



PCPG

Pennsylvania Council of Professional Geologists
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Hydrostructural Geology: The Geology within Hydrogeology

August 18, 2020

Regional Learning Alliance, Cranberry Township, PA

Overview: Unlike the mental imagery geologists construct of groundwater flow through a porous medium, investigators in fractured rock aquifers must first visualize the three-dimensional network of water-conducting planes before considering how the spacing, orientation and interconnection of those planes control and constrain gravity-driven flow. Complicating that visualization even further, it is usually the case that none of the sets of intersecting, non-randomly-oriented planes are aligned parallel to the prevailing hydraulic gradient.

Combining a refresher on the concepts and methods of structural geology with quantitative analysis of groundwater flow within and between discrete, connected flow pathways, this full day, hands-on course provides the tools of both visualization and quantification of gravity-driven flow in three-dimensional space. Including a complete review of the methods of planar structural analysis, the course explores: structurally-controlled deflection of contaminant plumes; the effects of the scale of observation on aquifer heterogeneity and anisotropy; migration of separate phase liquids and gases; and groundwater flow within structural domains of differing, yet overlapping, scales of observation from individual fractures to wells, sites, through study areas and regional flow systems.

Proposed Agenda

- 8:00-8:30 Arrivals, Registration & Morning Refreshments
- 8:30 Overview of modeling flow in fractured media, introduction to hydrostructural geology and practical applications
- Structural planes, right sections, apparent dips, stratigraphic thickness, one-point problems, three-dimensional projections - problem solving session No. 1
- Three-point problems, structural contours, problem solving session No. 2
- 10:15-10:30 Break

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- 10:30 Structure and topography, outcrop patterns, subsurface projections, problem solving session No. 3
- 12:00-12:45 Group Luncheon
- 12:45 Faults, fault motion, fault solutions, planar discontinuities in rock masses, characterization, spatial and orientational distribution, statistical analysis, structural data plotting. Problem solving session No. 4.
- Hydro-Structural Geology; Structural controls on groundwater flow. Flow in planar discontinuities, structurally-controlled anisotropy, approximations and porous medium equivalents
- 2:30-2:45 Break
- 2:45 Hydro-Structural Geology - Application of structural geology to groundwater flow and contaminant transport. Problem solving session No. 5
- Hydro-Structural modeling, structural controls on contaminant dispersion and distribution, modeled prediction of transport anisotropy. The special case of structural controls in karst aquifers
- 4:30 Adjournment, Evaluations, & Certificate of Attendance

About Our Presenter

Thomas D. Gillespie, P.G., Senior Professional Geologist (Gilmore & Associates) – Tom is a licensed professional geologist with 37 years' experience in groundwater, water resource management, engineering geology, geologic hazard assessments, environmental risk management, site remediation, mining, oil & gas exploration. Expert hydrogeologic witness at all levels of the Court System. Expert representative for regulatory compliance and negotiation for cases in all experience sectors. Legal action strategist for a natural gas exploration company in cases ranging from Court of Common Pleas to the Commonwealth Court and ultimately to the PA Supreme Court; qualified expert in Federal Courts in the Third and Fourth Circuits. Qualified expert in hydrogeology/engineering geology, PA Environmental Hearing Board; expert consultant on cases ranging from stormwater damage to Superfund litigation. Two consecutive six-year terms on the Pennsylvania State Registration Board for Professional Engineers, Land Surveyors and Geologists; two terms as President of that Board. National Association of State Boards of Geology, subject matter expert in structural geology, hydrogeology and engineering geology. Institutional expert consultant to the Department of the Army's Technical Assistance Team.

Adjunct professor of geology at The College of New Jersey, Penn State, LaSalle University; continuing education instructor of structural geology and hydrostructural geology. Founding member of the Pennsylvania Council of Professional Geologists - Board of Directors, one term. Current research in modeling groundwater flow through fractured media.