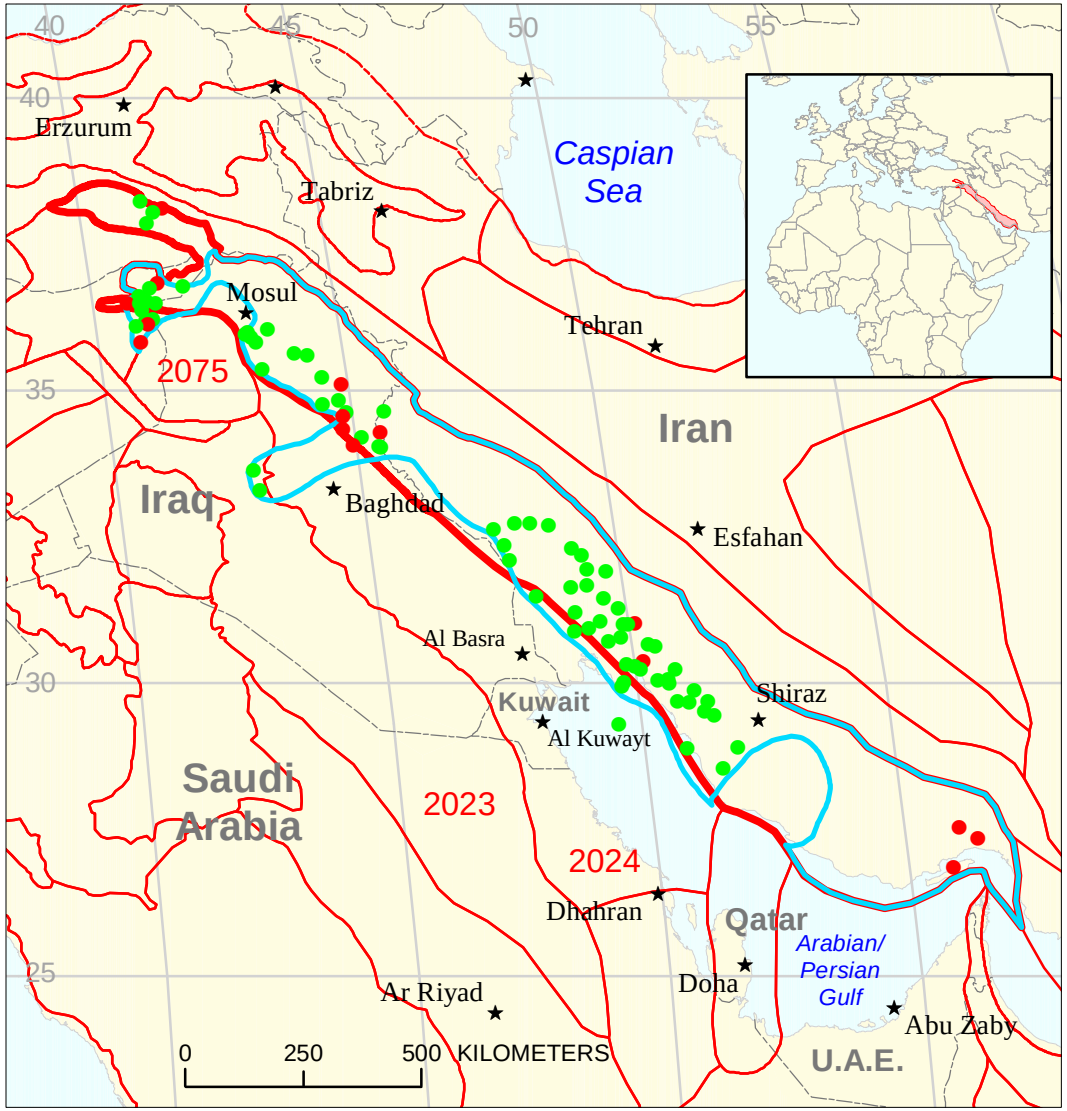
Go to Table of Contents

Go to index map

Tertiary Reservoirs
Assessment Unit 20300102



Tertiary Reservoirs Assessment Unit 20300102

Zagros Fold Belt Geologic Province 2030

Other geologic province 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: Zagros Fold Belt (2030) **GEOLOGIST:** T.S. Ahlbrandt

TOTAL PETROLEUM SYSTEM: Zagros-Mesopotamian Cretaceous-Tertiary (203001)

ASSESSMENT UNIT: Tertiary Reservoirs (20300102)

DESCRIPTION: This assessment unit contains both Tertiary carbonate and clastic reservoirs within the Zagros fold belt and foreland. Carbonate reservoirs are more common to the east nearer the Zagros thrust belt and are the dominant reservoir. The Total Petroleum System was considered to be charged by Cretaceous source rocks although there is uncertainty as to mixing of Jurassic and Cretaceous oils in the area. Considerable proprietary data was available, particularly in Iran and Iraq, that facilitated the analysis including GeoMark data and other sources. Structural complexity increases within the unit as one nears the Zagros Mountains.

SOURCE ROCKS: Several source rock intervals have been identified dominated by Lower Cretaceous Shales. The Berriasian Sulaiy and Minagish Formations are known source intervals in Kuwait. Source rocks have been identified in several Cretaceous age intervals, including Hauterivian Ratawi Shale, Albian Zubair, Aptian Burgan (Nahr Umr), Shuaiba, and Mauddud Formations. Upper Cretaceous source rocks include Cenomanian Rumaila and Mishrif Formations.

MATURATION: Maturation (expulsion) in some models commences as early as 90 Ma with peak expulsion about 27 Ma. Most models show peak generation to be very recent (15 Ma or less) in the Mid Miocene (Neogene) coincident with the Zagros collision and the thick accumulation of orogenic clastics in the Zagros foredeep.

MIGRATION: Although expulsion may have started in Late Cretaceous, significant migration commenced probably no earlier than latest Oligocene/earliest Miocene and continues to present. Migration into the Zagros fold and thrust belt has permitted extensive oil and gas seeps and tar belt formation in the eastern Zagros thrust. The eternal flame at Kirkuk is an example of the ongoing charge and seepage of petroleum on the east flank of the petroleum system.

RESERVOIR ROCKS: Exposed carbonate banks, high-energy shoals, of the Asmari Formation (Oligocene/Miocene) are important reservoirs in Iran and Iraq. Porous, coralline, reefal limestones of the Kirkuk Group (Oligocene) are also important reservoirs. Clastic reservoirs such as those in the Lower Fars Formation (Miocene) are subordinate to carbonate reservoirs.

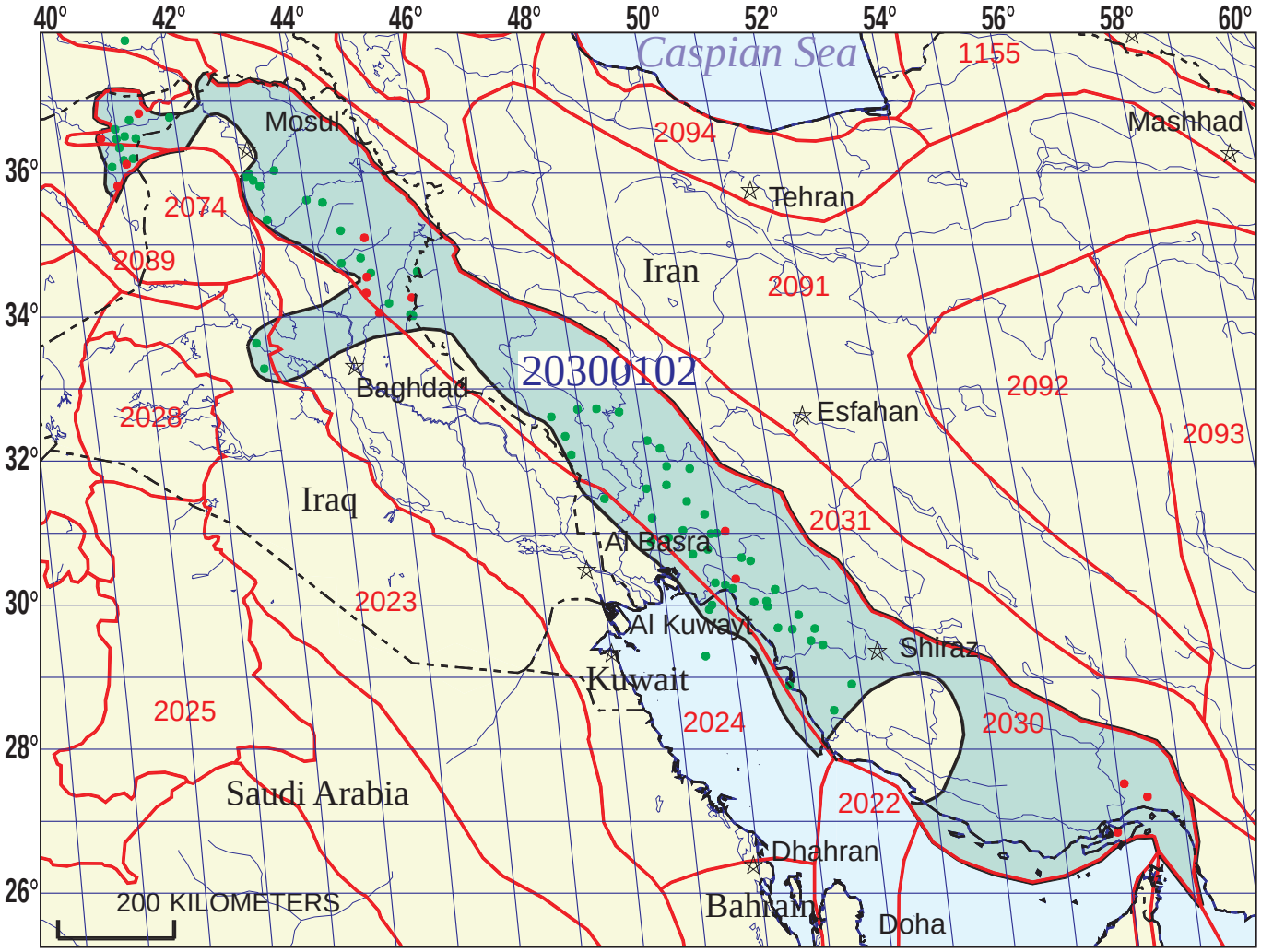
TRAPS AND SEALS: Miocene salt and anhydrite seals of the Fars and Gashsaran Formations in the Zagros fold belt are critical blocks to vertical migration in the thrust belt structures of Iraq and Iran. The Fars Group reaches thicknesses of 5,000 m; however, the salt interval is generally several hundred meters thick.

REFERENCES:

Alsharhan, A.S., and Nairn, A.E.M., 1997, Sedimentary basins and petroleum geology of the Middle East: Netherlands, Elsevier, 843 p.

Beydoun, Z.R., Hughes-Clarke, M.W., and Stoneley, R., 1992, Petroleum in the Zagros basin—A late Tertiary foreland basin overprinted onto the outer edge of a vast hydrocarbon-rich Paleozoic-Mesozoic passive margin shelf, *in* Macqueen, R., and Leckie, D., eds., Foreland basins and foldbelts: American Association of Petroleum Geologists Memoir 55, p. 309-339.

Jones, R.W., and Racey, A., 1994, Cenozoic stratigraphy of the Arabian Peninsula and Gulf, *in* Simmons, M.D., ed., Micropaleontology and hydrocarbon exploration in the Middle East: Chapman and Hall, p. 273-303.



Tertiary Reservoirs
Assessment Unit - 20300102

EXPLANATION

- Hydrography
- Shoreline
- 2030 — Geologic province code and boundary
- Country boundary
- Gas field centerpoint
- Oil field centerpoint
- 20300102 — Assessment unit code and boundary

Projection: Robinson. Central meridian: 0

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

Date:……..	11/16/99		
Assessment Geologist:……..	T.S. Ahlbrandt		
Region:……..	Middle East and North Africa	Number:	2
Province:……..	Zagros Fold Belt	Number:	2030
Priority or Boutique……	Priority		
Total Petroleum System:……	Zagros-Mesopotamian Cretaceous-Tertiary	Number:	203001
Assessment Unit:……..	Tertiary Reservoirs	Number:	20300102
* Notes from Assessor	Lower 48 growth function.		

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: 66 Gas: 14
Established (>13 fields) X Frontier (1-13 fields) _____ Hypothetical (no fields) _____

Median size (grown) of discovered oil fields (mmboe):
1st 3rd 444.4 2nd 3rd 466.0 3rd 3rd 158.0
Median size (grown) of discovered gas fields (bcfg):
1st 3rd 2585.1 2nd 3rd 483.8 3rd 3rd 527.4

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.	75	max no.	175
Gas fields:……min. no. (>0)	5	median no.	50	max no.	120

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	80	max. size	10000
Gas in gas fields (bcfg):……min. size	60	median size	480	max. size	20000

Assessment Unit (name, no.)
Tertiary Reservoirs, 20300102

AVERAGE RATIOS FOR UNDISCOVERED FIELDS, TO ASSESS COPRODUCTS

(uncertainty of fixed but unknown values)

Oil Fields:	minimum	median	maximum
Gas/oil ratio (cfg/bo)……	1100	2200	3300
NGL/gas ratio (bngl/mmcfg)……	30	60	90

Gas fields:	minimum	median	maximum
Liquids/gas ratio (bngl/mmcfg)……	22	44	66
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)……	15	32	50
Sulfur content of oil (%)……	1	2.5	5.5
Drilling Depth (m) ……	750	2500	5000
Depth (m) of water (if applicable)……	0	50	100

Gas Fields:	minimum	median	maximum
Inert gas content (%)……	0.2	1	2
CO_2 content (%)……	0	1	3
Hydrogen-sulfide content (%)……			
Drilling Depth (m)……	500	2500	5500
Depth (m) of water (if applicable)……	0	50	100

Assessment Unit (name, no.)
Tertiary Reservoirs, 20300102

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

1. Iraq represents 22.5 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		23	
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):...		23	
Portion of volume % that is offshore (0-100%).....		0	

2. Iran represents 74.5 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		76	
Portion of volume % that is offshore (0-100%).....		8	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):.....			
Volume % in parcel (areal % x richness factor):...		76	
Portion of volume % that is offshore (0-100%).....		8	

3. Turkey represents 0.4 areal % of the total assessment unit

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

4. Syria represents 2.6 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):...		1	
Portion of volume % that is offshore (0-100%).....		0	

5. Province 2030 represents 94 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		94	
Portion of volume % that is offshore (0-100%)……		5	

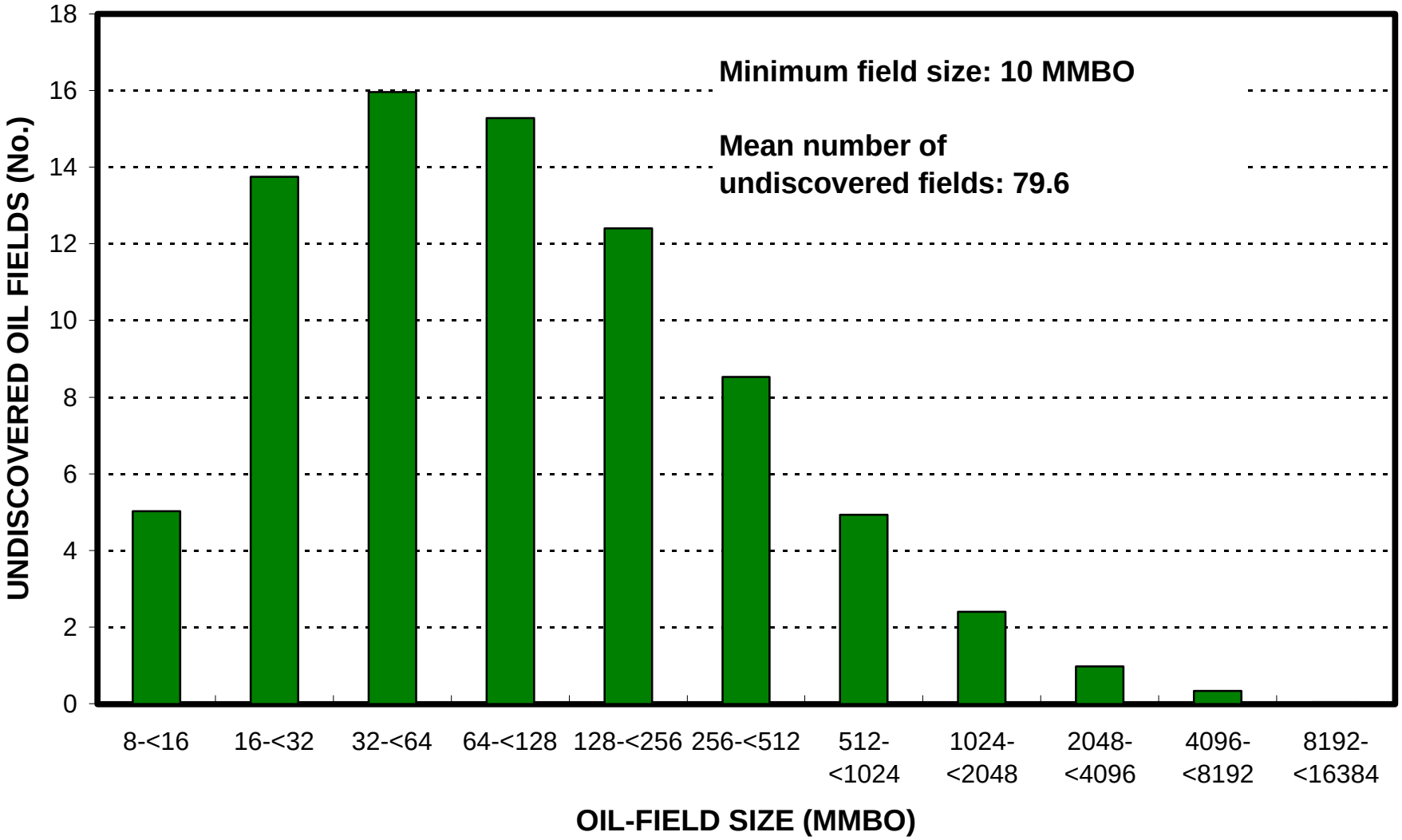
Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		94	
Portion of volume % that is offshore (0-100%)……		5	

6. Province 2024 represents 6 areal % of the total assessment unit

Oil in Oil Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		6	
Portion of volume % that is offshore (0-100%)……		30	

Gas in Gas Fields:	minimum	median	maximum
Richness factor (unitless multiplier):……			
Volume % in parcel (areal % x richness factor):…		6	
Portion of volume % that is offshore (0-100%)……		30	

Tertiary Reservoirs, AU 20300102
Undiscovered Field-Size Distribution



Tertiary Reservoirs, AU 20300102
Undiscovered Field-Size Distribution