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Reservoir Characterization Pilot Study: Porosity, Permeability, Petrography, and Facies Analysis of 75 Upper Cretaceous to Mississippian Age Outcrop Samples, Eastcentral Brooks Range Foothills and North Slope, Alaska

A new reservoir characterization pilot study based on surface geologic mapping, facies analysis, petrography, and porosity and permeability data addresses seven siliciclastic formations and one carbonate formation and yields critical reservoir characteristics and petroleum-resource information relevant to oil exploration for Prudhoe Bay satellite fields, new play-type evaluations, and surface and subsurface stratigraphic correlations. North Slope and Brooks Range foothills stratigraphy outcrop units include: Tuluvak sandstone (UK), Schrader Bluff (UK), Nanushuk (LK), Torok (LK), Fortress Mountain (LK - Albian), Cobblestone sandstone (LK - Aptian), Karen Creek Sandstone (Triassic), Otuk (Triassic), and Lisburne Limestone (Mississippian). Outcrop samples are from Brookian, Beaufortian, and Ellesmerian sequences; part of the allochthonous Paleozoic and Mesozoic mountain front and foothills belt. The foreland basin succession (Brookian) lies north of the Brooks Range fold-and-thrust belt, and prograded north, overlapping the south flank of the Beaufort sill, which separates the Colville Basin from the Canada Basin in the Arctic Ocean. Stratigraphy is part of the 1,000 km-long and 50 to 350 km-wide Colville Basin, some of which forms, in the subsurface, reservoir and source rocks for Prudhoe Bay and satellite fields.

Porosity and Klinkenberg permeability data range from Tuluvak sandstone (19 to 8% and 0.5 to 8,000 millidarcy - mD), Nanushuk (3 to 14 % and 0.005 to 247 mD), Fortress Mountain (3 to 8% and 0.1 and 12 mD), Gilead sandstone (5 to 6% and 0.001 mD), Cobblestone sandstone (2% and 0.001 mD), to the relatively low Lisburne Limestone (1.4 to 2.8% and 0.1 to 0.4 mD).