

Structural geology of West Beach Formation, Black River, New Brunswick, Canada

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Rocks assigned to the Late Devonian-Early Carboniferous West Beach Formation, Lorneville Group, are exposed along the Bay of Fundy between the Neoproterozoic Millican Lake granite to the west and the Carboniferous Cumberland Group to the east. The studied units comprise basalt blocks embedded in foliated siltstone and sandstone, as well as more massive basalt. The objectives of this study are to establish the deformation geometry and history, including the dating of different tectonic events, and to test the utility of detailed photogrammetry and LiDAR in examining remote exposures. Herein we summarize the recent findings of the studies.

The intercalated sedimentary and basalt units are intensely deformed and exhibit multiple foliations. A minimum of three generations of folds are identified and they generally fall on a great circle distribution. The earliest compositional layering (S_c) dips gently to moderately southeast, as does the enveloping surface of folds. S_1 and S_{1b} are axial planar cleavages associated with near-recumbent folds; they are subsequently transposed by pervasively southeast-dipping S_2 and S_3 . The observed transposition and cleavage orientations infers a southeast-to-northwest shearing and progressive deformation.

Fault orientations are similar to those of the foliations. Strike-slip faults and associated calcite-veined fractures are predominantly steeply dipping, and striking east-northeast—west-southwest to northeast-southwest. Slickenside fibres on fault surfaces preserved on strike-slip fault planes infer subsequent dip-slip motion. Basalts at Powers Point that are affected by steep northeast-southwest faults contain extensive hematite veins. Northeast-striking, gently to moderately dipping faults are interpreted from fracture patterns to be low-angle normal faults; however, given that the normal fault plane orientations are close to S_3 , some of the normal faults could be re-activated thrust faults associated with earlier ($S_3?$) shearing. The detailed structural history will serve as a template for extracting absolute ages from the different events with the aim of extending such analyses to less well exposed areas.