



**WATER SUPPLY
FORUM**

Serving Snohomish, King & Pierce Counties

Resiliency Project

20th Anniversary Celebration
Moving the Region
Forward Together

March 25 | 2019

H₂O

Water Supply Forum

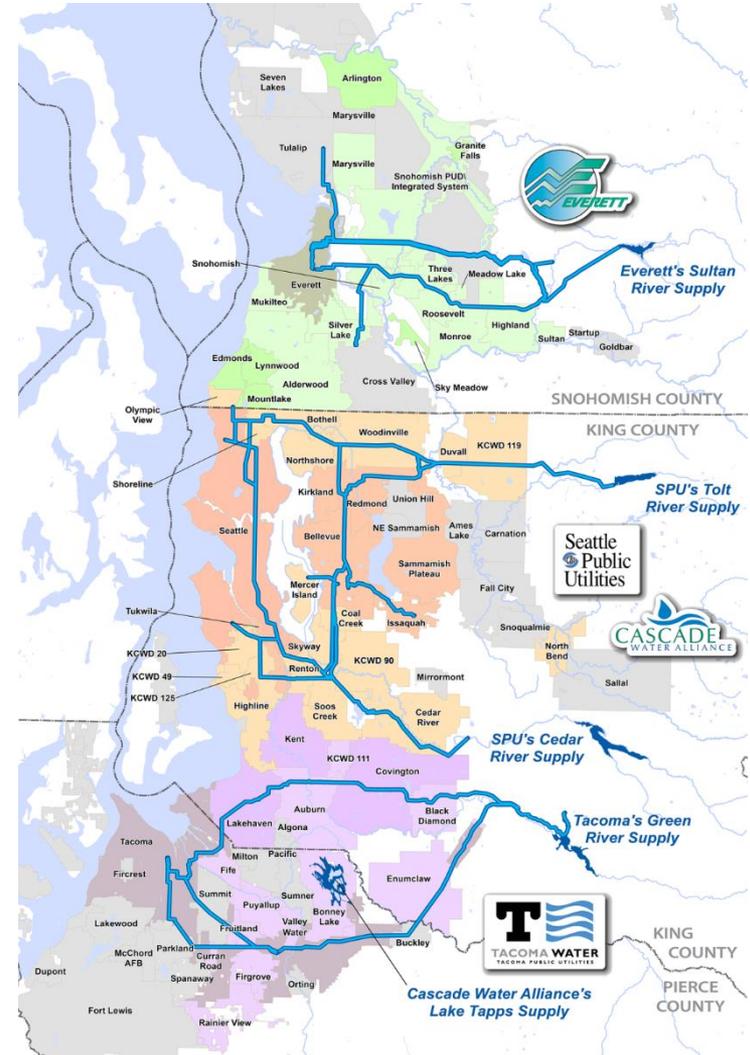
VISION

Provide leadership, from the utility perspective, on current and future regional water supply and related water resources issues in King, Pierce and Snohomish counties.

MISSION

Provide a venue for policy discussions on critical water supply and stewardship issues while sharing utility perspectives and insights with regional stakeholders.

The Forum provides members and the public with a portal for water supply and related water resource issues.



Natural Disasters by the Numbers

H₂O

Hurricane Katrina (New Orleans) 2005

- Nearly 2,000 fatalities
- Over 100,000 homes destroyed
- 80% of the city flooded
- \$140 billion in economic losses
- Pre-Katrina population – 483,000
- Post-Katrina population - +/- 200,000
- Current population (2018) – 417,000



Hurricane Sandy (New Jersey / New York) 2012

- More than 150 fatalities
- 650,000 buildings damaged or destroyed
- More than \$70 billion in economic losses
- 8 million homes lost power



Breezy Point, 80 homes

Hurricane Harvey (Houston) 2017

- More than 100 fatalities
- More than 8 million people experienced flooding impacts
- More than \$125 billion in economic losses
- A year's worth of rain in three days



DAVID J. PHILLIPS/AP

Caption?

Optimism Bias

This is the belief that each of us is more likely to experience good outcomes and less likely to experience bad outcomes. The key to optimism bias is that we disregard the reality of an overall situation because we think we are excluded from the potential negative effects.

Kobe Earthquake (Japan) 1995

- More than 6,000 deaths
- More than 30,000 injuries
- More than 150,000 buildings destroyed
- More than 300,000 people homeless
- About \$200 billion in economic losses
- Over 60 days to restore water delivery to 90% of population



109 fires in Kobe

Chile 2010

- Almost 800 fatalities
- 500,000 buildings destroyed
- 93% of country experienced a blackout
- \$30 billion in economic losses



The question is not whether infrastructure will fail.

It will fail!

The question is *“How long will it take to recover once it does fail?”*

That’s what the Forum tackled!

Forum Resiliency Overview

1. Resiliency project context and objective
2. Scope and Focus of Resiliency Project
3. Phase 1 Findings
4. Phase 2 Findings
5. What's next?

H₂O

Context and Objectives

1. Proactively evaluate and enhance region's water supply system resiliency
2. Improve resiliency within and across utilities service areas
3. Develop short-term and medium to long-term action items
4. Communicate and educate stakeholders and funding agencies

Context and Objectives (cont.)

1. Engage emergency responders in local, County, State and Federal level.
2. Duty and responsibility to take action
3. Tackle elephant in small pieces
4. Cost of implementing action steps

Scope and Focus

Four Major Scope Areas and Risk Teams

1. Earthquake
2. Water Quality
3. Drought
4. Climate Change

Risk Teams assigned to tackle each – Forum partners will report back on Phase 1,2 and next steps

Resiliency Project Phase I Overview

Preparing for Water Supply Disruption



EARTHQUAKE



WATER QUALITY



CLIMATE CHANGE



DROUGHT

EARTHQUAKE RESILIENCY

Cascadia Subduction Zone

ANNALS OF SEISMOLOGY JULY 20, 2015 ISSUE

THE REALLY BIG ONE

An earthquake will destroy a sizable portion of the coastal Northwest. The question is when.



By Kathryn Schulz



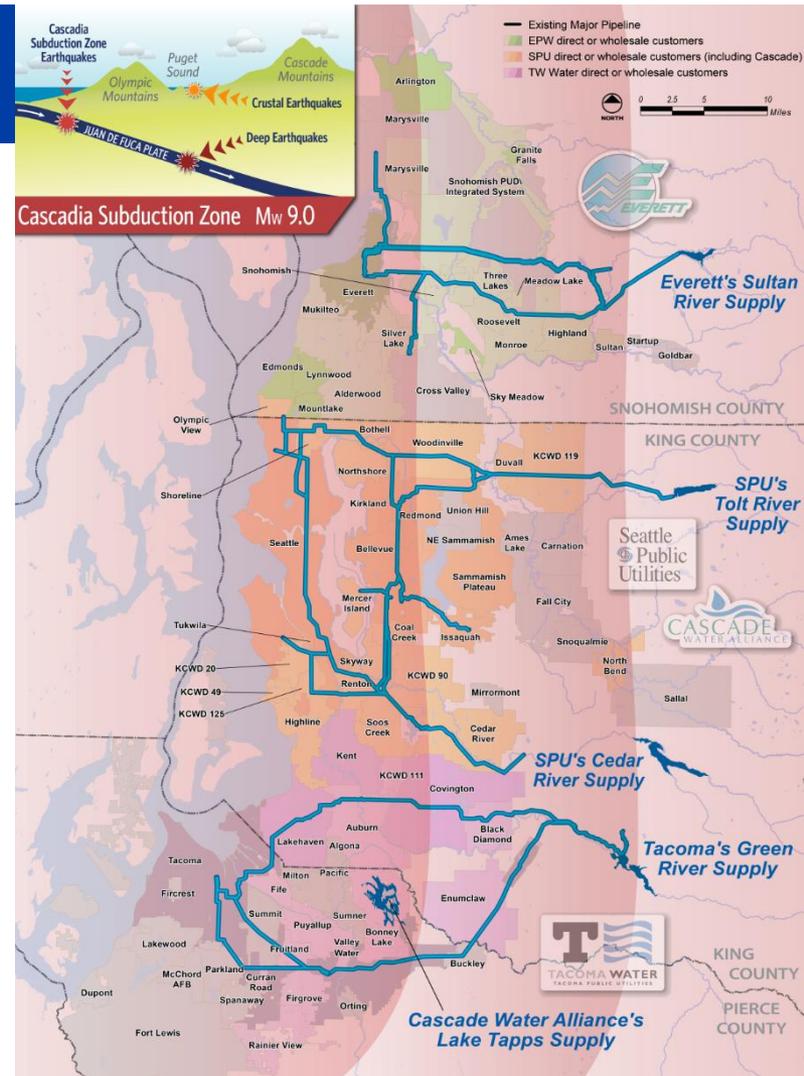
When the 2011 earthquake and tsunami struck Tohoku, Japan, Chris Goldfinger was two hundred miles away, in the city of Kashiwa, at an international meeting on seismology. As the shaking started, everyone in the room began to laugh. Earthquakes are common in Japan—that one was the third of the week—and the participants were, after all, at a seismology conference. Then everyone in the room checked the time.

Seismologists know that how long an earthquake lasts is a decent proxy for its magnitude. The 1989 earthquake in Loma



The next full-margin rupture of the Cascadia subduction zone will spell the worst natural disaster in the history of the continent.

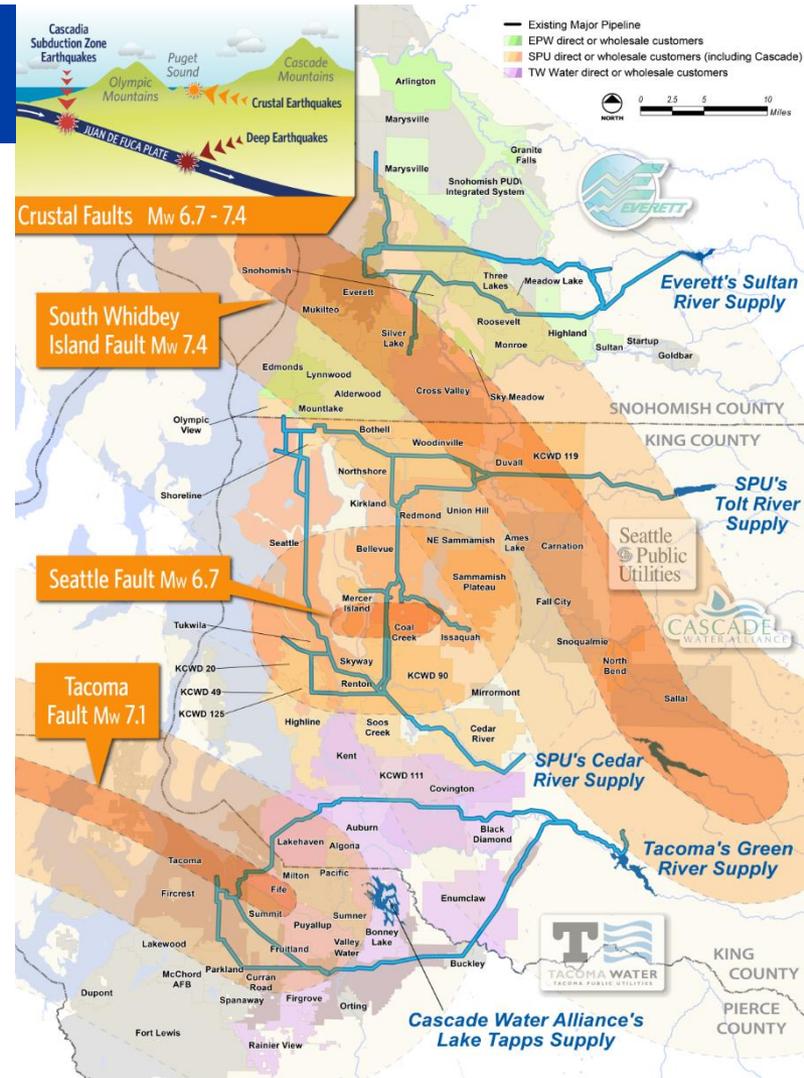
Illustration by Christoph Niemann; Map



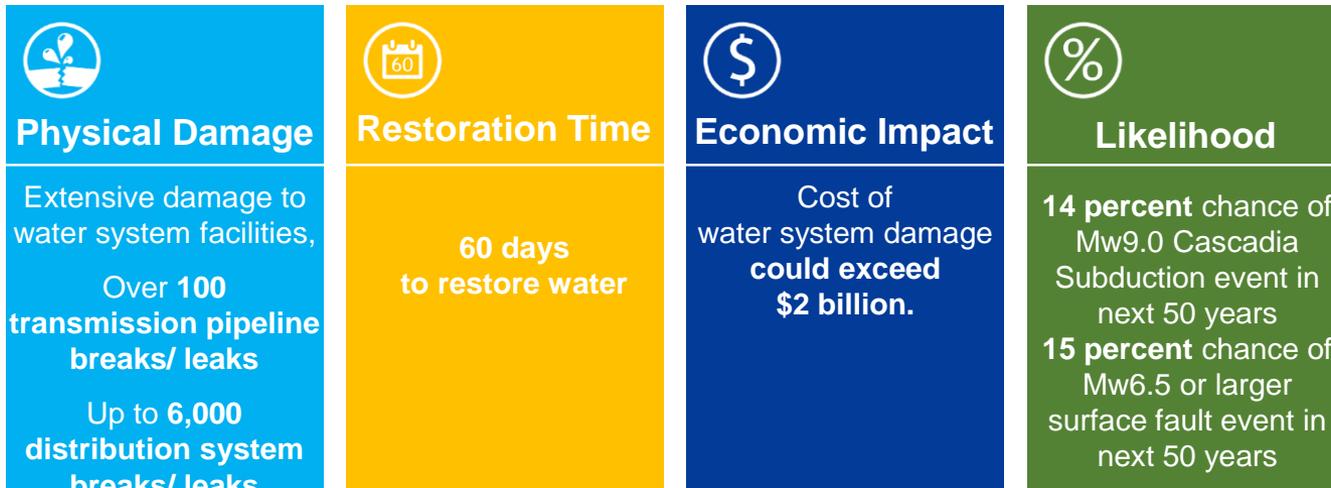
EARTHQUAKE RESILIENCY

SURFACE FAULTS:

- South Whidbey Island Fault
- Seattle Fault
- Tacoma Fault



EARTHQUAKE RESILIENCY



WATER QUALITY RESILIENCY



WATER QUALITY RESILIENCY

- Wildfire Impacts
- Volcanic Eruption Impacts
- Supply Chain Disruption
- Accidental Contamination
- Severe Adverse Weather
- Earthquakes



DROUGHT RESILIENCY

Surface Water Assessment

- Historical drought scenario
- Extreme drought scenario

Groundwater Assessment

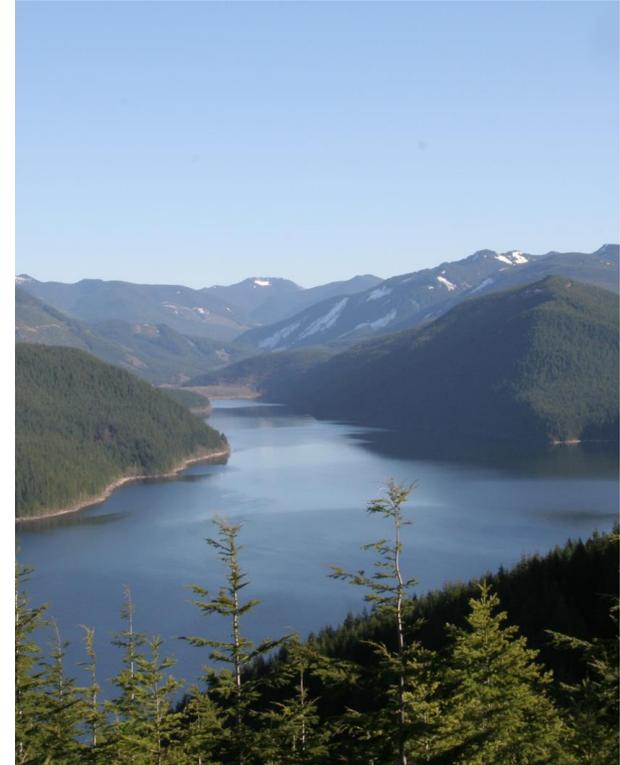
- Aquifer susceptibility
- Potential mitigation options

Drought Survey

- Surveyed 45 water utilities in the central Puget Sound region

CLIMATE CHANGE RESILIENCY

- Surface Water Assessment
- Groundwater Assessment
- Climate Migration Study
- Water Quality Literature Review
- Wildfire Assessment



CLIMATE CHANGE RESILIENCY

Surface Water

- Water availability may be significantly reduced
- Impacts to surface water will be similar throughout the region

Groundwater Resources

- Less risk to groundwater resources
- Sea level rise poses little or no risk

Climate migration

is unlikely

Water quality

will be degraded

Likelihood

frequency will increase

Resiliency Project Phase II Overview



EARTHQUAKE



WATER QUALITY



CLIMATE CHANGE



EMERGENCY
SUPPLY



LIFELINE
SECTORS



ACTION PLAN

EARTHQUAKE RISK

Post-Event LOS

- Time to restore services
- Earthquake type (i.e., crustal vs. CSZ)
- Planning horizon (20 years vs. 50 years)
- Funding level (basic, moderate, aggressive)

Preparedness & Response

- Transmission line repair materials
- Access to specialized personnel
- Tanker truck availability for emergency supply

Mitigation Strategies

- Isolation of vulnerable areas
- Seismic retrofit and replacement of vulnerable pipe

WATER QUALITY RISK

“Break-the-System”

Wildfire Impacts
Supply Chain Disruption
Severe Adverse Weather

Volcanic Eruption Impacts
Accidental Contamination
Earthquakes

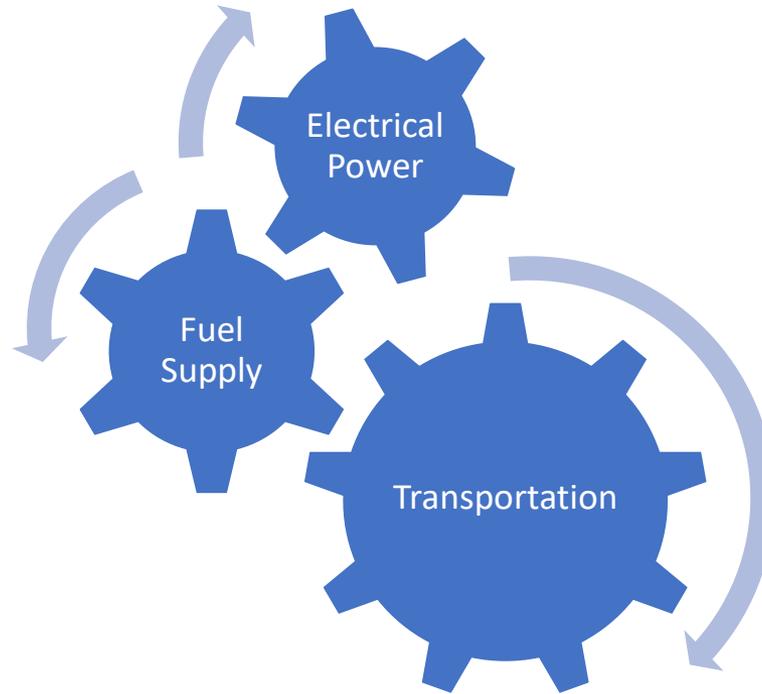


Template for Utilities Restoring Potability



Emergency Communications Planning Template

Coordination with Other Lifeline Services



EMERGENCY SHORT-TERM WATER SUPPLIES

Critical Needs

- Fire Flows
- Hospitals
- Vulnerable Populations
- Domestic Needs

Alternative Supplies

- Bottled water deliveries
- Public and private wells
- Tanker trucks and bladders
- Public utility reservoirs
- Rivers, lakes, and seawater
- Truck- or ship-mounted filtration plant

Utility Roles and Coordination with
Emergency Response Entities
(Held March 7 at Bellevue City Hall)

Mapping of Emergency Wells

CLIMATE CHANGE RISK

Do's and Don'ts for Using Climate Science



- When designing a study



- When selecting models



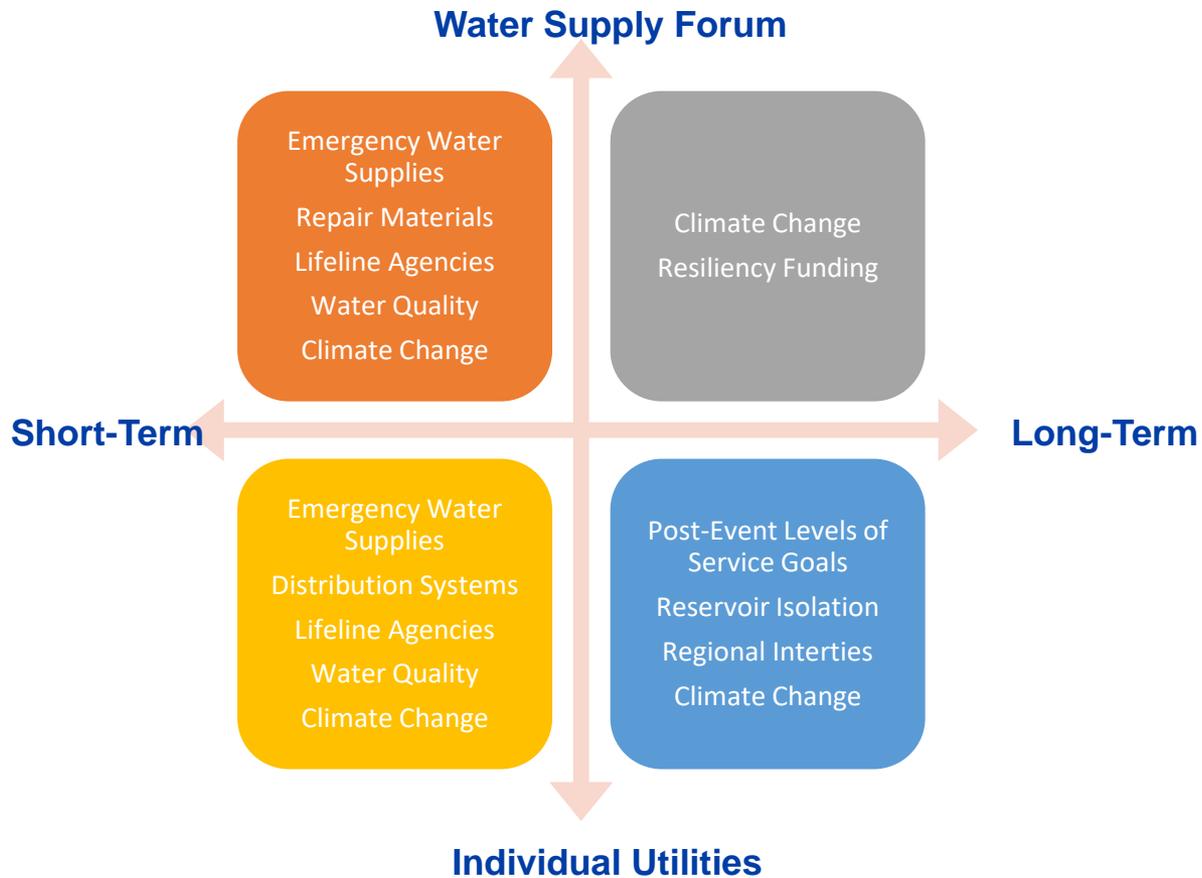
- When interpreting climate change data



The screenshot shows a webpage header for 'RAL' (Regional Assessment Laboratory) with navigation links for 'ABOUT', 'HOW AND WHERE', and 'FOUNDATIONS'. The main content is titled 'Study Design' and lists ten items:

- DO recognize benefits that go beyond climate change preparedness
- DO start by determining the level of detail that fits your need and resources
- DON'T start from scratch, leverage the work and expertise of others
- DON'T wait to decide evaluation criteria for assessing climate impacts
- DO identify major uncertainties that impact your decision and assess their magnitude
- DON'T expect every question is answerable with currently available models and datasets
- DON'T wait until new info is available, there will always be new research coming soon
- DO plan for iterations as the first time you download climate data shouldn't be your last
- DO be aware of multiple ways to evaluate future change

Action Plan



On the Web <https://www.watersupplyforum.org/home/resiliency.html>

RESILIENCY

A water utility's resiliency - the ability to provide an uninterrupted supply of safe, clean water - can be affected by natural occurrences such as earthquakes, drought, climate change and water quality conditions. The Water Supply Forum has embarked on a project to help water utilities in King, Pierce and Snohomish counties proactively evaluate the region's existing water supply systems resiliency and plan for potential water supply disruptions.

Phase 1 of this project was done in 2015-16, identifying key risks to water supply. These included risks related to earthquakes, climate change, drought, and threats to water quality that could have regional impact. Phase 2 was completed in 2018 and features more in-depth study of key topics, focusing largely on earthquake risks. Additional detailed information on appropriate approaches to climate change modeling, and response to water quality risks was also developed. The findings for both phases are listed to the right.

PHASE 1 FINDINGS

- [Regional Water Supply Resiliency Project: Summary Report](#)
- [Climate Change Resiliency Technical Memorandum](#)
- [Earthquake Vulnerability Assessment Technical Memorandum](#)
- [Drought Resiliency Assessment Technical Memorandum](#)
- [Water Quality Assessment Technical Memorandum](#)
- [Resiliency: Preparing for Water Supply Disruption brochure](#)

PHASE 2 FINDINGS

- [Regional Water Supply Resiliency Project: Phase 2 Summary Report](#)
- [Appendix A - PE-LOS and Mitigation Measure Assessment](#)
- [Appendix B - Transmission Line Repair Materials for Earthquake Damage](#)
- [Appendix C - Specialized Personnel Database](#)
- [Appendix D - Tanker Truck Availability for Emergency Water Supply](#)
- [Appendix E - Mitigation Strategies for Earthquake Damage to Water Distribution Systems](#)
- [Appendix F - Break the System Analysis](#)
- [Appendix G - Guideline for Restoring Potable Water Service to Regional Infrastructure](#)
- [Appendix H - Emergency Communications Planning Template](#)
- [Appendix I - Climate Change Workshop](#)
- [Appendix J - Short-term Emergency Supply Options Following an Earthquake](#)
- [Appendix K - Mapping of Emergency Supply Wells](#)
- [Appendix L - Coordination with Emergency Response Agencies for Water Delivery](#)
- [Appendix M - Lifeline Sector Coordination](#)
- [Emergency Wells: Cascade | EPW | SPU | TPU](#)