

# Applying Asset Management Principles in Water Treatment Plants

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# Why is asset management needed?

- Short answer:
  - Senate Bill 2
- Longer answer:
  - Proactive management of assets throughout their lifecycle should be a key component within a water utility to ensure its ability to supply and deliver an adequate quantity of safe water in a cost-effective and reliable manner.<sup>[1]</sup>



# Senate Bill 2

Sec. 6109.24 (B)(1):

“A public water system shall demonstrate the technical, managerial, and financial capability of the system to comply with this chapter and rules adopted under it by implementing an asset management program not later than October 1, 2018.”



# Senate Bill 2, cont.

Sec. 6109.24 (B)(3):

"A public water system shall include in the asset management program all of the following:

- a) An inventory and evaluation of all public water system assets
- b) Public water system operation and maintenance programs
- c) A public water system emergency preparedness and contingency planning program
- d) Criteria and timelines for public water system infrastructure rehabilitation and replacement
- e) Approved water system capacity projections and public water system capital improvement planning
- f) A long-term funding strategy to support the public water system's asset management implementation



# Senate Bill 2, cont.

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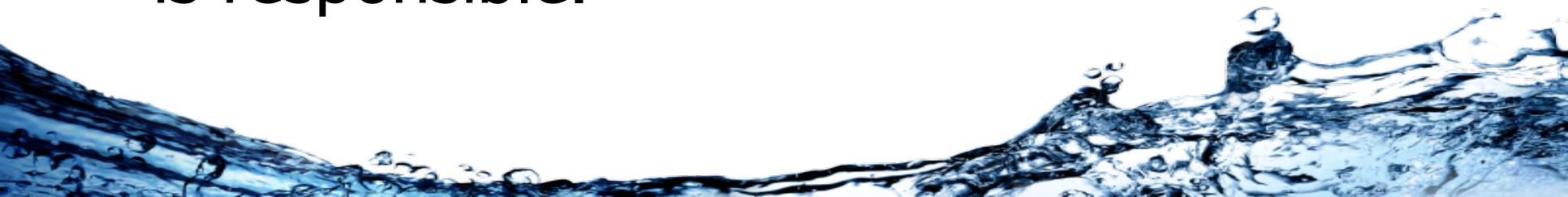
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# What are all public water system assets?

Per the AWWA Asset Management Definitions Guidebook<sup>[2]</sup>

- Asset: “Plant, equipment, buildings, property, pipelines, infrastructure and other items that have potential or actual value to the organization.”
- Asset Inventory: “A complete list of all physical assets for which an organization is responsible.”



# How should asset management be implemented?

- Many references are available for asset management planning for water systems; however, most focus on asset management in the distribution system
  - Water Research Foundation has 18 projects listed under its Asset Management Knowledge Portal<sup>[3]</sup>
  - 15 of those projects focus on the distribution system
- AWWA's Asset Management Resource Community provides technical resources on water main rehabilitation, computer modeling, energy management, and infrastructure financing<sup>[4]</sup>



# How should asset management be implemented at WTPs?

- Asset management at WTPs is not identical to asset management in the distribution system
  - Distribution system has infrastructure with wide geographic distribution
    - Well-suited for GIS
  - WTPs have hundreds of components in one geographical location
    - GIS-based approach can be problematic



# What assets are present in WTPs?



- Each plant contains hundreds of pieces of equipment
- In this room alone:
  - Pumps
  - Sluice gates
  - Traveling screen
  - Bridge crane
  - Unit heaters
  - Water quality instrumentation

# Developing an organizational schema is critical

More key definitions:[2]

- Asset Type: "A group of Assets with similar function or use."
- Asset System: "A group of Assets that work together to deliver a required business function or purpose."
- Asset Hierarchy: "A tiered structure to allow for organize management of Assets and asset data ... typically uses a parent-child relationship."
- Maintenance Managed Item: "An Asset or component that exists generally at the lowest level in the Asset Hierarchy and for which an owner will make management decisions to Repair, rehabilitate, or typically replace instead of running to failure."

# Developing an organizational schema is critical, cont.

As a utility, determine an asset hierarchy that makes sense for you.

- What are/are not maintenance managed items?
- What asset classes / asset systems will be considered?
- How will asset hierarchy be ordered?

There is no “right” answer – you need to find a system that works for you.

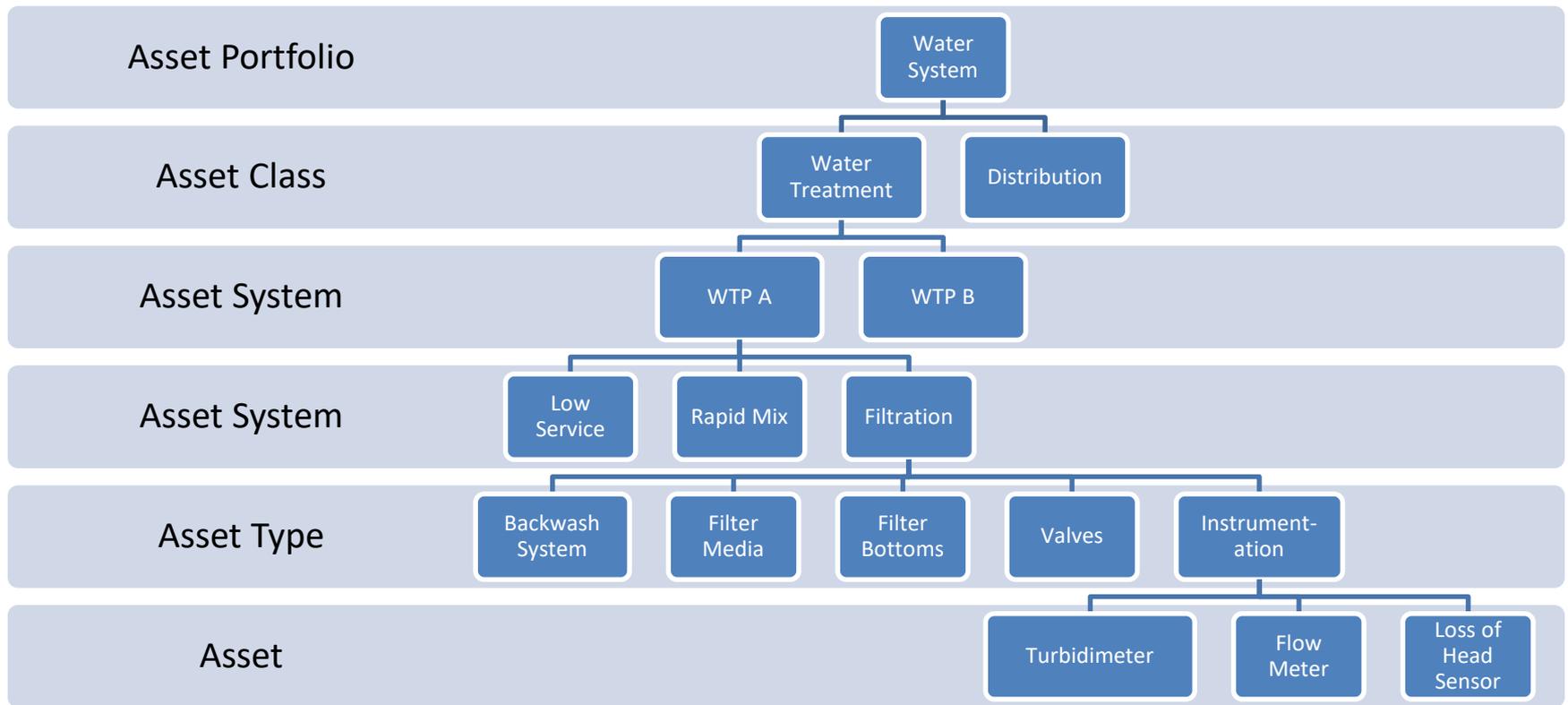
# Define maintenance managed items



# Define maintenance managed items, cont.

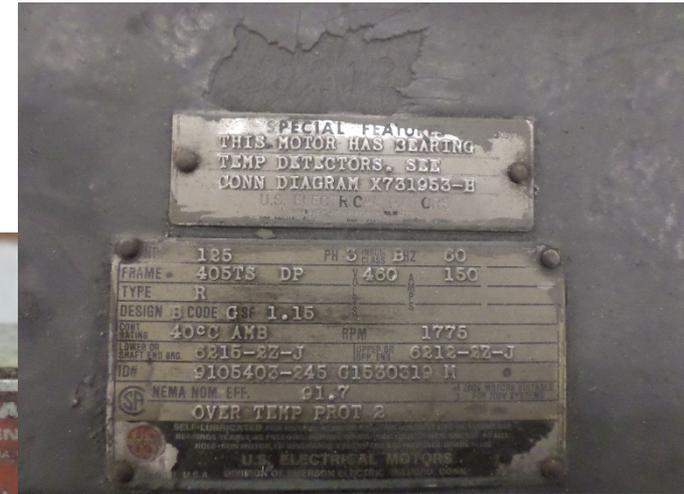
- What components are serviced/replaced separately?
  - Example: High service pump & motor vs. sump pump
- What components are consumables?
  - Are components maintenance managed items or spare parts?
- What can be replaced “off the shelf”?
  - Example: 1/2-inch ball valve vs. 6-inch gate valve

# Example process-based asset hierarchy



# Developing the inventory

- Once the asset hierarchy has been established, it needs to be populated
- Physical inspection/verification of assets is necessary
- Nameplates are your friend, but may not have all the answers



# Developing the inventory, cont.

- Commercial asset management software can be used, but spreadsheets can also be a good solution
- Lower barrier to entry can increase staff interaction with inventory
  - Less training required for staff to use spreadsheet
  - Most workstations will have licenses for spreadsheet software



# Asset evaluation

- Once the inventory is populated, the condition of the assets needs to be evaluated
- Ranking systems for distribution systems may not be applicable
  - Example, IPWEA suggests a scale of 1 to 5<sup>[5]</sup>
    - 1 represents “only normal maintenance is required”
    - 5 represents “over 50 percent of the asset requires replacement”

# Asset evaluation, cont.

- Find a rating system that you are comfortable with
- Example rating system we've used in the past:
  - 0 = Inoperable or severely deteriorated condition
  - 1 = Unsatisfactory condition, significant defects and/or wear
  - 2 = Satisfactory condition, minor defects/wear
  - 3 = Good condition, minimal to no noticeable defects
  - 4 = Excellent condition, no noticeable defects

# Asset criticality

- Used to prioritize future maintenance and capital improvement efforts
- Criticality is a function of assets probability of failure and consequence of failure
- Probability of failure is a function of
  - Asset condition
  - Asset age
  - Asset type
  - Redundancy
  - Spare part availability
- Past experience is often useful guidance for determining probability of failure

# Asset criticality, cont.

- Consequence of failure is a function of several factors:
  - Potential impact to public safety
  - Potential impact to public health
  - Direct costs
    - Repair Costs
    - Fines
    - Lost revenues
  - Public relations/perception
  - Environmental impacts
  - Permit violations

# Asset criticality, cont.

- Combine probability of failure and consequence of failure to determine asset criticality

Probability of Failure	Consequence of Failure				
	1	2	3	4	5
1	Low	Low	Low	Medium	High
2	Low	Low	Medium	Medium	High
3	Low	Medium	Medium	High	High
4	Low	Medium	Medium	High	High
5	Medium	Medium	High	High	High

# Takeaways

- There is no “right” or “wrong” way to approach asset management – the key is to find an approach that works for your utility
  - What is “right” for the distribution system may not be “right” for water treatment plants
- Take the time to develop asset hierarchy before starting inventory
- Consider how staff will interact with asset inventory
  - It should be a “living” document

# Takeaways, cont.

- Develop a rating criteria for condition assessment to improve consistency
- Leverage the knowledge of your maintenance staff to assess probability of failure
- Consequences of failure for WTPs will be different than those for the distribution system

# References

- [1] <https://www.awwa.org/about-us/policy-statements/policy-statement/articleid/188/asset-management.aspx> (accessed 8/24/2018)
- [2] AWWA Asset Management Committee. 2018. *AWWA Asset Management Definitions Guidebook*.
- [3] <http://www.waterrf.org/knowledge/asset-management/risk-management/Pages/default.aspx> (accessed (8/29/2018))
- [4] <https://www.awwa.org/resources-tools/water-knowledge/asset-management.aspx#351191644-awwa-technical-resources> (accessed 8/29/2018)
- [5] IPWEA (Institute of Public Works Engineering Australia). 2011. *International Infrastructure Management Manual*. Sydney, IPWEA, Australia.



# Questions?

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