Basic Seismological Characterization for Fremont County and Surrounding Areas

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Background

Seismological characterizations of an area can range from an analysis of historic seismicity to a long-term probabilistic seismic hazard assessment. A complete characterization usually includes a summary of historic seismicity, an analysis of the Seismic Zone Map of the Uniform Building Code, deterministic analyses on active faults, "floating earthquake" analyses, and short- or long-term probabilistic seismic hazard analyses.

Presented below, for Fremont County and the surrounding areas, are an analysis of historic seismicity, an analysis of the Uniform Building Code, deterministic analyses of a nearby active faults, an analysis of the maximum credible "floating earthquake", and current short- and long-term probabilistic seismic hazard analyses.

Historic Seismicity

Fremont County has had a number of earthquakes recorded within the County boundaries over the last 125 years, with some causing significant damage. Residents within the county have also felt or have had property damaged by earthquakes originating outside of the County boundaries. The first reported earthquake occurred in 1873, and the last that was recorded in the County occurred in 1997. Historically, the region has had a moderate level of seismicity compared to the rest of the State.

The enclosed map of "Earthquake Epicenters and Suspected Active Faults with Surficial Expression in Wyoming" (Case and others, 1997) shows the historic distribution of earthquakes in Wyoming. Significant historic earthquakes are described below, and are organized by the area in which they occurred. All earthquakes within Fremont County and many from neighboring counties are discussed.

Atlantic City Area

One of the first reported earthquakes in central Wyoming was near Atlantic City in southern Fremont County. The earthquake occurred on December 10, 1873, and was felt as an intensity III event at nearby Camp Stambaugh (Case, 1996). An intensity V earthquake was reported from Atlantic City on December 12, 1923, with no significant damage being recorded (Humphreys, 1924). Non-damaging earthquakes were also reported in the area on October 30, 1925 (intensity III) and on August 22, 1959 (intensity IV).

On February 25, 1963, a magnitude 4.3, intensity V earthquake occurred in southeastern Sublette County, approximately 25 miles west-northwest of Atlantic City. The earthquake was felt for over a minute in Altantic City, and for approximately six seconds in the Lander and Hudson areas(Casper Star-Tribune, February 26, 1963). Windows, doors, and dishes were rattled in Fort Washakie as a result of the earthquake (von Hake and Cloud, 1965). On October 14, 1963 a magnitude 4.5 earthquake was recorded in northeastern Sweetwater County, approximately 30 miles southeast of Atlantic City. No damage was reported.

On September 4, 1980, a magnitude 3.1 earthquake was recorded approximately 15 miles west southwest of Atlantic City, with no damage being reported. On November 3, 1984, a magnitude 5.1, intensity VI earthquake was recorded approximately 10 miles northwest of Atlantic City. The earthquake, which was felt in Dubois and Casper, was one of the strongest fault-related events recorded in the southwestern quarter of the State. A number of residents in Lander and Atlantic City reported cracked walls, foundations, and windows (Casper Star-Tribune, November 4, 1984). Most recently, on October 21, 1996, a magnitude 3.7 earthquake was recorded in southeastern Sublette County, approximately 30 miles west-northwest of Atlantic City. No damage was reported.

Lander Area

A number of earthquakes have occurred in the Lander area. The first reported earthquake occurred on January 22, 1889, and had an intensity of III-IV (Case, 1993). This earthquake was followed by an intensity IV event on November 21, 1895, which resulted in the jarring of houses and the rattling of dishes (Case, 1993). On November 23, 1934, an intensity V earthquake was centered approximately 20 miles northwest of Lander. For a radius of 10 miles around Lander, residents reported that dishes were thrown from cupboards and pictures fell from walls. Cracks were found in buildings in two business blocks, and the brick chimney of the Fremont County Courthouse was moved two inches away from the building. The earthquake was felt at Rock Springs and Green River (Casper Tribune-Herald, November 25, 1934).

There were a series of earthquakes in the Lander area in the 1950's that caused little damage. On August 17, 1950, there was an intensity IV earthquake that caused loose objects to rattle and buildings to creak (Murphy and Ulrich, 1952). On January 11, 1954, there was an intensity II event (Reagor, Stover, and Algermissen, 1985), and on December 13, 1955, there was an intensity IV event near Lander (Murphy and Cloud, 1957), with no damage reported.

On June 14, 1973, a small earthquake was reported about 8 miles east northeast of Lander. Recently, the earthquake has been interpreted as a probable explosion. On August 31, 1982, a magnitude 3.2, intensity IV earthquake occured approximately 10 miles southwest of Lander. No significant damage was reported. On January 31, 1992, a non-damaging magnitude 2.8 earthquake occurred approximately 20 miles northwest of Lander (Case, 1994). This event was followed on October 10, 1992, by a magnitude 4.0, intensity III earthquake centered approximately 22 miles east of Lander (Case, 1994). Most recently, on April 25, 1997, a magnitude 3.1 earthquake occurred approximately 10 miles south of Lander. No damage was associated with the event.

Sand Draw/Gas Hills Area

The first earthquake to be reported in the area occurred on August 11, 1916, approximately 6 miles south of Jeffrey City (Reagor, Stover, and Algermissen, 1985). No damage was associated with the intensity III event. On April 22, 1973, a magnitude 4.8, intensity V earthquake was recorded approximately 12 miles north of Jeffrey City. Dishes were rattled and pictures on walls were disturbed in Jeffrey City (Casper Star-Tribune, April 24, 1973). On March 25, 1975, there was a magnitude 4.8, intensity III earthquake recorded approximately 18 miles northwest of Jeffrey City. A mobile home 35 miles southeast of Riverton was moved an inch off its foundation as a result of the earthquake (Laramie Daily Boomerang, March 26, 1975). On December 19, 1975, a non-damaging magnitude 3.5 earthquake was recorded approximately 25 miles northeast of Jeffrey City (Reagor, Stover, and Algermissen, 1985). On August 16, 1985, a magnitude 4.3, intensity IV earthquake was recorded approximately 25 miles northwest of Jeffrey City. No damage was reported. On June 1, 1993, a non-damaging, magnitude 3.8, intensity III earthquake occurred near Bairoil, approximately 20 miles southeast of Jeffrey City (Case, 1994). Most recently, on December 11, 1996, a magnitude 3.4 earthquake occurred approximately 11 miles southeast of Jeffrey City. No damage was associated with the event.

Pavillion/Maverick Springs Dome Area

Beginning in the 1960's, and continuing into the 1990's, a series of earthquakes have been recorded in the area between Pavillion and the Maverick Springs Dome, which is located approximately 23 miles northwest of Pavillion. On October 12, 1961, a small-magnitude earthquake was recorded approximately 7 miles northwest of Pavillion (Reagor, Stover, and Algermissen, 1985). On April 26, 1967, two earthquakes were recorded in the area. A magnitude 4.7 earthquake occurred approximately 12 miles north of Pavillion, and a magnitude 4.2 earthquake occurred near Maverick Springs Dome (Reagor, Stover, and Algermissen, 1985). No damage was associated with either event. Most recently, on August 7, 1991, a magnitude 3.5 earthquake was recorded near Maverick Springs Dome (Case, 1994). The non-damaging earthquake was felt in Thermopolis.

Thermopolis Area

Although Thermopolis is not in Fremont County, it is close enough to the northern part of the County to warrant inclusion in the discussion. The Thermopolis area has experienced a number of earthquakes, with a few causing minor damage. The first earthquake to be reported in the area occurred on February 13, 1928, approximately 10 miles south of Thermopolis. The intensity IV earthquake was felt as three shocks in Thermopolis, and was "felt sharply" in Worland, Owl Creek, Gebo, Crosby, and Kirby. It was also strongly felt at a mine in the Copper Mountain mining district, near Bonneville. Reports indicate that two men entered their mine when aftershocks were occurring and found that many of the mine props were so loose that they could be moved by hand (Heck and Bodle, 1930). On June 19, 1928, another intensity IV earthquake was reported in the area, with the epicenter placed approximately 6 miles northwest of Thermopolis (Heck and Bodle, 1930). In this case, a single shock was felt in Thermopolis, with sounds slightly preceding the earthquake.

An intensity IV earthquake, which caused damage, occurred in the Thermopolis area on October 11, 1944. Several landslides occurred as a result of the earthquake, and rocks fell onto the highway in the Wind River Canyon. At Hot Springs State Park, there was a "caving of earth on the south rim of the large hot spring in the park" (Casper Tribune-Herald, October 13, 1944). On January 26, 1946, there was an intensity IV earthquake near Thermopolis that rattled windows and dishes. The earthquake, which was felt for approximately ten seconds, clouded the water in Hot Springs State Park for a few days (Laramie Republican-Boomerang, January 29, 1946). On January 23, 1950, an intensity V earthquake was felt near Hamilton Dome, approximately 22 miles northwest of Thermopolis. Houses shook and dishes rattled in the Hamilton Dome area, and the earthquake was felt in Thermopolis (Murphy and Ulrich, 1952). On January 31, 1954, an intensity V earthquake occurred in the Thermopolis area (Casper Tribune-Herald, February 2, 1954). No damage was associated with that earthquake.

One of the largest earthquakes recorded in the Thermopolis area occurred on December 8, 1972. The magnitude 4.1, intensity V earthquake was centered approximately eight miles west of Thermopolis. It caused two cracks in the ceiling of a new addition to a Thermopolis rest home (Laramie Daily Boomerang, December 9, 1972), and the floor in a local lumber yard sank a few inches (Casper Star-Tribune, December 9, 1972). The earthquake was felt in Kinnear, Pavillion, and the Riverton area, and was reportedly felt as far away as Craig, Colorado. On June 6, 1978, a magnitude 4.0 earthquake was recorded approximately 20 miles east of Thermopolis (Reagor, Stover, and Algermissen, 1985). No damage was associated with that earthquake.

Uniform Building Code

The Uniform Building Code (UBC) is a document prepared by the International Conference of Building Officials. Its stated intent is to "provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within this jurisdiction and certain equipment specifically regulated herein."

The UBC contains information and guidance on designing buildings and structures to withstand seismic events. With safety in mind, the UBC provides Seismic Zone Maps to help identify which design factors are critical to specific areas of the country. In addition, depending upon the type of building, there is also an "importance factor". The "importance factor" can, in effect, raise the standards that are applied to a building.

The current UBC Seismic Zone Map (1997) has five seismic zones, ranging from Zone 0 to Zone 4, as can be seen on the enclosed map. The seismic zones are in part defined by the probability of having a certain level of ground shaking (horizontal acceleration) in 50 years. The criteria used for defining boundaries on the Seismic Zone Map were established by the Seismology Committee of the Structural Engineers Association of California (Building Standards, September-October, 1986). The criteria they developed are as follows:

Zone	Effective Peak Acceleration, % gravity (g)
4	30% and greater
3	20% to less than 30%
2	10% to less than 20%
1	5% to less than 10%
0	less than 5%

The committee assumed that there was a 90% probability that the above values would not be exceeded in 50 years, or a 100% probability that the values would be exceeded in 475 to 500 years.

Fremont County is in both Seismic Zones 1 and 2 of the UBC. The southeastern two-thirds the County is in Seismic Zone 1, and the northwestern third of the County is in Seismic Zone 2. Effective peak accelerations (90% chance of non-exceedance in 50 years) can range from 5%-10%g in Zone 1, and from 10%g-20%g in Zone 2. Considering that southeastern Fremont County is near the boundary between Zone 1 and 2, it may be reasonable to assume that peak accelerations of 8%g – 10%g could be applied to the design of a non-critical facility in that part of the County. In northwestern Fremont County, it may be reasonable to assume that peak accelerations of 10%g – 20%g could be applied to the design of a non-critical facility in that part of the County. Again, it must be kept in mind that the UBC is designed to provide minimum standards to protect life, health, property, and public welfare. Depending upon the type of facility, more stringent regulations and criteria may apply.

Deterministic Analysis of Regional Active Faults with a Surficial Expression

Fremont County has two known active fault systems and one suspected active fault system with a surficial expression within the County boundary. The known systems are the South Granite Mountain fault system and the Stagner Creek fault system. The suspected system is the Cedar Ridge/Dry Fork fault system. The South Granite Mountain fault system trends west-northwest along the northern flanks of the Seminoe Mountains, Ferris Mountains, Green Mountain, and Crooks Mountain. The Stagner Creek fault system trends roughly east-west in the vicinity of Boysen Reservoir on the south flank of the Owl Creek uplift. The Cedar Ridge/Dry Fork fault system is located along the south flank of the Bridger and Bighorn Mountains, and extends into the northeastern part of the County.

South Granite Mountain Fault System

Geomatrix (1988b) divided the South Granite Mountain fault system into five segments. The segments, from west to east, are the Crooks Mountain segment, the Green Mountain segment, the Muddy Gap segment, the Ferris Mountains segment, and the Seminoe Mountains segment. The Crooks Mountain segment, the Green Mountain segment, and the western part of the Muddy Gap segment are present in Fremont County. Geomatrix (1988b) investigated all segments of the South Granite Mountain fault system, and discovered evidence of late-Quaternary faulting on the Green Mountain and Ferris Mountains segments of the fault system. They concluded that the Green Mountain segment was capable of generating a maximum credible earthquake of magnitude 6.75 with a recurrence interval of 2,000 to 6,000 years (1988b). They also concluded that the Ferris Mountains segment was capable of generating a maximum credible earthquake of magnitude 6.5 – 6.75 with a recurrence interval of 5,000 to 13,000 years.

Green Mountain Segment

Geomatrix (1988b) estimated that the east-west trending Green Mountain segment is 14.9 miles (24 km) long. Approximately 2.5 miles (4 km) north of the 14.9 mile long segment, Geomatrix mapped and described an east-west-trending lineament approximately 1.9 miles (3 km) long. The exact relationship between the 1.9- and 14.9-mile-long fault traces was not addressed by Geomatrix (Case, 1996). For the purposes of this analysis, it is assumed that the fault systems are connected, and that the 1.9-mile-long segment represents a system that is capable of generating a magnitude 6.75 earthquake.

A magnitude 6.75 earthquake, originating on the Green Mountain segment of the South Granite Mountain fault system, could generate a peak horizontal acceleration of 24%g to 36%g in Jeffrey City. The reason for the range in accelerations, is that the eastern part of the Green Mountain segment shows evidence of ground rupture, and the western part has no preserved evidence of ground rupture. The western part of the segment is closest to Jeffrey City. If rupture initiates on that part of the segment, a peak horizontal acceleration of 36%g could be felt in Jeffrey City (Campbell, 1987). If rupture initiates in the eastern part of the segment, a peak horizontal acceleration of 24%g could be felt in Jeffrey City (Campbell, 1987). These accelerations would be approximately felt as an intensity VIII earthquake in Jeffrey City, and could cause significant damage.

A magnitude 6.75 earthquake, originating on the Green Mountain segment of the South Granite Mountain fault system, could generate peak horizontal accelerations of 3%g in Atlantic City, 2.6g in Riverton, and 2.4g in Lander (Campbell, 1987). These accelerations would be approximately felt as an intensity V earthquake in Atlantic City, and as an intensity IV-V earthquake in Riverton and Lander. Cracked plaster may result in some buildings.

Crooks Mountain Segment

Geomatrix (1988b) did not find evidence of late-Quaternary movement on the Crooks Mountain segment, and scarps that were present were found to be fault-line scarps due to differential erosion. The Crooks Mountain segment, however, is an extension of other segments of the South Granite Mountain fault system that have been shown to be active in the late-Quaternary. Because of this, the segment should be considered to be potentially active. Geomatrix (1988b) estimated the length of the Crooks Mountain segment to be 21.1 miles (34 km). Such a fault length would result in a magnitude 6.85 earthquake if the entire length ruptured (Wells and Coppersmith, 1994). All other active segments of the South Granite Mountain fault system, however, have been assigned a maximum magnitude of 6.5 to 6.75. Because of this, the segment should be considered to be potentially capable of generating a magnitude 6.75 earthquake.

A magnitude 6.75 earthquake, originating on the Crooks Mountain segment of the South Granite Mountain fault system, could generate peak horizontal accelerations of 7.8%g in Jeffrey City, 6.8%g in Atlantic City, 5%g in Riverton, and 4.5%g in Lander (Campbell, 1987). These accelerations would be approximately felt as an intensity VI-VII earthquake in Jeffrey City and Atlantic City, and as an intensity V-VI earthquake in Riverton and Lander. An intensity VI-VII earthquake could cause moderate to significant damage, and an intensity V-VI earthquake could cause minor to moderate damage.

Stagner Creek Fault System

Geomatrix (1988a) investigated the Stagner Creek fault system, which roughly trends east-west in the vicinity of Boysen Reservoir. They determined that the maximum length of the fault is 24 miles (38km), with Quaternary-age displacement found along a 17 mile (27 km) segment of the fault between Mexican Pass and Tough Creek. Holocene to late-Pleistocene surfaces that were offset in the Birdseye Creek to Jewell Creek areas were examined in detail. Geomatrix (1998a) concluded that multiple events have occurred in the area, with an average displacement of 1.5 feet per event. The maximum credible earthquake was determined to be a magnitude 6.75 event, with a recurrence interval between 8,000 and 20,000 years.

A magnitude 6.75 earthquake, originating on the Stagner Creek fault system, could generate peak horizontal accelerations of 19%g in Shoshone, 10%g in Thermopolis, 8%g in Lysite, 6.5%g in Riverton, and 3%g in Lander (Campbell, 1987). These accelerations would be approximately felt as an intensity VII-VIII earthquake in Shoshoni, an intensity VII earthquake in Thermopolis, an intensity VI-VII earthquake in Lysite, an intensity VI earthquake in Riverton, and as an intensity V earthquake in Lander. An intensity VII-VIII earthquake could cause significant damage, an intensity VI-VII earthquake could cause moderate to significant damage, and an intensity V earthquake could cause minor damage.

Cedar Ridge/Dry Fork Fault System

Geomatrix (1988a) conducted investigations at three sites on the Cedar Ridge/Dry Fork fault system, which is located along the south flank of the Bridger and Bighorn Mountains. The westernmost Cedar Ridge fault, which is located in northeastern Fremont County, is approximately 35 miles long. The easternmost Dry Fork fault, which is primarily located in northwestern Natrona County, is approximately 15 miles long. Pleistocene-age movement was found only on the Cedar Ridge fault system, and then only at one location (NE ¼ Section 10, T39N, R92W) in northeastern Fremont County. A short scarp, approximately 0.8 miles long, was identified at that location. Since the entire fault system is approximately 50 miles long, and only one small active segment was discovered, Geomatrix (1988a) did not estimate the magnitude of a maximum credible earthquake or a recurrence interval. In fact they stated that the "age of this scarp and the absence of evidence for late Quaternary faulting elsewhere along the Cedar Ridge/Dry Fork fault suggest that this fault is inactive." As a result of this assessment, it is not possible to conduct a reliable deterministic analysis on the fault system, however general estimates can be made.

There is no compelling reason to believe that the entire Cedar Ridge fault system is active. If the entire system did activate, however, it could potentially generate a magnitude 7.1 earthquake. This is based upon a postulated length of 35 miles (Wells and Coppersmith, 1994). A magnitude 7.1 earthquake, originating on the Cedar Ridge fault system, could generate peak horizontal accelerations of 34%g at Lost Cabin, 26%g at Lysite, 20%g at Shoshoni, 6.5%g at Riverton, and 3.7%g at Lander (Campbell, 1987). These accelerations would be approximately felt as an intensity VIII earthquake at Lost Cabin and Lysite, an intensity VII earthquake at Shoshoni, an intensity VI earthquake at Riverton, and as an intensity V earthquake at Lander. An intensity VIII earthquake could cause significant damage, an intensity VII earthquake could cause moderate to significant damage, and intensity VI earthquake could cause minor to moderate damage, and a magnitude V earthquake could cause minor damage. Again, there is no compelling reason to believe that the entire Cedar Ridge fault will activate and generate a magnitude 7.1 earthquake.

Maximum Tectonic Province Earthquake - "Floating Earthquake"/Seismogenic Source

Many federal regulations require an analysis of the earthquake potential in areas where active faults are not exposed, and where earthquakes are tied to buried faults with no surface expression. Regions with a uniform potential for the occurrence of such earthquakes are called tectonic provinces. Within a tectonic province, earthquakes associated with buried faults are assumed to occur randomly, and as a result can theoretically occur anywhere within that area of uniform earthquake potential. In reality, that random distribution may not be the case, as all earthquakes are associated with specific faults. If all buried faults have not been identified, however, the distribution has to be considered random. "Floating earthquakes" or seismogenic sources are earthquakes that are considered to occur randomly in a tectonic province.

It is difficult to accurately define tectonic provinces when there is a limited historic earthquake record. When there are no nearby seismic stations that can detect small-magnitude earthquakes, which occur more frequently than larger events, the problem is compounded. Under these conditions, it is common to delineate larger, rather than smaller, tectonic provinces.

The U.S. Geological Survey identified tectonic provinces in a report titled "Probabilistic Estimates of Maximum Acceleration and Velocity in Rock in the Contiguous United States" (Algermissen and others, 1982). In that report, Fremont County was roughly classified as being in the "Faulted Laramide-Age Mountain Uplift" and the "Wind River Basin" tectonic provinces. Both provinces were assigned a "floating earthquake" with a maximum magnitude of 6.1. Geomatrix (1988a) suggested using a more extensive regional tectonic province, called the "Wyoming Foreland Structural Province", which is approximately defined by the Idaho-Wyoming Thrust Belt on the west, 104° West longitude on the east, 40° North latitude on the south, and 45° North latitude on the north. Geomatrix (1988b) estimated that the largest "floating" earthquake in the "Wyoming Foreland Structural Province" would have a magnitude in the 6.0 – 6.5 range, with an average value of magnitude 6.25.

Federal or state regulations usually specify if a "floating earthquake", seismogenic source, or tectonic province analysis is required for a facility. Usually, those regulations also specify at what distance a floating earthquake is to be placed from a facility. For example, for uranium mill tailings sites, the Nuclear Regulatory Commission requires that a floating earthquake be placed 15 kilometers from the site. That earthquake is then used to determine what horizontal accelerations may occur at the site. A magnitude 6.25 "floating" earthquake, placed 15 kilometers from any site in Fremont County, would generate horizontal accelerations of approximately 15%g at the site. That acceleration would be adequate for designing a uranium mill tailings site, but may be too large for less critical sites, such as a landfill. If a facility is to be sited in Fremont County, regulations will have to be examined to determine at what distance a "floating" earthquake should be placed from the site.

Probabilistic Seismic Hazard Analyses

The U.S. Geological Survey (USGS) publishes probabilistic acceleration maps for 500-, 1000-, and 2,500-year time frames. The maps show what accelerations may be met or exceeded in those time frames by expressing the probability that the accelerations will be met or exceeded in a shorter time frame. For example, a 10% probability that an acceleration may be met or exceeded in 50 years is roughly equivalent to a 100% probability of exceedance in 500 years.

The USGS has recently generated new probabilistic acceleration maps for Wyoming. Copies of the 500-year (10% probability of exceedance in 50 years), 1000-year (5% probability of exceedance in 50 years), and 2,500-year (2% probability of exceedance in 50 years) maps are enclosed. The 500-year map is often used for planning purposes for average structures, because a 10% chance of meeting or exceeding the accelerations shown on the map in 50 years is considered to be acceptable for designing average structures. For more critical structures, including radioactive facilities and mill tailings containments, the 2,500-year map may be useful for design purposes. The maps reflect current perceptions on seismicity in Wyoming. The maps do not show the effects of an activation on the South Granite Mountain fault system, the Stagner

Creek fault system, or the Cedar Ridge/Dry Fork fault system, because the expected return periods for those systems are generally much greater than 2,500 years.

Based upon the 500-year map (10% probability of exceedance in 50 years), the estimated peak horizontal accelerations in Fremont County range from 6-8%g in the eastern three-quarters of the County to 18%g in the northwestern corner of the County. The 6-8%g accelerations are comparable to an intensity VI earthquake, and are similar to the 7.5%g acceleration derived from the Uniform Building Code Seismic Zone Map for Seismic Zone 1. The 18%g acceleration is comparable to an intensity VII-VIII, and is similar to the 10%g-20%g accelerations derived from the Uniform Building Code Seismic Zone Map for Seismic Zone 2.

Based upon the 1000-year map (5% probability of exceedance in 50 years), the estimated peak accelerations in Fremont County range from 10-12%g in the eastern three-quarters of the County to 20-30%g in the northwestern corner of the County. The 10-12%g accelerations are comparable to an intensity VII earthquake, and the 20-30%g accelerations are comparable to an intensity VIII earthquake.

Based upon the 2500-year map (2% probability of exceedance in 50 years), the estimated peak accelerations in Fremont County range from 16-20%g in the eastern three-quarters of the County to 40%g in the northwestern corner of the County. The 16-20%g accelerations are comparable to an intensity VII-VIII earthquake, and the 40%g acceleration is comparable to an intensity VIII-IX earthquake.

Summary

Damaging earthquakes have occurred and will continue to occur in Fremont County. A maximum credible "random" earthquake of magnitude 6.25 is postulated for the County. In addition, exposed known or suspected active fault systems, in or near the County, are capable of generating earthquakes in the magnitude 6.75 – 7.1 range. New probabilistic acceleration maps for Wyoming indicate that horizontal accelerations in Fremont County can range from 6%g-18%g in 500 years (10% probability of exceedance in 50 years), from 10%g-30%g in 1,000 years (5% probability of exceedance in 50 years), and from 16%g-40%g in 2,500 years (2% probability of exceedance in 50 years). The probabilistic accelerations in Fremont County do not include a consideration of active faults in the County, because the recurrence intervals for the faults exceed the time periods for the probabilistic estimates.

A seismic hazard analysis for any site within the County has to incorporate a consideration

Depending on the location in Fremont County, average facilities and homes should be designed to provide for life safety during an intensity VII-VIII earthquake or an earthquake that would produce a peak horizontal acceleration of 10%g-20%g. Exceptions to this suggestion include the Jeffrey City area, the Lysite area, and the Lost Cabin area, because of their proximity to active fault systems with a surficial expression. In those areas, consideration should be given to designing average facilities and homes to Critical facilities should be designed to a higher standard.

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