

High Resolution Radar Stratigraphy (GPR) of Braided Channel Complexes in the Triassic Wolfville Formation- Controls on Reservoir Heterogeneity

M.J. Vaughan and G.D. Wach

*Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia B3H 4J1,
Canada,*

mattvaughan@dal.ca, grant.wach@dal.ca

The Triassic Wolfville Formation crops out along the shoreline of the Minas Basin of the Bay of Fundy, Nova Scotia. Cambridge Cove contains an exceptionally well preserved outcrop which presents 2D and 3D exposures of the braided channel depositional environment of the Wolfville Formation. These outcrops demonstrate the stratigraphic complexities associated with the depositional environment.

This study aims to: 1) Use Ground Penetrating Radar survey techniques spatially calibrated with DGPS to image braided channel depositional architecture in the subsurface for correlation to outcrop LiDAR data; 2) Provide 3D, hi-resolution stratigraphic and structural information about braided channel deposits and their effectiveness as petroleum reservoirs; 3) Understand gas and fluid connectivity within braided channel complexes and the influence of these factors on petroleum production and geological sequestration of CO₂.

Post processing methods have rendered GPR profiles for interpretation. Several radar facies have been recognized on profiles at multiple survey frequencies, with lower frequency (50Hz) data successfully imaging large scale architecture and structural features (channel sequences, faults and a major unconformity) and higher frequency (100 and 200Hz) data imaging smaller scale architectural features such as braid channel bar forms.

Integration of these GPR grids into a 3D spatial framework with LiDAR data acquired from the outcrop adjacent to the survey location, has allowed for the comprehensive examination and delineation of the architectural elements of this braid channel deposit in 3-D space. This architectural framework has been used to evaluate this deposit as hypothetical petroleum reservoir, in particular, the nature of fluid connectivity and compartmentalization through the formation of baffles and barriers.