

Utah Seismic Safety Commission

Conference 97

Earthquakes: Mean Business

September 9, 1997 Utah State Capitol

One third of all retail businesses affected by the Northridge, California earthquake failed within the following year.

Every business person needs to ask: What can I expect the day an earthquake hits Salt Lake City? Or one week, one month, or one year later?

To help answer those questions, the USSC will again sponsor a day-long earthquake conference in Salt Lake City on Tuesday, September 9, 1997, in conjunction with *Salt Lake City and County's "It's Our Fault" Earthquake Preparedness Week*. The conference will focus on workplace and business preparedness issues, emphasizing expanded breakout sessions with specific, hands-on training as last year's attendees requested.

To be placed on the mailing list for more information, or if you have any questions about or suggestions for this conference, please contact Janine Jarva at

> Utah Geological Survey (801) 537-3386 fax (801) 537-3400 E-mail: **nrugs.jjarva@state.ut.us**



Walter J. Arabasz, newly elected Chairman of the Utah Seismic Safety Commission (see USSC News, page 3).

Conference 97 Schedule

Registration is \$50 and includes a continental breakfast, refreshments during breaks, and lunch. Registration forms will be mailed in July. Attendance will be restricted because of limited space, so return your registration forms quick-ly!

Conference 97 will be opened by a keynote speaker who has personal experience with earthquakes in metropolitan areas. There will be morning and afternoon breakout sessions with a luncheon and awards ceremony. This year's breakout topics:

- Session 1: Recap of the 1996 Conference's Earthquake Scenario Slide Presentation — The effects and consequences of a magnitude 6.7 earthquake centered in the Salt Lake Valley; the day of the event and oneweek, one month, and one year later will be presented. Two of last year's panel members will discuss direct effects and repercussions for area businesses and local officials.
- Session 2: The Lifeguard Session Employee planning and training in the workplace, your "insurance" to remain open after an earthquake.
- Session 3: Legal Liability/Insurance Legal and insurance industry experts will discuss legal liability issues that employers should be concerned with, and insurance issues a business may wish to consider.
- Session 4: Will Your Employees Survive? Office AND Home Safeguards — What you can do to make your offices and homes safer. Presentation will discuss steps homeowners and businesses can take to improve their chances of surviving when an earthquake strikes.

Session 5: CERT Training — Community Emergency Response Teams bring businesses and communities together in times of disaster. Immediate response saves lives. Disaster preparedness, disaster medical operations, search and rescue, and disaster psychology will be discussed.

Session 6: A Business Overview — The National Fire Protection Association has developed guidelines for businesses to use in implementing their disaster-management/business-resumption plans. Recommended practices will be presented.

Participants will be able to attend four of the sessions. **Conference 97** will conclude with a Call to Action and a drawing for door prizes.



Arabasz Elected Chairman of USSC; Licensing of Plans Examiners Proposed

The Utah Seismic Safety Commission (USSC) met on April 29, 1997, and unanimously elected Walter J. Arabasz to serve a one-year term as Chairman of the USSC beginning July 1, 1997. He replaces Les Youd, who has chaired the USSC since its creation in 1994. Arabasz commented that it is "time to regroup and get new ideas on how we can make a difference with earthquake safety in Utah — and certainly without relying on state officials for action."

Legislative update. The Engineering and Architecture Committee reported to the USSC last fall that the lack of licensing requirements for plans examiners contributes to serious deficiencies in building code enforcement and could cause potentially dangerous consequences during earthquakes. Senate Bill 135 was designed to correct this problem by requiring state licensing of building-plans examiners. Plans examiners review building plans for conformance to the standards of the building code. Any deficiencies they find should then be corrected before construction begins. Building inspectors then check that buildings are constructed according to the plans that were approved. Utah currently licenses building inspectors but not building-plans examiners. So a building could pass inspection by a licensed building inspector but still fall short of minimum structural code requirements, if the plans were not checked for conformance to code at the beginning of the process. Senate Bill 135 passed the Senate by a vote of 25 - 4 but failed on a 35 - 39 vote in the House.

Carl Eriksson, Salt Lake County's chief building official and a member of the Engineering and Architecture Committee which helped draft the legislation, said lastminute opposition was raised by some building inspectors and contractors. The building inspectors and contractors believed that the existing requirement that building inspectors be licensed was not being enforced by the state and that additional requirements would not be enforced either. Eriksson told the USSC that he and the Engineering and Architecture Committee will now attempt to address the problem differently. They are drafting rule changes to present to the Uniform Building Code Commission (UBCC) to require licensing of plans examiners who review plans for commercial, industrial, or multifamily buildings with more than two stories or with more than 10,000 square feet of floor space. Senate Bill 135 would have required State licensure of all plans examiners, including those who review single-family-home plans. Additionally, the licensed plans examiners would be required to submit plans for peer review by a structural engineer so that structural code conformance is ensured. Plans examiners only review for fireand life-safety-code conformance.

If, after input from their advisory committees, the UBCC supports the proposed rule changes to the State Inspector Licensing Law, the changes would then be circulated for outside comment and put to a public hearing. Some of those building officials who voiced opposition to Senate Bill 135 have indicated they could be more supportive of the currently proposed rule changes. USSC Commissioner Jim Bailey, who is also a member of the UBCC, indicated that he believed the proposed rule changes would have the support of the UBCC. They also supported Senate Bill 135. If the public hearing is successful, the UBCC will recommend to the State's Division of Professional Licensing (DOPL) that the rule changes be adopted. The rule changes would be incorporated into the State Inspector Licensing Law, administered and enforced by DOPL. If DOPL decides against implementing the UBCC's recommendation, the UBCC can override this decision with a 2/3 vote of UBCC members.

As an example of the problems that proposed rule changes hope to address, Eriksson pointed out that only 7 to 8 of 230 city and county jurisdictions in the state of Utah regularly obtain structural peer review for even their largest and most critical buildings. He believes that the state review process is significantly better but only applies to a small percentage of all building projects completed. School districts are considered separate jurisdictions and therefore not subject to the regulations of local jurisdictions. Eriksson said he knows of only 4 to 5 out of 40 districts statewide that use licensed building inspectors. Their primary responsibility is to check for Utah Seismic Safety Commission News

by Janine L. Jarva Utah Geological Survey

Plans examiners review building plans for conformance to the standards of the building code...before construction begins. Joni Whitear, Chair of the 1997 Earthquake Conference, said full registration materials would be mailed in July.

Licensing....Continued from previous page

contract violations; does the new building, addition, or remodel meet district specifications? They check if the building is being built to the plans, not if the structure complies with building codes generally or earthquake-safety requirements specifically.

Eriksson pointed out that local jurisdictions, especially the smaller ones throughout the state, will complain that they do not have the funds to hire or contract with a licensed building-plans examiner or licensed building inspector. The fee assessed whenever a building permit is issued includes money designated to cover the costs of plan checks and inspections. But Eriksson stated that historically these local jurisdictions have put the money in their general funds and used it to "fill potholes." There is no state requirement that this money be put to the use for which it is collected. The currently proposed rule changes do not attempt to resolve this problem because of the opposition from local jurisdictions that do not want to be required by the state to change the way they do business.

USSC's 1997 action plan. Promoting good engineering, strengthening advocacy, and conference planning topped the USSC Standing Committees reports. Ron Dunne, the new chair of the **Engineering and Architecture Committee**, said his group will be focusing on developing the proposal discussed earlier for presentation to the UBCC. Utah is experiencing a building boom, he said, and during a period of building frenzy even bad engineers are busy. His committee's long-term goal is to elevate and promote good engineering. Ron is a consulting structural engineer who relocated to Utah from California where he was involved in earthquakeengineering issues.

Ann Becker, chair of the Awareness and Education Committee, said her group is identifying 1-, 2-, and 5-year committee goals while exploring the idea of developing a "Friends of the USSC" group to strengthen advocacy of the USSC's goals. With an annual budget (for all USSC activities) from the Legislature of only \$4,500, the USSC needs outside support from community and business champions. Bob Carey, reporting for Pat Lewis, chair of the Emergency Management Committee, said that that committee's membership has been significantly changed recently. He said his group would be actively involved in the 1997 Earthquake Conference, helping to organize and stage many of the breakout sessions.

Walter Arabasz reported that most members of the **Geoscience Committee** spent the past year in an advisory capacity to the teams planning the I-15 retrofit and reconstruction projects. Gary Christenson was recently elected chair of this committee. Jim Golden has the **Lifelines Committee** members in place and will be meeting soon. An **Intergovernmental Relations Committee** has not yet been formed.

Finally, Joni Whitear, Chair of the **1997 Earthquake Conference**, gave an update on conference planning. She said a preliminary announcement of the conference would be mailed mid-May with full registration materials mailed in July. The conference will be held at the State Capitol in Salt Lake City, Tuesday, September 9, 1997, in conjunction with Salt Lake City and County's "It's Our Fault" week. The registration fee is \$50. The conference will again focus on workplace and business preparedness issues, targeting businesses, the construction and contracting industry, and community nonprofit organizations. The breakout session schedule is currently being finalized.

Earthquake Engineering Research Center proposal. Les Youd reported that the National Science Foundation (NSF) is re-evaluating the proposals for earthquake-engineering research centers that were submitted in October 1996. NSF deemed the initial review unsatisfactory and is starting over. If non-federal dollar-for-dollar matching funds are provided, the NSF may endow as many as three research centers with up to \$2 million per year for an initial five-year period, with a possible extension of three years. The NSF will not conduct site visits; instead, it may ask proposers to make presentations in Washington, D.C.

The next USSC meeting will be 9 a.m. Wednesday, July 2, room 2112 of the State Office Building. Anyone interested in attending is welcome. For more details please contact Janine Jarva, Utah Geological Survey, (801) 537-3386, fax: (801) 537-3400, or Brenda Edwards, Utah Division of Comprehensive Emergency Management, (801) 538-3752, fax: (801) 538-3770.

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New UGS Brochure Answers the Public's Questions

Questions often asked about Utah's earthquakes: Where in Utah have earthquakes occurred? Why do earthquakes happen? How often do Utah earthquakes occur? How big are they? How are earthquakes measured? What may happen during an earthquake? *Earthquakes & Utah*, the UGS's new brochure by Sandra N. Eldredge, offers an introduction for non-geologists to the hazard from earthquakes in Utah, and answers these commonly asked questions with diagrams, photos, and simple, non-technical language.

Some of the state's most memorable earthquakes include the 1901 Richfield (M 6.5), 1934 Hansel Valley (M 6.6), 1962 Richmond (M 5.7), and 1992 St. George (M 5.8) earthquakes. These earthquakes illustrate that larger magnitude earthquakes don't necessarily cause the most damage. The amount of damage also depends on the number and types of structures in an area, and local geologic conditions—soil, rock type, ground-water depth, and topography. Whereas the Richfield and Hansel Valley earthquakes were Utah's largest, the Richmond and St. George earthquakes were the most damaging. Damage costs of \$1 million in 1962 dollars make the Richmond earthquake Utah's most costly. The second-most damaging was the St. George earthquake which cost about \$1 million in 1992 dollars. Most of the damage occurred from a large landslide in Springdale, 28 miles east of the epicenter.

Earthquakes happen when stresses within the earth cause portions of the earth's crust to slip (rupture) along a fault. Utah's most active crustal stretching, and resulting stress, is in the Intermountain seismic belt along the eastern edge of the Basin and Range, where 16 earthquakes of magnitude 5.5 or greater occurred between 1850 and 1995. Earthquake size in Utah is usually reported using the Richter magni-



Hansel Valley: Utah's largest historical earthquake caused surface rupture, liquefaction, and the appearance of new springs. Eighty miles away in Salt Lake City, ground shaking was strong enough to cause two adjacent buildings to sway and make contact. (From Earthquakes & Utah, photo courtesy of Special Collections, University of Utah Libraries)

tude scale. On this scale, for each unit increase in an earthquake's magnitude, the energy released is 30+ times greater. Thus, it would take more than 30 earthquakes of magnitude 6.0 to release the same amount of energy as one earthquake of magnitude 7.0.

Why is the Wasatch fault of serious concern? Utah's Wasatch fault presents the greatest earthquake hazard to the state's population because of its length, proximity to the majority of residents, and evidence of repeated movement during the past 10,000 years. The Wasatch fault is approximately 240 miles long, extending from Malad City, Idaho to Fayette, Utah. It is divided into 10 segments which are likely to rupture one-at-a-time. Approximately every 350 years, a large earthquake occurs somewhere on the Wasatch fault. Trenching studies show that during the past 6,000 years, 19 earthquakes large enough to rupture the ground surface have occurred on the five central segments of the fault (Brigham City to Nephi) and one distal See Brochure page 6

Wasatch fault presents the greatest earth– quake hazard to the state's population because of its length, proximity to the majority of residents, and evidence of repeated movement during the past 10,000 years. HAZUS, a geographic information system program recognizes earthquake hazards and assesses risk for local communities.

CEM INTRODUCES FEMA EARTHQUAKE LOSS-ESTIMATION METHODOLOGY

Utah's Division of Comprehensive Emergency Management (CEM) is implementing HAZUS, a geographic information system program that recognizes earthquake hazards and assesses risk for local communities. Both emergency management and planning staffs will find this pre-earthquake tool helpful in projecting casualties, damage, and lifeline disruption.

Background. Over the years, the Federal Emergency Management Agency (FEMA) has struggled to compare different states' earthquake risk. Each state had its own methods of determining its vulnerability for any given hazard. Some states had more resources available to complete this assessment than others. In the end, the studies could not be readily compared. FEMA needed to create some way to standardize these studies.

History. In the early 1990s, FEMA approached the Applied Technology Council (ATC) to pilot a project, ATC-36, to develop a software program that uses mathematical formulas; information about building stock, local geology, and the location and size of potential earthquakes; economic data; and other information to estimate losses from potential earthquakes for Wasatch Front counties. ATC completed about 75 percent of the project before exhausting its funding, and FEMA elected to discontinue funding. However, ATC acquired alternative sources of funding to complete the project, and it is currently being used by Salt Lake County.

Program development and features. FEMA approached the National Institute of Building Standards to pilot a project known as HAZUS. Using Portland, Oregon as the project study area, HAZUS uses an approach similar to

Brochure... Continued from page 5

segment of the fault (Levan). (See illustrations on page 7.) The interval between surface-rupturing earthquakes on individual segments of the fault is from 1,200 to 2,600 years, with the interval between earthquakes varying from segment to segment.

How can we be prepared? Earthquakes cannot be predicted, and an economically devastating, destructive earthquake could happen today, next week, or hundreds of years from now. that used in ATC-36. But while ATC-36 focuses on earthquakes, HAZUS can be expanded into a multi-hazard methodology by initiating development of nationally applicable standardized modules for estimating potential losses for wind and floods. The software program uses a geographic information system to map and display ground shaking, the pattern of building damage, and demographic information about individual communities. Once the program knows the location and size of a hypothetical earthquake, HAZUS estimates the amount of ground shaking, the number of casualties and buildings damaged, the impact on transportation systems, the extent of disruption to the electrical and water utilities, the number of people displaced from their homes, and the estimated cost of repairing projected damage and other effects.

The products of the earthquake loss estimation methodology have several pre-and postearthquake applications. In addition, the program estimates the scale and extent of damage and disruption.

Pre-earthquake applications include:

• Development of earthquake-hazard-mitigation strategies as a countermeasure to earthquake loss-es and disruption indicated in the initial loss-estimation study.

• Development of preparedness (contingency) planning measures.

• Anticipation of the nature and scope of response and recovery efforts.

Post-earthquake applications include:

• Projection of immediate economic impacts for state and federal resource allocation and support.

Activation of immediate emergency recovery

See CEM page 8

Therefore preparedness is vital. *Earthquakes and Utah* gives sources of information on earthquake preparedness.

For pricing information on *Earthquakes and Utah* by Sandra N. Eldredge, contact the Natural Resources Bookstore. The bookstore is located at 1594 West North Temple, Salt Lake City, Utah 84114; phone (801) 537-3320; fax (801)537-3395; e-mail: nrugs.geostore @state.ut.us. Within Utah, but outside Salt Lake City, call 1-888-UTAHMAP.

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Earthquakes in the Intermountain West —a traveling photographic exhibit

- WHERE? In the lobby on the 2nd floor of the Browning Building (College of Mines and Earth Sciences) on the University of Utah campus (1440 East 100 South).
- Until the end of Summer 1997 (then-traveling begins!). WHEN?
- WHAT? The exhibit of photographs, text, and graphics focuses on what can happen in earthquakes in our region, as well as what we can do about it. The photographs are all from previous earthquakes that have occurred in the Intermountain West.

Earthquake Education Services in the University's Seismograph Stations developed the exhibit with funding from the National Earthquake Hazards Reduction Program through the U.S. Geological Survey. The target audiences are the general public and school communities. The 8' x 19' freestanding display is appropriate for libraries, government buildings, small museums, and conventions. For scheduling and other information, contact Deedee O'Brien at 801-581-6201 or obrien@seis.utah.edu.



The Wasatch fault (illustrations adapted from Earthquakes & Utah).

1000 2000 3000 4000 5000 6000 Years Ago

CEM...Continued from page 6

efforts.

· Application of long-term reconstruction plans.

HAZUS level of accuracy depends upon the quality of the databases. The software provides for three different levels of estimated losses. HAZUS supplies the user with all the information needed to produce a rough estimate of losses. The default data come from national databases which will provide a general view of regional geology, building inventory, and economic structure. The default data provide a Level One estimate of losses.

Utah's Comprehensive Emergency Management (CEM) to acquire local data. To produce a more accurate estimate of losses (Level Two), more detailed information about each community is needed. This information includes local geology, local building inventory, and data about utilities and transportation systems. More detailed information requires a substantial amount of effort, not only in acquiring the databases, but in convincing the different agencies to release the needed information. In some cases, the information may be proprietary, so agencies need to understand the uses of the data before releasing it.

The most accurate estimate of losses, Level Three, requires detailed engineering and geotechnical input to customize the methodology to the specific conditions of each community.

Beneficial outcomes. HAZUS provides local emergency management and planning staffs with a pre-earthquake tool that illustrates potential areas of damage to building and infrastructure, provides insight into numbers of casualties, assists in the possible location of shelters, and supplies indirect economic impacts. For a risk assessment to be useful, planners need to work closely with public works, utilities, transportation agencies, county assessors, and the geotechnical community. Coordinating with these agencies provides planners with the best available data to achieve the most accurate results.

Western States Seismic Policy Council Awards in Excellence 1997

The Western States Seismic Policy Council (WSSPC) is a regional forum for earthquake hazard mitigation technology transfer. WSSPC's primary aims are to improve public understanding of seismic risk; to improve earthquake preparedness; and to provide the means for creating partnerships and a cooperative forum to enhance the transfer of mitigation technologies between its member states, the federal government, private companies, non-profit organizations, and the general public.

The WSSPC Awards in Excellence recognize achievements in earthquake mitigation, preparedness, and response. This program is both an effective method to share model programs throughout our region, as well as to recognize the hard-working, creative and innovative efforts within the earthquake-hazard-reduction community. The WSSPC hopes to bring greater visibility to exemplary state, county, and local programs and policies, and to facilitate the transfer of those successful experiences to other states.

Those eligible for the Award are state, provincial, county, or city governmental agencies in WSSPC member states, including Utah. Originating or outside agencies may nominate programs. The categories include mitigation efforts, educational outreach programs (one each for outreach efforts to business/government, schools, and the general public), response plans/materials, use of new technology, innovations, and research projects. Deadline for applications is August 15, 1997. Contact WSSPC directly for application materials at:

Awards in Excellence Western States Seismic Policy Council 121 Second Street, 4th Floor San Francisco, CA 94105 (415) 974-6435 (415) 974-1747 fax E-mail: wsspc@wsspc.org Web Site: http://www.wsspc.org



Frank Ashland, geologist at the Utah Geological Survey (UGS), and Walt Jungblut, physical scientist in the U.S. Geological Survey's National Strong-Motion Program (NSMP), moved the digital Kinemetrics SSA-2 strong-motion accelerograph for the Tremonton area from the County Fairgrounds to a more secure location in South Park, Tremonton City. The instrument is one of seven SSA-2s purchased by the state to implement the Utah Strong-Motion Instrumentation Program (USMIP). NSMP maintains these instruments under a cooperative agreement with the Utah Geological Survey (see Fault Line Forum, v. 12, no. 2, pp. 8-9). The engineering community uses ground acceleration data to set the seismic provisions in the building code.

The digital Kinemetrics SSA-2 collects ground acceleration data that can be quickly downloaded to a laptop computer. Using software provided by Kinemetrics, a scientist then processes the digital data by scaling and locating "tops," thus defining the strong ground-motion wave peaks. Although the SSA-2s were a great improvement over earlier analog instruments which record data on photographic film and therefore require extensive processing, newer instruments, such as the Kinemetrics Etna, are far more advanced.

Recently, the UGS expanded the USMIP array with the purchase of a new Etna strong-motion instrument that will be installed in the Salt Lake City area later this year. The Etna affords higher resolution in the digital data, has more memory, and stores the data more conveniently. Trans-

Reflecting on the lessons of the Kobe (1995), Northridge (1994), Loma Prieta (1989), and Mexico City (1985) earthquakes, two social scientists have proposed that societies invert the traditional way information is communicated in the hours and days after a natural disaster. Eli Noam, director of Columbia University's Institute for Tele-Information, and Harumasa Soto, an economist at Konan University in Kobe, Japan, point out that decentralized, free-wheeling radio call-in shows and computer bulletin board services turned out to be the most effective and reassuring means of communication during the disasters they studied. Hence, instead of traditional communication, the researchers propose the establishment of a "711" open-access emergency system of interconnected computer servers. Individuals, relief agencies, government leaders, nonprofit organizations, and many others could upload and download information about the problems and the resources in their local communities. Though some of the information would lack "official" authority, Noam and Soto assert that the pooling of communal wisdom would provide a better aggregate picture of

ferring data to the computer from the Etna is much easier because the record is stored on a memory card that, like a 3-1/2" PC floppy disk, is easily removed. In addition, the Etna's timing mechanism can be tied into a GPS system to take advantage of satellite clock accuracy, and options allow remote interrogation of the instrument.

Strong-motion instrumentation in Utah goes back to 1939, when, given impetus by the 1934 magnitude 6.6 Hansel Valley earthquake, a USC&GS-1 (U.S. Coastal & Geodetic Survey) instrument was installed at Utah State University (USU) in Logan. This large instrument, which was monitored by USU faculty, recorded on photographic paper which scrolled on a drum. Strongmotion data have been recorded continuously in Logan since that time, although on more up-todate equipment. Other NSMP sites include strongmotion recorders installed at the V.A. Hospital in Salt Lake City in the early 1970s. During the 1980s NSMP expanded their Utah array to include six accelerographs in the greater Salt Lake City area and a line of freefield stations along the Wasatch Front at Logan, Brigham City, Ogden, Provo, Nephi, Richfield, and Cedar City; and instrumented the base-isolated Salt Lake City-County Building with a 24-channel structural array.

* With appreciation to Frank Ashland, UGS, and Walt Jungblut of NSMP for their informative discussions. Strong-Motion Instrument Goes to New Site in Tremonton City

by Bea Mayes* Utah Geological Survey

Recently, the UGS purchased a new Etna strong-motion instrument that will be installed in the Salt Lake City area...

what is happening in an area.

The researchers cite the flooding of emergency telephone networks after the Kobe earthquake and the overdramatized perspective of television programs in Mexico and California—along with the poor communication between crippled cities and national officials—as evidence that the most common forms of communication become frustrating and often useless in the wake of a natural disaster. Rather than the usual top-down, military-style, need-to-know approach to sharing information after a natural disaster, they suggest that emergency communications should be decentralized into an "open-access" system to serve leaders and ordinary citizens alike.

Noam and Soto published their research in the November 1 issue of *Science*.

Modified from "No grand central stations," EOS, v. 77, no. 48, 1996, p. 478.

An "Open-Access" Emergency Communication System for Natural Disasters?

Earthquake Activity in the Utah Region

by Susan J. Nava University of Utah Seismograph Stations Department of Geology and Geophysics Salt Lake City, UT 84112-1183 (801) 581-6274

Magnitudes 0 0 0 0.0 +0 42 0 1.0 + 2.0+ ☆ 3.0+ 41 Dec 14 M_c 3.0 0 The Soft Lake City Vernal 8 80 0 40 Oct 24 M, 3.1 11 M_c 3.3 Dec 0 Oct 25 M, 3.1 00 Nov 21 Mc 3.1 Dec 6 M_c 3.4 Price Earthquakes Oct 18 Mc 3.2, Mc 3.2 39 Dec 3 M. 3.6, M. 3.2, N e1 400 O Dec 24 M. 3.3 Maab Dec 28 M. 38 0 a C eorge 37 O 114 ° 113° 112 ° 1119 M_C 3.2 M_C 3.1 M_C 3.4

October 1 - December 31, 1996

During the three-month period October 1 through December 31, 1996, the University of Utah Seismograph Stations located 271 earthquakes within the Utah region (see accompanying epicenter map). The total includes thirteen earthquakes in the magnitude 3 range and 102 earthquakes in the magnitude 2 range. Earthquakes which have magnitudes of 3.0 or larger (plotted as stars and specifically labeled on the epicenter map) are described below. There was one earthquake reported felt during the report period. (Note: Magnitudes listed are coda magnitude, M_C. All times indicated below are local time, which was Mountain Daylight Time from October 1 through 27, and was Mountain Standard Time during the remainder of the report period.)

• Significant Main Shocks and Clusters of Earthquakes

• Eastern Wasatch Plateau-Book Cliffs area near Price (coal-mining related): Seismic events in the region (magnitude 1.5 to 3.8) make up 25 percent of the shocks that occurred in the Utah region during the period. Significant earthquakes include:

		0	*		
11	M _C 3.2	October 18	4:53 p.m.	16 miles NW of Huntington	
	E M _C 3.2	October 18	4:55 p.m.	16 miles NW of Huntington	
21/1/1	M _C 3.1	October 24	2:42 p.m.	10 miles NE of Price	
	= M _C 3.8	October 25	12:32 p.m.	11 miles ENE of Helper	
	M _C 3.1	November 21	7:15 a.m.	12 miles ENE of Helper	
110° 109	• M _C 3.6	December 3	4:20 a.m.	7 miles WNW of Emery	
December 3	4:44 a.ı	n. 8 m	iles WNW o	f Emery	
December 3	5:55 a.ı	m. 9 m	iles WNW o	f Emery	
December 6	6:53 a.ı	n. 11 r	niles ENE of	Helper	
December 11	6:55 p.i	m. 6 m	iles ENE of	Helper	
December 24	6:21 a.ı	n. 8 m	iles WNW o	f Emery	

• Significant northern Utah earthquakes: A cluster of 20 earthquakes ($0.6 \le M \le 1.8$) located about 5 miles SSW of Corinne (23 miles SW of Logan) occurred sporadically throughout the report period. Significant shocks include:

M _C 3.0	December 14	3:23 p.m.	8 miles NW of Park City.
			Felt in Park City.

• **Significant southwestern Utah earthquakes:** A swarm of 31 shocks, located about 11 miles WNW of Summit (13 miles NNW of Cedar City) occurred primarily during December. Earthquakes in this sequence ranged in magnitude from 1.1 to 3.5. Significant shocks include:

	Mannam
10	

M_C 3.3 M_C 3.3

M_C 3.5 December 28 4:35 a.m. 11 miles WNW of Summit

Additional information on earthquakes within the Utah region is available from the University of Utah Seismograph Stations.

- July 10 11, 1997, Mitigation—The Bottom Line, Portland, Oregon. Sponsored by Cascadia Region Earthquake Workgroup (CREW) and Portland State University Geology Department. Registration materials available from Meeting Points, 5413 S.E. Milwaukie Avenue, Suite 5, Portland, OR 97202; (503) 233-1244; additional questions can be directed to Diane Earl, (415) 664-7532; fax (415) 566-8906.
- July 13 16, 1997, 22nd Annual Workshop on Hazards Research and Applications, Denver, Colorado. For information contact Hazards Workshop, IBS #6, Campus Box 482, University of Colorado, Boulder, CO 80309-0482; (303) 492-6818; fax: (303) 492-2151; email: hazards.workshop@colorado.edu

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- July 20 24, 1997, Eighth International Conference on Soil Dynamics and Earthquake Engineering (SDEE '97), Istanbul. Information: http://www.ceor.princeton.edu/sdee.html
- August 20 22, 1997, Northridge Earthquake Research Conference, Los Angeles. Information: Northridge Earthquake Research Conference, California Universities for Research in Earthquake Engineering, 1301 S. 46th Street, Richmond, CA 94804; (510) 231-9557; fax (510) 231-5664; e-mail: curee@nisee.ce.berkeley.edu
- September 9, 1997, Utah Seismic Safety Commission 1997 Earthquake Conference, Salt Lake City, at the State Capitol Building. For information contact Janine Jarva, Utah Geological Survey, (801) 537-3386; fax (801) 537-3400; email: nrugs.jjarva@state.ut.us
- October 6 8, 1997, Association of Contingency Planners (ACP) Business Recovery Symposium, Salt Lake City, Utah. To be added to the mailing list, contact Milt Maughan, Registrar, 1997 ACP Business Recovery Symposium, P.O. Box 264, Brigham City, Utah 84302-0264; (800) 753-7813; fax (800) 753-7814; e-mail: maughma@tc.thiokol.com
- October 7 8, 1997, UGIC Conference 97—GIS: It's Not Magic, at the Provo Park Hotel, Provo, Utah. Sponsored by Utah Geographic Information Council (UGIC), GIS Advisory Council

(GISAC), Urban and Regional Information Systems Association (URISA), and GPS Users Group (GPSUG). For information, contact Don Nay at (801) 370-8626, or Dennis Goreham at (801) 538-3163, or visit the UGIC web site at www.agr.state.ut.us

- October 20 23, 1997, **Geological** Society of America Annual Meeting— Global Connections, Salt Lake City, Utah. For information contact GSA Meetings Department, P.O. Box 9140, Boulder CO 80301; (303) 447-2020 or (800) 472-1988; fax (303) 447-0648; email: meetings@geosociety.org; WWW: http://www.geosociety.org
- November 4 7, 1997, Western States
 Seismic Policy Council (WSSPC)
 1997 Annual Conference, Victoria,
 British Columbia, Canada. For information, contact WSSPC, 121 Second
 Street, Fourth Floor, San Francisco, CA
 94105; (415) 974-6435; fax (415) 974-1747; WWW: http://vishnu.glg.nau.
 edu/wsspc/brpshs.html; e-mail wsspc-@wsspc.org

Meetings and Conferences



Geological Society of America ANNUAL MEETING AND EXPOSITION

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