To: Thorseth, Jay C
Cc: Bozeman, Walt
Subject: FW: Macondo TAM
Importance: Normal
Attachments: 0904_Macondo_Tam.xls

Jay,

CH1 of Macondo is finished and ready to upload. Ch2 and 3 should also be on their way to you this afternoon from Walt. Recommend we do not upload the drilling chapter till next month (we'll have the actual work done) and we probaly need a discussion around how to frame the economics, the FM, the AFE and then write the economics chapter around that.

The short answer: upload 1,2 and 3 this afternoon.

Regards,

Jasper Peijs
Exploration Manager
Eastern GOM Deepwater
email: peijsj@bp.com
Tel: 281-366 3267
Mobile: 832-668 6738

From: Bondurant, Charles H
Sent: Thursday, April 23, 2009 2:53 PM
To: Peijs, Jasper
Subject: Macondo TAM

Here is the final V1 of the Macondo TAM.

Chuck Bondurant
BP Geologist EGoMX
Westlake 4 02065B
Office # (281) 366-7848

5246
Exhibit No.
Worldwide Court Reporters, Inc.

bp

Confidential Technical Assurance Memorandum		
Section: 1 (Subsurface)		
Region:	USA	
Prospect:	Macondo	
Operator	BP	
Date	April	2009

Prepared by:		Role
Chuck Bondurant		Geologist
Binhy Nguyen		Geophysicist
Chris Cassler		Geophysicist
Pierre-Andre Depret		PeST
Donald Charles		Petrophysicist
Sharma Tadepalli		Rock Properties
Tanner Gansert		Reservoir Engineer
Endorsed by:	Jasper Peijs	Team Leader
Approved by:	Jay Thorseth	PUL

exploration excellence

Country	Operator	Month	Year	Role
uk	BP	January	2008	Geologist
Algeria	Exxon-Mobil	February	2009	Geophysicist
Russia	Chev-Tex	March	2010	Team Leader
Colombia	Conoco-Philips	April	2011	PUL
Algeria	Amerada	May	2012	Geoscientist
Angola	IOC	Jun	2013	Reservoir Engineer
Peru	Petrobras	July		Petroleum Engineer
USA	Lukoil	August		Commercial
Canada	Shell	September		
China	BG	October		
Indonesia	other	November		
Libya		December		
Egypt				

1 Executive Summary

Copy?

Prospect Name	Macondo				
Prospect description					

The primary target is an amalgamated low relief channel-levee system of Middle Miocene age (M56). The channel system tracks from the NW to the SE both perpendicular to the strike and over an elongated Mesozoic ridge. The expected facies are low relief channel-levee deposits with adequate vertical and lateral connectivity. The trapping elements are a combination of dip and stratigraphic.

Two zones of interest have been identified along with the primary target. The first zone is a channel-levee complex at Rigel field, M87 in age and producing biogenic gas. Seismic evidence shows that the lateral extent of this channel does not reach the Macondo wellbore. The Macondo well will penetrate the M87 horizon updip of the Rigel field possibly encountering thin bedded reservoir charged with hydrocarbons.

The second zone of interest is the Miocene section below the M56 primary target. The current geologic model predicts the absence of any lower Miocene reservoirs with NW to SE trending channel complexes mapped west of the Macondo prospect. However, there is the chance of channel-levee overbank deposits thinning up and over the Macondo 4-way.

Current volume estimates do not deem these zones of interest as being commercially viable.

Unrisked In-place	185.0	mmbls	Pos (%)	67%	
Total Unrisked Resource	64.0	mmboe	Total Risked Resource	43	mmboe
Resource range:	44.0	64.0	86.0	P90-P50-P10	
Critical risk					
Charge Access	Critical risk %	79%	Working Interest %	100.0%	

Critical risk description

The critical uncertainty of the Macondo prospect is charge access. The uncertainty lays in the possibility of permeable beds below the M56 which could act as thief beds for hydrocarbon migration to the target reservoir zone. The latest PeST work suggests that the Middle Miocene M56 sand interval is charged. The top-down seismic amplitude work is consistent of hydrocarbon bearing reservoir too. XX Feedback: Charge Access is the only significant risk. The principal charge model delivers 135-170 mmstb of medium GOR oil to the reservoir after trap formation; an additional 20-30 mmboe biogenic gas charge is predicted

Is this likely to be a high temperature/high pressure well?			no	
Water depth/elevation	4992 ft	Well TD	20200	ft
Depth to deepest contact	18785 ft	Depth to shallowest crest	18120	ft

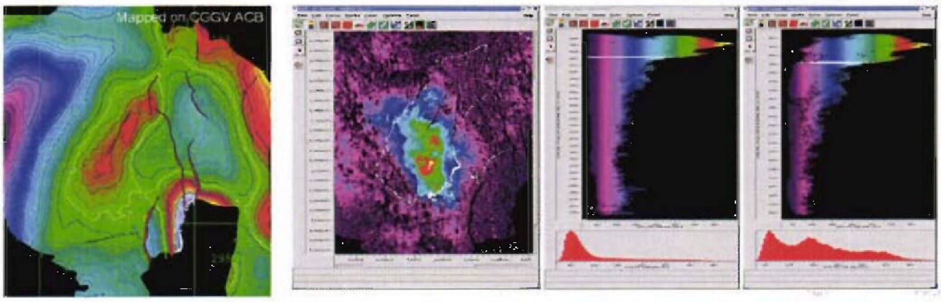
HSES & Commercial risks

Loop Currents - Hurricane season

Map View (from primary segment)

Structure & Amplitude Map: M56

bp



1

Seismic Section (from primary segment)

Primary Target: M56 Seismic LOS NW2SE

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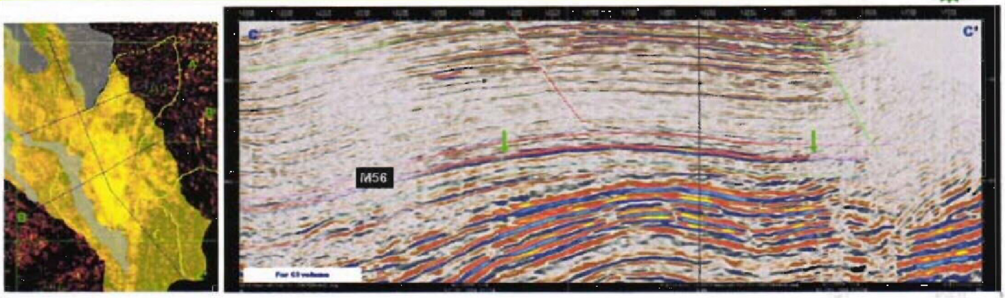


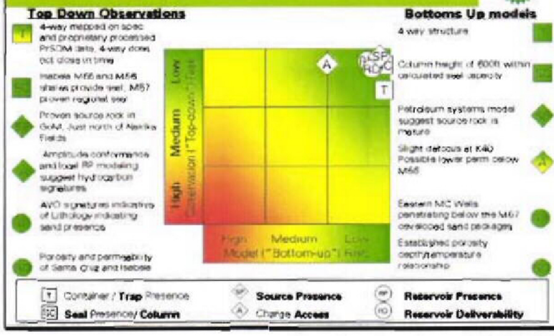
1

Risk Matrix (from primary segment)

Risk Matrix: Macondo M56 (22 January 2009)

Fluid type: oil

bp



1

2 Location data

Country	USA				
Basin	Gulf of Mexico				
Datum	NAD 27 CONUS				
Projection	UTM 16N				
Latitude	28	44	17.28	North	
Longitude	88	21	57.34	West	
X	1202803.88				
Y	10431617				
Depth to primary crest	18120	ft			
Depth to primary contact	18785	ft			
Water Depth	4992	ft			
Licence Designation	MC0252				
Distance to shore	47	Miles	Comment		
Distance to Nearest Facility	99	Miles	Distance to shore Port of Fourchon, LA		

3 Regional Context

Play Fairway Description:

The Macondo prospect reservoir was deposited in a mid to lower slope setting where Miocene sand systems generally trend in a northwest to southeast direction. A number of the Miocene systems track up and over broad Mesozoic turtle structures setting up traps with stratigraphic and dip elements. The sand systems are predominantly broad low relief channel levee systems that are amalgamating. These systems periodically are incised by mudfill channels which generate the stratigraphic trapping element.

Play Fairway Risks

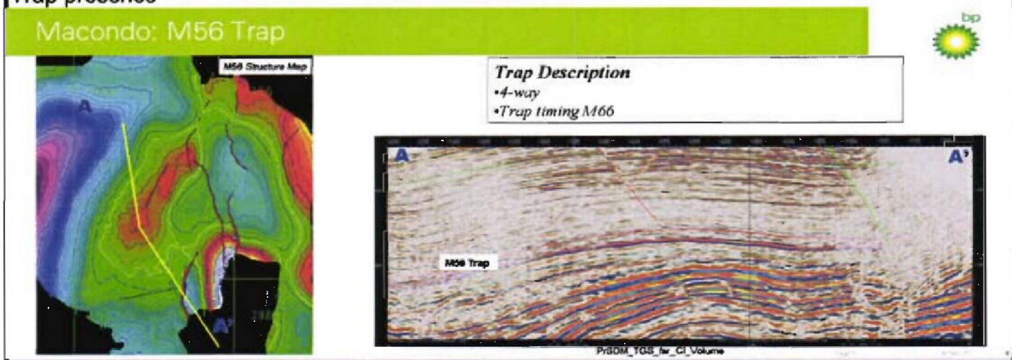
Individual channel systems could be below seismic resolution so additional stratigraphic complexity possible.

Play Success Rate: (%)	67%

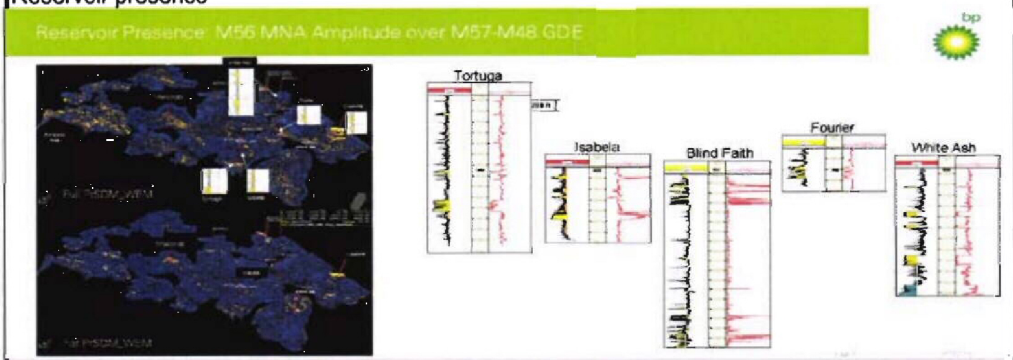
Regional Context:
MC contains numerous Mesozoic turtle structures younging in the southwest direction. Surface expression of the turtles contains erosional scours, slumps, and incised valleys trending NW to SE which set up accommodation space for Miocene turbidite systems entering from the NW.

4 Key GDE or CCRS maps

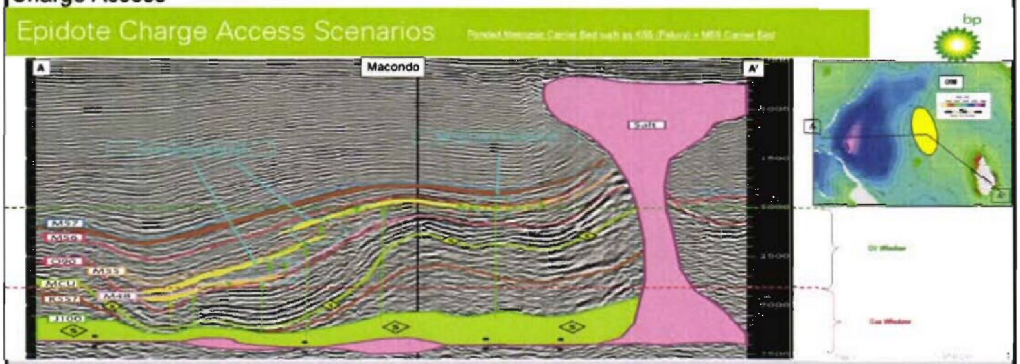
Trap presence



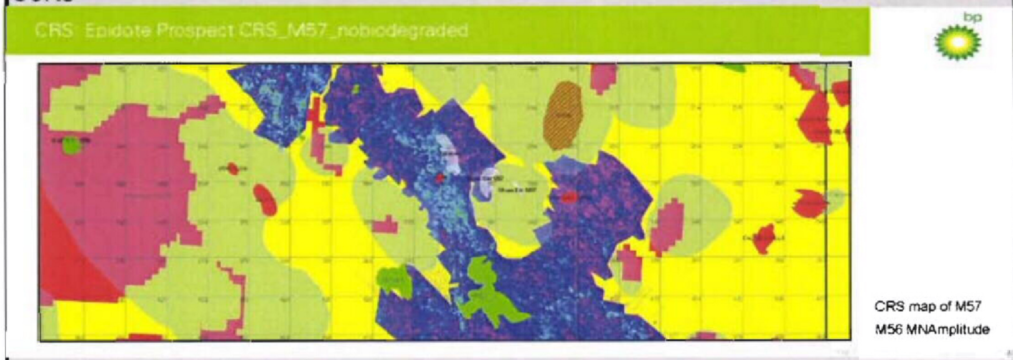
Reservoir presence



Charge Access



CCRS



5 Database

5.1 Seismic

Survey Name	Acquired	Processed	Type	Comments
TGS Revival	1999	Kirchhoff T	Spec	Corridor stacks raw and af
TGS Revival	1999	WEM Dep	Spec	Corridor stacks raw and af
TGS Revival	1999	RTM and I	2009 Prop	Full anisotropic re-process

Seismic comments

5.2 Velocities

Sources of velocity data available
Original isotropic spec velocity model from TGS. Proprietary VTI data set from CGGV in 2009.

5.3 Wells

Well Name	Year	Distance	Units	Comment	Status
MC0562_1BP1	2007	21.8	Miles	Isabela	Discovery
MC0561_2BP1	2008	23.5	Miles	Tortuga	Shows
MC0519_1	2009	21	Miles	Santa Cruz	Discovery
MC0252_1BP2	1999	2.8	Miles	Rigel	Discovery
MC0296_SS01_BP1	2003	3	Miles	Rigel	Discovery
MC0392_1	2001	26.3	Miles	White Ash	Dry hole

Wells Comments
MC0562_1 Isabela encountered a 40' gas sand of effective reservoir at the M56. At the M55, the well penetrated 90' blocky oil sand of effective reservoir. MC0561_2BP1 Tortuga encountered 165 ft net sand of effective reservoir at the M55 (wet). The well penetrated 30 feet of net sand at the M56 followed by two small pay stringers (~5ft). MC0392_1 White Ash encountered 295 ft net of effective reservoir between the M56 and M48. The Santa Cruz well, Isabela offset, encountered hydrocarbon bearing reservoirs in the M89, M56 and M55. Total pay for the Santa Cruz well are: M89 ~130ft, M56 ~124ft, and M55 ~47ft. The Rigel well MC0296_SS01_BP1 is producing from a 50 ft gas bearing reservoir of M89 age.

5.4 Key reports

Author	Year	Title

6 Segment 1

6.1 Summary

Copy?

Segment description

The primary target is an amalgamated low relief channel-levee system of Middle Miocene age (M56). The channel system tracks from the NW to the SE both perpendicular to the strike and over an elongated Mesozoic ridge. The expected facies are low relief channel-levee deposits with adequate vertical and lateral connectivity. The trapping elements are a combination of dip and stratigraphic.

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Critical risk description

The critical uncertainty of Macondo prospect is charge access. The uncertainty lays in the possibility of lower permeability beds which could act as thief beds for hydrocarbon migration to the M56 reservoir zone. The latest PeST work suggests that the Middle Miocene M56 sand interval is charged. The top-down seismic amplitude work is consistent of hydrocarbon bearing reservoir too. XX Feedback: Charge Access is the only significant risk. The principal charge model delivers 135-170 mmstb of medium GOR oil to the reservoir after trap formation; an additional 20-30 mmboe biogenic gas charge is predicted 612

6.2 Trap

age/name	M56

Description (include any critical failure modes)

Elongated 4-way with low relief channel levee system draped over the crest. The east and west edges of Macondo are defined as stratigraphic edges. The north edge of the trap is controlled by dip and the southern portion spills into a potential 3-way at Mica's West Ear.

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Crest depth		Contact depth		Contact description (spill, leak etc.)
18120	ft	18785	ft	Spill

ML Closure Area		ML Gross interval Thickness	
4498	acres	42	ft

Trap Element (Direction)	Description	Failure mode	Trap POS %	Lateral Seal PoS %
North	Dip		100%	100%
South	Dip		100%	100%
East	Strat Edge	lateral permeability	85%	100%
West	Strat Edge		100%	100%
			Overall Trap POS %	0.85

6.3 Top/Base Seal

Description (include any critical failure modes)

Seals are capillary seals associated with intra-formational mudstones of the type seen in the Isabela (MC0562-1BP1) and Santa Cruz (MC0519_1) well.

147

Column Height & comments below	1400	ft	

For a medium oil the column height ranges from 1400-2200 ft. The calculated column height at the primary target (M56) is 640 ft. Hydrocarbons will spill before breaching the seal.

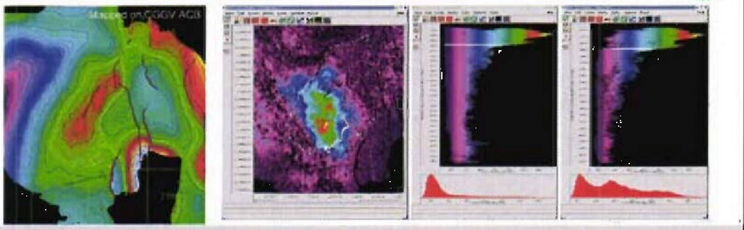
182

Seal POS %	100%

6.4 Maps and sections

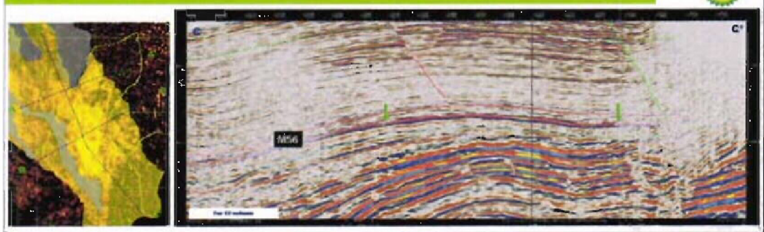
Map View

Structure & Amplitude Map: M56



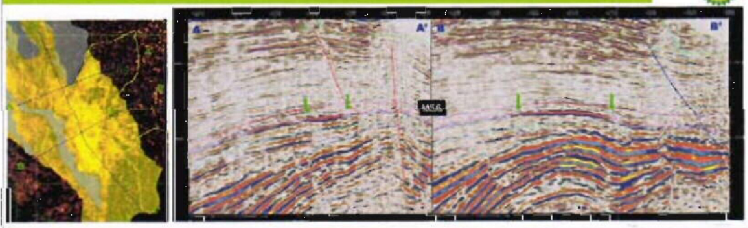
Best Seismic Line

Primary Target: M56 Seismic LOS NW2SE



Worst Seismic Line

Primary Target: M56 Seismic LOS W2E



Picture Descriptions

0

6.5 Charge Parameters

Phase	Oil	API Gravity	32	Sulphur %	15%
H2S %	0%	Nickel ppm	2	Vanadium ppm	1
CO2 %	0%	N2 %	0%	Pyrobitumen risk %	0%
Range	Percentile	P90	P50	P10	comment
Degree of fill %		100%	100%	100%	
GOR/ CGR	bbl/mmscf	500.0	800.0	1300.0	
FVF/ GEF		1.31	1.46	1.61	
Saturation %		60%	75%	80%	

6.6 Source Characteristics

Age	Tithonian (J90) – Cenomanian Turonian (K64)				
Source Characteristics					
Biomarkers suggest contribution from J100 source rock. The Tithonian level (J100) was penetrated by the Shiloh well, (41 miles E). Rafted Mesozoic section might create a Tithonian hiatus on west side of Macondo.					
Source Rock Type (first)		A	(second)	B	
Phase predicted	Oil	Phase Risk (POS) %		100%	

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6.7 Timing of generation

Description					
HC generation started ~ 12 Ma. HC expulsion started ~ 11 Ma. Peak of oil generation ~ 9Ma. Peak of gas generation ~ 4Ma.Trap in place ~ 11.5 Ma. M56 receiving early mature HC at ~6Ma due to ~ 5 Ma migration lag.					

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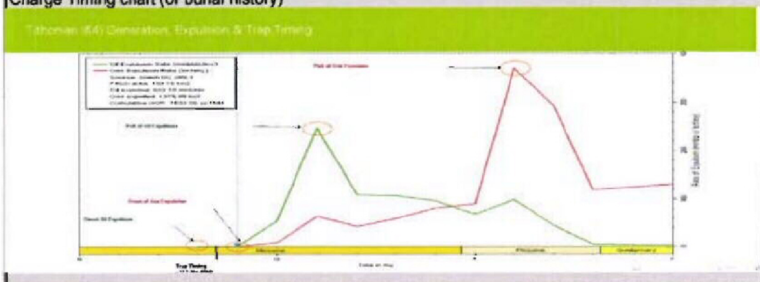
Charge Timing chart (or burial history)



Geotherm. Grad.	63.0	F/Mile			
source temp.	191	F			
Max fetch cell temp.	202	F	when max?	9	Ma

6.8 Focus & Access

Description					
K40 focus is more to the east of Macondo Prospect, while K63, K100 and O90 focus are at the level of Macondo prospect. M55 is potential 1st carrier bed, leaking into M56 sand at top of structure. M56 can also be charged from vertical migration.					

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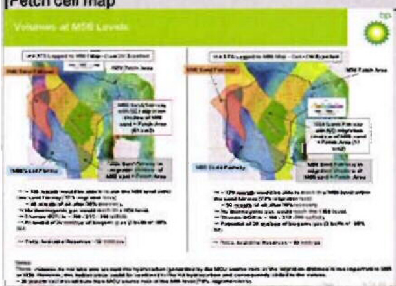
Fetch cell map



Fetch Cell Area		121	km2	Efficiency %	70
Expulsion volume	Min	3360	STOIIP/GIIP vol.	Min	135
range Min-Max	ML	5160	available	ML	197
units mmboe	Max	5640		Max	290

6.9 Source presence and charge access risks

Source presence Critical Risk Description	POS %	100%	

Western basin potentially rafted removing minimal amount of source rock. Biomarkers analysis suggests significant contribution from J100 source rock. All Nakika fields have additional biogenic gas charge, with yields varying from 1-5 BCF/Km2. 242

Charge Access Critical Risk Description	POS %	79%	

The critical uncertainty of Macondo prospect is charge access. The uncertainty lays in the possibility of lower permeability beds which could act as thief beds for hydrocarbon migration to the M56 reservoir zone. The latest PeST work suggests that the Middle Miccene M56 sand interval is charged. The top-down seismic amplitude work is consistent of hydrocarbon bearing reservoir too. 385

6.10 Reservoir parameters

Environment of Deposition Description	Age:	M56

Work on the M56 and deeper systems recognize more laterally extensive amalgamated sand systems that were subsequently incised by mud filled channels. GDE is slope channel facies. The reservoir thickness was calculated using SNPQ and are reflected as average NRV. Prediction at well (60-95-120)ft. 298

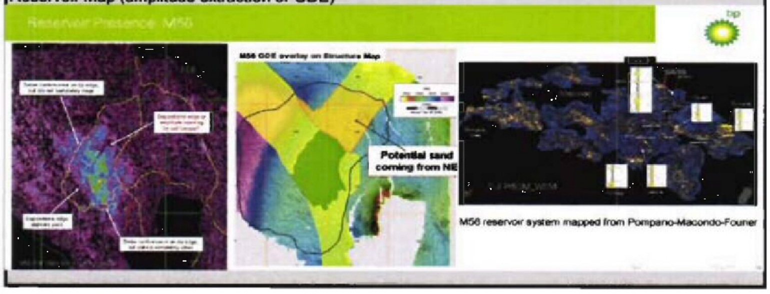
Range	Percentile		P90	P50	P10	
Gross thickness		ft	25	42	44	
Net thickness		ft	25	42	44	
Net to gross		%	100%	100%	100%	
Porosity		%	17%	23%	28%	
Permeability		mD	20.0	500.0	1001.0	

6.11 Reservoir Presence

Description (include any critical failure modes)	POS %	100%

AVO signature supports presence of sand-prone system. Extrasalt amplitude mapping of reservoir extends from Pompano to Fourier fields. These maps are tied to offset wells with logs that show reservoir presence. 211

Reservoir Map (amplitude extraction or GDE)



6.12 Reservoir Deliverability

Description (include any critical failure modes)	POS %	100%
Rock and fluid properties are both favorable, with initial rates of approximately 18 mboe/d expected based on modeling. Conceptual field development is based on three wells with an average well drainage of 1500 acres, which is at the upper limit of benchmarking data. Despite the large well spacing, effective resource recovery from the proposed well locations should be possible, in the absence of compartmentalization, due to the wells' crestal positions in the thickest areas of the reservoir. Compressiblity and compartmentalization are therefore the main deliverability risks.		

584

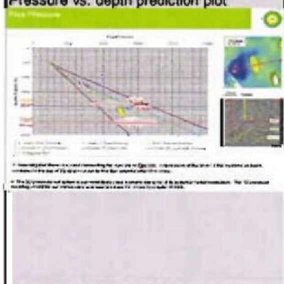
Reservoir Temp.		236	F		
Min-Max	range	Min	ML	Max	Comment
Recovery Factor %		15%	30%	45%	Na Kika analogue

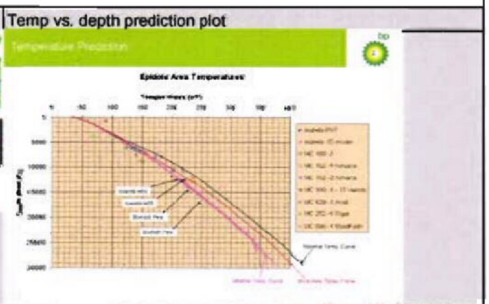
6.13 Pressure/ Temperature Prediction

Description
Temperature of primary target is 236 F and was derived from surrounding wells.

78

Pressure vs. depth prediction plot	Temp vs. depth prediction plot





Target Depth (primary)	18120	ft tvdss
Target Pressure	13300.00	PSI

6.14 Expected Seismic Indicators

Should See Hydrocarbons?	Yes
Background Lithology	Shale

Lithology+ Fluid	Near AI Contrast	AVO Class
Water wet sand	Soft	Class II
Oil Sand	Soft	Class II
Gas Sand	Soft	Class II

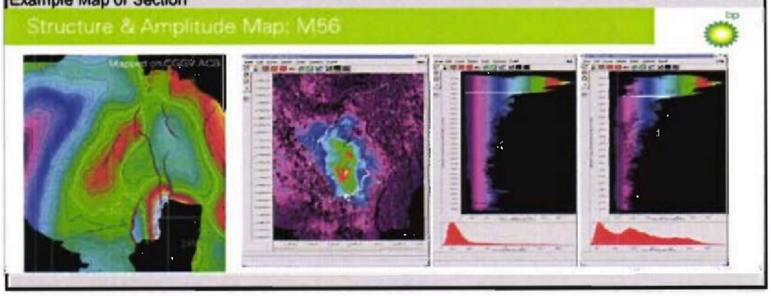
6.15 Observed Seismic indicators

observation	Interpretation	Quality	Fits model
Conformance	Oil Sand	Moderate	Supports Model
Class II	Oil Sand	Good	Supports Model
Class II	Water wet sand	Good	none expected

Comments

The brine sand response is expected to be within the background/noise.

Example Map or Section



6.16 Time to Depth Conversion

Will time to depth conversion be a critical issue for this Prospect?				Yes
T/D model source:	Seismic	Likely error at target	200	ft

Comments:

New seismic processing project with CGGV generated accurate velocity model.

6.17 Segment parameter summary

Min-Max	<<-range	Min	ML	Max	Comment
Thickness	ft	25	42	44	
					NRV is used instead of GRV - NRV calculated using SNPQ
GRV	acre feet	90376	197199	365680	
Area	acres	3639	4498	8697	
Net/gross %		100%	100%	100%	
Porosity %		17%	23%	28%	
Oil/ Gas Sat. %		60%	75%	80%	
Degree of fill %		100%	100%	100%	
FVF/ GEF		1.31	1.46	1.61	

6.18 Recovery factor

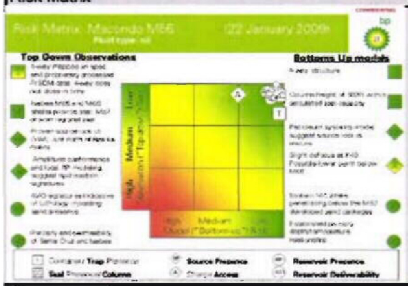
Min-Max	<<-range	Min	ML	Max	Comment
Recovery Factor %		15%	30%	45%	Na Kika analogue

6.19 Volumetrics

Percentile	<<-range	P90	P50	P10	Mean
STOIIP	mmbls	138.00	181.00	239.00	185
Comments					
Resource	mmboe	44.00	64.00	86.00	64
Comments					

6.20 Risk

Risk	PoS %
Trap	85%
Seal	100%
Source Presence	100%
Charge Access	79%
Phase	100%
Reservoir presence	100%
Reservoir Effectiveness	100%
Overall Chance of success	67%
Risk Matrix	



depth	area	direction	trap element	phase	fluid	SR type	GOR/CGR	temp	GT grad	units	Percentile	depth	PSI	reservoir L	Y/N	Backgrour	AI	AVO?	DHI	Quality	Model?	volume
m	km2	North	Dip	Oil	Oil	A	bbl/mmscf	C	C/km	mmbls	Min-Max	m tvdss	Bar	Shale	Yes	Shale	Hard	No AVO	Flatspot	Good	Supports Model	million m3
ft	miles2	North-East	Fault	Gas	Dry gas	B	bbl/m3	F	F/Mile	Tcf		ft tvdss	Mpa	Water wet	No	Carbonate	Zero	Class I	Conformal	Moderate	Contradicts mo	million ft3
	hectares	East	Strat Edge	Condensat	Wet gas	C	vol/vol			Bcf				Oil Sand	unknown	Tight Sanc	Soft	Class II	Hard AI	Poor	none expected	acre feet
	acres	South-East	Combination		Condensat	D	mmscf/bbl			mmboe				Gas Sand		unknown	unknown	Class III	Soft AI		unknown	
		South	Subcrop		Biogenic g	E	m3/bbl							Wet Silt				ClassIIp	Nothing			
		South-West	Diagenetic		Heavy oil	Biogenic	scf/bbl							Gas Silt				Class IV	Class I			
		West	Hydrodynamic											Carbonate				unknown	Class II			
		North-West	Salt											Oil Carbonate					Class III			
			Weld											Gas Carbonate					ClassIIp			
														Halite					Class IV			
														Anhydrite					unknown			
														Basement								
														Volcanics								
														Coal								
														Unconformity								
														Unknown								