

GORD McKENNA, PhD, PEng, PGeol (AB, BC, ON, SK, YT) Geotechnical Engineer, Landform Designer – McKenna Geotechnical Inc

Education

PhD Geotechnical Engineering,
University of Alberta (2002)

BASc Geological Engineering, U of
British Columbia (1987)

Experience

2017 – Present. Geotechnical
Engineer and Landform Designer,
McKenna Geotechnical Inc.

2007 – 2017. Principal Geotechnical
Engineer, BGC Engineering Inc

2014 – 2018. Adjunct Professor,
Department of Renewable
Resources, University of Alberta

2004 – 2007. Senior Geotechnical
Engineer, Norwest Corporation

2004 – 2009. Adjunct Professor,
Department of Civil and Geological
Engineering, University of
Saskatchewan

1987 – 2004. Geotechnical
Engineer, Syncrude Canada.

Affiliations

Association of Professional
Engineers and Geoscientists of
Alberta (PEng, PGeol)

Engineers and Geoscientists BC
(PEng, PGeo)

Association of Professional
Engineers & Geoscientists of
Saskatchewan (PEng, PGeo)

Professional Engineers Ontario
(PEng)

Engineers Yukon (PEng)

Canadian Geotechnical Society

Canadian Institute of Mining

Canadian Dam Association

Canadian Land Reclamation
Association

Pacific Flying Club (CZBB)

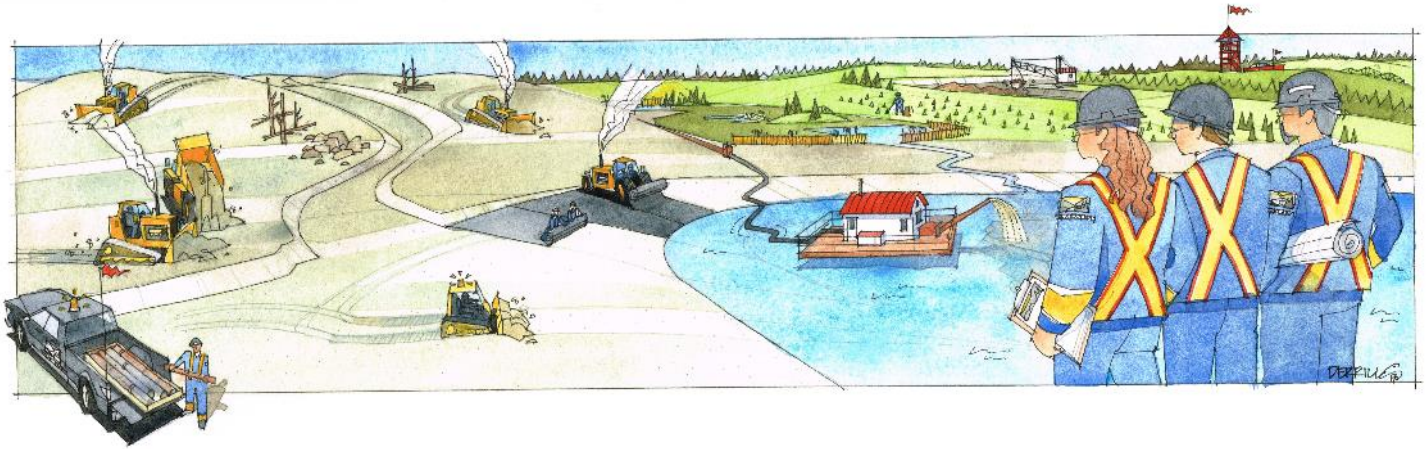
Gord McKenna is a geotechnical engineer specializing in tailings and mine waste management, landform design, and reclamation and land-use planning. He has 30+ years of experience as a geotechnical engineer at a large oil sands mine and as a consulting engineer for mines in Canada, the United States and South America. Gord has served on several geotechnical and geo-environmental review boards and expert panels and has authored over 90 papers and book chapters. Following is a summary of select projects in which Dr McKenna has been involved.

LANDFORM DESIGN, MINE RECLAMATION, AND LAND-USE PLANNING

Building on oil sands experience and his 2002 PhD thesis in landform design, Gord has led teams that have developed numerous mine closure plans, landform and watershed designs, and technical guidance documents for end pit lakes, wetlands, covers and landform design. His design efforts led to the relinquishment of the first oil sands landform to the Crown.

Gord has led the design and construction of 20 large mining landform projects totalling 40 km² including 30 wetlands and 92 km of watercourses. Eight of these projects were instrumented watersheds for reclamation research, each of which fostered several post-graduate degrees. The information acquired from the design, construction, operation, and research has been synthesized and communicated to practitioners and regulators as part of novel tech-transfer programs.

- CNRL Albion MRM ETF-SEA External Tailings Facility 2018 (1420 ha)
- CNRL Albion NE Dump / Dump 2C 2018 (298 ha)
- Detour Gold Cover Field Trial 2018 (10 ha)
- Faro Rose Creek Tailings 2016 (212 ha)
- Faro Waste Rock Dump 2016 (350 ha)
- Suncor MD2 Dump 2009 (34 ha)
- Suncor Nikanotee Fen and Watershed 2012 (35 ha)
- Suncor Pond 1 / Wapisiw Lookout 2010 (225 ha)
- Suncor Pond 5 and Pond 6 2011 (1168 ha)
- Syncrude Composite Tailings Prototype 2009 (80 ha)
- Syncrude Mildred Lake Settling Basin East Toe Berm 1999 (182 ha)
- Syncrude MLSB Coke Watershed 2001 (11 ha)
- Syncrude S4 Dump/Gateway Hill 2004 (3 watersheds covering 104ha)
- Syncrude S5 Dump 2001 (74 ha)
- Syncrude Sandhill Fen and Watershed 2012 (52 ha).
- Syncrude South Bison Hills Dump 2002 (100 ha)
- Syncrude SWSS Cell 32 2000 (39 ha)
- Syncrude W1/W2 Dumps 2004 (7 watersheds covering 244 ha)



Gord has also helped lead several breakthroughs in mine closure planning and relinquishment, including the use of formal goal-setting, design checklists, GIS tools, and various communication techniques that have become routine in oil sands closure planning, such as project design topographic surfaces, constraint maps, and landscape design risk assessments. Gord's main messages are to work collaboratively with stakeholders, clearly define and obtain agreement on measurable goals, and work toward creating landforms that will be reclaimed reliably and efficiently and returned to users as quickly as practical.

GEOTECHNICAL INVESTIGATIONS AND DESIGNS

Gord carries out geotechnical site investigations and designs for a variety of mining foundations, dumps, dams, and borrow. Many site investigations involve characterizing large mine waste facilities for landform design. Major design/construction projects have included highwall dragline mining (1987-1991), refinery foundation designs (1991-1994), sulphur block burial (2002-2004), development of grouted piezometer technology (1991-1995), Questa Rockpile investigation and geotechnical risk assessment (2004-2007), Wolverine Tailings Dam design (2004-2006), Galore Creek Tailings Dam design (2007-2009), Coal Valley waste rock dumps (2013-2014), and various dam safety inspections and reviews.

SCREENING AND ECONOMICS STUDIES

Gord has worked on a dozen screening studies for tailings, mining, and reclamation projects. Major projects include oil sands tailings technology evaluations, tailings capping projects, and mine waste rock physical/chemical stabilization projects. Gord uses holistic life-cycle design, simple and transparent decision analysis tools, simplified economics, and management/regulatory/stakeholder involvement to help teams make their best decisions.





TAILINGS R&D

Gord has been involved in oil sands tailings research and development for over 25 years in dozens of projects ranging from bench scale, through piloting, prototyping, commercialization, operation, closure and reclamation. Example projects include commercialization of Syncrude composite tailings, development of soft tailings capping technologies, and new reclamation techniques. Most of this work happens in the field, dealing with real-life conditions in large pilots and in start-up. Recent work has focussed on international capping and reclamation techniques.

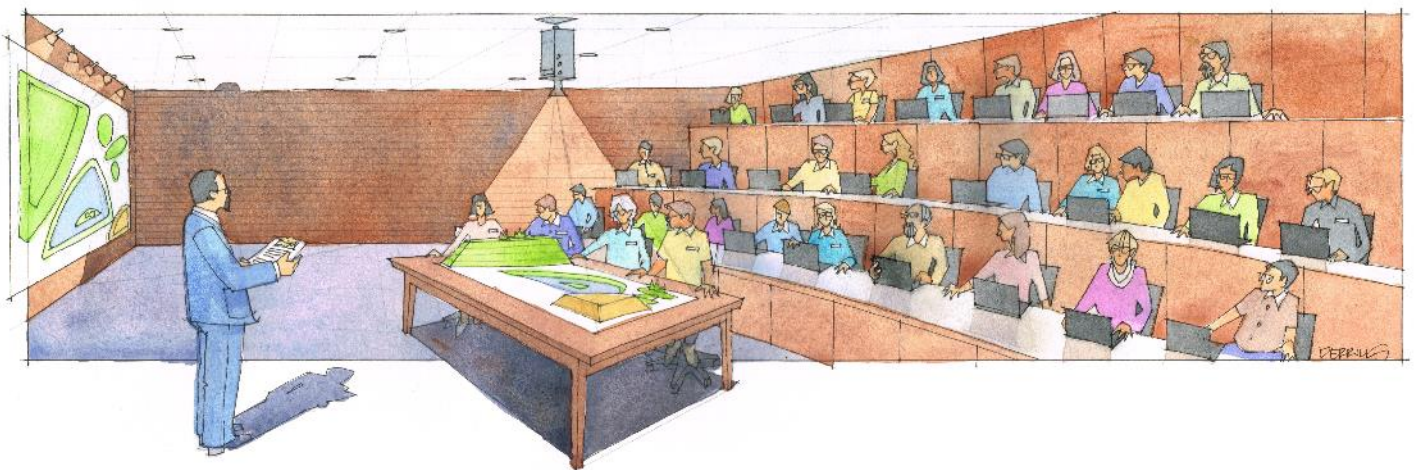
REVIEW BOARDS AND EXPERT PANELS

Gord has participated in a number of review panels, guiding operations and landform design for large dams and dumps as well as advising on research and development programs. Belonging to such panels has given Gord a chance to collaborate with experts from many other disciplines.

- CEMA Landform Design Checklist 2003-2004
- Questa Rockpile Weathering ADTI Panel 2006-2009
- Albian InPit Dyke Design and Construction Internal BGC team 2008-2012
- Suncor Pond 5 Coke capping review team 2008-2010
- CEMA End Pit Lake Guidance Document 2010-2012
- CTMC Oil Sands Tailings Roadmap 2010-2012
- Strategic Advisory Panel on Selenium Management 2010-2011
- MEND Cold Regions Cover System Design Technical Guidance Document 2011-2012
- University of Alberta Land Reclamation International Graduate School Management Board 2012-2016
- CEMA Guidelines for Wetlands Establishment on Reclaimed Oil Sands Leases 2012-2014
- De-Licensing of Oil Sands Tailings Dams: Technical Guidance Document 2012-2014
- Syncrude Base Mine Lake R&D Review Panel 2012-2014
- Syncrude EIP Landform Design Review Team 2012-2014
- Canadian Natural Albian Sands Tailings Geotechnical Advisory Panel 2013-present
- Council of Canadian Academies Expert Panel on the Potential for New and Emerging Technologies to Reduce the Environmental Impacts of Oil Sands Development 2013-2015

- INAP Cover Systems Guidance Document 2014-2017
- CanAus Coal Water Management Advisory Team 2015-2017
- Suncor PASS Technology Development review 2015-present
- Highland Valley Copper Tailings Review Board 2018-present
- Shell Canada Tailings Technology Development review 2015-2017
- North Coal Waste Rock Management Team 2017-present
- Silvertip Tailings Review Board(2018-present
- COSIA Deep Deposit Design Guide 2018-present

And a half-dozen organizing committees for national and international mining and reclamation conferences.



SHORT COURSES

Gord leads short courses for 8 to 80 people, often at international conferences, sometimes right on the land. The courses focus on practical, hands-on learning and provides participants with the tools and case histories to complete their own landform designs and closure plans. Gord has hosted over two dozen workshops to date.

- Successful Reclamation – CIM Calgary '99 – Calgary 1999
- Landform design checklist – CEMA – Fort McMurray 2003
- Geostatistics for hydraulic conductivity – Syncrude Canada – Fort McMurray 2004
- Landform design for oil sands tailings – Canadian Geotechnical Society – Calgary 2006
- Landform design – Tailings and Mine Waste '08 – Vail 2008
- Oil sands geotechnique – BGC Engineering – Vancouver 2008
- Landform design – Tailings and Mine Waste '09 – Banff 2009
- Landform design for oil sands – Syncrude Canada – Fort McMurray 2010
- Oil sands geotechnique – BGC Engineering – Vancouver 2010
- Landform design – Tailings and Mine Waste '11 – Vancouver 2011
- Landform design – BGC Engineering – Vancouver 2012
- Oil sands geotechnique – BGC Engineering – Kamloops 2012
- Landform design – ICARD 2012 – Ottawa 2012

- Sustainable Mining Now – Mine Closure '12 – Brisbane 2012
- Landform design and closure planning – University of Alberta Mining Engineering – Edmonton 2013



- Landform design – University of Alberta, LRIGS – Edmonton 2013
- Landform design and covers – CLRA '13 – Whitehorse 2013
- Landform design and cover – Tailings and Mine Waste '13 – Banff 2013
- Landform design for oil sands – oil sands company client course – Calgary 2013
- Landform design for oil sands – oil sands company client course – Calgary 2013
- Mine closure seminar – BGC Engineering – Santiago 2013
- Oil sands geotechnique – BGC Engineering – Vancouver 2014
- Landform design and closure planning – University of Alberta Mining Engineering – Edmonton 2014
- Landform design and covers – Seminar on Cold Regions – Cover Systems and Mine Closure – Whistler 2014
- Landform design for oil sands – oil sands company client course – Calgary 2014
- Hot Topics in oil sands tailings management – International Oil Sands Tailings Conference – Lake Louise 2014
- Landform design and closure planning – University of Alberta Mining Engineering – Edmonton 2015

- Landform design and reclamation for northern mines – Northern Latitudes Mining Reclamation Workshop – Juneau 2015
- Landform design for oil sands – oil sands company client course – Calgary 2016
- Landform design and closure planning – University of Alberta Mining Engineering – Edmonton 2016
- Landform design and land use – Fort McMurray First Nation #468 – Anzac 2017 (outdoor workshop)
- Landform design and closure planning – University of Alberta Mining Engineering – Edmonton 2018
- Landform design and closure planning – Detour Gold – Timmins 2018
- Landform design for oil sands – oil sands company client course – Calgary 2018

Gord also provides a half-dozen annual lectures to graduate and undergraduate university classes at BCIT, UBC, and UofA.

CLIENTS

- Alberta Energy Regulator (Edmonton AB)
- Alberta Environment (Edmonton AB)
- Alberta Innovates – Technology Futures (Edmonton AB)
- Barkerville Gold (Wells BC)
- Barrick Gold Pueblo Viejo Mine (Dominican Republic)
- BC Hydro Site C (Fort St John BC)
- BGC Engineering Inc (Vancouver BC)
- BHP Potash (Jansen SK)
- BP Yerrington Mine (Yerrington NV)
- Canadian Dam Association (Toronto ON)
- Canadian Oil Sands Innovation Alliance COSIA (Calgary AB)
- Coeur d'Alene Basin Rema
- Coeur Silvertip Mine (Northern BC)
- CNRL Council of Canadian Academies (Ottawa ON)
- CNRL Albion Muskeg River Mine, Jack Pine Mine, Horizon Mine (Fort McMurray, AB)
- Coal Valley Mine (Hinton AB)

- CRE Stantec (Anzac AB)
- Cumulative Environmental Management Association (Fort McMurray AB)
- Detour Gold Mine (Cochrane ON)
- El Volcan Gold (Ojo de Agua, Chile)
- Golder Associates (Calgary AB)
- Graymont (Richmond BC)
- Hatch (Brisbane Australia)
- Imperial Oil Kearn (Fort McMurray, AB)
- Indigenous and Northern Affairs Canada (Ottawa ON)
- Integral Ecology Group (Duncan BC)
- Lorax Environmental (Vancouver BC)
- Lundin Neves—Corvo Mine (Portugal)
- Lundin Zinkgruvan Mine (Sweden)
- Nlaka'pamux Nation Tribal Council (Lytton BC)
- North Coal (Sparwood BC)
- Norwest Corporation (Vancouver BC)
- NovaGold Galore Creek (Smithers BC)
- O'Kane Consulting Ltd (Saskatoon SK)
- Petrocan Fort Hills UTS (Fort McMurray AB)
- Pimenta de Avila Consultoria (Brazil)
- Rio Tinto / Ranger Uranium Mine (Australia)
- Tsilhqot'in National Government (Williams Lake BC)
- Rio Tinto Ranger Mine Tailings (Australia)
- Stantec (Calgary AB)
- Suncor Energy Tar Island Steepbank and Millennium Oil Sands Mines (Fort McMurray AB)
- Swanson Environmental (Fernie BC)
- Syncrude Canada (Mildred Lake Aurora North and Aurora South Oil Sands Mines (Fort McMurray AB)
- Synenco Energy Northern Lights Oil Sands Project (Fort McMurray AB)
- Taseko Gibraltar Mine (Likely BC)
- Teck Coal Fording Greenhills Line Creek Elkview Cheviot and Cardinal River Mines (Sparwood BC, Hinton AB)
- Teck Frontier Oil Sands Project Calgary (Fort McMurray AB)
- Total E&P Canada Joslyn Creek Oil Sands Project (Fort McMurray AB)
- Tsilhqot'in National Government (Williams Lake BC)
- UTS Fort Hills (Fort McMurray AB)
- Vale Xavier Iron Ore (Brazil)
- Western Canadian Coal Wolverine Coal Mine (Tumbler Ridge BC)
- WHA Engineering (Calgary AB)
- YG/INAC Faro Mine (Faro YK)
- Yukon Government Faro Mine (Whitehorse / Faro YT)





PUBLICATIONS

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- Ansah-Sam M, Hachey L, McKenna G, & Mooder B. 2016. The DBM approach for setting engineering design criteria for an oil sands mine closure plan. Fifth International Oil Sands Tailings Conference, December 4–7. Lake Louise, Alberta. University of Alberta Geotechnical Group, Edmonton. 11p.
- Aubertin M & McKenna G. 2016. Tailings Disposal Challenges and Prospects for Oil Sands Mining Operations. Geo-Chicago 2016: Geotechnics for Sustainable Energy. Aug 14-18. Chicago. p359-371.
- Barbour S & McKenna G. 2010. Engineering for Wetland Reclamation, Reclamation and Restoration of Boreal Peatland and Forest Ecosystems: Toward a Sustainable Future. Edmonton. March 25-27. Paper 3-6.
- BGC Engineering Inc. 2010. Oil Sands Tailings Technology Review. OSRIN Report No. TR-1. BGC Engineering Inc. Vancouver. 136p. (co-author)
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- Chow R, McKenna G, Win SMK, & Journault J. 2013. Recovery of Bitumen from Oil Sands Tailings Streams and Deposits: Potential Opportunities and Benefits. Consultant's report for Alberta Innovates, Energy and Environment Solutions (AI-EES) and the Canadian Oil Sands Innovation Alliance (COSIA). Report dated Dec 18, 2013.
- Consortium of Tailings Management Consultants (CTMC). 2012. Oil Sands Tailings Technology Deployment Roadmap: Project Report – Volume 2, Component 1 Results. Consultants report to Alberta Innovates – Energy and Environment Solutions. June 22, 2012. 112p. (Co-author)
- Council of Canadian Academies (CCA). 2015. Technological Prospects for Reducing the Environmental Footprint of Canadian Oil Sands: The Expert Panel on the Potential for New and Emerging Technologies to Reduce the Environmental Impacts of Oil Sands Development. Council of Canadian Academies. Ottawa. 254p. (Panel member and author)
- Crossley C, Russell B, van Zyl D, & McKenna G. 2011. Developing an operation, maintenance and surveillance manual for the post-closure management of tailings facilities. Mine Closure 2011 Conference. September 18-21. Lake Louise, Alberta, Canada. Australian Centre for Geomechanics. Perth. 10p.

- Cumulative Environmental Management Association (CEMA). 2005. Landscape Design Checklist, Revised RSDS Government Regulator Version. May 2005. CEMA-RWG Landscape Design Subgroup. 8p. (editor and contributor)
- Cumulative Environmental Management Association (CEMA). 2012. Oil Sands End Pit Lakes Guidance Document. CEMA. Fort McMurray. 494p. (chapter author, technical advisor)
- Cumulative Environmental Management Association (CEMA). 2014. Guidelines for Wetland Establishment on Reclaimed Oil Sands Leases (3rd Edition). CEMA. Fort McMurray. 436p. (chapter author, technical advisor)
- Daly C, Atkinson J, Birkham T, Chapman D, Ciborowski J, McKenna G, O'Kane M, Price J, Rochefort L, & Russell B. 2010. Novel wetland reclamation design: The Suncor pilot fen and Wapisiw wetland. 37th Annual Aquatic Toxicity Workshop October 3-6. Toronto. Fisheries and Oceans Canada.
- Eaton BR, Fisher JT, McKenna GT, & Pollard J. 2014. An Ecological Framework for Wildlife Habitat Design for Oil Sands Mine Reclamation. OSRIN Report No. TR-67. Oil Sands Research and Information Network, University of Alberta. Edmonton. 83p.
- Holden A, McKenna G, Fan X, & Biggar K. 2014. The potential impact of different types of tailings on water quality and quantity reporting to oil sands end pit lakes: a preliminary modeling exercise. International Oil Sands Tailings Conference (IOSTC 2014). December 7-10. Lake Louise, Canada. University of Alberta Geotechnical Centre. Edmonton.
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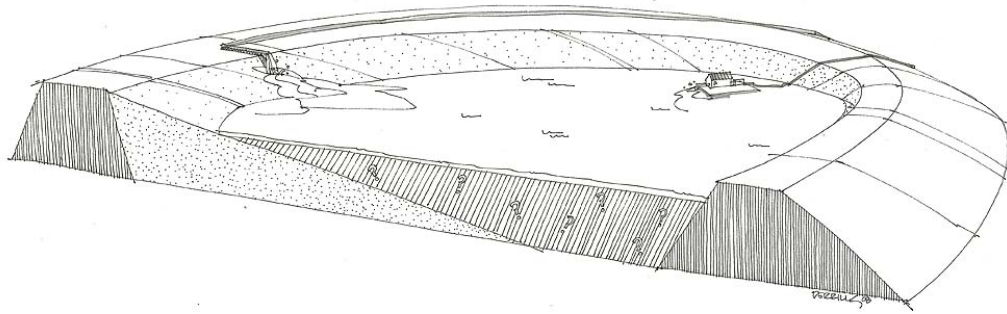
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List last updated 2018-12-18.

Please contact Gord for a copy of any of these papers.

Illustrations by Derrill Shuttleworth.



OTHER ACTIVITIES

Gord is a writer, traveller, speaker, photographer, and private pilot (more information at www.gordmckenna.com).



Gord at the reclaimed (and certified) Syncrude Gateway Hill / S4 Dump in Fall 2017.

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