

**ASSET MANAGEMENT
PROGRAM
GUIDANCE FOR THE INDIANA
STATE REVOLVING FUND LOAN
PROGRAM**



July 2024

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Asset Management Program Guidance

Overview

Table of Contents

- I. Introduction to the Asset Management Program**
- II. Federal & Statutory Requirements**
- III. Asset Management Program Guidance**

ASSET MANAGEMENT PROGRAM GUIDANCE FOR INDIANA STATE REVOLVING FUND LOAN PROGRAM

OVERVIEW

I. Introduction to the Asset Management Program

An Asset Management Program (AMP) is a document(s) developed by a Utility to assist in the long-term management of the assets necessary to support cost effective, proactive decisions including creation, acquisition, operation & maintenance (O&M), and replacement/upgrade of Utility assets. Physical components deteriorate over time, resulting in increased O&M costs or capital reinvestment to maintain the level of service expected by the customers and stakeholders.

AMPs are intended to ensure the long-term sustainability of a Utility and should be treated as “living documents” that are regularly referenced, revised, expanded, and implemented as an integral part of the operation and management of a Utility’s system. They provide a structured framework of the asset information to help the Utility and stakeholders determine when it is most appropriate to repair, replace, or rehabilitate a particular asset as well as scheduling a long-term funding strategy to ensure sufficient funds will be available to implement the Utility’s improvements as needed. The objective of an AMP is to achieve the lowest long-term cost of operation while continuously providing the desired level of service.

An AMP is important for the following reasons:

1. Utility assets provide an essential customer service.
2. Proper O&M and scheduled replacement of these assets is essential for public health and safety.
3. These assets represent a major public investment.
4. Utilities are important to economic development.
5. Proactive management will maximize system reliability and control efficiency.

II. Federal & Statutory Requirements

Pursuant to Indiana Code 5-1.2-10-16, Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) Loan Recipients are required to provide “documentation demonstrating that the Participant has the financial, managerial, technical, and legal capability of operating and maintaining” its wastewater collection and treatment system (or drinking water supply, treatment, and distribution system, respectively) and are required to “demonstrate that it has developed or is in the process of developing an asset management program as defined in the guidelines of the authority”. The “authority” is the Indiana Finance Authority (IFA), which administers the State Revolving Fund (SRF) as well as other Environmental Finance Programs.

III. Asset Management Program Guidance

Whether a Utility has implemented an AMP or will implement an AMP, these plans should provide a basis for the ongoing “living document” for the Utility and stakeholders to assist in the long-term management of assets. An AMP is required for the entire wastewater system for CWSRF funded projects and for the entire water system for DWSRF funded projects. The minimum steps that the Utility must take to satisfy these requirements are outlined in this guidance.

The IFA provides this guidance document to assist in the development of the required AMP. The Utility must develop and implement an AMP that includes the following minimum requirements:

1. System map
2. An inventory and assessment of system assets
3. Development of an infrastructure inspection, repair, and maintenance plan, including a plan for funding such activities
4. An evaluation and implementation of water and energy conservation efforts
5. An analysis of the customer rates necessary to support the AMP
6. An Audit performed every two years
7. Cyber Vulnerability Assessment performed at least annually
8. Demonstration of the technical, managerial, legal and financial capability to operate and maintain the system, per the guidelines established by the IFA

The IFA provides this guidance document to assist in the development of an effective and compliant document. It is incumbent upon a community to determine the proper tools or framework for the AMP to provide a “best fit” for the size and type of the Utility. It is important to ensure stakeholders are involved early in the process such as the governing board/council, Mayor, Town Manager, City Engineer, etc.

The AMP guidance is organized into the following three sections:

1. Technical
2. Managerial
3. Financial

It is recommended that the Utility’s AMP be organized in a similar fashion.

Asset Management Program (AMP) Guidance

Technical Section

Table of Contents

- I. Introduction**
- II. Utility System Map**
- III. Inventory of Utility System's Assets**
- IV. Evaluation of Utility System's Assets**
- V. Evaluation and Implementation of Water and Energy Conservation Efforts as Part of the Plan**
- VI. Plan for Maintaining, Repairing, and Replacing the Utility System's Assets and Plan for Funding**
- VII. AMP Schedule for SRF Projects**
- VIII. Pulling It All Together**

I. Introduction

This Section provides the guidance for development of the required Technical requirements of the AMP. Appendix A contains an Asset Management Workbook Tool which includes sample tables that can assist in the development of the technical section of the AMP.

II. System Map

Create a map of the utility system's Assets and link the Assets to a specific location. An AMP may include GIS mapping, but it is not required. GIS mapping is an effective means of system mapping and has the ancillary benefits including improved record keeping, efficiency, communication, and management. Asset information can be stored in a GIS database and is easily accessible for grouping and reporting. GIS maps are also easily updated and expanded.

Include such Assets as:

1. Gravity and pressure lines (including sizes and material)
2. Valves, hydrants, fittings, backflow preventers, sample stations, chemical feed points, manholes, inlets
3. Lead lines (as identified)
4. Booster/lift stations
5. Water or wastewater treatment plants
6. Water or wastewater storage facilities
7. Meters
8. Wells
9. CSO outfalls and diversion structures

III. Inventory of Critical Utility System Assets

The first core component of an AMP is to identify and document all Assets in the system and applicable date each Asset went into service. Determining the criticality of each Asset is also part of this step. Creating an Asset hierarchy and Asset classification groups will help to facilitate tracking of Asset inventory, condition, and cost. Please reference Appendix A, Table 1 and Sample List of Assets, to assist with completing an inventory of system Assets.

To be considered an Asset, the item should meet at least one of the following criteria:

1. Has a value greater than \$5,000. The value can be lower if desired, per a threshold adopted by the City/Town/Utility.
2. Has a useful life greater than one year.
3. Will be the lowest level where a work order is generated by the utility.
4. Is critical to the delivery of process, compliance of regulatory standards, and/or provision of staff safety.

These criteria help to distinguish between an Asset and a component.

Guidance for a utility when performing the Asset inventory include:

- A. Accounting for all Assets associated with the Utility: Tools and resources for developing the inventory list may include record drawings, staff knowledge, visual observations, and interviews with residents and consultants. Establishing a complete Asset inventory on the first try may not be possible for a number of reasons, and it is important to remember that the Asset inventory needs to be an ongoing process.
- B. Locating the Assets: Utilize the System Map described above.
- C. Probability of Failure: The first step to assessing criticality of an Asset is to determine the Condition (Probability of Failure). Factors to consider when determining the Probability of Failure include Asset age, current condition of Asset, failure history, historical knowledge, experiences with that type of Asset, maintenance records, and knowledge regarding how that type of Asset is likely to fail. Then rank the Probability of Failure for each Asset using the following rating system:
 - 5 – Imminent – Likely to occur in the near future
 - 4 – Probable – Not Imminent, but likely to occur several times in the life of an item
 - 3 – Occasional – Likely to occur sometime in the life of an item
 - 2 – Remote – Unlikely, but possible to occur in the life of an item
 - 1 – Improbable – Unlikely, and assumed occurrence may not be experienced
- D. Consequence of Failure: The second step to assessing criticality is to determine the Consequence of Failure of the Asset. Rank the Consequence of Failure for each Asset using the following rating system:
 - 5 – Catastrophic disruption
 - 4 – Major disruption
 - 3 – Moderate disruption
 - 2 – Minor disruption
 - 1 – Insignificant disruption
- E. Assessing Criticality:
 - 1. The system Assets that have the greatest Probability of Failure and the greatest consequences associated with a failure will be the system Assets that are the most critical.
 - a. Multiply Probability of Failure and Consequence of Failure to determine Criticality factor for each system Asset.
 - b. Suggested system Asset Criticality factor risk ranges (individual utilities may determine their own ranges as they see fit):
 - i. 1 to 8 – Not considered a critical rating.
 - ii. 9 to 16 – Important, but not critical.
 - iii. >16 – Critical rating.

Example Criticality Table:

Asset	Probability of Failure	Consequence of Failure	Criticality Factor	Criticality Risk Rating
RWW Pump Station	4	5	20	Critical
RAS Pump Station	3	4	12	Important
Digester Basement Sump Pump	2	1	3	Not Critical

2. If a system Asset is determined to have a critical risk rating, then redundancy or close monitoring is important. These will also rank higher in capital improvement priority than other system Assets with similar condition and performance rankings as described in the next section.
3. Because the condition of an Asset will change over time as will the consequences related to failure, it will be necessary to periodically review the criticality analysis and make adjustments.

IV. Evaluation of the Condition and Performance of Utility System Assets

Evaluating the system Assets' condition and performance is very important. Physical inspections of the system Assets will be needed as well as a review of any available equipment manuals. Please reference Appendix A, Tables 2 and 3, to assist with completing an evaluation of the conditions of the system's Assets.

Questions that a utility will need to ask when performing this component include:

- A. What is the condition and remaining useful life of the Asset?
 1. Rank the condition of each system Asset using the following rating system:
 - a. 5 – Unserviceable/End of useful life (>50% of Asset requires replacement)
 - b. 4 – Significant deterioration (20-50% requires renewal/upgrade)
 - c. 3 – Moderate deterioration (10-19% requires significant maintenance/renewal)
 - d. 2 – Minor deterioration (<10% requires minor maintenance)
 - e. 1 – Excellent or as-built condition (only normal maintenance required)
 2. If resources are available, higher levels of assessment could be performed such as sewer televising, tank inspections, etc. in order to better define an Asset's condition.

3. Estimate the remaining useful life of each utility system Asset (refer to Asset definition in Section III).
 - a. Estimate remaining life of each utility system Asset based on factors such as maintenance practices, type of materials, usage, and surrounding environment.
 - b. Because useful service life of an Asset varies over time, it should be reevaluated on a regular basis.
 - c. Industry standard useful life ranges can be referenced here on page 28 of the following document https://www.rd.usda.gov/files/UWP_Bulletin_1780-2.pdf

B. What is the value of the Asset?

1. The value of an Asset is the cost to replace the Asset after it has exhausted its useful life. It is important to factor inflation into the Asset's value with respect to the schedule for replacement.

C. What is the desired Level of Service?

1. Level of Service (LOS) defines the way in which utility stakeholders expect the utility system Assets to perform over the long term. Defining the LOS establishes the utility's goals. This is related to the consequence of failure in Section III.D.
2. This can be thought of as a performance target for a worst-case scenario. However, performance targets should be realistic targets based on regulatory requirements and customer needs and will help set the utility's goals.

Example: for a major lift station in the collection system, it may be determined that it is not acceptable for the lift station not to function. Therefore, total redundancy should be provided as well as a regular maintenance plan developed and implemented for the pumps. The pumps should also be replaced prior to the end of their useful life, and not upon total lift station failure.

3. There is a direct link between the LOS provided and the cost to the customer.
4. The public or customers of the utility could be actively involved in the development of the desired LOS.

V. Evaluation and Implementation of Water and Energy Conservation Efforts as Part of the Plan

The federal Water Resources Reform and Development Act (WRRDA) requires an SRF Utility to evaluate and implement water and energy conservation efforts for the SRF-funded project. As a part of the AMP, the Utility applying for funding from the State's SRF Loan Program must include a brief discussion from the Preliminary Engineering Report's alternatives evaluation for the major project

components in which water and energy conservation was considered. If using SRF's Green Project Reserve Program, the discussion can be included from the associated business case.

VI. Plan for Maintaining, Repairing, and Replacing the Utility System's Assets and Plan for Funding

Finally, building on the components of the AMP developed above, a fiscal plan for the maintenance, repair, and replacement of the Assets should be discussed in the AMP along with a proposed funding structure to ensure funds are available as needed. The AMP may be used as the financial framework for the utility's future operating and capital budgets, impact fees, and utility rates. Refer to Appendix A, Tables 3, 4 and 5 for spreadsheets to assist with the compilation of this information.

A. The recommended period for fiscal planning is 20 years.

1. Anticipated projects and updated Asset information should be updated each year so as to show current needs for the next 20 years.
2. Changing conditions may reveal that some projects on the list can be pushed back for several years or others may need to be addressed sooner

B. Categories of improvements that should be considered:

1. Fiscal needs related to future/upcoming regulations.
2. Fiscal needs related to major Asset replacement.
3. Fiscal needs related to system expansion.
4. Fiscal needs related to system consolidation or regionalization.
5. Fiscal needs related to improved technology to replace obsolete technology.
6. Fiscal needs related to climate resiliency.

C. The following information is helpful when prioritizing an improvement project:

1. Description of project.
2. Brief statement regarding need for project.
3. Year project is needed. Identify if year is absolute or flexible.
4. Estimated total project cost.
5. Explanation of how costs were estimated.
6. Identification of funding source(s) considered available for project.
7. Changes in overall operations that may occur as a result of the project.
8. Impact of project on LOS.

D. This information is an input into the Financial Section of the AMP, wherein user rates and charges are reviewed to determine what is needed to provide sufficient revenues to cover operation, maintenance, replacement, capital improvement projects, and debt costs. This information should be supplied to the financial advisor/group completing the financial section of the AMP.

VII. AMP Schedule for SRF Projects

- A. Include the AMP Certification, inclusive of the Cyber requirements, to the SRF when the PER is submitted. SRF requires an AMP Certification form which is inclusive of the requirements for a Fiscal Sustainability Plan (FSP) as defined by the criteria set forth in CWA Section 603 (d) (1) (E). The AMP should be completed prior to financing projects through the IFA. The actual AMP document should not be submitted to SRF but should be a stand-alone document and kept on site at the Utility's office. SRF intends to view the AMP when performing an onsite inspection.

VIII. Pulling It All Together

After all the data is gathered and evaluations are completed for the existing Assets, the next step is to prioritize the funding that is required to maintain the existing Utility system Assets as well as the new Assets included in the SRF funded project. A suggested method is as follows:

- A. Create a spreadsheet listing all the individual Assets in one column. Subsequent columns may have the following headings:
 1. Capacity/Size – Descriptive and can be used for grouping
 2. Material – Descriptive and can be used for grouping
 3. Manufacturer – Descriptive and can be used for grouping
 4. Tag/Serial Number – Can be used for grouping
 5. Original Cost – Cost to install the year it was installed
 6. Replacement Cost – Cost to replace at end of useful life
 7. Year Installed
 8. Expected Useful Life in years
 9. Remaining Useful Life in years
 10. Condition of each System Asset – 1 through 5
 11. Probability of Failure – 1 through 5
 12. Consequence of Failure – 1 through 5
 13. Criticality – 1 through 25
 14. Notes – Expand on Consequence of Failure, Condition, etc.
- B. The AMP Workbook Tool is available on the SRF website as an example spreadsheet. The workbook tool includes tabs for inventory and assessment of Assets. These can be found in Appendix A and on SRF's website: <https://www.in.gov/ifa/srf/2376.htm>
- C. Sort the utility system Assets by their Condition/Useful Life remaining ranking, highest ranking first.
- D. Sort each of these by Criticality, highest risk ranking first.
- E. Use the data to develop the 20-year fiscal plan. See the Financial Section of the AMP guidance.

Asset Management Program (AMP) Guidance

Managerial Section

Table of Contents

- I. Introduction**
- II. Property Documentation**
- III. Operator Certifications and Licenses**
- IV. Overview and Description of System**
- V. Operating Plan**
- VI. Written Procedures**
- VII. External Contact Information**
- VIII. Internal Contracting and Purchasing Procedures**

I. Introduction

The managerial components of an AMP address Utility structure, organization and support necessary to operate and maintain a water or wastewater system capable of consistently and responsibly meeting the needs of its users.

AMPs, as set out within this guidance, will provide a significant benefit to any Utility as a living document that is to be referenced, utilized and updated on a consistent basis. Effectively managed Utilities are more efficient, less fiscally volatile, have a reduced risk of system failure and are more insulated from loss of knowledge when compared to poorly managed Utilities. It is the intent of an AMP to facilitate and document management structures that can be usefully scaled to Utilities of any size.

Many of the managerial components from the AMP are likely to already exist. Each Utility shall be responsible for gathering or creating each of the documents below as a part of an effective AMP.

II. Property Documentation

In order to document ownership of Assets, include information on all deeds, titles, easements, leases and/or receipts for all properties in the Utility. Examples of facilities that should be documented include, but are not limited to the following:

- Water Utilities (as applicable)
 - Water Intake Facility
 - Groundwater Wells
 - Water Treatment Facilities
 - Water Storage Tanks
 - Booster Stations
 - Chemical Injection Facilities
 - Large Meters/Valves
 - Distribution System Easements
 - Access Easements
 - Maintenance or Billing Offices Owned by Utility
- Wastewater Utilities (as applicable)
 - Collection System Easements
 - Access Easements
 - Pump Stations
 - CSO Facilities (Outside of Wastewater Treatment Facilities)
 - Wastewater Treatment Facilities
 - Treatment Facility Outfall
 - Maintenance or Billing Offices Owned by Utility

- A. Identify location(s) where property documentation is stored (i.e. Water Billing Office; Clerk Treasurer's Office, etc.)
- B. Provide status of property documentation
 1. Confirm if property information for each facility is complete and accounted for.
 2. For any property information not complete, provide a status of documentation (e.g. all land ownership documented, easements in process) and provide a plan and timeline for completing documentation.

III. Operator Certifications and Licenses

Provide documentation of all Certified Operators employed by the Utility. Documentation shall be verified through the State of Indiana Search and Verify Website for Indiana Profession License Holders (<https://mylicense.in.gov/everification/Search.aspx>).

- A. Table with Names, License Numbers, Issuance Dates, Expiration Date, Type of Classification for Each Certified Operator, and License Status should be included.
- B. List Continuing Education Requirements for each Operator (i.e. based on Classification). Include what has been obtained and keep record up to date.

IV. Overview and Description of System

Include a non-technical summary of the water/wastewater system. Description information can typically be found at the following locations:

- National Pollutant Discharge Elimination System (NPDES) Permit (IDEM)
- Drinking Water (DW) or Wastewater Construction Permit and/or Design Summaries (IDEM)
- IDEM Drinking Water Branch Directory Information (https://myweb.in.gov/IDEM/DWW/Maps/Map_Template.jsp)
- Sanitary Survey (DW)
- O&M Manuals
- Past Preliminary Engineering Reports/Studies
- Monthly Report Data (MROs)

Description information shall include the following:

1. General description of type of treatment facility (including Class and list of treatment plant components, i.e. disinfection, aeration, clarification, fluoridation [DW], etc.) or distribution/collection system. State if treatment is by others.
2. Average Daily Demand - As indicated in NPDES/Construction Data or Current MRO/Metered Data
3. Minimum and Maximum Daily Flow/Demand - As indicated in NPDES/Construction Data or Current MRO/Metered Data
4. Number of Connections/Customers - Assumes that every property with a connection (DW or WW) is required to pay a minimum fee (therefore is a customer). If not, please document additional connections.
 - a) Resources
 - i. For DW, Service Connections for each water system can be found through the IDEM Drinking Water Branch Directory or Sanitary Survey (https://myweb.in.gov/IDEM/DWW/Maps/Map_Template.jsp)
 - ii. Recent Billing Records
5. Population Served
 - a) Resources
 - i. For DW, population served for each water system can be found through the IDEM Drinking Water Branch Directory (https://myweb.in.gov/IDEM/DWW/Maps/Map_Template.jsp)
 - ii. U.S. Census Data (<http://factfinder.census.gov>)
6. Water Source Type (DW)
 - a) Surface Water – Include intake location information
 - b) Groundwater – Include number of wells and general location
 - c) Purchase Water – Indicate public water supply source if drinking water is purchased from another Utility. Include interlocal agreement(s).
7. Receiving Stream (NPDES Permitted Facilities)
 - a) Effluent receiving streams for Wastewater Treatment Plant and/or High Rate Clarification
 - b) Backwash receiving stream for Water Treatment Plants (if applicable)
8. Storage Capacity
 - a) Water Storage Tanks (DW) – List number of tanks and total volume (gallons)
 - b) Wet Weather Storage/Flow Equalization (Wastewater) - List number of facilities and total volume (gallons)
9. Sell Drinking Water
 - a) Indicate other public water supply systems that utilize your Utility's water
 - b) Include applicable interlocal agreement(s)
10. Treatment by Other Utilities (WW)
 - a) If wastewater system is collection system only, indicate the wastewater Utility that receives the flow for treatment
 - b) If Wastewater Utility receives flow from other wastewater systems, indicate those entities
 - c) Include interlocal agreement(s)

11. Combined Sewer Overflow (CSO) vs. Non-CSO (WW)
 - a) CSO
 - i. Indicate number of CSOs
 - ii. Indicate number and location of high rate clarification facilities (if applicable)
 - b) Non-CSO
 - i. If any SSOs are documented in NPDES permit, indicate number and approximate location
12. Pretreatment (WW) - Indicate if wastewater Utility is designated as a pretreatment system
13. Accounting of Infiltration/Inflow (I/I) and/or water loss

V. Operating Plan

As part of the AMP, a Utility should provide details regarding their operating structure and processes in a Utility Operating Plan. The Operating Plan details required are listed within this section.

Organizational Chart. The Utility Operating Plan should include an Organizational Chart.

- A. Provide, as part of the Operating Plan, a copy of the Utility organizational chart. The chart should identify responsible parties and inter-party relationships.
 1. Include on the organizational chart the Utility Service Board or other executive group that 'owns' the Utility or establishes budget, operational characteristics and processes.
 2. All staff with pertinent licenses should be shown on the organizational chart.
 3. The organizational chart should show any contracted entities that perform a service for which the Utility relies on for operational capacity.
 4. Establish relationship with Legal Authority (entity responsible for ordinances, contracts, etc.)
- B. If the Utility currently does not have an organizational chart, it is encouraged to produce a chart for inclusion in the Asset Management Program.

Job Duties. As part of the Utility operating plan, specific positions with work requirements should be identified. Each unique position should have performance needs described. Provide the job duties for each position type. The Job Duties portion should include:

- A. A job title that corresponds to each position on the Utility organizational chart.
- B. List training needs or certifications/licenses required for the job duties to be adequately performed. Training should include:
 1. Fundamental Mission, goals and policies.
 2. Mandatory training requirements identified for key employees.
 3. On-the-Job training progress and performance measurements.
 4. Confirm new employees should adequate training for the positions they occupy.
 5. Include any Continuing Education Requirements for pertinent registrations and licenses.
- C. Include all internal communication routes and requirements to link specific job duties to others.

- D. Provide a position summary.
- E. Describe all essential duties and responsibilities, including any federal and/or state reporting requirements
- F. Disclose probable working conditions.
- G. See sample job description template in Appendix B.
- H. For suggested staffing levels, refer to EPA's Guide for Evaluating Capacity, Management, Operation and Maintenance (CMOM) Programs of Sanitary Sewer Collection Systems. https://www3.epa.gov/npdes/pubs/cmom_guide_for_collection_systems.pdf
- I. Identify tree of advancement opportunities and succession plan as appropriate for key positions.
- J. Include a schedule of routine tasks, including reporting requirements.

Daily Operating Procedures should be captured within the Asset Management Program. Documentation of daily procedures prevents confusion between team members and can increase the team's efficiency. Documented procedures can also assist with gauging when to make capital improvements to the system and streamline regular maintenance activities.

- A. Describe managerial processes (e.g. Biweekly meeting between department heads, etc.).
- B. List regular maintenance activities for mechanical equipment.
- C. List any regular communication.
- D. Include as attached checklists or forms any regular or recurring work orders used by the Utility.

Operation and Maintenance Manuals. Equipment and systems purchased by the Utility should each be accompanied by Operation and Maintenance (O&M) Manuals. O&M Manuals should be stored digitally (with appropriate backup) and in hardcopy. Provide the storage locations of all O&M Manuals.

The following list is not exhaustive, but includes some equipment and systems that should be accompanied by O&M Manuals:

- A. Pumps of any kind
- B. Any treatment equipment/devices (includes active and passive systems)
- C. Any vehicles or construction equipment
- D. Supervisory Control and Data Acquisition (SCADA) systems or other control/operation software
- E. Control panels
- F. Testing and sampling equipment

VI. Written Procedures

- A. Security, including cyber security
 - 1. Establish access security measures for facilities (Consider use of cameras and personalized key cards and/or pass codes)
 - 2. Establish record storage, access, and disposal process
 - 3. Establish cyber security procedures including SCADA systems

4. Perform an annual Cyber Security Vulnerability Assessment (information located in Appendix C)
 5. Establish reporting procedures for security breaches
 6. A Cyber Security Checklist is located in Appendix C
- B. Personal Access/User Rights for System Equipment/Computers/Controls/SCADA including the following:
1. Unrestricted facility access
 2. Accompanied facility access
 3. Equipment use limits
 4. Procedure for addition or removal of access/use
- C. Customer Complaints including the following:
1. Customer complaint reporting procedures
 2. Identification of customer complaint response personnel
 3. Training for Utility personnel that will address complaints
 4. Customer complaint response procedures
 5. Involving Utility regulatory agency on complex complaints
- D. Purchasing Authority
1. Identify who has purchasing authority and dollar limits
 2. Define who can add/remove Utility personnel to/from accounts
 3. Procedure for verifying satisfactory completion of work prior to payment
 4. Approval process for spending Utility revenue on non-Utility expenses
- E. Internal Controls (checks and balances)
1. Establish process for internal and external review of execution of written procedures
 2. Establish what would be a conflict of interest for review of execution of written procedures
- F. Customer Deposits/Payments
1. Establish payment methods and accounting procedures
 2. Identify personnel who can receive payments
 3. Establish process for deposits of funds and accounting procedures
- G. Collections
1. Establish late payment procedures
 - a) Notification of non-payment
 - b) Notification of disconnect date
 - c) Disconnect procedure for Utility personnel
 2. Define and establish process for handling delinquent accounts
 3. Establish procedure for restoring services
 4. Establish procedure for "Theft of Services"
- H. Connection Charges (new water tap or sewer connections)
1. Establish procedures for adding new customers including the following:
 - a) Customer check list
 - b) Pre/post inspections
 - c) Fees
 - d) Approval process

- e) Restrictions
- 2. Establish procedures for upgrading existing customers connects including the following:
 - a) Customer check list
 - b) Pre/post inspections
 - c) Fees
 - d) Approval process
 - e) Restrictions
- I. Routine Billing – AMR, AMI, monthly/quarterly billing
 - 1. Establish standard billing and payment process
 - 2. Establish process for Billing disputes
- J. Use ordinances
 - 1. Identify ordinances required by regulation and others as needed
 - 2. Establish ordinance review process and frequency of review
- K. Training and Safety
 - 1. Identify minimum Federal and State training requirements
 - 2. Identify required safety equipment
 - 3. Establish written work procedures as needed
 - 4. Establish accident and injury reporting process

VII. External Contact Information

This Section includes a list of external contact information for emergency, permits and compliance, suppliers, and other purposes. This list should be reviewed on a quarterly basis and revised when updated contact information is available or received from the respective organizations.

The Utility list should be revised as applicable for various types of local Utilities. Please reference example table below.

EXTERNAL CONTACT INFORMATION							
Contact Type	Name & Title	Organization	Address	Telephone			
				Phone	Fax	Cell	Website
Emergency							
Police							
Fire							
Hospital							
Accidents/Safety Violations							
Permits/Compliance							
Permit Violations							
Spill Reporting							
Chemical Handling							
Traffic Control and Site Safety							
Other							
Utilities - 811 - Know what's BELOW - CALL before you dig							
Electric							
Gas							
Telephone							
Drinking Water							
Wastewater (Sanitary Sewers)							
Stormwater (Storm Sewers)							
Cable							
Communications							
Fiber Optic							
Petroleum							
Other							
Suppliers							
Other Contact Information							

VIII. Internal Contracting and Purchasing Procedures

A budget is one of the most important components of an effective AMP. A key element of the operations budget is the tracking of costs in order to have accurate records each time the annual operating budget is developed. Having an annual baseline provides documentation for future budget considerations and provides justification for future rate increases.

The cost of preventive and corrective maintenance and major collection system repairs and alterations are key items in the annual operating budget. The collection system owner or operator should keep adequate records of all maintenance costs, both in-house and contracted, plus the costs for spare parts. This will assist in the preparation of the following year's budget. In general, there should be an annual (12-month cycle) budget of discretionary and non-discretionary items.

The major categories of operating costs are labor, Utilities, and material supplies. Cost accounting for these categories should include information on unit costs, total costs, and the amount and/or quantities used. Internal contracting and purchasing procedures must therefore be developed and followed for efficient tracking of the operational and maintenance costs. Each community typically develops these procedures for both routine and emergency situations based on their past governmental experience and community regulations and/or ordinances. A typical process is to create a Work Order and issue a

Purchase Order for the work to be performed. Preparation of the Work Order is very important while thinking about the O&M strategy and asset management. The Work order allows the reviewer to know:

- A. If this maintenance was planned or unplanned
- B. The actual labor and materials cost included in the expense
- C. What was done to complete the work order
- D. Why the asset failed
- E. The impact that this work order had on customers

A Work Order template is included in Appendix D.

Provide procedures for emergency contracting and/or purchasing including:

- A. Authorization
- B. Budget Limit
- C. Existing on-call agreements

Asset Management Program (AMP) Guidance

Financial Section

Table of Contents

- I. Introduction**
- II. Forward-Looking Cash Flow Analysis**
- III. Historical Financial Statements**
- IV. Outstanding Long-Term Bonds and Leases**
- V. Other Items**

I. Introduction

This Section provides the guidelines for development of the required Financial requirements of the AMP. The Utility must develop and implement a Financial Plan that includes the following minimum requirements:

1. Forward-looking cash flow analysis
2. Historical financial statements
3. Listing of all outstanding debt with funding source and security
4. Last bond rating agency report
5. Current annual budget
6. Current rate ordinance and rate structure
7. Date of last rate review/examination/audit
8. Collection procedures for delinquent accounts

The purpose of the information in this Financial Section is to provide the Utility with financial information and forward-looking cash flow planning model that can be modified from time-to-time as different infrastructure needs arise and priorities change. As such, it should be considered a living document with the information updated periodically. Appendix E includes sample tables that can assist in the compilation of information listed in this portion of the AMP.

II. Forward Looking Cash Flow Analysis

The financial model will be helpful to assist Utility management to develop a plan to fund the future infrastructure needs detailed in the AMP. The long-term financial plan prepared by the Utility's municipal advisor should match the planning period covered in the AMP. It should also show the annual rate increases necessary to finance all of the revenue requirements of the Utility including any necessary bond issues and the resulting future debt service. The Forward-Looking Cash Flow Analysis should be updated at a minimum of every 5 years. See example for reference.

The minimum requirements for the Forward Looking Cash Flow Analysis are as follows:

1. Revenues by line item which should match the Utility's historical financial statements. Normal revenues include but are not limited to:
 - a. Revenues by user type, if available.
 - i. Residential
 - ii. Commercial
 - iii. Industrial
 - iv. Multi-family
 - v. Wholesale
 - b. Fire protection
 - c. Forfeited discounts/penalties
 - d. Excessive strength surcharges
 - e. System development charges fees
 - f. Interest Income
 - g. Other
2. Customer growth, if any
 - a. Historical and future assumptions

3. Collection rates
 - a. Historical and future assumptions
4. Operating expenses (by function if available) by line item which should match the Utility's historical financial statement. Normal expenses include but are not limited to:
 - a. Salaries and wages
 - b. Employee benefits
 - c. Purchased power
 - d. Chemicals
 - e. Sludge removal
 - f. Repairs and maintenance
 - g. Materials and supplies
 - h. Contractual services
 - i. Insurance
 - j. Rent
 - k. Transportation
 - l. Other
5. Future expense assumptions including assumed annual inflation rate
6. Capital improvement plan for the AMP period
7. Estimated project costs and funding schedule for bond funded projects
8. Outstanding bond debt service (Include amortization schedules)
9. Proposed bond debt service (Include amortization schedules)
 - a. Debt assumptions – terms, rates, funding source
10. Outstanding lease payments (Include amortization schedules)
11. Combined debt service schedule
12. Outstanding and proposed debt service reserve requirements
13. Capital improvement plan expenditures from rates and charges
14. Payment in lieu of property taxes and other transfers if applicable
15. Each year's cash flow should result in an increase/(decrease) in cash and cash equivalents and also have a beginning and ending balance. The ending balance for cash and cash equivalents should not go below the minimum required balance for operating cash and cash equivalents as determined by the Utility. The ending balance for cash and cash equivalents should not result in a negative balance.
16. Resulting rate increase required to fund requirements
17. Resulting average user rates assuming 4,000 gallons per month
18. Resulting debt service coverage meeting or exceeding SRF requirements

III. Historical Financial Statements

1. Historical financial statements should be included for the last three years
2. Audits
 - a. Prior to completing a drinking water or sewer infrastructure financing with SRF on or after July 1, 2019, an SRF Loan Recipient must submit, along with a standard SRF Due Diligence package, audited financial statements of the SRF Loan Recipient (an "Audit") performed by the Indiana State Board of Account or another independent public accountant of the calendar year ending no later than two years prior the SRF loan

closing date. The SRF Loan Program will no longer accept reviews or examinations; rather, instead, the SRF Loan Program will require that all SRF Loan Recipients submit to the SRF Loan Program an Audit of one the last two calendar years. Thus, prospective SRF Loan Recipients submitting an application are advised and encouraged to begin or continue undertaking the steps necessary to assure their Audit(s) are performed at an early enough stage so as to not delay completing a project financing with the SRF Loan Program.

i.

b. Beginning July 1, 2018, the standard SRF financial assistance loan agreement will include a requirement such that the SRF Loan Recipient will be required to prepare and submit an Audit every two years throughout the life of the repayment of the debt to the SRF Loan Program.

IV. Outstanding Long-Term Bonds and Leases

Provide a listing of the outstanding debt noting the funding source, security and bond rating.

V. Other Items

Attach or describe the other documents including:

1. Last bond rating agency report
2. Current annual budget
3. Current rate ordinance and rate structure
4. Date of last review

Appendix A

Technical Section – Workbook Tool

Asset Management Program Workbook Tool

Asset Management Program Team Template

Utility Information

Utility Name: Anytown Utilities Department
Street Address: 123 River Road
City: Anytown, IN
Zip Code: 47999
Phone Number: 740-867-5309
Email: utilities@anytownin.gov

NPDES Number:
Number of Connections:
Number of Customers:

Personnel

Contact Person:
Title:
Role:
Email:

Team Member:
Title:
Role:
Email:

Team Member:
Title:
Role:
Email:

Team Member:
Title:
Role:
Email:

Team Member:
Title:
Role:
Email:

Team Member:
Title:
Role:
Email:

Table 1a Sample List of Assets

Sample Wastewater Utility

Collection Assets

Northwest Sewershed
8"
Northeast Sewershed
8"
10"
Main Street Pump Station
copy from FSP but no screening
Force Main
South Sewershed
8"
10"
12"

Treatment Assets

Headworks - screens in building, no grit, no pumping
24" pipe
Oxidation ditches
24" pipe
Final clarifier splitter
24" pipe
Final clarifiers
24" pipe
Ultraviolet disinfection
24" pipe to outfall
RAS pump station
8" force main
WAS actuated valve
6" force main
Sludge holding tank
Dewatering building - feed pump, belt press, to landfill
Admin building - with lab
Drives, sidewalks, drainage
Generator

Asset Inventory

Table 1

Utility Name:	Wastewater
Current Plan Year:	2018

- Directions:
- A. List assets
 - B. Enter asset information
 - C. To add more assets use insert function and add rows then copy first asset row to new rows to transfer formulas
 - D. Enter information in yellow cells
 - E. Remaining cells will calculate automatically.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Collection Assets	Capacity / Size	Material	Manufacturer	Tag Number (Optional)	Original Cost	Replacement Cost	Year Installed	Expected Useful Life in Years	Remaining Useful Life in Years	Condition	Probability of Failure	Consequence of Failure	Criticality
Enter asset													0
Enter asset													0
Enter asset													0
Enter asset													0
Enter asset													0
Enter asset													0
Collection Assets Subtotal					\$0	\$0							0

A	B	C	D	E	F	G	H	I	J	K	L	M	N
Treatment Assets	Capacity / Size	Material	Manufacturer	Tag Number (Optional)	Original Cost	Replacement Cost	Year Installed	Expected Useful Life in Years	Remaining Useful Life in Years	Condition	Probability of Failure	Consequence of Failure	Criticality
Main Street Pump Station													
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Wastewater Treatment Plant													
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Enter asset									-2018				0
Treatment Assets Subtotal					\$0	\$0							0
Total of All Collection and Treatment Assets					\$0	\$0							0

Asset Rating Table 2

Column K	
Condition Assessment	
Condition Rating	Description
5	Unserviceable/End of useful life - Over 50% of asset requires replacement
4	Significant Deterioration - 20-40% requires renewal/upgrade
3	Moderate Deterioration - 10-20% requires significant maintenance
2	Minor Deterioration - Requires minor maintenance
1	New or Excellent Condition - Only normal maintenance required

Column L	
Probability of Failure	
Performance Rating	Description
5	Imminent - Likely to occur in the near future
4	Probable - Likely to occur several times in the life of an item
3	Occasional - Likely to occur sometime in the life of an item
2	Remote - Unlikely but possible to occur in the life of an item
1	Improbable - So unlikely, it can be assumed occurrence may not be experienced

Column M	
Consequence of Failure	
Performance Rating	Description
5	Catastrophic disruption
4	Major disruption
3	Moderate disruption
2	Minor disruption
1	Insignificant disruption

Replacement and/or Rehabilitation Expenses

Table 3

Directions:

A. List assets to be replaced or rehabilitated
B. Determine how long before action must take place
C. Enter cost to replace or rehabilitate
D. Enter "C" in column D for large replacement expenses that would be funded as a capital project separate from the reserve money set aside each year.
E. To add more replacement expenses, use insert function and add rows then copy first line item row to new rows to transfer formulas
F. Enter information in yellow cells
G. Remaining cells will calculate automatically.

Guidance Note:

Include items here that will need to be replaced during the normal course of operating the system.

Include only the items from the Asset Inventory (Table 1) with a remaining useful life less than 20 years.

A	B	C	D	E	F	G
Projects	Remaining Useful Life in Years	Replacement Cost	R = Use Reserve C = Capital Expense	Reserve Required Each Year	Future Capital Funds Required	Potential Funding Source
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Enter asset to be replaced				\$ -	\$ -	
Total Replacement Expenses Required in the Current Year				\$ -	\$ -	
Total Future Capital Funds Required					\$ -	

Future Improvement Expenses

Table 4

Directions:

A. List projects to be completed
B. Determine how long before the project must begin
C. Enter the total projected cost of the project
D. Enter "C" in column D for large replacement expenses that would be funded as a capital project separate from the reserve money set aside each year.
E. To add more improvement expenses, use insert function and add rows then copy first row to new rows to transfer formulas
F. Enter information in yellow cells.
G. Remaining cells will calculate automatically.

Guidance Note:

<p>Include improvements here which are related to:</p> <ol style="list-style-type: none"> 1. Future/upcoming regulations 2. Major asset replacement, such as structures, tanks, or interceptors 3. System expansion to provide additional capacity or service area 4. System consolidation or regionalization 5. Improved technology to replace obsolete technology 6. Climate resiliency <p>Include only projects expected to occur within the next 20 years.</p>
--

A	B	C	D	E	F	G
Projects	Years Until Project Must Begin	Cost	R = Use Reserve C = Capital Expense	Reserve Required Each Year	Future Capital Funds Required	Potential Funding Source
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Enter project	0	\$ -		\$ -	\$ -	
Total Improvement Expense Required in the Current Year				\$ -		
Total Future Capital Funds Required					\$ -	

Total Reserve Required for Facility Improvement Project
Table 5

Directions:

- | |
|--|
| A. Total Reserve Required will calculate automatically from the total replacement and total improvement expenses in Tables 3 and 4 respectively. |
| B. If reserve provided does not cover the total reserve required, additional funding for replacement and future improvement is needed |

Total Reserve Required Each Year	\$0
---	------------

Total Future Capital Funds Required	\$0
--	------------

Appendix B

Managerial Section – Sample Job Description Example/Template

Job Description

Example/Template

Job Title:	Operational Operator
Department:	Operations
Direct Manager/Supervisor:	Head Operator
Description Updated:	2018

POSITION SUMMARY

Licensed Operator with five or more years of design or field experience required. Responsible for project quality, schedule and budget. Project Manager Capabilities.

ESSENTIAL DUTIES AND RESPONSIBILITIES

- Operate
- Turn wrench
-
-
-

EDUCATION and/or EXPERIENCE

- Must possess Operators License. 5+ years' experience preferred. Continuing education to remain current with area of responsibility.
- 5 years-experience in related field.
- Strong verbal communications skills and the ability to effectively present information and respond to questions from groups of managers, equipment suppliers, contractors/consultants, and the general public are necessary.
- A strong understanding of operations.
- Ability to apply common sense understanding to carry out instructions.

WORK ENVIRONMENT AND PHYSICAL REQUIREMENTS

While performing the duties of this job, the employee is consistently outdoors and some physical exertion may be necessary.

Appendix C

Managerial Section – Cyber Security Information and Checklist

INDIANA FINANCE AUTHORITY
CYBER SECURITY PLAN CHECKLIST

INTRODUCTION

This document is a checklist of recommendations for maintaining the overall Cybersecurity posture of Water and/or Wastewater Treatment operations. At least twice a year, the utility should verify that people, systems and software continue to align with the cybersecurity plan. The checklist has been established for the utility to become compliant with Indiana Senate Enrolled Act 362.

This document and recommended actions in creating a cyber security plan are taken from EPA Water Sector Cybersecurity Brief for States and Indiana Department of Homeland Security Leadership for a Safe and Secure Indiana Cyber Security for Employees Fact Sheet.

Implementing cybersecurity best practices is critical for water and wastewater utilities. Cyber-attacks are a growing threat to critical infrastructure sectors, including water and wastewater systems. Many critical infrastructure facilities have experienced cybersecurity incidents that led to the disruption of a business process or critical operation.

CYBER THREATS TO WATER AND WASTEWATER SYSTEMS

Cyber-attacks on water or wastewater utility business enterprises or process control systems can cause significant harm, such as:

- Upset treatment and conveyance processes by opening and closing valves, overriding alarms or disabling pumps or other equipment;
- Deface the utility's website or compromise the email system;
- Steal customers' personal data or credit card information from the utility's billing system; and
- Install malicious programs like ransomware, which can disable business enterprise or processcontrol operations.

These attacks can: compromise the ability of water and wastewater utilities to provide clean and safe water to customers, erode customer confidence, and result in financial and legal liabilities.

BENEFITS OF A CYBERSECURITY PROGRAM

The good news is that cybersecurity best practices can be very effective in eliminating the vulnerabilities that cyber-attacks exploit. Implementing a basic cybersecurity program can:

- Ensure the integrity of process control systems;
- Protect sensitive utility and customer information;
- Reduce legal liabilities if customer or employee personal information is stolen; and
- Maintain customer confidence.

CHALLENGES FOR UTILITIES IN STARTING A CYBERSECURITY PROGRAM

Many water and wastewater utilities, particularly small systems, lack the resources for information technology (IT) and security specialists to assist them with starting a cybersecurity program. Utility personnel may believe that cyber-attacks do not present a risk to their systems or feel that they lack the technical capability to improve their cybersecurity.

Basic cybersecurity best practices can be carried out by utility personnel without specialized training, and user-friendly resources are available to help. The Cybersecurity & Infrastructure Security Agency (CISA) Cyber Vulnerability Scanning tool can be used to determine strengths and weaknesses within the utility's cyber infrastructure. Information related to this tool is located [here](#). A CISA fact sheet is provided in this appendix for reference.

CHECKLIST FOR CYBERSECURITY

IDENTIFY

- Keep an inventory of control system devices and ensure this equipment is not exposed to networks outside the utility
 - Never allow any machine on the control network to “talk” directly to a machine on the business network or on the Internet
- Write down the roles and responsibilities of all personnel including Managers, Operators, Clerks, Superintendents, Council Members, and Suppliers
- Identify the critical service of the utility and the minimum requirements to support the delivery of the critical service
- Identify the legal and regulatory requirements of the utility
- Conduct a risk assessment that identifies asset and data vulnerabilities, internal and external vulnerabilities, and the potential business impacts
 - Assets include physical assets, including computers, mobile devices
 - Data may include personal information related to customers or operations information
- Establish a risk management strategy that identifies the level of protection required for different information and operation and provides the implementation strategy to protect the information and operations and subsequently monitor the protection.

PROTECT

- Segregate any SCADA networks from business networks and apply firewalls
 - Classify IT assets, data, and personnel into specific groups, and restrict access to these groups.
- Use secure remote access methods
 - A secure method, like a virtual private network, should be used if remote access is required.
- Establish roles to control access to different networks and log system users
 - Based on job functions (role-based)
 - Lock the screen on computers when leaving the area
 - Keep devices physically locked up while travelling
- Require and enforce strong passwords and password management practices and policies
 - Use strong passwords, at least 8 characters
 - Have different passwords for different accounts.
 - Requires passwords to be changed regularly
 - Remember passwords; do not write them down
- Stay aware of vulnerabilities and implement patches and updates when needed
 - Monitor for and apply IT system patches and updates.
 - Update antivirus software on all devices
- Enforce policies for the security of devices
 - Limit the use of mobile devices on your networks and ensure devices are password protected.
- Have an employee cybersecurity training program
 - All employees should receive regular cybersecurity training

- Do not open unsolicited or unknown emails
- Involve utility executives in cybersecurity
 - Organizational leaders are often unaware of cybersecurity threats and needs.

DETECT

- Monitor for anomalies and events
 - Establish a baseline of network operations and expected data flow, analyze detected events to understand targets and methods, and determine the impact of the event
 - Establish when an incident gets reported (alert threshold)
 - See attached Steps for Responding to a Suspected Cyber Incident at a Water or Wastewater Utility
- Continuously monitor for network intrusions and have a plan in place to respond
 - Monitor the physical environment, personnel activity, external service provider activity, unauthorized personnel, connections, devices and software
 - Perform vulnerability scans
 - Be capable of detecting a compromise quickly and executing an incident response plan.
 - Stay informed on latest risks
- Implement detection processes
 - Define the roles and responsibilities for detection and communicate the event detection information
 - Test the detection process
 - Register for cyber security alerts and advisories from water sector and government partners
 - Ensure the control system network is separated from the public network

RESPOND

- Develop a Response Plan to ensure that staff is aware of security policies and incident response/notification procedures
 - See attached Steps for Responding to a Suspected Cyber Incident at a Water or Wastewater Utility
- Communicate
 - Incidents are reported and information is shared in accordance with the established criteria
- Analysis
 - Investigate and categorize the incidents
 - Establish procedures to receive, analyze and respond to vulnerabilities
- Contain and mitigate the incident

RECOVER

- Develop a Recovery Plan that includes processes and procedures to ensure the restoration of systems and assets affected by the incident
- Improve recovery and update recovery strategies by incorporating lessons learned
- Communicate recovery activities to internal and external stakeholders, managerial teams, and the public

STEPS FOR RESPONDING TO A SUSPECTED CYBER INCIDENT AT A WATER OR WASTEWATER UTILITY

Response

1. Disconnect compromised computers from the network. Do *not* turn off or reboot systems.
2. Assess the scope of the compromise, and isolate all affected IT systems.
3. Open a ticket with your antivirus software or security service vendor.
4. Assess any potential damage, including impacts to treatment processes or service disruptions.
5. Initiate manual operation of equipment if control systems have been compromised.
6. Distribute any advisories or alerts to customers as needed, including customers whose records may have been compromised.
7. Identify methods to scan all IT assets to eradicate malicious code. Assess and implement recovery procedures.

Reporting

1. Report the incident to local law enforcement and the primary oversight agency (typically, the state).
2. Contact the National Cybersecurity and Communications Integration Center (NCCIC) at 888-282-0870 or NCCIC@hq.dhs.gov. NCCIC can assist your utility with identifying and restoring affected systems, coordinating federal assistance, and improving security.
3. Submit an incident report through [WaterISAC \(analyst@waterisac.org\)](mailto:analyst@waterisac.org); 866-H2O-ISAC).

IMPORTANT CONTACT INFORMATION

Role	Point of Contact	Phone Number	Email
IT service vendor			
Local law enforcement			
State agency			
National Cybersecurity and Communications Integration Center (NCCIC)		888-282-0870	NCCIC@hq.dhs.gov
WaterISAC		866-426-4722 (866-H2O-ISAC)	analyst@waterisac.org

For More Information

For more information on available cybersecurity guidance and resources:

- [WaterISAC 10 Basic Cybersecurity Measures: Best Practices to Reduce Exploitable Weaknesses and Attacks](#)
- [Department of Homeland Security Critical Infrastructure Cyber Community Voluntary Program](#)
- [American Water Works Association \(AWWA\) Cybersecurity Guidance and Tool](#)
- <https://www.epa.gov/homeland-security-research/water-system-security-and-resilience-homeland-security-research>



Top Cyber Actions for Securing Water Systems



Overview

Water and Wastewater Systems Sector entities (herein referred to as “water systems”) run operational technology (OT) and information technology (IT) systems that are too often vulnerable to cyberattacks. This fact sheet highlights the top cyber actions water systems can take today to reduce cyber risk and improve resilience to cyberattacks and provides free services, resources, and tools to support these actions, which can be taken concurrently.^{1,2,3} Visit CISA’s [Water and Wastewater Systems Cybersecurity](#) and EPA’s [Cybersecurity for the Water Sector](#) webpages for more information and resources.

Buyer beware: Technology manufacturers make security choices that affect the quality of their software and hardware. Review CISA’s [Secure by Design](#) guidance and ask your vendors how they are adopting the secure by design principles and tactics within their products to mitigate cybersecurity threats.

1. Reduce Exposure to the Public-Facing Internet

Use cyber hygiene services to reduce exposure of key assets to the public-facing internet. OT devices such as controllers and remote terminal units (RTUs) are easy targets for cyberattacks when connected to the internet.

- **Free resource:** [CISA’s Free Cyber Vulnerability Scanning for Water Utilities](#) fact sheet explains the process and benefits of signing up for CISA’s free vulnerability scanning program.
- **Free service:** Email vulnerability@cisa.dhs.gov with the subject line, “Requesting Cyber Hygiene Services” for [CISA Cyber Hygiene Services](#), which proactively identify and enable timely mitigation of internet-exposed assets.

2. Conduct Regular Cybersecurity Assessments

Conduct a cybersecurity assessment on a regular basis to understand the existing vulnerabilities within OT and IT systems. Assessments enable you to identify, assess, and prioritize threats to vulnerabilities in both OT and IT networks.

- **Free service:** [EPA Cybersecurity Assessments](#) can help assess cybersecurity posture.
- **Free resource:** [CISA’s Cross-Sector Cybersecurity Performance Goals](#) (CPGs) provide a set of baseline cyber protections. CISA provides a free CPG assessment that can be administered by a CISA cybersecurity advisor (listed at [CISA Regions | CISA](#)) or through a self-assessment.

3. Change Default Passwords Immediately

Require unique, strong, and complex passwords for all water systems, including connected infrastructure. Weak default or insecure passwords are easy to discover and exploit, and they may allow cyber threat actors to make changes to a water systems’ operational processes. This can negatively impact public health and safety. Change default or insecure passwords and implement multifactor authentication (MFA) where possible. Focus on deploying MFA to IT infrastructure, such as email, to make it difficult for threat actors to access OT systems. Consider asking manufacturers to [eliminate default passwords](#).

- **Free resources:** [CISA’s Secure our World Campaign: Use Strong Passwords](#) and [More than a Password Campaign](#). For additional cyber guidance, see [CISA’s Cyber Guidance for Small Businesses](#).

¹ The Cybersecurity and Infrastructure Security Agency (CISA), Environmental Protection Agency (EPA), and Federal Bureau of Investigation (FBI) jointly authored this fact sheet.

² Joint FBI-CISA-NSA-EPA-INCD Advisory: [IRGC-Affiliated Cyber Actors Exploit PLCs in Multiple Sectors, Including U.S. WWS Facilities](#)

³ Joint FBI-CISA-EPA-NSA Cybersecurity Advisory: [Ongoing Cyber Threats to U.S. Water and Wastewater Systems](#)

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TLP:CLEAR

4. Conduct an Inventory of OT/IT Assets

Create an inventory of software and hardware assets to help understand what you need to protect. Focus initial efforts on internet-connected devices and devices where manual operations are not possible. Use monitoring to identify the devices communicating on your network.

- **Free service:** [EPA's Cybersecurity Technical Assistance Program](#) supports you in conducting an inventory.
- **Free tool:** A first step in conducting an inventory is identifying the devices on the network. [CISA's Malcolm tool](#) enables network monitoring with custom parsers designed for industrial control system (ICS)/OT protocols.

5. Develop and Exercise Cybersecurity Incident Response and Recovery Plans

Develop

Understand incident response actions, roles, responsibilities, as well as who to contact and how to report a cyber incident before one occurs to ensure readiness against potential targeting.

- **Free resources:** EPA's [Cybersecurity Action Checklist](#) and CISA's [Incident Response Plan \(IRP\) Basics](#) help to develop cyber incident response plans. The [Joint CISA-FBI-EPA Water Incident Response Guide](#) provides valuable information on how to work with federal response partners before, during, and after a cyber incident. **Note:** See this guide for contact information for [CISA](#), [FBI](#), and the [EPA Water Infrastructure and Cyber Resilience Division](#).

Exercise

Test your incident response plan annually to ensure all operators are familiar with roles and responsibilities.

- **Free tools:** [CISA Tabletop Exercise Package \(CTEP\)](#) and [EPA tabletop exercise \(TTX\)](#) scenario tools assist critical infrastructure owners and operators in developing their own tabletop exercises to meet their specific needs.

6. Backup OT/IT Systems

Regularly backup OT/IT systems so you can recover to a known and safe state in the event of a compromise. Test backup procedures and isolate backups from network connections. Implement the NIST 3-2-1 rule: 3) Keep three copies: one primary and two backups; 2) Keep the backups on two different media types; 1) Store one copy offsite.

- **Free resources:** [CISA's Cyber Essentials Toolkit Chapter 5: Your Data](#) and [NIST's Protecting Data From Ransomware and Other Data Loss Events](#) provide guidance on backing up your systems.

7. Reduce Exposure to Vulnerabilities

Mitigate known vulnerabilities and keep all systems up to date with patches and security updates. Prioritize OT patches in accordance with [CISA's Known Exploited Vulnerabilities \(KEV\) catalog](#) during scheduled downtime of OT equipment; prioritize patches in IT, as applicable. [CISA's Secure our World Campaign](#) provides guidance on updating software.

8. Conduct Cybersecurity Awareness Training

Conduct cybersecurity awareness training annually, at a minimum, to help all employees understand the importance of cybersecurity and how to prevent and respond to cyberattacks.

- **Free resources:** See [EPA Cybersecurity Training](#) and CISA's free [Industrial Control Systems](#) cybersecurity virtual training to learn how to protect against cyberattacks to critical infrastructure. Also see [CISA's Secure our World Campaign: Employee Phishing Training](#) for practical steps to help your employees avoid phishing scams.

Support

If you require additional support for implementing any of these actions, contact [EPA](#) and/or your regional [CISA cybersecurity advisor](#) for assistance.

Appendix D

Managerial Section –Work Order Template

WORK ORDER

Work Order No.: _____ Date: _____

Work Order Type: Planned: _____ Unplanned: _____

Equipment Name: _____ Equipment No.: _____

Work To Be Performed:

Job Estimate:

- 1. Labor: \$ _____
- 2. Plant: \$ _____
- 3. Material: \$ _____

Work Performed By:

- 1. _____
- 2. _____
- 3. _____
- 4. _____

Procedures Followed:

Primary Cause of Failure:

Impact on Customers:

Other Issues:

Signed: _____

Date: _____

Comments:

Appendix E

Financial Section – Sample Tables

ANYTOWN WATER UTILITY/SEWAGE WORKS

UTILITY CAPITAL IMPROVEMENT PLAN

Capital Improvement Categories:	Estimated Project Year										Totals	
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027		
Gravity and pressure lines			\$50,000		\$100,000	\$125,000						\$275,000
Valves, hydrants, fittings, backflow preventors, sample stations, chemical feed points, manholes, inlets	\$10,000	\$10,000	10,000	\$10,000	10,000	10,000	\$10,000	\$10,000	\$10,000	\$10,000		100,000
Lead lines as identified						100,000						100,000
Booster/lift stations	25,000			100,000			50,000				225,000	400,000
Water or wastewater treatment plants									1,000,000	1,000,000		2,000,000
Water or wastewater storage facilities					500,000							500,000
Meters	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500		75,000
Wells						300,000						300,000
CSO outfalls and diversion structures												-
Other	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000		500,000
Totals	92,500	67,500	117,500	167,500	667,500	592,500	117,500	67,500	1,067,500	1,292,500		4,250,000
Less assumed bond funding					(550,000)	(475,000)			(1,000,000)	(1,200,000)		(3,225,000)
Net Rate Fund Capital	<u>\$92,500</u>	<u>\$67,500</u>	<u>\$117,500</u>	<u>\$167,500</u>	<u>\$117,500</u>	<u>\$117,500</u>	<u>\$117,500</u>	<u>\$67,500</u>	<u>\$67,500</u>	<u>\$92,500</u>		<u>\$1,025,000</u>

Note: These are samples of standard capital improvements. Add other improvements as necessary.

(Continued on next page)

ANYTOWN WATER UTILITY/SEWAGE WORKS

(Cont'd)

UTILITY CAPITAL IMPROVEMENT PLAN

Capital Improvement Categories:	Sub-totals	Estimated Project Year										Totals
		2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	
Gravity and pressure lines	\$275,000			\$50,000		\$100,000		\$125,000	\$100,000	\$100,000	\$100,000	\$850,000
Valves, hydrants, fittings, backflow preventors, sample stations, chemical feed points, manholes, inlets	100,000	\$10,000	\$10,000	10,000	\$10,000	10,000	\$10,000	10,000	10,000	10,000	10,000	200,000
Lead lines as identified	100,000		50,000									150,000
Booster/lift stations	400,000	25,000			100,000			25,000			250,000	800,000
Water or wastewater treatment plants	2,000,000											2,000,000
Water or wastewater storage facilities	500,000											500,000
Meters	75,000	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	7,500	150,000
Wells	300,000										100,000	400,000
CSO outfalls and diversion structures	-											-
Other	500,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	1,000,000
Totals	4,250,000	92,500	117,500	117,500	167,500	167,500	67,500	217,500	167,500	167,500	517,500	6,050,000
Less assumed bond funding	(3,225,000)											(3,225,000)
Net Rate Fund Capital	<u>\$1,025,000</u>	<u>\$92,500</u>	<u>\$117,500</u>	<u>\$117,500</u>	<u>\$167,500</u>	<u>\$167,500</u>	<u>\$67,500</u>	<u>\$217,500</u>	<u>\$167,500</u>	<u>\$167,500</u>	<u>\$517,500</u>	<u>\$2,825,000</u>
Average annual rate funded capital improvements												<u>\$141,300</u>

Note: These are samples of standard capital improvements. Add other improvements as necessary.

ANYTOWN WATER UTILITY/SEWAGE WORKS

**SCHEDULE OF AMORTIZATION OF \$2,955,000 PRINCIPAL AMOUNT
OF OUTSTANDING [SEWAGE WORKS/WATERWORKS] REVENUE BONDS OF 2012**

Payment Date	Principal Balance (-----In \$1,000's-----)	Principal	Interest Rate (%)	Debt Service		Bond Year Total
				Interest	Total	
				-----In Dollars-----		
07/01/18	\$2,955	\$70	3.00	\$44,325.00	\$114,325.00	
01/01/19	2,885	75	3.00	43,275.00	118,275.00	\$232,600.00
07/01/19	2,810	75	3.00	42,150.00	117,150.00	
01/01/20	2,735	75	3.00	41,025.00	116,025.00	233,175.00
07/01/20	2,660	75	3.00	39,900.00	114,900.00	
01/01/21	2,585	80	3.00	38,775.00	118,775.00	233,675.00
07/01/21	2,505	80	3.00	37,575.00	117,575.00	
01/01/22	2,425	80	3.00	36,375.00	116,375.00	233,950.00
07/01/22	2,345	80	3.00	35,175.00	115,175.00	
01/01/23	2,265	85	3.00	33,975.00	118,975.00	234,150.00
07/01/23	2,180	85	3.00	32,700.00	117,700.00	
01/01/24	2,095	85	3.00	31,425.00	116,425.00	234,125.00
07/01/24	2,010	85	3.00	30,150.00	115,150.00	
01/01/25	1,925	90	3.00	28,875.00	118,875.00	234,025.00
07/01/25	1,835	90	3.00	27,525.00	117,525.00	
01/01/26	1,745	90	3.00	26,175.00	116,175.00	233,700.00
07/01/26	1,655	90	3.00	24,825.00	114,825.00	
01/01/27	1,565	95	3.00	23,475.00	118,475.00	233,300.00
07/01/27	1,470	95	3.00	22,050.00	117,050.00	
01/01/28	1,375	95	3.00	20,625.00	115,625.00	232,675.00
07/01/28	1,280	100	3.00	19,200.00	119,200.00	
01/01/29	1,180	100	3.00	17,700.00	117,700.00	236,900.00
07/01/29	1,080	100	3.00	16,200.00	116,200.00	
01/01/30	980	100	3.00	14,700.00	114,700.00	230,900.00
07/01/30	880	105	3.00	13,200.00	118,200.00	
01/01/31	775	105	3.00	11,625.00	116,625.00	234,825.00
07/01/31	670	105	3.00	10,050.00	115,050.00	
01/01/32	565	110	3.00	8,475.00	118,475.00	233,525.00
07/01/32	455	110	3.00	6,825.00	116,825.00	
01/01/33	345	110	3.00	5,175.00	115,175.00	232,000.00
07/01/33	235	115	3.00	3,525.00	118,525.00	
01/01/34	120	120	3.00	1,800.00	121,800.00	240,325.00
		<u>\$2,955</u>		<u>\$788,850.00</u>	<u>\$3,743,850.00</u>	<u>\$3,743,850.00</u>

ANYTOWN WATER UTILITY/SEWAGE WORKS

SCHEDULE OF ESTIMATED PROJECT COSTS AND FUNDING

<u>ESTIMATED PROJECT COSTS</u>	Years	
	<u>2022</u>	<u>2026</u>
Estimated Construction Costs and Contingencies:		
Project __	\$855,000	
Project __		\$1,850,000
	<u>855,000</u>	<u>1,850,000</u>
Estimated Non-Construction Costs:		
Engineering	170,000	350,000
Grant administration (if grant funding is anticipated)		
Underwriter's discount (for open market bonds)		
Legal, bond counsel, financial advisory and contingencies	<u>90,000</u>	<u>90,000</u>
	<u>260,000</u>	<u>440,000</u>
Total Estimated Project Costs	<u><u>\$1,115,000</u></u>	<u><u>\$2,290,000</u></u>
<u>ESTIMATED PROJECT FUNDING</u>		
Proposed [Sewage Works/Waterworks] revenue bonds	\$1,115,000	\$2,290,000
Grant funding		
Cash on hand		
	<u>1,115,000</u>	<u>2,290,000</u>
Total Estimated Project Funding	<u><u>\$1,115,000</u></u>	<u><u>\$2,290,000</u></u>

Note: Include in this schedule the bond funding requirements from the Utility Capital Improvement Plan schedules.

ANYTOWN WATER UTILITY/SEWAGE WORKS

**SCHEDULE OF AMORTIZATION OF \$1,115,000 PRINCIPAL AMOUNT
OF PROPOSED [SEWAGE WORKS/WATERWORKS] REVENUE BONDS OF 2022**

Assumes bonds are issued July 1, 2022.

Payment Date	Principal Balance (-----In \$1,000's-----)	Principal	Assumed Interest Rate* (%)	Debt Service		Bond Year Total
				Interest	Total	
01/01/23	\$1,115			\$22,300.00	\$22,300.00	\$22,300.00
07/01/23	1,115	\$20	4.00	22,300.00	42,300.00	
01/01/24	1,095	20	4.00	21,900.00	41,900.00	84,200.00
07/01/24	1,075	20	4.00	21,500.00	41,500.00	
01/01/25	1,055	20	4.00	21,100.00	41,100.00	82,600.00
07/01/25	1,035	20	4.00	20,700.00	40,700.00	
01/01/26	1,015	20	4.00	20,300.00	40,300.00	81,000.00
07/01/26	995	20	4.00	19,900.00	39,900.00	
01/01/27	975	20	4.00	19,500.00	39,500.00	79,400.00
07/01/27	955	20	4.00	19,100.00	39,100.00	
01/01/28	935	20	4.00	18,700.00	38,700.00	77,800.00
07/01/28	915	20	4.00	18,300.00	38,300.00	
01/01/29	895	25	4.00	17,900.00	42,900.00	81,200.00
07/01/29	870	25	4.00	17,400.00	42,400.00	
01/01/30	845	25	4.00	16,900.00	41,900.00	84,300.00
07/01/30	820	25	4.00	16,400.00	41,400.00	
01/01/31	795	25	4.00	15,900.00	40,900.00	82,300.00
07/01/31	770	25	4.00	15,400.00	40,400.00	
01/01/32	745	25	4.00	14,900.00	39,900.00	80,300.00
07/01/32	720	25	4.00	14,400.00	39,400.00	
01/01/33	695	25	4.00	13,900.00	38,900.00	78,300.00
07/01/33	670	25	4.00	13,400.00	38,400.00	
01/01/34	645	30	4.00	12,900.00	42,900.00	81,300.00
07/01/34	615	30	4.00	12,300.00	42,300.00	
01/01/35	585	30	4.00	11,700.00	41,700.00	84,000.00
07/01/35	555	30	4.00	11,100.00	41,100.00	
01/01/36	525	30	4.00	10,500.00	40,500.00	81,600.00
07/01/36	495	30	4.00	9,900.00	39,900.00	
01/01/37	465	30	4.00	9,300.00	39,300.00	79,200.00
07/01/37	435	30	4.00	8,700.00	38,700.00	
01/01/38	405	35	4.00	8,100.00	43,100.00	81,800.00
07/01/38	370	35	4.00	7,400.00	42,400.00	
01/01/39	335	35	4.00	6,700.00	41,700.00	84,100.00
07/01/39	300	35	4.00	6,000.00	41,000.00	
01/01/40	265	35	4.00	5,300.00	40,300.00	81,300.00
07/01/40	230	35	4.00	4,600.00	39,600.00	
01/01/41	195	35	4.00	3,900.00	38,900.00	78,500.00
07/01/41	160	40	4.00	3,200.00	43,200.00	
01/01/42	120	40	4.00	2,400.00	42,400.00	85,600.00
07/01/42	80	40	4.00	1,600.00	41,600.00	
01/01/43	40	40	4.00	800.00	40,800.00	82,400.00
		<u>\$1,115</u>		<u>\$538,500.00</u>	<u>\$1,653,500.00</u>	<u>\$1,653,500.00</u>

*Assumes a 4% SRF interest rate.

ANYTOWN WATER UTILITY/SEWAGE WORKS

**SCHEDULE OF AMORTIZATION OF \$2,290,000 PRINCIPAL AMOUNT
OF PROPOSED [SEWAGE WORKS/WATERWORKS] REVENUE BONDS OF 2026**

Assumes bonds are issued July 1, 2026.

Payment Date	Principal		Assumed Interest Rate* (%)	Debt Service		Bond Year Total
	Balance (-----In \$1,000's-----)	Principal		Interest	Total (-----In Dollars-----)	
01/01/27	\$2,290			\$57,250.00	\$57,250.00	\$57,250.00
07/01/27	2,290	\$35	5.00	57,250.00	92,250.00	
01/01/28	2,255	35	5.00	56,375.00	91,375.00	183,625.00
07/01/28	2,220	35	5.00	55,500.00	90,500.00	
01/01/29	2,185	35	5.00	54,625.00	89,625.00	180,125.00
07/01/29	2,150	35	5.00	53,750.00	88,750.00	
01/01/30	2,115	40	5.00	52,875.00	92,875.00	181,625.00
07/01/30	2,075	40	5.00	51,875.00	91,875.00	
01/01/31	2,035	40	5.00	50,875.00	90,875.00	182,750.00
07/01/31	1,995	40	5.00	49,875.00	89,875.00	
01/01/32	1,955	40	5.00	48,875.00	88,875.00	178,750.00
07/01/32	1,915	45	5.00	47,875.00	92,875.00	
01/01/33	1,870	45	5.00	46,750.00	91,750.00	184,625.00
07/01/33	1,825	45	5.00	45,625.00	90,625.00	
01/01/34	1,780	45	5.00	44,500.00	89,500.00	180,125.00
07/01/34	1,735	50	5.00	43,375.00	93,375.00	
01/01/35	1,685	50	5.00	42,125.00	92,125.00	185,500.00
07/01/35	1,635	50	5.00	40,875.00	90,875.00	
01/01/36	1,585	50	5.00	39,625.00	89,625.00	180,500.00
07/01/36	1,535	55	5.00	38,375.00	93,375.00	
01/01/37	1,480	55	5.00	37,000.00	92,000.00	185,375.00
07/01/37	1,425	55	5.00	35,625.00	90,625.00	
01/01/38	1,370	55	5.00	34,250.00	89,250.00	179,875.00
07/01/38	1,315	60	5.00	32,875.00	92,875.00	
01/01/39	1,255	60	5.00	31,375.00	91,375.00	184,250.00
07/01/39	1,195	60	5.00	29,875.00	89,875.00	
01/01/40	1,135	65	5.00	28,375.00	93,375.00	183,250.00
07/01/40	1,070	65	5.00	26,750.00	91,750.00	
01/01/41	1,005	65	5.00	25,125.00	90,125.00	181,875.00
07/01/41	940	70	5.00	23,500.00	93,500.00	
01/01/42	870	70	5.00	21,750.00	91,750.00	185,250.00
07/01/42	800	70	5.00	20,000.00	90,000.00	
01/01/43	730	75	5.00	18,250.00	93,250.00	183,250.00
07/01/43	655	75	5.00	16,375.00	91,375.00	
01/01/44	580	75	5.00	14,500.00	89,500.00	180,875.00
07/01/44	505	80	5.00	12,625.00	92,625.00	
01/01/45	425	80	5.00	10,625.00	90,625.00	183,250.00
07/01/45	345	85	5.00	8,625.00	93,625.00	
01/01/46	260	85	5.00	6,500.00	91,500.00	185,125.00
07/01/46	175	85	5.00	4,375.00	89,375.00	
01/01/47	90	90	5.00	2,250.00	92,250.00	181,625.00
		<u>\$2,290</u>		<u>\$1,418,875.00</u>	<u>\$3,708,875.00</u>	<u>\$3,708,875.00</u>

*Assumes a 5% SRF interest rate.

ANYTOWN WATER UTILITY/SEWAGE WORKS

SCHEDULE OF PROPOSED COMBINED BOND AMORTIZATION

<u>Bond Year Ending</u>	<u>Outstanding Bonds</u>	<u>Proposed Bonds 1</u>	<u>Proposed Bonds 2</u>	<u>Total</u>	<u>Bond Year Total</u>
07/01/18	\$114,325.00			\$114,325.00	
01/01/19	118,275.00			118,275.00	\$232,600.00
07/01/19	117,150.00			117,150.00	
01/01/20	116,025.00			116,025.00	233,175.00
07/01/20	114,900.00			114,900.00	
01/01/21	118,775.00			118,775.00	233,675.00
07/01/21	117,575.00			117,575.00	
01/01/22	116,375.00			116,375.00	233,950.00
07/01/22	115,175.00			115,175.00	
01/01/23	118,975.00	\$22,300.00		141,275.00	256,450.00
07/01/23	117,700.00	42,300.00		160,000.00	
01/01/24	116,425.00	41,900.00		158,325.00	318,325.00
07/01/24	115,150.00	41,500.00		156,650.00	
01/01/25	118,875.00	41,100.00		159,975.00	316,625.00
07/01/25	117,525.00	40,700.00		158,225.00	
01/01/26	116,175.00	40,300.00		156,475.00	314,700.00
07/01/26	114,825.00	39,900.00		154,725.00	
01/01/27	118,475.00	39,500.00	\$57,250.00	215,225.00	369,950.00
07/01/27	117,050.00	39,100.00	92,250.00	248,400.00	
01/01/28	115,625.00	38,700.00	91,375.00	245,700.00	494,100.00
07/01/28	119,200.00	38,300.00	90,500.00	248,000.00	
01/01/29	117,700.00	42,900.00	89,625.00	250,225.00	498,225.00
07/01/29	116,200.00	42,400.00	88,750.00	247,350.00	
01/01/30	114,700.00	41,900.00	92,875.00	249,475.00	496,825.00
07/01/30	118,200.00	41,400.00	91,875.00	251,475.00	
01/01/31	116,625.00	40,900.00	90,875.00	248,400.00	499,875.00
07/01/31	115,050.00	40,400.00	89,875.00	245,325.00	
01/01/32	118,475.00	39,900.00	88,875.00	247,250.00	492,575.00
07/01/32	116,825.00	39,400.00	92,875.00	249,100.00	
01/01/33	115,175.00	38,900.00	91,750.00	245,825.00	494,925.00
07/01/33	118,525.00	38,400.00	90,625.00	247,550.00	
01/01/34	121,800.00	42,900.00	89,500.00	254,200.00	501,750.00
07/01/34		42,300.00	93,375.00	135,675.00	
01/01/35		41,700.00	92,125.00	133,825.00	269,500.00
07/01/35		41,100.00	90,875.00	131,975.00	
01/01/36		40,500.00	89,625.00	130,125.00	262,100.00
07/01/36		39,900.00	93,375.00	133,275.00	
01/01/37		39,300.00	92,000.00	131,300.00	264,575.00
07/01/37		38,700.00	90,625.00	129,325.00	
01/01/38		43,100.00	89,250.00	132,350.00	261,675.00
07/01/38		42,400.00	92,875.00	135,275.00	
01/01/39		41,700.00	91,375.00	133,075.00	268,350.00
07/01/39		41,000.00	89,875.00	130,875.00	
01/01/40		40,300.00	93,375.00	133,675.00	264,550.00
07/01/40		39,600.00	91,750.00	131,350.00	
01/01/41		38,900.00	90,125.00	129,025.00	260,375.00
07/01/41		43,200.00	93,500.00	136,700.00	
01/01/42		42,400.00	91,750.00	134,150.00	270,850.00
07/01/42		41,600.00	90,000.00	131,600.00	
01/01/43		40,800.00	93,250.00	134,050.00	265,650.00
07/01/43			91,375.00	91,375.00	
01/01/44			89,500.00	89,500.00	180,875.00
07/01/44			92,625.00	92,625.00	
01/01/45			90,625.00	90,625.00	183,250.00
07/01/45			93,625.00	93,625.00	
01/01/46			91,500.00	91,500.00	185,125.00
07/01/46			89,375.00	89,375.00	
01/01/47			92,250.00	92,250.00	181,625.00
Totals:	<u>\$3,743,850.00</u>	<u>\$1,653,500.00</u>	<u>\$3,708,875.00</u>	<u>\$9,106,225.00</u>	<u>\$9,106,225.00</u>

ANYTOWN WATER UTILITY/SEWAGE WORKS

ESTIMATED ANNUAL CASH OPERATING EXPENSES

	<u>Test Year</u>	<u>Adjustment</u>	<u>Ref.</u>	<u>Estimated 2018</u>
Annual Operating Expenses:				
Salaries and wages	\$350,000	\$35,000	(1)	\$385,000
Employee pensions and benefits	125,000	12,500	(2)	137,500
Purchased water/treatment	100,000			100,000
Materials and supplies	15,000	500	(3)	15,500
Chemicals	95,000	2,900	(3)	97,900
Repairs and maintenance [Sludge removal]	50,000	25,000	(4)	75,000
Contractual services	50,000	1,500	(3)	51,500
Utilities	75,000	2,300	(3)	77,300
Transportation	23,000	700	(3)	23,700
Insurance	60,000	2,000	(4)	62,000
Miscellaneous	7,000	200	(3)	7,200
	<u>\$950,000</u>	<u>\$82,600</u>		<u>\$1,032,600</u>

References

- (1) Assumes the salaries and wages are adjusted per the adopted salary ordinance and the addition of one new employee.
- (2) Benefits are based on current premiums and the addition of one new employee.
- (3) Assumes a 3% inflationary increase.
- (4) The repairs and maintenance and insurance expenses are adjusted to the budgeted amount and to provide an allowance for tank maintenance.

ANYTOWN WATER UTILITY/SEWAGE WORKS
SCHEDULE OF ESTIMATED REVENUES, EXPENSES,
ENDING CASH AND RESULTING AVERAGE MONTHLY BILL

	Estimated Year									
	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Operating Revenues:										
Metered sales/Collections (1)										
Residential	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000
Commercial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Industrial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Governmental	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Fire protection (1)	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Additional revenues from rate increases (2)		57,300	115,300	175,800	238,900	312,000	388,600	468,800	569,600	693,900
Capacity fees (3)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Other revenues (4)	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Total Operating Revenues	1,355,000	1,412,300	1,470,300	1,530,800	1,593,900	1,667,000	1,743,600	1,823,800	1,924,600	2,048,900
Operation and Maintenance Expenses (5)	1,032,600	1,063,600	1,095,500	1,128,400	1,162,300	1,197,200	1,233,100	1,270,100	1,308,200	1,347,400
Net Operating Revenues	322,400	348,700	374,800	402,400	431,600	469,800	510,500	553,700	616,400	701,500
Non-Operating Revenues										
Interest income (4)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Misc. Revenues (4)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total Non-Operating Revenues	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Non-Operating Expenditures:										
Outstanding and proposed debt service (6)	232,600	233,200	233,700	234,000	256,500	318,300	316,600	314,700	370,000	494,100
Debt service reserve funding (7)					8,600	17,100	17,100	17,100	35,700	45,700
Payment in lieu of taxes (4)	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Capital improvements - cash funded (8)	92,500	67,500	117,500	167,500	117,500	117,500	117,500	67,500	67,500	92,500
Total Non-Operating Expenditures	350,100	325,700	376,200	426,500	407,600	477,900	476,200	424,300	498,200	657,300
Increase (Decrease) in Cash and Cash Equivalents	(25,200)	25,500	1,100	(21,600)	26,500	(5,600)	36,800	131,900	120,700	46,700
Beginning Cash and Cash Equivalents	750,000	724,800	750,300	751,400	729,800	756,300	750,700	787,500	919,400	1,040,100
Ending Cash and Cash Equivalents	\$724,800	\$750,300	\$751,400	\$729,800	\$756,300	\$750,700	\$787,500	\$919,400	\$1,040,100	\$1,086,800
Estimated increase in rates	0.00%	4.50%	4.50%	4.50%	4.50%	5.00%	5.00%	5.00%	6.00%	7.00%
Monthly bill (currently \$35.00 per month assuming residential usage of 4,000)	\$35.00	\$36.60	\$38.25	\$40.00	\$41.80	\$43.90	\$46.10	\$48.45	\$51.40	\$55.00
Dollar Increase	\$0.00	\$1.60	\$1.65	\$1.75	\$1.80	\$2.10	\$2.20	\$2.35	\$2.95	\$3.60
Debt Service Coverage	139%	150%	161%	172%	169%	148%	162%	176%	167%	142%
Debt Service Coverage (All-In)	127%	138%	149%	160%	158%	139%	153%	167%	159%	136%

(Continued on next page)

ANYTOWN WATER UTILITY/SEWAGE WORKS

(Cont'd)

**SCHEDULE OF ESTIMATED REVENUES, EXPENSES,
ENDING CASH AND RESULTING AVERAGE MONTHLY BILL**

	Estimated Year									
	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Operating Revenues:										
Metered sales/Collections (1)										
Residential	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000	\$900,000
Commercial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Industrial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Governmental	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Fire protection (1)	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Additional revenues from rate increases (2)	769,700	848,300	848,300	848,300	889,100	951,500	951,500	951,500	951,500	951,500
Capacity fees (3)	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Other revenues (4)	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Total Operating Revenues	2,124,700	2,203,300	2,203,300	2,203,300	2,244,100	2,306,500	2,306,500	2,306,500	2,306,500	2,306,500
Operation and Maintenance Expenses (5)	1,387,800	1,429,400	1,472,300	1,516,500	1,562,000	1,608,900	1,657,200	1,706,900	1,758,100	1,810,800
Net Operating Revenues	736,900	773,900	731,000	686,800	682,100	697,600	649,300	599,600	548,400	495,700
Non-Operating Revenues										
Interest income (4)	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Misc. Revenues (4)	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total Non-Operating Revenues	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Non-Operating Expenditures:										
Outstanding and proposed debt service (6)	498,200	496,800	499,900	492,600	494,900	501,800	269,500	262,100	264,600	261,700
Debt service reserve funding (7)	37,100	37,100	37,100	18,600						
Payment in lieu of taxes (4)	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Capital improvements - cash funded (8)	92,500	117,500	117,500	167,500	167,500	67,500	217,500	167,500	167,500	517,500
Total Non-Operating Expenditures	652,800	676,400	679,500	703,700	687,400	594,300	512,000	454,600	457,100	804,200
Increase (Decrease) in Cash and Cash Equivalents	86,600	100,000	54,000	(14,400)	(2,800)	105,800	139,800	147,500	93,800	(306,000)
Beginning Cash and Cash Equivalents	1,086,800	1,173,400	1,273,400	1,327,400	1,313,000	1,310,200	1,416,000	1,555,800	1,703,300	1,797,100
Ending Cash and Cash Equivalents	\$1,173,400	\$1,273,400	\$1,327,400	\$1,313,000	\$1,310,200	\$1,416,000	\$1,555,800	\$1,703,300	\$1,797,100	\$1,491,100
Estimated increase in rates	4.00%	4.00%	0.00%	0.00%	2.00%	3.00%	0.00%	0.00%	0.00%	0.00%
Monthly bill (currently \$35.00 per month assuming residential usage of 4,000)	\$57.20	\$59.50	\$59.50	\$59.50	\$60.70	\$62.55	\$62.55	\$62.55	\$62.55	\$62.55
Dollar Increase	\$2.20	\$2.30	\$0.00	\$0.00	\$1.20	\$1.85	\$0.00	\$0.00	\$0.00	\$0.00
Debt Service Coverage	148%	156%	146%	140%	138%	139%	241%	229%	208%	190%
Debt Service Coverage (All-In)	142%	150%	141%	134%	132%	134%	231%	218%	197%	179%

ANYTOWN WATER UTILITY/SEWAGE WORKS

**SCHEDULE OF ESTIMATED REVENUES, EXPENSES,
ENDING CASH AND RESULTING AVERAGE MONTHLY BILL**

(Explanation of References)

- (1) Assumed at calendar year 2017 amounts. The future revenue estimates assume no significant customer growth.
- (2) The collection rate has historically been 98% for the last 5 years. We have assumed a 95% collection rate for future years as an allowance for conservation and rate fatigue.
- (3) Assumes two new connections per year.
- (4) Assumed at calendar year 2017 amounts.
- (5) See page 8 for the 2018 estimated amount. Future years assume 3% annual inflationary increases.
- (6) See the combined amortization schedule on page 7.
- (7) Assumes the debt service reserve account equal to the maximum annual principal and interest payment is funded from revenues over a 5 year period.
- (8) See the Utility Capital Improvement Plan on pages 1 and 2.

ANYTOWN WATER UTILITY/SEWAGE WORKS

COMPARATIVE SCHEDULE OF SELECTED FINANCIAL INFORMATION ARISING FROM CASH TRANSACTIONS

	Calendar Year Ended *		
	20__	20__	20__
<u>Cash and Cash Equivalents:</u>			
Operating fund			
Sinking fund:			
Bond and interest			
Debt service reserve			
Depreciation/improvement fund			
Meter deposit fund			
Construction fund			
Total Cash and Cash Equivalents	-	-	-
<u>Investments:</u>			
Operating			
Sinking fund:			
Bond and interest			
Debt service reserve			
Depreciation/improvement fund			
Construction			
Total Investments	-	-	-
Total Cash and Investments	\$0	\$0	\$0
<u>Bonded Indebtedness:</u>			

* Historical financial statements.

ANYTOWN WATER UTILITY/SEWAGE WORKS

COMPARATIVE SCHEDULE OF CASH RECEIPTS AND DISBURSEMENTS

	Calendar Year Ended		
	20__	20__	20__
Operating Receipts:			
Metered sales/collections			
Residential			
Commercial			
Industrial			
Governmental			
Penalties/forfeited discounts			
Fire protection			
Capacity fees			
Excessive strength surcharges			
Other			
	_____	_____	_____
Total Operating Receipts	_____ -	_____ -	_____ -
Operating Disbursements:			
Salaries and wages			
Employee pensions and benefits			
Purchased water/treatment			
Materials and supplies			
Chemicals			
Repairs and maintenance			
Sludge removal			
Contractual services			
Utilities			
Transportation			
Insurance			
Miscellaneous			
	_____	_____	_____
Total Operating Disbursements	_____ -	_____ -	_____ -
Net Operating Receipts	_____ -	_____ -	_____ -
Non-Operating Receipts:			
Tap fees			
Interest			
Meter deposits (net)			
Miscellaneous receipts			
	_____	_____	_____
Total Non-Operating Receipts:	_____ -	_____ -	_____ -
Non-Operating Disbursements:			
Debt service			
Capital improvements			
Payment in lieu of taxes			
	_____	_____	_____
Total Non-Operating Disbursements:	_____ -	_____ -	_____ -
Increase (decrease) in cash and cash equivalents	-	-	-
Beginning cash and cash equivalents	-	-	-
Ending Cash and Cash Equivalents	_____ \$0	_____ \$0	_____ \$0

For Accrual Financial Statements - Insert in next few worksheets.

ANYTOWN WATER UTILITY/SEWAGE WORKS