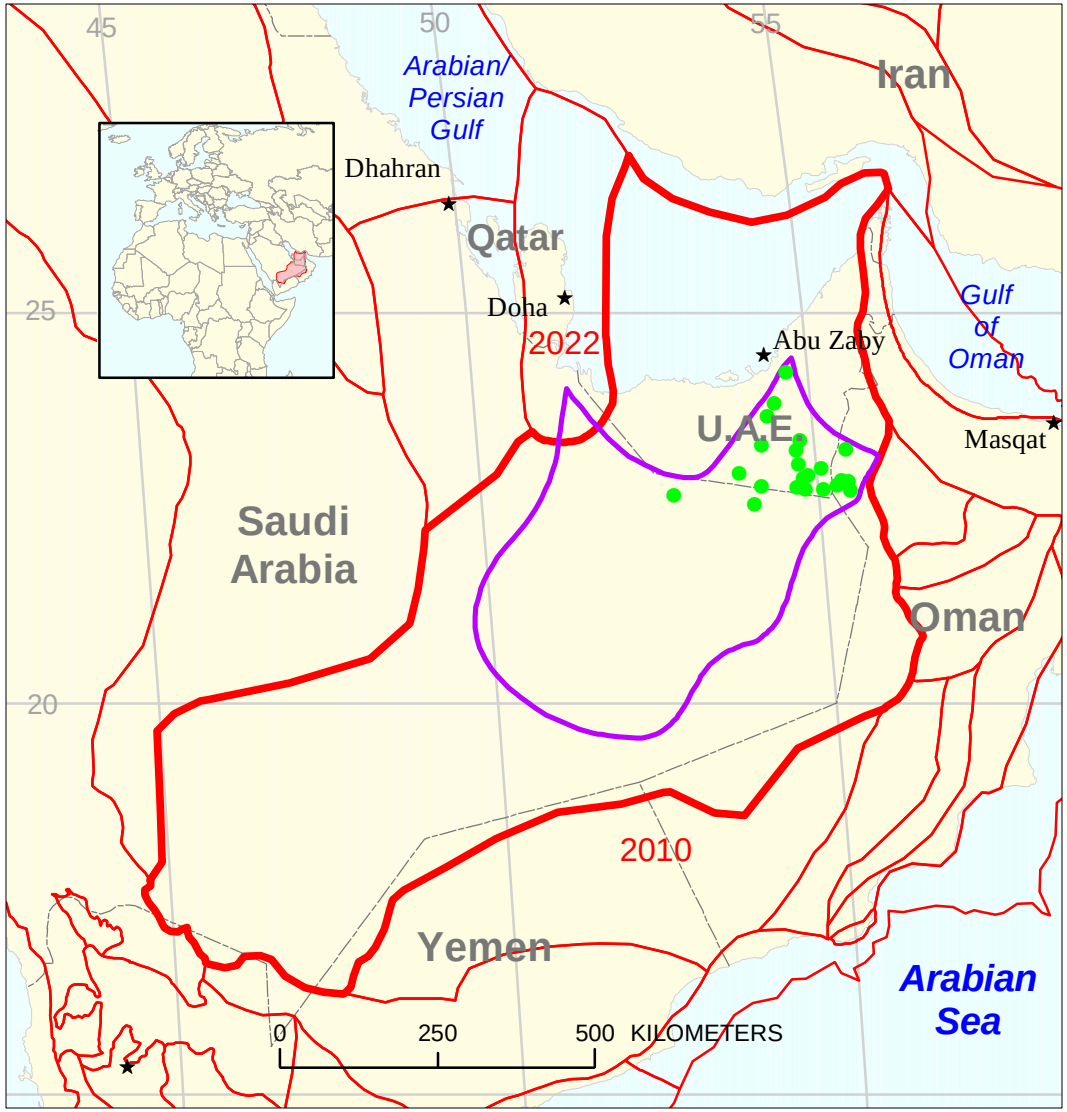
Go to Table of Contents

Go to index map

Cretaceous Reservoirs in Northwest Desert Anticlines Assessment Unit 20190101



Cretaceous Reservoirs in Northwest Desert Anticlines Assessment Unit 20190101

Rub Al Khali Basin Geologic Province 2019

Other petroleum system boundary

Geologic Summary

Detailed map of this assessment unit

Exploration/Discovery-History Data

- Plots of Known Field Sizes
- Plots of Grown Resources
- Tables

Assessment Input Data

Assessment Results

- Assessment Unit Summary
- Detailed Assessment Results
- Undiscovered Field-Size Distributions

USGS PROVINCE: Rub Al Khali Basin (2019)–Petroleum system is centered within the Rub 'al Khali Basin province but extends into the southeast corner of province 2022-Qatar Arch.

GEOLOGIST: R.M. Pollastro

TOTAL PETROLEUM SYSTEM: Cretaceous Thamama/Wasia (201901)

ASSESSMENT UNIT: Cretaceous Reservoirs in Northwestern Desert Anticlines (20190101)

DESCRIPTION: This assessment unit is onshore Rub 'al Khali Basin and bounded to the north by the Dibba transform fault and South Gulf Hormuz Salt. It is structurally bounded by the Qatar Arch to the west, Fahud Salt Basin and Oman Mountain foreland bulge to the east, and limited by mature Shu'aiba basinal source-rock facies to the south. The unit is characterized by a primary north-south structural grain formed by anticlinal structures often underlain by basement fault blocks. Cretaceous reservoirs are assessed separately recognizing possible overlap with Jurassic and Paleozoic petroleum systems.

SOURCE ROCKS: The organic-rich, basinal facies (100 ft thick) of the Shu'aiba Formation and a series of argillaceous dense layers, Lower Cretaceous Thamama Group, and argillaceous basinal facies of the Middle Cretaceous Shilaif (Khatiyah) Formation, Wasia Group are the primary source rocks. These source rocks contain Type II and I organic matter and as much as 10 weight percent total organic carbon content (2.0 percent average). Jurassic oils also mix with Cretaceous oils along the eastern edge of the Hith evaporite.

MATURATION: Thamama source rocks are presently mature (Ro > 0.65) for oil generation along the basin axis of the Rub 'al Khali basin. Cretaceous oils in the assessment unit range from 26° to 45° API gravity. More mature oils of 40° or greater are produced from Asab and Shah fields adjacent to the Falaha syncline where Thamama source rocks are presently in the gas window. Shu'aiba source rocks started generating oil as early as the Eocene (65 Ma) with major expulsion of petroleum from the Falaha syncline and Oman foreland basin commencing about 40 Ma with both of these areas presently in the gas generation window. The remaining portion of the assessment unit is presently in the oil generation window.

MIGRATION: Both vertical and lateral migration has occurred in the assessment area. The Thamama has good carrier beds below the regional Nahr Umr Shale seal. Earliest oil migration occurred mainly from the Falaha syncline to adjacent fields (Bab, Bu Hasa, Asab, Shah) and westerly out from the Omani foredeep to fields (Fateh, Zakum, Jarn Yaphour, Safah, Lekhwair). Short vertical migration is from the Shu'aiba basinal facies into porous Shu'aiba reservoirs along basin margin reefs and other rudistid and algal buildups.

RESERVOIR ROCKS: Primary reservoirs are the cyclic, shallow-water, platform and shelf carbonate grainstones and packstones of the Lower Cretaceous Shu'aiba Formation. Secondary reservoirs include the high microporous, fine-grained, fractured, chalky limestone facies. Some fields may produce Silurian-sourced gas from the Permian Khuff Formation.

TRAPS AND SEALS: Traps are mainly structural and most are anticlinal (crest and flank traps) with combination structural/stratigraphic traps along a north-southeast trending, secondary leached shelfal limestone. Some anticlines drape basement horst blocks and (or) are faulted due to compression and wrenching from Oman and Zagros Stress. Primary regional seals are the Nahr Umr and Laffan Shales.

REFERENCES:

Alsharhan, A.S., and Nairn A.E.M., 1997, Sedimentary Basins and Petroleum Geology of the Middle East: Amsterdam, Elsevier, 942 p.

Christian, L., 1997, Cretaceous subsurface geology of the Middle East region: GeoArabia, v. 2, p. 239-256.

Hawas, F.H., and Takezaki, H., 1995, A model for migration and accumulation of hydocarbons in the Thamama and Arab reservoirs in Abu Dhabi, *in* Al-Husseini, M.I., ed., Geo '94, Middle East Geoscience Conference, Gulf Petrolink, Bahrain: p.483-495.

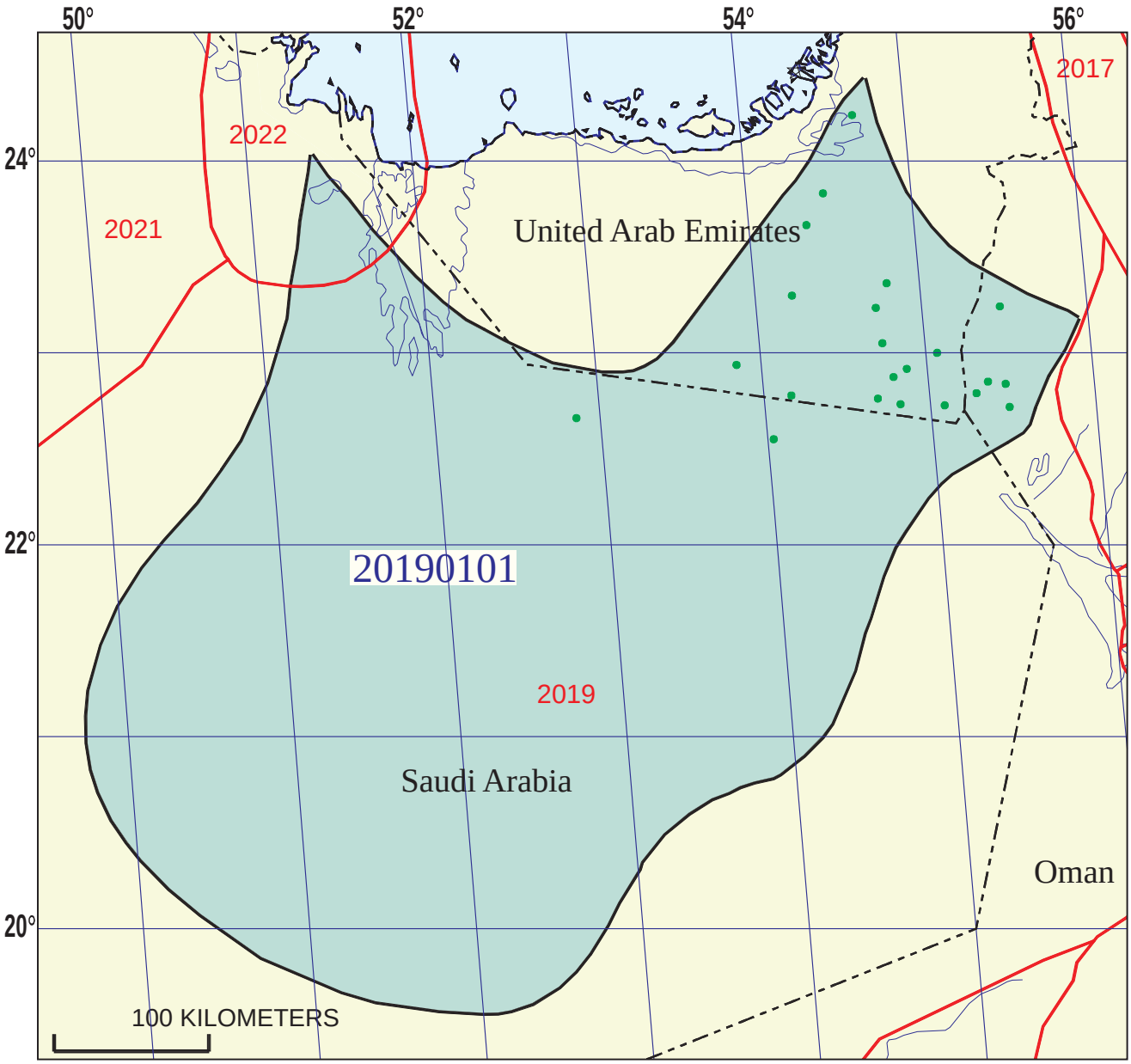
Gumati, Y.D., 1993, Kinetic modeling, thermal maturation, and hydrocarbon generation in the United Arab Emirates: Marine and Petroleum Geology, v. 10, p. 153-161.

Marzouk, I., and El Sattar, M.A., 1995, Wrench tectonics in Abu Dhabi, United Arab Emirates, *in* Al-Husseini, M.I., ed., Geo '94, Middle East Geoscience Conference, Gulf Petrolink, Bahrain: p. 655-668.

Milner, P.A., 1998, Source rock distribution and thermal maturity in the Southern Arabian Peninsula: GeoArabia, v. 3, p. 339-356.

Murris, R.J., 1980, Middle East–Stratigraphic evolution and oil habitat: American Association of Petroleum Geologists Bulletin, v. 64, p. 597-618.

Taher, A.A., 1997, Delineation of organic richness and thermal history fo the Lower Cretaceous Thamama Group, East Abu Dhabi–A modeling approach for oil exploration: GeoArabia, v. 2, p. 56-88.



Cretaceous Reservoirs in Northwest Desert Anticlines Assessment Unit - 20190101

EXPLANATION

- Hydrography
- Shoreline
- 2019 — Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 20190101 — Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

SEVENTH APPROXIMATION
NEW MILLENNIUM WORLD PETROLEUM ASSESSMENT
DATA FORM FOR CONVENTIONAL ASSESSMENT UNITS

Date:……..	12/7/99		
Assessment Geologist:……..	R.M. Pollastro		
Region:……..	Middle East and North Africa	Number:	2
Province:……..	Rub Al Khali Basin	Number:	2019
Priority or Boutique……	Priority		
Total Petroleum System:……	Cretaceous Thamama/Wasia	Number:	201901
Assessment Unit:……..	Cretaceous Reservoirs in Northwest Desert Anticlines	Number:	20190101
* Notes from Assessor	Lower 48-all growth function. This is an assessment of Cretaceous reservoirs (assessed separately from other reservoirs), recognizing possible overlap of Jurassic and Paleozoic.		

CHARACTERISTICS OF ASSESSMENT UNIT

Oil (<20,000 cfg/bo overall) **or** Gas (≥20,000 cfg/bo overall):… Oil

What is the minimum field size?……. 10 mmboe grown (≥1mmboe)
(the smallest field that has potential to be added to reserves in the next 30 years)

Number of discovered fields exceeding minimum size:…… Oil: 20 Gas: 0
Established (>13 fields) X Frontier (1-13 fields) _____ Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd 1668 2nd 3rd 199 3rd 3rd 149
Median size (grown) of discovered gas fields (bcfg):
1st 3rd _____ 2nd 3rd _____ 3rd 3rd _____

Assessment-Unit Probabilities:

Attribute	Probability of occurrence (0-1.0)
1. **CHARGE:** Adequate petroleum charge for an undiscovered field ≥ minimum size……	1.0
2. **ROCKS:** Adequate reservoirs, traps, and seals for an undiscovered field ≥ minimum size……	1.0
3. **TIMING OF GEOLOGIC EVENTS:** Favorable timing for an undiscovered field ≥ minimum size	1.0

Assessment-Unit GEOLOGIC Probability (Product of 1, 2, and 3):…….. 1.0

4. **ACCESSIBILITY:** Adequate location to allow exploration for an undiscovered field ≥ minimum size…… 1.0

UNDISCOVERED FIELDS

Number of Undiscovered Fields: How many undiscovered fields exist that are ≥ minimum size?:
(uncertainty of fixed but unknown values)

Oil fields:……min. no. (>0)	10	median no.	40	max no.	100
Gas fields:……min. no. (>0)	_____	median no.	_____	max no.	_____

Size of Undiscovered Fields: What are the anticipated sizes (**grown**) of the above fields?:
(variations in the sizes of undiscovered fields)

Oil in oil fields (mmbo)……min. size	10	median size	40	max. size	4000
Gas in gas fields (bcfg):……min. size	_____	median size	_____	max. size	_____

Assessment Unit (name, no.)
Cretaceous Reservoirs in Northwest Desert Anticlines, 20190101

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	400	600	800
NGL/gas ratio (bngl/mmcfg)……	30	45	60

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……			
Oil/gas ratio (bo/mmcfg)……			

SELECTED ANCILLARY DATA FOR UNDISCOVERED FIELDS

(variations in the properties of undiscovered fields)

Oil Fields:	minimum	median	maximum
API gravity (degrees)……	27	35	45
Sulfur content of oil (%)……	0.5	1	2.7
Drilling Depth (m) ……	1000	2500	3500
Depth (m) of water (if applicable)……			

Gas Fields:	minimum	median	maximum
Inert gas content (%)……			
CO_2 content (%)……			
Hydrogen-sulfide content (%)……			
Drilling Depth (m)……			
Depth (m) of water (if applicable)……			

Assessment Unit (name, no.)
Cretaceous Reservoirs in Northwest Desert Anticlines, 20190101

ALLOCATION OF UNDISCOVERED RESOURCES IN THE ASSESSMENT UNIT TO COUNTRIES OR OTHER LAND PARCELS (uncertainty of fixed but unknown values)

1. Saudi Arabia represents 81 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		81	
Portion of volume % that is offshore (0-100%).....		0	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...			
Portion of volume % that is offshore (0-100%).....			

2. United Arab Emirates represents 15 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		15	
Portion of volume % that is offshore (0-100%).....		0	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...			
Portion of volume % that is offshore (0-100%).....			

3. Oman represents 4 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		4	
Portion of volume % that is offshore (0-100%).....		0	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...			
Portion of volume % that is offshore (0-100%).....			

4. Province 2019 represents 99 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		99	
Portion of volume % that is offshore (0-100%).....		0	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...			
Portion of volume % that is offshore (0-100%).....			

5. Province 2022 represents 1 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		1	
Portion of volume % that is offshore (0-100%)……		0	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…			
Portion of volume % that is offshore (0-100%)……			

Cretaceous Reservoirs in Northwest Desert Anticlines, AU 20190101, Undiscovered Field-Size Distribution