

Seattle Public Utilities Seismic Study Summary

Civil Rights, Utilities, Economic Development & Arts Committee
January 25, 2019

Presentation Outline

- Seismic Program and Background
- Seismic Hazards
- Study Findings
- Mitigation Recommendations



SPU Seismic Program

- 30-year history; first seismic study in 1990
- \$100 million in seismic investments to date
- Pathway to building a more resilient drinking water system
- Part of SPU's Resiliency Framework
- Seismic projects part of overall capital budget
- Seismic planning citywide effort

Importance of Post-Earthquake Water Supply

- Fire Fighting
- Public Health
- Economic Prosperity



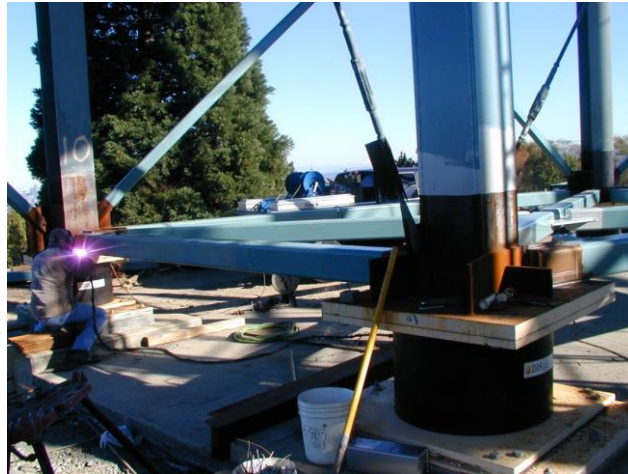
Seismic Hazards - Recent Earthquakes

	Year	Magnitude	Impacts
Loma Prieta, Bay Area	1989	6.9	Water outages mostly less than a few days; fire suppression water was an issue
Northridge, So. Cal	1994	6.7	Over 100 fires; water system damage mostly in poor soil areas; outage: 8 to 13+ days
Kobe, Japan	1995	6.9	109 fires immediately after earthquake (another 88 in surrounding cities); 60+ days to restore service
Christchurch, NZ*	2011	6.2	45+ days to restore service
Tohoku, Japan*	2011	9.0	345 fires; 45+ days to restore service

*15%-20% chance of a Christchurch-like or Tohoku-like type event in Seattle in next 50 years

SPU Seismic Mitigation Program History

- Seismic studies in 1990, 2018
- Seismic upgrades per recommendations



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SEISMIC RELIABILITY STUDY OF THE
SEATTLE WATER DEPARTMENTS
WATER SUPPLY SYSTEM

Prepared for:

Seattle Water Department
Dexter Horton Building
710-2nd Avenue
Seattle, Washington 98104

Prepared by: Ronald M. Polivka 2/6/90
Ronald M. Polivka Date

Cynga Energy Services
2121 N. California Blvd.
Walnut Creek, California 94596



February 6, 1990

New Developments since 19

- Seattle Fault Zone, Cascadia Subduction Zone
- Earthquake experience (e.g., Northridge, Japanese, Chilean and New Zealand events)
- Potential for mass availability of earthquake-resistant pipe in U.S.



Seismic Vulnerability Assessment , Goals

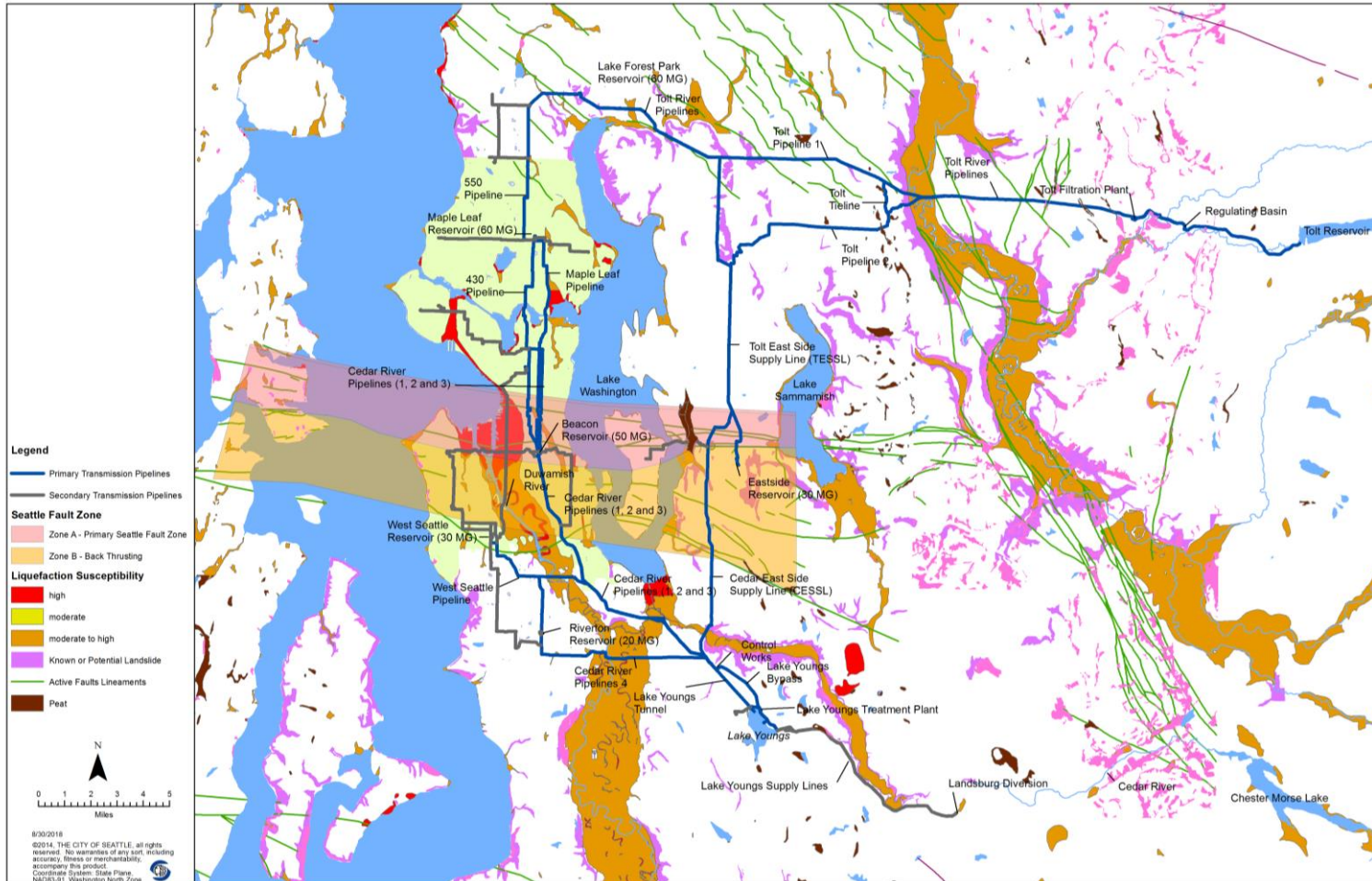
- Seismic vulnerability assessments for water system facilities
- Hydraulic modeling of post-earthquake performance
- Establish post-earthquake performance goals
- Develop planning level mitigation measures, cost estimates and schedule
- Define seismic design standards for water transmission and distribution pipelines

Seattle Earthquake Likelihood in 50 Years

- 15% to 20% chance of catastrophic earthquake, similar to 2011 Christchurch or Tohoku earthquakes
- 85% chance of at least one intraplate earthquake “similar” to the 2001 Nisqually earthquake



SPU Water System Seismic Hazard Map



Earthquake Vulnerability Assessment

- Loss of Cedar and Tolt transmission systems likely
- Loss of Eastside Supply Line likely
- Distribution pipeline failures
 - M7 SFZ Scenario: \pm 2000 failures
 - M9 CSZ Scenario: \pm 1400 failures
- Most terminal reservoirs remain functional
- Loss of over one dozen critical facilities
- Loss of water pressure throughout direct service area within \pm 24 hours

Mitigation Approach – Next 15 to 20 Years

- Enhance emergency preparedness and response planning
 - Earthquake-specific response plan
 - Significantly augment pipeline repair material stocks
 - Assess adequacy/improve emergency drinking water
- Develop/implement isolation and control strategies
 - Reservoir isolation valves
 - Explore isolating areas of large amounts of pipe damage
 - Add valves to make isolation easier
- Keep Roosevelt and Volunteer as non-potable emergency storage

Mitigation Approach – Next 50-Plus Years

- Build it right
 - Use earthquake-resistant pipe when pipe is replaced
 - Design new facilities to remain functional
- Upgrade vulnerable critical facilities
 - Most vulnerable transmission pipelines locations
 - Critical facilities

Capital Projects

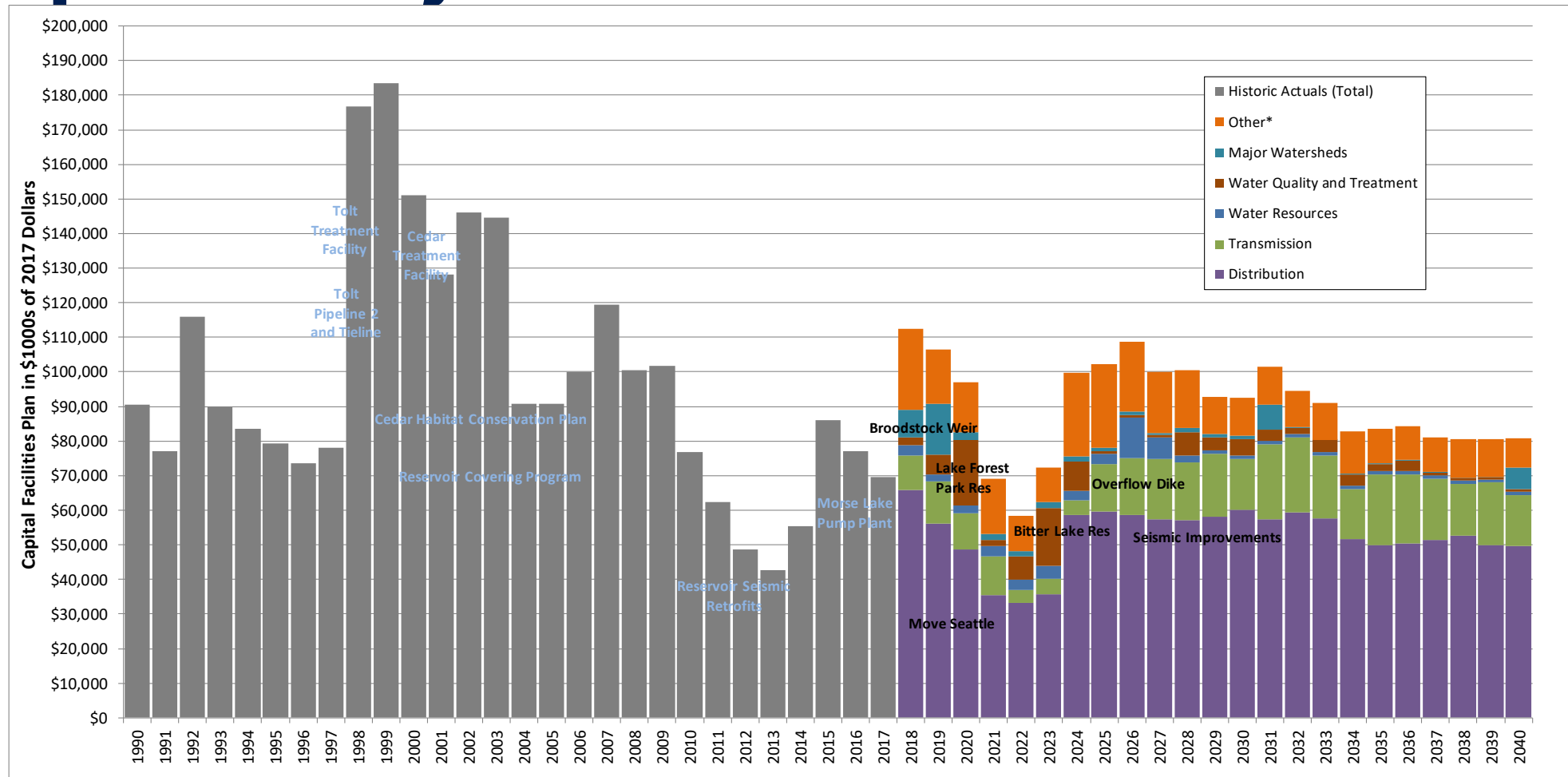
- \$15 to \$20 million per year – 50+ years
- Options analysis for all projects
 - Cost and functional tradeoff between:
 - Full upgrades – functional after design EQ
 - Upgrades – non-functional but repairable
 - Operational/response: expect significant damage, but able to repair quickly



Capital Projects

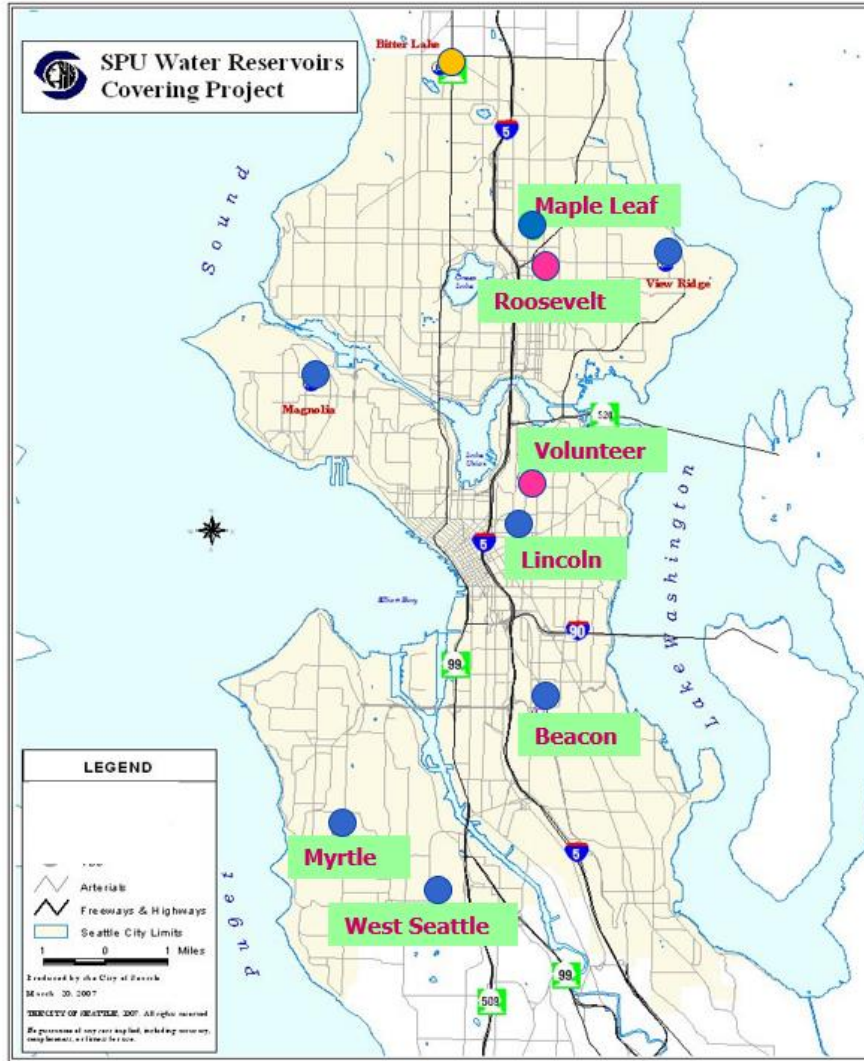
- Many drivers for capital projects, including seismic
- 2019 Water System Plan shows 20-year CIP projections, including seismic

Capital Projects



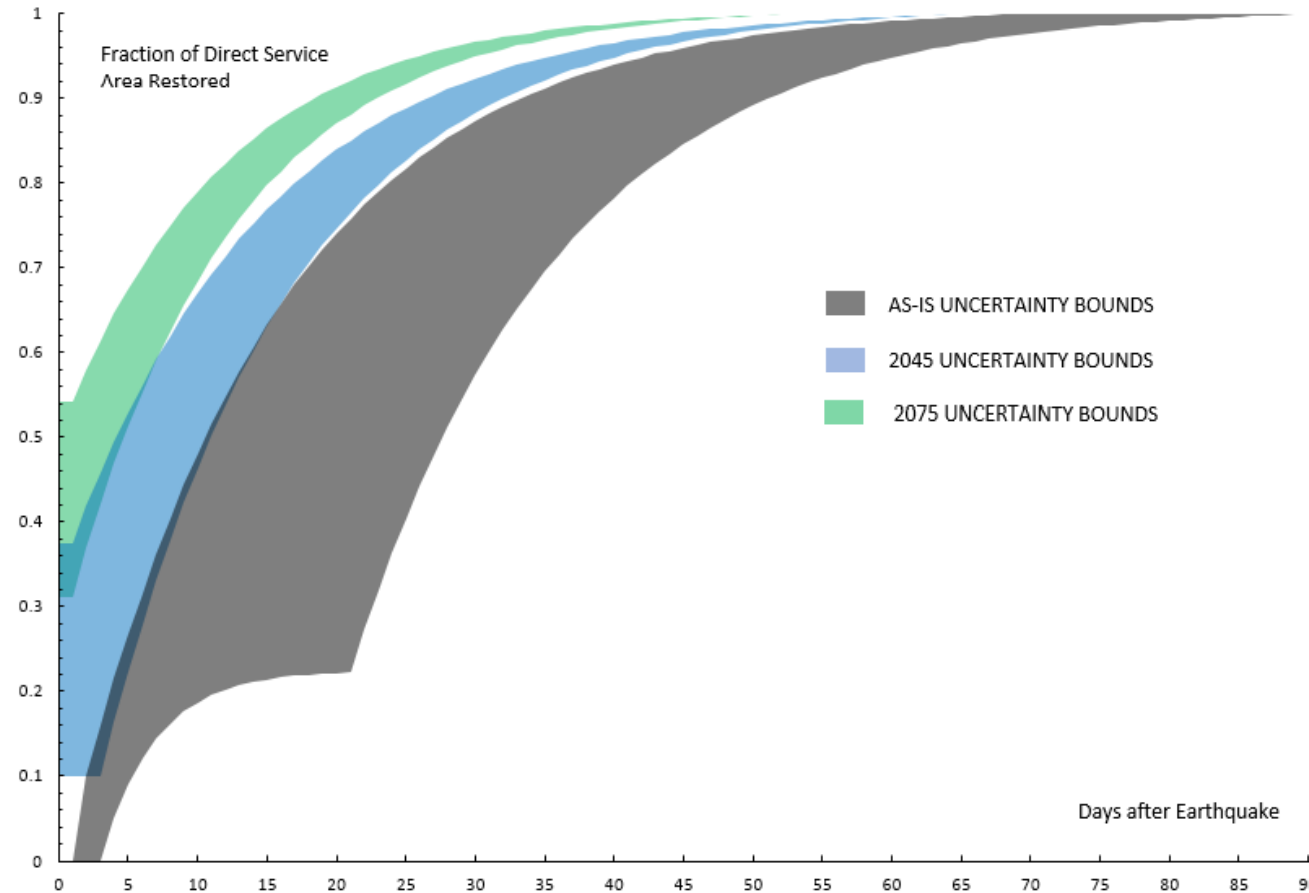
Roosevelt and Volunteer Reservoirs

- Study findings demonstrated importance of large reservoirs
- SPU has less emergency storage than other comparable utilities
- Provides additional flexibility for emergency response
- Flexibility to convert into future potable storage



Reservoir	Status
Riverton	Covered (from start)
Eastside	Covered (from start)
View Ridge	Covered (from start)
Magnolia	Covered (1994)
Bitter Lake	Covered (floating / 2001)
Lake Forest Park	Covered (floating/ 2002)
Recent Reservoir Covering Program	
Lincoln	Covered (w/ park 2005)
Myrtle	Covered (w/ park 2008)
Beacon	Covered (w/ park 2009)
West Seattle	Covered (w/ park 2010)
Maple Leaf	Covered (w/ park 2012)
Roosevelt	
Volunteer	

Direct Service Area Restoration Projected Improvement



Summary

- New information about and better understanding of seismic risk and Seattle's drinking water system
- Provides a path to a more resilient drinking water system
- Short- and long-term planning; infrastructure upgrades
- \$15 to \$20 million per year for next 50 years
- Spending folded into capital improvement budget

Questions?

