Reservoir Characterization of Ironton and Galesville Sandstones, North-central Illinois

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Abstract

The Galesville and Ironton Sandstones are part of the Cambrian Knox Group and form extensive permeable reservoirs in northern Illinois. This study focuses on lithofacies analysis, stratigraphic variability, and reservoir characteristics of these reservoirs in OEE Well No. 1, McLean County, and the surrounding counties in north-central Illinois.

The Galesville Sandstone (up to 100 feet thick) is a mature quartzose sandstone. It overlies, with a sharp contact, the Eau Claire Formation and conformably underlies the dolomitic Ironton Sandstone. The Ironton Sandstone is over 100 feet thick and underlies, with a sharp contact, the glauconitic sandstone of the Franconia Formation. It consists of interlayering of dense dolomitic sandstone, dolomite, and porous quartzose sandstone. The Galesville and Ironton Sandstones are over 200 feet thick in northern Illinois, but thin southward and grade to dolomite toward the south and southeast. The sandstone intervals in these units are generally white, fine to medium grained, porous reservoirs. Reservoir porosity may be reduced due to cementation by dolomite or silica overgrowth on quartz grains or it may be enhanced by partial dissolution of quartz grains. In the OEE No. 1, with 10% DPHI cutoff, the Galesville (55 feet thick) contains over 35 feet of reservoir in which average sidewall core porosity and permeability are 15.8% and 293 mD, respectively. In this well, Ironton (120 feet thick) consists of nearly 30 feet of reservoir with an average core porosity and permeability of 10.45% and 84 mD, respectively. The reservoir intervals of the Galesville and Ironton are encased in impermeable units and have excellent potential to serve as repositories for anthropogenic CO_2 and waste material.

Acknowledgments

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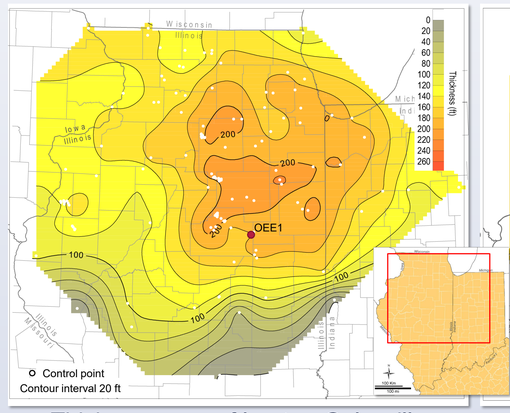
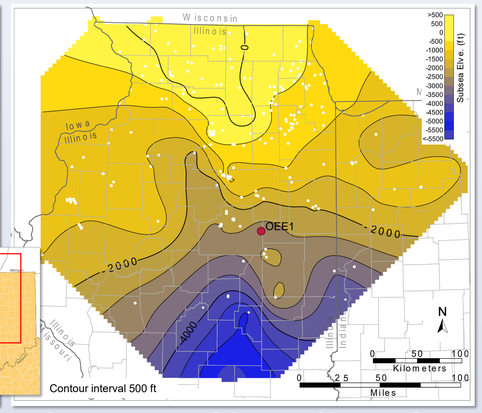
Sys.	Gr.	Fm.
Cambrian	Knox	Eminence Dol.
		Potosi Dol.
		Franconia Fm.
		Ironton Ss.
		Galesville Ss.
		Eau Claire Fm.

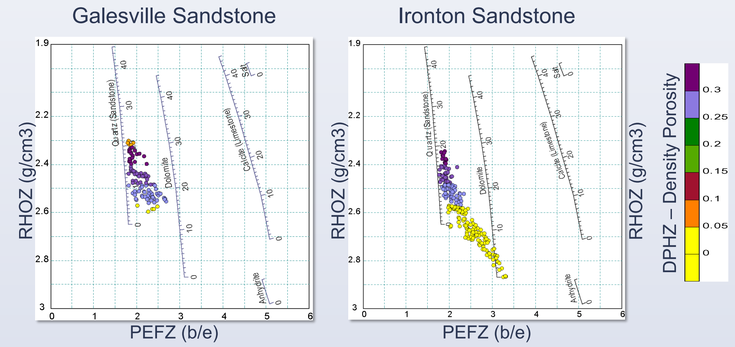
Stratigraphic column in northern Illinois



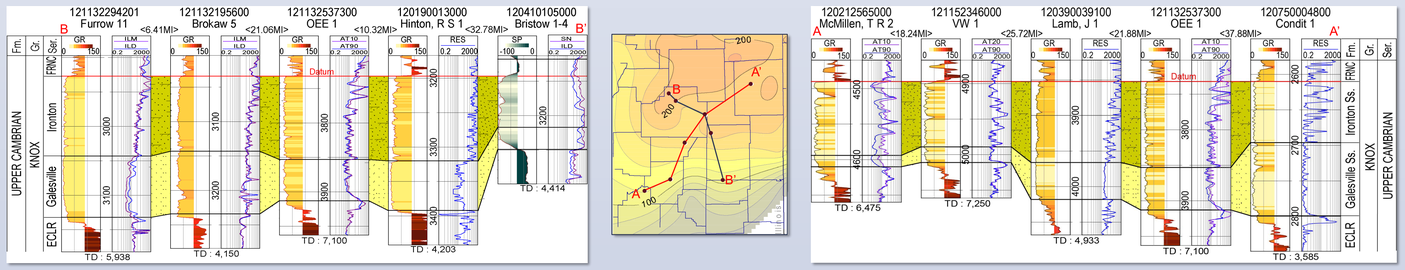
Thickness map of Ironton-Galesville



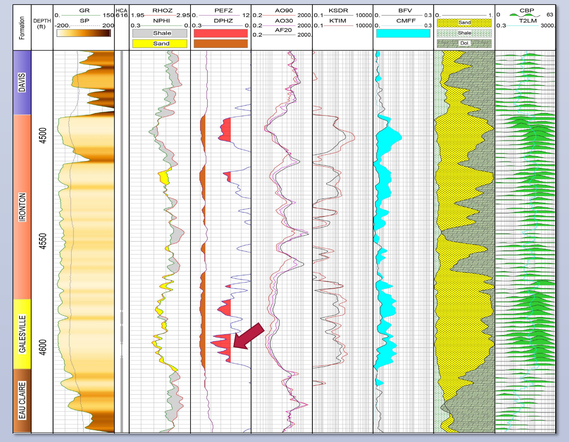
Structure map of the top of Ironton Ss.



PE vs. Bulk density crossplot for Ironton and Galesville in OEE 1

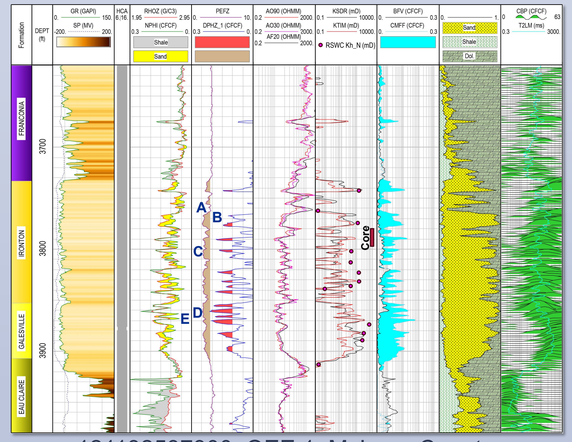


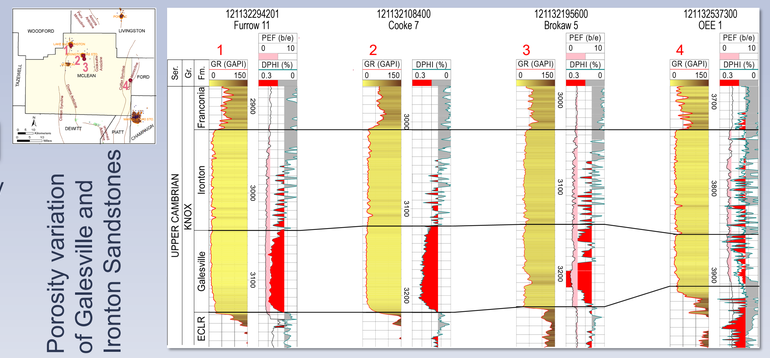
Stratigraphic variability of Ironton and Galesville Sandstones in north-central Illinois

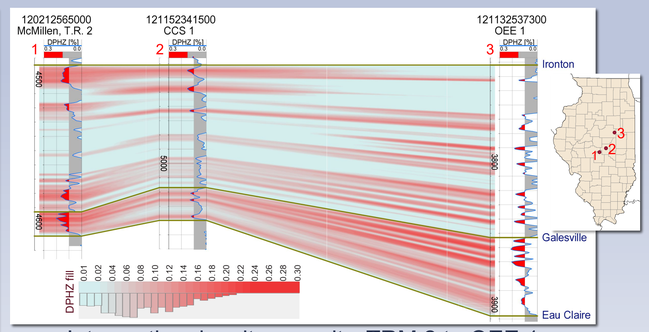


Fm.	OEE 1, Ave. values, sidewall core	
	Porosity (%)	Permeability (mD)
Ironton	10.45	84
Galesville	15.8	293

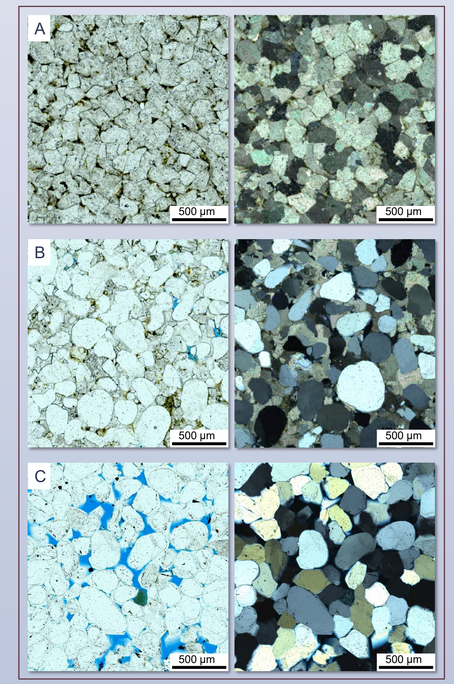
TRM 2, RSWC	
Depth (ft)	4597
Bulk Density	2.25
Porosity (%)	15
Permeability (mD)	51.35







Interpretive density porosity, TRM 2 to OEE 1



Porous quartzose sandstone under plain light (left) and polarized light (right). Pore spaces appear as blue color in plane light. (A) Depth 3759 ft: Dense dolomite. (B) Depth 3767 ft: Dolomitic Sandstone; (C, D and E) depth 3802, 3861, and 3869 ft: Porous quartzose sandstone.