Lucity Success Story – Merging Systems

Presented to Lucity ACT 2016
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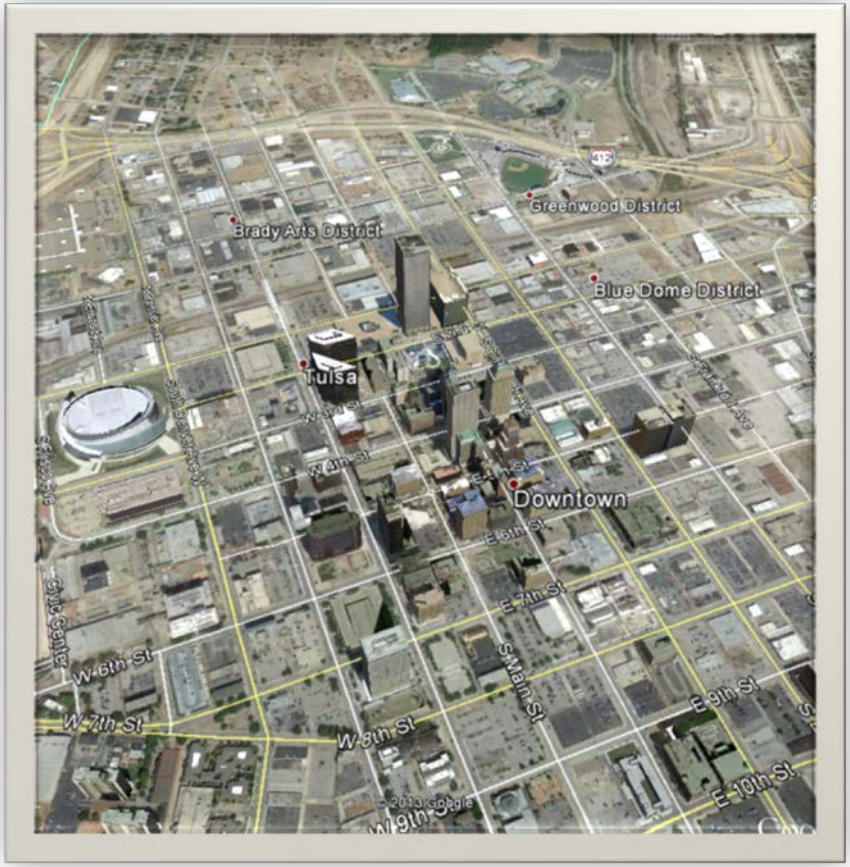
About Tulsa

- Located in NE Oklahoma on the Arkansas River about half way between KC and Dallas
- City population 400,000; Metro 950,000
- 47th largest city in the US
- Over 200 square miles
- Incorporated in 1898
- 3600 employees
- Mayor as city manager, 9 Councilors, Auditor
- Lot's of pride in our community



Water System Overview

- Raw water comes from 3 lakes in 2 watersheds via 4 major transmission lines
- 2 water treatment plants (90 – 210 MGD)
- 2,300 miles of water main; 15,000 hydrants
- 13 pump stations; 16 tanks & reservoirs
- 140,000 metered accounts serving > 500,000 residents
- www.cityoftulsa.org/city-services/water.aspx

AMERICAN WATER WORKS ASSOCIATION
SOUTHWEST REGION | *BEST TASTING WATER*

Wastewater System Overview

- 1,960 miles of sewers
- 62 lift stations
- 4 wastewater treatment plants (103 MGD avg day flow)
- 3 labs, Compliance, IPT, and FOG programs
- www.cityoftulsa.org/city-services/wastewater.aspx

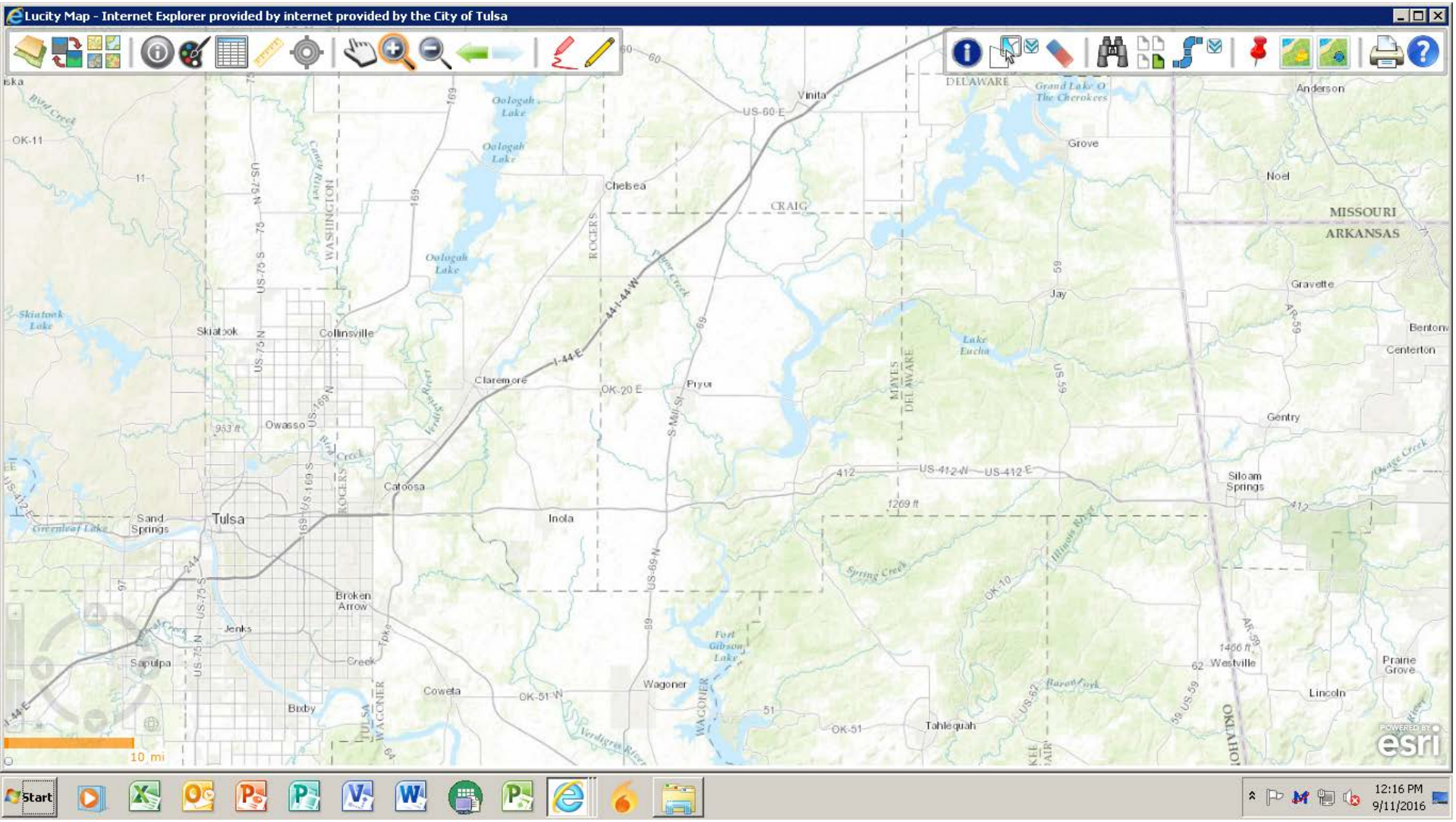
TRAP THE GREASE

FATS, OILS AND GREASE CAN CAUSE PROBLEMS IN THE SEWER SYSTEM. THESE INCLUDE:

- FRYING OIL
- SALAD OIL
- MEAT DRIPPINGS
- BACON FAT
- GREASY LEFTOVERS
- SHORTENING OR LARD

Partners for A Clean Environment
PACE

Water & Sewer Service Area



Tulsa Metropolitan Utility Authority (TMUA)

- Public Trust of the City of Tulsa charged with overseeing the water and sewer systems
- Board has 6 trustees appointed by the mayor who serve 3 year terms
- TMUA Board consists of respected business leaders from our community.
- TMUA Organizational Values:
  - Accountability
  - Integrity
  - Transparency
  - Efficiency
  - Safety & Public Health

TMUA Financial Standing

- Tulsa's water and sewer budget
  - $215 million combined operating budget annually
  - $70 million CIP annually for Water & Sewer alone
- Every year Tulsa's City Council is asked to raise rates by up to 10% to cover capital projects and continually increasing operational costs.

TMUA vs. City of Tulsa

- City of Tulsa owns the water and sewer Utility
- TMUA contracts with the City to govern the Utility (mostly to manage long-term debt)
- TMUA can:
  - Operate Utility themselves and hire staff
  - Outsource to a private operator
  - Hire the City to operate
- TMUA Board hired the City to operate its own assets.
- Problem: TMUA and City priorities do not always align

Supporting Departments

- Engineering (Planning, Design, Construction, Survey, Graphics, Capital Projects)
- Finance (Utilities Billing, Accounting, Payroll, Grants, Inventory Control, Purchasing)
- Customer Care (Call Center)
- Information Technology (Servers, Network, Database, Radio, Client Support, Application Support, Development, Deployment)
- Real Estate (ROW, Easements, City Property)
- Security (Physical Security and Cybersecurity)

Supporting Departments

- Communications (Public Relations, Internal Communications, Web Content)
- Human Resources (Recruiting, Classification, Compensation, Benefits, Labor Negotiations, Workers Comp, Safety)
- Development Services (Plan Review, Neighborhood Inspections, Permits, Licensing)
- Fire (Hydrant inspections and testing)
- Equipment Management (Fleet)
- All of these functions used to be Public Works

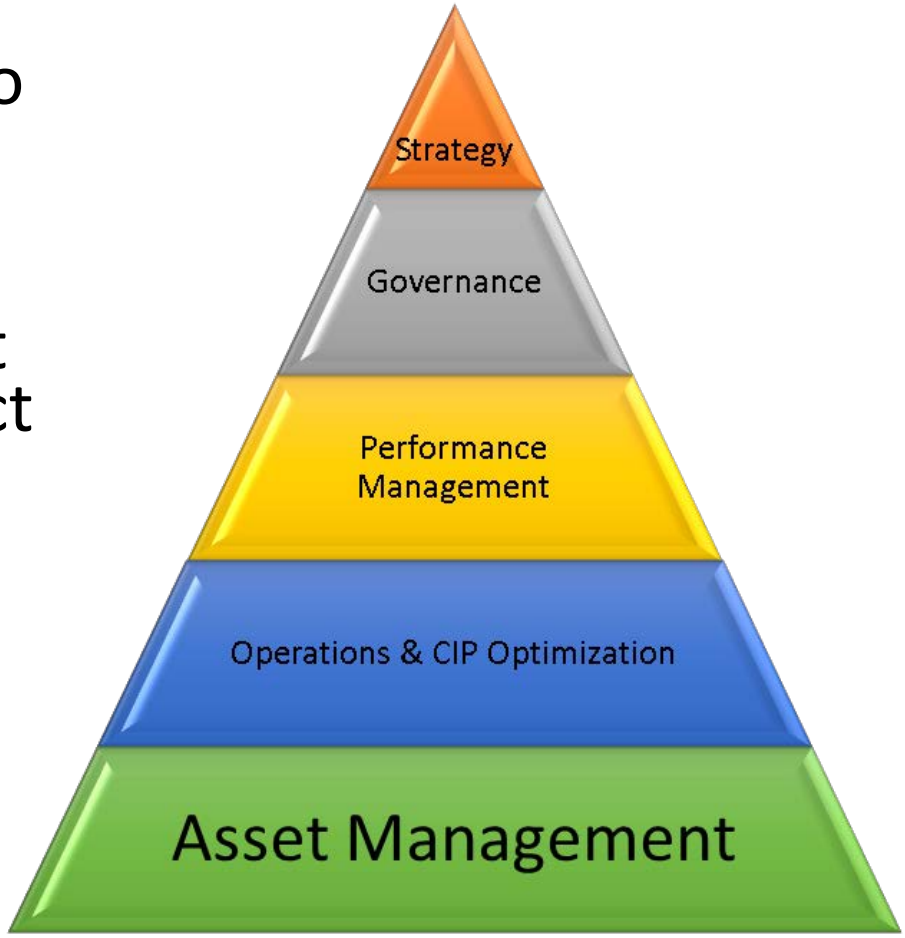
TMUA conducts Utility-wide Assessment

- City's KPMG study recommended to sell the Utility
- TMUA conducted its own comprehensive assessment which found:
  - Tulsa is within industry norms for quality and cost-efficiency
  - Rates will grow faster than income for decades to come due to increasingly stringent regulations and aging infrastructure
  - Program Improvements could reduce rate increases by 20 to 30 percent

TMUA launches Utility Enterprise Initiative (UEI)

Asset Management (AM) is the Foundation of the UEI

- AM strategy aligns with TMUA strategic plan
- AM governance needed to maintain consistency and engagement
- AM performance management efforts must capture the data to predict asset lifecycle
- Analysis of asset data necessary to optimize the balance between maintenance and capital investments to extend useful life of assets.



Asset Management Strategy

- Follow PAS55 & ISO 55000 framework for asset management

- Whole life cycle management and cost analysis
- Risk Management
- Capital Prioritization

- Improved Information Management

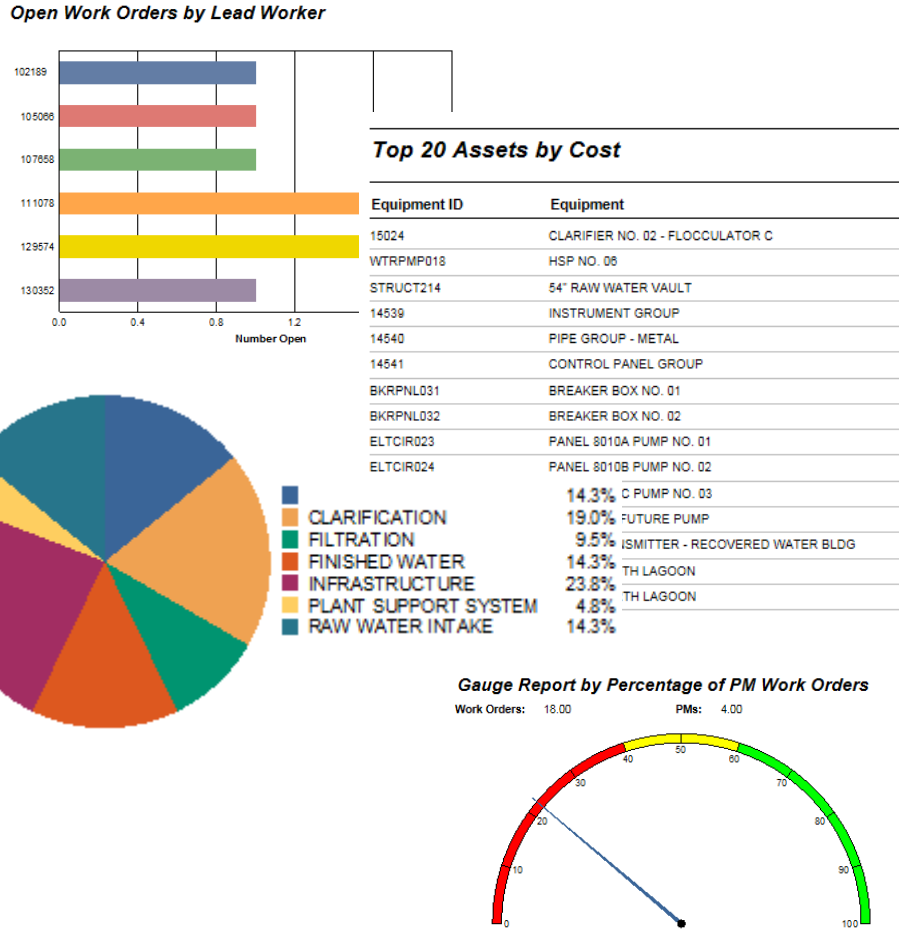
- Levels of Service and Performance Monitoring
- Continual Improvement

Key Asset Management Goals

- Consider the whole asset life cycle
- Use life cycle cost analysis in developing asset management plans and decision making
- Implement a risk-based approach to managing assets and identifying replacement and rehabilitation needs

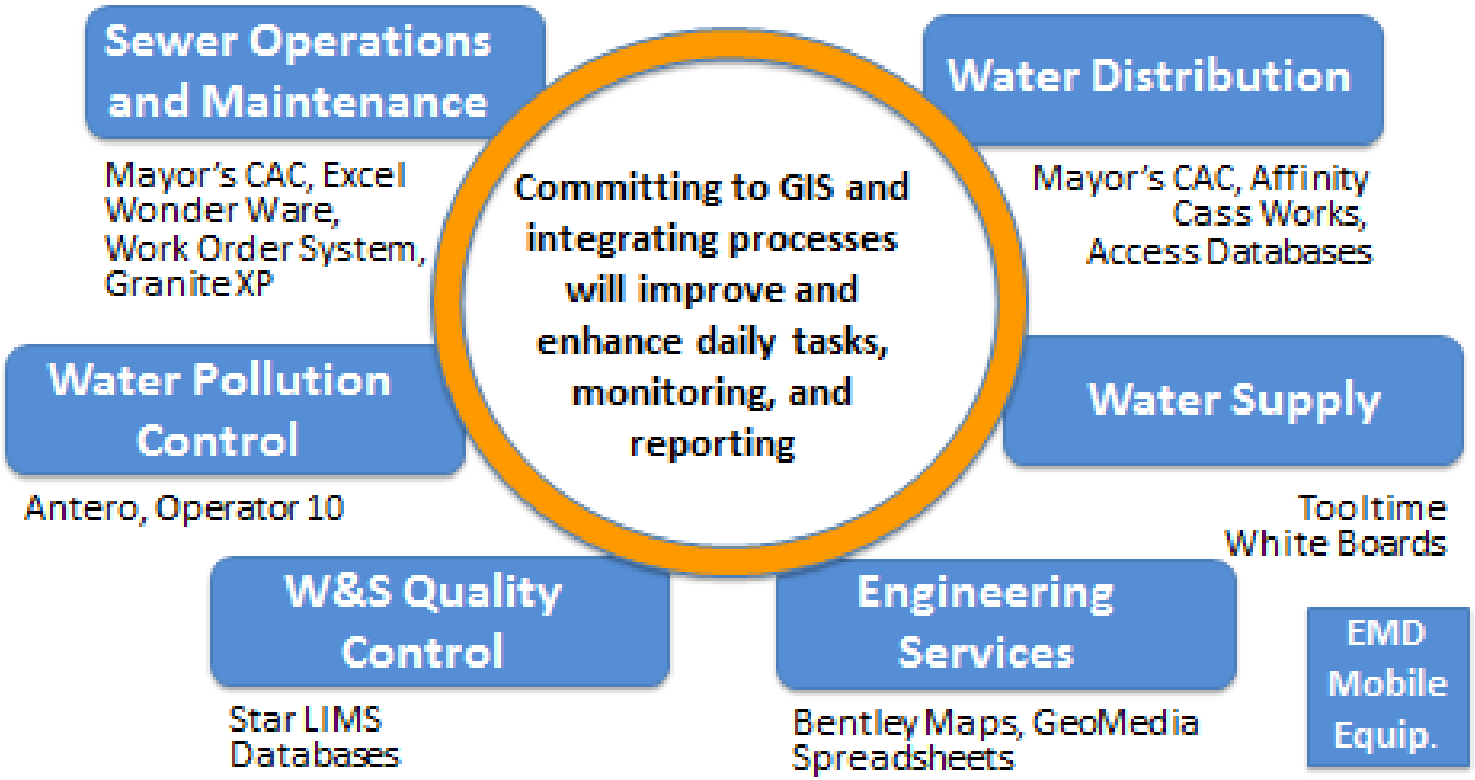
A Key Asset Management Objective

- Implement Utility Wide CMMS
  - ❖ Manage work orders
  - ❖ Track lifecycle costs
  - ❖ Monitor asset condition
  - ❖ Improve maintenance practices

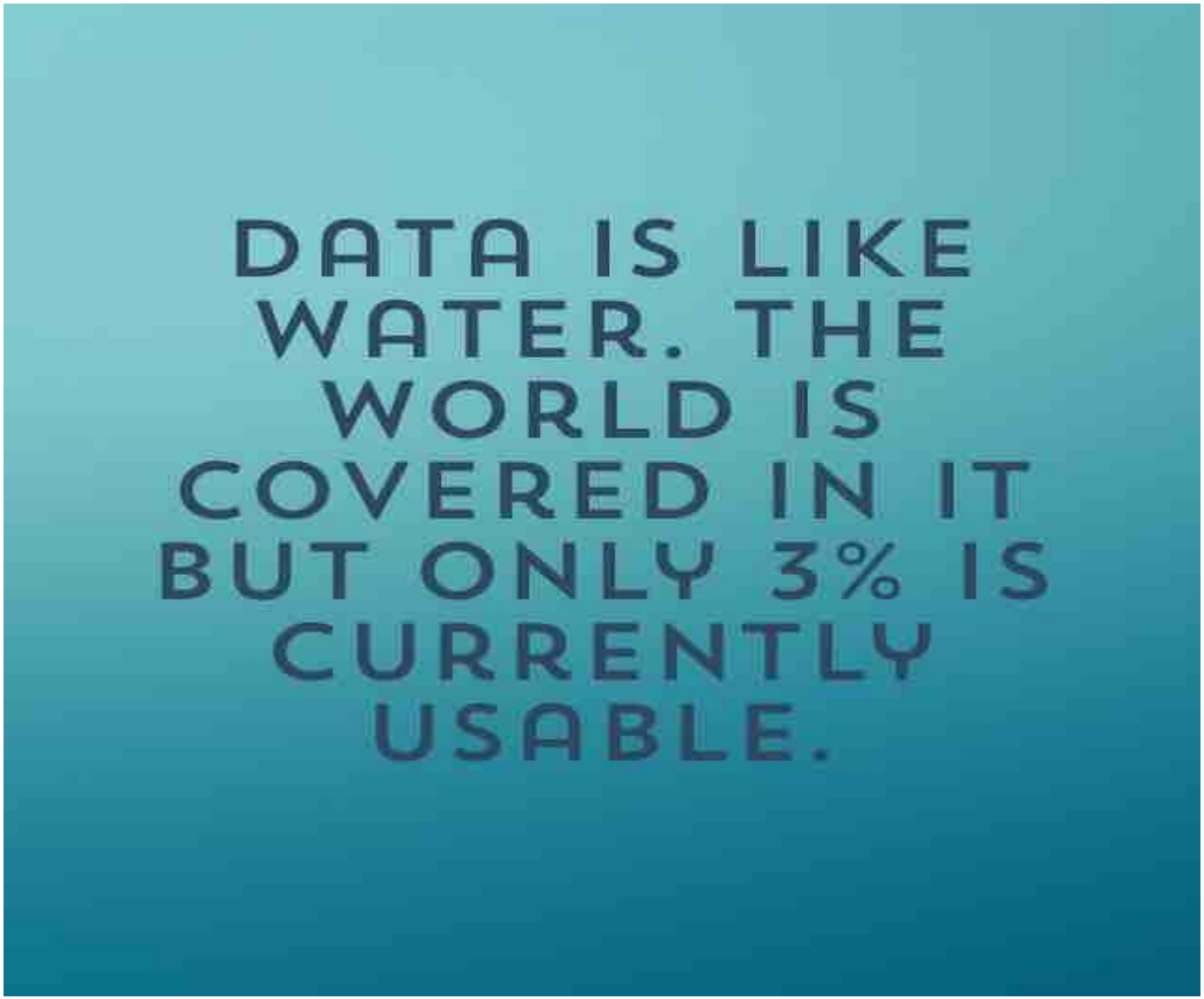


Consolidation of Disparate Systems

Current System



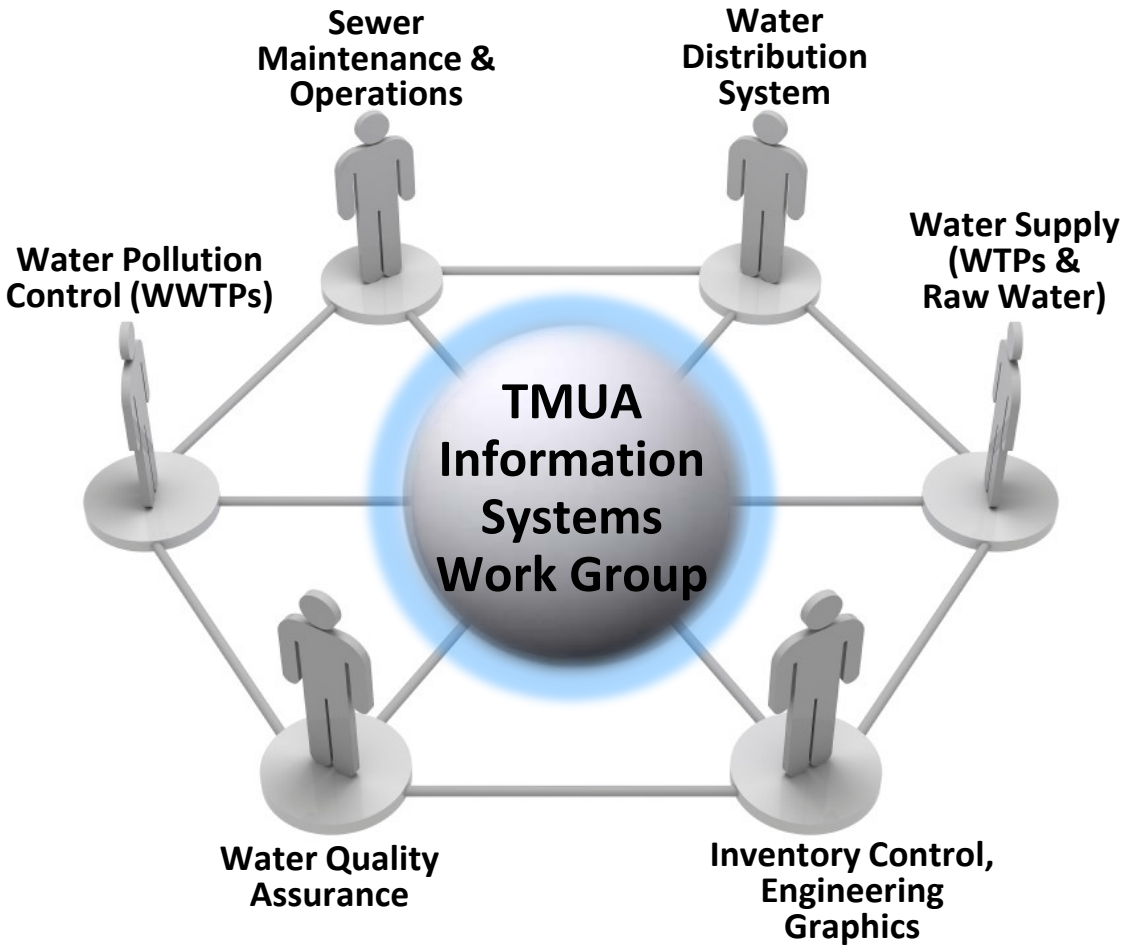
About Data


DATA IS LIKE WATER. THE WORLD IS COVERED IN IT BUT ONLY 3% IS CURRENTLY USABLE.

TMUA Information Systems Group

Formed Information Systems Governance Work Group

- Comprised of reps from each aspect of Utility operations
- Monthly meetings with formal agendas
- Decisions made as a group



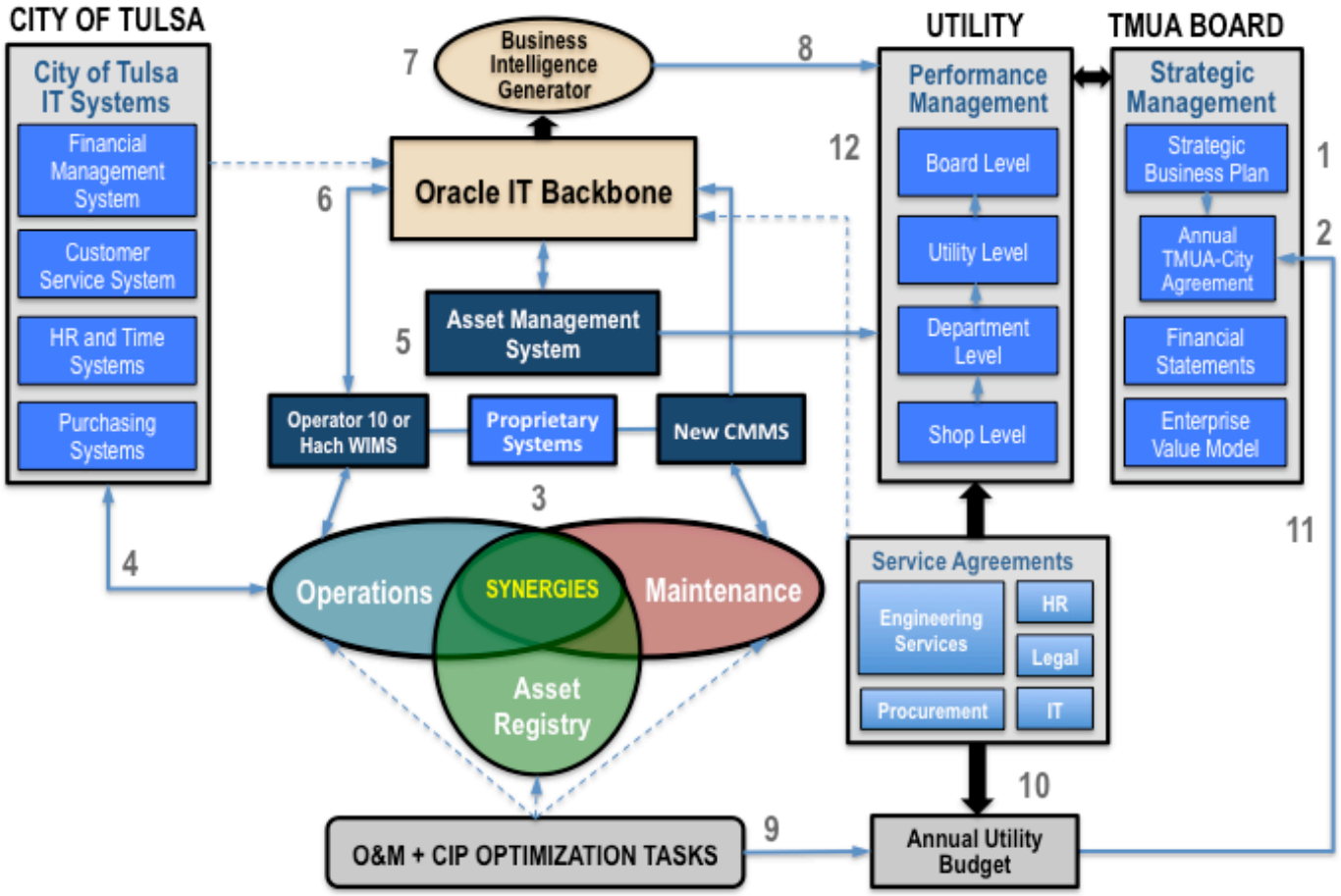
CMMS Implementation Directive

- “Thou shalt be willing to make compromises for the greater good of the Utility.” - Clayton Edwards, Director of Water and Sewer.

AMIS/CMMS Goals-TMUA Board

- Collect detailed operational data related to work management trends, asset conditions, costs of operations, and customer service responses that can be rolled into the departmental weekly status report.
- Build a centralized data repository of asset data for use by the performance management system by consolidating data that is now collected in log books, databases, and spreadsheets.
- Facilitate efficient data collection for water and wastewater asset performance.
- Replace 7 work order systems with 1 system.

The Grand Scheme per our consulting team



The Grand Scheme per WRF

From: High-Performing Information Systems Aligned With Utility Business Strategy Web Report #4316

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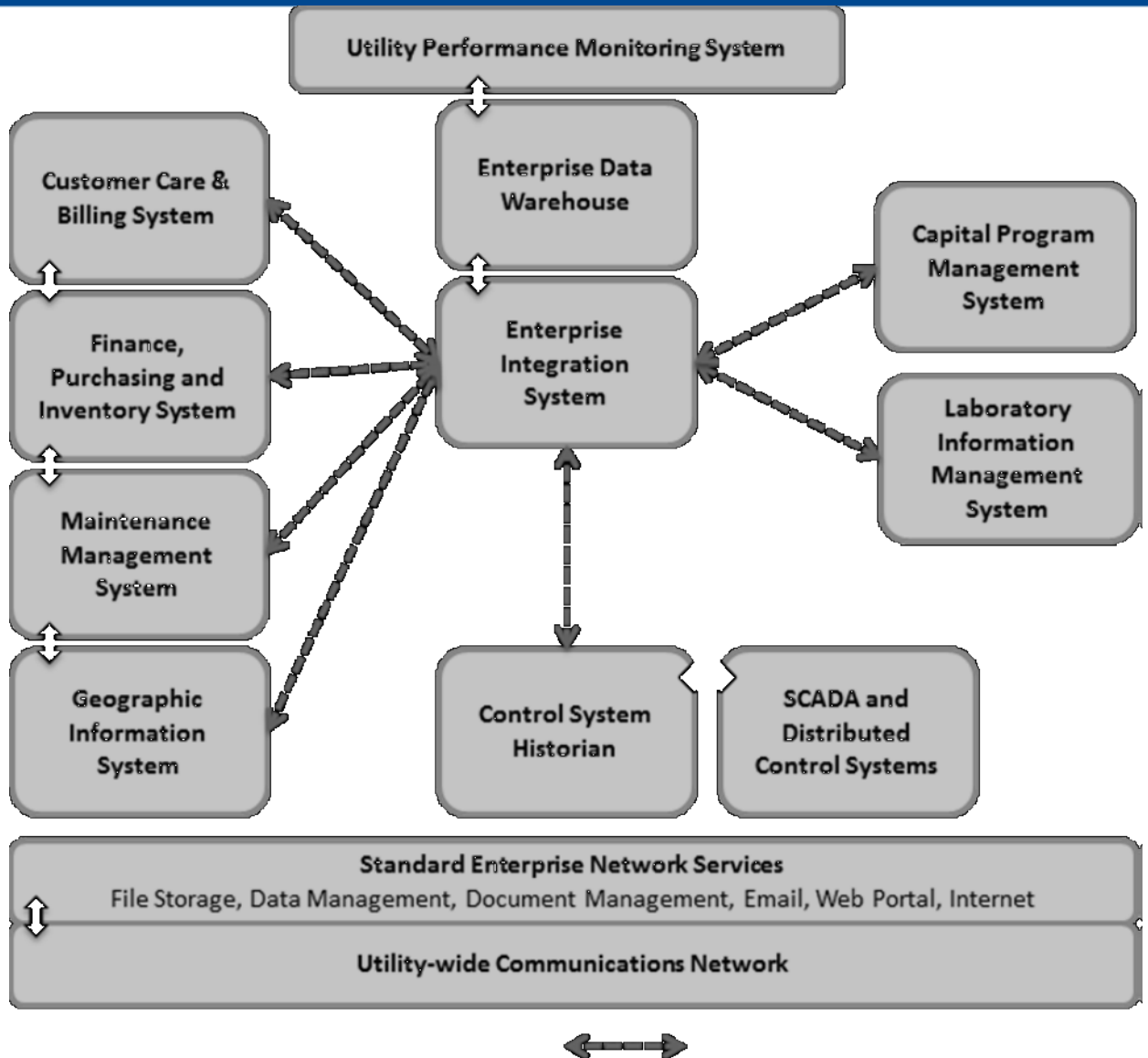
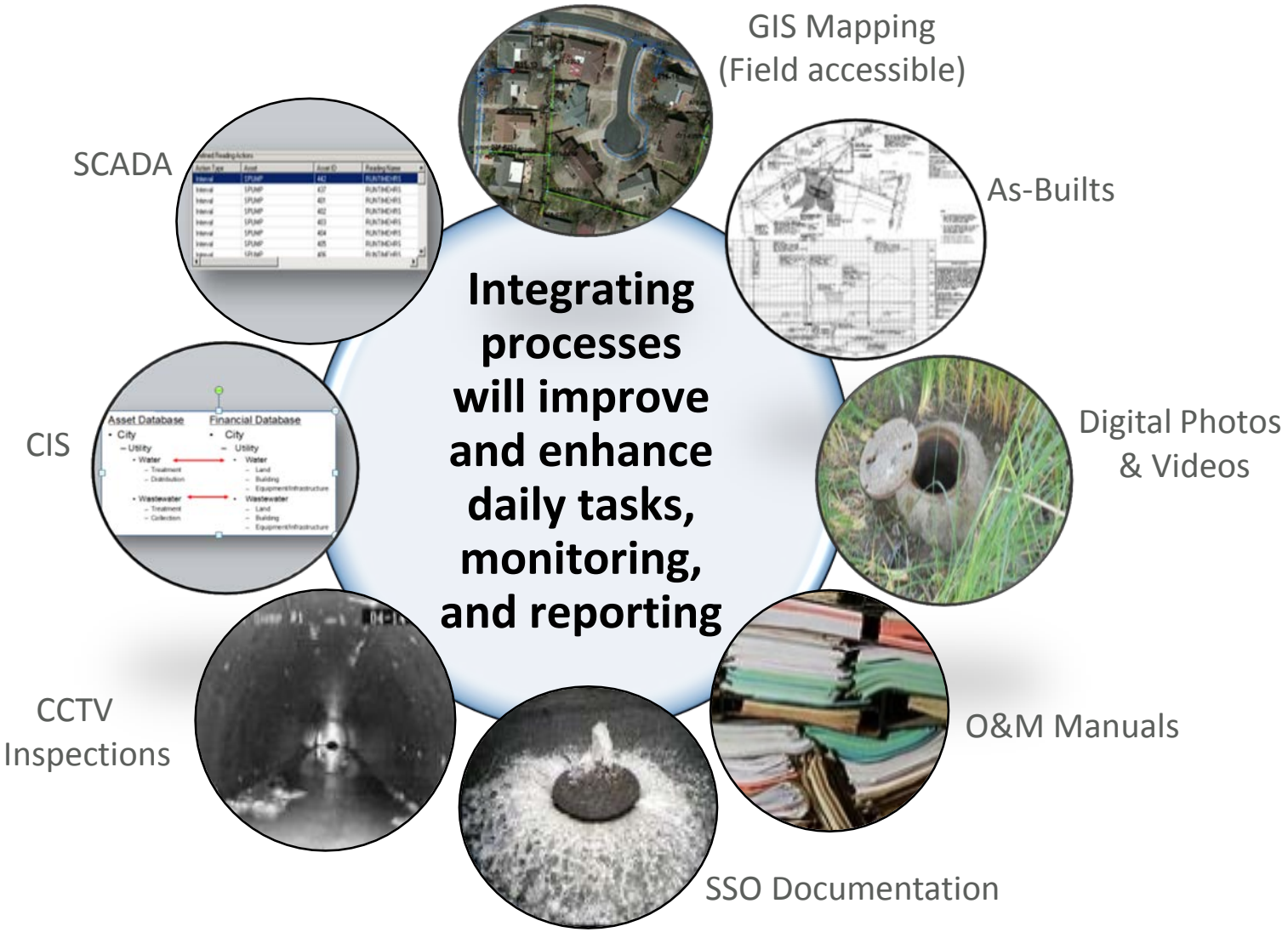


AMIS/CMMS Goals-End Users

- Save time required for manual data collection.
- Enable hands-on digital access to work orders, dynamic maps, and related reference documentation in the field.
- Expand usage of the Engineering Atlas by incorporating GIS functionality and dynamic map interaction for all field and operations users.
- **Prime Directive: Implement a measurable improvement in a work activity for each worker in utility operations.**

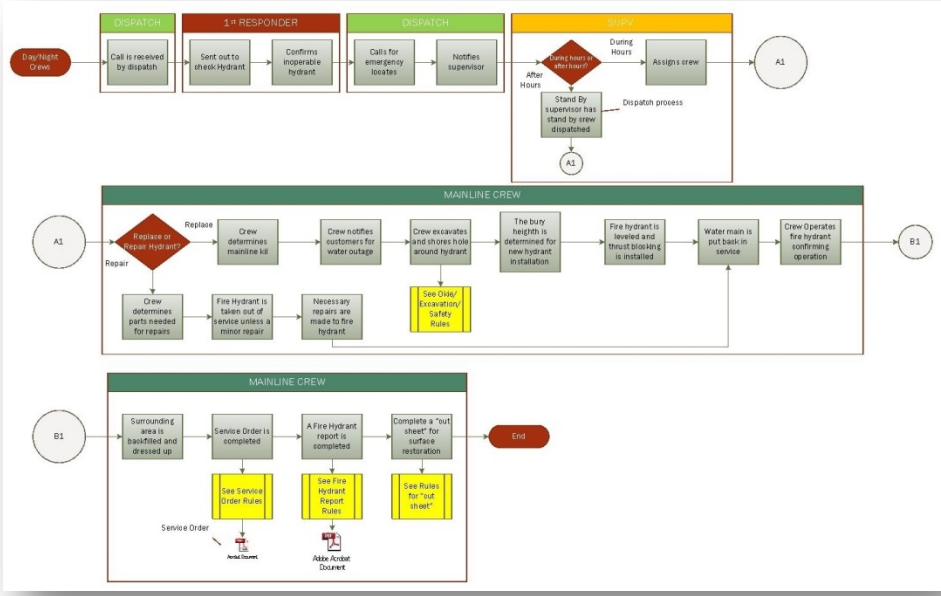
Single AMIS – Gives you the Power of Integrated Data

CITY OF Tulsa
A New Kind of Energy.



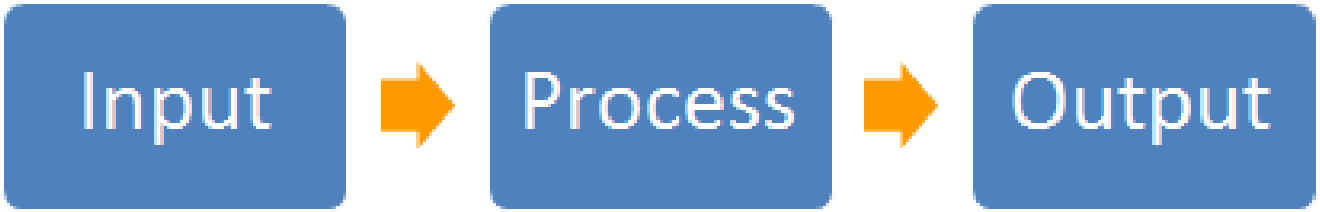
Evaluation of Current Work Environments

- Live in Their World
  - ❖ Work with each group to understand their business
- Map Business Processes
  - ❖ Document triggers, participants, inputs, transformations, and outputs for each step
- Review Current Reporting
- Review and improve existing processes as needed



Evaluating Work Flows

Work Flow Processes



What is activity?
Where does information come from?
What triggers an activity?

Where does it go next?
Who is it assigned to?
Who has to approve it?
How is it prioritized?

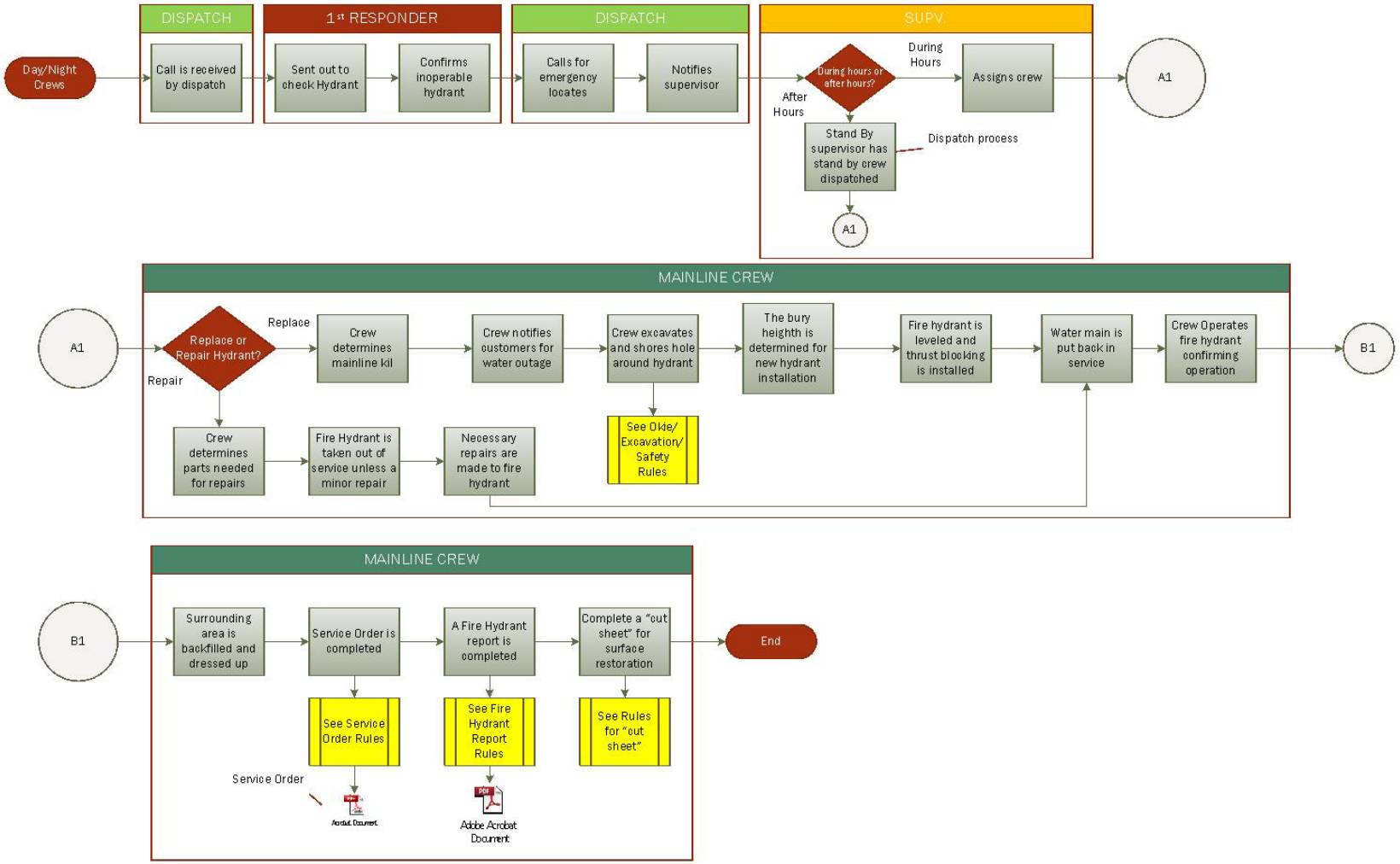
What is the deliverable?

- Asset Inventory
- Inspections
- Preventative/Corrective Maintenance
- Service Requests/Work Orders
- Parts and Equipment Inventory Tracking

Process Mapping

WATER DISTRIBUTION INOPERABLE HYDRANT

September 15, 2015



Information Pyramid

From Organizational Development for Knowledge Management at Water Utilities

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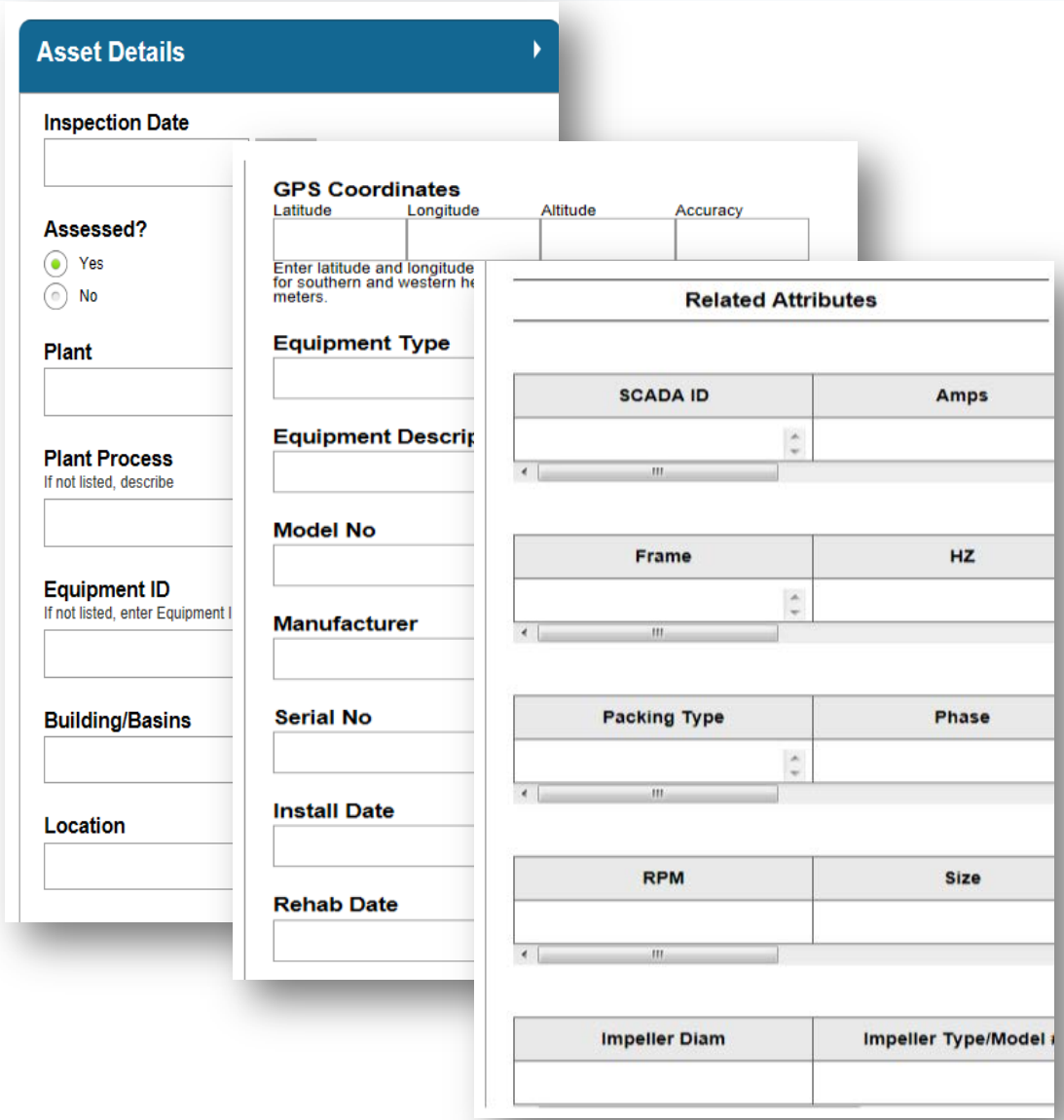
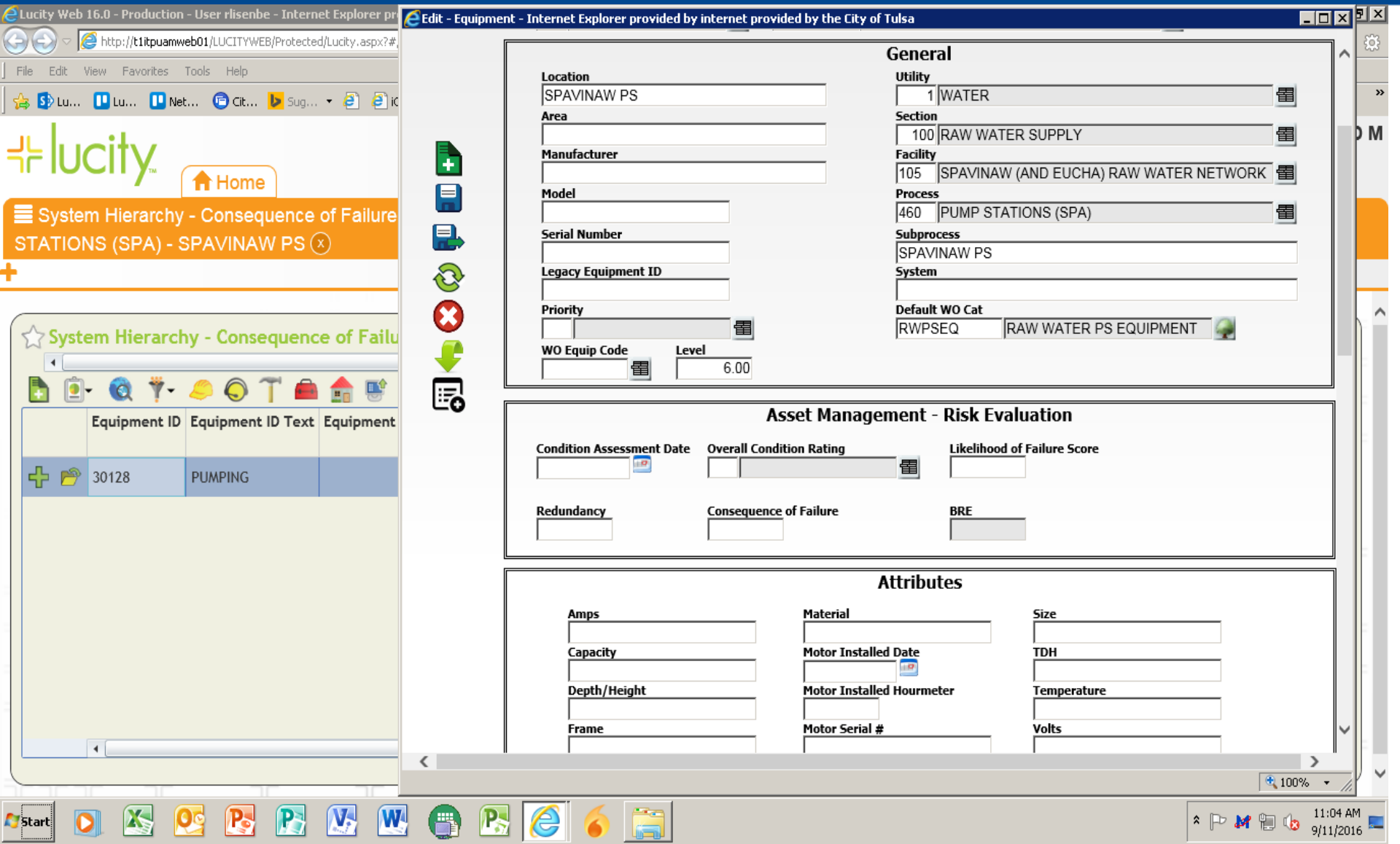
Equipment (or Fixed) Asset Data

Equipment Assets

- Plants, Lift/Pump Stations, Tanks, etc
- Develop consistent hierarchy structure
  - ❑ Define the asset level and build up
  - ❑ Allows for drill down to individual maintenance asset
  - ❑ Roll-up of information for an asset
- Collect Attribute Data
  - ❑ Determine each attribute's definition for consistent use



Equipment Asset Management Data Captured in Lucity



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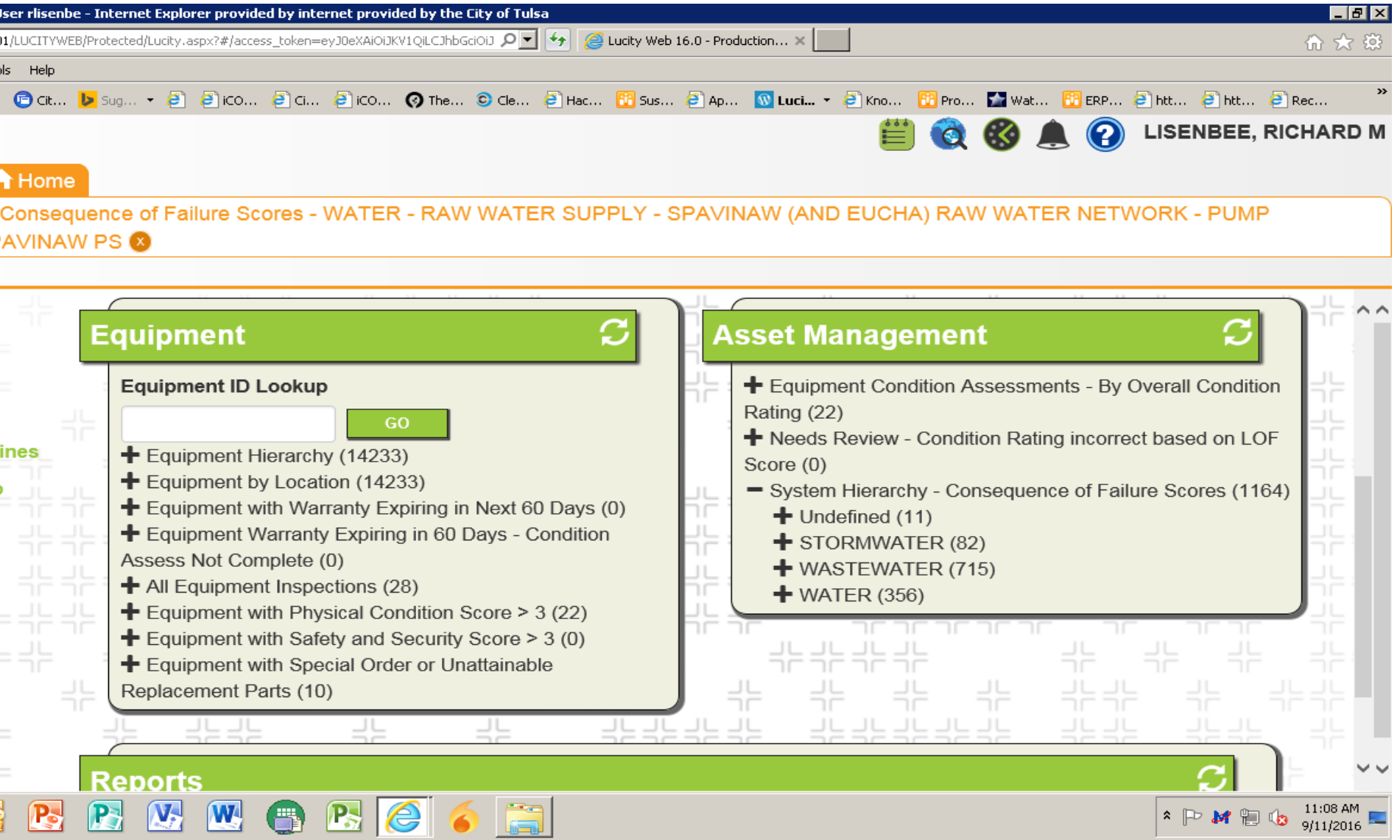


Merging Data From Tool Time for AB Jewell Water Treatment Plant

- Tool Time is a custom-written tool based on MS Access
- Installed and run on a local desktop at the Plant
- No backup (data was lost several times)
- Only 1 user could use it for input or reporting
- 800+ PM templates did not convert to Lucity and had to be redone
- 32000 historical work orders were successfully converted to Lucity
- Successfully went live in September 2015

Merging Data From VB Scripts for Mohawk Water Treatment Plant

- Custom-written Visual Basic scripts extracted data from SCADA system into spreadsheets
- Installed and run on a local desktop at the Plant
- No backup
- Only 1 user could use it for input or reporting
- No PM templates
- Superintendent who developed the scripts has retired
- Nothing was electronically converted
- Went live for corrective work orders in June 2016
- Still developing PM templates

Merging Data From Custom Work System for Sewer Lift Stations

- Custom-written existing work order system data converted to Lucity in December 2015
- Developer of the original system is also the key system analyst for the Lucity implementation
- PM templates did not convert correctly and had to be rebuilt in Lucity
- Conversion the day before go-live did not allow time to check the data or allow staff to get used to the new format
- Lots of problems with the Asset Hierarchy
- Using the Lucity Equipment module over-simplified the information needed for lift station systems

Merging Data From Hierarchy Tool for Raw Water Pump Stations

- Transition to Lucity was fairly smooth due to 2 staff members that attended last year's Lucity ACT in KC
- Decided to focus usage with just a few key staff
- Asset hierarchy tool developed by a consultant did not fit well in Lucity and made it difficult to identify assets
- Extensive staff time needed to correct the hierarchy
- Successfully went live in March 2016

Merging Data From Antero for Wastewater Plants

- Antero already contained unique equipment numbering
- Focusing usage with just a few key admin staff
- Designing exact replica of Antero work order form in Lucity to print – no change for trade staff
- Extensive staff time needed to correct the hierarchy
- Consultant was able to convert 6400 PM templates from Antero to Lucity
- Antero equipment records already contain likelihood and consequence of failure values
- Go-live now planned for October 2016

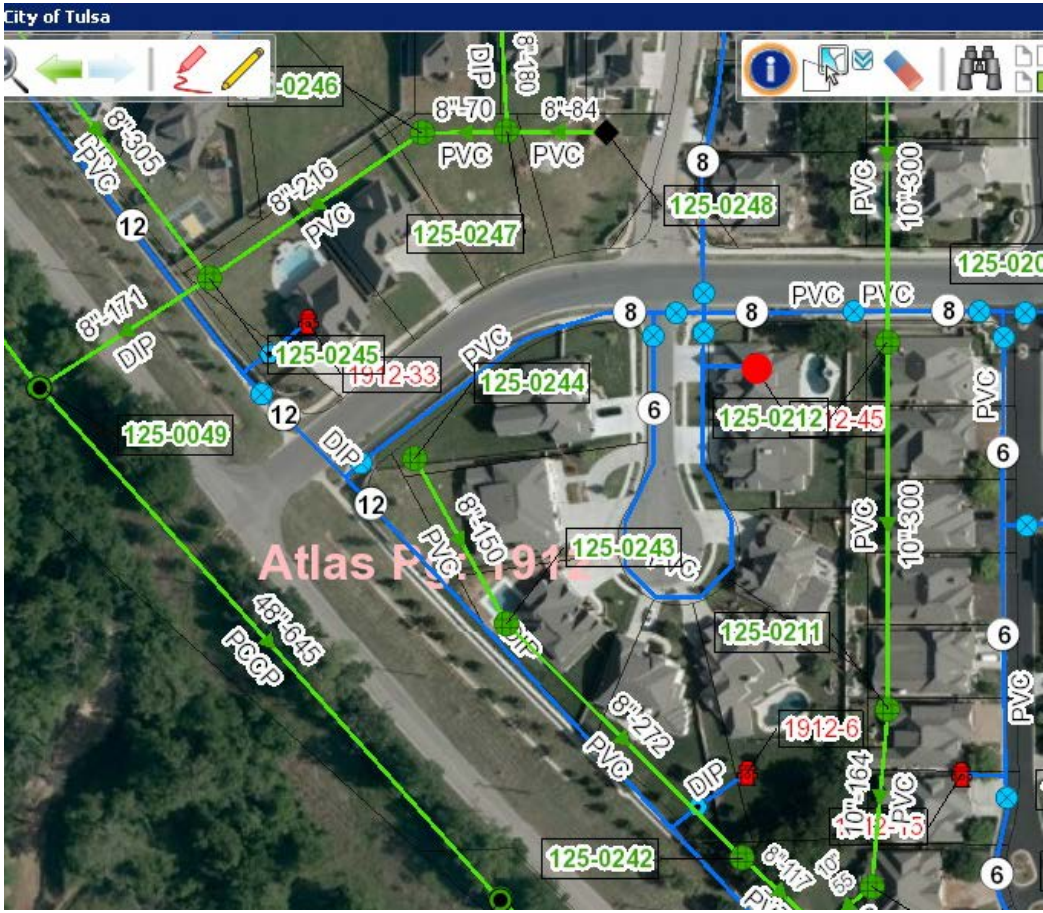
Receiving New Assets

- Defining a template for contractors and consultants
- Initial extraction of Lucity data at the beginning of the project provides unique record identifiers
- Using Lucity Import Tool to process new data that conforms to the template
- GIS-based assets must use City-provided first-order survey monuments to tie design plans to real world coordinates

Linear (or GIS-based) Asset Data

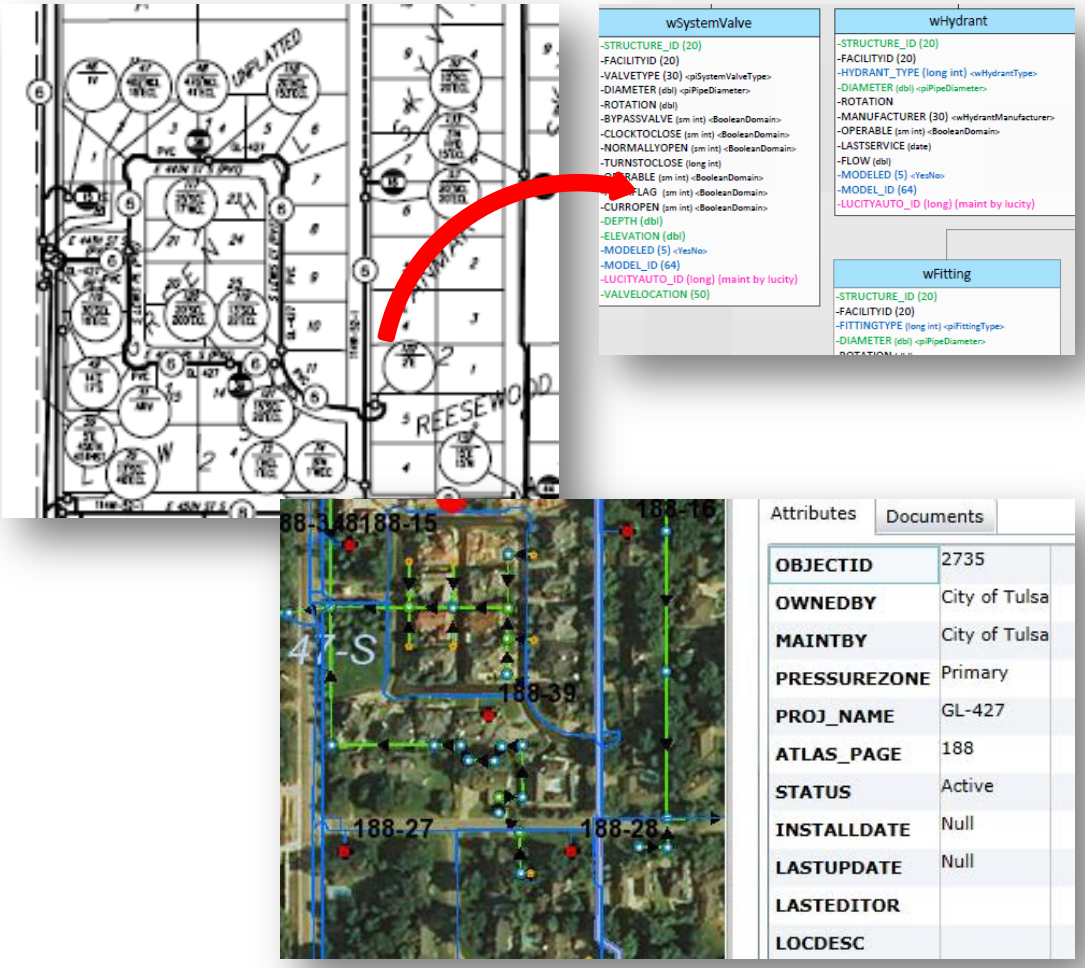
Linear Assets

- Water Distribution, Collection System, Raw Water
- Collect GPS Coordinates
  - ❖ GIS represented in actual location
- Collect Attribute Data
  - ❖ Link Documents
- Add projects while under construction



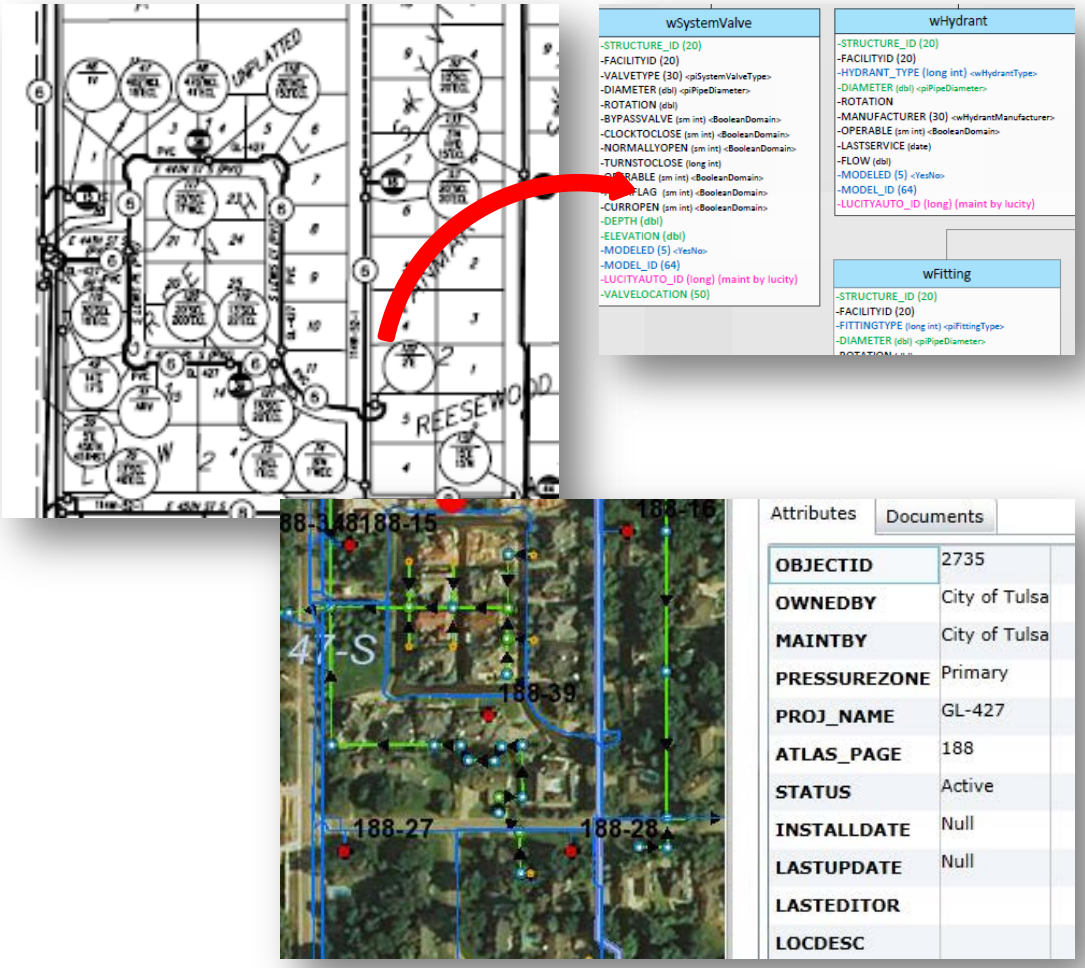
Migrating GIS Data from Oracle Spatial and Bentley Map to ESRI

- Integrated asset management concepts into the enterprise-wide GIS
- Applied the ESRI Local Government Information Model
- Leveraged ArcGIS Server Map Services
- Consolidating 3 sources of fire hydrant data

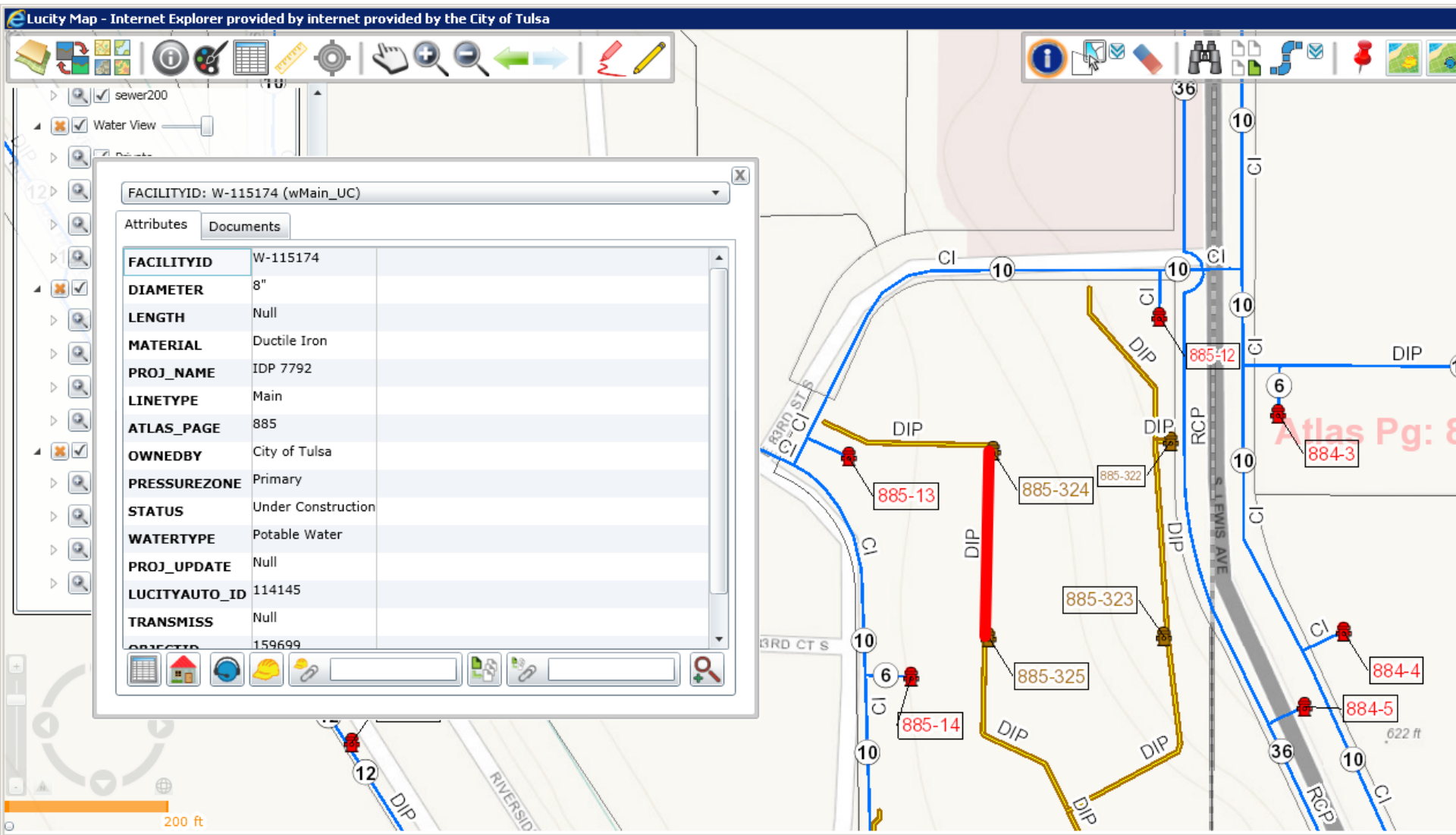


Merging Other Data into the GIS

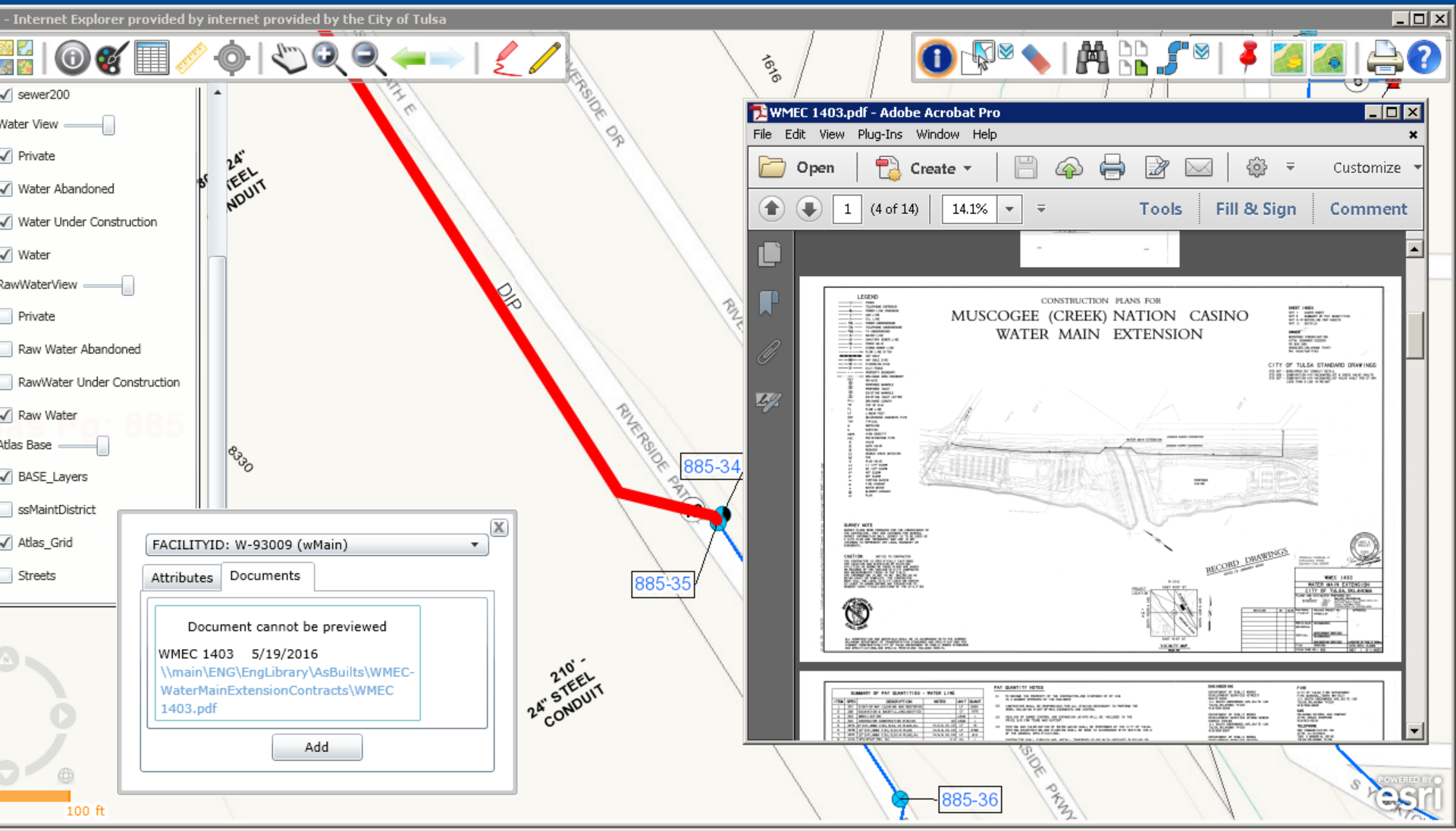
- Added “under construction”
- Added links to record drawings
- Added county assessor property data from 5 counties
- Added 2ft contours
- Registered Tulsa’s high resolution orthophotography with ESRI as a universal base map



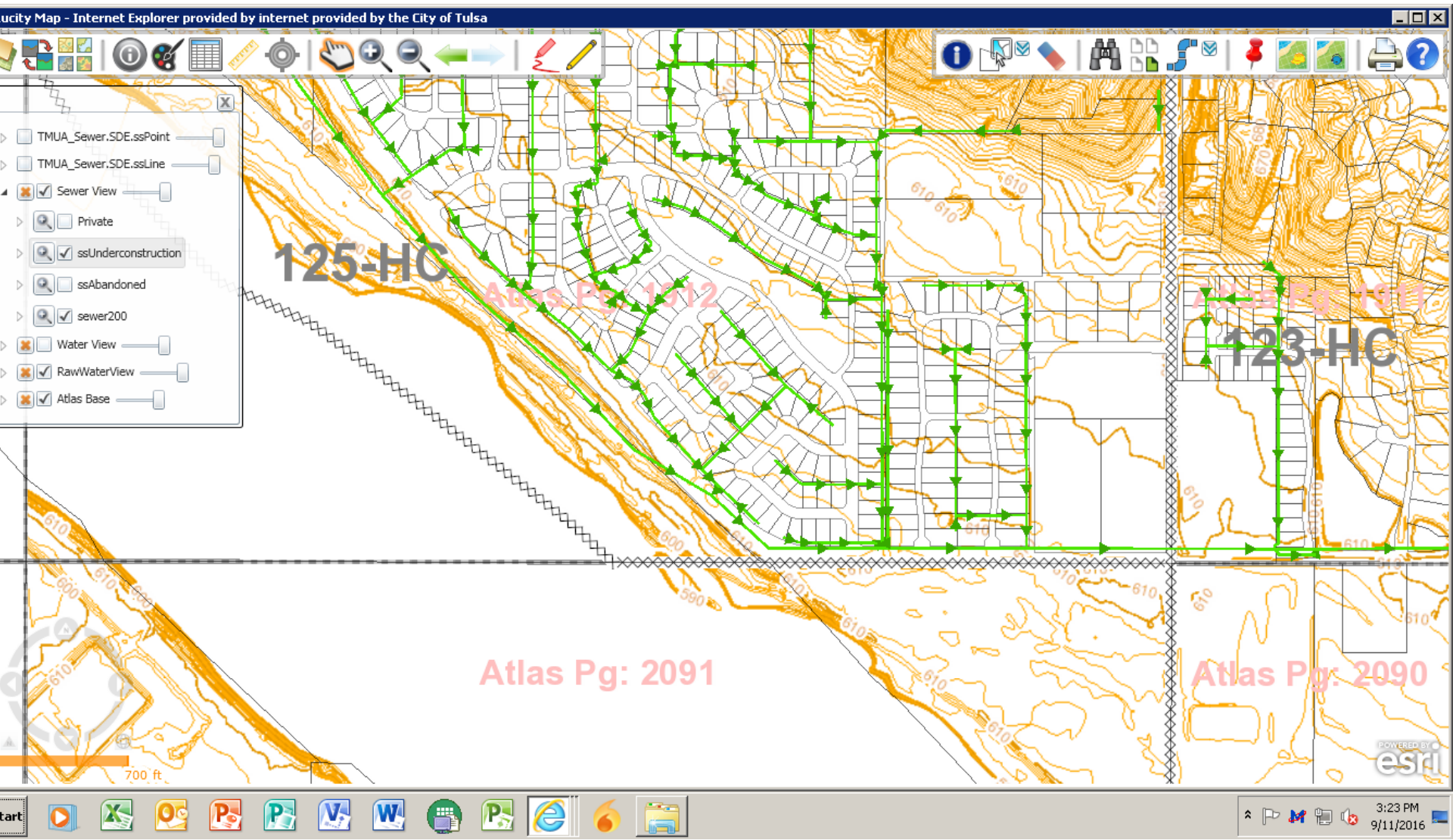
Under Construction Features



Links to Record Drawings



2 Foot Contours from Digital Terrain Models



Structure Numbering Synchronized

- Engineering Graphics group went live with ArcGIS for Water & Sewer Atlas Updates in August 2015
- Uses 2-way synchronization between Lucity and ArcGIS
- Previous structure numbering method was manual and prone to errors
- Lucity auto-generates next available valve and hydrant numbers by Atlas Page and manhole numbers by Maintenance District when new features are placed in ArcGIS

Redline Markups

- Proposed projects are illustrated with redlining tools
- Central online system of redlines eliminates a dozen large hard-copy Atlas books containing various notes
- Engineering Graphics also tracks Atlas Correction Requests as Lucity work orders

Merging Data from Custom Work Order System for Sewer Base

- Custom-written existing work order system data will be converted to Lucity
- Conversion proof of concept was successful
- Many specialty functions of the old system do not correlate to Lucity modules
- Developer of the original system is also the key system analyst for the Lucity implementation
- Working closely with admin team
- Consultant researched missing GIS feature attributes
- Also planning to merge Cues Granite video data

Merging Data from Synexus for Environmental Compliance

- Synexus has no GIS component
- Synexus is built on MS Access
- Geocoded sampling sites
- Pulling some date from LIMS also

Merging Data from MS Access for Fats Oils Grease

Merging Systems for Water Distribution

- Cassworks – tracks work orders, equipment, inventory in SQL Server with no ties to GIS
- CSD Database – customer service dispatch tracking system base on MS Access
- Breakboard – Web-published, spreadsheet-driven current break activity board
- Breaks and Leaks Database – a separate MS Access database for trend analysis with no tie to GIS
- Meter Database – captures details on meter change out and maintenance activities
- Billing system tracks all service orders

Merging Data from Engineering, Fire, and Water for Hydrants

- Engineering tracked hydrant location and numbering in Water Atlas via Bentley Map and Oracle Spatial
- Water Distribution tracked hydrant details such as manufacturer, install date, etc. in Cassworks
- Fire Department tracked hydrant inspections in Firehouse
- All hydrant data has been merged into Lucity with 2-way synchronization to ArcGIS
- Planning to build Lucity dashboard, workflow, and forms for hydrant inspections

Lucity Manages Data For All Water and Sewer Assets:

- Work history
- Breaks and leaks
- Inspections
- Equipment repairs and failures
- Repair response time and service outages
- Preventive maintenance
- Asset condition and deterioration rates
- Business risk exposure
- Asset life-cycle costs

Expected Outcomes

- Integrated solution (CMMS, GIS, CCTV, SCADA, etc.)
- Improved communication among multiple groups
  - One stop shop for multiple types of information – plans/drawings, photographs/videos, asset details, inspections, work orders, CCTV data, inventory warehousing, SSO records, breaks/leaks, FEMA....
- Ability to replace paper and individual spreadsheets
- Single 'system of record' for more efficient roll up of data to support decision making (Performance Mgmt)
- Field access to information (dynamic maps and data)
- Reduced IT management and support for multiple systems (replaces 7 separate systems)

Unintended Benefits

- Staff has rallied around the cause.
- Better collaboration and cooperation utility-wide.
- We all speak the same language.
- We can leverage the GIS for more applications now that it conforms to ESRI's Local Government Information Model.
- Lucity is platform agnostic because of their web approach (HTML5 direction will improve that).
- Ability to link reference documentation in Lucity allows us to capture legacy knowledge.

Unintended Consequences

- Our aggressive implementation plan puts a strain on staff's ability to do daily work.
- Retirements/transitions leave gaps in knowledge that are affecting our understanding of legacy data.
- IT security challenges increase with wider use.
- Increased demand on IT services with more users (some brand new computer users also).
- More TMUA Board awareness of performance data can generate questions that we may not be prepared to answer without time to analyze data.
- Project communication is an ongoing challenge.

Our Lucity Support Model

- Tulsa has a traditional IT support approach with some unique concepts:
  - A support team with both W&S and IT staff as Super Users
  - Business-side subject matter experts (SME's)
  - Business-side software application owners
  - 550 miles of City-owned fiber connects over 200 locations
  - Large data center that is heavily virtualized and fully redundant

Lucity will scale with our growth

- We plan to expand Lucity by using their partners.
- Scope is just water and sewer today, but ……
  - The mayor is watching
  - Interest from other groups
    - Streets
    - Traffic
    - Storm and Vegetation Management
    - Building Operations
    - Parks
    - Real Property Management

Other New Systems or Upgrades

- SCADA Master Plan – consolidate on Wonderware with historians
- StarLIMS replacement for lab data
- Automated Vehicle Location (AVL) solution
- Financial System replacement
- Utility Billing System replacement
- Permits and Licensing System replacement
- Performance Management System
- Document Management System replacement
- 311 Customer Care System along with IVR

Questions and open discussion

Tulsa Metropolitan Utility Authority (TMUA)

City of Tulsa
Water & Sewer Department