IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF LOUISIANA

IN RE: OIL SPILL by the OIL RIG "DEEPWATER HORIZON" in the GULF OF MEXICO, on APRIL 20, 2010	MDL No. 2179
	Section: J
Applies to:	
ALL CASES and 2:10-cv-02771	The Honorable Judge Barbier Mag. Judge Shushan

REPORT OF RICHARD F. STRICKLAND, P.E., PhD

TREX-60083

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I. Introduction and Charge

1. My name is Richard F. Strickland, and I have been retained by Halliburton Energy Services, Inc. to express an opinion as to the highest hydrocarbon bearing zone in the open hole interval of the BP operated Mississippi Canyon, Block 252 well #1 (the *"Macondo Well"*) prior to running and cementing the final string of casing.

II. Executive Summary

2. BP mistakenly identified the M56A zone at 17,803 ft (md)[1] as the uppermost hydrocarbon bearing zone in the Macondo well. My analysis has confirmed that BP should have identified the uppermost hydrocarbon bearing zone as the M57B zone, located at 17,467 ft (md). BP's analysis of the highest hydrocarbon zone was superficial, incomplete and thus incorrect. BP knew or should have known that the M57B zone was the shallowest hydrocarbon zone in the well prior to cementing the final string of casing in the Macondo well. I understand that BP did not provide information concerning the M57B zone to Halliburton and that BP's incorrect identification of the

[1] The measured depths of this and other zones may vary slightly from log to log.

uppermost hydrocarbon bearing zone could have affected the cement job. It is also possible that additional hydrocarbon bearing zones exist deep in the well and are located at and below the location of the reamer shoe at 18,304 ft (md).

3. Halliburton began cementing the final string of casing in the Macondo well on April 19, 2010. It is my understanding that Halliburton designed the cement job based on parameters obtained from the operator BP including the depth of the highest hydrocarbon bearing interval. I further understand that adequate cement above the highest hydrocarbon interval is important for zonal isolation and for satisfying federal regulations.

4. BP determined and that the highest hydrocarbon bearing zone was located at a depth of 17,803 ft (md), the so-called *"M56A"* zone as it was named post-incident. I understand that BP then represented to Halliburton, based on the depth of this zone, that the top of cement (TOC) should be designed at 17,300 ft, approximately 500 ft above the zone at 17,803 ft (md). BP's Ms. Galina Skripnikova took 27 minutes to make the interpretation of the highest hydrocarbon bearing zone using a qualitative review of a hard copy print of log measurements.

5. My calculations, including variations of methods and inputs, demonstrate that the highest hydrocarbon bearing zone was actually zone M57B located at a depth of 17,467 ft (md). The actual highest zone is 336 ft higher than BP's interpretation.

6. Ms. Skripnikova and possibly others at BP possessed adequate information to identify the M57B as the highest hydrocarbon bearing zone before the final cement job was pumped on April 19th.

    a. Appropriate calculations could have been conducted April 3rd or later based on logging while drilling (LWD) data.

    b. Appropriate calculations could have been conducted April 12th or later based on wireline logging data. In fact, the evidence suggests that calculations were made but not reviewed for the purpose of determining the highest hydrocarbon bearing zone.

c. Appropriate calculations, whether made by hand or using specialized software, would have shown that the M57B zone contained gas.

7. Because Ms. Skripnikova used a brief and qualitative approach instead of a quantitative one, her interpretation was superficial, incomplete and incorrect. Ms. Skripnikova spent twenty-seven minutes or less to arrive at her conclusion. She performed only a visual inspection of the field print of the Triple Combo log to make the determination. Ms. Skripnikova ignored other available data and failed to perform or to consult simple and available calculations which would have confirmed that the M57B zone contained gas.

8. BP did not identify the M57B zone as the highest hydrocarbon bearing interval in the open hole section of the well from as early as the taking of the LWD data around April 3rd through the review of the wire line data by Ms. Skripnikova on April 13th and up until the day after the blowout.

9. All BP documentation I have reviewed since the blowout suggests that BP held the view that the zone M57B zone contains gas. On April 21st, the day after the blowout, a team of BP petrophysicists first identified the M57B as the correct highest hydrocarbon zone. Subsequently, additional quantitative analysis by Ms. Skripnikova corroborates that interpretation. Technical documentation prepared by Ms. Skripnikova and a team of other technical personnel reiterates and affirms that the M57B contains gas. The last technical documentation, as well as Ms. Skripnikova herself, emphasize uncertainties but maintain the baseline conclusion that the zone contains gas.

10. Based on my review and analysis of information available prior to the pumping of the cement job, a reasonably prudent analyst would have determined the highest hydrocarbon bearing zone is at 17,467 ft (md), the M57B zone. BP, therefore, knew or should have known that the highest hydrocarbon bearing zone was the M57B, 336 feet above the M56A zone at 17,803 ft (md) as picked by Ms. Skripnikova, before the cement job was pumped.

11. Finally, it is my understanding that Halliburton relied on BP's incorrect analysis when designing and pumping the cement job. Accordingly, Halliburton performed the cement job on the Macondo well without knowledge of the M57B gas zone at 17,467 ft (md). Since it was designed based on an incorrect conclusion, the top of cement would only be roughly 164 feet above the M57B, potentially failing to provide adequate zonal isolation and failing to meet federal regulatory requirements.

12. Since the pressure was not directly measured, I have calculated from data in a nearby zone that the gas in M57B exists at a pressure of 12,871.1 psia.

13. My analysis also indicates that potential additional hydrocarbon intervals exist adjacent to and below the reamer shoe, that is, beside and below the end of the final casing string.

III. Qualifications

14. I am the President of The Strickland Group, Inc. (TSG). TSG provides petroleum consulting services in the area of reservoir and geological engineering to oil-and-gas producers, pipeline companies, and other parties in the oil and gas business. I have performed studies on fields throughout the United States including the Gulf of Mexico, Eastern and Western Europe, the North Sea, the Middle-East, China, North Africa, CIS countries, India, Indonesia, Central America and South America.

15. I graduated from Texas A&M University with a BS degree in Petroleum Engineering in 1970. I received my MSc and PhD in Petroleum Engineering from Texas A&M in 1974 and 1976, respectively. After that time, I was an Associate Professor of Petroleum Engineering at Texas A&M University for six years, teaching courses in reservoir engineering and numerical simulation of oil and gas reservoirs. I have also taught these same subjects in over seventy-five company run, or industry sponsored courses attended by reservoir engineers and geoscientists from practically every major oil company in the world.

16. I am a registered professional engineer in the State of Texas and a member of the National Society of Professional Engineers. I am a

member of the Society of Petroleum Engineers and have held several positions at the national and local level. I have served as an officer and director of the Accrediting Board of Engineering and Technology, which accredits graduate and undergraduate engineering programs in the United States, and have served on this board's Engineering Accreditation Commission, which is the only body that accredits such programs in the United States.

17. Over the past 35 years I have performed and supervised hundreds of reservoir engineering and geological projects including field studies, economic evaluations, audits and field unitizations. I have testified as a petroleum engineering expert before state regulatory commissions in Texas, Oklahoma, Arkansas, Alaska and Mississippi, in over thirty state and federal court proceedings in the United States and in similar proceedings in the United Kingdom and Sweden including international arbitrations. I have also served as an arbitrator in an oil and gas matter. My resume, a bibliography of my published papers and a list of cases where I have provided testimony during the last four years are attached as Appendix A.

18. I am frequently employed by various governmental entities such as the United States Department of Justice and the Internal Revenue Service to determine the fair market value of oil and gas assets. My clients include major oil companies such as BP, ExxonMobil, ChevronTexaco, ConocoPhillips as well as major independents.

19. My specialty is in the area of reservoir engineering, describing the physical nature of formations and the fluids they contain, and predicting future performance of wells and entire fields. Integral to that process is a reservoir description developed from petrophysical analysis. Analysis of open hole well logs is an important part of a reservoir engineering tool kit, and I have evaluated well logs in most of the field studies I have performed. Earlier in my career I developed mathematical models for log evaluation but now use commercial software packages.

20. Appendix B lists Bates-numbered materials received and available for my review in the preparation of my opinions.

IV. Background Information Concerning Hydrocarbon Bearing Zones

21. A hydrocarbon bearing zone is a defined interval that contains oil and/or gas at a sufficient level such that oil and/or gas will flow out of the zone and into a well bore when the pressure in the well bore is reduced below the pressure in the zone. In reservoir engineering and geological terms, the zone containing oil and gas is normally called a reservoir, and the rock is called a formation. For convenience and clear communication formations may be given names or labels such as M56A or M57B.

22. For a formation to be hydrocarbon bearing it must have sufficient porosity and oil or gas saturation such that it will flow in the presence of a pressure differential. Underground formations are composed of various types of rocks and almost always contain some type of fluid. Most rocks have tiny pore spaces that contain the fluid. Quantification of the pore spaces is expressed as a fraction or percentage of the bulk volume of the rock and termed *"porosity"*. Porosity values range from 0.0% (no pores in the rock) to a high value of approximately 37%.

23. In reservoir engineering terms, a fluid is water, oil or gas or any combination of the three. The volume of water, oil or gas in the pore spaces is expressed as a fraction or percentage of the pore volume, called either oil, water or gas saturation. If all the pore spaces in a rock are full of water then it is said to be 100% water saturated. It is very rare to find a subsurface formation that does not contain some water. Typically, if a formation contains some percentage of water saturation (*e.g.*, 52%), the remainder of the pore spaces will be filled with a hydrocarbon (*e.g.*, the remaining 48%). Hydrocarbon bearing zones, by definition, must contain some level of oil and/or gas saturation. However, if the hydrocarbon saturation is too low then the fluid will not flow.

24. Permeability is the engineering term describing the resistance to flow of a single fluid in a porous formation. Permeability is measured in terms of millidarcies, md, not to be confused with the abbreviation for measured depth (md). In general terms the higher the porosity the higher the permeability. If the rock contains more than one fluid, for example oil and water, then the concept of relative permeability, a

value between 0.0 and 1.0, comes into play. Relative permeability is directly related to the saturation of the fluid. If the rock is 100% water saturated then its relative permeability will be 1.0. The minimum gas saturation required for flow in response to a pressure differential is low. Gas saturations above 30% will almost certainly flow gas and most likely water.

25. Operators typically characterize zones as having *"net pay"* and containing volumes of oil, gas or water based on criteria reflective of commerciality. For a zone to have net pay, usual criteria are the porosity must be greater than a specified value, perhaps 12% or 14%, and the water saturation must be less than 40% or perhaps 50%. For example, on the Macondo well BP defined *"net pay"* zones as zones having less than 50% water saturation.[2] Other criteria such as clay or shale content may be specified.

26. A hydrocarbon bearing zone does not have to meet the same criteria as net pay. As it relates to the issue of designing and executing a successful cement job, a hydrocarbon bearing zone is one that can flow oil or gas into the wellbore, contaminating the cement or producing channels. As I understand the cementing process both contamination and channels jeopardize the integrity of the seal between the formation and the casing.

V. Quality and Availability of Data Was Sufficient for the Determination of the Highest Hydrocarbon Bearing Zone Before Cementing

27. When cementing began on April 19, 2010 a considerable amount of high quality data had been obtained over the open hole interval of the Macondo well. The types of data fall under several categories including daily drilling reports, measurements and logging while drilling, open hole wire line logs, core samples and fluid samples.

28. The process of data gathering begins before the well is drilled and continues after the well has been completed. One of the most

[2] *e.g.*, BP-HZN-2179MDL02396746-83

important times to gather subsurface data is during and immediately after drilling the well to total depth (TD). On the Macondo well, during drilling, information is collected including drilling parameters as well as information about the rocks being penetrated. This digital data is termed Measurement While Drilling (MWD), Logging While Drilling (LWD) and mud logs. After drilling to TD and before setting the final string of casing and cementing, the drill string (which contains the MWD and LWD instruments) and bit are removed from the well. The interval between the last string of casing down to TD is called the *"open hole"*. Numerous specialized instruments, termed logging tools, are lowered by means of a wire line to TD and then slowly retrieved up through the open hole interval. The recorded measurements are called the open hole wire line logs, or more generally the wire line logs. The wire line is run in and out of the open hole several times as different instruments are employed. Pressure in the formation along with physical samples of the rock and fluid in the formations can also be sampled by wire line. The rock samples are called sidewall cores, and in the case of the Macondo well the device used is called a rotary sidewall coring tool. Fluid samples are obtained by forcing a small sealing probe against the face of the formation and withdrawing fluid which is stored in sample containers in the tool and, like the rotary sidewall cores, are retrieved at the surface.

29. From my review the data appears to be of sufficient quantity and quality such that it is appropriate for use in determining the highest hydrocarbon bearing interval.

30. At the time of cementing some of the data had yet to be analyzed. The core and fluid samples were at onshore labs for processing and analysis. The state of analysis of the petrophysical data by BP on that date is not clear.

VI. BP Analysis of Highest Hydrocarbon Bearing Zone

31. The analysis by BP of the highest hydrocarbon bearing zone, and specifically of the M57B zone, appears to have gone through several stages. Initially, BP did not identify the M57B zone as hydrocarbon bearing. Shortly after the incident, BP concluded that the zone does,

in fact, contain hydrocarbons. Finally, after review by the incident investigation team, the writing of BP emphasizes the uncertainty of the zone, less rigorous analyses and the possibility that it contains brine instead of gas.

32. As discussed in further detail below, from my analysis of the Macondo well data I conclude that BP, through its petrophysicist Ms. Galina Skripnikova, was mistaken in identifying the M56A zone at 17,803 ft (md) as the uppermost hydrocarbon bearing zone in the well. Based on my review of the documents and testimony, BP knew or should have known that the M57B zone at 17,467 ft (md) was the uppermost hydrocarbon bearing zone in the open hole section of the Macondo we'll before the cement was pumped and before the blowout occurred.

BP's Analysis before the Blowout Could Have Identified the M57B Zone as Hydrocarbon Bearing But Did Not

33. Ms. Skripnikova was the BP log analyst on the Deepwater Horizon at the time the open hole logs were run and determined the zone at 17,803 ft (md) was the shallowest hydrocarbon bearing zone, assuming that the M57B contains brine instead.

34. In her original analysis of the highest hydrocarbon bearing zone, conducted while on the rig the morning of April 13th, Ms. Skripnikova relied solely upon a *"printout"* or *"field print"* of the Schlumberger logs.[3] She evidently could not see the data as precisely on the hard copy printout as she could subsequently when working with software and digital data. She observed that the density and neutron logs seemed to *"touch"* in the M57B zone. Because she did not observe *"cross-over",* she concluded that the interval, though a porous sand, was water-bearing.[4] Cross-over is a log response common to permeable gas-bearing zones. The tool which determines porosity based upon the density (*"density"* tool) of the measured rock reads artificially high while the tool which calculates porosity based upon the concentration of hydrogen atoms (*"neutron"* tool) reads artificially low. By convention,

[3] Skripnikova Depo. Tr. pg 566:24 to 567:23

[4] Skripnikova Depo. Tr. pg 443:2 to 7, 445:11 to 13, and 438:19 to 439:7

the area between the graphed curves is shaded when the values invert this way because *"cross-over"* is a tell-tale sign of the presence of gas.

35. The next time Ms. Skripnikova recalls considering the M57B zone was the day after the incident, April 21st. After returning back from the rig, she proceeded with her log analysis but focused on the main pay zones; she did not reconsider her initial evaluation of the M57B.[5]

36. Instead of the brief and qualitative analysis actually performed, Ms. Skripnikova and/or other members of BP's staff could and should have conducted quantitative petrophysical analyses for the determination of the highest hydrocarbon-bearing zone. Appropriate data, including that in digital form, was timely and available for this purpose.

LWD Data Could Have Been Used to Identify M57B as Gas

37. Ms. Skripnikova began her quantitative log analysis using LWD data before wire line logs were acquired. She regularly produced and distributed analyses based on this data. The analyses utilized digital data and were produced using log analysis software. For example, Ms. Skripnikova produced and distributed analyses on April 2nd, April 3rd, April 4th, April 5th and April 10th after total depth was reached.[6] In each of these cases, she distributed an annotated image of the digital log curves in a PowerPoint file. Exhibit 1 is an example of the interpretation made by Ms. Skripnikova based upon the LWD data and distributed to the BP team.[7]

38. Though the log curves did not include density or neutron measurements at this time, they did include gamma ray, resistivity and others. On two of the distributions, she presented quantitative analyses of water saturation and net pay, and included the assumptions used in the calculations.[8] I have not found any documentation to demonstrate that such calculations were made over

[5] Skripnikova Depo. Tr. pg 440:8 to 441:18

[6] BP-HZN-2179MDL00032399-400, BP-HZN-2179MDL00022623-4, BP-HZN-2179MBI00118092-3, BP-HZN-2179MDL00002589, BP-HZN-2179MDL0000529, BP-HZN-MBI00125815-7

[7] Exhibit 1 is BP-HZN-2179MBI00118092-3.

[8] BP-HZN-2179MBI00118092-3, BP-HZN-2179MDL00005293

the M57B interval, but, given the way most log analysis packages work, the calculation was very likely made just not presented in her PowerPoint slides.

39. The basic parameters Ms. Skripnikova used for quantitative log analysis of the main pay zones are shown in the following table:

Constant	Description	Value
a	Tortuosity factor	1.0
m	Cementation exponent	1.81
n	Saturation exponent	1.88
Rw	Formation water resistivity	0.03
Phi	Porosity	23% or 28%

40. In her later analysis after the wire line logs were run she used the same values for *"a"*, *"m"*, and *"n"* and a value for formation water resistivity *"Rw"* of 0.021. Had Ms. Skripnikova made similar calculations with the LWD data using the same assumptions, she would have shown that the M57B zone was hydrocarbon bearing.

41. The LWD data was readily and timely available to Ms. Skripnikova in digital format as demonstrated by the analyses which she did conduct and present. In fact, the necessary data was loaded into her software program apparently as early as April 3rd.[9]

Wire Line Logs Could Have Been Used to Identify M57B as Gas

42. In order to make an appropriate, quantitative analysis of the wire line log data, Ms. Skripnikova could have used the same field print which she actually used. A more thorough analysis could have been easily conducted using specialized software. Available documentation provided by BP, including for example Exhibit 2, demonstrates that Ms. Skripnikova did have both the software and the data necessary to make a quantitative analysis of the highest hydrocarbon zone when the question was asked of her. Instead, she relied upon a brief and qualitative review of the data. It is not clear why even the simplest quantitative analysis was not made or, if they were already made, why they were not reviewed.

[9] BP-HZN-2179MDL00022623-4

43. On April 9th, Ms. Skripnikova travelled to the rig to witness the recording of the wire line logs.[10] Wire line logs and other wire line tests were recorded from April 10th to April 15th. The first log run was the Triple Combo which began late on April 10th and was completed in the early morning of the 11th. The next log run was the CMR completed by the afternoon of the 11th. It should be noted that *"the wire line logging diary"* indicates that special note was taken of the M57B zone during the acquisition of the CMR log. The diary records, *"12:05 [April 11th] Slow down to log thin sand @ 17,468' md"*. The phrase *"Slow down"* refers to the speed the logging tool is being pulled by the formations.[11]

44. The OBMI log was the third run made the evening and night of April 11th. The next wire line tools run took samples of fluids and rock from the wellbore. For the current purpose, all relevant wire line logging data was acquired by the start of April 12th. Ms. Skripnikova witnessed the logging runs including the Triple Combo, CMR and others until April 13th.[12] It was, of course, the morning of April 13th that Ms. Skripnikova relied upon the field print of the Triple Combo log to determine the highest hydrocarbon zone.

45. An email exchange on April 12th while she was on the rig demonstrates that Ms. Skripnikova had loaded wire line log data into her log analysis software and had performed relevant analytical calculations one day before the inquiry about the highest hydrocarbon zone. This same exchange strongly suggests that other personnel in Houston, including at least one petrophysicist, also had available to them the wire line log data and that the data was viewed by these other personnel in a conference room setting possibly similar to that conducted later when the M57B was identified as a hydrocarbon bearing zone.

46. The email exchange, attached as Exhibit 2, pertains to the fluid sampling program, that is, what depth intervals they wished to take

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[10] Skripnikova Depo. Tr. pg 36: 11 to 22

[11] BP-HZN-2179MDL00889345-52

[12] BP-HZN-2179MDL00889352

fluid samples using wire line tools.[13] Both the Triple Combo and CMR logs had both been completed the day before. The issues under discussion were unrelated to the M57B. In order to simplify the exchange, the following excerpts demonstrate the basis of the discussion and not the details. The exchange progressed as follows:

Ms. Kelly McAughan writes, evidently from Houston,

"From looking at logs we have decided. . ."

And again,

"Around here they are thinking because of the high porosity on CMR that. . .. The density was too high saying. . .You guys probably have a different interpretation. What do you think of. . .?"

Ms. Skripnikova replies,

"We think it is CMR and Density reading. . .Bruce, did you see the logs? Can you please comment?"

(*"Bruce"* refers to Bruce Wagner, another petrophysicist who subsequently participated in the group meeting which first identified the M57B as hydrocarbon bearing.[14])

Ms. McAughan answers,

"I'm waiting on Bruce right now. We have all been in the conference room."

47. The discussion above demonstrates that both Ms. Skripnikova and a group of BP personnel in Houston were viewing both Triple Combo and CMR data on April 12th.

48. About five hours later, Ms. Skripnikova replies again, apparently to confirm the sampling program. She attaches to her email a PowerPoint slide[15] which is a screen capture from log analysis

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[13] Exhibit 2 is BP-HZN-2179MDL00884298-300.

[14] Skripnikova Depo. Tr. pg 573:9 to 18

[15] BP-HZN-2179MDL00884300

software. Though the lettering is somewhat difficult to read in the image, it is clear it includes data from the first logging run, that is, from the Triple Combo log, such as environmentally corrected gamma ray, caliper, and density. The image also includes tracks based upon the interpretation of the raw data such as porosity and water saturation. The attachment to this email establishes that Ms. Skripnikova had received, loaded and analyzed Triple Combo data in digital format by April 12th.

49. It may be noted that both normal practice and other emails corroborate that digital data was available to Ms. Skripnikova and others for quantitative analysis. The workorder for the wireline logging services specified that the digital format should be created prior to generation of "*prints*" and that the digital format should be made available through a web portal.[16] The Schlumberger field personnel listed on the same workorder testified that data on the Macondo well would have been available to BP personnel very quickly after beginning the upload to the web portal.[17]

50. As for the loading and analysis of the digital data, Ms. Skripnikova emailed the last of her analyses based on LWD data cited above on the afternoon of April 10th while she was on the rig.[18] This fact strongly suggests that Ms. Skripnikova had with her on the rig the necessary hardware and software to conduct quantitative log analysis, as would be appropriate and expected. Shortly after returning to shore on April 14th, Ms. Skripnikova distributed another analysis showing that she had imported wire line data into her log analysis software by that time.[19] Also on April 14th, Mr. Bodek and a manager planned to review the CMR data.[20] By April 15th, digital form of the wire line data was available and distributed to partners in the well.[21]

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[16] BP-HZN-MBI00117468-79 at 470.

[17] Emanuel Depo. Tr. pg 158:10 - 159:15, 94:3-22, and 31:1 - 32:9.

[18] BP-HZN-MBI00125815-7

[19] BP-HZN-2179MDL00884286-9

[20] *Ibid.*

[21] BP-HZN-MBI00127247

51. The day after the email exchange above is when Ms. Skripnikova identified the 17,803 ft (md) interval M56A as the highest hydrocarbon bearing zone. An email from geologist Mr. Bobby Bodek requests her interpretation of the highest hydrocarbon bearing interval for use in the cementing design, though seven other individuals were copied on the email.

Mr. Bodek writes,

"The drilling team, in their cement procedure preparations, needs to know the depth of the shallowest hydrocarbon-bearing interval in the open hole. From your calculations, could you provide the depth of the shallowest hydrocarbon zone and 'reply all' to this email."

Twenty-one minutes later and based strictly on the hard copy field print, Ms. Skripnikova replies,

"I think the shallowest HC sand is at 17,803 md".

In reply, Mr. Bodek writes,

"I can buy that. Tha't the shallowest sand that we see legitimate DEN/NEU cross-over on the triple combo log". [*sic*]

Finally, Ms. Skripnikova returns,

"And high resistivity. don't see much on gas though. Bobby, can you look back at geological report? Anything in it? Maybe too thin though" [*sic*]

From the documents I have reviewed, it appears that the email exchange ends here, twenty-seven minutes after the first question was asked. A copy of this exchange can be found at Exhibit 3.[22]

52. From this email exchange between Ms. Skripnikova and Mr. Bodek I observe the following:

[22] Exhibit 3 is BP-HZN-MBI00126430.

- The request from Mr. Bodek to Ms. Skripnikova includes a justification of the need for the information and without reference to any prior conversation or understanding.

- The request assumes that Ms. Skripnikova has made *"calculations."* This is unsurprising since Mr. Bodek received from Ms. Skripnikova several interpretations including the analysis the day before and including prior analyses based on LWD data.

- Ms. Skripnikova replies in a very short time.

- Mr. Bodek's reply suggests that he also had log data available to him and that he saw a lesser cross-over or near cross-over at a higher depth, presumably the M57B.

- The analysis by Mr. Bodek, like the qualitative work made by Ms. Skripnikova, centers on the presence or absence of density-neutron cross-over.

53. The analysis by Ms. Skripnikova was superficial and incomplete. Superficial in that she only spent twenty seven minutes to arrive at her conclusion and incomplete in that she only did a visual inspection of the field print of the Triple Combo log. It is not clear why even the simplest quantitative analysis was not made or, if they were already made, why they were not reviewed.

54. As demonstrated when the group of petrophysicists zoomed in to view the data on April 21st, the log data does show density-neutron cross-over at M57B. Since Ms. Skripnikova did have digital data on April 12th she could have easily determined whether there was neutron-density cross-over in the M57B zone. Her log analysis software would allow a detailed visual examination of the M57B zone by zooming in to observe the tell-tale cross-over. Alternatively, she could have used the software to create a simple cross plot of the data, to make water saturation calculations or, more likely, just to view calculations which she had already made.

55. Even if the digital data was not available, Ms. Skripnikova could have made routine water saturation calculations showing the M57B was likely hydrocarbon bearing. As discussed above she had basic parameters for analysis and with the Triple Combo log a better estimate of porosity read directly from the log. For this purpose water saturation calculations are straight forward and do not require specialized software. A hand held calculator is sufficient or a spreadsheet even better. I have tested the procedure and found that the calculations can be done in about 30 minutes or perhaps longer depending on the sophistication of the calculations.

56. With an estimated porosity of 21% the water saturation is 54% and the hydrocarbon saturation 46%, M57B was certainly a hydrocarbon bearing zone. Later calculations done by Ms. Skripnikova, discussed in more detail below, using digital data, refined parameters and specialized log analysis software determined the water saturation of the M57B was 52% and the hydrocarbon saturation 48%.

57. Not only did Ms. Skripnikova's analysis overlook the M57B, at least two others also reviewed the logs and evidently had the opportunity to recognize the M57B zone, namely Mr. Wagner and Mr. Bodek.

58. Lastly, the same digital data and software were available to BP and Ms. Skripnikova after she returned from the rig on April 14th and continuously through the pumping of the cement on April 19th.

59. BP's analysis of the highest hydrocarbon zone was superficial and incomplete. BP should have identified the M57B zone as the highest hydrocarbon-bearing interval in the open hole section of the well. The deficiency persisted from as early as the taking of the LWD data around April 3rd, through the review of the wire line data on April 13th and up through the date of the blowout.

BP Analysis after the Blowout Consistently Identified the M57B as Gas

60. A caucus of petrophysicists first agreed on the day after the blowout that the M57B contains gas. Subsequently, Ms. Skripnikova conducted a rigorous analysis of the M57B, along with other zones in the well. Like my work described below, she concluded that the M57B

zones contains gas. The contemporaneous documentation of these analyses often states the conclusions flatly, without statements of uncertainty. The most comprehensive document predating the involvement of the Bly investigation team does expound on some uncertainties but still concludes that the M57B is *"Gas"* or *"likely gas"* without even an implied reference to the possibility that the interval is a water bearing zone.

April 21st Group Discussion First Interpreted M57B as Gas

61. After April 13th, the next time Ms. Skripnikova recalls considering the M57B zone was the day after the incident. After returning back from the rig, she proceeded with her log analysis but focused it on the main pay zones; she did not reconsider her initial evaluation of the M57B.[23] However, on the day after the incident, a meeting was called with a larger number of BP petrophysicists.[24] It was then, using software and digital data, that she and the others more closely examined the zone and concluded that it did indeed show cross-over and was likely a gas-bearing zone.[25] Though more data was available, it appears that the same Triple Combo log, which was the basis for the rig interpretation, remained the basis for the revised interpretation.[26] The primary difference identified by Ms. Skripnikova in her deposition was that the data was magnified and viewed more clearly on the 21st using software and digital data than it was on April 13th using a printout.

62. Meeting on the day after the blowout, this group of four or five petrophysicists reached a consensus that the M57B zone likely contained gas due primarily to the density-neutron cross-over observed at one data point in the zone.[27] In her deposition Ms. Skripnikova emphasized the uncertainty involved and the *"possibility"* of its being gas.[28] The uncertainty, she argues, is the reason the zone

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[23] Skripnikova Depo. Tr. pg 440:8 to 441:18

[24] Skripnikova Depo. Tr. pg 441:14 to 18 and 210: 9 to 212:16

[25] Skripnikova Depo. Tr. pg 444:14 to 448:17

[26] Skripnikova Depo. Tr. pg 441:19 to 444:21

[27] Skripnikova Depo. Tr. pg 211:18 to 212:16, 377:4 to 14, 434:21 to 435:13, 441:14 to 18, 444:9 to 20, 518:20 to 22, and 573:9 to 18

[28] Skripnikova Depo. Tr. pg 504: 6 to 9

was called gas.[29] In any event, this information identifying the M57B as a gas zone then went to other people investigating the cause of the blowout[30] and evidently to those planning relief wells. The *"Macondo sand table"* created and distributed by the group identified the contents of the 17,467 ft to 17,468 ft (md) zone without caveat, *"GAS".* One version of the document is attached as Exhibit 4.[31]

Calculations by Ms. Skripnikova, Technical Notes and Memorandum Corroborate Interpretation of Gas-Bearing Zone

63. Following this meeting on April 21st, Ms. Skripnikova undertook a more rigorous evaluation of all of the zones in the Macondo well, including the M57B. That work was evidently completed by May 19th when documentation began in a series of *"Technical Notes".* By this date, Ms. Skripnikova had received all of the relevant information and all information she had requested.[32] Ms. Skripnikova recalled that the analysis "*was accurate to the best of my interpretation. It was the best interpretation I could come at this point of time.*"[33] [*sic*] Ms. Skripnikova's best interpretation concluded, without ambiguity, that the 17,467 ft (md) zone contained gas.

64. From April 21st forward until the results were formally documented with text in the latest *"Technical Memorandum"* of July 26th, Ms Skripnikova remained the only one of the group of petrophysicists who actually made any petrophysical calculations. She offered in deposition, "*Most of the technical work, all of the calculation was done by myself, was done by me, by myself exclusively. There was some corrections to my text.*"[34] [*sic*]

65. My review of documents shows that the analysis by Ms. Skripnikova was initially documented and distributed in slides and spreadsheets.[35]

[29] Skripnikova Depo. Tr. pg 517:17 to 518:6

[30] Skripnikova Depo. Tr. pg 435:7 to 13

[31] Exhibit 4 is BP-HZN-2179MDL00426906-8.

[32] Skripnikova Depo. Tr. pg 331:22 to 332:11

[33] Skripnikova Depo. Tr. pg 326:19 to 25

[34] Skripnikova Depo. Tr. pg 389:16 to 20

[35] See *e.g.* BP-HZN-2179MDL02522551, BP-HZN-2179MDL00449834-5, BP-HZN-2179MDL02655864-5, BP-HZN-2179MDL02912088

It seems that her analyses were best documented in Technical Notes and a Technical Memorandum, including drafts. These documents seem to contain the relevant work by Ms. Skripnikova and offer some discussion of the results.

66. Concerning the M57B, a Technical Note drafted between May 19th and May 22nd shows the analysis by Ms. Skripnikova and the *"consensus"* of the contributors that the zone contains gas.[36] Fifteen individuals, including geologists, reservoir engineers, managers and others, contributed to the May 19th draft of the Technical Note dealing with the pressures expected to be found in various sands for the purpose of evaluating kill options for the well. Ms. Skripnikova is listed among the contributors, and she was responsible for at least the majority of the data in the attached table *"Layer Properties Used for Calculations"* to the drafts.[37] Concerning the May 20th version of this document, Ms. Skripnikova states that the column labeled *"Fluid Content"* was *"done with a team of petrophysicists."*[38] She testified that she did not know who was responsible for the *"Expected to Flow"* column.[39]

67. This table of *"layer properties"* presented the results of her log analysis and the consensus of the *"team of petrophysicists"* for the M57B and other zones. While the fluid content for a deeper zone is listed as *"Uncertain",* the fluid content for the M57B is shown as *"Gas".* Under the column *"Expected to Flow"*, the M57B zone reads, *"Yes".* Similarly, a separate table containing the final calculated pressures lists *"M57B Gas".* Most significantly, the text of the Note reiterates the conclusion reached by the group of 15 contributors, *"This range [of pressures] considers the impact of shallower high pressure gas zones, which are found at depths between 17,467 – 17,806 ft MD-RKB."* It continues, *"There was consensus that these gas zones were likely to be open. . ."* The May 19th version of this document can be found at Exhibit 5. This Note went through three more revisions dated May 20th to May 22nd.

[36] The May 19th version of the document references a May 17th version, but my research has not yet located this previous version.

[37] Skripnikova Depo. Tr. pg 324:6 to 326:18; Skripnikova deposition exhibits 3529, 3530, 3531, BP-Hzn-2179MDL02176694-6699, BP-HZN-2179MDL02181151-1157, BP-HZN-2179MDL02178046-8053

[38] Skripnikova Depo. Tr. pg 391:4 to 9

[39] Skripnikova Depo. Tr. pg 391: 10 to 23

However, the relevant language cited above is common through all of the drafts which I've reviewed.[40]

68. A second draft Technical Note dated May 26th on a closely related issue refers back to the work in the first Technical Note. It is attached as Exhibit 6.[41] The eight preparers of this second Note perform their work on the assumption that the M57B is gas and may be *"adding to the total flow"* from the well. The Note attaches an image of log analysis results prepared by Ms. Skripnikova titled *"Reservoir Description, Macondo Sand Identification, 5/18/2010."* This graphic labels five lower zones as either *"Brine"* or *"Oil".* Two zones are treated with some ambiguity. M56A is labeled *"Oil or Gas",* and M57C is labeled *"Uncertain".* Like the lowest zones, the M57B is labeled without ambiguity, *"Gas".*

69. Before the review by the Bly investigation team, the most comprehensive document about the log analysis of M57B is the *"Technical Memorandum"* of May 25th titled *"Post-well Subsurface Description of the Macondo well (MC 252)".*[42] This longer and more detailed document was prepared by seven authors including Ms. Skripnikova. In deposition she testified that she wrote the petrophysical section.[43] Some copies of the document are watermarked *"DRAFT"* while others are not.[44] The majority of the petrophysical section discusses analysis of the main pay intervals. Other parts contain analysis and references to the M57B. The document, one copy of which is attached as Exhibit 7,[45] provides the most descriptive account of analysis for the M57B zone to this date:

- Figure 2 is a sand identification chart for sands below the 9 7/8" liner showing the M57B as *"Gas".* (pg 4)

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[40] I have not located the *"C"* draft nor a final version of the memo.

[41] Exhibit 6 is BP-HZN-2179MDL00646535-47.

[42] BP-HZN-2179MDL02181151-7, BP-HZN-2179MDL02178046-53

[43] Skripnikova Depo. Tr. pg 363:1 to 6

[44] *e.g.* BP-HZN-2179MDL03289695-732 and BP-HZN-2179MDL02396746-83

[45] Exhibit 7 is BP-HZN-2179MDL02396746-83.

- The section *"Determination of net sand cut off"* beginning on page 24 discusses the issue of the effect of gas on the calculation of porosity from the density log and whether or not the density log for various zones should be corrected. Ms. Skripnikova describes how the lower, main sands exhibited *"gas signature"* on logs but were determined by sampling to contain volatile oil instead of gas and, as such, the density log should not be corrected. Concerning other sands which were not sampled, she writes, *"Three further sands have been identified in the TD hole section, which have a gas signature on Neutron-Density logs: namely M57B, M56A and M56F.. . .Fluid typing of the sands is uncertain and parameters are difficult to assess accurately due to the thin nature of these sands, being below confident log resolution."* (pg 27) In the context of this section the discussion is whether the identified zones contain oil or gas.

- Figure 29 pertains to *"fluid typing"*. One label on the figure reads, *"M57B, Gas, above thermogenic front".*

- In the section above Figure 29, Ms. Skripnikova discusses the sonic log and the interpreted *"thermogenic front"* to infer whether certain, zones that were not sampled are oil or gas. She extends this discussion to the M57B and writes, *"The M57B sand is approximately 2 feet thick and likely to be below log resolution for accurate fluid determination, but based on its position above the thermogenic front it is likely to be gas."* (pg 30)

- The summary table of properties in Figure 33 lists M57B as *"Gas"* while some other zones are treated less decisively as *"Uncertain"* or *"Oil or Gas"*.

70. Concerning the M57B, the text and the figures consistently point to the conclusion that the zone contains either *"Gas"* or *"likely gas"* and was treated as such in tables summarizing *"pay"* in the well.

BP Analysis after Discussion with Bly Team Emphasizes Uncertainty, Still Interprets Gas in M57B

71. The nature of the discussion of the M57B in the Technical Memorandum changed somewhat from the May 25th version to the latest version of July 26th. Though some more data was presented and the associated uncertainty was emphasized, the baseline interpretation that the zone contains gas remains unchanged. These changes were made after Ms. Skripnikova met with the Bly team to explain her conclusions.

72. On June 5th, the Bly team received a copy of a spreadsheet by Ms. Skripnikova titled *"MC252-1 Sand Description v2.xls".* This table is substantially the same as the tables shown in a Technical Note and Technical Memorandum of late May, clearly showing the M57B as *"Gas"* and *"Yes"* under the column labeled *"Expected to flow"*. The document generated a request from Mr. Allen Pere of the Bly team to discuss the M57B sand and two other zones with the asset team members. This meeting was planned for June 9th between Mr. Pere, Ms. Skripnikova and Ms. McAughan. Ms. Skripnikova did, in fact, meet with Mr. Pere.[46] As requested in a prior email, he talked with her specifically about the M57B sand, among other things. More to the point, *"[H]e asked me to show him the data and my explanations why – it's gas."*[47] Shortly afterwards, Ms. McAughan sent Mr. Pere the May 25th version of the Technical Memorandum. The email chain and relevant exhibits may be found at Exhibit 8 and Exhibit 9.[48]

73. Between the time the May 25th version was provided to Mr. Pere and the latest version dated July 26th, Ms Skripnikova recalls only one significant change in the document: the fluid type contained in M57B was changed from gas to water.[49] Ms Skripnikova described that the change was a "*team decision to be more accurate*" since they had done additional work to evaluate the uncertainty associated with the

[46] Skripnikova Depo. Tr. pg 395:7 to 16

[47] Skripnikova Depo. Tr. pg 396: 8 to 15

[48] Exhibit 8 is BP-HZN-BLY00115511-13. Exhibit 9 is BP-HZN-2179MDL02393584-626.

[49] Skripnikova Depo. Tr. pg 334:22 to 335:10

sand and had included an interpretation by Schlumberger.[50] Ms Skripnikova offered, "*But then after we received the analysis of – of all the sands within the last open hole section done by Schlumberger and ELAN it kind of confirms my understanding what I was thinking on – on the rig.*"[51]

74. As cited above, Ms. Skripnikova testified that, at the time she produced her analysis as reflected in the earlier May 25th version, she had received all data she required and requested. The analysis was "*accurate to the best of [her] interpretation,*" and Ms. Skripnikova was the only person among BP staff to perform petrophysical calculations. Moreover, the July 26th version of the document dates the Schlumberger ELAN log interpretation to May 3rd, more than three weeks before the original May 25th version of the Technical Memo.

75. As mentioned by Ms. Skripnikova in deposition, the final draft has extensive editorial changes to the text which she originally wrote, most unrelated to the M57B.[52] The document can be found as Exhibit 10.[53] Changes related to the fluids of the M57B zone include:

- The summary of zonal properties in Figure 35 (previously Figure 33) was changed so that M57B now shows *"Probable Gas"* instead of *"Gas"*. All other parameters, including water saturation of 52%, remain unchanged from the May 25th version. (pg 36)
- The *"fluid typing"* Figure 29 is changed so that M57B is labeled *"Probable Gas"* instead of *"Gas"*. (pg 31)
- Two figures are added and discussed briefly. Figure 30 shows the field print of the Triple Combo log from which Ms. Skripnikova's original, qualitative interpretation was made on April 13th. The brief text notes the absence of *"pronounced"*

[50] Skripnikova Depo. Tr. pg 335:11 to 21

[51] Skripnikova Depo. Tr. pg 435:14 to 18

[52] Skripnikova Depo. Tr. pg 336:8 to 19

[53] Exhibit 10 is BP-HZN-BLY00082874-914.

density-neutron cross-over and the lack of *"mud gas response"*. (pg 32)

- The new Figure 31 shows the standard analysis of the ELAN log interpretation from May 3rd. The text observes that this interpretation shows the M57B saturation to be *"moved water"*. (pg 33)

- The text about fluid typing shown in Figure 29 previously read *"The M57B sand is approximately 2 feet thick and likely to be below log resolution for accurate fluid determination, but based on its position above the thermogenic front it is likely to be gas."* The new text reads, *"The M57B sand is approximately 2 feet thick and is below log resolution for accurate fluid determination. However, if hydrocarbons were present, based on the density-neutron cross-over and its position above the thermogenic front it is likely to be gas rather than oil."* (pg 31)

- Additional text in this section also notes the lack of a *"show"*[54] over the M57B interval, *"There was no gas heavier than C1 [methane] observed on mud gas chromatograph in the M57B and M56A sands and neither cut or florescence on cuttings."* The M56A is the zone at 17,803 ft (md) which was originally treated as the highest hydrocarbon zone. (pg 31)

- The discussion on earlier pages of how fluids affect porosity calculations remains almost exactly the same. Instead of the M57B being listed as having a *"gas signature on Neutron-Density logs,"* the zone is stated to have a *"probable gas signature."* (pg 27)

76. The three additional data points / analyses offered in this version of the Memo do not provide good evidence to support the changes made. All of the newly included data was available for the original May 25th interpretation:

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[54] A *"show"* is when hydrocarbons are physically present in the mud or cuttings recovered from the wellbore after drilling through a zone.

- First, the Triple Combo field print does nothing to substantiate proper interpretation of the M57B zone. It is useful to understand the qualitative interpretation made by Ms. Skripnikova.

- Second, the observation about the lack of hydrocarbons physically observed in mud or cuttings is not probative. Specifically, the M56A zone at 17,803 ft (md) was accepted as the highest hydrocarbon bearing zone without the same physical evidence.

- Third, the text does not justify why the Schlumberger standard ELAN interpretation presented is equal or superior to the calculations performed by Ms. Skripnikova. The text merely offers the standard ELAN as an alternative without opining on its reliability.

- Finally, the Schlumberger ELAN log interpretation presented is incomplete. The document presents the ELAN standard analysis as one alternative but omits the Laminated Sand Analysis (LSA) as another alternative. Unlike the standard analysis shown in the figure, the LSA analysis does indicate that the M57B contains hydrocarbons.[55]

77. In the entire petrophysical section of this July 26th memorandum the only evidence presented that the M57B may not be hydrocarbon bearing is a single sentence and accompanying figure referencing the Schlumberger ELAN analysis. I do not find this convincing.

78. It appears that Ms. Skripnikova also continues not to be persuaded that the M57B is a water zone. Although she acknowledges in her deposition high uncertainty related to the zone, she continues to believe that the M57B zone probably contains gas.[56] She states that she agrees with the July 26th version of the memo concerning most of the sands but not all of them.[57] Specifically, she concludes about the

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[55] Deposition exhibit 3541

[56] Skripnikova Depo. Tr. pg 432:20 to 434:20

[57] Skripnikova Depo. Tr. pg 433:3 to 14

M57B, "*It's probable gas*," a conclusion which she reiterates twice more.[58] It should be noted that Ms Skripnikova stated a different conclusion at the end of the deposition.[59]

VII. Strickland Analysis of Highest Hydrocarbon Bearing Zone

BP had Sufficient Information as of April 13, 2010 to Identify the M57B Gas Zone

79. As of April 13, 2010 the primary data sources were the open hole logs, MWD and LWD data and daily drilling reports. Review of the MWD and LWD data along with the daily drilling reports showed potential hydrocarbon zones that should be reviewed at several intervals above the main pay zones. The following table identifies potential hydrocarbon intervals on the left side and the indicators of possible hydrocarbons on the right.

DEPTH[60] – MEASURED DEPTH	COMMENTS AND INDICATORS OF POTENTIAL HYDROCARBON ZONES
17,408 (17,389)	Gamma ray, resistivity
17,487 (17,467)	M57B Gamma ray, resistivity
17,491 (17,474)	Gamma ray, resistivity
17,677 (17,662)	Gamma ray, resistivity, C1, C2
17,720-17,780 (17,704-17,724)	Gamma ray, resistivity, C1, C2, HW, well not static and lost circulation
17,821 (17,803)	M56A Gamma ray, resistivity
17,928 (17,912)	Gamma ray, resistivity
17,943 (17,927)	Gamma ray, resistivity, C1, C2
17,991 (17,976)	Gamma ray, resistivity, C1, C2
18,047 (18,031)	Gamma ray, resistivity, C1, C2
18,057	Gamma ray, resistivity, C1, C2
18,076	Gamma ray, resistivity, C1, C2

58 Skripnikova Depo. Tr. pg 434:14 to 20 and 436:6 to 10

59 Skripnikova Depo. Tr. pg 518:24 to 519:4

60 File MC252_001_ST00BP01_5MD_PHASE_ATTEN.emf. The second number in parentheses is from the final print of the Triple Combo Log, file BP_MC252_OCSG_32306_ST00BP01_R1D1_MD_TCOM_Final_5in.PDS

80. The depths in the above table (MWD, LWD logs) differ from the measured depths recorded with the Triple Combo Log (numbers in parentheses) by 15 to 56 feet. The indicator notations are described as follows:

a. Gamma ray – the gamma ray is significantly below shale values. This is an indication of sand, containing fluid that may flow, as compared to shale, which does not.

b. Resistivity – the resistivity measurement (curve P40H) is greater than surrounding shale values which may indicate hydrocarbons.

c. C1 and C2 – Hydrocarbon components methane (C1) and ethane (C2) from the chromatograph analysis shown on the mud log.[61] The presence of these components in the mud suggests the presence of hydrocarbons in associated formations.

d. HW – Hot Wire measurements taken as part of the mud logs suggest an increased gas volume in the mud returning to the surface from these zones.

81. The presence of methane and ethane from the mud log are indicators that hydrocarbons are present, although the precise depth is uncertain due to the lag time between drilling an interval and surface detection from entrained gas in the circulating mud system. The same is true for an increase in gas volume detected by the hot wire system.

82. Quantitative determinations of fluid content can be made from gamma ray, resistivity, and an indicator of porosity such as neutron, density or sonic values. The Triple Combo log records these values (except for sonic) along with other parameters. Although calculations are required for specific values, pattern recognition of the response from the four curves is used for a *"quick look"* indication of hydrocarbons. An industry accepted graphical format aids in pattern recognition. Exhibit 11 is a plot of the curves from the Triple Combo log for the M56A

[61] File MC252_001_ST00BP01_5MD_COMBO.emf

zone, identified by Ms. Skripnikova as the highest hydrocarbon bearing zone, at a depth of 17,803 ft (md). The curves are plotted on three *"tracks"* representing three different horizontal axes with a common vertical depth axis. The first track contains the gamma ray and also the actual hole size as measured by a caliper. The second track displays resistivity measurements, five measurements each with a different horizontal depth of investigation, plotted on a logarithmic axis. The neutron and density curves, both of which indicate porosity, are plotted in the third track.

83. The *"pattern"* an analyst looks for is the gamma ray curve moving to the left (track one), the resistivity curves moving to the right (track two) and the neutron density curves coming together with the neutron moving left to right and the density moving right to left (track three). The value of each curve is important but the pattern is recognized in the context of the curves response compared to the adjacent formations. A crossover of the neutron and density curves is a traditional indicator of a porous zone containing gas; however, this is not an absolute proof but rather an indicator of gas. If the pattern holds, *i.e.* all four indicators are exhibited at the same depth, this is a very positive signal that the zone contains hydrocarbons. Cross-over of the neutron and density curves is a fifth, and strong positive indicator, signaling the hydrocarbons in the zone may be gas as compared to oil.

84. Exhibit 12 is a plot of these same curves for the M57B zone at a depth of 17,467 ft (md) showing the same pattern as the M56A zone.

85. It appears that Ms. Skripnikova used pattern recognition as the only basis for determining the highest hydrocarbon bearing interval. This conclusion is supported by the fact that she spent 27 minutes for her analysis. Before concluding that the M56A zone was the highest hydrocarbon zone she should have considered other factors and at least done some quantitative analysis as discussed below.

86. A review of the final print of the Triple Combo log shows cross-over of the neutron and density curves in the M56A zone at 17,803 ft (md), Exhibit 13, and although not as distinct as the M56A zone, the M57B zone at 17,467 ft (md), Exhibit 14. The M57B zone cross-over is less

distinct on the field copy, Exhibit 15[62], as compared to the final print shown in Exhibit 14. However, it appears that Ms. Skripnikova had the Triple Combo digital data on April 13th loaded into log analysis software, and she could have easily resolved the issue.

87. If a zone has sufficient porosity, the resistivity log is also useful as a visual indicator of fluid content with increased resistivity potentially indicating hydrocarbons. Reading from the final print (Exhibit 14), the porosity in the M56A is approximately 25% and in the M57B zone approximately 21%, both well above minimum values for flow.

88. For thin sands such as the M56A and the M57B, low resistivity of the adjacent shales or very thin shales, on the order of one inch or less, within the sand reduces the resistivity values recorded by the logging tools. The true resistivity of a sand containing hydrocarbons will be higher than the resistivity of a combination of sands and thin shales. For porous sands such as these, higher resistivity is a strong indicator of hydrocarbons.

89. The Structural Dipmeter Computation[63] is a Schlumberger processed interpretation of the angle at which formations intersect the well bore. The log header lists April 12, 2010 as the date processed. The dipmeter shows increasing dip in the 80 feet of beds above the M57B zone. At 17,467 ft (md) the M57B zone dips at approximately 36 to 45 degrees. Just below the zone the dip increases to a maximum of about 75 degrees before suddenly dropping below 10 degrees. Schlumberger interpreted the abrupt change in dip to be a small fault at approximately 17,476 ft (md).

90. In a vertical well, resistivity measurements are perpendicular to the well bore. In a thin bed dipping at 36 to 45 degrees resistivity determined from an induction tool is a complex mixture of parameters. Resistivity is determined from the induction measurements. For the M57B zone it is likely that the true resistivity of the sand is higher than recorded by the tool due to the dip of the sand. Higher resistivity will

[62] BP Technical Memorandum dated July 26, 2010, page 32, Figure 30 Triple Combo field print over M57B and M56A, Exhibit 3533

[63] File BP_Macondo_OCSG_32306_001_ST00BP01_MSD_Final.pds

result in lower water saturations for this zone making it more likely that the M57B zone is hydrocarbon bearing.

91. There is no evidence from my review that Ms. Skripnikova took these factors into consideration. In my opinion, had she done so she would have concluded that the M57B zone was the highest hydrocarbon bearing interval.

92. There are other considerations that also have relevance to the calculation of water saturation in a zone.

Analysis of the Depth of Investigation of Resistivity Tool Confirms that Hydrocarbons Detected in M57B were not Solely Due to Infiltration of Oil Base Mud

93. The gamma ray, neutron and density curves record their readings as a function of the characteristics of the formation in the immediate vicinity of the well bore. Resistivity tools used in the Macondo well are designed with a vertical and horizontal resolution. The digital files from the Triple Combo log present 15 different resistivity values in three groups of five. The three groups are for three different vertical resolutions of one, two or four feet. In each group there are five different horizontal resolutions, 10, 20, 30, 60 and 90 inches. The 10 inch horizontal curve measures the resistivity in the formation 10 inches away from the well bore, *i.e.* a depth of investigation of 10 inches, while the 90 inch log has a 90 inch depth of investigation.

94. Exhibit 16 is a comparison of the five logs in each of the three different vertical resolutions. For clarity on the exhibit all five curves are not shown for the one and four foot vertical resolution. Track one on the left of the exhibit shows the gamma ray curve in green, extending to the left at the depth of the M57B, and the caliper in red. The second track contains two resistivity curves with a one foot vertical resolution and a depth of investigation of 10 inches, black curve, and 90 inches, red curve. The third track has five resistivity curves all with a vertical resolution of two feet, while the fourth track has two resistivity curves with a four foot vertical resolution. Resistivity curves are traditionally plotted on a logarithmic scale as shown in the exhibit. Comparison of

the tracks demonstrates the suppression of the resistivity as the vertical resolution increases.

95. As is standard in the industry, the field print and the final print of the Triple Combo log displayed resistivity curves with a two foot vertical resolution. However in thin sands the one foot vertical resolution resistivity curves may be a better choice for water saturation calculations.

The Effect of Oil Base Mud and Mud Filtrate Invasion

96. The final open hole section of the Macondo well was drilled with a synthetic oil base mud consisting of a mixture of about 70% synthetic oil and 30% water. The drilling mud has numerous functions such as cuttings transport to the surface for inspection and removal, cooling and lubricating the bit and drill string and formation pressure control among others.

97. During the drilling process the hydrostatic pressure exerted by the column of mud is usually slightly greater than the pressure in the formation. As the drilling mud tries to flow into a formation due to the positive difference in pressure, solid particles in the mud form a layer on the rock face. In drilling terms this is called *"mud cake"*. The mud cake filters out the solid particles but allows some of the liquid, synthetic oil and water, to invade the formation. The invading fluid is called *"mud filtrate"*.

98. The resistivity tools make measurements at five different depths of investigation, 10, 20, 30, 60 and 90 inches. The shallow depth of investigation tools tend to measure the resistivity of the sand containing mud filtrate while the deeper looking tools are less influenced by mud filtrate and tend to measure the resistivity of the sand containing the undisturbed reservoir fluid. The synthetic oil in the mud filtrate is highly resistive.

99. Exhibit 17 is similar to Exhibit 16 except the resistivity curves are plotted on a linear instead of logarithmic scale. An additional curve, radius of invasion, is shown in the fifth track. The effect of synthetic oil based mud filtrate invasion is demonstrated by examining the five curves in the third track. Note the successively lower resistivity values

of the 10, 20 and 30 inch tools. The 10 inch tool is most influenced by the mud filtrate while the 20 and 30 inch tools are less influenced. The 60 and 90 inch tools read almost the same value indicating that the depth of mud filtrate invasion is somewhere between 30 and 60 inches.

100. The digital data from the Triple Combo Log contains a calculated diameter of invasion, curve AOD2. The fifth track on Exhibit 17 is the radius of invasion, one-half the diameter, for comparison to the resistivity curves. The scale on the radius of invasion curve is from zero to 100 with each vertical line representing 10 inches. At the depth of the M57B sand the radius of invasion is about 30 inches, confirming the response of the tools shown in track three and the appropriateness of using the 90 inch resistivity measurement for water saturation calculations. Water saturation calculations require a resistivity of the formation, true resistivity (Rt), not influenced by mud filtrate invasion or other issues. The use of the resistivity curve with the greatest depth of investigation, 90 inch curve, for the M57B zone calculates a water saturation of about 50%, corresponding to a hydrocarbon saturation of about 50%, and thus a hydrocarbon bearing zone.

Water Saturation Calculations Show the M57B as Hydrocarbon Bearing

101. In addition to the different vertical resolutions for the resistivity logs, the Triple Combo also has high resolution values for the gamma ray, density and neutron curves. For thin sands these are useful for better quantifying values within a zone.

102. The simplest method to calculate water saturation uses Archie's equation. More complex equations for water saturation are the Simandoux or Modified Simandoux and the Indonesian formula. Other methods to determine water saturation are Waxman and Smits, Dual Water and the Laminated Sand Analysis. The more complex equations require additional data and analysis before making water saturation calculations.

103. Using the high resolution curves I calculated water saturation for the M57B zone by several different methods for comparison. For the log parameters of *"a"*, *"m"*, *"n"* and *"Rw"* I used two sets of parameters. The first set, identified by the letters "BP" in the following figures, are the same as used by Ms. Skripnikova in her post incident analysis. The second set, identified by the letters *"SLB"*, are values that Schlumberger, the company that ran the logs, used in their analysis. Following a similar procedure as BP, porosity was calculated from a corrected density curve with a fluid density representing a 70%/30% mixture of base oil and water.

104. Exhibit 18 shows water saturation calculated by four methods with the BP parameter set for the M57B zone. The first track shows the gamma ray in green, the caliper in red and the differential caliper as a dotted grey line. The second track just to the right of the depth labels, is the water saturation, labeled Sw, from Archie's equation with a horizontal scale of 0.0 to 1.0 and ten divisions such that each light grey vertical line is 0.1 or 10%. Reading from the blue curve opposite the M57B label the water saturation is about 40%. The third track, same horizontal scale as track two, shows calculated water saturations by three methods. The lowest Sw value, 29%, is the blue curve labeled SW_ModS_BP, comes from the Modified Simandoux equation. The black curve Sw value is about 32% and comes from the Indonesian formula, SW_Ind_BP. The red curve from the Simandoux equation, SW_Sim_BP, calculates a Sw value of about 36%.

105. Exhibit 19 is the same presentation format as Exhibit 18 except the three water saturation curves in the third track use the Schlumberger parameter set identified by the label SLB in the curve names. The second track is the same in both exhibits. Using Schlumberger parameters yields higher water saturation values ranging from 36% to 53% compared to the 29% to 36% with the BP parameters.

106. The above calculations demonstrate that the M57B zone is hydrocarbon bearing. In my opinion Ms. Skripnikova was incorrect in her April 13^{th} conclusion concerning the highest hydrocarbon bearing zone.

Available Information about Schlumberger ELAN Analysis Does Not Establish Superior Reliability

107. The Technical Memorandum dated July 26, 2010, page 33 (Exhibit 10) contains the only description of the Schlumberger ELAN Log Analysis: *"The Schlumberger ELAN well logs analysis shows the M57B saturation is moved water (i.e. the elevated resistivity is due to synthetic mud invasion), see Figure 31."* Figure 31 displays in conventional log format five tracks of measured and calculated curves. The graphic design and presentation of Figure 31 is of poor quality, rendering the figure indecipherable. The M57B zone is displayed as part of a 100 foot interval printed in 1.5 vertical inches. At the time of this writing a more legible version has just been received from BP. However, an extensive document search did not produce additional information about the Schlumberger ELAN analysis. The combination of the one sentence and the figure are an insufficient basis for proper review or conclusions at this time. As presented, the one sentence and the figure do not establish that the ELAN analysis should be relied on to the exclusion of other methods.

108. The fifth track on the above mentioned Figure 31 of the Technical Memorandum appears to be taken from a Schlumberger processed log titled *"Laminated Sand Analysis"*[64] (LSA). The LSA does provide information relevant to the topic of hydrocarbon saturations in the M57B zone. The oft-mentioned Triple Combo log (general industry name) is the Schlumberger product called *"RT Scanner"* (RTS). When BP purchased the RT Scanner, Schlumberger also provided their Laminated Sand Analysis. The two acronyms are usually part of the name used for the file containing the digital measurements, *e.g.* R1D1_RTS-LSA. The results of the Laminated Sand Analysis are presented as a graphical image (.pds file) and as an ASCII file (.las file).

109. One of the objectives of the LSA calculations is to calculate water saturation for each component of the rock instead of a single water saturation for all the components combined. The calculation

[64] Graphic file BP_MC252_OCSG_32306_001_ST00BP1_R1D1_RTS-LSA-14-inch-wide.pds, digital file BP_MC252_OCSG_32306_001_ST00BP1_R1D1_RTS-LSA.las

procedure divides the formation into four components: sand, silt, laminated shale and dispersed shale. Silt has a much smaller particle size than sand. The shale component is divided between laminated shale, existing as thin layers, and dispersed shale, existing as tiny particles spread throughout the sand.

110. The silt, laminated and dispersed shale volumes usually have very high water saturations. Even though the water saturation is high, water may not flow because of bonding and capillary forces. If a hydrocarbon bearing sand contains silts and shales, the measured resistivity values will be lower than the same sand without these components. Lower resistivity values result in higher calculated water saturations unless the effects of the other components are taken into account.

111. Archie's water saturation equation does not account for water contained in shales. Other equations such as Simandoux, Modified Simandoux and Indonesian have additional terms to account for the water in shales. The next level of calculation sophistication is the Laminated Sand Analysis. Each level of increasing complexity in the analysis requires additional calculations and physical constants which may not be available and are estimated from general principles or regional studies.

112. The digital file of Schlumberger LSA contains values for three water saturation calculations. Exhibit 20 displays information in three tracks. The first two tracks are the same as previous Exhibit 18 and Exhibit 19. The third track displays the water saturation in the sand, (blue curve labeled SWT_SAN) and a curve described in the LSA file as *"Total Water Saturation Standard"* (red curve labeled SWT_STD). Of note is the water saturation in the sand, about 31% meaning that the hydrocarbon saturation is 69%.

Another Zone above M56A May Contain Hydrocarbons

113. Only the M56A and the M57B show cross-over on the Triple Combo Log, however another zone may contain some level of hydrocarbon saturation. Of particular interest is the zone at 17,704 to 17,724 ft (md), the M57C zone. The resistivity is higher at 17,708 and 17,723 ft

with a much lower resistivity in between. The out of gauge hole makes the density curve less reliable. However, in this interval the daily drilling report showed that the well was not static. On April 3, 2010 while drilling from 17,634 to 17,761 ft (md) the well lost 134 barrels of mud.[65] Between 1:30 and 2:00 a.m. the driller flow checked the well, was not able to obtain a *"no flow"* condition and subsequently shut in the well. Over the next 6.5 hours the well flowed back at rates from 6 to 24 barrels per hour and built up pressure at the surface. While drilling this interval the mud log recorded a significant rise in the gas content of the mud and the gas chromatograph showed the gas contained both methane and ethane. These are strong indications of a hydrocarbon bearing zone.

VIII. Pore Pressure in M57B is around 12,871 psia

114. For use in other calculations, I have been asked also to opine on the pressure of fluids in the M57B zone. Though BP measured directly the pressure in a number of zones, it did not measure the pressure in the M57B zone. Consequently, it is necessary to calculate a pressure in the M57B zone based on pressure measurements taken in other zones. The nearest direct pressure measurements, and thus the most suitable for this purpose, come from the nearby M57C zone located a few hundred feet below the M57B.

115. In the M57C zone there were four tests with multiple pressure measurements in each test. The final results[66] showed five pressure measurements that appear valid for this analysis.

116. The next issue is the True Vertical Depth (TVD) of the pressure measurements. The difference between measured depth (md) and TVD is due to the reality of drilling; a perfectly straight vertical hole is not possible. To account for the deviation from vertical a survey is taken of the well bore and measured depths converted to true vertical depth. For the Macondo well there are two primary sources for the survey: one taken as the well is drilled and another taken when the

[65] File Daily drilling report 2.pdf. See 4/3/2010 pg. 4.

[66] File GeoTap Data_HAL_0060925.pdf

open hole logs were recorded. At the point where the Geotap pressures were recorded there is a 15 foot difference in the TVD values from the two sources. The survey taken when the open hole logs are recorded is normally considered superior to the measurements made during the drilling process, and this is the one I have used. However for completeness I have also calculated pressures using the TVD information obtained during the drilling process.

117. During the drilling process formation properties of gamma ray and resistivity were continuously recorded. At the depths of the Geotap, there is a distinct gamma ray and resistivity signature easily located on the open hole, Triple Combo log, which also recorded the same formation properties. From this I concluded that a measured depth of 17,724 ft corresponds to a TVD of 17,696 ft. Since logs are measured from the elevation of the derrick floor, 75 feet above mean sea level, to calculate the sub-sea depth subtract 75 feet from the TVD value to achieve a TVDss of 17,621 ft.

118. The M57B depth is 17,467 ft (md) on the Triple Combo log or 17,382 feet TVDss which is 238 feet above the Geotap level. The following table summarizes the values based on TVD measurements from the wire line logs:

TVDSS (FEET)	MEASURED PRESSURE OF M57C (PSIA)	CALCULATED PRESSURE OF M57B (PSIA)
17,619.5	13,046.9	12,870.6
17,619.5	13,038.1	12,862.0
17,619.5	13,049.4	12,873.1
17,620.0	13,065.4	12,888.5
17,619.6	13,037.3	12,861.1
Average	13,047.4	**12,871.1**

119. The following table presents the same information except the TVD measurements are referenced to TVD values determined during the drilling process.

TVDSS (FEET)	MEASURED PRESSURE OF M57C (PSIA)	CALCULATED PRESSURE OF M57B (PSIA)
17,637.5	13,046.9	12,869.7
17,637.5	13,038.1	12,861.1
17,637.5	13,049.4	12,872.2
17,637.9	13,065.4	12,887.7
17,637.5	13,037.3	12,860.2
Average	13,047.4	**12,870.2**

120. From the above analysis the pressure in the M57B is 12,871.1 psia.

IX. An Analysis of the Macondo LWD Data Suggests that Additional Hydrocarbon Intervals May Exist at the Bottom of the Well

121. Schlumberger was unable to lower its wire line tools past a depth of approximately 18,280 ft (md). However, LWD data is available down to a depth of 18,340 ft (md). The base of the main pay zone, M56D is at 18,206 ft (md). While drilling at 18,260 ft (md) circulation was lost. Over the next two days over 1,500 barrels of mud was lost to the well.

122. The Triple Combo log did not record a gamma ray at this depth but the neutron and density curves were captured and show four feet of cross-over. The M56F is classified as an oil zone by BP.

123. The gamma ray and resistivity LWD data shows a package of sands and shales from 18,224 to 18,322 ft (md) with the most pronounced sand at 18,250 ft (md), the M56F zone. There is not enough data to calculate water saturations below the level of the M56F; missing is a measurement of porosity. However, the LWD data can be used to illustrate the pattern of sands and shales. To demonstrate, I prepared two exhibits using just the LWD data of gamma ray and the deep reading resistivity.

124. Exhibit 21 shows this information for the M57B zone. In the first track on the left is the gamma ray curve with a color gradient from lower gamma ray reading (left extension) in yellow, indicating sand, to higher readings (moving to the right) in gray, indicating shale. The second

track on the right displays resistivity on a logarithmic scale with higher values (right extension) shaded green indicative of possible hydrocarbons and lower values shaded blue indicative of water. As discussed in a previous section there are porosity measurements over this zone so that water saturation can be calculated, approximately 50% water and 50% hydrocarbon. There are zones above and below the M57B level that show a slight yellow color mixed with mostly grey and probably have high water saturations.

125. Exhibit 22 is the same presentation for the last 132 feet of the well below the main pay sands, M56D and M56E. The last string of casing was landed in this interval with the reamer shoe at 18,304 ft (md). The gamma ray and resistivity curves are shaded in the same fashion as Exhibit 21. The M56F, an oil zone, is the most prominent of the sands in this interval. Other sands are thin, two to four feet thick, and the resistivity response is suppressed compared to the M56F zone but indicative of possible hydrocarbons.

126. At a depth of 18,330 ft (md) to 18,340 ft (md) the mud log recorded methane and ethane and the cuttings showed a slight increase in sand count and a dull yellow fluorescence on 1-2 pieces with no cut. Unfortunately, the resistivity values were not recorded over this interval. The gamma ray response, methane and ethane on the mud log, a slight increase in sand count and fluorescence, taken together suggest that the lowest interval in the well may be hydrocarbon (oil) bearing.

X. Summary of My Analyses

127. Visual inspection of the Triple Combo log shows the M57B zone has positive hydrocarbon indicators of decreasing gamma ray, increasing resistivity, neutron and density curves merging, neutron density crossover and adequate porosity. Additionally, steep bed dip most likely reduces measured resistivity. Taken together, this method shows it is highly likely that the zone is hydrocarbon bearing.

128. Before the cement job was pumped on April 19, 2010 there was sufficient data available such that a reasonably prudent analyst would have classified the M57B zone as hydrocarbon bearing.

129. After the incident quantitative analysis by BP, Schlumberger's LSA calculations and my independent analysis confirm that the M57B was the uppermost hydrocarbon bearing zone in the open hole section of the Macondo well prior to cementing the final string of casing.

130. Based on my work I have formed the following opinions:

- BP mistakenly identified the M56A zone at 17,803 ft (md) as the uppermost hydrocarbon bearing zone in the Macondo well;
- BP should have identified the uppermost hydrocarbon bearing zone as the M57B zone, located at 17,467 ft (md);
- BP's analysis of the highest hydrocarbon zone was superficial, incomplete and thus incorrect;
- BP knew or should have known that the M57B zone was the shallowest hydrocarbon zone in the well prior to the final pumping of cement in the Macondo well;
- I understand that BP did not provide information concerning the M57B zone to Halliburton, and that BP' incorrect identification of the uppermost hydrocarbon bearing zone could have affected the cement job;
- It is possible that additional hydrocarbon bearing zones exist deep in the well and are located at and below the location of the reamer shoe at 18,304 ft (md); and
- The pressure in the M57B is 12,871.1 psia.

131. I reserve the right to modify this report and to supplement my opinions if additional data becomes available and in response to reports served by other parties.

Richard F. Strickland, P.E., PhD
October 17, 2011
PE License No. 45925

The Strickland Group, Inc.
Texas Registered Engineering Firm F-4263

Statement of Compensation

I am being compensated at the rate of $450 per hour for my services to HESI in preparing this report, and will be paid at the rate of $450 per hour for any deposition or trial testimony in this matter.

XI. List of Exhibits

Exhibit 20: Water saturation information from Schlumberger's laminated sand analysis.

Exhibit 21: Color-coded LWD measurements of gamma ray and deep resistivity around M57B zone.

Exhibit 22: Color-coded LWD measurements of gamma ray and deep resistivity around M56F zone, near casing shoe.

XII. List of Appendices

Appendix A: Resume, bibliography of published papers and a list of recent testimonies of Richard F. Strickland.

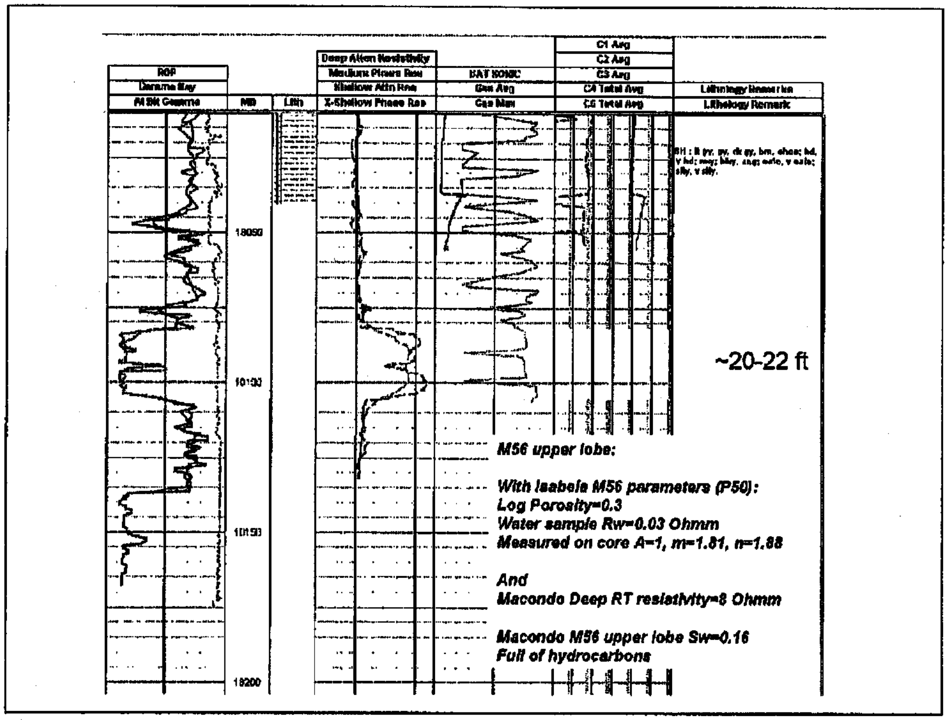
Appendix B: List of Documents Received and Reviewed in Preparation of Opinions.

Strickland Exhibit 1

From: Skripnikova, Galina
Sent: Sun Apr 04 13:32:58 2010
To: Bennett, Gord (Q0 Inc.); Albertin, Martin L.; Arca, Serkan; Bellow, Jonathan M; Bodek, Robert; Boesiger, Todd ; Bondurant, Charles H; Cocales, Brett W; Decalf, Carole; Depret, Pierre-Andre ; Guide, John; Hafle, Mark E; Johnston, Paul J (Houston); Lacy, Stuart C (QO Inc.); LeBleu, John B; Lundquist, Jason J; McAughan, Kelly; Morel, Brian P; Nguyen, Binh Van; Paine, Kate (QuaDril Energy LT); Piccoli, Leonardo H; Reiter, Doris; Ritchie, Bryan; Scherschel, Craig; Simpson, Brad; Sims, David C; Vinson, Graham (Pinky); Zamorouev, Alexander V
Subject: Macondo Update - Good News!
Importance: Normal
Attachments: Macondo_TD_Section_Drilling_04042010_8am.ppt

<<...>>
Galina

3371
Exhibit No. ______
Worldwide Court Reporters, Inc.


ROP
Gamma Ray
MD
Lith
Medium Phase Res
Shallow Attn Res
X-Shallow Phase Res
Gas Avg
Gas Max
C1 Avg
C2 Avg
C3 Avg
C4 Total Avg
C5 Total Avg
Lithology Remark
18050
18100
18150
18200
~20-22 ft
M56 upper lobe:
With Isabela M56 parameters (P50):
Log Porosity=0.3
Water sample Rw=0.03 Ohmm
Measured on core A=1, m=1.81, n=1.88
And
Macondo Deep RT resistivity=8 Ohmm
Macondo M56 upper lobe Sw=0.16
Full of hydrocarbons

Strickland Exhibit 2

From: Skripnikova, Galina
Sent: Mon Apr 12 15:38:17 2010
To: McAughan, Kelly; Bodek, Robert; Bellow, Jonathan M; Bondurant, Charles H
Cc: Wagner, Bruce E
Subject: RE: Fluid Sampling Program
Importance: Normal
Attachments: Presentation2.ppt

Are you all happy we continue the latest updated sampling program, including the very low sand? 3 samples all together.
Gor is quite stable at 3150, contamination<5%
about to start filling bottles

let us know

From: McAughan, Kelly
Sent: Monday, April 12, 2010 10:27 AM
To: Skripnikova, Galina
Subject: RE: Fluid Sampling Program

I'm waiting on Bruce right now. We have all been in the conference room. We thought the caliper looked fine but I will see what he says again.

Looks great on fluids!

From: Skripnikova, Galina
Sent: Monday, April 12, 2010 10:23 AM
To: McAughan, Kelly; Bondurant, Charles H; Bodek, Robert; Bellow, Jonathan M
Cc: Wagner, Bruce E
Subject: RE: Fluid Sampling Program

We think it is CMR and Density reading mud in washout (on caliper) just below the tight zone from 18185 to the bottom of the sand.
Bruce, did you see the logs? Can you please comment?
Thank you,
Galina, Stuart

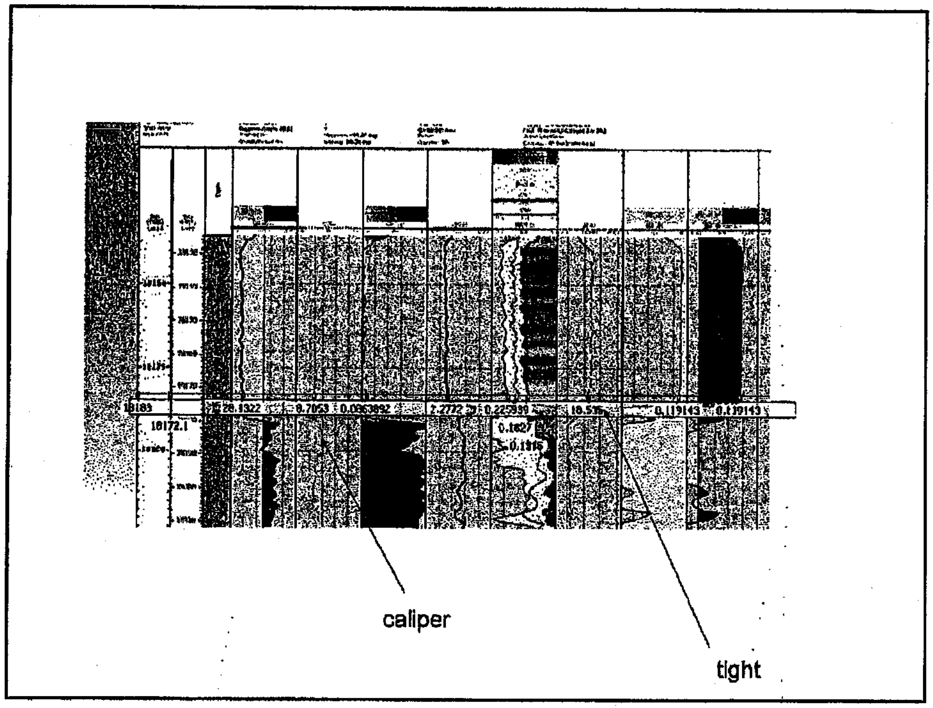
From: McAughan, Kelly
Sent: Monday, April 12, 2010 10:18 AM
To: Skripnikova, Galina

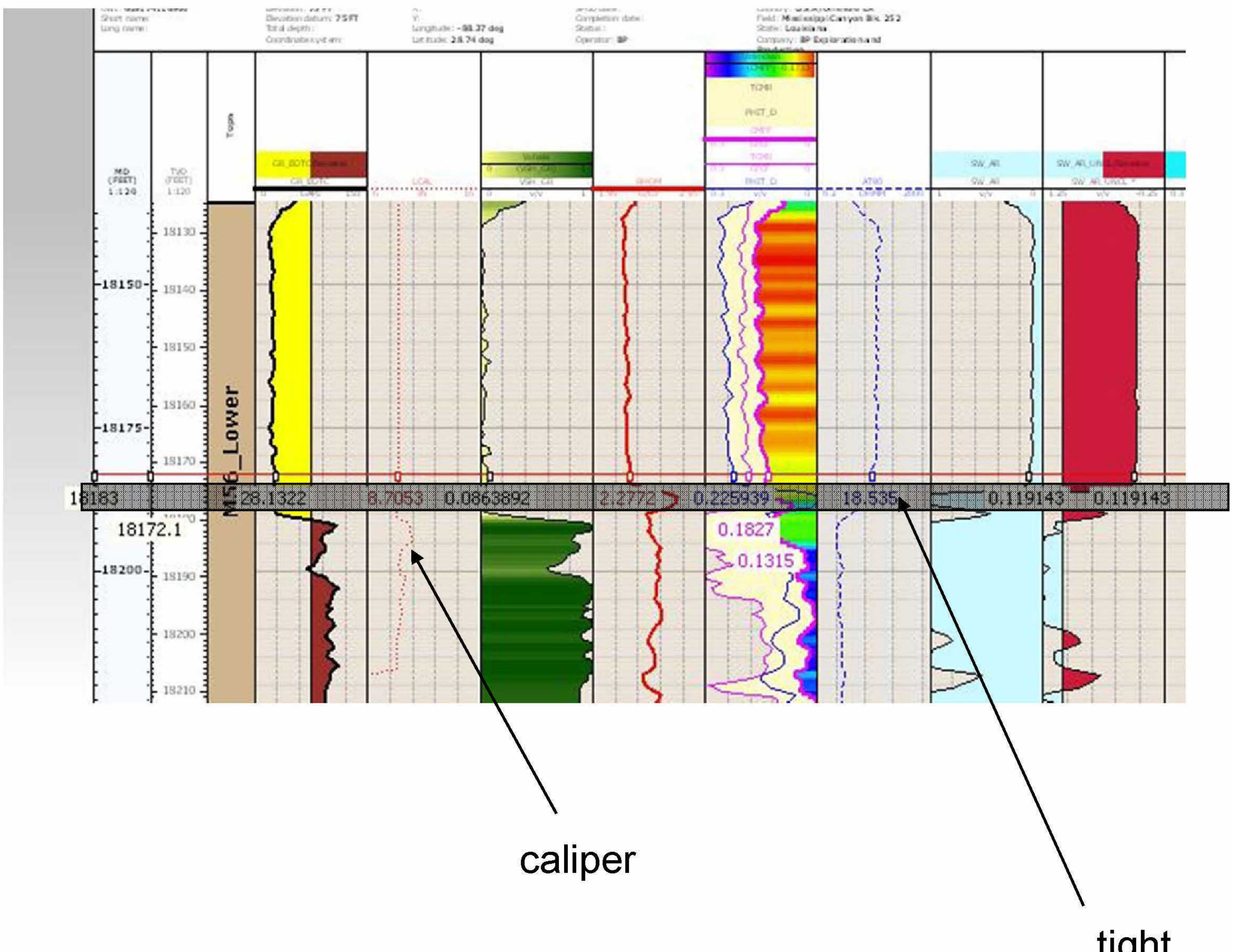
Subject: RE: Fluid Sampling Program
Around here they are thinking because of the high porosity on CMR that it looks frac' into. The density was high too saying lots of LCM material. You guys probably have a different interpretation. What do you think of that response on the bottom of the main pay?

From: Skripnikova, Galina
Sent: Monday, April 12, 2010 10:05 AM
To: McAughan, Kelly
Subject: RE: Fluid Sampling Program

Kelly, why do you think it's a loss zone?

From: McAughan, Kelly
Sent: Monday, April 12, 2010 9:47 AM
To: Skripnikova, Galina; Lacy, Stuart C (QO Inc.)
Cc: Bondurant, Charles H; Bodek, Robert; Bozeman, Walt; Ritchie, Bryan
Subject: Fluid Sampling Program
From looking at logs we have decided not to get a sample in that lower zone because of the loss zone at the bottom of the main pay. So we are going to take 3 sampling points.


caliper
tight


M56_Lower
18183
28.1322
8.7053
0.0863892
2.2772
0.225939
18.535
0.119143
0.119143
18172.1
0.1827
0.1315
caliper
tight

Strickland Exhibit 3

From: Skripnikova, Galina
Sent: Tue Apr 13 16:57:04 2010
To: Bodek, Robert
Cc: Ritchie, Bryan; Bondurant, Charles H; Morel, Brian P; Walz, Gregory S; Cocales, Brett W; Guide, John; Hafle, Mark E
Subject: RE: Top hydrocrabon bearing zone?
Importance: Normal

And high resistivity, don't see much on gas data though. Bobby, can you look back at geological report? Anything in it? Maybe too thin though

---

From: Bodek, Robert
Sent: Tuesday, April 13, 2010 11:54 AM
To: Skripnikova, Galina
Cc: Ritchie, Bryan; Bondurant, Charles H; Morel, Brian P; Walz, Gregory S; Cocales, Brett W; Guide, John; Hafle, Mark E
Subject: RE: Top hydrocrabon bearing zone?

I can buy that. Tha't the shallowest sand that we see legitimate DEN/NEU cross-over on the triple combo log

Bobby

From: Skripnikova, Galina
Sent: Tuesday, April 13, 2010 11:51 AM
To: Bodek, Robert
Cc: Ritchie, Bryan; Bondurant, Charles H; Morel, Brian P; Walz, Gregory S; Cocales, Brett W; Guide, John; Hafle, Mark E
Subject: RE: Top hydrocrabon bearing zone?

I think the shallowest HC sand is at 17,803 md

From: Bodek, Robert
Sent: Tuesday, April 13, 2010 11:30 AM
To: Skripnikova, Galina
Cc: Ritchie, Bryan; Bondurant, Charles H; Morel, Brian P; Walz, Gregory S; Cocales, Brett W; Guide, John; Hafle, Mark E
Subject: Top hydrocrabon bearing zone?

Galina,
The drilling team, in their cement procedure preparations, needs to know the depth of the shallowest hydrocarbon-bearing interval in the open hole. From your calculations, could you provide the depth of the shallowest hydrocarbon zone and 'reply all' to this email.
Thanks!

Bobby Bodek
BP America Inc.
Geological Operations Coordinator
Gulf of Mexico Exploration - Tiger Team
(o) 281.366.3862
(c) 713.213.7553

Strickland Exhibit 4

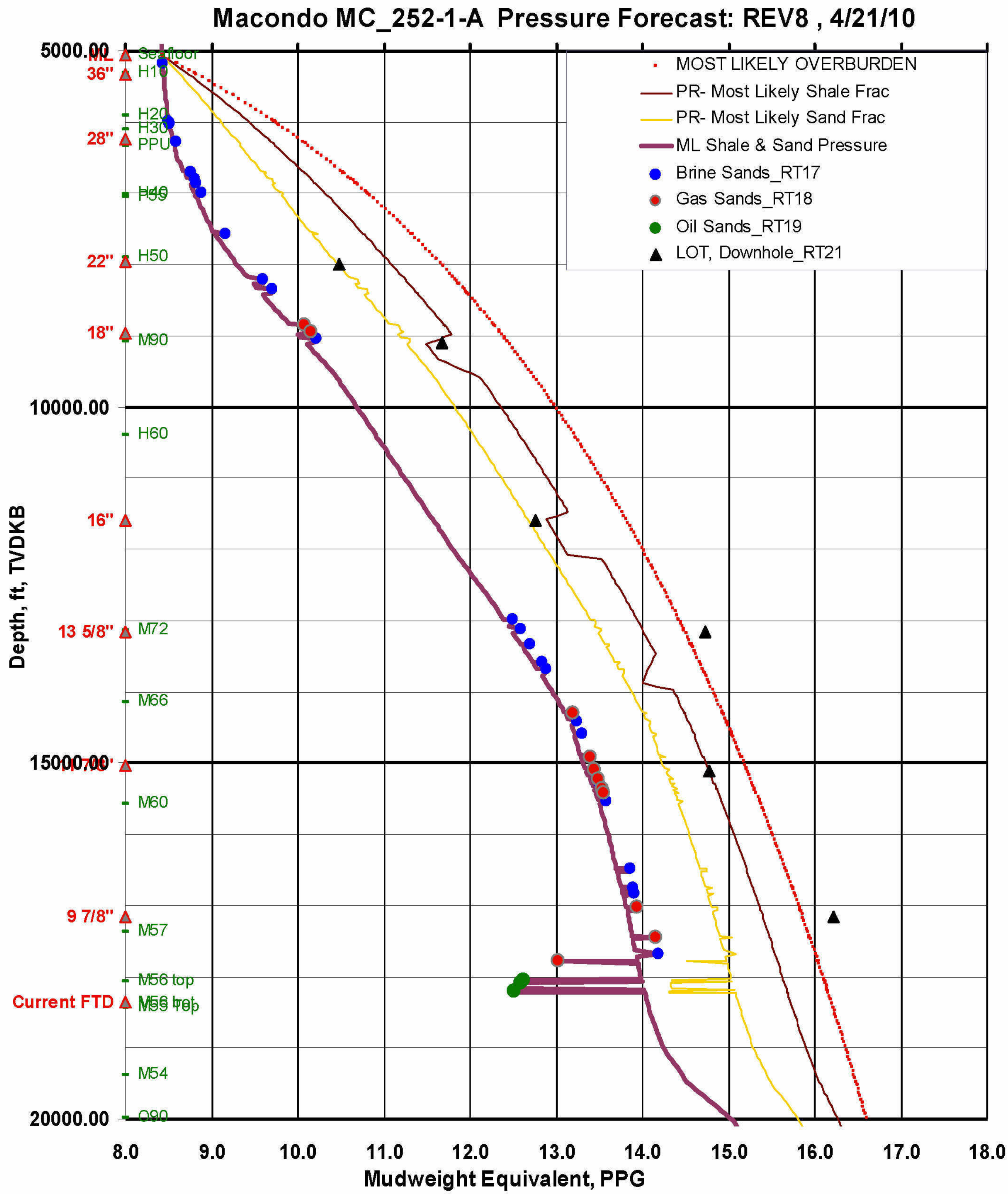
From: Albertin, Martin L.
Sent: Thu Apr 22 02:54:30 2010
To: Johnston, Paul J (Houston); Fleece, Trent J; Bodek, Robert; Bellow, Jonathan M; Hafle, Mark E; Morel, Brian P
Cc: Mix, Kurt; Skripnikova, Galina; Wagner, Bruce E
Subject: RE: PPFG for Macondo
Importance: Normal
Attachments: Maxondo_sand_table.xls; Macondo_PPFG_042110.ppt

Team,
Attached is the Macondo detailed sand pressure table, and a slide of the updated PPFG forecast.
<<...>> <<...>>
Let me know if you want the forecast spreadsheet, and I will post it to a transfer disk.
Marty

From: Johnston, Paul J (Houston)
Sent: Wednesday, April 21, 2010 9:35 PM
To: Fleece, Trent J; Bodek, Robert; Bellow, Jonathan M; Albertin, Martin L.
Subject: PPFG for Macondo

Trent
As requested. What I have included here is the predrill on Macondo which is spreadsheet dated 091809.xls. As well as Marty's Post well which he showed in the Hive today dated 042110.xls. I also grabbed what I think is Ray/ Marty and Bruce's preliminary information on where all the sands are in the well and basic fluids. Marty is working on a more detailed plot which will include the pressure's as well for tomorrow.
Hope this helps. I had to put it on this transfer folder as the files are too big. Let me know if you have issue's getting them. Bobby, Jon, Marty included to keep them in the loop.
Paul J
\\Amhous10\public\Johnston_Paul\Macondo_PPFG

Paul Johnston
Geological Operations Coordinator
Gulf Of Mexico Exploration
office # 281-366-1664
cell # 713-540-7926



Macondo PPFG update: 4/21/10
All sands identified on LWD and Wireline Data

Top (MD)	Base, MD	Top, TVDSS	Base, TVDSS	Interpreted Fluid Type	Estimated Formation Pressure, psig	Estimated Sand Fracture Pressure, psig
5196	5325	5106	5236	BRINE	2270	2293
6006	6009	5916	5920	BRINE	2645	2833
6029	6037	5940	5948	BRINE	2658	2850
6042	6049	5952	5960	BRINE	2665	2859
6288	6319	6199	6230	BRINE	2802	3037
6723	6726	6634	6637	BRINE	3053	3357
6822	6861	6732	6772	BRINE	3113	3430
6866	6876	6776	6787	BRINE	3139	3464
7008	7015	6919	6926	BRINE	3225	3571
7580	7582	7490	7493	BRINE	3601	4019
8230	8273	8140	8184	BRINE	4097	4567
8362	8420	8273	8331	BRINE	4206	4683
8858	8862	8768	8773	GAS	4632	5129
8876	8943	8786	8854	BRINE	4648	5145
8948	8953	8859	8864	GAS	4711	5211
9045	9096	8956	9007	BRINE	4795	5300
13003	13073	12903	12974	BRINE	8429	9067
13148	13153	13048	13053	BRINE	8579	9216
13357	13368	13257	13268	BRINE	8795	9432
13605	13607	13505	13508	BRINE	9052	9689
13701	13768	13601	13669	BRINE	9152	9789
14319	14323	14219	14223	GAS	9792	10430
14328	14331	14228	14232	BRINE	9801	10440
14442	14466	14342	14367	BRINE	9920	10558
14622	14625	14522	14526	BRINE	10089	10737
14940	14949	14840	14849	GAS	10375	11047
15110	15112	15010	15013	GAS	10534	11217
15244	15248	15144	15148	GAS	10662	11351
15308	15310	15208	15211	BRINE	10724	11416
15390	15392	15290	15292	GAS	10802	11498
15440	15442	15340	15342	GAS	10850	11549
15562	15564	15462	15464	BRINE	10966	11672
16513	16548	16413	16449	BRINE	11868	12631
16785	16786	16685	16686	BRINE	12094	12890
16853	16856	16753	16756	BRINE	12151	12955
16860	16860	16760	16761	BRINE	12156	12961
17056	17081	16956	16981	GAS	12330	13153
17467	17468	17367	17369	GAS	12829	13626
17699	17708	17599	17609	BRINE	13020	13847
17804	17806	17704	17706	GAS	12023	13397
18067	18089	17967	17990	OIL	11824	13438
18120	18191	18020	18091	OIL	11835	13472
18232	18239	18132	18139	OIL	11832	13531

bp

Macondo Technical Note

Title:	Shut-in Pressures: Range and Likelihood
Contributors:	Mike Levitan, Debbie Kercho, Farah Saidi, Simon Bishop, Yun Wang, Charles Bondurant, Andrew Sweeney, Galina Skripnikova, David Grass, Pierre Andre Depret, Tony Laio, Kelly McAughan, Chris Cecil, Bob Merrill
Issued by:	Bob Merrill
Date:	May 19, 2010
Version:	A - DRAFT

Question Addressed in this Technical Note:
As BP is currently evaluating kill options for the Macondo well, this technical report addresses the following questions:

- What is the likely range of shut-in pressures at the well head (SIWHP)?
- What probability of occurance can be assigned to each of the calculation methods.
- Is it likely to change over time?

This note expands upon earlier work documented in a draft technical note dated 17-May. We are not able answer the third question at this time; there was insufficient time to obtain the results from transient wellbore simulation.

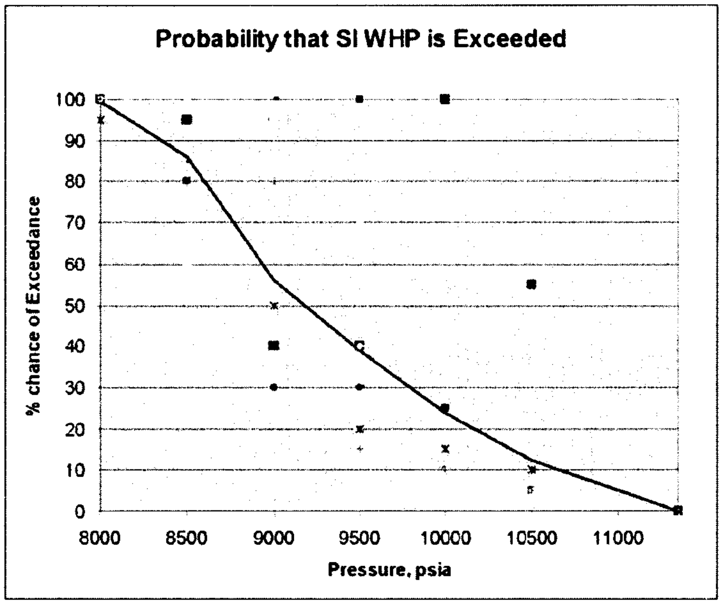
Key Conclusions

1. The SIWHP is expected to be between ~8,100 psia and 11,350 psia. This range considers the impact of shallower high pressure gas zones, which are found at depths between 17,467 – 17,806 ftMD-RKB.

   - There was consensus that these gas zones were likely to be open, but the contribution and depletion of these zones was an area of uncertainty.

   - The shallower gas zones at 12,030 – 13,320 ftMD-RKB are behind the 13 5/8 inch liner and are not likely to increase the stated range of SIWHP.

2. The team was requested to estimate the likelihood of SIWHP exceeding a number of values. The following figure provides that estimate:



It is clear that the team believes that there is a 20% probability that the SIWHP will exceed 10,000 psia. The team also believes that the SIWHP is only 15% likely to be less than 8,500 psia.

3. The Enterprise has reported considerable variation in the gas oil ratio of the recovered oil. These GORs range from an initial 2,850 SCF/stb, consistent with the oil's PVT data, to almost 7,500 SCF/stb. The GORs show an increasing trend.

   - The 7,500 SCF/stb value is consistent with a calculated SIWHP of ~9,500 psia.
   - The trend of GOR with time influenced the presented cumulative probability chart.

Attachments

1. Pressure Ranges and Calculation Methods
2. Method for Establishing probabilities
3. Table of Formation Properties
4. Thermal Gradient

Model Results of Shut-In Pressure for Macondo Well

Modelled Sand(s)	SI WHP	Tool	Correlation	Gradient
M56E Oil	8,164	Pipesim	EoS Tables	Geothermal
M56F Oil	8,169	Pipesim	EoS Tables	Geothermal
M56D Oil	8,181	Pipesim	EoS Tables	Geothermal
M56e,d,f	8,351	Prosper	Al-Marhoun	Geothermal
M56A Oil	8,481	Pipesim	EoS Tables	Geothermal
Lower Oil Sands + Gas Zone	8,503	Prosper	Al-Marhoun	Geothermal
Lower Oil Sands + Gas Zone	8,605	Prosper	Vasquez-Beggs	Geothermal
M56E Oil	8,232 - 8,860	Excel	Incompressible	none
M56E Gas	10,200	Excel	Hall-Yarborough	linear
M56A (2nd sand @17804) Gas	10,372	Prosper	Al-Marhoun	Geothermal
M56A (as gas-filled)	10,569	Pipesim	EoS Tables	Geothermal
M56A+M57B Gas	10,797	Prosper	Al-Marhoun	Geothermal
M57B Gas	11,184	Prosper	Al-Marhoun	Geothermal
M57B Gas	11,327	Pipesim	EoS Tables	Geothermal
M57B Gas	11,368	Excel	Hall-Yarborough	linear
Oil, GOR = 7500	9,450	Prosper	Al-Marhoun	Geothermal
Oil, GOR = 7500	9,600	Pipesim	EoS Tables	Geothermal

Method Used to Develop Cumulative Probabilities

The cumulative probabilities were determined through a polling process. The petroleum and reservoir engineers were presented the model results, the modelling assumptions, and the other considerations / constraints.

Each engineer was asked to consider a range of values (8000, 8500, 9000, 9500, 10000, 10500, and 11350 psia) and estimate in their own best judgement the probability that the SIWHP would exceed that value. As the models predicted a pressure range of 8,100 psia to 11,350 psia, the probability of exceeding 8,000 psia was almost 100% and that of exceeding 11,350 psia was 0%.

After each engineer wrote down their values, they were polled in a random order for their estimated probability. These were then averaged to create a cumulative permeability curve for each pressure.

This was then followed by a discussion of the technical reasons behind the estimates At the conclusion of this discussion the group consensus was to increase the probabilities of exceedance for 10,000 and 10,500 psia by 5%.

The resulting curve was plotted. The statistics associated with each point (after the 5% shift) are provided in the following table:

Pressure	Mean Probability to Exceed	Min Probability	Max Probability
8,000	99%	95%	100%
8,500	86%	60%	100%
9,000	56%	30%	100%
9,500	39%	5%	100%
10,000	24%	10%	100%
10,500	12%	5%	55%
11,350	0%	0%	0%

Layer Properties Used for Calculations

Top of Sand MD Depth	Bottom of Sand MD Depth	Top of Sand TVDSS Depth	Bottom of Sand TVDSS Depth	Fluid Content	Expected to flow (Used in Modeling)	Sand Name	Gross Sand	Net Sand	Pay Sand	Average Gross Porosity	Average Net Porosity	Average Pay Porosity	Average Net Sw	Average Pay Sw	Arithmetic Air Perm	Geometric Air Perm	Geometric Perm converted to Oil (85%)	Temperature	Pressure
Feet	Feet	Feet	Feet				Feet	Feet	Feet	%	%	%	%	%	MD	MD	MD	Degrees F	psia
12030.0	12246.0	11645.0	12161.0	Gas	Yes if Liner Leak	S023	2	2	2								1000	152	7081 psia (based on pore pressure)
13227.2	13230.2	13141.6	13144.6	Gas	Yes if Liner Leak	S028	3	3	3								1000	176	8405 psia (based on pore pressure)
17467.0	17469.0	17381.1	17383.1	Gas	Yes	M57B	2	2	2	17.95	17.95	17.95	51.58	51.58	15.08	7.5	7.50	234	12847 psia (based on post well pore pressure)
17700.0	17708.5	17614.1	17622.6	Uncertain	No	M57C	8.5	0	0	8.95								237	13017 psia (Geo tap) (MDT 3 attempts no seal)
17804.0	17806.5	17718.1	17720.6	Oil or Gas	Yes	M56A	2.5	2.5	2.5	22.48	22.48	22.48	24	24	1702.07	467.39	397.28	239	12038 psia (MDT)
17975.5	17989.5	17880.6	17303.6	Brine	No	M56B	6	3	0	14.18	16.09		57.65		7.43	3.12		241	
18030.0	18032.0	17944.1	17946.1	Brine	No	M56C	2	2	0	17.28	17.28		64.2		4.73	4.05		241	
18067.0	18089.0	17981.1	18003.1	Oil	Yes	M56D	22	22	22	20.67	20.67	20.67	17.17	17.17	257.87	101.8	86.53	242	11841 psia (MDT & Geotap)
18120.0	18191.0	18034.1	18105.0	Oil	Yes	M56E	59.5	64.5	64.5	21.42	22.08	22.08	9.7	9.7	514.04	323.79	275.22	243	11850 psia (MDT)
18217.5	18238.5	18131.5	18152.5	Oil	Yes	M56F	6.5	6.5	6.5	21.08	21.08	21.08	21.85	21.85	1440.50	129.87	110.30	244	11868 psia (based on fluid gradient)
							Vsh<0.4	Poro>0.14	Sw<0.5	Vsh<0.4	Poro>0.14	Sw<0.5							
If Density log is not corrected to match core porosity																			
18067.0	18089.0	17981.1	18003.1	Oil	No Use Other	M56D	22	22	22	18.32	18.32	18.32	18.55	18.55	28.93	10.48	23.96		

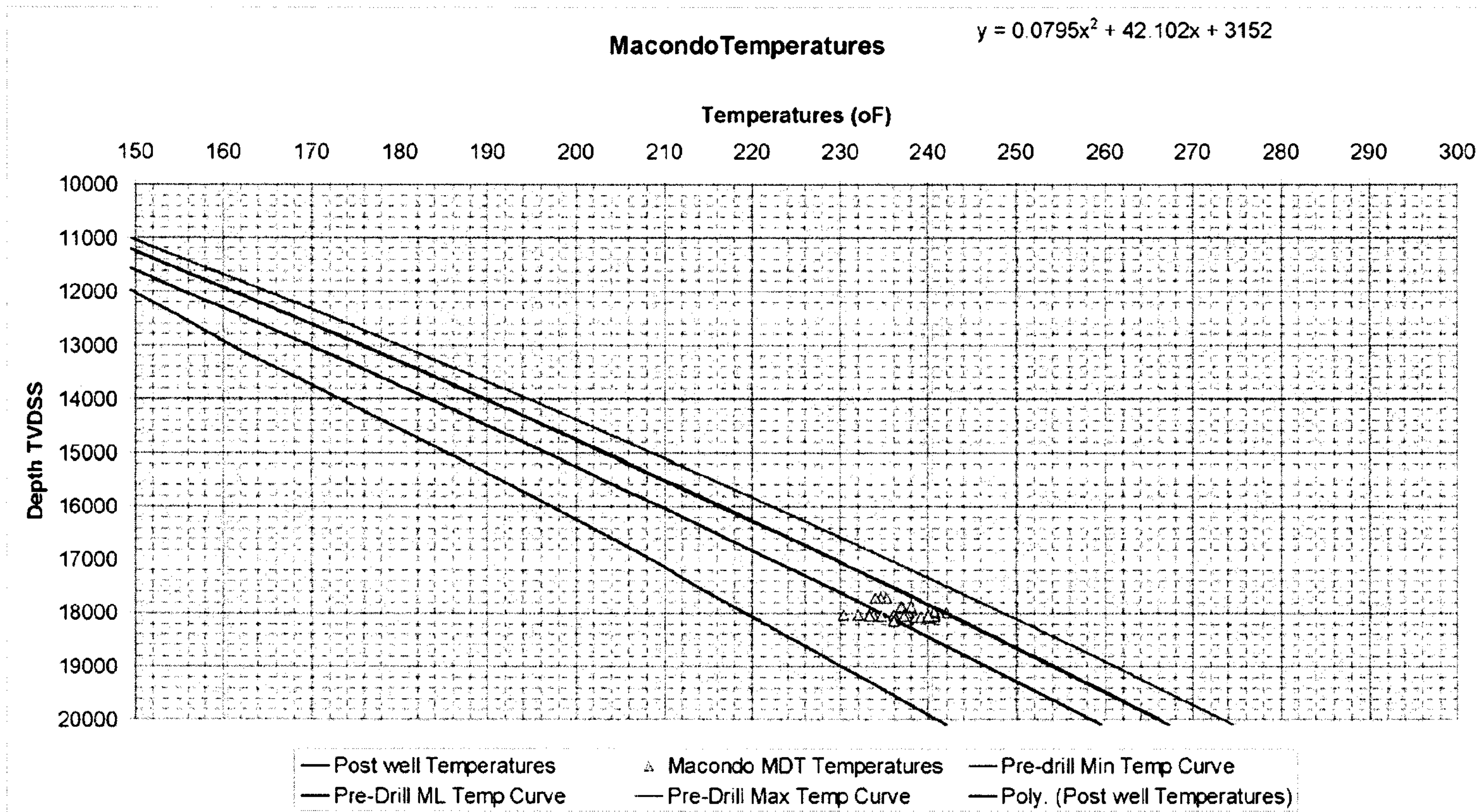
1. From core in M56D and M56E: K (klinkenberg air core at net confining stress = 2000 psi) is a function of core porosity at net confining stress
2. Log porosity is calibrated to core porosity at net confining stress in M56D & M56E
3. Log perm is calculated from core derived equation (from #1)

Gross has Vshale cut off Vsh<0.4
Net has a Porosity cut off Poro>0.14
Pay has a Sw cut off Sw<0.5

Water Depth = 4992 feet

Draft for Discussion

Thermal Gradient



Technical Note

Title:	Macondo SIWHP and Build-up Times
Prepared by:	Mike Levitan, Debbie Kercho, Farah Saidi, Simon Bishop, Tony Liao, Thomas von Schroeter, Kelly McAughan, Chris Cecil
Issued by:	Debbie Kercho and Chris Cecil
Date:	May 26, 2010
Revision:	D (Draft for Discussion)

Question Addressed in this Technical Note

As BP is currently evaluating kill options for the Macondo well, this technical report addresses the following question:

What is the estimated shut in pressure character for the well addressing:

a) time for Pressure Build Up at normal SIWHP

b) ultimate shut-in pressure taking into account both the oil bearing and gas bearing sands?

Incorporation of Subsequent Work

Subsequent to forming the evaluation team for this report, a larger team was established to evaluate both the range of shut-in pressures and the probability distribution for the pressures within that range. Portions of that team's work are included in Rev. D of this text. The larger team's work is documented in a separate note: Macondo Technical Note – Shut-in Pressures: Range and Likelihood.

Key Conclusions

1) The SIWHP is expected to be between 7,959 psia and 8,515 psia for the various oil sands between depths of 18,067' and 18,238.5' (MD-RKB). This range is based upon measured PVT data* and assumes no significant reservoir depletion.

*Note: oil-only cases were considered using a hypothetically assumed 7,500 scf/stb GOR oil which could be consistent with a 7,475 scf/stb value reportedly observed on the Enterprise vessel during a 3-1/2 hour flow period. This GOR measurement is considered highly uncertain for a number of reasons. The case was evaluated for completeness and resulted in SIWHP between 9,450 psia and 9,600 psia.

2) Depending upon how much free gas from the various gas sands between depths of 17,467' and 17,806.5' (MD-RKB) is considered to be adding to the total flow, the maximum SIWHP could range between 7,515 psia and 8,615 psia. Methane was used for the dry gas PVT properties. Varying degrees of gas sand depletion were considered, as was cross-flow between oil and gas sands during the shut-in period.

3) Were the entire well bore to be gas filled, SIWHP would range between 9,190 psia and 11,327 psia. For this to occur it is necessary to assume that the oil sands do not contribute to flow. Finger-printing of the oil on the surface of the Gulf of Mexico confirm M56 as their source, making this assumption impossible. Methane was used for the dry gas PVT properties.

4) The time required for oil sands between depths 18,067' and 18,238.5' (MD-RKB) to build-up to a static SIWHP depends on the assumed location of the flow restriction.

   a. for a case in which there is a flow restriction at a shallow location in the well the time to build-up to a nearly-static SIWHP is on the order of 5 minutes.

   b. for a case in which there is a flow restriction located deep in the well the time to build-up to a nearly-static SIWHP is on the order of 30 minutes.

5) When both the gas sand at a top depth of 17,804' (MD-RKB) and the oil sands between depths 18,067' and 18,238.5' (MD-RKB) contribute to flow, the time required to build-up to a static SIWHP is essentially the same as the cases listed above in conclusions (4) a. and (4) b.

6) Reservoir pressure depletion is expected to range from 40 psi (assuming a production rate of 5,000 bopd) to 400* psi (assuming a production rate of 60,000 bopd) from April 20 to May 14, 2010. Such depletion would reduce all SIWHP estimates by an equivalent amount, except those calculated using the GAP software program which already includes the impact of depletion.

*Note: Reported wellhead pressure was 3800 psig initially and 3100 psig on May 14. A case was developed to determine that an initial flow rate of ~93 mbopd would be required to create sufficient reservoir depletion to account for the observed 700 psi decrease in flowing wellhead pressure using current estimates of OOIP. A new wellhead pressure of 3500 psig was reported on May 21, so this scenario is no longer considered valid.

Discussion

Shut-in Wellhead Pressure (SIWHP) – BP Estimates

All oil SIWHP calculations are based on a static formation pressure measured by MDT (11,850 psia at 18,124' MD-RKB) and PVT lab analyses from Pencor and Schlumberger. The PVT lab analyses were conducted on MDT samples taken at 18,142' MD-RKB. We have conducted QA/QC on the samples and are satisfied that they represent the reservoir fluid. The two vendors' results are consistent with each other with respect to a single phase fluid. Tests are ongoing as of May 14, 2010 on two additional samples taken at depths: 18,086' MD-RKB and 18,142' MD-RKB.

Black-Oil PVT tables were generated in Petroleum Experts software using published correlations. Initial estimates were based on reference values of Oil Gravity (35 °API,) GOR (3,000 scf/stb,) Pbp (6,650 psig,) Reservoir Temperature (240 °F,) initial Reservoir Pressure (11,850 psig) and used the Lasater correlation. The reference values were updated during the evaluation process as new data were obtained. The SIWHP values in the table below which were generated using the PROSPER and GAP software programs are generally based on the Al-Marhoun correlation using reference values of Oil Gravity (35 °API,) GOR (2,920 scf/stb,) Pbp (6,500 psig,) Reservoir Temperature (243 °F,) initial Reservoir Pressure (11,850 psig.) This correlation provided the closest match to lab-measured fluid density.

Note: Pbp = 6,650 psia is an early value obtained from the GoM Exploration team (who received it verbally from PENCOR) and has been carried through these calculations. An observed value of 6,550 psia was reported by PENCOR on Monday, April 26, 2010. More recently (May 13, 2010) values were reported by Schlumberger (~6,322 psia) and Pencor (6,504 psia;) both from CCVE tests on a sample taken at 18,142' MDRKB. In an e-mail dated May 17, 2010, Kelly McAughan stated that she is using values of 6,504 and 6,307 (no units given.)

Gas was represented as nearly-pure Methane with gas gravity of 0.554.

A complete table of SIWHP calculation methods and results follows:

Modelled Sand(s)	SI WHP	Comments	Tool	Correlation	Gradient
M56F Zone Only	7,959		Olga	EoS Tables	Geothermal
M56E Oil, GOR ~3000 SCF/stb	8,164		Pipesim	EoS Tables	Geothermal
M56F Oil, GOR ~3000 SCF/stb	8,169		Pipesim	EoS Tables	Geothermal
M56D Oil, GOR ~3000 SCF/stb	8,181		Pipesim	EoS Tables	Geothermal
M56D Zone Only	8,213		Olga	EoS Tables	Geothermal
M56E Zone Only	8,238		Olga	EoS Tables	Geothermal
M56e,d,f; GOR ~3000 SCF/stb	8,351	3 Sands	Prosper	Al-Marhoun	Geothermal
Zone 56DEF assumed 10mbd rate	8,385		GAP	Prosper hydraulics	Geothermal
M56A Oil, GOR ~3000 SCF/stb	8,481	1 sand	Pipesim	EoS Tables	Geothermal
M56A Zone as oil	8,510		Olga	EoS Tables	Geothermal
Zone 56DEF; 10mbd; + aquifer	8,515		GAP	Prosper hydraulics	Geothermal
M56E Oil	8,232 - 8,860		Excel	Incompressible	none
Oil, GOR = 7500	9,450		Prosper	Al-Marhoun	Geothermal
Oil, GOR = 7500	9,600	1 sand	Pipesim	EoS Tables	Geothermal
Zone 56A, 57B + 56DEF unconstrained	7,515		GAP	Prosper hydraulics	Geothermal
Zone 56A, 57B + 56DEF @10mbd	8,415		GAP	Prosper hydraulics	Geothermal
Lower Oil Sands + Gas Zone	8,503	All 5 sands open	Prosper	Al-Marhoun	Geothermal
Lower Oil Sands + Gas Zone	8,605	All 5 sands open	Prosper	Vasquez-Beggs	Geothermal
Zone 56A, 57B + 56DEF @5mbd; 10x volume in gas sand	8,615		GAP	Prosper hydraulics	Geothermal
M56A Zone as gas	9,190		Olga	EoS Tables	Geothermal
M57B Gas	10,013		Olga	EoS Tables	Geothermal
M56E Gas	10,200		Excel	Hall-Yarborough	linear
M56A (2nd sand @17804) Gas	10,372	Single sand	Prosper	Al-Marhoun	Geothermal
M56A (as gas-filled)	10,569		Pipesim	EoS Tables	Geothermal
M56A+M57B Gas	10,797	2 sands	Prosper	Al-Marhoun	Geothermal
M57B Gas	11,184	1 sand	Prosper	Al-Marhoun	Geothermal
M57B Gas	11,327		Pipesim	EoS Tables	Geothermal
M57B Gas	11,363		Excel	Hall-Yarborough	linear

Legend:			
Oil, 3000 GOR		GAP	PVT Tables
Oil, 7500 GOR		OLGA	EoS Tables
Oil + Gas		Pipesim	
Gas		Prosper	
		Excel	

One further case should be noted, the only fully compositional oil simulation performed for this evaluation. IT predicted a SIWHP of 8,400 psia and was calculated using the OLGA v5.3 compositional, transient model (Ole Rygg, add energy, May 13, 2010)

Shut-in Wellhead Pressure (SIWHP) – U.S. National Laboratories Estimates

Teams from Lawrence Livermore, Los Alamos and Sandia National Laboratories provided estimates of SIWHP which range from 8,540 psia for oil alone to 9,510 psia for only gas. Methods and assumptions varied considerably between the 3 labs and are summarized by the following table, which is taken from Table 1 their report titled "*Tri-Lab Calculations on Oil Pressure – Report to BP*" and dated May 22, 2010.

Table 1. – Static Shut-In pressure predicted at the Well Head

Analysis	SNL	LANL	LLNL
Description	Hydraulic head analysis using PVT data supplied by BP in file *32126 Preliminary Data.xl.*	Hydraulic analysis using PVT data supplied by BP	Hydraulic analysis using PVT data supplied by BP. No separate methane (as above bubble point)
Assumptions	Bracketing calculations for liquid and vapor	Used column-averaged liquid oil density, no gas	Used BP provided PVT fluid properties.
Properties	13,000 ft elevation change Black Oil 587 kg/m^3 Vapor Density 415 kg/m^3	Black Oil 31 lb/ft^3 (497 kg/m^3) 13293 ft elevation change	Density will change with temperature
Results	8540 psia using oil 9510 psia using gas	8938 psia	<u>Pure BP PVT fluid:</u> 9082 psia (at equilibrium with geothermal gradient); 9187 psia (initially isothermal) <u>Pure methane:</u> 8095 psia (equilibrium); 8648 psia (isothermal)
Comments	Pressures consistently above 6650 psia, so fluid single phase	This represents a final steady-state condition. Initial transient shut-in pressure may be significantly higher.	SINDA/FLUINT model, 50m vertical resolution, coupled fluid/thermal solution

Note: during the initial presentation from the National Labs, BP requested verification that the shut-in pressures would actually be lower with Methane filling the well bore than they would with the oil/gas mixture. The presenter verified that the numbers stated correctly reflect his findings. This is not consistent with BP's mental model.

The National Labs teams expressed concerns about gas bubbling to the top of the well bore after shut-in, and asked whether BP models allow for that; and also for gas re-dissolving in the oil? They believe that it could add ~200 psi and will model it if requested. Their modeling does not currently account for this.

Note: *this requires confirmation with the OLGA modelers*, but other team members believe that the OLGA models both account for the gas bubbling upward effect; and that the compositional OLGA model accounts for the gas re-dissolution effect.

Pressure Build-up Time

The reservoir pressure transient calculations were performed using the PIE pressure transient analysis software. Two reservoir models were used:

1) a single oil layer (k_o= 300mD, h= 88ft, A= 3,500' x 8,000', ϕ= 21%, S_w= 12.3%, c_o= 14.6 μsips, μ_o= 0.168 cP, B_o= 2.77rb/stb, P_{ri}= 11,850 psia)

2) two layers, the first identical to the previously described oil layer and the 2nd mimicking a gas layer which has the same areal extent, water saturation and porosity, h= 3ft, k_g= 15 mD (equiv. k_o= 72mD) and P_{ri}= 12,028 psia. This model incorporates cross-flow between the two layers in the well bore. The initial model date was May 3, 2010.

Rates of 5,000 bopd and 25,000 bopd were assumed for the flow period in these calculations. There was no significant difference in the build-up times between cases using these assumed flow rates.

The well bore portion of the pressure calculations were performed using OLGA software with the bottom-hole pressure calculations from PIE as a boundary condition.

Reservoir Depletion

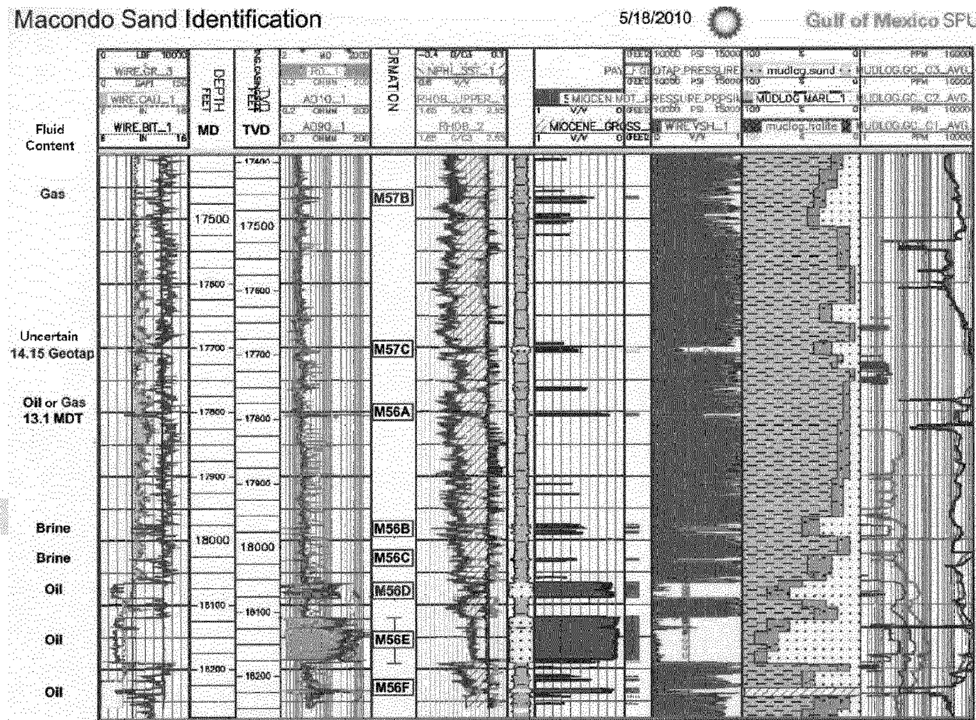
Reservoir pressure depletion due to production was evaluated using the MBal software. Model inputs included: 11,850 psig initial reservoir pressure, 188 mmstb original oil in place (based on volumetric calculations,) no aquifer, no gas cap, S_w=15%, c_f= 6 μsips c_w= 4.5 μsips; Corey exponents and endpoints of 1.2 and 0.63 for water, 2 and 0.8 for oil, 1.5 and 0.9 for gas.

Three production rate scenarios were evaluated. A wellhead restriction was added to restrict initial rate to 5, 20 and 60 mbopd. The production rate was allowed to decrease as reservoir pressure depleted. For the time period from April 20 – May 15, 2010, the expected depletion is 40 psi for the 5 mbopd case and 460 psi for the 60 mbopd case.

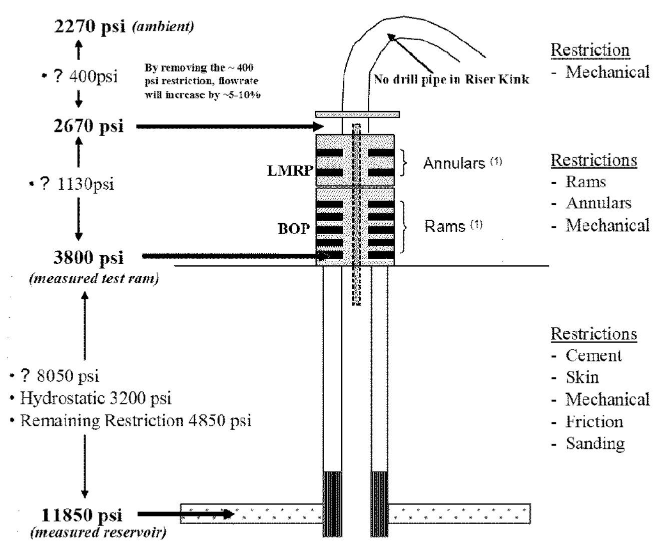
Further MBal work was performed to determine what withdrawal rate would have been necessary for reservoir depletion alone to account for the reported 700 psi decrease in flowing well head pressure from the value of ~3,800 psig measured on May 8, 2010 to the value of ~3,100 psig measured on May 15, 2010. Modelling showed that an initial rate of ~93 mbopd would be necessary to cause sufficient depletion to create this pressure response. This model assumed the same reservoir parameters as listed for the 40 – 460 psi depletion cases. A new wellhead pressure of 3,500 psig was reported on May 21, 2010, so this scenario is no longer considered relevant.

Appendix

Reservoir Description

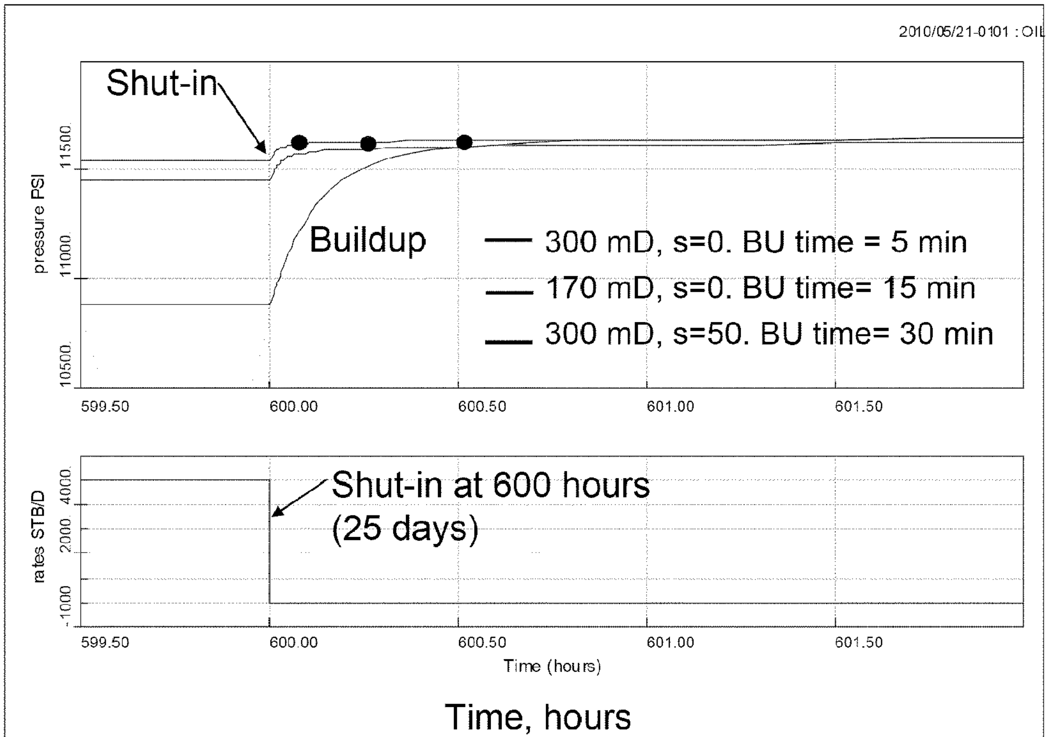


Current Available Pressure Measurements and Well Conditions



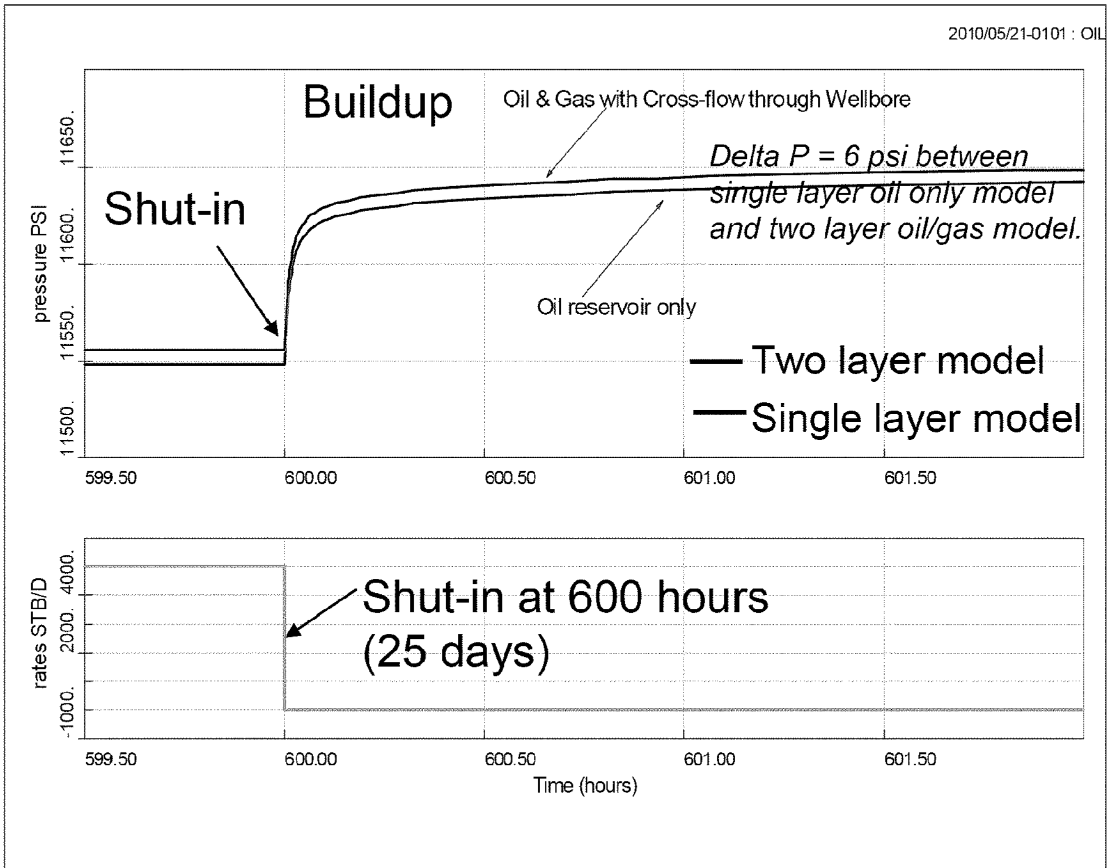
(1) All Rams and Annulars Closed

Single-layer Oil Reservoir Pressure Build-up Cases (5,000 bopd)




```
Homogeneous Reservoir
** Simulation Data **                                   Static-Data and Constants
 well. storage  = 0.10000              BBLS/PSI        Volume-Factor  = 2.770 vcl/vcl
 skin           =       0.      50.000 ()              Thickness      = 88.00 FEET
 permeability   =  300.00 170.00       MD              Viscosity      = 0.1780 CP
 Areal Ky/Kx    =  1.0000              ()              Total Compress = .1917E-04 1/PSI
 Perm-Thickness =  26400. 14960.       MD-FEET         Rate           = 5000. STB/D
 +x boundary    =   1750.              FEET            Storivity      = 0.0003543 FEET/PSI
 +x boundary    =    1.00              FOG-FACTOR      Diffusivity    = 110400. FEET^2/HR
 -x boundary    =   1750.              FEET            Gauge Depth    = N/A FEET
 -x boundary    =    1.00              FOG-FACTOR      Perf. Depth    = N/A FEET
 +y boundary    =   4000.              FEET            Datum Depth    = N/A FEET
 +y boundary    =    1.00              FOG-FACTOR      Analysis-Data  ID: DATA
 -y boundary    =   4000.              FEET            PFA Starts: 2010-04-26 01:01:01
 -y boundary    =    1.00              FOG-FACTOR      PFA Ends  : 2010-06-10 21:01:01
 Initial Press. = 11850.0              PSI
 Average Press. = 11654.0              PSI
```

Comparison of Single Layer Oil and Two Layer Oil & Gas Reservoir Pressure Build-up Cases

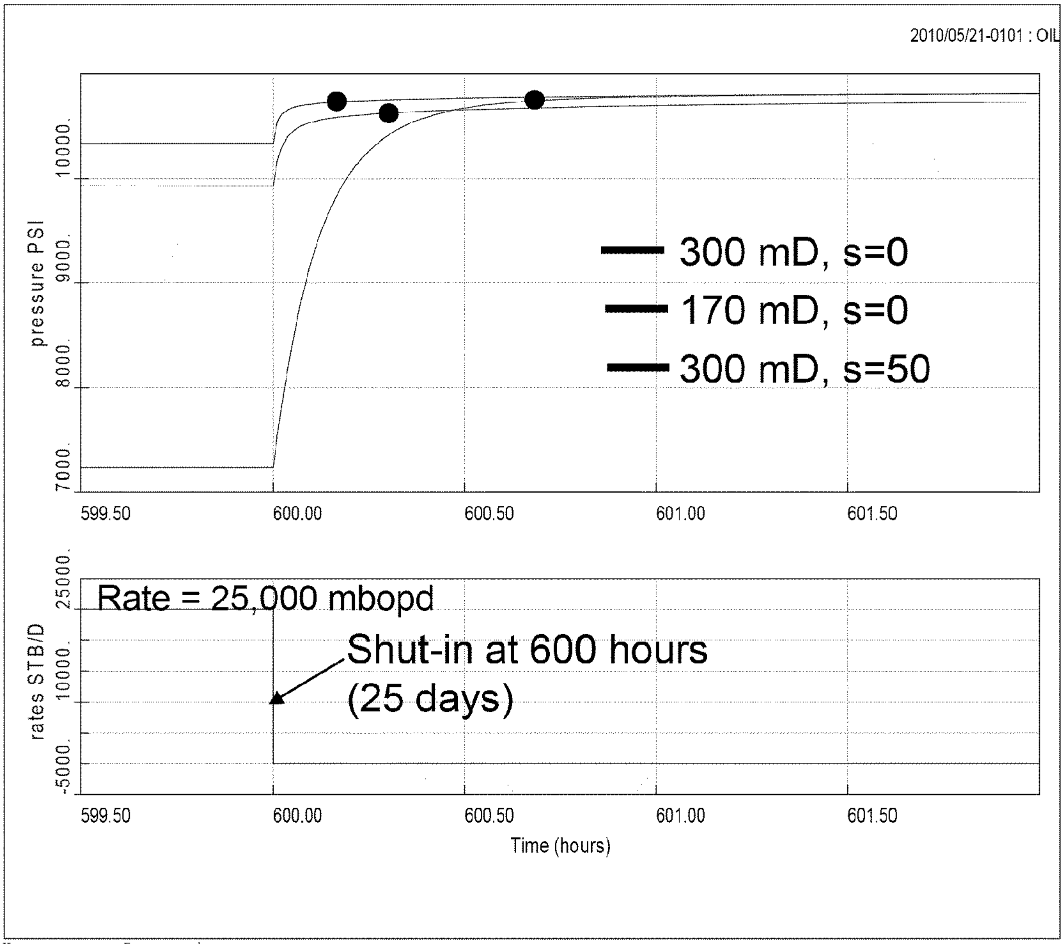



```
Two-layer Reservoir with NO Cross-flow and Limits
** Simulation Data **
 well. storage  =   0.10000 BBLS/PSI
 Skin(1)        =        0.
 Skin(2)        =        0.
 permeability-1 =    72.000 MD
 permeability-2 =    300.00 MD
 omega          =  0.032967
 Layer(P2-P1)   =   -178.00 PSI
 Perm-Thickness =    26616. MD-FEET
 +x boundary(1) =     1750. FEET (1.00)
 -x boundary(1) =     1750. FEET (1.00)
 +y boundary(1) =     4000. FEET (1.00)
 -y boundary(1) =     4000. FEET (1.00)
 +x boundary(2) =     1750. FEET (1.00)
 -x boundary(2) =     1750. FEET (1.00)
 +y boundary(2) =     4000. FEET (1.00)
 -y boundary(2) =     4000. FEET (1.00)
 Initial Press. =   12028.0 PSI
 Average Press. =   11666.4 PSI
 Pore-Volume    = .5351E+09 FEET^3
```

```
Type-Curve Model Static-Data
'Wall' Thick.   = 0. FEET
Layer-1 Thick.  = 3.00 FEET
Layer-2 Thick.  = 88.0 FEET

Static-Data and Constants
Volume-Factor   = 2.770 vol/vol
Thickness       = 91.00 FEET
Viscosity       = 0.1680 CP
Total Compress  = .1917E-04 1/PSI
Rate            = 5000. STB/D
Storivity       = 0.0003664 FEET/PSI
Diffusivity     = 114000. FEET^2/HR
Gauge Depth     = N/A FEET
Perf. Depth     = N/A FEET
Datum Depth     = N/A FEET
Analysis-Data  ID: DATA
PFA Starts: 2010-04-26 01:01:01
PFA Ends  : 2010-05-25 05:01:01
```

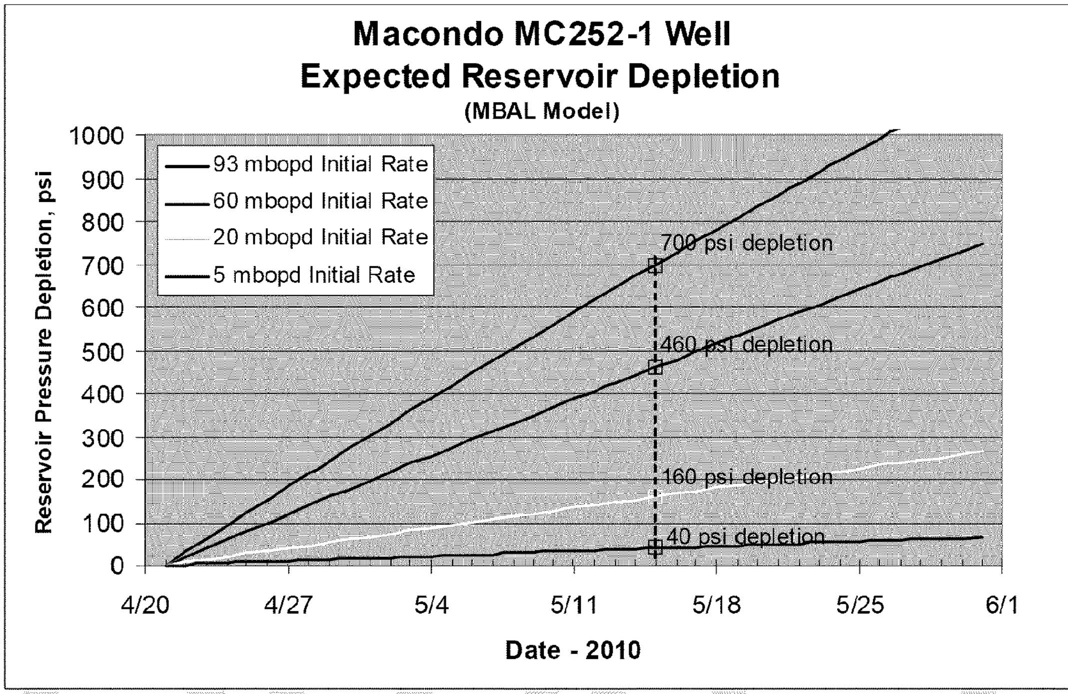
Single-layer Oil Reservoir Pressure Build-up Cases (25,000 bopd)



Homogeneous Reservcir

** Simulation Data **					Static-Data and Constants	
well. storage	=	0.10000		BBLS/PSI	Volume-Factor	= 2.770 vol/vol
skin	=	0.	50.000	()	Thickness	= 80.00 FEET
permeability	=	300.00 170.00		MD	Viscosity	= 0.1680 CP
Areal Ky/Kx	=	1.0000		()	Total Compress	= .1917E-04 1/PSI
Perm-Thickness	=	26400. 14960.		MD-FEET	Rate	= 25000. STB/D
+x boundary	=	1750.		FEET	Storivity	= 0.0003543 FEET/PSI
+x boundary	=	1.00		FOG-FACTOR	Diffusivity	= 117000. FEET^2/HR
-x boundary	=	1750.		FEET	Gauge Depth	= N/A FEET
-x boundary	=	1.00		FOG-FACTOR	Perf. Depth	= N/A FEET
+y boundary	=	4000.		FEET	Datum Depth	= N/A FEET
+y boundary	=	1.00		FOG-FACTOR	Analysis-Data	ID: DATA
-y boundary	=	4000.		FEET	PFA Starts:	2010-04-26 01:01:01
-y boundary	=	1.00		FOG-FACTOR	PFA Ends :	2010-05-25 05:01:01
Initial Press.	=	11850.0		PSI		
Average Press.	=	10870.2		PSI		
Pore-Volume	=	.5174E+09		FEET^3		

Summary of Pressure Depletion Calculations



Selected PVT data from Al-Marhoun correlations in PROSPER by Tony Liao:

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#####################
# PVT CALCULATIONS #
#####################
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Temperature (deg F)	Pressure (psig)	Bubble Point (psig)	Gas Oil Ratio (scf/STB)	Oil Density (g/cc)	Oil Viscosity (centipoise)	Oil FVF (RB/STB)	Oil Compress (1/psi)	Gas Density (g/cc)	Gas Viscosity (centipoise)	Gas FVF (ft3/scf)	Z Factor
----------	--------	-------	--------	-------	-----------	--------	----------	--------	-----------	--------	-------
40	500	3634	155	0.8573	93.7580	1.0222	2.0324E-04	0.0413	0.0107	0.02313	0.842
40	1097	3634	462	0.8009	20.8526	1.1592	2.1652E-04	0.1174	0.0142	0.00813	0.640
40	1695	3634	844	0.7516	8.4904	1.3219	2.2241E-04	0.2128	0.0218	0.00449	0.542
40	2292	3634	1285	0.7074	4.6022	1.5103	2.2312E-04	0.2713	0.0291	0.00352	0.574
40	2889	3634	1775	0.6677	2.9193	1.7247	2.2068E-04	0.3040	0.0345	0.00314	0.645
40	3487	3634	2306	0.6319	2.0401	1.9654	2.1612E-04	0.3256	0.0387	0.00293	0.726
40	4084	3634	2920	0.6062	1.5541	2.2211	3.2633E-05	0.3415	0.0421	0.00280	0.810
40	4682	3634	2920	0.6154	1.6493	2.1877	2.8482E-05	0.3541	0.0451	0.00270	0.895
40	5279	3634	2920	0.6227	1.7545	2.1622	2.5268E-05	0.3646	0.0478	0.00262	0.980
40	5876	3634	2920	0.6285	1.8680	2.1421	2.2706E-05	0.3737	0.0503	0.00255	1.064
40	6474	3634	2920	0.6334	1.9883	2.1258	2.0615E-05	0.3816	0.0525	0.00250	1.148
40	7071	3634	2920	0.6374	2.1137	2.1124	1.8877E-05	0.3886	0.0547	0.00246	1.231
40	7668	3634	2920	0.6408	2.2429	2.1011	1.7410E-05	0.3950	0.0567	0.00242	1.313
40	8266	3634	2920	0.6438	2.3743	2.0915	1.6154E-05	0.4008	0.0586	0.00238	1.395
40	8863	3634	2920	0.6463	2.5064	2.0832	1.5067E-05	0.4062	0.0604	0.00235	1.475
40	9461	3634	2920	0.6486	2.6377	2.0760	1.4117E-05	0.4112	0.0621	0.00232	1.556
40	10058	3634	2920	0.6505	2.7670	2.0697	1.3280E-05	0.4158	0.0638	0.00230	1.635
40	10655	3634	2920	0.6523	2.8929	2.0641	1.2536E-05	0.4202	0.0654	0.00227	1.714
40	11253	3634	2920	0.6539	3.0143	2.0591	1.1871E-05	0.4243	0.0670	0.00225	1.792
40	11850	3634	2920	0.6553	3.1299	2.0546	1.1274E-05	0.4282	0.0685	0.00223	1.870

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####################
# PVT CALCULATIONS #
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Temperature (deg F)	Pressure (psig)	Bubble Point (psig)	Gas Oil Ratio (scf/STB)	Oil Density (g/cc)	Oil Viscosity (centipoise)	Oil FVF (RB/STB)	Oil Compress (1/psi)	Gas Density (g/cc)	Gas Viscosity (centipoise)	Gas FVF (ft3/scf)	Z Factor
160	500	5290	103	0.7887	1.2674	1.0999	1.3548E-04	0.0302	0.0127	0.03156	0.926
160	1097	5290	309	0.7544	0.7364	1.1962	1.4516E-04	0.0712	0.0141	0.01340	0.850
160	1695	5290	565	0.7237	0.5044	1.3071	1.5143E-04	0.1167	0.0163	0.00818	0.797
160	2292	5290	861	0.6955	0.3788	1.4326	1.5516E-04	0.1609	0.0192	0.00593	0.780
160	2889	5290	1190	0.6690	0.3008	1.5726	1.5679E-04	0.1990	0.0223	0.00480	0.795
160	3487	5290	1546	0.6442	0.2478	1.7273	1.5697E-04	0.2298	0.0254	0.00415	0.829
160	4084	5290	1928	0.6209	0.2094	1.8967	1.5602E-04	0.2546	0.0284	0.00375	0.877
160	4682	5290	2332	0.5990	0.1802	2.0810	1.5417E-04	0.2747	0.0311	0.00348	0.931
160	5279	5290	2758	0.5784	0.1574	2.2801	1.5168E-04	0.2913	0.0336	0.00328	0.989
160	5876	5290	2920	0.5799	0.1601	2.3216	2.6209E-05	0.3054	0.0359	0.00313	1.050
160	6474	5290	2920	0.5874	0.1709	2.2920	2.3796E-05	0.3175	0.0381	0.00301	1.112
160	7071	5290	2920	0.5937	0.1824	2.2678	2.1790E-05	0.3281	0.0401	0.00291	1.176
160	7668	5290	2920	0.5991	0.1943	2.2475	2.0096E-05	0.3375	0.0420	0.00283	1.239
160	8266	5290	2920	0.6037	0.2065	2.2303	1.8646E-05	0.3459	0.0437	0.00276	1.303
160	8863	5290	2920	0.6077	0.2190	2.2155	1.7392E-05	0.3535	0.0454	0.00270	1.367
160	9461	5290	2920	0.6113	0.2314	2.2026	1.6295E-05	0.3605	0.0471	0.00265	1.431
160	10058	5290	2920	0.6144	0.2438	2.1914	1.5329E-05	0.3670	0.0486	0.00260	1.494
160	10655	5290	2920	0.6172	0.2560	2.1814	1.4470E-05	0.3729	0.0501	0.00256	1.557
160	11253	5290	2920	0.6197	0.2679	2.1726	1.3703E-05	0.3785	0.0516	0.00252	1.620
160	11850	5290	2920	0.6220	0.2794	2.1646	1.3013E-05	0.3837	0.0530	0.00249	1.683

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####################
# PVT CALCULATIONS #
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Temperature (deg F)	Pressure (psig)	Bubble Point (psig)	Gas Oil Ratio (scf/STB)	Oil Density (g/cc)	Oil Viscosity (centipoise)	Oil FVF (RB/STB)	Oil Compress (1/psi)	Gas Density (g/cc)	Gas Viscosity (centipoise)	Gas FVF (ft3/scf)	Z Factor
240	500	6455	82	0.7462	0.6887	1.1576	1.0720E-04	0.0261	0.0141	0.03663	0.952
240	1097	6455	246	0.7208	0.4611	1.2371	1.1483E-04	0.0592	0.0151	0.01614	0.906
240	1695	6455	451	0.6981	0.3421	1.3272	1.2033E-04	0.0940	0.0166	0.01015	0.877
240	2292	6455	687	0.6771	0.2705	1.4278	1.2419E-04	0.1283	0.0185	0.00744	0.867
240	2889	6455	949	0.6571	0.2227	1.5389	1.2668E-04	0.1600	0.0206	0.00597	0.875
240	3487	6455	1234	0.6381	0.1884	1.6606	1.2799E-04	0.1878	0.0229	0.00508	0.899
240	4084	6455	1538	0.6199	0.1626	1.7929	1.2851E-04	0.2119	0.0251	0.00450	0.933
240	4682	6455	1861	0.6025	0.1423	1.9360	1.2826E-04	0.2326	0.0273	0.00410	0.973
240	5279	6455	2201	0.5858	0.1260	2.0897	1.2744E-04	0.2505	0.0294	0.00381	1.019
240	5876	6455	2556	0.5698	0.1126	2.2543	1.2618E-04	0.2660	0.0314	0.00359	1.068
240	6474	6455	2920	0.5551	0.1016	2.4254	2.5917E-05	0.2797	0.0333	0.00341	1.118
240	7071	6455	2920	0.5630	0.1087	2.3914	2.3732E-05	0.2917	0.0351	0.00327	1.171
240	7668	6455	2920	0.5698	0.1162	2.3630	2.1887E-05	0.3025	0.0368	0.00316	1.224
240	8266	6455	2920	0.5756	0.1238	2.3390	2.0308E-05	0.3123	0.0385	0.00306	1.278
240	8863	6455	2920	0.5807	0.1317	2.3184	1.8941E-05	0.3211	0.0401	0.00297	1.333
240	9461	6455	2920	0.5853	0.1396	2.3005	1.7747E-05	0.3292	0.0416	0.00290	1.388
240	10058	6455	2920	0.5893	0.1475	2.2849	1.6695E-05	0.3366	0.0431	0.00284	1.443
240	10655	6455	2920	0.5928	0.1554	2.2711	1.5760E-05	0.3435	0.0445	0.00278	1.498
240	11253	6455	2920	0.5960	0.1631	2.2589	1.4925E-05	0.3499	0.0459	0.00273	1.553
240	11850	6455	2920	0.5989	0.1706	2.2479	1.4173E-05	0.3559	0.0472	0.00268	1.607

Gulf of Mexico SPU

bp

Technical Memorandum

TITLE: **Post-Well Subsurface Description of Macondo well (MC 252)**

TO: **Kate Baker, Cindy Yeilding, Jay Thorseth, Peter Carragher**

WRITTEN BY: **Marty Albertin, Chuck Bondurant, Kelly McAughan, Binh van Nguyen Bryan Ritchie, Craig Scherschel, Galina Skripnikova**

DATE: **25th May 2010**

Introduction

This technical memorandum outlines the post-well subsurface description of the Macondo well in Mississippi Canyon Block 252 (OCS-G-32306) in the north-central Gulf of Mexico.

Prospect Name	Macondo
Surface Location Block No.	Mississippi Canyon 252
BP well name	MC 252_1
OCS-G Well number	OCS – G32306_01
Spud date on Marianas	6th October 2009
Released Marianas due to Hurricane Ida	27th November 2009
Re-entered well on Deepwater Horizon	10th February 2010
Category (Expl/Appr)	Exploration
Total Depth (MD/TVD/TVSS)	18,360' md / 18,349' tvd / -18,274' tvdss
EP Approved by MMS	04/06/2009
Water Depth	4,992 feet
Rotary Table Elevation	75 feet RKB
Top Reservoir Depth	18,065' md / 18,054' tvd / -17,965' tvdss
Net Reservoir Thickness	90 ft
Reservoir Temperature	236° F
Reservoir Pressure	11,850 psi
GOR	3,000 scf/bbl
API	35

Macondo spud
October 6, 2009

Marianas pulled off location
November 27, 2009
After running the 18" casing and cementing the same, the Marianas BOP failed a scheduled test. At the time of the failed test, the 18" casing had been run and cemented. No open hole was exposed. A cement plug was set in the 28" casing, and the riser/BOP stack was pulled. While the BOP stack was being repaired on deck, the late season hurricane Ida formed in the gulf. The well location was in the projected path of the hurricane. The Marianas was evacuated. Upon returning to the rig after the storm, inspections had revealed extensive damage to wire/cables along the underside of the rig. These wires/cables were damaged as the result of waves/swells impacting the underside of the hull. This caused the sheathing of many of the wires/cables to be worn to the point that bare wires were exposed. After assessing the situation it was deemed that the damage was too extensive to perform repairs on location. The rig was de-moored and towed to a shipyard in Mississippi to perform the requisite repairs. While being repaired in the shipyard, the rig contract expired. After finishing repairs, the rig was released.

Well status at time the Marianas was pulled off location
The 18" casing was run and cemented. A 200' cement plug was set near the 28" casing shoe. It was decided that the Deepwater Horizon would finish drilling the Macondo well after finishing appraisal drilling operations at the Kodiak discovery.

On location with the Deepwater Horizon
January 31, 2010
After performing scheduled drawworks and BOP maintenance, running the riser, and testing the BOP on the wellhead, the Macondo well was re-entered on February 10, 2010. Upon re-entry, the cement plug set by the Marianas was drilled-out. After squeezing the 18" casing shoe, the Deepwater Horizon began making new hole on February 15, 2010.

Date encountered and depth of main target
The primary M56 target was encountered on April 4, 2010 while drilling at a depth of 18,065' (MD)/18,054' (TVD).

Date and depth of final TD
The Macondo well reached a final TD of 18,360' (MD)/18,349' (TVD) on April 9, 2010.

Post-TD operations
After reaching TD, a full suite of wireline evaluation was performed. Following wireline operations, production casing was run and cemented. At the time of the incident, the riser was being displaced to seawater in preparation to unlatch from the wellhead and pull the riser/BOP stack.

Geological description

The primary target for the Macondo well was an amalgamated low relief channel-levee system of Middle Miocene age (M56 ~13Ma) (Figure 1). The channel system trends in a north-west to south-east direction over an elongated Mesozoic 4-way ridge that strikes north-east to south-west. The trapping elements are a combination of dip and stratigraphic. The expected facies are low relief channel-levee deposits with vertical and lateral connectivity.

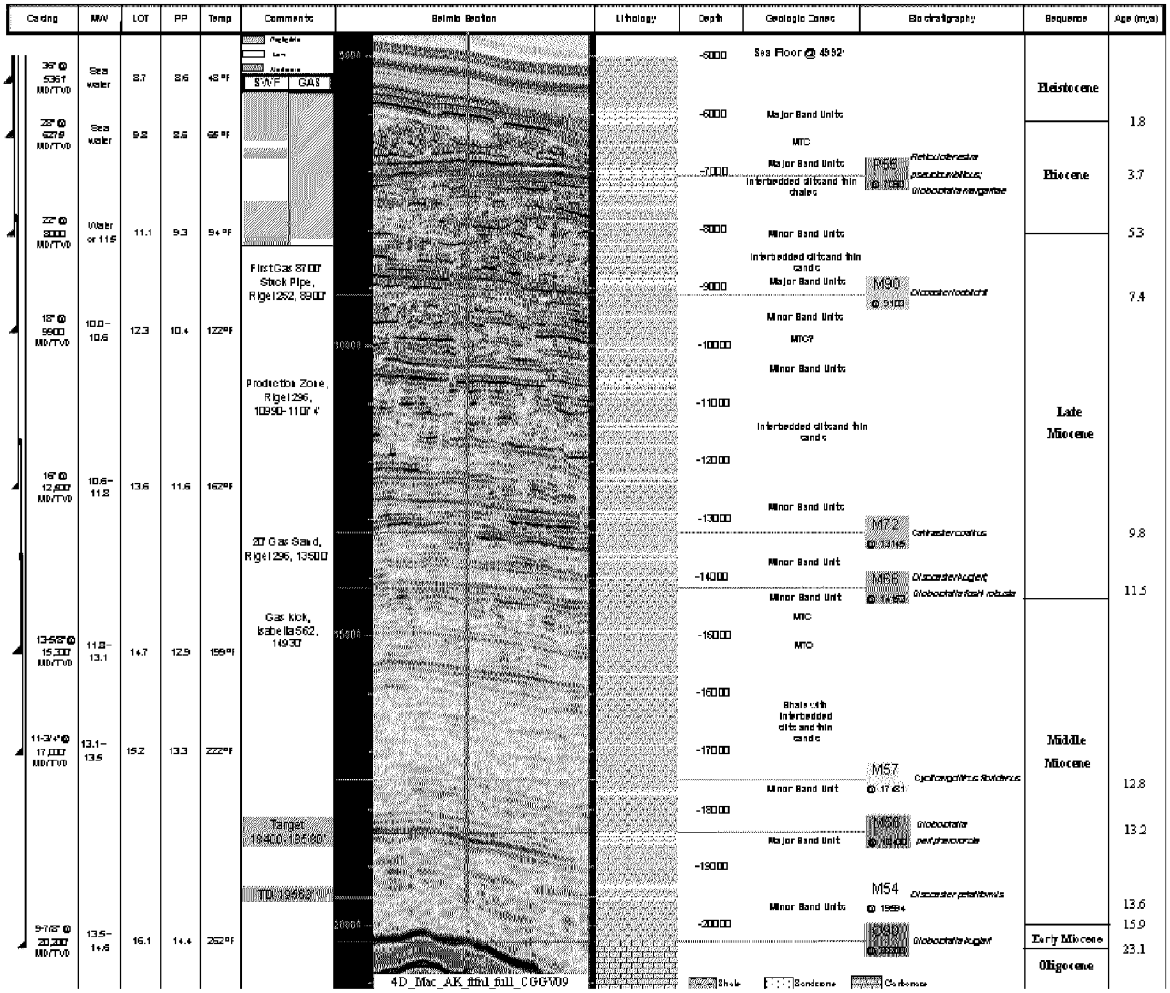

Figure 1: Pre-drill lithostratigraphy and drilling plan for MC0252_1 well.

The Macondo well discovered >90 feet of hydrocarbons in the M57 and M56 sands, the majority occurring in the M56D (22') and M56E (64.5') sands (Figure 2). The depth structure and amplitude maps for the M56 and M57 intervals are shown in Figures 3 and 4.

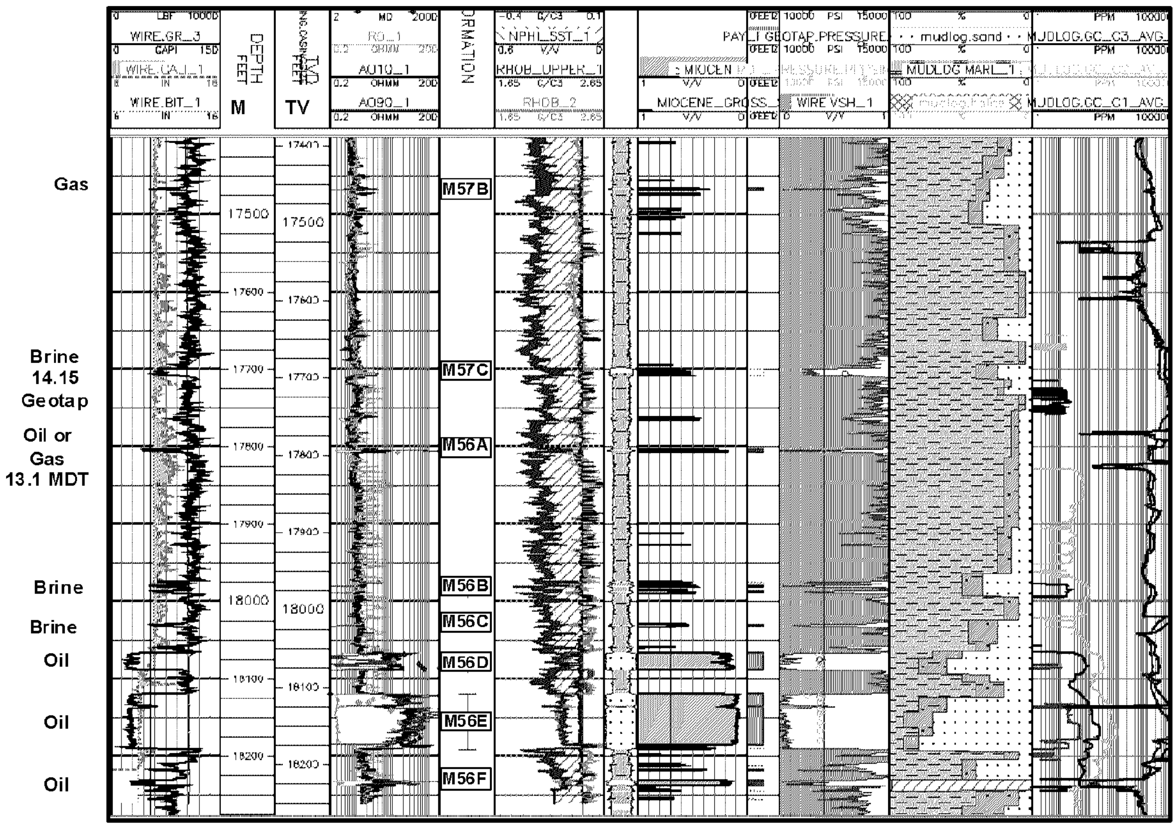

Figure 2: Sand identification chart for sands below the 9-7/8" liner that were cut by the MC0252_1BP1 well.

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[redacted]

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[redacted]

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[redacted]

Shallow Hazards

BP completed an archaeological and seafloor geohazards survey across Mississippi Canyon Block 252 and vicinity in January 2009 to meet MMS requirements for archaeologically significant blocks. No significant man-made or natural hazards were identified near the proposed MC 252-1 well or within the proposed anchor radius for the Marianas drilling rig.

The shallow hazards discussion is limited to the top-hole or riserless section (i.e. between seafloor and the base of the 22-inch casing section). Figure 7 shows the top-hole formation forecast (THFF) for shallow geohazards that was derived from 3D seismic data. Figure 8 shows the shallow hazards top-hole observations log that was generated after drilling the top-hole section. The post-well comparison between actual drilling conditions and pre-drill prediction is provided below.

Shallow Gas

The zone from the seafloor to 8,001 ft MD (base of 22-inch casing section) was predicted to have a *Negligible* potential of shallow gas. No shallow gas was observed while drilling the riserless section.

Shallow Water Flow

A *Low* risk for SWF was assessed for two intervals (6,570 ft to 6,701 ft MD and 7,025 ft to 7,614 ft MD). There was one unit predicted with a *Moderate* risk of encountering SWF in the pre-drill THFF between 6,913 ft and 7,025 ft MD. Although sand-prone intervals are noted from the gamma log between 6,660 ft to 6,900 ft and 6,950 ft to 7,080 ft, no SWF was noted while drilling the riserless section.

A slight flow was noted across the top of the wellhead about 50 hrs after reaching the total depth (TD) of the 22-inch casing section while tripping in hole with the 22-inch casing. It is assumed that the slight flow may have come from possible sands noted above. The flow was stopped by circulating mud.

Hydrates

The potential for gas hydrates was predicted as *Negligible-Low* for the entire riserless section. There was no visual evidence or log data that indicated possible gas hydrates while drilling the riserless section.

Gumbo

The potential for gumbo shale, a plastic clay return response to water based mud, was not addressed in the pre-drill THFF. This was not a concern because the plan was to drill the hole section with seawater. Gumbo was observed towards the end of drilling the 22-inch casing hole section. The gumbo coincided with circulating pad mud in place in preparation of running casing.

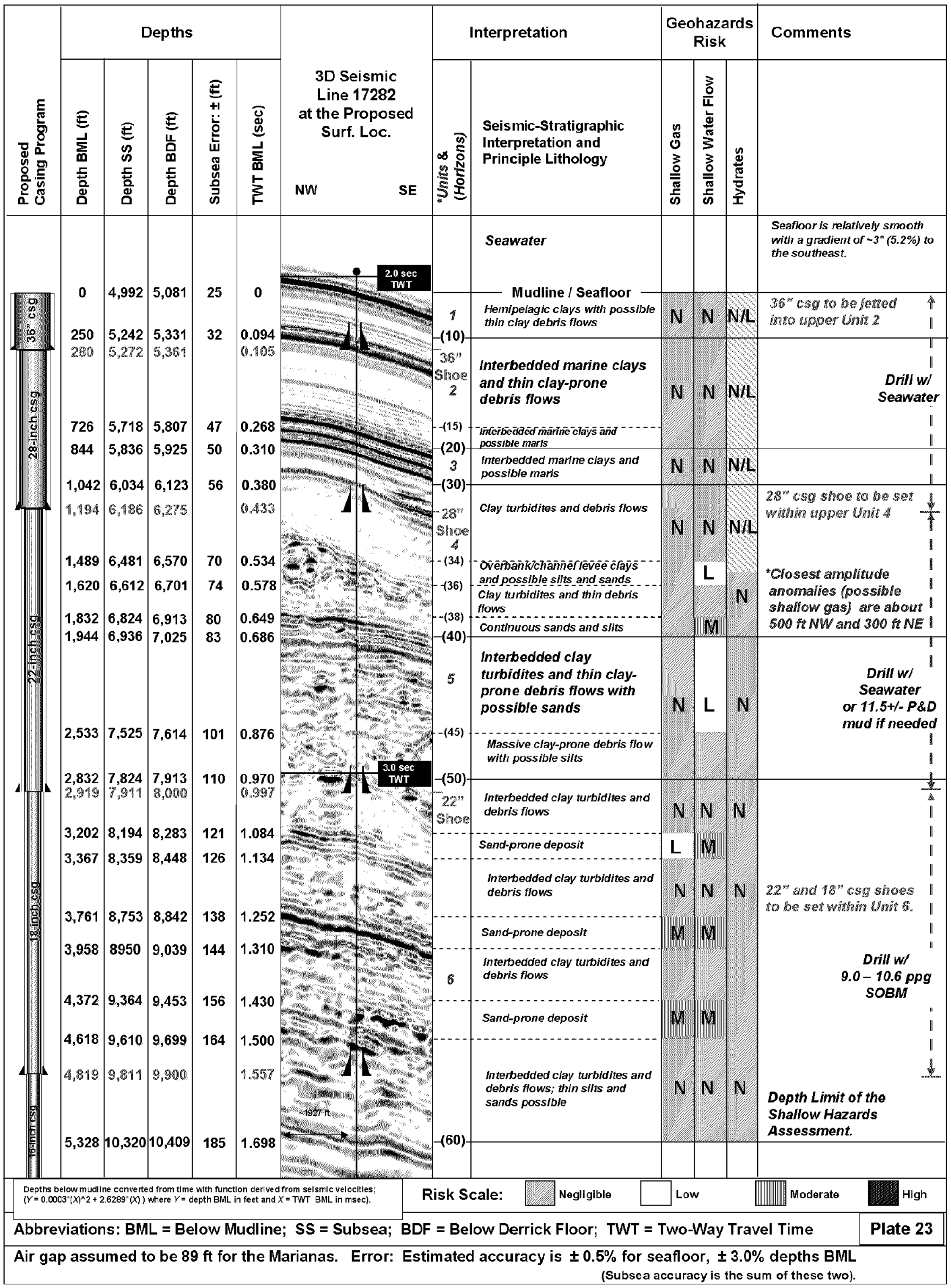


Figure 7: Original Top-Hole Formation Forecast at the Proposed MC-252 #1 Location (produced by Craig A. Scherschel, 08 June 2009).

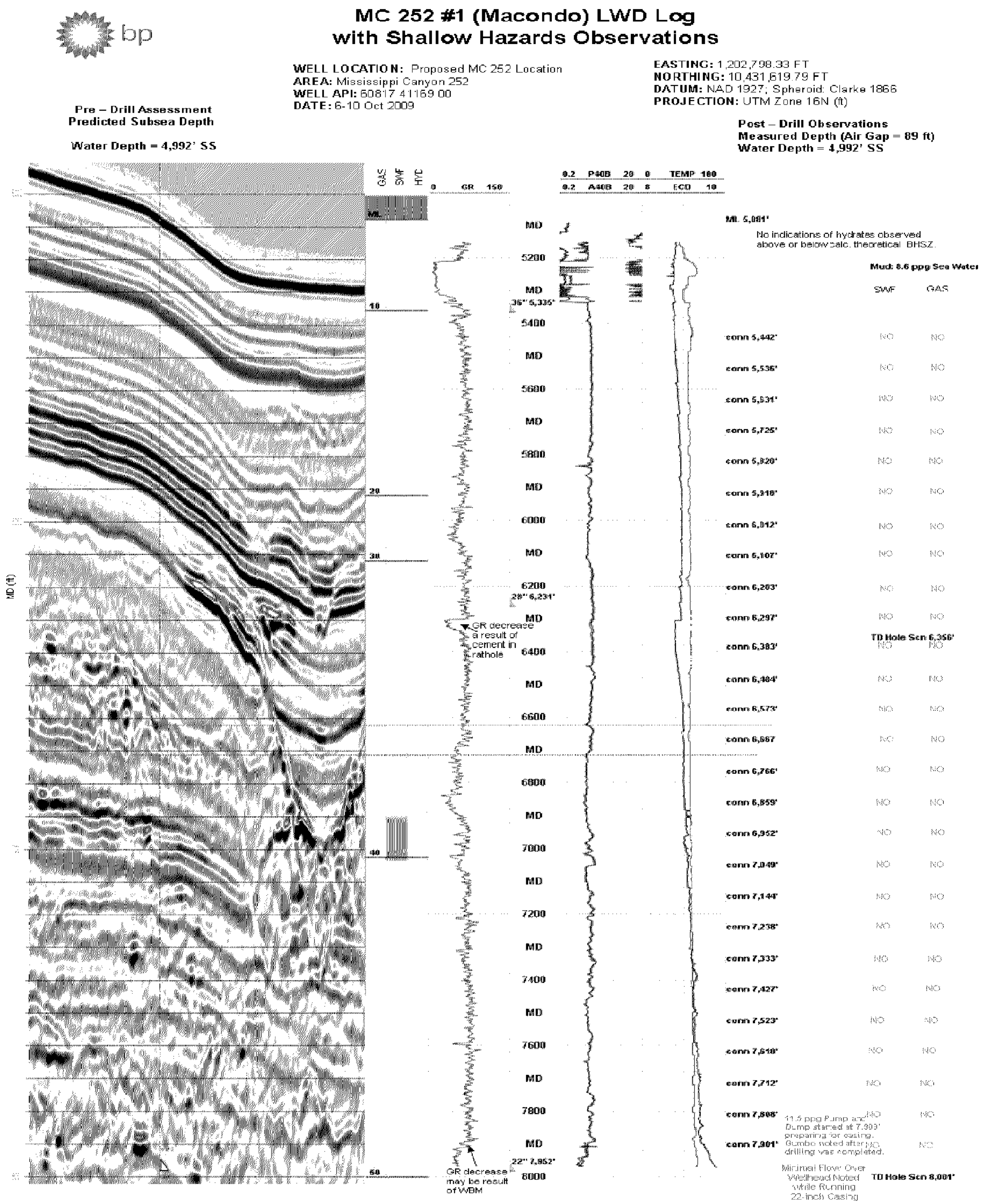


Figure 8: Shallow Hazards Top-hole Observations Log for the MC-252 #1 Location between Seafloor and the Base of the 22-inch Casing Hole Section (produced by Kate Paine, October 2009).

Pore Pressure and Fracture Gradient

The current Macondo pressure interpretation incorporates revisions to the pre-drill forecast based on: synthesis of LWD and wireline pressure indicators (pressure transforms based on resistivity, sonic and checkshot, and density); drilling parameters and data (RxC, background and connection gases), direct drilling indicators (kicks, losses), and GeoTap and MDT pressure measurements (Figure 9). Pore pressure is higher than the predrill most likely curve, from 9000' to 17750' TVDKB. The pre-drill pressure prediction was too low in this interval due to slower than predicted interval velocities, and the apparent need for higher pressure transform model more similar to that used in the analysis of the high pressure, narrow margin offset well "Yumuri", MC382-1. Reservoir pressures are much lower than predicted. Pre-drill centroid modeling of channel sands draped over the large 4-way Macondo structure placed reservoir pressures 0.1-0.3 ppg higher than shale pressure. Actual reservoir pressures imply regional hydraulic connectivity to deeper water, lower overburden/pore pressure environments to the south (similar reservoir pressure to Isabella), or local connectivity updip beneath the salt bodies southwest and east of the prospect. Though wireline density is limited to the reservoir section, calibrated acoustic to density transforms of the Macondo sonic and checkshot imply that overburden is lower than predicted. Lower densities used in the calibrated postwell overburden are consistent with the higher than predicted pore pressure observed at the prospect. The narrower than predicted PPFG window above the reservoir level led to shallower than planned shoes, and use of contingency liners.

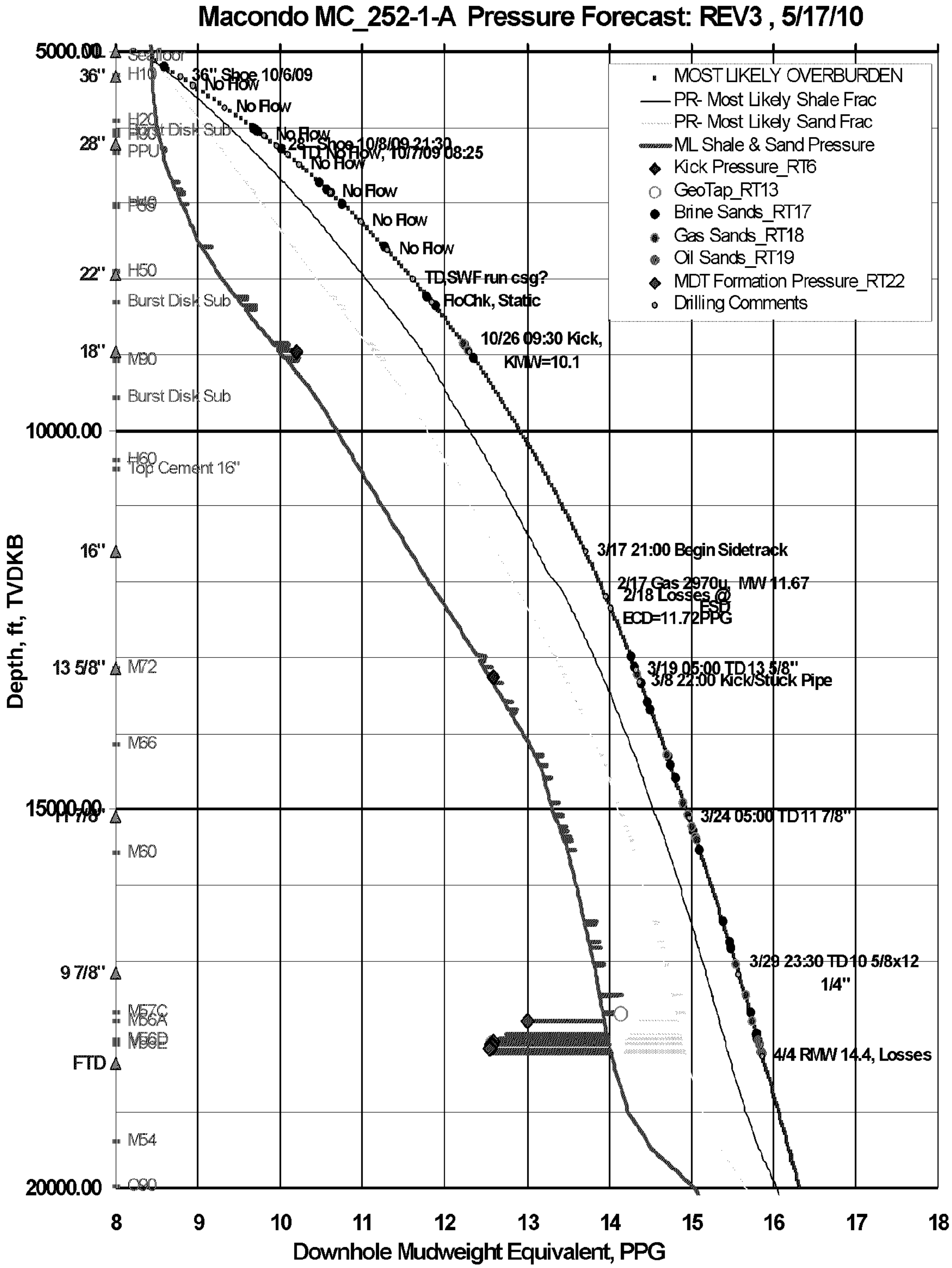


Figure 9: Post-well PPFG interpretation.

Petrophysics

Summary

From shows, log response and fluid samples it is interpreted that >90 feet of hydrocarbons were discovered in the M57 and M56 sands, the majority occurring in the M56D (22') and M56E (64.5') sands. Porosity averages 22%, Sw averages 10 - 17% and permeability averages in the range of 250 - 500 mD (arithmetic, log derived).

Fluid sample quality is high - volatile oil with GOR ~3000 and API=35, PVT analysis showed viscosity of 0.17 cp.

No hydrocarbon-water contacts were penetrated and no significant aquifer sandstone was observed.

Log derived porosity and permeability were calibrated to data from rotary side wall core sample analysis.

M56D is probably slightly different rock type and more heterogeneous than M56E, this is supported by core and log data.

The successful calibration of log data to core plug data in the M56E sand gives a reasonably high degree of certainty around the petrophysical parameters despite the relative lack of core data. A greater degree of uncertainty exists in the more heterogeneous M56D sand. Further uncertainty exists in the thin minor hydrocarbon bearing intervals in M56 and M57. They were not covered by core data and are difficult to resolve with standard logging tools as they are less than 2.5 feet in thickness. The lowest M56F sand was not fully covered by logs.

Electrical properties, capillary pressure data and thin section analysis will be incorporated into the interpretation when available.

Data base

All LWD, Wireline, Mud logging, Pressure and Core data was loaded into Geolog where formation evaluation was completed.

LWD

Halliburton was the Logging While Drilling (LWD) vendor. GR, Resistivity, Sonic and PWD tools were in the BHA while drilling plus Geotap formation pressure in target section.

In the wireline section, LWD was depth shifted to TCOMBO Gamma Ray. In cased hole section, where wireline Sonic in casing was run, LWD was shifted to it to match sonic response on LWD and wireline. From mudline to top of sonic in casing (~11,700' md) the depth shift was distributed.

Wireline

The following Schlumberger open hole wireline logs were run in 6 descents in open hole section from 17,150'-18,270' MD. They include the following tools:

R1D1: ZAIT-GPIT-LDS-CNL-GR-LEHQT
R1D2: CMR-ECS-HNGS-LEHQT
R1D3: Dual OBMI-GPIT-DSI-GR-LEHQT
R1D4: MDT-GR-LEHQT (pressure and samples)

R1D5: MSCT-GR-LEHQT (rotary side wall cores) was not fully successful; repeated as R1D7 after R1D6
R1D6: Quad VSI-GR-LEHQT

Basic observation on logs and borehole condition:

- The hole has a diameter of 8.5" from TD of 18270' to 18,090'md and 9.875" from 18,090' md to the 9.875" casing due to the use of a hole opener assembly.
- This hole section was drilled with barite as a mud weighting material (~20 % of high gravity weight solids). This causes the density correction curve (DRHO) to read negative and also significantly affects the quality of the PEF curve.
- Run R1D1 was run ~7 days after the formation was drilled and 20 hours after the last circulation stopped. During that time the open hole was exposed to different kinds LCM materials to treat losses, below the 9.875" shoe and close to TD. The caliper indicates some wash outs in shales but mainly gauge hole in sandstone.

Core

There were 44 rotary side wall core samples recovered from 3 MSCT runs. Sample preparation and analyses were done at Weatherford's Laboratories.

Only around 2/3rds of the samples were in a condition suitable for petrophysical analysis. After sufficient cleaning and drying, 6 samples were dedicated for mechanical properties and pore compressibility studies. 19 samples were selected for Routine Core Analysis (RCA). The analyses from 17 samples from M56D and M56E have been completed to date and are referenced in this document whilst 2 more sample are still being analysed. RCA was performed at 500 psi and at Net Confining Stress (NCS) of 2000 psi. NCS was calculated from post well sand fracture evaluation, over burden estimation and pore pressure.

If the assumption is made that one sample describes one inch of rock, the core plus represent approximately 2% of the M56D unit and 1.4% of the M56E in terms of amount of interval covered.

Currently Special Core analysis (Electrical Properties and Capillary pressure measurements) are been run on a set of samples

16 out of the 17 samples were described as fine to medium size grain sandstones, one as shale.

Laser Gain Size Analysis (LGSA) results on 17 samples (6 in M56D and 11 in M56E) are presented in Figures 10 and 11.

In Figure 10 Klinkenberg corrected permeability to air at NCS is plotted versus the percentage of different size particles in the sample. There is a clear relationship between sand content and permeability.

It could be argued that the M56D samples (green) have marginally more silt and less sand grain size particles than M56E samples (blue), though with the relatively small data set this may be a function of the sampling.

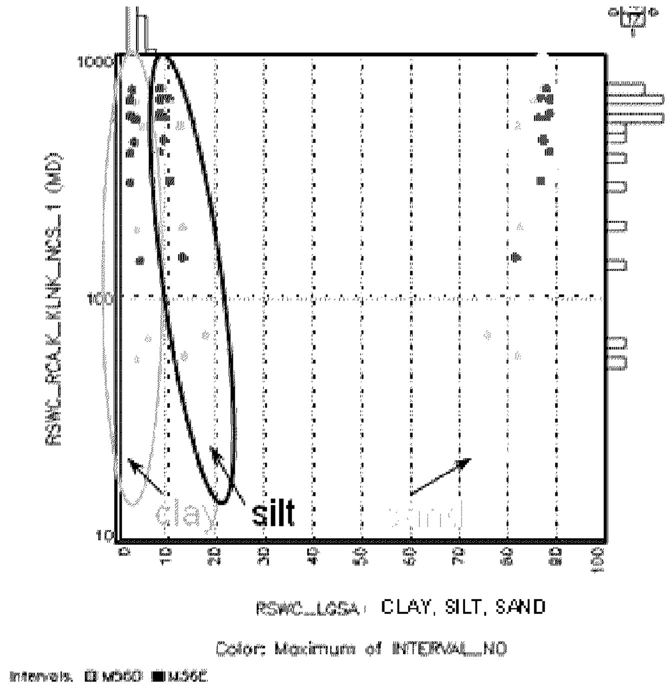


Figure 10: Laser Grain Size Analysis, Permeability vs. percentage of different (sand, silt, clay) size particles.

In Figure 11 Klinkenberg permeability to air at NCS is plotted versus percentage of different size sand particles. The data shows a clear relationship between grain size and permeability. In general M56D (green) has a subtly wider range of grain size suggesting slightly poor sorting, while the M56E (blue) is more homogeneous.

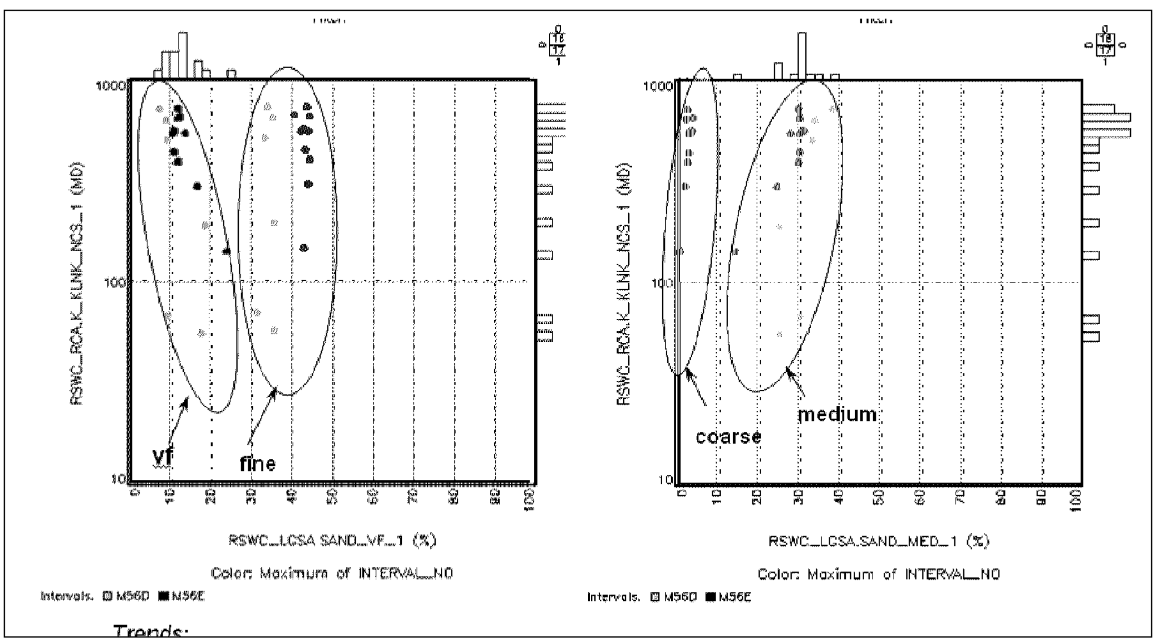


Figure 11: Laser Grain Size Analysis, Permeability vs. percentage of different (very fine, fine, medium and coarse) size sand particles.

The observations from Figures 10 and 11 leads to the suggestion that the M56E core plugs indicate slightly better sorting than the M56D plugs. This is reflected in their respective positioning in K/PHI pace as indicated in Figure 12. Further the Winland iso-pore throat lines suggest that two sands may be slightly different rock types based on their degree of sorting. The 10 micron line divides the two rock type.

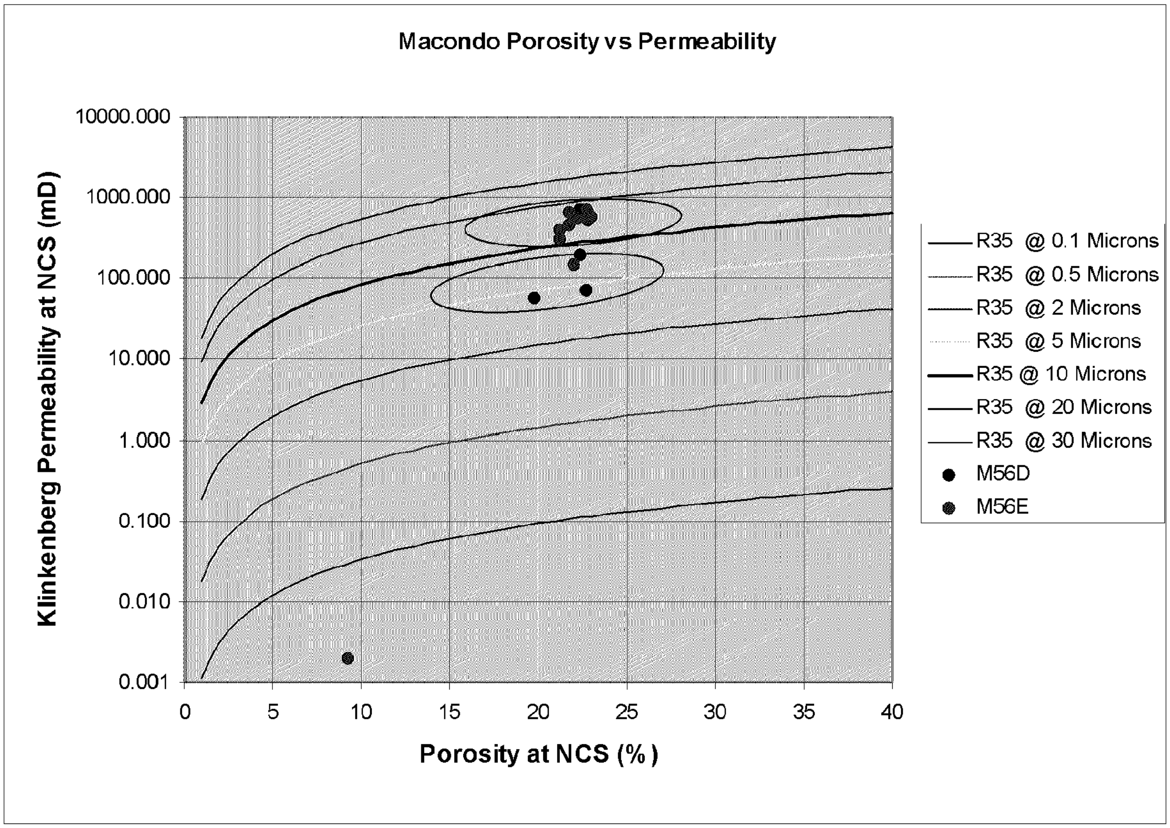


Figure 12: Winland R35 rock typing plot.

X-Ray diffraction (XRD) analysis results from 10 samples (4 in M56D and 6 in M56E) are presented in Figure 13. Mineralogical content of all analysed sandstone samples are in average 93% Quartz with Kaolinite (~2%) and Illite 1% clays, 1% K-spar and 3 % Plagioclase. Based on the 10 samples from M56D and M56E there appears to be no difference in mineralogy between the two sand bodies, so any variation in petrophysical properties is likely to be a function of grain size and most likely sorting.

WEATHERFORD LABORATORIES
X-RAY DIFFRACTION
(WEIGHT %)

Client: BP America Production Company
Well: OCS-G-32306 No.1
Area: Mississippi Canyon Block 252
Sample Type: Rotary Sidewall Core

Plug	Sample	CLAYS				CARBONATES			OTHER MINERALS						TOTALS		
Number	Depth (ft)	Chlorite	Kaolinite	Illite	Mx I/S*	Calcite	Dol/Ank	Siderite	Quartz	K-spar	Plag.	Pyrite	Zeolite	Barite	Clays	Carb.	Other
3-4R	18069.8	Tr	2	1	Tr	Tr	0	Tr	92	1	4	Tr	0	0	3	Tr	97
3-6R	18074.9	Tr	2	1	Tr	Tr	0	Tr	92	1	4	Tr	0	0	3	Tr	97
3-9R	18083.0	Tr	2	Tr	Tr	Tr	0	Tr	94	1	3	Tr	0	0	2	Tr	98
2-4R	18087.0	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	0	3	Tr	97
3-14R	18124.9	Tr	3	1	Tr	Tr	0	Tr	91	1	4	Tr	0	0	4	Tr	96
3-18R	18134.1	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97
3-19R	18141.9	Tr	3	1	Tr	Tr	0	Tr	92	1	3	Tr	0	0	4	Tr	96
3-25R	18161.0	Tr	2	1	Tr	Tr	0	Tr	94	1	2	Tr	0	Tr	3	Tr	97
1-3R	18174.0	Tr	1	1	Tr	Tr	0	Tr	94	1	3	Tr	0	0	2	Tr	98
3-31R	18183.1	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97
	AVERAGE	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97

Figure 13: X-Ray Diffraction Analysis. First 4 samples (from 3-4R to 2-4R) are for M56D, 6 next samples are from M56E.

Routine Core Analysis

After the rotary sidewall core plugs were cleaned and dried, the 17 samples were subjected to Routine Core Analysis (RCA). The measurements of porosity and permeability were performed at 500 psi and at 2000 psi (NCS). The analysis also included stair steps and repeat measurements of porosity and permeability.

Klinkenberg permeability to air at NCS is plotted versus Porosity at NCS in Figure 14. M56D sand may be more heterogeneous than M56E and its reservoir characteristics are hardly described by the available samples. More core data will be necessary for rock typing work. From the Laser grain analysis - sorting may be a function in this effect more than grain size.

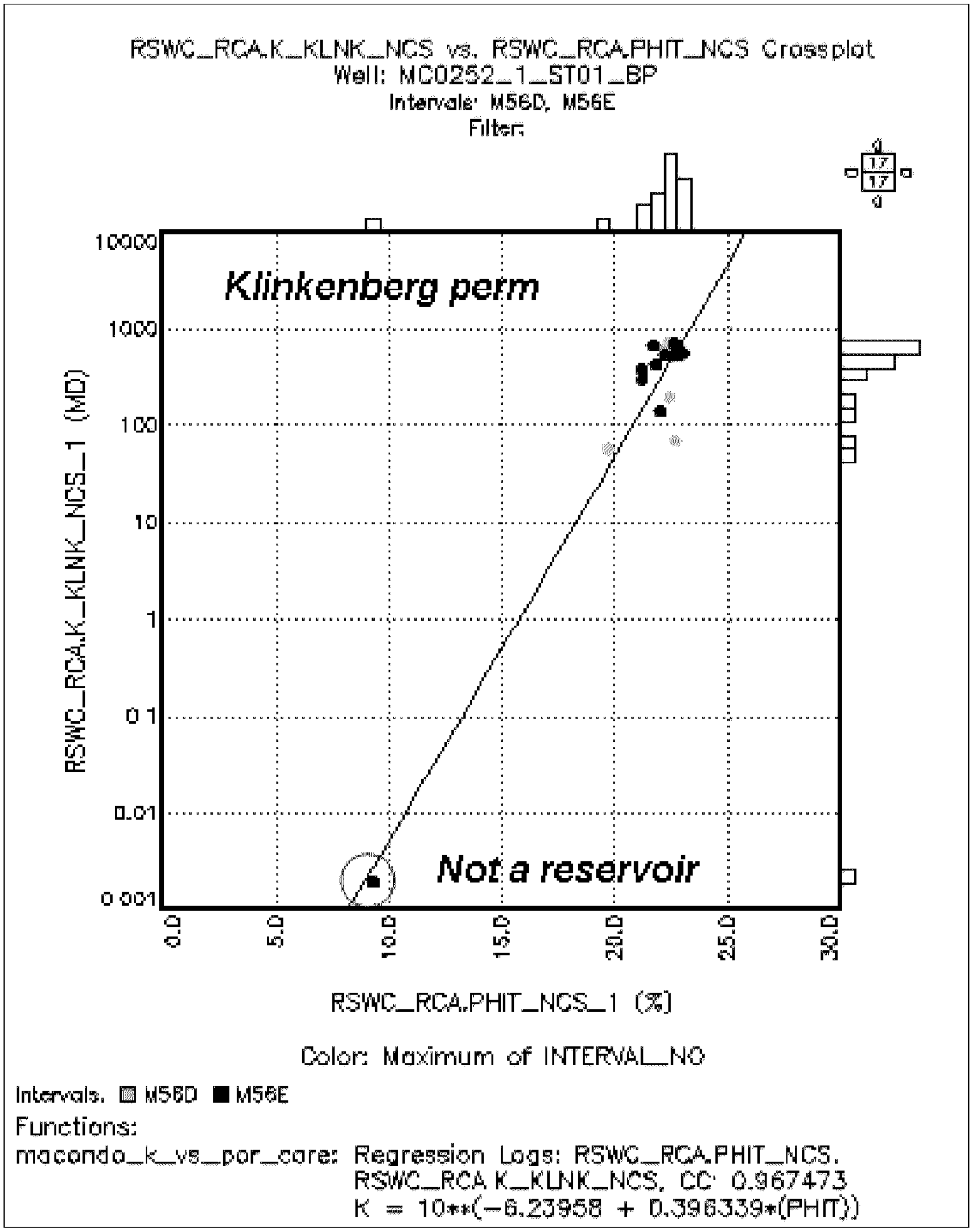


Figure 14: RCA. Klinkenberg permeability to air at NCS is plotted versus Porosity at NCS with linear regression function used for Permeability calculation.

Frequency histograms of core derived Porosity and Permeability are presented in Figure 15. Porosity of M56D samples are very close to M56E samples but Permeability is slightly less, it maybe due to sorting, packing and to grain size distribution as mineralogical content of the sands is similar.

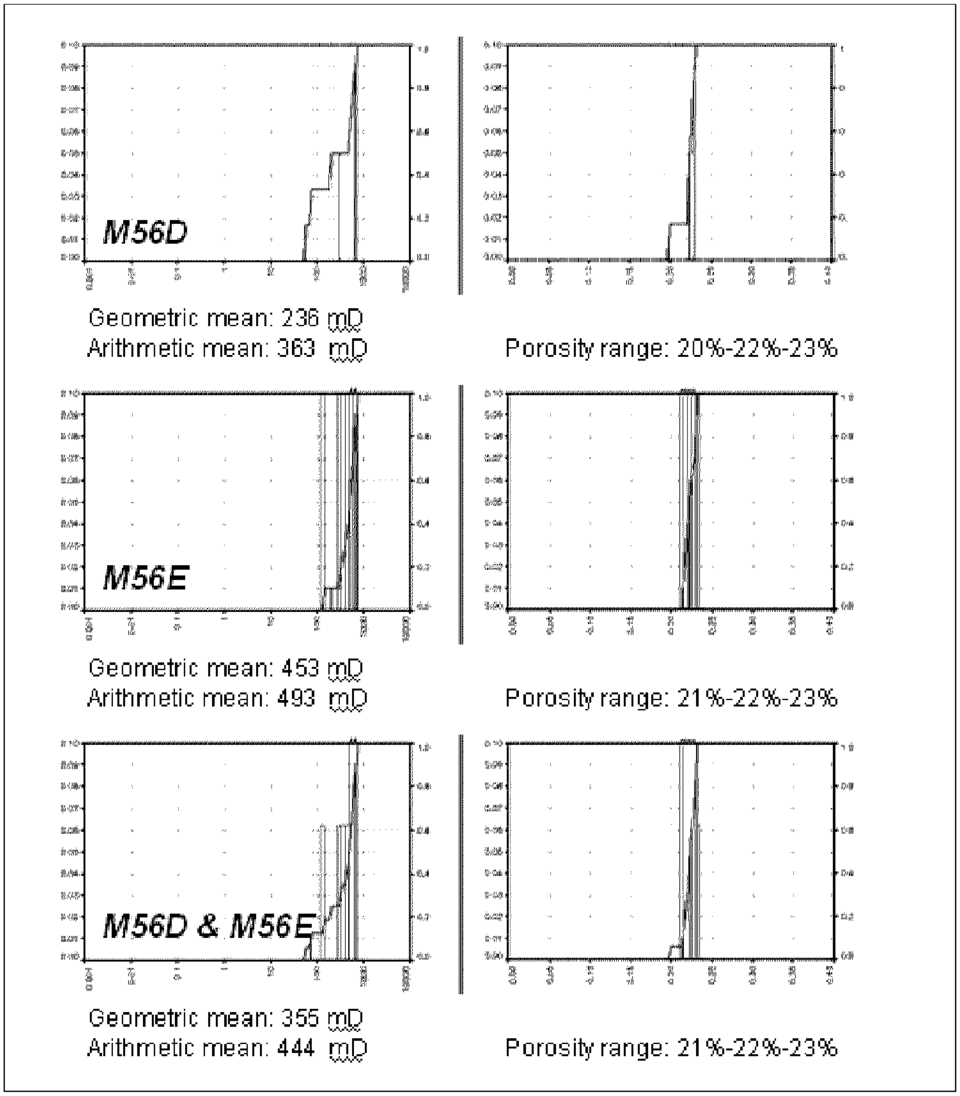


Figure 15: Frequency distribution of Core measured Klinkenberg permeability to air at NCS and Porosity at NCS separately per sands and both sands together.

Log to Core calibration

Porosity was derived from the density log from the following equation:

Density porosity (dec) = (Rhog - Rhob) / (Rhog - Rhof)

Where: Rhog is grain density (g/cc)
Rhob is the density log (g/cc)
Rhof is the fluid density (g/cc)

Grain Density (Rhog) and Fluid Density (Rhof) were determined from core derived data.

Frequency distributions of core measured Rhog and log Density (Rhob) vs. core measured porosity (Phit_ncs) plot are presented in Figure 16.

Core derived Rhog from the M56D and M56E sands are very similar at 2.645 g/cc. However the cross-plot of Core porosity v Density log (Rhob) shows the M56D sand plugs to plot off trend with the M56E plugs. The force fit line through the M56E plugs through the grain density of 2.645 g/cc gives a very reasonable Fluid density Rhof of 0.845 g/cc, which is consistent with the reservoir fluid from pressure data and the mud filtrate density. A number of M56D plugs suggest a higher Rhof of greater than 1 g/cc which is inconsistent with the reservoir fluids derived form logs, pressure data and fluid evaluation. Considering these data points to be anomalous, a RHOF=0.845 g/cc is used for Density porosity evaluation for all sands.

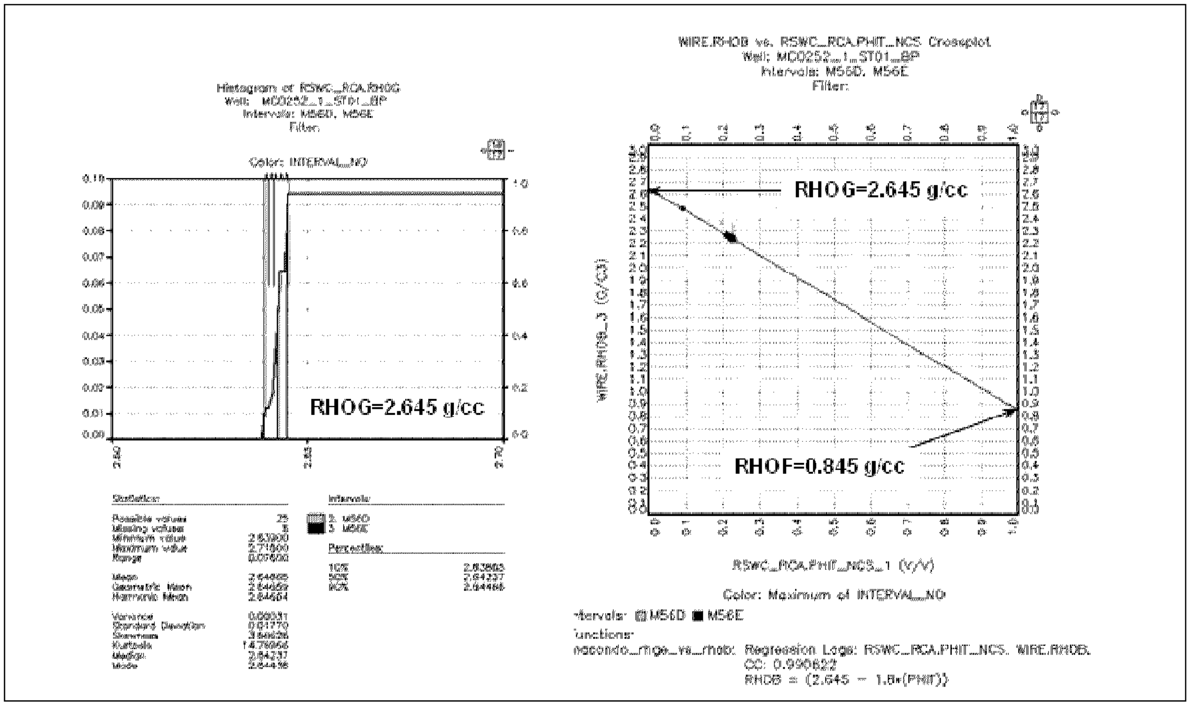


Figure 16: RCA. Core grain density distribution and Cross plot of Density log vs. Core porosity at NCS.

Figure 17 is an overlay of calculated density porosity core plug porosity. Core plugs were slightly shifted to logs, the original samples location on the left side of the Figure 17 with depth shifted plugs on the right side.

The depth shift is to better match the Density porosity and correct the misplacement of shale sample at 18,121'.

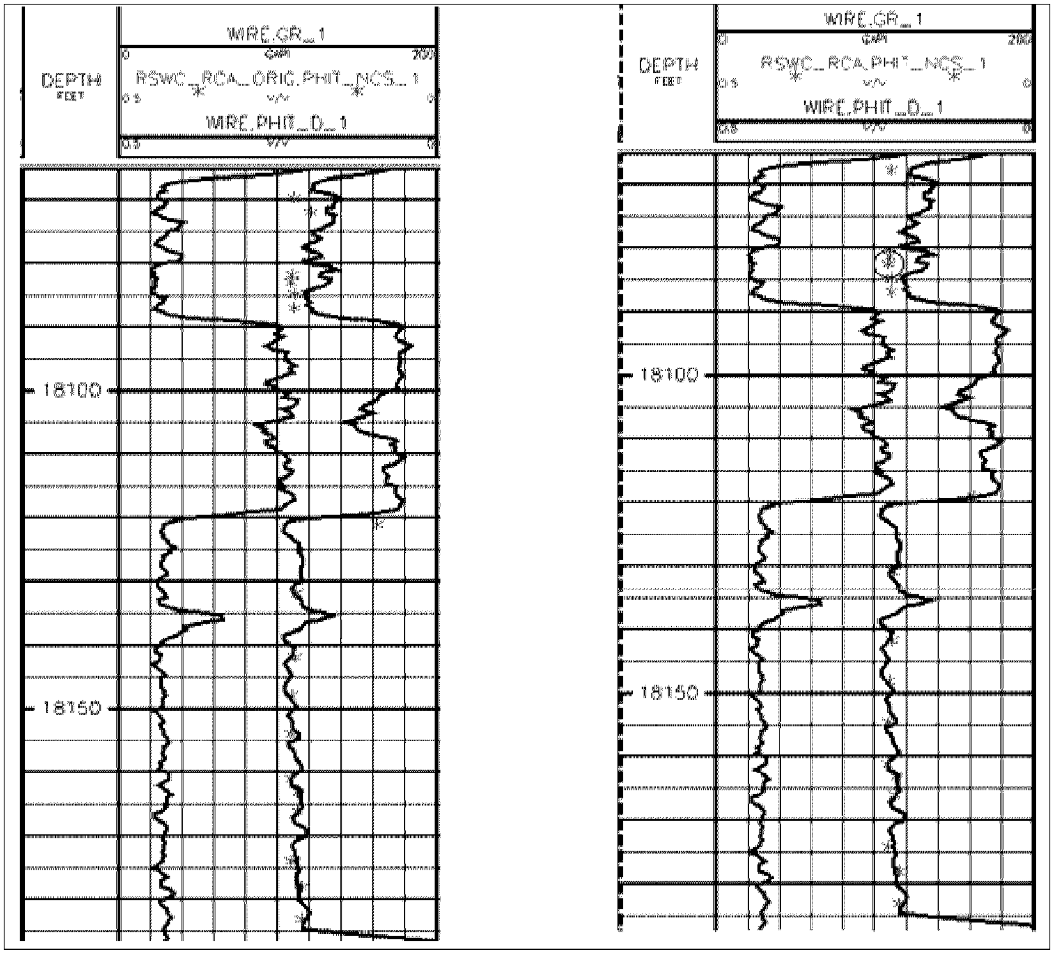


Figure 17: Calibration Logs to core. Core porosity at NCS overlays with Density log derived porosity. Original sidewall core plug depths on the left plot, depth shifted plugs on the right.

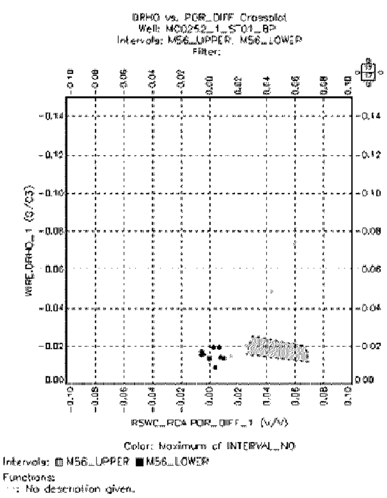
Porosity calculated from density log in upper lobe (M56D) is 2-6 porosity units lower than core derived porosity while in the lower lobe (M56E) they match well.

One of the possible reasons for this mismatch is overcorrecting of the density log (RHOB) for barite additives to mud. The degree of correction (DRHO log) is shown by the red shading in Figure 18.

On the left side in Figure 18a, DRHO (Y axis) is plotted versus the difference between core porosity and density derived porosity (X axis). For M56E sand (in blue) the difference is +/- 1 porosity unit while density correction DRHO is around -0.015 g/cc; For M56D sand (in green) the density correction and the porosity difference are higher for most of the samples.

The large DRHO corrections match spikes in the PEF curve indicating the greatest barite effect (blue curve in Neutron-Density track) in Figure 18b.

Density correction (DRHO) vs. difference between Core porosity and log porosity.



If Upper sand was affected by barite as Lower sand DRHO should be ~-0.015 g/cc

Density correction (DRHO) vs. difference between Core porosity and log porosity.

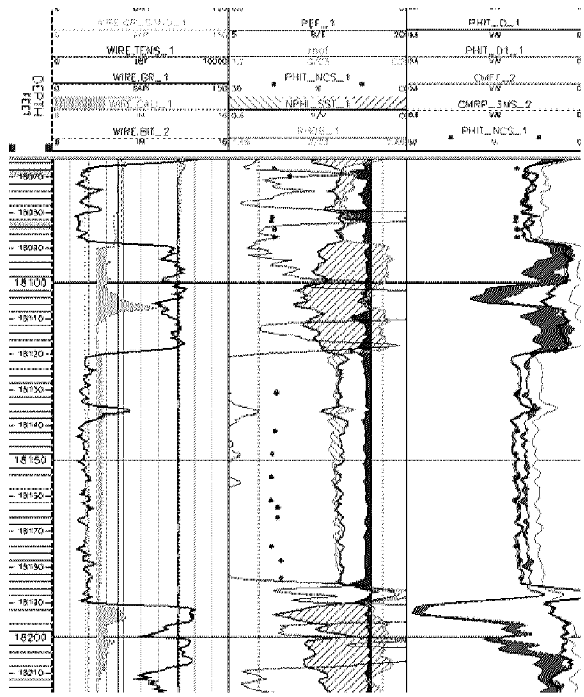


Figure 18a and Figure 18b: Density log correction in M56D.

To eliminate the over correction, DRHO values<=-0.-015 were replaced by -0.015 and Rhob in upper sand M56D log was corrected and used for density porosity calculation.

After the correction was made, the Density porosity (Phit_Upper) matched Core porosity more closely and the extrapolated fluid density matched much closer to the fluid density of 0.845 g/cc, estimated in M56E. As the reservoir fluids in both reservoirs are very similar and the mud filtrate is the same this is a reasonable outcome (Figure 19).

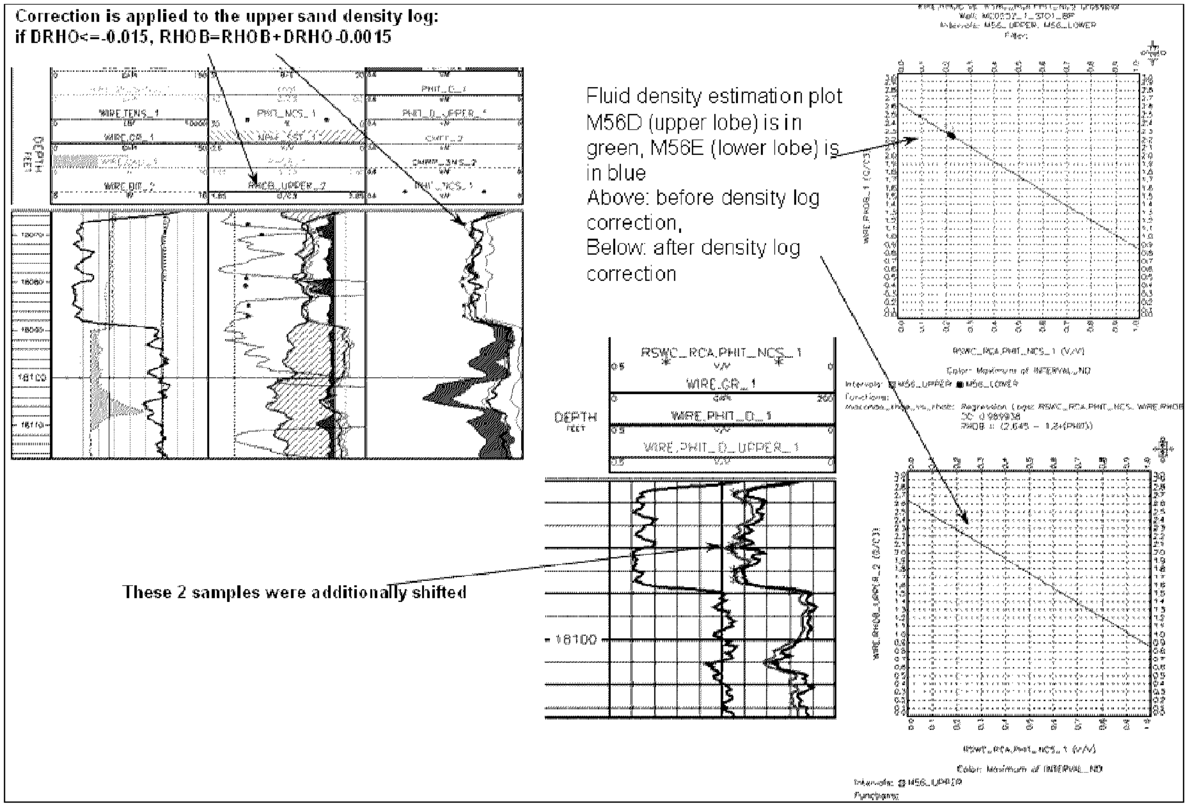


Figure 19: Overlaying Density porosity in M56D with core porosity and cross plots of corrected Density log with core porosity for Fluid density estimation.

The need to make this correction to tie the core data suggest a slightly higher uncertainty in petrophysical parameters in the M56D sand compared to the M56E sand.

There may be other factors to take in to consideration such as anisotropy due to thin beds.

Permeable intervals

Volume of shale (Vsh) cut-off was used to identify permeable intervals.

Gamma Ray log was used for Vsh estimation. For VSH calculation GR_sand and GR_shale lines were created and Vsh was derived as:

$$Vsh=(GR-GR\_sand)/(GR\_shale-GR\_sand)$$

The sand and shale lines were adjusted to reflect the sand percentages from the mudlog and Quartz volume estimated by of ECS log.

For identifying all possibly permeable layers a Volume of shale (VSH) cut-off of 0.4 is used.

The cumulative sand count for each of the permeable sands is presented in Figure 20.

	TOPS_SAND TVD_1	TOPS_SAND TVDSS_1	TOPS_SAND FORMATION_1	TOPS_SAND :UM_GROSS_SAND_
17467.0000	17456.07351	17381.07351	M57B	2.00000
17469.0000	17458.07347	17383.07347		
17700.0000	17689.07027	17614.07027	M57C	8.50000
17708.5000	17697.57014	17622.57014		
17804.0000	17793.06826	17718.06826	M56A	2.50000
17806.5000	17795.56821	17720.56821		
17975.5000	17964.56328	17889.56328	M56B	5.00000
17989.5000	17978.56256	17903.56256		
18030.0000	18019.06017	17944.06017	M56C	2.00000
18032.0000	18021.06004	17946.06004		
18067.0000	18056.05774	17981.05774	M56D	22.00000
18089.0000	18078.05618	18003.05618		
18120.0000	18109.05382	18034.05382	M56E	69.50000
18191.0000	18180.04842	18105.04842		
18217.5000	18206.54683	18131.54683	M56F	6.50000
18238.5000	18227.54573	18152.54573		

Figure 20: Cumulative sand thickness per sand unit.

Petrophysical parameters calculations

Determination of net sand cut off

A frequency histogram of Density porosity is presented in Figure 21. A net sand cut off of 14 % porosity and < 0.4 Vsh was used. These values are based on GOM analog Middle Miocene wells. There is not enough core data to confirm these parameters with permeability distributions.

The Density porosity was compared to Core porosity in M56D and M56E sands, where rotary sided wall derived porosity was used for calibration. In spite of an apparent slight gas signature on Neutron-Density log and CMR porosity being lower than Density porosity (usual for gas sands), fluid sampling of both reservoir sands showed volatile oil, therefore no gas correction applied to the Density log. The density log derived porosity has been demonstrated to tie reasonably well to porosity from core plugs.

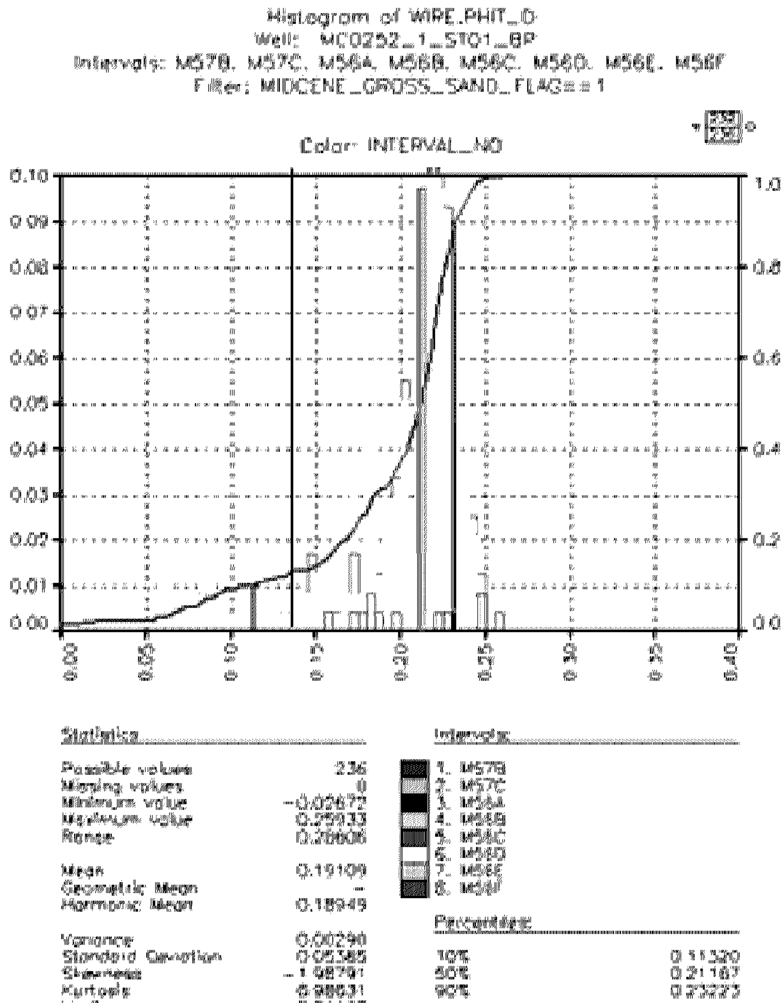


Figure 21: Density porosity histogram with 14% cut off.

Density porosity distribution in the M56E net sand was compared to Core porosity and presented in Figure 22. It shows a good match in minimum, maximum and most likely values. The same histograms for M56D did not show a good match due to underestimating the porosity in this sand if the uncorrected density is used for the calculation (Figure 23).

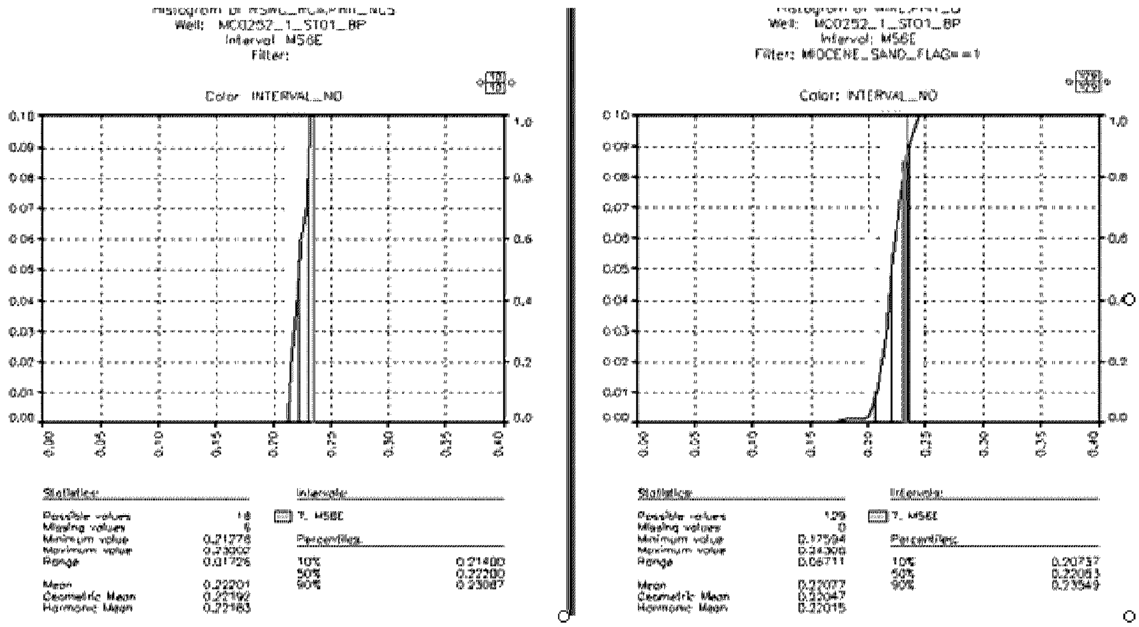


Figure 22: Density Porosity distribution in M56E sand vs. Core porosity.

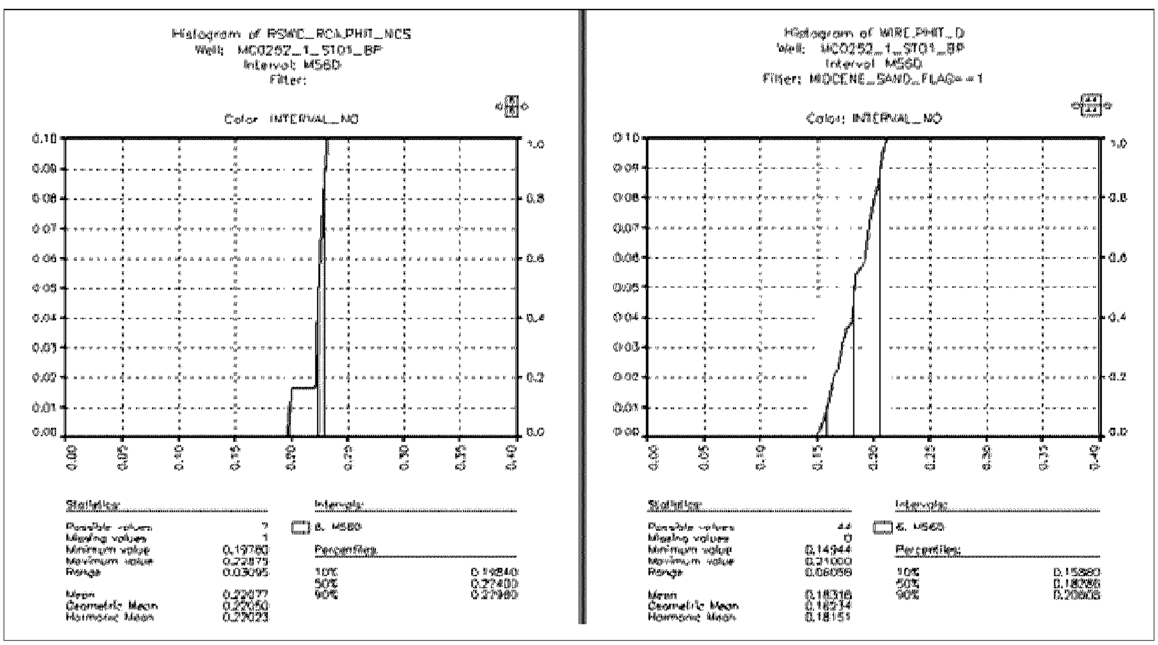


Figure 23: Density Porosity (with uncorrected density input) distribution in M56D sand vs. Core porosity.

If the corrected density is used in the M56D sand for porosity calculation the comparison with core data is closer (Figure 24).

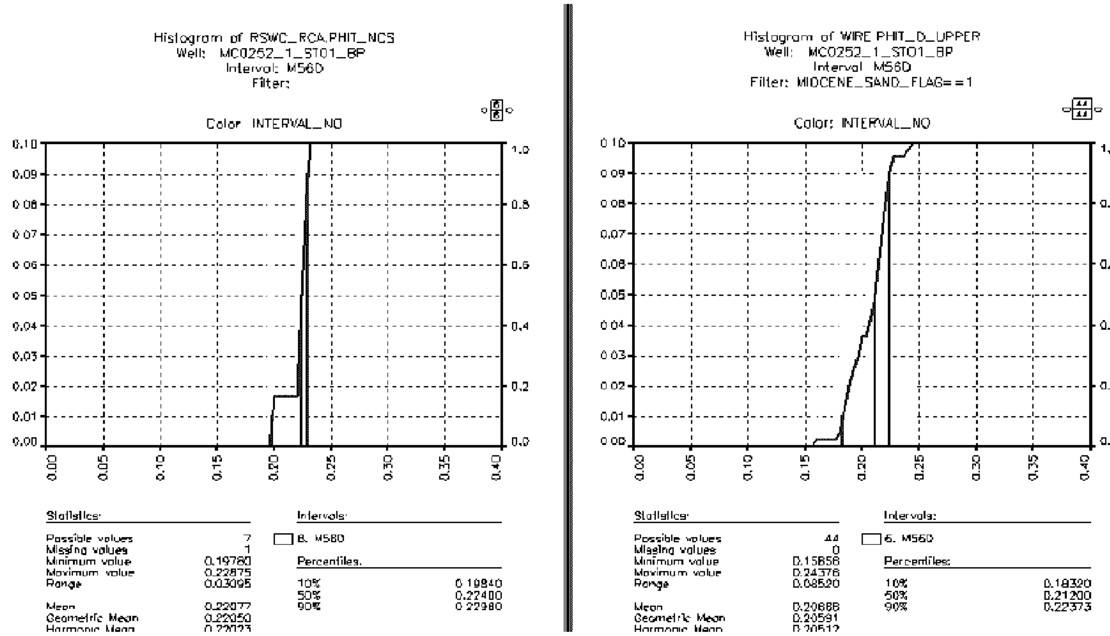


Figure 24: Density Porosity (with corrected density input) distribution in M56D sand vs. Core porosity.

Three further sands have been identified in the TD hole section, which have a gas signature on Neutron-Density logs: namely M57B, M56A and M56F. No core samples were taken in the M57B and M56A sands though one sample was taken in M56F and is currently under evaluation.

Fluid typing of the sands is uncertain and parameters are difficult to assess accurately due to the thin nature of these sands, being below confident log resolution. At this point of interpretation no gas correction applied to the Density porosity in these sands

Water Saturation (Sw)

No thick aquifer sand was observed in the interval of evaluation to determine Rwa.

An assumed regional value of Rw of 0.021 Ohmm at a bottom hole Temperature of 243°F from control data was used for Sw evaluation.
The parameters; a=1, m=1,81 and n=1.88 from the Isabella analog well were used to calculate Sw using the Archie equation.

The Sw evaluation will be re-visited after Electrical properties and Mercury Injection Capillary Pressure measurements are finished. Sw is a subject to some uncertainty currently.

Frequency histograms of Sw are presented in Figure 25. The Sw cut off for pay is estimated at 50 %. The cut off value will be revisited after SCAL results are available

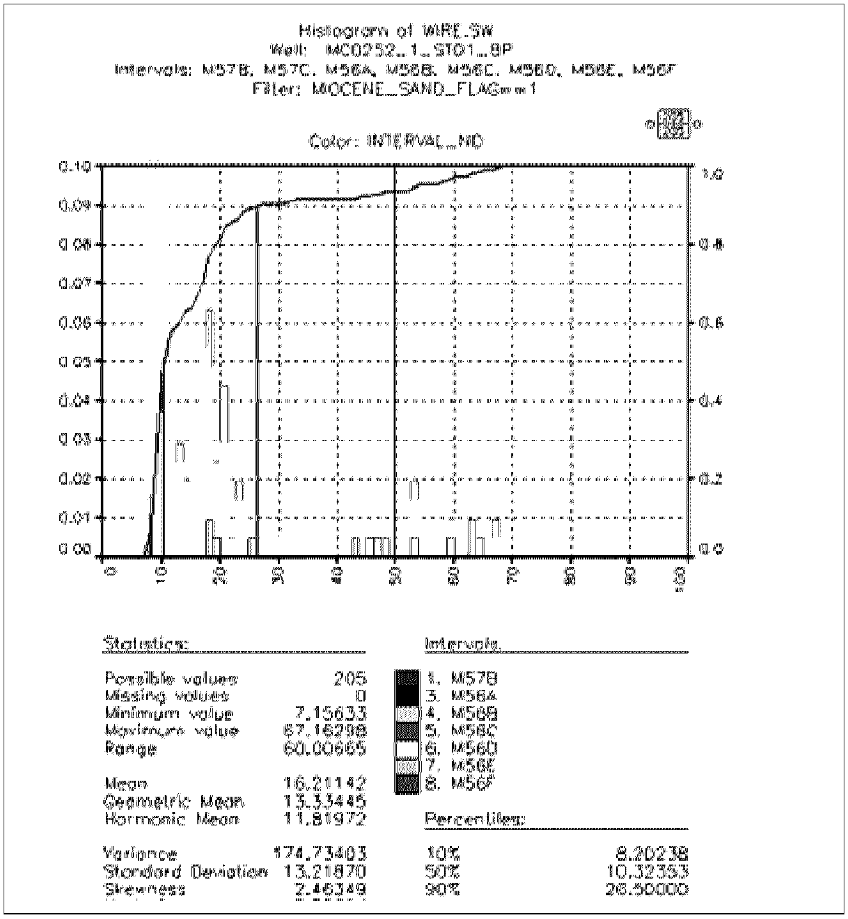


Figure 25: Water saturation Sw histogram with Sw=50% cut off.

Permeability

Permeability (to air) was calculated using core derived equation of:

K=10**(-6.23958 + 0.396339*(PHIT_D*100)),

Where PHIT_D is density porosity in v/v

Log derived permeability in the M56E net sand was compared to Core permeability and presented in Figure 26. It shows reasonable match in geometric and arithmetic mean values. A similar histogram for M56D did not show good match because the Permeability was calculated using Density porosity derived with uncorrected density (Figure 27).

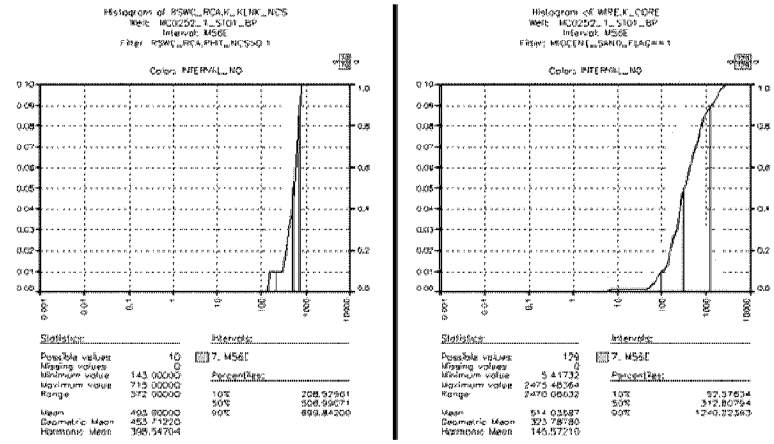


Figure 26: Log derived Permeability distribution in M56E sand vs. Core Permeability.

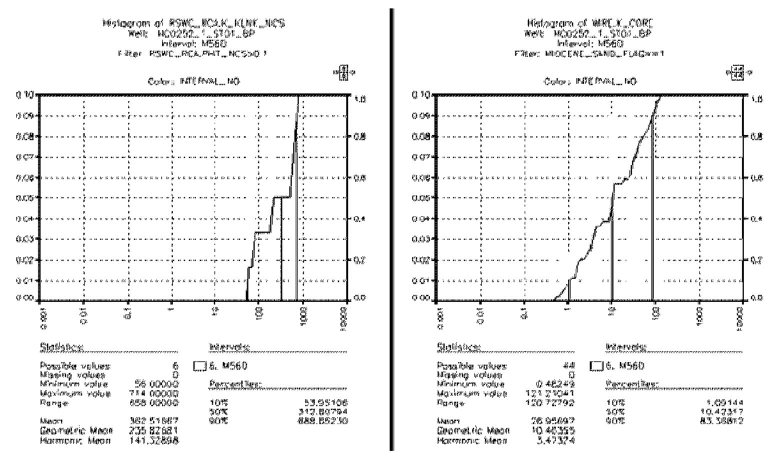


Figure 27: Log derived Permeability distribution in M56D sand vs. Core Permeability. Underestimated due to Density porosity derived with uncorrected density log input.

After using corrected density for porosity evaluation and following it Permeability evaluation, the match to Core is better, see Figure 28.

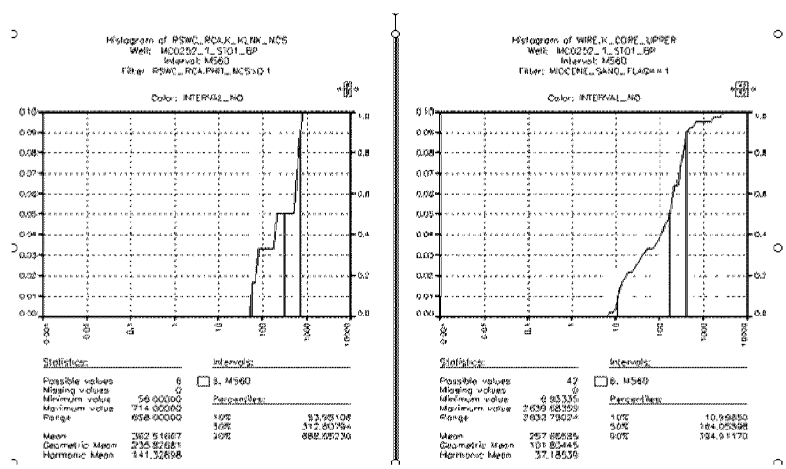


Figure 28: Log derived Permeability distribution in M56D sand vs. Core Permeability. Closer to Core Perm distribution when Density porosity derived with corrected density log input.

Fluid Typing

Based on MDT pre-test pressure data analysis and fluid sampling analysis, the M56D and M56E reservoirs comprise volatile oil with GORs of around 3000 with an API gravity of 35. A more complete set of data and analysis will be presented in Fluid Properties section.

The M56F sand underlying the main pay zone was not sampled by the MDT tool but based on it's location below M56D and M56E and below the thermogenic front it is likely to be oil.

The fluid analysis of the M57D and M56A sands is uncertain (Figure 29). Sand M56A has a sonic log signature similar to M56D and M56E, which are oil bearing sands. Sonic porosity calculated in the sand matched density porosity, which also an evidence to be oil sand as Sonic porosity is usually higher than density porosity in gas sand. Based on it is position on the boundary of thermogenic front – right above it, it could be gas.

The M57B sand is approximately 2 feet thick and likely to be below log resolution for accurate fluid determination, but based on its position above the thermogenic front it is likely to be gas.

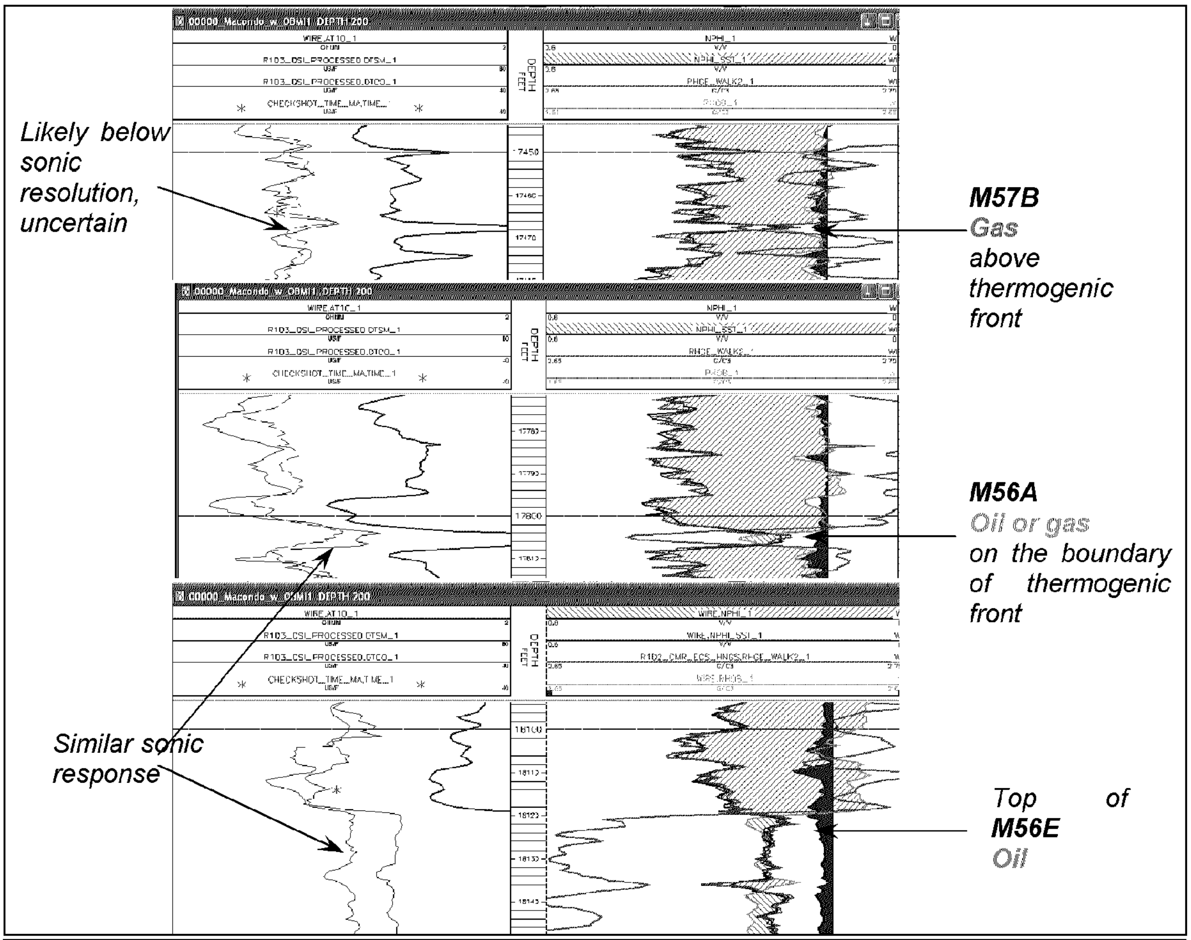


Figure 29: Fluid typing of sands M57B and M56A.

The M57C Sand was pressure tested by the LWD real time Geotap pressure tool at 17606' MD with an equivalent mud weight pressure of 14.19 ppg. This pre-test failed to repeat on re-logging with the MDT due to repeated seal failure. The OBMI image suggests that the sand is very thinly interbedded (Figure 30) and the thin sand stringers are below density log resolution so the evaluation of porosity, Sw and fluid type is compromised.

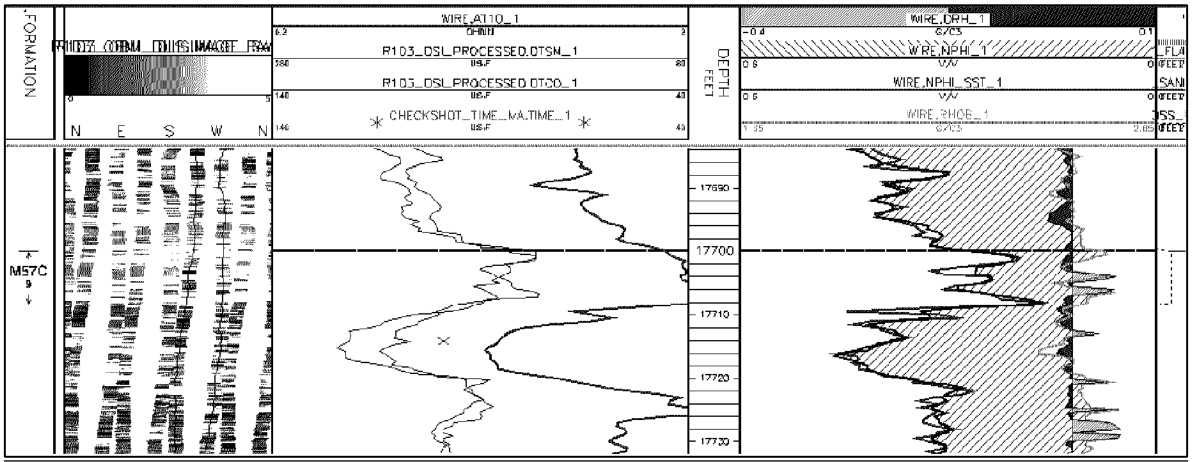


Figure 30: Logs over sand M57C.

Sands M56B and M56C are thin water bearing sands.

Reservoir and fluid quality

Despite limited core data availability, the integration of the core, log and pressure data suggests that:

- Both M56D and M56E sands have good reservoir quality and reservoir fluid.

- Based on XRD data, the M56D and M56E sand lobes have similar mineralogical content with Quartz content averaging 93% with only minor amounts of clay and secondary minerals (Figure 13).

- Sorting, grain size and sand content are the main controls on reservoir quality.

- From Core data, two rock types have been identified; M56E comprises mainly Rock type 1 and is differentiated from Rock Type 2 by improved sorting. The rock Types are also identifiable in K/Phi space with an average pore throat radius of 10 microns dividing the Rock types. The M56D sand comprises both Rock type 1 and 2. Rock type 1 maybe associated with a more homogeneous sand package, Rock Type 2 in the M56D unit may be associated with some thin bedded pay as evidenced by increased anisotropy from the tensor resistivity data and the CMR bin porosity distribution. There is a better match between core porosity and permeability in the Rock Type 1 of the M56E sand then the more heterogeneous sands of M56D and therefore less uncertainty on reservoir parameters. Thin section data will be integrated with the rest of the data when available to strengthen these assumptions.

- Mobilities from MDT pre tests confirm the two sands have high permeability in the 100's of millidarcy range.

- Figure 31 shows the permeability estimation from different data.
  Red symbols – permeability measured on core (to air),
  Brown line – permeability calculated from Density porosity using core derived equation (see underestimation of Permeability in M56D).

Red line was used for averages instead – permeability with corrected Density porosity input.
Blue symbols – drawdown mobilities from MDT pretests,
Green symbols – draw down mobility from MDT samples.
Drawdown mobility is rough estimate of permeability to oil.
Pretests mobility do not look valid to use, MDT samples mobility multiplied by 0.17 cp viscosity can be compared to Permeability to air measured on core and calculated with logs – magenta stars.

- There is a good match of log derived porosity K_CORE and CMR derived KTIM (purple curve).

- There was some initial difficulty in acquiring MDT Pressure data in the two sands. Three fluid samples were eventually taken – 1 in M56D and 2 in M56E. All 3 samples identified same fluid - volatile oil with GOR ~3000 and API=35, PVT analysis showed viscosity=0.17 cp. After the sampling, the pressure tests program was resumed.

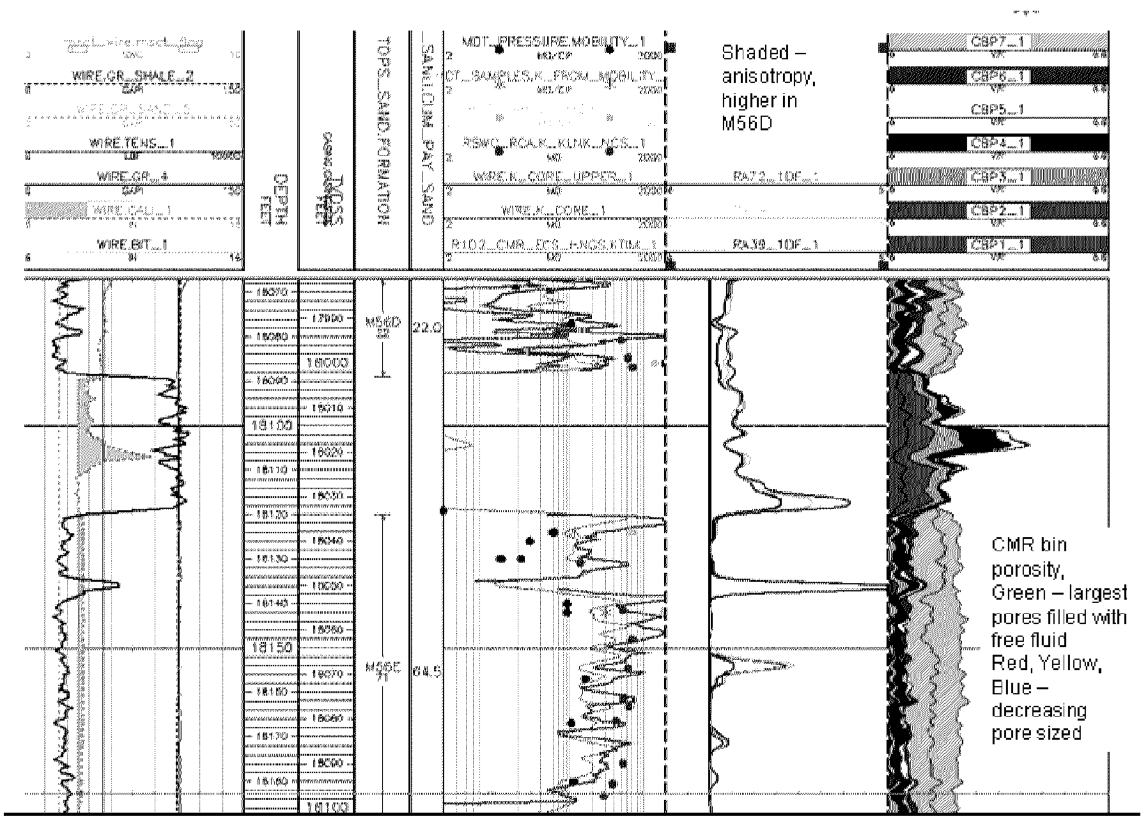


Figure 31: Logs data demonstrating M56D and M56E analysis.

- Pressure gradients are presented in Figure 32. Sample and MDT points show very slight different gradients between the two sands (0.249 psi/ft and 0.251 psi/ft for M56E and M56D respectively) but they were taken with different probes that may explain the difference.

- Water saturation uncertainty will be decreased as capillary pressure and electrical properties measurements are available.

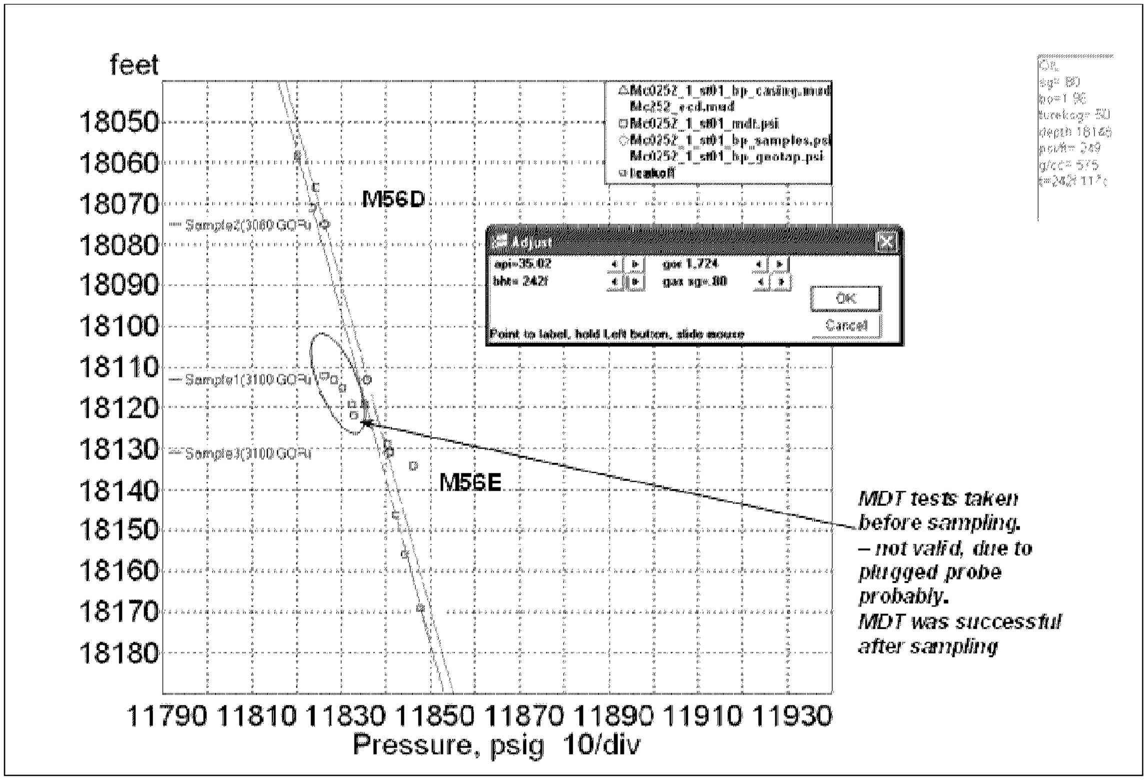


Figure 32: Presgraf pressure plot.

Net/Pay summary

Summary table is presented in Figure 33. For M56D corrected Density porosity, Sw and Permeability are used for averaging.

Top of Sand MD Depth	Bottom of Sand MD Depth	Top of Sand TVDSS Depth	Bottom of Sand TVDSS Depth	Fluid Content	Sand Name	Gross Sand	Net Sand	Pay Sand	Average Gross Porosity	Average Net Porosity	Average Pay Porosity	Average Net Sw	Average Pay Sw	Arthmetic Air Perm	Geometric Air Perm
Feet	Feet	Feet	Feet			Feet	Feet	Feet	%	%	%	%	%	MD	MD
17467.0	17469.0	17381.1	17383.1	Gas	M57B	2	2	2	18	18	18	52	52	15	8
17700.0	17708.5	17614.1	17622.6	Uncertain	M57C	8.5	0	0	9						
17804.0	17806.5	17718.1	17720.6	Oil or Gas	M56A	2.5	2.5	2.5	22	22	22	24	24	1702	467
17975.5	17989.5	17889.6	17903.6	Brine	M56B	5	3	0	14	17		58		7	3
18030.0	18032.0	17944.1	17946.1	Brine	M56C	2	2	0	17	17		64		5	4
18067.0	18089.0	17981.1	18003.1	Oil	M56D	22	22	22	21	21	21	17	17	258	102
18120.0	18191.0	18034.1	18105.0	Oil	M56E	69.5	64.5	64.5	21	22	22	10	10	514	324
18217.5	18238.5	18131.5	18152.5	Oil	M56F	6.5	6.5	6.5	21	21	21	22	22	1441	130

Figure 33: Macondo net/pay summary table.

Petroleum Systems and Fluid Properties

Temperatures (pre- versus post-drill)

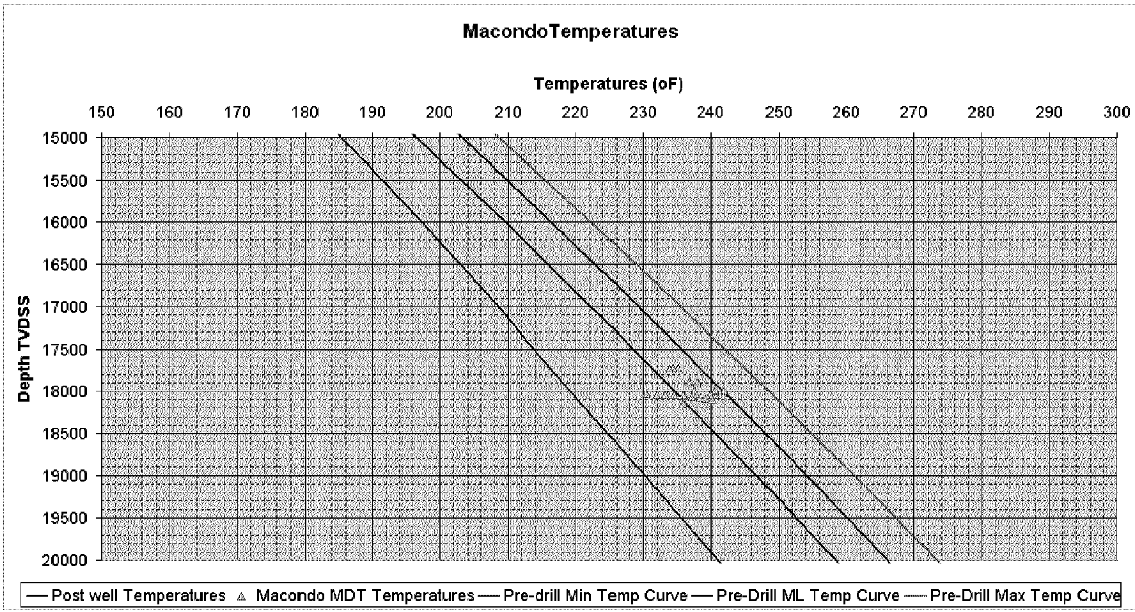


Figure 34: Pre- versus Post-drill temperature comparison.

The reservoir temperatures were predicted to be in between 219 and 248 °F, with a most likely case at 235 °F. The post well temperatures, acquired from the MDT tool gave a broad range between 230 and 242 °F (Figure 34). Therefore the post-drill temperature range was similar to the pre-drill temperature prediction.

The black curve is the post-well temperature curve. It takes into account the outer limit of the MDT temperatures as the closest reservoir temperature reading.

The post-well temperature curve is slightly above the most-likely pre-drill curve (~7 °F) but is close to the pre-drill temperature prediction. The 7 °F temperature difference should not impact the rest of the subsurface work.

Headspace & Isotope (Reservoir zone)

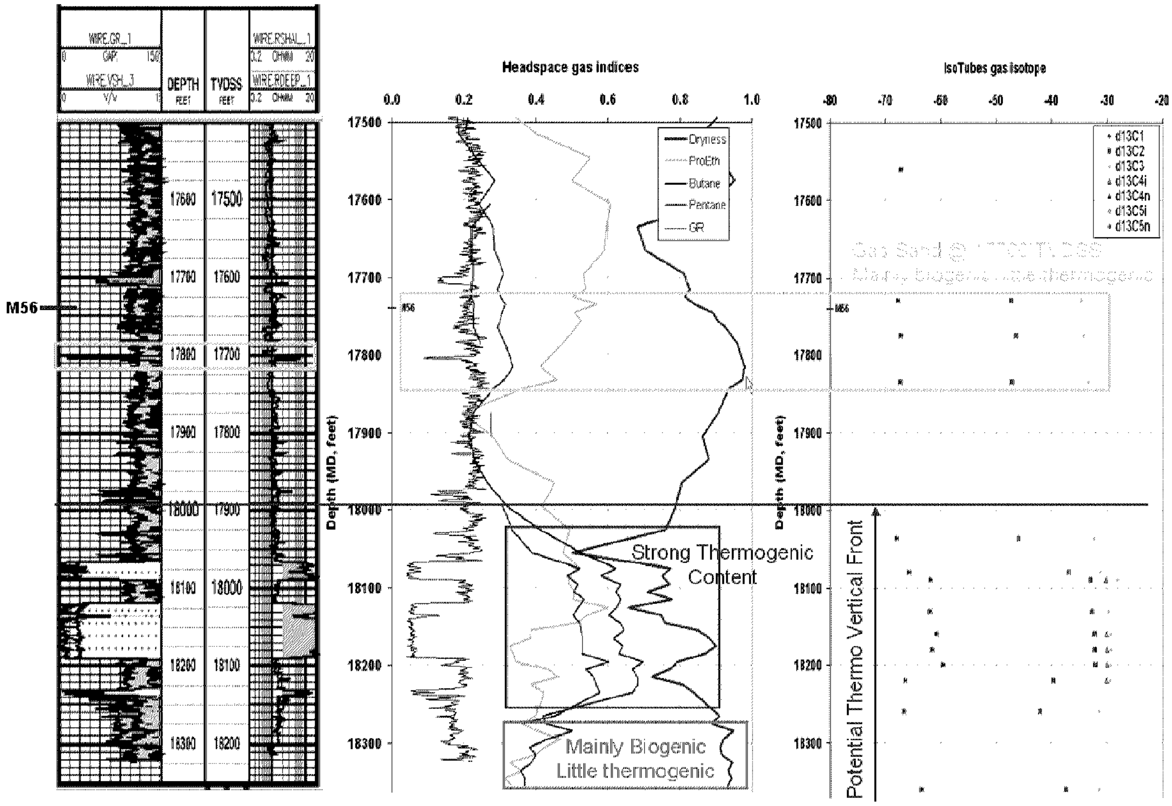


Figure 35: headspace gas indices and isotope results from isotubes.

Using the headspace gas indices and isotope results from isotubes, the thermogenic vertical front appears at 18000' MD (17900' TVDSS) (Figure 35). Indeed, the pro-ethane, butane, and pentane indices increase drastically, while the dryness index severely decreases. Moreover, the methane isotopes appear less depleted and the butane isotopes become present.

The base of the well (below 18250' MD / 18150' TVDSS) has more a biogenic signature. It is believed that the vertical thermogenic front does not pass exactly by the wellbore, giving the idea of a lateral charge. However, it is certainly a vertical thermogenic front.

The section shallower than 18000' MD (~17900' TVDSS) has a strong biogenic signature with some rare amount of thermogenic hydrocarbon. However, it is mainly biogenic gas. The sand at 17800' MD (17700' TVDSS) is a good example: it is mainly biogenic methane, but has a small amount of ethane and propane coming from the thermogenic charge. This charge was lateral in nature.

Fluid properties

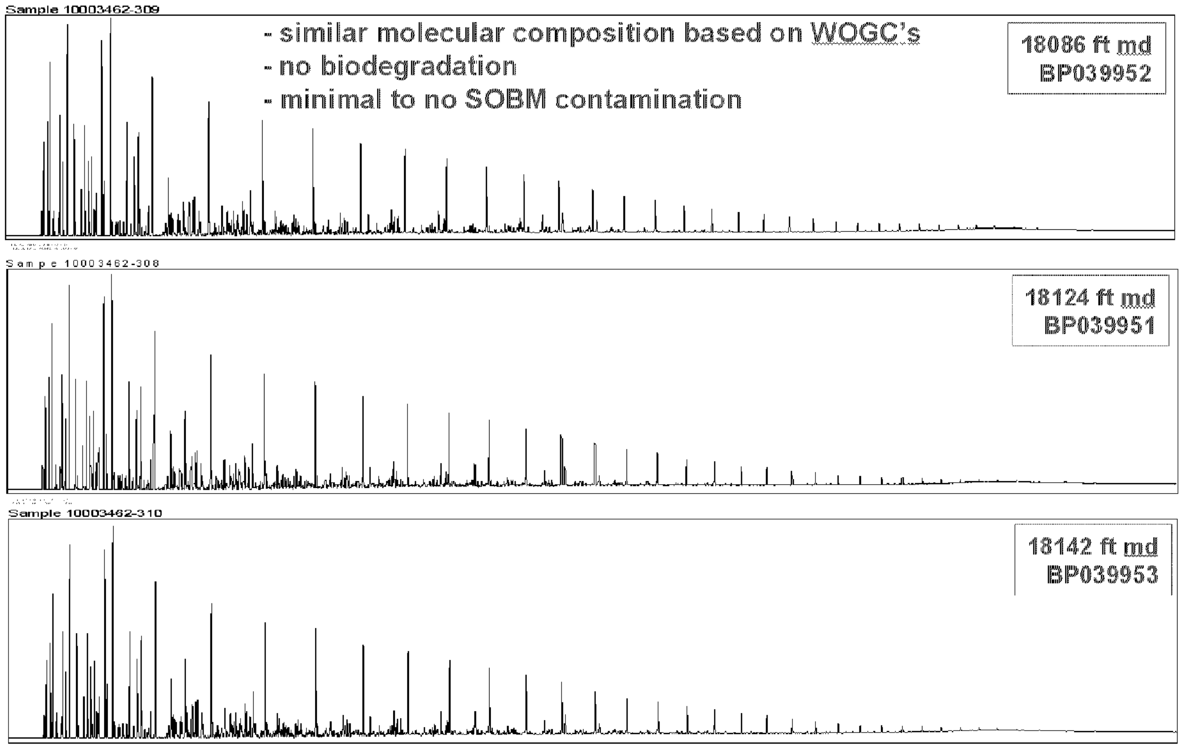


Figure 36: Chromatograms for the three dead oil samples derived from the 3 fluid samples.

Three fluid samples where taken at the level of the reservoir zone: one sample in the M56D sand (upper sand lobe at 18086' MD / 17999' TVDSS), and 2 samples in the M56E sand (middle sand lobe at 18124' and 18142' MD / 18037' and 18055' TVDSS).

Three dead oil samples were derived from those 3 fluid samples and were analysed for whole gas chromatography. The chromatograms are shown in the Figure 36.

By comparing the three chromatograms, we can conclude that the 3 oil samples have a very similar molecular composition, that there is no biodegradation and a minimal contamination level from the drilling mud.

By looking at the headspace and isotube concentrations as well as the isotope signatures, we can also conclude that the M56D, M56E, and M56F sands are oil and have similar composition. The M56F sand (18250' MD) is oil but has a higher content of biogenic gas than the M56D and M56E sands.

MDT fluid samples were taken at three depths. These are the volumes that were obtained during sampling.

Sample Depth	2 ¾ gallons	MPSR	SPMC
18086' MD	1	4	2
18124' MD	1	4	2
18142' MD	1	6	0

The three samples were tested offshore for quality assurance. The results from a single flash are summarized below.

Sample Depth	Contamination	Gas-Liquid Ratio (scf/stb)	Liquid API	Gas Gravity	Reservoir Pressure (psi)	Temperature (F)
18086' MD	1.2 wt %	3017	34.9	0.7823	11841.04	241.9
18124' MD	<1.0 wt %	2909	34.7	0.8050	11850.41	242.3
18142' MD	<1.0 wt %	2840	35.0	0.7837	11855.83	242.6

After samples were brought back to shore, the MPSRs were restored for 5 days to reservoir pressure and temperature.

From flash liquid composition all three zones are the same (Figure 37).

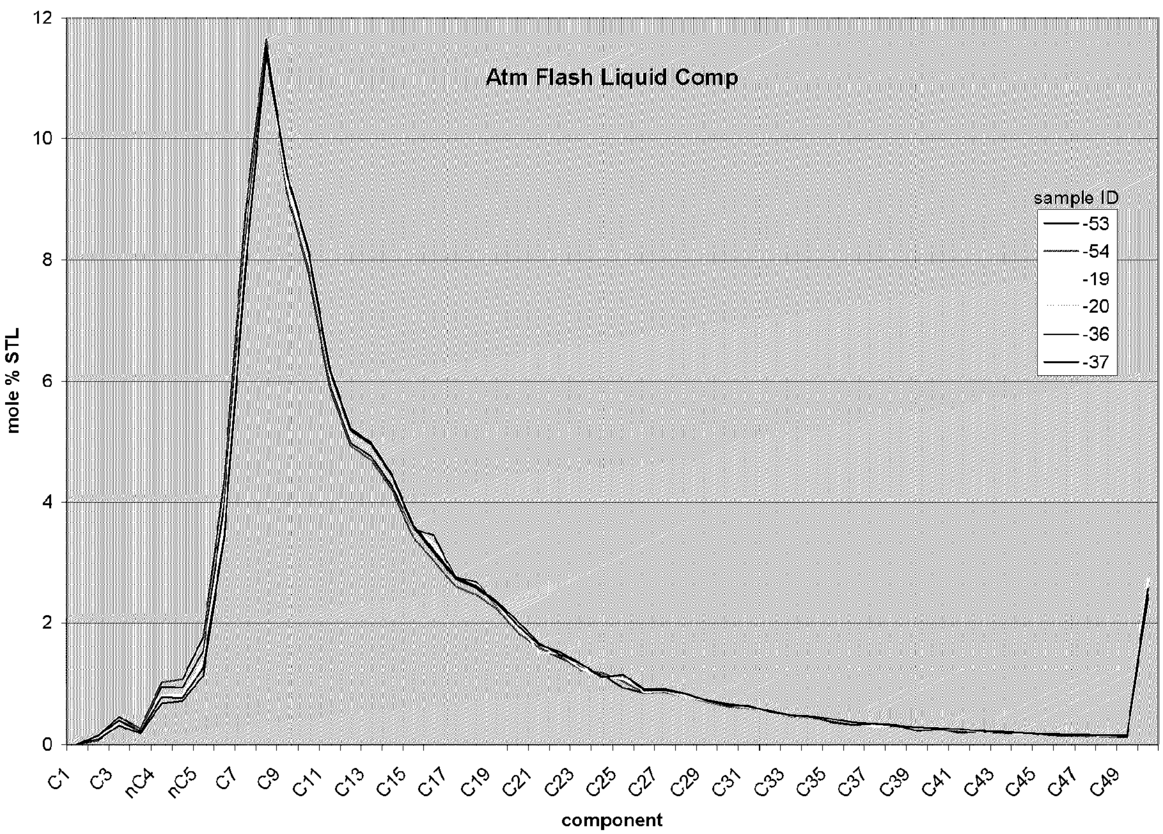


Figure 37: Flash liquid composition comparison.

Pencor conducted the initial test of the fluid at 18142' MD. The saturation pressure was determined to be 6504 psi. The liquid volume percent increased below the saturation pressure which makes it a dewpoint system instead of a bubblepoint system. From LFA records during MDT sampling it was determined this was an oil system. Therefore we had an MPSR sample sent to a separate lab, Schlumberger Oilphase, to confirm or deny the system and saturation pressure. Oilphase had a saturation pressure of 6348 psi and saw liquid volume decrease below the saturation pressure making it a bubblepoint system. A third lab, Westport, was selected to confirm the bubblepoint system. Their analysis determined it is a bubblepoint system and the saturation pressure is 6438 psi. Below is a summary of the analyses conducted by the labs for sample at 18142' MD thus far on May 24, 2010.

Lab	Pencor	OilPhase	Westport	Comments
Psat (psia)	6504	6348	6438	18142' MD sample
Oil Density (gm/cc) @ Res Cond	0.587	0.590		18142' MD sample
Co (10^{-6}/psi) @ Res Cond		12.2		18142' MD sample
Oil Viscosity @ Res Cond	0.168			18142' MD sample
FVF (rb/stb)	2.564			18142' MD sample
WAT (^{o}F)	89			Dead Oil

Strickland Exhibit 8

From: Corser, Kent
Sent: Mon Jun 07 22:42:00 2010
To: Horizon Legal Copy (MC252_Email_Retention@bp.com); Kent.Corser@bp.com; Knudsen, Torben (Torben.Knudsen@bp.com); McKay, Jim; Pere, Allen L (Allen.Pere@bp.com); Renter, Stephen (Stephen.Renter@bp.com); Warren.Winters@bp.com
Subject: FW: Request: 14.1 sand potenial
Importance: Normal
Attachments: MC252-1 Sand Description v2.xls

Kent Corser
Drilling Engineering Manager NAG
BP America Inc
510 Westlake Park Blvd Room - 2.332A
Houston Texas 77079
Office- 281-366-2142
Cell - 281-433-0093
Home - 281-578-3224

From: McAughan, Kelly
Sent: Saturday, June 05, 2010 8:40 AM
To: Corser, Kent
Cc: Ritchie, Bryan
Subject: RE: Request: 14.1 sand potenial

Our petrophysicist deemed the sand at 17700'MD not to have hydrocarbons. Possible brine filled. The perm & porosity is low 1 to 5 md and less than 9% porosity. I attached a spreadsheet that has the description of all the sands below the 9 7/8" liner. Hopefully this will help you guys. Let me know if you need anything else.
Kelly
<<...>>

From: Corser, Kent
Sent: Saturday, June 05, 2010 8:24 AM
To: McAughan, Kelly; Corser, Kent
Subject: Request: 14.1 sand potenial

Kelly - Can you provide comment regarding the sand that was measured with the PWD tool (14.1 ppg).

Questions:

1. Are there any hydrocarbons?
2. Is the sand capable of flow?
3. What are the properties of the sand (perm, porosity etc.)

We are trying to make a judgment on what started to flow first and need to determine if this sand has potential.

Kent Corser

Drilling Engineering Manager NAG
BP America Inc
510 Westlake Park Blvd Room - 2.332A
Houston Texas 77079
Office- 281-366-2142
Cell - 281-433-0093
Home - 281-578-3224

	Top of Sand MD Depth	Bottom of Sand MD Depth	Top of Sand TVDSS Depth	Bottom of Sand TVDSS Depth	Fluid Content	Expected to flow (Used in Modeling)	Sand Name	Gross Sand	Net Sand	Pay Sand	Average Gross Porosity	Average Net Porosity	Average Pay Porosity	Average Net Sw	Average Pay Sw	Arithmetic Air Perm	Geometric Air Perm	Geometric Perm converted to Oil (85%)	Temperature	Pressure	Pressure Depth Datum
	Feet	Feet	Feet	Feet				Feet	Feet	Feet	%	%	%	%	%	MD	MD	MD	Degrees F	psia	Feet TVDSS
	12030.0	12246.0	11945.0	12161.0	Gas	Yes if Liner Leak	S023	2	2	2			35		10			1000	162	7081 psia (based on 11.3 ppg pore pressure)	12053
	13227.2	13230.2	13141.6	13144.6	Gas	Yes if Liner Leak	S026	3	3	3			35		10			1000	178	8405 psia (based on 12.3 ppg pore pressure)	13143
LINER	17168.0		17157.0																		
14.2	17467.0	17469.0	17381.1	17383.1	Gas	Yes	M57B	2	2	2	17.95	17.95	17.95	51.58	51.58	15.08	7.5	7.50	234	12847 psia (based on post well 14.2 ppg pore pressure)	17382
14.1	17700.0	17708.5	17614.1	17622.6	Uncertain	No	M57C	8.5	0	0	8.95								237	13017 psia (14.1 ppg) (Geo tap @ 17713' tvdss) (MDT 3 attempts	17713
13.07	17804.0	17806.5	17718.1	17720.6	Oil or Gas	Yes	M56A	2.5	2.5	2.5	22.48	22.48	22.48	24	24	1702.07	467.39	397.28	239	12038 psia (13.07 ppg)(one MDT pressure at 17721' tvdss)	17721
	17975.5	17989.5	17889.6	17903.6	Brine	No	M56B	5	3	0	14.18	16.99		57.65		7.43	3.12		241		
	18030.0	18032.0	17944.1	17946.1	Brine	No	M56C	2	2	0	17.28	17.28		64.2		4.73	4.05		241		
12.6	18067.0	18089.0	17981.1	18003.1	Oil	Yes	M56D	22	22	22	20.67	20.67	20.67	17.17	17.17	257.67	101.8	86.53	242	11838 psia (12.67 ppg) (MDT & Geotap)	17993
12.6	18120.0	18191.0	18034.1	18105.0	Oil	Yes	M56E	69.5	64.5	64.5	21.42	22.08	22.08	9.7	9.7	514.04	323.79	275.22	243	11856 psia (MDT) (12.64 ppg)	18065
12.6	18217.5	18238.5	18131.5	18152.5	Oil	Yes	M56F	6.5	6.5	6.5	21.08	21.08	21.08	21.85	21.85	1440.59	129.87	110.39	244	11875 psia (12.6 ppg) (based on fluid gradient 0.568 gm/cc)	18142
								Vsh<0.4	Poro>0.14	Sw<0.5	Vsh<0.4	Poro>0.14	Sw<0.5								

If Density log is not corrected to match core porosity

18067.0	18089.0	17981.1	18003.1	Oil	No Use Other	M56D	22	22	22	18.32	18.32	18.32	18.55	18.55	26.96	10.46	26.96

1. From core in M56D and M56E: K (klinkenberg air core at net confining stress = 2000 psi) is a function of core porosity at net confining stress
2. Log porosity is calibrated to core porosity at net confining stress in M56D & M56E
3. Log perm is calculated from core derived equation (from #1)

Gross has Vshale cut off Vsh<0.4
Net has a Porosity cut off Poro>0.14
Pay has a Sw cut off Sw<0.5

Water Depth = 4992 feet

Strickland Exhibit 9

From: McAughan, Kelly
Sent: Wed Jun 09 14:53:24 2010
To: Pere, Allen L; Skripnikova, Galina
Subject: Subsurface Technical Memo
Importance: Normal
Attachments: MC252 Subsurface Technical Memo v1.ZIP
Attachments: MC252 Subsurface Technical Memo v1.ZIP

From:	Pere, Allen L
Sent:	Tuesday, June 08, 2010 2:32 PM
To:	Skripnikova, Galina; McAughan, Kelly
Subject:	RE: Request: 14.1 sand potenial

Wednesday will be fine.

Thanks
Allen Pere
BtBcp Lead
EPT - Drilling & Completions
Office: 281-366-0278
Cell: 281-615-2078

From:	Skripnikova, Galina
Sent:	Tuesday, June 08, 2010 2:25 PM
To:	Pere, Allen L; McAughan, Kelly
Subject:	RE: Request: 14.1 sand potenial

Allen,
If it's urgent we can meet now. I will show you my interpretation and answer your questions.
Otherwise - see you tomorrow.
Thanks,
Galina

From:	Pere, Allen L
Sent:	Tuesday, June 08, 2010 2:23 PM
To:	McAughan, Kelly; Skripnikova, Galina
Subject:	RE: Request: 14.1 sand potenial

Sounds good, I had access but will call if I can't get in.

Thanks
Allen Pere
BtBcp Lead
EPT - Drilling & Completions
Office: 281-366-0278
Cell: 281-615-2078

3542
Exhibit No.
Worldwide Court Reporters, Inc.

From: McAughan, Kelly
Sent: Tuesday, June 08, 2010 2:21 PM
To: Skripnikova, Galina
Cc: Pere, Allen L
Subject: RE: Request: 14.1 sand potenial

Galina, I'm out this afternoon. My baby is sick with a stomach virus but I will be there in the morning (my husband and I switch half days).

Allen is it okay for you to come over to WL4 2nd floor tomorrow morning say 8ish?? I don't know if you have access to the floor. You can call me - there is a directory and phone at the elevators on 2.

Thanks,
Kelly

From: Skripnikova, Galina
Sent: Tuesday, June 08, 2010 2:16 PM
To: McAughan, Kelly
Cc: Pere, Allen L
Subject: RE: Request: 14.1 sand potenial

Kelly,
I can do tomorrow. I think you may better come here and look at the data. I am in today as well. Let me know if you want to have look today.
Thanks,
Galina

From: McAughan, Kelly
Sent: Tuesday, June 08, 2010 1:37 PM
To: Skripnikova, Galina
Subject: FW: Request: 14.1 sand potenial

Galina,
Would 8:00 be good tomorrow to meet with these guys on the investigation? I won't respond to them until I hear back from you.

Thanks,
Kelly

From: Pere, Allen L
Sent: Tuesday, June 08, 2010 1:35 PM
To: McAughan, Kelly
Cc: Corser, Kent
Subject: RE: Request: 14.1 sand potenial

Kelly,

That is a good time, it would be good to bring the petrophysicist.

Thanks

Allen Pere
BtBcp Lead
EPT - Drilling & Completions
Office: 281-366-0278
Cell: 281-615-2078

From: McAughan, Kelly
Sent: Tuesday, June 08, 2010 12:57 PM
To: Pere, Allen L
Cc: Corser, Kent
Subject: RE: Request: 14.1 sand potenial

Allen,
I'm at home this afternoon with a sick baby but will be in the office tomorrow morning. Can we meet then? Would you like me to bring the petrophysicist too?

Kelly

From: Pere, Allen L
Sent: Tuesday, June 08, 2010 11:33 AM
To: McAughan, Kelly
Cc: Corser, Kent
Subject: FW: Request: 14.1 sand potenial

Kelly,

Do you have time this week to discuss the sands in the production interval of the Macondo well. I have question around the three sand that are in **Bold red.**

Thanks
Allen

	Top of Sand MD Depth Feet	Bottom of Sand MD Depth Feet	Top of Sand TVDSS Depth Feet	Bottom of Sand TVDSS Depth Feet	Fluid Content	Expected to flow (Used in Modeling)	Sand Name
	12030.0	12246.0	11945.0	12161.C	Gas	Yes if Liner Leak	S023
	13227.2	13230.2	13141.6	13144.6	Gas	Yes if Liner Leak	S026
LINER	17168.0		17157.0				
14.2	**17467.0**	**17469.0**	**17381.1**	**17383.1**	**Gas**	**Yes**	**M57B**
14.1	17700.0	17708.5	17614.1	17622.€	Uncertain	No	M57C
13.07	17804.0	17806.5	17718.1	17720.€	Oil or Gas	Yes	M56A
	17975.5	**17989.5**	**17889.6**	**17903.6**	**Brine**	**No**	**M56B**
	18030.0	**18032.0**	**17944.1**	**17946.1**	**Brine**	**No**	**M56C**
12.6	18067.0	18089.0	17981.1	18003.1	Oil	Yes	M56D
12.6	18120.0	18191.0	18034.1	18105.C	Oil	Yes	M56E
12.6	18217.5	18238.5	18131.5	18152.£	Oil	Yes	M56F

Allen Pere

BtBcp Lead
EPT - Drilling & Completions
Office: 281-366-0278
Cell: 281-615-2078

From:	Corser, Kent
Sent:	Monday, June 07, 2010 5:42 PM
To:	MC252_Email_Retention; Corser, Kent; Knudsen, Torben; McKay, Jim; Pere, Allen L; Renter, Stephen; Winters, Warren J
Subject:	FW: Request: 14.1 sand potenial

Kent Corser
Drilling Engineering Manager NAG
BP America Inc
510 Westlake Park Blvd Room - 2.332A
Houston Texas 77079

Office- 281-366-2142
Cell - 281-433-0093
Home - 281-578-3224

From:	McAughan, Kelly
Sent:	Saturday, June 05, 2010 8:40 AM
To:	Corser, Kent
Cc:	Ritchie, Bryan
Subject:	RE: Request: 14.1 sand potenial

Our petrophysicist deemed the sand at 17700'MD not to have hydrocarbons. Possible brine filled. The perm & porosity is low 1 to 5 md and less than 9% porosity. I attached a spreadsheet that has the description of all the sands below the 9 7/8" liner. Hopefully this will help you guys. Let me know if you need anything else.

Kelly

<< File: MC252-1 Sand Description v2.xls >>

From: Corser, Kent
Sent: Saturday, June 05, 2010 8:24 AM
To: McAughan, Kelly; Corser, Kent
Subject: Request: 14.1 sand potenial

Kelly - Can you provide comment regarding the sand that was measured with the PWD tool (14.1 ppg).

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3. What are the properties of the sand (perm, porosity etc.)

We are trying to make a judgment on what started to flow first and need to determine if this sand has potential.

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Houston Texas 77079

Office- 281-366-2142
Cell - 281-433-0093
Home - 281-578-3224

Technical Memorandum

TITLE: Post-Well Subsurface Description of Macondo well (MC 252)

TO: Kate Baker, Cindy Yeilding, Jay Thorseth, Peter Carragher

WRITTEN BY: Marty Albertin, Chuck Bondurant, Kelly McAughan, Binh van Nguyen
Bryan Ritchie, Craig Scherschel, Galina Skripnikova

DATE: 25th May 2010

Introduction

This technical memorandum outlines the post-well subsurface description of the Macondo well in Mississippi Canyon Block 252 (OCS-G-32306) in the north-central Gulf of Mexico.

Prospect Name	Macondo
Surface Location Block No.	Mississippi Canyon 252
BP well name	MC252_1
OCS-G Well number	OCS – G32306_01
Spud date on Marianas	6th October 2009
Released Marianas due to Hurricane Ida	27th November 2009
Re-entered well on Deepwater Horizon	10th February 2010
Category (Expl/Appr)	Exploration
Total Depth (MD/TVD/TVSS)	18,360' md / 18,349' tvd / -18,274' tvdss
EP Approved by MMS	04/06/2009
Water Depth	4,992 feet
Rotary Table Elevation	75 feet RKB
Top Reservoir Depth	18,065' md / 18,054' tvd / -17,965' tvdss
Net Reservoir Thickness	90 ft
Reservoir Temperature	236° F
Reservoir Pressure	11,850 psi
GOR	3,000 scf/bbl
API	35

Macondo spud
October 6, 2009

Marianas pulled off location
November 27, 2009
After running the 18" casing and cementing the same, the Marianas BOP failed a scheduled test. At the time of the failed test, the 18" casing had been run and cemented. No open hole was exposed. A cement plug was set in the 28" casing, and the riser/BOP stack was pulled. While the BOP stack was being repaired on deck, the late season hurricane Ida formed in the gulf. The well location was in the projected path of the hurricane. The Marianas was evacuated. Upon returning to the rig after the storm, inspections had revealed extensive damage to wire/cables along the underside of the rig. These wires/cables were damaged as the result of waves/swells impacting the underside of the hull. This caused the sheathing of many of the wires/cables to be worn to the point that bare wires were exposed. After assessing the situation it was deemed that the damage was too extensive to perform repairs on location. The rig was de-moored and towed to a shipyard in Mississippi to perform the requisite repairs. While being repaired in the shipyard, the rig contract expired. After finishing repairs, the rig was released.

Well status at time the Marianas was pulled off location
The 18" casing was run and cemented. A 200' cement plug was set near the 28" casing shoe. It was decided that the Deepwater Horizon would finish drilling the Macondo well after finishing appraisal drilling operations at the Kodiak discovery.

On location with the Deepwater Horizon
January 31, 2010
After performing scheduled drawworks and BOP maintenance, running the riser, and testing the BOP on the wellhead, the Macondo well was re-entered on February 10, 2010. Upon re-entry, the cement plug set by the Marianas was drilled-out. After squeezing the 18" casing shoe, the Deepwater Horizon began making new hole on February 15, 2010.

Date encountered and depth of main target
The primary M56 target was encountered on April 4, 2010 while drilling at a depth of 18,065' (MD)/18,054' (TVD).

Date and depth of final TD
The Macondo well reached a final TD of 18,360' (MD)/18,349' (TVD) on April 9, 2010.

Post-TD operations
After reaching TD, a full suite of wireline evaluation was performed. Following wireline operations, production casing was run and cemented. At the time of the incident, the riser was being displaced to seawater in preparation to unlatch from the wellhead and pull the riser/BOP stack.

Geological description

The primary target for the Macondo well was an amalgamated low relief channel-levee system of Middle Miocene age (M56 ~13Ma) (Figure 1). The channel system trends in a north-west to south-east direction over an elongated Mesozoic 4-way ridge that strikes north-east to south-west. The trapping elements are a combination of dip and stratigraphic. The expected facies are low relief channel-levee deposits with vertical and lateral connectivity.

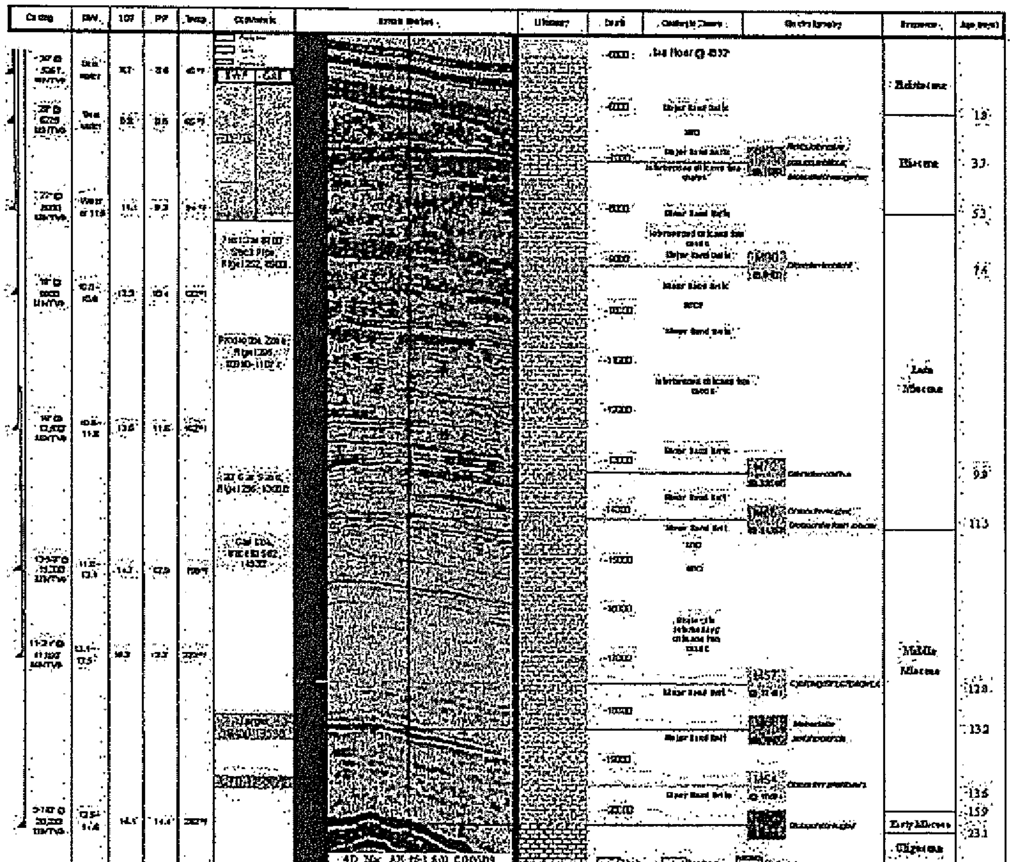


Figure 1: Pre-drill lithostratigraphy and drilling plan for MC0252_1 well.

The Macondo well discovered >90 feet of hydrocarbons in the M57 and M56 sands, the majority occurring in the M56D (22') and M56E (64.5') sands (Figure 2). The depth structure and amplitude maps for the M56 and M57 intervals are shown in Figures 3 and 4.

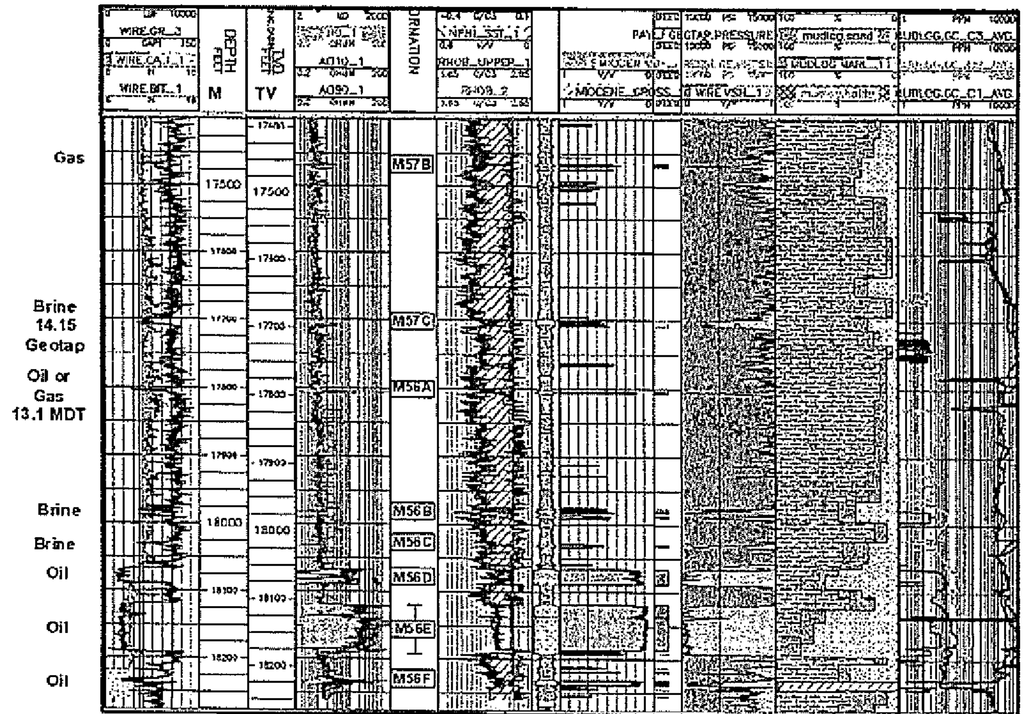


Figure 2: Sand identification chart for sands below the 9-7/8" liner that were cut by the MC0252_1BP1 well.

REDACTED-CONFIDENTIAL

[redacted]

REDACTED-CONFIDENTIAL

[redacted]

REDACTED-CONFIDENTIAL

[redacted]

Shallow Hazards

BP completed an archaeological and seafloor geohazards survey across Mississippi Canyon Block 252 and vicinity in January 2009 to meet MMS requirements for archaeologically significant blocks. No significant man-made or natural hazards were identified near the proposed MC 252-1 well or within the proposed anchor radius for the Marianas drilling rig.

The shallow hazards discussion is limited to the top-hole or riserless section (i.e. between seafloor and the base of the 22-inch casing section). Figure 7 shows the top-hole formation forecast (THFF) for shallow geohazards that was derived from 3D seismic data. Figure 8 shows the shallow hazards top-hole observations log that was generated after drilling the top-hole section. The post-well comparison between actual drilling conditions and pre-drill prediction is provided below.

Shallow Gas

The zone from the seafloor to 8,001 ft MD (base of 22-inch casing section) was predicted to have a *Negligible* potential of shallow gas. No shallow gas was observed while drilling the riserless section.

Shallow Water Flow

A *Low* risk for SWF was assessed for two intervals (6,570 ft to 6,701 ft MD and 7,025 ft to 7,614 ft MD). There was one unit predicted with a *Moderate* risk of encountering SWF in the pre-drill THFF between 6,913 ft and 7,025 ft MD. Although sand-prone intervals are noted from the gamma log between 6,660 ft to 6,900 ft and 6,950 ft to 7,080 ft, no SWF was noted while drilling the riserless section.

A slight flow was noted across the top of the wellhead about 50 hrs after reaching the total depth (TD) of the 22-inch casing section while tripping in hole with the 22-inch casing. It is assumed that the slight flow may have come from possible sands noted above. The flow was stopped by circulating mud.

Hydrates

The potential for gas hydrates was predicted as *Negligible-Low* for the entire riserless section. There was no visual evidence or log data that indicated possible gas hydrates while drilling the riserless section.

Gumbo

The potential for gumbo shale, a plastic clay return response to water based mud, was not addressed in the pre-drill THFF. This was not a concern because the plan was to drill the hole section with seawater. Gumbo was observed towards the end of drilling the 22-inch casing hole section. The gumbo coincided with circulating pad mud in place in preparation of running casing.

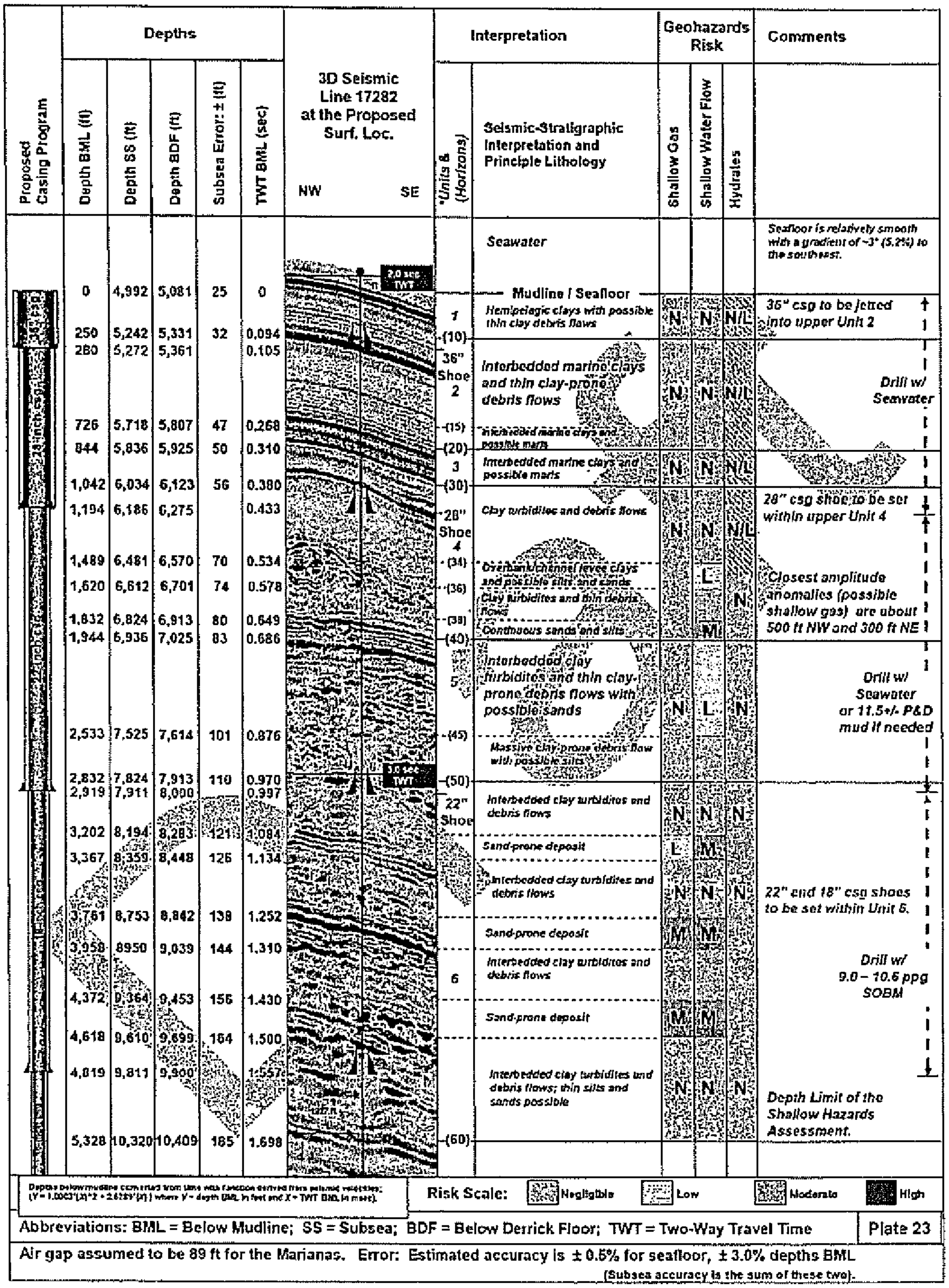


Figure 7: Original Top-Hole Formation Forecast at the Proposed MC-252 #1 Location (produced by Craig A. Scherschel, 08 June 2009).

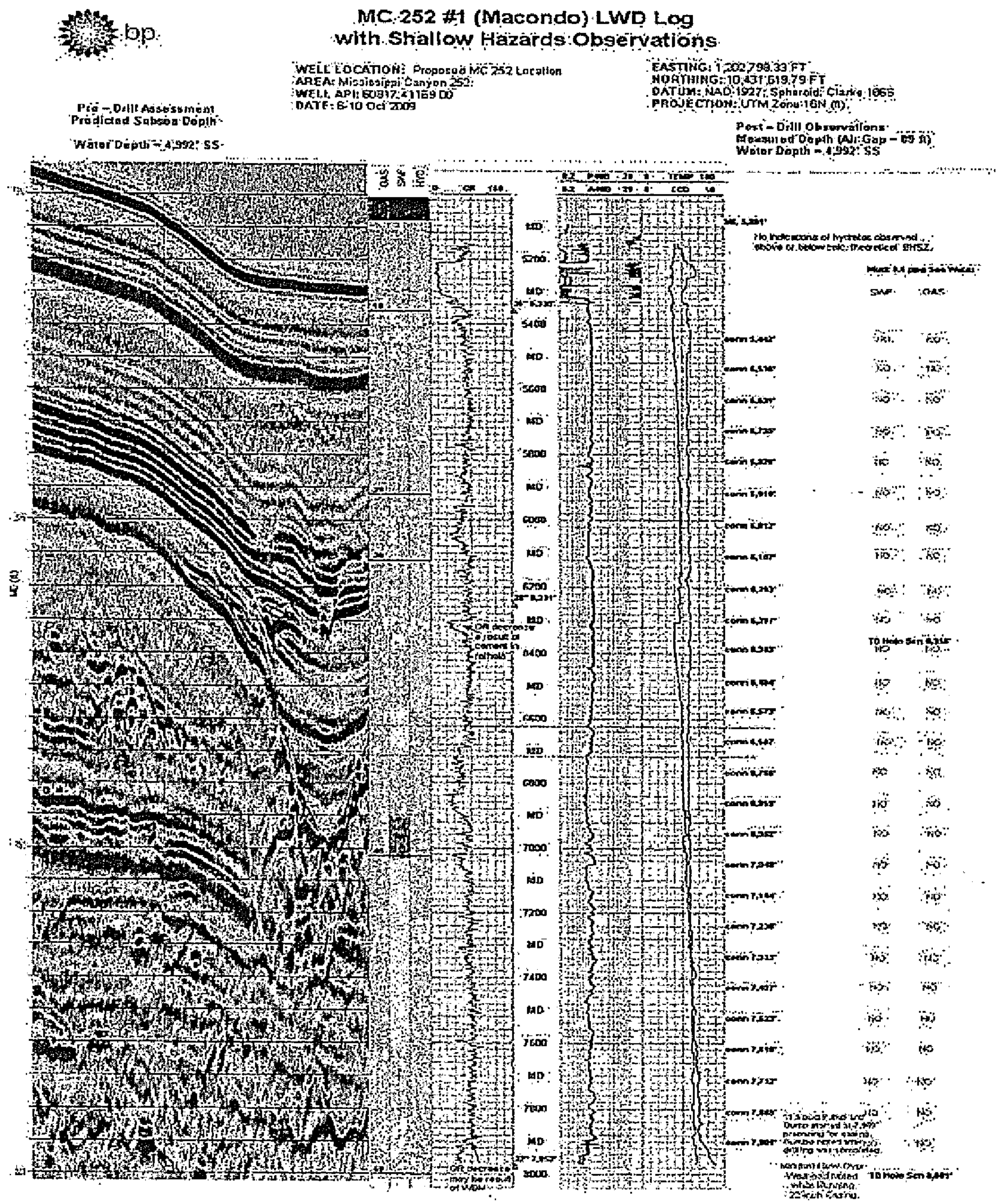


Figure 8: Shallow Hazards Top-hole Observations Log for the MC-252 #1 Location between Seafloor and the Base of the 22-inch Casing Hole Section (produced by Kate Paine, October 2009).

Pore Pressure and Fracture Gradient

The current Macondo pressure interpretation incorporates revisions to the pre-drill forecast based on: synthesis of LWD and wireline pressure indicators (pressure transforms based on resistivity, sonic and checkshot, and density); drilling parameters and data (RxC, background and connection gases), direct drilling indicators (kicks, losses), and GeoTap and MDT pressure measurements (Figure 9). Pore pressure is higher than the predrill most likely curve, from 9000' to 17750' TVDKB. The pre-drill pressure prediction was too low in this interval due to slower than predicted interval velocities, and the apparent need for higher pressure transform model more similar to that used in the analysis of the high pressure, narrow margin offset well "Yumuri", MC382-1. Reservoir pressures are much lower than predicted. Pre-drill centroid modeling of channel sands draped over the large 4-way Macondo structure placed reservoir pressures 0.1-0.3 ppg higher than shale pressure. Actual reservoir pressures imply regional hydraulic connectivity to deeper water, lower overburden/pore pressure environments to the south (similar reservoir pressure to Isabella), or local connectivity updip beneath the salt bodies southwest and east of the prospect. Though wireline density is limited to the reservoir section, calibrated acoustic to density transforms of the Macondo sonic and checkshot imply that overburden is lower than predicted. Lower densities used in the calibrated postwell overburden are consistent with the higher than predicted pore pressure observed at the prospect. The narrower than predicted PPFG window above the reservoir level led to shallower than planned shoes, and use of contingency liners.

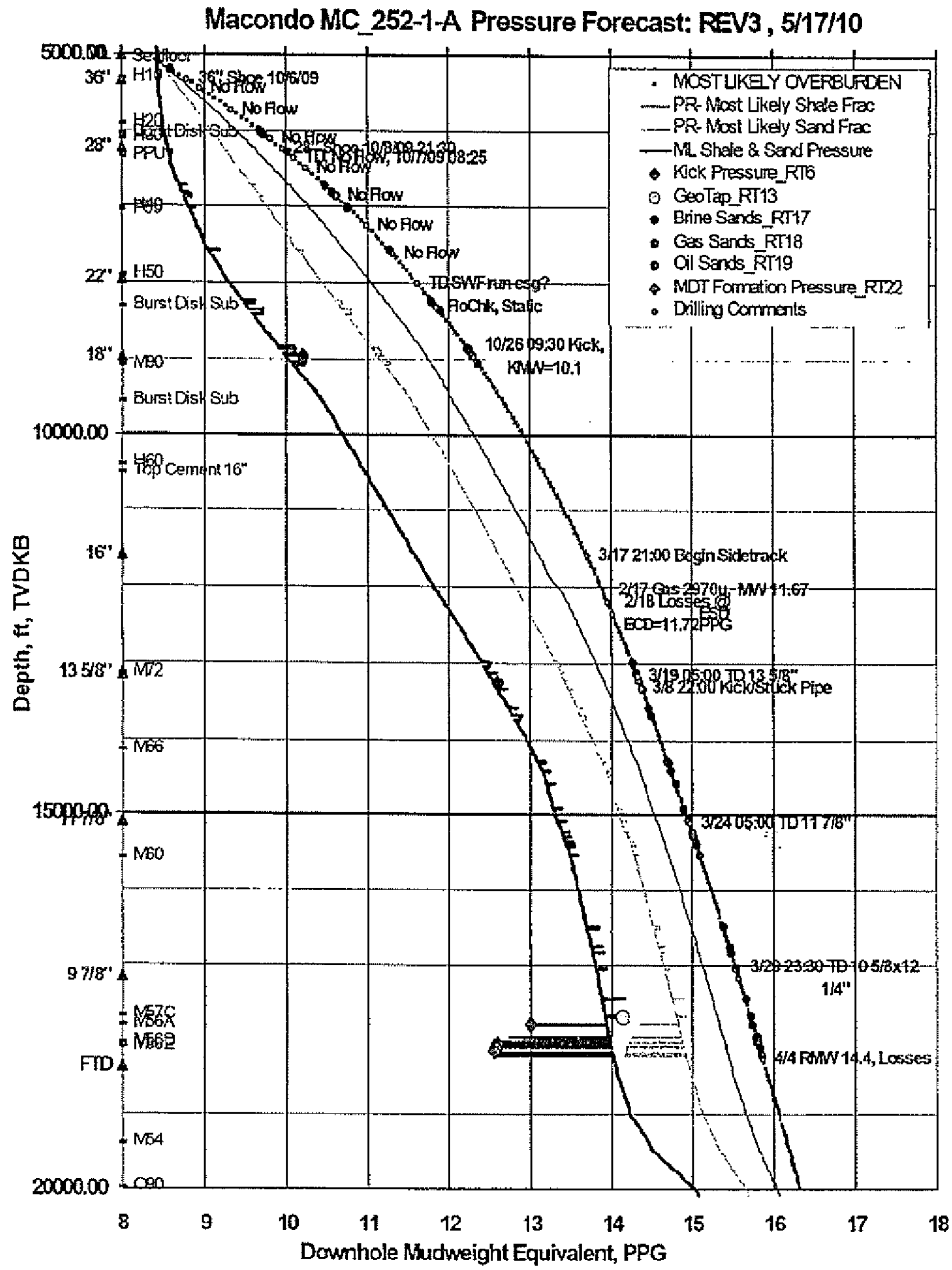


Figure 9: Post-well PPFG interpretation.

Petrophysics

Summary

From shows, log response and fluid samples it is interpreted that >90 feet of hydrocarbons were discovered in the M57 and M56 sands, the majority occurring in the M56D (22') and M56E (64.5') sands. Porosity averages 22%, Sw averages 10 - 17% and permeability averages in the range of 250 - 500 mD (arithmetic, log derived).

Fluid sample quality is high - volatile oil with GOR ~3000 and API=35, PVT analysis showed viscosity of 0.17 cp.

No hydrocarbon-water contacts were penetrated and no significant aquifer sandstone was observed.

Log derived porosity and permeability were calibrated to data from rotary side wall core sample analysis.

M56D is probably slightly different rock type and more heterogeneous than M56E, this is supported by core and log data.

The successful calibration of log data to core plug data in the M56E sand gives a reasonably high degree of certainty around the petrophysical parameters despite the relative lack of core data. A greater degree of uncertainty exists in the more heterogeneous M56D sand. Further uncertainty exists in the thin minor hydrocarbon bearing intervals in M56 and M57. They were not covered by core data and are difficult to resolve with standard logging tools as they are less than 2.5 feet in thickness. The lowest M56F sand was not fully covered by logs.

Electrical properties, capillary pressure data and thin section analysis will be incorporated into the interpretation when available.

Data base

All LWD, Wireline, Mud logging, Pressure and Core data was loaded into Geolog where formation evaluation was completed.

LWD

Halliburton was the Logging While Drilling (LWD) vendor. GR, Resistivity, Sonic and PWD tools were in the BHA while drilling plus Geotap formation pressure in target section.

In the wireline section, LWD was depth shifted to TCOMBO Gamma Ray. In cased hole section, where wireline Sonic in casing was run, LWD was shifted to it to match sonic response on LWD and wireline. From mudline to top of sonic in casing (~11,700' md) the depth shift was distributed.

Wireline

The following Schlumberger open hole wireline logs were run in 6 descents in open hole section from 17,150'-18,270' MD. They include the following tools:

R1D1: ZAIT-GPIT-LDS-CNL-GR-LEHQT
R1D2: CMR-ECS-HNGS-LEHQT
R1D3: Dual OBMI-GPIT-DSI-GR-LEHQT
R1D4: MDT-GR-LEHQT (pressure and samples)

R1D5: MSCT-GR-LEHQT (rotary side wall cores) was not fully successful; repeated as R1D7 after R1D6
R1D6: Quad VSI-GR-LEHQT

Basic observation on logs and borehole condition:

- The hole has a diameter of 8.5" from TD of 18270' to 18,090'md and 9.875" from 18,090' md to the 9.875" casing due to the use of a hole opener assembly.
- This hole section was drilled with barite as a mud weighting material (~20 % of high gravity weight solids). This causes the density correction curve (DRHO) to read negative and also significantly affects the quality of the PEF curve.
- Run R1D1 was run ~7 days after the formation was drilled and 20 hours after the last circulation stopped. During that time the open hole was exposed to different kinds LCM materials to treat losses, below the 9.875" shoe and close to TD. The caliper indicates some wash outs in shales but mainly gauge hole in sandstone.

Core

There were 44 rotary side wall core samples recovered from 3 MSCT runs. Sample preparation and analyses were done at Weatherford's Laboratories.

Only around 2/3rds of the samples were in a condition suitable for petrophysical analysis. After sufficient cleaning and drying, 6 samples were dedicated for mechanical properties and pore compressibility studies. 19 samples were selected for Routine Core Analysis (RCA). The analyses from 17 samples from M56D and M56E have been completed to date and are referenced in this document whilst 2 more sample are still being analysed. RCA was performed at 500 psi and at Net Confining Stress (NCS) of 2000 psi. NCS was calculated from post well sand fracture evaluation, over burden estimation and pore pressure.

If the assumption is made that one sample describes one inch of rock, the core plus represent approximately 2% of the M56D unit and 1.4% of the M56E in terms of amount of interval covered.

Currently Special Core analysis (Electrical Properties and Capillary pressure measurements) are been run on a set of samples.

16 out of the 17 samples were described as fine to medium size grain sandstones, one as shale.

Laser Gain Size Analysis (LGSA) results on 17 samples (6 in M56D and 11 in M56E) are presented in Figures 10 and 11.

In Figure 10 Klinkenberg corrected permeability to air at NCS is plotted versus the percentage of different size particles in the sample. There is a clear relationship between sand content and permeability.

It could be argued that the M56D samples (green) have marginally more silt and less sand grain size particles than M56E samples (blue), though with the relatively small data set this may be a function of the sampling.

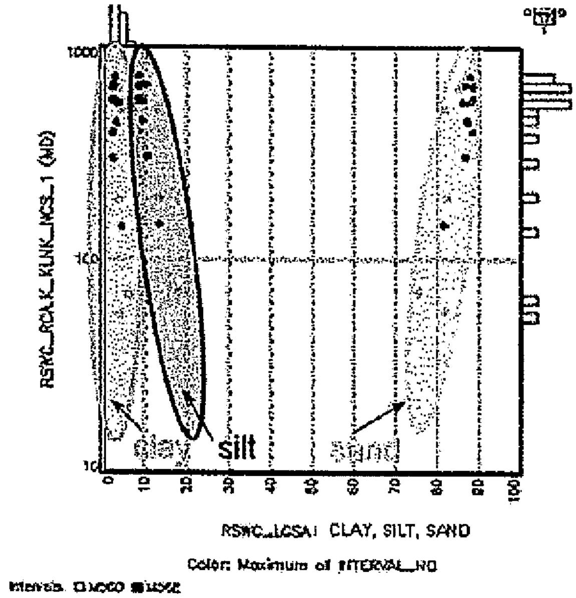


Figure 10: Laser Grain Size Analysis, Permeability vs. percentage of different (sand, silt, clay) size particles.

In Figure 11 Klinkenberg permeability to air at NCS is plotted versus percentage of different size sand particles. The data shows a clear relationship between grain size and permeability. In general M56D (green) has a subtly wider range of grain size suggesting slightly poor sorting, while the M56E (blue) is more homogeneous.

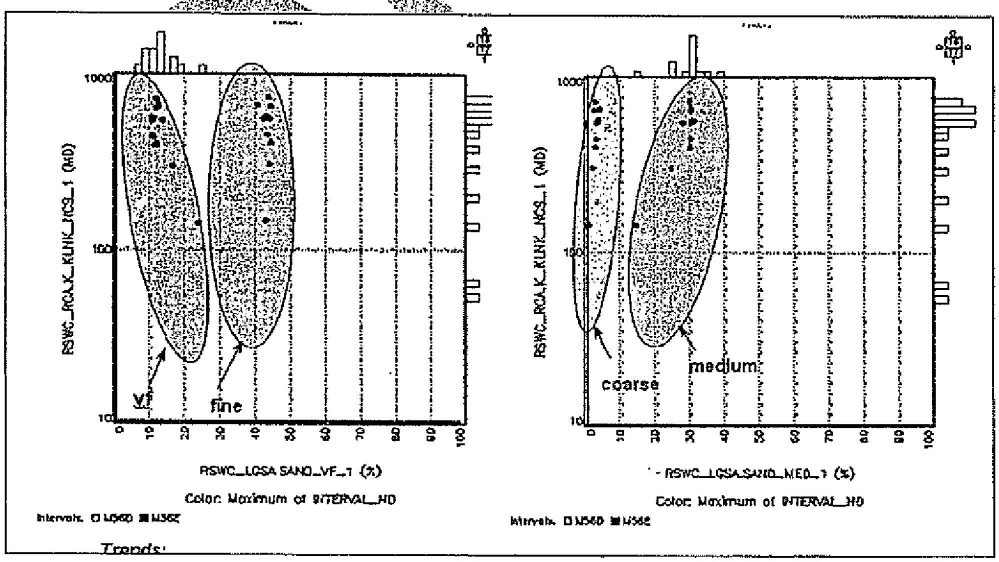


Figure 11: Laser Grain Size Analysis, Permeability vs. percentage of different (very fine, fine, medium and coarse) size sand particles.

The observations from Figures 10 and 11 leads to the suggestion that the M56E core plugs indicate slightly better sorting than the M56D plugs. This is reflected in their respective positioning in K/PHI pace as indicated in Figure 12. Further the Winland iso-pore throat lines suggest that two sands may be slightly different rock types based on their degree of sorting. The 10 micron line divides the two rock type.

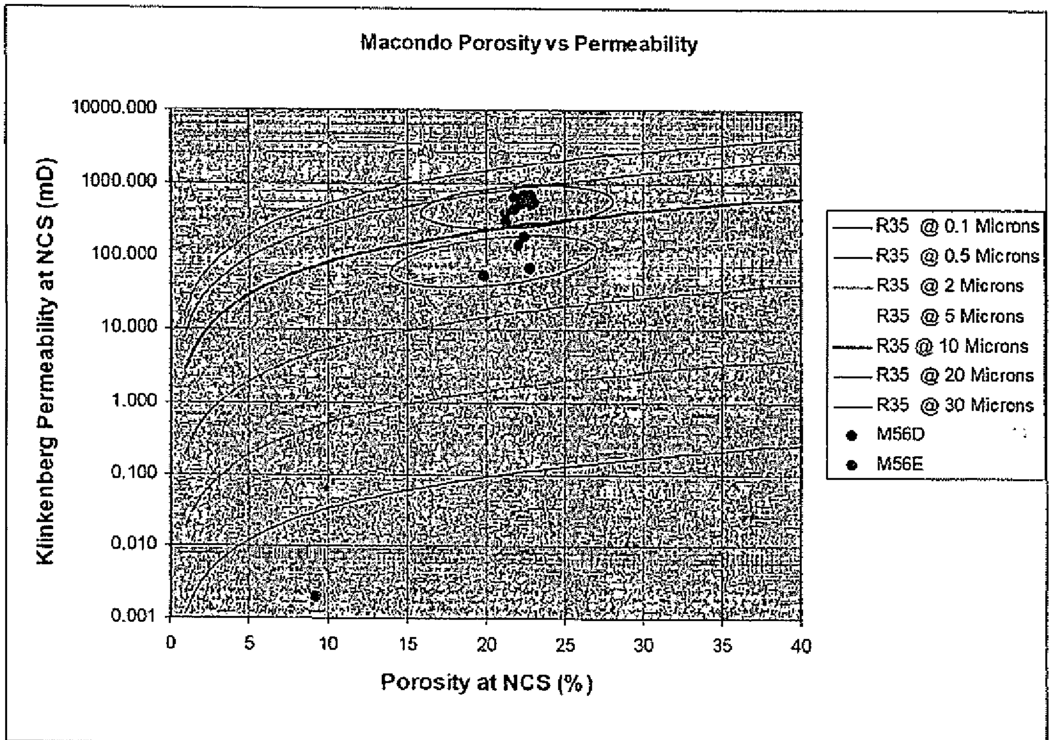
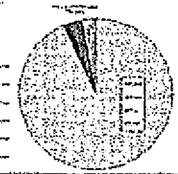


Figure 12: Winland R35 rock typing plot.

X-Ray diffraction (XRD) analysis results from 10 samples (4 in M56D and 6 in M56E) are presented in Figure 13. Mineralogical content of all analysed sandstone samples are in average 93% Quartz with Kaolinite (~2%) and Illite 1% clays, 1% K-spar and 3 % Plagioclase. Based on the 10 samples from M56D and M56E there appears to be no difference in mineralogy between the two sand bodies, so any variation in petrophysical properties is likely to be a function of grain size and most likely sorting.

WEATHERFORD LABORATORIES
X-RAY DIFFRACTION
(WEIGHT %)



Client: BP America Production Company
Well: OCS-G 32306 No.1
Area: Mississippi Canyon Block 252
Sample Type: Rotary Sidewall Core

Plug	Sample	CLAYS				CARBONATES			OTHER MINERALS						TOTALS		
Number	Depth (ft)	Chlorite	Kaolinite	Illite	Mx I/S*	Calcite	Dol/Ank	Siderite	Quartz	[illegible]	[illegible]	Pyrite	Zeolite	Barite	Clays	Carb.	Other
3-4R	18069.8	Tr	2	1	Tr	Tr	0	Tr	92	[illegible]	[illegible]	Tr	0	0	3	Tr	97
3-6R	18074.9	Tr	2	1	Tr	Tr	0	Tr	92	[illegible]	[illegible]	Tr	0	0	3	Tr	97
3-9R	18083.0	Tr	2	Tr	Tr	Tr	0	Tr	94	[illegible]	[illegible]	Tr	0	0	2	Tr	98
2-4R	18087.0	Tr	2	1	Tr	Tr	0	Tr	93	[illegible]	[illegible]	Tr	0	0	3	Tr	97
3-14R	18124.9	Tr	3	1	Tr	Tr	0	Tr	91	[illegible]	[illegible]	Tr	0	0	4	Tr	96
3-18R	18134.1	Tr	2	1	Tr	Tr	0	Tr	93	[illegible]	[illegible]	Tr	0	Tr	3	Tr	97
3-19R	18141.9	Tr	3	1	Tr	Tr	0	Tr	92	[illegible]	[illegible]	Tr	0	0	4	Tr	96
3-25R	18161.0	Tr	2	1	Tr	Tr	0	Tr	94	[illegible]	[illegible]	Tr	0	Tr	3	Tr	97
1-3R	18174.0	Tr	1	1	Tr	Tr	0	Tr	94	[illegible]	[illegible]	Tr	0	0	2	Tr	98
3-31R	18183.1	Tr	2	1	Tr	Tr	0	Tr	93	[illegible]	[illegible]	Tr	0	Tr	3	Tr	97
	AVERAGE	Tr	2	1	Tr	Tr	0	Tr	93	[illegible]	[illegible]	Tr	0	Tr	3	Tr	97

Figure 13: X-Ray Diffraction Analysis. First 4 samples (from 3-4R to 2-4R) are for M56D, 6 next samples are from M56E.

Routine Core Analysis

After the rotary sidewall core plugs were cleaned and dried, the 17 samples were subjected to Routine Core Analysis (RCA). The measurements of porosity and permeability were performed at 500 psi and at 2000 psi (NCS). The analysis also included stair steps and repeat measurements of porosity and permeability.

Klinkenberg permeability to air at NCS is plotted versus Porosity at NCS in Figure 14. M56D sand may be more heterogeneous than M56E and its reservoir characteristics are hardly described by the available samples. More core data will be necessary for rock typing work. From the Laser grain analysis, sorting may be a function in this effect more than grain size.

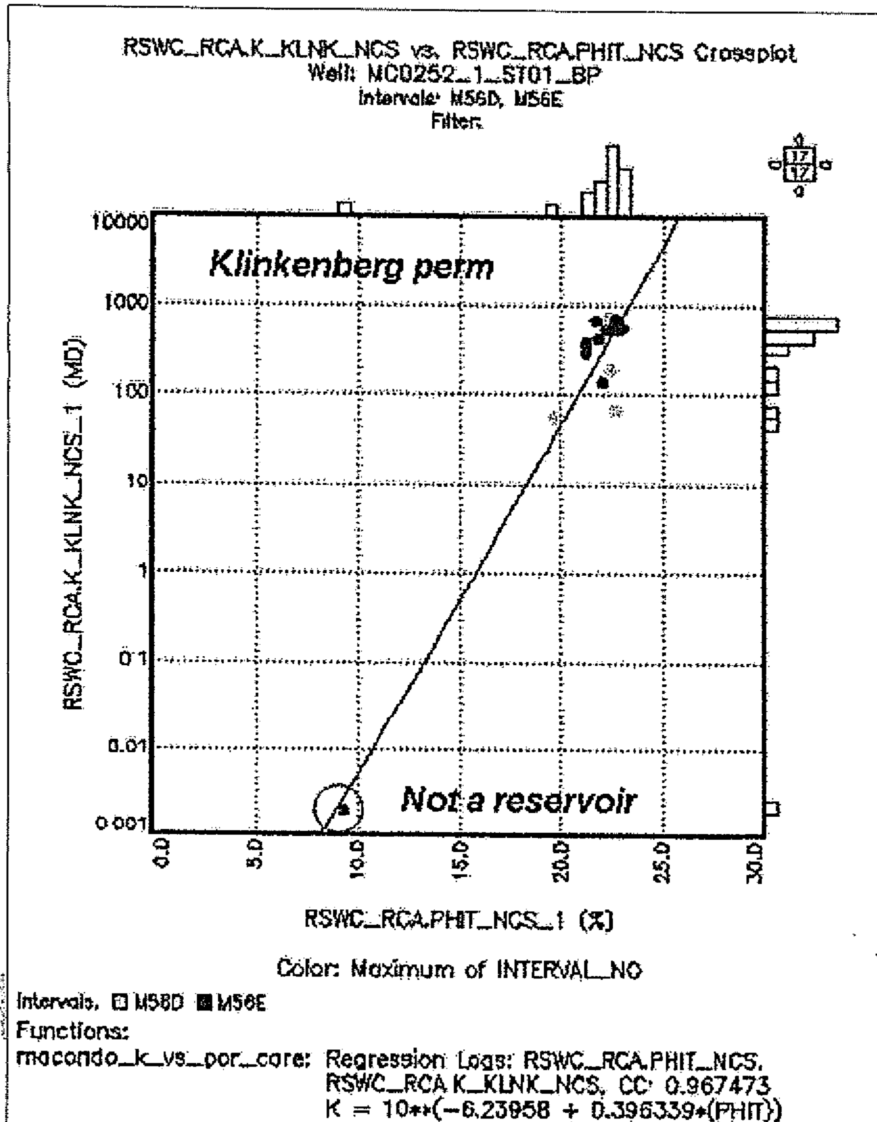


Figure 14: RCA. Klinkenberg permeability to air at NCS is plotted versus Porosity at NCS with linear regression function used for Permeability calculation.

Frequency histograms of core derived Porosity and Permeability are presented in Figure 15. Porosity of M56D samples are very close to M56E samples but Permeability is slightly less, it maybe due to sorting, packing and to grain size distribution as mineralogical content of the sands is similar.

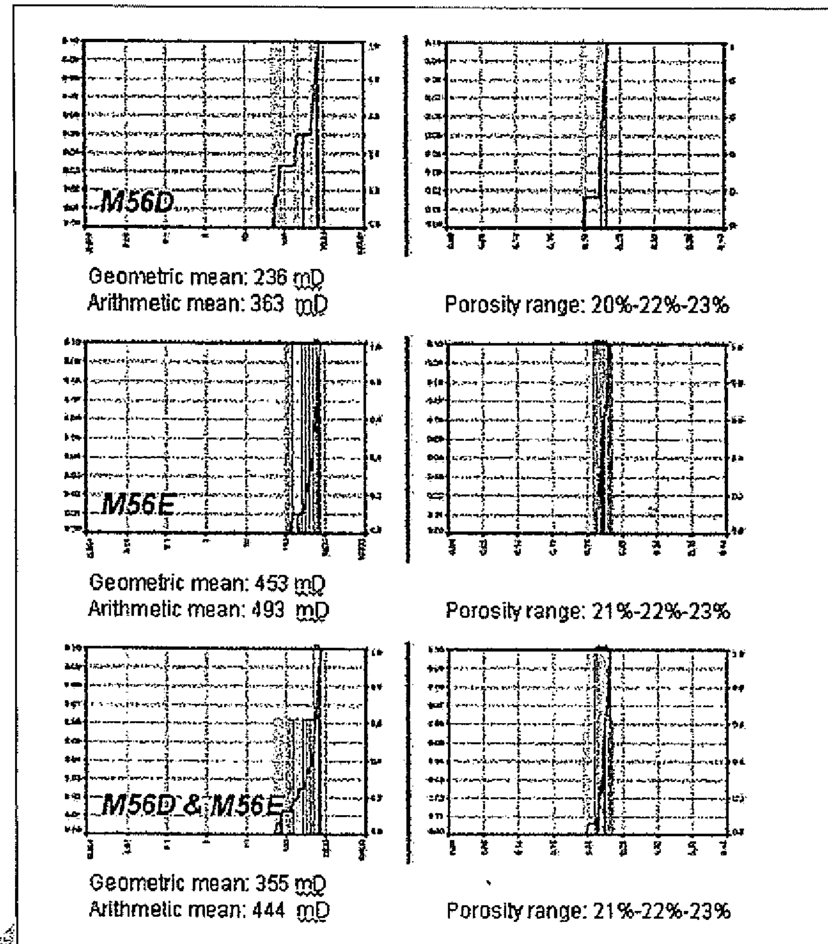


Figure 15: Frequency distribution of Core measured Klinkenberg permeability to air at NCS and Porosity at NCS separately per sands and both sands together.

Log to Core calibration

Porosity was derived from the density log from the following equation:

Density porosity (dec) = (Rhog - Rhob) / (Rhog - Rhof)

Where: Rhog is grain density (g/cc)
Rhob is the density log (g/cc)
Rhof is the fluid density (g/cc)

Grain Density (Rhog) and Fluid Density (Rhof) were determined from core derived data.

Frequency distributions of core measured Rhog and log Density (Rhob) vs. core measured porosity (Phit_ncs) plot are presented in Figure 16.

Core derived Rhog from the M56D and M56E sands are very similar at 2.645 g/cc. However the cross-plot of Core porosity v Density log (Rhob) shows the M56D sand plugs to plot off trend with the M56E plugs. The force fit line through the M56E plugs through the grain density of 2.645 g/cc gives a very reasonable Fluid density Rhof of 0.845 g/cc, which is consistent with the reservoir fluid from pressure data and the mud filtrate density. A number of M56D plugs suggest a higher Rhof of greater than 1 g/cc which is inconsistent with the reservoir fluids derived form logs, pressure data and fluid evaluation. Considering these data points to be anomalous, a RHOF=0.845 g/cc is used for Density porosity evaluation for all sands.

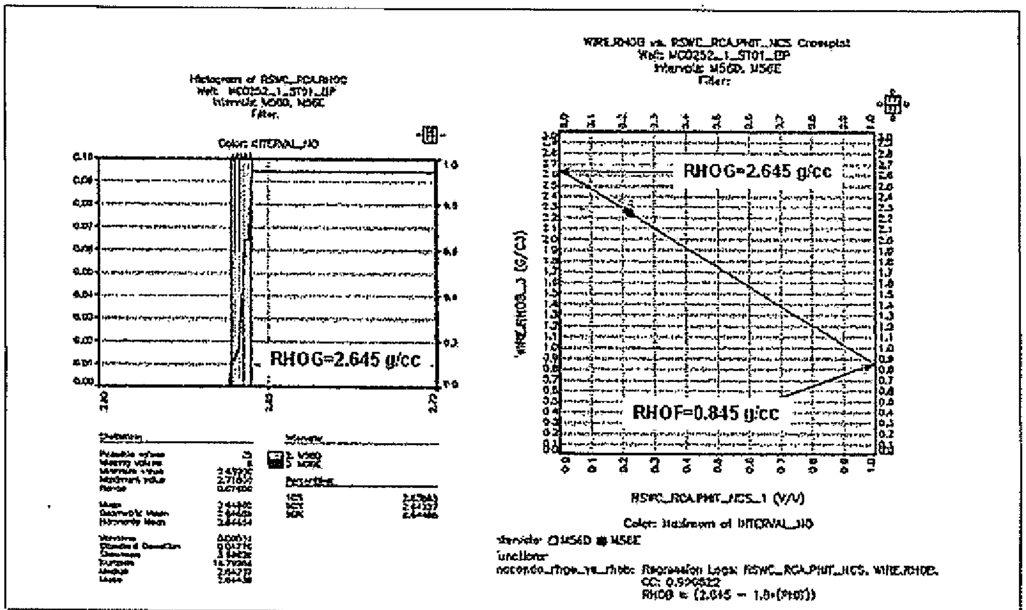


Figure 16. RCA. Core grain density distribution and Cross plot of Density log vs. Core porosity at NCS.

Figure 17 is an overlay of calculated density porosity core plug porosity. Core plugs were slightly shifted to logs, the original samples location on the left side of the Figure 17 with depth shifted plugs on the right side.

The depth shift is to better match the Density porosity and correct the misplacement of shale sample at 18,121'.

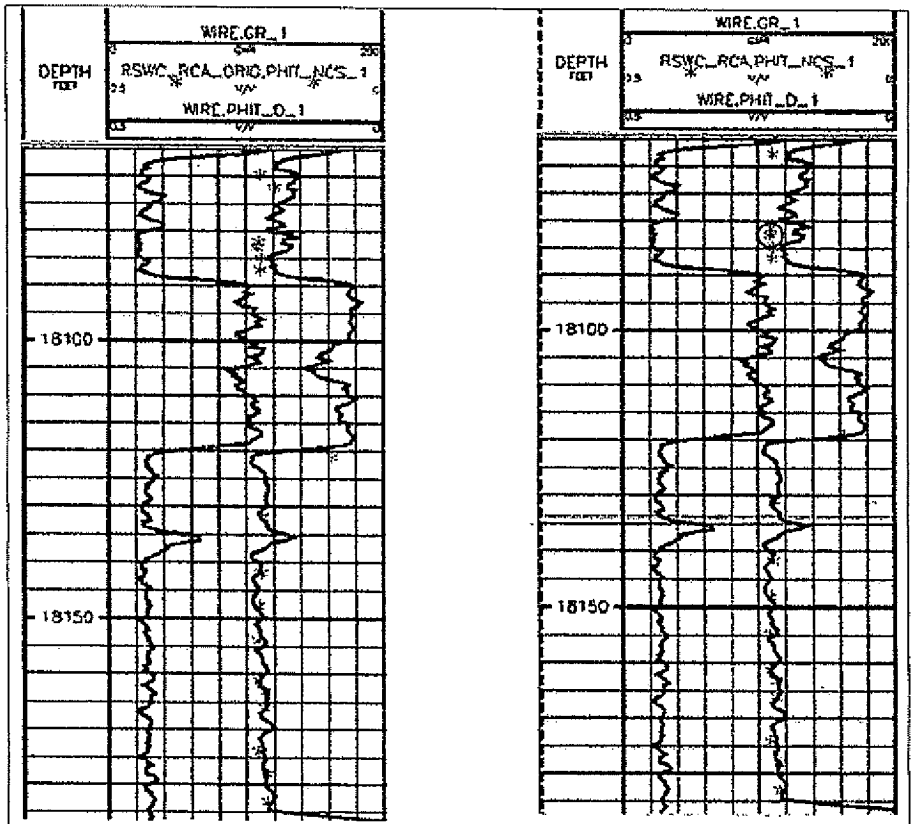


Figure 17: Calibration Logs to core. Core porosity at NCS overlays with Density log derived porosity. Original sidewall core plug depths on the left plot, depth shifted plugs on the right.

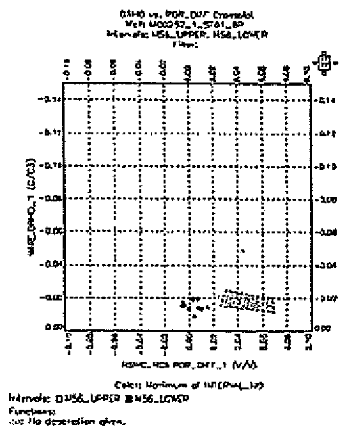
Porosity calculated from density log in upper lobe (M56D) is 2-6 porosity units lower than core derived porosity while in the lower lobe (M56E) they match well.

One of the possible reasons for this mismatch is overcorrecting of the density log (RHOB) for barite additives to mud. The degree of correction (DRHO log) is shown by the red shading in Figure 18.

On the left side in Figure 18a, DRHO (Y axis) is plotted versus the difference between core porosity and density derived porosity (X axis). For M56E sand (in blue) the difference is +/- 1 porosity unit while density correction DRHO is around -0.015 g/cc; For M56D sand (in green) the density correction and the porosity difference are higher for most of the samples.

The large DRHO corrections match spikes in the PEF curve indicating the greatest barite effect (blue curve in Neutron-Density track) in Figure 18b.

Density correction (DRHO) vs. difference between Core porosity and log porosity.



If Upper sand was affected by barite as Lower sand DRHO should be ~-0.015 g/cc

Density correction (DRHO) vs. difference between Core porosity and log porosity.

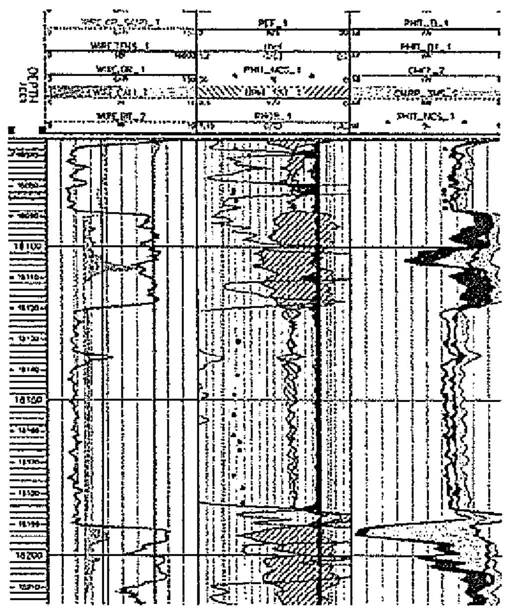


Figure 18a and Figure 18b: Density log correction in M56D.

To eliminate the over correction, DRHO values<=-0.015 were replaced by -0.015 and Rhob in upper sand M56D log was corrected and used for density porosity calculation.

After the correction was made, the Density porosity (Phit_Upper) matched Core porosity more closely and the extrapolated fluid density matched much closer to the fluid density of 0.845 g/cc, estimated in M56E. As the reservoir fluids in both reservoirs are very similar and the mud filtrate is the same this is a reasonable outcome (Figure 19).

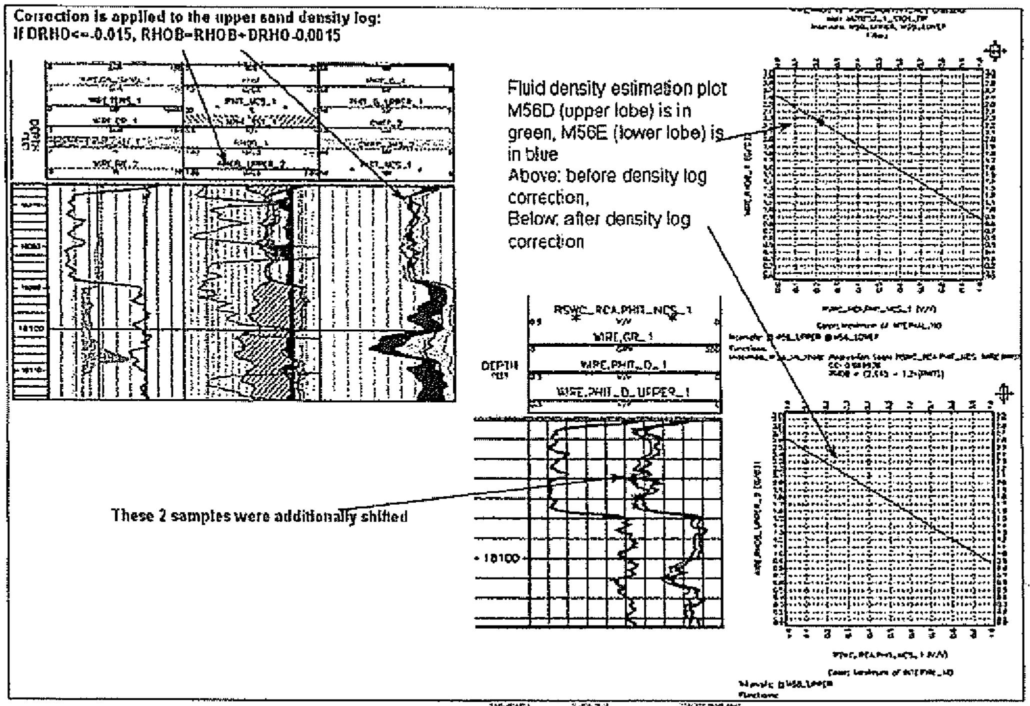


Figure 19: Overlaying Density porosity in M56D with core porosity and cross plots of corrected Density log with core porosity for Fluid density estimation.

The need to make this correction to tie the core data suggest a slightly higher uncertainty in petrophysical parameters in the M56D sand compared to the M56E sand.

There may be other factors to take in to consideration such as anisotropy due to thin beds.

Permeable intervals

Volume of shale (Vsh) cut-off was used to identify permeable intervals.

Gamma Ray log was used for Vsh estimation. For VSH calculation GR_sand and GR_shale lines were created and Vsh was derived as:

$$Vsh=(GR-GR\_sand)/(GR\_shale-GR\_sand)$$

The sand and shale lines were adjusted to reflect the sand percentages from the mudlog and Quartz volume estimated by of ECS log.

For identifying all possibly permeable layers a Volume of shale (VSH) cut-off of 0.4 is used.

The cumulative sand count for each of the permeable sands is presented in Figure 20.

	TOPS_SAND TVD_1	TOPS_SAND TVDSS_1	TOPS_SAND FORMATION_1	TOPS_SAND UM_GROSS_SAND
17467.0000	17456.07351	17381.07351	M57B	2.00000
17469.0000	17458.07347	17383.07347		
17700.0000	17689.07027	17614.07027	M57C	8.50000
17708.5000	17697.57014	17622.57014		
17804.0000	17793.06826	17718.06826	M56A	2.50000
17806.5000	17795.56821	17720.56821		
17975.5000	17964.56328	17889.56328	M56B	5.00000
17989.5000	17978.56256	17903.56256		
18030.0000	18019.06017	17944.06017	M56C	2.00000
18032.0000	18021.06004	17946.06004		
18067.0000	18056.05774	17981.05774	M56D	22.00000
18089.0000	18078.05618	18003.05618		
18120.0000	18109.05382	18034.05382	M56E	69.50000
18191.0000	18180.04842	18105.04842		
18217.5000	18206.54683	18131.54683	M56F	6.50000
18238.5000	18227.54573	18152.54573		

Figure 20: Cumulative sand thickness per sand unit

Petrophysical parameters calculations

Determination of net sand cut off

A frequency histogram of Density porosity is presented in Figure 21. A net sand cut off of 14 % porosity and < 0.4 Vsh was used. These values are based on GOM analog Middle Miocene wells. There is not enough core data to confirm these parameters with permeability distributions.

The Density porosity was compared to Core porosity in M56D and M56E sands, where rotary sided wall derived porosity was used for calibration. In spite of an apparent slight gas signature on Neutron-Density log and CMR porosity being lower than Density porosity (usual for gas sands), fluid sampling of both reservoir sands showed volatile oil, therefore no gas correction applied to the Density log. The density log derived porosity has been demonstrated to tie reasonably well to porosity from core plugs.

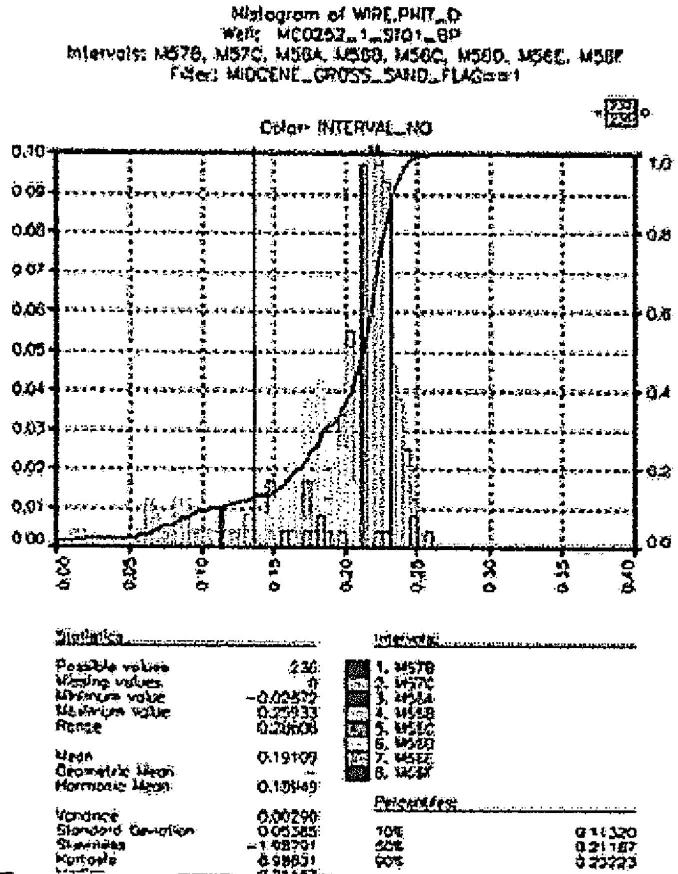


Figure 21: Density porosity histogram with 14% cut off.

Density porosity distribution in the M56E net sand was compared to Core porosity and presented in Figure 22. It shows a good match in minimum, maximum and most likely values. The same histograms for M56D did not show a good match due to underestimating the porosity in this sand if the uncorrected density is used for the calculation (Figure 23).

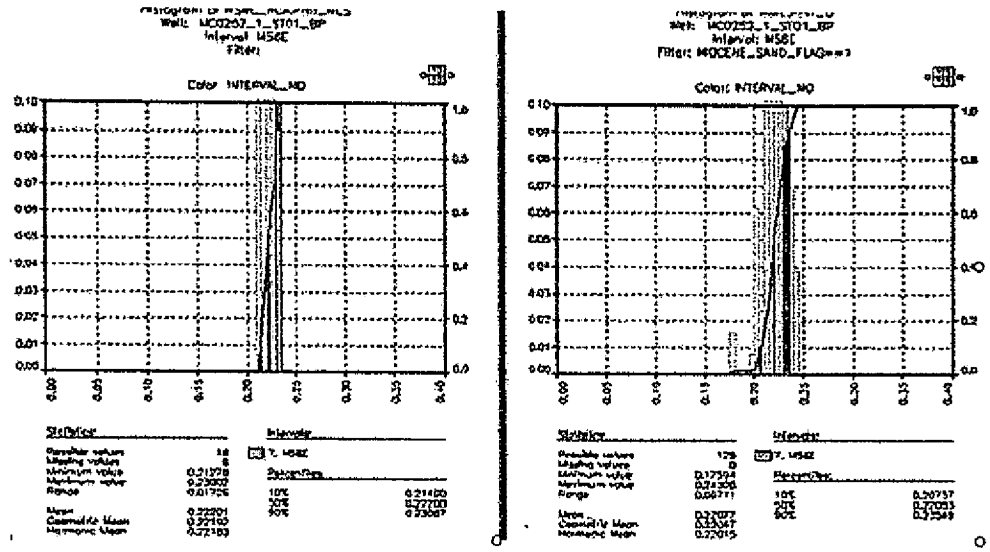


Figure 22: Density Porosity distribution in M56E sand vs. Core porosity.

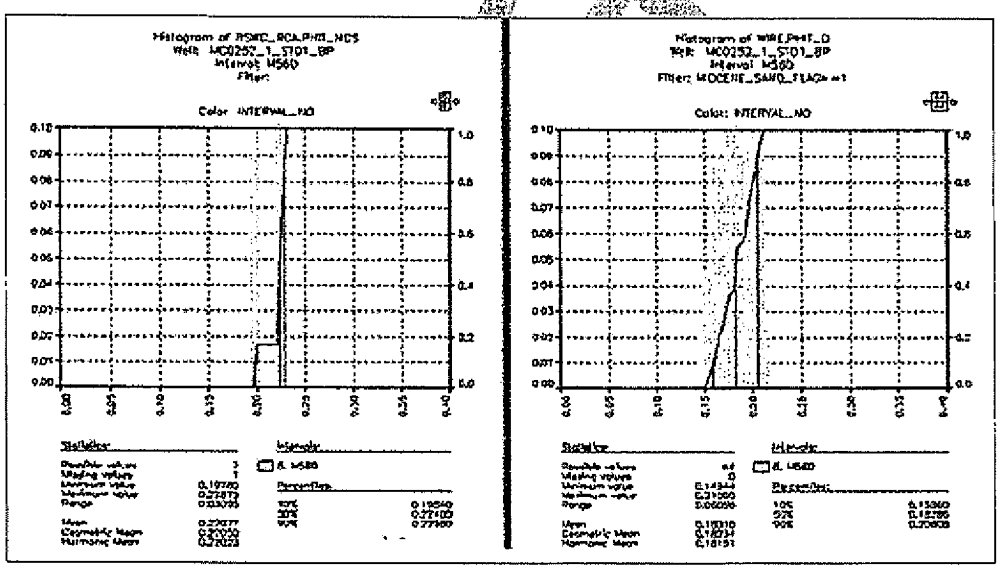


Figure 23: Density Porosity (with uncorrected density input) distribution in M56D sand vs. Core porosity.

If the corrected density is used in the M56D sand for porosity calculation the comparison with core data is closer (Figure 24).

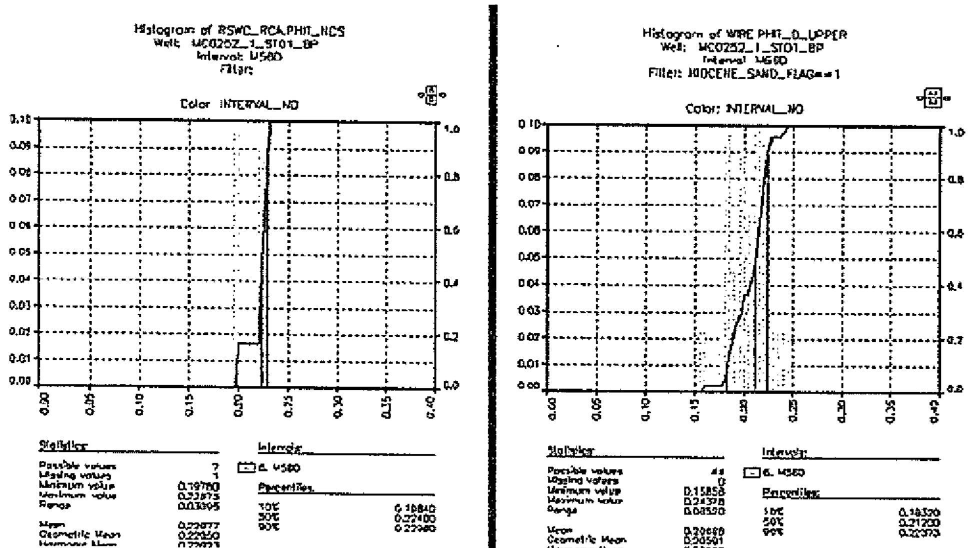


Figure 24: Density Porosity (with corrected density input) distribution in M56D sand vs. Core porosity.

Three further sands have been identified in the TD hole section, which have a gas signature on Neutron-Density logs: namely M57B, M56A and M56F. No core samples were taken in the M57B and M56A sands though one sample was taken in M56F and is currently under evaluation.

Fluid typing of the sands is uncertain and parameters are difficult to assess accurately due to the thin nature of these sands, being below confident log resolution. At this point of interpretation no gas correction applied to the Density porosity in these sands

Water Saturation (Sw)

No thick aquifer sand was observed in the interval of evaluation to determine Rwa.

An assumed regional value of Rw of 0.021 Ohmm at a bottom hole Temperature of 243°F from control data was used for Sw evaluation.
The parameters a=1, m=1,81 and n=1.88 from the Isabella analog well were used to calculate Sw using the Archie equation.

The Sw evaluation will be re-visited after Electrical properties and Mercury Injection Capillary Pressure measurements are finished. Sw is a subject to some uncertainty currently.

Frequency histograms of Sw are presented in Figure 25. The Sw cut off for pay is estimated at 50 %. The cut off value will be revisited after SCAL results are available

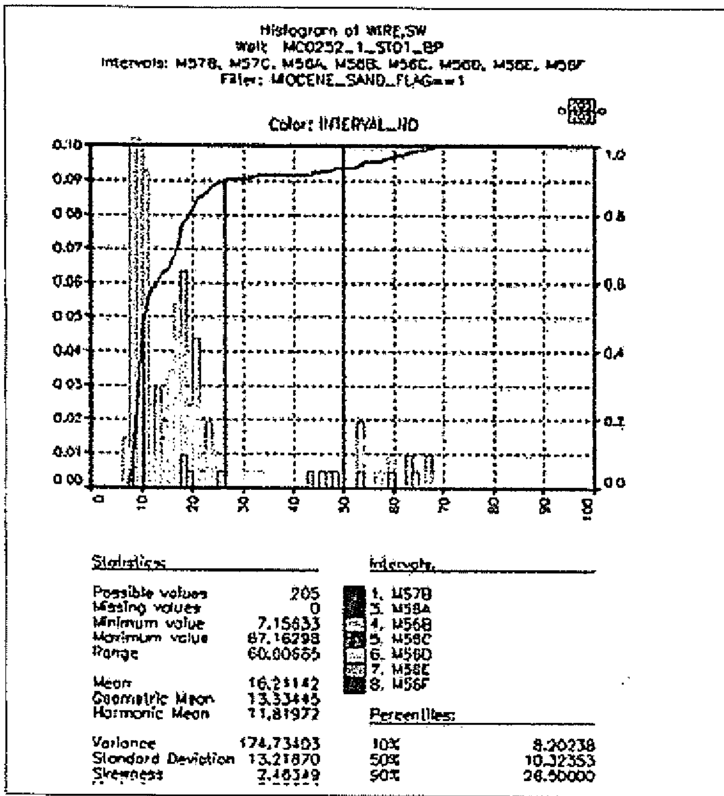


Figure 25: Water saturation Sw histogram with Sw=50% cut off.

Permeability

Permeability (to air) was calculated using core derived equation of:

K=10**(-6.23958 + 0.396339*(PHIT_D*100)),

Where PHIT_D is density porosity in v/v

Log derived permeability in the M56E net sand was compared to Core permeability and presented in Figure 26. It shows reasonable match in geometric and arithmetic mean values. A similar histogram for M56D did not show good match because the Permeability was calculated using Density porosity derived with uncorrected density (Figure 27).

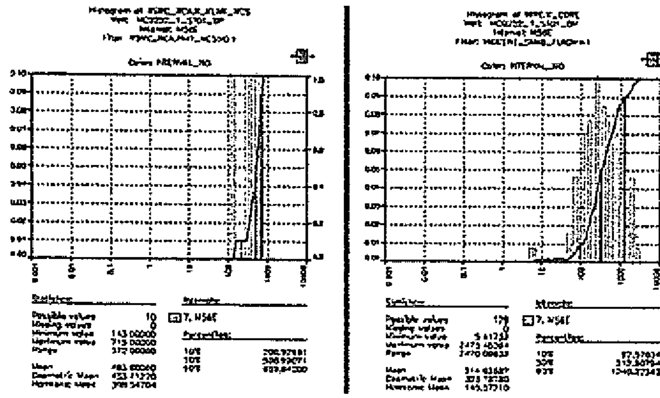


Figure 26: Log derived Permeability distribution in M56E sand vs. Core Permeability.

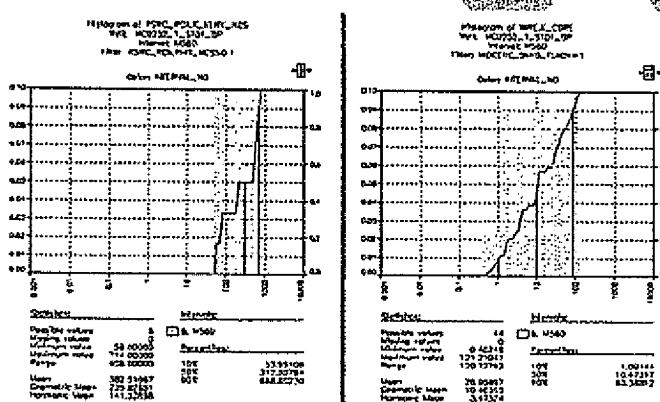


Figure 27: Log derived Permeability distribution in M56D sand vs. Core Permeability. Underestimated due to Density porosity derived with uncorrected density log input.

After using corrected density for porosity evaluation and following it Permeability evaluation, the match to Core is better, see Figure 28.

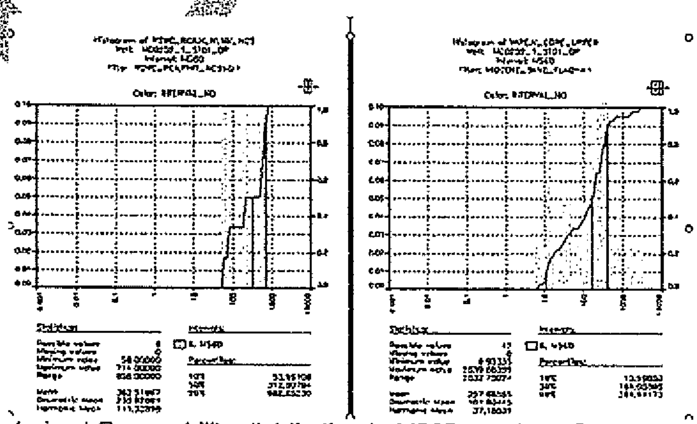


Figure 28: Log derived Permeability distribution in M56D sand vs. Core Permeability. Closer to Core Perm distribution when Density porosity derived with corrected density log input.

Fluid Typing

Based on MDT pre-test pressure data analysis and fluid sampling analysis, the M56D and M56E reservoirs comprise volatile oil with GORs of around 3000 with an API gravity of 35. A more complete set of data and analysis will be presented in Fluid Properties section.

The M56F sand underlying the main pay zone was not sampled by the MDT tool but based on it's location below M56D and M56E and below the thermogenic front it is likely to be oil.

The fluid analysis of the M57D and M56A sands is uncertain (Figure 29). Sand M56A has a sonic log signature similar to M56D and M56E, which are oil bearing sands. Sonic porosity calculated in the sand matched density porosity, which also an evidence to be oil sand as Sonic porosity is usually higher than density porosity in gas sand. Based on it is position on the boundary of thermogenic front – right above it, it could be gas.

The M57B sand is approximately 2 feet thick and likely to be below log resolution for accurate fluid determination, but based on its position above the thermogenic front it is likely to be gas.

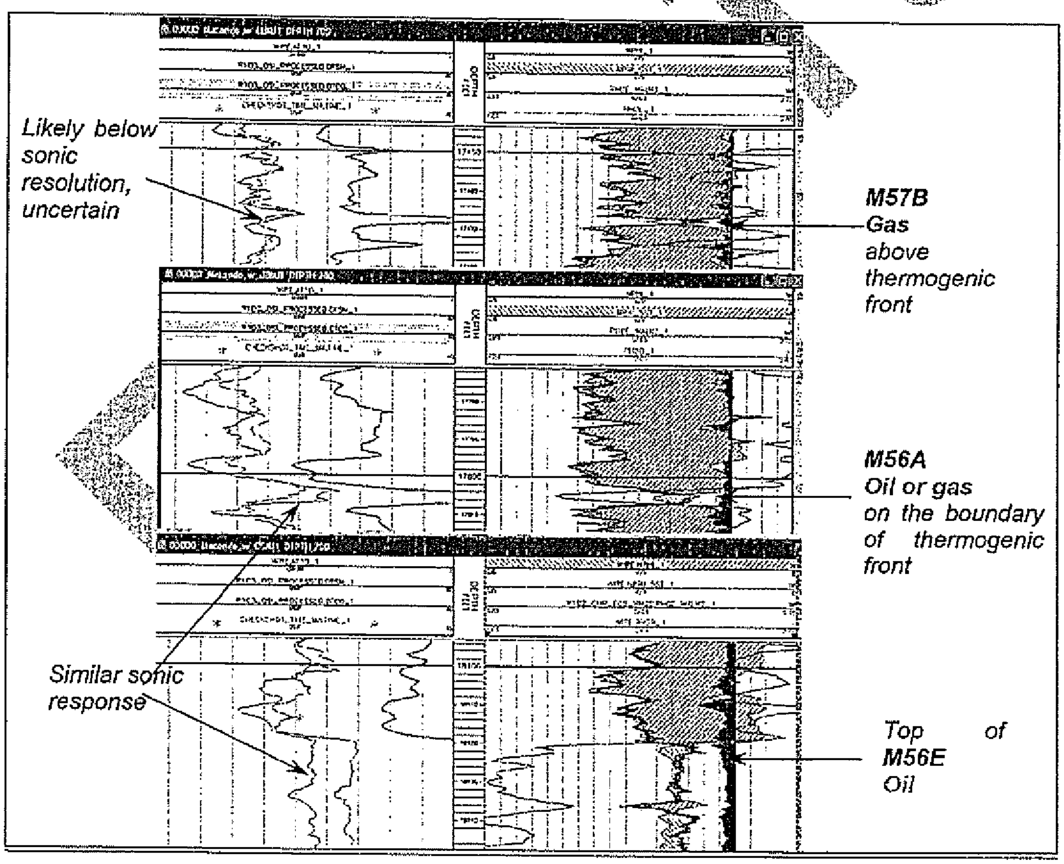


Figure 29: Fluid typing of sands M57B and M56A.

The M57C Sand was pressure tested by the LWD real time Geotap pressure tool at 17606' MD with an equivalent mud weight pressure of 14.19 ppg. This pre-test failed to repeat on re-logging with the MDT due to repeated seal failure. The OBMI image suggests that the sand is very thinly interbedded (Figure 30) and the thin sand stringers are below density log resolution so the evaluation of porosity, Sw and fluid type is compromised.

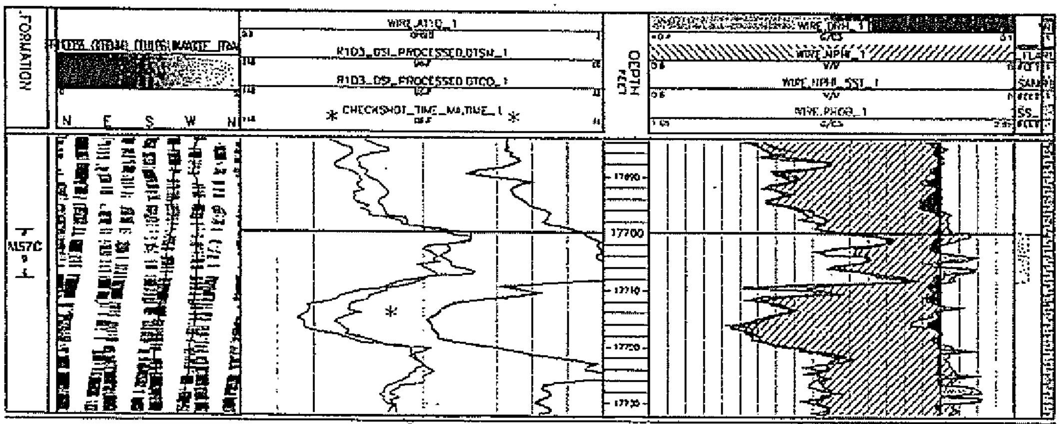


Figure 30: Logs over sand M57C.

Sands M56B and M56C are thin water bearing sands.

Reservoir and fluid quality

Despite limited core data availability, the integration of the core, log and pressure data suggests that:

- Both M56D and M56E sands have good reservoir quality and reservoir fluid.
- Based on XRD data, the M56D and M56E sand lobes have similar mineralogical content with Quartz content averaging 93% with only minor amounts of clay and secondary minerals (Figure 13).
- Sorting, grain size and sand content are the main controls on reservoir quality.
- From Core data, two rock types have been identified; M56E comprises mainly Rock type 1 and is differentiated from Rock Type 2 by improved sorting. The rock Types are also identifiable in K/Phi space with an average pore throat radius of 10 microns dividing the Rock types. The M56D sand comprises both Rock type 1 and 2. Rock type 1 maybe associated with a more homogeneous sand package, Rock Type 2 in the M56D unit may be associated with some thin bedded pay as evidenced by increased anisotropy from the tensor resistivity data and the CMR bin porosity distribution. There is a better match between core porosity and permeability in the Rock Type 1 of the M56E sand then the more heterogeneous sands of M56D and therefore less uncertainty on reservoir parameters. Thin section data will be integrated with the rest of the data when available to strengthen these assumptions.
- Mobilities from MDT pre tests confirm the two sands have high permeability in the 100's of millidarcy range.
- Figure 31 shows the permeability estimation from different data.
  Red symbols – permeability measured on core (to air).
  Brown line – permeability calculated from Density porosity using core derived equation (see underestimation of Permeability in M56D).

Red line was used for averages instead – permeability with corrected Density porosity input.
Blue symbols – drawdown mobilities from MDT pretests,
Green symbols – draw down mobility from MDT samples.
Drawdown mobility is rough estimate of permeability to oil.
Pretests mobility do not look valid to use, MDT samples mobility multiplied by 0.17 cp viscosity can be compared to Permeability to air measured on core and calculated with logs – magenta stars.

- There is a good match of log derived porosity K_CORE and CMR derived KTIM (purple curve).

- There was some initial difficulty in acquiring MDT Pressure data in the two sands. Three fluid samples were eventually taken – 1 in M56D and 2 in M56E. All 3 samples identified same fluid - volatile oil with GOR ~3000 and API=35, PVT analysis showed viscosity=0.17 cp. After the sampling, the pressure tests program was resumed.

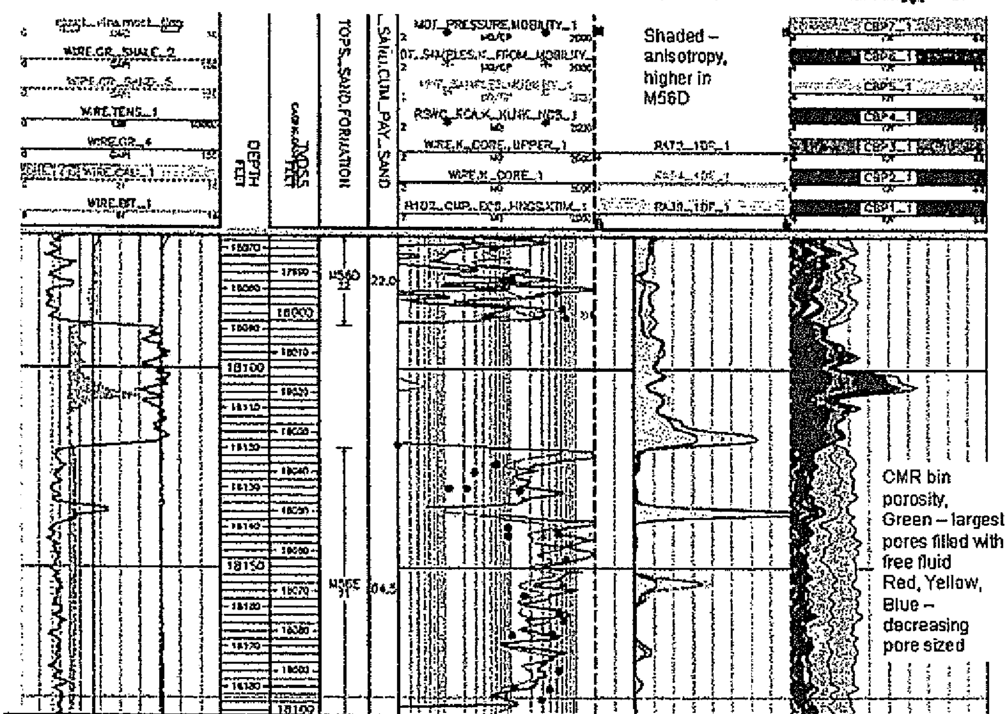


Figure 31: Logs data demonstrating M56D and M56E analysis.

- Pressure gradients are presented in Figure 32. Sample and MDT points show very slight different gradients between the two sands (0.249 psi/ft and 0.251 psi/ft for M56E and M56D respectively) but they were taken with different probes that may explain the difference.

- Water saturation uncertainty will be decreased as capillary pressure and electrical properties measurements are available.

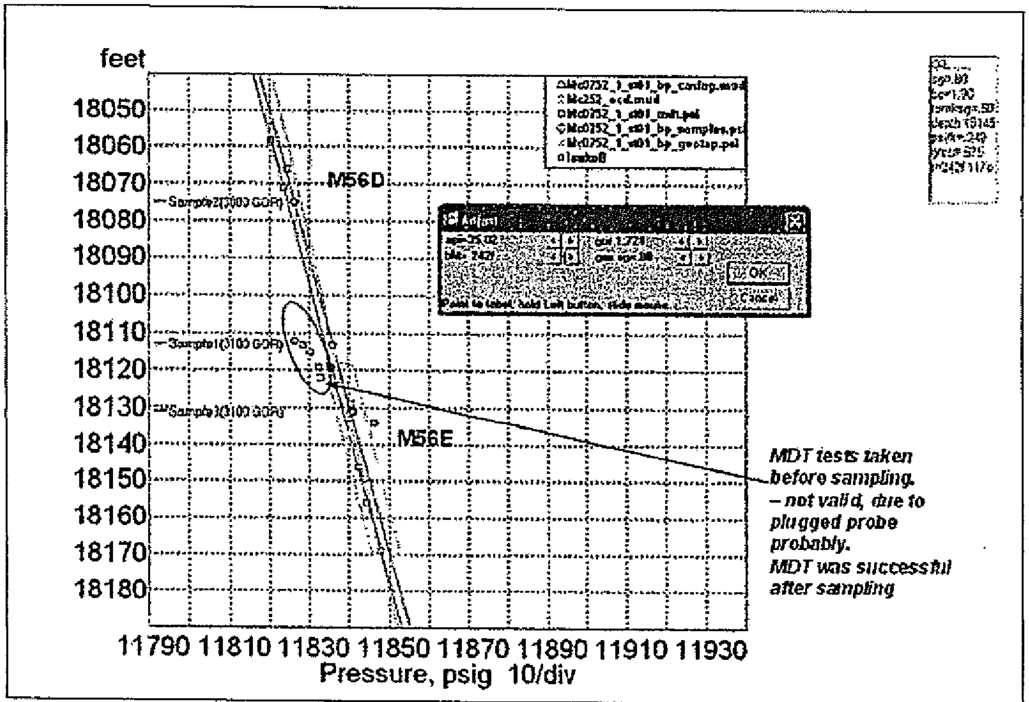


Figure 32: Presgraf pressure plot.

Net/Pay summary

Summary table is presented in Figure 33. For M56D corrected Density porosity, Sw and Permeability are used for averaging.

Top of Sand MD Depth	Bottom of Sand MD Depth	Top of Sand TVDSS Depth	Bottom of Sand TVDSS Depth	Fluid Content	Sand Name	Gross Sand	Net Sand	Pay Sand	Average Gross Porosity	Average Net Porosity	Average Pay Porosity	Average Net Sw	Average Pay Sw	Airborne Arith Air Perm	Geometric Air Perm
Feet	Feet	Feet	Feet			Feet	Feet	Feet	%	%	%	%	%	mD	mD
17457.0	17459.0	17381.1	17383.1	Gas	M57B	2	2	2	18	18	18	52	52	15	8
17700.0	17708.5	17614.1	17622.6	Uncertain	M57C	8.5	0	0	9						
17804.0	17806.5	17718.1	17720.6	Oil or Gas	M56A	2.5	2.5	2.5	22	22	22	24	24	1792	467
17975.5	17989.5	17889.6	17903.6	Brine	M56B	5	3	0	14	17		58		7	3
18030.0	18032.0	17944.1	17946.1	Brine	M56C	2	2	0	17	17		64		5	4
18067.0	18089.0	17981.1	18003.1	Oil	M56D	22	22	22	21	21	21	17	17	258	102
18120.0	18191.0	18034.1	18105.0	Oil	M56E	69.5	64.5	64.5	21	22	22	10	10	514	324
18217.5	18238.5	18131.5	18152.5	Oil	M56F	6.5	6.5	6.5	21	21	21	22	22	1441	130

Figure 33: Macondo net/pay summary table.

Petroleum Systems and Fluid Properties

Temperatures (pre- versus post-drill)

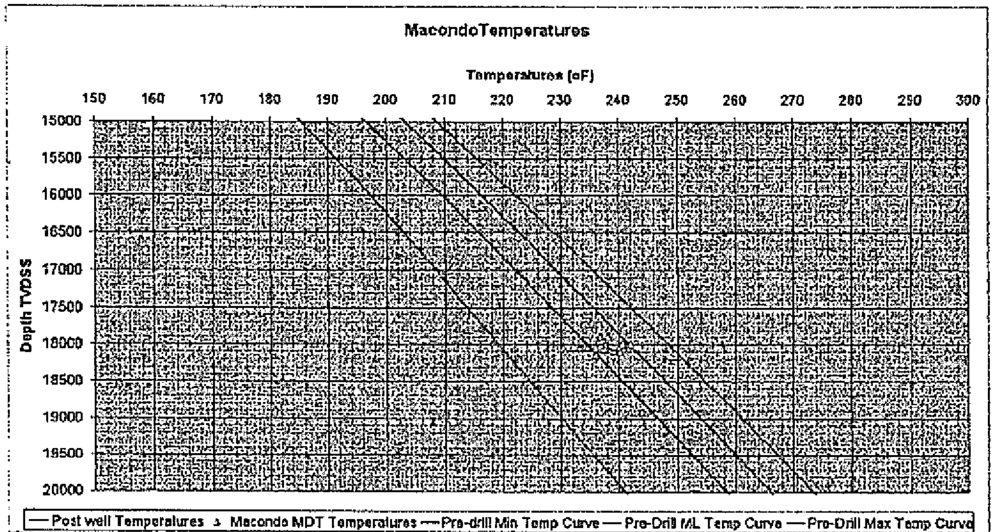


Figure 34: Pre- versus Post-drill temperature comparison

The reservoir temperatures were predicted to be in between 219 and 248 °F, with a most likely case at 235 °F. The post well temperatures, acquired from the MDT tool gave a broad range between 230 and 242 °F (Figure 34). Therefore the post-drill temperature range was similar to the pre-drill temperature prediction.

The black curve is the post-well temperature curve. It takes into account the outer limit of the MDT temperatures as the closest reservoir temperature reading.

The post-well temperature curve is slightly above the most-likely pre-drill curve (~7 °F) but is close to the pre-drill temperature prediction. The 7 °F temperature difference should not impact the rest of the subsurface work.

Headspace & Isotope (Reservoir zone)

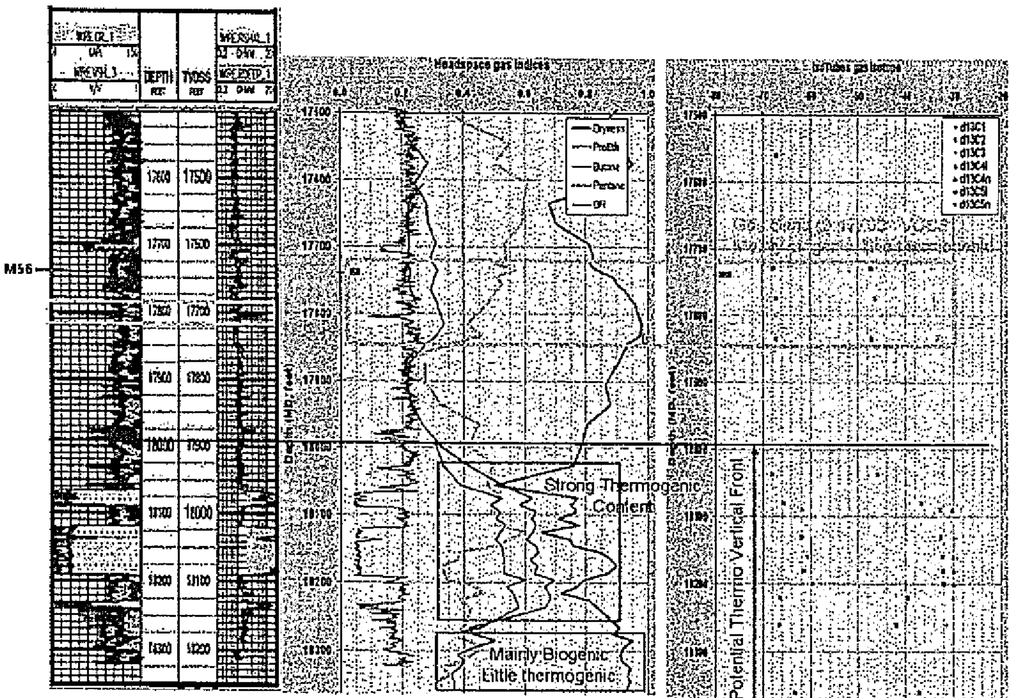


Figure 35: headspace gas indices and isotope results from isotubes.

Using the headspace gas indices and isotope results from isotubes, the thermogenic vertical front appears at 18000' MD (17900' TVDSS) (Figure 35). Indeed, the pro-ethane, butane, and pentane indices increase drastically, while the dryness index severely decreases. Moreover, the methane isotopes appear less depleted and the butane isotopes become present.

The base of the well (below 18250' MD / 18150' TVDSS) has more a biogenic signature. It is believed that the vertical thermogenic front does not pass exactly by the wellbore, giving the idea of a lateral charge. However, it is certainly a vertical thermogenic front.

The section shallower than 18000' MD (~17900' TVDSS) has a strong biogenic signature with some rare amount of thermogenic hydrocarbon. However, it is mainly biogenic gas. The sand at 17800' MD (17700' TVDSS) is a good example: it is mainly biogenic methane, but has a small amount of ethane and propane coming from the thermogenic charge. This charge was lateral in nature.

Fluid properties

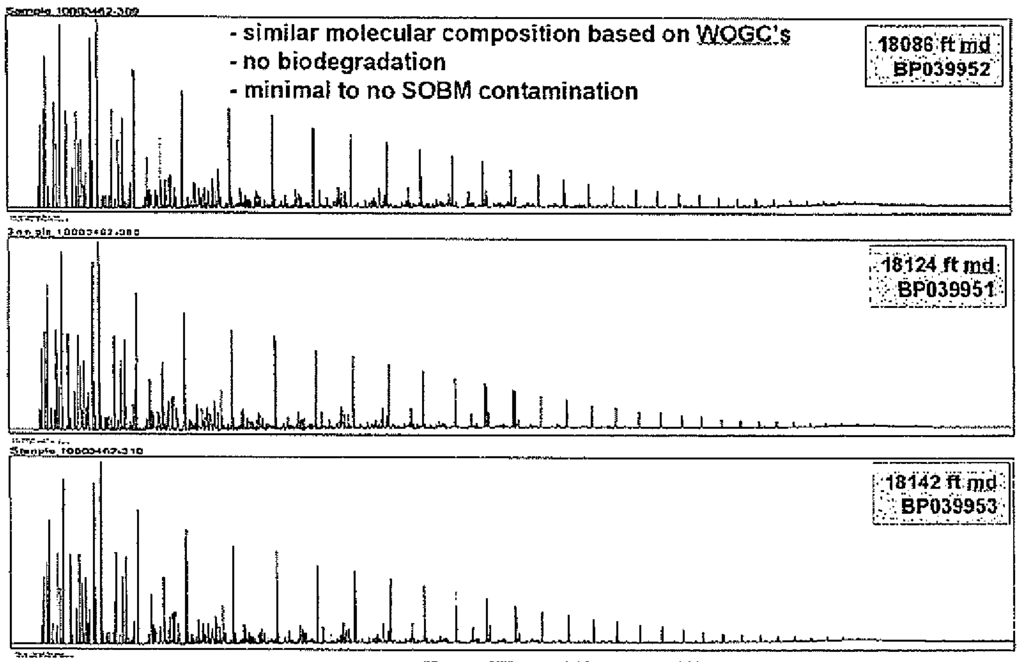


Figure 36: Chromatograms for the three dead oil samples derived from the 3 fluid samples.

Three fluid samples where taken at the level of the reservoir zone: one sample in the M56D sand (upper sand lobe at 18086' MD / 17999' TVDSS), and 2 samples in the M56E sand (middle sand lobe at 18124' and 18142' MD / 18037' and 18055' TVDSS).

Three dead oil samples were derived from those 3 fluid samples and were analysed for whole gas chromatography. The chromatograms are shown in the Figure 36.

By comparing the three chromatograms, we can conclude that the 3 oil samples have a very similar molecular composition, that there is no biodegradation and a minimal contamination level from the drilling mud.

By looking at the headspace and isotube concentrations as well as the isotope signatures, we can also conclude that the M56D, M56E, and M56F sands are oil and have similar composition. The M56F sand (18250' MD) is oil but has a higher content of biogenic gas than the M56D and M56E sands.

MDT fluid samples were taken at three depths. These are the volumes that were obtained during sampling.

Sample Depth	2 ¾ gallons	MPSR	SPMC
18086' MD	1	4	2
18124' MD	1	4	2
18142' MD	1	6	0

The three samples were tested offshore for quality assurance. The results from a single flash are summarized below.

Sample Depth	Contamination	Gas-Liquid Ratio (scf/stb)	Liquid API	Gas Gravity	Reservoir Pressure (psi)	Temperature (F)
18086' MD	1.2 wt %	3017	34.9	0.7823	11841.04	241.9
18124' MD	<1.0 wt %	2909	34.7	0.8050	11850.41	242.3
18142' MD	<1.0 wt %	2840	35.0	0.7837	11855.83	242.6

After samples were brought back to shore, the MPSRs were restored for 5 days to reservoir pressure and temperature.

From flash liquid composition all three zones are the same (Figure 37).

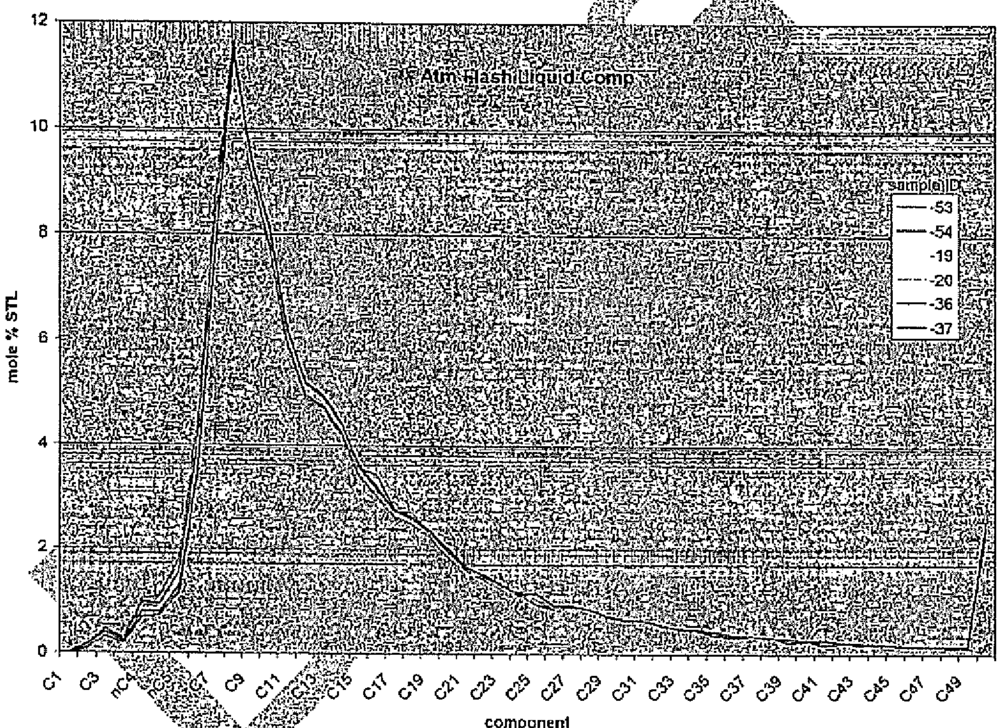


Figure 37: Flash liquid composition comparison.

Pencor conducted the initial test of the fluid at 18142' MD. The saturation pressure was determined to be 6504 psi. The liquid volume percent increased below the saturation pressure which makes it a dewpoint system instead of a bubblepoint system. From LFA records during MDT sampling it was determined this was an oil system. Therefore we had an MPSR sample sent to a separate lab, Schlumberger Oilphase, to confirm or deny the system and saturation pressure. Oilphase had a saturation pressure of 6348 psi and saw liquid volume decrease below the saturation pressure making it a bubblepoint system. A third lab, Westport, was selected to confirm the bubblepoint system. Their analysis determined it is a bubblepoint system and the saturation pressure is 6438 psi. Below is a summary of the analyses conducted by the labs for sample at 18142' MD thus far on May 24, 2010.

Lab	Pencor	OilPhase	Westport	Comments
Psat (psia)	6504	6348	6438	18142' MD sample
Oil Density (gm/cc) @ Res Cond	0.587	0.590		18142' MD sample
Co (10^{-6}/psi) @ Res Cond		12.2		18142' MD sample
Oil Viscosity @ Res Cond	0.168			18142' MD sample
FVF (rb/stb)	2.564			18142' MD sample
WAT (°F)	89			Dead Oil

bp

Technical Memorandum

TITLE: **Post-Well Subsurface Description of Macondo well (MC0252_1BP1) v3**

TO: **Kate Baker, Cindy Yeilding, Jay Thorseth, Peter Carragher**

WRITTEN BY: **Marty Albertin, Chuck Bondurant, Kelly McAughan, Binh van Nguyen Bryan Ritchie, Craig Scherschel, Galina Skripnikova**

DATE: **26th July 2010**

Introduction

This technical memorandum outlines the post-well subsurface description of the Macondo well in Mississippi Canyon Block 252 (OCS-G-32306) in the north-central Gulf of Mexico.

Prospect Name	Macondo
Surface Location Block No.	Mississippi Canyon 252
BP well name	MC 252_1
OCS-G Well number	OCS – G32306_01
Spud date on Marianas	6th October 2009
Released Marianas due to Hurricane Ida	27th November 2009
Re-entered well on Deepwater Horizon	10th February 2010
Category (Expl/Appr)	Exploration
Total Depth (MD/TVD/TVSS)	18,360' md / 18,349' tvd / -18,274' tvdss
EP Approved by MMS	6th April 2009
Water Depth	4,992 feet
Rotary Table Elevation	75 feet RKB

Macondo spud
October 6, 2009

Marianas pulled off location
November 27, 2009
After running the 18" casing and cementing the same, the Marianas BOP failed a scheduled test. At the time of the failed test, the 18" casing had been run and cemented. No open hole was exposed. A cement plug was set in the 28" casing, and the riser/BOP stack was pulled. While the BOP stack was being repaired on deck, the late season hurricane Ida formed in the gulf. The well location was in the projected path of the hurricane. The Marianas was evacuated. Upon returning to the rig after the storm, inspections had revealed extensive damage to wire/cables along the underside of the rig. These wires/cables were damaged as the result of waves/swells impacting the underside of the hull. This caused the sheathing of many of the wires/cables to be worn to the point that bare wires were exposed. After assessing the situation it was deemed that the damage was too extensive to perform repairs on location. The rig was de-moored and towed to a shipyard in Mississippi to perform the requisite repairs. While being repaired in the shipyard, the rig contract expired. After finishing repairs, the rig was released.

Well status at time the Marianas was pulled off location
The 18" casing was run and cemented. A 200' cement plug was set near the 28" casing shoe.
It was decided that the Deepwater Horizon would finish drilling the Macondo well after finishing appraisal drilling operations at the Kodiak discovery.

On location with the Deepwater Horizon
January 31, 2010
After performing scheduled drawworks and BOP maintenance, running the riser, and testing the BOP on the wellhead, the Macondo well was re-entered on February 10, 2010. Upon re-entry, the cement plug set by the Marianas was drilled-out. After squeezing the 18" casing shoe, the Deepwater Horizon began making new hole on February 15, 2010.

Date encountered and depth of main target
The primary M56 target was encountered on April 4, 2010 while drilling at a depth of 18,065' (MD)/18,054' (TVD).

Date and depth of final TD
The Macondo well reached a final TD of 18,360' (MD)/18,349' (TVD) on April 9, 2010.

Post-TD operations
After reaching TD, a full suite of wireline evaluation was performed. There were wiper trips during the logging operations but there was a wiper trip after the logging was completed. Following wireline operations, production casing was run and cemented on April 18-20. At the time of the incident, the riser was being displaced to seawater in preparation to unlatch from the wellhead and pull the riser/BOP stack.

Geological description

The primary target for the Macondo well was an amalgamated low relief channel-levee system of Middle Miocene age (M56 ~13Ma) (Figure 1). The channel system trends in a north-west to south-east direction over an elongated Mesozoic 4-way ridge that strikes north-east to south-west. The trapping elements are a combination of dip and stratigraphic. The depositional system is interpreted to be low relief channel-levee deposits.

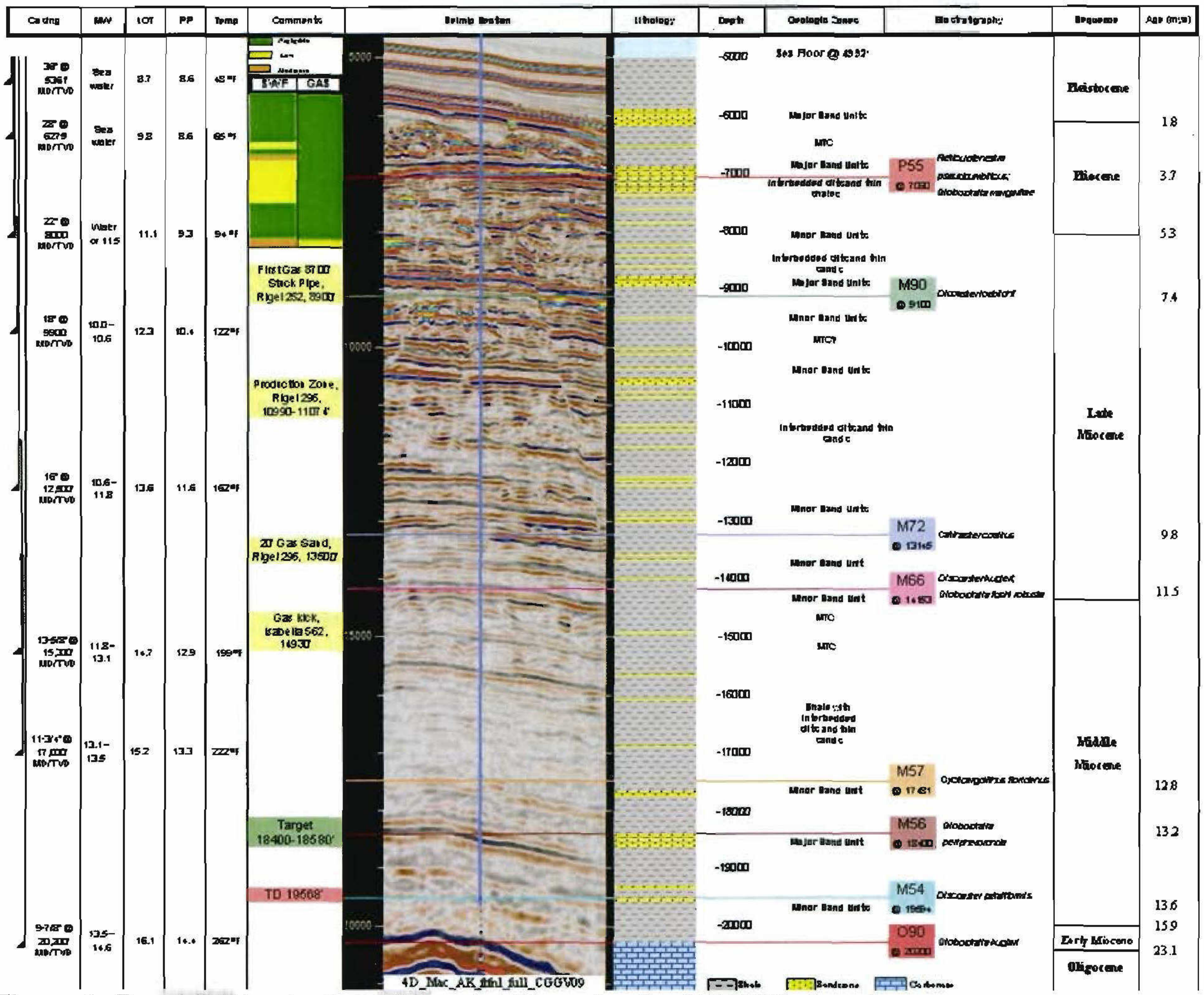


Figure 1: Pre-drill lithostratigraphy and drilling plan for MC0252_1 well.

The log signature and naming convention for the sands below the 9-7/8" liner that were penetrated by the MC0252_1BP1 well are shown in Figure 2. The depth structure and amplitude maps for the M56 and M57 intervals are shown in Figures 3 and 4.

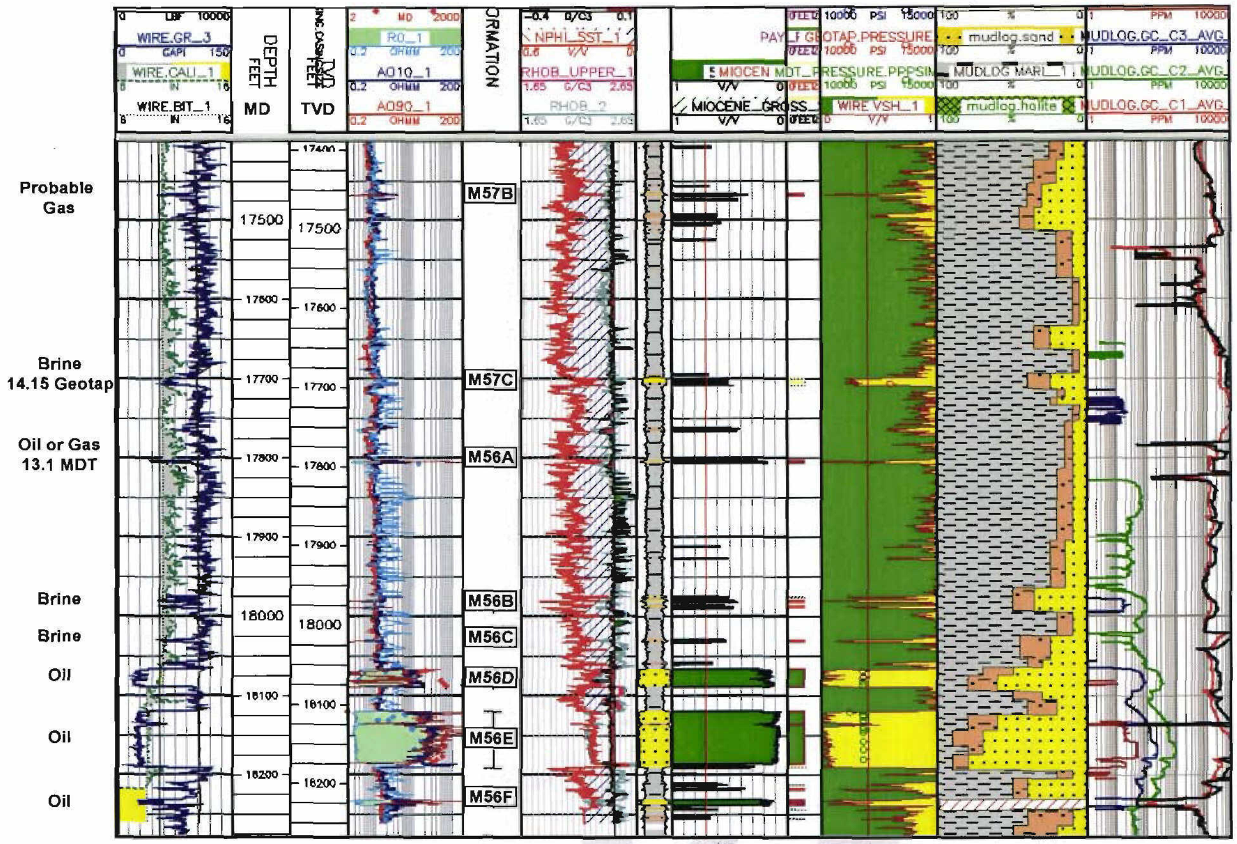


Figure 2: Sand identification chart for sands below the 9-7/8" liner that were penetrated by the MC0252_1BP1 well.

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Shallow Hazards

BP completed an archaeological and seafloor geohazards survey across Mississippi Canyon Block 252 and vicinity in January 2009 to meet MMS requirements for archaeologically significant blocks. No significant man-made or natural hazards were identified near the proposed MC 252-1 well or within the proposed anchor radius for the Marianas drilling rig.

The shallow hazards discussion is limited to the top-hole or riserless section (i.e. between seafloor and the base of the 22-inch casing section). Figure 7 shows the top-hole formation forecast (THFF) for shallow geohazards that was derived from 3D seismic data. Figure 8 shows the shallow hazards top-hole observations log that was generated after drilling the top-hole section. The post-well comparison between actual drilling conditions and pre-drill prediction is provided below.

Shallow Gas

The zone from the seafloor to 8,001 ft MD (base of 22-inch casing section) was predicted to have a *Negligible* potential of shallow gas. No shallow gas was observed while drilling the riserless section.

Shallow Water Flow

A *Low* risk for SWF was assessed for two intervals (6,570 ft to 6,701 ft MD and 7,025 ft to 7,614 ft MD). There was one unit predicted with a *Moderate* risk of encountering SWF in the pre-drill THFF between 6,913 ft and 7,025 ft MD. Although sand-prone intervals are noted from the gamma log between 6,660 ft to 6,900 ft and 6,950 ft to 7,080 ft, no SWF was noted while drilling the riserless section.

A slight flow was noted across the top of the wellhead about 50 hrs after reaching the total depth (TD) of the 22-inch casing section while tripping in hole with the 22-inch casing. It is assumed that the slight flow may have come from possible sands noted above. The flow was stopped by circulating mud.

Hydrates

The potential for gas hydrates was predicted as *Negligible-Low* for the entire riserless section. There was no visual evidence or log data that indicated possible gas hydrates while drilling the riserless section.

Gumbo

The potential for gumbo shale, a plastic clay return response to water based mud, was not addressed in the pre-drill THFF. This was not a concern because the plan was to drill the hole section with seawater. Gumbo was observed towards the end of drilling the 22-inch casing hole section. The gumbo coincided with circulating pad mud in place in preparation for running casing.

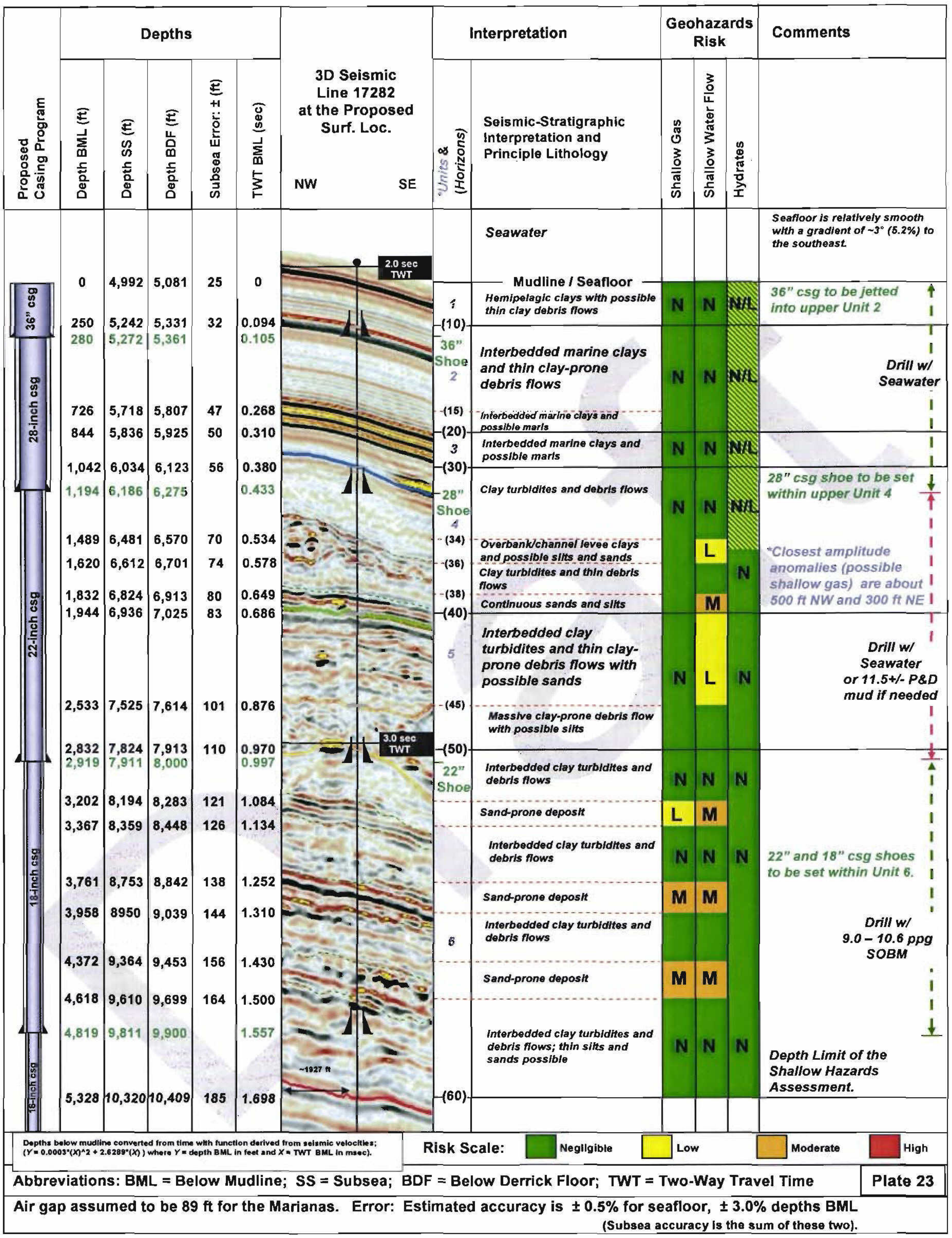


Figure 7: Original Top-Hole Formation Forecast at the Proposed MC-252 #1 Location (produced by Craig A. Scherschel, 08 June 2009).

MC 252 #1 (Macondo) LWD Log
with Shallow Hazards Observations

WELL LOCATION: Proposed MC 252 Location
AREA: Mississippi Canyon 252
WELL API: 60817 41169 00
DATE: 6-10 Oct 2009

EASTING: 1,202,798.33 FT
NORTHING: 10,431,619.79 FT
DATUM: NAD 1927; Spheroid: Clarke 1866
PROJECTION: UTM Zone 16N (ft)

Pre – Drill Assessment
Predicted Subsea Depth

Water Depth – 4,992' SS

Post – Drill Observations
Measured Depth (Air Gap – 89 ft)
Water Depth – 4,992' SS

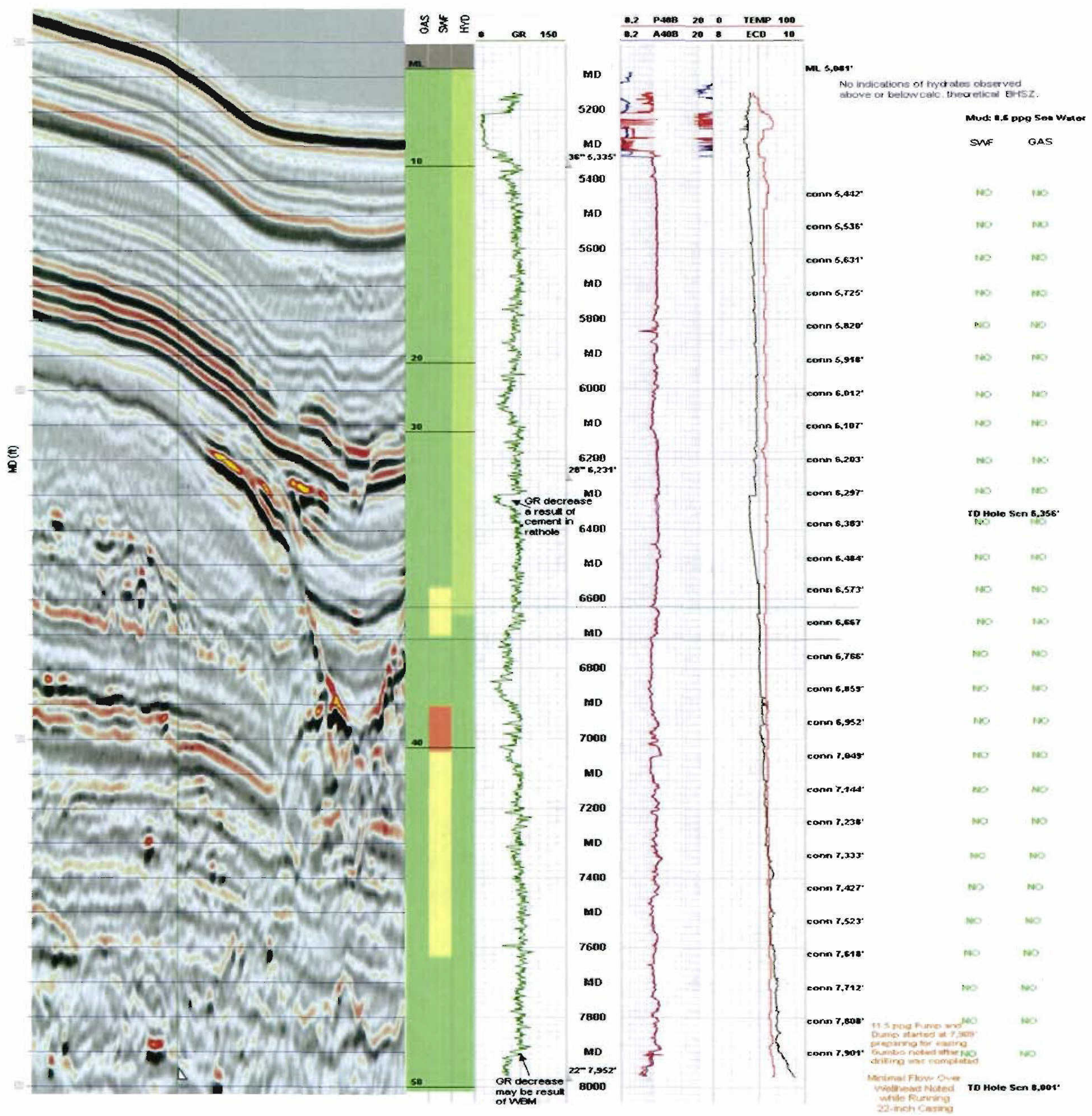


Figure 8: Shallow Hazards Top-hole Observations Log for the MC-252 #1 Location between Seafloor and the Base of the 22-inch Casing Hole Section (produced by Kate Paine, October 2009).

Pore Pressure and Fracture Gradient

The current interpretation of pore and fracture pressure at Macondo incorporates revisions to the pre-drill forecast based on: synthesis of LWD and wireline pressure indicators (pressure transforms based on resistivity, sonic, checkshot, and density); drilling parameters and data (D-Exponent, background, and connection gases); and direct drilling indicators (kicks, losses, and real-time/wireline direct pressure measurements), Figure 9. Pore pressure is interpreted to be higher than the predrill most likely curve from 9000' to 17750' TVDKB. This is due to slower than predicted interval velocities and revised pressure transform parameters more similar to those required to reconcile pressure measurements and indirect pressure estimates from logs at the high pressure, narrow margin offset well "Yumuri", MC382-1. Reservoir pressures at Macondo are much lower than predicted – pressure in the oil bearing reservoir sands represent the only interval which falls outside of the pre-drill minimum-maximum pressure envelope. Pre-drill centroid modeling of channel sands draped over the large 4-way Macondo structure placed reservoir pressures 0.1-0.3 ppg higher than shale pressure. Actual reservoir pressures (similar reservoir pressure to Isabella) imply regional hydraulic connectivity, at least on a geologic time scale, to deeper water lower overburden/pore pressure environments to the south, or local connectivity updip beneath allochthonous salt bodies southwest and east of the prospect. Though wireline density is limited to the reservoir section, calibrated acoustic to density transforms of the Macondo sonic and checkshot imply that overburden is lower than predicted. Lower densities used in the calibrated postwell overburden are consistent with the higher than predicted pore pressure observed at the prospect. The narrow PPFG window above reservoir level, and weak formations exposed at the 22" shoe, led to shallower than planned casing depths, and the use of contingency liners.

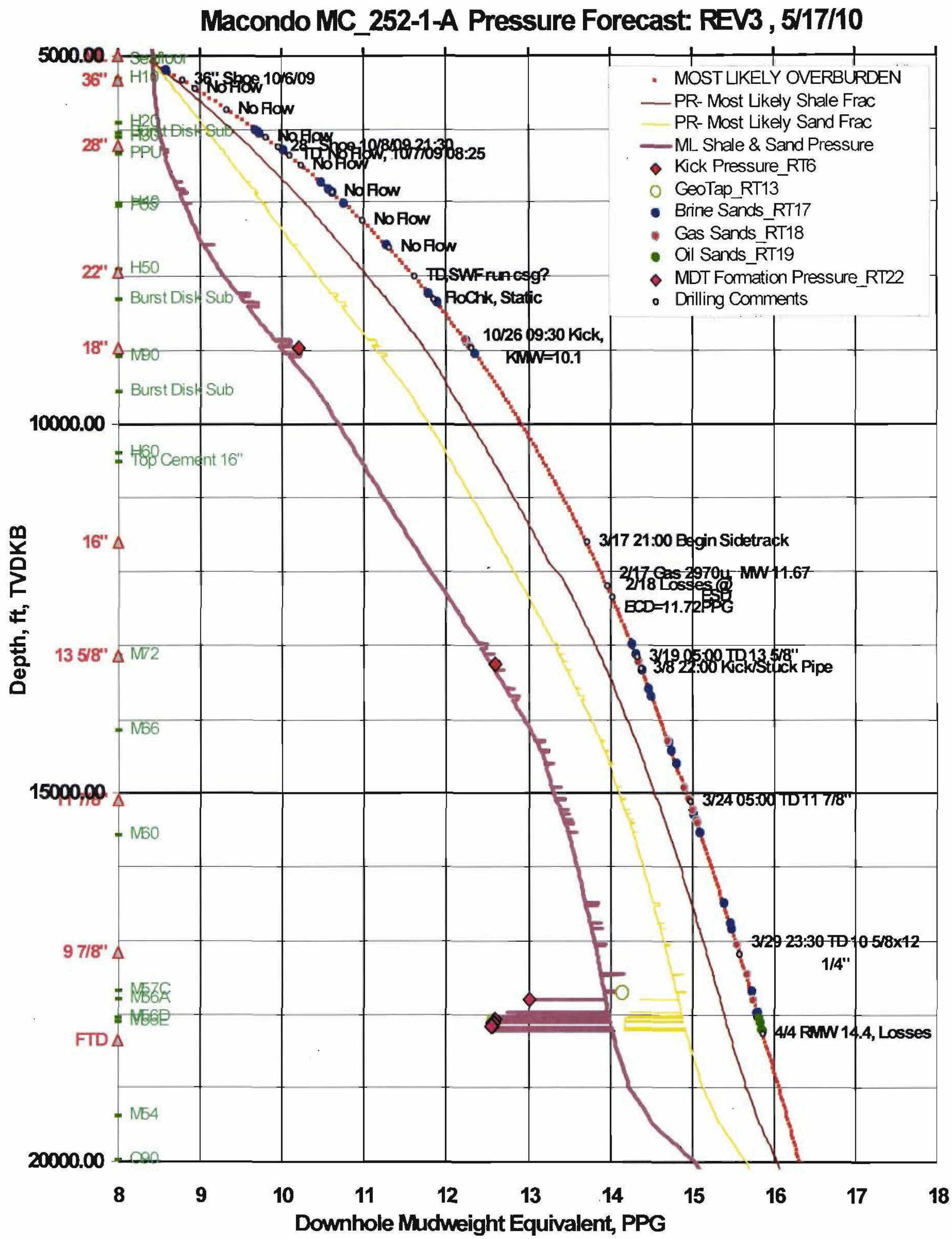


Figure 9: Post-well PPFG interpretation.

Petrophysics

Summary

From shows, log response and fluid samples it is interpreted that >90 feet of hydrocarbons were discovered by the Macondo well, the majority occurring in the M56D (22') and M56E (64.5') sands. Porosity averages 22%, Sw averages 10 - 17% and permeability averages in the range of 250 - 500 mD (arithmetic, log derived). Permeability was calculated using a porosity-permeability transform based on Macondo well rotary side wall core data analysis.

Three MDT multiphase fluid samples were collected. MDT sample analysis and PVT analysis confirm low OBM contamination level (0-1.2%) The samples were characterized as volatile oil with GOR ~3000 scf/stb, API 35 degrees, and viscosity of 0.2 cp.

No hydrocarbon-water contacts were penetrated and no significant aquifer sandstone was observed.

Rotary side wall core data were used to calibrate log derived porosity and permeability at net confining stress. Log porosity was calculated from density log calibrated to side wall core porosity data measured at net confining stress. Permeability data was calculated from log porosity calculated using a porosity-permeability transform based on Macondo well rotary side wall core data analysis. Water saturation was calculated from log derived porosity and resistivity data. Log porosity tied to core porosity well, log derived permeability had reasonable match. There is no core calibration for water saturation yet.

Based on core measurement (lower porosity and permeability values and laser grain size analysis) M56D is probably slightly different rock type and more heterogeneous than M56E. Nuclear-magnetic resonance (CMR) and RT Scanner logs response also show higher rock anisotropy of M56D lobe (See Figure 33).

The close match of core and log derived porosities in the M56E sand gives a reasonably high degree of certainty around the petrophysical parameters despite the relative lack of core data in Figure 17. A greater degree of uncertainty exists in the more heterogeneous M56D sand. Further uncertainty exists in the thin minor hydrocarbon bearing intervals in M56 and M57. They were not covered by core data and are difficult to resolve with standard logging tools as they are less than 2.5 feet in thickness. The lowest M56F sand was not fully covered by logs.

Electrical properties, capillary pressure data and thin section analysis will be incorporated into the interpretation when available.

Data base

All Logging While Drilling (LWD), Wireline, Mud logging, Pressure and Core data were loaded into Geolog where formation evaluation was completed.

LWD

Halliburton was the LWD vendor. GR, Resistivity, Sonic and PWD tools were in the BHA while drilling plus Geotap formation pressure in the target section.

In the section of the hole logged with wireline tools, LWD was depth shifted to TCOMBO Gamma Ray. In cased hole section, where wireline Sonic in casing was run, LWD was shifted to it to match sonic response on LWD and wireline. From mudline to top of sonic in casing (~11,700' md) the depth shift was distributed.

Wireline

The following Schlumberger open hole wireline logs were run in 6 descents in open hole section from 17,150'-18,270' MD. They include the following tools:

R1D1: ZAIT-GPIT-LDS-CNL-GR-LEHQT
R1D2: CMR-ECS-HNGS-LEHQT
R1D3: Dual OBMI-GPIT-DSI-GR-LEHQT
R1D4: MDT-GR-LEHQT (pressure and samples)
R1D5: MSCT-GR-LEHQT (rotary side wall cores) was not fully successful; repeated as R1D7 after R1D6
R1D6: Quad VSI-GR-LEHQT

Well logs interpretation sequence

- *Well site interpretation based on log field prints (R1D1 and R1D2) identifying depth of the shallowest hydrocarbon-bearing interval in the open hole - April 13th, 2010.*
- *Post incident peer review identifying every possible permeable interval and its saturation type - April 21st, 2010.*
- *Schlumberger ELAN interpretation - May 3rd, 2010.*

Basic observation on logs and borehole condition:

- The hole has a diameter of 8.5" from TD of 18270' to 18,090'md and 9.875" from 18,090' md to the 9.875" casing due to the use of a hole opener assembly.
- This hole section was drilled with barite as a mud weighting material (~20 % of high gravity weight solids). This causes the density correction curve (DRHO) to read negative and also significantly affects the quality of the PEF curve.
- Run R1D1 was run ~7 days after the formation was drilled and 20 hours after the last circulation stopped. During that time the open hole was exposed to different kinds LCM materials to treat losses, below the 9.875" shoe and close to TD. The caliper indicates some wash outs in shales but mainly gauge hole in sandstone.

Core

There were 44 rotary side wall core samples recovered from 3 MSCT runs. Sample preparation and analyses were done at Weatherford's Laboratories in Houston.

Only around 2/3rds of the samples were in a condition suitable for petrophysical analysis. After sufficient cleaning and drying, 6 samples were dedicated for mechanical properties and pore compressibility studies. 19 samples were selected for Routine Core Analysis (RCA). The analyses from 17 samples from M56D and M56E have been completed to date and are referenced in this document whilst 2 more sample are still being analysed. RCA was performed at 500 psi and at Net Confining Stress (NCS) of 2000 psi. NCS was calculated from post well sand fracture evaluation, over burden estimation and pore pressure.

If the assumption is made that one sample describes one inch of rock, the core plus represent approximately 2% of the M56D unit and 1.4% of the M56E in terms of amount of interval covered.

Currently Special Core analysis (Electrical Properties and Capillary pressure measurements) are planned to be run on a sub-set of samples. As of July 27th 2010, the samples are in the

Weatherford Laboratories in Houston. The SCAL measurements are on hold as they have been subpoenaed.

16 out of the 17 samples were described as fine to medium size grain sandstones, one as shale.

Laser Gain Size Analysis (LGSA) results on 17 samples (6 in M56D and 11 in M56E) are presented in Figures 10 and 11.

In Figure 10 Klinkenberg corrected permeability to air at NCS is plotted versus the percentage of different size particles in the sample. There is a clear relationship between sand content and permeability.

It appears that the M56D samples (green) have marginally more silt and less sand grain size particles than M56E samples (blue), though with the relatively small data set this may be a function of the sampling.

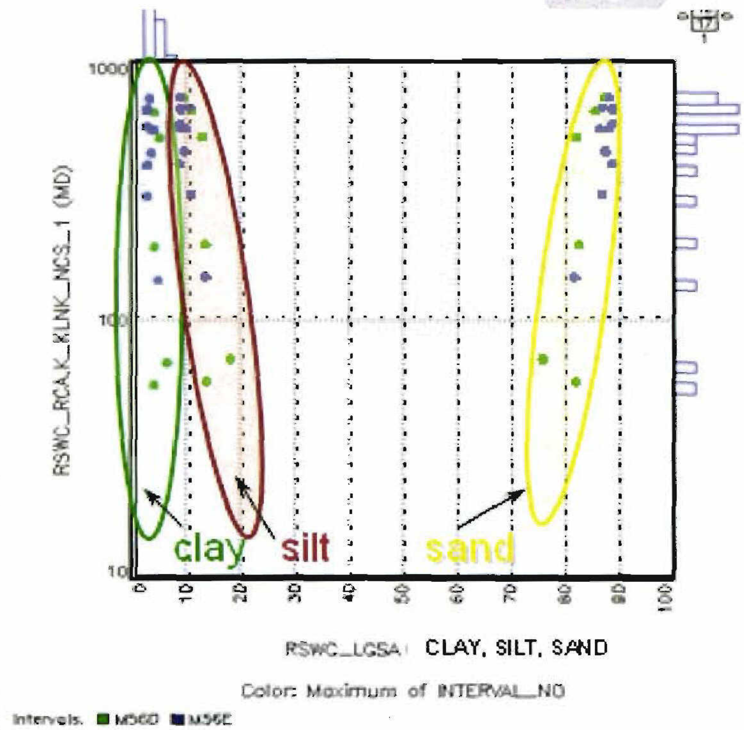


Figure 10: Laser Grain Size Analysis, Permeability vs. percentage of different (sand, silt, clay) size particles.

In Figure 11 Klinkenberg permeability to air at NCS is plotted versus percentage of different size sand particles. The data shows a clear relationship between grain size and permeability. In general M56D (green) has a subtly wider range of grain size suggesting slightly poor sorting, while the M56E (blue) is more homogeneous.

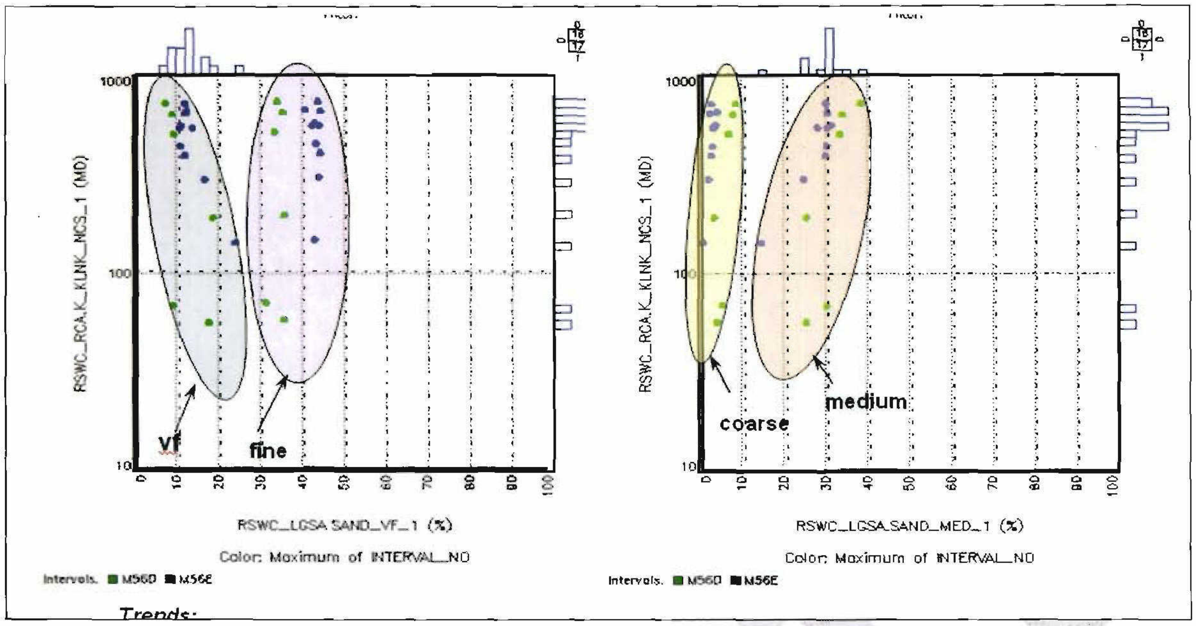


Figure 11: Laser Grain Size Analysis, Permeability vs. percentage of different (very fine, fine, medium and coarse) size sand particles.

The observations from Figures 10 and 11 leads to the suggestion that the M56E core plugs indicate slightly better sorting than the M56D plugs. This is reflected in their respective positioning in K/PHI pace as indicated in Figure 12. Further the Winland iso-pore throat lines suggest that two sands may be slightly different rock types based on their degree of sorting. The 10 micron line divides the two rock type.

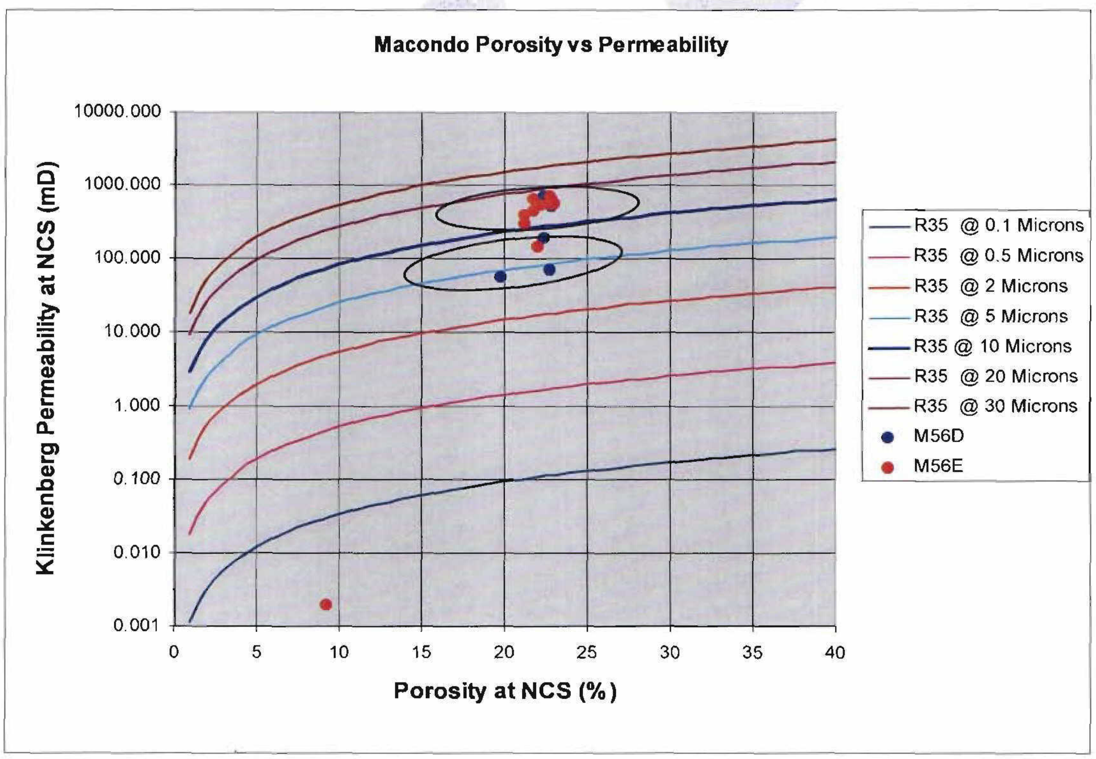
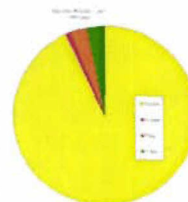


Figure 12: Winland R35 rock typing plot.

X-Ray diffraction (XRD) analysis results from 10 samples (4 in M56D and 6 in M56E) are presented in Figure 13. Mineralogical content of all analysed sandstone samples are in average 93% Quartz with Kaolinite (~2%) and Illite 1% clays, 1% K-spar and 3 % Plagioclase. Based on the 10 samples from M56D and M56E there appears to be no difference in mineralogy between the two sand bodies, so any variation in petrophysical properties is likely to be a function of grain size and most likely sorting.

WEATHERFORD LABORATORIES
X-RAY DIFFRACTION
(WEIGHT %)



Client: BP America Production Company
Well: OCS-G-32306 No.1
Area: Mississippi Canyon Block 252
Sample Type: Rotary Sidewall Core

Plug	Sample	CLAYS				CARBONATES			OTHER MINERALS						TOTALS		
Number	Depth (ft)	Chlorite	Kaolinite	Illite	Mx I/S*	Calcite	Dol/Ank	Siderite	Quartz	K-spar	Plag.	Pyrite	Zeolite	Barite	Clays	Carb.	Other
3-4R	18069.8	Tr	2	1	Tr	Tr	0	Tr	92	1	4	Tr	0	0	3	Tr	97
3-6R	18074.9	Tr	2	1	Tr	Tr	0	Tr	92	1	4	Tr	0	0	3	Tr	97
3-9R	18083.0	Tr	2	Tr	Tr	Tr	0	Tr	94	1	3	Tr	0	0	2	Tr	98
2-4R	18087.0	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	0	3	Tr	97
3-14R	18124.9	Tr	3	1	Tr	Tr	0	Tr	91	1	4	Tr	0	0	4	Tr	96
3-18R	18134.1	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97
3-19R	18141.9	Tr	3	1	Tr	Tr	0	Tr	92	1	3	Tr	0	0	4	Tr	96
3-25R	18161.0	Tr	2	1	Tr	Tr	0	Tr	94	1	2	Tr	0	Tr	3	Tr	97
1-3R	18174.0	Tr	1	1	Tr	Tr	0	Tr	94	1	3	Tr	0	0	2	Tr	98
3-31R	18183.1	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97
	AVERAGE	Tr	2	1	Tr	Tr	0	Tr	93	1	3	Tr	0	Tr	3	Tr	97

Figure 13: X-Ray Diffraction Analysis. First 4 samples (from 3-4R to 2-4R) are for M56D, 6 next samples are from M56E.

Routine Core Analysis

After the rotary sidewall core plugs were cleaned and dried, the 17 samples were subjected to Routine Core Analysis (RCA). The measurements of porosity and permeability were performed at 500 psi and at 2000 psi (NCS). The analysis also included stair steps and repeat measurements of porosity and permeability.

Klinkenberg permeability to air at NCS is plotted versus Porosity at NCS in Figure 14. M56D sand may be more heterogeneous than M56E and its reservoir characteristics are hardly described by the available samples. More core data will be necessary for rock typing work. From the Laser grain analysis - sorting may be a function in this effect more than grain size.

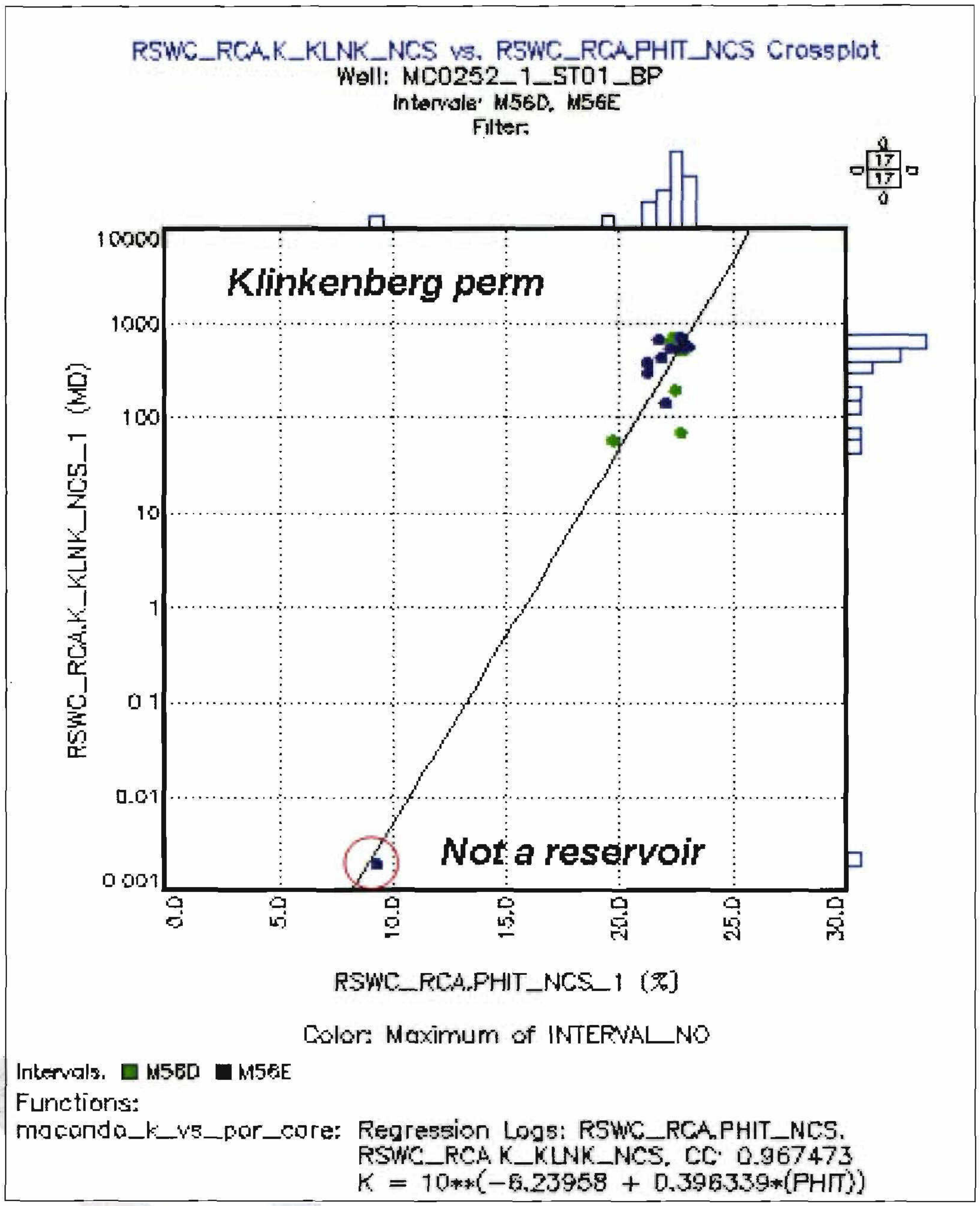


Figure 14: RCA Klinkenberg permeability to air at NCS is plotted versus porosity at NCS with linear regression function used for permeability calculation. Set of 17 samples is plotted.

Frequency histograms of core derived porosity and permeability are presented in Figure 15. The porosity of the M56D samples is very close to M56E samples. The permeability of the M56D samples is less than M56E samples. This may be due to sorting, packing, grain size distribution or combination of these factors. The mineralogical content of the M56D and M56E is interpreted to be similar. Given paucity of core data, the permeability variation of the two sands is not greatly significant (363 mD in M56 mD vs. 493 mD in M56E, see Figure 15).

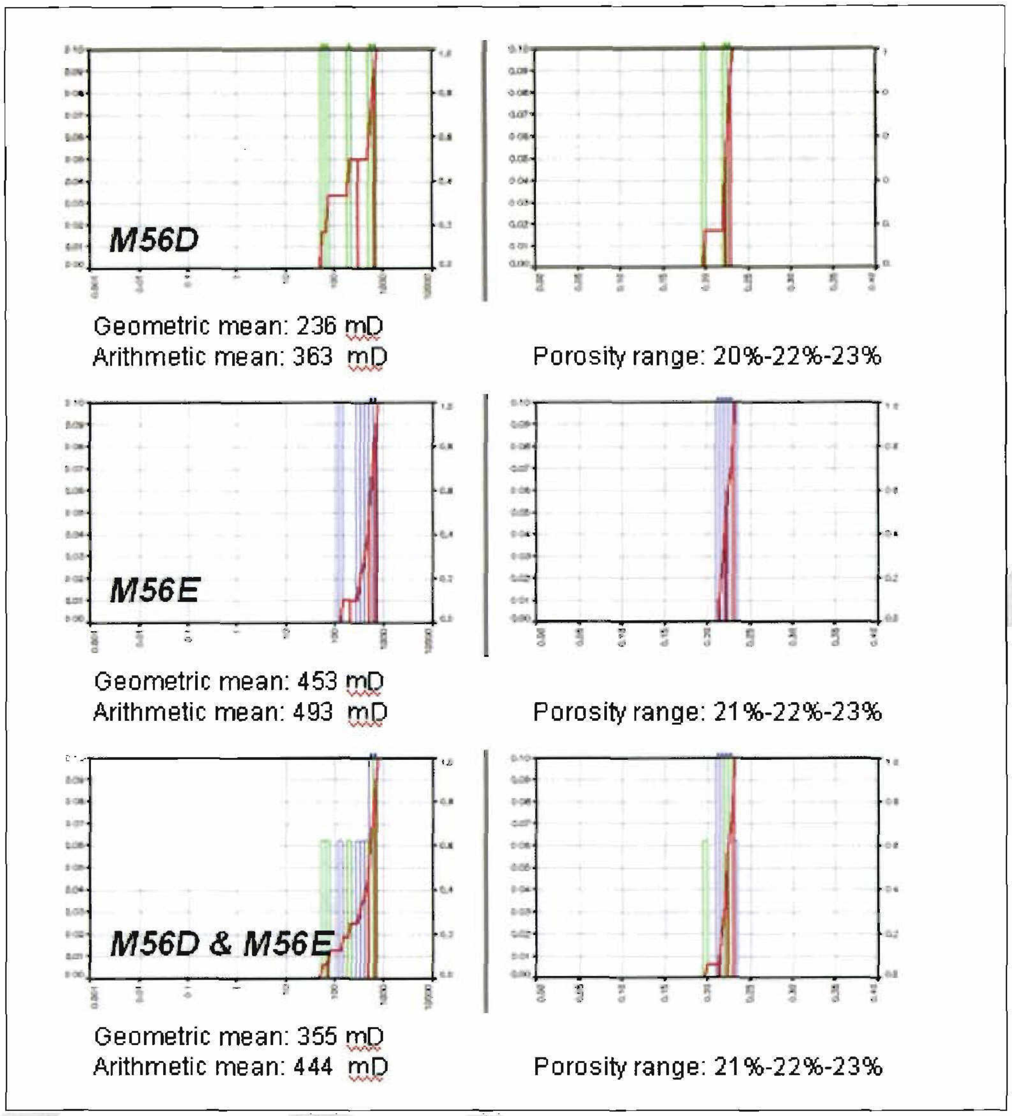


Figure 15: Frequency distribution of Core measured Klinkenberg permeability to air at NCS and Porosity at NCS separately per sands and both sands together.

Log to Core calibration

Porosity was derived from the density log from the following equation:

Density porosity (dec) = (Rhog - Rhob) / (Rhog - Rhof)

Where: Rhog is grain density (g/cc)
Rhob is the density log (g/cc)
Rhof is the fluid density (g/cc)

Grain Density (Rhog) and Fluid Density (Rhof) were determined from core derived data.

Frequency distributions of core measured Rhog and log Density (Rhob) vs. core measured porosity (Phit_ncs) plot are presented in Figure 16.

Core derived Rhog from the M56D and M56E sands are very similar at 2.645 g/cc. However the cross-plot of Core porosity v Density log (Rhob) shows the M56D sand plugs to plot off trend with the M56E plugs. The force fit line through the M56E plugs through the grain density of 2.645 g/cc gives a very reasonable Fluid density Rhof of 0.845 g/cc, which is consistent with the reservoir fluid from pressure data and the mud filtrate density. A number of M56D plugs suggest a higher Rhof of greater than 1 g/cc which is inconsistent with the reservoir fluids derived from logs, pressure data and fluid evaluation. Considering these data points to be anomalous, a RHOF=0.845 g/cc is used for Density porosity evaluation for all sands.

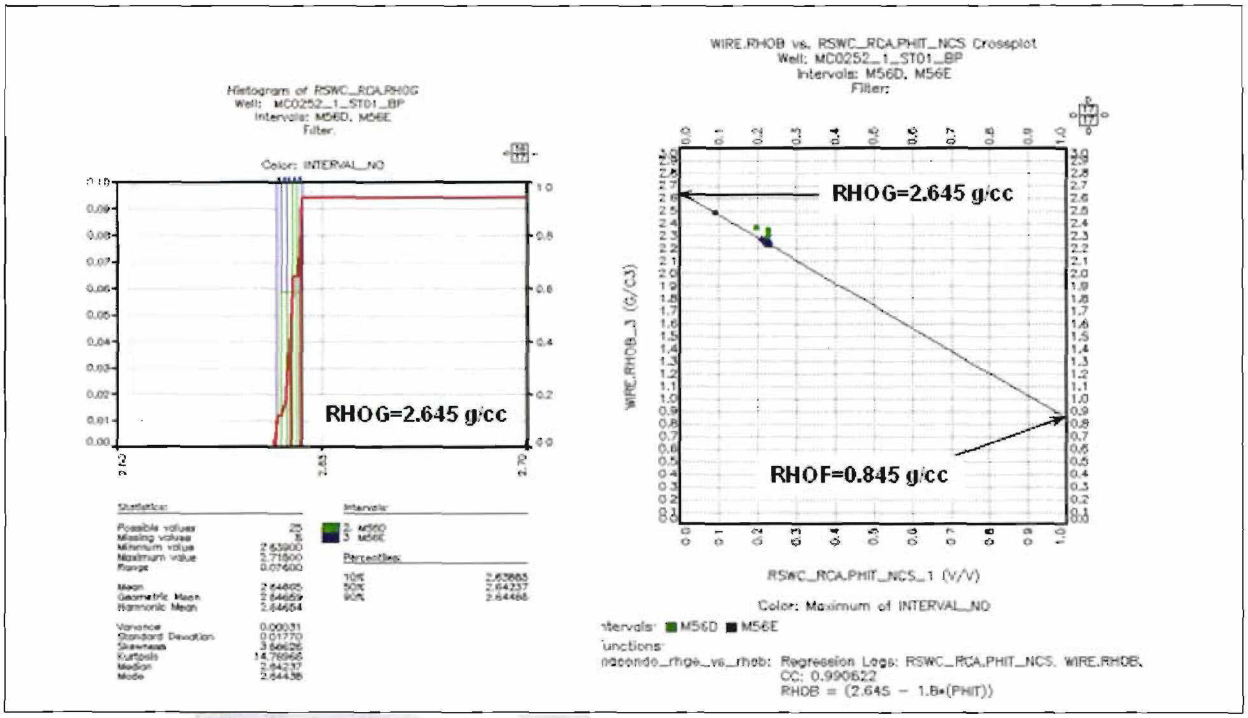


Figure 16: RCA. Core grain density distribution and Cross plot of Density log vs. Core porosity at NCS.

Figure 17 is an overlay of calculated density porosity core plug porosity. Core plugs were slightly shifted to logs, the original samples location on the left side of the Figure 17 with depth shifted plugs on the right side.

The depth shift is to better match the Density porosity and correct the misplacement of shale sample at 18,121'.

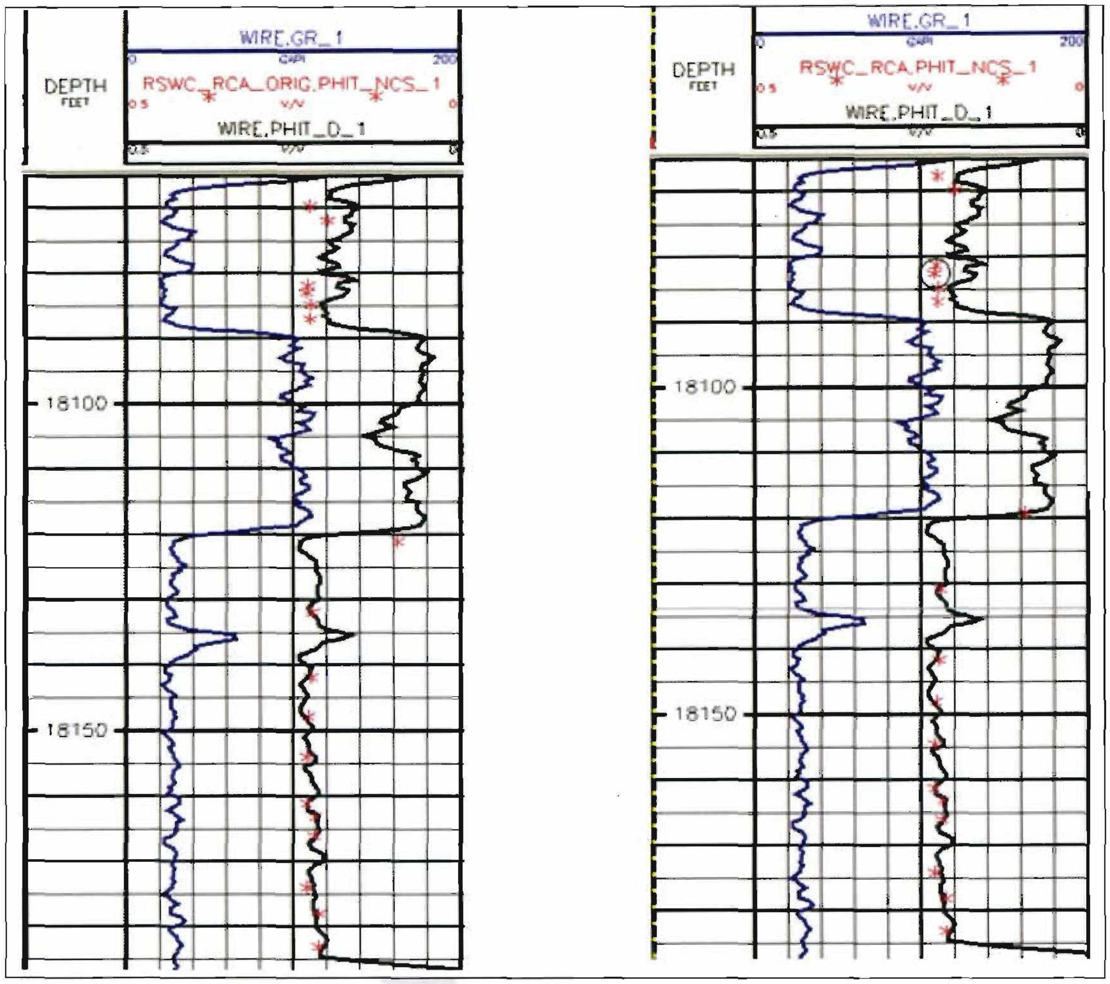


Figure 17: Calibration Logs to core. Core porosity at NCS overlays with Density log derived porosity. Original sidewall core plug depths on the left plot, depth shifted plugs on the right.

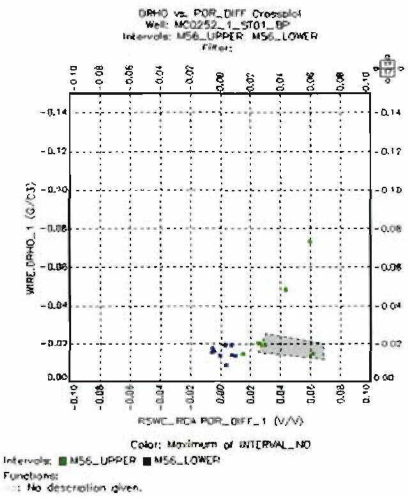
Porosity calculated from density log in upper lobe (M56D) is 2-6 porosity units lower than core derived porosity while in the lower lobe (M56E) they match well.

One of the possible reasons for this mismatch is overcorrecting of the density log (RHOB) for barite additives to mud. The degree of correction (DRHO log) is shown by the red shading in Figure 18.

On the left side in Figure 18a, DRHO (Y axis) is plotted versus the difference between core porosity and density derived porosity (X axis). For M56E sand (in blue) the difference is +/- 1 porosity unit while density correction DRHO is around -0.015 g/cc; For M56D sand (in green) the density correction and the porosity difference are higher for most of the samples.

The large DRHO corrections match spikes in the PEF curve indicating the greatest barite effect (blue curve in Neutron-Density track) in Figure 18b.

Density correction (DRHO) vs. difference between Core porosity and log porosity.



If Upper sand was affected by barite as Lower sand DRHO should be ~-0.015 g/cc

Density correction (DRHO) vs. difference between Core porosity and log porosity.

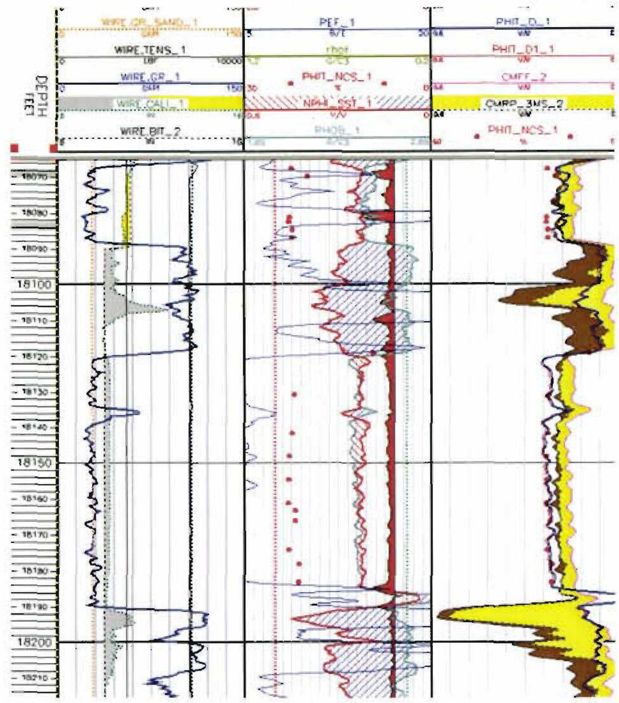


Figure 18a and Figure 18b: Density log correction in M56D.

To eliminate the over correction, DRHO values<=-0.-015 were replaced by -0.015 and Rhob in upper sand M56D log was corrected and used for density porosity calculation.

After the correction was made, the Density porosity (Phit_Upper) matched Core porosity more closely and the extrapolated fluid density matched much closer to the fluid density of 0.845 g/cc, estimated in M56E. As the reservoir fluids in both reservoirs are very similar and the mud filtrate is the same this is a reasonable outcome (Figure 19).

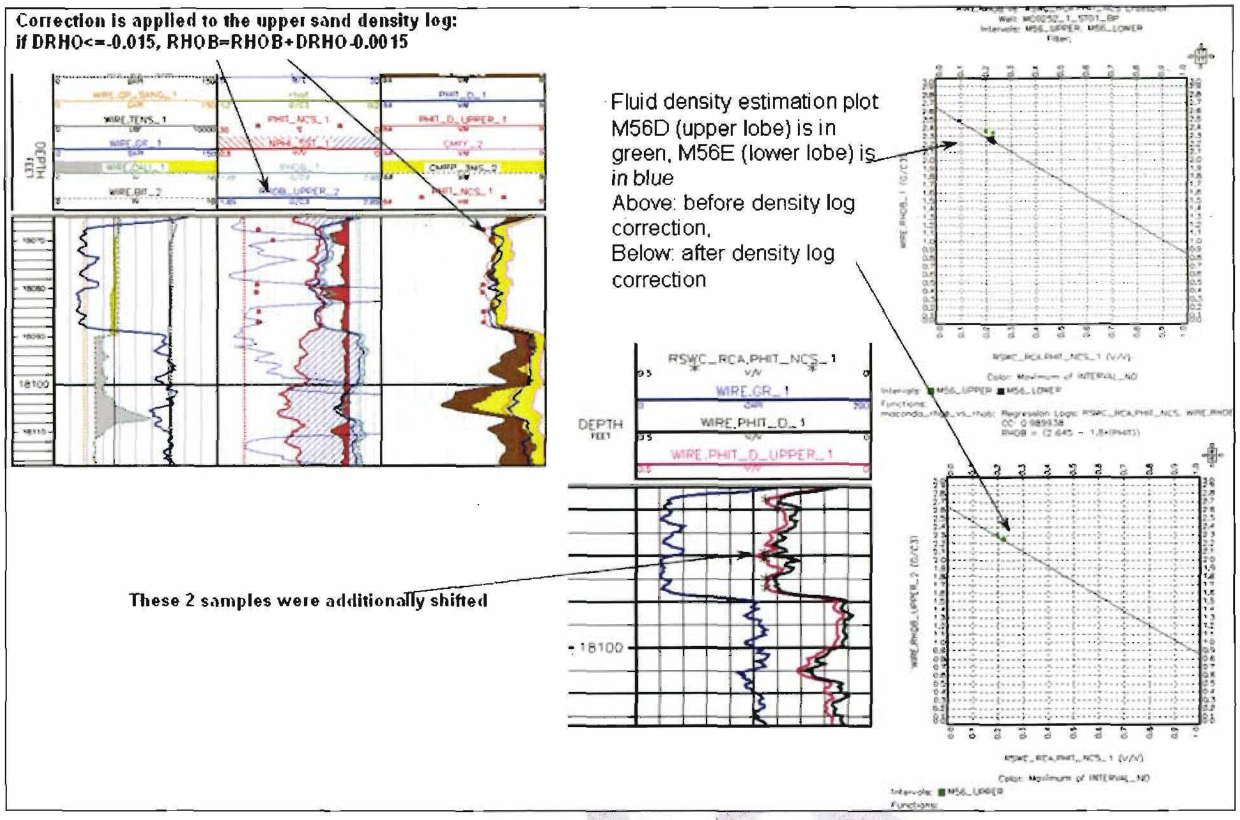


Figure 19: Overlaying Density porosity in M56D with core porosity and cross plots of corrected Density log with core porosity for Fluid density estimation.

The need to make this correction to tie the core data suggest a slightly higher uncertainty in petrophysical parameters in the M56D sand compared to the M56E sand.

There may be other factors to take in to consideration such as anisotropy due to thin beds.

Permeable intervals

Volume of shale (Vsh) cut-off was used to identify permeable intervals.

Gamma Ray log was used for Vsh estimation. For VSH calculation GR_sand and GR_shale lines were created and Vsh was derived as:

$$Vsh=(GR-GR\_sand)/(GR\_shale-GR\_sand)$$

The sand and shale lines were adjusted to reflect the sand percentages from the mudlog and Quartz volume estimated by of ECS log.

For identifying all possibly permeable layers a Volume of shale (VSH) cut-off of 0.4 is used.

The cumulative sand count for each of the permeable sands is presented in Figure 20.

	TOPS_SAND TVD_1	TOPS_SAND TVDSS_1	TOPS_SAND FORMATION_1	TOPS_SAND :UM_GROSS_SAND_
17467.0000	17456.07351	17381.07351	M57B	2.00000
17469.0000	17458.07347	17383.07347		
17700.0000	17689.07027	17614.07027	M57C	8.50000
17708.5000	17697.57014	17622.57014		
17804.0000	17793.06826	17718.06826	M56A	2.50000
17806.5000	17795.56821	17720.56821		
17975.5000	17964.56328	17889.56328	M56B	5.00000
17989.5000	17978.56256	17903.56256		
18030.0000	18019.06017	17944.06017	M56C	2.00000
18032.0000	18021.06004	17946.06004		
18067.0000	18056.05774	17981.05774	M56D	22.00000
18089.0000	18078.05618	18003.05618		
18120.0000	18109.05382	18034.05382	M56E	69.50000
18191.0000	18180.04842	18105.04842		
18217.5000	18206.54683	18131.54683	M56F	6.50000
18238.5000	18227.54573	18152.54573		

Figure 20: Cumulative sand thickness per sand unit.

Petrophysical parameters calculations

Determination of net sand cut off

A frequency histogram of Density porosity is presented in Figure 21. A net sand cut off of 14 % porosity and < 0.4 Vsh was used. These values are based on Gulf of Mexico analog Middle Miocene wells. There is not enough core data to confirm these parameters with permeability distributions.

The Density porosity was compared to Core porosity in the M56D and M56E sands, where rotary sided wall derived porosity was used for calibration (Figure 21). The match between the porosities is characterized with a correlation coefficient 0.862.

In spite of an apparent slight gas signature on Neutron-Density log and CMR porosity being lower than Density porosity (usual for gas sands), fluid sampling of both reservoir sands showed volatile oil, therefore no gas correction was applied to the Density log.

Figure 21: Density porosity histogram with 14% cut off and cross-plot of Core vs. Log derived porosity (with corrected density in M56D).

The Density porosity distribution in the M56E net sand was compared to Core porosity and presented in Figure 22. It shows a good match in minimum, maximum and most likely values suggesting that the rotary sidewall cores taken were not biased towards either more porous and permeable or less porous and permeable zones, and are representative of the bulk formation or at least of the net sand. The same histograms of porosity in M56D do not show such a good match using log porosity derived from uncorrected density as discussed above (Figure 23).

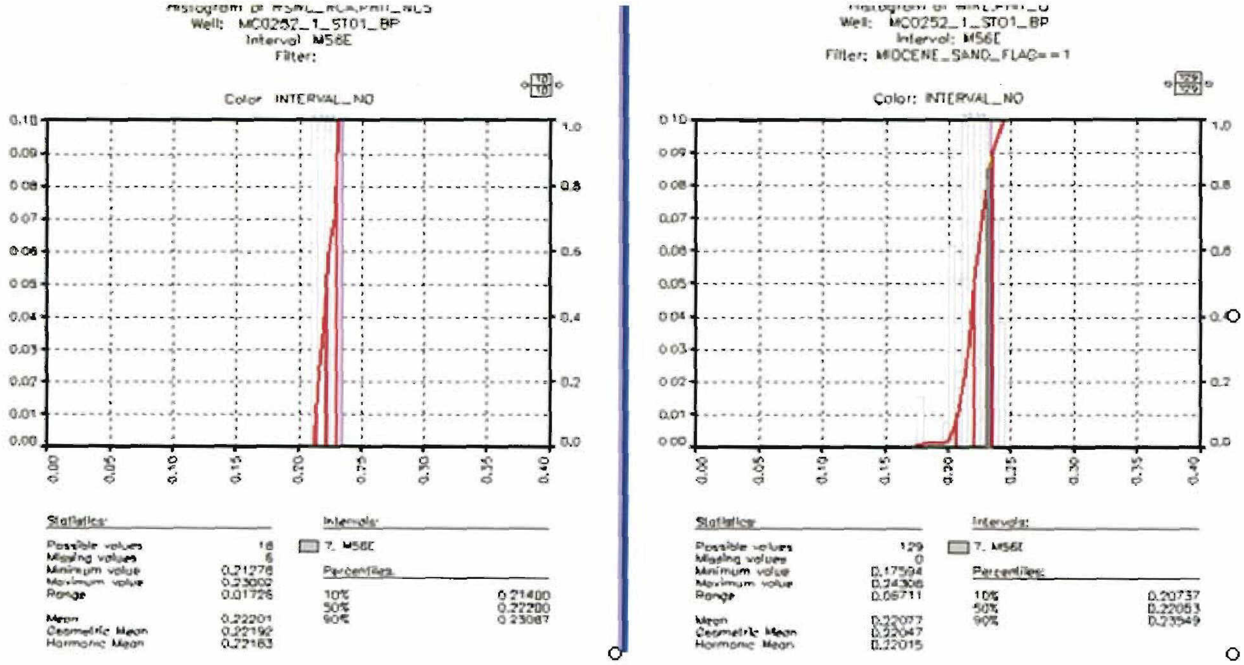


Figure 22: Core porosity (left) and Density Porosity distribution in M56E sand. The red lines represent the 10, 50 and 90 percentiles.

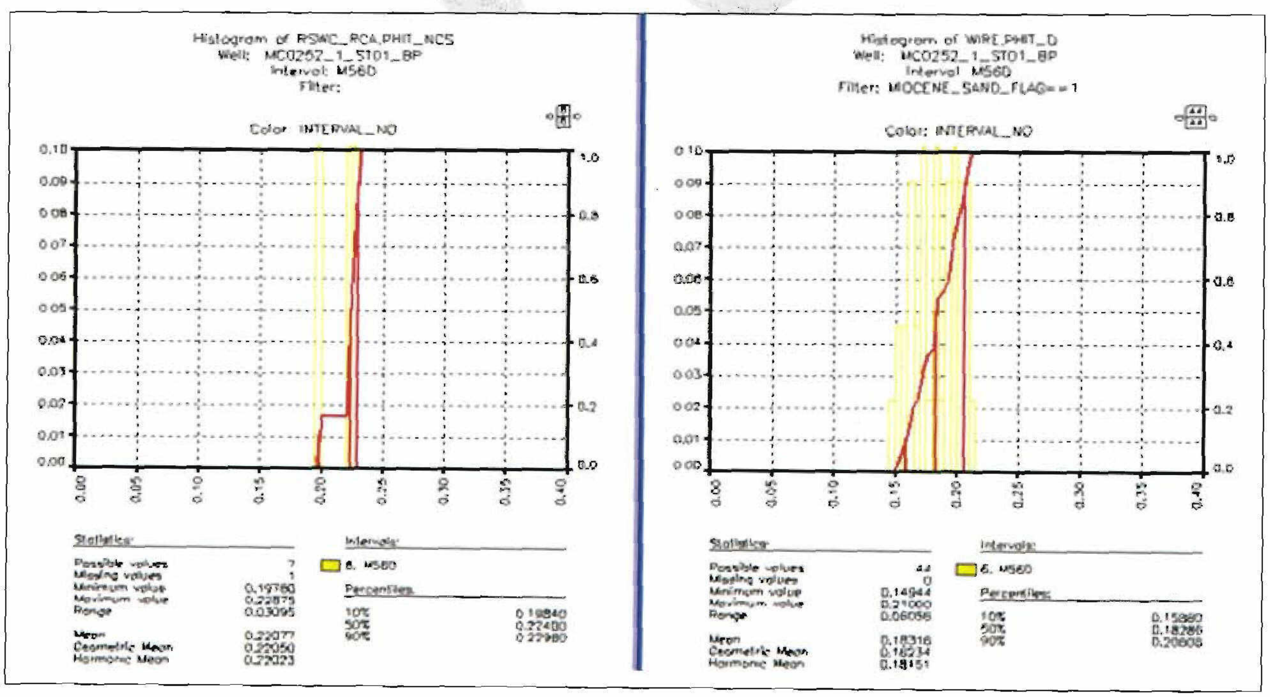


Figure 23: Core porosity (left) and Density Porosity (with uncorrected density input) distribution in M56D sand. The red lines represent the 10, 50 and 90 percentiles.

If the corrected density is used in the M56D sand for porosity calculation the comparison with core data is closer (Figure 24).

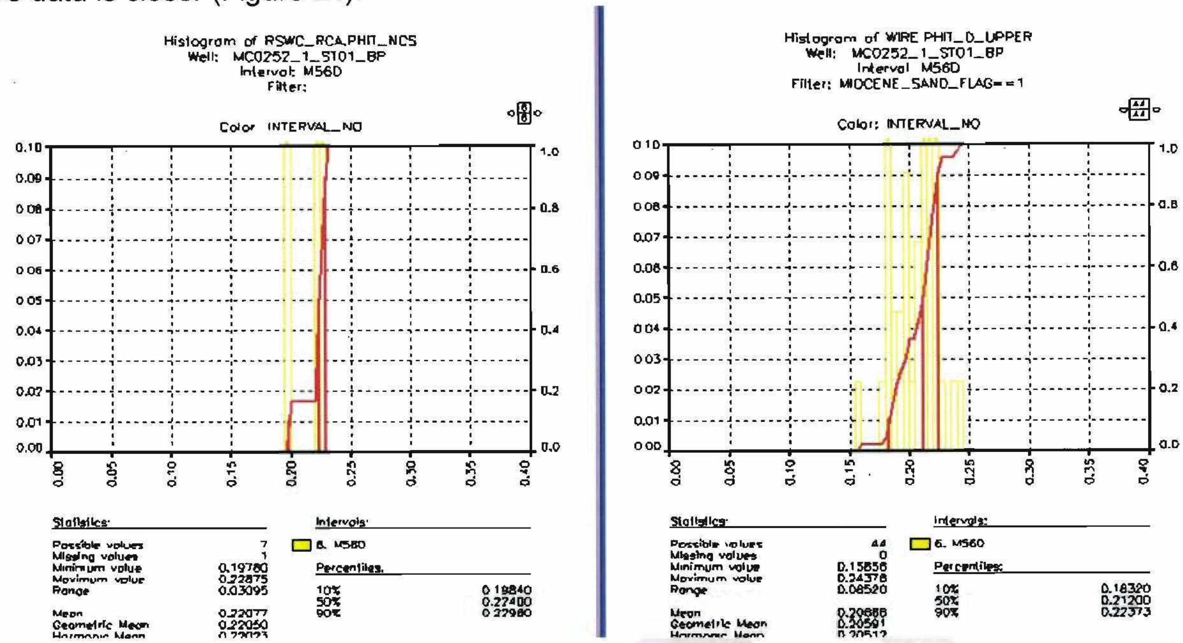


Figure 24: Core porosity (left) and Density Porosity (with corrected density input) distribution in M56D sand. The red lines represent the 10, 50 and 90 percentiles.

Three further sands have been identified in the TD hole section, which have a probable gas signature on Neutron-Density logs: namely M57B, M56A and M56F. No core samples were taken in the M57B and M56A sands though one sample was taken in M56F and is currently under evaluation. Fluid typing of the sands is uncertain and parameters are difficult to assess accurately due to the thin nature of these sands, being below confident log resolution. At this point of interpretation no gas correction applied to the Density porosity in these sands

Water Saturation (Sw)

No thick aquifer sand was observed in the interval of evaluation to determine Rwa.

An assumed regional value of Rw of 0.021 Ohmm at a bottom hole Temperature of 243°F from control data was used for Sw evaluation.

The Archie parameters; a=1, m=1,81 and n=1.88 from the Isabella well were used as an analog for Sw calculation. They were determined from Special Core Analysis on rotary side wall cores plugs from the Isabela well.

The Sw evaluation will be re-visited after Electrical properties and Mercury Injection Capillary Pressure measurements are finished. Sw is a subject to some uncertainty currently.

Frequency histograms of Sw are presented in Figure 25. A conservative estimate of 50 % Sw cut off for pay was used in this evaluation. The cut off value will be revisited after SCAL results are available. SCAL program is planned to include capillary pressure measurements in conjunction with resistivity index measurement to derive drainage fluid distribution and irreducible water saturation (Swi). The histogram in Figure 25 shows a bi-modal saturation distribution and this is also reflected in the permeability distribution in Figure 15. Both sands are considered at irreducible water saturation, however it will be confirmed by completing the air-brine capillary pressure program.

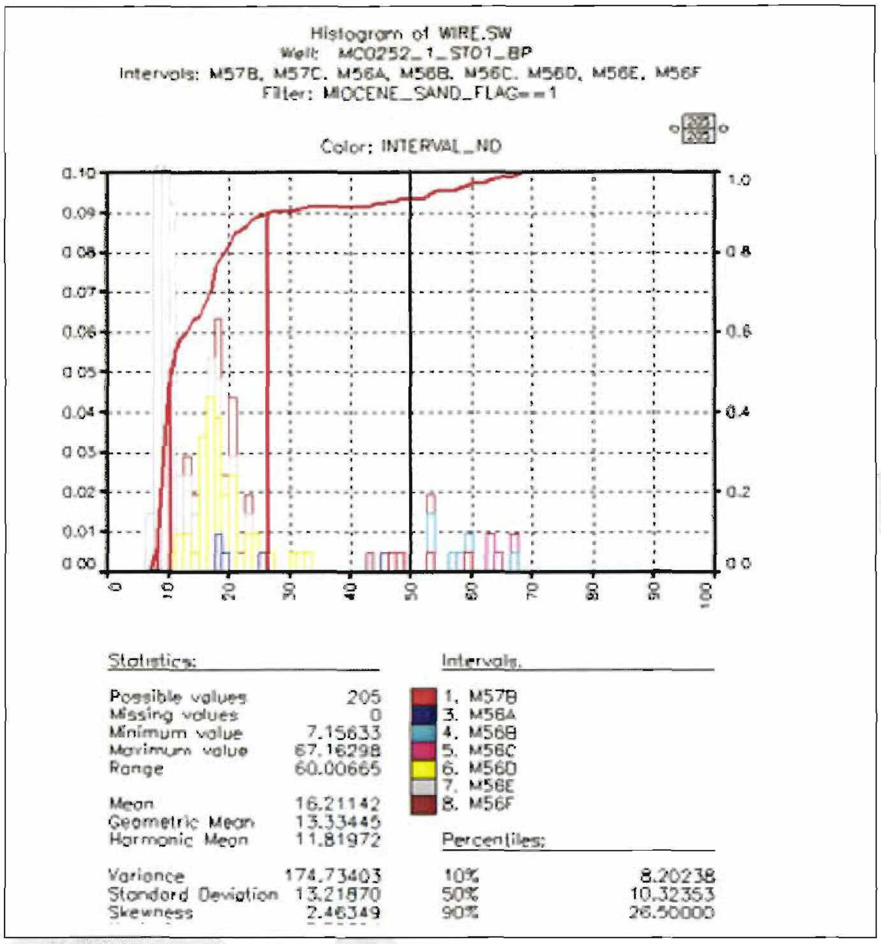


Figure 25: Water saturation Sw histogram with Sw=50% cut off. The red lines are 10, 50 and 90 percentiles.

Permeability

Permeability (to air) was calculated using core derived equation of:

K=10**(-6.23958 + 0.396339*(PHIT_D*100)),

Where PHIT_D is density porosity in v/v

Core derived permeability in the M56D and M56E net sand was compared to Log derived permeability and presented in Figure 26. It shows reasonable match in geometric and arithmetic mean values. Log permeability was derived from uncorrected density porosity.

CORE: LOGS:

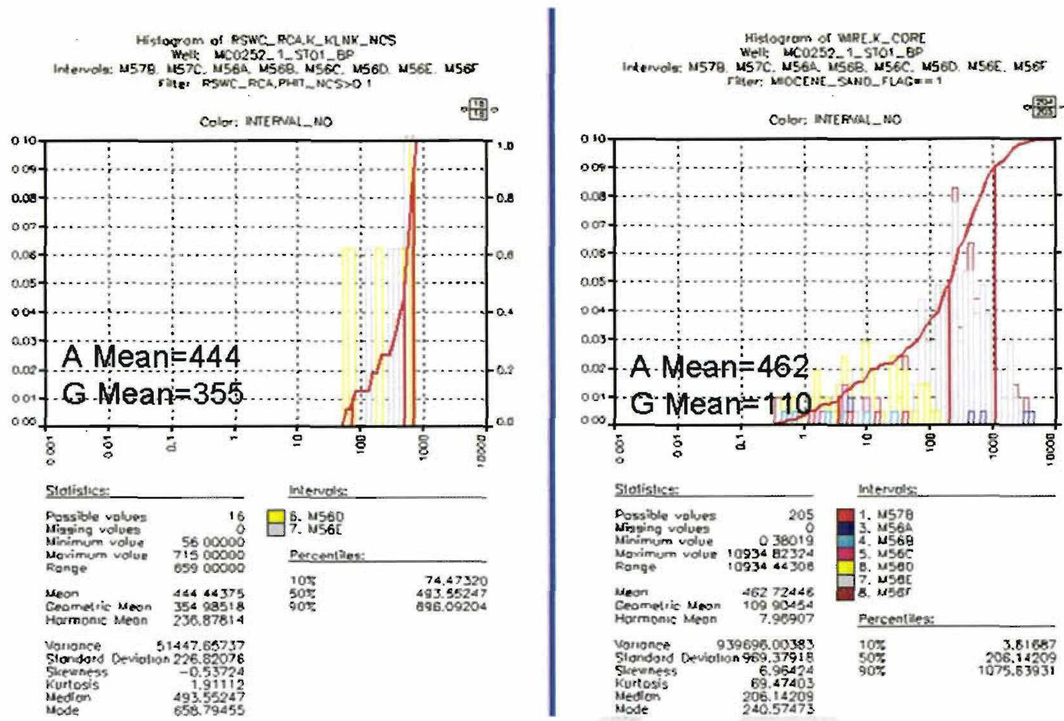


Figure 26: Core derived (on the left) and Log derived Permeability

However if the corrected density porosity is used for log permeability calculation, the geometric average of log permeability matches better to core derived, see Figure 27.

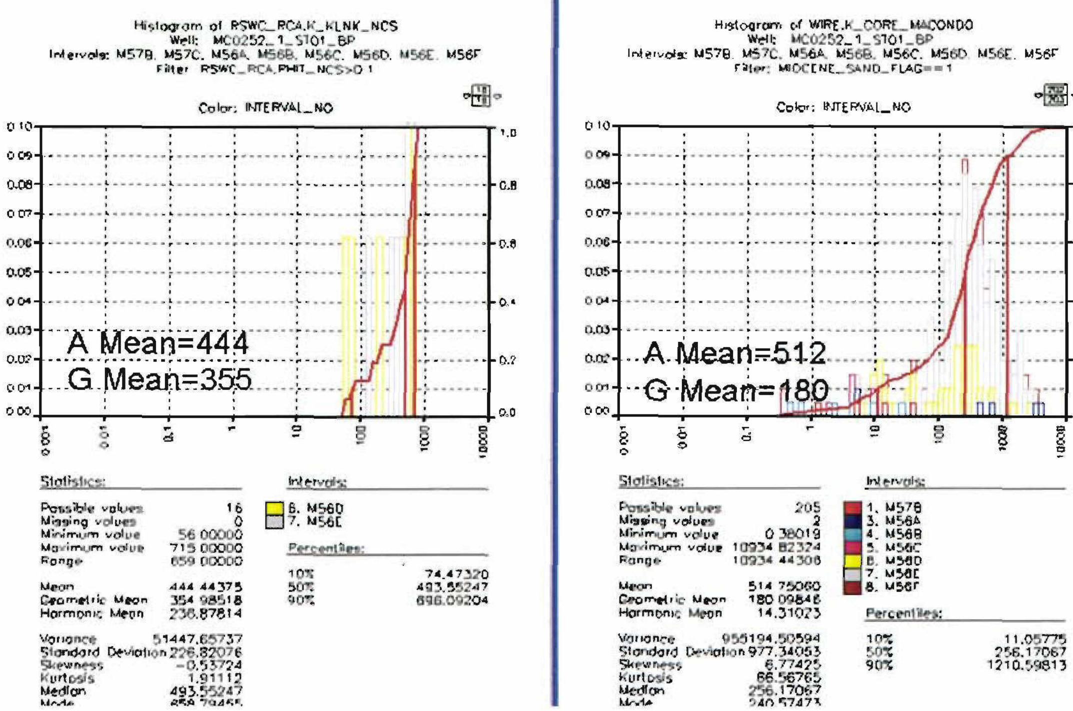


Figure 27: Core derived (on the left) and Log derived Permeability with corrected density log input.

Fluid Interpretation

Based on MDT pre-test pressure data analysis and fluid sampling analysis, the M56D and M56E reservoirs comprise volatile oil with GORs of around 3000 with an API gravity of 35. A more complete set of data and analysis will be presented in the Fluid Properties section.

The M56F sand underlying the main pay zone was not sampled by the MDT tool but based on its location below M56D and M56E and below the thermogenic front it is likely to be oil.

The fluid analysis of the M57B and M56A sands is uncertain (Figure 29). Sand M56A has a sonic log signature similar to M56D and M56E, which are oil bearing sands. Sonic porosity calculated in the sand matched density porosity, which also an evidence to be oil sand as Sonic porosity is usually higher than density porosity in gas sand. There was no gas heavier than C1 observed on mud gas chromatograph in the M57B and M56A sands and neither cut or florescence on cuttings. However, based on the M56A position right above the boundary of thermogenic front, it could be gas (see Figure 37).

The M57B sand is approximately 2 feet thick and is below log resolution for accurate fluid determination. However, if hydrocarbons were present, based on the neutron-density cross-over and its position above the thermogenic front it is likely to be gas rather than oil.

Figure 29: Fluid typing of sands M57B and M56A.

During the initial analysis at the well site, the M57B sand was not interpreted as gas bearing. The interpretation was based on logs field print presented in Figure 30, where the M57B lacks the pronounced neutron–density cross-over as observed in the gas bearing M56A sand. In addition there was no mud gas response over M57B.

Figure 30 Triple Combo field print over M57B and M56A.

The Schlumberger ELAN well logs analysis shows the M57B saturation is moved water (i.e. the elevated resistivity is due to synthetic mud invasion), see Figure 31.

Figure 31 Schlumberger ELAN analysis over M57B and M56A

A pressure reading of 14.19 ppg was obtained in the M57C Sand (17,700' MD) using logging while drilling (LWD) real-time Geotap tool. During formation evaluation testing, MDT pressure readings in this sand failed to seal. The geotap test of 14.19 ppg was deemed acceptable and can not be disregarded. The OBMI image suggests that the sand is very thinly interbedded (Figure 32). The thin sand stringers are below density log resolution so the evaluation of porosity, Sw and fluid type is compromised.

There are several more thin (<1 ft) sand or silt stringers, characterized by slightly decreased density and slightly increased resistivity values such as those at 17437.5', 17450', 17474' md. The stringers properties are below conventional logs resolution and their lithology and fluid type are uncertain.

Sand M56B is interpreted to be a thin, low porosity water-bearing sand. Sand M57C is interpreted to be a thin, low porosity sand of uncertain saturation.

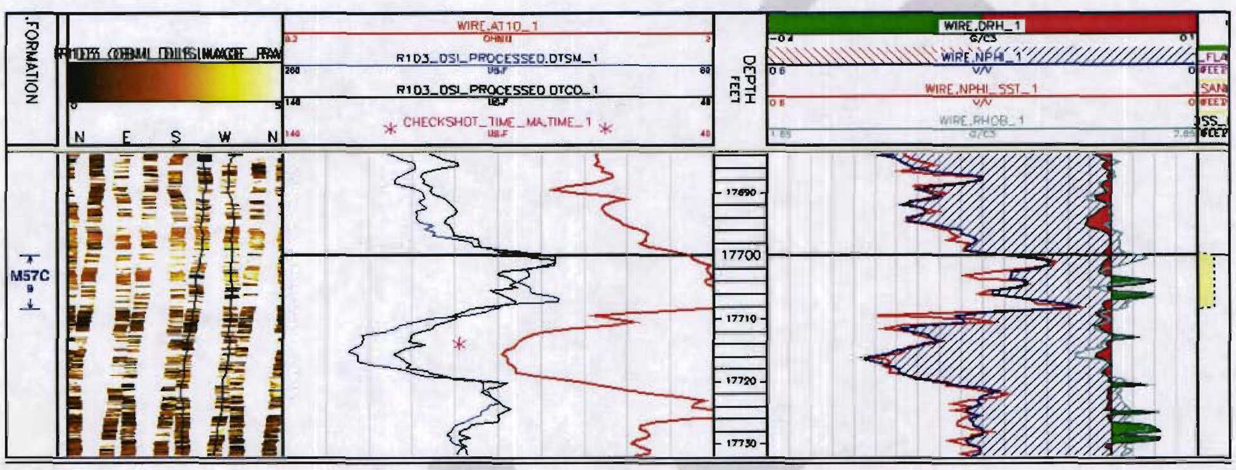


Figure 32: Logs over sand M57C.

Reservoir and fluid quality

Despite limited core data availability, the integration of the core, log and pressure data suggests that:

- Both M56D and M56E sands have good reservoir quality and reservoir fluid.

- Based on XRD data, the M56D and M56E sand lobes have similar mineralogical content with Quartz content averaging 93% and with only minor amounts of clay and secondary minerals (Figure 13).

- Sorting, grain size and sand content are the main controls on reservoir quality.

- From Core data, two rock types have been identified; M56E comprises mainly Rock type 1 and is differentiated from Rock Type 2 by improved sorting. The rock Types are also identifiable in K/Phi space with an average pore throat radius of 10 microns dividing the Rock types. The M56D sand comprises both Rock type 1 and 2. Rock type 1 maybe associated with a more homogeneous sand package; Rock Type 2 in the M56D unit may be associated with some thin bedded pay as evidenced by increased anisotropy from the tensor resistivity data and the CMR bin porosity distribution. There is a better match between core porosity and permeability in Rock Type 1 of the M56E sand than exists for the more heterogeneous sands of M56D and therefore less uncertainty on reservoir parameters.

Thin section data will be integrated with the rest of the data when available to strengthen these assumptions.

- Mobilities from MDT pre tests confirm the two sands have high permeability in the 100's of millidarcy range.

- Figure 33 shows the permeability estimation from different data.
  Red symbols – permeability measured on core (to air),
  Brown line – permeability calculated from Density porosity using core derived equation (see underestimation of Permeability in M56D).
  Red line was used for averages instead – permeability with corrected Density porosity input.
  Blue symbols – drawdown mobilities from MDT pretests,
  Green symbols – draw down mobility from MDT samples.
  Drawdown mobility is a rough estimate of permeability to oil.
  Pretests mobility does not look valid to use, MDT samples mobility multiplied by 0.17 cp viscosity can be compared to Permeability to air measured on core and calculated with logs – magenta stars.

- There is a good match of log derived porosity K_CORE and CMR derived KTIM (purple curve).

- Three fluid samples were obtained – one in M56D and two in M56E. All three samples identified the same fluid type - volatile oil with GOR ~3000 and API=35°. The three samples have contamination below 1.2% of mud filtrate which is considered high quality.

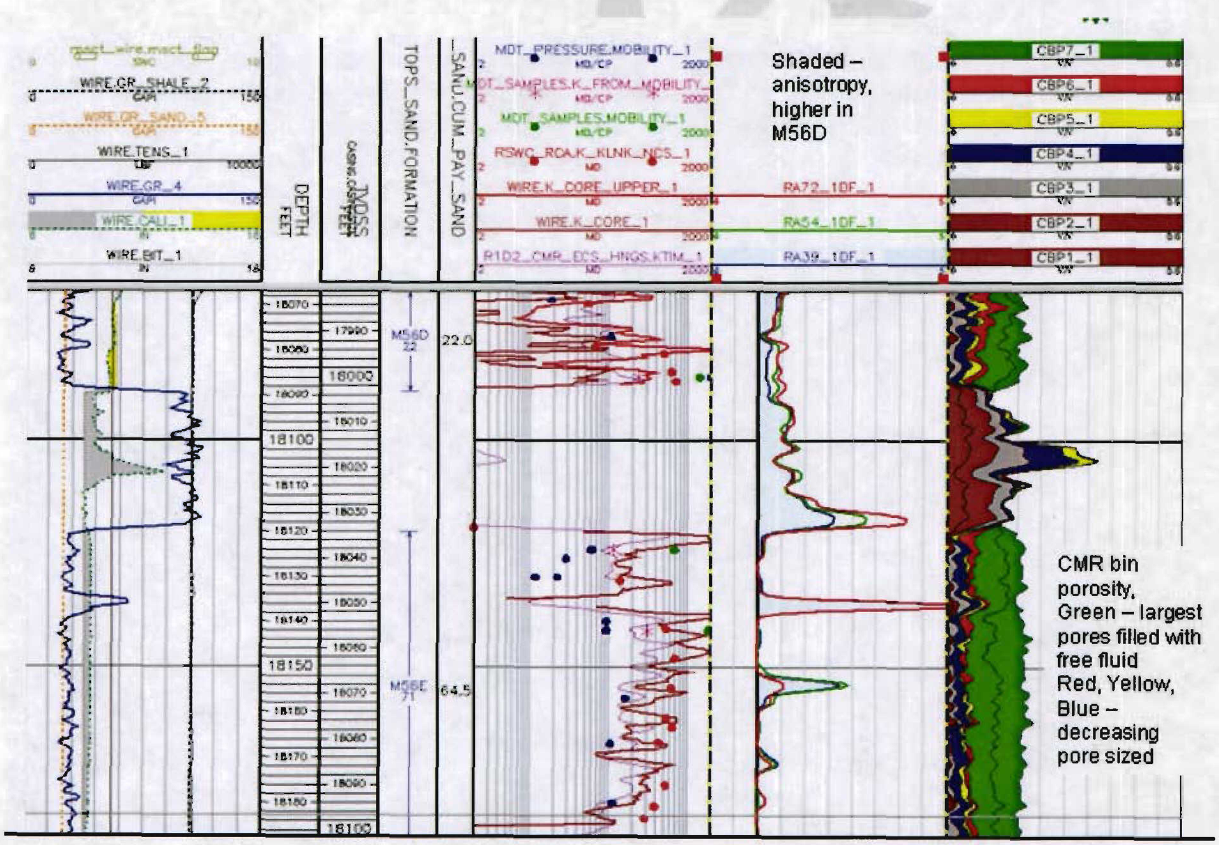


Figure 33: Log data demonstrating M56D and M56E analysis.

- Pressure gradients are presented in Figure 34. Sample and MDT points show very slight different gradients between the two sands (0.249 psi/ft and 0.251 psi/ft for M56E and M56D respectively) but they were taken with different probes that may explain the difference.

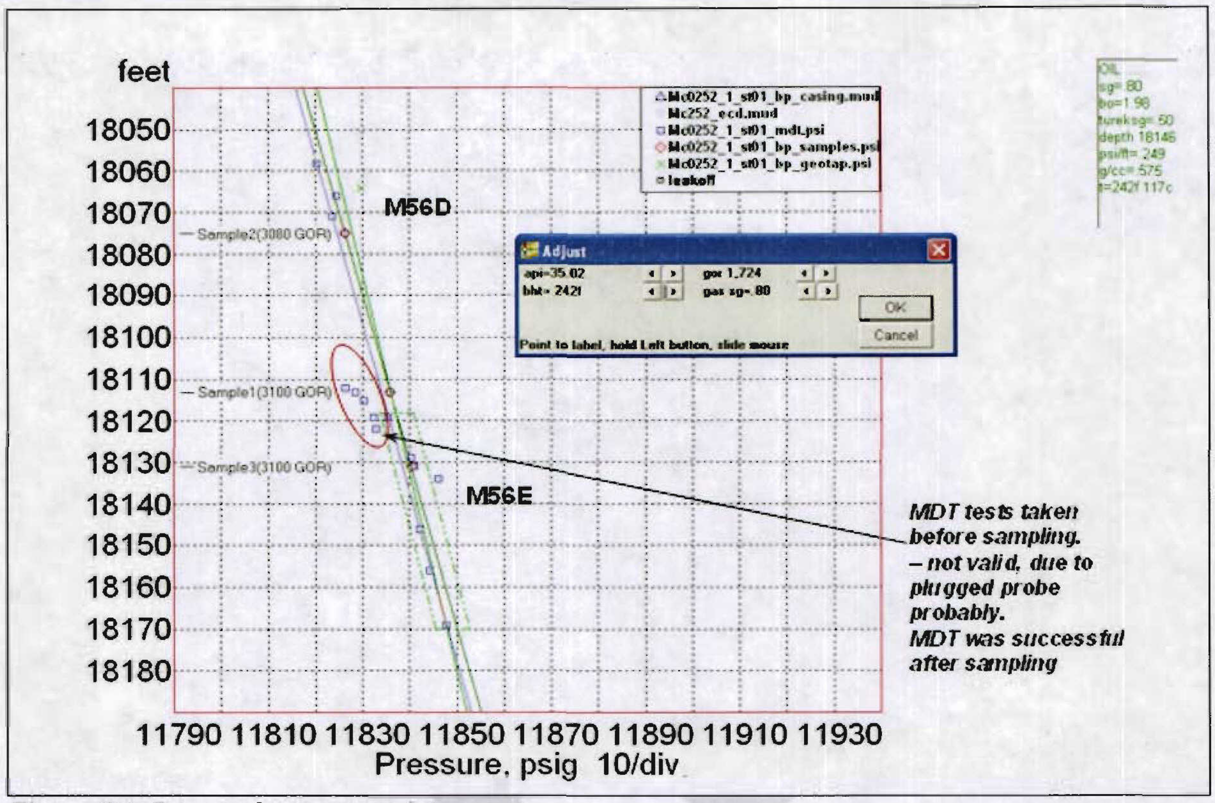


Figure 34: Presgraf pressure plot.

Net/Pay summary

A summary of the gross, net and pay sand is presented in Figure 35. For M56D corrected Density porosity, Sw and Permeability are used for averaging.

Top of Sand MD Depth	Bottom of Sand MD Depth	Top of Sand TVDSS Depth	Bottom of Sand TVDSS Depth	Fluid Content	Sand Name	Gross Sand	Net Sand	Pay Sand	Average Gross Porosity	Average Net Porosity	Average Pay Porosity	Average Net Sw	Average Pay Sw	Arithmetic Air Perm	Geometric Air Perm
Feet	Feet	Feet	Feet			Feet	Feet	Feet	%	%	%	%	%	MD	MD
17467.0	17469.0	17381.1	17383.1	Probable Gas	M57B	2	2	2	18.0	18.0	18.0	52	52	15	8
17700.0	17708.5	17614.1	17622.6	Uncertain	M57C	8.5	0	0	9.0						
17804.0	17806.5	17718.1	17720.6	Oil or Gas	M56A	2.5	2.5	2.5	22.5	22.5	22.5	24	24	1702	467
17975.5	17989.5	17889.6	17903.6	Brine	M56B	5	3	0	14.2	17.0		58		7	3
18030.0	18032.0	17944.1	17946.1	Brine	M56C	2	2	0	17.3	17.3		64		5	4
18067.0	18089.0	17981.1	18003.1	Oil	M56D	22	22	22	20.7	20.7	20.7	17	17	258	102
18120.0	18191.0	18034.1	18105.0	Oil	M56E	69.5	64.5	64.5	21.4	22.1	22.1	9.7	9.7	514	324
18217.5	18238.5	18131.5	18152.5	Oil	M56F	6.5	6.5	6.5	21.1	21.1	21.1	22	22	1441	130

Figure 35: Macondo net/pay summary table.

Petroleum Systems and Fluid Properties

Temperatures (pre- versus post-drill)

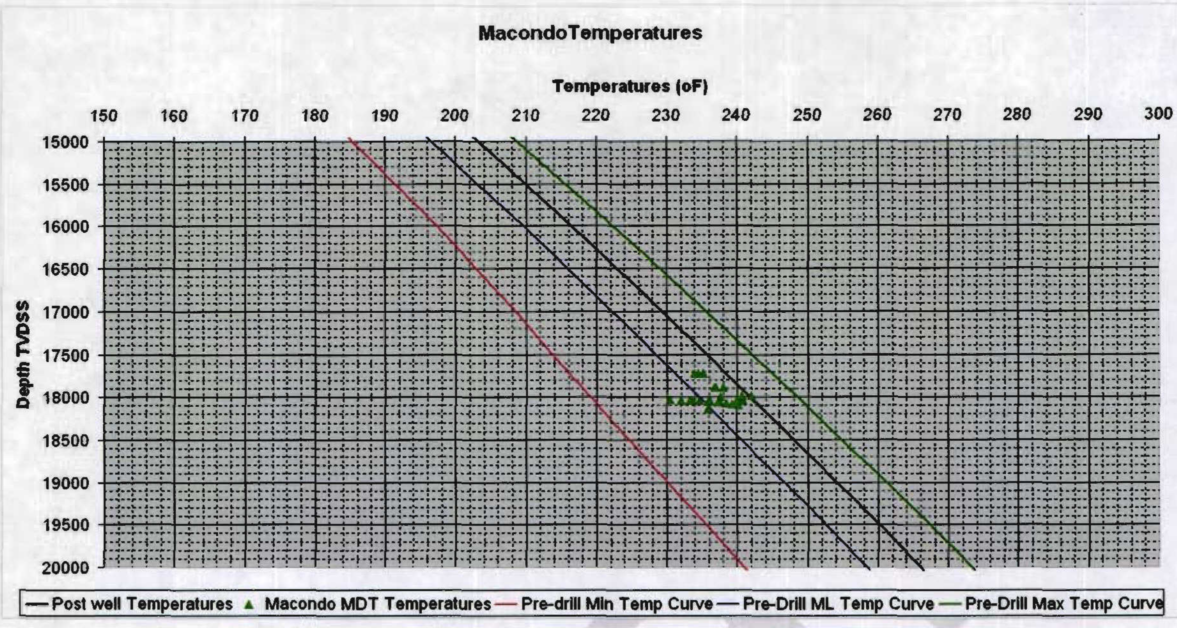


Figure 36: Pre- versus Post-drill temperature comparison.

The reservoir temperatures were predicted to be in between 219 and 248 °F, with a most likely case at 235 °F. The post well temperatures, acquired from the MDT tool gave a broad range between 230 and 242 °F (Figure 36). Therefore the post-drill temperature range was similar to the pre-drill temperature prediction.

The black curve is the post-well temperature curve. It takes into account the outer limit of the MDT temperatures as the closest reservoir temperature reading.

The post-well temperature curve is slightly above the most-likely pre-drill curve (~7 °F) but is close to the pre-drill temperature prediction. The 7 °F temperature difference should not impact the rest of the subsurface interpretation.

Headspace & Isotope (Reservoir zone)

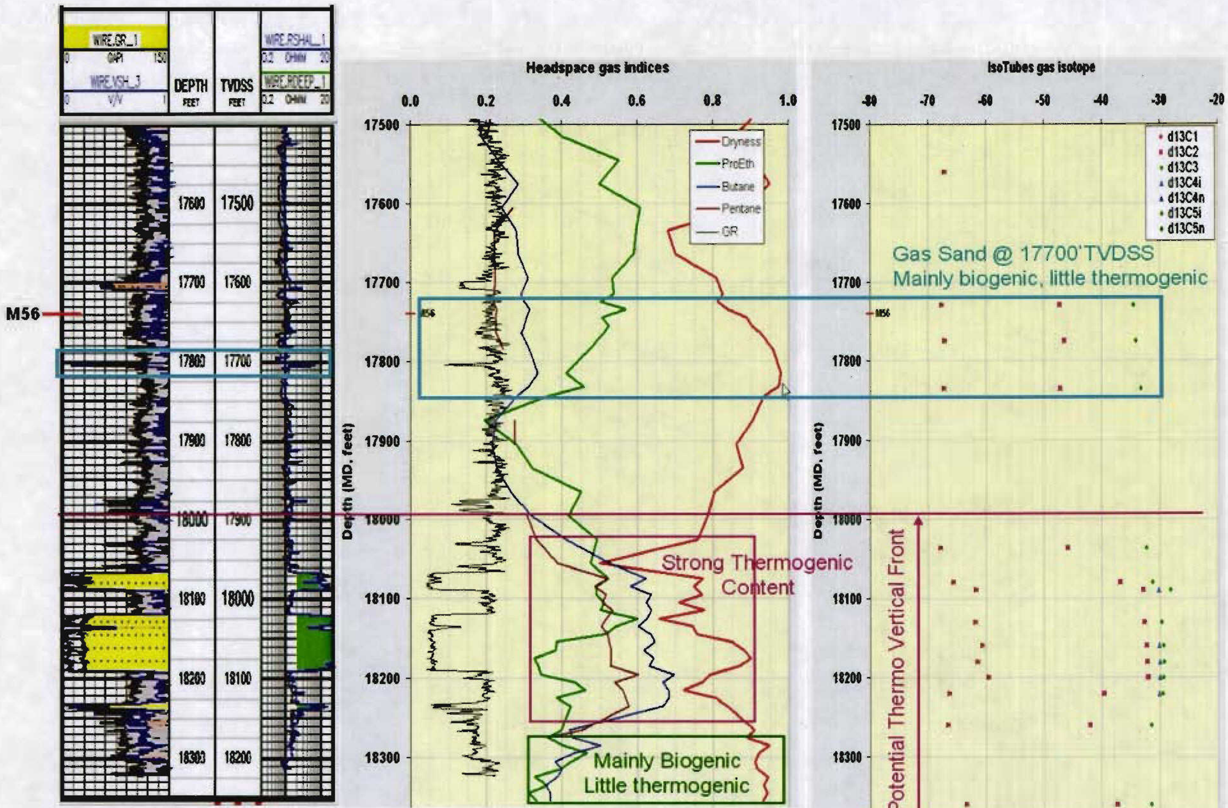


Figure 37: headspace gas indices and isotope results from isotubes.

Using the headspace gas indices and isotope results from isotubes, the thermogenic vertical front appears at 18000' MD (17900' TVDSS) (Figure 37). Indeed, the pro-ethane, butane, and pentane indices increase drastically, while the dryness index severely decreases. Moreover, the methane isotopes appear less depleted and the butane isotopes become present.

The base of the well (below 18250' MD / 18150' TVDSS) has more a biogenic signature. It is believed that the vertical thermogenic front does not pass exactly by the wellbore, giving the idea of a lateral charge. However, it is certainly a vertical thermogenic front.

The section shallower than 18000' MD (~17900' TVDSS) has a strong biogenic signature with some rare amount of thermogenic hydrocarbon. However, it is mainly biogenic gas. The sand at 17800' MD (17700' TVDSS) is a good example: it is mainly biogenic methane, but has a small amount of ethane and propane coming from the thermogenic charge. This charge was lateral in nature.

Fluid properties

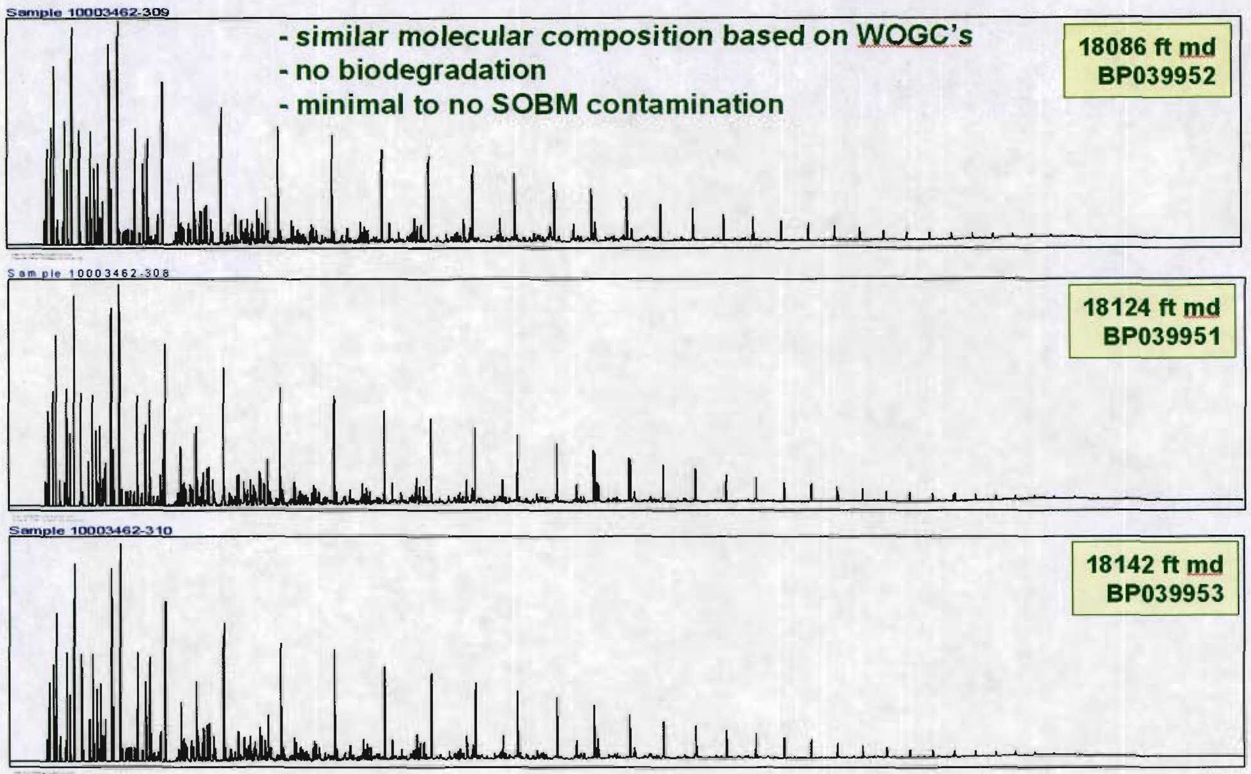


Figure 38: Chromatograms for the three dead oil samples derived from the 3 fluid samples.

Three fluid samples where taken at the level of the reservoir zone: one sample in the M56D sand (upper sand lobe at 18086' MD / 17999' TVDSS), and 2 samples in the M56E sand (middle sand lobe at 18124' and 18142' MD / 18037' and 18055' TVDSS).

Three dead oil samples were derived from those 3 fluid samples and were analysed for whole gas chromatography. The chromatograms are shown in the Figure 38.

By comparing the three chromatograms, we can conclude that the 3 oil samples have a very similar molecular composition, that there is no biodegradation and a minimal contamination level from the drilling mud.

By looking at the headspace and isotube concentrations as well as the isotope signatures, we can also conclude that the M56D, M56E, and M56F sands are oil and have similar composition. The M56F sand (18250' MD) is oil but has a higher content of biogenic gas than the M56D and M56E sands.

MDT fluid samples were taken at three depths. These are the volumes that were obtained during sampling.

Sample Depth	2 ¾ gallons	MPSR	SPMC
18086' MD	1	4	2
18124' MD	1	4	2
18142' MD	1	6	0

The three samples were tested offshore for quality assurance. The results from a single flash are summarized below.

Sample Depth	Contamination	Gas-Liquid Ratio (scf/stb)	Liquid API	Gas Gravity	Reservoir Pressure (psi)	Temperature (F)
18086' MD	1.2 wt %	3017	34.9	0.7823	11841.04	241.9
18124' MD	<1.0 wt %	2909	34.7	0.8050	11850.41	242.3
18142' MD	<1.0 wt %	2840	35.0	0.7837	11855.83	242.6

After samples were brought back to shore, the MPSRs were restored for 5 days to reservoir pressure and temperature.

From flash liquid composition all three zones are equivalent in signature (Figure 39).

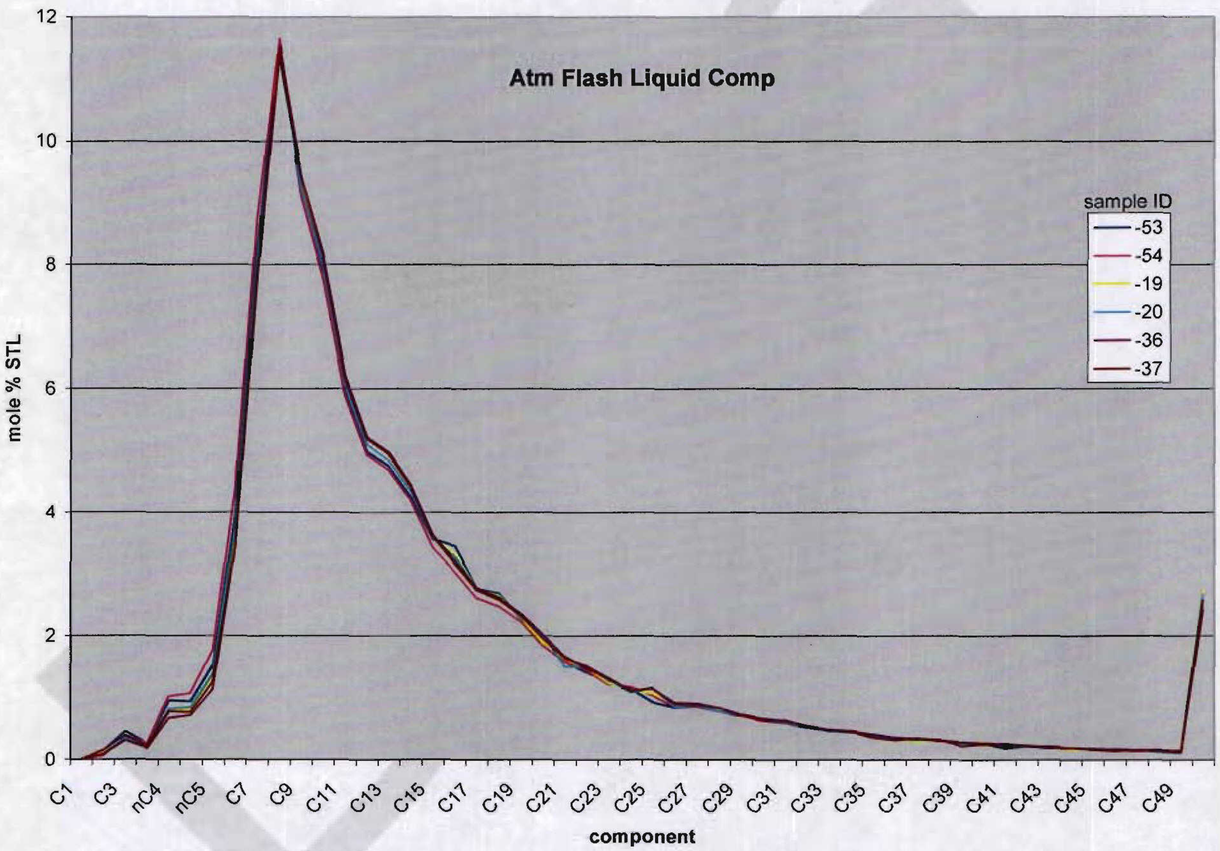


Figure 39: Flash liquid composition comparison.

Three separate labs, Pencor, OilPhase, and Westport, conducted independent tests. Testing conducted at the labs (Note: not all labs did the same tests) are single-stage flash, viscosity and density measurements, constant composition expansion, differential liberation, multi-stage separator test, mini-assay, asphaltene onset pressure, and wax appearance test. Below is a summary of the measured results conducted by the labs at different sample depths. Full PVT reports are available.

PVT Properties	Pencor (Core Lab)	Oilphase (Schlumberger)	Westport (Intertek)	Sample Depth (MD, ft)
Saturation Pressure (psia) at Reservoir Temperature	6,504	6,348	6,438	18,142
Saturation Pressure (psia) at Reservoir Temperature	6,500	N/A	N/A	18,124
Saturation Pressure (psia) at 100F	6,636	6,235	6,107	18,142
Saturation Pressure (psia) at 100F	6,640	N/A	N/A	18,124
GOR (scf/stb), Single-Stage Flash	2,810	2,945	2,831	18,142
GOR (scf/stb), Single-Stage Flash	3,056	3,096	N/A	18,086
GOR (scf/stb), Single-Stage Flash	2,890	2,994	N/A	18,124
API, Single-Stage Flash	35.2	34.6	35.6	18,142
API, Single-Stage Flash	34.8	34.7	N/A	18,086
API, Single-Stage Flash	34.7	34.6	N/A	18,124
Oil FVF (rb/stb) at Saturation Pressure, Single-Stage Flash	2.564	2.539	2.510	18,142
Oil FVF (rb/stb) at Saturation Pressure, Single-Stage Flash	2.618	N/A	N/A	18,124
GOR (scf/stb), Separator Test	2,554	2,442	2,747	18,142
GOR (scf/stb), Separator Test	2,485	N/A	N/A	18,124
API, Separator Test	38.2	37.4	37.4	18,142
API, Separator Test	38.3	N/A	N/A	18,124
Oil FVF (rb/stb) at Saturation Pressure, Separator Test	2.367	2.262	2.388	18,142
Oil FVF (rb/stb) at Saturation Pressure, Separator Test	2.339	N/A	N/A	18,124
Oil Density (g/cc) at Initial Reservoir Conditions	0.587	0.590	N/A	18,142
Oil Density (g/cc) at Initial Reservoir Conditions	0.583	N/A	N/A	18,124
Oil Viscosity (cp) at Initial Reservoir Conditions	0.168	N/A	0.260	18,142
Oil Viscosity (cp) at Initial Reservoir Conditions	0.203	N/A	N/A	18,124
Asphaltene Onset Pressure (AOP, psia) at Reservoir Temperature	N/A	9,500	N/A	18,086
Asphaltene Onset Pressure (AOP, psia) at Reservoir Temperature	N/A	6,615	N/A	18,124
Wax Appearance Temperature (F) at 4,200 psia	N/A	80.0	N/A	18,142
Dead Oil Wax Appearance Temperature (F)	89	N/A	N/A	18,142
Dead Oil Wax Appearance Temperature (F)	N/A	92.5	N/A	18,124
Dead Oil Wax Content (wt%)	N/A	1.77	N/A	18,124

Strickland Exhibit 11

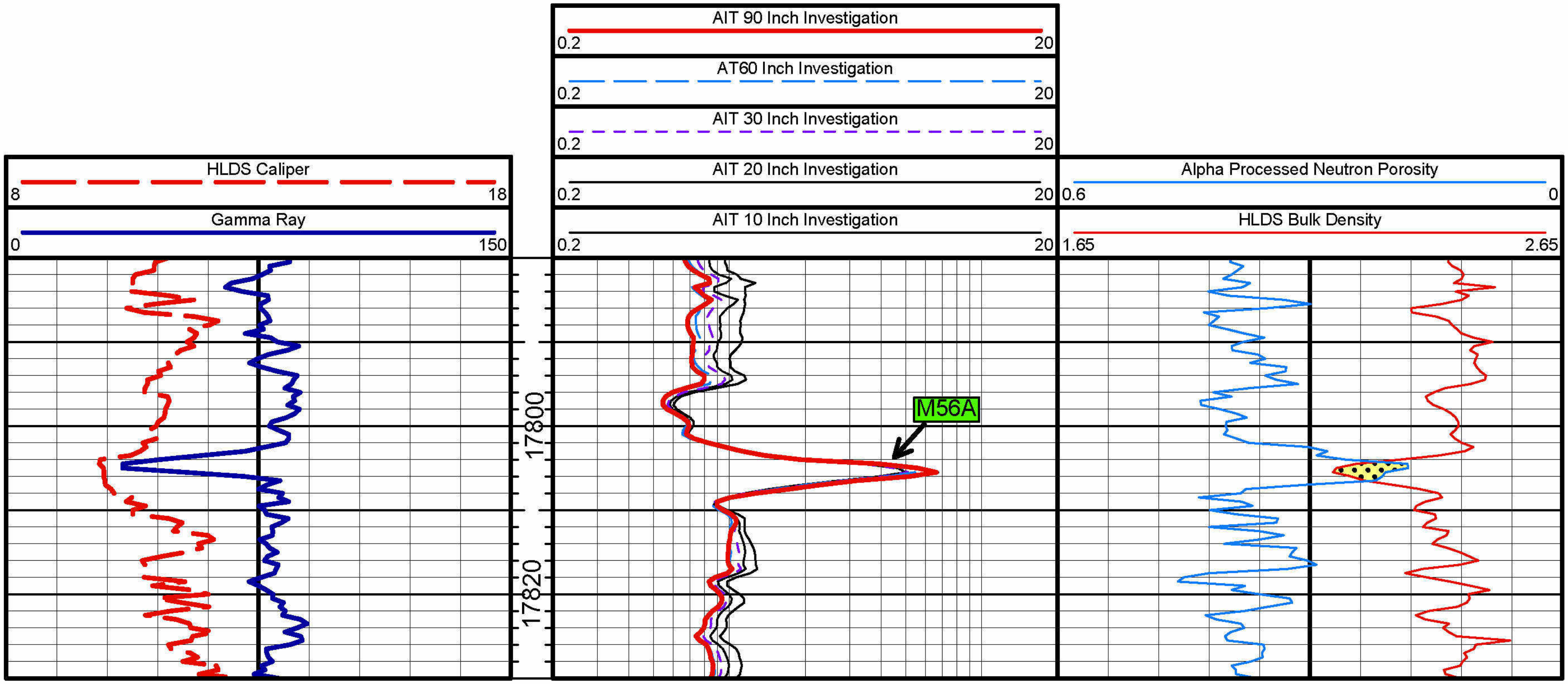


Figure 1. Triple Combo Log - M56A Zone

Strickland Exhibit 12

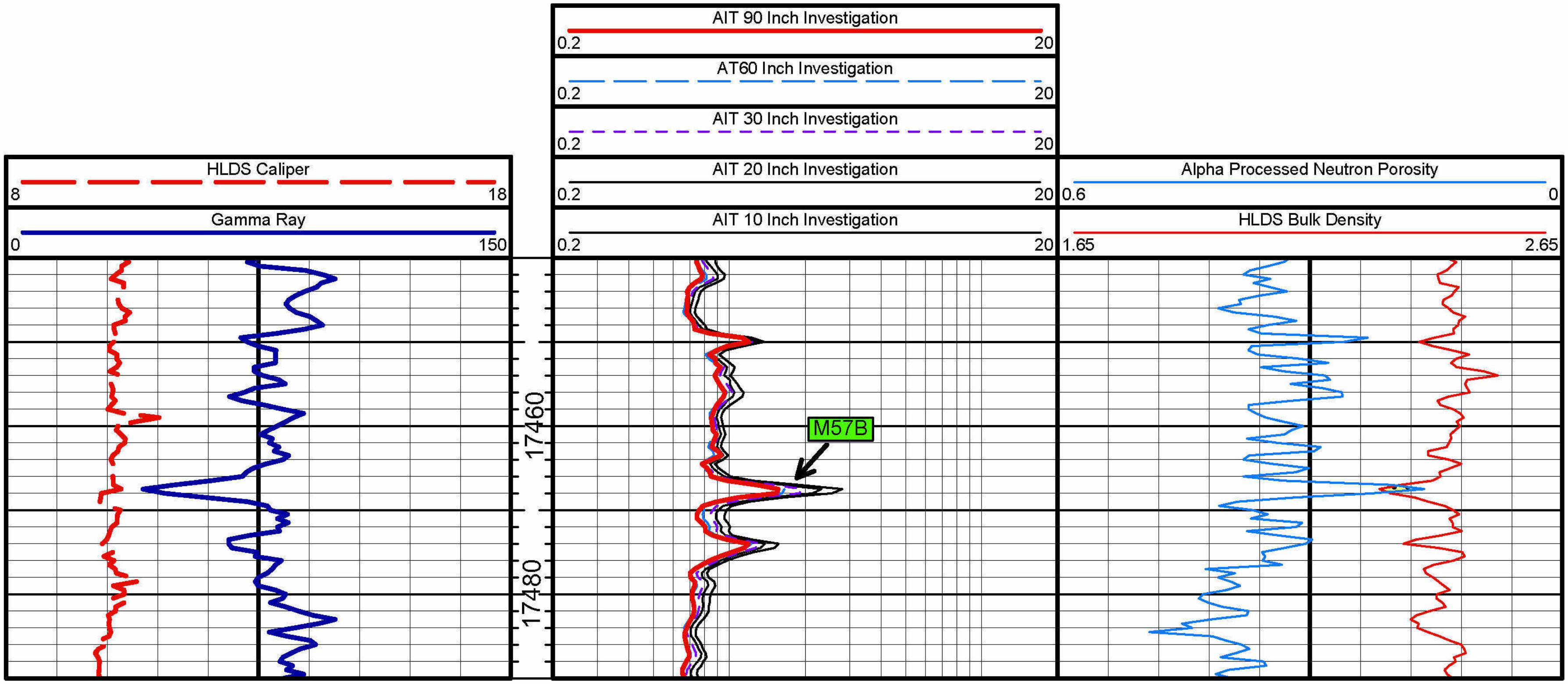


Figure 2. Triple Combo Log - M57B Zone

Strickland Exhibit 13

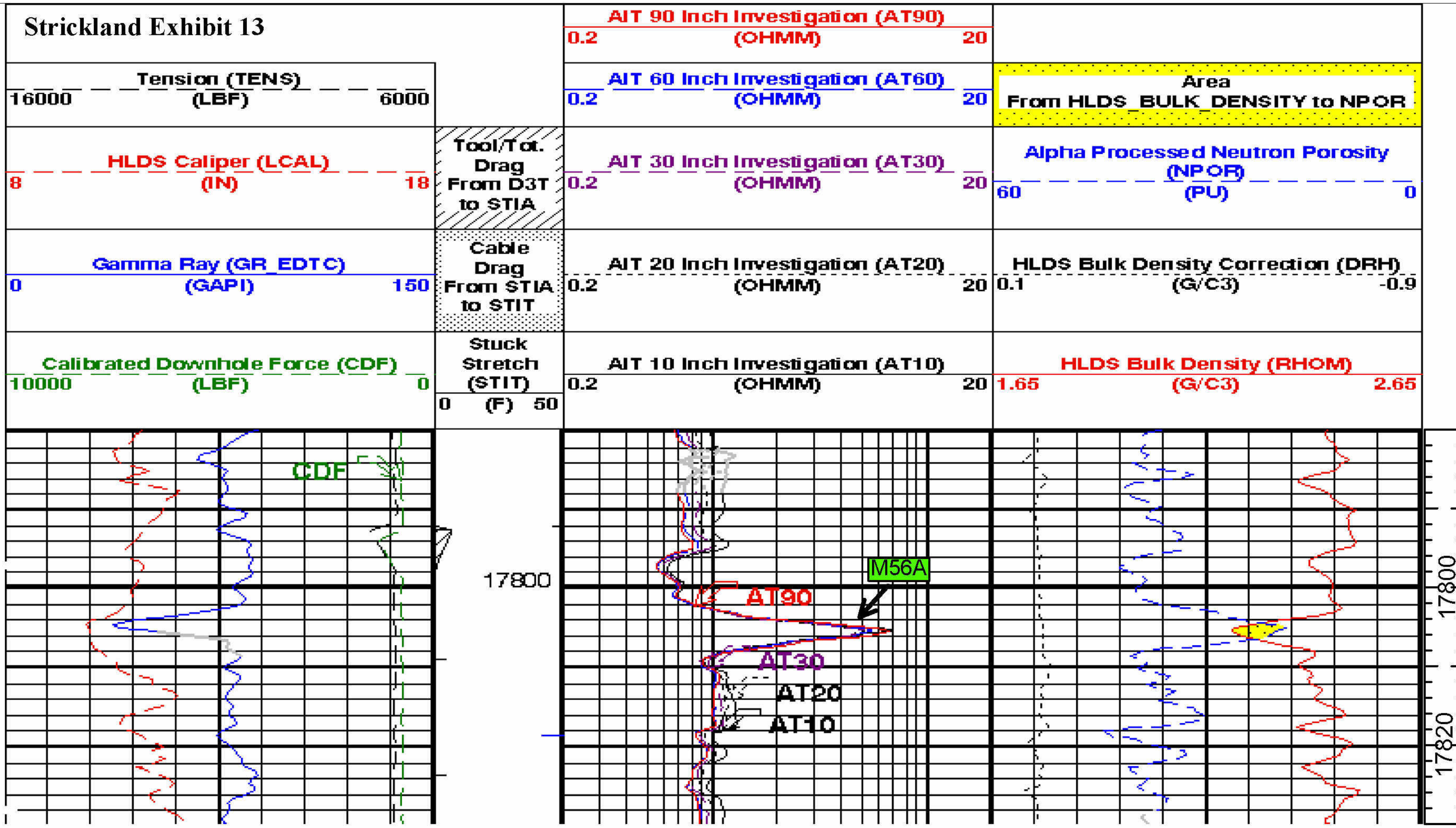


Figure 3. Final Print Triple Combo Log - M56A Zone

Strickland Exhibit 14

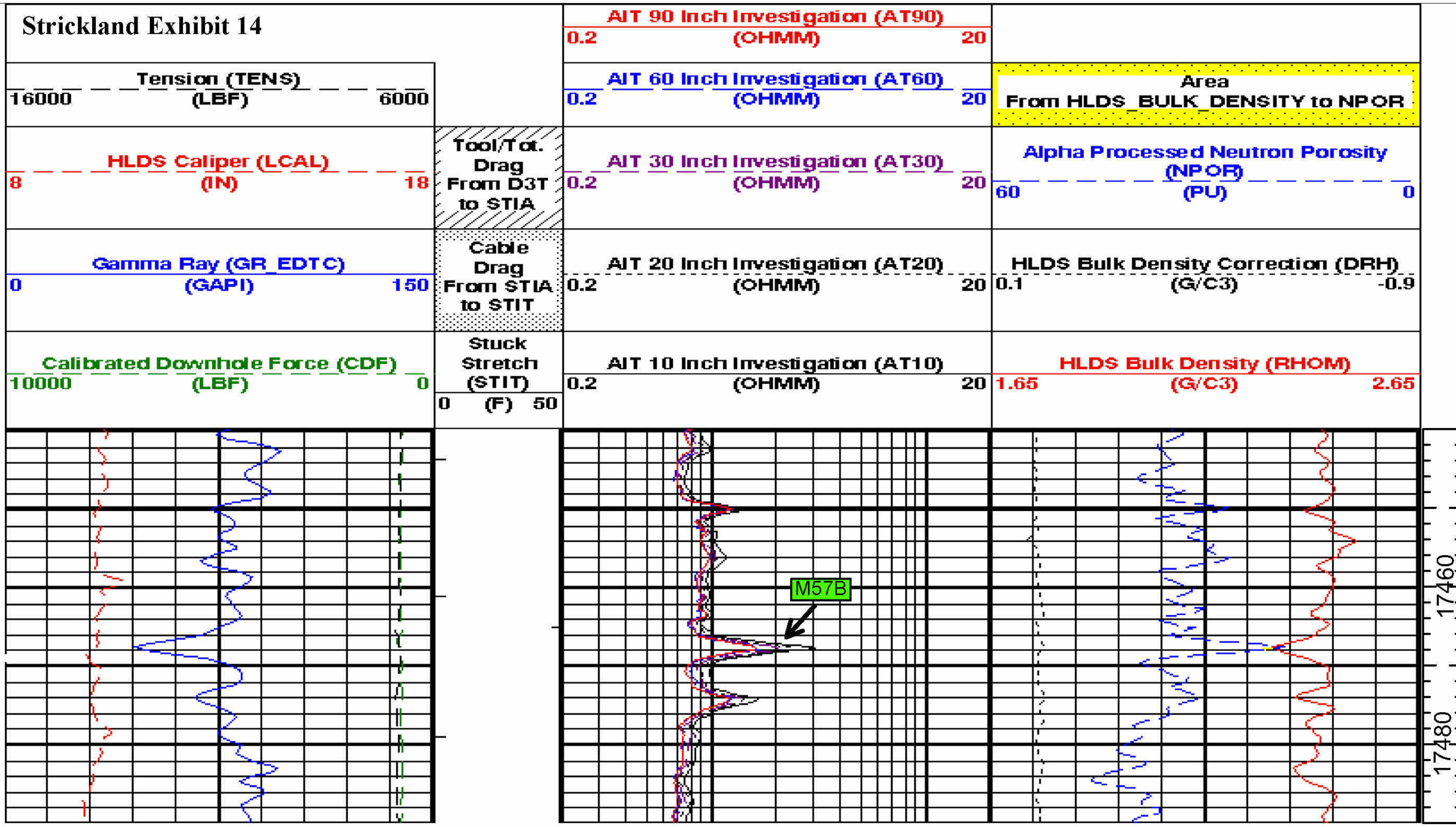


Figure 4. Final Print Triple Combo Log - M57B Zone

Strickland Exhibit 15

Figure 5. Triple Combo Log Field Copy

During the initial analysis at the well site, the M57B sand was not interpreted as gas bearing. The interpretation was based on logs field print presented in Figure 30, where the M57B lacks the pronounced neutron–density cross-over as observed in the gas bearing M56A sand. In addition there was no mud gas response over M57B.

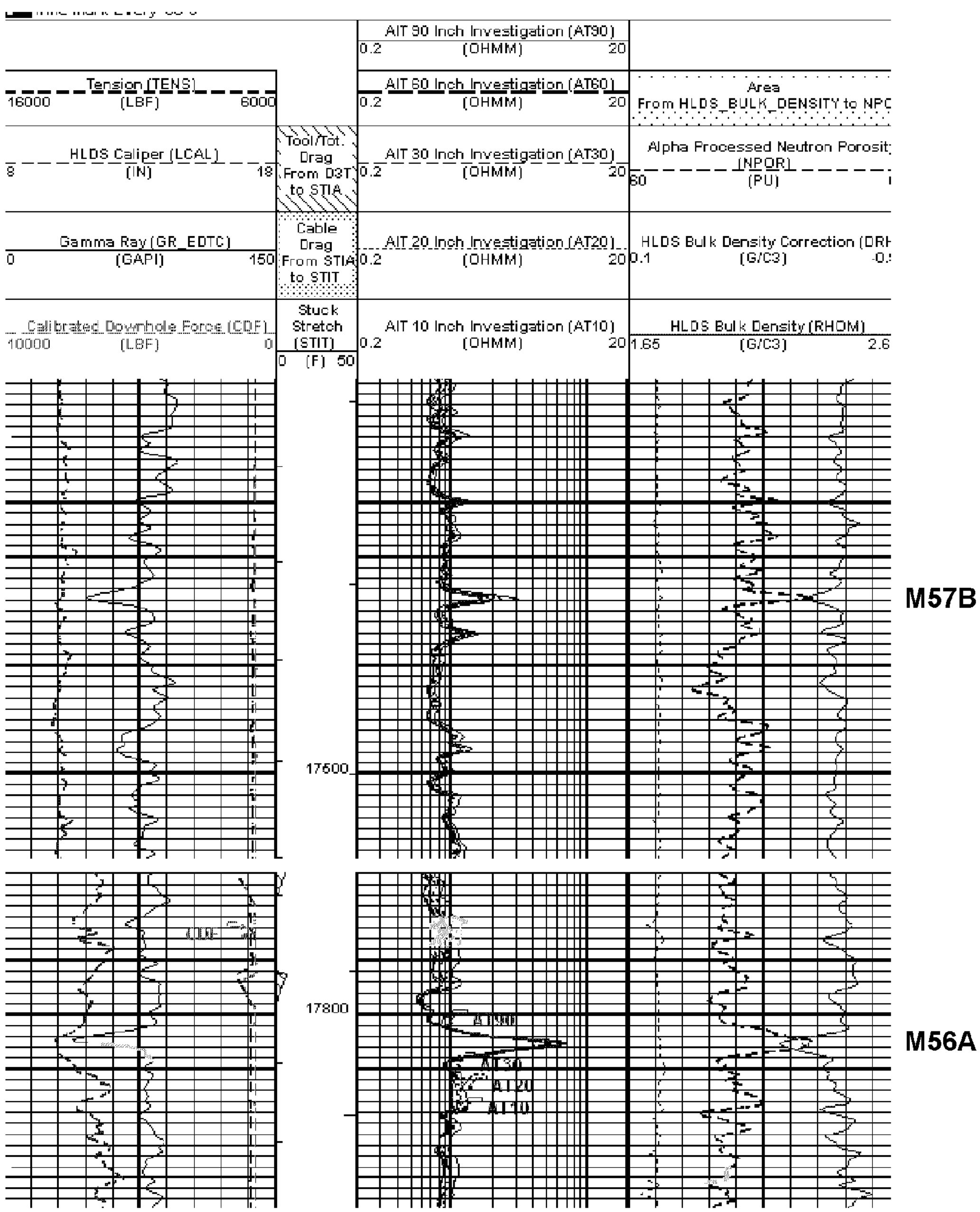
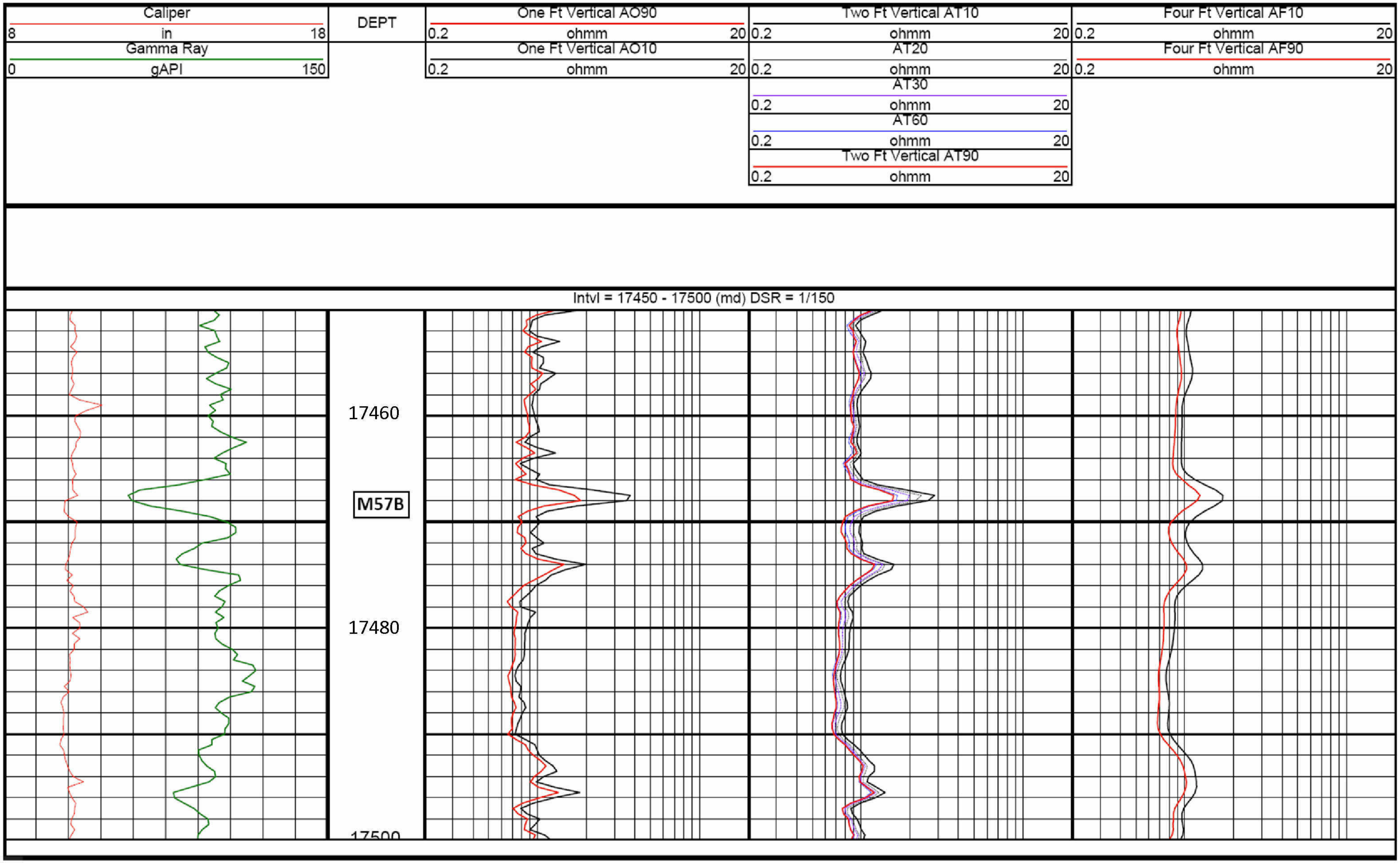


Figure 30 Triple Combo field print over M57B and M56A.

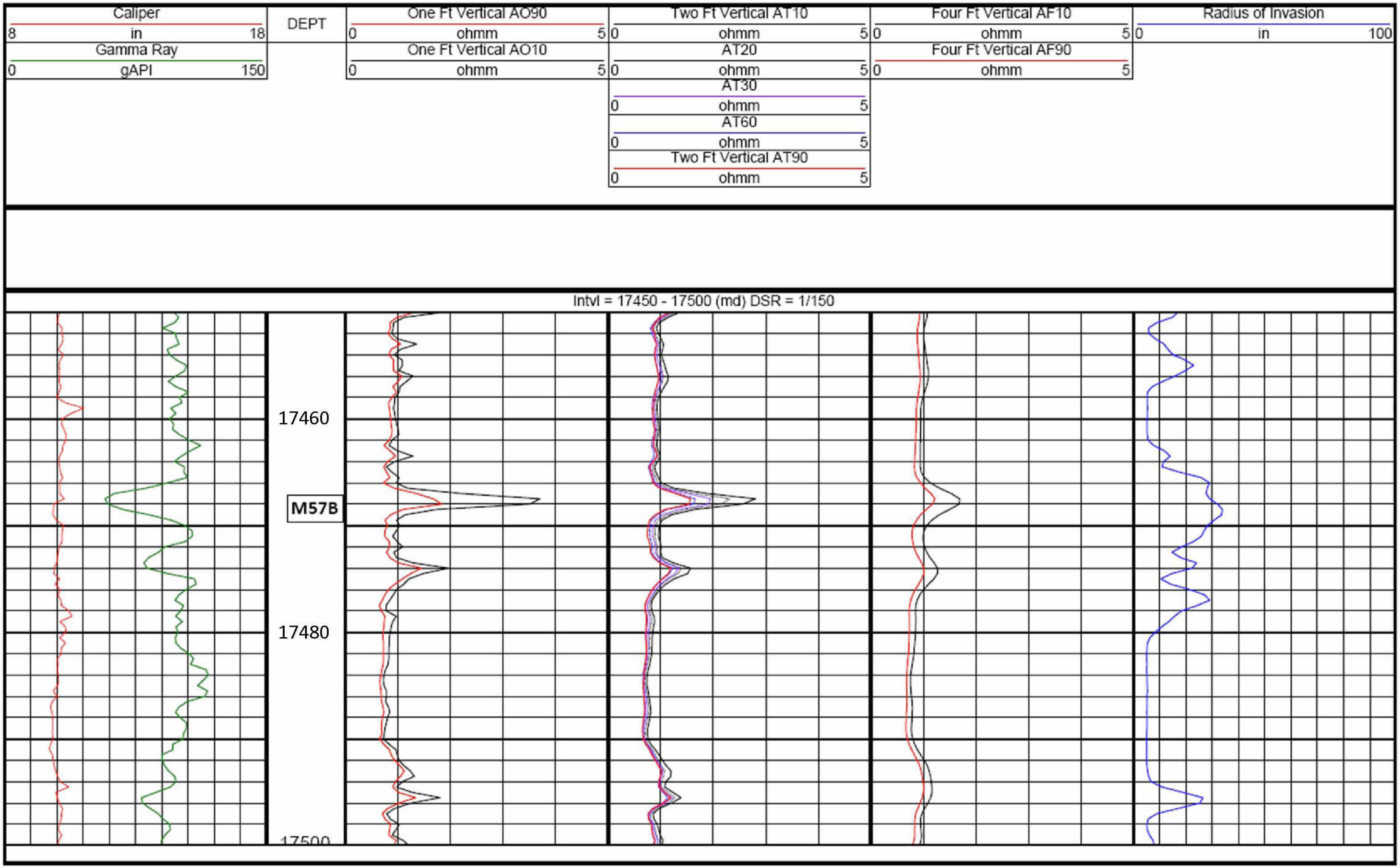
Strickland Exhibit 16

Figure 6. Resistivity Comparison 2



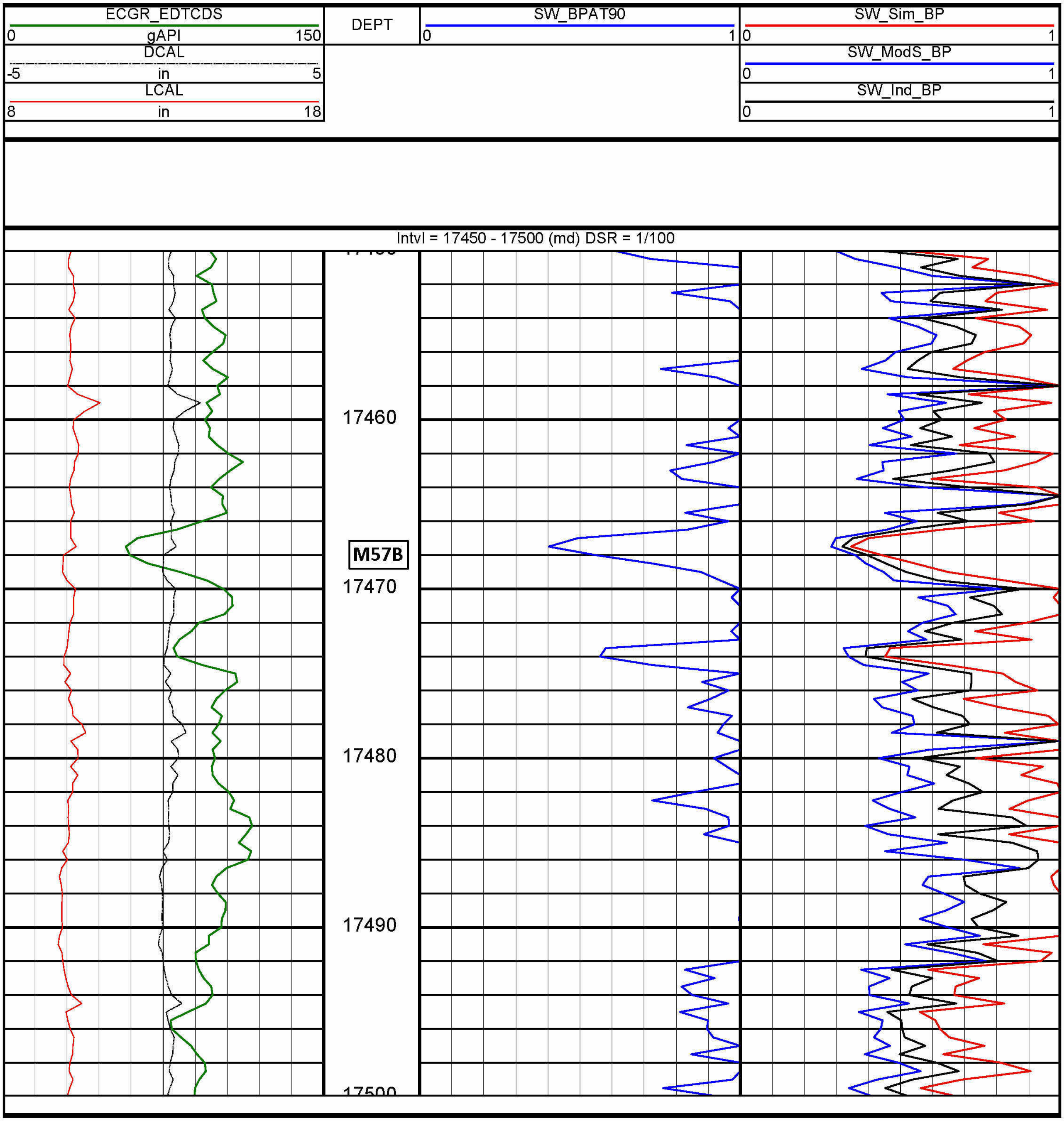
Strickland Exhibit 17

Figure 7. Resistivity with Invasion Linear



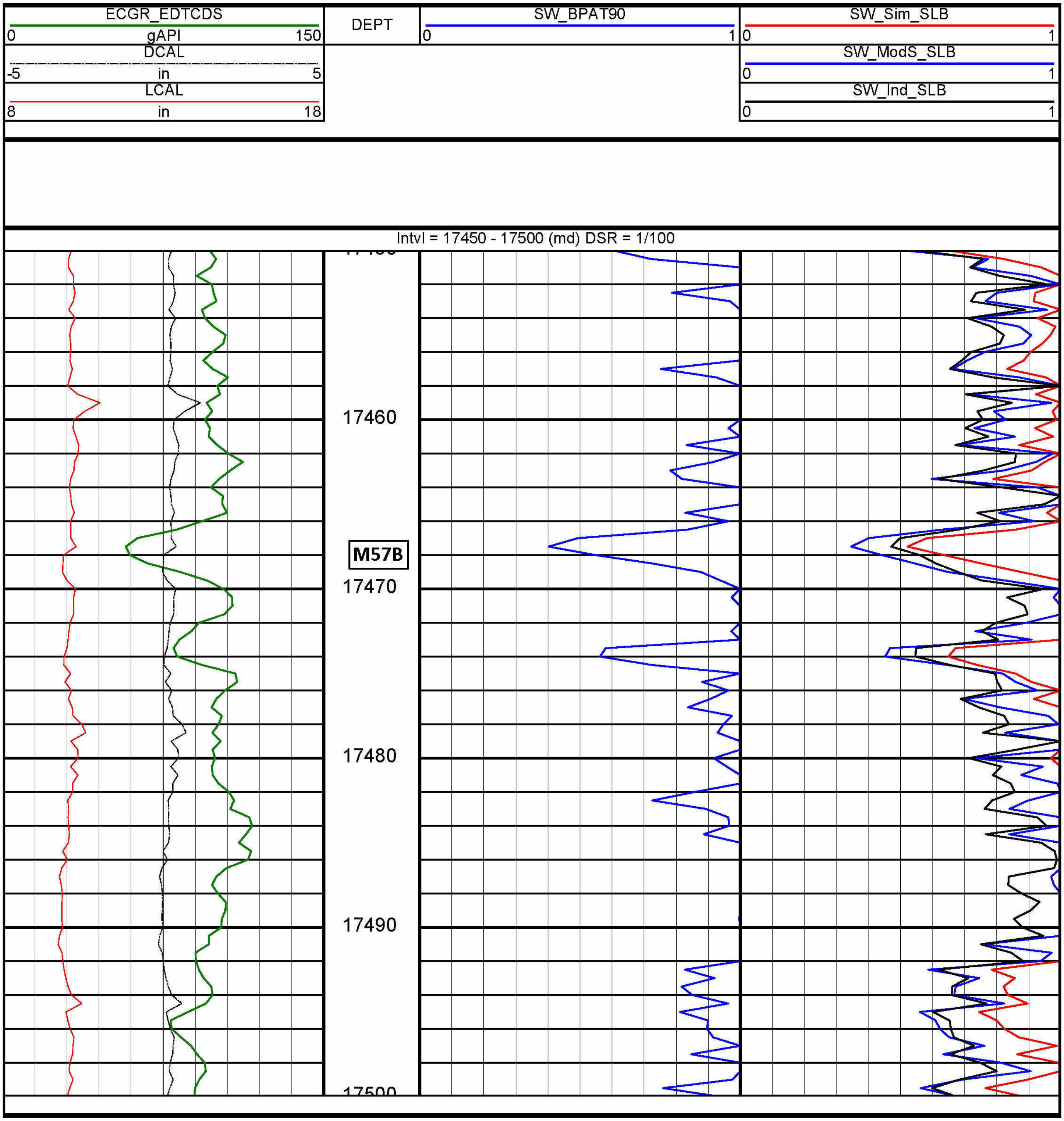
Strickland Exhibit 18

Figure 8: Comparison of water saturation calculations for M57B using BP parameters



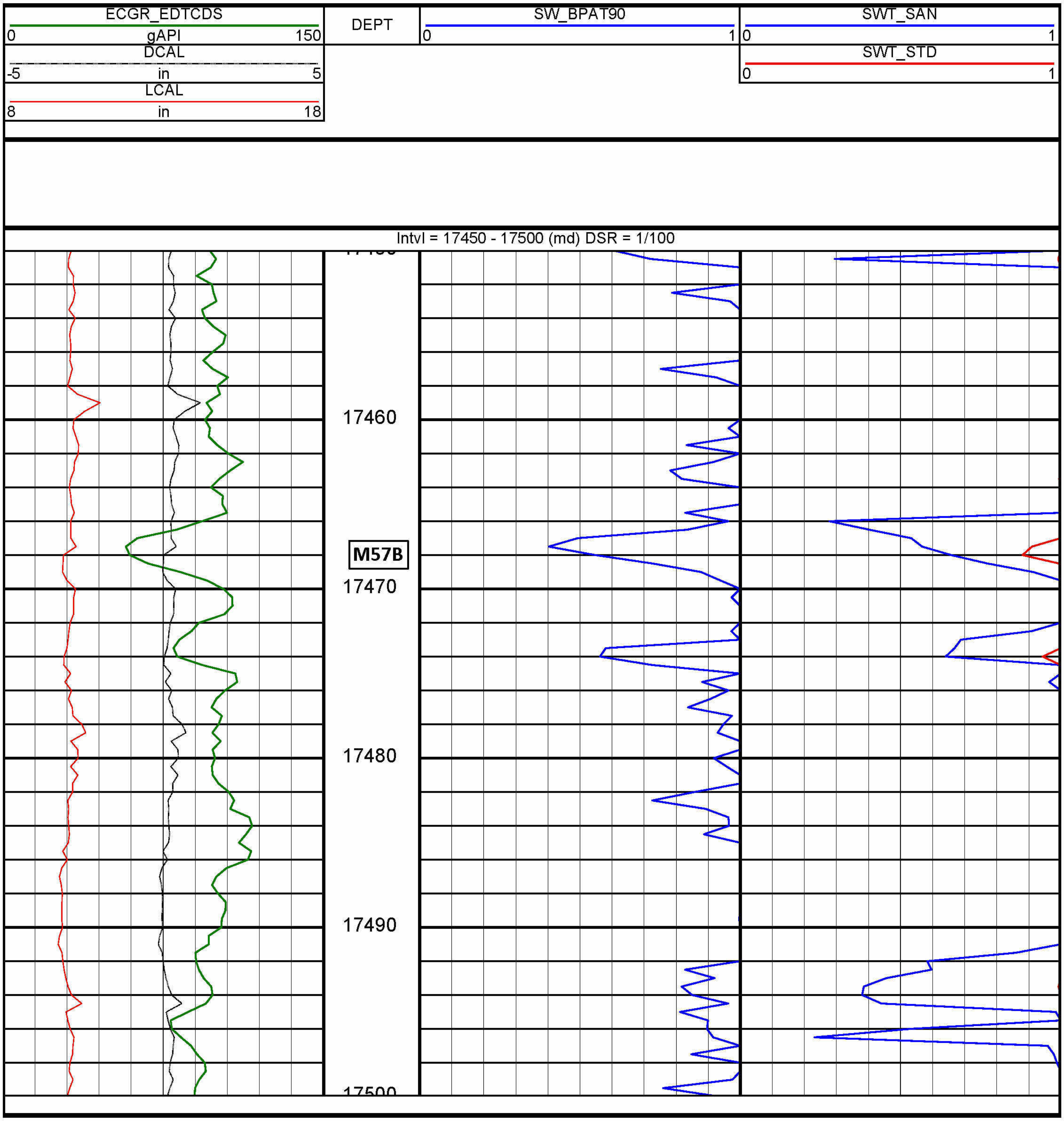
Strickland Exhibit 19

Figure 9: Comparison of water saturation calculations for M57B using Schlumberger parameters.



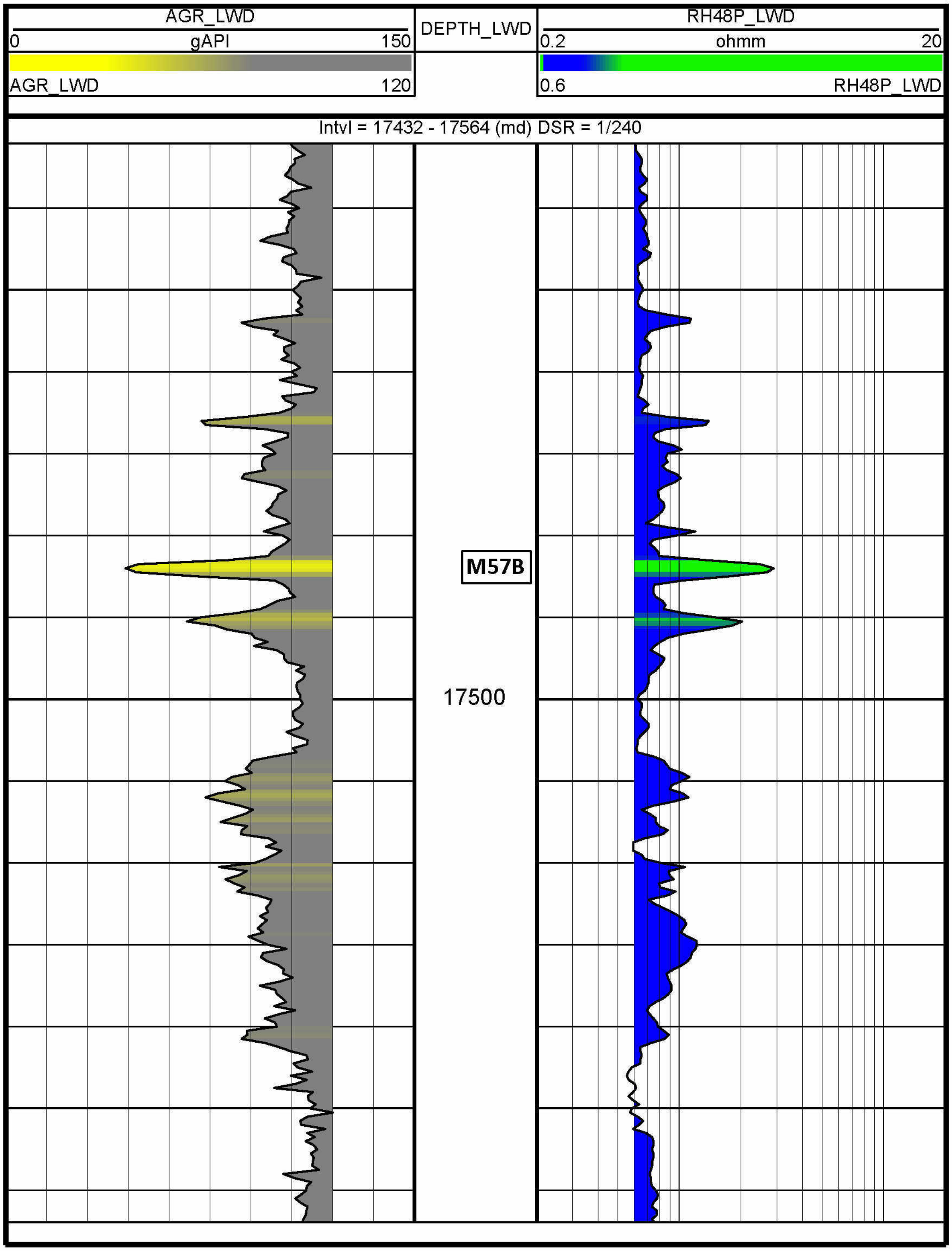
Strickland Exhibit 20

Figure 10: Water saturation information from Schlumberger's laminated sand analysis.



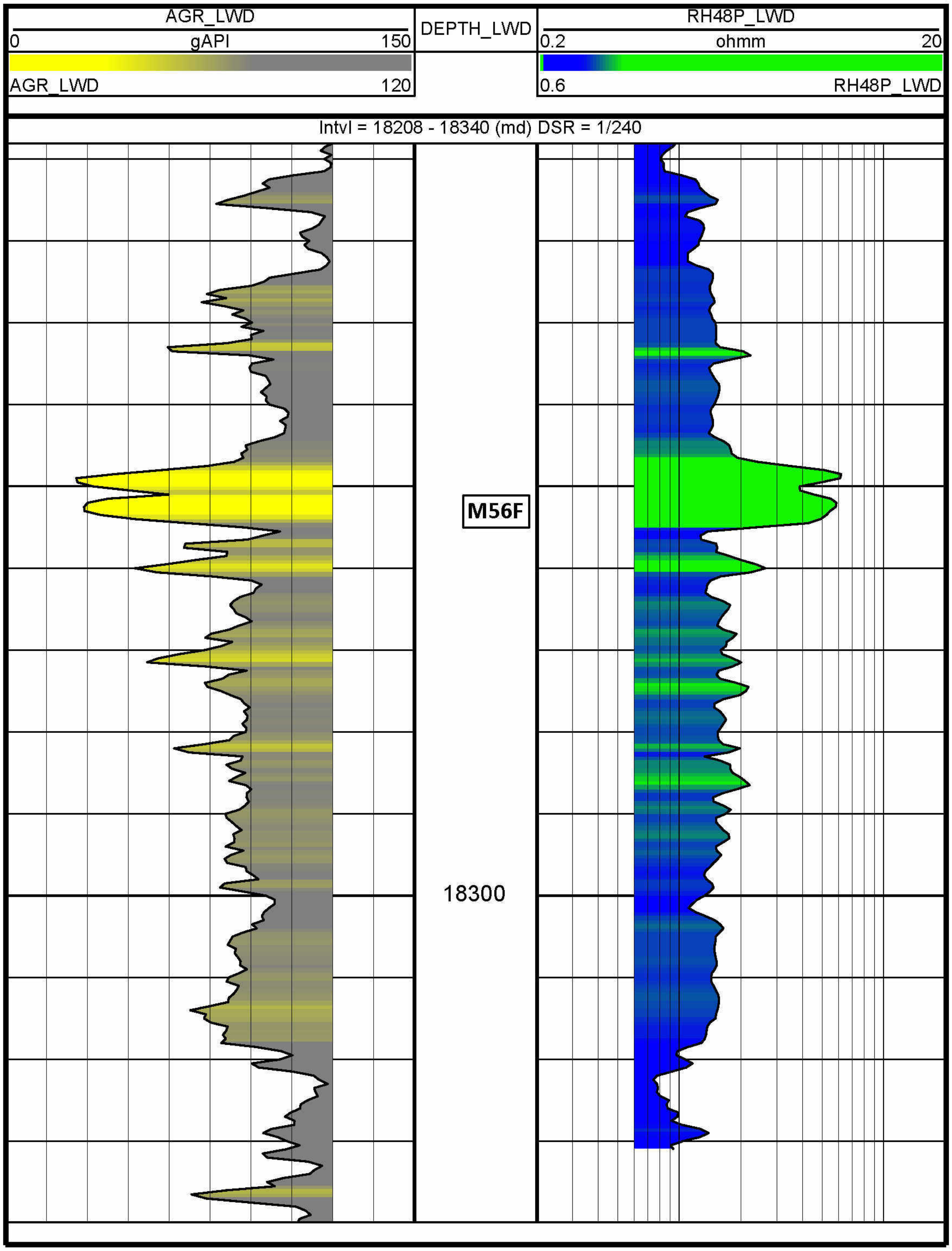
Strickland Exhibit 21

Color-coded LWD readings of gamma ray and deep resistivity over M57B interval.



Strickland Exhibit 22

Color-coded LWD readings of gamma ray and deep resistivity over M56F interval near casing shoe.



Appendix A

RICHARD F. STRICKLAND

THE STRICKLAND GROUP, INC.

4521 S Hulen, Suite 102
Fort Worth, TX 76109
(817) 338-0800
(817) 338-0830 (fax)
www.tsg.net

BIOGRAPHICAL DATA

Birth date: August 31, 1948
Citizenship: United States

Marital Status: Married, two children

EDUCATION

College

B.S., Petroleum Engineering, Texas A&M University (1970)
M.S., Petroleum Engineering, Texas A&M University (1974)
Ph.D., Petroleum Engineering, Texas A&M University (1976)

Honor Societies

Tau Beta Pi (Engineering Honor Society)
Pi Epsilon Tau (Petroleum Engineering Honor Society)

EXPERIENCE

Industrial
The Strickland Group, Inc, President (June 2001 to Present)
Cawley, Gillespie & Associates, Inc., President (January 1991 – May 2001)
Cawley, Gillespie & Associates, Inc., Executive Vice President (January 1988 - December, 1990)
Cawley, Gillespie & Associates, Inc., Petroleum Consultant (July 1982 - December 1987)
Reservoir Simulation Technology, Inc., President (December 1980 - May 1982)
Simulation Technology, Partner (September 1974 - November 1980)
Numerical Simulation Section, Phillips Petroleum Company, Reservoir Engineer (May 1974 - Sep. 1974)
Atlantic Richfield, Reservoir and Production Engineer (1970 and 1972)
Pan American Petroleum, Engineering Assistant (May 1969 - September 1969)
Tidewater Oil and Gas, Engineering Assistant (May 1968 - September 1968)
Getty Oil, Engineering Assistant (May 1967 - September 1967)

Educational
Associate Professor, Texas A&M University (September 1980 - May 1982)
Assistant Professor, Texas A&M University (September 1976 - August 1980)
Instructor, Texas A&M University (September 1975 - May 1976)

Military

US Army, South Vietnam, Infantry (September 1970 - February 1972)

PROFESSIONAL AFFILIATIONS

Society of Petroleum Engineers (SPE)
Texas Society of Professional Engineers (TSPE)
National Society of Professional Engineers (NSPE)
NSPE - Professional Engineers in Private Practice (NSPE-PEPP)
American Consulting Engineers Council
Registered Professional Engineer in the State of Texas
Sigma Xi

PROFESSIONAL COMMITTEE MEMBERSHIPS

Frost Bank Advisory Board (2000 to Present)
Petroleum Engineering Industry Board, Texas A&M University (1995 - 2000)
Society of Petroleum Engineers Editorial Review Committee (1978 - 1980)
Student Development Committee of American Association of Engineering Studies (1979 - 1980)
Society of Petroleum Engineers Education and Accreditation Committee (1981 - 1994)
Engineering Accreditation Commission of ABET (1984 - 1987)
Board of Directors of the Accreditation Board for Engineering and Technology (1988 -1994)
Chairman of the Fort Worth Section of the Society of Petroleum Engineers (1988)
Board of Directors of the Fort Worth Section of the Society of Petroleum Engineers (1989 - 1992)

Texas A&M University Committee Memberships

Academic Council, Member
College of Engineering Computing Committee, Member
Petroleum Engineering Scholarship Committee, Chairman
University Disciplinary Appeals Panel, Member
L. F. Peterson Engineering Computing Center, Director
College of Engineering Student Honors and Awards Committee, Chairman
Brazos Valley Regional Science and Engineering Fair, Director

HONORS AND AWARDS

Outstanding Faculty Award, College of Engineering, Texas A&M University (April, 1980)
Member, Graduate Faculty, Texas A&M University
Dresser Professor of Petroleum Engineering
Accreditation Board for Engineering and Technology - Fellow

PUBLICATIONS AND PRESENTATIONS

Strickland, R.F.: "An Analysis of Artificial Barriers for Controlling Water Coning," M.S. Thesis, Texas A&M University, May 1974.

Strickland, R.F. and Morse, R.A.: "Artificial Barriers May Control Water Coning," Oil and Gas Journal, October 4 & 7, 1974.

Strickland, R.F.: "Gas Injection for Up-structure Oil Drainage," Ph.D. Dissertation, Texas A&M University, December 1976.

Strickland, R.F. and Jennings, J.W.: "Recent Developments in Texas A&M University's Lignite Gasification Project," 4th Annual Underground Coal Conversion Symposium. June 1978, Steamboat Springs, Colorado.

Strickland, R.F. and Jennings, J.W.: "Analysis of Geological Limitations to Underground Coal Gasification," In Situ, Vol. 3, Number 3, September 1979.

Strickland, R.F. and Morse, R.A.: "Gas Injection for Up-structure Oil Drainage," Journal of Petroleum Technology, October 1979, pp. 1323-1331.

Jennings, J.W., Strickland, R.F., and Von Gonten, W.D.: "Underground Lignite Gasification at Texas A&M," Presented at:

Symposium on Energy and Mineral Recovery Research, April 12-14, 1977, Golden, Colorado;
Third Annual Underground Coal Conversion Symposium, June 6-9, 1977, Fallen Leaf Lake, California;
Second Annual In-Situ Energy Recovery Technology, July 11-12, 1977, Albuquerque, New Mexico.

Strickland, R.F. "Short Courses for Industrial Representatives,"

Topics: Oil and Gas Technology
Basic Reservoir Engineering
Advanced Reservoir Engineering
Numerical Simulation
Thermodynamics and Phase Behavior
Oil and Gas Property Evaluation
Presented 1977 through 1990

Strickland, R.F. "Disputes about the Panhandle Field of Texas",
Society of Petroleum Engineers, Dallas Section, November 1986, December 1989.
Dallas Geological Society, February 1990.

Strickland, R.F. "Oil & Gas Property Evaluation - A Seminar for Fiduciaries'," May 1988, May 1990.

Ravnaas, R.D., Strickland, R.F., Lake, L.W., Yang, A.P., Malik, Prezbindowski, and Mairs. "Three Dimensional Conditional Simulation of Schneider (Buda) Field," paper SPE 23970 presented at the Permian Basin Oil and Gas Recovery Conference, Midland, TX, March 1992.

Strickland, R.F., "Attributes of the Petroleum Engineer of the Future", presented at the Society of Petroleum Engineers Fall Meeting, September 1993.

Strickland, R.F., "Outsourcing, The View of a Consultant", presented at the Society of Petroleum Engineers Annual Meeting, September, 1994. SPE Houston Section, November, 1994. SPE Dallas Section, December 1994. SPE Ft. Worth Section, March 1995.

Strickland, R.F., Shingler, T., "Comparison of US and UK Transactions: Expected Market Value, paper SPE 28191 presented at the SPE Oil & Gas Economics, Finance & Management Conference in London, UK, June 1994.

Strickland, R.F., Purvis, Dwayne C., Alexander, R.A., Quinn, M.A., "Coupling Probabilistic Methods and Finite Difference Simulation: Three Case Histories" paper SPE 38777 presented at the SPE Annual Technical Conference and Exhibition, San Antonio, TX, October 1997.

Strickland, R.F., Purvis, Dwayne C., "Problems Reconciling Probabilistic and Deterministic Reserve Classifications and Evaluations" paper SPE 68591 presented at the SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 2001.

Nickle, Brad, Strickland, R.F., Purvis, Dwayne C., "Resolving the Nightmare of Performance Reporting and Portfolio Management – A Web Based Approach" paper SPE 95164-PP presented at the SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, TX, April 2005.

Strickland, R.F., *"Finite Difference Simulation of the Barnett Shale"* presented at the Barnett Shale Symposium II, Dallas, TX, June 2005.

Strickland, R.F., Purvis, Dwayne C., Presentation at the Unconventional A&D – 2008 Round Table, "Barnett Shale – Was It Worth It", Denver, CO, March 2008.

Strickland, R., Purvis, D., and Blasingame, T., *Practical Aspects of Reserve Determinations for Shale Gas* paper SPE 144357 presented at the SPE North American Unconventional Gas Conference and Exhibition, The Woodlands, TX, June 2011.

UNIVERSITY AND INDUSTRY SCHOOLS TAUGHT

University Courses

Engineering Analysis: Introduction to engineering analysis affording practice in analyzing and solving engineering problems including computational methods and devices.

Petroleum Development: Principles of oil field development including drilling equipment, drilling fluids, casing and cementing of wells and formation evaluation.

Reservoir Rock Properties: Systematic study of physical properties of petroleum reservoir rocks; lithology, porosity, fluid saturation, permeability, relative and effective permeability and capillary characteristics.

Petroleum Development Laboratory: Properties and the testing and treating of drilling fluids and cements; well surveying practices.

Fluid Properties Laboratory: Conventional and special core analysis. Analysis of drill cuttings. Determination of lithology, porosity, fluid saturation, capillary pressure characteristics, electrical properties, permeability and relative permeability.

Reservoir Fluids: Thermodynamic behavior of naturally occurring hydrocarbon mixtures. Evaluation and correlation of physical properties of petroleum reservoir fluids including laboratory and empirical methods.

Petroleum Property Management: Factors which influence industrial organizations, securities and value of oil and gas properties. Preparation of valuation reports; taxation; introduction to mineral law. Regulation of petroleum production.

Petroleum Measurement and Transportation: Fluid static and dynamics. Theory and methods of gas and liquid measurements and transportation including mixed streams.

Measurements Laboratory: Flow and metering of gas and liquid in pipelines. Oil and gas well testing, field automation and optimization of sucker rod pumping installations.

Petroleum Engineering Numerical Methods: Use of numerical methods for petroleum problems. Application of numerical differentiation, integration, interpolation, and curve fitting. Introduction to numerical simulation.

Reservoir Engineering: Frontal advance processes. Influence of rock and fluid properties on reservoir performance. Well performance as related to various completion and stimulation techniques.

Materials Balance Methods: Materials balance methods. Identification of type of reservoir mechanism. Estimation of fluids in place and future production under primary recovery, gas injection and water influx.

Unsteady State Processes: Transient phenomena in fluid flow systems. Applications to finite and infinite reservoirs. Pressure build up and draw down, skin factor, interference, reservoir limits, drill stem testing, pulse testing.

Petroleum Recovery Methods: Secondary and tertiary oil recovery. Gas drive, water flooding, steam, hot water, in-situ combustion and miscible displacement. Use of carbon dioxide, surfactants, emulsions and viscous water for increasing oil recovery.

Special Topics in numerical methods and reservoir simulation.

<u>Industry Schools</u>
Basic Reservoir Engineering
Advanced Reservoir Engineering
Numerical Simulation
Oil and Gas Property Evaluation
Oil and Gas Technology
Thermodynamics and Phase Behavior

COMMUNITY

<u>Church</u>

Ordinations: Deacon, Elder, The Church in Cityview

Recreational

Golf, Machinist

CASES WHICH AS AN INDEPENDENT CONSULTANT DR. RICHARD F. STRICKLAND HAS GIVEN EXPERT TESTIMONY AND BEEN SUBJECT TO CROSS EXAMINATION 2005-2011

No.	Date	Type (Trial or Deposition)	Court	Style	Cause
1	2004 2005	Deposition	State District Court Wise County, Texas	Littlefield Limited Partnership and Rodney Hughes v. Savannah Energy, Inc. and EnCana Oil and Gas USA, In.	Case No. 03-06-696
2	2004 2005	Trial	State District Court Victoria County, Texas	David Ohrt, et al. v. Union Gas Corporation, et al.	Case No. 01-12-57, 427-A
3	2005	Trial	International Court of Arbitration of the International Chamber of Commerce	Occidental Peninsula II, Inc. v. Nexen Inc.	ICC Case No. 12788/JNK
4	2005	Report	American Arbitation Association Commercial Arbitration Rules	The Louisiana Land and Exploration Company v. Chevron USA, Inc. and Hilcorp Energy I, L.P.	Case No. 701980075404
5	2006	Deposition	Texas Railroad Commission Travis County, Texas	Application to Amend the Field Rules for the Texas Hugoton field,	Oil & Gas Docket No. 10-0246056
6	2006 2007 2008	Trial	United States Court of Federal Claims,	Amber Resources Co., et al v. United States	Nos. 02-30C, 04-1822C, 05-249C
7	2007	Trial	International Court of Arbitration of the International Chamber of Commerce	Yemen Exploration & Production v. Republic of Yemen	ICC Case No 14108/EC
8	2008	Deposition	United States Bankruptcy Court, Southern District of New York	Investment Properties of America, LLC, et al., Debtors	Case No. 07-13621 (MG)
9	2008	Trial	Superior Court of State Alaska Third Judicial District Anchorage, Alaska	Remand Proceedings Pursuant to December 26, 2007 Order of Superior Court Regarding Point Thomson Unit Agreement	3AN-06-13751 CI
10	2008	Deposition	United States Distrct Court Eastern District of Louisiana	Texaco Exploration and Production, Inc. and Marathon Oil Company vs. AmClyde Engineered Products, Inc., et al	No. 99-3623

11	2009	Report	United States District Court Eastern District of Texas Sherman Division	Hillwood Enterprises, LP v. Intel Corporation v. Council Properties, LLC	Cause No. 4:08-cv-00112
12	2009	Trial	Probate Court 24th Judicial District Denver County, Colorado	In the Matter of the Estate of Sheldon K. Beren	Case No. 96PR401
13	2009	Report	Permanent Court of Arbitration, The Hague, Netherlands	Sonatrach v. BP Exploration (El Djazair) Limited, BP Exploration Operating Company Limited	Case No. AA224
14	2009	Trial	Oklahoma Corporation Commisstion	St. Mary Land and Exploration	CD 200902218-T
15	2010	Report	67th Judicial District Tarrant County, Texas	Glade 121, LP v. Douglas Lee Harrington, et al., v. Rubloff Development Group, Inc and Mark A Robinson	
16	2011	Trial	United States Court of Federal Claims	Chevron U.S.A., Inc. v. United States	Case No. 1:04cv1365C

Appendix B

MDL NO. 2179

In re: Oil Spill by the Oil Rig "Deepwater Horizon" in the Gulf of Mexico, on April 20, 2010

RICHARD F. STRICKLAND, P.E., PhD SOURCE / RELIANCE APPENDIX

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000001910		Communications re Sand
ANA-MDL-000001912		Communications re Sand
ANA-MDL-000001919		Communications re Sand
ANA-MDL-000001922		Communications re Sand
ANA-MDL-000001946		Communications re Sand
ANA-MDL-000002001		Communications re Sand
ANA-MDL-000002004		Communications re Sand
ANA-MDL-000002047		Communications re Sand
ANA-MDL-000002150		Communications re Sand
ANA-MDL-000002157		Communications re Sand
ANA-MDL-000002164		Communications re Sand
ANA-MDL-000002456		Communications re Sand
ANA-MDL-000002459		Communications re Sand
ANA-MDL-000002460		Communications re Sand
ANA-MDL-000002521		Communications re Sand
ANA-MDL-000002524		Communications re Sand
ANA-MDL-000002589		Communications re Sand
ANA-MDL-000002601		Communications re Sand
ANA-MDL-000002762		Communications re Sand
ANA-MDL-000002765		Communications re Sand
ANA-MDL-000002835		Communications re Sand
ANA-MDL-000002886		Communications re Sand
ANA-MDL-000003336		Communications re Sand
ANA-MDL-000003347		Communications re Sand
ANA-MDL-000003352		Communications re Sand
ANA-MDL-000003437		Communications re Sand
ANA-MDL-000003583		Communications re Sand
ANA-MDL-000003586		Communications re Sand
ANA-MDL-000003736		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000003792		Communications re Sand
ANA-MDL-000003795		Communications re Sand
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ANA-MDL-000003797		Communications re Sand
ANA-MDL-000003804		Communications re Sand
ANA-MDL-000004180		Communications re Sand
ANA-MDL-000004270		Communications re Sand
ANA-MDL-000004271		Communications re Sand
ANA-MDL-000004282		Communications re Sand
ANA-MDL-000004339		Communications re Sand
ANA-MDL-000004342		Communications re Sand
ANA-MDL-000004348		Communications re Sand
ANA-MDL-000004352		Communications re Sand
ANA-MDL-000004435		Communications re Sand
ANA-MDL-000004467		Communications re Sand
ANA-MDL-000004469		Communications re Sand
ANA-MDL-000004531		Communications re Sand
ANA-MDL-000004541		Communications re Sand
ANA-MDL-000004545		Communications re Sand
ANA-MDL-000004574		Communications re Sand
ANA-MDL-000004610		Communications re Sand
ANA-MDL-000004622		Communications re Sand
ANA-MDL-000004625		Communications re Sand
ANA-MDL-000005118		Communications re Sand
ANA-MDL-000005126		Communications re Sand
ANA-MDL-000005142		Communications re Sand
ANA-MDL-000005280		Communications re Sand
ANA-MDL-000005347		Communications re Sand
ANA-MDL-000005350		Communications re Sand
ANA-MDL-000006810		Communications re Sand
ANA-MDL-000006844		Communications re Sand
ANA-MDL-000007258		Communications re Sand
ANA-MDL-000007305		Communications re Sand
ANA-MDL-000007315		Communications re Sand
ANA-MDL-000007323		Communications re Sand
ANA-MDL-000007326		Communications re Sand
ANA-MDL-000007365		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000007435		Communications re Sand
ANA-MDL-000007458		Communications re Sand
ANA-MDL-000007463		Communications re Sand
ANA-MDL-000007517		Communications re Sand
ANA-MDL-000007527		Communications re Sand
ANA-MDL-000007529		Communications re Sand
ANA-MDL-000007539		Communications re Sand
ANA-MDL-000007805		Communications re Sand
ANA-MDL-000007896		Communications re Sand
ANA-MDL-000007897		Communications re Sand
ANA-MDL-000007899		Communications re Sand
ANA-MDL-000007902		Communications re Sand
ANA-MDL-000007904		Communications re Sand
ANA-MDL-000008010		Communications re Sand
ANA-MDL-000008058		Communications re Sand
ANA-MDL-000008067		Communications re Sand
ANA-MDL-000008072		Communications re Sand
ANA-MDL-000008105		Communications re Sand
ANA-MDL-000008200		Communications re Sand
ANA-MDL-000008202		Communications re Sand
ANA-MDL-000008659		Communications re Sand
ANA-MDL-000008661		Communications re Sand
ANA-MDL-000008672		Communications re Sand
ANA-MDL-000008733		Communications re Sand
ANA-MDL-000008837		Communications re Sand
ANA-MDL-000008856		Communications re Sand
ANA-MDL-000008868		Communications re Sand
ANA-MDL-000008889		Communications re Sand
ANA-MDL-000008922		Communications re Sand
ANA-MDL-000008951		Communications re Sand
ANA-MDL-000008973		Communications re Sand
ANA-MDL-000008989		Communications re Sand
ANA-MDL-000009150		Communications re Sand
ANA-MDL-000009365		Communications re Sand
ANA-MDL-000009438		Communications re Sand
ANA-MDL-000009445		Communications re Sand
ANA-MDL-000009527		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000011055		Communications re Sand
ANA-MDL-000011066		Communications re Sand
ANA-MDL-000011157		Communications re Sand
ANA-MDL-000011158		Communications re Sand
ANA-MDL-000011398		Communications re Sand
ANA-MDL-000011399		Communications re Sand
ANA-MDL-000011422		Communications re Sand
ANA-MDL-000014551		Communications re Sand
ANA-MDL-000015355		Communications re Sand
ANA-MDL-000018939		Communications re Sand
ANA-MDL-000020766		Communications re Sand
ANA-MDL-000021155		Communications re Sand
ANA-MDL-000022826		Communications re Sand
ANA-MDL-000024856		Communications re Sand
ANA-MDL-000030369		Communications re Sand
ANA-MDL-000036337		Communications re Sand
ANA-MDL-000040368		Communications re Sand
ANA-MDL-000041076		Communications re Sand
ANA-MDL-000044566		Communications re Sand
ANA-MDL-000047988		Communications re Sand
ANA-MDL-000047991		Communications re Sand
ANA-MDL-000047998		Communications re Sand
ANA-MDL-000048002		Communications re Sand
ANA-MDL-000048029		Communications re Sand
ANA-MDL-000048169		Communications re Sand
ANA-MDL-000048172		Communications re Sand
ANA-MDL-000048247		Communications re Sand
ANA-MDL-000048366		Communications re Sand
ANA-MDL-000048374		Communications re Sand
ANA-MDL-000049189		Communications re Sand
ANA-MDL-000049192		Communications re Sand
ANA-MDL-000049254		Communications re Sand
ANA-MDL-000049257		Communications re Sand
ANA-MDL-000049322		Communications re Sand
ANA-MDL-000049334		Communications re Sand
ANA-MDL-000049616		Communications re Sand
ANA-MDL-000049619		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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ANA-MDL-000050370		Communications re Sand
ANA-MDL-000050375		Communications re Sand
ANA-MDL-000050460		Communications re Sand
ANA-MDL-000050767		Communications re Sand
ANA-MDL-000050770		Communications re Sand
ANA-MDL-000050928		Communications re Sand
ANA-MDL-000050990		Communications re Sand
ANA-MDL-000051002		Communications re Sand
ANA-MDL-000051818		Communications re Sand
ANA-MDL-000051819		Communications re Sand
ANA-MDL-000051887		Communications re Sand
ANA-MDL-000051890		Communications re Sand
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ANA-MDL-000051900		Communications re Sand
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ANA-MDL-000052070		Communications re Sand
ANA-MDL-000052072		Communications re Sand
ANA-MDL-000052140		Communications re Sand
ANA-MDL-000052150		Communications re Sand
ANA-MDL-000052154		Communications re Sand
ANA-MDL-000052188		Communications re Sand
ANA-MDL-000052246		Communications re Sand
ANA-MDL-000052374		Communications re Sand
ANA-MDL-000053035		Communications re Sand
ANA-MDL-000053059		Communications re Sand
ANA-MDL-000053282		Communications re Sand
ANA-MDL-000053369		Communications re Sand
ANA-MDL-000053372		Communications re Sand
ANA-MDL-000054859		Communications re Sand
ANA-MDL-000055628		Communications re Sand
ANA-MDL-000055638		Communications re Sand
ANA-MDL-000055646		Communications re Sand
ANA-MDL-000055649		Communications re Sand
ANA-MDL-000055688		Communications re Sand
ANA-MDL-000055919		Communications re Sand
ANA-MDL-000055972		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000055977		Communications re Sand
ANA-MDL-000056509		Communications re Sand
ANA-MDL-000056511		Communications re Sand
ANA-MDL-000056526		Communications re Sand
ANA-MDL-000057026		Communications re Sand
ANA-MDL-000057028		Communications re Sand
ANA-MDL-000057031		Communications re Sand
ANA-MDL-000057033		Communications re Sand
ANA-MDL-000057312		Communications re Sand
ANA-MDL-000057377		Communications re Sand
ANA-MDL-000057386		Communications re Sand
ANA-MDL-000057391		Communications re Sand
ANA-MDL-000058372		Communications re Sand
ANA-MDL-000058374		Communications re Sand
ANA-MDL-000058385		Communications re Sand
ANA-MDL-000058446		Communications re Sand
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ANA-MDL-000058746		Communications re Sand
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ANA-MDL-000063426		Communications re Sand
ANA-MDL-000063502		Communications re Sand
ANA-MDL-000063553		Communications re Sand
ANA-MDL-000063559		Communications re Sand
ANA-MDL-000063721		Communications re Sand
ANA-MDL-000063723		Communications re Sand
ANA-MDL-000063769		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
ANA-MDL-000064299		Communications re Sand
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ANA-MDL-000064637		Communications re Sand
ANA-MDL-000064899		Communications re Sand
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ANA-MDL-000065764		Communications re Sand
ANA-MDL-000066074		Communications re Sand
ANA-MDL-000067723		Communications re Sand
ANA-MDL-000068613		Communications re Sand
ANA-MDL-000068618		Communications re Sand
ANA-MDL-000068623		Communications re Sand
ANA-MDL-000068628		Communications re Sand
ANA-MDL-000068634		Communications re Sand
ANA-MDL-000068639		Communications re Sand
ANA-MDL-000073611		Communications re Sand
ANA-MDL-000073705		Communications re Sand
ANA-MDL-000076331		Communications re Sand
ANA-MDL-000076530		Communications re Sand
ANA-MDL-000076634		Communications re Sand
ANA-MDL-000076769		Communications re Sand
ANA-MDL-000076947		Communications re Sand
ANA-MDL-000077552		Communications re Sand
ANA-MDL-000079430		Communications re Sand
ANA-MDL-000079529		Communications re Sand
ANA-MDL-000079530		Communications re Sand
ANA-MDL-000079698		Communications re Sand
ANA-MDL-000090850		Communications re Sand
ANA-MDL-000135827		Communications re Sand
ANA-MDL-000153686		Communications re Sand
ANA-MDL-000158317		Communications re Sand
ANA-MDL-000165870		Communications re Sand
ANA-MDL-000176182		Communications re Sand
ANA-MDL-000194048		Communications re Sand
ANA-MDL-000194587		Communications re Sand
ANA-MDL-000194688		Communications re Sand
ANA-MDL-000195037		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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ANA-MDL-000195242		Communications re Sand
ANA-MDL-000196736		Communications re Sand
ANA-MDL-000196820		Communications re Sand
ANA-MDL-000196895		Communications re Sand
ANA-MDL-000197204		Communications re Sand
ANA-MDL-000197707		Communications re Sand
ANA-MDL-000203376		Communications re Sand
ANA-MDL-000205563		Communications re Sand
ANA-MDL-000217922		Communications re Sand
ANA-MDL-000219080		Communications re Sand
ANA-MDL-000219424		Communications re Sand
ANA-MDL-000219477		Communications re Sand
ANA-MDL-000219553		Communications re Sand
ANA-MDL-000219820		Communications re Sand
ANA-MDL-000221276		Communications re Sand
ANA-MDL-000221654		Communications re Sand
ANA-MDL-000228742		Communications re Sand
ANA-MDL-000232239		Communications re Sand
ANA-MDL-000232591		Communications re Sand
ANA-MDL-000233335		Communications re Sand
ANA-MDL-000239826		Communications re Sand
ANA-MDL-000239861		Communications re Sand
ANA-MDL-000240574		Communications re Sand
ANA-MDL-000241064		Communications re Sand
ANA-MDL-000241071		Communications re Sand
ANA-MDL-000244078		Communications re Sand
ANA-MDL-000244127		Communications re Sand
ANA-MDL-000244128		Communications re Sand
ANA-MDL-000244186		Communications re Sand
ANA-MDL-000244306		Communications re Sand
ANA-MDL-000244564		Communications re Sand
ANA-MDL-000244662		Communications re Sand
ANA-MDL-000255996		Communications re Sand
ANA-MDL-000256174		Communications re Sand
ANA-MDL-000256286		Communications re Sand
ANA-MDL-000256451		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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ANA-MDL-000261851		Communications re Sand
ANA-MDL-000263291		Communications re Sand
ANA-MDL-000273404		Communications re Sand
ANA-MDL-000273607		Communications re Sand
ANA-MDL-000273853		Communications re Sand
ANA-MDL-000274636		Communications re Sand
ANA-MDL-000275310		Communications re Sand
ANA-MDL-000276009		Communications re Sand
ANA-MDL-000276038		Communications re Sand
APC-HEC1-000000590.101		Communications re Sand
APC-HEC1-000001600		Communications re Sand
APC-HEC1-000001600R		Communications re Sand
APC-HEC1-000003355		Communications re Sand
APC-HEC1-000003357		Communications re Sand
APC-HEC1-000004785		Communications re Sand
APC-HEC1-000004788		Communications re Sand
APC-HEC1-000004791		Communications re Sand
APC-HEC1-000004793		Communications re Sand
APC-HEC1-000004795		Communications re Sand
APC-HEC1-000004797		Communications re Sand
APC-SHS2A-000000001		Communications re Sand
APC-SHS2A-000000339		Communications re Sand
APC-SHS2A-000000614		Communications re Sand
APC-SHS2A-000001256		Communications re Sand
APC-SHS2A-000001274		Communications re Sand
APC-SHS2A-000001365		Communications re Sand
BEIRUTE 30(B)(6) 01600		Communications re Sand
BP-HZN-2179MBI00117676	4/1/2010	
BP-HZN-2179MBI00117837	4/2/2010	
BP-HZN-2179MBI00117985	4/3/2010	
BP-HZN-2179MBI00117987	4/3/2010	
BP-HZN-2179MBI00118006	4/3/2010	
BP-HZN-2179MBI00118092-118093	4/4/2010	
BP-HZN-2179MBI00118094	4/4/2010	
BP-HZN-2179MBI00118763	4/7/2010	

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-2179MBI00119175	4/8/2010	
BP-HZN-2179MBI00125815-125816	4/10/2010	
BP-HZN-2179MBI00125851-125853	4/10/2010	
BP-HZN-2179MBI00125857-125858	4/10/2010	
BP-HZN-2179MBI00125866	4/10/2010	
BP-HZN-2179MBI00126426	4/13/2010	
BP-HZN-2179MBI00126430	4/13/2010	
BP-HZN-2179MBI00126436	4/13/2010	
BP-HZN-2179MBI00882106	4/10/2010	
BP-HZN-2179MD00025070	4/6/2010	
BP-HZN-2179MDL00000968		Communications re Sand
BP-HZN-2179MDL000010232-10234	4/16/2010	
BP-HZN-2179MDL00001095		Communications re Sand
BP-HZN-2179MDL00001230		Communications re Sand
BP-HZN-2179MDL00001578		Communications re Sand
BP-HZN-2179MDL00001746		Communications re Sand
BP-HZN-2179MDL00001792		Communications re Sand
BP-HZN-2179MDL00001917		Communications re Sand
BP-HZN-2179MDL00001923		Communications re Sand
BP-HZN-2179MDL00001931		Communications re Sand
BP-HZN-2179MDL00001935		Communications re Sand
BP-HZN-2179MDL00001999		Communications re Sand
BP-HZN-2179MDL00002077		Communications re Sand
BP-HZN-2179MDL00002080	4/13/2010	
BP-HZN-2179MDL00002080		Communications re Sand
BP-HZN-2179MDL00002089	4/15/2010	
BP-HZN-2179MDL00002090		Communications re Sand
BP-HZN-2179MDL00002146		Communications re Sand
BP-HZN-2179MDL00002160		Communications re Pay Zone
BP-HZN-2179MDL00002584		Communications re Sand
BP-HZN-2179MDL00002589		Communications re Pay Zone
BP-HZN-2179MDL00002661		Communications re Sand
BP-HZN-2179MDL00002674		Communications re Sand
BP-HZN-2179MDL00002697		Communications re Pay Zone
BP-HZN-2179MDL00002699		Communications re Sand
BP-HZN-2179MDL00002703		Communications re Sand
BP-HZN-2179MDL00002767		

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00002855		Communications re Sand
BP-HZN-2179MDL00002897		Communications re Sand
BP-HZN-2179MDL00002902		Communications re Sand
BP-HZN-2179MDL00002916		Communications re Sand
BP-HZN-2179MDL00002968		Communications re Sand
BP-HZN-2179MDL00002980		Communications re Sand
BP-HZN-2179MDL00003040		Communications re Pay Zone
BP-HZN-2179MDL00003056		Communications re Sand
BP-HZN-2179MDL00003061		Communications re Sand
BP-HZN-2179MDL00003164		Communications re Pay Zone
BP-HZN-2179MDL00003204		Communications re Sand
BP-HZN-2179MDL00003212		Communications re Sand
BP-HZN-2179MDL00003257		Communications re Sand
BP-HZN-2179MDL00003271		Communications re Sand
BP-HZN-2179MDL00003286		Communications re Pay Zone
BP-HZN-2179MDL00003300		Communications re Sand
BP-HZN-2179MDL00003445		Communications re Sand
BP-HZN-2179MDL00003541		Communications re Sand
BP-HZN-2179MDL00003552		Communications re Sand
BP-HZN-2179MDL00003567		Communications re Sand
BP-HZN-2179MDL00003598		Communications re Sand
BP-HZN-2179MDL00003688		Communications re Sand
BP-HZN-2179MDL00003727-3728	4/8/2010	
BP-HZN-2179MDL00003744		Communications re Pay Zone
BP-HZN-2179MDL00003761		Communications re Sand
BP-HZN-2179MDL00003765		Communications re Sand
BP-HZN-2179MDL00003800		Communications re Sand
BP-HZN-2179MDL00003806		Communications re Sand
BP-HZN-2179MDL00003822		Communications re Sand
BP-HZN-2179MDL00003840		Communications re Sand
BP-HZN-2179MDL00003907		Communications re Sand
BP-HZN-2179MDL00003935		Communications re Sand
BP-HZN-2179MDL00004012		Communications re Sand
BP-HZN-2179MDL00004053		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00004291		Communications re Sand
BP-HZN-2179MDL00004299		Communications re Sand
BP-HZN-2179MDL00004320		Communications re Sand
BP-HZN-2179MDL00004321		Communications re Sand
BP-HZN-2179MDL00004397		Communications re Sand
BP-HZN-2179MDL00004424		Communications re Sand
BP-HZN-2179MDL00004450		Communications re Pay Zone
BP-HZN-2179MDL00004453		Communications re Sand
BP-HZN-2179MDL00004535	4/11/2010	
BP-HZN-2179MDL00004537		Communications re Sand
BP-HZN-2179MDL00004678		Communications re Sand
BP-HZN-2179MDL00004695		Communications re Sand
BP-HZN-2179MDL00004706		Communications re Sand
BP-HZN-2179MDL00004855		Communications re Sand
BP-HZN-2179MDL00004868		Communications re Sand
BP-HZN-2179-MDL00004878-4879	4/10/2010	Email from Skripnikova to Bondurant re distribution lists for daily ops updates
BP-HZN-2179MDL00004902		Communications re Sand
BP-HZN-2179MDL00004909		Communications re Sand
BP-HZN-2179MDL00004917-4918	4/6/2010	
BP-HZN-2179MDL00004972		Communications re Sand
BP-HZN-2179MDL00004981		Communications re Pay Zone
BP-HZN-2179MDL00005015		Communications re Sand
BP-HZN-2179MDL00005120		Communications re Sand
BP-HZN-2179MDL00005124		Communications re Sand
BP-HZN-2179MDL00005162-5164	4/13/2010	
BP-HZN-2179MDL00005182		Communications re Sand
BP-HZN-2179MDL00005212		Communications re Sand
BP-HZN-2179MDL00005249		Communications re Sand
BP-HZN-2179MDL00005257		Communications re Sand
BP-HZN-2179MDL00005266-5270		Macondo-M56 Reservoir (Real Time Data)
BP-HZN-2179MDL00005288		Communications re Sand
BP-HZN-2179MDL00005292		
BP-HZN-2179MDL00005293		Communications re Sand
BP-HZN-2179MDL00005388		Communications re Sand
BP-HZN-2179MDL00005433		Communications re Sand
BP-HZN-2179MDL00005461		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00005595		Communications re Sand
BP-HZN-2179MDL00005599		Communications re Sand
BP-HZN-2179MDL00005606		Communications re Sand
BP-HZN-2179MDL00005680		Communications re Sand
BP-HZN-2179MDL00005748		Communications re Sand
BP-HZN-2179MDL00005752		Communications re Sand
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BP-HZN-2179MDL00005862		Communications re Sand
BP-HZN-2179MDL00005889		Communications re Sand
BP-HZN-2179MDL00005899		Communications re Sand
BP-HZN-2179MDL00006037		Communications re Sand
BP-HZN-2179MDL00006046		Communications re Pay Zone
BP-HZN-2179MDL00006104		Communications re Sand
BP-HZN-2179MDL00006107		Communications re Sand
BP-HZN-2179MDL00006122		Communications re Sand
BP-HZN-2179MDL00006158		Communications re Sand
BP-HZN-2179MDL00006190-6192	4/13/2010	
BP-HZN-2179MDL00006194		Communications re Sand
BP-HZN-2179MDL00006220		Communications re Sand
BP-HZN-2179MDL00006245		Communications re Sand
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BP-HZN-2179MDL00006459		Communications re Sand
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BP-HZN-2179MDL00006965		Communications re Sand
BP-HZN-2179MDL00007014		Communications re Sand
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BP-HZN-2179MDL00007097		Communications re Sand
BP-HZN-2179MDL00007112		Communications re Sand
BP-HZN-2179MDL00007115-7117	4/13/2010	
BP-HZN-2179MDL00007139		Communications re Sand
BP-HZN-2179MDL00007207		Communications re Sand
BP-HZN-2179MDL00007282	4/6/2010	Communications re Sand
BP-HZN-2179MDL00007302		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00007520	4/8/2010	Communications re Sand
BP-HZN-2179MDL00007533		Communications re Sand
BP-HZN-2179MDL00007564		Communications re Sand
BP-HZN-2179MDL00007605		Communications re Sand
BP-HZN-2179MDL00007611		Communications re Sand
BP-HZN-2179MDL00007620		Communications re Sand
BP-HZN-2179MDL00008466		Communications re Sand
BP-HZN-2179MDL00008604		Communications re Sand
BP-HZN-2179MDL00008724		Communications re Sand
BP-HZN-2179MDL00008726-8728	4/13/2010	Communications re Sand
BP-HZN-2179MDL00008745		Communications re Sand
BP-HZN-2179MDL00008770		Communications re Sand
BP-HZN-2179MDL00008782		Communications re Sand
BP-HZN-2179MDL00008801		Communications re Sand
BP-HZN-2179MDL00008830		Communications re Sand
BP-HZN-2179MDL00008848		Communications re Sand
BP-HZN-2179MDL00008967	4/18/2010	
BP-HZN-2179MDL00009007		Communications re Sand
BP-HZN-2179MDL00009014		Communications re Sand
BP-HZN-2179MDL00009020		Communications re Sand
BP-HZN-2179MDL00009026		Communications re Sand
BP-HZN-2179MDL00009032		Communications re Sand
BP-HZN-2179MDL00009037		Communications re Sand
BP-HZN-2179MDL00009044		Communications re Sand
BP-HZN-2179MDL00009051		Communications re Sand
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BP-HZN-2179MDL00009071		Communications re Sand
BP-HZN-2179MDL00009326		Communications re Sand
BP-HZN-2179MDL00009396		Communications re Sand
BP-HZN-2179MDL00009431-9433	4/13/2010	Communications re Sand
BP-HZN-2179MDL00009448		Communications re Sand
BP-HZN-2179MDL00009456		Communications re Sand
BP-HZN-2179MDL00009478		Communications re Sand
BP-HZN-2179MDL00009534	4/13/2010	Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00009604		Communications re Pay Zone
BP-HZN-2179MDL00009630		Communications re Sand
BP-HZN-2179MDL00009681		Communications re Pay Zone
BP-HZN-2179MDL00009714		Communications re Sand
BP-HZN-2179MDL00009715		Communications re Sand
BP-HZN-2179MDL00009717		Communications re Sand
BP-HZN-2179MDL00009722		Communications re Sand
BP-HZN-2179MDL00009784		Communications re Sand
BP-HZN-2179MDL00010331		Communications re Pay Zone
BP-HZN-2179MDL00010426		Communications re Sand
BP-HZN-2179MDL00010502		Communications re Sand
BP-HZN-2179MDL00010664		Communications re Sand
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BP-HZN-2179MDL00011219		Communications re Sand
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BP-HZN-2179MDL00014475		Communications re Sand
BP-HZN-2179MDL00014477		Communications re Sand
BP-HZN-2179MDL00014508		Communications re Sand
BP-HZN-2179MDL00014696		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00015221		Communications re Sand
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BP-HZN-2179MDL00015266		Communications re Sand
BP-HZN-2179MDL00015316		Communications re Sand
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BP-HZN-2179MDL00015501	4/6/2010	
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BP-HZN-2179MDL00015918		Communications re Sand
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BP-HZN-2179MDL00015944		Communications re Sand
BP-HZN-2179MDL00015979		Communications re Sand
BP-HZN-2179MDL00016033		Communications re Sand
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BP-HZN-2179MDL00016234		Communications re Sand
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BP-HZN-2179MDL00016413		Communications re Sand
BP-HZN-2179MDL00016512		Communications re Sand
BP-HZN-2179MDL00016515		Communications re Sand
BP-HZN-2179MDL00016520		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00021027		Communications re Sand
BP-HZN-2179MDL00021045		Communications re Pay Zone
BP-HZN-2179MDL00021045		Communications re Sand
BP-HZN-2179MDL00021053		Communications re Sand
BP-HZN-2179MDL00021059		Communications re Sand
BP-HZN-2179MDL00021224		Communications re Sand
BP-HZN-2179MDL00021320		Communications re Sand
BP-HZN-2179MDL00021370		Communications re Sand
BP-HZN-2179MDL00021431		Communications re Sand
BP-HZN-2179MDL00021432	4/6/2010	Communications re Sand
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BP-HZN-2179MDL00021526		Communications re Sand
BP-HZN-2179MDL00021600		Communications re Sand
BP-HZN-2179MDL00021766		
BP-HZN-2179MDL00021767		Communications re Sand
BP-HZN-2179MDL00021768		Communications re Pay Zone
BP-HZN-2179MDL00021768		Communications re Sand
BP-HZN-2179MDL00021776		Communications re Sand
BP-HZN-2179MDL00021928		Communications re Sand
BP-HZN-2179MDL00021957		Communications re Sand
BP-HZN-2179MDL00021977	4/18/2010	Communications re Sand
BP-HZN-2179MDL00021998		Communications re Sand
BP-HZN-2179MDL00022002		Communications re Sand
BP-HZN-2179MDL00022052		Communications re Sand
BP-HZN-2179MDL00022141		Communications re Sand
BP-HZN-2179MDL00022172		Communications re Sand
BP-HZN-2179MDL00022182		Communications re Sand
BP-HZN-2179MDL00022191		Communications re Sand
BP-HZN-2179MDL00022209		Communications re Sand
BP-HZN-2179MDL00022213	4/8/2010	
BP-HZN-2179MDL00022258		Communications re Sand
BP-HZN-2179MDL00022268		Communications re Sand
BP-HZN-2179MDL00022302		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00022464		Communications re Sand
BP-HZN-2179MDL00022503		Communications re Sand
BP-HZN-2179MDL00022516		Communications re Sand
BP-HZN-2179MDL00022614		Communications re Sand
BP-HZN-2179MDL00022623-22624		Communications re Sand
BP-HZN-2179MDL00022624_Native		Lithology Graph
BP-HZN-2179MDL00022625		Communications re Sand
BP-HZN-2179MDL00022639		Communications re Sand
BP-HZN-2179MDL00022669		Communications re Pay Zone
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BP-HZN-2179MDL00024681		Communications re Sand
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BP-HZN-2179MDL00025537		Communications re Sand
BP-HZN-2179MDL00025769		Communications re Sand
BP-HZN-2179MDL00025855		Communications re Sand
BP-HZN-2179MDL00025895-25896	4/10/2010	Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00025983		Communications re Sand
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BP-HZN-2179MDL00026155		Communications re Sand
BP-HZN-2179MDL00026194		Communications re Pay Zone
BP-HZN-2179MDL00026209		Communications re Sand
BP-HZN-2179MDL00026230		Communications re Pay Zone
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BP-HZN-2179MDL00026249		Communications re Sand
BP-HZN-2179MDL00026303		Communications re Sand
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BP-HZN-2179MDL00029107		Communications re Sand
BP-HZN-2179MDL00029153		Communications re Sand
BP-HZN-2179MDL00029261		Communications re Sand
BP-HZN-2179MDL00029286		Communications re Sand
BP-HZN-2179MDL00029300		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00029367		Communications re Sand
BP-HZN-2179MDL00030466	4/15/2010	
BP-HZN-2179MDL00031407		Communications re Pay Zone
BP-HZN-2179MDL00031418		Communications re Sand
BP-HZN-2179MDL00031518		Communications re Sand
BP-HZN-2179MDL00031639		Communications re Sand
BP-HZN-2179MDL00031670		Communications re Sand
BP-HZN-2179MDL00031696		Communications re Sand
BP-HZN-2179MDL00031697		Communications re Pay Zone
BP-HZN-2179MDL00031697		Communications re Sand
BP-HZN-2179MDL00031728		Communications re Sand
BP-HZN-2179MDL00031820		Communications re Sand
BP-HZN-2179MDL00031833		Communications re Sand
BP-HZN-2179MDL00031859		Communications re Sand
BP-HZN-2179MDL00031887		Communications re Sand
BP-HZN-2179MDL00031926		Communications re Sand
BP-HZN-2179MDL00031950		Communications re Pay Zone
BP-HZN-2179MDL00032018		Communications re Sand
BP-HZN-2179MDL00032069		Communications re Sand
BP-HZN-2179MDL00032079		Communications re Sand
BP-HZN-2179MDL00032184		Communications re Sand
BP-HZN-2179MDL00032191		Communications re Sand
BP-HZN-2179MDL00032337		Communications re Sand
BP-HZN-2179MDL00032349		Communications re Sand
BP-HZN-2179MDL00032399	4/2/2010	
BP-HZN-2179MDL00032400		Communications re Sand
BP-HZN-2179MDL00032452		Communications re Sand
BP-HZN-2179MDL00032541		Communications re Sand
BP-HZN-2179MDL00032594		Communications re Sand
BP-HZN-2179MDL00032607		Communications re Sand
BP-HZN-2179MDL00032640		Communications re Sand
BP-HZN-2179MDL00032791		Communications re Sand
BP-HZN-2179MDL00032837		Communications re Sand
BP-HZN-2179MDL00032842		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00032992		Communications re Sand
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BP-HZN-2179MDL00033054		Communications re Sand
BP-HZN-2179MDL00033065		Communications re Sand
BP-HZN-2179MDL00033077		Communications re Pay Zone
BP-HZN-2179MDL00033096		Communications re Sand
BP-HZN-2179MDL00033115		Communications re Sand
BP-HZN-2179MDL00033280		Communications re Sand
BP-HZN-2179MDL00033284		Communications re Sand
BP-HZN-2179MDL00033303		Communications re Sand
BP-HZN-2179MDL00033349	4/13/2010	
BP-HZN-2179MDL00033356		Communications re Sand
BP-HZN-2179MDL00033386		Communications re Sand
BP-HZN-2179MDL00033412		Communications re Sand
BP-HZN-2179MDL00033432-33433	4/8/2010	
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BP-HZN-2179MDL00034252		Communications re Sand
BP-HZN-2179MDL00034259	4/6/2010	
BP-HZN-2179MDL00034259		Communications re Sand
BP-HZN-2179MDL00034300		Communications re Pay Zone
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00039104		Communications re Sand
BP-HZN-2179MDL00039109		Communications re Pay Zone
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BP-HZN-2179MDL00039192		Communications re Sand
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BP-HZN-2179MDL00039334		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00043397		Communications re Sand
BP-HZN-2179MDL00043419		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00044347		Communications re Sand
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BP-HZN-2179MDL00044371-44372	4/14/2010	
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BP-HZN-2179MDL00044399-44400	4/10/2010	Communications re Sand
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BP-HZN-2179MDL00044464		Communications re Sand
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BP-HZN-2179MDL00044731		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00044957		Communications re Sand
BP-HZN-2179MDL00044968		Communications re Sand
BP-HZN-2179MDL00045095		Communications re Pay Zone
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BP-HZN-2179MDL00045096		Communications re Sand
BP-HZN-2179MDL00045117-45119	4/13/2010	Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00211242		Communications re Sand
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BP-HZN-2179MDL00211322		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00247846		Communications re Sand
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BP-HZN-2179MDL00248415		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL00323460-323508	5/19/2010	CSI Technologies OptiCem Analysis
BP-HZN-2179MDL00323709-323711	6/8/2010	Sabins email to Febbraro re Feedback on CSI Report Draft
BP-HZN-2179MDL00323712		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL02177817		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL02316367		Communications re Sand
BP-HZN-2179MDL02335749		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-2179MDL03017351		Communications re Sand
BP-HZN-2179MDL03017781-3017786	10/22/2010	Wilmer Hale letter to National Academy of Engineering/National Research Council Committee for Analysis of Causes of the Deepwater Horizon Explosion, Fire, and Oil Spill
BP-HZN-2179MDL03017783-3017786	10/22/2010	Responses to September 2, 2010 and October 1, 2010 Information and Document Requests from the National Academy of Engineering/National Research Council Committee
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BP-HZN-2179MDL03157970		Communications re Sand
BP-HZN-2179MDL03164546		Communications re Sand
BP-HZN-2179MDL03166301		Communications re Sand
BP-HZN-2179MDL03167250		Communications re Sand
BP-HZN-2179MDL03167298		Communications re Sand
BP-HZN-2179MDL03167567		Communications re Sand
BP-HZN-2179MDL03167674		Communications re Sand
BP-HZN-2179MDL03167801		Communications re Sand
BP-HZN-2179MDL03171666		Communications re Sand
BP-HZN-2179MDL03171787		Communications re Sand
BP-HZN-2179MDL03172153		Communications re Sand
BP-HZN-2179MDL03172249		Communications re Sand
BP-HZN-2179MDL03172489		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-2179MDL03172591		Communications re Sand
BP-HZN-2179MDL03174545		Communications re Sand
BP-HZN-2179MDL03174648		Communications re Sand
BP-HZN-2179MDL03176551		Communications re Sand
BP-HZN-2179MDL03176677		Communications re Sand
BP-HZN-2179MDL03177874		Communications re Sand
BP-HZN-2179MDL03219805		Communications re Sand
BP-HZN-2179MDL03276907		Communications re Sand
BP-HZN-2179MDL03289682		Communications re Sand
BP-HZN-2179MDL03289695-3289732		Communications re Sand
BP-HZN-2179MDL03289733		Communications re Sand
BP-HZN-2179MDL03289789		Communications re Sand
BP-HZN-2179MDL03289819		Communications re Sand
BP-HZN-2179MDL03289853		Communications re Sand
BP-HZN-2179MDL03289922		Communications re Sand
BP-HZN-2179MDL03289987		Communications re Sand
BP-HZN-2179MDL03289999		Communications re Sand
BP-HZN-2179MDL03290025-3290027		
BP-HZN-2179MDL03290028-32900034		
BP-HZN-2179MDL03290035		Communications re Sand
BP-HZN-2179MDL03290054		Communications re Sand
BP-HZN-2179MDL03290182		Communications re Sand
BP-HZN-2179MDL03290247		Communications re Sand
BP-HZN-2179MDL03290315		Communications re Sand
BP-HZN-2179MDL03290357		Communications re Sand
BP-HZN-2179MDL03290365		Communications re Sand
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BP-HZN-2179MDL03290840		Communications re Sand
BP-HZN-2179MDL03290847		Communications re Sand
BP-HZN-2179MDL03290893		Communications re Sand
BP-HZN-2179MDL03291171		Communications re Sand
BP-HZN-2179MDL03291183		Communications re Sand
BP-HZN-2179MDL03291224		Communications re Sand
BP-HZN-2179MDL03291268		Communications re Sand
BP-HZN-2179MDL03291312		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-2179MDL03291366		Communications re Sand
BP-HZN-2179MDL03291438		Communications re Sand
BP-HZN-2179MDL03291440		Communications re Sand
BP-HZN-2179MDL03291472		Communications re Sand
BP-HZN-2179MDL03291513		Communications re Sand
BP-HZN-2179MDL03291913		Communications re Sand
BP-HZN-2179MDL03292676		Communications re Sand
BP-HZN-2179MDL03292814		Communications re Sand
BP-HZN-2179MDL03292868		Communications re Sand
BP-HZN-2179MDL03293015		Communications re Sand
BP-HZN-2179MDL03293319		Communications re Sand
BP-HZN-2179MDL03293370		Communications re Sand
BP-HZN-2179MDL03293609		Communications re Sand
BP-HZN-2179MDL03294328		Communications re Sand
BP-HZN-2179MDL03294342		Communications re Sand
BP-HZN-2179MDL03294354		Communications re Sand
BP-HZN-2179MDL03294465		Communications re Sand
BP-HZN-2179MDL03294809		Communications re Sand
BP-HZN-2179MDL03294844		Communications re Sand
BP-HZN-2179MDL03295335		Communications re Sand
BP-HZN-2179MDL03295727		Communications re Sand
BP-HZN-2179MDL03295836		Communications re Sand
BP-HZN-2179MDL03296105		Communications re Sand
BP-HZN-2179MDL03296436		Communications re Sand
BP-HZN-2179MDL03296725		Communications re Sand
BP-HZN-2179MDL03297013		Communications re Sand
BP-HZN-2179MDL03698003	4/3/2010	
BP-HZN-2179MDL03775520-3775521	4/15/2010	
BP-HZN-2179MDL03775522	4/14/2010	
BP-HZN-2179MDL03775533	4/14/2010	
BP-HZN-2179MDL03775539-3775540	4/10/2010	
BP-HZN-2179MDL03775552-3775554	4/10/2010	
BP-HZN-2179MDL03775559	4/12/2010	
BP-HZN-2179MDL03775572	4/15/2010	
BP-HZN-2179MDL03775610-3775611	4/13/2010	
BP-HZN-2179MDL03775624-3775625	4/15/2010	
BP-HZN-2179MDL03775645-3775648	4/13/2010	

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-2179MDL03775655-3775657	4/15/2010	
BP-HZN-2179MDL03775659	4/15/2010	
BP-HZN-2179MDL03775783-3775784	4/15/2010	
BP-HZN-2179MDL03775795-3775796	4/15/2010	
BP-HZN-2179MDL03775847	4/12/2010	
BP-HZN-2179MDL03775871	4/12/2010	
BP-HZN-2179MDL03775921-3775922	4/15/2010	
BP-HZN-2179MDL03775924	4/15/2010	
BP-HZN-2179MDL03775940	4/11/2010	
BP-HZN-2179MDL03775957	4/14/2010	
BP-HZN-2179MDL03775964	4/13/2010	
BP-HZN-2179MDL03775972-3775973	4/15/2010	
BP-HZN-2179MDL03775986-3775988	4/15/2010	
BP-HZN-2179MDL03775998	4/14/2010	
BP-HZN-2179MDL03776000-3776001	4/15/2010	
BP-HZN-2179MDL03776006-3776007	4/15/2010	
BP-HZN-2179MDL03776010	4/10/2010	
BP-HZN-2179MDL03776032	4/11/2010	
BP-HZN-2179MDL03776038	4/15/2010	
BP-HZN-2179MDL03776048-3776049	4/15/2010	
BP-HZN-2179MDL03776065-3776066	4/15/2010	
BP-HZN-2179MDL03776077	4/14/2010	
BP-HZN-2179MDL03776119	4/15/2010	
BP-HZN-2179MDL03776120-3776122	4/14/2010	
BP-HZN-2179MDL03776167-3776169	4/15/2010	
BP-HZN-2179MDL03776217-3776218	4/15/2010	
BP-HZN-2179MDL03776277	4/14/2010	
BP-HZN-2179MDL04361547	4/19/2010	
BP-HZN-2179MDL04363806	4/15/2010	
BP-HZN-2179MDL04363845	4/8/2010	
BP-HZN-2179MDL04364912	4/12/2010	
BP-HZN-2179MDL04366707-4366708	4/11/2010	
BP-HZN-2179MDL04367002	4/4/2010	
BP-HZN-2179MDL04367108	4/19/2010	
BP-HZN-2179MDL04367698-4367700	4/20/2010	
BP-HZN-2179MDL04367891	4/2/2010	
BP-HZN-2179MDL04367899	4/8/2010	

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-2179MDL04368508	4/4/2010	
BP-HZN-2179MDL04372509	4/13/2010	
BP-HZN-BLY00000001		Communications re Pay Zone
BP-HZN-BLY00000204		Communications re Sand
BP-HZN-BLY00000761		Communications re Sand
BP-HZN-BLY00039000		Communications re Sand
BP-HZN-BLY00039005		Communications re Sand
BP-HZN-BLY00039010		Communications re Sand
BP-HZN-BLY00039016		Communications re Sand
BP-HZN-BLY00039026		Communications re Sand
BP-HZN-BLY00039031		Communications re Sand
BP-HZN-BLY00039036		Communications re Sand
BP-HZN-BLY00039040		Communications re Sand
BP-HZN-BLY00039043		Communications re Sand
BP-HZN-BLY00039047		Communications re Sand
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BP-HZN-BLY00039053		Communications re Sand
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BP-HZN-BLY00039061		Communications re Sand
BP-HZN-BLY00039074		Communications re Sand
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BP-HZN-BLY00039083		Communications re Sand
BP-HZN-BLY00039087		Communications re Sand
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BP-HZN-BLY00039096		Communications re Sand
BP-HZN-BLY00039099		Communications re Sand
BP-HZN-BLY00039102		Communications re Sand
BP-HZN-BLY00039105		Communications re Sand
BP-HZN-BLY00039108		Communications re Sand
BP-HZN-BLY00039114		Communications re Sand
BP-HZN-BLY00039117		Communications re Sand
BP-HZN-BLY00039120		Communications re Sand
BP-HZN-BLY00039123		Communications re Sand
BP-HZN-BLY00039126		Communications re Sand
BP-HZN-BLY00039129		Communications re Sand
BP-HZN-BLY00039132		Communications re Sand
BP-HZN-BLY00039135		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00039138		Communications re Sand
BP-HZN-BLY00039141		Communications re Sand
BP-HZN-BLY00039144		Communications re Sand
BP-HZN-BLY00039147		Communications re Sand
BP-HZN-BLY00039150		Communications re Sand
BP-HZN-BLY00039153		Communications re Sand
BP-HZN-BLY00039160		Communications re Sand
BP-HZN-BLY00039167		Communications re Sand
BP-HZN-BLY00039175		Communications re Sand
BP-HZN-BLY00039180		Communications re Sand
BP-HZN-BLY00039185		Communications re Sand
BP-HZN-BLY00039188		Communications re Sand
BP-HZN-BLY00039191		Communications re Sand
BP-HZN-BLY00039194		Communications re Sand
BP-HZN-BLY00039197		Communications re Sand
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BP-HZN-BLY00039206		Communications re Sand
BP-HZN-BLY00039209		Communications re Sand
BP-HZN-BLY00039212		Communications re Sand
BP-HZN-BLY00039216		Communications re Sand
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BP-HZN-BLY00039223		Communications re Sand
BP-HZN-BLY00039226		Communications re Sand
BP-HZN-BLY00039229		Communications re Sand
BP-HZN-BLY00039232		Communications re Sand
BP-HZN-BLY00039236		Communications re Sand
BP-HZN-BLY00039239		Communications re Sand
BP-HZN-BLY00039242		Communications re Sand
BP-HZN-BLY00039246		Communications re Sand
BP-HZN-BLY00039249		Communications re Sand
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BP-HZN-BLY00039255		Communications re Sand
BP-HZN-BLY00039357		Communications re Sand
BP-HZN-BLY00039398		Communications re Sand
BP-HZN-BLY00039405		Communications re Sand
BP-HZN-BLY00039410		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00039441		Communications re Sand
BP-HZN-BLY00039448		Communications re Sand
BP-HZN-BLY00039456		Communications re Sand
BP-HZN-BLY00039462		Communications re Sand
BP-HZN-BLY00039467		Communications re Sand
BP-HZN-BLY00039501		Communications re Sand
BP-HZN-BLY00039506		Communications re Sand
BP-HZN-BLY00039511		Communications re Sand
BP-HZN-BLY00046017		Communications re Sand
BP-HZN-BLY00046020		Communications re Sand
BP-HZN-BLY00046245		Communications re Sand
BP-HZN-BLY00046252		Communications re Sand
BP-HZN-BLY00046257		Communications re Sand
BP-HZN-BLY00046262		Communications re Sand
BP-HZN-BLY00046267		Communications re Sand
BP-HZN-BLY00046272		Communications re Sand
BP-HZN-BLY00046276		Communications re Sand
BP-HZN-BLY00046280		Communications re Sand
BP-HZN-BLY00046289		Communications re Sand
BP-HZN-BLY00046294		Communications re Sand
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BP-HZN-BLY00046304		Communications re Sand
BP-HZN-BLY00046310		Communications re Sand
BP-HZN-BLY00046315		Communications re Sand
BP-HZN-BLY00046322		Communications re Sand
BP-HZN-BLY00046328		Communications re Sand
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BP-HZN-BLY00046339		Communications re Sand
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BP-HZN-BLY00046358		Communications re Sand
BP-HZN-BLY00046364		Communications re Sand
BP-HZN-BLY00046371		Communications re Sand
BP-HZN-BLY00046377		Communications re Sand
BP-HZN-BLY00046382		Communications re Sand
BP-HZN-BLY00046389		Communications re Sand
BP-HZN-BLY00046395		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00046400		Communications re Sand
BP-HZN-BLY00046406		Communications re Sand
BP-HZN-BLY00046412		Communications re Sand
BP-HZN-BLY00046418		Communications re Sand
BP-HZN-BLY00046424		Communications re Sand
BP-HZN-BLY00046431		Communications re Sand
BP-HZN-BLY00046438		Communications re Sand
BP-HZN-BLY00046445		Communications re Sand
BP-HZN-BLY00046452		Communications re Sand
BP-HZN-BLY00046459		Communications re Sand
BP-HZN-BLY00046465		Communications re Sand
BP-HZN-BLY00046472		Communications re Sand
BP-HZN-BLY00046479		Communications re Sand
BP-HZN-BLY00046484		Communications re Sand
BP-HZN-BLY00046490		Communications re Sand
BP-HZN-BLY00046496		Communications re Sand
BP-HZN-BLY00046502		Communications re Sand
BP-HZN-BLY00046509		Communications re Sand
BP-HZN-BLY00046515		Communications re Sand
BP-HZN-BLY00046520		Communications re Sand
BP-HZN-BLY00046526		Communications re Sand
BP-HZN-BLY00046714		Communications re Sand
BP-HZN-BLY00046839		Communications re Sand
BP-HZN-BLY00046845		Communications re Sand
BP-HZN-BLY00046851		Communications re Sand
BP-HZN-BLY00046857		Communications re Sand
BP-HZN-BLY00047129-47141	5/3/2010	Skripnikova email to Epps, et al. re Update on Fluids
BP-HZN-BLY00047152		Communications re Sand
BP-HZN-BLY00047195		Communications re Sand
BP-HZN-BLY00047262		Communications re Sand
BP-HZN-BLY00047380		Communications re Pay Zone
BP-HZN-BLY00047380		Communications re Sand
BP-HZN-BLY00047473		Communications re Sand
BP-HZN-BLY00047901		Communications re Sand
BP-HZN-BLY00048023		Communications re Pay Zone
BP-HZN-BLY00048023		Communications re Sand
BP-HZN-BLY00048087		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00061325		Communications re Pay Zone
BP-HZN-BLY00061446		Communications re Pay Zone
BP-HZN-BLY00061456		Communications re Pay Zone
BP-HZN-BLY00061692		Communications re Sand
BP-HZN-BLY00076265		Communications re Sand
BP-HZN-BLY00076371		Communications re Sand
BP-HZN-BLY00077911		Communications re Pay Zone
BP-HZN-BLY00078151		Communications re Sand
BP-HZN-BLY00078512		Communications re Pay Zone
BP-HZN-BLY00081440		Communications re Pay Zone
BP-HZN-BLY00082874-82914		Communications re Pay Zone
BP-HZN-BLY00083856		Communications re Pay Zone
BP-HZN-BLY00083892		Communications re Sand
BP-HZN-BLY00084664		Communications re Pay Zone
BP-HZN-BLY00086315		Communications re Sand
BP-HZN-BLY00087852		Communications re Sand
BP-HZN-BLY00088050		Communications re Sand
BP-HZN-BLY00088088		Communications re Sand
BP-HZN-BLY00089598		Communications re Sand
BP-HZN-BLY00089713		Communications re Sand
BP-HZN-BLY00091025		Communications re Sand
BP-HZN-BLY00091062		Communications re Pay Zone
BP-HZN-BLY00091394		Communications re Sand
BP-HZN-BLY00092422		Communications re Pay Zone
BP-HZN-BLY00092469		Communications re Pay Zone
BP-HZN-BLY00092532		Communications re Sand
BP-HZN-BLY00092892		Communications re Pay Zone
BP-HZN-BLY00093067		Communications re Sand
BP-HZN-BLY00093410		Communications re Pay Zone
BP-HZN-BLY00094096		Communications re Sand
BP-HZN-BLY00094231		Communications re Pay Zone
BP-HZN-BLY00094231		Communications re Sand
BP-HZN-BLY00094477		Communications re Sand
BP-HZN-BLY00094581		Communications re Pay Zone
BP-HZN-BLY00095674		Communications re Sand
BP-HZN-BLY00095916		Communications re Sand
BP-HZN-BLY00095918		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00095984		Communications re Sand
BP-HZN-BLY00096431		Communications re Sand
BP-HZN-BLY00096957		Communications re Pay Zone
BP-HZN-BLY00097557		Communications re Pay Zone
BP-HZN-BLY00097566		Communications re Pay Zone
BP-HZN-BLY00098399		Communications re Pay Zone
BP-HZN-BLY00098495		Communications re Pay Zone
BP-HZN-BLY00098524		Communications re Pay Zone
BP-HZN-BLY00099599		Communications re Sand
BP-HZN-BLY00102364		Communications re Pay Zone
BP-HZN-BLY00102364		Communications re Sand
BP-HZN-BLY00102817		Communications re Pay Zone
BP-HZN-BLY00102842		Communications re Pay Zone
BP-HZN-BLY00102884		Communications re Pay Zone
BP-HZN-BLY00102964		Communications re Pay Zone
BP-HZN-BLY00103032		Communications re Pay Zone
BP-HZN-BLY00103032		Communications re Sand
BP-HZN-BLY00103137		Communications re Sand
BP-HZN-BLY00103231		Communications re Sand
BP-HZN-BLY00103344		Communications re Pay Zone
BP-HZN-BLY00103361		Communications re Pay Zone
BP-HZN-BLY00103361		Communications re Sand
BP-HZN-BLY00103628		Communications re Sand
BP-HZN-BLY00104100		Communications re Pay Zone
BP-HZN-BLY00104108		Communications re Sand
BP-HZN-BLY00104122		Communications re Sand
BP-HZN-BLY00105054		Communications re Pay Zone
BP-HZN-BLY00105054		Communications re Sand
BP-HZN-BLY00105269		Communications re Pay Zone
BP-HZN-BLY00105488-105491	6/8/2010	Brown email to McKay, et al. re Feedback on CSI report draft
BP-HZN-BLY00105592		Communications re Sand
BP-HZN-BLY00105597		Communications re Pay Zone
BP-HZN-BLY00105680		Communications re Sand
BP-HZN-BLY00105706		Communications re Pay Zone
BP-HZN-BLY00105787		Communications re Sand
BP-HZN-BLY00106019		Communications re Sand
BP-HZN-BLY00106220		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00107735		Communications re Pay Zone
BP-HZN-BLY00107751-107756	6/26/2010	Emilsen email to Corser re ACTION - Dynamic Simulation Report
BP-HZN-BLY00107765		Communications re Sand
BP-HZN-BLY00107770		Communications re Sand
BP-HZN-BLY00107771		Communications re Sand
BP-HZN-BLY00107834		Communications re Sand
BP-HZN-BLY00107871		Communications re Pay Zone
BP-HZN-BLY00107871		Communications re Sand
BP-HZN-BLY00107880		Communications re Pay Zone
BP-HZN-BLY00107957		Communications re Pay Zone
BP-HZN-BLY00108003-108004		
BP-HZN-BLY00108112-108113	6/5/2010	Corser email to McAughan, et al. re Request: 14.1 sand potential
BP-HZN-BLY00108114		Communications re Sand
BP-HZN-BLY00109239		Communications re Sand
BP-HZN-BLY00109676		Communications re Pay Zone
BP-HZN-BLY00109706		Communications re Sand
BP-HZN-BLY00110069		Communications re Sand
BP-HZN-BLY00110151		Communications re Sand
BP-HZN-BLY00110197		Communications re Sand
BP-HZN-BLY00110906		Communications re Pay Zone
BP-HZN-BLY00110906		Communications re Sand
BP-HZN-BLY00110912		Communications re Sand
BP-HZN-BLY00110987		Communications re Sand
BP-HZN-BLY00111089		Communications re Sand
BP-HZN-BLY00111099-111101	7/12/2010	Pere email to Corser, et al. re OptiCem Reports
BP-HZN-BLY00111105		Communications re Sand
BP-HZN-BLY00111325		Communications re Pay Zone
BP-HZN-BLY00111497		Communications re Pay Zone
BP-HZN-BLY00111908		Communications re Sand
BP-HZN-BLY00111945		Communications re Pay Zone
BP-HZN-BLY00114770		Communications re Sand
BP-HZN-BLY00114805		Communications re Sand
BP-HZN-BLY00114829		Communications re Sand
BP-HZN-BLY00115236		Communications re Sand
BP-HZN-BLY00115275		Communications re Pay Zone
BP-HZN-BLY00115374		Communications re Sand
BP-HZN-BLY00115505		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00115508		Communications re Sand
BP-HZN-BLY00115511-115512	6/7/2010	Corser email to Horizon Legal Copy, et al. re Request: 14.1 sand potential
BP-HZN-BLY00115513		Sand Log
BP-HZN-BLY00116206		Communications re Sand
BP-HZN-BLY00116583		Communications re Sand
BP-HZN-BLY00116679		Communications re Pay Zone
BP-HZN-BLY00116679		Communications re Sand
BP-HZN-BLY00116795		Communications re Sand
BP-HZN-BLY00116854		Communications re Sand
BP-HZN-BLY00116916		Communications re Sand
BP-HZN-BLY00116918		Communications re Sand
BP-HZN-BLY00117139		Communications re Sand
BP-HZN-BLY00117242		Communications re Sand
BP-HZN-BLY00119944-945		Communications re Sand
BP-HZN-BLY00119946		Communications re Sand
BP-HZN-BLY00119950		Communications re Sand
BP-HZN-BLY00120158-159		Communications re Sand
BP-HZN-BLY00120160		Communications re Sand
BP-HZN-BLY00120269		Communications re Pay Zone
BP-HZN-BLY00120269		Communications re Sand
BP-HZN-BLY00120294		Communications re Pay Zone
BP-HZN-BLY00121004		Communications re Pay Zone
BP-HZN-BLY00121335		Communications re Sand
BP-HZN-BLY00121337		Communications re Sand
BP-HZN-BLY00121339		Communications re Sand
BP-HZN-BLY00121444		Communications re Sand
BP-HZN-BLY00121479		Communications re Sand
BP-HZN-BLY00121626		Communications re Sand
BP-HZN-BLY00121700		Communications re Sand
BP-HZN-BLY00121701		Communications re Sand
BP-HZN-BLY00122047		Communications re Pay Zone
BP-HZN-BLY00122731		Communications re Sand
BP-HZN-BLY00123611		Communications re Pay Zone
BP-HZN-BLY00123668		Communications re Pay Zone
BP-HZN-BLY00123670		Communications re Pay Zone
BP-HZN-BLY00123727		Communications re Sand
BP-HZN-BLY00123763		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00124206		Communications re Pay Zone
BP-HZN-BLY00124217		Communications re Pay Zone
BP-HZN-BLY00124442		Communications re Pay Zone
BP-HZN-BLY00124732-124733	6/7/2010	Brown email to Winters, et al. re Feedback on CSI report draft
BP-HZN-BLY00124742		Communications re Sand
BP-HZN-BLY00124746		Communications re Pay Zone
BP-HZN-BLY00124890		Communications re Sand
BP-HZN-BLY00125210-125211		Communications re Sand
BP-HZN-BLY00125212		Communications re Sand
BP-HZN-BLY00125219		Communications re Pay Zone
BP-HZN-BLY00125290		Communications re Sand
BP-HZN-BLY00125334		Communications re Pay Zone
BP-HZN-BLY00125399		Communications re Pay Zone
BP-HZN-BLY00125436		Communications re Pay Zone
BP-HZN-BLY00125447		Communications re Pay Zone
BP-HZN-BLY00125470		Communications re Pay Zone
BP-HZN-BLY00126280		Communications re Sand
BP-HZN-BLY00126427	4/13/2010	Bodek email to Bondurant re Top hydrocarbon bearing zone?
BP-HZN-BLY00126428	4/13/2010	Bodek email to Bondurant re Top hydrocarbon bearing zone?
BP-HZN-BLY00126590-126591	5/5/2010	Sabins email to Winters, et al. re BP Macondo OptiCem Run based on April 15th Design Report
BP-HZN-BLY00129181		Communications re Pay Zone
BP-HZN-BLY00129256		Communications re Sand
BP-HZN-BLY00129261		Communications re Sand
BP-HZN-BLY00129270		Communications re Sand
BP-HZN-BLY00129276		Communications re Sand
BP-HZN-BLY00129282		Communications re Sand
BP-HZN-BLY00129286		Communications re Sand
BP-HZN-BLY00129290		Communications re Sand
BP-HZN-BLY00129295		Communications re Sand
BP-HZN-BLY00129300		Communications re Sand
BP-HZN-BLY00129305		Communications re Sand
BP-HZN-BLY00129315		Communications re Sand
BP-HZN-BLY00129321		Communications re Sand
BP-HZN-BLY00129326		Communications re Sand
BP-HZN-BLY00129549		Communications re Sand
BP-HZN-BLY00129652		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00130294		Communications re Pay Zone
BP-HZN-BLY00130450		Communications re Sand
BP-HZN-BLY00130455		Communications re Sand
BP-HZN-BLY00130464		Communications re Sand
BP-HZN-BLY00130476		Communications re Sand
BP-HZN-BLY00130480		Communications re Sand
BP-HZN-BLY00130484		Communications re Sand
BP-HZN-BLY00130489		Communications re Sand
BP-HZN-BLY00130494		Communications re Sand
BP-HZN-BLY00130499		Communications re Sand
BP-HZN-BLY00130504		Communications re Sand
BP-HZN-BLY00130509		Communications re Sand
BP-HZN-BLY00130515		Communications re Sand
BP-HZN-BLY00130525		Communications re Sand
BP-HZN-BLY00130652		Communications re Sand
BP-HZN-BLY00130781		Communications re Pay Zone
BP-HZN-BLY00130801		Communications re Sand
BP-HZN-BLY00130876		Communications re Sand
BP-HZN-BLY00130920		Communications re Sand
BP-HZN-BLY00131142		Communications re Sand
BP-HZN-BLY00132911		Communications re Sand
BP-HZN-BLY00133570-133571		Communications re Sand
BP-HZN-BLY00133572		Communications re Sand
BP-HZN-BLY00133713		Communications re Pay Zone
BP-HZN-BLY00133839		Communications re Pay Zone
BP-HZN-BLY00134565		Communications re Sand
BP-HZN-BLY00135129		Communications re Sand
BP-HZN-BLY00135446		Communications re Sand
BP-HZN-BLY00135446-135447		
BP-HZN-BLY00135448		Communications re Sand
BP-HZN-BLY00135491		Communications re Sand
BP-HZN-BLY00137108		Communications re Sand
BP-HZN-BLY00138633		Communications re Sand
BP-HZN-BLY00138675		Communications re Pay Zone
BP-HZN-BLY00139388		Communications re Sand
BP-HZN-BLY00139820		Communications re Sand
BP-HZN-BLY00140148		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00140270		Communications re Pay Zone
BP-HZN-BLY00140873		Communications re Sand
BP-HZN-BLY00141150		Communications re Pay Zone
BP-HZN-BLY00141175		Communications re Pay Zone
BP-HZN-BLY00141198		Communications re Sand
BP-HZN-BLY00141223		Communications re Pay Zone
BP-HZN-BLY00141258		Communications re Pay Zone
BP-HZN-BLY00141258		Communications re Sand
BP-HZN-BLY00141434		Communications re Sand
BP-HZN-BLY00141464		Communications re Pay Zone
BP-HZN-BLY00142084		Communications re Pay Zone
BP-HZN-BLY00142084		Communications re Sand
BP-HZN-BLY00142191		Communications re Sand
BP-HZN-BLY00142196		Communications re Pay Zone
BP-HZN-BLY00142301		Communications re Sand
BP-HZN-BLY00142333		Communications re Sand
BP-HZN-BLY00142413		Communications re Sand
BP-HZN-BLY00142418		Communications re Pay Zone
BP-HZN-BLY00142442		Communications re Pay Zone
BP-HZN-BLY00142442		Communications re Sand
BP-HZN-BLY00142469		Communications re Pay Zone
BP-HZN-BLY00142557		Communications re Pay Zone
BP-HZN-BLY00142567		Communications re Pay Zone
BP-HZN-BLY00143495		Communications re Pay Zone
BP-HZN-BLY00143555		Communications re Sand
BP-HZN-BLY00143585		Communications re Sand
BP-HZN-BLY00143671		Communications re Pay Zone
BP-HZN-BLY00143778		Communications re Sand
BP-HZN-BLY00144208		Communications re Sand
BP-HZN-BLY00144940		Communications re Sand
BP-HZN-BLY00145181		Communications re Pay Zone
BP-HZN-BLY00145792		Communications re Sand
BP-HZN-BLY00145915		Communications re Sand
BP-HZN-BLY00145998		Communications re Sand
BP-HZN-BLY00146075		Communications re Sand
BP-HZN-BLY00146087		Communications re Sand
BP-HZN-BLY00146107		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00147064		Communications re Sand
BP-HZN-BLY00147291		Communications re Sand
BP-HZN-BLY00147301		Communications re Sand
BP-HZN-BLY00147312		Communications re Sand
BP-HZN-BLY00147357		Communications re Sand
BP-HZN-BLY00147615		Communications re Sand
BP-HZN-BLY00147625		Communications re Sand
BP-HZN-BLY00147640		Communications re Sand
BP-HZN-BLY00147651		Communications re Sand
BP-HZN-BLY00147661		Communications re Sand
BP-HZN-BLY00147671		Communications re Sand
BP-HZN-BLY00147733		Communications re Sand
BP-HZN-BLY00147765		Communications re Sand
BP-HZN-BLY00147788		Communications re Sand
BP-HZN-BLY00147811		Communications re Sand
BP-HZN-BLY00148343		Communications re Sand
BP-HZN-BLY00148526		Communications re Sand
BP-HZN-BLY00148898-148925	7/27/2010	Draft Report re Failure to Establish Well Integrity
BP-HZN-BLY00148926		Communications re Sand
BP-HZN-BLY00149340		Communications re Sand
BP-HZN-BLY00149348		Communications re Sand
BP-HZN-BLY00149406		Communications re Sand
BP-HZN-BLY00149494		Communications re Sand
BP-HZN-BLY00149530		Communications re Sand
BP-HZN-BLY00149637		Communications re Sand
BP-HZN-BLY00149673		Communications re Sand
BP-HZN-BLY00149714		Communications re Sand
BP-HZN-BLY00149732		Communications re Sand
BP-HZN-BLY00149756		Communications re Sand
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BP-HZN-BLY00150597		Communications re Sand
BP-HZN-BLY00150613		Communications re Sand
BP-HZN-BLY00151846		Communications re Sand
BP-HZN-BLY00152240		Communications re Sand
BP-HZN-BLY00152458		Communications re Sand
BP-HZN-BLY00152496		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00152524		Communications re Sand
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BP-HZN-BLY00152549		Communications re Sand
BP-HZN-BLY00152689		Communications re Sand
BP-HZN-BLY00152745		Communications re Sand
BP-HZN-BLY00152875		Communications re Sand
BP-HZN-BLY00153042		Communications re Sand
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BP-HZN-BLY00156116		Communications re Sand
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BP-HZN-BLY00159532		Communications re Sand
BP-HZN-BLY00159899		Communications re Sand
BP-HZN-BLY00160844		Communications re Sand
BP-HZN-BLY00161587		Communications re Sand
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BP-HZN-BLY00162388		Communications re Sand
BP-HZN-BLY00162552		Communications re Sand
BP-HZN-BLY00162856		Communications re Sand
BP-HZN-BLY00163384		Communications re Sand
BP-HZN-BLY00163435		Communications re Sand
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BP-HZN-BLY00163641		Communications re Sand
BP-HZN-BLY00163689		Communications re Sand
BP-HZN-BLY00163951		Communications re Sand
BP-HZN-BLY00164047		Communications re Sand
BP-HZN-BLY00164099		Communications re Sand
BP-HZN-BLY00164157		Communications re Sand
BP-HZN-BLY00164207		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00164225		Communications re Sand
BP-HZN-BLY00164280		Communications re Sand
BP-HZN-BLY00165614		Communications re Sand
BP-HZN-BLY00166122		Communications re Sand
BP-HZN-BLY00166199		Communications re Sand
BP-HZN-BLY00166492		Communications re Sand
BP-HZN-BLY00166601		Communications re Sand
BP-HZN-BLY00166616		Communications re Sand
BP-HZN-BLY00166704		Communications re Sand
BP-HZN-BLY00166709		Communications re Sand
BP-HZN-BLY00166903		Communications re Sand
BP-HZN-BLY00166968		Communications re Sand
BP-HZN-BLY00167160		Communications re Sand
BP-HZN-BLY00167177		Communications re Sand
BP-HZN-BLY00167547		Communications re Sand
BP-HZN-BLY00167589		Communications re Sand
BP-HZN-BLY00167657		Communications re Sand
BP-HZN-BLY00167748		Communications re Sand
BP-HZN-BLY00167757		Communications re Sand
BP-HZN-BLY00167815		Communications re Sand
BP-HZN-BLY00167996		Communications re Sand
BP-HZN-BLY00168031		Communications re Sand
BP-HZN-BLY00168283		Communications re Sand
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BP-HZN-BLY00168359		Communications re Sand
BP-HZN-BLY00168565		Communications re Sand
BP-HZN-BLY00168740		Communications re Sand
BP-HZN-BLY00168871		Communications re Sand
BP-HZN-BLY00168882		Communications re Sand
BP-HZN-BLY00168903		Communications re Sand
BP-HZN-BLY00169145		Communications re Sand
BP-HZN-BLY00169194		Communications re Sand
BP-HZN-BLY00169288		Communications re Sand
BP-HZN-BLY00169327		Communications re Sand
BP-HZN-BLY00169517		Communications re Sand
BP-HZN-BLY00170202		Communications re Sand
BP-HZN-BLY00171970		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-BLY00172537		Communications re Sand
BP-HZN-BLY00172582		Communications re Sand
BP-HZN-BLY00173428		Communications re Sand
BP-HZN-BLY00174622		Communications re Sand
BP-HZN-BLY00174629		Communications re Sand
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BP-HZN-BLY00174655		Communications re Sand
BP-HZN-BLY00174660		Communications re Sand
BP-HZN-BLY00174664		Communications re Sand
BP-HZN-BLY00174668		Communications re Sand
BP-HZN-BLY00174674		Communications re Sand
BP-HZN-BLY00174689		Communications re Sand
BP-HZN-BLY00175059		Communications re Sand
BP-HZN-BLY00175745		Communications re Sand
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BP-HZN-BLY00175878		Communications re Sand
BP-HZN-BLY00176762		Communications re Sand
BP-HZN-BLY00177130		Communications re Sand
BP-HZN-BLY00177150		Communications re Sand
BP-HZN-BLY00178192		Communications re Sand
BP-HZN-BLY00178307		Communications re Sand
BP-HZN-BLY00178352		Communications re Sand
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BP-HZN-BLY00178702		Communications re Sand
BP-HZN-BLY00178706		Communications re Sand
BP-HZN-BLY00178846		Communications re Sand
BP-HZN-BLY00178986		Communications re Pay Zone
BP-HZN-BLY00178986		Communications re Sand
BP-HZN-BLY00179035		Communications re Sand
BP-HZN-BLY00179455		Communications re Sand
BP-HZN-BLY00179931		Communications re Pay Zone
BP-HZN-BLY00180215		Communications re Sand
BP-HZN-BLY00180351		Communications re Pay Zone
BP-HZN-BLY00180807		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00180811		Communications re Sand
BP-HZN-BLY00182412		Communications re Sand
BP-HZN-BLY00183110		Communications re Pay Zone
BP-HZN-BLY00183221		Communications re Sand
BP-HZN-BLY00184260		Communications re Sand
BP-HZN-BLY00184359		Communications re Sand
BP-HZN-BLY00184851		Communications re Sand
BP-HZN-BLY00185582		Communications re Sand
BP-HZN-BLY00187895		Communications re Sand
BP-HZN-BLY00189053		Communications re Sand
BP-HZN-BLY00189101		Communications re Pay Zone
BP-HZN-BLY00189110		Communications re Sand
BP-HZN-BLY00189153		Communications re Sand
BP-HZN-BLY00189888		Communications re Sand
BP-HZN-BLY00189890		Communications re Sand
BP-HZN-BLY00190480		Communications re Sand
BP-HZN-BLY00191186		Communications re Sand
BP-HZN-BLY00191192		Communications re Pay Zone
BP-HZN-BLY00192121		Communications re Sand
BP-HZN-BLY00192197		Communications re Sand
BP-HZN-BLY00193047		Communications re Sand
BP-HZN-BLY00193425		Communications re Sand
BP-HZN-BLY00193467		Communications re Sand
BP-HZN-BLY00194027		Communications re Sand
BP-HZN-BLY00194038		Communications re Sand
BP-HZN-BLY00194165		Communications re Sand
BP-HZN-BLY00194277		Communications re Sand
BP-HZN-BLY00195848		Communications re Sand
BP-HZN-BLY00195854		Communications re Pay Zone
BP-HZN-BLY00195960		Communications re Pay Zone
BP-HZN-BLY00195974		Communications re Sand
BP-HZN-BLY00196063		Communications re Sand
BP-HZN-BLY00196074		Communications re Sand
BP-HZN-BLY00196096		Communications re Sand
BP-HZN-BLY00196119		Communications re Sand
BP-HZN-BLY00196811		Communications re Sand
BP-HZN-BLY00196870		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
BP-HZN-BLY00197051		Communications re Sand
BP-HZN-BLY00197147		Communications re Sand
BP-HZN-BLY00197188		Communications re Sand
BP-HZN-BLY00197789		Communications re Sand
BP-HZN-BLY00197937		Communications re Sand
BP-HZN-BLY00198213-198216	6/16/2010	Winters email to Brown, et al. re Request for additional OptiCem cases
BP-HZN-BLY00198219		Communications re Sand
BP-HZN-BLY00198828		Communications re Sand
BP-HZN-BLY00200094		Communications re Sand
BP-HZN-BLY00200181		Communications re Sand
BP-HZN-BLY00200703		Communications re Sand
BP-HZN-BLY00202239		Communications re Sand
BP-HZN-BLY00202907		Communications re Sand
BP-HZN-BLY00203301		Communications re Sand
BP-HZN-BLY00204231		Communications re Sand
BP-HZN-BLY00204447		Communications re Sand
BP-HZN-BLY00204656		Communications re Sand
BP-HZN-BLY00204672		Communications re Sand
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BP-HZN-BLY00205493		Communications re Sand
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BP-HZN-BLY00210000		Communications re Sand
BP-HZN-BLY00212029		Communications re Sand
BP-HZN-BLY00212337		Communications re Sand
BP-HZN-BLY00234917		Communications re Sand
BP-HZN-BLY00234922		Communications re Sand
BP-HZN-BLY00234928		Communications re Sand
BP-HZN-BLY00234935		Communications re Sand
BP-HZN-BLY00235168		Communications re Sand
BP-HZN-BLY00235173		Communications re Sand
BP-HZN-BLY00235179		Communications re Sand
BP-HZN-BLY00235186		Communications re Sand
BP-HZN-BLY00235194		Communications re Sand
BP-HZN-BLY00235200		Communications re Sand
BP-HZN-BLY00235205		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-BLY00235234		Communications re Sand
BP-HZN-BLY00235239		Communications re Sand
BP-HZN-BLY00235244		Communications re Sand
BP-HZN-BLY00235249		Communications re Sand
BP-HZN-BLY00235255		Communications re Sand
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BP-HZN-BLY00237226		Communications re Sand
BP-HZN-BLY00237231		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BP-HZN-BLY00237551		Communications re Sand
BP-HZN-BLY00237556		Communications re Sand
BP-HZN-BLY00237560		Communications re Sand
BP-HZN-BLY00237972		Communications re Sand
BP-HZN-BLY00237975		Communications re Sand
BP-HZN-BLY00241268		Communications re Sand
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BP-HZN-MBI00118072-118074	4/4/2010	BP Daily PPFG Report
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BP-HZN-MBI00180367		Communications re Sand
BP-HZN-MBI00180472		Communications re Sand
BP-HZN-MBI00180586	6/14/2010	Pineda email to Gal re Info on the Macondo well
BP-HZN-MBI00180587		Support for MC252 #1 well 9 7/8" collapse design dispensation
BP-HZN-MBI00180594-180601	1/21/2009	Macondo prospect D&C overview for Mar09 Spud Option
BP-HZN-MBI00180605		Communications re Sand
BP-HZN-MBI00181038		Communications re Sand
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CSI(30B6)00073		Communications re Sand

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CSI(30b6)01987-1989	6/7/2010	McKay email to Brown, et al. re Feedback on CSI report draft
CSI(30B6)03628		Communications re Sand
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DWHMX00321342		Communications re Sand
DWHMX00321386		Communications re Sand
DWHMX00321407		Communications re Sand
DWHMX00321750		Communications re Sand
DWHMX00321759		Communications re Sand
DWHMX00321776		Communications re Sand
DWHMX00321791		Communications re Sand
DWHMX00321813		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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DWHMX00322042		Communications re Sand
DWHMX00322094		Communications re Sand
DWHMX00325760		Communications re Sand
DWHMX00337176		Communications re Sand
DWHMX00337239		Communications re Sand
DWHMX00337257		Communications re Sand
DWHMX00337283		Communications re Sand
DWHMX00337301		Communications re Sand
DWHMX00337537		Communications re Sand
DWHMX00337655		Communications re Sand
DWHMX00337695		Communications re Sand
DWHMX00337708		Communications re Sand
DWHMX00337773		Communications re Sand
DWHMX00337786		Communications re Sand
DWHMX00337846		Communications re Sand
DWHMX00337879		Communications re Sand
DWHMX00337924		Communications re Sand
DWHMX00337937		Communications re Sand
DWHMX00338068		Communications re Sand
DWHMX00338076		Communications re Sand
DWHMX00338109		Communications re Sand
DWHMX00338117		Communications re Sand
DWHMX00338150		Communications re Sand
DWHMX00338158		Communications re Sand
DWHMX00338191		Communications re Sand
DWHMX00338199		Communications re Sand
DWHMX00338615		Communications re Sand
DWHMX00338661		Communications re Sand
DWHMX00338716		Communications re Sand
DWHMX00338755		Communications re Sand
DWHMX00341357		Communications re Sand
DWHMX00341467		Communications re Sand
DWHMX00341499		Communications re Sand
DWHMX00341558		Communications re Sand
DWHMX00343450		Communications re Sand
DWHMX00343670		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
DWHMX00343944		Communications re Sand
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DWHMX00344367		Communications re Sand
DWHMX00344615		Communications re Sand
DWHMX00344792		Communications re Sand
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DWHMX00347587		Communications re Sand
DWHMX00349950		Communications re Sand
DWHMX00377629		Communications re Sand
DWHMX00377653		Communications re Sand
DWHMX00378125		Communications re Sand
DWHMX00378314		Communications re Sand
DWHMX00378463		Communications re Sand
DWHMX00378558		Communications re Sand
DWHMX00388278		Communications re Sand
DWHMX00398096		Communications re Sand
DWHMX00407831		Communications re Sand
DWHMX00417557		Communications re Sand
DWHMX00427363		Communications re Sand
DWHMX00427389		Communications re Sand
DWHMX00427498		Communications re Sand
DWHMX00427736		Communications re Sand
DWHMX00427738		Communications re Sand
DWHMX00427799		Communications re Sand
DWHMX00427801		Communications re Sand
DWHMX00434535		Communications re Sand
DWHMX00434785		Communications re Sand
DWHMX00436251		Communications re Sand
DWHMX00436284		Communications re Sand
DWHMX00436693		Communications re Sand
DWRM0000866		Communications re Sand
HAL_0000001		HAL_0000001: LAS/EOWR/Graphics, Mudlogging Data;
HAL_0000002		HAL_0000002: Well Data, Mudlogging Data;
HAL_0000003		LAS/ASCII/Graphics Data (MWD/LWD Data)
HAL_0000004		LAS/Color Graphics Data (MWD/LWD Data)
HAL_0000005		HAL_0000005: MMS/Survey ASCII Data, MWD/LWD Data;
HAL_0000006		HAL_0000006: Well Data, Mudlogging Data;

BATES RANGE	DATE	SUMMARY / DESCRIPTION
HAL_0000007		HAL_0000007: LAS/ASCII/Graphics Data, MWD/LWD Data;
HAL_0000008		HAL_0000008: LAS/EOWR/Graphics, Mudlogging Data;
HAL_0000009		LAS/Color Graphics Data (MWD/LWD Data)
HAL_0000010		HAL_0000010: MMS/Survey ASCII Data, MWD/LWD Data
HAL_0000011		HAL_0000011: Geotap Report Data, MWD/LWD Data
HAL_0001012		Communications re Sand
HAL_0004071		Communications re Sand
HAL_0004080		Communications re Sand
HAL_0005403		Communications re Sand
HAL_0005409		Communications re Sand
HAL_0005416		Communications re Sand
HAL_0005422		Communications re Sand
HAL_0005428		Communications re Sand
HAL_0007143		Communications re Sand
HAL_0007147		Communications re Sand
HAL_0007151		Communications re Sand
HAL_0007155		Communications re Sand
HAL_0007161		Communications re Sand
HAL_0007166		Communications re Sand
HAL_0007172		Communications re Sand
HAL_0007179		Communications re Sand
HAL_0007185		Communications re Sand
HAL_0007191		Communications re Sand
HAL_0007197		Communications re Sand
HAL_0007202		Communications re Sand
HAL_0007209		Communications re Sand
HAL_0007214		Communications re Sand
HAL_0007221		Communications re Sand
HAL_0007228		Communications re Sand
HAL_0007235		Communications re Sand
HAL_0007242		Communications re Sand
HAL_0007249		Communications re Sand
HAL_0007255		Communications re Sand
HAL_0007262		Communications re Sand
HAL_0007270		Communications re Sand
HAL_0007277		Communications re Sand
HAL_0007284		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0007309		Communications re Sand
HAL_0007314		Communications re Sand
HAL_0007323		Communications re Sand
HAL_0007329		Communications re Sand
HAL_0007334		Communications re Sand
HAL_0007340		Communications re Sand
HAL_0007347		Communications re Sand
HAL_0007352		Communications re Sand
HAL_0007357		Communications re Sand
HAL_0007363		Communications re Sand
HAL_0007366		Communications re Sand
HAL_0007372		Communications re Sand
HAL_0007379		Communications re Sand
HAL_0007599		Communications re Sand
HAL_0007754		Communications re Sand
HAL_0007761		Communications re Sand
HAL_0007892		Communications re Sand
HAL_0007924		Communications re Sand
HAL_0008032		Communications re Sand
HAL_0008065		Communications re Sand
HAL_0008090		Communications re Sand
HAL_0008234		Communications re Sand
HAL_0008368		Communications re Sand
HAL_0009258		Communications re Sand
HAL_0009270		Communications re Sand
HAL_0009275		Communications re Sand
HAL_0009361		Communications re Sand
HAL_0009438		Communications re Sand
HAL_0009446		Communications re Sand
HAL_0009480		Communications re Sand
HAL_0009535		Communications re Sand
HAL_0009661		Communications re Sand
HAL_0009706		Communications re Sand
HAL_0009772		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0010186		Communications re Sand
HAL_0010194		Communications re Sand
HAL_0010199		Communications re Sand
HAL_0010203		Communications re Sand
HAL_0010209		Communications re Sand
HAL_0010214		Communications re Sand
HAL_0010220		Communications re Sand
HAL_0010301		Communications re Sand
HAL_0010331		Communications re Sand
HAL_0010554		Communications re Sand
HAL_0011163		Communications re Sand
HAL_0011169		Communications re Sand
HAL_0011174		Communications re Sand
HAL_0011179		Communications re Sand
HAL_0011319		Communications re Sand
HAL_0012408		Communications re Sand
HAL_0012412		Communications re Sand
HAL_0012416		Communications re Sand
HAL_0012420		Communications re Sand
HAL_0024887		Communications re Sand
HAL_0024930		Communications re Sand
HAL_0028198		Communications re Sand
HAL_0028203		Communications re Sand
HAL_0028209		Communications re Sand
HAL_0028214		Communications re Sand
HAL_0028685		Communications re Sand
HAL_0028692		Communications re Sand
HAL_0028697		Communications re Sand
HAL_0028703		Communications re Sand
HAL_0044962		Communications re Sand
HAL_0044967		Communications re Sand
HAL_0044972		Communications re Sand
HAL_0044981		Communications re Sand
HAL_0044987		Communications re Sand
HAL_0044993		Communications re Sand
HAL_0044997		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
HAL_0045001		Communications re Sand
HAL_0045006		Communications re Sand
HAL_0045011		Communications re Sand
HAL_0045016		Communications re Sand
HAL_0045021		Communications re Sand
HAL_0045026		Communications re Sand
HAL_0045033		Communications re Sand
HAL_0045041		Communications re Sand
HAL_0048881		Communications re Pay Zone
HAL_0048925		Communications re Sand
HAL_0048956		Communications re Sand
HAL_0079714		Communications re Sand
HAL_0080703		Communications re Sand
HAL_0080714		Communications re Sand
HAL_0080742		Communications re Sand
HAL_0080748		Communications re Sand
HAL_0080753		Communications re Sand
HAL_0083711		Communications re Sand
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HAL_0084790		Communications re Sand
HAL_0112955		Communications re Sand
HAL_0113576		Communications re Sand
HAL_0115655		Communications re Sand
HAL_0115887		Communications re Sand
HAL_0116469		Communications re Sand
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HAL_0116905		Communications re Sand
HAL_0118357		Communications re Sand
HAL_0118447		Communications re Sand
HAL_0118500		Communications re Sand
HAL_0118564		Communications re Sand
HAL_0118723		Communications re Sand
HAL_0118726		Communications re Sand
HAL_0118811		Communications re Sand
HAL_0118995		Communications re Sand
HAL_0120459		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0121382		Communications re Sand
HAL_0121486		Communications re Sand
HAL_0121527		Communications re Sand
HAL_0121823		Communications re Sand
HAL_0121946		Communications re Sand
HAL_0122110		Communications re Sand
HAL_0122329		Communications re Sand
HAL_0122559		Communications re Sand
HAL_0122618		Communications re Sand
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HAL_0122645		Communications re Sand
HAL_0122745		Communications re Sand
HAL_0122806		Communications re Sand
HAL_0122868		Communications re Sand
HAL_0122964		Communications re Sand
HAL_0122981		Communications re Sand
HAL_0123256		Communications re Sand
HAL_0123388		Communications re Sand
HAL_0123743		Communications re Sand
HAL_0123833		Communications re Sand
HAL_0123980		Communications re Sand
HAL_0124040		Communications re Sand
HAL_0124086		Communications re Sand
HAL_0124223		Communications re Sand
HAL_0124263		Communications re Sand
HAL_0124334		Communications re Sand
HAL_0124534		Communications re Sand
HAL_0124765		Communications re Sand
HAL_0124935		Communications re Sand
HAL_0125252		Communications re Sand
HAL_0125919		Communications re Sand
HAL_0127755		Communications re Sand
HAL_0128036		Communications re Sand
HAL_0129604		Communications re Sand
HAL_0129835		Communications re Sand
HAL_0131302		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0201178		Communications re Sand
HAL_0218041		Communications re Sand
HAL_0238999		Communications re Sand
HAL_0266311		Communications re Sand
HAL_0269223		Communications re Sand
HAL_0272838		Communications re Sand
HAL_0283861		Communications re Sand
HAL_0287757		Communications re Sand
HAL_0291590		Communications re Sand
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HAL_0319531		Communications re Sand
HAL_0376873		Communications re Sand
HAL_0391366		Communications re Sand
HAL_0405954		Communications re Sand
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HAL_0412000		Communications re Sand
HAL_0416717		Communications re Sand
HAL_0442474		Communications re Sand
HAL_0453848		Communications re Sand
HAL_0457377		Communications re Sand
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HAL_0502948		Communications re Sand
HAL_0502985		Communications re Sand
HAL_0503159		Communications re Sand
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HAL_0503649		Communications re Sand
HAL_0503677		Communications re Sand
HAL_0503692		Communications re Sand
HAL_0504295		Communications re Sand
HAL_0504511		Communications re Sand
HAL_0504723		Communications re Sand
HAL_0504799		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0505370		Communications re Sand
HAL_0505372		Communications re Sand
HAL_0505602		Communications re Sand
HAL_0505802		Communications re Sand
HAL_0505816		Communications re Sand
HAL_0505856		Communications re Sand
HAL_0505888		Communications re Sand
HAL_0506078		Communications re Sand
HAL_0506273		Communications re Sand
HAL_0506392		Communications re Sand
HAL_0506459		Communications re Sand
HAL_0506496		Communications re Sand
HAL_0506948		Communications re Sand
HAL_0507337		Communications re Sand
HAL_0507524		Communications re Sand
HAL_0507639		Communications re Sand
HAL_0508066		Communications re Sand
HAL_0508086		Communications re Sand
HAL_0508185		Communications re Sand
HAL_0508315		Communications re Sand
HAL_0510020		Communications re Sand
HAL_0510284		Communications re Sand
HAL_0510621		Communications re Sand
HAL_0510841		Communications re Sand
HAL_0510879		Communications re Sand
HAL_0511158		Communications re Sand
HAL_0511414		Communications re Sand
HAL_0511670		Communications re Sand
HAL_0511894		Communications re Sand
HAL_0512154		Communications re Sand
HAL_0512321		Communications re Sand
HAL_0512693		Communications re Sand
HAL_0512823		Communications re Sand
HAL_0513016		Communications re Sand
HAL_0513546		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0515291		Communications re Sand
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HAL_0515617		Communications re Sand
HAL_0515662		Communications re Sand
HAL_0515718		Communications re Sand
HAL_0516128		Communications re Sand
HAL_0516196		Communications re Sand
HAL_0516269		Communications re Sand
HAL_0516686		Communications re Sand
HAL_0516940		Communications re Sand
HAL_0530381		Communications re Sand
HAL_0530848		Communications re Sand
HAL_0534520		Communications re Sand
HAL_0534775		Communications re Sand
HAL_0534800		Communications re Sand
HAL_0535548		Communications re Sand
HAL_0536162		Communications re Sand
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HAL_0536198		Communications re Sand
HAL_0536342		Communications re Sand
HAL_0536403		Communications re Sand
HAL_0536561		Communications re Sand
HAL_0536660		Communications re Sand
HAL_0536836		Communications re Sand
HAL_0537188		Communications re Sand
HAL_0537465		Communications re Sand
HAL_0537640		Communications re Sand
HAL_0537647		Communications re Sand
HAL_0537705		Communications re Sand
HAL_0538387		Communications re Sand
HAL_0538707		Communications re Pay Zone
HAL_0538763		Communications re Sand
HAL_0539656		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0541984		Communications re Sand
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HAL_0544297		Communications re Sand
HAL_0547983		Communications re Sand
HAL_0548799		Communications re Sand
HAL_0549076		Communications re Sand
HAL_0549403		Communications re Sand
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HAL_0549603		Communications re Sand
HAL_0549803		Communications re Sand
HAL_0550198		Communications re Sand
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HAL_0551833		Communications re Sand
HAL_0551923		Communications re Sand
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HAL_0552482		Communications re Sand
HAL_0552776		Communications re Sand
HAL_0552961		Communications re Sand
HAL_0554152		Communications re Sand
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HAL_0555414		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0566925		Communications re Sand
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HAL_0567458		Communications re Sand
HAL_0567700		Communications re Sand
HAL_0567702		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0569864		Communications re Sand
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HAL_0578623		Communications re Sand
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HAL_0579501		Communications re Sand
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HAL_0580478		Communications re Sand
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HAL_0580591		Communications re Sand
HAL_0580792		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0606676		Communications re Pay Zone
HAL_0607097		Communications re Sand
HAL_0607625		Communications re Sand
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HAL_0607792		Communications re Sand
HAL_0607855		Communications re Sand
HAL_0608000		Communications re Sand
HAL_0608153		Communications re Sand
HAL_0608220		Communications re Sand
HAL_0608222		Communications re Sand
HAL_0608442		Communications re Sand
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HAL_0613696		Communications re Sand
HAL_0613903		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0616706		Communications re Sand
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HAL_0617314		Communications re Sand
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HAL_0617975		Communications re Sand
HAL_0620862		Communications re Sand
HAL_0620959		Communications re Sand
HAL_0621150		Communications re Sand
HAL_0622124		Communications re Sand
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HAL_0625763		Communications re Sand
HAL_0625796		Communications re Sand
HAL_0625838		Communications re Sand
HAL_0629971		Communications re Sand
HAL_0630027		Communications re Sand
HAL_0630049		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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HAL_0635850		Communications re Sand
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HAL_0678666		Communications re Sand
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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IIG013-000343		Communications re Sand
IIG013-008054		Communications re Sand
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IMS017-006925		Communications re Sand
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IMS017-014334		Communications re Sand
IMS017-030545		Communications re Sand
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IMS021-014426		Communications re Sand
IMS023-047764		Communications re Sand
IMS025-034944		Communications re Pay Zone
IMS026-003147		Communications re Sand
IMS026-004111		Communications re Sand
IMS026-019724		Communications re Pay Zone
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BATES RANGE	DATE	SUMMARY / DESCRIPTION
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IMS052-001173		Communications re Sand
IMS059-003282		Communications re Sand
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IMS059-009755		Communications re Sand
IMS059-015436		Communications re Sand
IMS059-022897		Communications re Sand
IMS062-012466		Communications re Sand
IMS064-010149		Communications re Pay Zone
IMS064-010150		Communications re Pay Zone
IMS065-000456		Communications re Pay Zone
IMS065-000457		Communications re Pay Zone
IMS065-000458		Communications re Pay Zone
IMS065-004672		Communications re Pay Zone
IMS065-004673		Communications re Pay Zone
IMS065-005493		Communications re Pay Zone
IMS066-010465		Communications re Pay Zone
IMS066-010466		Communications re Pay Zone
IMS067-001321		Communications re Pay Zone
IMS067-001322		Communications re Pay Zone
IMS067-006386		Communications re Pay Zone
IMS069-003484		Communications re Pay Zone
IMS069-003806		Communications re Pay Zone
IMS069-006889		Communications re Pay Zone
IMS069-009567		Communications re Pay Zone
IMS069-009568		Communications re Pay Zone
IMS070-002162		Communications re Pay Zone
IMS070-002163		Communications re Pay Zone
IMS071-002819		Communications re Pay Zone
IMS071-005364		Communications re Pay Zone
IMS073-000111		Communications re Pay Zone
IMS073-005044		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
IMS073-005705		Communications re Pay Zone
IMS108-000056		Communications re Sand
IMS108-005974		Communications re Sand
IMS172-029551		Communications re Sand
IMS172-029560		Communications re Sand
IMS172-029942		Communications re Sand
IMS172-035448		Communications re Sand
IMS172-035769		Communications re Sand
IMS172-035779		Communications re Sand
IMS172-035783		Communications re Sand
IMS172-035787		Communications re Sand
IMS172-035796		Communications re Sand
IMS172-035805		Communications re Sand
IMS172-035807		Communications re Sand
IMS172-035809		Communications re Sand
IMS172-035811		Communications re Sand
IMS172-035813		Communications re Sand
IMS172-037040		Communications re Sand
IMS172-049566		Communications re Sand
IMS172-049577		Communications re Sand
IMS172-050023		Communications re Sand
IMS180-026966		Communications re Sand
IMS183-000652		Communications re Sand
M-I 00001014		Communications re Sand
M-I 00002216		Communications re Sand
M-I 00002221		Communications re Sand
M-I 00002228		Communications re Sand
M-I 00002235		Communications re Sand
M-I 00002242		Communications re Sand
M-I 00002249		Communications re Sand
M-I 00002255		Communications re Sand
M-I 00002262		Communications re Sand
M-I 00002456		Communications re Sand
M-I 00003306		Communications re Sand
M-I 00003309		Communications re Sand
M-I 00003795		Communications re Sand
M-I 00003799		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
M-I 00005051		Communications re Sand
M-I 00005058		Communications re Sand
M-I 00005065		Communications re Sand
M-I 00005072		Communications re Sand
M-I 00005381		Communications re Sand
M-I 00005389		Communications re Sand
M-I 00005396		Communications re Sand
M-I 00005402		Communications re Sand
M-I 00005407		Communications re Sand
M-I 00005413		Communications re Sand
M-I 00005416		Communications re Sand
M-I 00005423		Communications re Sand
M-I 00005428		Communications re Sand
M-I 00005434		Communications re Sand
M-I 00005440		Communications re Sand
M-I 00005445		Communications re Sand
M-I 00005451		Communications re Sand
M-I 00005455		Communications re Sand
M-I 00005460		Communications re Sand
M-I 00005466		Communications re Sand
M-I 00005473		Communications re Sand
M-I 00005479		Communications re Sand
M-I 00005484		Communications re Sand
M-I 00005489		Communications re Sand
M-I 00005494		Communications re Sand
M-I 00005500		Communications re Sand
M-I 00005507		Communications re Sand
M-I 00005513		Communications re Sand
M-I 00005519		Communications re Sand
M-I 00005528		Communications re Sand
M-I 00005533		Communications re Sand
M-I 00005538		Communications re Sand
M-I 00005546		Communications re Sand
M-I 00005551		Communications re Sand
M-I 00005557		Communications re Sand
M-I 00005562		Communications re Sand
M-I 00005566		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
M-I 00005570		Communications re Sand
M-I 00005575		Communications re Sand
M-I 00005592		Communications re Sand
M-I 00005601		Communications re Sand
M-I 00005613		Communications re Sand
M-I 00005620		Communications re Sand
M-I 00005627		Communications re Sand
M-I 00005633		Communications re Sand
M-I 00005638		Communications re Sand
M-I 00005644		Communications re Sand
M-I 00005650		Communications re Sand
M-I 00005656		Communications re Sand
M-I 00005662		Communications re Sand
M-I 00005668		Communications re Sand
M-I 00005674		Communications re Sand
M-I 00005680		Communications re Sand
M-I 00005686		Communications re Sand
M-I 00005693		Communications re Sand
M-I 00005700		Communications re Sand
M-I 00005708		Communications re Sand
M-I 00005712		Communications re Sand
M-I 00005718		Communications re Sand
M-I 00005722		Communications re Sand
M-I 00005727		Communications re Sand
M-I 00005732		Communications re Sand
M-I 00005738		Communications re Sand
M-I 00005744		Communications re Sand
M-I 00005749		Communications re Sand
M-I 00005756		Communications re Sand
M-I 00005762		Communications re Sand
M-I 00005769		Communications re Sand
M-I 00005777		Communications re Sand
M-I 00005784		Communications re Sand
M-I 00005791		Communications re Sand
M-I 00005796		Communications re Sand
M-I 00005801		Communications re Sand
M-I 00007546		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
M-I 00008479		Communications re Sand
M-I 00008484		Communications re Sand
M-I 00008491		Communications re Sand
M-I 00008498		Communications re Sand
M-I 00008505		Communications re Sand
M-I 00008512		Communications re Sand
M-I 00008518		Communications re Sand
M-I 00008525		Communications re Sand
M-I 00010857		Communications re Sand
M-I 00012678		Communications re Sand
M-I 00012924		Communications re Sand
M-I 00013100		Communications re Sand
M-I 00013107		Communications re Sand
M-I 00013299		Communications re Sand
M-I 00013687		Communications re Sand
M-I 00013783		Communications re Sand
M-I 00013791		Communications re Sand
M-I 00014027		Communications re Sand
M-I 00015234		Communications re Sand
M-I 00015962		Communications re Sand
M-I 00016122		Communications re Sand
M-I 00016169		Communications re Sand
M-I 00016281		Communications re Sand
M-I 00018279		Communications re Sand
M-I 00018526		Communications re Sand
M-I 00018574		Communications re Sand
M-I 00018625		Communications re Sand
M-I 00019653		Communications re Pay Zone
M-I 00020508		Communications re Sand
M-I 00020700		Communications re Sand
M-I 00020892		Communications re Sand
M-I 00021033		Communications re Sand
M-I 00021265		Communications re Sand
M-I 00022789		Communications re Sand
M-I 00025088		Communications re Sand
M-I 00025197		Communications re Sand
M-I 00025310		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
M-I 00025312		Communications re Sand
M-I 00025320		Communications re Sand
M-I 00025437		Communications re Sand
M-I 00025639		Communications re Sand
M-I 00025748		Communications re Sand
M-I 00025866		Communications re Sand
M-I 00025986		Communications re Sand
M-I 00026094		Communications re Sand
M-I 00026212		Communications re Sand
M-I 00026384		Communications re Sand
M-I 00026540		Communications re Sand
M-I 00026541		Communications re Sand
M-I 00026793		Communications re Sand
M-I 00026890		Communications re Sand
M-I 00026985		Communications re Sand
M-I 00027000		Communications re Sand
M-I 00027183		Communications re Sand
M-I 00027280		Communications re Sand
M-I 00027374		Communications re Sand
M-I 00027578		Communications re Sand
M-I 00027579		Communications re Sand
M-I 00027580		Communications re Sand
M-I 00027658		Communications re Sand
M-I 00027752		Communications re Sand
M-I 00027846		Communications re Sand
M-I 00027962		Communications re Sand
M-I 00027963		Communications re Sand
M-I 00028071		Communications re Sand
M-I 00028164		Communications re Sand
M-I 00028367		Communications re Sand
M-I 00028434		Communications re Sand
M-I 00028637		Communications re Sand
M-I 00028676		Communications re Sand
M-I 00028726		Communications re Sand
M-I 00029133		Communications re Sand
M-I 00029146		Communications re Sand
M-I 00029194		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
M-I 00029289		Communications re Sand
M-I 00029391		Communications re Sand
M-I 00029486		Communications re Sand
M-I 00029814		Communications re Sand
M-I 00029846		Communications re Sand
M-I 00031270		Communications re Sand
ORL001-000273		Communications re Sand
ORL001-000347		Communications re Sand
ORL001-000434		Communications re Sand
ORL001-000436		Communications re Sand
ORL001-000563		Communications re Sand
ORL001-000565		Communications re Sand
ORL001-000572		Communications re Sand
ORL001-000574		Communications re Sand
ORL001-000663		Communications re Sand
ORL001-000665		Communications re Sand
ORL001-000726		Communications re Sand
ORL001-000730		Communications re Sand
ORL001-000743		Communications re Sand
ORL001-000775		Communications re Sand
ORL001-000783		Communications re Sand
OSC002-000001		Communications re Sand
OSE001-017930		Communications re Sand
OSE001-017939		Communications re Sand
OSE003-002122		Communications re Sand
OSE004-002451		Communications re Sand
OSE006-000943		Communications re Sand
OSE006-002985		Communications re Sand
OSE006-003033		Communications re Sand
OSE006-003071		Communications re Sand
OSE006-021676		Communications re Sand
OSE006-027628		Communications re Sand
OSE006-027647		Communications re Sand
OSE006-027740		Communications re Sand
OSE014-001004		Communications re Sand
OSE014-001048		Communications re Sand
OSE014-006456		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE015-005773		Communications re Sand
OSE015-005817		Communications re Sand
OSE016-003264		Communications re Sand
OSE016-003702		Communications re Sand
OSE024-000551		Communications re Sand
OSE024-002951		Communications re Sand
OSE024-003275		Communications re Sand
OSE024-005255		Communications re Sand
OSE024-008818		Communications re Sand
OSE024-011388		Communications re Sand
OSE025-006412		Communications re Sand
OSE025-006455		Communications re Sand
OSE025-006498		Communications re Sand
OSE025-015690		Communications re Sand
OSE027-006374		Communications re Sand
OSE027-015819		Communications re Sand
OSE030-006282		Communications re Sand
OSE030-007901		Communications re Sand
OSE032-004177		Communications re Sand
OSE040-007547		Communications re Sand
OSE043-000687		Communications re Sand
OSE043-001094		Communications re Sand
OSE044-000945		Communications re Sand
OSE044-045058		Communications re Sand
OSE047-004048		Communications re Sand
OSE047-006756		Communications re Sand
OSE113-001976		Communications re Sand
OSE113-003194		Communications re Sand
OSE123-009182		Communications re Sand
OSE124-001627		Communications re Sand
OSE124-001744		Communications re Sand
OSE124-001745		Communications re Sand
OSE124-001774		Communications re Sand
OSE125-009180		Communications re Sand
OSE125-010004		Communications re Sand
OSE127-006152		Communications re Sand
OSE129-003783		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE129-004607		Communications re Sand
OSE131-002084		Communications re Pay Zone
OSE132-002256		Communications re Pay Zone
OSE132-002256		Communications re Sand
OSE132-002400		Communications re Pay Zone
OSE132-007937		Communications re Sand
OSE132-007941		Communications re Sand
OSE134-003852		Communications re Sand
OSE134-004676		Communications re Sand
OSE135-006685		Communications re Pay Zone
OSE135-006685		Communications re Sand
OSE135-006688		Communications re Pay Zone
OSE135-006688		Communications re Sand
OSE140-001075		Communications re Sand
OSE140-002350		Communications re Sand
OSE144-001879		Communications re Sand
OSE145-009948		Communications re Sand
OSE185-004229		Communications re Sand
OSE185-010639		Communications re Sand
OSE185-010647		Communications re Sand
OSE187-003690		Communications re Sand
OSE187-003733		Communications re Sand
OSE196-006917		Communications re Sand
OSE204-013858		Communications re Sand
OSE245-008556		Communications re Sand
OSE275-008043		Communications re Sand
OSE297-000005		Communications re Sand
OSE297-001255		Communications re Sand
OSE297-001714		Communications re Sand
OSE297-002963		Communications re Sand
OSE297-003551		Communications re Sand
OSE297-003864		Communications re Sand
OSE297-004873		Communications re Sand
OSE298-000005		Communications re Sand
OSE298-001206		Communications re Sand
OSE298-002954		Communications re Sand
OSE298-003573		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE298-003748		Communications re Sand
OSE298-005042		Communications re Sand
OSE304-004706		Communications re Sand
OSE304-006559		Communications re Sand
OSE304-008413		Communications re Sand
OSE307-001680		Communications re Sand
OSE307-003535		Communications re Sand
OSE307-005395		Communications re Sand
OSE310-005047		Communications re Sand
OSE310-005050		Communications re Sand
OSE310-006572		Communications re Sand
OSE317-005835		Communications re Sand
OSE317-011121		Communications re Sand
OSE317-011629		Communications re Sand
OSE317-011631		Communications re Sand
OSE317-011633		Communications re Sand
OSE317-011786		Communications re Sand
OSE317-011790		Communications re Sand
OSE317-011878		Communications re Sand
OSE317-011880		Communications re Sand
OSE317-011883		Communications re Sand
OSE317-011949		Communications re Sand
OSE317-012904		Communications re Sand
OSE317-012909		Communications re Sand
OSE317-013030		Communications re Sand
OSE317-013042		Communications re Sand
OSE317-013164		Communications re Sand
OSE317-013243		Communications re Sand
OSE317-013299		Communications re Sand
OSE317-013406		Communications re Sand
OSE317-013434		Communications re Sand
OSE317-013438		Communications re Sand
OSE317-013440		Communications re Sand
OSE317-013458		Communications re Sand
OSE317-013460		Communications re Sand
OSE317-013462		Communications re Sand
OSE317-013464		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE317-013466		Communications re Sand
OSE317-013497		Communications re Sand
OSE317-013498		Communications re Sand
OSE317-013914		Communications re Sand
OSE317-013915		Communications re Sand
OSE317-013920		Communications re Sand
OSE317-013922		Communications re Sand
OSE317-014076		Communications re Sand
OSE317-014085		Communications re Sand
OSE317-014093		Communications re Sand
OSE317-014104		Communications re Sand
OSE317-014106		Communications re Sand
OSE327-007464		Communications re Sand
OSE327-007466		Communications re Sand
OSE327-007468		Communications re Sand
OSE327-007496		Communications re Sand
OSE327-007498		Communications re Sand
OSE327-007531		Communications re Sand
OSE327-007533		Communications re Sand
OSE327-007536		Communications re Sand
OSE327-007547		Communications re Sand
OSE327-007607		Communications re Sand
OSE327-007609		Communications re Sand
OSE327-007623		Communications re Sand
OSE327-007630		Communications re Sand
OSE327-007656		Communications re Sand
OSE327-007667		Communications re Sand
OSE327-007682		Communications re Sand
OSE327-007701		Communications re Sand
OSE327-007703		Communications re Sand
OSE327-007704		Communications re Sand
OSE327-007770		Communications re Sand
OSE327-007771		Communications re Sand
OSE327-007776		Communications re Sand
OSE327-007778		Communications re Sand
OSE327-008357		Communications re Sand
OSE327-008458		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE327-008460		Communications re Sand
OSE327-008462		Communications re Sand
OSE327-008487		Communications re Sand
OSE327-008489		Communications re Sand
OSE327-008496		Communications re Sand
OSE327-008498		Communications re Sand
OSE327-008501		Communications re Sand
OSE327-008507		Communications re Sand
OSE327-008599		Communications re Sand
OSE327-008603		Communications re Sand
OSE327-008661		Communications re Sand
OSE327-008668		Communications re Sand
OSE327-008684		Communications re Sand
OSE327-008735		Communications re Sand
OSE327-008754		Communications re Sand
OSE327-008756		Communications re Sand
OSE327-008757		Communications re Sand
OSE327-008903		Communications re Sand
OSE327-008904		Communications re Sand
OSE327-008909		Communications re Sand
OSE327-008911		Communications re Sand
OSE327-009767		Communications re Sand
OSE327-009769		Communications re Sand
OSE327-009771		Communications re Sand
OSE327-009848		Communications re Sand
OSE327-009850		Communications re Sand
OSE327-009894		Communications re Sand
OSE327-009896		Communications re Sand
OSE327-009899		Communications re Sand
OSE327-009928		Communications re Sand
OSE327-010059		Communications re Sand
OSE327-010063		Communications re Sand
OSE327-010112		Communications re Sand
OSE327-010119		Communications re Sand
OSE327-010166		Communications re Sand
OSE327-010202		Communications re Sand
OSE327-010245		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE327-010264		Communications re Sand
OSE327-010266		Communications re Sand
OSE327-010267		Communications re Sand
OSE327-010378		Communications re Sand
OSE327-010379		Communications re Sand
OSE327-010384		Communications re Sand
OSE327-010386		Communications re Sand
OSE327-010430		Communications re Sand
OSE327-010433		Communications re Sand
OSE327-010441		Communications re Sand
OSE327-010450		Communications re Sand
OSE327-010452		Communications re Sand
OSE327-011240		Communications re Sand
OSE327-011242		Communications re Sand
OSE327-011244		Communications re Sand
OSE327-011307		Communications re Sand
OSE327-011309		Communications re Sand
OSE327-011344		Communications re Sand
OSE327-011346		Communications re Sand
OSE327-011349		Communications re Sand
OSE327-011367		Communications re Sand
OSE327-011479		Communications re Sand
OSE327-011484		Communications re Sand
OSE327-011527		Communications re Sand
OSE327-011534		Communications re Sand
OSE327-011594		Communications re Sand
OSE327-011612		Communications re Sand
OSE327-011617		Communications re Sand
OSE327-011671		Communications re Sand
OSE327-011690		Communications re Sand
OSE327-011692		Communications re Sand
OSE327-011693		Communications re Sand
OSE327-011705		Communications re Sand
OSE327-011706		Communications re Sand
OSE327-011707		Communications re Sand
OSE327-011709		Communications re Sand
OSE327-011711		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE327-011718		Communications re Sand
OSE327-011719		Communications re Sand
OSE327-011833		Communications re Sand
OSE327-011834		Communications re Sand
OSE327-011839		Communications re Sand
OSE327-011841		Communications re Sand
OSE327-011897		Communications re Sand
OSE327-011900		Communications re Sand
OSE327-011908		Communications re Sand
OSE327-011918		Communications re Sand
OSE327-011920		Communications re Sand
OSE327-012694		Communications re Sand
OSE327-012698		Communications re Sand
OSE327-012709		Communications re Sand
OSE327-012711		Communications re Sand
OSE327-012714		Communications re Sand
OSE327-012725		Communications re Sand
OSE327-012783		Communications re Sand
OSE327-012798		Communications re Sand
OSE327-012804		Communications re Sand
OSE327-012834		Communications re Sand
OSE327-012869		Communications re Sand
OSE327-012888		Communications re Sand
OSE327-012890		Communications re Sand
OSE327-012891		Communications re Sand
OSE327-013505		Communications re Sand
OSE327-013506		Communications re Sand
OSE327-013511		Communications re Sand
OSE327-013513		Communications re Sand
OSE327-013524		Communications re Sand
OSE327-013526		Communications re Sand
OSE353-011083		Communications re Sand
OSE353-011265		Communications re Sand
OSE353-011393		Communications re Sand
OSE353-011551		Communications re Sand
OSE353-011768		Communications re Sand
OSE353-011989		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE353-012423		Communications re Sand
OSE353-012512		Communications re Sand
OSE353-012591		Communications re Sand
OSE353-012657		Communications re Sand
OSE353-012753		Communications re Sand
OSE353-012822		Communications re Sand
OSE353-012902		Communications re Sand
OSE353-013010		Communications re Sand
OSE353-013077		Communications re Sand
OSE353-013137		Communications re Sand
OSE355-002307		Communications re Sand
OSE355-003557		Communications re Sand
OSE355-004016		Communications re Sand
OSE355-005265		Communications re Sand
OSE355-005853		Communications re Sand
OSE355-006166		Communications re Sand
OSE355-007175		Communications re Sand
OSE356-000005		Communications re Sand
OSE356-001206		Communications re Sand
OSE356-002954		Communications re Sand
OSE356-003573		Communications re Sand
OSE356-003748		Communications re Sand
OSE356-005042		Communications re Sand
OSE414-046971		Communications re Sand
OSE414-050862		Communications re Sand
OSE414-050880		Communications re Sand
OSE414-052017		Communications re Sand
OSE414-052937		Communications re Sand
OSE414-053476		Communications re Sand
OSE414-053478		Communications re Sand
OSE414-053479		Communications re Sand
OSE414-053481		Communications re Sand
OSE414-053482		Communications re Sand
OSE414-053483		Communications re Sand
OSE414-053499		Communications re Sand
OSE414-053513		Communications re Sand
OSE414-053515		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE414-053623		Communications re Sand
OSE414-053624		Communications re Sand
OSE414-053636		Communications re Sand
OSE414-053645		Communications re Sand
OSE414-053681		Communications re Sand
OSE414-053684		Communications re Sand
OSE414-053688		Communications re Sand
OSE430-001529		Communications re Sand
OSE430-001532		Communications re Sand
OSE430-003054		Communications re Sand
OSE445-000518		Communications re Sand
OSE445-000761		Communications re Sand
OSE468-001139		Communications re Sand
OSE468-002357		Communications re Sand
OSE468-003632		Communications re Sand
OSE472-009933		Communications re Sand
OSE502-008045		Communications re Sand
OSE524-000005		Communications re Sand
OSE524-001255		Communications re Sand
OSE524-001714		Communications re Sand
OSE524-002963		Communications re Sand
OSE524-003551		Communications re Sand
OSE524-003864		Communications re Sand
OSE524-004873		Communications re Sand
OSE525-000005		Communications re Sand
OSE525-001206		Communications re Sand
OSE525-002954		Communications re Sand
OSE525-003573		Communications re Sand
OSE525-003748		Communications re Sand
OSE525-005042		Communications re Sand
OSE531-004704		Communications re Sand
OSE531-006557		Communications re Sand
OSE531-008411		Communications re Sand
OSE534-001678		Communications re Sand
OSE534-003533		Communications re Sand
OSE534-005393		Communications re Sand
OSE537-005047		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE537-005050		Communications re Sand
OSE537-006572		Communications re Sand
OSE554-007464		Communications re Sand
OSE554-007466		Communications re Sand
OSE554-007468		Communications re Sand
OSE554-007496		Communications re Sand
OSE554-007498		Communications re Sand
OSE554-007531		Communications re Sand
OSE554-007533		Communications re Sand
OSE554-007536		Communications re Sand
OSE554-007547		Communications re Sand
OSE554-007607		Communications re Sand
OSE554-007609		Communications re Sand
OSE554-007623		Communications re Sand
OSE554-007630		Communications re Sand
OSE554-007656		Communications re Sand
OSE554-007667		Communications re Sand
OSE554-007682		Communications re Sand
OSE554-007701		Communications re Sand
OSE554-007703		Communications re Sand
OSE554-007704		Communications re Sand
OSE554-007770		Communications re Sand
OSE554-007771		Communications re Sand
OSE554-007776		Communications re Sand
OSE554-007778		Communications re Sand
OSE554-008357		Communications re Sand
OSE554-008458		Communications re Sand
OSE554-008460		Communications re Sand
OSE554-008462		Communications re Sand
OSE554-008487		Communications re Sand
OSE554-008489		Communications re Sand
OSE554-008496		Communications re Sand
OSE554-008498		Communications re Sand
OSE554-008501		Communications re Sand
OSE554-008507		Communications re Sand
OSE554-008599		Communications re Sand
OSE554-008603		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE554-008661		Communications re Sand
OSE554-008684		Communications re Sand
OSE554-008735		Communications re Sand
OSE554-008754		Communications re Sand
OSE554-008756		Communications re Sand
OSE554-008757		Communications re Sand
OSE554-008903		Communications re Sand
OSE554-008904		Communications re Sand
OSE554-008909		Communications re Sand
OSE554-008911		Communications re Sand
OSE554-009767		Communications re Sand
OSE554-009769		Communications re Sand
OSE554-009771		Communications re Sand
OSE554-009848		Communications re Sand
OSE554-009850		Communications re Sand
OSE554-009894		Communications re Sand
OSE554-009896		Communications re Sand
OSE554-009899		Communications re Sand
OSE554-009928		Communications re Sand
OSE554-010059		Communications re Sand
OSE554-010063		Communications re Sand
OSE554-010112		Communications re Sand
OSE554-010119		Communications re Sand
OSE554-010166		Communications re Sand
OSE554-010202		Communications re Sand
OSE554-010245		Communications re Sand
OSE554-010264		Communications re Sand
OSE554-010266		Communications re Sand
OSE554-010267		Communications re Sand
OSE554-010378		Communications re Sand
OSE554-010379		Communications re Sand
OSE554-010384		Communications re Sand
OSE554-010386		Communications re Sand
OSE554-010430		Communications re Sand
OSE554-010433		Communications re Sand
OSE554-010441		Communications re Sand
OSE554-010450		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE554-010452		Communications re Sand
OSE554-011240		Communications re Sand
OSE554-011242		Communications re Sand
OSE554-011244		Communications re Sand
OSE554-011307		Communications re Sand
OSE554-011309		Communications re Sand
OSE554-011344		Communications re Sand
OSE554-011346		Communications re Sand
OSE554-011349		Communications re Sand
OSE554-011367		Communications re Sand
OSE554-011479		Communications re Sand
OSE554-011484		Communications re Sand
OSE554-011527		Communications re Sand
OSE554-011534		Communications re Sand
OSE554-011594		Communications re Sand
OSE554-011612		Communications re Sand
OSE554-011617		Communications re Sand
OSE554-011671		Communications re Sand
OSE554-011690		Communications re Sand
OSE554-011692		Communications re Sand
OSE554-011693		Communications re Sand
OSE554-011705		Communications re Sand
OSE554-011706		Communications re Sand
OSE554-011707		Communications re Sand
OSE554-011709		Communications re Sand
OSE554-011711		Communications re Sand
OSE554-011718		Communications re Sand
OSE554-011719		Communications re Sand
OSE554-011833		Communications re Sand
OSE554-011834		Communications re Sand
OSE554-011839		Communications re Sand
OSE554-011841		Communications re Sand
OSE554-011897		Communications re Sand
OSE554-011900		Communications re Sand
OSE554-011908		Communications re Sand
OSE554-011918		Communications re Sand
OSE554-011920		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE554-012694		Communications re Sand
OSE554-012698		Communications re Sand
OSE554-012709		Communications re Sand
OSE554-012711		Communications re Sand
OSE554-012714		Communications re Sand
OSE554-012725		Communications re Sand
OSE554-012783		Communications re Sand
OSE554-012798		Communications re Sand
OSE554-012804		Communications re Sand
OSE554-012834		Communications re Sand
OSE554-012869		Communications re Sand
OSE554-012888		Communications re Sand
OSE554-012890		Communications re Sand
OSE554-012891		Communications re Sand
OSE554-013505		Communications re Sand
OSE554-013506		Communications re Sand
OSE554-013511		Communications re Sand
OSE554-013513		Communications re Sand
OSE554-013524		Communications re Sand
OSE554-013526		Communications re Sand
OSE582-002307		Communications re Sand
OSE582-003557		Communications re Sand
OSE582-004016		Communications re Sand
OSE582-005265		Communications re Sand
OSE582-005853		Communications re Sand
OSE582-006166		Communications re Sand
OSE582-007175		Communications re Sand
OSE583-000005		Communications re Sand
OSE583-001206		Communications re Sand
OSE583-002954		Communications re Sand
OSE583-003573		Communications re Sand
OSE583-003748		Communications re Sand
OSE583-005042		Communications re Sand
OSE613-016690		Communications re Sand
OSE641-046971		Communications re Sand
OSE641-050862		Communications re Sand
OSE641-050880		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
OSE641-052017		Communications re Sand
OSE641-052937		Communications re Sand
OSE641-053476		Communications re Sand
OSE641-053478		Communications re Sand
OSE641-053479		Communications re Sand
OSE641-053481		Communications re Sand
OSE641-053482		Communications re Sand
OSE641-053483		Communications re Sand
OSE641-053499		Communications re Sand
OSE641-053513		Communications re Sand
OSE641-053515		Communications re Sand
OSE641-053623		Communications re Sand
OSE641-053624		Communications re Sand
OSE641-053636		Communications re Sand
OSE641-053645		Communications re Sand
OSE641-053681		Communications re Sand
OSE641-053684		Communications re Sand
OSE641-053688		Communications re Sand
OSE662-000518		Communications re Sand
OSE662-000761		Communications re Sand
OSE679-000400		Communications re Sand
OSE679-003217		Communications re Sand
OSE682-002734		Communications re Sand
PNL001-000004		Communications re Pay Zone
PNL001-000025		Communications re Pay Zone
PNL001-000048		Communications re Pay Zone
PNL001-000070		Communications re Pay Zone
PNL001-000092		Communications re Pay Zone
PNL001-000114		Communications re Pay Zone
PNL001-000136		Communications re Pay Zone
PNL001-001080		Communications re Sand
PNL001-001849		Communications re Sand
PNL001-001982		Communications re Sand
PNL001-010878		Communications re Sand
PNL001-011969		Communications re Pay Zone
PNL001-016670		Communications re Pay Zone
PNL001-016691		Communications re Pay Zone

BATES RANGE	DATE	SUMMARY / DESCRIPTION
PNL001-016720		Communications re Pay Zone
PNL001-025016		Communications re Pay Zone
PNL001-025656		Communications re Sand
PNL001-026082		Communications re Sand
PNL001-026753		Communications re Sand
PNL001-026827		Communications re Sand
PNL001-026947		Communications re Pay Zone
PNL001-026969		Communications re Pay Zone
PNL001-027076		Communications re Pay Zone
PNL001-027147		Communications re Pay Zone
PNL001-027169		Communications re Pay Zone
PNL001-027796		Communications re Pay Zone
PNL001-027825		Communications re Pay Zone
PNL001-027854		Communications re Pay Zone
PNL001-029116		Communications re Sand
PNL001-030109		Communications re Pay Zone
PNL001-030232		Communications re Pay Zone
PNL001-030253		Communications re Pay Zone
PNL001-030276		Communications re Pay Zone
PNL001-030298		Communications re Pay Zone
PNL001-030320		Communications re Pay Zone
PNL001-030354		Communications re Pay Zone
PNL001-030670		Communications re Pay Zone
PNL001-030814		Communications re Pay Zone
PNL001-032277		Communications re Pay Zone
PNL001-032301		Communications re Pay Zone
PNL001-032331		Communications re Sand
PNL001-032405		Communications re Sand
PNL001-032540		Communications re Sand
PNL001-032614		Communications re Sand
PNL001-033033		Communications re Sand
PNL001-033037		Communications re Sand
PNL001-033332		Communications re Sand
PNL001-033373		Communications re Sand
PNL001-033482		Communications re Sand
PNL001-033507		Communications re Sand
PNL001-033667		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
PNL001-033741		Communications re Sand
PNL001-035701		Communications re Pay Zone
PNL001-035723		Communications re Pay Zone
PNL001-036084		Communications re Sand
PNL001-036086		Communications re Sand
PNL001-036219		Communications re Pay Zone
PNL001-036243		Communications re Pay Zone
PNL001-036383		Communications re Sand
PNL001-036385		Communications re Sand
PNL001-037016		Communications re Pay Zone
PNL002-000151		Communications re Sand
PNL003-001768		Communications re Pay Zone
PNL003-002929		Communications re Pay Zone
PNL003-002929		Communications re Sand
PNL003-003514		Communications re Pay Zone
PNL003-003681		Communications re Pay Zone
PNL003-004060		Communications re Pay Zone
PNL003-004216		Communications re Pay Zone
PNL003-004216		Communications re Sand
PNL003-005876		Communications re Pay Zone
PNL003-005994		Communications re Pay Zone
SNL019-003907		Communications re Sand
SNL019-003908		Communications re Sand
SNL022-021195		Communications re Sand
SNL022-021205		Communications re Sand
SNL042-010726		Communications re Sand
SNL042-019110		Communications re Sand
SNL045-000729		Communications re Sand
SNL045-000730		Communications re Sand
SNL048-000525		Communications re Sand
SNL048-000535		Communications re Sand
SNL066-022626		Communications re Sand
SNL072-006767		Communications re Sand
SNL072-009898		Communications re Sand
SNL084-002062		Communications re Sand
SNL084-002072		Communications re Sand
SNL084-002082		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
SNL085-001137		Communications re Sand
SNL097-008244		Communications re Sand
SNL106-003378		Communications re Sand
SNL108-006675		Communications re Sand
SNL108-012051		Communications re Sand
SNL115-000694		Communications re Sand
SNL115-000700		Communications re Sand
SNL117-027120		Communications re Sand
SNL117-031884		Communications re Sand
TRN-HCJ-00093507		Communications re Sand
TRN-INV-00011997		Communications re Sand
TRN-INV-00017948		Communications re Sand
TRN-INV-00018002		Communications re Sand
TRN-INV-00030956		Communications re Sand
TRN-INV-00032525		Communications re Sand
TRN-INV-00034737		Communications re Sand
TRN-INV-00103488		Communications re Sand
TRN-INV-00111953		Communications re Sand
TRN-INV-00163119		Communications re Sand
TRN-INV-00362529		Communications re Sand
TRN-INV-00407253		Communications re Sand
TRN-INV-00597855		Communications re Sand
TRN-INV-00687127		Communications re Sand
TRN-INV-00687293		Communications re Sand
TRN-INV-00690177		Communications re Sand
TRN-INV-00693675		Communications re Sand
TRN-INV-00695076		Communications re Sand
TRN-INV-00698678		Communications re Sand
TRN-INV-00707596		Communications re Sand
TRN-INV-00736727		Communications re Sand
TRN-INV-00756188		Communications re Sand
TRN-INV-00763844		Communications re Sand
TRN-INV-00763849		Communications re Sand
TRN-INV-00763854		Communications re Sand
TRN-INV-00763860		Communications re Sand
TRN-INV-00763865		Communications re Sand
TRN-INV-00763872		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
TRN-INV-00763876		Communications re Sand
TRN-INV-00763880		Communications re Sand
TRN-INV-00763884		Communications re Sand
TRN-INV-00763890		Communications re Sand
TRN-INV-00763895		Communications re Sand
TRN-INV-00763901		Communications re Sand
TRN-INV-00763908		Communications re Sand
TRN-INV-00763914		Communications re Sand
TRN-INV-00763920		Communications re Sand
TRN-INV-00763926		Communications re Sand
TRN-INV-00763931		Communications re Sand
TRN-INV-00763938		Communications re Sand
TRN-INV-00763945		Communications re Sand
TRN-INV-00763952		Communications re Sand
TRN-INV-00763959		Communications re Sand
TRN-INV-00763965		Communications re Sand
TRN-INV-00763972		Communications re Sand
TRN-INV-00763979		Communications re Sand
TRN-INV-00763986		Communications re Sand
TRN-INV-00763993		Communications re Sand
TRN-INV-00763998		Communications re Sand
TRN-INV-00764004		Communications re Sand
TRN-INV-00764010		Communications re Sand
TRN-INV-00764017		Communications re Sand
TRN-INV-00764023		Communications re Sand
TRN-INV-00764030		Communications re Sand
TRN-INV-00764036		Communications re Sand
TRN-INV-00764042		Communications re Sand
TRN-INV-00764048		Communications re Sand
TRN-INV-00764054		Communications re Sand
TRN-INV-00764059		Communications re Sand
TRN-INV-00764065		Communications re Sand
TRN-INV-00764071		Communications re Sand
TRN-INV-00764078		Communications re Sand
TRN-INV-00764083		Communications re Sand
TRN-INV-00764088		Communications re Sand
TRN-INV-00764094		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
TRN-INV-00764097		Communications re Sand
TRN-INV-00764104		Communications re Sand
TRN-INV-00764110		Communications re Sand
TRN-INV-00764116		Communications re Sand
TRN-INV-00764122		Communications re Sand
TRN-INV-00764128		Communications re Sand
TRN-INV-00764135		Communications re Sand
TRN-INV-00764140		Communications re Sand
TRN-INV-00764145		Communications re Sand
TRN-INV-00764151		Communications re Sand
TRN-INV-00764157		Communications re Sand
TRN-INV-00764164		Communications re Sand
TRN-INV-00764169		Communications re Sand
TRN-INV-00764175		Communications re Sand
TRN-INV-00764180		Communications re Sand
TRN-INV-00764185		Communications re Sand
TRN-INV-00764191		Communications re Sand
TRN-INV-00764198		Communications re Sand
TRN-INV-00764206		Communications re Sand
TRN-INV-00764212		Communications re Sand
TRN-INV-00764217		Communications re Sand
TRN-INV-00764222		Communications re Sand
TRN-INV-00764227		Communications re Sand
TRN-INV-00764236		Communications re Sand
TRN-INV-00764242		Communications re Sand
TRN-INV-00764248		Communications re Sand
TRN-INV-00764252		Communications re Sand
TRN-INV-00764256		Communications re Sand
TRN-INV-00764261		Communications re Sand
TRN-INV-00768803		Communications re Sand
TRN-INV-00768918		Communications re Sand
TRN-INV-00770133		Communications re Sand
TRN-INV-00770226		Communications re Sand
TRN-INV-00770474		Communications re Sand
TRN-INV-00770563		Communications re Sand
TRN-INV-00775919		Communications re Sand
TRN-INV-00776084		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
TRN-INV-00776124		Communications re Sand
TRN-INV-00776184		Communications re Sand
TRN-INV-00777233		Communications re Sand
TRN-INV-00777550		Communications re Sand
TRN-INV-00777790		Communications re Sand
TRN-INV-00778182		Communications re Sand
TRN-INV-00778234		Communications re Sand
TRN-INV-00778296		Communications re Sand
TRN-INV-00791989		Communications re Sand
TRN-INV-00792103		Communications re Sand
TRN-INV-00792464		Communications re Sand
TRN-INV-00795542		Communications re Sand
TRN-INV-00801227		Communications re Sand
TRN-INV-00807476		Communications re Sand
TRN-INV-00809206		Communications re Sand
TRN-INV-00822424		Communications re Sand
TRN-INV-00822715		Communications re Sand
TRN-INV-00824923		Communications re Sand
TRN-INV-00825376		Communications re Sand
TRN-INV-00825519		Communications re Sand
TRN-INV-00825664		Communications re Sand
TRN-INV-00828760		Communications re Sand
TRN-INV-00829027		Communications re Sand
TRN-INV-00829588		Communications re Sand
TRN-INV-00829898		Communications re Sand
TRN-INV-00834774		Communications re Sand
TRN-INV-00840337		Communications re Sand
TRN-INV-00845900		Communications re Sand
TRN-INV-00847117		Communications re Sand
TRN-INV-00847221		Communications re Sand
TRN-INV-00847327		Communications re Sand
TRN-INV-00847431		Communications re Sand
TRN-INV-00855619		Communications re Sand
TRN-INV-00856030		Communications re Sand
TRN-INV-00856278		Communications re Sand
TRN-INV-00856390		Communications re Sand
TRN-INV-00857063		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
TRN-INV-00857821		Communications re Sand
TRN-INV-00868187		Communications re Sand
TRN-INV-00869062		Communications re Sand
TRN-INV-00871849		Communications re Sand
TRN-INV-00872391		Communications re Sand
TRN-INV-00882299		Communications re Sand
TRN-INV-00887017		Communications re Sand
TRN-INV-00887793		Communications re Sand
TRN-INV-00889444		Communications re Sand
TRN-INV-00891435		Communications re Sand
TRN-INV-00892002		Communications re Sand
TRN-INV-00903519		Communications re Sand
TRN-INV-00904220		Communications re Sand
TRN-INV-00904356		Communications re Sand
TRN-INV-00905303		Communications re Sand
TRN-INV-00906359		Communications re Sand
TRN-INV-00906879		Communications re Sand
TRN-INV-00907221		Communications re Sand
TRN-INV-00907440		Communications re Sand
TRN-INV-00908139		Communications re Sand
TRN-INV-00908275		Communications re Sand
TRN-INV-00909074		Communications re Sand
TRN-INV-00911900		Communications re Sand
TRN-INV-00914153		Communications re Sand
TRN-INV-00914255		Communications re Sand
TRN-INV-00914352		Communications re Sand
TRN-INV-00920245		Communications re Sand
TRN-INV-00924922		Communications re Sand
TRN-INV-00930334		Communications re Sand
TRN-INV-00931322		Communications re Sand
TRN-INV-00936766		Communications re Sand
TRN-INV-00941394		Communications re Sand
TRN-INV-00941553		Communications re Sand
TRN-INV-00941603		Communications re Sand
TRN-INV-00943864		Communications re Sand
TRN-INV-00944070		Communications re Sand
TRN-INV-00944182		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
TRN-INV-00944373		Communications re Sand
TRN-INV-00944552		Communications re Sand
TRN-INV-00988973		Communications re Sand
TRN-INV-00989192		Communications re Sand
TRN-INV-00990248		Communications re Sand
TRN-INV-01009233		Communications re Sand
TRN-INV-01010390		Communications re Sand
TRN-INV-01631955		Communications re Pay Zone
TRN-INV-01797963		Communications re Sand
TRN-INV-01798011		Communications re Sand
TRN-INV-01816193		Communications re Sand
TRN-INV-01824251		Communications re Sand
TRN-INV-01825234		Communications re Sand
TRN-INV-01826544		Communications re Sand
TRN-INV-01826551		Communications re Sand
TRN-INV-01826556		Communications re Sand
TRN-INV-01826561		Communications re Sand
TRN-INV-01826567		Communications re Sand
TRN-INV-01827174		Communications re Sand
TRN-INV-01831195		Communications re Sand
TRN-INV-01838069		Communications re Sand
TRN-INV-01860060		Communications re Sand
TRN-INV-01860739		Communications re Sand
TRN-INV-01861451		Communications re Sand
TRN-INV-01861514		Communications re Sand
TRN-INV-01861578		Communications re Sand
TRN-INV-01861787		Communications re Sand
TRN-INV-01861951		Communications re Sand
TRN-INV-01862535		Communications re Sand
TRN-INV-02003142		Communications re Sand
TRN-INV-02299854		Communications re Sand
TRN-INV-02301634		Communications re Sand
TRN-INV-02373112		Communications re Sand
TRN-INV-02373322		Communications re Sand
TRN-INV-02498771		Communications re Sand
TRN-INV-02500239		Communications re Sand
TRN-INV-02500246		Communications re Sand

BATES RANGE	DATE	SUMMARY / DESCRIPTION
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TRN-INV-02500642		Communications re Sand
TRN-INV-02506029		Communications re Sand
TRN-INV-02506036		Communications re Sand
TRN-INV-02506043		Communications re Sand
TRN-INV-02506048		Communications re Sand
TRN-INV-02506054		Communications re Sand
TRN-INV-02506060		Communications re Sand
TRN-INV-02506067		Communications re Sand
TRN-INV-02506073		Communications re Sand
TRN-INV-02506080		Communications re Sand
TRN-INV-02506086		Communications re Sand
TRN-INV-02506092		Communications re Sand
TRN-INV-02506098		Communications re Sand
TRN-INV-02506104		Communications re Sand
TRN-INV-02506109		Communications re Sand
TRN-INV-02506115		Communications re Sand
TRN-INV-02506121		Communications re Sand
TRN-INV-02506128		Communications re Sand
TRN-INV-02506215		Communications re Sand
TRN-INV-02506513		Communications re Sand
TRN-INV-02506520		Communications re Sand
TRN-INV-02511217		Communications re Sand
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	9/14/2011	The Bureau of Ocean Energy Management, Regulation and Enforcement -- Report Regarding the Causes of the April 20, 2010 Macondo Well blowout (JIT Report)
	7/7/2011	Skripnikova, Galina Deposition Transcript
	7/8/2011	Skripnikova, Galina Deposition Transcript
		Ex. 3549
		Ex. 3550
		Ex. 3551
		Ex. 3533
		Ex. 3534
		Ex. 3535
		Ex. 3536
		Ex. 3537
		Ex. 3538
		Ex. 3539
		Ex. 3540
		Ex. 3541
		Ex. 3542
		Ex. 3543
		Ex. 3544

BATES RANGE	DATE	SUMMARY / DESCRIPTION
		Ex. 3545
		Ex. 3546
		Ex. 3547
		Ex. 3548
		Ex. 3519
		Ex. 3520
		Ex. 3521
		Ex. 3522
		Ex. 3523
		Ex. 3524
		Ex. 3525
		Ex. 3526
		Ex. 3527
		Ex. 3528
		Ex. 3529
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		Ex. 3531
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		Ex. 3377
		Ex. 3378
		Ex. 3379
		Ex. 3380
		Ex. 3381
		Ex. 3382
		Ex. 3383
		Ex. 3384
		Ex. 3385

BATES RANGE	DATE	SUMMARY / DESCRIPTION
		Ex. 3386
		Ex. 3387
		Ex. 3388
		Ex. 3389
		Ex. 3390
		Ex. 3391
		Ex. 3392
		Ex. 3393
		Ex. 3394
		Ex. 3395
		Ex. 3396
		Ex. 3397
		Ex. 3398
		Ex. 3399
		Ex. 3483
		Ex. 3484
		Ex. 3485
		Ex. 3486
		Ex. 3487
		Ex. 3488
		Ex. 3489
		Ex. 3490
		Ex. 3491
		Ex. 3492
		Ex. 3493
		Ex. 3494
		Ex. 3495
		Ex. 3496
		Ex. 3497
		Ex. 3498
		Ex. 3499
		Ex. 3512
		Ex. 3513
		Ex. 3514
		Ex. 3515
		Ex. 3516
		Ex. 3517

BATES RANGE	DATE	SUMMARY / DESCRIPTION
		Ex. 3518
		005 OCS-G 32306 001 SY00BP01 - One Arm Caliper - Borehole Profile.pdf
		006 OCS-G 32306 001 SY00BP01 - Laminated Sand Analysis.pdf
		001 OCS-G 32306 001 SY00BP01 - Dip Display.pdf
		002 OCS-G 32306 001 SY00BP01 - Compensated Neutron.pdf
		003 OCS-G 32306 001 SY00BP01 - Correlation Log (TVD).pdf
		004 OCS-G 32306 001 SY00BP01 - Correlation Log (MD).pdf
	8/26/2011	Hurst, Andrew Expert Report (Pls)
	8/26/2011	Pritchard, David Expert Report (Pls)
	8/26/2011	Bea-Gayle Expert Report (Pls)
	8/31/2011	Heenan, Richard Expert Report (USA)
	8/1/2011	Huffman, Dr. Alan Expert Report (USA)
	9/8/2010	BP Deepwater Horizon Accident Investigation Report (Bly Report)
		SLB Wireline Logs: Sonic Triple_Combo F.Tester OBMI
		Sperry Log Files: MWD Logs SDL Logs 5 Sec Surface Data Cementing Data Depth Data Pit Data
	9/23/2011	Lacy, Stuart Deposition Transcript

BATES RANGE	DATE	SUMMARY / DESCRIPTION
		Schlumberger CDs/DVDs: 1. DVD BP-001253 (Schlumberger): BP-HZN-SNR00000009, BP-HZN-HNR00000049, BP-HZN-CEC079803, BP-HZN-MBI00193578, BP-HZN-2179MDL0060040, BP-TO1505198; 2. CD BP-001224 (Schlumberger Dual OBMI Geology Composite): BP-HZN-SNR00000010, BP-HZN-HNR00000048, GP-HZN-CDC079804, BP-MBI00193579, BP-HZN-2179MDL00060032; 3. CD BP-001254 (Schlumberger LAS PDS Reports): BP-HZN-2179MDL00060041, BP-HZN-SNR0000000, BP-HZN-CDC079802, BP-HZN-MBI00193581, BP-TO1105203; 4. DVD BP-001252 (Schlumberger MDT Complete Report): BP-HZN-SNR00000007, BP-HZN-CDC079801, BP-HZN-MBI00193580, BP-HZN-2179MDL00060039, BP-TO1105196
	9/27/2011	Emanuel, Victor Deposition Transcript
	4/3/2010	Daily Drilling Report
	4/13/2010	MC252_001_ST00BP01_5MD_PHASE_ATTEN.emf
	4/13/2010	BP_MC252_OCSG_32306_ST00BP01_R1D1_MD_TCOM_Final_5in.PDS
	4/13/2010	MC252_001_ST00BP01_5MD_COMBO.emf
	4/12/2010	BP_Macondo_OCSG_32306_001_ST00BP01_MSD_Final.pds
	7/26/2010	BP_MC252_OCSG_32306_001_ST00BP1_R1D1_RTS-LSA-14-inch-wide.pds
	7/26/2010	BP_MC252_OCSG_32306_001_ST00BP1_R1D1_RTS-LAS.las
HAL_0060925		GeoTap Data