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Evaluating the Origin of Isolated Cretaceous Sandstones Encased in Marine Mudstone: The Prairie Canyon Member of the Mancos Shale, Hatch Mesa, East-Central Utah

The Prairie Canyon Member (PCM) of the Mancos Shale represents multiple isolated sandstone lenses located downdip and basinward of associated shoreface strata. The PCM has been variously interpreted as shelf sandstones, forced regression lowstand shorefaces and valley fills, and turbidites. Two former interpretations place these deposits in the topset position of a prograding shelf-slope-basin clinoform, whereas the latter interpretation places them in a bottomset position. These various models invoke different sediment dispersal mechanisms for sand deposition, a distinction that is relevant to exploration/exploitation in the PCM and all other isolated Cretaceous sandstones located downdip and basinward of shoreface strata.

Preliminary sedimentological study of the PCM at Hatch Mesa across a 50 km² area suggests that this sandstone lens was deposited from northeasterly directed sediment gravity flows. Dinoflagellate and palynomorph assemblages indicate normal marine conditions throughout the interval. The dominant sandstone facies are complete to incomplete Bouma sequences forming laterally continuous sheet sandstones (2 m thick and 200 m long). Flute and tool marks and sandstone injection features are common at sandstone bases. Soft sediment deformation is pervasive. The 60 m thick interval consists of four sharp-based sandstone units 10 m thick and 5 km long that show bed compensation at a 1 km scale. The average sandstone bed thickness is 2 m, with beds commonly separated by volcanic ash beds and bedding parallel burrows that suggest significant pauses between sand depositional events. Local hummocky cross stratification near unit tops indicates wave reworking and a relatively shallow bathymetry. Wave-generated structures reflect the water depth and not clinoform position.