Fundamentals of Asset Management

Step 1. Develop Asset Registry

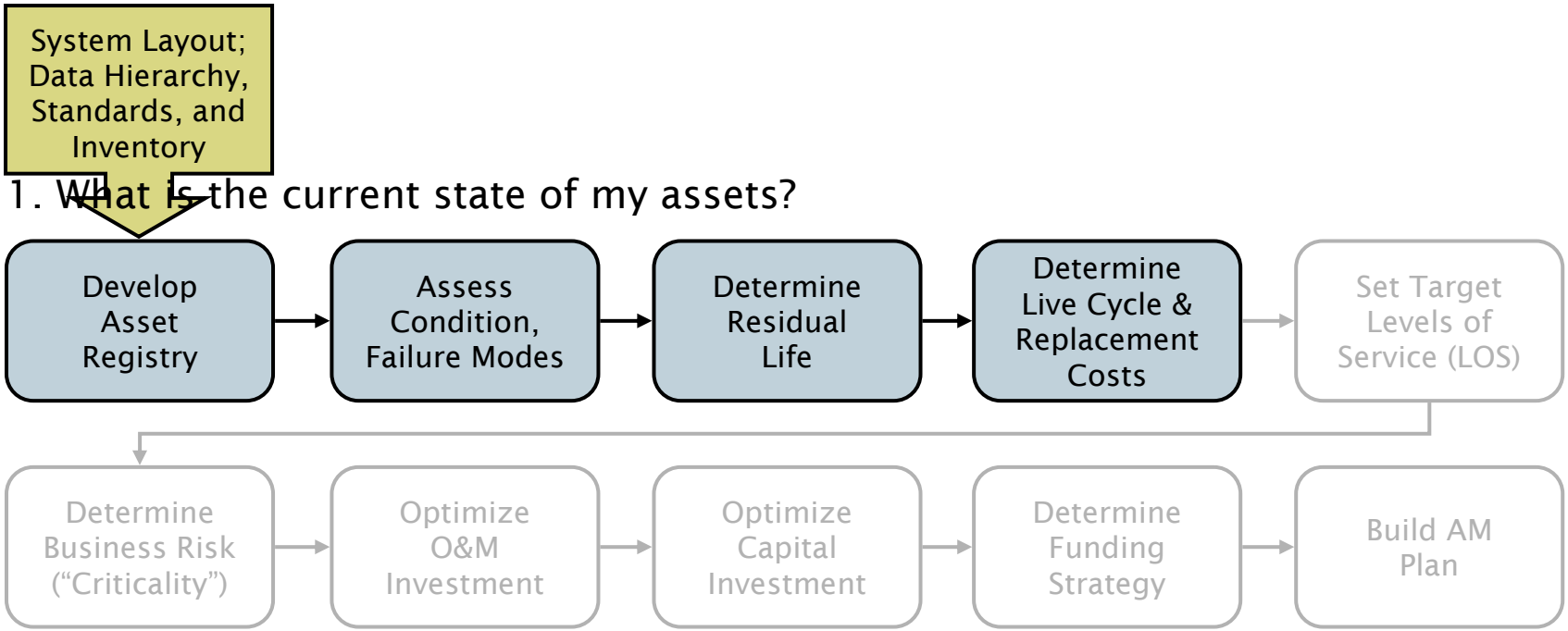
A Hands-On Approach

Tom’s bad day…

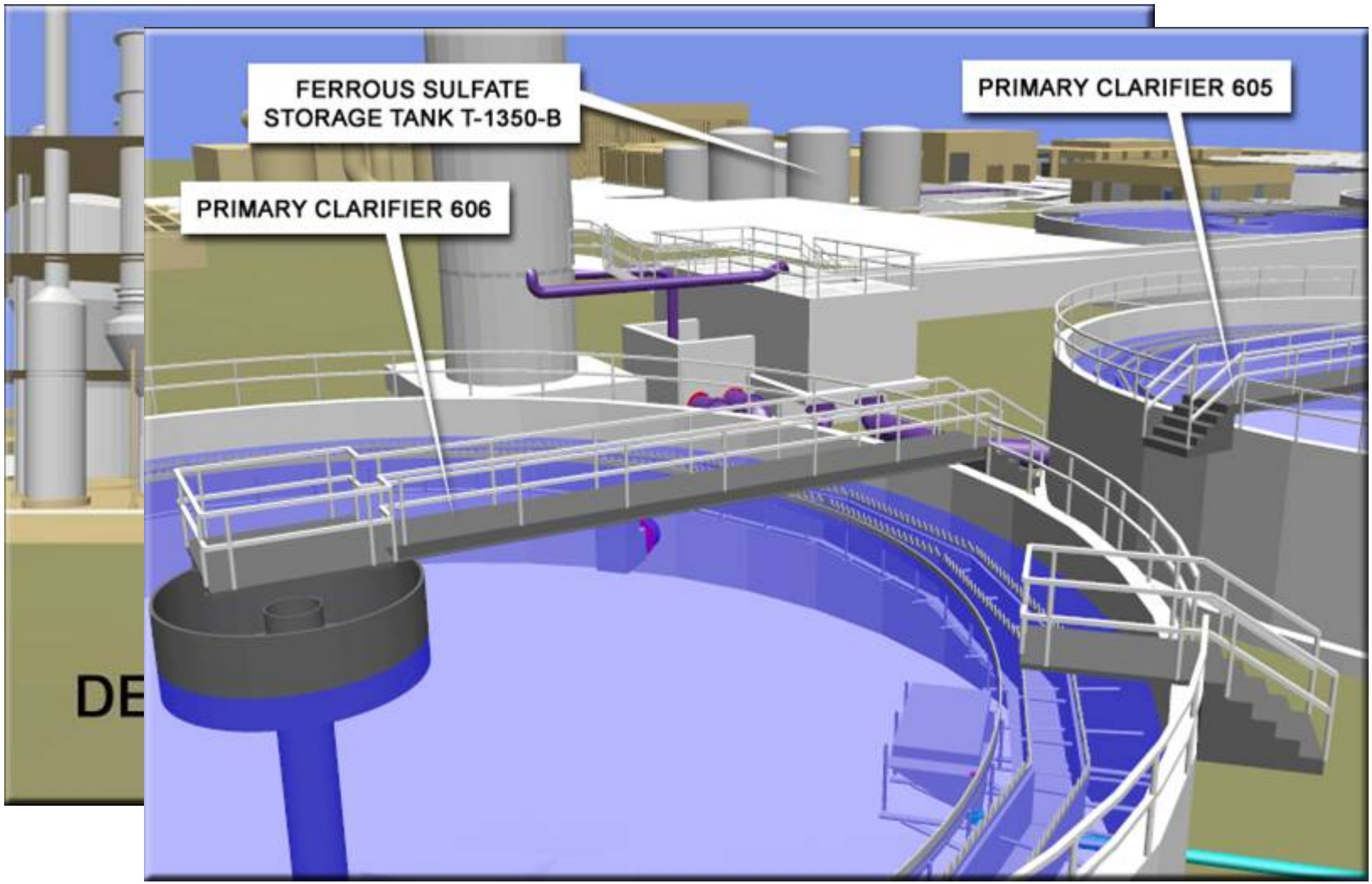
First of 5 core questions

1. What is the current state of my assets?
   - *What* do I own?
   - *Where* is it?
   - What *condition* is it in?
   - What is its *remaining useful life*?
   - What is its *remaining economic value*?

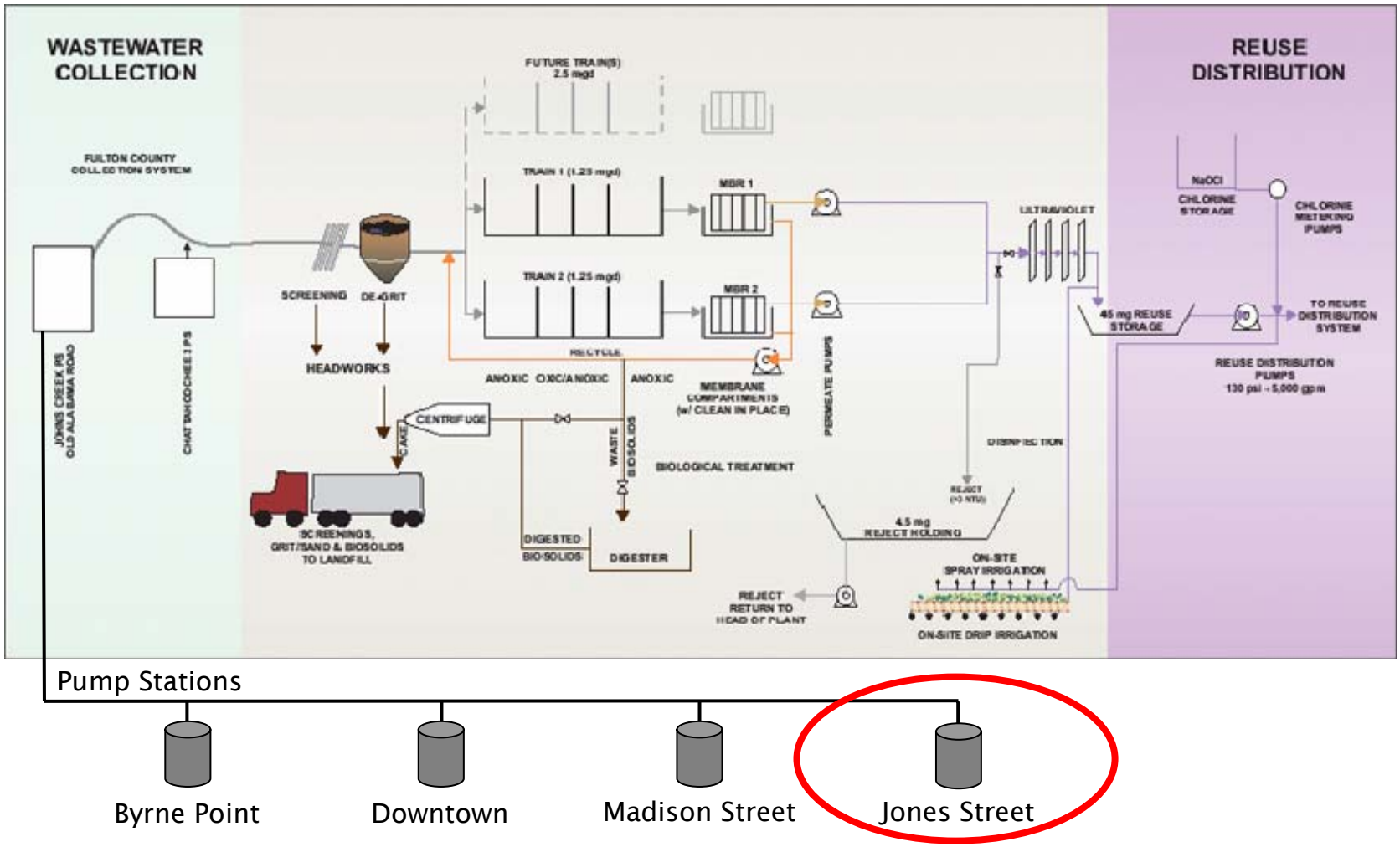
AM plan 10-step process



What exactly is an asset?



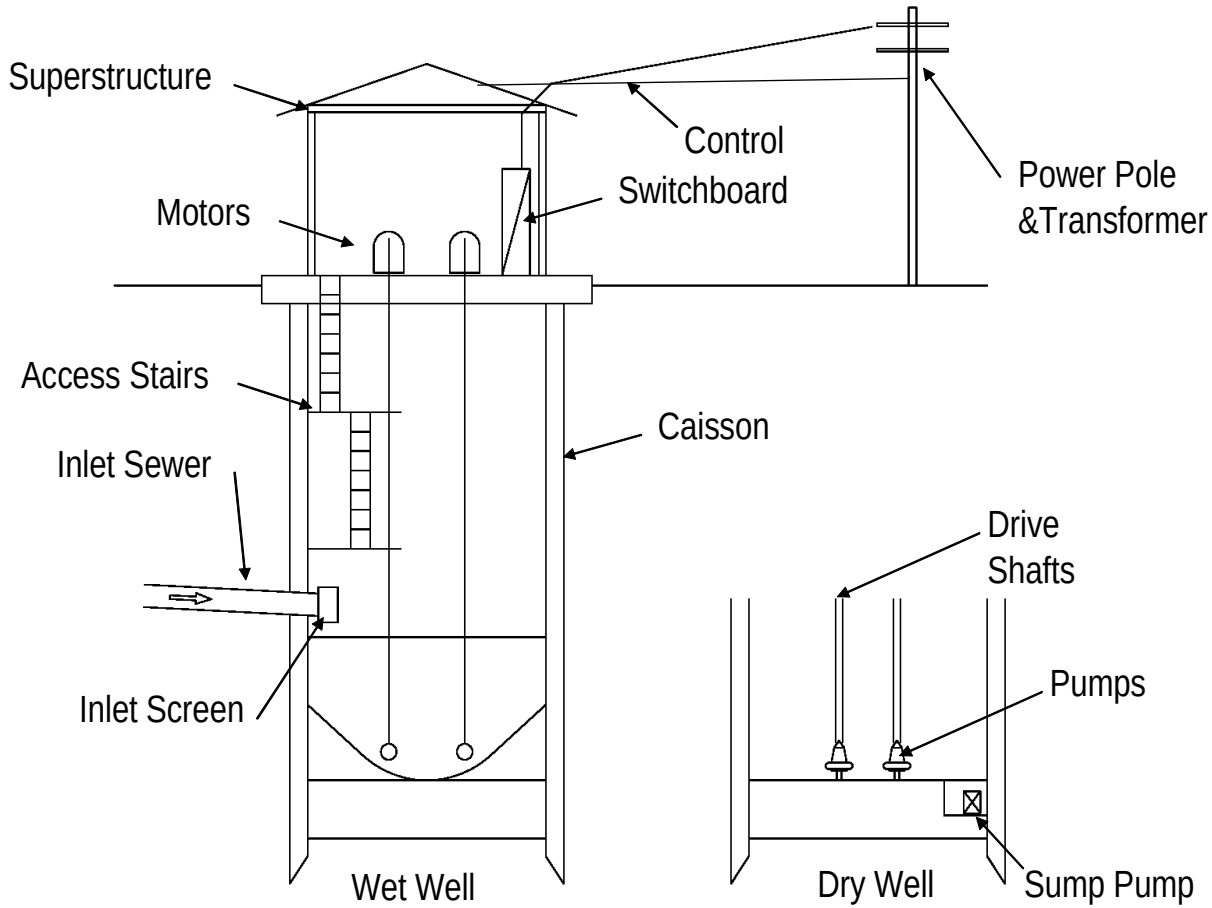
Tom's wastewater collection system layout



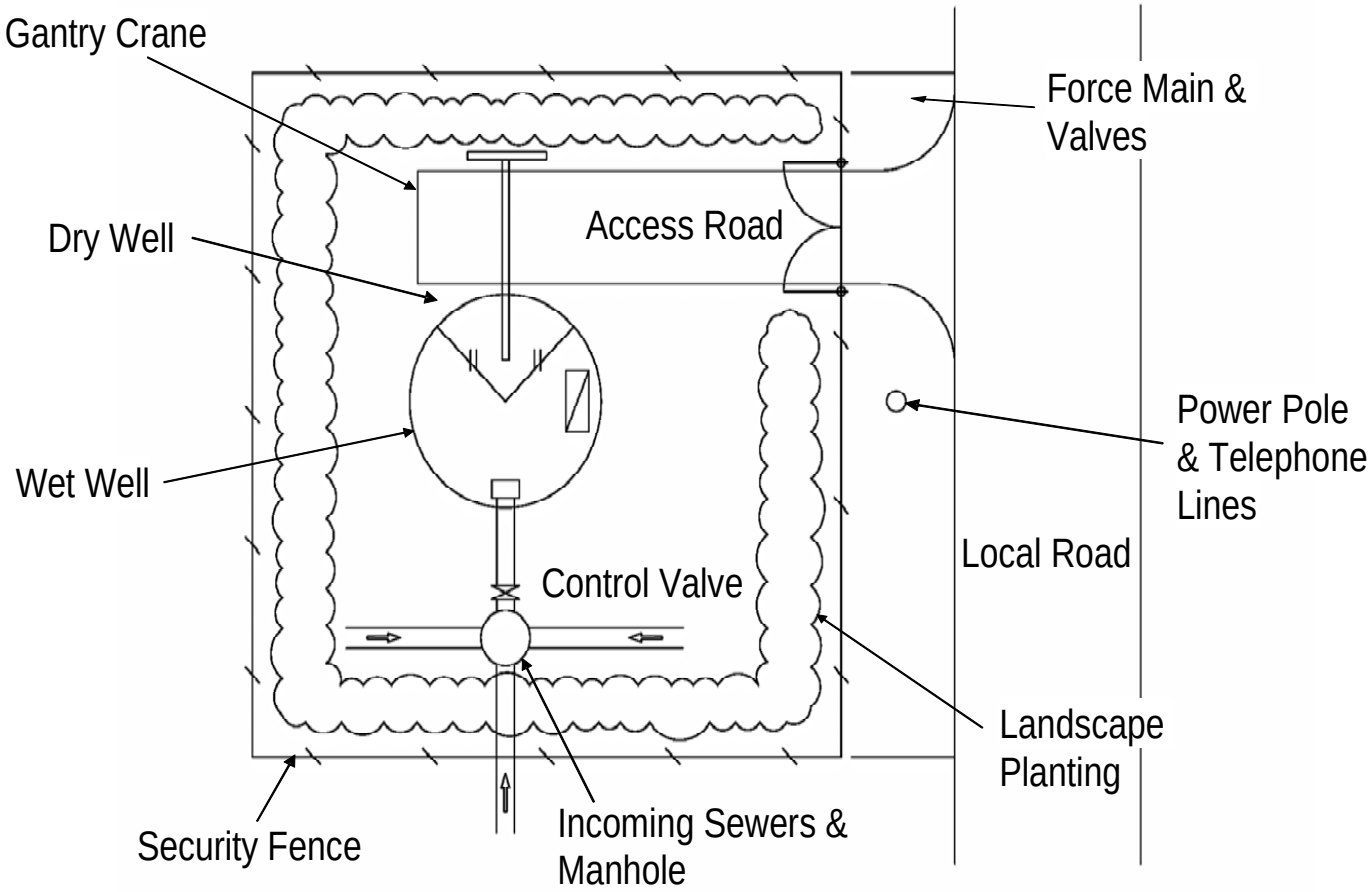
Pump Stations

Byrne Point | Downtown | Madison Street | Jones Street

Jones Street pump station cross-section view



Jones Street pump station “aerial” view

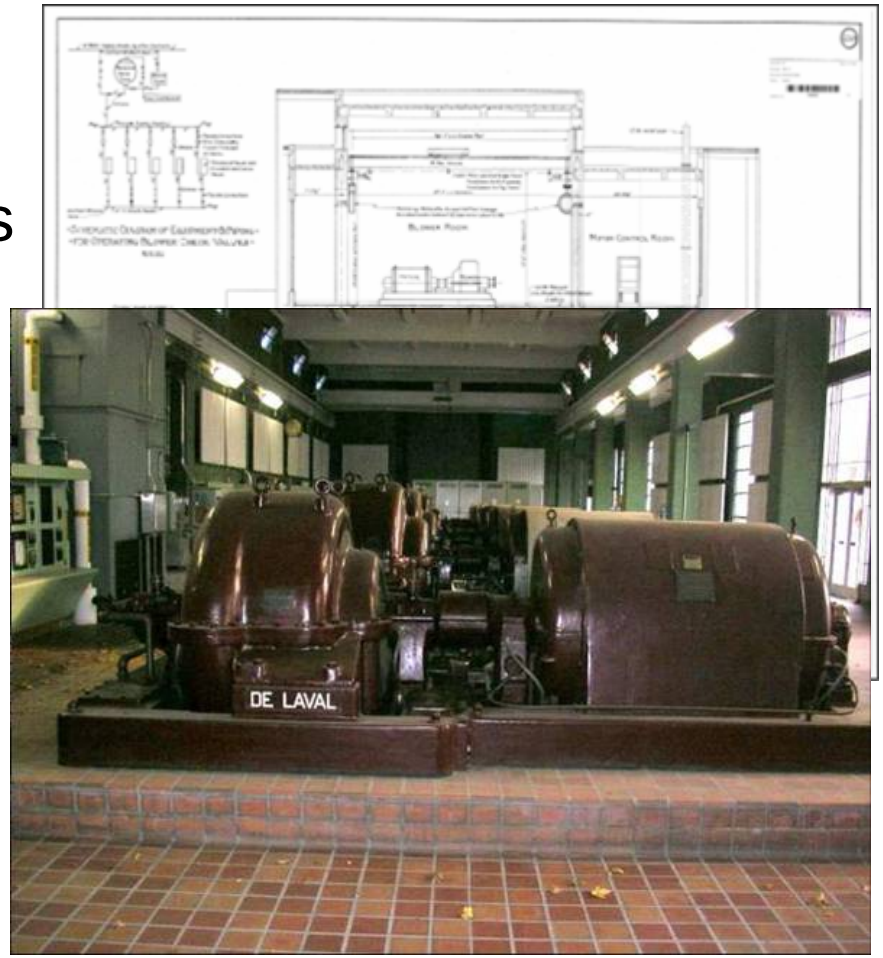


What is an asset register?

- *Systematic recording* of all assets an organization owns or for which it has responsibility
- Uses *asset identification numbers* to which attribute information can be linked

Sources of data

- As-built drawings
- Design drawings
- Manufacturers' manuals
- Bid documents
- Schedules of quantities
- Staff—current and previous
- Photos and videos

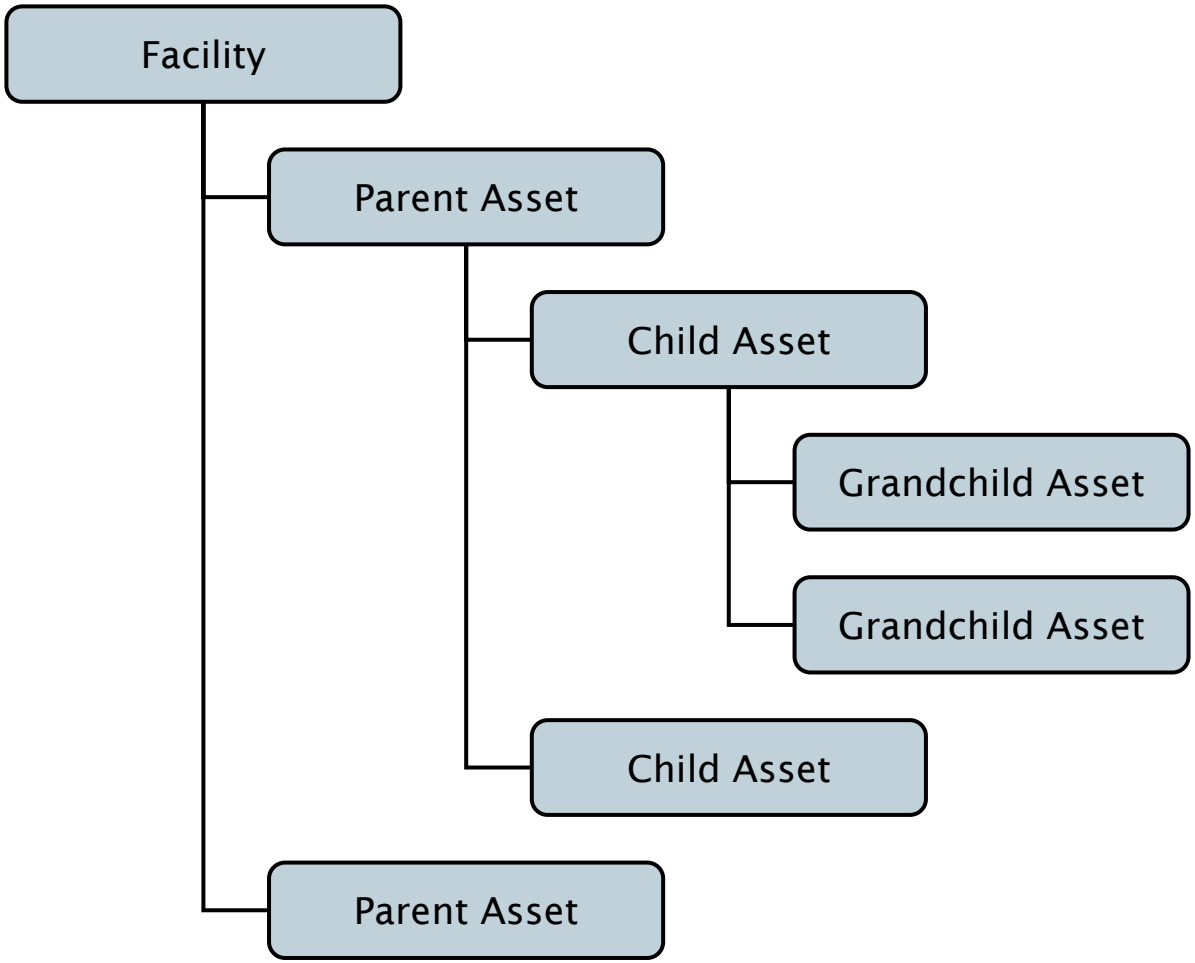


Types of asset registers

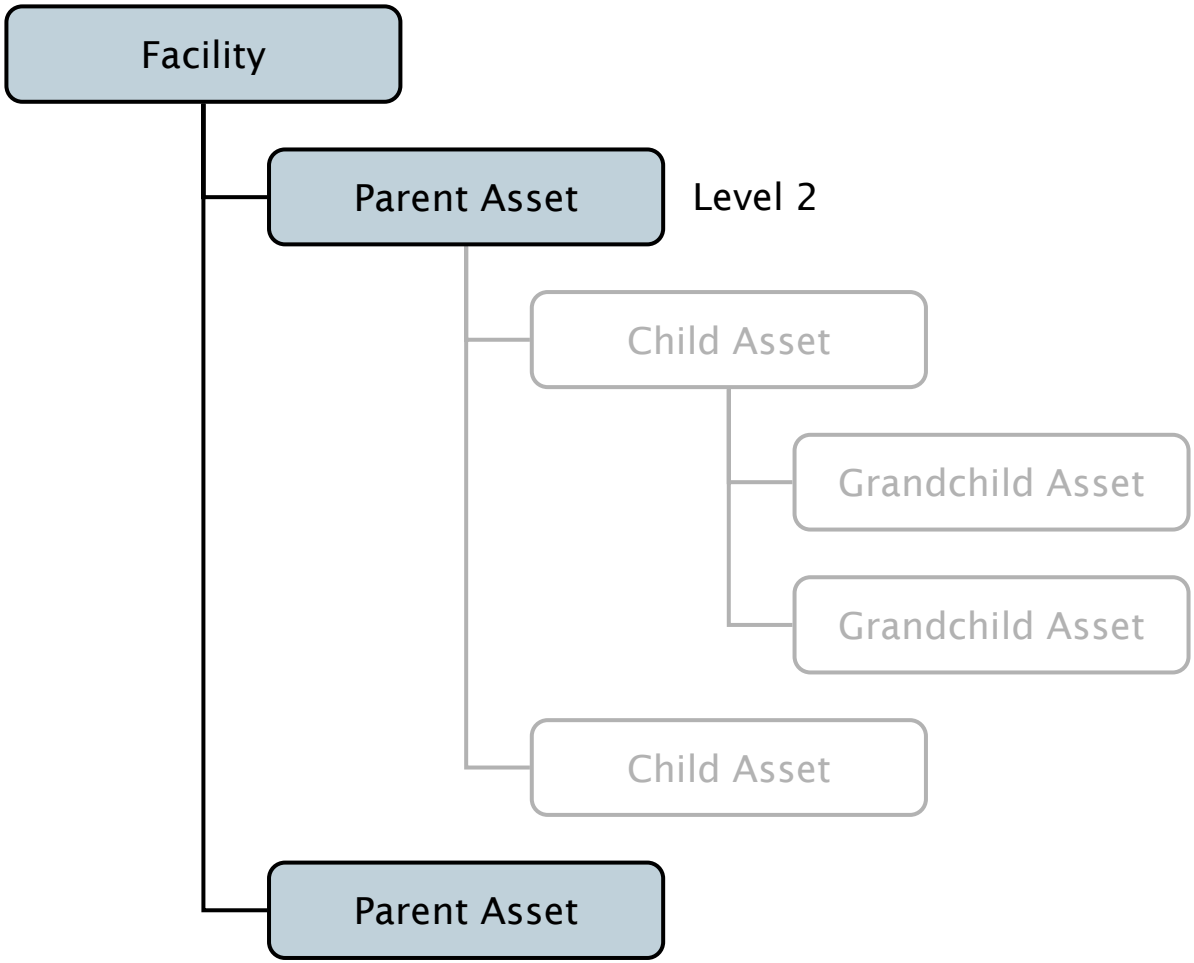
- Hierarchical—parent, child
- Category-based
- Process loops
- Spatial relationships—GPS-generated
- Business unit responsibilities
- Service provisions

GPS is global positioning system

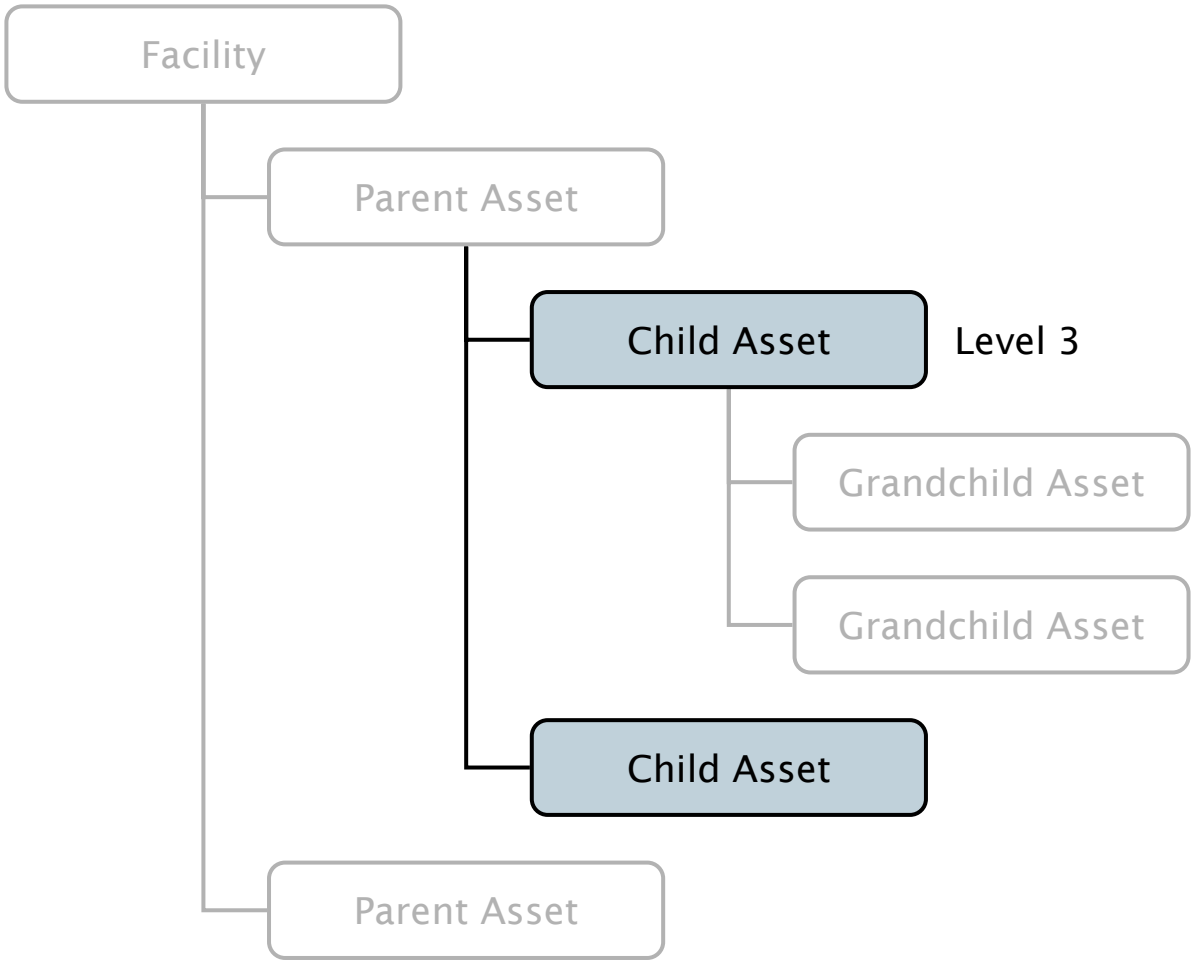
Asset hierarchy



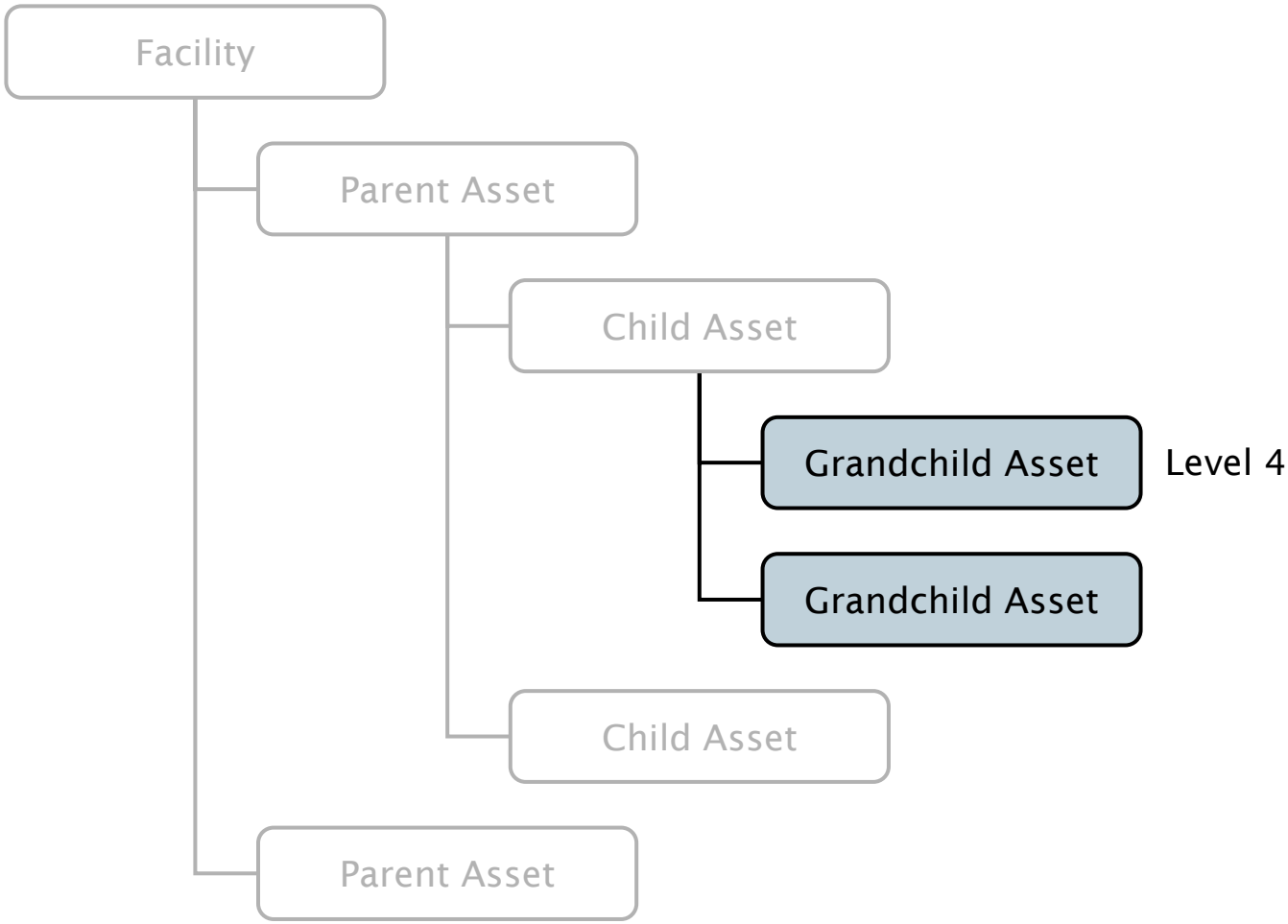
Asset hierarchy, levels 1 and 2



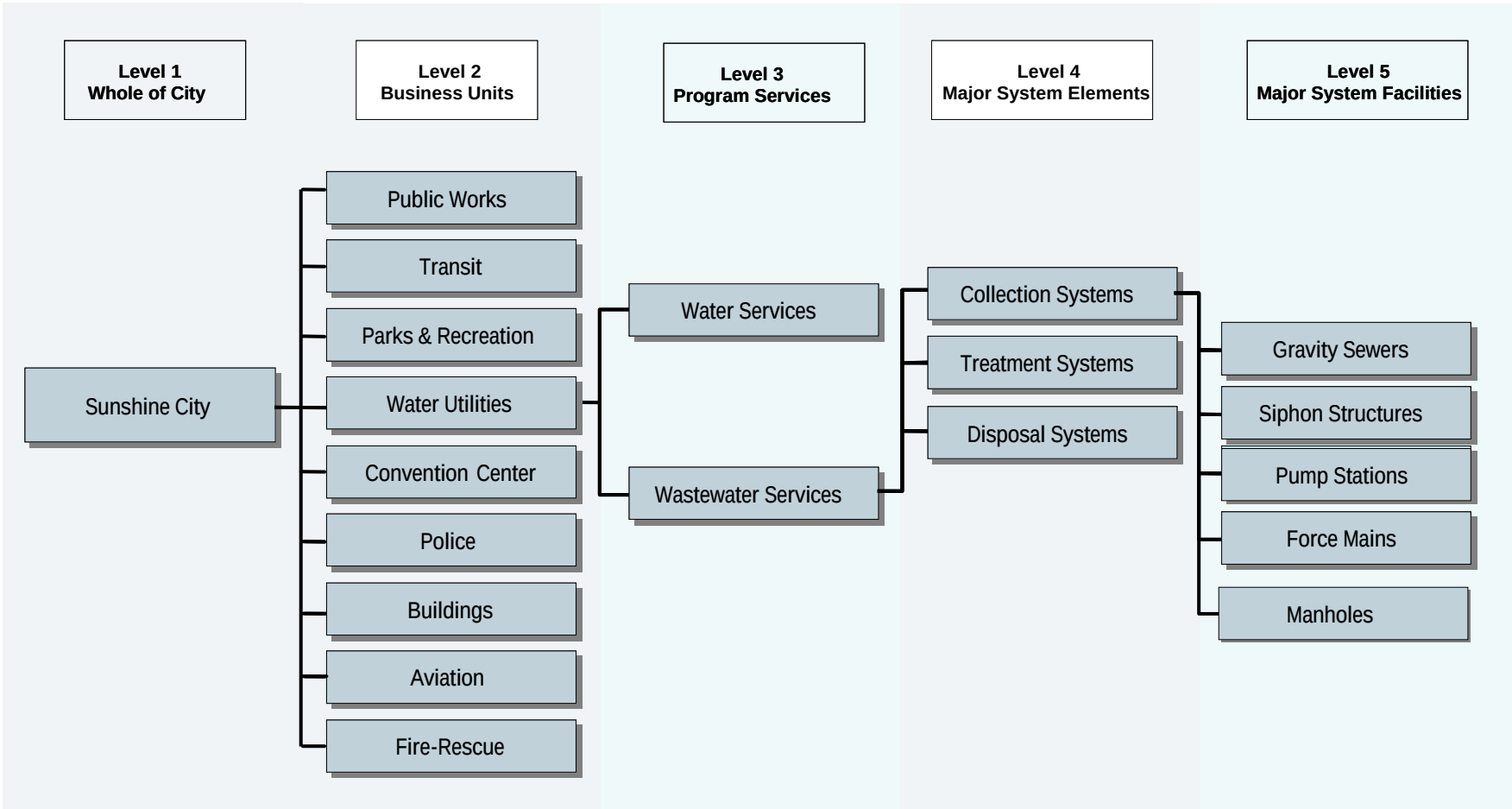
Asset hierarchy, level 3



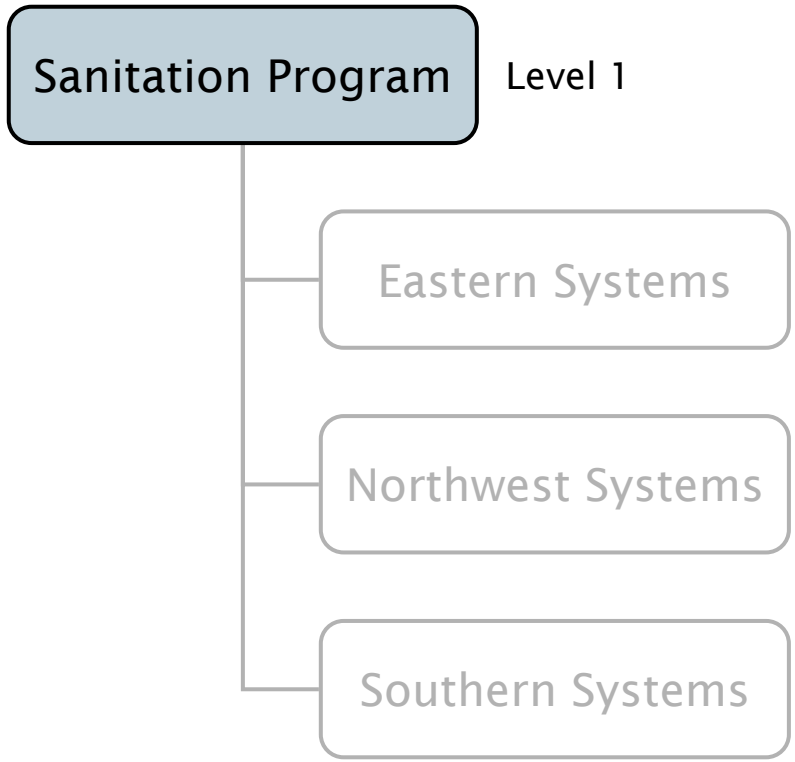
Asset hierarchy, level 4



“Whole of government” asset hierarchy



Asset hierarchy example, levels 1 and 2



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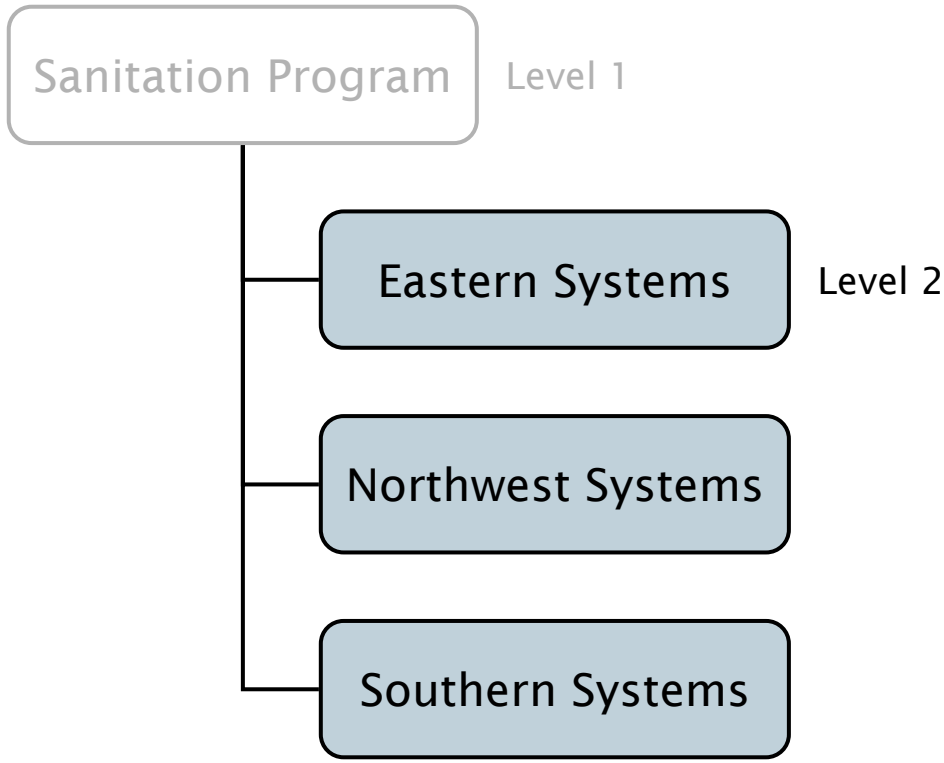

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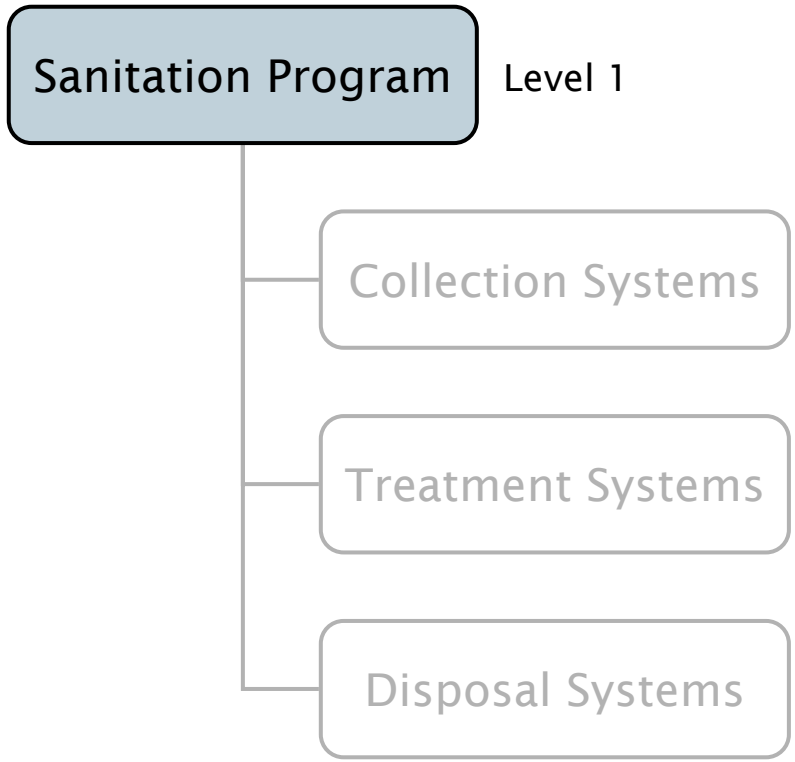

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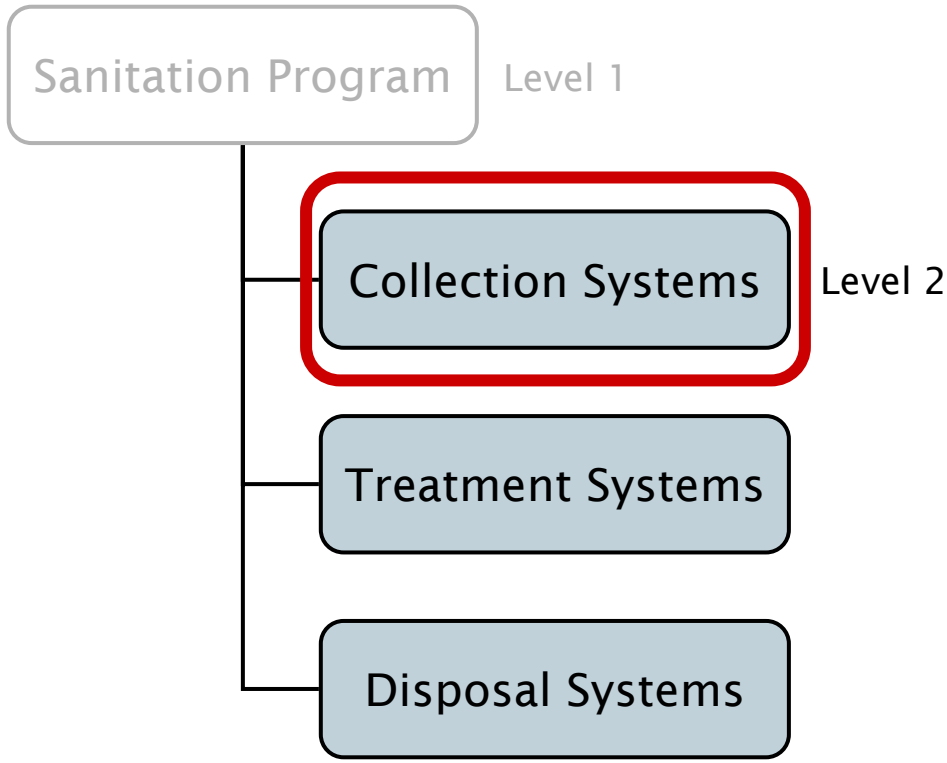
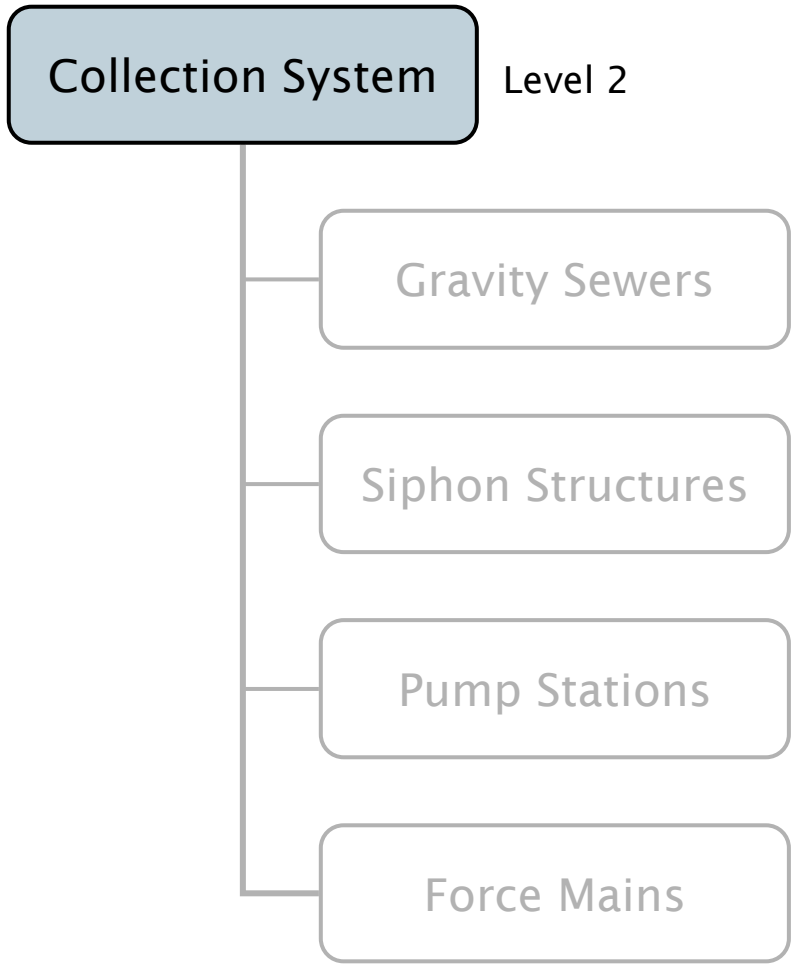


Asset hierarchy example, levels 2 and 3



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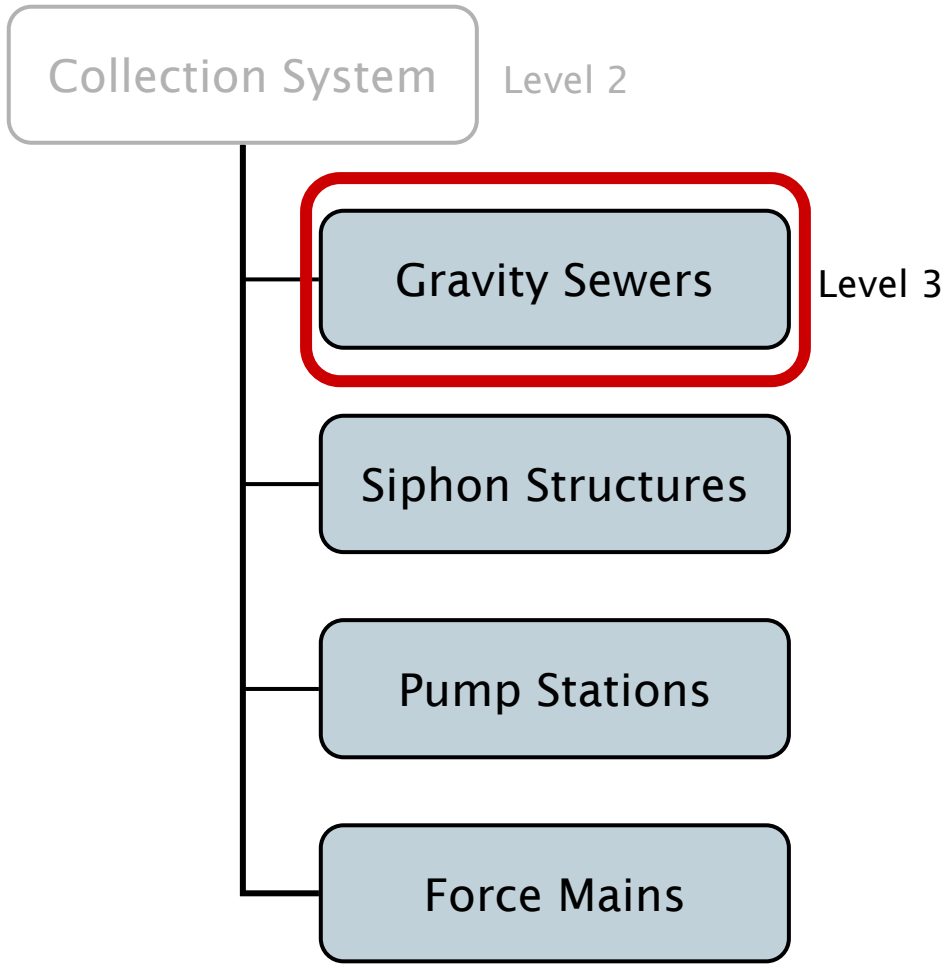

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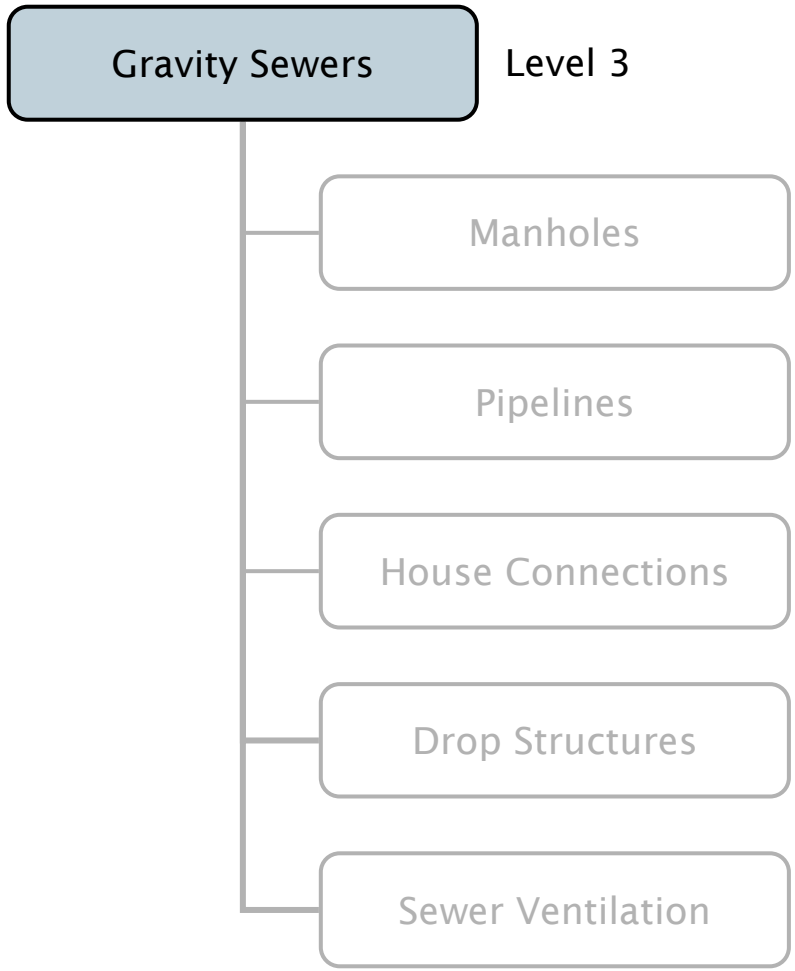

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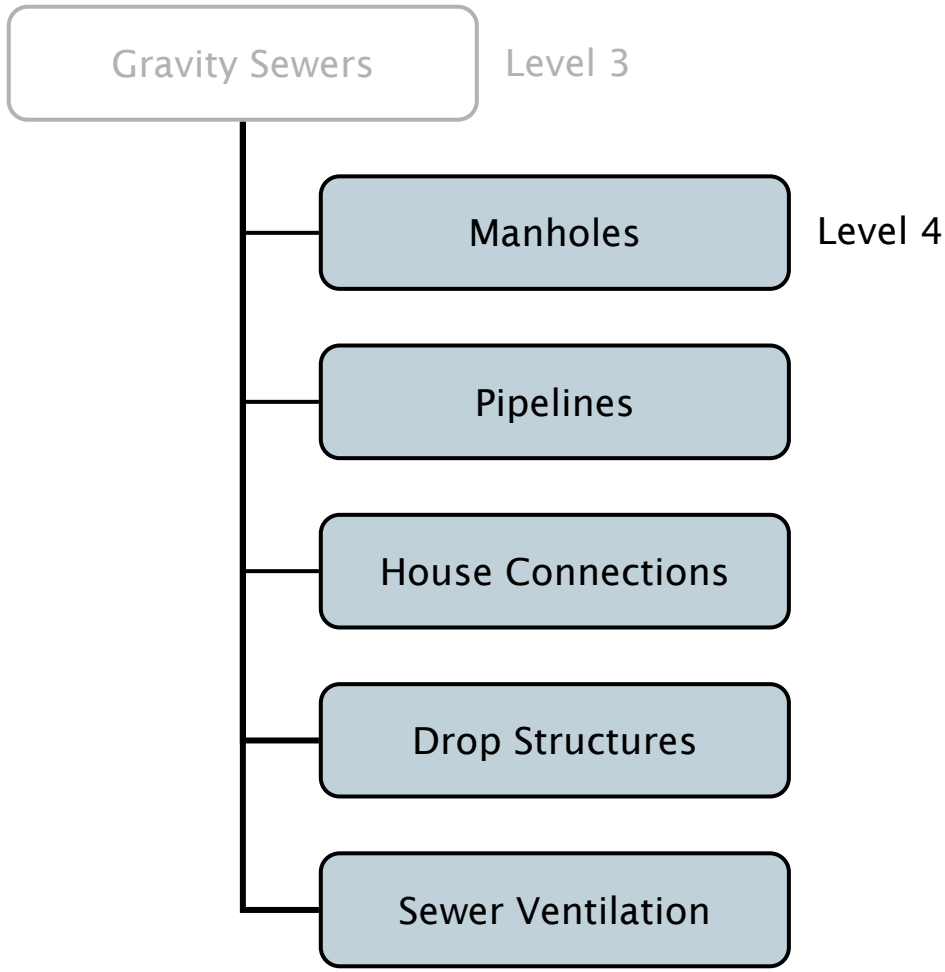

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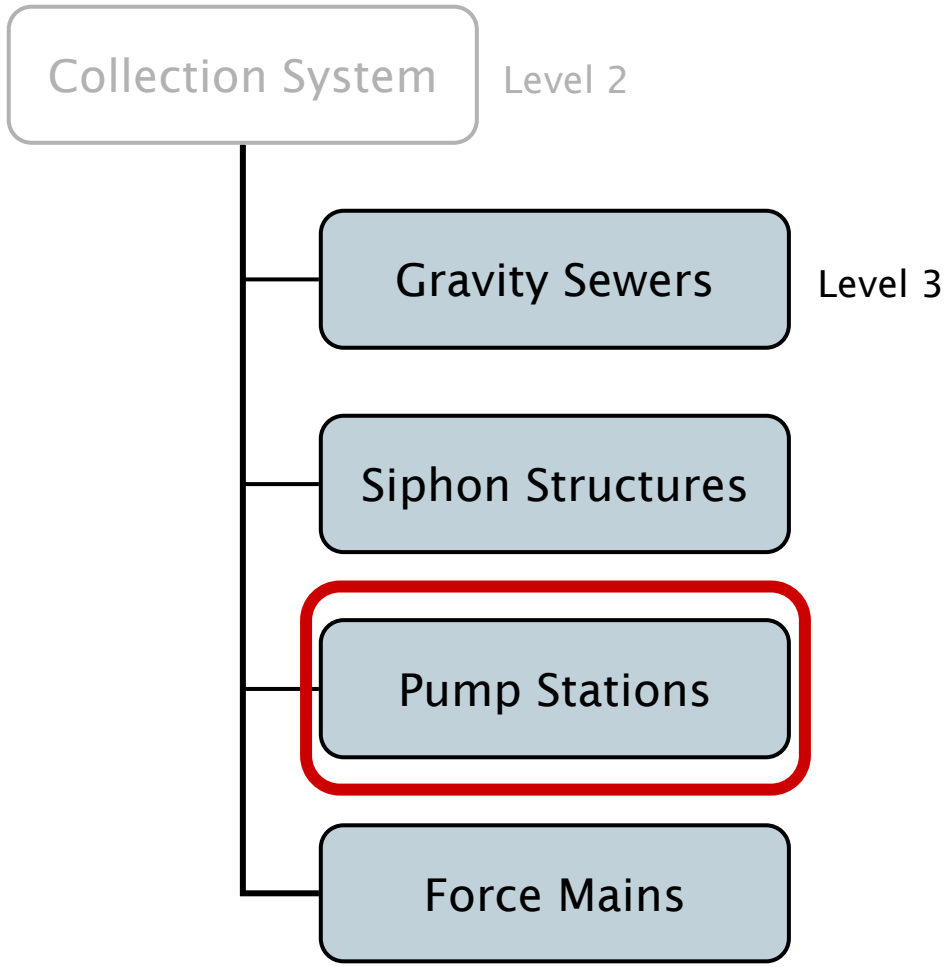

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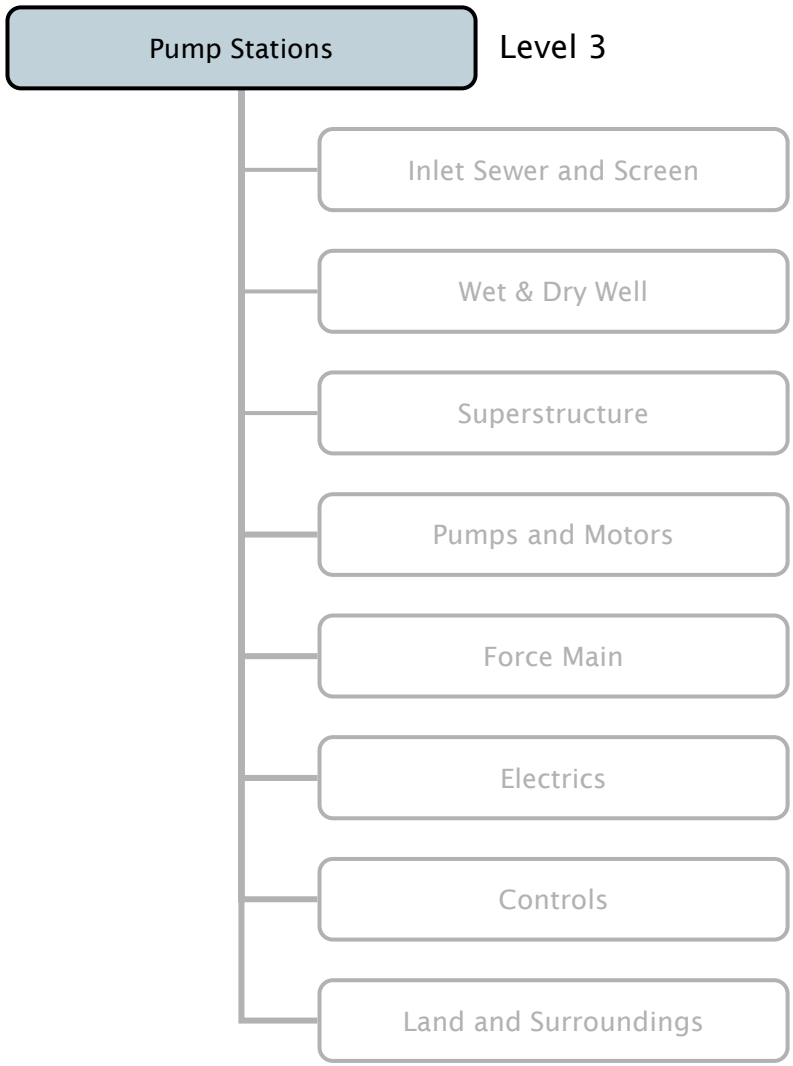

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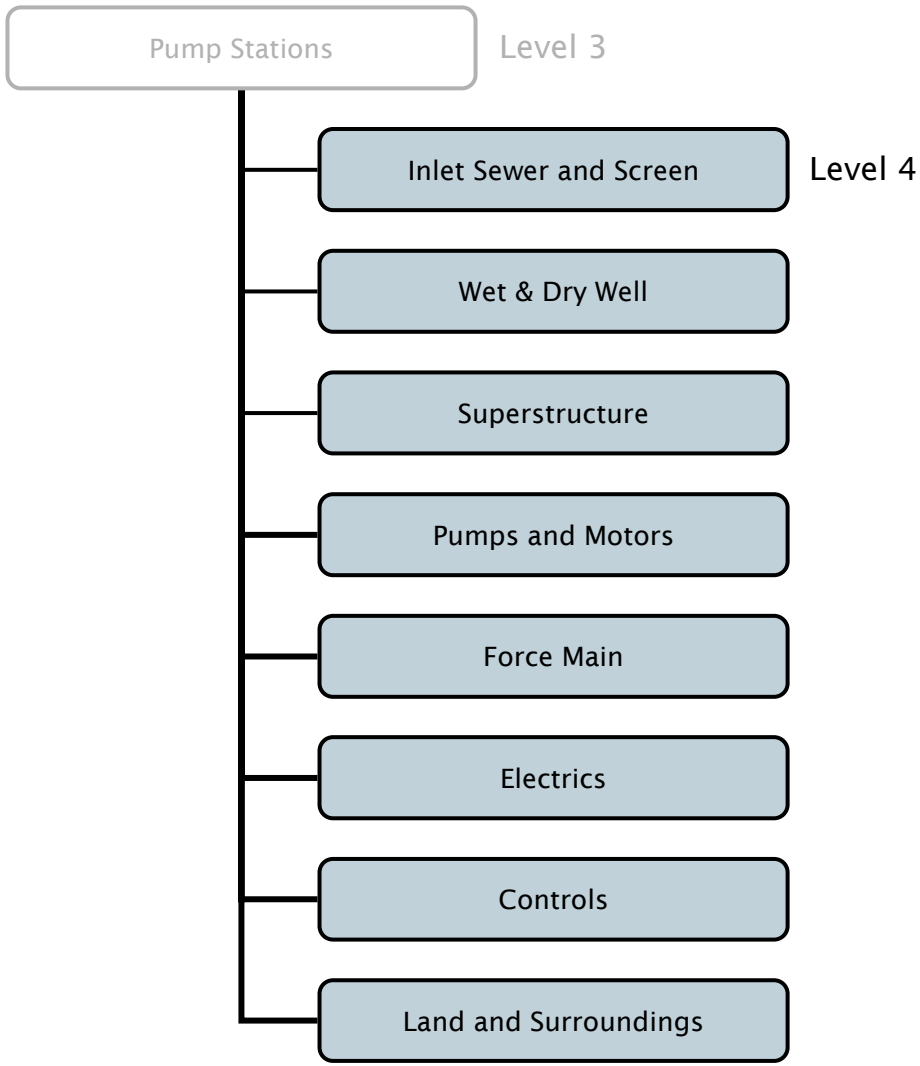
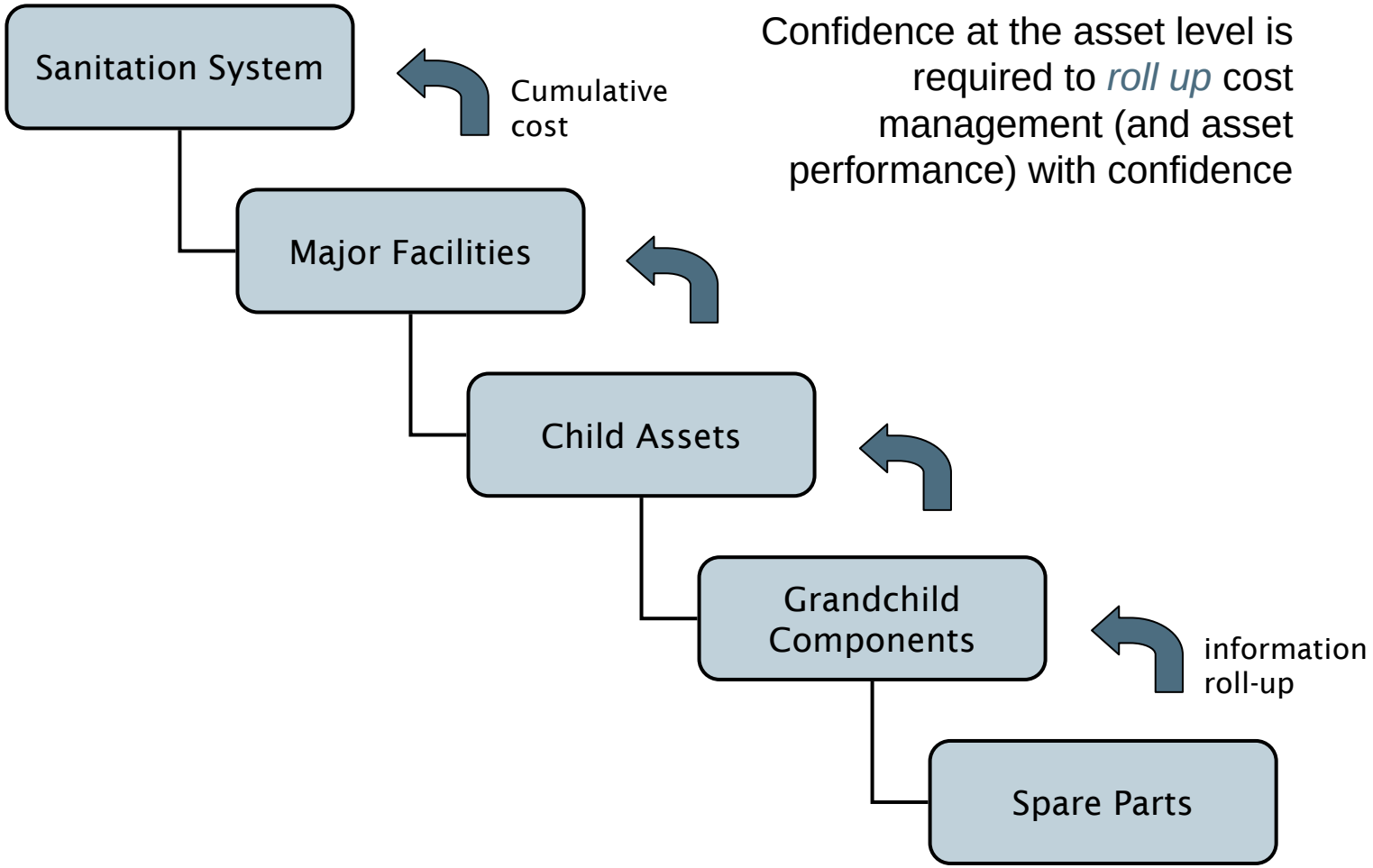


Roll up concept



Confidence at the asset level is required to *roll up* cost management (and asset performance) with confidence

Maintenance managed item

- *Maintenance managed item* (MMI) is an item at the lowest level—*the smallest subdivision*—of an asset registry composed as a nested hierarchy
- Typically, it is the level at which an asset is *maintained* (for example, parts are identified), or *decisions* are made to repair, refurbish, or replace

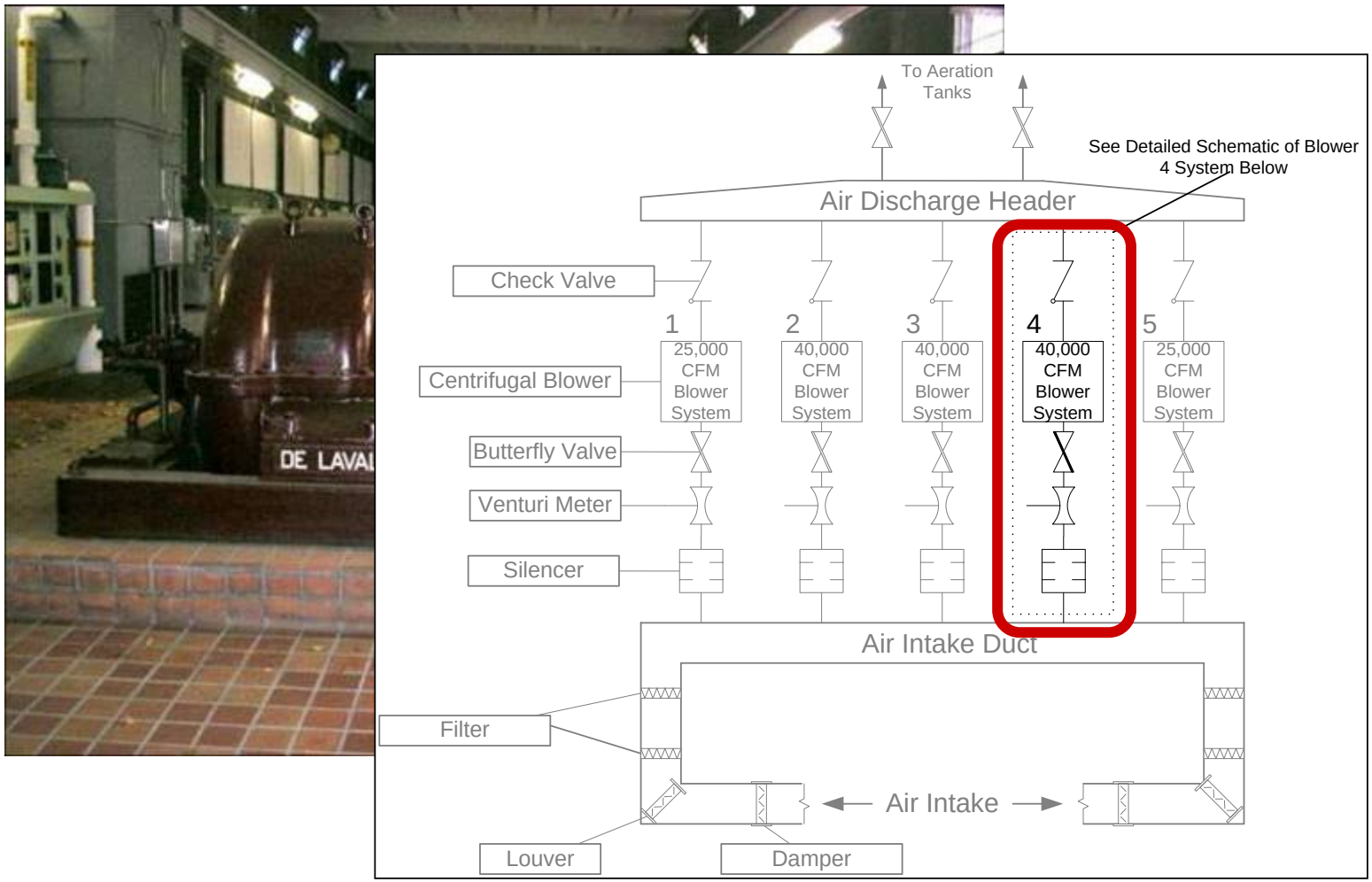
Asset

OR?

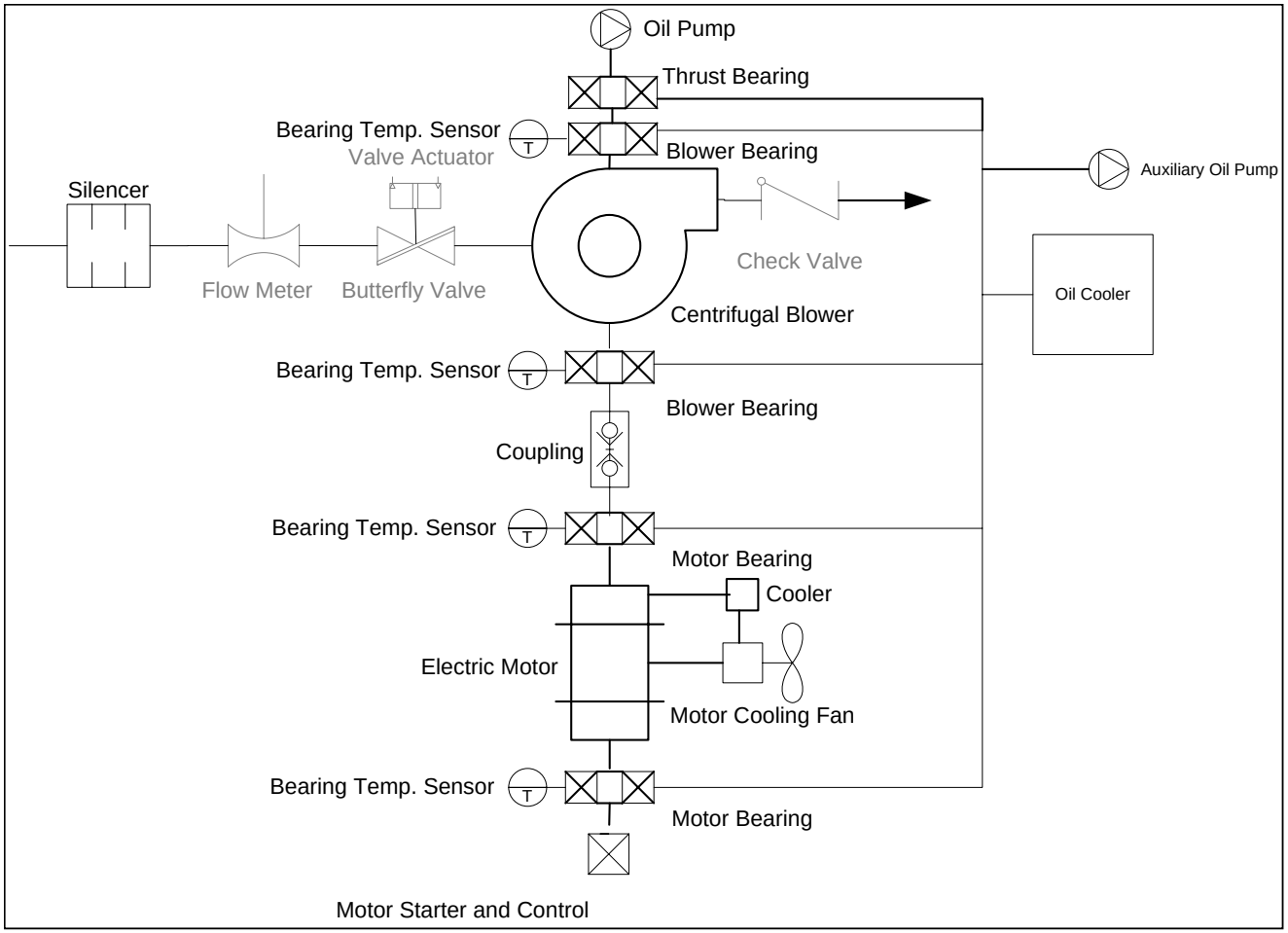
Component

Think “work order”

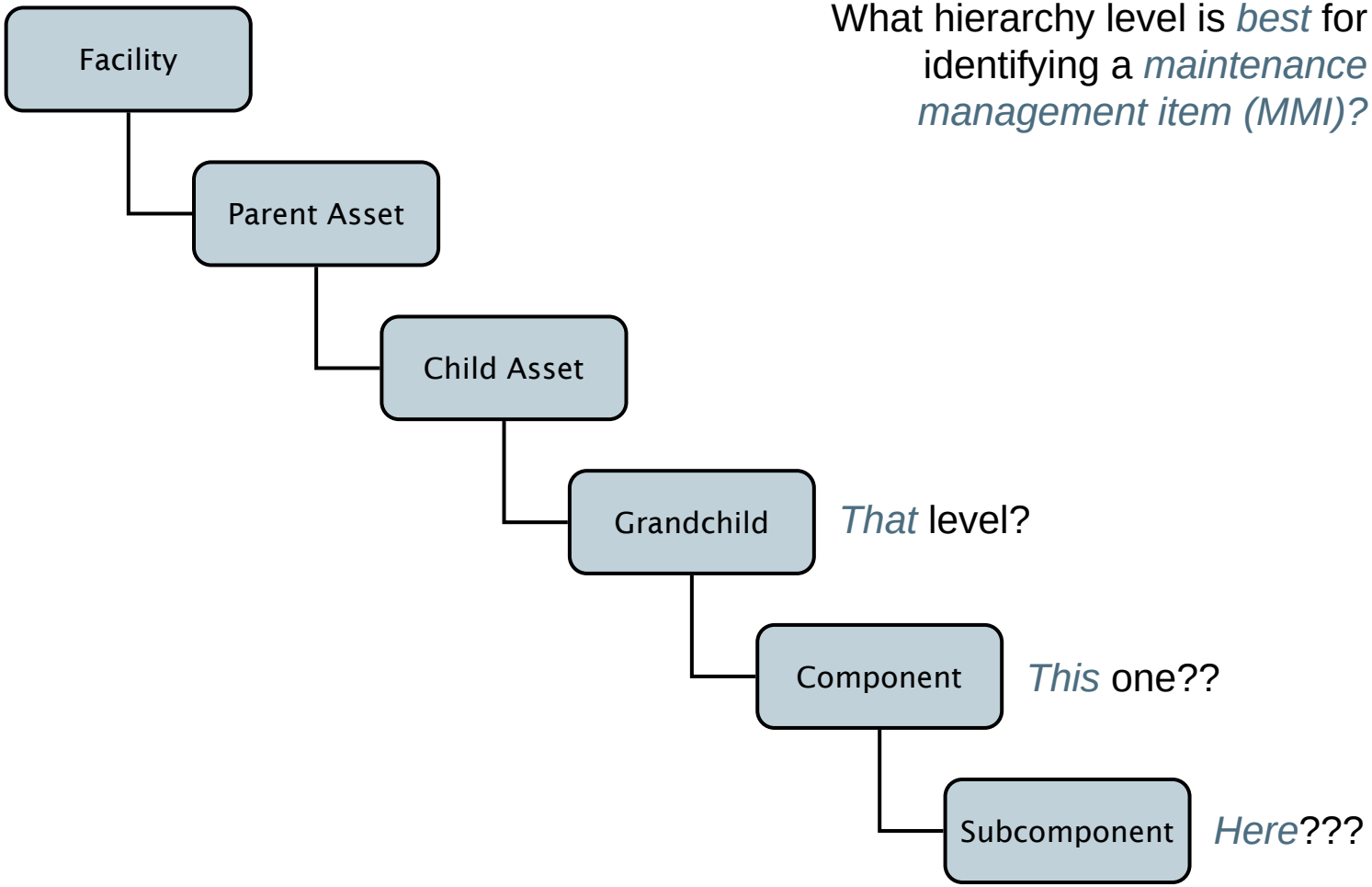
Using process layout with asset registry



Using process layout with asset registry

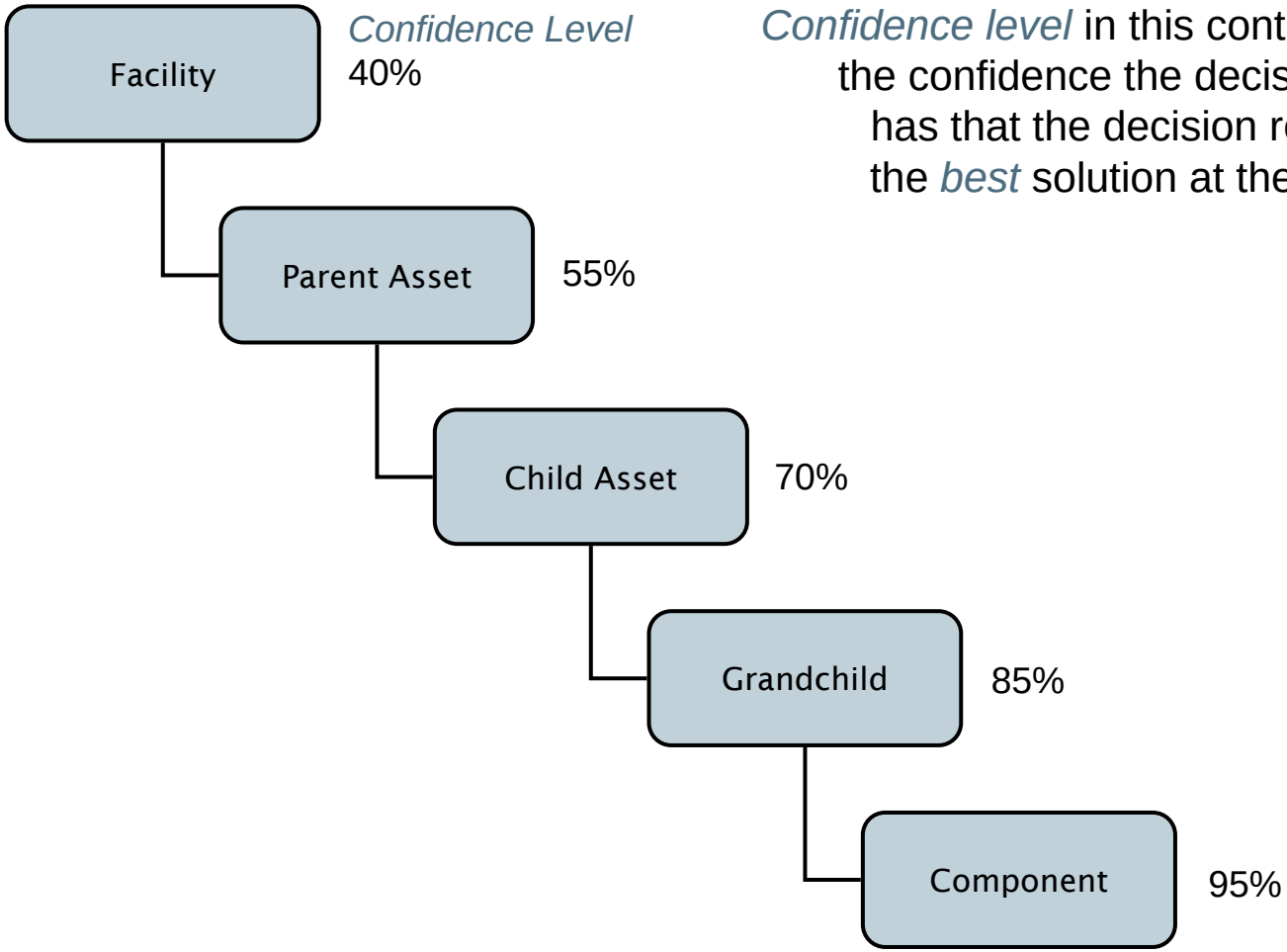


Asset hierarchy



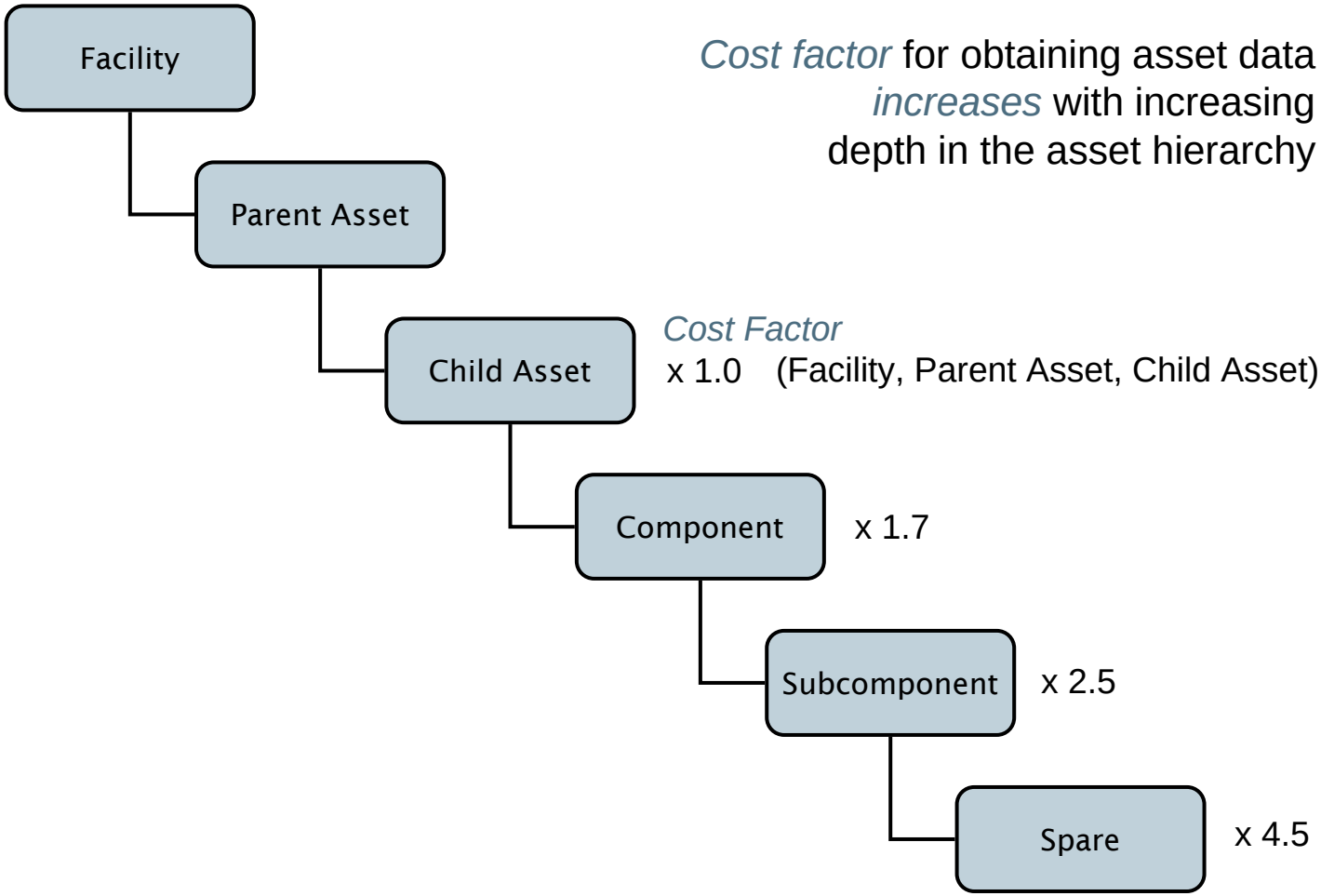
What hierarchy level is *best* for identifying a *maintenance management item (MMI)?*

Data confidence levels within asset hierarchy



Confidence level in this context means the confidence the decision-maker has that the decision rendered is the *best* solution at the *right* time

Data costs within asset hierarchy



Cost factor for obtaining asset data *increases* with increasing depth in the asset hierarchy

Cost Factor

x 1.0 (Facility, Parent Asset, Child Asset)

x 1.7

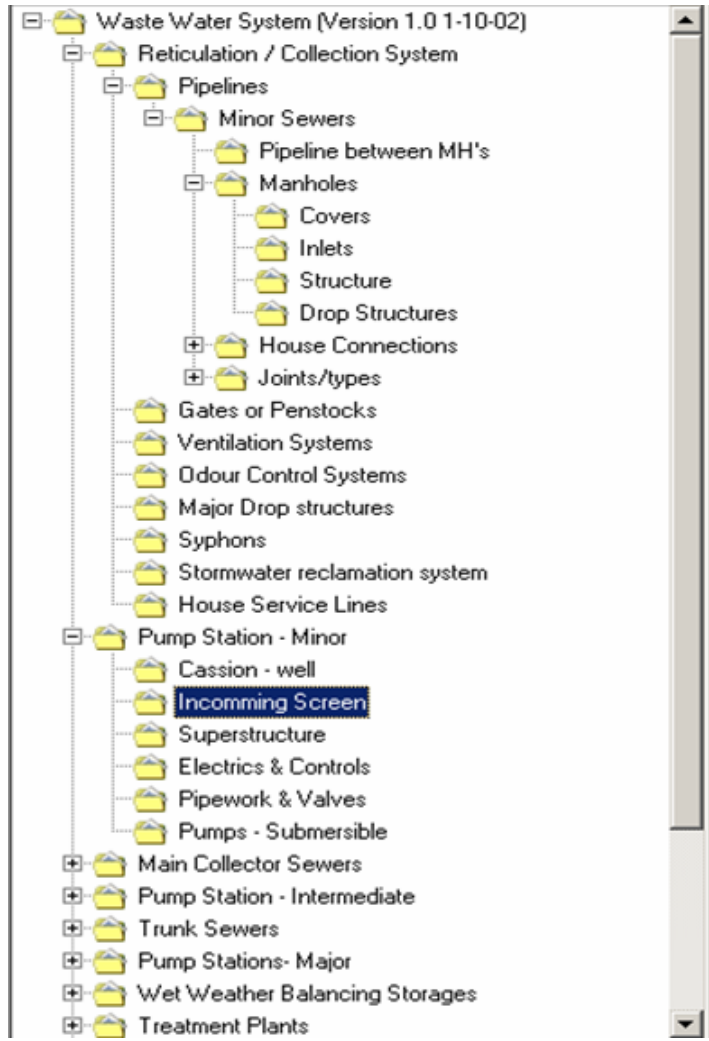
x 2.5

x 4.5

Examples of tree-style asset hierarchy

Asset Hierarchy

1	2	3	4	5	6	7	8	Level 9 Name
Sanitation System								
	Disposal System							
	Collection System							
	Treatment Plants							
		Westerly Treatment Plant						
		Southerly Treatment Plant						
		Easterly Treatment Plant						
			Aeration System					
				Aeration Facility				
					Building & Services			
					Intake Header			
					Blower Assembly			
						Motor Starter		
						Blower Assembly 1		
						Blower Assembly 1		
						Blower Assembly 1		
						Blower Assembly 4		
							Rear motor bearing	
							Rear bearing temp sensor	
							Oil lube/cooling system	
								Oil pump
								Circulation tubing
								Oil sensor
							Motor Cooling System	
								Cooling Water Pumps
								Eletric Motor for Cooling System
								Piping and valves
							Electric motor	
							Front motor bearing	
							Front bearing temp sensor	
							Coupling	
							Rear blower bearing	
							Rear bearing temp sensor	
							Centrifugal blower	
								Housing
								Main shaft
								Impeller
								Seals
							Front bearing temp sensor	
							Front blower bearing	
							Discharge check valve	
							Inlet butterfly valve	
							Silencer	
							Flow Meter	
							Thrust Bearing	
							Blower Assembly 5	
						Discharge Header		
					Aeration Tanks			



Data standard

Written record:

- Asset identification naming convention
- Attributes
- Record layouts
- Database architecture and protocols
- Data collection protocols

Asset ID naming convention issues

- What is an asset? (What gets a unique ID?)
- Linear (pipe) vs. vertical (plant) assets
  - Geo-reference
  - CAD versus GIS
- Active vs. passive
  - Lock-out/tag-out
  - Asset ID vs. asset location for mobile assets

CAD is computer-aided design, GIS is geographic information system

Data collection strategy

ATTRIBUTE	SOURCE	LEVEL	USE
Asset List	SPL / Drawings	Asset	All
Asset Hierarchical	SPL / Drawings	Asset	All
Asset ID / Number	SPL / Data Standard	Asset	All
Asset Status	Field Inspection, Staff Interviews	Asset	All
Asset Type	SPL / Data Standard	Asset	See Level Column
Installation Date	Drawings / Staff Interviews	Asset	Renewal Timing
Last Rehab Date	Staff Interviews	Asset	Renewal Timing
Size	Drawings / Field Inspection	Asset	CoF, Valuation
Size Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Length	Drawings / Field Inspection	Asset	CoF, Valuation
Length Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity	Drawings / Field Inspection	Asset	CoF, Valuation
Capacity Unit	Drawings / Field Inspection	Asset	CoF, Valuation
Condition	Inspection, Staff Interviews	Asset	Renew Timing, PoF

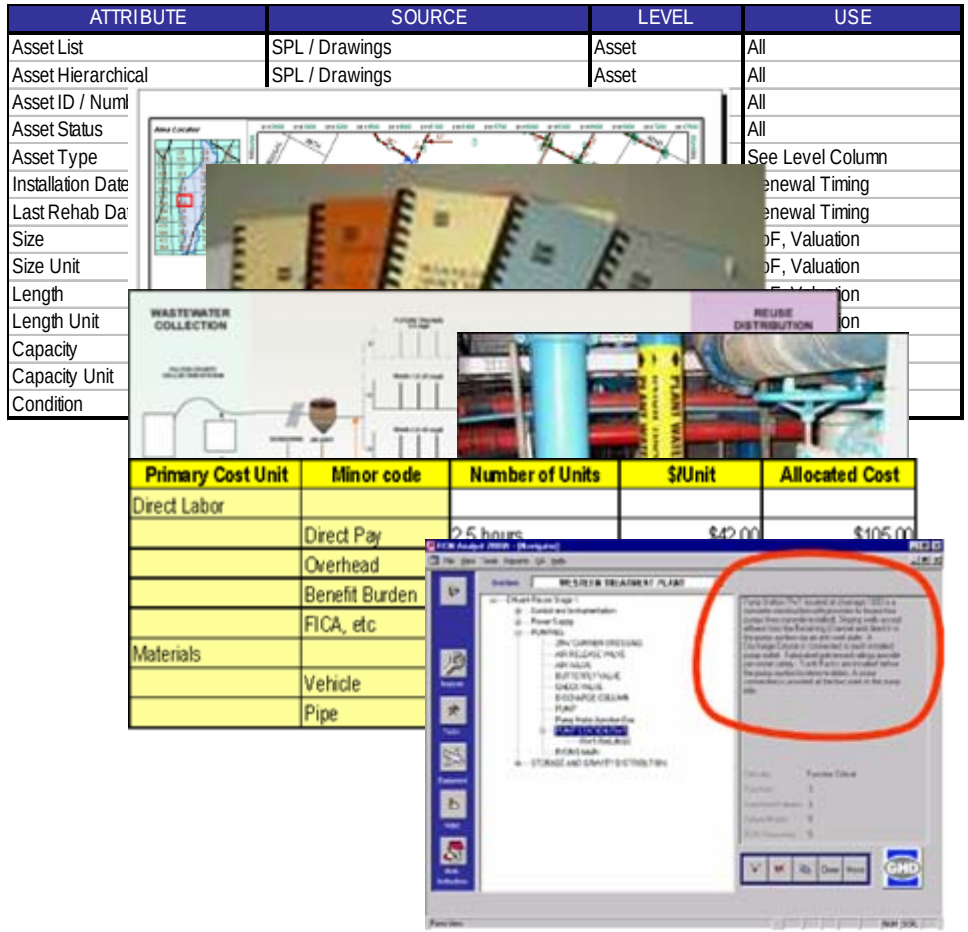
-
-
-

Etc.

Major components of asset data

Tied to the *asset ID*…

- Physical attributes
- Geo-reference
- O&M manuals
- Drawings and photos
- Life cycle costs
- Knowledge and strategy



Two approaches to generating registry data

What we already have—retrospective

- *Critical first*
- Use existing crews as they respond to Work Orders
- Use engineering students

What we are about to acquire—prospective

- Tie to commissioning or handover process
- Use contract details to retain control

Recording data—new technology

Ricoh Caplio Pro G3

Data responsibilities

Data Task	*Organization Group*
Asset details	Operations
Condition assessment	Maintenance
Asset values	Engineering
Residual physical lives	Engineering
Probability of failure	Maintenance
Consequence of failure	Engineering
Business risk exposure	Engineering
Optimal renewal strategy	Maintenance or Engineering

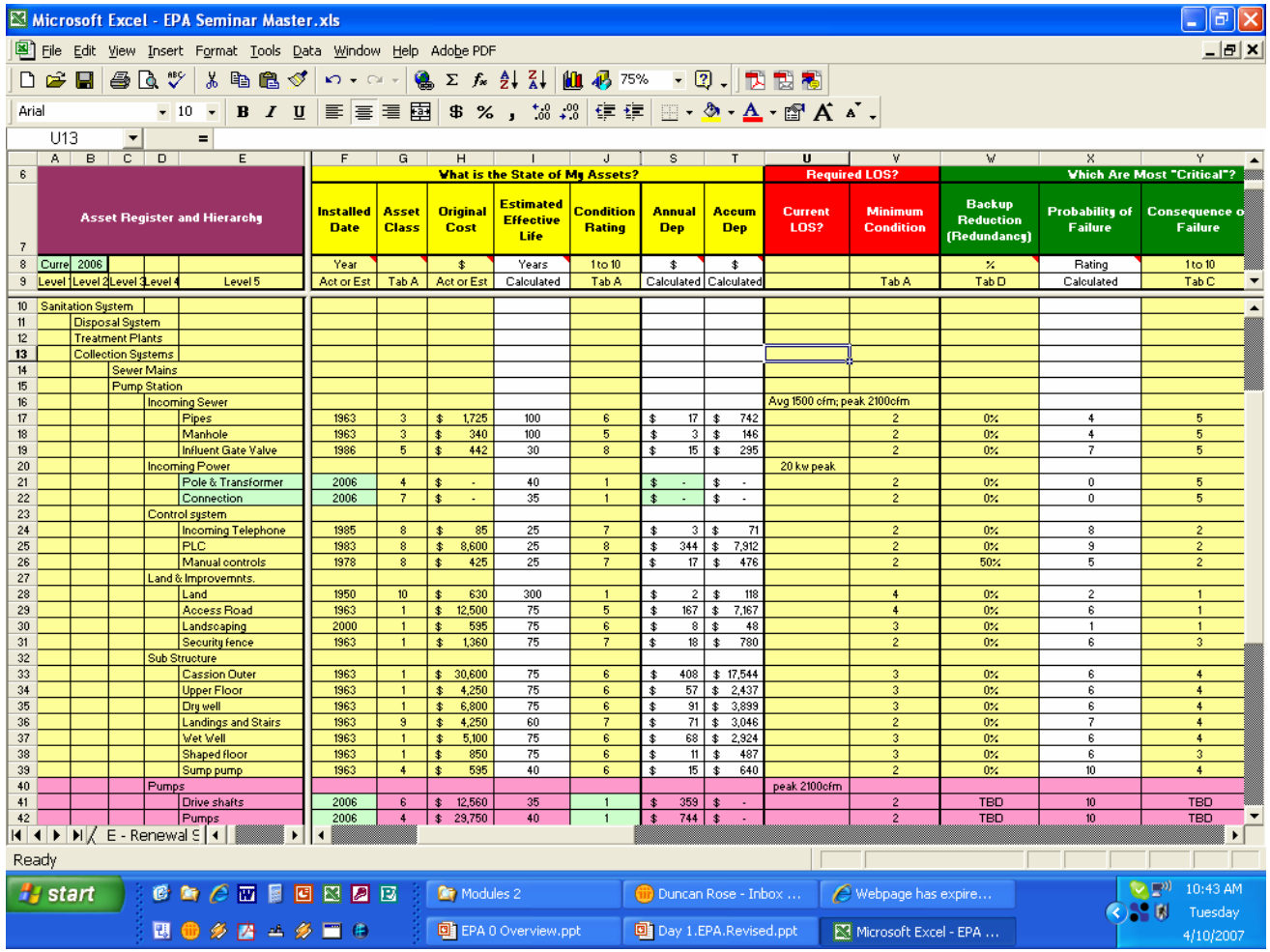
Key points from this session

What do I own and where is it?

Key Points:

- We have to know what we have before we can manage appropriately what residual life is left.
- Everything in AM starts with the Asset Registry.
- The “data standard” is the key building block for AM asset registries.

Associated Techniques:

- Asset registry/inventory
- Data standards, asset hierarchy
- System maps
- Delphi approach to locating other sources of data
- Process diagrams
- “Handover” procedures

Tom's spreadsheet