Water System Modeling
A Unique Way to Use Meter Technology

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Engineering Consultant for NE MD since 2010

• Metering Project provides higher level of data
• Powerful data that can be used to accurately allocate water demands

Presentation Topics
• Meter Replacement Project
• Hydraulic Modeling Overview
• Manipulating Meter Data
• Graphical Information System (GIS)
• Customer Meter Units
• Conclusion
North East, MD  The Town

- Location: Headwaters of Chesapeake Bay
North East, MD The Town

- Location: Headwaters of Chesapeake Bay
- Nearby: Elk Neck State Park, Turkey Point Light House
- Once occupied by Shawnee Indians
- 1658: Settled by English
- 1850: Town of North East incorporated
North East, MD  The System

- 2 Surface Water Treatment Plants
- Elevation Range: sea level to 400’+
- 3 Elevated Tanks
- 2 Ground Level Tanks
- 5 Major Pressure Zones
- Production: 650,000 GPD
- Customers: Residential, Commercial, Industrial, Institutional
Meter Project  Water Meter Replacements

- Entire system, minus approximately 150 meters
- 2,600 Sensus iPERL AMR/AMI Water Meters
- Primarily in Meter Pits
Project Objectives

- Update old tired water meters
- Improve reading accuracy (reads as low as .1 to .3 gpm)
- Eliminate manual meter reading routes
- Automatically collect and log system and customer data
Meter Project  Water Meter Replacements

Benefits
• Latitude/Longitude meter locations
• Prevents tampering
• Detects system leaks
• Remote management, monitoring, and diagnosis
• No lead content and no moving parts
Meter Network

• Flex Net Managed Data
• 2 towers required for system
• Approximately 150 meters read manually
Objectives

- Hydraulic model representative of field conditions
- Update pipe network
- Determine:
  - System operational procedures
  - Pressure zone connectivity
  - Accurate tank and pump information
  - System Water Demands
WaterGEMS
Intelligent decisions for water distribution
Hydraulic Model Project Overview

Components

- Junctions or Nodes: elevation, water demand, connectivity, ...
- Pipes: diameter, material, age, C-factor, ...
- Tanks: base, minimum, initial, and overflow elevations, physical attributes, ...
- Valves: variety, from check valve to complex flow control valves
- Pumps: pump curves, efficiency information, ...
Demand Allocation - Methods

- Split daily demand equally throughout system nodes
- Proportional distribution based on area population
- Determine largest users, enter manually at nearby node, split remaining demand among system nodes
- Use meter routes to split equally in localized node areas
- Determine each customer’s usage from recent readings and manually insert meter symbols
- Import water meter data file to locate and assign most recent meter data into the model
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<th>Lat</th>
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**NE MD Billing Data**

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• Meter locations: excel spreadsheet table
• Spreadsheet imported into ESRI ArcGIS software
• Latitude/longitude in decimal degrees to map meter locations
• Mapped locations converted to ESRI shapefile with Maryland State Plane 83 coordinates
• Meter ID, Customer ID, Customer Name, Customer Address information preserved in GIS Conversion
• Shapefile output from ArcGIS for direct import into WaterGEMS software
Hydraulic Model

Model Builder – Customer Meter Units

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Hydraulic Model Model Builder – Customer Meter Units
Hydraulic Model Model Builder – Customer Meter Units
Hydraulic Model

Model Builder – Customer Meter Units
Hydraulic Model Model Builder – Customer Meter Units
Hydraulic Model Load Builder – Customer Meter Units

Available LoadBuilder Methods
Select one of the available LoadBuilder methods and click the Next button to continue.

Choose the method to use for processing your demand data
- External Data
  - Point load data
  - Area load data
  - Population/land use data
- Internal Data
  - Customer Meter load data

Billing Meter Aggregation
Nearest Node

Nearest Pipe
Hydraulic Model Load Builder – Customer Meter Units
Hydraulic Model
Load Builder – Customer Meter Units
Hydraulic Model Load Builder – Customer Meter Units

Completing the LoadBuild Process

Click Finish to start the LoadBuild exporting process.

Label:

Choose the procedure to follow when exporting this run’s Load calculations

- Update Existing Alternative
  10875: Base Demi
- New Alternative

Parent Alternative: <none>
Hydraulic Model Load Builder – Customer Meter Units

LoadBuilder Wizard

LoadBuilder for Bentley WaterGEMS V8i (SELECTseries 6) Summary

Date: 4/10/2017
Elapsed Time: 0 day(s) 0 hr(s) 0 min(s) 1 sec(s).

Export Summary
2583 Total number of customer meters assigned.
Hydraulic Model Load Builder – Customer Meter Units
Hydraulic Model

Load Builder – Customer Meter Units
Notable Items

**Meters**
- About 150 meters are not part of AMR/AMI system, require manual readings
- Non AMR/AMI meters - data manually entered
- Data reviewed/refined to eliminate “bad” and duplicate data

**Data**
- Time to manipulate into the model in meaningful way
- Now easy to update system demands with model in the future
Notable Items

Unaccounted for Water
• Approximately 20%
• Allocation assigned as even distribution amongst all system nodes

Calibration
• Respectable calibration uses best known or available data
• Using the best available water usage information is one piece
• Calibration: ongoing process & effort, revisit periodically

Global Edits
• Customer Meter Unit demands: globally edited from Model table
Project Summary

• Bentley WaterGEMS Software Customer Meter feature allows for water usage demand allocation of each customer assigned in the Model
• Information from billing software may be exported and manipulated into a usable form to import into a hydraulic model to automate the allocation process
• With the Customer Meter feature in place, the water demand data can be updated at the Owner’s desired frequency
• Applying the actual water meter reading data in the model provides a high level of confidence in the Model water demand allocation
Conclusion

- NE MD meter replacement project led to a higher level water allocation capability in their hydraulic model that can be easily updated as often as they desire.

- The high level water allocation data will provide improved results for the Town to make informed decisions on system improvements, particularly with water quality issues.

- Higher confidence in the model results can guide the Town to efficient problem resolutions, potentially saving them money on unnecessary infrastructure and improvements.
Questions?

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