Paul Dittrich – Cross-Canada Lecture – Fall 2025

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Biography:

Paul Dittrich, PhD, PEng, FEIC is a Geotechnical Engineer and Senior Technical Director of WSP with 30 years of experience on a wide variety of projects in the transportation, infrastructure, and mining sectors within Canada and internationally. His main areas of expertise include site characterization, foundation design, settlement analysis, stability of slopes, embankments and excavations, specialized geotechnical analysis/modelling, geotechnical instrumentation and monitoring, and ground improvement. Paul is approved as a Designated Principal Contact for MTO's High Complexity foundation engineering services. Paul has been an active member of the Canadian Geotechnical Society (CGS) during his career holding leadership positions at both the local and national levels and has served on the organizing committee of several CGS conferences. He has contributed to the geotechnical profession by being a sessional instructor or adjunct professor at the University of Toronto, Queen's University, McMaster University, Humber College and University of Waterloo, as well as teaching a continuing education course on geotechnical engineering at EPIC. Paul is currently a member of the CSA Group S6 Canadian Highway Bridge Design Code (CHBDC) – Technical Sub-Committee (TSC) working on the updates to the 2025 version of the Code. He is the author or co-author of more than 30 technical publications.

Presentation Titles and Abstracts:

#1 - Influence of Exsolved Gases on Slope Performance at the Sarnia Approach to the St. Clair River Tunnel: In 1993, over 100 years after completion of the original St. Clair Tunnel and its approach cuts, work commenced on the new St. Clair Tunnel. The new tunnel alignment used the existing approaches, but the larger tunnel required additional excavation to widen and deepen the original cuts. In Sarnia, Ontario, the new construction triggered unusual, deep-seated deformations on the south slope of the approach. Limit equilibrium analysis using undrained shear strengths evaluated from CPT can predict low FoS values consistent with the observed movements; however, the reason for the lower than expected shear strengths within portions of the clayey stratum was unclear. Finite element analysis was used to model the 1993 construction, but initial

results did not capture the trend of deformations observed in the field. Naturally occurring gases are frequently encountered near the base of the overburden in the Sarnia area and this phenomenon was observed during the geotechnical drilling investigations in the Sarnia approach cut. Including the effects of the presence of exsolved natural gases in the fine-grained, clayey soils subjected to unloading in the FEA model resulted in substantially better predictions in the trend of deformation on the slope of the approach cut. This lecture will present the details of this interesting case study and highlight the importance of considering the effects of the presence of naturally occurring gases on fine-grained soil behaviour.

#2 - Geotechnical Challenges in Barbados: The Caribbean island of Barbados has a unique geologic history and composition that results in challenging geotechnical conditions for both investigation and foundation design. From weak coralline rock with relatively high tensile strength that often contains voids and cavities, to very loose, unconsolidated coralline sands, to swelling clays, and weak clays with low friction angles, geotechnical design work can be a challenge and unexpected, poor foundation performance can occur. This lecture will present a high-level overview of the geologic conditions on the island and the various methods of investigation and testing carried out to examine the subsurface conditions. In addition, two case studies will be presented: the first involving ground improvement by vibroflot/stone columns to support the foundations for a new power station; and the second involving a micropile and grouting remediation for the foundations of an existing building experiencing settlement and cracking.

#3 - Geotechnical Lessons Learned: As a geotechnical engineer with 30 years of experience, there are a number of things I've learned from working on various projects in Canada (mostly Ontario) and abroad that may be of value to those early in their geotechnical careers. Drawing on experience mainly from transportation projects, this lecture will present an overview of some geotechnical aspects of wick drain design, slope stability and deformation monitoring, rock fill settlement, long-term creep behaviour of clays, and axial and lateral pile behaviour from a collection of case studies.