

Pulling it all Together:

Integrating water resources planning with asset management, Canton MA

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NH



NEWEA Annual Conference, January, 27 2015,

Outline

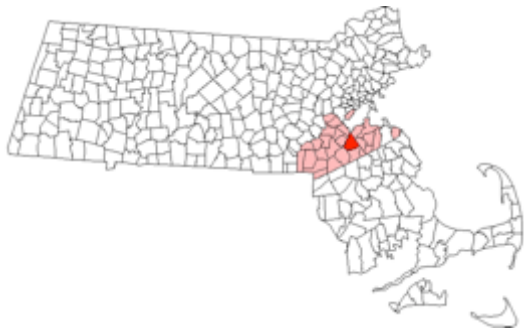
1. Background & Project Drivers
2. Project Framework & Approach
3. Phased 5-Year Plan
4. Year 1 Methods and Outcomes
5. Year 2 Tasks & Goals
6. Looking Ahead to Year 3



Background & Project Drivers

Canton at a Glance:

- Population - 21,500
- Roadways - 112 miles
- Water – 120 miles
- Sewer – 86 miles
- Drain – 56 miles



Background – Challenges & Opportunities

- Infrastructure Capital & Maintenance
 - Dams
 - Flooding
 - Roadways
 - Water Supply
 - Sewer I/I



Background – Challenges & Opportunities

- Regulatory Compliance
- Data Capture & Management
- Funding for planning efforts



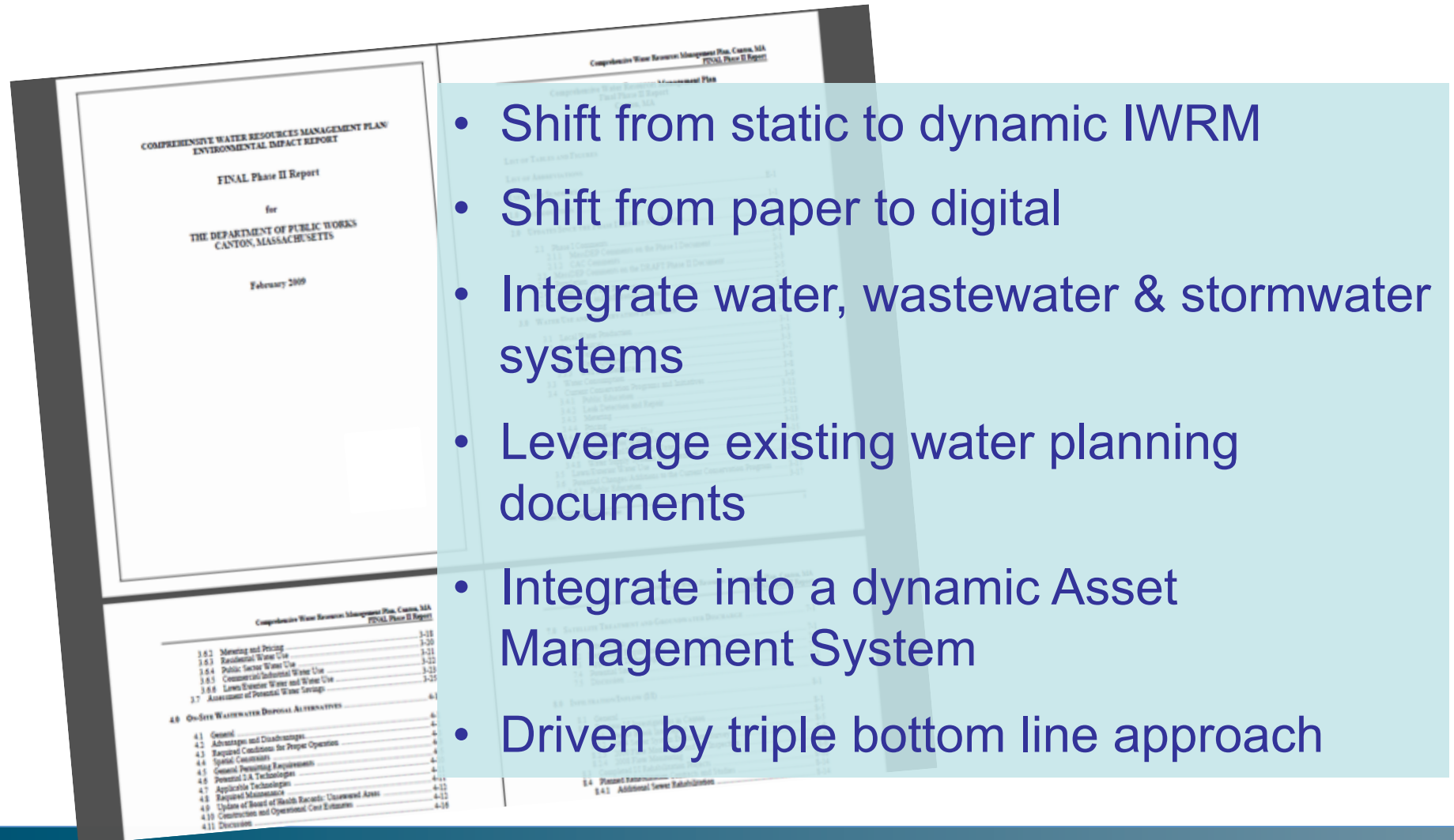
Background – Challenges & Opportunities

- Break from tradition
- Leave a legacy
- Engage staff fully in the process
- Enhance customer service
- Compliance integrated into service
- Dynamic system for continuous improvement

Vision for Project Outcome:

- Informed decisions based on accurate information
- Consistent decision making processes
- Incorporate all utilities in decisions
- Continuously improving system
- Staff engaged at all levels
- Enhanced customer service
- Regulatory compliance integrated with service
- Operational efficiency and capital project selection reduce costs

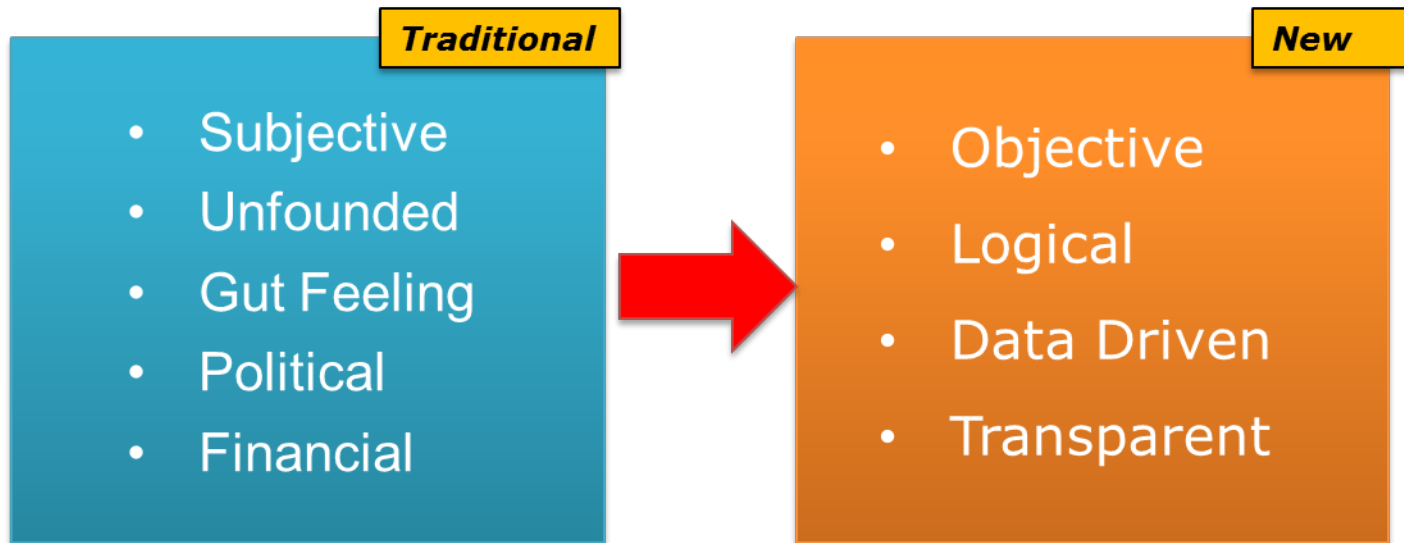
Project Framework & Approach- A Break from Tradition



- Shift from static to dynamic IWRM
- Shift from paper to digital
- Integrate water, wastewater & stormwater systems
- Leverage existing water planning documents
- Integrate into a dynamic Asset Management System
- Driven by triple bottom line approach

Project Framework & Approach- IWRM-CIP

Paradigm Shift for Capital Improvement Planning

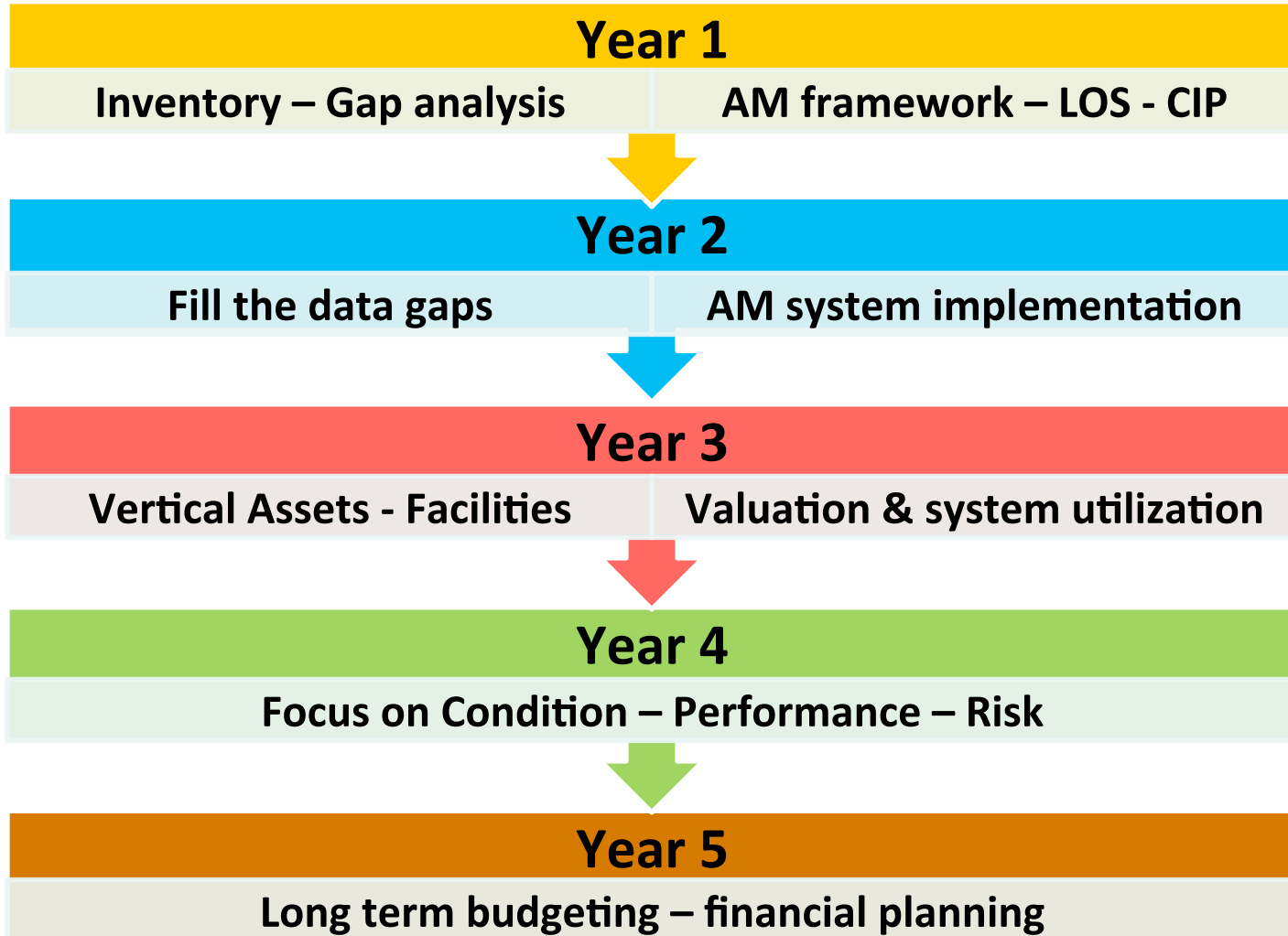


Project Framework & Approach- IWRM-CIP

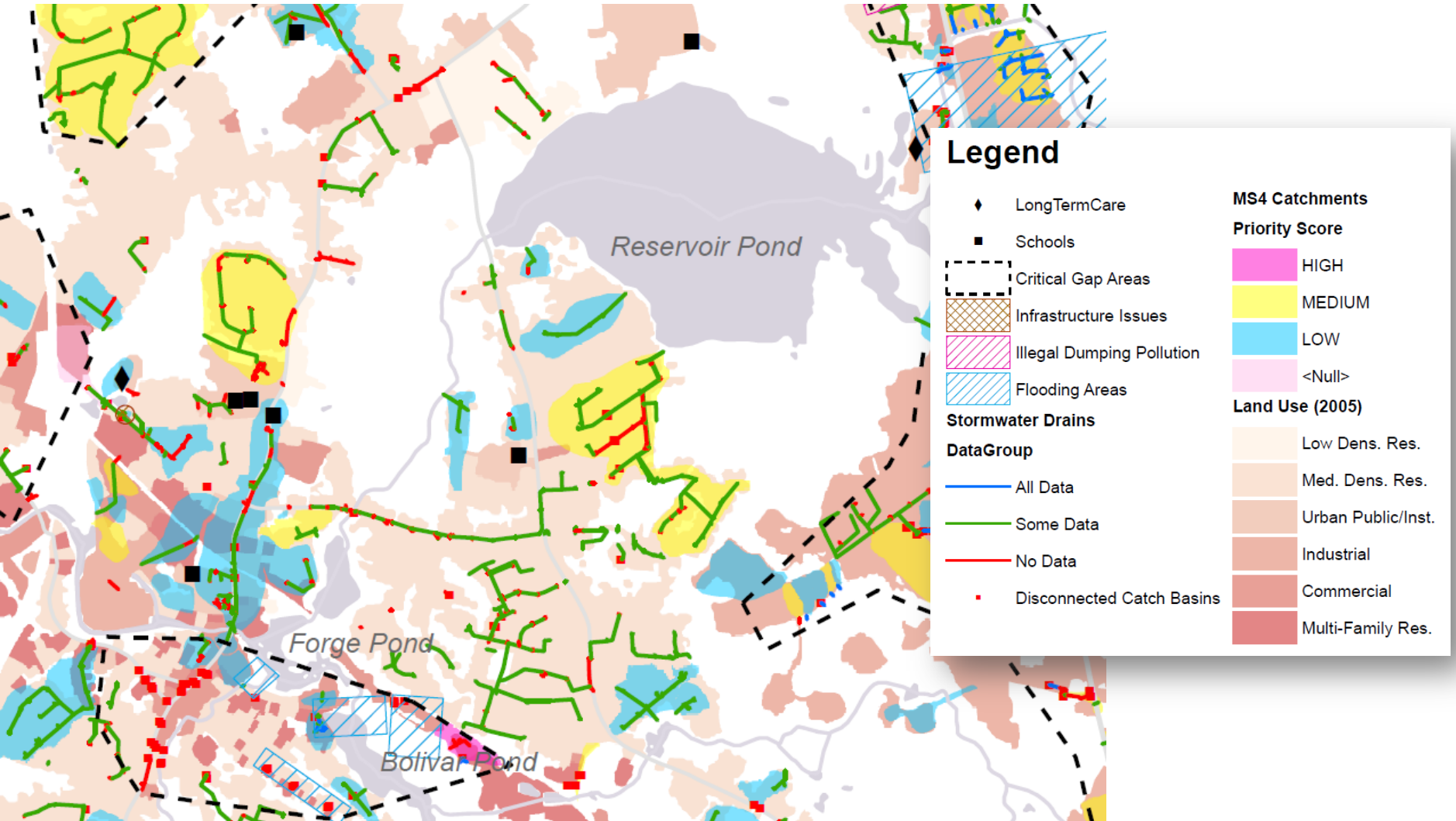
- Phased 5-Year Plan
- Utilize Risk Based Asset Management
- Top-down & Bottom-Up
- Demonstrate real value in Year 1
- Build Support for full implementation
- Focus on Continuous Improvement



Five Year Plan Summary

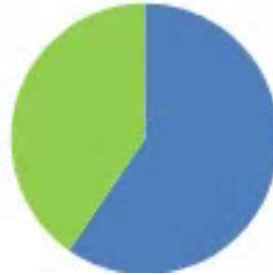


Year 1: Inventory and Gap Analysis



Year 1: GAP Analysis

Water



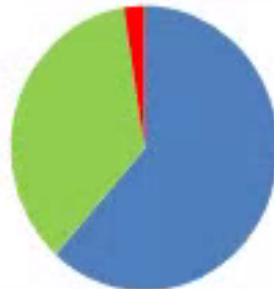
- All Data
- Some Data
- No Data

Storm



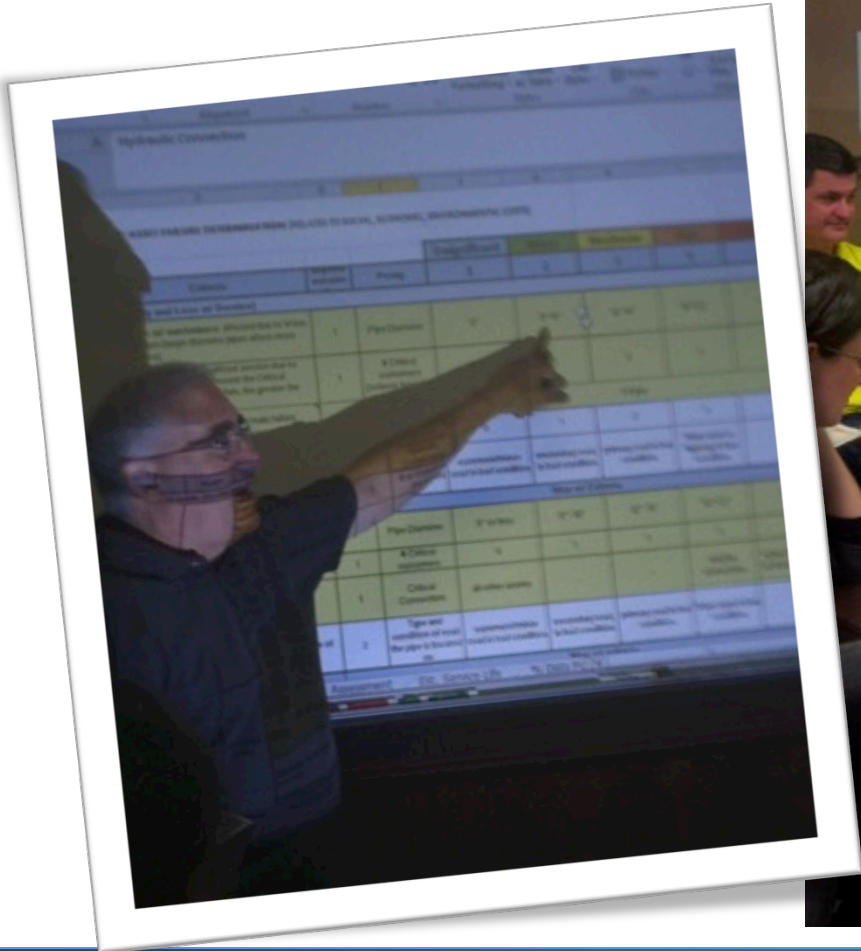
- All Data
- Some Data
- No Data

Sewer



- All Data
- Some Data
- No Data

Year 1: Collaborative Workshops

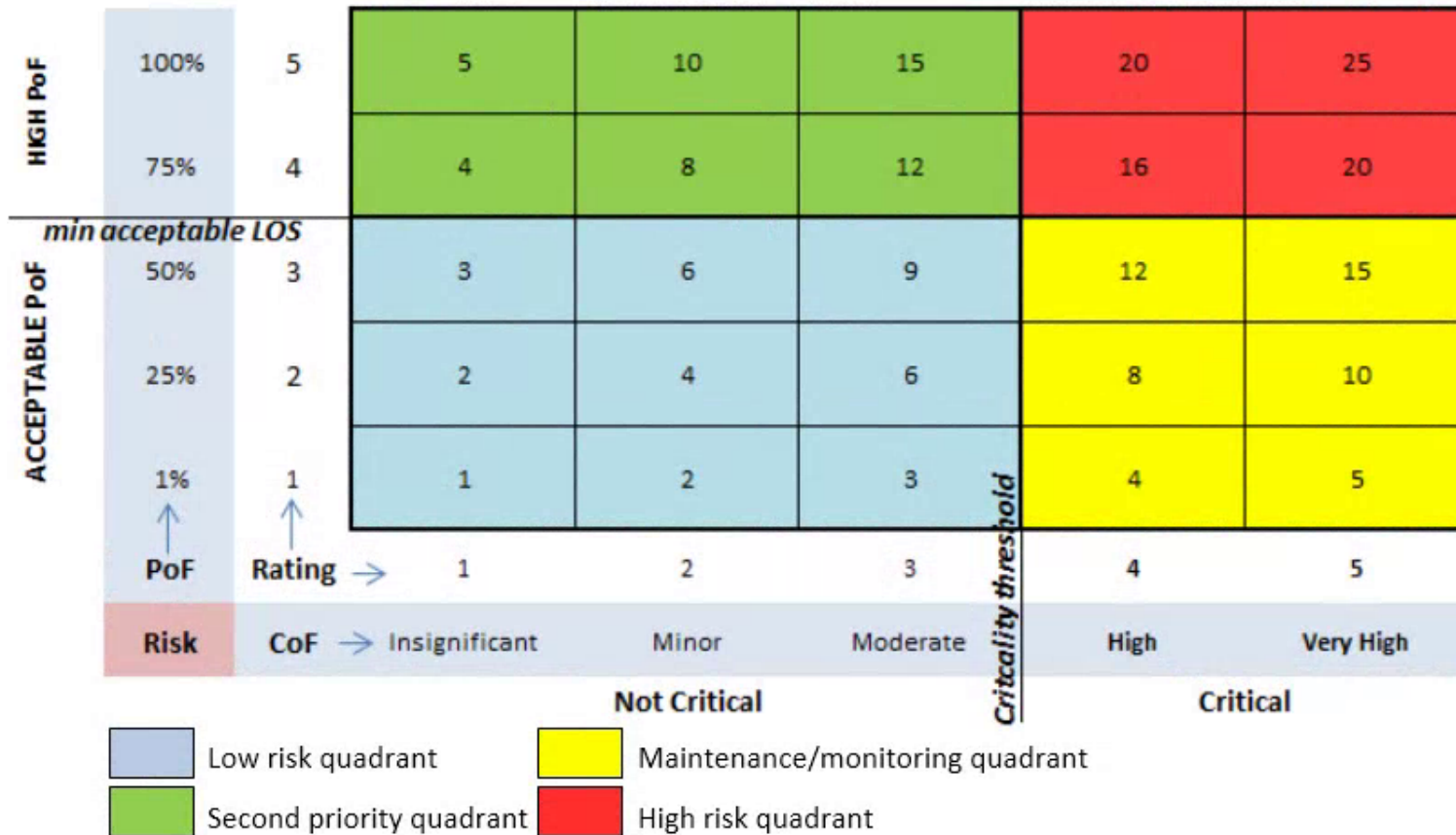


Year 1: AM Framework – Levels of Service

Canton Asset Management Level of Service			
Stormwater Services			
Level of Service	Performance Measure	Target	
Health and Safety	1. MONITORING AND COMPLIANCE		
	Compliance with Clean Water Act (CWA)	Number of violations per year	0
	Compliance National Pollutant Discharge Elimination System (NPDES)	Number of violations per year	0
	State Water Quality Standards	Number of violations per year	0
	Approved Total Maximum Daily Loads (TMDL)	Number of violations per year	0
	Illicit Discharge Detection Elimination (IDDE) Program	Number of deficiencies	0
Customer Service	2. OPERATIONS & MAINTENANCE	All problem catchments will be investigated and resolved	100% of the time
	Inspection Frequency	Inspections conducted to identify operation issues <ul style="list-style-type: none"> • Outfalls • Catch basins • Drain Condition 	Yearly
	3. STORMWATER HYDRAULIC PERFORMANCE	Design parameters	No Surcharges for design storms
	4. RESPONSE TIME	Respond to customer complaints/requests in a timely manner	Response time due to <ul style="list-style-type: none"> ▪ Emergency < 1 hour ▪ Overflows < 1 hour ▪ Flooding < 1 hour ▪ Staining, Odor, Debris in vicinity of outfall 1-2 days
	5. COMPLAINTS	Customer complaints will be tracked and monitored on a regular basis	Number of complaints due to Utility fault <ul style="list-style-type: none"> ▪ Blocked Drains < 5 per month

Year 1: AM Framework – Risk matrix

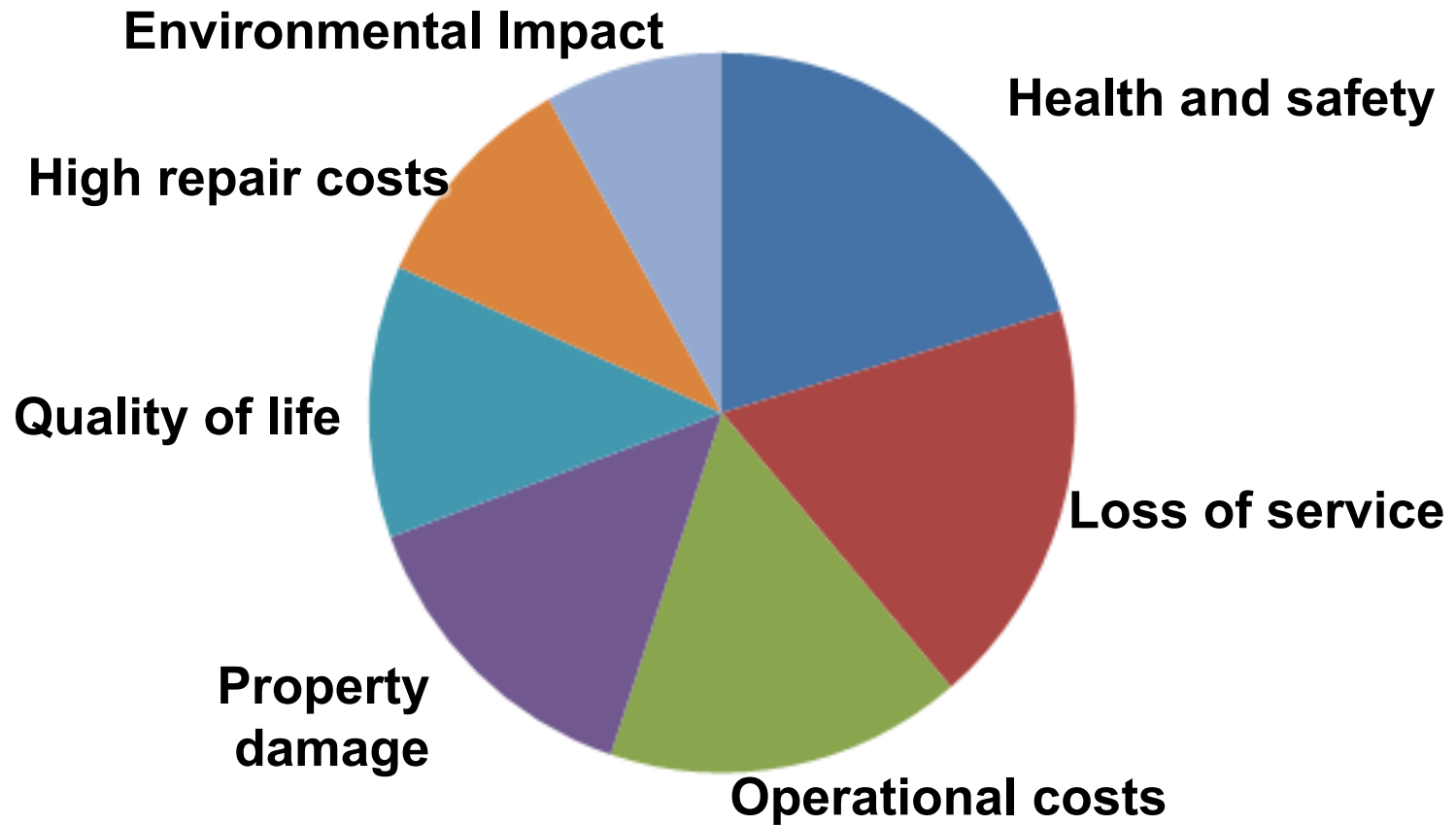
Canton's Risk Space



Year 1: AM Framework – Failure Modes

				Performance	Excellent	Good	Acceptable	Near Failure	Failure
				Rating	1	2	3	4	5
				PoF (%)	1%	25%	50%	75%	100%
Failure Modes	Criteria	Implementation Year	Measure or Proxy						
Physical Integrity	Remaining Useful Life	1	Life Left (yrs)	25 yr or more	24-11 yrs	10-5 yrs	4-2 yrs	1 yr or less	
	Condition	2	C-Value from Calibrated Hydraulic Model	>120	120-90	90-60	60-30	30	
		3 (opt.)	Condition Assessment (Field Data Inst. Knowledge)	Refer to Condition Assessment Tab					
	Struct. Integrity	10	Number of main breaks per 10 years	1	2	3	4	6	
Max									
Financial Inefficiency	O&M Information	5	Maintenance & Replacement Costs	Maintenance < 10% Replacement	Maintenance = 25% of Replacement	Maintenance = 50% Replacement	Maintenance = Replacement	Maintenance > Replacement	
Capacity	Pressure	2	Hydraulic model or field measurements	(90-100) psi	(60-90) psi	(45-60) psi	(45-35) psi	<35 psi or >100 psi	
	Fire Flow	2	Fire Flow Adequacy from hydraulic model AND	>3500 gpm	(1500-3500) gpm	(750-1500) gpm	(750-500) gpm	<500 gpm	
			ISO Target Flow*	If Target ISO Flow < Available flow then use Fire Flow Adequacy Table If Target ISO Flow > Available Flow then Rating = 4					
					Max				
				0	1	2	3		>5
Water Quality	Violations	2	# Dections/yr	0	1	2	3		
	Customer Complaints	3-4	# Customer Complaints/yr	0	1	2	3		
				Max					
				Max of all PoFs					
PoF									

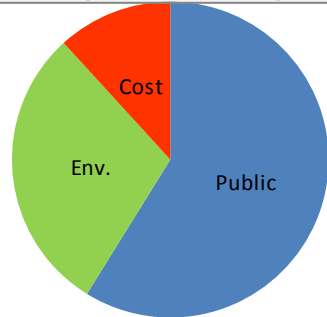
Year 1: AM Framework – Consequences



Year 1: AM Framework – Consequence Criteria

		Env Impact	Loss of Service	High Repair costs
	Description	Proximity to waterbody or wetland	Diameter of the pipe as indicator of "importance" and therefore Num of people affected	Prox major features (buildings, highways, railroads, river...) OR Depth
Consequence		Distance (ft)	Diameter (in)	distance (ft) & depth (ft)
Very Low	1	> 200'	< 10	all other
	2			
Low	3	100'-200' from waterbody or wetland	10-12	[Pipes within secondary roadway] OR [depth 15-20']
	4			
Moderate	5	Within 100' of surface water body or wetland	12-18	[Pipes within a primary roadway] OR [within 10-30 feet of major feature] OR [depths 20- 25 feet]
	6			
High	7	Within 100' of NHESP or VP	18 - 33	[Pipes located directly <10 ft a railroad, building, river, or highway] OR [deeper than 25-30']
	8			
Very High	9	Within boundary of wetland or 50' from VP or within boundary of water body	> 33	[Pipes located directly beneath a railroad, building, river, or highway] OR [deeper than 30']
	10			

Year 1: AM Framework – CIP

Town of Canton CIP		Risk Projects		Opportunity	Consequence Factors			Threshold		Risk/Opportunity Factor		Quadrant			
		Condition	% Life Left	Probability of Success	Risk Projects: Negative Impact in case project is not conducted and an asset had to fail	Opportunity Projects: Positive Impacts from the implementation	Weight	Weight	Weight	1-5	1-5		(1-25)		
Consequence Factors		Weight	Weight	Weight				Threshold	Threshold	Risk/Opportunity Factor		Quadrant			
10.0	5.0	2.0	3	3.0	(1-25)										
Public	Env.	Cost	PoF (Condition)	PoF (%LifeLeft)	LifeLeft Rating	Likelihood of Failure (or Success)	Conseq. Factor	Risk/Opportunity Factor		Quadrant					
SW-J	Bailey Street -design drainage	Risk	Bad/Failed	1950		3-Moderate	3-Moderate	2-Low	5	65%	3.25	4.42	2.88	12.7	2nd Priority
ALL-C	GIS Updates; Document Management & Software Config.	Opportunity			100%	2-Low	3-Moderate	4-High	#N/A	100%	5	5.00	2.53	12.6	2nd Priority
ALL-B	Asset Management Software / hardware	Opportunity			100%	2-Low	3-Moderate	4-High	#N/A	100%	5	5.00	2.53	12.6	2nd Priority
ALL-D	Planning Board Electronic Submittal Standards	Opportunity			100%	2-Low	3-Moderate	4-High	#N/A	100%	5	5.00	2.53	12.6	2nd Priority
SW-H	Elm Street culvert -design upgrades	Risk	Poor	1850		3-Moderate	3-Moderate	2-Low	4	100%	5	4.33	2.88	12.5	2nd Priority
SW-B	Old Shepard Street Dam Repair	Risk	Poor	1972		4-High	3-Moderate	3-Moderate	4	43%	2.15	3.38	3.59	12.1	High Risk
W-K	Hydraulic Model Update	Opportunity			100%	3-Moderate	1-Minimal	3-Moderate	#N/A	100%	5	5.00	2.41	12.1	2nd Priority
W-J	Well Management/Optimization Plan	Opportunity			100%	2-Low	3-Moderate	3-Moderate	#N/A	100%	5	5.00	2.41	12.1	2nd Priority

Year 1 – Major Accomplishments & Findings

- ✓ GIS Data – data schema established and inventory compiled
- ✓ Data gaps identified and prioritized
- ✓ Software needs and solutions assessed
- ✓ Grant to fund Software costs in Year 2

Year 1 – Major Accomplishments & Findings

- ✓ Risk model framework developed for asset management system
- ✓ Risk-based Capital planning tool developed
 - ✓ Assisted FY16 Capital budgeting
- ✓ Stormwater Master Plan developed
 - ✓ Addresses many MS4 Draft requirements
 - ✓ Inter-department collaboration initiated
 - ✓ Grant-funded Stormwater Utility Feasibility Study

Year 1 – Major Accomplishments & Findings

- Data compilation & organization time consuming
- Stormwater data least complete of 3 utilities
- Redundancy in some software systems
- Inconsistent document/ data management
- Asset condition data not being captured in useful way
- Common systems, tools, training needed & desired

Year 1 – Major Accomplishments & Findings

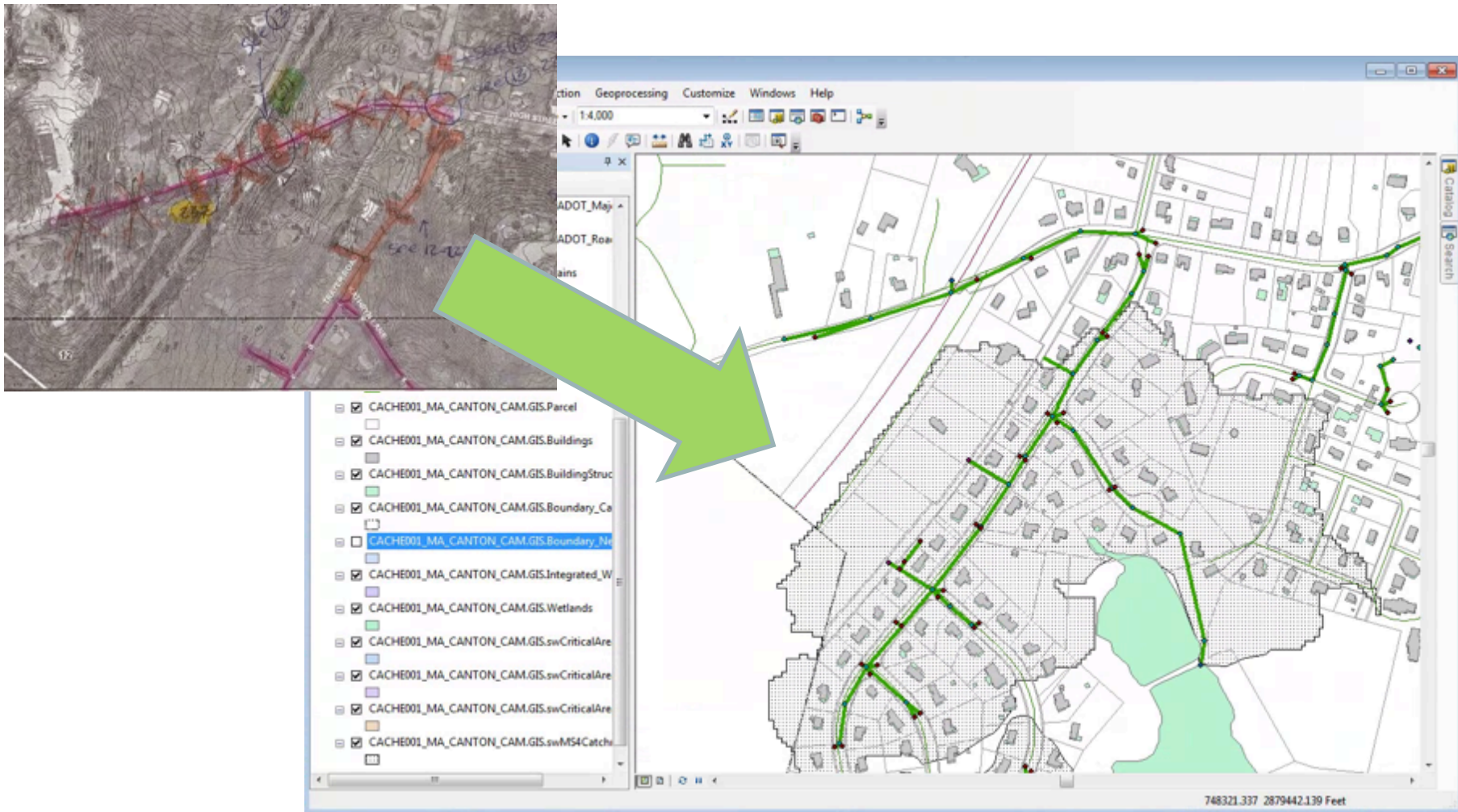
- ★ High degree of collaboration in workshops
- ★ Staff at all levels actively engaged in process
- ★ Consensus on Levels of Service goals
- ★ Consensus on Risk Metrics
- ★ Partnership across departments: DPW, Engineering, IT
- ★ Sense of ownership & commitment at all levels

Year **2** – Goals & Tasks

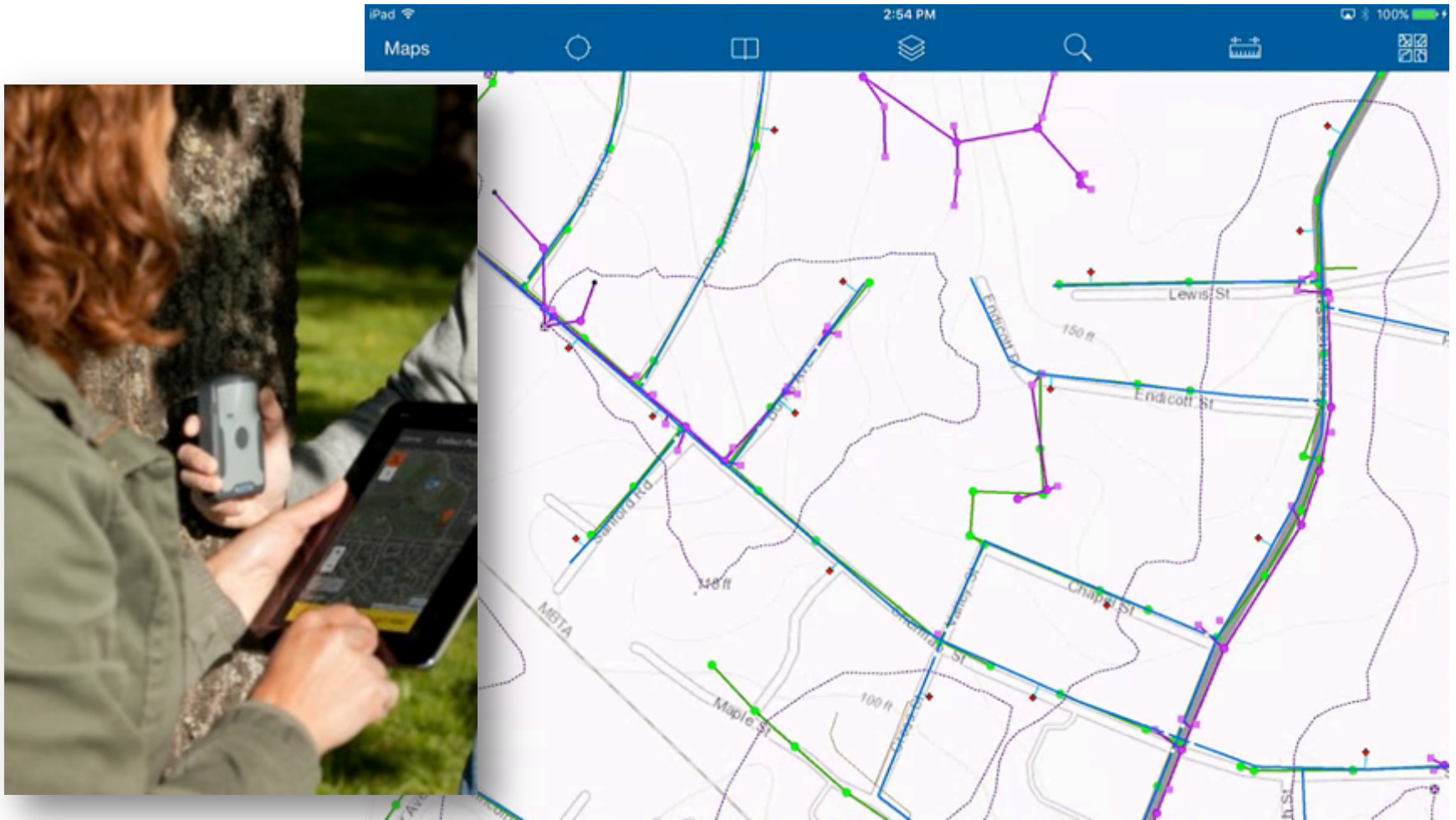
- Populate Priority Data Gaps
- Technology, tools & training
 - Tablets & GPS for Field Data Capture
- Maintenance Management Systems
- Integrate Pavement Management



Year 2: Fill The Gaps – with staff knowledge



Year 2: Fill The Gaps – with Tablets & GPS



Year 2: Maintenance Management

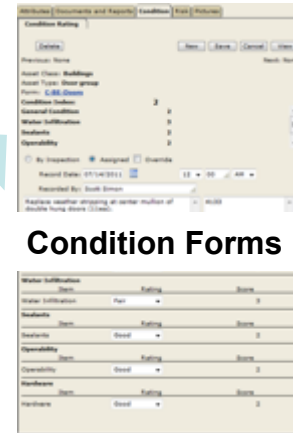


Storm Water Master Plan

- Min. LOS
- What to check
- How often

Catch basins:

- <50% full
- If >50% full twice → Investigation

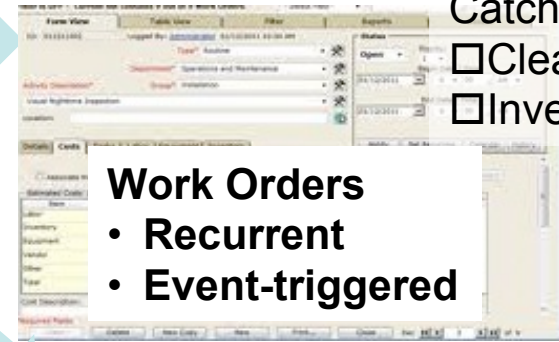



Condition Forms

Worker Satisfaction

Worker Satisfaction	Rating	Score
Worker Satisfaction	Plan	3
Healthcare	Good	3
Healthcare	Good	3
Healthcare	Good	3
Healthcare	Good	3
Healthcare	Good	3

Catch basins:
 % full



Work Orders

- Recurrent
- Event-triggered

Catch basins:
 Clean CB
 Investigation



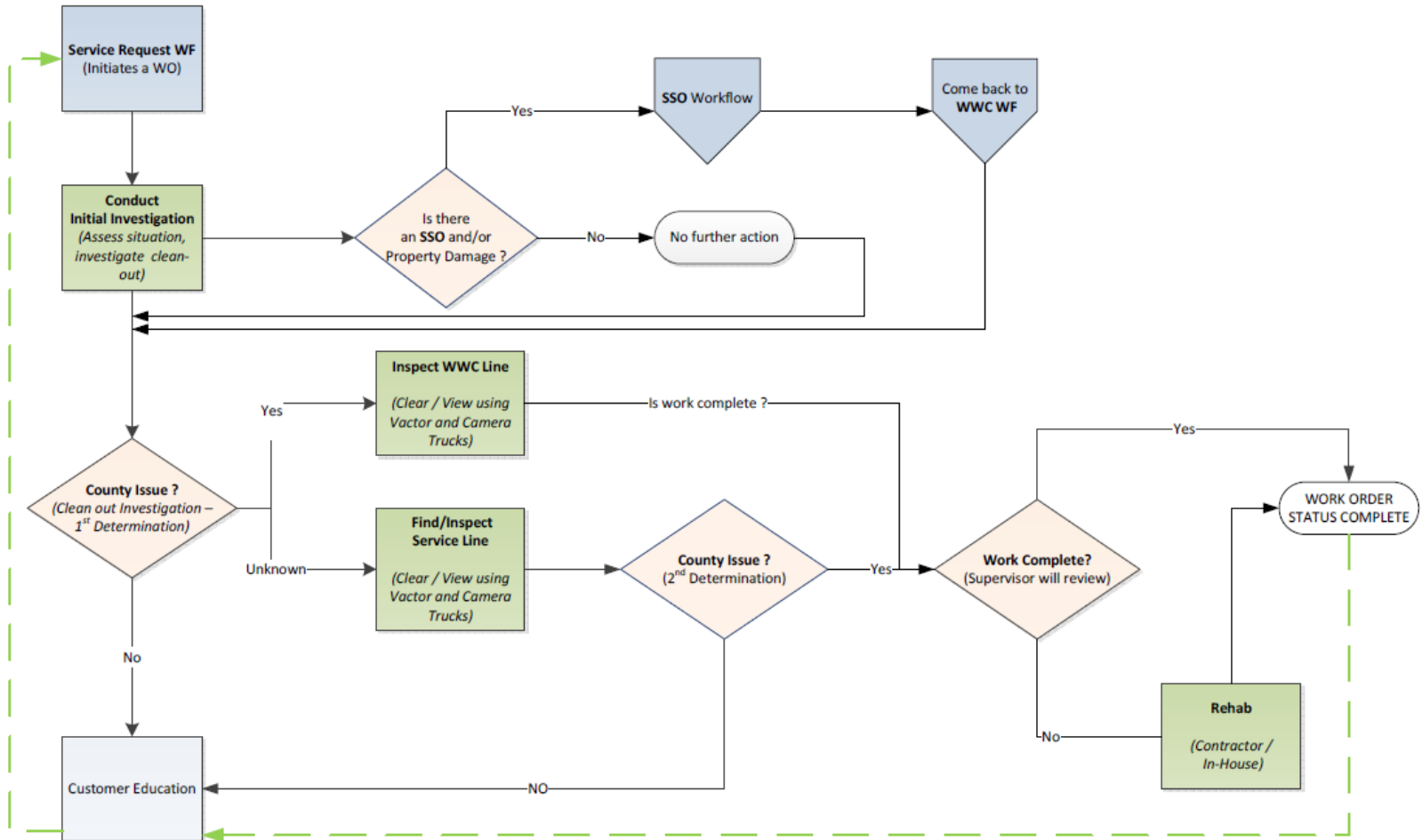
Reports

WQ_ID	Label	Start	End	Classification	Current Status	Historical Status	Current Value	Historical Value
484_Sig	Suburban Site 1	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Suburban Site 2	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Commercial Site 1	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Commercial Site 2	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 1	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 2	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 3	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 4	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 5	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 6	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 7	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 8	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 9	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 10	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 11	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 12	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 13	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 14	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 15	2010	2010	0.0	0.0	0.0	0.0	0.0
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484_Sig	Industrial Site 24	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 25	2010	2010	0.0	0.0	0.0	0.0	0.0
484_Sig	Industrial Site 26	2010	2010	0.0	0.0	0.0	0.0	0.0
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484_Sig	Industrial Site 28	2010	2010	0.0	0.0	0.0	0.0	0.0
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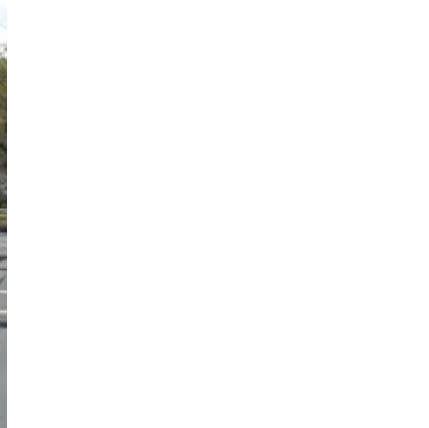
Catch basins:
 % full over time
 High % CBs
 Times cleaned

Year 2: Work flow mapping

Customer Back-up Workflow



Year 2: Pavement management integration



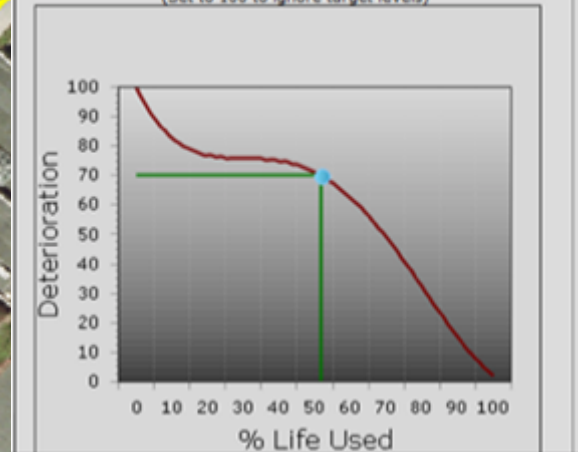
Year 2: Pavement management integration

Town of Canton 2012 Pavement Management Pavement Condition Index (PCI)

STREET	TO	FROM	PCI	INSP. DATE
ABBEY LN	CHAPELGATE RD	CUL-DE-SAC	81.44	2/23/2012
ADRIENNE DR	WASHINGTON ST	CUL-DE-SAC	44.98	9/1/2011
ALDRICH RD	WATERMAN RD	THOREAU RD	94.20	11/9/2011
ALGONQUIN RD	ELM ST	CHEROKEE RD	73.16	9/21/2011
ALGONQUIN RD	CHEROKEE RD	CUL-DE-SAC	81.98	9/21/2011
AMES AV	WASHINGTON ST	DEAD END	23.95	2/24/2012
ANDREA DR	PLEASANT ST	CUL-DE-SAC	24.62	12/19/2011
ANGELA ST	105' E. OF ELIZABETH	CUL DE SAC	21.05	1/10/2012
ANGELA ST	105' W OF ELIZABETH ST	PLEASANT ST	87.50	1/10/2012
ANNA DR	LEXINGTON ST	PATRIOTS DR	30.10	11/8/2011
APPLE BLOSSOM WY	NEPONSET ST	CUL DE SAC	28.40	10/11/2011
ASHDALE RD	OAKDALE RD	BIRCHCROFT RD	73.29	8/22/2011
AUTUMN CIR	HILLSVIEW ST	AUTUMN CIRCLE	12.42	11/9/2011
BAILEY CT	BAILEY ST	CUL-DE-SAC	62.25	12/19/2011
BAILEY ST	MESSINGER ST	750' W. OF	14.45	12/19/2011



Set the Average Deterioration Curve target for each Asset Type
(Set to 100 to ignore target levels)



Distress: 3-Block Cracking MEDIUM
 Sample Type: Random
 Add Quantity: 0.00
 Density: 16.67%
 Extrap Quantity: 2147.10

Distress: 10-Long and Trans Cracking HIGH
 Sample Type: Random
 Add Quantity: 0.00
 Density: 3.17%
 Extrap Quantity: 408.30

Distress: 11-Patching and Util Cut Patching MEDIUM
 Sample Type: Random
 Add Quantity: 0.00
 Density: 6.67%
 Extrap Quantity: 888.10

Record: 14 of 1 | Show All
 N: 206763 - E: 4573459



Looking Ahead to Year 3 and beyond..

- | | |
|--|--|
| ▪ Informed decisions, accurate information | ➤ Build out data in Facilities / vertical assets |
| ▪ consistent decision making processes | ➤ Expand risk model with long term budget planning using triple bottom line and benefit / costs criteria |
| ▪ Incorporate all utilities in decisions | ➤ Stormwater, water, sewer and pavement incorporated |
| ▪ System for continuous improvement | ➤ Data from work order activities integrated to support risk-based planning |
| ▪ Enhance customer service | ➤ Integrate customer requests / feedback |
| ▪ Integrate regulatory compliance | ➤ Refine Level of Service criteria; streamline reporting |
| ▪ Cost savings via efficiency and risk-based CIP | ➤ More planned work, less reactive work; metrics to measure improvements |

Questions?

...relentlessly chase perfection, knowing full well you will not catch it because nothing is perfect. But in the process you will catch excellence...

---Vince Lombardi



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