Possible correlatives of the Bull Arm Formation: preliminary lithogeochemistry for mafic volcanic rocks from the Bonavista Peninsula, northeastern Newfoundland, Canada

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The Bonavista Peninsula is underlain predominantly by Neoproterozoic siliciclastic rocks comprising two distinct depositional basins. The Spillars Cove–English Harbour fault zone is a regional tectonic boundary that demarcates the western extent of the marine and deltaic, Conception, St. John's and Signal Hill groups. Shallow marine to fluvial rocks of the Rocky Harbour and Crown Hill formations (Musgravetown Group) occur west of the fault zone. The Bull Arm Formation is a dominantly volcanic assemblage found near the base of the Musgravetown Group. Three, potential Bull Arm-equivalent volcanic suites crop out on the Bonavista Peninsula. The approximately 2-km-wide Plate Cove volcanic belt comprises mafic, intermediate, and felsic volcanic and volcaniclastic rocks, is fault-bound to the east and west, and extends more than 20 km southward from Plate Cove East.

In the Sweet Bay area (west of the Plate Cove volcanic belt), plagioclase glomerocrystic basalt and intercalated red pebble conglomerate unconformably overlie, or are in fault contact with, shoaling upward marine siliciclastic rocks of the upper Connecting Point Group. These volcanic rocks are therefore possible correlatives of the Bull Arm Formation. Vesicular to amygdaloidal basalt exposed at Dam Pond, approximately midway between Catalina and Upper Amherst Cove (central-eastern Bonavista Peninsula), has been previously correlated with the Bull Arm Formation. It is overlain by green-grey siliceous rocks that have been assigned by previous workers to either the Rocky Harbour or the Big Head formations.

Lithogeochemical results for 22 samples of mafic volcanic rocks from these three distinct stratigraphic settings on the Bonavista Peninsula are presented. Mafic volcanic rocks of the Plate Cove volcanic belt are transitional to (weakly) calcalkaline basalts with variable Th/Nb and La/Nb relationships and were derived from a lithosphere-contaminated, slightly enriched, E-MORB-like, shallow mantle source. Plagioclase porphyritic basalts from three prominent headlands in the Sweet Bay area are evolved, calk-alkaline basalts with well-developed negative HFSE anomalies and show the highest degree of lithospheric recycling. The basalts exposed at Dam Pond, however, have distinct ocean island basalt-like chemistry with minor lithospheric input as indicated by supra-asthenospheric Th/Nb values and are clearly not correlative with the transitional arc-like rocks of the Plate Cove volcanic belt exposed 30 km to the west.

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