Sand Body Geometries in Miocene-Pliocene Nonmarine Deposits, Cook Inlet Forearc Basin, South-Central Alaska

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Cook Inlet basin is a collisional forearc basin located along the north Pacific rim in south-central Alaska. The Tertiary history of the basin is dominated by nonmarine deposition, including basin margin alluvial fans and lower gradient fluvial and associated flood plain systems distal to the basin margins. The late Miocene to early Pliocene Beluga and Sterling Formations comprise part of the axial fluvial fill in the basin. Current published interpretations of depositional systems recorded in these formations are contradictory, which hinders detailed reconstruction of reservoir geometries.

Detailed facies and architectural analysis of Beluga and Sterling outcrops on the Kenai Peninsula demonstrate the presence of three fluvial facies associations. Fluvial facies associations (FA) include: 1) broadly lenticular, erosionally based fining-upward successions 8 to 15 m thick that define multistory channel-fills deposited in meandering river systems; 2) erosionally based fine- to medium-grained ribbon sand bodies 2 to 5 m thick comprised dominantly of vertical accretion deposits and, locally, lateral accretion deposits, that accumulated in anastomosing channels; 3) tabular, medium-grained, multistory sand bodies 8-40 m thick deposited in low-sinuosity sandy braided streams. The Beluga Formation includes associations 1 and 2 and the Sterling Formation association 3. Calculated average channel dimensions include: association 1 - channel widths of ~115-340 m and average width to thickness ratio of ~14-23; association 2 - channel widths of ~11-40 m and average width to thickness ratios of ~5-10; association 3 - channel widths ranging from ~115m to ~2 km and average width to thickness ratios ranging of ~14-21.

The contact between the Beluga and Sterling Formations is a gradational contact where present in outcrop on the Kenai Peninsula. This gradational contact is evidenced by interstratification of facies associations 1, 2, and 3, recording the gradual change from lower gradient/lower sediment supply fluvial systems in the Beluga Formation to higher gradient/higher sediment supply systems typical of the Sterling Formation.

A fluvial stochastic modeling study has been carried out in RMS-2010 using the detailed geologic description of the Sterling formation. This approach characterizes the expected inter-sand body connectivity and may also be used to assess the stratigraphic trap potential.