

Uses of 3D Geological Modelling, Data Visualization, and Pragmatic Risk Management Approaches to Extract Value from Large Heritage Datasets and Drive Legacy Contaminated Sites Towards Closure

Nicholas Bueckert, Heather Murdoch and Kate Witte. AECOM Canada

The path to closure for some of Alberta's longest standing remote contaminated sites can be obfuscated under decades of multi-disciplinary data, worked and reworked by generations of contaminated sites teams. These complex and costly datasets underpin the technical understanding of the site but are often poorly understood and relatively inaccessible to the increasingly multi-disciplinary technical teams. This can lead to misguided Conceptual Site Model development, misinterpretation of risk, increased costs, and poor remediation outcomes.

Recent technological advancements allow for the assimilation and presentation of very large geospatial data sets in three-dimensions. These tools help eliminate the "noise" endemic with the large and multi-disciplinary datasets, help refine and clarify the Conceptual Site Model, ultimately allowing for clear identification of active risk pathways, targeted risk assessment, and expediting constructive remedial and/or risk management decision-making.

Use of the 3D models also facilitates clearer communication with site owners and operators, regulatory agencies and affected communities, resulting in a clear path to closure for previously stagnant complex contaminated sites.

A successful example of integrating 3D tools, risk assessment, and remedial approaches will be demonstrated at a large chloride-impacted site in Northern Alberta, where refinement of the conceptual site model, targeted risk assessment and remediation has provided a cost-effective path to site closure.

The use of 3D implicit modelling has been leveraged at the site to develop 3D conceptual site models that integrate decades of all types of subsurface and geospatial data. The resulting models have been used throughout the site assessment and remediation process from site conceptualization to data quality checks, evaluation against regulatory criteria, data gap analysis, targeted field work planning, and tracking of on-site remedial activity.

Nick Bueckert

Nick Bueckert has twelve years of experience as a geologist working on remediation, civil infrastructure, mining, and waste management projects in Western and Arctic Canada and U.S. He has technical depth in geologic and hydrogeologic characterization built on broad field experience including soil and bedrock geological and geomechanical core logging, geological mapping, hydrogeological and geotechnical field testing, horizontal directional drilling oversight and microtunnelling. In recent years, Nick has turned focus to geostatistics and 3D modelling where he supports a team of geological modellers to produce 3D geological models, contaminant plume estimates and volumetrics for a variety of technical and non-technical end uses.

Heather Murdoch

Heather Murdoch is a senior environmental consultant (contaminant hydrogeology and risk assessment) with 17+ years experience focused on restoration and liability management for contaminated sites. She is registered as a professional geoscientist with EGBC and APEGA and completed a Hon. B.Sc. in Geology with Environmental Science from the University of Western Ontario in 2006. Her skill set is focused on contaminant hydrogeology assessments, including assessing conceptual hydrogeological site models, hydraulic properties, and groundwater fate and transport. Heather has also worked extensively on risk-based assessments, including development of conceptual site models, completion of preliminary risk screening assessments and more detailed quantitative risk assessments.