Engineering Geology of the Proposed 4th Bore of the Caldecott Tunnel

Geomatrix Consultants, Inc. recently completed geologic and geotechnical field studies to support preliminary design of the proposed 4th bore of the Caldecott Tunnel in the Oakland-Berkeley Hills. The geology of the tunnel area is complex and, in general, characterized by northwest-trending, steeply-dipping and locally overturned marine (Sobrante and Claremont Formations) and non-marine (Orinda Formation) sedimentary rocks of middle to late Miocene age. A comprehensive geologic/geotechnical field exploration program for the proposed 4th bore was carried out between December 2004 and July 2005 and included: field mapping, 18 exploratory test pits, nine exploratory borings, including four vertical borings ranging from 50 to 150 feet deep and five sub-horizontal/angled borings ranging from 400 to 920 feet long, in situ borehole testing (pressuremeter, Goodman jack, and packer permeability tests), and downhole geophysical logging (optical and acoustic imaging and P- and S-wave measurements). These investigations revealed a wide range of geologic conditions along the alignment, including variably fractured and locally crushed bedrock, variably oriented bedding, irregular and highly contorted bedding, intra-formational and inter-formational faults, diabase and probable sandstone dikes, pockets of "trapped" or confined groundwater, and locally bituminous conditions. Preliminary geologic interpretations of information obtained from the field studies suggest that many of the geologic units along the 4th bore alignment are juxtaposed by previously unrecognized, northwest-trending faults. These faults generally coincide with zones of intensely fractured and crushed rock and, in some cases, with changes in geologic structure. One fault, which marks the boundary between the Claremont and Orinda Formations, also may be a groundwater barrier. The rock mass structure of the geologic units along the alignment ranges from very blocky to crushed and locally seamy. Representative intact rock strengths range from about 400 psi to 7500 psi. Evaluation of the complex geologic structure and geomechanical properties along the alignment by the Tunnel Design Team results in five ground classes, or support categories, which form the basis of the preliminary tunnel excavation and initial support design schemes.

Biography Todd Crampton is a Senior Geologist with Geomatrix Consultants, Inc., located in Oakland, California. He received his B.S. and M.S. degrees in Earth Science from U.C. Santa Cruz in 1992 and 1994, respectively. Todd is a Professional Geologist and a Certified Engineering Geologist in California with over 11 years of experience conducting and managing engineering geologic and geologic hazard studies for pipelines, water system facilities, tunnels, dams, and other critical and non-critical facilities.