

Not My Fault: Transitions can be messy part 2

Lori Dengler/For the Times-Standard

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Tectonic transitions pose challenges for the fragile human world built atop them. But when government, research agencies and the private sector work together, impacts can be lessened or averted.

Remember the great Alaska pipeline failure of 2002? Not so sure? It's not your memory that is fuzzy. The failure never happened. But without government regulations, investment in scientific research and a business focused on the long term, it would have.

In 1969, the Trans-Alaskan Pipeline was proposed to bring crude oil from Prudhoe Bay to Valdez. The route would traverse 800 miles of wilderness, cross three mountain ranges, and several active faults. In the early 70s, my colleague and fellow HSU emeritus professor Gary Carver was part of a team of geologists tasked to identify the precise locations of fault zones and assess the maximum likely slip if an earthquake occurred. The team put particular attention on the monster Denali fault system, located about 140 miles north of Anchorage. Denali is a strike-slip fault, similar to the San Andreas with a scar so prominent that you can easily see it on Google Earth.

The geology team narrowed the fault zone to a 1900-foot corridor crossing the pipeline route and estimated that a magnitude 8.5 could produce 20 feet of slip. An innovative solution was proposed – putting the pipeline on Teflon-coated tracks in the fault zone rather than on rigid pillar supports.

There was some debate between the geology team and management about how far north the fault zone extended. The Teflon rails were more expensive to install than standard posts and the company wanted to restrain construction costs. The geologists' arguments won out and an extra 50 feet were added to the zone.

No one on the team of structural and geo-technical engineers expected the solution to be tested in their lifetimes. They were wrong.

On November 3, 2002, the Denali Fault ruptured over a distance of 200 miles, producing the largest earthquake

from a continental fault in North America since 1906 San Francisco. The magnitude 7.9 quake caused 14 feet of horizontal and 2.5 feet of vertical slip beneath the pipeline. Ironically, almost all of the slip was beneath the fifty-foot extension the geologists had argued for.

After the quake, valves were shut and the company spent the next three days evaluating the pipes and supports. The tracks worked – allowing the ground to slide and leaving the pipeline undisturbed. The violent shaking damaged a few of the supports, but the pipeline itself did not break and there were no leaks.

The valves were reopened. No interruption of supply. No surge in fuel costs. No environmental cleanup. No glaring headlines. No crisis.

The survival of the pipeline in the Denali Fault earthquake was the result of careful engineering to meet stringent regulations based on thorough geological studies. The studies cost about \$3 million – a big chunk in 1970 but a tiny fraction of what a pipe failure would have cost. Lost revenue, repair and environmental cleanup could have easily exceeded \$100 million, perhaps many times more. And the bad publicity would continue to this day.

Pipeline companies all over the world took note. After Gary Carver retired from HSU, he became one of the world's foremost pipeline geologists and spent more than a decade scouting proposed pipeline routes all over the world.

This story has a happy ending in large part because of the decades-long government investment in the paleoseismic research that gave the geologic team the tools to analyze the fault and because of the environmental regulations that required a thorough evaluation of the fault potential.

This leads me to another transition that could affect our seismic safety. It is going on right now and is the political transition between administrations. I am worried that hazard mitigation may not have the same priority as it has had in the past.

We are a reactive species with short memories - good at learning from recent or frequent events and adjusting our behavior to reduce the possible impacts. But our memories aren't long, especially when it comes to phenomena with a geologic time-scale attached. In times of transition some longstanding programs and efforts

may not seem immediately valuable to the new administration.

Investment in scientific research and maintaining reasonable regulations that contribute to everyone's health and safety are of benefit to all of us. Please communicate with your government representatives that this is a priority – and just remind them about the great Alaska oil failure that wasn't.

Note: More about the pipeline story at <http://www.amusingplanet.com/2014/08/how-trans-alaska-pipeline-survived-2002.html> and see the pipeline where it crosses the fault on Google Earth by zooming into the coordinates 63.38°N, 145.73°W. For best results, click the clock icon on the menu bar for historical imagery and go back to 2004.

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