

Discovery and Development of the Trenton/Black River Napoleon Field, Jackson County, Michigan

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ABSTRACT

The Napoleon Field is a fractured hydrothermal dolomite reservoir developed in the Trenton/Black River formations in southeastern Jackson County, Michigan. The field was discovered by West Bay Exploration Company and its partners in 2008 using proprietary 2D seismic. The majority of the 2D seismic was acquired using a vibrator source with an emphasis on obtaining high frequency and high signal-to-noise data. Static issues caused by glacial drift and interbed multiples presented challenges. Seismic data collected over the Albion-Scipio Field, also a fractured hydrothermal dolomite reservoir, was used as an analog in the search for similar anomalies. Placement of the regional 2D seismic program was based on proximity to known production in areas that had both limited drilling and were under-explored seismically in the past. Due to the generally restricted nature of fractured hydrothermal dolomite reservoirs in Michigan, as well as their limited structural expression, well control was not a reliable indicator of reservoir proximity.

The approximate extent of the Napoleon Field was first defined using a coarse grid of 2D seismic. The 2D anomalies were used solely to aid in leasing and positioning of detailed 3D seismic surveys. Various attributes of the 3D surveys; such as time maps, amplitudes, coherency, and others were used to map the extent and internal architecture of the reservoir. Time maps were used to map the classic Trenton ‘sag’ features which are commonly associated with fractured hydrothermal dolomite reservoirs. Amplitudes were useful for mapping deep-seated fracture trends and in certain cases were used to map high porosity zones within the Trenton/Black River interval. Coherency was useful in mapping the likelihood of fractures in the reservoir interval as well as the fracture orientation.

The drilling program for the Napoleon Field began with several vertical holes in order to establish fluid contacts and to better understand the distribution of reservoir dolomite within the stratigraphic section. Data from vertical wells revealed consistencies of dolomitization within porous facies and further showed that majority of reservoir storage to be in the matrix rather than in fractures and vugs. A model of consistent dolomitization was constructed to identify and define lateral targets for horizontal wells. A total of 35 vertical wells and 30 horizontal wells have been drilled so far. Of the 65 total, 54 have produced a total of approximately 8.1 MMBO and 10.1 BCFG to date.