Vlaming Sub-basin

SW WESTERN AUSTRALIA, OFFSHORE

Reservoir:

Gage, Charlotte, Jervoise sandstones

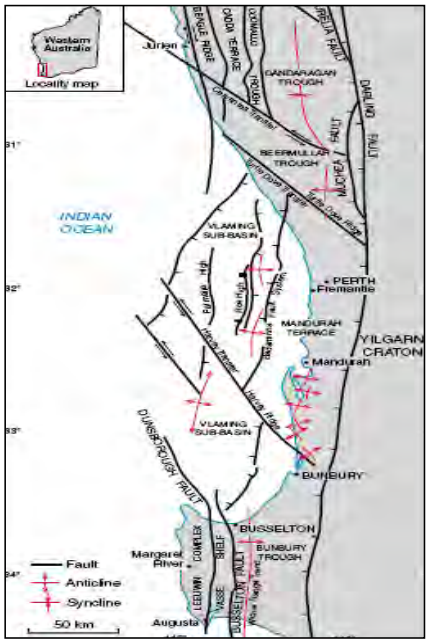
Seal:

South Perth Shale, Carnac, Otorowiri formations

HYDROCARBON POTENTIAL

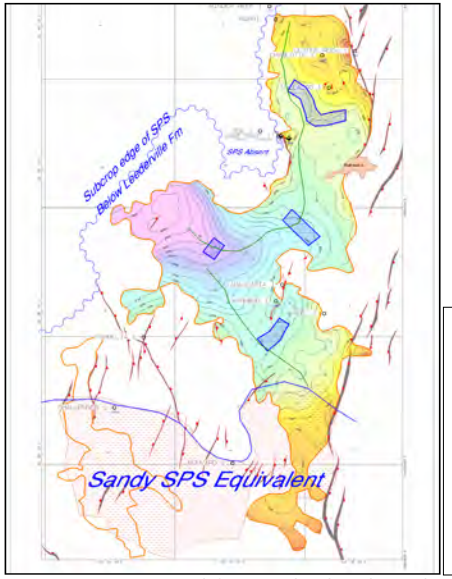
Despite some encouraging shows, no commercial hydrocarbons have been discovered in the Vlaming Sub-basin to date.

STRUCTURAL ELEMENTS



(After Crostella & Backhouse, 2000)

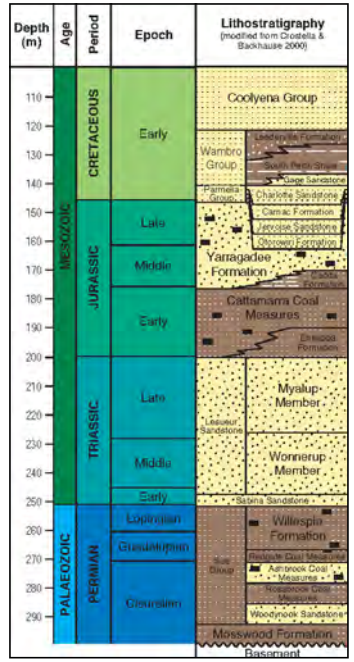
REGIONAL SEAL AREA



(After Causebrook et al., 2007)

Depth Structure Map of the Top Gage Sandstone/Base South Perth Shale (SPS-seal) showing the extent of the SPS and the sandy facies within the seal in the southern part of the basin.

STRATIGRAPHY

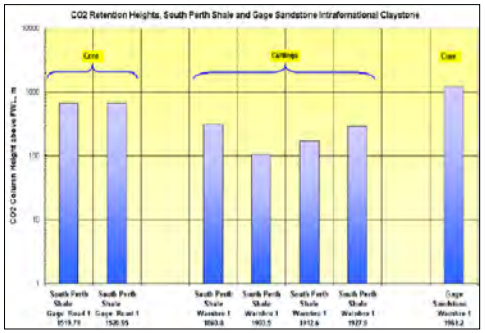


(After Nicholson et al., 2008)

OIL AND GAS FIELDS

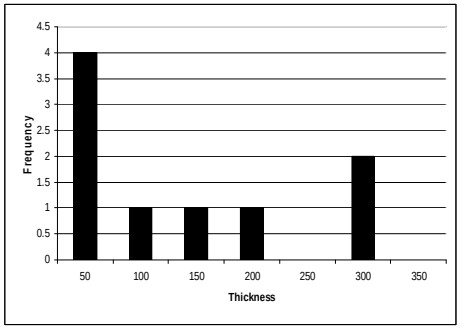
WELLS AND SEISMIC COVERAGE

TOP SEAL POTENTIAL

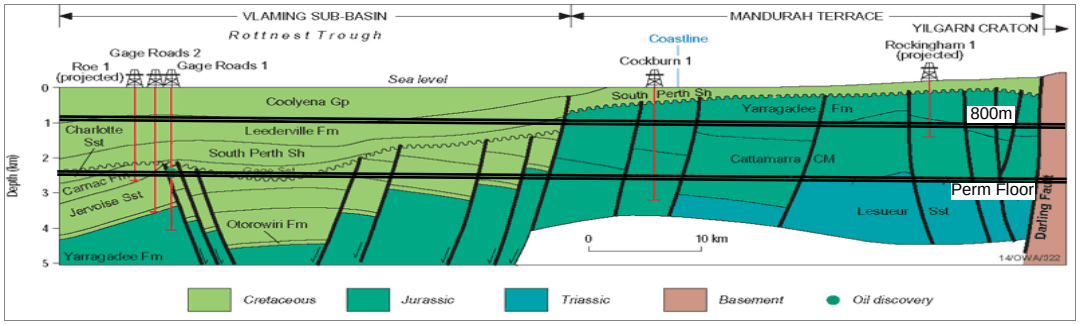


(After Daniel, 2005)

RESERVOIR THICKNESS

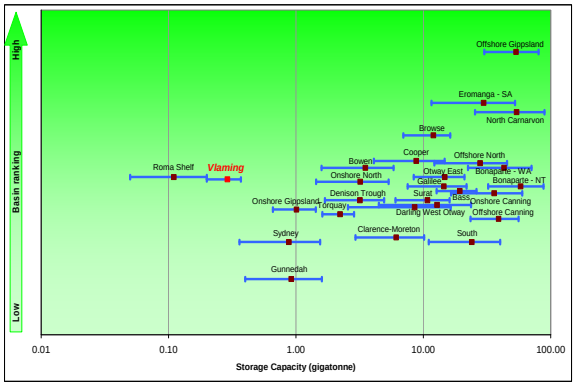


REGIONAL CROSS SECTION (LOCATION IN OIL AND GAS FIELDS MAP)



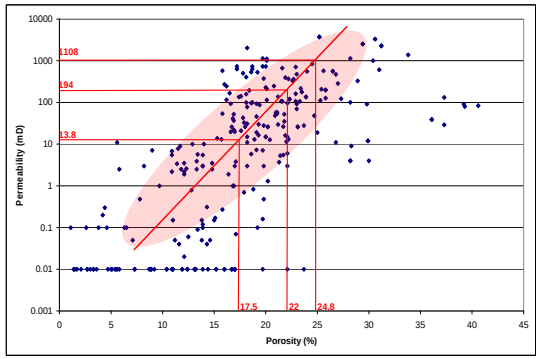
(After Crostella and Backhouse, 2000)

BASIN RANKING VS. CAPACITY

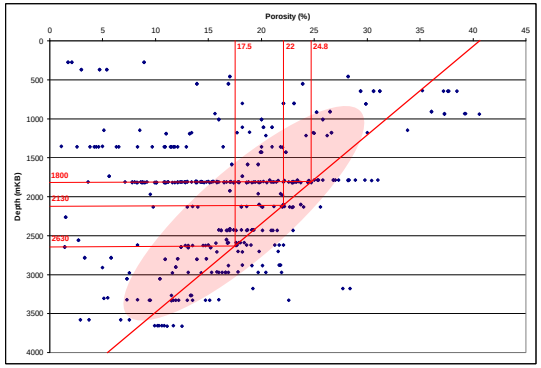


Vlaming Sub-basin

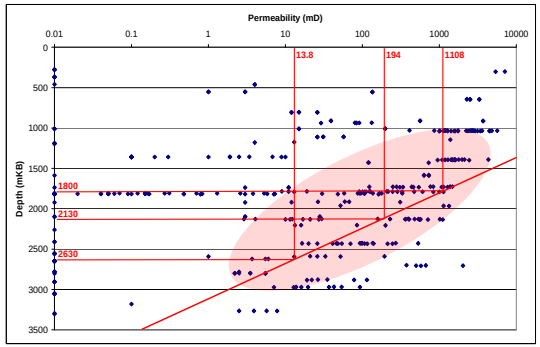
POROSITY VS. PERMEABILITY *Values from basin-wide dataset



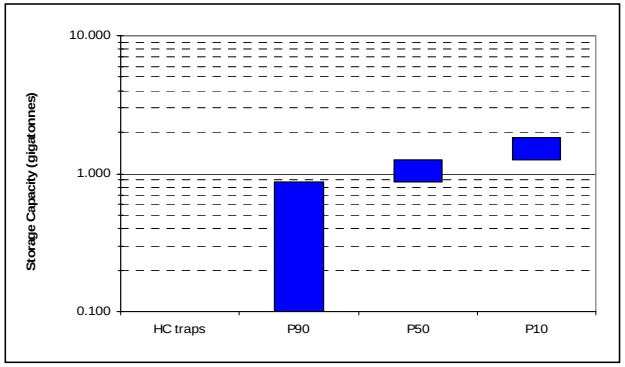
POROSITY VS. DEPTH



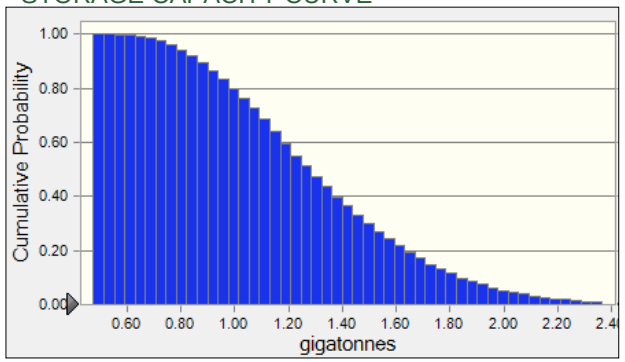
PERMEABILITY VS. DEPTH



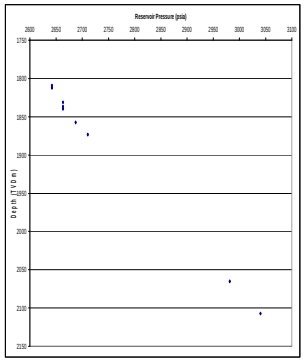
STORAGE CAPACITY



STORAGE CAPACITY CURVE



RESERVOIR PRESSURE VS. DEPTH *CSIRO PressurePlot



Insufficient data for the following items:

•Fracture Pressure vs. Depth Graph

BASIN RANKING

Category	Description	Score	Weighting
Tectonics (Seismicity)	Medium/Low	4	0.00
Size	Large	3	0.06
Depth	Intermediate	3	0.10
Type	Non-marine and Marine	2	0.04
Faulting intensity	Moderate	2	0.14
Hydrogeology	Good	3	0.04
Geothermal	Moderate	2	0.05
Hydrocarbon potential	Medium	3	0.05
Maturity	Exploration	2	0.05
Coal and CBM	Deep	3	0.00
Reservoir	Excellent	5	0.16
Seal	Good	4	0.18
Reservoir/Seal Pairs	Excellent	4	0.03
Onshore/Offshore	Shallow Offshore	2	0.00
Climate	Temperate	5	0.00
Accessibility	Easy	4	0.00
Infrastructure	Extensive	4	0.00
CO_2 sources	Major	4	0.00
Knowledge level	Good	3	0.05
Data availability	Moderate	2	0.05
Overall Ranking			**10**

STORAGE CAPACITY ESTIMATE

Parameter	Unit	Score (P90)	Score (P50)	Score (P10)	Distribution
Area of storage region	km^2	630	1100	2040	Triangular
Gross thickness of saline formation	m	150	200	300	Triangular
Average porosity of saline formation over thickness interval	%	17	20	23	Triangular
Density of CO_2 at average reservoir conditions	$tonne/m^3$	0.5	0.6	0.7	Triangular
E-storage efficiency factor (% of total pore volume)	%	4	4	4	
Calculated storage potential	gigatonnes	0.9	1.3	1.8	

POTENTIAL INJECTION PARAMETERS

Parameter	Unit	Shallow	Mid-Depth	Deep
Depth base seal	m	1650	1930	2330
Formation thickness	m	150	200	300
Injection depth	m	1800	2130	2630
Porosity	%	24.8	22	17.5
Absolute permeability	mD	1108	194	13.8
Formation pressure	psia	2635	3115	3850
Fracture pressure	psia	3895	4610	5695

** No data, estimated using 30,000-40,000ppm salinity and 0.66psi/ft fracture gradient

DISCLAIMER

The purpose of these montages is to aid a high level evaluation of the geological storage potential of Australia's sedimentary basins for future CO_2 emissions. The evaluations are based on core analysis and other data derived from Geoscience Australia and other sources. However due to time constraints, it has not been possible to carry out the detailed evaluation of the data, which will be required for the next phase of analysis.

In this exercise, we sought to recognise a range of characteristics within each basin by identifying three sets of parameters at different locations and depths in the basin. The intent is to generate an indication of a range of storage capacity and potential injection rates. These capacities and rates are being used in high level reservoir modelling work to generate injection tariffs* and capacity estimates. All of this work feeds into a process that provides indicative, conceptual transport and storage tariffs for CO_2 emissions captured in various parts of Australia.

This 'top down', simplistic approach seeks to describe the magnitude and range of potential costs for transport and storage in Australia, at a 'conceptual' level of accuracy. Clearly, any final investment decision would call on an increased understanding and level of accuracy through the usual project development process.

* Cost per tonne of CO_2 avoided, calculated using the net present value of cash flows over a 25 year asset life.

REFERENCES

Causebrook, R., Dance, T., Bale, K., Allinson, G., Daniels, R., Dunsmore, R., Ennis-King, J., Henning, A., Ho, M., Monteil, E., Neal, P., O'Sullivan, T., Otto, C., Tyson, S., Van Ruth, P., Watson, M., Wu, G. and Yanq, Q., 2007. Southern Perth Basin site investigation and geological model for Storage of Carbon Dioxide. Research Program 1.1-Technologies for Assessing Sites for CO2 Storage. Cooperative Research Centre for Greenhouse Gas Technologies, Canberra, Australia. CO2CRC Publication Number RPT06-0162

Crostella, A. and Backhouse, J., 2000. Geology and petroleum exploration of the central and southern Perth Basin, Western Australia. Western Australia Geological Survey, Report 57, 75pp.

Daniel, R.F., 2005. Carbon dioxide seal capacity study, Vlaming Sub-basin, Perth Basin, Western Australia, Australia. Cooperative Research Centre for Greenhouse Gas Technologies, Adelaide. CO2CRC Publication No RPT05-0044, 32pp.

Nicholson, C.J., Borissova, I., Krassay, A.A., Boreham, C.J., Monteil, E., Neumann, V., di Primio, R., and Bradshaw, B.E. 2008. New Exploration opportunities in the southern Vlaming Sub-basin. APPEA Journal 48, 371-379.