Today's presentations will cover:

**Computerized Maintenance Management Systems (CMMS) – If I Knew Then What I Know Now**

*(Based upon MOP FD-7)*

Jim Paluch
Assistant Superintendent / Collection System Ops
Joint Meeting of Essex & Union Counties, Elizabeth, NJ

Tina Wolff
Principal Environmental Engineer
Malcolm Pirnie, Inc.
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Abraham Araya
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Project Manager
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Seattle, Washington

**Computerized Maintenance Management Systems (CMMS)**

**WEF CSC Committee**

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Jim Paluch
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Joint Meeting of Essex & Union Counties, Elizabeth, NJ
King County DNRP, WTD
Ft. Wayne, IN
Seattle, Washington
Computerized Maintenance Management Systems (CMMS)

**Webcast Sub-Committee Members**

- Abraham Araya – Seattle, Washington
- Samantha Bartow – Taylor, South Carolina
- Thomas Curl – The Woodlands, Texas
- Mattie A. Engels – Dallas, Texas
- Wes Frye – Nashville, Tennessee
- Chris Johnston – Burnaby, British Columbia
- Stephen A. Lipinski – Duluth, Minnesota
- John Nelson, Pewaukee, Wisconsin
- Jim Paluch – Elizabeth, New Jersey
- Tina Wolff – Fort Wayne, Indiana

Wastewater Collection Systems Management

- Water Environment Federation (WEF)

  Manual of Practice
  No. 7

- 2010, Sixth Edition
The Wastewater Collection Systems Management Series Begins

- February 2012: Computerized Maintenance Management Systems (CMMS) / Planning & Implementation
- June 2012: Condition Assessment / Building Out Your CMMS
- November 2012: Asset Management / Translating Your Data To Information
- February 2013: Business Case For Action / Replacement or Rehabilitation
- June 2013: Optimize Your System Operations / Concepts & Benefits
- November 2013: Asset Management Design / Cost Minimization & Safety Considerations

Collection System Challenges

- Financial limitations are forcing us to “do more with less”.
- The refining of traditional procedures and the development of new concepts are required.
- A programmatic approach to managing and maintaining assets that is accepted and supported by the entire organization needs to be developed.
Speakers and Agenda

• Joe Rambaldi
  American Water
  ✓ Data Retrieval in a Consistent Manner
  ✓ Key Training Points and Configuration Tips
  ✓ Successful Implementation

• Hal Balthrop, P.E. & Kevin McCollough, P.E.
  Metro Water Services
  ✓ Lessons Learned
  ✓ Database Consistency
  ✓ Do the Right Maintenance on the Right Equipment at the Right Time
Speakers and Agenda

• **PS Arora, P.E.**
  
  *Denton Water Utilities*

  ✓ How Prioritization Works
  ✓ Types of Data Employed
  ✓ Decision, Coordination, Investment

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**Computerized Maintenance Management System**

Achieving Value through Data Consistency

Joseph Rambaldi
American Water
American Water

- Founded in 1886 as the American Water Works & Guarantee Company

- Serves approximately 15 million people with drinking water and wastewater services

- Located in 30 states and parts of Canada

A Computerized Maintenance Management System (CMMS) only brings value if data can be retrieved in a way that it is useful.
Benefits That Can be Achieved with CMMS

• Improved cost control
  – Higher equipment reliability
  – Traceable labor costs
  – Reduction of spare parts carrying cost

• Better understanding of equipment

• Faster workforce training

• Standardized procedures which can be continually improved

Few CMMS implementations meet expectations because data proves to be inconsistent and therefore not useful

• Data Consistency can be improved when:
  – Upper level management support exists
  – The system is easy to use
  – A complete asset inventory is developed
  – Training and change management occurs
Upper Management Support Drives Data Consistency

• Regardless of department or supervisor, all users must use the system the same way

• Various departments must be held to the same data quality standards

• Upper Management must hold departments responsible to report status from the system frequently.

Sample Reports

[Charts and graphs showing total booked hours and hours breakdown for January]
Sample Reports

Ease of Use Drives Data Consistency

- If it is not easy to enter information AND extract information, it will not be used to its maximum capabilities
- Use drop down menus whenever possible to standardize your data and speed data entry
- You can only determine ease of use through testing with end users
### Work Order Data Consistency

<table>
<thead>
<tr>
<th>Work Order</th>
<th>Work Order Description</th>
<th>Equipment Description</th>
<th>Problem Code</th>
<th>Action Code</th>
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<tbody>
<tr>
<td>1170756</td>
<td>CLEAN DEBRIS GRINDER AND CHECK SUCTION VALVE</td>
<td>WWTP-DG1 DIGESTER REC/PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
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<tr>
<td>891797</td>
<td>Polymer clogged in diaphragm.</td>
<td>SCW1-MB-POLYMER /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
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<tr>
<td>889555</td>
<td>Right side of pump is not pumping</td>
<td>HYPO #1 /PUMP</td>
<td>BLOCKAGE</td>
<td>REPLKEY</td>
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<tr>
<td>878864</td>
<td>check valve locked up</td>
<td>SPRNGFLD #1 /PUMP</td>
<td>BLOCKAGE</td>
<td>FOLLOWUP</td>
</tr>
<tr>
<td>844980</td>
<td>Clean pressure feed line to pressure switch for jockey pump</td>
<td>WWTP-RUW PLANT /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
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<tr>
<td>787178</td>
<td>Clogged pump/rags</td>
<td>LS02 RAW SEWAGE #3 /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
</tr>
<tr>
<td>727518</td>
<td>pump seems to be not pumping</td>
<td>LS02 SUMP #1 /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
</tr>
<tr>
<td>727028</td>
<td>Rush from pump discharge pipe to injector with hot water to insure proper flow</td>
<td>WTP HYPO #3 /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
</tr>
<tr>
<td>639748</td>
<td>Replace pump packing drain line with large one.</td>
<td>WL04 WELL /PUMP</td>
<td>BLOCKAGE</td>
<td>REPLMINR</td>
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<tr>
<td>633944</td>
<td>hopper frozen &amp; clogged</td>
<td>WTP Screw Conveyor /PUMP</td>
<td>BLOCKAGE</td>
<td>CLEANED</td>
</tr>
</tbody>
</table>

**Free Text for Details**

**Standardized Codes for Reporting**
An accurate and complete equipment list drives data consistency

- Every activity must be logged against a single equipment “object” to achieve accurate equipment history
- The users lose faith in the system when they can not find a piece of equipment in the database.
- Resist being too generic or too specific

<table>
<thead>
<tr>
<th>Asset #</th>
<th>Asset Description</th>
<th>Asset Class</th>
<th>Manufacturer</th>
<th>Model</th>
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<tbody>
<tr>
<td>5023</td>
<td>Plant 1 Effluent FREE CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>PROMANENT</td>
<td>DC1-01</td>
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<tr>
<td>5023</td>
<td>GRISW EFF FREE CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>PROMINENT Corp</td>
<td>DC1-1</td>
</tr>
<tr>
<td>3932</td>
<td>BRAD-MNB-HS Chlor /ANALYZER</td>
<td>WQANLZR</td>
<td>HACH</td>
<td>CL.17</td>
</tr>
<tr>
<td>7934</td>
<td>BRAD-MNB-PIPEGAL CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>HACH</td>
<td>CL-17</td>
</tr>
<tr>
<td>3479</td>
<td>MATS E8FW CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>HACHE</td>
<td>CL-17</td>
</tr>
<tr>
<td>3496</td>
<td>TLNO-BTR CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>HACH</td>
<td>CL 17</td>
</tr>
<tr>
<td>499</td>
<td>BPTP-BP-FB-LAB Chlorine /ANALYZER</td>
<td>WQANLZR</td>
<td>PROMINENT</td>
<td>CL17</td>
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</tbody>
</table>
**Equipment Data Consistency**

<table>
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<tr>
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**Consistent equipment naming**

**Equipment Data Consistency**

<table>
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<tr>
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<td>GRISW EFF FREE CL2 /ANALYZER</td>
<td>WQANLZR</td>
<td>PROMINENT Corp</td>
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<tr>
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<td>BRAD-MNB-HS Chlor /ANALYZER</td>
<td>WQANLZR</td>
<td>HACH</td>
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<td>7934</td>
<td>BRAD-MNB-PIPEGAL CL2 /ANALYZER</td>
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<td>HACHE</td>
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<td>WQANLZR</td>
<td>PROMINENT</td>
<td>CL17</td>
</tr>
</tbody>
</table>
A solid training program supports data consistency

• Regardless of department or trade everyone uses the system the same way

• Helps reinforce a shared purpose

• Periodic retraining fine tunes understanding and resynchronizes the team

• If the other aspects are done well the training becomes the final touch rather than the foundation for data consistency

Key Training Points

• Formal sessions
• Hands-On
• Modular
  – Login, Searching for equipment and work orders, Writing work orders, Completing work orders, Reporting, Data Analysis
• Handouts, cheat sheets
• Refreshers periodically
**Configurations/Set Up Tips for Consistent Data**

- When implementing a CMMS configurations are critical

- To extract good quality information that enables sound business decisions:
  - The entire implementation must be continually focused on getting standardized data in and out of the database
  - Every decision made during implementation and configuration must support this objective

**Configurations/Set Up are Critical Asset Hierarchy**

- Determine your facility/location list OUTSIDE of CMMS based on how you wish to report statistics

<table>
<thead>
<tr>
<th>Facility Hierarchy</th>
<th>3rd &amp; Harbor Sewer Lift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayside Wastewater Treatment Plant Site</td>
<td>4th &amp; Bay Street Sewer Lift</td>
</tr>
<tr>
<td>Bayside Wastewater TP Effluent Vault</td>
<td>20th Street Sewer Lift</td>
</tr>
<tr>
<td>Bayside Wastewater TP Inflow Structure</td>
<td></td>
</tr>
<tr>
<td>Bayside Wastewater TP Lift Stations</td>
<td></td>
</tr>
<tr>
<td>Bayside Wastewater TP Office</td>
<td></td>
</tr>
<tr>
<td>Bayside Wastewater TP Outflow Structure</td>
<td></td>
</tr>
</tbody>
</table>
Configurations/Set Up are Critical Assets

• Organize your assets **OUTSIDE** of the system first

  – If your system offers a means of classifying assets, determine that list based on how you want to report statistics

  • Sewer main
  • Manholes
  • Pumps
  • Grinders
  • Valves

Configurations are Critical Asset Details

• Organize your equipment attributes **OUTSIDE** of the system first

  – Make a list for each Class of Asset of what type of information you wish to gather such as

  • Materials of construction, Diameter
  • Manufacturer, Model, Serial Numbers
  • HP, Voltage, RPM

  – Decide which attributes are mandatory and which can be shared
### Configurations are Critical Work Types

- Predetermine the types of work you wish to report on:
  - Reactive
  - Preventive
  - Predictive
  - Emergency
  - Projects
  - Training
  - Follow-up Repairs

![Last Quarters Labor Efforts Graph]

### Configurations are Critical Reporting Codes

**Sample Problem, Action Codes (Sewer Mains)**

<table>
<thead>
<tr>
<th>Problems</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collapse</td>
<td>Flushed</td>
</tr>
<tr>
<td>Exposed Cage</td>
<td>Cleaned</td>
</tr>
<tr>
<td>Roots</td>
<td>Repaired Wall</td>
</tr>
<tr>
<td>Grease</td>
<td>Replaced</td>
</tr>
<tr>
<td>Infiltration</td>
<td></td>
</tr>
<tr>
<td>*Other</td>
<td>*Other</td>
</tr>
</tbody>
</table>
Reporting Codes

There may be hundreds of Problem Codes you want to define

- Leaking
- Overheating
- Electrical Failure
- Infiltration
- Frozen
- Seized
- Noisy
- Dirty
- Collapsed
- Roots

Reporting Codes

Grouped by Equipment Type is better

- Pump Problems
  - Leaking
  - Frozen
  - Seized
- Motor Problems
  - Overheating
  - Seized
- Gravity Main Problems
  - Leaking
  - Infiltration
  - Collapsed
  - Roots
Other Items to Standardize and Configure

- Equipment Criticality
- Vendors
- Craft Codes
- Departments
- Units of Measure
- Manufacturers
- Cost Codes

Keys to Successful Implementations

- Maintenance managers and supervisors must be measured and rewarded from data out of CMMS
- Select a CMMS Administrator and a responsible and accountable manager to head the implementation
- Periodically audit the use of the system
Keys to Successful Implementations

• Trades people must record all their efforts against work orders in CMMS

• Train the users

• Retrain and refresh periodically

Keys to Successful Implementations

• Ease into use of the system

• Data quality must be high and continually improved

• Use this as an opportunity to define and REFINE work practices and the data quality
Questions
Computerized Maintenance and Management Systems (CMMS) – an evolution of application and use

Hal Balthrop, P.E.
Kevin McCullough, P.E.

Metro Water Services
Nashville, Tennessee

Music City USA
Perspective

Service Area
• 533 square miles

Sewer Collection
• Est. Population Served 705,637
• Sewer Customers 189,898
• Annual Sewage Treatment (billions of gallons) 56.1
• Average Daily Treatment (millions of gallons) 153.8
• Total Miles of Sewer Lines 3,051
• Treatment Plants 4
• Sewer Pumping Stations 111
• Utility Plant Value (3) (thousands) $1,592,652,125
• Satellite Population Served 138,744
Water Distribution

- Est. Population Served: 521,511
- Water Customers (1): 177,475
- Average Daily Treatment (millions of gallons): 100.8
- Water Sales for Fiscal Year (2) (billions of gallons): 22.6
- Maximum Daily Demand (millions of gallons): 111
- Reservoirs: 38
- Storage Capacity (millions of gallons): 60
- Water Pumping Stations: 57
- Miles of Distribution Lines: 2,912
- Fire Hydrants: 20,545

Sanitary Sewer Stats as of 1/24/2012
These figures include the SSS (Separate Sewer System) and the CSS (Combined Sewer System) Gravity Mains – note that this information is based on current asset database (Hansen) information and will be updated as sewer inspection continues and more accurate information is collected from the field.

<table>
<thead>
<tr>
<th>DIA.</th>
<th>MATERIAL</th>
<th>MILES</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Brick pipe</td>
<td>28.44</td>
<td>150,163</td>
</tr>
<tr>
<td>2</td>
<td>Cast iron pipe</td>
<td>4.6</td>
<td>22,222</td>
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<tr>
<td>3</td>
<td>Corrugated metal pipe</td>
<td>0.16</td>
<td>840</td>
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<tr>
<td>4</td>
<td>Concrete pipe</td>
<td>18.16</td>
<td>307,731</td>
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<tr>
<td>6</td>
<td>Corrugated polyethylene pipe</td>
<td>18.98</td>
<td>100,214</td>
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<td>8</td>
<td>Ductile iron pipe</td>
<td>55.82</td>
<td>294,730</td>
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<td>10</td>
<td>Fiber pipe</td>
<td>3.03</td>
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<td>12</td>
<td>Plastic pipe</td>
<td>0.06</td>
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<td>9,000</td>
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<tr>
<td>33</td>
<td>Reinforced concrete pipe</td>
<td>0.06</td>
<td>5,000</td>
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</tbody>
</table>

Length of Pipe by Material

<table>
<thead>
<tr>
<th>DIA.</th>
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</tr>
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<tbody>
<tr>
<td>2</td>
<td>Brick pipe</td>
</tr>
<tr>
<td>2</td>
<td>Cast iron pipe</td>
</tr>
<tr>
<td>3</td>
<td>Corrugated metal pipe</td>
</tr>
<tr>
<td>4</td>
<td>Concrete pipe</td>
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<tr>
<td>6</td>
<td>Corrugated polyethylene pipe</td>
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<td>Reinforced concrete pipe</td>
</tr>
<tr>
<td>33</td>
<td>Reinforced concrete pipe</td>
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</tbody>
</table>

Length of Pipe by Diameter (Inches)

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<td>2.83</td>
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<td>0.27</td>
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<tr>
<td>6</td>
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<tr>
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Length of Pipe by Decade Installed

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<td>1800</td>
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</tr>
</tbody>
</table>

Length of Pipe By Diameter (Inches)
GIS screenshot with CMMS data

Other Technology Utilized at MWS Relative to CMMS
(not endorsing these specific software but are referencing what we utilize at MWS)

- CMMS – Hansen version 7.7 (upgrade to version 8 in process)
- Mobile Dispatch (MWM) – Oracle
- Granite XP (Collection System) - Cues
- GIS - ESRI
Users

- Field Staff
- Office Staff
- Contractors
- Engineers – internal and external to MWS
- Legal – Attorneys and Claims
- Planners
- Management

Basic Purpose/Use of the Technology at MWS – all interface

- CMMS – service requests (internal and external), work orders, analysis (production, labor, equipment and materials) and scheduling
- Mobile Dispatch (MWM) – work allocation, field data collection tool for CMMS
- Granite XP (Collection System) – collection system condition assessment inspection using PACP, still photo and video
- GIS - mapping
Using CMMS to do the Right Maintenance on the Right Equipment at the Right Time

The use of CMMS and related tools enables intelligent management of the sewer collection system. Examples include:
- Resource assignment and utilization
- Reporting
  - General Operational Reports
  - Regulatory
    - CMOM
    - 9MC
    - Consent Decree/Order Deliverables
- Budgeting
- Availability
- Planning
- Stakeholder confidence
- Operator Peace of Mind
- Remember – if you know about it shouldn’t you do something about it
Use and Refinement of CMMS

• Include Users in definition of function and development/refinement of the tool
• Define usable, practical, universal and standardized inputs (i.e. problem codes, asset details, etc)

Use and Refinement of CMMS

• Communicate to stakeholders (users of the information) how data will be represented and formatted – condition assessment, GIS representation, etc
• Ensure that technology designers/ITS understand criticality of data (preferences versus regulatory/required)
• Be flexible in getting desired results within the format and capabilities of the technology
4 Year Sanitary Sewer Cleaning and Inspection Data

<table>
<thead>
<tr>
<th>Year</th>
<th>CCTV Footage (ft.)</th>
<th>Percentage of System Inspected</th>
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</thead>
<tbody>
<tr>
<td>2008</td>
<td>727,590</td>
<td>4.70%</td>
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<tr>
<td>2009</td>
<td>376,700</td>
<td>2.44%</td>
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<tr>
<td>2010</td>
<td>2,181,820</td>
<td>14.11%</td>
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<tr>
<td>2011</td>
<td>2,741,640</td>
<td>17.73%</td>
</tr>
<tr>
<td>Total</td>
<td>6,027,750</td>
<td>38.98%</td>
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<table>
<thead>
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<th>Year</th>
<th>Sewer Cleaning Footage (ft.)</th>
<th>Percentage of System Cleaned</th>
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</thead>
<tbody>
<tr>
<td>2008</td>
<td>791,200</td>
<td>5.12%</td>
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<tr>
<td>2009</td>
<td>839,950</td>
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<td>818,570</td>
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<td>427,840</td>
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<tr>
<td>Total</td>
<td>2,877,560</td>
<td>18.61%</td>
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</tbody>
</table>

Testing of the Tools – Lesson’s Learned

- Incorporate Users in product testing
- Review data collected during Test with stakeholder groups
- Refine as needed
Utilization of the Tools – Lesson’s Learned

- Generate exception reports in a timely manner
- Enable regular review of data by decision makers
- Demonstrate to Users how their data is incorporated into decision making and use
Benefits of the Tools – Database Consistency

Uniformity of asset information example:

- There are 4,493 sewer line segments that have been identified in Granite with material that isn’t in GIS or Hansen.
- There are 1,800 sewer line segments that have been identified in Hansen (pushed in via MWM) and confirmed by SSFBTV Granite Inspections with material that isn’t in GIS.
- We are populating 6,293 sewer line segments in GIS with the material identified in the above.

Reporting:
Granite and MWM (Oracle) both report to CMMS (Hansen)
Utility Managers Perspective on Implementing CMMS

- Organizational acceptance and use
- Useful information collection
- Understandability of data collected/reported for stakeholders
- Data integrity
  - System condition
  - Resource allocation
  - Project determination
  - Budgeting
- Collected and reported in universally accepted and understood units for operational quality assurance and related comparative analysis
How to Work Smarter on a Tighter Budget

Gain in efficiencies – Sewer Collection System
- Operators - learn your system configuration, operation, problems and longevity
- Long-term planning and scheduling based on condition, material, location in basin, etc
- Enabling a definition of potential projects for budgeting and rate analysis
- Better data integrity due to direct entry (from the field) as opposed to second-party data entry
- Real-time information from MWM – next day in Granite (Flash drive data transfer)
- Graphical representation of data

To enable buy-in and ensure future commitment ask yourself the following...

• Implementing New Technology through Employee Buy-in
• From the employee’s standpoint is the new technology and associated process easier to use?
• Is data being used as it was expected? At all?
• Are you sharing results with all users?
• Do you have a schedule of checking data integrity/use?
• If you know about problems do you do anything about them?
That’s all Folks!

Questions?
Using CMMS Data to Prioritize Collection System Maintenance and Rehabilitation

PS Arora, P.E.
Gary Myers
Joel Nickerson

About Denton, Texas

- North of Ordinary
- 120,000 people
- 472 miles of gravity mains
- $361,000,000 replacement cost
Use of CMMS Data

- The previous presentations discussed the CMMS evolution, implementation, data consistency, and use.
- In Denton we have been using CMMS for 15 years and have developed a database of all collection system work done since.
- We wanted to use this data to further enhance the collection system operations.

What Are The Drivers?

- Managing growth along with aging infrastructure.
- Smart & efficient management of the collection system.
- Good custodians of rate payer money.
- Enhanced use of the data collected using CMMS tools.
- How do we get there?? What is the nexus??
The Prioritization Nexus

• As we ponder the “how we get there” one thing becomes clear that to better manage the collection system you have to know your entire system

• If we advance the CMMS database to include all of the sewer lines, then we can begin to establish which sewer lines are critical; are old and thus have a higher probability of failure; would have a high consequence of failure due to location etc..

The Prioritization Nexus

• So what we begin to do through this process is to rank the collection system and thus to establishing a priority of maintenance and rehab for each and every pipe in the collection system

• This will then lead to enhanced use of the CMMS database, allow us to work smart and be better custodians of the collection system, and rate payer dollars, in essence begin to “get there”
How Prioritization Works

- **Consequence of Failure:** generally related to location: repair cost, disruption to the public and economy, impairment of system operation, regulatory compliance, public health & safety, and damage to environment
- **Probability of Failure:** based on pipe material and condition, defects including I/I, soil conditions, water table, frequency of surcharge
- **Prioritization Score =** Cons. Of Failure $\times$ Probability of Failure

Many Prioritization Models

- There are several consultant developed prioritization models
- We picked WERF’s SCRAPS model
- Sewer Cataloging, Retrieval, and Prioritization System
- Turns knowledge about your pipes into priority. Mimics the decision making process of an “expert in the field” by using information stored in a knowledge database
The SCRAPS Approach

• Scores each pipe segment from 0 (Low Priority) to 100 (High Priority)

• Using this ranking, wastewater agencies can focus the use of available dollars to areas most in need of attention

Data Types

• Pipe characteristics
  – Age
    – we used plat dates + staff experience + CMMS
  – Diameter, material
    – we made a rule for unknown material based on install date and size + CMMS
  – Depth
    – from Infoworks Model, CMMS, old SSES data. We now collect this during flushing and inspection
Data Types

• Hydraulic characteristics
  – Hydraulic demand
    – from Infoworks model
  – Surcharge frequency
    – from overflow reports in CMMS and Infoworks
  – Slope
    – from depth info and GIS topo layer to determine manhole elevation

• Pipe environment characteristics
  – Quality attributes: pH, H₂S, high temp
    – from Pretreatment program sampling and experience
  – Soil type for corrosiveness
    – from NRCS soil maps
  – Tree canopy for roots
    – UNT used satellite imagery to map Denton’s canopy & CMMS
Data Types

• Pipe environment characteristics
  – Served areas: from GIS and experience
  – vital services: hospitals, public safety, large commercial
  – high density: apartment buildings
  – difficult repair: pipes under buildings, road and rail crossings

The Data Gathering Process

• The data gathering process is invaluable on its own for finding out what you know and don’t. **This is where we get the staff buy-in in the process**
• Completing the data gathering task, and populating the SCRAPS database is an achievement. You have electronic data at your finger tips. You can better manage your system.
Staff Buy-In is Critical

Data Sources

• CMMS: Cityworks work orders data on all maintenance from last 15 years: point repairs, flushing, root treatment, Manhole inspections for I-I, depth, diameter, material
• CCTV: NASSCO PACP scores and observations
• Plans
• GIS
Staff Data Qualification

- Turning data into SCRAPS categories
  - What counts as a low, moderate, or high structural issue when turning CCTV PACP scores and observations into structural categories?
  - How long is maintenance effective before it needs to be repeated?
  - These allow additional staff input & buy-in
SCRAPS Need to Inspect scores

High Priority Lines

Low Priority Lines
SCRAPS Need to Inspect scores

- 34 - 55 Low Priority Lines
- 56 - 65
- 66 - 75
- 76 - 85
- 86 - 94 High Priority Lines

History of SCRAPS Need to Inspect scores  

<table>
<thead>
<tr>
<th>Year</th>
<th>High Priority Lines</th>
<th>Low Priority Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
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<td>500</td>
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</tbody>
</table>
Implementation

Do we trust these scores?

- **Staff buy-in is important**
- Use known failed lines as test cases
- Regular database updates to reflect maintenance conducted. Easy if you have unique ID, maintenance database
- Experience, judgment are still key
Using SCRAPS Results

- Basin cleaning prioritization
- CCTV inspection prioritization
- CIP project screening
- Targeting public education for specific problems – like grease or root lines

Basin Cleaning Prioritization

- SCRAPS scores follow age, service density, restaurants - all reasons to clean a line
- Using the average score for each sub-basin, split our cleaning schedule into high- and low-priority
  - High-priority: cleaned every 5 years
  - Low-priority: cleaned every 10 years
Orange sub-basins have higher average SCRAPS scores

Basin cleaning prioritization

- Using CMMS data modified this for a third flushing truck: lines with a history of chokes cleaned every year
- The dry weather overflows and choke data in CMMS justified purchase of the combo Vacuum/Flushing truck, and hiring of 2-person crew
Helping Economic Expansion

Red segments have choke history

Basin cleaning prioritization

1 year cycle

Red segments have choke history
CCTV Prioritization

- High SCRAPS priority ≠ high PACP score from CCTV
  - As we improve SCRAPS, it better follows CCTV results
- Averaging scores for a neighborhood or subdivision might be more useful to target CCTV inspection, especially if your data isn’t perfect
Some Lines Become Higher Need to Inspect

SCRAPS 2008:
Need to Inspect 35
10” PVC installed 1988

SCRAPS 2011:
Need to Inspect 78
10” VCP installed 1970
commmercial district
known roots but not maintained

CIP Decisions

• Probability of failure score is now a standard parameter in the replacement decision. High “probability of failure” score filters out the pipe for rehab consideration.
CIP Coordination

- Pipe Score is a great screener tool if you need to cooperate with water and street projects
- SCRAPS need to inspect + water break rate + overall condition index (OCI) of street
- Maximize investment by fixing things in a rational way
Future Plans

- Continue to enhance data accuracy using the CMMS database
  - Pipe material
  - Include groundwater table information
  - Soil corrosion potential
  - Depth of pipe and pipe material
  - Better infiltration/ inflow observation
  - Use the SCAPS priority ranking in the asset management software

Questions ??

Contact
P. S. Arora, P.E.
p.s.arora@cityofdenton.com
Questions?

Round “cover” Discussion / Audience Participation

- Jim Paluch, JMEUC
- Joseph Rambaldi, American Water
- Hal Balthrop & Kevin McCollough, Metro Water Services
- PS Arora, Denton Water Utilities
- Webcast Attendees
Key Ideas

• A proper and thorough evaluation of your CMMS is necessary.
• Do you really get what you pay for?
• Custom software vs. “off-the-shelf” package.
• Is the cost worth the effort?
• The data conversion activity will most likely be the largest effort required of most utilities.

The Wastewater Collection Systems Management Series Continues

• June 2012: Condition Assessment: Building Out Your CMMS
• November 2012: Asset Management / Translating Your Data To Information
• February 2013: Business Case For Action / Replacement or Rehabilitation
• June 2013: Optimize Your System Operations / Concepts & Benefits
• November 2013: Asset Management Design / Cost Minimization & Safety Considerations
Thank you for joining today’s presentation:

Computerized Maintenance Management Systems (CMMS) – If I Knew Then What I Know Now

Sewer Lift Stations Repair Hours: February

11th Street Sewer Lift 20%
30th Street Sewer Lift 7%
70th Street Sewer Lift 49%
8th Street Sewer Lift 25%

Based upon MOP FD-7