

# Stratigraphy, facies analysis and depositional environments of the Upper Unit of Abu Roash "E" member in the Abu Gharadig field, Western Desert, Egypt



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## ABSTRACT

Abu Roach "E" member is of an important hydrocarbon reservoir-producing horizon in the Abu Gharadig Field (north Western Desert, Egypt). This study is used to build facies analysis and depositional environments model for the Upper Unit of the Abu Roash "E" member in Abu Gharadig Field. This target has been achieved throughout the sedimentological, wire line logs, lithostratigraphic and biostratigraphic analyses of more than 528 feet cores.

The high-resolution biostratigraphic analysis provides a calibration for the paleo-bathymetry and depositional environmental interpretations. Biozonation and lithostratigraphic markers are used to constrain stratigraphic correlation. Integration between the core description and petrographic microfacies analysis by microscope examination provide an excellent indication for the rock types and depositional environments. Five depositional facies types are detected including carbonate inner ramp, tidal flats, tidal channels, supra-tidal and tide dominated delta facies.

This model helps in the understanding of the Upper Unit of Abu Roash "E" member reservoir distribution as well as lateral and vertical facies changes that contribute to the development strategy for the remaining hydrocarbon reserves for this important oil reservoir.

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## 1. Introduction

Abu Gharadig oil, gas and condensate Field is located in Blocks 9 and 30 of the Egyptian Western Desert. It is located about 256 Km west of Cairo and 128 km south of the Mediterranean Sea. The Abu Gharadig Field is roughly 15 km long by 4 km wide. It was discovered in May 1969 (Abu Gharadig-1 well), and was the first oil and gas discovery in the E-W Abu Gharadig Basin in the Western Desert of Egypt (EGPC, 1992) (Fig. 1). Abu Gharadig Field produces from Early Cenomanian Bahariya Formation, Turonian Abu Roash "E" and Abu Roach "C" Members reservoirs.

The main objective of this study is to construct an improved stratigraphic model for Abu Roash "E" Member reservoir in Abu Gharadig Field. This model is expected to result in more understanding of Abu Roash "E" Member reservoir facies distribution, reservoir quality (porosity and permeability) changes with

depositional environment that will contribute in how to develop the remaining hydrocarbon reserves for this important oil reservoir.

## 2. Stratigraphy of study area

The North Western Desert stratigraphic section is a thick sedimentary section and includes most of the sedimentary succession from Pre-Cambrian basement rocks to the recent rocks. Fig. 2 is a generalized stratigraphic section of Abu Gharadig Basin, Western Desert, showing the positions of reservoir, seal and source rock horizons (Wahdan et al., 1996).

The Abu Roash Formation is characterized by a cyclic alternation of deltaic flood-plain sandstones, coastal sandstones and shales, and shallow marine shales and limestones. The Abu Gharadig anticline was developed during the deposition of the Abu Roash Formation, and important, rapid thickness changes have taken place across the structure.

Sediments of one or other member may be thin, or even absent, over palaeotopographic highs, whereas it may be relatively thick in adjacent lows (Ezzat et al., 1998). The total thickness of the Abu

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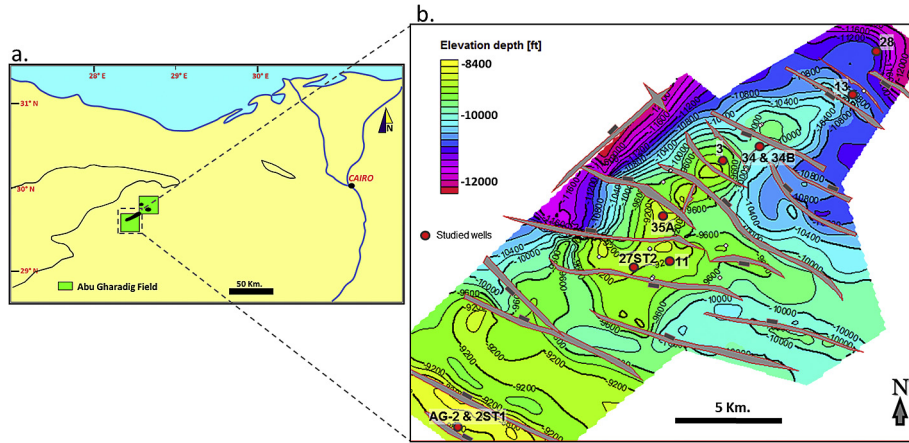


Fig. 1. a. Location Map of Abu Gharadig Field. b. Depth structure map, near top Abu Roash "E" Member, Abu Gharadig Field (Modified after EGPC, 1992).

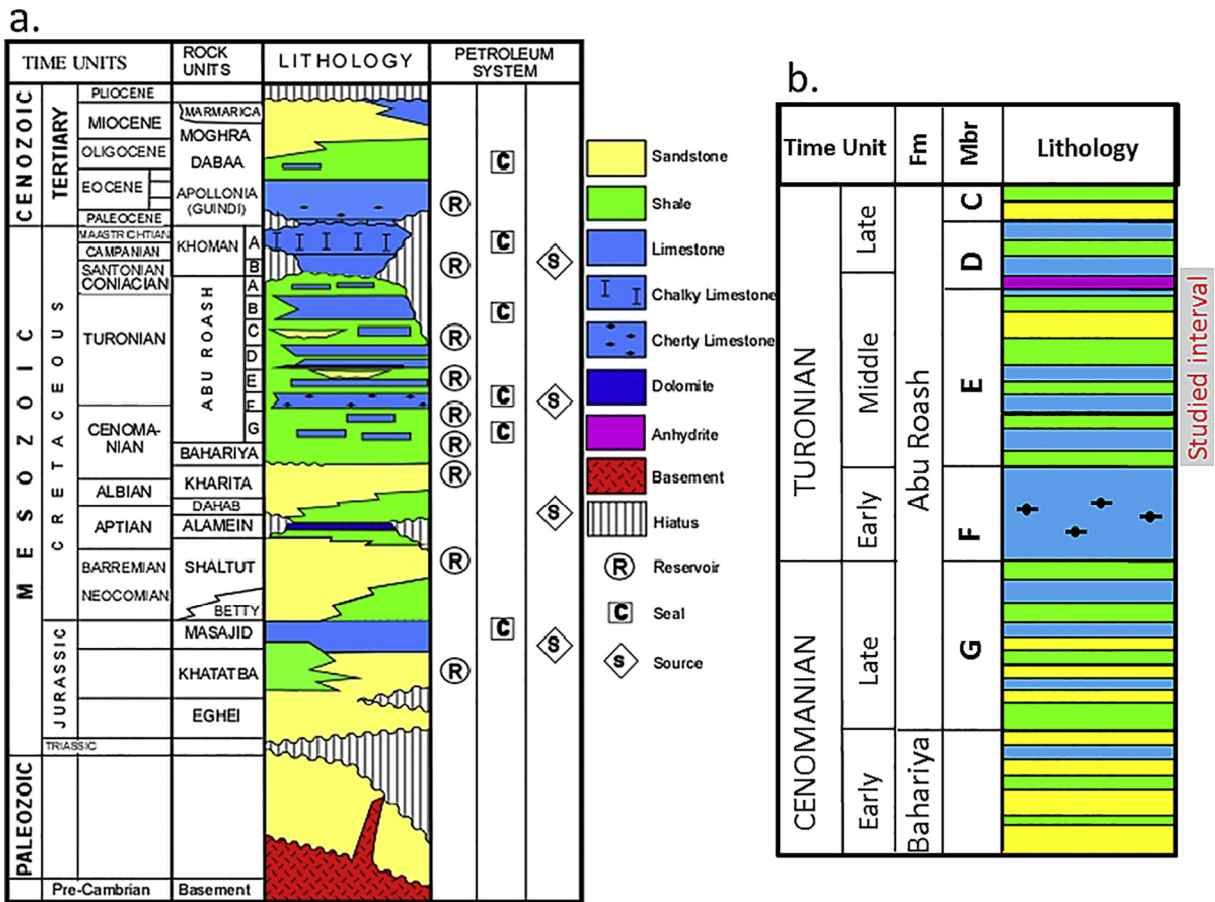


Fig. 2. a. A generalized stratigraphic columnar section of the Abu Gharadig basin, showing the different stratigraphic rock units and the positions of reservoir, seal and source rock horizons. (Modified after Shahin et al., 1983, 1986; Hataba and Ammar, 1990; Hantar, 1990; Said, 1990 and Wahdan et al., 1996). b. detailed Stratigraphic column for the studied interval.

Roash Formation in the Abu Gharadig Field is very variable due to erosion at the base of the Khoman Formation, but is typically between 2000 and 3000 ft.

Structurally, Egypt has undergone several tectono-stratigraphic episodes from Paleozoic to Recent (Dolson et al., 2000; Moustafa, 2008). The Abu Gharadig Field is mapped as a NE-SW anticline whose northwest flank is much steeper than its southeast flank. The faults which cut the anticline now map out in a predominantly

NW-SE to WNW-ESE directions. The Abu Gharadig structure has a number of weakly defined culminations along its crest, but it plunges gently to the northeast.

A series of WNW-ESE and NE-SW faults, just northwest of the plunging nose of the Abu Gharadig anticline, have served to define a small trap in the Abu Roash Formation, which has been named the North Abu Gharadig Field. The Abu Gharadig anticline apparently began to develop soon after the deposition of the Bahariya

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