Basic Seismological Characterization
for
Sublette County, Wyoming

by

James C. Case, Rachel N. Toner, and Robert Kirkwood
Wyoming State Geological Survey
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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 Sublette County, Wyoming, are an analysis of historic seismicity, an analysis of the Uniform Building Code, deterministic analyses of nearby active faults, an analysis of the maximum credible "floating earthquake", and current short- and long-term probabilistic seismic hazard analyses.

Historic Seismicity in Sublette County

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. Eighteen magnitude 2.5 or intensity III and greater earthquakes have been recorded in Sublette County.

On October 24, 1936, two earthquakes occurred in western Wyoming. The U.S.G.S. National Earthquake Information Center reported these two intensity III earthquakes as occurring in Sublette County, approximately 3 miles southwest of Cora. The original reference and description of these events, however, indicates that these earthquakes originated in the Star Valley of Lincoln County (Neumann, 1936).

In June of 1945, two earthquakes occurred in southwestern Sublette County. These intensity III earthquakes were recorded on June 7, 1945, approximately 4 miles northwest of Calpet, and on June 23, 1945, approximately 3 miles northeast of Calpet. Although people reported feeling the earthquakes, no damage resulted from them (Casper Tribune-Herald, June, 1945). The earthquakes did cause several camp buildings to creak.

On February 21, 1951, the U.S.G.S. National Earthquake Information Center reported that an intensity III earthquake occurred in Sublette County. A check of the original reference and description of this event, however, suggests a location error, as only three people in Rock Springs felt the earthquake (Murphy and Cloud, 1951). The epicenter of this earthquake will therefore be tentatively located in northwestern Sweetwater County.

No other earthquakes were recorded in the county until the 1960s. A magnitude 4.3, intensity V earthquake occurred in southeastern Sublette County on February 25, 1963, approximately 15 miles north-northeast of Big Sandy. The earthquake was felt for over a minute in Atlantic 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). Four more earthquakes were detected in Sublette County in the 1960s, but no one reported feeling the earthquakes and no damage was reported (U.S.G.S. National Earthquake Information Center). On July 31, 1965, a magnitude 2.8 earthquake occurred in western Sublette County, approximately 9 miles northwest of Calpet. A magnitude 2.7 earthquake occurred on August 18, 1967, approximately 7 miles northwest of Calpet. On December 18, 1967, an earthquake of no specific magnitude or intensity was recorded in northeastern Sublette County, which was centered approximately 34 miles northeast of Bondurant. On June 6, 1969, a magnitude 2.5 earthquake was recorded in the southern portion of the county, approximately 5 miles west of Calpet. Again, no one reported feeling these 1965 - 1969 earthquakes in Sublette County (U.S.G.S. National Earthquake Information Center).

In December 1971, two earthquakes occurred in southwestern Sublette County. On December 2, 1971, a magnitude 4.1 earthquake was detected approximately 15 miles southwest of Big Piney. A day later, on December 3, 1971, a magnitude 4.2 earthquake was recorded approximately 12 miles southwest of Big Piney. No one reported feeling either event (U.S.G.S. National Earthquake Information Center). A magnitude 3.3 earthquake was detected in the same area on February 6, 1978. No one felt this earthquake, which was centered approximately 13 miles southwest of Big Piney (U.S.G.S. National Earthquake Information Center).

Only one earthquake was recorded in the county in the 1980s. On October 21, 1988, a magnitude 3.6 earthquake occurred near the Teton County – Sublette County border. The epicenter of this earthquake was located approximately 4.5 miles north-northeast of Bondurant. No one felt this earthquake (U.S.G.S. National Earthquake Information Center).

Three earthquakes occurred in Sublette County in the 1990s. A magnitude 2.9 earthquake was reported on September 4, 1993, in southern Sublette County. No one reported feeling this earthquake that was centered approximately 2 miles north-northeast of Calpet. On October 21, 1996, a magnitude 3.7 earthquake was recorded approximately 13 miles southeast of Big Sandy. No one felt this earthquake and no damage was reported (U.S.G.S. National Earthquake Information Center). On November 16, 1999, a magnitude 3.1 event occurred on the Teton County – Sublette County border. Again, no one felt this earthquake that was centered approximately 9 miles north-northeast of Bondurant. (U.S.G.S. National Earthquake Information Center).

On June 27, 2000, the University of Utah Seismograph Stations detected a magnitude 2.7 earthquake in southwestern Sublette County, approximately 8 miles north-northeast of Calpet. No one reported feeling this event (U.S.G.S. National Earthquake Information Center).

Most recently, on September 27, 2001, an earthquake was recorded near the Fremont County-Teton County-Sublette County borders. Area residents reported feeling this magnitude 4.3 event that was centered approximately 25 miles northeast of Bondurant (U.S.G.S. National Earthquake Information Center).

Regional Historic Seismicity

Numerous earthquakes have also occurred near Sublette County. The first took place on December 6, 1921, in northeastern Lincoln County. No damage was reported from this intensity III earthquake that was located approximately 26 miles southwest of Merna. On December 12, 1923, an intensity V earthquake was detected in Fremont County, approximately 37 miles east-southeast of Big Sandy (Humphreys, 1924). No significant damage was reported. This area experienced another non-damaging, intensity III earthquake on October 30, 1925.

On November 23, 1934, an intensity V earthquake was reported in Fremont County, approximately 37 miles northeast of Big Sandy. Residents in a 10-mile radius around Lander reported that dishes were thrown from cupboards and pictures fell from walls. Buildings in two business blocks were cracked, and the brick chimney of the Fremont County Courthouse was moved two inches away from the building. The earthquake was felt as far away as Rock Springs and Green River (Casper Tribune-Herald, November 25, 1934).

On August 22, 1959, an intensity IV earthquake was detected in western Fremont County, approximately 37 miles east-southeast of Big Sandy. No damage was associated with this earthquake.

Several earthquakes occurred near Sublette County in the 1960s. On May 7, 1964, an earthquake of no specific magnitude or intensity was detected in southeastern Teton County. No one felt this event, which was centered approximately 6 miles north-northeast of Bondurant. Another earthquake of no specific magnitude or intensity occurred in eastern Lincoln County on July 10, 1964, approximately 19 miles west-southwest of Merna. No damage was reported. A non-damaging earthquake occurred in eastern Lincoln County on September 17, 1964. The epicenter of the magnitude 4.0 event was located approximately 26 miles southwest of Merna. On May 20, 1965, the U.S.G.S. National Earthquake Information Center recorded another earthquake of no specific magnitude or intensity in Lincoln County. This event was centered approximately 13 miles southwest of Bondurant. A magnitude 3.3 earthquake occurred in Lincoln County on August 22, 1965, approximately 18 miles west of Calpet. No one reported feeling the earthquake (U.S.G.S. National Earthquake Information Center). A non-damaging, magnitude 3.9 earthquake occurred in Lincoln County on December 24, 1965. This earthquake's epicenter was located approximately 21 miles southwest of Merna. On July 12, 1966, an earthquake occurred approximately 22 miles west-southwest of Calpet. No damage was reported from this magnitude 2.5 earthquake. On March 10, 1967, a magnitude 3.7 earthquake was recorded in Lincoln County approximately 16 miles south of Calpet. Residents in the area reported feeling this event, but no damage was reported (U.S.G.S. National Earthquake Information Center). A magnitude 2.5 earthquake was detected in Lincoln County on July 30, 1968. No damage was reported from this event that was centered approximately 18 miles west-southwest of Calpet. On August 27, 1969, a magnitude 4.2, intensity III earthquake was reported in Lincoln County, approximately 24 miles west-southwest of Merna. Residents of Auburn reported feeling this earthquake, but no damage was caused. On the same day, a magnitude 3.9 earthquake was detected roughly 21 miles northwest of Merna. No one reported feeling this event (U.S.G.S. National Earthquake Information Center). A second 3.9 earthquake occurred a few days later on August 30, 1969. This event was located in northeastern Lincoln County, approximately 16 miles southwest of Bondurant. Again, no one reported feeling this event (U.S.G.S. National Earthquake Information Center).

Seven earthquakes occurred in the region in the 1970s. The largest earthquake recorded in northern Lincoln County in the 1970s occurred on September 21, 1970, approximately 17 miles west-southwest of Bondurant. The magnitude 4.4 earthquake, which occurred near the Elbow Campground in the Snake river Canyon, was primarily felt in Teton and Sublette Counties. The Jackson Hole Guide (September 24, 1970) reported that residents from Jackson through the Hoback Canyon to Bondurant felt the earthquake. Some residents in Jackson thought that the event was a sonic boom. At Camp Davis, a resident reported a figurine knocked off a television set and a “vibrating” staircase. Eleven miles south of Jackson, a resident reported rattling windows and a shaking bed. Near Bondurant, a resident reported that windows rattled and her whole house shook. This event was followed by a magnitude 3.1 earthquake on December 27, 1975. Its epicenter was located in the northern part of Lincoln County, approximately 17 miles west-southwest of Bondurant. No damage was reported. In March of 1976, a series of earthquakes occurred in southern Teton County. On March 14, 1976, a magnitude 3.7 earthquake was recorded approximately 16 miles west-northwest of Bondurant. This event was followed by a magnitude 3.9 earthquake on March 17, 1976. This earthquake was centered approximately 13 miles west-northwest of Bondurant. On March 21, 1976, a magnitude 2.9 earthquake and a magnitude 2.8 earthquake occurred approximately 14 miles west-northwest of Bondurant. No one reported feeling any of the March 1976 earthquakes, and no damage was associated with them. On July 3, 1979, a magnitude 3.2, intensity IV earthquake occurred approximately 19 miles northwest of Bondurant. Jackson residents reported that dishes rattled and that pictures on walls moved. Horses at the Teton County Fairgrounds were also noticeably disturbed (Casper Star-Tribune, July 4, 1979).

The first regional earthquake that was felt in the 1980s occurred on May 6, 1981. The epicenter of the magnitude 3.7, intensity IV earthquake was located in Teton County, approximately 18 miles northwest of Bondurant. A local disc jockey reported that “window frames changed position briefly, and the turntable and the seat of my pants came up and down at the same time”. A local secretary said her desk moved during the event (Casper Star-Tribune, May 7, 1981). A magnitude 3.2, intensity IV earthquake occurred in Fremont County on August 31, 1982. No significant damage was reported from this earthquake, which was centered approximately 34 miles east-northeast of Big Sandy (Case, 1994). The next earthquake to occur in Teton County took place on December 20, 1983, approximately 18 miles west-northwest of Bondurant. This magnitude 4.5, intensity IV earthquake was felt from Jackson to the Palisades Reservoir in Idaho. In Jackson, there were reports of Christmas trees falling over and dishes breaking (Laramie Daily Boomerang, December 21, 1983). A number of aftershocks followed the December 20, 1983 event, the largest of which was a magnitude 3.4 earthquake that occurred on December 22, 1983. On January 5, 1984, a magnitude 3.0 aftershock occurred in the same area. A magnitude 2.8 earthquake was detected on March 23, 1984, approximately 20 miles northwest of Bondurant. Residents near Hoback Junction reported feeling it as an intensity II event. On November 3, 1984, a magnitude 5.1, intensity VI earthquake was detected in Fremont County, approximately 35 miles southeast of Big Sandy. The earthquake was felt in Lander, Dubois, Atlantic City, and Casper. Residents in Lander and Atlantic City reported cracked walls, foundations, and windows (Casper Star-Tribune, November 4, 1984). This event was one of the largest earthquakes to occur in the southwestern quarter of the state. A magnitude 4.8 earthquake occurred on August 21, 1985, approximately 18 miles west-southwest of Bondurant. It was felt as an intensity V event at Alpine, and intensity IV event at Wilson in Teton County, an intensity IV event at Lander in Fremont County, and was lightly felt in Jackson. No major damage was reported, although the Teton County Sheriff's Department reported that the earthquake caused a motorist to drive off the highway in the Snake River Canyon (Casper Star-Tribune, August 22, 1985). A second earthquake, a magnitude 4.3 event, occurred on August 22, 1985, approximately 21 miles southwest of Bondurant. It was felt as an intensity IV event in Alpine, with no significant damage reported (Laramie Daily boomerang, August 23, 1985). Magnitude 3.4 and magnitude 3.2 earthquakes also occurred in Lincoln County on August 22, 1985. No one reported feeling these earthquakes, which were centered approximately 24 miles southwest of Bondurant. On August 30, 1985, a magnitude 4.3, intensity V earthquake was recorded approximately 24 miles west-southwest of Bondurant. It was felt as an intensity V event at Alpine, and was also felt in Jackson. A magnitude 4.6, intensity V earthquake occurred on September 6, 1985, approximately fifteen miles west-southwest of Bondurant. It was felt as an intensity V event at Alpine, and as an intensity IV event in Wilson. An earthquake-induced landslide temporarily closed a portion of U.S. Highway 89 in the Snake River Canyon (Casper Star-Tribune, September 8, 1985). A second earthquake occurred on September 6, 1985 in the same area. No one reported feeling this magnitude 3.6 earthquake. Two earthquakes occurred in Lincoln County on November 17, 1986, approximately 19 miles west-southwest of Bondurant. The first was a magnitude 3.9 event, which was felt by residents in the area. The second, a magnitude 3.7 earthquake, was not felt. Two non-damaging magnitude 2.9 earthquakes occurred in Sweetwater County on December 4, 1986. No one reported feeling these earthquakes that were centered approximately 27 and 31 miles west-southwest of Calpet (Stover and Brewer, 1994). No major earthquakes occurred in the region until 1988 and 1989, when several were recorded in southeastern Teton County. On August 24, 1988, two earthquakes occurred approximately 24 miles northwest of Bondurant. Jackson area residents reported feeling the first earthquake, which was a magnitude 2.8 event, but no one reported feeling the second, magnitude 2.4 earthquake. The U.S.G.S. National Earthquake Information Center detected two earthquakes in southern Teton County on October 21, 1988. The first, a magnitude 3.6 earthquake, was centered near the Teton County-Sublette County border, approximately 4.5 miles north-northeast of Bondurant. The second earthquake was a magnitude 3.5 event, located approximately 10 miles north-northeast of Bondurant. Neither earthquake was felt. A magnitude 3.6 earthquake on December 4, 1988, was centered approximately 17 miles north-northeast of Bondurant. No one felt this earthquake. On May 12, 1989, a magnitude 2.6 earthquake occurred in southeastern Teton County, approximately 24 miles northwest of Bondurant. No one reported feeling this earthquake. It was followed closely by a magnitude 3.1 earthquake approximately 20 miles northwest of Bondurant. The U.S.G.S. National Earthquake Information Center reported that the earthquake was felt as an intensity III event in Jackson, but no damage occurred. On June 24, 1989, two earthquakes were felt strongly at Jackson. They both were centered approximately 26 miles northwest of Bondurant. The first earthquake, which occurred at 3:25 a.m., had a magnitude of 3.8. The second earthquake, which occurred one hour later, had a magnitude of 3.7. People reported windows rattling, but no damage was associated with these earthquakes (Casper Star-Tribune, June 25, 1989). Two more earthquakes were detected by the U.S.G.S. National Earthquake Information Center later that same day in the same area. Both were magnitude 3.0, but neither was felt.

Many earthquakes also occurred near Sublette County in the 1990s. The first was recorded in southeastern Teton County on March 4, 1990. This magnitude 4.1 earthquake was centered approximately 20 miles northwest of Bondurant. Jackson area residents felt the earthquake as an intensity IV event, but no damage was reported (Casper Star-Tribune, March 6, 1990). On April 9, 1990, a magnitude 3.5 earthquake was detected in northeastern Lincoln County. The earthquake, which was located approximately 11 miles southwest of Bondurant, did not cause any damage. On November 17, 1990, a magnitude 3.1 earthquake also occurred in northeastern Lincoln County, roughly 17 miles southwest of Bondurant. No one reported feeling this event. Between 1991 and 1999, several earthquakes occurred in southeastern Teton County. They ranged in magnitude between 2.8 and 4.7. Only the two that were felt are discussed below. A non-damaging earthquake occurred in western Fremont County on January 31, 1992, approximately 39 miles northeast of Big Sandy (Case, 1994). Area residents reported feeling this magnitude 2.8 event (U.S.G.S. National Earthquake Information Center). A magnitude 3.1 earthquake was also recorded in northwestern Fremont County, on August 22, 1993, approximately 36 miles northeast of Bondurant. No one felt this earthquake. The next regional earthquake that was felt occurred on December 28, 1993, in southeastern Teton County. This magnitude 4.7 earthquake, intensity V earthquake was centered approximately 23 miles northeast of Bondurant. The earthquake was felt in Jackson, Dubois, Hudson, Lander, and Rock Springs. Most reports indicated that the earthquake felt like a heavy truck passing by. A ranch near the epicenter reported swinging lights, but no damage. Another magnitude 4.7 earthquake occurred in southeastern Teton County on June 20, 1998, approximately 13 miles west-northwest of Bondurant. No damage was reported from the magnitude 4.7 event, but it was distinctly felt at Hoback Junction and was felt by many residents of Jackson. Approximately 14 aftershocks of magnitude2.0 and greater occurred in the same area through June 22, 1998. A series of seven earthquakes were detected on January 30, 1999 through February 1, 1999, in northern Lincoln County. These events, located approximately 17-20 miles west-southwest of Bondurant, ranged from magnitude 2.8 to magnitude 3.9. On June 18, 1999, a magnitude 3.5 earthquake occurred in the same area. No one reported feeling these 1999 earthquakes in Lincoln County.

On January 8, 2000, a magnitude 3.5 earthquake was recorded in northern Lincoln County, approximately 13 miles south-southwest of Calpet. Two earthquakes also occurred in Lincoln County on April 20, 2000. These magnitude 2.7 and magnitude 2.3 events were centered approximately 14 miles west of Bondurant. A magnitude 3.9 earthquake occurred in southeastern Teton County on October 3, 2000, approximately 25 miles north of Bondurant. The last regional earthquake to occur in 2000 took place in Lincoln County on December 1, 2000. The epicenter of this magnitude 3.2 event was located approximately 17 miles west-southwest of Bondurant. None of these 2000 earthquakes were felt and no damage was reported.

No major regional earthquakes were recorded until January 2, 2002, when a magnitude 3.1 earthquake occurred in southern Teton County. No one reported feeling the event, which was located approximately 20 miles north-northeast of Bondurant. On January 29, 2002, an earthquake was also detected in Teton County, approximately 27 miles north-northwest of Bondurant. According to the U.S.G.S. National Earthquake Information Center, Jackson area residents reported feeling this magnitude 3.7 earthquake. In March 2002, a series of earthquakes were recorded in northern Lincoln County near Alpine. A magnitude 3.4 earthquake occurred on March 24, 2002, approximately 19 miles west-southwest of Bondurant. This event was followed by magnitude 2.8 and magnitude 3.1 events on March 25, 2002, in the same area. A week later, on March 31, 2002, a magnitude 3.5 earthquake was reported approximately 15 miles west-southwest of Bondurant. No one felt the March earthquakes and no damage was reported. On May 8, 2002, the U.S. Bureau of Reclamation recorded three earthquakes in the same area as the March events. Again, no one felt these magnitude 3.3, 2.7, and 3.2 earthquakes. Three earthquakes also occurred in the Alpine area in October 2002. On October 21, 2002, a magnitude 3.2 earthquake was detected approximately 27 miles west of Bondurant. This event was followed closely by a magnitude 4.4 earthquake centered approximately 21 miles west-southwest of Bondurant. Residents in the area reported feeling both of these earthquakes. No damage was reported from either event. On October 23, 2002, a magnitude 3.4 earthquake was reported approximately 28 miles west of Bondurant. No one reported feeling this earthquake. The most recent event to occur in the region took place in Teton County on November 9, 2002. This magnitude 3.0 earthquake was centered approximately 23 miles north-northeast of Bondurant. No one felt this event.

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 (Figure 1) (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.

Sublette County is in Seismic Zones 1, 2, and 3 of the UBC. Since effective peak accelerations (90% chance of non-exceedance in 50 years) can range from 5%g-30%g in these zones, and there has been some significant historic seismicity in the county, it may be reasonable to assume that an average peak acceleration of 17%g could be applied to the design of a non-critical facility located in the county if only the UBC were used. Such acceleration, however, is significantly less than would be suggested through newer building codes.

Recently, the UBC has been replaced by the International Building Code (IBC). The IBC is based upon probabilistic analyses, which are described in a following section. Sublette County still uses the UBC, however, as do most Wyoming counties as of January 2003.

Deterministic Analysis of Regional Active Faults with a Surficial Expression

Deterministic analyses for twelve active fault systems are included for Sublette County (see Table 1 and Figure 2). The South Granite Mountain fault system is composed of several northwest-southeast trending fault segments in southeastern Fremont County and northwestern Sublette County. Geomatrix (1988b) divided the South Granite Mountain fault system into five segments. The segments, from east to west, are the Seminoe Mountains segment, the Ferris Mountains segment, the Muddy Gap segment, the Green Mountain segment, and the Crooks Mountain segment. Geomatrix (1988b) discovered evidence of late-Quaternary faulting on the Ferris Mountains and Green Mountain segments of the fault system. They 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. They also 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). Geomatrix (1988b) did not find evidence

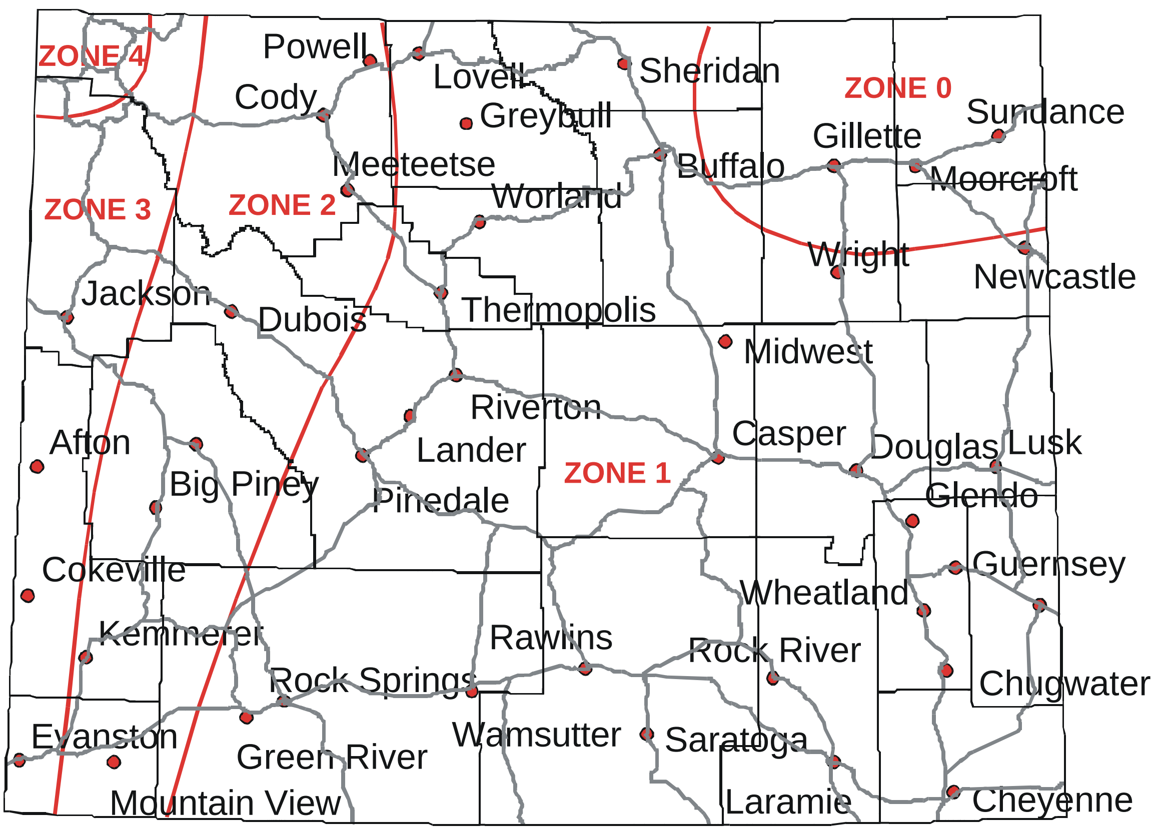

Figure 1. UBC Seismic Zone Map.

of late-Quaternary movement on the Seminoe Mountains, Muddy Gap, and Crooks Mountain fault segments. These segments, however, may be extensions of the known active faults in the South Granite Mountain fault system. They should therefore be considered to be potentially active. Geomatrix (1988b) estimated the length of the Seminoe Mountains segment to be 22.5 miles (36 km). Such a fault length would result in a magnitude 6.85 earthquake if the entire length ruptured (Wells and Coppersmith, 1994). The length of the Crooks Gap fault segment was estimated to be 21.25 miles (34 km) (Geomatrix, 1988b). This fault length could generate a magnitude 6.86 earthquake if the entire length ruptured (Wells and Coppersmith, 1994). The Muddy Gap fault system is approximately 14.4 miles (23 km) in length (Geomatrix, 1988b). If the entire fault ruptured, a magnitude 6.66 earthquake could be generated (Wells and Coppersmith, 1994).

Because only a rupture of the Crooks Gap fault segment of the South Granite Mountain fault system would affect Sublette County, only this segment will be discussed. A magnitude 6.86 earthquake could generate peak horizontal accelerations of approximately 1.9%g at Big Sandy. This acceleration would be roughly equivalent to an intensity IV earthquake, which should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should not sustain any damage.

The Rock Creek fault system is a north-south-trending normal fault located approximately 15 miles west of Kemmerer, Wyoming, near Fossil Butte National Monument. McCalpin and Warren (1992) found evidence of late-Quaternary movement on this system. Based upon a surface rupture length of 24 miles (38 km) and Quaternary displacement amounts, it has been estimated that the Rock Creek fault is capable of generating a magnitude 6.9 to 7.2 earthquake with an approximate recurrence interval of 600-1500 years (Chambers, 1988; McCalpin, 1993). The most recent events on the Rock Creek fault, however, occurred approximately 3600±300 and 4600±200 years before present (McCalpin, 1993). This suggests that the recurrence interval for this fault system may be variable and an exact interval may be difficult to determine. A maximum magnitude 7.2 earthquake could generate peak horizontal accelerations of approximately 5.4%g at Big Piney, approximately 2.1%g at Big Sandy and Bondurant, approximately 2.4%g at Boulder, approximately 8.6%g at Calpet, approximately 2.6%g at Cora, approximately 3.3%g at Daniel, approximately 5.1%g at Marbleton, approximately 3.4%g at Merna, and approximately 2.5%g at Pinedale (Campbell, 1987). These accelerations are roughly equivalent to intensity V earthquakes at Big Piney and Calpet, and intensity IV earthquakes at Big Sandy, Bondurant, Boulder, Cora, Daniel, Marbleton, Merna, and Pinedale. Big Piney and Calpet could sustain very light damage, but no damage should occur at Big Sandy, Bondurant, Boulder, Cora, Daniel, Marbleton, Merna, or Pinedale.

The Grey's River fault system is another active fault system located in Lincoln County on the western side of the Wyoming Range. Evidence of late-Holocene movement has also been identified on this north-south-trending normal fault (Jones and McCalpin, 1992; McCalpin, 1993). Based upon an estimated surface rupture length of 54 km, the Grey's River fault system could potentially generate a magnitude 7.1 earthquake with a recurrence interval of approximately 2970 – 3400 years (Jones, 1995; Jones and McCalpin, 1992). The most recent events on the fault occurred 1910-2110 and 5080-5310 years before present. However, because no movement occurred on the Grey's River fault system between approximately 5000 and 15,000 years before present, this recurrence interval may be variable (Jones and McCalpin, 1992). A magnitude 7.1 earthquake could generate peak horizontal accelerations of approximately 8.2%g at Big Piney, approximately 2.8%g at Big Sandy, approximately 10.1%g at Bondurant, approximately 3.7%g at Boulder, approximately 8.4%g at Calpet, approximately 5.6%g at Cora, approximately 7.2%g at Daniel, approximately 7.8%g at Marbleton, approximately 10.3%g at Merna, and approximately 4.7%g at Pinedale (Campbell, 1987). These accelerations are roughly equivalent to intensity VI earthquakes at Bondurant and Merna, intensity V earthquakes at Big Piney, Calpet, Cora, Daniel, Marbleton, and Pinedale, and an intensity IV earthquake at Big Sandy. Light damage could occur at Bondurant and Merna, whereas Big Piney, Calpet, Cora, Daniel, Marbleton, and Pinedale could sustain very light damage. No damage should occur at Big Sandy.

The Star Valley fault system is also an active fault system in Lincoln County. This fault system, which has been subdivided into north and south segments, bounds the eastern edge of the Star Valley. Investigations of the Star Valley fault system determined that Holocene and late-Pleistocene offsets exist along the south fault segment (Piety et al., 1986; McCalpin et al., 1990; McCalpin, 1990). Several maximum magnitude earthquakes have been suggested for the Star Valley fault system. Piety and others (1986) proposed that the Star Valley fault system is capable of generating a maximum credible earthquake of magnitude 7.5 with a recurrence interval of 5,000 to 7,000 years. Based upon a surface rupture length of 27 miles, McCalpin and others (1990) determined that the Star Valley fault system could produce a maximum magnitude 7.2 earthquake. When McCalpin (1990) trenched a portion of the Star Valley fault near Afton, he determined that a magnitude 7.3 earthquake with a recurrence interval of 2550-6000 years is possible on this system. Approximately 5,500 years (radiocarbon age) has elapsed since the latest event on the fault system at the Afton locality. Based upon this evidence, the Star Valley fault system is near the maximum limit for the recurrence interval assigned to the system. Because of the extensive seismic activity associated with the area surrounding the Star Valley fault, and because of the close proximity of towns to this fault system, a maximum magnitude of 7.5 will be used for this analysis. It should also be noted that it has been approximately 5500 years since the last confirmed event on the Star Valley fault at Afton. This fault system is therefore nearing its recurrence interval limit. A magnitude 7.5 earthquake could generate peak horizontal accelerations of approximately 6.0%g at Big Piney, approximately 2.6%g at Big Sandy, approximately 9.4%g at Bondurant, approximately 3.6%g at Boulder, approximately 5.8%g at Calpet, approximately 5.2%g at Cora, approximately 6.0%g at Daniel, approximately 5.8%g at Marbleton, approximately 9.4%g at Merna, and approximately 4.4%g at Pinedale (Campbell, 1987). These accelerations are roughly equivalent to intensity VI earthquakes at Bondurant and Merna, intensity V earthquakes at Big Piney, Calpet, Cora, Daniel, Marbleton, and Pinedale, and an intensity IV earthquake at Big Sandy. Light damage could occur at Bondurant and Merna, whereas Big Piney, Calpet, Cora, Daniel, Marbleton, and Pinedale could sustain very light damage. No damage should occur at Big Sandy.

The Teton fault system is a series of northeast-southwest-trending normal faults located in Teton County on the eastern edge of the Teton Range near Jackson, Wyoming. While Quaternary/Holocene-aged fault scarps have been identified along the entire length of the fault (Smith et al., 1990a, Wong et al., 2000), much is still unresolved about the Teton fault system. Previous investigations have divided it into northern, central, and southern segments (Smith et al., 1990a; Susong et al., 1987). Other researchers prefer an unsegmented model of the Teton fault (Ostenaa et al., 1988, Byrd et al., 1994). In addition, questions still exist as to whether or not the Beula-Hering Lakes faults in Yellowstone National Park are a northern extension of the Teton fault (Wong et al., 2000). Based upon unsegmented surface rupture lengths (48 miles/77 km including Beula-Hering Lakes faults; 40miles/64km not including Beula-Hering Lakes faults), Wong and others (2000) estimate that the Teton fault is capable of generating a magnitude 6.9 to 7.5 earthquake. This agrees with other analyses, in which a maximum credible earthquake of magnitude 7.5 and a recurrence interval of 800-3600 years were suggested for the Teton fault (Doser and Smith, 1983; Gilbert et al., 1983). A trench on the Teton fault indicated that the fault most recently activated between 4800-7000 years ago (Smith et al., 1993). As a result, Case (1997a) suggests that the Teton fault may be overdue for a magnitude 7.5 earthquake. If a magnitude 7.5 earthquake did occur on the Teton fault, it could potentially generate peak horizontal accelerations of approximately 2.2%g at Big Piney, approximately 1.6%g at Big Sandy, approximately 9.0%g at Bondurant, approximately 2.2%g at Boulder, approximately 1.7%g at Calpet, approximately 3.5%g at Cora and Daniel, approximately 2.3%g at Marbleton, approximately 4.8%g at Merna, and approximately 2.9%g at Pinedale (Campbell, 1987). These accelerations are roughly equivalent to intensity V earthquakes at Bondurant and Merna, and intensity IV earthquakes at Big Piney, Big Sandy, Boulder, Calpet, Cora, Daniel, Marbleton, and Pinedale. Very light damage could occur at Bondurant and Merna, but no damage should occur at Big Sandy, Big Piney, Big Sandy, Boulder, Calpet, Cora, Daniel, Marbleton, or Pinedale.

The Baldy Mountain fault system is a series of short faults located approximately 21 miles (33 km) east of the Teton fault. Investigators at the U.S.G.S. identified areas where the faults offset Quaternary-aged glacial moraines. No maximum magnitude earthquake has been specifically postulated for the Baldy Mountain fault system. It is generally accepted that a magnitude 6.5 earthquake is required to produce ground surface rupture. While evidence of ground surface rupturing has been identified on the Baldy Mountain fault system, the ground surface rupture length is not consistent with a magnitude 6.5 event. In the interest of public safety, however, this report will model the Baldy Mountain fault system as being capable of generating a magnitude 6.5 earthquake with a recurrence interval of approximately 13,000-25,000 years (Machette et al., 2001; Pierce and Morgan, 1992). A magnitude 6.5 earthquake on this fault system could, in turn, generate peak horizontal accelerations of approximately 3.2%g at Bondurant, approximately 1.6%g at Cora, and approximately 1.8%g at Merna. These accelerations are roughly equivalent to intensity IV earthquakes, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

The last active fault system in Teton County is the Togwotee Lodge fault system. This series of faults lie in the eastern part of the county, approximately 9 miles (15 km) west of Togwotee Pass. The U.S.G.S. found evidence that Quaternary-aged glacial deposits have been offset along the fault traces, with a recurrence interval of approximately 16,000-23,000 years (Marchette et al, 2001). As with the Baldy Mountain fault system, the Togwotee Lodge faults have a shorter ground surface rupture length than would be produced by a magnitude 6.5 earthquake. The presence of any ruptured ground surface along these faults, however, suggests that they may be capable of producing at least a magnitude 6.5 earthquake. A magnitude 6.5 earthquake on the Togwotee Lodge fault system could generate peak horizontal accelerations of approximately 2.8%g at Bondurant, approximately 1.6%g at Cora, and approximately 1.7%g at Merna. These accelerations are roughly equivalent to intensity IV earthquakes, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

Active fault systems present in the southern portion of Yellowstone National Park may also affect Sublette County. Love and Christiansen (1985) describe the Buffalo Fork fault as beginning on the western side of the South Arm of Yellowstone Lake and continuing south to Gravel Mountain in Teton National Forest. This normal fault that reactivated a reverse fault surface offsets the Quaternary Lava Creek Tuff near Channel Mountain (U.S.G.S., 1972). Based upon a maximum surface rupture length of 32 miles (51 km), a maximum credible earthquake of magnitude 7.1 has been postulated for this fault (Wong et al., 2000). No definite recurrence interval has been determined for the Buffalo Fork fault. The U.S.G.S. suggests a long recurrence interval of approximately 10,000 to 100,000 years (Marchette et al., 2001), since at least one event has occurred on the fault since the glaciers receded from the area. A magnitude 7.1 earthquake on the Buffalo Fork fault could potentially generate peak horizontal accelerations of approximately 3.5%g at Bondurant, approximately 2.0%g at Cora, approximately 1.8%g at Daniel, approximately 2.0%g at Merna, and approximately 1.7%g at Pinedale. These accelerations are roughly equivalent to intensity IV earthquakes, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

The Beula-Hering Lakes faults are present east of Hering Lake and extend south into Teton County. They may even be an extension of the Teton fault system (Case, 1997a; Love, 1961; Love et al., 1992; Wong et al., 2000). For this analysis, however, they will be considered as a separate fault system. (See the first paragraph of this section for information related to including the Beula-Hering Lakes faults as part of the Teton fault) The Quaternary-aged Huckleberry Ridge Tuff and Lewis Canyon Rhyolite are displaced by the Beula-Hering Lakes faults. Based upon a maximum surface rupture length of 8 miles (13 km), Wong and others (2000) estimated that a maximum magnitude 6.7 earthquake could result from this fault system. A long recurrence interval is probable, as the most recent event is dated to less than 630,000 years before present (offset of the Lava Creek Tuff), but the 70,000 year old Pitchstone Plateau rhyolite flow is not disturbed by these faults (U.S.G.S., 1972; Marchette et al., 2001). A magnitude 6.7 earthquake on the Beula-Hering Lakes faults could generate a peak horizontal acceleration of approximately 1.8%g at Bondurant. This acceleration is roughly equivalent to an intensity IV earthquake, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

The Mount Sheridan-Heart River fault system extends from the Heart Lake Geyer Basin southwest of Yellowstone Lake to near Bobcat Ridge in the Bridger-Teton National Forest. Quaternary-aged movement has been identified along these north-south-trending faults, as they offset the Huckleberry Ridge Tuff in several locations. Based upon a maximum surface rupture length of nearly 26 miles (41 km), a maximum magnitude 7.0 earthquake has been suggested for this fault system (Wong et al., 2000). The U.S.G.S. estimated that because this fault system has a high slip rate (1-5mm/yr), the recurrence interval for the Mount Sheridan-Heart River fault is less than 5,000 years. The age of the most recent events are not known, as no dating has been done on this fault system. A magnitude 7.0 earthquake on the Mount Sheridan-Heart River fault could generate peak horizontal accelerations of approximately 2.6%g at Bondurant and 1.6%g at Merna. These accelerations are roughly equivalent to intensity IV earthquakes, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

The Yellowstone River Valley in the southeastern portion of Yellowstone National Park is bounded by several active normal faults. These faults displace Quaternary/Holocene deposits and alluvium along their trace. Based upon a maximum surface rupture length of 14 miles (22 km), these faults could generate a maximum magnitude 6.6 earthquake (Wong et al., 2000). No specific recurrence interval has been determined for these faults. A magnitude 6.6 earthquake on these faults could in turn generate a peak horizontal acceleration of approximately 1.5%g at Bondurant, or an intensity IV earthquake. No damage should occur at Bondurant. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

The Yellowstone Lake fault extends from Dot Island in Yellowstone Lake south to Overlook Mountain. The U.S.G.S. (1972) found evidence that this fault has disturbed Quaternary Lava Creek Tuff and Mount Jackson Rhyolite deposits, as well as lacustrine deposits from Yellowstone Lake. Based upon a maximum surface rupture length of 17.5 miles (28 km), Wong and others (2000) estimated that a maximum magnitude 6.8 earthquake could be generated by this fault. Preliminary investigations of the Yellowstone Lake fault suggest a recurrence interval of approximately 7,000 years for the middle section of the fault (Marchette et al., 2001; Locke et al., 1992). A magnitude 6.8 earthquake could produce peak horizontal accelerations of approximately 1.6%g at Bondurant. This acceleration is roughly equivalent to an intensity IV earthquake, and should not cause any damage. The rest of the towns in Sublette County would be subjected to ground accelerations of less than 1.5%g and should also not sustain any damage.

Floating or Random Earthquake Sources

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” 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, Sublette County was classified as being in a tectonic province with a “floating earthquake” maximum magnitude of 6.1. Geomatrix (1988b) 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” 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 structure in Sublette 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. Critical facilities, such as dams, usually require a more detailed probabilistic analysis of random earthquakes. Based upon probabilistic analyses of random earthquakes in an area distant from exposed active faults (Geomatrix, 1988b), however, placing a magnitude 6.25 earthquake at 15 kilometers from a site will provide a fairly conservative estimate of design ground accelerations.

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 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 (Case, 2000). 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 attached. Until recently, the 500-year map was often used for planning purposes for average structures, and was the basis of the most current Uniform Building Code. The new International Building Code, however, uses a 2,500-year map as the basis for building design. The maps reflect current perceptions on seismicity in Wyoming. In many areas of Wyoming, ground accelerations shown on the USGS maps can be increased due to local soil conditions. For example, if fairly soft, saturated sediments are present at the surface, and seismic waves are passed through them, surface ground accelerations will usually be greater than would be experienced if only bedrock was present. In this case, the ground accelerations shown on the USGS maps would underestimate the local hazard, as they are based upon accelerations that would be expected if firm soil or rock were present at the surface. Intensity values can be found in Table 2.

Based upon the 500-year map (10% probability of exceedance in 50 years) (Figure 3), the estimated peak horizontal acceleration in Sublette County ranges from approximately 7%g in the southeastern portion of the county to over 25%g in the northwestern corner of the county. These accelerations are roughly comparable to intensity V earthquakes (3.9%g – 9.2%g), intensity VI earthquakes (9.2%g – 18%g), and intensity VII earthquakes (18%g – 34%g). Intensity V earthquakes can result in cracked plaster and broken dishes. Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures, such as unreinforced masonry. Chimneys may be broken. Big Piney and Pinedale would be subjected to accelerations of approximately 10%g (intensity VI) and 9%g (intensity V) respectively.

Based upon the 1000-year map (5% probability of exceedance in 50 years) (Figure 4), the estimated peak horizontal acceleration in Sublette County ranges from approximately 10%g in the eastern part of the county to nearly 40%g in the northwestern corner of the county. These accelerations are roughly comparable to intensity VI earthquakes (9.2%g – 18%g), intensity VII earthquakes (18%g – 34%g), and intensity VIII earthquakes (34%g – 65%g). Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures, such as unreinforced masonry. Chimneys may be broken. Intensity VIII earthquakes can result in considerable damage in ordinary buildings and great damage in poorly built structures. Panel walls may be thrown out of frames. Chimneys, walls, columns, factory stacks may fall. Heavy furniture may be overturned. Big Piney and Pinedale would be subjected to accelerations of approximately 10-15%g, or intensity VI.

Based upon the 2500-year map (2% probability of exceedance in 50 years) (Figure 5), the estimated peak horizontal acceleration in Sublette County ranges from approximately 17%g in the northeast and south-central parts of the county to over 60%g in the northwestern corner of the county. These accelerations are roughly comparable to intensity VI earthquakes (9.2%g – 18%g), intensity VII earthquakes (18%g – 34%g), and intensity VIII earthquakes (34%g – 65%g). Intensity VI earthquakes can result in fallen plaster and damaged chimneys. Intensity VII earthquakes can result in slight to moderate damage in well-built ordinary structures, and considerable damage in poorly built or badly designed structures, such as unreinforced masonry.

Chimneys may be broken. Intensity VIII earthquakes can result in considerable damage in ordinary buildings and great damage in poorly built structures. Panel walls may be thrown out of frames. Chimneys, walls, columns, factory stacks may fall. Heavy furniture may be overturned. Big Piney and Pinedale would be subjected to accelerations of approximately 20%g, or intensity VII.

As the historic record is limited, it is nearly impossible to determine when a 2,500-year event last occurred in the county. Because of the uncertainty involved, and based upon the fact that the new International Building Code utilizes 2,500-year events for building design, it is suggested that the 2,500-year probabilistic maps be used for Sublette County analyses. This conservative approach is in the interest of public safety.

Table 2:

Modified Mercalli Intensity	Acceleration (%g) (PGA)	Perceived Shaking	Potential Damage
I	<0.17	Not felt	None
II	0.17 – 1.4	Weak	None
III	0.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 – 34	Very Strong	Moderate
VIII	34 – 65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X	>124	Extreme	Very Heavy
XI	>124	Extreme	Very Heavy
XII	>124	Extreme	Very Heavy

Modified Mercalli Intensity and peak ground acceleration (PGA) (Wald, et al 1999).

Abridged Modified Mercalli Intensity Scale

Intensity value and description:

I Not felt except by a very few under especially favorable circumstances.

II Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.

III Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing automobiles may rock slightly. Vibration like passing of truck. Duration estimated.

IV During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing automobiles rocked noticeably.

V Felt by nearly everyone, many awakened. Some dishes, windows, and so on broken; cracked plaster in a few places; unstable objects overturned. Disturbances of trees, poles, and other tall objects sometimes noticed. Pendulum clocks may stop.

VI Felt by all, many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster and damaged chimneys. Damage slight.

VII Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving cars.

VIII Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving cars disturbed.

IX Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.

X Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations; ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed, slopped over banks.

XI Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.

XII Damage total. Waves seen on ground surface. Lines of sight and level distorted. Objects thrown into the air.

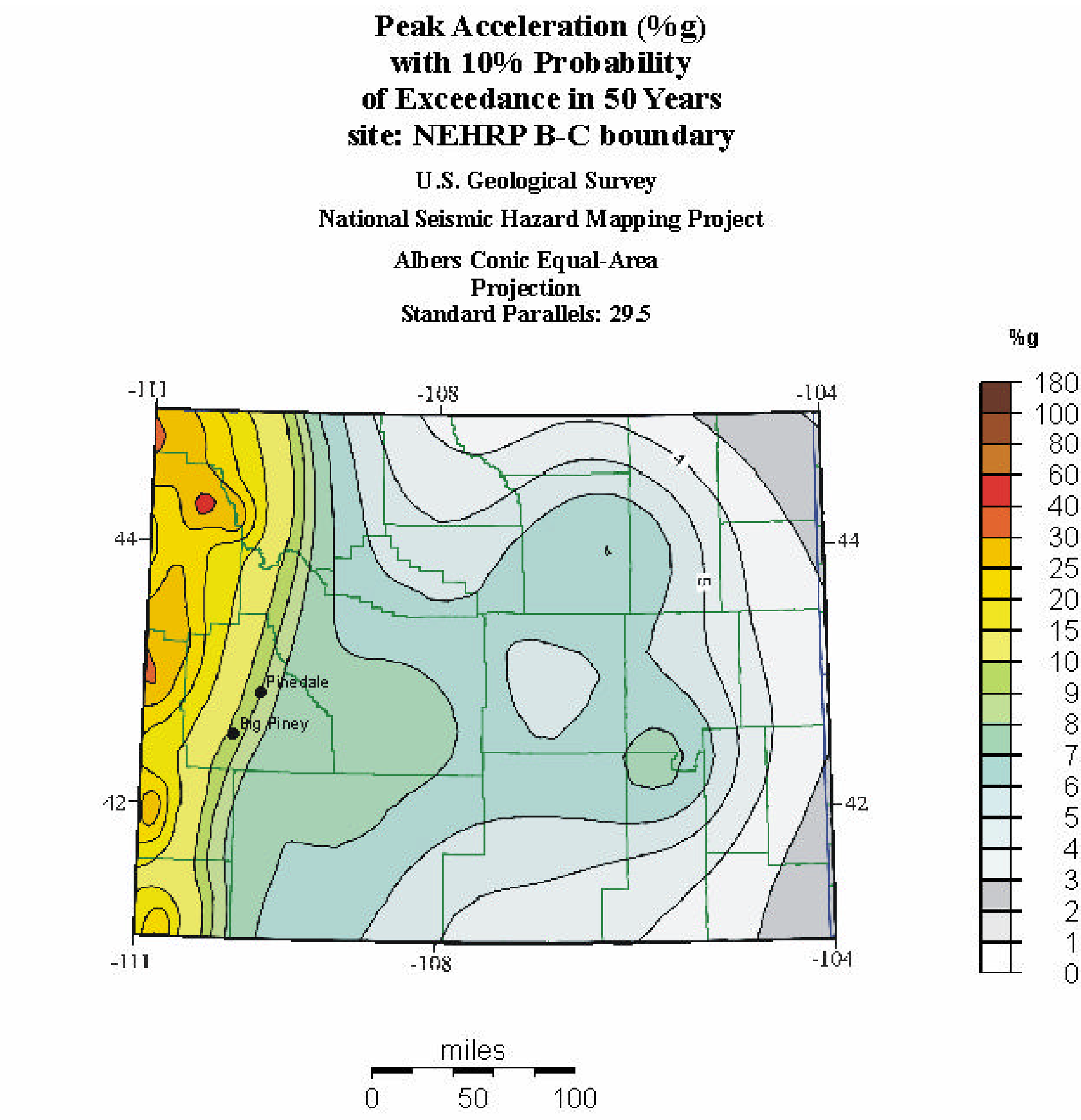

Figure 3. 500-year probabilistic acceleration map (10% probability of exceedance in 50 years).

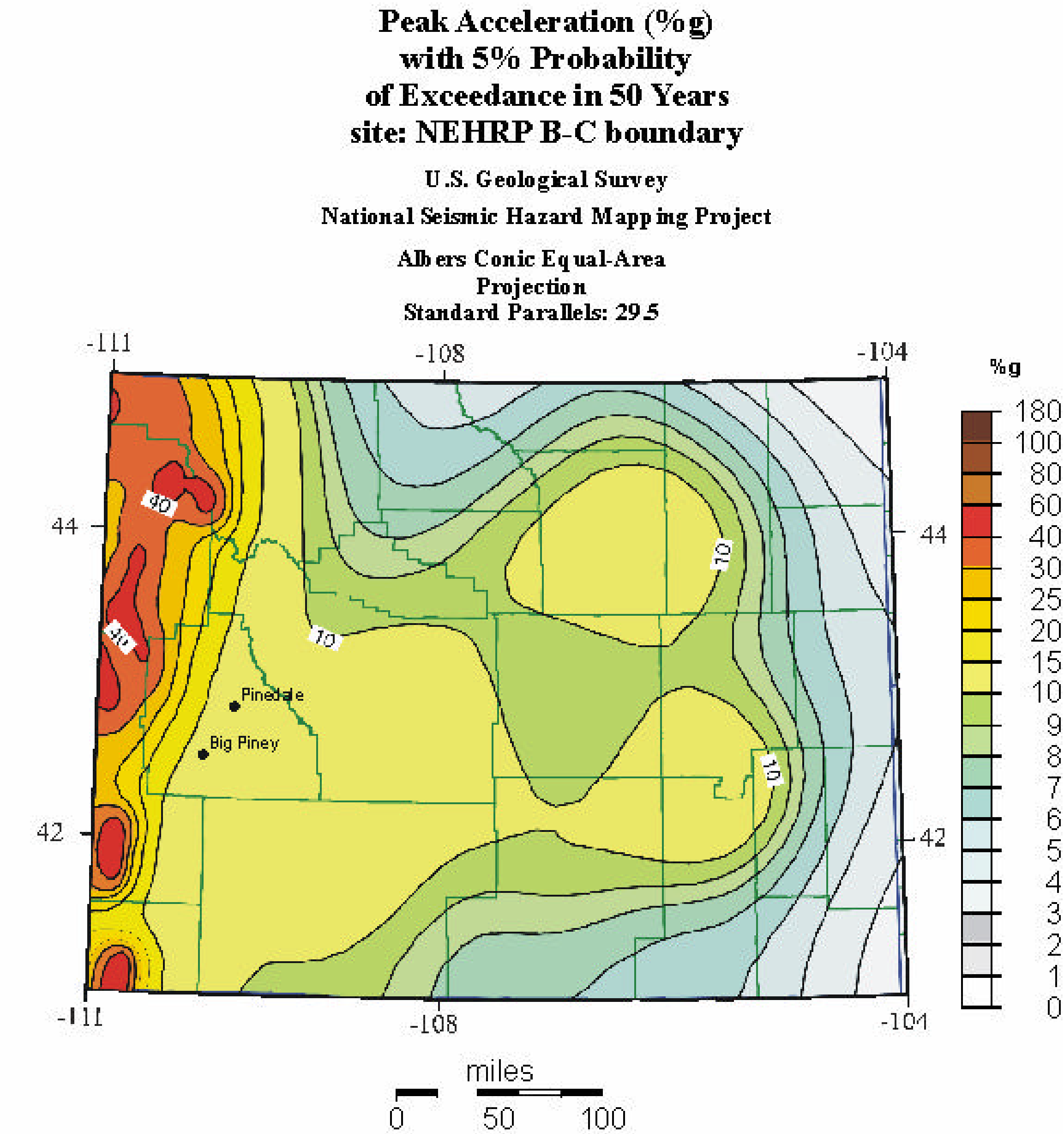

Figure 4. 1000-year probabilistic acceleration map (5% probability of exceedance in 50 years).

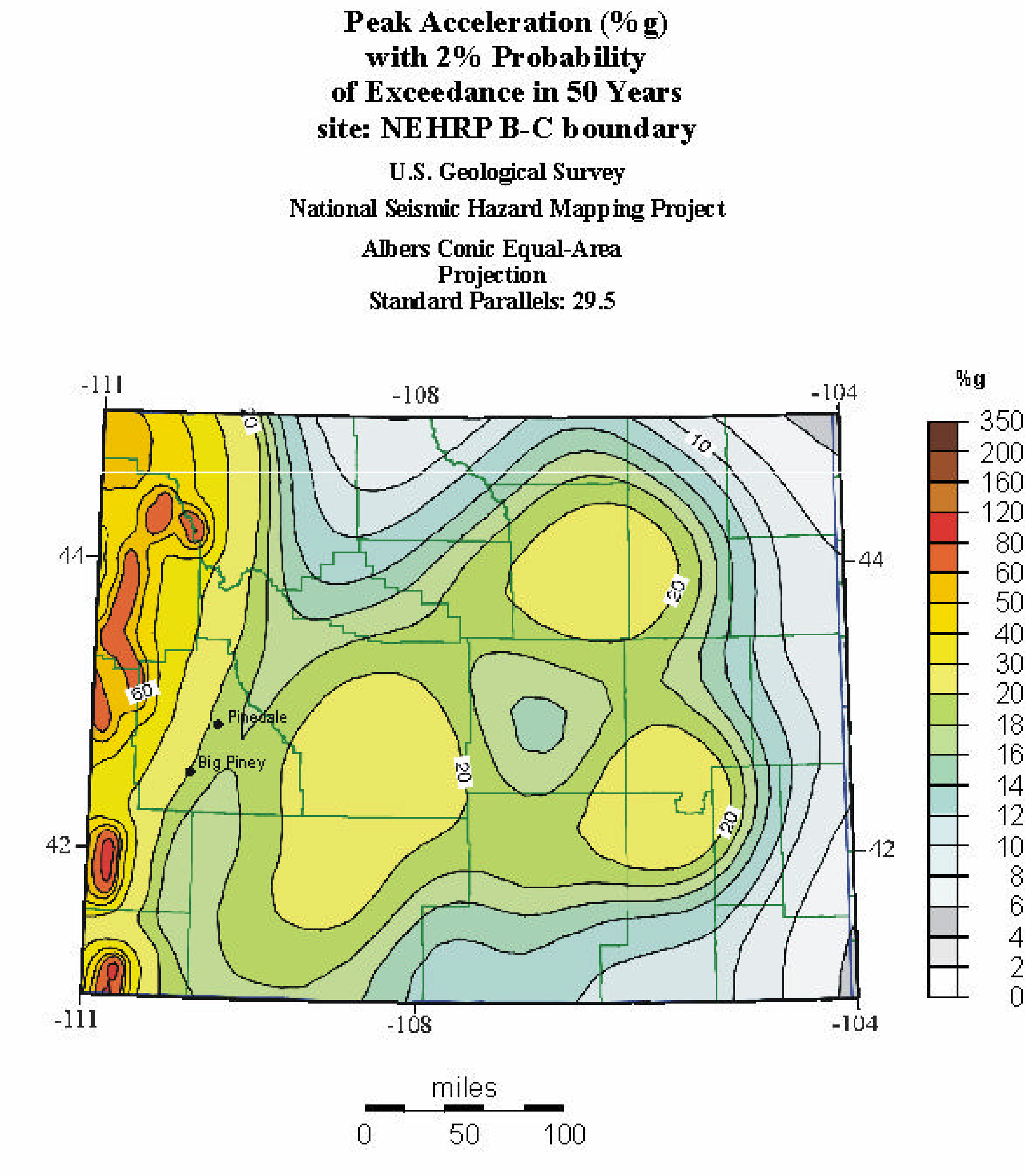

Figure 5. 2500-year probabilistic acceleration map (2% probability of exceedance in 50 years).

Summary

There have been numerous historic earthquakes with a magnitude greater than 2.0 recorded in or near Sublette County. Because of the limited historic record, it is possible to underestimate the seismic hazard in Sublette County if historic earthquakes are used as the sole basis for analysis. Earthquake and ground motion probability maps and specific fault analyses give a more reasonable estimate of damage potential in Sublette County.

Current earthquake probability maps that are used in the newest building codes suggest a scenario that would result in moderate to heavy damage to buildings and their contents, with damage increasing from the center and southeast to the northwest. More specifically, the probability-based or fault activation-based worst-case scenario could result in the following damage at points throughout the county:

Intensity VIII Earthquake Areas

Bondurant

Intensity VIII earthquakes can result in considerable damage in ordinary buildings and great damage in poorly built structures. Panel walls may be thrown out of frames. Chimneys, walls, columns, factory stacks may fall. Heavy furniture may be overturned.

Intensity VII Earthquake Areas

Big Piney
Big Sandy
Boulder
Calpet
Cora
Daniel
Marbleton
Merna
Pinedale

In intensity VII earthquakes, damage is negligible in buildings of good design and construction, slight-to-moderate in well-built ordinary structures, considerable in poorly built or badly designed structures such as unreinforced masonry buildings. Some chimneys will be broken.

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