

# **Reservoir Characterization and 3D Modeling of Silurian Reef Slopes: Pipe Creek Jr. Quarry, Grant County, Indiana**

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## **ABSTRACT**

Silurian reefs are significant hydrocarbon reservoirs in the Michigan Basin, having produced over 490 MMBO and 2.9 TCF of gas. Primary production from these reefs is low, averaging 20-25% due to the internal heterogeneity of the reservoir. Exploration and development has focused on the reef cores, rather than associated reef slope deposits. Slope deposits of the Pipe Creek Jr. reef complex exhibit similarities to productive slope reservoirs (e.g. Poza Rica trend in Mexico; Malampaya in the Phillipines; Tengiz and Karachaganak in the Caspian region). Depositional processes and resulting geometries of potential reservoir and seals in these Silurian reef slopes, as well as early diagenesis and effect on reservoir quality, are likely similar to other forereef reservoirs.

The objectives of this study include analysis of facies distribution, bed geometries, and reservoir characterization of the reef slope in order to develop a drone-based, georeferenced, 3-D outcrop model developed in Petrel. Initial results indicate the exposed forereef facies consist of coarse skeletal grainstone-packstones, stromatactis and skeletal mudstone-wackestones, and argillaceous silty dolomite mudstones. Similar to other forereef deposits, lenticular bedded skeletal packstones and grainstones deposited by grainflow processes comprise the majority of the 40-450 depositional slopes. Slump scars, channels, and resedimented blocks from the inferred reef crest are common, as are Neptunian dikes filled with marine cements.

Insights related to reservoir architecture within forereef facies of these Silurian reefs might open up additional exploration and development opportunities and increase hydrocarbon recovery in similar complex reef reservoirs.