

# Discovering Our Energy Future

## Barque Prospect

Canterbury Basin

Offshore SE New Zealand

February 2012

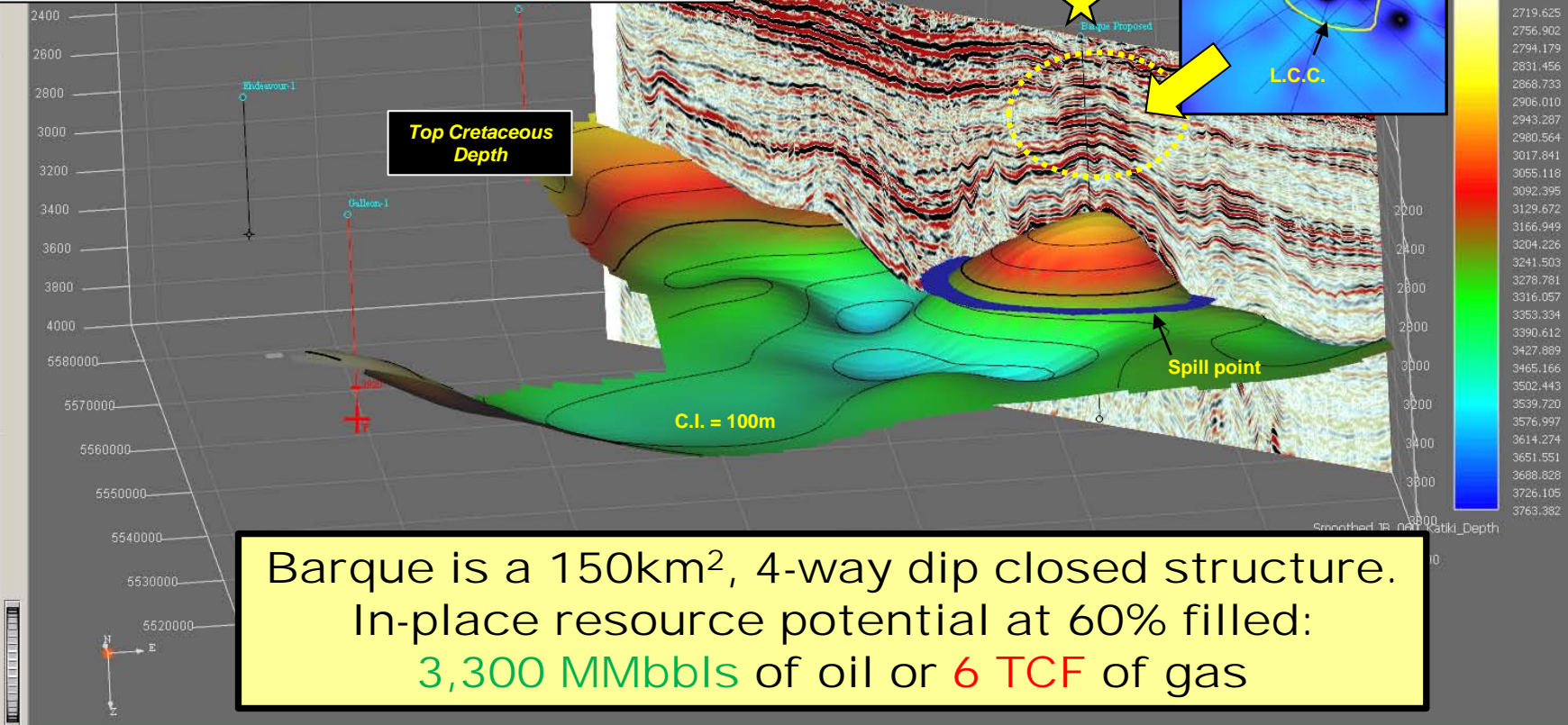
# Barque Prospect

## Prospect Details

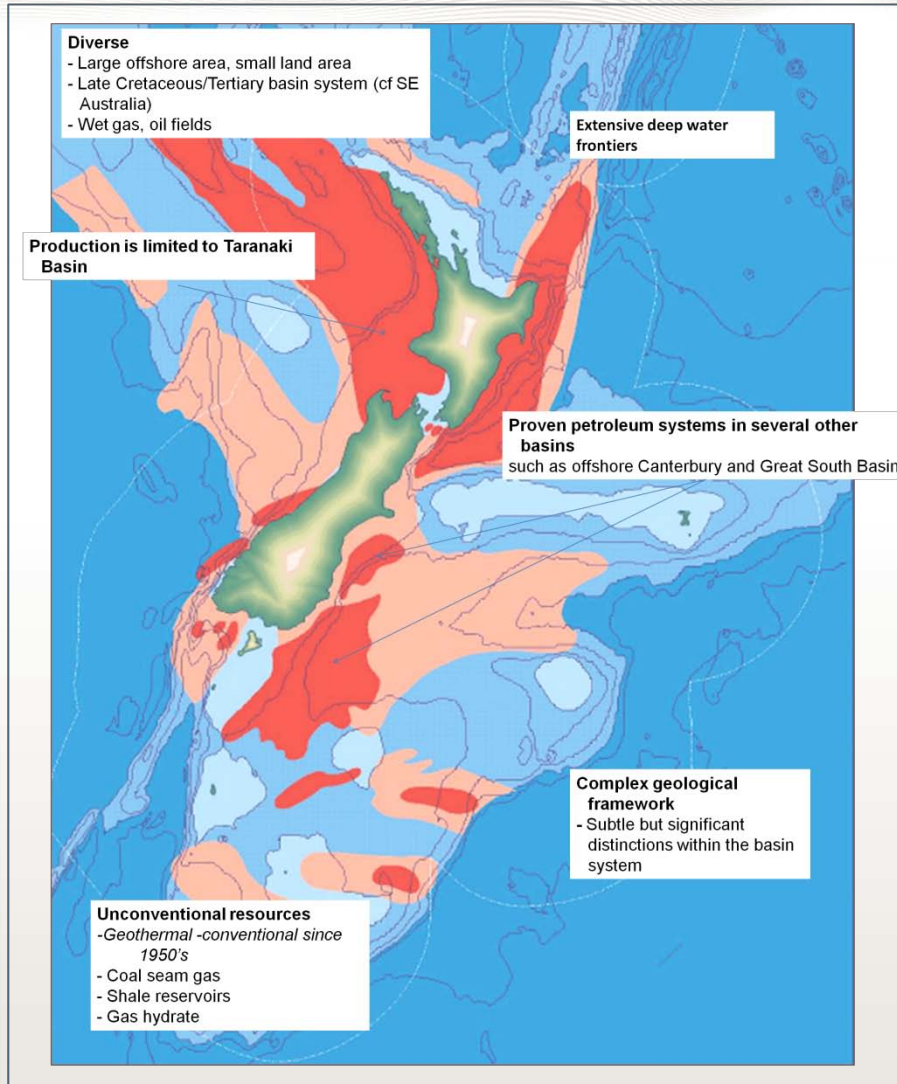
The Barque structure is a 150 sq km 4-way dip closure formed by a Late Cretaceous igneous intrusion at depth, within the syn-rift Clipper Graben.

Paleo-topography has concentrated reservoir sand development during Latest Cretaceous and Paleocene, including the Shag Point sequence.

The smaller analogous Galleon structure closer to shore tested gas and condensate from Late Cretaceous shore face sands associated with the Herbert Formation.



# New Zealand: A Good Place To Do Business



Mineral rights to petroleum vested in the Crown, 1937

Crown Minerals Act 1991

Administered by an agency within Ministry of Economic Development (New Zealand Petroleum & Minerals) [www.nzpam.govt.nz](http://www.nzpam.govt.nz)

Royalty and tax take provides for excellent returns to developer/producer

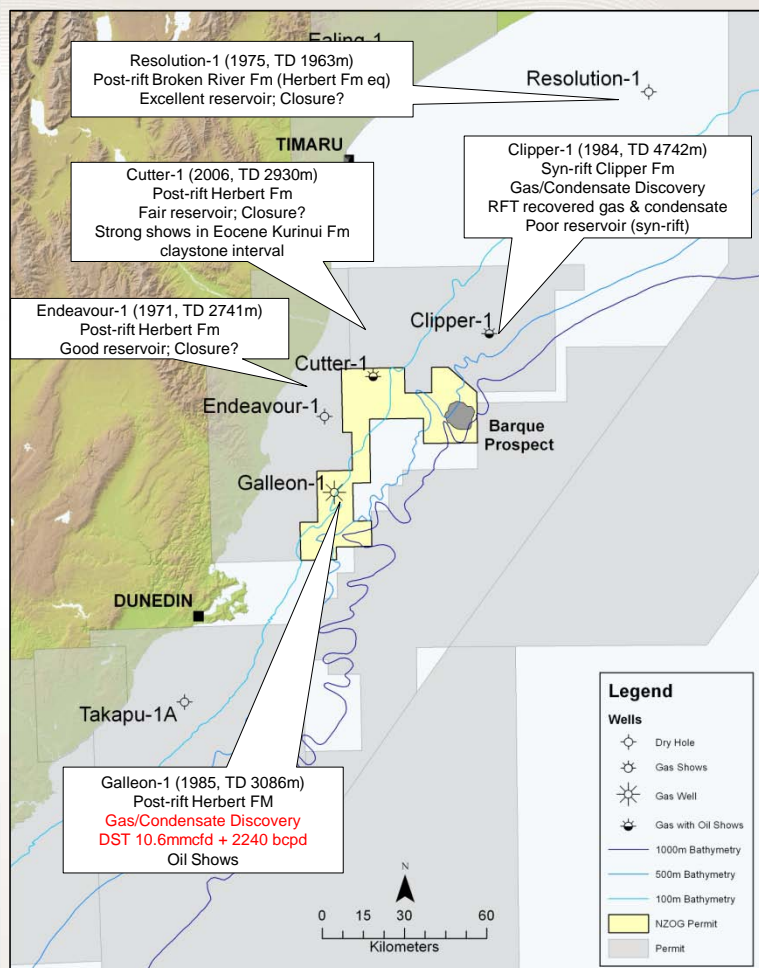
Royalty of 5% net revenue, or 20% accounting profit

Company tax of 28%

Low sovereign risk

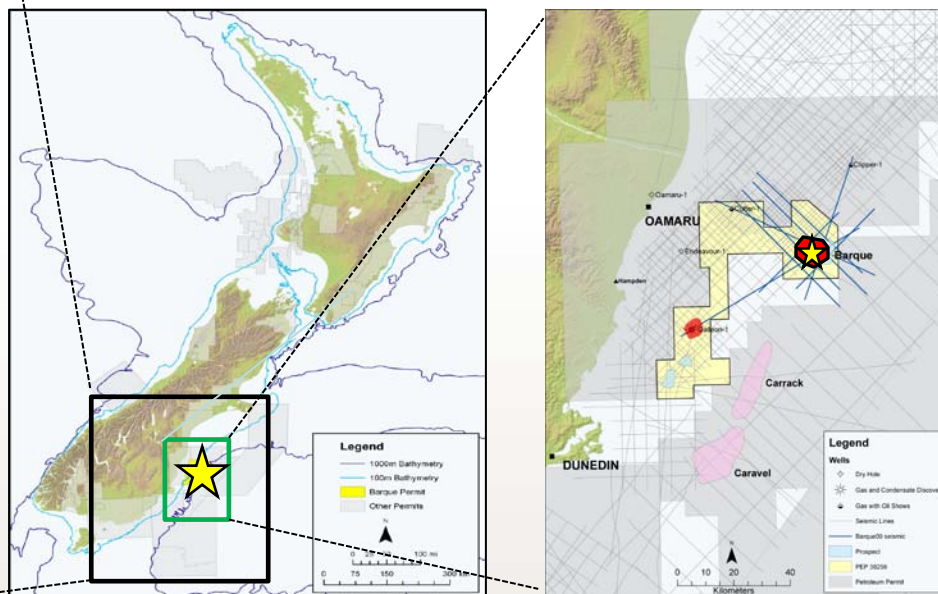


# Regional Location

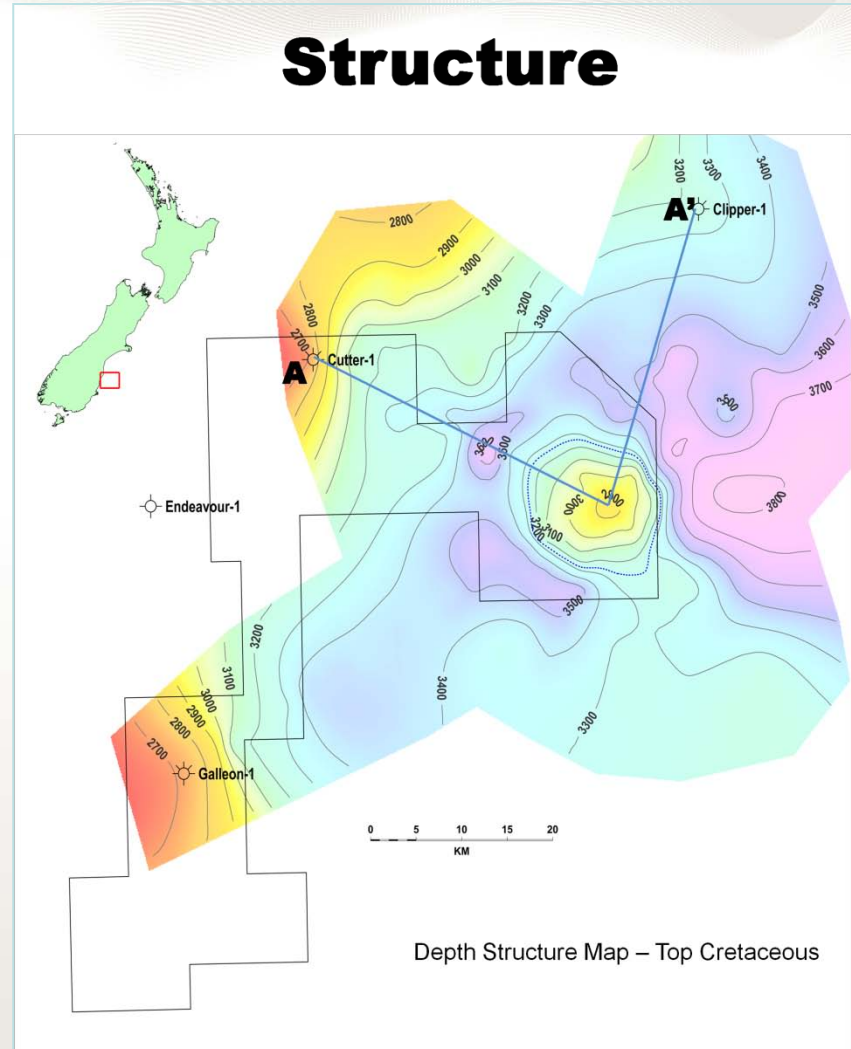
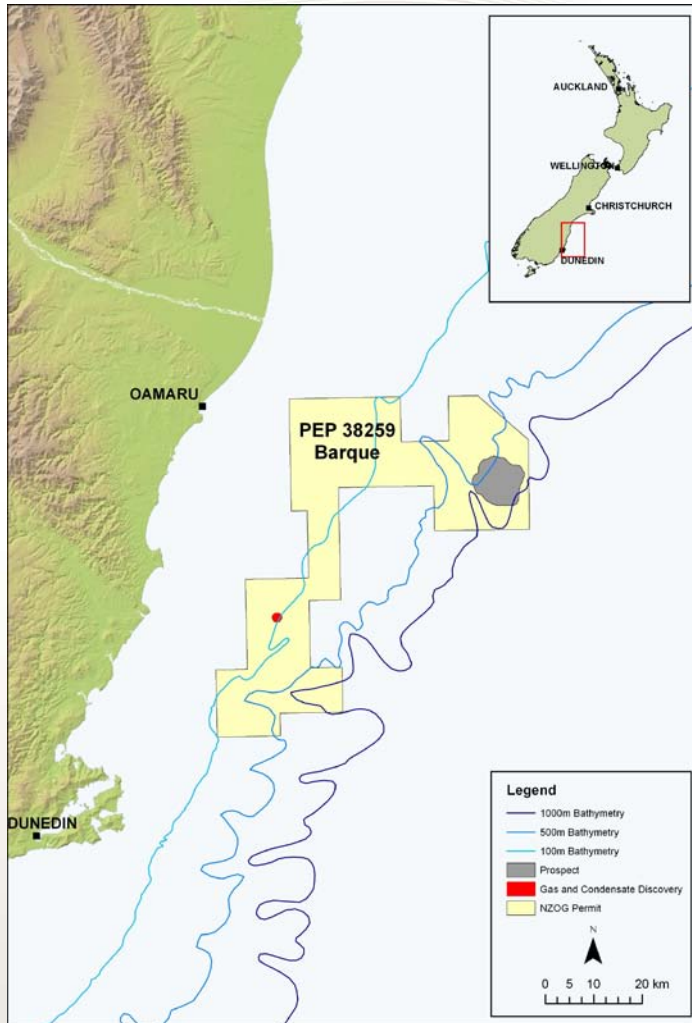


## PEP 38259 Details

<b>JV:</b>	<b>NZOG 40% (from former operator Tap Oil in 2008)</b> <b>Beach 35%</b> <b>AWE 25%</b>
<b>Water Depth:</b>	400-1000m
<b>Award Date:</b>	August 2003
<b>Work Programme:</b>	Cutter-1 was drilled in 2006, encountered gas shows: P&A 480km of 2D seismic shot around Barque in 2009 Geomechanical PSDM processing (canyon effects) Well to be drilled in 2012/2013



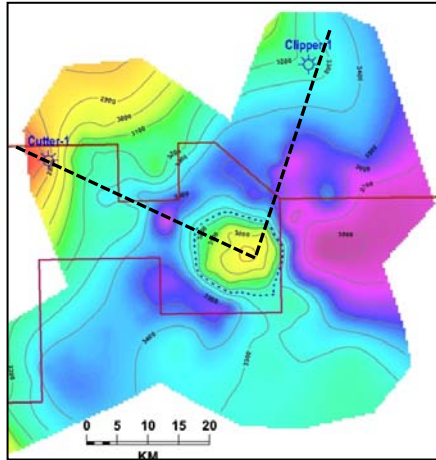
# Barque Structure





# PSDM Seismic Section

Composite 2009 PSDM seismic line shows distribution of relatively reflective reservoir facies across the high-relief Barque structure compared to the poorly-reflective mudstone dominated sequence encountered in Clipper-1.

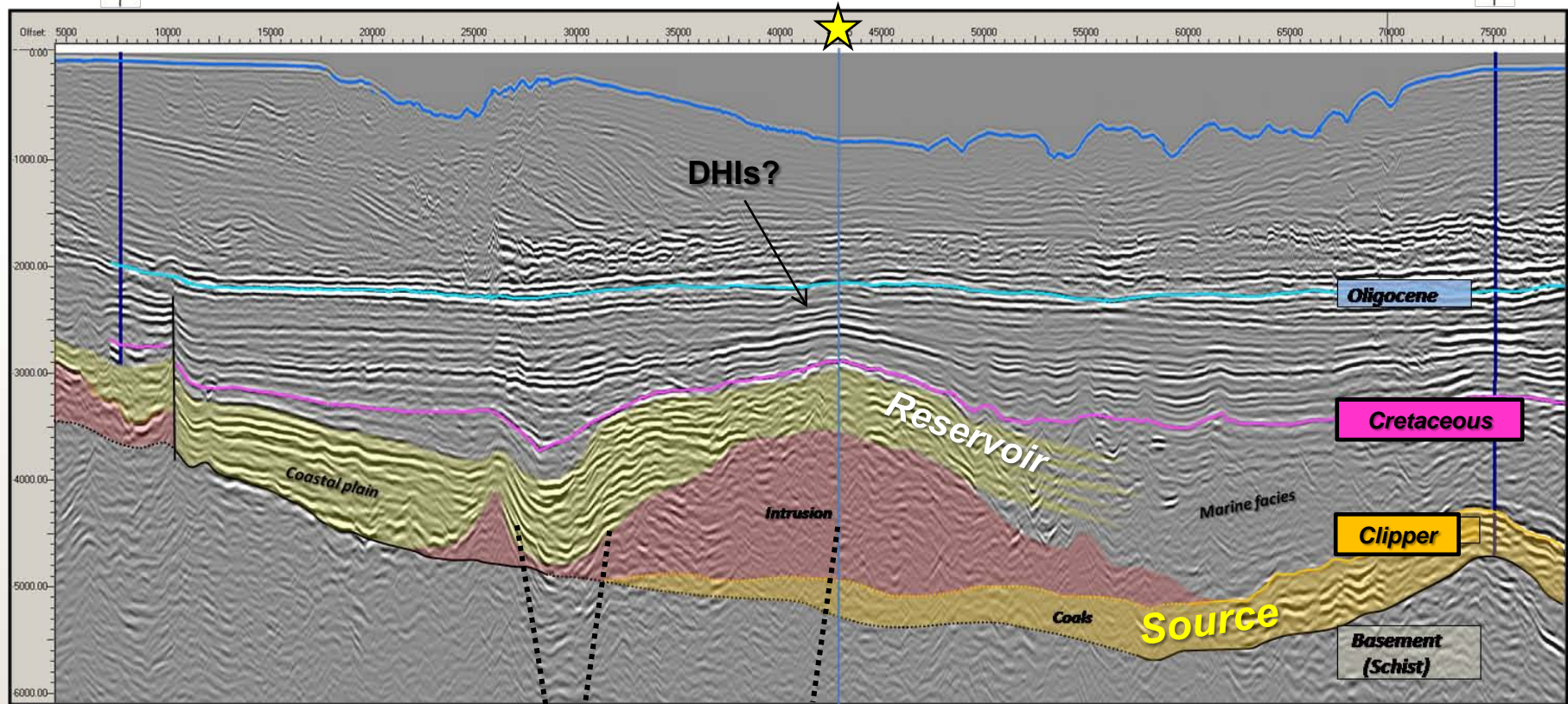


**Cutter**

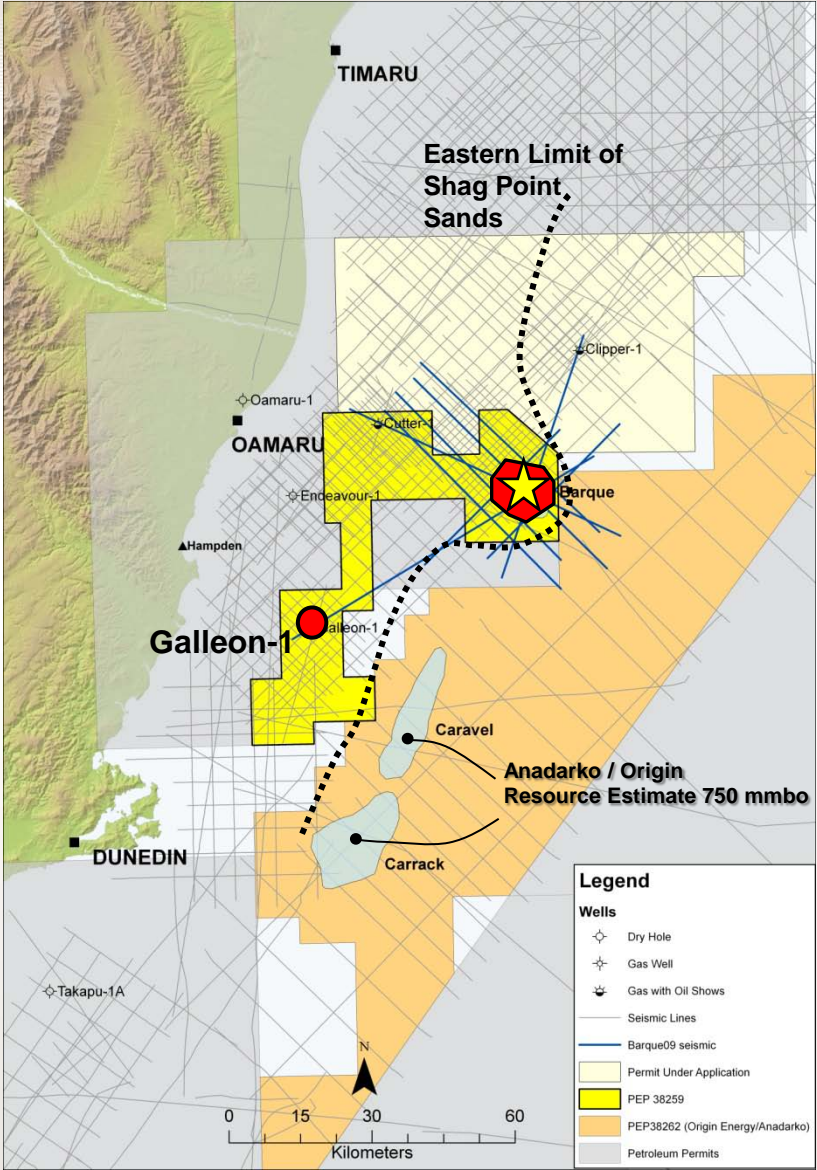


**Barque**

**Clipper**



# Reservoir at Galleon-1



Gamma & SP		Depth	Mudlog	Core & Tests	Resistivity
0.0	GR (API)	200.0	DEPT		0.2
-80.0	SP (MV)	20.0	M		0.2
		1.500	TVDss		
			M		

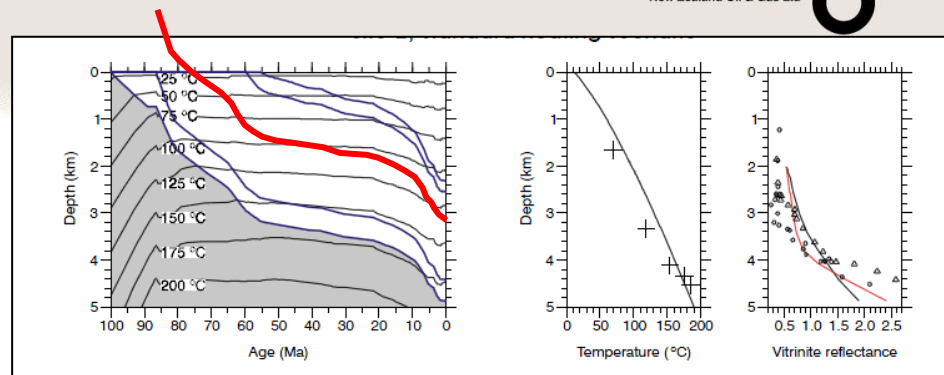
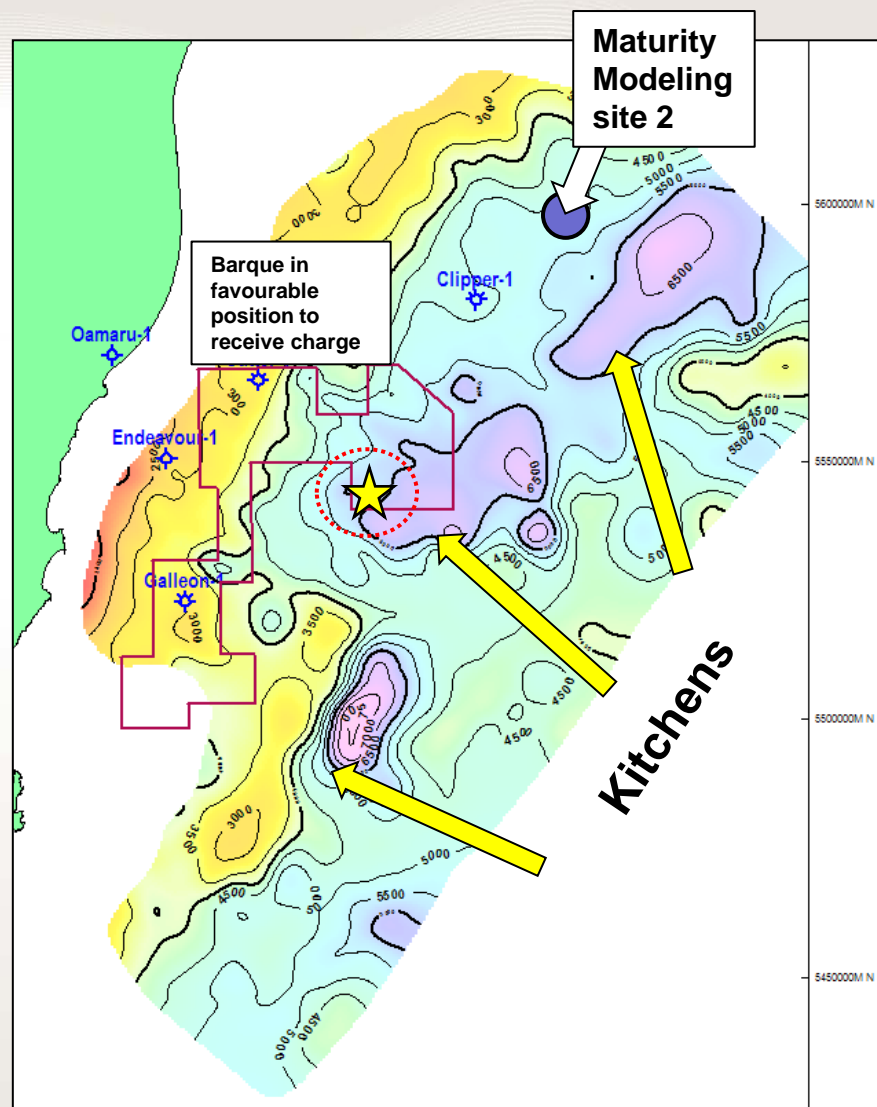
Herbert

Underfilled trap due to minimal charge – highly localized kitchen

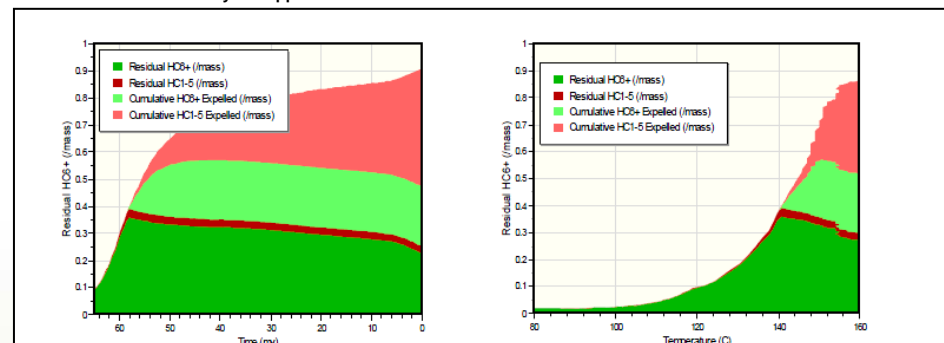
Taratu



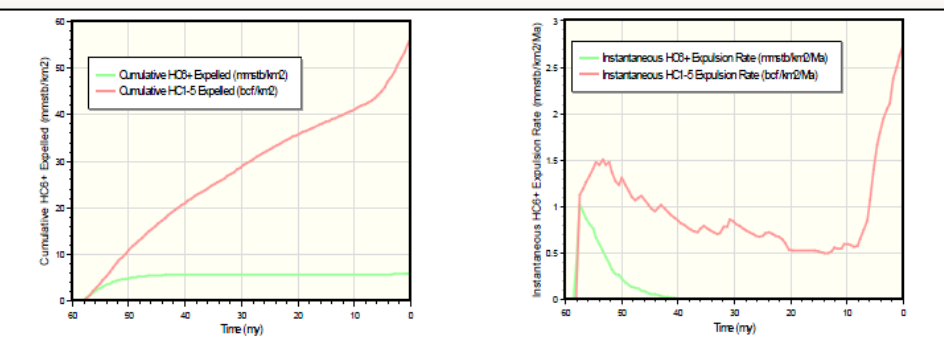
# Top BSMT Depth: Kitchen Map



Burial and thermal history of Clipper at site 2



Thermal maturity of Clipper for residual oil and gas, expelled oil and gas plotted against age and temperature



Cumulative and instantaneous expulsion rate history for a 100m thick interval of top Clipper at site2

From Petroleum Modelling in PEP 38258, Funnell, 2005



# Source Rock Distribution

## Clipper Formation

Syn-rift Clipper Formation contains source rocks based on the Clipper-1 and wells into the analogous Hoiho Group of the Great South Basin

Apart from Clipper-1, Canterbury Basin wells previously drilled are outside the depositional range of the Clipper Formation and poorly located for lateral migration

Moderate Source potential:

4.5 metric tons HC/m<sup>2</sup>

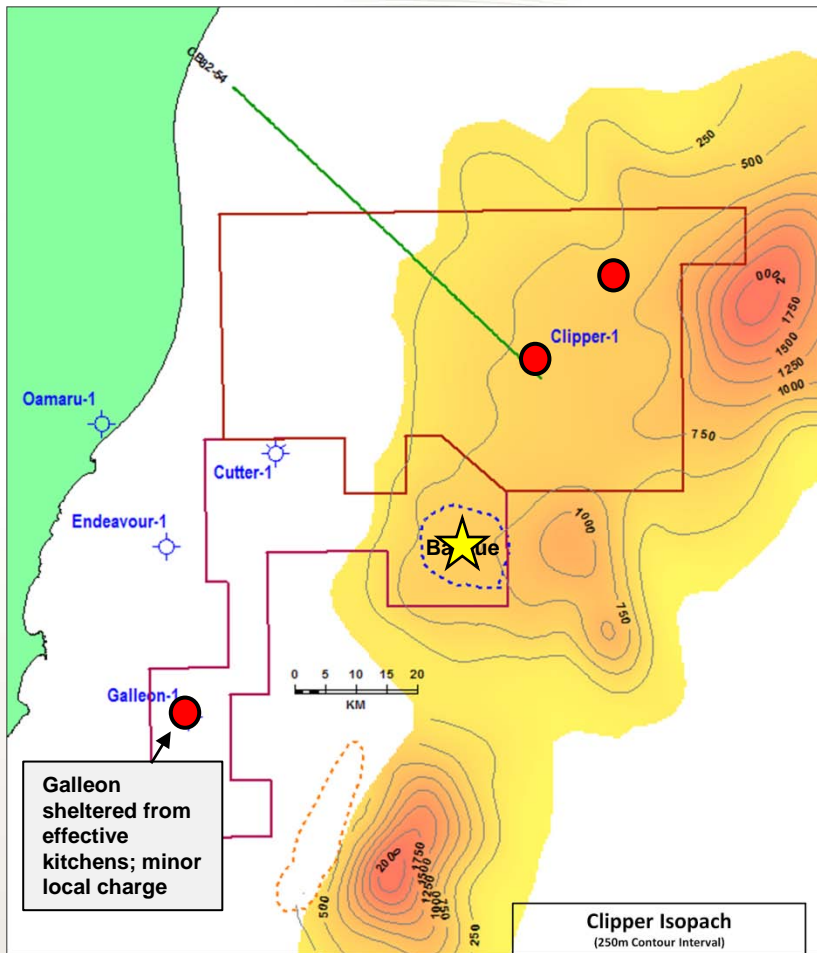
**30%** from 5-7m of coal.

**70%** from 270m of low yield carbonaceous muds

(Sykes & Funnell, 2002)

“...data suggest a condensate-associated gas derived from an oil-prone source of quite high maturity” *Clipper-1 Well Report*

“Coals and carbonaceous shales of the Upper Coal Measures member of the Clipper Formation lie below the oil floor but still retain significant potentials for gas and other low molecular weight hydrocarbons. Significant original potentials for oil are proposed”

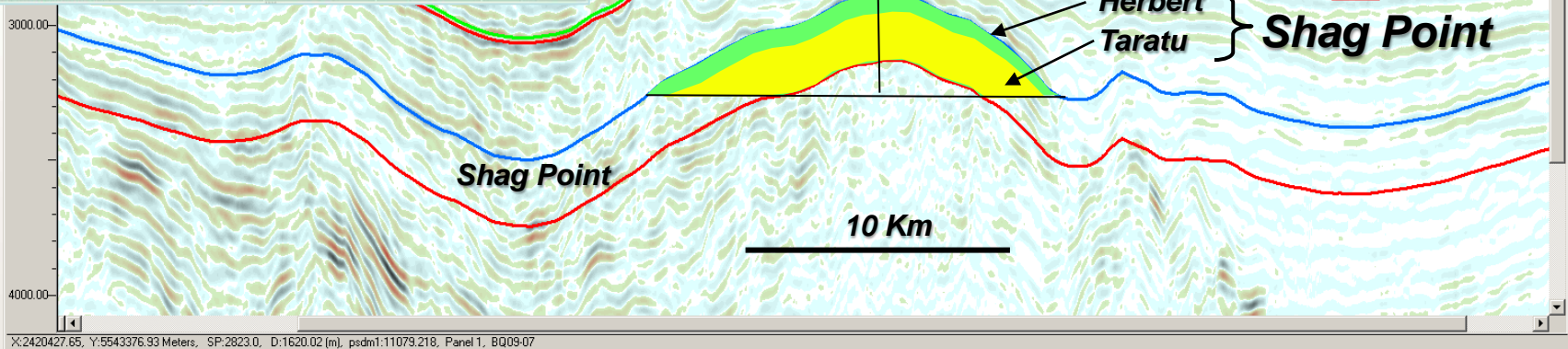


# Barque: Resource Estimation

NW

SE

	Primary Target		Secondary Targets	
	Taratu	Herbert	Paleocene	Eocene
Assumes 60% HC Fill	Thickness (m)	180	65	20
	Area (km <sup>2</sup> )	57	75	30
	NTG (%)	35	88	100
	GRV (MM m <sup>3</sup> )	3,803	4,565	1378
	Porosity (%)	18	18	18
	S <sub>h</sub> (%)	65	65	65
Gas Case	GEF (scf/rcf)	250	250	250
	CGR (bbls/MMCF)	50	50	50
	<b>GIIP (BCF)</b>	<b>1,375</b>	<b>4,149</b>	<b>1423</b>
	Gas Recov. Factor	50%	50%	50%
	Cond. Recov. Factor	85%	85%	85%
	R.R. (MMBC/Bcf)	<b>29 / 512</b>	<b>88 / 1500</b>	<b>30 / 530</b>
Oil Case	FVF	1.2	1.2	1.2
	<b>STOIIP (MMbbls)</b>	<b>816</b>	<b>2,464</b>	<b>845</b>
	Recovery Factor	25%	25%	25%
	R.R. (MMbbls)	<b>204</b>	<b>616</b>	<b>211</b>



X:2420427.65, Y:5543376.93 Meters, SP:2823.0, D:1620.02 (m), psdm1:11079.218, Panel 1, BQ09-07

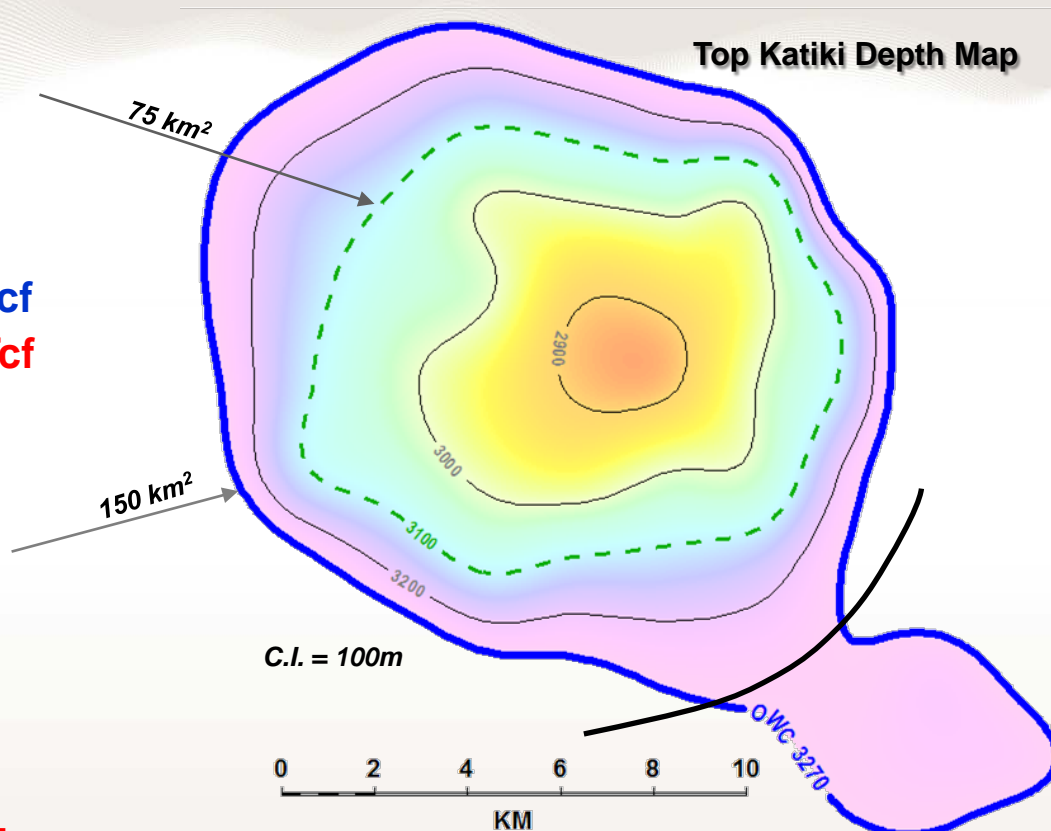
# Primary Target Volumetrics (Shag Point)

## Base Case (60% filled<sup>†</sup>)

STOIIP: 3.3 Bbbls  
GIIP: 5.5 Tcf  
R.R.: 117 MMBC / 2.0 Tcf  
234 MMBC / 1.3 Tcf

## Filled to Spill

STOIIP: 8.7 Bbbls  
GIIP: 16 Tcf  
R.R.: 300 MMBC / 5.5 Tcf  
620 MMBC / 3.5 TCF



### Notes:

†: Producing NZ fields are on average filled to ~ 60% of total relief

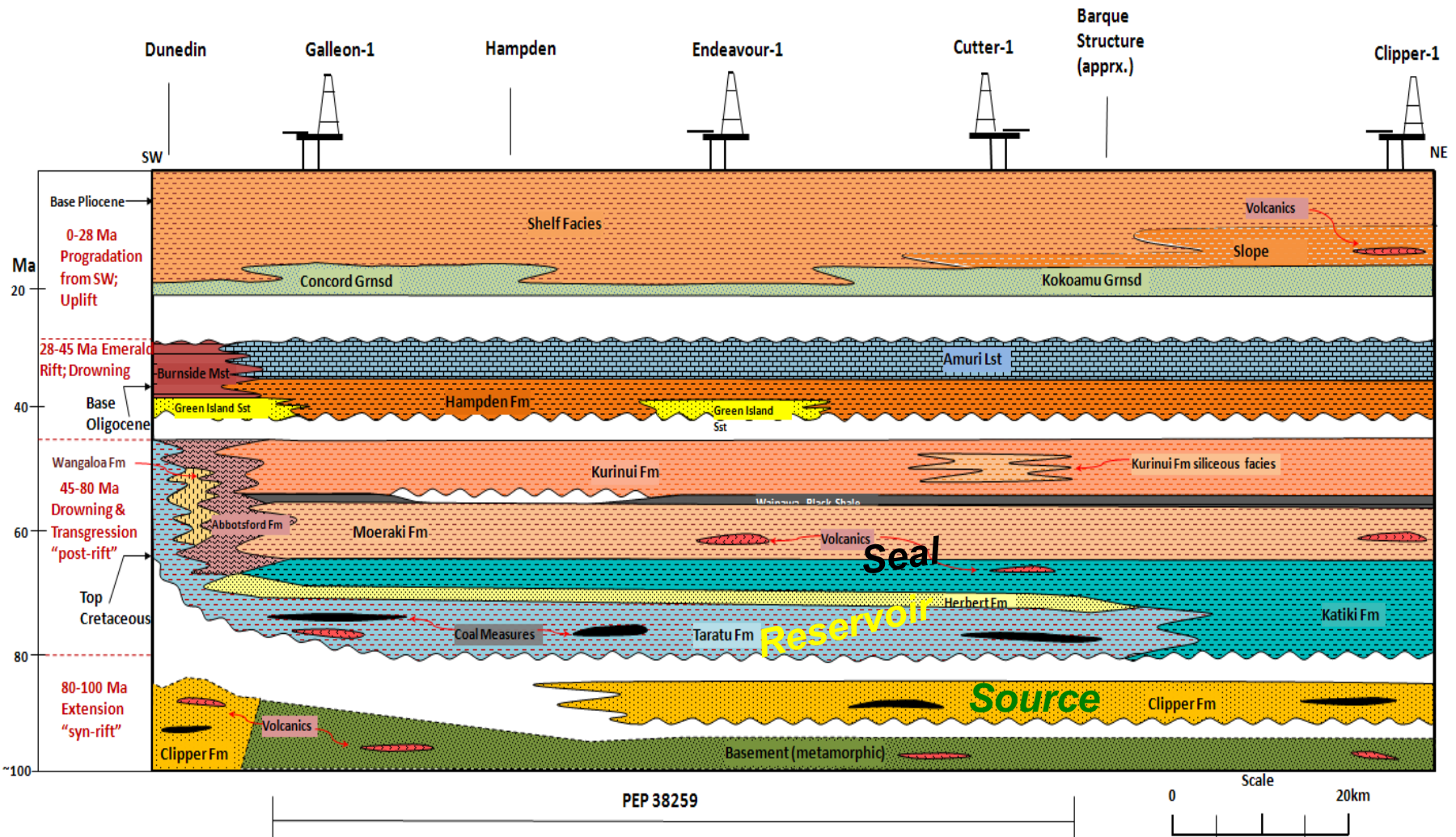
Figures in **Blue**: CGR = 50 bbls/mmcf

Figures in **Red**: CGR = 100 bbls/mmcf

No accounting for CO<sub>2</sub> (Typical range: ~ 5 – 30%)



# Canterbury Basin Stratigraphy



Note : Shag Point = Herbert + Taratu formations

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