

# Reference Guide For Asset Management Inventory and Risk Analysis (Drinking Water)



*Prepared by the Southwest Environmental Finance Center*

**Document's Intended Use:** This document provides suggestions on the type of information to be collected, by asset category, when completing an asset inventory. For each asset category, following the inventory table, there is a table providing suggestions for where the data may be found. Following the Data Locations information is a table for factors that could be considered when defining what impacts Probability of Failure and Consequence of Failure when determining an asset's criticality (or risk). The lists provided are not intended to be all inclusive nor do they purposefully exclude any items. Certainly, you will come up with other things that are important to your utility. This guide is intended to help you get started.

## Hydrants (Fire, Flush, Flow Test)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size - diameter and/or flow rate</li> <li>Asset location</li> <li>Installation date</li> <li>Condition - Visible inspection, then update as needed with Maintenance history, age</li> <li>Useful life (varies with type, if unknown an estimate is 50 years)</li> </ul>	<ul style="list-style-type: none"> <li>Redundancy – is another hydrant accessible?</li> <li>Model number</li> <li>Supplier name &amp; phone</li> <li>Under warranty</li> <li>Warranty expiration date</li> <li>Manufacturer</li> <li>Manufacturer's recommended O&amp;M</li> <li>Maintenance records: last date hydrant was flushed or exercised</li> <li>Operational</li> <li>Color (if useful)</li> <li>Were design specifications followed?</li> <li>Asset use</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>Aerial photographs</li> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> <li>O&amp;M Manual</li> </ul>	<ul style="list-style-type: none"> <li>Interview current and former operators</li> <li>Site visit</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

*Note: Data may not be available for all sources- record what is available*

Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition - rusting, corrosion, leaking seal?</li> <li>Frequency of use - is it opened at least annually as part of a flushing or testing program?</li> <li>Routine maintenance completed?</li> <li>Pipe size connected to - less than 6 inch may cavitate</li> <li>Tools needed to open readily available to fire department and water department?</li> </ul>	<ul style="list-style-type: none"> <li>Inability to fight a fire - loss of property, loss of life</li> <li>Inability to properly flush system - health concerns</li> <li>Water damage to nearby structures</li> <li>Level of service failures</li> </ul>

# Meters

## (Commercial, Master, Residential, Source, Well)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size - diameter and/or flow rate</li> <li>Asset location</li> <li>Installation date</li> <li>Condition - Visible inspection, then update as needed with gallons flowed, Maintenance history, age</li> <li>Useful life (varies with type, if unknown an estimate is 15 years)</li> </ul>	<ul style="list-style-type: none"> <li>Redundancy - are spare meters/parts always available for repair/replacement</li> <li>Model Number</li> <li>Serial Number - if not tied to address in billing or other records</li> <li>Manufacturer</li> <li>Operational – is the meter operational?</li> <li>Supplier Name and Phone</li> <li>Under Warranty/Warranty Expiration Date</li> <li>Maintenance recorded – primarily for larger commercial and master meters</li> <li>Design specifications followed</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>Billing Records</li> <li>Aerial photographs</li> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> </ul>	<ul style="list-style-type: none"> <li>O&amp;M Manual</li> <li>Interview current and former operators</li> <li>Site visit</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Properly sized (meter size not always equal to pipe size)</li> <li>Properly installed (distance to elbows, tees, etc.)</li> <li>Age</li> <li>Condition</li> <li>Clogging issues</li> <li>Air in lines</li> <li>Maintenance History</li> </ul>	<ul style="list-style-type: none"> <li>Impacts to revenue (typically meters fail by under-reading = lost revenue)</li> <li>Inability to understand water loss</li> <li>Level of Service Failures</li> <li>Cost of the failure</li> </ul>

# Pipe

(Asbestos Concrete, Cast Iron, Concrete, Ductile Iron, Polyvinyl Chloride (PVC), Steel, Transmission Main)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size</li> <li>Asset location</li> <li>Installation date</li> <li>Condition – base on break history and age, then update when inspection is possible</li> <li>Useful life (varies with type, if unknown an estimate is 50-80 years)</li> </ul>	<ul style="list-style-type: none"> <li>Operational - is this pipe in use or valved off?</li> <li>Redundancy - can water still reach all customers if this pipe fails?</li> <li>Model Number</li> <li>Manufacturer</li> <li>Supplier Name and Phone</li> <li>Under Warranty</li> <li>Warranty Expiration Date</li> <li>Manufacturer's Recommended Installation and Operation (pressure not exceeding rating)</li> <li>Maintenance records - break records</li> <li>Design Specifications followed?</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection – valve locations used to indicate pipe locations</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> </ul>	<ul style="list-style-type: none"> <li>Interview current and former operators</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Bedding</li> <li>Vibration</li> <li>Temperature change</li> <li>Depth of Bury</li> <li>Soil corrosivity</li> <li>Electrolysis</li> </ul>	<ul style="list-style-type: none"> <li>Water Loss</li> <li>Damage to structures (buildings, pavement, etc.)</li> <li>Damage to environment (sink holes, chlorinated water entering a natural waterway, etc.)</li> <li>Revenue Loss</li> <li>Level of Service Failures</li> <li>Cost of the failure</li> <li>Number and type of customers impacted</li> </ul>

# Pumps

## (Booster, Chemical, Metering, Pressure, Transfer, Well)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size - diameter and/or flow rate</li> <li>Asset location</li> <li>Condition – visible inspection, maintenance history, age, etc.</li> <li>Installation date</li> <li>Useful life (varies with type, 5 - 15 years)</li> </ul>	<ul style="list-style-type: none"> <li>Operational - is this pump operational?</li> <li>Model number</li> <li>Serial number</li> <li>Manufacturer</li> <li>Supplier name &amp; phone</li> <li>Under warranty</li> <li>Warranty expiration date</li> <li>Manufacturer's recommended O&amp;M</li> <li>Maintenance completed regularly</li> <li>Redundancy- Spare pump/parts always available if this pump fails?</li> <li>Were design specifications followed?</li> </ul> <p>Electrical Data:</p> <ul style="list-style-type: none"> <li>Variable speed?</li> <li>Nameplate horsepower (used to calculate power consumption)</li> <li>Average run time</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>Aerial photographs</li> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> <li>O&amp;M Manual</li> </ul>	<ul style="list-style-type: none"> <li>Interview current and former operators</li> <li>Site visit</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> <li>Maintenance Records</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Maintenance History - routine maintenance performed? Correct lubricants used? etc.</li> <li>Installation - vibration concerns, alignment concerns</li> <li>Running as designed - on the pump curve</li> <li>Properly sized?</li> </ul>	<ul style="list-style-type: none"> <li>Level of Service Failures</li> <li>Health concerns</li> <li>Inability to provide water</li> <li>Time to repair may be lengthy - spare parts on hand?</li> <li>Cost of the failure</li> <li>Number and type of customers impacted</li> </ul>

## Sources (Intake Structure, Springs, Well Casing)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size - diameter and/or flow rate</li> <li>Asset location</li> <li>Installation date</li> <li>Condition - Visible inspection if possible, age, maintenance history, etc.</li> <li>Useful life (varies with type, if unknown an estimate is 20-50 years)</li> </ul>	<ul style="list-style-type: none"> <li>Operational - is this source in use?</li> <li>Redundancy - is another source accessible if this source becomes unavailable?</li> <li>Model Number</li> <li>Serial Number</li> <li>Manufacturer</li> <li>Supplier Name &amp; Phone</li> <li>Under Warranty</li> <li>Warranty Expiration Date</li> <li>Manufacturer's Recommended O&amp;M</li> <li>Maintenance records</li> <li>Design Specifications followed?</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>As-built record drawings</li> <li>Well Logs</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> </ul>	<ul style="list-style-type: none"> <li>Purchase records</li> <li>O&amp;M Manual</li> <li>Interview current and former operators</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Maintenance History</li> <li>Installation</li> <li>Clogging</li> </ul>	<ul style="list-style-type: none"> <li>Level of Service Failures</li> <li>Health concerns</li> <li>Inability to provide water</li> <li>Time to repair may be lengthy - spare parts on hand?</li> <li>Cost of the failure</li> </ul>

## Storage Tanks/Structures (Concrete, Earthen Basin, Fiberglass, Metal, Plastic/Polymer)

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size - diameter and/or capacity</li> <li>Asset location</li> <li>Installation date</li> <li>Condition - Visible inspection, maintenance history, age, etc,</li> <li>Useful life (varies with type, if unknown an estimate is 50 years)</li> </ul>	<ul style="list-style-type: none"> <li>Operational - is this storage tank in use?</li> <li>Redundancy</li> <li>Model Number</li> <li>Serial Number</li> <li>Manufacturer</li> <li>Supplier Name &amp; Phone</li> <li>Under Warranty</li> <li>Warranty Expiration Date</li> <li>Manufacturer's Recommended O&amp;M</li> <li>Maintenance completed regularly (inspected, painted, cleaned)?</li> <li>Design Specifications followed?</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>Aerial photographs</li> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> </ul>	<ul style="list-style-type: none"> <li>O&amp;M Manual</li> <li>Interview current and former operators</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Inspection and Maintenance History</li> <li>Location / elevation</li> <li>Size</li> <li>Exposure to corrosive or damaging elements - sun for plastic tanks, chlorine for metal tanks, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Level of Service Failures</li> <li>Health concerns</li> <li>Inability to provide water or sufficient pressure</li> <li>Time to repair</li> <li>Cost of the failure</li> <li>Environmental concerns</li> <li>Flooding/washout concerns</li> </ul>

## Treatment

(Chlorination System, Contamination Removal, Disinfection System, Filtration, Ozonation System, Reverse Osmosis, Sedimentation System, Ultraviolet System)

Inventory	
Necessary Data	
<ul style="list-style-type: none"> <li>Asset size – diameter, capacity and/or flow rate</li> <li>Asset location</li> <li>Installation date</li> <li>Condition - Visible inspection, maintenance history, age, etc.</li> <li>Useful life (varies with type, if unknown an estimate is 10-30 years)</li> </ul>	
Optional Data	
<ul style="list-style-type: none"> <li>Operational - is treatment unit in use?</li> <li>Redundancy - can the water continue treatment if this asset becomes unavailable?</li> <li>Model Numbers</li> <li>Serial Numbers</li> <li>Manufacturer</li> <li>Supplier Name &amp; Phone</li> <li>Under Warranty</li> <li>Warranty Expiration Date</li> <li>Manufacturer's Recommended O&amp;M</li> <li>Maintenance completed regularly?</li> <li>Design Specifications followed?</li> </ul>	<b>Electrical Data</b> <ul style="list-style-type: none"> <li>Variable Speed?</li> <li>Nameplate Horsepower (used to calculate power consumption)</li> <li>Measured power consumption per month or year</li> <li>Average run time (used to calculate annual hours of operation)</li> <li>Hours of operation per year</li> <li>Peak Energy Demand</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> </ul>	<ul style="list-style-type: none"> <li>O&amp;M Manual</li> <li>Interview current and former operators</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Maintenance History</li> <li>Frequency of Inspection</li> <li>Standard Operating Procedures developed and followed</li> <li>Chemical Supplies on-hand and ability to obtain in timely manner</li> </ul>	<ul style="list-style-type: none"> <li>Level of Service Failures</li> <li>Health concerns</li> <li>Inconvenience to customer -boil water notices</li> <li>Inability to provide water</li> <li>Time to repair may be lengthy - spare parts on hand?</li> <li>Cost of the failure</li> </ul>



# Valves

## (Air Release (ARV), Air Vacuum, Ball, Butterfly, Check, Gate, Pressure Relief (PRV))

Inventory	
Necessary Data	Optional Data
<ul style="list-style-type: none"> <li>Asset size – diameter, flow rate or settings</li> <li>Asset location</li> <li>Installation date</li> <li>Condition – visible inspection, maintenance history, age, etc</li> <li>Useful Life (if unknown an estimate is 15 years for check valve, 20 for all others)</li> </ul>	<ul style="list-style-type: none"> <li>Operational - is this valve operational? Distribution system valves may need more than yes/or no answer - 100% flow stoppage, allows break to be repaired, etc.</li> <li>Redundancy – will water service continue normally if this valve becomes unavailable?</li> <li>Model Number</li> <li>Serial Number</li> <li>Manufacturer</li> <li>Supplier Name &amp; Phone</li> <li>Under Warranty</li> <li>Warranty Expiration Date</li> <li>Manufacturer's Recommended O&amp;M</li> <li>Maintenance completed regularly (exercised, cleaned)?</li> <li>Design Specifications followed?</li> </ul>

Inventory Data Locations	
<ul style="list-style-type: none"> <li>Aerial photographs</li> <li>As-built record drawings</li> <li>Existing utility maps</li> <li>Visible inspection</li> <li>Repair, maintenance and inspection records</li> <li>Purchase records</li> </ul>	<ul style="list-style-type: none"> <li>O&amp;M Manual</li> <li>Interview current and former operators</li> <li>Photographs</li> <li>Contact contractors or engineers familiar with the system</li> </ul>

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Risk Assessments	
Factors Affecting Probability of Failure	Factors Affecting Consequence of Failure
<ul style="list-style-type: none"> <li>Age</li> <li>Condition</li> <li>Maintenance History (exercised regularly, pressure gauges inspected regularly, etc.)</li> <li>Clogging</li> <li>Water Hammer</li> </ul>	<ul style="list-style-type: none"> <li>Backflow concerns</li> <li>Pressure concerns</li> <li>Health concerns</li> <li>Level of Service Failures</li> <li>Maintenance concerns</li> </ul>