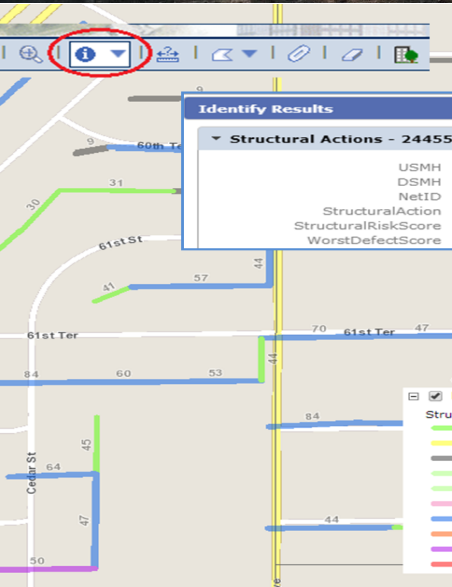




Lessons Learned from Large Agency SSO Reduction Programs

Michael Flores, HDR

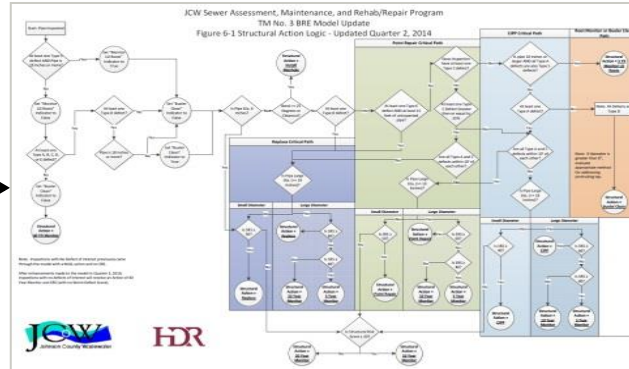
Southern California Alliance of POTWs – Collection System Committee
March 29, 2016 - Irvine, CA



Today's Agenda



Data
Maint. History
Condition
Consequence
Deterioration



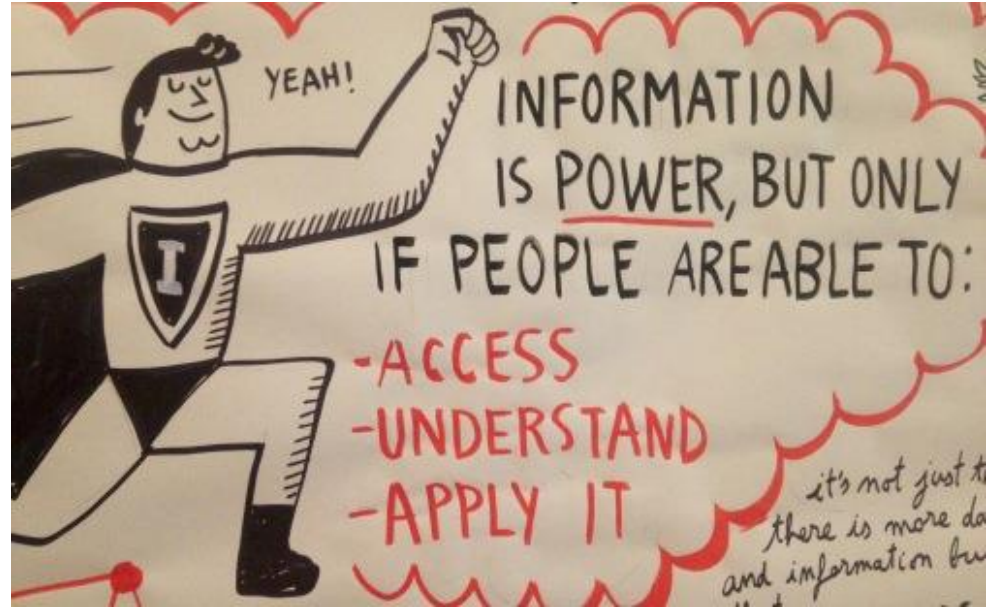
Action
Cost
Risk

Risk-Based Maintenance Optimization



The Situation

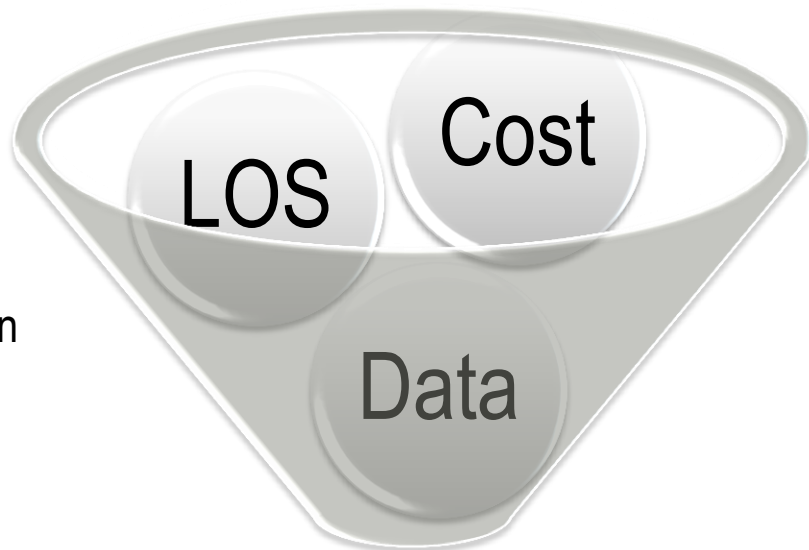
- High SSO rate
 - Roots, grease, debris
- High regulatory risk
- Limited resources
- Data overload
 - Quality?



The Goal

LOS Goal:

Significant SSO reduction in short timeframe



Cost Management Goal:

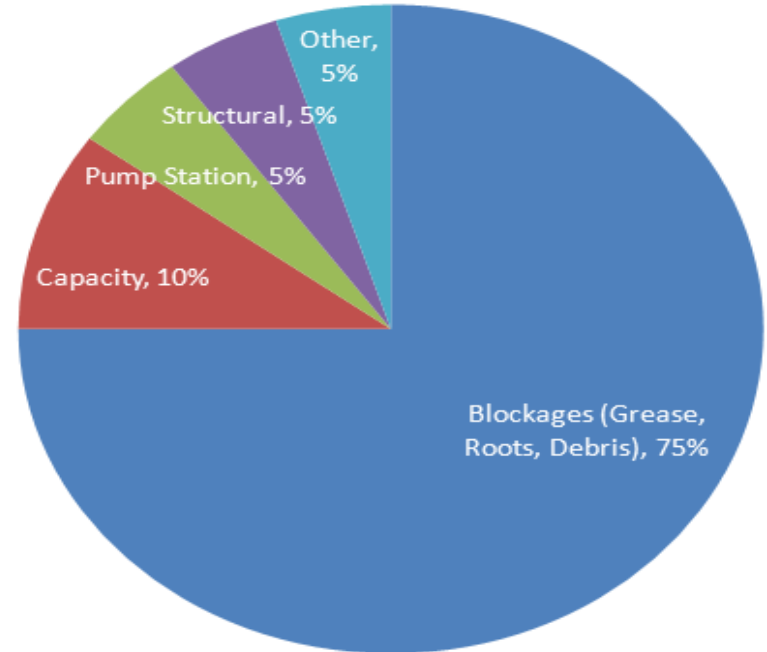
Minimize short-term and long-term rate impacts



Consistent,
transparent,
justifiable decisions

Failure Analysis Usually Indicates Most SSOs Manageable Using Maintenance Strategy

- Objective
 - Cost effective SSO Reduction
- Cause / Mitigation
 - Blockage / Cleaning
- Tactic
 - Schedule Optimization
 - Risk/GIS Scheduling
 - Schedule Synchronization

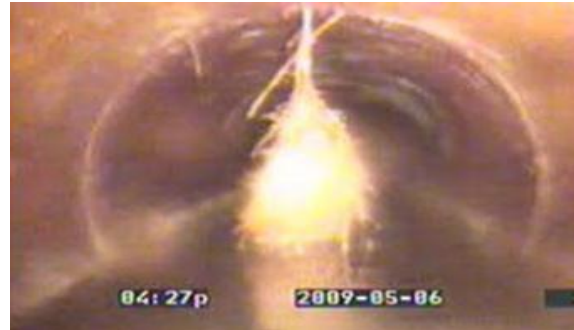
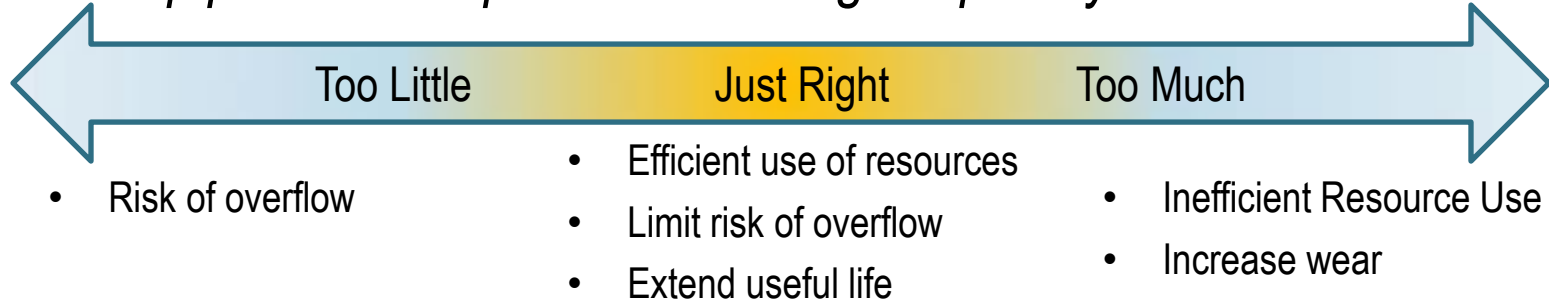


Risk Based Maintenance Optimization

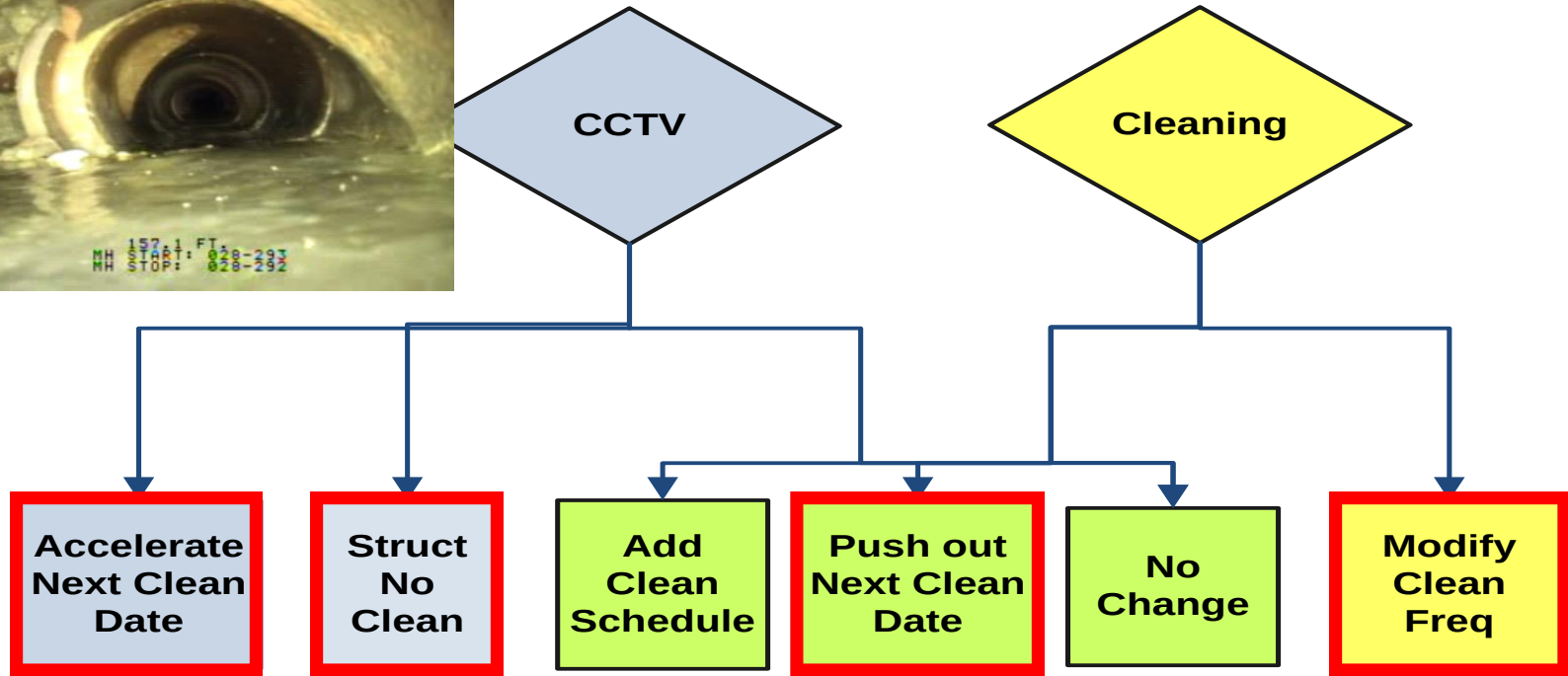
Schedule Optimization

Tactic 1: Schedule Optimization

Each pipe has an optimum cleaning frequency



Decision Types



Large Agency Case Study: Data-Driven Strategies to Improve Operations

Sewer Cleaning Frequency Optimization – Continuous Improvement

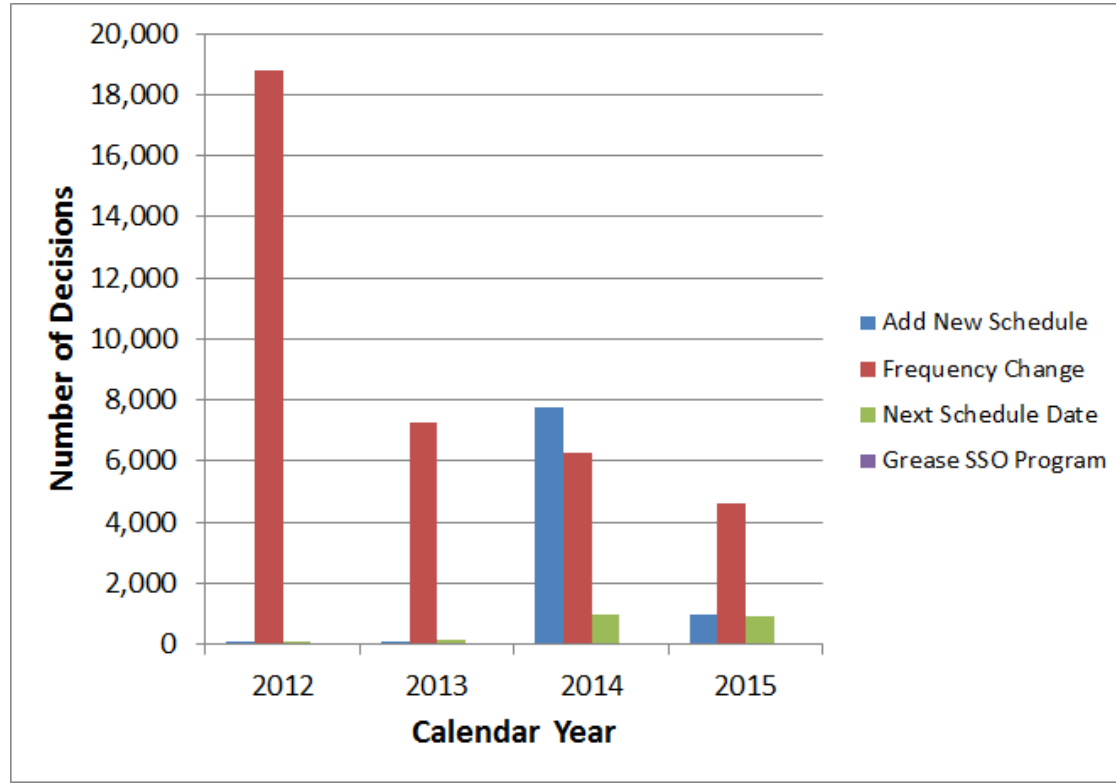
- Data Utilized:
 - Cleaning findings and severity
 - CCTV O&M defects and severity
- Decision Support
 - Proposes frequency changes
 - Schedule accelerations
- Software Integrations
 - Hansen CMMS (history, frequencies, generating schedules), & exempt assets
 - GIS (packaging)
 - CCTV



Large Agency Case Study: Data-Driven Strategies to Improve Operations

Sewer Cleaning Frequency Optimization – Continuous Improvement

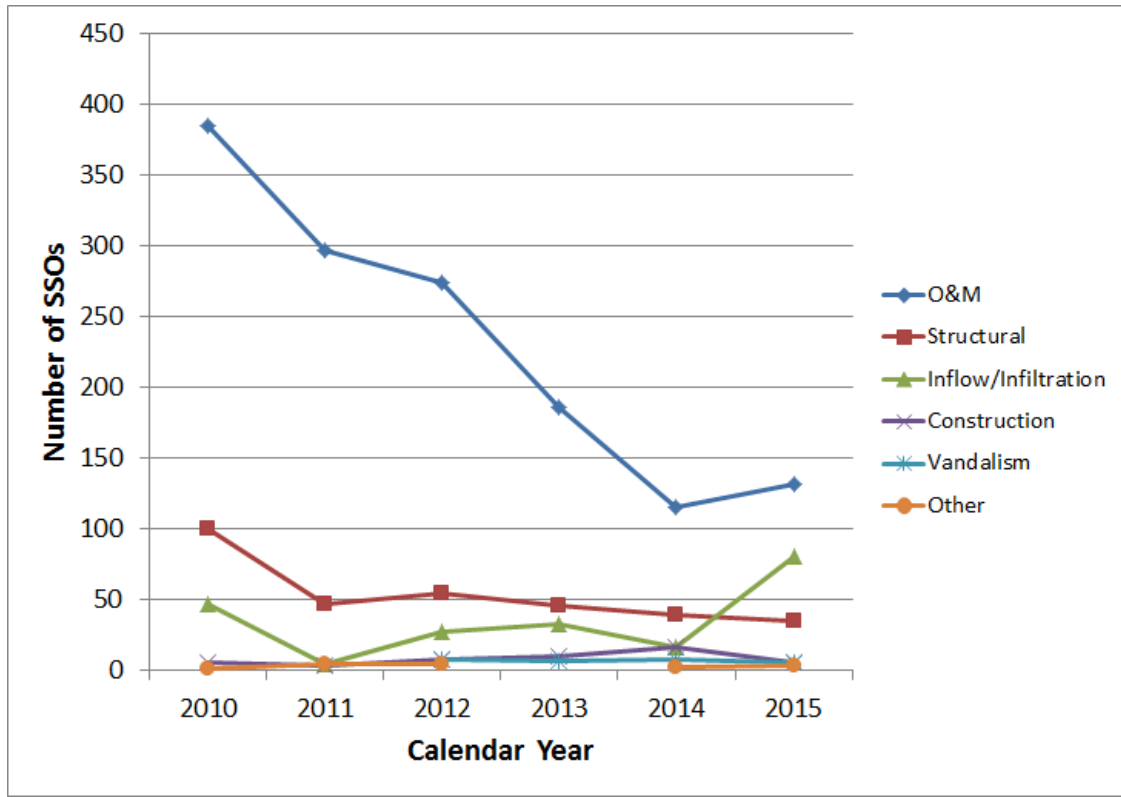
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Large Agency Case Study: Data-Driven Strategies to Improve Operations

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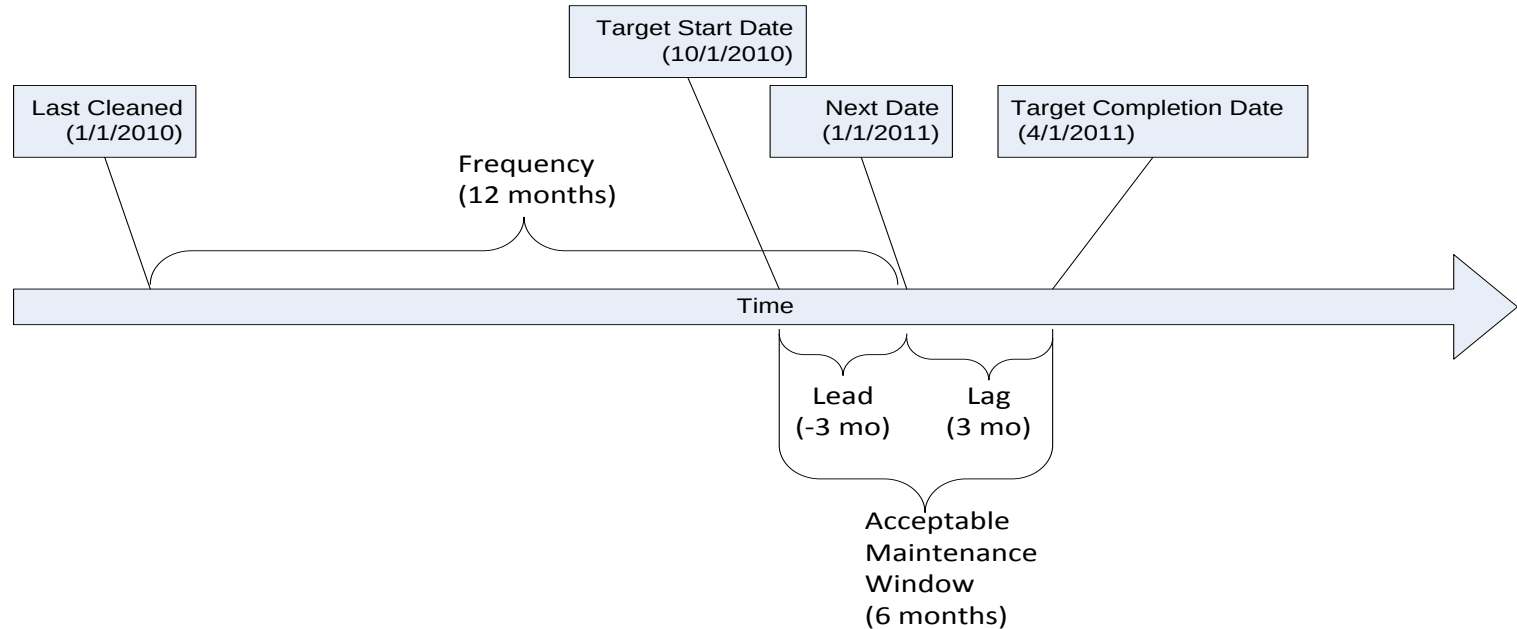
The **RIGHT** work,
at the **RIGHT** time,
at the **RIGHT** cost.

Risk Based Maintenance Optimization

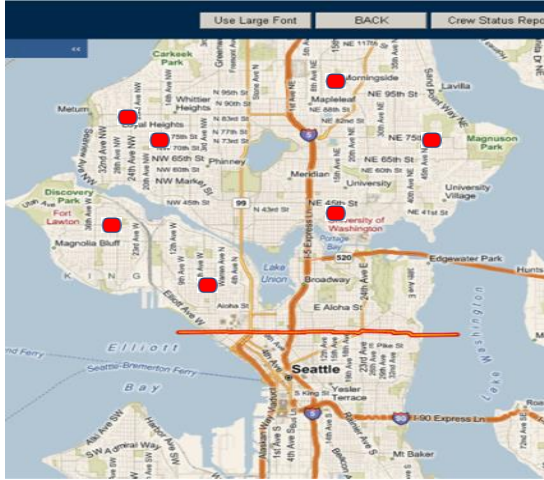
Risk/GIS Based Scheduling

Acceptable Maintenance Window Philosophy

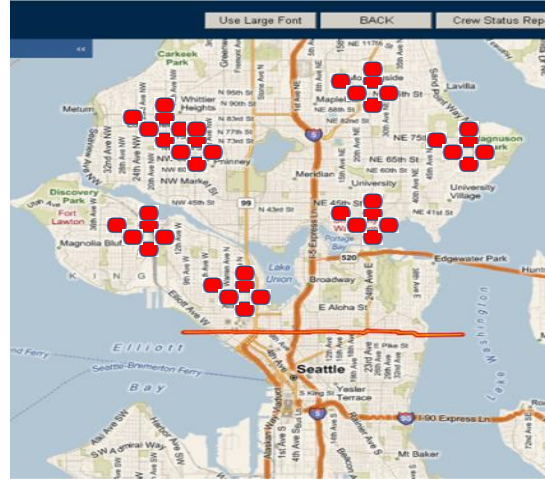
Assumption: An asset should not have a Maintenance-related SSO if maintained within it's acceptable maintenance window"



Results of Maintenance Window Philosophy



No Window



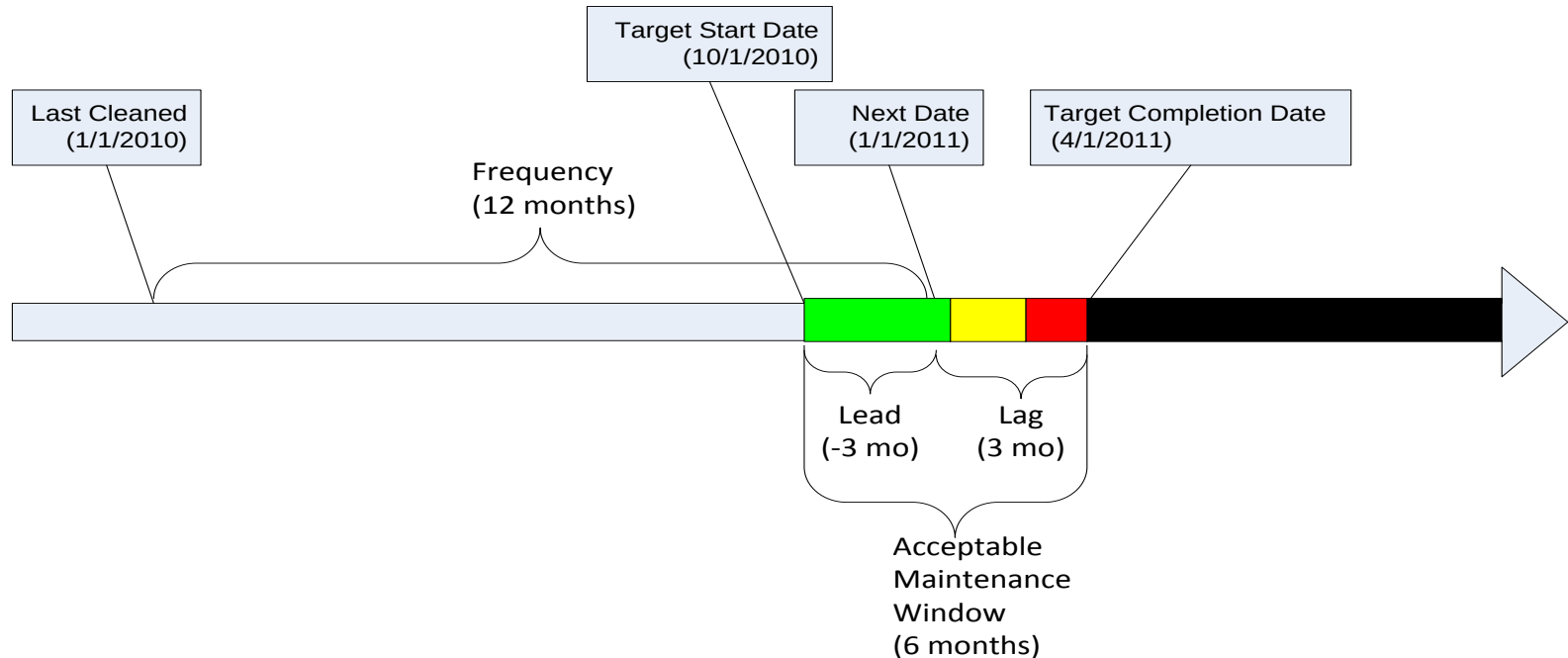
Window

Benefit: Less Drive Time between work orders

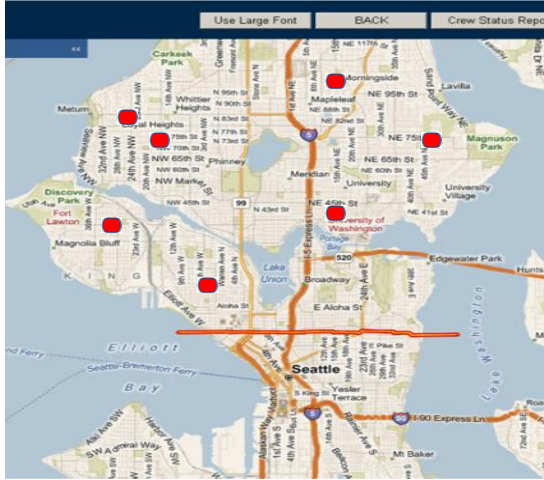
Problem: What work should I do first?

Risk in Maintenance

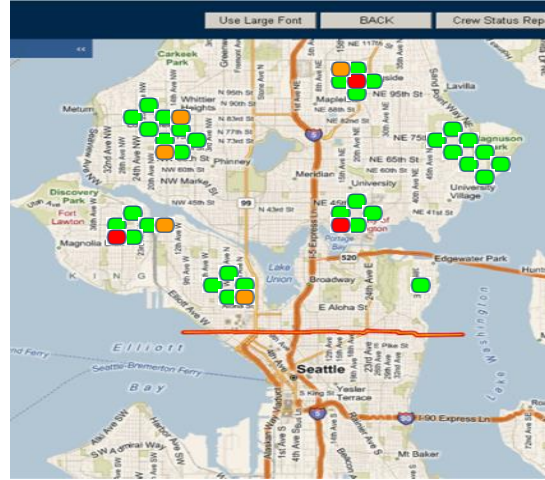
- Theory: Risk of SSO increases once you pass the end of the acceptable maintenance window



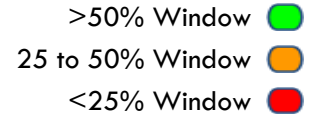
Risk & Acceptable Maintenance Window



As-Is

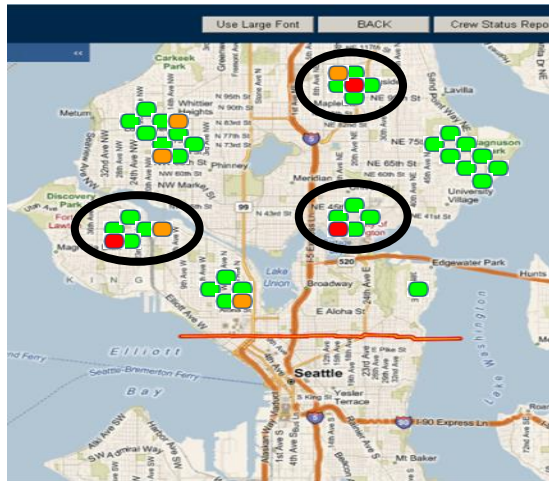


To-Be

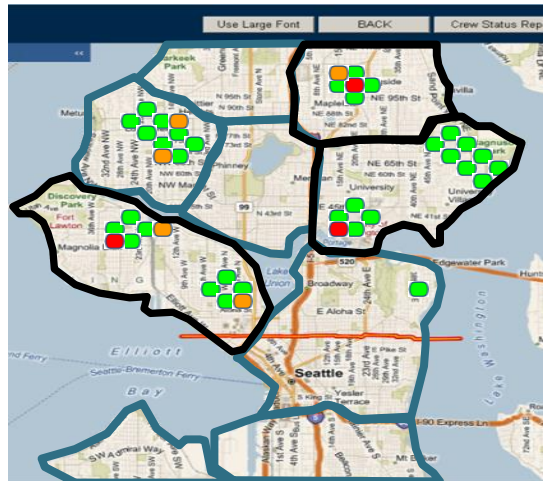


Benefit: Allows Maintenance Planner to quickly and effectively balance risk and geographic location when assigning work

Schedule Synchronization



No Zone

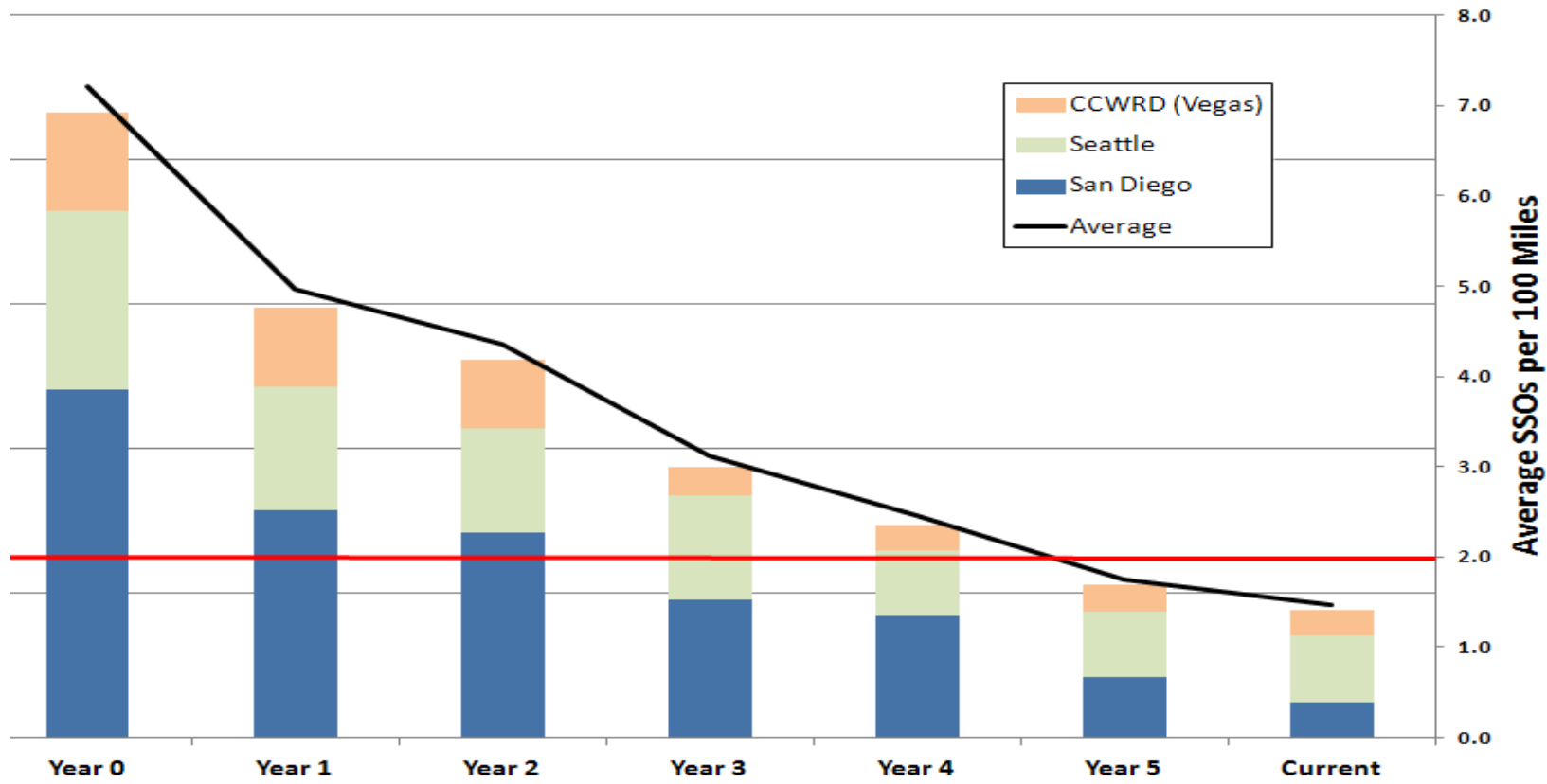


Zone

- >50% Window ●
- 25 to 50% Window ●
- <25% Window ●

Benefit: Minimizes trips to a zone

Results at Several Large Agencies (~18,000 mi)



Renewal Optimization

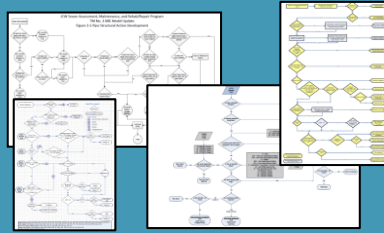


Calibration: *Balancing Risk Tolerances & Cost of Service*

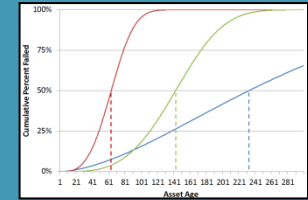
Your Data

CCTV
CoF
Maintenance
SSO

Failure Definition & Decision Guidelines



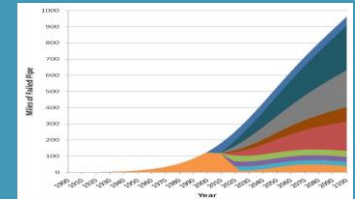
Failure Projection



Refine Risk Thresholds



Financial Impact



Update Resources

Risk Assessment

▪ Likelihood of failure

- Defect count/type/size (e.g. hole)
- Count of critical defects
- Capacity issues
- Presence of groundwater
- Material
- Cleaning frequency
- History of grease and debris

▪ Consequence of failure

- Backup / SSO History
- Diameter
- Proximity to water body
- Roadway type
- Near railroad
- Within downtown corridor
- Within slide area
- Proximity to critical infrastructure (e.g. school)
- Location (main, connection, lateral)

100

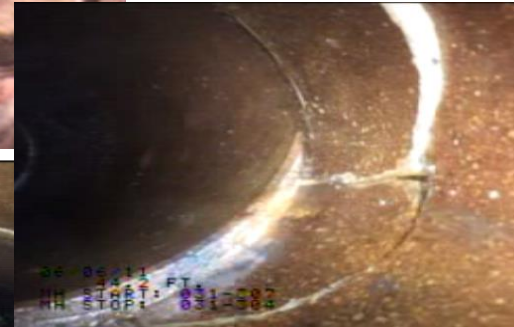
75

50

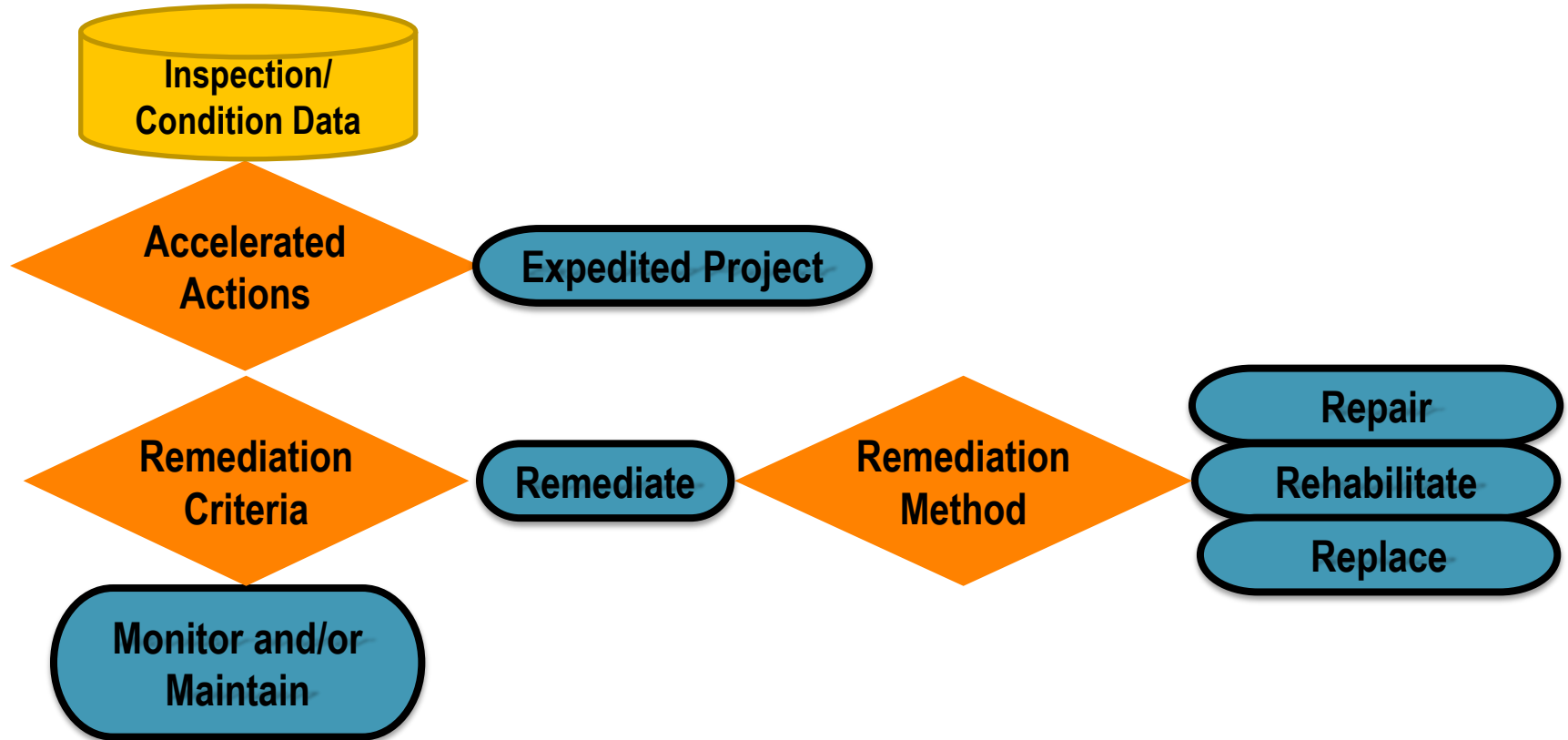
25

0

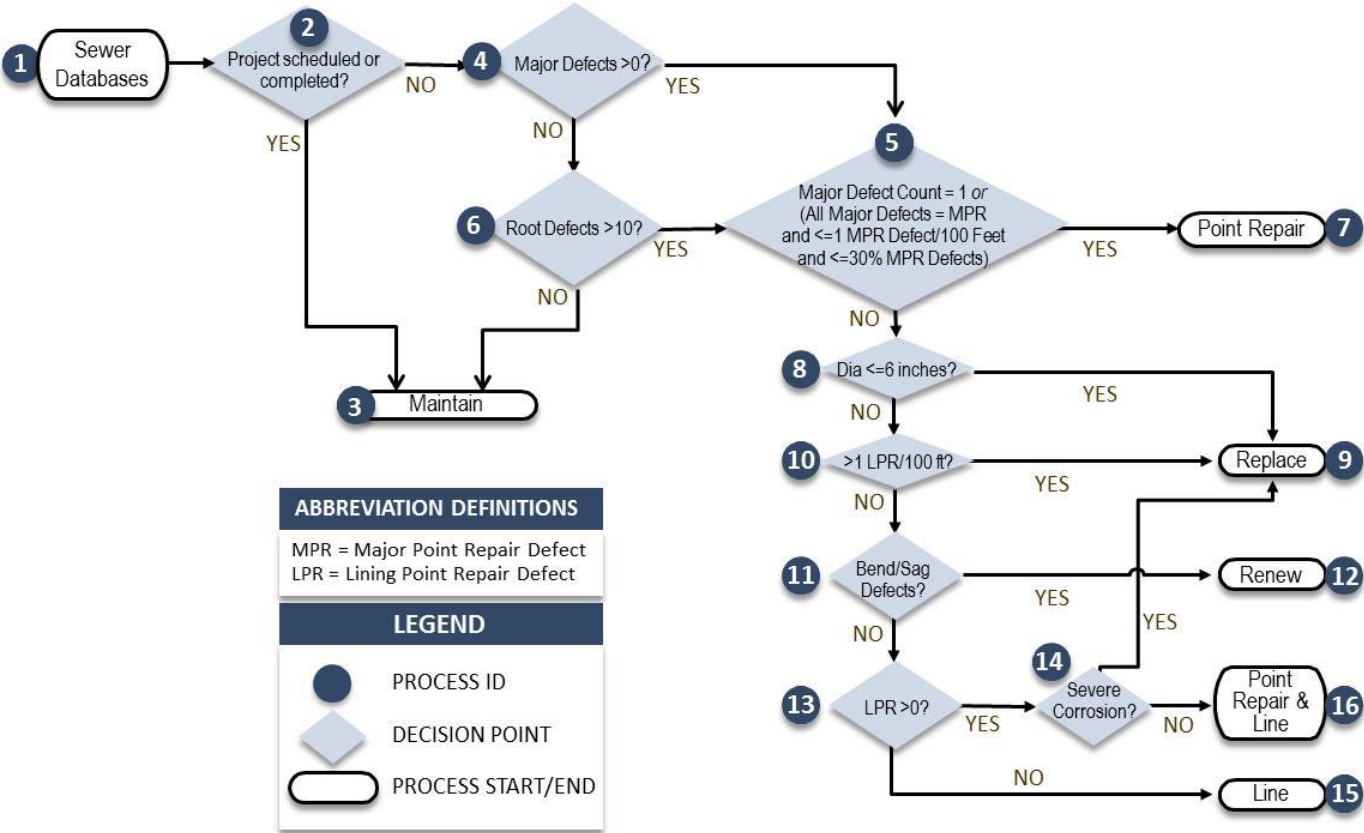
Increasing Risk



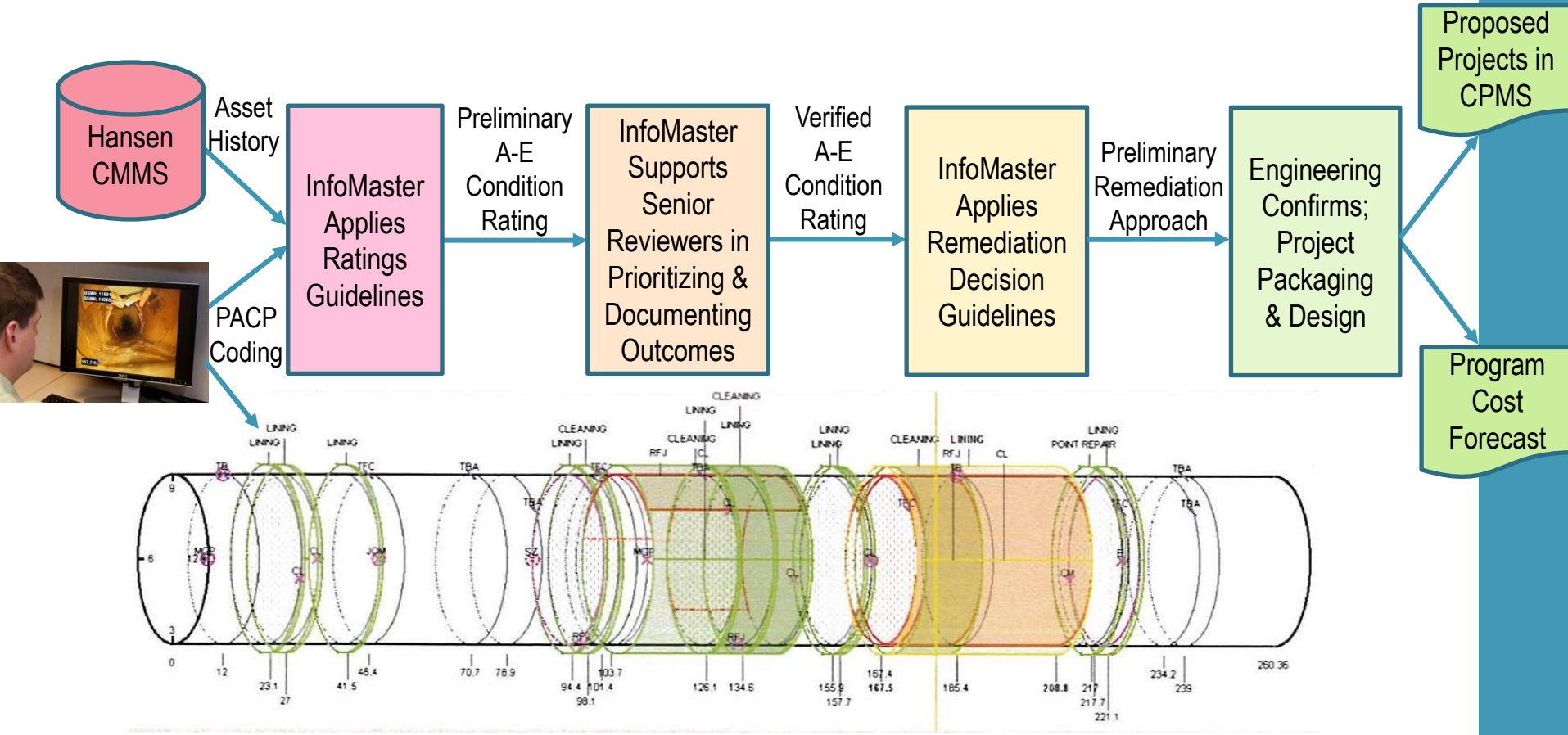
Defined Decision Guidelines Create Consistency and Opportunity for Support Tools



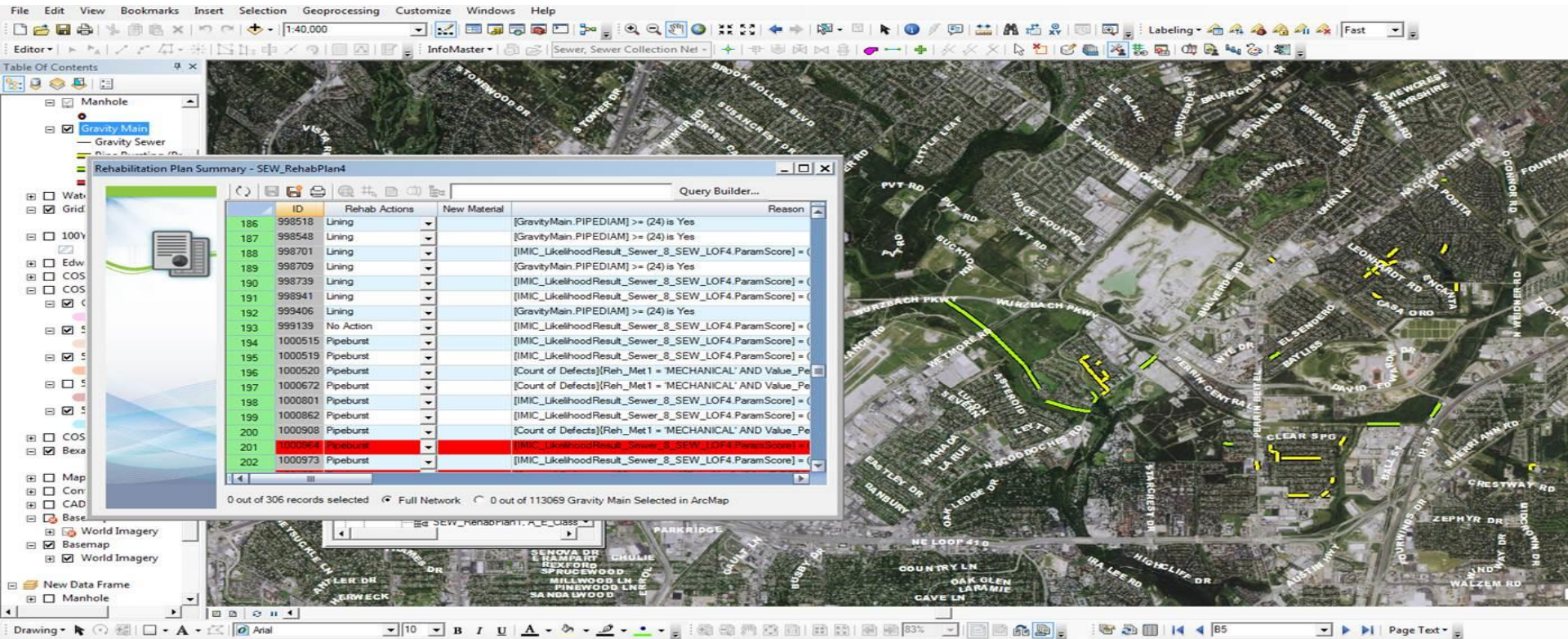
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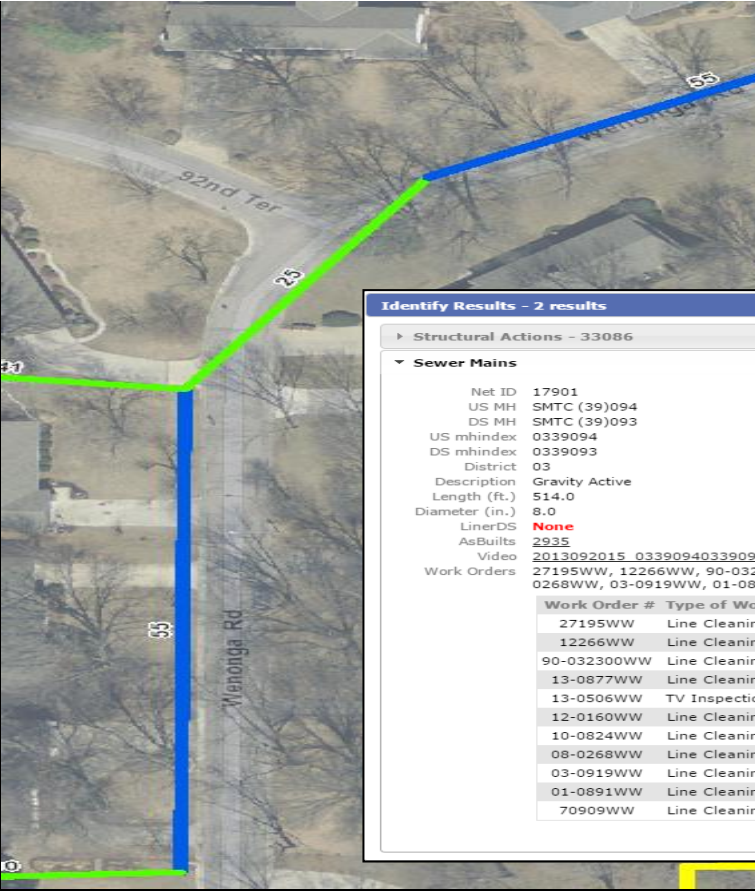
Large Agency Case Study: Asset Condition Assessment & Remediation Planning



Implement Condition Analytics Tools to Support Remediation Decision-Making



Implement Condition Analytics Tools to Support Remediation Decision-Making



Identify Results - 2 results

► Structural Actions - 33086

▼ Sewer Mains

Net ID 17901
US MH SMTC (39)094
DS MH SMTC (39)093
US mindex 0339094
DS mindex 0339093
District 03
Description Gravity Active
Length (ft.) 514.0
Diameter (in.) 8.0
LinerDS **None**
AsBuilt 2935
Video 2013092015_03390940339093P.WMV
Work Orders 27195WW, 12266WW, 90-032300WW, 13-0877WW, 13-0506WW, 12-0160WW, 10-0824WW, 08-0268WW, 03-0919WW, 01-0891WW, 70909WW [hide](#)

Work Order #	Type of Work	WO Created	Crew Assigned	Status	Completed Date
27195WW	Line Cleaning		Hudro Jet Truck	Complete	6/12/1996
12266WW	Line Cleaning		Hudro Jet Truck	Complete	6/23/1995
90-032300WW	Line Cleaning			Complete	7/2/1990
13-0877WW	Line Cleaning	12/17/2013	Hydro-Jet Unit	Complete	7/31/2014
13-0506WW	TV Inspection	8/14/2013	Video Inspection Unit	Complete	9/19/2013
12-0160WW	Line Cleaning	3/2/2012	Hydro-Jet Unit	Complete	
10-0824WW	Line Cleaning	10/18/2010	Hydro-Jet Unit	Complete	9/13/2011
08-0268WW	Line Cleaning	5/28/2008	Hydro-Jet Unit	Complete	7/30/2008
03-0919WW	Line Cleaning			Complete	6/13/2005
01-0891WW	Line Cleaning			Complete	1/10/2002
70909WW	Line Cleaning		Hudro Jet Truck	Complete	9/27/1999



09:48

From MHI: 0339093 To MHI: 0339094
0220.0 CC 09/19/13 01:01 AM

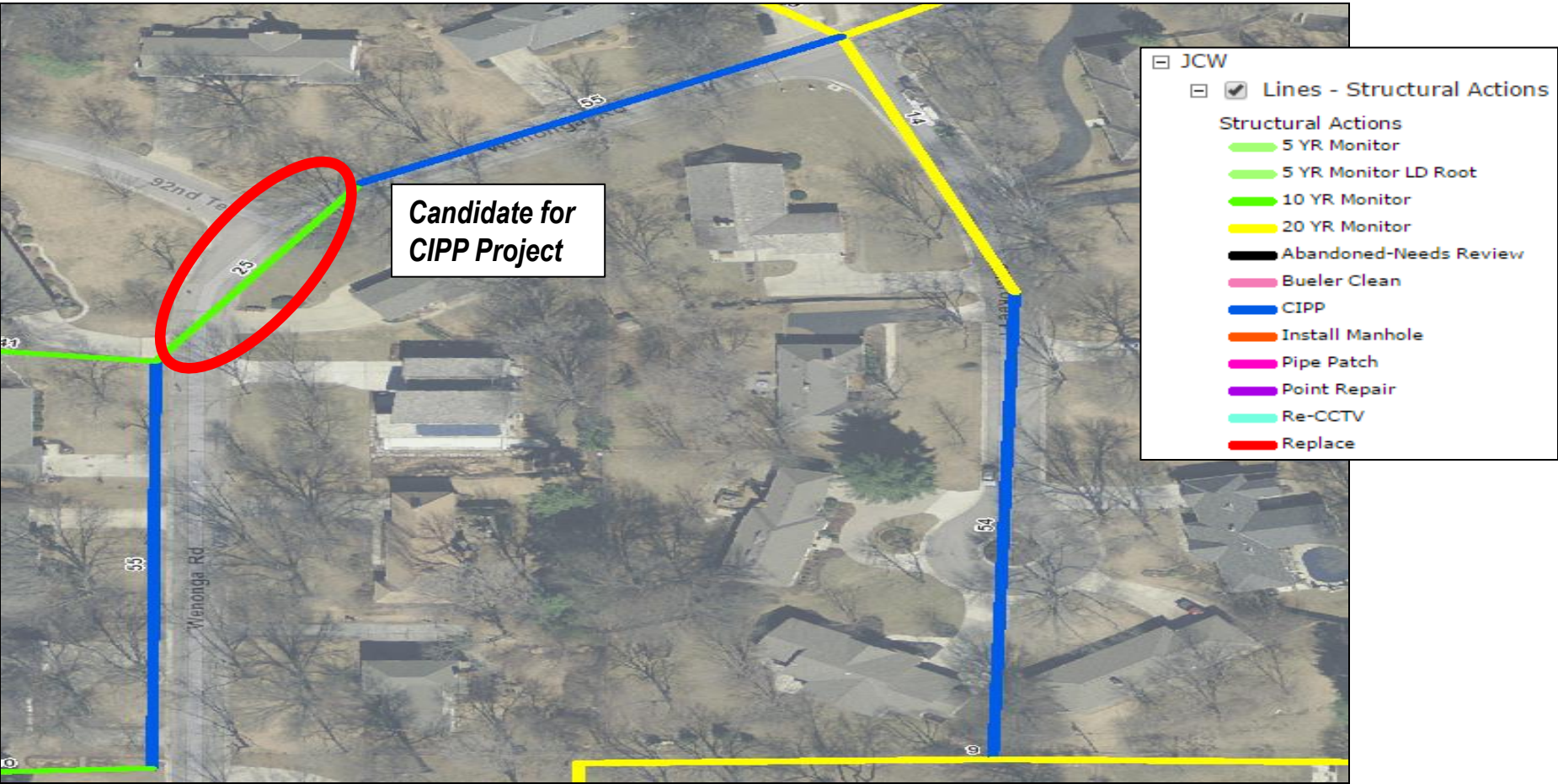


Structural Actions

Root

Needs Review

Leverage GIS for Effective Decision-Making at Project Level



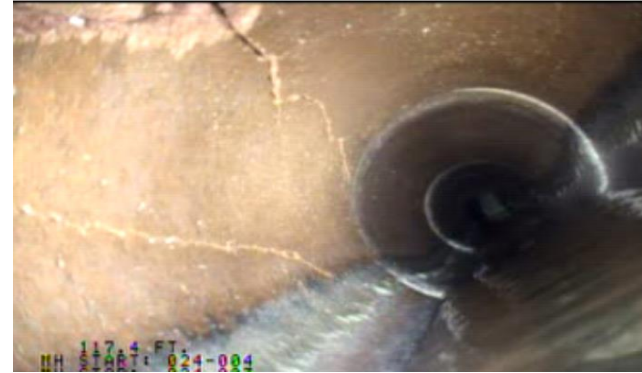
Seattle Public Utilities Example



Old Approach:

True run to failure

(Only reactive ER repairs)



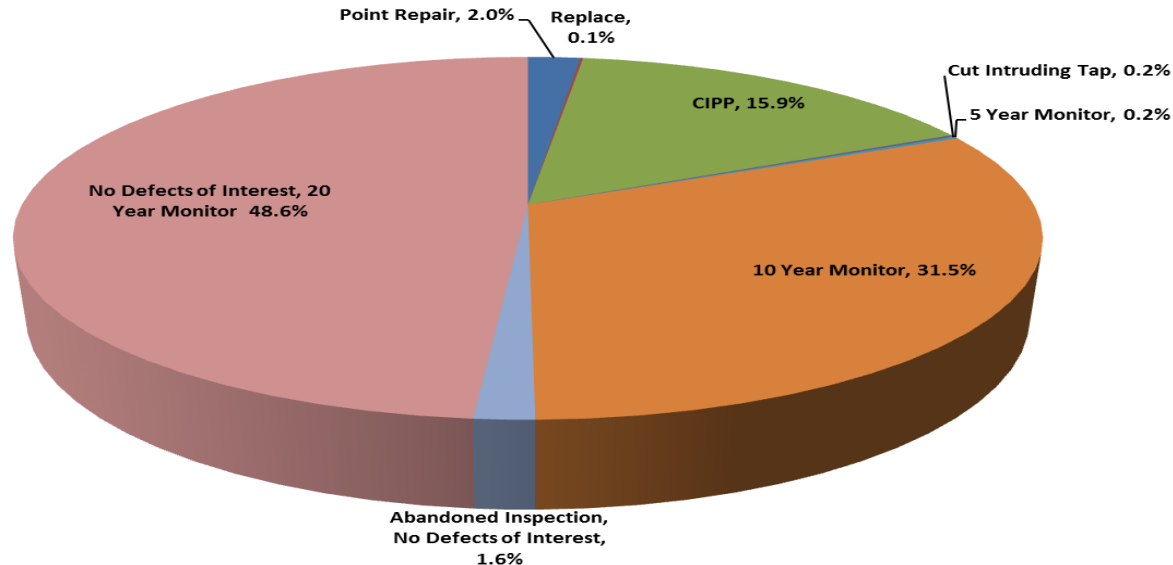
New Approach:

Proactive Risk Management

- ✓ Better understanding of systematic needs
- ✓ Prudent decision making: consistent, transparent, defensible
- ✓ Sustainable renewal rate (tripled CIP budget)

Johnson County Wastewater Results:

- ✓ **Increased Confidence in System-wide Renewal Forecast**
 - Old Age based: \$40M per year
 - New Risk based: \$5M per year
- ✓ **Tools Implemented to Support more Efficient & Effective Decisions**
- ✓ **Better Understanding of the Type and Quantity of Future Work**



Lessons Learned from Large Agency SSO Reduction Programs

Thank you!

For Additional Information, Contact:

Michael Flores, HDR
Practice Lead for Collection System Operations
714-785-9421