Transforming a Grass Roots Program to an Enterprise GIS
Aqua America is the second largest, publicly traded water and wastewater utility

- Investor owned water and wastewater utility (NYSE: “WTR”)
- 3 million people served across 8 states
- Founded in 1886
- 1,600 employees
- 12,000 miles of water main
- 1,500 water & wastewater systems
Overview

• Background
• GIS Timeline
• Development of Enterprise GIS
  • Planning
  • IT
  • Technical issues
    • Coordinate system
  • Communication
  • Rollout
• Takeaways
GIS Timeline at Aqua

1. **GIS Needs Study**
2. **Step back from GIS and focus on mapping improvements**
3. **Convert Aqua PA to GIS**
4. **GIS web applications in office**
5. **GIS to Aqua PA field crews on laptops**
6. **Begin converting Aqua OH and IL to GIS**
7. **GIS viewer available within office**
8. **“Temporary” GIS position created**
9. **GIS available to field crews on tablets**
10. **Begin rollout of GIS to all Aqua states**
Aqua GIS – the early days

- Engineering initiative to support water main replacement program
- Little or no IT involvement
- The “server under the desk”
- Started by converting > 700 individual maps (plates) for southeast PA
- User access initially through ArcReader
- Eventually converted all water systems in PA
- Separate consulting contract to expand to Aqua OH and Aqua IL

3 separate databases

Aqua PA  Aqua OH  Aqua IL
Enterprise GIS Scope of Work

- Install and configure Aqua GIS Production & Test server environments
- Consolidate and optimize Aqua’s GIS data model for improved sustainability and performance
- Create “base” and asset GIS data for all Aqua states
- Improve web based capabilities to share GIS information with a variety of end users within Aqua
- Review, document, and optimize all related “back office” scripts and processes

3 separate databases

\[ \text{Aqua PA} \quad \text{Aqua OH} \quad \text{Aqua IL} \]

\[ \text{Single database} \]

\[ \text{Aqua} \]
Original configuration

- Database Server (1) – separate database for each state
- ArcGIS Server (1)
- Web Server (1) – also supported other applications

Current configuration

- Database Server (1) – single database for all of Aqua
- ArcGIS Server (3)
- Web Server (1) – dedicated to GIS
- Image Server (1)

Significant corporate commitment to GIS in 2016...
Planning for Success

- Thorough review of staffing needs
- Expectation of supporting advanced capabilities
- Sustainable technology solutions
Planning for Success

AQUA

GIS States Plan: What are the Components?

GIS Maturity

Base GIS

Base GIS data is at the core of any location-based information system:

- System lists and boundaries
- PWSIDs
- NPDES #s
- Customer points
- Parcel data
- State and municipal boundaries
- Roads
- Regulatory districts

Asset GIS

A core pattern of utility GIS usage at Aqua is storage, management, and maintenance of accurate asset records:

- Water Distribution systems
- Wastewater collection systems
- Wells, Plants, Pump stations, Tanks (linked to MC)

Planning & Analysis

- Hydraulic modeling

Asset records

Document Management (optional)

Engineering documents

- As-Builts
- Design drawings

GIS Viewer

GIS viewers already established in PA, OH, & IL enable field mobility, getting information into and back from the field on tablets. Office staff gain increased operational awareness through easy web access to Base GIS data, Asset GIS data, and engineering drawings.

GI S Viewer

- Base records
- Asset records
- Engineering drawings

GIS plays an integral role in the various asset management activities already in place at Aqua and can contribute to more mature asset management applications moving forward.

- Improvement charge and capital planning
- Qlikview and corporate reporting
- PUC applications
- Salesforce

Future components

- Maintenance Connection/GIS integration
- Banner/GIS integration

Quick Wins

GIS Viewer can be created immediately

- Utilize Maintenance Connection
- GPS coordinates to create initial Asset GIS
- Utilize existing GIS data in states like IN to create initial Asset GIS

Quick Wins

- Tap cards
- Plates

Long Term Benefits

- Digital engineering documents are much easier to access than paper
- Engineering documents typically have detailed information that is unavailable from any other source

Future components

- Outage maps
- Emergency response
- Customer notification
- Maintenance activities

Key Concepts

- GIS is a key component of an overall Asset Mgmt plan
- Leverage existing improvements made by other states
- GIS processes established to maintain linear asset data
Planning for Success

GIS States Plan: How do we achieve this?

AQUA

1. Acquire publically available datasets
   - Parcel data
   - State and municipal boundaries
   - Roads
   - Regulatory districts
   - Other utility data
   - Topography
   - Planimetric data
   - Aerial photography
   - Hydrography

2. Develop AQUA specific datasets

Base GIS

1. Obtain Maintenance Connection GPS coordinate data
2. Obtain existing state GIS data (shapefiles, etc.)

Asset GIS

3. Obtain existing Google Earth data
4. Plot existing GIS and GPS and evaluate data quality
5. Make any data quality corrections as necessary
6. Load data into existing standardized data models

Document Management (optional)

1. Identify existing engineering documents to be scanned
2. Scan engineering documents
3. Deploy AIMS document management system
4. Load scanned drawings into AIMS
5. Where applicable, link scanned documents to GIS

Planning Needs
- Establish Steering Committee
- Establish Users Committee

1. Develop GIS viewers for office use and field use
2. Build data "cache" for optimized performance
3. Build necessary scripting & automation for keeping the viewers up to date
4. Establish maintenance procedures for the GIS viewers
5. Assign maintenance to a GIS staff member

GIS Viewer

1. Develop permanent integration points between Maintenance Connection & GIS
   - Take advantage of asset based workflows in Maintenance Connection (asset replacement & retirement)
2. Develop permanent integration points between Banner & GIS
   - Location and visualization helps leverage the value of customer data
3. For states that have capital planning needs, deploy GIS tools and workflows already established in other states

Asset Management

4. Assign primary support responsibility for your state to a GIS staff member

Develop future components
1. Outage maps
2. Emergency response
3. Customer notifications
4. Maintenance activities

Q1 2016
- Costs: Low
  - Most data needs to be acquired
  - Data may need to be standardized

Q3 2016
- Costs: High
  - Contribute to Esri ELA
  - Contribute to supporting staff

Q4 2016
- Costs: Medium
  - Cost of scanning paper documents
  - AIMS to be replicated

Q1/Q3/Q4 2016
- Costs: Low
  - Current viewers to be replicated
  - Maintained by single staff member

Q2 2017
- Costs: Medium
  - Internal IT resources for integration
  - Communication between stakeholders
Building an Enterprise GIS - Systems

Then:
• 3 server setup on ArcGIS for Server 10.1
• ~50 custom SQL and Python integration scripts
• ~400 active tablet users
• ~20 databases
• Minimal IT support
• 6 general “viewer” applications

Now:
• 6 server setup on ArcGIS for Server 10.4.1
• ~10 custom SQL and Python integration scripts
• ~600 active tablet users
• ~4 databases
• Enterprise level IT support
• 2 general “viewer” applications
Building an Enterprise GIS - Data

Then:

• PA, OH, IL
• 300 water/wastewater systems
• 500,000 customers

Now:

• PA, OH, IL, NJ, IN, VA, NC, TX
• 1,500 water/wastewater systems
• 1,000,000 customers

Over 2 TB of data collected! (~1.4 million selfies)
8 editors

ArcGIS
Desktop - 10 “casual” users

ArcGIS Web
App Builder
- Webmap -
?? users

Explorer - 600 users
8 editors

EDIT

Overnight Replication

PUBLISH

ArcGIS Web App Builder
- Webmap -
?? users

ArcGIS Desktop - 10 “casual” users

Explorer - 600 users
### GIS by the numbers

#### Number of Hydrants

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<thead>
<tr>
<th>State</th>
<th>Count</th>
<th>Hyd/Mi</th>
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<tbody>
<tr>
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<td>23,866</td>
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"The midwest loves fire hydrants" 

#### Number of Valves

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"Are we missing valves in GIS?"

#### Number of Manholes

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"PA has a lot of low pressure force main"
Takeaways

• Plan, plan, and plan some more
• Make friends with IT
• Communicate early and often
• Be careful not to value the quickest way over the best way
• Be prepared to manage change and expect to manage change
• Implementing a GIS is not an overnight process