



**LANDFORM
DESIGN
INSTITUTE**

Landform Design Quarterly

New corporate members bolster LDI ranks

by David Wylynko

The LDI's corporate membership list is growing, thanks to the addition of BHP, JDS Energy & Mining, Klohn Crippen Berger, Knight Piésold, Okane Consultants, and Teck Resources. Many other firms are also considering joining, and a sponsorship drive is set to kickoff in the fall.

The new corporate partners join McKenna Geotechnical and Swanson Environmental Strategies in helping the Institute implement its mandate, while being able to take advantage of numerous products available exclusively to members. "The Institute is greatly bolstered and encouraged by the support of these high-profile firms which all constitute landform

design practitioners, just the people we need to move our agenda forward," commented Gord McKenna, LDI Founder and Chair.

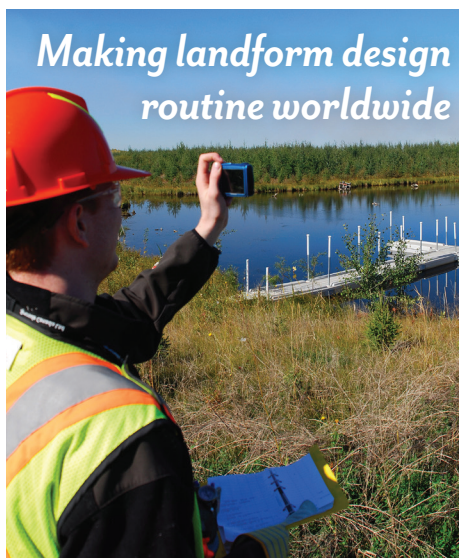
Corporate membership advantages include the Institute's recently initiated corporate "Lunch and Learn" series, and the products made available to all members, which include the six-part UBC lecture series, the video-vignettes series, and a discount at the upcoming short course scheduled for November 2-4 in Calgary, Alberta. Registration is still available at: landformdesign.com/events/2022course.html.

Meanwhile, the Institute is forging ahead with the roll out of its 2022-2023 mandate, with the Technical Advisory Panel having

met twice to discuss steps forwards, the Annual General Meeting being held May 11 to gather input from the broader landform design community, and two Town Halls staged in February to solicit views and direction from all landform practitioners in Canada and abroad. The podcast series hosted by Mike O'Kane, Chair of the LDI Technical Advisory Panel, has lined up its next four guests, and is available to all (see page 8).

The six UBC lectures on landform design were created by Gord McKenna for classes led by Dr. Dirk Van Zyl, a professor of mine water management at the University of

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**Making landform design
routine worldwide**

The Landform Design Institute is dedicated to creating and supporting a community of landform design practitioners. Its intention is to help their teams design and build truly sustainable mining landscapes. Its mission is to make landform design routine in the mining industry worldwide by 2030.

Short course slated for November

The LDI will host its second in-person landform design short course November 2-4, 2022, in Calgary, Alberta. The three-day course will be taught by LDI Chair Gord McKenna and Mike O'Kane, Chair of the LDI Technical Advisory Panel (TAP). Guest speakers will include LDI board member Lois Boxill and TAP member Jerry Vandenberg. Other guest lecturers will be added.



**Guest speakers Lois Boxill
and Jerry Vandenberg**

McKenna and O'Kane are seasoned landform design professionals, and both have lectured many times on landform design and related topics in Canada and abroad. Boxill is an independent mine closure specialist with a focus on re-establishing enduring, beneficial interconnections between humans and the environment. She previously served as the Global Manager for Tailings and Land Reclamation projects with BASF. Vandenberg is a professional chemist working in Alberta and BC. He previously worked with Golder Associates and all three levels of government.

The short course fee is CDN \$1895 (+5% GST) per person. Corporate, individual, and student members of the Landform Design Institute receive a 20% discount. The fee covers

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AGM embraces design basis memorandum

By David Wylynko

To achieve its mission of making landform design routine by 2030, it is imperative the LDI create and disseminate a generic design basis memorandum (DBM) to mining practitioners and reclamation experts. This was a key consensus of the Institute's second annual general meeting, held virtually on May 11, 2022.

As described in *Mining with the End in Mind*, the Institute's landmark position paper, which was released in March 2021, an agreed-upon design basis is typically the first step in landform design, and "lays out the vision, goals design objectives, and design criteria, and includes the regulatory requirements and formal commitments with Indigenous and local communities."

Because actual DBMs are proprietary, the Institute is considering the preparation of a generic DBM, likely a 50-page document that could be provided to landform design practitioners worldwide.

The DBM will also be a hot-topic item at the November LDI short course in Calgary, and at the case history symposium, which is tentatively scheduled for 2023 in Vancouver. Much discussion is anticipated at both events on what constitutes landform design. "Most organizations talk about turning the land into a landform. We are saying it always is a landform," commented Gord McKenna, Chair of the LDI, during the annual general meeting.

Landform design is making inroads. Participants at the AGM spoke about

closure at each mine, one similar in status to an engineer of record. To date, reclamation has often proceeded largely only thanks to the heroic efforts of a single individual at the mine.

Some AGM participants spoke of the importance of advancing progressive reclamation as part of stewardship of the land. Others emphasized the importance of broadening the Institute's international collaboration, and the importance of integrating landform design guidance into educational environments such as colleges and universities.

Other major topics addressed at the AGM included efforts by the federal and provincial governments to reduce active water treatment in favour of passive treatment and progressive reclamation. Many also noted that tailings — a waste stream generated by mining — are getting far more attention now due to the SME 2022 release of *The Tailings Management Handbook: A Life-Cycle Approach* and the 2020 *Global Industry Standard on Tailings Management*. These documents are viewed by many in the industry as important steps toward a broader, more all-encompassing approach to reclamation.



the increasing popularity of adding a reclamation designer of record to the team responsible for



- **January**
 - Corporate membership drive
 - Landform Design Quarterly pubs
- **February**
 - BCIT mining lecture
 - UofA mining lab
 - Hiring Jasmine Winters as LDI admin
 - LDI townhall meeting
 - Chapter in SME Tailings Handbook published
- **March**
 - UBC LFD risk management lecture
 - UBC Intro to LFD lecture
 - Video vignettes and info graphics
- **April**
 - Planning for LFD 3-day short course, Calgary Canada, November
 - Planning for DBM How-To guide / strategy
- **May**
 - LDI corporate hello meetings
 - INAP presentation & collaboration discussion
 - Calgary_CGS AGM presentation on "Safe closure"
 - UofA lecture in Mine Waste Structures

- GISTM "Safe Closure" interest, life cycle interest
- Shift in doing the least to doing the most for reclamation and closure for new mine permitting
- Overpromising again / still
- Designing waste rock dumps from bottom up for source control and leachate collection
- Adding people with closure and landform design expertise to geotechnical / tailings review boards
- Exploration of Reclamation Designer of Record (Straker and McKenna)
- Water / reclamation review boards
- First Nations / Mining / Reconciliation with the land
- Other trends?



Corporate members,, from page 1

British Columbia and member of the LDI Technical Advisory Panel (TAP). The series covers the current state of mine reclamation, provides an introduction to landform design and the design team in action constructing landforms, offers case histories, and describes the challenges that lie ahead.

The video-vignette series so far consists of 14 episodes, which offer short presentations on landform design topics that are designed to provide insight and guidance on a single landform design issue. Each episode is presented by LDI founder Gord McKenna. Infographics for episodes 6 through 13 are available to both members and non-members.

David Wylynko is the LDI's director of communication and principal of West Hawk Associates

Progressive reclamation

Commentary by
Gord McKenna PhD PENG PGEOL
Geotechnical Engineer, Landform Designer, LDI Chair

Landform Design Institute - Video Vignette Series
Episode #013 - 2021-12-27

Exclusive to members ~ join today

www.landformdesign.com

Aesthetics for mine reclamation

Commentary by
Gord McKenna PhD PENG PGEOL
Geotechnical Engineer, Landform Designer, LDI Chair

Illustrations by **Derrell Shuttleworth**, Gabriola Island, BC, Canada

Landform Design Institute - Video Vignette Series
Episode #004 - 2021-09-05

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Benches on landform slopes

Commentary by
Gord McKenna PhD PENG PGEOL
Geotechnical Engineer, Landform Designer, LDI Chair

Illustrations by **Derrell Shuttleworth**, Gabriola Island, BC, Canada

Landform Design Institute - Video Vignette Series
Episode #001 - 2021-09-05

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A plea for common terminology at LDI town halls

Participants in the Landform Design Institute's first two Town Hall meetings, held virtually in February 2022, identified the need for common terminology, clarity in closure practices, and cooperation with like-minded organizations.

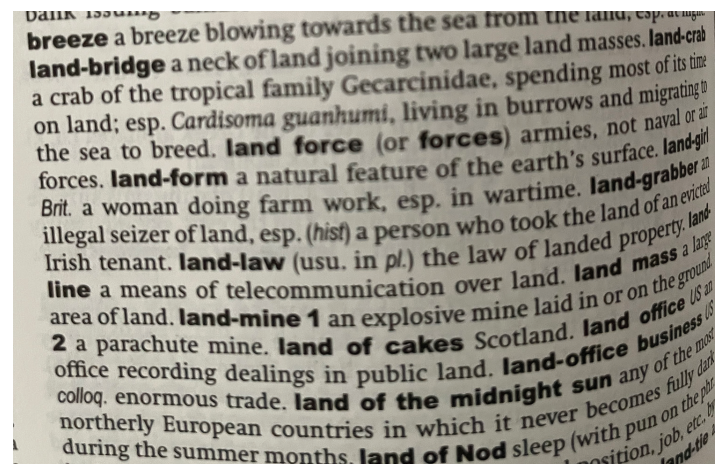
To open each of the gatherings, LDI Chair and Founder Gord McKenna provided updates on LDI activities to date, which include the inaugural 40-hour graduate-level landform design course, a ground-breaking position paper, a video-vignette series, essays in the *Landform Design Quarterly*, and a podcast series.

In the general discussion, which took place Feb. 8 (Feb. 9 in Australia), participants enthusiastically debated the point at which a mine transitions to landform design activities, with several pointing out that the opportunity to bring in landform designers is often routinely missed. Some suggested that landform designers need to be engaged earlier to ensure key milestones are met and opportunities for effective design realized. The Institute has advocated for the integration of landform design as a key part of the entire life-of-mine cycle, starting years before the mine becomes active.

Terminology was another prominent topic, particularly whether a reasonable working definition of landform design can be agreed on, and what constitutes safe closure. Some questioned how landform design fits into the broader definition of mine closure, and how it can be integrated into the regulatory framework. As more global

standards are developed for tailings, dams, and reclamation, opportunities exist to refine the definition of safe closure.

Some participants suggested avenues and opportunities for collaboration with similar groups such as the Closure Planning Practitioners Association (CPPA) in Australia. Based in Perth, Western Australia, the Association engages with practitioners to develop and build professional capacity and has many areas of potential synergy with LDI. Overall, the Institute plans to broaden its focus beyond Western Canada, and will examine ways to cooperate with the Canadian Institute of Mining, Metallurgy and Petroleum (CIM).



Stressing the ‘how to’ of landform design

The LDI Technical Advisory Panel (TAP) held its first two meetings in March and May of 2022, with members focusing much of both discussions on how best to provide industry with the tools needed to transition to sustainable mining and closure.

The TAP was established to provide the Institute with technical guidance on major issues and assist with LDI projects. It has 14 industry and academic members from Canada and abroad, their range of expertise and experience spanning geotechnical engineering, geochemistry, wildlife biology, mining engineering, geology, mine reclamation and closure, soil science and forest ecology, tailings and mine rock structures, and environmental chemistry.

The rationale for why a transition to sustainability is necessary and what needs to be done are well established. But Mike O’Kane, Chair of the TAP, stressed that, while the industry does not lack for published

guidance, the available information tends to be quite high level, lacking the “next level down” detail that mines require.

As well, areas of closure information where “gaps” exist need to be addressed, and conceivably more exhaustive literature searches (perhaps as university projects) are needed to identify gaps than those the LDI has already undertaken. One consideration is the production of a short document identifying what guidance exists and what is missing, which could be produced in conjunction with a half-day workshop of practitioners.

The TAP discussed holding workshops on closure gaps in conjunction with other organizations. Providing more practical, on-the-ground, detailed guidance will also be of great help to those involved in closure who don’t possess geotechnical engineering training or experience.

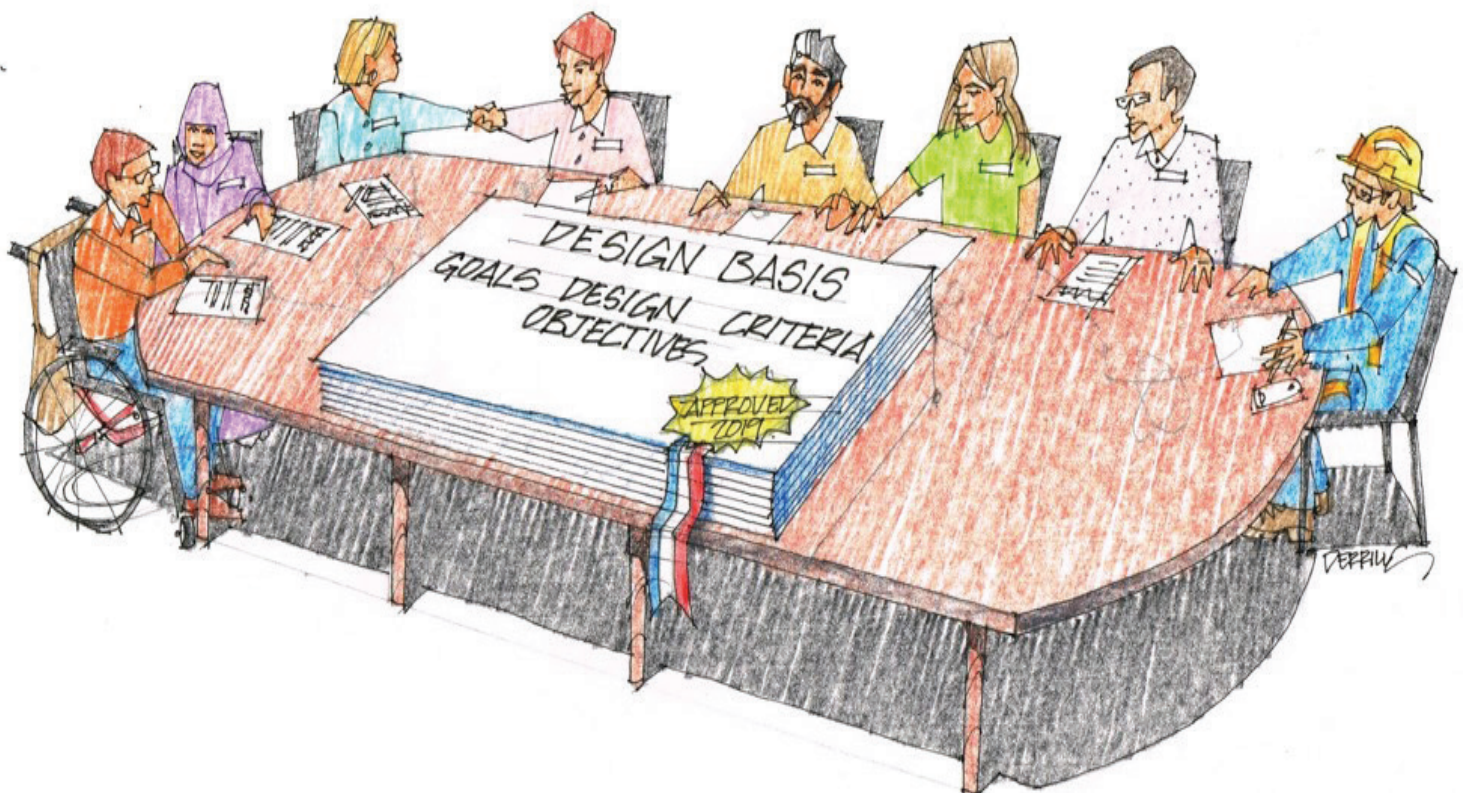
As noted by Gord McKenna, LDI Chair, new mines are finding it increasingly difficult

to get permits, in part because they need to do a better job from the very beginning of setting out their closure and reclamation plans and need to spell out how they intend to consult and collaborate with local communities, particularly Indigenous communities.

As a central piece of the guidance needed, the TAP emphasized the importance of mines generating a design basis memorandum (DBM) at the outset of any project. Many in the industry have expressed their need for DBMs specific to their projects, and the TAP contemplated whether the creation of a virtual DBM was plausible and would prove useful. The May 25 TAP meeting produced a consensus that a generic DBM needs to be produced as early as this fall.

A DBM was a key element of the position paper the Institute released just over a year ago, entitled *Mining with the End in Mine*. The

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Technical Advisory Panel Members



Mike O'Kane, Chair



June Pollard, Co-Chair



Nick Beier



Stephen Day



Jason Fisher



Andy Fourie



Kathleen Hanley



Jennifer McConnachie



Steven Pearce



Doina Priscu



Justin Straker



Dirk Van Zyl



Jerry Vandenberg



David Williams

Stressing the 'how to,' from page 4
position paper described the DBM as the document that lays out the preliminary elements of landform design, including the vision, goals, design objectives, and design criteria. It includes the regulatory requirements and the formal commitments with Indigenous Peoples and local communities.

The TAP contemplated whether DBMs could be integrated into other closure and reclamation documents, representing a way to plug one gap in closure planning. DBMs could also be featured in the landform design courses that industry needs to

integrate into regular events. For example, the LDI may present a paper on DBMs and landform design at the University of Alberta's oilsands workshop in December.

The group discussed the need to have half-day DBM working sessions at mine sites and stressed that approval of projects should be contingent on integrating the precautionary principle or adaptive management into the mine plans. If the objectives of the DBM aren't being met as mining proceeds, certain triggers could kick in instructing the mine to exercise contingencies.

TAP members also considered the

importance of collaborating with other organizations working toward improved closure, such as the United Nations Environment Programme (UNEP), Principles for Responsible Investment (PRI), and the International Council on Mining and Metals (ICMM), who collectively produced the *Global Industry Standard on Tailings Management*. Such collaborations will help communicate the mission of the Institute, which is to make landform design routine by 2030, and assist in efforts by industry to bring about the closure and reclamation that communities, government, and the public are demanding.

Making the case for landform design

This excerpt is part of the Landform Design Quarterly's ongoing publication of different chapters from Mining with the End in Mind: Landform Design for Sustainable Mining. The full document can be downloaded at landformdesign.com. Supporting reference endnotes have been removed from this excerpt but are included in the full document.

by Gord McKenna and June Pollard

The case for broadly instituting landform design begins with a review of historical practices and the current state of practice. Mine reclamation only started in earnest in the 1960s and 1970s, when mines were much smaller and expectations more modest. At the time, reclamation was rudimentary, and involved grading the slopes of mine waste facilities to constant grades (or approximate original contours), sometimes with benches, placing a thin layer of growth media, and revegetating with agronomic grasses mostly to control erosion.

The need to manage surface water was recognized, but implementation varied widely and was usually overlooked. Even these modest beginnings present a steep learning curve; today, cover design and revegetation are mature reclamation technologies. Although acid rock drainage has been problematic for mining landforms for millennia, methods to control it only arrived in the 1960s, and in recent years the application of these technologies has matured but continues to evolve.

With ever-larger mines and ever-increasing expectations and commitments, a significant gap has developed between what mines have promised to achieve on reclaimed lands and what is actually delivered. This gap has persisted since the 1960s. Work by various groups over the past 15 years has clarified what needs to be done, at a high level, and what activities need to take place. But mines still struggle with setting clear goals and objectives, with working with local communities, with executing timely progressive reclamation, and with achieving signoff on completion of

“Despite billions of dollars in investments, thousands of dedicated practitioners working hard for years, and usually agreeable landscape performance, few mine sites are ever fully reclaimed.”



Mining with the end in mind: Landform design for sustainable mining

POSITION PAPER



MARCH 2021

reclamation. Despite billions of dollars in investments, thousands of dedicated practitioners working hard for years, and usually agreeable landscape performance, few mine sites are ever fully reclaimed, fewer result in the return of financial assurance, and users are typically barred indefinitely from even well-reclaimed land. What seems to be missing is the how-to aspects and a framework for successful reclamation.

The international mine reclamation community is highly fragmented — by jurisdiction, by speciality, by commodity, and by climatic region. There is a dearth of reclamation textbooks, and training is typically local and region-specific. Much of the know-how resides in individual mines. Considerable sharing of expertise does occur, mainly through published conference papers and mine tours. But little unified work occurs.

A more multidisciplinary approach, one that builds on the current approach to mine reclamation, means tapping into engineering tools, setting design parameters, producing formal designs, identifying and addressing failure modes, constructing mining landforms that will be easy to reclaim, and bringing the whole weight of proper governance and engineering rigour to bear. It begins with the vision, followed by the setting of a design basis,

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Making the case, continued from page 6

various levels of design, stamped issued-for-construction drawings and specifications, construction monitoring, and production of as-built reports to demonstrate that the landform was built to the design. It ensures that members of the landform design team accept professional responsibility for the results.

The main stumbling block is residual risk. There are always residual risks to any reclaimed landform or mining landscapes — the risk that the landform won't perform as intended, that people or animals might be injured or become sick, that the vegetation won't grow as vigorously or as fast as intended, or that it is replaced with less-desirable species.

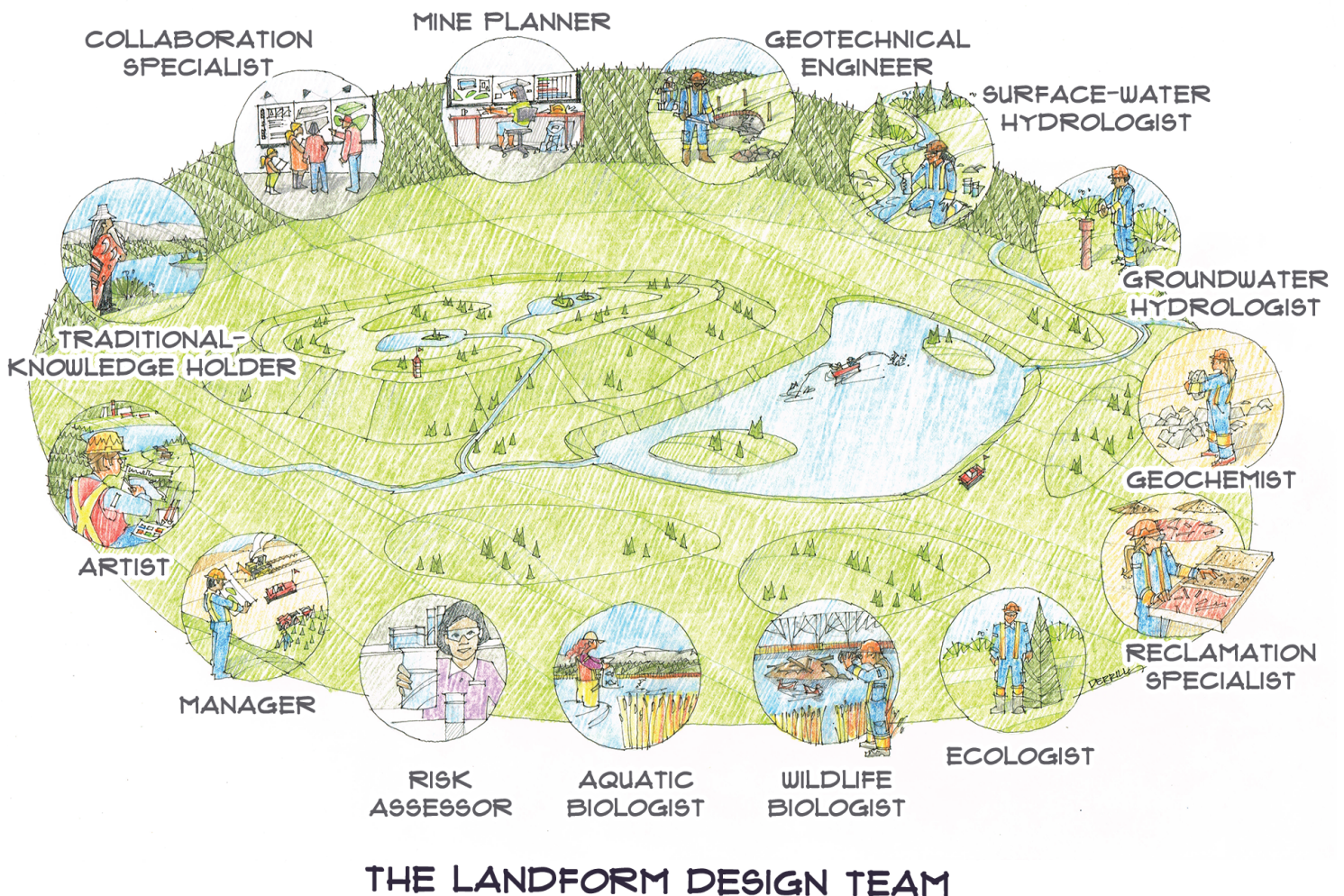
Additional risks exist: that people can't use the land as intended, that the performance doesn't meet the regulatory requirements for geotechnical or erosional stability, or that the water quantity or quality fail to meet regulatory requirements.

A further complication is the dynamic (not static) nature of all landscapes. Good performance today is not a guarantee of good performance tomorrow. More than 200 potential failure modes are recognized. Each can react with others in complex pathways — many mine sites are the size of modest cities and exhibit complex, unpredictable behaviour. People's desires change,

regulations change, expectations change, and climates change. Accordingly, the Institute will be examining and pioneering new risk management methods related to landform design as part of successful reclamation.

The next most fundamental issue is that the required performance is rarely well defined, and that in almost no cases are the regulators inclined to sign off on the reclamation or take on liability. Mine owners, recognizing they are liable for the performance of the reclaimed landscape, are usually unwilling to give control to a regulator (though transfer of liability to a new mine owner is common). Mine owners are often reluctant to spend millions or billions of dollars on mine reclamation or seek signoff. While these two issues are framed in terms of the interaction between the mine and the regulator, they also apply to Indigenous and local communities who will inherit the risks. Regulatory policy is often lacking or wed to old paradigms.

A new approach, a structured, multidisciplinary approach with a clearly stated vision, goals, and objectives, is required for successful reclamation. As well, a transparent mechanism to manage the residual risk, ideally developed up front, is critical. The framework of landform design provides such a system and has been successfully employed at numerous projects in recent decades. These successes bolster the case for landform design.



Short course slated for November, continued from page 1

three days of instruction, breakfast, lunch, and morning and afternoon coffee, and electronic versions of course materials. (Fees do not include dinners or accommodations.)

The course consists of a series of lectures and exercises. Case histories will be presented and analyzed to provide real-world examples of landform design application for sites using a wide range of resource types and climatic settings. The course is focused on providing practical “how-to” advice to design, build, reclaim, and monitor mining landforms and landscapes that reliably meet declared land uses, goals, design objectives, and design criteria. In addition, the “how-to” is presented within the broader strategic thought process that guides landform design.

Landform design is an emerging process used to reconstruct mine lands in a more responsible and sustainable manner. It is both a “thought process” and a set of tools, which allows industry, regulators, and communities to work together to minimize residual risks, optimize opportunities, and reduce the costs required to achieve progressively reclaimed landscapes with confidence and pride.

2022 LANDFORM DESIGN SHORT COURSE

November 2–4, 2022

7:30 a.m. to 5 p.m.

**Calgary Marriott Downtown Hotel
110 — 9th Ave SE, Calgary, AB Canada**

Register at [eventbrite.com](https://www.eventbrite.com) (search for “landform design”)

Registration deadline

September 30, 2022

Early-bird registration ends July 15

**Early-bird registrants will be entered
in a raffle for one of two Suunto clinometers**

Fees: \$1895 + 5% GST

(LDI members receive a 20% discount)

Cue up the next episode

Guests for another three episodes of the Getting Closure podcast have been confirmed: Andy Robertson, Lois Boxill, and Mark Swinnerton. The Institute’s podcast series launched in February of 2020, just before COVID-19 shut down virtually all in-person meetings in Canada and much of the world. But host Mike O’Kane went on to complete five episodes, which are available to all: www.landformdesign.com/pod and through all major podcasting platforms.



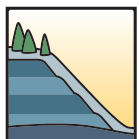
Podcast host
Mike O’kane

O’Kane will interview Robertson in Vancouver in September. Robertson has 30 years of experience in geotechnical and environmental engineering. He spent 27 years as one of three senior principals at Steffen, Robertson & Kirsten and as the president of Robertson GeoConsultants Inc.

Lois Boxill is an independent mine closure specialist with a focus on re-establishing enduring, beneficial interconnections between humans and the environment. Formerly, she served as the Global Manager for Tailings and Land Reclamation projects with BASF.

Mark Swinnerton is founder and CEO of Green Gravity and has over 25 years of global experience in the mining, metals, manufacturing, and logistics sectors. He has a proven track record of strategic and change leadership, alongside financial, commercial, and stakeholder management.

The podcasts are available to all landform practitioners. Sponsorship opportunities are available and those interested in sponsoring one or more episodes should contact Aja Elemans of Okane Consultants (aelemans@okc-sk.com or +1.587.583.5741). Other guests will be announced in the coming months.



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CONTACTING THE LDI

5223 Laurel Dr.

Delta, BC, V4K 4S4

Canada

+1.604.838.6773

info@landformdesign.com

Web: landformdesign.com

Twitter: @LandformDesign