Standards and Guidelines for Utility Work & Asset Management

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SUEZ

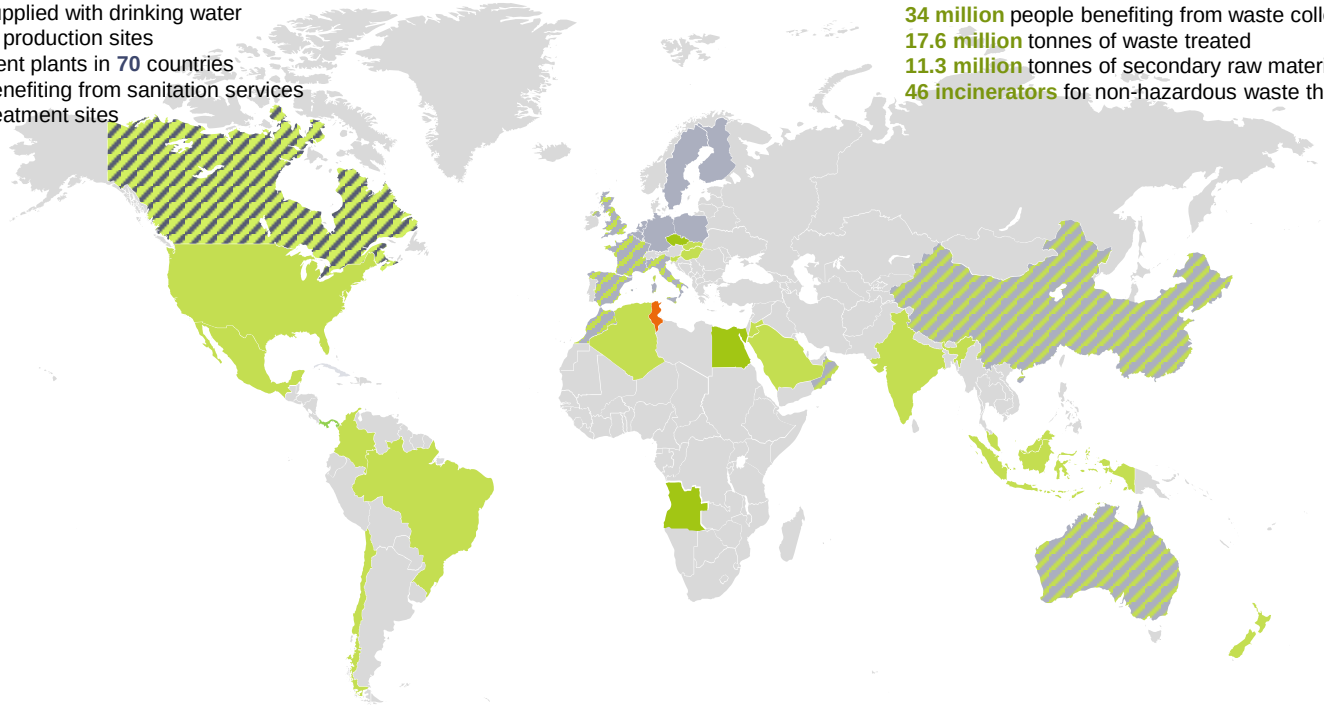
A world leader in sustainable management of resources

WATER

92 million people supplied with drinking water
1,130 drinking water production sites
10,000 water treatment plants in **70** countries
65 million people benefiting from sanitation services
2,310 wastewater treatment sites

WASTE

34 million people benefiting from waste collection services
17.6 million tonnes of waste treated
11.3 million tonnes of secondary raw materials
46 incinerators for non-hazardous waste throughout the world



82,500
employees

€16.2 Billion
revenue in 20145

€74 Million
invested in Research

SUEZ – a single brand serving the circular economy

SUEZ in North America

Operating in all 50 States and Canada

3,400 employees

15 water utilities

Regulated by State Utility Commissions

55,000 tons of waste for recycling

16,000 industrial & municipal sites

for water treatment and advanced network solutions

7.5 million people water & wastewater served

78 public-private partnerships – municipal water systems

Two concession agreements investing over $300 million in infrastructure in partnership with private equity firm KKR

Revenue $1.3 billion

Manager of $3.3 billion in total assets in 2014

Benefiting from $80 million global research & innovation budget

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SUEZ in Boise, Idaho

Serving 240,000 Residents in the Greater Boise Area

89,000 Connections

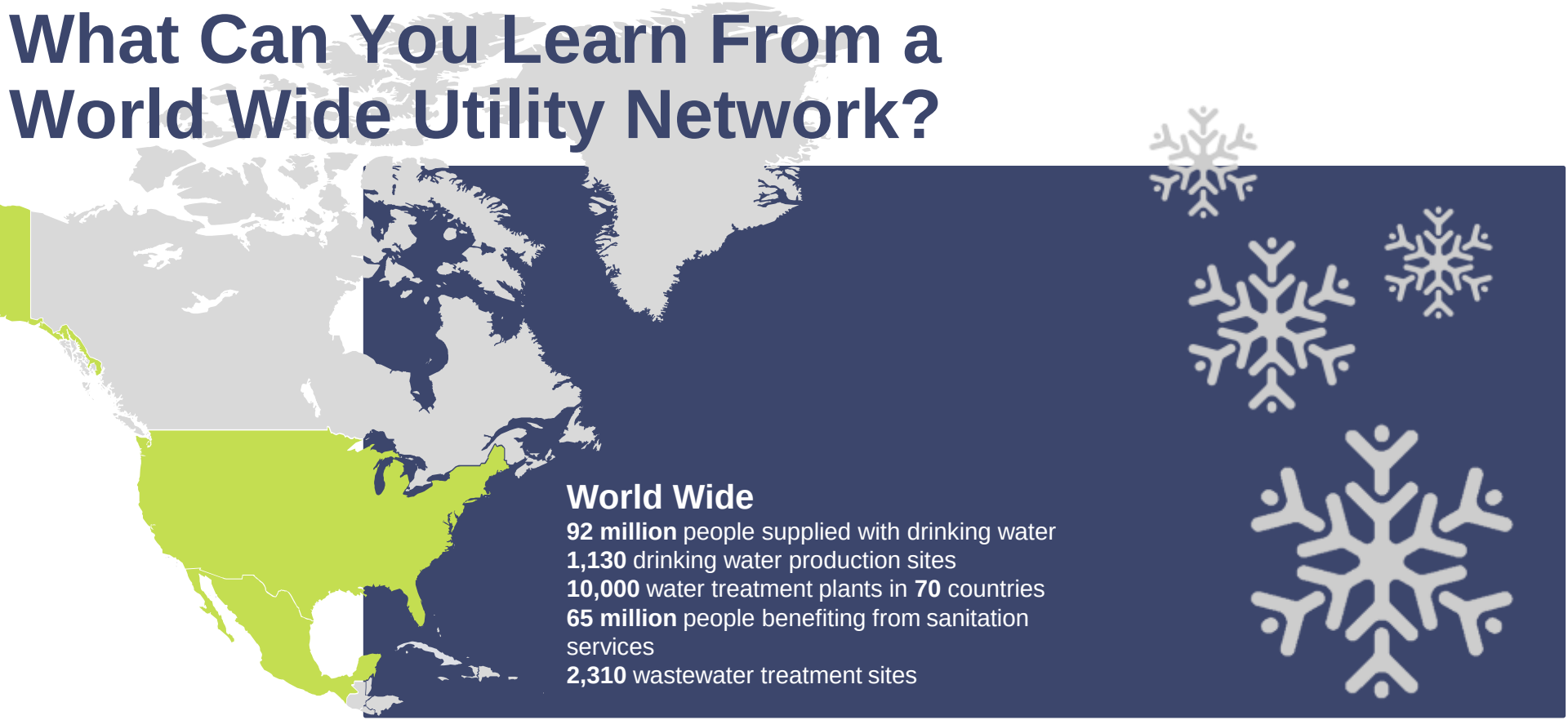
1,200 Miles of Pipe

80 Wells

2 Treatment Plants

99 Employees

What Can You Learn From a World Wide Utility Network?



World Wide

92 million people supplied with drinking water
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Operations Are Not Unique Snowflakes

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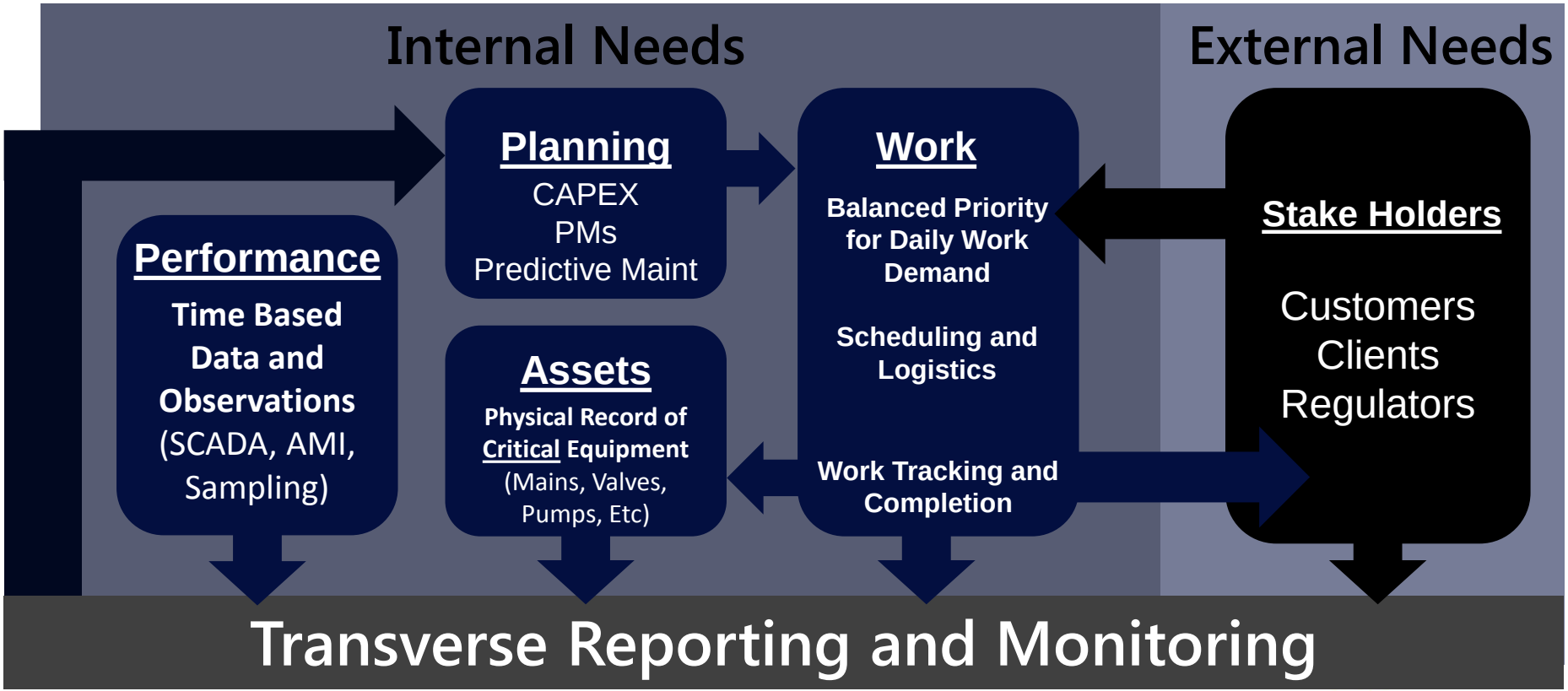
The Basics of Operations Technology



Work and Assets

Assets

- The Things We Manage
- What we Know About Them
- Long Term Needs

Work

How To…

- Qualify
- Plan
- Prepare
- Execute
- Close

…Immediate Work Demands

Assets

What Is an Asset?

Standard

Assets are defined as any piece of operational equipment that is:

deemed critical

or assigned preventive maintenance tasks

or is monitored by sensors (SCADA)

or has been physically modeled in GIS

or used as the basis for Hydraulic analysis.

Each utility shall maintain a registry of assets that conforms to the records criteria outlined in this document.

The only exception to this is road licensed fleet equipment (Cars, Trucks, etc), which are managed in accordance with corporate fleet management policy.

Guideline

A worthy goal will be turning the minimum standard "*or*" based definition into:

*Critical operational equipment that have been assigned preventive maintenance tasks **and** been physically modeled in GIS with considerations for SCADA monitoring and Hydraulic analysis(if applicable).*

You are building your organizations central source of asset truth for years to come. Do it right!

Assets

What Is an Asset?

What ultimately gets tracked as an 'Asset' will depend entirely on what you need to keep track of. A useful tool for determining what else may need to be tracked is the S.A.L.T. acronym:

Statutes	Regulatory requirements for equipment records?
Accounting	Accounting or Financial reasons to track the equipment?
Legal	What is your liability if you do not track the equipment?
Taxation	Are there tax implications if the equipment is not tracked?

Assets

Building a Central Source of Truth

Standard

At a minimum, asset registries will provide them minimum of descriptive attributes outlined in Table 1 (next slide).

A registry requires the simplest structure possible to be effective long term (i.e. a simple tabulated format, A dedicated central database table is preferred).

Spreadsheet formats should never be used as a long-term solution to this challenge.

Guideline

For long-term success the boundary between assets lists and GIS representations must be dissolved.

The ultimate goal should be a complete asset registry housed in GIS for maximum utility.

Assets

Minimum Record Requirements

Basic Info

Links to GIS, SCADA

Criticality

Record History

Attribute Name	Attribute Description	Data Type
Unique ID	A unique identification number for the asset. Based on some method of automatic or systematic protocol for creation (Auto Number, Smart ID, etc)	GUID or Auto Assigned Alpha-Numeric ID
CEA	The foundational CEA that that brought the asset into existence	Alpha-Numeric
In-Service Date	CEA In-Service Date for this Asset	Full Date (MM/DD/YYYY)
In-Service Value	Engineering Supplied Value of the in-service asset	Numeric (Dollars)
Financial System Asset ID	Financial Asset Record Reference ID for this asset	Alpha-Numeric
Installation Date	Date asset was installed for eventual service. May or may not be the same as In-Service Date.	Full Date (MM/DD/YYYY)
Asset Class**	Example: Hydrants, Pumps, Network Valves, Transformers	Choose from list
Asset Type**	Examples: PRV, Vertical Turbine, etc.	Choose from list
Precise Physical Location	X/Y Coordinate, or Measured location from referenced facility benchmarks.	
General Physical Location	Physical Address, Facility Name, or Facility Sub-Area (ie. Shop, Garage, Process Area, etc)	
Make	Manufacturer	
Model	Manufacturer's Designation for this product line	
GIS Feature Class**	GIS Feature Class housing the feature record for this asset	
GIS Feature ID**	GIS Feature ID of the corresponding record	
Performance Tacking Number	SCADA Tag#, or eOPS IPN#	
Expected Life	Anticipated useful life of the asset. Generally corresponds with the assets depreciable life (but not always)	Numeric (in Years)
Condition Assessment	See notes on criticality Assessment	numeric
Date of Condition Assessment	Date of most recent condition assessment	Full Date (MM/DD/YYYY)
Probability of Failure (PoF)	See notes on criticality Assessment	numeric
Consequence of Failure (CoF)	See notes on criticality Assessment	numeric
Criticality	See notes on criticality Assessment	numeric
Date of Criticality Assessment	Date of most recent risk assessment	Full Date (MM/DD/YYYY)
Date Added	Auto populated date of record addition to asset registry	Full Date (MM/DD/YYYY)
Record Addition By	Auto populated username of computer user who entered the record	text
Date Modified	Auto populated date of last record modification to asset registry	Full Date (MM/DD/YYYY)
Record Modified By	Auto populated username of computer user who modified the record	text

** *Flagged items are included for organizations were GIS is not used as the central asset registry.*

Assets

Management and Risk Based Criticality Scoring

Standard: All assets will be analyzed for risk-based criticality. These scores are an expression of the assets current condition (i.e. the risk present in the system today). The formula below outlines the essential method for assessment.

Minimum Requirements for Asset Criticality Scoring

$$\text{Risk} = (\text{Likelihood of Failure}) \times (\text{Consequence of Failure})$$

Likelihood of Failure (LoF) *will be based on the best available asset condition ranking using the outlined 1-5 scoring matrix.*

Consequence of Failure (CoF) *will be the estimated cost of the assets unplanned replacement.*

Assets

Management and Risk Based Criticality Scoring

Asset Management and Risk Based Criticality Scoring

Risk = (Likelihood of Failure) x (Consequence of Failure)

Where:

Likelihood of Failure (LoF) = Asset Condition Ranking (1-5 Scale)

5 = Failure imminent (within 1 year)

3 = Failure expected between 2-4 years (Or, with adequate warning)

1 = Failure unlikely (Or, degradation will slowly occur over time)

Consequence of Failure (LoF) = Cost of replacement following unplanned failure ($'s)

Asset criticality scores must be routinely re-assessed a minimum of every 2 Years. This should be a continually evolving process coordinated between engineering and operations staff to be most effective

Assets

Management and Risk Based Criticality Scoring

Depending on the type of asset, there are numerous ways to establish risk scoring.

Example Scoring for Water Mainlines

***Risk* = *(*LoF1 + LoF2 + LoF3 + LoF4*) x (*CoF1 + CoF2 + CoF3)**

Where:

Likelihood of Failure = (LoF1 + LoF2 + LoF3 + LoF4)

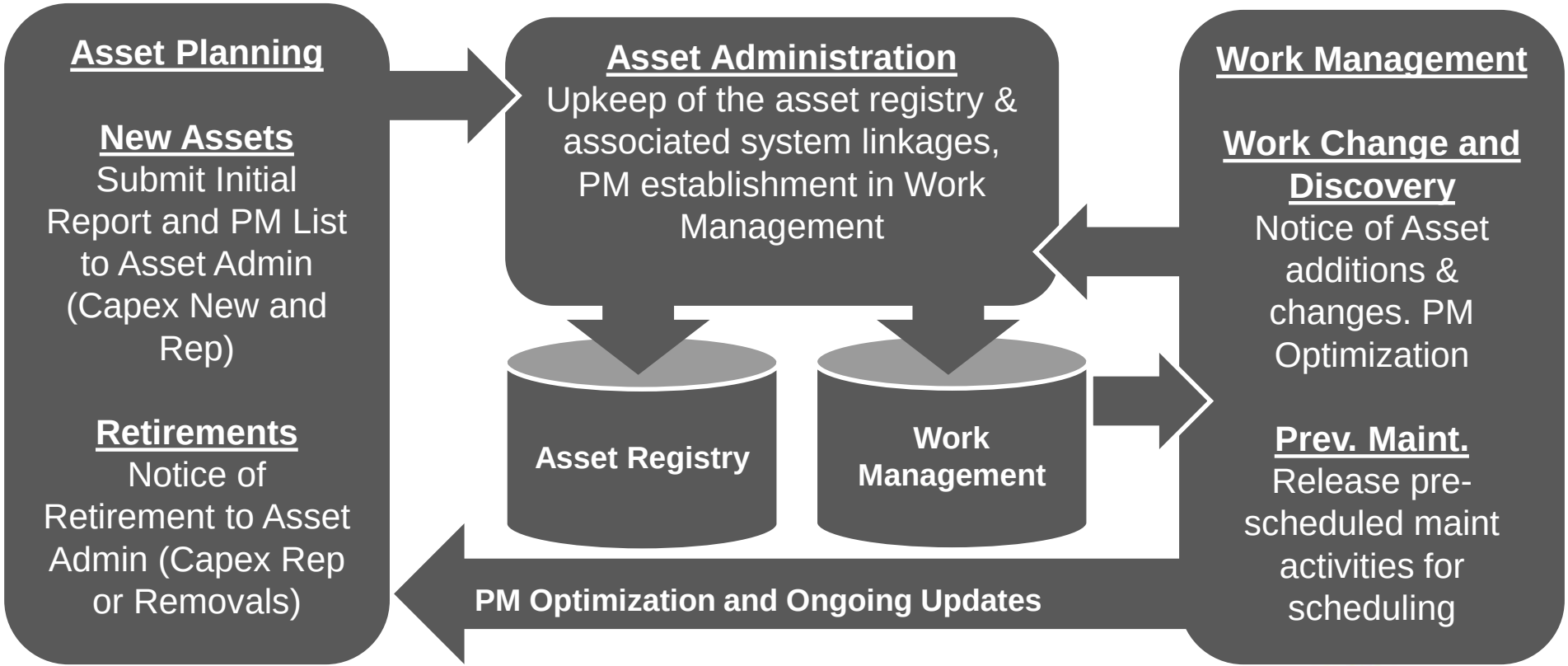
LoF1 = Probability of Failure due to Material Age (1-5)
LoF2 = Probability of Failure on Material and Diameter Combination (1-5)
LoF3 = Probability of Failure due to Vintage Installation Practices (1-5)
LoF4 = Probability of Failure to Meet Fire Flow Requirements (1-5)

Consequence of Failure = (CoF1 + CoF2 + CoF3 + CoF4)

CoF1 = Cost to Repair Unplanned Failure ($'s per Asset Foot)
CoF2 = Impact to Customers (# of Customers Impacted by Failure)
CoF3 = Impact to Critical Customers (Hospitals, schools, etc in proximity)
CoF4 = Is redundancy present for this mainline? (Y/N)

This example illustrates the flexibility of the basic formula for multi-variable analysis.

Assets Roles and Responsibilities



Work

The term **Work** is used here to describe any operational maintenance activity where time and money are valued (i.e. Labor, Materials, Sub-Contractor Services). Common types would include Work Orders, Inspections/Calibrations, and Field Service Requests.

Associated Assets

Disassociated Actions

Work

Standard: As a minimum standard, all work associated with the asset registry will hold a reference to the asset taking part in the work (ie. Asset Identification Number).

Minimum standards for documentation of actions are outlined in the next slide.

Guideline: For full record keeping purposes, work records will likely require additional detail beyond the minimum standard. However, the standard will define the minimum acceptable level of detail. Work records can always have more detail, but should never have less.

Work

Minimum Record Requirements – Activity Description

Attribute Name	Description	Type
Workorder ID	Unique workorder identifier	Text
Work Type	The type of work being completed (Select from List)	Text
Workorder Status	Released, Scheduled, Dispatched, Completed	Text
Charge Code	Accounting charge code for workorder	Text
Asset Identifier	Identifier of the asset	Text
Asset Class	The infrastructure feature class the workorder is associated with	Text
Priority	A numeric value (1-3) used to indicate the priority, or importance, of the workorder	Number
Reactive Incident	A flag used to indicate whether the workorder is a reactive action (Y/N)	Text
Root Cause	Root Cause of Failure for Reactive Incidents (From List)	Text
Assigned To	User the project is assigned to	Text
Supervisor	Identity of the responsible Supervisor (UserID or Name)	Text
Creation Date	Automatically Populated date/time work event was created	Date
Planned Start	Planned start date/time	Date
Planned End	Planned end date/time	Date
Actual Start	Actual start date/time	Date
Actual End	Actual end date/time	Date
Address	Street address of the work location (and nothing more)	Auto/Text
Location	Descriptive location of the workorder (ie. NW corner, South fence line, etc)	Text
Notes	General comments on the work activity	Text
Miscellaneous Performance Data	Activity related performance data gathered as part of the work activity (Pressure or Temperature Readings, Valve Turns, Flow Rates, etc). Data generally to be transferred to a performance tracking system.	Misc

Work

Minimum Record Requirements – Activity Performance

Essential Measurements of Work Performance

Standard: In addition to the work record documentation, the following attributes will be maintained as performance measurements for all work actions.

Attribute Name	Description	Type
Time to Dispatch	Difference Between Creation and Actual Start date/time	Hours
Time to Complete	Difference Between Actual Start and End date/time	Hours
Planning Accuracy	Difference Between Planned Duration and Actual Duration	Hours
Total Labor Cost	The total cost of all labor for completion of this action (based on average hourly labor cost)	Numeric (Dollars)
Total Material Cost	The total cost of all materials for this action (based on manual from material cost sheets, or associated system interface)	Numeric (Dollars)
Total Sub-Contractor Cost	The total cost of sub-contractor related fees associated with this action	Numeric (Dollars)
Permit Cost	The total cost of permit related fees associated with this action	Numeric (Dollars)

Guideline: The standard defines the minimum acceptable level of detail for full record keeping purposes. In many cases, activity specific work records will likely require additional detail beyond the minimum standard. Work records can always have more detail, but they will never have less.

The challenge of maintaining detailed work records highlights the clear benefit of a centralized work management system. When labor and material costs enter the picture, it becomes increasingly difficult (if not impossible) to maintain an appropriate level of information using a manual back-office processes. This standard was considered from the viewpoint that utilities are will be implementing a central system in the very near term.

Work

Minimum Record Requirements – Categories of Work

Work Management Process Flows

It is recognized that a one-size-fits-all approach cannot accommodate the unique nature of all work activities. The minimum activity standards were designed to suit three standard scenarios that create work for utilities (e.g. Reactive, Planned, and Proactive Work). They were not designed to address unique types of work actions (Hydrant Inspections, Main Breaks, Service Requests).

Standard Work Scenarios

Reactive	Planned	Proactive
Work is needed in response to external demands (equipment break-fix, customer request). A quantity of reactive work is always expected. Anticipated demands are to be balanced with planned activities. Reactive work includes field response to customer inquiries.	Non-routine activities that are planned in advance, such as capital project delivery, or specific operations maintenance events also create work. Planned scenarios often require logistical planning in advance of work activities (Labor availability, Materials, Equipment, or Sub-Contractors) Planned actions may be issued individually, or as part of large multi-phase project delivery schedules.	Routine maintenance inspections or recurring maintenance events are examples of proactive scenarios. Examples include: Annual vibration analysis, Pump oil change, Sensor calibration, etc. Schedules may be based on recurring calendar events, recommended best-practices, machine run-time intervals, or regulatory requirements.

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Thank You!

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