bp

MC 252 #1
Macondo Prospect

Drilling Program
January 2010
Final

Prepared by:	Brian Morel		1-27-10
		Drilling Engineer	
Reviewed by:	Mark Hafle		
		Senior Drilling Engineer	
Reviewed by:	Brett Cocales		
		Ops Drilling Engineer	
Approved:	David Sims		1-27-10
		Drilling Engineer Team Lead	
Approved:	John Guide		
		Well Team Leader	
Approved:	Ian Little		
		Wells Manager	

GOMX
Gulf of Mexico Exploration

EXHIBIT # 291
WIT:

bp	**GoM Exploration Wells** **MC 252 #1 – Macondo Prospect** **Well Information**	Macondo MC252 #1

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1 Well Information

1.1 Well Objectives

- Drill and evaluate the Macondo prospect in MC 252 #1. Primary target interval expected at ~18,400', with the secondary target being below the primary target interval (as prescribed in the PDDP).
- If well results are positive, acquire sufficient information to plan an efficient appraisal program. If negative, acquire information to determine reasons for failure.
- Deliver drilling performance targets established in the AFE.
- Successfully evaluate any commercial hydrocarbon interval discovered.
- Incur (0) MMS "Incidents of Non-Compliance" while conducting operations on this federal lease.
- Our HSSE objective is Zero Incidents, no harm to people, environment or equipment. We will accomplish this by:
  - Fully implementing Transocean's Health & Safety Management System on the Horizon
  - Supervision on deck.
  - Living the Horizon Safe Way Forward Plan
  - Focus on: Risk Assessment, Planning, Lifting, DROPS and preventing Hand injuries.
  - Use of the THINK Planning Process and the START Observation and Monitoring Process.

1.2 Basic Well Data

Well Data	
Operator	BP
Working Interest Partner	Anadarko, Mitsui
Well Name	OCS-G 32306, Mississippi Canyon 252 #1
Common Name	Macondo
Water Depth	4992'
MSL - RT	75' (Transocean Deepwater Horizon)
RT – ML	5067'
Planned Total Depth	19,650'
Authorized Total Depth	19,650'
Authorized Cost	$96.16MM
AFE number (SAP)	X2-000X8
Regulatory Agency	MMS – New Orleans District
API number	608174116900
Surface Location Tolerance	50'
BH Target Hard Lines	125' Radius

Location	X Coordinate	Y Coordinate	Latitude	Longitude
Surface (actual)	1,202,798.01	10,431,619.69	28° 44' 17.1424" N	88° 21' 58.5024" W
Bottom Hole	1,202,803.88	10,431,617.00	28° 44' 17.277" N	88° 21' 57.340" W

1.3 Program Specifics

1.3.1 Casing Program

Casing Size	Setting MD	Setting TVD
36 in.	5321	5321
28 in.	6217	6217
22 in.	7937	7937
18 in.	8969	8969
16 in.	12250	12250
13-5/8 in.	15300	15300
11-7/8 in.	Contingency	Contingency
9-7/8 in.	19,650	19,650

1.3.2 Wellhead Program

Vendor	Equipment
Dril-Quip	SS-15 ES Big Bore II
	36 in. Low Pressure Housing, Annular Outlet Spool with 6 Annular Shut-Off Valves
	Two (2) Slope Indicator Supports
	28 in. Supplemental Hanger
	18-3/4 in. High Pressure Housing – with HD-H4, 27" O.D. wellhead connector
	18 in. and 16 in. Supplemental Adapters, Hangers, and Seal Assemblies
	9-7/8 in. 2nd position hanger with 1st position dummy hanger

1.3.3 Mud Program

Casing Interval	Mud Type	Density
28 in.	SW	8.6 (surface)
22 in.	SW / WBM	8.6 – 12.0 ppg PAD (surface)
18 in.	SOBM	10.1 ppg (surface)
16 in.	SOBM	10.1 – 11.8 ppg (DH)
13-5/8 in.	SOBM	11.8 – 13.1 ppg (surface)
9-7/8 in. or OH	SOBM	13.1 – 14.6 ppg (surface)

1.3.4 Wellbore Surveying Program

Casing Interval	Survey Type	Frequency
28 in.	MWD	Every stand
22 in.	MWD	Every stand
18 in.	MWD	Every 500 ft minimum (to be advised)
16 in.	MWD	Every 500 ft minimum (to be advised)
13-5/8 in.	MWD	Every 500 ft minimum (to be advised)
9-7/8 in. or OH	MWD	Every 500 ft minimum (to be advised)

Note: Survey frequency may be increased if inclination becomes problematic.

1.3.5 Open Hole Wireline Logging Program

All wireline logs are **optional** runs. Please refer to the PDDP for logging decision guidelines.

1.3.6 Mud Logging

Mud logging (recording drilling parameters) will begin at the mud line. (For the full sampling and shipping requirements, see the PDDP.) Sample collection will begin after 22 in. casing is set and riser is run.

1.3.7 Coring Program

No cores are planned.

1.4 MMS Notes

The Macondo Exploration Plan was approved by the MMS on April 6, 2009 with the following comments:

- Exercise caution while drilling due to indications of shallow gas and possible water flow.
- Hydrogen sulfide (H2S) classification, the area in which the proposed drilling operations are to be conducted is hereby classified, in accordance with 30 CFR 250.490(c), as "H2S absent."

A revised APD was approved January 14, 2010 with following cautions/comments:

- All conditions/cautions of approval for the original APD remain in effect.

The original Macondo APD was submitted on May12, 2009 and approved May 26, 2009. Exercise caution while drilling due to indications of shallow gas and possible water flow.

The APD was approved with the following cautions / conditions:

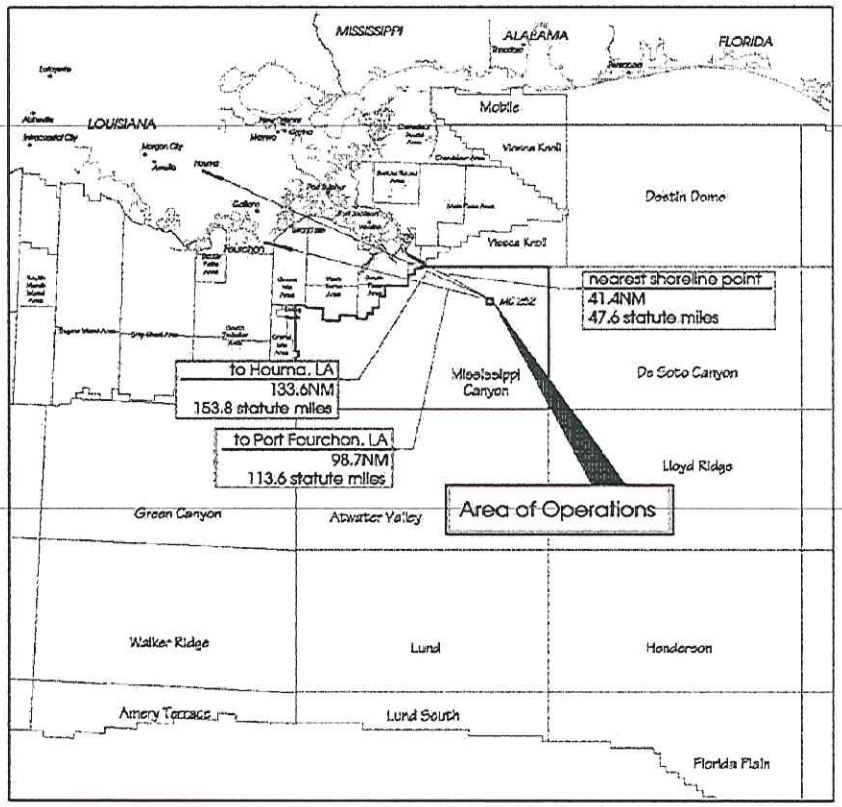
- Please use caution while drilling because of possible shallow gas at 4370 feet to 4820 feet (BML).
- Please use caution while drilling because of a moderate potential shallow water flow at1832 feet to 1944 feet, 3200 feet to 3367 feet 3760 feet to 3960 feet and 437- feet to 4600 feet BML.
- Please be reminded that an APM should be submitted with a final surveyed surface location plat (in NAD 83), KB, and water depth as soon as they are determined.
- If the water depth is greater than 800 meters (2,624 feet) and you plan to leave the wellhead on the seafloor after plugging and abandoning of this well, you are required to obtain MMS approval as soon as possible and no later than 5 work days prior to the start of plugging operations for the well so that MMS will have time to get concurrence from the Navy. Your request should contain the following information: Lat. and Long. coordinates, water depth, wellhead height, completion guide base height, and aerial extent. If the water depth is greater than 1,666 meters (5000 feet), then concurrence from the Navy is not required. The approval of waiver to leave a wellhead on the sea floor in water depth less than 800 meters (2,624 feet) will be limited to request that pose a mechanical problem or a safety concern, such as diver safety when excavating around the wellhead on the seafloor. The waiver must be approved by the District Manager and concurrence from the Navy must be obtained.

Note:	**For any clarification requirements, contact Scherie Douglas at** [redacted]

Please read and post the APD in the WSL office, as it is the governing document for these well operations and any deviation from the printed details will need to be approved by the MMS before continuing operations.

	GoM Exploration Wells MC 252 #1 – Macondo Prospect Well Information	

1.5 Location Map



Projection: UTM Zone 16 North
Datum: NAD27
Distance Units: US Survey Feet

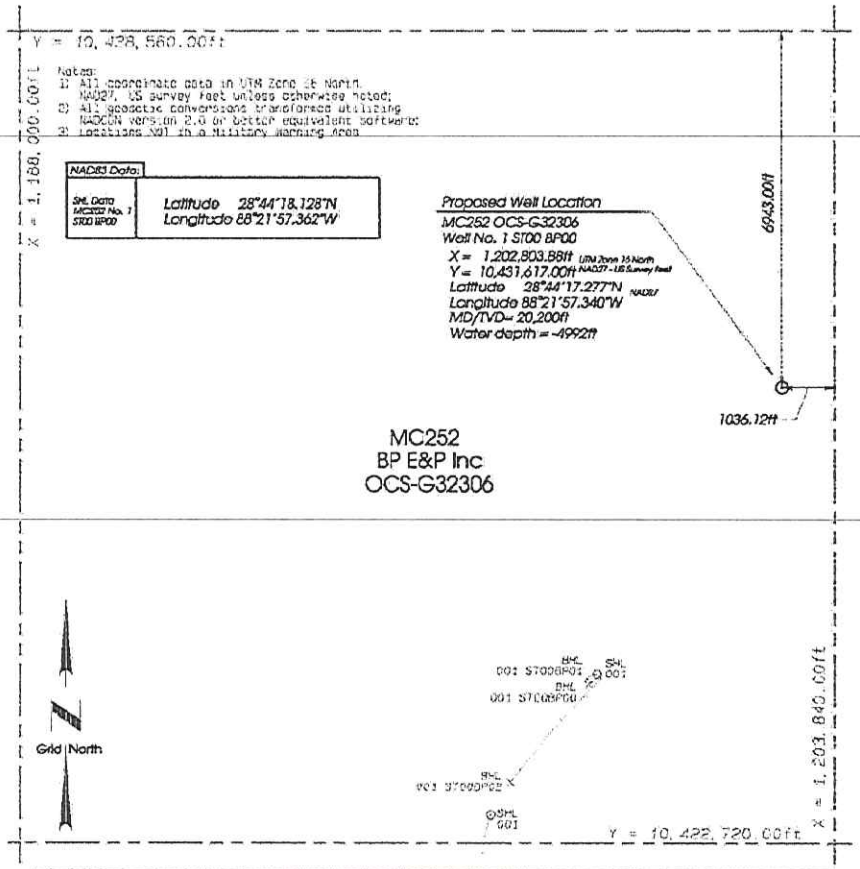
"VICINITY CHART"

Sheet 1 of 2

bp	BP EXPLORATION AND PRODUCTION Proposed Well Location OCS-G32306 MC 252 No. 1 ST00BP00 Mississippi Canyon Area (OPD# N-116-10) Block 252 Offshore Federal - Louisiana Plat prepared by [illegible]	Scale 1" = 50 miles Date: 5May2009

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **Well Information**	Macondo

1.6 Location Plat



Digital Copy
Signed & sealed original on file
Brian D. Autio Date: 8 May 2009
Registered Professional Land Surveyor
State of Louisiana
Registration Number 4818
Employee of bp America, Inc
(281) 366-3452

I, Brian D. Autio, hereby certify that the proposed surface location of BP EXPL & PROD. OCS-G32306 MC 252 No. 1 ST00BP00 is as follows:
Location: 1,036.12 ft. from the East Line and 6,943.00 ft. from the North Line of Mississippi Canyon Block 252.

"Confidential Information"

Sheet 2 of 2

bp	BP EXPLORATION AND PRODUCTION	Scale 1" = 2000 ft
	Proposed Well Location OCS-G32306 MC 252 No. 1 ST00BP00	Date: 8May2009
	Mississippi Canyon Area (OPD# NH16-10) Block 252 — Offshore Federal - Louisiana	

1.7 Drilling Summary

Prospect Overview

Macondo is a moderate depth Miocene prospect in the Mississippi Canyon area. The prospect is located entirely outside of any salt body. It is located approximately 24 miles north of BP's Isabela discovery which was drilled in MC 562 during 2006. The primary target for the Macondo prospect is the M56, which was the same as Isabela. The target depth for Macondo is approximately 18,400'. The well will be drilled to a TD of 19,650' to test the older Miocene section below the targeted M56. Seismic data quality over this prospect is very good since there is no salt involved. The well will be drilled as a vertical hole from the "A" location as permitted in the approved Exploration Plan for MC 252.

Drilling Plan Summary

Previous sections completed. A clean-out run will be done with the drilling BHA and 18-1/8" bit (minus the geo-pilot and 16-1/2" bit).

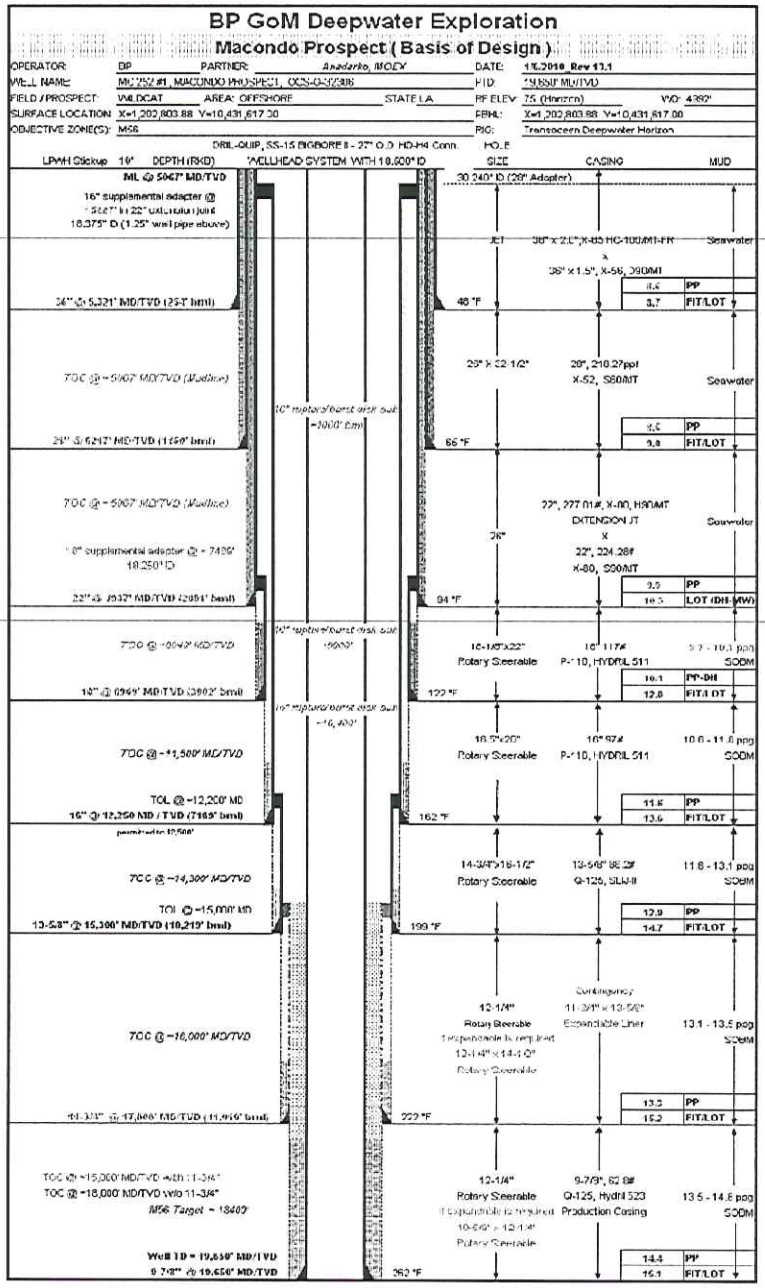
A 16-1/2" x 20" hole will be drilled with SOBM to a deep as possible (permitted to 12,500'). There is a very low chance of depleted sands in this interval and the standard 7/7/7 exploration formula will be applied with a preventive high concentration LCM pill ready if the depleted sand is encountered. A detailed plan will be in place to deal with the depleted plans if encountered and will be supplied to the rig separately prior to drilling this hole section. At section TD, a 16.0 - 16.5 ppg pad mud will be spotted in the rathole prior to POOH for 16" casing. After POOH, the 16" casing will be run and cemented in place with Halliburton Class H lead and tail slurries. A Leak-off Test (LOT) will be performed after drilling out. The estimated fracture gradient is ~13.6 ppg EMW. This setting depth should give sufficient fracture gradient to achieve the 13-5/8" casing point at 15,300' md/tvd.

A 14-3/4" x 16-1/2" hole will be drilled with SOBM to 15,300' md/tvd. At section TD, the rathole will be filled with 16.0 - 16.5 ppg pad mud prior to POOH for 13-5/8" liner. After POOH, the 13-5/8" liner will be run and cemented in place with Halliburton Class H lead and tail slurries. A Leak-off Test (LOT) will be performed after drilling out. The estimated fracture gradient is ~14.7 ppg EMW. This setting depth should give sufficient fracture gradient to achieve drilling to the TD of 19,650' md/tvd.

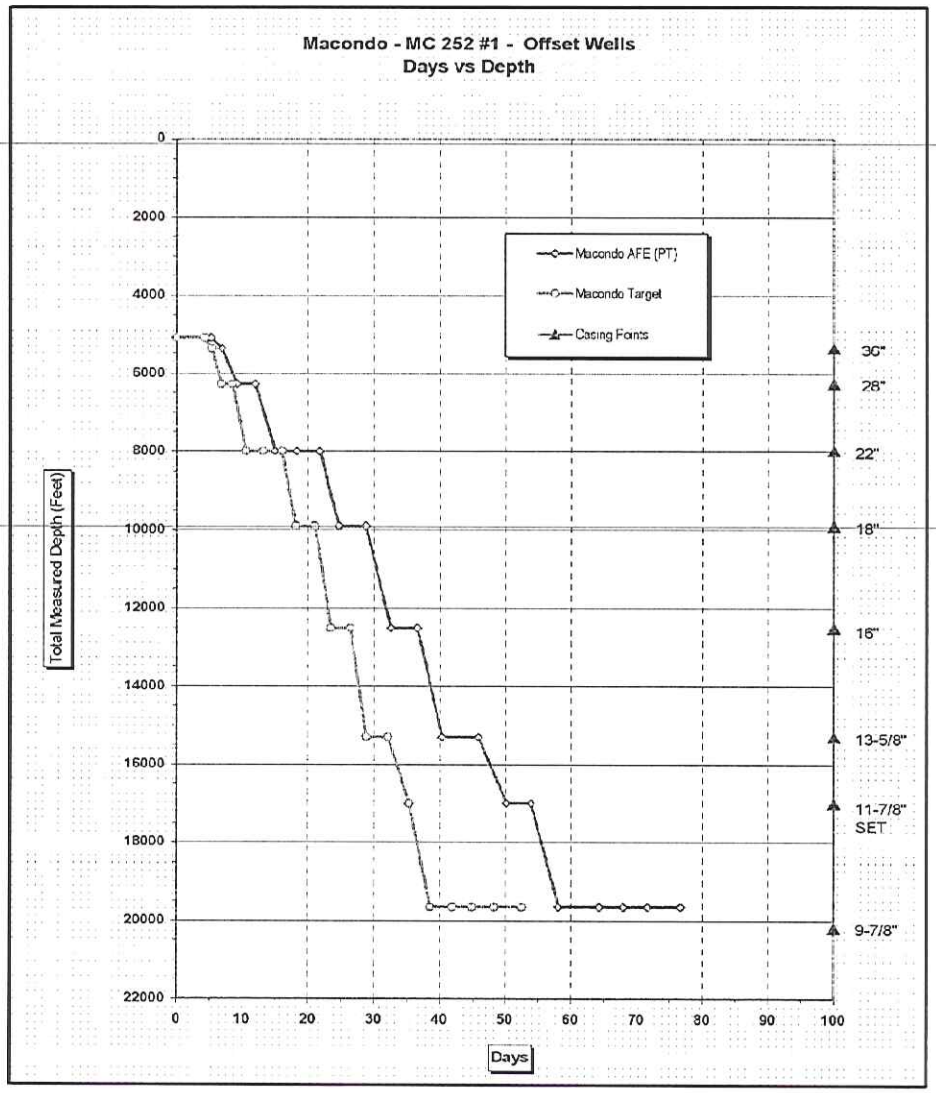
A 12-1/4" hole will be drilled to 19,650' md/tvd. The need for wireline evaluation of this interval will be determined by real time LWD data. A decision on the way forward will be made following evaluation of the open hole interval. The well will have either production casing run if exploration is successful, if not it will either P&A'd or temporarily abandoned. Once the final evaluation program is complete, a decision will be made as to whether to sidetrack, run production casing string, TA, or PA the well.

	GoM Exploration Wells MC 252 #1 – Macondo Prospect Well Information	

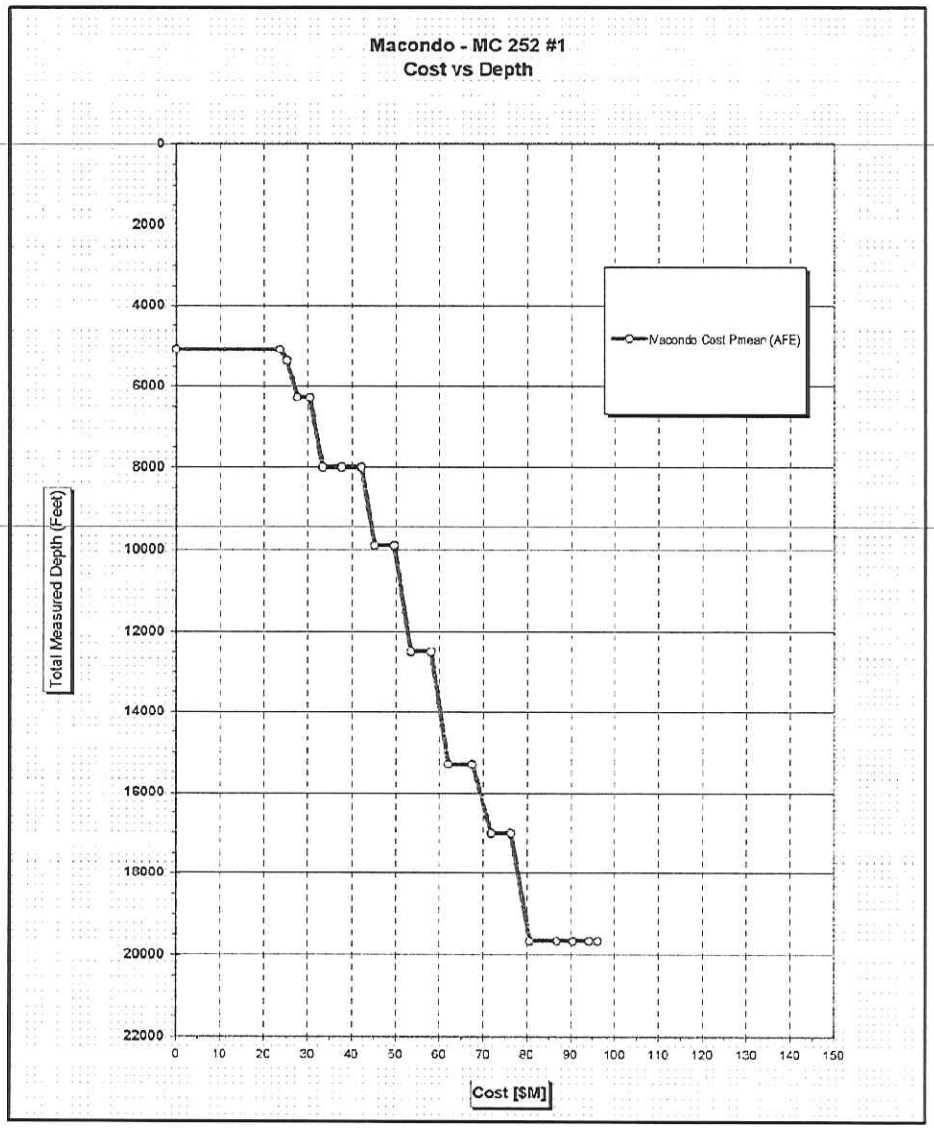
1.8 Wellbore Schematic



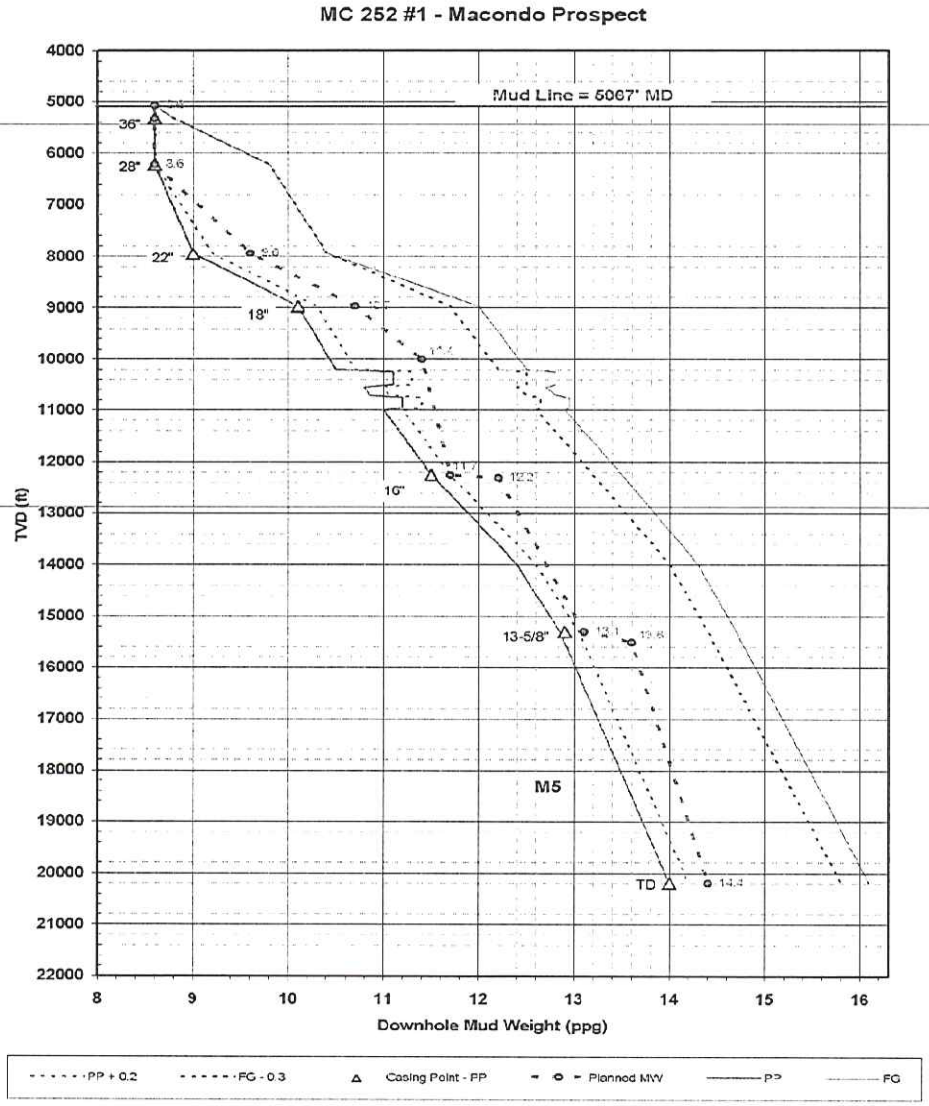
1.9 Days vs Depth Curve



1.10 Cost vs Depth Curve



1.11 Mud Program



	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **Subsurface Information**	

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2 Subsurface Information

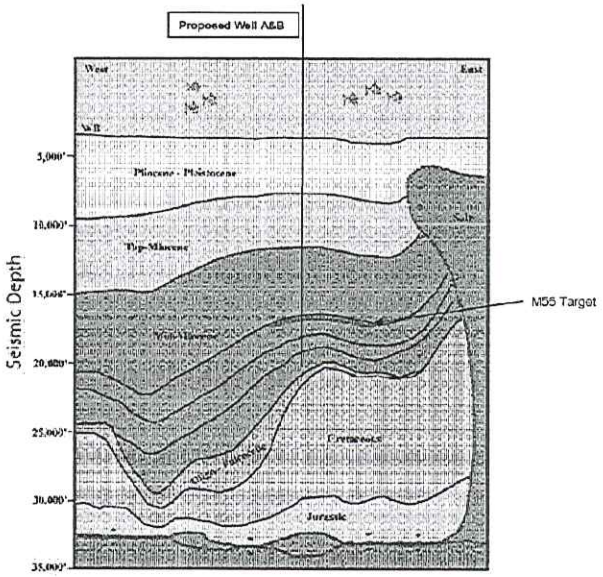
2.1 Prospect Summary

The Macondo project is proposed to test an extra salt amplitude prospect in northeastern Mississippi Canyon protraction area. The Macondo prospect is located in Block 252 where BP is Operator and currently has a WI=100%. (It is expected to have a partner prior to spud, or shortly thereafter)

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.



2.2 Formation Tops

List of Significant Markers Anticipated		
Name	**Subsea Depth**	**Top MD**
Reticulofenestra pseudoumbilicus; Globorotalia margaritae	7060	7060
Catinaster mexicanus	9100	9100
Catinaster coalitus	13145	13145
Discoaster kugleri; Globorotalia fohsi robusta	14153	14153
Cyclicargolithus floridanus	17481	17481
Globorotalia peripheroronda – M56	18400	18400
Sphenolithus heteromorphus	19120	19120
Discoaster petaliformis	19594	19594

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Subsurface Information

2.3 Top Hole Formation Forecast

Prospect or Field Name:	Macondo			
Well Location Name:	Proposed MC 252 #1 Location (Surface location in MC 252)			
Well Type:	Exploration			
Surface Location Coordinates:	Latitude	Longitude	Easting	Northing
	28° 44' 1.2770" N	88° 21' 57.3401" W	X = 1,202,803.88 ft E	Y = 10,431,617.00 ft N
Geodetic Datum & Projection:	Geodetic Datum: NAD 1927; Spheroid: Clarke 1866; X and Y Coordinates in UTM Zone 16 (US feet)			
Protraction Area & Block No.:	Mississippi Canyon 252	Block Calls:	6,943 ft FNL	1,036 ft FEL

Author:	Craig A. Scherschel	Date:	08 June 2009	Revision No.:	0

Proposed Casing Program	Depth BML (ft)	Depth SS (ft)	Depth DDF (ft)	Subsea Error ± (ft)	TWT BML (sec)	3D Seismic Line 17282 at the Proposed Surf. Loc. (NW – SE)	Units & (Horizons)	Seismic-Stratigraphic Interpretation and Principle Lithology	Shallow Gas	Shallow Water Flow	Hydrates	Comments
								Seawater				Seafloor is relatively smooth with a gradient of ~2° (5.2%) to the southeast.
	0	4,992	5,081	25	0			Mudline / Seafloor				
	250	5,242	5,331	32	0.094		1 (10)	Hemipelagic clays with possible thin clay debris flows	N	N	N/L	36" csg to be jetted into upper Unit 2
	250	5,272	5,361		0.105		36" Shoe 2	Interbedded marine clays and thin clay-prone debris flows	N	N	N/L	Drill w/ Seawater
	726	5,718	5,807	47	0.268		(15)	Interbedded marine clays and possible sands				
	844	5,836	5,925	50	0.310		(20) 3	Interbedded marine clays and possible sands	N	N	N/L	
	1,042	6,034	6,123	56	0.380		(30)					
	1,194	6,186	6,275		0.433		28" Shoe 4	Clay turbidites and debris flows	N	N	N/L	28" csg shoe to be set within upper Unit 4
	1,489	6,481	6,570	70	0.534		(34)	Overbank/channel levee clays and possible silts and sands				
	1,620	6,612	6,701	74	0.578		(36)	Clay turbidites and thin debris flows		L	N	*Pliocene amplitude anomalies (possible shallow gas) are about 500 ft NW and 300 ft NE
	1,832	6,824	6,913	80	0.649		(38)	Continuous sands and silts		M		
	1,944	6,936	7,026	83	0.686		(40)					
	2,633	7,626	7,614	101	0.876		5 (45)	Interbedded clay turbidites and thin clay-prone debris flows with possible sands	N	L	N	Drill w/ Seawater or 11.5+/- P&D mud if needed
	2,832	7,824	7,913	110	0.970		(50)	Massive clay-prone debris flow with possible silts				
	2,919	7,911	8,000		0.997		22" Shoe	Interbedded clay turbidites and debris flows	N	N	N	
	3,202	8,194	8,283	121	1.084			Sand-prone deposit	L	M		
	3,367	8,359	8,448	126	1.134			Interbedded clay turbidites and debris flows	N	N	N	22" and 18" csg shoes to be set within Unit 6.
	3,761	8,753	8,842	138	1.262			Sand-prone deposit	M	M		
	3,968	8,960	9,039	144	1.310		6	Interbedded clay turbidites and debris flows				Drill w/ 9.0 – 10.6 ppg SOBM
	4,372	9,364	9,453	156	1.430			Sand-prone deposit	M	M		
	4,613	9,610	9,699	164	1.500							
	4,919	9,911	9,999		1.587			Interbedded clay turbidites and debris flows; thin silts and sands possible	N	N	N	Depth Limit of the Shallow Hazards Assessment
	5,328	10,320	10,409	186	1.698		(60)					

Depths below mudline corrected from time with function derived from cleanest velocities. ($Y = 0.0062^*X^2 + 2.0600^*X$) where Y = Depth BML in feet and X = TWT BML in msec).

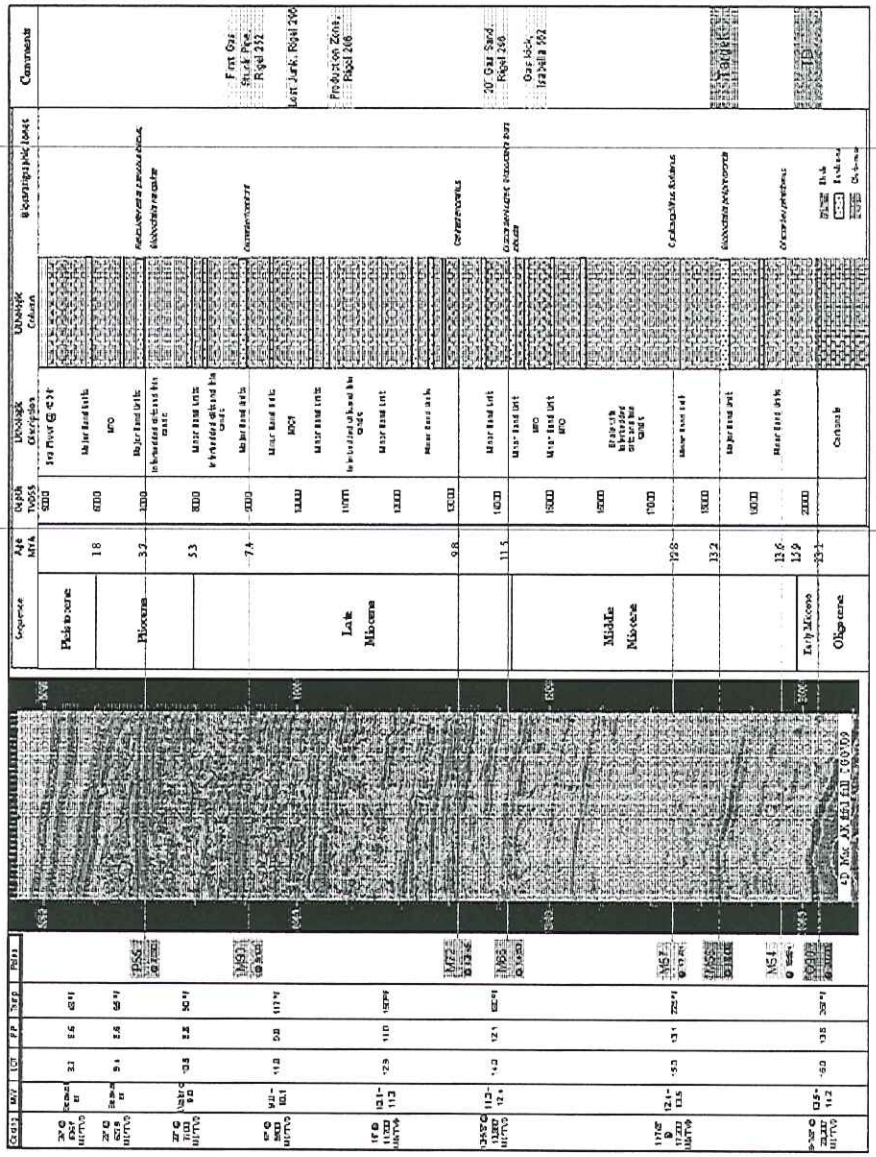
Risk Scale: Negligible, Low, Moderate, High

Abbreviations: BML = Below Mudline; SS = Subsea; DDF = Below Derrick Floor; TWT = Two-Way Travel Time

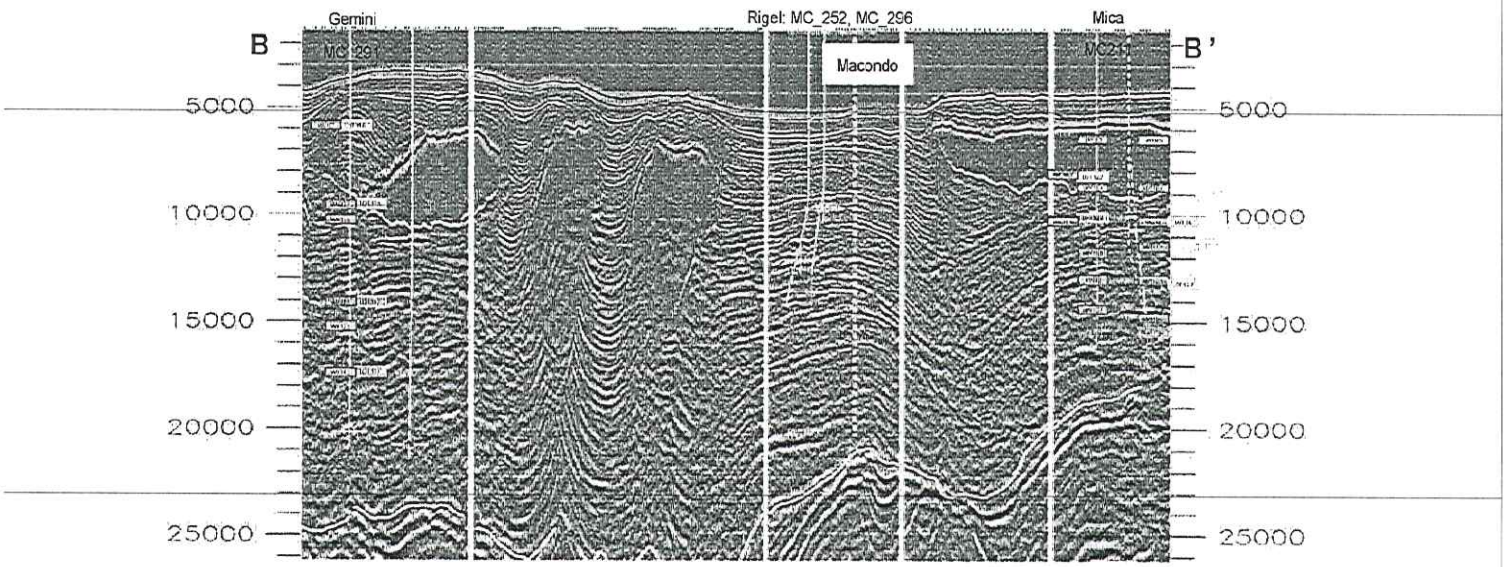
Plate 23

Air gap assumed to be 89 ft for the Marianas. Error: Estimated accuracy is ± 0.5% for seafloor, ± 3.0% depths BML (Subsea accuracy is the sum of these two).

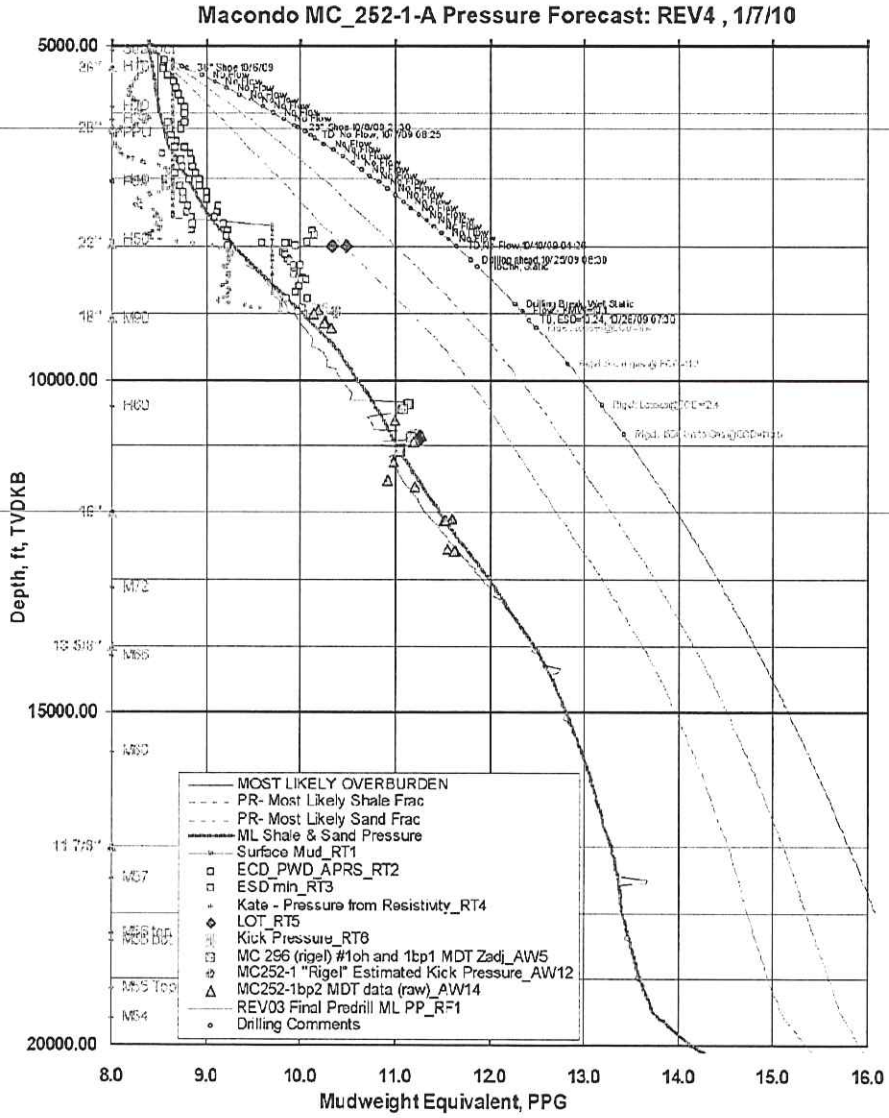
2.4 Stratigraphic Section



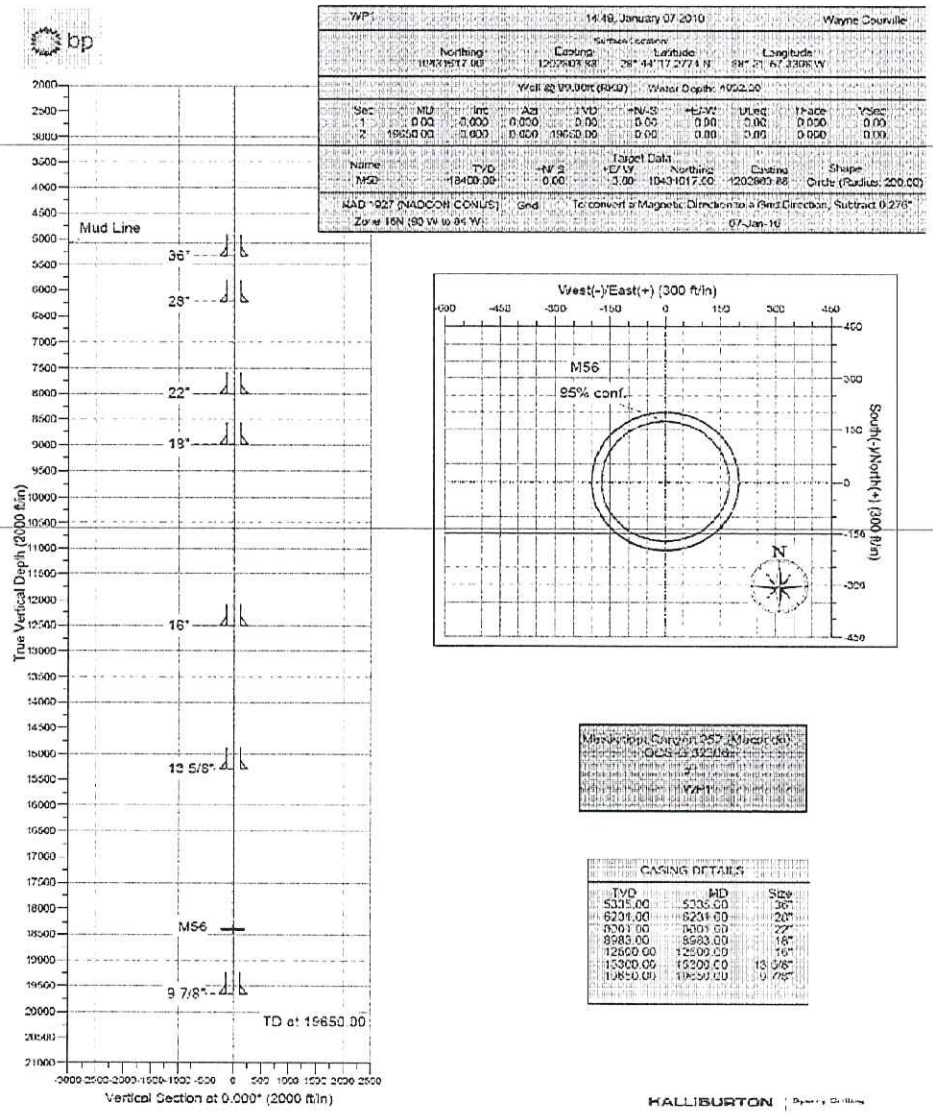
2.5 Seismic Cross Section



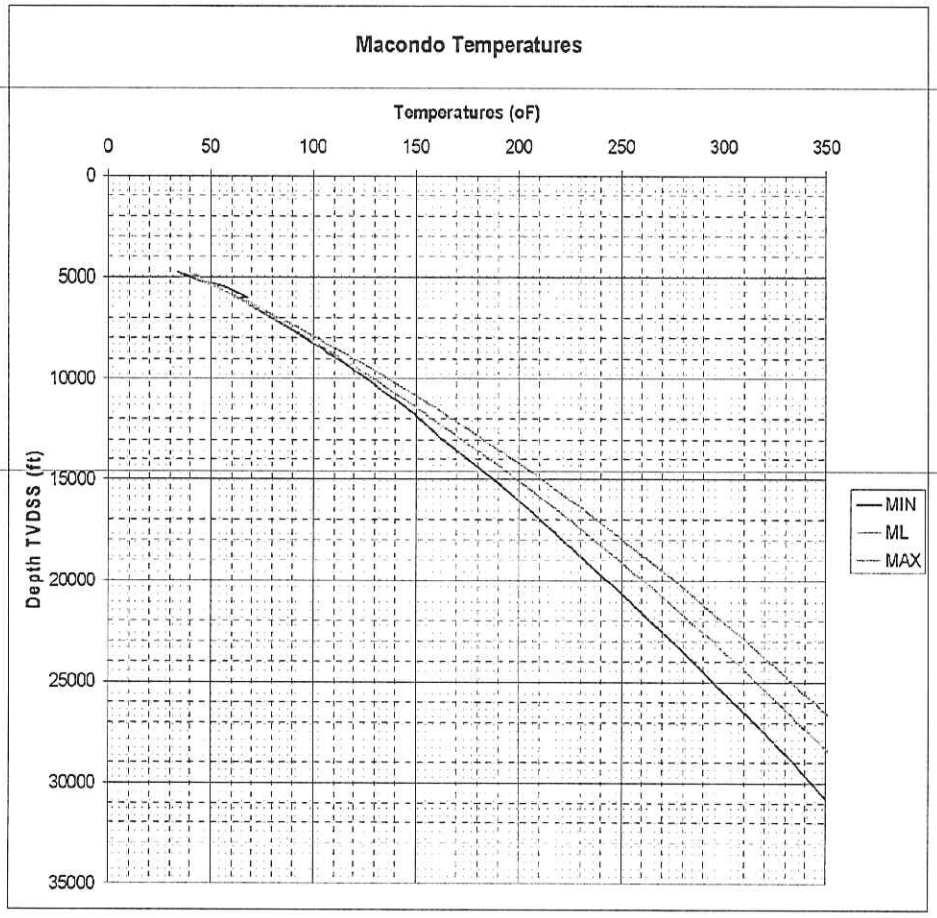
2.6 Pore Pressure Curve



2.7 Directional Plan



2.8 Estimated Temperature Plot



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3 Pre-Spud Activities

Surface Location			
Latitude:	28° 44' 17.1424" N	Longitude	88° 21' 58.5024" W

3.1 Mobilization

- Confirm that BP regulatory department (Scherie Douglas, 281-366-6843) has notified all proper authorities (i.e. MMS, Coast Guard, Naval Air Station-Air Operations, etc.) at least 48 hours prior to reaching new location.

3.2 Pre-Spud Meetings

A crew engagement meetings will be conducted prior to spud, at the rig site. The agenda will include safety status and goals, and presentation of the project plan.

Prior to drilling each hole section a review will be conducted with the well site leadership and office personnel to ensure all questions / concerns are addressed prior to undertaking the required work.

3.3 Action Items

- Required mud should be prepared and at location prior to latching up, with a displacement plan in place (~5500 bbls).
- Ensure 16-1/2" x 20" BHA components are on the rig, and prepared to RIH as efficiently as possibly.
- Ensure a plan to displace wellbore back to SOBM from seawater is prepared and reviewed.
- Stump test the stack per APD on 5-1/2" and 6-5/8".
- Test the surface subsea on 6-5/8" drill pipe only (per updated APD)
- Ensure enough 6-5/8" drill pipe to TD well at 20,000' TVD is available. At least 5500' of this should be 40 ppf S-135 or higher grade.
- Ensure all contingency LCM products are on the rig prior to starting this hole section.

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

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Interval Notes

Item	Comment
Cleanout Bit	18-1/8" Hughes Rock Bit
Bits	16-1/2" HC507Z (primary)
Underreamers	Hughes GuagePro XPR (20")
BHA	RSS, MWD, PWD, LWD, DDS, GR, Res
Special Equipment	16" support plate (800 kips), Bore protector (wear sleeve w/ bit sub), 16" Casing Hanger and Seal Assembly running tool, burst disks (3), 16" casing swedge with XO to TIW (liner length > water depth), (2) ATC Diverter Subs, mud surge tool, BlackHawk Automated cement head, dual plugs in backup 16" hanger (contingency)
Drillstring	6-5/8" 32 ppf FH
Mud system	SOBM, Drillout MW = 10.6 ppg (surface). Projected MW at end of interval is 11.7 ppg (downhole). Weight up system to 11.4 ppg (downhole) prior to drilling past 10,000 TVD.
Casing	16", 96 ppf, P-110, 0.575" wall, Hyd 511 connections
Cementing Displacement	Inner string (if well control use backup joint which will be set-up with dual plugs).
Landing string	6-5/8" 40 ppf S-135 FH
Cementing	16.2 ppg Halliburton Class H cement (see detailed cement program)
Anticipated LOT at drill out (start of 16" interval / 18" shoe)	12.0 ppg EMW LOT

8 16" Liner Interval

8.1 Introduction

The objective of this interval is to push the 16" liner set at 12,250 ft MD / TVD and obtain an adequate LOT to allow drilling to the 13-5/8" casing point. The section is permitted to 12,500', but due to the shallow setting depth of the 18" casing, this depth won't be achievable unless a higher than expected LOT is achieved. Extending the casing point in this section as deep as possible is critical in reducing the chances of requiring an expandable liner deeper in the well.

At approximately 10,250' TVD, there exists a potential sand which is pressured and has been seen in other wellbores (expected to be water bearing). Below this at 10,750' TVD, there exists another sand, which has been produced from in the same block and could potentially be depleted, but forecasts have it still being pressured between 11.1 – 11.4 psi due to faulting. Background LCM will be applied to the system to help should any of these sands be depleted (plug pore throats, strengthen the weakened formations) and drill to section TD.

8.2 Objectives

- Achieve sufficient LOT for drilling to next planned casing point (13.6 ppg).
- Push 16" casing as deep as possible in order to reach 13-5/8" casing point and decrease chances of needing 11-7/8" liner.
- Cement 16" casing per design to achieve a 13.6 ppg LOT without remedial operations.
- Minimize mud losses / wellcontrol events.

8.3 Concerns

Concern / Hazard	Mitigation of Concern / Hazard
Pore Pressures and Fracture Gradients	Utilize BP GoM procedures during 18" LOT to ensure accurate measurement. Wellsite geologists to monitor pore pressure trends to ensure proper analysis of wellsite pore pressures. Wellsite leaders, tool pushers, drillers, and crew are responsible for monitoring drilling trends and will have an active role in ECD management. Wellsite leaders must ensure that personnel become familiar with wellbore pressure/ECD management guidelines.
Massive Lost Circulation	As there is potential for a depleted sand starting at 10,750' TVD and continuing until 11,000' TVD a high concentration LCM pill should be made prior to drilling out (84 ppb / 100 - 200 bbls). A LCM decision tree is supplied for review in the appendix. The standard 7/7/7 exploration background LCM formulation should be applied throughout the interval.
Running 16" liner	Allamon diverter system should be in place to minimize surge pressures. Also, have a mud surge return tool available to minimize mud losses on floor while running casing due to tight tolerance through stack / wellhead.
Vibration issues	Monitor BHA vibration. Utilize all prior lessons learned on 18" shoe track and salt drilling.

Concern / Hazard	Mitigation of Concern / Hazard
	Vary drilling parameters (WOB, RPM, etc) to minimize downhole and/or surface vibrations. If unable to mitigate vibrations discuss alternatives with Houston Team.
Stuck Liner Off Bottom	A contingency plan will be in place should the liner get stuck off bottom. This will be supplied to the rig prior to drilling this section
Offset Well Problems	Kick, losses, drag / swabbing, and stuck pipe have all been encountered on offset wells. Some of these wells were drilled with WB mud, which may have exacerbated these issues.
Tight Clearance Profiles	Note following minimum IDs: • 18-3/4" HP housing – 18.510" • 16" casing Hanger – 18.375" (OD) • 18" casing Hanger – 16.553" (OD) • 18" Seal Assembly – 17.592" (OD) Slowly run 16" casing to minimize surge pressures

8.4 General Drilling Operations Procedure

1. Ensure BOP has been tested (per compliance with approved APD).
   - Initiate well control and emergency disconnect drills.
   - Ensure all personnel are in compliance with MMS Sub Part "O".
2. Ensure 18" liner and blind shear rams have been tested **(per APD requirements).** Record pressure with volume pumped. This data will be compared with planned 18" shoe LOT.
3. PU and RIH with clean-out BHA.
   - Run a retrievable wear sleeve in the BHA.
   - 18-1/8" Rock bit (no Geo-pilot)
   - Offline - rack back Geo-pilot with 16-1/2" PDC bit for the drilling BHA.
4. Slow tripping speed and use care when running through the wellhead and supplemental adapter with the rock bit.
5. Tag up 200' cement plug at ~5866' TVD.
6. Drill and ream the plug while displacing to 10.6 ppg SOBM.
7. Pump weighted/viscous sweeps to help clean the wellbore of cement chunks
8. TOH and rack back the clean-out BHA.
9. Pick up the Geo-pilot and bit, followed by the drilling BHA.
10. TIH to the shoe track
11. Drill shoe track.
    - Ream shoe joints to remove cement sheath (especially shoe and float collar)
    - As shoe track is being drilled increase mud weight to 10.6 ppg (surface).
12. Clean out rat hole and drill 10' of new hole.

- Circulate cuttings above the stack.
- Close annular or pipe ram.
- Perform LOT per standard GoM LOT procedure (anticipated LOT = 12.0 ppg)
- If LOT is good prepare to drill ahead

	Prior to LOT, obtain ESD value with MWD. If unable to get ESD value after two attempts, continue LOT. After LOT, make one attempt to get ESD value.
Notes:	**Shape of LOT curve rather than an actual value will dictate whether a squeeze job is required.**
	If surface mud weight is < 0.5 ppg of surface LOT, MMS approval is required.

13. Drill ahead mud weight to be determined by LOT at 18" shoe:
    - Mud weight should be increased to 11.4 - 11.5 ppg (DHE) prior to drilling past 10,000' TVD. This should be done while drilling ahead.
    - Estimated mud weight at TD will be 11.8 ppg (DHE), but weight shouldn't be raised above 11.5 ppg downhole until the potentially depleted sands are drilled unless required by pore pressure.
14. Drop 1-3/4 in. ball to activate reamer and confirm arms are open with over-pull against casing shoe.
15. Control drill **16-1/2" x 20"** interval using following parameters.

Parameter	Guidelines
ROP	Limit to rate for adequate hole cleaning (as determined by WS Leader and Mud Engineer).
WOB	10-65 kips (limited by Vibration, Bit / BHA performance, and Wellbore Inclination)
RPM	120-160 is planned range. Optimize for ROP, vibration limits, and directional considerations.
ECD / PWD	Maintain ECD / PWD of at least 0.5 ppg < LOT value. (Remember to include any mud compressibility in LOT number.) Based on actual hole conditions, the ECD readings may be adjusted closer to LOT in order to push the casing point deeper. Before doing so discussions should be had with the Houston based team, and MMS approval granted. Close coordination between BP wellsite leaders, drilling crew, and LWD Engineers will be required on ECD management to achieve maximum performance. Roles and responsibilities of all involved parties should be discussed in hole interval planning meeting.
Pump Rates	800-1200 gpm is planned range. Optimize for ROP, hole cleaning, and ECD limits.
Vibration	Monitor vibration indicators to maintain in acceptable range.
Hole Deviation	Limit hole deviation to under 3°. Rotary steerable tools will be in the hole and dog legs should be kept under 1°/100.
Section TD	16" liner point is permitted to 12,500' ft MD / TVD. Because of the shallow setting depth on the 18" a max of 12,250' seems more probable for this interval. The objective of this interval is to isolate pressured/depleted sands and achieve required LOT to reach 13-5/8" TD. Pushing casing point as deep as possible should be considered, based on hole conditions, MW, and ECD's. **Prior to drilling more than 100' TVD deeper than the permitted hole section TD (12,500'), MMS approval is required.**

16. As this is a vertical wellbore with sufficient pumps, sweeps should not be required. Only pump weighted / viscous sweeps if PWD/wellbore indicates hole cleaning issues.

Caution:	**Prior to drilling potentially depleted sands, ensure:** ○ **100 – 200 bbl / 84 ppb LCM pill has been built (per the mud program)** ○ **Decision tree has been reviewed and steps are clear to all parties.** ○ **BP & Transocean leadership should be present in the drillers shack to ensure these actions are followed while drilling this interval.** ○ **Use salt exit strategy to drill sands from ~10,200' – 11,000'.**

17. At interval TD, pump a 100 bbl weighted / viscous sweep and circulate hole clean with a minimum of 1-1/2 capacity. Adjust TD for casing tally, as needed.
    - Rat hole = ~10-15' above the pilot hole (~110-~115' total)
18. Circulate and condition, as required, to clean hole and lower yield point for running casing (lower YP to ~15 or as hole conditions dictate and keep gels flat).
19. Prior to POOH, spot a 16.5 ppg weighted SOBM pill in rathole.
20. If hole conditions warrant, make a short trip to determine hole conditions and reduce potential of sticking 16" liner.
21. POOH into 18" shoe, ensuring cement sheath has been removed. If drag is observed in 18" shoe, wash and ream cement sheath until drag is gone. Attention should be paid, as reamer will still be activated with flow.
22. Continue POOH to place bit in 16" profile area, wash 16" wellhead profile area. Continue to POOH, recovering wear sleeve and prepare to run casing.

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

Figure 1: 16" Liner OH Section: Drill String – MOP

Drill String Design: Margin of Overpull

This worksheet calculates ***Margin of Overpull (MOP)*** for pipe configurations with up to 5 different sizes of drill pipe and 3 different sizes of drill collars plus hevi-wate dp. It can also incorporate a safety factor.

	Macondo			**16" LINER OH SECTION**			
6.625	OD		OD	OD		OD	
5.625	ID		ID	ID		ID	
32.67	Nominal Wt		Nominal Wt	Nominal Wt		Nominal Wt	
37.71	Adjusted Wt		Adjusted Wt	Adjusted Wt		Adjusted Wt	
135,000	Yield strength, psi		Yield strength, psi	Yield strength, psi		Yield strength, psi	
80	% rem wall		% rem wall	% rem wall		% rem wall	
			Tensile strengths from the pipe drill pipe data entered above				
1,022,117	Tensile Strength		Tensile Strength	Tensile Strength		Tensile Strength	

BHA Data

9.500	⇐ DC #1 OD	8.000	⇐ DC #2 OD		⇐ DC #3 OD	6.625	⇐ HWDP OD	Tensile Str.
3	⇐ DC #1 ID	2.8	⇐ DC #2 ID		⇐ DC #3 ID	4.499	⇐ HWDP ID	1,021,600
300	⇐ DC #1 Length	105	⇐ DC #2 Length		⇐ DC #3 Length	920	⇐ HWDP Length	HWDP Air Wt
☑ Spiraled	⇐ Spiraled (√)	☑ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☑ Spiraled	⇐ Spiraled (√)	67,503
209	Wt/ft DC #1	144	Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor		0.8243
62,633	Wt. DC #1	15,152	Wt. DC #2		Wt. DC #3	Air weight of BHA		145,289
						Buoyed weight of BHA		119,764
Depth of Interest ⇒⇒⇒⇒			12,500	Safety Factor	80 %	Total length of BHA		1,325
Anticipated Mud weight			11.50	Block Wt.	145,000	Total depth		12,500

		Buoyed Wt	Section MOP		
				Pipe needed on last sec	0'
Enter Length DP #1 ⇒	11,175	347,376	350,553 #	Weak point in string	350,553
Enter Length DP #2 ⇒	0			Total weight of string	467,140
Enter Length DP #3 ⇒	0			Total weight BLK & string	612,140
Enter Length DP #4 ⇒	0			Total weight Indicator Reading	
Enter Length DP #5 ⇒	0			With over pull	962,694

NOTE: The air weight of spiraled hevi-wate drill pipe is calculated as 96% of non-spiraled HWDP.
Assumes lowest planned MW of 11.5 ppg

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

Figure 2: Clean-out BHA Schematic

sperry-sun
DRILLING SERVICES

BHA Schematic

Bp America Production

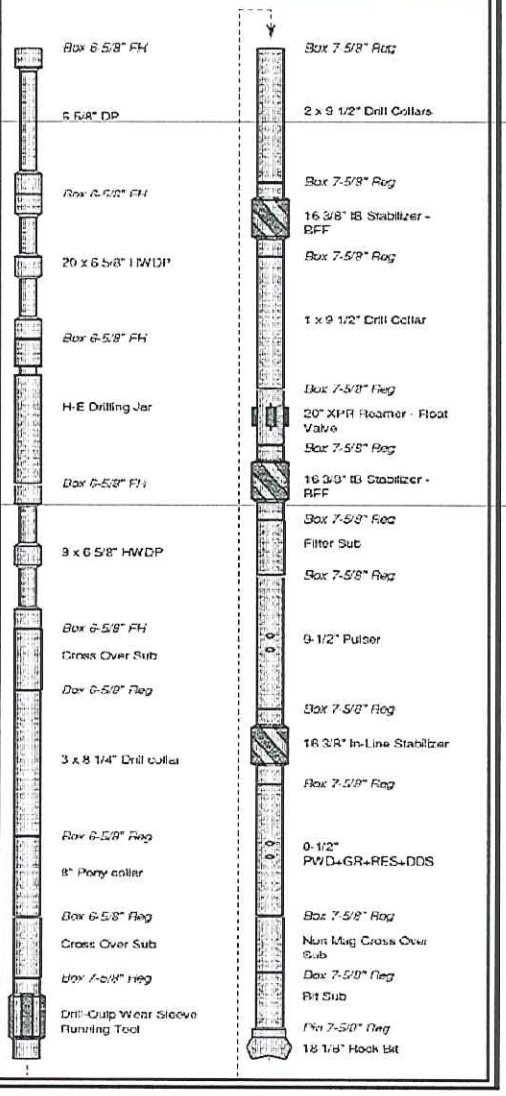
Macondo Prospect

BHA ID #: 11

18 1/8" Clean Out

BHA Configuration

C.D.	Length	Description
18.5"	2.73'	18 1/8" Rock Bit
9.5"	5'	Bit Sub
9.5"	1.58'	Non Mag Cross Over Sub
9.5"	27'	9-1/2" PWD+GR+RES+DDS
9.5"	4'	16 3/8" In-Line Stabilizer
9.5"	17'	9-1/2" Pulser
9.5"	6'	Filter Sub
9.5"	8'	16 3/8" IB Stabilizer - BFF
9.5"	15'	20" XPR Reamer - Float Valve
9.5"	30'	1 x 9 1/2" Drill Collar
9.5"	15'	16 3/8" IB Stabilizer - BFF
9.5"	60'	2 x 9 1/2" Drill Collars
9.5"	7.19'	Drill-Quip Wear Sleeve Running Tool
9.437"	4'	Cross Over Sub
8"	10'	8" Pony collar
8.25"	90'	3 x 8 1/4" Drill collar
9.125"	4'	Cross Over Sub
6.625"	270'	9 x 6 5/8" HWDP
8"	32'	H-E Drilling Jar
6.625"	600'	20 x 6 5/8" HWDP
6.625"	30'	6 5/8" DP



	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

Figure 3: Drilling BHA Schematic

sperry-sun
DRILLING SERVICES

BHA Schematic

Bp America Production

Macondo Prospect

BHA ID #: 4

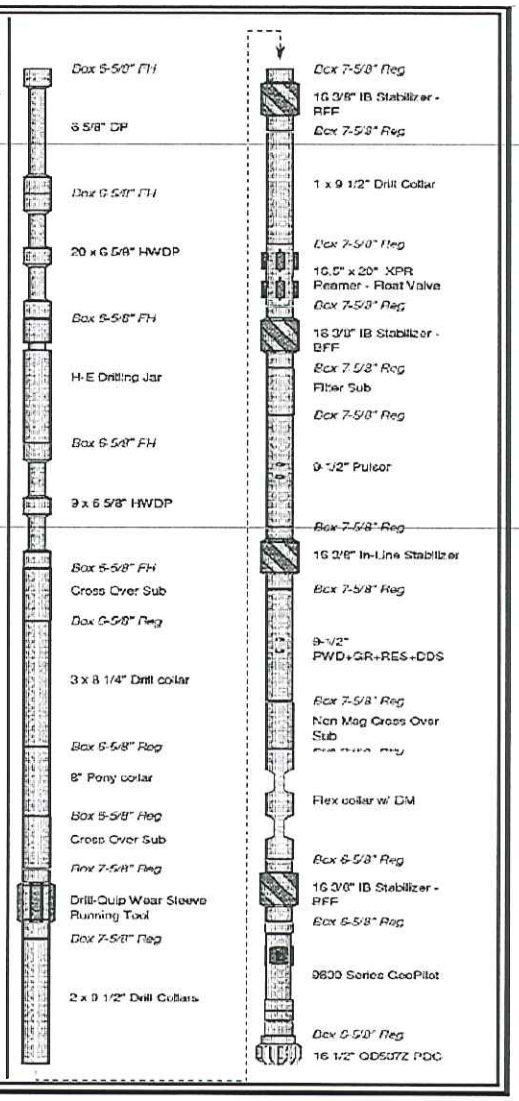
16 1/2" x 20" Geo-Pilot

BHA Configuration

O.D.	Length	Description
16.5"	2.79'	16 1/2" QD507Z PDC
9.625"	18.76'	9600 Series GeoPilot
9.5"	2.7'	16 3/8" IB Stabilizer - BFF
9.5"	10'	Flex collar w/ DM
9.5"	1.58'	Non Mag Cross Over Sub
9.5"	27'	9-1/2" PWD+GR+RES+DDS
9.5"	4'	16 3/8" In-Line Stabilizer
9.5"	17'	9-1/2" Pulser
9.5"	6'	Filter Sub
9.5"	8'	16 3/8" IB Stabilizer - BFF
9.5"	15'	16.5" x 20" XPR Reamer - Float Valve
9.5"	30'	1 x 9 1/2" Drill Collar
9.5"	15'	16 3/8" IB Stabilizer - BFF
9.5"	60'	2 x 9 1/2" Drill Collars
9.5"	7.19'	Drill-Quip Wear Sleeve Running Tool
9.437"	4'	Cross Over Sub
9"	10'	8" Pony collar
8.25"	90'	3 x 8 1/4" Drill collar
9.125"	4'	Cross Over Sub
6.625"	270'	9 x 6 5/8" HWDP
8"	32'	H-E Drilling Jar
6.625"	600'	20 x 6 5/8" HWDP
6.625"	30'	6 5/8" DP

BHA Discussion

Drill 16 1/2" x 20" hole section vertically.
8,993' - 12,500' - 10" Casing Point
MW - 10.6 - 11.8 ppg



8.5 16" Casing and Cementing Operations

8.5.1 Casing and Cementing Preparation

- Dril-Quip will ship Casing Hanger Running Tool and Casing Hanger to rig made-up in handling cradle and ready to run. If Dril-Quip cannot supply cradle, make-up Casing Hanger Running Tool, 16" Casing Hanger, and Seal Assembly.
- Prior to shipping, ensure Dril-Quip has made-up crossovers and appropriate DP pups at their shop. Inspect equipment once offshore to ensure everything has been properly made (For detailed make-up instructions, see *Dril-Quip Service Manual.*)
- Prior to shipping, primary float equipment should have been bucked up and thread-locked onto a joint of pipe. Inspect shoe and float collar joints for debris prior to picking up.
- Ensure cement, additives, and fresh and seawater samples are sent to Halliburton (Lafayette) lab for final lab testing.
- **Ensure burst disks and hand are offshore prior to running 16" casing.**
- Boost riser while rigging up casing equipment (not while running 16", as mud can flow up through casing).
- 16" casing will be run as a liner with an inner string. In case well control is encountered, the backup hanger joint will have a Weatherford dual plug system.
- OD of this casing string is critical and any loading could cause "ovality". Ensure it is clear to crews that pipe must be handled carefully.
- Prepare 16" casing tally. Inspect box threads and clean as required.
- Prior to shipment, verify casing has been drifted. Visually inspect to ensure there is no debris in pipe.
- Calculate swab/surge pressures for various running speeds. Select an acceptable running speed to ensure formation breakdown pressure is not exceeded.
- Prior to running casing, rabbit 6-5/8" 40 ppf landing string.
- Make-up primary Dril-Quip Casing Hanger Running Tool and place on riser skate.
- Prepare and rig-up Frank's flowback tool, ensure tool will stab into Hydil nubbins.
- Make-up Blackhawk cementing head.
  - Details to be supplied prior to running 16" casing
- Ensure any pup joints or crossovers required in landing are rented and inspected. Give material certifications to rig. (These certifications will be used to verify proper load carrying capabilities.)
- Ensure any pup joints or crossovers in landing do not have internal square shoulders or bore-backs, which have proven to hang-up drill pipe darts. Ensure internal tapers are at least 45 degrees.

8.5.2 Casing Procedure

1. Rig-up and run 16" casing. 16" casing string will consist of the following:

Item	Ftg	Size	Wall	ppf	Grade	Connection
Shoe Jt with guide shoe (centralized)	~48'	16"	0.575"	96	P110	Hydril 511
Float Collar Jt withL47WA float collar (centralized)	~48'	16"	0.575"	96	P110	Hydril 511
Centralized jt (2)	~90'	16"	0.575"	96	P110	Hydril 511
Non-centralized Jts	~x,xxx	16"	0.575"	96	P110	Hydril 511
Hanger Joint	~20'	16"	0.575"	96	P110	Hydril 511
16" Hanger/Seal Assembly	~5'	18.466'	N/A	160	N/A	Hydril 511
ATC Dart Catcher Sub & Down-Jet Sub	~6'	N/A	N/A	N/A	N/A	HT-55
Inner String (150' above shoe)	~x,xxx	5-1/2"	N/A	-	N/A	HT-55
ATC Diverter Sub "B"	~6	9-1/4"	3.13"	402	Q-125	HT-55
Inner String (2 stands)	~240'	5-1/2"	N/A	-	N/A	HT-55
Cross-Over	~5'	5-1/2"	0.415"	24	S-135	4-1/2"IF x HT-55
MRLD Tool	~6.5	18.341'	N/A	354	N/A	4-1/2"IF x 6-5/8"R
Cross-Over	~5'	5-1/2"	0.415"	24	S-135	6-5/8"R x 6-5/8" FH
Landing String	~120'	6-5/8"	0.625"	40	S-135	FH
ATC Diverter Sub "A"	~6	9-1/4"	3.13"	402	Q-125	FH
Landing String	~x,xxx'	6-5/8"	0.625"	40	S-135	FH

Centralizer details: Weatherford Bow Spring centralizer (4 subs)

Casing ID: 14.85 in.

Casing drift: 14.75 in.

Casing collar OD: 16.00 in.

Burst Disk: ~6100' TVD (1000' BML), 9400'-9100' TVD (500-800' above the 18" shoe), and 10,400'-10,600' TVD (500-700' below the 18" shoe)

Connection Size	Minimum Torque Required	Optimum Torque	Maximum (Yield) Torque
16 in.	37,000 ft-lb	44,000 ft-lb	450,000 ft-lb

- Have Hydril thread representative on location to inspect casing threads and connection make-up.

- Thread lock **5 joints** from shoe up.
- Do not close blind shear rams or annulars when running casing.
- Monitor well via choke and kill lines.
- Casing swedge required is required as the liner length > water depth
- 16" pin threads will be delivered pre-doped with Jet Lube Seal Guard. Only pin should have a thin coating of Jet Lube.
- As required, clean box threads prior to make-up.
- ***Four 16" subs will be sent out. Each sub should contain two burst disks and two collapse disks. The subs should be located approximately 1,000' below the mudline, 500' - 800' above the 18" shoe, and 500' - 700' below the 18" shoe. The fourth sub is included as a back-up.***

2. Make up Casing Hanger joint.
   - Ensure break on traveling block is unlocked and remains unlocked until casing hanger is landed.
3. PU and install wellhead housing support plate.
   - Land casing on support plate.
   - Break out Casing Hanger Running Tool and stand back in derrick.
   - Rig down casing tools.
4. Run inner string as follows, or as recommended by on site representative:
   - ATC downhole drop ball sub with Cement Sub
   - 5-1/2" DP to space out stinger **~150' above shoe**
   - ATC Diverter Sub "B"
   - Two (2) Stands drillpipe
   - Dril-Quip (1) Casing Running Tool (with upper and lower x-overs)
   - One (1) stands 6-5/8" drillpipe
   - ATC Diverter Sub "A"
   - 6-5/8" landing string
5. Install Seal Assembly
   - Run casing on 6-5/8 in., 40 ppf landing string (inspected to 95%).

Note:	**After make-up of running tool, do NOT turn drill string to the right at any time.**

   - Reduce running speed as the casing shoe passes through the BOP stack and wellhead, along with centralized joints.
   - While running Dril-Quip hanger through BOP, pump down choke and kill line as hanger passes outlets in BOP to help clean hanger area.

- Limit running speed to avoid surging formation. (Allamon recommends 2–3 minutes per stand based on planned well conditions.) Actual running speed will be based on hole conditions.
- Start and stop casing slowly. Detailed casing running schedule will be determined based on actual conditions.

6. Free drop 2-3/8" ball 5 stands prior to landing out.
7. Just prior to landing 16" hanger, pick-up Blackhawk cementing manifold.
   - Land 16" hanger in 22" adapter profile on 22" casing. Confirm proper placement (per Dril-Quip recommended procedures).
   - An initial weight loss of 120,000 lbs may be observed. This weight loss will be immediately regained when shear pins are on activator sleeve shear.
8. With 2-3/8" ball on seat in ATC Diverter, increase pump pressure to 1000 psi and hold same for 2-3 minutes (latching window will shift at 300 - 600 psi). Continue to increase pump pressure to 2200 - 2400 psi to blow ball through seat.
9. After blowing ball through seat, let ball fall to ATC DTD.
   - Pressure up to 1000 psi as before and hold same for 2-3 minutes. (Latching window will shift at 300 - 600 psi).
   - Continue to increase pump pressure to 2200 - 2400 psi to blow ball through second seat.
   - Let the ball free-fall to the ATC diverter sub "B" and repeat pressure sequence
   - Now let 2-3/8" ball fall to ATC Downhole Drop Ball Sub.

- After 2-3/8" ball down lands in ATC Downhole Drop Ball Sub, increase pump pressure to 1000 psi.
  - Shear pins in Downhole Drop Ball Sub and launch 3-1/2" ball.
  - After blowing ball through seat, continue pumping 3-1/2" ball, which will activate float equipment with 600 psi (which may not be seen).
  - Sleeve, along with ball seat assembly, will fall to guide shoe and remain there during circulating and cementing operations.

8.5.3 Cementing 16" Liner

Test Pressures & Volumes are provided only as a reference, review APD for final values.

1. Circulate and condition drilling fluid for cement job.

Note:	**Do not circulate above 30 spm until thick mud is above hanger assembly.**

2. Mix and pump cement (per detailed Halliburton cement program / ensure at minimum APD cement volumes is pumped).
   - Drop bottom DP wiper dart
   - Pump cement job
   - Drop top DP wiper dart

Note:	**Include mud compressibility in displacement calculations.** **An updated procedure with actual pressure sequence and dual wiper plug steps will be supplied to the rig once details have been finalized.**

3. Displace cement until top plug lands out.
   - 10 bbls prior to reaching the diverters and plug catcher, slow pump rate to 5 bpm.
   - Dart will pass two ATC diverter subs "A" & "B" with 1700 - 2100 psi.
   - Displace enough mud below DP stinger to leave **~50' of cement above float collar and a <u>total of 100' in casing</u>.**
   - Shut down, bleed off pressure, and check floats are holding.
4. If floats do not hold (allow 10-15 bbls to flowback), pump flowback volume and hold for an appropriate set time based on cement slurry.
5. Release Dril-Quip 16" running tool (per Dril-Quip procedure).
   - Set drill string weight down (not to exceed 50 kips).
   - Close pipe rams or annular and pressure up to 3500 psi for 30 seconds (locks down seal assembly).
   - Build pressure quickly to 5000 psi and hold for one minute. Release
   - Pressure test seal assembly to <u>3300 psi for 5 minutes w/ 11.6 ppg mud (same as APD casing test value)</u>.
   - Pick up and circulate to the wellhead

Note:	**Driller, Mud Engineer, and Mud Logger closely monitor and agree on the amount of mud lost during the liner job. Separate and report mud losses during the different phases of the job as follows:** • **Barrels lost while PU and running the liner.** • **Barrels lost while TIH with liner on landing string.** • **Barrels lost while washing the liner to bottom (if required).** • **Barrels lost while circulating, after the liner is landed.** • **Barrels lost while pumping and displacing cement.** • **Barrels left behind pipe.**

6. POOH to place end of cement stinger just below 16" hanger.

- Circulate bottoms-up at maximum rate to ensure no cement is left at hanger area.
- Continue to POOH w/landing string, running tool, and stinger (recovering **2-3/8"** ball and **2.5"** DP dart).

7. Test casing and blind/shear rams (per **APD** requirements).
8. Based on forward timeline of next hole section versus 14 days required for a BOP test, evaluate if a BOP test is needed. If a BOP test is needed, perform a test (per approved APD). If a BOP test is not needed, ensure a casing point BOP waiver has been approved on APD. **Test is only required per on 6-5/8" DP.**

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

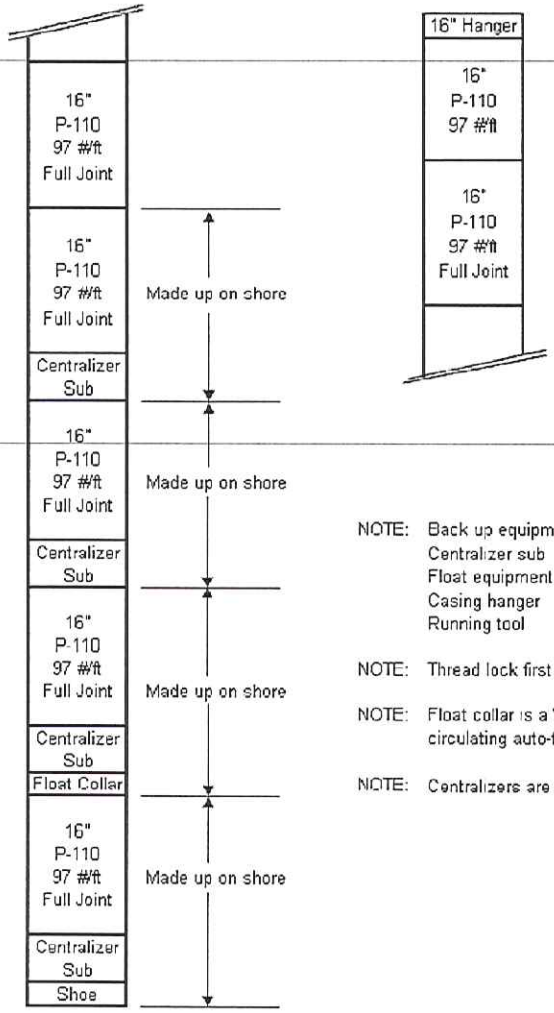
Attachments

No.	Title
1	16" Liner Diagram
2	16" Liner with 6-5/8 in. Landing String – MOP

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo

Attachment 1:
16" Liner Diagram

16" Casing Shoe Diagram



NOTE: Back up equipment on site includes:
Centralizer sub
Float equipment
Casing hanger
Running tool

NOTE: Thread lock first 5 joints run in the hole.

NOTE: Float collar is a Weatherford model L47W large bore circulating auto-fill double valve float collar

NOTE: Centralizers are Weatherford bowspring subs

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **16" Drilling Liner Interval**	Macondo MC 252 #1

Attachment 2:
16" Liner with 6-5/8 in.: Landing String – MOP

Landing string design - margin of overpull

This worksheet calculates ***Margin of Overpull (MOP)*** for pipe configurations with up to 5 different sizes of drill pipe and 3 different sizes of drill collars plus hevi-wate dp. It can also incorporate a safety factor

Macondo — **16" LINER LANDING STRING**

16	OD	5.5	OD	6.625	OD		OD
14.85	ID	4.67	ID	5.375	ID		ID
97	Nominal Wt	22.51	Nominal Wt	40.01	Nominal Wt		Nominal Wt
97	Adjusted Wt	28.6	Adjusted Wt	46.46	Adjusted Wt		Adjusted Wt
110,000	Yield strength, psi	135,000	Yield strength, psi	135,000	Yield strength, psi		Yield strength, psi
100	% rem wall	90	% rem wall	95	% rem wall		% rem wall
			Tensile strengths from the pipe drill pipe data entered above				
3,065,036	Tensile Strength	798,925	Tensile Strength	1,503,040	Tensile Strength		Tensile Strength

BHA Data

9.500	⇐ DC #1 OD	8.000	⇐ DC #2 OD		⇐ DC #3 OD	6.625	⇐ HWDP OD	Tensile Str.
3	⇐ DC #1 ID	3	⇐ DC #2 ID		⇐ DC #3 ID	4.499	⇐ HWDP ID	1,021,600
0	⇐ DC #1 Length	0	⇐ DC #2 Length		⇐ DC #3 Length	0	⇐ HWDP Length	HWDP Air Wt.
☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	
217	Wt/ft DC #1	147	Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor		0.8243
0	Wt. DC #1	0	Wt. DC #2		Wt. DC #3	Air weight of BHA		3,220
			WH / RT	3,220		Buoyed weight of BHA		2,654
Depth of Interest ⇒ ⇒ ⇒ ⇒			12,500	Safety Factor	80 %	Total length of BHA		0'
Anticipated Mud weight			11.50	Block Wt.	145,000	**Total depth**		**12,500**

		Buoyed Wt	Section MOP		
Enter Casing Length ⇒	7,273	581,542		Pipe needed on last sec.	0'
Enter Inner String ⇒	7,123	167,929		Weak point in string	**250,124**
Enter Length DP #1 ⇒	5,227	200,183	**250,124 #**	Total weight of string	**952,308**
Enter Length DP #2 ⇒				Total weight BLK & string	**1,097,308**
Enter Length DP #3 ⇒				Total weight Indicator Reading	
				With over pull	**1,347,432**

Assumes inner string design
Assumes lowest planned mud weight of 11.5 ppg
WH / RT includes running tool, hanger, and seal assembly

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **13-5/8" Liner Interval**	

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Interval Notes

Item	Comment
Bits	14-3/4" QD507Z (primary)
Underreamers	Hughes GuagePro XPR 16-1/2"
BHA	RSS, MWD, PWD, LWD, DDS, GR, Res
Special Equipment	13-5/8" liner hanger, Weatherford liner top packer / slips, PBR, Bore protector, mud surge tool, Weatherford single plug system, Allamon Diverter and DTD, BlackHawk Automated cement head.
Drillstring	6-5/8" 32 ppf S-135 FH x 6-5/8" 40 ppf S-135 FH
Mud system	SOBM, Drillout MW = TD MW 16" hole section (~11.8 ppg), Projected MW at end of interval is 13.1 ppg (may vary with hole conditions)
Casing	13-5/8", 88.2 ppf, Q-125, 0.625" wall, SLIJ-II connections
Landing string	6-5/8" 32 ppf S-135 FH x 6-5/8" 40 ppf S-135 FH
Cementing	16.2 ppg Halliburton Class H cement (see detailed cement program)
Anticipated LOT at drillout (start of 13-5/8" interval)	13.6 ppg LOT

9 13-5/8" Casing Interval

9.1 Introduction

The objective of this interval is to push 13-5/8" liner as deep as hole conditions will allow in order to achieve the maximum LOT possible so that the well TD can be reached without requiring and expandable liner. Currently, 13-5/8" casing point is estimated to be at 15,300 ft MD / TVD. The hole size for this interval will be **14-3/4" x 16-1/2"**.

9.2 Objectives

- Set casing as deep as possible without encountering major well control or losses.
- Cement 13-5/8" casing per design to achieve isolation and required LOT without remedial operations.
- Achieve at least a 14.7 ppg LOT on drill-out of 13-5/8" shoe.

9.3 Concerns

Concern / Hazard	Mitigation of Concern / Hazard
Pore Pressures and Fracture Gradients	Utilize BP GoM procedures during 16" LOT to ensure accurate measurement. Wellsite geologists to monitor pore pressure trends to ensure proper analysis of wellsite pore pressures. Wellsite leaders, tool pushers, drillers, and crew are responsible for monitoring drilling trends and will have an active role in ECD management. Wellsite leaders must ensure that personnel become familiar with wellbore pressure/ECD management guidelines.
Running 13-5/8" Liner	Optimize running speeds to avoid sudden starts and stops. Have Allamon system in place to minimize surge pressures. Also, have a mud surge return tool available to minimize mud losses on floor while running liner due to tight tolerance through stack / wellhead.
Vibration issues	Monitor BHA vibration. Utilize all prior lessons learned on 16" shoe track and salt drilling. Vary drilling parameters (WOB, RPM, etc) to minimize downhole and/or surface vibrations. If unable to mitigate vibrations discuss alternatives with Houston Team.
Casing Wear	Casing wear is a critical issue. Install and monitor ditch magnets. Report daily and cumulative metal volumes on daily drilling reports.
Tight Clearance Profiles	Note following minimum IDs: • 16" casing Hanger – 14.800" • 16" Seal Assembly – 15.312" Run 13-5/8" casing to minimize surge pressures
Offset Well Problems	Well control, stuck pipe, losses, and packing off, have been experienced on some of the offset wells.

9.4 General Drilling Operations Procedure

1. Ensure BOP has been tested (per compliance with approved APD).
   - Initiate well control and emergency disconnect drills.
   - Ensure all personnel are in compliance with MMS Sub Part "O".
2. Ensure 16" liner and blind shear rams have been tested (per APD requirements). Record pressure with volume pumped. This data will be compared with planned 16" shoe LOT.
3. Pick-up and run-in-hole with **14-3/4" x 16-1/2"** drilling assembly complete with Dril-Quip Wear Sleeve Running/Retrieval Tool.
   - Run retrievable wear sleeve in drilling BHA
   - Tag top of cement.
4. Drill-out cement and float equipment.
   - Ream shoe joints to remove cement sheath.
   - Drill-out with mud weight used to TD previous hole section.
5. Clean out rat hole and drill 10' of new hole.
   - Circulate cuttings above the stack.
   - Close annular or pipe ram.
   - Perform LOT per standard GoM LOT procedure (anticipated LOT = 13.6)
   - A minimum acceptable value for a successful LOT will be supplied to the rig prior to completing the test. If this is not reached contact Houston to discuss options prior to drilling ahead.

Notes:	**Prior to LOT, obtain ESD value with MWD. However, if unable to get ESD value after two attempts, continue LOT. After LOT, make one attempt to get ESD value.** **Shape of LOT curve rather than an actual value will dictate whether a squeeze job is required.** **If surface mud weight is < 0.5 ppg of surface LOT, MMS approval is required.**

6. Drill ahead mud weight to be determined by LOT at shoe.
   - Adjust mud weight prior to drilling ahead per hole conditions and weight up schedule.
   - Estimated mud weight at TD will be 13.1 ppg.
7. Drop 1-3/4 in. ball to activate reamer and confirm arms are open with overpull against casing shoe.

8. Control drill **14-3/4" x 16-1/2"** interval using following parameters.

Parameter	Guideline
ROP	Limit to rate for adequate hole cleaning (as determined by WS Leader and Mud Engineer).
WOB	10 - 65 kips (limited by Vibration, Bit / BHA performance, and Wellbore Inclination)
RPM	120 - 180 is planned range. Optimize for ROP, vibration limits, and directional considerations.
ECD / PWD	Maintain ECD / PWD of at least 0.5 ppg < LOT value. (Remember to include any mud compressibility in LOT number.) Based on actual hole conditions, the ECD readings may be adjusted closer to LOT in order to push the casing point deeper. Before doing so discussions should be had with the Houston based team. Close coordination between BP wellsite leaders, drilling crew, and LWD Engineers will be required on ECD management to achieve maximum performance. Roles and responsibilities of all involved parties should be discussed in hole interval planning meeting.
Pump Rates	800 - 1200 is planned range. Optimize for ROP, hole cleaning, and ECD limits.
Vibration	Monitor vibration indicators to maintain in acceptable range.
Hole Deviation	Limit hole deviation to under 3°. Rotary steerable tools will be in the hole and dog legs should be kept under 1°/100.
Section TD	13-5/8" liner point is designed at 15,300 ft MD / TVD. Objective of this interval is to drill as deep as possible in order to maximize LOT value before drilling the next section. Pushing casing point should be discussed with the team based on hole conditions, MW, and ECD's. Being able to push casing deeper than planned, reduces the risk of needing another string before TD. This should be considered before calling section TD and if required the Drilling Engineer will request approval from the MMS for a departure from the APD. **Prior to drilling more than 100' TVD deeper than permitted hole section TD, MMS approval is required.**

9. Pump weighted / viscous sweeps, as needed, to clean hole and minimize ECD. As this is a vertical wellbore with sufficient pumps, sweeps should not be required.
10. At interval TD, pump a 100 bbl weighted / viscous sweep and circulate hole clean with a minimum of 1-1/2 capacity. Adjust TD for liner tally, as needed.
    - Plan to set the 13-5/8" liner 5-10' off bottom (in pilot hole)
11. Circulate and condition, as required, to clean hole and lower yield point for running liner (lower YP to ~15 or as hole conditions dictate and keep gels flat).
12. If hole conditions warrant, make a short trip to determine hole conditions and reduce potential of sticking 13-5/8" liner.
13. POOH into casing shoe, ensuring cement sheath has been removed. If drag is observed in casing shoe, wash and ream cement sheath until drag is gone. Attention should be paid, as reamer will still be activated with flow.
14. Continue POOH, recovering wear sleeve and prepare to run casing.

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **13-5/8" Liner Interval**	Macondo

Figure 1: 13-5/8" Liner OH Section: Drill String – MOP

Drill String Design - Margin of Overpull

This worksheet calculates ***Margin of Overpull (MOP)*** for pipe configurations with up to 5 different sizes of drill pipe and 3 different sizes of drill collars plus hevi-wate dp. It can also incorporate a safety factor.

Macondo — **13-5/8" CASING OH SECTION**

5.625	OD	6.625	OD		OD		OD
5.625	ID	5.375	ID		ID		ID
32.67	Nominal Wt	40.01	Nominal Wt		Nominal Wt		Nominal Wt
37.71	Adjusted Wt	46.46	Adjusted Wt		Adjusted Wt		Adjusted Wt
135,000	Yield strength, psi	135,000	Yield strength, psi		Yield strength, psi		Yield strength, psi
80	% rem wall	80	% rem wall		% rem wall		% rem wall
Tensile strengths from the pipe drill pipe data entered above							
1,205,617	Tensile Strength	1,245,838	Tensile Strength		Tensile Strength		Tensile Strength

BHA Data

9.500	⇐ DC #1 OD	8.000	⇐ DC #2 OD		⇐ DC #3 OD	6.625	⇐ HWDP OD	Tensile Str.
3	⇐ DC #1 ID	2.8	⇐ DC #2 ID		⇐ DC #3 ID	4.499	⇐ HWDP ID	1,021,600
250	⇐ DC #1 Length	101	⇐ DC #2 Length		⇐ DC #3 Length	920	⇐ HWDP Length	HWDP Air Wt.
☑ Spiraled	⇐ Spiraled (√)	☑ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☑ Spiraled	⇐ Spiraled (√)	67,503
209	Wt/ft DC #1	144	Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor		0.8014
52,194	Wt. DC #1	14,575	Wt. DC #2		Wt. DC #3	Air weight of BHA		134,272
			Wt WH equip.			Buoyed weight of BHA		107,607
Depth of Interest ⇒ ⇒ ⇒ ⇒			15,300	Safety Factor	80 %	Total length of BHA		1,271'
Anticipated Mud weight			13.00	Block Wt.	145,000	Total depth		14,000

		Buoyed Wt	Section MOP		
				Pipe needed on last sec.	0'
Enter Length DP #1 ⇒	13,000	392,873	464,014 #	Weak point in string	457,878
Enter Length DP #2 ⇒	1,029	38,313	457,878 #	Total weight of string	538,793
Enter Length DP #3 ⇒	0			Total weight BLK & string	683,793
Enter Length DP #4 ⇒	0			Total weight Indicator Reading	
Enter Length DP #5 ⇒	0			With over pull	1,141,670

NOTE: The air weight of spiraled hevi-wate drill pipe is calculated as 95% of non-spiraled HWDP.
Assumes lowest planned mud weight of 13.0 ppg for section

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
13-5/8" Liner Interval

Figure 2: BHA Schematic

sperry-sun
DRILLING SERVICES

BHA Schematic

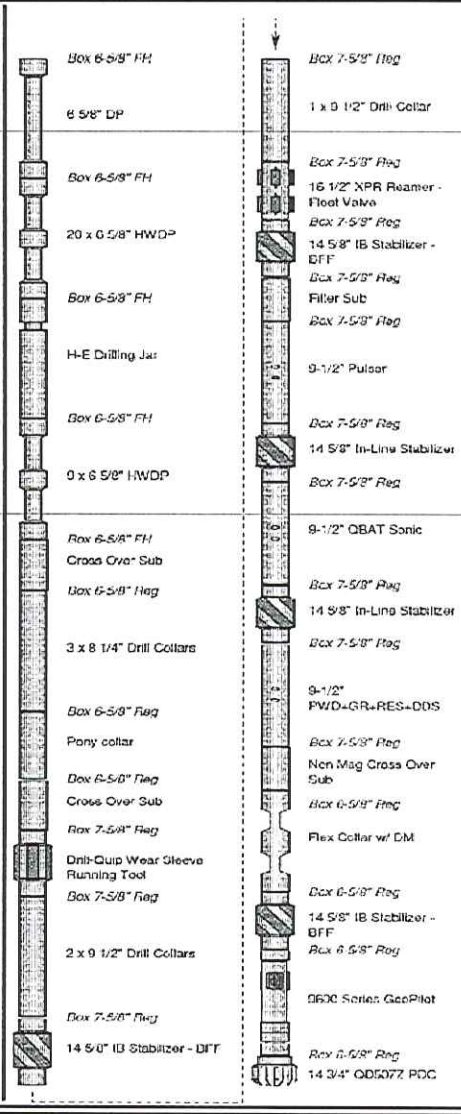
Bp America Production
Macondo Prospect
BHA ID #: 5
14 3/4" X 16 1/2" Geo-Pilot

BHA Configuration

O.D.	Length	Description
14.75"	2.73'	14 3/4" QD507Z PDC
9.625"	16.75'	9600 Series GeoPilot
9.5"	2.7'	14 5/8" IB Stabilizer - BFF
9.5"	10'	Flex Collar w/ DM
9.5"	1.58'	Non Mag Cross Over Sub
9.5"	27'	9-1/2" PWD+GR+RES+DDS
9.5"	4'	14 5/8" In-Line Stabilizer
9.5"	21'	9-1/2" QBAT Sonic
9.5"	4'	14 5/8" In-Line Stabilizer
9.5"	17'	9-1/2" Pulser
9.5"	6'	Filter Sub
9.5"	8'	14 5/8" IB Stabilizer - BFF
9.5"	15'	16 1/2" XPR Reamer - Float Valve
9.5"	30.64'	1 x 9 1/2" Drill Collar
9.5"	7'	14 5/8" IB Stabilizer - BFF
9.5"	60'	2 x 9 1/2" Drill Collars
9.5"	7.10'	Drill-Quip Wear Sleeve Running Tool
9.437"	4'	Cross Over Sub
9.5"	10'	Pony collar
8.25"	90'	3 x 8 1/4" Drill Collars
9.125"	3.98'	Cross Over Sub
6.625"	270'	9 x 6 5/8" HWDP
8"	32'	H-E Drilling Jar
6.625"	600'	20 x 6 5/8" HWDP
6.625"	30'	6 5/8" DP

BHA Discussion

Drill 14 3/4" x 16 1/2" hole section vertically.
12,500' - 13,900' - 13 5/8" Casing Point
MW 11.8 - 13.1 ppg



9.5 13-5/8" Casing and Cementing Operations

9.5.1 Casing and Cementing Preparation

- Weatherford will ship the following pre-assembled: 10' (6-5/8" FH) DP pup joint, cross-over, liner hanger / LT packer, PBR, running tool, single wiper plug, casing cross-over, and casing pup joint.
- Prior to shipping, ensure Weatherford has made-up crossovers and appropriate DP pups at their shop. **Landing string will be 6-5/8" 32 ppf FH x 6-5/8" 40 ppf FH.** Therefore all surge reduction tools should be setup for use with **6-5/8" FH** connections.
- Prior to shipping, primary float equipment should have been bucked up and thread-locked onto a joint of pipe. Inspect shoe and float collar joints for debris prior to PU.
- Ensure cement, additives, fresh water, and seawater samples are sent to cement company lab for final lab testing.
- Boost riser while rigging up casing equipment (not while running 13-5/8", as mud can flow up through liner).
- Prepare 13-5/8" casing tally. Inspect box threads and clean as required.
- Prior to shipment, verify casing has been drifted. Visually inspect to ensure there is no debris in pipe.
- Back-up Weatherford liner hanger, liner top packer, PBR, running tool, and Weatherford plugs to be shipped loose in separate basket.
- Ensure all critical load-bearing equipment has been inspected.
- Calculate swab/surge pressures for various running speeds. Select an acceptable running speed to ensure formation breakdown pressure is not exceeded.
- Prior to running liner, rabbit landing string to 2-5/8 in.
- Drilling engineer will determine final ID for displacement calculations, and send to rig.
- Ensure all crossovers in landing string have been inspected and that material certifications are provided to verify proper load capabilities.
- WSL should witness Weatherford/Blackhawk hand loading 2-1/8" ball into the cement head.
- Ensure all crossovers do NOT have square shoulders (may hang up drill pipe darts).
- Rig up the Blackhawk Top Drive Cement Head and stand back:

9.5.2 Casing Procedure

1. Rig-up and run 13-5/8" casing. 13-5/8" casing string will consist of the following.

Item	Ftg	Size	Wall	ppf	Grade	Connection
Shoe Jt with guide shoe (centralized)	~48'	13-5/8"	0.625	88.2	Q-125	SLIJ-II
Centralized Shoe Track Jts (centralized)	~135'	13-5/8"	0.625	88.2	Q-125	SLIJ-II
Float Collar Jt with L47WA float collar	~45'	13-5/8"	0.625	88.2	Q-125	SLIJ-II
Intermediate jts	~x,xxx'	13-5/8"	0.625	88.2	Q-125	SLIJ-II
Spacer Joint	~15-20'	13-5/8"	0.625	88.2	Q-125	SLIJ-II
Cross-Over Bushing	~2'	13-5/8"	0.625	88.2	Q-125	SLIJ-II x New Vam
13-5/8" Liner Hanger / Packer	~10'	14-7/16"	N/A	N/A	P110	New Vam
PBR	~20'	14-3/8"	N/A	N/A	P110	New Vam
Weatherford Single Plugs	---	13-3/16"	NA	NA	NA	N/A
Liner hanger Running Assembly	~5.4'	N/A	N/A	N/A	N/A	6-5/8" FH
Landing String (=>4 stands)	~480'	6-5/8"	0.500"	32	S-135	FH
ATC DTD sub	~6'	9"	N/A	N/A	Q-125	FH
Landing String (=>4 stands)	~480'	6-5/8"	0.500"	32	S-135	FH
ATC Diverter Sub	~6'	9-1/4"	N/A	N/A	Q-125	FH
Landing String	~8,000'	6-5/8"	0.500"	32	S-135	FH
Landing String	~x,xxx	6-5/8"	0.625"	40	S-135	FH

Centralizer details: Weatherford Bow Spring subs (4)

Casing ID: 12.375 in.

Casing drift: 12.25 in.

Casing collar OD: 13.875 in.

Note:	**Ensure enough liner is run to place the hanger above previous shoe track inside 16" casing (>200').**

Connection Size	Minimum Torque Required	Optimum Torque	Maximum Torque
13-5/8 in.	31,000 ft-lb	34,400 ft-lb	37,800 ft-lb

- Have VAM thread representative on location to inspect casing threads and connection make-up.
- Thread lock first **5 joints** up.

- Monitor well via choke and kill lines on trip tank.
- 13-5/8" pin threads will be delivered pre-doped with Jet Lube Seal Guard. Only pin should have a thin coating of Jet Lube.
- As required, clean box threads prior to make-up.

2. Limit running speed to avoid surging formation. (Actual running speed to be based on hole conditions.) Start and stop casing slowly.
3. Free drop the 3-1/2" float collar conversion ball prior to making up the liner hanger.
4. Prior to making up liner hanger assembly, install safety bushing on last liner joint Fill top of liner with 25 bbl of clean mud (no LCM), do not exceed 2 bpm while filling to prevent converting floats. Remove Safety bushing and make up liner assembly.
5. MU liner hanger assembly with Weatherford single wiper plug (total length ~72'):
   - Ensure slips are set on space joint (do not set on hanger, packer, or PBR)
   - Pick up 3' (with slips still set) to ensure setting tool and connections are properly made up
   - Slack off so PBR sleeve is accessible from the rig floor and fill the floating junk bonnet with clean water (do not set on hanger, packer, or PBR)
   - Record liner weight
   - Continue to slack off, and set drill pipe slips on the setting tool lift sub or pup jt.
   - Run casing on 6-5/8" 32 ppf FH (~8000') x 6-5/8", 40 ppf FH landing string.
   - Install drill pipe wiper rubber on pipe as it runs in the hole to prevent foreign material entering the wellbore.
   - Make up Allamon DTD (4 stands or more above setting tool lift sub) and Diverter (4 stands or more above DTD) to the 6-5/8" 32 ppf FH landing string. (Ensure both tools have FH connections once on location).
   - Check to ensure pipe is filling (Fill every 10 stands).
   - Do not circulate liner greater than 5 bpm, unless required, as it will convert autofil equipment.
   - Slow running speed and proceed with caution when running liner shoe and hanger through the wellhead.

Notes:	**Recommended Well Control consideration while running this equipment and subsea casing:** **If fillups are marginal, there are two options:** • **Convert auto-fill float equipment to a positive float shoe and run subsea casing conventionally.** • **Run a 1-7/8" drop ball in place in ATC Diverter Sub to minimize time required to close tool. With the 1-7/8" drop ball on seat, if you observe any type of increased returns while running drillpipe, stop running drillpipe and screw top drive into drillstring. Commence pumping. It should take 20 to 30 strokes to pressure-up on ball to close diverter**

sub and then blow ball.

WSL should check balls for correct size and witness Weatherford drop each ball as prescribed in the procedure.

6. Just prior to the liner reaching open hole, record pickup, slack-off, and slow pump rates (15 – 25 – 35 spm).
7. Free drop 1-7/8" wash down ball when the liner enters open hole.
8. Continue RIH with casing until 1 stand from the pilot hole. MU top drive. Attempt to space out drill pipe so liner can be run into the pilot without making a connection.
9. While still in the reamed hole, and with the wash down ball on seat at the diverter.
10. Pressure up to 1000 psi slowly and hold for 2 minutes. Then increase to 2500 psi to yield the ball seat.
11. Let ball free fall to DTD sub, repeat step 9 (test diverter is close).
12. Continue to circulate and slowly increase pump rates greater than 8 bpm to convert the float equipment (~ 500 - 700 psi) per Weatherford recommendation.

Notes:

Adjust pump rates as necessary, Do no exceed 1200-1400 psi while circulating, the liner hanger is pinned to set at 1700-2000 psi (70%). Check with service hand for actual value.

Review pressures with Weatherford Liner Hanger Service hand and confirm all details with inspection documentation prior to running job.

13. Run liner into the pilot hole
    a. Make up the Blackhawk cement head and tag bottom, then pick up to the final setting depth 5-10' off bottom.
    b. Monitor running speeds to minimize surge and reduce losses as much as possible.
14. Drop 2-1/8" liner hanger setting ball from the cement head. Pump ball down to diverter sub and pressure up to 2000 psi to yield the seat.
15. Allow the ball to free fall onto the DTD sub, and pressure up to 2000 psi (yield seat).
16. After yielding DTD seat. Allow the 2-1/8" ball to free fall to the Weatherford liner hanger running tool setting seat.
    - Pressure up to 1700 - 2000 psi
    - Set down 20 kips on hanger, rotate 6-8 turns to the right (torque free)
    - Pick up (6' + stretch) to check if running tool has released (weight loss) (stretch will be ~6'). Ensure actuator sub isn't pulled from the PBR.
    - Pressure up to 3000 - 3400 psi and blow the ball seat.
    - Set down 30 kips, to prevent from pumping setting tool out of liner

9.5.3 Cementing 13-5/8" Casing

Test Pressures and Volumes are only as a reference, review APD for final values.

1. Circulate at least one (1) casing and drill pipe capacity, if hole conditions allow. Recommend circulating at reduced rates (~8 bpm) until gels are broken to reduce potential losses.
2. Mix and pump spacer and cement per detailed Halliburton cement program (ensure at minimum APD volume is pumped).
   - Maintain 20 – 30 kips down on hanger while pumping the job.
3. After pumping cement job, launch Weatherford drill pipe dart (2.50" OD) and displace with rig pumps. Maximize pump rates until displacing fluid has caught up with the cement slurry (after releasing top wiper plug).

Note:	**Minimum pump rate on darts in the landing string is 5 bpm.** **Maximum pump rate through plug system before launching the plug is 30 bpm.**

4. Pressure required to yield seat in Diverter and DTD with DP dart should be ~2400 - 3200 psi above circulating rate.
5. After yielding both seats, continue to pump DP Dart down to Wiper Plug.
   - 5 bbls prior to reaching the wiper plug slow rate to 3-4 bpm.
   - DP dart will release Wiper Plug at 2000 - 2500 psi above circulating pressure.

Notes:	• **Do NOT slow displacement rate other than directed.** • **To have a greater chance to bump plug on float collar:** 1. **Caliper ~20% of casing with Tri-Mic's to determine a more accurate ID. (Do NOT use mill or book specs.)** 2. **Calculate mud compressibility based on actual conditions.** 3. **Factor in rig pump efficiency.** • **Whenever you attempt to wash-down, you have a greater chance of sticking subsea casing with additional ECD or creating a packing off problem due to cuttings bed you are pushing.** • **When closing diverter sub, pipe should be moving at all times.** • **After closing diverter tool, go back to circulating slowly (no more than 15 SPM) and start washing to bottom immediately.** • **If you plan on using boost line prior to landing hanger, do NOT drop ball early. Circulate through diverter prior to dropping ball. (This prevents debris from plugging diverter sub and causing high shear out pressures.)** • **All pup joints and cross-overs must be free of "bore-backs" or square shoulders (less than 1/8" transition) and must have high angle tapers to the ID from the root thread in the box. Tapers should be at least 30 degrees. *Special attention should be given to the TIW valve below the Cement head. This is to prevent hanging-up the DP dart during displacement. A Teflon bushing on top of the valve assembly will help transition the dart cleanly.**

6. Continue displacing at maximum displacement rate.
   - 5 bbls prior to bumping the plug slow rate to 1-2 bpm.
   - When top subsea plug reaches float / landing collar, bump plugs with 1000 psi above circulating pressure.
   - Do **not** over-displace by more than mud compressibility + 50% shoe track.
   - Plug will land/lock.
7. Release pressure.
   - Ensure floats and/or subsea wiper plugs are holding (flow back up to10 bbls).
   - If floats do not hold, pump flowback volume and hold for an appropriate set time based on cement slurry.
8. Pick up 12 feet and release packer actuator sub from the PBR extension.
   - Slack off setting packer actuator dogs on the PBR sleeve
   - Apply 60-100 kips down to shear pins and energize TSP packer
   - Rotate string slowly to the right to change friction points and work weight down to the packer.
9. Close annular or pipe rams and pressure up to 2000 psi (13.6 ppg mud) for 5 minutes to test liner top packer.
10. Open BOP stack up, pick up the running tool, leaving the end of the setting tool just inside the liner top and begin to circulate slowly.
11. Once returns are established, slowly pick up, placing the bottom of the liner hanger running tool 5' above the top of the liner.
12. Increase pump rates and continue to pick up placing the running tool 10-15' above the liner top and drop a neft ball. Pump 2 drill string volumes. Do not exceed 4000 psi, and rotate string slowly to ensure pipe is free while circulating.
13. POOH with liner hanger running tool.
14. Test casing and blind shear rams **(per APD requirements)** while preparing BHA and/or running in the hole to the BOP stack.

Note: **It is responsibility of Driller, Mud Engineer, and Mud Logger to closely monitor and agree on amount of mud lost during liner job. Separate and report mud losses during different phases of job as follows:**

- **Bbls lost while PU and running casing.**
- **Bbls lost while TIH with casing on landing string.**
- **Bbls lost while washing casing to bottom, if required.**
- **Bbls lost while circulating, after casing is landed.**
- **Bbls lost while pumping and displacing cement.**
- **Bbls left behind pipe.**

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **13-5/8" Liner Interval**	

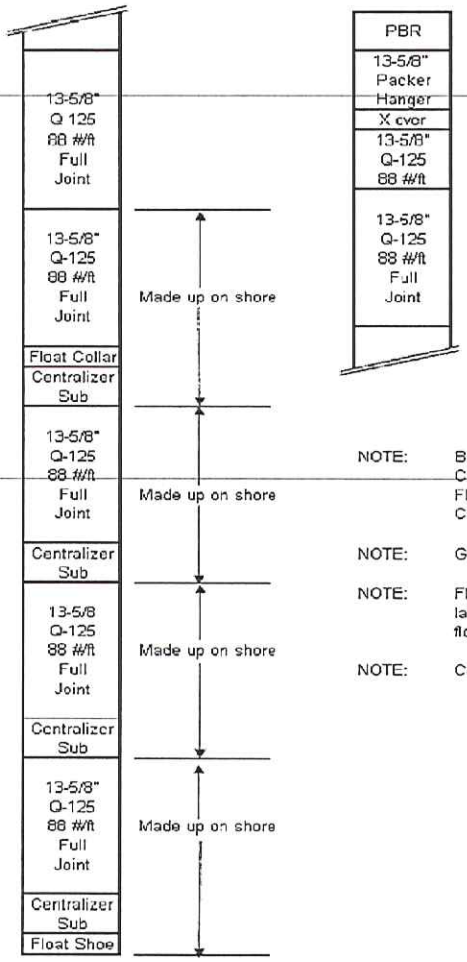
Attachments

No.	Title
1	13-5/8" Casing Diagram
2	13-5/8" Casing Landing String – MOP

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **13-5/8" Liner Interval**	Macondo

Attachment 1: 13-5/8" Hanger / Liner Diagram

13-5/8" Casing Shoe Diagram



NOTE: Back up equipment on site includes:
Centralizer sub
Float equipment
Casing hanger

NOTE: Guide shoe

NOTE: Float collar is a Weatherford model L47WO large bore circulating auto-fill double valve float collar

NOTE: Centralizers are Weatherford bowspring subs

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **13-5/8" Liner Interval**	Macondo

Attachment 2: 13-5/8" Casing Landing String – MOP

Landing String Design - Margin of Overpull

This worksheet calculates ***Margin of Overpull (MOP)*** for pipe configurations with up to 5 different sizes of drill pipe and 3 different sizes of drill collars plus hevi-wate dp. It can also incorporate a safety factor

Macondo — **13-5/8" CASING LANDING STRING**

13.625	OD	6.625	OD	6.625	OD		OD	
12.317	ID	5.625	ID	5.375	ID		ID	
88.2	Nominal Wt	32.67	Nominal Wt	40.01	Nominal Wt		Nominal Wt	
88.2	Adjusted Wt	37.71	Adjusted Wt	46.46	Adjusted Wt		Adjusted Wt	
125,000	Yield strength, psi	135,000	Yield strength, psi	135,000	Yield strength, psi		Yield strength, psi	
100	% rem wall	80	% rem wall	80	% rem wall		% rem wall	

Tensile strengths from the pipe drill pipe data entered above

3,331,280	Tensile Strength	1,022,117	Tensile Strength	1,245,838	Tensile Strength		Tensile Strength	

BHA Data

	⇐ DC #1 OD		⇐ DC #2 OD		⇐ DC #3 OD	6.625	⇐ HWDP OD	Tensile Str.
	⇐ DC #1 ID		⇐ DC #2 ID		⇐ DC #3 ID	4.499	⇐ HWDP ID	1,021,600
	⇐ DC #1 Length		⇐ DC #2 Length		⇐ DC #3 Length	0	⇐ HWDP Length	HWDP Air Wt.
☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	☐ Spiraled	⇐ Spiraled (√)	
	Wt/ft DC #1		Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor		0.8014
	Wt. DC #1		Wt. DC #2		Wt. DC #3	Air weight of BHA		3,190
			WH / RT	3,190		Buoyed weight of BHA		2,556
Depth of interest ⇒ ⇒ ⇒ ⇒			15,300	Safety Factor	80 %	Total length of BHA		0'
Anticipated Mud weight			13.00	Block Wt.	145,000	**Total depth**		**15,300**

		Buoyed Wt	Section MOP		
Enter Casing Length ⇒	3,100	219,120		Pipe needed on last sec.	0'
Enter Legnth DP #1 ⇒	8,000	241,768	354,236 #	Weak point in string	354,236
Enter Length DP #2 ⇒	4,200	156,380	376,846 #	Total weight of string	619,825
Enter Length DP #3 ⇒	0			Total weight BLK & string	764,825
Enter Length DP #4 ⇒	0			Total weight Indicator Reading	
				With over pull	1,119,061

Assumes lowest planned mud weight of 13.0 ppg for section
WH / RT includes running tool, hanger, and seal assembly

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Interval Notes

Item	Comment
Bits	12-1/4" QD507 Hughes (primary)
Underreamers	*Hughes GuagePro XPR 14-1/2" (contingency)*
BHA	RSS, MWD, PWD, LWD, DDS, GR, Res, FPWD
Special equipment	18-3/4" casing hanger and seal assembly running tool, Allamon diverter & DTD, Bore protector, mud surge tool, Allamon cement head
Drillstring	6-5/8" 32 ppf S-135 FH x 6-5/8" 40 ppf S-135 FH x 6-5/8" 40 ppf V-150 FH (if required to reach TD, length issue only not tension)
Mud system	SOBM, Drillout MW = TD MW 13-5/8" hole section (~13.6 ppg), Projected MW at end of interval 14.2 ppg
Casing	9-7/8", 62.8 ppf, Q-125, 0.625" wall, Hyd 523 (only will be run if commercial hydrocarbons are found)
Landing string	6-5/8" 40 ppf S-135 FH
Cementing	Foamed nitrogen cement (see detailed cement program)
Anticipated LOT at drillout (start of 13-5/8" interval)	14.7 ppg LOT

10 9-7/8" Casing Interval

10.1 Introduction

The objective of this interval is drill through the production interval and set 9-7/8" long string at 19,650 ft MD / TVD if a thick enough productive sand is found. The primary well design is to drill this section with a 12-1/4" hole and no underreamer, however based on casing point selection the section may required to be set-up with 12-1/4" x 14-1/2" or 10-5/8" x 12-1/4" hole. It is preferred that 12-1/4" hole be drilled through the productive interval to help achieve a competent cement job for completions, therefore prior to drilling this section the BHA design will be reviewed to best suit the dynamic needs of this well. As with all sections of this well, the fracture and pore pressure margins are tight, therefore mud weights and ECD should be managed to permit drilling as deep as possible without requiring any extra strings of casing.

This section is the primary exploration interval, and should contain small sand units interbedded throughout, with the anticipated production sand (M56) existing at approximately 18,400' MD / TVD. It is planned that the wellbore will be extended past this sand to determine if more hydrocarbons exist in the M54 interval. Once this object has been completed, the section TD will be called. As seen on the PP/FG chart, a pressure ramp occurs below the M54.

10.2 Objectives

- Drill section without major losses, well control, or other NPT.
- Set long string of 9-7/8" casing after drilling the M54 sand package, prior to entering the pressure ramp in the lower Miocene and Oligocene.
- Cement 9-7/8 casing per design to achieve isolation and required LOT without remedial operations.

10.3 Concerns

Concern / Hazard	Mitigation of Concern / Hazard
Pore Pressures and Fracture Gradients	Utilize BP GoM procedures during 13-5/8" LOT to ensure accurate measurement. Wellsite geologists to monitor pore pressure trends to ensure proper analysis of wellsite pore pressures. Wellsite leaders, tool pushers, drillers, and crew are responsible for monitoring drilling trends and will have an active role in ECD management. Wellsite leaders must ensure that personnel become familiar with wellbore pressure/ECD management guidelines.
Monitor for Losses / Wellcontrol	Utilize all available tools and personnel for ECD management. Limit pump pressures when a pack-off is detected or suspected. Pore pressure and fracture gradients are tight in each interval and getting production casing to depth without requiring a contingency liner will be dependent on pushing both the 16" to 13-5/8" strings as deep as possible. If ECD trends differ from models a large deal discuss options with Houston.

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **9-7/8" Casing Interval**	Macondo

Concern / Hazard	Mitigation of Concern / Hazard
Surge problems and losses while running 9-7/8" casing	Optimize running speeds to avoid sudden starts and stops. Utilize Allamon system to minimize surge pressures. Also, have a mud surge return tool available to minimize mud losses on the floor while running the casing.
Vibration issues	Monitor BHA vibration. Utilize all prior lessons learned on 13-5/8" shoe track. Vary drilling parameters (WOB, RPM, etc) to minimize downhole and/or surface vibrations. Discuss alternatives with Houston Team.
Casing Wear	Casing wear is a critical issue. Install and monitor ditch magnets. Report daily and cumulative metal volumes on morning report on a daily basis. Watch for trends. As this well is planned vertical, wear problems should not be a major issue. However, if any high doglegs are established or unexpected issues downhole (shifting, damage to casing, ect...) then wear may exist. Either way retrieved metal should be monitored for and reported.
Faults	The well has been designed not to encounter any major faulting in this interval.
Offsets	No major problems encountered on offset wells (if previous casing points are all pushed to all the required depths). If casing points are not pushed deep enough or pore pressure greatly differs from the prediction losses could be encountered and a contingency liner needed to reach TD.

10.4 General Drilling Operations Procedure

1. Ensure BOP has been tested (per compliance with approved APD).
   - Initiate well control and emergency disconnect drills.
   - Ensure all personnel are in compliance with MMS Sub Part "O".
2. Ensure 13-5/8" casing and blind shear rams have been tested (per APD requirements). Record pressure with volume pumped. This data will be compared with the 13-5/8" shoe LOT.
3. Pick-up and run-in-hole with the drilling assembly complete with Dril-Quip Selective Retrievable Wear Bushing with Running/Retrieving Tool set to leave Wear Bushing in place on trip out.
   - Hole size may change based on 13-5/8" setting depth, and deployment of the expandable contingency.
   - The objective is to allow for the entire interval to be drilled using 6-5/8" pipe. Ensure enough 6-5/8" pipe is on location to reach TD.
   - Run selectable wear sleeve in drilling BHA, it will be remain in the wellbore during drilling, logging, and will be retrieved on the clean-out run BHA.

Note:	**If formation pressure tool is used, give special attention when picking up BHA to ensure formation pressure probe is correctly oriented in relationship with the MWD for down hole measurements. WSL / Drilling Engineer / Geologist to discuss formation pressure objectives prior to running BHA in hole.**

4. After washing down to liner wiper plugs, drill out cement and float equipment.
   - Follow Weatherford FE and plug drill out procedure.
   - Tag plug, turn drill string 60-80 rpm and pump enough to remove cuttings (40-50 gpm/inch of bit ~490 – 613 gpm)
   - Slowly apply 2 klbs WOB until bit pattern is made then slowly increase WOB to 3-5 kips.
   - Maintain WOB. If issues are encountered refer to Weatherford procedure.
5. Clean out rat hole and drill 10' of new hole.
   - Drill-out mud weight is expected to be same as MW at TD of prior 13-5/8" section (~13.6 ppg).
   - Circulate cuttings above the stack.
   - Close annular or pipe ram.
   - Perform LOT per standard GoM LOT procedure (anticipated = ~ 14.7 ppg surface EMW)

- A minimum acceptable value for a successful LOT will be supplied to the rig prior to completing the test. If this is not reached contact Houston to discuss options prior to drilling ahead.

Note:	**Prior to LOT, obtain ESD value with MWD. However, if unable to get ESD value after two attempts, continue LOT. After LOT, make one attempt to get ESD value.** **Shape of LOT curve rather than an actual value will dictate whether a squeeze job is required.** **If surface mud weight is < 0.5 ppg of surface LOT, MMS approval is required.**

6. Drill ahead mud weight to be determined by LOT at shoe.
   - Adjust mud weight prior to drilling ahead per hole conditions and weight up schedule.
   - Estimated mud weight at TD will be 14.2 ppg.
7. Control drill hole using following parameters.

Parameter	Guideline
ROP	Limit to rate for adequate hole cleaning (as determined by WS Leader and Mud Engineer).
WOB	10 - 50 kips (limited by Vibration, Bit / BHA performance, and Wellbore Inclination)
RPM	120 – 160 is planned range. Optimize for ROP, vibration limits, and directional considerations.
Torque	Monitor difference between on and off bottom torque. Do not exceed makeup torque of weakest connection in hole.
ECD / PWD	Maintain ECD / PWD of at least 0.3 ppg < LOT value. (Remember to include any mud compressibility in LOT number.) Close coordination between BP wellsite leaders, drilling crew, and LWD Engineers will be required on ECD management to achieve maximum performance. Roles and responsibilities of all involved parties should be discussed in hole interval planning meeting.
Pump Rates	650 -750 is planned range. Optimize for ROP, hole cleaning, and ECD limits.
Mud Weight	Drill-out with same mud weight as TD 13-5/8" section. Monitor output and drilling parameters for indications of increasing formation pressure and adjust mud weight accordingly.
Hole Deviation	Limit hole deviation to under 3°. Rotary steerable tools will be in the hole and dog legs should be kept under 1°/100.
Section TD	9-7/8" x 10-3/4" production casing point is designed at 20,200 ft MD / TVD. Objective of this interval is to drill through the production sands (M56) and test the M54 sands for hydrocarbons. Final TD will be determined by paleo picks and downhole LWD data. The rigsite and office based teams should confirm final section TD prior to pulling out of the hole. **Prior to drilling more than 100' TVD deeper than permitted hole section TD, MMS approval is required.**

8. Pump weighted / viscous sweeps, as needed, to clean hole and minimize ECD. As this is a vertical wellbore with sufficient pumps, sweeps should not be required.
9. Continue drilling to TD.

10. At interval TD, pump a 100 bbl viscous sweep and circulate hole clean (at a minimum one bottoms up or until shakers clean up).
    - Rat Hole - Plan to set casing ~50' off bottom (unless reamed, then set 150' off bottom or ~ 50' above pilot hole).
    - Lower YP to ~15 or as hole conditions dictate and keep gels flat.
    - Prior to POOH, spot a 16.5 ppg weighted SOBM pill in rathole. Monitor displacement while TOOH.
11. If hole conditions warrant, make a short trip to determine hole conditions and reduce potential of sticking 9-7/8" liner.
12. POOH into casing shoe, ensuring cement sheath has been removed. If drag is observed in casing shoe, wash and ream cement sheath until drag is gone. Attention should be paid, as reamer will still be activated with flow.
13. Continue POOH, recovering wear sleeve.
14. Once bit is at the wellhead, wash the hanger landing profile.
15. POOH, lay down the BHA, and prepare to log the wellbore.
16. Log well per the PDDP program
17. Once logging is complete, make up BHA and RIH for a clean-out trip prior to running casing. Ensure wear bushing tool is set to retrieve on the way out.
18. Stage in the hole to condition mud, without damaging the wellbore.
19. Once in open hole, continue to stage in as necessary and clean out wellbore, working any tight spots to ensure smooth casing running conditions.
20. POOH and lay down the BHA, retrieve bushing, and prepare to run 9-7/8" casing.

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **9-7/8" Casing Interval**	

Figure 1: 9-7/8" Casing OH Section: Drill String – MOP

Drill String Design - Margin of Overpull

This worksheet calculates *Margin of Overpull (MOP)* for pipe configurations with up to 5 different sizes of drill pipe and 3 different sizes of drill collars plus hevi-wate dp. It can also incorporate a safety factor.

	Macondo				**Drill to TD**			
6.625	OD	6.625	OD	6.625	OD		OD	
5.625	ID	5.375	ID	5.345	ID		ID	
32.67	Nominal Wt	40.01	Nominal Wt	40.86	Nominal Wt		Nominal Wt	
37.71	Adjusted Wt	46.46	Adjusted Wt	47.23	Adjusted Wt		Adjusted Wt	
135,000	Tor Yield	135,000	Tor Yield	150,000	Tor Yield		Tor Yield	
80	% Yield Wall	80	% Yield Wall	80	% Yield Wall		% Yield Wall	
Tensile strengths from the pipe drill pipe data entered above								
1,022,117		1,245,638		1,413,144				

BHA Data

9.500	DC #1 OD	8.000	DC #2 OD		DC #3 OD	6.625	HWDP OD	Tensile Str
2.38	DC #1 ID	3	DC #2 ID		DC #3 ID	4.499	HWDP ID	1,021,600
25	DC #1 Length	350	DC #2 Length		DC #3 Length	920	HWDP Length	HWDP Air Wt
☐ Spiraled	Spiraled ↑	☑ Spiraled	Spiraled ↑	☐ Spiraled	Spiraled ↑	☑ Spiraled		67,503
226	Wt/ft DC #1	141	Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor		0.7831
5,660	Wt DC #1	49,464	Wt DC #2		Wt DC #3	Air weight of BHA		122,627
						Buoyed weight of BHA		96,026
Depth of interest			19,650		80 %	Total length of BHA		1,295'
Anticipated mud weight			14.20	Block Wt	146,000	**Total depth**		**19,650**

		Buoyed Wt	Section MOP	Pipe needed on last sec	0'
Enter Length DP #1 ⇒	13,750	406,033	315,634 #	Weight point to string	315,634
Enter Length DP #2 ⇒	4,100	149,165	345,446 #	Total weight of string	669,901
Enter Length DP #3 ⇒	505	18,677	460,613 #	Total weight BHA & string	814,901
Enter Length DP #4 ⇒	0			Total weight indicator Reading	
Enter Length DP #5 ⇒	0			Wt over pull	**1,130,536**

NOTE: The air weight of spiraled hevi-wate drill pipe is calculated as 96% of non-spiraled HWDP.
Assumes lowest planned mud weight 14.2 ppg

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **9-7/8" Casing Interval**	Macondo

Figure 2: BHA Schematic

sperry-sun
DRILLING SERVICES

BHA Schematic

Bp America Production

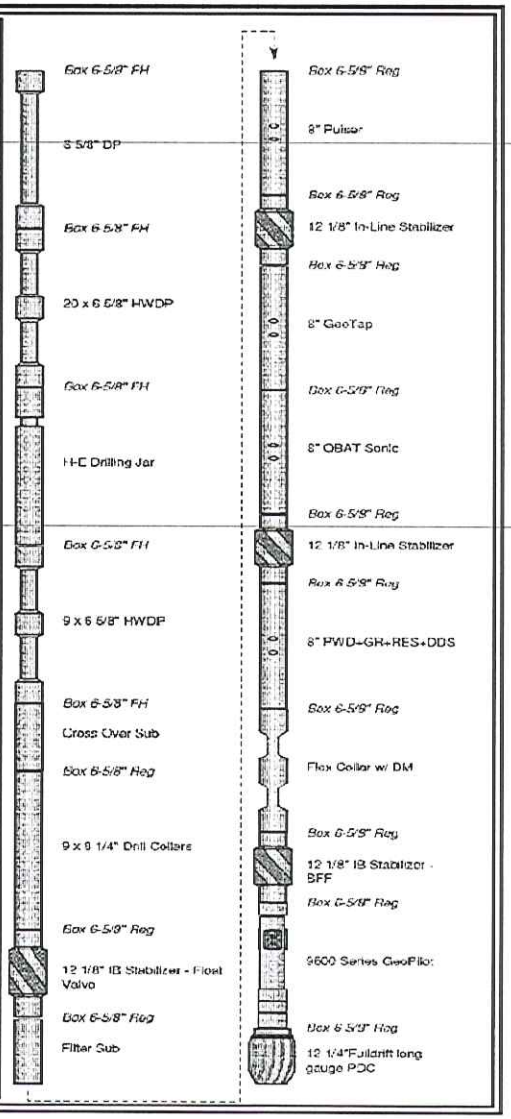
Macondo Prospect

BHA ID #: 10

12 1/4" Geo-Pilot

BHA Configuration

O.D.	Length	Description
12.25"	1.9'	12 1/4"Fulldrift long gauge PDC
9.625"	18.80'	9600 Series GeoPilot
8.5"	2.83'	12 1/8" IB Stabilizer - BFF
7.875"	10'	Flex Collar w/ DM
8"	25'	8" PWD+GR+RES+DDS
8"	3.8'	12 1/8" In-Line Stabilizer
8"	21'	8" OBAT Sonic
8"	26.7'	8" GeoTap
8"	3.8'	12 1/8" In-Line Stabilizer
8"	17'	8" Pulser
8"	6'	Filter Sub
8"	7'	12 1/8" IB Stabilizer - Float Valve
8"	270'	9 x 8 1/4" Drill Collars
6.25"	4'	Cross Over Sub
6.625"	270'	9 x 6 5/8" HWDP
8"	32'	H-F Drilling Jar
6.625"	600'	20 x 6 5/8" HWDP
6.625"	30'	6 5/8" DP



10.5 9-7/8" Casing and Cementing Operations

10.5.1 Casing and Cement Preparation

- Prior to shipping, primary float equipment should have been bucked up and thread-locked onto a joint of pipe. Inspect shoe and float collar joints for debris prior to picking up.
- Ensure cement, additives, and fresh and seawater samples are sent to cement company lab for final lab testing.
- Prior to shipment, verify casing has been drifted to 8-1/2". Visually inspect to ensure there is no debris in pipe. A laser caliper of all joints should have been completed, engineer should supply to the rig prior to running the casing.
- Prepare 9-7/8" casing tally. Inspect threads and clean as required.
- Boost riser while rigging up casing equipment (not while running 16", as mud can flow up through casing).
- Calculate swab/surge pressures for various running speeds. Select an acceptable speed to ensure formation breakdown pressure isn't exceeded.
- Prior to running casing, rabbit 6-5/8" running string to 2-3/4 in drift ID.
- Ensure any crossover required in landing string is rented, inspected, and has a specific request to provide material certifications to rig and engineer. These certs are to be used to verify proper load carrying capabilities.
- Ensure all crossovers in string do NOT have internal square shoulders as these have proven to hang up drill pipe darts.
- Make-up primary Dril-Quip casing hanger running tool and place on riser skate
- Ensure wellhead protector sleeve has been pulled prior to running casing.
- Ensure that a 9-7/8" Halliburton Fast drill is on location for remedial cement job or temporary abandonment.
- 750 ton equipment should be used for this section, ensure inspected and ready to use prior to running casing.
- Centralizers will be run every joint for the first 5 joints, followed by every other joint from the shoe to 500' above productive interval. Check system which is supplied to ensure it's in proper working fashion.
- Rig up Allamon Top Drive Surface Cement Equipment as follows and place on riser skate or stand back in derrick:
  - 6-5/8" DP singled (drifted to 2-5/8")
  - 15' DP pup jt
  - Full open safety valve
  - ATC dual Dart Cement Head
    - ATC 2.375" bottom DP dart (pre-installed)
    - ATC 2.5" top DP dart (pre-installed)
  - ATC positive launch indicator sub (PLI)
  - Full open safety valve
    - Function test valve to verify alignment versus the bore is centered
  - 6-5/8"DP single (drifted to 2-3/4")

10.5.2 Casing Procedure

1. Rig-up 22' bails for Fill and Circulate Tool.

Item	Ftg	Size	Wall	ppf	Grade	Connection
Shoe Jt with Guide Shoe	~45'	9-7/8"	0.625"	62.8	Q125	Hydril 523
Shoe Track Jts	~210'	9-7/8"	0.625"	62.8	Q125	Hydril 523
Float Collar Jt with L47WA float collar	~45	9-7/8"	0.625"	62.8	Q125	Hydril 523
Casing Jts	~xx,xxx'	9-7/8"	0.625"	62.8	Q125	Hydril 523
2nd Position Hanger (9-7/8) w/ 1st Position Dummy Hanger (13-3/8)	~5	NA	NA	NA	NA	Hydril 523
Dual ATC Wiper Plug Subsea system	NA	NA	NA	NA	NA	4-1/2" IF
18-3/4" Casing Hanger & Seal Assembly Running Tool	~8'	NA	NA	NA	NA	4-1/2" IF x 6-5/8FH
Landing String	~480'	6-5/8"	0.625"	40	S-135	FH
ATC Diverter Sub	~6'	9-1/4"	N/A	N/A	Q-125	FH
Landing String	~x,xxx'	6-5/8"	0.625"	40	S-135	FH

Centralizer details: ***Bow springs every jt for the first 5 jts, followed by every other jt to 500' above productive interval.***

Casing ID: 8.625"

Casing drift: 8.5"

Casing collar OD: 9.875"

Connection Size	Minimum Torque Required	Optimum Torque	Maximum Torque
9-7/8 in	25,000 ft-lbs	30,000 ft-lbs	187,000 ft-lbs (yield)

- Have Hydril thread representative on location to inspect casing threads and connection make-up.
- Thread lock first (5) casing joints.
- Monitor well via choke and kill lines.
- Casing swedge required is required as the casing length > water depth

2. Pickup and run 9-7/8" shoe track:
   - Apply a thin coating of API-modified thread dope to pin end only, as needed.
   - Check for proper thread make-up.

Notes:

Recommended Well Control consideration while running this casing:

If fill-ups are marginal, there are two options:

- **Convert auto-fill float equipment to a positive float collar and run casing conventionally.**
- **Run 1-7/8" wash-down ball in place in ATC Diverter Sub to minimize time required to close tool. With 1-7/8" wash-down ball on seat, if you observe any type of increased returns while running drillpipe, stop running drillpipe and screw top drive into drillstring. Commence pumping. It should take 20 to 30 strokes to pressure-up on ball to close diverter sub and then blow ball.**

3. Continue running 9-7/8" casing:
   - Take returns to trip tank.
   - Verify casing is filling through auto-fill float equipment.
   - Run ~xx,xxx' ft of 9-7/8" casing @ approximately 1 minute per jt.
4. Observe and record pick-up and slack-off weights before entering open hole
5. Pick up off the skate: hanger joint, 2nd position hanger (9-7/8") and 1st position dummy hanger (13-3/8") along with running tool and seal assembly. Record casing weight.
6. Free drop the 2-1/4" float conversion ball prior to entering open hole.
7. After entering the open hole change running speeds based on hole conditions and modeling. Estimated to be 2 mps.
8. Makeup ATC Diverter Sub ~(4) stands above top of 1st position casing hanger running tool. Review surge pressure calculations running speeds with Allamon rep to determine optimum drill pipe-running speed. (For Allamon Tool pressure sequence, see Attachment 5.)
   - ATC dual subsea plug system
   - Dril-quip casing hanger / seal assembly running tool
   - ~(4) stands 6-5/8" FH DP
   - ATC Diverter Test Device
   - 6-5/8" 40 ppf FH Drill pipe (inspected to 95%)

Note:

Ensure all DP has been drifted with a 2-3/4" in. drift prior to or while running casing.

Do not circulate the drill string (will close the diverter)

9. Pick up the ATC cement head and land out the 1st position hanger:
   - Do not pick-up or rotate once the hanger has landed until the cement job is complete.
   - After landing out, start pumping slowly to close ATC Diverter Sub.

- Wash-down ball will be on seat so pressure up to 1000 psi slowly and hold same for 2 minutes.
- Continue to increase pump pressure until ball yields seat with 2400 psi.
- Stop pumped and let the 2-1/4" ball free fall to ATC dual plug system
- Pressure up to 800 psi (test running tool and landing string for pressure integrity)
- Increase pressure to 2600 psi and yield the seat. This will launch the 3-1/2" float conversion ball.
- Circulate 3-1/2" ball down to the float collar and convert (~600 psi / may not be seen). Max flow rate not to exceed 12 bpm.

10. Circulate and condition the drilling fluid (1.5 x pipe volume), unless loss returns are experienced or more time is required to properly clean up the mud for the cement job.

10.5.3 Cementing 9-7/8" Casing

Test Pressures and Volumes are provided for reference, review APD for final values.

1. After conditioning the mud, mix and pump the foam spacer.
2. Once the cement is ready to pump downhole, launch the 2.375" bottom dart; a 1400 psi pressure increase will be seen as the dart exits the PLI sub. (Min displacement rate = 5 bpm)
3. Mix and pump foam cement (per Halliburton detailed program).
4. After the cement has been pumped, launch the 2.5" top wiper dart; a 1700 psi pressure increase will be seen as the dart exits the PLI sub.
5. Displace as fast as possible to catch up to the slugging cement/darts.
   - Once indication that the cement has been caught continue displacing until 5 bbls before the bottom dart reaches the diverter sub.
   - Displacement may be limited to slow speeds, if not slow pump rates to 5 bpm. When the dart yields the diverter seat, a 1200 psi pressure spike will be seen.
   - Continue displacing the bottom dart down to the bottom plug. The bottom dart will land out and release the bottom plug with 1200 psi above circulating pressure.
   - Continue to displace job, until 5 bbls before the top dart reaches the diverter. Slow pumps to 5 bpm, an 1800 psi pressure increase over circulating pressure will be seen when the seat yields.
   - Continue displacing the top dart down to the top plug. The top dart will land out and release the bottom plug with 1800 psi above circulating pressure.
   - Continue with displacement at max displacement rate (do not slow)
   - Bump the bottom plug without slowing displacement rate, plug will shift to allow circulation with 1200 psi above circulating pressure.

- Displace top wiper plug to the landing collar at max rate and land out with 500 psi above circulating pressure. The plugs will land / lock / non-rotate together.

Note: **It is responsibility of Driller, Mud Engineer, and Mud Logger to closely monitor and agree on amount of mud lost during casing job. Report mud losses for different phases of job as follows:**

- **Bbls lost while PU and running casing.**
- **Bbls lost while TIH with casing on landing string.**
- **Bbls lost while washing casing to bottom, if required.**
- **Bbls lost while circulating, after casing is landed.**
- **Bbls lost while pumping and displacing cement.**
- **Bbls left behind pipe.**

6. Release the pressure to check if floats are holding. Allow max of 10-15 bbls to flow back if floats aren't holding, then pump back the same. Hold pressure until cement has sufficient time to set-up.
7. Release the subsea running tool.
   - Set 20 kips down on the running tool and mark the drill pipe at the rotary table for vertical movement.
   - Rotate the drill string 5-6 turns to the right or until the string drops about 10 inches (rotation releases the running tool and lands the seal assembly, indicated by the 10 inch drop).
   - Set drill string weight down on the seal assembly (per Dril-quip rep) to energize the resilient seals.
   - Close the drill pipe rams and pressure test: Build quickly to 3000 psi, then increase to 6500 psi and ensure, seals are holding. Finally increase pressure to 10,000 psi and hold for 10 seconds. This provides the force required to establish a metal to metal seal and lock down the seal assembly to the casing hanger.
8. Pick up running tool from the wellhead. Approximately 60-90 kips over-pull will be required to shear the pins
9. Once fully release from the hanger, position the cement plug launcher above the wellhead and circulate (drop a nerf ball) one drill string volume.
10. Trip back in the hole and land running tool with 30 kips down. Re-test the casing hanger to 6,500 psi for 1-2 minutes to ensure seals are still effective.
11. POOH with the running tool.
12. Test casing prior to releasing (pressure will be supplied to the rig).

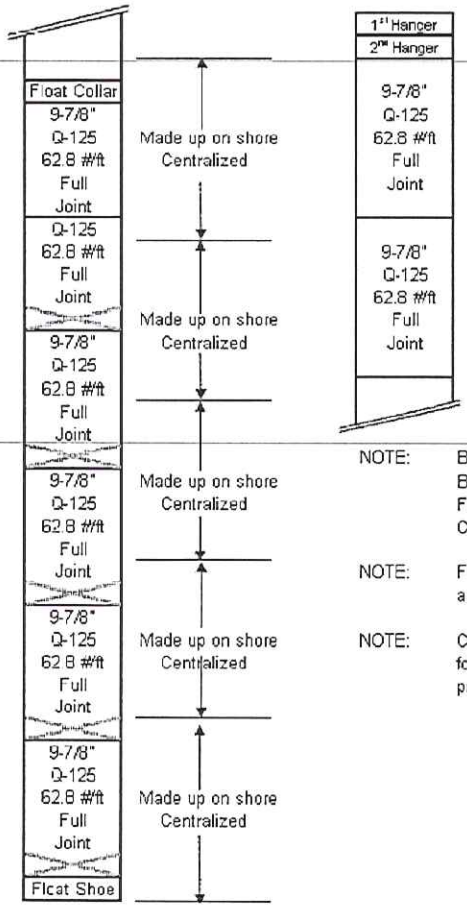
Attachments

No.	Title
1	9-7/8" Casing Diagram
2	9-7/8" Casing Landing String – MOP
3	Allamon Tool Pressure Sequence

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **9-7/8" Casing Interval**	Macondo MC 252 #1

Attachment 1:
9-7/8" Casing Diagram

9-7/8" Casing Shoe Diagram



NOTE: Back up equipment on site includes:
Bow spring centralizers
Float equipment
Casing hanger

NOTE: Float collar is a Weatherford model L47WA auto-fill double valve float collar

NOTE: Centralizers will be run on the 1st 5 joints followed by every other jt to 500' above the productive interval

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **9-7/8" Casing Interval**	Macondo MC 252 #1

Attachment 2:
9-7/8" Casing Landing String – MOP

	Macondo				**9-7/8" CASING LANDING STRING**		
9.875	OD	6.625	OD		OD		OD
8.625	ID	5.375	ID		ID		ID
62.8	Nominal Wt	40.05	Nominal Wt		Nominal Wt		Nominal Wt
62.8	Adjusted Wt	47.8	Adjusted Wt		Adjusted Wt		Adjusted Wt
125,000	Yield strength, psi	135,000	Yield strength, psi		Yield strength, psi		Yield strength, psi
100	% rem wall	95	% rem wall		% rem wall		% rem wall
			Tensile strengths from the pipe drill pipe data entered above				
2,270,292	Tensile Strength	1,503,040	Tensile Strength		Tensile Strength		Tensile Strength
			BHA Data				
	⇐DC #1 OD		⇐DC #2 OD		⇐DC #3 OD	6.625	⇐HWDP OD Tensile Str.
	⇐DC #1 ID		⇐DC #2 ID		⇐DC #3 ID	4.499	⇐HWDP ID 1,021,600
	⇐DC #1 Length		⇐DC #2 Length		⇐DC #3 Length	0	⇐HWDP Length HWDP Air Wt
☐ Spiraled	⇐Spiraled (√)	☐ Spiraled	⇐Spiraled (√)	☐ Spiraled	⇐Spiraled (√)	☐ Spiraled	⇐Spiraled (√)
	Wt/ft DC #1		Wt/ft DC #2		Wt/ft DC #3	Buoyancy Factor	0.7831
	Wt. DC #1		Wt. DC #2		Wt. DC #3	Air weight of BHA	3,500
			WH / RT	3,500		Buoyed weight of BHA	2,741
Depth of Interest ⇒⇒⇒⇒			19,650	Safety Factor	80 %	Total length of BHA	0'
Anticipated Mud weight			14.20	Block Wt	145,000	**Total depth**	19,650
			Buoyed Wt		Section MOP	Pipe needed on last sec.	0'
Enter Casing Length ⇒		14,594	717,689			Weak point in string	292,751
Enter Length DP #1 ⇒		5,056	189,251		292,751 #	Total weight of string	909,681
Enter Length DP #2 ⇒		0				Total weight BLK & string	1,054,681
Enter Length DP #3 ⇒		0				Total weight Indicator Reading	
Enter Length DP #4 ⇒		0				With over pull	1,347,432

WH / RT includes liner hanger, seal assembly, and running tool

Attachment 3:
Allamon Tool Pressure Sequence
9-7/8" ATC Surge Reduction

No	Operation	Anticipated Pressure
1	Drop the 2-1/4" ball	-
2	Pressure up and shift diverter seat (hold for 2 minutes)	1000
3	Yield the diverter ball seat	2400
4	Test Dril-quip subsea RT and landing string intergrity	800
5	Yield ball seat and release 3-1/2" float conversion ball	2600
6	Convert float equipment	600
7	Launch the bottom dart through PLI sub	1400
8	Yield the diverter ball seat	1200
9	Release the bottom plug	1200
10	Release the top dart through the PLI sub	1700
11	Yield the diverter ball seat	1800
12	Release the top plug	1800
13	Bump the bottom plug	1200
14	Bump the top plug	500
15	Pressure up on Casing hanger seal assembly	3000
16	Pressure up to confirm no leaks on seal assembly	6500
17	Set casing hanger seal assembly and lock down	10000
18	Re-test casing hanger seal assembly	6500

	GoM Exploration Wells **MC 252 #1 – Macondo Prospect** **Appendix**	Macondo MC252#1

Table of Contents

Appendix A:
Contact List

Primary Services	Company	Phone	Location	Field Contact	Office Contact	Phone
Casing Running	Weatherford	(337) 374-4713 (800) 252-3019 [redacted]	Lafayette, LA	Ed Pryor	Bill Bruce	[redacted]
Cementing	Halliburton*	(800) 444-7830 (337) 572-4621	Lafayette, LA	Chris Daigle	Jesse Gagliano	[redacted]
Directional/Rotary Steerable/BHA/Jars	Sperry/Halliburton*				Chip Lacombe	[redacted]
Drilling Fluids	MI Drilling Fluids*	(800) 391-3147	Port Fourchon	Tab Haygood, Leo Linder, Gordon Jones	Maxie Doyle	[redacted]
Mud Logging	Sperry/Halliburton*	(800)-288-4371 (337) 837-7555	Broussard	Earl Fly	Skip Clark	[redacted]
MWD/LWD	Sperry/Halliburton*	(800) 288-4371			Greg Navarette	[redacted]
ROV	Oceaneering*	(985) 395-8525 (985) 518-5298	Morgan City	James Hotard	Brett Eychner	[redacted]
Solids Control/Dryers	Swaco/MI*	(281) 988-1849 (281) 366-4017	Houston BP Office	Barrett Miles	Maxie Doyle	[redacted]
Trucking	ACE Trucking, Inc.	(800) 349-6562	Gulf Coast		Tim Broussard	
Wireline Logging	Schlumberger*	(985) 693-3161	Larose, LA	Jose Diaz	Carl Leweke	[redacted]
Wellhead – (Subsea)	Dril-Quip*	(713) 939-7711	Houston, TX		Barry Patterson	[redacted]

Specialty Services	Company	Telephone	Location	Field Contact	Office Contact	Phone #
Abandonment	Weatherford*	(504) 851-0600 (800) 729-0601	Houma	Chris Cutrer	Bill Bruce	[redacted]
BOP Test Tool - contg	Nu-Tec Inc.	(318) 433-6843	Lake Charles	Brian Williams		
Casing Threads	TenarisHydril	(281) 449-2000 (800) 872-0992	Houston	Jon Barton	Jon Barton	[redacted]
Communications	CAP Rock	(832) 668-2300 (504) 469-9233	Houston, St. Rose, LA			
Concentric Reamers Underreamers	Smith International*	(888) 876-2850 (985)876-2852	Houma	Gene Deroche David Voisin	Billy Northcutt Taylor Hennigan	[redacted]
Drill Bits	Hughes	(337) 837-1414 (985) 396-4211	Lafayette Fourchon		Charles Ubaru	[redacted]
	Reed Hycalog DPI	(832) 681-8000	Houston	Matthew Mitchell (337) 654-9684	Ernie Prochaska	[redacted]
	Security DBS Halliburton	(337) 837-1892	Houma	Timmy Lyons	Buddy Urech	[redacted]
	Smith International	(800) 872-2487 (800) 645-2487	Broussard, LA	Kirk Robichaux	Godwin Gabriel	[redacted]
Drilling Jars	Smith International HE	(337) 364-88141	New Iberia	Carl Viator	Glenn Martin	[redacted]
Fishing Tools	Weatherford*	See Abandonment.				
	Smith Inernational*	(800) 788-2487	New Orleans	Mel Adams	Mel Adams	[redacted]
Float Equipment	Weatherford-Gemoco	(281) 859-7888	Houston	Chris Lopez	Bryan Clawson	[redacted]
	Davis Lynch	(281) 485-8301	Houston		Jeff Musslewhite	[redacted]

GoM Exploration Wells

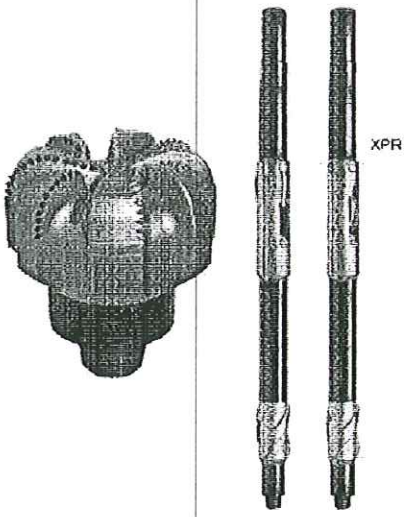
MC 252 #1 – Macondo Prospect
Appendix

Specialty Services	Company	Telephone	Location	Field Contact	Office Contact	Phone #
Inspection Services	BP Contacts	(281) 560-8574	Houston		Byron Wolfe	[redacted]
BP Yard	Casing & Equipment	(281) 456-5406	Houston	David Obermiller		
	Drill Pipe, BHA Tools	(281) 456-5407	Houston	Tom Seeley Byron Wolfe		
Liner Equipment	Weatherford*	(281) 874-6435	Houston	Darrell Cleboski	Darrell Cleboski	[redacted]
Liner Equipment	Halliburton Versaflex	(281) 988-2312	Houston	Georgia Brogdon	Georgia Brogdon	
Location Survey	C&C Technology*	(337) 261-0660	Lafayette	Eric Granger	Bruce Carter(BP)	
Packers / Retainers	Halliburton*	(800) 444-7830	Lafayette	Roman Victoriana	Phillip Costlow	
PBL Subs	Downhole Devices	(337) 839-2413 (337) 839-2414 fax	Broussard	John Broussard	Ross Landry	
Rental Tools	Quail	(337) 365-8154	New Iberia	Mark White	Lyndon Bolen	
	Allis-Chalmers	(800) 631-2573 (281)-443-7664	Morgan City	Rob Duhon	Joe Van Matre Dwight Gross (LAST)	
Surge Reduction	Allamon Tool, Inc.	(877) 449-5433	Montgomery	Jerry Allamon Mark Davis	Vernon Goodwin	
Torque Machine (Bucky)	Offshore Energy Services OES	(800) 489-6202	Broussard		Brian Theriot	
Bulk Material Rack	Proline Systems	(337) 369-3343	New Iberia, LA			
Well Location Signs	ABC Signs	(985) 475-6357 (985) 475-6369 fax	Golden Meadows	Melissa Collins		
Rig	TOI	(281) 647-8533	Houston		Paul Johnson	[redacted]

Appendix B:
Bit / Reamer Program

BP / Macondo - Bit and Reamer Program

- 26" x 32-1/2"
  - Bit: CR1 Roller Cone
  - DTU: Smith 22000 DTU Underreamer
- 18-1/8" X 22" Section
  - Bit: CR1 Roller Cone
- 18-1/8" X 22" Section
  - Bit: 18-1/8" HCD507Z (N17515)
  - XPR Tool: Series 18 XPR 18-1/8" x 22" (E17198)
- 16-1/2" X 20" Section
  - Bit: 16-1/2" QD507 (N17511)
  - XPR Tool: Series 16 XPR 16-1/2" x 20" (E17204)
- 14-3/4" X 16-1/2" Section
  - Bit: 14-3/4" QD507 (N6251)
  - XPR Tool: Series 14 XPR 14-3/4" x 16-1/2" (E17277)
- 12-1/4"
  - Bit: 12-1/4" QD507 (N5751)
  - XPR Tool: Series 12 XPR 12-1/4" x 14-3/4" (E17131) (back-up)



bp	**GoM Exploration Wells** **MC 252 #1 – Macondo Prospect** **Appendix**	Macondo

Appendix D: Dispensations

bp Drilling & Completions MOC Initiate

MOC #:	DCMOC-09-0054
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Asset/Project:	GoM	Type of Change:	Dispensation
Rig:	Marianas	Well (i.e., MC 252 #1 or N/A):	MC 252 #1 (Macondo)
Vendor:	Hafle, Mark	Priority:	B - Modifiers - Less Than 1 Week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #:	DPA-D-003 section 5.3
Desired Completion Date:	07/10/2009	Duration:	Well
Proceed with MOC?	☑ Yes ☐ No / Cancel ☐ Clarify		

Title:
9-7/8" production casing collapse design

Scope:
Dispensation is requested from DPA-D-003 section 5.3 (as referenced in DWOP 13.2).
The 9-7/8" production casing for Macondo does not meet the BP DWOP production collapse design requirements.
A dispensation is required to use the alternate fluid density below the packer for the production collapse load case.

Justification (include financial impact where appropriate):
The proposed production casing collapse design basis includes the abandonment pressure planned for the well. It is very unlikely the casing below the packer would ever see "0" psi during the well's life expectancy.
DWOP design factors
AB Pb: SF=0.71, we 9 ppg fluid density below the packer
(To improve these results we can increase the collapse resistance of the pipe or decrease the collapse load requirements. The AB Pb load case default is a design with PP external and zero (0) pressure internal, this would simulate a well that would not flow and was jetted of all fluid to below the perforations. This would certainly be a worst case scenario; however I have seen it happen so know it can occur. If we assume that we will not jet the well dry, the minimum internal load is from a column of dry gas at the abandonment pressure, and the external load is original PP the collapse load is acceptable. I assumed an abandonment pressure of 5150 psi at the perforations or about 3130 psi (assuming 0.1 psi/ft) at the wellhead, which is equivalent to about 4.3 ppg fluid density.)
AB Pb: SF=1.00, we 4.0 ppg fluid density below the packer
(per Steve Maxey, EPTC casing design specialist)

Risk/Mitigation (attach risk documentation where appropriate):
To minimize risk of casing collapse failure late in well life, the well should plan for appropriate abandonment pressures.

bp Drilling & Completions MOC Review

MOC #:	DCMOC-09-0054
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George E	Gray, George E	☑ Agree	☐ Disagree	Gray, George E
Sims, Lewis C	Sims, Lewis C	☑ Agree	☐ Disagree	Sims, Lewis C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Appendix

Drilling & Completions MOC Initiate

MOC #:	DCMOC-09-0052
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Asset/Project:	GoM	Type of Change:	Deprivation
Rig:	Marianas	Well #, GC 823 #1 or N/A:	MC 252 #1 (Macondo)
Vendor:	Hafle, Mark	Priority:	5 (Medium) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #:	DPA-D-003 sections 6.4 and 6.5.3
Desired Completion Date:	07/10/2009	Duration:	Well (Estimated at 98 days)
Proceed with MOC?	Yes	No / Cancel	Clarify

Title:

16" casing burst design

Scope:

Deprivations are requested from: DPA-D-003 sections 6.4 and 6.5.3 (as referenced in DWOP (D.3.A.13.H))
The 16" casing for Macondo does not meet the Burst and Axial SF (TAS) with gas under 4.5 surface Burst load case as the Tubular requirements per the BP DWOP.
The FAS case gives a Burst SF=0.72 and a Tri-Axial SF=0.91.
The 16" casing will design for Burst and Tri-Axial requirements using the gas kick profile (GKP).
A deprivation is required to use the GKP load case for the 16" casing burst load case.

Justification (include financial impact where appropriate):

The fracture at shoe scenario assumes a 19# equivalent to the FG with a gas gradient at the surface. This scenario has a very low probability of occurring.

Using a gas kick profile (GKP) approach with a 160 bbl influx (7.6 ppg kick intensity) and using 7.6 ppg base fluid density for back-up satisfies both the BP Burst and Tri-Axial design criteria.

Burst SF goes from 0.72 to 1.02
Tri-Axial SF goes from 0.91 to 1.21

(This result is close enough with the very conservative 7.6 ppg external fluid density, an increase of less than 1.0 ppg increases the SFB and SFVME factors to greater than the recommended minimum of 1.10 and 1.25 respectively. Per Shawn Mewly, BP TC casing design specialist)

Risk/Mitigation (attach risk documentation where appropriate):

To minimize risk of casing burst failure, kicks of greater magnitude and intensity will not be circulated to the surface.

Drilling & Completions MOC Review

MOC #:	DCMOC-09-0052
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George F	Gray, George F	Agree	Disagree	Gray, George F
Sims, David C	Sims, David C	Agree	Disagree	Sims, David C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

bp

Drilling & Completions MOC Initiate

MOC #:	DCMOC-09-0051
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Asset/Project:	Gom	Type of Change:	Operations
Rig:	Multiple	Well (I.e., GC 823 #1 or N/A):	MC 252 #1 (Macondo)
Vendor:	Hafle, Mark	Priority:	2 (Medium) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #:	BPA-D-003 sections 6.4 and 6.5.2
Desired Completion Date:	07/10/2009	Duration:	Well (Estimated 36 days)
Proceed with MOC?	(•) Yes ( ) No / Cancel ( ) Clarify		

Title:

22" casing burst design

Scope:

Dispensations are requested from BPA-D-003 sections 6.4 and 6.5.2 (as referenced in DWOP (13.2 & 13.4)).

The 22" casing for Macondo does not meet the Rathole at shoe (FAS) with gas gradient to surface Burst load case or the Tri-axial requirements per the BP DWDP.

The FAS case gives a Burst SF=0.83 and a Tri-Axial SF=0.90.

The 22" casing will design for Burst and Tri-Axial requirements using the gas kick profile (GKP).

A dispensation is required to use the GKP load case for the 22" casing burst load case.

Justification (include financial impact where appropriate):

The fracture at the rathole assumes a FP equivalent to the FG with a gas gradient to the surface. This scenario has a very low probability of occurring.

Using a gas kick profile (GKP) approach with a 100 bbl influx (0.8 ppg kick intensity) and using seawater density for back-up arrivers both the BP Burst and Tri-Axial design criteria.

Burst SF goes from 0.83 to 2.28.
Tri-Axial SF goes from 0.90 to 2.55.
(per Steve Mercy, EPTC casing design specialist)

Risk/Mitigation (attach risk documentation where appropriate):

To minimize risk of casing burst failure, kicks of greater magnitude and intensity will not be circulated to the surface.

bp

Drilling & Completions MOC Review

MOC #:	DCMOC-09-0051
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George F	Gray, George F	(•) Agree	( ) Disagree	Gray, George F
Sims, David C	Sims, David C	(•) Agree	( ) Disagree	Sims, David C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Appendix

Drilling & Completions MOC Initiate

MOC #: DCMOC-09-0050
Date Initiated: 6/22/2009
Initiator: Hafle, Mark

Asset/Project:	GoM	Type of Change:	Deterministic
Rig:	Marianas	Well (i.e., OC 523 #1 or N/A)	MC 252#1 (Macondo)
Vendor:	Hafle, Mark	Priority	B (Mid-Term) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #	BPA-D-201 13.14
Desired Completion Date:	07/10/2009	Duration:	Well (Estimated at 98 days)
Proceed with MOC?	☑ Yes ☐ No/Cancel ☐ Clarify		

Title:
Auto-fill Float Equipment

Scope:
Auto-fill float equipment may be run through hydrocarbon bearing zones without tripping auto-fill float equipment.

BP DWUP states, Auto-fill float equipment shall be tripped prior to running through any hydrocarbon bearing zone.

Hole conditions in narrow PP/FG environments may lead to the operational practice of running the casing strings through the subject sections prior to converting the auto-fill float equipment.

Dispensation is requested to allow running 16", 14", 13-5/8", 11-7/8", and 9-7/8" through hydrocarbon bearing zones without tripping auto-fill float equipment (pending hole conditions) on an as needed basis.

Justification (include financial impact where appropriate):
Offset wells have encountered hydrocarbons in the subject hole sections. Disabling the auto-fill function may add unnecessary surge pressure and may contribute to significant mud losses & cementing problems if the float equipment is activated prior to reaching TD.

Due to the planned size of the Alternate bypass sub above the running tools, the vertical dimension of any pre-existing wall bore ratio will be greatly reduced if the auto-fill floats are not converted. Also, the closing ball can be run in place on the auto-fill tools, reducing the time necessary to convert (close) the equipment.

Risk/Mitigation (attach risk documentation where appropriate):
The change does not introduce additional risks or hazards to the liner running process. As noted above, well control safety will be enhanced and mud costs should be reduced.

There are no MMS regulations governing the use of auto-fill float equipment.

Drilling & Completions MOC Review

MOC #: DCMOC-09-0050
Date Initiated: 6/22/2009
Initiator: Hafle, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George E	Gray, George E	☑ Agree	☐ Disagree	Gray, George E
Sims, David C	Sims, David C	☑ Agree	☐ Disagree	Sims, David C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

Drilling & Completions MOC Initiate

MOC #: DCMOC-09-0049
Date Initiated: 6/22/2009
Initiator: Hafle, Mark

Asset/Project:	GoM	Type of Change:	Dispensation
Rig:	Marianas	Well (i.e., GC 323 #1 or N/A):	MC 252#1 (Macondo)
Verifier:	Hafle, Mark	Priority:	H (Medium) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #:	BP-D-003 Part 3 Sec. 6
Desired Completion Date:	07/10/2009	Duration:	Well (Estimated 98 Days)
Proceed with MOC?	(•) Yes ( ) No / Cancel ( ) Clarify		

Title:
Design Pore Pressure (DPP) requirements

Scope:
The Macondo casing design does not comply with the Design Pore Pressure (DPP) requirements specified in Part 3, Section 6 of the BP Casing Design Manual (BP-D-003).

The BP Casing Design Manual calls for the use of DPP in the calculation of bottom hole pressure (BHP). DPP is given by the following formula: expected pore pressure x (1 + (1.64 x COV)) where COV = 0.12 for Macondo. In the calculation of BHP, DPP is then multiplied by 1.08.

Justification (include financial impact where appropriate):
For Macondo, this method is overly conservative. For example, if the expected pore pressure at the wellbore TD (20,200' TVD) is 14.4 ppg, DPP = 17.2 ppg. The calculated BHP is 18.6 ppg or 18.6 ppg.
Dispensation is requested to permit drilling operations to proceed when the DPP kick intensity for a 100 bbl kick is too high for casing burst pressure ratings to meet/exceed a 1.15 design factor.
The DPP methodology is overly conservative, particularly since the DPP BHP exceeds the 18.6 ppg overbalance pressure present at TD.

Risk/Mitigation (attach risk documentation where appropriate):
For the wellbore TD (20,200' TVD), the 16" casing will design for a 100 bbl kick with 2.0 ppg intensity assuming a 7.5 ppg and density backup fluid and no breakdown at the 16" shoe.

Drilling & Completions MOC Review

MOC #: DCMOC-09-0049
Date Initiated: 6/22/2009
Initiator: Hafle, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George E	Gray, George E	(•) Agree	( ) Disagree	Gray, George E
Sims, David C	Sims, David C	(•) Agree	( ) Disagree	Sims, David C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Appendix

Drilling & Completions MOC Initiate

MOC #: DCMOC-09-0048
Date Initiated: 6/22/2009
Initiator: Heffe, Mark

Asset/Project:	GoM	Type of Change:	Deviation
Rig:	Marianas	Well (i.e., OC 023 #1 or N/A):	MC 252 #1 (Macondo)
Vendor:	Heffe, Mark	Priority:	B (Medium) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #:	BPA-D-001-10.3 BPA-D-002-1.5.5
Desired Completion Date:	07/10/2009	Duration:	Well - 90 Days estimated
Proceed with MOC?	Yes / No / Cancel / Clarify		

Title:
Kick Tolerance less than 25 bbls with a 1.0 ppg kick intensity

Scope:
Kick Tolerance less than 25 bbls with a 1.0 ppg kick intensity will likely occur in multiple hole intervals while drilling the MC 252 #1, Macondo prospect.

The BP Drilling and Well Operations Policy states ¿Kick tolerances are to be calculated as described in the Well Control Manual (BPA-D-002). On all wells, the design kick tolerance shall be greater than 25 bbls based on maximum anticipated pore pressure and planned mud weights.¿ The Well Control Manual requires a 1.0 ppg kick intensity over expected pore pressure for exploration or appraisal well operations. Below are the estimated kick tolerances that do not meet the DWOP:
Hole MW Kick size Kick Tolerance
19-1/8¿ x 22¿ 10.6 25 bbls 0.55 ppg
19-1/2¿ x 20¿ 11.8 25 bbls 0.53 ppg
16-3/4¿ x 18¿ 13.1 25 bbls 0.50 ppg
12-1/4¿ x 14¿ 14.2 25 bbls 0.37 ppg*
10-5/8¿x12-1/4¿ 14.6 25 bbls 0.40 ppg**

* For drilling to TD w/o contingency 11-7/8 SET liner
** Only applies if contingency 11-7/8 SET liner is used)

For MC 252 #1, a kick tolerance of 25 bbls is not achievable in all hole intervals. This fact, like many other deepwater wells, has a minimal pore pressure to fracture gradient margin. This results in the setting of multiple casing strings to achieve target depth.

Dispensation from meeting BP DWOP Policy of 25 bbls kick size at 1.0 ppg intensity is requested.

Justification (include financial impact where appropriate):
The BP Well Control Manual states for deepwater drilling considerations, ¿Traditional kick tolerance calculation is based on circulating the kick out. Deepwater drilling is subject to particular complications due to tight mud weight/fracture margins and high choke and friction pressures, which would render some wells non-drillable if required to comply with policy. In such event, an alternative approach can be adopted based on keeping the problem downhole and utilizing slow kill rates, bullhead techniques or other emerging technologies are the well control method of choice.¿

Risk/Mitigation (attach risk documentation where appropriate):
Kick margin will be monitored on a continual basis during the drilling of the MC 252 #1 well. Slow pump rates have previously been proven successful in circulating out influxes. If unable to circulate out influx at reduced rates, bullhead techniques may be required.

Drilling & Completions MOC Review

MOC #: DCMOC-09-0048
Date Initiated: 6/22/2009
Initiator: Heffe, Mark

Level 1 Reviews

Review	Responsible Person	Disposition		Completed By
Gray, George E	Gray, George E	Agree	Disagree	Gray, George E
Sims, David C	Sims, David C	Agree	Disagree	Sims, David C

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Appendix

bp

Drilling & Completions MOC initiate

MOC #:	DCMOC-09-0050
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Asset/Project:	GoM	Type of Change:	Documentation
Rig:	Marianas	Well (i.e., GC 823 #1 or N/A):	MC 252#1 (Macondo)
Verifier:	Hafle, Mark	Priority:	5 (Routine) - Less than 1 week
Coordinator:	Wilson, Gabe S	Policy / Paragraph #	BPA-D-001 10.14
Desired Completion Date:	9/11/2009	Duration:	WOE (Estimated at 95 days)
Proceed with MOC?	Yes / No, Cancel / Clarify		

Title:

Auto-Fill Float Equipment

Scope:

Auto-Fill Float Equipment may be run through hydrocarbon bearing zones without tripping auto-fill float equipment.

BP DWOP states, Auto-fill float equipment shall be tripped prior to running through any hydrocarbon bearing zone.

Hole conditions in Marine/BPCO environments may lead to the operational practice of running the casing strings through the suspect sections prior to converting the auto-fill float equipment.

Dispensation is requested to allow running 16", 18", 13-3/8", 11 7/8", and 9 7/8" through hydrocarbon bearing zones without tripping auto-fill float equipment (pending hole conditions) on an as needed basis.

Justification (include financial impact where appropriate):

Offset wells have encountered hydrocarbons in the subject hole sections. Disabling the auto-fill function may add unnecessary surge pressure and may contribute to significant mud losses & cementing problems the float equipment is activated prior to reaching TD.

Due to the planned use of the Allmon bypass sub above the running tools, the vertical elongation of any pre existing well bore influx will be greatly reduced if the auto-fill floats are not converted. Also, the closing ball can be run in place on the auto-fill tools, reducing the time necessary to convert (close) the equipment.

Risk/Mitigation (attach risk documentation where appropriate):

This change does not introduce additional risks or hazards to the linear running process. As noted above, well control safety will be enhanced and mud costs should be reduced.

There are no MMS regulations concerning the use of auto-fill float equipment.

bp

Drilling & Completions MOC Review

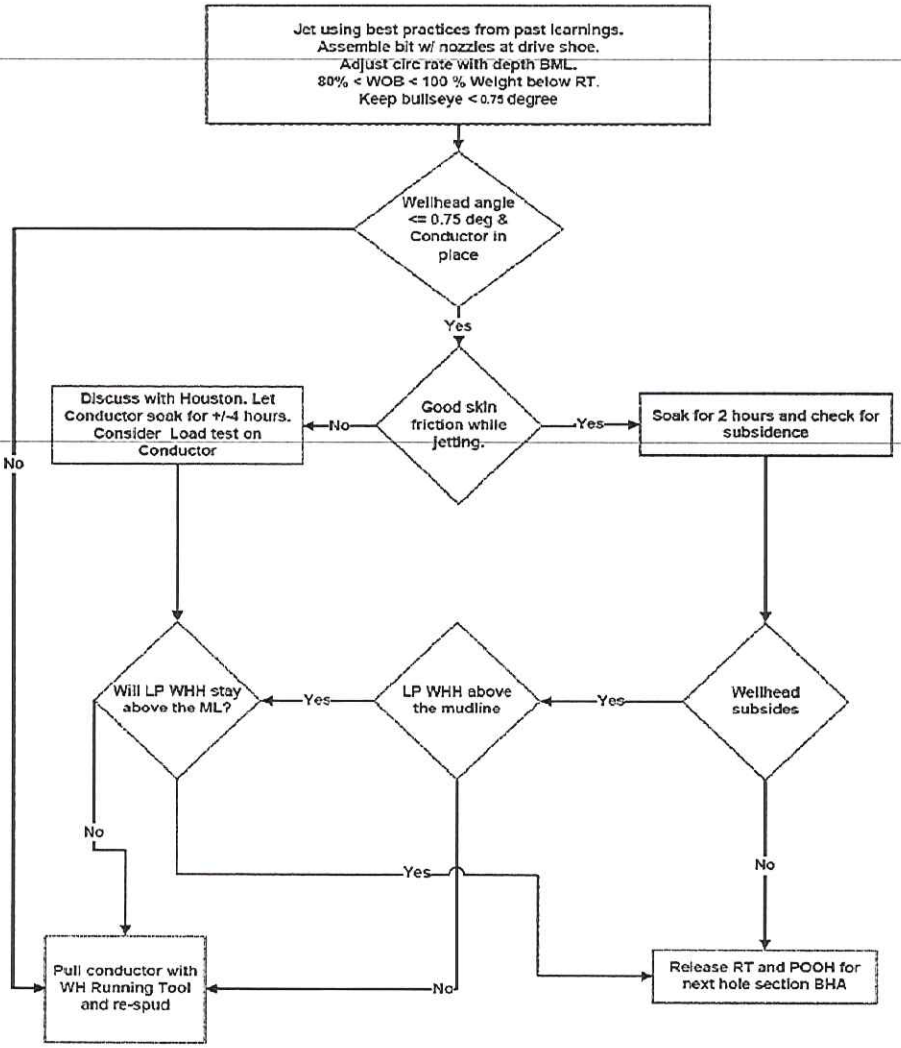
MOC #:	DCMOC-09-0050
Date Initiated:	6/22/2009
Initiator:	Hafle, Mark

Level 1 Reviews

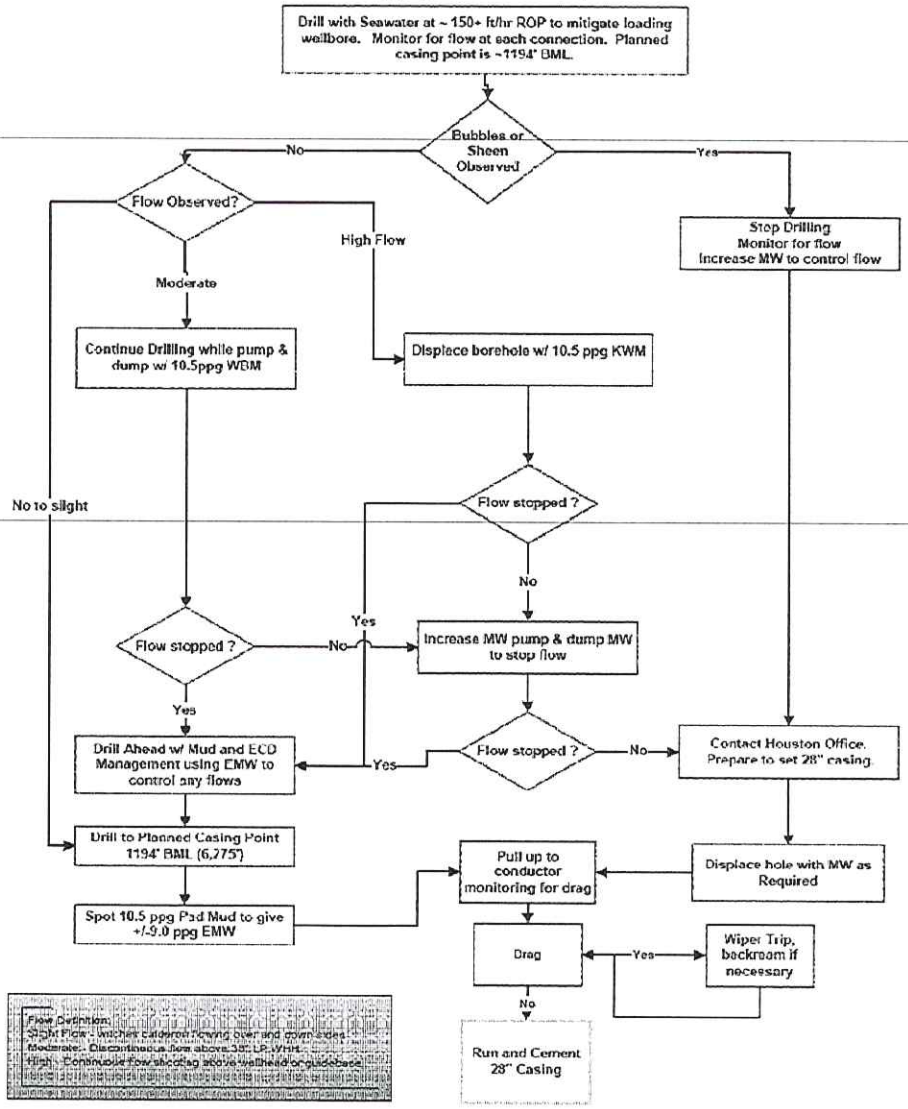
Review	Responsible Person	Disposition	Completed By
Gray, George E	Gray, George E	Agree / Disagree	Gray, George E
Sims, David C	Sims, David C	Agree / Disagree	Sims, David C

Appendix E:
Decision Trees

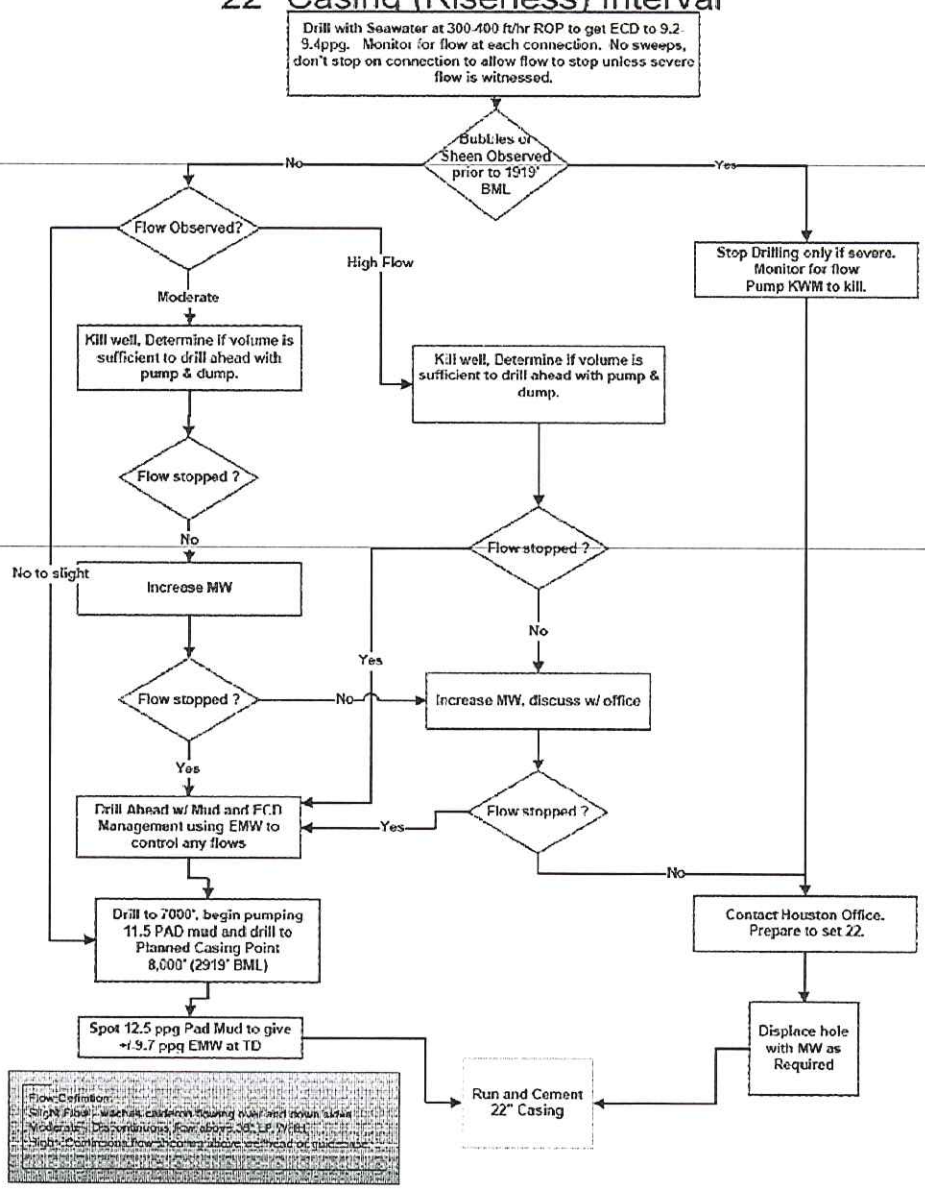
36" Structural Casing



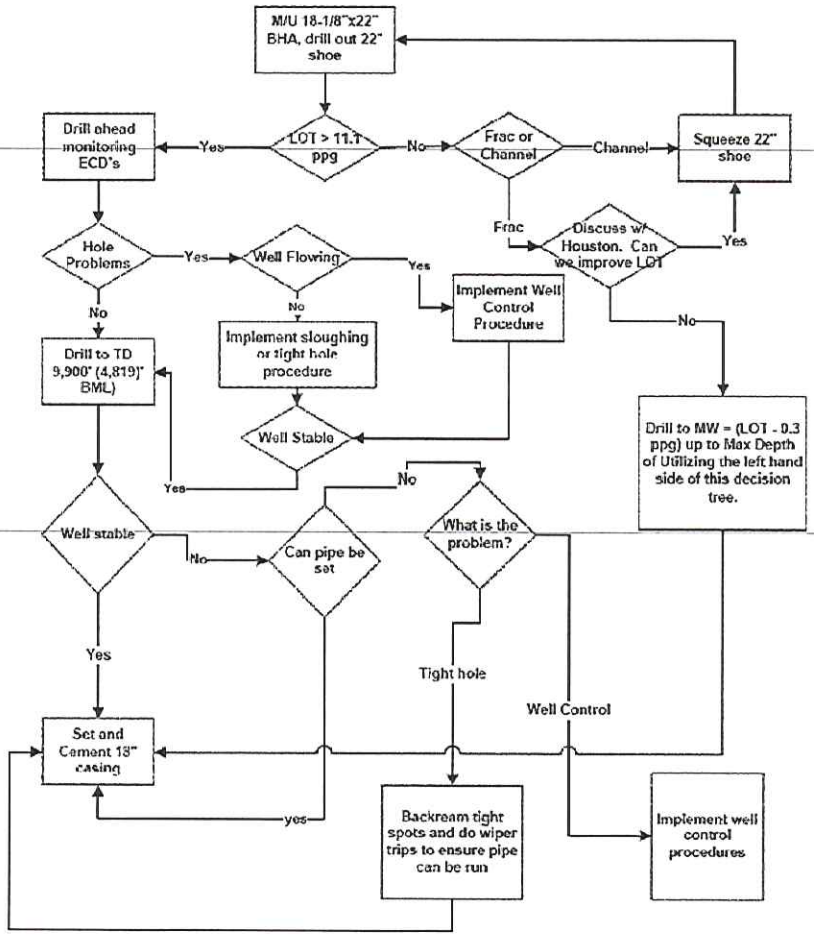
28" Casing (Riserless) Interval



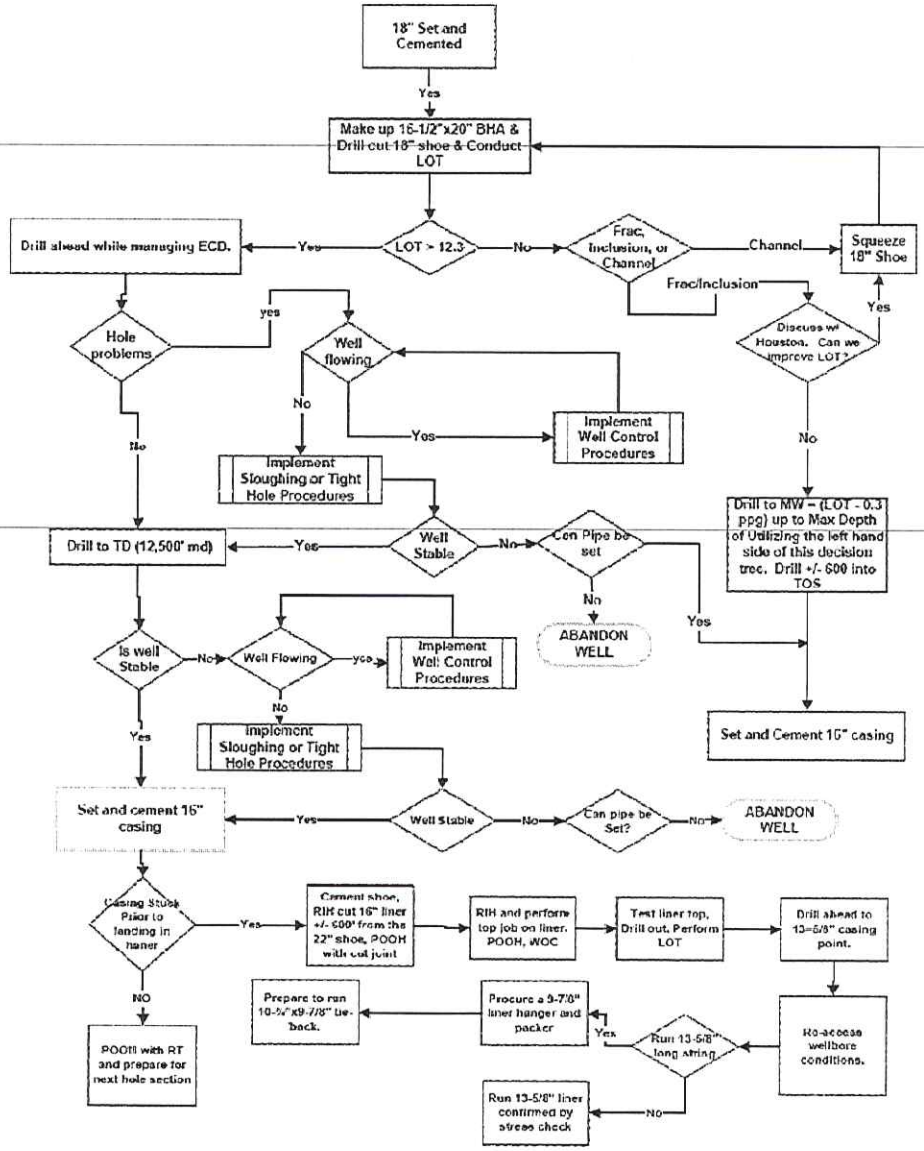
22" Casing (Riserless) Interval



18" Decision Tree

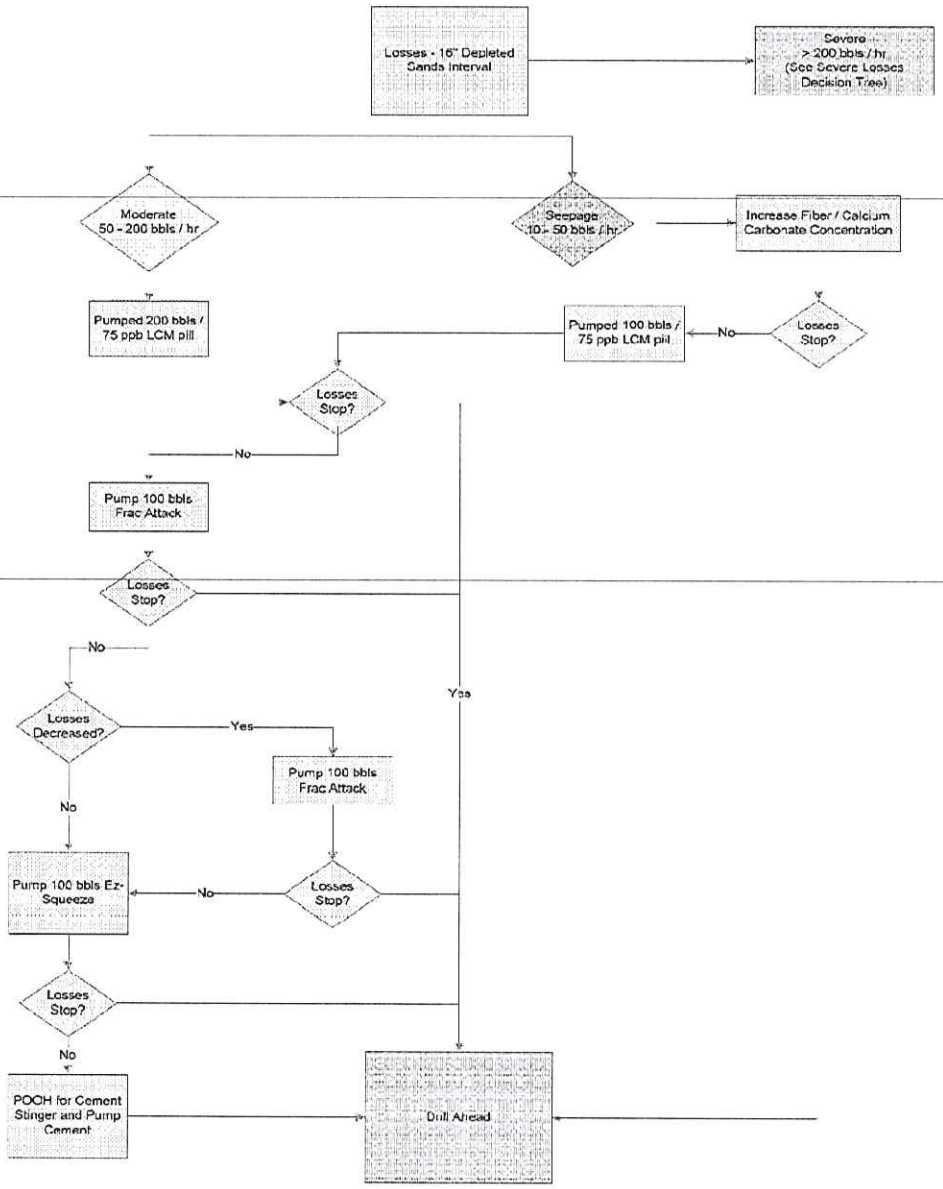


16" Liner Decision Tree



GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix



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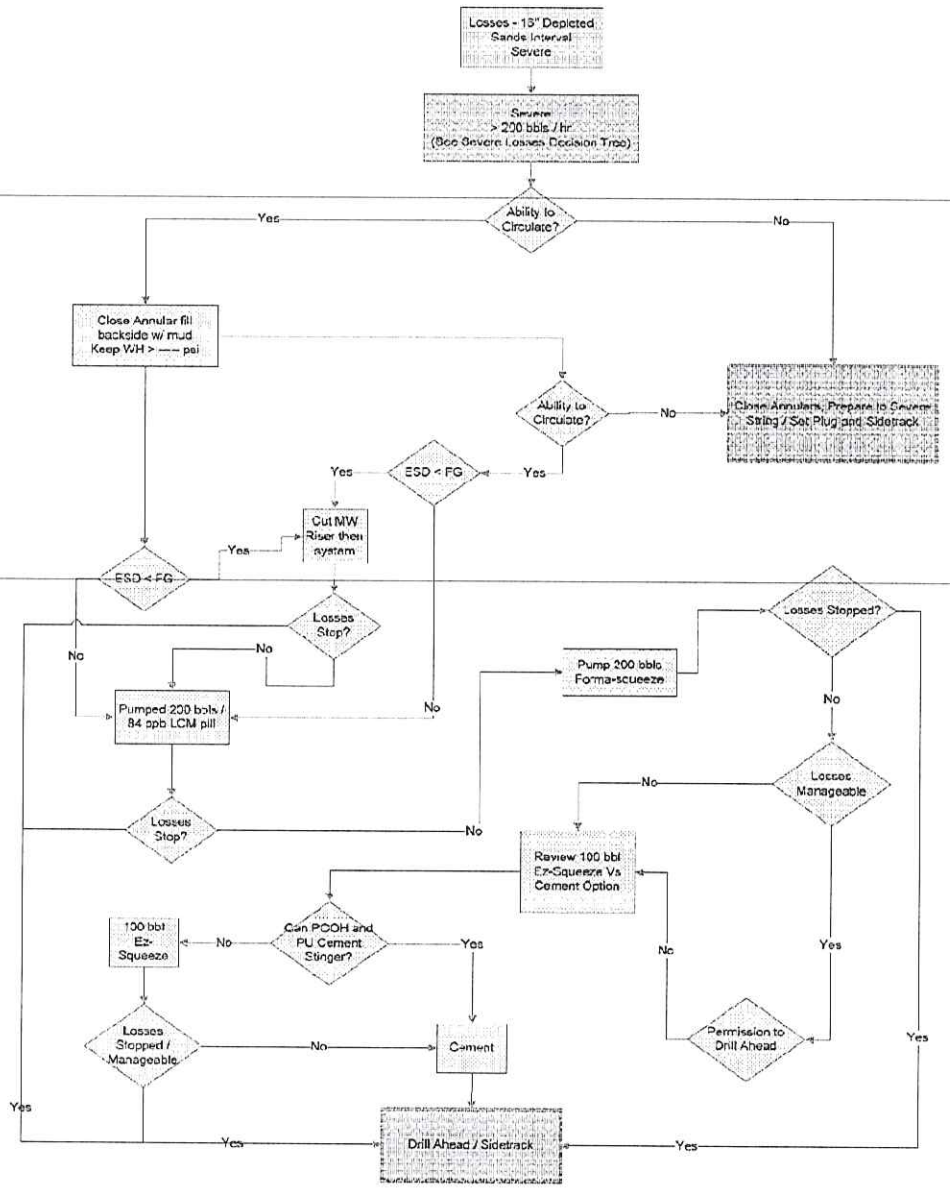
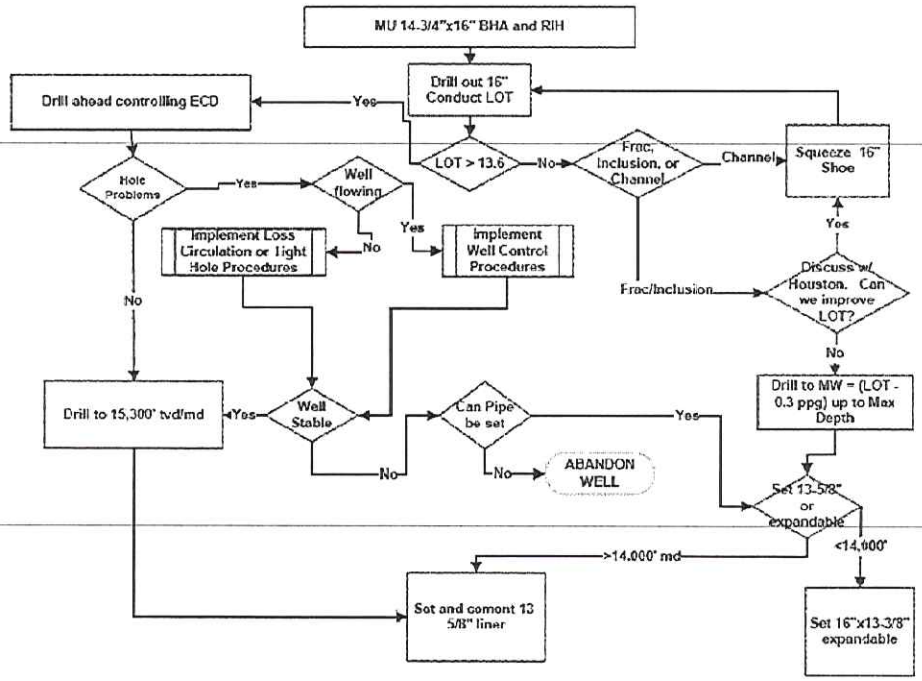
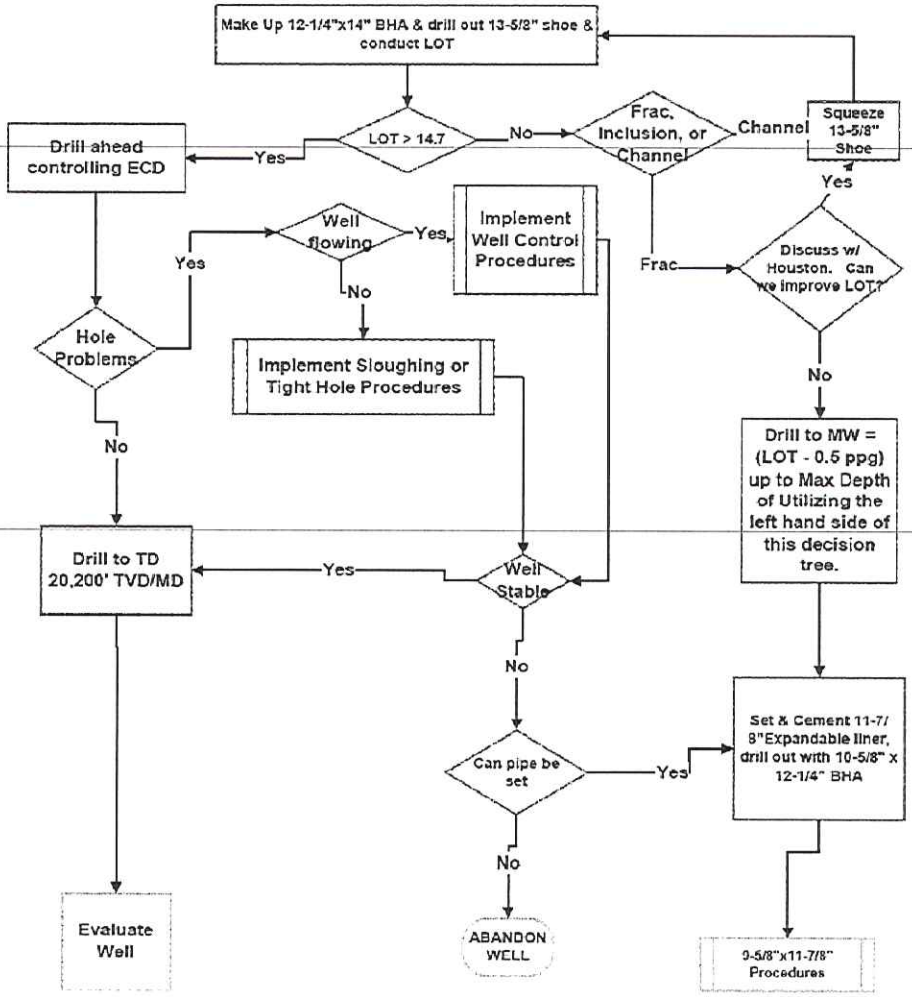
MC 252 #1 – Macondo Prospect Appendix



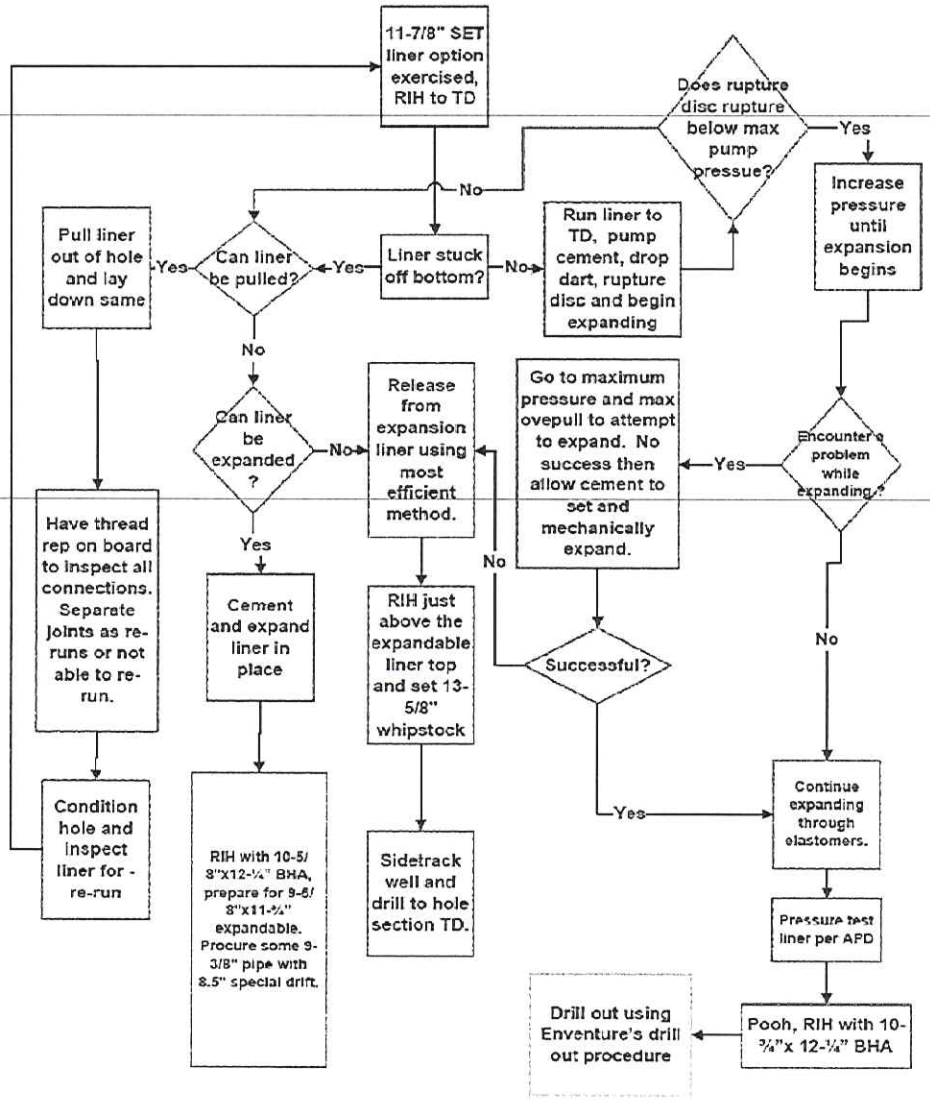
13-5/8" Interval Decision Tree



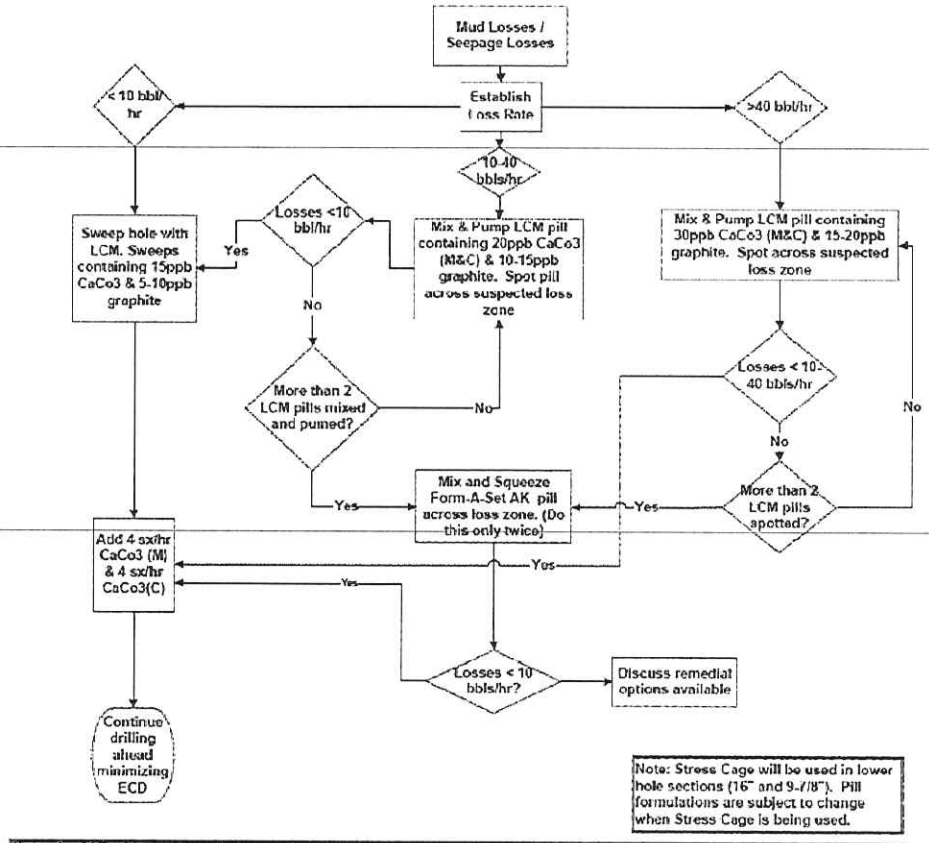
12-¼" x 14" Interval Decision Tree



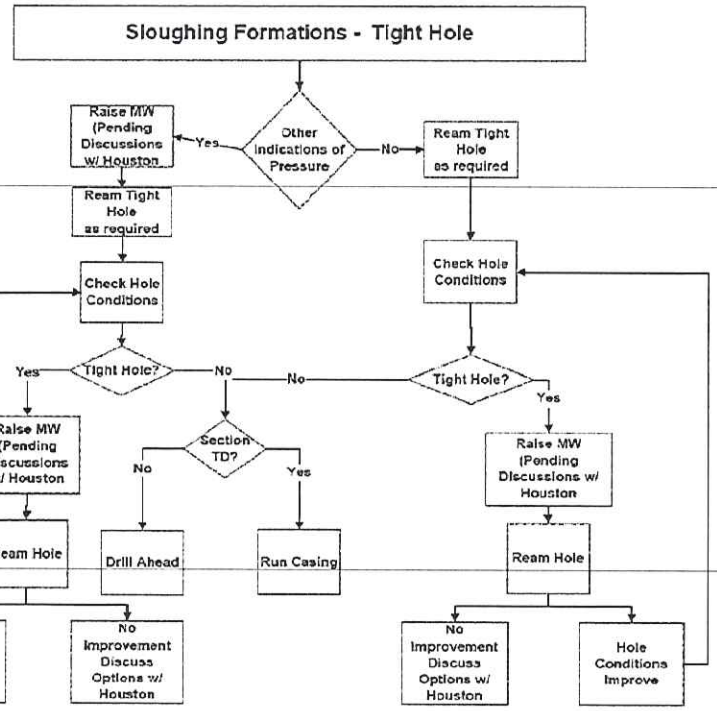
Expandable Contingencies



Loss Circulation Plan



Note: Avoid Rapid movement of pipe causing surge pressures while circulating. Avoid rapid pump start up.
In suspected loss circulation intervals, have 300-400 bbls of loss circulation pill ready consisting of:
10 lbs/bbl G-seal, 20 lbs/bbl Safe Carb 40, 20 lbs/bbl Safe Carb 250, 20 lbs/bbl Vinseal



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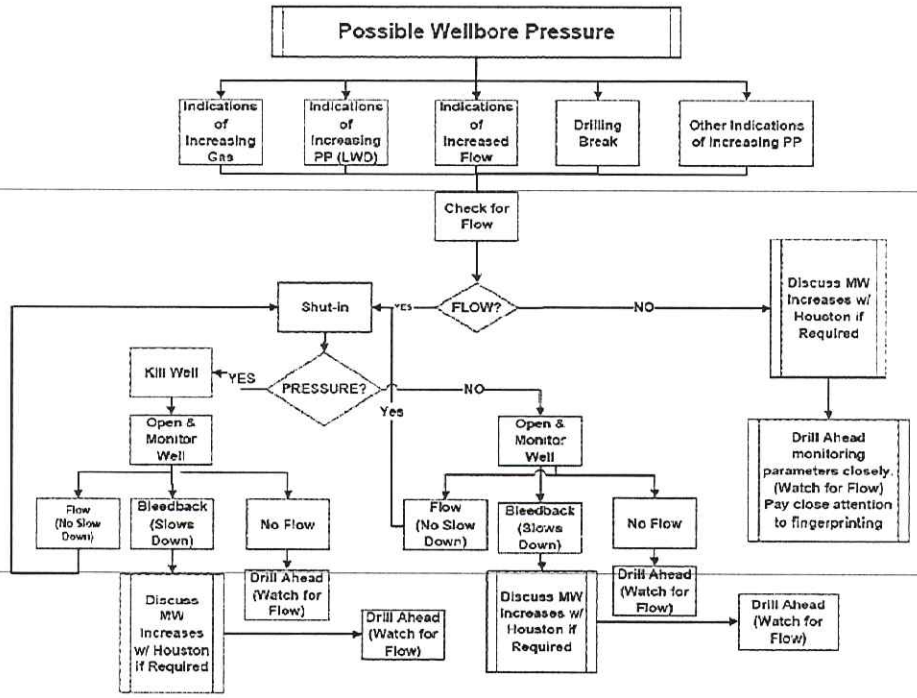
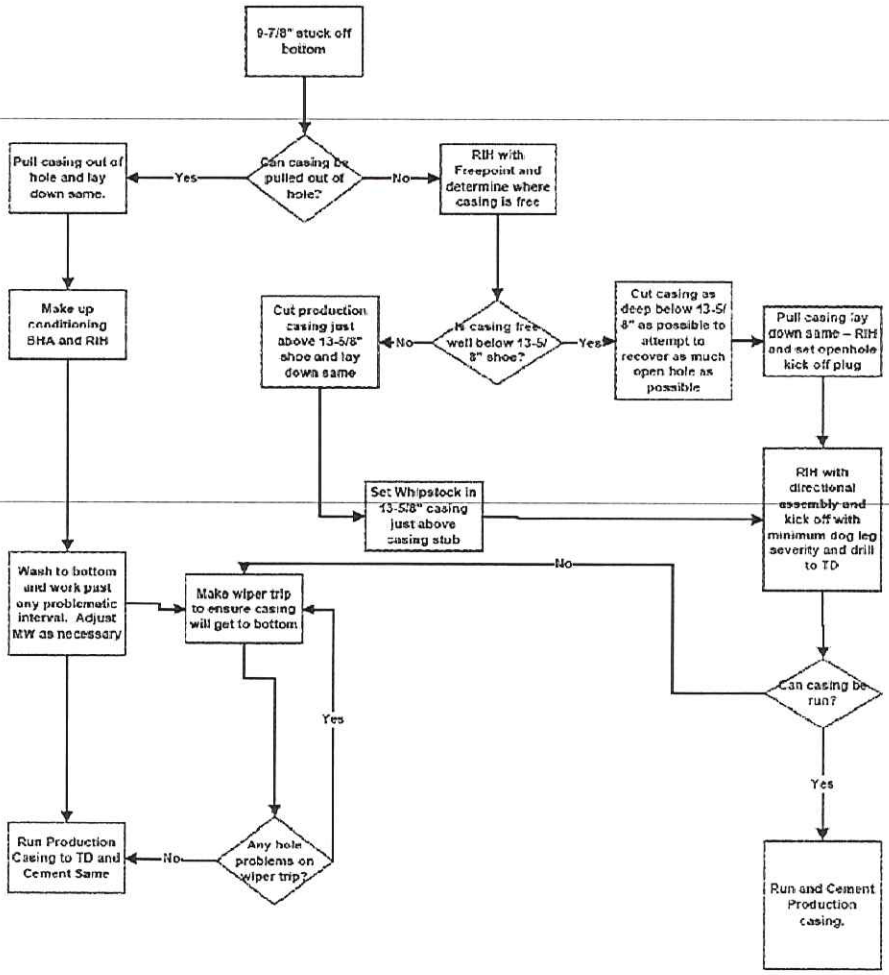
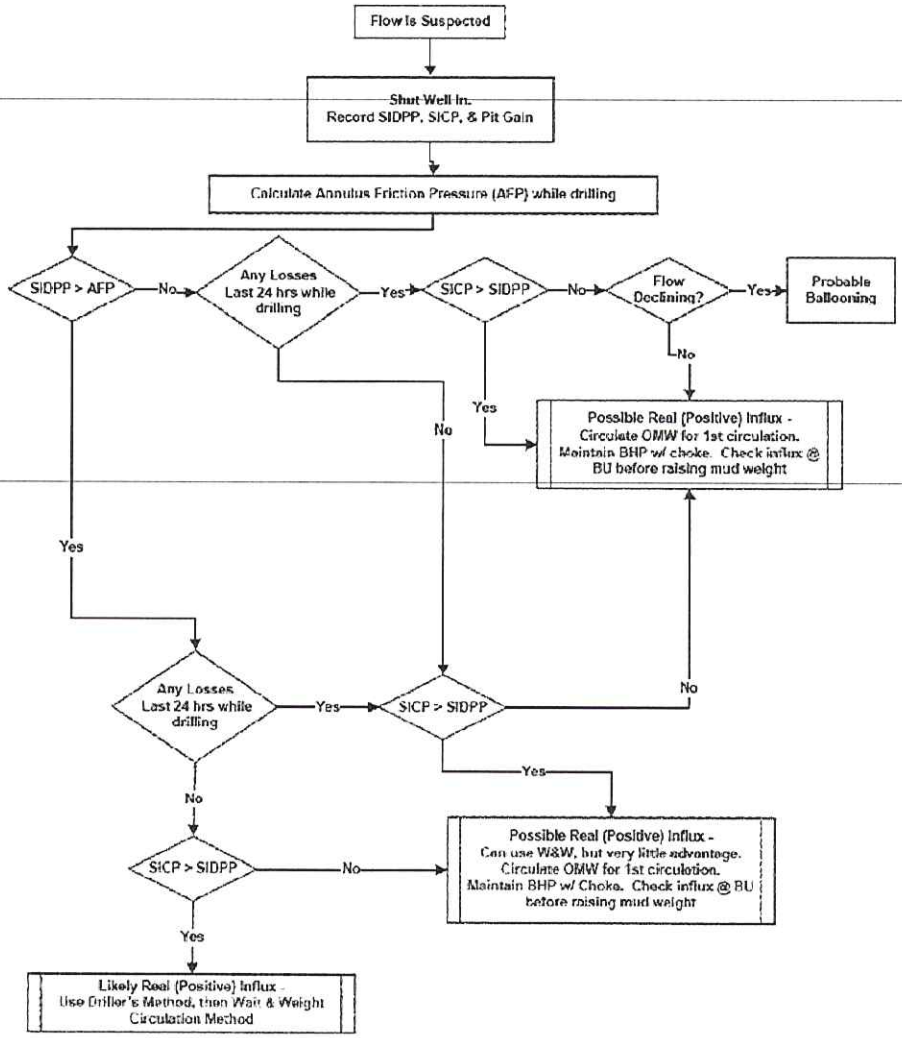


Stuck Production Casing



Ballooning vs. Real (Positive) Influx



Appendix F:
Application for Revised New Well (APD)

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 **Area/Block** MC 252 **Well Name** 001 **ST** 00 **BP** 00 **Well Type** Exploration
Application Status Approved **Operator** 02481 BP Exploration & Production Inc.

Correction Narrative 01-25-10 -

1) Revise Annular Pressure test from 5000 psi to 3500 psi.

2) Request departure to stump test the 6-5/8" and 5-1/2" drill pipe but only the 6-5/8" drillpipe subsea. The only time the 5-1/2" will be run below the stack is as an inner string during the 16" casing job. Once the 16" string is landed out and cemented, the seal assemble will be set, and the inner string pulled out of the wellbore. During this time the 5-1/2" will be below the stack inside the casing

---

01-12-10 - Revision to use the Deepwater Horizon to finish drilling operations (Marianas sent to shipyard for repairs, no longer under BP contract).

Revised attachments include:
1) Horizon BOP schematic
2) Wellbore schematic with revised RKB
3) Revised Departure List (removed departure for 250.449 (f)
4) Revised Pore Pressure Plot with Horizon RKB

The casing information has been upated to reflect actual setting depths, mudweights, etc.

Attachments referring to the Marianas BOPs and mooring have been removed.

10-29-09 - Revised to show shallow setting depth and revised cement volume for the 18" casing.

Revision I: 10-15-09
This RPD is to request approval to replace the upper annular element from the originally approved standard element rated to 10k on 5-1/2" pipe to a 6-5/8" element which is rated to 7.5k on 5-1/2" and 10k on 6-5/8".

Please see the attached chart which shows the rating of each element. Our max annular tests per the approved APD will be 5k both on the stump test and down hole.

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 06/31/2000

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 Area/Block MC 252 Well Name 001 ST 00 BP 00 Well Type Exploration
Application Status Approved Operator 02481 BP Exploration & Production Inc.

General Well Information

API Number 608174116900		Approval Date	01/29/2010	Approved By	Frank Patton
Date of Request 01/25/2010		Req Spud Date	06/15/2009	Kickoff Point	N/A
Water Depth (ft.) 4992		Drive Size (in)	36	Mineral Code	Hydrocarbon
RKB Elevation 75		Drive Depth (ft.)	5361	Subsea BOP	Yes
Verbal Approval Date		Verbal Approval By			

Proposed Well Location

Surface Location

LEASE (OCS) G32306	Area/Block	MC 252	Authority	Federal Lease	
Entered NAD 27 Data		Calculated NAD 27 Departures		Calculated NAD 27 X-Y Coordinates	
Lat: 28.73836889		N	6857	X	1202802.892336
Lon: -88.36593389		E	1037	Y	10431702.916855
Surface Plan	Plan Lease (OCS) G32306		Area/Block	MC 252	

Bottom Location

LEASE (OCS) G32306	Area/Block	MC 252			
Entered NAD 27 Data		Calculated NAD 27 Departures		Calculated NAD 27 X-Y Coordinates	
Lat: 28.73836889		N	6857	X	1202802.892336
Lon: -88.36593389		E	1037	Y	10431702.916855
Bottom Plan	Plan Lease (OCS) G32306		Area/Block	MC 252	

Approval Comments

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 Area/Block MC 252 Well Name 001 ST 00 BP 00 Well Type Exploration
Application Status Approved Operator 02481 BP Exploration & Production Inc.

Geologic Information

H2S Designation Absent	H2S TVD

Anticipated Geologic Markers	
Name	Top MD
Reticulofenestra pseudoumbilicus	7060
Catinaster mexicanus	9100
Catinaster coalitus	13145
Discoaster kugleri	14153
Cyclicargolithus floridanus	17481
Globorotalia peripheroronda	18400
Sphenolithus heteromorphus	19120
Discoaster petaliformis	19594

Rig Information

RIG SPECIFICATIONS		ANCHORS	No
Rig Name	T.O. DEEPWATER HORIZON		
Type	SEMISUBMERSIBLE	ID Number	46428
Function	DRILLING	Constucted Year	2001
Shipyard	HYUNDAI	Refurbished Year	
RATED DEPTHS			
Water Depth	10000	Drill Depth	35000
CERTIFICATES			
ABS/DNV	02/28/2011	Coast Guard	07/27/2011
SAFE WELDING AREA			
Approval Date	09/26/2001	District	1
Remarks			

GoM Exploration Wells

MC 252 #1 – Macondo Prospect
Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 **Area/Block** MC 252 **Well Name** 001 **ST** 00 **BP** 00 **Well Type** Exploration
Application Status Approved **Operator** 02481 BP Exploration & Production Inc.

Number	Question	Response	Response Text
1	Will you maintain quantities of mud and mud material (including weight materials and additives) sufficient to raise the entire system mud weight 1/2	YES	
2	If hydrocarbon-based drilling fluids were used, is the drilling rig outfitted for zero discharge and will zero discharge procedures be followed?	N/A	
3	If drilling the shallow casings strings riserless, will you maintain kill weight mud on the rig and monitor the wellbore with an ROV to ensure that it i	YES	
4	If requesting a waiver of the conductor casing, have you submitted a log to MMS G&G that is with in 500 feet of the proposed bottom hole location for th	N/A	
5	Will the proposed operation be covered by an EPA Discharge Permit? (please provide permit number in comments for this question)	YES	NOI has been submitted but permit number has not yet been assigned.
6	Will all wells in the well bay and related production equipment be shut-in when moving on to or off of an offshore platform, or from well to well on the plat	N/A	

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32308 **Area/Block** MC 252 **Well Name** 001 **ST** 00 **BP** 00 **Well Type** Exploration
Application Status Approved **Operator** 02481 BP Exploration & Production Inc.

Permit Attachments

File Type	File Description	Status

Required Attachments

pdf	Drilling prognosis and summary of drilling, cementing, and mud processes	Attached
pdf	Directional Program	Attached
pdf	Proposed Well Location Plat	Attached
pdf	BOP & Diverter Schematics with Operating Procedures	Attached
pdf	Pore pressure (PP), Mud Weight (MW), and Fracture Gradient (FG) Plot	Attached
pdf	Proposed Wellbore Schematic	Attached
pdf	Engineering Calculation	Attached

Optional/Supplemental Attachments

pdf	Departure List	Attached
PDF	Application for Permit to Drill	Attached

Contacts Information

Name	Heather Powell
Company	02481 BP Exploration & Production Inc.
Phone Number	281-504-0984
E-mail Address	heather.powell@bp.com
Contact Description	Regulatory
Name	Scherie Douglas
Company	02481 BP Exploration & Production Inc.
Phone Number	281-366-6843
E-mail Address	scherie.douglas@bp.com
Contact Description	Regulatory

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 **Area/Block** MC 252 **Well Name** 001 **ST** 00 **BP** 00 **Well Type** Exploration
Application Status Approved **Operator** 02481 BP Exploration & Production Inc.

Well Design Information

Interval Number 1 Type Casing Name Conductor

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1	28.000	218.0	X-52	2437	952	6217	6217	8.6

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	32.500	Type	No Preventers	Annular Test (psi)	0
Mud Weight (ppg)	8.6	Size (in)	N/A	BOP/Diverter Test (psi)	0
Mud Type Code	Gelled Sea Water	Wellhead Rating (psi)	0	Test Fluid Weight (ppg)	0.0
Fracture Gradient (ppg)	9.8	Annular Rating (psi)	0	Casing/Liner Test (psi)	0
Liner Top Depth (ft)		BOP/Diverter Rating (psi)	0	Formation Test (ppg)	0.0
Cement Volume (cu ft)	4636				

Interval Number 2 Type Casing Name Surface

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1	22.000	277.0	X-80	7955	5670	5227	5227	8.6
2	22.000	224.0	X-80	6363	3876	7937	7937	9.3

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	26.000	Type	Blowout	Annular Test (psi)	5000
Mud Weight (ppg)	9.5	Size (in)	18.75	BOP/Diverter Test (psi)	6500
Mud Type Code	Water Base	Wellhead Rating (psi)	15000	Test Fluid Weight (ppg)	8.6
Fracture Gradient (ppg)	10.5	Annular Rating (psi)	10000	Casing/Liner Test (psi)	3400
Liner Top Depth (ft)		BOP/Diverter Rating (psi)	15000	Formation Test (ppg)	10.5
Cement Volume (cu ft)	6301				

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32306 Area/Block MC 252 Well Name 001 ST 00 BP 00 Well Type Exploration
Application Status Approved Operator 02481 BP Exploration & Production Inc.

Interval Number 3 Type Liner Name Intermediate

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1	18.000	117.0	P-110	6680	2110	8969	8969	10.0

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	22.000	Type	Blowout	Annular Test (psi)	5000
Mud Weight (ppg)	10.2	Size (in)	18.75	BOP/Diverter Test (psi)	6500
Mud Type Code	Synthetic Base	Wellhead Rating (psi)	15000	Test Fluid Weight (ppg)	10.2
Fracture Gradient (ppg)	12.1	Annular Rating (psi)	10000	Casing/Liner Test (psi)	3000
Liner Top Depth (ft)	7489.0	BOP/Diverter Rating (psi)	15000	Formation Test (ppg)	12.1
Cement Volume (cu ft)	993				

Interval Number 4 Type Casing Name Intermediate

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1	16.000	97.0	P-110	8620	2340	12500	12500	11.4

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	20.000	Type	Blowout	Annular Test (psi)	3500
Mud Weight (ppg)	11.6	Size (in)	18.75	BOP/Diverter Test (psi)	6500
Mud Type Code	Synthetic Base	Wellhead Rating (psi)	15000	Test Fluid Weight (ppg)	11.6
Fracture Gradient (ppg)	13.6	Annular Rating (psi)	10000	Casing/Liner Test (psi)	3300
Liner Top Depth (ft)		BOP/Diverter Rating (psi)	15000	Formation Test (ppg)	13.6
Cement Volume (cu ft)	930				

Interval Number 5 Type Liner Name Intermediate

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1	13.625	88.2	Q-125	10030	4800	15300	15300	12.9

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	16.000	Type	Blowout	Annular Test (psi)	3500
Mud Weight (ppg)	13.1	Size (in)	18.75	BOP/Diverter Test (psi)	6500
Mud Type Code	Synthetic Base	Wellhead Rating (psi)	15000	Test Fluid Weight (ppg)	13.1
Fracture Gradient (ppg)	14.7	Annular Rating (psi)	10000	Casing/Liner Test (psi)	2000
Liner Top Depth (ft)	12200.0	BOP/Diverter Rating (psi)	15000	Formation Test (ppg)	14.7
Cement Volume (cu ft)	410				

GoM Exploration Wells

MC 252 #1 – Macondo Prospect Appendix

U.S. Department of the Interior
Minerals Management Service (MMS)

OMB Control Number 1010-0141
OMB Approval Expires 08/31/2008

Form MMS 123A/123S - Electronic Version

Application for Revised New Well

Lease G32308 **Area/Block** MC 252 **Well Name** 001 **ST** 00 **BP** 00 **Well Type** Exploration
Application Status Approved **Operator** 02481 BP Exploration & Production Inc.

Interval Number 6 Type Open Hole Name Open Hole

Section Number	Casing Size (in)	Casing Weight (lb/ft)	Casing Grade	Burst Rating	Collapse Rating (psi)	Depth (ft) MD	Depth (ft) TVD	Pore Pressure (ppg)
1						20200	20200	14.0

GENERAL INFORMATION		PREVENTER INFORMATION		TEST INFORMATION	
Hole Size (in)	14.000	Type	Blowout	Annular Test (psi)	3500
Mud Weight (ppg)	14.2	Size (in)	18.75	BOP/Diverter Test (psi)	6500
Mud Type Code	Synthetic Base	Wellhead Rating (psi)	15000	Test Fluid Weight (ppg)	0.0
Fracture Gradient (ppg)	16.1	Annular Rating (psi)	10000	Casing/Liner Test (psi)	0
Liner Top Depth (ft)		BOP/Diverter Rating (psi)	15000	Formation Test (ppg)	0.0
Cement Volume (cu ft)					

PAPERWORK REDUCTION ACT OF 1995 (PRA) STATEMENT: The PRA (44 U.S.C. 3501 et seq. Requires us to inform you that we collect this information to obtain knowledge of equipment and procedures to be used in drilling operations. MMS uses the information to evaluate and approve or disapprove the adequacy of the equipment and/or procedures to safely perform the proposed drilling operation. Responses are mandatory (43 U.S.C. 1334). Proprietary data are covered under 30 CFR 250.196. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB Control Number. Public reporting burden for this form is estimated to average 27 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the form. Direct comments regarding the burden estimate or any other aspect of this form for the Information Collection Clearance Officer, Mail Stop 4230, Minerals Management Service, 1849