
SERPs Up! **Seismic Evaluation and Resiliency Planning**

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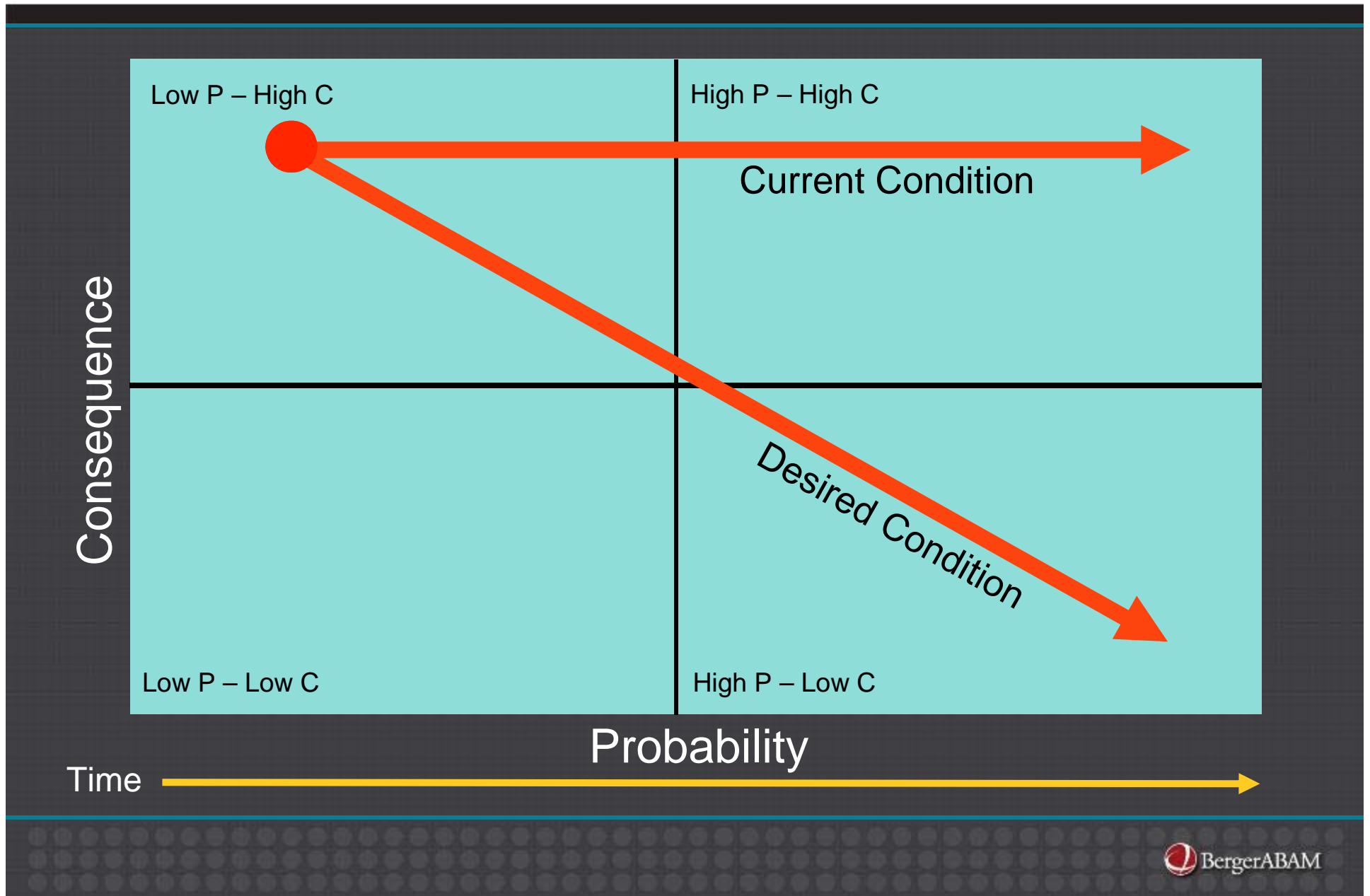
*“If we cannot control the volatile tides of change,
we can learn to build better boats.”*

- Resilience: Why Things Bounce Back

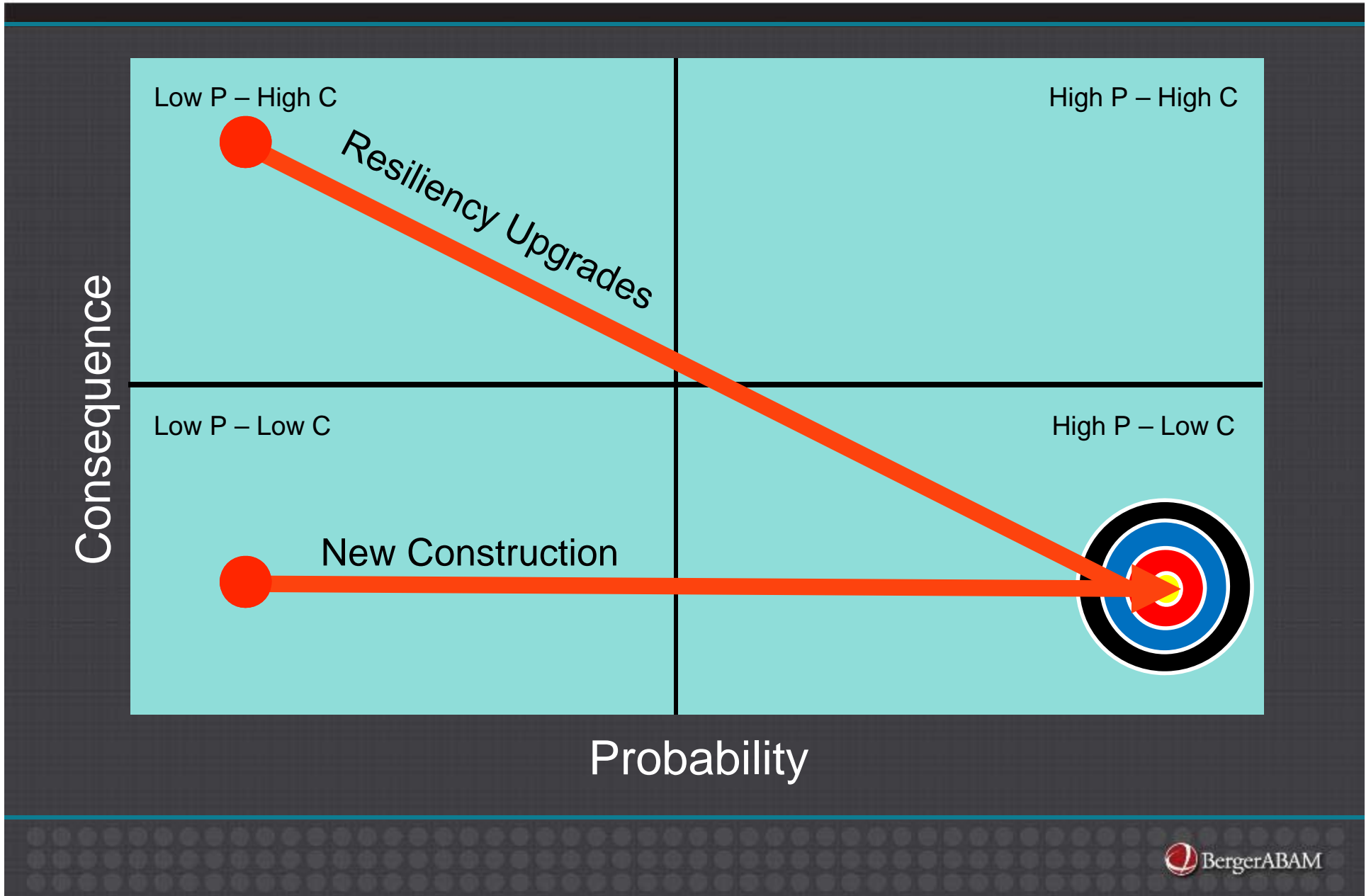
Let's Wrap Our Brains Around This

- Potentially, the most damaging natural disaster in U.S. history.
- A 50-year preparation horizon.
- We are in a statistical 300-year recurrence window.
- Could happen tomorrow, or not impact your family until your great, great, great, great, great, great, great, great, great, great-grandchildren.

The Elusive Low Probability – Low Consequence



Intersecting Efforts



Goals Before Planning, What's Your LOS Objective?

- Potable or non-potable?
- 1 day, 3 days, a week, a month?
- Critical facilities? 10%, 30%, 80%, 100%?
- For which seismic event are you preparing?

Expectations



Non-potable

1 month

10%

\$

Potable

1 day

100%

\$\$\$

Your 9.0 May Not Be My 9.0

*The ground motion prediction equations (GMPEs) provide **ground motion intensity as a function of the magnitude, distance, and rupture mechanism** of the earthquake. The intensity that a structure **experiences at any given location is significantly affected by local site conditions** which are often addressed through site amplification factors.*

(Nasseri, 2014)

Local vs CSZ Scenarios

Peak Ground Acceleration
Seismic Loads on Structures



Duration
Liquefaction
Landslides

Duration
Liquefaction
Landslides



Peak Ground Acceleration
Seismic Loads on Structures

Begin To Make It Real, and Eliminate Deniability

Asset	Pre-1960	1960-1990	1990-2000	Post-2000
Reservoir	Red	Red	Blue	Green
Transmission	Red	Red	Blue	Green
WTP	Red	Red	Blue	Green
Pump Station	Red	Red	Blue	Green

What's Your System's Prognosis?

- What are your top five critical assets?
- When were those assets last reinforced to seismic code?
- Do you know the geotechnical characteristics of the soils they are constructed on?

Haven't Been There, or Done That

- How long does it take your agency to implement a capital improvement under ideal conditions?
- How long will it take if there are hundreds of water utilities with the same need competing for the same resources?
- How cost-effective do you think an emergency replacement will be?
- When was the last time your staff functioned under a sustained regional natural disaster?

The Moment of Truth

How do you think your system measures up?

What is your responsibility for preparedness?

Does Your Reality Meet The Targets

ORP Recommended LOS		ORP Recommended Recovery Period																												
		Hours	Days		Weeks				Months																					
		24 Hrs.	1-3 Days	3-7 Days	1	2	3	4	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21		
Potable supply available at source	CS/Event	Red	Gold		Green	Green																								
Backbone assets operational		Green								Blue	Blue																			Red
Supply to critical facilities		Gold	Green								Blue	Blue																		Gold
Fire suppression at critical points		Green		Blue																										Green
Fire suppression at hydrants				Red	Gold	Gold	Green	Green							Blue	Blue	Blue	Blue	Blue	Blue										Blue
Water available at distribution centers			Gold	Green	Blue	Blue																								
Distribution system operational			Red	Gold	Green	Green									Blue	Blue	Blue	Blue	Blue	Blue										

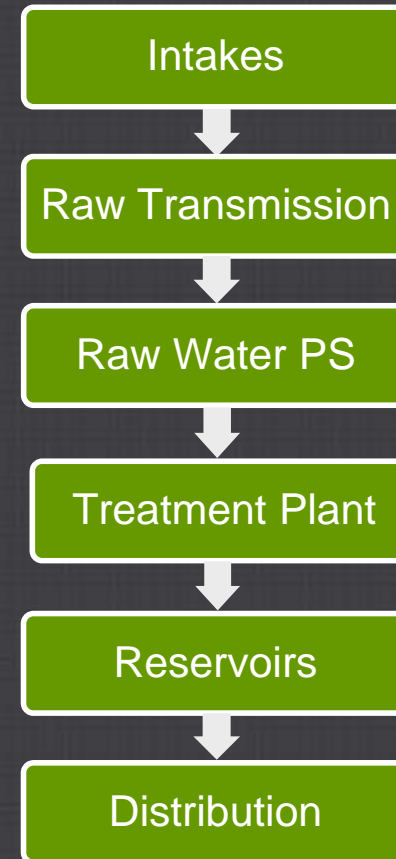
Red 20-30% Operational
 Gold 50-60% Operational
 Green 80-90% Operational
 Blue Pre-event operational level

Preparation = Resiliency = Recovery



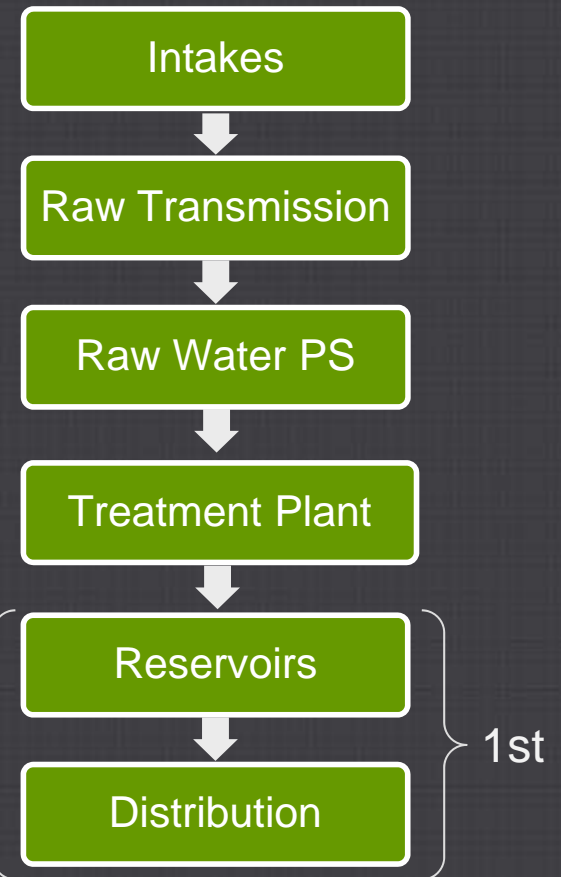
Backbone Assets and Considerations

- Level of service
- Remoteness of facilities
- Condition of facilities
- Interties
- Service agreements
- Geophysical hazards
- Design basis event
- Asset criticality
- Critical facilities



Backbone Assets and Priorities

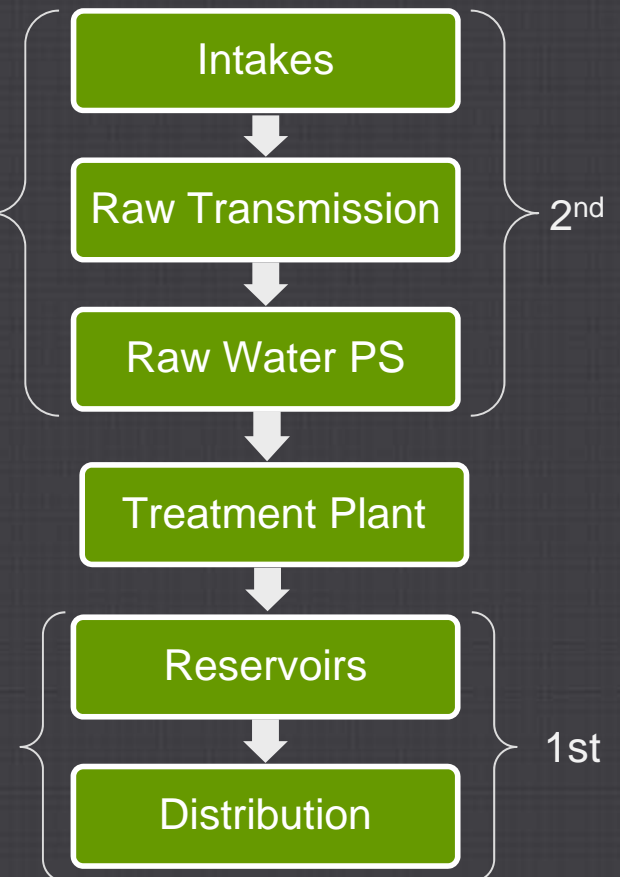
	CSZ Event	Hours	Days		Weeks			
		24 Hrs.	1-3 Days	3-7 Days	1	2	3	4
ORP Recommended LOS								
Potable supply available at source		Red	Yellow		Green			
Backbone assets operational		Green						
Supply to critical facilities		Yellow	Green					
Fire suppression at critical points		Green		Blue				
Fire suppression at hydrants				Red	Yellow	Green		
Water available at distribution centers			Yellow	Green	Blue			
Distribution system operational			Red	Yellow	Green			



Backbone Assets and Priorities

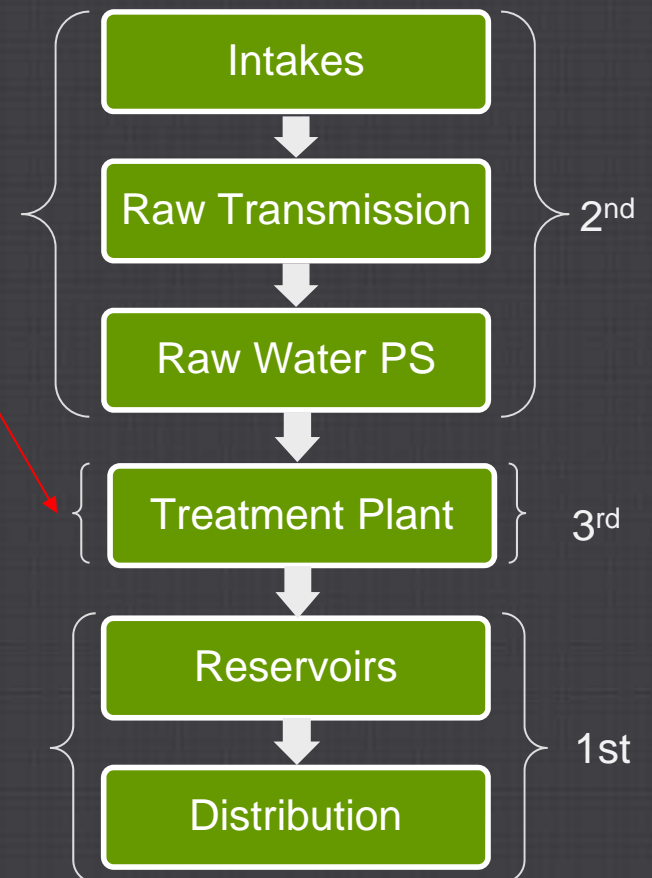
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Main System



Backbone Assets and Priorities

	CSZ Event	Hours	Days		Weeks			
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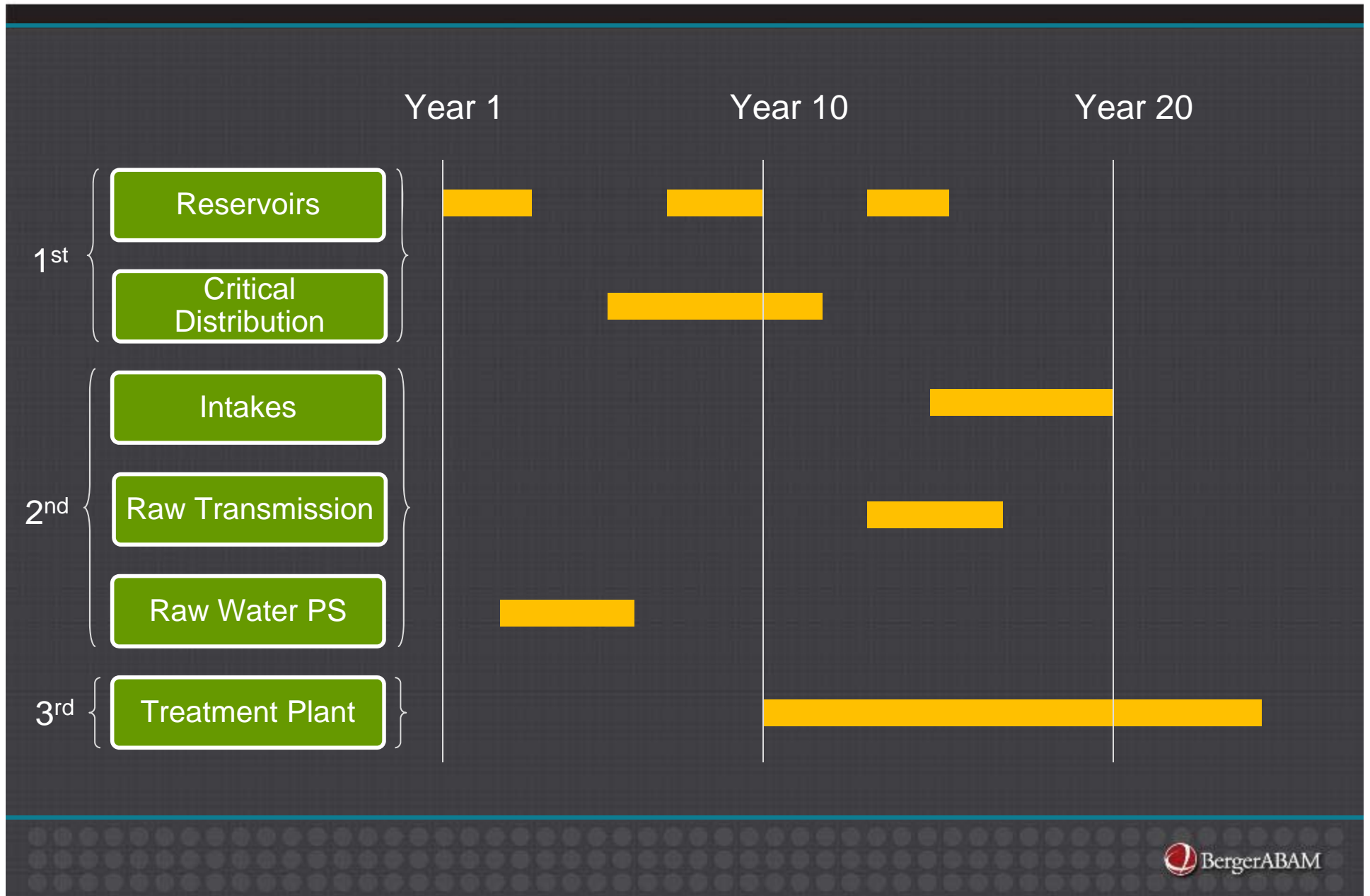


We Know What To Do, and How To Do It

*Achieve water system resiliency using **a phased approach** to harden backbone assets over a **50-year time frame** through **upgrading, retrofitting, or rebuilding** to withstand a Cascade Subduction Zone earthquake.*

- Oregon Resiliency Plan

The Goal – Resilient in 50



Diverse Expertise, One Team



Purpose of the SERP

- Document reasoning and decision processes.
- Establish a baseline for future decisions.
- Communicate the hazards, vulnerabilities, and consequences.
- Provide documentation for planners of other lifeline networks.
- Communicate with local government officials, public, and stakeholders.
- Provide data, a plan, budget, and time line for resiliency.
- Communicate and manage expectations.

The Challenges of Resiliency Improvements

- Non-LOS asset improvements
- “Selling” generational responsibility
- Impact to CIP programs and rate setting
- Taking on debt to address a “someday” event
- Lack of funding sources
- Apparent lack of commitment to improvements

Need Action? Know The Motivator



Balance Gets You to The Destination



The SERP PE³ Philosophy

Once thought unimaginable, now considered inevitable.

Resiliency will require a commitment to:

Planning

Execution

Education

Expectation management

Step One

Got a Plan?

It Is What It Is

You can avoid reality, but you can't avoid the consequences of avoiding reality.

- Ayn Rand

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Questions?

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