The Thayyem discovery was the culmination of an exploration effort that included basin analysis and hydrocarbon habitat studies over much of Syria. The study team consisted of explorers from Pecten, Shell and Syria Petroleum Co.

The Euphrates Graben consists of pre-Early to Middle Cretaceous sedimentary sequences, which are rifted into rotated fault blocks, covered and infilled by Upper Cretaceous and Tertiary strata. A marine incursion into the rift setting resulted in the deposition of rich source rocks which may provide a charge, if mature, and seal to the rotated and eroded fault blocks. These blocks may contain the Lower Cretaceous Rutbah and/or Triassic Mulussa reservoir units. Minor post-rift adjustments caused limited structural inversion and reverse movement along fault zones.

Local geological factors at Thayyem include an upthrown fault block of Lower Cretaceous Rutbah bounded by a down-to-the-graben fault of varying throw and slight lateral movement, an across-fault charge and a gently folded sealing section. Estimated ultimate recovery for Thayyem field is 150 MMBO.

Continued exploration by Al Furat Petroleum Co. (Pecten, Syrian Shell Petroleum Development, Deminex, Syria Petroleum Co.) led to substantial additional discoveries in Deir Ez Zor block, and an ongoing exploration and development program in the adjacent Ash Sham block.