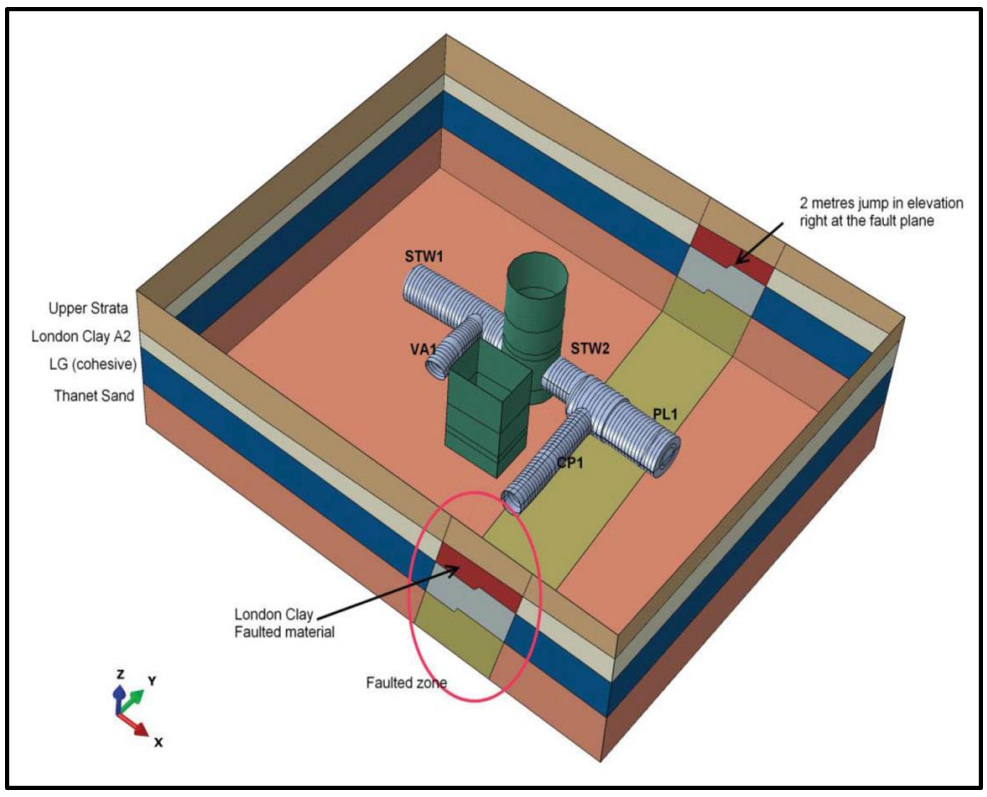
Applying 3D Geological Modeling to Infrastructure Design

Alan Keith Turner

Emeritus Professor of Geology and Geological Engineering, CSM

Wednesday, February 10th at NOON in BB W210

Lunch Provided –



In 2009, while the preliminary design of Farringdon Station was underway, Crossrail commissioned the British Geological Survey (BGS) to develop a 3D geological site model. This model used 3D modeling techniques developed by the BGS and was based on preliminary site investigations data provided by Crossrail and a previously completed regional 3D model of London. As excavation of Farringdon station began in 2013, the BGS model and its associated software was transferred to the construction consortium and integrated into the site supervision workflow. Initially, the model was updated with data from additional ground investigation boreholes and shaft excavations, received between 2009 and 2013. Subsequently, data from face mapping and tunnel probing, as the station excavation advanced, was integrated into the model on a daily basis. This provided a constantly evolving geological database and ground model used to predict ground conditions and guide tunnel excavation with increasing accuracy. The use of the 3D geological model materially reduced the geotechnical risk, allowed for efficient construction, and resulted in a 4-month reduction in the planned construction time.

The success of the Farringdon Station project led to several other infrastructure design applications using 3D geological models. The UK government has mandated the use of Building Information Modeling (BIM) techniques on all government-funded construction. A jointly funded government-industry research project is developing methods to integrate the CAD-based BIM data management and visualization capabilities with 3D geological models of the subsurface ground conditions. This will facilitate multi-organizational collaboration and efficient data sharing throughout the design-build process.

Alan Keith Turner is emeritus professor of geology and geological engineering at CSM. Between 1999 and 2002, Dr. Turner occupied the chair in engineering geology at the Delft University of Technology in the Netherlands. He has had a longstanding interest in computer applications to geological and environmental studies. He is currently a visiting research associate with the British Geological Survey, where he is continuing these research interests. Dr. Turner has been active in the Transportation Research Board (TRB) throughout his career, chairing several TRB standing committees, task forces, and panels. He was chief editor for TRB books on Landslides and Rockfall. Dr. Turner received the TRB 2010 Roy W. Crum Distinguished Service Award in recognition of his achievements in transportation research. In 2011, Dr. Turner was recognized as a National Associate of the National Academies for his service to TRB. Dr. Turner received the 2014 Schuster Medal, jointly awarded by the Association of Environmental and Engineering Geologists and the Canadian Geotechnical Society, for his contributions to North American geo-hazards research.

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