



Integrating Asset Management Principles and Emergency Preparedness to Assess Risk

America's Water Infrastructure Act of 2018



Signed into law in October 2018

USEPA will issue guidance by August 2019

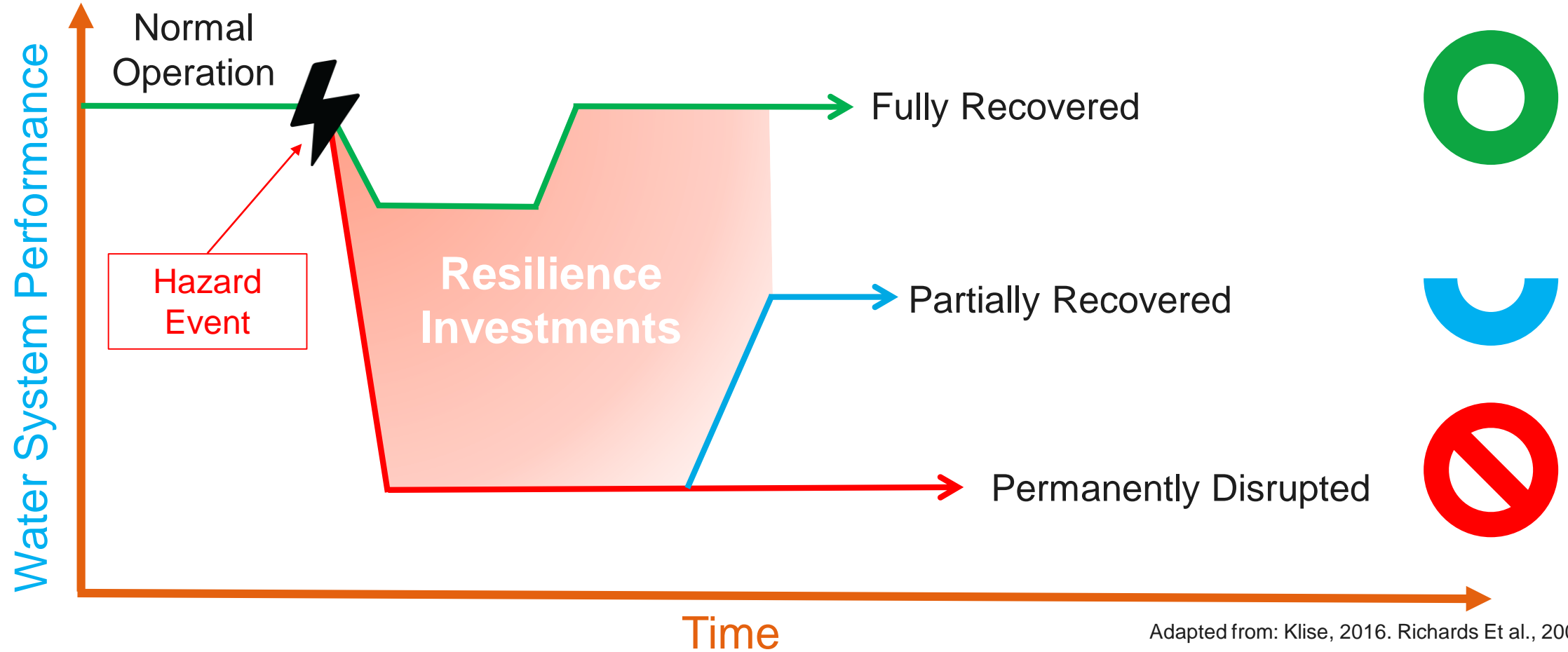
*Large utilities then have **7 months** to complete risk and resilience assessments*

Agenda

- What is Resilience?
- The Evolution of Water Sector Resilience
- Safe Drinking Water Act Updates
- Consensus Standards & Guidance
- Case Study: J100 & Asset Management
- Emergency Response Planning
- Moving toward Enterprise Risk and Resilience Management



Resilience is ??? Bouncing Back



Water Industry Resilience Challenges

Ranking	Category	Weighted Average	% Ranked Critically Important
1	Renewal and replacement of aging water and wastewater infrastructure	4.59	64
2	Financing for capital improvements	4.44	55
3	Public understanding of the value of water systems and services	4.37	50
4	Long-term water supply availability	4.30	50
5	Public understanding of the value of water	4.26	44
6	Watershed / source water protection	4.17	41
7	Aging workforce / anticipated retirements	4.16	43
8	Public acceptance of future water and wastewater rate increases	4.12	35
9	Emergency preparedness	4.10	34
10	Governing board acceptance of future water and wastewater rate increases	4.09	35
10	Cost recovery (pricing water to accurately reflect its true cost)	4.09	32
11	Talent attraction and retention	4.08	33
12	Asset management	3.98	27
13	Cybersecurity issues	3.92	27
13	Data management	3.92	25
14	Improving customer, constituent, and community relationships	3.91	26
14	Compliance with current regulations	3.91	25
15	Groundwater management and overuse	3.88	26
16	Compliance with future regulations	3.86	21
17	Certification and training	3.84	22
18	Water rights	3.77	27
19	Drought or periodic water shortages	3.74	23
20	Water loss control	3.73	17
21	Water conservation / efficiency	3.72	25
22	Energy use/efficiency and cost	3.70	16
23	Physical security issues	3.58	15
24	Water quality issues from premise plumbing systems	3.56	12
25	Expanding water reuse / reclamation	3.46	18
26	Climate risk and resiliency	3.43	15
27	Financing for water research	3.40	12

Source: 2018 AWWA State of the Water Industry

Evolution of Water Sector Resilience



How has Water Sector Resilience Evolved?



State Regulatory Trends – Moving Towards Resilience

Ohio

- Requires Asset Management & Emergency Preparedness Programs for Public Water Systems



New Jersey

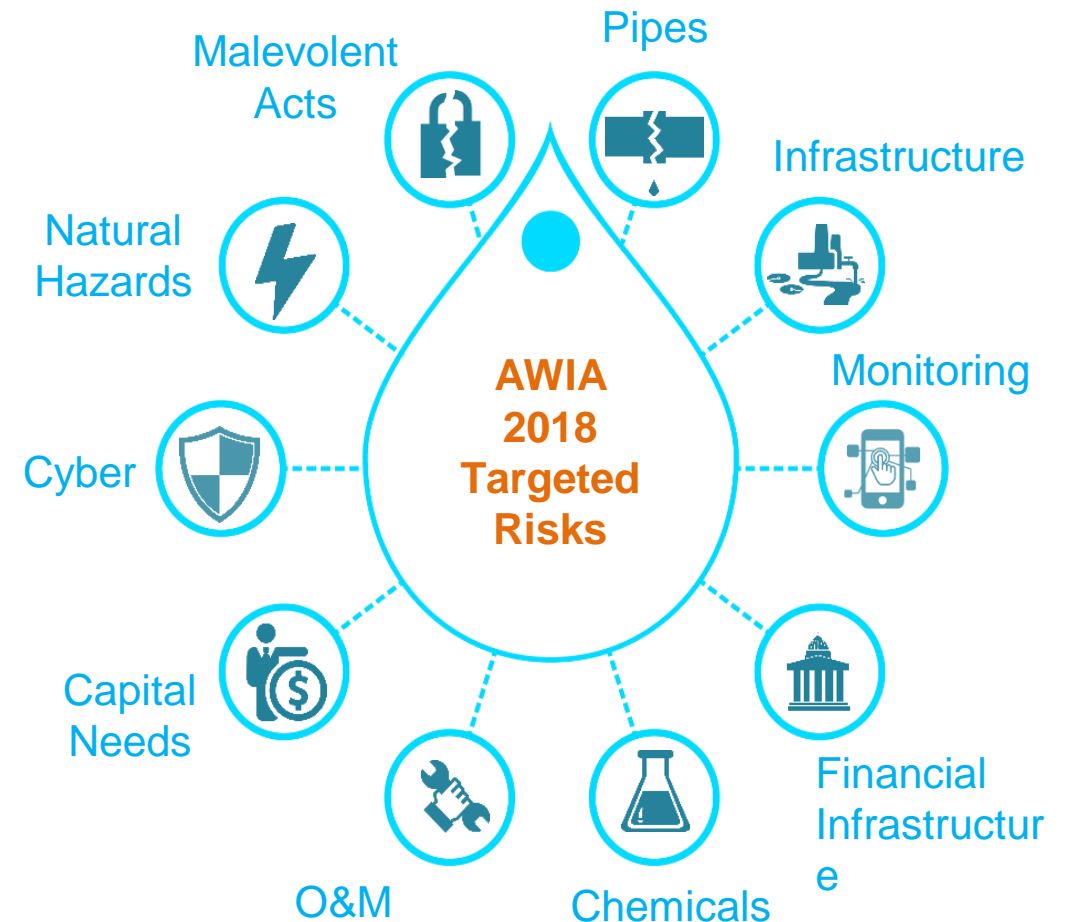
- Requires Asset Management Plans to Evaluate:
 - Power supply (primary and auxiliary)
 - Communication
 - Equipment and Supplies
 - Personnel Capabilities
 - Security
 - Emergency Procedures
 - Treatment Processes Capabilities
 - Conveyance/Distribution Capabilities

Safe Drinking Water Act Updates



America's Water Infrastructure Act of 2018 (AWIA)

- Mandates **water systems** serving **>3,300**
- ✓ Conduct *Risk and Resilience Assessment*
- ✓ Update RRA & Emergency Response Plans every **five** years
- ✓ Certification Letter to EPA





RISK AND RESILIENCE ASSESSMENTS

Water systems serving more than 3,300 people shall conduct risk and resilience assessments, including:

- Risk to system from malevolent acts & natural hazards
- Resilience of physical barriers, storage/ distribution, automated systems
- Chemical management
- SCADA systems
- System O&M
- Financial infrastructure

Optional – Evaluate capital and operational needs for the system



EMERGENCY RESPONSE PLAN

Water systems shall prepare an ERP within six months of the initial risk and resilience assessment, to improve:

- Strategies & resources to improve resilience of the system, including physical & cyber security
- Plans, actions, procedures, & equipment to be utilized & lessen the impact of malevolent acts or natural hazards
- Alternate source water options
- Relocation of water intakes
- Construction of flood barriers
- Strategies to detect malevolent acts or natural hazards






FUNDING

Grant funding authorized for water systems large and small, including funding for:

- Equipment to detect contaminants/malevolent acts
- Fencing, gating, lighting, cameras
- Equipment to improve resilience of system
- Improve electronic, computer, financial, automated, remote systems
- Emergency power or water supply
- Chemical storage
- Flood protection barriers
- Tamper-proofing manhole covers & valve boxes

\$ Yet to be appropriated....

AWIA Deadlines for Water Systems

POPULATION SERVED	RISK & RESILIENCE ASSESSMENT DEADLINE	EMERGENCY RESPONSE PLAN DEADLINE
 100k+	03/31/2020	09/30/2020
 50K+<100k	12/31/2020	06/30/2021
 3,300 < 50k	06/30/2021	12/30/2021

Certification letter required for each deadline. EPA penalty is up to \$25,000/day.

Consensus Standards & Guidance



Standards, Guidance & Tools

Risk & Resilience Assessments

- ANSI/AWWA J100-10 (R13) Risk & Resilience Management
- AWWA Cybersecurity Guidance and Tools
- EPA VSAT





















Cyber Security

- AWWA Cybersecurity Risk and Responsibility in the Water Sector
- NIST Cybersecurity Framework Version 1.1
- AWWA Process Control System Security Guidance for the Water Sector
- AWWA Cybersecurity Tool

Emergency Response Planning

- M19 Emergency Planning for Water and Wastewater Utilities
- ANSI/AWWA G440-17 Emergency Preparedness Practices
- Planning for an Emergency Drinking Water Supply (EPA/AWWA)
- Emergency Power Source Planning for Water and Wastewater
- Emergency Water Supply Planning Guide for Hospital (CDC/AWWA)



A Standards Based Approach		J100	Cyber Frameworks	M19
	Risk & Resilience Assessments			
	Risk to the system from malevolent acts and natural hazards			
	Resilience of physical and cyber assets			
	Monitoring practices of the system			
	Financial infrastructure of the system			
	Use, storage, or handling of various chemicals by the system			
	Operation and maintenance of the system			
	Optional – include an evaluation of capital and operational needs for risk and resilience management or the system			
	Emergency Response Planning			
	Strategies and resources to improve the resilience of the system, including physical security and cybersecurity			
	Response plans and procedures			
	Actions, procedures, and equipment which can obviate or significantly lessen the impact of a threat or hazard			
	Strategies to support detection of malevolent acts or natural hazards that threaten the security or resilience of the system			
	Coordinate with existing local emergency planning committees established pursuant to EPCRA 1986 during ERP development			

Case Study: J100 & Asset Management



J100 Methodology

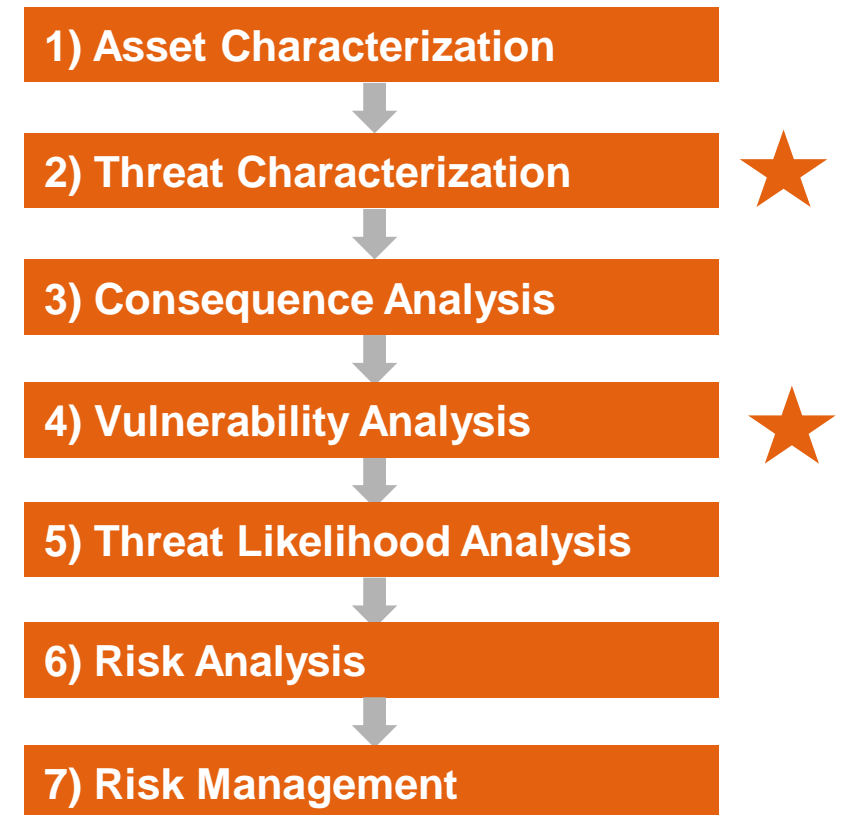
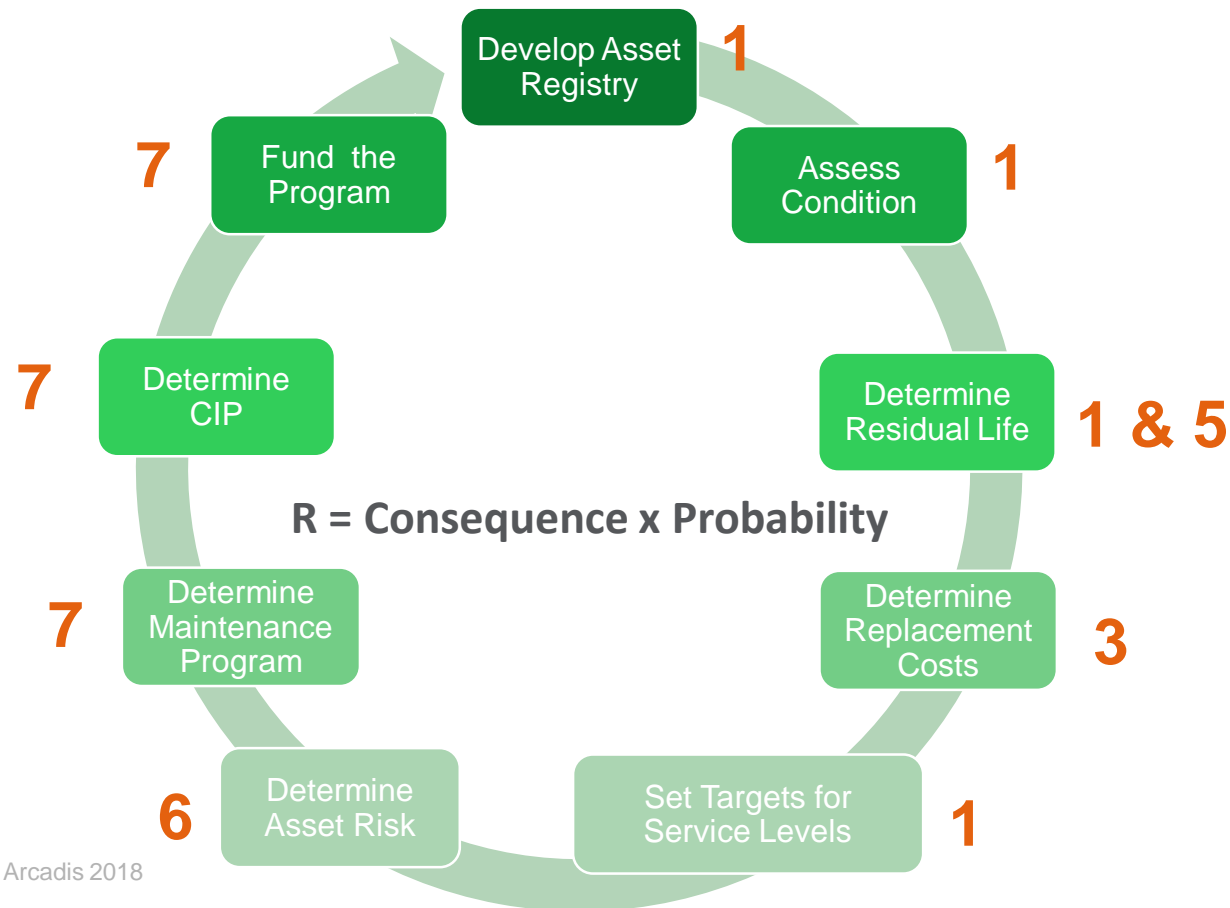
Consistency Across All Assets and Hazards



$$R=C*V*T$$

Asset Management & J100

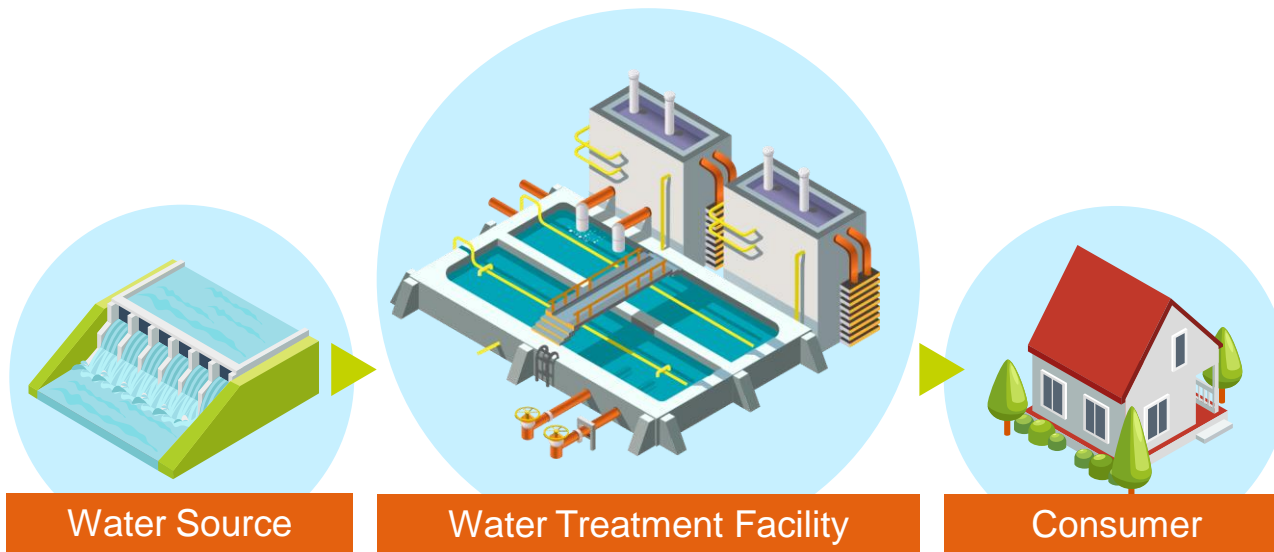
Comparing the Steps



$$R = C \times V \times T$$

Case Study: Building a Threat-Asset Pair

Pump Station 1 – Use of Asset Management Data

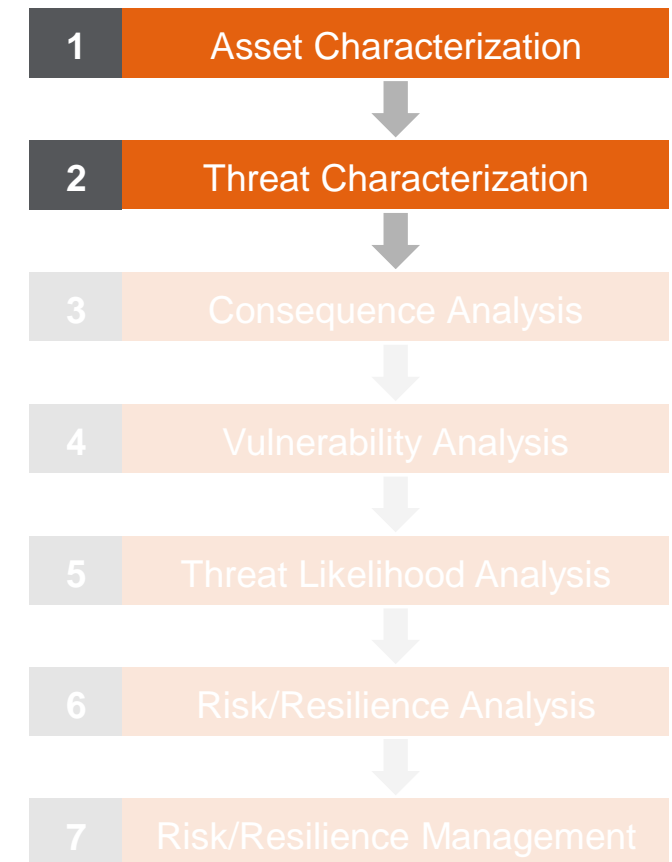
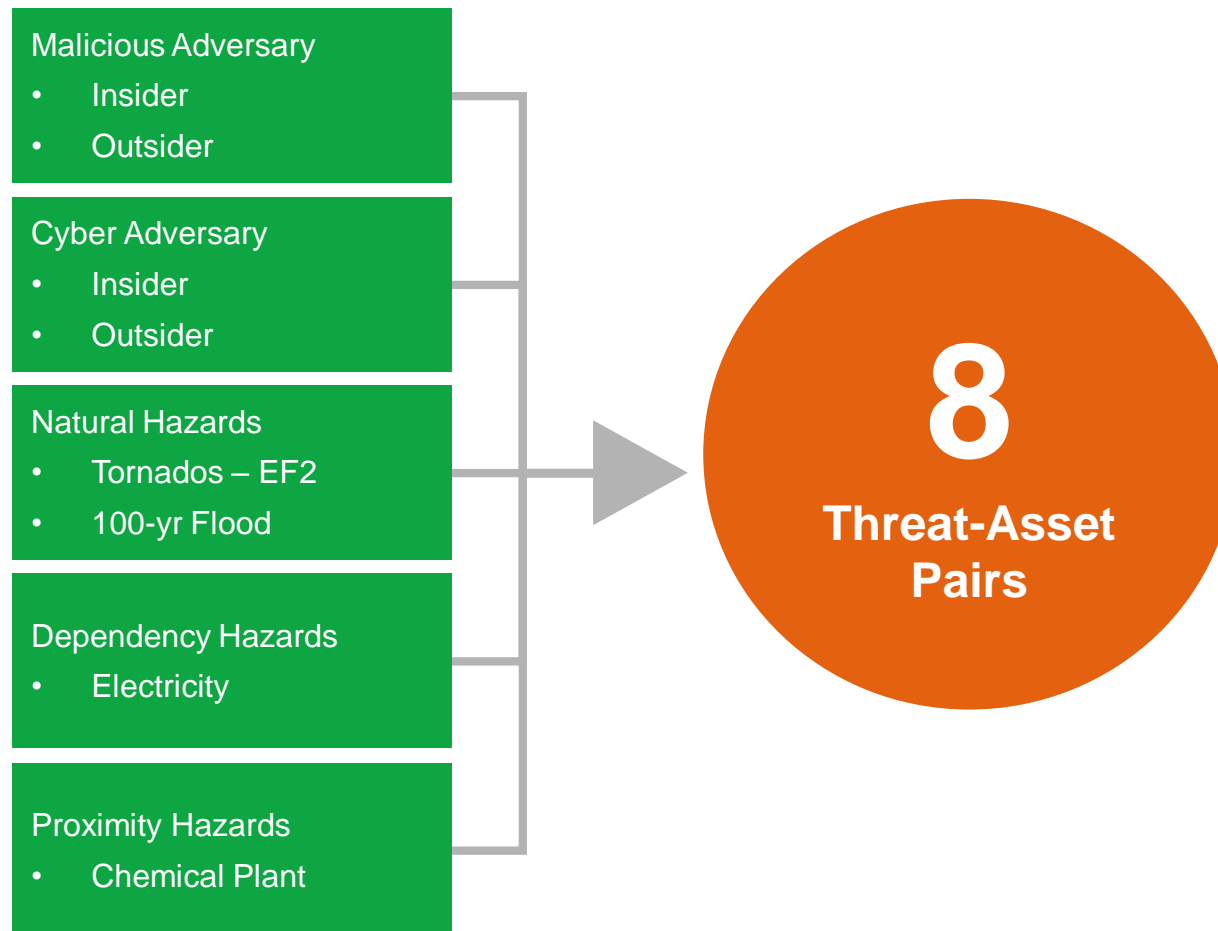


- Single Point of Failure = No Workaround
- Critical to Water Distribution
- 60 MGD Level of Service



Threat Characterization

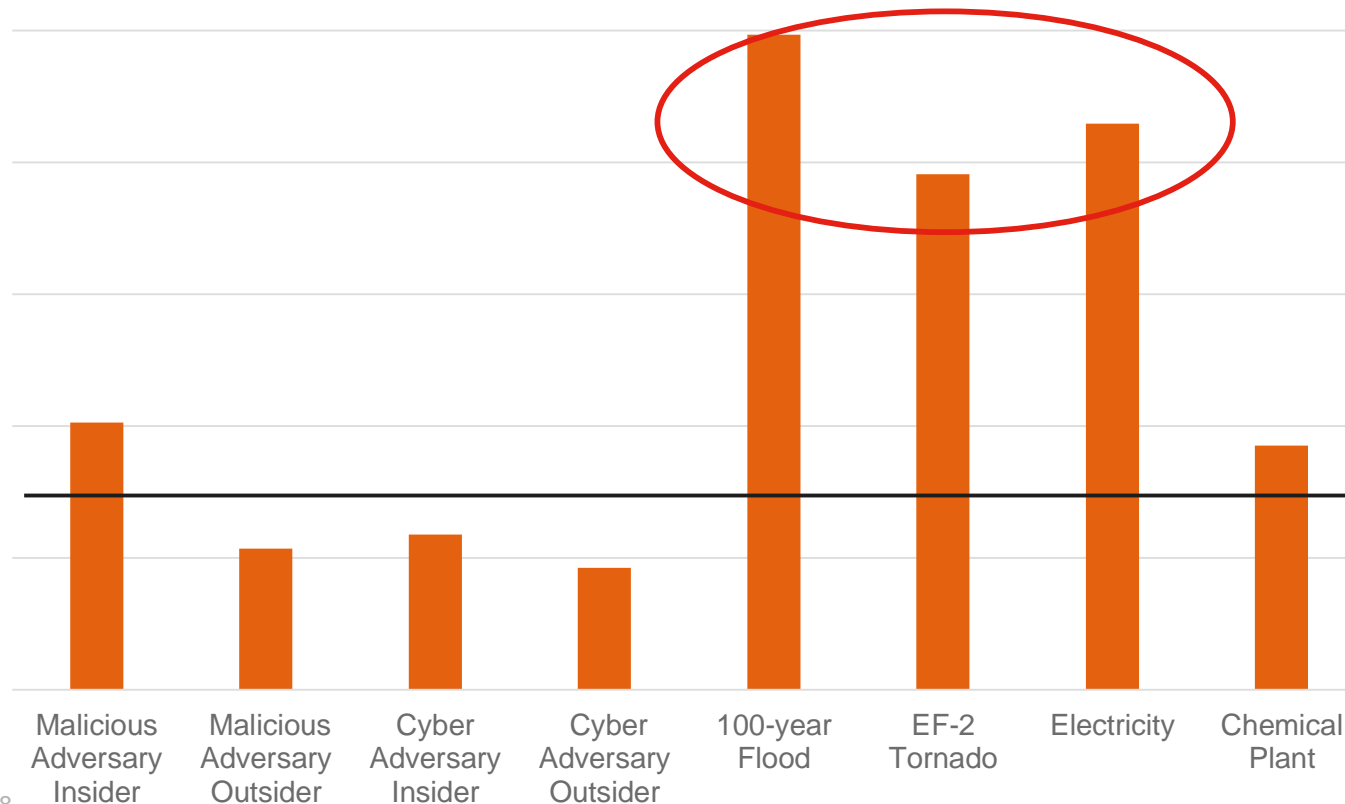
Identify All Relevant Threats to Pump Station 1



Risk Analysis

Risk = Consequence x Vulnerability x Threat Likelihood

Pump Station 1 Risk Profile



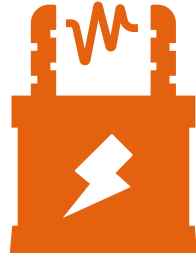
Risk/Resilience Management

Risk Mitigation Measure Project Development

FACILITY UPGRADES PROJECT



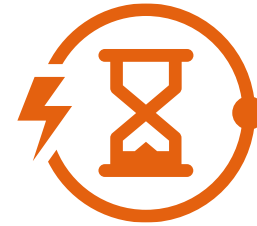
Flood –
Protection



Electricity -
Backup
Generator



Tornado -
Structural
Stability



Redundancy

TO PROTECT AGAINST INSIDER MALICIOUS ADVERSARY



Access
Control
on Doors



Unique
SCADA
Logins



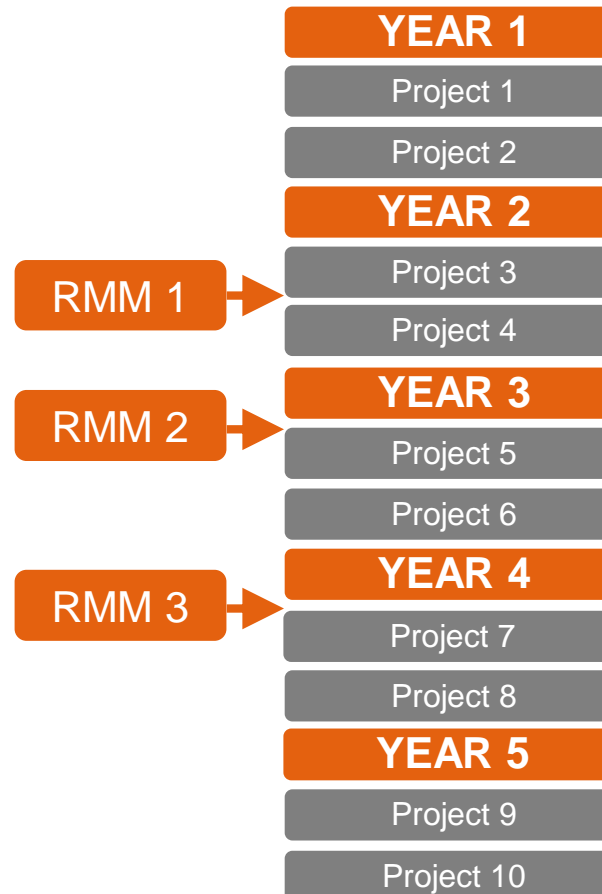
Cameras



Budget Planning

Risk Mitigation Measure Project Priorities

- 5-Year-CIP-Ready
- Synch w/ Asset Mgmt
- Prioritization:
 - Short-term/ Long-Term
 - % Risk Reduction
 - Benefit-Cost Analysis
 - Capital Cost
 - O&M Cost



Emergency Response Planning



Preparedness Cycle

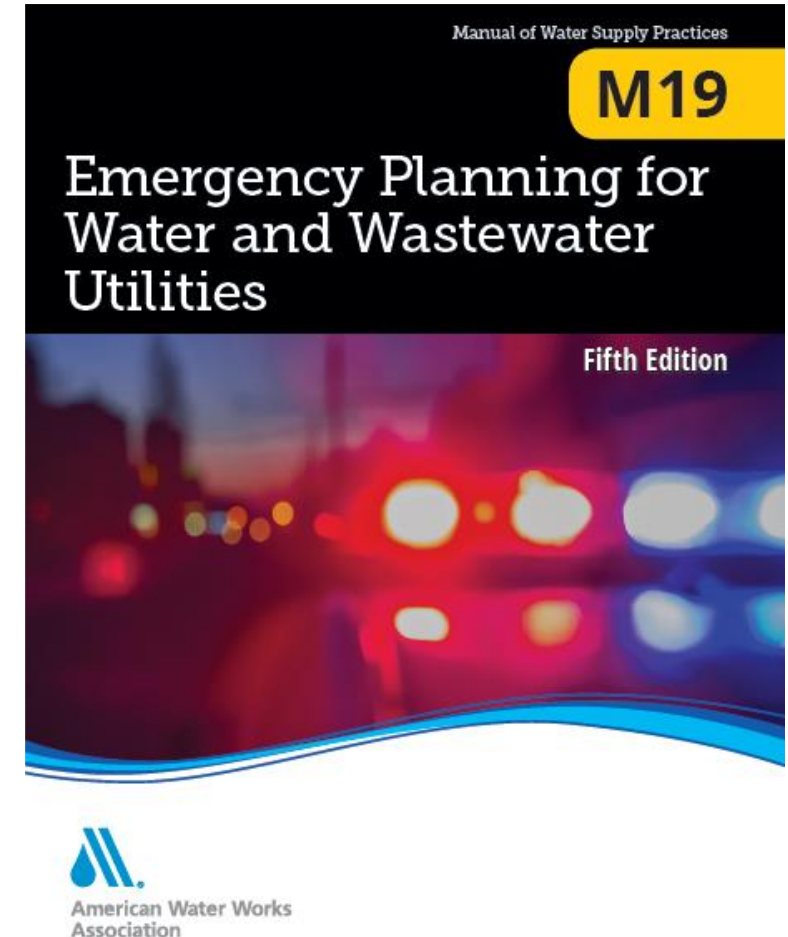


“ If you **fail** to prepare you
are **preparing** to fail”
- origin unknown

Plan
Organize/Equip
Train
Exercise
Evaluate

ANSI/AWWA M19 Components

- Preparedness Culture
- **Risk and Resilience Assessment**
- **Developing an Emergency Response Plan**
- Mutual Aid and Partnerships
- Internal and External Communications
- **Training and Exercises**
- Mitigation



Risk & Resilience Assessment Summary

Threats Identified



MALICIOUS

- Malicious Adversary Insider/Outsider
- Cyber Adversary Insider/Outsider
- Water Contamination



NATURAL HAZARDS

- 100-yr & 500-yr Floods
- Tornado/High Wind
- Winter Storm



DEPENDENCY

- Electricity
- Natural Gas
- Treatment Chemicals
- Department of Technology



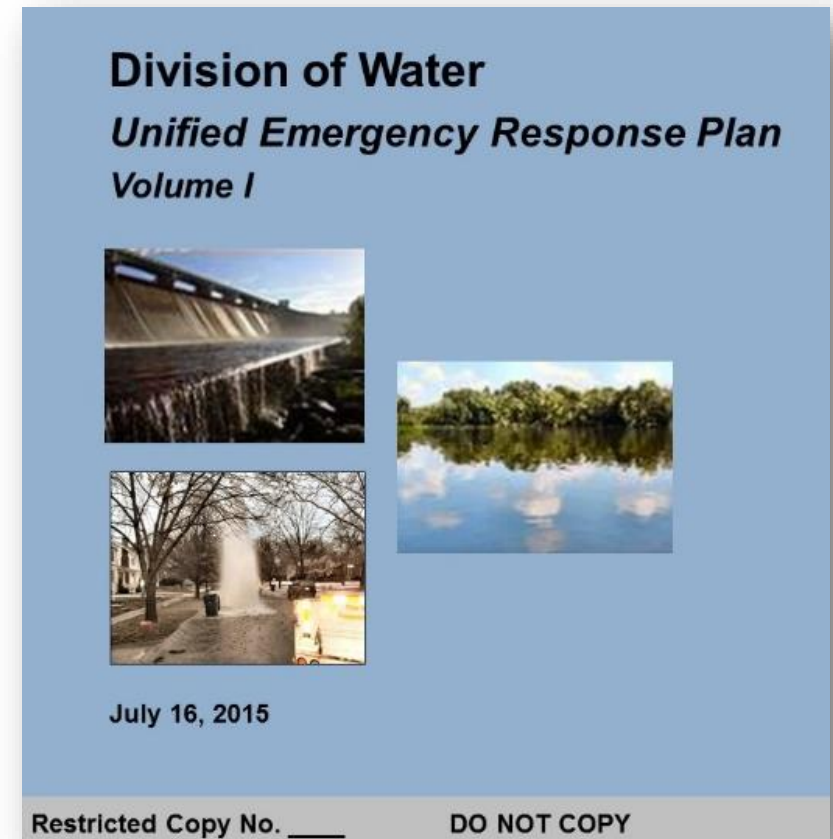
PROXIMITY

- Source Water Contamination

Emergency Response Plans

Purpose - To identify and support specific response actions to be taken during an emergency to:

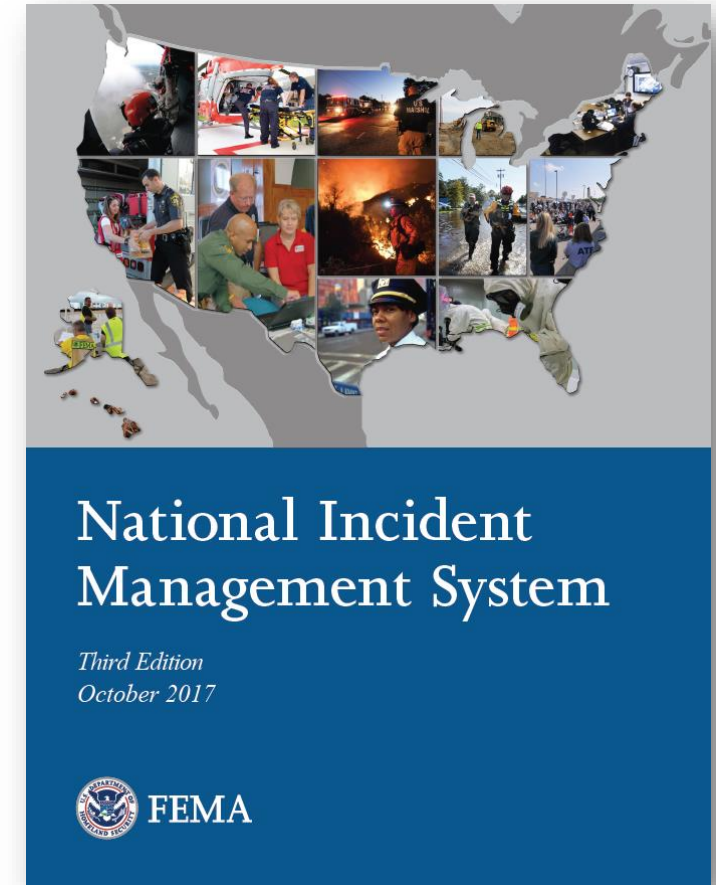
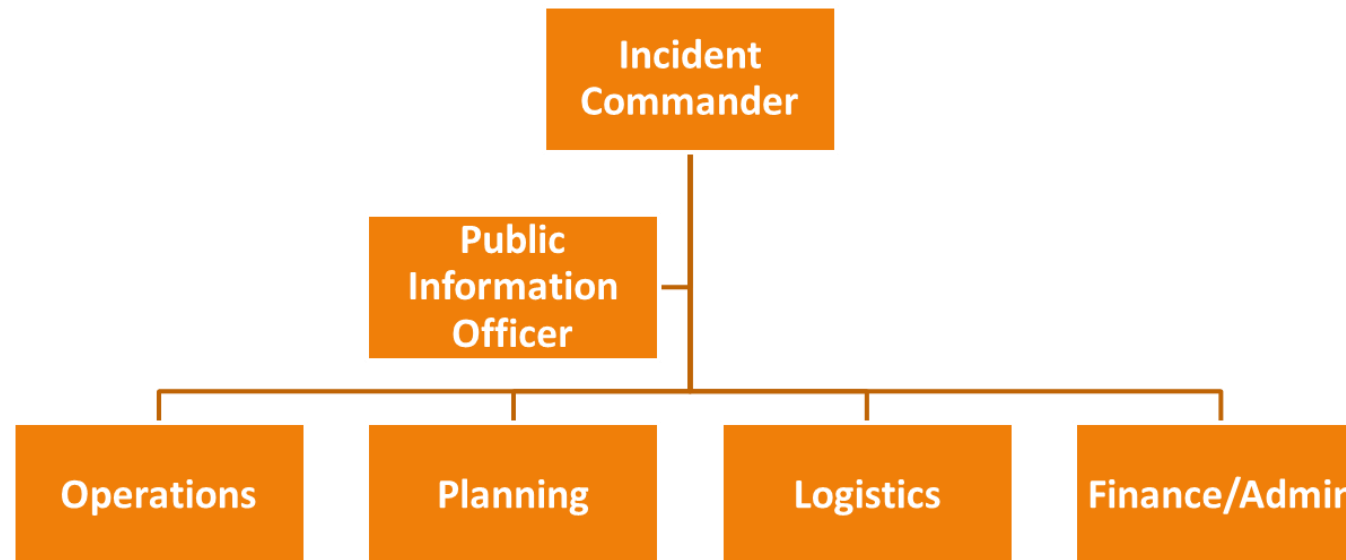
- Protect employees & public
- Preserve property
- Protect the environment
- Maintain operations & minimize disruption to the public



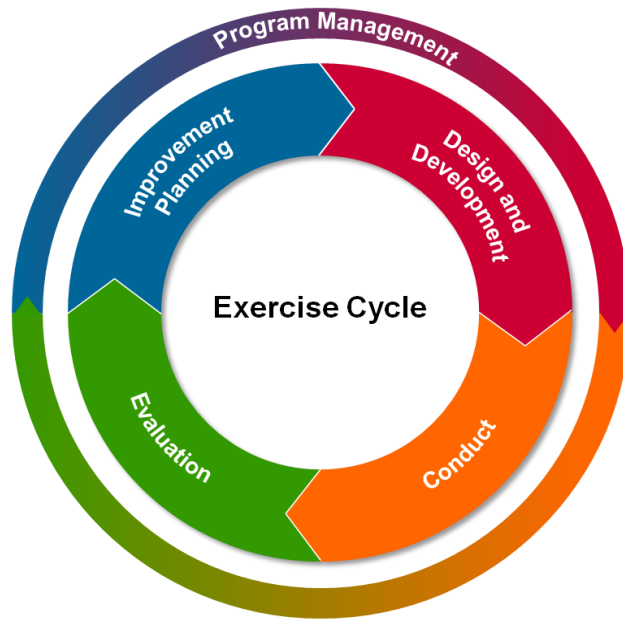
Unified & scalable approach, framework, communications

Response Plans: NIMS & ICS

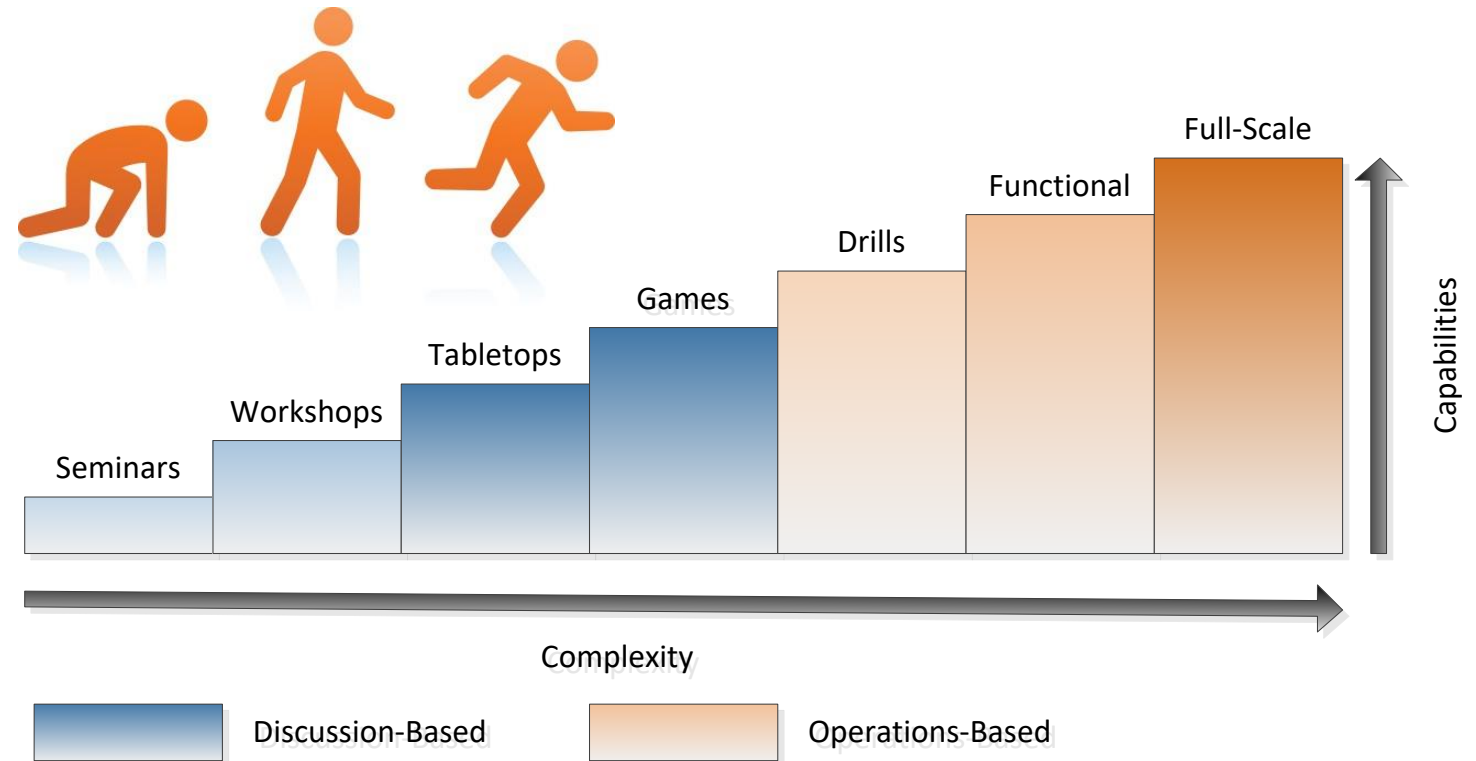
- Scalable, common framework
- Command & management structures
- Mutual aid & resources management



Multi-Year Training & Exercise Plan



HSEEP



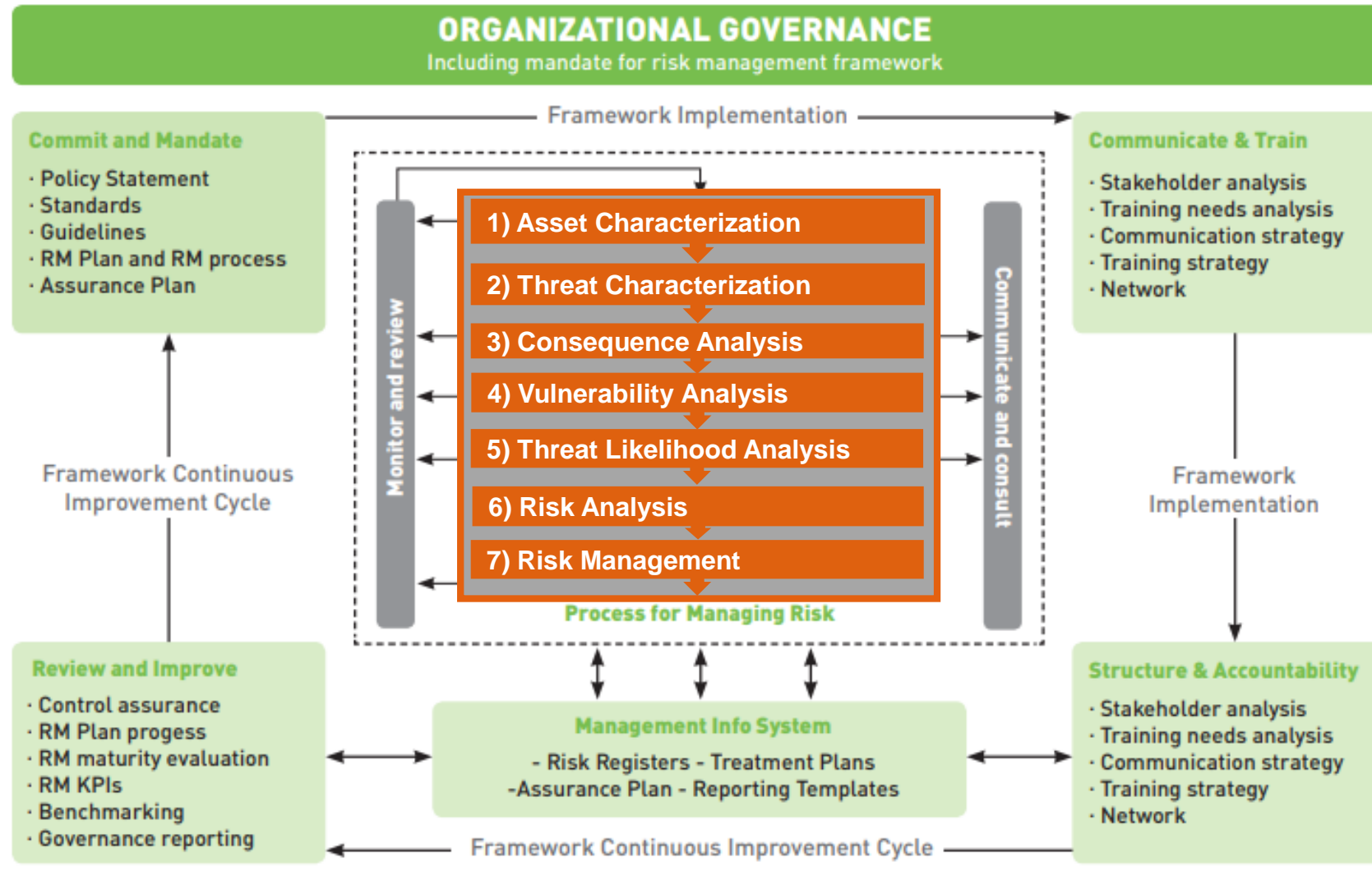
Crawl, Walk, Run

Enterprise Risk & Resilience Management

“Risk Mitigation is painful, not a natural act for humans to perform.”

– Gentry Lee
Chief Systems Engineer
U.S. National Aeronautics and Space Administration

ISO 31000 & J100



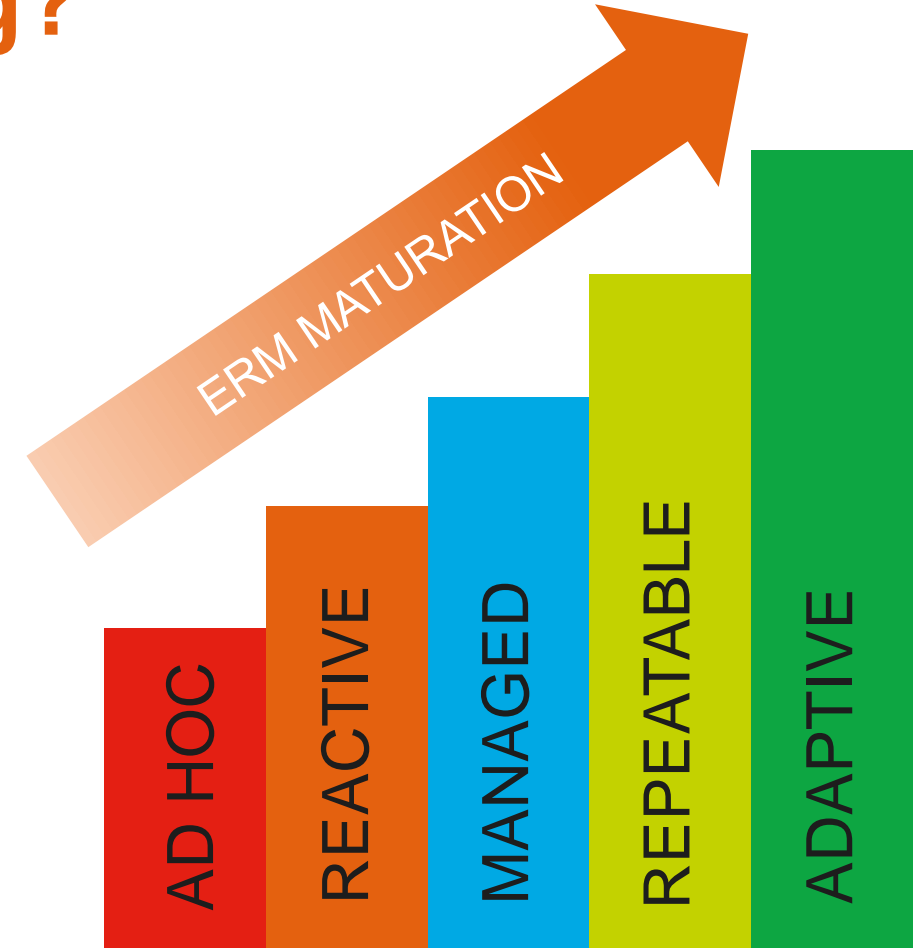
What do the Two Methods Bring?

ISO 31000 –

- Establishes an enterprise-wide framework
- Applicable to all aspects of the organization
- Not prescriptive on the methods to evaluate individual risks
- Opens up a broad internal dialogue about risks

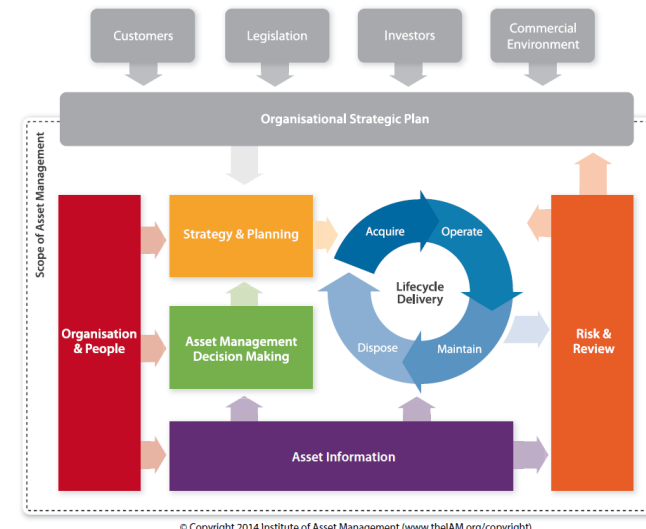
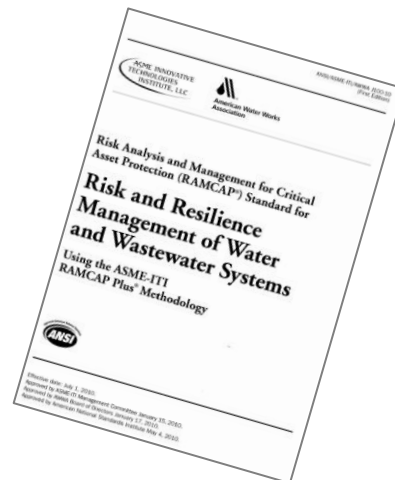
AWWA J100 –

- Water industry consensus standard and best practice
- Detailed all-hazards risk assessment method with extensive guidance on specific hazards/threats
- Adaptive to evaluate any type of any organizational risks

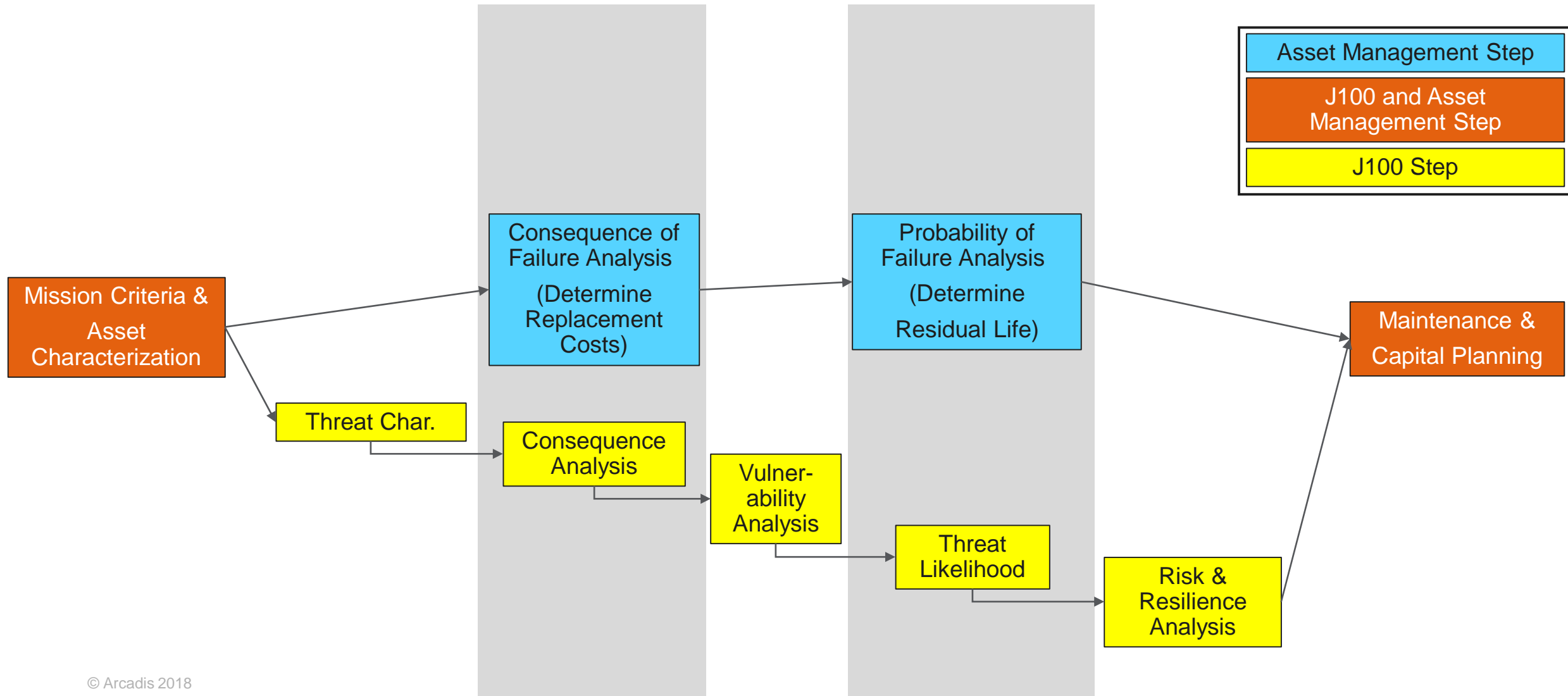


Asset Management & Resilience Integration – A Case Study

- Coastal water/wastewater client requested to integrate J100 into a new formalized asset management project
- Need a centralized asset management approach
- Need to account for J100 reference hazards/threats within the asset management process



Asset Management & Resilience Integration



Example Performance Criteria

Performance Condition Assessment						
Criteria	Evaluation	1 (best)	2	3	4	5
Resilience	Impacts at Flooding Recurrence Interval	Impact > 500-year flood	Impact < 500-year flood	Impact < 100-year flood	Impact < 25-year flood	Impact < 10-year flood
	Standby Power Availability	Standby power generation with >3 days of fuel reserves	Standby power generation with <3 days of fuel reserves	Mobile standby power with >1 day of fuel reserves	Mobile standby power with <1 day of fuel reserves	No backup power capabilities
	Primary Power Availability	More than 1 primary power feed, feeds coming from different substations	--	More than 1 primary power feed, feeds coming from same substation	--	Single primary power feed

Conclusions



A graphic of a checklist on a white background with an orange border. It contains five items, each with a checkbox and a horizontal line for text. The first three items have a checkmark in the checkbox, and the last two have an empty checkbox.

- ☒ _____
- ☒ _____
- ☒ _____
- ☐ _____
- ☐ _____

Closing Thoughts

- Utilities will have to continue to build resilience
- Use the consensus standards
- Integrate into other planning processes
- Be prepared to do it again in 5 years!

Get started sooner rather than later!

What Can Utilities Do Now to Prepare?

1

Start your Risk and Resilience Scorecard. Conduct a gap analysis to understand your utility's current risk profile and how your organization is already resilient before August 2019 to set your utility up for compliance.

Q. What assets are most important?

Q. What threats and hazards are relevant?

Q. What mitigation measures and countermeasures do you already have in place?

2

Leverage what you are already doing. Incorporate with ongoing planning efforts such as asset management or capital planning to facilitate five-year updates.

Q. Which ongoing planning efforts provide the best opportunity for integration?

Q. How up-to-date is your Emergency Response Plan?

Q. How are your relationships with other response agencies?

Q&A



Contact Information



CORINNE KETCHUM, PE, J100

Senior Risk & Resilience Consultant

o 914 641 2937
c 203 767 6680
e Corinne.Ketchum@arcadis.com



RYAN JOYCE, MBA

Senior Risk & Resilience Consultant

o 770 384 6506
e Ryan.Joyce@arcadis.com

Thank you!

