Seismology

Seismology

- Suitability of site
- Design of Peak Horizontal Acceleration (PHA)

Determination of Design Earthquake

- Technical Approach Document (TAD) requires evaluation of a floating earthquake (FE) located 15 km from the site
- Evaluate effects of a maximum earthquake for each surrounding tectonic province at a point closest to the site
- Evaluate potential effects of movement along capable faults identified in the expanded site area
- Earthquake with largest peak horizontal acceleration (PHA) at the site is the design earthquake

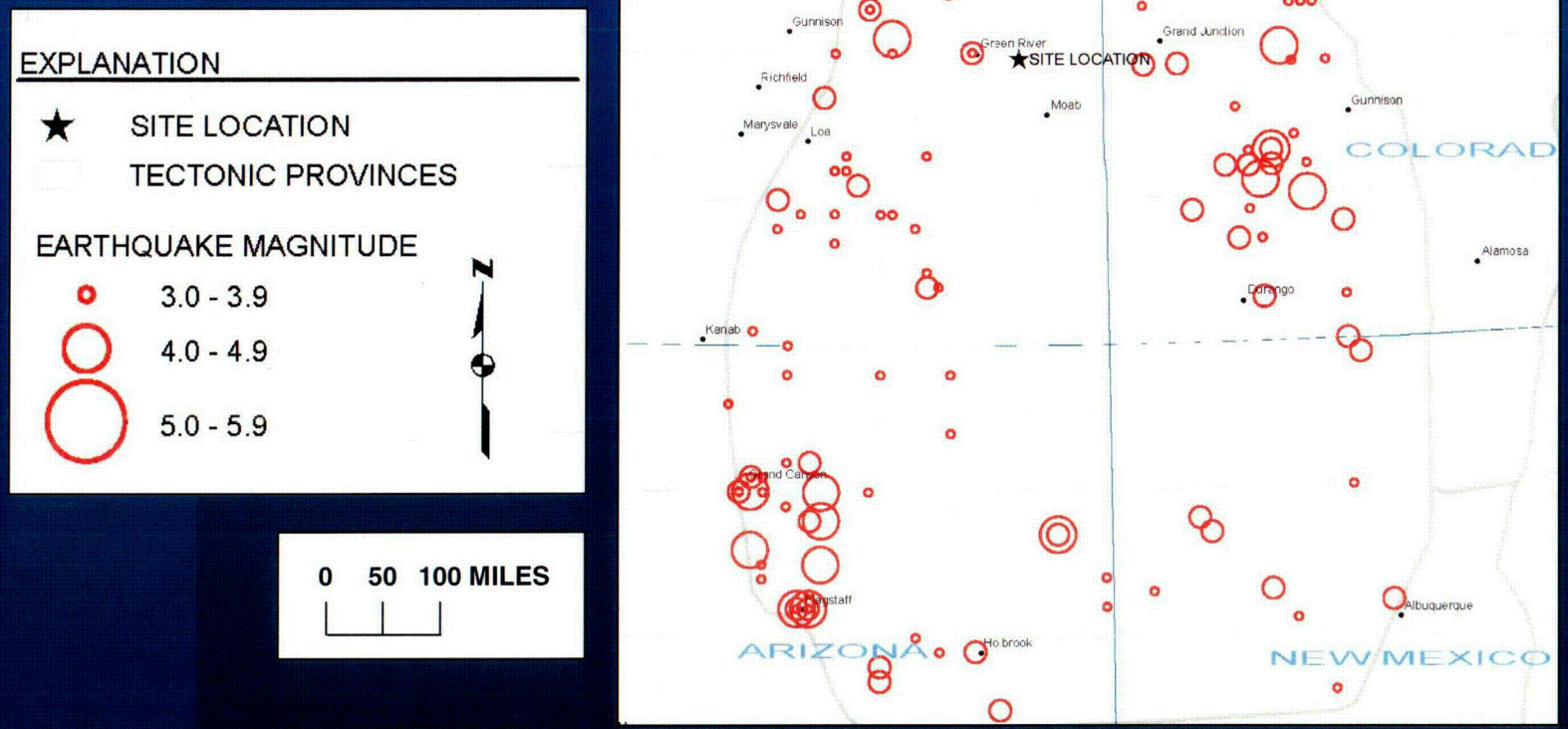
Floating Earthquake

- Estimates a "background" level of seismicity within a tectonic province
- Accounts for low to moderate earthquakes not associated with tectonic structures.
- The maximum magnitude associated with an FE event is limited to 6.2 (larger earthquakes typically have surface expressions)

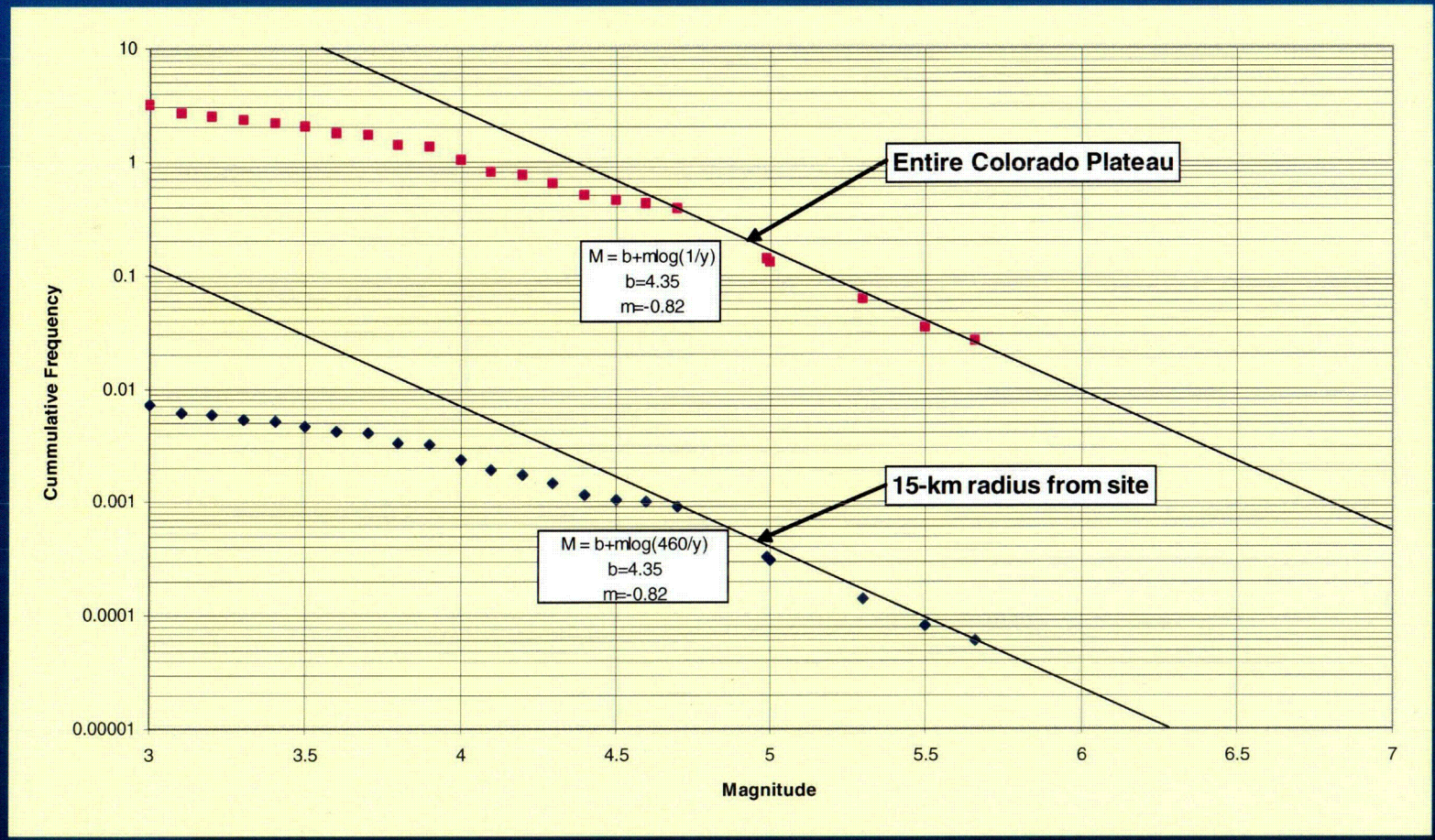
Floating Earthquake

- Compiled earthquake records from instrumentally and historically recorded earthquakes within Colorado Plateau
- Statistical analysis of data to determine the recurrence intervals of earthquake events

Historical Earthquakes Within Colorado Plateau



Magnitude Versus Earthquake Frequency



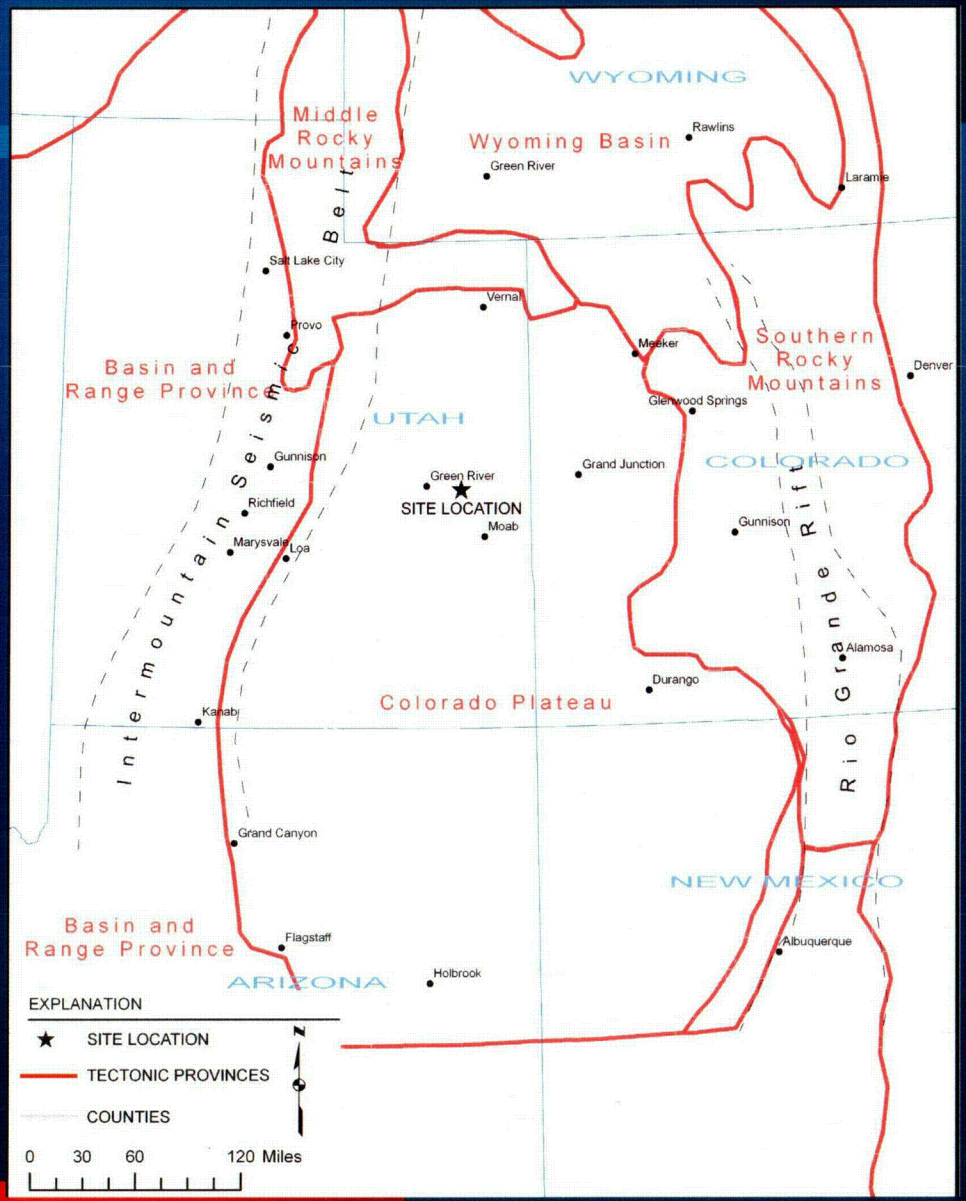
Floating Earthquake

- Max earthquake associated with FE is applied 15 km from site
- Recurrence interval of a 6.2 earthquake within 15 km of the site is 77,000 years
- Probability of exceedance of this event within 1,000 year design life is 1%

Floating Earthquake (continued)

- Earthquake is attenuated to the site
- PHA = f (distance, magnitude) using Campbell and Bozorgnia (2003)
- PHA resulting from event is 0.22 g
- FE of magnitude 6.2 applied 15 km from site is design earthquake for Green River, Utah

Regional Tectonic Provinces



Regional Tectonic Provinces (continued)

- All provinces surrounding Colorado Plateau
- Compiled estimates of MCE from the literature
- Determined PHA for occurrence of MCE at closest point to site
- All PHAs much lower than 0.22 g (<0.1 g)
- Retain FE as design basis

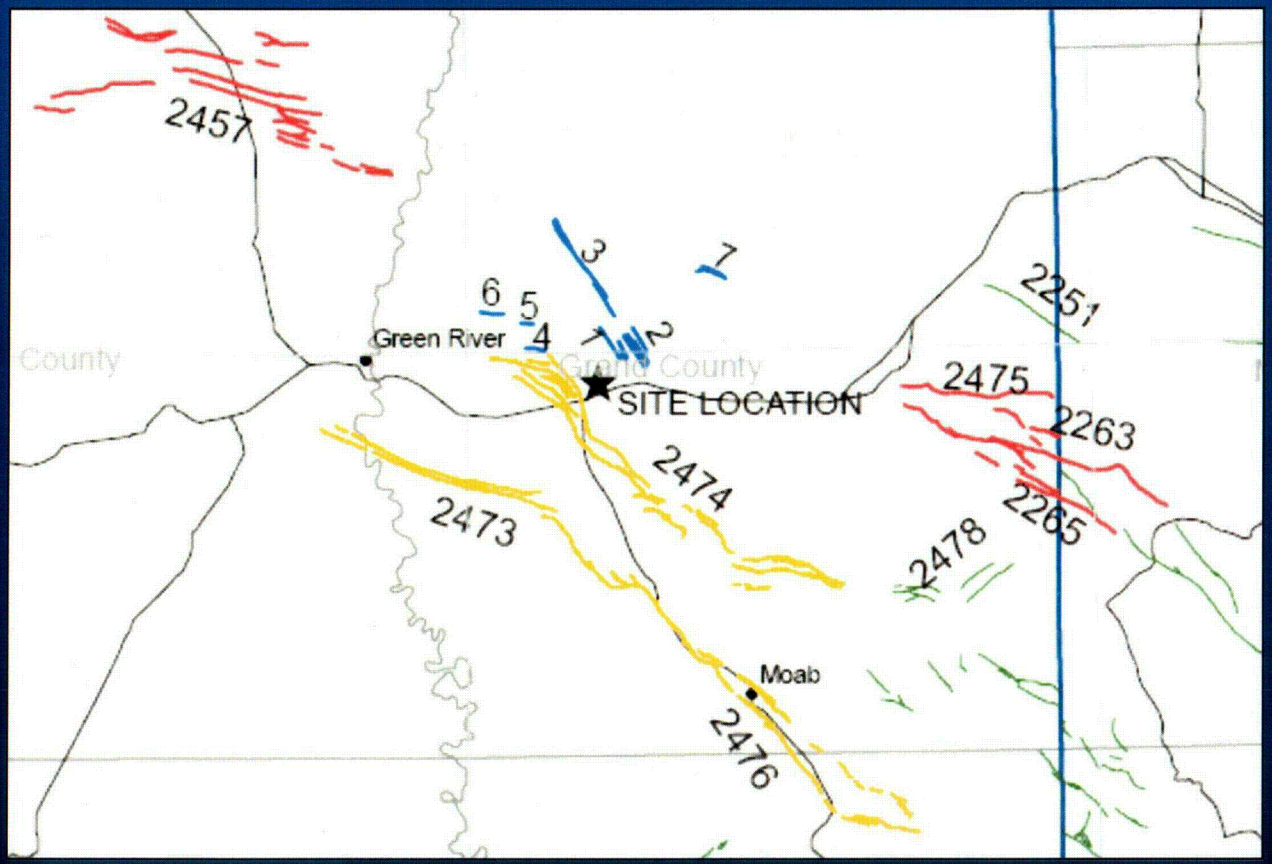
Capable Faults

- Movement at least once within the past 35,000 years or recurring movement within the past 500,000 years
- Macroseismicity (magnitude 3.5 or greater) determined with instruments to demonstrate a direct relationship with the fault
- A structural relationship to a capable fault such that movement on one fault could be reasonably expected to cause movement on the other

Analysis of Earthquakes on Known Faults

- Considered all faults of Quaternary or unknown age within expanded study area that meet minimum length requirements (10 CFR 100)
- Applied MCE along each fault using Wells and Coppersmith (1994) relationships (based on fault length)
- Determined which faults have the potential to generate PHA of 0.1 g or greater at the Crescent Junction site

Considered Faults



- Salt-dissolution features, not tectonic in Quaternary
- Quaternary faults capable of generating PHA equal to or greater than 0.1 g
- Faults of unknown age, not considered Quaternary, capable of generating PHA equal to or greater than 0.1 g if capable

Analysis of Known Faults (continued)

- 13 faults capable of PHA > 0.10 g
- Only 5 faults with PHA > 0.22 g (2474, 1, 2, 3, 4)
- None of these 5 are known to be active in Quaternary
- Of known or suspected Quaternary faults, maximum PHA is estimated to be 0.13 g (2457)
- Retain FE as design basis

Other Studies in Area

- UMTRA Site at Green River designed for PHA of 0.21 g (floating earthquake)
- National Seismic Hazard Mapping Project shows 0.12 g with 2% chance of exceedance in 50 years at site (2475-year return period)
- UGS Bedrock Acceleration maps for Utah show 0.5 g for site, influenced predominately by Tenmile Graben (not considered capable)
- Study done for tailings site at Moab estimated PHA of 0.18 g for 10,000-year return period based on probabilistic model

Summary: Seismology

- Maximum PHA from floating earthquake is 0.22 g
- Maximum PHA from outlying tectonic provinces is < 0.1 g
- Maximum PHA from existing fault is 0.13 g
- Use FE of magnitude 6.2 and PHA of 0.22 g as design event

Summary: Seismology Site Suitability

- Stability of disposal cell will meet required factors of safety considering peak acceleration from MCE
- Potential for on-site rupture is minimal
- No deficiencies identified