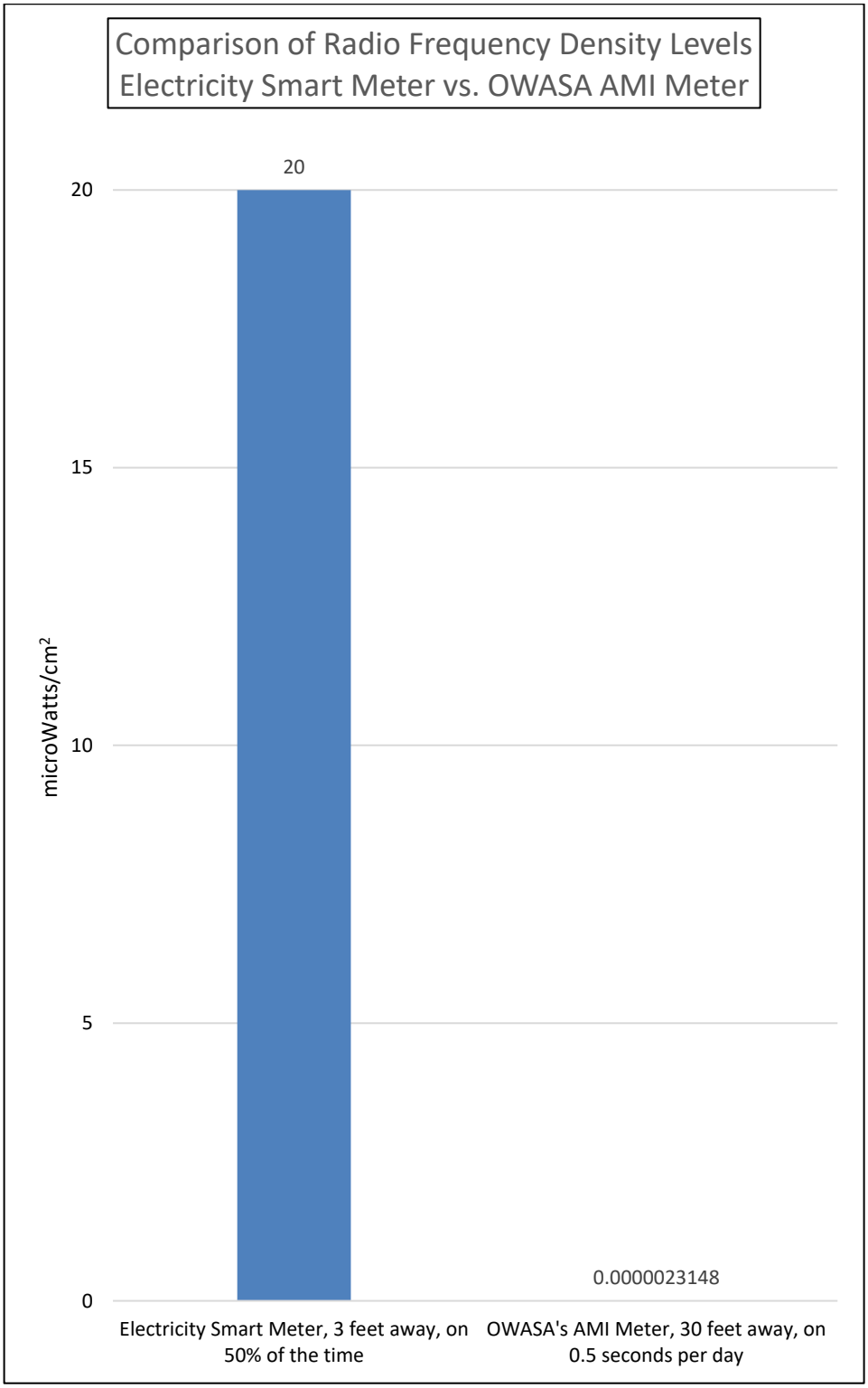


Figure 1. Instantaneous Radio Frequency Power Density Levels of Common Devices (in microWatts/cm^2)
About this figure: This figure was developed by the CCST project team. Quantities for different distances calculated using Inverse Square Law. Assumes distances in far-field, where power density reduces as the square of the distance from the source. Smart meter power scaled to obtain output for 50% duty cycle. The source for the various starting measurements came from Electric Power Research Institute (EPRI), Radio-Frequency Exposure Levels from Smart Meters: A Case Study of One Model (February 2011)

The CCST study was done for electricity smart meters which are typically attached to the home and communicate frequently. As previously stated, OWASA's meters are typically located away from most residences and AMI meters will only transmit once per day for 0.5 seconds. The graph below compares the radio frequency power density levels of the electricity smart meter shown on the previous page (three feet away and on 50% of the time) with an OWASA AMI meter located 30 feet away.



RESOLUTION ADOPTING A MANUAL READ CHARGE FOR MANUALLY READING WATER METERS TO BE EFFECTIVE ON AND AFTER JANUARY 1, 2018

WHEREAS, General Statute 162A-6(9) and Section 7.04 of Orange Water and Sewer Authority (OWASA) Bond Order empower and direct OWASA to fix and revise from time to time and to collect rates, fees and other charges for the use of or for the services and facilities furnished by any system operated by OWASA; and

WHEREAS, OWASA's rates, fees and other charges are based on the cost of providing the service; and

WHEREAS, after conducting a feasibility study which included soliciting and considering input from the public, OWASA's Board of Directors approved implementing an Advanced Metering Infrastructure (AMI) system to enable enhanced customer service and operational efficiency; and

WHEREAS, the AMI system facilitates reading meters remotely over a computer network thereby eliminating the need to travel to meter locations; and

WHEREAS, the Board of Directors has determined to permit customers to elect to have their water meters read manually, instead of by an AMI meter installed at their service address, and to charge such customers for this service on a cost of service basis.

NOW, THEREFORE, BE IT RESOLVED:

1. That a *Manual Read Charge* of $_____ per month shall be charged to OWASA customers who choose to have their meters read manually instead of by the AMI system.

2. That the *Manual Read Charge* will be effective on and after January 1, 2018, reviewed in the future, and amended from time to time as necessary.

3. That customers choosing a manual read option shall not be eligible for leak notifications or emergency water loss adjustments.

4. That the Executive Director is hereby directed to take the necessary steps to implement the *Manual Read Charge*.

Adopted this 26th day of October, 2017.

_____
Robert Morgan, Chair

ATTEST:

_____
Yinka Ayankoya, Secretary

Draft Motion to Approve Not Offering a Manual Read Option

NOW, THEREFORE, BE IT RESOLVED BY THE ORANGE WATER AND SEWER AUTHORITY BOARD OF DIRECTORS:

That the Board of Directors authorizes staff to proceed with implementing the AMI project without providing an option for customers to elect to have their meters read manually by OWASA instead of by an AMI meter.

AGENDA ITEM

- Process for Periodic Review of Fluoridation

PURPOSE

- To seek public input and discuss a process for periodic review of water fluoridation.

BACKGROUND

- As recommended by the US Centers for Disease Control (CDC), US Environmental Protection Agency (EPA), American Dental Association, NC Division of Public Health, Orange County Board of Health and other organizations, OWASA fluoridates its drinking water to promote dental health.

- At the March 9, 2017 meeting, following public comment and careful deliberation, the OWASA Board decided to continue fluoridating drinking water.

- On September 14, 2017, the Board asked staff to develop a recommendation for discussing a process to periodically review professional health organizations' guidance on fluoridating drinking water. The Board noted that the Durham County Board of Health reviewed fluoridation in 2012 and 2013 at the request of the City of Durham.

- Dr. Dorothy Cilenti, Interim Orange County Health Director, is aware of the community interest in fluoridation and has advised that she is very interested in considering a County-wide opportunity to discuss oral health and fluoridation in the next couple of years.

- Such a review process would include opportunities for public comment.

ACTION REQUESTED

- That the Board receive and discuss feedback from the public about the concept of a County-wide process facilitated by the Orange County Health Department regarding fluoridation of drinking water.

October 26, 2017

ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

To: Board of Directors

From: Ed Kerwin

Date: October 20, 2017

Subject: Process for Periodic Review of Fluoridation

Purpose

To seek public input and discuss a process for the periodic review of water fluoridation.

Background

In accordance with recommendations from the US Centers for Disease Control (CDC), US Environmental Protection Agency (EPA), American Dental Association, NC Division of Public Health, Orange County Board of Health and other organizations, OWASA fluoridates its drinking water to promote dental health. Since 1964, the Carrboro-Chapel Hill community's drinking water has been fluoridated (OWASA began operation in 1977). OWASA fluoridates drinking water to the level of 0.7 parts per million (ppm) as recommended by the U.S. Public Health Service. For more information: fluoridation.

At the March 9, 2017 meeting, following public comment and careful deliberation, the OWASA Board decided to continue fluoridating drinking water. The primary basis for the OWASA Board's decision to continue fluoridation is the recommendations from the agencies noted above that have the scientific data and expertise, and in some cases the statutory responsibility, to advise the public on health issues.

The OWASA Board appreciates the feedback received from those who support and those who do not support fluoridation. Understanding and appreciating the community interest in fluoridation, on September 28, 2017, Robert Morgan, Chair of the OWASA Board of Directors, announced that OWASA invites public feedback on a process for the periodic review of fluoridation at the Board's October 26, 2017 meeting at Chapel Hill Town Hall.

An overview and chronology of the fluoridation review process of the City of Durham and the Durham County Board of Health in 2012 and 2013 is attached.

Process for Periodic Review of Fluoridation

OWASA staff met with Dr. Dorothy Cilenti, Interim Orange County Health Director; Dr. Michael Day, Dental Division Director; and Kristin Prelipp, Communications Manager to

discuss future opportunities to engage the public and oral and other health experts on fluoridation of drinking water. Dr. Cilenti is aware of the community interest in fluoridation and very interested in considering a County-wide opportunity to discuss oral health and fluoridation within the next couple of years. She said they may consider doing this as part of a Healthy Carolinians of Orange County initiative. Dr. Cilenti said the matter is important to the Orange County Health Department and that she planned to further review the possibilities.

While we didn't discuss the details on how such a County-wide process may be structured, it was understood that the public will be invited to participate and that information from individuals and organizations that both support and do not support fluoridation will be included.

Staff Recommendation

Staff recommends that the Board receive and discuss feedback from the public about the concept of a County-wide process facilitated by the Orange County Health Department regarding fluoridation of drinking water.

Ed Kerwin
Executive Director

c: Dr. Dorothy Cilenti, Interim Orange County Health Director

Attachment: Fluoridation review process of the Durham City Council and the Durham County Board of Health in 2012 and 2013

Fluoridation review process of the Durham City Council and the Durham County Board of Health in 2012 and 2013
October 20, 2017

Overview

- On August 13, 2012, the Mayor of Durham asked Durham County's Board of Health for recommendations on fluoridation of drinking water.

- On October 11, 2012, the Board of Health appointed a subcommittee of four Board Members to review information received by the Board, gather additional information and make a recommendation to the full Board.

- Regular meetings of the Board of Health include a time for public comments.

- On March 14, 2013, a panel provided information on fluoridation to the Board of Health. The Board received comments from residents before the panel's presentation. The panel included representatives of the UNC School of Dentistry, NC Divisions of Water Quality and Public Health and City of Durham Department of Water Management.

- On June 13, 2013, the Board of Health unanimously approved the subcommittee's recommendation supporting fluoridation of municipal drinking water.

- On September 5, 2013, the Durham City Council held a work session to discuss the Board of Health's recommendation and received comments from three residents.

- On September 16, 2013, the Durham City Council adopted the Board of Health's recommendation. (The fluoridation item was on the consent agenda.)

Chronology

(The links below are to minutes.)

August 13, 2012: Mayor of Durham asked the Durham County Board of Health for recommendations regarding fluoridation.

September 13, 2012: Durham County Board of Health received information about fluoridation from five residents. The residents asked the Board to do due diligence in discussing and evaluating the information that was presented to them today and to make a recommendation to remove the fluoride in the drinking water in Durham County.

October 11, 2012: Board of Health appointed a 4-member fluoridation subcommittee "to review the information that the board has received and to gather any other information regarding fluoridation; then the subcommittee will make a recommendation to the board in the next 60 days."

November 8, 2012: The fluoridation subcommittee reported to the Board of Health that the subcommittee will meet on November 19, 2012 to discuss next steps.

November 19, 2012: The fluoridation subcommittee discussed information it had received and next steps.

December 13, 2012: The Board of Health received a report from the fluoridation subcommittee.

December 17, 2012: The fluoridation subcommittee agreed to plan a presentation by a panel at the March 14, 2013 meeting of the Board of Health.

January 10, 2013: The Board of Health received information and the fluoridation subcommittee's plans for the panel presentation on March 14th, and agreed to proceed.

February 14, 2013: The fluoridation subcommittee reported to the Board of Health that five people (see March 14, 2013 item) had been invited to participate in the panel presentation on March 14, 2013.

February 22, 2013: The fluoridation subcommittee discussed information to be provided to the panel and questions to be addressed by appropriate panelists.

March 14, 2013: The Board of Health met and the panel provided information on fluoridation. The panel included representatives of the UNC School of Dentistry, NC Divisions of Water Quality and Public Health and City of Durham Department of Water Management. Before the panel's presentation, the Board of Health received comments from one resident.

May 24, 2013: The Board of Health's fluoridation subcommittee considered public comments which had been received and other information, and recommended to the Board of Health that fluoridation of City of Durham water continue at current levels, as deemed effective for prevention of tooth decay and for promoting good oral health by the US Centers for Disease Control and Prevention.

June 13, 2013: After receiving comments from two residents, the Board of Health discussed and unanimously approved the fluoridation subcommittee's recommendation.

September 5, 2013: The Durham City Council held a work session including discussion of the Board of Health's report and received comments from three residents.

September 16, 2013: The Durham City Council received the Board of Health's report and adopted the Board's recommendation in support of fluoridation. The fluoridation item was on the consent agenda.

AGENDA ITEM

- Administration of Strategic Plan:
  A. Annual Review and Update of Strategic Trends and Utility Planning Issues
  B. Strategic Plan Progress Report

PURPOSE

- To provide information about long-term trends and utility planning issues and progress on the Strategic Plan Initiatives.

BACKGROUND

- The Board of Directors adopted a Strategic Plan in March 2014 and updated it in June 2016.

- The June 2016 update to the Strategic Plan stated that the *Annual Review and Update of Strategic Trends and Utility Planning Issues* report would be modified as a companion document to the Strategic Plan.

- The *Annual Review and Update of Strategic Trends and Utility Planning Issues* summarizes recent OWASA's utility trends and issues. This annual report summarizes observed trends in customer growth and demands, water supply and drinking water treatment, wastewater treatment, the reclaimed water system, environmental regulations, and technology to ensure that OWASA continues to provide high quality water, wastewater, and reclaimed water services. Staff will provide an overview of this report.

ACTION NEEDED

- No action is needed; discussion as desired by the Board.

ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

TO: Board of Directors

THROUGH: Ed Kerwin

FROM: Ruth Rouse

DATE: October 20, 2017

SUBJECT: Annual Review and Update of Strategic Trends and Utility Planning Issues

Attached for your review and discussion is the 2017 edition of the "Annual Review and Update of Strategic Trends and Utility Planning Issues" (Attachment A). This annual report to the Board of Directors summarizes observed trends in the water, wastewater, and reclaimed water systems, environmental regulations, and technology to ensure that OWASA continues to provide high quality and reliable services. This report serves as a companion document to the June 9, 2016 Strategic Plan.

We made a couple modifications to the report format this year:

- We added information to the Technology and Research section of the introductory "OWASA's Planning Environment" to include an overview of some of the reports published by national water and wastewater organizations.
- We included a new trend on our annual Water Audit.

A few main points from the report are:

- Our customers have reduced peak day drinking water demands by 36 percent since FY 1999 despite a 30 percent increase in customer accounts over that same period. Similarly, demands on our raw water supply have decreased substantially. These reduced demands result from:
    - Increased water use efficiency and conservation by our customers
    - Conservation pricing and conservation ordinances including year-round water restrictions
    - Implementation of the reclaimed water system in partnership with the University of North Carolina at Chapel Hill in 2009, which now meets approximately ten percent of the community's water needs.
- These reductions in drinking water demand – and the associated reductions in wastewater flows – help defer the need for costly expansion of the capacities of our raw water supplies,

water treatment plant, and wastewater treatment plant. More efficient use of water also helps reduce costs for energy and chemicals for water and wastewater treatment.

- Based on current demands, we believe we have sufficient raw water supply for the next few decades under most conditions, but the community will become increasingly vulnerable to drought before the expanded Quarry Reservoir is available until 2035. Our allocation of Jordan Lake water supply serves as an insurance policy to meet demands during extended droughts or operational emergencies. We will update projected water supply demands in calendar year 2017 as part of the update to the Long-Range Water Supply Plan.

- Based on current demands, we anticipate no need to expand the hydraulic capacity of the water or wastewater plant for at least the next 20 years. We will update treatment capacity demands as part of the update to the LRWSP.

At the October 26, 2017 Board meeting, we will make a brief presentation highlighting some of the trends included in this report. We look forward to your questions and comments, as well as your feedback regarding the content of the report. We will incorporate any feedback into future annual trends reports for the Board.

Ruth C. Rouse

Ruth C. Rouse, AICP
Planning and Development Manager

Attachment A: Annual Review and Update of Strategic Trends and Utility Planning Issues
Attachment B: Strategic Plan

Annual Review and Update of Strategic Trends and Utility Planning Issues

OCTOBER 2017

Orange Water and Sewer Authority

Carrboro, North Carolina

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

Table of Contents

Purpose and Summary

This report summarizes observed trends for several indicators – such as customer growth and demands, water supply and drinking water treatment, wastewater treatment, use of reclaimed water, and environmental regulations – which are important factors that influence the need for, timing, and scope of our facilities planning and investment decisions. Through the process of regularly reviewing and updating this report, we strive to anticipate and proactively prepare for change so that we are better positioned to provide high quality and reliable water, wastewater, and reclaimed water services for the long-term. Some of the key messages are:

- Our customers have reduced peak day drinking water demands by 36 percent since Fiscal Year (FY) 1999 despite a 30 percent increase in customer accounts over that same period. Similarly, demands on our raw water supply have decreased substantially. These reduced demands result from:
    - Increased water use efficiency and conservation by our customers;
    - Conservation pricing and conservation ordinances including year-round water restrictions; and
    - Implementation of the reclaimed water system in partnership with the University of North Carolina at Chapel Hill (UNC) in 2009, which now meets approximately 10 percent of the community's water needs.
- These reductions in drinking water demand – and the associated reductions in wastewater flows – help defer the need for costly expansion of the capacities of our raw water supplies, water treatment plant, and wastewater treatment plant. More efficient use of water also helps reduce costs for energy and chemicals for water supply, drinking water treatment and water distribution, and wastewater collection and treatment.
- Based on current demands, we believe we have sufficient raw water supply for the next few decades under most conditions, but the community will become increasingly vulnerable to drought before the expanded Quarry Reservoir is available around 2035. Our allocation of Jordan Lake water supply, which we can access through our mutual aid agreements with the City of Durham and Town of Cary, serves as an insurance policy to meet demands during extended droughts or operational emergencies. We will update projected water supply demands in 4th quarter calendar year (CY) 2017 as part of the update to the Long-Range Water Supply Plan (LRWSP).
- Based on current demands, we anticipate no need to expand the hydraulic capacity of the water or wastewater plant for at least the next 20 years. We will update treatment capacity demands as part of the update to the LRWSP.
- OWASA is committed to providing high quality and reliable services to our customers. We have an asset management program to evaluate our infrastructure and risks and guide our investments ongoing maintenance programs. The trends listed in this report are one mechanism to evaluate how well we meet our core mission.

Acronyms

AMI	advanced metering infrastructure
AMWA	Association of Metropolitan Water Agencies
AWWA	American Water Works Association
BG	billion gallons
CIP	Capital Improvements Program
CY	calendar year
DEQ	NC Department of Environmental Quality
EMC	NC Environmental Management Commission
EPA	US Environmental Protection Agency
FY	fiscal year (July – June)
JLP	Jordan Lake Partnership
kWh	kilowatt-hour
KWh/MG	kilowatt-hour per million gallons
lb/yr	pounds per year
LRWSP	Long-Range Water Supply Plan
LT2	Long-Term 2 Enhanced Surface Water Treatment Rule
MCL	maximum contaminant level
ME	meter equivalent
MG	million gallons
mgd	million gallons per day
NCSU	North Carolina State University
OWASA	Orange Water and Sewer Authority
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic Acid
RCW	reclaimed water
TN	total nitrogen
TP	total phosphorus
µg/l	micrograms per liter
UCMR3	Unregulated Contaminant Monitoring Rule 3
UCMR4	Unregulated Contaminant Monitoring Rule 4

UNC	University of North Carolina at Chapel Hill
WHO	World Health Organization
WSMPBA	Water and Sewer Management, Planning and Boundary Agreement
WTP	water treatment plant
WWTP	wastewater treatment plant

Background

Orange Water and Sewer Authority (OWASA) publishes this annual report to evaluate how well we are meeting our mission of providing our customers with high quality water, wastewater, and reclaimed water services through responsible and creative stewardship of the resources we manage.

This report summarizes observed trends for several indicators – such as customer growth and demands, water supply and drinking water treatment, wastewater treatment, use of reclaimed water, and environmental regulations – which are important factors that influence the need for, timing, and scope of our facilities planning and investment decisions. Thus, the information in this document is one item that shapes our Capital Improvements Program (CIP). Through the process of regularly reviewing, updating, and publishing this report, we strive to anticipate and proactively prepare for change so that we are better positioned to engage the community as we consider and decide on how best to meet service requirements for the foreseeable future.

The OWASA Board of Directors adopted a Strategic Plan in March 2014 and an update to the Strategic Plan in June 2016. The Strategic Plan identifies the key initiatives and corresponding actions OWASA will take to address the issues we believe are most important for the customers and community we serve. The June 2016 Strategic Plan stated that this Annual Review and Update of Strategic Trends and Utility Planning Issues (Strategic Trends report) would be modified to serve as a companion document to the Strategic Plan. The information provided in this report may be used to update or add initiatives to future updates of the Strategic Plan.

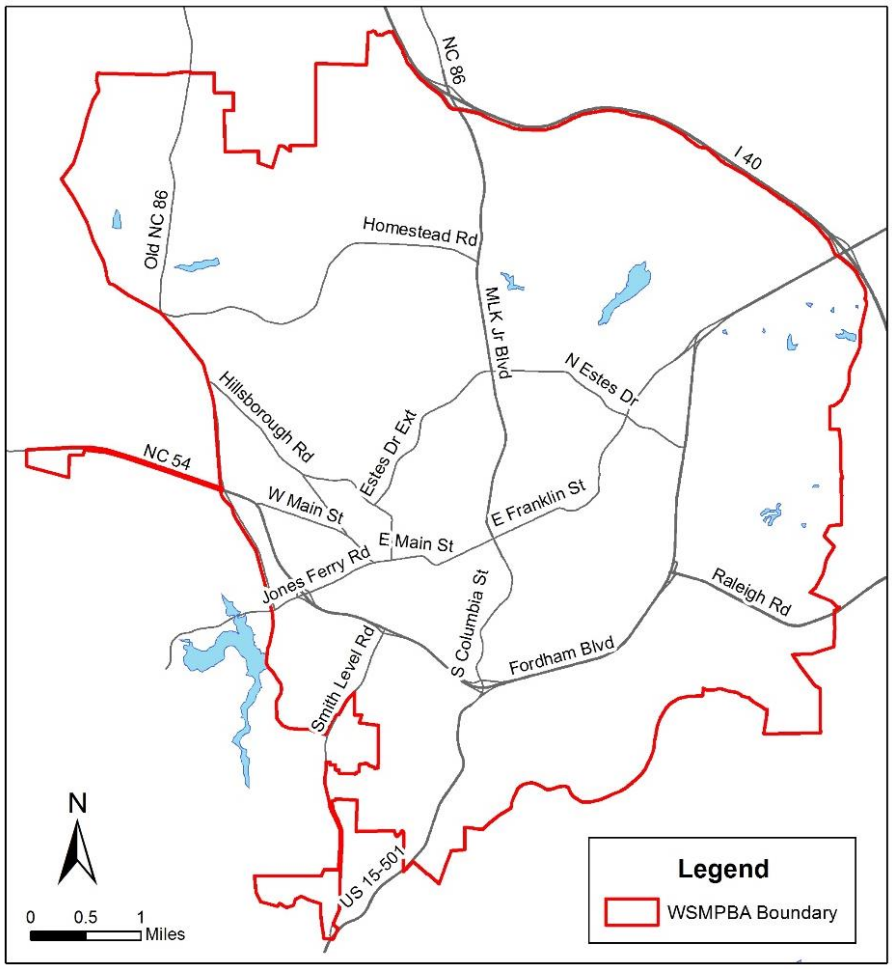
This Strategic Trends report begins with an overview of OWASA's planning environment which includes a description of those items which may impact the timing and scope of our facilities planning and investment decisions. It then includes a description of OWASA's main management areas beginning with source water protection; then raw water supply and treatment; distribution of drinking water to our customers; wastewater collection, treatment, and disposal or reuse. Each topic includes information on regulations, technology and research, energy management, links to the Strategic Plan, and follow-up actions.

OWASA's Planning Environment

This section describes the items in OWASA's planning environment that would impact the timing and scope of our facilities planning and investment decisions. Understanding these items ensures that we provide our customers with high quality and reliable water, wastewater, and reclaimed water services through responsible and creative stewardship of the resources we manage.

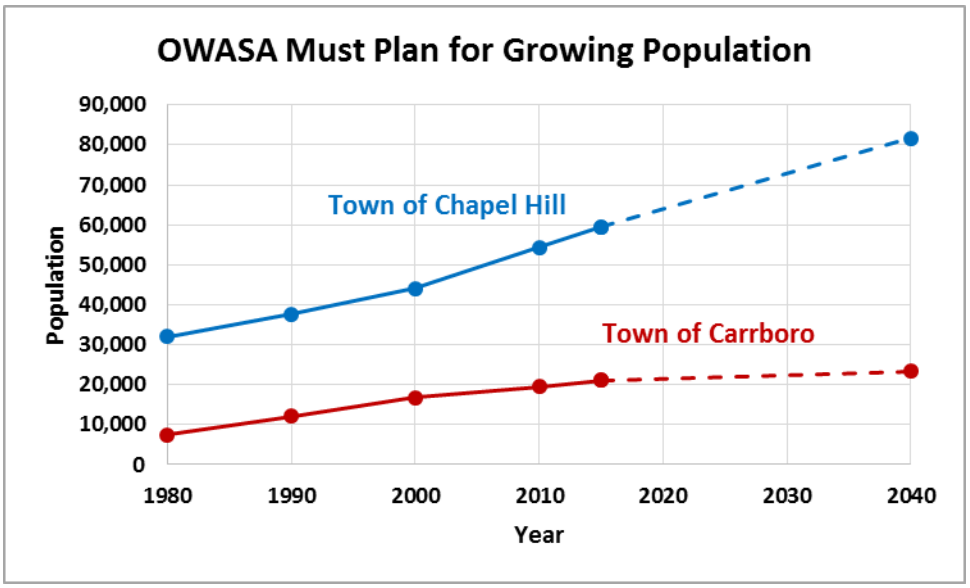
Service Area

The local governments in Orange County have developed several agreements to determine who has jurisdiction over certain areas and what areas are to be served by municipal water and sewer. These agreements help concentrate growth in compact municipal areas, preserve the rural character of the County, and limit urban sprawl. The area that OWASA can provide service to is shown in the map below and is from the Water and Sewer Management, Planning and Boundary Agreement (WSMPBA) which was adopted in 2001 and amended in 2010 and 2017. The 2017 amendments included minor changes to the boundary along Smith Level Road. If changes are made to OWASA's service area, OWASA will need to ensure its resources and infrastructure will reliably meet the demands of those new areas along with the projected development within our current service area.



Growth and Development

It is important to project when, where, and how much growth will occur, and what the subsequent demands will be on our water, wastewater, and reclaimed water services to ensure we have adequate capacity to meet the community's future needs. The graphic below illustrates past population numbers for the Towns of Carrboro and Chapel Hill as well as the 2040 projected population based on regional transportation planning completed in 2013. The Towns and Orange County, along with other communities in the Triangle area, are working together to update the projected population and job growth through 2045, and new numbers will be available for the next annual update of this Strategic Trends report.



UNC is included in Town of Chapel Hill population projections

We anticipate that growth will continue to be higher density, with redevelopment and infill projects such as the Blue Hill District (formerly Ephesus Fordham), Carolina Square, and Shelton Station, and with new development projects such as Carraway Village (formerly The Edge) and South Creek (formerly Obey Creek). Higher density development tends to result in lower per capita demands and may make better use of existing water and wastewater infrastructure. OWASA will use local government future growth information to ensure that the capacity of our water distribution system and wastewater collection system is sized appropriately.

Climate Change

While experts believe the southeastern United States will receive about the same amount of rainfall on average in the future, that rainfall will likely be provided in more severe storms and flooding events with more severe and prolonged droughts in between. This new pattern of rainfall will impact the yield of OWASA's and the region's reservoirs and the patterns of water demand including the water used for irrigation and cooling. As a result, OWASA and our utility neighbors must address the resiliency of water supply and storage, especially for periods of severe and extended droughts as well as the capacity of our reclaimed water system, which may face higher peak demands.

OWASA worked with our utility neighbors through the Jordan Lake Partnership (JLP) to develop the Triangle Regional Water Supply Plan to ensure all Partners have sufficient and reliable water supply through 2060. The JLP also contracted a regional interconnection study to evaluate the interconnection capacity of our drinking water systems and to identify needed infrastructure improvements to meet future needs. The JLP is planning to use this model to run planning scenarios to identify strategies to improve the region's resiliency to planned and unplanned water supply challenges. OWASA is updating its Long-Range Water Supply Plan (LRWSP) to ensure we have water to meet our needs through 2065.

Our climate change planning to date has focused on drought management planning and natural disaster emergency preparedness. However, high rain events could result in greater flooding of our infrastructure. While our infrastructure has been designed to meet certain flood events, the frequency of those events could increase in the future. In addition, hurricanes and other storms could damage critical infrastructure. OWASA plans for forecasted events, and coordinates emergency planning with our neighboring communities and other utility partners in North Carolina.

Climate change also has potential implications on the quality of the water in our reservoirs. With temperature change and impacts on rainfall, we could experience more frequent algal blooms in our reservoirs and potential increases in taste and odor events and cyanotoxin concentrations. (Cyanotoxins are toxins produced by blue-green algae and were responsible for the City of Toledo's "Do Not Use" warning in 2014.)

OWASA continues to monitor climate change science, and we participate in applied research projects with universities, other utilities, and other agencies where applicable, to proactively plan to meet the community's water and wastewater needs in the face of increasing climate variability.

Regulations

OWASA monitors the regulatory arena closely so that we proactively ensure we can meet all legal requirements applicable to the provision of water, wastewater, and reclaimed water services to our customers. Many of these potential regulations would impact our drinking water supplies and treatment facilities. Potential regulations are included for trends where they are applicable in this Strategic Trends report.

Technology and Research

OWASA strives to stay informed about advancements in technology and research, their capital and operating costs, and ability to better position us to provide services to our customers in a more sustainable manner. OWASA often partners with local university researchers, professional associations, and our consultants to obtain information on how emerging technologies may apply specifically to OWASA. Technologies that OWASA is monitoring are described in applicable sections with this Strategic Trends report. General information on our use of university research, professional associations, and consultants is provided below.

University Partnerships

OWASA often partners with our local universities to evaluate emerging technologies. We have provided water and wastewater samples to local universities to test emerging technologies. We have supported university classes by providing data. One effective use of university research is through our membership in the Urban Water Consortium, a group of twelve of the largest water utilities in the state. Together these twelve utilities pool their funds to bridge our research needs with university expertise. Some of the current research funded through this consortium is included in applicable sections of this report.

Professional Associations

OWASA is a member of various water and wastewater organizations, and our employees review their publications and attend their conferences. Staff regularly meet with other utility staff locally and throughout the southeast region through these memberships; these contacts with other utility staff enable us to stay abreast of the latest technologies that work in our region to better meet our water, wastewater, and reclaimed water needs. Some of the industry trends noted by attending these conferences and interacting with staff from other utilities are:

- Renewal and replacement of aging infrastructure
- Conservation and reclaimed water to meet the needs of growing populations with existing water resources
- Public understanding of the value of water
- The need to attract, train, and retain staff
- Excellence in customer service and public awareness of water issues

Several of the national organizations develop annual reports that often reiterate these industry trends and that we use to evaluate OWASA's practices:

- AWWA's State of the Industry Report – this report is based on an annual survey of utilities to identify and track challenges facing the water industry, provide data and analysis to support water professionals, and inform decision makers and the public of challenges facing the water industry
- Association of Metropolitan Water Agencies (AMWA) Annual Report - this report is focused on regulatory and security issues, but AMWA also supports scientific research, collaboration, and sustainable utility practices
- The National Association of Clean Water Agencies, Water Environment Federation and Water Environment Research Foundation Water Resources Utility of the Future – this report was first developed in 2013 to recognize that water and wastewater utilities were recognizing themselves as resource managers rather than waste managers. One trend that the latest Utility of the Future recognizes is that utilities in the United States are beginning to expand their use of technologies used in other countries. The latest report also notes how partnerships between utilities, consulting engineers, government, and finance are used to move utilities forward

The Water Research Foundation also maintains a website that summarizes current research on topics important to water utilities including cyanotoxins, fluoride, and taste and odor.

The U.S. Environmental Protection Agency (EPA) and six major water and wastewater associations developed a Primer on Effective Utility Management which was written to guide utility managers to make effective changes to achieve excellence in meeting their core missions.

Engineering Consultants

OWASA hires engineering firms to plan, design, and construct our infrastructure. These engineering firms design and construct similar infrastructure throughout the region and nation. We hire them for their expertise; based on our specific requirements and circumstances and their experiences with different technologies, they recommend technologies that will best meet our needs.

Other Important Utility Planning Issues

This section includes a brief overview of other utility planning issues in which OWASA is currently engaged which support our mission and the values included in the Strategic Plan. This section is not intended to be a comprehensive overview of utility planning issues.

Energy Management

Strategic Initiative Number 4 in OWASA's Strategic Plan is to implement an Energy Management Program. Our use of energy to treat and deliver drinking water, wastewater, and reclaimed water services not only has an impact on our costs and the environment, but on the resiliency of our operations. The OWASA Board of Directors has set the following goals and objectives for energy management:

1. Reduce use of purchased electricity by 35 percent by the end of Calendar Year (CY) 2020 compared to CY 2010 baseline;
2. Reduce use of purchased natural gas by 5 percent by CY 2020 compared to CY 2010 baseline;
3. Beneficially use all wastewater treatment plant (WWTP) biogas by 2022, provided the preferred strategy is projected to have a positive payback within the expected useful life of the required equipment;
4. Formally engage local governments and partners in discussion about potential development of a biogas-to-energy project at the Mason Farm WWTP; and
5. Seek proposals for third-party development of renewable energy projects on OWASA property.

This Strategic Trends report includes information on electricity and natural gas use for OWASA's operations for trends where it is appropriate. We are not tracking vehicle fuel use by functional area and are not reporting that energy use in this Strategic Trends report. For further information on OWASA's Energy Management Program, please see our website.

OWASA staff is staying abreast of changes in the marketplace and regulations that impact the financial viability of certain energy management strategies. For example, a recent bill passed in North Carolina (Session Law 2017-192) that changes how solar projects will be developed in the State.

Safety

Safety of our staff, our customers, and the environment is important to the OWASA Board of Directors, staff leadership, and individual staff members. Much of the information contained in this Strategic

Trends report helps us make sure that we are providing the community with safe drinking water and protecting both public health and the environment through proper conveyance, treatment, and disposal of wastewater.

Staff continually evaluate methods to improve our processes. We routinely perform after action reviews following small and large events that did not go as planned. The after action review process identifies what happened, what we set out to accomplish, what worked well, and where we can improve. As an example of this process, OWASA recently hired a consultant to perform a reliability and risk assessment on our water and wastewater treatment plants. This risk assessment is the result of the internal after action reviews that OWASA conducted following the February 2017 water emergency.

Safety is the number one priority of every member of the OWASA team. We are dedicated to reducing injuries, accidents and ensuring compliance. We achieve this by fostering a culture focused on awareness and safe work methods and by providing high-quality training, comprehensive workplace evaluation and emergency response.

Source Water Protection

Description

Our community has a long history of taking progressive actions to ensure the health and safety of our drinking water supplies. Since it began operations in 1977, OWASA has understood that to protect the water source, you must protect the watershed, and we have been actively involved in a wide range of watershed protection efforts, such as:

- Limits on the extension of water/sewer service into the Cane Creek and University Lake watersheds;
- Support for stringent zoning and land use controls;
- Restrictions on in-lake recreational activities;
- Financial support for agricultural Best Management Practices;
- Special technical studies and educational activities; and
- **Land acquisition through the strategic purchase of property or conservation easements in areas determined to be critical for water quality protection**.

It is the later of these efforts which is the focus of this section of the report.

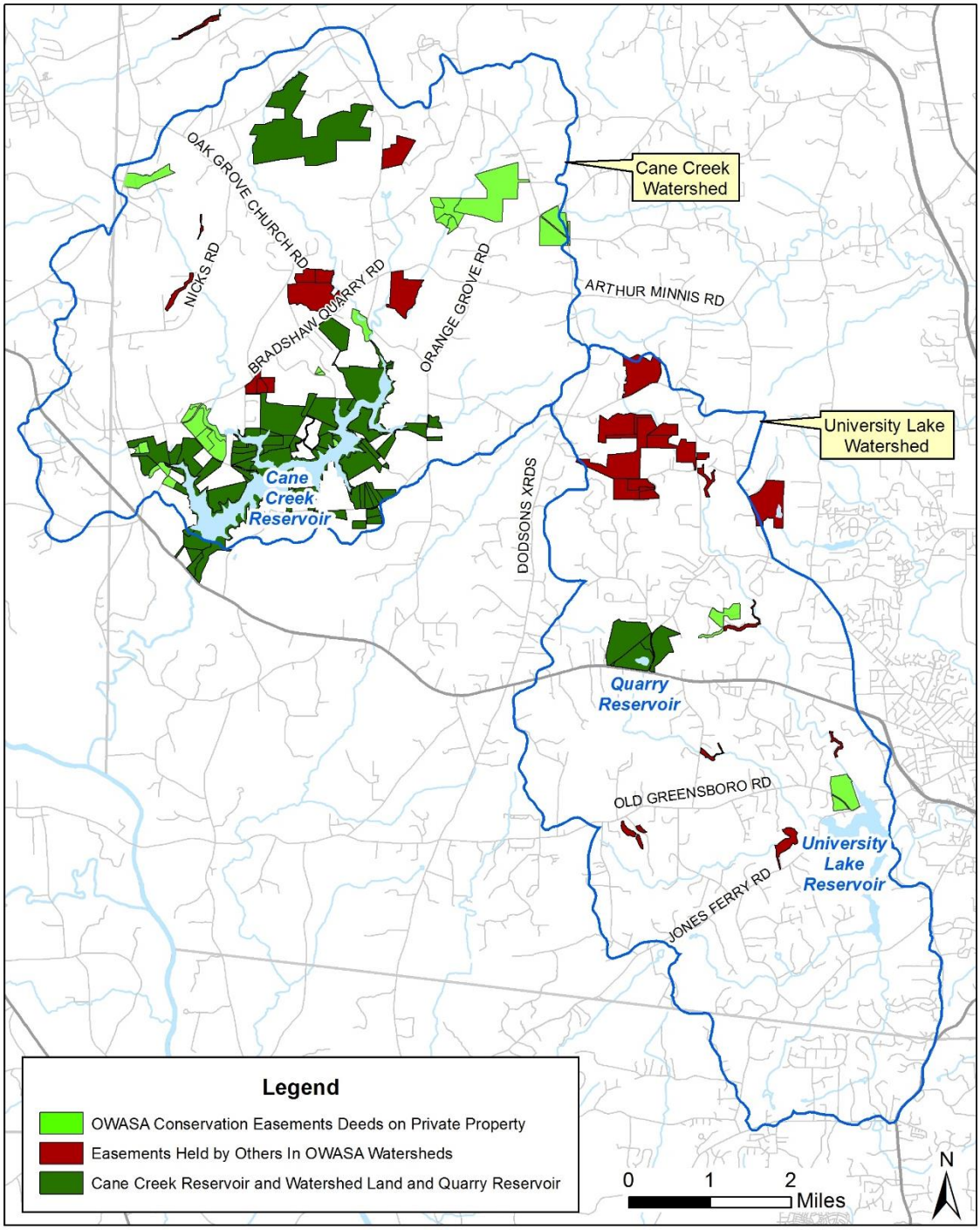
Land acquisition was among the options evaluated in the University Lake watershed management study and plan commissioned in the late 1980s. Water quality modeling indicated that permanently protecting 2,900 acres (approximately 15 percent) of the watershed would have only slight water quality benefits and not justify the multi-million-dollar cost, but that selected land acquisition in critical areas of the watershed may be appropriate. This recommendation was later confirmed in a follow-up analysis, which found that land acquisition would probably not be effective, but a possible exception may apply to undeveloped land very near the lake, and that conservation easements along stream buffers would be particularly valuable near the downstream ends of tributaries as they approach University Lake.

Based on these technical recommendations, OWASA elected not to pursue a program of land or easement acquisition in the University Lake watershed, but to consider land preservation opportunities on a case-by-case basis. In 2006, OWASA purchased a 73-acre property along Morgan Creek immediately upstream of University Lake (with the help of a $1.2 million NC Clean Water Management Trust Fund grant). This property was placed under a permanent restrictive conservation easement that protects all riparian areas and severely restricts future development; subdivided into two large tracts; and re-sold on the open market in 2011 – with all restrictions in place.

The primary recommendations in a 1996 study of the Cane Creek Reservoir watershed included large lot (5 acres or greater) residential re-zoning and the permanent protection of 1,265 additional acres of watershed land either through fee simple purchase or conservation easements. OWASA adopted those recommendations as goals for the protection of Cane Creek Reservoir and subsequently protected an estimated 1,075 acres of additional Cane Creek watershed land through purchase or conservation easements. Since 1997, Orange County's Land Legacy Program also acquired protective conservation

easements on an additional 678 acres in the Cane Creek watershed. Together, OWASA and Orange County's land protection efforts have exceeded OWASA's original goal. OWASA and Orange County staff continue to work closely in coordinating the needs of our respective programs as the County protects additional land in the watershed and elsewhere.

Protected Land in OWASA's Watersheds



Regulations

- In accordance with direction from EPA, the North Carolina Department of Environmental Quality (DEQ) is developing draft nutrient criteria for surface waters in the state. If nutrient levels in one or more of our water supply reservoirs, Morgan Creek, and/or other surface waters in our area exceed future nutrient-related water quality limits, we and/or other parties could be required to take action to reduce the discharge of nutrients into those water bodies. The technical, economic, and environmental feasibility of complying with such requirements can only be determined once proposed criteria are issued.
- The North Carolina General Assembly ratified House Bill 894 to improve Source Water Protection in August 2014 in response to the accidental release of 4-methylcyclohexanemethanol in West Virginia and the coal ash spills in North Carolina. Under this bill, the North Carolina Environmental Management Commission (EMC) must adopt rules that will require all public water supplies which use surface water to develop a source water protection plan. OWASA is participating in this rule-making process, and we are well positioned to develop the plan.

Technology and Research

- The City of High Point employs artificial mixing in its two water supply reservoirs City Lake and Oak Hollow Lake to improve treatability of their drinking water. The Town of Cary recently began mixing Jordan Lake water near its intake. Current research suggests this technology may work well for some smaller reservoirs and lake areas near intake structure. Researchers at North Carolina State University (NCSU) are evaluating the effectiveness of artificial mixing in Piedmont reservoirs accounting for factors such as depth, temperature, wind, and nutrient concentrations. OWASA supports this research and is providing data from University Lake as a control (do not employ artificial mixing) for the study. This study will help staff evaluate whether in-lake mixing may reduce algal blooms and the resulting increases in taste and odor events and cyanotoxin concentrations.
- The 2016 General Assembly directed the UNC Collaboratory to evaluate water quality and nutrient management strategies in the Jordan and Falls Lake watersheds. These studies could result in new management strategies in the Jordan Lake watershed which could impact OWASA operations. Staff stay updated on the work of the Collaboratory and have provided data to some of the researchers.

Energy Management

Energy use to manage OWASA's lands is minimal and consists of fuel needed for travel and equipment to manage the land.

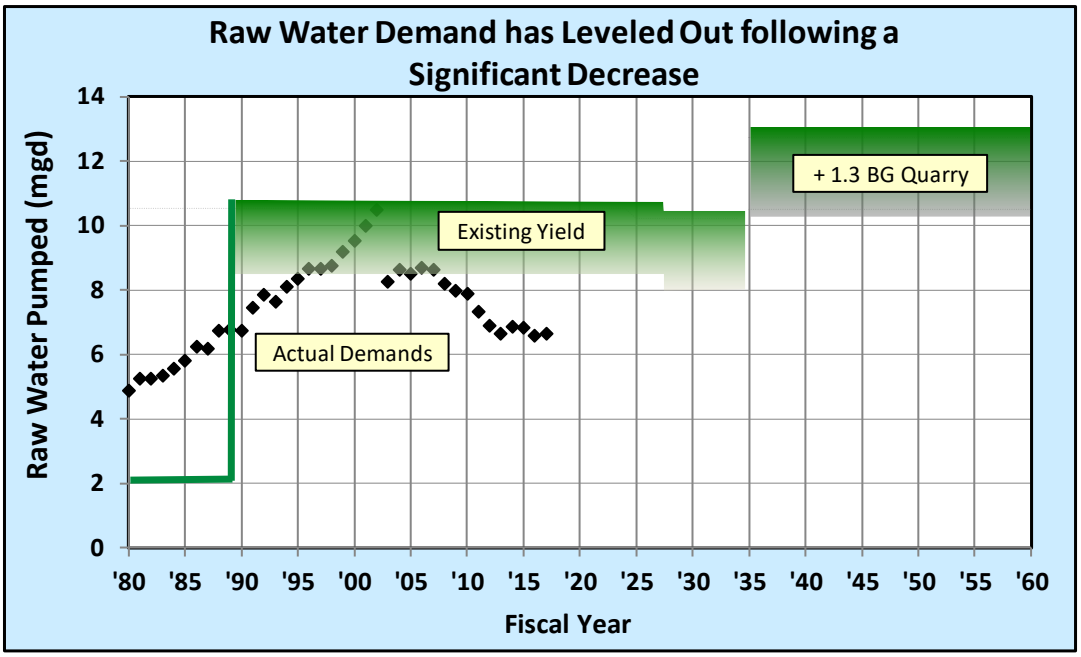
Strategic Plan Elements

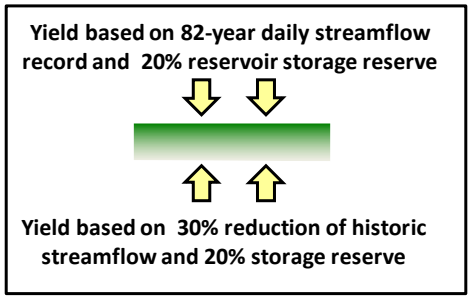
Strategic Initiative 6 includes a goal that states "Land assets provide the expected value to fulfill OWASA's mission and the assets are effectively managed". Forest lands owned by OWASA in our water supply watersheds could be managed in the future to protect water quality and meet other objectives.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Since OWASA met its watershed protection goals, it will not seek additional land conservation. However, it will continue to evaluate cost-effective land acquisition opportunities through conservation easements or purchase when available.	Ongoing	X	
2. Inspect conservation easements on private land to make sure owners are following the terms of the easement	Annually		X
3. Develop Source Water Protection Plan when required	Currently due 1/1/2020	X	
4. Evaluate data from NCSU studies when completed and identify any follow up steps or recommendations for future.	CY 2018		X

Raw Water Supply and Long-Range Water Supply Plan





Future demands are shown per LRWSP Appendix II, Attachment 4, rev 8/30/2011; these demands are being reassessed as part of the ongoing LRWSP update.

Description: This trend evaluates the supply (reliable yield) of our locally-owned upland water sources – Cane Creek Reservoir, University Lake, and the Quarry Reservoir – and historic raw water demands. (Since we do not have permanent facilities and/or agreements in place to access Jordan Lake, the above graph does not include our Level I Jordan Lake water storage allocation of about 5 million gallons per day (mgd). We can access this allocation through Town of Cary and City of Durham on a limited, emergency basis.

Key Observations:

- The annual average-day amount of water we pumped from reservoirs has declined substantially since peaking in FY 2002.
- Annual average-day raw water demands are now at the same level they were in the early-1990s, shortly after Cane Creek Reservoir was placed into service. This has occurred despite over a 60 percent increase in the number of customer accounts during that period.

- Key factors in the reduction in water withdrawal rates include:
    - Increased water use efficiency and conservation by our customers;
    - Conservation pricing and conservation ordinances, including year-round restrictions;
    - Implementation of a process water recycling system at the drinking water treatment plant (2002), which reduced annual average-day raw water withdrawals by about seven percent;
    - Implementation of the reclaimed water system in partnership with UNC (2009), which now meets about ten percent of the community's annual average-day water needs.
- OWASA is beginning the process to update the LRWSP. One of the first tasks will be to develop future raw water demand projections. We anticipate that OWASA's current and planned locally-controlled water supply sources will meet most customer demands through the next thirty to forty years. However, we will face an increasing risk of shortfall, particularly during extended droughts, between now and the time the expanded Quarry Reservoir is online around 2035.
- We anticipate that Jordan Lake, an alternative source, and/or additional demand management measures are expected to be needed to reduce risk to acceptable levels, particularly between now and the time the expanded Quarry Reservoir is placed into service.

Regulations

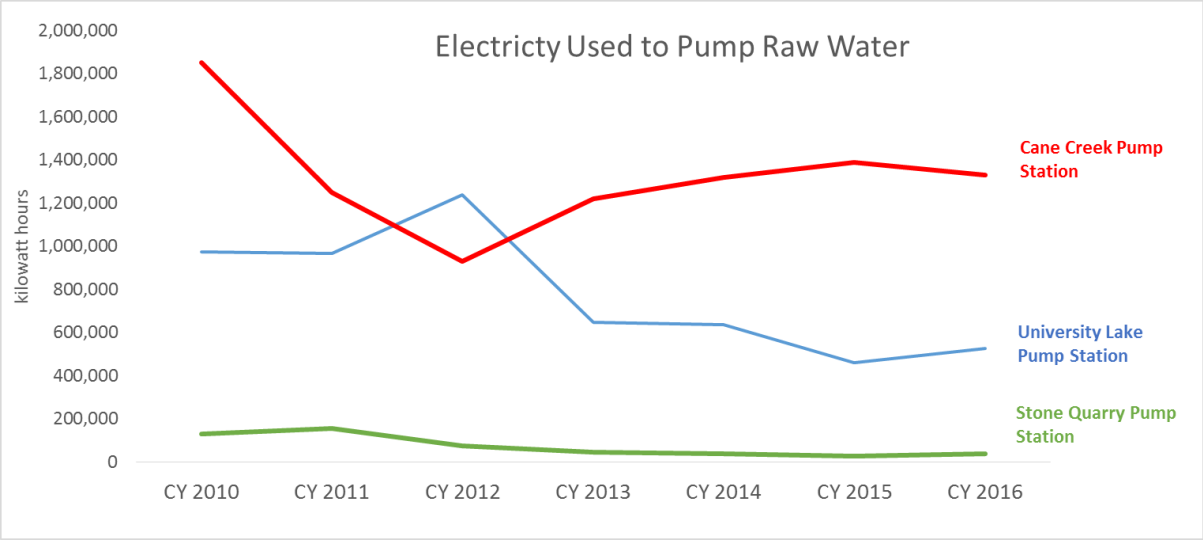
- The Long Term 2 Enhanced Surface Water Treatment Rule (LT2) builds upon the 1996 amendment to the federal Safe Drinking Water Act to strengthen protection against microbial contaminants, especially *Cryptosporidium*. OWASA completed the first round of monitoring for *Cryptosporidium* and *E. coli* in our source waters in 2009. As a result of this monitoring, OWASA was placed in the lowest treatment category, which requires no additional treatment. Staff completed the second round of two years of monthly monitoring in August 2017. Based on the round 2 results, OWASA remains in the lowest treatment category and will not be required to provide additional filtration treatment.
- OWASA follows developments regarding pharmaceuticals and personal care products in drinking water, wastewater, and reclaimed water. These products enter wastewater systems through excretion, disposal of unused medicine in sinks or toilets, and personal care products washed from skin and hair. They can also be present in runoff from livestock operations. Cane Creek Reservoir and University Lake watersheds are highly protected, and no treated municipal or industrial wastewater is discharged within our local water supply watersheds. However, there are livestock operations and private septic systems in both watersheds. A 2007 study by the U.S. Geological Survey of local untreated (or raw) water sources including Cane Creek Reservoir and University Lake tested for pharmaceuticals. In this study, one pharmaceutical (acetaminophen) was detected in one sample from Cane Creek Reservoir; all other results were below the detectable levels. OWASA does participate in EPA monitoring efforts of unregulated contaminants. This tool is used to improve drinking water quality standards by collecting data on compounds that are suspected to be present in drinking water, but do not have health-based standards set under the Safe Drinking Water Act. Pharmaceuticals and personal care products have not been included in this program to date, and there are no federal requirements for them.

Technology and Research

OWASA is working with researchers at NCSU to monitor cyanotoxin trends in both reservoirs using a method that integrates cyantoxin levels over two to four week periods of time. This method allows for constant monitoring of cyantoxin trends at the intake structures and will provide valuable baseline data on the cyanotoxin concentrations coming into the plant. This work is being coordinated with the work described in the Source Water Protection technology section above. Together these efforts will provide OWASA with valuable information about the frequency and concentration of cyanotoxins and potentially the conditions in our lake where they may be a concern. Occurrence and abundance data for algae and cyanobacteria, paired with grab sample data for cyanotoxins and removal through the treatment process will inform future treatment technology enhancements.

Energy Use

As shown in the graphic below, total kilowatt-hours (kWh) of electricity used to pump our raw water to the treatment plant has decreased by 36 percent since 2010. As shown in the graphic at the beginning of this section, the community's raw water demand has decreased which impacts the amount of pumping and electricity required to meet water supply needs. In addition, we installed a new, low-flow pump and variable speed drive pump at the University Lake Pump Station which enables us to better optimize system-wide pumping across a wide range of demand conditions.



Strategic Plan Elements

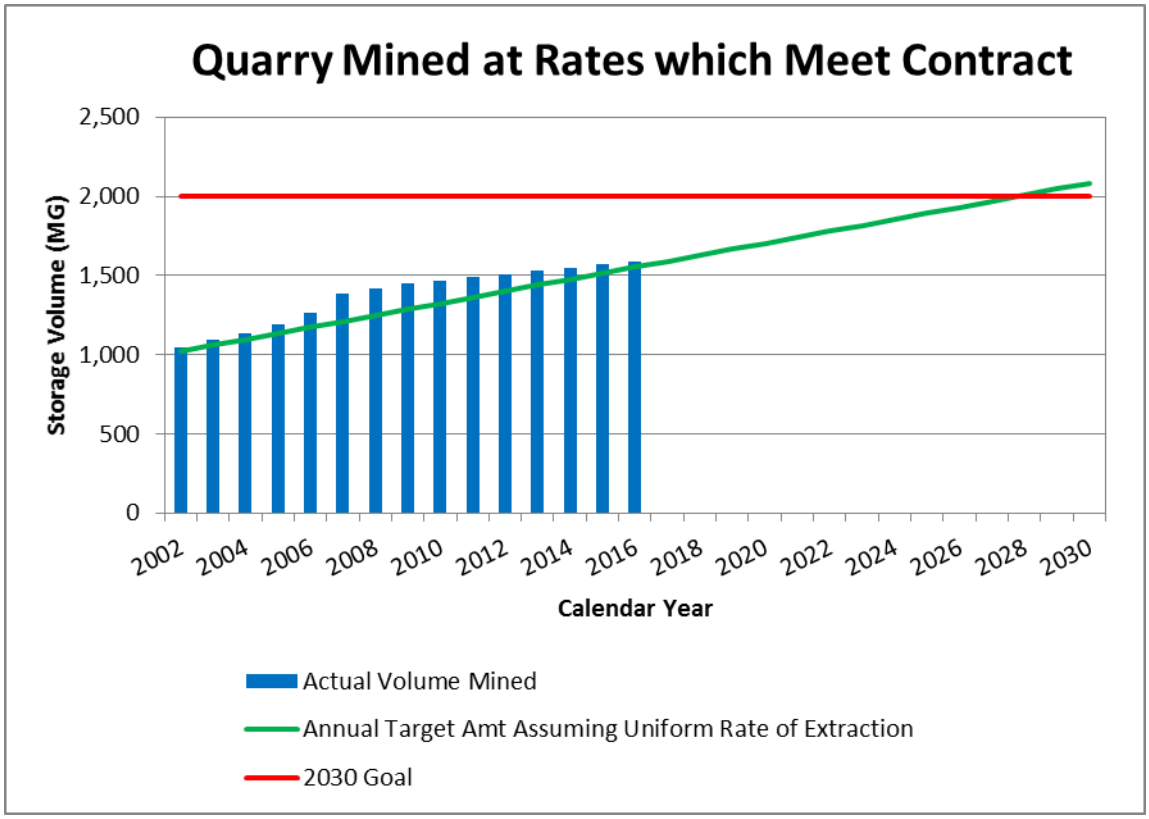
This trend is directly related to updating the LRWSP, Strategic Initiative 1. One of the first steps to update the LRWSP will be to project future water demands. The projected future demands will be compared to OWASA's estimated reliable yield to determine if any new sources of water are required for our long term needs. Updating the LRWSP will also engage the community (Strategic Initiative 2), and the technology of advanced metering infrastructure (AMI, Strategic Initiative 5) may help detect and address leaks sooner which would reduce raw water demand. It also is related to Strategic Initiative 3 in

that we want to invest in any new water supply at the right time to sustain the community's drinking water supply.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Evaluate assumptions used to estimate reservoir yield and projected demands during the planned update of the LRWSP, which is scheduled to be completed in CY 2019. In future years, update calculations when warranted (e.g., when new drought of record occurs [impacts yield], service area boundaries change, local governments or UNC revise growth projections).	4th Qtr. CY 2017 and review when warranted thereafter	X (as part of LRWSP update)	
2. Continue to proactively plan and account for uncertainty, including increasing climate variability, through a diversified water supply and demand management portfolio.	Ongoing (Climate change assessment for OWASA now underway by U. of South Carolina PhD student and advisor)	X (as part of LRWSP update)	
3. Continue to pursue cost-effective ways to access OWASA's Jordan Lake allocation in partnership with neighboring utilities.	Ongoing (Participated in Jordan Lake West Facilities Feasibility Study in 2015)	X	
4. Once we have a better understanding of the potential cost to ensure access to our Jordan Lake water allocation, review and reconsider the advantages and disadvantages of other feasible supply and demand management alternatives as part of update of the LRWSP.	CY 2018	X (as part of LRWSP update)	
5. Evaluate data from NCSU studies when completed and identify any follow up steps or recommendations.	CY 2018		X
6. Identify potential energy savings opportunities for raw water pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	

Quarry Reservoir Storage Volume



Description: In accordance with an agreement with OWASA, Martin Marietta (formerly American Stone Company) is mining rock from OWASA-owned land adjacent to our Quarry Reservoir. Per that agreement and the requirements of Orange County's Special Use Permit that authorized expansion of the quarry, mining operations must cease by 2030, after which OWASA will begin to fill the expanded quarry with water. Martin Marietta is required to remove enough stone to ensure that the expanded quarry (including OWASA's existing Quarry Reservoir at 0.2 billion gallons (BG) will store at least 2.2 BG of water. This trend evaluates whether the quarry is being mined at rates which will meet that minimum water storage capacity requirement.

Key Observations:

- The quarry is being mined at rates which meet or exceed the contractual requirements.

Regulations

There are no regulations to report for the quarry. However, OWASA will perform microbial monitoring on the expanded Quarry Reservoir as soon as it is put into service, and DEQ may need to approve it as a water supply source.

Technology and Research

There are no updates in technology to report for the quarry.

Energy Management

The existing Quarry Reservoir is used only during extreme droughts or other emergencies. We periodically test the pumps to ensure they are ready in time of need. As a result, our energy use at the Quarry Reservoir is negligible (see Raw Water Supply and Long-Range Water Supply Plan trend).

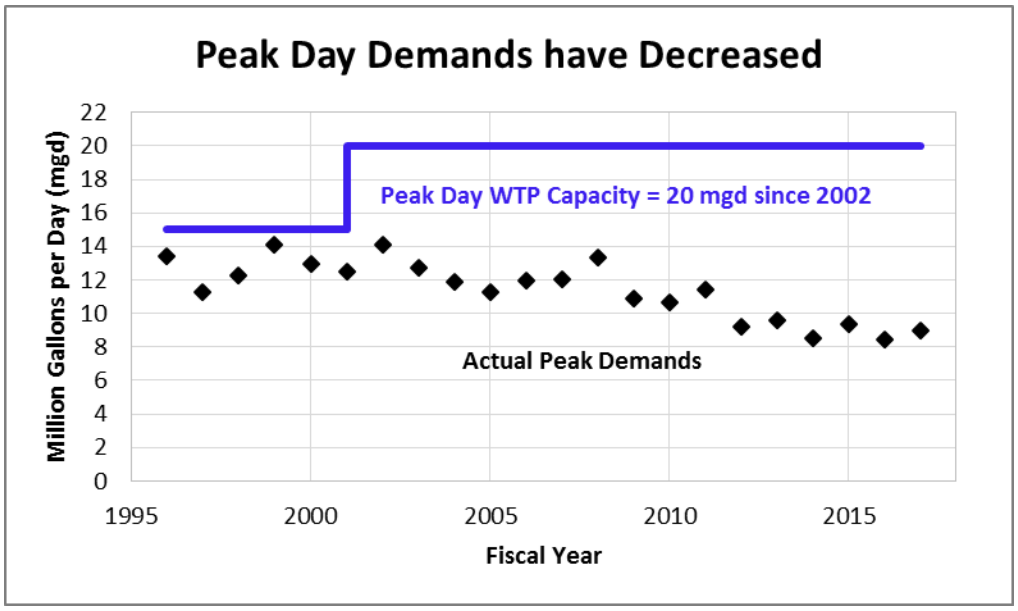
Strategic Plan Elements

The Quarry Reservoir is an essential part of OWASA's water supply portfolio and is tied to Strategic Initiative 1, "Provide reliable and high quality supply of water for the next 50 years".

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor the annual rate of rock excavation at the quarry to ensure contractual requirements are met.	Annual		X
2. Maintain and follow the Quarry Reservoir implementation checklist in order to ensure timely implementation of the Quarry Reservoir water storage project once mining ceases in 2030.	Ongoing		X
3. As part of LRWSP update, evaluate the benefits and costs of various Quarry Reservoir alternatives (e.g., developing permanent pump station to withdraw deeper water).	CY 2018	X (as part of LRWSP update)	

Water Treatment Plant: Peak-Day Drinking Water Demands and LRWSP



Description: This trend evaluates peak-day drinking water demands and compares those demands to the 20 mgd rated capacity of the Jones Ferry Road Water Treatment Plant (WTP).

Key Observations:

- Since FY 1999, the year with the highest peak-day demand, peak-day drinking water demands have declined by 36 percent despite a 30 percent increase in customer accounts over that same period.
- This decline has resulted from the following primary factors: (1) our customers are using water more efficiently, (2) we have adopted conservation pricing and conservation ordinances including year-round water use restrictions, and (3) since March 2009, reclaimed water has been used instead of drinking water to meet certain non-drinking water needs at several UNC facilities that have high summer season demands (cooling towers and irrigation).
- OWASA is beginning the process to update the LRWSP. One of the first tasks will be to develop future raw water demand projections which will be used to estimate future drinking water demands and treatment capacity requirements. We anticipate that the Jones Ferry Road WTP has adequate capacity to meet projected peak-day drinking water demands for at least the next 20 years.

(NOTE: The observations presented above assume that the reclaimed water system is in service throughout the peak-day demand season. Peak-day drinking water demands would be considerably greater if the reclaimed water system is out-of-service.)

Regulations

- The 1996 amendments to the federal Safe Drinking Water Act require that monitoring be completed for a list of unregulated contaminants every five years. EPA will use the data collected to determine if any of these contaminants should be regulated. In May 2012, EPA published the rule to complete the third round of this monitoring (UCMR3); monitoring was staggered among facilities and all monitoring was completed by December 2015 with all results reported to EPA by summer 2016. OWASA participated in the Assessment Monitoring of 21 contaminants under the UCMR3 and completed monitoring in August 2014. Some larger utilities also monitored other emerging contaminants such as human and veterinary hormones. OWASA UCMR3 monitoring consistently detected the following three unregulated contaminants: Chromium-6, Strontium, and Chlorate (see next bullets). In December, 2016 the EPA published the rule for the 4th round of this monitoring (UCMR4) and will require monitoring for 30 parameters including cyanotoxins, pesticides, and disinfection by-products. UCMR4 monitoring will occur between 2018 and 2020. OWASA will begin monitoring in August 2019.
- EPA has set the maximum contaminant level (MCL) of total chromium (i.e., all forms of chromium) at 100 µg/L but has not yet published a drinking water standard for Chromium-6. The State of California adopted a Chromium-6 MCL of 10 µg/L, which became effective on July 1, 2014; but on May 31, 2017 the Superior Court of Sacramento County issued a judgment invalidating the MCL and ordering the State to adopt a new MCL. During the UCMR3, OWASA's monitoring for Chromium-6 detected levels between < 0.03 - 0.06 µg/L, which are well below the now invalid California standard.
- EPA has not yet published a drinking water standard for Strontium, but has established a health advisory level of 1,500 µg/L. A health advisory is a non-enforceable, non-regulatory federal guidance which describes the concentration which can be consumed with little or no risk to health. OWASA's monitoring for Strontium detected levels between 53 - 75 µg/L, well under the health advisory level.
- EPA has not yet published a drinking water standard for Chlorate. The health advisory for Chlorate is 210 µg/L. OWASA's monitoring for Chlorate during UCMR3 detected levels between 160 – 650 µg/L. The State of California has not set an MCL for Chlorate but has set a notification level of 800 µg/L. The World Health Organization (WHO) guideline for Chlorate is 700 µg/L. Chlorate is known to occur in drinking water as a result of the disinfection process and as a result of sodium hypochlorite (bleach) degradation. Concentration, long storage times, and temperature all contribute to the degradation of sodium hypochlorite. Following UCMR3, OWASA changed the concentration and reduced storage times of our bulk sodium hypochlorite. OWASA completed a two-year study to test the Chlorate levels of our treated drinking water leaving the WTP and in the distribution system quarterly since implementing these changes and Chlorate levels have decreased by an average of 64 percent compared to levels measured as part of UCMR3. OWASA will continue to follow this issue to ensure its drinking water continues to be safe for its customers.
- EPA has not yet published a drinking water standard for Perchlorate, but published a notice of a draft approach document to establish a standard in September 2017; based on litigation involving the Natural Resources Defense Council, there is a court-ordered deadline to have a standard by

December 2019. The EPA health advisory for Perchlorate is 15 µg/L, effective October 2008, and California adopted a standard of 6 µg/L, effective October 2007. Massachusetts adopted a drinking water standard of 2 µg/L. OWASA's monitoring detected Perchlorate at a concentration of 0.33 µg/L in the finished water, well below the advisory level and California and Massachusetts standards.

- In 2016, EPA published new health advisories for Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) of 0.07 µg/L as a lifetime concentration for a combined concentration of PFOA and PFOS. This level of 0.07 µg/L was set to protect the most sensitive populations over a life time of exposure to the two contaminants. OWASA monitored for these substances as part of UCMR3; PFOA concentrations ranged from <0.02 µg/L to 0.03 µg/L, and PFOS was not detected.
- OWASA has historically met all disinfection by-product criteria applicable to finished drinking water provided to our customers. Monitoring data indicates that we should continue to meet any criteria developed for disinfection by-products. Additionally, currently unregulated disinfection by-products will be included in UCMR4.
- Cyanotoxins are toxins produced by blue-green algae (i.e., cyanobacteria) under certain conditions. These toxins can be harmful to the environment, animals, and human health; one was responsible for the City of Toledo's "Do Not Use" warning in summer 2014. In June 2015, EPA issued health advisories for two cyanotoxins: microcystin (1.6 micrograms per liter [µg/L] for children 6 and up and adults and 0.3 µg/L for children less than 6 years old) and cylindrospermopsin (3.0 µg/L for children 6 and up and adults and 0.7 µg/L for children less than 6 years old). Establishing a monitoring program and benchmarks for when source and/or finished water should be analyzed for toxins provides a solid foundation for a cyanotoxin management approach. OWASA has proactively been monitoring algal cyanotoxins since 2007 in our finished drinking water using a contract laboratory when our blue-green algal counts rise above 100,000 units/mL in University Lake or Cane Creek Reservoir. Additionally, beginning in the summer of 2016 staff began monitoring cyanotoxin levels at the intakes and through the treatment process on a weekly basis to gather baseline data on occurrence and removal. To date, OWASA has not exceeded the health advisory levels in our finished drinking water. OWASA has never detected cylindrospermopsin; microcystin was detected at a level of 0.2 µg/L on one occasion. In addition, OWASA also monitors for anatoxin-a (detected on two occasions) and saxitoxin (never detected). Staff will continue to evaluate algal toxins (additional information provided in Treatment Technology section).

Technology and Research

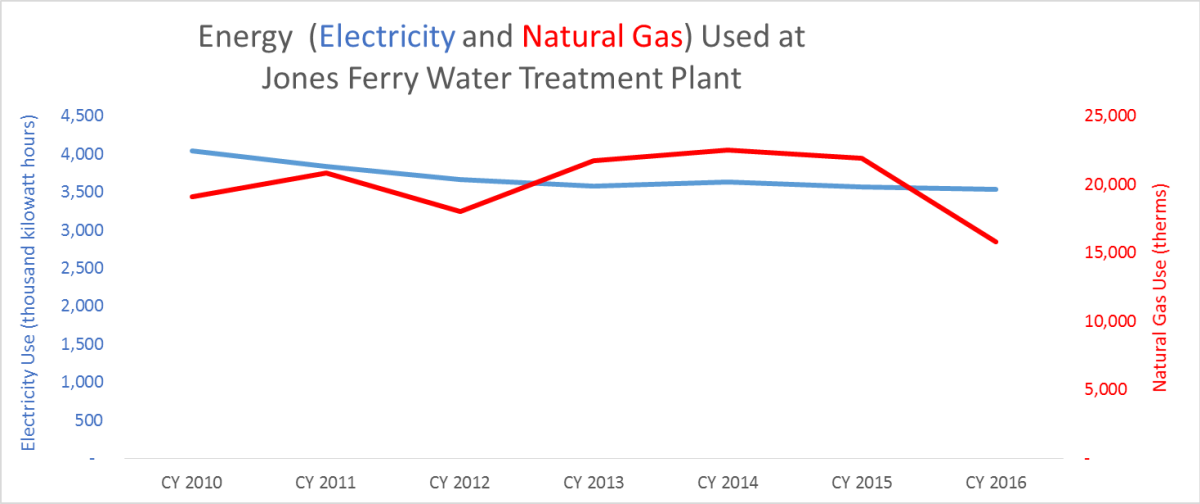
- OWASA evaluates the treatment technologies we have at our water plant to ensure we can meet any potential upcoming standards with current treatment technologies. OWASA can meet most of the potential standards discussed in the Regulations section above. Activated carbon, ozone, and membrane technologies have been found effective at removing cyanotoxins, and we currently use activated carbon in our treatment process, which is currently effective at removing our cyanotoxins. Since summer 2016, staff has been performing in-house monitoring for cyanotoxin levels in the raw water and throughout the treatment process; eliminating the 1-week lag between collection and

results when using a contract laboratory. Staff continues to follow on-going research on this topic to ensure safe drinking water for our customers.

- Staff at the WTP periodically evaluate the chemicals we use at the plant to ensure we are using the best available in terms of meeting our treatment goals in the most sustainable manner as well as to ensure that we do not foresee shortages in chemicals we use which could impact treatment or their price. At this time, staff believe we are using the correct blend of chemicals and no shortages are foreseen in their supply.

Energy Management

Since 2010, our electricity use at the Jones Ferry Water Treatment Plant (WTP) has decreased by about 13 percent. This is in large part thanks to the conservation and efficiency of our customers, as well as UNC's use of reclaimed water. Natural gas is used at the WTP to heat buildings, and our use of natural gas is largely driven by weather. The use of natural gas (therms) was about 17 percent lower in 2016 than it was in 2010, largely attributable to weather and operational changes.



OWASA recently installed power monitors at several locations within the WTP to learn which processes use the most energy and identify areas where we may be able to reduce our energy use. We have just begun to collect this data.

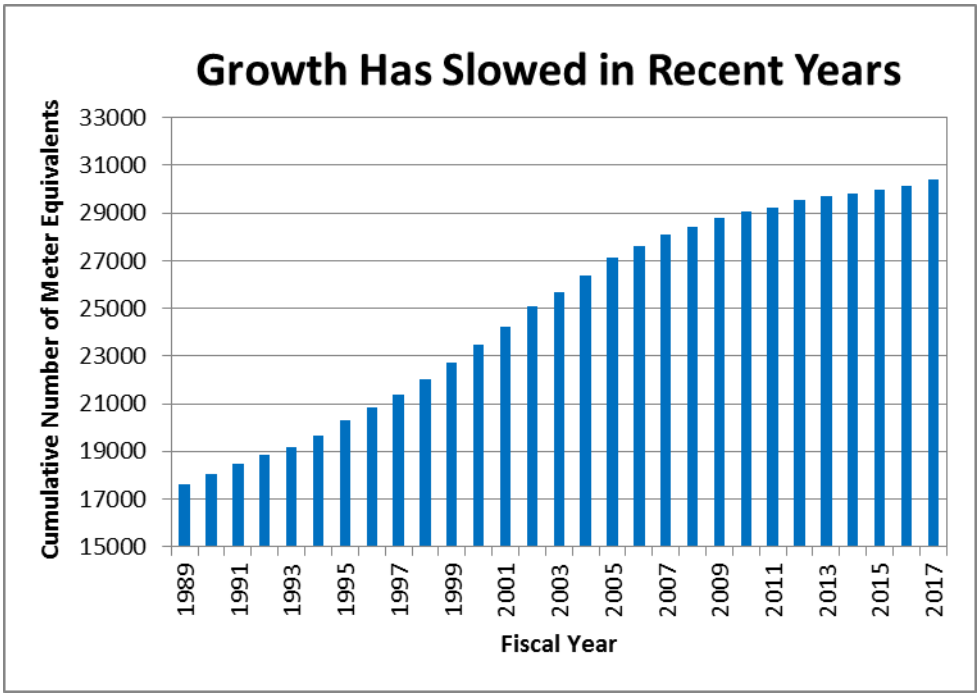
Strategic Plan Elements

Strategic Initiative 1 includes preparing a Water Conservation Plan. Conserving water will help reduce peak day and average day demands. In addition, Strategic Initiative 3 includes a goal to invest at the right time in our community's water assets. Understanding the capacity of our WTP, the demands placed on it, and the potential implications of future treatment requirements will inform our CIP.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor peak-day demands at the Jones Ferry Road WTP and identify cost-effective practices that could be implemented to further reduce peak-day demands.	Ongoing		X
2. Continue to identify and pursue cost-effective opportunities for additional conservation or reclaimed water use, which help reduce peak demands.	Ongoing		X
3. Continue to monitor potential growth in our service area by working closely with Carrboro, Chapel Hill, and UNC to ensure we have sufficient drinking water treatment, pumping and storage capacity.	Ongoing		X
4. Continue to monitor our water and stay current with the potential new drinking water standards to ensure we can meet future requirements. Identify any studies or technologies needed to ensure we provide safe, high quality drinking water to our customers.	Ongoing		X
5. Continue to monitor treatment technologies and chemical use for potential to improve our level of service.	Ongoing		X
6. Identify potential energy savings opportunities for water treatment and pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	

Cumulative Number of Water Meter Equivalents (MEs)



Description: This trend evaluates the number of meter equivalents (MEs) served by OWASA. The smallest meters (5/8-inch) serve single family homes and small non-residential customers, while larger meters are used to serve locations with larger water demands. The capacities of larger meters are expressed in hydraulic capacity proportional equivalents of a 5/8-inch meter, or "meter equivalent". (For example, a 2-inch meter has a meter hydraulic capacity ratio of 8 MEs, and a 6-inch meter has an equivalency of 50 MEs.) The number of meter equivalents is an indicator of the potential rate of growth in customer demands the service area.

Key Observations

- Growth in the service area is slower in recent years than in past.
- The number of meter equivalents has grown 34 percent since FY 1999, the year with our highest peak-day drinking water demands (see Peak-Day Drinking Water Demands Trend).

Regulations

There are no regulations to report for meter equivalents.

Technology and Research

There are no updates in technology to report for meter equivalents.

Energy Management

There is no energy use to report for meter equivalents.

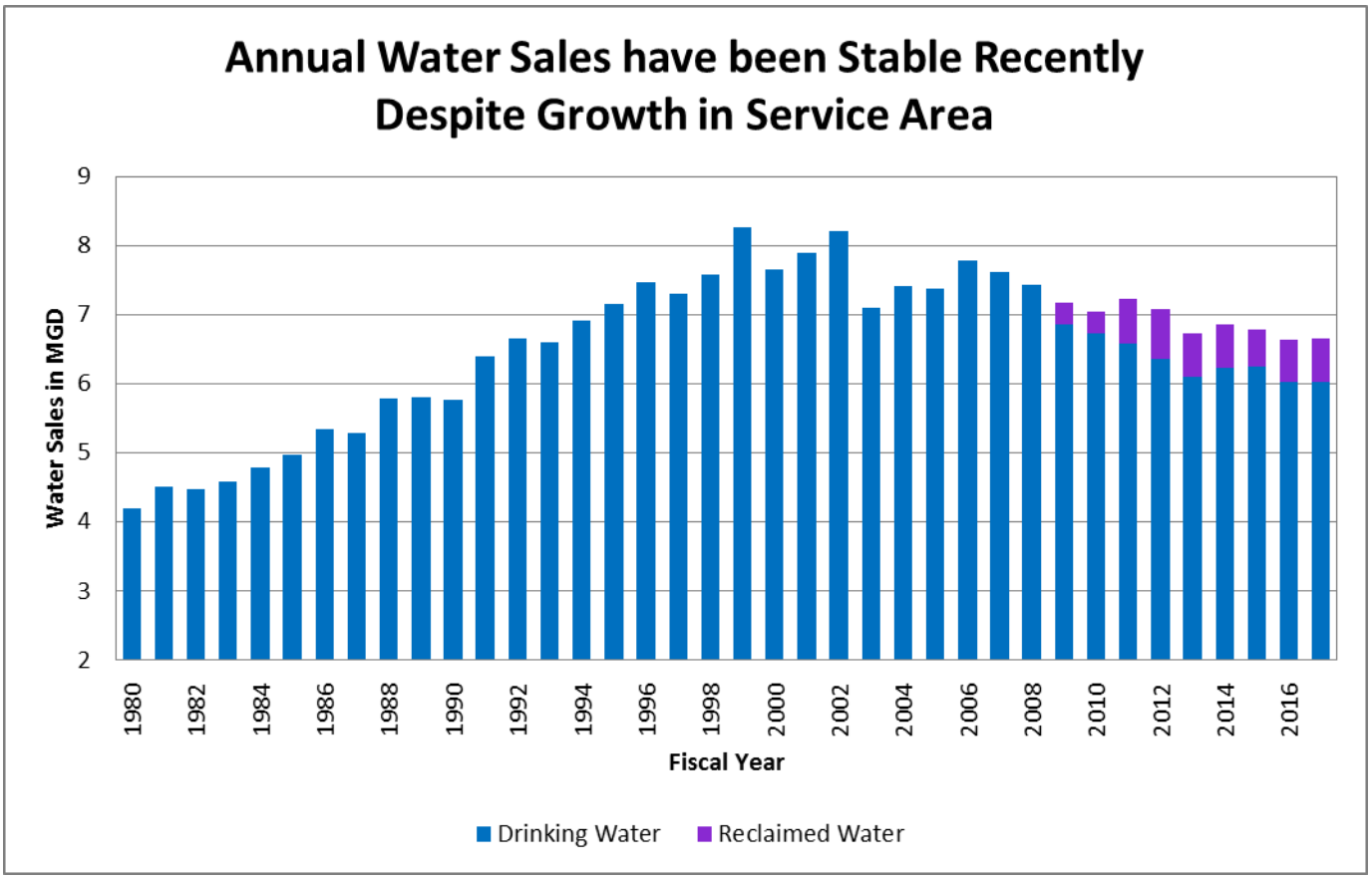
Strategic Plan Elements

Understanding how growth is occurring in our service area allows us to plan for our water supply needs and treatment and conveyance capacity needs (as well as our wastewater collection and treatment capacity needs). These are related to Strategic Initiatives 1 (provide reliable and high quality supply of water for next 50 years) and 3 (adopt budget decision processes to ensure affordable services).

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor growth in service area by tracking new meter equivalents.	Monthly (for Dashboard report)		X

Drinking Water and Reclaimed Water Sales



Description: This trend evaluates average-day sales of drinking water and reclaimed water (in mgd) since 1980. (The reclaimed water system began operating in March 2009.)

Key Observations:

- OWASA's annual average drinking water sales have declined despite growth in the service area as shown in the Meter Equivalents trend. Drinking water sales are currently at about the same level they were 25 years ago.
- Total annual water sales (including reclaimed water) are 20 percent less from when they peaked in FY 1999, despite a 30 percent increase in customer accounts during that same time period. Drinking water sales declined 27 percent over that same period.
- Reclaimed water sales meet almost 10 percent of the community's water needs.

Regulations

There are no regulations to report for drinking water sales. For regulations on reclaimed water, see Reclaimed Water section.

Technology and Research

In accordance with Strategic Initiative 5, OWASA will be installing advanced metering infrastructure (AMI) over the next couple of years. AMI will allow OWASA and our customers to detect leaks earlier and may result in further reduced water sales.

Energy Management

Energy used to pump drinking water is shown in the Peak-Day Drinking Water Demands section.

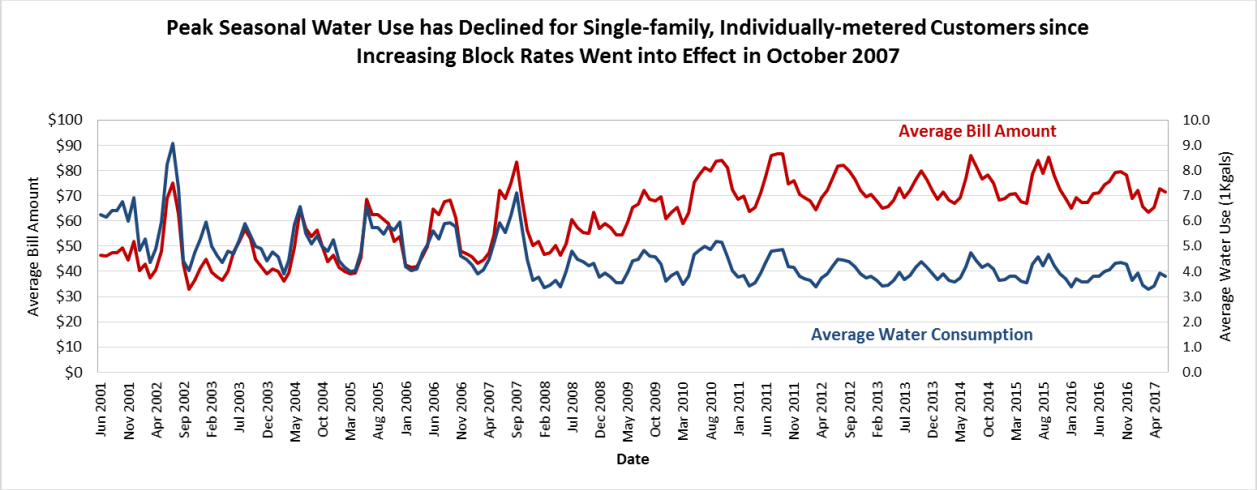
Strategic Plan Elements

The Water Conservation Plan included in Strategic Initiative 1 may result in reduced drinking water sales. This in turn would impact revenue, which would be addressed through the financial management policies included in Strategic Initiative 3. Financial reserves help OWASA meet its financial obligations during times of reduced water sales such as may occur during drought conditions.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to identify cost-effective opportunities to expand the reclaimed water system which will help reduce our community's risk to drought, extend the capacity of the WTP, and optimize the use of our locally-controlled water supplies.	As opportunities arise	X (as part of LRWSP update)	
2. Continue to identify cost-effective and customer-accepted opportunities for additional conservation.	Ongoing	X (as part of LRWSP update)	
3. Continue to monitor potential growth in our service area by working closely with Carrboro, Chapel Hill, and UNC to ensure we have adequate water treatment capacity for the future.	Annual with ongoing communication		X

Average Monthly Water Use and Billed Amount



Description: This trend evaluates average monthly water use and the average monthly water and sewer charges for single-family, individually metered residential customers.

Key Observations:

- Peak seasonal water use by this group of customers has declined, particularly after OWASA's increasing block rates went into effect in October 2007. This indicates that outdoor water use for single-family, individually-metered residential customers has diminished and implies a relationship with the change in our water rate structure.

Regulations

There are no regulations to report for water use.

Technology and Research

In accordance with Strategic Initiative 5, OWASA will be installing advanced metering infrastructure (AMI) in the next couple of years. AMI will allow OWASA and our customers to detect leaks earlier and may result in further reduced water use.

Energy Management

Energy used to pump drinking water is shown in the Peak-Day Drinking Water Demands section.

Strategic Plan Elements

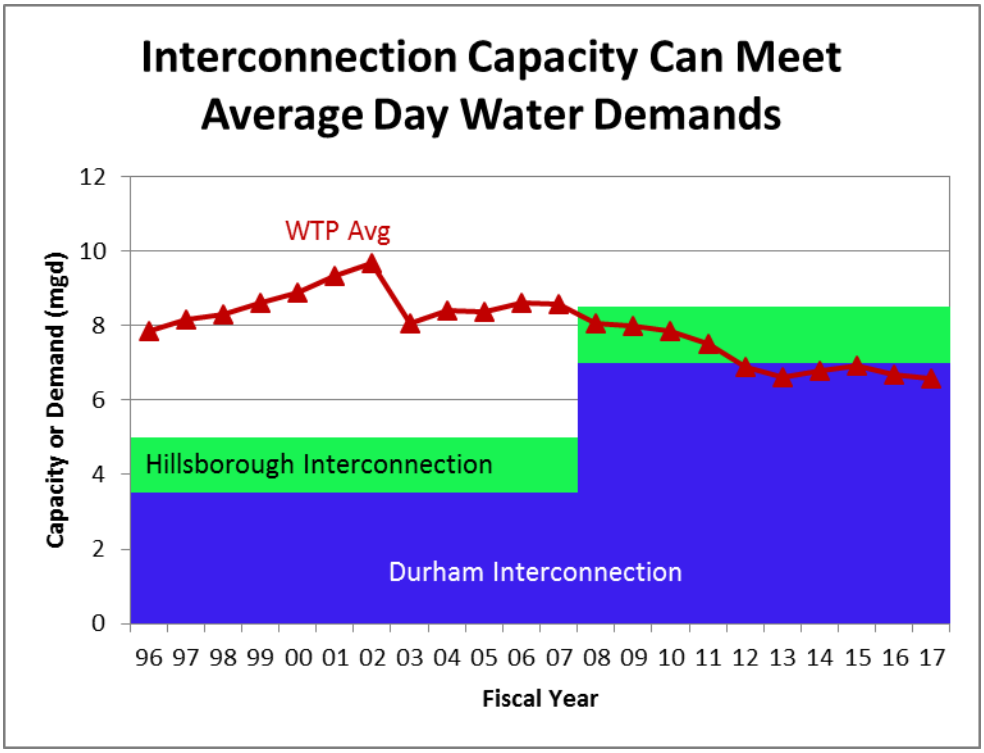
The Water Conservation Plan included in Strategic Initiative 1 may result in reduced drinking water sales. This in turn would impact revenue, which would be addressed through the financial management

policies included in Strategic Initiative 3. Financial reserves help OWASA meet its obligations during times of reduced water sales such as may occur during drought conditions.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to track this trend to determine whether water use is increasing.	Annual		X

Physical Interconnection Capacity and Average Annual WTP Demands



Description: This trend evaluates the ability of OWASA's drinking water system interconnections with neighboring communities to meet average-day drinking water demands during planned or unplanned events that could affect our ability to treat and deliver water to our customers.

Key Observations:

- OWASA's existing physical interconnections are of sufficient capacity to meet average-day drinking water demands in an emergency.
- Our drinking water system interconnections with the City of Durham have a combined capacity of about 7 mgd.
- We can receive about 1.5 mgd through our interconnection with the Town of Hillsborough.
- The combined capacity of our interconnections is about 8.5 mgd, which is over 140 percent of our FY 2017 average-day drinking water demands and over 125 percent of our FY 2017 water demands including reclaimed water.
- OWASA also has an interconnection with Chatham County that is not shown on graph. OWASA could potentially receive 1 mgd through this connection based on modeling analyses, and the interconnection was turned on during the February 2017 water emergency.

Regulations

There are no regulations to report for interconnections.

Technology and Research

There are no updates in technology to report for interconnections.

Energy Management

Energy used to pump water at our interconnections is negligible under most conditions; however, it would increase considerably if, when, and in what amounts we are obtaining drinking water from (or supplying water to) a neighboring utility.

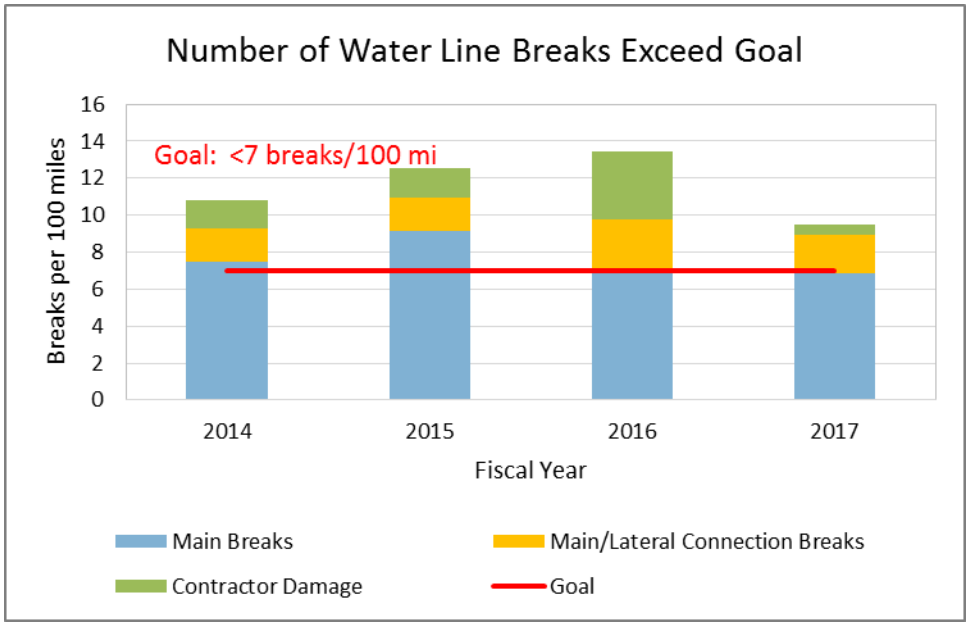
Strategic Plan Elements

While Strategic Initiative 1 does not directly include operational emergencies, our interconnections help us meet our water supply needs for short periods if something happened to our raw water supply, treatment plant or distribution system.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. OWASA should continue to monitor this trend to ensure that average-day drinking water demands could be met through water system interconnections with our neighboring utilities.	Annual		X
2. Re-evaluate the capacity of system interconnections to ensure changes in system facilities and demands have not adversely affected our ability to import an adequate supply of drinking water to meet average-day demands during an emergency.	Periodically as needed		X
3. Perform field tests on all interconnections to ensure proper operation, train staff, and confirm capacity.	Annual		X
4. Continue to work with Jordan Lake Partnership to use regional interconnections model for planning purposes to improve regional reliability and resiliency.	Ongoing		X

Drinking Water Distribution System Integrity



Description: This trend evaluates the number of water main breaks per 100 miles of water mains and connections with service lateral lines. These are important indicators of the integrity of our drinking water distribution system. It also includes information on lines damaged by contractors; while that metric does not impact the integrity of our water distribution system, there is an impact on our customers and thus we include contractor damage in this trend.

Key Observations:

- We have had more water main breaks than our goal of 7 main breaks or less per 100 miles of pipeline, which is based on median of value included in the most recent American Water Works Association (2016) Benchmarking report. (Note: In prior report we used a goal of 11 main breaks or less per 100 miles of pipeline based on the 2012 Benchmarking report).

Regulations

Federal and State testing requirements require public water systems such as OWASA to test for lead in drinking water collected from customers' homes as part of the Lead and Copper Rule. Samples must be collected from homes that meet criteria set by the EPA; these criteria identify "high priority" homes that are most likely to have elevated lead levels. OWASA tests for lead in drinking water in 30 homes built from 1983 to 1985 that have copper pipes with lead solder every three years. In the previous four rounds of monitoring, we have had only one sample with a measurable level of lead and the result was below the regulatory limit. The most recent round of monitoring for lead and copper in the distribution system was completed September 30, 2017; only one sample had a measurable level of lead and the

result was below the regulatory limit. OWASA also provides testing of our drinking water for lead at no charge when requested by a customer.

Technology and Research

There are emerging technologies to monitor the condition of our water lines and detect leaks, but these are not cost-effective to implement throughout our distribution system at this time. Acoustic leak detection finds leaks through estimating the speed of sound in water pipes. Acoustic leak detection can be integrated with AMI technology, and staff will evaluate the cost-feasibility of this technology when the AMI project is nearing completion if they believe it will add value to our ongoing maintenance program.

Cameras can also be used to monitor the condition of pipes in our distribution system. Camera-based inspections do not detect all potential risks, and they are not cost-effective at this time. However, it may be appropriate to consider this type of technology on some of our large, critical pipes. We will consider this type of technology as we work with our engineering contractors on our capital improvements program.

Energy Management

Much of the energy used at the WTP is actually for pumping drinking water into the distribution system and for maintaining system storage levels to maintain pressure and meet peak demands. The energy meters installed at the WTP will help us evaluate the energy used in the distribution system. Other energy is fuel for vehicles and equipment used to maintain our drinking water distribution system.

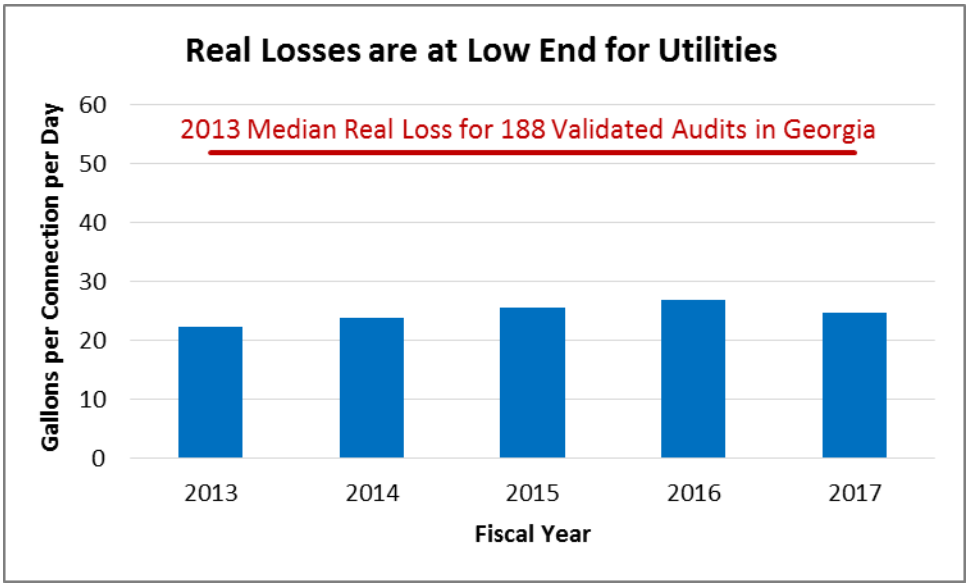
Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Maintaining and replacing our infrastructure when needed enables us to maintain high levels of service to our customers over the long-term.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to use OWASA's water main prioritization model to inform decisions and investments for the rehabilitation and replacement of the drinking water distribution system.	Annual		X
2. Continue the programmatic replacement of aging galvanized water mains throughout the distribution system.	Through FY 2020		X
3. Update the prioritization model to reflect field condition assessment and break history.	Every 3-5 years		X
4. Integrate the results of the water main prioritization model into the comprehensive asset management program framework so that the trade-offs of different capital improvements investment decisions can be consistently evaluated and prioritized to ensure cost-effectiveness.	Annual		X
5. Continue to fund our water main renewal/replacement program to ensure system sustainability.	Annual	X	

Water System Audit



Description: This trend evaluates the annual volume of water lost through leaks in the distribution system. Real loss is the difference between water supplied and authorized consumption; utilities also subtract out apparent losses associated with inaccuracies in metering, data errors, and estimated water theft.

Key Observations:

- OWASA has lower real losses than a study of 188 validated water audits in Georgia (52 gallons per connection per day). Cavanaugh and Associates presented a typical range of real loss of up to 200 gallons per connection per day at AWWA's Annual Conference and Exposition in June 2016.

Regulations

There are no regulations to report for real water loss.

Technology and Research

The Drinking Water Distribution System Integrity trend includes information on acoustic leak detection.

Energy Management

Energy used to pump drinking water is shown in the Peak-Day Drinking Water Demands section.

Strategic Plan Elements

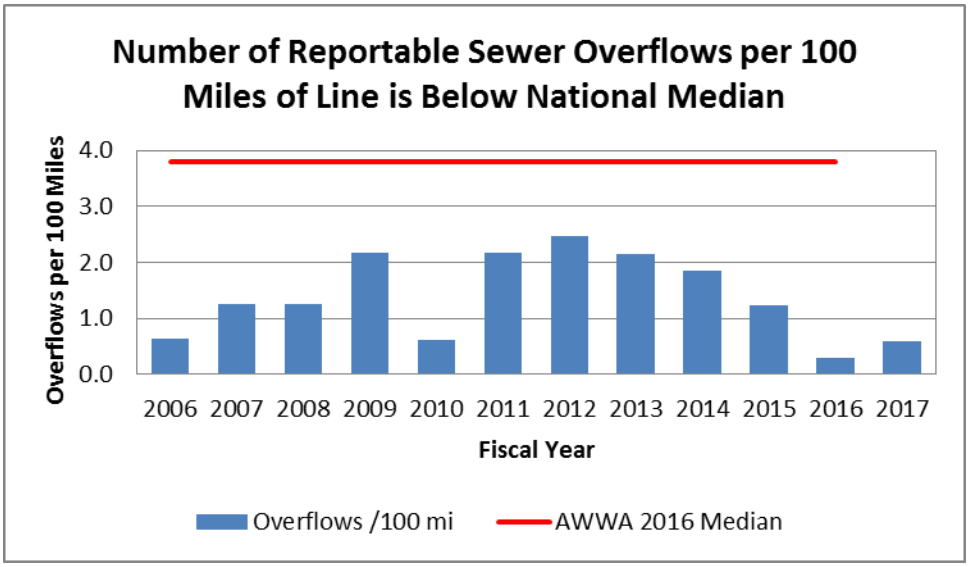
Strategic Initiative 1 includes the development of a Water Conservation Plan, an important element of our updated Long-Range Water Supply Plan. Strategic Initiative 3 includes a goal to make the right

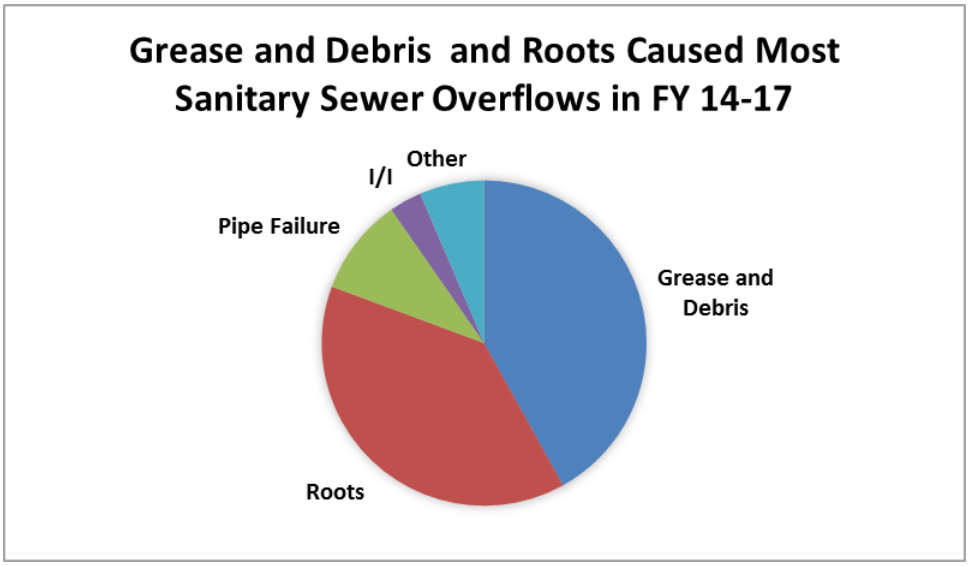
investments at the right time, and to base this information on our asset management program. Understanding the amount of water loss in our system helps make investment decisions. Maintaining and replacing our infrastructure when needed enables us to maintain high levels of service to our customers over the long-term.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Update water audit information	Annual		X

Wastewater Collection System Integrity





Description: This trend evaluates the number of reportable sewer overflows, which is an important indicator of the integrity of our wastewater collection system.

Key Observations:

- The number of overflows is consistently less than 3.8 per 100 miles of pipeline, which is the national median per the American Water Works Association 2016 Benchmarking report. The 25th percentile in that report was 1.1 overflows per 100 miles of pipeline. Per DEQ guidance, OWASA strives to have no overflows. (Note: We used the median value of 2.7 per 100 miles of pipeline from the 2012 Benchmarking report in prior Strategic Trends reports).
- The cause of overflows has been tracked electronically for four full fiscal years.

- Grease, debris, and roots are the primary causes of overflows. Reducing grease will require proactive, recurring education of our customers – especially those in the food service sector. Customers can also help minimize potential root intrusion by not planting trees near our sewer lines.

Regulations

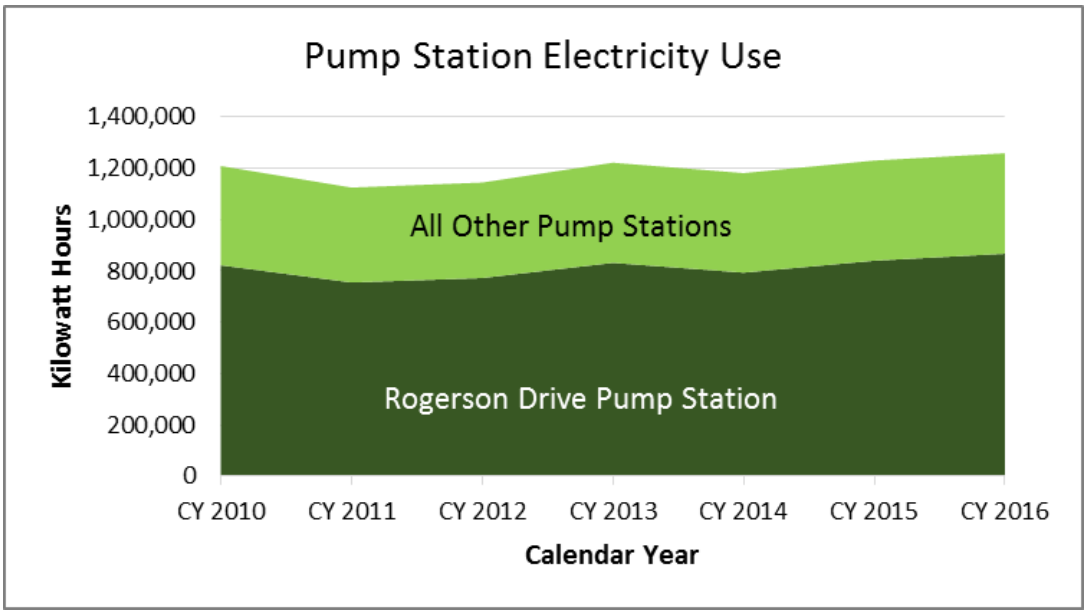
There are no upcoming regulations to report for our wastewater collection system.

Technology and Research

- Advanced, automated flow measurement technologies are available for real-time monitoring and control of wastewater collection systems. Permanent flow monitors may be connected to SCADA; smart manhole covers can also be moved around in the system. OWASA evaluates these technologies periodically and we have done some pilot tests with manufacturers. When monitors indicate that water levels have increased over time, it may be an indication that the line is blocked downstream. OWASA tested this technology using smart manhole covers in two locations near restaurants to determine if we could reduce the frequency of maintenance on lines; the controller and antenna failed so staff have continued with our scheduled maintenance of the lines. We are continuing to evaluate this technology.
- Smart manhole covers measure the water levels within sewer lines. If the level gets to a pre-set level, an alarm sounds. These smart manhole covers can also be linked to rain gages set in the service area. The combined rain gage and smart manhole cover can help find areas where infiltration and inflow may be a problem. OWASA tested this technology near our Rogerson Drive Pump Station; we are currently evaluating the data and plan to move the smart manhole covers to determine if the technology will help us identify areas with higher levels of infiltration and inflow.
- Acoustic monitoring to detect sewer line blockages is available. A device sends a sound down a line to help find obstructions. A pilot test of this type of technology indicated that it was not yet reliable and cost-effective.

Energy Management

Wastewater is primarily conveyed through the force of gravity; however, wastewater pumping stations are necessary to transport wastewater when gravity flow is not possible. All of our wastewater pumping stations are powered by electricity, with diesel fuel or natural gas being used to power emergency standby generators when electrical service is unavailable. Electricity use by OWASA's wastewater pumping stations has been relatively consistent over the last six years, with the Rogerson Drive Pump Station accounting for about 65 to 70 percent of the electricity used for collection system pumping.



Strategic Plan Elements

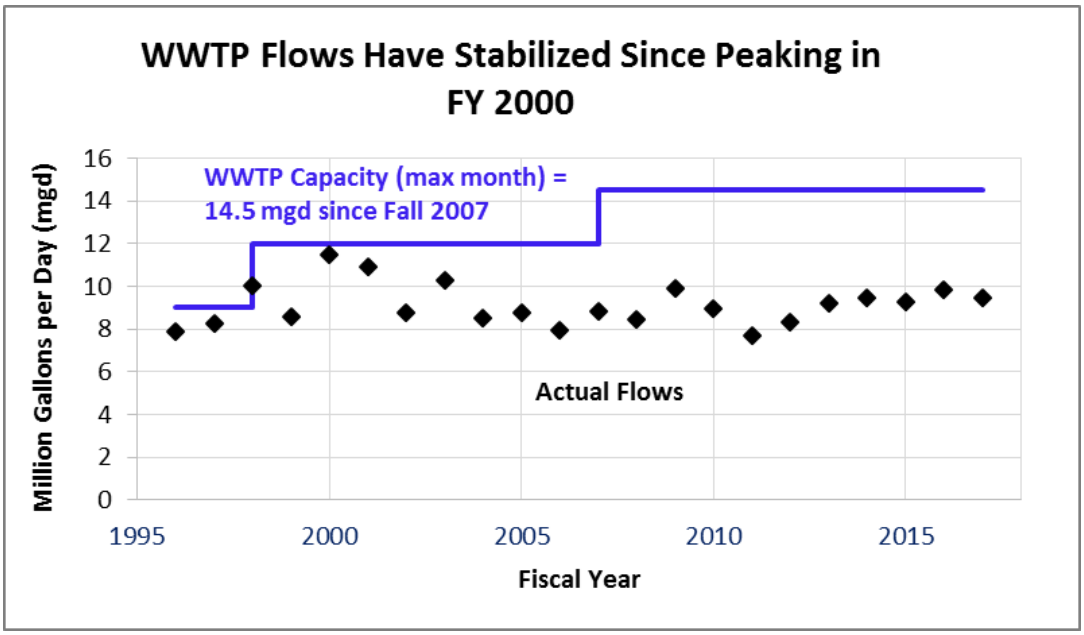
Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Maintaining and replacing our infrastructure when needed helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to use the findings and recommendations from the 2011 Sewer System Master Plan and subsequent Sewer Evaluation Reports as a guide for prioritizing funding for sewer system evaluation, rehabilitation and replacement. Update the Master Plan's modeling efforts periodically as flow demand patterns change.	Ongoing		X
2. Integrate the results of the sewer system modeling and field condition assessment work into the comprehensive asset management program so that the trade-offs of different capital improvements investment decisions can be consistently evaluated and prioritized.	Annual		X
3. Continue to inspect, clean, and rehabilitate our sewer lines and wastewater pumping stations as needed to prevent overflows, reduce infiltration and inflow, and ensure adequate capacity.	Ongoing		X
4. Continue to monitor and maintain sewer easements to ensure our equipment and personnel can access the sewer system for maintenance and repair work, and to ensure tree root intrusion into sewers is minimized and corrected.	Ongoing		X

5. Continue to educate the public on the importance of not pouring fats, oils and grease, medications, etc. down the drain and not flushing items other than toilet paper.	Ongoing		X
6. Continue to fund the sewer system renewal/replacement program to ensure system sustainability.	Annual	X	
7. Identify potential energy savings opportunities for wastewater collection in Energy Management Program	Ongoing	X (as part of Energy Mgmt Plan)	

Mason Farm Wastewater Treatment Plant Maximum Month Flow Projections



Description: The Mason Farm Wastewater Treatment Plant (WWTP) has a permitted capacity of 14.5 mgd, which is the maximum average daily flow which can be treated in any given month. This trend tracks historical annual maximum month of flow and compares those against the permitted capacity of the WWTP.

Key Observations:

- OWASA's maximum month wastewater flows have declined from a peak of 11.5 mgd in FY 2000. This corresponds to reduced drinking water demands by our customers, as well as our continuing investments in the rehabilitation and replacement of sewer lines and manholes.
- In FY 2017, the maximum month flow was 9.4 mgd, which is 65 percent of the WWTP's permitted flow capacity.
- OWASA is beginning the process to update the LRWSP. One of the first tasks will be to develop future raw water demand projections which will be used to estimate future wastewater treatment needs. We anticipate that the WWTP has adequate capacity to meet projected wastewater demands for at least the next 20 years. Although the WWTP's hydraulic capacity may be adequate, imposition of more stringent nutrient limits or other treatment requirements could require process modifications and related capital improvements. Other non-capacity improvements may include renewal and replacement in accordance with our comprehensive asset management plan and efficiency and optimization improvements.

Regulations

Important regulations pertaining to wastewater treatment are related to nutrient removal at the WWTP, which is described in the Mason Farm WWTP Nutrient Capacity section of this report.

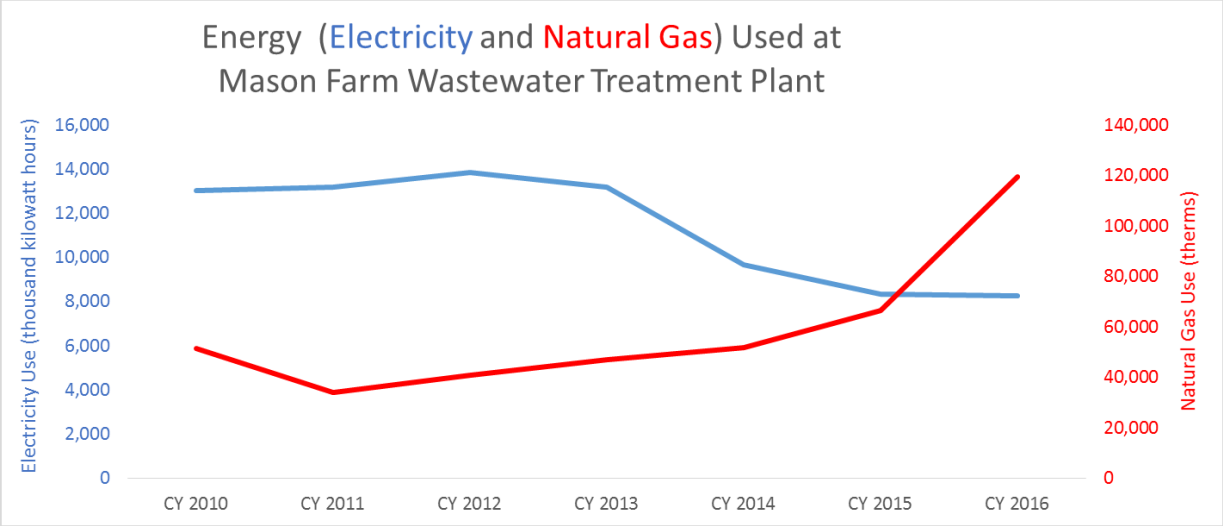
Technology and Research

- Staff at the WWTP periodically evaluate the chemicals used at the plant to ensure we are using the best available in terms of meeting our treatment goals in the most sustainable manner as well as to ensure that we do not foresee shortages in chemicals we use which could impact treatment or their price. At this time, staff believe we are using the correct blend of chemicals and no shortages are foreseen in their supply.
- Staff is closely following advancements in technology and actual industry experience for resource recovery at the wastewater treatment plant. This includes energy generation such as the biogas to energy alternatives currently being evaluated as part of the Energy Management Program, nutrient and metal mining[1], and direct and indirect potable reuse. Biogas recovery strategies are being evaluated as part of the Energy Management Plan, and opportunities for greater reuse will be evaluated as part of the Long-Range Water Supply Plan. Nutrient recovery strategies are discussed in the following section.

Energy Management

The Mason Farm WWTP is our largest energy-using facility. Since 2010, our electricity use at the WWTP has decreased by about 37 percent. This is largely attributable to a $10.4 million capital improvement project that reduced electricity use, further reduced off-site odor releases, improved plant performance, and prepared us to meet future standards for treated wastewater quality. In 2016, our use of natural gas was 177 percent higher than it was in 2010, primarily as a result of our biogas storage and use system being out-of-service since mid-2015 due to the ongoing renovation of two of our digesters. We normally use biogas as fuel for our boilers that provide heat for the anaerobic digestion process. When biogas is unavailable, we must use natural gas.

[1] Process to recover nitrogen, phosphorus, or metals from wastewater treatment process for beneficial reuse.



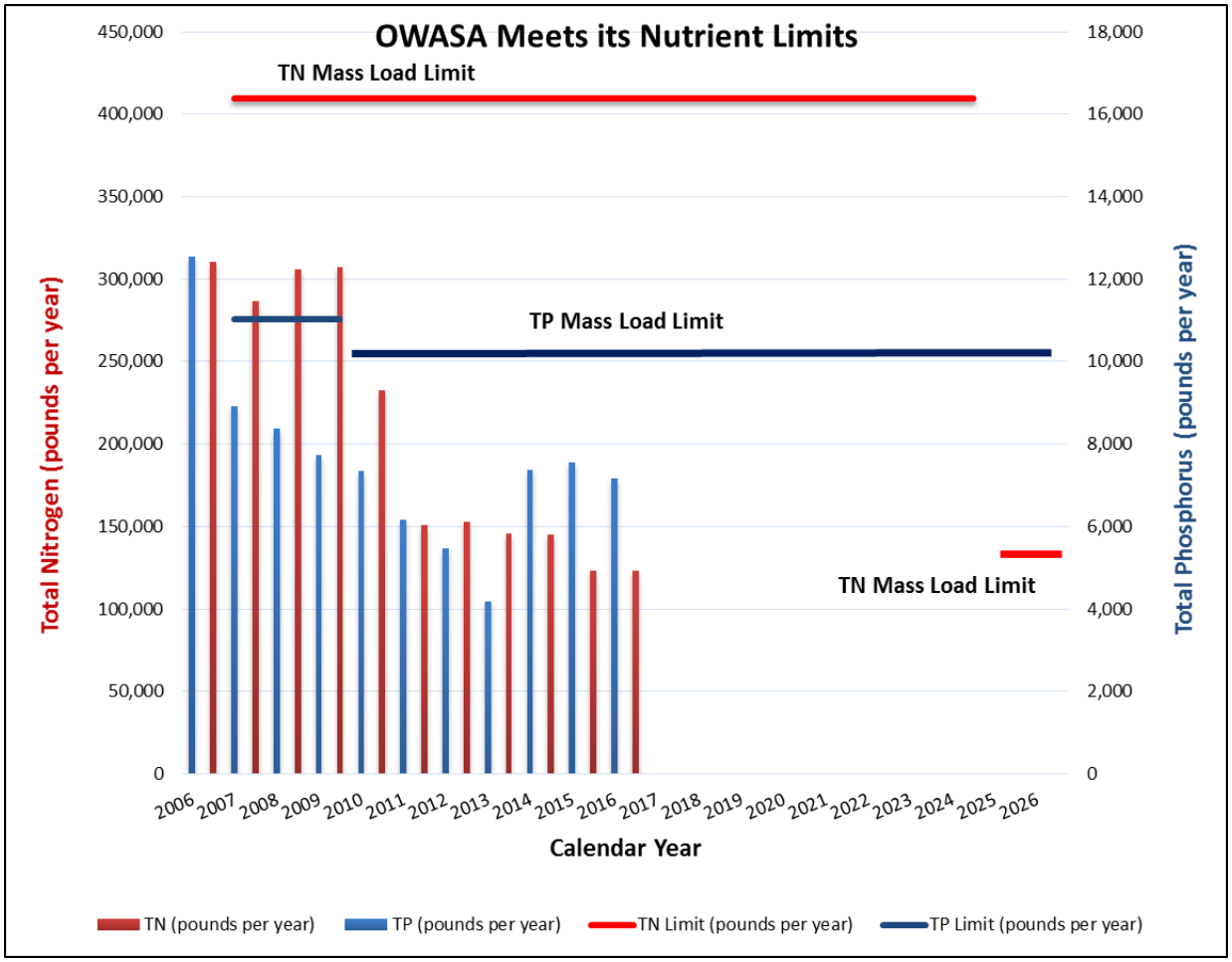
Strategic Plan Elements

Biogas recovery strategies are being evaluated as part of the Energy Management Plan, which is Strategic Initiative 4. Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our wastewater treatment capacity is adequate, and timing expansions properly, helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor growth and development activity and projections in our service area by working closely with the Towns of Carrboro, Chapel Hill, and UNC to ensure we have adequate wastewater treatment capacity for the future.	Annually with ongoing communication		X
2. Revisit the peaking factors used to estimate maximum month flow as part of the LRWSP update.	CY 2018	X (as part of LRWSP update)	
3. Continue to inspect, rehabilitate, and replace our sewer lines when necessary to reduce infiltration and inflow.	Ongoing		X
4. Identify potential energy savings opportunities for wastewater treatment and pumping in Energy Management Program.	Ongoing	X (as part of Energy Mgmt Plan)	

Mason Farm WWTP Nutrient Capacity



Description: The State's Jordan Lake nutrient management rules require point sources to reduce their discharge of Total Phosphorus (TP) and Total Nitrogen (TN). OWASA's current discharge permit requires that we meet further TN load reductions by 2021; however, during the 2015 Session, the NC General Assembly enacted legislation that extends that date to at least 2024. We report nutrient loading on a calendar year basis rather than a fiscal year basis since our permit limits for TN and TP are on a calendar year.

Key Observations:

- OWASA has met its TP limit since the annual mass load limit was first incorporated into our permit in 2007. We expect to continue to meet the limit within the 20-year planning horizon without the need for additional major capital improvements for TP removal.
- OWASA has consistently met its current TN limit, but we will have to operate our filters in denitrification mode and incur considerably greater energy and chemical costs to meet the more stringent limits when those go into effect around 2024. It is possible that installation of sidestream

treatment facilities would reduce operating costs and energy use for TN compliance and have a positive payback compared to relying primarily on the denitrification in the filters at the WWTP.

Regulations

As noted previously, the NC General Assembly has enacted legislation (House Bill 97) that defers the effective date for implementation of more stringent TN mass load limits for WWTPs in the Jordan Lake watershed to at least 2024. Staff will continue to closely follow this issue, and we will inform the Board if any changes are needed in the timing or scope of major anticipated capital or operational improvements required to ensure compliance with the new limit.

Technology and Research

- OWASA evaluates the treatment technologies we have at our wastewater plant to ensure we can meet upcoming standards with current treatment technologies. OWASA can meet all applicable permit limits, but we will need to operate our filters in denitrification mode to remove nitrogen when revised limits become effective. (Based on 2015 action by the NC General Assembly, the new expected date for a much more stringent TN limit is 2024). Carbon must be added to achieve denitrification in the WWTP filters, and there are different operational, safety, financial, and environmental considerations associated with different carbon sources We will evaluate the advantages and disadvantages of alternative carbon sources, and conduct pilot and plant-scale testing as needed, to inform our decisions regarding the preferred source.
- Sidestream treatment for greater nutrient removal is a process that may be considered for the Mason Farm WWTP if we decide to dewater a greater portion of our biosolids. Sidestream treatment would help to reduce nitrogen loading in the liquid treatment process. Modeling studies indicate that if we dewater all of our biosolids, sidestream treatment could provide annual chemical and energy cost savings of approximately $200,000 and have a payback of less than ten years. Sidestream treatment could also provide additional process flexibility in meeting TN limits; it may also allow a rerating of the plant to a higher treatment capacity, thereby providing substantial cost savings for our customers. The City of Durham uses side stream treatment at one of its WWTPs.

Energy Management

See the section titled Mason Farm Wastewater Treatment Plant Maximum Month Flow Projections for energy use information at the WWTP. As noted above, certain advanced nutrient recovery technologies may have the potential to further reduce energy use for the liquid wastewater treatment process.

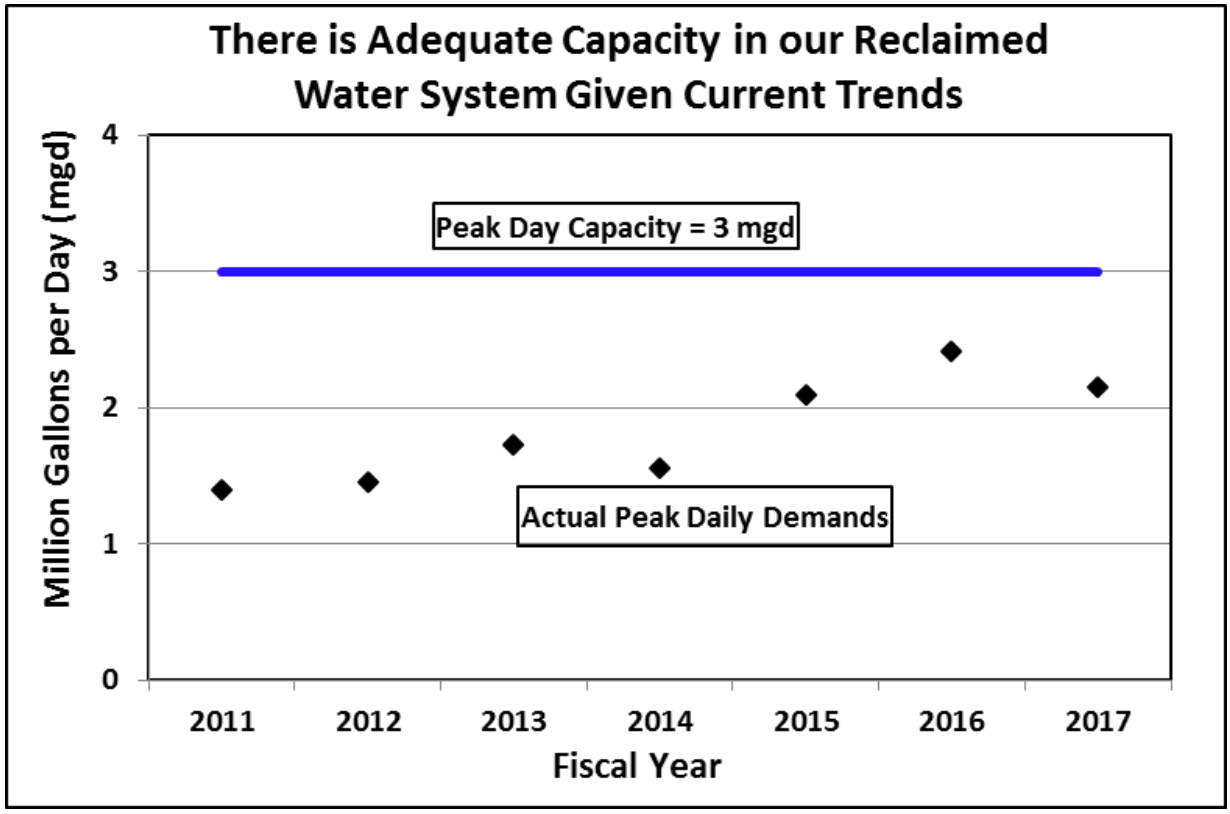
Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our wastewater treatment technology can meet permit requirements, and incorporating changes in operations to meet limits, helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Continue to monitor nutrient loadings at the plant.	Monthly		X
2. Evaluate ability of existing filters (and advantages and disadvantages of alternative carbon sources) to meet TN permit limits.	2022		X
3. Evaluate benefits and costs of sidestream treatment for advanced nutrient removal.	Within 5 years of new TN limit	X	

Reclaimed Water



Description: This trend tracks historical annual peak-day reclaimed water (RCW) demands and compares those against the peak day capacity of the Mason Farm WWTP's RCW system.

Key Observations:

- The majority of RCW is used for chilled water and irrigation of landscaping and athletic fields and these demands peak during warm months (April-October). Demands are typically lower during cold months (November-March).
- Peak daily demand of 2.4 mgd occurred in August 2016 when it was very hot and humid. The RCW system is currently configured to meet a total peak day demand of 3 mgd (average daily demand of 1.2 mgd); however, the system is designed and constructed to allow cost-effective expansion to 5.2 mgd by adding only an additional transfer pump and additional chemical feed system capacity (if that feed system is deemed necessary).
- There is no anticipated significant change in demand for the next 15 years, and therefore the RCW system can meet projected RCW demand for the foreseeable future.

Regulations

In 2014, the NC General Assembly ratified Senate Bill 163 (Session Law 2014-113) to allow for indirect potable reuse, provided that a pretreatment mixing basin is created and used to mix raw source water

and reclaimed water, and that reclaimed water does not comprise more than 20% of the total combined supply. OWASA will evaluate the costs and benefits of this potential water supply source as one of the options considered during the update of our Long-Range Water Supply Plan. More information on RCW and reuse is provided in the Technology and Research section below.

Technology and Research

One aspect of reuse is recycling water within a building, which has been done in other parts of the country. One example (Solaire) is a high rise building in New York City which uses various filtration (membranes) and disinfection (ultraviolet light) technologies to produce reclaimed water that is beneficially recycled within the building and used for flushing toilets, cooling tower make-up water, and irrigating the green roof. The WaterHub at Emory University is an onsite wastewater reclamation system which uses ecological processes and stormwater capture to meet the campus's nonpotable water demands. A similar stormwater capture and treatment system is being planned for Chatham Park in Chatham County.

Energy Management

In February 2015, we began sub-metering and monitoring the energy uses of a few specific processes at the WWTP, including the RCW system. The RCW system is not just important for its impact on our use of raw water resources, but it is a more energy-efficient way to meet demands. The energy required to treat and deliver reclaimed water is less than that is required to treat and deliver raw water to the community. In 2016, on average, we used 2.33 kWh to treat and deliver 1,000 gallons of raw water. Since January 2016, on average, we used 1.98 kWh to treat and deliver 1,000 gallons of reclaimed water, a savings of over 15 percent.

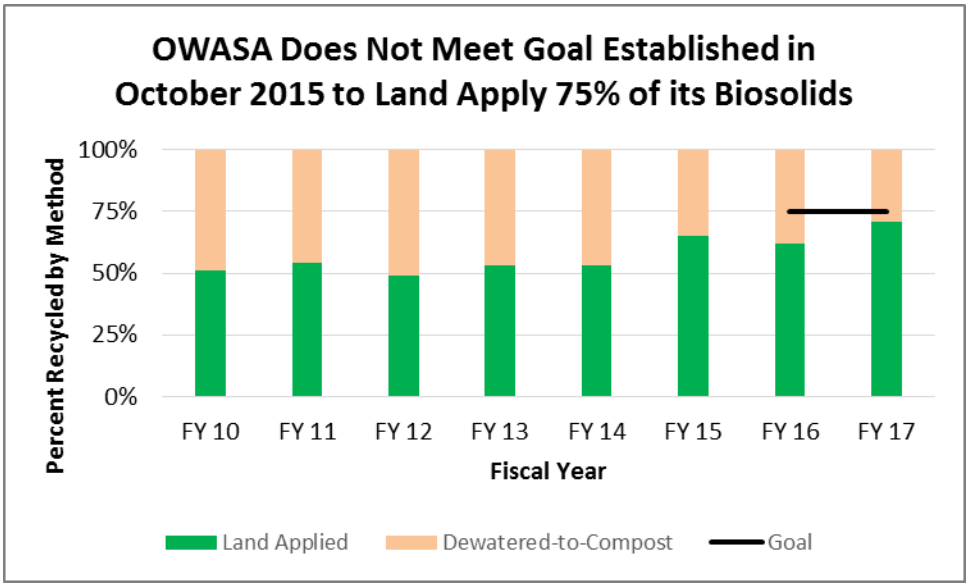
Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our RCW system capacity is adequate will help meet the community's water needs. This also ties to Strategic Initiative 1; the use of RCW reduces the demand on our drinking water supplies which will help meet our community's long-term water supply needs. Finally, the use of RCW uses less energy than treating and delivering raw water, which ties to Energy Management Program in Strategic Initiative 4.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Verify RCW meters are properly calibrated and recording flows accurately.	Annual		X
2. Closely monitor RCW demands in order to ensure RCW system capacity expansion is planned, designed, and funded in time to meet future demands.	Ongoing		X
3. Pursue cost-effective opportunities to expand the RCW system to serve non-drinking water demands of non-UNC customers as new growth and development/redevelopment occurs.	Ongoing	X	

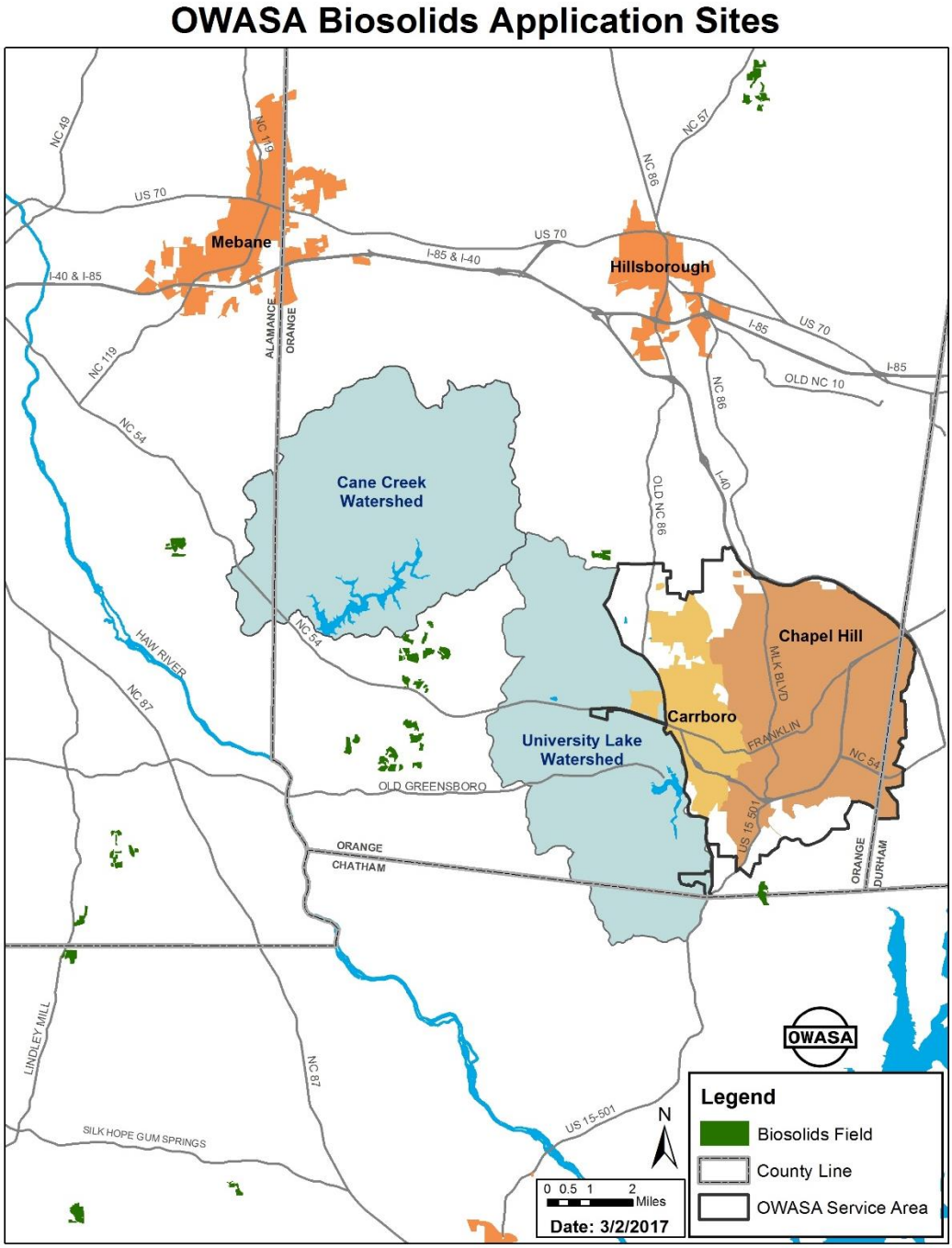
Biosolids



Description: This trend evaluates the amount of biosolids which OWASA applies to land and the amount it dewaters for composting. The WWTP produces about four dry tons of biosolids each day. Most of this is applied in liquid form to agricultural land and a portion is dewatered to the texture and consistency of moist soil and transported to a private composting facility in Chatham County. For the liquid form, OWASA has 910 acres of farm land in Orange, Chatham and Alamance counties available for its Class A land application program (see map below). 83 percent (756 acres) is privately owned. The remaining 154 acres are owned by OWASA as part of a 700-acre tract west of Orange Grove Road in Orange County. At its October 8, 2015 work session, the Board of Directors agreed that OWASA's goal is to apply 75 percent of our biosolids in liquid form, and to dewater 25 percent of our biosolids. The Board of Directors understands that there are factors including weather conditions which may keep staff from meeting the goal.

Key Observations:

- Prior to FY 2015, OWASA consistently land applied about half of its biosolids and dewatered and composted the remaining half.
- In FY 2017, OWASA land applied 71 percent of its biosolids. While this has not met the goal, it should be noted that this was accomplished during a wet year when we had staff shortages in the biosolids management team. In addition, our biosolids tanks are empty moving into the colder, wetter winter months when there are limited opportunities to apply liquid biosolids. Thus, OWASA is well positioned to handle its solids over the next twelve months to meet the goal. It should be noted that if 2018 is wet and our opportunities to apply liquid biosolids are limited, OWASA can dewater higher amounts of biosolids while meeting all applicable regulatory requirements for our biosolids treatment and recycling program.



Regulations

Federal and state regulations specify the agronomic rates at which biosolids may be land applied for designated crops (the maximum amount of biosolids that can be applied to a given field is currently determined by the nitrogen content of the biosolids and is limited to the nitrogen requirements of the particular crop to which it is being applied). OWASA closely monitors the application rates on each individual field and historically has applied at rates well below the maximum allowed by regulation. Some states also limit land application of biosolids based on the phosphorus content of the biosolids

and the soil; however, North Carolina does not have such a loading limit. If North Carolina adopts this approach, the amount of land needed to support our land application program would increase considerably.

Technology and Research

As described in the Mason Farm WWTP Nutrient Capacity section, sidestream treatment for greater nutrient removal is a process that may be considered for the Mason Farm WWTP if we decide to dewater a greater portion of our biosolids. To the extent that the nutrient content of our biosolids is lower, we would need less land area for our land application program.

Energy Management

The primary energy uses of OWASA's biosolids management program are for vehicle fuel, biosolids loading, running the rotary press for dewatering, treating the nutrient-rich dewatering filtrate loads returned to the aeration process, and mixing the biosolids holding tanks.

Strategic Plan Elements

Strategic Initiative 3 includes a goal to make the right investments at the right time, and to base this information on our asset management program. Ensuring that our biosolids program meets federal and state requirements and protects public health, helps us meet the community's wastewater needs.

Actions Needed

Action Items	Timing	Board Action?	
		Yes	No
1. Evaluate the 75 percent liquid land application goal and report our performance to the Board	Annually		X
2. If Board decides that we should dewater a higher percentage, evaluate the advantages and disadvantages of sidestream treatment to ensure permit compliance	As needed	X	
3. Evaluate the amount of land in our biosolids program to ensure it is adequate to meet liquid land application goal	As needed (if farmers drop out of program)		X

Strategic Plan Progress Report

We identified six strategic initiatives with accompanying goals, actions, and measures of success. We believe that these initiatives and actions address each of our strategic themes and will result in positive change.

Strategic Initiative 1

Provide reliable and high quality supply of water for the next 50 years

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Optimum mix of technically, environmentally, economically, and socially feasible water supply and demand management alternatives that meet projected demands and level-of-service objectives under a range of future conditions and uncertainties.	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 potential 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.	Updated plan provides a clear and responsible path forward to ensure a reliable and high quality supply of water for the next 50 years that is supported by stakeholders.	***The Board agreed to goals and objectives to evaluate supply and demand management alternatives against on November 10, 2016. Staff will use growth projections currently being finalized for regional transportation planning as the basis for our future demand projections (growth projections anticipated by end of October 2017). Staff is working with a graduate student at the University of South Carolina who is evaluating the dependability of our estimated yield under different climate change assumptions.***
	Adopt Long-Range Water Supply Plan and begin implementation.	Adequate supply of high-quality water which meets customer needs for next 50 years across the range of assumptions and scenarios included in the Plan.	
Enhanced water supply reliability, reduced energy use, and reduced long-term life-cycle costs of water and sewer service through cost-effective water use efficiency (WUE), conservation, and RCW strategies.	Prepare Water Conservation Plan that includes a program to educate customers on the value and importance of water, best practices for reducing water use and monthly bills through conservation, WUE practices, and collaboration with Towns, County and others on conservation and WUE standards.	Reduce residential water use by X% (currently 4,000 gallons/month for individually-metered single-family residential accounts). (Target to be established) Establish targets for other customer classes.	***The Water Conservation Plan will be prepared as part of the Long-Range Water Supply Plan.***

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Maintain our Jordan Lake water supply allocation.	Application for Jordan Lake water supply allocation (Round 4) was submitted in November 2014.	Allocation request granted to OWASA by Environmental Management Commission (EMC). (*Note*: Latest information from NC Division of Water Resources indicates the EMC may make decisions in January 2017.)	***Complete. OWASA's Round 4 Jordan Lake water supply allocation was granted by the EMC on March 9, 2017.***
New or amended water transfer agreements with Town of Cary and City of Durham for OWASA to access our Jordan Lake water supply allocation through those entities when needed.	Coordinate with staff from the Town of Cary and City of Durham to determine terms and conditions for ensuring cost-effective access to our Jordan Lake allocation.	Successful adoption of new or amended water transfer agreements for OWASA to reliably and cost-effectively access our Jordan Lake water supply allocation when needed.	***As part of the update to the LRWSP, staff will evaluate the amount of water we need from Jordan Lake and the best way to cost-effectively access the allocation when needed. Staff continues to work with the City of Durham, Chatham County, and Town of Pittsboro to evaluate the feasibility and cost of constructing a new intake and water treatment plant on the west side of Jordan Lake. This information will be used as we evaluate different alternatives to access our Jordan Lake allocation.***

Strategic Initiative 2

Engage the Community

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Engage stakeholders to understand their perceptions and expectations so that we make well-informed decisions about our services and so that we maintain their trust; and empower stakeholders with information so they use water wisely and protect water quality through proper use of our wastewater system; and provide stakeholders with timely information about projects, programs, and policies that are important to them and offer them meaningful opportunities to give their feedback so that we can continue to improve.	Prepare and implement Community Engagement Plans (CEPs) for all capital improvement projects and key initiatives.	Stakeholders trust OWASA to make informed decisions about our services. Positive feedback from customers and stakeholders about effectiveness of engagement work. Stakeholders have the information they need regarding projects, programs and policies and they have opportunities to provide feedback on matters of importance to them.	***The Board accepted criteria for when they will review Community Engagement Plans (CEPs) at the February 25, 2016 Board meeting. CEPs for key initiatives have been approved by the Board including the Advanced Metering Infrastructure project (December 8, 2016), Long-Range Water Supply Plan Update (February 12, 2015 and updated in November 2016 based on Board feedback at its November 10, 2016 work session), and Energy Management Plan (September 8, 2016). A CEP will be developed for Forest Management in late spring 2018. CEPs are prepared for all capital improvement projects.***

Strategic Initiative 3

Adopt financial management policies and budget decision processes to ensure affordable services and fiscal sustainability

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Financial reserve funds set at appropriate level.	Review reserve policies during the annual budget development process to determine the desired level of reserve funds.	New or revised policies adopted, if appropriate.	***The Board reviewed reserves policies and projections for future reserve balances at its meeting on April 21, 2017 as part of the process of developing the FY 2018 budget. The Board took no action regarding OWASA's reserve policies but agreed to discuss the subject again in November of 2017.***
Efficient process which provides opportunities for stakeholder input and allows the Board of Directors to make well-informed budget and rate decisions.	During the annual budget development process, review Capital Improvement Program (CIP) investment practices.	New or revised CIP investment practices are adopted, if appropriate.	***In September 2016, the Board reviewed OWASA's process for developing its annual operating budget and capital improvements program. The Board expressed satisfaction with the processes used. A Finance Committee meeting will be scheduled to discuss the budget process for next fiscal year.***
The right investments at the right time to sustain the community's essential water, wastewater and reclaimed water assets.	Comprehensive asset management report was completed in March 2016.	Service levels are part of the asset management program report.	***Complete. The Asset Management Program report was updated and posted to the OWASA website in July 2017.***
Rates, fees and charges that meet objectives.	Evaluate possible rate structure changes for customer classes to include possible update to Service Availability Fees.	A rate structure that fairly and fully recovers revenues, promotes water conservation, promotes affordability, and is understood by customers.	***Based on results of a rate study, the Board changed the water commodity rate for the multi-family master-metered customer class from seasonal rates which are higher in the warmer months from May to September and lower the rest of the year to a year-round rate. Additionally, the Board approved adjusting Service Availability Fees; the adjustments were mostly reductions in amounts charged for new service connections. Several alternative rate structures were considered and the Board agreed to reconsider alternatives once the AMI project is near completion.***

Strategic Initiative 4

Implement an Energy Management Program

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Cost-effective measures to reduce our use of energy, related energy costs, and associated greenhouse gas (GHG) emissions.	Develop an Energy Management Program that includes: > Goals for energy reduction by 2030 against a 2010 baseline. > Ongoing assessment of energy use, costs, and GHGs. > Assessment of the energy performance of our equipment, operations, and buildings and identification of opportunities for energy savings and the associated return on investment. > Prioritized energy savings opportunities. > Implementation of selected energy management and energy efficiency projects as part of CIP and annual budget. > Evaluation and prioritization of potential renewable energy strategies. > Feedback from community stakeholders.	Program provides a clear and responsible path forward for effective energy management. Energy cost savings (costs avoided) achieved from energy management, energy efficiency measures and renewable energy measures. Amount of grants, rebates, incentives, etc. received to fund energy management efforts. Percent reduction in our GHGs compared to baseline year.	***On September 8, 2016, the Board approved OWASA's Energy Management Program and associated Stakeholder Engagement Plan. In addition, the Board approved using a separate social cost of carbon in the business case evaluation of clean energy projects at OWASA. OWASA's Energy Management Program, as explained in the 2017 Energy Management Plan, is an iterative process of system and strategy evaluation.*** ***In Fiscal Year 2017, OWASA spent about $90,000 less on electricity and natural gas than in Fiscal Year 2010.***
	Adopt Energy Management Plan and begin implementation of Energy Management Program.	Continued reduction in electricity use (kilowatt-hours) and natural gas use (therms).	***Complete. On April 13, 2017, the Board approved the Energy Management Plan that identifies strategies to meet the energy management goals and objectives set by the Board. The Plan is an output of OWASA's Energy Management Program which was established to identify cost-effective measures to reduce our use of energy, related energy costs, and associated greenhouse gas (GHG) emissions.*** ***Since 2010, OWASA has reduced its use of purchased electricity by 27% by implementing cost-effective energy efficiency projects and conservation measures. Although our natural gas use in 2016 was 79% higher than in 2010, we anticipate that in bringing the biogas-to-boiler system back on-line in the coming months and in implementing strategies identified in the Energy Management Plan, we will reduce our natural gas use below 2010 levels.***

Strategic Initiative 5

Implement Advanced Metering Infrastructure

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Cost-effective, accurate, reliable and timely water metering information for enhanced customer service.	System procurement and implementation planning. Develop and implement Community Engagement Plan.	Procure a system within budget constraints that meets OWASA's needs. Develop implementation plans that will effectively mitigate risks identified in the AMI Feasibility Study and will fully inform and engage customers.	***Complete. The Board awarded the contract to Mueller Systems in May 2017 following extensive procurement and contract negotiation processes conducted by OWASA staff and our consultants. The total capital outlay per this contract is $4,903,304, which is 4.6% less than the $5,140,000 estimated in the 2015 Feasibility Study. Annual operation and maintenance costs are $106,500, which is 29% below the $150,000 per year projected in the Study. The project will be financed with low-interest loans from the State of North Carolina.*** ***A comprehensive set of implementation performance standards were included in the contract documents to mitigate risks. Subsequent implementation planning has used these standards as the foundation and guidance for document development.*** ***A robust Community Engagement Plan has been developed and approved by the Board in December 2016. The initial communications with customers began in October 2017 with the mailing of a "welcome flyer" to all accountholders. Customers will also receive a notice about 30 days prior to the upgrade of their meter.***
	System deployment.	Ensure the system delivers accurate, reliable and timely water use information for billing purposes. Processes are in place to ensure customers are provided accurate and timely information about their water use and prompt notifications about potential leaks.	***Software integration and testing to ensure that customers receive accurate billing is nearly complete. Process mapping and reconfiguring to ensure that we receive the full benefits of the system for our customers is underway. In November 2017, we will be releasing approximately 200 meters to the installation contractor to test the deployment procedures and revise as needed. In January 2018, we intend to begin full-scale deployment in the service area which should take 15-16 months to complete. Customers will have***

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
		Reduce energy use and carbon footprint associated with meter reading and field service functions. Customer feedback on their experiences with the system installation, process changes and use of the portal is mostly positive.	***access to the web portal once we are about 75% complete with the deployment.***

Strategic Initiative 6

Develop a plan and policy framework for long-term management and disposition of OWASA lands

GOALS	ACTIONS	MEASURES OF SUCCESS	*PROGRESS*
Land assets provide the expected value to fulfill OWASA's mission and the assets are effectively managed.	Develop a long-term plan for sustainable management of OWASA forest lands (not including Cane Creek Mitigation Tract, which is already being managed). Management options range from "no active management" to comprehensive management that includes a variety of activities such as thinning, small seed tree cuts, small area clear-cuts, etc.	Forest lands are effectively managed to meet the goals provided in the Forest Stewardship Plan.	***Staff provided an overview of OWASA's land assets and why we own them to the Board on May 25, 2017. At that meeting, the Board directed staff to develop a Community Engagement Plan for forest management by late spring 2018.***
	Evaluate land assets to determine if the asset is needed, what degree of ownership is needed, and if the asset should be sold.	Land assets provide expected value to meet OWASA's current and future needs.	***At a meeting on September 26, 2017, the Natural Resources and Technical Services Committee reviewed several options to evaluate OWASA land to determine if any should be sold. The Committee unanimously agreed that the Board should wait to decide whether to do an analysis after we work through the forest management process and shared that recommendation with the Board on September 28, 2017.***

Administering Our Strategic Plan

We will provide regular updates on our progress towards achieving our Strategic Plan goals, including measures of success, which can be found on our website. We welcome your questions or comments about our Strategic Plan or any of our services and programs. You may contact us by:

- Phone: 919-968-4421
- E-mail: info@owasa.org
- Fax: 919-968-4464
- Address: 400 Jones Ferry, Carrboro, NC 27510

There are other high priority tasks that we will address over the next couple of years that are not included in our Strategic Plan because they do not require strategic action at this time. However, these tasks may require action by the Board in the future.

1. Continue to increase community awareness of options to manage and reduce OWASA bills and empower low-income customers and the local agencies that serve them with information and tools to manage and reduce OWASA bills through the Affordability Outreach Program.

   On December 8, 2016, the Board approved Year 2 of the Affordability Outreach Plan and has been receiving periodic updates on the plan throughout 2017.

2. Evaluate alternative employee compensation strategies to encourage and reward high performance as part of a Total Compensation Study.

   On September 14, 2017, the OWASA Board discussed employee compensation and requested the Human Resources (HR) Committee to develop a recommendation. The HR Committee met on October 18, 2017 and will meet again on November 16, 2017, to develop a recommendation.

3. Develop and implement an Inclusion and Diversity Plan for the organization.

   Implementation of our Diversity and Inclusion plan is well underway. Our consultant, VISIONS, Inc. has provided training to three groups of OWASA employees. Our next steps include an organizational assessment which will be pertinent to the planning of future strategies.

We provide an Annual Review and Update of Strategic Trends and Utility Planning Issues to the Board each October. This report will be modified as a companion document to this Strategic Plan for the Board's consideration in October 2017.

We will routinely update and amend our Strategic Plan as necessary, and we will keep our customers and stakeholders informed of significant changes.

Summary

As your community-owned water utility, we are committed to providing reliable, high quality water, wastewater and reclaimed water services for our customers, now and into the future. Our Strategic Plan is one of many tools we use to effectively manage our essential responsibilities to the Carrboro-Chapel Hill community. We will continue to work hard to provide excellent service so that if our customers could choose their water utility, they would always select OWASA.

AGENDA ITEM

- Financial Report for The Three Month Period Ended September 30, 2017

PURPOSE

- To inform the Board of Directors of OWASA's financial performance and fiscal position.

BACKGROUND

- The financial report consists of a Statement of Net Position, an Income Statement that includes a budget to actual comparison, graphical presentations of financial performance indicators and a Financial Management Policy Report Card.

- Highlights of the report include:

    - All financial performance targets were met.

    - Operating Revenues for the period were about $276,000 or 2.7% under budget.

    - Customer Fees (Service Availability Fees) were about $3,000 or 0.8% under budget.

    - Operating Expenses were under budget by 9.2% or about $491,000.

    - Net Income less Debt Service was 5.8% or roughly $211,000 over budget.

    - Capital Improvement Program expenditures were under budget for the three month period by approximately $288,000.

ACTION NEEDED

- Receive and discuss the Financial Report for the three month period ended September 30, 2017.

October 26, 2017

ORANGE WATER AND SEWER AUTHORITY

A public, non-profit agency providing water, sewer and reclaimed water services to the Carrboro-Chapel Hill community.

MEMORANDUM

To: Board of Directors

Through: Ed Kerwin

From: Stephen Winters, CPA

Date: October 20, 2017

Subject: Financial Report for the three month period ended September 30, 2017

Purpose

The financial report for the three month period ended September 30, 2017 is presented to inform the Board of Directors of OWASA's financial position and financial performance in relation to budget.

Contents

- Statement of Net Position
- Income Statement
- Graphs of Key Performance Indicators
- Financial Management Policy Report Card

Fiscal Performance

- As shown on page 10 of the financial report, all financial performance measurement targets were met for the period.
- Average drinking water sales for the period was 6.43 million gallons per day (MGD), 6.73 was projected. Combined drinking and reclaimed water sales for the period averaged 7.62 MGD versus a projection of 8.07.
- Total Operating Revenue was 2.7% or about $276,000 under budget.
- Revenue from new system connections was about equal to budget.
- Total Operating Expenses for the period were 9.2% or about $491,000 under budget.
    - General and Administrative expenses were under budget by about $266,000 due primarily to not incurring consulting fees when expected and vacancies in the Engineering and Planning and Finance departments.
    - The Water Supply and Treatment department was under budget by about $33,000 primarily due to lower than expected maintenance costs.
    - Water Distribution expenses were under budget by about $33,000 due primarily to position vacancies.
    - Wastewater Treatment expenses were under budget by about $117,000. Maintenance costs were about $36,000 less than projected for the period. Position vacancies also contributed.

  - Wastewater Collection expenses were under budget by about $43,000. Personnel and energy costs were lower than budgeted.

- Net Income less Debt Service for the period was approximately $211,000 or 5.8% more than budget.
- Capital Improvements Program (CIP) expenses of $2.6 million included significant construction activity on the Hillsborough Street Water Main Replacement, Rogerson Drive Force Main Rehabilitation, and Gravity Sewer Rehabilitation projects. Other notable projects in construction included Water Treatment Plant Filter Media and Backwash Improvements, Eastowne, Eubanks, Meadowmont 1 Pump Station Rehabilitation, Rogerson Drive Pump Station Rehabilitation (Phase 1), and Water Treatment Plant Fluoride System Improvements. In addition, construction on the Historic Rogers Road Area Sewer Extension project began in September; staff is providing project management services for this $4.7 million construction project which is being funded by Orange County.

  At the close of the first quarter, we are projecting to spend $15.9 million in FY 2018 for the CIP, equating to about 105% of budget. In addition to the projects referenced above, the projection accounts for significant construction expenses on Little Creek Interceptor Replacement, Brandywine Road Water Main Replacement, Administration Building HVAC Improvements, Advanced Meter Infrastructure System implementation, as well as reimbursement to UNC for construction of the Kenan Stadium Interceptor Replacement.

  Staff expects to present several construction contracts for Board approval over the next two quarters, including Rogerson Drive Pump Station Rehabilitation (Phase 2), Galvanized Water Main Replacement, and Wastewater Treatment Plant Intermediate Pump Station Rehabilitation.

Stephen Winters, CPA
Director of Finance and Customer Service

Orange Water and Sewer Authority

Financial Report
For the Three Month Period Ended
September 30, 2017

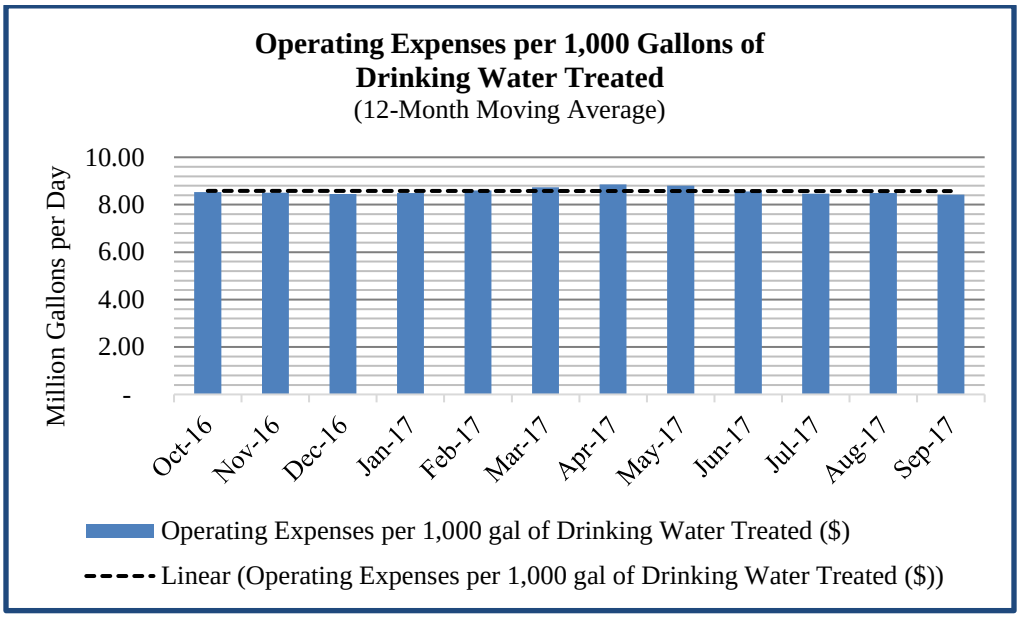
Orange Water and Sewer Authority
Statement of Net Position
September 30, 2017
(unaudited)

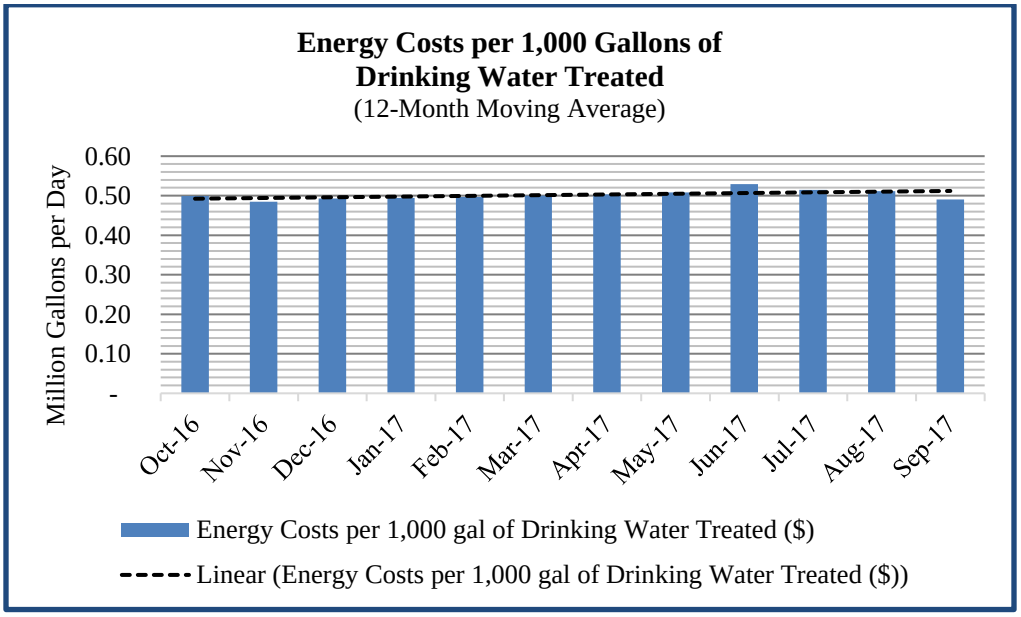
Assets	
Current Assets	
Cash	$25,106,707
Receivables	5,748,113
Inventory	1,010,659
Prepaid expenses	286,786
Restricted cash	1,821,288
Total Current Assets	33,973,553
Noncurrent Assets	
Capital assets (net of depreciation)	276,926,964
Other noncurrent assets	29,633,194
Total Noncurrent Assets	306,560,158
Total Assets	$340,533,711
Liabilities and Net Position	
Current Liabilities	
Accounts payable and accrued expenses	$1,003,998
Unearned income	184,230
Customer deposits	1,270,012
Total Current Liabilities	2,458,240
Noncurrent Liabilities	
Bonds payable	62,626,000
Other noncurrent liabilities	7,769,058
Total Noncurrent Liabilities	70,395,058
Net Position	
Contributed capital	114,653,604
Net position at the beginning of the year	149,425,983
Year-to-date accrual basis net income	3,600,826
Total Liabilities and Net Position	$340,533,711
Net income reconciliation:	
Accrual basis net income	$3,600,826
Depreciation, other post-employment benefits, and interest expense	1,878,758
Modified accrual basis net income	$5,479,584

Orange Water and Sewer Authority
Income Statement
For the Three Month Period Ended September 30, 2017
(unaudited)

	Actual through September 30, 2017	Budget through September 30, 2017	Variance (effect on net change in Fund Balance)	Percent Variance
Operating Revenue:				
Water	$5,201,050	$5,614,613	($413,563)	(7.4%)
Sewer	4,351,532	4,250,505	101,027	2.4
Reclaimed Water	139,260	145,504	(6,244)	(4.3)
Service Initiation Fees	60,205	41,412	18,793	45.4
Other	257,730	249,096	8,634	3.5
Refunds and Allowances	(46,415)	(61,521)	15,106	24.6
Total Operating Revenue	9,963,362	10,239,609	(276,247)	(2.7)
Non-Operating Income:				
Customer Fees	351,339	354,165	(2,826)	(0.8)
Interest	7,449	9,609	(2,160)	(22.5)
Total Non-Operating Income	358,788	363,774	(4,986)	(1.4)
Total Income	10,322,150	10,603,383	(281,233)	(2.7)
Operating Expense:				
General and Administrative	1,428,466	1,694,481	266,015	15.7
Water Supply and Treatment	1,433,668	1,466,579	32,911	2.2
Water Distribution	733,876	767,125	33,249	4.3
Wastewater Treatment	1,009,924	1,126,436	116,512	10.3
Wastewater Collection	236,632	279,141	42,509	15.2
Total Operating Expense	4,842,566	5,333,762	491,196	9.2
Net Income (modified accrual)	5,479,584	5,269,621	209,963	4.0
Debt Service	1,654,450	1,655,384	934	0.1
Net Income less Debt Service	3,825,134	3,614,237	210,897	5.8
Less: CIP Expenditures	2,606,000	2,894,000	288,000	10.0
Capital Equipment Expenditures	287,555	1,231,100	943,545	76.6
Net Change in Fund Balance	$931,579	($510,863)	$1,442,442	-

Orange Water and Sewer Authority
Select Financial Data
For the Three Month Period Ended September 30, 2017





Orange Water and Sewer Authority
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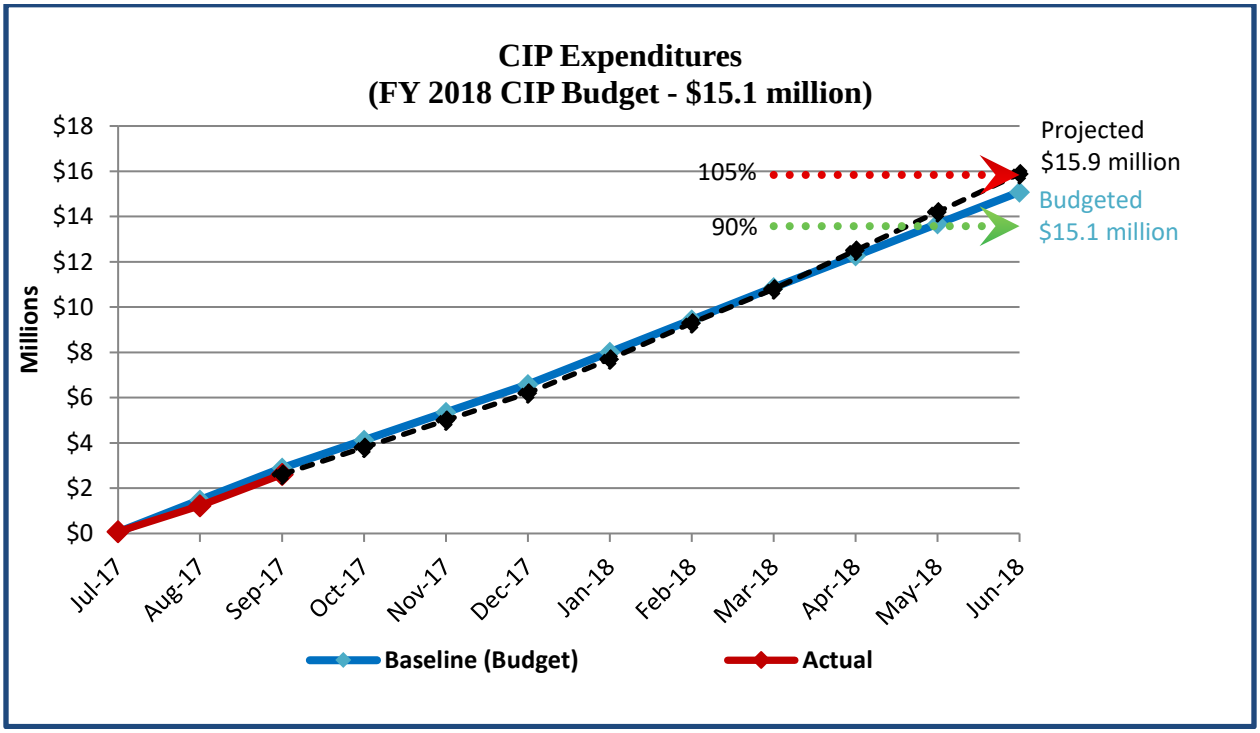
For the Three Month Period Ended September 30, 2017

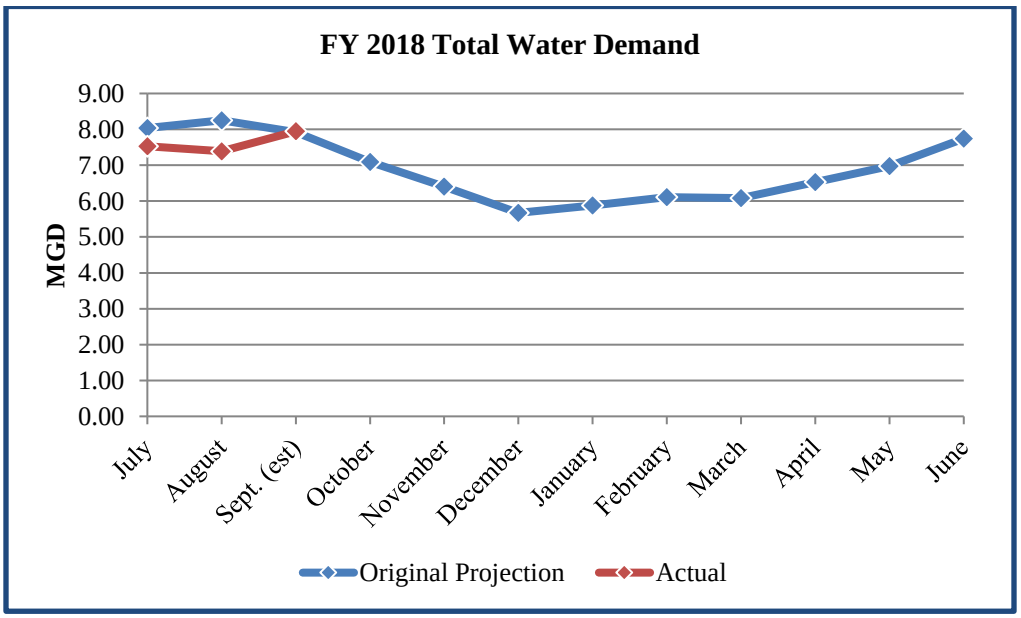


Orange Water and Sewer Authority
Select Financial Data
For the Three Month Period Ended September 30, 2017

FY 2018 Water Sales Projection (Average Day)

	Original FY 2018 Sales Projections		Actual FY 2018 Water Sales		Revised FY 2018 Sales Projections	
	DW	RCW	DW	RCW	DW	RCW
July	6.59	1.45	6.24	1.29	6.24	1.29
August	6.77	1.48	6.22	1.17	6.22	1.17
September	6.82	1.10	6.84	1.10	6.82	1.10
October	6.47	0.62			6.47	0.62
November	6.05	0.36			6.04	0.36
December	5.41	0.26			5.41	0.26
January	5.64	0.23			5.64	0.23
February	5.85	0.26			5.85	0.26
March	5.72	0.37			5.72	0.37
April	5.94	0.58			5.95	0.58
May	6.07	0.90			6.07	0.90
June	6.47	1.27			6.47	1.27
Average	6.15	0.74	6.43	1.19	6.08	0.70

Estimates shown in red



Orange Water and Sewer Authority
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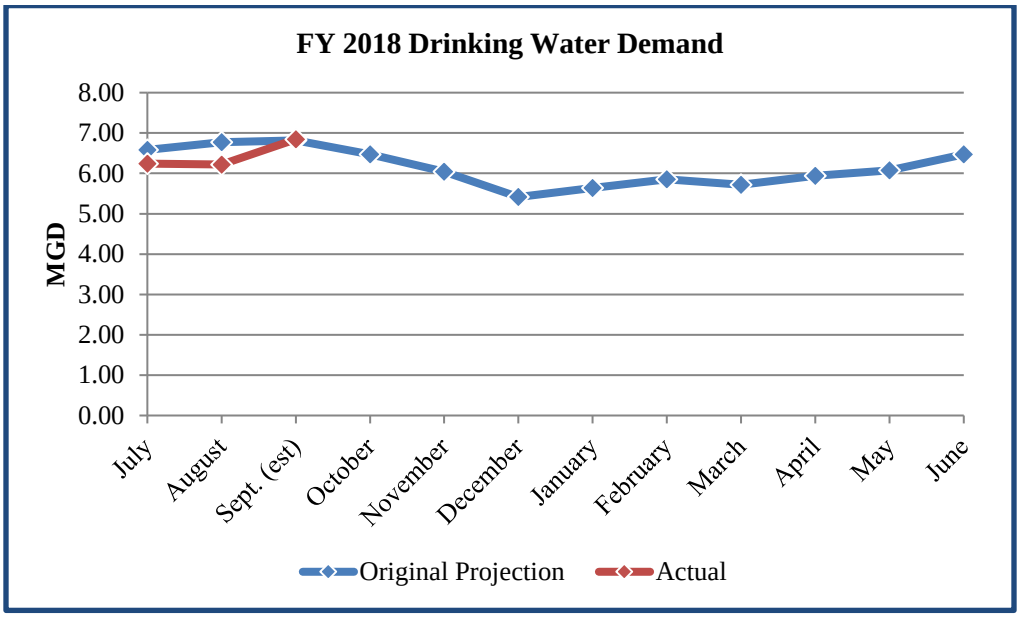
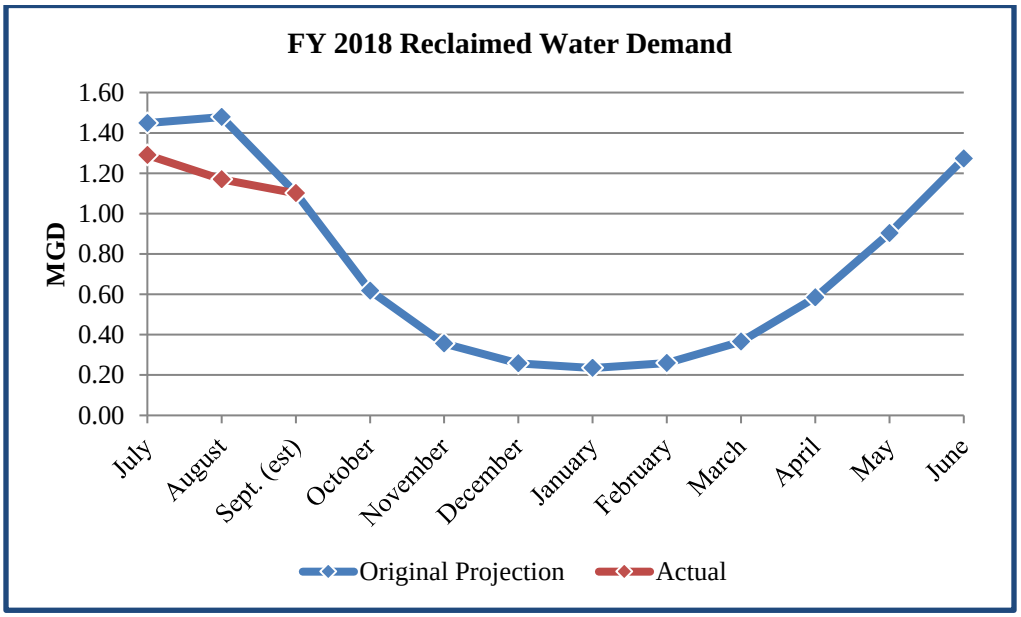
For the Three Month Period Ended September 30, 2017





Orange Water and Sewer Authority
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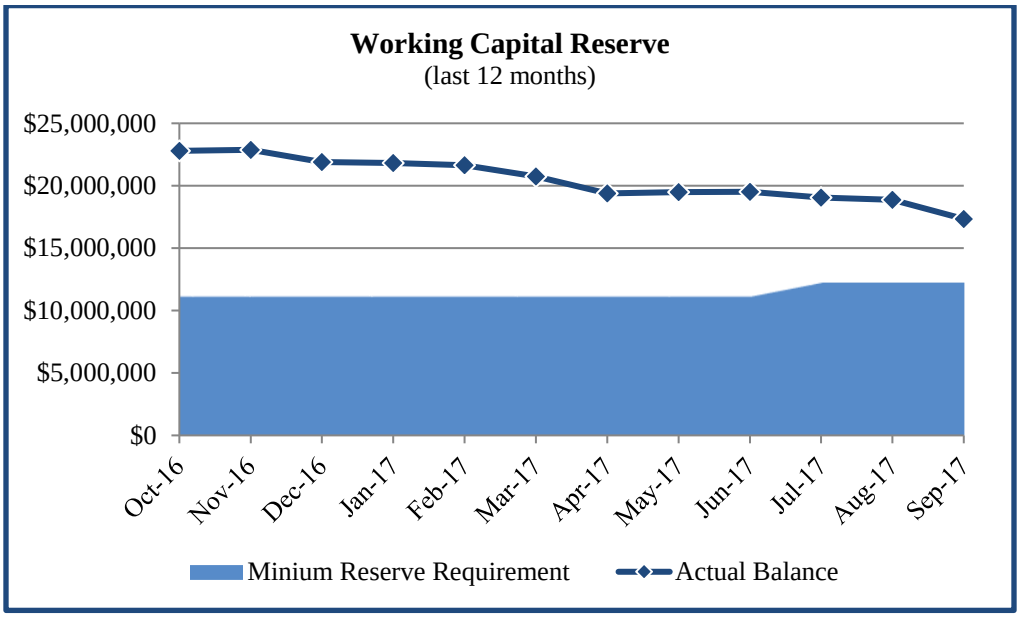
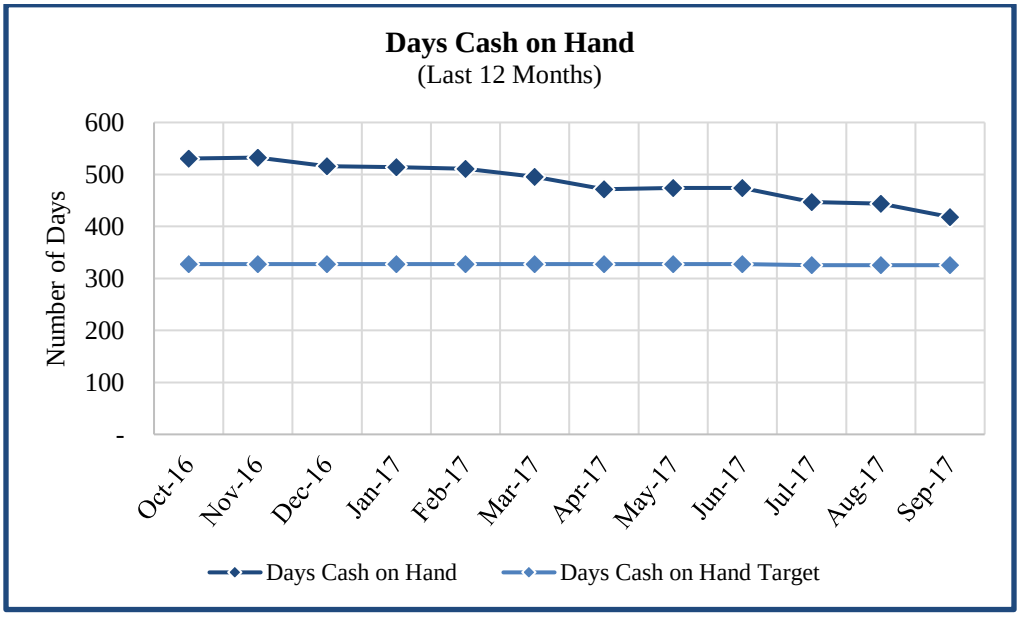
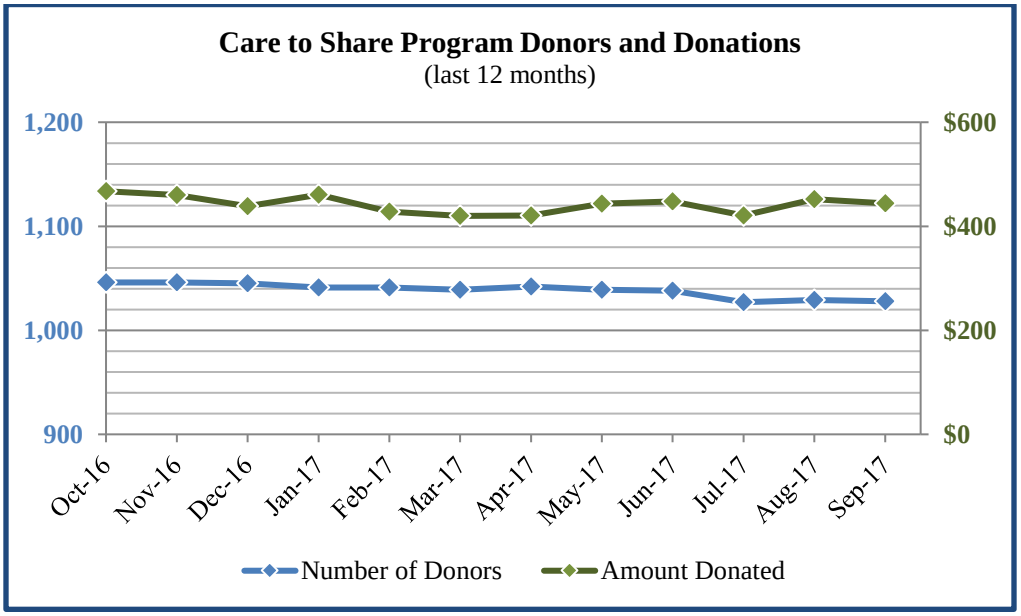
For the Three Month Period Ended September 30, 2017





Orange Water and Sewer Authority
Select Financial Data
For the Three Month Period Ended September 30, 2017



Orange Water and Sewer Authority
Financial Management Policy Report Card
For the Three Month Period Ended September 30, 2017

Measurement	Objective	FY17 Results	FY18 Goal	YTD FY18 Results
Working Capital Reserves	Greater of four months Operating expenses or 20% of succeeding three years CIP	$19.5M	$12.2M	$17.3M
Capital Improvements Reserve	2% of Net Capital Assets (Funding $400,000 per year until reach goal of approximately $6M)	$3.2M	$3.6M	$3.6M
Rate/Revenue Stabilization Reserve	5% of annual Water and Sewer Revenue	$1.7M	$1.7M	$1.7M
Debt Burden to Asset Value	Total Debt not more than 50% of Total Assets	23%	≤ 50%	21%
Sufficiency of Revenues above Debt Requirements [1]	Annual Debt Service no more than 35% of Gross Revenue	18%	≤ 35%	19%
Cash Financing of Capital [2]	Annual revenues and reserves provide at least 30% of CIP funding	50%	≥ 30%	49%
Debt Service Coverage Ratio [1]	Annual Net Income not less than two times Annual Debt Service	2.4	2.0	2.2
Service Affordability Ratio [3]	Average annual OWASA bill not more than 1.5% of area median household income	1.35%	1.5%	1.35%

M = million

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[1] Calculation based on the FY 2018 Annual Budget until full-year results are available.
[2] Cash Financing of Capital based on 5-Year CIP Budget and potential borrowing during the same period.
[3] FY 2018 Calculation based on median household income of $62,620 (per 2015 U.S. Census Bureau, American Community Survey, 5-Year Estimates) and average monthly household water use of 4,000 gallons.