west virginia department of environmental protection

Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304
(304) 926-0450
(304) 926-0452 fax

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

PERMIT MODIFICATION APPROVAL

April 09, 2015

PANTHER, LLC
PO BOX 1001
SCOTT DEPOT, WV 25560

Re: Permit Modification Approval for API Number 500283 , Well #: 1
PRESSURE CEMENTING PROCEDURE FOR MINE-THROUGH PER MSHA

Oil and Gas Operator:
The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

Gene Smith

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

500283M

PERMIT CONDITIONS

West Virginia Code §22-6-11 allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. All pits must be lined with a minimum of 20 mil thickness synthetic liner.
2. In the event of an accident or explosion causing loss of life or serious personal injury in or about the well or while working on the well, the well operator or its contractor shall give notice, stating the particulars of the accident or explosion, to the oil and gas inspector and the Chief within twenty-four (24) hours.
3. Well work activities shall not constitute a hazard to the safety of persons.

SEE ATTACHED PERMIT CONDITION.

Permit Condition
500283M

PO Box 99
Dawes, WV 25054
304-205-8846 (Phone)
304-595-1901 (Fax)

April 6, 2015

Mr. James Martin
WV DEP – Division of Oil and Gas
601- 57th Street
Charleston, WV 25304

RE: Speed Mining LLC, American Eagle Mine, Plugging of B&C #1 Oil Well

Dear Mr. Martin,

Please find below a list of safety pre-cautions that will be observed during plugging operations of the B&C #1 oil well, located in Little White Oak in Boone County, West Virginia.

- A 2,000' area around the B&C #1 well will be observed for water wells prior to beginning plugging operations. Any water wells within this area will be clearly marked for observation during the stimulation process. If at any time during stimulation there appears to be an interaction with the water well, appropriate actions will be taken to eliminate that interaction.

- Empirical data shows that shallow stimulation of strata through a vertical well tends to propagate in a horizontal direction. This trend is much more prevalent in stimulation jobs that are less than 1,000 feet from the surface. The deepest point of stimulation for the B&C #1 well will be 720'.

Attached are three (3) copies for your review and approval. If you need additional information or have questions, please feel free to contact me at (304) 981-0124.

Sincerely,

Barrett Justice, PE
Manager of Engineering

500283 M

WW-4B
Rev. 2/01

1) Date Sept. 2 , 2014
2) Operator's
Well No. B&C 1
3) API Well No. 47-005-Unknown (BOO-283)

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS

APPLICATION FOR A PERMIT TO PLUG AND ABANDON

4) Well Type: Oil X / Gas ____ / Liquid injection ____ / Waste disposal ____ /
(If "Gas, Production ____ or Underground storage ____) Deep ____ / Shallow ____

5) Location: Elevation 1,044' Watershed Little White Oak Creek
District Sherman County Boone Quadrangle Sylvester

6) Well Operator Panther, LLC
Address 500 Lee Street, East Suite 900
Charleston, WV 25301

7) Designated Agent Gary Acord
Address 500 Lee Street, East Suite 900
Charleston, WV 25301

8) Oil and Gas Inspector to be notified
Name Terry Urban
Address P.O. Box 1207
Clendenin, WV 25045

9) Plugging Contractor
Name CJ's Well Service
Address P.O. Box 133
Rowe, VA 24646

10) Work Order: The work order for the manner of plugging this well is as follows:
See attached plugging prognosis

10/C

SEE ATTACHED MODIFICATION
DATED 4/9/2015

RECEIVED
Office of Oil and Gas
SEP 05 2014
WV Department of
Environmental Protection

Notification must be given to the district oil and gas inspector 24 hours before permitted work can commence.

Work order approved by inspector Terry Urban Date 9/8/14

500283 M

PLUGGING PROGNOSIS

Well B & C #1
API # 47-005-00283
Sherman District, Boone County

Current Status

Elevation: 1,044'

Drilled 8 ¾ " hole to 530'
Drilled 6 ½ " hole to 735'
Active: No
Previously Plugged

Procedure for Plugging **(101C Approved)**

1) Notify state inspector, Danny Mullins, @ 304-932-6844, before starting.
2) Clean out 8 ¾" hole to the top of Eagle Seam (~ 530') adjacent to original B & C #1.
3) Set 7" casing from 410' to surface. Gel hole. Cement 7" casing to surface. WOC 8 hours.
4) Clean out 6 ½ " hole to 200' below the Eagle Seam (~ 735').
5) Set 4 ½" casing from 730' to the surface. Cement 4 ½" casing to surface.
6) Let cement cure, perforate the 4 ½" casing from 720' to 410' with (88) 0.5" diameter shots.
7) Utilize a Slick Water Stimulation Method to enhance the Pressure Cementing of the fractured strata near the Eagle Seam. This will allow for a safer mine through of the Eagle Seam by decreasing the permeability to gas migration of the surrounding strata.
8) All cement used in the pressure cementing process will be expanding cement.
9) Set an expanding cement plug from the bottom of the wellbore to surface.
10) Erect a permanent monument with API Number.
11) Reclaim site and access road.

SEE ATTACHED DOCUMENTS FOR DETAILS

4/9/15

Jeffrey W. McLaughlin
4/9/15 WV DEP
OFFICE OF OIL & GAS

S00283M

U.S. Department of Labor

Mine Safety and Health Administration
100 Bluestone Road
Mount Hope, WV 25880-1000

APR 0 1 2015

Mr. Barrett Justice
Speed Mining, LLC
P.O. Box 99
Dawes, West Virginia 25054

Dear Mr. Justice:

Subject: 30 CFR 75.1700; Acknowledgement, Alternative Plan to Plug Oil Well B&C #1, American Eagle Mine, ID No. 46-05437, Speed Mining, LLC, Dawes, Kanawha County, West Virginia

This will acknowledge receipt of the alternative plan for plugging procedures in preparation of a mine through for Oil Well B&C #1 located on the subject mine property as stipulated in the approved 101(c) petition on page 7, subpart D.

A mine through plan must be submitted to and approved by MSHA once the alternative plan to plug the oil well has been completed and prior to mining through the oil well as required in the approved 101(c) petition.

If you have any questions concerning this matter, please contact Michael R. Wooldridge of this office at (304) 877-3900, extension 177.

Sincerely,

David S. Mandeville
District Manager
Coal Mine Safety and Health, District 4

TZB/tew

500283M

WW-4B

API No. 47-005- 0028:
Farm Name LaFollete
Well No. B&C 1

INSTRUCTIONS TO COAL OPERATORS
OWNERS AND LESSEE

The well operator named on the obverse side of WW-4 (B) is about to abandon the well described in the enclosed materials and will commence the work of plugging and abandoning said well on the date the inspector is notified. Which date shall not be less then five days after the day on which this notice and application so mailed is received, or in due course should be received by the Department of Environmental Protection Office of Oil & Gas.

This notice and application is given to you in order that your respective representatives may be present at the plugging and filling of said well. You are further notified that whether you are represented or not the operator will proceed to plug and fill said well in the manner required by Section 24, Article 6, Chapter 22 of the Code and given in detail on obverse side of this application.

NOTE: If you wish this well to be plugged according to 22-6-24(d) then as per Regulation 35CSR4-13.9 you must complete and return to this office on form OB-16 "Request by Coal Operator, Owner, or Lessee for plugging" prior to the issuance of this plugging permit.

WAIVER

The undersigned coal operator ___X___ / owner _____ / lessee _____ / of the coal under this well location has examined this proposed plugging work order. The undersigned has no objection to the work proposed to be done at this location, provided, the well operator has complied with all applicable requirements of the West Virginia Code and the governing regulations.

Date: 4/6/15

_____Speed Mining LLC__
By: [signature]
Its Managing Engineer

5002831M

SURFACE OWNER WAIVER

Operator's Well Number B&C #1

INSTRUCTIONS TO SURFACE OWNERS NAMED ON PAGE WW4-A

The well operator named on page WW-4A is applying for a permit from the State to plug and abandon a well. (Note: If the surface tract is owned by more than three persons, then these materials were served on you because your name appeared on the Sheriff's tax ticket on the land or because you actually occupy the surface tract. In either case, you may be the only owner who will actually receive these materials.) See Chapter 22 of the West Virginia Code. Well work permits are valid for 24 months. If you do not own any interest in the surface tract, please forward these materials to the true owner immediately if you know who it is. Also, please notify the well operator and the Office of Oil and Gas.

NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.
WHERE TO FILE COMMENTS AND OBTAIN ADDITIONAL INFORMATION:

Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0450

Time Limits and methods for filing comments. The law requires these materials to be served on or before the date the operator files his Application. You have **FIVE (5) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

Comments must be in writing. Your comments must include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

The Chief has the power to deny or condition a well work permit based on comments on the following grounds:

1) The proposed well work will constitute a hazard to the safety of persons.
2) The soil erosion and sediment control plan is not adequate or effective;
3) Damage would occur to publicly owned lands or resources;
4) The proposed well work fails to protect fresh water sources or supplies;
5) The applicant has committed a substantial violation of a previous permit or a substantial violation of one or more of the rules promulgated under Chapter 22, and has failed to abate or seek review of the violation...".

If you want a copy of the permit as it is issued or a copy of the order denying the permit, you should request a copy from the Chief.

VOLUNTARY STATEMENT OF NO OBJECTION

I hereby state that I have read the instructions to surface owners and that I have received copies of a Notice and Application For A Permit To Plug And Abandon on Forms WW-4A and WW-4B, and a survey plat.
I further state that I have no objection to the planned work described in these materials, and I have no objection to a permit being issued on those materials.

FOR EXECUTION BY A NATURAL PERSON

John C. Bullock 4-3-15
Signature Date

FOR EXECUTION BY A CORPORATION,

Name LaFollete
By John C. Bullock
Its Manager Date 4-3-15

500283m

WW-4B

API No. 47-005-0028;
Farm Name LaFollete
Well No. B&C 1

INSTRUCTIONS TO COAL OPERATORS
OWNERS AND LESSEE

The well operator named on the obverse side of WW-4 (B) is about to abandon the well described in the enclosed materials and will commence the work of plugging and abandoning said well on the date the inspector is notified. Which date shall not be less then five days after the day on which this notice and application so mailed is received, or in due course should be received by the Department of Environmental Protection Office of Oil & Gas.

This notice and application is given to you in order that your respective representatives may be present at the plugging and filling of said well. You are further notified that whether you are represented or not the operator will proceed to plug and fill said well in the manner required by Section 24, Article 6, Chapter 22 of the Code and given in detail on obverse side of this application.

NOTE: If you wish this well to be plugged according to 22-6-24(d) then as per Regulation 35CSR4-13.9 you must complete and return to this office on form OB-16 "Request by Coal Operator, Owner, or Lessee for plugging" prior to the issuance of this plugging permit.

WAIVER

The undersigned coal operator ___ ____/ owner _____/ lessee ___X____/ of the coal under this well location has examined this proposed plugging work order. The undersigned has no objection to the work proposed to be done at this location, provided, the well operator has complied with all applicable requirements of the West Virginia Code and the governing regulations.

Date: 4/06/2015

___Panther LLC
By: GARY E. ACORD
Its AGENT

500283 M

WW-2A / 3A Coal Waiver

COAL OPERATOR, OWNER, OR LESSEE WAIVER

County Boone
Operator Panther LLC Operator's Well Number B&C #1

INSTRUCTIONS TO COAL OPERATOR, OWNER, OR LESSEE

To the coal operator, owner, or lessee named on page WW-2A / 3A. You are hereby notified that any objection you wish to make or are required to make by WV Code 22-6-15, 16 or 17, must be filed with the Chief of the Office of Oil and Gas within fifteen (15) days after the receipt of this application by the Office. Mail objections to:

Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0499 extension 1654

WAIVER

The undersigned coal operator X / owner ____/ lessee ____/ of the coal under this well location has examined this proposed well location. If a mine map exists which covers the area of well location, the well location has been added to the mine map. The undersigned has no objection to the work proposed to be done at this location, provided, the well operator has complied with all applicable requirements of the West Virginia Code and the governing regulations.

FOR EXECUTION BY A NATURAL PERSON

Signature Date 4/6/15

FOR EXECUTION BY A CORPORATION, ETC.

Company Name Speed Mining LLC
By Barrett Smith
Its Managing Member Date

Signature Date 4/6/15

500283M

WW-2A / 3A Surface Waiver

SURFACE OWNER WAIVER

County Boone

Operator Panther LLC
Operator well number B&C #1

INSTRUCTIONS TO SURFACE OWNERS NAMED ON PAGE WW2-A / 3A

The well operator named on page WW-2A / 3A is applying for a permit from the State to do oil or gas well work. (Note: If the surface tract is owned by more than three persons, then these materials were served on you because your name appeared on the Sheriff's tax ticket on the land or because you actually occupy the surface tract. In either case, you may be the only owner who will actually receive these materials.) See Chapter 22 of the West Virginia Code. Well work permits are valid for 24 months. If you do not own any interest in the surface tract, please forward these materials to the true owner immediately if you know who it is. Also, please notify the well operator and the Office of Oil and Gas.

NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.

WHERE TO FILE COMMENTS AND OBTAIN ADDITIONAL INFORMATION:

Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0450

Time Limits and methods for filing comments. The law requires these materials to be served on or before the date the operator files his Application. You have **FIFTEEN (15) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

Comments must be in writing. Your comments must include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

The Chief has the power to deny or condition a well work permit based on comments on the following grounds:

1) The proposed well work will constitute a hazard to the safety of persons.
2) The soil erosion and sediment control plan is not adequate or effective;
3) Damage would occur to publicly owned lands or resources;
4) The proposed well work fails to protect fresh water sources or supplies;
5) The applicant has committed a substantial violation of a previous permit or a substantial violation of one or more of the rules promulgated under Chapter 22, and has failed to abate or seek review of the violation...".

If you want a copy of the permit as it is issued or a copy of the order denying the permit, you should request a copy from the Chief.

List of Water Testing Laboratories. The Office maintains a list of water testing laboratories which you can hire to test your water to establish water quality prior to and after drilling. Contact the Chief to obtain a copy.

VOLUNTARY STATEMENT OF NO OBJECTION

I hereby state that I have read the instructions to surface owners and that I have received copies of a Notice and Application for a Well Work Permit on Form WW2-A / 3A, and attachments consisting of pages 1 through ___ including a work order on Form WW-2B / 3A, a survey plat, and a soil and erosion plan, all for proposed well work on my surface land as described therein.

I further state that I have no objection to the planned work described in these materials, and I have no objection to a permit being issued on those materials.

FOR EXECUTION BY A NATURAL PERSON

John C. Bullock — Signature — Date 4/3/15

John C. Bullock — Print Name

FOR EXECUTION BY A CORPORATION, ETC.

Company Name LRPB

By John C. Bullock — Date 4/3/15

Its Manager

John C. Bullock — Signature — Date 4/3/15

500283M

WW-2A / 3A Coal Waiver

COAL OPERATOR, OWNER, OR LESSEE WAIVER

County Boone
Operator Panther LLC Operator's Well Number B&C #1

INSTRUCTIONS TO COAL OPERATOR, OWNER, OR LESSEE

To the coal operator, owner, or lessee named on page WW-2A / 3A. You are hereby notified that any objection you wish to make or are required to make by WV Code 22-6-15, 16 or 17, must be filed with the Chief of the Office of Oil and Gas within fifteen (15) days after the receipt of this application by the Office. Mail objections to:

Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0499 extension 1654

WAIVER

The undersigned coal operator X / owner _____/ lessee _____/ of the coal under this well location has examined this proposed well location. If a mine map exists which covers the area of well location, the well location has been added to the mine map. The undersigned has no objection to the work proposed to be done at this location, provided, the well operator has complied with all applicable requirements of the West Virginia Code and the governing regulations.

FOR EXECUTION BY A NATURAL PERSON

Signature Date 4/6/15

FOR EXECUTION BY A CORPORATION, ETC.

Company Name Speed Mining LLC
By Barrett Justice
Its Managing Engineer Date 4/6/15

Signature Date

500283 M

Cement Service Call Sheet

Customer	Date of Job	Pump Time
Patriot Coal	w/c	w/c

Well Number / Lease Name	County	State	Job Type
Unknown	Kanawha	WV	Surface and Production

Directions

Comments / Instructions

Casing Size	Casing Weight	Tubing Size	Tubing Weight	Tubing Thread	Annulus	Cement Head	Swage	Plug	Wireline Needed?
7"						Yes	Yes	Yes	No

Hole TD	Hole Size	% Excess	TD of Casing	Mine or Water Depth	Top of Cement Calcualted To:	Top Pressure	Other

Amount	Unit	System / Additives	Yield cu ft / ft	Density lbs / gal	Water gals / sk
		410' of 7" Casing in 720' of 8 7/8 OH 30% Excess			
600	lbs	Bentonite Gel to fill 310' of open hole below bottom of 7" pipe			
75	Sks	Type 1 Cement + 3% CaCL2 + 1/4 #/sk Super Flake	1.18	15.60	5.20
1	ea	7" Top Rubber Plug			
		720' of 4 1/2 Casing in 720' of 8 7/8 OH 20% Excess			
240	Sks	Type 1 Cement + 3% CaCL2 + 1/4 #/sk Super Flake	1.18	15.60	5.20
200	lbs	Bentonite Gel			
210	Gls	7.5% HCL			
1	gl	Al-2 Acid Inhibitor			
1	ea	4 1/2 Top Rubber Plug			

Top WOODEN Plug	yes	Float Shoe		Cement Basket		Stage Collar		3.0" Baffle		Other:
Latchdown Plug		Guide Shoe		Centralizer		Packer Shoe		3 5/16" Baffle		
Latchdown Baffle		Insert Float		Stop Ring		Baffle Plate		3 9/16" Baffle		

Additional Comments on Procedures:

Customer Field Contact	Superior Contact
Barrett Justice	Chris Cook
Customer Contact	**Number(s) for Contact**
304-981-0124	276-679-5860

C&J Energy Services

500283m

Prepared for
Patriot Coal
Barrett Justice and Jerry Swanson
83 Corporate Centre Drive Scott Depot WV 25560
304-901-0124
305-553-2642

C&J Energy Services

Prepared by
C&J Energy Services
Larry.Van Hoorebeke
Norton Va.
304-377-6803
276-679-5863

Plug Job for Long Wall

420' 7" Casing in 720' 8 7/8 OH with 30% Excess

Price Code	Description	Amount	Units of Sale	Unit Cost	Total Cost
20-200-0001	Mileage DOT Units, Cmt - per unit, per one-way mile	100	ut-mi	$ 6.00	$ 420.00
20-200-0002	Mileage non-DOT Units, Cmt - per unit, per mile	100	ut-mi	$ 3.40	$ 238.00
20-200-0008	Bulk Cement Delivery - per sack, per one-way mile	7500	sk-mi	$ 0.16	$ 840.00
20-215-0001	Bulk Blending Service - per sack	75	sk	$ 2.70	$ 141.75
20-220-0005	Depth Pumped 301 to 500', first 4 hours - per unit	1	unit	$ 1,410.00	$ 987.00
20-299-0006	Plug Container Left on Well - each, per job	1	ea	$ 112.00	$ 78.40
20-299-0008	AccuDat Recording System - each, per job	1	ea	$ 1,110.00	$ 777.00
20-299-0010	High-Energy Mix System (HEMS) - each, per job	1	ea	$ 647.00	$ 452.90
25-310-1302	Cement-Standard, 3% CC, 1/4# Super Flake - per sack	75	sk	$ 42.09	$ 2,209.73
25-330-0020	Bentonite (Gel) - per pound	600	lb	$ 0.92	$ 386.40
50-760-0070	Rubber Plug Top 7" - each	1	ea	$ 207.00	$ 144.90

Gross Price $ 9,537.25

Special Line Item Discounts Applied $ 6,676.08

This Price is Good For 6 Hours on Location

500283M

Prepared for
Patriot Coal
Barrett Justice and Jerry Swanson
83 Corporate Centre Drive Scott Depot WV 25560
304-901-0124
305-553-2642

C&J Energy Services

Prepared by
C&J Energy Services
Larry.Van Hoorebeke
Norton Va.
304-377-6803
276-679-5863

Plug Job for Long Wall

720' 4 1/2 Casing in720' 8 7/8 OH with 20% Excess

Price Code	Description	Amount	Units of Sale	Unit Cost	Total Cost
20-200-0001	Mileage DOT Units, Cmt - per unit, per one-way mile	100	ut-mi	$ 6.00	$ 420.00
20-200-0002	Mileage non-DOT Units, Cmt - per unit, per mile	100	ut-mi	$ 3.40	$ 238.00
20-200-0008	Bulk Cement Delivery - per sack, per one-way mile	24000	sk-mi	$ 0.16	$ 2,688.00
20-215-0001	Bulk Blending Service - per sack	240	sk	$ 2.70	$ 453.60
20-220-0010	Depth Pumped 501 to 1,000', first 4 hours - per unit	1	unit	$ 1,540.00	$ 1,078.00
20-299-0006	Plug Container Left on Well - each, per job	1	ea	$ 112.00	$ 78.40
20-299-0008	AccuDat Recording System - each, per job	1	ea	$ 1,110.00	$ 777.00
20-299-0010	High-Energy Mix System (HEMS) - each, per job	1	ea	$ 647.00	$ 452.90
25-310-1302	Cement-Standard, 3% CC, 1/4# Super Flake - per sack	240	sk	$ 42.09	$ 7,071.12
25-330-0020	Bentonite (Gel) - per pound	200	lb	$ 0.92	$ 128.80
35-400-0075	HCl Acid (0-7.5%) - per gallon	210	gal	$ 3.84	$ 564.48
35-405-0002	Acid Inhibitor 2 (AI-2) - per gallon	1	gal	$ 220.00	$ 154.00
50-760-0045	Rubber Plug Top 4-1/2" - each	1	ea	$ 115.00	$ 80.50

Gross Price $ 20,264.00

Special Line Item Discounts Applied $ 14,184.80

This Price is Good For 6 Hours on Location

500283M

Prepared for
Patriot Coal
Barrett Justice and Jerry Swanson
83 Corporate Centre Drive Scott Depot WV 25560
304-901-0124
305-553-2642

C&J Energy Services

Prepared by
C&J Energy Services
Larry.Van Hoorebeke
Norton Va.
304-377-6803
276-679-5863

Plug Job for Long Wall

Stimulation Service - 1 Stg Stimulation Injection for Sqeeze Job to Plug Well

Price Code	Description	Amount	Units of Sale	Unit Cost	Total Cost
30-200-0001	Mileage DOT Units, Stim - per unit, per one-way mile	500	ut-mi	$ 6.00	$ 2,100.00
30-200-0002	Mileage non-DOT Units, Stim - per unit, per one-way mile	100	ut-mi	$ 3.40	$ 238.00
30-200-0007	Minimum Acid & Mat Delivery, Stim - per job	1	job	$ 635.00	$ 444.50
30-260-0003	Blender Minimum, first 4 hours - per unit	1	unit	$ 2,720.00	$ 1,904.00
30-270-1000	Pump Minimum, first 4 hours - per unit	2	unit	$ 7,290.00	$ 10,206.00
30-270-0000	Pump Standby - per pump	1	ea	$ 3,770.00	$ 2,639.00
30-299-2101	AccuDat Frac Van I - per job	1	job	$ 1,150.00	$ 805.00
30-299-2010	Densiometer, Stim - each, per job	1	ea	$ 695.00	$ 486.50
30-299-1025	Ground Manifold - per job	1	job	$ 867.00	$ 606.90
35-455-1121	Perf Ball Injector - each, per job	1	ea	$ 624.00	$ 436.80
35-455-8753	Perf Balls RCN 7/8" 1.3 SG - each	80	ea	$ 4.80	$ 268.80
35-400-0180	HCl Acid (12.5-18.0%) - per gallon	500	gal	$ 5.97	$ 2,089.50
35-405-0002	Acid Inhibitor 2 (AI-2) - per gallon	1	gal	$ 220.00	$ 154.00
35-470-1507	WFR-6W	17	gal	$ 116.00	$ 1,380.40
35-475-0905	Breaker FR - per gallon	3	gal	$ 148.00	$ 310.80
35-440-0170	AQUCAR DB-20	3	gal	$ 263.00	$ 552.30

Gross Price $ 35,175.00

Special Line Item Discounts Applied $ 24,622.50

This Price is Good For 6 Hours on Location

Additional Items - If Requested Or Ordered

Price Code	Description	Amount	Units of Sale	Unit Cost	Total Cost
30-260-0001	Blender Additional - per unit, per hour	1	ut-hr	$ 742.00	$ 244.86
30-270-1001	Pump Additional Hours - per unit, per hour	1	ut-hr	$ 1,036.00	$ 341.88

500283M

Customer	SWS Stimulation Service Call	Pump Time
Patriot Coal	W/C	W/C

Well Number / Lease Name	County	State	Job Type
Unknown	Kanawha	KY	Slick Water Treatment

Directions

Casing Size	Weight	Tubing Size	Weight	Thread	Rate Req'd	Top Pressure	Foam Quality	Perf Ball Inj.	Perf Balls	Size
4.5	10.5	n/a	n/a	n/a		4000		no	no	

Total H2O Needed for Job: 403

Stage	Stage 1	Stage 2	Stage 3
Formation	Shale1	Shale2	Shale3	Shale4
Baffles	TD			
Depths	720			
Top Perf	410			
Bottom Perf	720			
Number of Perfs	88			
Sand Conc.	0-10 ppg			
Fluid Rates	12-15 bpm			
Water Behind Acid				
PrePad/Pad Volume	92			
Clean Volume (w/ sand)	305			
Flush Volume	7			
Total Fluid Vol bbls	403			

TOTALS	MATERIAL	CONC. U/M	STG1
0	20/40 Sand	sks	0
0	Nitrogen	mscf	0
500	15% HCl Acid	gals	500
0	20% HCl Acid		0
0	w/ Al-2	gals	0
80	Perf Balls	gals	80
0	ClayTreat TS	gals	0
	Gel System		20 lb/1000
16.9	WFR-6W	gal	16.9
2.5	FR Breaker	gal	2.5
2.5	Aqucar DB-20	lbs	2.5
0.0	Super TSC		0.0
0.0	ICP-1000	gal	0.0
0.0	Super Flo RPM	gal	0.0

Additional Comments on Procedures:

Customer Contact	Superior Contact

C&J Energy Services

4/6/2015

500283M

McLaughlin, Jeffrey W

From: Denny Mills <Denny.Mills@cjes.com>
Sent: Wednesday, April 08, 2015 11:10 AM
To: McLaughlin, Jeffrey W
Cc: 'Justice, Barrett D'; Swanson, Jerry; Richard Smith; Larry Vanhoorebeke
Subject: Narrative for Summary Report - Patriot Coal
Attachments: Summary Report - Patriot Coal.pdf

Jeff,
The report summary explains the expected geometry for the water injection to be performed for Patriot Coal's plugging operation. The data collected and submitted by Patriot Coal was used in fracture modeling software, in this case, MFrac, a trademark of Baker Hughes Incorporated. The report gives an approximate profile to include the coal and shale stringers throughout the rock strata. Standard inputs for rock mechanics were used from data library within the program. The procedure is to inject water at a rate of 15 barrels per minute (bpm). The volume to be pumped is approximately 400 barrels (bbl). The zone is perforated with 88 holes with 0.5 in diameter shots. Perfs balls will be dropped periodically throughout the procedure to initiate inject in multiple zones, thus the 4 regions (fracs as listed in report). With a constant volume and rate, the model simulates and divides the volume evenly because the program does not have the ability to simulate perf balls being dropped during the injection. The anticipated geometry with the volume divided is horizontal to the surface due to the overburden being the least principle stress and fracture propagation is perpendicular to that stress, this is common due to the shallow depth of less than 1000 feet. The radius of fracture is anticipated to be 30 to 60 feet. The flow is modeled radially and if so, tends to be a shorter radius, but if the flow follows a less than radial path, the radius is extend but with a constant volume the radius is still limited. The pressures simulated at the bottomhole during the injection (BHTP) range from 480 to 540 psi. This is with the simulation of 88 holes and thus minimizes the surface pressures due to near zero friction pressure at the low rates of injection. The anticipated surface pressures are in the 1000 to 3000 psi range due to planned limitation of injection area with the introduction of perf balls.

If you have any other questions regarding the report please do not hesitate to contact me.

C&J Energy Services

Denny Mills
Account Manager
C&J Energy Services, Inc.
41 Devonwood Drive
Bridgeport, WV 26330
Ph: 304-657-8821
cjenergy.com

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Email Change Alert: With the Merger of Nabors & C&J, my new email address is denny.mills@cjes.com . *Please update my contact information in your address book. All my phone contact #'s will remain the same.*

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C&J Energy Services

MFrac

Three-Dimensional Hydraulic Fracturing Simulator

MFrac is a trademark of Baker Hughes Incorporated
Copyright © 1985-2013 Baker Hughes Incorporated
2130 Freeport Rd, Suite C, Natrona Heights, PA 15065 USA
MFrac version 5.80.2303
http://www.mfrac.com/
Simulation Date 4/7/2015 10:39 AM

Company :	Patriot Coal
Well:	Unknown
Location:	Kanawha, WV
Date:	4/7/15

Comments:
Weir Formation

Input Data

FRACTURE OPTIONS

Fracture Geometry: Horizontal Ellipsoidal

ROCK PROPERTIES

Zone Name	TVD at Bottom (ft)	MD at Bottom (ft)	Stress Gradient (psi/ft)	Stress (psi)	Young's Modulus (psi)	Poisson's Ratio	Fracture Toughness (psi-in^½)	Critical Stress (psi)	Stress Interpolation
Coal	395	395	0.65	256.75	1e+06	0.3	1000	0	Off
Sandstone	490	490	0.65	318.5	5e+06	0.15	1000	0	Off
Shale	526	526	0.75	394.5	6.2e+06	0.25	1000	0	Off
Coal	531	531	0.65	345.15	1e+06	0.3	1000	0	Off
Shale	538	538	0.75	403.5	6.2e+06	0.25	1000	0	Off
Sandstone	547	547	0.65	355.55	5e+06	0.15	1000	0	Off
Coal	550	550	0.65	357.5	1e+06	0.3	1000	0	Off
Shale	555	555	0.75	416.25	6.2e+06	0.25	1000	0	Off

FLUID LOSS DATA

Zone Name	TVD at Bottom (ft)	MD at Bottom (ft)	Leakoff Coef. (ft/min^½)	Spurt Loss (gal/ft²)
Coal	395	395	0.01	0.001
Sandstone	490	490	0.01	0.001
Shale	526	526	0.001	0.001
Coal	531	531	0.01	0.001
Shale	538	538	0.001	0.001
Sandstone	547	547	0.01	0.001
Coal	550	550	0.01	0.001
Shale	555	555	0.001	0.001

WELLBORE HYDRAULICS DATA

Wellbore Volume	353.16	(U.S. gal)
Injection Down	Casing	
Horizontal Well	Off	
Surface Line Volume	0	(U.S. gal)
Wellbore Volume Reference MD	541	(ft)
Wellbore Volume Reference TVD	541	(ft)
Maximum BHTP	1e+05	(psi)

PERFORATION ZONES

	Active	Zone	Center of Perfs MD (ft)	Center of Perfs TVD (ft)	Ellipsoidal Aspect Ratio	Perforations Number	Diameter (in.)
1.	Yes	Coal	530	530	1	88	0.5

ZONE DATA

	Zone	Azimuth of Min. Hor. Stress (°)	No. of Multiple Fractures	Stiffness Interaction	Fluid Loss Interaction	Multi-Layer Stiffness Interaction	Multi-Layer Fluid Loss Interaction	Pay Zone From (ft)	To (ft)	Perm. (mD)
1.	Coal	0	4	0	0	0	0	526	531	10

INPUT SURFACE TREATMENT SCHEDULE

Schedule Type	Surface	
Wellbore Fluid Type	KCL2	
Fraction of Well Filled	1	
Recirculation Volume	0	(U.S. gal)

Stage No.	Slurry Rate (bpm)	Stage Liquid Volume (U.S. gal)	Stage Time (min)	Stage Type	Fluid Type	Prop Type	Prop Conc. (lbm/gal)	Prop Damage Factor
1	15	500	0.79365	Acid	T003	0000	0	0

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2	15	3843	6.1	Pad	FR01	0000	0	0
3	15	2562	4.0667	Prop	FR01	0000	0	0
4	15	2562	4.0667	Prop	FR01	0000	0	0
5	15	2562	4.0667	Prop	FR01	0000	0	0
6	15	2562	4.0667	Prop	FR01	0000	0	0
7	15	353	0.56032	Flush	FR01	0000	0	0

Fluid Type: KCL2 - 2% KCl	353.16	(U.S. gal)
Fluid Type: T003 - 15% HCl	500	(U.S. gal)
Fluid Type: FR01 - Slickwater - 1 gal/1000 friction reducer	14444	(U.S. gal)
Proppant Type: 0000 - No Prop, Slug, ...	0	(lbm)

Output Data

SURFACE TREATMENT SCHEDULE PUMPED

Stage No.	Avg Slurry Rate (bpm)	Liquid Volume (U.S. gal)	Slurry Volume (U.S. gal)	Total Slurry Volume (U.S. gal)	Total Time (min)	Fluid Type	Prop Type	Conc. From (lbm/gal)	Conc. To (lbm/gal)	Prop. Stage Mass (lbm)
1	15	500	500	500	0.79365	T003	0000	0	0	0
2	15	3843	3843	4343	6.8937	FR01	0000	0	0	0
3	15	2562	2562	6905	10.96	FR01	0000	0	0	0
4	15	2562	2562	9467	15.027	FR01	0000	0	0	0
5	15	2562	2562	12029	19.094	FR01	0000	0	0	0
6	15	2562	2562	14591	23.16	FR01	0000	0	0	0
7	15	353	353	14944	23.721	FR01	0000	0	0	0

Total Slurry Volume	14944	(U.S. gal)
Total Liquid Volume	14944	(U.S. gal)
Total Proppant Mass	0	(lbm)

BOTTOMHOLE TREATMENT SCHEDULE PUMPED

Stage No.	Avg Slurry Rate (bpm)	Liquid Volume (U.S. gal)	Slurry Volume (U.S. gal)	Total Slurry Volume (U.S. gal)	Total Time (min)	Fluid Type	Prop Type	Conc. From (lbm/gal)	Conc. To (lbm/gal)	Prop. Stage Mass (lbm)
Well	15	345.98	345.98	345.98	0.54918	KCL2	0000	0	0	0
1	15	500	500	845.98	1.3428	T003	0000	0	0	0
2	15	3843	3843	4689	7.4428	FR01	0000	0	0	0
3	15	2562	2562	7251	11.509	FR01	0000	0	0	0
4	15	2562	2562	9813	15.576	FR01	0000	0	0	0
5	15	2562	2562	12375	19.643	FR01	0000	0	0	0
6	15	2562	2562	14937	23.709	FR01	0000	0	0	0
7	15	7.0168	7.0168	14944	23.721	FR01	0000	0	0	0

Total Slurry Volume	14944	(U.S. gal)
Total Liquid Volume	14944	(U.S. gal)
Total Proppant Mass	0	(lbm)

WELLBORE HYDRAULICS SOLUTION

Hydraulic Power Required	90.196	(hhp)
Surface Pressure, Min.	202.99	(psi)
Surface Pressure, Max.	245.43	(psi)
BHTP Pressure, Min.	482.01	(psi)
BHTP Pressure, Max.	538.16	(psi)
Gravitational Head, Min.	315.51	(psi)
Gravitational Head, Max.	333.63	(psi)
Frictional Pressure Loss, Min.	36.488	(psi)
Frictional Pressure Loss, Max.	37.557	(psi)

FRACTURE PROPAGATION SOLUTION
(Calculated Values at End of Treatment)

	Coal (1 frac)	Coal (4 fracs)	
Slurry Volume Injected	3736	14944	(U.S. gal)
Liquid Volume Injected	3736	14944	(U.S. gal)
Fluid Loss Volume	3674.9	14700	(U.S. gal)
Frac Fluid Efficiency	0.016358	0.016358	
Net Frac Pressure	52.154	52.154	(psi)
Length (one wing)	31.941	31.941	(ft)
Upper Frac Height	31.941	31.941	(ft)
Lower Frac Height	31.941	31.941	(ft)
Center of Perfs (TVD)	530	530	(ft)
Total Frac Height	63.882	63.882	(ft)
Max. Frac Width at Perfs	0.045882	0.18353	(in.)
Avg. Hydraulic Frac Width	0.030588	0.12235	(in.)

PROPPANT DESIGN SUMMARY

	Coal (1 frac)	Coal (4 fracs)

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Frac Length - Created	31.941	31.941	(ft)
Frac Length - Propped	0	0	(ft)
Frac Height - Avg.	0	0	(ft)
Propped Height (Pay Zone) - Avg.	0	0	(ft)
Max Width at Perfs - EOJ	0.045882	0.18353	(in.)
Propped Width (Well) - Avg.	0	0	(in.)
Propped Width (Pay Zone) - Avg.	0	0	(in.)
Conc./Area (Frac) - Avg. at EOJ	0	0	(lbm/ft²)
Conc./Area (Pay Zone) - Avg. at Closure	0	0	(lbm/ft²)
Frac Conductivity (Pay Zone) - Avg. at Closure	0	0	(mD-ft)
Dimensionless Frac Conductivity (Pay Zone)	0	0	
Beta	0	0	(atm-s²/gm)
Avg. Fracture Permeability	0	0	(darcy)
Propped Fracture Ratio (EOJ)	0	0	
Closure Time	0.41201	0.41201	(min)
Screen-Out Time	0	0	(min)

PROPPANT TRANSPORT SUMMARY TABLE

			End of Job					After Closure		
Stage No.	Interval From (ft)	Interval To (ft)	Height Slurry (ft)	Height Bank (ft)	Conc. Inlet (lbm/gal)	Conc. Final (lbm/gal)	Prop Width (in.)	Prop Ht. Total (ft)	Prop Ht. Pay (ft)	Conc. Area (lbm/ft²)
7	0	4.4876	62.61	0	0	0	0	62.61	5	0
6	4.4876	31.94	44.306	0	0	0	0	44.306	4.6185	0
5	31.94	31.94	0	0	0	0	0	0	0	0
4	31.94	31.94	0	0	0	0	0	0	0	0
3	31.94	31.94	0	0	0	0	0	0	0	0
2	31.94	31.94	0	0	0	0	0	0	0	0
1	31.94	31.94	0	0	0	0	0	0	0	0
0	31.94	31.941	18.336	0	0	0	0	18.336	2.5	0