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# Unlocking the Exploration Potential of the South Oman Haima Play Through Integrated, Data-Driven, Play-Based Exploration.

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## Abstract

The South Oman Haima Play is a producing clastic reservoir, contributing approximately 30% of the discovered oil volumes within PDO's Block 6 concession in South Oman. The Haima Supergroup, dating from the Cambrian to Early Silurian, is a siliciclastic-dominated succession that lies above the Angudan Unconformity and is overlain by the Misfar, Haushi, or younger stratigraphic units. In South Oman in our area of interest, the Haima stratigraphy comprises, from oldest to youngest, the Amin, Mahwis, Ghudun, and Hasirah formations. The Amin, Mahwis, and Ghudun formations are proven oil reservoirs in South Oman within structures formed by salt tectonics. Despite exploration assessments indicating significant yet-to-find potential, the Haima play remains relatively underexplored compared to the overlying Haushi clastics. This is mainly due to challenges with seal integrity, reservoir net preservation, charge access, and defining the remaining prospectivity.

This study applies an integrated, data-driven Play-Based Exploration (PBE) approach to unlock the prospectivity of the Haima play across South Oman. It leverages all available subsurface data to define the play fairway, identify sweet spots within play segments, and assess the remaining exploration potential. The evaluation integrates a validated structural-stratigraphic framework, sedimentology, petrophysical re-evaluation, fluid inclusion stratigraphy (FIS), and petroleum systems modelling. It also incorporates forensic well reviews, drilled hole analysis, and detailed seismic interpretation at regional and opportunity scales.

Hydrocarbon charge into the Haima Play is from pre-salt Nafun/Ara source rocks with migration via direct access to mature source kitchen areas, back spill phenomena and/or through salt welds, deep-seated faults, and capillary forces. Identified facies include clean fluvial channel sandstones, sheetflood sandstones, playa-lacustrine deposits, argillaceous sandstones, and conglomeratic intervals in the Amin and Mahwis formations. Minor aeolian facies are also observed in the Amin. Fluvial sheetflood deposits dominate the Ghudun Formation, while the Hasirah Formation comprises deltaic sands. Optimal reservoir quality is predicted within the fluvial facies, sheetfloods, and aeolian sands. The playa are non-reservoir facies and may form baffles or barriers to vertical flow. The conglomerates are also tight and predicted to be non-reservoir. Integration of core, logs, BHI analysis, GDE maps, sub-crop maps and seismically derived thicknesses highlights areas of potentially high-net reservoirs vs low-net reservoirs. Seals are provided by the Nahr Umr shales, Kahmah tight carbonates, Base Al Khlata sequences, and Haima Intraformational shales. Petrophysical interpretations, fluid contacts, pressure-depth profiles, lithology data, Fluid Inclusion Stratigraphy (FIS), and Haima supra crop maps were integrated to create seal distribution maps across the area. Identified traps and play concepts

include structural closures and/or structural-stratigraphic traps such as fault-bounded closures, 4-way dip closures, salt flank traps, and truncation traps. All critical play elements—reservoir, seal, and charge—are synthesized into play element maps and incorporated into Common Risk Segment (CRS) and Composite Common Risk Segment (CCRS) evaluations, enabling a predictive regional understanding of the play's remaining potential.

The integration of insights from this data-driven PBE approach, supported by advanced technologies and enablers, has expanded the Haima sweet spots beyond known segments and identified undrilled exploration opportunities. This establishes a solid foundation for advancing future exploration and fully unlocking the prospectivity of the South Oman Haima play.