

A UOSA Perspective: Enterprise Asset Management



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VWEA Education Seminar
Managing Risk Through Process and Organizational Innovation
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UOSA is Responsible to its Ratepayers for Many Physical Assets

- UOSA has a 240 square mile service area
- 27 miles of interceptor sewers - 6" to 78" in diameter
- 472 manholes; 18 flow-metering stations
- 9 pump stations - < 1mgd to > 100 mgd
- 8 offline storage facilities
- 15 miles of force mains - 8" to 48" in diameter
- And a Potable Reuse Treatment Facility - 54 mgd



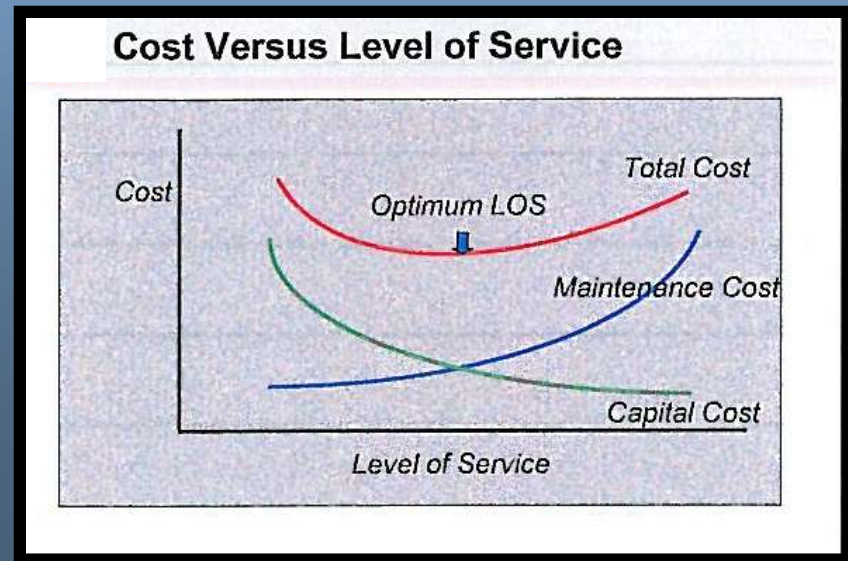
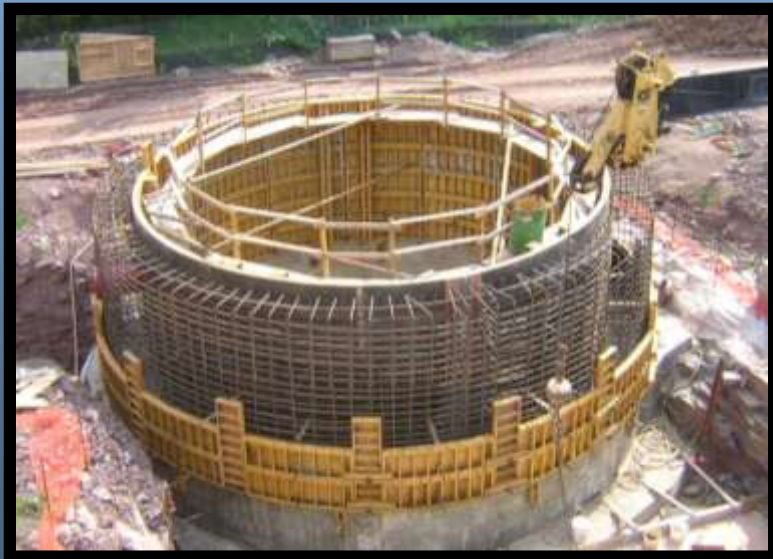
Examples of UOSA's Plant Assets

- Conventional preliminary & primary treatment
- BNR secondary treatment
- Lime/Recarbonation AWT
- Filtration & GAC adsorbers
- Chlorination/dechlorination
- Anaerobic Digestion, DAFTs, Centrifuges, Plate Presses, Rotary Dryer/Pelletizer
- Onsite Dam & Reservoir
- Onsite Landfill
- 7.5 MW Power Station
- 0.85 MW Cogen Facility
- 15,000 I/O DCS
- Office Buildings
- Mobile Equipment
- Roads, sewers, water pump & distribution networks



Why Does UOSA Need Asset Management?

- Keep track of and minimize asset life cycle costs
- Understand capability and criticality of its assets
- Maintain assets in a proactive manner
- Evaluate PM & PdM program effectiveness
- Account for the value of assets
- Optimize asset utilization
- Make informed decisions about repair or replacement
- Forecast capital projects for asset renewal/replacement



Timeline for EAM Implementations

Began Fixed Assets Pilot on Collection System Assets

Completed Oldest Plant Assets

Began EAM

Go Live with Collection System Assets, Start Oldest Plant Assets

Completed Newest Plant Assets

2004

2005

2008

2010

2015

2000-2002

2004-2005

2007

2013

Financials, Purchasing, Inventory & Maintenance Modules in ERP

Business Process, Asset Accounting & Hierarchy Structure

Fixed Asset Prototype & Asset Valuations

Completed Intermediate Expansion Plant Assets



UOSA's EAM Costs

- Asset Management Related Costs:
2005 – 2009 Consulting Services & Internal Labor for Implementing EAM
Annual Upkeep and Improvements thereafter

Asset Management CDM Business & Financial Consulting	\$323,386
Asset Management Mindset Application Consulting	\$93,937
Asset Management Solutions Application Consulting	\$45,000
Asset Management Cost of Internal UOSA Labor	\$115,000
Annually Budget for EAM Improvement Initiatives	\$25,000

Iterative and Phased Approach

Captures Asset:

- Inventory & Categorization
- Valuation
- Condition
- Criticality/Risk
 - Likelihood of Failure
 - Consequence of Failure



Business Risk Exposure by Replacement Value (\$)											
		Probability									
		1	2	3	4	5	6	7	8	9	10
Consequence	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	342,722	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	27,025	-	-	339,066	546,303
	5	-	-	-	-	-	-	-	-	-	-
	6	-	250,950	-	101,184	-	962,414	-	4,341,732	-	-
	7	-	-	-	-	-	-	-	-	-	-
	8	-	-	-	74,214	-	12,162	-	6,276,508	-	204,257
	9	-	-	-	-	-	-	-	-	-	-
	10	-	-	-	-	-	-	-	-	-	-

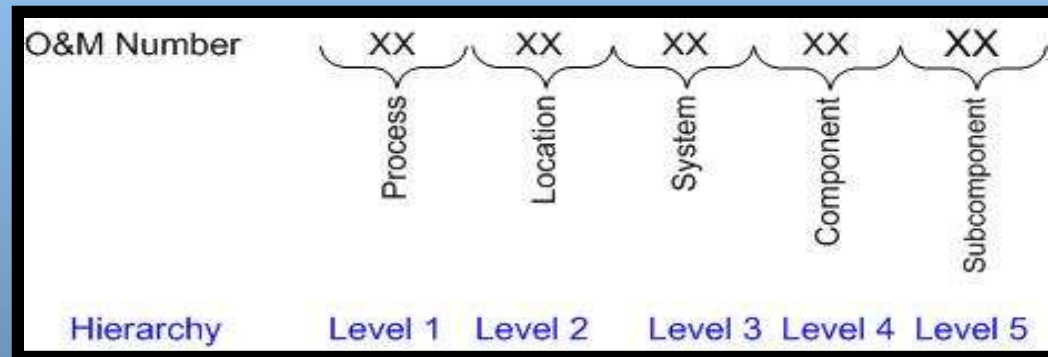
Assets Categorized for Accounting, Maintenance and Engineering

- Multiple ways to organize assets

i.e. - Fixed Assets Chart of Accounts vs. Equipment Master Hierarchy

- Land
- Treatment Plant/Reservoir
- Pump Stations
- Interceptor Sewers
- Mobile Equipment
- Vehicles
- Furniture and Equipment
- Construction-in-progress

- Useful Life defined by different ledgers



Examples	Manufacture Useful Life	Financial Life
Manhole	100	50
Interceptors	100	50
Pumps	30	25
Buildings	60	50

Records 1 - 3		Customize Grid										
<input type="checkbox"/>	<input checked="" type="checkbox"/>	LT	Ledger Type Description	Depr Meth	Depr Method Description	Life Mos	Initial Term	Compute Direction	Start * Depr	Meth %	Meth 9 Sch No	Salvage Value
<input type="checkbox"/>	<input checked="" type="checkbox"/>	AA	General Ledger	MY	MID YEAR CONVENTION	600	Y	R	06/30/1992			
<input type="checkbox"/>	<input type="checkbox"/>	ML	MANUFACTURER'S	ML	MANUFACTURER'S LIFE	1200	Y	R	06/30/1992			
<input type="checkbox"/>	<input type="checkbox"/>											



System Level Asset Valuations

Collect Original Installation Cost Using Construction Activities & Schedule of Values

- **Ongoing Maintenance Costs**
 - Purchase Orders
 - Work Orders
- **Replacement Value - Use Cost Index and manufacturer's life since date of installation to escalate Original Costs**
- **Net Book Value - Use standard depreciation schedules for financial life to obtain it**



Example Failure Consequence Matrix

Consequence of Failure						
Factor	Wt	1	3	5	7	10
		Negligible	Minor	Moderate	Major	Severe
Permit compliance	23%	Permit conditions met	Above target on an individual day but no impact on monthly standard	Above target on week but no impact on monthly standard	Violated monthly standard	Chronic permit violation; pending enforcement action.
Impact on process	15%	Individual equipment level. Can still meet all flow demands with excess capacity available No impact on process Can be out of service for several months	Multiple equipment level. Can still meet all flow demands with firm capacity still available Routine adjustment on process Can be down more than a month	System level or major equipment. Inability to meet peak flow. Pond available. Significant adjustment in process necessary requiring significant labor effort Cannot be down beyond a week	System level. Inability to meet peak flow. Bypass of unit process Significant adjustment in process necessary with uncertainty as to recovery Cannot be down for more than a couple of days	Plant level. Inability to meet average flow. Bypass/SSO Major process upset with recovery uncertain Cannot be down more than several hours
Financial impact (repair, loss of revenue, claims, etc)	18%	Within budget line item; cost effective	Exceeds O&M budget line item	Requires reserve maintenance funds in excess of expectations	Requires deferral of other reserve expenditures	New money needed. Board action required.
Health and safety	25%	No injuries or adverse health effects		Minor injury with no lost time; no public health effects	Minor injury with lost time; no public health effects	Major injury with lost time; localized public health issue.
Community and public image (community/environment impact and media coverage)	20%	No complaints. No third-party damage. No media coverage.	Small number of complaints. No third-party damage. Neutral or no coverage in media	Many complaints. Minor third-party damage. Adverse media coverage	Widespread complaints. Major third-party damage. Minor short-term impact on environment. Widespread adverse media coverage	Extensive complaints. National adverse media coverage. Political opposition. Environmental impact reversible in 6 months or more

Example Failure Probability Matrix

Probability of Failure						
Description	Wt	1	3	5	7	10
Physical Condition	53%	Very Good No corrective maintenance needed	Good Few minor deficiencies. Some corrective maintenance needed	Fair Several minor deficiencies. Requires corrective maintenance	Poor Major deficiencies. Requires significant repair or rehabilitation	Very Poor Rehabilitation or replacement necessary. May be unserviceable
Performance	32%	Exceeds performance expectations	Meets performance expectations	Barely meets current expectations. Room for performance improvement	Does not meet current performance expectations	Inefficient performance, bottleneck, obsolete
Repair History	16%	Repair history does not suggest problems	Repair history suggests occasional minor problems	Repair history indicates frequent minor problems	Repair history suggests occasional major problems	Repair history indicates frequent major problems

Estimating Business Risk

$$\text{BRE} = (\text{CoF})(\text{Fp})(\text{R}),$$

Where:

BRE=business risk exposure score

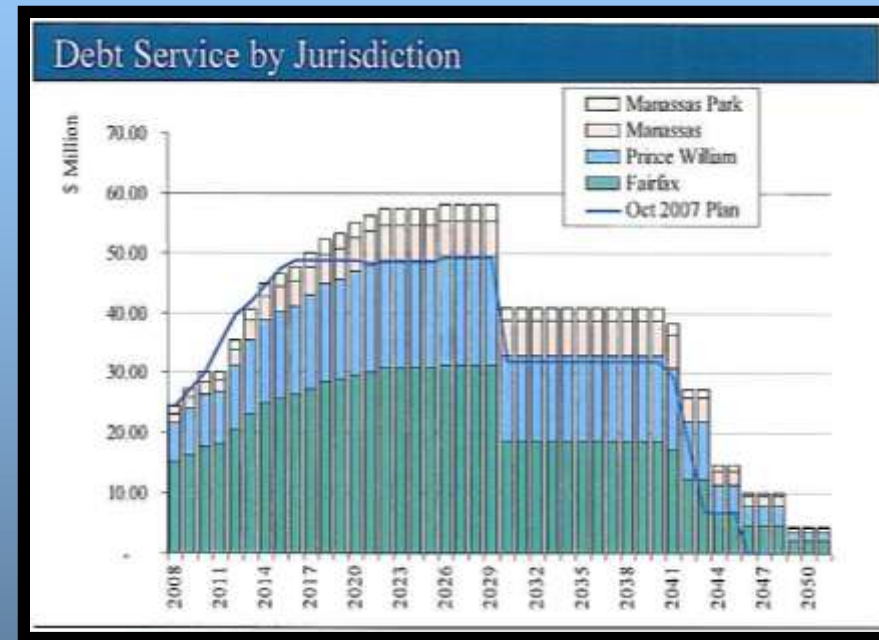
CoF=failure consequence score

Fp =failure probability score

R =reduction factor due to either process
or component redundancy

What Does UOSA Get from it?

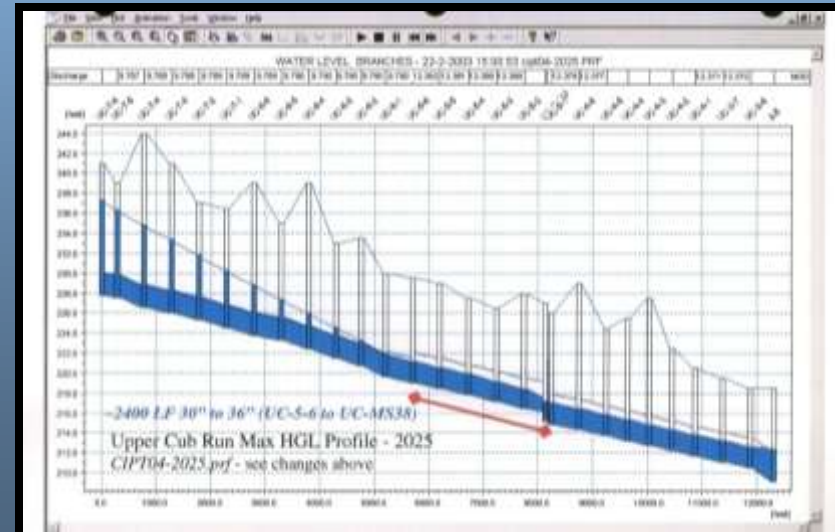
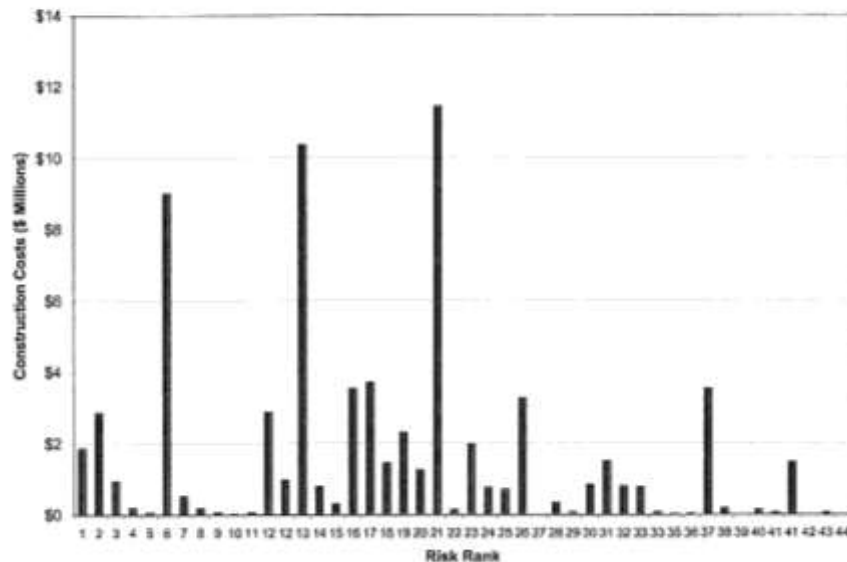
- Improved stewardship, accountability & sustainability
- Method to justify capital investments
- Improve & display financial health
- Unified approach for investment decisions
- Optimized investment – target dollars at greatest enterprise advantages
- Consistent level of service & regulatory compliance
- Appropriately manage business risk exposure
- Improved image for organization
- Improved communication & consistency within the organization thru multi-disciplined management teams focused on common goals & objectives



What Results is UOSA Seeing From It So Far?

- Introduction of Asset Criticality concept
- Capturing Life Cycle Costs
- Forecasting tools
- New Reports help to make informed decisions
- Automation of our fixed asset accounting

FIGURE 2-2
Construction Cost by Level 2 Revised Risk Ranking



What Lessons Has UOSA Learned?

- There's a difference between financial information and information needed by Engineers
 - Categorize assets in different ways
 - Difference between financial life and actual life expectancy
 - Replacement value is inflated, while book value is depreciated
- Enterprise Asset Management is an ongoing process, not a one time project. Developing a mature and robust program is not trivial. Expect a major commitment in time, money and internal staff resources.