



## Earthquakes and Pipelines

Although rare, damaging earthquakes are not unknown in New Jersey and Pennsylvania.<sup>1</sup> The risk of damage in combination with the population density, puts New Jersey 10<sup>th</sup> among all states for potential economic loss from earthquakes.<sup>2</sup> Although generally smaller than those that occur west of the Rocky Mountains, eastern earthquakes affect areas ten times larger.<sup>3</sup> The time-spans between the most intense (VII) earthquakes recorded in the last 300 years implies a return period of 100 years or less suggesting that the Northeast is overdue for a moderate earthquake<sup>4</sup>

Although there are multiple faults in Northeast, the Ramapo Fault is the best known separating the Piedmont and Highlands Physiographic Provinces.<sup>5</sup> This fault line starts in Pennsylvania and crosses New Jersey through Hunterdon, Somerset, Morris, Passaic and Bergen counties. This fault system is one of the longest and oldest systems of cracks in the Northeast.

Earthquakes and seismic activity have the potential to damage pipelines and cause spills and environmental damage. For example, the 1994 Northridge earthquake in southern California resulted in the failure of an old buried pipeline, 190,000 gallons of oil poured into the Santa Clara River, a settlement fine of \$7.1 million in restoration costs, and the replacement of 150 acres of river bottom.<sup>6</sup> Although engineering solutions exist to protect pipelines from seismic activity, the safety comes at a huge price, and these methods are rarely implemented in locations where there are few references to seismic risk. Depending on the size of the pipeline, the location of the spill, the depth/ width/ flow rate of the impacted river and the ease of access, and the product carried by the pipeline, the impact of any pipeline failure will vary.

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<sup>1</sup> USGS. Earthquake History, New Jersey and Pennsylvania: [http://earthquake.usgs.gov/earthquakes/states/new\\_jersey/history.php](http://earthquake.usgs.gov/earthquakes/states/new_jersey/history.php); <http://earthquake.usgs.gov/earthquakes/states/pennsylvania/history.php>.

<sup>2</sup> NJ Geological Survey. 2003. Information Circular, Predicting Earthquake Damage in New Jersey: <http://www.njgeology.org/enviroed/infocirc/eqdamage.pdf>

<sup>3</sup> USGS. 2009. Why should people in the Eastern United States be concerned about earthquakes? <http://gallery.usgs.gov/audios/?a=279#.VCxO4RZKPCV>

<sup>4</sup> Dombroski, D.R. 1998. Earthquake Risk in New Jersey. Department of Environmental Protection, Land Use Management, NJ Geological Survey. <http://www.state.nj.us/dep/njgs/enviroed/freedwn/e-quake.pdf>

<sup>5</sup> Earthquakes and the Ramapo Fault System in Southeastern New York State. Earth Institute News Archive, Columbia University, 2004. Accessed October 24, 2009.

<sup>6</sup> <http://www.dfg.ca.gov/ospr/NRDA/arco-sc.aspx>