Earth retention and shoring systems are used to stabilize excavations, slopes, and adjacent structures. Monitoring the performance of these systems helps engineers assess risk, prevent potential damage, and evaluate the effectiveness of remediation measures.

Subsurface instrumentation may include piezometers, shape arrays, and instrumented soil nails and tiebacks. Surface instrumentation may include AMTS, laser scanners, tiltmeters, and crackmeters. Vibration, noise, and dust monitoring may also be required at some sites.

Transbay Transit Center
Construction of the Transbay Transit Center required a massive support of excavation system. GEO-Instruments provided continuous monitoring of the support system, deploying six automated total stations (AMTS) and a strong geometric network of 250 target prisms and 30 control prisms. GEO’s Monstar software output measurements in project coordinates for easy use with other project documents. Every two hours for four years, the system delivered spatial measurements with an accuracy better than one mm, providing critical observational data for evaluating operations and managing risks.

Dulles International Airport
Monitoring the SOE, tunneling, and foundation work at Dulles was challenging because instrumentation was distributed over a wide area. To collect measurements efficiently, GEO implemented a mixed-mode wireless network and developed the unique Lid-Link® antenna to extend the network to locations where loggers and radios had to be installed flush with the pavement. At its peak, the wireless network handled data from more than seven hundred geotechnical sensors and two automated total stations (AMTS). GEO’s server collected readings hourly, checked for alarms, and posted results on a project website.

Salesforce Tower
Salesforce tower will be the tallest building in San Francisco and the centerpiece of the Transbay Redevelopment project. To monitor the support system, GEO-Instruments has deployed 138 prisms and four automated total stations (AMTS), two mounted on waler and two mounted on buildings. This configuration not only provides complete coverage of the support system, but also allows the four AMTS to share some common points of measure, creating a strong geometric network for least-squares processing and delivery of accurate measurements. The system provides updates every two hours.

Sound Transit I-5 Undercrossing
Sound Transit’s U-Link project extends the light-rail system from downtown Seattle to the University District. GEO-Instruments monitored a high risk section of the project, where twin tunnels would cross under I-5 and through the foundations of the 40-foot high, 400-foot long retaining walls on either side of the highway. To monitor for deformation of the walls, GEO deployed multiple technologies, including automated total stations (AMTS), a laser scanner, tiltmeters, crackmeters, inclinometers, six data loggers, and mixed mode data communications.

Castle Village Retaining Wall
When a large retaining wall failed, 41,000 cubic yards of rock, soil, and trees slumped onto a major urban highway, closing it and endangering nearby apartment buildings. To help manage risk during reconstruction of the wall, GEO installed more than 100 sensors to monitor settlements, lateral displacements, and rotation. Readings were obtained every 15 minutes, checked against alarm thresholds, and displayed on a dedicated website. The system earned the praise of the design and construction engineers for giving them tremendous peace of mind during a very difficult project.