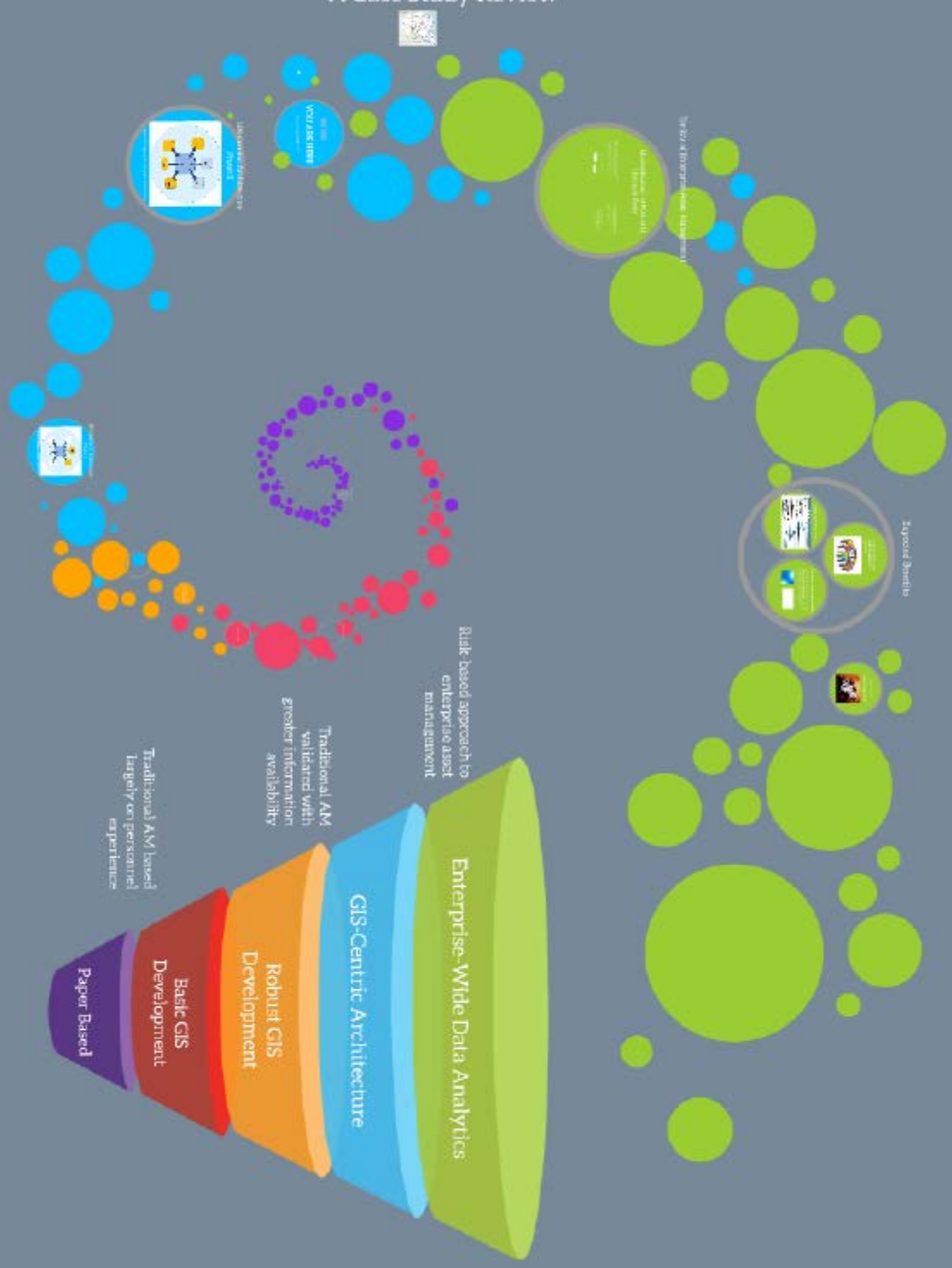
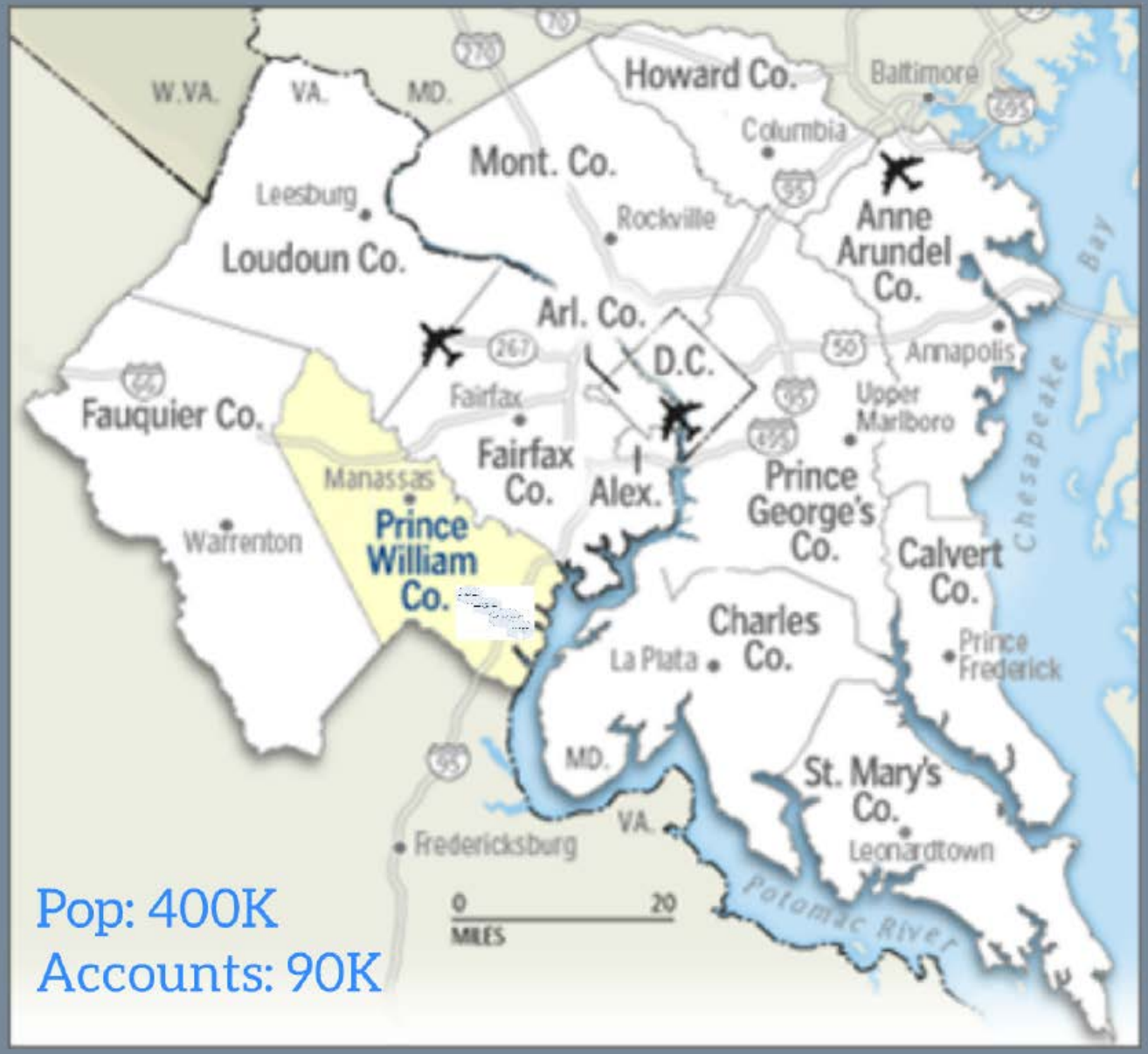
Enterprise Asset Management

GIS Driving Paradigm Shift in Utility Asset Management
A Case Study Review





Pop: 400K
Accounts: 90K

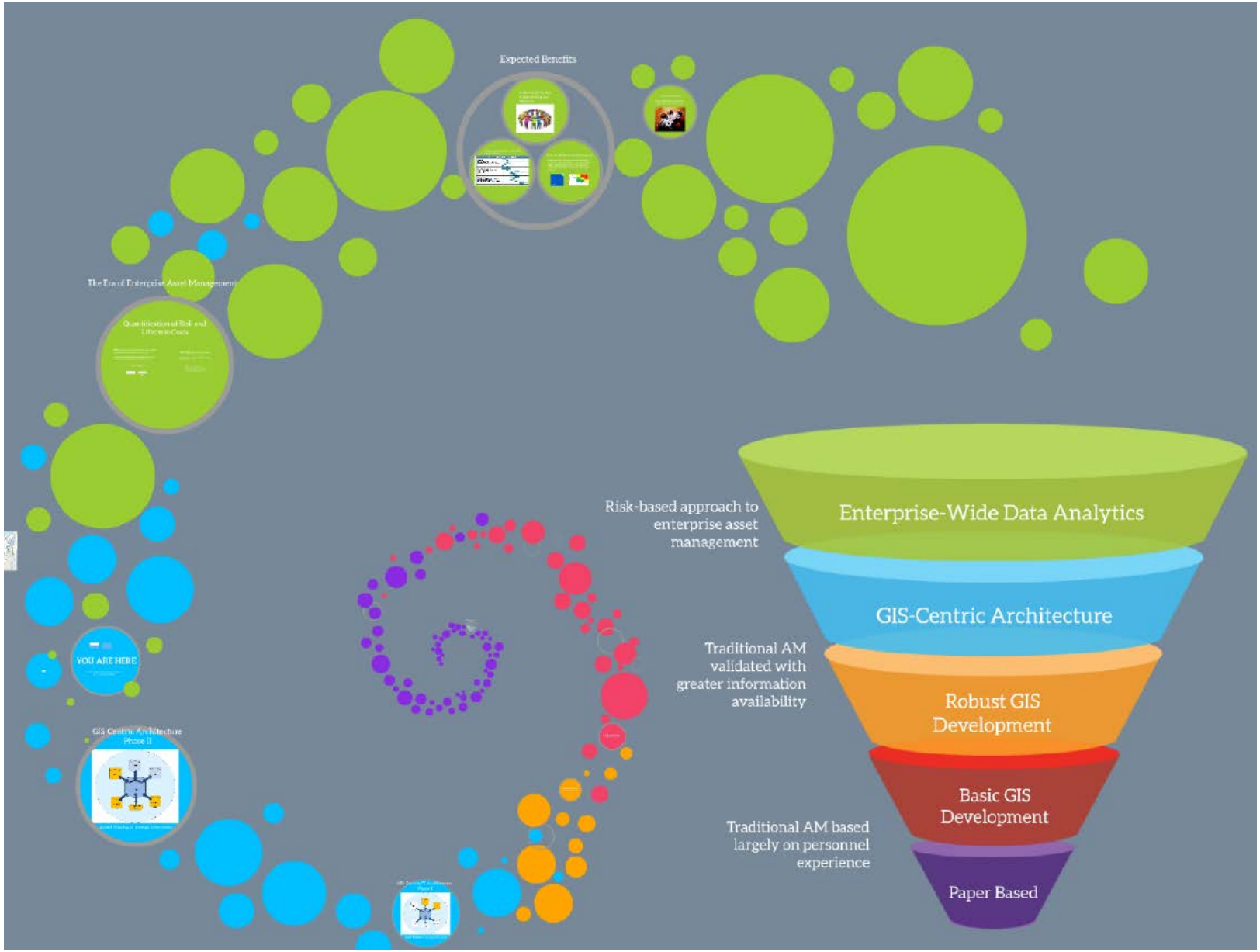
Become a ***best-in-class*** utility

...through development of an ***enterprise asset management system***

Focus on ***long-term life cycle analysis*** & ***risk-based planning***

Seek to meet regulatory requirements and ***exceed level of service targets***

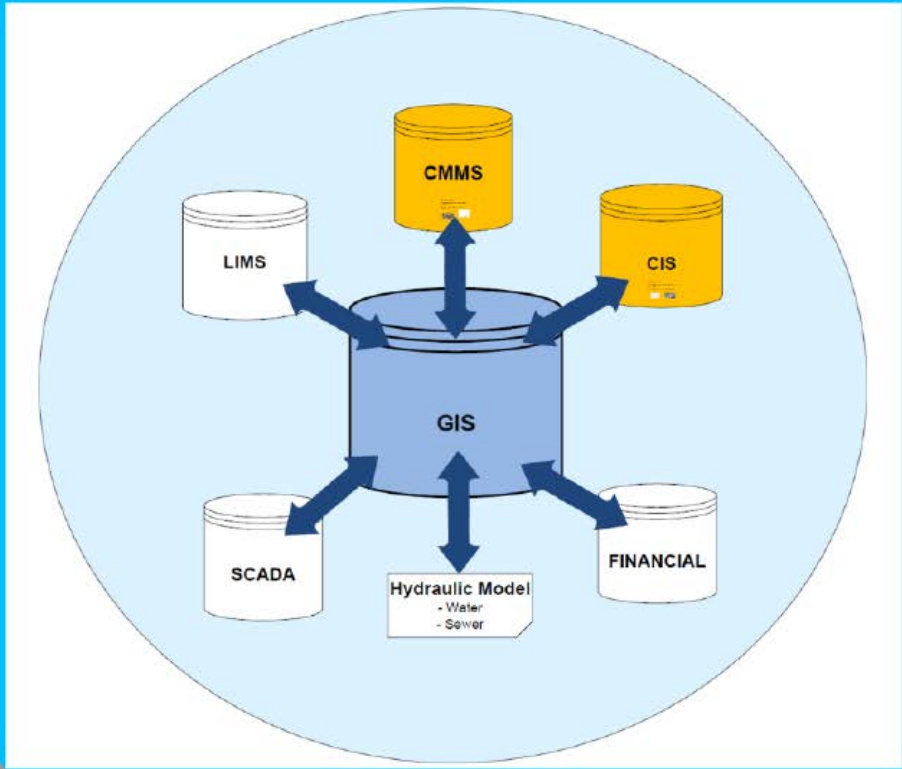
- IT Master Planning
- Transition from CAD to ESRI GIS
- GIS Integration with Work Orders and Customer Data
- GIS Integration with Finance, SCADA and Hydraulic Models
- Approach to Enterprise Asset Management Program Development
- Expected Benefits & Lessons Learned


Expected Benefits
The Era of Enterprise Asset Management
Quantification of Risk and Efficiency Gains
VOU ARE HERE
GIS-Centric Architecture Phase II
Risk-based approach to enterprise asset management
Traditional AM validated with greater information availability
Traditional AM based largely on personnel experience
Enterprise-Wide Data Analytics
GIS-Centric Architecture
Robust GIS Development
Basic GIS Development
Paper Based

IT Master Plan

Transition from CAD to ESRI GIS

GIS-Centric IT Architecture
Phase I

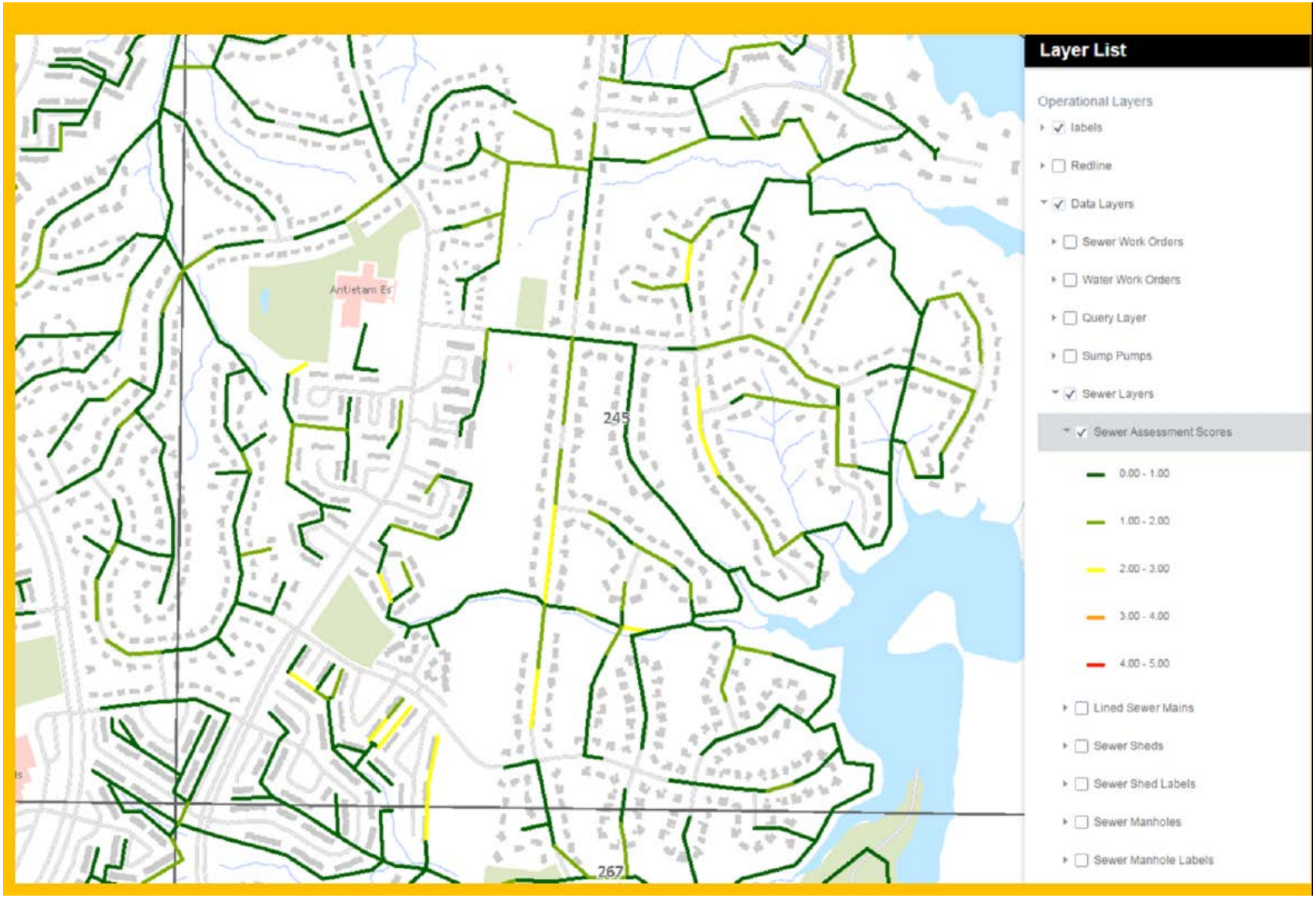


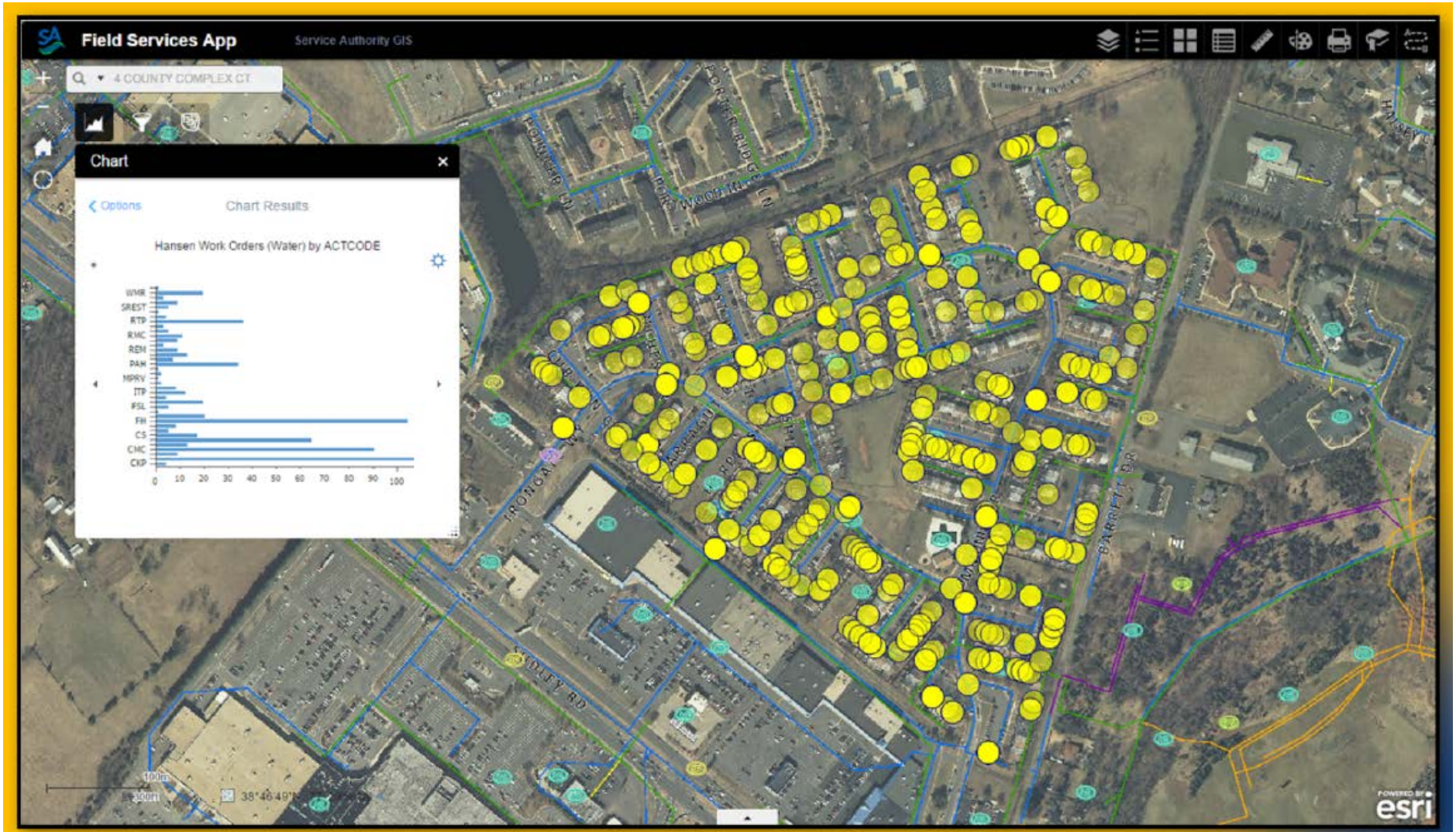
Spatial Mapping of Strategic Information

GIS | CMMS Integration

Spatial mapping and querying of work orders for linear assets

Improved speed and accuracy of existing workflows

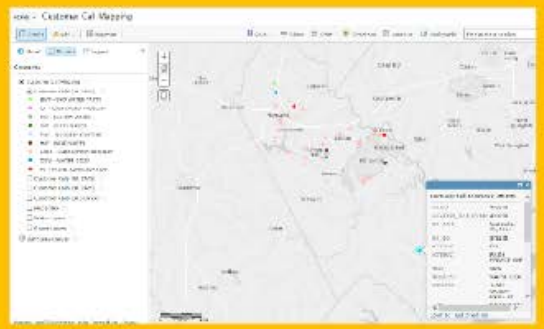

Antietam Es
245
267
Layer List
Operational Layers
labels
Redline
Data Layers
Sewer Work Orders
Water Work Orders
Query Layer
Sump Pumps
Sewer Layers
Sewer Assessment Scores
0.00 - 1.00
1.00 - 2.00
2.00 - 3.00
3.00 - 4.00
4.00 - 5.00
Lined Sewer Mains
Sewer Sheds
Sewer Shed Labels
Sewer Manholes
Sewer Manhole Labels

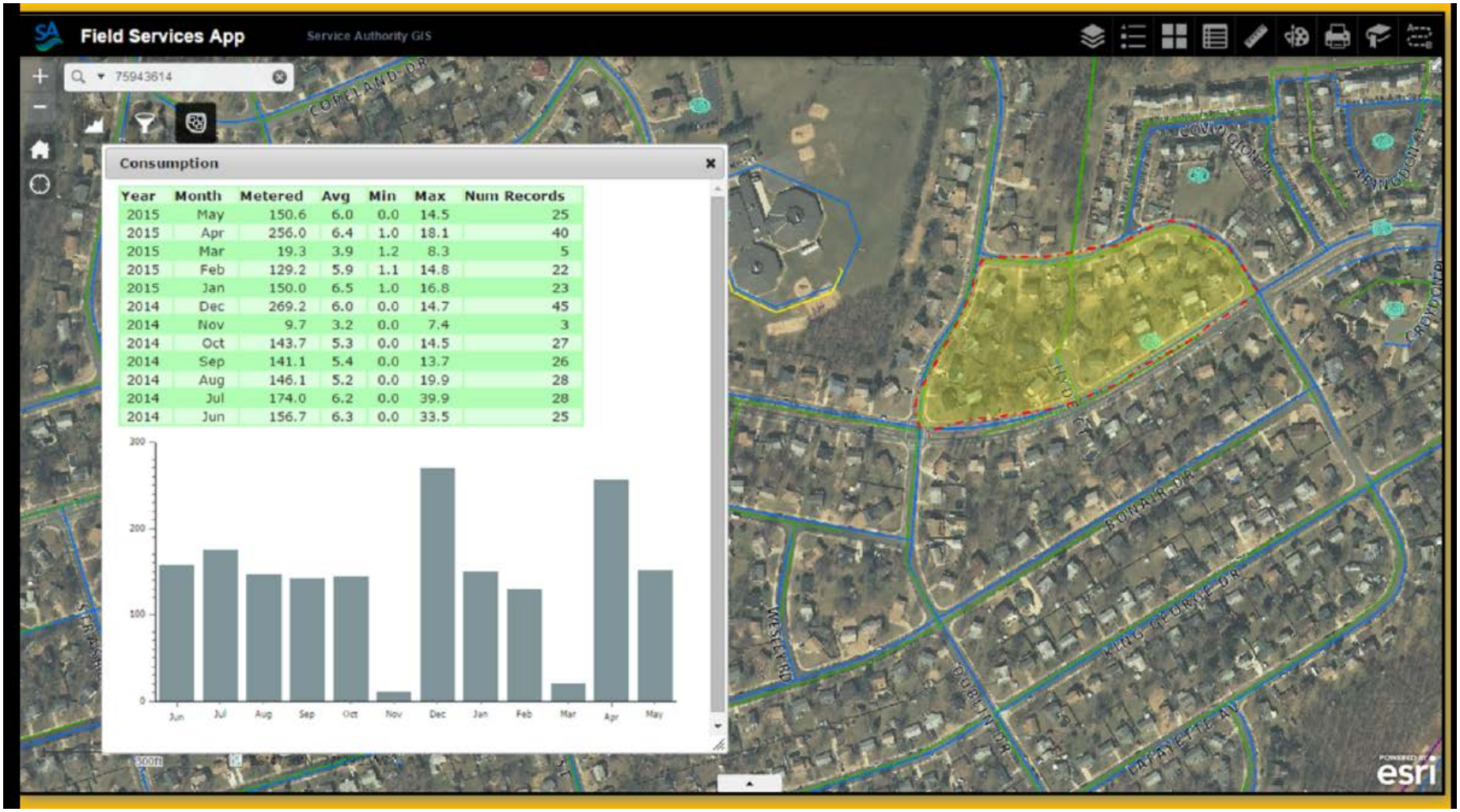

Field Services App
Service Authority GIS
4 COUNTY COMPLEX CT
Chart
Options
Chart Results
Hansen Work Orders (Water) by ACTCODE
WMR
SREST
RTP
RMC
REM
PAH
MPRV
ITP
FSL
FH
CS
CMC
CKP
0
10
20
30
40
50
60
70
80
90
100
IRONGATE WY
DILLY RD
BARRETT DR
HALSEY
38°46'49"
esri

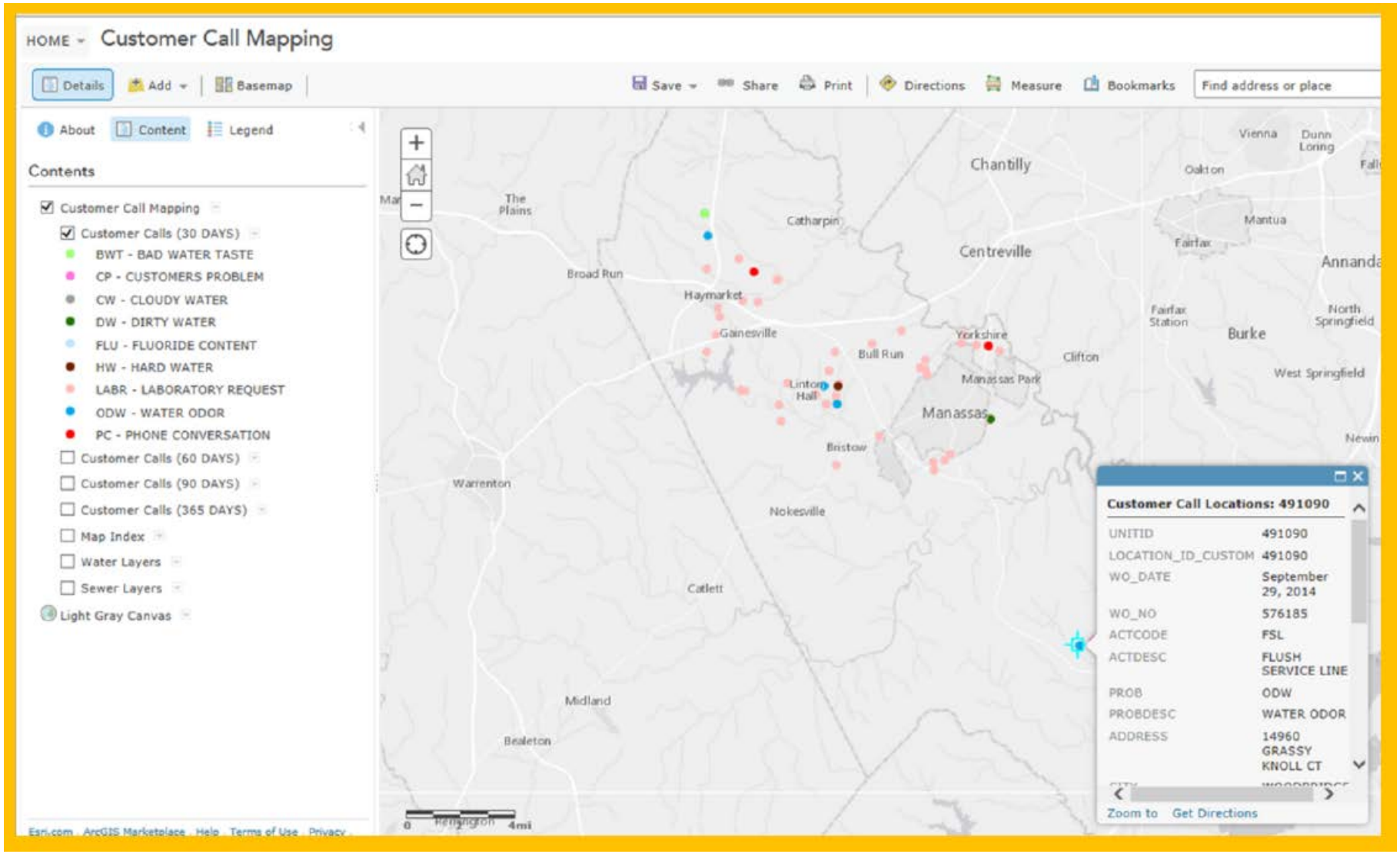
GIS | CIS Integration

Spatial mapping and querying of account details, service calls & customer calls

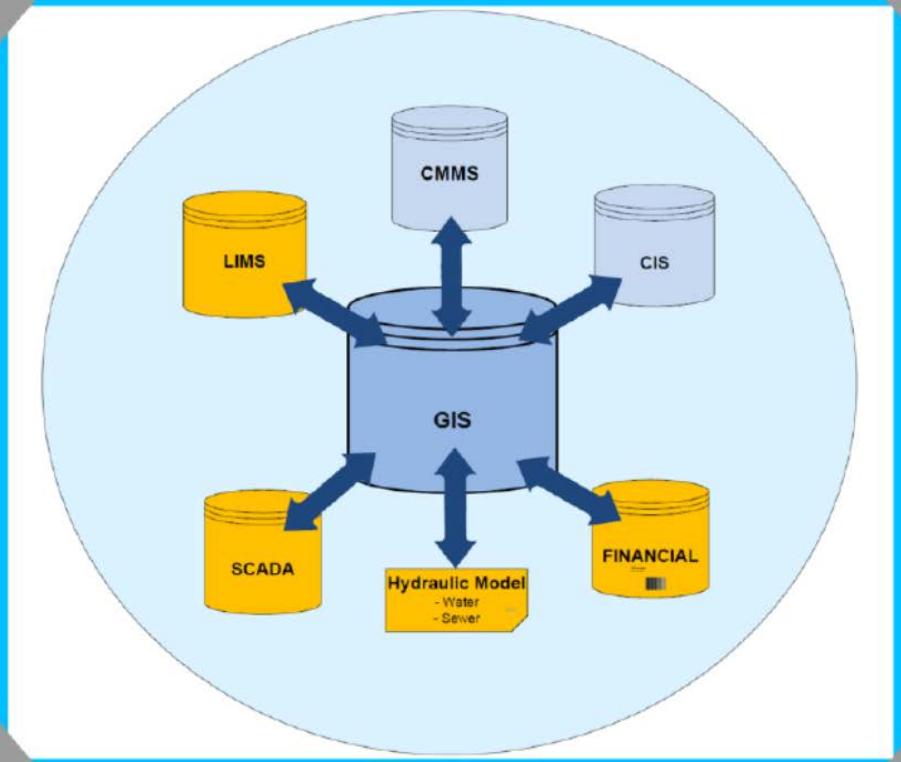
Improved speed and accuracy of existing workflows:




Field Services App
Service Authority GIS
75943614
Consumption
Year Month Metered Avg Min Max Num Records
2015 May 150.6 6.0 0.0 14.5 25
2015 Apr 256.0 6.4 1.0 18.1 40
2015 Mar 19.3 3.9 1.2 8.3 5
2015 Feb 129.2 5.9 1.1 14.8 22
2015 Jan 150.0 6.5 1.0 16.8 23
2014 Dec 269.2 6.0 0.0 14.7 45
2014 Nov 9.7 3.2 0.0 7.4 3
2014 Oct 143.7 5.3 0.0 14.5 27
2014 Sep 141.1 5.4 0.0 13.7 26
2014 Aug 146.1 5.2 0.0 19.9 28
2014 Jul 174.0 6.2 0.0 39.9 28
2014 Jun 156.7 6.3 0.0 33.5 25
300
200
100
0
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
COPELAND DR
COVINGTON PL
ARMAGH CT
CROYDON PL
HYDE ST
BONAIR DR
KING GEORGE DR
WESTLAND
DUBLIN DR
LAFAYETTE AV
esri


HOME
Customer Call Mapping
Details
Add
Basemap
Save
Share
Print
Directions
Measure
Bookmarks
Find address or place
About
Content
Legend
Contents
Customer Call Mapping
Customer Calls (30 DAYS)
BWT - BAD WATER TASTE
CP - CUSTOMERS PROBLEM
CW - CLOUDY WATER
DW - DIRTY WATER
FLU - FLUORIDE CONTENT
HW - HARD WATER
LABR - LABORATORY REQUEST
ODW - WATER ODOR
PC - PHONE CONVERSATION
Customer Calls (60 DAYS)
Customer Calls (90 DAYS)
Customer Calls (365 DAYS)
Map Index
Water Layers
Sewer Layers
Light Gray Canvas
Chantilly
Centreville
Catharpin
The Plains
Broad Run
Haymarket
Gainesville
Bull Run
Yorkshire
Clifton
Manassas Park
Manassas
Bristow
Linton Hall
Warrenton
Nokesville
Catlett
Midland
Bealeton
Vienna
Dunn Loring
Oakton
Mantua
Fairfax
Fairfax Station
Burke
North Springfield
West Springfield
Customer Call Locations: 491090
UNITID 491090
LOCATION_ID_CUSTOM 491090
WO_DATE September 29, 2014
WO_NO 576185
ACTCODE FSL
ACTDESC FLUSH SERVICE LINE
PROB ODW
PROBDESC WATER ODOR
ADDRESS 14960 GRASSY KNOLL CT
Zoom to
Get Directions
0
4mi
Esri.com . ArcGIS Marketplace . Help . Terms of Use . Privacy

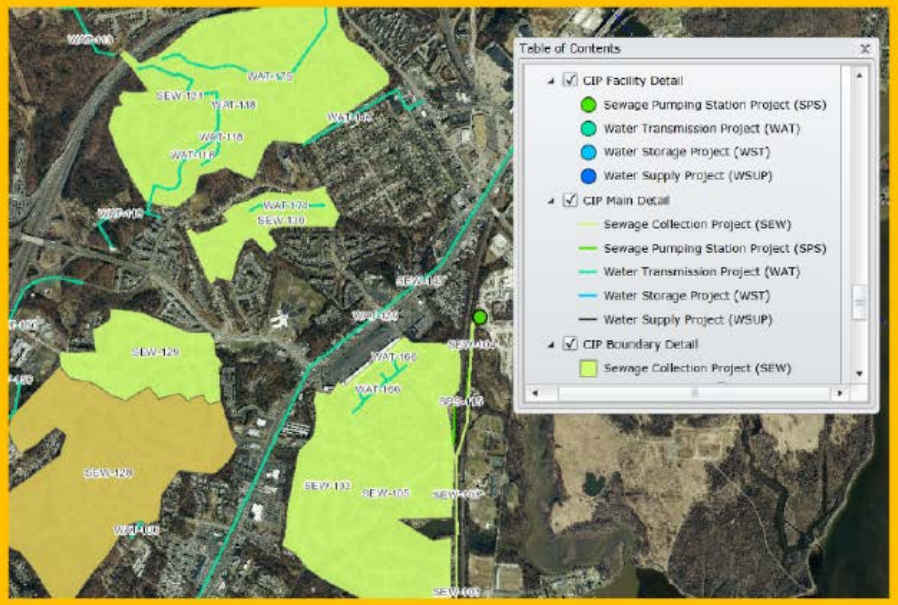
GIS-Centric Architecture
Phase II

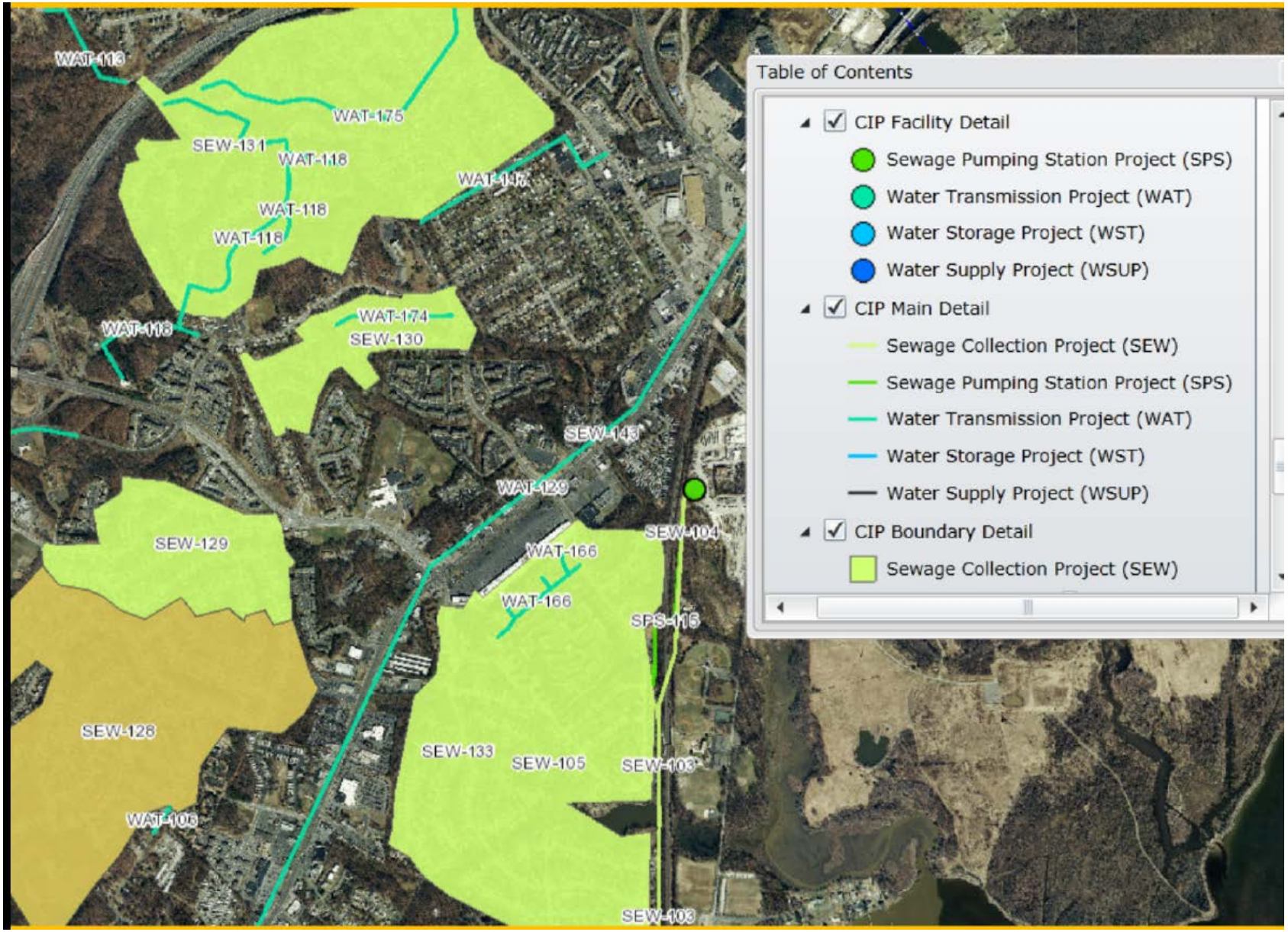


Spatial Mapping of Strategic Information

GIS | Finance Integration

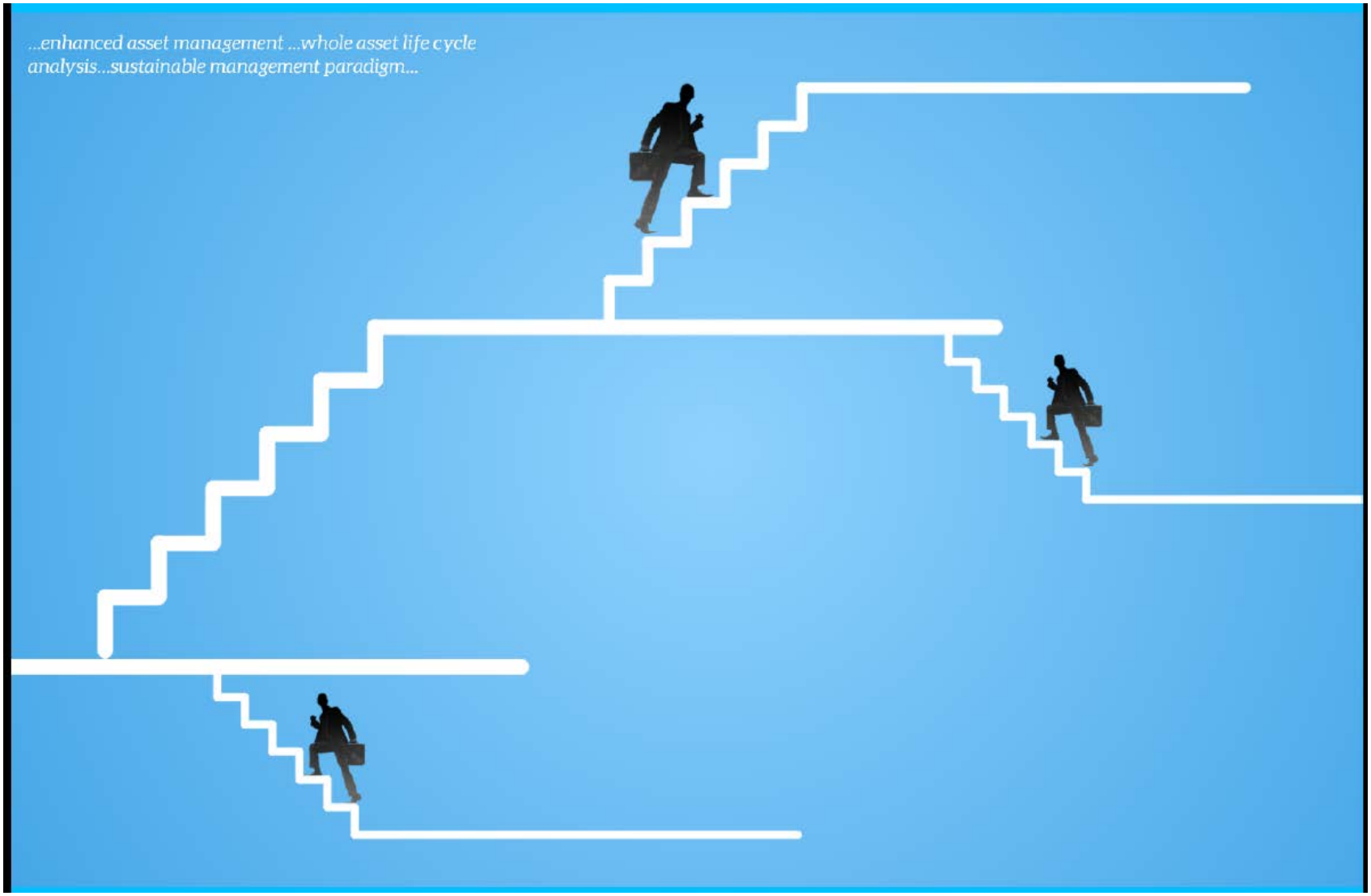
Project cost mapping

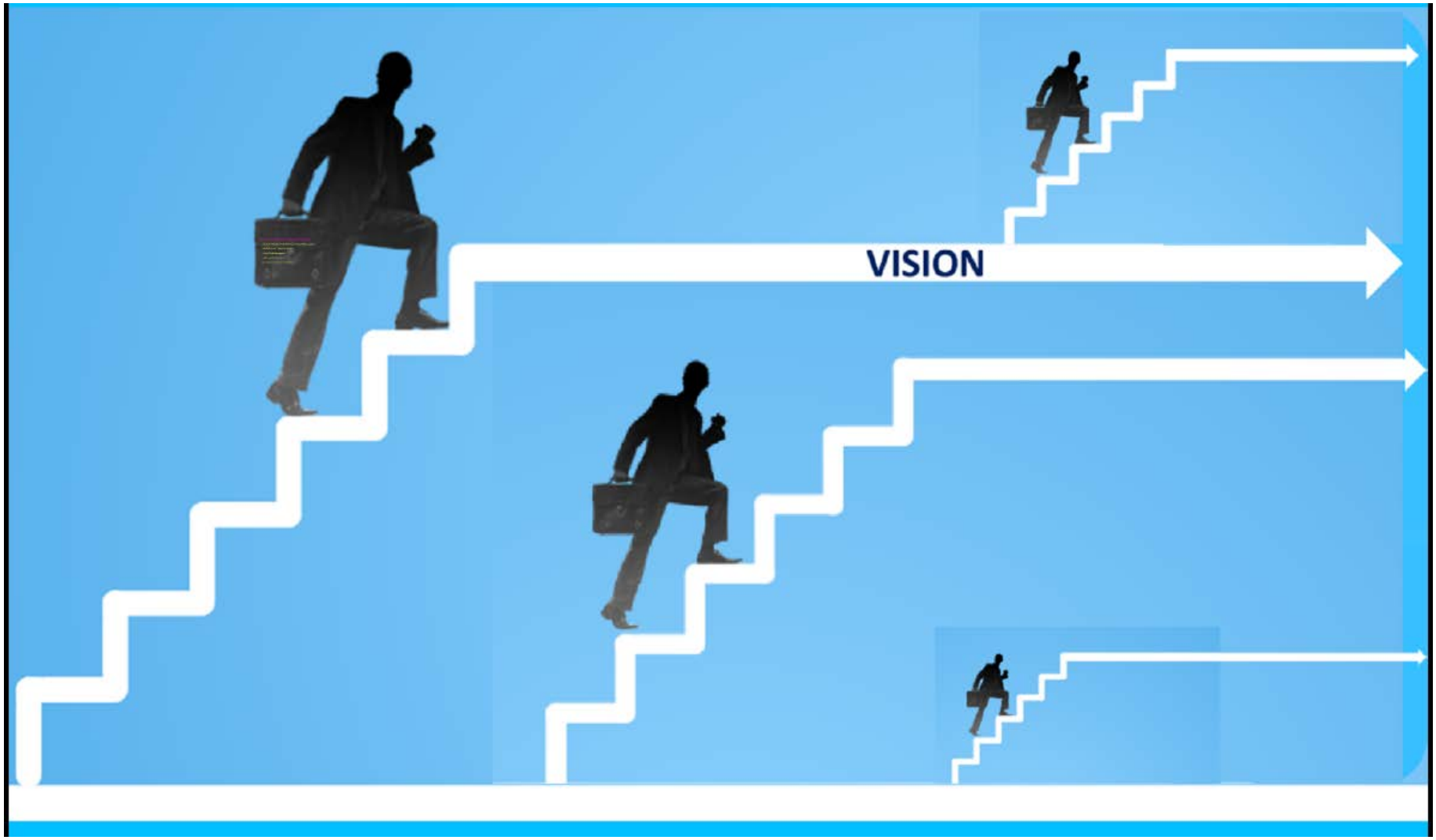



WAT-113
WAT-175
SEW-131
WAT-118
WAT-117
WAT-118
WAT-118
WAT-116
WAT-174
SEW-130
SEW-143
WAT-129
SEW-104
SEW-129
WAT-166
WAT-166
SPS-116
SEW-128
SEW-133
SEW-105
SEW-103
WAT-108
SEW-103
Table of Contents
CIP Facility Detail
Sewage Pumping Station Project (SPS)
Water Transmission Project (WAT)
Water Storage Project (WST)
Water Supply Project (WSUP)
CIP Main Detail
Sewage Collection Project (SEW)
Sewage Pumping Station Project (SPS)
Water Transmission Project (WAT)
Water Storage Project (WST)
Water Supply Project (WSUP)
CIP Boundary Detail
Sewage Collection Project (SEW)

YOU ARE HERE

Finishing the IT framework for Enterprise Asset Management (EAM)


...enhanced asset management ...whole asset life cycle
analysis...sustainable management paradigm...


VISION

Formally Create an Enterprise Asset Management Program

- Align Organizational-wide Perspectives on Asset Management
- Establish Formal Detailed AM Goals
- Collect Fresh Requirements
- Develop EAM Project List
- Execute Projects Over the Long-Term

The Era of Enterprise Asset Management

Quantification of Risk and Lifecycle Costs

Risk measures the criticality of an asset and the probability of it failing in a time frame

Risk of asset failure should be a key consideration in the maintenance, inspection and CIP planning process

Whole Lifecycle Costs

Use lifecycle costs to measure confidence in repair versus replacement decision making

Risk measures the criticality of an asset and the probability of it failing in a time frame

Risk of asset failure should be a key consideration in the maintenance, inspection and CIP planning process

Risk = Consequence of Failure (COF) x Likelihood of Failure (LOF)

Consequence of Failure

Likelihood of Failure

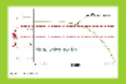
Risk = Consequence of Failure (COF) x Likelihood of Failure (LOF)

Consequence of Failure

Consequence by Level of Service Category					
Level of Service Category	Weight	Negligible = 1	Low = 4	Moderate = 7	Severe = 10
System Reliability	50%	Adequate capacity for all existing flows and future development (No SSOs)	Adequate capacity for existing flows (SSO < 1,000 gallons)	Loss of <50% of capacity (SSO between 1k - 25k gallons)	Loss of > 50% existing capacity (SSO >25K gallons)
Regulatory Compliance	30%	No permit violations and meet all Consent Decree reqs	Minor violation with no formal enforcement action	Formal enforcement action but no fines or Consent Decree impact	Major enforcement action including fines & adverse impact on Consent Decree
Fiscal Impacts	15%	Sufficient financial resources to meet capital and O&M budget	Need Director approval ($5-$10K)	Need Committee approval ($10-$100K)	Board of Directors approval (>$100K)

Likelihood of Failure

Likelihood by Category						
Likelihood Factor Category	Weight	1	2	4	7	10
Physical Condition	60%	Very Good	Good	Fair	Poor	Very Poor
Performance	25%	Sufficient capacity for existing peak flows	Sufficient capacity but not verified	Sufficient capacity but does not meet current requirements	Not sufficient capacity for peak flows	Not sufficient for average flows
History of Financial Maintenance as % of Total PM Expenditures	15%	> 10%	10% - 6%	6% - 4%	4% - 2%	< 2%



Consequence of Failure

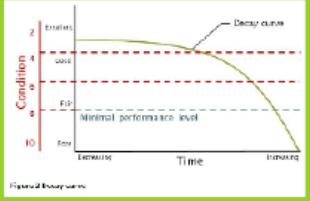
Consequence by Level of Service Category					
Level of Service Category	Weight	Negligible = 1	Low = 4	Moderate = 7	Severe = 10
System Reliability	50%	Adequate capacity for all existing flows and future development (No SSO's)	Adequate capacity for existing flows (SSO < 1,000 gallons)	Loss of < 30% of capacity (SSO between 1K - 25K gallons)	Los of > 30% existing capacity (SSO >25K gallons)
Regulatory Compliance	35%	No permit violations and meet all Consent Decree reqs	Minor violation with no formal enforcement action	Formal enforcement action but no fines or Consent Decree impact	Major enforcement action including fines & adverse impact on Consent Decree
Fiscal Impacts	15%	Sufficient financial resources to meet capital and O&M budget	Need Director approval ($5-$10K)	Need Committee approval ($10-$100K)	Board of Directors approval (>$100K)

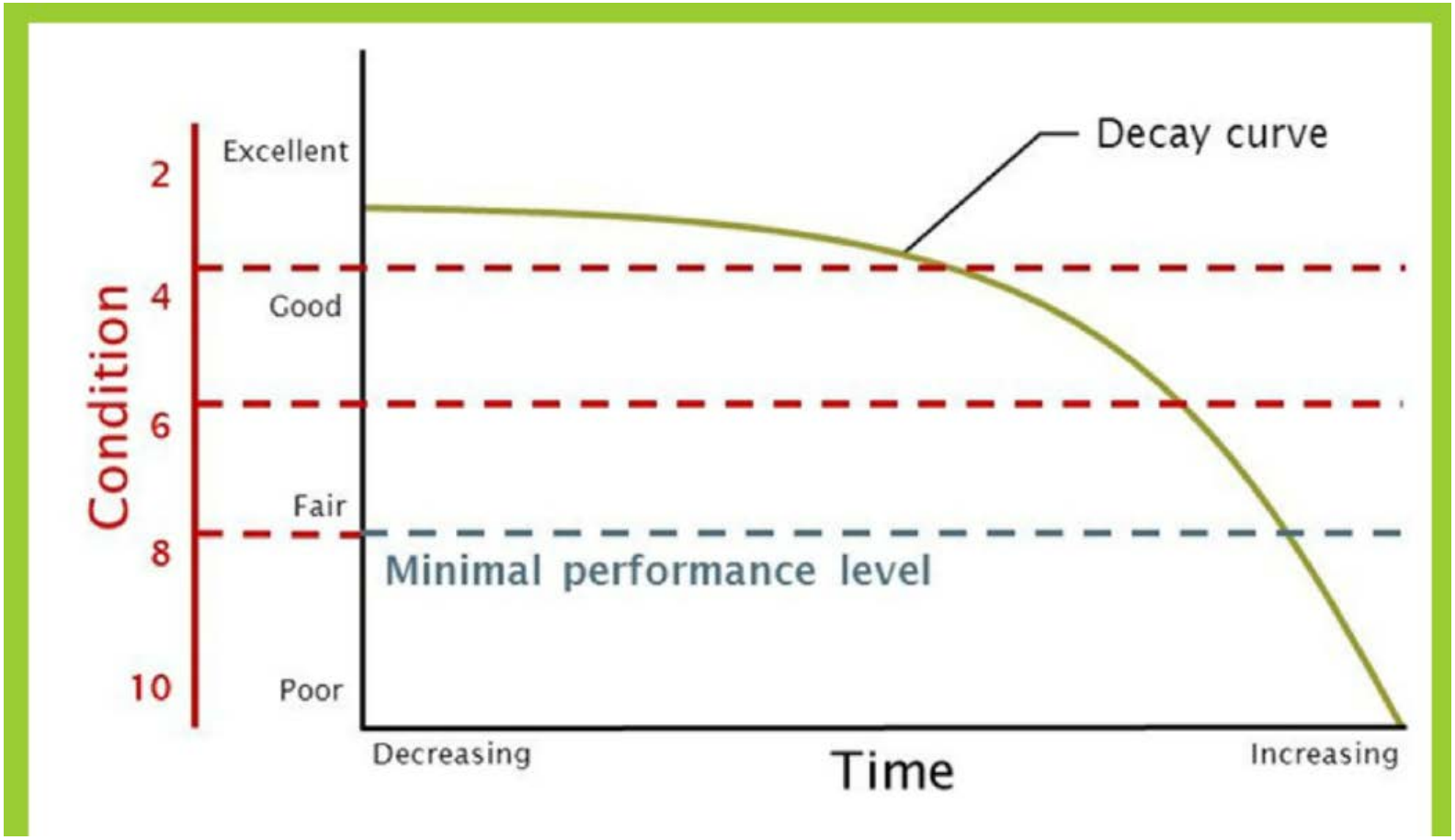
- Use integrated systems Geometric Network and Hydraulic Model to help determine consequence of failure

- Use integrated systems, Geometric Network and Hydraulic Model to help determine consequence of failure

Likelihood of Failure

Likelihood by Category						
Likelihood of Failure Category	Weight	1	2	4	7	10
Physical Condition	60%	Very Good	Good	Fair	Poor	Very Poor
Performance	25%	Sufficient capacity to meet peak flows	Sufficient capacity but over-utilized	Sufficient capacity but does not meet functional requirements	Not sufficient capacity for peak flows	Not sufficient for average flows
History of Planned Maintenance as a % of Total Maintenance	15%	> 70%	70% - 60%	60% - 40%	40% - 30%	< 30%




Decay curve
Excellent
Good
Fair
Poor
Condition
2
4
6
8
10
Minimal performance level
Decreasing
Time
Increasing

Whole Lifecycle Costs

Use lifecycle costs to increase confidence in repair replace decision making

- What does a particular asset cost
- How does it differ from area to area
- Determine optimal time for asset renewal
  - workload planning improvements
  - Reduce spikes in reactive maintenance

Expected Benefits

Cultural shift in AM understanding and approach

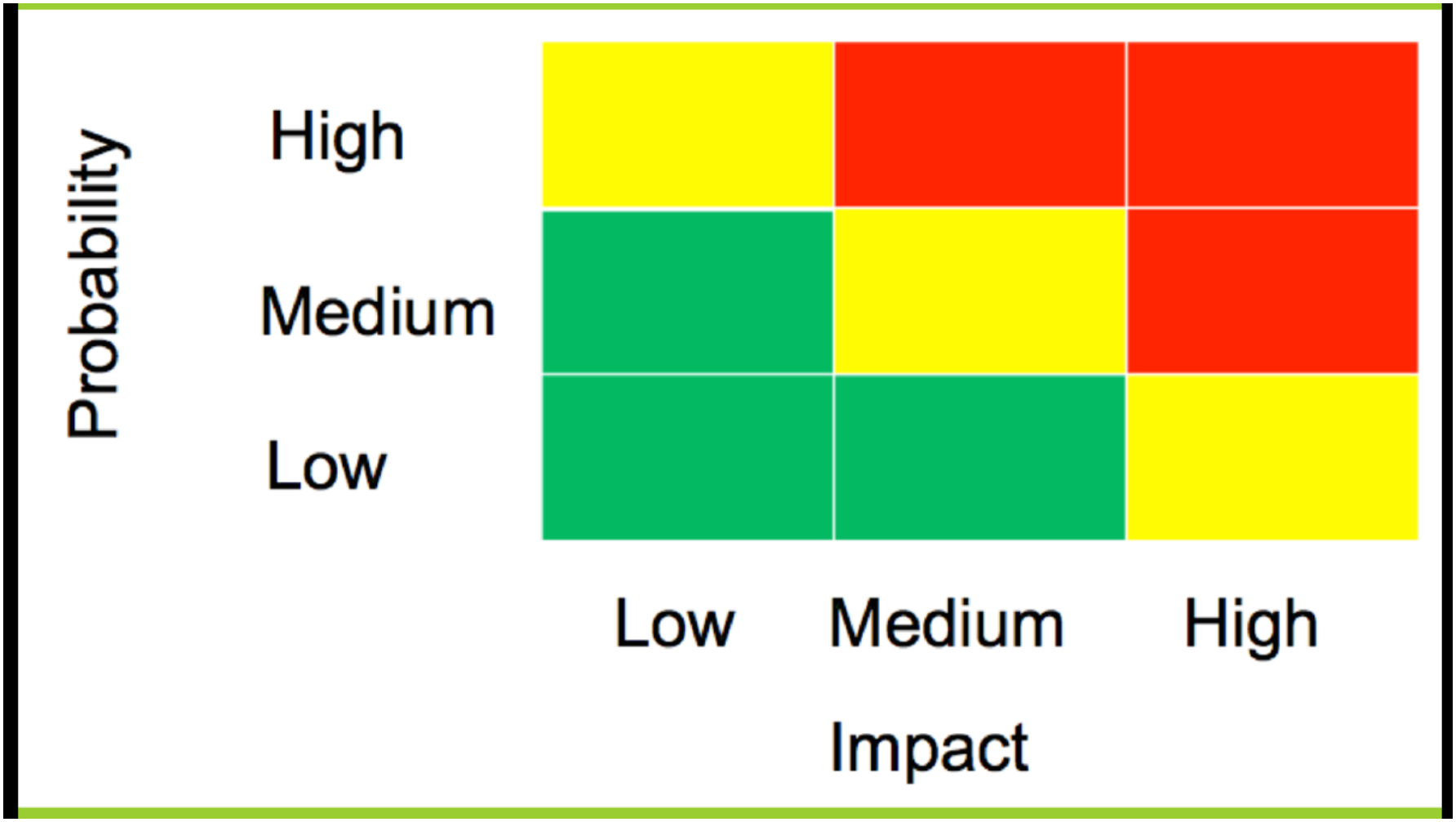
Risk-based planning and forecasting

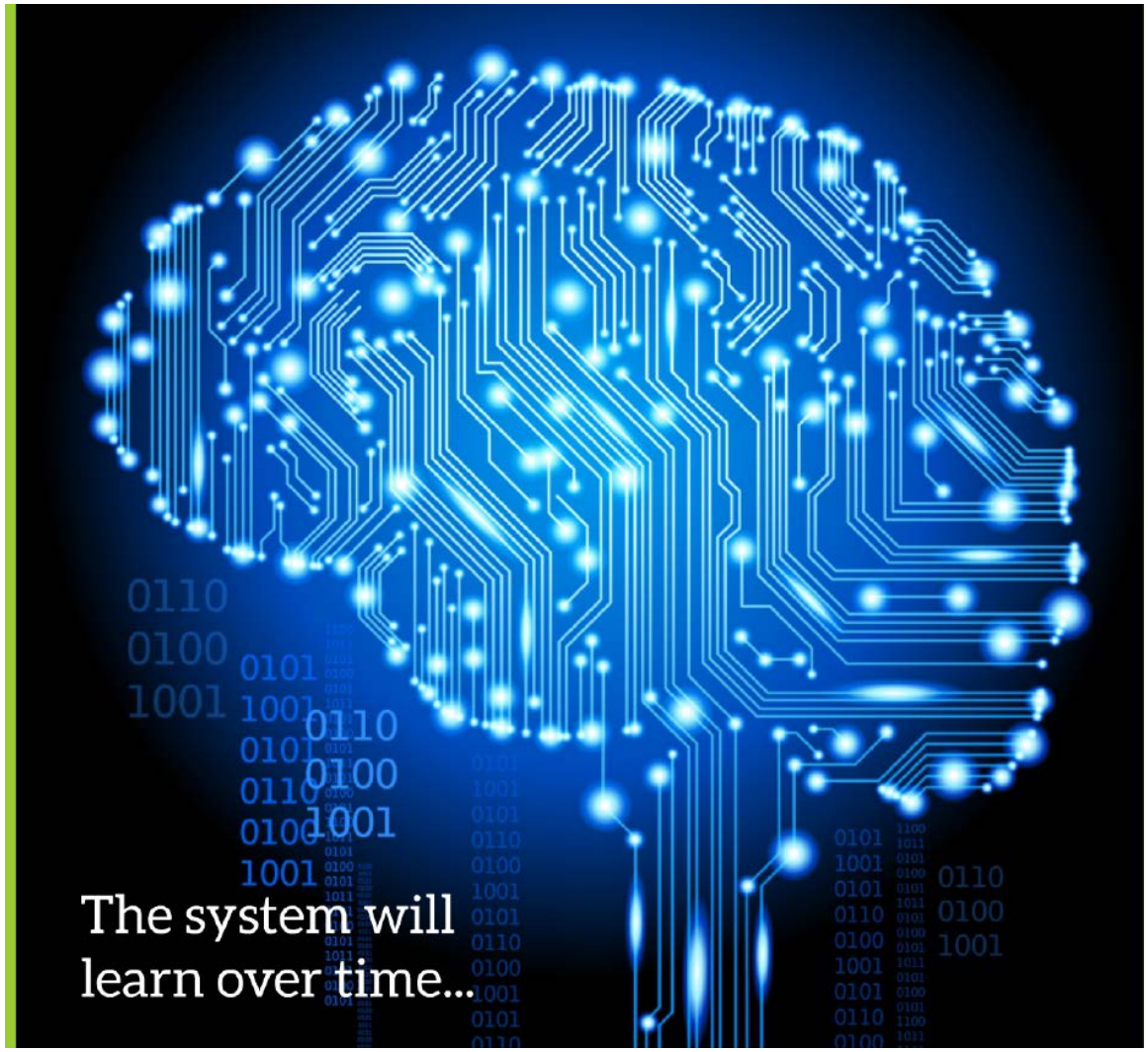
Lessons Learned

Cultural shift in AM understanding and approach

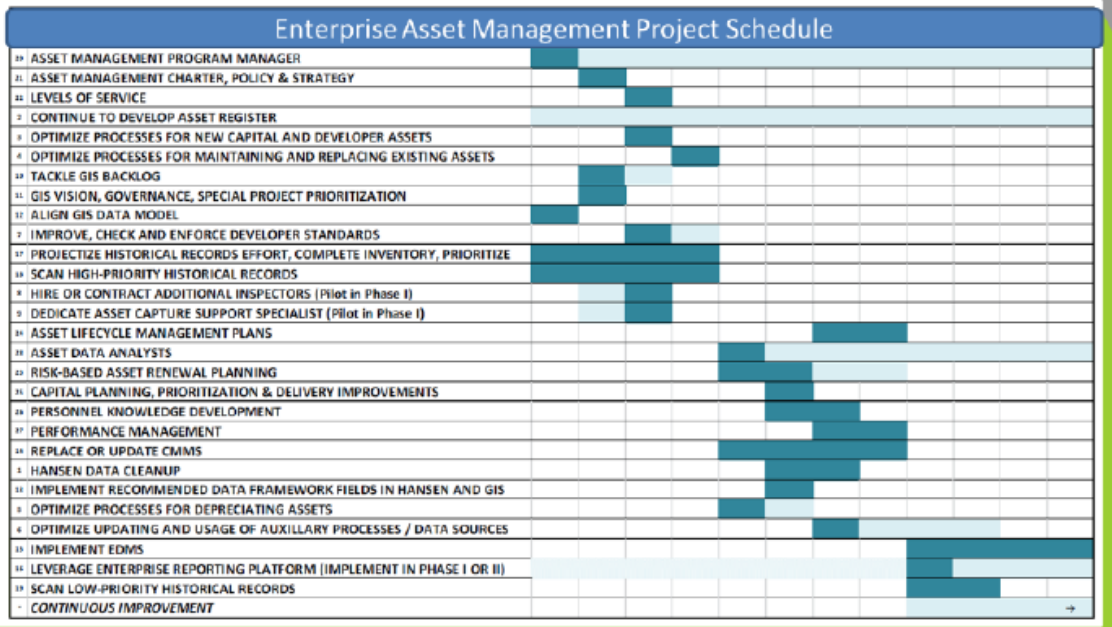
Risk-based planning and forecasting

Precise CIP Repair/Replace decision making by location will improve the SA's understanding of where funds need to be spent, why and when – resulting in long-term cost savings. Key inputs include:


Probability
High
Medium
Low
Low
Medium
High
Impact


The system will
learn over time...

Enterprise-wide alignment in AM project scopes & schedule



Lessons Learned

Develop EAM Program early in the process (after IT Master Planning)

Enterprise Asset Management

GIS Driving Paradigm Shift in Utility Asset Management

A Case Study Review