

Dr. Douglas Baumgardt

Dr. Baumgardt has over 37 years of experience in seismology and geophysics. He has performed research on several problems in seismology associated with improving monitoring of nuclear test ban treaties, including analysis of regional phase propagation, regional and teleseismic Lg propagation efficiencies in different tectonic regions, seismic discrimination of nuclear explosions and earthquakes, explosion location and yield estimation. He has a B. Sci. in geology and M. Sci. in geophysics from Indiana University, and a PhD. in seismology from Penn State University, where he performed dissertation research in lateral heterogeneities in the earth's mantle and scattering of seismic waves from phase boundaries in the mantle. Dr. Baumgardt currently serves as Chief Scientist at ENSCO, Inc. in Springfield, VA, where he has performed research in a variety of problems in geophysics and signal processing, including analysis and characterization of seismic, acoustic, magnetic, radar, and biometric data. In 2017, he celebrates his 35th year as a member of the Potomac Geophysical Society.

Water, Rocks and Seismology:

Fairfax Water Purification and Seismic Analysis of the Construction of the F.P Griffith Tunnel, Occoquan, VA

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This presentation describes the construction of the F.P. Griffith Water Tunnel in Occoquan, VA, its connection with water purification for Fairfax and Prince William Counties of Virginia, the geology of the Occoquan Formation in which it was emplaced, and seismic analysis of the construction blasting associated with the construction of the tunnel and nearby quarry blasting. Tunnel construction began in November 2000 as part of the Fairfax Water (formerly, Fairfax County Water Authority) water purification infrastructure upgrade and modernization of the F.P. Griffith water treatment facility at Lorton, VA, which was completed in 2006. The 10-foot-wide tunnel took 174 days and 15,000 lbs of dynamite to excavate in the Occoquan granite and 7,700 tons of rock were hauled off-site. The local pumping station, completed in early 2003, pumps water from the Occoquan River at the Occoquan Reservoir at the input point on the Prince William County side through the tunnel under the Occoquan and to the Lorton purification plant and services 55 % of the water requirements of eastern and central Fairfax and Prince William Counties. The Occoquan Granite, which is associated with the extensive Occoquan Batholith of Paleozoic age, is highly siliceous with large content of quartz and feldspar grains. Excellent exposures of the Occoquan granite can be viewed in the abandoned Vulcan Quarry pit to the north of the town where the rock is highly jointed and fractured. During the construction of the F.P. Griffith tunnel, local acoustic and seismic recordings of the tunnel blasting were collected on two occasions to characterize tunnel construction blasting practice. In addition, seismic data for three blasts

in the active Vulcan Quarry 2 km to the north of Occoquan was also collected and seismic-acoustic data for tunnel and quarry blasting were compared. This study provided information about the geophysical characteristics of the granite and acoustic-to-seismic coupling efficiency for seismic sensors on the hard rock. The coupling efficiency was found to be very low at the lower seismic frequencies (> 20 Hz) as expected for the granitic rock-air interfaces in the area. Comparison of the tunnel and quarry blasts revealed significant differences in the pattern and duration of ripple fire blasting as well as characteristics of the signals produced by the explosions.