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Landform Design Quarterly

New approach needed for mine reclamation

Traditional mine reclamation isn't yielding the results society is increasingly demanding, and a more multi-disciplinary approach with clear leadership from mine management and regulators is needed, according to the new Landform Design Institute (LDI).

"All mines need to start preparing for reclamation before they even begin operations," said Gord McKenna, Chair of the Landform Design Institute, which was launched in September and formally incorporated Dec. 10. "And the team of specialists needed to reclaim lands affected by a mine should be formed before the first shovel hits the ground."

Under the approach advocated by several industry experts at the landform design course (see p. 3), new mines around the world will take all aspects of reclamation into account when the mine opens, involving experts in several areas including landform design and construction, mine waste management, groundwater and wetland design, and



The inaugural Landform Design for Sustainable Mining course took place at the University of Alberta Dec. 5-10. See story page 3.

revegetation and ecology. Existing mines are starting to adopt this approach as well.

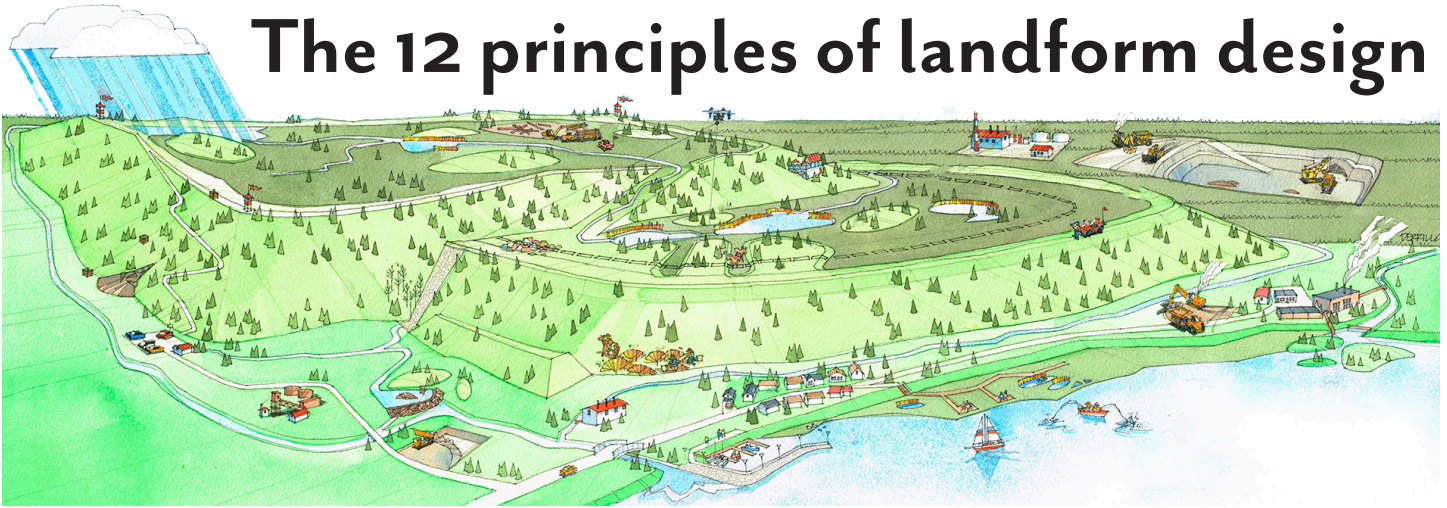
On Dec. 20, the Institute announced the appointment of a Board of Directors and a Technical Advisory Panel (see p. 4). Mike O'Kane, new Chair of the

advisory panel, emphasized the urgency of the paradigm shift. "The Institute will create greater awareness of ways to build landforms more effectively and earlier, so that closure planning and mine planning are done together. This approach will actually reduce mine life-cycle costs."

Making landform design routine worldwide

The Landform Design Institute is a new organization 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.

The 12 principles of landform design



The Landform Design Institute has established the following 12 initial principles. These will be refined over the coming year:

1. Begin with the end in mind. Create a shared vision for the reclaimed land among the mine, its stakeholders and First Nations. Work together to earn each other's trust.
2. Establish governance. Assemble a multidisciplinary design team. Appoint a lead designer. Design mining landscapes with flair.
3. Set clear land-use targets, goals, design objectives, and design criteria in a Design Basis Memorandum. Support the vision. Anticipate the land will evolve over time — physically, chemically, ecologically, and socially. Design and maintain the land to adapt to these changes, including those driven by an ever-changing climate.
4. Work collaboratively in every endeavor. Build the reclaimed landscape with (not for) the land's users.
5. Work all spatial scales — regional, landscape, landform, element — simultaneously.
6. Design for construction and operations. Landforms and landscapes should be easy to build and reclaim using available technology that is fit for purpose. Control the source of contaminants. Avoid producing soft tailings.
7. Use a risk-based approach. Design for the most reliable or most likely case. Embrace the observational method and true adaptive management. Enact predetermined contingencies as needed to allow the evolving land to perform as intended.
8. Follow every drop of water through the landscape. Water is both a key to life and a great agent of disruption.
9. Know your materials. Cover and revegetate all mine waste. Ensure adequate borrow. Conserve soils.
10. Favour progressive reclamation. Learn by doing and document achievements. Ensure timely access to reclaimed land. Collaborate for progressive signoff. Minimize the work required after the last tonne of ore is mined and the mill shuts down.
11. Acknowledge the land will revert to the local community and support their duty of stewardship. Reclaim every square metre. Avoid unnecessary long-term care but anticipate where it will be required. Provide full financial assurance for all phases of mine life.
12. Share experiences locally and globally. Learn from failure and celebrate success.



LDI holds first-ever landform design course

Dozens of landform design practitioners and students from Canada and abroad attended the inaugural landform design course Dec. 5-10 at the University of Alberta in Edmonton. Participants heard some of the world's leading experts describe how to use the new process of landform design to support an interdisciplinary approach to successful mine reclamation.

Presenters spoke on a range of high-level topics that included the trajectory of the mining sector, the current state of practice in mine reclamation and mine closure, and the steps involved in landform design. Specialized experts spoke on many specific topics, including mine waste management, groundwater and wetland design, bringing back soils, vegetation and wildlife, and adaptive management.

Several presenters stressed the need to bring stakeholders into the reclamation process early, and of the need to respect the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). Participants undertook exercises in creating their own design basis memorandum and ways to approach landform design at actual sites.

Many participants and presenters concurred that reclamation of a mine site needs to start before mining operations even begin, and that experts of all relevant disciplines should be in the room from the outset. They also noted that landform design is a multi-disciplinary and complicated, but critical, undertaking. The next course has been scheduled for Dec. 9-14, 2021.



The story so far ...

In just a few months, the Landform Design Institute has grown from a one-person organization new to the mining landscape to an active organization with a board of directors, advisory panel, a vibrant social media presence, and a detailed action plan. The plan calls for the development of technical reports, quarterly training webinars, bi-annual case history symposia, and the production of the first-ever landform design textbook in the fall of 2021. The textbook will become the foundation for accredited landform design courses at the post-secondary level. In 2020, the Institute will begin negotiating sponsorship agreements and soliciting memberships in order to fund these initiatives.



Institute Board and Advisory Panel appointed

The Institute has announced its new Board and Technical Advisory Panel. The Board consists of senior mine reclamation practitioners, and includes **Gord McKenna** (Chair) of McKenna Geotechnical Inc; **Rob Abbott** of Abbott Strategies; **Lois Boxill**, Global Technology Manager for tailings at BASF; **Anne Naeth**, Professor of Land Reclamation and Restoration Ecology at the University of Alberta; **Mike O’Kane** of Okane Consultants; and **June Pollard**, a senior engineering geologist at J. Pollard Consulting. The Institute will add directors from industry in the new year.

Mike O’Kane will also Chair the advisory panel, which includes **Nick Beier** of the University of Alberta, **Steve Day** of SRK Consulting, **Jason Fisher** of the University of Victoria, **Andy Fourie** of the University of Western Australia, **Kathleen Hanley** of BGC Engineering, **Justin Straker** of the Integral Ecology Group, **Jerry Vandenberg** of Vandenberg Water Science, **Dirk van Zyl** of the University of British Columbia, and **David Williams** of the University of Queensland in Australia.



Gord McKenna



Rob Abbott



Lois Boxill



Anne Naeth



Mike O’Kane



June Pollard



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