Programs and Technologies for Resilient San Francisco

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City and County of San Francisco
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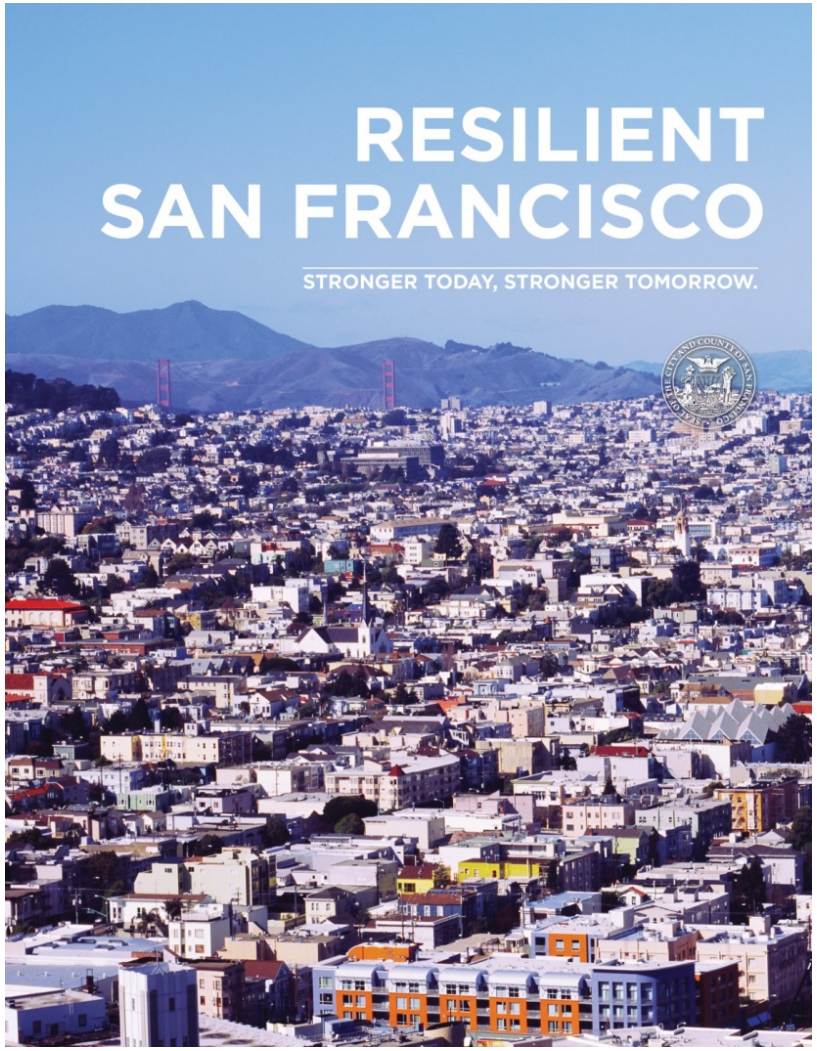
Office of Resilience and Capital Planning

Mission: **To promote the preservation and long-term sustainability of San Francisco as a whole no matter the acute shocks and chronic stresses it experiences.**



EARTHQUAKES

There is a 76% chance the Bay Area will experience a 7.0 magnitude earthquake in the next 30 years. Even the relatively moderate and distant 1989 Loma Prieta Earthquake (6.9) caused substantial damage to our city. It is imperative to the survival of San Francisco that we continue working to prepare and recover from the "big one."

INFRASTRUCTURE

Infrastructure is central to our daily lives—from the roads and pipes we use every day, to the larger systems, like food and social networks and housing that we rely on as lifelines. Sometimes these systems continue to operate past their intended life span and sometimes they are inadequate all together to meet the needs of a growing and vibrant city.

CLIMATE CHANGE

change are already being felt in the form of drought and increasingly severe storm events. We must secure our city's future through mitigation, while recognizing the likely impacts of climate change by beginning to adapt today rather than when it is too late.

SOCIAL INEQUITY

San Francisco embraces equality and equity in all policies but this work is never done. Social equity and inclusiveness needs to be at the core of what makes a city thrive.

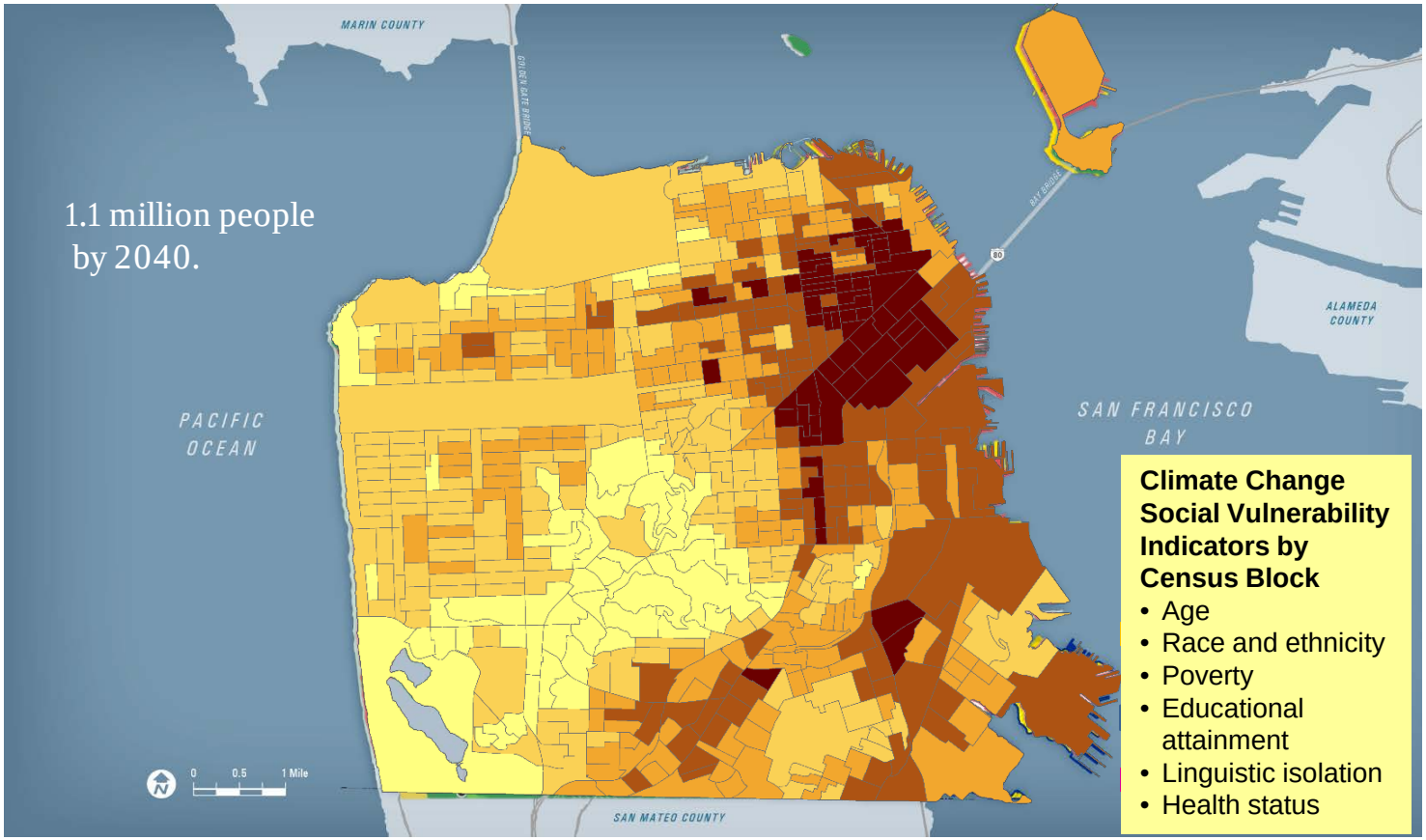
SEA LEVEL RISE

we expect a total in 66 of sea level rise to impact our shores by 2100. As we plan for the growth of our city, we need to adapt to this challenge that threatens not only our waterfront but also our way of life in San Francisco and regionally.

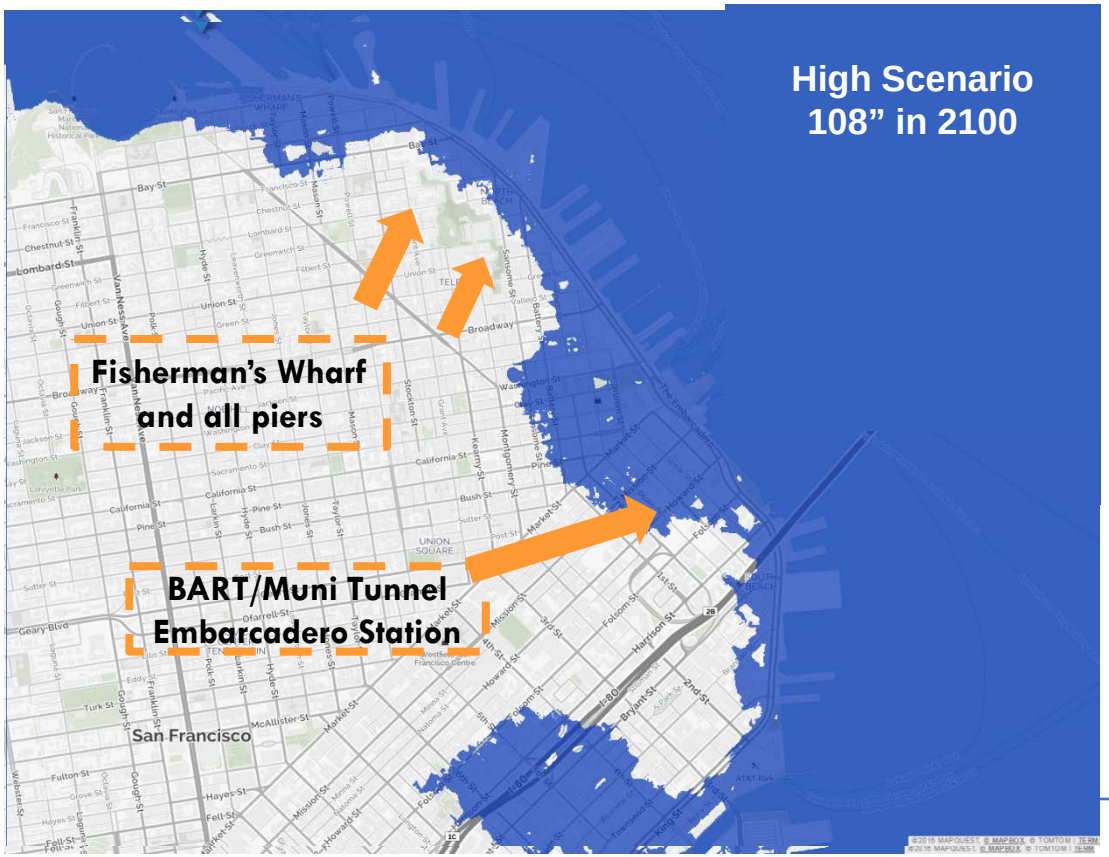
UNAFFORDABILITY

Forty-five percent of renters in San Francisco pay more than 30% of their household income in rent, Median home prices are continuing to rise, making it a challenge for first time home buyers. San Francisco is becoming out of reach for many of the people who made the city what it is today.

Resilience Challenges



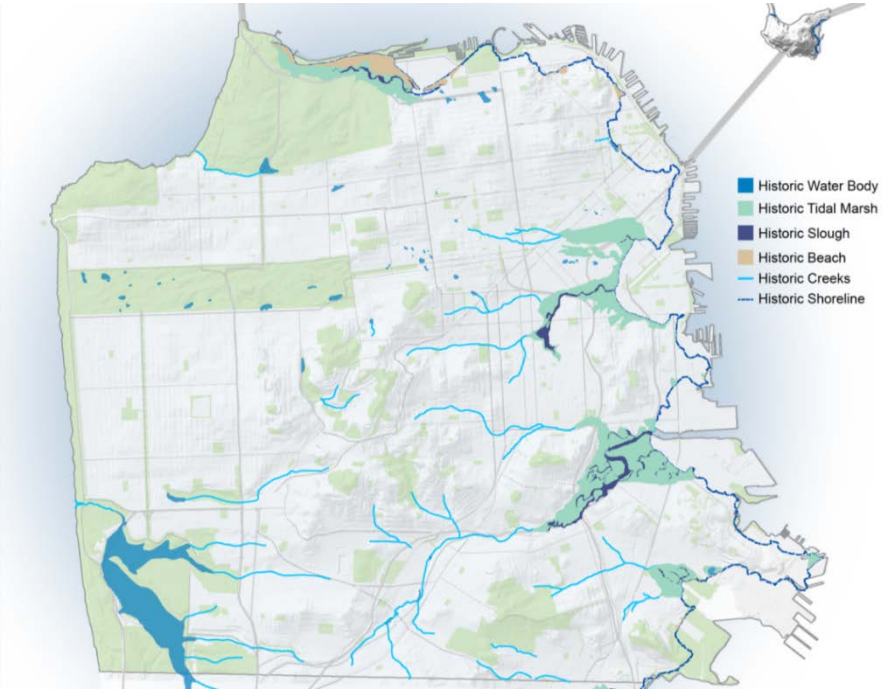
Resilience Challenges



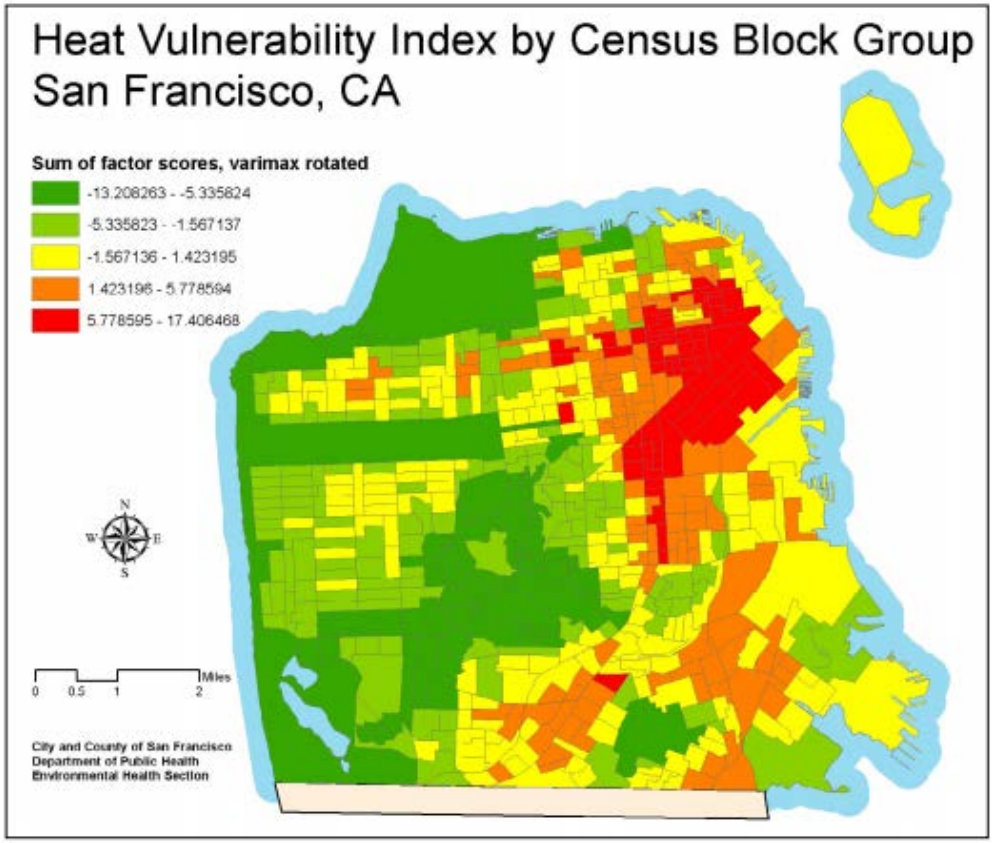
YEAR 2100	PRIVATE PROPERTY	PUBLIC PROPERTY	TOTAL EXPOSURE
66" (SLR)	$19 Billion	$35 Billion	$54 Billion
108" (SLR + stormsurge)	$38 Billion	$37 Billion	$75 Billion

Note: Dollar amounts indicate asset replacement cost only. Numbers are in 2016 dollars and reflect upper range, end-of-century projections without adaptation or action.

Resilience Challenges



Resilience Challenges



Resilience Challenges

Policies & Tools: Hazards & Climate Resilience Plan

Five Goals

- **Reduce risk** of damage and disruption
- **Build capacity** to prevent, mitigate, respond, and recover
- **Advance collaboration** towards risk reduction solutions
- **Address inequitable impacts** of hazards through policies and programs that address existing racial, economic, and health disparities
- **Increase public awareness** with education, empowerment, and engagement

Looks at over 25 assets including population

Geological				Weather				Combustion			Biological / Toxic	
Earthquake	Tsunami	Landslide	Dam or Reservoir Failuure	Flooding	High Wind	Extreme Heat	Drought	Large Urban Fire	Wildfire	Poor Air Quality	Pandemic	Hazardous Materials

Policies & Tools: Hazards & Climate Resilience Plan

- **Considers role of government and outcomes.**
- **Includes over 90 Strategist to mitigate risks**

	Domains		
City and County of San Francisco Roles	**Resilient Infrastructure (IN)**	**Resilient Buildings (B)**	**Resilient Communities (C)**
Public Asset Owner			
Community Services Delivery			
Research, Planning, and Guidance			
Adopt & Enforce Regulations			

DOMAIN: RESILIENT BUILDINGS

Primary Hazard Group: Geological

B-1.01.01	Assess and seismically retrofit municipal buildings
KEY PLANNING ISSUES: Existing Buildings	VULNERABILITY ADDRESSED: Community members rely on services provided by the City. The consequences of municipal building disruption are more severe for residents who are resource-constrained.
LEAD: ORCP PARTNERS: BOS, ADM, MYR, Budget Office, DPW, all impacted departments	STRATEGY SUMMARY: ORCP uses seismic hazard ratings, HAZUS, and other analytical tools to assess risk and prioritize seismic-strengthening projects within the public facilities portfolio. This strategy allows for effective prioritization. This strategy ensures retrofits first work to reduce life safety risk and then to minimize potential interruptions to essential services for San Francisco's most vulnerable populations. Known priority buildings at the time of this Plan's publication include 170 Otis, Kezar Pavilion, the Hall of Justice, the City's homeless shelters, as well as the City's Temporary shelters.
COST: High: $5M and above	SF GOVERNMENT ACTIVITY: Public Assets Owner
	STATUS: New

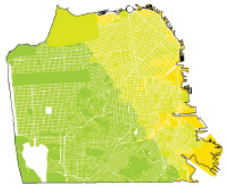
Policies & Tools: 10-Year Capital Plan

Funding Principles and Uses

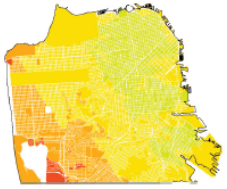
1. Addresses legal or regulatory mandate
2. Protects life safety & enhances resilience
3. Ensures asset preservation and sustainability
4. Supports approved plans and programs
5. Supports economic development

Policies & Tools: 10-Year Capital Plan

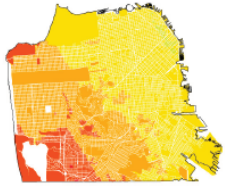
- Where are the risks for 240 city-owned Buildings?
  - Scenario planning
  - Multiple factors considered
  - Prioritization tool
  - Low cost analysis



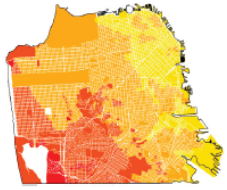
Hayward M6.9



San Andreas M6.5



San Andreas M7.2



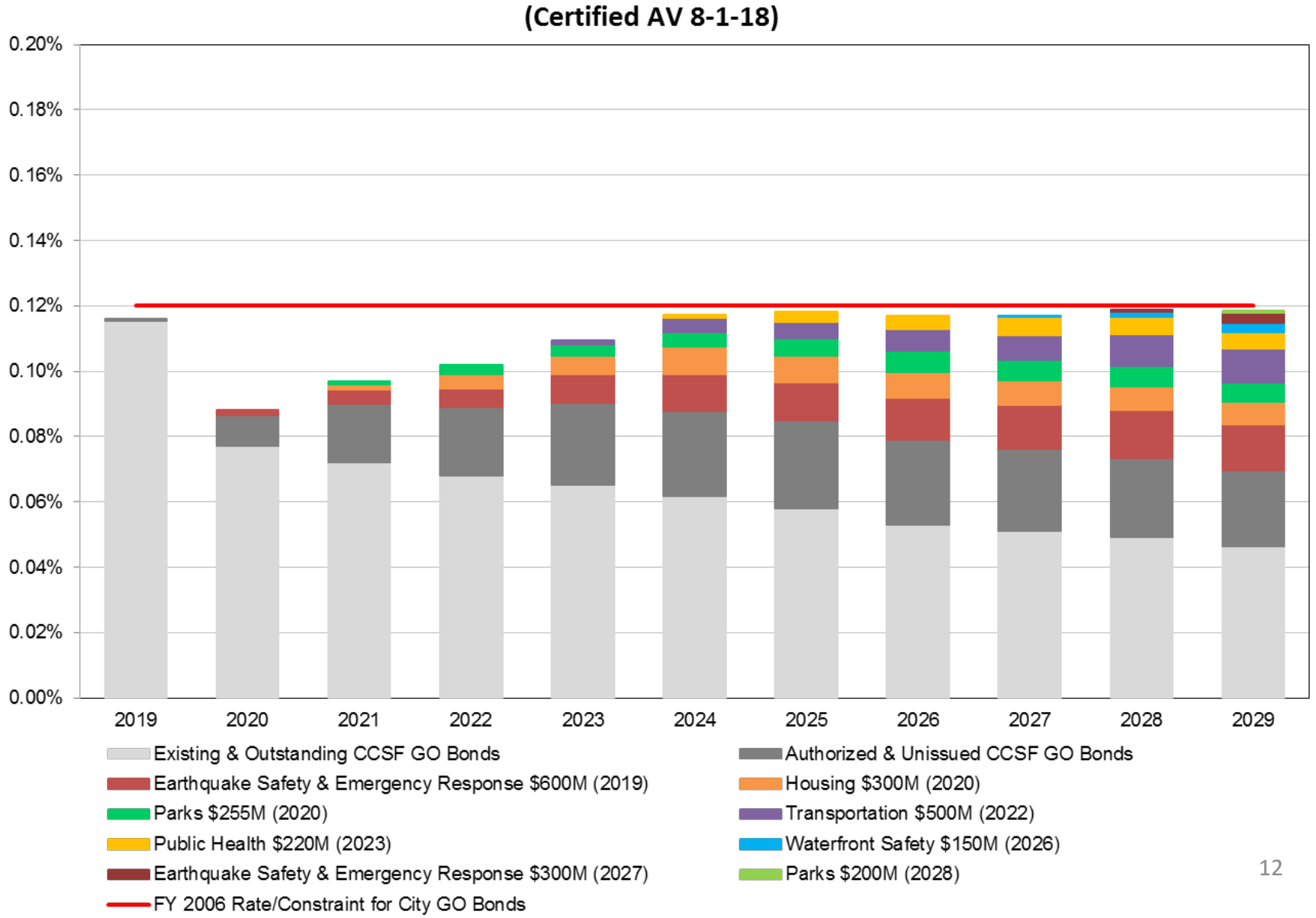
San Andreas M7.9

PUBLIC BUILDING TOTAL ECONOMIC LOSS	PUBLIC BUILDING POTENTIAL LOSSES	PUBLIC BUILDING POSSIBLE PERFORMANCE	PUBLIC BUILDING POSSIBLE CASUALTIES
$790.4M	**STRUCTURAL** $107.2M **NON-STRUCTURAL** 398.3M	195 / 32 / 12	597
$1.3B	**STRUCTURAL** $133.4M **NON-STRUCTURAL** $545.4M	183 / 44 / 12	1,099
$1.9B	**STRUCTURAL** $212.3M **NON-STRUCTURAL** $859.7M	127 / 89 / 23	1,798
$3.1B	**STRUCTURAL** $353.1M **NON-STRUCTURAL** $1.45B	75 / 74 / 90	3,248

Policies & Tools: 10-Year Capital Plan

General Obligation Bond

- $4 billion since 2008

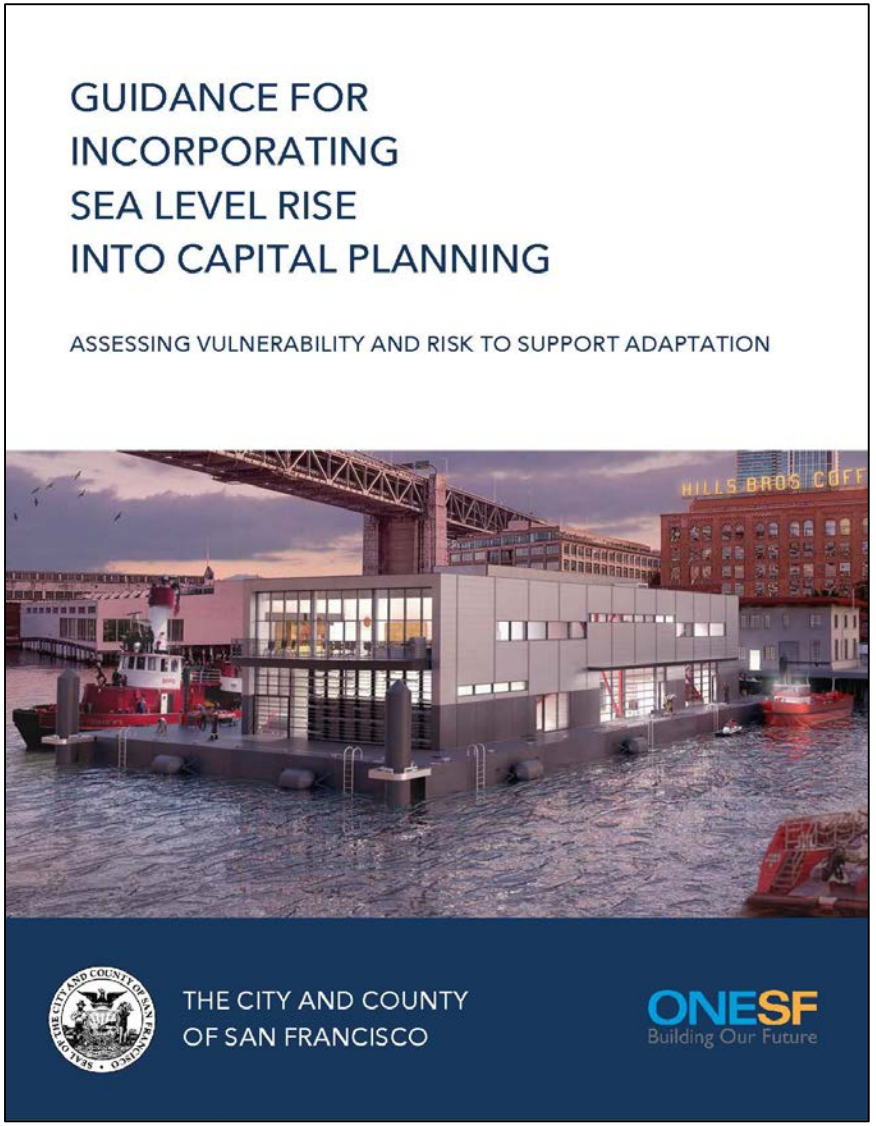


Policies & Tools: 10-Year Capital Plan

Sea Level Rise Guidelines for Capital Planning

- Findings on best available science
- All funded projects in 108” zone over $5M must address exposure, sensitivity and adaptive capacity over useful life of the asset
- Trained over 100 project managers, easy-to-use checklist
- Paves way for private property owners

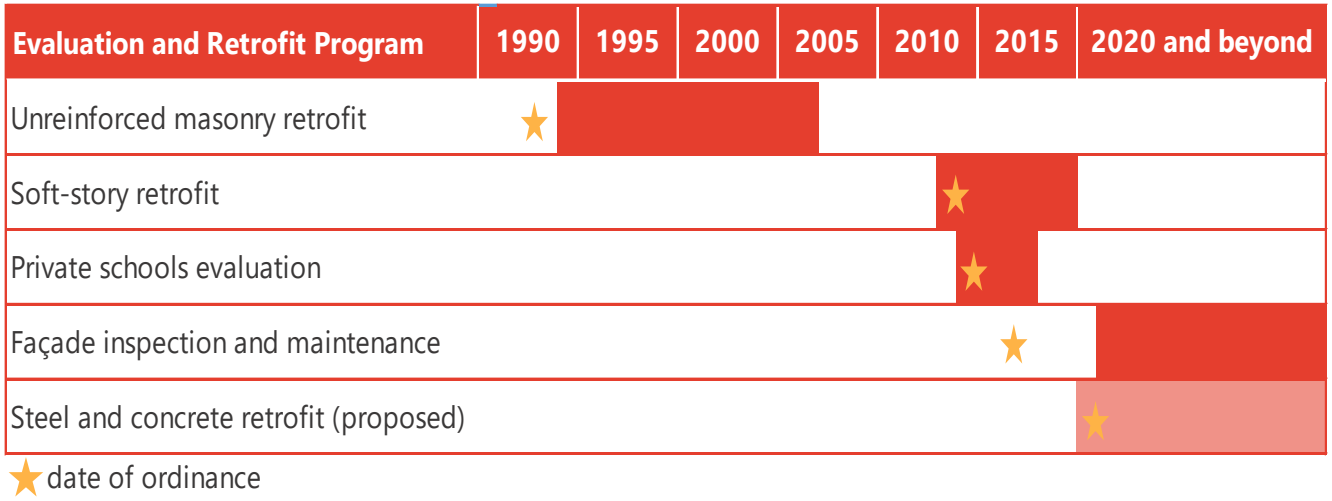
Year	Projections Likely levels of SLR	Ranges Unlikely but possible SLR
2030	6 in	12 in
2050	11 in	24 in
2100	36 in	66 in

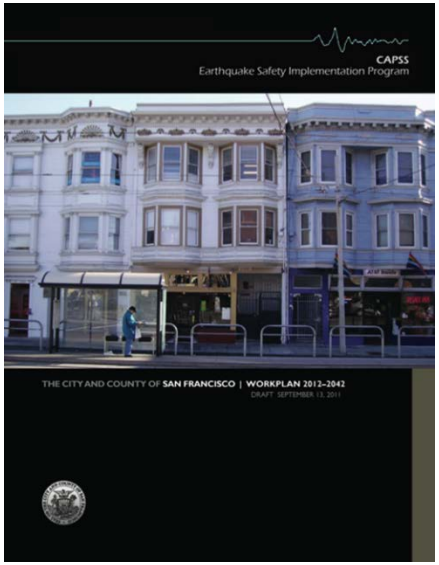


Programs: Earthquake Safety Implementation Program

30 Year Plan for Private Buildings

- Populations growth and changing conditions
- 2001 Community Action Plan for Seismic Safety
  - 10 year stakeholder driven consensus process
  - Earthquake Safety Implementation Program
  - Comprehensive plan for all buildings
  - Mandatory evaluation, retrofit
- Feasibility varies for some building subsets
  - Tall buildings
  - Similarly complex or recovery-critical buildings





Mandatory Soft-Story Retrofit Program

Passed in 2013 and phased in over 7 years

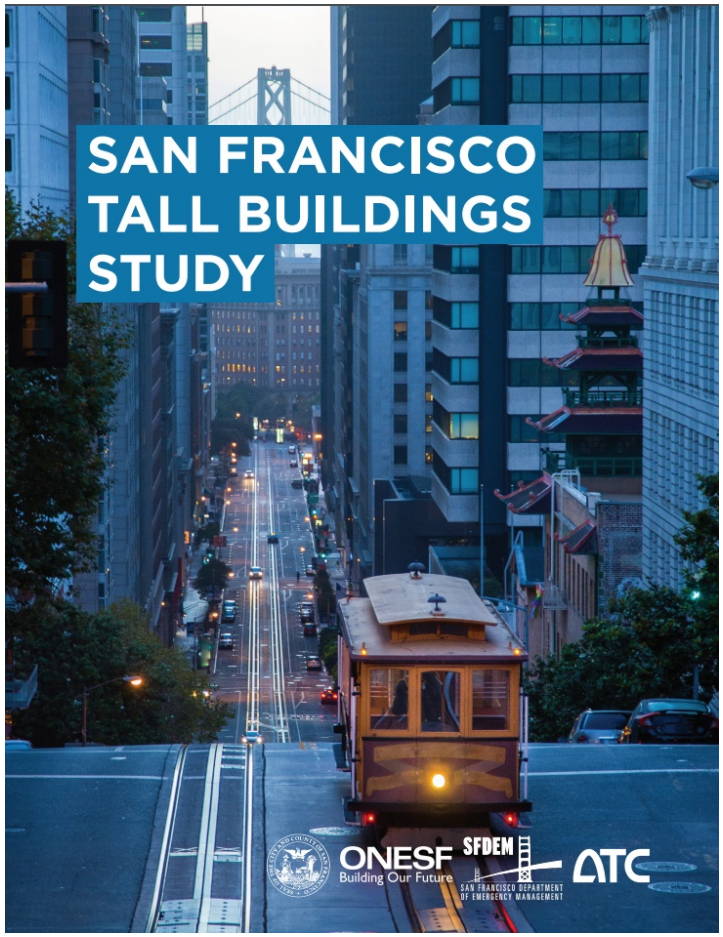
- Wood frame residential buildings with 3+ stories, 5+ units, built before 1978
- Affects ~111,000 residents
- Housing preservation and expansion through additional dwelling units (ADUs)
- PACE Financing

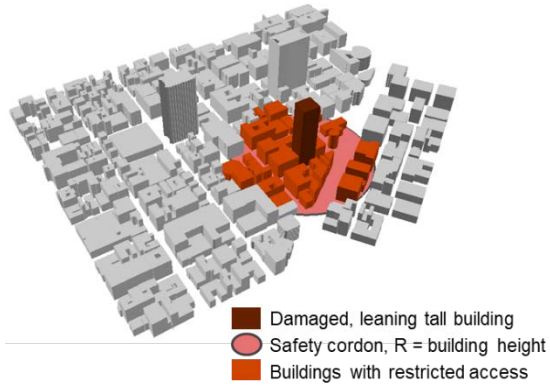
Total Properties	**6,973**
Properties Subject to the Ordinance	4,921
Number of Units	~48,317
Compliance Rate	76%
Permits Submitted	4,823
Work Completed	3,212
Average Retrofit Cost	~$78,000

Program Timeline

Tier	Permit Required by	CFC Required by
1	9/15/2015	9/15/2017
2	9/15/2016	9/15/2018
3	9/15/2017	9/15/2019
4	9/15/2018	9/15/2020

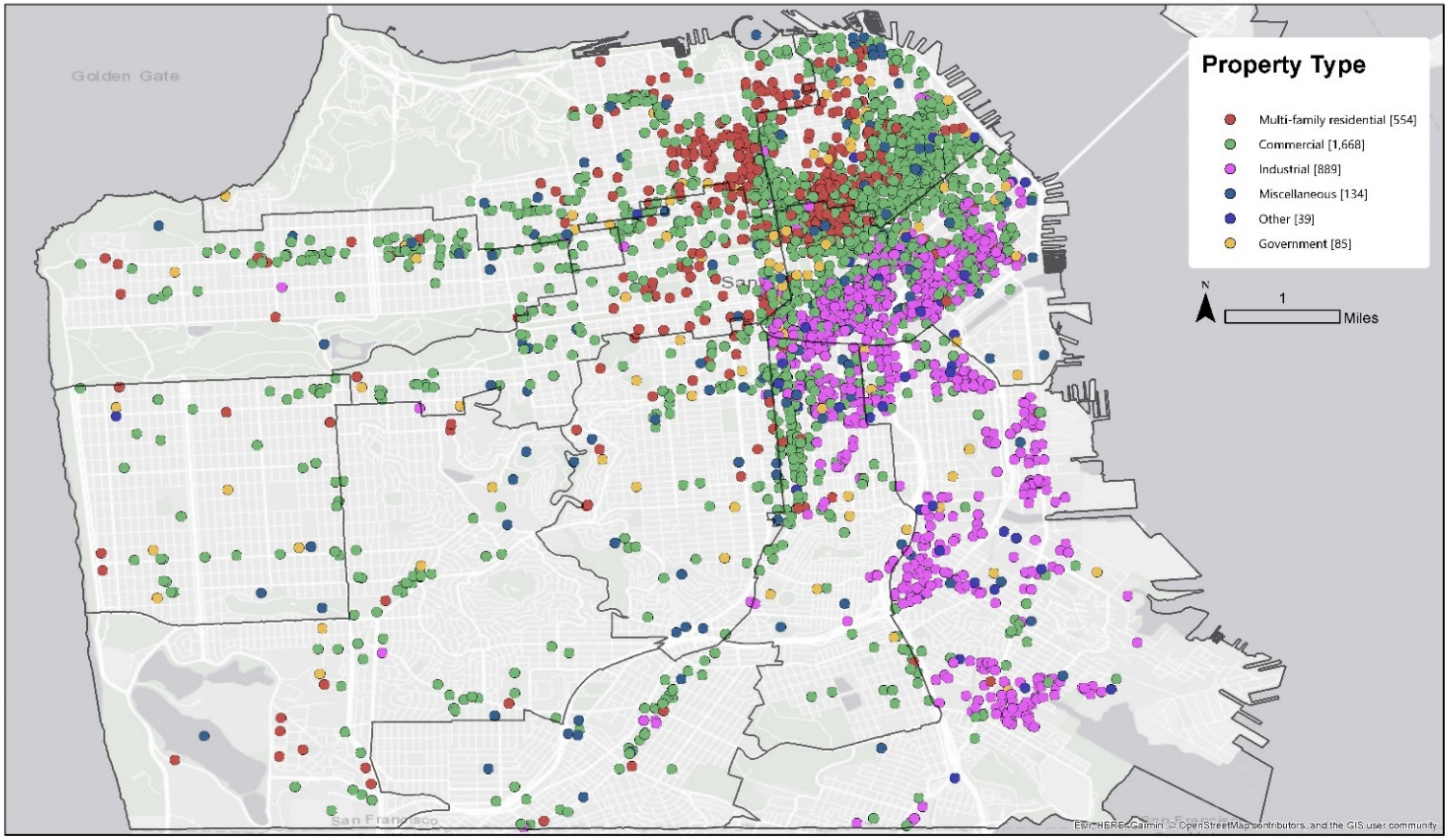
Programs: Tall Buildings Study





Programs: Non-Ductile Concrete

- ~3,400 pre-1980 concrete buildings; 116 city-owned
- Small percentage very vulnerable to collapse in earthquakes
- Much of San Francisco's affordable housing stock and 40% of private schools in older concrete buildings

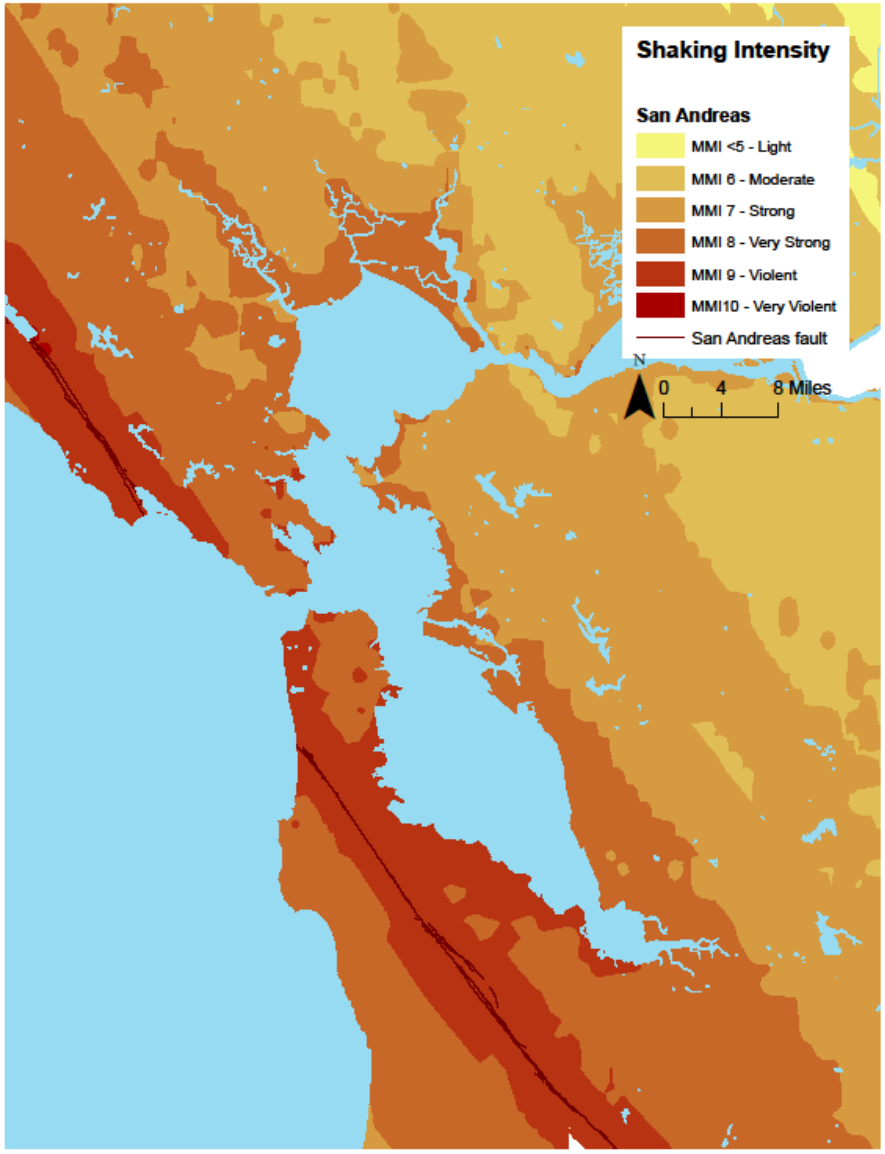


CONCRETE BUILDINGS

Illustrated here are all concrete buildings in the city except for the following: post 1980 construction, public schools, colleges and universities, hospitals, SF Port buildings, and 1-4 unit residential buildings.

Programs: Lifelines Council Restoration Project

Sector	Agency
Water & Wastewater	SFPUC
Electric Power & Natural Gas	PG&E
Highways & Roads	Caltrans
	SF Public Works
	Golden Gate Bridge HTD
Transit	BART
	SF MTA
Airports	SFO
Ports & Waterways	SF Port
Fuel	Kinder Morgan
Telecommunications	AT&T
	Comcast
	Verizon Wireless
	SF Dept of Technology
AWSS (Firefighting Water)	SFPUC



Programs: Lifelines Council Restoration Project

Expected Restoration Timelines and Goals for Lifelines

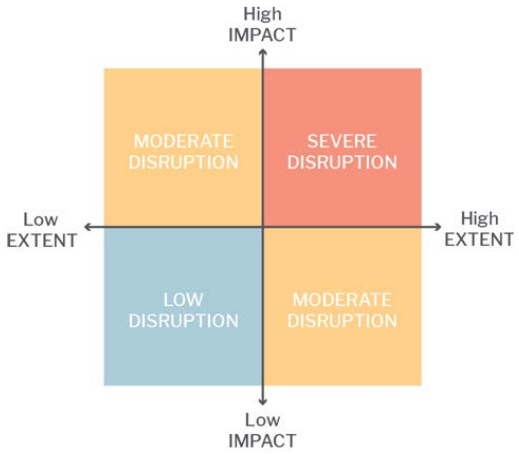
San Andreas Scenario

Sector	Organization	Emergency Response		Short-term Restoration		Long-term Recovery		
		0 hours	72 hours	2 weeks	2 months	6 months	1 year	3 years
Water	SFPUC					✦		
Electric Power	PG&E			✦				
	SFPUC					✦		
Fuel	Kinder Morgan[1,2]					✦		
Communications	AT&T[1]					✦		
	Comcast				✦			
	Verizon Wireless		✦					
	SF Dept of Technology			✦				
Highways & Local Roads	Caltrans[2]							✦
	Golden Gate Bridge					✦		
	Public Works							✦
Transit	MUNI					✦		
	BART[2]					✦		
Port	Port of San Francisco							✦
Airport	SFO							✦
Solid Waste	Recology					✦		
Wastewater	SFPUC						✦	
Natural Gas	PG&E					✦		
Auxiliary Water Supply System[4]	SFPUC	✦						

[1] AT&T and Kinder Morgan have not provided expcted restoration performance. Kinder Morgan many unknown and externalities that make estimating restoration of fuel delivery challenging.

[2] Worst case scenario is Hayward Fault

[4] Goal of AWSS is low disruption immediately after an earthquake. After post-earthquake fire fighting needs are met, SFPUC will focus repair efforts on restoring municipal water first and then return to completing needed repairs to AWSS system.



Timeline shows expected restoration timeline if scenario earthquake were to occur today.

✦ shows the goal time period full restoration of the system after the scenario earthquake

ONESF
Building Our Future

Thanks!

Any questions?

You can find me at:

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