505001

TPR
OR- 406

BORAL
ENERGY

T/25P - DETERMINISTIC AND PROBABILISTIC POTENTIAL RESERVE CALCULATIONS AND PROSPECT RISKING

FOR: EDDYSTONE
NANGKERO SOUTH
TOURVILLE
VERIDIAN
WARREGO

R J SUTTILL
BORAL ENERGY RESOURCES LIMITED
SEPTEMBER 1995

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EDDYSTONE LEAD

The primary objectives for Eddystone are Lower and Middle M diversus sandstone reservoirs of probable fluvial channel facies. The reseroir distribution and quality carries the greatest uncertainty associated with the lead. It is anticipated that the reservoir sequence would be similar to that intersected at Pelican Field, because of lack of well control it is not known whether the location was outside of the main fluvial tract of the Pelican Trough. Even if the lead is outside of the main fluvial tract it is possible that tributary or fans deposits draining the margin of the trough could have deposited thick sandstones at this location. The Eddystone structure is approximately 150 metres updip of the Pelican Field wells. There is little control to demonstrate how this may affect the porosity and perhaps more importantly the permeability of the reservoirs at Eddystone.

Three deterministic gas and oil in place calculations were made all using a simple slab geometric model to reflect the probability of stacked reservoirs at this location. The following parameters are varied between the models, largely to reflect the great uncertainty in the net pay likely at Eddystone.

	Model 1 Eddymod1.xls	Model 2 Eddymod2.xls	Model 3 Eddymod3.xls
Net Pay	20m	40m	60m
Porosity	23%	21%	19%
Sh	70%	65%	60%
Recovery (gas)	70%	65%	60%
Recovery (oil)	25%	20%	20%

A probabilistic analysis was also undertaken using REP (Reserve Evaluation Programme, Version 3) to calculate potential reserves. A problem calculating gross rock volume from area and contour values using the REP program restricted the handling of the probability distribution of gross rock volumes. Therefore a polygonal probability distribution for gross rock volume was sampled from the deterministic calculations as follows:

Probability	GRV (mmcm)	Comments
P100	80	
P90	100	2310m contour and 60 metres pay
P30	1080	2380m contour and 60 metres pay
P10	1600	larger closure (including Grindstone) or greater pay thickness
PO	2000	

Other input variables are shown on the attached REP output.

EDDYSTONE - T/25P

EVCM Lower to Middle M diversus - Model 1

RESERVES CALCULATION (Simple Slab Model)

Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2260			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2270	10	0.05	9.40E+05	1.13	0.79	0.56	0.61	0.08	0.64	0.16
2280	20	0.21	4.28E+06	5.16	3.61	2.53	2.79	0.36	2.93	0.73
2290	30	0.45	8.92E+06	10.75	7.53	5.27	5.82	0.75	6.11	1.53
2300	40	0.99	1.97E+07	23.79	16.66	11.66	12.88	1.67	13.52	3.38
2310	50	1.71	3.41E+07	41.13	28.79	20.15	22.26	2.88	23.38	5.84
2320	60	3.50	6.99E+07	84.30	59.01	41.31	45.64	5.90	47.92	11.98
2330	70	6.54	1.31E+08	157.75	110.43	77.30	85.40	11.04	89.67	22.42
2340	80	8.62	1.72E+08	207.68	145.37	101.76	112.43	14.54	118.05	29.51
2350	90	10.81	2.16E+08	260.61	182.43	127.70	141.09	18.24	148.14	37.04
2360	100	14.26	2.85E+08	343.83	240.68	168.48	186.14	24.07	195.45	48.86
2370	110	16.31	3.26E+08	393.20	275.24	192.67	212.86	27.52	223.51	55.88
2380	120	18.03	3.61E+08	434.64	304.25	212.97	235.30	30.42	247.06	61.77

RISKED SALES GAS (PJ)	22.41
RISKED REC OIL (MMSTB)	3.27

Input Parameters	
Net Pay (m)	20
Porosity	0.23
Sh	0.7
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.7
Recovery factor (oil)	0.25
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	90%
SOURCE OIL	50%
SEAL	42%
RESERVOIR	35%
STRUCTURE	72%
CHANCE OF SUCCESS GAS	9.53%
CHANCE OF SUCCESS OIL	5.29%

Notes: Net pay based on intersecting sequence similar to Pelican 5 but with better permeability.

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EDDYSTONE - T/25P

EVCM Lower to Middle M diversus - Model 2

RESERVES CALCULATION (Simple Slab Model)										
Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2260			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2270	10	0.05	1.88E+06	1.92	1.25	0.87	0.97	0.12	1.09	0.22
2280	20	0.21	8.56E+06	8.75	5.69	3.98	4.40	0.57	4.97	0.99
2290	30	0.45	1.78E+07	18.23	11.85	8.29	9.16	1.18	10.36	2.07
2300	40	0.99	3.95E+07	40.34	26.22	18.36	20.28	2.62	22.93	4.59
2310	50	1.71	6.82E+07	69.73	45.33	31.73	35.05	4.53	39.64	7.93
2320	60	3.50	1.40E+08	142.94	92.91	65.04	71.86	9.29	81.25	16.25
2330	70	6.54	2.62E+08	267.49	173.87	121.71	134.47	17.39	152.05	30.41
2340	80	8.62	3.45E+08	352.15	228.90	160.23	177.02	22.89	200.17	40.03
2350	90	10.81	4.32E+08	441.91	287.24	201.07	222.14	28.72	251.20	50.24
2360	100	14.26	5.71E+08	583.01	378.96	265.27	293.08	37.90	331.41	66.28
2370	110	16.31	6.52E+08	666.73	433.37	303.36	335.16	43.34	378.99	75.80
2380	120	18.03	7.21E+08	736.99	479.05	335.33	370.48	47.90	418.93	83.79

RISKED SALES GAS (PJ)	35.29
RISKED REC OIL (MMSTB)	4.43

Input Parameters	
Net Pay (m)	40
Porosity	0.21
Sh	0.65
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	90%
SOURCE OIL	50%
SEAL	42%
RESERVOIR	35%
STRUCTURE	72%
CHANCE OF SUCCESS GAS	9.53%
CHANCE OF SUCCESS OIL	5.29%

Notes: Net pay based on intersecting sequence similar to Pelican 5 but with better permeability.

EDDYMOD2.XLS 9/20/95
R J Suttill

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EDDYSTONE - T/25P

EVCM Lower to Middle M diversus - Model 3

RESERVES CALCULATION (Simple Slab Model)

Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2260			0.00E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2270	10	0.05	2.82E+06	**2.41**	**1.44**	**1.01**	**1.12**	**0.14**	**1.37**	**0.27**
2280	20	0.21	1.28E+07	**10.96**	**6.58**	**4.60**	**5.08**	**0.66**	**6.23**	**1.25**
2290	30	0.45	2.68E+07	**22.84**	**13.70**	**9.59**	**10.60**	**1.37**	**12.98**	**2.60**
2300	40	0.99	5.92E+07	**50.54**	**30.32**	**21.23**	**23.45**	**3.03**	**28.73**	**5.75**
2310	50	1.71	1.02E+08	**87.36**	**52.42**	**36.69**	**40.54**	**5.24**	**49.66**	**9.93**
2320	60	3.50	2.10E+08	**179.07**	**107.44**	**75.21**	**83.09**	**10.74**	**101.79**	**20.36**
2330	70	6.54	3.93E+08	**335.10**	**201.06**	**140.74**	**155.49**	**20.11**	**190.48**	**38.10**
2340	80	8.62	5.17E+08	**441.15**	**264.69**	**185.28**	**204.70**	**26.47**	**250.77**	**50.15**
2350	90	10.81	6.49E+08	**553.60**	**332.16**	**232.51**	**256.88**	**33.22**	**314.69**	**62.94**
2360	100	14.26	8.56E+08	**730.37**	**438.22**	**306.76**	**338.91**	**43.82**	**415.17**	**83.03**
2370	110	16.31	9.79E+08	**835.24**	**501.15**	**350.80**	**387.57**	**50.11**	**474.78**	**94.96**
2380	120	18.03	1.08E+09	**923.27**	**553.96**	**387.77**	**428.42**	**55.40**	**524.82**	**104.96**

RISKED SALES GAS (PJ)	**40.81**
RISKED REC OIL (MMSTB)	**5.55**

Input Parameters	
Net Pay (m)	60
Porosity	0.19
Sh	0.6
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.6
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	90%
SOURCE OIL	50%
SEAL	42%
RESERVOIR	35%
STRUCTURE	72%
CHANCE OF SUCCESS GAS	**9.53%**
CHANCE OF SUCCESS OIL	**5.29%**

Notes: Net pay based on intersecting sequence similar to Pelican 5 but with better permeability.

EDDYMOD3.XLS 9/20/95
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Prospect Evaluation - Recoverable Gas

Country:	AUSTRALIA	Name:	EDDYSTONE
State:	TASMANIA	Segment:	L & M diversus
Block:	T/25P	Classification:	unassigned

Input Data

Variable	Unit	Shape	min	P90	P50	P10	max	mode
GRV	mmcm	poly	80.0	100	753	1600	2000	745
Deg. of fill	%	single	100	100	100	100	100	100
Net-to-gross	%	single	100	100	100	100	100	100
Porosity	%	triang	19.0	19.9	21.0	22.1	23.0	21.0
Sw	%	triang	30.0	32.2	35.0	37.8	40.0	35.0
FVF (1/Bg)	vol/vol	single	212	212	212	212	212	212
Gas rec fac	%	triang	60.0	62.2	65.0	67.8	70.0	65.0

Risk Factors

Play Chance:	49	Prospect Specific Chance:	15
Reservoir:	70	Trap:	70
Source:	100	Reservoir:	50
Regional Seal:	70	Seal:	60
		Migration:	72

Overall Prospect Success Chance: 7.41

Reserves Summary

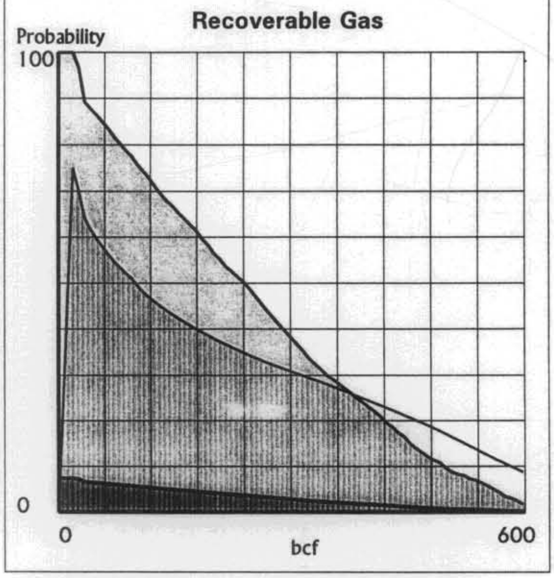
units: bcf

	In-Place	Recoverable Gas			
	Gross	Gross		Net	
	unrisked	unrisked	risked	unrisked	risked
P90	111	72.2	0	33.4	0
P50:	802	522	0	241	0
P10	1652	1073	0	496	0
Mean:	846	550	40.7	254	18.8

Production Working Interest: 46.25

Exploration Working Interest: 46.25

Production Working Interest is used to calculate net volumes



min net unrisked: 18.9 max net unrisked: 773

Comments:

5 cm

REP file: c:\rep\data\t25p\veridian.ppr
version: 3.03
3.03

Author: rjs
Date: 19/09/95

PROSPECT ADEQUACY WORKSHEET
"MINIMUM GEOLOGIC CASE"

Prospect Name: EDDYSTONE (L-M M. diversus) Assessment Date: SEPT 95

Assessor: R. J. SUTTILL Overall Chance of Success 9.52%

Risk Severity

CONFIDENCE LEVEL	High	Moderate	Low	
High	0-.3	0.4-0.8	.9-1.0	Lots of Data/ Good Quality
Moderate	.1-.4	.4-.7	.7-.9	
Low	.2-.5	.5-.6	.6-.7	Sparse Data/ Poor Quality

Conclusions Interpreted from Data

Bad News Good News

REGIONAL PLAY CONSIDERATIONS

Presence of Reservoir Facies
COS: .7
Comments:

Presence of Adequate Source
(Richness + Maturity)
COS: 1
Comments:

Presence of Top Seal
COS: .7
Comments:

Timing and Preservation
COS: .9
Comments:

LOCAL PROSPECT CONSIDERATIONS

Adequate Reservoir Quality
COS: .5 .35
Comments:

Adequate Source Migration
COS: .9 .9
Comments:

Fault Seal
COS: .6 .42
Comments:

Presence of Trap
COS: .8 .72
Comments

PRESENCE OF RESERVOIR FACIES ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Chance of reservoir missing by facies change, non-deposition, truncation or faulting	none	possible	probable
• Prospect located in favourable reservoir depositional fairway	yes	near margin	no
• Reservoir facies interpreted as being continuous over prospect	yes	questionable	no
• Probability of multiple reservoirs	yes	possible	no
• ~~Seismic modelling (if applicable)~~ suggests favourable reservoir facies	~~yes~~	~~questionable~~	~~does not support~~
• Presence of amplitude anomaly is supported by rock properties analysis in DHI trend	strong support	weak support	none

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Number of wells present within prospective fairway (trend) <20 kilometres from prospect	≥ 2	1	~~none~~
• Seismic data quality	good	fair	poor
• Seismic data coverage (Consider impact of well control)	good	adequate	sparse
• Isopachous and/or facies map of prospective interval	yes/prospect and regional	yes/prospect only	no, or incomplete
• Reservoir interval tied to seismic lines from well control and correlated onto prospect	yes	no	unable to correlate
• Reservoir model consistent with analog field(s) in trend	yes	slight difference	conceptual model only

ADEQUACY OF RESERVOIR QUALITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Adequate porosity and permeability encountered when facies penetrated	almost always	usually	often absent
• Clastic reservoir composition	Quartzose < 10% clay or ductile material	Arkosic > 10%-<20% clay or ductile material	Lithic or sublithic > 20% clay or ductile material
• ~~Carbonate reservoir composition~~	~~dolo~~	dolo/LS	LS
• Grain size/sorting	fn-med/well sorted	v. fn-fn/ moderately sorted	v. fn-coarse/poorly sorted
• Mapped porosity/fracture fairway correlates to adequate permeability	almost always	usually	no
• Effect of diagenesis on reservoir quality	almost always enhances/no effect	usually ? enhances/no effect	usually detrimental

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Nearby wells in trend (less than 20 kilometres) demonstrate adequate quality porosity/permeability for HC production	yes/≥ 2 wells	yes/< 2 wells	no/no wells
• Seismic models (where applicable) calibrated to reservoir/non-reservoir rock properties	yes/properties measured	yes/properties estimated	no/no model
• Nearby DST or production test of reservoir indicates sustainable economic deliverability	yes/≤ 20 kms	yes > 20 kms	no ≤ 20 kms
• ~~Fracture analysis run (where applicable)~~	~~yes/positive results~~	~~yes/but not~~ conclusive	~~no, or negative~~ results

SOURCE RICHNESS AND MATURITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Original TOC level	high/ ≥3.0%	moderate/1-2.9%	low/ < 1%
• Original hydrogen index level	high/ ≥ 300	moderate/200-299	low/ < 200
• Source depositional environment	favourable	marginal	unfavourable
• Nearby field(s) demonstrate rich source rocks in area	yes	maybe	no
• Maturity within drainage area. (Indicative only, depends on source models).			
Oil Prospects (Rv)	0.7-0.9	0.5-0.7 or 0.9-1.1	<0.5 or >1.1
Gas Prospects (R_v)	>1.3	1.0-1.3	<1.0
• Nearby field/well penetration	Numerous oil/rich liquid shows or production	Lean gas/undrilled	Several wells, no shows

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Availability of geochem data from core, cuttings, and/or log data	within prospective source bed drainage area	outside prospective source bed drainage area	unavailable (richness postulated)
• Reservoired HCs in play area matched to the identified source bed horizon	matched	not matched	source beds poorly identified
• Thermal Model of drainage area	well constrained by down hole temperature and maturity data	unreliable/sparse data/conflicting measurements	no down hole measurements/ postulated from paleo-environment
• Source maturity proven in play	yes	uncertain	no

SOURCE MIGRATION PATHWAYS AND TIMING ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Relationship of source beds to reservoir	indigenous/in juxtaposition/ stratigraphically ~~lower~~	stratigraphically much lower/ pathway uncertain	stratigraphically much higher/ pathways uncertain
• Potential migration avenues present and focused towards prospect	yes	questionable	no
• Adequate drainage area for prospect	yes	questionable	inadequate
• Reservoir pressure (at migration)	underpressured	balanced	overpressured
• Timing of trap formation vs peak HC maturation	trap predates maturation or synchronous	trap slightly postdates maturation	trap considerably postdates maturation but may be filled by spill from earlier accumulations
• Thick source rocks or multiple sources reaching peak maturation over long time period	yes	uncertain	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Well/seismic data support interpretation of migration pathways	yes, strongly	possibly	inconclusive or poorly
• Well/seismic data quality	good	fair	poor
• Regional structure maps	on source beds or decollement surface and reservoir	on top reservoir only	no regional map
• Analog fields(s)	< 20 kms	> 20 kms	none
• Isopachs or datumed seismic sections indicate trap predates maturation	yes	uncertain	no
• Structural complexity makes timing uncertain	no	questionable	yes

REGIONAL TOP SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Top seal thickness and continuity	thick/continuous	thin/somewhat continuous	unknown
• Evidence of seal missing by facies change, non-deposition, truncation, or broken by fracturing	no	possible	probable
• Seal lithology composition	shale or evaporite	silty or limy shale	carbonates or silty

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of seal lithologies and continuity	adequate	marginal	not adequate

PROSPECT-SPECIFIC/FAULT SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Non-associated fault trap ~~(independent)~~	4-way closure	updip closure ~~against salt/strat~~ (combination, unconformity, diagenetic)	strat ~~(facies change)~~
• Associated fault trap (dependent)			
- trap type	high-side/faulted closure	low-side closure <35% sand in prospective interval	fault intersection/ low-side closure >35% sand in prospective interval
- fault position relative to reservoir	buried, dies out in thick overlying sh	buried, dies out in overlying sd/sh sequence	intersects surface/post-dates trap formation
- facies relationship across fault	sd vs sh	thin sd/sh sequence vs thin sd/sh sequence	massive sd/sh sequence vs massive sd/sh sequence
• Presence of amplitude anomaly supported by rock properties analysis	strong support	weak support	none
• Fault leak apparent in nearby analogous traps	no	uncertain	yes

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of fault orientation, displacement and high/lowside lithologies	adequate	marginal	not adequate
• Fault plane profile of sealing faults completed	yes, all faults	most critical fault only	none
• Cross fault juxtapositions modelled for traps	yes, all faults	most critical faults only	none

TRAP CLOSURE ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Trap configuration and imagability	simple/easy	complex/possible	complex/difficult
• Trap style consistent with regional analogs	consistent	somewhat consistent	not consistent
• ~~Sequence stratigraphy concepts~~ used in mapping prospect	~~yes~~	~~to some degree~~	~~no~~
• Shallower mapping horizon(s) also demonstrate trap presence	yes	somewhat	no
• ~~Trap geometry interpretation~~ balanced in compressional setting	~~yes/good balance~~	~~yes/fair balance~~	~~no, or poor~~ balance
• Multiple horizons and critical fault planes mapped	yes	horizons or faults mapped, but not both	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Seismic data quality	good	fair	poor
• Seismic data coverage across prospect	3D coverage or dense, recent vintage 2D coverage	moderate coverage of recent vintage 2D data	old data and/or sparse coverage
• Dip line and strike line ties	emphatically	some discrepancies between dip and strike lines	misties at critical components of trap
• Seismic data over prospect tied to synthetic of well penetrating objective interval within 20 kms of prospect	yes	yes/ > 20 kms	no
• Velocity control wells within 20 kms of prospect in same geologic trend	≥ 2 wells	1 well	none

TIMING AND PRESERVATION

RISK SEVERITY

	LOW	MODERATE	HIGH
• Tectonic alteration post trap formation and charge	none	Minor movement on non-critical faults. Minor tilting/warping.	Widespread movements on faults. Major tilting and/or folding. Volcanic activity. Ongoing tectonic activity.
• Nature of current stress regime	neutral	compressional	tensional/wrench
• Flushing/water washing*	Poor aquifer support, little ground water movement. No evidence of detrimental water washing in the basin.	Strong aquifer support but little water movement. Some evidence of detrimental water washing.	Strong aquifer support and active water movement interpreted. Well evidence supports detrimental effects.
• Biodegradation	Reservoir temperature >80°C. No connection to meteoric ground water. No evidence of biodegradation.	Reservoir temperature 60-80°C. Some evidence of biodegradation in the basin.	Reservoir temperature <60°C. Influx of meteoric waters interpreted. Strong well evidence of biodegradation.
• High temperature cracking of reservoired hydrocarbons ?	Reservoir $< R_v$ 0.7 for oil, 1.0 for wet gas. Target hc. reservoired in nearby wells under similar conditions.	Reservoir between R_v 0.7-1.3. Only "more mature" hydrocarbons found at similar levels.	Reservoir R_v >1.3. Temperatures known to be hostile to the preservation of target hydrocarbons.

* Evaluate this criteria carefully. Water washing may enhance oil plays by removing gas, but long exposure may result in heavy, waxy crudes.

TIMING AND PRESERVATION - CONT'D

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Timing of post-charge tectonic alteration	Supported by well data, seismic data and regional models.	Tectonic history well understood but timing of hydrocarbon charge poorly understood (or vice versa).	Post charge tectonic alteration inferred from regional analogs only. No evidence for or against.
• Temperature profiles at prospect well constrained	Temperature depth profiles available from wells within 20 kms extending below reservoir target depth.	Some temperature depth profiles available within the basin but >20 kms away/unreliable/ too shallow.	Temperature profiles inferred from regional models only.
• Water washing	Well data and regional models support analysis of fluid movement. Recovered hydrocarbons within 20 kms support model.	Regional models suggest it may be an issue, but not confirmed by well results (or vice versa).	No relevant data.
• Bio-degradation	Good temperature data. Hydrocarbons recovered within the same play within 20 kms support analysis.	Conflicting information from well data. Poor understanding of regional models.	No relevant data.
• Hydrocarbon cracking	Burial history analysis and heat flow analysis conducted. Nearby wells support analysis at target depth.	No detailed analysis. Nearby wells are shallower/in differe t geological conditions.	No relevant data.

505019

NANGKERO SOUTH LEAD

The primary objectives for Nangkero South are Palaeocene sandstone reservoirs of probable distributary channel facies similar to those encountered at Poonboon 1. The Nangkero South prospect shares a similar geological setting with the Veridian lead.

Two deterministic gas and oil calculations were made using a simple slab geometric model to reflect the probability of stacked reservoirs, each up to approximately 10 metres in thickness.

Model 1 (Nangs60m.xls)

Map: Palaeocene (linked fault gridding)

Net Pay: 60m (based on Poonboon 1 using permeability cut-off of 10 md).

Porosity Average: 21.41% (from analysis of Poonboon 1).

Hydrocarbon saturation: 70%

Recovery factor (gas): 70%

Model 2 (Nang100m.xls)

Map: Palaeocene linked fault gridding)

Net Pay: 100m (based on Poonboon 1 using permeability cut-off 1 md).

Porosity Average: 19.38% (from analysis of Poonboon 1).

Hydrocarbon saturation: 65% (to reflect lower value in lower permeability sandstones)

Recovery factor (gas): 65% (to reflect lower value from lower permeability sandstones)

Recovery factor (oil): 20% (to reflect lower value from lower permeability sandstones)

The greater closure of Nangkero South on a Palaeocene map with unlinked faults is encompassed by the closure of Veridian (see deterministic calculation for Veridian, model 3). For a probabilistic potential reserve calculation refer to the model for Veridian.

505020

NANGKERO SOUTH - T/25P

EVCM Palaeocene - Model 1

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2065	2556.7			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2070	2566.7	10	0.05	2.94E+06	3.39	2.37	1.66	1.84	0.24	1.80	0.45
2080	2585	28.3	1.89	1.13E+08	130.63	91.44	64.01	70.72	9.14	69.28	17.32
2090	2603.3	46.6	6.32	3.79E+08	437.64	306.35	214.44	236.92	30.63	232.11	58.03
2100	2621.7	65	11.78	7.07E+08	815.68	570.97	399.68	441.57	57.10	432.62	108.15
2110	2640	83.3	19.16	1.15E+09	1326.28	928.40	649.88	717.99	92.84	703.43	175.86

RISKED SALES GAS (PJ)	83.37
RISKED REC OIL (MMSTB)	14.18

Input Parameters	
Net Pay (m)	60
Porosity	0.2141
Sh	0.7
Bg	218
Boi	1.54
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.7
Recovery factor (oil)	0.25
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	72%
SOURCE OIL	50%
SEAL	36%
RESERVOIR	64%
STRUCTURE	70%
CHANCE OF SUCCESS GAS	11.61%
CHANCE OF SUCCESS OIL	8.06%

Notes: Net pay is based on petrophysical analysis of Poonboon 1 using permeability cut-off of 10 md.

NANGS60M.XLS 9/19/95
R J Suttill

505021

NANGKERO SOUTH - T/25P

EVCM Palaeocene - Model 2

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2065	2556.7			0.00E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2070	2566.7	10	0.05	4.90E+06	**4.75**	**3.09**	**2.16**	**2.39**	**0.31**	**2.52**	**0.50**
2080	2585	28.3	1.89	1.89E+08	**182.99**	**118.95**	**83.26**	**91.99**	**11.89**	**97.06**	**19.41**
2090	2603.3	46.6	6.32	6.32E+08	**613.08**	**398.50**	**278.95**	**308.19**	**39.85**	**325.16**	**65.03**
2100	2621.7	65	11.78	1.18E+09	**1142.67**	**742.73**	**519.91**	**574.41**	**74.27**	**606.04**	**121.21**
2110	2640	83.3	19.16	1.92E+09	**1857.96**	**1207.67**	**845.37**	**933.98**	**120.77**	**985.42**	**197.08**

RISKED SALES GAS (PJ)	**108.46**
RISKED REC OIL (MMSTB)	**15.89**

Notes: Net pay is based on petrophysical analysis of Poonboon 1 using permeability cutoff of 1 md

Input Parameters	
Net Pay (m)	100
Porosity	0.1938
Sh	0.65
Bg	218
Boi	1.54
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	**%**
SOURCE GAS	72%
SOURCE OIL	50%
SEAL	36%
RESERVOIR	64%
STRUCTURE	70%
CHANCE OF SUCCESS GAS	**11.61%**
CHANCE OF SUCCESS OIL	**8.06%**

TOURVILLE LEAD

The primary objectives for Tourville are Lower to Middle M diversus fluvial channel sandstone reservoirs.

Three deterministic gas and oil in place calculations were made using a simple slab geometric model to reflect the probability of stacked reservoirs. The following parameters are varied between the models, largely to reflect the uncertainty in the net pay likely at Tourville.

	Model 1 Tourmod1.xls	Model 2 Tourmod2.xls	Model 3 Tourmod3.xls
Net Pay	30m	45m	60m
Porosity	23%	21%	19%
Sh	70%	65%	60%
Recovery (gas)	70%	65%	60%
Recovery (oil)	25%	20%	20%

A probabilistic analysis was also undertaken using REP (Reserve Evaluation Programme, Version 3) to calculate potential gas reserves. A problem calculating gross rock volume from area and contour values using the REP program restricted the handling of the probability distribution of gross rock volumes. Therefore a polygonal probability distribution of gross rock volume was sammpled from the deterministic calculations as follows:

Probability	GRV (mmcm)	Comments
P100	100	
P90	227	2340 m contour, 30 metres of net pay (Model 1)
P50	536	2390 m contour, 30 metres of net pay (Model 1)
P10	1120	2410 m contour (LCC), 45 metres of net pay (Model 2)
PO	2980	Estimated volume based on combined closure with Actaeon.

Other input variables are shown on the attached REP output.

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TOURVILLE - T/25P

EVCM Lower to Middle M diversus - Model 1

RESERVES CALCULATION (Simple Slab Model)

Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2270			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2280	10	0.127	3.81E+06	4.59	3.21	2.25	2.49	0.32	2.61	0.65
2290	20	0.44	1.33E+07	16.02	11.21	7.85	8.67	1.12	9.09	2.27
2300	30	0.84	2.51E+07	30.19	21.14	14.79	16.35	2.11	17.14	4.28
2310	40	1.26	3.78E+07	45.52	31.87	22.31	24.65	3.19	25.84	6.46
2320	50	1.89	5.68E+07	68.45	47.91	33.54	37.06	4.79	38.85	9.71
2330	60	3.90	1.17E+08	141.06	98.74	69.12	76.36	9.87	80.07	20.02
2340	70	7.55	2.27E+08	273.04	191.13	133.79	147.81	19.11	154.99	38.75
2350	80	10.86	3.26E+08	392.73	274.91	192.44	212.61	27.49	222.92	55.73
2360	90	13.35	4.01E+08	482.87	338.01	236.61	261.41	33.80	274.09	68.52
2370	100	15.28	4.58E+08	552.48	386.74	270.72	299.09	38.67	313.60	78.40
2380	110	16.67	5.00E+08	602.63	421.84	295.29	326.24	42.18	342.07	85.52
2390	120	17.88	5.36E+08	646.64	452.65	316.85	350.07	45.26	367.05	91.76
2400	130	23.32	7.00E+08	843.17	590.22	413.15	456.46	59.02	478.61	119.65
2410	140	24.86	7.46E+08	898.78	629.15	440.40	486.56	62.91	510.17	127.54

RISKED SALES GAS (PJ)	**32.44**
RISKED REC OIL (MMSTB)	**6.75**

Input Parameters	
Net Pay (m)	30
Porosity	0.23
Sh	0.7
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.7
Recovery factor (oil)	0.25
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	63%
SOURCE OIL	50%
SEAL	35%
RESERVOIR	48%
STRUCTURE	63%
CHANCE OF SUCCESS GAS	**6.67%**
CHANCE OF SUCCESS OIL	**5.29%**

Notes:

TOURMOD1.XLS 9/20/95
R J Suttill

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TOURVILLE - T/25P

EVCM Lower to Middle M diversus - Model 2

RESERVES CALCULATION (Simple Slab Model)

Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2270			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2280	10	0.127	5.72E+06	5.84	3.80	2.66	2.94	0.38	3.32	0.66
2290	20	0.44	1.99E+07	20.37	13.24	9.27	10.24	1.32	11.56	2.31
2300	30	0.84	3.76E+07	38.40	24.96	17.47	19.30	2.50	21.80	4.36
2310	40	1.26	5.67E+07	57.90	37.63	26.34	29.10	3.76	32.86	6.57
2320	50	1.89	8.52E+07	87.05	56.58	39.61	43.76	5.66	49.41	9.88
2330	60	3.90	1.76E+08	179.39	116.60	81.62	90.18	11.66	101.83	20.37
2340	70	7.55	3.40E+08	347.24	225.70	157.99	174.55	22.57	197.10	39.42
2350	80	10.86	4.89E+08	499.45	324.64	227.25	251.07	32.46	283.50	56.70
2360	90	13.35	6.01E+08	614.09	399.16	279.41	308.70	39.92	348.58	69.72
2370	100	15.28	6.88E+08	702.61	456.70	319.69	353.20	45.67	398.82	79.76
2380	110	16.67	7.50E+08	766.39	498.16	348.71	385.26	49.82	435.03	87.01
2390	120	17.88	8.05E+08	822.36	534.53	374.17	413.39	53.45	466.79	93.36
2400	130	23.32	1.05E+09	1072.29	696.99	487.89	539.03	69.70	608.66	121.73
2410	140	24.86	1.12E+09	1143.02	742.96	520.07	574.58	74.30	648.81	129.76

RISKED SALES GAS (PJ)	38.31
RISKED REC OIL (MMSTB)	6.87

Input Parameters	
Net Pay (m)	45
Porosity	0.21
Sh	0.65
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	63%
SOURCE OIL	50%
SEAL	35%
RESERVOIR	48%
STRUCTURE	63%
CHANCE OF SUCCESS GAS	6.67%
CHANCE OF SUCCESS OIL	5.29%

Notes:

TOURMOD2.XLS 9/20/95
R J Suttill

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TOURVILLE - T/25P

EVCM Lower to Middle M diversus - Model 3

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
	2270			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2280	10	0.127	7.62E+06	6.50	3.90	2.73	3.02	0.39	3.69	0.74
	2290	20	0.44	2.66E+07	22.68	13.61	9.53	10.53	1.36	12.88	2.58
	2300	30	0.84	5.01E+07	42.76	25.65	17.96	19.84	2.57	24.27	4.85
	2310	40	1.26	7.55E+07	64.47	38.68	27.08	29.92	3.87	36.59	7.32
	2320	50	1.89	1.14E+08	96.94	58.16	40.71	44.98	5.82	55.02	11.00
	2330	60	3.90	2.34E+08	199.76	119.86	83.90	92.69	11.99	113.39	22.68
	2340	70	7.55	4.53E+08	386.67	232.00	162.40	179.42	23.20	219.48	43.90
	2350	80	10.86	6.52E+08	556.16	333.70	233.59	258.07	33.37	315.69	63.14
	2360	90	13.35	8.01E+08	683.82	410.29	287.21	317.31	41.03	388.16	77.63
	2370	100	15.28	9.17E+08	782.40	469.44	328.61	363.05	46.94	444.11	88.82
	2380	110	16.67	1.00E+09	853.42	512.05	358.44	396.01	51.21	484.43	96.89
	2390	120	17.88	1.07E+09	915.74	549.44	384.61	424.92	54.94	519.80	103.96
	2400	130	23.32	1.40E+09	1194.05	716.43	501.50	554.07	71.64	677.78	135.56
	2410	140	24.86	1.49E+09	1272.81	763.68	534.58	590.61	76.37	722.48	144.50

RISKED SALES GAS (PJ)	**39.38**
RISKED REC OIL (MMSTB)	**7.65**

Input Parameters	
Net Pay (m)	60
Porosity	0.19
Sh	0.6
Bg	212
Boi	1.48
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.6
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	63%
SOURCE OIL	50%
SEAL	35%
RESERVOIR	48%
STRUCTURE	63%
CHANCE OF SUCCESS GAS	**6.67%**
CHANCE OF SUCCESS OIL	**5.29%**

Notes:

505026

Prospect Evaluation - Recoverable Gas

Country:	AUSTRALIA	Name:	TOURVILLE
State:	TASMANIA	Segment:	L-M M DIVERSUS
Block:	T/25P	Classification:	unassigned

Input Data

Variable	Unit	Shape	min	P90	P50	P10	max	mode
GRV	mmcm	poly	100	227	536	1120	2980	602
Deg. of fill	%	single	100	100	100	100	100	100
Net-to-gross	%	single	100	100	100	100	100	100
Porosity	%	triang	19.0	19.9	21.0	22.1	23.0	21.0
Sw	%	triang	30.0	32.2	35.0	37.8	40.0	35.0
FVF (1/Bg)	vol/vol	single	212	212	212	212	212	212
Gas rec fac	%	triang	60.0	62.2	65.0	67.8	70.0	65.0

Risk Factors

Play Chance:	50	Prospect Specific Chance:	13
Reservoir:	80	Trap:	70
Source:	90	Reservoir:	60
Regional Seal:	70	Seal:	50
		Migration:	63

Overall Prospect Success Chance: 6.67

Reserves Summary

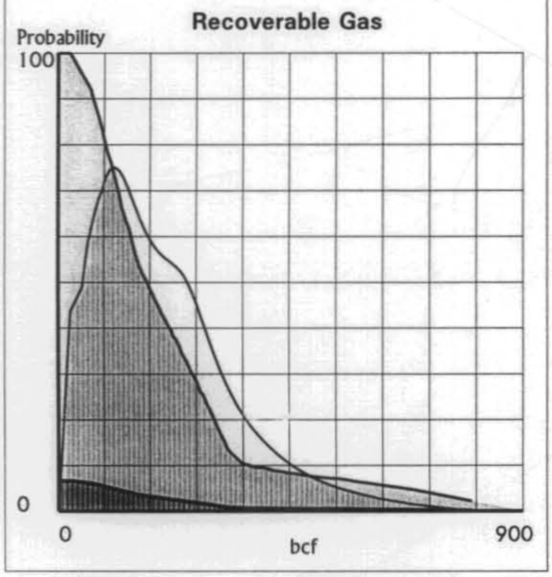
units: bcf

	In-Place	Recoverable Gas			
	Gross	Gross		Net	
	unrisked	unrisked	risked	unrisked	risked
P90	229	148	0	68.5	0
P50:	579	377	0	174	0
P10	1240	805	0	372	0
Mean:	738	480	32.0	222	14.8

Production Working Interest: 46.25

Exploration Working Interest: 46.25

Production Working Interest is used to calculate net volumes



min net unrisked: 23.7 max net unrisked: 801

Comments:

5 cm

REP file: c:\rep\data\t25p\tourville.ppr
version: 3.03

Author: rjs
Date: 20/09/95

3.03

PROSPECT ADEQUACY WORKSHEET

"MINIMUM GEOLOGIC CASE"

Prospect Name: TOURVILLE - L - M. M. diversus Assessment Date: SEPT 95

Assessor: R. J. SUTTILL Overall Chance of Success 6.67% .

Risk Severity

		High	Moderate	Low	
CONFIDENCE LEVEL	High	0-.3	0.4-0.8	.9-1.0	Lots of Data/ Good Quality
	Moderate	.1-.4	.4-.7	.7-.9	
	Low	.2-.5	.5-.6	.6-.7	Sparse Data/ Poor Quality

Conclusions Interpreted from Data

Bad News Good News

REGIONAL PLAY CONSIDERATIONS

Presence of Reservoir Facies
COS: .8
Comments:

Presence of Adequate Source
(Richness + Maturity)
COS: .9
Comments:

Presence of Top Seal
COS: .7
Comments:

Timing and Preservation
COS: .9
Comments:

LOCAL PROSPECT CONSIDERATIONS

Adequate Reservoir Quality
COS: .6 .48
Comments:

Adequate Source Migration
COS: .7 .63.
Comments:

Fault Seal
COS: .5 .35
Comments:

Presence of Trap
COS: .7 .63
Comments

PRESENCE OF RESERVOIR FACIES ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Chance of reservoir missing by facies change, non-deposition, truncation or faulting	none	possible	probable
• Prospect located in favourable reservoir depositional fairway	yes	near margin	no
• Reservoir facies interpreted as being continuous over prospect	yes	questionable	no
• Probability of multiple reservoirs	yes	possible	no
• ~~Seismic modelling (if applicable)~~ suggests favourable reservoir facies	~~yes~~	~~questionable~~	~~does not support~~
• ~~Presence of amplitude anomaly is~~ supported by rock properties analysis in DHI trend	~~strong support~~	weak support	~~none~~

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Number of wells present within prospective fairway (trend) <20 kilometres from prospect	≥ 2	1	none
• Seismic data quality	good	fair	poor
• Seismic data coverage (Consider impact of well control)	good	adequate	sparse
• Isopachous and/or facies map of prospective interval	yes/prospect and regional	yes/prospect only	no, or incomplete
• Reservoir interval tied to seismic lines from well control and correlated onto prospect	yes	no	unable to correlate
• Reservoir model consistent with analog field(s) in trend	yes	slight difference	conceptual model only

ADEQUACY OF RESERVOIR QUALITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Adequate porosity and permeability encountered when facies penetrated	almost always	usually	often absent
• Clastic reservoir composition	Quartzose < 10% clay or ductile material	Arkosic > 10%-<20% clay or ductile material	Lithic or sublithic > 20% clay or ductile material
• ~~Carbonate reservoir composition~~	~~dolo~~	~~dolo/LS~~	~~LS~~
• Grain size/sorting	fn-med/well sorted	v. fn-fn/ moderately sorted	v. fn-coarse/poorly sorted
• Mapped porosity/fracture fairway correlates to adequate permeability	almost always	usually	no
• Effect of diagenesis on reservoir quality	almost always enhances/no effect	usually enhances/no effect	usually detrimental

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Nearby wells in trend (less than 20 kilometres) demonstrate adequate quality porosity/permeability for HC production	yes/ ≥ 2 wells	yes/ < 2 wells	no/no wells
• ~~Seismic models (where applicable)~~ calibrated to reservoir/non-reservoir rock properties	~~yes/properties~~ measured	yes/properties estimated	no/no model
• Nearby DST or production test of reservoir indicates sustainable economic deliverability	yes/ ≤ 20 kms	yes > 20 kms	no ≤ 20 kms
• Fracture analysis run (where ~~applicable)~~	yes/positive results	yes/but not ~~conclusive~~	no, or negative ~~results~~

SOURCE RICHNESS AND MATURITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Original TOC level	high/ ≥3.0%	moderate/1-2.9%	low/ < 1%
• Original hydrogen index level	high/ ≥ 300	moderate/200-299	low/ < 200
• Source depositional environment	favourable	marginal	unfavourable
• Nearby field(s) demonstrate rich source rocks in area	yes	maybe	no
• Maturity within drainage area. (Indicative only, depends on source models).			
Oil Prospects (Rv)	0.7-0.9	0.5-0.7 or 0.9-1.1	<0.5 or >1.1
Gas Prospects (R_v)	>1.3	1.0-1.3	<1.0
• Nearby field/well penetration	Numerous oil/rich liquid shows or production	Lean gas/undrilled	Several wells, no shows

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Availability of geochem data from core, cuttings, and/or log data	within prospective source bed drainage area	outside prospective source bed drainage area	unavailable (richness postulated)
• Reservoired HCs in play area matched to the identified source bed horizon	matched	not matched	source beds poorly identified
• Thermal Model of drainage area	well constrained by down hole temperature and maturity data	unreliable/sparse data/conflicting measurements	no down hole measurements/ postulated from paleo-environment
• Source maturity proven in play	yes	uncertain	no

SOURCE MIGRATION PATHWAYS AND TIMING ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Relationship of source beds to reservoir	indigenous/in juxtaposition/ stratigraphically lower	stratigraphically much lower/ pathway uncertain	stratigraphically much higher/ pathways uncertain
• Potential migration avenues present and focused towards prospect	yes	questionable	no
• Adequate drainage area for prospect	yes	questionable	inadequate
• Reservoir pressure (at migration)	underpressured	balanced	overpressured
• Timing of trap formation vs peak HC maturation	trap predates maturation or synchronous	trap slightly postdates maturation	trap considerably postdates maturation but may be filled by spill from earlier accumulations
• Thick source rocks or multiple sources reaching peak maturation over long time period	yes	uncertain	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Well/seismic data support interpretation of migration pathways	yes, strongly	possibly	inconclusive or poorly
• Well/seismic data quality	good	fair	poor
• Regional structure maps	on source beds or decollement surface and reservoir	on top reservoir only	no regional map
• Analog fields(s)	< 20 kms	> 20 kms	none
• Isopachs or datumed seismic sections indicate trap predates maturation	yes	uncertain	no
• Structural complexity makes timing uncertain	no	questionable	yes

REGIONAL TOP SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Top seal thickness and continuity	thick/continuous	thin/somewhat continuous	unknown
• Evidence of seal missing by facies change, non-deposition, truncation, or broken by fracturing	no	possible	probable
• Seal lithology composition	shale or evaporite	silty or limy shale	carbonates or silty

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of seal lithologies and continuity	adequate	marginal	not adequate

PROSPECT-SPECIFIC/FAULT SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Non-associated fault trap ~~(independent)~~	4-way closure	updip closure against salt/strat (combination, unconformity, diagenetic)	strat (facies change)
• Associated fault trap (dependent)			
- trap type	high-side/faulted closure	low-side closure <35% sand in prospective interval	fault intersection/ low-side closure >35% sand in prospective interval
- fault position relative to reservoir	buried, dies out in thick overlying sh	buried, dies out in overlying sd/sh sequence	intersects surface/post-dates trap formation
- facies relationship across fault	sd vs sh	thin sd/sh sequence vs thin sd/sh sequence	massive sd/sh sequence vs massive sd/sh sequence
• Presence of amplitude anomaly supported by rock properties analysis	strong support	weak support	none
• Fault leak apparent in nearby analogous traps	no	uncertain	yes

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of fault orientation, displacement and high/lowside lithologies	adequate	marginal	not adequate
• Fault plane profile of sealing faults completed	yes, all faults	most critical fault only	none
• Cross fault juxtapositions modelled for traps	yes, all faults	most critical faults only	none

TRAP CLOSURE ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Trap configuration and imagability	simple/easy	complex/possible	complex/difficult
• Trap style consistent with regional analogs	consistent	somewhat consistent	not consistent
• ~~Sequence stratigraphy concepts used in mapping prospect~~	~~yes~~	~~to some degree~~	~~no~~
• Shallower mapping horizon(s) also demonstrate trap presence	yes	somewhat	no
• ~~Trap geometry interpretation balanced in compressional setting~~	~~yes/good balance~~	~~yes/fair balance~~	~~no, or poor~~ balance
• Multiple horizons and critical fault planes mapped	yes	horizons or faults mapped, but not both	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Seismic data quality	good	fair	poor
• Seismic data coverage across prospect	3D coverage or dense, recent vintage 2D coverage	moderate coverage of recent vintage 2D data	old data and/or sparse coverage
• Dip line and strike line ties	emphatically	some discrepancies between dip and strike lines	misties at critical components of trap
• Seismic data over prospect tied to synthetic of well penetrating objective interval within 20 kms of prospect	yes	yes/ > 20 kms	no
• Velocity control wells within 20 kms of prospect in same geologic trend	≥ 2 wells	1 well	none

TIMING AND PRESERVATION

	RISK SEVERITY		
	LOW	MODERATE	HIGH
• Tectonic alteration post trap formation and charge	none	Minor movement on non-critical faults. Minor tilting/warping.	Widespread movements on faults. Major tilting and/or folding. Volcanic activity. Ongoing tectonic activity.
• Nature of current stress regime	neutral	compressional	tensional/wrench
• Flushing/water washing*	Poor aquifer support, little ground water movement. No evidence of detrimental water washing in the basin.	Strong aquifer support but little water movement. Some evidence of detrimental water washing.	Strong aquifer support and active water movement interpreted. Well evidence supports detrimental effects.
• Biodegradation	Reservoir temperature >80°C. No connection to meteoric ground water. No evidence of bio-degradation.	Reservoir temperature 60-80°C. Some evidence of bio-degradation in the basin.	Reservoir temperature <60°C. Influx of meteoric waters interpreted. Strong well evidence of bio-degradation.
• High temperature cracking of reservoired hydrocarbons	Reservoir $<R_v$ 0.7 for oil, 1.0 for wet gas. Target hc. reservoired in nearby wells under similar conditions.	Reservoir between R_v 0.7-1.3. Only "more mature" hydrocarbons found at similar levels.	Reservoir R_v >1.3. Temperatures known to be hostile to the preservation of target hydrocarbons.

* Evaluate this criteria carefully. Water washing may enhance oil plays by removing gas, but long exposure may result in heavy, waxy crudes.

TIMING AND PRESERVATION - CONT'D

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Timing of post-charge tectonic alteration	Supported by well data, seismic data and regional models.	Tectonic history well understood but timing of hydrocarbon charge poorly understood (or vice versa).	Post charge tectonic alteration inferred from regional analogs only. No evidence for or against.
• Temperature profiles at prospect well constrained	Temperature depth profiles available from wells within 20 kms extending below reservoir target depth.	Some temperature depth profiles available within the basin but >20 kms away/unreliable/ too shallow.	Temperature profiles inferred from regional models only.
• Water washing	Well data and regional models support analysis of fluid movement. Recovered hydrocarbons within 20 kms support model.	Regional models suggest it may be an issue, but not confirmed by well results (or vice versa).	No relevant data.
• Bio-degradation	Good temperature data. Hydrocarbons recovered within the same play within 20 kms support analysis.	Conflicting information from well data. Poor understanding of regional models.	No relevant data.
• Hydrocarbon cracking	Burial history analysis and heat flow analysis conducted. Nearby wells support analysis at target depth.	No detailed analysis. Nearby wells are shallower/in different geological conditions.	No relevant data.

VERIDIAN LEAD

The primary objectives for Veridian are Palaeocene sandstone reservoirs of probable distributary channel facies similar to those encountered in Poonboon 1. The Nangkero South lead shares a similar geological setting with the Veridian lead.

Initially three deterministic gas and oil in place calculations were made all using a simple slab geometric model to reflect the probability of stacked reservoirs, each up to 10 metres in thickness.

<u>Model 1 (Verid60m.xls)</u>

Map: Palaeocene (linked fault gridding)

Net pay: 60m (based on Poonboon 1 using permeability cut-off of 10md)

Porosity Average: 21.41% (from analysis of Poonboon 1)

Hydrocarbon saturation: 70%

Recovery factor (gas): 70%

<u>Model 2 (Veri100m.xls)</u>

Map: Palaeocene (linked fault gridding)

Net pay: 100m (based on Poonboon 1 using permeability cut-off of 1md)

Porosity Average: 19.38% (from analysis of Poonboon 1)

Hydrocarbon saturation: 65% (to reflect lower value in lower permeability sandstones)

Recovery factor (gas): 65% (to reflect lower value in lower permeability sandstones)

<u>Model 3 (Verismoo.xls)</u>

Map: Palaeocene (unlinked fault gridding, enlarged closure to include Nangkero South)

Net Pay: 100m (based on Poonboon 1 using permeability cut-off of 1md)

Porosity Average: 19.38% (from analysis of Poonboon 1)

Hydrocarbon saturation: 65%

Recovery factor (gas): 65% (to reflect lower value in lower permeability sandstones)

A probabilistic analysis was also undertaken using REP (Reserve Evaluation Programme, Version 3) to calculate potential gas reserves. A problem calculating gross rock volume from area and contour values using the REP program restricted the handling of the probability distribution of gross rock volumes. Therefore a polygonal probability distribution for gross rock volume was sampled from the deterministic calculations as follows:

Probability	GRV (mmcm)	Comments
P100	100	
P90	437	2090 ms contour, 60 metres net pay linked fault map, Veridian closure only
P50	1043	2100 ms contour, 60 metres net pay linked fault map, Veridian closure only
P10	2900	2100 ms contour, 100 metres net pay unlinked fault map, Veridian closure only
P1	4830	2110 ms contour (LCC), 100 metres net pay unlinked fault map, Veridian and Nangkero South.
P0	6000	

Degree of Fill and Net to Gross ratio were set to 100% as the variation of these parameters is included in that of the gross rock volume.

A triangular porosity distribution was utilised based on log analysis results from Poonboon 1 as follows:

Probability	Porosity	Comments
Min	19.38%	Based on 1 md cut-off at Poonboon 1
P50	21.41%	Based on 10 md cut-off at Poonboon 1
Max	26.91%	Based on 100 md cut-off at Poonboon 1

A triangular water saturation distribution of 35%, 30% and 25% was estimated.

A single value of 1/Bg was input based on Pelican Field gas composition corrected for depth.

A triangular gas recovery factor of 60%, 70% and 80% was estimated.

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VERIDIAN - T/25P

EVCM Palaeocene - Model 1

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2045	2520			0.00E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2050	2530	10	0.02	9.00E+05	**1.04**	**0.73**	**0.51**	**0.56**	**0.07**	**0.55**	**0.14**
2060	2548.3	28.3	0.15	9.12E+06	**10.52**	**7.37**	**5.16**	**5.70**	**0.74**	**5.61**	**1.40**
2070	2566.7	46.7	0.54	3.23E+07	**37.24**	**26.07**	**18.25**	**20.16**	**2.61**	**19.85**	**4.96**
2080	2585	65	2.66	1.59E+08	**183.79**	**128.65**	**90.06**	**99.50**	**12.87**	**97.97**	**24.49**
2090	2603.3	83.3	7.28	4.37E+08	**503.68**	**352.58**	**246.80**	**272.67**	**35.26**	**268.49**	**67.12**
2100	2621.7	101.7	15.07	9.04E+08	**1043.15**	**730.20**	**511.14**	**564.72**	**73.02**	**556.05**	**139.01**
2110	2640	120	20.09	1.21E+09	**1390.87**	**973.61**	**681.52**	**752.96**	**97.36**	**741.40**	**185.35**

RISKED SALES GAS (PJ)	**87.43**
RISKED REC OIL (MMSTB)	**14.95**

Input Parameters	
Net Pay (m)	60
Porosity	0.2141
Sh	0.7
Bg	218
Boi	1.53
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.7
Recovery factor (oil)	0.25
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	72%
SOURCE OIL	50%
SEAL	36%
RESERVOIR	64%
STRUCTURE	70%
CHANCE OF SUCCESS GAS	**11.61%**
CHANCE OF SUCCESS OIL	**8.06%**

Notes: Net pay is based on petrophysical analysis of Poonboon 1 using permeability cut-off of 10 md.

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VERIDIAN - T/25P

EVCM Palaeocene - Model 2

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2040	2512			0.00E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2050	2530	18	0.02	1.50E+06	**1.45**	**0.95**	**0.66**	**0.73**	**0.09**	**0.78**	**0.16**
2060	2548.3	36.3	0.15	1.52E+07	**14.74**	**9.58**	**6.71**	**7.41**	**0.96**	**7.86**	**1.57**
2070	2566.7	54.7	0.54	5.38E+07	**52.17**	**33.91**	**23.74**	**26.23**	**3.39**	**27.81**	**5.56**
2080	2585	73	2.66	2.66E+08	**257.47**	**167.36**	**117.15**	**129.43**	**16.74**	**137.24**	**27.45**
2090	2603.3	91.3	7.28	7.28E+08	**705.60**	**458.64**	**321.05**	**354.70**	**45.86**	**376.12**	**75.22**
2100	2621.7	109.7	15.07	1.51E+09	**1461.33**	**949.86**	**664.90**	**734.60**	**94.99**	**778.96**	**155.79**
2110	2640	128	20.09	2.01E+09	**1948.44**	**1266.48**	**886.54**	**979.46**	**126.65**	**1038.61**	**207.72**

RISKED SALES GAS (PJ)	**113.74**
RISKED REC OIL (MMSTB)	**16.75**

Input Parameters	
Net Pay (m)	100
Porosity	0.1938
Sh	0.65
Bg	218
Boi	1.53
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	72%
SOURCE OIL	50%
SEAL	36%
RESERVOIR	64%
STRUCTURE	70%
CHANCE OF SUCCESS GAS	**11.61%**
CHANCE OF SUCCESS OIL	**8.06%**

Notes: Net pay is based on petrophysical analysis of Poonboon 1 using permeability cutoff of 1 md

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VERIDIAN - T/25P

EVCM Palaeocene - Model 3

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
2055	2538.3			0.00E+00	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
2060	2548.3	10	0.03	2.80E+06	**2.72**	**1.76**	**1.24**	**1.36**	**0.18**	**1.44**	**0.29**
2070	2566.7	28.4	0.35	3.50E+07	**33.94**	**22.06**	**15.44**	**17.06**	**2.21**	**18.05**	**3.61**
2080	2585	46.7	1.64	1.64E+08	**159.14**	**103.44**	**72.41**	**80.00**	**10.34**	**84.62**	**16.92**
2090	2603.3	65	12.62	1.26E+09	**1223.64**	**795.37**	**556.76**	**615.11**	**79.54**	**650.63**	**130.13**
2100	2621.7	83.4	28.97	2.90E+09	**2809.19**	**1825.98**	**1278.18**	**1412.16**	**182.60**	**1493.69**	**298.74**
2110	2640	101.7	48.29	4.83E+09	**4682.96**	**3043.92**	**2130.75**	**2354.08**	**304.39**	**2489.99**	**498.00**

RISKED SALES GAS (PJ)	**273.36**
RISKED REC OIL (MMSTB)	**40.16**

Input Parameters	
Net Pay (m)	100
Porosity	0.1938
Sh	0.65
Bg	218
Boi	1.54
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	72%
SOURCE OIL	50%
SEAL	36%
RESERVOIR	64%
STRUCTURE	70%
CHANCE OF SUCCESS GAS	**11.61%**
CHANCE OF SUCCESS OIL	**8.06%**

Notes: Net pay is based on petrophysical analysis of Poonboon 1 using permeability cutoff of 1 md
Mapping based on closure gridded without linking faults

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Prospect Evaluation - Recoverable Gas

Country:	AUSTRALIA	Name:	VERIDIAN
State:	TASMANIA	Segment:	PALAEOCENE
Block:	T/25P	Classification:	unassigned

Input Data

Variable	Unit	Shape	min	P90	P50	P10	max	mode
GRV	mmcm	poly	100	437	1043	2900	5044	1252
Deg. of fill	%	single	100	100	100	100	100	100
Net-to-gross	%	single	100	100	100	100	100	100
Porosity	%	triang	19.4	20.6	22.4	24.9	26.9	21.4
Sw	%	triang	25.0	27.2	30.0	32.8	35.0	30.0
FVF (1/Bg)	vol/vol	single	218	218	218	218	218	218
Gas rec fac	%	triang	60.0	64.5	70.0	75.5	80.0	70.0

Risk Factors

Play Chance:	52	Prospect Specific Chance:	22
Reservoir:	80	Trap:	70
Source:	90	Reservoir:	80
Regional Seal:	72	Seal:	50
		Migration:	80

Overall Prospect Success Chance: 11.6

Reserves Summary

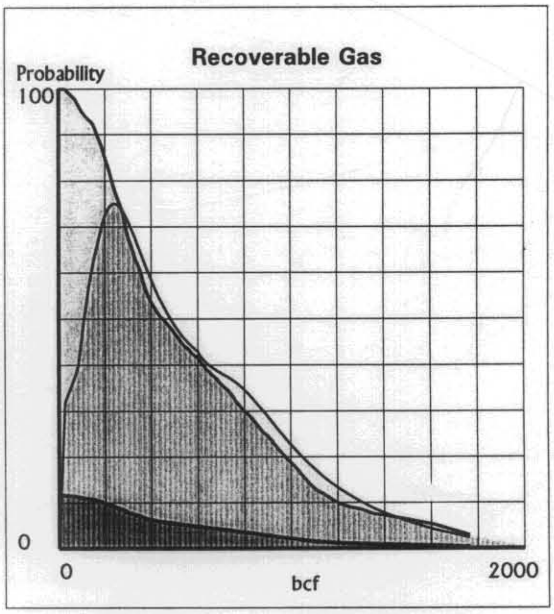
units: bcf

	In-Place	Recoverable Gas			
	Gross	Gross		Net	
	unrisked	unrisked	risked	unrisked	risked
P90	518	360	0	166	0
P50:	1381	971	0	449	0
P10	3746	2595	421	1200	195
Mean:	1883	1319	153	610	70.8

Production Working Interest: 46.25

Exploration Working Interest: 46.25

Production Working Interest is used to calculate net volumes



min net unrisked: 26.9 max net unrisked: 2039

Comments:

5 cm

REP file: c:\rep\data\t25p\veridian.ppr
version: 3.03

Author: rjs
Date: 19/09/95

3.03

PROSPECT ADEQUACY WORKSHEET
"MINIMUM GEOLOGICAL CASE"

Prospect Name: VERIDIAN

Assessment Date: SEPT 95

Assessor: R.J. SUTTILL

Overall Chance of Success 11.61 gas.

Risk Severity

CONFIDENCE LEVEL	High	Moderate	Low	
High	0-.3	0.4-0.8	.9-1.0	Lots of Data/ Good Quality
Moderate	.1-.4	.4-.7	.7-.9	
Low	.2-.5	.5-.6	.6-.7	Sparse Data/ Poor Quality

Conclusions Interpreted from Data

Bad News — Good News

REGIONAL PLAY CONSIDERATIONS

Presence of Reservoir Facies
COS: 0.8
Comments:

Presence of Adequate Source (Richness + Maturity)
COS: 0.9
Comments:

Presence of Top Seal
COS: 0.8
Comments:

Timing and Preservation
COS: 0.9
Comments:

LOCAL PROSPECT CONSIDERATIONS

Adequate Reservoir Quality
COS: 0.8 — 0.64
Comments:

Adequate Source Migration
COS: 0.8 — 0.72
Comments:

Fault Seal
COS: 0.5 — 0.4
Comments:

Presence of Trap
COS: 0.7 — 0.63
Comments

PRESENCE OF RESERVOIR FACIES ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Chance of reservoir missing by facies change, non-deposition, truncation or faulting	none	possible	probable
• Prospect located in favourable reservoir depositional fairway	yes	near margin	no
• Reservoir facies interpreted as being continuous over prospect	yes	questionable	no
• Probability of multiple reservoirs	yes	possible	no
• Seismic modelling (if applicable) suggests favourable reservoir facies	yes	questionable	does not support
• Presence of amplitude anomaly is supported by rock properties analysis in DHI trend	strong support	weak support	none

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Number of wells present within prospective fairway (trend) <20 kilometres from prospect	≥ 2	1	none
• Seismic data quality	good	fair	poor
• Seismic data coverage (Consider impact of well control)	good	adequate	sparse
• Isopachous and/or facies map of prospective interval	yes/prospect and regional	yes/prospect only	no, or incomplete
• Reservoir interval tied to seismic lines from well control and correlated onto prospect	yes	no	unable to correlate
• Reservoir model consistent with analog field(s) in trend	yes	slight difference	conceptual model only

ADEQUACY OF RESERVOIR QUALITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Adequate porosity and permeability encountered when facies penetrated	almost always	usually	often absent
• Clastic reservoir composition	Quartzose < 10% clay or ductile material	Arkosic > 10%-<20% clay or ductile material	Lithic or sublithic > 20% clay or ductile material
• ~~Carbonate reservoir composition~~	~~dolo~~	~~dolo/LS~~	~~LS~~
• Grain size/sorting	fn-med/well sorted	v. fn-fn/ moderately sorted	v. fn-coarse/poorly sorted
• Mapped porosity/~~fracture~~ fairway correlates to adequate permeability	almost always	usually	no
• Effect of diagenesis on reservoir quality	almost always enhances/no effect	usually enhances/no effect	usually detrimental

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Nearby wells in trend (less than 20 kilometres) demonstrate adequate quality porosity/permeability for HC production	yes/ ≥ 2 wells	yes/ < 2 wells	no/no wells
• ~~Seismic models (where applicable) calibrated to reservoir/non-reservoir rock properties~~	~~yes/properties measured~~	~~yes/properties estimated~~	~~no/no model~~
• Nearby DST or production test of reservoir indicates sustainable economic deliverability	yes/ ≤ 20 kms	yes > 20 kms	no ≤ 20 kms
• ~~Fracture analysis run (where applicable)~~	~~yes/positive results~~	~~yes/but not conclusive~~	~~no, or negative results~~

SOURCE RICHNESS AND MATURITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Original TOC level	high/ ≥3.0%	moderate/1-2.9%	low/ < 1%
• Original hydrogen index level	high/ ≥ 300	moderate/200-299	low/ < 200
• Source depositional environment	favourable	marginal	unfavourable
• Nearby field(s) demonstrate rich source rocks in area	yes	maybe	no
• Maturity within drainage area. (Indicative only, depends on source models).			
Oil Prospects (Rv)	0.7-0.9	0.5-0.7 or 0.9-1.1	<0.5 or >1.1
Gas Prospects (R_v)	>1.3	1.0-1.3	<1.0
• Nearby field/well penetration	Numerous oil/rich liquid shows or production	Lean gas/undrilled	Several wells, no shows

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Availability of geochem data from core, cuttings, and/or log data	within prospective source bed drainage area	outside prospective source bed drainage area	unavailable (richness postulated)
• Reservoired HCs in play area matched to the identified source bed horizon	matched	not matched	source beds poorly identified
• Thermal Model of drainage area	well constrained by down hole temperature and maturity data	unreliable/sparse data/conflicting measurements	no down hole measurements/ postulated from paleo-environment
• Source maturity proven in play	yes	uncertain	no

SOURCE MIGRATION PATHWAYS AND TIMING ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Relationship of source beds to reservoir	indigenous/in juxtaposition/ stratigraphically lower	stratigraphically much lower/ pathway uncertain	stratigraphically much higher/ pathways uncertain
• Potential migration avenues present and focused towards prospect	yes	questionable	no
• Adequate drainage area for prospect	yes	questionable	inadequate
• Reservoir pressure (at migration)	underpressured	balanced	overpressured
• Timing of trap formation vs peak HC maturation	trap predates maturation or synchronous	trap slightly postdates maturation	trap considerably postdates maturation but may be filled by spill from earlier accumulations
• Thick source rocks or multiple sources reaching peak maturation over long time period	yes	uncertain	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Well/seismic data support interpretation of migration pathways	yes, strongly	possibly	inconclusive or poorly
• Well/seismic data quality	good	fair	poor
• Regional structure maps	on source beds or decollement surface and reservoir	on top reservoir only	no regional map
• Analog fields(s)	< 20 kms	> 20 kms	none
• Isopachs or datumed seismic sections indicate trap predates maturation	yes	uncertain	no
• Structural complexity makes timing uncertain	no	questionable	yes

REGIONAL TOP SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Top seal thickness and continuity	thick/continuous	thin/somewhat continuous	unknown
• Evidence of seal missing by facies change, non-deposition, truncation, or broken by fracturing	no	possible	probable
• Seal lithology composition	shale or evaporite	silty or limy shale	carbonates or silty

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of seal lithologies and continuity	adequate	marginal	not adequate

PROSPECT-SPECIFIC/FAULT SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Non-associated fault trap (independent)	4-way closure	updip closure against salt/strat (combination, unconformity, diagenetic)	strat (facies change)
• Associated fault trap (dependent)			
- trap type	high-side/faulted closure	low-side closure <35% sand in prospective interval	fault intersection/ low-side closure >35% sand in prospective interval
- fault position relative to reservoir	buried, dies out in thick overlying sh	buried, dies out in overlying sd/sh sequence	intersects surface/post-dates trap formation
- facies relationship across fault don't know	sd vs sh	thin sd/sh sequence vs thin sd/sh sequence	massive sd/sh sequence vs massive sd/sh sequence
• Presence of amplitude anomaly supported by rock properties analysis	strong support	weak support	none
• Fault leak apparent in nearby analogous traps	no	uncertain	yes

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of fault orientation, displacement and high/lowside lithologies	adequate	marginal	not adequate
• Fault plane profile of sealing faults completed	yes, all faults	most critical fault only	none
• Cross fault juxtapositions modelled for traps	yes, all faults	most critical faults only	none

TRAP CLOSURE ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Trap configuration and imagability	simple/easy	complex/possible	complex/difficult
• Trap style consistent with regional analogs	consistent	somewhat consistent	not consistent
• Sequence stratigraphy concepts used in mapping prospect	yes	to some degree	no
• Shallower mapping horizon(s) also demonstrate trap presence	yes	somewhat ?	no
• Trap geometry interpretation balanced in compressional setting	yes/good balance	yes/fair balance	no, or poor balance
• Multiple horizons and critical fault planes mapped	yes	horizons or faults mapped, but not both	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Seismic data quality	good	fair	poor
• Seismic data coverage across prospect	3D coverage or dense, recent vintage 2D coverage	moderate coverage of recent vintage 2D data	old data and/or sparse coverage
• Dip line and strike line ties	emphatically	some discrepancies between dip and strike lines	misties at critical components of trap
• Seismic data over prospect tied to synthetic of well penetrating objective interval within 20 kms of prospect	yes	yes/ > 20 kms	no
• Velocity control wells within 20 kms of prospect in same geologic trend	≥ 2 wells	1 well	none

TIMING AND PRESERVATION

RISK SEVERITY

	LOW	MODERATE	HIGH
• Tectonic alteration post trap formation and charge	none	Minor movement on non-critical faults. Minor tilting/warping.	Widespread movements on faults. Major tilting and/or folding. Volcanic activity. Ongoing tectonic activity.
• Nature of current stress regime	neutral	compressional	tensional/wrench
• Flushing/water washing*	Poor aquifer support, little ground water movement. No evidence of detrimental water washing in the basin.	Strong aquifer support but little water movement. Some evidence of detrimental water washing.	Strong aquifer support and active water movement interpreted. Well evidence supports detrimental effects.
• Biodegradation 218°F BHT 103.3°C. @ Poonbarn 1	Reservoir temperature >80°C. No connection to meteoric ground water. No evidence of bio-degradation.	Reservoir temperature 60-80°C. Some evidence of bio-degradation in the basin.	Reservoir temperature <60°C. Influx of meteoric waters interpreted. Strong well evidence of bio-degradation.
• High temperature cracking of reservoired hydrocarbons gas	Reservoir < R_v 0.7 for oil, 1.0 for wet gas. Target hc. reservoired in nearby wells under similar conditions.	Reservoir between R_v 0.7-1.3. Only "more mature" hydrocarbons found at similar levels. oil	Reservoir R_v >1.3. Temperatures known to be hostile to the preservation of target hydrocarbons.

* Evaluate this criteria carefully. Water washing may enhance oil plays by removing gas, but long exposure may result in heavy, waxy crudes.

TIMING AND PRESERVATION - CONT'D

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Timing of post-charge tectonic alteration	Supported by well data, seismic data and regional models.	Tectonic history well understood but timing of hydrocarbon charge poorly understood (or vice versa).	Post charge tectonic alteration inferred from regional analogs only. No evidence for or against.
• Temperature profiles at prospect well constrained	Temperature depth profiles available from wells within 20 kms extending below reservoir target depth.	Some temperature depth profiles available within the basin but >20 kms away/unreliable/too shallow.	Temperature profiles inferred from regional models only.
• Water washing	Well data and regional models support analysis of fluid movement. Recovered hydrocarbons within 20 kms support model.	Regional models suggest it may be an issue, but not confirmed by well results (or vice versa).	No relevant data.
• Bio-degradation	Good temperature data. Hydrocarbons recovered within the same play within 20 kms support analysis.	Conflicting information from well data. Poor understanding of regional models.	No relevant data.
• Hydrocarbon cracking	Burial history analysis and heat flow analysis conducted. Nearby wells support analysis at target depth.	No detailed analysis. Nearby wells are shallower/in different geological conditions.	No relevant data.

WARREGO LEAD

The primary objectives for Warrego are fluvial sandstones of Palaeocene age. Pelican 3 provides the nearest well control for this structural setting.

Two deterministic calculations were performed as follows:

Model 1 (Warmod1.xls)

Net Pay based on analysis of Pelican 3 which shows the presence of three major sandstones in the Palaeocene with combined total thickness of 38 metres. Average porosity (using the density log) is 19%.

Model 2 (Warmod2.xls)

Net pay was increased to 76 metres (double that of Model 1) to reflect the possibility that the sandstones intersected at Pelican 3 may thicken, or to represent the possibility of pay in thinner sandstones seen in Pelican 3. The average porosity was reduced to 17.5% to reflect the inclusion of more net pay with possibly lower porosity.

A probabilistic analysis was also undertaken using REP (Reserve Evaluation Programme, Version 3) to calculate potential reserves. A problem calculating gross rock volume from area and contour values using the REP program restricted the handling of the probability distribution of gross rock volumes. Therefore a polygonal probability distribution for gross rock volume was sampled from the deterministic calculations as follows:

Probability	GRV	Comments
P100	50	
P90	63	Based on 1910 m closing contour and 38 m of net pay from model 1.
P50	512	Based on 1950 m closing contour and 38 m of net pay from model 1.
P10	1750	Based on 1970 m closing contour (LCC) and 76 m of net pay.
P0	2000	

Other input variables are shown on the attached REP output.

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WARREGO - T/25P

EVCM Palaeocene - Model 1

RESERVES CALCULATION (Simple Slab Model)

	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
1855	2215			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1860	2223.3	8.3	0.01	2.66E+05	0.26	0.17	0.12	0.13	0.02	0.15	0.03
1870	2238.3	23.3	0.05	1.82E+06	1.76	1.14	0.80	0.88	0.11	1.04	0.21
1880	2253.3	38.3	0.13	4.98E+06	4.79	3.12	2.18	2.41	0.31	2.84	0.57
1890	2268.3	53.3	0.37	1.42E+07	13.65	8.87	6.21	6.86	0.89	8.08	1.62
1900	2283.3	68.3	0.92	3.50E+07	33.66	21.88	15.32	16.92	2.19	19.92	3.98
1910	2298.3	83.3	1.66	6.29E+07	60.59	39.38	27.57	30.46	3.94	35.86	7.17
1920	2313.3	98.3	3.91	1.48E+08	142.91	92.89	65.02	71.84	9.29	84.57	16.91
1930	2330	115	6.36	2.42E+08	232.84	151.35	105.94	117.05	15.13	137.79	27.56
1940	2345	130	9.10	3.46E+08	332.98	216.44	151.51	167.39	21.64	197.05	39.41
1950	2360	145	13.48	5.12E+08	493.01	320.46	224.32	247.83	32.05	291.76	58.35
1960	2375	160	17.60	6.69E+08	643.97	418.58	293.01	323.72	41.86	381.09	76.22
1970	2390	175	23.04	8.75E+08	842.93	547.91	383.53	423.73	54.79	498.83	99.77

RISKED SALES GAS (PJ)	37.36
RISKED REC OIL (MMSTB)	5.43

Input Parameters	
Net Pay (m)	38
Porosity	0.19
Sh	0.7
Bg	205
Boi	1.47
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	81%
SOURCE OIL	50%
SEAL	42%
RESERVOIR	36%
STRUCTURE	72%
CHANCE OF SUCCESS GAS	8.82%
CHANCE OF SUCCESS OIL	5.44%

Notes: Net pay based on intersecting sequence similar to Pelican 3

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WARREGO - T/25P

EVCM Palaeocene - Model 2

RESERVES CALCULATION (Simple Slab Model)											
	Depth (m)	Vertical Closure (m)	Area (sq km)	Bulk Rock Volume (cubic m)	Cum. OGIP (BCF)	Cum. Raw Gas (BCF)	Cum. Sales Gas (BCF)	Cum. Sales Gas (PJ)	Cum. Condensate (MMSTB)	Cum. OOIP (MMSTB)	Cum. REC. OIL (MMSTB)
1855	2215			0.00E+00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1860	2223.3	8.3	0.01	5.32E+05	0.47	0.31	0.21	0.24	0.03	0.28	0.06
1870	2238.3	23.3	0.05	3.65E+06	3.24	2.10	1.47	1.63	0.21	1.91	0.38
1880	2253.3	38.3	0.13	9.96E+06	8.83	5.74	4.02	4.44	0.57	5.22	1.04
1890	2268.3	53.3	0.37	2.83E+07	25.14	16.34	11.44	12.64	1.63	14.88	2.98
1900	2283.3	68.3	0.92	6.99E+07	62.01	40.30	28.21	31.17	4.03	36.69	7.34
1910	2298.3	83.3	1.66	1.26E+08	111.61	72.55	50.78	56.11	7.25	66.05	13.21
1920	2313.3	98.3	3.91	2.97E+08	263.25	171.12	119.78	132.34	17.11	155.79	31.16
1930	2330	115	6.36	4.84E+08	428.92	278.80	195.16	215.61	27.88	253.83	50.77
1940	2345	130	9.10	6.92E+08	613.38	398.70	279.09	308.34	39.87	362.99	72.60
1950	2360	145	13.48	1.02E+09	908.18	590.32	413.22	456.53	59.03	537.45	107.49
1960	2375	160	17.60	1.34E+09	1186.26	771.07	539.75	596.32	77.11	702.01	140.40
1970	2390	175	23.04	1.75E+09	1552.77	1009.30	706.51	780.56	100.93	918.90	183.78

RISKED SALES GAS (PJ)	68.83
RISKED REC OIL (MMSTB)	10.00

Input Parameters	
Net Pay (m)	76
Porosity	0.175
Sh	0.7
Bg	205
Boi	1.47
Condensate (BBL's/MMSCF)	100
Recovery factor (gas)	0.65
Recovery factor (oil)	0.2
Sales factor (gas)	0.7

RISK	%
SOURCE GAS	81%
SOURCE OIL	50%
SEAL	42%
RESERVOIR	36%
STRUCTURE	72%
CHANCE OF SUCCESS GAS	8.82%
CHANCE OF SUCCESS OIL	5.44%

Notes: Net pay based on intersecting sequence with double that intersected in Pelican 3

WARMOD2.XLS 9/19/95
R J Suttill

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Prospect Evaluation - Recoverable Gas

Country:	AUSTRALIA	Name:	WARREGO
State:	TASMANIA	Segment:	PALAEOCENE
Block:	T/25P	Classification:	unassigned

Input Data

Variable	Unit	Shape	min	P90	P50	P10	max	mode
GRV	mmcm	poly	50.0	63.0	512	1750	2000	506
Deg. of fill	%	single	100	100	100	100	100	100
Net-to-gross	%	single	100	100	100	100	100	100
Porosity	%	triang	16.0	16.8	17.8	19.0	20.0	17.5
Sw	%	triang	30.0	32.2	35.0	37.8	40.0	35.0
FVF (1/Bg)	vol/vol	single	205	205	205	205	205	205
Gas rec fac	%	triang	60.0	62.2	65.0	67.8	70.0	65.0

Risk Factors

Play Chance:	38	Prospect Specific Chance:	23
Reservoir:	60	Trap:	72
Source:	90	Reservoir:	60
Regional Seal:	70	Seal:	60
		Migration:	90

Overall Prospect Success Chance: 8.82

Reserves Summary

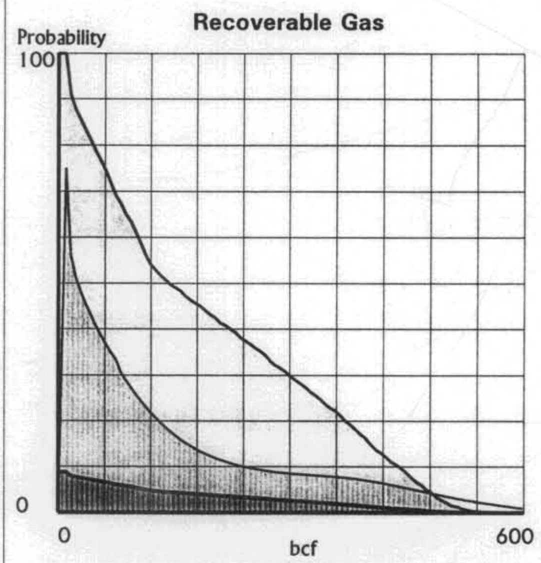
units: bcf

	In-Place Gross unrisked	Recoverable Gas Gross unrisked	Recoverable Gas Gross risked	Recoverable Gas Net unrisked	Recoverable Gas Net risked
P90	57.2	38.5	0	17.8	0
P50:	480	310	0	143	0
P10	1464	951	0	440	0
Mean:	657	427	37.7	198	17.4

Production Working Interest: 46.25

Exploration Working Interest: 46.25

Production Working Interest is used to calculate net volumes



min net unrisked: 9.64 max net unrisked: 650

Comments:

5 cm

REP file: c:\rep\data\t25p\warrego.ppr
version: 3.03

Author: rjs
Date: 20/09/95

3.03

PROSPECT ADEQUACY WORKSHEET
"MINIMUM GEOLOGIC CASE"

Prospect Name: WARREGO - PALAEOCENE Assessment Date: SEPT 95

Assessor: R. J. SUTTILL Overall Chance of Success 8.82%

Risk Severity

CONFIDENCE LEVEL	High	Moderate	Low	
High	0-.3	0.4-0.8	.9-1.0	Lots of Data/ Good Quality
Moderate	.1-.4	.4-.7	.7-.9	
Low	.2-.5	.5-.6	.6-.7	Sparse Data/ Poor Quality

Conclusions Interpreted from Data

Bad News Good News

REGIONAL PLAY CONSIDERATIONS

Presence of Reservoir Facies
COS: .6
Comments:

Presence of Adequate Source
(Richness + Maturity)
COS: .9
Comments:

Presence of Top Seal
COS: .7
Comments:

Timing and Preservation
COS: .9
Comments:

LOCAL PROSPECT CONSIDERATIONS

Adequate Reservoir Quality
COS: .6
Comments:

.36

Adequate Source Migration
COS: .9
Comments:

.81

Fault Seal
COS: .6
Comments:

.42

Presence of Trap
COS: .8
Comments

.72

PRESENCE OF RESERVOIR FACIES ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Chance of reservoir missing by facies change, non-deposition, truncation or faulting	none	possible	probable
• Prospect located in favourable reservoir depositional fairway	yes	near margin	no
• Reservoir facies interpreted as being continuous over prospect	yes	questionable	no
• Probability of multiple reservoirs	yes	possible	no
• ~~Seismic modelling (if applicable)~~ suggests favourable reservoir facies	~~yes~~	~~questionable~~	~~does not support~~
• Presence of amplitude anomaly is supported by rock properties analysis in DHI trend	strong support	weak support	none

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Number of wells present within prospective fairway (trend) <20 kilometres from prospect	≥ 2	1	none
• Seismic data quality	good	fair	poor
• Seismic data coverage (Consider impact of well control)	good	adequate	sparse
• Isopachous and/or facies map of prospective interval	yes/prospect and regional	yes/prospect only	no, or incomplete
• Reservoir interval tied to seismic lines from well control and correlated onto prospect	yes	no	unable to correlate
• Reservoir model consistent with analog field(s) in trend	yes	slight difference	conceptual model only

ADEQUACY OF RESERVOIR QUALITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Adequate porosity and permeability encountered when facies penetrated	almost always	usually	often absent
• Clastic reservoir composition	Quartzose < 10% clay or ductile material	Arkosic > 10%-<20% clay or ductile material	Lithic or sublithic > 20% clay or ductile material
• ~~Carbonate reservoir composition~~	~~dolo~~	~~dolo/LS~~	~~LS~~
• Grain size/sorting	fn-med/well sorted	v. fn-fn/ moderately sorted	v. fn-coarse/poorly sorted
• Mapped porosity~~/fracture~~ fairway correlates to adequate permeability	almost always	usually	no
• Effect of diagenesis on reservoir quality	almost always enhances/no effect	usually enhances/no effect	usually detrimental

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Nearby wells in trend (less than 20 kilometres) demonstrate adequate quality porosity/permeability for HC production.	yes/ ≥ 2 wells	yes/ < 2 wells	no/no wells
• Seismic models (where applicable) calibrated to reservoir/non-reservoir rock properties	yes/properties measured	yes/properties estimated	no/no model
• Nearby DST or production test of reservoir indicates sustainable economic deliverability	yes/ ≤ 20 kms	yes > 20 kms	no ≤ 20 kms
• Fracture analysis run (where applicable)	yes/positive results	~~yes/but not~~ conclusive	~~no, or negative~~ results

SOURCE RICHNESS AND MATURITY ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Original TOC level	high/ ≥3.0%	moderate/1-2.9%	low/ < 1%
• Original hydrogen index level	high/ ≥ 300	moderate/200-299	low/ < 200
• Source depositional environment	favourable	marginal	unfavourable
• Nearby field(s) demonstrate rich source rocks in area	yes	maybe	no
• Maturity within drainage area. (Indicative only, depends on source models).			
Oil Prospects (Rv)	0.7-0.9	0.5-0.7 or 0.9-1.1	<0.5 or >1.1
Gas Prospects (R_v)	>1.3	1.0-1.3	<1.0
• Nearby field/well penetration	Numerous oil/rich liquid shows or production	Lean gas/undrilled	Several wells, no shows

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Availability of geochem data from core, cuttings, and/or log data	within prospective source bed drainage area	outside prospective source bed drainage area	unavailable (richness postulated)
• Reservoired HCs in play area matched to the identified source bed horizon	matched	not matched	source beds poorly identified
• Thermal Model of drainage area	well constrained by down hole temperature and maturity data	unreliable/sparse data/conflicting measurements	no down hole measurements/ postulated from paleo-environment
• Source maturity proven in play	yes	uncertain	no

SOURCE MIGRATION PATHWAYS AND TIMING ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Relationship of source beds to reservoir	indigenous/in juxtaposition/ stratigraphically lower	stratigraphically much lower/ pathway uncertain	stratigraphically much higher/ pathways uncertain
• Potential migration avenues present and focused towards prospect	yes	questionable	no
• Adequate drainage area for prospect	yes	questionable	inadequate
• Reservoir pressure (at migration)	underpressured	balanced	overpressured
• Timing of trap formation vs peak HC maturation	trap predates maturation or synchronous	trap slightly postdates maturation	trap considerably postdates maturation but may be filled by spill from earlier accumulations
• Thick source rocks or multiple sources reaching peak maturation over long time period	yes	uncertain	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Well/seismic data support interpretation of migration pathways	yes, strongly	possibly	inconclusive or poorly
• Well/seismic data quality	good	fair	poor
• Regional structure maps	on source beds or decollement surface and reservoir	on top reservoir only	no regional map
• Analog fields(s)	< 20 kms	> 20 kms	none
• Isopachs or datumed seismic sections indicate trap predates maturation	yes	uncertain	no
• Structural complexity makes timing uncertain	no	questionable	yes

REGIONAL TOP SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Top seal thickness and continuity	thick/continuous	thin/somewhat continuous	unknown
• Evidence of seal missing by facies change, non-deposition, truncation, or broken by fracturing	no	possible	probable
• Seal lithology composition	shale or evaporite	silty or limy shale	carbonates or silty

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of seal lithologies and continuity	adequate	marginal	not adequate

PROSPECT-SPECIFIC/FAULT SEAL ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• ~~Non-associated fault trap (independent)~~	4-way closure	updip closure against salt/strat (combination, unconformity, diagenetic)	strat (facies change)
• Associated fault trap (dependent)			
- trap type	high-side/faulted closure	low-side closure <35% sand in prospective interval	fault intersection/ low-side closure >35% sand in prospective interval
- fault position relative to reservoir	buried, dies out in thick overlying sh	buried, dies out in overlying sd/sh sequence	intersects surface/post-dates trap formation
- facies relationship across fault	sd vs sh	thin sd/sh sequence vs thin sd/sh sequence	massive sd/sh sequence vs massive sd/sh sequence
• Presence of amplitude anomaly supported by rock properties analysis	strong support	weak support	none
• Fault leak apparent in nearby analogous traps	no	uncertain	yes

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Distance from analog field(s)	≤ 20 kms	> 20 kms	no analogs
• Demonstration of seal concepts via well control	adequate	fair	poor
• Adequacy of well/seismic control for determination of fault orientation, displacement and high/lowside lithologies	adequate	marginal	not adequate
• Fault plane profile of sealing faults completed	yes, all faults	most critical fault only	none
• Cross fault juxtapositions modelled for traps	yes, all faults	most critical faults only	none

TRAP CLOSURE ATTRIBUTES

RISK SEVERITY

	LOW	MODERATE	HIGH
• Trap configuration and imagability	simple/easy	complex/possible	complex/difficult
• Trap style consistent with regional analogs	consistent	somewhat consistent	not consistent
• Sequence stratigraphy concepts used in mapping prospect	yes	to some degree	no
• Shallower mapping horizon(s) also demonstrate trap presence	yes	somewhat	no
• ~~Trap geometry interpretation~~ balanced in compressional setting	~~yes/good balance~~	~~yes/fair balance~~	~~no, or poor~~ balance
• Multiple horizons and critical fault planes mapped	yes	horizons or faults mapped, but not both	no

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Seismic data quality	good	fair	poor
• Seismic data coverage across prospect	3D coverage or dense, recent vintage 2D coverage	moderate coverage of recent vintage 2D data	old data and/or sparse coverage
• Dip line and strike line ties	emphatically	some discrepancies between dip and strike lines	misties at critical components of trap
• Seismic data over prospect tied to synthetic of well penetrating objective interval within 20 kms of prospect	yes	yes/ > 20 kms	no
• Velocity control wells within 20 kms of prospect in same geologic trend	≥ 2 wells	1 well	none

TIMING AND PRESERVATION - CONT'D

CONFIDENCE LEVEL

	HIGH	MODERATE	LOW
• Timing of post-charge tectonic alteration	Supported by well data, seismic data and regional models.	Tectonic history well understood but timing of hydrocarbon charge poorly understood (or vice versa).	Post charge tectonic alteration inferred from regional analogs only. No evidence for or against.
• Temperature profiles at prospect well constrained	Temperature depth profiles available from wells within 20 kms extending below reservoir target depth.	Some temperature depth profiles available within the basin but >20 kms away/unreliable/ too shallow.	Temperature profiles inferred from regional models only.
• Water washing	Well data and regional models support analysis of fluid movement. Recovered hydrocarbons within 20 kms support model.	Regional models suggest it may be an issue, but not confirmed by well results (or vice versa).	No relevant data.
• Bio-degradation	Good temperature data. Hydrocarbons recovered within the same play within 20 kms support analysis.	Conflicting information from well data. Poor understanding of regional models.	No relevant data.
• Hydrocarbon cracking	Burial history analysis and heat flow analysis conducted. Nearby wells support analysis at target depth.	No detailed analysis. Nearby wells are shallower in different geological conditions.	No relevant data.