Earthquake Scenario Committee

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Progress Report and Recommendations to the Alaska Seismic Hazards Safety Commission

UPDATE
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ASHSC Alaska Seismic Hazards Safety Commission

Mission Statement

The Earthquake Scenario Committee will develop, regularly report progress on, and present to the Commission plans for funding and conducting scientifically credible earthquake planning scenarios in areas of high earthquake risk in Alaska as a basis for mitigation and preparedness planning.

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Types of earthquake scenarios

Planning scenario

A collaborative process resulting in a document that describes in detail a credible earthquake event, its physical effects, likely impacts to people and infrastructure, and estimated losses. A planning scenario will provide the information necessary to prevent casualties, reduce property losses, and efficiently respond to earthquake emergencies.

Response scenario

A collaborative process that begins with a hypothetical event, ideally the outcome of a planning scenario, and develops plans and procedures to respond to the likely impacts. A response scenario may include an earthquake-response exercise in which these plans and procedures are tested and practiced.

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Elements of an earthquake planning scenario

1. Description of the earthquake source event
2. Description of the probable seismic, geologic, and induced effects
3. Description of engineering effects
4. Loss estimations
5. Recommendations for mitigation and preparedness

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1. Description of the earthquake source event

- Location and geometry of fault
- Past earthquakes (historic and paleoseismic)
- Rupture area, sense and amount of displacement (moment magnitude)
- Nature and amount of surface displacement, if any
- Time of year, and time of day of earthquake occurrence
- Probabilistic estimate of warm versus cold conditions
- Likelihood of occurrence

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1. Description of the earthquake source event (cont'd)

Example: Anchorage 1997 scenario

HAZUS inputs

Hazard definition: Shallow crustal event
Source and location: Border Ranges fault near Campbell Airstrip
Depth: 5 km (3 mi)
Magnitude: 7.5
Attenuation function:
Project 97 West Coast
Project 97 Pacific Northwest
Boore, Joyner & Fumal (1994)
Sadigh et al. (1993)
Youngs et al. (1995)
Rupture: Subsurface rupture length 85 km (53 mi) (default, Wells & Coppersmith, 1994)
Surface rupture length 73 km (46 mi) "
Orientation N30°E, dip 50°NW (user defined)
Fault type: Reverse slip

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2. Description of the probable seismic, geologic, and induced effects

- Duration and dominant period of shaking
- Spectral and peak ground accelerations
- Directivity
- Distribution of ground motions/intensities
- Earthquake-induced landslides and snow avalanches
- Liquefaction and sensitive-clay failures
- Tsunamis
- Induced effects: Fire, flooding, hazardous materials release

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2. Description of the probable seismic, geologic, and induced effects (continued)

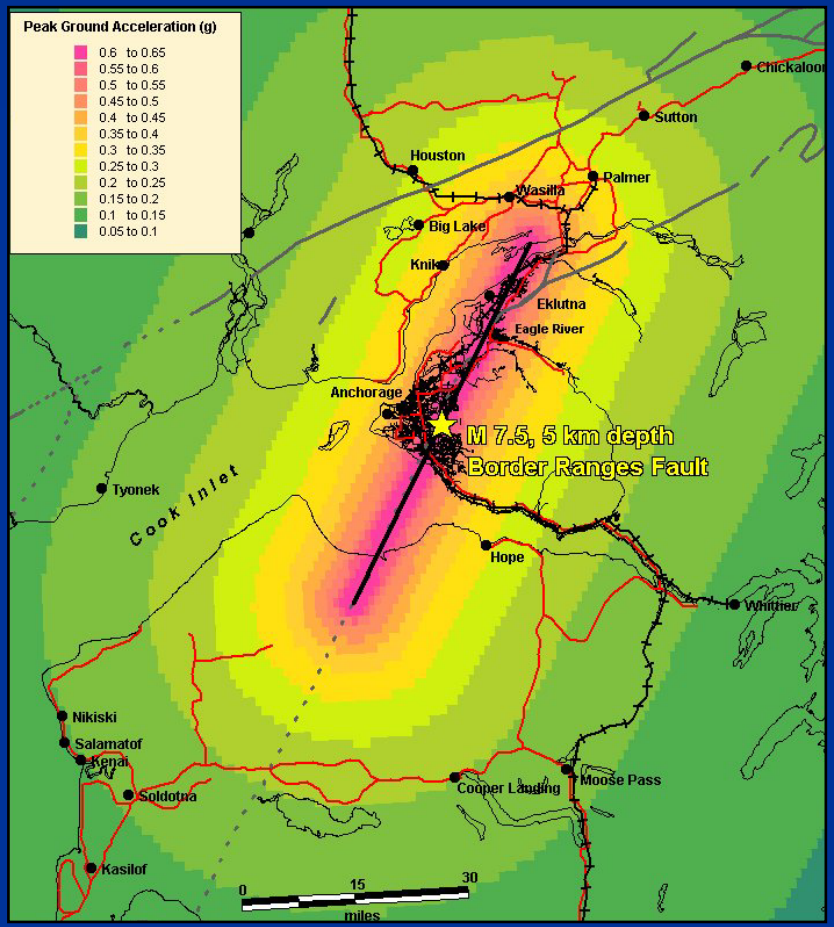
Example: Anchorage 1997 scenario

	Earthquake #1	Earthquake #2
Magnitude	7½	8
Description	Shallow crustal	Deep subduction megathrust
Location	Near Anchorage	Upper Cook Inlet
Depth	3-15 km	40-50 km
Peak acceleration	0.8 g	0.2 g
Duration	~40-50 sec	~1½-2 min
Characteristics	Sudden jolt, then high frequency shaking, 0.1-1 sec/cycle (1-10 motions/second)	Continuous rolling motion, 2-5 sec/cycle (0.2-0.5 motions/sec)
Induced effects	Landslides Possible liquefaction Snow avalanches	Landslides Liquefaction Snow avalanches
Local tsunamis	Not likely due to shallow water	Not likely due to shallow water

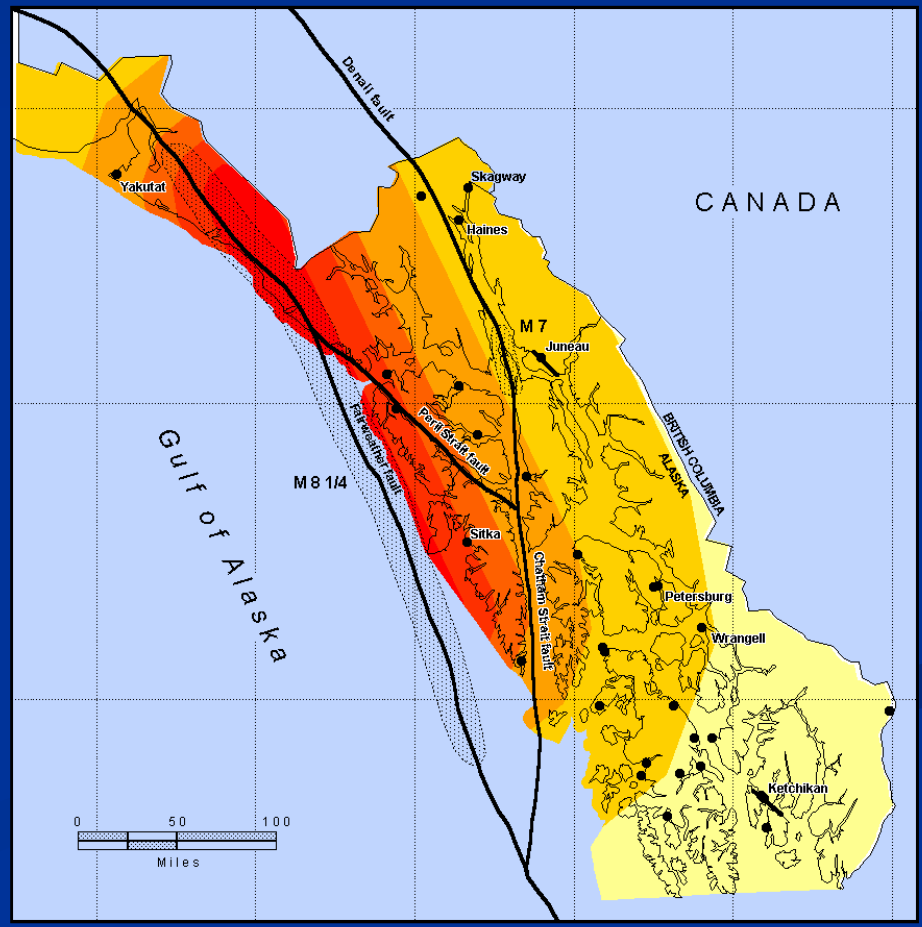
2. Description of the probable seismic, geologic, and induced effects (cont'd)

Examples of HAZUS graphic outputs

Anchorage 1997



Southeast Alaska 1998



3. Description of engineering effects

- Schools
- Hospitals
- Other critical facilities
- Highways
- Airports
- Railroads
- Marine facilities
- Electricity & communications
- Water and sewer
- Oil and gas production, refining, and delivery systems

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4. Loss estimation

- Description of methodology (HAZUS, VRISKMAP, other)
- Economic losses resulting from impacts to facilities and systems
- Deaths and injuries
- Indirect business and socioeconomic losses (e.g., business continuity, failures)

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5. Recommendations for mitigation and preparedness

- Land-use planning
- Building code revision
- Facilities management
- Emergency response planning

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Resources Needed

- Seismic & geologic data on earthquake sources
- Detailed geologic map of affected area showing seismic soil types
- Subsurface geologic and geophysical data (e.g., shear wave velocities) if available
- Tsunami inundation map if coastal
- Infrastructure data: Inventory of facilities and their vulnerabilities based on age, structure type, and materials used
- Population & demographic data for affected region
- Engineering analysis of scenario impacts on facilities, performed on classes of structures (not necessarily individual structures)
- Loss estimation software (e.g., HAZUS, VRISKMAP)
- Scenario manager and point contact person
- Qualified personnel to run loss estimation

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Possible Sources of Support

- State CIP funding (DNR)
- EERI funding and participation
- Local governments (in-kind and monetary)
- USGS/NEHRP funding
- Private sector, ideally through partnerships like CREW
- Volunteers

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Recommendations to Commission

1. **Select and prioritize target scenario events (future committee meetings) – Possibilities include:**
   - Castle Mountain fault – Mat-Su Valley, Municipality of Anchorage
   - Fairbanks seismic zone – Fairbanks, North Pole, military bases, UAF
   - Rude River fault – Cordova & Valdez
   - Fairweather fault – Sitka
   - Narrow Cape fault – Kodiak Island
   - Western Denali fault – Parks Highway, Cantwell, Healy, Alaska Railroad, and Denali NP
   - Johnstone Bay fault – Seward
   - Cook Inlet blind thrust faults – Anchorage, Kenai, Tyonek, Cook Inlet oil & gas facilities
   - Yakataga seismic gap – Yakutat, Cordova, Valdez?; tsunami
   - Northern Alaska Range foothills thrust belt - Transportation corridors

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Recommendations to Commission (continued)

2. Research what mitigation efforts have resulted from previous scenarios (e.g., Hayward fault, Seattle fault)
3. Develop scenario budget request for state funding
4. Pursue potential funding sources
5. Coordinate with DHS&EM to assist in scenario planning
6. Contact potential sources of in-kind and volunteer support
7. Develop private sector partnership like CREW (Cascadia Region Earthquake Workgroup)

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END

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