Affordable Asset Management Workshop
Making Use of the Data You Have
An Owners Perspective

Building the Foundation for an
Effective Asset Management Program

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City of West Palm Beach

Presented by the
FWEA Collection Systems Committee

April 2014
City of West Palm Beach

- Water Accounts: 35,890
- 2010 Population: 99,919
- Sewer Accounts: 27,518
- City Land Area: 58 sq. miles
- Water Service Area: 61 sq. miles

* Supplies water service to Palm Beach and South Palm Beach
Key Drivers for Asset Management at the City of West Palm Beach

- Process safety
- Large investment in meeting regulatory mandates related to water quality and other system deficiencies dating back to 2008.
- Debt/asset ratio exceeding 62% - debt to customer high at $2,700– no room for large capital outlay
- Reduction in revenues due to decline in the economy – need to contain operation and maintenance budget
- Rate increases have moved West Palm Beach into upper quartile in rates compared to peer group in region
- Aging workforce – succession planning and knowledge transfer
- Utility master planning and asset criticality modeling have identified risks associated with sewer collection and water distribution systems
## Extensive Asset Inventory Drives Enterprise Wide Asset Management Program

### City of West Palm Beach Asset Inventory

<table>
<thead>
<tr>
<th>Vertical Assets</th>
<th>Locations</th>
<th>Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Treatment Plant</td>
<td>1</td>
<td>TBD</td>
</tr>
<tr>
<td>Wells</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Water Tanks</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Re-Pump and Booster Pump Stations</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Waste Water Treatment Plant</td>
<td>1</td>
<td>TBD</td>
</tr>
<tr>
<td>Sanitary Lift Stations</td>
<td>134</td>
<td>TBD</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>152</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>
# Extensive Asset Inventory Drives Enterprise Wide Asset Management Program

## City of West Palm Beach Asset Inventory

<table>
<thead>
<tr>
<th>Linear Assets</th>
<th>Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary Air Release Valves</td>
<td>182</td>
</tr>
<tr>
<td>Fire Hydrants</td>
<td>2,942</td>
</tr>
<tr>
<td>Water Air Control Valves</td>
<td>286</td>
</tr>
<tr>
<td>Water Valves (System &amp; Control)</td>
<td>12,577</td>
</tr>
<tr>
<td>Miles of Water Pipe</td>
<td>493</td>
</tr>
<tr>
<td>Miles of Reclaimed Water Pipe</td>
<td>10</td>
</tr>
<tr>
<td>Miles of Sanitary Gravity Pipe</td>
<td>282</td>
</tr>
<tr>
<td>Miles of Sanitary Forcemain Pipe</td>
<td>92</td>
</tr>
<tr>
<td>Sanitary Valves (System &amp; Control)</td>
<td>573</td>
</tr>
<tr>
<td>Sanitary Manholes</td>
<td>6,654</td>
</tr>
</tbody>
</table>
Building a Foundation for Asset Management

Program Initiatives

- Asset management workshops and needs assessment
- Enterprise wide data management systems
- Asset Inventory Initiative using Global Positioning System (GPS)
- Quality initiatives and employee training
- Organization to foster employee involvement
- Consultant driven master planning and criticality models
- Employee driven condition assessments and operation and maintenance programs
Risk & Compliance Mgmt. Workshop
Identified Key Public Utilities Risks

1. Safe and adequate water supply
2. Public and employee safety
3. Environmental integrity
4. Aging infrastructure
5. Customer complaints
6. Failure to submit timely and accurate regulatory information
7. Homeland security issues

Will feed asset criticality assessments, CIP prioritization, and risk mitigation activities
# City of West Palm Beach
## Asset Management Program Workshop Outcomes

<table>
<thead>
<tr>
<th>Program Direction &amp; Resources</th>
<th>Do we have management support and direction, adequate resources and staff buy-in and sustain the AM program?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Services</td>
<td>What are the expectations of our stakeholders (public, regulators)?</td>
</tr>
<tr>
<td>Asset Knowledge</td>
<td>What do we own and where is it?, What condition is it in?, How likely is it to fail?</td>
</tr>
<tr>
<td>Asset Planning</td>
<td>When should it be rehabbed and replace?, When and where will we need new assets?, How much will it cost?</td>
</tr>
<tr>
<td>Critical Assets</td>
<td>What is most likely to fail and has the highest consequence if it fails?</td>
</tr>
<tr>
<td>O&amp;M Strategy</td>
<td>How do we operate and maintain it to deliver service levels at the lowest life cycle cost?</td>
</tr>
<tr>
<td>CIP Strategy</td>
<td>How should we spend capital resources to deliver service levels at the lowest life cycle cost?</td>
</tr>
<tr>
<td>Long-term Funding Strategy</td>
<td>How do we provide funding to deliver service levels at the lowest life cycle cost?</td>
</tr>
</tbody>
</table>
Transition to Enterprise Wide Data Management Systems

- Over the years, different work groups (Divisions) within the Utilities Department accumulated silos of asset information captured in the variety of formats e.g., as-builts, design drawings, paper work orders and incomplete CAD maps.

- Data conversion from Computer Aided Drafting (CAD) and paper as-builts into GIS centric system commenced in 2006.

- GPS data collection and field verification with emphasis on spatial locations and asset attributes (i.e., materials, sizes, and install dates) started in 2012.

- Adopted the ESRI water / wastewater GIS data model in 2012
Enterprise Wide Primary Information Management Systems

- Innovyze InfoWater
- Trimble GPS
- Customer Care & Billing (CC&B)
- Mobile HTML5 Platform
- Infor Maintenance Management Information System
- ESRI GIS
- Oracle Financials
- SCADA Wonderware Human Machine Interface (HMI)
- iFIX
- Trihedral
Compiling Asset Inventory Using Global Positioning System (GPS) Initiative

- Laptops, tablets and handheld Trimble units for field workers were purchased and mobile maps were deployed
- Development of application that enables direct transfer of field-collected asset condition information into GIS
- Every asset was assigned a unique identified; employees were trained to use that numbering system
HTML5 Mobile Application for Storm, Sanitary and Water
Quality Initiatives and Employee Training

- Enterprise wide ISO-14001 certification in progress
- Six Sigma Greenbelt certification training classes scheduled for May 2014
- Performance Dashboards and Key Performance Indicators (KPI’s) established in 2013
- 22 employees certified in NASSCO Pipeline Assessment and Certification Program (PACP), Manhole Assessment and Certification Program (MACP), and Lateral Assessment Certification Program (LACP)
- All water, wastewater, and storm water craft positions will be cross-functional. (Initiated in 2014)
Environmental Management System (EMS)  
ISO 14001
Operations Dashboard Example

Work Orders Total: 668 / Years: 2008-2013
Organizing to Foster Employee Involvement

- Created Asset Management Coordinator Assignment
- Created Environmental Management System (EMS) Coordinator Assignment
- Reassigned four persons full time to condition assessment of linear assets
- Multitasked employee job descriptions for craft positions
- Hiring professional engineer to establish asset life cycle management programs
Consultant Driven Water Master Planning Established Framework for Asset Management Program

- Determined the water system demands and allocation of demands for existing, 2015, 2025 and 2035.
- Developed an all pipes model of the Distribution System
- Evaluation of Fire Flow Demands, Control Optimization, Storage Evaluation under existing and future population scenarios
- Small pipe (<6 inch) and Alley Way projects
- Criticality Model (likelihood of failure and consequence of failure) to determine prioritization of condition assessments, risk profiles and O&M programs
Water Distribution System Criticality Assessment

- Identifies water pipes that pose most risk of failure
- Used to prioritize condition assessments and rehabilitation

Likelihood of Failure Criteria:
- Pipe age
- Operating Pressure
- Material
- Work order history
- Aerial crossings
- Soils
- Water Crossings

Consequences Failure Criteria:
- Pipe size
- Accessibility for repairs
- Transportation impact
- Difficulty to repair
Map of Leak Repairs on Water System Criticality Mains
Consultant Driven Sanitary Sewer System Planning Established Framework for Asset Management Program

- Determine the sanitary system flows and allocation of demands for existing, 2015, 2025 and 2035.
- Developed an all pipes model of the Sanitary System (gravity and force main)
- Flow Monitoring and field data collected in support of model development and calibration
- Evaluation of dry weather flow and wet weather flow under existing and future population scenarios
- Infiltration/Inflow Desktop Analysis for parent Lift Station – Inflow, Infiltration
- Update to Criticality Model (likelihood of failure and consequence of failure)
Sanitary Sewer Collection System Criticality Assessment

- Identified **sanitary sewer pipes** that pose most risk of failure
- Used to prioritize condition assessments and rehabilitation

Criteria

- **7** Likelihood of Failure
  - Pipe age
  - Sanitary sewer overflows
  - Material
  - Work order history
  - Aerial crossings
  - Soils
  - Internal corrosion

- **6** Consequences
  - Pipe size
  - Surface water impact
  - Potable water impact
  - Public health
  - Transportation impact
  - Difficulty to repair
# Gravity Main Criticality Model Scoring Criteria

**Likelihood of Failure Scoring Criteria**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Breakdown</th>
<th>Rank</th>
<th>Weight</th>
<th>Risk Score (Rank x Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pipe Age</td>
<td>Remaining Useful Life (RUL) of pipe</td>
<td>&lt;=20% RUL</td>
<td>10</td>
<td>5</td>
<td>50</td>
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<tr>
<td></td>
<td></td>
<td>&gt;20% but &lt;=40% RUL</td>
<td>8</td>
<td>5</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;40% but &lt;=60% RUL</td>
<td>6</td>
<td>5</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;60% but &lt;=80% RUL</td>
<td>4</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;80% RUL</td>
<td>2</td>
<td>5</td>
<td>10</td>
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<tr>
<td>Sanitary Sewer Overflows</td>
<td>Number of recorded SSO's</td>
<td>More than 1 overflow</td>
<td>10</td>
<td>10</td>
<td>100</td>
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<tr>
<td></td>
<td></td>
<td>1 overflow</td>
<td>8</td>
<td>10</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No overflows</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Gravity Main Material</td>
<td>Gravity Main Material</td>
<td>High (VCP)</td>
<td>10</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium (AC, DIP, CAS, RCP)</td>
<td>5</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low (PVP, CIPP, Misc, Lined)</td>
<td>1</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Work Order History</td>
<td>Number of recorded maintenance</td>
<td>More than 1 work order</td>
<td>10</td>
<td>10</td>
<td>100</td>
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<tr>
<td></td>
<td></td>
<td>1 work order</td>
<td>8</td>
<td>10</td>
<td>80</td>
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<tr>
<td></td>
<td></td>
<td>No work order</td>
<td>0</td>
<td>10</td>
<td>0</td>
</tr>
</tbody>
</table>
Sewer Gravity and Force Main Criticality
Prioritize Areas for Condition Assessments

Prioritized Gravity
Criticality Areas

Sewer Forcemain
Criticality Areas
Water System Asset Management Programs

- Leak Detection
- Valve Exercising
- Fire Hydrant Inspection / Flushing
- Hydrant Condition Assessment
- Manhole Condition Assessment
- Sanitary Gravity Main Assessment
- Sewer Condition Assessment
- Water Distribution System Criticality Assessment
- Sanitary Sewer Collection System Criticality Assessment
- Smoke Testing
Geocoding work orders

Distribution of work orders throughout the City can be overlapped with GIS utility asset data enabling the ability to identify where patterns / clusters exist spatially

Assist decision makers on where to best allocate resources for improvement
Leak Detection

Water Leak Work Orders
Date Range: 2012-2014

Work Orders
- Leak in Main

Likelihood of Failure
- Very High
- High
- Medium
- Low
- City Limits
Valve Exercising
Fire Hydrant Condition Assessment
**Sanitary Sewer Asset Management Programs**

- Maintenance driven by data such as sanitary sewer overflows, cave-ins, force main failures, pump station run times etc. (Need examples if possible)
- Performing sanitary manhole condition assessment using MACP
- Closed circuit television inspections using PACP and LACP
- Smoke testing to locate infiltration and inflow
Sanitary Sewer Overflows

4. Gravity Main Sanitary Sewer Overflows

+ Likelihood of Failure Score Range

+ Critical Project Areas
Manhole Condition Assessment

- Collecting Spatial Inspection Data (e.g., Frame Condition, Cover Type, Barrel Type, Cone Condition) using Mobile Tablets.

- Employees are MACP (Manhole Assessment Certification Program) certified.
Sanitary Gravity Main Assessment

37.2% Assessed with CCTV Video

62.8% Not Assessed

150,684 ft. of 405,121 ft.
CCTV Crews are Working in Project Areas Identified by Master Plan
Sewer Condition Assessment

- Closed Circuit Television Video (CCTV) pipe inspections
- Ability to readily assess conditions of the underground utility
- Employees are PACP (Pipeline Assessment Certification Program) certified
Smoke Testing Program Reduces Infiltration and Inflow

- Smoke testing finds the source of an inflow or infiltration problem. It is also used to find leaks and illegal connections to sewer lines and help locate abandoned sewer lines not previously surveyed.
- Pump stations handling large volumes of water can overload and backup.
- Roots and soil enters the collection system through cracks decreasing capacity.
- Soil deposits causes premature wear on moving parts shorting the expected asset life.
SCADA Data Analyzed to Prioritize Smoke Testing Efforts to Locate Inflow and Infiltration on Master Pump Stations

- LS013 is a Master Station
- There are 3 pumps
- Each pump has a capacity of 3,400 gpm
- 15 Lift Stations Feed into LS013 (directly and indirectly)

Further assessment is required to identify the stations with I/I

Brown & Caldwell
Lift Station 42 Runtime Analysis
Indicated High Inflow During Rain Events
Smoke Testing Locates Major Problem in Lift Station Zone 42
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Thank You

Questions?

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