Development of a Mud-Pulse High-Temperature Measurement-While-Drilling (MWD) System

Final Report

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Appendix A: Field Test Report

Executive Summary

The overall program objective is to develop a mud-pulse measurement-whiledrilling (MWD) tool for oil and gas drilling operations that can be used where downhole temperatures are as high as 195°C (383°F). The work was planned to be completed in two phases: Phase I and an optional Phase II.

The objectives of Phase I were first to identify critical components of existing MWD systems that can or cannot operate at 195°C. For components not able to meet the higher standard, one of several strategies was pursued: 1) locate high-temperature replacement components, 2) develop new designs that eliminate the unavailable components, or 3) use cooling to keep components at acceptable operating temperatures (under 195°C). New designs and components were then tested under high temperatures in the laboratory. The final goal of Phase I was to assemble two high-temperature MWD prototype tools and test each in at least one low-temperature well to verify total system performance.

Phase II was also envisioned as part of this development. Its objective would be to test the two new high-temperature MWD prototype tools in wells being drilled in the United States where the bottom-hole temperatures were 195°C (or the highest temperatures attainable).

The high-temperature MWD tool **(Figure)** is designed to send directional and formation data to the surface via mud pulses, to aid in the drilling of guided wellbores. The modules that comprise the tool are housed in sealed barrels that protect the electronics from exposure to down-hole fluids and pressures. These pressure barrels are hung inside a non-magnetic collar located above the drilling assembly.

A number of significant accomplishments were achieved during the course of the Phase I project, including:

- Tested two MWD strings for function in an oven at 195°C
- Conducted field test of prototype 195°C MWD tool (at well temperatures up to 140-180°C)



Figure i. High-Temperature MWD Tool

- Tested ELCON hybrid chip with processor, clock, and memory in a custom package for 700 hours at 200°C
- Contracted with APS Technology to conduct study of thermoelectric cooling of downhole electronics
- Conducted successful Peltier cooling test with APS Technology
- Tested and improved the electronics of Sperry Sun's Geiger Muller-based gamma detector for operation at 195°C
- Developed two high-temperature magnetometers (one in-house, one with Tensor)
- Encouraged outside source to develop lithium/magnesium high-temperature batteries (operating temperature of 125 to 215°C)

One of this project's greatest achievements was improvement in Sperry Sun's current tool with changes made as a direct result of work performed under this project. These improvements have resulted in longer life and a more robust MWD tool at the previous temperature rating of 175°C, as well as at higher temperatures.

A field test of two prototype 195°C MWD tools was conducted in Lavaca County, Texas. The purpose of this operation was to provide directional services on a sidetrack of a straight hole. The sidetrack was to intersect the formation up-dip above the water/gas interface. In addition, the gamma tool provided formation data including seam tops and thickness. Results from these field tests indicate progress in the development of a 195°C tool. Although the pulsers failed downhole in both tools, failure of the pulsers was determined to be from mechanical rather than electrical causes.

Analysis of the economics of the 195° C tool highlights the greatest obstacle to future commercialization. Costs to screen individual components, then subassemblies, and finally completed tools for high-temperature operations are very high. Tests to date also show a relatively short life for high-temperature tools – on the order of 300 hours. These factors mean that the daily cost of the tool will be higher (3 to 5 times more) than a conventional tool.

Sperry Sun and the MWD industry have benefited from this program in the following areas:

Pulser Improvements. Several improvements were implemented in "O" ring selection, oil selection, and other areas.

Magnetometer and Calibration Improvements. Work on the magnetometer included upgrades to Sperry Sun magnetometers. This has led to improvements to the design of Sperry Sun's existing magnetometers, which will be beneficial across all directional work.

Software Improvements, Resetting and Power-Up Problems. Software changes that were required in the downhole code and tool programming code provided another opportunity to improve the robustness of the downhole tool string.

Identification of Circuit Design Weaknesses. While screening components for high temperatures, unexpected problems were observed, including voltage reference drift problems and capacitor failures. Voltage reference drift is another candidate for high-temperature semiconductor technology. The capacitor issue identified a failure in the QC process of production.

The project has helped in clearly demonstrating the limitations of the methods Sperry Sun is currently using to produce high-temperature tools. Based on this work, they are considering the available high-temperature technologies and looking at approaches for introducing these technologies over the longer term.

Conclusions and Recommendations

- 1. Results of this development effort showed that, while it is possible to build a mudpulse MWD tool that can operate at 195°C, performance of the current tool is probably not sufficient for commercial success.
- 2. Industry's current R&D goals and perception of future MWD requirements do not focus on operations in hotter and deeper formations.
- 3. Due to the extensive testing required and the high percentage of failing components, use of a binning qualification process to build high-temperature (195°C) MWD tools is cost-prohibitive.
- 4. Increasing the operating temperature of current MWD tools to 195°C and above will require development of a new platform for the electronics used in these tools. This new platform will be based on silicon-on-insulator (SOI) components.
- 5. There are several hindrances to the development of SOI tools for the MWD industry. Most are economic, rather than technological factors.
- 6. DOE leadership and partership with industry can play a significant role in encouraging the development of high-temperature MWD tools to prepare for the future.
- 7. A critical leadership role for the DOE is to convince the industry that future gas reserves will be produced from high-temperature reservoirs.

Development of a Mud-Pulse High-Temperature Measurement-While-Drilling (MWD) System

Project Objectives

The overall objective of this program is to develop a mud-pulse measurementwhile-drilling (MWD) tool for oil and gas drilling operations that can be used where downhole temperatures are as high as 195°C (383°F). The tool is to include a hightemperature (195°C) gamma-ray detector to serve as the formation identification component of the MWD system. Other components in the assembly include triaxial accelerometer and magnetometer suites to provide directional data.

The work was planned to be completed in two phases: Phase I and an optional Phase II. The objectives of Phase I were to:

- Identify critical components of existing MWD systems that can or cannot operate at 195°C
- For those components that cannot meet the new 195°C limit, employ one of the following strategies to achieve required performance: 1) locate high-temperature replacement components, 2) develop new designs that eliminate the unavailable components, or 3) use cooling to keep components at acceptable operating temperatures (under 195°C)
- Test new designs and components under high temperatures in the laboratory
- Assemble two high-temperature MWD prototype tools and test each in at least one low-temperature well to verify total system performance

Phase II was also envisioned as part of this development. Its objective would be to test the two new high-temperature MWD prototype tools in wells being drilled in the United States where the bottom-hole temperatures were 195°C (or the highest temperature attainable in current U.S. deep drilling operations, although at least 185°C). Up to five directional/horizontal wells were planned to be used for the field tests to establish system reliability and the tool's mean-time-between-failure (MTBF) performance.

Project Background

This project was co-proposed by Maurer Technology Inc. (MTI) and Halliburton Energy Services (HES) through its Halliburton Drilling Systems Division. During the course of the project, HES and Dresser Industries merged. The Federal Trade Commission, in their approval of the merger, required Halliburton Drilling Systems to be spun off as a separate company. This new company, called Pathfinder, continued with the improvement of HES's MWD tools, but had limited funding and could not meet the program's cost-sharing requirements. Halliburton's MWD and LWD services would now be handled by Sperry Sun, a former Dresser Industries company. This significantly impacted the project. Under the original proposal, HES's HDS-1 MWD tool was to be upgraded for operation in temperatures up to 195°C. HES had significant corporate motivation to achieve this objective since their standard tool could only be operated up to 150°C and was below the latest industry standards in reliability. The engineering approach to increase temperature limits was to first test the existing tool using highly-accelerated life testing (HALT) equipment to identify components that would function at higher temperatures and components that would fail at higher temperatures. Once components that fail were identified, improved replacement components were to be located and tested. If these could not be found, new designs were to be developed to replace the missing components. This MWD system development process was well under way when Halliburton and Dresser Industries merged.

The first effect of the merger was a complete work stoppage on the project. Halliburton-Sperry Sun now owned the Solar 175 tool previously developed by Sperry Sun. This tool's upper operating temperature is 175°C. The new company thus had different incentives with respect to continuing the project. It took one year to resolve how the contractual obligations were to be meet. In the end, Halliburton-Sperry Sun decided to continue with the project, but would upgrade the existing Solar 175 tool for operations to 195°C.

The new engineering approach was a continuation of Sperry Sun's current "binning" process. In this method, tool components are tested at the desired working conditions. Component lots found to perform satisfactorily are set aside ("binned"). Lots not meeting required performance levels are returned to the manufacturer or discarded. After binning, assemblies and sub-assemblies of components are then tested. This process is very costly, since many components and sub-assemblies must be tested to find enough components that meet acceptable standards. Assembly testing also includes determining failure modes by post-mortem examinations. In cases where component binning or change-out would not achieve required performance, the board design was modified. However, this was considered a last resort, and only minor changes were to be acceptable. The objective was to produce an upgraded Solar 175 tool, not a new 195°C tool.

The effort was also impacted by a complete change in Halliburton personnel assigned to the project. As would be expected, it took time before the new team came "up to speed" on the goals and objectives of the project, and progress could resume. This was further complicated as changeovers in tools and procedures were enacted under the merged companies. In addition, since the Sperry Sun tool was already rated to 175°C (best in the industry at that time) compared to 150°C for HES's HDS-1 tool, the high-temperature MWD market was considered after the merger as a niche market rather than as an opportunity to become the industry leader in high-temperature MWD. These factors led to minimal resources being allocated to the project and slowed its progress. Fortunately, interest in the effort was soon heightened after an important

customer independently approached Sperry Sun and requested MWD tools with higher temperature capabilities.

The merger resulted in some of the work accomplished previously during the project by HES later becoming superfluous to the Halliburton-Sperry Sun effort. That work is still reported here since it was good science and the knowledge gained could help in development with the Solar 195 tool. Other planned activities no longer needed to be pursued since a solution already existed in the merged companies. An example of this was the development of a high-temperature gamma detector based on Geiger Muller tubes. Sperry Sun already had this type of detector available, so that effort was stopped after the merger.

At the end of the effort, Sperry Sun constructed two prototype MWD tools that were successfully tested in the laboratory at 195°C and then field tested in Phase I. Results of these field tests are described in this report.

System Description

The high-temperature measurement-while-drilling (MWD) tool (**Figure 1**) is designed to send directional and formation data to the surface via mud pulses, to aid in the drilling of guided wellbores. The modules that comprise the tool are housed in sealed barrels that protect the electronics from exposure to down-hole fluids and pressures. These pressure barrels are hung inside a non-magnetic collar located above the drilling assembly. Descriptions of the modules and their functions are presented below.



Figure 1. High-Temperature MWD Tool

Telemetry Module (TM). The telemetry module controls the entire tool. It communicates with other modules over the communications line. Data are gathered from the gamma module and directional module, formatted for transmission, and stored in random access memory (RAM) on the TM board. These data can be downloaded at the surface even if they are not relayed via the pulser. The TM also conditions the electric power from the pulser/generator for use by the other modules. The TM uses 512 kB of static RAM divided into 8 kB blocks for continuous memory storage.

Gamma Module (GM). The gamma module measures naturally occurring gamma radiation from formations encountered. It incorporates Geiger Muller tubes because they are rugged and able to survive high temperatures. Conventional gamma sensors based on scintillation technology cannot be used in high-temperature environments because detector performance degrades rapidly at elevated temperatures. Three stacked banks of four Geiger Mueller tubes each make up the sensor section of the GM. None of these tubes are redundant, but are what is required to achieve a statistically accurate count. The Geiger Muller tubes contain a gas that becomes ionized when gamma energy passes through it. This allows high voltage to pass between an anode and cathode, which is recorded as a single pulse. The pulses from all the tubes are added to provide the gamma count. The gamma count is used to determine formation type and transition depths between formations. In horizontal drilling, gamma data are used to steer the drilling assembly within the producing formation.

Pulser/Generator. The pulser module has two functions: to generate electrical power and to restrict the mud flow to create a pressure pulse that can be detected at the surface. It is always connected to the TM and is unique among the modules in this aspect. The pulser contains turbine blades that are driven by the flowing mud to turn a generator and a small hydraulic pump. Power from the generator is sent to the TM for conditioning prior to being sent to the remainder of the tool. The hydraulic pump is used to operate a poppet valve that blocks the flow of mud in the drill string, thereby creating a pressure pulse. The TM controls the pulser operations and encodes data into the pulses that are received and decoded at the surface using a pressure transducer and computer. The pulser is typically found at the top of the MWD stack.

Battery Module (BM). The battery module provides power to the tool when there is no flow of drilling fluid to operate the generator. The MWD tool can operate without a BM, but then could not store data when the rig pumps were off. The BM allows operation during these periods. High-temperature lithium batteries are used in the BM. Halliburton worked with Battery Engineering to develop higher temperature batteries for this project.

Directional Module (DM). The directional module uses magnetometers and accelerometers to measure the compass direction of the bottom-hole assembly and the angle of the hole. These data along with depth are then used to calculate the trajectory of the well. The DM is usually placed near the bottom of the MWD stack so that it will be as close as possible to the drill bit.

Accomplishments

A number of accomplishments were achieved during the course of the project. These are listed below. (More detail is provided in other sections of this report.)

- Tested two MWD strings for function in an oven at 195°C
- Conducted field test of prototype 195°C MWD tool (at well temperatures from 140 to 180°C)
- Tested ELCON hybrid chip with processor, clock, and memory in a custom package for 700 hours at 200°C (see Figure 3)
- Contracted with APS Technology to conduct study of thermoelectric cooling of downhole electronics
- Conducted Peltier cooling test with APS Technology
- Tested and improved the electronics of Sperry Sun's Geiger Muller-based gamma detector for operation at 195°C
- Developed two high-temperature magnetometers (one in-house, one with Tensor)
- Encouraged outside source to develop lithium/magnesium high-temperature batteries (operating temperature of 125 to 215°C)

One of this project's greatest achievements was improvement in Sperry Sun's current tool with changes made as a direct result of work performed under this project. Table 1 lists many of the modifications. These have resulted in improved life and a more robust MWD tool at the previous temperature rating of 175°C, as well as at higher temperatures.

Table 1. Solar 175 System Upgrades to IncreaseOperating Temperature to 195° C

I. Directional Module (DM)

- Increased the life of the DC-DC converter and reduced the amount of 5-volt drift via modifications to the DM power board.
- Special software was used to create the thermal models at $195^{\rm o}\,{\rm C}.$
- Developed magnetometer that operated at 200°C at Cheltenham Engineering Center.

- Worked with Honeywell to develop and test magnetometer package for operation up to 200°C.
- Worked with JAE to provide accelerometer package for operation up to 200°C.
- Changed the download of HC811 code. The appropriate code is stored in all 4 banks of the external EEPROM. This corrects reset problems at temperatures above 175°C.
- Added a brown-out monitor to the power board to insure that HC811 is reset properly.
- Upgraded the CMOS analog switch on the power board.

II. Processor Board

- No hardware was changed in the processor board to reach the 195° C temperatures.
- Changed software to add additional time delay during initialization to allow processor to recover from a Power On Reset when operating above 190° C.
- The only circuit that does not operate reliably at temperatures above 180°C is the Real Time Clock.

III. Power Board

- To solve problems with voltage drift of the precision 5volt reference with time and temperature, it was necessary to decrease the amount of output current the device must source. This increased the life of the reference to approximately 150 hours at 200°C. A reference manufactured by a different vendor was located, that required minor modification to work in Sperry Sun circuit. Five-volt reference used in the power supply circuits prevents drift with temperature and time. Tested three different parts; the ceramic part did not fail after approximately 500 hours at 200°C. Built two 195°C telemetry modules and gamma modules using the new reference chip.
- Increased main power input electrolytic capacitor life to 300 hours at 195°C by lowering the generator supply from 24 volts to 22 volts.

IV. Gamma Module (GM)

 Screened timer chip to operate at higher temperatures. During tests on the first GM's built, we discovered that the high-voltage supply would shut down at temperatures above 183°C. A timer chip used in the high-voltage supply circuit was found to be the cause. We screened different date codes on these devices to find those that would work above the required 195°C. Also tested two other timers from different vendors that will also work in this circuit. Qualification of these new devices is still in process. The GM's built for this project used the screened timers.

• The 5-volt reference chip was changed to the new type.

V. Battery Module

- Changed 5-volt reference chip to a Maxim brand.
- Changed 5-volt supply from just a reference chip to a reference chip with a buffer and current pump system.
- Change of voltage measurements for Battery and Sub-bus by the PIC A/D. Changed divider networks from high impedance to less than 10 k-Ohms.
- Changed instantaneous current measurement impedance to PIC A/D by decreasing from 50 k-Ohms to 10 k-Ohms.
- Added 10 k-Ohm input impedance lines to PIC on the pulse accumulation measurement. This improves long-term average current draw measurement reliability in the PIC.

VI. Pulser

There were three areas (wear, oil compensation, and sealing) where improvements were made to the pulser for high temperatures.

A. Wear

- Conical rams redesigned with increased contact area for reduced wear
- Conical rams retained with anti-rotation spider to eliminate coil spring wear
- Angle plate bearing races changed to high-grade M50 bearing steel
- Angle plate bearing elements changed to Silicon Nitride balls and precision machined cage
- Tapered roller bearing mounting changed to minimize mechanical shock related spalling
- Oil changed to Mobil SHC 1025 to eliminate viscosity breakdown
- 25-micron filter and auger to circulate oil and trap particles

• Metal screen (70 micron) oil filter with conical rams

B. Oil Compensation

- Piston pressure compensation system replaced boot-style design
- Kemlon caps to reduce oil volume
- Pump outer case

C. Sealing

- Changed to 90-durometer O-rings
- Tee-seals on the bulkhead
- HPHT feed-through connectors for the bulkhead

Project Tasks and Work Completed

Following are listed the Phase I tasks with a discussion of the work conducted under each task. Work on many tasks was accomplished both before and after the Halliburton/Sperry Sun merger. To clarify this distinction, work performed before the merger is referred to as "Halliburton" and work after the merger as "Sperry Sun."

Task 1. <u>High-Temperature Characterization of HDS-1 MWD/Gamma Tool</u>

Both Halliburton and Sperry Sun used HALT (highly-accelerated life testing) to characterize the HDS-1 and Solar 175 tools. **Figure 2** shows the HALT equipment used by Sperry Sun. HALT allows accelerated life testing of components by subjecting them to vibration and temperature fluctuations. HALT equipment allows desired cycles and rates to be programmed for each test. The product is monitored during the test for

function. When components fail, they can be replaced and testing continued, if desired. Good correlation between HALT and field life has been observed.

Halliburton and Sperry Sun were both able to identify components or circuit designs that failed as temperatures were increased to 200°C. For circuit design failures, eliminating components or altering the design addressed the shortcomings. Other failures required that new components be substituted for those that could not meet the temperature requirements.



Figure 2. Sperry Sun HALT Equipment

Task 2. Evaluation of High-Temperature Components

Work under this task highlighted a fundamental difference in the approaches of Halliburton and Sperry Sun. Halliburton's goal was to identify, test, and use components that were either designed to operate at higher temperatures or had been specially modified to operate at higher temperatures. Sperry Sun chose to keep the same components (when possible), but identify batches from the manufacturer that functioned at elevated temperatures. One reason for the difference in this philosophy is that Halliburton's then-current tool was initially only rated to 150°C and they realized that their product was falling behind the industry standard as a whole. Sperry Sun's tool currently achieved a rating of 175°C and was a leader in the industry for temperature



Figure 3. ELCON Hybrid Processor Chip for Test

capabilities. Sperry Sun believed that they had already identified components with superior temperature performance and that the project's goal to increase temperature capability to 195°C could be accomplished by locating exceptional batches of components that could survive even higher temperatures.

Halliburton was successful in finding several components that demonstrated improved high-temperature performance. Many of the components were radiation hardened. A major concern at the onset of the project was the performance of the microprocessor and memory chips.

Halliburton located a hybrid chip manufactured by ELCON Technology of Phoenix, Arizona, that was successfully tested at 200°C for over 700 hours. The test was halted at the time of the merger, and was never completed or repeated. Since the chip did not meet Sperry Sun's configuration, it was not considered in their development. **Figure 3** shows the hybrid chip on a test board. It has been isolated so that only the chip will be placed in the test oven and not the

circuit used to operate the chip.

Task 2a.Design of Active
Cooling System

At part of the contract, Halliburton undertook and paid for the work under this subtask, which involved analytical and experimental work on an active cooling system. Halliburton contracted this work to APS Technology of Cromwell, Connecticut. They developed an analytical model to simulate cooling of an MWD system and a dummy board, using resistance heating to simulate electrical components. **Figure 4** shows



Figure 4. TEC Test Setup

the test set-up employed by APS; Figure 5 summarizes temperatures during the test.

Thermoelectric coolers (TEC) were used to remove heat from within a pressure barrel containing the dummy MWD board. Temperature and power data were recorded

as the assembly was operated in an The oil bath represented oil bath. fluids in a hot well just as the dummy represented the board heat generated by MWD components. The data show that TECs can reduce the temperature inside the pressure barrel and on the circuit boards to acceptable levels. Table 2 summarizes the test data. The temperature of the oil bath was manually controlled and held at 200°C while temperatures where measured at two locations on the housing 180° apart at the inside surface of the pressure housing at the TEC and on the dummy board. Power to the TEC was monitored, as was power to the dummy board. The





heat that leaks into the pressure barrel is estimated from the analytical model, and the efficiency of the thermoelectric device (ratio of heat pumped to thermoelectric power consumed – COP) calculated. The data show that the thermal model effectively represented the test. Results indicated that the TEC can reduce the board temperature from 40 to 54° C below ambient temperature. Since this is a sufficient reduction to keep the board cool in wells that are 195° C, it was found that a TEC is a possible solution.

Time	Temperatures					Thermoelectric Coolers		Power						
(min)	Oil	Housing @TEC	Housing @180°	Shell	Board Max.	Board Avg	ÄT TEC	Amps	Volts	Watts	Board	Leak	Total	COP
4	202.4	203.1	202.9	162.3	162.5	162.4	40.8	4.5	8.25	37.125	0	21.4	21.4	0.58
48	200.0	201.1	200.6	173.0	178.3	175.7	28.1	4.5	9.52	42.84	15	14.7	29.7	0.69
72	200.5	202.3	201.5	148.3	148.8	148.5	53.9	7	14.26	99.82	0	28.3	28.3	0.28
105	200.5	202.6	201.8	161.9	167.6	164.7	40.7	7	14.06	98.42	15	21.4	36.4	0.37
131	201.3	204.6	203.2	143.2	144.5	143.8	61.4	9.5	18.96	180.12	0	32.2	32.2	0.18
173	200.8	204.9	203.2	155.2	162.0	158.6	49.7	9.5	18.78	178.41	15	26.1	41.1	0.23

 Table 2.
 Thermoelectric Cooling Test Data

The test data also show that a TEC would consume considerable electrical power, thus requiring the use of a turbine generator. Power would then only be available when the pumps were operating, so a Dewar-type pressure housing would be

needed to insulate the MWD electronics and keep them at rated temperatures for acceptable periods of time while the pumps were off. Both the generator and housing increase the cost of this system. In addition, to achieve higher efficiency, the inside of the Dewar would need to be filled with a dielectric fluid. This makes assembly more difficult since the normal potting medium is not a good heat conductor and space would need to be provided for the dielectric when potting the system.

Despite these drawbacks, a cooling system should be considered in the future for high-temperature MWD systems. The market size for these systems will likely remain small and the potential for development of new high-temperature components is not well defined. Both of these factors will dictate whether cooling is a more economical approach.

Task 3. Design of a High-Temperature Gamma-Ray Detector

Many MWD suppliers, including Halliburton, normally use solid-state gamma detectors. Unfortunately, these devices cannot be used at high temperatures because materials used in their construction will break down. The best way to measure gamma radiation at higher temperatures is with Geiger Muller tubes. One advantage to the Halliburton/Sperry Sun merger was that Sperry Sun already had a gamma detector based on Geiger Muller tubes. Halliburton had received designs from two different companies, but neither of these systems was constructed before the merger. CBG group in Austin, Texas, was one of the companies that quoted on the construction of a Geiger Muller-based gamma detector. Halliburton was preparing to release a purchase order at the time of the merger. Instead, Sperry Sun later performed HALT to determine changes needed to upgrade their Geiger Muller unit to 195°C. Testing highlighted problems in the unit's electronics which were modified and repaired successfully.

Task 4. Selection of High-Temperature Components for Use in MWD/Gamma Tool

Both Halliburton and Sperry Sun used HALT to identify components or batches of components that performed adequately at high temperatures. Halliburton sought to develop new components and designs while Sperry Sun identified areas that could not be addressed through the batch process and redesigned the circuits to eliminate these components.

Halliburton had selected many different high-temperature elements before the project was temporarily halted (due to the merger). The processor and memory selected would likely have been the ELCON hybrid chip set. High-temperature passive components such as resistors and capacitors had been purchased. In addition, board, solder, and potting materials for the 195°C tool had all be selected.

Halliburton had made progress on developing high-temperature magnetometers and accelerometers. ATEC agreed to manufacture high-temperature magnetometers at no cost in return for test data from the project. Japan Aviation Electronics in Tokyo completed tests on accelerometers and it appeared that they had solved problems with long-term drift. Halliburton had also located a radiation-hardened hex buffer IC that was test to 250°C (the limit of their oven).

Halliburton ran HALT on the TCM (telemetry communications module), which developed failures at 160 to 165°C due to E-prom read or write errors. This problem had been anticipated and would have been solved by using flash memory in place of the E-prom.

Halliburton, working with Battery Engineering Inc. of Hyde Park, Massachusetts, had developed a lithium-magnesium battery that would operate in the temperature range of 125-214°C. Lithium thionyl chloride batteries are normally used to provide power for MWD tools. Unfortunately, lithium has a melting point of 180°C, and standard lithium batteries are normally limited to operating temperatures of 160°C and below. If magnesium is alloyed with the lithium anode, operating temperature can be increased, although with a reduction in current capacity (Table 3).

Anode Type	% Magnesium	Melting Point (°C)	Max Oper Temp (°C)	Current Capacity (A-hr)
Lithium	0	180	160	26
Li-Mg	10	202	180	20
Li-Mg	25	220	200	15

 Table 3. Temperature Performance of Li-Mg Batteries (DD size)

Battery Engineering developed high-temperature batteries based on the lithium/magnesium alloy. A size DD battery with 25% magnesium can be safely used to 200°C (as required for this MWD development). Current capacity, while reduced to 15 A-hr, is sufficient for at least 250 circulating hours downhole. The primary disadvantage of this recipe is that power output below 100°C is poor.

At the time the project was paused due to the merger, discussions were taking place to decide if heaters would be used to maintain the temperature of the lithium/magnesium batteries at minimum operational levels, or if a sacrificial nickel-cadmium battery pack would be used to power the tool at lower temperatures. For the approach incorporating a sacrificial battery, a low-temperature battery pack would shut down and the high-temperature batteries come on-line as the tool's temperature rose above 125°C. The low-temperature batteries would be replaced after each run.

Sperry Sun had difficulty in proving two directional packages (magnetometers and accelerometers) for the test. These were the last individual components proven. One was from Sperry Sun's internal research department in Cheltenham, England and the other from Tensor in Austin, Texas. Work with Tensor began under Halliburton, but no contract was ever placed. Tensor had indicated that they could build the 195°C directional package, but never provided a quote to Halliburton. Only one of three units supplied to Sperry Sun was found to qualify at higher temperatures. This area remains as a key item requiring additional work.

The problem components identified by Halliburton for the directional package (magnetometers and accelerometers) were never tested because they dd not fit the

form that Sperry Sun needed. However, the manufacturers felt confident they had succeeded in developing high-temperature components.

Task 5. Design High-Temperature MWD/Gamma Tool

Both Halliburton and Sperry Sun took advantage of the opportunity presented by the project to make changes in the design of their MWD tools. Sperry Sun enhanced many areas of their tool (Table 1 presents a list of major changes that were made and incorporated into their current line of tools). Halliburton was just beginning this task when the merger took place; however, through HALT testing they had identified many changes that would be required to meet the temperature goals.

Task 6. System Fabrication

Halliburton did not have the opportunity to advance as far as system fabrication. Sperry Sun was, in one sense, working on fabrication throughout Tasks 4 and 5 since they used their current system as a base and were only modifying and substituting parts that qualified for higher-temperature service for existing parts. **Figure 6** shows the Sperry Sun tool being loaded into an oven for a high-temperature proof test. **Figure 7** shows the temperature controller during the test. The temperature is 193°C with a set point of 195°C. Both tools were tested and proven in this oven before field testing.





Figure 6. Sperry Sun MWD Tool Being Prepared for Oven Test

Figure 7. Oven Controllers

Task 7. Laboratory Testing

The Sperry Sun tool was under constant laboratory testing during the proofing process. Task 7 was originally conceived for the Halliburton MWD tool since it was basically a new tool (in contrast to Sperry Sun's tool, which had already undergone significant development and testing).

Task 8. Low-Temperature Field Test

A field test was conducted with the two Sperry Sun MWD tools prepared under this project. Originally, this test was to be a shake-out of a new Halliburton tool and therefore was to be conducted at lower temperatures so that problems not related to temperature could be identified. Since the Sperry Sun tool was much closer to a conventional (market-ready) tool, the first test was conducted at elevated temperatures (180°C). While not the tool's limit, this temperature range still represented an ambitious test. (See next section for details on field testing.)

Field Test

A field test of two 195°C MWD tools was conducted in Lavaca County, Texas (**Figure 8**). Sperry Sun's field report is presented in **Appendix A**. The purpose of this operation was to provide directional services on a sidetrack of a straight hole. The sidetrack was to intersect the formation up-dip above the water/gas interface. In addition, the gamma tool provided formation data including seam tops and thickness.

Conventional Solar 175 tools were used in the beginning of the operation. The well temperature at 16,500 ft was 160°C. The prototype 195°C tools were then run instead of the standard Solar 175 tools. The first prototype tool went below the rotary table on August 1, 2001 at 17:30 hours (**Figure 9**). Thirty minutes later, a shallow test was conducted to check for proper operation. At 11:45 hours on August 2, 2001,



Figure 8. Rig Site

the tool reached bottom and drilling was begun. (The long trip time is the result of a rig shut-down for BOP repair.) The first recorded temperature was 178°C. The tool stopped pulsing on August 4, 2001 at 23:00 hours, after operating on bottom for 59 hours. Data downloaded at the surface at the end of the test showed that the tool continued to record data until 1:44 hours on August 5, 2001 – an additional 27 hours. The tool was pulled from the well at 2:30 hours on August 6, 2001. Total downhole hours (from the time the tool moves below the rotary table until it is returned to the surface or fails down hole) was 115 hours.



Figure 9. Tool Preparation

The second prototype tool was run into the well at 3:30 hours on August 6, 2001. Gamma logging of a missed interval from the previous run was begun at 18:30 hours the same day. At 22:00 the tool was on bottom drilling. At 5:30 hours on August 7, 2001 the tool stopped pulsing. The highest temperature recorded was 187.2°C. Drilling continued blind and the tool was pulled from the well on August 13, 2001 at 22:00 hours. Total time below the rotary table was 186.5 hours. Total time before data transmission was lost was 26 hours.

Each of the tools was given a post-mortem examination. The first tool was found to have a failed pulser. Drilling fluid had entered the tool past the poppet seals. The poppet bearings also showed unusual wear. Although the barite content of the field mud was high, the amount of wear on the bearing was unexpected. A typical tolerance for this bearing is 0.003 inches. The bearing in the first tool was found to have a clearance of 0.015 inches. This allowed the poppet to move laterally and damage the seal, ultimately leading to the failure of the pulser. Data from the tool's telemetry module were successfully downloaded after the operation, demonstrating that the electronics had not failed during this run. Battery voltage was very low (which could have been caused by exposure to high temperatures). The special high-temperature batteries do not begin functioning at full voltage until they reach 125°C.

On the second tool, the pulser was also found to have failed. However, a bearing that had been inadvertently left out during assembly caused the premature failure. It was also found that the back-up battery in the telemetry module had vented, which damaged wiring and electronic components. After the battery was removed, attempts to unload memory were unsuccessful due to damage from the battery fluid. Data from this run were determined to be lost. It was not apparent why the battery had vented. Heat could have been a factor, although these batteries should have been capable of operations up to 214°C.

Results from these field tests indicate some progress in the development of a 195°C tool. Failure of the pulsers appears to have been from mechanical rather than electrical causes. The vented battery may indicate that more work is needed in this area, but only further field tests would conclusively highlight the weakness(es). It was particularly unfortunate that the second tool was improperly assembled. Even with a vented battery, data collected from the run would have helped determine how the electronics were performing under elevated temperatures.

Economic Analysis

Analysis of the economics of the 195°C tool highlights the greatest obstacle to future commercialization. Costs to screen individual components, then subassemblies, and finally completed tools for high-temperature operations are very high. Tests to date also show a relatively short life for high-temperature tools – on the order of 300 hours (as compared to approximately 1000 hours for a commercial MWD tool operating at temperatures up to 150°C). These factors mean that the daily cost of the tool will be much higher than a conventional tool. In addition, high-temperature MWD tools are difficult to prepare. For these development efforts, the engineering department made use of highly trained technicians and engineers to prepare these tools. While the normal production staff is well qualified to manufacture tools for conventional applications, it would be difficult for them to prepare, trouble-shoot, and maintain the 195°C tools on a continuing basis.

Table 4 summarizes costs for the extra labor required to produce 195°C tools. These data are then used to calculate a daily cost for the tool. Daily costs are based on an operating life of 300 hours, which was determined from the laboratory testing of the 195°C tools. Table 4 shows additional screening costs to run HALT on components to find those that will function at 195°C.

Tool Module	Standard Cost	Additional Screening Cost	Total Cost
Pulser	-	-	-
TM	-	-	-
DM	-	-	-
GM	-	-	-
BM	-	-	-
Expendables (flow gear, interconnects)	-	-	-
TOTAL	\$129,062	\$48,000	\$177,062

 Table 4. Screening Costs for Higher Temperature Components

Table 5 shows the recovered costs after a field run. This is calculated by subtracting the standard (expected) repair costs from the new equipment cost. The cost of a nonmagnetic drill collar to house the tool is approximately \$30,000.

Tool Module	Standard Cost	Repair Costs	Total Recovered Costs
Pulser	-	-	\$6,927
ТМ	-	-	\$1,300
DM	-	-	\$2,426
GM	-	-	\$2,426
BM	-	-	\$2,426
Total	\$119,753	\$104,248	\$15,505

 Table 5. Recovered Costs

The total cost to operate the tool, excluding manpower, will be the cost of a standard tool plus the cost for additional screening minus the recoverable costs or;

Operating Cost = \$129,062 + \$48,000 - \$15,505 = **\$161,557**

The operating time of 300 hours is equivalent to 12 days; thus, the day rate will be \$13,463. This cost does not include the cost of capital to build the tools or the cost associated with the loss of technical personnel's time when they are needed to keep these tools operating.

Other costs include depreciation (\$282/day) and crew charges (estimated at \$1000/day). The total estimated daily cost for the new tool is \$14,745/day. This cost compares to \$3,000 to \$4,000/day for a Solar 175. Thus, the cost of the 195°C tool is 3 to 5 times more than a conventional tool. It is unlikely that many operators will be willing to pay this price, making the 195°C tool uneconomical to offer commercially.

These estimates are based on an operating life of 300 hours, high costs of screening parts, and a highly technical labor force needed to maintain the prototype

tools. It is difficult to determine whether operational experience could increase operational life and reduce manufacturing and maintenance costs, and thereby reduce the daily rate. Currently, Sperry Sun does not foresee sufficient market size to justify the expense to estimate these parameters. However, it is clear that new gas discoveries will be from increasingly deeper and hotter wells, and that the DOE should aid in the development of tools for these applications. It is also clear that an important area for additional work is to determine what is possible in reducing the costs and extending the life of the 195°C tools.

Benefits to the MWD Industry

Sperry Sun and the MWD industry have benefited from this program in the following areas:

Pulser Improvements. Several improvements were implemented in "O" ring selection, oil selection, and other areas. Many improvements were made to the positive pulser as a result of the 175°C programs, which had taken place before this contract was started with Sperry Sun. Based on project tests, relatively few components of the system needed to be upgraded.

Magnetometer and Calibration Improvements. Work on the magnetometer included upgrades to Sperry Sun (i.e., Tewkesbury) magnetometers in response to higher temperature requirements. This has led to improvements to the design of Sperry Sun's existing magnetometers as used in the Tewkesbury tool family, which will be beneficial across all directional work. Further work was done with Tensor (then Honeywell) in Austin to obtain high temperature. This work showed clearly some of the limitations in the screening strategy Sperry Sun was following. Tensor has included a redesign of the magnetometers with some high-temperature electronics. It proved very difficult to get magnetometers built that perform consistently. This work in turn revealed deficiencies in the modeling methods used to correct errors introduced by temperature. Required modifications to address these findings are still ongoing within Sperry Sun. They are re-evaluating calibration methods for all of our directional tools used in the USA and internationally.

Software Improvements, Resetting and Power-Up Problems. It was discovered as part of this effort hat the processor Sperry Sun was using has anomalous behavior when being reset at high temperatures. This required software changes to be made both in the downhole code and tool programming code. The changes that were required provided another opportunity to improve the robustness of the downhole tool string. This is one of the indicators that translating the processor to a high-temperature semiconductor would be very beneficial in producing a new range of high-temperature tools.

Identification of Circuit Design Weaknesses. As the process of screening MWD components for higher and higher temperatures was conducted, unexpected problems were observed, including voltage reference drift problems

and capacitor failures. Voltage reference drift proved difficult to solve because of its impact on the power supply. (This is another candidate for high-temperature semiconductor technology.) The capacitor issue identified a failure in the QC process of production and led to a re-evaluation of tantalum capacitors and testing under high-stress conditions. This work was undertaken independently (not as part of this contract) with a company, which Sperry Sun subcontracted to investigate this issue. A further conclusion regarding capacitor problems is that only improving the silicon is not enough. To make high-temperature tools, we need to develop designs which eliminate the need for these types of capacitors or work with manufacturers to build very high-temperature (high-capacitance) capacitors. Sperry Sun believes the temperature range of some low (<100,000 pF) capacitor technologies can be extended; however, they are less certain that it will be possible to economically extend high value technologies.

The project has helped in clearly demonstrating the limitations of the methods Sperry Sun is currently using to produce high-temperature tools. Based on this work, they are considering the available high-temperature technologies and looking at approaches for introducing these technologies over the longer term.

Conclusions and Recommendations

- 1. Results of this development effort showed that, while it is possible to build a mud-pulse MWD tool that can operate at 195°C, performance of the current tool is probably not sufficient for commercial success. The current temperature limit of 175°C is apparently the practical limit for conventional electronics. This conclusion is further supported by Sperry Sun's decision to market two tools, one for service up to 150°C and another (the Solar 175) tool for service from 150 to 175°C. This decision was made based on the additional costs to screen components for the Solar tools, which make if more difficult to compete with lower temperature tools from other manufacturers. Currently, the bulk of commercial MWD work is at temperatures below 150°C.
- 2. Industry's current R&D goals and perception of future MWD requirements do not focus on operations in hotter and deeper formations. Sperry Sun (for example) is pursuing the larger segment of the market (operations at less than 150°C). Their corporate vision is not in strict agreement with the DOE's vision that future gas needs for the USA will be met with gas produced from deeper, hotter reservoirs. However, businesses almost always trend toward the high-volume sector(s) of business. This apparent difference in vision may indicate that the service industry does not currently recognize what the future needs will be. The DOE can help bridge this gap in perception by presenting data that demonstrate how much gas is located in high-temperature reservoirs. If this information describing future markets is not readily available, the DOE could fund a study to highlight the quantity and location of current and future high-temperature reserves. These data may then serve to encourage the MWD industry to place resources into development of tools for high-temperature operations.

- 3. Due to the extensive testing required and the high percentage of failing components, use of a binning qualification process to build high-temperature (195°C) MWD tools is very costly. Costs to screen individual components, then subassemblies, and finally completed tools for high-temperature operations are very high. Tests also show a relatively short life for high-temperature tools. These factors mean that the daily cost of an MWD tool developed through binning processes will be much higher than a conventional tool.
- 4. Increasing the operating temperature of current MWD tools will require development of a new platform for the electronics used in these tools. This technology already exists in a limited number of components, and has been used to develop some special geothermal tools. Sandia National Laboratory has taken the lead role in this area and is developing or interested in the development of tools based on silicon-on-insulator (SOI) technology to overcome high geothermal temperatures. Oilfield MWD could make use of SOI technology to develop the next generation of tools that could allow raising the current temperature limit (175°C) not marginally (as seems to be the limit with conventional electronics), but to as high as 300°C.
- 5. There are several hindrances to the development of silicon-on-insulator (SOI) tools for the MWD industry. First is the size of the task at hand. Since this represents a new platform, programming would have to be extensively modified. Sperry Sun and MTI estimate that this is at least a 2-man-year effort. This does not include testing and debugging after programming. Completely new circuits would have to be developed to use the SOI chips now available. In addition, some components still need to be improved for high-temperature use including magnetometers and accelerometers needed for determining direction and trajectory of the well. This project has advanced the development of these components, but more work is needed, including examining other non-conventional technologies to measure primary MWD parameters, angle, and direction. Perhaps one of the most challenging obstacles to the development of the next generation of MWD tools is the (understandable) reluctance of service companies to make obsolete their current inventories of tools.
- 6. DOE leadership and partership with industry can play a significant role in encouraging the development of high-temperature MWD tools to prepare for the future. If the DOE's prediction of future requirements for higher and higher temperatures is correct, then the oil and gas industries could find themselves without proper means to exploit reserves to meet the nation's demand. This could have a significant impact on the US economy. The price of oil and gas is very volatile, and an inability to meet demand can result in rapid price increases. If reserves from hotter reservoirs were soon needed, it could require 2-3 years to develop the tools to efficiently recover them. During this period, prices would continue to rise, increasing the cost of US products and the costs to maintain the current standard of living. The DOE can encourage industry to develop critical components needed to construct new high-

temperature platforms. Providing funding will help reduce the risk and offset the loss for obsolescence of current inventories. Critical components include the magnetometer and accelerometers, as well as the new circuits that implement SOI technology. The final critical area for DOE assistance is in programming required for the new platform. MTI and Sperry Sun believe that the best area to start this work is to develop the primary processor chip using SOI technology. It may be possible to build the current processor using this method, which could reduce reprogramming time. Development of high-temperature directional packages is equally important since these are common to all MWD tools.

Appendix A Field Test Report



a Halliburton company

Technical Services

Job Number: HD-MJ-10113

Solar 195

Lavaca Co., Texas <1 Aug to 14 Aug 2001>

Tech Services Engineers: Harvey Mueller

01 Aug 2001 – 14 Aug 2001

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01 Aug 2001 – 14 Aug 2001

Objectives

- Purpose of Job

This well was a sidetrack to the original straight hole. The target zone produced only water. The well was sidetracked to intersect the target payzone updip and above gas/water contact. The open hole sidetrack was done using Solar 175 directional tools. Directional tools were run to maintain directional control of the wellpath and the Natural Gamma Ray logging tool was included to correlate with offset wells, determine formation tops and payzone thickness.

- Goals

The development Solar 195 tools were run in this well to test the operation and survivability of these tools. Anticipated BHT was expected to be 360° F at a depth of 18400 ft. using 18.5# oil base mud. This would test of the operational capabilities of these tools.

Test Plan

BHT was 321° F at a depth of 16500 toward the end of run 400 using Solar 175 tools. The Solar 195 tools were run on the following and all subsequent runs. The Solar 195 tools are a drop in replacement and will provide surveys and Gamma data.

- NEPA Information

4. Project/Activity Description: The proposed action involves field testing a new drilling services system, specifically a **Solar 195 Directional Gamma MWD tool**, in order to assess the system's performance level. DOE's contractor is responsible for identifying field test opportunities, i.e., a well, and arranging all logistics with the operator (owner) of the well to conduct the drilling system performance test. A wellbore or section of wellbore will be drilled with the motor/bit combination for an <u>appropriately permitted</u> well.

Drill cuttings (sandstone, shale, & limestone fragments) will be generated during operation/testing of the product. These cuttings, however, are <u>not</u> incremental waste. The cuttings will be generated by the well owner's own actions (drilling operations), whether testing of the DOE-sponsored product(s) occurs or not. The well operator/owner is responsible for proper treatment and disposition of the cuttings.

The DOE-sponsored drilling product will be "on location" (at the wellsite) for varying lengths of time. It is anticipated that the drilling system will be on location for about 1 weeks, beginning on or about 24 Jul 2001.

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

5. Brief Description of Affected Environment: Field performance testing of the drilling system will occur in an <u>appropriately permitted</u> well. Testing of the motor/bits will take place in the John W. Hancock, Sr A-1 ST, a **new well**, located 29° 18' N Latitude and 96° 38' W Longitude. The well is owned/operated by Louis Dreyfus Natural Gas and will be located 10 mi SE of Hallettsville, TX. The surface environment in the immediate vicinity is gently rolling grassland associated with local farms and ranches.

The affected environment will be primarily below ground level (subsurface, as a well is being drilled). The drilling, using the **Solar 195 Directional Gamma MWD tool**, will take place in an <u>appropriately permitted</u> well, thus all penetrated strata will be treated in an approved manner, e.g., aquifers isolated, etc.

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Summary

Run 500 Timeline

01 Aug 17:30 Below rotary
01 Aug 18:00 Shallow test
02 Aug 11:45 On bottom and start drilling; First recorded temperature- 353° F
04 Aug 23:00 Tool quit pulsing; Drill ahead blind
05 Aug 01:44 Last good data point in Gamma memory; After this point all Bank A, B and C were filled with 7590 or 7650.
05 Aug 01:54 Gap in gamma data 01:54:42 to 01:58:41
05 Aug 10:16 Gap in gamma data from 10:16:13 to 12:49:49
05 Aug 15:13 Gap in gamma data from 15:13:11 to 06 Aug 02:57:02
06 Aug 02:30 End of run

Run 500 Post Run Evaluation

Mk 8 Pulser 8176

Incoming:

Passed resistance test but failed poppet extension and bench test. No signs of mud leaking out of the tool.

Tear down:

The pulser was full of drilling fluids. The origin of the drill fluid intrusion was the seal pack and the oring seal on the poppet shaft. The o-rings in the seal pack was nibbled. Where the poppet shaft rides on the seal pack the shaft showed some pitting on it. The o-ring on the poppet shaft was extruded and blown inward into the pulser. All the case seal o-rings looked good. The o-rings on the kemlon feedthru's were still sealing but showed some sign's of extrusion. The intermediate case was checked and it had no cracks.

Over view:

The upper bearing was also very worn. The upper bearing in this pulser measured .4491. The old bearing was worn out so far it couldn't be pressed out. A new bearing in the end plug measured .4341 This leaves a gap of .015. This upper bearing ring ID has an extreme amount of wear. We control the ID to within a

TS01-001-HT195: <Solar 195> 01 Aug 2001 – 14 Aug 2001

.0003" tolerance. It wore .015" oversized diametral in a relatively short amount of time. The wear would have allowed for more and more lateral deflection of the poppet.

A new end plug assembly was picked out at random and was measured.

New housing = .5650New bearing O.D. = .5675New bearing I.D. = .4353New bearing I.D. installed = .4341Poppet shaft O.D. = .4341

BM 146746

Incoming:

Downloaded memory data successfully using INSITE. Manually enabled sub bus power from the batteries. Sub bus power was ~10 V. and would fail once CIM I/O card power was removed from the SBM. It appears the batteries were depleted, perhaps due to the short in the end plug.

Tear down:

Tested the SBM electronics at 195°C. The board is still working as it is supposed to. It is measuring the battery voltages, currents, and temperature correctly. The battery over-current protection is also still functioning as specified.

The cells do appear to be near dead from room temperature evaluation. In the next 2 weeks I plan on getting the cells heated up and tested again at or above 125°C. Their present poor performance could be due to the cold room temperature.

Overview:

Run 600 Timeline

06 Aug 03:30 Below Rotary
06 Aug 18:30 Begin reaming to log Gamma over section lost when tool failed on previous run
06 Aug 22:00 On bottom; begin drilling
06 Aug 05:30 Tool quit pulsing; Drill ahead blind.
13 Aug 22:00 End of run

01 Aug 2001 – 14 Aug 2001

Run 600 Post Run Evaluation

Mk 8 Pulser 8178

Incoming:

Passed resistance test but failed poppet extension and bench test. The poppet cap was broken.

Tear down:

The pulser was full of drilling fluids. The origin of the drill fluid intrusion was the seal pack and the oring seal on the poppet shaft. The poppet shaft had two groves in it where it was hitting the end cap. There was no upper bearing in the end cap. This caused premature failure in the bootless top end and the breaking of the poppet cap. All the case seal o-rings looked good. The o-rings on the kemlon feedthru's were still sealing but showed some sign's of extrusion.

The intermediate case was checked and it had no cracks.

Over view:

The upper bearing was not installed and caused the failure of the pulser.

TM 146620

Incoming:

We were unable to communicate with the TM.

Tear down:

Upon pulling the electronics from the case it was found that the backup battery had vented which damaged the wiring to the electronics package. The backup battery was removed and we attempted to communicate with the electronics but were unable to as the vented cell damaged the boards.

Overview:

The backup battery caused the failure on the TM. It has not yet been determined what caused the backup battery to vent.

BM 146747

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Recommendations

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Job Report

- End of Well Report
End of Well Report for Louis Dreyfus Natural Gas

Rig:	H & P 89
Well:	John W. Hancock Sr. #A-1 ST
Field:	Wildcat
Country:	U.S.A.
Job No:	HD-MJ-10113
Date:	08-Jul-01
API No:	42-285-32871-01

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- 2. Operational Overview
- 3. Summary of MWD Runs
- 4. Bitrun Summary
- 5. Directional Survey Data
- 6. Service Interrupt Report

General Information

Company:	Louis Dreyfus N	atural Gas	
Rig:	H & P 89		
Well:	John W. Hancoo	ck Sr. #A-1 ST	
Field:	Wildcat		
Country:	U.S.A.		
API Number:	42-285-32871-0	1	
Sperry-Sun Job Number:	HD-MJ-10113		
Job start date:	08-Jul-01		
Job end date:	09-Aug-01		
North reference:	Grid		
Declination:	5.138	deg	
Dip angle:	58.842	deg	
Total magnetic field:	48529.223	nt	
Date of magnetic data:	01-Jan-70		
Wellhead coordinates N:	29 deg. 18 min ²	1.640 sec North	
Wellhead coordinates E:	96 deg. 38 min 3	34.350 sec West	
Vertical section direction:	122.526	deg	
MWD Engineers:	K. McCoy		T. Bufford
	L. Motl		
Company Representatives:	D. Patton		R. Coates
Company Geologist:			
Lease Name:	John W. Hancoo	ck Sr.	
Unit Number:			
State:	Texas		
County:	Lavaca		

Operational Overview

Sperry-Sun Drilling Services was contracted to provide Solar 175 MWD and directional drilling services for sidetracking the John W. Hancock Sr. A-1 well. MWD services began 08-Jul-01. The sidetrack was completed 12-Aug at a measured depth of 17777. Run 100 was a directional only run to open hole sidetrack the well at 14153' MD. The run started 09-Jul and was completed at 14212' MD 12-Jul after 50 circulating hours. MWD tool RPM's dropped from 3200 to 2200 during the run, but caused no problems during the run. Post-run inspection revealed damaged marine bearings. Run 200 directional / gamma run began 12-Jul and was completed at 15094' MD after 136 circulating hours. MWD tool RPM's caused the intermittent pulsing during the run and ranged from 3200 at run start to 1200 at end of run. Pulser failed post-run poppet extension test. Run 300 began 19-Jul and was completed 20-Jul after MWD guit pulsing after 16.5 circulating hours. Tool sent to R & M for testing. Run 400 began 21-Jul and was completed 31-Jul after 213 circulating hours. MWD setup was changed to compensate for RPM loss during run. Tool RPM's ran from 3900 at start of run to 2200 at end of run. Post run inspection revealed damaged marine bearings. Maximum temperature during run was 332°F. Pulser failed post-run retraction test. Run 500 was the first run for the Solar 195 tool. The run started 01-Aug. at 16719' MD. MWD quit pulsing after 55 circulating hours. Drilled ahead 19 hours without real-time MWD. Tool logged 2 hours after failure before short in end plug turned the subbus off. Maximum temperature prior to failure was 360°F. and maximum temperature recorded in tool was 367 deg. F. Pulser failed post-run retraction test. Run 600 with Solar 195 tool began 06-Aug 17173' MD. Logged 130' of data lost on prior run and started drilling at 2200 06-Aug. MWD guit pulsing at 05:30 07-Aug. Drilled ahead to TD without MWD.^a«



Summary of MWD runs

Run No.	Bit No.	Hole Size (in)	MWD Sensors	Start Depth (ft)	End Depth (ft)	Drill/Wipe Distance (ft)	Run Start Date Time	Run End Date Time	BRT Hrs.	Oper. Hrs.	Circ. Hrs.	Max. Temp. (degF)	Serv. Int.	Trip for MWD	Failure Type
0100	0100	6.75	DIR	14153.00	14212.00	59.00	09-Jul-01 20:00	12-Jul-01 14:00	66.00	66.00	50.00	302.00	No	No	
0200	0200	6.75	DIR-GR	14212.00	15094.00	882.00	12-Jul-01 14:00	19-Jul-01 11:00	165.00	165.00	136.00	289.00	Yes	Yes	Pulser
0300	0300	6.75	DIR-GR	15094.00	15195.00	101.00	19-Jul-01 12:00	20-Jul-01 23:00	35.00	35.00	18.00	304.00	Yes	Yes	Pulser
0400	0400	6.75	DIR-GR	15195.00	16719.00	1524.00	21-Jul-01 01:00	31-Jul-01 13:30	252.50	252.50	213.00	318.00	No	No	
0500	0500	6.75	DIR-GR	16719.00	17173.00	454.00	01-Aug-01 17:30	06-Aug-01 02:30	105.00	105.00	74.00	353.00	Yes	Yes	Pulser
0600	0600	6.75	DIR-GR	17173.00	17777.00	604.00	06-Aug-01 03:30	13-Aug-01 22:00	186.50	186.50	106.00	360.00	Yes	No	Pulser
0601	0600	0.00		17173.00	17777.00	604.00	06-Aug-01 03:30	13-Aug-01 22:00	186.50	186.50	106.00	360.00	Yes	No	
4000	0	0.00		0.00	0.00	0.00	09-Aug-01 16:17	09-Aug-01 16:17	0.00	0.00	0.00	0.00	No	No	
				TOTALS	====>	4228.00			996.50	996.50	703.00)	5	3	

sperr	'y-sun
DRICCING	SERVICES

Bitrun Summary Run Time Data **Drilling Data** Mud Data MWD Run : 0100 Start Depth : Mud Type : Oil Based 14153.00 ft 0100 Rig Bit No: End Depth : 14212.00 ft Weight / Visc: 18.10 90.00 ppg/ spqt Hole Size : 6.75 in 59.00 Chlorides : 0.00 Footage : ft mg/l Run Start : PV/YP: 09-Jul-01 20:00 Avg. Flow Rate : 234.00 58.00 qpm cp / 15.00 lhf2 Run End : 12-Jul-01 14:00 Avg. RPM : 40.00 Solids/Sand : % / TR % 40 rpm BRT Hrs : 66.00 Avg. WOB : 2.00 %Oil / O:W : 53.5 % 90/10 klb 1 Circ. Hrs : 50.00 Avg. ROP : 2.00 fph pH/Fluid Loss: 0.00 pH / 0.00 mptm 66.00 Oper. Hrs : Avg. SPP : 3000.00 302.00 Max. Temp. : degF psig **MWD** Schematics **BHA Schematics** (9) Component Length O.D. I.D. (3)(ft) (in) (in) (8) (7) (6) (2) (5) 6x HWDP 184.78 4.000 2.560 09. Cross Over Sub 2.250 08. 2.67 5.188 (4) 07. **Drilling Jars** 30.15 4.750 2.250 3. MARK VII (1) SN: 102 3x Drill collar 89.41 4.750 2.250 06. 1 x Non-Mag Drill Collar 2.250 05. 31.19 4.750 2. Telemetry Module (3) DWD SlimHole 04. 28.61 4.750 2.810 SN: 132003 (2) 0.00 ft Distance from Bit Float Sub 2.33 4.750 2.250 03. 1. Directional Module 02. 4-3/4"SperryDrillLobe 4/5-6.3s 25.12 4.750 2.794 90554 SN: (1) ft Distance from Bit 0.54 0.00 01. Diamond 6.750 1.920 **MWD** Performance Comments

Job No.: HD-MJ-10113

100% MWD Run. Tool Setup: 35 IMP / 30 IFA Stator / 1.675 DT

Time drilled to sidetrack well.

POOH to change bit type and BHA.

4.75

4.40

4.50

120.50

13270.92 psig

in /

% /

% /

deg /

deg/

deg

HH

100.00

14145.00 ft

14113.00 ft

0.00

%

%

Tool OD / Type :

Min. Inc. :

Max. Inc. :

Final Az. :

Max Op. Press. :

MWD Real-time%: 100.00

MWD Recorded%: 0.00

sperr	'y-sun
DRILLING	SERVICES

Run Tim	Drilling Data			Mud Data					
MWD Run :	0200	Start Depth :	14212.0	0 ft	Mud Type :	Oil Bas	ed		
Rig Bit No:	0200	End Depth :	15094.0	0 ft	Weight / Visc :	17.90	ppg/	64.00	spqt
Hole Size :	6.75 in	Footage :	882.00	ft	Chlorides :	0.00	mg/l		
Run Start :	12-Jul-01 14:00	Avg. Flow Rate :	234.00	gpm	PV / YP :	63.00	ср /	16.00	lhf2
Run End :	19-Jul-01 11:00	Avg. RPM :	45.00	rpm	Solids/Sand :	39.44	% /		%
BRT Hrs :	165.00	Avg. WOB :	10.00	klb	%Oil / O:W :	54	% /	90/10	
Circ. Hrs :	136.00	Avg. ROP :	5.00	fph	pH/Fluid Loss:	0.00	рН /	0.00	mptm
Oper. Hrs :	165.00	Avg. SPP :	3200.00	psig	Max. Temp. :	289.00	degF		
MWD Sch	ematics				BHA Schem	atics			
(4)		 (11) (10) (9) (8) (7) 	Comp	onent			Length (ft)	O.D. (in)	I.D. (in)
			11. 6>	k HWDP			184.78	4.000	2.560
		(6)	10. C	ross Ove	er Sub		2.67	5.188	2.250
(2)			00 2	Drill oo	llor		01 00	4 750	2 250
4. MA			09. 37		liai		91.90	4.750	2.250
	. 90	(5)	08. 2>	k Drill co	llar		60.00	4.750	2.375
3. Tele	emetry Module		07. D	rilling Ja	rs		30.15	4.750	2.250
SN	: 86654	(4)	06. D	rill collar			29.41	4.750	2.375
(1) 0.00	0 ft Distance from Bit	(4)	05 1	x Non-M	lag Drill Collar		31 19	4 750	2 250
2. Dire	ectional Module		04 D				00.04	4 750	2.200
SN	: 90554	(3)	04. D	GWD 3			20.01	4.750	2.010
0.00	D It Distance from Bit	(2)	03. FI	oat Sub			2.33	4.750	2.250
SN	· 156070		02. 4-	-3/4"Spe	rryDrillLobe 4/5	-6.3s	25.10	4.750	2.794
0.00	0 ft Distance from Bit	(1)	01. PI	DC			1.00	6.750	2.560
	Со	mments				MWE) Perfor	mance	
Drilled ahead with slic	ling to build angle.				Tool OD / Type	e: 4.75	5 in	/ HH	
POOH to switch MW	/D tool failure, change bit	and motor.			MWD Real-tim	e%: 100	.00 %	/ 100.	00 %
	stator, 55 deg. imp, 1.070				MWD Recorde	d%: 100	.00 %	/ 0.00	%
					Min. Inc. :	3.20	0 de	g/ 1417	'4.00 ft
					Max. Inc. :	30.2	20 de	g/ 1500	04.00 ft
					Final Az. :	116	.10 de	g	
					Max Op. Press	.: 138	68.92 psi	g	

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DRILLING	SERVICES

Ru	in Time Data	Drilling Data			Mud Data					
MWD Run :	0300	Start Depth :	15094.00	ft	Mud Type :	Oil Bas	ed			
Rig Bit No:	0300	End Depth :	15195.00	ft	Weight / Visc :	17.90	ppg/	75.00	spqt	
Hole Size :	6.75 in	Footage :	101.00	ft	Chlorides :	0.00	mg/l			
Run Start :	19-Jul-01 12:00	Avg. Flow Rate :	238.00	gpm	PV / YP :	60.00	ср /	16.00	lhf2	
Run End :	20-Jul-01 23:00	Avg. RPM :	45.00	rpm	Solids/Sand :	40.5	% /		%	
BRT Hrs :	35.00	Avg. WOB :	5.00	klb	%Oil / O:W :	54	% /	91/9		
Circ. Hrs :	18.00	Avg. ROP :	5.00	fph	pH/Fluid Loss:	0.00	рН /	0.00	mptm	
Oper. Hrs :	35.00	Avg. SPP :	3200.00	psig	Max. Temp. :	304.00	degF			
MWE	D Schematics				BHA Schem	atics				
(4)		 (11) (10) (9) (8) (7) 	Compo	nent			Length (ft)	O.D. (in)	I.D. (in)	
			11. 6x	HWDP			184.78	4.000	2.560	
(2)		(6)	10. Cro	oss Ove	er Sub		2.67	5.188	2.250	
	4. MARK VII		09. 3x	Drill co	llar		91.90	4.750	2.250	
	SN: 102	(5)	08. 2x	Drill co	llar		60.00	4.750	2.375	
	0 Talana structura		07. Dril	lling Ja	rs		30.15	4.750	2.250	
	SN - 132003		06 Dril				20.41	4 750	2 375	
(1)	0.00 ft Distance from Bit	(4)	00. Diii				23.41	4.750	2.575	
	2. Directional Module		05. 1 X	Non-IV	lag Drill Collar		31.19	4.750	2.250	
	SN: 122099	(3)	04. SO	LAR D	GWD SlimHole		28.61	4.750	2.810	
	0.00 ft Distance from Bit	(2)	03. Flo	at Sub			2.33	4.750	2.250	
	1. Gamma Module		02. 4-3	/4" Spe	erryDrill 4/5 6.3 s	stg	25.01	4.750	2.794	
	SN: 78005 0.00 ft Distance from Bit		01 PD	с.		C	1 00	6 750	2 560	
						N // \ / F				
		mments			T 100 (T					
POOH for MW	D. Tool flatlined after 16.5 circ. h	nrs			Tool OD / Type	4.7	5 in	/ HH	o 0/	
Tool Setup: 3	5 IMP / 30 IFA / 1.675 DT				NIVUD Real-time	3%: 90. 40/ · 00.	00 %	/ 90.00	0 %	
					Nin La	u%: 90.	00 %	/ 0.00	%	
					IVIIN. INC. :	31.	nn qeố	j/ 1503	50.00 ft	
					Tinol A-	34.	∠∪ 060	j/ 1513	51.00 Tt	
					wax Op. Press	140	iso.us psi	y		

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DRILLING	SERVICES

Run Time Data **Drilling Data** Mud Data MWD Run : 0400 Start Depth : 15195.00 ft Mud Type : Oil Based 0400 Rig Bit No: End Depth : 16719.00 ft Weight / Visc: 18.40 90.00 ppg/ spqt Hole Size : 6.75 in Footage : 1524.00 ft Chlorides : 0.00 mg/l Run Start : 21-Jul-01 01:00 PV/YP: Avg. Flow Rate : 215.00 74.00 cp / lhf2 qpm 28.00 Run End : 31-Jul-01 13:30 Avg. RPM : 41.5 % 64.00 Solids/Sand : % / rpm BRT Hrs : 252.50 Avg. WOB : 8.00 %Oil / O:W : 53.5 % / klb 91/9 Circ. Hrs : 213.00 Avg. ROP : pH/Fluid Loss: 0.00 8.00 fph pH / 0.00 mptm 252.50 Oper. Hrs : Avg. SPP : 3300.00 Max. Temp. : 318.00 degF psig **MWD** Schematics **BHA Schematics** Length (4)(11)Component O.D. I.D. (ft) (in) (in) (10)(9) (3)(8) (7) 6x HWDP 184.78 4.000 2.560 11. Cross Over Sub 2.250 (6) 10. 2.67 5.188 (2) 2.250 3x Drill collar 91.90 4.750 4. MARK VII 09. SN: 76 2x Drill collar 60.00 4.750 2.375 08. (5) 07. **Drilling Jars** 30.15 4.750 2.250 3. Telemetry Module SN: 86654 06. Drill collar 29.41 4.750 2.375 (4) ft Distance from Bit 0.00 (1) 1 x Non-Mag Drill Collar 4.750 2.250 05. 31.19 2. Directional Module SOLAR DGWD SlimHole 2.810 04. 28.61 4.750 SN: 90554 (3) 0.00 ft Distance from Bit Float Sub 2.33 4.750 2.250 03. (2) 1. Gamma Module 02. 4-3/4" SperryDrill 4/5 6.3 stg 24.40 4.750 2.794 SN: 156070 ft Distance from Bit (1) 0.00 01. PDC 1.00 6.750 2.560

Comments	MWD Performance						
100 % MWD run. POOH to switch BHA, MWD because of hours, and test	Tool OD / Type :	4.75	in /	HH			
BOP's. ^a «35 impeller, 41 stator, 1.675 orifice. ^a «	MWD Real-time%:	100.00	% /	100.00	%		
	MWD Recorded%:	100.00	% /	0.00	%		
	Min. Inc. :	34.30	deg /	15131.00	ft		
	Max. Inc. :	48.30	deg /	16661.00	ft		
	Final Az. :	119.10	deg				
	Max Op. Press. :	15996.74	psig				

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DRILLING	SERVICES

Run Time Data **Drilling Data** Mud Data MWD Run : 0500 Start Depth : 16719.00 ft Mud Type : Oil Based 0500 Rig Bit No: End Depth : 17173.00 ft Weight / Visc: 18.50 ppg/ 63.00 spqt Hole Size : 6.75 in Footage : 454.00 Chlorides : 0.00 mg/l ft Run Start : 01-Aug-01 17:30 PV/YP: Avg. Flow Rate : 211.00 48.00 7.00 lhf2 qpm cp / Run End : Avg. RPM : Solids/Sand : % 06-Aug-01 02:30 55.00 41.5 % / rpm BRT Hrs : 105.00 Avg. WOB : 10.00 %Oil / O:W : 53 % / klb 91/9 Circ. Hrs : 74.00 Avg. ROP : pH/Fluid Loss: 0.00 0.00 12.00 fph pH / mptm Oper. Hrs : 105.00 Avg. SPP : 3200.00 Max. Temp. : 353.00 degF psig **MWD** Schematics **BHA Schematics** (11)Component Length O.D. I.D. (5) (ft) (in) (in) (10)(9) (4) (8) (3) (7) 5. Mark VIII 11. 6x HWDP 184.78 4.000 2.560 SN: 8176 Cross Over Sub 2.688 10. 1.87 5.188 (6) 2.250 5x Drill collar 152.07 4.750 09. 4. Telemetry Module SN: 146619 2.250 (2) **Drilling Jars** 30.15 4.750 08. ft Distance from Bit 0.00 (5) 07. 1x Drill collar 30.50 4.750 2.250 3. Directional Module SN: 146618 1x Non-Mag Drill collar 31.12 4.750 2.250 06. 50.28 ft Distance from Bit DGWD SlimHole 24.47 4.625 3.500 05. (4) 2. Gamma Module (1) Float Sub 2.41 2.250 04. 4.750 (3) SN: 146171 44.10 ft Distance from Bit (2) Integral Blade Stabilizer 5.68 4.750 1.938 03. 1. Battery Probe 02. 4-3/4"SperryDrillLobe4/5-6.3st 24.40 4.750 2.794 SN: 146746 ft Distance from Bit (1) 1.00 0.00 01. PDC 6.750 2.560

Comments	MWD Performance					
MWD Failure. Orifice 1.6375, stator 41, impeller 35	Tool OD / Type :	4.75	in /	HH		
	MWD Real-time%:	70.00	% /	70.00	%	
	MWD Recorded%:	70.00	% /	0.00	%	
	Min. Inc. :	48.30	deg /	16662.00	ft	
	Max. Inc. :	49.10	deg /	16757.00	ft	
	Final Az. :	119.80	deg			
	Max Op. Press. :	16434.81	psig			

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DRILLING	SERVICES

Run Time Data **Drilling Data** Mud Data MWD Run : 0600 Start Depth : Mud Type : Oil Based 17173.00 ft 0600 Rig Bit No: End Depth : 17777.00 ft Weight / Visc: 18.60 74.00 ppg/ spqt Footage : Hole Size : 6.75 in 604.00 Chlorides : 0.00 ft mg/l Run Start : PV/YP: 06-Aug-01 03:30 Avg. Flow Rate : 230.00 49.00 qpm cp / 9.00 lhf2 Run End : 13-Aug-01 22:00 Avg. RPM : 55.00 Solids/Sand : 42 % / % rpm BRT Hrs : 186.50 Avg. WOB : 5.00 %Oil / O:W : 52 klb % 1 90/10 106.00 Circ. Hrs : Avg. ROP : 5.00 fph pH/Fluid Loss: 0.00 pH / 0.00 mptm Oper. Hrs : 186.50 Avg. SPP : 3200.00 360.00 degF Max. Temp. : psig MWD Schematics **BHA Schematics** (5) Component Length O.D. I.D. (11)(ft) (in) (in) (10)(9) (4) (8) (3) (7) 5. Mark VIII 6x HWDP 184.78 4.000 2.560 11. SN: 8178 2.688 10. Cross Over Sub 1.87 5.188 (6) 2.250 5x Drill collar 152.07 4.750 09. 4. Telemetry Module SN: 146620 (2) **Drilling Jars** 4.750 2.250 08. 30.15 ft Distance from Bit 0.00 (5) 07. 1x Drill collar 30.50 4.750 2.250 3. Directional Module SN: 146617 1x Non-Mag Drill collar 31.12 4.750 2.250 06. ft Distance from Bit 0.00 DGWD SlimHole 28.61 3.500 05. 4.625 (4) 2. Gamma Module (1) 2.250 Float Sub 2.41 4.750 (3) 04. SN: 146170 0.00 ft Distance from Bit (2) Integral Blade Stabilizer 4.69 4.750 2.188 03. 1. Battery Probe 02. 4-3/4"SperryDrillLobe4/5-6.3st 25.12 4.750 2.794 SN: 146747

01. PDC

Bitrun Summary

ft Distance from Bit (1)

Comments

0.00

MWD quit pulsing after 13 circulating hours.

Drilled to TD without realtime MWD.

41/35, 1.650 DT orifice.

Tool OD / Type :

Min. Inc. :

Max. Inc. :

Final Az. :

Max Op. Press. :

MWD Real-time%: 25.00

MWD Recorded%: 25.00

1.00

MWD Performance

in 1

% /

% /

deg /

deg/

deg

4.75

48.10

48.30

122.60

166842.00psig

6.750

ΗH

25.00

0.00

17141.00 ft

17012.00 ft

2.560

%

%



Measured	Inclination	Direction	Vertical	Latitude	Departure	Vertical	Dogleg
(foot)	(dogroop)	(dograda)	(foot)	(foot)	(foot)	(foot)	(dog/100f)
(leel)	(degrees)	(degrees)	(leel)	(leel)	(leel)	(ieel)	(deg/1001)
14072.00	3.68	105.75	14067.00	109.35 N	23.75 W	-78.82	TIE-IN
14113.00	4.50	115.00	14107.90	108.31 N	21.03 W	-75.97	2.56
14145.00	4.40	120.50	14139.80	107.16 N	18.83 W	-73.49	1.37
14174.00	3.20	154.50	14168.74	105.86 N	17.52 W	-71.70	8.62
14206.00	5.90	195.90	14200.64	103.48 N	17.59 W	-70.47	12.77
14238.00	7.80	186.90	14232.41	99.74 N	18.30 W	-69.06	6.80
14269.00	8.50	177.00	14263.10	95.36 N	18.43 W	-66.82	5.05
14301.00	9.40	169.30	14294.71	90.43 N	17.82 W	-63.65	4.68
14333.00	9.80	159.70	14326.27	85.31 N	16.39 W	-59.69	5.15
14365.00	10.60	147.10	14357.76	80.28 N	13.85 W	-54.84	7.39
14397.00	11.20	143.70	14389.19	75.31 N	10.41 W	-49.27	2.75
14429.00	11.60	142.80	14420.56	70.24 N	6.63 W	-43.35	1.37
14461.00	12.30	137.20	14451.86	65.18 N	2.37 W	-37.04	4.23
14493.00	12.70	131.30	14483.11	60.35 N	2.59 E	-30.26	4.18
14525.00	13.40	124.40	14514.28	55.94 N	8.30 E	-23.08	5.33
14557.00	14.20	121.00	14545.36	51.82 N	14.72 E	-15.45	3.56
14588.00	15.70	117.10	14575.31	47.95 N	21.71 E	-7.47	5.82
14620.00	16.80	117.80	14606.03	43.82 N	29.66 E	1.44	3.49
14652.00	17.50	116.90	14636.61	39.49 N	38.04 E	10.84	2.34
14684.00	18.50	115.60	14667.04	35.12 N	46.91 E	20.67	3.37
14716.00	19.30	115.60	14697.32	30.64 N	56.26 E	30.96	2.50
14749.00	20.20	115.40	14728.37	25.84 N	66.32 E	42.03	2.73
14781.00	21.50	116.00	14758.28	20.90 N	76.58 E	53.34	4.12
14813.00	23.00	116.70	14787.89	15.52 N	87.44 E	65.38	4.76
14845.00	23.80	116.70	14817.26	9.81 N	98.79 E	78.02	2.50
14877.00	24.70	117.30	14846.44	3.84 N	110.50 E	91.11	2.92
14909.00	25.70	117.30	14875.39	2.41 S	122.61 E	104.67	3.13
14941.00	27.20	116.50	14904.04	8.86 S	135.32 E	118.86	4.82
14973.00	28.70	115.90	14932.31	15.48 S	148.78 E	133.76	4.77
15004.00	30.20	116.10	14959.30	22.16 S	162.48 E	148.91	4.85
15036.00	31.00	115.00	14986.85	29.18 S	177.17 E	165.07	3.05
15068.00	31.60	113.90	15014.19	36.06 S	192.31 E	181.53	2.59
15099.00	33.00	115.00	15040.39	42.92 S	207.39 E	197.93	4.90
15131.00	34.30	117.30	15067.03	50.74 S	223.30 E	215.55	5.69
15162.00	35.80	118.00	15092.41	59.00 S	239.06 E	233.29	5.01
15194.00	37.00	118.70	15118.16	68.02 S	255.78 E	252.23	3.97
15226.00	38.10	118.70	15143.53	77.39 S	272.88 E	271.69	3.44
15258.00	38.80	119.30	15168.59	87.03 S	290.28 E	291.55	2.48
15290.00	39.50	120.10	15193.41	97.04 S	307.83 E	311.73	2.70
15321.00	39.60	120.40	15217.31	106.99 S	324.88 E	331.45	0.70



Measured Depth	Inclination	Direction	Vertical Depth	Latitude	Departure	Vertical Section	Dogleg
(feet)	(degrees)	(degrees)	(feet)	(feet)	(feet)	(feet)	(deg/100f)
15352.00	39.80	119.80	15241.16	116.92 S	342.02 E	351.23	1.39
15384.00	40.70	118.20	15265.59	126.94 S	360.10 E	371.87	4.28
15416.00	41.70	117.60	15289.67	136.80 S	378.73 E	392.88	3.36
15448.00	42.30	117.00	15313.45	146.62 S	397.75 E	414.20	2.26
15479.00	42.70	117.20	15336.30	156.16 S	416.40 E	435.05	1.36
15511.00	43.00	117.10	15359.76	166.09 S	435.76 E	456.72	0.96
15543.00	43.10	117.20	15383.15	176.06 S	455.20 E	478.47	0.38
15575.00	43.70	116.90	15406.40	186.06 S	474.78 E	500.35	1.98
15607.00	43.80	117.10	15429.51	196.10 S	494.50 E	522.38	0.53
15639.00	44.00	117.00	15452.57	206.20 S	514.26 E	544.47	0.66
15671.00	44.20	117.10	15475.55	216.32 S	534.09 E	566.63	0.66
15703.00	44.30	116.90	15498.47	226.46 S	553.99 E	588.86	0.54
15735.00	44.40	117.50	15521.35	236.69 S	573.88 E	611.13	1.35
15766.00	44.70	117.10	15543.45	246.66 S	593.21 E	632.79	1.33
15799.00	44.90	116.80	15566.86	257.20 S	613.94 E	655.93	0.88
15831.00	45.30	116.70	15589.45	267.40 S	634.18 E	678.48	1.27
15863.00	45.40	116.10	15611.94	277.52 S	654.57 E	701.12	1.37
15895.00	45.60	116.30	15634.37	287.60 S	675.05 E	723.80	0.77
15927.00	45.60	115.60	15656.76	297.60 S	695.61 E	746.51	1.56
15959.00	45.90	115.90	15679.09	307.56 S	716.25 E	769.28	1.15
15991.00	46.00	115.70	15701.33	317.57 S	736.96 E	792.12	0.55
16023.00	46.10	115.20	15723.54	327.47 S	757.76 E	814.98	1.17
16054.00	46.50	114.90	15744.96	336.96 S	778.06 E	837.20	1.47
16086.00	46.60	115.50	15766.97	346.85 S	799.08 E	860.24	1.40
16118.00	46.90	114.60	15788.90	356.72 S	820.20 E	883.35	2.25
16150.00	46.90	114.50	15810.76	366.43 S	841.45 E	906.49	0.23
16182.00	47.20	114.80	15832.56	376.20 S	862.74 E	929.69	1.16
16214.00	46.70	116.20	15854.41	386.26 S	883.85 E	952.90	3.56
16246.00	46.70	117.10	15876.35	396.71 S	904.66 E	976.07	2.05
16278.00	46.30	118.60	15898.38	407.55 S	925.18 E	999.20	3.62
16310.00	46.50	118.80	15920.45	418.68 S	945.51 E	1022.32	0.77
16342.00	46.60	119.10	15942.46	429.92 S	965.84 E	1045.51	0.75
16374.00	46.80	118.40	15964.40	441.13 S	986.26 E	1068.74	1.71
16437.00	46.00	119.10	16007.85	463.07 S	1026.25 E	1114.27	1.50
16501.00	46.40	118.70	16052.15	485.39 S	1066.69 E	1160.37	0.77
16533.00	46.60	118.70	16074.17	496.54 S	1087.05 E	1183.53	0.62
16565.00	46.80	118.60	16096.12	507.70 S	1107.49 E	1206.76	0.67
16597.00	47.20	119.20	16117.94	519.02 S	1127.98 E	1230.12	1.86
16629.00	47.70	118.90	16139.58	530.46 S	1148.59 E	1253.65	1.71
16661.00	48.30	119.10	16161.00	541.99 S	1169.39 E	1277.39	1.93



Measured Depth	Inclination	Direction	Vertical Depth	Latitude	Departure	Vertical Section	Dogleg
(feet)	(degrees)	(degrees)	(feet)	(feet)	(feet)	(feet)	(deg/100f)
16693.00	49.00	118.30	16182.14	553.53 S	1190.46 E	1301.35	2.88
16757.00	49.10	118.80	16224.08	576.63 S	1232.92 E	1349.57	0.61
16821.00	48.80	119.10	16266.11	599.99 S	1275.15 E	1397.75	0.59
16885.00	48.60	119.10	16308.35	623.37 S	1317.16 E	1445.74	0.31
16949.00	48.30	119.80	16350.80	646.92 S	1358.87 E	1493.57	0.94
17012.00	48.30	121.20	16392.71	670.79 S	1399.40 E	1540.57	1.66
17077.00	48.20	121.90	16436.00	696.17 S	1440.72 E	1589.06	0.82
17141.00	48.10	122.60	16478.70	721.61 S	1481.04 E	1636.73	0.83
17777.00	48.10	122.60	16903.44	976.65 S	1879.84 E	2110.11	0.00



CALCULATION BASED ON Minimum Curvature METHOD

SURVEY COORDINATES RELATIVE TO WELL SYSTEM REFERENCE POINT TVD VALUES GIVEN RELATIVE TO DRILLING MEASUREMENT POINT

VERTICAL SECTION RELATIVE TO WELL HEAD VERTICAL SECTION IS COMPUTED ALONG A DIRECTION OF 122.53 DEGREES (GRID) A TOTAL CORRECTION OF 3.98 DEG FROM MAGNETIC NORTH TO GRID NORTH HAS BEEN APPLIED

> HORIZONTAL DISPLACEMENT IS RELATIVE TO THE WELL HEAD. HORIZONTAL DISPLACEMENT(CLOSURE) AT 17777.00 FEET IS 2118.41 FEET ALONG 117.45 DEGREES (GRID)

TIE-IN SURVEY AT 14072' MD IS PROVIDED BY MULTI-SHOT. SURVEYS FROM 14113' MD TO 17141' MD IS PROVIDED BY SPERRY-SUN MWD. SURVEY AT 17141' MD IS PROJECTED TO TD AT 17777' MD. SPERRY-SUN ENGINEERS, K. MCCOY AND T. BUFFORD.



Service Interrupt Report

MWD run number :	0500	Time/Date of Failure :	04-Aug-01 23:00
Rig Bit Number :	0500	Depth at time of Failure :	17015.00 ft
MWD Run start time/date :	01-Aug-01 17:30	Lost Rig Hours :	18.00
MWD Run end time/date :	06-Aug-01 02:30		

Rig Activity

Drilling ahead.

Description of Failure

Tool quit pulsing.

Action Taken

Cycled pumps, changed flow rates, changed pressure tranducer, etc... Drilled ahead 19.5 hrs without MWD.

Operation Impact POOH for MWD. Lost 130' of data. Delayed data delivery 24 hrs. 20 hrs lost rig time.

Reason for Failure

Pulser failed poppet retraction test. BM shorted sub bus.



Service Interrupt Report

MWD run number :	0600	Time/Date of Failure :	07-Aug-01 05:30
Rig Bit Number :	0600	Depth at time of Failure :	17233.00 ft
MWD Run start time/date :	06-Aug-01 03:30	Lost Rig Hours :	0.00
MWD Run end time/date :	13-Aug-01 22:00		
Rig Activity			
Drilling ahead.			

Description of Failure

Tool quit pulsing.

Action Taken

Cycled pumps, changed flow rates, changed pressure tranducer, etc... Drilled ahead to TD without MWD.

Operation Impact

POOH for MWD. Lost 600' of data, delayed data delivery 96 hrs.

Reason for Failure

Found nut on top of poppet. Surface test revealed a broken poppet, and was unable to communicate with TM. Poppet failed poppet retraction test.

Sperry-Sun, A Halliburton Company



01 Aug 2001 – 14 Aug 2001

LWD Logs

- Gamma Ray MD log from 16610 to 16760. Last reading from Solar 175 Gamma at 16681. Depths below this point are from Solar 195 Gamma tool.

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001



TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Mud Reports

	Drill	ling	·• .		••	. OIL-	BASE		REPO	RT	No.92		
	Flui	ds	100 A		Date	07/28/2001	Dept		1634	3-117-14	15943 @		
V Jahandan				Spu	Id Dat	04/26/2001	Mud	Туре		Versad	1		
				Water	Dept	h	A	ctivity		Drillin	9	•	
Operator :	Louis Dre	yfus				Field/Are	a: NE. 5	peaks			-		
Report For :	Royce Co	ats		· · ·		Descriptio	n: A-532	2	:				
Well Name :	John Hand	cock Sr.	A-1			Locatio	n: Lavad	a County, T	exas		۰.		
Contractor :	Helmerich	& Payn	e #89			Well No	b. : C388	7					
Report For :	Rick Haw	thorne											
DRILLING /	SSEMBLY	1	CAS	NG			(hhi)				ΔΤΔ		
Bit Size 6.75 in P)C		Surfa	ce	<u> </u>	Hole	(00-)	Pump Make	G.D.P	Z-11	G.D.	PZ-11	
Nozzles 4x12/1	/32*		3.375in @298	6ft (2986TV	D)	934		Pump Size	6 X 1	l in	6 X	11.in	
Drill Pipe Size	Lengt	h	Interme	diate		Active Pits	_	Pump Cap	3.837	gal/stk	3.837	gal/stk	
Drift Pine Size	8/81 Leng	n 9.	625in @1075	lâ (10751TV	<u>D)</u> ,	599 Total Circulation	Pu	mp stk/min	57@9	5%	10 11		
4 in	7075	ft 7	625in @1407	11410 78 (14072TV	m	10tai Circulating	VOE	Pl Bott	ow.Kate	124	(19 gal/n	un Kath	
Drill Collar Size	Leng	h	Production	or Liner		In Storage		Total Ci	inc Time	294 mi	in 167	58 etk	
4.75 in	302	ft ·				975		Circulating]	Pressure		3550 psi	/0 304	
<u> </u>	MUD	PROPE	RTIES					PRODU	CTS USE	DLAST	24 HR	3	
Sample From			PIT@03.	00			Рго	ducts		S	ize	Amt	
LING Temp		Ý	168	42			<u>M-I</u>	BAR BULK		1001	LB BG	175	
Mud Weight		11 h/~*1	10545/155	145 PE	<u> </u>	4	VER	ISACOAT		16	A BK	15	
Funnel Viscositu		10/881	76	<u>r</u> .			VER	DRI ADOOD	3437	50 L	BBG	2	
Rheology Temp		<u></u>	160					DIFET	DANI	1 SOL	A DV	2	
R600/R300			139/79		·	-	SHR	INK WRAP		1 100	RA	780	
R200/R100			1			-	TRU	CKING SERV	ICE	<u>†</u>	EA	80	
R6/R3			-/-			_	ENC	INEERING SI	ERVICE	i i	EA	1	
PV		cP	60			<u> </u>	QUI	CKLIME (KE)	YOX)	50 L	B BG	12	
100/10-20-C	<u> </u>	b/100ft ²	19			`							
API Fluid T and	a	0/100tt ²	5/17/24										
HTHP FI Tomm	<u> </u>	430 min 1/30 min	1 NA	9 2				····		┝───		L	
Cake API/HTHE	<u>,</u>	1/37*	4.000400 _/	<u>*</u>									
Unc Ret Solids		%Vol	40.5			-							
Correct Solids		%Vol	39.9	_ <u>_</u>		-			·	↓		<u> -</u>	
Oil		%Vol	54			-	SO	LIDS EQUIP		SI	ze	Hrs	
Uncorr Water		%Vol	5.5				Der	rick Shaker	. 1	14/1	4/14	0	
Oil/Water Ratio			91/9				Der	rick Shaker		175/17	5/175	24	
Alkal (Pom)			2.8			·	Der	rick Shaker		175/17	5/175	24	
CI WROJE MUC			13500		12 00		D-5	lander		21	2	0	
Lime	·····		21.15	27	7500		D-9	liter		81	4	0	
E-Stability		10/001	1550				-		<u> </u>				
Received Volum	e.	bbl	2907			-					· <u></u>	. <u></u> .	
Returned Volum	8	bbl	377										
Present Volume		bbl	2508								· · ·		
Diff. Volume		bbl	-22										
						_		MUD PRO	PERTY 9	PECIFI	CATION	IS	
			•. •.					W	/eight	Co.	Orders		
	:			_				Visc	cosity	50)-60		
								Fi	utrate	<4 cc	HTHP	<u>)</u>	
A	EMARKS							DEMAG					
19 bbls Oil Add						Drilled head not	and slide to	16343' Inco	cased mud	wt to 19	.0 ppp dr	ie to '	
11 bbis Water A	dded				1	high gas. Last s	urvey @162	278/15898'- 4	6.3 deg. E	IGRN ga	is - 30 to	110	
13 bbls Product	s Added				. 1	units. Conn. gas	700 to 157	0 units, and c	lown time (gas was	800 to 10	175	
4.5 DDIS Mud Bu	uit coived				1	units.							
0 bble Mud Re	turned		:										
2489 bbls Starting	Volume					(corrected for sid	e track wel	n					
2508 bbls Present	Volume					Oil Base Mud C	uttings	,					
-24 bbls Mud Lo	ss /24 hrs				1	00 cu yds Daily	Haul Off						
-902 bbls Camula	tive Mud La	<u>ss 8 b</u>	bls New Hole	Volume		112 cu yds Cum	ilative Hau	Off					
INE DISTR La	it 24 Hrs	MUD VC	L ACCTG	(bbi)		SOLIDS ANAL	Y319	MUD	RHEOLOG	BY & HY	DRAULK	:\$	
NUR UD/SCIVICE	- 1	ni Added	l	0	Salt \	Wt%	27.75	np/ns Va	lucs	n	0.815	/0.815	
Drilling	24	water Ad	ived Dou		Salt (CONC,10/001	7.4	kp/ka (lb	-s'm/100ft	")	0.522	/0.522	
Drilling Trinning	└────┤ <u>╹</u>	nuu NCCE Jumned		<u>v</u>		suce Dolla %	39,93	Bit LOSS	(psi/%)	<u></u>	407	11.5	
Drilling Tripping Circulating	{ r	A DESCRIPTION OF THE OWNER OF THE		18	Aver	e SG Solide	41	Bit Let V-	(mp/nSi	1	321	<u>1.2</u> 50	
Drilling Tripping Circulating Chng Swyl Pkng		hakers	I		L		7.1	104 JOL VC	~ (493)		1 1.		
Drilling Tripping Circulating Chng Swyl Pkng P/U Rot. Head		ihakers vaporati	Den l	6	Low	Gr %	2.6	Annular V	ol DP (fi/n	ain)	181	1.57	
Drilling Tripping Circulating Chag Swyl Pkag P/U Rot. Head Slip Drill Line	I S	ihakers vaporation	DH1	6 0	Low	Gr % Gr Wt. lb/bbl	2.6 23.26	Annular V Annular V	el DP (ft/n	nin) nin)	18	1.57 3.37	
Drilling Tripping Circulating Chng Swyl Pkng P/U Rot. Head Slip Drill Line Dir Survey		ihakers Evaporation Cormation Left in Ho	on ı	6 0 0	Low (Low (High	Gr % Gr Wt, lb/bbl Gr %	2.6 23.26 37.4	Annular V Annular V Crit Vel D	ci DP (ft/n ci DC (ft/n P (ft/min)	nin) nin)	181 233 29	1.57 3.37 93	
Drilling Tripping Circulating Chag Swyl Pkag P/U Rot. Head Slip Drill Line Dir Survey Festing	F F F I I	ihakers Evaporation Cormation Cormation Crip Loss	on i le	6 0 0 0	Low (Low (High High	Gr % Gr Wt, lb/bbl Gr % Gr Wt lb/bbl	2.6 23.26 37.4 549.51	Annular V Annular V Crit Vel D Crit Vel D	el DP (ft/n el DC (ft/n P (ft/min) C (ft/min)	nin) nin)	181 233 29 30	1.57 3.37 93 55	
Drilling Tripping Circulating Chag Swyl Pkag P/U Rot. Head Slip Drill Line Dir Survey Festing Fishing		Shakers Evaporation Cormation Left in Ho Frip Loss Other		6 0 0 0 0	Low (Low (High High	Gr % Gr Wt, lb/bbl Gr % Gr Wt ib/bbi	2.6 23.26 37.4 549.51	Annular V Annular V Crit Vel D Crit Vel D ECD @ 10	el DP (ft/n el DC (ft/n P (ft/min) C (ft/min) 6343 (lb/g	nin) nin) gal)	181 233 29 30 18	1.57 3.37 93 65 .51	

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5

	8 E				AD9 4	A				DODT	B 12 PB	4000	~			• •
				2.U. DI	UX 4204					ate	NU	Deoth	9.	ł		
	·			STON,	TEAAS	05A			7/	24/200	01	1581	0 ft.			
361-886-	-3400	V	VELL	State		Well S	πŢ		Sp	ud Date		Presen	t Act	vity		
OPERATOR			JMBER			-3007 - (CONTRA		,	4/	26/200	01	TVD-	155	75 D	ng 8-15	/H
Louis Drey	fus					Heime	rich & Pa	vne				1	RIG I	NOWR	ER	
OPERATOR P	REPRES	ENTATIVE				CONTR	CTOR REF	RESENT	ATIVE				SEC.	TION-	TOWNSH	P-1
Royce Coa	ts					Dale N	lolar					Ì				
John Hanc	AND NU ock Sr.	MBER			FIE	ELD OR BLO	DCK NUMB	ER	COUNTY	PARISI	H, OF	FSHO	REA	REA	STAT	Έ
BIT DAT	A	r	npit		CCMD12		htti annia vyyy		Lavaca				9/030 /		lex	3S
No Siz	ze	Drill Pipe (OD 5	ID 4.2	76 Len	gth 824	18 MUL	Dola bola	le Pi	mp 1 Ma	ake <i>i</i> V	lodei	UDAT	Garne	DATA	7
6.7	75 in 1	Drill Pipe (DD 4	ID 3.3	34 Len	gth 70	75 Hole	[P	its Siz	ze	6 x 1	11]% E	Eff 9	5 bbi/st	k
SEC PD	c h	Drill Pipe (Drill Collar (1D 1D 25	Len 6 Len	gth ath 44	914	6	46 sp	m 6	1	bbl/min	1	5.58	gal/m	in
Jets 32nd	tin 👘	Drill Collar (OD 4.75	ID 2.2	5 Len	gui 10 ath 30	2	1560	Stume Pu	IMP 2 Ma 78	ake/M 6 x 1	100.000	94.5	Game ff c	r Denver P	Z.
12 12 12 1	2	in	C	ASING C	ATA	1	In Stora	ge We	ight sp	m		bbi/min	1~5		gal/m	in
	i i	Size 13.37	75 T	<u>ማ 😧</u>	O Set	<u>Q</u> 29	395	18	PPg To	tai bbi/m	<u>in</u>	5.58	3	Tota	l gal/min	
Angle 44.2	deg	Size 7.625	<u>у п</u> 5 Т	op 62.	0 Set 10428 Set	02 10/8 02 140	21 In Stone 721 500	ge vve 18		Culating	Pres	104	t inte	400	3,550	2
Dir. 117.	4	Size	T	w @	Set	0	N	lud Type	Bo	ttoms U	p Tim	He 123	ionia I min	Tota	Circ Time	24
Depth 15660) ft	Size	T	op @	Set	0	VE	RSADRIL	- 80	ttoms U	p Stle	<u>s</u> 7,	,527	Tota	Circ.Stks	_
Sample From		MUD	PROPER	UTIES	DIT	ľ	144-1-6-1	470	MUD	PROPE	RTY	SPECI	FICA	TION	9	
Time Sample 1	Taken				3:00 am		vveignt	17.9	PPg Via RECON	COSITY	60 7	-70 s	sec/q	Filtra Than-	nte < 4x	C
Flowline Temp	erature	(deg F)	·		172	TVD	_ Oil Ad	ded:		• 17 b	bls			1.721022		
Mud Weight 4	000)				15810	15575	Water	Added:		- 8 bł	ols					
Funnel Viscosi	rrs/ ity 62	163 deg F	(sec/qt)		70		- Produ	cts Add	ed:	- 1 bb	bls					
Plastic Viscosi	ty 🙆	160 deg F	(cP)		59		Mud B	NIIIC leceive	d	26 ł 0 ł.ł	DDIS nie					
Yield Point (lbr	s/100 sq	ft)	100 **		16		- Mud R	tetumed	4;	0 bl	bis					
API Filtrate (m	1/30 min)	ιω sq π)		0/16	27 1	- Startin	ıg Volur	ne:24	484 bb	Is					
HTHP Filtrate	Q 400	deg F (m	n1/30 min)		2.4		- Preser	nt Volun	ne :25	00 bbl	s					
Cake Thicknes	s (API/	HTHP) (32	2nd (n)		13	1	Mud L	oss / 24	hrs:	- 12 bb	ols Ia					
Oil / Water Con	(%) by wo	(גכ		1	40		- i Cumm		11115							
					e / a	— ,-	Oilhae	a Mud 4	Cuttinge	190 00	IS					
Solids Adjuster	d For Sal	by vol) It (% by vol)			36/6 39.3		Oilbas	e Mud (Haul Off	Cuttings f; 0 cu	yds	is Cun	nm. H	laul	Off: 3	352 cu v	ds
Solids Adjuster Alkalinity Mud (d For Sal (Pom)	by vol) It (% by vol)			39.3 1.8	<i>r</i>	Oilbas Daily I	e Mud (Haul Off	Cuttings f: 0 cu	yds	Cur	nm. H	laul (Off: 3	352 cu y	ds
Solids Adjuster Alkalinity Mud (Lime Content (I Salt Content W	d For Sai (Pom) Ib/bbi) (ster Phe	by vol) It (% by vol)			39.3 1.8 2.34		Oilbas Daily H Drig 8	aul Off	Cuttings f: 0 cu hr, Roll	yds ed stor	Cur Cur Cur	nm. H IRKS tanks	laul s 4 h	Off: 3	352 cu y	ds
Solids Adjuster Alkalinity Mud (Lime Content () Salt Content W Oil / Water Rat	d For Sal (Pom) Ib/bbl) /ater Pha ito	by vol) It (% by vol) Itse (% by W	<i>(</i> t)		35 / 6 39,3 1.8 2.34 2,34 23.84 0		Oilbas Daily H	aul Off	Cuttings f: 0 cu hr, Roll	yds ed sto	Cun Cun tema rage	nm. H IRKS tanks	laul s 4 h	Off: 3	352 cu y	ds
Solids Adjuster Alkalinity Mud (Lime Content (Satt Content W Oil / Water Rat Chlorides Who	d For Sat (Pom) Ib/bbi) /ater Pha iio iie Mud (i	oy vol) It (% by vol) Itse (% by W mg/L)	A;)		35 / 6 39.3 1.8 2.34 23.84 20 / 10 11000 1000		Oilbas Daily I Drig 8'	te Mud (Haul Off	Cuttings f: 0 cu	yds ed stor	Cur Cur REMA rage	nm. H IRKS Tanks	laul s 4 h	Off: 3	352 cu y	ds
Solids Adjuster Alkalinity Mud (Lime Content () Salt Content W Oil / Water Rat Chlorides Who Electrical Stabil Salt Content (Pl	d For Sal (Pom) Ib/bbi) /ater Pha iio iie Mud (i lifty (volta PM)	by vol) It (% by vol) Itse (% by W mg/L)	At)		35 / 6 39.3 1.8 2.34 2.34 23.84 30.1 10 11000 1600 300.4 300.4	1	Oilbas Daily H Drig 8'	aul Off	Cuttings f: 0 cu	yds ed sto	Cur Cur rage	nm. H ARKS tanks	laul s 4 h	Off: 3	352 cu y	ds
Solids Adjuste Alkalinity Mud (Lime Content (Salt Content W Oil / Water Rat Chlorides Who Electrical Stabil Salt Content (Pl	d For Sal (Pom) Ib/bbl) /ater Pha iio ie Mud (i lifty (volta PM)	by vol) It (% by vol) Itse (% by Vi mg/L)	//}		55 / 6 39.3 1.8 2.34 23.84 20 / 10 11000 1600 222,949	1	Oilbas Daily H Drig 8'	to 15' /	Cuttings f: 0 cu	yds ed sto	Cur Cur rage	nm. H IRKS tanks	laul (s 4 h	Off: 3	352 cu y	ds
Solids Adjuster Alkalinity Mud (Lime Content () Galt Content W Oil / Water Rat Chlorides Who Electrical Stabil Salt Content (Pl New Hole (bbbs)	d For Sat (Pom) Ib/bbl) /ater Pha ito he Mud (i lity (volta PM)	by vol) it (% by vol) ise (% by W mg/L) }	At)	5	55 / 6 39,3 1.8 2.34 23,84 30 / 10 11000 1600 222,949 8	<i>1</i>	Oilbas Daily H	aul Off	Cuttings f: 0 cu	yds ed sto	Cur Renter rage	nm. H 1865 Hanks	laul (Off: 3	352 cu y	ds
Solids Adjuste Alkalinity Mud I Lime Content (U Salt Content W Chlorides Who Electrical Stabil Salt Content (Pl Vew Hole (bbls) LCM (lb/bbl)	d For Sai (Pom) Ib/bbl) /ater Pha iio he Mud (i lity (volta PM)	oy vol) it (% by vol) ise (% by W mg/L) i}	At)		39,3 1.8 2.34 23,84 30 / 10 11000 1600 222,949 8	1 1	Oilbas Daily H	to 15' /	Cuttings f: 0 cu	yds ed sto	Cur (2000) rage	nm. H IRKS Hanks	laul s 4 h	Off: :	352 cu y	đs
Solids Adjuste Alkalinity Mud I Lime Content (U Oil / Water Rat Chlorides Who Electrical Stabl Salt Content (Pl Vew Hole (bbls) LCM (bbbb)	d For Sai (Pom) Ib/bbl) /ater Pha io ele Mud (i lity (volts PM))	by vol) it (% by vol) ise (% by W mg/L) }	<i>(t</i>)		85 / 6 39,3 1.8 2.34 23.84 23.84 1000 1000 1000 1600 222,949 8 8		Oilbas Daily f Drig 8'	to 15' /	Cuttings f: 0 cu	yds ed sto	Cun Cun rage	nm. H IRKS tanks	laul (Off: 3	352 cu y	
Solids Adjuste Alkalinity Mud I Lime Content (U Oil / Water Rat Chlorides Who Electrical Stabl Salt Content (Pl Vew Hole (bbls) LCM (bb/bb) 7/24/200 DALLY MUD	d For Sal (Pont) Ib/bbl) /ater Pha io he Mud (I lity (volta PM)) (COST	by voi) it (% by voi) ise (% by W mg/L) }	R)		85 / 6 39,3 1.8 2.34 23.84 23.84 1000 11000 1000 222,949 8 8		Oilbas Daily H Drig 8'	to 15' /	Cuttings f: 0 cu hr, Roll	yds ed stor	IS Cur KENA rage	nm. H IRKS tanks	laul s 4 h	Off: 3	352 cu y	
Solida Adjuste Alkalinity Mud I Lime Content (U Oil / Water Rat Chlorides Who Electrical Stabl Salt Content (P Vew Hole (bbls) LCM (Ib/bbl) 7/24/20 DALLY MUD \$2,707.	d For Sal (Pom) Ib/bbi) /ater Pha ito /ater Pha /ater Pha /ate	by voi) it (% by voi) isse (% by V mg/L) }		ENGR. SE	25 / 6 39,3 1.8 2.34 23.94 23.94 1000 1000 1000 222,949 8 8	PRODUC VERSA	Oilbas Daily H Drig 8'	to 15' /	Cuttings f: 0 cu hr, Roll	yds ed sto	Cur Cur rage	nm. H IRKS tanks	laul s 4 h	Off: 3	352 cu y	
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The recommendations made herein shall not be construed as authorizing the infringement of any valid patent, and are made without assumption of liability by either the software manufacturer or its author, THE MUD COMPANY or its agents, and are statements of opinion only. Oral or written statements are advisory only and may be rejected by the user

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Size	9 625	5 To	<u>.</u> 	0	Set @	29	86	395	_	18	PPG	Total b	bl/min	5.6	7	Total g	ai/min	238
Angle 40 deg Size	7.625	To		10428	Set (2	140	72	500 S		18	DOG DOG	Ann.Ve	illing Pre al. DP	197	filmin	3,5 Ann Ve	50 DC 2	951 153 ft/min
Dir. Size	3	T	70 Q		Set (2		h	Aud T	ype		Bottom	ns Up Ta	ne 12	0 min	Total C	irc.Time	278 min
	; ::::::::::::::::::::::::::::::::::::	PROPER	79 62 1716 S		Set (2		VE	:RSA	DRIL		Bottom	ns Up St	(S 7	7,440	Total C	irc.Stka	17,232
Sample From				PIT			٧	Veight	17	7.9	PPg	Viscos	ity 6	3-70	sec/at	Filtrate	< 4cc	HTHP cc
Time Sample Taken				3:00 an	Ţ						REC	OM:	NOLD	icana	IREA	Mani		
Depth (ft)	(F) ·			1/5	+		4	JII Ad Mater	ded:	:		12	2 bbls					
Mud Weight (ppg)				17.9				Produ	cts /	\dde	:be	3	bbis				÷	
Funnel Viscosity @ 162 Plastic Viscosity @ 160	deg F ((sec/qt)		<u>68</u>			I	Vlud E	Built:			17	7 bbls					
Yield Point (lbs/100 sq ft)	<u>a</u> ca (<u>.</u>		13			-!!	Viud F	Sece	ived	l:		0 bbis					
Gel Strength (10 sec/10 min	n) (Ibs/1	(100 sq ft)		5/1	6	25 /		viua r Startir	veiui no Vi	mea olum	: 1 0 :	(bhis					
HTHP Filtrate @ 400 de	eg F (m	1/30 min)		3	+		F	rese	nt V	olun	1 0 :-	- 2476	bbls					
Cake Thickness (API / HT	HP) (32	ind in)		1:	3	1		Mud L	.OSS	/24	hrs:-		bbls					
Solids Content (% by vol)	<u>al)</u>			41	-		\neg	Jumn Dilbas	n. Mi ve M	ua L ud C	.065:- Cuttin	-3400 ///s	DDIS					
Solids Adjusted For Salt (%	by vol)			40.5	<u>+</u>		-10	Daily	Haul	Off	: 16	cu yd	s Cu	ımm.	Haul (Off: 35	52 cu vo	s
Alkalinity Mud (Pom)	- • • • • • • • •			2.2									R.E.	ARKS:				
Salt Content Water Phase ((% by W	1)		2.86		·	C	Drilling	g 7 t	o 10)'/hr							
Oil / Water Ratio				90 / 1	0	1.												
Electrical Stability (volts)	L)			12000	-+-	·····	_											
Salt Content (PPM)				238385														
New Hole (hble)																		
LCM (Ib/bbi)				8	+		-											
						PRODU	GT	NVEN	TOP	Y								
	M	ĭ.		5								T						
\$1,796.46		Ū					1											
CUMULATIVE COST	Ê.	IESE	1 2						1]
\$66,013.59	על	4	<u> </u>	2	ð											ļ		
Starting Inventory Products Receivert	1,716	4,676		34	0													
Products Returned			 				+											
Used Last 24 Hours	50	511	1	5	5													
Cost Last 24 Hours 1:	1,666	4,165	\$650	00 \$22	100		+]							_			
Used (from IADC)			1-000		7.00		1			-+					+			

GIT, RHEOLOGY, and HY	RALKS	SOLIDS ANAL	YSIS	MUD CONSUL	B ARCN	# (M 60, 51 (2019)	TIO NE	# (+ 1 - 1 - 1 + NIA - 1 A A A		TA DO
Mud Gradient, psi/ft	0.9308	Low Gravity %	4.9	ADDITIONS	bbis	RIG OPERATION			SIZE of	1
Hydrostatic Pressure, psi	14,372	Low Gravity, ppb	44.2	Oil / ABO	12	Rio Uo / Service				795
ECD, ppg	18.37	Bentonite %		Freeh Water	2	Drilling	24.00	Derrick Shaker	3 x 14's	
Bit weight (WOB), lbs	7	Bentonite, ppb	1	Brine Water	<u> </u>	Circulating		Derrick Shaker	3 x 175	24
Bit RPM, rpm	110	Drill Solids %		Mud Built	3	Trioping		Denick Shaker	3 x 175	24
		Drill Solids, ppb	1	Mud Transfer		Surveys		D-Sander		10
Back Ground Gas	130-600	Shale CEC, ppb	1		<u> </u>	Logging		D-Sitter		ا آ
Connection Gas	25-55	D/B Ratio		LOSSES	bbia	Run Casing		D-Gasser		24
Bottom Hole Temp	300	High Gravity %	35.7	Mud Lost	14	Testing	· · · · · ·	· · · · ·		+
Water Meter	42739	High Gravity, ppb	524.3	Mud Dumped	1	Cementing	·	· · · · · · · · · · · · · · · · · · ·		+
	is _	Avg. SG	4.008	Mud Transfer	<u> </u>	Coring / Reaming			····	<u> </u>
500 123 200	A			TOTAL	bbls			· · · · · · · · · · · · · · · · · · ·		+
300 68 100	3	_		Gain / Loss	3					+
ENGINEER	ENG	NEER LOCATION	HOME	PHONE MOR		NE PAGER		AREHOUSEBOCATIO		1
Ina Ramae	10	Arnue Chrieti	261_00	22-6470 261	-112-3	724 261_442_2	734	Reovilla	281_358_0	1181

		M-I	Drill P.O. Bo	b g Fl	uids				REPORT			REPOR	T
		HOU	STON,	TEXAS	S USA				Date 7/21/20	Depti	1 R5 ft		
361-886-3400			State C	County	Well (S/T			Spud Date	e Prese	nt Activity		+ <u></u>
OPERATOR						ACTOR			4/20/20	ion Trug	RIG NU	MBER	<u></u>
OPERATOR REPRES	ENTATIVE			<u> </u>	CONTR	ACTOR R	ayne EPRESE	NTATIVE			89 SECTIC	N-TOWNSHI	P-RANGE
WELL NAME AND NU	MBER				Dale N	Nolar OCK NUM	RER		TV DADIO			1. 1.0747	
John Hancock Sr.	A -1			<u> </u>	E Speak	S		Lava	Ca	n, orran		Texa	E/PROV NS
No Size	Drill Pipe	OD 5	LING AS	SEMBLY 76 Len	igth 77	23 M	JO VOL bbls	UME	Pump 1 N	CIR ake/Model	ULATIO	N DATA	7 - 11
6.75 in Type	Drill Pipe (Drill Pipe (00 4 00	ID 3.3	4 Len Ler	gth 70 ath	75 Ho 89	le 4	Pits 668	Size	6 x 11	% Eff	95 bbl/st	0.0914
SEC. PDC	Drill Collar (Drill Collar (OD 4	ID 2.5	6 Len	gth 1	85 Total C	Circulating	Volume	Pump 2 M	lake/Model	Ga	mer Denver P	n 234 Z - 11
12 12 12 12	in Sizo 12.2	<u> </u>	ASING D	ATA	yui o	In Sto	rage \	Veight	spm	5 x 11 bbl/m	96.Eff	95 bbl/sti gal/mi	<u>(0.0914</u> n
DEVIATION	Size 9.62	5 T	op (2) op (2)	O Set	Q 29 Q 107	66 39 51 In Sto	5 rage \	18 ppg Veight	Total bbl/r Circulating	nin 5.8 Pressure	78 T	otal gal/min 3,470	234 psi
Dir.	512e 7.62: Size	5 T	op @ op @	0428 Set Set	<u>@</u> 140 @	72 50	0 Mud Tvic	8 ppg	Ann.Vel. C Bottome t	DP 194	ft/min A	nn.Vel. DC	249 ft/mia
Depth 15253 ft	Size NUID	T	op @	Set	<u>e</u>		/ERSAD	RIL	Bottoms U	Jp Stics	7,407 T	otal Circ. Time	280 min 17,090
Sample From	· · · · · · · · · · · · · · · · · · ·			PIT	L	Weigh	t 17.9) ppg	D PROPE Viscosity	60-70	Sec/qt F	NS itrate < 4c	c HTHP cc
Flowline Temperature (deg F)			3:30 am 172	<u> </u>	Oil A	dded:-	REC	21 b	ED TOUR bis	TREATN	IEN I	
Depth (ft) Mud Weight (ppg)				15285 17.9		Wate	er Adde	d:	12 b	bis			
Funnel Viscosity @ 1 Plastic Viscosity @	158 deg F 160 deg F	(sec/qt) (cP)		70			ucis Ac Built:	10eq;	1 DC 34 b	dis bis			
Yield Point (lbs/100 sq	ft)			15		Mud	Receiv Return	ed:	0 b	bls			
API Filtrate (mi/30 min)	/min) (ibs/	100 sq ft)		3 1 18	<u> </u>	- Start	ing Vol	ume:	-2454 bt	xls			-
HTHP Filtrate @ 400 Cake Thickness (API/	deg F (m HTHP) (32	11/30 min) 2nd in)		2.6		Mud	ent Vol Loss / :	ume : 24 hrs:-	- 2472 bi 12 bb	ols ols			
Solids Content (% by vo Oil / Water Content (%)	l) by yal)			40.5			m. Muc	Loss:-	-3452 bb	ols			1
Solids Adjusted For Salt	(% by vol)			4 / 5.5		Daily	Haul	Diff: 0 c	ys uyds	Cumm. H	laul Off	: 336 cu yd	s
Lime Content (Ib/bbi)				2.5 3.12		ТІН	Drilling	Βίτο	that sea	REMARKS	A		
Salt Content Water Pha Oil / Water Ratio	se (% by W	(1)		28.49		Back	to sha	akers h	ad 930	Max Gas	w/ 17.	gasw/17. 7 GC Mud	8 GCM,) , Rolled
Chiorides Whole Mud (n Electrical Stability (volte)	ng/L)			14000	······	_ Rese	rve tan	ks, Dril	ling at 10) to 20' / 1	۱r		
Salt Content (PPM)	,,,		2	1530 84,878									1
New Hole (bbis)		· · · · · · · · · · · · · · · · · · ·		4		-							
LCM (b/bbl)					PRODU	T IKG201	UTOBY						
7/21/2019	≦	2		s	E E	<u>5</u>	T		T				<u> </u>
\$2,679.38	RSA	₩	Ë	l S	GR. S	Ϋ́.			ł	{			
CUMULATIVE COST	ROL		Ę	ESE	ERV		{						
Starting Inventory	180	- <u>7</u> 80	53	5.576	<u></u> Ω	<u>5</u> 345	<u> </u>	+		_	<u> </u>		
Products Received Products Returned					<u> </u>		<u> </u>			_			
Used Last 24 Hours Closing Inventory	3	10	3	900	1	5		-					<u>}</u> }
Cost Last 24 Hours	\$211.77	\$434.60	\$200.40	4,676 \$801.00	\$650.00	340 \$224.00	<u> </u>	-{					
USED (ITOM TADIC)			l										
BIT: RHEOLOGY and H Mud Gradient, psi/ft	YORAULK	SO Low Gr	LIOS ANA	17818	MUDICION	SLIMP TIO	N	e distri	BUTION	TOURS	NUDS CO	Nin Kol Hold	IPMENT.
Hydrostatic Pressure, ps ECD, ppg	14,227	7 Low G	avity, ppb	33.5	Oil / ABO	21	Rig U	p / Servic	e 0.50	DEVIC	:/MAKE	SCREE	AS Here
Bit weight (WOB), lbs	7	Benton	ite, ppb		Fresh Wate Brine Wate	er 7 H	Drillin Circul	g	16.50	Derrick Sha	ker ker	3x14	
ou KPM, rpm		Drill So Drill So	lids % lids, ppb	+	Mud Built Mud Trans	fer 1	Trippi	ng	5.00	Derrick Sha	ker	3x17	24
Back Ground Gae Connection Gas	45	Shale C	EC, ppb	╅┈╌┥			Loggir	19		D-Silter			
Bottom Hole Temp	295-30	5 High G	ravity %	36.2	Mud Lost	12	Run C	asing	2.00	D-Gasser			24
METER READIN	42470 IGS	High Gi Avg. SG	navity, ppb	532.7 4.053	Mud Dump Mud Transi	ed internet	Ceme	nting / Reamin					
euu 135 200 309 75 190	6			-1	TOTAL Gain / Loss	bbla			*		;		
ENGINEER Joe Rames	EN	SINCER I	OCATION	HOME	PHONE A	KOBILE P	HONE	PAGE	R W	AREHOUS	LOCAT	ION WHEE	PHONE
The recommendations made	berein shell	not be com		1307-99	2-6470 3	61-442-	3734 3	61-442	-3734	Bee	ville	361-35	8-0181

The recommendations made herein shall not be construed as authorizing the infringement of any valid patent, and are made without assumption of liability by either the software manufacturer or its author, THE MUD COMPANY or its agents, and are statements of opinion only. Oral or written statements are advisory only and may be rejected by the user

	•											
	Drill	ing		1 ***		OIL-E	BASE	D MUD	REPO	DRT I	No.84	4
	Fluid	18			Date	07/18/2001	Dep	th/TVD	149	50 ft / 14	928 ft	
				Spu	d Date	04/26/2001	Mu	d Type		Versad	ril	
Operator :	Louis Dres			VVATOR	Depth	Eield/Ares		Activity		Drilling	.	
Report For	Rover Con	te te					на INE.) На вел	opeaks				
Well Name :	Tohn Linna	us l- C-				Description	1: A-33					
	John Hanc	OCK Sr.	A-1			Location	1: Lava	ca County, T	exas			
Contractor :	Heimerich	& Payn	le #89			Well No.	.: C388	37				
Report For :	Rick Hawt	horne										
DRILLING A	SEMBLY		CAS	SING	<u> </u>	UD VOLUME	(bbl)	<u> </u>	IRCULA	TION D	TA	
Nozzles $4 \times 12 / 1/$	C. FM2831 /32"		Surfa 13 375in (2029)	108 868 (7986TVT	<u>_</u>	Hoic 8914		Pump Make	G.D. F	2-11	<u> </u>	PZ-11
Drill Pipe Size	. Length		Interme	diate		Active Pits		Pump Cap	3.837	gal/stk	3 837	oal/stk
<u>5 in</u>	7388 1	t 9	.625in @1075	1A (10751TVI	D)	617.6	P	ump stk/min			61@	95%
Drill Pipe Size	Lengt			diate	T	otal Circulating	Vol	Fle	ow Rate	2	34 gal/n	nin
Drill Collar Size	Lengt	$\frac{n}{n}$	Production	2ft (140/21 VI	<u> </u>	1499		Bott Total Ci	oms Up	<u>120.4 n</u>	<u>nin 73</u>	43 stk
4.75 in	302 f	t				895		Circulating I	Pressure	209.1 m	400 nsi	+1 <u>2</u> 80K
	MUD	PROPE	ERTIES				Ľ	PRODUC	CTS USE	DLAST	24 HR	5
Sample From			PIT@03	:30		4	Pro	oducts		Si	ze	Amt
Depth/TVD		4- 4	14050/14	078		-	VE	RSACOAT		16/	BK	30
Mud Weight		lb/gsl	17.9@16	2°F		-	VE	ID DIESEI		50 L	S BO	10
Funnel Viscosity		s/qt	64			-	EN	GINEERING ST	RVICE		EA	980
Rheology Temp		۳	160		<u> </u>	1	175	PMD PYRAM	ID SCREE	2 1	EA	2
R600/R300			142/79)]	VE	RSAMUL		55 G/	A DM	1
K200/R100						4						
PV		۳۵	-/3			-						
YP	[ł:	/100ft ²	16			-1				· · · · · ·		
10s/10m/30m Ge	1 It	/100ft ²	3/22/2	7		1				+		
API Fluid Loss	CC/	'30 min	NA]				1		1
HTHP FL Temp	00	'30 min	2.8@400)°F								
Cake APJ/HTHP		1/32"	-/3			-{						
Correct Solids			30 44			-		····				L
Oil	·	%Vol	54			-	SC	LIDS EQUIP	,	84		Hrs
Uncorr Water		%Vol	6			1	De	rrick Shaker		14/14	/14	0
Oil/Water Ratio			90/10				De	rrick Shaker		175/17	5/175	24
Aikal (Pom)			3.8			4	De	rrick Shaker		175/17	5/175	24
Salt			26 75	261	1500	-		Sanger Silter		21:	2	
Lime		Ib/bbi	4.94		100	-		UILUI		51	4	
E-Stability			1360			1						
Received Volume	0	bbl	2907]						
Returned Volume	e	bbl	377			4						
Diff Volume		00l 551	_126									
		100	-130			-		MUD PRO	PERTY	SPECIF	CATION	18
· · · · · · · · · · · · · · · · · · ·						-		W	eight	Co. (Orders	
]		Viso	osity	50	-60	
· · · · · · · · · · · · · · · · · · ·			L			4		Fi	ltrate	<4 cc	HTHP	
			FATHENT					DEMAR				
23 bbls Oil Add	lodi Iodi	ard IR	ca i mcn l		r	milled to 14950	ft Laeter	NEMAR UTVOV at 14000	110) 1109 75 1	den Ros	tom hol	•
15 bbls Water A	dded				te	emperature 286 of	deg. F. Sł	hort tripped wi	th no prot	olems. No	increase	e in
3 bbls Product	s Added				C	hlorides at botto	oms up. E	SKGRN gas =	15 - 50 ur	uits. Trip	gas = 50). Last
41 obls Mud Bu	utt				٥	onnection gas =	60 units.					
0 bbls Mud Re	turned											
2380 bbls Starting	Volume											
2394 bbls Present	Volume				C	il Base Mud Cu	ttings					
-27 ODIS Mud Lo	iss /24 hrs tive Mud T ~	ee Ch	hie Man. Li-1	e Vohene	· "	00 cu yds Daily . 04 cu yds Daily .	Haul Off	108				
TIME DISTR Las	it 24 Hrs		OL ACCTO	(bbn	· · · · · ·	SOLIDS ANAL	1411 VC 1181 YSIS		RHEOLO	GY & HY	SRALU 4	C.S.
Rig Up/Service	0.5 0	il Addec	1	0	Salt W	/1%	26.75	np/na Va	lues		0.846	5/0.846
Drilling	22.5 W	ater Ad	ded	15	Salt C	onc,lb/bbl	7.67	kp/ka (lb	•s^n/100f	t²)	0.431	/0.431
Fripping	1 M	fud Rece	eived	0	Adjust	ted Solid %	39.44	Bit Loss	(psi / %)		462	/ 13.6
Circulating	D	umped		0	Oā/W	ater Ratio	90/10	Bit HHP	(bhp / HS	I)	63	/ 1.8
Uning Swyl Pking	S.	nakers		16	Averg	e SG Solids	4.1	Bit Jet Ve	1 (ft/s)			70
Slip Drill Line		v aporati ormation	1	<u> </u>	Low	n 70 hr Wt. Ih/h-h-l	2.1	Annular V	el DC (#/	min)	24	74 0 36
Dir Survey		eft in Ho	ole	0	High (Jt %	36.7	Crit Vel D	P (ft/min		2	82
Testing	Т	rip Loss		2	High (fr Wt lb/bbl	539.95	Crit Vel D	C (ft/min	, 1)	3	56
Fishing	0	ther		0				ECD @ 14	1950 (lb	gal)	18	3.35
M-I ENG	BR / PHONE	×1 000 -	R	IO PHONE		WAREHOUSE F	PHONE	DAR Y CO	87	CUMUL	ATIVE	COST
orky Marcher	30	51 985-74 30 708-50	715 24	51 798.7111		161 268 010	a	\$ 6 179 T	. 1		760 644	33
			· · · · · · · · · · · · · · · · · · ·	** 120-1111			<u>. </u>	4 3,310.1			100,044	

.

	- 1					OIL-	BAS	ED MUD	REPO	ORT I	No.78	
					Date	7/12/2001	De	pth/TVD	142	02 ft / 14	202 ft	
			[Spud	Date	4/26/2001	м	lud Type		Versadr		
			[Water [Depth		1	Activity	Т	ime Drill	ling	
Operator :	Louis Dreyfus					Field/Area	a:NE	E. Speaks				
Report For :	Dan Patton					Description	n: A-'	532				
Well Name	John Hancook	Sr A	-1			Location	n • T'~	vaca Comb. T	aver	-		1
Contractor	Lialmonial A	Dax and					in • Lial'	vaca County, 1	0792			1
		rayne	# ō 7			well No	o.: C3	887				
Report For :	Rick Hawthor	ne				<u> </u>						1
DRILLING A	SSEMBLY		CASIN	G	M	UD VOLUME	(bbl)	C	IRCUL	TION D	ATA	
Bit Size 6.75 in D	owdco Diamond	-	Surface			Hole		Pump Make	G.D. 1	PZ-11	G.D. 1	PZ-11
Nozzles 1/32"	¥	13.3	375in @2986ft	(2986TVD)	2.1	854.2		Pump Size	6 X 1	11.in	6 X 1	t1.in
Size	Length		Intermedia	ite		Active Pits	Ļ	Pump Cap	3.837	gal/stk	3.837	gal/stk
Drill Pine Sine	0/32 #	9.62	om @10751ft	(10751TVD	¥	570.8		Fump stk/min	· · · ·	·	61@	95%
4 in	7075 A	1 700		11C /1407275/75		oual Circulating	, vol	Flo	w Rate	2	gal/m 4	in 27 - d
Drill Collar Size	Length	/.62 p	roduction or	Liner	4	1423 In Stomac		Botti	oms Up	<u>117.7 π</u>	<u>un 717</u>	// stk
4.75 in	210 8	1	VII UI	-müi		m aronage	ŀ	Circulating E	reconne	233.8 m	10 130	VZ SIK
	MUD PR	OPER	TIES				ł	PRODIC		ED LAST	24 HR9	
Sample From			PIT@03:00)		1	T	Products		Si	ze	Amt
Flow Line Temp)	°F	172			7	ĥ	4-I BAR BULK	· ·	100 1	BBG	50
Depth/TVD		ft 1	4202/1420	2		1	ĥ	/ERSACOAT		1.04	ABK	15
Mud Weight	lb	/gal I	7.9+@161°	Ť		7	Ī	DIL DRI ABSORE	ANT	50 L	BBG	6
Funnel Viscosity	/	s/qt	66]	Ī	CLEAN-UP		5 G/	A CN	5
Rheology Temp		°F	160				N	MUD DIESEL		16/	ABK	835
K600/R300			108/60				E	INGINEERING SI	RVICE	1	EA	1
K200/R100			-/-			_	4	UICKLIME (KEN	ЮX)	50 L	B BG	65
KO/KJ		_	-/3			4	S	SWA (MAGCO)		55 G/	A DM	1
	44: T	CP	48			-	Ľ					
10e/10m/20m 0	1b/10	VIII ²	12			4	Ľ		,			
API Fluid Loss	<u>10/10</u>		4/18/24	··		4	L			1		
HTHP FT Tame	00/30	min	N/A	,			Ļ	<u> </u>		-		
Cake API/UTUE	02/30	1111	2.0(0/400°F	<u></u>			Ļ			_]
Unc Ret Solide		Vol -	400	-		-1	H					
Correct Solide	- 70	Vol				-	H					
Oil		Vol	54 0			-	╞					U
Uncorr Water		Vol	6:0			-4		Derrick Chal-		14/17	108 1/1 4	
Oil/Water Ratio			90/10			-1	H	Jorrick Chaker		19/14	14 5/175	U 22
Alkal (Pom)			4.6			4	H	Perrick Shake		175/17	5/175	23
Cl Whole Mud		ng/l	15000			4	H	-Sander		- 13/11	2	<u>2.3</u>
Salt		Wt	28.12	281	200	1	ĥ	D-Silter		41 97	ž –	0
Lime	lb	/bbl	5.98			1	F-			01	-1	
E-Stability			1160			1	⊢	· · · · · · · · · · · · · · · · · · ·	÷ +			
Received Volum	e	bbi	2907			1	-	<u> </u>				
Returned Volum	e	bbi	377]						
Present Volume		bbl	2320]						
Diff. Volume		bbl	-210		· <u> </u>							
							Ľ	MUD PRO	PERTY	SPECIFI	CATION	8
						1	Ľ	W	eight	Co. (Orders	
·····						1		Visc	osity	50	-60	
						1		Fi	ltrate	<4 cc	HTHP	
<u>.</u>												
R	EMARKS AND	TRE/	ATMENT		Т			REMAR	KS			
20 bbls Oil Ad	ded				B	uilding angle in	n 100%	shale.				
10 DDIS Water /	Added											
7 DOIS PTOQUC	us AUCICO milt											
0 bble Mud B	eceived											
0 bbls Mud R	eturned											
2303 bbls Starting	z Volume											
2320 bbls Present	Volume]o	I Base Mud C	uttince					
-27 bbls Mud L	oss /24 hrs					0 cu yds Daily	Haul C)ff				
-3286 bbls Cumula	ative Mud Loss	1.5 b	bls New Hol	le Volume	2	72 cu yds Cumi	ulative J	Haul Off				
TIME DISTR La	et 24 Hrs MU	DVOL	ACCTO	(bbl)		SOLIDS ANAL	Y818	MUD	RHEOLO	GY & HY	DRAULIC	\$
Rig Up/Service	0.5 Oil A	.dded		0	Salt W	/t%	28.1	2 np/na Va	lues		0.848	0.848
Drilling	22.0 Wate	r Adde	ad T	15	Salt Co	onc,lb/bbl	8.2	2 kp/ka (lb	- •s^n/100	ft²)	0.323/	0.323
Tripping	Mud	Receiv	/ed	0	Adjust	ed Solid %	39.3	9 Bit Loss	(psi / %))	361 /	11.3
Circulating	0.5 Dum	ped		0	Oil/Wa	ater Ratio	90/1	0 Bit HHP	(hhp/H	SI)	497	1.4
Unng Swyl Pkng	1.0 Shak	ers		18	Averge	e SG Solids	4,1	Bit Jet Ve	el (ft/s)	· · ·	15	50
P/U Kot. Head	Evap	oration		10	Low G	т %	2.3	Annular V	el DP (fl	l/min)	249	.36
Dir Summer	Form	ation		0	Low G	r Wt, lb/bbl	20.8	3 Annular V	el DC (f	t/min)	249	.36
Dif Survey		n Hole	;	0	High C	h %	37.	1 Crit Vel D	P (ft/mi	n)	28	80
Tishing	Trip	LOSS	<u> </u>	0	High C	ir Wt lb/bbl	545.	17 Crit Vel D	C (ft/mi	in)	28	30
1.15millig		-			··			ECD @ 14	1202 (11	v/gal)	18.	21
Mark Watnam	art / MONE		RIG	PHONE	1	WAREHOUSE	PHONE	DAILY CO	IST T	CUMUL	ATIVE C	OST
Cell Phone	361 3	08-4781	341 7			761 484						.
	10 100	12-3740	1 3017	70-/11			81	\$ 8,171.8	7	\$	727,774.	27

	Drillina				OIL-I	BASF		REP	ORT	No.36	3
🔳 ' / 💐	Fluids			Date		Dept	th/TVD	<u> </u>			-
📲 ilser di sent			Spud (Date		Mu	d Type				
T			Water De	epth		A	ctivity			·	
Operator : Loui	is Dreyfus				Field/Area	a: NES	peaks				
Report For: Roy	ce Coats				Description	n: A-53	2				
Well Name: J. Ha	ancock Sr A-	I ST			Location	n: Lava	ca County, 7	exas			
Contractor : Hein	nerich & Pay	ne #89			Well No	.: C395	7				
Report For : Dale	Moler										
DRILLING ASSE	MBLY	CASIN	IG	ML	JD VOLUME	<u>(рр)</u>				ATA	
Bit Size 6.75 in Security	FM2831	Surface	•	1	Hole	· · · · · · · · · · · · · · · · · · ·	Pump Make	G.D.	PZ-11	G.D.	PZ-11
Nozzles 4x12 / 1/32*	Langel	9.625in @10751ft	t (10751TVD)	<u> </u>	987.9		Pump Size	6 X	11.in	6 X	11.in
5 in	10210 A	Intermedia 7 625in @140728	800 (14072TVT)		Active Pits		Pump Cap	3,83	7 gal/stk	3.837	gal/stk
Drill Pipe Size	Length	Intermedia	ate	To	tal Circulating	Vol	Fl	ow Rate	1	∠3(0) 96 gal/m	9376 1113
<u>4 in</u>	7075 ft				1638		Bot	oms Up	318.1 г	nin 79	54 stk
Drill Collar Size	Length	Production or	r Liner		In Storage		Total C	irc Time	716.6 m	uin 179	16 stk
4./J m	307 ft	EDTIER		1	880		Circulating	Pressure		970 psi	
Sample From	MUD PROP	PIT@24 0	0		ł	Pr/		018 09		24 HRS	5 Arnt
Flow Line Temp		153	• 		1	M	BAR BUT K	<u></u>	1001	B RG	500
Depth/TVD	f	1 17777/1690	<u> </u>		1	AS	PHASOL SUPF	EME	50 1	BBG	15
Mud Weight	lb/ga	1 19.0@144°	F		1	VE	RSACOAT		10/	A BK	10
Funnel Viscosity	s/q	t 97				VE	RSATROL		50 L	B BG	17
Kheology Temp	<u> </u>	160				OI	DRI ABSOR	BANT	50.L	B BG	12
R000/R300		148/79				CLI	EAN-UP		5 G/	A CN	10
R6/R3					4	MU	D DIESEL		10/	A BK	1128
PV	-1	> 60			4	SA	E-CARB FIN	5 511 Pr 4	50 L	BBG	18
YP	16/100ft	2 10			1	SAL	E-CARBOOA	NOM		550 13120	36
10s/10m/30m Gel	16/100ft	² 3/13/20			1	ME	K II FINE		25 L	BBO	15
API Fluid Loss	cc/30 min	n NA			1	ME	X II MED		25 L	BBG	25
HTHP FL Temp	cc/30 mit	n 2.6@400°I	P			MD	X II COARSE		25 L	B BG	41
Cake API/HTHP	1/32	-/3			-	G-S	EAL		50 L	B BG	34
Our ref Solids	%V0	1 43			-	EN	GINEERING S	ERVICE	1	EA	1
Oil		42.0			4	60		<u>.</u>	5 7		j.j.
Uncorr Water	%Vo	1 5			-	De	rick Shaker		34 4/1/	4/]4	74
Oil/Water Ratio		91/9			1	De	rrick Shaker		175/17	5/175	
Alkal (Pom)		0.8			1	De	rrick Shaker		175/17	5/175	Ō
CI Whole Mud	mg/	1 10500			4						
Jall	%W	t <u>24.73</u>	24730	00	4						
E-Stability	10/00	060			4						
Received Volume	bh	2747			1						
Returned Volume	bb	478			1						
Present Volume	bb	1 2518]						
Diff. Volume	bb	1 +249								,	
					}		MUD PRO	PERTY	SPECIFI	CATION	18
		+					V	reight	<u>Co.</u>	Orders	··
					-	\vdash	V15	iltrate	50	עס-ט. געזידעזה	
·					1		F	utrate	~4 00	-ninr	
REMA	RKS AND TA	REATMENT			l	I	REMAR	หร			******
27 bbls Oil Added				Ci	rculating well	monitoring	gas and loss	s. Grad	ually increa	asing and	
4 bbls Water Added				ma	aintaining 18.9	/19.0 ppg.	B/up #1. 3/	4% inc. i	n retort wa	ter, Cl =	177K.
50 bbls Products Add	led			#2	. 1% inc. in 1	etort wate	r, Cl = 238K				-
0 bble Mud Built	d			Bu	ust 120 bbl of l	icm (31 Pl	(D) for sweep	s and vol	ume. Mud	sample i	S)),
0 bbls Mud Returne	d			EC	CD with nresen	nt theology	and 35 stks is	: 00000000 : 19.3 mm	varuoni ini a⊂ nar/2,5 stke	see helo	
2473 bbls Starting Volu	une			a	9.22).		والشطيفة مرمر فيستنا		.g , av sua	, 0010	•••
2518 bbls Present Volu	me			Ōi	il Base Mud Cu	uttings					
-36 bols Mud Loss /24	hrs	1.F. 1.F		1	6 cu yas Daily	Haul Off					
THE DETS	Hand Loss 0 b	DIS NEW Hole V	/olume	22	4 cu yds Cumu	lative Ha		BUSS	001	704111	~
Rig Un/Service		d I	0 0	alt W/+	W NO ANAL	24 72	mulas V.	the the	JUGT & HY		00 000
Drilling	Water A	dded	4 8	alt Co	nc.lb/bbl	5 75	kn/ka /ii		0ft²)	0.200	0.207
Tripping	Mud Rec	eived	0 4	diuste	ad Solid %	42.59	Bit Loss	(psi/%)	83	/ 8.5
Circulating	Shakers		0 0)il/Wa	ter Ratio	91/9	Bit HHP	(hhp / H	ÍSI)	5	/.1
Ship & Cut	Evapora	lion	7 A	verge	SG Solids	4.1	Bit Jet V	cl (fl/s)			70
Chng Rot. Head	Formatic	n	29 L	.ow Gr	۳%	1.4	Annular V	/el DP (f	t/min)	79	.59
Rig Repair	Left in H	ole	0 L	.ow Gr	r Wt, Ib/bbl	13.07	Annular V	/d DC (i	ft/min)	10	2.3
Wireline Logs	Trip Los	S	0 H	tigh G	τ%	41.2	Crit Vel I)P (ft/m	in)	2	44
1 esting	Other		<u> </u>	iigh G	r Wt ib/bbl	604.67		C (ft/m	<u>ເຫ)</u> ໄປ <i>ແ</i> ລ່ໃ	3	18
DISCUON WORK	Unumped		U	<u> </u>		L		<i>1111</i> (I	orgal)	19	.44
Corky Karcher	361 985-1	7424									
Cell Phone	830 708-	5715 361	798-7111		361 358-01	81	\$ 25,550	0.90	s	230,321	.08

	Drilling			OIL-BA	SED MUD	REPO	DRT No.3	J5
	Fluids		Dat	00/12/2001	Death/TVD	177	77 ft / 18904 ft	<u>. </u>
			Soud Dat	07/09/2001	Mud Type		Versadril	
			Water Dept	ħ	Activity	Ch	roulating Hole	
Operator : Lo	ouis Dreyfus			Field/Area :	NE Speaks			1
Report For : Re	oyce Coats			Description :	A-532			
Well Name : J	Hancock Sr A	-1 ST		Location : 1	Lavaca County,	Texas		
Contractor : H	elmerich & Pay	/ne #89		Well No. : (C3957			
Report For : D	ale Moler							
DRILLING AS	SEMBLY	CASI	NG	MUD VOLUME (bb)		CIRCUL	TION DATA	
Bit Size 6.75 in Secur	nity FM2831	Surface		Hole	Pump Make	• G.D. !	PZ-11 G.I	<u>). PZ-11</u>
Nozzics 4x12 / 1/32	"	9.625in @107516	1 (1075 (TVD)	<u>987.9</u>	Pump Size	6X	11.in: 6. Toel/etk 2.92	X 11.in 7. out/atk
5 in	10210 ft	7.625in @14072f	t (14072TVD)	605.1	Pump stk/min	3.03	44 gal/stk 5.85	@95%
Drill Pipe Size	Longth	Intermedi	ale	Total Circulating Vol		Flow Rate	169 gal	/min
4 in	7075 ft		·	1593	Be	stions Up	180.7 min	1952 stk
4 75 in	Longth 1 307 A	Production o		In Storage	Circulation	CUTC I IMC	<u>393,9 mm 1</u> 7340 m	/419 SLK
T+7+7 448	MUD PRO	PERTIES	······		PROD	UCTS US	ED LAST 24 H	Ř8
Sample From		PIT@24:0	0		Products		Size	Amt
Flow Line Temp	·	°F 152			M-J BAR BULK		100 LB BG	320
Depth/TVD Mud Waisht		n 17777/169	04		VERSACOAT		I GA BK	10
Funnel Viscosity	e/	α∟; ιο.>%(2)144 ∩t 0?	F		CLEANLIP		SULB BG	-+
Rheology Temp		PF 160		—-	MUD DIESEL		1 GA BK	882
R600/R300		144/77			SAFE-CAR9 FT	NE	50 LB BG	90
R200/R100					MIX II FINE		25 LB BG	94
K0/K3		-/3 -/3		··	O-SEAL	·····	50LBBG	. 10
YP	lb/100	ft ² 10			TRIKKING SE	RVICE		- 755
10s/10m/30m Gel	lb/100	R ² 4/17/23			ENGINEERING	SERVICE	1 EA	1
API Fluid Loss	cc/30 m	in NA			VERSAGEL HT		25 KO BO	3
HTHP FL Temp	cc/30 m	in 2.2@400°	F		QUICKLIME (K	ENOX)	50 LB BG	20
Unc Ret Solide	1/3: 	2" -/3			BEADS COARS	E	50 LB BG	10
Correct Solids		ol 42.6			┣		1	
Oil	%V	ol 52			SOLIDS EQU	IP	Size	Hrs
Uncorr Water	%V	ol 5			Derrick Shak	er	14/14/14	24
Oil/Water Ratio		91/9			Derrick Shak	er	175/175/175	<u>; 0</u>
CI Whole Mud		1.0			Derrick Shak			0
Salt	%\ %\	Vt 25.61	256100					·····
Lime	ib/t	bl 1.3						
E-Stability		1210		· ······				
Received Volume	t	DI 2747		_				
Present Volume	C	bi 2473						
Diff. Volume	b	61 +204						
· · · · · · · · · · · · · · · · · · ·					MUD PF	OPERTY	SPECIFICATI	ONS
						Weight	Co. Order	<u>s</u>
					<u>⊢</u> ⊻	iscosity	50-60	
				*****		FIRE	SA CC HIH	<u>ur</u>
RE	MARKS AND	REATMENT	,,,,,,,	 	REN	ARKS		
21 bbls Oil Adder	1			Gained 100 plus bbls	from well while	attempting	to POOH. Circ.	GCMud,
7 bbls Water Ad	ded Added			flaring to 30 ft. Cont	inued to loose mu	d. Pumper	t 40 ppb CarbF/N	AixF
61 bbls Mud Buil	nuutu t			sweep. incorporating	g mto system (14) mud & maintaini	mesn). Cos	unually pumping	3 22.5 ppb
0 bbls Mud Reco	sived			Spot beads and atten	apt POOH. Well	flowed. Ci	inc and adding los	n to
0 bbls Mud Reta	med			system. Transfered	110 bbls of reserv	e mud to a	ctive. Noted a 19	% inc. in
2551 bbls Starting V	/olume			retort water on botto	ms up.			
2473 DDIS Present V	osume v /24. bre			Uil Base Mud Cuttin	ജ ജ			
1134 bbls Cumulati	ve Mud Loss	bbls New Hole	Volume	208 cu yos Dally Ha	ve Haul Off			
TIME DISTR Last	24 Hrs MUD	VOL ACCTG	(66)	SOLIDS ANALYS	8	D RHEOL	OGY & HYDRAU	LICS
····	· · · · · · · · · · · · · · · · · · ·							

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				<u> </u>	Date	8/8/2001	Dep		17	415 # / 16	662 #	
				Spu	d Date	e 7/9/2001	Mu	id Type		Versadi	ril	
Onereter				Water	Depti	h		Activity		Drilling	3	
Operator : Boport For (Louis Dreyn	us				Field/Area	a: NE S	Speaks				
Report For :	Royce Coats					Description	1: A-53	32				
well Name :	J. Hancock	Sr A-1	ST			Locatior	1: Lava	aca County,	Texas	·		
Contractor :	Helmerich &	c Payn	ie #89			Well No	.: C39	57				
Report For :	Dale Moler											
DRILLING A	SSEMBLY		CASI	IG	<u> </u>	UD VOLUME	(bbl)		CIRCUL	ATION D/	ATA	
Bit Size 6.75 in Se	curity FM2831		Surface	: 		Hole		Pump Make	G.D	. PZ-11	G.D. 1	PZ-11
Drill Pipe Size	Length	- 9,	Intermedi	r(10/511 v ate	<u>ש</u>	9/4.2 Active Pite		Pump Size	2 0 X	7 opl/etk	0X	<u>11.in</u> col <i>le</i> tt
5 in	<u>9848 ft</u>	7.	625in @14072f	L (14072TV	(D)	575.8	T	ump stk/mir	1	/ Ban our	60@	<u>sansu</u> 95%
Drill Pipe Size	Length		Intermedi	ate	1	Fotal Circulating	Vol	I	low Rate	2	30 gal/m	lin
4 in Drill Collar Size	7075 ft		Decdustion	Time		1550		Bo	ttoms Up	131.5 m	<u>in 78</u>	88 stk
4.75 in	307 8		Production o	r Liner		in Storage	-	Literal Circulating	Dire Time	283 mi	n 1698	<u>13 stk</u>
	MUD P	ROPE	RTIES					PRODI		ED LAST	24 HRS	
Sample From			PIT@03:0	0			Рг	oducts		Si	ze	Am
Flow Line Temp		°F	159				M	I BAR BULK		100 L	BBG	250
Depth/TVD	· · · · ·	ft	17415/166	52		_	CL	EAN-UP		5 G/	A CN	12
Funnel Viscosite	r	io/gal	18.2+@149	-1			M	UD DIESEL		1 G/	A BK	780
Rheology Temp		<u>्रभूष</u> चर	160				EN	GINEERING	SERVICE	1	EA	1
R600/R300		I .	111/60				QU	NCKLIME (K	ENUX)	<u>50 Ll</u>	вBG	64
R200/R100			-/-			-	⊢			•		
R6/R3			-/2									
PV		cP	51							1		
11°	<u>1b/</u>]	100ft ²	9			_						
API Fluid Loss	<u>10/</u>	100ff ²	5/12/17			_]	
HTHP FL Temp	 cr/3	0 min	2.4@4000	╒┝───			\vdash			.		
Cake API/HTHP		1/32*	-/3	<u> </u>		[\vdash					
Une Ret Solids		%Vol	42.0									·
Correct Solids		%Vol	41.5							<u>_</u>	ا ا	
UII		%Vol	52.0			·	SC	DLIDS EQU	IP	Si	20	Hre
Oil/Water Potio		%V01	6.0		······	_	De	errick Shak	er	14/14	4/14	0
Alkai (Pom)			25			_	De	arrick Shake	er	175/17	5/175	24
Cl Whole Mud		mg/l	12500					ATICK SDAK	ся.	1/5/17	5/175	24
Salt		%Wt	24.59	24	5900		\vdash					
Lime		lb/bbl	3.25				F				,,	
E-Stability			1205	1		_						
Returned Volume	2	bbl	2747			_						
Present Volume	<u>م</u>	001	4/8				. J			·		
Diff. Volume		bbl	+271		,							
						-	\vdash	MUD PR	OPERT	SPECIFI	CATION	18
						1			Weight	Co. (Orders	
						_		Vi	iscosity	50	-60	
								1	Filtrate	<4 cc	HTHP	
BI			FATMENT					MM 1	BKC			
19 bbls Oil Add	ded	-0 IR()	CA IMENI		,	MWD & I WD -	nit work	NEMA	drilling	Rottom		male /
8 bbls Water A	Added				·	17,323'-17,337' l	ad 120 g	as units. Cin	culate con	nection @	17,393': 2	сяк (4 2,250
22 bbis Product	is Added				i	gas units and 18.	.I#/galn	nud cut down	flowline	then 450 u	nits after	
47 ODIS MULI BU () hals Musi De	uit eceived				1	mud/gas separate	or with 6	flare.				
0 bbls Mud Re	eturned											
2521 bbls Starting	; Volume	-			ļ			:-				
2540 bbls Present	Volume				1	Oil Base Mud C	uttings					
-30 ODIS Mud Lo	.xss / 24 hrs ative Mod I ~~	e 0.1	hle New Lieb	Volume		0 cu yds Dail; 176 marth Car	y Haul O	fí mi o g r				
TIME DISTR LM	st 24 Hrs M		L ACCTG	(bbi)	1	SOLIDA ANA	nauve fil Ysia					
Rig Up/Service	0.5 Oil	Addec	<u>i T</u>	0	Salt V	Wt%	24.59	10/78	Values		0 888	/0 889
Drilling	20.5 Wa	ter Ad	ded	8	Salt (Conc,lb/bbl	6.85	kp/ka (lb•s^n/10	Oft²)	0.253	/0.25
Tripping	Mu	d Rece	rived	0	Adju	sted Solid %	41.51	Bit Los	s (psi/%	b)	462 /	14.7
Circulating	3.0 Du	mped		0	Oil/V	Vater Ratio	90/10	Bit HH	P (hhp/)	HSI)	62 /	1.7
P/LI Rot Head	Sha D	akers		14	Aver	ge SG Solids	4.1	Bit Jet	Vel (ft/s)	~	10	57
Running Cosing	EVi For	mation		0	Low	Gr Wa 16/661	2.1	Annular	Vel DP (rumin)	190	1.69
Wireline Logs	. Lef	t in Ho	ole	0	High	Gr %	10.08 10.08	Crit Vel	DP /#/~	(iviiiin)	24:	5.1 01
Testing	Tri	p Loss		0	High	Gr Wt lb/bbl	579.76	5 Crit Vel	DC (ff/m	nin)	20	59
Direction Work	Ot	ier		8				ECD @	17415 (lb/gal)	18	.88
MAL CONC	SR / PHONE		RIG	PHONE		WAREHOUSE I	HONE	DAILY	COST	CUMUL	ATIVE C	OST
Mark Watson	361	358-47	81					_				

												230	en Sec
					I	<u> </u>		JAGE		VEL V	<u> /KI N</u>	<u>U.a</u> u	1.825
						Date	8/7/2001	Dept		172	<u>10 ft / 165</u>	25 ft	
					Spud	Date	7/9/2001	Mue	d Type		Versadri	L ¹	A.
					Water D	epth		A	ctivity		Drilling		
	Operator :	Louis Dreyfu	5				Field/Area	: NE \$	peaks				
	Report For :	Rovce Coats				1	Description	: A-53	2				
	Mell Name	I Honoolk S.	1	r		-	Londing						
	AAGU IASUUG :	J. Hancock Si	A-I 51	l			Location	: Lava	ca County, Te	xas			F
	Contractor :	Helmerich &	Payne #	89			Weli No.	: C395	7				1
	Report For :	Dale Moler											
		SSEMBI V		CARIN	IC					BALL A	TION DA	-	
	Bit Size 675 in Sa	miller EL42921		Surfana			Usla	DDI}		RUULA			
	Norrles Av12/ 1	20*	0 475	- (210561A	5 				Pump Make	G.D. P	2-11	<u>G.D. P</u>	2-11
	Drill Pipe Size	Length	9.023	Intermedia	ate	'	Active Dite		Pump Size	1 827	1.10	<u>0 X I</u>	1.in
	5 in	9643 8	7 625	in @14072 0	au. 	.	564 5		runp cap	3.637	gai/six	3.637 8	AUSUK
	Drill Pine Size	Lenoth	7.045	Intermedia	ate	Tot	al Circulating	Val	Flor	w Doto I		00(4)	/3%s
	4 in	2075 A		maman	auc	100		V01	<u> </u>	wikate	120 7		in in in
	Drill Collar Size	Length	Dr	aduction or	Liner	+	1551 In Storage		Bollo Total Ciar	ms Up	130.7 mi	n 784	3 SUK
	4 75 in	307 8		ounction of			III SIOTAge		Circulation D	c 1 me		1 107	74 SLK
		MUD PR	OPERT	NES		<u> </u>	990			Teller	34 1 A 6 7 4		
	Sample From			017/202-00	0 1			Der	PRODUC	13 085		4 MRS	
	Flow I ine Terre		- 	142	<u>~</u>			PR	AUGS		- <u>SIZ</u>	<u> </u>	ADI
	Depth/TVD	, 	- 1 A 1	134				EN	HINEERING SE	KVICE	1.8	<u> </u>	1 .
	Mud Wai-he		n f	141W 1002	ມ 			175	PMD PYRAMI	D SCREE		<u> </u>	3
	iviua weight	11	vgai 1	5.0@144°	T								
	runnel Viscosity	r 	s/qt	74									
	Rheology Temp		°F	160									
	R600/R300			107/58				<u> </u>					
	R200/R100			-/-							1		
	R6/R3			-/2					.				
	PV		cP	49			1						`
	YP	lb/10	00ft2	9			l				+		· · · · · ,
	10s/10m/30m G	el lb/10	00ft2	3/12/17									
	API Fluid Loss	cc/30	min	N/A									
	HTHP FL Temp	cc/30	min 2	0@4000	F								<u> </u>
	Cake API/HTHP	00000	/2.2.9	_/2									
	Uno Det Solide		Val	42.5	-						_		
	Correct Solids	7		42.5	_								
	Contect Solids			42.0									
			OVOL	52.0				80	LIDS EQUIP		Siz	9	Hrs
	Uncorr water		6V01	3.3				De	rrick Shaker		14/14	14	2
	Oil/water Ratio			90/10				· De	rrick Shaker		175/175	/175	10
	Alkal (Pom)			2.2				De	rrick Shaker		175/175	/175	10
	CI Whole Mud		mg/l	12500									
	Salt		%Wt	26.24	2624	100							
·	Lime	11	o/bbl	2.86									
	E-Stability			1100									
	Received Volum	e	bbl	2747			1						
· . ,	Returned Volum	e	bbl	478	1		1						
	Present Volume		bbl	2521	1								
	Diff. Volume		bbl	+252			1						
							{		MUD PROI	PERTY	SPECIFIC	ATION	8
					-		ſ		W	ejoht	<u>Co C</u>	rdere	
							ł		Vice	Ocity	20.0	60	
				.			1		V1SC	usily	30-	UV LITTIN	
				i			ł		Fil	uate	S4 CC.	nı mr	
				T1471-			1		- RPIII-				
		LMARNO AN	U IREA	. meni		-	*	a.1 1 1	REMAR	ц ө л	_1_ 0		
		ucu Addad				Bo	moms up from	unp had	maximum gas (ot 260 w	nits after m	ud/gas	
	A LL Date	nukici ta Addod				se	parator with 1	5.1 #/gal:		15 Hare.		connect	100
	16 hele Mara D	43 MUGOU				ga:	S OI JYJ UIIIS	with a 18		at; Dack j	ground gas	OI 23-50	 units.
		anaived					ist survey (a) I	/,141° MI	# 10,479° I VD	was 48.	.1 acgrees.		
	O DOIS MUG K	eturned											
	2520 HLL Shart	a Valume											
	2520 0018 Startin	g volume				10.	B						
	2321 DOIS PTESEN					0	a pase Mud C	unings	F				
		uss / 24 NFS atime Mard T -	31.1.1	• Ne **-*	a Wat		to cu yds Daily						
	-734 DOIS CUMUI	ative Mud Loss	2 DDI	3 New Hold	c voiume	17	o cu yas Cumi	uative Hi					
	TIME DISTR LA	ac 24 Mins Mi		AGGTO	(1001)		SOLIDS ANAL	T 318	MUD (KHEOLO	JGY & HYD	RAULIC	25
	Kig Up/Service	0.5 Oil	Added		0 1	Sait Wt	t%	26.24	np/na Va	lues		0.883	/0.883
	Drilling	5.0 Wat	er Addeo	1	16	Salt Co	nc,lb/bbl	6.85	kp/ka (lb	•s^n/100)ft²)	0.250	/0.250
	Tripping	16.0 Mu	1 Receive	ed	0	Adjuste	ed Solid %	42.	Bit Loss	(psi / %))	464 /	13.5
	Circulating	2.0 Dur	nped		0 0	Oil/Wa	ter Ratio	90/10	Bit HHP	(hhp/H	ISI)	62 /	1.7
	P/U Trip Nipple	0.5 Sha	kers		4 1	Averge	SG Solids	4.1	Bit Jet Ve	l (ft/s)		10	57
	P/U Rot. Head	0.5 Eva	poration	··	0 11	Low G	r %	2.7	Annular V	el DP (f	t/min)	190).69
\frown	Chk CrownOmetic	1 For	nation		0 1	Low Gr	r Wt, Ib/bbl	24.18	Annular V	el DC (f	t/min)	24	5,1
	Dir. Work / Log	3.0 Left	in Hole		0	High G	r %	30 1	Crit Vel D	P (ft/mi	in)		86
	Ching Spinners	2.0 Trin	Loss		- 	High G	r Wt lh/bbl	578 1		C (ft/m		2	52
	Chue Dir Toole	2.0 0	er	<u> </u>		- 101 0		510.14	FCD @ 12	7210 /1	y h/gel\	10	
	A4 1 PM		~	}			MADELOVAC					10 ATRIC C	.7V
	Mark Water		360 400-		- FRUME	_ *	MARENUUSE	TONE		HQ 1	CUMUL	ATIVEC	001
	Mark Walson	361	328-4781		700 7			a 1			~		
	Cen rhone	101	302-3940	j 301	/70-/111		361 358-01	0 I	\$1,389.8	o i	5	130,208	۲۵,

						011 -	RAS	SED I	MUD	RED			à
					0.				<u>/////////////////////////////////////</u>			10.20	9
				0	104	10 0/0/2001	- <u>-</u>		/0	. 1/	<u>1/0 π / τε</u>	499 π	
				Spu	d Ua	nte 7/9/2001	1	Mud Ty	pe		Versadi	ril	`
Operator :	Louis D			vvater	Dep			Activi	ity		Slug for	rip	
Operator .	Louis D	reyius				Field/Are	a: N	E Speak	s				
Report For :	Dan Pat	ton				Descriptio	n:A	-532					
Well Name :	J. Hance	ock Sr A-3	I ST			Locatio	n:La	avaca C	ounty. 1	Fexas			
Contractor :	Helmeri	ch & Pav	ne #80			Moli No		2057		- WALLED			
Bonart Car	D.1. M	-1.	10 #07			AAGU IAC	C	3931					
Report For :	Dale Mo	oler											
DRILLING A	SSEMB	LY	CAS	ING		MUD VOLUME	(bbl)			CIRCUL	ATION D/	TA	
Bit Size 6.75 in St	curity FM2	2831	Surfa	ice		Hole		Pun	p Make	G.D.	PZ-11	G.D.	PZ-11
Drill Dima Size	/32"	9	.625in @1075	1ft (10751TV	<u> </u>	965		Pur	np Size	6 X	11.in	<u>6 X</u>	11.in
S in	Len	gun ma la	Interme			Active Pits		Pu	np Cap	3.83	7 gal/stk	3.837	gal/stk
Drill Pine Size	 1 or	<u>12 π 7</u>	.625in @1407	2ft (14072TV	<u>D) </u>	565		Pump	stk/min		, İ	58@	95%
A in	701	18UI 74 A	mierme	diate		Total Circulating	g Vol		FI	ow Rate	2	23 gal/n	nin
Drill Collar Size	I er	noth	Production	or Liner		1530		 	Bot	toms Up	134.7 n	<u>in 78</u>	11 stk
4.75 in	30	s A	FIODUCTION	of Liner		in Storage			Total C	rc Time	288.2 m	<u>in 16</u>	713 stk
	Mi		FRTIES					Circ	ulating I	ressure	3	450 psi	_
Sample From			PITOIR	-30			ł	Deaduat	RODU	018 08	EDLASI	24 HR	5
Flow Line Tem	,	or or	161				ŀ	L L D AT	a DI 7 7		- 51	20	Amt
Depth/TVD			17170/14	200	-		ŀ	M-1 BAR	BULK		100 L	BBG	152
Mud Weight		1h/ae1	18 5/015	7°F			ŀ	VERSAC	UAT		1 6/	BK	5
Funnel Viscosita	,	107 Kal	KA					OIL DRI	ABSOR	BANT	50 L	BG	4
Rheology Temp	·		140			—	ļ	CLEAN-	UP North		5 G/	I CN	1
R600/R300		r	110/60	·		<u> </u>	Ļ	MUD DI	ESEL		10/	BK	1130
R200/R100			110/00	·			Ļ	TRUCKI	NG SER	/ICE		EA	902
R6/R3			/2				-	ENGINE	ERING S	ERVICE		EA	1
PV		~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	50				Ļ	QUICKL	IME (KE	NOX)	50 L	BBG	25
YP		16/10082	10	···			- -	+					
10s/10m/30m G	el	10/100ft	2/10/1/	<u></u>			- F						
API Fluid Loss	<u></u>	~/30 min	3/10/10				- F						
HTHP FL Temp		~/30 min	200400	010			ŀ.						
Cake API/HTHE	<u>, </u>	1/32	2.0(0)700	· ·			ŀ						
Unc Ret Solids		%Vol	42.0				ŀ						
Correct Solids		%Vol	41.5				ŀ						1
Oil		%Vol	\$2.5				+	001100	COUN				
Uncorr Water		%Val	32.5				H	Dini	CLUI		SI		Hrs
Oil/Water Ratio		/0101	91/9		-	_	H	Derrick	Shaker		14/14	14	0
Alkal (Pom)			16				H	Derrick	Shake		176/17	5/1/5	14.5
Cl Whole Mud	-	mg/l	12500			_	H	Dellica	GHAKCI		1/5/17	5/175	14.5
Salt		%Wt	26.24	263	2400		ŀ						
Lime		lb/bbl	2.08		5400		ŀ					-	
E-Stability			1050				F						
Received Volum	e	bbl	2747				ŀ						
Returned Volum	e	bbt	478				ŀ				<u> </u>		
Present Volume	<u> </u>	bbl	2520				H						
Diff. Volume		bbl	+251				- F		-				
								MI		DEDTV	OPECIE	CATIO	ué
			·			~	⊢	111.4	U	leight		Indone	10
			-				F		Vie	coeity		-60	
			······				F		F	iltrate			
					•••••	—	F		A /				
Ŕ	EMARKS	S AND TR	EATMENT			T	J.			2KB			
27 bbls Oil Ad	ded					MWD quit work	ing. Pr	umped 2	/ 5 661	lieset ww	cens but to	ol would	in'i
13 bbls Water	Added					work. Drill to 17	7.170' ti	hen slug	with 70	hhl 21 2	5 #/oal shi	o and Ti	OH to
12 bbls Produc	ts Added					change out MW	D tool.	Maximu	im conne	ction ga	s was 800 i	inits wit	h 18.0
52 bbls Mud B	uilt					#/gal mud cut, n	naximu	m down	time gas	was 70) units with	18.1 #/	gal
0 bbls Mud R	eceived					mud cut, and ave	erage b	ackgrou	nd gas of	60 units	3.		
U bbls Mud R	eturned												
2488 bbls Starting	g Volume												
20 bbla Maria V		-				Oil Base Mud C	uttings						
-739 bble Commit	uss / 24 RF; ative N4 1	a Loca fi	hhla 21 77	1. 17-1		16 cu yds Daily	/ Haul (
	at 24 Um	MHD W	NOIS NOW HI	AC VORUME	1	1 100 cu yas Cum	ulative	riaul Of	I				
Rig Un/Service	0 4	Oil Adda	<u>A AUGIG</u>	(1000)	0-1-	JULIUS ANAL	1010		MUD	RHEOL	UGY & HYI	RAULK	78
Drilling	14 <	Woter Ad	ded .	12		VY170	20.	<u>24 n</u>	pyna Va	atues	0.02)	0.874	/0.874
Tripping	19.3	Mud Da-	aivad	13	Salt	Conc,10/001	6.8	so k	pvka (il	p•s n/10	utt*)	0.274	/0.274
Circulating		Dumpad		<u>v</u>		usica Solid %	4].	<u></u>	IL LOSS	(psi / %)	434	/ 12.6
P/II Trin Ninale	 	Shake				water Katio	91/	<u>B</u>	n HHP	(http://	1SI)	56	/ 1.6
P/U Rot Head		L'ANDRETS		13	Ave	rge SG Solids	4,	I B	nt Jet V	el (tt/s)		<u> </u>	62
Pump Renair	0.4	Formetic		<u> </u>		Cr WA 11 A 1 1	2.	4 <u>A</u>	nnular	/el DP (1	t/min)	184	4,88
Direction Work	0.5	I off in LL		<u> </u>	1.0%	01 WL 10/001	21.	40 A	nnular \	ei DC (wmmn)	23	7.64
Testing		Trin Loss	15	<u> </u>			39.		nt Vel I	<u>가 (tt/m</u>	un)	2	06
Wireline Logs		Other		<u> </u>	Tria	IL UT WE ID/DDI	575.	<u>.17 </u>	rit Vel I	<u>. (tt/m</u>	un)	2	64
MJEM	GR / PHOA	L.S.			l	MADELOUSE	0000		CD (2) [/1/0 (1	o/gal)	18	.87
Mark Watson		361 258.41	191			MARENUUSEI	rnunie			181	COMUL	ATIVEC	OST
Cell Phone		361 362-59	40 36	1 798-7111		361 358-01	81	1.	\$ 56719	88		124 010	

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	'					OIL	-BA	SED	MUD	REPC	RT	No.28	} ्री
				ļ	Dí	ate 8/5/20	01 0	Depth/T	/D	1705	3 11/	16420 ft	,
				S	pud Da	ate 7/9/20	01	Mud Ty	pe		Versa	dril	
Operator :		dua		. Wat	er Dep	oth Eistel/Ar		Activ	ity		Drilii	ng	
Penort For :	Don Dotto	yius				Fielu/Ar	881: IV	E Spear	KS				1
Well Name :	Lunna	41 12 O -	A 4 OT			Description	911 : A [.]	-032		т			ļ
Contractor :	J. Hancou	. o m	A-131			Locan	DINI: La	avaca u	ounty,	lexas			
Contractor :	Diele March	16.1	ayne #59			AAGII IV	ю.: С	3957					i
DRILLING A	SSEMBLY	inom i	CA9	INC	3.81	D.VOLUME	(6.6.D)	· ······		BOIN AT		A T A	
Bit Size 6.75 in Sc	curity FM2831	-i-	OAO Surf	ace		Hole	(001)	Pumn	Make	GD P2	ION L		7-11
Nozzles 4x12/1	32"	9	.625in @4075	I# (10751TVF	»	960.6		Pum	p Size	6 X 11	.in	6 X 1	11.in
Drill Pipe Size	Length	_	Interm	ediate		Active Pit	3	Pun	np Cap	3.837	jal/stk	3.837	yal/sik
Drill Pine Size	<u> </u>	- 17	.62.5in @1407.	2ft (14072TVI. ediate) T	537.4	a Vol	Pump s	tk/min	Flow Data		<u> 55(@)</u>	25%
4 in	7075 ft	-	11661711	oquate		1498	R AOI		B	ottoms Up	[4].	<u>9 min 78</u>	in 103 stk
Drill Collar Size	Length		Production	n or Liner	1 -	In Storage	3		Total	Circ Time	298.2	min 16	400 stk
4.75 in	308 ft		4000.00			990		Ci	rculatin	g Pressure		3100 psi	
Sample From			PIT/2003	OPERTIES		12 @15.2			PR	ODUCTS	USED	LAST 24	HRS
Flow Line Temp	,	۴	161			165	, 		MID	AR BUILK		001102	350
Depth/TVD		ft	17053/164	20		16930/			CLEA	N-UP		5 GA CN	2
Mud Weight	11	b/gal	18.5:(@)15	2°F		18.4@165	F		MUD	DIESEL		I GA BK	295
Funnel Viscosity	,	s/qt	63			B/U From			ENGL	NEERING S	ERV	1 EA	1
Record and Record Recor		۴	1 100/05		-	Break			QUIC	KLIME (KE	NOX	50 LB BG	15
R200/R100		·	-/-		·	<u> </u>			+	· · ·			
R6/R3			-/2			<u>+</u>	1						h
PV		сP	48			1		· · · · · ·					<u> </u>
YP	lb/1	00ft*	7										
ADI Fluid Lass		UUIt ²	<u> 3/10/15</u>								1		
HTHP FL Temp	00/30	min	N/A	or									ļ
Cake API/HTHP	1	/32"	-/3	-							-+-		
Unc Ret Solids	9	6Vol	42.0			41.0			+				
Correct Solids	9	6Vol	41.5			40.47	- j				1		· · · · · ·
Oil	<u>%</u>	6Vol	53.0			54.0			SOL	IDS EQUI	P	Size	Hr
Oil/Water Ratio		6V0I	5.0			5.0			Derri	ck Shaker		14/14/14	1
Alkal (Pom)			11	~		0.8			Derri	ck Shaker		75/175/175	26
CI Whole Mud		mg/l	12500			13000			Louin	CE SHARES		75/115/115	- 20
Salt	0	%Wt	28.12	281	200	28.92	2	89200			-		
Lime	1	b/bbl	1.43			1.04							
E-Stability Received Volum		bibi	2747			710							
Returned Volum	e	bbl	478			· · · · ·							
Present Volume		bbl	2488				·-·		+		-		
Diff. Volume		bbí	+219			1			1				
									MUD	PROPER	TY SI	PECIFICA	TIONS
			<u> </u>							Weigl	nt	Co. Ord	ors
			<u> </u>						+	v iscosi Filten	y ie	30-00 	НР
· · · · · · · · · · · · · · · · · · ·			<u> </u>			1			+ -	4 1114	~		·"
R	EMARKS A	ND T	REATMENT	ř	T				REMAR	KS			
7 bbls Oil Add	fled Andra-1				Į	Made short tri	p to line	@ 16,81	85'. Bott	oms up had	1300 g	as units afi	ter
25 bbls Produce	saaca ts Added				1	mud/gas separ 5/10 bble news	ator with	a 20' fla Pinaroas	re. Swag	oped 500 bl	bis from	n system v	vith (
48 bbls Mud B	uilt				.	16,925' had 15	0 cas un	its after r	nud/eas	separator v	vith no	flare. Mas	e cimum
239 bbls Mud Re	eceived					connection gas	was 700) units wi	ith 18.2	#/gal mud	ur. M	aximum do	wn
228 bbls Mud Ri	eturned				1	time gas was 5	75 units	with 18.	2 #/gal r	nud cut. Be	ickgroi	und gas @	60
2488 bbis Present	Volume					anis. Lasi sur Ail Reca Mod	vey (a) H Cutting-	5,949" wa :	s 48.3 d	egrees.			
-76 bbls Mud La	oss /24 hrs					32 cu yds Da	ily Haul	Off					
-719 bbis Cumula	nive Mud Les	ss 8	bbls New H	lole Volume	<u> </u>	144 cu yds Cu	nulative	Haul Of	Ľ				
Rig Un/Service	81 24 Hrs #	NUD N	OL ACCTO	(1001)	0-11 5	SOLIDS ANA	1. 1818	10	MUD	RHEOLOC	Y & H	TORAULIC	3
Drilling	22.5 W	ater A	dded	<u> </u>	Salt W	one ib/bbl	- 28	.12 nj	VILA VE	uues	n .	0.905	0.905
Tripping	2.0 M	ud Re	ceived	11	Adius	ed Solid %	0. 	n.) K 19 B	it Lose	(nsi / %))	1208	0.208
Circulating	4.0 Du	mped	<u> </u>	0	Oil/W	ater Ratio	91	/9 B	it HHP	(hhp / HS	()	48/	1.3
P/U Trip Nipple	0.5 Sh	akers		20	Averge	e SG Solids	4	.1 B	it Jet V	el (ft/s)	<u>.</u>	1	\$3
P/U Rot. Head	0.5 Ev	арога	tion	16	Low G	ir %	1	9 A	nnular V	/el DP (ft/r	nin)	174	. 93
Direction Work	For	rmation fi in t	on. Hole	0	Low G	rr Wt, Ib/bbl	17	.37 A	nnular V	el DC (ft/1	nin)	224	1.85
Testing		ip Los	IS IS	18	High (n 70 fr Wt lh/hhl	35	7.0 C	uuveli. ritVel⊺	X (n)	<u>, </u>		5U 34
Wireline Logs	O	her		22				E	CD @ 1	7053 (lb/s	, (al)		1.8
M-I ENG	R / PHONE		R	UG PHONE		WAREHOU	E PHON	Æ	DAILY	COST	CUN	ULATIVE	COST
(Mark, Waison Cell Phone	3613	158-47 163-60	81	61 700 7111	i		A141	ł	.	10 50			
L. The Labor	3013	.04-39	1 27	01 170-1111		301 358	-0181		<u> 3</u> 4,5	20.70		\$ 129,14	HO.03

			,	I	D-4 -	UIL-1			
			•		Uate ud Data	7/0/2001	Uepth/		10870 ft / 16
				Wate	r Depth	119/2001	Acti	vity	Drilling
Operator : 1	Louis Dreyfu	\$				Field/Area	I: NE Spea	aks	
Report For : 1	Dan Patton					Description	: A-532		
Well Name : J	J. Hancock S	r A-1	ST			Location	: Lavaca	County, Texas	
Contractor : 1	Helmerich &	Pavn	e #89			Well No.	: C3057		
Report For ·	Rick Houtha	rne rne				44401 IVO.	1 63931		
	SSFMRI V	HIC	CA0	ING	- I BÀ		(661)	Alber	-
Bit Size 6.75 in Sec	JOCINDLI Jurite FM2831		Surfa	ing ce		Hole		URCL	
Nozzles 4x12 / 1/3	32"	9.6	i25in @1075)	∞ I£{(10751T	VD)	953.7		ump Size 6	X 11.in
Drill Pipe Size	Length		Interme	diate		Active Pits	P	ump Cap 3.	837 gal/stk
5 in	<u>9302 ft</u>	7.6	25in @1407;	2ft (14072T	<u>VD)</u>	582.3	Pum	p stk/min	
A in	Length		interme	diate	T	otal Circulating		Flow Ra	te 2
Drill Collar Size	Length		Production	or Liner		In Storage		Total Circ Tin	<u>/p 140./m</u>
4.75 in	308 ft					969	Ci	rculating Pressu	re 3
	MUD PP	RÓPE	RTIES			<u> </u>		PRODUCTS I	JSED LAST
Sample From	<u> </u>		PIT@03:	00		-	Produ	cts	Si
Denth/TVD	<u> </u>	- <u>+</u>	160	000			VERSA	COAT	10/
Mud Weight	T	π leg/r	18 5/0/10	670 PF		-	VERSA	ATROL	50 L
Funnel Viscosity		s/ot	108			-		MESEI	
Rheology Temp	<u></u>	 F	160	<u> </u>		-	SAFF-	CARB FINE	401
R600/R300			168/95			-	MIX II	FINE	25 L
R200/R100			-/-				G-SEA	L	50 L
Ko/KJ		<u>_</u>	-/3			_	ENGIN	EERING SERVIC	18 I
PV VD	16/1	CP 00A2	73		····-		QUICK	LIME (KENOX)	50 L
10s/10m/30m Ge	10/1	0000	5/20/20	<u></u>		-			
API Fluid Loss	. IU/1	min	N/A	···		-			
HTHP FL Temp		min	1.6@400	°F		-		·····	
Cake API/HTHP]	/32"	-/3	1		1			<u> </u>
Unc Ret Solids	9	6Vol	42.0		·······				
Correct Solids	9	6Vol	41.46			4			
Uncorr Water		oVOI	53.5				SOLI	DS EQUIP	Si
Oil/Water Ratio	<u>y</u>	0 V ØI	4.5			-	Derrie	ck Shaker	14/14
Alkal (Pom)			2.7			-	Derri	ck Sheker	175/17
CI Whole Mud	·	mg/l	13000	·		-	Dan	A DUGKCE	113/17
Salt		%Wt	31.13	3	11300	_			1
Lime	1	b/bbi	3.51						
E-Stability	<u> </u>	£1.1	1610			4			
Returned Volume	;	100	2508			-			
Present Volume	,	bbl	2505	<u> </u>		-	<u> </u>		<u> </u>
Diff. Volume		bbl	+253			-			<u> </u>
	<u> </u>					1		UD PROPER	TY SPECIFI
								Weight	Co. (
						4		Viscosity	<u>, 50</u>
~=						4		Filtrate	; <4 cc
RF		D TRF			- ···· ·	I	L	REMARKS	
10 bbis Oil Add	led	- 114			r	ull day of deilli	ng. Received	244 hhle new m	nd and reform
8 bbls Water A	udded				i n	nud from storage		TT UUS NGW III	aa anu isuur
2 bbis Products	s Added								
20 bbls Mud Bu 244 bble Mard Be	ill coived								
250 bbls Mud Re	turned								
2508 bbls Starting	Volume								
2505 bbls Present	Volume				c	Dil Base Mud Ci	uttings		
-17 bbls Mud Lo	ss /24 hrs					0 cu yds Daily	Haul Off		
TIME DIGTO 1	ave Mud Loss	4 b	Dis New Ho	Ne Volume	• <u> </u> 1	12 cu yds Cumu	uative Haul	Diff	
Rig Un/Service	0.5 0.1	Addad		(IGG)	Qale V	SULIDS ANAL	1515 21 12	MUD RHEO	JLOGY & HY
Drilling	17.0 Wat	er Adr	ied		Salt V	one lb/bbl	7 12	kn/ka (lbag/m/	100821
Tripping	Mux	Rece	ived	-6	Adius	ted Solid %	41.46	Bit Loss (nei /	'%)
Circulating	Duo	aped		0	Oil/W	ater Ratio	92/8	Bit HHP (hho	/HSI)
Reaming	Sha	kers		4	Averg	e SG Solids	4.1	Bit Jet Vel (ft	/s)
Chng. Rot. Head	0.5 Eva	poratic	m	8	Low	Gr %	2.2	Annular Vel DI	^{>} (ft/min)
Dir Survey	For	nation]	0	Low	Gr Wt, lb/bbl	19.94	Annular Vel DO	C (fl/min)
Direction Work	Left	m Ho	le	0	High	Gr %	39.3	Crit Vel DP (fl	/min)
A 107751 A 1 104		LOSS		<u> </u>	riigh	ur willo/bbl	576.97	Crit Vel DC (f	(Ib/cel)
Wireline Loss	11.010	~L		3	i	1		ECD @ 10870	(Iovgal)
Wireline Logs	R / PHONE			IG PHONE		WAREHOULEE		DAIL V COST	CINP
Wireline Logs M-I ENG Mark Watson	R / PHONE 361	358-471	R 81	ig phone		WAREHOUSE	HONE	DAILY COST	CUMU

			·				<u> </u>				
						BAS		REP	ORT N	lo 26	
	i.		1	Date	8/2/2004			116		220 A	
				Date	B 0/3/2001	De		10/	(01 π / 10	<u>239 π</u>	
			Spud	Date	e 7/9/2001	<u> M</u>	ud Type		Versadr	1	
			Water D	eptr		<u> </u>	Activity		Drilling		
perator : Louis Dr	reytus				Field/Area	a: NE	Speaks				
Report For : Dan Pati	ton				Description	1: A-5	32				
Well Name : I Hanco	ck Sr A-1	ST .			i ocation	ı · I au	aca County	Tevec			
Confractor I II-land								* 4443			
Contractor : Heimeric	ch & Payi	ne #89			Well NO	.: C39	457				
Report For: Rick Ha	wthorne										
DRILLING ASSEMB	LY	CAS	ING	IN	AUD VOLUME	(bbl)	1	CIRCUL	ATION DA	TA	
Bit Size 6.75 in Security FM2	831	Surfa	ce		Hole	<u> </u>	Pump Make	G.D.	PZ-11	G.D.	PZ-11
Nozzles 4x12 / 1/32"	9	.625in @1075	1ft (10751TVD)		950.3		Pump Size	6 X	11.in	6 X	11.in
Drill Pipe Size Len	gth	Interme	diate		Active Pits		Pump Cap	3.83	7 gal/stk	3.837	gal/stk
5 in 921	3 ft 7	.625 in @1407;	2ft (14072TVD)	•	582.7		Pump stk/min			53@	95%
Drill Pipe Size Len	gth	Interme	diate	1	fotal Circulating	Vol	F	low Rate	2	03 gal/m	nin
4 in 707	5 ft	•			1533		Bo	ttoms Up	146.3 m	in 77	56 stk
Drill Collar Size Len	gth	Production	or Liner		In Storage		Total C	irc Time	317.2 mi	n 168	310 stk
4.75 in 30	8 ft				975		Circulating	Pressure	3	500 psi	
Somala From	U PROP	L DET COOL	00			-	PRODU	CTS US	ED LAST	24 HR8	3
Flow Line Tom		1 11 @03	00		_	P	Toducts		Siz	ze	Amt
Plow Line Temp		103				v	ERSATROL		50 LI	BG	7
Mud Water	f	10/81/16	239		l	0	IL DRI ABSOR	BANT	50 LI	BG	6
Funnel Minerel	ib/gal	18.5@15	5°F			С	LEAN-UP		5 GA	CN	2
Punnel Viscosity	s/q	103			_	M	TUD DIESEL		1 GA	BK	446
Rueology Temp	°F	160			_	S	AFE-CARB FIN	E	50 LE	BG	5.
R000/K300		162/91			_	M	IIX II FINE		25 LE	BG	6
R200/R100		-/-				G	I-SEAL		50 LI	BG	5
KO/KJ		-/3			_	E	NGINEERING	SERVICE	11	A	1
17V	cP	71				L					
10-110-120	10/100ft	20									
10s/10m/30m Gel	16/100ft	4/18/20	5								
API Fluid Loss (cc/30 min	<u>N/A</u>									
HTHP FL Temp	cc/30 min	1.6@400	PF		_	L					
Cake API/HTHP	1/32	-/3									
Unc Ret Solids	<u>%Vol</u>	42.0			_						
Correct Solids	%Vol	41.46	_			Ē					
	%Vol	53.5				8	IOLIDS EQU	P	Siz		Hrs
Uncorr Water	%Vol	4.5				Γ	Derrick Shake	র 👘	14/14	/14	8.5
Oil/Water Ratio		92/8				Γ	Derrick Shake	a 🛛	175/17	5/175	17.5
Alkal (Pom)		2.3				I	Derrick Shake	r	175/17	5/175	17.5
Cl Whole Mud	mg/l	13000									
Salt	<u>%W1</u>	31.13	3113	800							
Lime	lb/bbl	2.99		•							
E-Stability		1645									
Received Volume	bbl	2264									
Returned Volume	bb	0									
Present Volume	bbl	2508									
Diff. Volume	bbl	+244									
		ļ.,					MUD PR	OPERTY	SPECIFI	CATIO	NS
								Weight	Co. (Orders	
						Ľ	Vi	scosity	50	-60	
		ļ				L		iltrate	<4 cc	HTHP	
REMARKS	S AND TH	REATMENT					REMA	RKS			
II DDIS OII Added					B/U f/ trip had 2	2,300 ga	s units after m	ud/gas sej	perator with	18.1 #/	'gal
U obis Water Added					mud cut and a l	2' flare.	Ream 16,400	-16,450'.]	Drilling wit	h 30-70	units
1 DOIS FROQUES Added					packground gas.	Mixed	50 DDI 21 #/bb	ı LCM pi	tt in slug pi	t; pump	ing 5
0 bhle Mud Passived					UOIS/NT.						
0 bbls Mud Returned											
2541 bbls Starting Volume											
2508 bbls Present Volume					Oil Base Mud C	uttina					
-45 bbls Mud Loss /24 hr	s				0 cu vds Daily	Hand C)ff				
-626 bbls Cumulative Mud	Loss 3	bbls New He	ole Volume		112 cu yds Cum	ulative I	Haul Off				
TIME DISTR Last 24 Hrs	MUDV	OL ACCTG	(bbl)	- '	SOLIDS ANAL	Y815	MU	D RHEOL	OGY & HY	RAULK	C8
Rig Up/Service 0.5	Oil Adde	xd b	0	Salt	Wt%	31.1	3 np/na	Values		0.832	/0.832
Drilling 14.5	Water A	lded	0	Salt (Conc, lb/bbl	7.1	2 kp/ka (lb•s^n/10	Oft²)	0.542	/0.542
Tripping 8.5	Mud Rec	eived	0	Adju	sted Solid %	41.4	6 Bit Los	s (psi / %	b)	360	/ 10.3
Circulating 2.0	Dumped		0	Oil/V	Vater Ratio	92/	8 Bit HH	P (hho/1	HSI)	43	/ 1.2
Reaming 1.0	Shakers		6	Aver	ge SG Solids	4.1	Bit Jet	Vel (ft/s)	,	1	47
P/U Rot. Head 0.5	Evaporat	ion	0	Low	Gr %	2.2	Annular	Vel DP (ft/min)	16	68.3
Dir Survey	Formatio	n	0	Low	Gr Wt, lb/bbl	19.9	4 Annular	Vel DC (ft/min)	21	6.32
Direction Work	Left in H	ole	0	High	Gr %	39.	3 Crit Vel	DP (ft/m	nin)	3	16
Testing	Trip Los	S	39	High	Gr Wt lb/bbl	576.	97 Crit Vel	DC (ft/n	ain)	3	96
Wireline Logs	Other		0				ECD @	16781 (lb/gal)	19	0.05
M-I ENGR / PHO	NE	R	IG PHONE	T	WAREHOUSE	PHONE	DAILY	COST	CUMUL	ATIVE	COST
Mark Watson	361 358-4	781						-			
Cell Phone	361 362-5	940 30	51 798-7111		361 358-01	81	\$ 2,95	8.45	\$	121,213	<u>.41</u>

8/02/2001 De 7/08/2001 M Field/Area : NE escription : A-5		<u>ORT No.25</u>									
Field/Area : NE escription : A-5	pth/TVD 16	719 ft / 16200 ft									
Fleid/Area : NE escription : A-5	ud Type	Versedril									
scription : A-5	Activity	TIH									
scription: A-5	. Speaks										
Location - T	532										
LUVATION : LAV	aca County, Texas										
Well No. : C39	957										
VULUME (DDI)	CIRCUL	ATION DATA									
	Pump Make G.D.	PZ-11 G.D. PZ									
Active Pits	Pump Cap	11.11 6X11									
518.1	Punap stik/min	Ran Srk Kai									
Circulating Vol	Flow Rate	gal/min									
518.1	Bottoms Up										
n Storage	Total Circ Time										
975	Circulating Pressure										
	PRODUCTS US	ED LAST 24 HRS									
P	roducts	Size /									
d	LEAN-UP	5 GA CN									
M	IUD DIESEL	I OA BK									
LE L	NOINEERING SERVICE	1 EA									
L L											
	·····										
}											
80		Qine t									
	errick Shaker										
Ē	errick Shaker	175/175/175									
	errick Shaker	175/175/175									
		113/113/113									
		······································									
		······									
	MUD PROPERTY	SPECIFICATIONS									
	Weight	Co. Orders									
\vdash	Viscosity	50-60									
	Filtrate	<4 cc HTHP									
l											
und ranaim to and to											
www.robana.co.andi.d	wardy DOPS. 1111. Add	er creact to anothou bit									
se Mud Cuttings	-										
yds Daily Haul Off	f										
1 VOS Comulative Ha	nul Off										
	MUD RHEOLO	GY & HYDRAULICS									
IDS ANALYSIS	np/na Values										
IDS ANALYSIS	kp/ka (lb•s^n/100	ť)									
105 ANALYSIS 28.92 /bbl 7.12	Bit Loss (psi / %)										
IDS ANALYSIS 28.92 /bbl 7.12 lid % 42.47	But HHP (hhp/HS	sil)									
Image: Construction of the second s	Bu Jet Vel (fl/s)										
Image: Non-Amalysis 28.92 /bbl 7.12 lid % 42.47 atio 91/9 Solids 4.	Annular Vel DD (6/	min)									
Image: Second state Second state Vobil 7.12 Vidid 42.47 Vatio 91/9 Solids 4. Vation 4.		min)									
Imps Analysis 28.92 Vobil 7.12 Naid 42.47 atio 91/9 Solids 4. 1b/bbl 36.8	Annular Vei DC (ft/	N									
Image: Second state Second state Vobil 7.12 Vobil 7.12 Vidid 42.47 Valid 42.47 Valid 4. Vobil 36.8 38.4 36.4	Annular Vei DC (ft/ Crit Vei DP (ft/min	<u>)</u>									
Jos Analysis 28.92 Vobil 7.12 lid % 42.47 atio 91/9 Solids 4. 1b/bbl 36.8 38.4 1b/bbl 1b/bbl 564.59	Annular Vei DC (ft/ Crit Vel DP (ft/min Crit Vel DC (ft/min) 1)									
Image: Second state Second state 105 ANALYSIS 28.92 28.92 28.92 110 Mark State 7.12 111 Mark State 42.47 110 Solids 4. 110 Mark State 36.8 38.4 38.4 1b/bbl 564.59	Annular Vei DF (ft/ Annular Vei DC (ft/ Crit Vei DP (ft/min Crit Vei DC (ft/min)									
/bt	o 91/9 ids 4.	Annular Vel D2 Bit HHP (hhp / HS ids 4. Bit jet Vel (ft/s) 4. Annular Vel D2 (ft/s) /bbl 36.8 Annular Vel DC (ft/s)									
	OIL-BASED MUD REPO							RT N	lo.24	5	
--	---	---------------	-------------	-----------	--	-------------------------------------	-----------------------	-----------------	--------------	-----------	--------------
Fluids			1	Date	08/01/2001	Depti	epth/TVD 167		9 ft / 162	200 ft	
			Spu	d Date	07/09/2001	Mud	Туре		Versadri	1	
Operator • T	Dearfre		Water	Depth	171 - 1 - 1 - 1	A	stivity	T	est BOP	8	
Operator : Louis	Dreytus				Field/Are	a: NE. S	peaks				
Report For : Dan I	Patton				Descriptio	n: A-532					
Well Name : John	HancockSr.1	A-IST			Locatio	n: Lavac	a County, Te	xas			
Contractor : Helm	erick & Payr	ne #89			Well No	D.: C3957	7				
Report For: Rick	Hawthorne										
DRILLING ASSEM	IBLY	CASI	VG	ML		(bbl)	CI	RCULAT		TA	
Bit Size 6.75 in Sec FM2	831	Surface	2	~	Hole		Pump Make	G.D. PZ	2-11	G.D. I	2.11
Nozzles 4x12 / 1/32"	9	625in @10751f	1 (10751TV)	D)	1047.9		Pump Size	6 X 11	.in	6 X)	l 1.in
5 in	-ongun	Intermedi	ate	D	Active Pits		Pump Cap		gal/stk	ĺ	zal/stk
Drill Pipe Size	Length /	Intermedi	iale:		525.1 tal Circulatine	Vol	mp suk/min Flow	Rate		cral func	
<u>4 in</u>	7075 £				523.1	· · · ·	Botto	ns Up		Revut	
Drill Collar Size	Length	Production of	r Liner		In Storage		Total Circ	Time			
4.75 in	<u>309 ft </u>				975		Circulating Pr	essure			
Sample From	MUU PROP	DITGO	0		ł	n	PRODUC	IS USE	DLAST	24 HRS)
Flow Line Temp	ন	NA	·		ł	PTO	JUCIS		Siz	e	Am
Depth/TVD		16719/1620	0		1		SACOAT		100 18	DR.	112
Mud Weight	lb/gal	18.6@120	F		1	VER	SATROL	 .	SO TP	BO	
Funnel Viscosity	s/qt	95			1	CLE	AN-UP		5 GA	<u></u>	
Rheology Temp	- of	162]	MUE	DIESEL	· · ·	1 GA	BK	221
R600/R300		169/96]	SAF	E-CARB FINE		50 LB	BO	2
K200/K100	·	<u>-/-</u>	_			MIX	II FINE		25 LB	BG	2
KO/KJ		-/3	_			G-SE	AL		50 LB	BG	2
VP	LK/10082	73			-	TRU	CKING SERVIC	æ	1 E	A	887
10s/10m/30m Gel	10/10011]b/100#2	6/10/20			-	ENG	INEERING SER	VICE	I E	A	1
API Fluid Loss	cc/30 min	NA NA	-		1		LIME (KENC	и к)	50118	BCI	5
HTHP FL Temp	cc/30 min	3.0@4009	F		1		÷	·····	<u> </u>		
Cake API/HTHP	1/32"	-/3			1				 	{	
Unc Ret Solids	%Vol	43			1				†		
Correct Solids	%Vol	42.5]				•		
Ull	%Vol	52	_		1	SOL	IDS EQUIP		Size	•	Hrs
Oil/Water Datio	%Vol	5			ł	Den	rick Shaker		14/14/	14	0
Alkat (Pom)		91/9			1	Den	nck Shaker		175/175	/175	0
Ci Whole Mud	mall	12000			-	Den	nck Shaker		175/175	/175	0
Salt		28.92	790	9200	1						
Lime	lb/bbl	3.25			1						
E-Stability		1610			1						
Received Volume	bbl	2264]						
Keturned Volume	bbl	0									
Diff Volume	bbl	2546									
Dati. volume	bbl	+282									
					{		MUD PROP		C- C	ATION	3
	·	····			1		Viero	situ	<u> </u>	60	
	••	·			1		Filt	rate		THP	
					1		+ 4151				
5 bbls Oil Added 3 bbls Water Added 9 bbls Products Adde 17 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurred 2561 bbls Starting Volun 2546 bbls Present Volun -32 bbls Mud Loss Volun -32 bbls Mud Loss Volun	d d e e brs wd I con 4 h		Volume	Pu	imp slug, POC I Base Mud C 0 cu yds Daib)H for new b uttings Haul Off	REMARK	න st BOPs.			
		DIS NEW HOLE	voiume	<u>11</u>	12 Cu yds Cum	ulative Hau					
Rig Up/Service			0	Salt We	With a state of the state of th	78.07	MUD R		i a hydi	KAULIC	¢
Drilling	Water Ad	ded -	3	Salt Co	nc.lh/hhl	7 12	hp/ma Valu	ແຮ ^n/10/18#		•	·
Tripping 7	Mud Reco	rived	0	Adjuste	d Solid %	42.47	Bit Loss (n	sj/%)	<u>'</u>		
BOP Testing 17	Centrifug	c –	0	Oil/Wat	ter Ratio	91/9	Bit HHP (h	hp/HSi	,		
Condition Hole	Formation	n	0	Averge	SG Solids	4.1	Bit Jet Vel	(fl/s)			
Circ. out Gas	Left in Ho	ole	0	Low Gr	%	3.3	Annular Vel	DP (ft/m	nim)		
Slip and Cut	Other		21	Low Gr	Wt, lb/bbl	29.97	Annular Vel	DC (ft/m	ain)		
Condition Mud	Dumped		0	High G	۳%	39.2	Crit Vel DP	(ft/min)			
Cus Swyl Pkng 🔰	Shakers		3	High Gr	r Wt Ib/bbl	575.62	Crit Vel DC	(ft/min)			
	E*										
MJ ENGD / OL	Evaporati	on	8	L	ADEUA	BUONE	041 9 00-	-			307
M-I ENGR / PH Corky Karcher	Evaporati IONE 361 985-74	on RiG	PHONE	- N	AREHOUSE	PHONE	DAILY COS	T	CUMULA	TIVE C	0 8 T

Drilling				OIL-BASED MUD REPORT No.23								
	A FR	uids			Date	07/31/2001	i De	pth/TVD	1	6719 ft / 1	18200 ft	
				Spi	ud Date	07/09/2001	1 M	ud Type		Versa	drii	
Operator ·	Louis D	herefue		Water	r Depti			Activity		Driffin	ng	
Report For :	Don Det	h cylus				rield/An	Ba: NE	Speaks				
Woll Name :	Lan rat	uon				Descriptio	on:A-5	32				
	JONN HA	ancockSr.	A-IST			Locatio	on: Lav	aca County,	Texas			
Contractor :	Helmeri	ick & Payl	ne #89			Well N	o.: C39	957				
Report For :	Rick Ha	awthorne										
DRILLING A	189EMB	LY	CAS	NG	N	NUD VOLUME	(bbl)		CIRCU	LATION E	ATA	
Bit Size 6.75 in Se	ec FM2831	<u> </u>	Surfa	÷		Hole		Pump Make	• G.I). PZ-11	G.D	PZ-11
Drill Pipe Size	/32 1.en	hoth	1.62.5m (@10751	II (10751TV	<u>/D)</u>	948.2		Pump Size	6	X 11.in	6 X	<u>(11.in</u>
5 in	915	57 A 7	.625in @14072	ft (14072TV	7DN	637 8	· _	Pump cap	9 3.8	37 gal/stk	3.837	′gai/si ⊇∩¢a/
Drill Pipe Size	La	ngth	Intermed	iate	1	fotal Circulatin	g Vol	i anap aqa mui F	Jow Rat	e	211 gal/	<u>49376</u> min
4 in	70	75 ft				1586		Bo	ttoms U	p 140,5	min 7	730 st
UTILI Collar Size	Ler	ngth	Production of	x Liner		In Storage	L	Total (Circ Tim	e 315.7	min 17	363 si
			FOTICO			975	Ľ	Circulating	Pressun	e	3650 psi	
Sample From			PITAN	<u>.</u>		-!	-	PRODU	JCT8 U	SED LAS	T 24 HR	\$
Flow Line Temp			170				H	J RAD DIT P				An
Depth/TVD	·	f	16719/162	00		-	M	SPHASOL ST	PPLC		LUBBO	57
Mud Weight	· · · · · · · · · · · · · · · · · · ·	lb/gal	18.5@160	°F		~~~		ERSACOAT	ANENWIE			10
Funnel Viscosity		s/qt	95			1	Tvi vi	ERSATROL		so 1	LBRO	
Kheology Temp		٩	160]	C	LEAN-UP		50	A CN	2
R000/R300			169/96				M	UD DIESEL		10	ABK	93
R6/R1						_	S/	FE-CARB FIN	Æ	501	LB BG	8
PV			-/4			4	M	IX II FINE		251	LB BG	6
YP			13			-	M	EX II MED		251	LBBG	2
10s/10m/30m Ge	1	1b/100ft	6/21/21	- [6	SEAL		501	BBG	8
API Fluid Loss		cc/30 min	NA			4	LEI LEI	NUINEERING S	SERVICE		EA	1
HTHP FL Temp		cc/30 min	2.8@400	F		-{	E Ha	JENIJYYKAN	NOV		EA	3
Cake API/HTHP)	1/32"	-/3			-	<u> </u>		atoA)			1 ?
Unc Ret Solids		%Vol	43			7						
Correct Solids		%Vol	42.8]		·····				.L
Ull		%Vol	52]	S	OLIDS EQUI	P	S	120	Hn
Oil/Water Dat	·	%Vol	5			_	D	errick Shaker	r i	14/1	4/14	I
Alkal (Pom)	.		91/9			4	D	errick Shaker	r	175/1	75/175	24
Cl Whole Mud		ma/l	13000			-	D	errick Shaker	r	175/1	75/175	24
Salt		%Wt	28.92	280	9200	-1	-	· · · · · · · · · · · · · · · · · · ·		 		
Lime		lb/bbl	3.38			1				<u> </u>		
E-Stability			1670]						
Received Volume	8	bbl	2264							1		
Present Volume	B	bbl	0			4						
Diff Volume		bbl	2561			_						
	<u></u>	DDL	+297			-						
	·	•				-		MUD PRO	PERT	Y SPECIF	CATION	48
			<u> </u>			-		<u>۷</u>	veight	Co.	Orders	
<u> </u>			<u> </u>			-		V18	ausity	5	U-0U	
				1				r	ли аңс	~4 00	nin	
RE 22 bbls Oil Adde 3 bbls Water Ac 42 bbls Products 67 bbls Mud Ret 0 bbls Mud Ret 2560 bbls Starting 2561 bbls Present 67 bbls Mud Lo	added adde add add	AND TR	LATMENT		L d d l l C l l	rilled to 16605 nits thru flow li hlorides at b/up ias 330-625 u. 6661/48,3 deg. bil Base Mud C. 16 cu yds Daily 12 cu yds Cum	and shor ine and 19 Drilled : w/mud cut Cost inc uttings y Haul Offi ulative Ha	REMAJ t tripped. Pull 0 units thru Ba ahead pumping t 18.1 ppg Bk cludes a Vacuu f aul Off	RKS led tight : uster with g 5 bbl s gnd gas : um Truck	at 16404'. h a 12' flare weeps ever 25-55 u. L c Credit.	B/up was . No inc y hours. ast surve;	i 1200 rease Conn y at
-539 bbls Cumula	tive Mud	Loss 5 b	bls New Hole	Volume	N	ote:Mud Acctg	Vol, Othe	r losses are tri	ip losses			
TIME DISTR Las	t 24 Hrs	MUD VO	L ACCTG	(bbi)		SOLIDS ANAL	Y 815	MUD	RHEOL	OGY & HY	DRAULK	28
Drilling	10 4	UII Added	l	0	Salt W	t%	28.92	np/na Vi	alues		0.816	/0.81
Tripping	3	Mud Para	ived	<u>د</u>	Salt Co	onC,ID/DDI	7.12	kp/ka (it	o-s'n/10	Off?)	0.632	/0.632
Reaming		Centrifi		0		ter Retio	42,47	Di LOSS	(psi / %	<u>)</u> 161)	389/	10.6
Condition Hole		Formation		0	Averor	SG Solide	<u>- 91/9</u>	Bit La V	$\frac{100p/1}{100}$	131)	48/	1.3
Circ. out Gas	1	Left in Ho	le	0	Low G	r%	4	Annular V	va (408) Vel INP /4	i/min)	174	33
Slip and Cut		Other		22	Low G	r Wt, Ib/bbl	36.8	Annular V	/el DC /i	ft/min)	274	1.85
Condition Mud		Dumped		0	High C	ir %	38.4	Crit Vel D	DP (ft/m	in)	3	37
Ing Swvi Pkng		Shakers		26	High G	ir Wt lb/bbl	564,59	Crit Vel E	X (ft/m	uin)	4	20
TU KOL Head	D I DUAT	Evaporatio		18				ECD @ 1	6719 (1	b/gal)	19	.12
Niel 2NG	IN I PHON	161 000	RiG	PHONE	1	NAREHOUSE	PHONE	DAILY CO	OST	CUMU	ATIVE C	:08T
any materia cil		301 985-74	44	200 2111								
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							ORT No	b.22			
Drilling Fluids			OIL-BASED MUD KEPUKI NU.22								
			0	ate 07/30/2001	Deptn/1		Verssdril				
والسلسليل ا			Spud D	ate 07/09/2001	Mud Fy Activ	/itv	Drilling				
			VVater De	Field/Area	: NE. Sper	aks					
Operator : Louis D	breyfus			Description	1: A-532						
Wall Name	Loats	4 107		Location	1 : Lavaca (County. Texas					
Wall Name John H	ancockSr.	A-1ST		Molt No.	. C2057	ounty, tonus					
Bonort For Helmer	ick & Pay	ne #89		AAGII IAC	1 (193)						
REPORT FOF Rick H	awthorne				410		ATION	A			
Bit Size 6 75 in San EM292	я. Ү	CASI	NG	MUD VOLUME	(DDI) D	In Make OF	PZ-11	010 PZ-11			
Nozzlos 4x12 / 1/32"	•	9.625in @10751	- A (10751TVD)	943.5		ump Size 67	K 11.in	6 X 11.in			
Drill Pipe Size Le	ngth	Intermed	iate	Active Pits	Р	ump Cap 3.8	37 gal/stk	3.837 gal/stk			
<u>5 in 90</u>	32 ft	7.625in @14072i	ft (14072TVD)	641.5	Pump	o stk/min		56@95%			
LJrill Pipe Size Le	ngth	Intermed	iate	Total Circulating	Voi	Flow Rate	213	5 gal/min			
Drill Collar Size 1 o	noth	Production	r Liner	In Storege		Bottoms Up	o 157.4 min	a /090 Stk			
4.75 in 3	02 ft		*******	975		irculating Pressure	e 307.0 min	<u>. 17337808</u> 50 msi			
M	UD PROP	ERTIES				PRODUCTS U	SED LAST 2	4 HRS			
Sample From		PIT@03.0	X0		Produ	cts	Size	e Amt			
Flow Line Temp	°]	170			M-I BA	R BULK	100 LB	BG 526			
Mud Weight	 /~~	1 10394/161	10 9E		VERSA	COAT	I GA I	BK 30			
Funnel Viscosity	10/88	1 10.4(0,102	<u>r</u>		VERSA	TROL	50 LB	BO 5			
Rheology Temp	<u></u> സ്വ സ	F 160			MIDT	HOP DESEL	5GA (UN 3			
R600/R300		176/102	••• • 		VACIN	UM TRUCK HATT		A 490			
R200/R100		-/-			SAFE-C	CARB FINE	50 LB	BO 13			
R6/R3		-/4			SAFE-C	ARB MEDIUM	50 LB	BG 6			
	cl	P 74	<lc< td=""><td>M in</td><td>MIX II</td><td>FINE</td><td>25 LB</td><td>BG 8</td></lc<>	M in	MIX II	FINE	25 LB	BG 8			
11' 10e/10m/20m C-1	16/100ft	28	<	Mud	MIX II	MED	25 LB	BO 2			
API Fluid Loss	10/10/1	- 5/19/29 NA			G-SEA	ING SEDUCOD	50 LB	BG 7			
HTHP FL Temp	cc/30 mi	3 2.6@4000			IRUCK	THA SEKAICE		452			
Cake API/HTHP	1/32	* -/3	·		LINGIN	LORUNO DERVICE	<u>, (8</u> 4	<u>}</u>			
Unc Ret Solids	%Vo	41.5									
Correct Solids	%Vo	40.69									
Oil	%Vo	53.5			SOLIE	S EQUIP	Size	h Hrs			
Uncorr Water	%Vo	<u>1 5</u>			Derric	k Shaker	14/14/	14 0			
Alkal (Pom)		30		·	Demic	k Shaker	175/175/	175 24			
Cl Whole Mud	mo	1 10500			Demic	n Shakef	1.13/1/3/	1/5 24			
Salt	%W	t 24.73	24730	0			<u> </u>				
Lime	lb/bb	3.9					1				
E-Stability		1700									
Received Volume	bb	2264					ļ				
Present Volume	00 	1 <u>2660</u>					·				
Diff. Volume	bh	+296					1				
						IUD PROPERT	Y SPECIFIC	ATIONS			
	· · · · · · · · · · · · · · · · · · ·					Weight	Co. Or	rders			
						Viscosity	50-0	60			
							<4 cc. H	the second s			
						Filtrate		ITHP			
						Filtrate		ITHP			
REMARK	(\$ AND TI	REATMENT				Filtrate REMARKS	8 44 mm 0				
REMARK 12 bbls Oil Added 8 bbls Water Added	(S AND TI	REATMENT		Drilled ahead slo 360 to 375 units	wly increasing with a 7 to 10	Filtrate REMARKS 3 mud weight to 1 ft, flare. D/T gas	8.4+ ppg. Cor s. 400 units w/	ITHP mection gas 6' flare.			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added	(S AND TI	REATMENT		Drilled ahead sko 360 to 375 units BKGRN gas, 35	wly increasing with a 7 to 10 to 350 units.	Filtrate REMARKS ; mud weight to 1 ft. flare, D/T gas Maintaining LCN	8.4+ ppg. Cor s, 400 units w/ A sweeps at 5 t	ITHP mection gas 6' flare. bbls on the			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built	(S AND TI	REATMENT		Drilled ahead sko 360 to 375 units BKGRN gas, 35 hour. Last surve	wly increasing with a 7 to 10 to 350 units. y: 16533/160	Filtrate REMARKS g mud weight to 1 ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. La	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection	ITHP mection gas 6' flare. bbls on the gas at 16559',			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Products	IS AND TI	REATMENT		Drilled ahead ske 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/	wly increasing with a 7 to 10 to 350 units. y: 16533/160 no flare.	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. La	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection	ITHP mection gas 6' flare. obls on the gas at 16559',			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Returned 2522 bble Starting Volume	(S AND TI	REATMENT		Drilled ahead ske 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/	why increasing with a 7 to 10 to 350 units. sy: 16533/160' no flare.	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. Li	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection	ITHP mection gas 6' flare. obls on the gas at 16559',			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Returned 2522 bbls Starting Volume 2560 bbls Present Volume		REATMENT		Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/	why increasing with a 7 to 10 to 350 units. y: 16533/160 no flare.	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. L	8.4+ ppg. Cor s, 400 units w/ A sweeps at 5 t ast connection	ITHP mection gas 6 flare. bbls on the gas at 16559',			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurned 2522 bbls Starting Volume 2560 bbls Present Volume -21 bbls Mud Loss /24 h		REATMENT		Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. uttings ' Haul Off	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. L	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 t ast connection	ITHP mection gas 6 flare. obls on the gas at 16559,			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurned 2522 bbls Starting Volume 2560 bbls Present Volume -21 bbls Mud Loss /24 h -472 bbls Cumulative Mu	IS AND TI	S bbis New He	oke Volume	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Cum	why increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. uttings 'Haul Off alative Haul Off	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. Li ff	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 t ast connection	ITHP mection gas 6 flare. bbls on the gas at 16559',			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurned 2522 bbls Starting Volume 2560 bbls Present Volume -21 bbls Mud Loss /24 h 472 bbls Cumulative Mu TIME DISTR Last 24 Her 1 1 0 0	S AND TI S AND TI d Loss 4 MUD V	S bbis New Ho	de Volume (bbi)	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Cum BOLIDS ANAL	why increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. uttings 'Haul Off ulative Haul O Y815	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. L ff MUD RHEO	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 t ast connection	ITHP mection gas 6 flare. obls on the gas at 16559, RAULICS			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurned 2522 bbls Starting Volume -21 bbls Mud Loss /24 hu -472 bbls Cumulative Mu TIME DISTR Last 24 Hrs Rig Up/Service 0.5	IS AND TI IS AND TI	5 bbis New Ho OL ACCTO	ke Volume (bibl) S	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Cum BOLIDS ANAL alt W/%	why increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off alative Haul Off 24.73	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 b ast connection	ITHP mection gas 6 flare. obls on the gas at 16559, RAULICE 0.787/0.787			
REMARK 12 bbls Oil Added 8 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 2522 bbls Starting Volume 21 bbls Mud Loss /24 hr 472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18	IS AND TI IS AND TI IS AND TI IS AND V Oil Adda Water A Mart B	5 bbls New Ho OL ACCTO	ke Volume (bbl) 0 S 8 S	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Ci 00 cu yds Daily 96 cu yds Cum BOLKOS ANAL alt Wt% alt Conc,lb/bbl	why increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y815 24.73 5.75	Filtrate REMARKS g mud weight to 1: ft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lbs'n/10	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 b ast connection	ITHP mection gas 6 flare. obls on the gas at 16559', RAULICE 0.787/0.787 0.804/0.804			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurred 2522 bbls Starting Volume -21 bbls Mud Loss /24 hr -472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming	IS AND TI IS AND TI IS AND TI IS AND V Oil Adda Water A Mud Rec	5 bbls New Ho OL ACCTO dded zeived pe	Ste Volume (bbl) 0 8 0 0	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Ci 00 cu yds Daily 96 cu yds Cum SCLOS ANAL alt W? alt Conc,lb/bbl djusted Solid % il/Water Ratio	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y345 24.73 5.75 41.09 91/9	Filtrate REMARKS g mud weight to 1: ft. flare. D/T gas Maintaining LCN 74' = 46.6 deg. Li ff MUD RHEO np/na Values kp/ka (lbes'n/10 Bit LEW (chen /	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 b ast connection LOGY & HYDF	ITHP mection gas 6' flare. bbls on the gas at 16559', RAULICE 0.787/0.787 0.804/0.804 401 / 11.3 50 / 14			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Recurred 2522 bbls Starting Volume 21 bbls Mud Loss /24 hr -472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole	IS AND TI IS AND TI IS AND TI IS AND V Oil Add Water A Mud Rec Centrifu, Formatic	5 bbls New Ho OL ACCTO ad dded seived ge m	Ste Volume (bbl) 0 8 0 0 0 0 0 0 0 0 0 0 0	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Cum BCLOS ANAL alt Conc,lb/bbl djusted Solid % il/Water Ratio verge SG Solids	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y345 24.73 5.75 41.09 91/9 4.1	Filtrate REMARKS g mud weight to 1: ft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. Li ff MUD RHEO np/na Values kp/ka (lb-s^n/10 Bit Loss (psi / 9 Bit HHP (hhp / Bit Jet Vel (f)/s)	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 b ast connection LOGY & HYDF	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICE 0.787/0.787 0.804/0.804 401/11.3 50/1.4			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 2522 bbls Starting Volume 21 bbls Mud Loss /24 hr 472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole 5.5	IS AND TI IS AND TI IS AND TI IS AND TI IS AND TI I LOSS 4 MUD V Oil Addd Water A Mud Rec Centrifu, Formatic Left in F	5 bbls New Ho OL ACCTO ad dded ge m lole	Site Volume (bbl) 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Drilled ahead slo 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Cum BOLIDS ANAL alt Conc,lb/bbl djusted Solid % il/Water Ratio verge SG Solids ow Gr %	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y315 24.73 5.75 41.09 91/9 4.1 1.7	Filtrate REMARKS g mud weight to 1: ft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. Li ff MUD RHEO np/na Values kp/ka (lb-s'n/10 Bit Loss (psi / 9 Bit HHP (hhp / Bit Jet Vel (d/s) Annular Vei DP (8.4+ ppg. Con s, 400 units w/ A sweeps at 5 b ast connection LOGY & HYDF DOR ²) (0) HSI) (f/min)	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 0 bbls Mud Returned 2522 bbls Starting Volume 2560 bbls Present Volume -21 bbls Mud Loss /24 hr -21 bbls Mud Loss /24 hr -472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole 5.5 Slip and Cut -5.5	IS AND THE SECOND SECON	5 bbls New Ho OL ACCTO ad dded ge m fole	Ske Volume (bbl) 0 S 0 A 0 0 A 0 0 1 0 0 0 0 0 0 0 0 0 0 0	Drilled ahead ski 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cr 00 cu yds Daily 96 cu yds Cum SOLIOS ANAL alt Conc, lb/bbl djusted Solid % il/Water Ratio verge SG Solids ow Gr %	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y345 24.73 5.75 41.09 91/9 4.1 1.7 15.5	Filtrate REMARKS g mud weight to 1: aft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lb-s'n/10 Bit Loss (psi /9 Bit HHP (hhp /) Bit Jet Vel (d/s) Annular Vel DC	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection LOGY & HYDF D0ft ²) (0) HSI) (fl/min) (fl/min)	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11			
REMARK 12 bbls Oil Added 8 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 0 bbls Mud Returned 2522 bbls Starting Volume 2560 bbls Present Volume -21 bbls Mud Loss /24 hr -21 bbls Mud Loss /24 hr -472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole 5.5 Slip and Cut Condition Mud	IS AND TH	5 bbls New Ho OL ACCTO ad dded ge m fole	skc Volume (bbl) 0 S 0	Drilled ahead ski 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cr 00 cu yds Daily 96 cu yds Cum SOLIOS ANAL alt Conc,lb/bbl djusted Solid % il/Water Ratio verge SG Solids ow Gr %	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y345 24.73 5.75 41.09 91/9 4.1 1.7 15.5 39.4	Filtrate REMARKS g mud weight to 1: aft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lb-s^n/10 Bit Loss (psi /9 Bit HHP (hhp /) Bit Jet Vel (d/s) Annular Vel DC Crit Vel DP (ft/n	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection LOGY & HYDF D0ft ²) (0) HSI) (1) (ft/min) (ft/min) (ft/min)	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11 368			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 2522 bbls Starting Volume -21 bbls Mud Loss /24 hr 472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping 8 Reaming Condition Hole Circulating 5.5 Slip and Cut Condition Mud Cheg Swyl Pkng 18	S AND TI S AND TI A MOD V Oil Add Water A Mud Rec Centrifu Formatic Left in F Other Dumped Shakers	5 bbls New Ho OL ACCTO ad dded ge m fole	skc Volume (bbl) 0 S 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15	Drilled ahead sko 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cr 00 cu yds Daily 96 cu yds Duily 96 cu yds Cum BOLIOS ANAL alt Conc,lb/bbl djusted Solid % il/Water Ratio verge SG Solids ow Gr % ow Gr % igh Gr % igh Gr %1 lb/bbl	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y385 24.73 5.75 41.09 91/9 4.1 1.7 15.5 39.4 578.7	Filtrate REMARKS g mud weight to 1: aft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lb-s^n/10 Bit Loss (psi /9 Bit HHP (hhp / Bit Jet Vel (d/x) Annular Vel DC Crit Vel DP (fl/n Crit Vel DC (fl/r	8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection LOGY & HYDF D0ft ²) (0) HSI) (f/min) (fl/min) (fl/min) nin) pin)	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11 368 453			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 2522 bbls Starting Volume -21 bbls Mud Loss /24 hr -472 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole 5.5 Slip and Cut Condition Mud Chg Swvi Pkng P/U Rot. Head	IS AND TH	5 bbls New Ho OL ACCTO ad dded ge m fole	Ske Volume (bbl) 0 S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 6	Drilled ahead sko 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cr 00 cu yds Daily 96 cu yds Cum BOLIOS ANAL alt Conc,lb/bbl djusted Solid % il/Water Ratio verge SG Solids ow Gr % ow Gr % igh Gr % igh Gr %1 lb/bbl	wy increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y385 24.73 5.75 41.09 91/9 4.1 1.7 15.5 39.4 578.7	Filtrate REMARKS g mud weight to 1: aft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lb-s'n/10 Bit Loss (psi /9 Bit HHP (hhp / Bit Jet Vel (d/s) Annular Vel DC Crit Vel DP (fl/n Crit Vel DC (fl/z ECD @ 16594 (8.4+ ppg. Con s, 400 units w/ A sweeps at 5 t ast connection LOGY & HYDF D0ft ²) (b) (fl/min) (fl/min) (fl/min) min) min) (tb/gal)	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11 368 453 19.1			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 39 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 252 bbls Starting Volume 2520 bbls Present Volume -21 bbls Mud Loss /24 hr -21 bbls Mud Loss /24 hr 472 bbls Cumulative Mu TIME DISTR Last 24 Hrs ig Up/Service 0.5 >rilping 18 'ripping 5.5 lip and Cut 2 >Ondition Hole 5.5 lip and Cut 2 Ondition Mud 18 'lg Swvi Pkng ////////////////////////////////////	S AND TI S AND TI d Loss 4 MUD V Oil Adda Water A Mud Rec Centrifu Formatic Left in F Other Dumped Shakers Evapora NHE	S bbls New Ho OL ACCTO ad dded ceived ge m fole	ske Volume (bbl) 0 S 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 6 3 PHONE	Drilled ahead sko 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cl 00 cu yds Daily 96 cu yds Duily 96 cu yds Duily 97 cu yds Duily 96 cu yds Duily 97 cu yds Duily 96 cu yds Duily 96 cu yds Duily 96 cu yds Duily 97 cu yds Duily 97 cu yds Duily 97 cu yds Duily 97 cu yds Duily 96 cu yds Duily 97 cu yda Duily 97 cu yda Duily 97 cu yda Duily 97 cu yda D	wily increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off Jative Haul O Y385 24.73 5.75 41.09 91/9 4.1 1.7 15.5 39.4 578.7 PHONE	Filtrate REMARKS g mud weight to 1: aft flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (Ibs^n/10 Bit Loss (psi/9 Bit HrIP (hhp // Bit Jet Vel (fl/s) Annular Vel DC (Crit Vel DP (fl/s) ECD @ 16594 (DAILY COST	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 t ast connection LOGY & HYDF 00ft ²) (0) HSI) (fl/min) (fl/min) (fl/min) min) min) CUMULA	ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11 368 453 19.1 TIVE COST			
REMARK 12 bbls Oil Added 8 bbls Water Added 39 bbls Products Added 39 bbls Products Added 59 bbls Mud Built 0 bbls Mud Received 0 bbls Mud Received 2522 bbls Starting Volume -21 bbls Mud Loss /24 hr -72 bbls Cumulative Mu -72 bbls Cumulative Mu TME DISTR Last 24 Hrs Rig Up/Service 0.5 Drilling 18 Tripping Reaming Condition Hole 5.5 Slip and Cut Condition Mud Chg Swvi Pkng P/U Rot. Head M-I ENGR / PHC Corky Karcher Cell Corky Karcher	S AND TI S AND TI A Loss 4 MUD V Oil Addd Water A Mud Rec Centrifu Formatic Left in F Other Dumped Shakers Evapora 361 985- 330 708-	S bbls New Ho OL ACCTO ad dded ge n fole fole fole fole fole fole fole fole	ske Volume (bbl) 0 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 15 6 3 1798-7111	Drilled ahead sko 360 to 375 units BKGRN gas, 35 hour. Last surve 365 units gas w/ Oil Base Mud Cr 00 cu yds Daily 96 cu yds Duily 96 cu yds D	wily increasing with a 7 to 10 to 350 units. y: 16533/160' no flare. Haul Off dative Haul O Y815 24.73 5.75 41.09 91/9 4.1 1.7 15.5 39.4 578.7 PHONE	Filtrate REMARKS g mud weight to 1: aft, flare. D/T gas Maintaining LCN 74' = 46.6 deg. La ff MUD RHEO np/na Values kp/ka (lbs^n/10 Bit Loss (psi /9 Bit HHP (hhp /) Bit Jet Vel (d/s) Annular Vel DC Crit Vel DP (fl/n Crit Vel DP (fl/n Crit Vel DC (fl/r ECD @ 16594 (DALY COST \$ 9714 99	8.4+ ppg. Cor s, 400 units w/ A swcops at 5 t ast connection (DGY & HYDF (DGY & HYDF (DGY) () (HSI) (fl/min) (ITHP mection gas 6' flare. obls on the gas at 16559', RAULICS 0.787/0.787 0.804/0.804 401 / 11.3 50 / 1.4 156 178.25 229.11 368 453 19.1 TIVE COST 102.056.43			

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Digital Data

- INSITE adi backup with Data directory on MO disk

TS01-001-HT195: <Solar 195>

01 Aug 2001 – 14 Aug 2001

Miscellaneous