39TH INTERNATIONAL ASSOCIATION OF HYDROGEOLOGISTS CONGRESS

Congress Program and Abstracts

September 16-21, 2012 • Niagara Falls, Canada

HOSTED BY: International Association of Hydrogeologists - Canadian National Chapter

PLATINUM SPONSORS: Ontario, Schlumberger Water Services, BGC

the order of metres. The occurrence of steeply-dipping faults within the sedimentary sequence is not revealed through surface outcrop fracture mapping, micro-seismic (M ≥ 1) monitoring, inclined borehole coring, or intersection of hydrothermal type dolomitized reservoir systems. Potential fault structures, interpreted from a 2-D seismic survey, were targeted by angled boreholes, which found no evidence for their existence.

In addition to the above, formation-specific continuity is evidenced by the lateral traceability of lithofacies and chronostratigraphic marker beds at decimetre scale vertically through the sedimentary sequence. The correlation of hydraulic conductivities, porosities and diffusion coefficients within these near-horizontal lithostratigraphic units is a significant factor influencing confidence in sub-surface exploration and predictability. This presentation describes the compilation of multi-disciplinary geoscientific information gathered during the Bruce nuclear site investigations in developing a basis for understanding the site hydrostratigraphy and long-term groundwater system evolution that supports the DGR safety case.

1082 - Origin and age of pore fluids in an Ordovician aquiclude in the Michigan Basin, Ontario

Ian D. Clark, Ratan Mohapatra & Hossein Mohammadzadeh,
Department of Earth Sciences – University of Ottawa, Ottawa, Ontario, Canada
Tom Al & Joe Saso
Department of Earth Sciences – University of New Brunswick, Fredericton, New Brunswick, Canada
Richard E. Jackson, Dru Heagle & Ken G. Raven
Geofirma Engineering Ltd., Ottawa, Ontario, Canada
Monique Hobbs, Laura Kennell & Mark Jensen
Nuclear Waste Management Organization, Toronto, Ontario, Canada

Ontario Power Generation is proposing to construct a Deep Geologic Repository (DGR) for Low- and Intermediate-Level Waste within an 850 m thick sedimentary sequence underlying the Bruce nuclear site in the Municipality of Kincardine, Ontario. As part of site characterization activities, pore fluids and gases were analyzed to understand both their origins and residence times within the Ordovician shales and in the underlying Cobourg Formation limestone; an aquiclude that is being considered as host rock for the repository. Presented here are profiles for measurements of $d^{18}O$ and dD of water, major ion concentrations, strontium isotopes, and major gas concentrations and isotopes (He, CH_4 and CO_2). The conservative solutes (Cl^- and Br^-) and stable isotopes (^{18}O and D) in the Ordovician shales indicate an evaporated seawater origin for the brines. In contrast, porewaters in the underlying Ordovician limestones show a downward dilution trend that is accompanied by depletion in ^{18}O, which is considered to indicate mixing with unevaporated Ordovician seawater.

The residence time of the porewaters in this Ordovician aquiclude was investigated using radiogenic isotopes and gases. Helium isotopes show authigenic He production in the shales. Using the measured concentrations of ^4He, the calculated rate of production in the shales provides a minimum accumulation time of 260 Ma. Rb-Sr isochrons suggest ingrowth of ^{87}Sr over a period of >300 Ma. Biogenic CH_4 in the section is interpreted to be ancient and to have been preserved in the section since the downward migration of hypersaline Late Silurian brine, as the elevated salinity would have inhibited archaeal methanogenic activity. These results suggest that solute transport has been very limited during the past several hundred Ma because peak burial and consolidation led to decreased porosity, permeability and ion filtration during dewatering, with consequent occlusion of primary and secondary porosity by secondary-mineral (halite) precipitation.

1078 - Long-term geomechanical stability assessment for a Deep Geological Repository

Tom Lam
Nuclear Waste Management Organization, Toronto, Ontario, Canada
Branko Damjanac
Itasca Consulting Group, Inc., Minneapolis, Minnesota, USA
Mark Diederichs
Queens University, Kingston, Ontario, Canada

Ontario Power Generation is proposing a Deep Geologic Repository (DGR) for the long-term management of low and intermediate level radioactive waste at the Bruce nuclear site, Municipality of Kincardine, Ontario. As envisioned, the DGR would be constructed within the Cobourg Formation, a 28 m thick argillaceous limestone formation at a depth of ≈680 m within a near horizontally layered 850 m thick Paleozoic sedimentary sequence. As part of geoscientific studies related to assessing the suitability of the site, geomechanical laboratory/field and numerical studies