

Oklahoma Comprehensive Water Plan

Public Wastewater System Planning Guide

Fiscal Sustainability Plan Edition

Also available in fillable spreadsheet format.

www.owrb.ok.gov/guides



Oklahoma Water Resources Board

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*Includes Fiscal Sustainability Plan (FSP) tables.

Sections shown in gray have been removed from this version. Please visit www.owrb.ok.gov/guides for the complete Wastewater Planning Guide.

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.

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 Region¹

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.

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 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.

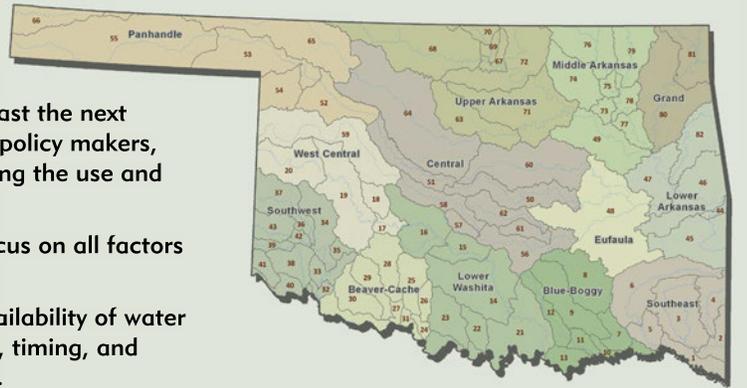
The 15 members are tasked with studying and recommending appropriate water conservation practices, incentives, and educational programs to moderate statewide water usage while preserving Oklahoma's population growth and economic development goals.

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.

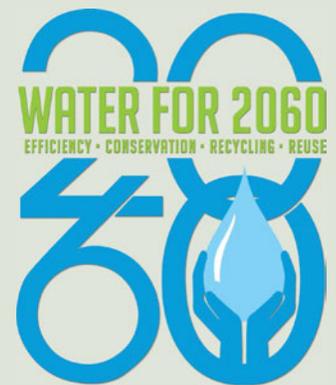
Information gleaned from these workshops will be used to shape the recommendations to be submitted to the Governor, Speaker of the House, and President Pro Tempore by late 2015.

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



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.



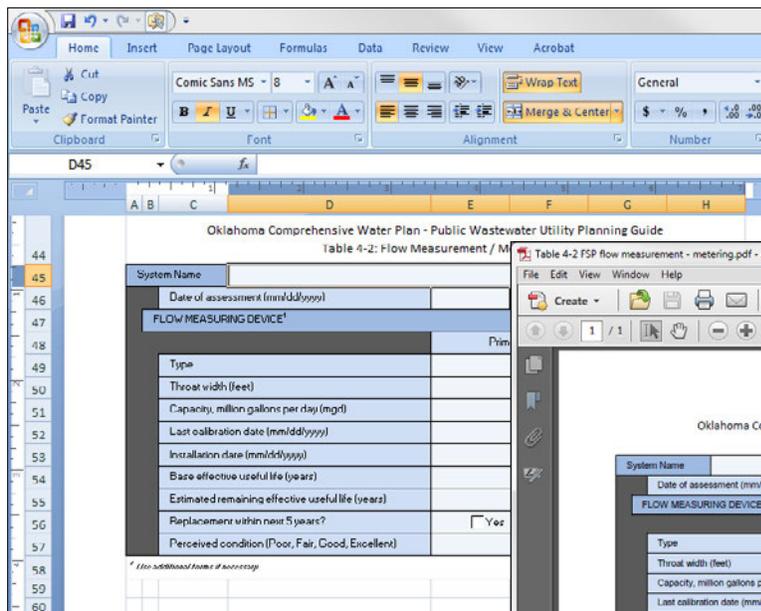
For more information on Water for 2060, please visit www.owrb.ok.gov/2060.

Using the WWPG as an FSP Template

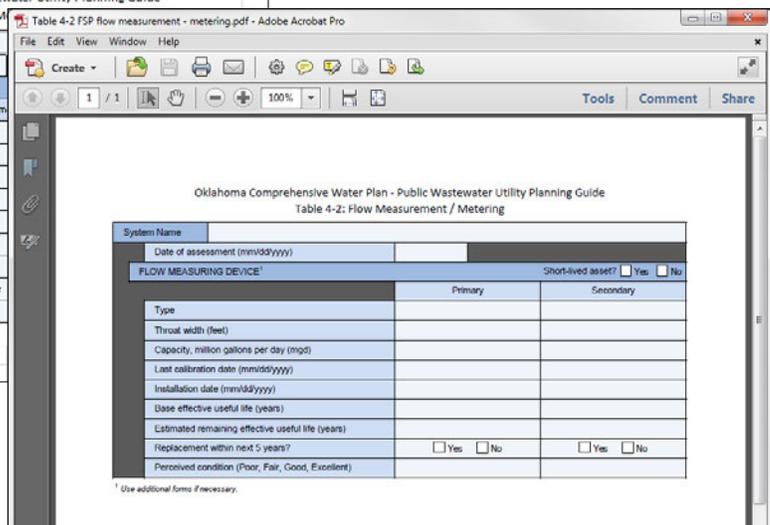
Federal guidance for FSP plans is broad and leaves ample latitude for your community to develop its Plan as you think best. This Wastewater Planning Guide is designed, in part, to act as a template to help a community or engineer fulfill these requirements. This guide may also be found online in PDF 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 3: Gathering Data

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.

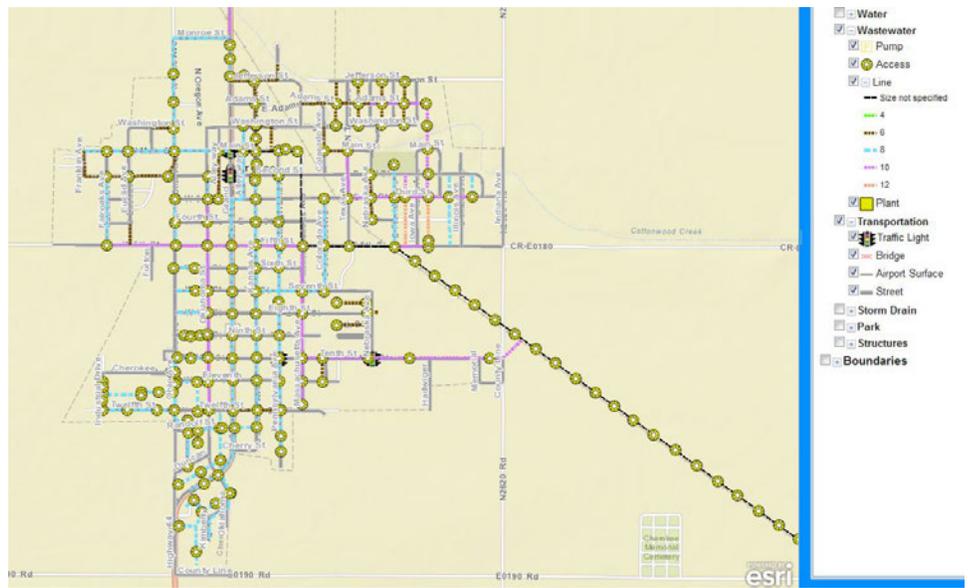
The Oklahoma Department of Environmental Quality (ODEQ) has developed a GIS Flex Viewer that displays many pertinent data layers, including PDES Discharges, Land Application Sites, Stormwater Sensitive Areas, Total Retention Facilities, 303(d) Waterbodies, local ODEQ offices, and more. Go to www.deq.state.ok.us/mainlinks/gis/index.html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



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.		
<input type="checkbox"/> Service area map(s) and facility diagram are attached.		
Physical Location		Electronic Location
<input type="checkbox"/> Identified key facilities on service area map.		
<input type="checkbox"/> Attached site maps and treatment system schematics.		
<input type="checkbox"/> Identified future service area changes.		
<input type="checkbox"/> 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.

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 <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Number of pumps				
<i>Use numbered columns for each separate unit¹</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Perceived condition (Poor, Fair, Good, Excellent)				
CONTROL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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			
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2
		Unit 3	
Mechanical / Manual?			
Manufacturer			
Model Number			
Drive Mechanism			
SCREENS Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2	Unit 3
Type (vortex, horizontal flow, etc.)				
Manufacturer				
Capacity				
Installation date (mm/dd/yyyy)				
PUMP				Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
MOTOR				Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Grit slurry processing				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Identification				
<i>Use numbered columns for each separate unit¹</i>		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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table continued on next page

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

CONTROL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)			
<i>Use numbered columns for each separate unit²</i>	Unit 1	Unit 2	Unit 3
STRUCTURE			
			Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
SOLIDS REMOVAL EQUIPMENT			
			Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table continued on next page

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

CONTROL				Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<i>Use numbered columns for each separate unit¹</i>				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?				<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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				
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2	Unit 3
PUMPS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
CONTROL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of Units				
<i>Use numbered columns for each separate unit¹</i>		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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
BLOWERS / AERATORS			Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Number of Units				
<i>Use numbered columns for each separate unit¹</i>		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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
BLOWERS / AERATORS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Number of Units				
<i>Use numbered columns for each separate unit¹</i>		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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
AERATORS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of Units			
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2
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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
BLOWERS / AERATORS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of Trains			
<i>Use numbered columns for each separate unit¹</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of Trains			
<i>Use numbered columns for each separate unit¹</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Number of Reactors				
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2	Unit 3
Reactor Chamber Dimensions (feet)	Length			
	Width			
	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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
CONTROL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No
<i>Use numbered columns for each separate unit¹</i>		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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
MEMBRANE BACKWASH PUMPS				Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table continued on next page

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

FILTERS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<i>Use numbered columns for each separate unit¹</i>		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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
AIR SCOUR SYSTEM		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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				
<i>Concentrate</i>				
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			
<i>Use numbered columns for each separate unit ¹</i>	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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of tanks			
Type of tank			
Tank material			
Tank Dimensions (feet)	Diameter		
	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table continued on next page

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

CIP FEED PUMPS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<i>Use numbered columns for each separate unit¹</i>		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			
	Phase			
	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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)				
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2	Unit 3
FILTERS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
AIR SCOUR BLOWERS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
STRUCTURE		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No

Table continued on next page

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

MEDIA		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No					
<i>Use numbered columns for each separate unit¹</i>		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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
FILTER BACKWASH PUMPS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No					
Facility name							
Number of pumps							
Type of pump							
Rated capacity of pump							
Manufacturer							
Discharge diameter							
Pump specifications	Horsepower						
	Voltage						
	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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
FILTER BACKWASH BLOWERS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
AIR COMPRESSORS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)				
<i>Use numbered columns for each separate unit</i>		Unit 1	Unit 2	Unit 3
SLUDGE THICKENING SYSTEM			Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> 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)	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Perceived condition (Poor, Fair, Good, Excellent)				
THICKENING WASTE SLUDGE PUMP		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<i>Use numbered columns for each separate unit</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Perceived condition (Poor, Fair, Good, Excellent)				
COMPRESSOR(S)		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)			
<i>Use numbered columns for each separate unit¹</i>			
	Unit 1	Unit 2	Unit 3
ANAEROBIC DIGESTER(S)		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
RECIRCULATION PUMP(S)		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
GAS COLLECTION AND DISPOSAL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
DIGESTED SOLIDS PUMP(S)		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)			
<i>Use numbered columns for each separate unit¹</i>			
	Unit 1	Unit 2	Unit 3
DEWATERING PROCESS		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Perceived condition (Poor, Fair, Good, Excellent)			
FINAL DISPOSAL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Method (incineration, land application, etc.)			
Base effective useful life (years)			
Estimated remaining effective useful life (years)			
Replacement within next 5 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<i>Use numbered columns for each separate unit¹</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
CHEMICAL STORAGE/STRENGTH		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	
RECIRCULATION		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Pump Type				
Model No.				
Horsepower				
Capacity (gpm)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Table continued on next page

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

CHEMICAL METERING		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Pump Type				
Model				
Horsepower				
Capacity (gpm)				
Base effective useful life (years)				
Estimated remaining effective useful life (years)				
Replacement within next 5 years?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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)				
<i>Use numbered columns for each separate unit¹</i>		Unit 1	Unit 2	Unit 3
EQUIPMENT		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> No		
Number of pumps				
Type (suction lift, submersible, etc.)				
Rated capacity of pump (gpm @ feet TDH)				
Manufacturer				
Solid passable size?				
Motor 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
PUMP CONTROL		Short-lived asset? <input type="checkbox"/> Yes <input type="checkbox"/> 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?		<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> 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? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Number of pipelines (by diameter)			
<i>Use numbered columns for each separate unit¹</i>	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?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No
Perceived condition (Poor, Fair, Good, Excellent)			

¹ Use additional forms if necessary.

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
			<input type="checkbox"/>

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	

¹ Cross check the operator licensure level with the facility classification.

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.

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

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 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 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.

Section 8: Identifying Conceptual Alternatives

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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?
	Treatment	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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		

Section 8: Identifying Conceptual Alternatives

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.	<input type="checkbox"/> Will be considered further <input checked="" type="checkbox"/> Will not be considered further (explain decision below)
2			<input type="checkbox"/> Will be considered further <input type="checkbox"/> Will not be considered further (explain decision below)
3			<input type="checkbox"/> Will be considered further <input type="checkbox"/> Will not be considered further (explain decision below)
4			<input type="checkbox"/> Will be considered further <input type="checkbox"/> Will not be considered further (explain decision below)
5			<input type="checkbox"/> Will be considered further <input type="checkbox"/> Will not be considered further (explain decision below)
6			<input type="checkbox"/> Will be considered further <input type="checkbox"/> Will not be considered further (explain decision below)
7			<input type="checkbox"/> Will be considered further <input type="checkbox"/> 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	<div style="border: 1px solid #90EE90; padding: 5px; min-height: 150px;"> <hr/><hr/><hr/><hr/><hr/><hr/><hr/><hr/> </div>	<div style="border: 1px solid #90EE90; padding: 5px; min-height: 150px;"> <hr/><hr/><hr/><hr/><hr/><hr/><hr/><hr/> </div>
Not Urgent	<div style="border: 1px solid #ADD8E6; padding: 5px; min-height: 150px;"> <hr/><hr/><hr/><hr/><hr/><hr/><hr/><hr/> </div>	<div style="border: 1px solid #ADD8E6; padding: 5px; min-height: 150px;"> <hr/><hr/><hr/><hr/><hr/><hr/><hr/><hr/> </div>

Table 8-11 : Project Prioritization With Timeline Matrix

	Critical		Non-Critical	
	Funding Sources	Funding Sources	Funding Sources	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.

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.

Appendix B: Resources

- 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.cfpubl.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 commercial 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/commercial/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 (i.e., 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 I.

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.nyserdera.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.ceel.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.ceel.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 unmetred 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	
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
Collection System Related	

Appendix F: Green Project Reserve Checklist

Business Case Required

Categorically Eligible

CWSRF GPR Ineligible

GREEN INFRASTRUCTURE	ENERGY EFFICIENCY	WATER EFFICIENCY	ENVIRONMENTALLY INNOVATIVE
<p>Not applicable</p> <ul style="list-style-type: none"> • Green streets <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Expansion of tree boxes • Stormwater harvesting/reuse <ul style="list-style-type: none"> • Cisterns • Distribution pipes • Downspout disconnection • Riparian buffers <ul style="list-style-type: none"> • Floodplains • Wetlands • Bioengineered streambank • Stream daylighting • Sustainable landscaping and site design • Stormwater controls with impervious or semi-impervious liners with no evapotranspiration or harvesting functions • Stormwater ponds with extended detention and/or filtration <ul style="list-style-type: none"> • Dirt-lined detention basins • In-line or end-of-pipe treatment systems that only filter or detain stormwater • Underground stormwater control <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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) 	<ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Metal halide pulse start technologies • Compact fluorescent • Light emitting diode (LED) • SCADA systems • Variable Frequency Drives • Renewable energy source for a POTW <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • Energy assessments • Energy audits • Optimization studies • Sub-metering individual processes • 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 	<ul style="list-style-type: none"> • Water meter replacement with traditional water meters • Projects that result from a water audit • Storage tank replacement/rehabilitation • New water efficient landscape irrigation • Install or retrofit water efficient devices <ul style="list-style-type: none"> • Plumbing fixtures • Appliances • Water conservation incentive programs <ul style="list-style-type: none"> • Rebates • Install water meters in previously unmetered areas (if rate structure is based on metered use) <ul style="list-style-type: none"> • Backflow prevention devices (installed in conjunction with meter replacement) • Replace broken water meters or upgrade existing meters with: <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Moisture and rain sensing controllers • Replacing drinking water distribution lines • Leak detection equipment for drinking water distribution systems (except reuse) 	<ul style="list-style-type: none"> • 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 technologies 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 • 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 <ul style="list-style-type: none"> • Individual onsite systems • Cluster systems • 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	MP	Medium Pressure
AADF	Annual Average Day Flow	MS4	Municipal Separate Storm Sewer System
ADAL	Average Day Annual Load	NEPA	National Environmental Policy Act
ADMM	Average day maximum month	NPDES	National Pollutant Discharge Elimination System
AQD	Air Quality Division	O&M	Operation and Maintenance
BOD5	5-day Biochemical Oxygen Demand	OCWP	Oklahoma Comprehensive Water Plan
CAA	Clean Air Act	ODEQ	Oklahoma Department of Environmental Quality
CBOD5	5-day Carbonaceous Oxygen Demand	ODOC	Oklahoma Department of Commerce
cip	Clean In Place	OML	Oklahoma Municipal League
CIP	Capital Improvements Projects	OPDES	Oklahoma Pollutant discharge Elimination System
CMMS	Computerized Maintenance Management Software	OWQS	Oklahoma Water Quality Standards
CWA	Clean Water Act	OWRB	Oklahoma Water Resources Board
CWSRF	Clean Water State Revolving Fund	PE	Population Equivalent
DAF	Dissolved Air Flotation	PH	Peak Hour
DMR	Discharge Monitoring Report	PHF	Peak Hour Flow
DO	dissolved oxygen	POR	period of record
DWF	dry weather flow	ppd	pounds per day
EA	Environmental Assessment	POTW	Publicly Owned Treatment Works
EIS	Environmental Impact Statement	PTE	potential-to-emit
EPA	U.S. Environmental Protection Agency	RAS	return activated sludge
ER	Environmental Report	REAP	Rural Economic Action Plan
FACT	Funding Agency Coordinating Team	RFP	Request for Proposal
ft	feet	rpm	revolutions per minute
fps	feet per second	SAR	Sodium Adsorption Ratio
gal	gallon	SBR	sequence batch reactor
gpcd	gallons per capita per day	scfm	standard cubic feet per minute
gpd	gallons per day	SSO	sanitary sewer overflow
gpm	gallons per minute	SU	Standard Units
GWI	groundwater infiltration	SWPPP	Storm Water Pollution Prevention Plan
H	Height	TDH	Total Dynamic Head
HAP	hazardous air pollutant	TKN	total Kjeldahl nitrogen
HRT	Hydraulic Retention Time	TMDL	Total Maximum Daily Load
hp	horsepower	TMP	Trans Membrane Pressure
I/I	inflow and infiltration	TP	total phosphorus
in	inch	TPY	tons per year
L	Length	TSS	Total Suspended Solids
LP	Low Pressure	USGS	U.S. Geological Survey
LPHO	Low Pressure high Output	UVT	Ultraviolet Treatment
MD	maximum day	V	Voltage
Min	Minutes	W	Width
MinD	minimum day	WAS	waste activated sludge
mg	million gallons	WLA	wasteload allocation
mgd	million gallons per day	WQA	Water Quality Act of 1987
mg/L	milligrams per liter	WWF	wet weather flow
MLSS	mixed liquor suspended solids	WWTP	Wastewater Treatment Plant
MMF	Maximum Month Flow		

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 BOD₅

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

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

Glossary

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