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Please fill in your abstract title.	Pre-Drill and Real-Time Mitigation of Drilling Risks Associated with Allochthonous Rafts and Evaporite Mélanges in the Red Sea

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Abstract

Within the Red Sea the Maqna Group was deposited as a series of shallow marine sediments consisting of intercalated carbonates, neritic shales, anhydrites and turbidite sandstones. A prominent unconformity typically marks the transition between the underlying syn-rift Burqan Formation and the late rift Maqna Group sediments so that the Maqna Group forms a “cap” to the rifted fault block architecture of the Red Sea. After the deposition of the Maqna Group a significant down to the west rotation took place within the Red Sea resulting in a regionally extensive westward dip to the base of the Maqna Group. During this period the Red Sea also became isolated from the Tethys resulting in a restricted marine environment and the deposition of the Mansiyah Formation halite.

The westward dipping unconformity surface at the base of the Maqna Group combined with laterally extensive anhydrite units within the Maqna Group and the deposition of Mansiyah halite created ideal conditions for raft tectonics. Anhydrite and halite layers formed multiple decollement surfaces and the Maqna Group responded by forming evaporite mélanges (blocks of sedimentary rock entrained within halite) and tectonic rafts.

Rafts of Maqna Group strata were translated down structural dip creating both isolated Maqna Group allochthons and stacked (or repeated) Maqna Group sections. The rafted and stacked units create significant drilling hazards due to internal deformation of the clastic rocks and the stacking of reservoir units between mobile halite and anhydrite. Faults and fractures within clastic units result in a low effective fracture gradient, requiring careful mud weight / ECD management to prevent down hole losses. At the same time, drilling through mobile halite requires higher mud weight to control dilatancy and creep, often exceeding the effective fracture gradients is the surrounding clastic rocks. In rare cases, complete isolation of reservoir units by halite has occurred, resulting in pore pressures at lithostatic pressures. Pre Drill and real time mitigation of the drilling risks associated with the

tectonic rafts and mélanges requires a combination of techniques including; calculations for salt creep and dilatancy rates, accurate sub-surface temperature monitoring to assess halite mobility, real-time pore pressure monitoring to maintain minimum overbalance in fractured reservoirs as well as precise placement of casing points to isolate rock units with radically different pressures and fracture gradients.