DOE-RMOTC-8067-445

Blast Energy Services, Inc.

ABRASIVE TREATMENT OF WELLBORE CASING

A demonstration of an abrasive jet to cut windows in well casing and to drill a horizontal borehole from an existing well bore.

Draft Report for the Period of October 24 – November 9, 2006

Date Completed: December 19, 2006

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Prepared for the United States Department of Energy

Office of Fossil Energy

Work performed under Rocky Mountain Oilfield Testing Center (RMOTC)
CRADA 2006-077

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ABSTRACT

Blast Energy Services, Inc. (Blast) and the Rocky Mountain Oilfield Testing Center (RMOTC) jointly conducted a test using patented Blast technology to cut slots and windows in a test well and drill out horizontally from a wellbore. A fluid was created by combining an abrasive with field water. This abrasive fluid was injected into the well via a high-pressure coiled tubing unit and specialized cutting nozzle. Initially, the tests were done using various concentrations of abrasive and various cutting rates and verified by downhole camera to determine optimum cutting parameters. Additional slots and windows were cut and horizontally drilled and verified by downhole camera. The information obtained from this test will be used to refine the cutting technology. In addition, this technology will give operators another option in recompletion and stimulation methods.

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EXECUTIVE SUMMARY

This report presents the findings of a demonstration project to cut slots and windows in well casing as well as drill out horizontally from a cut window. The test well is located in the Teapot Dome Oilfield, also known as the Naval Petroleum Reserve No. 3 (NPR-3), located north of Casper, Wyoming.

This demonstration project was funded in part by a Department of Energy Cooperative Research and Development Agreement (CRADA 2006-077) and by Blast Energy Services, Inc. (Blast). The project was performed by Blast using its proprietary cutting nozzle technology. The purpose of this project was to determine the optimal cutting parameters and cut various size and shape windows into the test well casing, and ultimately to test drill a horizontal micro-bore beyond the well casing.

Results of the Blast Abrasive Jet Cutting

The Blast results indicate that the cutting tool technology is very accurate in regard to depth and that the cuts are synchronized with the computer very well. Additional improvements are required in order to adapt the unit to cold weather and to facilitate the exit of the cutting tool for horizontal drilling from the window cut in the well casing.

Observations and Information Supportive of the Blast Results

The information gathered through the Blast test suggests that the Blast cutting tool is capable of cutting well casing quickly and efficiently. The downhole video camera, available at RMOTC, proved especially useful in this project. The camera's primary use was to verify the results of operations in the downhole environment and to diagnose problems. Downhole camera runs verified the cutting patterns and windows cut in the casing. In addition, the downhole camera inferred the horizontal drilling capabilities of the abrasive cutting nozzle.

Conclusion and Recommendations

The Blast test provided significant information about the abrasive jet cutting capabilities of the unit. During this test, problems were encountered. These will need to be resolved and Blast is going to attempt to correct these problems prior to returning to NPR-3 for further testing. The ultimate objective is to increase production in one or more of the

production wells at NPR-3 with this technology. The results of this test strongly support the need for further testing, development, and application of the Blast technology within the oil industry.

INTRODUCTION

Blast Energy Services, Inc. (Blast) is a Texas-based company that performs abrasive jet drilling/cutting in order to provide oil and gas operators with an alternative to existing well stimulation or horizontal drilling services. Blast contracted with the Rocky Mountain Oilfield Testing Center (RMOTC) to conduct a demonstration of its abrasive jet cutting unit and to refine the cutting technology.

This demonstration project was performed using proprietary technology to cut slots and windows in casing as well as drill horizontally from a window that was cut in the casing. The overall approach used in this study included using a sacrificial, low-producing well as a test well. RMOTC was asked to select a shallow well (less than 1,000 feet deep) with 5-1/2-inch casing. This would allow for quick trip times.

The test was performed from October 24, 2006, through November 9, 2006. Optimal cutting parameters were determined by adjusting the amount of abrasive used in the slurry along with the speed of the cutting nozzle. Blast's cutting tool presents a number of advantages including expected lower production costs and increased access to reserves. The information obtained from the project could provide the oil industry with an alternative means of well stimulation and recompletion. Having an accurate, cost-effective means of well stimulation and recompletion could significantly aid in reducing costs and increasing revenue by optimizing production and recovering additional reserves.

BACKGROUND INFORMATION

This test was performed at the Rocky Mountain Oilfield Testing Center (RMOTC) field site within the Naval Petroleum Reserve No. 3 (NPR-3), located approximately 35 miles north of Casper, Wyoming (Figure 1). NPR-3 is situated on the Teapot Dome Anticline in the Powder River Basin, Wyoming. Teapot Dome is the southern extension of the much larger Salt Creek Anticline. Since inception, over 1,300 wells have been drilled into the structure which consists of a doubly plunging anticline cored by a basement high-angle reverse fault. Today at NPR-3, there are approximately 700 active wells producing oil and gas from several different geologic formations.

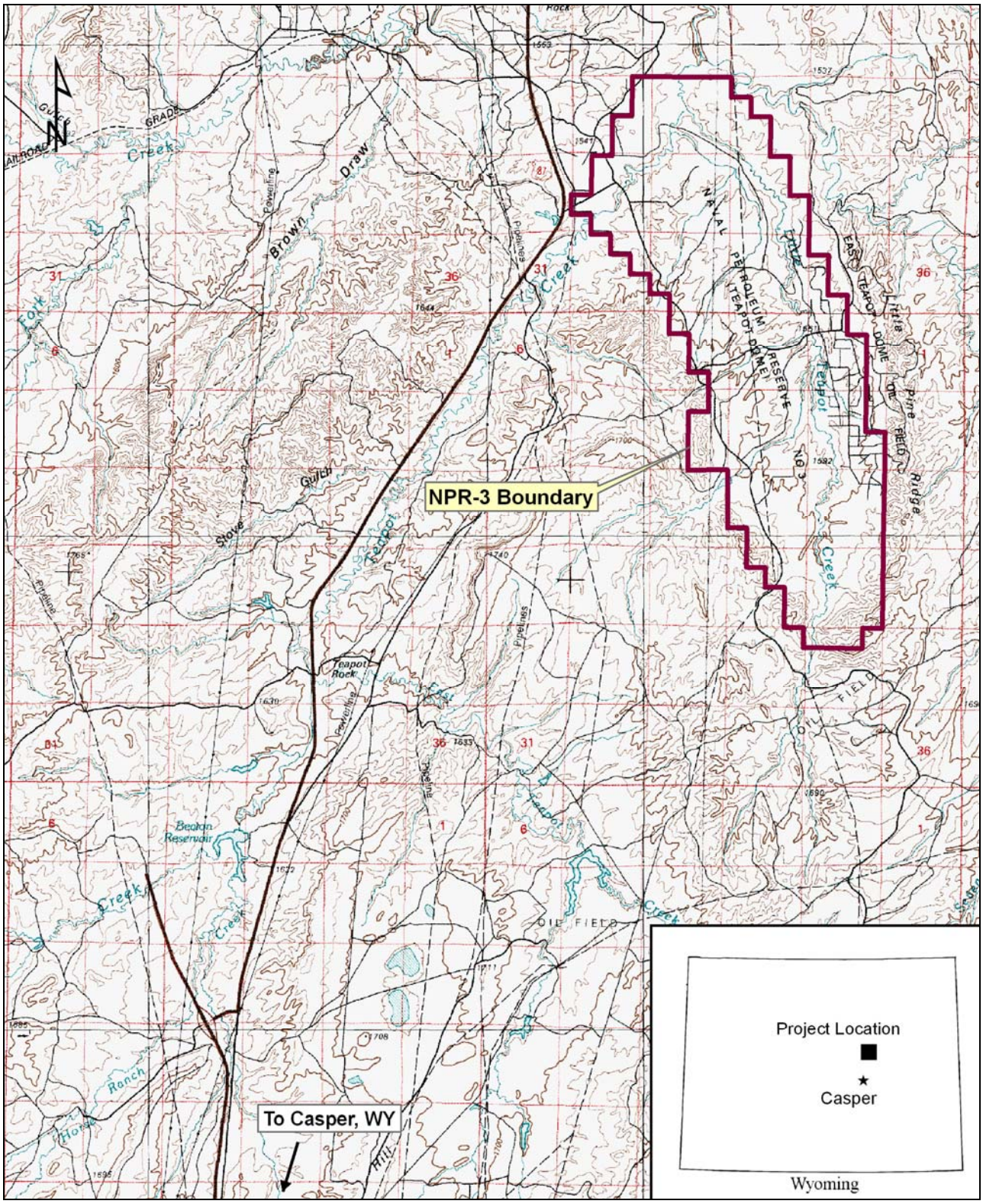

Figure 1. Map showing location of Teapot Dome on the Naval Petroleum Reserve No. 3 in East Central Wyoming, USA.

Well Description

Well 42-SX-11 was chosen as the test well based upon its limited production and having the requested 5-1/2-inch production casing. The well had 2-3/8-inch tubing and has a CIBP set at 811 feet. There are two sets of perforations, the first set being from 628 to 678 feet and the second set from 711 to 742 feet. Blast also requested a 50-foot rathole to catch the casing and abrasive. As the coiled tubing unit (CTU) is quite large in size, a large, flat location was required. Well 42-SX-11 met the requirements.

MATERIALS AND METHODS

The objective of this project was two-fold. First, Blast wanted to adjust the amount of abrasive used in the slurry along with the speed of the cutting nozzle to determine the optimal cutting parameters. Second, Blast wanted to drill out horizontally from a window cut in the well casing.

Equipment

The equipment used to perform the abrasive jet cutting included: a high-pressure CTU complete with a slurry mixing pump and a high-pressure injection pump, a "guide shoe" that attached to the end of the tubing, and the cutting nozzle that directed the flow of the abrasive fluid. The computer-controlled Formation Access Tool (FAT) was connected to the wellhead and allowed for both vertical and horizontal movement of the cutting tool. There were two electric motors that operated the FAT which had the capability for 4 feet of vertical travel.

Procedures

The overall approach used in this study included using a sacrificial, low-producing well as a test well. RMOTC was asked to select a shallow well (less than 1,000 feet deep) with 5-1/2-inch casing. This would allow for quick trip times. The well chosen (42-SX-11) as the test well was based upon its limited production and having the requested 5-1/2-inch production casing. The well had 2-3/8-inch tubing and a CIBP set at 811 feet. There are two sets of perforations, the first set being from 628 to 678 feet and the second set from 711 to 742 feet. The project also required a 50-foot rathole to catch the casing and abrasive.

Due to the size of the coiled tubing unit, a large, relatively flat well pad was required. All well equipment located near the wellhead was removed to gain access. In this case, the pump jack was moved approximately 2 to 3 feet from the wellhead. The next step was to pull the tubing from the well in order to attach a Blast-supplied proprietary "guide shoe" or Bottom Hole Assembly (BHA) to the end of the 2-3/8-inch tubing. The BHA was equipped with a "basket" on the bottom to catch metal, cement, and formation cuttings.

The tubing was then re-run to 692 feet with the BHA attached to the bottom. New tubing was run to minimize the possibility of a scale build-up and possible blockage in the returns. Wellhead blow-out preventers (BOPs) were flanged onto the wellhead with the FAT flanged on top of the wellhead BOPs.

The FAT is controlled by a computer in the cab and allows for vertical and horizontal movement of the cutting nozzle. The computer can be programmed to cut circumferential, vertical, and lateral cuts, as well as windows. This allows for virtually any size or shape slot to be cut in the casing. The unique design of the BHA enables the user to quickly change casing sizes. There are two electric motors that operate the FAT which is capable of up to 4 feet of vertical travel without repositioning the tubing.

Due to the weight of the equipment (8,000 pounds for the FAT and another 8,000 pounds for the BOPs), screw jacks assisted in handling the load. At this point, a "landing joint" was screwed into the tubing, allowing for the tubing and the BHA to be controlled by the FAT. The coiled tubing BOPs were rigged up, and finally, the CTU was rigged up. Blast mixed its abrasive mixture with field-supplied water to form a slurry. The slurry was then pumped through a specially built high-pressure coiled tubing unit at a pressure of up to 17,500 psi. The slurry exited a proprietary nozzle design at a speed approaching the speed of sound and cut through the casing and cement giving access to the rock formation. The initial phase of the test was to determine optimal abrasive concentrations and cutting speeds. Once the cutting tool was lowered to depth via coiled tubing, the computer was programmed for the cutting action. A 180-degree circumferential cut was made, the tool was then raised 2 inches, and the remaining 180-degree circumferential cut was performed. The cutting took about 9 minutes. The cutting tool was then raised

another 2 inches and 12-inch vertical slots were cut into the casing in a saw-tooth pattern at the various abrasive concentrations and cutting speeds. In two hours, 13 12-inch vertical slots were cut through the casing. Next, 3-1/2-inch diameter holes, 90 degrees apart, were cut and a 2-inch by 3-inch window was cut. At this point, the cutting tool was pulled out of hole.

Inspection of the cutting tool showed that the tip of the nozzle had broken off. A decision was made to attempt a short lateral through the window that had been cut. However, there was no forward movement after trying to lower the cutting tool through the guide shoe. When cutting was attempted, there was no pressure. The cutting tool was removed from the hole revealing that the cutting nozzle had been blown off. A camera run was determined to be the best course of action.

After the tubing was pulled out of the hole, the camera verified the circumferential cuts, the vertical slots, and the first window. Inspection of the guide shoe indicated that the hose had gotten stuck in the guide shoe and that the abrasive had entered the cutting tool by tubing annulus and not gone out the window.

The tubing and BHA were then re-run to a depth of 688 feet. This time, a 4-inch by 7-inch window was cut. The tubing was pulled and a piece of casing was recovered from the BHA. A camera run verified a very clean, 4-inch by 7-inch window had been cut in the casing and also revealed access beyond the cement. Another cut was made and verified by camera. Problems with exiting the window were evident in the cutting tool.

RESULTS

Blast Energy Services, Inc. demonstrated that its tool can effectively cut slots and windows in a well casing. In addition, it is able to drill horizontally on a limited basis. The results were verified by downhole video camera and indicated that the Blast technology was very accurate in regard to depth and the cuts were synchronized with the computer.

Additional improvements are required to adapt the unit to cold weather and to facilitate the exit of the cutting tool for horizontal drilling from windows cut in well casing. Because the unit uses fresh water, there were problems with cold temperatures. Blast

achieved about 80 percent of the testing planned before the Wyoming winter weather season caused them to suspend operations.

The test provided significant information about the abrasive jet cutting capabilities. While some problems were encountered, Blast is doing additional testing before it returns to NPR-3 to conduct more testing. The ultimate objective is to increase production in one or more of NPR-3's production wells with this technology. If the problems encountered during initial tests are corrected and additional testing prove the modifications, Blast will try a recompletion or stimulation of an existing, producing well in order to increase production from that well.

Additionally, video from the camera runs are available by calling RMOTC.

CONCLUSIONS AND RECOMMENDATIONS

Blast Energy Services, Inc. demonstrated the ability of its cutting tool. The computer-programmed cuts allow for circumferential, vertical, and lateral cuts as well as windows to be cut into the casing. By using the Formation Access Tool (FAT), the cutting tool can be operated vertically (up to 4 feet of travel) as well as rotationally, allowing for virtually any size or shape slot to be cut in the casing. The unique design of the guide shoe enables the user to quickly change casing sizes.

Because the unit uses fresh water, there were problems with cold temperatures. In addition, proper procedures must be used when operating the computer as parts of the unit are "specialty items." This is cause for concern in the event of a malfunction.

Blast has agreed to refine and address the issues of its technology and plans to continue testing at a later date. If the problems encountered during this test are corrected and additional testing proves out the modifications, then Blast would like to try a recompletion or stimulation of an existing, producing well in order to increase production from that well.

The results of this demonstration support the viability of this technology. In the next test, it is expected that well stimulation or recompletion will add to the production from various wells. Therefore, additional testing is warranted.

RMOTC is a Department of Energy field test site for emerging and developing technologies to address critical energy industry issues. NPR-3 is situated on the Teapot Dome Anticline in the Powder River Basin. Teapot Dome is the southern extension of the much larger Salt Creek Anticline. Since inception, over 1,300 wells have been drilled into the structure which consists of a doubly plunging anticline cored by a basement high-angle reverse fault. Today at NPR-3, there are approximately 600 active wells producing oil and gas from several different geologic formations ranging in depth from 500 to 5,000 feet.

Blast Energy Services, Inc. is a Texas-based company that performs abrasive jet drilling/cutting in order to provide oil and gas operators with an alternative to existing well stimulation or horizontal drilling services. Its mission is to substantially improve the economics of existing oil and gas operations through the application of worldwide licensed and proprietary technologies.

APPENDIX A

Photographs

Figure A1. Coiled tubing unit with formation access tool (FAT) on trailer.

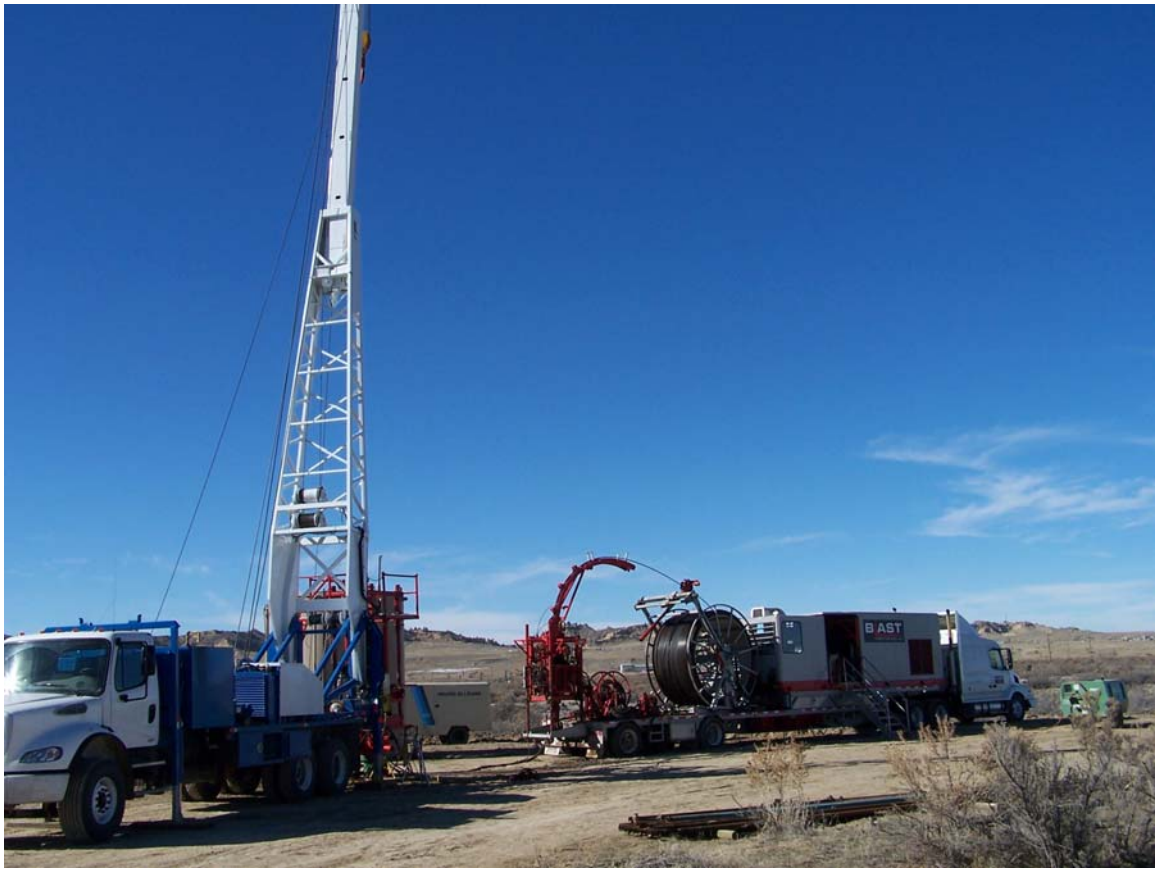

Figure A2. DOE Smeal unit and Coiled Tubing Unit (CTU).

Figure A3. Formation Access Tool (FAT) and BOPs.

Figure A4. Formation Access Tool (FAT) and BOPs.

Figure A5. Formation Access Tool (FAT) and BOPs.

Figure A6. Window cut in 5-1/2-inch casing.

Figure A7. Slots cut in 5-1/2-inch casing at various abrasive concentrations and cutting speeds.

APPENDIX B

Daily Operations Reports

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
DOE	# A2-11	10/2/06	692
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
—	—	—	—
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS		FORMATION CUTTING			CASING CUTTING			WATER RECORD / TYPE			
Operation	Total Hours	No.	Item	Amount	No.	Item	Amount	No.	Time	Fill (lbs)	Pumped (%)
RIG UP / DOWN			NO. PER DEPTH			NO. PER DEPTH		1	8:00	800	
RIH W/ TOOLS			DEPTH			DEPTH		2			
POOH W/ TOOLS		1	TARGET LENGTH		1	SHAPE		3			
CASING CUTTING			ACTUAL LENGTH			DIAMETER		4			
FORMATION CUTTING			CUTTING TIME IN			HEIGHT		5			
MAINTENANCE			TIME OUT			WIDTH			TOTAL WATER		
STANDBY						CUT TIME					
WAIT ON CLIENT		2	TARGET LENGTH		2	SHAPE		ADDITIVES RECORD			
TRAVEL			ACTUAL LENGTH			DIAMETER		NO.	TYPE	AMOUNT	
OTHER			CUTTING TIME IN			HEIGHT		1			
			TIME OUT			WIDTH		2			
						CUT TIME		3			
		3	TARGET LENGTH		3	SHAPE		4			
			ACTUAL LENGTH			DIAMETER		5			
			CUTTING TIME IN			HEIGHT			TOTAL ADDITIVES		
			TIME OUT			WIDTH		ABRASIVE RECORD			
						CUT TIME		NO.	Time	Fill (lbs)	Pumped (%)
GRAND TOTAL HOURS									TOTAL ABRASIVE		

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OTHER INFORMATION		TOOL INFORMATION		BHA DESCRIPTION
No. of days on Well	1	Casing Hose Length		
Cumulative Tripping Hours		Cashing Nozzle Size / OD		
Daily Rental Costs		Rock Cutting Hose Length		
Total Rental Costs		Rock Cutting Hose Size/OD		
BLAST DAILY COST:				

REMARKS: 7:30 ON Location Prepped unit & Dressed up Injector Head. Air compressor AT working using ACE Angular 0-100 Pressure Faster nozzle to 11,200 psi - OK 9:30 Made up hose with 8" & 3" Jumper hoses & laid down into stack.
10:30 Bueney System Failed. Did complete analysis & Sesame Manual down. Failed. 11:00 Standby - Meeting up to Cashco to get copies of all programs. 3:00 Download Newest Bueney Software - OK. Plasma System Software would not download. Need to convert to 3 1/2" floppy for Bueney to accept.

CREW INFORMATION	
Supervisor	J. Ord
Operator	S. Hamill
Technician	D. Johnson

Need Sat Draw for the Mend.

COMPANY REPRESENTATIVE - Printed

COMPANY REPRESENTATIVE - Signed

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
DCE	#42-11	10/25/04	692'
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
–	–	–	–
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16 - 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	

WATER RECORD / TYPE

No.	Time	Fill (lbs)	Pumped (%)
1	9:00	400	
2	12:10	400	
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT
1	~~Biocide~~ - ~~FR~~	
2		
3		
4		
5		
	TOTAL ADDITIVES	

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1	8:00	100	6%
2	12:10	100	6%
3	1:45	100	4 1/2%
4			
5			
	TOTAL ABRASIVE		

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OTHER INFORMATION		TOOL INFORMATION	
No. of days on Well	2	Casing Hose Length	
Cumulative Tripping Hours		Cashing Nozzle Size / OD	
Daily Rental Costs		Rock Cutting Hose Length	
Total Rental Costs		Rock Cutting Hose Size/OD	
BLAST DAILY COST:			

BHA DESCRIPTION — AUT PATHEAD

1. 180 2. 180

3. A B 12" 4 12"

NOTE: HELD SAFETY MEETING @ 10AM

REMARKS: 7:30 ON LOCATION 7:45 TGE LOADED SOFTWARE TO TURN HARD DRIVE 9:15 ALL PERSONNEL WORKING 9:25 START RIH TO 692' TAGGED 11:20 IN SHOE @ 697' ON MECHANICAL COUNTER - SET ABRASIVE MIX TO 6%. 11:40 STARTING 1ST CUT AT 180° @ 15Kpsi FLOW MEASURED AT 2" ROTATED & CUT 12" SLOT ON OPPOSITE SIDE OF CASING RAN OUTLINES FOR 44 MINUTES 12:10 RELOADED ABRASIVE AND FILLED H2O TANK 12:40 START 2ND CUTTING RUN @ 4% GARNET CUTTING 12" X 1" SAW TOOTH PATTERNS. STARTED @ 3 PER MINUTE (CPM) ON 1ST SLOT & SPED UP TO 6 FOR 1:45 RELOAD GARNET. CONTINUED TO ROTATE & CUT SAW TOOTH SLOTS FOR A TOTAL OF 13 VERTICAL SLOTS

CREW INFORMATION	
Supervisor	J. Cool
Operator	D. Johnson
Technician	S. Nowell

2:30 PROGRAMMED TRYING TO CUT CROSS PATTERNS

4:30 SHUT DOWN & PULLED OUT REEL W/ AB.

COMPANY REPRESENTATIVE - Printed

COMPANY REPRESENTATIVE - Signed

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
DOE	# 42-11	10/26/06	692'
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
—	—	—	—
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2	2 3/8
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
4	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
	TOTAL TIME	

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
4	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	

WATER RECORD / TYPE

No.	Time	Fill (lbs)	Pumped (%)
1	11:25	408	
2			
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT
1		
2		
3		
4		
5		
	TOTAL ADDITIVES	

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1	9:45	100	6 1/2%
2	11:25	100	6 1/2%
3	2:00	100	6 1/2%
4	2:45	100	6 1/2%
5			
	TOTAL ABRASIVE		

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OTHER INFORMATION		TOOL INFORMATION	
No. of days on Well	3	Casing Hose Length	
Cumulative Tripping Hours		Cashing Nozzle Size / OD	
Daily Rental Costs		Rock Cutting Hose Length	
Total Rental Costs		Rock Cutting Hose Size/OD	
BLAST DAILY COST:			

BHA DESCRIPTION Cutting Patterns

1. 4 361 IPM
2. 90° 90° 90° 1 1/2" 1 1/2" 3' 2'

REMARKS: 8:30 Hell Safety meeting, warmed up equipment & broke out air hose to reel, then made up auto slave connection. 9:45 Filled reel w/water check transducers on stack to pump head out - ok 10:25 Start Abrasive 11:00 Gaining at nozzle pressure up to 14,800 psi @ 12 Sepm @ 3 IPM 11:26 Finished cutting run. Reload slurry + water 11:55 RIH for 2nd cutting run. 12:20 Repressurized Bleeding to cut 3 1/2" holes 90° apart and a 2x3" window 12:30 Start 2nd cut run @ 10 kpsi @ 10 gpm @ 6 1/2% 12:50 Nozzle above gpm to hold psi (12.5 gpm @ 14.5 psi. Nozzle broke or damaged probably. 1:05 Finished cut 1:35 Start POOH 1:55 Break out hose. Most of the backing 1" fell off nozzle broke off from running against casing & the parts. Insert broke off above backing. 2:30 RIH w/ new hose rock cutter 3 1/2" tubing run steel cutter for client 2 to cut. 2:45 Started up all [illegible] w/ pump 3:45 Hose in shape - [illegible] up 5" to check depth same - no penetration 5:00 pulled up 5" to start down for night.

CREW INFORMATION	
Supervisor	J. Pool
Operator	D. Johnson
Technician	L. Neuxil

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Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
DOE	# 42-11	10/27/06	692
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
—	—	—	—
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
	LENGTH	

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
	Total TIME -->	

WATER RECORD / TYPE

No.	Time	Fill (lbs)	Pumped (%)
1	7:40	400	
2			
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT
1		
2		
3		
4		
5		
	TOTAL ADDITIVES	

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1	7:40	100	6%
2			
3			
4			
5			
	TOTAL ABRASIVE		

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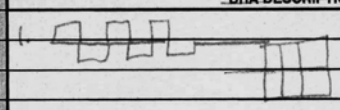
OTHER INFORMATION		TOOL INFORMATION	
No. of days on Well	4	Casing Hose Length	
Cumulative Tripping Hours		Cashing Nozzle Size / OD	
Daily Rental Costs		Rock Cutting Hose Length	
Total Rental Costs		Rock Cutting Hose Size/OD	
BLAST DAILY COST:			

BHA DESCRIPTION — Cutting Pattern



REMARKS: 7:40 on Location - warm units & fill ANNUL 7:50 Run in shoe 8:10 Hold safety meeting & prepared Survey for horizontal line cutting in both directions to check for packoff by shoe. 9:20 Program complete & practice run OK 9:25 Start cutting run #1 10:15 Lost Pressure - Blew off nozzle. 11:00 POOH inspect hose - nozzle gone. Rig down stack. ~~Line~~ & pulled tubing 1:00 Removed shoe & ran tubing back in hole. 3:00 Tricicall up RIA on tubing to unload water in hole up the back side. No water would lift. Decided to run camera anyway 5:15 Camera @ 650 ft & start recording. Tagged to 691'+/- water just below cutting area 6:00 Pulled camera OOH. 8:00pm camera showed both 180° cuts & clean picture of RIA "sawtooth" cuts. Circle cuts 180° apart - first windows did not show. Figure one above did not show. After inspection of tubing shoe apparent showed short hose stuck in shoe cutting up carbide slide. Reason why last 2 cutting patterns did not show.

CREW INFORMATION	
Supervisor	J. [illegible]
Operator	D. Johnson
Technician	S. [illegible]

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COMPANY REPRESENTATIVE - Signed

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
DOE/RMOTC	#A2-11	10/28/06	692
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
—	—	—	—
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
4	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
	GRAND TOTAL LENGTH	

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
4	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
	<--Total CUTS Total TIME -->	

WATER RECORD / TYPE

No.	Time	Fill (~~lbs~~ gal)	Pumped (%)
1	12:15	400	
2	3:00	400	
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT	
1			
2			
3			
4			
5			
	TOTAL ADDITIVES		

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1	1:50	100	6%
2	3:25	100	6%
3			
4			
5			
	TOTAL ABRASIVE		

OTHER INFORMATION

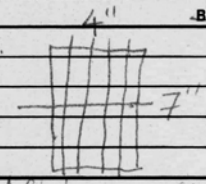
No. of days on Well	5
Cumulative Tripping Hours	
Daily Rental Costs	
Total Rental Costs	
BLAST DAILY COST:	

TOOL INFORMATION

Casing Hose Length	
Cashing Nozzle Size / OD	
Rock Cutting Hose Length	
Rock Cutting Hose Size/OD	

BHA DESCRIPTION – Cutting Pattern

1.



REMARKS: 7:30 on location Run shoe & landed 4ft higher. 9:15 Tubing landed 9:30 Rig up stack 11:00 flushed garnet out 11:45 Tested new steel cutter made up to stop at opening of shoe - ok. 12:15 Start RIH 1:05 Tagged shoe @ 692' Picked up 2 ft & programmed Burney for @ 7x4" Window 1:50 Test window program - ok 2:25 Start garnet cutting run 2:54 Garnet @ nozzle @ 2:54 cutting @ 12.1 gpm @ 15k psi @ 2.5 IPM 2:59 Pressure dropped 250 lbs 3:20 Pressure down 500 lbs - must be nozzle hole erosion. Increased gpm to maintain 15k psi. 3:25 Finished cutting run. Emptied AMU mixer to check how much garnet AMU will take. Fill w/ 2 bags (110 lbs) rather than 3 (165 lbs) not sure why AMU won't take 3 bags. 4:20 Start 2nd cut run to finish 4x7" cut @ 12.3 gpm to get 15400 psi 4:45 Cutting at 15000 psi @ 12.3 gpm @ 2 1/2" minute 5:20 Finished cut. POOH 6:00 Shut down for evening.

CREW INFORMATION

Supervisor	J. Pool
Operator	Q. Johnson
Technician	S. Howell

COMPANY REPRESENTATIVE - Printed

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Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
RMOTC / DOE	#A2-11	10-30-06 / 11-1	692
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
RMOTC / DOE	4 AZ-11	11-2-06	692
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2" 15.5	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
	GRAND TOTAL LENGTH	

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	<--Total CUTS Total TIME -->	

WATER RECORD / TYPE

No.	Time	Fill (lbs)	Pumped (%)
1			
2			
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT	
1			
2			
3			
4			
5			
	TOTAL ADDITIVES		

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1			
2			
3			
4			
5			
	TOTAL ABRASIVE		

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OTHER INFORMATION		TOOL INFORMATION		BHA DESCRIPTION
No. of days on Well		Casing Hose Length		
Cumulative Tripping Hours		Cashing Nozzle Size / OD		
Daily Rental Costs		Rock Cutting Hose Length		
Total Rental Costs		Rock Cutting Hose Size/OD		
BLAST DAILY COST:				

REMARKS: 7:30 AM ON LOCATION - MOVED UNIT BACK to LOCATION & STARTED RIGGING UP 1:30 Started PRESSURING UP & GOT NO CHANGE PRESSURE. 2:00 - 5:45 Tested EACH SYSTEM to find CAUSE - NOTHING WILL MAKE HYDRAULIC HOSE UP this PM to LOOP A & B PORTS AND CHECK PRESSURE AGAIN in the AM

CREW INFORMATION	
Supervisor	J. Pool
Operator	W. Johnson
Technician	S. Newell

COMPANY REPRESENTATIVE - Printed

COMPANY REPRESENTATIVE - Signed

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
RMOTC / DOE	#42-11	11-3-06	692'
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2" 15.5#	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	
GRAND TOTAL HOURS	

FORMATION CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
2	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
3	TARGET LENGTH	
	ACTUAL LENGTH	
	CUTTING TIME IN	
	TIME OUT	
GRAND TOTAL LENGTH		

CASING CUTTING

No.	Item	Amount
	NO. PER DEPTH	
	DEPTH	
1	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
2	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
3	SHAPE	
	DIAMETER	
	HEIGHT	
	WIDTH	
	CUT TIME	
	<--Total CUTS Total TIME -->	

WATER RECORD / TYPE

No.	Time	Fill (lbs)	Pumped (%)
1			
2			
3			
4			
5			
	TOTAL WATER		

ADDITIVES RECORD

NO.	TYPE	AMOUNT	
1			
2			
3			
4			
5			
	TOTAL ADDITIVES		

ABRASIVE RECORD

NO.	Time	Fill (lbs)	Pumped (%)
1			
2			
3			
4			
5			
	TOTAL ABRASIVE		

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OTHER INFORMATION		TOOL INFORMATION		BHA DESCRIPTION
No. of days on Well		Casing Hose Length		
Cumulative Tripping Hours		Cashing Nozzle Size / OD		
Daily Rental Costs		Rock Cutting Hose Length		
Total Rental Costs		Rock Cutting Hose Size/OD		
BLAST DAILY COST:				

REMARKS: 7:45 ON Location Loop Air hoses to F-24 pump. Got change pressure back to 375#. Checking with technician at Tro Fab, they believe could be bad motor.
11:00 Finish out machine to Reg pull motor & pump out location. Also rigged down to pull tubing. 12:15 Rig crew stop inside basket had about 20 pieces of cement, one piece of steel casing approx 1x3". 1:15 Kan tubing to blow down well. 2:15 Finished blowing down well. 3:30 Kan cameras - very clean up cut coupling 4x7" internal. Very clean cut. 5:00 Shut down & took F-24 motor to town for repairs.

CREW INFORMATION	
Supervisor	J. Teel
Operator	V. Johnson
Technician	S. Newell

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COMPANY REPRESENTATIVE - Signed

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
RMOTC/DOE	#A2-11	11-4/11-8	692'
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2" 15.5#	5 1/2"	2 3/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS

Operation	Total Hours
RIG UP / DOWN	
RIH W/ TOOLS	
POOH W/ TOOLS	
CASING CUTTING	
FORMATION CUTTING	
MAINTENANCE	
STANDBY	
WAIT ON CLIENT	
TRAVEL	
OTHER	

Blast Energy Services, Inc.

DAILY OPERATIONS REPORT

RIG # _____ REEL# _____ STRING# _____ FP# _____ SLURRY SYSTEM# _____ N2# _____

COMPANY NAME	WELL NAME	REPORT DATE	MAX CT DEPTH
REMOTE / DOE	#42-11	11-9-06	692'
WELL DEPTH - PBTD	**BOTTOM HOLE PRESSURE**	**FLOWING TUBING PSI**	**WELLHEAD SHUT IN PSI**
BOTTOM HOLE TEMPATURE	**CASING SIZE / WEIGHT / ID**	**SHOE SIZE**	**WORK STRING SIZE**
	5 1/2 15.5#	5 1/2"	2 7/8"
PACKER(S) DEPTH(S)	**MINIMUM TUBING ID**	**MINIMUM CASING ID**	**WELL HEAD CONNECTION**
			7 1/16" 5K

TIME DISTRIBUTION – HOURS		FORMATION CUTTING			CASING CUTTING			WATER RECORD / TYPE			
Operation	Total Hours	No.	Item	Amount	No.	Item	Amount	No.	Time	Fill (lbs)	Pumped (%)
RIG UP / DOWN			NO. PER DEPTH			NO. PER DEPTH		1			
RIH W/ TOOLS			DEPTH			DEPTH		2			
POOH W/ TOOLS		1	TARGET LENGTH		1	SHAPE		3			
CASING CUTTING			ACTUAL LENGTH			DIAMETER		4			
FORMATION CUTTING			CUTTING TIME IN			HEIGHT		5			
MAINTENANCE			TIME OUT			WIDTH			TOTAL WATER		
STANDBY						CUT TIME					
WAIT ON CLIENT		2	TARGET LENGTH		2	SHAPE		ADDITIVES RECORD			
TRAVEL			ACTUAL LENGTH			DIAMETER		NO.	TYPE	AMOUNT	
OTHER			CUTTING TIME IN			HEIGHT		1			
			TIME OUT			WIDTH		2			
						CUT TIME		3			
		3	TARGET LENGTH		3	SHAPE		4			
			ACTUAL LENGTH			DIAMETER		5			
			CUTTING TIME IN			HEIGHT			TOTAL ADDITIVES		
								ABRASIVE RECORD			
								NO.	Time	Fill (lbs)	Pumped (%)
								1			
								2			
								3			
								4			
								5			
GRAND TOTAL HOURS			GRAND TOTAL LENGTH			<--Total CUTS Total TIME -->			TOTAL ABRASIVE		

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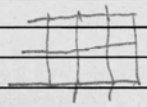
OTHER INFORMATION		TOOL INFORMATION		BHA DESCRIPTION
No. of days on Well		Casing Hose Length		 Pattern #2
Cumulative Tripping Hours		Cashing Nozzle Size / OD		
Daily Rental Costs		Rock Cutting Hose Length		
Total Rental Costs		Rock Cutting Hose Size/OD		
BLAST DAILY COST:				

REMARKS: 7:45 on Location - Rigging Spliced cuts in spiral lines & injector weight indicator. Animal bites. Bottom A.R. valve out. Opened manually, 8:50 Prog. Swivel Burning to cut "Backlash" pattern 8:55 RIH 9:25 Tagged up at 678' - Pick up 2 ft 9:35 Re-landed in shoe @ 678.2' Start pump at 10:3 gpm 9:41 Start cutting run @ 1030 psi @ 6% - 10:04 Increased to 12.2 gpm @ 14,600 psi 10:35 Finished above cutting pattern, centered nozzle - blew into center of cut to clear abrasive 10:55 POOH 11:10 Made up 8 1/2" rock cutter. Difference between steel cutter is 5'4" 11:53 Start RIH w/ 2:10 nozzle at casing @ 673' Start pumping H2O only @ 12.9 gpm @ 14,800 psi - No give back in weight. 12:18 Dropped pressure to zero to relax hose. Start again @ 12.9 gpm @ 14,100 psi with 10 minute stns. Noticed flat spot looking to give back weight - Continue hole 12:45 No progress. Dropped pressure to zero. Line filled up 2 ft & re-passed shoe at same depth. Note 2 ft of hose compression or cut in formation. 1:10 Passed shoe & tag hard. Lost pressure. POOH 2:00 OOH - Hose showed classic spiral compression & nozzle tip gone. Backside wall drag. 2:30-7:00 Rigged down & moved off location.

CREW INFORMATION	
Supervisor	J. Pool
Operator	D. Johnson
Technician	S. Manuel

COMPANY REPRESENTATIVE - Printed

COMPANY REPRESENTATIVE - Signed