Lithofacies analysis and diagenesis of strata in a salt-withdrawal mini-basin: Bashkirian Grand Anse Formation, Maringouin Peninsula, southeast New Brunswick, and Minudie Point, northern Nova Scotia, Canada

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The Lower Pennsylvanian Grande Anse Formation crops out in three coastal sections adjacent to the New Brunswick - Nova Scotia border. Sedimentological analysis of the >250 m-thick sections has identified 13 lithofacies in erosive, sharp, intercalated and/or transitional contact with each other. These lithofacies are grouped into four facies associations: (FA1) Braided channel deposits, (FA2) debris flow deposits, (FA3) sheet flood deposits, and (FA4) floodplain deposits, which accumulated in a mini basin initiated by salt tectonics in the underlying Windsor Group. This basin appears to have been isolated from the coeval rocks of the Cumberland Basin in the nearby Joggins area as the Minudie salt wall developed.

Petrographic and SEM investigations indicate these Bashkirian strata have undergone minor clay infiltration and various diagenetic alterations. Alterations include: (i) eodiagenetic iron oxide cements that occur in the form of red coating around detrital quartz and feldspar grains and filling pores between detrital grains. A later stage iron oxide associates with dissolved carbonate cement and feldspar grains, which imparted the red colour to many coarse- and fine-grained lithofacies in the lower part of the outcrops (~250m). (ii) Eodiagenetic replacement of feldspar and muscovite by kaolinite in [FA1, 2, and 3] sandstone; interpreted to be related to the influx of meteoric waters and alteration of these unstable detrital grains under conditions of slight acidity (pH ~5). The formation of kaolinite is associated with the creation of intragranular porosity, and thus porosity enhancement. (iii) Eodiagenetic quartz that occurs mainly as syntaxial overgrowths which partly to completely cover detrital quartz grains, fill either partially and/or wholly the adjacent intergranular pores (FA1, 2, and 3) and reduce porosity. Several samples also show later compound zones of quartz overgrowth, chertification, and multiple intergrowths. High silicification in various forms suggests feldspar dissolution and chemical compaction as a main source of silica in early and deep burial diagenesis, and uplifted telodiagenesis. (iv) Near-pure calcite is an eodiagenetic alteration but is followed by mesodiagenetic neocrystallization of high Mn- and Fe- calcite and variably Fe-rich dolomite in conglomerate and sandstone lithofacies (FA1, 2, and 3) that may enclose blocky silica and quartz overgrowths. (v) Barite is also present within sandstone lithofacies but diagenetic relationships remain uncertain. The suggested source of the barium and sulfate ions is likely from dissolution of limestone and evaporitic rocks of the Windsor Group.

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