On August 10, DGER held the second annual Decision-Makers Field Conference. The theme of the one-day conference was “Geological Hazards and the Economy of Washington: A Fragile Truce”. The conference is an opportunity for legislators and other local decision-makers to learn first-hand about natural hazards and their impacts on people, transportation, and the economy.

In an informal, primarily outdoor setting, speakers presented the latest information on understanding and mitigating geologic hazards. Participants visited sites that are the current focus of concern. The field-trip format stimulated on-site debates about public policy, strategies for growth, funding for geologic hazard work, and methods for solving problems.

The first stop was Safeco Field, a state-of-the-art earthquake-resistant structure that lies within the Seattle fault zone, which runs from east of Issaquah to west of Bremerton (Fig. 1). On the roof of the Safeco Field parking garage (Fig. 2), Tim Walsh of DGER gave an introduction to Puget Sound geology and the Seattle fault. Steve Kramer of the University of Washington discussed the threat to the Alaskan Way Viaduct from a major local earthquake due to its age and the liquefiable soil (hydraulic fill) it rests on. The 53-year-old viaduct was damaged in the 2001 Nisqually earthquake and continues to deteriorate. Its design and situation are similar to that of the Cypress Freeway that collapsed near Oakland, California, during the 1989 Loma Prieta quake. Also in jeopardy is the Seattle waterfront seawall, which helps stabilize the soil that supports the viaduct (Fig. 3).

Ron Paananen of the Washington State Department of Transportation (WSDOT) outlined the challenges faced in replacing the viaduct and the seawall. Two alternatives currently being considered are an elevated structure similar to the current viaduct with a separate seawall, and a tunnel that combines both the roadway and the seawall (http://www.wsdot.wa.gov/projects/viaduct).
Inside Safeco Field, John Hooper of Magnuson Klemencic Associates pointed out the building’s structural features designed to withstand a magnitude 7+ earthquake, such as eight 22-foot-long shock absorbing dampers, cross bracing with steel girders, and dividing the stadium into sections with expansion joints that widen as they go up. Susan Ranf of the Seattle Mariners described her experiences at Safeco Field during the Nisqually earthquake, and Bob Freitag of the Cascadia Region Earthquake Workgroup (CREW) showed how earthquake hazard information is used in community planning (http://www.crew.org/).

At Mee-Kwa-Mooks Park in West Seattle, Kathy Troost of the University of Washington explained why the folded peat beds visible at low tide (Fig. 4) are interpreted by many geologists as evidence for movement on the Seattle fault.

The group then traveled on the Bainbridge Island ferry while Tim Walsh pointed out various landslides around Puget Sound (Fig. 5) and Don West of Golder Associates discussed how planning for and monitoring geologic hazards can prevent costly pipeline breaks. Ned Kiley of WSDOT talked about the Washington State Ferries contingency plans for earthquakes and tsunamis and how a ferry can serve as a floating command center, since ferries are equipped to go as long as two weeks before having to refuel and reprovision.

Brian Sherrod of the U.S. Geological Survey (USGS) described his research on the Seattle fault and pointed out the 20+ feet of fault uplift on the wavecut platform at Restoration Point as the ferry went past (Fig. 6).

Craig Weaver of the USGS discussed the use of lidar (Fig. 1) (http://pugetsoundlidar.ess.washington.edu/) in geologic mapping and specifically how it is used to locate hidden faults.

Tim Walsh closed the ferry trip by describing the computer-modeled tsunami in Elliott Bay expected from a magnitude 7+ earthquake on the Seattle fault. Because Harbor Island is uplifted by the quake, the Duwamish Waterway initially drains rapidly before the wave reflects off the north side of the bay and then returns to inundate the Harbor Island area (Fig. 7). DGER Open File Report 2003-14 (http://www.dnr.wa.gov/geology/pdf/ofr03-14.pdf) shows the computer-modeled tsunami inundation areas for Seattle.

At the last stop outside the Colman Dock ferry terminal, George Crawford of the...
Washington State Emergency Management Division (EMD) explained the All Hazard Alert Broadcasting (AHAB) radio warning system (Fig. 8) and emergency preparedness (http://www.emd.wa.gov/). AHAB is a self-sufficient outdoor warning system tied into the NOAA (National Oceanic and Atmospheric Administration) Weather Radio All Hazards system. Alerts activate a brilliant blue U.S. Coast Guard light and a siren that can be heard for at least a mile, followed by an equally loud spoken message that advises the public how to respond to the hazard.

Specifics of next year’s Decision-Makers Field Conference, tentatively on the topic of energy and alternative energy sources, will be announced next spring. If you would like to be considered as a guest or speaker, e-mail your request along with your title, business address, and phone to geology@wadnr.gov. ■

**CELEBRATE EARTH SCIENCE WEEK, OCTOBER 8–14**

Earth Science Week is coming up fast! You can organize your own local activity or try one of the many activities already being planned for the week of October 8–14. How will you celebrate Earth Science Week 2006?

**Be a Citizen Scientist**

You can promote this year’s theme—Be a Citizen Scientist—by conducting real citizen-science research. Record observations of cloud patterns. Dig up fossil evidence of past life. Gather rocks in your neighborhood, crack them open with a rock hammer, and examine their insides with a magnifying glass. Take field trips to museums, science centers, parks, university geoscience departments, and weather stations. Volunteer to collect data on water and air quality, biodiversity, climate change, and other phenomena for environmental monitoring efforts. Do activities featured in the Earth Science Week Toolkit and website (see below).

**Try Geocaching**

Looking for adventure? Be one of the thousands of people nationwide who will go online the first day of Earth Science Week to look up predetermined latitude and longitude coordinates and use a Global Positioning System (GPS) to hunt down a nearby geocache (http://www.geocache.org). This event is being organized by the Geological Society of America (GSA). On Oct. 8, geocachers can visit geological outcrops, fossil and mineral collecting sites, college geoscience departments, and state geological surveys and find earth scientists and other experts who will give educational talks about their site.

For more ideas, read about successful past events at http://www.earthsciweek.org/highlights/index, or see recommendations for planning, fundraising, and advertising your event at http://www.earthsciweek.org/forplanners/index.

**Get a Toolkit**

The new Earth Science Week Toolkit is packed with everything you need to join the celebration, lead earth science educational activities, and promote science literacy. The 2006 toolkit includes a school-year calendar running from August 2006 through July 2007 that features classroom activities, important geoscience information, and dates of relevant current events and earth science milestones for each month. The toolkit also features an overview of resources available from the USGS, a NASA brochure on geoscience education programs and products, a National Parks DVD, a NOAA booklet on climate, a CD about Geographic Information Systems (GIS) from ESRI, a Scholastic/AGI poster for elementary-level earth science teachers, and more.

In addition, the careers-oriented 2005 Toolkit (“Geoscientists Explore the Earth”) and the natural hazards–focused 2004 Toolkit (“Living on a Restless Earth”) are still available for order.

**Enter a Contest**

This year, the photography contest, open to all ages, focuses on “Using and Studying Earth’s Resources.” Participants are encouraged to think creatively and submit pictures of geoscientists studying or working with the Earth’s natural resources or people using these resources. The 2006 visual arts contest is titled “Earth Science in Your Home Town.” Students in grades K–5 are encouraged to draw, paint, or create a poster on any aspect of earth science that affects their community.

Students in grades 5–9 are eligible to enter the essay contest: “Be a Citizen Scientist!” Essays must be no longer than 500 words and should highlight the ways every person can contribute to a better understanding of our planet.

These contests offer opportunities for both students and the general public to participate in the celebration. The first-place prize for each contest is $300. To learn more, visit http://www.earthsciweek.org/contests.

**Visit Websites**


Image 1

Figure 6. Restoration Point on the southeast end of Bainbridge Island where a bedrock wave-cut platform has been raised 20+ feet by uplift along the Seattle fault. View to the south.

Figure 7. Harbor Island and the SoDo District are at risk from a tsunami generated by an earthquake on the Seattle fault. View to the south.

Figure 8. The AHAB radio warning system tower (red trim) at Colman Dock ferry terminal on the Seattle waterfront. Seattle AHAB stations use seismic instruments, cameras, a weather station, and chemical sensors to detect natural and man-made hazards. They can also be activated by NOAA Weather Radio. A siren and a loud voice message tell the public how to seek safety. View to the north.
**NORTHWEST UNDERGROUND EXPLORATIONS MEMBERS FIND MISSING HIKER**

by Chris Bell

On Tuesday, June 20, 2006, Ronald Calder was last seen napping on the couch. When his wife arrived home that evening, he was nowhere to be found. On Thursday, June 22, a group of Northwest Underground Explorations (NWUE) members noticed a car parked off US 97 near Blewett Pass. On Friday, June 23, the car was still there, and when we returned on Monday, June 26, and the car was still there, we made an effort to contact the authorities. Starting at the Kittitas County Sheriff’s Office in Cle Elum, we were redirected to several other law enforcement agencies. Eventually, we gave up. Feeling discouraged, and as it was late, we headed home.

On Friday, June 30, a member returned to the site to find the car was still there. He then called the Chelan County Sheriff’s Office. The operator told him that the sheriff would like to be shown the location of the car. The sheriff confirmed that the car belonged to a missing hiker. Within several hours, the sheriff’s office responded with searchers, tracking dogs, and an ORV officer, and the vicinity was searched. Our group provided maps of the area showing dangerous mine workings and pinpointing locations to check first. The search ended quickly due to time of day and a lack of manpower. It was to resume in the morning.

We decided to keep searching, as the hiker had now been missing for 11 days. We headed up the hill, checking all known open tunnels and looking for any sign of a hiker. Darkness was closing in. At 9:45 pm, we arrived at the 300-foot vertical shaft—the location that had worried us the most. We spotted a rope dropping into the darkness. Another rope held two burned outchem lights. We then found a backpack. Inside were a digital camera, binoculars, candles, GPS, ID, cell phone (still charged and with service)—all the right things needed to survive in an emergency.

We called the sheriff’s office immediately, but were told rescue would have to wait until morning. We yelled down the shaft for a while, getting no response, and then headed back to camp, hoping for the best, but expecting the worst.

At 5:30 am, we met the rescue team and took them to the mine shaft. We explained the 100-year-old mine workings and what dangers they could expect to encounter. After about 1½ hours of prep work, the rescue team descended into the shaft. At the 100-foot level, they spotted the hiker down one of the tunnels. They knew immediately that he was dead and informed us above. We watched as they lowered the recovery gear, and when it was time to bring the hiker up, we helped pull him out. They said it looked like the hiker had unhooked himself from his rope to explore the tunnel and then found it had swung out of reach when he was ready to climb back up. After the rescue team secured the site and did a debriefing, we all headed back to the command center where they thanked us for our help.

We now know that Calder died from hypothermia and that our first attempt to contact authorities at the six-day mark would not have saved him. Still, we know if he had just told someone where he was going, most likely he would have been rescued. We were told he was inexperienced, but he carried IDs saying he was certified in CPR and that he was a volunteer for the King County Sheriff’s search and rescue team.

This accident should remind us that all abandoned mine workings are dangerous. The best advice is to “Stay Out and Stay Alive”—the motto adopted by the Nevada State Division of Minerals. Their 11-minute video on the subject is available for use at public meetings from Fritz Wolff of DGER’s Abandoned Mine Lands Program (360-902-1468). Most fatal accidents in abandoned mines occur before the victim even realizes there is a problem. Stay out of mines unless you have legitimate business there and have been trained and equipped to deal with the hazards. It is important to exercise care even while searching for mineral specimens on the surface dumps. Find out if the land is open to the public before entering. Many mines are on active private mining claims and you need the owner’s permission to explore.

Always take a partner when hiking, or at the very least, let people know where you are going. Leave an envelope in your car marked I.C.E. (In Case of Emergency) and fill it with your emergency and destination information. Be safe and explore smart!!!!!!

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**EARTH SCIENCE WEEK AT DGER**

To publicize Earth Science Week, DGER will be donating copies of the book "Bedrock—Writers on the Wonders of Geology" (edited by Laurel E. Savoy, Eldridge M. Moores, and Judith E. Moores; Trinity University Press, San Antonio, Texas; 339 p.) to the Washington State Library, the Timberland Regional Library, and the Office of the Superintendent of Public Instruction. From the back cover: "Novelists, poets, artists, anthropologists, traditional elders, philosophers, and naturalists come together to create a geological portrait of the Earth—from the violence of earthquakes and erupting volcanoes to epochal patterns in stone and the sinuous flow of rivers. With insights from many cultures and across time, ‘Bedrock’ wonderfully illuminates the geology of our home planet."

During Earth Science Week, DGER will hold a silent auction to benefit a geoscience organization that provides public education and outreach. Items to be auctioned include a gem and mineral collection, copies of Em Hansen (geologist) mysteries by Sarah Andrews, and a "Tapestry of Time and Terrain" jigsaw puzzle (GSA product).

DGER will also be collecting used geoscience books, textbooks, and journals to donate to the American Association of Petroleum Geologists’ Publication Pipeline Committee to send to foreign universities. If you have books you would like to donate, drop them off at the Geology Library.