Sewer Management using ArcGIS Online and ESRI Apps

Jerrard Whitten, Steve Lopez, Kelsey Quinlan
“MVPC promotes community and regional collaboration and innovation; plans for the strategic growth and development, and assists in regional development economically, efficiently and with an eye to the future.”
Today’s Discussion

- Plum Island
- Vacuum Sewer System
- Winter 2015
- Process and solutions
Winter 2014-2015

WBZ AccuWeather
Seasonal Snowfall So Far

- Burlington: 76"
- Bangor: 117"
- Syracuse: 107"
- Portland: 89"
- Albany: 71"
- Buffalo: 103"
- Binghamton: 76"
- Worcester: 109"
- Boston: 102"
- Hartford: 55"
- Providence: 60"
- New York: 28"

March 2015
"Historic" Winter

A costly sewer system failure on Plum Island

Sewage problem on Plum Island

Plum Island sewer system failure displaces hundreds

Meeting the challenges of so much snow, sewerage outage

Help for Plum Island's sewer woes

More money allocated to study problems
Plum Island
Vacuum Sewer Systems

How AIRVAC Works:

1. A traditional gravity line carries wastewater from the customer to an AIRVAC valve pit package.
2. When 10 gallons of wastewater collects in the sump, the AIRVAC valve opens and differential pressure propels the contents into the vacuum main.
3. Wastewater travels at 15 to 18 fps in the vacuum main, which is laid in a sawtooth fashion to insure adequate vacuum levels at the end of each line.
4. Wastewater enters the collection tank. When the tank fills to a predetermined level, sewage pumps transfer the contents to the treatment plant via a force main.
5. Vacuum pumps cycle on and off as needed to maintain a constant level of vacuum on the entire collection system.

Photo Credit: Bilfinger Airvac Water Technologies Inc.
Project Considerations

Data Development

Data Review

Web Maps & Mobile Apps

ArcGIS for Server (Amazon EC2)

ArcGIS Online

Collector for ArcGIS

Web Map

City Website

External Applications
State of the Data

Vacuum Pit:

- Provided with “as builts”
- Incorrect locations
- Unknown Quantity
- Don’t know which home is connected to which vacuum pit
State of the Data

Vent Pipe (Candy Cane):

- No existing dataset
- No record of which homes tied in
Data Development

Develop a plan to collect pertinent features to the island's sewer system.
Mobile Collection

• Divided island into 4 sub areas for ID scheme

• Worked with knowledgeable DPS staff member

• Collected approximately 1800 features

• Two months
Attributes

Vent Pipe:
- Height
- Obstruction
- Angled
- Broken
- Building Adjacent

Vacuum Pit:
- Vacuum pit ID
- Street name
- Last maintenance
- Controller status
- Condition

Trimble GeoExplorer6000
Mobile Collection Challenges
Data Review
The “Fruity Pebble” Map
Data Review
Drawing the Connections
Verification Process

Annual AirVac testing:
• Test timing of system
• City confirmed home & vacuum connections at the same time
Defining the objectives:
• Who will use the application(s)?
• How will the application(s) be used?
• What do(es) the application(s) need to accomplish?
Why use a web map?

- Simple to create
- Easy interaction

- Dynamic data
- Delivered via multiple platforms
Mobile Application

Why use Collector?
- Existing infrastructure
- Cost
- Easy to configure / Easy to use

Benefits to staff?
- View system in field
- Edit data on the fly
- Same map is available in other applications
City Website (embedded map)

How do residents benefit?
- Integrated in city website
- Search for data
- Receive real-time updates

Newburyport launches real-time view of Plum Island sewer system

The Newburyport Department of Public Service has launched a new real-time view of Plum Island’s sewer system operation.

DPS staff, with assistance from the Merrimack Valley Planning Commission, mapped the entire sewer system on Plum Island and used a geographic information system (GIS) application to create a map, hosted on the city’s website, where anyone can see the operational status of the system 24 hours a day, seven days a week.

In the wake of system failures last winter due to extreme weather conditions, DPS Sewer Division staff spent the spring and summer months mapping the systems on the island so that the department could better respond to operational glitches.

In the event of a system problem, DPS staff will load this information to the map so that any person can log onto the site and see the exact location of the inoperable area. Troubled locations will be denoted by a red line.

When the system is back up and operational, the lines will revert to green, indicating fully operational status.

According to an announcement from Heather Rowe, the city’s chief administrative officer, the mapping of the system has taken a lot of guesswork out of the equation for Sewer Department employees. Operators are now able to respond to low vacuum alerts situations with accurate locations of all components of the system. This information will expedite the process in finding any issues or mechanical failures, Rowe said.

Log onto the Plum Island Sewer Map hosted on the DPS Sewer Division webpage to view this new service at...
Integrations & future considerations...

- Integrated with AirVac SCADA
- Evolve systems as technology advances
  - ex. Migration from Green App to Collector
- Ongoing operation of apps
- Expand maintenance attributes & training
Questions?

Jerrard Whitten  GIS/IT Manager
jjwhitten@mvpc.org

Stephen Lopez  Senior GIS Analyst
slopez@mvpc.org

Kelsey Quinlan  GIS Analyst
kquinlan@mvpc.org

Technology Utilized

• Trimble GeoExplorer6000
• Trimble Pathfinder Office
• ArcGIS ArcMap 10.3.1
• Collector for ArcGIS

• Amazon Web Services (Elastic Cloud Compute)
• ArcGIS Server 10.4
• ArcGIS Online
• Android & IOS enabled devices