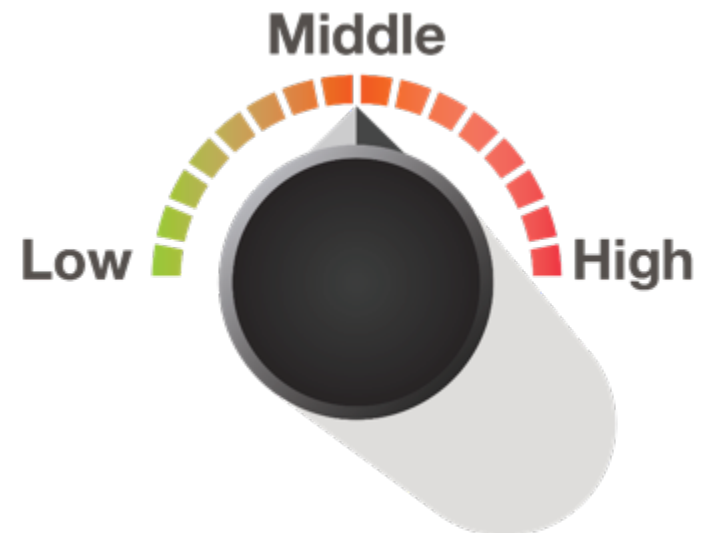


Enhanced Asset Management Through Vulnerability Assessment

- Vincent Morello / Broward County Water & Wastewater Services
- Linda Warren / Launch! Consulting
- Sanjay Puranik / Hazen
- Janeen Wietgreffe / Hazen

Presentation Outline

1. Background - Broward County Wastewater Treatment
2. Risk Analysis: Asset Management vs. Vulnerability Assessment (VA)
3. Why Combine Asset Management and VAs?
4. Lessons in Resilience
5. Questions and Answers





Background – Broward County Wastewater Treatment

Broward County Owns and Operates a 95 mgd WWTP

- Five separate treatment modules (each ~20 MGD)
- Modules were constructed in phases (1973 - 2007)
- Presently converting to fine bubble diffused aeration

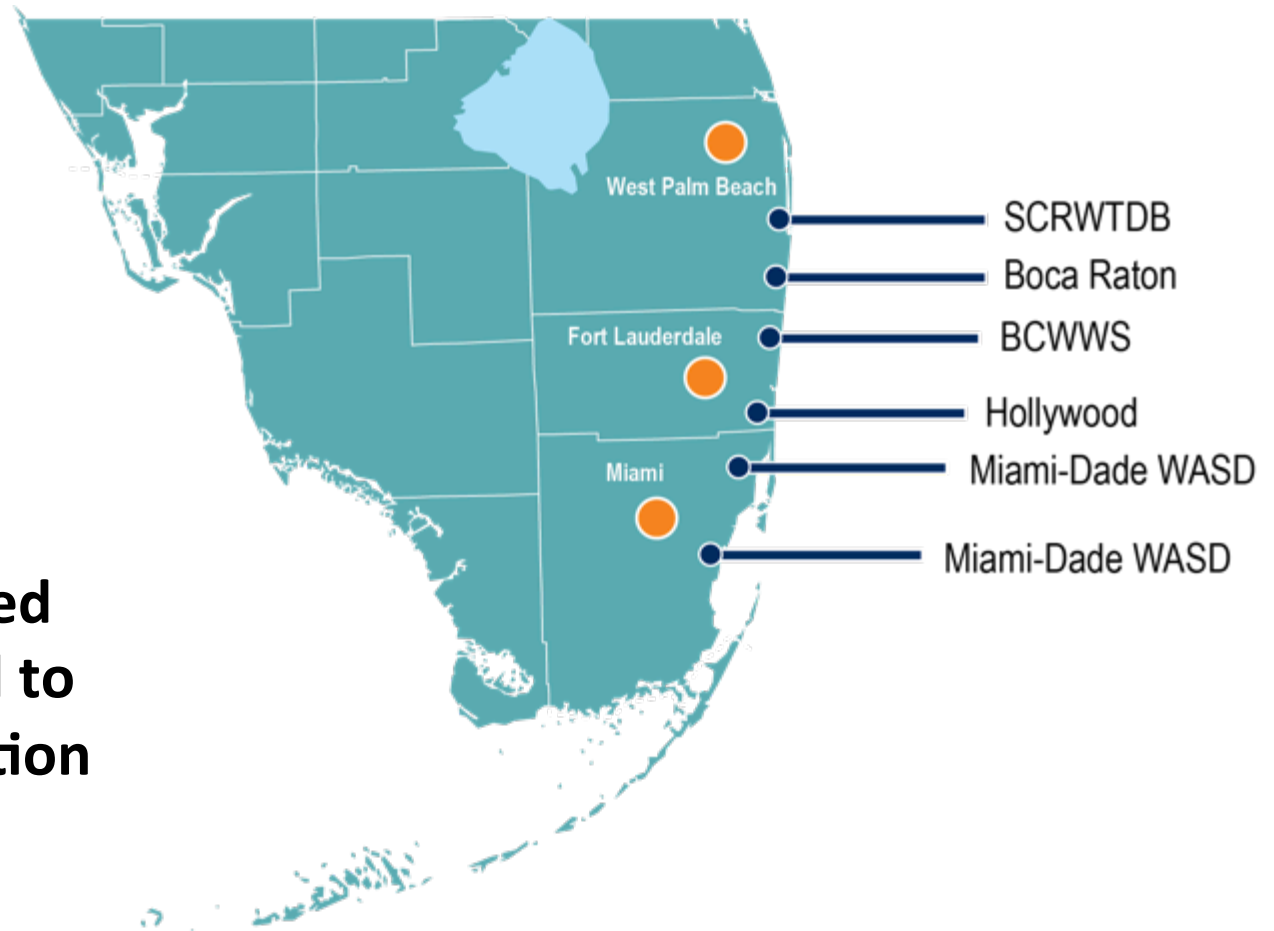


WWTP disposes via three modes

- Deep injection wells
- Ocean outfall
- Tertiary treatment for reclaimed water



Broward's WWTP is one of six ocean outfall WWTPs in South Florida



Disposal of treated effluent is critical to successful operation

Reliability is an Obligation to our Utility Customers

- Maintaining that Reliability is two-fold:
 - Assess/minimize our vulnerabilities



- Prioritize and maintain our assets



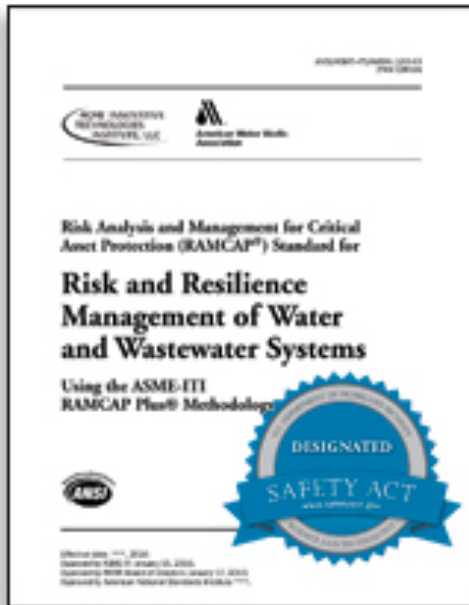
Risk Analysis: Asset Management vs. Vulnerability Assessment (VA)

Vulnerability Assessment vs Condition Assessment

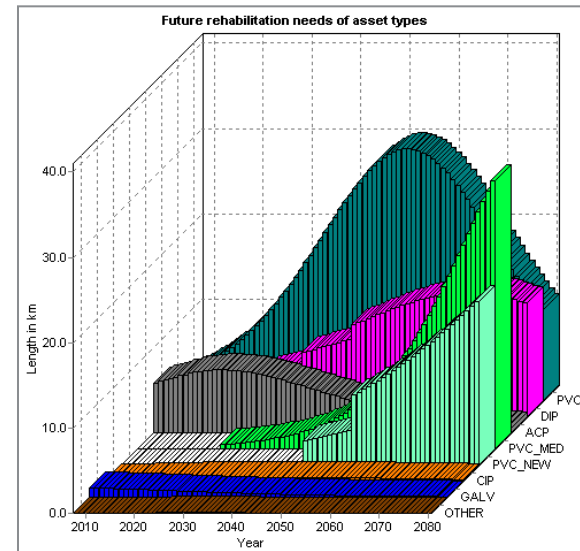
- Security/Risk Assessment (aka Vulnerability Assessment) – studies vulnerabilities of equipment/utility
- Condition Assessment – studies how equipment is functioning and assesses remaining life
- Both study consequence of failure of equipment



Today's Asset Management SHOULD Integrate Vulnerability Information from Vulnerability Assessment

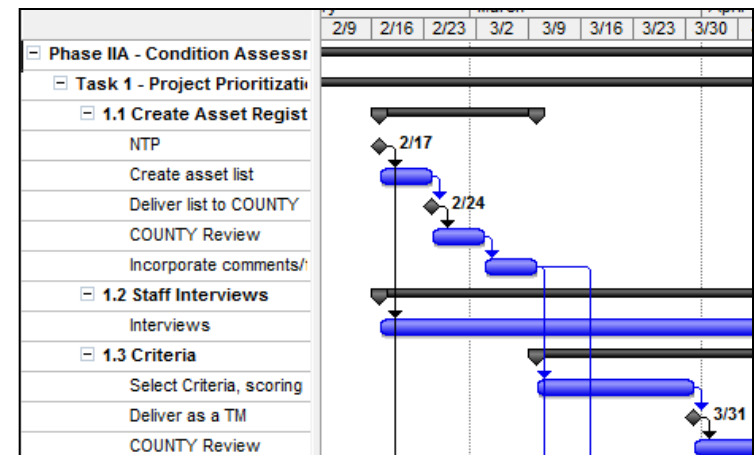


+

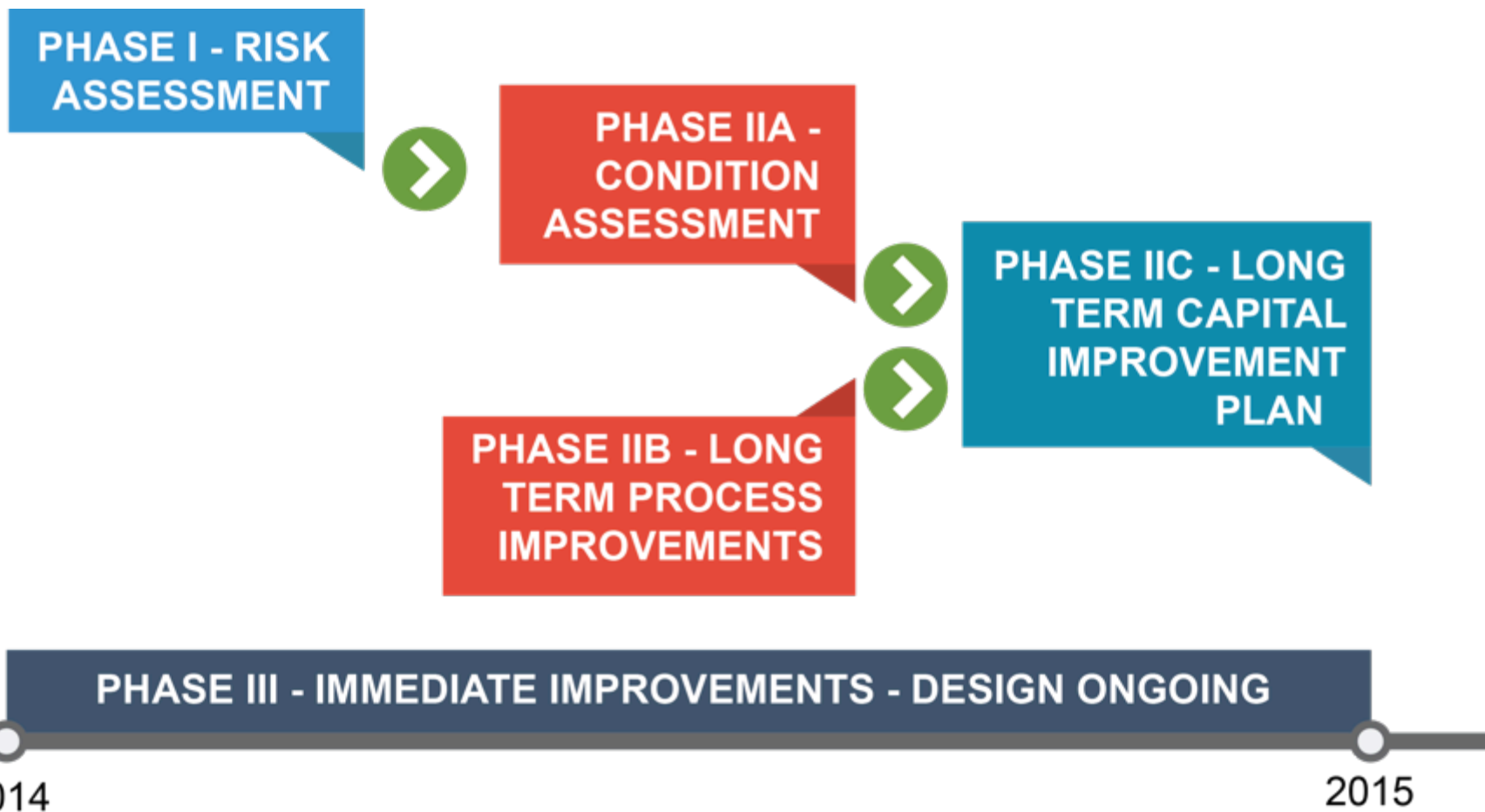


How Do We Integrate Both Studies?

- Through a concurrent scope under the Facility Improvements Project
 - Begin vulnerability assessment
 - Perform condition analysis
 - Determine overlap
 - Rank projects accordingly



The Facility Improvements Project Combines Condition Assessment and Vulnerability Assessment



Condition Assessment Inventory

- Assets were identified from the Maximo system
- Over 1,200 assets were assessed
 - Structural
 - Mechanical
 - Electrical



The Vulnerability Assessment was Conducted for Critical Assets

- 19 structures were identified by Utility/Consultant Team as critical
- 38 total critical assets are physically located within the 19 structures



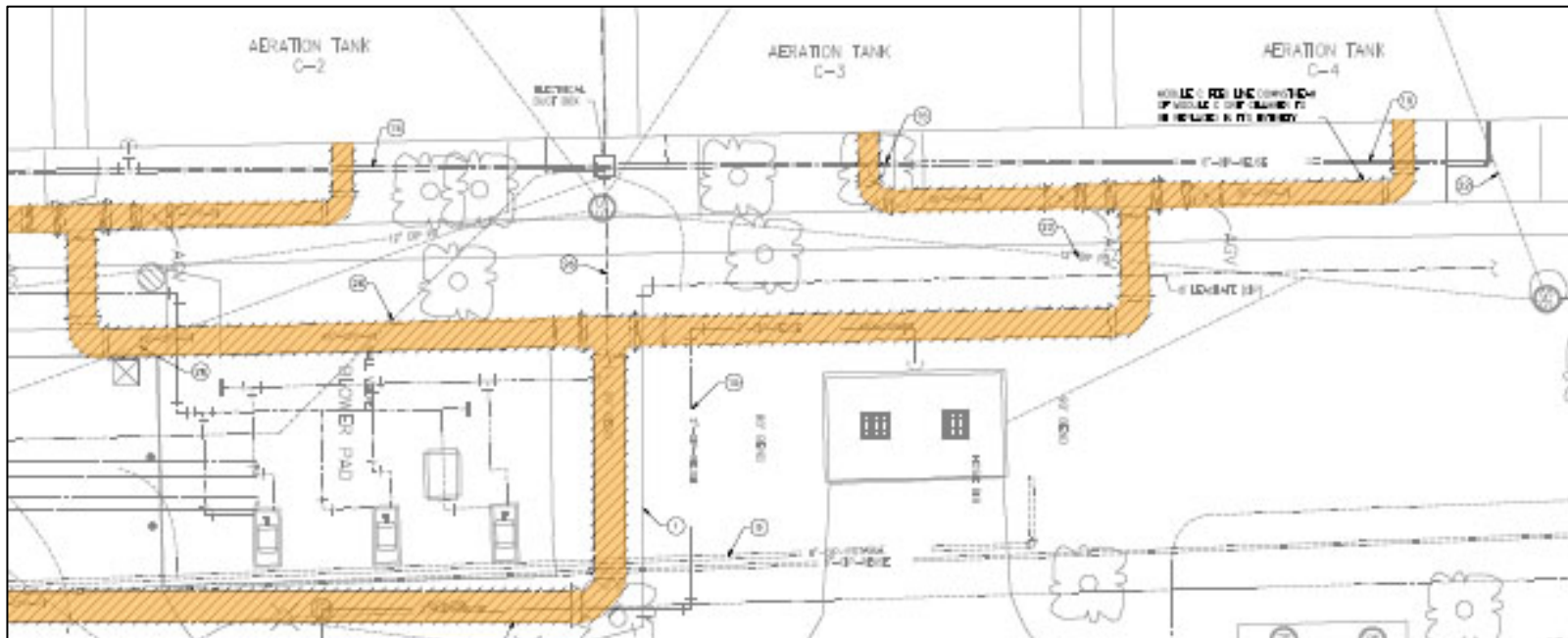


Why Combine Asset Management and Vulnerability Assessments?

Why Combine Asset Management and Vulnerability Assessments?

Identification of critical infrastructure based on condition assessment and risk assessment elevates immediate action projects.

Example: A pipe break between the headworks and aeration basins could result in 20 mgd spill of raw wastewater



Ongoing Projects and Future Projects Require Background/Support for Funding

- Large capital investments require engineering analysis
 - Condition Assessment serves as basis for future design projects
- If Capital Improvement Project (CIP) budget increases, explanation must be provided
 - Vulnerability Assessment serves as basis for budget increase

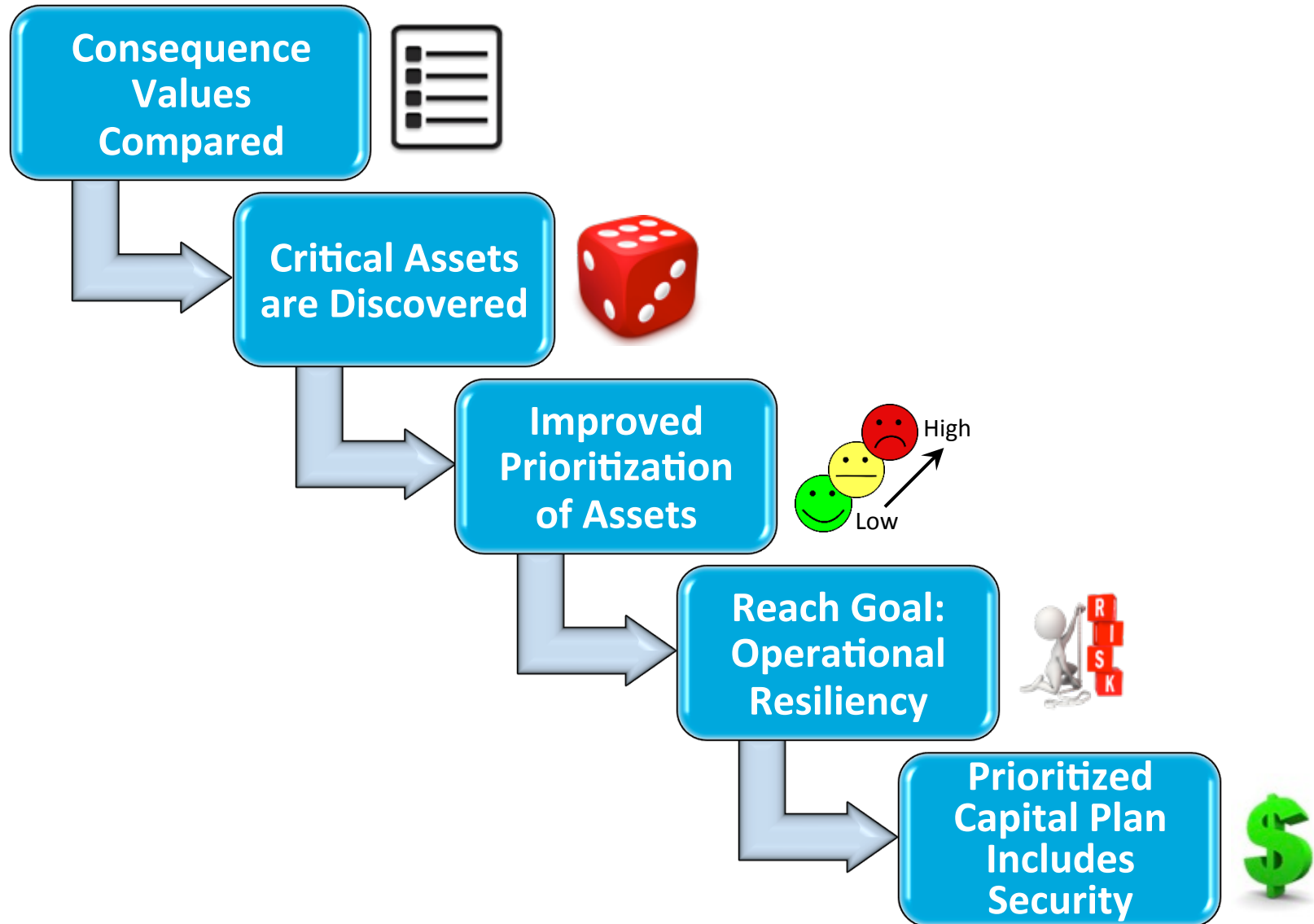


**RESILIENCE IS
PARAMOUNT**



Lessons in Resilience

Lessons in Resilience



Condition Assessment Probability of Failure and Consequence of Failure Scores are Based on...



Probability of Failure (Score 1- 5):

- Based on condition assessment score



Consequence of Failure (Score 1- 5):

- Assessment of asset relative to five weighted parameters:
 - Health and Safety
 - Public Perception
 - Regulatory Compliance
 - Redundancy



Vulnerability Assessment Probability of Threat and Consequence of Failure Scores are Based on...



Probability of Threat Success (Score 0-100%):

- Based on likelihood threat is successful (known as vulnerability)—includes redundancy consideration



Consequence of Failure (Score 0-4):

- Four non-weighted parameters:
 - Fatalities/Serious Injuries or Sickness
 - Cost to Remediate/Economic Loss
 - Environmental Damage
 - Public Perception



Evaluated Consequences were Similar

- **Condition Assessment
Consequence**

- Health and Safety
- Public Perception
- Regulatory Compliance
- Redundancy

- **Vulnerability Assessment
Consequence**

- Fatalities/Serious Injuries
or Sickness
- Public Perception
- Environmental Damage
- Cost to Remediate/
Economic Loss



Critical Assets were Evaluated by Both Assessments

- 1,200 assets from Condition Assessment
- 38 from Vulnerability Assessment



Improved the Prioritization of Assets

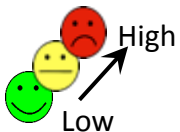
- 38 Assets from Vulnerability Assessment

- Elevated to Top Priority for:
 - Condition Assessment
 - Facilities Planning
 - Capital Improvements

- Priorities






- Chlorine
- Electrical
- Headworks
- Disposal

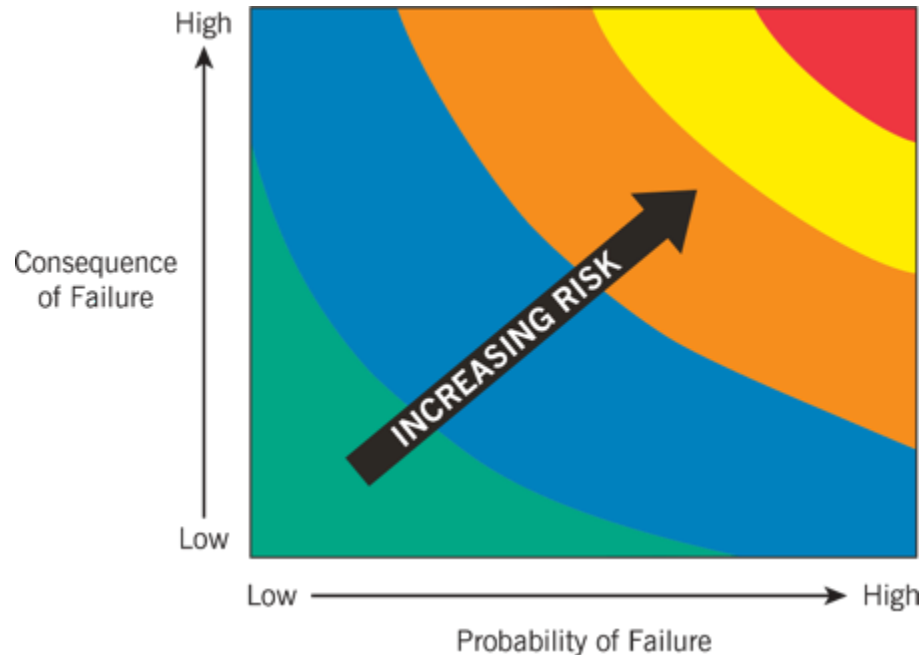
- Electrical Assets Common to Both
- LEL Detector Surprise



The End Goal is Operational Resiliency

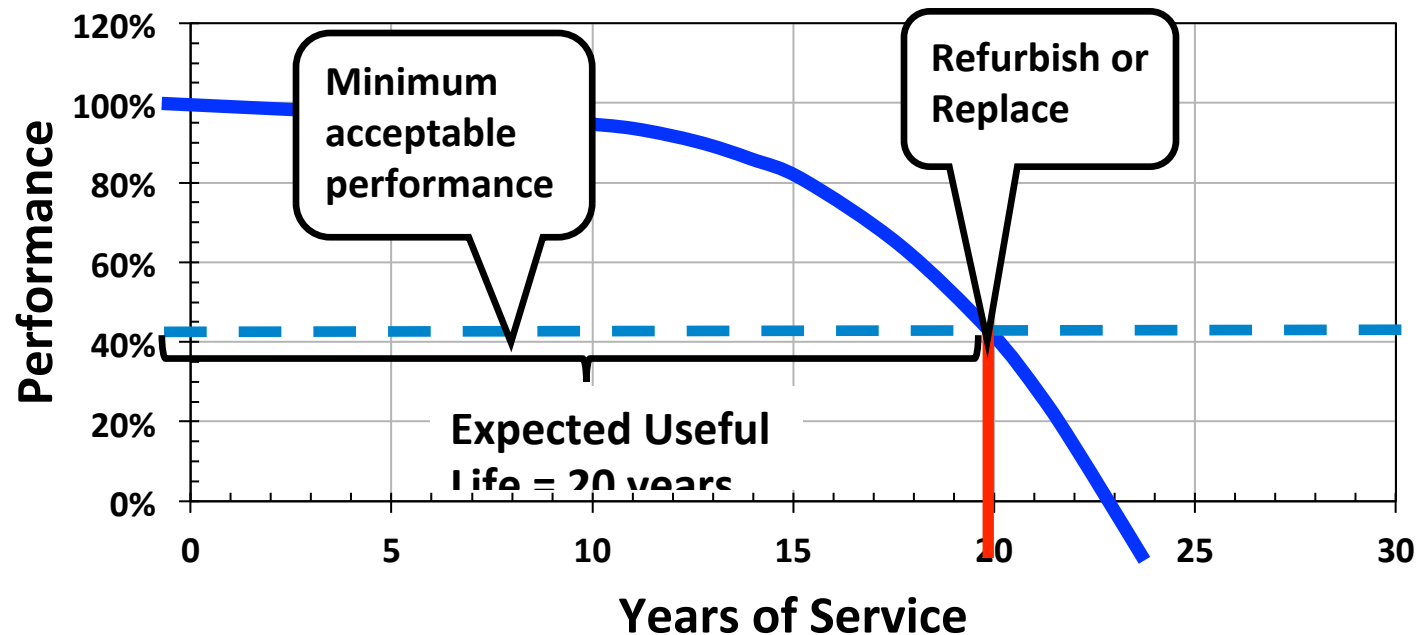
- Group asset improvements into project packages
 - Minimizes operational interruptions
 - Saves time and money

Risk Score	
	Very Low
	Low
	Medium
	High
	Very High



Prioritized Capital Plan includes Security

- Designs now include security aspects
- Projects are prioritized for resiliency



The Combination of Condition Assessment and Vulnerability Assessment Results...

...in continuous effluent disposal.

RESILIENCY





Questions and Answers