Witness Testimony

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Chairman Barletta, Ranking Member Carson, Members of the Committee, thank you for the invitation to testify at this hearing about reducing the devastation in the inevitable next megathrust earthquake in the Pacific Northwest.

The Pacific Northwest must be ready for a magnitude 9 earthquake. The source is the Cascadia subduction zone that extends from northern California up into Oregon, Washington, and southern Canada. Recent magnitude 9 events around the world include the 2011 Tohoku-Oki earthquake in Japan and the 2004 Sumatra earthquake. These were responsible for tens and hundreds of thousands of lives lost. The last magnitude 9 in the Pacific Northwest was just over 300 years ago, and we are now in the period when we should expect the next megathrust event.

My name is Richard Allen and I am the Director of the UC Berkeley Seismological Laboratory and a Professor of Earth and Planetary Science. I am also one of the principle architects of the ShakeAlert earthquake early warning system, a new technology that we hope to roll out along the US west coast to reduce the impacts of the next big event. We would very much like to build this warning system *before* the next quake occurs. But to do that will require action from this legislature.

The ShakeAlert earthquake early warning project is a collaboration between the University of Washington, the University of Oregon, the University of California Berkeley, the California Institute of Technology, the US Geological Survey and several state agencies. In a close collaboration, we are now operating a demonstration earthquake early warning system that issues alerts to a group of test users for events throughout Washington, Oregon and California.

So what is earthquake early warning? By using networks of geophysical sensors distributed across the west coast we can rapidly detect the beginnings of an earthquake. ShakeAlert then estimates the size of the event and predicts the

shaking intensity that will follow. The warning time depends on distance from the initiation point. In the case of the Pacific Northwest, if a magnitude 9 starts at the southern end of the Cascadia subduction zone--as research suggests--Portland could receive three minutes of warning and Seattle as much as five minutes.

There are many things that can be done to reduce the impact of an earthquake with a few minutes of warning. One of my colleagues, Professor Doug Toomey at the University of Oregon, asked one of his local elementary school principles how long it would take to evacuate his 350-students from the school, built in 1926. His answer: one and a half minutes. His is just one of 1000 schools that a recent Oregon state survey concluded would collapse in a magnitude 9 earthquake.

Studies of the injuries caused in the 1994 Northridge earthquake show that more than 50% were caused by falling hazards: bookcases, ceiling tiles, lighting fixtures etc. If everyone gets a warning, and if everyone drops, takes cover and holds on, then we could reduce the number of earthquake injuries by 50%. The total estimated cost of just injuries in the Northridge earthquake was $2-3 billion. That was just a magnitude 6.7 earthquake. A magnitude 9 quake will release one thousand times more energy.

Other applications of early warning include automated response of transportation systems, isolation of hazardous machinery and chemicals along production lines, opening elevator doors at the nearest floor possibly preventing hundreds of people from being trapped, mobilizing emergency response teams so that vehicles are not trapped in firehouses, and alerting surgeons to remove the scalpel from inside patients before the shaking starts.

The existing west coast ShakeAlert demonstration system has proven the capabilities of this technology. In the recent magnitude 6 earthquake in Napa California, ShakeAlert issued a warning across the San Francisco Bay Area. The BART train system is one of our test users. Although this is only a demonstration system, it is of such value to the BART train system that they have already implemented an automated train-stopping system. It takes BART just 24 sec to bring a train at full speed to a stop thereby reducing the likelihood of derailment. During peak hours, at any point in time, they have between 40 and 45 trains running at full speed, each carrying about 1000 passengers.

Earthquake early warning is not a panacea for the earthquake problem in the Pacific Northwest. It will not prevent buildings from collapsing and we must continue to make progress improving our buildings so that they will not collapse. At the same time, ShakeAlert provides a new opportunity to further reduce the impacts of coming quakes.

So what will it take to build an earthquake early warning system for the US west coast? The US Geological Survey is the federal agency with the responsibility for issuing alerts. But there is also a critical role for the private sector. Their expertise

is needed to distribute the alerts broadly through cell-phone and internet providers, TV and radio. Building a public warning system will also create new business opportunities to provide specialized alerts for specific users, and the development of automated control systems. Already several alerting and communication companies--including start-ups--have joined the group of test users to explore business opportunities.

Building this system is not expensive. The US Geological Survey has developed an implementation plan for the US west coast: Washington, Oregon and California. This system could be operational in two years if the necessary funding is made available. The cost of operating the west-coast system is $16.5 million per year above what is currently spent on operating the geophysical networks. With an additional one-time capitol investment of $38 million, the system could be fully operational in just two years.

Last year Congress appropriated $5 million to begin the process of transitioning from a demonstration system to a public system - *thank you*. The US Geological Survey and west coast universities are now using those resources to improve the geophysical network infrastructure to make the current system faster and more robust. This is a great first step, but the full implementation plan needs to be funded if we are to have fast, accurate and robust warning for *everyone* along the US west coast.

In closing, the earthquake threat along the US west coast increases every day as the strain builds on our faults. It is not *if*, but *when* will the next earthquake strike, and we are due for an earthquake in many locations. Earthquake early warning is a new and important tool to have in our disaster preparedness kit. Japan has a warning system; Mexico has system. China, Taiwan, Turkey and Romania have systems. If there was an earthquake today, I believe we would build this warning system tomorrow. Lets not miss this opportunity, let's fund ShakeAlert now.

I would like to thank the committee for its time and consideration of this important issue.