



Vancouver Geotechnical Society
A Local Section of the Canadian Geotechnical Society

www.v-g-s.ca

24th Vancouver Geotechnical Society Symposium

Engineered and Natural Slopes

Friday, June 2, 2017 – Pinnacle Hotel
1133 West Hastings Street, Vancouver, B.C.



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Papers and Presentations

Outcomes of the Canadian Railway Ground Hazard Research Program – Applications of remote sensing techniques for rock slope stability assessment; *Keynote Presentation by Jean Hutchinson, Department Head for Geological Sciences and Geological Engineering at Queens University, Kingston*

Hybrid Cutter Soil Mixing Shoring System for a Deep Temporary Excavation in Vancouver, BC; *Marina Li & Nadir Ansari, Isherwood Associates; Brian Wilson, Pacific Ground Engineering*

Road Reconstruction across Environmentally Sensitive Slopes on Vancouver Island; *Peter Bullock, GeoStabilization International*

Reconciling Civil Engineering and Agronomic Practice for Natural Slope Stabilization and Revegetation; *Trevor Kloeck, Synermulch*

Flexible Slope Stabilization Methods in BC – Using a High-Tensile Steel Mesh to Stabilize Steep Soil Slopes; *Jillian Jackson, Ministry of Transportation and Infrastructure; Andi Buechi, Trumer Schutzbauten*

Identifying Pre-Existing Shear Surfaces and Slope Stabilisation – A Case History Spanning Almost 30 Years; *Mahmoud Mahmoud & Sadaf Sani, GES Geotech Inc.*

Trim Blasting Techniques – Best Practices and State of the Art; *Sarah McAuley & Anders Frapell, Tetra Tech*

Influence of the Construction of Uncased Drilled Shafts at Close Proximity to MSE Wall Facing; *Willie Liew & Matthew Doss, Tensar International Corporation*

Geogrid-Reinforced Earth Structures for Transportation Projects in the Vancouver Region – Case Histories; *German Cajigas, Tensar International Corporation; Dan MacDonald, Nilex Civil Environmental Group*

Examples of Open Pit Slopes Validation Techniques to Evaluate Stability Performance and Design Aspects; *Edward Saunders, SRK Consulting*

Panel Discussion

Engineered and Natural Slopes – Preface

Marc Bossé, Symposium Chair

On behalf of the members of the Symposium organizing committee and the Vancouver Geotechnical Society, 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 2017 VGS Symposium relied on the dedication of many who volunteered their time to assist with the planning and execution of the Symposium. As Chair I would like to extend my thanks and gratitude to Yoshi Tanaka for his assistance in planning the event. The contribution of other volunteers during the event is also greatly appreciated.

Cover photos:

Upper Left – Cross section of a castle wall with blocks creating a smooth, tight fitting face (Kanazawa, Ishikawa, Japan).

Upper Right – Cross section of a castle wall with blocks creating a rough, open face (Kanazawa, Ishikawa, Japan).

Lower Left – A quarry near Antequera, Spain.

Lower Right – The Barrier on the hike up to Garibaldi Lake (photo taken by Erik Stevenson, Thurber).

Symposium Program

07:30 - 08:40	Registration
08:40 - 08:45	Opening Remarks
08:45 - 09:15	Hybrid Cutter Soil Mixing Shoring System for a Deep Temporary Excavation in Vancouver, BC; Marina Li, Nadir Ansari & Brian Wilson
09:15 - 09:45	Road Reconstruction across Environmentally Sensitive Slopes on Vancouver Island; Peter Bullock
09:45 - 10:15	Reconciling Civil Engineering and Agronomic Practice for Natural Slope Stabilization and Revegetation; Trevor Kloeck
10:15 - 10:45	Coffee Break
10:45 - 11:15	Flexible Slope Stabilization Methods in BC – Using a High-Tensile Steel Mesh to Stabilize Steep Soil Slopes; Jillian Jackson & Andi Buechi
11:15 - 12:00	Identifying Pre-Existing Shear Surfaces and Slope Stabilisation – A Case History Spanning Almost 30 Years; Mahmoud Mahmoud & Sadaf Sanii
12:00 - 12:15	VGS Award
12:15 - 13:15 Lunch	
13:15 - 14:15	Outcomes of the Canadian Railway Ground Hazard Research Program – Applications of remote sensing techniques for rock slope stability assessment Keynote Presentation by Jean Hutchinson of Queens University, Kingston
14:15 - 14:45	Trim Blasting Techniques – Best Practices and State of the Art; Sarah McAuley & Anders Frapell
14:45 - 15:15	Coffee Break
15:15 - 15:45	Influence of the Construction of Uncased Drilled Shafts at Close Proximity to MSE Wall Facing; Willie Liew & Matthew Doss
15:45 - 16:15	Geogrid-Reinforced Earth Structures for Transportation Projects in the Vancouver Region – Case Histories; Dan MacDonald & German Cajigas
16:15 - 17:15	Panel Discussion moderated by Peter Bullock, featuring Jean Hutchinson, and Horst Aschenbroich
17:15 - 17:20	Closing Remarks

Keynote and Gold Sponsors

Keynote Sponsor



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Since 2006, Trumer Schutzbauten Canada has serviced the Canadian market, having built some of the largest and highest capacity systems in North America, including Canada's first avalanche protection system and flexible-net debris flow barriers. Our solutions can be found protecting residential areas, public and commercial areas, highways, railways, pipelines, hydro infrastructure, and mining facilities.

Trumer offers an extensive line of off-the-shelf products including slope mesh, high tensile netting, gabions and CE-marked catchment fences. But perhaps most important are our expertise we bring to projects for robust, safe and efficient one-off solutions designed to meet the site-specific characteristics or owner requirements that are neglected by standardized solutions. We work closely with engineers, contractors and owners from feasibility studies through to long-term care and maintenance.

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THURBER

Thurber Engineering Ltd. is a private Canadian company wholly-owned by the senior practicing professionals. Thurber was established in 1957 in Victoria, BC and presently has a staff of about 320, operating out of nine permanent offices in British Columbia, Alberta and Ontario. The company has a wide base of professional experience in geotechnical, geological, environmental sciences, hydrogeological, pavement engineering, concrete and asphalt technologies, forensic investigations, as well as construction materials monitoring, inspection and testing.

The company has a strong base of operations in British Columbia, with offices in Victoria, Vancouver, and Kamloops. The Vancouver operations of the company presently have a total staff of about 40 and serve a variety of clients, including government agencies, municipalities, airports, commercial businesses, mining and industrial clients.

Thurber's team of professionals and technical staff are well supported by laboratory facilities, specialized field-testing equipment, and state-of-the-art computer analysis techniques. Our mission includes a strong desire to help our clients meet their objectives by providing high-quality professional services within our areas of technical expertise. Our staff members are led by a core group of senior professionals who have many years of practical experience in a variety of technical specialities. Our project teams are structured so that principals and senior specialists assigned to a project maintain a significant involvement at every level and stage of the project. This ensures high technical quality, consistency and supports our Client's best interests with respect to the limitation of liability and overall project compliance. Additionally, our BC offices are OQM certified with APEGBC.

Additional information about our company can be obtained from our website at www.thurber.ca.

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Tetra Tech Canada Inc. is a full-service engineering and science firm with a substantial global presence. We help our clients conceptualize and execute clear and innovative solutions to their most difficult problems. We provide best-in-class experts with worldwide project experience and deliver high level integrated services for full project life-cycles in five service areas: water, environment, infrastructure, resource management, and energy. Tetra Tech has become one of the largest engineering and science firms in Canada with more than 3,000 employees in 50 offices.

The Tetra Tech Geotechnical Group has a well-earned reputation for providing excellent, innovative geotechnical engineering services across the country and abroad. We specialize in site exploration, analysis, geohazard assessments, and design services for projects such as transit and transportation infrastructure, bridges, tunnels, and industrial

facilities. Our group has more than 35 engineers and technicians, many of whom hold graduate and post-graduate degrees, and who are well known in local practice.

The Tetra Tech Rock Engineering Group and Tunnel Engineering team comprises 15 highly qualified engineers and geologists, who are experienced in a variety of rock engineering problems such as underground tunneling, rock slope remediation and deep rock cut design. Our reputation in rock engineering is based on decades of local and international experience and spans over slope stabilization, rock fall assessment, rock foundation design, underground tunnel design, design using TBM, etc. We have excelled in mixed ground condition projects in the past that required engineering design solutions for both soil and rock ground conditions.



BGC Engineering Inc. (BGC) is an international consulting firm that provides professional services in applied earth sciences. Our practice was established in 1990, based on a specialized appreciation of the impacts of geology on engineered structures. This continues to be our foundation today, enabling us to address a broad spectrum of engineering and environmental issues related to development in challenging terrain.

BGC is composed of over 350 professional engineers, geoscientists, technicians and support staff who provide a full range of investigation, design, and construction review services in the applied earth sciences. We currently operate from seven Canadian offices in British Columbia, Alberta, Ontario, New Brunswick and Nova Scotia; two US offices in Colorado; and one South American office in Chile.

BGC's assignments range from pre-feasibility level studies and routing evaluations to detailed design, construction inspection and independent third-party review. We also provide services supporting and coordinating environmental impact studies, permitting and financial agency review.

BGC is a private, employee owned company with a flat management structure. All of BGC works together as one team, with coordination and integration of all offices and technical disciplines. This 'One Team' approach gives every client access to all of BGC's resources, and allows us to assemble the best team of professional and support staff for each and every project, regardless of the project location.

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Past VGS Symposia

Year	Theme
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 st 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 th 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 st US-Canada Rock Mechanics Symposium)
2008	Risk and Liability in Geotechnical Engineering
2009	No Symposium
2010	Geosynthetic Reinforced Walls, Slopes and Earthworks
2011	No Symposium
2012	Soft Ground Engineering
2013	Foundation and Lifeline Engineering
2014	Foreshore Engineering
2015	Soil Structure Interaction
2017	Engineered and Natural Slopes