Thursday, March 16, 2023
Virginia Tech - CGPR Annual Lecture Program

The Inn at Virginia Tech - Skelton Conference Center
Blacksburg, Virginia

8:00-8:45 AM **"New Findings on Performance Verification of Rigid Inclusions - Role of the CPT"**
Jesús Gómez, Ph.D., P.E., D.GE, *GEI Consultants*

Rigid inclusions are a ground improvement technique that provides soil reinforcement and settlement mitigation. Most often, the improvement is modeled through the mechanical contribution of the rigid inclusion and disregards the beneficial effect of the installation of the rigid inclusion on the mechanical properties of the soil. This is mostly due to the difficulty in evaluating post-installation soil properties, and their effect on rigid inclusion performance, in a reliable, repeatable way. Ignoring, or incorrectly considering the improvement of mechanical properties of the soil due to installation of rigid inclusions can yield overly conservative designs. It also has implications in seismic areas where rigid inclusions might be reliably used for liquefaction control if adequate pre- and post-installation soil properties can be assessed through testing.

This presentation will discuss the successful use of Cone Penetration Testing (CPT) for design and performance verification of rigid inclusions systems. One case history will be discussed where CPT data was used to show effective reduction of liquefaction potential at a highly seismic site in Mexico, as determined by current liquefaction assessment methods. Another case history will be used to illustrate efficient integration of CPT and load testing data with Monitoring While Drilling data to create better processes for Quality Assurance of all production rigid inclusions.

9:00-9:45 AM **"Stabilization of the Cliffs at Pointe du Hoc, Normandy, France"**
John R. Wolosick, P.E., SE, D.GE, F.ASCE, *Keller North America Inc.*

During World War II, after the occupation of France, the German army set up a 'Ragelbau' Observation Post (OP) and large, long range 155 mm guns at Pointe du Hoc near Omaha Beach along the coast of Normandy. The guns were installed to ward off Allied ships and to rebuff any Allied invasion from the northern coast of France. On D-day, June 6, 1944, an Army Ranger battalion led by Colonel James Earl Rudder was tasked with taking Point du Hoc. It was a tough battle, with about 100 Rangers losing their lives while scaling the cliff and capturing the remaining Germans. The site is now a highly visited landmark, with about 750,000 people visiting per year. However, due to the harsh weather and rough seas in this area, the cliffs have receded about 10 meters since 1944. This erosion threatened the stability of the Observation Post, which had to be closed to the public due to the danger of its immediate proximity to the precipice. A team led by Texas A&M University and Dr. Jean-Luis Briaud was charged by the site owner, the American Battle Monuments Commission (ABMC), to investigate the stability of the cliffs and the OP. Texas A&M has a close association with the site, since Colonel Rudder was later the President of the University from 1959 until his death in 1970.

The team performed geotechnical and geological investigations, recommended fixes with cost estimates and established instrumentation to monitor the OP and the cliff. The presentation presents the history of the site along with the results of the investigation, repair recommendations and the final construction which was designed and performed by French engineers and contractors. The repairs implemented included rock bolting with stainless steel netting, tieback anchors, micropiles, a few horizontal drains and special stone masonry. A reinforced concrete grade beam was built around the OP to transfer the stabilizing forces from the tiebacks and the micropiles into the cliff.

10:00-10:45 AM **"What lies beneath: How the ground impacts tall towers around the world"**
Seth Martin, P.E.*, Langan Engineering*

This presentation goes underground below some of the world's tallest towers and showcases how their foundations were designed around a variety of complex subsurface conditions. The subject towers include: One Vanderbilt, in New York City; Supertall and Megatall towers in Kuala Lumpur; and the Jeddah Tower, in Saudi Arabia. One Vanderbilt, one of mid-town Manhattan's first Supertall towers, is a 1,401-foot-tall tower adjacent to New York City's landmark Grand Central Terminal, active subway tunnels, and critical infrastructure. The tower is founded on shallow foundations on Manhattan bedrock about 50-feet below street level. Kuala Lumpur's Central Park, home to the Petronas Towers, will include several towers ranging from 300 to 700 meters tall. The foundation systems for these towers are piled-rafts, which consist of a reinforced concrete mat over a field of large-diameter piles extending up to 125 meters below grade. The towers are founded in erratic, deep limestone profiles with underground cliffs and pinnacles as much as 50 meters tall. The towers are also surrounded by critical infrastructure adjacent to 25-meter deep basement excavations. Finally, the Jeddah Tower, rising 1,000 meters into the Arabian sky, will be the tallest tower in the world. The tower rests on a field of large-diameter piles extending 45 to 105 meters below grade. The ground below the tower consists of a complex sequence of soil and soft rock layers that required extensive geotechnical investigations and rigorous soil-structure interaction analyses.

Keynote Speaker

11:00-12:00 Noon **"Lessons learned from three geosynthetic failures"**
Robert D. Holtz, Ph.D., P.E., D.GE, Dist. M. ASCE, *University of Washington*

This talk describes three failures involving geosynthetics. The first case was a geosynthetic-reinforced steep slope in Taiwan that failed twice, the first time during construction and the second due to a major earthquake. The second case involved an approximately 19m high tiered modular-faced geosynthetic-reinforced wall that failed shortly after completion. Multiple factors were involved in this catastrophe. The third failure was an unusual application: a silt curtain, that failed very soon after installation. As is true of most failures, all had multiple causes, but only the third one, the silt curtain, was due to the incorrect selection of the geosynthetic. Each case is described in some detail, with observations about each failure, post-failure investigations of the soils and geosynthetics involved, and other factors that may have influenced the failures. Finally, valuable lessons learned from each case are given.

12:00 Noon - The lecturers, CGPR members, and Virginia Tech faculty and graduate students are invited to join us for lunch in the Latham Ballroom.