From:	David Barnett
Sent:	Monday, May 31, 2010 10:01 AM
To:	Mazzella, Mark; Mark.Patteson@bp.com
Cc:	David W Moody; Michael W. Allen; Dicky J. Robichaux; William Burch; Christopher J. Murphy; Pat Campbell
Subject:	Top Kill Summary
Attachments:	WWCI_PM_Top_Kill_Ops_Summary_31May10.pdf; image001.jpg

Please see attached summary of top kill operations implemented last week.

Look forward to discussions about these procedures, lessons learned, etc. soonest.

Regards,

David Barnett
Wild Well Control, Inc.
Vice President, Engineering Services
dbarnett@wildwell.com • www.wildwell.com
281.784.4700 phone • 281.784.4750 fax
"Experience Makes The Difference"

10632
Exhibit No. _____
Worldwide Court Reporters, Inc.

Project Memo

Operator:	BP GoM Deepwater Exploration	**Well Name:**	Macondo – MC252#1
Date:	31 May 2010	**Time:**	10:00 hrs
To:	Mark Mazzella Mark Patteson	**From:**	D. Barnett
CC:	F. Gebhardt, D. Moody, C. Murphy, B. Burch, D. Robichaux, M. Allen, P. Campbell		
Subject:	Summary & Conclusions From Top Kill Efforts 26 – 28 May 2010		

Executive Summary

The objective of the top kill operation (defined in BP document 2200-T2-DO-PR-4100) was to hydrostatically control the MC 252 #1 by creating enough friction pressure through the BOP leak point(s) to match and then overcome shut in pressure. This would allow injection of kill mud into the blowout well which would be followed by cement to establish long term isolation. If sufficient pressure could not be generated by pumping alone (i.e., indicating that the leak path was too large), a variety of bridging material would be injected into the flow stream using surface and subsea mounted manifolds.

The crew that would be stationed onboard the Q-4000, HOS Centerline (pump & mud storage vessel) and MV Blue Dolphin (stimulation vessel) was mobilized on Friday and Saturday May 21st & 22nd. Deployment and pressure testing of the riser and attachment of the high pressure hoses between the riser and the BOP was completed on Monday evening May 24th.

Top kill operations commenced with diagnostic pumping that was implemented late afternoon / evening on Tuesday May 25th. Base line pressures were obtained, flow paths were confirmed and the existence of restrictions at various points along the BOP stack were identified and characterized to the extent possible.

The results of the diagnostics were that there was very little restriction offered by the Shear Blind Rams (SBRs), the Upper Variable Bore Rams (VBRs), the Casing Shear Rams (CSRs), either of the spherical BOPs (annulars) or the kink in the Deep Water Horizon riser (DWH riser).

Once pressure was applied to the upper VBR, the flow path through that ram was obviously decreased – initial diagnostics confirmed that it was not possible to keep up with the hydrostatic u-tube at 6 bpm but after applying closing pressure a positive pump pressure was maintained at a rate of 2 bpm.

Diagnostics indicated that there is something in the Upper VBRs – most likely drill pipe but could be casing, hanger, debris, well solids or any number of things. In the end very little was learned from the diagnostics and remaining unknowns include:

- Flow path up the wellbore – one or more
- Geometry of flow path through surface equipment
- Production rate & proportion of oil, gas, water & solids
- Location & extent of bridging in the subsurface flow path(s) and/or surface equipment
- Amount of draw down and pressure response of reservoir (modeled but real data unavailable)

Several attempts were made to subdue the well by pumping over 28,000 bbls of 16.4 ppg inhibited WBM at rates up to 78 bpm and pump pressures in excess of 10,500 psi. Numerous bridging material was deployed. The material used in attempts to bridge the flow path through the BOP consisted of items that have proven successful in similar operations plus numerous other items identified via full scale testing and commercially available bridging material purchased from a specialty vendor in UK.

While there were some indications of pump & BOP pressure reductions which provided some measure of encouragement during the procedure, it ultimately became obvious that the top kill method was ineffective.

Given the lack of response while pumping very large bridging material (as large as 2 ½" diameter), it is apparent that the geometry of the pathway(s) inside the BOP is quite large. One of the most discouraging signs was the re-appearance of oil in the flow stream at the riser kink within only a few minutes of pumping several thousand barrels of mud at very high rates. This is a strong indication that the mud is either being expelled from the top of the BOP, or at least not being injected into and moving downward through any of the flow paths between the BOP and the flowing reservoir.

It is not practical to pump at rates sufficient to create enough friction to cause mud injection into the well. If a 2 ½" sphere will pass through the flow path, an incredibly high flow rate would be required to even equalize surface shut in pressure. Additional pump rate would be required to cause fluid injection at any appreciable degree.

Unless some means can be devised to decrease the area of the flow path (i.e., crimping or more aggressive bridging material) it is considered extremely unlikely that further top kill operations will be successful in controlling the well.

Diagnostic Procedures & Conclusions

All of the diagnostic operations involved pumping at modest rates – maximum 6 bpm. A schematic of the DW Horizon BOP stack is shown in Figure 1.0 and the data obtained during the diagnostics procedure can be found in Appendix A.

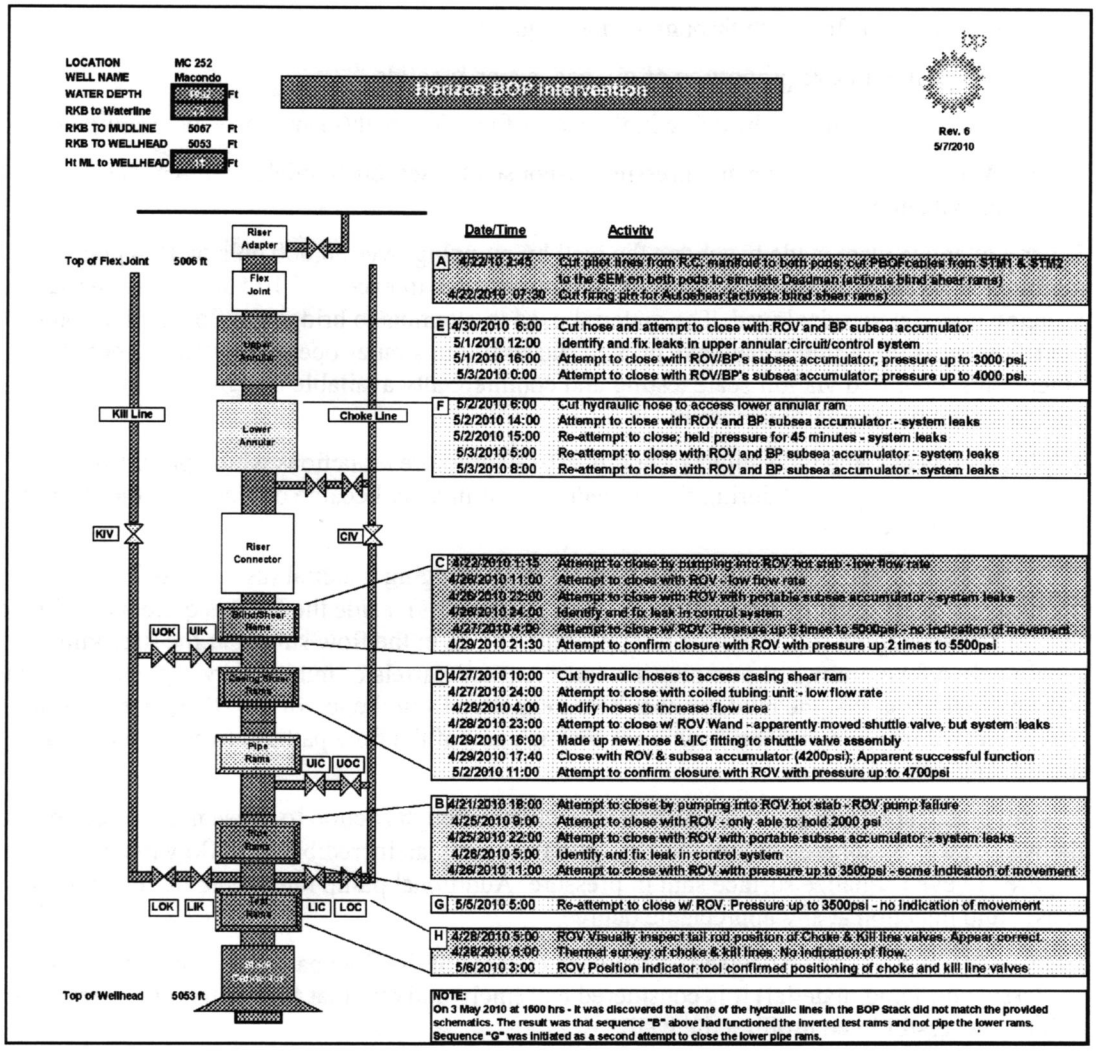

Figure 1.0 – BOP Stack

Table A.2 - Upper Kill Line (UKL)

Initial pressure with UKL valves open was 3,674 psi (BOP) & 2,860 psi (KL). Pumping at rates up to 6 bpm failed to keep up with u-tube rate into BOP. Took 14 bbls to fill riser after UKL valves were closed.

Table A.3 – Lower Kill Line (LKL)

Initial pressure when LKL valves were opened was 3,494 psi (BOP) & 3,684 psi (KL). Positive pressure was maintained at 2 bpm, 4 bpm and 6 bpm rates indicating that the leak geometry was much less than that encountered through the UKL. Pressure was encountered immediately upon closure of the KL valves indicting that the riser was full (as expected due to positive pressure throughout the procedure).

Pressure increase at the BOP gauge was insignificant (3,511 psi vs 3,494 psi) at the highest pump rate implemented – 6 bpm. KL pressure also showed a modest increase at 6 bpm – 3,739 psi vs original 3,684 psi when LKL valve was first opened.

Conclusions from the LKL diagnostics were that the leak path found while pumping under the VBRs and CSRs was much smaller than that encountered while injecting through the UKL – under the SBRs.

Table A.4 – Upper Choke Line (UCL)

Initial pressure upon opening the UCL valves was3,282 psi (BOP) and 3,274 psi (CL). A total of 164 bbls were pumped through the UCL at rates up to 6 bpm. Pressure indicated that the maximum rate (6 bpm) did not keep up with the u-tube rate through the BOP stack caused by the hydrostatic imbalance of seawater versus 16.4 ppg mud. A volume of 8 bbls was required to fill the riser after closing the LCL valve.

Conclusions from the UCL diagnostics were that the restriction observed while pumping into the LKL (previous procedure) were not present while pumping into the UCL. This indicated that the restriction was in the lower VBR and not in the upper VBR or CSR. UKL diagnostics had already confirmed very little restriction through the SBRs.

Note: At 13:40 hrs on Wednesday May 26th, the pressure on the upper VBRs was increased. Diagnostics were then repeated with the following results (Table 1.0)

Table 1.0 – Comparison of Rate vs Pressure Through UCL Before & After Applying Pressure to Upper VBRs

Date	Rate (bpm)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)
5/25/10	2.0	32	3,269	3,237
5/26/10	2.0	516	3,731	3,679

Table A.5 – Lower Choke Line (LCL)

Initial pressures upon opening the LCL valves were 3,412 psi (BOP) and 3,673 psi (CL). Pump pressures were positive for all rates (2 bpm up to 6 bpm) and the riser was full at the end of the procedure.

LCL diagnostics were, as expected, very similar to the findings from the LKL .Each diagnostic procedure indicated that there was a restriction through the lower VBRs. A side-by-side comparison of the rates & pressure while pumping through the upper and lower choke and kill lines is shown in Table 2.0.

Table 2.0 – Comparison of Rates & Pressure (Lower C/K Lines Vs UCL)

Rate (bpm)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)		Rate (bpm)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)		Rate (bpm)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)
2.0	275	3,462	3,667										
2.0	272	3,462	3,667										
4.0	390	3,469	3,706		2.0	357	3,436	3,728		4.0	37	3,262	3,231
4.0	347	3,456	3,679		4.0	460	3,449	3,784		4.0	36	3,262	3,237
6.0	**467**	**3,462**	**3,738**	↔	**6.0**	**545**	**3,463**	**3,823**	↔	**6.0**	**40**	**3,268**	**3,274**
6.0	**462**	**3,462**	**3,739**		**6.0**	**540**	**3,462**	**3,746**		**6.0**	**40**	**3,299**	**3,302**
6.0	**450**	**3,500**	**3,728**		**6.0**	**525**	**3,456**	**3,729**		**6.0**	**85**	**3,337**	**3,351**
6.0	**440**	**3,494**	**3,729**		**6.0**	**484**	**3,412**	**3,823**		**6.0**	**56**	**3,325**	**3,338**
6.0	**445**	**3,450**	**3,723**		**6.0**	**487**	**3,511**	**3,715**		**6.0**	**56**	**3,437**	**3,386**
6.0	**400**	**3,511**	**3,711**		**6.0**	**480**	**3,518**	**3,762**		**6.0**	**70**	**3,475**	**3,374**
6.0	**405**	**3,506**	**3,707**		**6.0**	**475**	**3,525**	**3,781**		**6.0**	**63**	**3,462**	**3,369**
6.0	400	3,487	3,712		4.0	356	3,506	3,773		**6.0**	**50**	**3,425**	**3,358**
4.0	277	3,450	3,657		4.0	345	3,481	3,717		4.0	36	3,394	3,337
2.0	150	3,387	3,596		2.0	240	3,456	3,679		2.0	32	3,375	3,304
		LKL					LCL					UCL	

Kill Operations & Results

High rate pumping commenced Wednesday morning, May 26th at approximately 13:00 hrs. As mentioned in the diagnostics discussion, closing pressure was applied to the upper VBRs prior to implementation of the kill operations. This changed the flow path through the BOP stack resulting in more restriction through the upper VBRs as evidenced by positive pump pressure while injecting into the UCL.

Kill Attempt #1 (26 May 10)

After final preparations and diagnostic pumping during the morning of 5/26, the test rams were opened and high rate pumping commenced through the lower choke and kill line at approximately 14:00 hrs. No bridging material was pumped during the initial kill attempt.

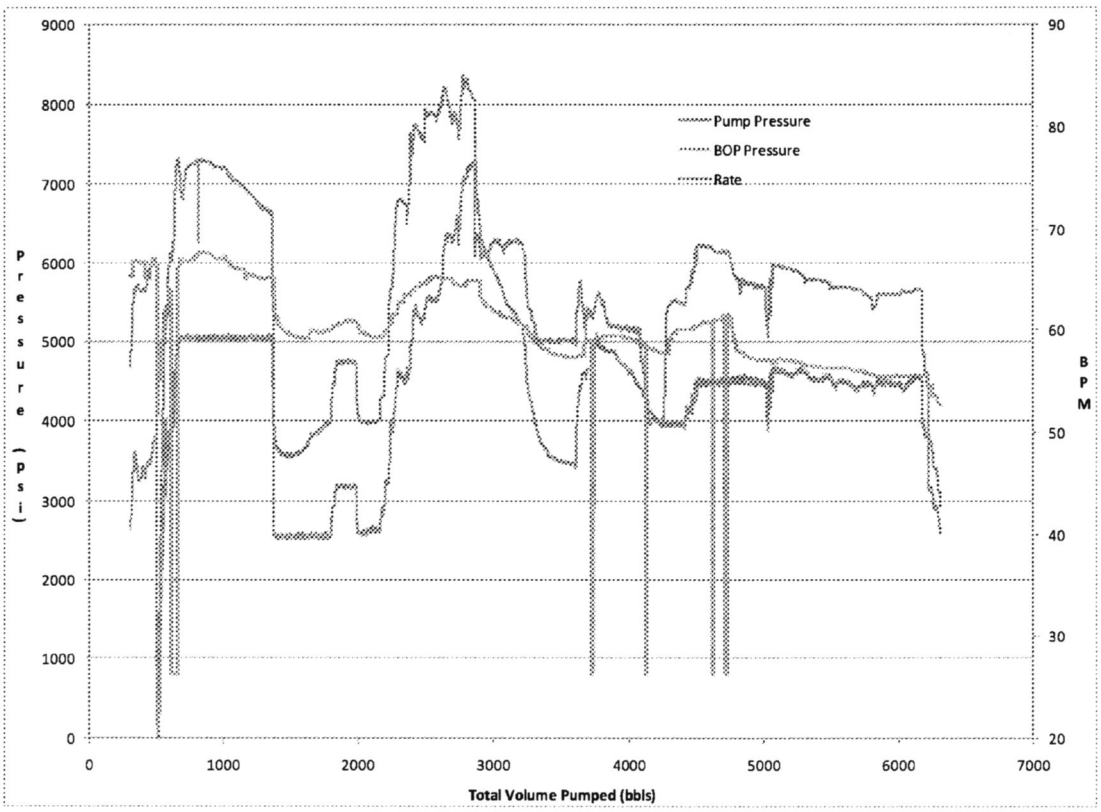

Figure 2.0 – Kill Attempt No. 1 Recorded Data

Pump rate was very erratic during kill attempt #1 due to start up difficulties with the two pumping plants (Halliburton pumps onboard HOS Centerline & BJ Blue Dolphin stimulation vessel). After approximately 6,500 bbls pumped at rates above 40 bpm (and up to 76 bpm at times) the pumps were stopped to assess the flow from the BOP. It was obvious at that point that the well was still flowing hydrocarbons.

For the most part, pump pressure and BOP pressure tracked up and down with the varying pump rates.

Kill Attempt #2 (26 May 10)

Kill attempt #2 took place between 18:30 hrs and 20:00 hrs on the evening of May 26th. During that time 3,600 bbls of 16.4 ppg mud were pumped through the LCL & LKL at fairly consistent rates of 50 bpm. It is apparent from Figure 3.0 that nothing of value was accomplished during this procedure.

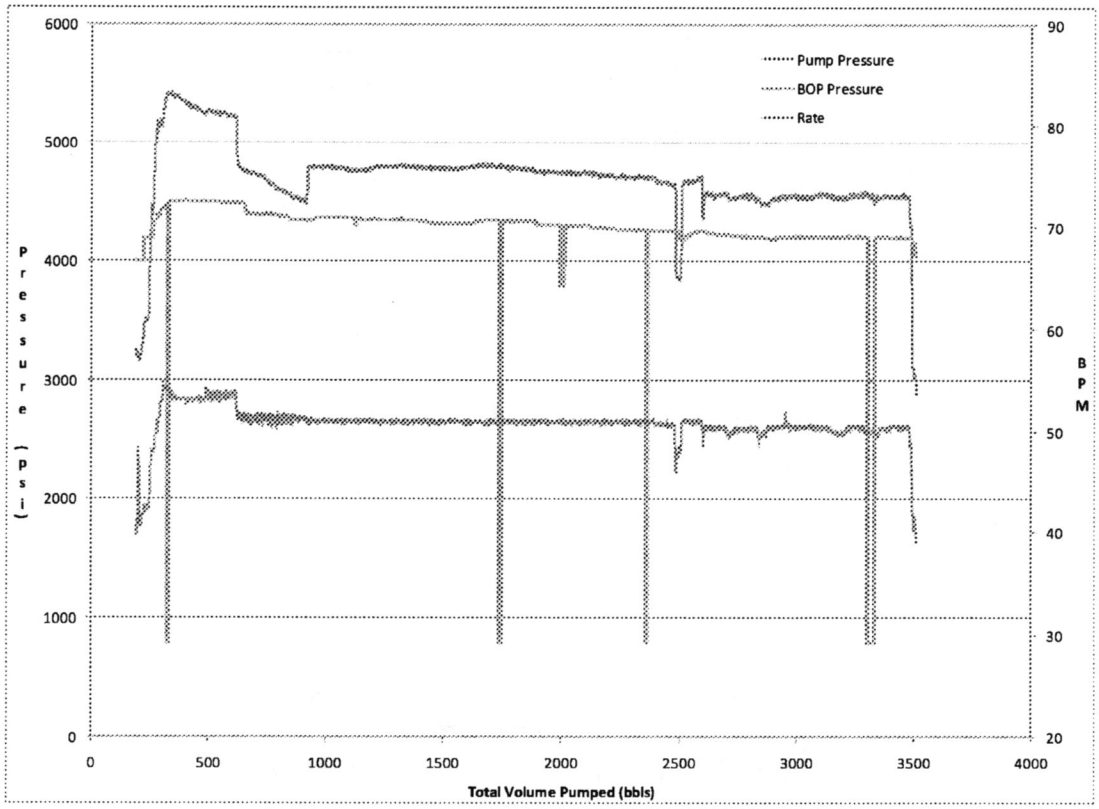

Figure 3.0 – Kill Attempt No. 2 Recorded Data

Kill Attempt #3 (26 May 10)

Shortly after the end of kill attempt #2, kill attempt #3 was initiated. This procedure consisted of pumping into the UKL while injecting frac balls and bridging material at the surface. As soon as an acceptable rate was established into the UKL, 100 x 7/8" frac balls were released and pumped down hole. No response was noted when the frac balls reached the BOP stack and no frac balls were observed exiting the DWH riser at the top of the BOP stack. It was later discovered that the first bridging material launcher malfunctioned. The result was that the material in that launch plus all subsequent launches were not be released as first thought.

There was a period between 3,725 bbls & 3,825 bbls where pump pressure steadily decreased while BOP pressure and pump rate remained constant. It is unclear why this happened – it is possible that some erosion of the restrictions was taking place. This is the first instance of pumping at high rate through the UKL (i.e., directly under the SBRs). There were no indications of gaining hydrostatic control of the well throughout kill attempt #3.

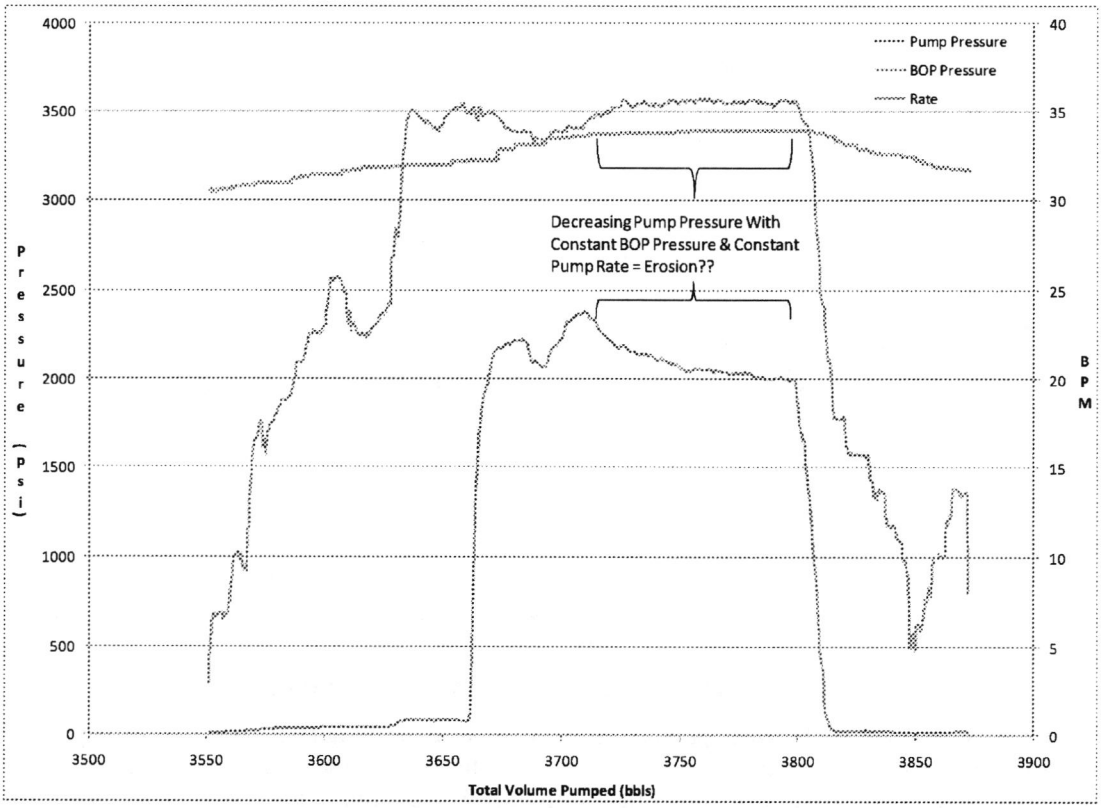

Figure 4.0 - Kill Attempt No. 3 Recorded Data

Kill Attempt #4 (27 May 10)

Kill attempt #4 was initiated at 17:00 hrs on Thursday May 27th. This procedure was designed to pump into the UKL and employed aggressive use of bridging material to block the exit path through the SBRs. A total of 7 shots of bridging material were introduced from the subsea manifold as well as at the surface, and pumped into the UKL over the course of pumping 2,000 bbls at rates up to 30 bpm. The first of the 7 shots of bridging material was from the 'B' header of the subsea manifold. The graph of the kill data is scattered due to the fact that the pumps were slowed to 5 bpm while bridging material launching mechanisms were being activated on the deck of the Q-4000.

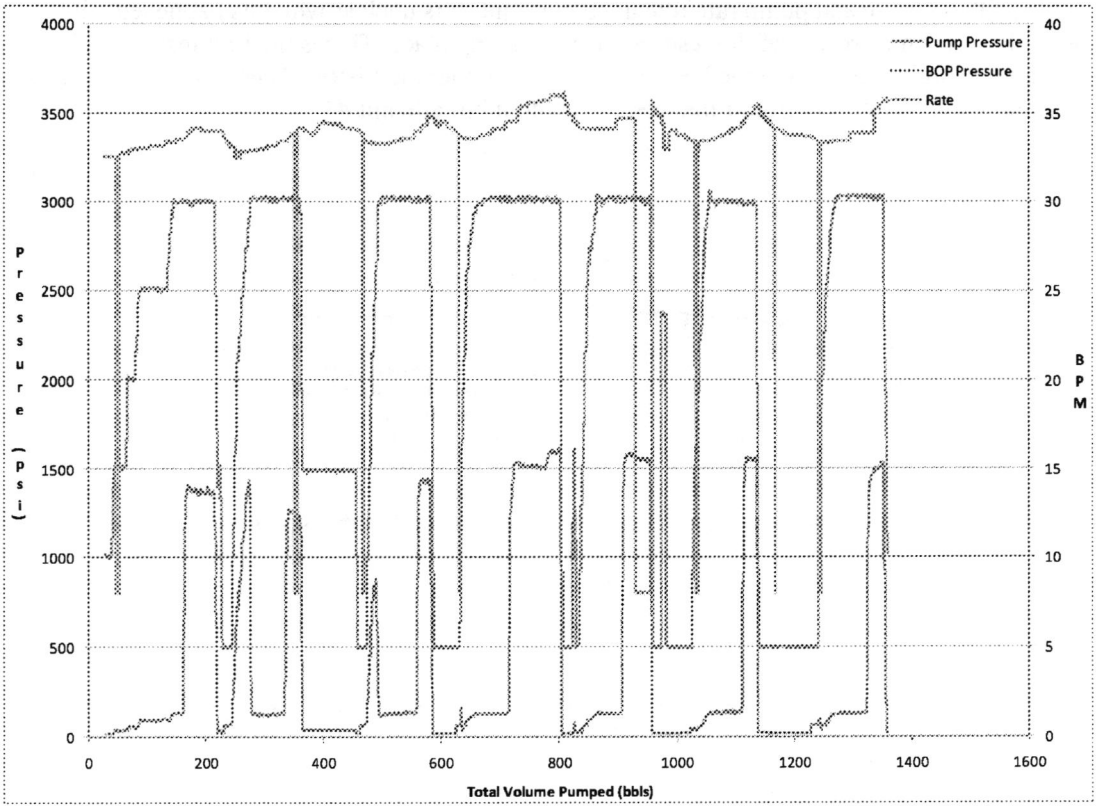

Figure 5.0 - Kill Attempt No. 4 Recorded Data

There is a consistent lag between pump pressure following bringing rates back up to 30 bpm. This is due to the u-tube outpacing the 5 bpm pump rate during launching of the bridging material. BOP pressure was essentially flat during the first portion of the operation although it did indicate a generally upward trend when pump rate remained at 30 bpm for an extended

period. There were no significant pressure spikes as would be expected if the bridging material had reduced the exit path geometry.

After pumping 1,441 bbls, pumps were stopped while the well was observed for 1 hour. After the observation period, another 500 bbls were pumped at rates of 30 to 40 bpm. BOP & pump pressure increased along with the higher pumps rates.

Kill Attempt #5 (27 May 10)

Kill attempt #5 was done through the LKL and involved injecting 9 additional bridging material shots while pumping at a constant 25 bpm rate. The 9 bridging shots were as shown in Table 3.0.

Table 3.0 – Bridging Material & Arrival Times During Kill Attempt #5

Material No.	Description	Launched (bbls)	ETA @ BOP (bbls)	ETA @ EOT (bbls)
1	275 x 7/8" frac balls	128	278	578
2	32 x 1-1/2" Brinker platelets	645	795	945
3	46 x Brinker rounded cubes	905	1,055	1,205
4	38 x 1" Brinker cubes	1,270	1,420	1,570
5	50 x 1-1/8" Brinker spheres	1,634	1,784	1,934
6	230 x 1-1/4" frac balls	2,445	2,595	2,745
7	18 x 2" spheres	2,815	2,965	3,115
8	17 x 2-1/4" balls & 19 x 2" balls	3,196	3,346	3,496
9	17 x 2-1/4" balls, 19 x 2" balls & 5 x 1-1/2" Brinker cubes	3,705	3,855	4,005

Numerous pump pressure spikes can be seen on the graph of the kill attempt #5 data (See Figure 6.0). These spikes coincide with the launching of the bridging material – not with the arrival of the material at the BOP stack or at the end of the drill pipe (if assume to be intact and hung in the BOP).

There is a noticeable spike at 3,595 bbls that does not correspond to the release of bridging material or arrival at the BOP/EOT of the previous bridging shot. The closest event that this spike corresponds with is the arrival of bridging material shot #8 (2" & 2-1/4" balls) at the End Of Tubing (EOT – end of drill pipe) which should have occurred at 3,496 bbls.

Pump pressure and BOP pressure both trend downward over the course of the bridging material injection with the pump rate constant. The BOP pressure reduces from approximately 4,900 psi at 300 bbls pumped down to 4,000 psi with 3,600 bbls pumped (1,000 psi / 3,300 bbls).

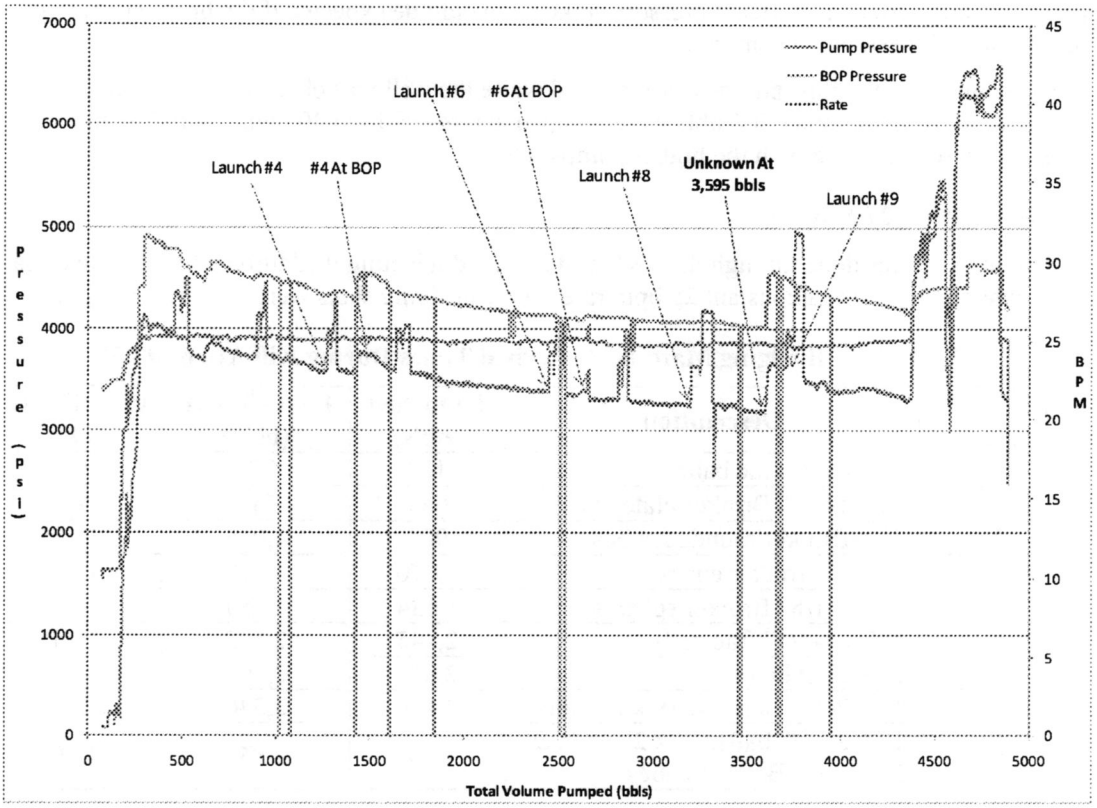

Figure 6.0 - Kill Attempt No. 5 Recorded Data

Static Pressure Check (28 May 10)

A check was made of the static pressures at various points along the BOP stack to compare with values obtained prior to kill operations on May 27th.

Table 4.0 – Static Pressure Comparison May 27th & May 28th

		28-May			27-May		
		CL	KL	BOP	CL	KL	BOP
Action	Open UKL		3,465	3,655		2,600	3,150
Action	Open LKL		3,618	3,537		3,231	3,137
Action	Open GVL	2,376		3,531	2,394		3,137
Action	Open UCL	3,278		3,531	3,022		3,131
Action	Open LCL	3,562		3,531	3,144		3,137

Pressures on May 28th were found to be higher be 200 psi to 400 psi at every measurement point except the Gas Vent Line (GVL) indicating possible plugging of the exit path through the BOP stack. The KL measurement made when the UKL was opened on May 27th was determined to be in error as the gauge did not stabilize before the data was recorded.

Kill Attempt #6 (28 May 10)

Kill attempt #6, the last attempt as of this writing, was implemented after recording the static pressures on May 28th. A considerable effort was mounted overnight to rebuild mud stocks to sufficient levels to provide every option for a successful kill in the event the well flow could be subdued or the flow path blocked.

All remaining surface bridging material was launched as soon as the pumps were at significant rate. Prior to the surface-launched bridging material reaching the subsea manifold, the 'A' header of the subsea manifold was opened to release the remaining bridging material.

Once all bridging material had arrived at the BOP stack, the pump rate was increased to approximately 78 bpm where they remained until all available mud was consumed – almost 10,000 bbls in total.

As seen in Figure 7.0, the BOP pressure fluctuated during the kill attempt. It initially decreased from 5,700 psi to 5,100 psi from roughly 2,500 bbls to around 4,000 bbls then increased back to 5,500 psi at 5,000 bbls before decreasing again between 5,000 bbls and 6,750 bbls. The BOP pressure had increased back to another peak around 5,300 psi by the time the pump rate started to decrease due to low mud stocks (suctions could not draw from tanks).

Once the pumps were shut down, oil resumed flowing from the top of the BOP stack within a few minutes indicating that at least one flow path from the flowing reservoir did not get filled with any appreciable amount of mud.

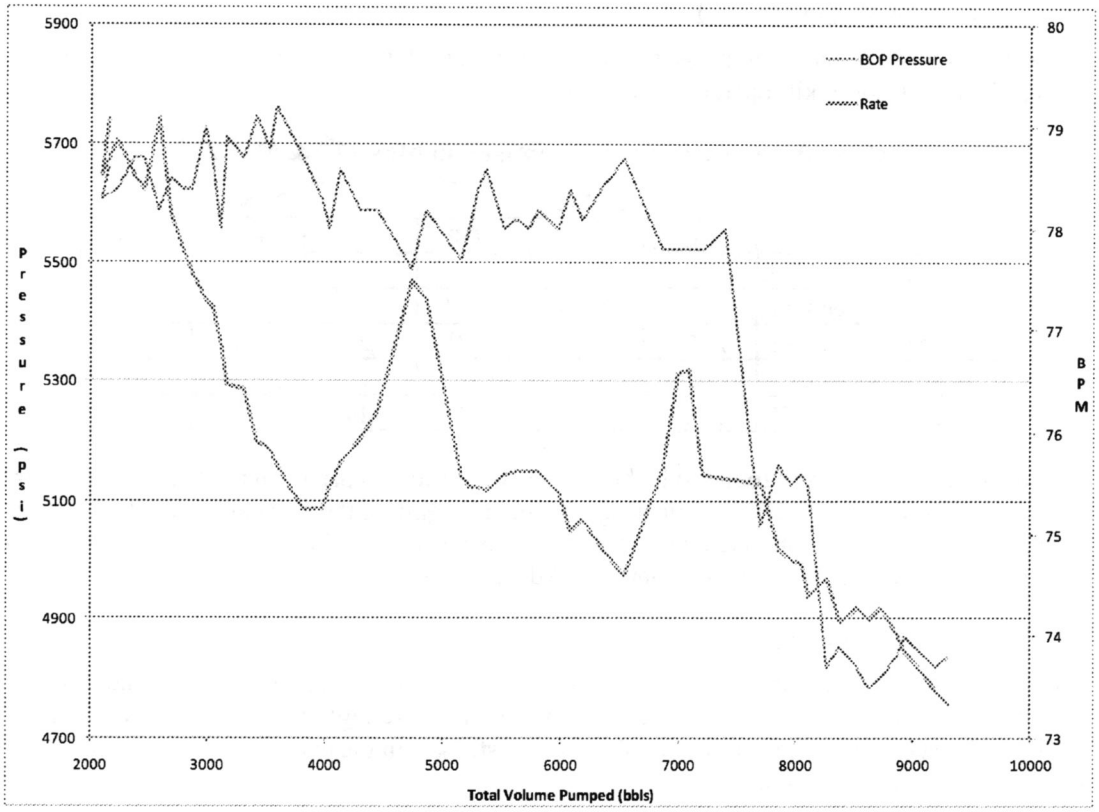

Figure 7.0 - Kill Attempt No. 5 Recorded Data

Appendix A

Diagnostic Data Tables

Table A.1 – Baseline Measurements – Prior to Pumping

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)	KL Pressure (psi)	BL Pressure (psi)	Comments/Notes
16:00	0.0	0.0	0	3,531		3,590		
16:15	0.0	0.0	0	3,531		3,590		Confirm valves & waiting on ROV to install gauge
16:30	0.0	0.0	0	3,531		3,590		Confirm CL isolation valve open
16:45	0.0	0.0	0	3,594		3,574		Confirm KL isolation valve open

Table A.2 – Upper Kill Line Diagnostics

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)	KL Pressure (psi)	BL Pressure (psi)	Comments/Notes
16:50	0.0	0.0	0	3,575		3,574		Opened OUKL valve
17:00	0.0	0.5	500	3,581		3,972		Pressure to 500 psi (step 1.7.1)
17:15	0.0	0.5	??	3,600		3,972		Work on junk shot manifold hydraulic circuit settings
17:30	0.0	0.5	450	3,562		3,972		Try to get Q4K ROV feed, Open IUKL
17:31	0.0	0.5	19	3,674		2,860		
17:32	2.0	1.0	29	3,669		2,840		First injection
17:34	2.0	5.0	29	3,631		2,810		Increase to 4.0 bpm at end (17:34 hrs)
17:35	4.0	7.0	37	3,612		2,805		
17:41	6.0	28.0	39	3,506		2,805		Pumped 10 bbls green dye pill 17:36 hrs to 17:38 hrs
17:47	6.0	60.0	37	3,512		2,811		
17:49	6.0	75.0	37	3,506		2,816		
17:53	6.0	100.0	39	3,537		2,772		
17:58	6.0	125.0	39	3,487		2,710		
18:01	6.0	150.0	39	3,494		2,716		Volume 152 bbls to 162 bbls green dye
18:06	6.0	175.0	39	3,481		2,706		
18:10	6.0	200.0	39	3,494		2,700		
18:13	6.0	216.0	39	3,494		2,721		Reduce rate to 4.0 bpm at end (18:13 hrs)
18:14	4.0	213.0	34	3,494		2,706		Volume 212 bbls to 222 bbls green dye
18:15	4.0	225.0	34	3,494		2,695		Reduce rate to 2.0 bpm at end (18:15 hrs)
18:16	2.0		31	3,487		2,683		
18:18	2.0	232.0	32	3,475		2,667		
18:21	2.0	237.0	32	3,475		2,661		
18:25	2.0	245.0	32	3,481		2,652		V-8 confirmed closed at 18:25 hrs - still pumping
18:30	2.0	254.0	32	3,481		2,662		
18:39	2.0	258.0	30	3,475		2,672		
18:40	0.0	272.0	500	3,469		2,666		Shut down / caught pressure

Table A.3 – Lower Kill Line Diagnostics

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	ΔP CL - BOP (psi)	KL Pressure (psi)	BL Pressure (psi)	Comments/Notes
19:05	0.0	0.00	0	3,394	-738	2,656		Checking/manipulating valves in prep for procedure
19:25	0.0	0.25	500	3,600	527	4,127		Pressure up against LOKL valve
19:31	0.0	0.25	393	3,544	544	4,088		Open LOKL valve
19:34	0.0	0.25	90	3,494	190	3,684		Open LIKL valve
17:41	1.8	2.00	275	3,462	205	3,667		**2.0 bpm stage**
19:44	2.0	7.00	272	3,462	205	3,667		Increase rate to 4.0 bpm at 19:44 hrs
19:45	4.0	10.00	390	3,469	237	3,706		**4.0 bpm stage**
19:48	4.0	23.00	347	3,456	223	3,679		Increase to 6.0 bpm at 25.0 bbls total pumped
19:50	6.0	30.00	467	3,462	276	3,738		**6.0 bpm stage**
19:51	6.0	40.00	462	3,462	277	3,739		
19:53	6.0	50.00	450	3,500	228	3,728		
19:55	6.0	60.00	440	3,494	235	3,729		
17:57	6.0	75.00	445	3,450	273	3,723		
20:01	6.0	100.00	400	3,511	200	3,711		Pump 15.0 bbls green dye at 103 bbls to 118 bbls
20:07	6.0	133.00	405	3,506	201	3,707		Back to mud at 133 bbls
20:10	6.0	150.00	400	3,487	225	3,712		
20:13	4.0	170.00	277	3,450	207	3,657		
20:14	2.0	173.00	150	3,387	209	3,596		Close V-8 at 20:16 hrs / 177 bbls
20:17	0.0	177.00	500	3,313	206	3,519		Pressured up when V-8 closed

Table A.4 – Upper Choke Line Diagnostics

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)	KL Pressure (psi)	BL Pressure (psi)	Comments/Notes
20:42	0.0	0.00	0	3,381	3,054			Manipulating valves, Open UOCL valve
21:07	0.0	0.00	0	3,425	3,657			Preparing to pressure up on inside valve
21:12	0.0	0.00	500	3,300	4,132			Close V-5 on junk shot manifold (0.1 bbls to pressure)
21:30	0.0	0.00	30	3,282	3,274			Open UICL valve
21:32	2.0	2.00	32	3,269	3,237			**2.0 bpm stage**
21:34	4.0	8.00	37	3,262	3,231			**4.0 bpm stage**
21:35	4.0	10.00	36	3,262	3,237			
21:36	6.0	20.00	40	3,268	3,274			**6.0 bpm stage**
21:38	6.0	30.00	40	3,299	3,302			
21:42	6.0	50.00	85	3,337	3,351			
21:46	6.0	75.00	56	3,325	3,338			
21:50	6.0	100.00	56	3,437	3,386			Green dye observed at riser bend
21:53	6.0	119.00	70	3,475	3,374			Pumped 15 bbls green dye 104 bbls to 119 bbls
21:55	6.0	130.00	63	3,462	3,369			
21:58	6.0	150.00	50	3,425	3,358			
21:59	4.0	155.00	36	3,394	3,337			
22:00	2.0	160.00	32	3,375	3,304			
22:03	2.0	164.00	32	3,414	3,172			V-1 closed on junk shot manifold
22:06	0.0	172.00	500	3,481	3,193			8.0 bbls to pressure up to 500 psi from 32 psi

Table A.5 – Lower Choke Line Diagnostics

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)	ΔP CL - BOP (psi)	BL Pressure (psi)	Comments/Notes
22:25	0.0	0.0	0	3,413	3,657	244		
22:26	0.0	0.0	500	3,406	4,155	749		Pressure up against LICL valve (LOCL valve open)
22:27	0.0	0.0	80	3,412	3,673	261		0.3 bbls to pressure up to 500 psi
22:29	2.0	2.0	357	3,436	3,728	292		**2.0 bpm stage**
22:31	4.0	6.0	460	3,449	3,784	335		**4.0 bpm stage**
22:35	6.0	25.0	545	3,463	3,823	360		**6.0 bpm stage**
22:37	6.0	35.0	540	3,462	3,746	284		
22:38	6.0	60.0	525	3,456	3,729	273		
22:42	6.0	75.0	484	3,412	3,823	411		
22:47	6.0	100.0	487	3,511	3,715	204		
22:52	6.0	130.0	480	3,518	3,762	244		Pump 15.0 bbls green dye from 104 bbls to 119 bbls
22:56	6.0	150.0	475	3,525	3,781	256		
22:57	4.0	155.0	356	3,506	3,773	267		
22:58	4.0	160.0	345	3,481	3,717	236		
22:59	2.0	164.0	240	3,456	3,679	223		
23:00	0.0	168.0	500	3,425	3,607	182		Close V-1 on junk shot manifold
23:05	0.0	168.0	0	3,394	3,592	198		0 bbls to pressure up to 500 psi

Table A.6 – Gas Vent Line Diagnostics

Time (H:M)	Rate (bpm)	Total Volume (bbls)	Pump Pressure (psi)	BOP Pressure (psi)	CL Pressure (psi)	KL Pressure (psi)	BL Pressure (psi)	Comments/Notes
23:22	0.0	0.00	0	3,406	3,688			Open GVL outer valve
23:29	0.0	0.00	500	3,412	4,134			0.5 bbls to pressure up to 500 psi
23:30	0.0	0.00	0	3,424	2,828			Opened GVL inner valve
23:32	2.0	4.00	33	3,450	2,661			**2.0 bpm stage**
23:34	4.0	8.00	37	3,444	2,633			**4.0 bpm stage**
23:39	6.0	30.00	39	3,431	2,600			**6.0 bpm stage**
23:40	6.0	40.00	40	3,431	2,612			
23:42	6.0	50.00	40	3,437	2,632			
23:46	6.0	75.00	40	3,437	2,639			Green dye to seafloor 23:49 hrs
23:50	6.0	100.00	40	3,437	2,632			
23:55	6.0	130.00	40	3,425	2,611			
23:58	6.0	150.00	39	3,425	2,617			
0:02	6.0	175.00	39	3,425	2,616			
0:03	4.0	180.00	36	3,425	2,611			
0:04	2.0	182.00	32	3,431	2,596			
0:07	2.0	190.00	32	3,425	2,517			V-1 closed 00:07 hrs
0:23	2.0	220.00	32	3,394	2,518			
0:30	0.0	239.00	500					49 bbls to fill & pressure to 500 psi