Controls on the Distribution, Geometries, and Reservoir Properties of Sandstone Bodies: Examples from the middle Permian Grayburg Formation at North Cowden and South Cowden fields.

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Mixed shallow water platform systems containing both carbonate and siliciclastic facies are common in the geological record. However, the processes that lead to this admixture, the geometries of these rocks, and their relative relationships to sealevel rise/fall events are not well understood. Detailed, core-based study of two producing oil fields in the Permian Basin (Permian Grayburg Fm) has shed important light on these questions.

We examined more than 16,000 ft of core from 54 wells in two fields along the eastern side of the Central Basin Platform. Cores were used to define facies, stacking patterns and cyclicity, and pore types. Core data were also used to calibrate wireline logs as a basis for defining field-wide correlations and sequence architecture.

Although both reservoir successions contain siliciclastics, their abundance, geometry, facies, and reservoir quality vary both within and between the fields. At South Cowden field, siliciclastics are limited and nonporous. At North Cowden field, 20 mi (32 km) to the north, siliciclastics are more abundant, locally thicker, and contain significant porosity and permeability.

Data indicate two distinctly different styles of siliciclastic deposition, each associated with distinct geometries, sedimentary features, and reservoir properties. Both reflect LST sediment flux and TST redeposition. Low accommodation siliciclastics are associated with tidal flat carbonates on the inner ramp. Although displaying high continuity in proximal areas, these rocks are typically mud-rich, poorly sorted and impermeable. High accommodation siliciclastics are associated with subtidal carbonates and were deposited in middle to outer ramp settings. These rocks are con-

tinuous in more distal platform areas but may display strike-elongate geometries.

Because their deposition is related to eustasy, siliciclastic deposits are potentially very valuable tools in sequence stratigraphic analysis. If accurately characterized, these rocks can provide more robust insights into the architecture of carbonate successions.