Fundamentals of Asset Management

**Step 5. Set Target Level of Service**

*An Hands-On Approach*
Tom’s bad day...
Second of 5 core questions

2. What is the required level of service (LOS)?
   - What is the *demand for my services* by my stakeholders?
   - What do *regulators require*?
   - What is my *actual performance*?
2. What is the required level of service?

AM plan 10-step process

1. Develop Asset Registry
2. Assess Condition, Failure Modes
3. Determine Residual Life
4. Determine Live Cycle & Replacement Costs
5. Set Target Levels of Service (LOS)
6. Determine Business Risk (“Criticality”)
7. Optimize O&M Investment
8. Optimize Capital Investment
9. Determine Funding Strategy
10. Build AM Plan

Demand Anal.; Balanced Scorecard; Perform. Metrics
Level of service

- Good, output-oriented management is driven by a defined standard or level of service
- Where that LOS is
  - Driven by customer-user demand
  - As determined by the appropriate legislative body in a political arena
  - Tied at the strategic organizational level to the tactical asset level
- LOS can be defined as
  - Characteristics or attributes of a service that describe its required level of performance
  - These characteristics typically describe how much, of what nature, and how frequently about the service
Why LOS?

It helps us…

- **Concentrate** (focus) efforts and resources
  - On agreed on service levels
  - Less *service-level-defined by notion*

- **Communicate** service expectations and choices
  - Increased services equal increased costs
  - Discussion of trade-offs and risks

- **Negotiate** (regulators and council/commission/board)
  - Service levels
  - Costs and budgets
  - Rate impacts
  - Reinvestments for renewal
  - Level of risk
LOS’s strategic position

Sewer Core Business Processes

- Collection
- Treatment
- Disposal

Cost of Service → Customer → LOS

Risk/Consequence
Alignment of routine O&M and capital activities with organizational strategies

Organizational strategies

- LOS performance targets: strategic (customer) and tactical (asset unit) levels
- Agency-wide asset performance targets

Routine O&M and capital activity cycle

- Plan
- Schedule
- Control Eval.
- Execute
Nature of LOS

- LOS occurs at multiple levels
  - Agency-wide
  - Groups or systems of assets (collection system, treatment plants)
  - Assets (individual pump stations, digesters, clarifiers)
  - Key asset components (pumps, motors, vfd's)

- LOS targets are established to *roll up* to meet higher level targets
Nature of LOS, continued

There are internal and external LOS targets

- External LOS targets typically are strategic or KPI outcomes
  - Driven by customer-user demand
  - Confirmed or determined by the appropriate legislative body in a political arena
- Internal LOS targets typically are tactical and geared toward focusing activities

LOS is level of service, KPI is key performance indicator
Roll up of LOS

LOS at each level can be met only by delivering related LOS at underlying levels.

- Sanitation System
  - Major Facilities
    - Major Systems
      - Subsystems
        - Individual Assets
          - Cumulative LOS
Jones Street pump station cross-section view
### ENVIRONMENTAL

#### Key Performance Indicators

1. OCSD will comply with effluent quality standards.
   - a. Compliance with all Ocean Discharge Permit Limits, %
   - b. Concentration of Emerging Chemical Constituents of Concern, Plant No. 1 Secondary Effluent
   - c. Effluent total coliform bacteria after initial dilution, mpn
   - d. Source Control permittee compliance with permit conditions, percent

2. OCSD will manage flows reliably.
   - a. Frequency of use of emergency 1-mile outfall
   - b. Sanitary sewer spills per 100 miles
   - c. Contain sanitary sewer spills within 5 hours

3. OCSD’s effluent will be recycled.
   - a. Treated effluent reclaimed, % (flow)

4. OCSD will implement a sustainable biosolids management program.
   - a. National Biosolids Program Certification for Environment Management System
   - b. Percent of biosolids beneficial reuse
     - Class "B"
     - Class "A/EQ"

5. OCSD will improve the regional watershed.
   - a. Dry weather urban runoff collected and treated
   - b. Rainfall induced inflow and infiltration, wet weather peak
   - c. Stormwater management, % of treatment process area treated on site
   - d. Per capita wastewater flow, rate, gallons per person per day

6. OCSD will protect the air environment.
   - a. Odor complaints: Reclamation Plant No. 1
     - Treatment Plant No. 2
     - Collection System
   - b. Air emissions health risk to:
     - Community, cancer risk per 1 million employees
     - Air mass emissions permit compliance, %

### SOCIAL

#### Key Performance Indicators

1. OCSD will be a good neighbor and will be responsive to its customers.
   - a. Off site Biosolids nuisance complaints
   - b. Odor complaint response
     - Treatment Plants within 1 hour
     - Collection System within 1 working day
   - c. Restore collection service to customer within 8 hours
   - d. Respond to public complaints or inquiries regarding construction projects within 1 working day
   - e. Respond to collection system spills within 1 hour
   - f. New connection permits processed within one working day
   - g. Dig Alert response within 48 hours

2. OCSD will provide public access to OCSD Information.
   - a. Public Records Act requests within 10 working days
   - b. Post Board/Committee Agenda Packages 72 hours prior to meeting
   - c. Post studies and reports on OCSD website within 1 week of receive/file

3. OCSD will take care of its people.
   - a. Training hours per employee
   - b. Employee Injury Incident Rate

### ECONOMIC

#### Key Performance Indicators

1. OCSD will exercise sound financial management.
   - a. New borrowing
   - b. COP coverage ratio
     - Between 1.25 and 2.0
   - c. COP service Principal and Interest
     - < than O&M expenses
   - d. Annual SFR user fee increase
     - not more than 15%
   - e. Annual user fees
     - Sufficient to cover I O&M requirements
   - f. Annual increase in collection, treatment, and disposal costs per million gallons
     - < 10%
   - g. Annual variance from adopted reserve policy
     - < 5%
Pump station LOS requirements

Which assets relate directly to achieving target levels of service?

External LOS for Pump Station
- No preventable SSOs
- 3 odor complaints/year, max.
- 35 dB at boundary, max.
- OSHA compliance
- NPDES & CMOM compliance

Where in the lift station is noise generated?

LOS is level of service, SSOs are storm sewer overflows, dB is decibel, OSHA is Occupational Safety and Health Administration, NPDES is National Pollutant Discharge Elimination System, CMOM is capacity, management, operation, and maintenance.
System performance requirements

**External LOS Targets**
- NPDES permit
  - 10 mg/L, BOD
  - 15 mg/L, SS
  - 2 mg/L, TN
  - 1 mg/L, P

**Unique LOS for each asset**

LOS is level of service, NPDES is National Pollutant Discharge Elimination System, BOD is biochemical oxygen demand, SS is suspended solids, TN is total nitrogen, P is phosphorus.
System performance requirements

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External LOS Targets
- NPDES permit
  - 10 mg/L, BOD
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Final Discharge and Disposal

Unique LOS for each asset

Network Collection Systems
- Trunk Sewer Systems
- Treatment Plant
- Disposal System
## Four major failure modes

<table>
<thead>
<tr>
<th>Failure Mode</th>
<th>Definition</th>
<th>Tactical Aspects</th>
<th>Management Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>Volume of demand exceeds design capacity</td>
<td>Growth, system expansion</td>
<td>Redesign</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td>Functional requirements exceed design capacity</td>
<td>Codes &amp; permits: NPDES, CSOs, OSHA, noise, odor, life safety; service, etc.</td>
<td>O&amp;M optimization, renewal</td>
</tr>
<tr>
<td><strong>Mortality</strong></td>
<td>Consumption of asset reduces performance below acceptable level</td>
<td>Physical deterioration due to age, usage (including operator error), acts of nature</td>
<td>O&amp;M optimization, renewal</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>Operations costs exceed that of feasible alternatives</td>
<td>Pay-back period</td>
<td>Replace</td>
</tr>
</tbody>
</table>

NPDES is National Pollutant Discharge Elimination System, CSOs are combined sewer overflows, and OSHA is Occupational Safety and Health Administration.
Forces driving LOS

LOS is constantly subjected to forces of change:

- Growth/retrenchment
- Regulatory requirements
- Demands of customers
- Physical deterioration
- Operational costs/efficiencies
Balancing future demand with current capabilities

Asset Management Strategy (AMP)

- Existing Assets
  - Maintainable
- Existing Assets
  - Renewable
- New Assets Augmentation
- Reconfigurable Disposable Assets
- Non-asset Solutions
Example: Pump station LOS

<table>
<thead>
<tr>
<th>Standard</th>
<th>Measure</th>
<th>Current</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odor</td>
<td>Complaints/year</td>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Number/year</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Spills</td>
<td>Gallons/spill</td>
<td>56,000</td>
<td>2,000</td>
</tr>
<tr>
<td>Pumping</td>
<td>Percent influent</td>
<td>99.68%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCADA</td>
<td>Outages/year</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Duration, hours</td>
<td>72+</td>
<td>8</td>
</tr>
<tr>
<td>Power</td>
<td>Outages/year</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Duration, hours</td>
<td>7</td>
<td>2.5</td>
</tr>
</tbody>
</table>
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<tr>
<th>Standard</th>
<th>Measure</th>
<th>Current</th>
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</thead>
<tbody>
<tr>
<td><strong>Reliability, cont.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumps</td>
<td>% reserve capacity, peak Q</td>
<td>30%</td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td>% redundancy at peak Q</td>
<td>0</td>
<td>50%</td>
</tr>
<tr>
<td>Power</td>
<td>2nd source, hours</td>
<td>7</td>
<td>2.5</td>
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<tr>
<td><strong>Regulatory</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Spill reporting</td>
<td>Verbal, hours</td>
<td>NA</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Report, days</td>
<td>21</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Impact notice, hours</td>
<td>NA</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Training, hours/yr</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>
Key points from this session

What is my required sustainable level of service?

Key Points:
- LOS is the “collection of measurable attributes or characteristics of a product or service delivered” to a customer.
- LOS is most useful in a long term perspective - “sustainable LOS”
- LOS is ultimately defined by customers and regulators through the agency’s Policy Board.
- System performance and customer satisfaction (“serviceability””) are related but separate concepts.
- LOS is directly related to the cost of service and the level of acceptable business risk.
- LOS is best measured across a range of balanced measures.
- Staff and Board should be involved in determining LOS, but it is not necessary that the Board be involved if they refuse.

Associated Techniques:
- Customer demand analysis
- Regulatory requirements analysis
- Level of service statements; LOS “roll-up” hierarchy
- Balanced scorecard”
- Asset functionality statements
- AM Charter