

SEDIMENTATION PATTERNS WITHIN THE MIDDLE JURASSIC UPPER SHAUNAVON MEMBER OF SOUTHWESTERN SASKATCHEWAN

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ABSTRACT

The Upper Shaunavon member forms a thin (40 to 60 feet) broadly distributed, coarse clastic, sedimentary wedge between relatively thick overlying Upper Jurassic Vanguard shales and underlying Middle Jurassic Lower Shaunavon lithographic limestones and Gravelbourg shales. Lying wholly within the subsurface of the area, the member is found at depths ranging between 3000 and 5200 feet, and is terminated in the north (south of latitude 51 degrees) and northwest by local pre-Lower and pre-Middle Vanguard erosional overlap and regionally by pre-Lower Cretaceous Blairmore truncation.

Quartz-arenite, oolitic and shelly calcarenite-calcirudite, coquina, marlstone, argillaceous limestone, calcareous and dolomitic mudstone and shale constitute the lithology of the Upper Shaunavon member. These components are incorporated into 10 to 12 thinly-bedded, broadly distributed units separated from each other by diastems, disconformities and facies change. Regionally, the quartzose units range southeastward from beyond the Alberta border to a broad area between longitudes 108½ and 108 degrees, where they interfinger with argillaceous tongues reaching west from the shale basin. The bioclastic facies are mostly associated with the sands and the materials generally indigenous.

Structurally, the member strikes northeast and dips 13 to 16 feet per mile southeast and south, as a broadly terraced monocline, into the Shaunavon syncline. Flexures are dominated largely by northeasterly and northwesterly broad and narrow downwarps reflecting draping on an apparently joint-controlled, old age, karst topography developed on Mississippian limestone. Structural knobs constitute

a minor but important element of the structural framework.

Distribution of sediments in the area was apparently controlled by oscillations of the strand over nearly flat bottoms interrupted by still-stands against terrace fronts. Thus the sedimentation processes had two components—(1) the down-dip shift of sediments by retreat of the strands, and (2) the strike-aligned buildup of beach deposits by longshore currents during still-stand of the sea. These components are represented by (1) broadly distributed sand blankets and (2) linear relict beach deposits which hug the flanks of local irregularities in the terrace fronts and fill apparent tidal channels. The sedimentation gradients indicate the present structural relief to have been considerably lower, and thereby suggest that local relief has been accentuated by subsequent compaction and increase of regional tilt.

Several of the major oil field traps owe their existence to the effect of pre-existing structure on Upper Shaunavon sedimentation. Thus the Rapdan field occupies a terrace-spur on which beach and submarine bank quartz sand and oolite were deposited and which projects southeast into offshore shale deposits. The Dollard field represents a former beach deposit of sand and coquina lying on a terrace-front and filling an intraformationally eroded tidal channel along its southwestern flank. The Bone Creek-Instow Field also consists of relict beach deposits of sand and coquina filling an intraformationally eroded channel. However, basic control is exercised by an underlying northwesterly-trending structural trough. The wholly structurally-controlled fields are represented by Gull Lake, Eastend and Leon Lake all of which occupy anticlinal forms. The Leitchville-Shaunavon Field lies on the flank of a southeasterly opening syncline.

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