PUBLIC WASTEWATER SYSTEM PLANNING GUIDE

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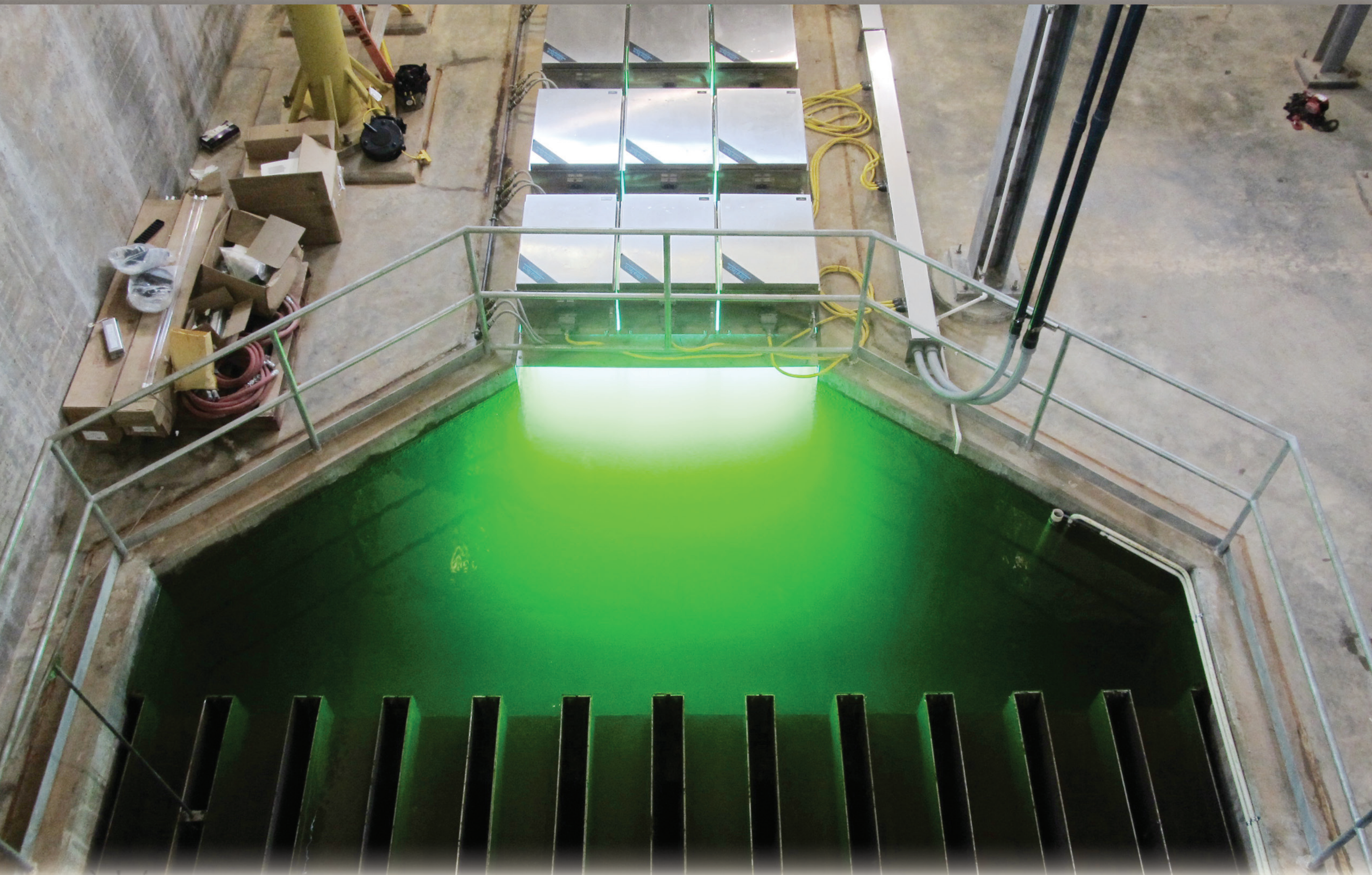

Oklahoma Comprehensive Water Plan
OCWP

WATER FOR 2060
EFFICIENCY • CONSERVATION • RECYCLING • REUSE

OWRB
the water agency

Oklahoma Comprehensive Water Plan

Public Wastewater System Planning Guide

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Oklahoma Water Resources Board

August 2015

Contents

**Includes Fiscal Sustainability Plan (FSP) tables.*

Section 1: Introduction

The Oklahoma Water Resources Board (OWRB) has prepared this Public Wastewater System Planning Guide to assist public wastewater utilities in developing plans to meet their long-term needs. While the *2012 Update of the Oklahoma Comprehensive Water Plan* (OCWP) focused primarily on water supply, the *OCWP Executive Report* (http://www.owrb.ok.gov) provides a summary of current water quality and pollution control rules and regulations and may be helpful when developing a long-term comprehensive wastewater system plan.

This guide may be most useful for smaller utilities who have not prepared plans in the past. However, the steps and processes outlined are applicable to any size wastewater system. The process of planning involves several steps, including gathering data, identifying goals and objectives of the organization, developing and assessing alternatives to meet goals, and outlining methods to implement selected alternatives. Planning also includes periodic reassessment to account for any changes in conditions, goals, or objectives. This guide also provides resources to additional information that may be valuable in the planning process.

Many wastewater system planning decisions are local and can vary greatly by system. The purpose of this guide is not to provide a single solution that fits every system, but to provide a framework for collecting data that is necessary for long-range wastewater system planning. The guide uses a question-and-answer format that may be used first to collect data, next to determine if there are gaps between the existing system and future needs, and finally to develop and assess strategies to close the gaps.

Wastewater Infrastructure Cost Summary by Region[1]

Region	Present-2020 Infrastructure Need	2021-2040 Infrastructure Need	2041-2060 Infrastructure Need	Total Period Infrastructure Need
	Millions of 2010 dollars			
Beaver-Cache	$710	$1,300	$600	$2,610
Blue-Boggy	$400	$650	$220	$1,270
Central	$3,300	$5,900	$2,300	$11,500
Eufaula	$520	$1,100	$420	$2,040
Grand	$720	$1,300	$480	$2,500
Lower Arkansas	$880	$1,800	$640	$3,320
Lower Washita	$960	$2,000	$630	$3,590
Middle Arkansas	$2,100	$3,100	$1,300	$6,500
Panhandle	$500	$690	$240	$1,430
Southeast	$280	$650	$240	$1,170
Southwest	$480	$1,000	$320	$1,800
Upper Arkansas	$1,140	$2,400	$740	$4,280
West Central	$520	$790	$300	$1,610
Total	**$12,510**	**$22,680**	**$8,430**	**$43,620**

Source: Draft Wastewater Needs Assessment by Region, CDM, November 2011

[1] Small differences in values may result from rounding

Wastewater System Sustainability

Sustainable activities are those that meet the needs of the present without compromising the ability of future generations to meet their needs. It includes three integrated dimensions—environmental, economic, and social. The EPA and state work with systems to help ensure the long-term sustainability of wastewater infrastructure. As systems go through the planning process, consideration of sustainability is necessary. More information on sustainability can be found on the EPA's website at water.epa.gov/infrastructure/sustain/index.cfm. The EPA's "Planning for Sustainability" handbook can be downloaded at water.epa.gov/infrastructure/sustain/upload/EPA-s-Planning-for-Sustainability-Handbook.pdf.

Fiscal Sustainability Plans (FSP)

A fiscal sustainability plan (FSP) is now required under the amended Water Resources Reform and Development Act (WRRDA) of 2014 for Clean Water State Revolving Fund (CWSRF) projects that upgrade or expand existing treatment works. Some systems may have a Capital Improvement Plan or similar document already in place that will fulfill some or all of the FSP requirements.

Complete language for involving the FSP and other WRDDA updates can be found in the WRRDA Interpretive Guidance on the OWRB website at www.owrb.ok.gov/CWSRF.

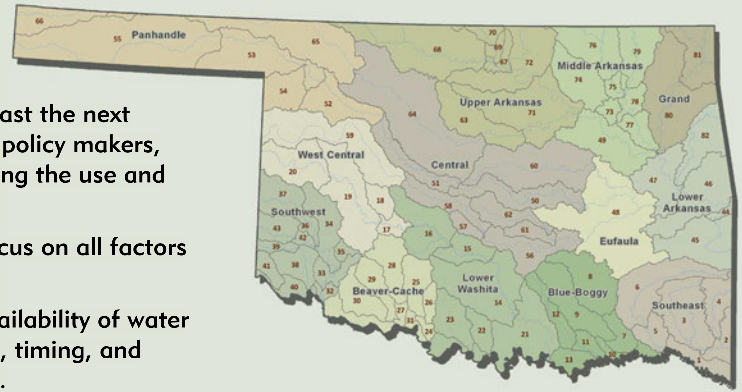
Such a plan, at a minimum, will need to include:

- An inventory of critical assets (Section 4);
- An evaluation of the condition and performance of those assets (Section 4);
- Certification that the loan recipient has evaluated and implemented water and energy conservation efforts (Section 8);
- A plan to maintain, repair and replace the treatment works over time and a plan to fund these activities (Sections 4,5, & 8 - especially the Project Prioritization tables on pages 99-100);
- The loan recipient will certify in their loan agreement that an FSP fulfilling these requirements will be completed no later than final inspection of project construction.

An FSP, properly completed is an ideal way for a community to stay on top of a system's effectiveness, avoid costly repairs, be prepared for necessary maintenance and upgrades in the future, and consider annual or regular fee increases to stay up with costs and inflation. Many advantages come from such a plan. Some systems may already have something in their Capital Improvement Plans or other similar document that may fulfill these requirements. If not, your city or consulting engineer is likely to be familiar with the strategies outlined above and may already incorporate these ideas into their proposal for your community.

Oklahoma Comprehensive Water Plan

The objective of the 2012 Oklahoma Comprehensive Water Plan (OCWP) Update is to establish a reliable supply of water for Oklahoma citizens throughout at least the next 50 years, providing information so that water systems, policy makers, and water users can make informed decisions concerning the use and management of Oklahoma's water resources.



OCWP studies were conducted for 82 surface water basins. Existing watershed boundaries were revised to include a USGS stream gage at or near the basin outlet where practical. To facilitate consideration of regional supply challenges and potential solutions, basins were aggregated into 13 distinct Watershed Planning Regions.

OCWP water demand analysis included an intensive focus on all factors impacting water use throughout the next 50 years.

The impacts of forecasted demands on the physical availability of water supplies through 2060 were evaluated and the amount, timing, and probability of potential water shortages were predicted.

Using both current and historical data, water quality trends in all 82 basins were analyzed. Based upon current trends and attainment of standards for beneficial use, 27 basins were considered to exhibit poor surface water quality and thus may face particular challenges in their ability to provide adequate and reliable supply.

For more information on water demand and water quality trends, visit the OCWP web page at www.owrb.ok.gov/ocwp and download the OCWP Executive Report.

Water For 2060

With passage of House Bill 3055 (the "Water For 2060 Act") in 2012, Oklahoma became the first state in the nation to establish a bold, statewide goal of consuming no more fresh water in 2060 than is consumed today.

Water for 2060 emphasizes the use of education and incentives, rather than mandates, to achieve this ambitious goal without limiting Oklahoma's future growth and prosperity. A fifteen-member advisory council was created in 2013. The Council is chaired by J.D. Strong, OWRB Executive Director, and is comprised of fourteen members appointed by the Governor, Speaker of the House, and President Pro Tempore of the Senate.

The 15 members are tasked with studying and recommending appropriate water conservation practices, incentives, and educational programs to moderate statewide water usage while preserving Oklahoma's population growth and economic development goals.

The OWRB has partnered with the U.S. Army Corps of Engineers to support the work of the Advisory Council. Quarterly meetings and workshops at the OWRB's Oklahoma City office have provided the Council an opportunity to hear from leaders in public water supply, crop irrigation, and a variety of industries.

Information gleaned from these workshops will be used to shape the recommendations to be submitted to the Governor, Speaker of the House, and President Pro Tempore by late 2015.

Eligible OWRB financial assistance projects—including those funded through both the Clean Water and Drinking Water State Revolving Fund loan programs—can help Oklahoma citizens, municipalities, farmers, ranchers, and industries meet Water for 2060 goals today. These projects can be focused on one or more of the following results:

- Water efficiency and reuse/recycling
- Repairing broken/malfunctioning meters
- Installation of leak detection equipment
- System water audits
- Water system conservation plan development
- Nonpoint source pollution control
- Capital project implementation resulting in direct benefits to water quality
- Streambank stabilization and related efforts to reduce erosion
- Green infrastructure (green streets, permeable pavement, green roofs, etc.) that reduces impervious surfaces and increases stormwater quality
- Bioretention of runoff and sediments
- Stormwater harvesting and reuse
- Natural habitat enhancement through urban forestry, rain gardens, etc.
- Low Impact Development (LID) through sustainable stormwater practices
- Long-range system management and utility sustainability planning
- Contingency projects to address acute climate variability impacts

For more information on Water for 2060, please visit www.owrb.ok.gov/2060.

How to Use this Guide

This guide presents basic concepts of wastewater system strategic planning that will prepare wastewater utilities to respond to changing circumstances while maintaining organizational and financial sustainability.

Wastewater system strategic planning consists of five main steps: 1) gathering data, 2) identifying future needs, 3) developing and assessing alternatives, 4) implementing selected alternatives, and 5) reassessing based on changes in conditions.

Long-range planning is an ongoing process. Reevaluating and updating the plan are necessary to reflect the changing conditions or goals of a wastewater system. The guide also includes information on the selection of a professional engineer to conduct detailed studies and design improvements, reassess strategies, and develop an implementation timeline.

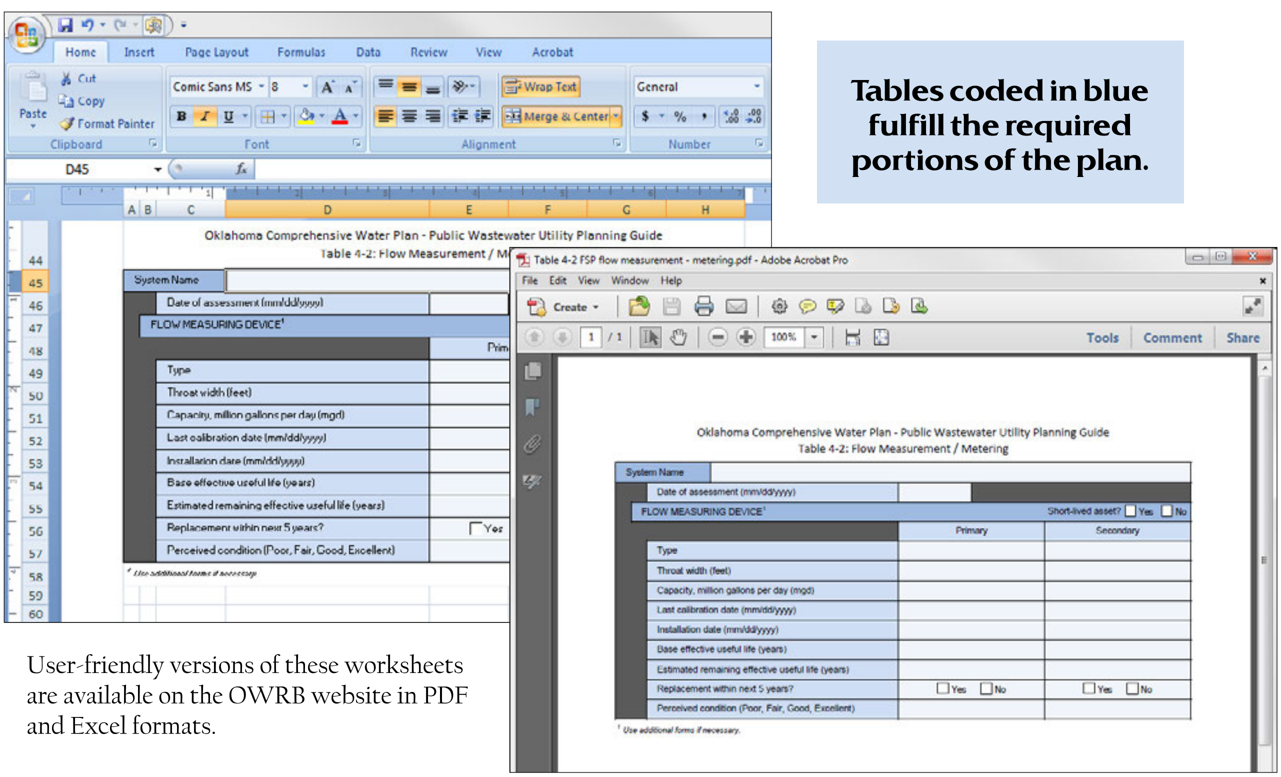
Sections 3 through 9 contain worksheets for gathering data. These worksheets are intended to be a general guide for collecting information that is necessary for strategic planning, but in many cases will need to be altered or adjusted to be relevant to a particular wastewater system. User-friendly versions of these worksheets are available on the OWRB website in pdf and excel formats. Please note that if the information on a particular worksheet already exists in another document, it may be attached or referenced in lieu of completing the worksheet.

Using the WWPG as an FSP Template

Federal guidance for FSP plans is broad and leaves ample latitude for your community to develop its Plan as you think best. This Wastewater Planning Guide is designed, in part, to act as a template to help a community or engineer fulfill these requirements. This guide may also be found online in PDF and Excel formats at www.owrb.ok.gov/guides.

Some important points about the FSP:

- Developing an FSP makes good business sense that ensures long-range planning and sustainability;
- The development of an FSP is an eligible cost and will be a condition of the loan agreement for projects that require it;
- The FSP is intended to be a living document that is regularly reviewed and revised;
- There is no final deadline for completion of an FSP; however, it will need to be "certified" prior to releasing final payment of a project;
- It is not necessary that the FSP cover the entire wastewater system; but rather may be phased in. The initial FSP may cover only the funded project and closely associated components, e.g. an FSP for a new lift station should describe the lift station and all collection lines connected to that station. For some very small systems it may make sense that the FSP describe the complete WWTP.



Tables coded in blue fulfill the required portions of the plan.

User-friendly versions of these worksheets are available on the OWRB website in PDF and Excel formats.

Section 2: Rules and Regulations

Governing Bodies

In Oklahoma, several government agencies are involved in issues related to wastewater, including the U.S. Environmental Protection Agency (EPA), Oklahoma Department of Environmental Quality (ODEQ), and Oklahoma Water Resources Board (OWRB). States have been granted the authority to enforce discharge regulations for publicly owned treatment works (POTW) if they adopt regulations as stringent as federal requirements. Enforcement of discharge regulations occurs through the ODEQ's Water Quality Division. More information about wastewater regulations in Oklahoma can be found at www.deq.state.ok.us.

Current Regulations

Oklahoma Administrative Code (OAC) outlines regulations on wastewater system discharges, receiving water quality, distribution systems, and Operation and Maintenance (O&M) of wastewater systems through the Oklahoma Pollutant Discharge Elimination System (OPDES). Most of these regulations can be found in OAC 252:656-1-1 *et seq.*, OAC 252:606-1-1 *et seq.*, and OAC 252:627-1-1 *et seq.* (www.deq.state.ok.us/mainlinks/deqrules.htm). Chapter 656 outlines construction requirements and general design guidelines for all aspects of wastewater (from collection and treatment to discharge). Chapter 606 sets standards for discharges and implements the OPDES. Chapter 627 establishes operating requirements for water reuse systems.

Oklahoma Pollution Discharge Elimination System

The OPDES is a permitting program that uses uniform technology-based and water quality-based minimum standards to ensure protection of receiving waters (cfpub.epa.gov/npdes/index.cfm). Technology-based standards are developed on the ability of all wastewater dischargers to treat wastewater using a common technology or practice. Water quality-based standards are developed if the technology-based limits are not sufficient to provide protection of the receiving water body.

Oklahoma developed its OPDES Program in 1996, as required by the CWA. The OPDES Program allows the state to perform the permitting, administrative, and enforcement aspects of the federal program (www.deq.state.ok.us/wqdnew/opdes/index.html and www.deq.state.ok.us/rules/606.pdf). Under this program, all facilities that receive primarily residential and commercial customers' sewage for treatment and discharge are required to obtain a permit.

Discharge Permit Requirements

Secondary treatment standards and performance requirements are established by EPA for municipal discharges. These technology-based regulations apply to all municipal wastewater treatment plants (WWTPs) and represent the minimum level of effluent quality required, in terms of 5-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) removal.

The secondary treatment standards also provide for special considerations regarding combined sewers, industrial wastes, waste stabilization ponds (or lagoons), and less concentrated influent wastewater for combined and separate sewers. In addition, the secondary treatment standards provide alternative standards established on a case-by-case basis for treatment facilities considered equivalent to secondary treatment (i.e., trickling filters and waste stabilization ponds).

Oklahoma's secondary treatment limits are divided into categories for facilities that discharge to perennial streams (continuous flow in parts of its stream bed all year round), intermittent streams (those with 7-day, 2 year, low flow measurements of zero), lakes, and lagoon treated discharge (either to a perennial or an intermittent stream). Table 2-1 provides a summary of the Oklahoma secondary treatment standards.

Table 2-1: Oklahoma Secondary Treatment Standards[1]

Frequency	Perennial Streams Discharge	Intermittent Streams or Lake Discharge	Lagoons Discharge
Monthly Average	30 mg/L BOD_5 [2] or 25 mg/L $CBOD_5$ [3]	20 mg/L BOD_5 or 18 mg/L $CBOD_5$	30 mg/L BOD_5 or 25 mg/L $CBOD_5$
Weekly Average	45 mg/L BOD_5 or 40 mg/L $CBOD_5$	30 mg/L BOD_5 or 25 mg/L $CBOD_5$	45 mg/L BOD_5 or 40 mg/L $CBOD_5$
Monthly Average	% removal BOD_5 or $CBOD_5$ cannot be less than 85%	% removal BOD_5 or $CBOD_5$ cannot be less than 85%	% removal BOD_5 or $CBOD_5$ cannot be less than 65%
Monthly Average	30 mg/L TSS [4]	30 mg/L TSS	90 mg/L TSS
Weekly Average	45 mg/L TSS	45 mg/L TSS	
Monthly Average	% removal TSS cannot be less than 85%	% removal TSS cannot be less than 85%	
pH	6.5 – 9.0 s.u. [5]	6.5 – 9.0 s.u.	6.5 – 9.0 s.u.

[1] *This table summarizes current treatment standards as of 9/12/2014; check with ODEQ for updates or more information.*
[2] *BOD_5 = 5-day Biochemical Oxygen Demand*
[3] *$CBOD_5$ = 5-day Carbonaceous Biochemical Oxygen Demand*
[4] *TSS = Total Suspended Solids*
[5] *s.u. = standard units*

Stormwater Program

Contaminated stormwater runoff can adversely impact water quality. The EPA has delegated all responsibilities for stormwater discharges associated with construction and industrial sites to the ODEQ. This program is administered under the OPDES.

All stormwater general permits require the permitted business or entity to complete, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP has to meet the requirements found in the general permit and must be site specific. Further information on the ODEQ Stormwater Program can be found on its website (www.deq.state.ok.us/wqdnew/stormwater/index.html).

Sewage Sludge/Biosolids Regulations

The ODEQ regulates all treatment of sewage sludge and land application of biosolids. Sewage sludge must be treated to EPA standards for beneficial reuse before it can be called "biosolids." Biosolids are solid, semi-solid, and liquid residues generated during treatment of sanitary (domestic) sewage, which can be safely recycled and applied as fertilizer/soil conditioner to improve soil quality and stimulate plant growth.

Biosolids are divided into two Classes: Class A biosolids must meet the pathogen reduction requirements of 40 CFR 503.32(a); and Class B biosolids must meet the pathogen reduction requirements of 40 CFR 503.32(b). "A Plain English Guide to the EPA Part 503 Biosolids Rule" can be a useful guide to understanding biosolids regulations (water.epa.gov/scitech/wastetech/biosolids/503pe_index.cfm).

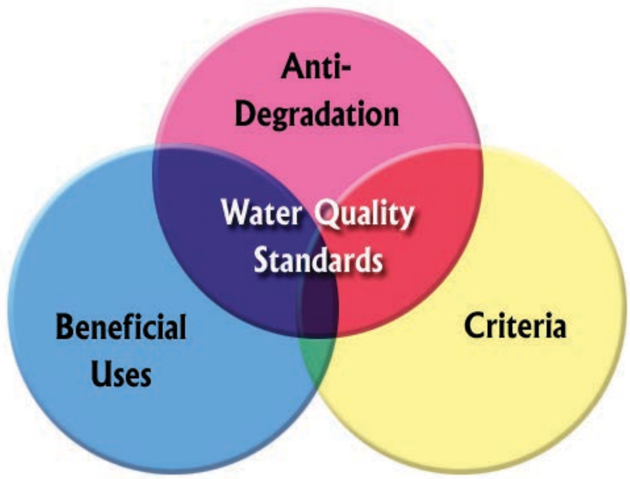
The ODEQ administers biosolids regulations through its OPDES Program. Limits are established for contaminants (mainly metals), pathogen content, and vector (or pest) attraction. A permit and an approved biosolids management plan are a requirement of the program. Surface disposal is prohibited other than disposal of biosolids in a municipal solid waste landfill that is permitted by ODEQ (www.deq.state.ok.us/rules/606.pdf).

Protection of Receiving Waters

Oklahoma's Water Quality Standards (WQS) were adopted by Oklahoma in accordance with the federal Clean Water Act, applicable federal regulations, and state pollution control and administrative procedure statutes. WQS establish water quality benchmarks and provide the basis for the development of pollution control programs, including discharge permits, which dictate specific treatment levels required of municipal and industrial wastewater dischargers.

The OWRB continuously samples Oklahoma's rivers, stream, and lakes through its water quality monitoring programs (www.owrb.ok.gov/quality/monitoring/monitoring.php) to provide data for setting and modifying the WQS.

Antidegradation policy statements give special protection to waterbodies such as scenic rivers that have a higher quality than that required for normal beneficial uses. These policies provide more stringent protection and are designed to keep water quality from declining in these areas.



Oklahoma's Water Quality Standards consist of three main components: (1) designation of beneficial uses, (2) water quality criteria to protect the designated uses, and (3) antidegradation policies.

Pretreatment Program

Generally, most wastewater treatment systems are designed to treat residential or domestic sewage only. However, these treatment systems may also receive wastewater from industrial (or non-domestic) customers. The General Pretreatment Regulations establish responsibilities of federal, state, and local government; industry; and the public to implement Pretreatment Standards to control pollutants from the industrial customers that may pass through or interfere with the wastewater treatment processes. Receiving stream water quality can be compromised if the treatment plant cannot meet its discharge permit limits.

The State of Oklahoma regulates industries through the ODEQ Industrial Pretreatment Program (www.deq.state.ok.us/wqdnew/pretreatment/index.html). There are two ways for the state to regulate industries: (1) through the local municipality's approved Pretreatment Program; or (2) through an Indirect Discharge Permit where the local municipality does not have an approved pretreatment program or is not required to have one. The ODEQ Pretreatment Program regulates those industries not covered under another approved pretreatment program.

Sanitary Sewer Overflows and Peak Flows

Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all of the sewage that flows into them to a wastewater treatment plant (WWTP). However, occasional unintentional discharges of untreated wastewater from sanitary sewers occur in almost every system. These types of discharges are called sanitary sewer overflows (SSOs). SSOs have a variety of causes, including but not limited to blockages, pipeline breaks, sewer defects that allow stormwater and groundwater into the wastewater collection system, lack of routine sewer system O&M, power failures, inadequate sewer design, and vandalism. The untreated wastewater from these overflows can contaminate streams, causing serious water quality problems. SSOs also can back up into homes and basements, causing property damage and threatening public health.

Aging sewer line infrastructure in many communities allows rain and snow melt to enter sanitary sewer systems. During significant storm events, these high volumes (or peak flows) can overwhelm certain parts of the wastewater collection systems or treatment process and may cause damage or failure of the system. Operators of wastewater utilities must manage these high flows both to ensure the continued operation of the treatment process and prevent backups and overflows of raw wastewater in basements, on city streets, or into waterways. The EPA's policy on SSOs and peak flows is to encourage municipalities to make investments in ongoing maintenance and capital improvements to improve their system's long-term performance. More information on SSO and peak flows can be found at cfpub.epa.gov/npdes/.

Clean Air Act

Established in 1970 and amended in 1990, the Clean Air Act (CAA) establishes limitations for specific air pollutants to prevent significant deterioration in air quality. Maximum achievable control technology is required for any of 189 listed chemicals from major sources (i.e., larger WWTPs). WWTPs may be required to obtain a Title V (or part 70) permit pursuant to federal or state regulations.

The ODEQ Air Quality Division (AQD) requires an air quality permit for a facility if it has an air contaminant source with actual emissions of 5 tons per year (TPY) or more of any regulated air pollutant, or an emissions unit, installed after April 30, 1991, that is subject to federal standards.

Permits and sources are further classified as either major or minor based on their potential-to-emit (PTE). In general, a major source is any source with PTE of 100 TPY or more of any regulated air pollutant, 10 TPY or more of any one hazardous air pollutant (HAP), or 25 TPY or more of any combination of HAPs. Certain sources are subject to additional regulations and are required to obtain a major source permit regardless of PTE. Minor sources are those that do not meet the major source definition (www.deq.state.ok.us/rules/100.pdf).

If you have permitting questions please contact ODEQ's "one-stop permitting assistance" toll-free number 1-800-869-1400.

Future Standards and Regulations

As water resources become scarce, the protection of surface waters will necessarily become even more important. The State of Oklahoma and EPA have indicated that more stringent discharge limitations will be included in future OPDES permits. Nutrient control (nitrogen and phosphorus) as well as ammonia and temperature limits are gaining attention with state and federal regulators. Many states are also implementing limits based upon receiving stream algae growth. Potential future regulatory changes that should be considered in master planning are discussed below.

Water Reuse

Wastewater reuse in Oklahoma has been focused primarily toward municipal total-retention lagoon systems designed for crop irrigation. Treated wastewater effluent also has been allowed for golf course irrigation during times when the golf course was not in use by the public. The ODEQ is expanding the municipal wastewater reuse options offered. Drought conditions have become more persistent in recent years, and alternatives to expanding public water supplies to meet increasing demand are becoming more critical.

Oklahoma's water reuse regulations, OAC 252:627-1-1 *et seq*, became effective July 1, 2012. As a result, ODEQ has established new standards for operation and maintenance of systems that take treated wastewater, and with additional treatment, make it into non-potable (not drinkable) "reclaimed water" for beneficial use. The new rules create four categories of reclaimed water (see Table 2-2), each with specific treatment levels and permitted uses. Operating standards for the land application of wastewater from lagoon treatment systems were formerly in Chapters 619 and 621; those provisions have been incorporated into the new rules under Categories 4 and 5. The ODEQ expects new rules for potable (drinkable) reclaimed water to be in place by the end of 2016.

Watershed Permitting

A whole basin planning approach in Oklahoma is being implemented by the ODEQ. Based on work by the U.S. Geological Survey (USGS), the state has delineated 13 Watershed Management Units that are used to implement the watershed approach. The intent is that planning, monitoring, permitting, and other water quality programs will be coordinated and organized at a watershed level. A watershed permitting program would allow for local leadership, in conducting watershed planning and selecting appropriate management options, to meet watershed goals and CWA requirements. Information on the basin monitoring program can be found at www.deq.state.ok.us/wqdnew/.

Table 2-2: Permitted Uses of Reclaimed Water

	Permitted Uses
Category 1	• Reserved for potable reuse
Category 2	• All uses in Categories 3, 4 and 5 • Drip irrigation on orchards or vineyards • Spray or drip irrigation on sod farms, public access landscapes and public use areas/sports complexes, including unrestricted access golf courses • Toilet and urinal flushing • Fire protection systems • Commercial closed-loop air conditioning systems • Vehicle and equipment washing (excluding self-service car washes) • Range cattle watering
Category 3	• All uses in Categories 4 and 5 • Subsurface irrigation of orchards or vineyards • Restricted access landscape irrigation • Irrigation of livestock pasture • Concrete mixing • Dust control • Aggregate washing/sieving • New restricted access golf course irrigation systems • Industrial cooling towers and once-through cooling systems • Restricted access irrigation of sod farms
Category 4	• All uses in Category 5 • Soil compaction and similar construction activities • Existing restricted golf course irrigation systems utilizing water that has received primary treatment in lagoon systems. Permits to construct shall not be issued for new Category 4 restricted access golf courses irrigation systems pending further research and evaluation of performance data collected from existing systems.
Category 5	• Restricted access pasture irrigation for range cattle • Restricted access irrigation of fiber, seed, forage and similar crops • Irrigation of silviculture

Section 3: Gathering Data

Section 3 is a guide to collecting a wastewater system's pertinent data and information, which will be used in subsequent sections for determining long-term wastewater infrastructure needs. Most of the information collected is required to complete an engineering report in order to obtain a permit or project funding. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

Table 3-1: Wastewater System Data Gathering To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

System Map

Gather maps, photographs, or sketches showing the current service area, surrounding areas, and facilities.

- Indicate facilities owned or operated by the wastewater system, including treatment plants and solids handling facilities, the collection system, lift stations, administrative buildings, etc. Site maps and treatment process schematics can be documented here. In addition to mapping these data, attach copies of ownership documents and legal descriptions of all properties and facilities. This information may be needed for permitting and project funding requirements.
- Indicate general elevations, major obstacles, and any environmental concerns in the service area. Equipment information may also be included on these maps if there is room.
- Indicate land development, density of population, and expected changes. Even if these are “unofficial” trends, knowing where growth or decline in development, demand, or population seems to be occurring is helpful in long-term planning.
- Indicate environmental or cultural resources, such as waterbodies, parks, historically significant areas, endangered species, or floodplains, that may affect facility siting.

The Oklahoma Department of Environmental Quality (ODEQ) has developed a GIS Flex Viewer that displays many pertinent data layers, including PDES Discharges, Land Application Sites, Stormwater Sensitive Areas, Total Retention Facilities, 303(d) Waterbodies, local ODEQ offices, and more. Go to www.deq.state.ok.us/mainlinks/gis/index.html and click on Flex Viewer to create a customized map.

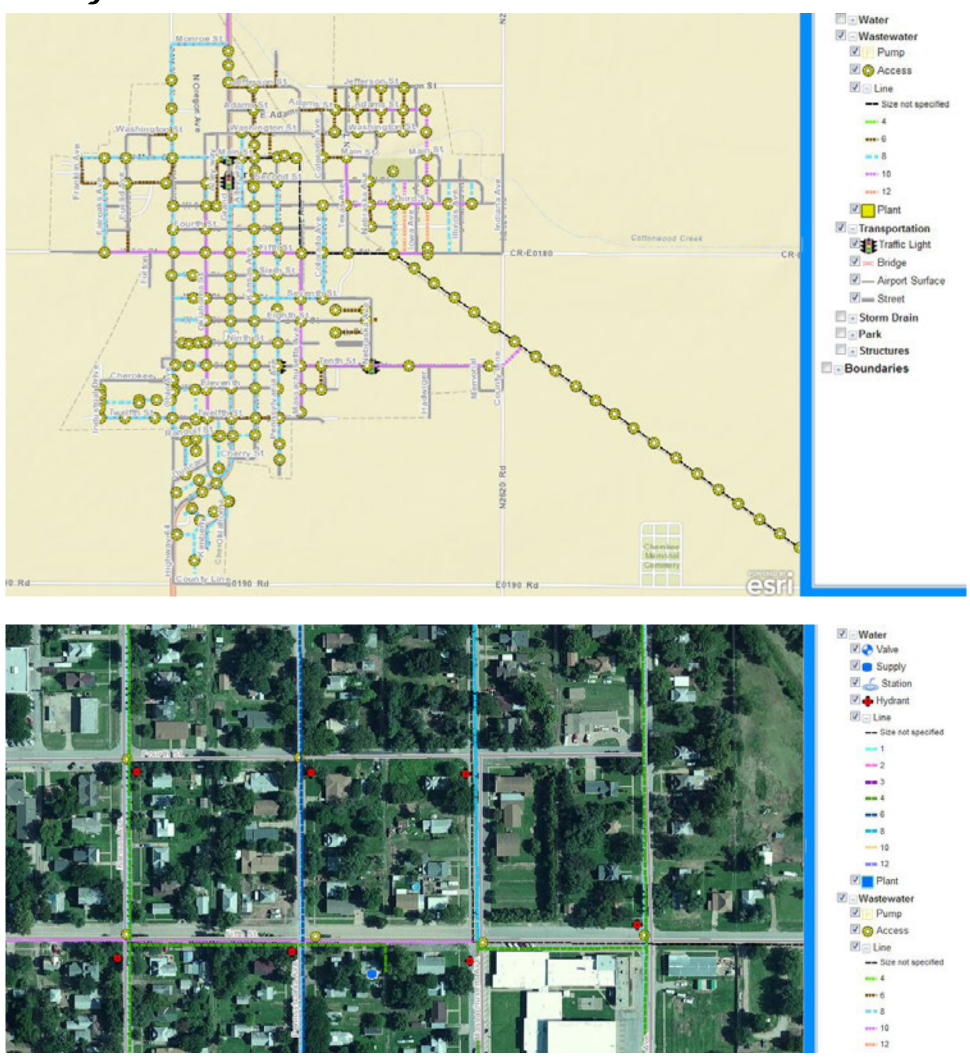
System Mapping and Inventory with GIS

This Guide strongly encourages the development GIS/GPS based maps of your wastewater system to assist with planning, inventory, and locating every component of your system.

Mapping your wastewater system with GIS may benefit the Operation and Management of the plant by:

- Facilitating efficient location of infrastructure during line break events;
- Preserving infrastructure location knowledge over time and employee turnover;
- Facilitating efficient water line leak detection or wastewater line I/I inspection activities
- Providing accurate information for planning for future system growth and needs;
- Providing accurate information for determining water/ wastewater service availability for new customers; and
- Aiding in disaster recovery efforts.

GIS mapping may also benefit the system indirectly by providing data for the Oklahoma One-Call System, engineers modeling system capacity, and sample site location determination.



Wastewater system mapping and inventory using GIS software.

Table 3-2: System Map

System Name	
Attach documentation and/or identify below physical and/or electronic location of service area map(a) and facility diagram.	
☐ Service area map(s) and facility diagram are attached.	
Physical Location	Electronic Location
☐ Identified key facilities on service area map.	
☐ Attached site maps and treatment system schematics.	
☐ Identified future service area changes.	
☐ Identified known environmental or cultural areas.	
State below any Information or assistance needed to finalize incomplete task(s).	

Note: Check each box where statement is true.

Historical Overview

Gather information from files and talk to current and former employees to record the development and history of the system. Historical knowledge of upgrades or additions is helpful in tracking flow trends and meeting continuously changing water quality discharge requirements. Compile and include correspondence with federal and state regulatory agencies, including ODEQ inspection reports, Notices of Violation, and Consent or Administrative Orders. Document any security issues.

Table 3-3: System History

System Name			
Year Built			
Type of Treatment Process [1]			
Describe secondary or advanced treatment.			
System has discharge ☐	Location		
Identify all upgrades to treatment system and date completed.	Historical Upgrades		Date Completed
Identify all permit changes and dates of changes.	Historical Permit Changes		Date of Change
Identify correspondence with regulatory agencies, or reference location.			
Identify all environmental reviews, or reference location.			

[1] Mechanical, lagoon, septic, land application
Note: Check each box where statement is true.

Permits and Agreements

Attach copies of NPDES (wastewater discharge) permit, industrial pretreatment permit, any current construction permits, stormwater discharge permits, or any other agreements or permits. The implementation of the NPDES is carried out through the ODEQ. The ODEQ issues discharge permits for municipalities and industries that discharge or dispose of treated wastewater.

The ODEQ Water Quality Division programs and wastewater, stormwater, industrial pretreatment, and construction permit information can be found at www.deq.state.ok.us/wqdnew/wqprogrms.html.

Table 3-4: Permits

System Name		
Permit Number:		*Please use a separate form for each permit.*

Attach documentation and/or identify physical and/or electronic location of permit document(s) below.

☐ Documentation attached

Physical Location	Electronic Location

If the permit includes a schedule of use, enter information below.

Year	Permitted Use (AFY)	Comments

Describe below any changes in the treatment process that have influenced effluent water quality if applicable.

Year	Change in Treatment Process

Describe below any changes in the influent strength or flows that have influenced the treatment process.

Year	Change in Influent Strength or Flows

Population Served

Gather information about the population served by the system. Population of counties and municipal areas, including historical data, may be directly obtained from the U.S. Census Bureau's American Community Survey at www.census.gov/program-survey/acs.html or the Oklahoma Department of Commerce at www.okcommerce.gov. Other possible sources for historical population are Regional Council of Government organizations and City Master Plans. (County or municipal population will need to be adjusted to reflect the system service area.)

Table 3-5: Historical Population

System Name			
Historical Population Data			
Year	Population Served [1]	Comments	Data Source(s) [2]
Identify and describe below any significant events that have affected changes in area population.			
Year	Event		

[1] *If population numbers are unavailable, estimate using number of connections times 2.5 persons.*

[2] *Data sources may include the American Community Survey or other agency databases, published documents, etc*

Historical Wastewater Flow Data

Determine trends in past wastewater flows (hydraulic) and strength of sewage (organic) loads. OCWP Regional Wastewater flows consist of dry weather flow (DWF) and wet weather flow (WWF). The DWF includes base wastewater flow and groundwater infiltration (GWI). Wastewater flows vary diurnally and typically include residential sanitary, commercial, and industrial flow components. GWI is groundwater that leaks into the system through cracks in pipes and joints and other structural defects. GWI is distinct from wet-weather induced flows in that GWI occurs even under dry weather conditions.

Wet weather sewer system flows can generally be divided into inflow and infiltration (I/I) components. Inflow is rainfall that directly enters the sewer system through manhole defects, illicit stormwater connections, sump pumps, and other sources. Wastewater flow response to inflow is relatively rapid, with flows usually closely following rainfall patterns. Infiltration occurs when groundwater in saturated soils leaks into the collection system through cracks in pipes, leaky joints or manholes, and similar defects. Infiltration usually occurs slowly, peaking after peak rainfall and taking hours to days to recede. Factors that affect the characteristics of infiltration can include physical sewer condition, local soil properties, and permeability of ground cover. Any I/I analysis or study should be noted in this section and the location documented so it can be easily retrieved.

Table 3-6: Historical Wastewater Flow

System Name						
Historical Wastewater Flow						
Period of Data (beginning date to end date)	Demand (mgd)					Data Source(s)
	ADF [1]	30-day Moving Average Flow [2]	ADMM [3]	MinD [4]	MD [5]	

Identify and describe below any significant events that may have affected flow. Examples may include a new company, loss of a company or an existing company that begins to produce more (or less) wastewater, etc.	
Year	Event

[1] *Calculate the current average daily flow (ADF) using a minimum of 1 year (3 years of data is preferred).*

[2] *Calculate a 30-day moving average flow (see Appendix A).*

[3] *Calculate the average day maximum month (ADMM) flow by determining the 95th percentile of the 30-day moving average values (see Appendix A).*

[4] *Calculate the minimum day (MinD) flow by determining the 5th percentile of the 30-day moving average values (see Appendix A).*

[5] *Calculate the maximum day (MD) flow by multiplying a factor of 1.2 to 2.0 to the ADF (see Appendix A).*

Historical Influent Wastewater Characterization

The influent characteristics or strength of wastewater influent can affect treatment plant design and operation. Any special connectors to the wastewater system or other unusual circumstances (such as septic systems or RV dumping stations) that could alter the influent quality should be noted. Influent wastewater characteristics can be estimated using historical influent data (preferably at least three years of data). Samples of wastewater influent can be taken over a two-week time period to compare historical data with current data. If sampling is not possible, use available current data for comparison with historical influent data of influent parameters. Collect all the data available here and determine if there are gaps. If so, develop a strategy to close the data gap.

Table 3-7 (Page1 of 3): Historical Wastewater Influent Characterization

System Name							
BOD_5 Historical Loading							
Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	
TSS Historical Loading							
Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	

Table continued on next page

Table 3-7 (Page 2 of 3): Historical Wastewater Influent Characterization

TKN Historical Loading

Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	

TP Historical Loading

Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	

___________ Historical Loading

Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	

Table continued on next page

Table 3-7 (Page 3 of 3): Historical Wastewater Influent Characterization

__________ Historical Loading							
Period of Data (beginning date to end date)	Constituent Concentration (mg/L)[1]	Loading by Flow Type[2] (lb/day)					Data Source(s)
		ADF	30-day Moving Average Flow	ADMM	MinD	MD	

Identify any significant changes that may have affected flow. (Examples may include a company that has begun to use more water, addition of a new company, or loss of a company, etc.)	
Year	Event

[1] *Sources for concentrations may be obtained from monthly DMRs.*

[2] *Calculate the Loading by Flow Type by multiplying the concentration by the corresponding flow type in Table 3-6.*

Pretreatment

Record significant industrial sources of pretreatment. Pretreatment refers to treating wastewater before it is sent to a wastewater treatment system. As discussed in Section 2, the State of Oklahoma regulates industries through the ODEQ Industrial Pretreatment Program. This program requires that industries discharging pollutants treat their wastewater before discharge to municipal sewer systems. Keep a copy of all industrial users' wastewater service plans in this section.

A wastewater system also can "pretreat" the incoming wastewater before it flows to the treatment process. This form of pretreatment is regulated under the system's discharge permit.

Table 3-8: Pretreatment

System Name	
List significant industrial sources and attach wastewater service plan for each.	
Industrial Sources	Service Plan is attached
	☐
	☐
	☐
	☐
	☐
	☐
	☐
	☐
	☐
If the utility has a pretreatment program that is different than ODEQ's program, attach program documents and/or describe below. ☐ Documentation is attached.	

Note: Check each box where statement is true.

Major System Processes

Record a summary of the major system processes and types of treatment for the existing treatment system that includes the following:

- Level of Treatment—preliminary, primary, secondary, advanced for phosphorus or nitrogen removal, etc.;
- Analysis of the existing system performance, deficiencies, and positive attributes;
- Size of the system components; and
- Solids processing system and method of beneficial reuse or disposal.

If a Stormwater Management Plan is required for the wastewater treatment site, include a copy of the plan in this section.

Table 3-9 (Page 1 of 2): Major System Processes

System Name	
Attach a schematic showing treatment processes or describe below. ☐ Schematic is attached.	
Level of Treatment:	
Analysis of the existing system performance, deficiencies, and positive attributes:	
Size of the system components:	
Solids processing system and method of beneficial reuse or disposal:	

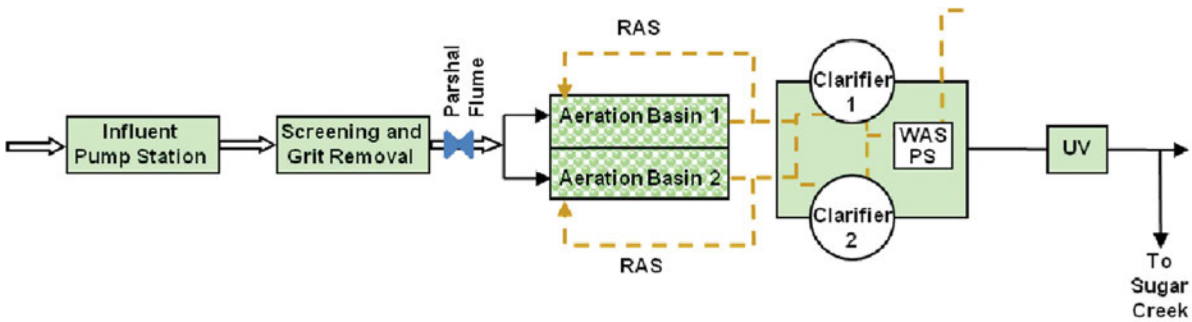
Table continued on next page

Table 3-9 (Page 2 of 2): Major System Processes

If a storm management plan is required attach the plan documents or describe below. ☐ Documentation is attached.

Note: Check each box where statement is true.

Sample Wastewater System Diagram



Collection System

Include collection system pipe information. A map with the location and size of the sewers in the collection system and the pumping capacity of the lift station(s) should also be included.

A collection system consists of the following: (1) the service line from a residence or business, (2) the main collection line that generally flows by gravity, and (3) an interceptor sewer (usually 24 inches) that transports domestic wastewater from the collection system to an adjoining collection system or interceptor sewer or directly to a treatment plant. Lift stations are used to pump wastewater to a different point in the system when the sewer cannot be continued at reasonable slopes and would involve burying the sewer at excessive depths. Lift stations are also used when an area is too low to drain by gravity into the existing sewers.

Note: This kind of information is easily stored in a GIS-based map system. See GIS Mapping at the beginning of this chapter.

Table 3-10: Collection System Pipe Information

System Name	
List below the total linear footage of each wastewater collection pipeline by size.	
Common Normalized Pipe Sizes	Total Linear Footage in System
4 or 6 inches	
8 inches	
10 inches	
12 inches	
18 inches	
24 inches	
30 inches	
36 inches	
42 inches	
48 inches	
60 inches	
other	
other	
Total of All Lines	

Historical Effluent Water Quality Characterization

Record all water quality issues for the plant's effluent. Determine if plant discharge will affect any receiving streams that are impaired, Habitat Limited (HLAC), or have other water quality issues. If the effluent quality is or reasonably could be affected by water quality limited water, identify constituents of concern and source of water quality limited designation (e.g., 303(d) list, 305(b) report or watershed planning and implementation effort; see www.deq.state.ok.us). Identify any wasteload allocation (WLA) (concentration, poundage, or other alternatives) or TMDL by constituent as they apply to the treatment plant or receiving water. WLA requirements can affect effluent limits and treatment options.

Water quality data should include a significant (suggested five-year minimum) period of record (POR). Most of this information can be gathered from the Discharge Monitoring Reports (DMR). This data will be helpful when developing and evaluating alternatives related to treatment.

Table 3-11: Historical Wastewater Effluent Characterization

System Name					
Historical Wastewater Effluent Characterization					
Period of Data (beginning date to end date)	Parameter	Permit Limit [1]	Average	Maximum	Data Source(s)
	BOD_5 (mg/L)				
	pH (s.u.)				
	TSS (mg/L)				
	Toal Coliform (mg/L)				
	Chlorine (mg/L)				
	TKN (mg/L)				
	TP (mg/L)				
Notes [2] (Reference Parameter)					

[1] *List the discharge permit limit if applicable.*

[2] *Include any relevant notes, such as number of times discharge permit limit exceeded, anticipated permit limit changes, etc.*

TMDL/Wasteload Allocation

If a watershed based Water Quality Management Plan (208) is in place, document implementation strategies. Develop a list of projected discharge permit limitations based on state effluent standards, receiving water classifications, and established water quality standards. This may include nutrients (total phosphorus, total nitrogen, or chlorophyll a), temperature, or E. coli bacteria. Document effluent quality necessary to meet any TMDLs or WLAs and other effluent limits or criteria necessary to meet state requirements.

Table 3-12: TMDL/Wasteload Allocation

System Name				
TMDL and/or Wasteload Allocations Future Limits				
Parameter	TMDL and/or WLA (30-day average)			Data Source(s)
	2015 - 2025	2025 - 2035	Beyond 2035	

Reuse and Land Application

For wastewater reuse, ODEQ has established standards for operation and maintenance of systems that take treated wastewater, and with additional treatment, make it into non-potable (not drinkable) “reclaimed water” for beneficial use. The rules create four categories of reclaimed water (see Table 2-2), each with specific treatment levels and permitted uses. New rules for potable reuse are expected to be released in 2016.

Land application refers to controlled application of wastewater to the surface of land. The system is designed to achieve a certain degree of treatment through natural, chemical, and biological processes that occur on and in the soil. In Oklahoma, land application systems are adequate for meeting agronomic water needs of pasture land and hay meadows, and for crop production where the crops will not be eaten raw. Hydraulic loading (rate of application), BOD_5, suspended solids, nitrogen, phosphorus, and crop selection must be considered when designing land application systems. Land Application Regulations can be found at www.deq.state.ok.us/wqdnew/rules/. Operating standards for the land application of wastewater from lagoon treatment systems were formerly in Chapters 619 and 621; those provisions have been incorporated into the new rules in Chapter 627 under Categories 4 and 5.

Table 3-14: Reuse/Land Application of Municipal Wastewater

System Name					
If any portion of system’s effluent is being land applied, provide information below.					
Name of entity applying effluent	Contact	Phone Number	Permitted by ODEQ?	Effluent	
				Annual Volume	Reuse Category[1]
			☐		
			☐		
			☐		
			☐		
			☐		
			☐		

[1] Refer to Table 2-2

Note: Check each box where statement is true.

Section 4: Critical Asset Management

Section 4 is a guide to developing an inventory and collecting a system's O&M information, which will be used in subsequent sections for determining long-term wastewater infrastructure needs. Most of the information collected is required to complete an engineering report in order to obtain a permit or project funding. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

This section contains simple tables that the current operator(s) can use to pass on the wealth of information about their individual plant that may not be found in a manual. For example, the operator may be aware of details about the locations of hidden valves, which settings to use on certain pump or motor, where critical pipelines are found, or how to best perform routine maintenance on specific components of the plant.

Table 4-1: Asset Management To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Wastewater Facilities Inventory

Include a component inventory and assessment of the wastewater system, which will help identify critical equipment that needs to be replaced soon (within the next 5 years) as well as the capacity and condition of critical components. This information is useful for developing an operating budget or planning for expanded capacity. An inventory can also help identify bottlenecks that hinder existing system performance.

Information requested in the following tables is typical of information that would be needed to design a new or replacement system. The "base effective useful life" is an estimate that is highly dependent on many factors, including materials of construction, location, installation method, application, etc. Use information specific to the system's equipment if it is available.

Table 4-2: Flow Measurement/Metering

System Name		
Date of assessment (mm/dd/yyyy)		
FLOW MEASURING DEVICE[1]	Short-lived asset?[2] ☐ Yes ☐ No	
	Primary	Secondary
Type		
Throat width (feet)		
Capacity, million gallons per day (mgd)		
Last calibration date (mm/dd/yyyy)		
Installation date (mm/dd/yyyy)		
Base effective useful life (years)		
Estimated remaining effective useful life (years)		
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)		

[1] *Use additional forms if necessary.*

[2] *Short-lived assets are components that typically require replacement, repair, or rehab within 20 years of installation. See Appendix E for examples.*

Table 4-3: Influent Pumps

System Name				
Date of assessment (mm/dd/yyyy)				
Facility type				
EQUIPMENT		Short-lived asset? ☐ Yes ☐ No		
Number of pumps				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Rated capacity of pump (gpm @ feet TDH)				
Manufacturer				
Solid passable size				
Pump specifications	Horsepower			
	Volts			
	Speed (rpm)			
Variable or constant speed?				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				
CONTROL		Short-lived asset? ☐ Yes ☐ No		
Instrumentation type				
Description of control strategy				
Variable or constant speed?				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-4: Screenings Removal System

System Name			
Date of assessment (mm/dd/yyyy)			
SYSTEM			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Mechanical / Manual?			
Manufacturer			
Model Number			
Drive Mechanism			
SCREENS			Short-lived asset? ☐ Yes ☐ No
Number of screens			
Screen openings (inch or mm)			
Screenings Washer / Compactor			
Screenings conveyor			
Screenings storage			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-5: Grit Removal System

System Name				
Date of assessment (mm/dd/yyyy)				
SYSTEM			Short-lived asset? ☐ Yes ☐ No	
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Type (vortex, horizontal flow, etc.)				
Manufacturer				
Capacity				
Installation date (mm/dd/yyyy)				
PUMP			Short-lived asset? ☐ Yes ☐ No	
Number of Units				
Manufacturer				
Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
MOTOR			Short-lived asset? ☐ Yes ☐ No	
Number of Units				
Manufacturer				
Motor Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Grit slurry processing				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-6 (Page 1 of 2): Wastewater Tanks

System Name				
Purpose				
Date of assessment (mm/dd/yyyy)				
CONTROL				Short-lived asset? ☐ Yes ☐ No
Identification				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Number of Tanks				
Type of tank[2]				
Tank dimensions (feet)	If RECTANGULAR, Length,			
	Width,			
	& Height.			
	If ROUND, Diameter			
	& Height.			
Side water depth (feet)				
Storage tank volume (million gallons)				
Number of inlets				
Type of inlet (90° upturned flare, submerged side inlet, etc.)				
Size of inlet (inches)				
Number of outlets				
Size of outlet (inches)				
Additional manway(s)				
Type of discharge				
Operating elevation (if applicable)				
Treatment capacity (if applicable)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-6 (Page 2 of 2): Wastewater Tanks

CONTROL	Short-lived asset? ☐ Yes ☐ No		
Identification			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Instrumentation Type (level sensor, altitude valve, etc.)			
Tank level control strategy			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

[2] *Including clear wells and storage tanks in distribution. (Coated concrete, steel, etc.)*

Table 4-7 (Page 1 of 2): Primary Clarification

System Name				
Date of assessment (mm/dd/yyyy)				
Clarification Type (conventional, high rate, solids contact, etc.)				
Design overflow rate (gpm/sf)				
Use numbered columns for each separate unit[2]		Unit 1	Unit 2	Unit 3
STRUCTURE		Short-lived asset?	☐ Yes	☐ No
Number of Tanks				
Type of tank (coated concrete, steel, etc.)				
Tank dimensions (feet)	If RECTANGULAR, Length,			
	Width,			
	& Height.			
	If ROUND, Diameter			
	& Height			
Side water depth (feet)				
Type of inlet (inlet trough, weir, pipe inlet, etc.)				
Type of outlet (Launders, collection pipe, etc.)				
Additional manway(s)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
SOLIDS REMOVAL EQUIPMENT		Short-lived asset?	☐ Yes	☐ No
Number of Units				
Type (chain/flight, spiral, or plow scraper)				
Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Variable or constant speed				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-7 (Page 2 of 2): Primary Clarification

CONTROL	Short-lived asset? ☐ Yes ☐ No		
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Instrumentation Type			
Tank level control strategy			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-8: Primary Sludge Pumps

System Name				
Date of assessment (mm/dd/yyyy)				
Facility type				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
PUMPS			Short-lived asset?	☐ Yes ☐ No
Number of pumps				
Type of pump				
Manufacturer				
Rated capacity of pump (gpm @ feet TDH)				
Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Assumed solids concentration?				
Variable or constant speed?				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
CONTROL			Short-lived asset?	☐ Yes ☐ No
Number of units				
Instrumentation type				
Description of control strategy				
Installation date (mm/dd/yyyy)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-9: Secondary Treatment System--Suspended Growth

System Name				
Date of assessment (mm/dd/yyyy)				
SYSTEM		Short-lived asset?	☐ Yes	☐ No
Number of Units				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Type				
Dimensions (feet)	Length			
	Width			
	Height			
Side Water Depth (feet)				
Design Solids Retention Time [SRT] (days)				
Hydraulic Retention Time [HRT] (hours)				
Target MLSS (mg/L)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
BLOWERS / AERATORS		Short-lived asset?	☐ Yes	☐ No
Number of Units				
Type				
Capacity (standard cubic feet per minute [scfm])				
Motor Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-10: Secondary Treatment System--Attached Growth

System Name				
Date of assessment (mm/dd/yyyy)				
SYSTEM		Short-lived asset? ☐ Yes ☐ No		
Number of Units				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Type				
Dimensions (feet)	Length			
	Width			
	Height			
Side Water Depth (feet)				
HRT (hours)				
Design BOD loading				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
BLOWERS / AERATORS		Short-lived asset? ☐ Yes ☐ No		
Number of Units				
Type				
Capacity (scfm)				
Motor Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-11: Lagoon System

System Name				
Date of assessment (mm/dd/yyyy)				
SYSTEM		Short-lived asset?	☐ Yes	☐ No
Number of Units				
Use numbered columns for each separate unit[1]		Unit 1	Unit 2	Unit 3
Type				
Dimensions (feet)	Length			
	Width			
	Depth			
HRT (hours)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
AERATORS		Short-lived asset?	☐ Yes	☐ No
Number of Units				
Type				
Motor Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-12: Other Systems

System Name				
Date of assessment (mm/dd/yyyy)				
SYSTEM			Short-lived asset? ☐ Yes ☐ No	
Number of Units				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Identification/Type				
Dimensions	Length			
	Width			
	Height			
Side Water Depth (feet)				
Design SRT (days)				
HRT (hours)				
Target MLSS (mg/L)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
BLOWERS / AERATORS			Short-lived asset? ☐ Yes ☐ No	
Number of Units				
Type				
Capacity (scfm)				
Motor Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-13: Disinfection

System Name			
Date of assessment (mm/dd/yyyy)			
DISINFECTION		Short-lived asset? ☐ Yes ☐ No	
Number of Trains			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Design Flow Capacity (mgd)			
Peak flow Capacity (mgd)			
Contact Time at Peak Flow (min)			
Number of Passes per Basin			
Pass Channel Width (feet)			
Side Water Depth (feet)			
Pass Channel Area (square feet)			
Length per Pass (feet)			
Channel Length-to-Width Ratio			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-14: Dechlorination

System Name			
Date of assessment (mm/dd/yyyy)			
DECHLORINATION		Short-lived asset? ☐ Yes ☐ No	
Number of Trains			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Design Flow Capacity (mgd)			
Peak flow Capacity (mgd)			
Contact Time at Peak Flow (min)			
Number of Passes per Basin			
Pass Channel Width (feet)			
Side Water Depth (feet)			
Pass Channel Area (square feet)			
Length per Pass (feet)			
Channel Length-to-Width Ratio			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-15: Ultraviolet Disinfection

System Name			
Date of assessment (mm/dd/yyyy)			
SYSTEM		Short-lived asset?	☐ Yes ☐ No
Number of Reactors			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Reactor Chamber Dimensions (feet) — Length			
Reactor Chamber Dimensions (feet) — Width			
Reactor Chamber Dimensions (feet) — Depth			
Number of Lamps per Reactor			
Type of Lamp Used (magnetic, electronic)			
Number of Ballasts per Reactor			
Ballast Type[2]			
Cleaning System Type			
Cleaning System Details			
Installation Date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
CONTROL		Short-lived asset?	☐ Yes ☐ No
Instrumentation Type			
Description of Control Strategy			
Tank Level Control Strategy			
Installation Date (mm/dd/yyyy)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Base Effective Useful Lives of the following (years):			
Reactor housing			
Low-pressure lamps (LP and LPHO)			
MP lamps			
Sleeve			
Duty and reference UV sensors			
UVT analyzer			
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

[2] *Low pressure (LP), low pressure high output (LPHO), medium pressure, etc*

Table 4-16 (Page 1 of 4): Membrane Clarification (MBR)

System Name				
Date of assessment (mm/dd/yyyy)				
MEMBRANE MANUFACTURER GENERAL INFORMATION		Short-lived asset? ☐ Yes ☐ No		
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
Overall rack dimensions (feet)	Length			
	Width			
	Height			
Process description				
Number of membrane filtration trains				
Number of manifolds per train				
Number of pressure vessels per train				
Number of membrane elements per pressure vessel				
Membrane identification				
Length of membrane element				
Surface area per membrane element				
Instantaneous flux rate at 5 degrees C				
Instantaneous flux rate per train at 20 degrees C				
Spare Membrane Capacity				
Maximum Allowable TMP				
Pressure vessel rating				
Pressure vessel diameter				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
MEMBRANE BACKWASH PUMPS		Short-lived asset? ☐ Yes ☐ No		
Number of pumps				
Rated capacity of pumps				
Manufacturer				
Pump Specifications	Horsepower			
	Volts			
	Speed (rpm)			
Variable or Constant Speed				
Backwash Pulse Duration, Frequency				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-16 (Page 2 of 4): Membrane Clarification (MBR)

FILTERS			Short-lived asset? ☐ Yes ☐ No
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Number of filters			
Filter type			
Filter capacity (gpm/ft^2)			
Monomedia / Dual Media / Other			
Type(s) of media			
Backwash Type (Automatic / Manual)			
Backwash Frequency and Duration			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
AIR SCOUR SYSTEM			Short-lived asset? ☐ Yes ☐ No
Number of blowers			
Type of blower			
Number of air compressors			
Type of compressor			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
CLEAN-IN-PLACE (CIP) SYSTEM			
Cleaning substances			
Cleaning solution			
pH range			
Temperature range			
Additional notes			
Heats of dilution			
Direction of flow for cleaning solution			
Installation date (mm/dd/yyyy)			
ACID CIP			
Type			
Maximum concentration in cleaning solution			
Minimum pH of cleaning solution			
Specific gravity of maximum concentration cleaning solution			
Concentrate			
Delivery options			
Installation date (mm/dd/yyyy)			

Table continued on next page

Table 4-16 (Page 3 of 4): Membrane Clarification (MBR)

SODIUM HYPOCHLORITE CIP			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Maximum concentration in cleaning solution			
Minimum pH of cleaning solution			
Specific gravity of maximum concentration cleaning solution			
Concentrate			
Delivery options			
Installation date (mm/dd/yyyy)			
CIP TANKS		Short-lived asset?	☐ Yes ☐ No
Number of tanks			
Type of tank			
Tank material			
Tank Dimensions (feet) — Diameter			
Tank Dimensions (feet) — Height			
Tank volume			
Assumed freeboard			
Tank inlet for permeate filling			
Tank inlet for alkaline solution filling			
Tank inlet for citric acid			
Tank inlet/outlet for cleaning solution			
Other outlets			
Tank heater type			
Heater capacity			
Heater material of construction			
Configuration			
Temperature range of cleaning solution			
Heating time			
Estimated tank weight (with flange connections)			
Estimated fluid weight			
Installation date (dd/mm/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-16 (Page 4 of 4): Membrane Clarification (MBR)

CIP FEED PUMPS		Short-lived asset? ☐ Yes ☐ No	
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Number of CIP feed pumps			
Type			
Rated flow and TDH			
Pump operating pressure			
Pump horsepower			
Motor horsepower			
Electrical service — Volts			
Electrical service — Phase			
Electrical service — Hertz			
Assumed efficiency			
Materials of construction			
Suction connection			
Discharge connection			
Installation date (dd/mm/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-17 (Page 1 of 2): Filtration

System Name				
Date of assessment (mm/dd/yyyy)				
Use numbered columns for each separate unit [1]		Unit 1	Unit 2	Unit 3
FILTERS		Short-lived asset? ☐ Yes ☐ No		
Facility name				
Number of dual-cell filters				
Type of filter				
Design filtration rate				
Empty bed contact time				
Dimensions, each filter cell	Length			
	Width			
	Height			
Total surface area				
Filter media				
Underdrain				
Filter media support				
Wash water troughs				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
AIR SCOUR BLOWERS		Short-lived asset? ☐ Yes ☐ No		
Number of blowers				
Type of blower				
Capacity				
Discharge pressure				
Motor horsepower				
Electrical service	Volts			
	Phase			
	Hertz			
Maximum blower speed				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
STRUCTURE		Short-lived asset? ☐ Yes ☐ No		
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Initial Efficiency Rating				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-17 (Page 2 of 2): Filtration

MEDIA	Short-lived asset? ☐ Yes ☐ No		
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Installation date (mm/dd/yyyy)			
Type of media			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
FILTER BACKWASH PUMPS	Short-lived asset? ☐ Yes ☐ No		
Facility name			
Number of pumps			
Type of pump			
Rated capacity of pump			
Manufacturer			
Discharge diameter			
Pump specifications – Horsepower			
Pump specifications – Voltage			
Pump specifications – Speed (rpm)			
Type drive			
Valves and appurtenances			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
FILTER BACKWASH BLOWERS	Short-lived asset? ☐ Yes ☐ No		
Number of blowers			
Type of blower			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
AIR COMPRESSORS	Short-lived asset? ☐ Yes ☐ No		
Number of air compressors			
Type of compressor			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-18 (Page 1 of 2): Solids Thickening--Aerobic Digestion Facilities

System Name			
Date of assessment (mm/dd/yyyy)			
Use numbered columns for each separate unit	Unit 1	Unit 2	Unit 3
SLUDGE THICKENING SYSTEM	Short-lived asset?	☐ Yes	☐ No
Type[1]			
Number of units			
Diameter (feet)			
Surface area (feet)			
Belt width (meters)			
Solids loading (ppd / ft)			
Hydraulic capacity (gpd)			
Air to solids ratio			
Solids loading capacity (ppd)			
Installation date (mm/dd/yyyy)			
CONDITIONING AGENT(S) USED			
Type (polymers, metal salts, other coagulant)			
Average feed solids (percent)			
Average dewatered solids (percent)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Perceived condition (Poor, Fair, Good, Excellent)			
PUMP(S)	Short-lived asset?	☐ Yes	☐ No
Number of units			
Capacity (gpm / TDH)			
Motor size (hp)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years? (Yes/No)	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

Table continued on next page

Table 4-18 (Page 2 of 2): Solids Thickening--Aerobic Digestion Facilities

BOTTOM PUMP OR SLUDGE FEED PUMP	Short-lived asset? ☐ Yes ☐ No		
Number of units			
Type			
Pump capacity (gpm / TDH)			
Motor size (hp)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			
THICKENING WASTE SLUDGE PUMP	Short-lived asset? ☐ Yes ☐ No		
Use numbered columns for each separate unit	Unit 1	Unit 2	Unit 3
Number of units			
Type			
Sludge concentration			
Pump capacity (gpm / TDH)			
Motor size (hp)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			
COMPRESSOR(S)	Short-lived asset? ☐ Yes ☐ No		
Number of units			
Motor size (hp)			
Wasting rate (number hours / days / week)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *DAF/Gravity Thickener/Gravity Belt Thickener/Rotary Drum Thickener, etc*

Table 4-19: Solids Thickening--Anaerobic Digestion Facilities

System Name			
Date of assessment (mm/dd/yyyy)			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
ANAEROBIC DIGESTER(S)		Short-lived asset?	☐ Yes ☐ No
Number of units			
Volume (gal.)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
RECIRCULATION PUMP(S)		Short-lived asset?	☐ Yes ☐ No
Number of units			
Type			
Capacity (gpm / TDH)			
Motor size (hp)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
GAS COLLECTION AND DISPOSAL		Short-lived asset?	☐ Yes ☐ No
Number of units			
Type			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
DIGESTED SOLIDS PUMP(S)		Short-lived asset?	☐ Yes ☐ No
Number of units			
Type			
Capacity (gpm / TDH)			
Motor size (hp)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-20: Dewatering/Disposal Methods

System Name			
Date of assessment (mm/dd/yyyy)			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
DEWATERING PROCESS		Short-lived asset?	☐ Yes ☐ No
Type (belt press, centrifuge, etc.)			
Design solids loading			
Operating hours per week			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			
FINAL DISPOSAL		Short-lived asset?	☐ Yes ☐ No
Method (incineration, land application, etc.)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-21 (Page 1 of 2): Odor Control

System Name			
Date of assessment (mm/dd/yyyy)			
Location of system			
ODOR CONTROL SYSTEM		Short-lived asset?	☐ Yes ☐ No
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
Number of Units			
Type[2]			
Manufacturer			
Model No.			
Size			
Treatment capacity (cfm)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
CHEMICAL STORAGE/STRENGTH		Short-lived asset?	☐ Yes ☐ No
Number of Tanks			
Tank Material of Construction			
Sodium Hypochlorite Storage Capacity (gals)			
Sodium Hypochlorite Strength (percent)			
Sodium Hydroxide Storage Capacity (gals)			
Sodium Hydroxide Strength (percent)			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
RECIRCULATION		Short-lived asset?	☐ Yes ☐ No
Pump Type			
Model No.			
Horsepower			
Capacity (gpm)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No

Table continued on next page

Table 4-21 (Page 2 of 2): Odor Control

CHEMICAL METERING	Short-lived asset? ☐ Yes ☐ No		
Pump Type			
Model			
Horsepower			
Capacity (gpm)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

[2] *Scrubbers, biofilters, etc.*

Table 4-22: Pumps

System Name			
Date of assessment (mm/dd/yyyy)			
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3
EQUIPMENT		Short-lived asset?	☐ Yes ☐ No
Number of pumps			
Type (suction lift, submersible, etc.)			
Rated capacity of pump (gpm @ feet TDH)			
Manufacturer			
Solid passable size?			
Motor Specifications — Horsepower			
Motor Specifications — Volts			
Motor Specifications — Speed (rpm)			
Variable or constant speed?			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Initial Efficiency Rating			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
PUMP CONTROL		Short-lived asset?	☐ Yes ☐ No
Instrumentation type			
Description of control strategy			
Installation date (mm/dd/yyyy)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
Perceived condition (Poor, Fair, Good, Excellent)			

[1] *Use additional forms if necessary.*

Table 4-23: Critical Pipeline(s)

System Name		Location		
Date of assessment (mm/dd/yyyy)				
PIPELINES		Short-lived asset? ☐ Yes ☐ No		
Number of pipelines (by diameter)				
Use numbered columns for each separate unit [1]	Unit 1	Unit 2	Unit 3	
Diameter of pipe (in)				
Approximate length in this location (linear feet)				
Pipe material				
Maximum design flow (gpm)				
Maximum velocity (fps)				
Minimum design flow (gpm)				
Minimum velocity (fps)				
Installation date (mm/dd/yyyy)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
Perceived condition (Poor, Fair, Good, Excellent)				

[1] *Use additional forms if necessary.*

Table 4-24: Other Key Features

System Name		
Date of assessment (mm/dd/yyyy)		
OTHER KEY FEATURES (for which a table was not provided)		
Feature	Description/Value, etc.	Condition[1]

[1] *Perceived condition (Poor, Fair, Good, Excellent)*

Inventory of Short-Lived Assets

Identify the system's short-lived assets and include the expected year of replacement and anticipated cost for each (see Appendix E for examples). Prepare a recommended annual reserve deposit to fund the replacement of these items. Generally, short-lived assets are items not covered under O&M, however, this does not include facilities that are usually funded with long-term capital financing.

Table 4-25: List of Items to be Replaced in 5 Years

System Name		
Name	Date	Means of Replacement[1]

[1] *Authority's Cash, Bond Issue, Rate Increase, Bank Loan, CWSRF Low-Interest Loan, other*

Operation and Maintenance Program

Identify staff and duties necessary to operate and maintain the system in compliance with wastewater regulations. It may be helpful to have the individual responsible for maintenance of the system to complete this section.

The ODEQ specifies minimum staffing and certification levels based on the population served and complexity of the wastewater system. More information on staffing and certification can be found on the ODEQ's website at www.deq.state.ok.us/rules/710.pdf.

Table 4-26: System Staffing Data

System Name			
Facility Name	Population Served	Staffing Requirements	Existing Staffing Meets Requirements
			☐
			☐
			☐
			☐
			☐
			☐
			☐

Note: Check each box where statement is true.

Table 4-27: Personnel

System Name				
Name	Title/Certification Level[1]	Email	Telephone	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	

[1] *Cross check the operator licensure level with the facility classification.*

Table 4-28: Routine Operation and Preventative Maintenance Program

System Name	
Attach documentation and/or describe routine operation and preventative maintenance programs. ☐ Documentation is attached.	

Table 4-29: Routine and Preventative Maintenance Data

System Name	
Function	Frequency
List below items to check and/or adjust[1]	Enter function performance interval[2]

[1] Such as adjusting flow control valves, reading flow meters, checking water or chemical levels, exercising critical valves, lubricating equipment, etc.

[2] Daily, weekly, monthly, etc.

"Normal" Operation

Use the following table to provide a history of process settings during "normal" facility / system operation. For example, in order to achieve a better hydraulic split of flow between two basins, one inlet valve (or gate) may need to be 100 percent open while the valve (or gate) to the other basin needs to be only 75 percent open. If no unique settings are known, the table can be disregarded. This can also include process parameters that achieve successful results, such as "a mixed liquor suspended solids (MLSS) operating range of 2,500 to 3,000 milligrams per liter (mg/L) produces compliant effluent through the entire year" or "keep dissolved oxygen (DO) in the aeration basins at 1 to 3 mg/L, etc."

Table 4-30: Normal Operational Data Tips and Tricks

System Name	
Element	Setting
List below items which require specific settings[1]	Enter setting values or specific instructions including units below[2]

[1] *Such as valve, switch, control, etc.*

[2] *Such as valve position, readings for pump controls, gauges, electrical switches, etc.*

Table 4-31: Suppliers

System Name				
Supply Item(s)	Contractor / Supplier	Email - Website	Telephone	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	
			Day	
			Night	

Section 5: Wastewater System Administration

Section 5 is a guide to identifying all financial data and obligations of a wastewater system, including rate schedules, existing debt, O&M costs, and Capital Improvement Projects (CIP). Guidelines for documenting pertinent system administration practices are also provided. Most of the information collected is required to complete an engineering report in order to obtain a permit or project funding. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

Table 5-1: System Administration To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
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14			
15			

System Administration

Document current system administration practices including those related to decision making.

Table 5-2: (Page 1 of 4) System Administration

System Name					
1 Select type of system ownership (check all that apply).					
Type of Ownership	Name				
☐ Water/Wastewater Association					
☐ Local government					
☐ Corporation					
☐ Single private owner					
☐ Partnership					
☐ Other, describe below.					
2 List name(s) of owner(s), below. (Use additional sheet if necessary.)					
3 If there are written system rules, attach document or identify physical and/or electronic location of information below. ☐ Documentation is attached.					
Physical Location			Electronic Location		
4 Identify and check below who makes major decisions for the system (such as when to make capital improvements, how to finance improvements, when to expand/consolidate, etc.).					
☐ SINGLE PARTY (Identify):					
☐ BOARD Number of members:		Length of service (years):		Selected by:	
☐ SYSTEM USER GROUP Number of members:		Length of service (years):		Selected by:	
☐ COMMISSION Number of members:		Length of service (years):		Selected by:	
☐ State below any other decision-making individuals or parties not listed above and describe association with organization.					

Table continued on next page

Table 5-2: (Page 2 of 4) System Administration

5	How often do those responsible for decision making meet?
☐	Monthly
☐	Annually
☐	When necessary, describe below.
☐	Other, describe below.
6	If all system users are notified about these meetings, identify the notification process (check all that apply).
☐	Notice on water bill.
☐	Telephone distribution list
☐	Email distribution list
☐	Notice in local paper
☐	Other, describe below.
7	If water/wastewater bills are mailed, select and check frequency below.
☐	Monthly
☐	Other, describe below.
8	If water/wastewater bills are not mailed, describe below the notification process and frequency.
9	What is the plan for financing future system improvements (check all that apply)?
☐	Reserve account(s)
☐	Loans
☐	Grants
☐	System user rates or one time fees
☐	Unknown at this time
☐	Other, describe below.

Table continued on next page

Table 5-2: (Page 3 of 4) System Administration

10	**Personnel Management:** If the system has paid employees and there are policies in place regarding personnel management (salaries, benefits, hiring/firing, supervision, raises, etc.), describe the process and attach documentation or identify physical and/or electronic location of information below. ☐ Documentation is attached.	
	Physical Location	Electronic Location
11	**Plan in Case of Operator Loss:** If the system has an operator, and there is a plan in place in the event of operator loss, describe the process and attach or identify physical and/or electronic location of information below. ☐ Documentation is attached.	
	Physical Location	Electronic Location
12	**Customer Complaints Process:** If there is a process to record and respond to customer complaints, describe the process and attach or identify physical and/or electronic location of information below. ☐ Documentation is attached.	
	Physical Location	Electronic Location

Table continued on next page

Table 5-2: (Page 4 of 4) System Administration

13 Insurance Policies: If the system has insurance policies, check all that apply and list coverage amounts:

Policy Coverage	Coverage Amount
☐ Commercial General Liability	
☐ Automobile Liability	
☐ Garage Liability	
☐ Excess/Umbrella Liability	
☐ Workers Compensation and Employers Liability	
☐ Employment Practices Liability	
☐ Flood Liability	
☐ Other, describe below	

Attach documentation or identify physical and/or electronic location of policy information below.

☐ Documentation is attached.

Physical Location of Policy	Electronic Location of Policy

14 Safety Procedures: If the system has written safety procedures, describe the process and attach or identify physical and/or electronic location of information below.

☐ Documentation is attached.

Physical Location	Electronic Location

15 Financial Transaction Personnel: Identify and list below the person/party responsible for conducting financial transactions (maintaining records, customer billings, making debt payments, etc.)

Name	Title	Responsibility

Note: Check each box where statement is true.

Table 5-3: System Administration Checklist

System Name	
System Management Information	
☐ Completed system management table	
☐ Identified any potential changes to current practices on To-Do list.	
☐ Attached documentation used to develop tables or identify physical and/or electronic location of information here.	
Physical Location	Electronic Location
State below any Information or assistance needed to finalize incomplete task(s)	

Note: Check each box where statement is true.

Rate Schedule(s)

Compile information on the existing rate structure. The following table briefly summarizes some common rate structures. Other rate schedules may be possible.

Table 5-4: Rate Schedule Descriptions

Flat Rate	All customers are charged the same amount regardless of their water usage or wastewater generated. The flat (or fixed) rate may be used in systems that do not meter water usage and may also be used in conjunction with other rate structures to cover administrtive costs and customer expenses.
Uniform Rate	All customers are charged the same amount per water usage (typically 1,000 gallons). The uniform rate requires metering, allowing customers to pay for their individual usage.
Tiered Rates	These are rates designed to encourage water and wastewater treatment efficiency by charging more (at different tiers or levels) as customers use more water which naturally produces more wastewater.
Surcharge	A surcharge is assessed on the quantity of extra strength waste being treated that exceeds residential strength waste. The surcharge is usually assessed by the pound.

Table 5-5: Rate Schedule Information

System Name	

Describe below the system's rate schedule.

Attach the system's rate schedule document or identify physical and/or electronic location below.

☐ Documentation is attached.

Physical Location	Electronic Location

List below the distribution of monthly billable gallons by customer type.

Customer Type	No. of Customers	Billable Gallons	Customer Type	No. of Customers	Billable Gallons

Billing period: ☐ Monthly ☐ Other: Describe

Describe the System's policy for changing wastewater rates. Select <u>one</u> of the options below.

☐ A vote <u>is</u> requried to change rates. By whom?

☐ A vote <u>is not</u> requried to change rates. Describe below the process for changing rates

If there a maximum monthly quantity billed to residential wastewater customers, show the quantity? gals.

If a percent of water used by residential customers determines wastewater volume charges, show the percentage? %

Describe below the customer billing process.

Metered - Describe the metering process.	Non-Metered - Describe water usage determination (billing) process.
What percentage of customers is metered? %	

Note: Check each box where statement is true.

Table 5-6: Existing Debt

System Name							
List below information on the system's existing debt.							
Debt Name	Amount of Debt		Repayment Period		Interest Rate	Amount paid Annually	Payment Interval
	Original	Remaining	Original	Remaining			
	$	$			%	$	
	$	$			%	$	
	$	$			%	$	
	$	$			%	$	
	$	$			%	$	
	$	$			%	$	
	$	$			%	$	

Known System Improvements

Identify system improvements (repairs, replacements, expansions, etc.) currently planned and funded (refer to Table 4-25). It may be beneficial to include projects that are known but currently unfunded, which will affect the revenue or financing needed by the wastewater system in the future. A CIP Budget is an important part of the planning process. As the system ages and/or expands, replacement costs as well as costs to add infrastructure to the existing system need to be planned for and budgeted.

Table 5-7: Funded System Improvement Projects

System Name				
Asset/Project Name	Expected Year	Project Description or Purpose	Cost Estimate	Potential Funding Source[1]
			$	
			$	
			$	
			$	
			$	
			$	
			$	
		Known Projects Estimated Cost	$	

[1] *Funded with cash, bond issue, rate increase, bank loan, CWSRF loan, other*

Table 5-8: Unfunded System Improvement Projects

System Name				
Asset/Project Name	Expected Year	Project Description or Purpose	Cost Estimate	Potential Funding Source[1]
			$	
			$	
			$	
			$	
			$	
			$	
			$	
		Known Projects Estimated Cost	$	

[1] *Funded with cash, bond issue, rate increase, bank loan, CWSRF loan, other*

Table 5-9: Capital Improvement Projects Costs

System Name				
Asset/Project Name	Expected Year	Project Description or Purpose	Cost Estimate	Potential Funding Source[1]
			$	
			$	
			$	
			$	
			$	
			$	
			$	
	Capital Improvement Projects Total Cost		$	

[1] *Funded with cash, bond issue, rate increase, bank loan, CWSRF loan, other*

Table 5-10: Short-Lived Assets

System Name			
Asset	**Work Description**	**Cost Estimate**	**Potential Funding Source**
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	
		$	

Operational and Capital Improvement Costs and Budgets

Wastewater systems are encouraged to develop 5-year operating budgets that include information on revenue, expenses, and financing. Financial solvency affects both a system's ability to obtain funding for CIPs and its ability to meet water quality requirements. Include any contracts or agreements with other entities for wastewater collection and/or treatment. Debt service coverage, renewal/replacement, and reserve funding requirements should also be identified.

Table 5-11: Operating Budget

System Name							
Budget Item			Year	Year	Year	Year	Year
A	Operating revenues (including wastewater rates, service impact fees, other)		$	$	$	$	$
B	Expenses	Operating Expenses (including salaries and benefits, insurance, routine and preventative maintenance, others less power, chemicals and other variable expenses)	$	$	$	$	$
C		Operating expenses due to CIP	$	$	$	$	$
D		Other expenses (including emergency or unplanned repairs/projects, professional services, training, etc.)	$	$	$	$	$
E		Taxes (paid by the utility system)	$	$	$	$	$
F		Debt payments	$	$	$	$	$
G	Operating Budget Total [A – (B through F)]		$	$	$	$	$

Table 5-12: Capital Improvement Budget

System Name							
Budget Item			Year	Year	Year	Year	Year
A	Capital Improvement Project (CIP) Costs		$	$	$	$	$
B	Financing Sources	1. Grants	$	$	$	$	$
		2. Reserves	$	$	$	$	$
		3. Loans/Bonds	$	$	$	$	$
		4. User Charges	$	$	$	$	$
C	CIP Total [A – (B1+B2+B3+B4)]		$	$	$	$	$

Section 6: Determining Future Wastewater Needs

Section 6 is a guide to determining future population and long-term treatment and system needs. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

Table 6-1: Projected Wastewater Needs To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
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15			

Population Projections

Determine the projected population of the service area. Wastewater flows are the basis for collection system and treatment improvements; they can be projected using per capita (per person) flows and mass loads and using land use projections. Population projections may come from analysis of historical growth patterns and/or projections published by the U.S. Census Bureau's American Community Survey. Another option is to use (or modify as appropriate) population projections made for water supply systems as part of the *2012 OCWP Update*, especially if the wastewater service area closely matches the water service area. A special tabulation of projections by county and municipality was provided by the Oklahoma Department of Commerce and updated for the OCWP.

Table 6-2: Population Projections

System Name				
List selected population projections below for the system service area.				
Planning Year	Projected Population		Comments	Source for Projections[1]
	A Population Served by System	Population Not Served by System		

[1] *U.S. Census Bureau's American Community Survey, 2012 Oklahoma Comprehensive Water Plan Update, etc.*

Influent Wastewater Flow Projections

Influent wastewater flow projections can be determined by using per capita, land use, or drinking water demand information.

Flow Projections Based on Per Capita Information

Basing wastewater flow projections on historical wastewater operating data is generally considered the most accurate method. Using historical wastewater flow and population, the system will develop per capita wastewater influent flows. If no changes to wastewater usage patterns are anticipated, the system can divide the historical average day flow by the corresponding historical population to get the per capita flow. If low-use water fixtures at homes or infiltration repairs to the sewer system are being actively pursued, the system may want to reduce the per capita flow to account for the anticipated reduction in wastewater flows.

Table 6-3a: Historical Wastewater Flow and Per Capita Flow Computation

System Name				
Historical Wastewater Flow and Per Capita Flow Computation				
Historical Data for Wastewater Flow per capita Computation				
Year of Record	Historical Population	Historical Influent Wastewater ADF (mgd)	Historical Influent Wastewater ADF per capita (mgd)[1]	Data Source(s)[2]

Selected Historical Inf. Wastewater ADF per capita (mgd)[3] >		< Enter this value in Table 6-3b, Column **B**

[1] To calculate per capita wastewater flow, divide the historical influent wastewater flow by the corresponding population. Example, using a population of 3,000 and a corresponding historical wastewater ADF of 1.0 mgd, the per capita wastewater flow is 0.003 mgd per capita or 333 gpcd (or 1,000,000 gpd/3,000 people = 333 gpcd).

[2] Sources for average daily flows may be found in Section 3 of this guide, monthly DMRs, typical values for residential population, etc.)

[3] Select per capita wastewater flow data for use in calculating annual wastewater flow projections in Table 6-3b.

Table 6-3b: Projected Influent Wastewater Flow using Per Capita Information

System Name				
Influent Wastewater Flow Projections using Per Capita Information				
Planning Year	Projected Wastewater Annual Flow Computation			If any of the values based on historic data need to be modified for future planning, provide an explanation below and include values selected for future planning.
	A Projected Population [1]	B Selected Historical Influent Wastewater ADF (gpcd) [2]	C Projected [3] Annual Influent Wastewater ADF (mgd)	
		This value will be used here to calculate influent wastewater projections for each planning year.		

[1] Use population projections from Table 6-2, Cloumn A.

[2] Use the Selected Historical Influent Wastewater ADF per capita data from Table 6-3a

[3] To calculate the projected annual wastewater flow, multiply the historical selected historical wastewater per capita flow by the corresponding population projection. (Example, using .333 mgd, the per capita historical wastewater flow and a corresponding projected population of 3,600, the projected annual wastewater flow is 1.20 mgd. (or 333.3 gpcd/3,600 people = 1.20 mgd).

Flow Projections Based on Land Use

Land use plans may be based on historical patterns or on city master plans. Land use plans show how property within the service area will be developed or used in the future or at build-out (defined as when no further growth can be expected within the service area). Information is tabulated by unit (e.g., number of single family houses, number of offices or number of employees, number of schools, and number of students).

Table 6-3c: Projected Influent Wastewater Flow using Land Use Information

System Name

Note: Use separate copies of this table for each year of wastewater flow projection planning using land use information.

Influent Wastewater Flow Projections using Land Use Information

< Planning Year

Land Use Category Information		Unit Information					
Category Description	Number in Service Area	Unit	Units per Category	Total Units	Typical Wastewater Flow per Unit (gpd)[1]	Projected Influent Wastewater ADF (gpd)[4]	Data Source(s) [2]
Residential Housing, single family		Persons			55		
Residential Housing, apartment		Persons			40		
Office		Employee			5		
Restaurant (including toilet)		Customer			9		
Hotel		Guest			50		
Hotel		Employee			10		
Shopping Center		Parking Space			2		
Shopping Center		Employee			10		
Theater, indoor		Seat			3		
Hospital, medical		Bed			150		
Hospital, medical		Employee			10		
Rest Home		Resident			90		
Rest Home		Employee			10		
School, day, with cafeteria, gym and showers		Student			25		
School, day, with cafeteria		Student			15		
			Planning Year >			< gpd / < mgd[3]	Projected Total

[1] *Typical values taken from Wastewater Engineering, Treatment Disposal Reuse published by Metcalf & Eddy. Local wastewater flows should be used if available.*
[2] *Sources for per capita information (e.g., Section 3 of this guide, monthly DMRs, typical values for residential population, etc.):*
[3] *Record each planning year's resulting mgd value in "Table 6-3c-1: Summary of Influent Wastewater Flow Projections Using Land Use Information"*
[4] *Total units x Typical wastewater flow per unit*

Table 6-3c-1: Summary of Influent Wastewater Flow Projections using Land Use Information

System Name

Summary of Influent Wastewater Flow Projections using Land Use Information

Planning Year	Projected Influent Wastewater ADF (mgd) [1]	Notes

[1] *From Table 6-3c for each planning year.*

Flow Projections Using Drinking Water Demand

While less preferred than the two previous methods, using drinking water demand to project wastewater flow can be a temporary method until more accurate information can be collected. Depending on how water is used in a community, approximately 60 to 90 percent of drinking water used is returned as wastewater (examples of water returned as wastewater include water used for brushing teeth, flushing toilet, showering). Water consumed (such as that used for watering lawn) should not be included in the wastewater flows. Using a historical monthly demand pattern applied to the drinking water demand projection, apply the wastewater flow percentage to the minimum monthly demand to project average daily influent wastewater flows.

Table 6-3d: Monthly Distribution of Drinking Water Usage

System Name			
Note: Use separate copies of this table for each year of monthly distribution pattern calculating .			
Monthly Distribution of Drinking Water Usage			
< Year of Record			
	Monthly Drinking Water Usage (mgd) [1]	Monthly Distribution Pattern [2]	Data Source(s)
January			
February			
March			
April			
May			
June			
July			
August			
September			
October			
November			
December			
Total Annual Usage (mgd) >			< Total of Distribution Pattern should sum to 1.00
Year of Record >			< Minimum Monthly Distributation Pattern [4]

[1] *Information may be taken from metered results or water treatment plant production values.*

[2] *To calculate the monthly distribution pattern, divide the monthly usage by the total annual usage. Note: the sum of the monthly distribution pattern values should sum to 1 (one).*

[3] *Sources for drinking water demand information include 2012 OCWP Update, City's Master Plan, etc.*

[4] *Enter each planning year's Minimum Mohthly Distribution Pattern on Form 6-3e.*

Note: this method of flow projection is least preferred of the three methods presented. If possible, use one of the previous methods

Table 6-3e: Influent Wastewater Flow Projections using Drinking Water Demand Information

System Name				
Influent Wastewater Flow Projections using Drinking Water Demand Information				
Planning Year	Drinking Water Demand (mgd) [1]	Minimum Monthly Distribution Pattern [2]	Ratio of Return Flow to Demand [3]	Projected Influent Wastewater ADF (mgd) [4]

[1] *Use drinking water demand projections. Sources for this information include the 2012 OCWP Update.*

[2] *Use the minimum monthly distribution pattern value from Table 6-3d.*

[3] *This ratio of return flow (or flow returned to the system as wastewater) to demand may be based on historical information. The 2012 OCWP Update used a 95 percent ratio of return flow to minimum monthly municipal and industrial water demand.*

[4] *To calculate the influent wastewater, multiply the drinking water demand by the minimum monthly distribution value by the ratio of return flow to demand.*

*Example: if the drinking water demand is 1.0 mgd, the minimum monthly distribution value is 0.05, and the ratio of return flow to demand is 0.95, the projected wastewater flow is 0.048 mgd (1.0 * 0.05 * 0.95 = 0.048).*

Influent Wastewater Load Projections

Future influent wastewater loads can be projected by dividing historical mass load (in pounds per day) by the corresponding historical population. This is a useful method if water conservation or I/I elimination programs are being actively implemented.

Table 6-4a: Wastewater Load Projections - Historical Mass Loads

System Name													
Historical Mass Loads													
Data Period of Record	Population [1]	Wastewater ADF (mgd) [2]	Inf BOD_5 (lb/d) [3]					Inf TSS (lb/d) [3]					
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD	
Data Period of Record	Population [1]	Wastewater ADF (mgd) [2]	Inf TP (lb/d) [3]					Inf TKN (lb/d) [3]					
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD	
Data Source 1													
Data Source 2													

[1] *Record this information from Table 3-5*
[2] *Record this information from Table 3-6*
[3] *Record this information from Table 3-7*

ADF: Average daily flow
30-Day: 30-Day Moving Average Flow
ADMM: Average day maximum month

MinD: Minimum day flow
MD: Maximum day

Note: Sources for per capita information include Section 3 of this guide, monthly DMRs, typical values for residential population, etc.

Table 6-4b: Wastewater Load Projections - Historical Mass Loads Per Capita

System Name													
Historical Mass Loads Per Capita													
Data Period of Record	Population	Wastewater ADF (mgd)	Inf BOD_5 (lb/d per capita) [1]					Inf TSS (lb/d per capita)					
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD	
Data Period of Record	Population	Wastewater ADF (mgd)	Inf TP (lb/d per capita)					Inf TKN (lb/d per capita)					
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD	
Data Source 1													
Data Source 2													

[1] *To calculate the per capita flow and loads, divide the values in Table 6-4a by the historical population (Table 6-4a). Record these per capita values in Table 6-4b. For example, with an Inf BOD_5 of 540 lb/d and a population of 3,000, the Inf BOD_5 per capita would be 0.18 lb/d per capita (calculated by dividing 540 by 3,000).*

Note: Sources for per capita information include Section 3 of this guide, monthly DMRs, typical values for residential population, etc.

Table 6-4c: Wastewater Load Projections - Selected Historical Mass Loads Per Capita

System Name													
Selected Historical Mass Loads Per Capita													
Data Period of Record	Population	Wastewater ADF (mgd)	Inf BOD_5 (lb/d per capita) [1]					Inf TSS (lb/d per capita) [1]					
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD
Data Period of Record	Population	Wastewater ADF (mgd)	Inf TP (lb/d per capita) [1]					Inf TKN (lb/d per capita) [1]				
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD
Data Source 1												
Data Source 2												

If any of the values based on historical data need to be modified for future planning and include list values selected for future planning provide an explanation below.

[1] To calculate the per capita flow and loads, divide the values in Table 6-4a by the historical population (Table 6-4a). Record these per capita values in Table 6-4b. For example, with an Inf BOD_5 of 540 lb/d and a population of 3,000, the Inf BOD_5 per capita would be 0.18 lb/d per capita (calculated by dividing 540 by 3,000).

Note: Sources for per capita information include Section 3 of this guide, monthly DMRs, typical values for residential population, etc.

Table 6-4d: Wastewater Load Projections - Projected Flow and Mass Loads Per Capita

System Name												
Projected Flow and Mass Loads Per Capita												
Period of Data	Population [1]	Wastewater ADF (mgd) [2]	Inf BOD_5 (lb/d per capita) [3]					Inf TSS (lb/d per capita) [3]				
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD
Period of Data	Population [1]	Wastewater ADF (mgd) [2]	Inf TP (lb/d per capita) [3]					Inf TKN (lb/d per capita) [3]				
			ADF	30-Day	ADMM	MinD	MD	ADF	30-Day	ADMM	MinD	MD
Data Source 1												
Data Source 2												

[1] Record this information from Table 6-2
[2] Record this information from Table 6-3
[3] To complete the Inf BOD_5, Inf TSS, Inf TP and Inf TKN, take the projected population and multiply it by the per capita numbers in Table 6-4C.

Design Criteria for Different Project Types

Wastewater flow used to size projects varies by project type. The following table contains guidelines. Anticipated future permit limits or regulatory trends also play an important role in planning future projects.

Table 6-5: Design Flow/Load as it Relates to Facility/Process

Design Flow Type	Wastewater Component or Process Type
Maximum Day (MD) and Peak Hour (PH)	Sizing for secondary clarifiers, filters, disinfection processes
Peak Hour (PH)	Sizing for all hydraulic elements (examples include pumping, screening, weirs) including lift stations located within collection system lines
Minimum Day (MinD)	Sizing for all hydraulic elements (examples include pumping, screening, weirs)
Annual Average Day Flow (ADF) or Maximum Month (ADMM)	Design capacity of wastewater treatment plant
Design Load Type	**Wastewater Component or Process Type**
Maximum Month (ADMM)	Sizing for biological reactors (BOD5) and nutrient (nitrogen, phosphorus, etc.) removal processes
Maximum Day (MD)	Sizing for aeration system, solids processing system
Minimum Day (MinD)	Check for turn down on aeration system, trickling filter recycle

Table 6-6: Future Permits[1]

System Name			
Future Discharge Permit Notes			
Constituent	Existing Permit Limit	Anticipated Future Limit [2]	Notes
BOD_5 (mg/L)			
$CBOD_5$ (mg/L)			
TSS (mg/L)			
pH (s.u.)			
DO (mg/L)			
SAR			
TKN (mg/L)			
TP (mg/L)			
E. *coli Bacteria (number/1000 ml)*			
Chlorine (mg/L)			
Temperature (^oF)			

[1] Talk to DEQ about any upcoming changes that may happen
[2] Refer to DEQ 525:656 for anticipated project limits

Section 7: Wastewater System Capacity Analysis

Section 7 is a guide to evaluating a system's capacity and ability to meet future rules and regulations. This evaluation is essential in determining the existence of gaps between the system's current capacity and its projected future needs. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

Wastewater Permitting Process

In Oklahoma a permit is required to discharge treated wastewater. The OPDES outlines the regulations for wastewater system discharges (including biosolids), as well as receiving water quality, distribution systems, and O&M of these systems. Most of these regulations can be found in Title 252 at www.deq.state.ok.us/mainlinks/deqrules.htm. The ODEQ has its own applicable rules for each of its water quality programs. Information on stormwater, industrial pretreatment, operator certification, construction, among others, can be found at www.deq.state.ok.us/wqdnew.

Table 7-1: Capacity Analysis To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Capacity Challenges

The primary purpose of this section is to facilitate internal discussion on a wastewater collection and treatment system's deficiencies or excesses and how to address them. Duplicate table 7-2 to list all of the system capacity analyses. Should deficiencies exist, infrastructure expansions/replacement/new facilities may be needed. The design of new or expanded facilities depends on many variables, and a professional engineer should be engaged at the appropriate time.

The purpose of this table is not to determine the exact amount of shortage or excess, but to facilitate internal discussions. Examples of concerns are: not enough transmission capacity for peak flows, not enough treatment capacity to handle future wastewater flows, not enough treatment processes to treat existing loads or to meet future water quality limits, aging infrastructure unable to handle existing flows, etc.

Table 7-2: Wastewater System Capacity Challenges

System Name	

List specified year and known data for that year below.	
Year[1]	
Discharge Permit Limits[2]	
Selected Population Projection[3]	
Selected Wastewater Flow Projection[4]	
Selected Wastewater Load Projection[5]	
Collection System Capacity (existing and planned projects)[6]	
Treatment System Capacity (existing and planned projects)[7]	

System Capacity Challenges (For the specified year, identify any concerns in meeting projected demands.)
List collection system operation or capacity concerns.
List treatment ability to meet discharge requirements concerns.
List treatment capacity concerns.
List aging infrastructure concerns.
List receiving water quality concerns.
List future effluent limits concerns.

1. Include as many years as appropriate, using a separate form for each year. Selection of years may be based on permitted schedule of use, planned water supply improvements, dates for demand and/or population projections, etc.
2. See your system's 208 WLA.
3. Use Table 6-2.
4. List projections selected in Section 6.
5. List projections selected in Section 6.
6. List capacity of major wastewater collection system components such as lift stations, interceptors, collection lines, etc. The system may choose to show the limiting capacity (for example if the lift system has pumping capacity of 2 mgd but only 1 mgd of transmission capacity, the limiting capacity for getting wastewater to the treatment plant is the transmission capacity) or identify capacity for all components. Please include additional notes as appropriate. Information on existing equipment may have been recorded in Section 4 as part of the system's Wastewater Facilities Inventory. Information on planned projects may have been recorded in Section 5.
7. List capacity of the wastewater treatment facilities. The system may choose to show either limiting capacity or identify capacity for all major components. Information on existing facilities may have been recorded in Section 4 as part of the Wastewater Facilities Inventory. Information on planned projects may have been recorded in Section 5

Table 7-3: Wastewater System Capacity Analysis

System Name	
Describe below system capacity concerns indentified in Table 7-2.	Supplemental Information Source(s)[1]
Describe below any regional strategies identified to address these concerns.	Supplemental Information Source(s)[1]
If no regional strategies were identified to address these concerns, explain below.	Supplemental Information Source(s)
List below the most significant concerns and rank them in order of importance.	

[1] *OCWP Regional Reports (available at www.owrb.ok.gov/ocwp) specific to your area may be helpful.*

Section 8: Identifying Conceptual Alternatives

Section 8 is a guide to determining alternatives associated with the projects identified in Section 7. These techniques may be used to prioritize projects across multiple system categories or when funding is limited. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed to complete the worksheets.

Table 8-1: Preliminary Alternatives To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Developing Alternatives

One important concept to remember about treatment plant design is that there are so many ways to approach a problem. Keeping that in mind, it is best to contemplate your entire system and be aware that you have alternatives. You may be able to do many things with your system to help your community save or use water better. Looking at Appendices C and D for ideas, consider if things will change over time in your community, what the outlook for water resources might be in the coming years, new requirements, expected population trends for your community, problem constituents, and so forth. Then begin to brainstorm the possibilities.

When developing alternatives, it is important to consider current regulations. Oklahoma Administrative Code Title 252, Chapter 656 provides specific requirements on wastewater system discharges, receiving water quality, collection systems, and O&M of these systems (see www.deq.state.ok.us/mainlinks/deqrules.htm). Some typical concerns and potential solutions are presented in this section. However, since meeting gaps between existing conditions and future needs is very system specific, not all solutions may be appropriate.

Generally, wastewater management challenges can be addressed by one of the following methods:

- Increasing capacity (hydraulic treatment)—achieved through permanent new lift stations, storage facilities, pipelines, and expanded treatment capacity.
- Reducing Flow—achieved through reducing I/I in collection piping, eliminating illicit connections (such as roof drains and stormwater systems), and implementing drinking water conservation measures that will reduce wastewater flow. With drinking water conservation, the strength of influent to wastewater treatment facilities will likely increase and there will be no reduction in overall solids production.

For wastewater collection, transmission, treatment, effluent disposal, and sludge management, alternatives typically fall within three categories.

- Improve performance – Wastewater utilities may want to improve the system's performance for a variety of reasons, including reducing customer complaints about odor or system surcharging, reducing operating costs, replacing aging equipment/ infrastructure, evaluating equipment/processes that require excessive maintenance, etc.
- Address changed conditions – Changed conditions such as changes in waste streams, permit requirements, or development may necessitate modification of the existing system.
- Increase capacity – A system may need additional capacity to collect, pump, or treat increased wastewater flow or load. Additional capacity may be necessary even if the system's existing components are in peak condition or it may be combined with projects necessary for existing system equipment.

To address challenges, wastewater utilities can evaluate the following options:

- Optimizing existing equipment—can more capacity or better performance be achieved with the existing system by repairing, rehabilitating, or replacing existing equipment or infrastructure? Consider the remaining useful life and and the anticipated future conditions such as changes in regulations or loading.
- Expanding the system—what is the availability of physical space, ability to implement plans, potential impacts (e.g., the need to bring other facilities or process units up to code)?

The Cheapest Source of Water is Conservation!

When thinking about alternatives, consider the Water for 2060 goals and the simple fact that the cheapest source of water is conservation! Water reuse, for example, isn't meant to be a buzz-word; in some situations it can be a very real water, cost, and energy-saving alternative that can replace potable with non-potable sources. Instead of sending effluent down the creek, sell it to a local industry for washdown or irrigation. Appendix F provides examples of green infrastructure, water efficiency, energy efficiency, and environmentally innovative projects. Appendix C lists a full set of considerations when thinking about options for your next facility.

Water conservation includes efficiency and reuse efforts to not only conserve our raw water supply, but to also reduce flow to wastewater treatment plants. Therefore, one way CWSRF borrowers can fulfill the water conservation requirement is to consider alternative or complementary projects that result in reduced wastewater flows and therefore reduce a treatment works' capacity needs. There are a number of water conservation projects borrowers can consider. See Appendix D for more information.

The Oklahoma Department of Environmental Quality (ODEQ) is piloting a water loss auditing program. The goal of the pilot project is to help community water systems with less than 10,000 consumers find and correct sources of non-revenue and unaccounted-for water. A water loss audit is a tool to help identify and control water loss in a water distribution system. It is an accounting of all the water produced, sold, consumed, and lost in a water system. A water loss audit indicates how much water is lost due to faulty meters, data handling errors, and unauthorized use (apparent losses) and how much is lost due to leaks and overflows (real losses).

The audit will involve software developed by the American Water Works Association (AWWA) to calculate real and apparent water losses using metering and billing data routinely gathered by the water system. The audit is usually completed in a matter of hours, and the results are available immediately.

For community water systems that meet the criteria of this pilot project and are selected to participate, there is no charge for the water audit or the software, which will be provided to the system for future use. For more information contact the DEQ.

One example of how CWSRFs can evaluate the energy portion of the certification is to use information developed by the recipient through energy assessments and audits. Energy assessments help utilities identify the amount of energy being used in various aspects of its operations. Energy audits, in turn, allow utilities to identify and prioritize projects that will result in operational and capital improvements to their infrastructure and operations, cost savings, and other climate-related benefits like reductions in greenhouse gas emissions and the use of renewable energy. EPA encourages CWSRFs to promote the use of these proven and objective methods by CWSRF borrowers. See Appendix D for more information.

The Envision Sustainable Infrastructure Rating System developed by the Institute for Sustainable Infrastructure (ISI) can further help you weigh alternatives. Envision™ provides a holistic framework for evaluating and rating the community, environmental, and economic benefits of all types and sizes of infrastructure projects. It evaluates, grades, and gives recognition to infrastructure projects that use transformational, collaborative approaches to assess the sustainability indicators over the course of the project's life cycle. This free downloadable Checklist and Tool is available online at www.sustainableinfrastructure.org.

Several helpful online tools and resources on water and energy efficiency have been collected into one document, broken out with some guidance in the latest EPA Interpretive Guidance on the 2014 WRRDA Amendments and included as Appendix D in this Guide. These tools include:

- EPA's WaterSense Program
- EPA's Water Conservation Plan Guidelines
- AWWA Water Audit Software
- AWE Water Conservation Tracking Tool
- Texas Water Conservation Plan with guidelines and tutorials
- EPA's Energy Use Assessment Tool
- New York's Energy Benchmarking Tool
- Maine's Sample Audit RFP Language
- Center for Energy Efficiency self-audit checklists

Table 8-2 lists typical wastewater management factors to consider when developing alternatives. Sometimes combining solutions is the best way to address a system's challenge.

Table 8-2: Wastewater Management Considerations

		Factors to Consider When Developing Alternatives
Service Area Modification		• Are there plans to expand or modify the existing service area? Are there plans to add new customers or bulk service treatment? • Does consolidation with other facilities (in the service area or geographic region) make sense for providing overall treatment? • Would connecting to nearby systems for emergency or other supply be feasible?
Inflow & infiltration reduction		• What is the anticipated wastewater flow based upon residential and commercial connections? How does the anticipated flow differ from actual dry-weather and wet-weather flows? • Do pump stations or the plant experience significant variations in flow throughout the day and following wet-weather events? • What is the overall condition of the collection and transmission system and are repairs able to be readily made? • Is the system configured in such a way as to be able to distinguish the areas with higher peaking factors (and potentially higher I/I)? • Will reduction in I/I make a positive impact on overall system capacity or reduce system overflows? • Can high efficiency pumps be installed?
Capacity increase	Piping & transmission	• Are there known bottlenecks in the system? • Are there areas of future potential development that are served by pipes and pump stations of limited capacity? • Can some pipes be re-routed to relieve areas that have capacity constraints? • Are some pump stations impacting the system due to limited capacity or equipment malfunction? • Is it feasible to add in-system storage or change pump system operations to more effectively use wet-wells for storage? • Will I/I reduction eliminate capacity problems in the system? • Can high efficiency pumps be installed?
Capacity increase	Treatment	• Does the influent flow following a wet-weather event result in hydraulic capacity limitations at the treatment plant? Would on-plant storage eliminate this impact? • Are there treatment unit processes that are capacity limited resulting in a lower overall treatment plant capacity? • Does the condition of any unit process impact the overall capacity of treatment (i.e. bar screens in poor condition limit ability to pass inflow flow through preliminary treatment unit)? • Is the overall plant capacity adequate to treat current and future loads based upon permit effluent limits? • Do potential future effluent limits result in the plant being undersized (i.e. nutrient limits, anticipated change in TSS or BOD5 limits, etc.)? • Are there anticipated changes in the customer base that will result in a change in flow to the plant (characterization or volume)? • Is there a likely change in sludge disposal that will result in the need for increased treatment (i.e. moving to Class B or Class A solids or change in disposal location)? • Does projected solids generation exceed processing or disposal capacity?
Treatment Type		• Will the current treatment processes allow compliance with the existing permit? Will the current process provide adequate treatment for compliance with anticipated future permit limits? • Is the current treatment technology reasonable for the anticipated flows and loads? • Is the current plant operating effectively and resulting in permit compliance? Would changes in the process help with permit compliance? • Should alternative processes be considered to provide more effective and efficient treatment? • Does the existing plant and process unit configuration allow for easy upgrade or process change?
Effluent Management		• Are there other potential methods of effluent disposal? What regulatory steps will be required to implement an alternative disposal plan? • Is the effluent disposal method sized consistent with the plant capacity or will changes be required. • Will new regulations or permit changes make the current method of effluent disposal possible? • Is wastewater reuse a possibility? Are there customers available? Are there potential industrial customers for reuse?
Environmental Considerations		• Endangered species or their habitat nearby? (common for OK – Least Tern, American Burying Beetle, Whooping Crane, Leopard Darter) • Near a High Quality Water, Scenic River, Nutrient Limited Watershed, or other sensitive areas? • TMDL for the watershed? What constituent(s)? • Will project involve undeveloped property? • Near natural or archeological landmarks? • Project in the floodway or floodplain? • Substantive increase in volume or loading of pollutants?

Table 8-3: Evaluation and Implementation of Water and Energy Conservation Efforts

System Name		
Planning Methodology	**Yes**	**No**
Project is a comprehensive planning effort that includes other public and/or private sector organizations		
Project alternatives analysis explores the most cost-effective solution at a regional level		
Project incorporates at least one planning methodology[1]		
Rate structures will support ongoing operations and maintenance for this project		
Energy Efficiency	**Yes**	**No**
Facility has performed a professional energy audit		
Facility has developed an Energy Conservation Plan		
Equipment is properly maintained, operating as close to nameplate voltage as practicable, and the connection on switches on all major power-driven equipment is checked at least annually		
Facility uses variable frequency drives to improve pump efficiency		
Pump operations are automated		
Facility uses variable and multiple staged single-speed blowers		
Facility uses digester gas to fuel engine-driven blowers		
Facility uses two-speed mechanical aerators where applicable		
Facility implements continuous DO monitoring		
Facility uses digester gas to fuel engine-driven blowers		
Automated aeration control systems are installed		
Facility uses natural light to the greatest extent possible		
Facility uses programmable thermostats		
Facility has assessed building insulation R-values and sealed leaks		
Water Efficiency	**Yes**	**No**
Facility has developed a Water Conservation Program		
Facility has taken measures to implement pressure management controls throughout collection system		
Facility utilizes leak detection equipment and protocols to address leaks, collapses, and I/I issues		
Facility has developed and employed mechanisms to recycled gray water		
Facility produces Class II treated effluent for agricultural/industrial/fire protection/groundwater recharge, etc.		
Facility produces Class I treated effluent used for landscape irrigation, fire protection, or groundwater recharge		
System design allows for water reuse treatment and distribution		
Project uses stormwater best management practices, exceeding permit requirements		
System planning involved consultation with potential water reuse and land application customers		
Project planning involved consultation with potential water reuse customers		

[1] *Planning methodologies include: Comprehensive Land Use Plan, Fix-it First Methodology, Asset Management Plan, Watershed Management Plan, Nutrient Management Plan, and/or Open Space Preservation Plan*

Cataloguing Preliminary Alternatives

At this stage, it is important to consider a wide range of alternatives. Clearly identify the wastewater system's overall goals, purpose, and main objective(s) both from the whole system and component perspective. Review existing information and generate (and record) ideas of how to address the challenge. Evaluating ideas will come later. Brainstorming sessions should be relatively brief. Some ideas can be eliminated; others can be left for later discussion. Table 8-3 and Appendices C and D may be helpful for generating ideas.

Document challenges developed in Section 7 and preliminary alternatives from this section on the following tables. Notes include items that need to be investigated, links to other alternatives, or key concepts to consider when evaluating alternatives. Time frames for implementation, both short- and long-term, may be specific dates or general times.

Table 8-4: Influent Wastewater Challenges and Preliminary Alternatives

System Name		
Influent Wastewater Challenges	Preliminary Alternatives	Implementation Time Frame
Notes		

Table 8-5: Wastewater Collection Challenges and Preliminary Alternatives

System Name		
Wastewater Collection Challenges	Preliminary Alternatives	Implementation Time Frame
Notes		

Table 8-6: Wastewater Treatment Challenges and Preliminary Alternatives

System Name		
Wastewater Treatment Challenges	Preliminary Alternatives	Implementation Time Frame
Notes		

Table 8-7: Effluent Disposal/Reuse Challenges and Preliminary Alternatives

System Name		
Wastewater Effluent Disposal/Reuse Challenges	Preliminary Alternatives	Implementation Time Frame
Notes		

Table 8-8: Sludge Management Challenges and Preliminary Alternatives

System Name		
Sludge Management Challenges	Preliminary Alternatives	Implementation Time Frame
Notes		

In Table 8-9, develop alternatives (or combinations of preliminary solutions in the previous subsection) to be considered in Section 9. Because of the interconnected nature of utilities, decisions in one category of preliminary alternatives may have a significant impact on other categories. Do some solutions work better together? Do some potential solutions exclude others? Consider the alternative of doing nothing. What happens if no action is taken and no costs or changes to operation are incurred? The "no action" alternative must always be evaluated by NEPA-driven funding programs.

Table 8-9: Conceptual Alternatives

System Name			
	Conceptual Alternative Name	Conceptual Alternative Description	Will this alternative be given further consideration?
1	No Action	This alternative involves continued operation of the existing wastewater system without modifications to collection, transmission, treatment, effluent disposal, or residuals management.	☐ Will be considered further ☑ Will not be considered further (explain decision below)
2			☐ Will be considered further ☐ Will not be considered further (explain decision below)
3			☐ Will be considered further ☐ Will not be considered further (explain decision below)
4			☐ Will be considered further ☐ Will not be considered further (explain decision below)
5			☐ Will be considered further ☐ Will not be considered further (explain decision below)
6			☐ Will be considered further ☐ Will not be considered further (explain decision below)
7			☐ Will be considered further ☐ Will not be considered further (explain decision below)

Selecting the Most Critical Project(s)

Categorize identified projects. The capacity analysis table may have identified more projects than there are funds to complete. Projects must be prioritized and timelines implemented to the advantage of the system. Two simple matrices are provided below. The projects in the Important/Urgent quadrant should be considered high priority projects. The projects in the Important/Not Urgent and Not Important/Urgent quadrants should be evaluated individually to determine relative priority. Projects in the Not Important/Not Urgent quadrant should be re-evaluated for need. This matrix can be expanded to include defined time periods or critical versus noncritical infrastructure as needed to capture the system's needs. The goal of this exercise is to have a roadmap of where to go and how to get started. Consider the following when making quadrant assignments:

- Does this project involve critical infrastructure?
- Is this project necessary for the protection of employees or customers?
- Is this project necessary to meet regulations?
- When is this project needed? To determine when a project must start, begin with when the project must be operational and subtract the time needed for construction, design, permitting, funding, planning, etc. Use this project start time to determine urgency.
- Does this project involve long lead items such as specialized equipment or permits?
- Are there components increasing the difficulty of the project that may result in additional time needed for completion?
- Can this project be combined with other projects for better efficiency?

Table 8-10: Project Prioritization Matrix

	Important	Not Important
Urgent		
Not Urgent		

Table 8-11: Project Prioritization With Timeline Matrix

	Critical	Funding Sources	Non-Critical	Funding Sources
Within 1 Year				
1 to 3 Years				
3 to 5 Years				
5 to 10 Years				
10 to 25 Years				
Beyond 25 Years				

The second example allows the incorporation of implementation timeline priorities. The projects are listed in critical and noncritical categories similar to the first example. They are placed in time priority order using the general periods listed on the left.

Section 9: Evaluating Alternatives

Section 9 provides a method for evaluating the conceptual alternatives developed in Section 8. It may be helpful to work through this section for each project identified due to differences in objectives (for example, the objectives of a wastewater collection system project may be significantly different or have different performance measures than a wastewater treatment project). A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed.

Conceptual alternatives must be evaluated in light of multiple and potentially conflicting objectives. The method provided in this section is only one of several available for deciding between alternatives. It can be completed by hand, on a spreadsheet, or with commercially available software that provides the ability to conduct sensitivity analyses.

Table 9-1: Evaluating Alternatives To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Determining Objectives

The first step in evaluating alternatives is to determine the objectives. Objectives facilitate the analysis, comparison, and screening of the alternatives. To the degree practical, the objectives should be designed as follows:

- Distinctive
- Measurable
- Non-redundant
- Understandable
- Concise

Primary objectives are more general; secondary objectives help define the primary objectives in more specific terms. Objectives should incorporate system, regulatory, and funding priorities.

Some objectives may be more relevant for a given stakeholder than others. For example, for a given system, reliability may be more important than cost. Thus, weights will be developed for each objective so that the alternatives analysis better reflects the relative values and priorities of the system. Relative weights are also assigned for secondary objectives, with the total weight of the secondary objectives equaling 100 percent for a given primary objective. In this way, alternatives that score best for the most important objectives will be ranked the highest.

Performance measures are used to assess the degree to which each alternative meets each objective. In cases where performance cannot be quantified, a relative scale of qualitative performance is used to gauge the degree to which alternatives meet objectives.

The following table provides an example of primary objectives, secondary objectives, and performance measures.

Table 9-2: Example Primary and Secondary Objectives

	Objective Name	Objective Description	Secondary Objectives	Performance Measure (units)
1	Improve Reliability	Minimize risk of overflows in collection system and ensure ability to treat organic loads with variable wastewater flows. Each alternative will be evaluated based on system redundancy, ramifications of system failure, and use of proven technology.	Provide system redundancy (equipment, treatment trains) to keep system operating during component failure	Number of trains and N redundancy *For N: 0=none, 1=single equipment back-up, 2=full equipment back-up*
			Use proven technology for treatment	Use of proven technology in alternative *Qualitative 1-5 where 1 represents least proven technology and 5 represents most proven*
			Maximize flexibility in operations (flow path changes, ability to change process)	Ability to change flow path through valve, gate or piping control *Qualitative 1-5 where 1 represents least flexibility and 5 represents most flexibility*
			Reliability of lift stations and collection system.	Susceptibility to pump failure or treatment problems resulting in violations to discharge permit *Qualitative 1-5 where 1 represents most impact from failure and 5 represents least impact*
2	Minimize Cost	This objective evaluates both capital and life cycle costs of each alternative. Ease of phasing improvements while deferring capital costs is also assessed.	Manage capital costs	Capital construction cost for improvements *Qualitative 1-5 for initial screening where 1 represents highest cost and 5 represents lowest cost*
			Phase implementation to defer capital costs	Degree to which improvements can be phased *Qualitative 1-5 where 1 represents few or no phasing and 5 represents the most phasing opportunities*
			Manage life-cycle costs	20-year –public sewer cost for improvements *Qualitative 1-5 for initial screening where 1 represents highest cost and 5 represents lowest cost*
3	Minimize environmental impacts/incorporate sustainability	This objective will evaluate permit compliance of each alternative. This objective also will evaluate the ability to minimize construction impacts to environmentally sensitive areas.	Minimize construction impacts to environmentally sensitive areas	Perceived construction impacts *Qualitative 1-5 where 1 represents most impact and 5 represents least impact*
			Increase energy efficiency	Perceived reduction in carbon footprint or energy demand *Qualitative 1-5 where 1 represents the least reduction in carbon footprint and 5 represents the most reduction*
			Maintain compliance with permit limits	Ease of maintaining compliance *Qualitative 1-5 where 1 represents most difficult to maintain compliance and 5 represents least difficult*

Table continued on next page

	Objective Name	Objective Description	Secondary Objectives	Performance Measure (units)
4	Operability and integration with existing facilities	This objective will evaluate similarity to existing operational procedures and capabilities, compatibility with staff experience, system complexity, and complexity of individual unit processes or system components.	Match system with existing operational procedures and capabilities, experience of staff	Staff training requirements *Qualitative 1-5 where 1 represents most training required and 5 represents least training required*
			Reduce system complexity	Degree of overall simplification of O&M *Qualitative 1-5 where 1 represents most complex O&M and 5 represents least complex O&M*
			Reduce complexity of individual unit processes or system components	Degree of simplification of process operations *Qualitative 1-5 where 1 represents most complex and 5 represents least complex*
5	Maintainability	This objective will evaluate the maintenance requirements of each alternative.	Reduce/simplify overall maintenance requirements	Reduction in overall maintenance impacts and individual equipment maintenance requirements *Qualitative 1-5 where 1 represents most maintenance and 5 represents least maintenance*
			Increase ease of maintaining facilities and equipment	Ease with which improvements can be maintained *Qualitative 1-5 where 1 represents most complex and 5 represents least complex*
6	Constructability	This objective will measure the ease of constructing each alternative, including the level of disruption to the existing system during construction.	Minimize disruption to existing system during construction	Level of system disturbance *Qualitative 1-5 where 1 represents most disruption and 5 represents least disruption*
			Perceived difficulty of actual construction, considering access, tie-ins and physical limitations	Perceived ease of construction *Qualitative 1-5 where 1 represents most difficult construction and 5 represents least difficult construction*
7	Public Acceptance	This objective will assess the public acceptability of each alternative by evaluating perceived public safety and discharge water quality.	Minimize handling hazardous substances and storage quantity of chemicals onsite	Perceived public safety *Qualitative 1-5 where 1 represents most risk and 5 represents least risk*
			Provide collection and wastewater treatment that is affordable and maintains receiving water quality.	Perceived level of receiving water quality *Qualitative 1-5 where 1 represents lower effluent quality and 5 represents higher effluent quality*
8	Timely Implementation	Ability to implement required improvements with minimal technical and regulatory difficulty	None	Implementation schedule *Qualitative 1-5 where 1 represents the longest implementation time and 5 represents the shortest*

Table 9-3: Objective Weighting using Paired Comparisons (Working Table)

System Name						
Objective's assigned number >	1	2	3	4	5	6
Name of selected objective >						
Total number of times objective was selected >						
Total number of possible selections > (Total from all participants if applicable)						
Weight in percentage >						

Weighting of Objectives

A method called paired comparisons can be used to weight each of the objectives. Similar to the brainstorming session in Section 8, it may be helpful to have several stakeholders in the organization participate.

Single Participant/Group Consensus

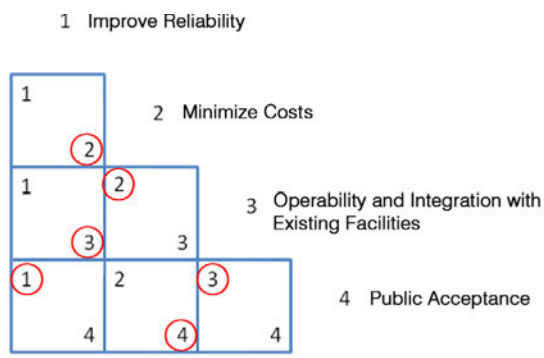
As the name suggests, essentially the system is comparing two objectives at a time to determine which of the pair is more important. For example, is objective 1 or 2 more important? Is objective 1 or 3 more important? Using the example objectives in Table 9-2, a weighting grid was developed (see page 99). Each box in the grid compares 2 objectives. There is no priority implied in the objective's numbering assignment - the numbers simply facilitate the exercise. Each objective will be compared to each of the other objectives selected for use in the chart. For Example A we have chosen to compare four objectives, however the number of objectives used in the exercise should be based on issues relevant to the individual system.

Once the objectives have been determined and selections have been made for comparison, the participant would:

1. Determine which of the two objective (represented by numbers) in each box is more important (excluding all other objectives) and circle that number. For example, in the first box the objective "Improve Reliability" is compared to "Minimize Cost". The option, "Minimize Cost" was elected as the more important objective of the two. This process would be continued for all 6 boxes.
2. Tally the number of times each objective was selected (circled). Notice that objective 2, "Minimize Costs" was circled two times in Example A.
3. Divide the number of times each objective was selected by the total number of possible choices (6) among all the objectives to determine the objective weighting. Multiply the results by 100 to determine the weighting in percent. For example, since objective 2, "Minimize Costs" was selected a total of 2 times in the chart among all comparisons and the total number of selections (circles) in the chart is 6, therefore the result is: 2 divided by 6 = .33 times 100 = 33, resulting in a weighted value of 33% for this objective. The total percentage for all weighted objectives should be near 100 (rounding applied).

Example A- Single Participant Comparing Four Objectives

Sample Weighting Grid



Sample Objective Weighting - Single Participant and Four Example Objectives

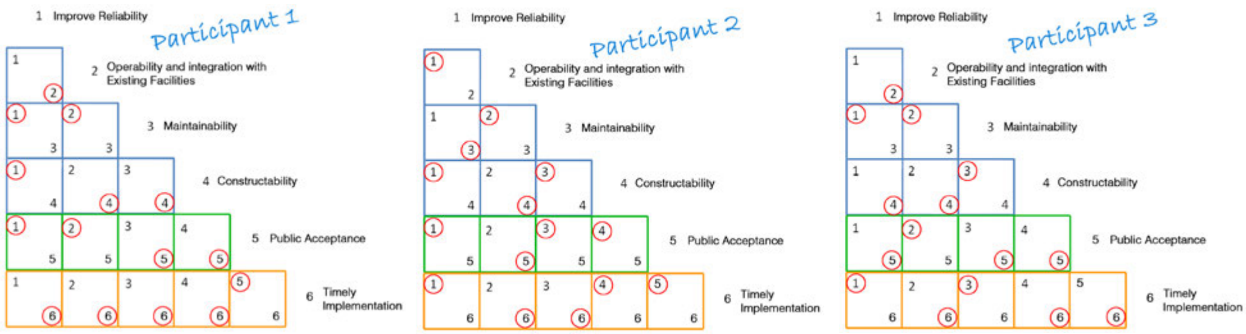
Objective's assigned number >	1	2	3	4
Name of selected objective >	Improve Reliability	Minimize Cost	Operability and Integration with Existing Facilities	Public Acceptance
Total number of times objective was selected >	1	2	2	1
Total number of possible selections >	6	6	6	6
Weight in percentage >	17%	33%	33%	17%

Multiple Participants

If multiple stakeholders are participating in the exercise, gather the completed weighting grid from each participant, total the number of times each objective is chosen by all the participants and divide by the number of selections in all the grids combined. For this process it might be helpful to create a tally sheet (see Sample Tally Sheet below). The total number of possible selections in each grid will always be the same as the number of squares in the grid.

In the following sample, we presume 6 objectives are considered by 3 participants which results in 15 squares or possible choices each (see Example B). The number used for weighting would be 45, (3 x 15 = 45). Therefore, since objective 2 was selected a total of 7 times, (7 divided by 45 = .1555 x 100 = 15.55) would result in a weighted value of 16% for this objective. This process would continue for all objectives.

Example B - Three Participants Comparing Six Objectives
Sample Weighting Grids



Sample Tally Sheet - Three Participants and Six Example Objectives

Objective's assigned number	Name of selected Objective	Participant 1 Selections	Participant 2 Selections	Participant 3 Selections	Total number of times the objective was selected
1	Improve Reliability	3	4	2	9
2	Operability and Integration with Current System	3	1	3	7
3	Maintainability	0	3	2	5
4	Constructability	2	3	2	7
5	Public Acceptance	3	2	3	8
6	Timely Implementation	4	2	3	9

Sample Objective Weighting - Three Participants and Six Example Objectives

Objective's assigned number >	1	2	3	4	5	6
Name of selected objective >	Improve Reliability	Operability and Integration with Current System	Maintainability	Constructability	Public Acceptance	Timely Implementation
Total number of times objective was selected >	9	7	5	7	8	9
Total number of possible selections (3 x 15) > (Total from all participants if applicable)	45	45	45	45	45	45
Weight in percentage >	20%	16%	11%	16%	18%	20%

Scoring and Selection of Preferred Alternatives

Score each of the alternatives against each performance measure on a one through five scale, where a higher score corresponds to better performance. These values can be generated preliminarily by an individual and revised based on larger group discussions.

The following example illustrates a ranking table. Unless one of the sub-objective criteria is more important, generally each sub-objective for a given major objective is weighted equally (or divide 100 by the number of sub-objectives to determine the relative weight of each sub-objective).

At this level it is appropriate to rate the alternatives relative to one another. A few examples are provided.

- Is the cost of Alternative 1 higher than cost of Alternative 2? If the capital cost of Alternative 1 is higher than Alternative 2, then Alternative 1 would receive a lower score than Alternative 2 (remember the higher score indicates better performance or, in this case, lower cost). If the costs are close, score them 1 and 2 (with 2 indicating the lower cost option). If the costs are not close, consider scoring them 1 and 3 (with 3 indicating the lower cost option).
- Does Alternative 1 provide more redundancy than Alternative 2? If Alternative 1 provides more redundancy, it would receive a higher score than Alternative 2. Consider the relative spread of alternatives and separate the score accordingly.
- Does Alternative 1 provide more flexibility than Alternative 2? If Alternative 1 provides more flexibility, it would receive a higher score than Alternative 2.
- Does Alternative 1 use less energy than Alternative 2? If Alternative 1 uses less energy, it would receive a higher score than Alternative 2 (a higher score indicates better performance or, in this case, lower energy consumption).

If quantitative information is known, it can be used in the rating system. Two examples are provided below.

- The costs of various alternatives are known. The following ratio scale may be applied to assign alternative ratings. (Table 9-4)
- The timeline for implementation of various alternatives is known. The following ratio scale may be applied to assign alternative ratings. (Table 9-5)

To determine the alternative sub-objective score, multiply the objective weight times the sub-objective weight times the rating. The sub-objective scores are summed to determine the alternative's total score. For example, Improve Reliability has an objective weight of 17 percent (or 0.17) and System Redundancy has a sub-objective weight of 25 percent (or 0.25). To calculate the score of Alternative 2, multiply 0.17 by 0.25 by the score of 1 (0.17 * 0.25 * 1 = 0.435).

Table 9-4: Alternative Cost Rating

Cost Range [A]	Alternative Rating [B]
Less than $5,000	5
$5,001 to $25,000	4
$25,001 to $100,000	3
$100,001 to $500,000	2
Greater than $500,000	1

A The cost range should reflect the relative cost differences between the alternatives. For example, if all projects have estimated costs of less than $10,000, then $2,000 cost windows may be used to better distinguish between the projects.

B Note that the higher ranking indicates a lower cost.

Table 9-5: Alternative Timeline Rating

Time for Implementation [A]	Alternative Rating [B]
Less than 1 year	5
1 to 3 years	4
3 to 5 years	3
5 to 10 years	2
More than 10 years	1

A The time range should reflect the relative cost differences between the alternatives. For example, if all projects can be implemented within three years, it may be more appropriate to look at time on a monthly basis.

B Note that the higher ranking indicates a faster implementation.

Table 9-6: Sample Rating Table with Scores

Objective		Sub-Objective		Alternative 1		Alternative 2	
Weight	Objective	Relative Weight	Sub-Objective	Alternative Rating	Sub-Objective Score	Alternative Rating	Sub-Objective Score
17%	Improve Reliability	25%	Provide system redundancy (equipment, treatment trains) to keep system operating during component failure.	0	0	1	0.0425
		25%	Reduce ramifications of failure of all or part of system.	1	0.0425	3	0.1275
		25%	Use proven technology for treatment .	3	0.1275	3	0.1275
		25%	Maximize flexibility in operations (flow path changes, ability to change process).	2	0.085	4	0.17
33%	Minimize Cost	33%	Manage capital costs.	5	0.5445	3	0.3267
		33%	Phase implementation to defer capital costs.	5	0.5445	3	0.3267
		34%	Manage life-cycle costs.	5	0.561	3	0.3366
33%	Operability and integration with existing facilities	33%	Match system with existing operational procedures and capabilities, experience of staff.	5	0.5445	3	0.3267
		34%	Reduce system complexity.	3	0.3366	3	0.3366
		33%	Reduce complexity of individual unit processes or system components.	3	0.3267	3	0.3267
17%	Public Acceptance	50%	Minimize handling hazardous substances and storage quantity of chemicals on site.	3	0.255	3	0.255
		50%	Provide collection and wastewater treatment that is affordable and maintains receiving water quality.	1	0.085	1	0.085
				Alternative Score:	3.4528		2.7875

In the previous example, Alternative 1 has a higher score than Alternative 2. Therefore, while Alternative 1 will be considered the preferred alternative, Alternative 2 should not necessarily be eliminated from consideration, since changes in costs or operability could change the preferred alternative and some of the scoring is subjective.

Summary

The method presented in this section represents a technique for comparing alternatives based on objective and measurable qualities. However, there may be intangible benefits to a system in selecting a lower ranked alternative. While this method can aid in decision making, all decisions should be based on the needs of the wastewater system as a whole, including those factors that cannot be numerically captured.

Section 10: Preparing an Engineering Report and Project Financing

Section 10 is a guide to financing a project, preparing a formal engineering report, and reassessing a water supply plan. A "To-Do" list form has been included below to assist with tracking items in this section that need to be investigated further or in listing areas where additional information is needed.

Table 10-1: Preparing an Engineering Report and Project Financing To-Do List

System Name			
	Task	Person Responsible	Target Completion Date
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Selecting a Consulting Engineer

After a system determines the need for a project, a consulting engineer must be selected. The Oklahoma FACT provides a sample Request for Proposal (RFP) for Engineering Services, which provides general information about the system, a description of the project, and instructions to engineers. The instructions describe specific items that proposals must contain as well as evaluation and selection criteria. This sample RFP can be modified as needed. To facilitate the review process, a specific response format is sometimes requested. An example format might require the following sections:

- Qualifications
- Approach
- Key Personnel

If there is no solicitation list for the type of work being proposed, the water system may want to contact neighboring utilities, funding agencies, etc. to obtain a list of engineers to send RFPs.

After RFPs are received, they should be reviewed against the evaluation criteria. The engineering companies are ranked based on their qualifications. Interviews may be held with the top ranking firms. The interview provides an opportunity to meet key personnel and discuss the project. After selecting the top engineering firm for this project, contract negotiations begin.

The Oklahoma FACT provides a sample Agreement for Engineering Services. This is the legal contract between the system (owner) and the engineering firm. It should contain provisions describing the following:

- Engineering services required
- Owner's responsibilities
- Time period for performance of services
- Method of payment
- Any special provisions not covered elsewhere in the document

Preparing an Engineering Report for Water Projects

The Oklahoma FACT provides procedures, guidelines, and checklists for engineering reports for water projects. Consulting engineers will use much of the information gathered in previous sections of this guide to develop the engineering report.

The consulting engineer will develop alternatives, including design criteria, environmental impacts, construction problems, and cost estimates. The advantages and disadvantages of each alternative will be considered and the recommended alternative will be explored further. The conceptual design of the project will be included in the engineering report and provide more detailed information. At this level of design, the following key tasks will have been completed:

- Code regulations and standard requirements
- Evaluation of alternatives
- Additional design information
- Conceptual process and instrumentation diagrams
- Process sizing and hydraulics
- Initial equipment sizing and number
- Civil, site and environmental conditions and constraints defined
- Conceptual facility layout and/or pipeline routing plans

This engineering report is not intended to finalize equipment selection nor will it result in final construction plans. Additional refinements will be made as the design progresses through the subsequent steps of preliminary design, design development, and final design in advance of bidding and construction.

Oklahoma Funding Agency Coordinating Team (FACT)

The Oklahoma Funding Agency Coordinating Team (FACT) is a group of federal and state organizations that offer financing to eligible Oklahoma public entities for water and wastewater projects. The purpose of the team is to facilitate the funding process through communication and streamlined application processes. Several documents have been created by FACT members to provide water and wastewater applicants a single, uniform method for requesting funding and regulatory approvals. These documents can be found on the OWRB website at www.owrb.ok.gov/fact.

FACT is hosted by the Oklahoma Rural Water Association (ORWA). FACT meets quarterly to discuss the status of Oklahoma community water supplies identified in DEQ's enforcement list. Invitations are extended to water systems from across the state that are contending with the most urgent problems and have the greatest financial need, with the purpose of providing help to them as quickly and effectively as possible.

With every public financing agency present at FACT, communication barriers are reduced and application processes are streamlined, resulting in rapid assistance. FACT provides a single uniform method for requesting funding and regulatory approvals, and it offers guides, checklists, and forms that are accepted by all FACT-participating agencies.

Potential Funding Sources

The Financial Assistance Division of the OWRB provides information on potential state and federal grant or loan financing for water projects at www.owrb.ok.gov/financing and maintains an up-to-date Loan and Grant Resource Guide at www.owrb.ok.gov/financing/resources.pdf to assist public water systems in identifying funding sources for water and wastewater projects. The guide contains a list of funding sources, the type of funding provided, and relevant contact information.

Reassessment of a Wastewater System Plan

Periodic reassessment of a wastewater system plan should be completed as conditions change, action items accomplished, or new challenges arise. Generally, plans should be updated every five years. Alternatively, it is a good idea to update plans at least five years prior to expected major improvements.

A wastewater system plan is a living document. It should be used for prioritizing projects during annual budgeting sessions. It should be used to determine timing of project planning, engineering, and construction. Make notes in the current version of the plan to document evolving conditions, inaccuracies, or items to investigate during the next planning cycle.

Appendix A: Calculations and Formulas

Water Quantity Conversion Factors

Desired Unit (columns); Initial Unit (rows)

	CFS	GPM	GPD	MGD	AFY	AFD
CFS	—	449	646,300	.646	724	1.98
GPM	2.22 e-3	—	1,440	.00144	1.61	4.42 e-3
GPD	1.55 e-6	6.94 e-4	—	1.0 e-6	1.12 e-3	3.07 e-6
MGD	1.55	695	1,000,000	—	1,120	3.07
AFY	1.38 e-3	.62	892.2	8.9 e-4	—	2.74 e-3
AFD	.504	226	325,851	.326	365	—

	Foot	Mile
Foot	—	5,280
Mile	1.89 e-4	—

CFS: cubic feet per second
GPM: gallons per minute
GPD: gallons per day
MGD: millions gallons per day
AFY: acre-feet per year
AFD: acre-feet per day
1 acre-foot: 325,851 gallons
1 mile: 5,280 feet
1 foot: 1.89 e-4 miles

EXAMPLE: Converting from MGD to CFS. To convert from an initial value of 140 MGD to CFS, multiply 140 times 1.55 to come up with the desired conversion, which would be 217 CFS (140 X 1.55 = 217).

Part 1: Calculating Average Daily Flow (ADF)

Calculate ADF using a minimum 1 year of data (3 years is preferable).

The amount of wastewater produced by Town X is recorded in the table below.

Days	Flow Rate - m^3 (m^3, ft^3, gallon) / day
1	1500
2	1500
3	1500
4	1500
5	1500
6	1500
7	1500
8	1500
9	1500
10	1500
11	1500
12	1500
13	1500
14	1500
15	1500
16	1500
17	1500
18	1500
19	1500
20	1500
21	1500
22	1500
23	1500
24	1500
25	1500
26	1500
27	1500
28	1500
29	1500
30	1500
...	...
365 (1 year)	1500

Calculate the total flow for the year.

$$Total\ Volume, V = \left(\frac{1500\ m^3}{day}\ X\ 1\ (Day\ 1)\right) + \left(\frac{1500\ m^3}{day}\ X\ 1\ (Day\ 2)\right) + \ldots$$

$$\left(\frac{1500\ m^3}{day}\ X\ 1\ (Day\ 365)\right) = 547500\ m^3$$

$$Average\ Daily\ Flow, ADF = \frac{Total\ Volume, V\ (m^3)}{Total\ days\ (day)}$$ [1]

$$= \frac{547500\ \text{m}^3}{365\ \text{day}} = \frac{1500\ \text{m}^3}{\text{day}}$$

[1] "Appendix D: Definitions and Calculations for DMRs", accessed March 4, 2015, http://www.nmenv.state.nm.us/swqb/FOT/WastewaterStudyManual/d.pdf

Part 2: Calculating 30-Day Moving Average Flow

Determine the 30-Day Moving Average Flow Rate on March 20, 2010. Add the flow rate for March 20, 2010, plus the previous 29 days.

Days	Date	Flow Rate - m^3 (m^3, ft^3, gallon) / day	Days	Date	Flow Rate - m^3 (m^3, ft^3, gallon) / day
1	02/20/2010	38.04	16	03/06/2010	45.00
2	02/21/2010	38.29	17	03/07/2010	42.75
3	02/22/2010	38.38	18	03/08/2010	37.50
4	02/23/2010	37.46	19	03/09/2010	38.83
5	02/24/2010	45.21	20	03/10/2010	30.92
6	02/25/2010	37.50	21	03/11/2010	38.38
7	02/26/2010	38.80	22	03/12/2010	38.46
8	02/27/2010	30.67	23	03/13/2010	31.04
9	02/28/2010	30.89	24	03/14/2010	30.90
10	02/29/2010	45.20	25	03/15/2010	29.96
11	03/01/2010	31.13	26	03/16/2010	45.00
12	03/02/2010	45.21	27	03/17/2010	38.40
13	03/03/2010	30.54	28	03/18/2010	38.33
14	03/04/2010	30.92	29	03/19/2010	38.04
15	03/05/2010	44.92	30	03/20/2010	38.30
Subtotals		563.16	Subtotals		561.81

$$Total\ Flow\ Rate\ , TFR\ = \frac{561.81\ m^3}{day} + \frac{563.16\ m^3}{day} = \frac{1124.97\ m^3}{day}$$

$$30 - \ Days\ Average\ Flow = \frac{Total\ Flow\ Rate, TFR}{Number\ of\ days} = \frac{\frac{1124.97\ m^3}{day}}{30} = 37.50\ \frac{m^3}{day}$$ [2]

To determine 30-day Moving Average Flow Rate on March 21, 2010, use data for February 21, 2010 through March 21, 2010.

[2] "The Houston-Galveston-Brazoria Area, Minor Source Rule", accessed March 4, 2015, http://c.ymcdn.com/sites/www.tahfm.org/resource/resmgr/imported/rg-440_1904129%20Final_1.pdf

Part 3: Calculating Average Day Maximum Month (ADMM)

Calculate the Average Day Maximum Month (ADMM) flow by determining the 95th percentile of the 30-Day Moving Average values.

i. Rank the Flow Rate in ascending order to determine 95th percentile.

Rank	Date	Flow Rate - m³ (m³, ft³, gallon) / day	Rank	Date	Flow Rate - m³ (m³, ft³, gallon) / day
16	03/20/2010	38.30	25	03/05/2010	44.92
14	03/19/2010	38.04	6	03/04/2010	30.92
17	03/18/2010	38.33	2	03/03/2010	30.54
20	03/17/2010	38.40	29	03/02/2010	45.21
27	03/16/2010	45.00	9	03/01/2010	31.13
1	03/15/2010	29.96	28	02/29/2010	45.20
5	03/14/2010	30.90	4	02/28/2010	30.89
8	03/13/2010	31.04	3	02/27/2010	30.67
21	03/12/2010	38.46	22	02/26/2010	38.80
19	03/11/2010	38.38	11	02/25/2010	37.50
7	03/10/2010	30.92	30	02/24/2010	45.21
23	03/09/2010	38.83	10	02/23/2010	37.46
12	03/08/2010	37.50	18	02/22/2010	38.38
24	03/07/2010	42.75	15	02/21/2010	38.29
26	03/06/2010	45.00	13	02/20/2010	38.04

Note that the Rank (Part 3) is different from Days (Part 2). The Rank order is based on the Flow Rate in an ascending order (smallest value to the largest value).

ii. Re-arrange the order in ascending format.

Rank	Flow Rate - m³ (m³, ft³, gallon) / day	Rank	Flow Rate - m³ (m³, ft³, gallon) / day	Rank	Flow Rate - m³ (m³, ft³, gallon) / day
1	29.96	11	37.50	21	38.46
2	30.54	12	37.50	22	38.80
3	30.67	13	38.04	23	38.83
4	30.89	14	38.04	24	42.75
5	30.90	15	38.29	25	44.92
6	30.92	16	38.30	26	45.00
7	30.92	17	38.33	27	45.00
8	31.04	18	38.38	28	45.20
9	31.13	19	38.38	29	45.21
10	37.46	20	38.40	30	45.21

To calculate the 95th percentile, compute "*i*", the position within the ordered data of the value of *percentile*.

$$i = \left(\frac{percentile}{100}\right)n \qquad \text{(See footnote 3.)}$$

$$n = Number\ of\ data$$

$$i = \left(\frac{95}{100}\right) X\ 30 = 28.50$$

If "*i*" is a decimal, round up and the data value at position "*i*" is the value at the given percentile.

If "*i*" is a whole number, take the data item in position "*i*" and average it with the data item in position "*i*" + 1.

In this example, since "*i*" is 28.50, round up to 29. At rank 29, the 95th percentile is 45.21 m³/day.

[3] "Finding Percentiles in a Data Set: Formula, Examples & Quiz", accessed March 4, 2015, http://education-portal.com/academy/lesson/finding-percentiles-in-a-data-set-formula-examples-quiz.html

Part 4: Calculating Minimum Day (MinD) Flow

Calculate the Minimum Day (MinD) Flow by determining the 5th percentile of the 30-Day Moving Average values.

Using the data from Part 3-II, the flow rate is ranked in ascending order.

Rank	Flow Rate - m^3 (m^3, ft^3, gallon) / day	Rank	Flow Rate - m^3 (m^3, ft^3, gallon) / day	Rank	Flow Rate - m^3 (m^3, ft^3, gallon) / day
1	29.96	11	37.50	21	38.46
2	30.54	12	37.50	22	38.80
3	30.67	13	38.04	23	38.83
4	30.89	14	38.04	24	42.75
5	30.90	15	38.29	25	44.92
6	30.92	16	38.30	26	45.00
7	30.92	17	38.33	27	45.00
8	31.04	18	38.38	28	45.20
9	31.13	19	38.38	29	45.21
10	37.46	20	38.40	30	45.21

To calculate the 5th percentile, using the same equation from Part 3-II.

$$i = \left(\frac{percentile}{100}\right) n$$

$$i = \left(\frac{5}{100}\right) X\ 30 = 1.50$$

In this example, since "i" is 1.50 and is a decimal, 1.50 is round up to 2. At rank 2, the 5th percentile is 30.54 m^3/day.

Part 5: Calculating Maximum Day (MD) Flow

Calculate the Maximum Day (MD) Flow by multiplying a factor of 1.2 to 2.0 to the Average Daily Flow (ADF) from Part 1.

$$Maximum\ Day\ (MD) Flow = 1.2\ to\ 2.0\ \ X\ Average\ Daily\ Flow^3$$

$$Maximum\ Day\ (MD) Flow = 1.5\ X\ 1500\ \frac{m^3}{day} = 2250\ \frac{m^3}{day}$$

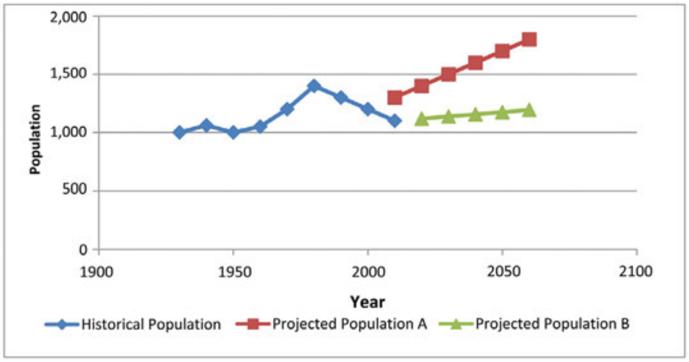
Note that a multiplier of 1.5 is used in this example. Any number between 1.2 and 2.0 is acceptable.

It is suggested that OCWP population projections be used for planning purposes unless other sources are available. If OCWP projections are not acceptable and no other population projections are available, then the average historical percent change in population (column G) can be used to estimate future population (column F) as illustrated.

Population Projections Table (Example)

A	B	C	D	E	F	G
Year	Historical Population	Percent Change	Projected Population A	Percent Change	Projected Population B	Percent Change
1930	1,000					
1940	1,060	6.00%				
1950	1,000	-5.66%				
1960	1,060	5.00%				
1970	1,200	14.29%				
1980	1,400	16.67%				
1990	1,300	-7.14%				
2000	1,200	-7.69%				
2010	1,100	-8.33%	1,300			
2020			1,400	7.69%	1,118	1.64%
2030			1,500	7.14%	1,136	1.64%
2040			1,600	6.67%	1,155	1.64%
2050			1,700	6.25%	1,174	1.64%
2060			1,800	5.88%	1,193	1.64%

Population Projections Charted



Column descriptions:

(B) Historical population available

(C) Calculated percent change in historical population

(D) Available population projections (e.g. from OCWP)

(E) Calculated percent change in available population projection (column D)

(F) Calculated population projection based on average historical percent change (column G). This method should be used when the OCWP projections are not acceptable and no other population projections are available.

(G) Assumed percent change used to calculate population projection (column F).

Population Projections (Working Table)

A	B	C	D	E	F	G
Year	Historical Population	Percent Change	Projected Population A	Percent Change	Projected Population B	Percent Change
1930						
1940						
1950						
1960						
1970						
1980						
1990						
2000						
2010						
2020						
2030						
2040						
2050						
2060						

Pipe Capacity

Flow		Velocity	Diameter (inches)	
(mgd)	(cfs)	(fps)	Calculated	Normalized
0	-	5	0	0
0.25	0	5	3.87	4
0.50	1	5	5.31	5
0.75	1	5	6.52	6
1.00	2	5	7.54	8
2.00	3	5	10.64	10
3.00	5	5	13.04	14
4.00	6	5	15.07	16
5.00	8	5	16.85	16
10.00	15	5	23.82	24
15.00	23	5	29.17	30
20.00	31	5	33.68	36
25.00	39	5	37.66	36
30.00	46	5	41.26	42
35.00	54	5	44.56	42
40.00	62	5	47.64	48
45.00	70	5	50.53	48
50.00	77	5	53.26	54
55.00	85	5	55.86	54
60.00	93	5	58.34	60
65.00	101	5	60.73	60
70.00	108	5	63.02	66
75.00	116	5	65.23	66
80.00	124	5	67.37	66
85.00	132	5	69.44	72
90.00	139	5	71.46	72
95.00	147	5	73.42	72
100.00	155	5	75.32	78
105.00	162	5	77.18	78
110.00	170	5	79.00	78
115.00	178	5	80.77	78
120.00	186	5	82.51	84
125.00	193	5	84.21	84
130.00	201	5	85.88	84
135.00	209	5	87.52	90
140.00	217	5	89.12	90
145.00	224	5	90.70	90
150.00	232	5	92.25	90
155.00	240	5	93.78	96
160.00	248	5	95.28	96
165.00	255	5	96.75	96
170.00	263	5	98.21	96
175.00	271	5	99.64	102
180.00	279	5	101.06	102
185.00	286	5	102.45	102
190.00	294	5	103.83	102
195.00	302	5	105.18	108
200.00	309	5	106.52	108
205.00	317	5	107.85	108
210.00	325	5	109.15	108
215.00	333	5	110.44	108
220.00	340	5	111.72	114
225.00	348	5	112.72	114
230.00	356	5	114.23	114
235.00	364	5	115.47	114
240.00	371	5	116.69	114
245.00	379	5	117.90	120
250.00	387	5	119.10	120
255.00	395	5	120.28	120
260.00	402	5	121.46	120
265.00	410	5	122.62	120
270.00	418	5	123.77	120
275.00	425	5	124.91	120
280.00	433	5	126.04	132
285.00	441	5	127.16	132
290.00	449	5	128.27	132

Appendix B: Resources

Oklahoma Water Resources Board (OWRB)
3800 N. Classen Boulevard,
Oklahoma City, OK 73118
Ph: 405-530-8800

The OWRB website is available at www.owrb.ok.gov:

- Wastewater Planning Guide—E-version and fillable forms are available at www.owrb.ok.gov/guides
- Oklahoma Comprehensive Water Plan—The *2012 OCWP Update* is available at www.owrb.ok.gov/ocwp. From this link, the *2012 OCWP Executive Report*, the OCWP Watershed Planning Region Reports, the OCWP Study Workgroup and Supplemental Reports, Technical Background Reports, and other OCWP information and reports are available.
- OWRB Water Use Laws and Procedures—appropriation and use of stream water (Ch. 20), the taking and use of groundwater (Ch. 30), information on financial assistance (Ch. 50), and other water-related rules.
- OWRB Financial Assistance Programs (FAP)—water and wastewater project financing information, Oklahoma Funding Agency Coordinating Team (FACT) documents, and the Loan and Grant Resource Guide.

Oklahoma Department of Environmental Quality (ODEQ)
707 N. Robinson
Oklahoma City, OK 73101-1677
Tel: 405-702-1000

The ODEQ website is available at www.deq.state.ok.us:

- ODEQ Rules and Regulations—Title 252, Chapter 626 outlines construction requirements and general design guidelines for all aspects of drinking water (from source development to distribution). Chapter 631 requires public water systems to meet EPA's standards. Chapter 633 outlines the DWSRF program. Chapter 710 provides information on water and wastewater staffing and operators.
- Water Quality Division Programs— Public water supply information, including the Safe Drinking Water Information System (SDWIS), NPDES, TMDL and MS4 Stormwater Programs, Operator Certification, Source Water Protection, and Water facility construction permit information, annual compliance reports, consumer confidence reports, water system security, forms, and some EPA guides.
- ODEQ's 303(d) List of Impaired Waters.

U.S. Environmental Protection Agency (EPA)
Region 6 Main Office
1445 Ross Avenue, Suite 1200
Dallas, TX 75202
Tel: 800-887-6063

The EPA website is available at water.epa.gov.

- EPA water page: www.epa.gov/gateway/science/water.html
- EPA water regulations main page: www.epa.gov/lawsregs/topics/water.html
- EPA Safe Drinking Water Act (SDWA) page: water.epa.gov/lawsregs/rulesregs/sdwa/index.cfm —includes links to the laws, guidance, and fact sheets.
- EPA National Primary and Secondary Drinking Water Regulations: water.epa.gov/drink/contaminants/index.cfm —provides a list of contaminants and their MCL.
- EPA Small Public Water System main page: water.epa.gov/type/drink/pws/smallsystems/ —designed to aid small systems with technical assistance and capacity development.
- EPA Regulations 101 page: water.epa.gov/type/drink/pws/smallsystems/regulations_101.cfm —designed to aid small systems in understanding key regulations.
- EPA LT2ESWTR Toolbox Guidance Manual: www.epa.gov/safewater/disinfection/lt2/pdfs/guide_lt2_toolboxguidancemanual.pdf.
- EPA National Service Center for Environmental Publications (NSCEP): www.epa.gov/nscep/ —provides free EPA print and digital documents using the search feature. One document reviewed in preparation of this guide was Manual of Small Public Water Supply Systems.
- EPA Guidance, Guides and Manuals home page: water.epa.gov/infrastructure/sustain/Guides.cfm —provides links to publications on water rates including several that specifically target water rates for small systems.

- EPA LT2ESWTR Toolbox Guidance Manual document: www.epa.gov/safewater/disinfection/lt2/pdfs/guide_lt2_toolboxguidancemanual.pdf —provides technical information on applying the "Toolbox" of Cryptosporidium treatment and management strategies that are part of the LT2ESWTR. Information ranges from watershed management programs to specific treatment technologies.
- EPA Alternative Disinfectants and Oxidants Guidance Manual: www.epa.gov/safewater/mdbp/alternative_disinfectants_guidance.pdf —offers technical information on disinfectants and oxidants not as widely used as chlorine.
- EPA Sustainable Infrastructure Tool Kit page: water.epa.gov/infrastructure/sustain/toolkit.cfm —contains several links to publications on management, full cost pricing, water efficiency, and approaches. Also contains links to several of the Simple Tools for Effective Performance (STEP) Guide Series. The Setting Small Drinking Water System Rates for a Sustainable Future, Small Systems Guide to Safe Drinking Water Act, A Small Systems Guide to the Total Coliform Rule, Strategic Planning: A Handbook for Small Systems, and Microbial and Disinfection Byproducts Rules Simultaneous Compliance Guidance Manual are some examples of references available.
- EPA NPDES page: http://cfpub.epa.gov/npdes/ .This page includes links to the laws, guidance, fact sheets, etc. related to the NPDES.
- EPA MS4 Stormwater Program can be found at: www.cfpub1.epa.gov/npdes/stormwater/munic.cfm?program_id=6
- The EPA provides the following website specifically to assist small communities with wastewater issues at: http://water.epa.gov/type/watersheds/wastewater/smcomm_index.cfm

U.S. Geological Survey (USGS)
USGS National Center
12201 Sunrise Valley Drive
Reston, VA 20192
Tel: 888-275-8747

The USGS is available at www.usgs.gov.

- USGS Water Resources page: www.usgs.gov/water.
- USGS Maps, Imagery, and Publications page: www.usgs.gov/pubprod/ —printed maps can be purchased or digital topographic maps can be downloaded to use as a base map for planning activities.

U.S. Census Bureau
Kansas City Regional Office
1211 N. 8th Street
Kansas City, KS 66101-2129
Tel: 913-551-6728

The U.S. Census Bureau website, www.census.gov, provides information on historical population and household economic information.

Oklahoma Department of Commerce
Oklahoma City Location
900 North Stiles Ave.
Oklahoma City, OK 73104
Tel: 405-815-6552

Tulsa Location
700 N. Greenwood Ave
Suite 1400
Tulsa, OK 74106
Tel: 918-594-8116

The Oklahoma Department of Commerce website, www.okcommerce.gov/, provides historical measurements, between census estimates, and population projections.

Resources from Other States

While other states' specific rules and regulations may be different from Oklahoma's, the technical information may be useful and provide a slightly different perspective during the planning process.

- Missouri Department of Transportation, Value Engineering Program page: www.modot.mo.gov/ValueEngineering/ —offers information on how to conduct a systematic process of review and analysis of a project.
- Washington State Department of Health, Division of Environmental Health, Office of Drinking Water page: www.doh.wa.gov/ehp/dw/default.htm —offers several publications on planning and water use efficiency including Small Water System Management Program, Water System Plan, and Water System Design.

Appendix C: Energy and Water Efficiency

The following considerations are organized into 5 important topics for every city or town to incorporate into treatment facility design. Though all of them may not be applicable to your facility, many are likely to give you new ideas or another perspective for your project.

Planning Methodology

- Project is part of a comprehensive cross-sector planning effort that includes cooperative efforts with other public and/or private sector organizations
- Project alternatives analysis explores the most cost-effective solution at a regional level
- Project incorporates one or several of the following planning methodologies: Comprehensive Land Use Plan, Fix-it First Methodology, Asset Management Plan, Watershed Management Plan, Nutrient Management Plan, and/or Open Space Preservation Plan
- Rate structures will support ongoing operations and maintenance for this project

Project Planning and Design

- Percentage of proposed service area that already contains residential and/or commericial development (closest estimate)
- Treatment alternatives were evaluated with an emphasis on methods that minimize the need for chemical treatment and energy consumption
- Planning process considers appropriate capacity needs to reduce the risk of overbuilding
- Planning process includes a present worth analysis prior to selecting an alternative
- Planning process evaluates equipment layouts to minimize energy intensive operations
- Facility will be designed to reduce the amount of material going to landfills by providing on-site compost bins, recycling bins, and opportunities for biosolids reuse applications
- Decentralized system allows for multiple (10+) connections in a concentrated area
- Service area includes a prioritized development/redevelopment area
- Collection system is designed to serve a variety of customers (industrial/commerical/residential)
- Project does not “leap frog” services outside of the current service area
- Service area contains established infrastructure (transportation, water, emergency services)
- Project follows development concurrency ordinance (ie., customers must exist before service is expanded)
- Project will be constructed on a brownfield or grayfield site
- Project will reuse or rehabilitate existing structures
- Project will reuse, rehabilitate or protect historic structures
- Site selection criteria considers the technical, financial and environmental feasibility of the potential sites
- Site directs runoff to natural drainage areas and encourages infiltration/recharge of waterbodies and aquifers
- Site has features that mimic natural hydrology features
- Project will minimize the requirements for pervious surfaces, landscape disturbance, and intrusive construction
- Project plans specify construction methods that minimize waste, reduce pollution and maximize efficiency
- Design lists the native, environmentally friendly post-consumer recycled and/or reclaimed materials that could be used within the project

Energy Efficiency

- Facility has performed a professional energy audit
- Facility has developed an Energy Conservation Plan
- Equipment is properly maintained, operating as close to nameplate voltage as practicable, and the connection on switches on all major power-driven equipment is checked at least annually
- Facility uses variable frequency drives to improve pump efficiency
- Pump operations are automated
- Facility uses variable and multiple staged single-speed blowers
- Facility uses digester gas to fuel engine-driven blowers
- Facility uses two-speed mechanical aerators where applicable
- Facility implements continuous DO monitoring
- Automated aeration control systems are installed
- Facility uses natural light to the greatest extent possible
- Facility uses programmable thermostats
- Facility has assessed building insulation R-values and sealed leaks

Renewable Energy

- Facility utilizes solar power
- Facility utilizes wind power
- Facility utilizes hydroelectric power
- Facility uses CHP or cogeneration technologies to produce power for operations
- Facility is capable of biofuels production

Water Efficiency

- Facility has developed a Water Conservation Program
- Facility has taken measures to implement pressure management controls throughout collection system
- Facility utilizes leak detection equipment and protocols to address leaks, collapses, and inflow/infiltration issues
- Facility has developed and employed mechanisms to recycled gray water
- Facility produces Class II treated effluent used for agricultural/industrial/fire protection/groundwater recharge, etc
- Facility produces Class I treated effluent used for landscape irrigation, fire protection, or groundwater recharge

Efficient Use and Protection of Resources

- System design allows for water reuse treatment and distribution
- Project uses stormwater best management practices, exceeding permit requirements
- Local building and plumbing codes allow for residential water reuse (irrigation, toilet flushing, etc.)
- System planning involved consultation with potential water reuse and land application customers
- Project planning involved consultation with potential water reuse customers
- Project includes biosolids reuse, biosolids co-composting or biodegeneration
- Project adds or preserves native trees, vegetation, soils and natural drainage patterns
- If the project utilizes water reuse, potential reuse customers have been identified
- Project will divert waste from landfill disposal
- Project avoids development on virgin, agricultural or forest lands
- Project design protects or creates onsite wildlife habitat
- Project reuses or recycles existing onsite materials
- Construction practices implement activities to reclaim onsite materials not suitable for use in the project
- Equipment and vehicle access are planned to minimize soil compaction and disturbance in designated areas
- Project provides erosion control and seeding with native plant species to protect slopes
- Construction practices provide protected on-site storage for excavated rock, soil and vegetation
- Effluent outfall sites are calibrated to avoid streambed erosion
- Project will result in septic systems decommissioned and/or connected to a central sewer

Creating a Livable Community

- Community uses of discharging waterbodies (ie., recreation/drinking water/agriculture) were considered when deciding what level of treatment the facility should attain
- Project responds to community needs identified in a comprehensive planning document
- Project design includes traffic calming devices (bump-outs, etc.)
- Project design provides or maintains streetside sidewalk networks
- Project utilizes technology that minimizes disruptions to people and the environment in the surrounding area
- Project utilizes local businesses to conduct planning and/or construction
- Project utilizes materials from local sources
- Project utilizes small or disadvantaged businesses
- Project provides direct employment after construction is completed
- Project will result in an increase to the tax base

Encouraging Community Involvement

- Project involves volunteers from the community for portions of the work
- Residents in areas near the project area will be engaged in decision-making and kept informed of the project
- Stakeholder concerns are documented and addressed formally
- Project increases opportunities for community training and education
- Project utilizes community in-kind contributions
- Project will include “field-trip friendly” elements used to educate the local community

Appendix D: Online Tools and Resources for Energy and Water Efficiency

Excerpt from the EPA January 6, 2015, Memorandum Interpretive Guidance for Certain Amendments in the Water Resources Reform and Development Act to Titles I, II, V, and the Federal Water Pollution Control Act, Appendix 1.

Energy Conservation

One example of how CWSRFs can evaluate the energy portion of the certification is to use information developed by the recipient through energy assessments and audits. Energy assessments help utilities identify the amount of energy being used in various aspects of its operations. Energy audits, in turn, allow utilities to identify and prioritize projects that will result in operational and capital improvements to their infrastructure and operations, cost savings, and other climate-related benefits like reductions in greenhouse gas emissions and the use of renewable energy. EPA encourages CWSRFs to promote the use of these proven and objective methods by CWSRF borrowers.

Energy Use Assessments

A number of tools are available to help utilities conduct energy assessments, including:

EPA's Energy Use Assessment Tool—this is a free Excel-based tool that can be downloaded and is specifically designed for small and medium sized wastewater and water utilities. It enables utilities to analyze their current energy bills and analyze energy consumption for major pieces of equipment. It also allows the utility to develop a printable summary report outlining current energy consumption and costs, generate graphs depicting energy use over time, and highlight areas of potential improvement in energy efficiency. It is available at http://water.epa.gov/infrastructure/sustain/energy_use.cfm.

NYSERDA Energy Benchmarking Tool—The New York State Energy Research and Development Agency (NYSERDA) has developed a tool to help wastewater utilities assess and benchmark their current energy usage, along with a number of other useful self-audit checklists, available at http://www.nyserda.ny.gov/-/media/Files/EERP/Commercial/Sector/Municipal-Water-Wastewater-Facilities/benchmark-tool-water.zip.

Energy Audits

Energy audits can be broadly characterized according to the following three levels:

- Level 1 (Walk Through Audits)
  - ◊ Generally last several hours at the facility
  - ◊ Usually result in suggestions for low cost improvements in areas like HVAC or lighting
- Level 2 (Energy Survey and Analysis Audits)
  - ◊ One or two days in duration, plus additional time to review energy bills, etc.
  - ◊ In addition to HVAC/lighting recommendations, usually result in recommendations for equipment upgrades in existing processes (e.g., variable frequency drives, more efficient motors, etc.)
- Level 3 (Process Energy Audit)
  - ◊ One or more days at the facility, time to analyze energy bills and pump curves, and time for additional data gathering
  - ◊ Audit covers energy use in both existing and alternative processes, potential design modifications, and optimization of processes and equipment
  - ◊ Audit suggestions covered detailed operational and process suggestions for both short-term and long-term payback periods as well as capital intensive projects that may require outside funding
  - ◊ Most likely to result in significant savings

EPA hosted a webinar in August 2014 describing a number of energy assessment and audit tools available to states and potential recipients of CWSRF funding. The webinar slides are available at http://water.epa.gov/infrastructure/sustain/upload/NRWA-Energy-Audits-for-Small-Utilities-8-4-14.pdf.

Tools available to help wastewater utilities obtain or conduct energy audits include:

- EPA's Energy Use Assessment Tool (http://water.epa.gov/infrastructure/sustain/energy_use.cfm)
- EPRI Energy Audit Manual for Water and Wastewater Facilities (http://www.cee1.org/ind/mot-sys/ww/epri-audit.pdf)
- Maine DEP Sample Audit RFP Language—designed to help utilities obtain assistance for Level 3 Audits (http://www.maine.gov/dep/water/grants/SRF/2014/model_energy_audit_rfp.pdf)
- The Center for Energy Efficiency (CEE) self-audit checklists (www.cee1.org/ind/mot-sys/ww/epri-audit.pdf)

Both energy assessments and audits are eligible for funding under the CWSRF, and a number of organizations can help utilities with these activities, including:

- State Energy Offices (www.naseo.org/members-states)
- Electric utilities serving wastewater utilities (www.dsireusa.org/)
- Technical assistance providers like the National Rural Water Association, RCAP, and others
- Department of Energy Industrial Assessment Centers (energy.gov/eere/amo/industrial-assessment-centers-iacs)

Water Conservation

Water conservation includes efficiency and reuse efforts to not only conserve our raw water supply, but to also reduce flow to wastewater treatment plants. Therefore, one way CWSRF borrowers can fulfill the water conservation requirement is to consider alternative or complementary projects that result in reduced wastewater flows and therefore reduce a treatment works' capacity needs. There are a number of water conservation projects borrowers can consider, including:

- Water Reuse—recycling and water reuse projects that replace potable sources with non-potable sources
    - Gray water, condensate, and wastewater effluent reuse systems
    - Extra treatment costs and distribution pipes associated with water reuse
- Water Efficient Devices—installing or retrofitting water efficient devices, such as plumbing fixtures and appliances
    - Shower heads, faucets, toilets, urinals, etc.
    - Education and incentive programs to conserve water such as rebates
- Water Meters—installing any type of water meter in a previously unmetered area, or replacing existing broken/malfunctioning water meters or upgrading them if rate structure is based on metered use
- Water Audits and Conservation Plans—performing audits of entire utilities or individual users (e.g., large corporations) to assess the amount of water being consumed, the need for retrofits, etc.

Utilities can also fulfill this requirement by considering water conservation projects that are not CWSRF eligible.

Water Efficiency Tools

Tools are readily available to help utilities determine how much water is being conserved, including:

- EPA's WaterSense Program—Tools and resources to promote water efficiency are available at www.epa.gov/watersense/. States, local governments, and utilities can partner with WaterSense to get access to additional tools and resources to help them design and implement water efficiency and conservation programs. Partnership is free.
- EPA's Water Conservation Plan Guidelines—Helpful recommendations to utilities for creating and implementing a Water Conservation Plan, depending on the size of the population served by the utility, available at epa.gov/watersense/pubs/guide.html.
- AWWA Water Audit Software—Free software specifically designed to help utilities perform water audits, to help quantify and track water losses, and determine areas for improved efficiency. Available at www.awwa.org/resources-tools/waterknowledge/water-loss-control.aspx.
- AWE Water Conservation Tracking Tool—A tool to evaluate water savings, costs, and benefits of conservation programs for a specific water utility, available to AWE members at www.allianceforwaterefficiency.org/tracking-tool.aspx.
- Many states have guidelines and example plans to help utilities develop water conservation plans. For example:
    - TWDB Water Conservation Plan—Texas Water Development Board has developed a set of guidelines, tutorials, and example plans to help utilities create a water conservation plan that can be adopted and utilized by different entities. Available at www.twdb.texas.gov/conservation/municipal/plans/.

Appendix E: Examples of Short-Lived Assets

Estimated Repair, Rehab, Replacement by Item within 20 Years of Installation	
Drinking Water Utilities	**Wastewater Utilities**
Source Related	
Pumps Controls Pump Motors Telemetry Intake/Well screens	Not Applicable
Treatment Related	
Chemical feed pumps Altitude Valves Valve Actuators Field & Process Instrumentation Equipment Granular filter media Air compressors & control units Pumps Pump Motors Pump Controls Water level Sensors Pressure Transducers Sludge Collection & Dewatering UV lamps Membranes Back-up power generators Chemical Leak Detection Equipment Flow meters SCADA Systems	Pump Pump Controls Pump Motors Chemical feed pumps Membrane Filters Fibers Field & Process Instrumentation Equipment UV lamps Centrifuges Aeration blowers Aeration diffusers and nozzles Trickling filters, RBCs, etc. Belt presses & driers Sludge Collecting and Dewatering Equipment Level Sensors Pressure Transducers Pump Controls Back-up power generator Chemical Leak Detection Equipment Flow meters SCADA Systems
Distribution System Related	Collection System Related
Residential and Small Commercial Meters Meter boxes Hydrants & Blow offs Pressure reducing valves Cross connection control devices Altitude valves Alarms & Telemetry Vaults, lids, and access hatches Security devices and fencing	Pump Pump Controls Pump Motors Trash racks/bar screens Sewer line redding equipment Air compressors Vaults, lids, and access hatches Security devices and fencing

Appendix F: Green Project Reserve Checklist

	GREEN INFRASTRUCTURE	ENERGY EFFICIENCY	WATER EFFICIENCY	ENVIRONMENTALLY INNOVATIVE
Business Case Required	Not applicable	• POTW projects or unit process projects that achieve less than a 20% energy efficiency improvement • (Non-categorical) projects implementing recommendations from an energy audit • Projects that cost effectively eliminate pumps or pumping stations • Infiltration/inflow correction projects that save energy • I/I correction projects where excessive groundwater infiltration is requiring unnecessary treatment processes • Replacing pre-Energy Policy Act of 1992 motors with NEMA premium efficiency motors • Upgrade of POTW lighting to energy efficient sources · Metal halide pulse start technologies · Compact fluorescent · Light emitting diode (LED) • SCADA systems • Variable Frequency Drives	• Water meter replacement with traditional water meters • Projects that result from a water audit • Storage tank replacement/ rehabilitation • New water efficient landscape irrigation	• Constructed wetlands projects used for municipal wastewater treatment, polishing, and/or effluent disposal • Projects or project components resulting from total/integrated water resource management planning • Projects that facilitate POTW adaptation to climate change identified by a carbon footprint analysis or climate adaptation study • POTW upgrades or retrofits that remove phosphorus for biofuel production • Projects that significantly reduce or eliminate the use of chemicals in wastewater treatment • Treatment techologies or approaches that significantly reduce the volume of residuals or lower chemical volume in residuals • Educational activities and demonstration projects for water or energy efficiency • Projects that achieve the goals of utility asset management plans • Sub-surface land application of effluent and other means for ground water recharge such as spray irrigation and overland flow
Categorically Eligible	• Green streets · Permeable pavement · Bioretention · Trees · Green roofs · Constructed wetlands · Other practices that mimic natural hydrology to prevent wet weather flows · Equipment to maintain green streets (vactor trucks, etc.) • Street tree/urban forestry · Expansion of tree boxes • Stormwater harvesting/reuse · Cisterns · Distribution pipes • Downspout disconnection • Riparian buffers · Floodplains · Wetlands · Bioengineered streambank · Stream daylighting • Sustainable landscaping and site design	• Renewable energy source for a POTW · Wind · Solar · Geothermal · Micro-hydroelectric · Biogas combined heat and power (CHP) • Projects that achieve 20% reduction in energy consumption • Collection system I/I detection equipment • POTW energy management planning (reasonably expected to result in a capital project) · Energy assessments · Energy audits · Optimization studies · Sub-metering individual processes	• Install or retrofit water efficient devices · Plumbing fixtures · Appliances • Water conservation incentive programs · Rebates • Install water meters in previously unmetered areas (if rate structure is based on metered use) · Backflow prevention devices (installed in conjunction with meter replacement) • Replace broken water meters or upgrade existing meters with: · Automatic meter reading systems · Advanced metering infrastructure · Smart meters · Meters with built-in leak detection · Backflow prevention devices (installed in conjunction with meter replacement) • Retrofit existing meters to add AMR capability or leak detection equipment • Water audit and water conservation plans • Recycling and water reuse projects that replace potable sources with non-potable · Gray water/condensate/ wastewater effluent reuse systems · Extra treatment costs and distribution pipes associated with water reuse • Retrofit or replace landscape irrigation systems with more efficient systems · Moisture and rain sensing controllers	• Total/integrated water resources management planning likely to result in a capital project • Utility Sustainability Plan • Greenhouse gas (GHG) inventory or mitigation plan • POTW planning activities to adapt to long-term effects of climate change and/or extreme weather • Construction of LEED certified buildings or renovation of an existing building on POTW facilities • Decentralized wastewater treatment solutions · Individual onsite systems · Cluster systems
CWSRF GPR Ineligible	• Stormwater controls with impervious or semi-impervious liners with no evapotranspiration or harvesting functions • Stormwater ponds with extended detention and/or filtration · Dirt-lined detention basins • In-line or end-of-pipe treatment systems that only filter or detain stormwater • Underground stormwater control · Swirl concentrators · Hydrodynamic separators · Baffle systems for grit · Trash/floatables removal · Oil and grease · Inflatable booms · Dams for in-line underground storage and flow diversion • Stormwater conveyance systems that are not soil/vegetation-based · Pipes and concrete channels • Hardening, channelizing or straightening streams and/or stream banks • Street sweepers, sewer cleaners and vactor trucks (unless they support green infrastructure projects)	• Privately owned renewable energy generation • The portion of a publicly owned renewable energy facility that does not provide power to a POTW • Simply replacing a piece of equipment that is at the end of its useful life with something of average efficiency • Facultative lagoons • Hydroelectric facilities	• Replacing drinking water distribution lines • Leak detection equipment for drinking water distribution systems (except reuse)	• Air scrubbers to prevent nonpoint source deposition • Facultative lagoons • Surface discharging decentralized wastewater systems • Higher seawalls to protect POTWs from rising sea levels • Reflective roofs at POTW

Acronyms

ADF	average daily flow
AADF	Annual Average Day Flow
ADAL	Average Day Annual Load
ADMM	Average day maximum month
AQD	Air Quality Division
BOD5	5-day Biochemical Oxygen Demand
CAA	Clean Air Act
CBOD5	5-day Carbonaceous Oxygen Demand
cip	Clean In Place
CIP	Capital Improvements Projects
CMMS	Computerized Maintenance Management Software
CWA	Clean Water Act
CWSRF	Clean Water State Revolving Fund
DAF	Dissolved Air Flotation
DMR	Discharge Monitoring Report
DO	dissolved oxygen
DWF	dry weather flow
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ER	Environmental Report
FACT	Funding Agency Coordinating Team
ft	feet
fps	feet per second
gal	gallon
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GWI	groundwater infiltration
H	Height
HAP	hazardous air pollutant
HRT	Hydraulic Retention Time
hp	horsepower
I/I	inflow and infiltration
in	inch
L	Length
LP	Low Pressure
LPHO	Low Pressure high Output
MD	maximum day
Min	Minutes
MinD	minimum day
mg	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
MLSS	mixed liquor suspended solids
MMF	Maximum Month Flow
MP	Medium Pressure
MS4	Municipal Separate Storm Sewer System
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
O&M	Operation and Maintenance
OCWP	Oklahoma Comprehensive Water Plan
ODEQ	Oklahoma Department of Environmental Quality
ODOC	Oklahoma Department of Commerce
OML	Oklahoma Municipal League
OPDES	Oklahoma Pollutant discharge Elimination System
OWQS	Oklahoma Water Quality Standards
OWRB	Oklahoma Water Resources Board
PE	Population Equivalent
PH	Peak Hour
PHF	Peak Hour Flow
POR	period of record
ppd	pounds per day
POTW	Publicly Owned Treatment Works
PTE	potential-to-emit
RAS	return activated sludge
REAP	Rural Economic Action Plan
RFP	Request for Proposal
rpm	revolutions per minute
SAR	Sodium Adsorption Ratio
SBR	sequence batch reactor
scfm	standard cubic feet per minute
SSO	sanitary sewer overflow
SU	Standard Units
SWPPP	Storm Water Pollution Prevention Plan
TDH	Total Dynamic Head
TKN	total Kjeldahl nitrogen
TMDL	Total Maximum Daily Load
TMP	Trans Membrane Pressure
TP	total phosphorus
TPY	tons per year
TSS	Total Suspended Solids
USGS	U.S. Geological Survey
UVT	Ultraviolet Treatment
V	Voltage
W	Width
WAS	waste activated sludge
WLA	wasteload allocation
WQA	Water Quality Act of 1987
WWF	wet weather flow
WWTP	Wastewater Treatment Plant

Glossary

Average daily flow: (1) the total quantity of liquid tributary to a point divided by the number of days of flow measurement; (2) in water and wastewater applications, the total flow past a point over a period of time divided by the number of days in that period

Average Day Annual Load: the average daily loading (certain solid facilities such as lagoons and drying beds) for an annual period

Average Day Maximum Month: the average daily flow that occurs during the maximum flow month of the year; primarily used to size secondary treatments; also calculated as the maximum 30-day average for the year

Air Quality Division: the division within the Oklahoma Department of Environmental Quality (ODEQ) which monitors air quality across the state of Oklahoma, and implements the state and federal Clean Air Acts

Biochemical Oxygen Demand 5-day: the total amount of oxygen used by microorganisms decomposing organic matter increases each day until the ultimate BOD is reached, usually in 50 to 70 days. BOD usually refers to the five-day BOD or BOD_5

Clean Air Act: The original Clean Air Act was passed in 1963; but our national air pollution control program is actually based on the 1970 version of the law. The 1990 Clean Air Act Amendments are the most far-reaching revisions of the 1970 law. EPA often refers to the 1990 amendments as the 1990 Clean Air Act

Carbonaceous Oxygen Demand 5-day: the amount of dissolved oxygen needed by aerobic organisms in the wastewater to break down organic material present over 5 days

Clean In Place: a method of cleaning the interior surfaces of pipes, vessels, process equipment, filters and associated fittings, without disassembly

Capital Improvements Projects: Projects which are a part of a Capital Improvement Plan

Capital Improvements Plan: a detailed plan that identifies requirements for the repair, replacement, and rehabilitation of facility infrastructure over an extended period, often 20 years or more. A utility usually updates or prepares this plan annually. For water systems, the plan is often a part of a master plan that combines water demand projections with supply alternatives and facility requirements. For wastewater systems, the plan consists of programs and projects to upgrade and rehabilitate wastewater collection and treatment systems and increase their capacity to allow for future growth

Computerized Maintenance Management Software: a software package that maintains a computer database of information about an organization's maintenance operations, i.e. CMMIS – computerized maintenance management information system. This information is intended to help maintenance workers do their jobs more effectively (for example, determining which machines require maintenance and which storerooms contain the spare parts they need) and to help management make informed decisions (for example, calculating the cost of machine breakdown repair versus preventive maintenance for each machine, possibly leading to better allocation of resources). CMMS data may also be used to verify regulatory compliance

Clean Water Act: an act passed by the US Congress to control water pollution. The Federal Water Pollution Control Act passed in 1972 (Public Law [PL] 92-500). It was amended in 1977 (the Clean Water Act, PL 95-217) and again in 1987 (the Water Quality Act, PL 100-4)

Clean Water State Revolving Fund: a fund or program used to provide loans to eligible entities for qualified projects in accordance with Federal law, rules and guidelines administered by the EPA and state. Two separate SRF programs are administered in Oklahoma: the Clean Water SRF is intended to control water pollution and is administered by OWRB; the Drinking Water SRF was created to provide safe drinking water and is administered jointly by the OWRB and ODEQ

Dissolved Air Flotation: a separation process in which air bubbles emerging from a supersaturated solution become attached to suspended solids in the liquid undergoing treatment and float them up to the surface

Discharge Monitoring Report: the form used (including any subsequent additions, revisions, or modifications) to report self-monitoring results by NPDES permittees. DMRs must be used by approved states as well as by EPA

Dissolved oxygen: a measure of the amount of oxygen dissolved in water

Dry weather flow: (1) the flow of wastewater in a combined sewer during dry weather consisting mainly of wastewater, with no stormwater included; (2) the flow of water in a stream during dry weather, usually contributed entirely by groundwater

Environmental Assessment: an environmental analysis prepared pursuant to the National Environmental Policy Act to determine whether a Federal action should significantly affect the environment and thus require a more detailed environmental impact statement

Environmental Impact Statement: a document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals significantly affecting the environment. A tool for decision making, it describes the positive and negative effects of the undertaking and cites alternative actions

Funding Agency Coordinating Team: is comprised of the following state and federal water and wastewater project funding agencies: Oklahoma Department of Environmental

Quality, Oklahoma Department of Commerce, Oklahoma Water Resources Board, Indian Health Service, U.S. Department of Agriculture-Rural Development, Oklahoma Association of Regional Councils, Community Resource Group, EPA, and the Cherokee Nation;

FACT provides a single uniform method for requesting funding and regulatory approvals. It offers guides, checklists, and forms that are accepted by all FACT-participating agencies

Gallons per capita per day: the rate of water, wastewater, or other flow measured in U.S. gallons (liters) per capita of served population per day

Groundwater infiltration: The seepage of groundwater into a sewer system, including service connections. Seepage frequently occurs through defective or cracked pipes, pipe joints and connections, interceptor access risers and covers, or manhole walls

Hazardous air pollutant: Defined under the Clean Air Act as pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. Currently, the Clean Air Act regulates 188 chemicals and chemical categories as HAPs

Hydraulic Retention Time: the length of time water, sludge, or solids are retained or held in a clarifier or sedimentation tank

Inflow and infiltration: water that enters the sewer system through indirect and direct means. Infiltration is extraneous water that enters the sewer system through leaking joints, cracks and breaks, or porous walls. Inflow is stormwater that enters the sewer system from storm drain connections (catch basins), roof leaders, foundation and basement drains, or through manhole covers

Low Pressure: a type of UV lamp which is efficient in converting electrical energy to germicidal UV light, but total output is weaker than other UV lamps using higher pressure in the lamp

Low Pressure High Output: a type of UV lamp which produces high intensity UV light at a lower pressure in the lamp

Maximum day: the maximum flow during one 24-hour period during the year; used primarily to size pump stations and some units of wastewater treatment plant processes that rely on short-term hydraulic detention times

Minimum day: the average lowest flow in a 24-hour period; used to size turndown capacity of pumps and flow meters

Million gallons: a unit of measurement used in wastewater treatment plant design and collection system capacities or performances. One million gallons of water is approximately equivalent to these units of measurement:

- 13,690 cubic feet
- 3.07 acre-feet
- 8,340,000 pounds
- 4,170 tons
- 3,785 cubic meters

Million gallons per day: a measure of flow equal to 1.547 cu ft/sec, 681 gpm, or 3 785 m3/d

Milligrams per liter: a measure of concentration equal to and replacing ppm in the case of dilute concentrations

Mixed liquor suspended solids: the amount (mg/L) of suspended solids in the mixed liquor of an aeration tank; the concentration of suspended solids in activated-sludge mixed liquor, expressed in milligrams per liter (mg/L). Commonly used in connection with activated-sludge aeration units

Maximum Month Flow: the average daily flow during the maximum calendar month. This flow factor is typically used to design unit WWTP processes and used as a critical flow in determining effluent limits for toxic substances on the basis of chronic toxicity for a surface water discharge

Medium Pressure: an acronym describing a type of UV lamp with higher intensity UV light output than LPHO and requiring less lamps

Municipal Separate Storm Sewer System: a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): 1.) Owned and operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act (CWA) that discharges to waters of the United States; 2.) Designed or used for collecting or conveying stormwater; 3.) Which is not a combined sewer; and 4.) Which is not part of a publicly owned treatment works (POTW)

National Environmental Policy Act : NEPA [42 U.S.C. 4321 et seq.] was signed into law on January 1, 1970. The Act establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within the federal agencies. The Act also establishes the Council on Environmental Quality (CEQ)

National Pollutant Discharge Elimination System: the regulatory agency document issued by either a federal or state agency that is designed to control all discharges of potential pollutants from point sources and stormwater runoff into US waterways. NPDES permits regulate discharges into US waterways from all point sources of pollution, including industries, municipal wastewater treatment plants, sanitary landfills, large animal feedlots, and return irrigation flows

Operation and Maintenance: actions taken after construction to ensure that facilities constructed to treat waste water will be properly operated and maintained to achieve normative efficiency levels and prescribed effluent limitations in an optimum manner

Oklahoma Comprehensive Water Plan: the objective of the Oklahoma Comprehensive Water Plan is to ensure a dependable water supply for all Oklahomans through integrated and coordinated water resources planning by providing the information necessary for water providers, policy-makers, and end users to make informed decisions concerning the use and management of Oklahoma's water resources

Oklahoma Pollutant Discharge Elimination System: The Department of Environmental Quality regulates facilities that discharge any pollutant into waters of the state. Permits must be acquired before the discharge of any pollutants into state waters. Parameters of the permit for stormwater are outlined by the Environmental Quality Board. The rules may require permits on a case-by-case basis, exempt categories of discharges, or provide a schedule for obtaining a permit. The Department of Environmental Quality has the authority to determine whether a facility, activity or entity regulated by the Department is required to obtain a stormwater permit

Oklahoma Water Quality Standards: rules promulgated by the OWRB in Oklahoma Administrative Code Title 785, Chapter 45, which establish classifications of uses of waters of the state, criteria to maintain and protect such classifications, and other standards or policies pertaining to the quality of such waters

Population Equivalent: a flow of 100 gallons (378 liters) per day is the hydraulic or flow equivalent to the contribution or flow from one person. Population equivalent = 100 GPCD or gallons per capita per day (378 LPCD or liters per capita per day)

Peak Hour Flow: the peak sustained flow rate occurring during a one-hour period. This flow factor is typically used to design collection and interceptor sewers, pump stations, piping, flow meters, and certain physical WWTP processes such as grit chambers and sedimentation tanks, whose performance can be affected by sudden high hydraulic inputs

Period of record: the time period (weeks, months or years) from which data has been gathered and used for historical wastewater effluent characterization/projections

Publicly Owned Treatment Works: a treatment works that is owned by a state, municipality, city, town, special sewer district, or other publicly owned and financed entity as opposed to a privately (industrial) owned treatment facility. This definition includes any devices and systems used in the storage, treatment, recycling, and reclamation of municipal sewage (wastewater) or industrial wastes of a liquid nature. It also includes sewers, pipes, and other conveyances only if they carry wastewater to a POTW treatment plant. The term also means the municipality (public entity) that has jurisdiction over the indirect discharges to and the discharges from such a treatment works

Potential-to-emit: the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable. Secondary emissions do not count in determining the potential to emit of a stationary source

Return activated sludge: settled activated sludge that is collected in the secondary clarifier or the membrane basin and returned to the aeration basin to mix with incoming raw or primary settled wastewater

Rural Economic Action Plan: a point-based program designed to assist smaller communities that lack sufficient fiscal capacity. Cities, towns, and municipalities with a population less than 1,750 are given priority. Rural water and/or sewer districts with less than 525 non-pasture customers are also given priority

Request for Proposal: a solicitation made often through a bidding process, by an agency or company interested in procurement of a commodity, service or valuable asset, to potential suppliers to submit business proposals. It is submitted early in the procurement cycle, either at the preliminary study, or procurement stage

Sequence batch reactor: a type of activated sludge system that is specifically designed and automated to mix/aerate untreated wastewater and allow solids flocculation/separation to occur as a batch treatment process

Standard cubic feet per minute: the volumetric flow rate of a gas corrected to "standardized" conditions of temperature and pressure

Sanitary sewer overflow: wastewater that flows out of a sanitary sewer (or lift station) as a result of flows exceeding the hydraulic capacity of the sewer or stoppages in the sewer. SSOs exceeding hydraulic capacity usually occur during periods of heavy precipitation or high levels of runoff from snow melt or other runoff sources

Storm Water Pollution Prevention Plan: a plan to describe a process whereby a facility thoroughly evaluates potential pollutant sources at a site and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in storm water runoff

Total Dynamic Head: when a pump is lifting or pumping water, the vertical distance (in feet or meters) from the elevation of the energy grade line on the suction side of the pump to the elevation of the energy grade line on the discharge side of the pump. The total dynamic head is the static head plus pipe friction losses

Total Kjeldahl nitrogen: a measure of both the total ammonia and the organic forms of nitrogen

Total Maximum Daily Load: the sum of individual wasteload allocations for point sources, safety reserves, and loads from nonpoint source and natural backgrounds

Trans Membrane Pressure: the difference in pressure between two sides of a membrane. It is a valuable measurement because it describes how much force is needed to push water (or any liquid to be filtered -- referred to as the "feed") through a membrane. A low transmembrane pressure indicates a clean, well-functioning membrane. On the other hand, a high transmembrane pressure indicates a dirty or "fouled" membrane with reduced filtering abilities

Total phosphorus: a measure of both inorganic and organic forms of phosphorus. Phosphorus can be present as dissolved or particulate matter

Total Suspended Solids: a measure (mg/L) of the particulate matter that is suspended within the water column

Ultraviolet Treatment: pertaining to a band of electromagnetic radiation just beyond the visible light spectrum. Ultraviolet radiation is used to disinfect water and wastewater. When ultraviolet radiation is absorbed by the cells of microorganisms, it damages the genetic material in such a way that the organisms are no longer able to grow or reproduce, thus ultimately killing them

Waste activated sludge: the excess quantity (mg/L) of microorganisms that must be removed from the process to keep the biological system in balance

Wasteload allocation: the proportion of a receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution

Water Quality Act of 1987: a major amendment to the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act, which was passed in 1972

Wet weather flow: any storm made surge of water - rain or snowmelt. During extreme weather events, this water may overwhelm the wastewater collection system, resulting in overflows

Wastewater Treatment Plant: an arrangement of pipes, equipment, devices, tanks, and structures for treating wastewater and industrial wastes; a water pollution control plant