




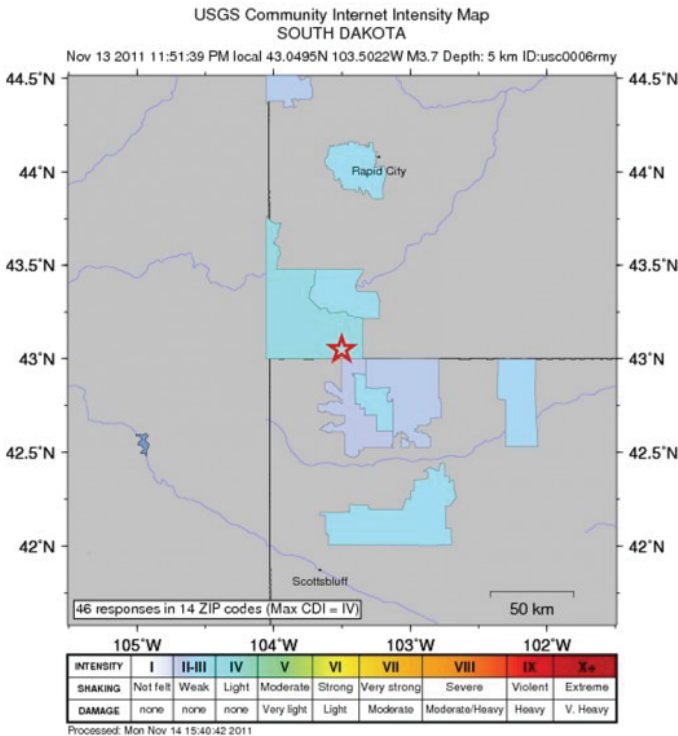
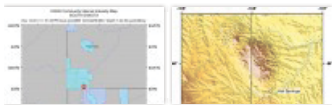
United States Nuclear Regulatory Commission Official Hearing Exhibit			
In the Matter of:		CROW BUTTE RESOURCES, INC.	
		(License Renewal for the In Situ Leach Facility, Crawford, Nebraska)	
	ASLBP #:	08-867-02-OLA-BD01	
	Docket #:	04008943	
	Exhibit #:	INT-020-00-BD01	
	Admitted:	8/18/2015	
	Rejected:	8/18/2015	
	Other:		
		Identified:	8/18/2015
		Withdrawn:	
		Stricken:	

INT-020



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# Two earthquakes strike area



This USGS map shows the epicenter and intensity levels of Sunday's 3.7 earthquake.

November 15, 2011 2:18 pm • [By KERRI REMPP Record staff writer](#) [\(0\) Comments](#)

UPDATE: A second earthquake in the region has been confirmed by the U.S. Geological Survey. A 3.3 magnitude tremor occurred 31 miles west-northwest of Chadron and 26 miles south of Hot Springs, S.D., during the early morning hours Tuesday. The quake, which happened at a depth of three miles, struck at 2:31 a.m. As of Thursday morning, three people in Crawford, two each in Chadron and Hot Springs and one each in Bridgeport and Spearfish, S.D., reported feeling the earthquake to the USGS.

## ORIGINAL STORY

If you were still awake just before midnight Sunday, you might have noticed the earth shaking.

"I heard a sound like a cat trying to climb the gutter pipe. It was actually shaking. It woke me up," Robin Smith noted on Facebook.

A 3.7 magnitude earthquake shook the ground at 11:51 p.m. The tremor's epicenter was 29 miles west-northwest of Chadron and 26 miles south of Hot Springs, S.D. It occurred at a depth of 3.1 miles below the surface.

Joyce Hardy was preparing her cell biology lectures when the earthquake hit and said it wasn't immediately apparent what was happening.

"I thought the dogs were chasing the cat in the living room," she remarked on Facebook.

Shaye Miller emailed The Chadron Record within an hour of the event. She and her husband were on their living room couches.

"We were just about ready for bed when we both felt our couches rock. We quickly got up and looked out the window to see if there was a huge windstorm or something that might be shaking the house. Nada! Within about 20 minutes the (U.S. Geological Survey) had the event listed as a 3.7 somewhere between here and Hot Springs."

As of Monday afternoon, 26 Chadron residents had submitted reports to the USGS. Another seven from Crawford, two from Gordon, four from Whitney and one from Harrison had also submitted remarks. The USGS received reports from 11 people in Hot Springs, as well as two from Edgemont, three from Rapid City and one from Spearfish. A resident in Custer and two from Pine Ridge reported feeling the quake.

A resident from Cassville, Mo., 1,091 miles from the epicenter, also submitted comments to the USGS. Two other reports came from Missouri, one comment was submitted from Littleton, Colo., and one from Cantril, Iowa, 990 miles away.

Locally, the Chadron dispatch center took several calls after the event. Dawes County Sheriff's logs indicate that at 12:02 a.m. Nov. 14, a caller from the Crawford area reported that she and her daughter were awakened by a boom, followed by a rumbling that shook their home for approximately three seconds. Three minutes later, another Crawford resident called to say her bed started shaking, she heard a rumbling and saw the gravel outside her home moving. At 12:24 a.m. patrons at a local bar reported hearing a rumbling and feeling the shaking.

A call to the Dawes County Sheriff's Office at 11:58 p.m. Nov. 13 was attributed by the caller as possibly an animal at the time but may have been related to the earthquake. The caller reported that something bumped against her house. While on the phone with dispatch she went outside and noticed her lawn chairs had moved slightly. She told the dispatch center it may have been an animal and that everything appeared to be okay. Likewise, a call to the Chadron Police Department at 11:56 p.m. may be connected to the tremor. That caller said she believed someone attempted to break in to her back door on Maple Street.

Jennifer Balmat, an adjunct professor of geosciences at Chadron State College, studied lineaments as part of her master's thesis. Lineaments are surface expressions of features visible on satellite images and aerial photos as a faint coloration of the landscape. Balmat mapped the lineaments between Chadron and the Black Hills and found that in most cases they are actually fault lines, according to a CSC press release issued Monday. Many of the faults extend into basement rocks like granite and schist, similar to the rock exposed in the central Black Hills.

In addition to Sunday's earthquake, at least five other quakes are known to have occurred near the same lineament from 1975-2009. They all had magnitudes between three and four.

Fault lines are not typically studied in Nebraska because they are poorly expressed on the surface, but Balmat said simple tools like satellite images can help map them.

Earthquake-producing faults exist in the subsurface in the Chadron area, but chances of a magnitude five or greater tremor are low. Balmat said there are other reasons to study the area, however.

"Identifying and studying faults in northwestern Nebraska and southwestern South Dakota is important not only for hazard assessment but also for understanding groundwater resources in the region," she said.

Area residents last felt an earthquake in May 2003 when a 4.4 earthquake 32 miles east northeast of Pine Ridge, S.D., shook the ground.

According to the USGS, most of North America east of the Rocky Mountains experiences earthquakes infrequently, often going years without a tremor large enough to be felt. Several U.S. states have never reported a damaging quake.

When earthquakes do strike, however, they are often felt across a much wider region, the USGS says. East of the Rockies, an earthquake can be felt over an area up to 10 times larger than similar magnitude quakes on the West Coast. A magnitude 4.0 earthquake east of the Rockies can be felt as far as 60 miles from where it occurred, and a 5.5 quake can be felt as far as 300 miles away.

#### Historical Earthquakes

Nebraska's first significant earthquake was in 1867. The quake was actually centered near Lawrence, Kan., but was felt in much of Nebraska.

Since then at least seven quakes of intensity five or greater originated within the state's boundaries, according to the USGS. One of those was centered in Dawes County. On July 30, 1934, an intensity six earthquake affected Nebraska, South Dakota and Wyoming residents. It damaged chimneys in Chadron, knocked plaster from walls and dishes and canned goods were thrown from shelves and cupboards.

The first earthquake reported in South Dakota happened in 1872. It was centered near Sioux City, Iowa. The state also experienced earthquakes in 1879, 1911, 1946 and 1961. In 1964, a tremor struck Wind Cave National Park and was followed up by another tremor three days later. That quake and a third a day later that was centered at Merriman, caused damage in several places, including Rushville, Alliance and Deadwood, Interior, Martin and Pine Ridge., South Dakota.

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