

Not My Fault: The Humboldt DAS experiment is a public – private partnership

Lori Dengler/For the Times-Standard

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<https://www.times-standard.com/2022/06/11/lori-dengler-running-a-seismic-experiment-requires-a-public-private-partnership/>

Last week I introduced the Humboldt dark fiber DAS (Distributed Acoustic Sensing) experiment. This experiment which sends laser pulses along an unused (dark) strand of optic cable, is unusual in many ways. It involves many contributors including local government, Federal and State agencies, private companies, and seven universities. But even with so many players, was able to jump from inception to operation in less than six months. We had the right people in the right places at the right time.

Humboldt County's broadband infrastructure was being improved and several academic groups had recently published papers about the application of cable technology to earthquake characterization. This was all new to me when our fledgling group first met sixteen months ago. Larry Oetker of the Humboldt Bay Harbor District took the lead on that zoom call as the proposed trans-Pacific cable lines would launch from Harbor District property on the Samoa Peninsula.

Larry was enthusiastic about side benefits of optic fiber and pulled in Chris Brungardt, President of RTI Solutions, Inc., the cable installation company negotiating the permitting process. Submarine cables have been in the realm of private enterprise since the first trans-Atlantic cable was laid in the mid 19th century and we were fortunate that Chris was also interested in the potential scientific applications to cables.

Our first zoom meetings were in the depths of COVID isolation. The pandemic had pushed pause on many projects, and we were open to exploring new ways of working. Bob McPherson and I had been waving our arms about the triple junction area for decades with many polite nods but not much active interest. The combination of the COVID pause and the promise of the new cable technology suddenly generated a lot of interest.

Getting access to a strand of unused fiber on one of the trans-Pacific cables was going to be complicated. For starters, the cables weren't in the water yet and we didn't know who the eventual owners would be. And while we could argue that the seismic cable technology seemed promising, there was no iron-clad proof of what the cable signals actually meant.

Let's do an experiment Connie Stewart and Jeff McGuire said. Connie, the Executive Director of Initiatives at Cal Poly Humboldt, had been working with companies involved with broadband infrastructure improvement on the North Coast and knew what optic fiber cables had been installed and who owned them. Jeff, a seismologist at the USGS, was eager to demonstrate the benefits of cable seismology and had the flexibility to set up short-term contracts.

Connie approached Vero Fiber Networks, the company that owns the onshore fiber optic lines. Vero was willing to lease dark fiber to the University for the experiment and agreed to extend the cable into Arcata City Hall where the DAS interrogator (the machine that send the laser pulses and records the returns) would be attached.

The DAS interrogator was another piece of the private-public partnership. The USGS contracted with Optasense to provide the interrogator for the Humboldt study. We got their equipment and their expertise as well. Martin Karrenbach of Optasense was excited to join the research team. Six weeks ago, he joined us in a strategy meeting at the Seismological Society of America meeting in Bellevue, WA. Martin has been great at communicating with those of us who are DAS newbies, including Cal Poly Humboldt students who have helped with the deployment.

From the start, we wanted this project to involve Cal Poly Humboldt students. The Geology Department has earned a reputation for undergraduate research. Mark Hemphill-Haley found three Geology students who were willing to spend their short break between final exams and the beginning of field camp to assist in locating and installing the nodes and broadband seismographs.

The nodes are thermos-sized geophones that are similar to the detectors used in exploration seismology. Small, portable, and relatively inexpensive, each node records high frequency signals in three directions. Arcata City and Humboldt County officials fast-tracked permits to place 44 nodes parallel to the optic cable route. Students helped with inserting them in the ground and GPS locations. After installation, the students conducted tap tests – striking the

ground with a sledgehammer along the instrument route and noting the time and location of each hammer spot.

Students also assisted in installing the four broadband seismographs. These are the opposite of the nodes – expensive, state-of-the-art instruments capable of recording a wide range of frequencies. The Berkeley Seismology Laboratory will be installing these instruments at locations in Northern California over the next year as part of the Earthquake Early Warning system but was kind enough to lend them to the Humboldt experiment in the interim before they are moved to permanent homes.

Another private partner helped with broadband sites. These instruments need secure locations with power and a concrete base. Bob McPherson who ran the first seismic network in Humboldt County in the 1980s worked with Berkeley's Horst Rademacher to select sites. The PG&E substation off Myrtle was the perfect location for the southernmost broadband. Thanks to substation manager Jessie Murphy and Jeff Bachhuber who heads PG&E's seismology team, we were able to get permission in less than a week.

In addition to the Berkeley and USGS scientists, researchers from the University of Washington and UC Santa Barbara were also part of the installation group.

The nodes, broadbands, and DAS will continue to operate until the end of July. Then the DAS interrogator will likely be unplugged, nodes and broadbands removed, terabytes of data uploaded, and the hard work of data crunching will begin. If the results are encouraging, it may lead to a longer experiment and perhaps the dawn of a new era where seismic sensing becomes a permanent part of all cable systems.

Note: Here's an introduction to node and broadband installation

<https://www.youtube.com/watch?app=desktop&v=MxDDcObt9c4>

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/resources> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email rctwg@humboldt.edu for questions and comments about this column, or to request a free copy of the North Coast preparedness magazine "Living on Shaky Ground."