The Marrat carbonate reservoir produces a significant volume of hydrocarbons in the Partitioned Neutral Zone (PNZ) and Kuwait. This play has emerged as an increasingly important Jurassic exploration target in Saudi Arabia, the PNZ and Kuwait. The Marrat Formation is unconformably underlain by late Triassic Minjur Formation clastics and overlain unconformably by middle Jurassic “Dhruma Shale”. It comprises a composite 3rd order sequence with the Lower, Middle and Upper Marrat each comprising 4th order sequences.

The Lower Marrat consists of mixed clastics and carbonates with anhydritic interbeds. It is the earliest basin-fill in response to early Jurassic marine transgression that flooded the platform from the northeast, progressively onlapping onto the Qatar Arch and the Arabian Shield. The Lower Marrat was deposited in a very shallow, and relatively low energy environment with limited accommodation space. The cleaner, grainy carbonates are confined predominantly to the northern onshore and offshore areas. Overlying the Lower Marrat carbonates is the "Lower Marrat Shale", which thickens to the southwest and thins substantially to the northeast, suggesting a possible siliciclastic influx from the Arabian Shield. The top of the Lower Marrat was locally eroded and marks a 4th order sequence boundary. Renewed flooding and moderately increased accommodation space during the Middle Marrat resulted in the major transgression and maximum flooding onto the platform with widespread carbonate deposition. An extensive shoaling complex and backshoal flats, with mixed skeletal and oolitic grainstones-packstones, were developed as aggrading and generally north-easterly prograding highstand systems in the northeast onshore and offshore areas. Latest Middle Marrat sediments are mostly anhydrites, which provide an excellent marker and top seal for the Middle Marrat across the region. The Upper Marrat consists of shaley carbonates and thinly intercalated evaporites, particularly in southerly and westerly, more restricted areas. The post-Marrat subaerial unconformity has been identified in the subsurface through well-log correlations and is evident in a recently cored shallow well in an outcrop south of Riyadh.

Exploration opportunities for the Marrat play have been identified by integrating the reservoir fairways, source rocks and seals through 3D basin modeling. Potential stratigraphic traps within Marrat carbonate reservoirs may add additional hydrocarbon resources.
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