



**Vancouver Geotechnical Society**  
*A Local Section of the Canadian Geotechnical Society*

[www.v-g-s.ca](http://www.v-g-s.ca)

**20th Vancouver Geotechnical Society Symposium**

**Soft Ground Engineering**

Friday, June 8, 2012 – The Hyatt Regency  
655 Burrard Street, Vancouver, B.C.



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\*Cover photo taken looking west over Glenlyon Business Park, April 11, 2009

## Soft Ground Engineering – Preface

Marc Bossé, Symposium Chair

On behalf of the members of the Symposium organizing committee, I would like to thank the authors and keynote speakers for the dedication of their time and labours towards this event. Without the voluntary commitment of individuals, the sharing of experience and knowledge at events like this would not be possible. We are also grateful for the generous financial support of our sponsors, and the exhibitors who help make this event a success. Most importantly, we are very grateful for the ongoing participation of the community of geotechnical practitioners, who through their collective participation help make the Vancouver Geotechnical Society, and its Symposium, possible.

The organization of the 2012 VGS Symposium relied on the dedication of many who volunteered their time to assist with the planning and technical review of the papers submitted to the Symposium. As Chair I would like to extend my thanks and gratitude to **S. Sriskandakumar, Ryan Mills, Andrea Lougheed, Ali Amini, Jason Pellett, and Carl Kelman** for their assistance in planning the event; and to **Mustapha Zergoun** for his assistance in the technical aspects of the event. The contribution of other volunteers during the event is also greatly appreciated.

## Symposium Program

07:30 - 08:30	<b>Registration</b>
08:30 - 08:45	<b>Opening Remarks</b>
08:45 - 09:45	Keynote Presentation No.1 : “The Observational Method: Case History and Models”; Tien Wu
09:45 - 10:15	“Methodology for the Design of a Staged Construction Program on Soft Clay”; Makram El Sabbagh & Demetrious Koutsoftas
10:15 - 10:45	<b>Coffee Break</b>
10:45 - 11:15	“Helical Piles in Soft Sensitive Soils – A Field Study of Disturbance Effects on Pile Capacity”; Christopher Weech & John Howie
11:15 - 12:00	“Highway Embankment Performance on Compressible Clay at Highway 1 / 200th Street, Langley, British Columbia”; Alex Sy & Don Gillespie
12:00 - 12:30	“Peat Behaviour – Some Conceptual Mechanisms and Challenges”; Howard Taylor
12:30 - 13:30	<b>Lunch</b>
13:30 - 14:45	Keynote Presentation No. 2 : “Peats and Creepy Soils”; Arvid Landva
14:45 - 15:15	“Comparison of In-Situ Shear Strength Measurement Techniques of Soft Clays”; Jeff Schaeffers & Ilmar Weemees
15:15 - 15:45	<b>Coffee Break</b>
15:45 - 16:15	“Sunrise City, Vietnam — A Case History of Testing and Analysis”; Bengt Fellenius & Nguyen Minh Hai
16:15 - 16:45	“The ‘Broadway’ Project, Kelowna, BC”; Norman Williams
16:45 - 17:00	<b>Closing Remarks</b>

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**ConeTec Investigations** is an international site investigation company with offices in Canada and the

United States. ConeTec specializes in the design and use of some of the most advanced in-situ testing equipment available. ConeTec operates a wide range of CPT equipment, sampling systems and seismic testing equipment.

In just over 26 years of operation, ConeTec has carried out thousands of site investigations in all types of ground conditions. The company is operated by geotechnical engineers with diversified academic and practical backgrounds. Clients include all of the major geotechnical consulting firms, mining companies, oil companies, utilities, government agencies and property owners.

Projects have been undertaken from coast to coast in Canada, the United States, the Canadian and American arctic, South and Central America, the Caribbean, and throughout Asia.

ConeTec services include: Piezocone penetration testing (CPTu), Seismic CPTu, Resistivity CPTu, Ultraviolet Induced Fluorescence CPTu, Natural and Active Gamma CPTu, Full-flow penetration testing, soil and groundwater sampling, Downhole and Crosshole Seismic testing, surface wave testing (MASW, CSWS), Pressuremeter testing, In-situ Vane Shear testing, auger, coring, mud rotary, and sonic drilling, SPT energy calibration, customized electronic installation, and specialty data acquisition systems. ConeTec specializes in offering all of these services for both onshore and offshore deployment.



Celebrating over 54 years, **exp**, is a multi-disciplinary engineering consulting firm providing professional, technical and strategic

services in six key practice areas: Buildings, Earth & Environment, Energy, Industrial, Infrastructure, and Sustainability. **exp** has grown from a handful to approximately 4,000 in more than 110 offices across North America and around the world. **exp** is renowned for high quality engineering work with emphasis on innovation and technical expertise.

The **exp** Burnaby office is an ISO 9000:2008 registered company and provides consulting services in the fields of Geotechnical Engineering, Pavement, Concrete Technology, Materials Testing, Building Science, Environmental Engineering and Quality Management.

**exp** Services Inc. has been providing geotechnical solutions for construction on soft soils to our clients since the 1970s. Projects include highway embankments on soft foundation soils for the Golden Ears Bridge, W.R. Bennett Bridge, South Fraser Perimeter Road, numerous buildings and business parks on soft soils.

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**GEOPAC**

**Geopac** has been a leader and innovator in the Canadian geotechnical construction industry for more than four decades. With offices in Montreal, Vancouver, and Toronto, Geopac is a nationally renowned specialty contractor, offering proven expertise in design and execution of soil improvements and geotechnical solutions. We can also work with owners and foundation / geotechnical consultants to provide design-build solutions where requested.

Geopac is the Canadian ground improvement subsidiary of the Menard Group and Soletanche Freyssinet, both leading international construction groups with a wide range of specialties and services offered through their subsidiaries.

Geopac's extensive experience in ground improvement gives us a unique perspective. We have developed many new methods and technologies that provide distinct advantages in all types of foundations and soil improvement scenarios. Geopac offers economical solutions that can be attractive alternative to excavation & replacement or deep foundations. Our ground improvement design and construction experience has been successfully used in the construction of buildings, commercial warehouses, marine port / airport platforms, heavy industrial structures, material / handling storage facilities, roads, embankments, and railways.

Geopac is continuously improving and refining its ground improvement technologies and methods. A fundamental objective for the company is to lead the ground improvement industry through accrued efficiency, reliability, and cost-effectiveness with each project. Our continuous improvement processes include in-situ measurement and monitoring, along with optimization of construction equipment techniques in the field.



At **Golder Associates** we strive to be the most respected global company providing consulting, design, and construction services in our specialist areas of earth, environment, and the related areas of energy. With Golder, clients gain the advantage of working with highly skilled engineers, scientists, project managers, and other technical specialists who are committed to helping them succeed. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services firms in the world.

Employee owned since our formation in 1960, we serve our clients as a globally connected community collaborating to share our knowledge to find the answers to technical issues requiring innovative approaches. Golder's superior skills at developing client relationships and understanding their business needs enables us to help clients achieve their short- and long-term financial, social, and environmental goals. We are recognised by our clients for our technical expertise and service excellence.

We are known as an industry leader in Health & Safety and as a responsible global citizen. Our people take pride in giving back to those in need and to the communities in which they work.

The success of Golder's approach can be seen through our steady growth. We now employ more than 8,000 people who operate from more than 180 offices located throughout Africa, Asia, Australasia, Europe, North America, and South America. Our knowledge of local cultures, languages, and regulatory requirements, combined with our global resources, makes it possible for us to help our clients achieve their business objectives around the world and at home.

## Gold Sponsors



**MEG Consulting Ltd.**  
(M+EG) is a 10-year old Canadian consulting company that specializes in geotechnical engineering.

Both our main office and soil testing laboratory are located in Richmond BC.

M+EG has worked on numerous high profile projects, both in BC and around the world, and has extensive geotechnical experience on projects that vary in both size and complexity. Areas of Specialization in Geotechnics are: Bridges and Highways, Marine Terminals, Offshore Oil and Gas Infrastructure, Earthquake Engineering and Soil Dynamics, Soil-Structure Interaction, In Situ Testing and Monitoring, PDA Testing, Arctic Geotechnics.

M+EG has developed a flexible approach to its method of operation to meet client's demands by multi level partnering. Based on this, we have been able to participate in many projects that would not normally be within the reach of a company of our size.

MEG Technical Services is a division of M+EG that provides a geotechnical testing capability. We are able to offer the full suite of geotechnical laboratory tests ranging from basic classification and index tests through to advanced testing. We are also able to offer state-of-practice cyclic/dynamic testing of soil by means of resonant column and cyclic simple shear equipment. The cyclic simple shear equipment is fitted with bender elements for the measurement of both shear (S) and compression (P) wave velocities.

The M+EG geotechnical team can provide expertise for pre-feasibility studies through to design and construction.

## Silver Sponsors



Bronze Sponsors





## Past VGS Symposia

<b>Year</b>	<b>Theme</b>
1986	Transportation Geotechnique
1987	Earthquake Engineering
1988	Risk and Liability in Geotechnical Engineering
1989	Geotechnical Aspects of Tailings Disposal and Acid Mine Drainage
1990	Geotechnical Aspects of Contaminated Sites
1991	Geosynthetics: Design and Performance
1992	No Symposium (1 <sup>st</sup> Canadian Symposium on Geotechnique and Natural Hazards)
1993	Ground Improvement
1994	Deep Foundations
1995	Construction on Peat and Soft Soils
1996	Earth Retention Systems
1997	Forestry Geotechnique
1998	Site Characterization
1999	Slope Stability and Landslides
2000	Lifeline Geotechnical Engineering
2001	Land Reclamation Geotechnique
2002	Foundation Engineering
2003	Geotechnical Engineering for Geoenvironmental Application
2004	No Symposium (13 <sup>th</sup> World Conf. On Landslide Risk Management)
2005	No Symposium (Int'l Conf. On Landslide Risk Management)
2006	No Symposium (CGS/IAH Conference)
2007	No Symposium (1 <sup>st</sup> US-Canada Rock Mechanics Symposium)
2008	Risk and Liability in Geotechnical Engineering
2010	Geosynthetic Reinforced Walls, Slopes and Earthworks