

# APPROVED

NAME: *Chad G. Johnson*

DATE: *2/10/2016*

Well Operator's Report of Well Work



Where energy meets innovation.

Well Number: 513148

API: 47 - 017 - 06462

Submission:  Initial  Amended

Notes: Correction to Production Cement Top (MD)

RECEIVED  
Office of Oil and Gas

DEC 21 2015

WV Department of  
Environmental Protection

*AK 04/01/16*  
*04/01/2016*

State of West Virginia  
Department of Environmental Protection - Office of Oil and Gas  
Well Operator's Report of Well Work

API 47 - 017 - 06462 County DODDRIDGE District WEST UNION  
Quad OXFORD 7.5' Pad Name OXFORD 157 Field/Pool Name \_\_\_\_\_  
Farm name JUSTIN L. HENDERSON ET AL Well Number 513148  
Operator (as registered with the OOG) EQT Production Company  
Address 625 Liberty Ave. EQT Plaza, Suite 1700 City Pittsburgh State PA Zip 15222

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey  
Top hole Northing 4,342,996 Easting 520,171  
Landing Point of Curve Northing 4,342,981 Easting 520,471  
Bottom Hole Northing 4,342,157 Easting 520,872

Elevation (ft) 970 GL Type of Well  New  Existing Type of Report  Interim  Final  
Permit Type  Deviated  Horizontal  Horizontal 6A  Vertical Depth Type  Deep  Shallow  
Type of Operation  Convert  Deepen  Drill  Plug Back  Redrilling  Rework  Stimulate  
Well Type  Brine Disposal  CBM  Gas  Oil  Secondary Recovery  Solution Mining  Storage  Other \_\_\_\_\_  
Type of Completion  Single  Multiple Fluids Produced  Brine  Gas  NGL  Oil  Other \_\_\_\_\_  
Drilled with  Cable  Rotary

Drilling Media Surface hole  Air  Mud  Fresh Water Intermediate hole  Air  Mud  Fresh Water  Brine  
Production hole  Air  Mud  Fresh Water  Brine

Mud Type(s) and Additive(s)  
Water base Mud 12.5 ppg barium sulfate, sodium chloride, xanthan gum, polyanionic cellulose, modified starch, sodium hydroxide, phosphonates and alkyl phosphates, glutaraldehyde solution, calcium hydroxide, partially hydrolyzed polyacrylamide/polyacrylate, potassium chloride, sodium carbonate, ground walnut shells, alcohol and modified fatty acid, ferrochrome lignosulfonate, calcium carbonate, fibrous cellulose

Date permit issued 04/18/2014 Date drilling commenced 08/18/2014 Date drilling ceased 1/22/2015  
Date completion activities began 5/5/2015 Date completion activities ceased 5/9/2015  
Verbal plugging (Y/N) N Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 144 Open mine(s) (Y/N) depths N  
Salt water depth(s) ft - Void(s) encountered (Y/N) depths N  
Coal depth(s) ft 337 Cavern(s) encountered (Y/N) depths N  
Is coal being mined in area (Y/N) N

Reviewed by: \_\_\_\_\_

04/01/2016

API 47-017 - 06462 Farm name JUSTIN L. HENDERSON ET AL Well number 513148

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor	24"	20"	63'	NEW	A-500 40LB/FT	NONE	Y
Surface	17.5"	13.375"	941'	NEW	J-55 54.5LB/FT	262'	Y
Coal							
Intermediate 1	12.375"	9.625"	5,020'	NEW	P-110 40LB/FT	1265',2955',4065'	Y
Intermediate 2							
Intermediate 3							
Production	8.5"	5.5"	10,204'	NEW	P-110 20LB/FT	NONE	N
Tubing							
Packer type and depth set							

Comment Details \_\_\_\_\_

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft <sup>3</sup> /sks)	Volume (ft <sup>3</sup> )	Cement Top (MD)	WOC (hrs)
Conductor	CLASS A	61	15.6	1.18	71.98	0	8
Surface	CLASS A	790	15.6	1.19	940.1	0	8
Coal							
Intermediate 1	CLASS A / CLASS A	366 / 308	14.2 / 15.6	1.28 / 1.18	831.92	0	8
Intermediate 2							
Intermediate 3							
Production	Class A / Class H	325 / 455	14.2 / 15.2	1.26 / 1.97	1305.9	4,638'	8
Tubing							

Drillers TD (ft) 10,214' Loggers TD (ft) N/A

Deepest formation penetrated Marcellus Plug back to (ft) N/A

Plug back procedure N/A

Kick off depth (ft) 5,090'

Check all wireline logs run  caliper  density  deviated/directional  induction  
 neutron  resistivity  gamma ray  temperature  sonic

Well cored  Yes  No  Conventional  Sidewall Were cuttings collected  Yes  No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING \_\_\_\_\_

CONDUCTOR- NONE

SURFACE- JOINTS: 1,10,20

INTERMEDIATE- RAN AT LEAST EVERY 500' FEET JOINTS: 1,12,24,36,48,60,72,84,96,108,120

PRODUCTION- Composite Body Centralizers run every joint from bottom to 4,500'

WAS WELL COMPLETED AS SHOT HOLE  Yes  No DETAILS \_\_\_\_\_

WAS WELL COMPLETED OPEN HOLE?  Yes  No DETAILS \_\_\_\_\_

WERE TRACERS USED  Yes  No TYPE OF TRACER(S) USED \_\_\_\_\_





WR-35  
Rev. 8/23/13

Page \_\_\_ of \_\_\_

API 47- 017 - 6462 Farm name JUSTIN L. HENDERSON ET AL Well number 513148

Drilling Contractor Patterson UTI (Rig 252)  
Address 207 Carlton Drive City Eighty Four State PA Zip 15330

Logging Company GYRODATA  
Address 601 MAYER ST City BRIDGEVILLE State PA Zip 15017

Logging Company \_\_\_\_\_  
Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Cementing Company NABORS CEMENTING SERVICES  
Address 2504 SMITH CREEK ROAD City WAYNESBURG State PA Zip 15370

**513148 Final Formations API #47-017-06462**

<b>Formation Name</b>	<b>Final Top MD (ftGL) (ft)</b>	<b>Final Top TVD (ft)</b>	<b>Final Btm MD (ftGL) (ft)</b>	<b>Final Btm TVD (ft)</b>
FRESH WATER ZONE	1		154	
SAND/SHALE	1		347	
PITTSBURGH COAL SEAM	347		351	
SAND/SHALE	351		1,599.00	
BIG LIME	1,599.00		1,884.00	
WEIR	1,884.00		2,089.00	
BEREA	2,089.00		2,093.00	
GANTZ	2,093.00		2,204.00	
50F	2,204.00		2,294.00	
30F	2,294.00		2,349.00	
GORDON	2,349.00		2,438.00	
4TH	2,438.00		2,660.00	
BAYARD	2,660.00		2,933.00	
WARREN	2,933.00		3,010.00	
SPEECHLEY	3,010.00		3,499.00	
BALLTOWN A	3,499.00		4,146.00	
RILEY	4,146.00		4,596.00	
BENSON	4,596.00		4,849.00	
ALEXANDER	4,849.00		6,210.00	6,009.50
SONYEA	6,210.00	6,009.50	6,397.00	6,150.70
MIDDLESEX	6,397.00	6,150.70	6,473.00	6,203.60
GENESEE	6,473.00	6,203.60	6,584.00	6,272.30
GENESEO	6,584.00	6,272.30	6,680.00	6,320.50
TULLY	6,680.00	6,320.50	6,740.00	6,345.40
HAMILTON	6,740.00	6,345.40	6,820.00	6,373.60
MARCELLUS	6,820.00	6,373.60		

# **EQT Production - Marcellus**

**Doddridge County, WV Grid**

**Doddridge County 513148**

**Well #513148**

**API: 47-1706462**

**Main Wellbore**

**Design: As Drilled Surveys**

## **Standard Survey Report**

**23 January, 2015**

**04/01/2016**



# Phoenix Technologies

## Survey Report

<b>Database:</b> EDM 5000 1 Single User Db	<b>Local Co-ordinate Reference:</b> Site # Daddridge County 513148	
<b>Company:</b> EQT Production - Marcellus	<b>TVD Reference:</b> KB @ 991.0usft	
<b>Project:</b> Daddridge County, WV Grid	<b>MD Reference:</b> KB @ 991.0usft	
<b>Site:</b> Daddridge County 513148	<b>North Reference:</b> Grid	
<b>Well:</b> Well #513148	<b>Survey Calculation Method:</b> Minimum Curvature	
<b>Wellbore:</b> Main Wellbore		
<b>Design:</b> As Drilled Surveys		

<b>Project</b> Daddridge County, WV Grid		
<b>Map System:</b> US State Plane 1927 (Exact solution)	<b>System Datum:</b> Mean Sea Level	
<b>Geo Datum:</b> NAD 1927 (NADCON CONUS)		
<b>Map Zone:</b> West Virginia North 4701	Using geodetic scale factor	

<b>Site</b> Daddridge County 513148		
<b>Site Position:</b>	<b>Northing:</b> 270,574.29 usft	<b>Latitude:</b> 39.24
<b>From:</b> Map	<b>Easting:</b> 1,641,281.30 usft	<b>Longitude:</b> -80.77
<b>Position Uncertainty:</b> 0.0 usft	<b>Slot Radius:</b> 13-3/16 "	<b>Grid Convergence:</b> -0.81 °

<b>Well</b> Well #513148			
<b>Well Position</b>	<b>+N/-S</b> 0.0 usft	<b>Northing:</b> 270,574.29 usft	<b>Latitude:</b> 39° 14' 9.399 N
	<b>+E/-W</b> 0.0 usft	<b>Easting:</b> 1,641,281.30 usft	<b>Longitude:</b> 80 45' 59.209 W
<b>Position Uncertainty</b>	0.0 usft	<b>Wellhead Elevation:</b> usft	<b>Ground Level:</b> 968.0 usft

<b>Wellbore</b> Main Wellbore		
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Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010_14	12/15/2014	-8.49	66.72	52,205

<b>Design</b> As Drilled Surveys		
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**Audit Notes:**

<b>Version:</b> 1.0	<b>Phase:</b> ACTUAL	<b>Tie On Depth:</b> 0.0
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Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)
	0.0	0.0	0.0	141.09

Survey Program		Date			
From (')	To (usft)	Survey (Wellbore)	Tool Name	Description	
0.00	5,010.0	513148 Gyrodata (Main Wellbore)	GYD_DP_MS	Gyrodata gyro-compassing and drop	
0.00	10,214.0	513148 PHX MWD (Main Wellbore)	MWD+IGRF	MWD+IGRF v3 standard declination	

<b>Survey</b>										
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Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
0.0	0.00	0.00	0.0	-991.0	0.0	0.0	0.0	0.00	0.00	0.00
110.0	0.13	141.59	110.0	-881.0	-0.1	0.1	0.1	0.12	0.12	0.00
210.0	0.10	169.37	210.0	-781.0	-0.3	0.2	0.3	0.06	-0.03	27.78
310.0	0.04	122.67	310.0	-681.0	-0.4	0.2	0.4	0.08	-0.06	-46.70
410.0	0.05	114.09	410.0	-581.0	-0.4	0.3	0.5	0.01	0.01	-8.58
510.0	0.06	93.70	510.0	-481.0	-0.4	0.4	0.6	0.02	0.01	-20.39
610.0	0.13	328.09	610.0	-381.0	-0.3	0.4	0.5	0.17	0.07	-125.61
710.0	0.14	323.33	710.0	-281.0	-0.1	0.2	0.3	0.02	0.01	-4.76

# Phoenix Technologies

## Survey Report

<b>Database:</b>	BMM 5000 1 Single User Db	<b>Local Co-ordinate Reference:</b>	Site Doddridge County 513148
<b>Company:</b>	FOI Production - Marcellus	<b>TVD Reference:</b>	KB @ 991.0usft
<b>Project:</b>	Doddridge County, WV Gas	<b>MD Reference:</b>	KB @ 991.0usft
<b>Site:</b>	Doddridge County 513148	<b>North Reference:</b>	Grid
<b>Well:</b>	Well #513148	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Main Wellbore		
<b>Design:</b>	As Drilled Surveys		

### Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
810.0	0.14	314.85	810.0	-181.0	0.0	0.1	0.0	0.02	0.00	-8.48
910.0	0.11	306.33	910.0	-81.0	0.2	-0.1	-0.2	0.04	-0.03	-8.52
1,010.0	0.23	307.21	1,010.0	19.0	0.4	-0.3	-0.5	0.12	0.12	0.88
1,110.0	0.59	276.26	1,110.0	119.0	0.5	-1.0	-1.0	0.41	0.36	-30.95
1,210.0	0.61	272.77	1,210.0	219.0	0.6	-2.0	-1.8	0.04	0.02	-3.49
1,310.0	0.70	272.23	1,310.0	319.0	0.7	-3.2	-2.5	0.09	0.09	-0.54
1,410.0	0.71	268.78	1,410.0	419.0	0.7	-4.4	-3.3	0.04	0.01	-3.45
1,510.0	0.70	275.16	1,510.0	519.0	0.7	-5.6	-4.1	0.08	-0.01	6.38
1,610.0	0.47	284.15	1,610.0	619.0	0.9	-6.7	-4.9	0.25	-0.23	8.99
1,710.0	0.32	278.82	1,710.0	719.0	1.0	-7.3	-5.4	0.15	-0.15	-5.33
1,810.0	0.20	258.04	1,810.0	819.0	1.0	-7.8	-5.7	0.15	-0.12	-20.78
1,910.0	0.15	211.03	1,910.0	919.0	0.9	-8.0	-5.7	0.15	-0.05	-47.01
2,010.0	0.17	219.13	2,010.0	1,019.0	0.6	-8.2	-5.6	0.03	0.02	8.10
2,110.0	0.21	184.39	2,110.0	1,119.0	0.4	-8.3	-5.5	0.12	0.04	-34.74
2,210.0	0.22	191.28	2,210.0	1,219.0	0.0	-8.3	-5.2	0.03	0.01	6.89
2,310.0	0.24	179.42	2,310.0	1,319.0	-0.4	-8.4	-4.9	0.05	0.02	-11.86
2,410.0	0.27	179.18	2,410.0	1,419.0	-0.9	-8.4	-4.6	0.03	0.03	0.24
2,510.0	0.24	180.50	2,510.0	1,519.0	-1.3	-8.4	-4.2	0.03	-0.03	1.32
2,610.0	0.28	190.73	2,610.0	1,619.0	-1.8	-8.4	-3.9	0.06	0.04	10.23
2,710.0	0.22	177.74	2,710.0	1,719.0	-2.2	-8.4	-3.6	0.08	-0.06	-12.99
2,810.0	0.21	183.57	2,810.0	1,819.0	-2.6	-8.4	-3.3	0.02	-0.01	5.83
2,910.0	0.21	176.40	2,910.0	1,919.0	-2.9	-8.4	-3.0	0.03	0.00	-7.17
3,010.0	0.22	178.82	3,010.0	2,019.0	-3.3	-8.4	-2.7	0.01	0.01	2.42
3,110.0	0.26	180.20	3,109.9	2,118.9	-3.7	-8.4	-2.4	0.04	0.04	1.38
3,210.0	0.23	192.30	3,209.9	2,218.9	-4.1	-8.5	-2.1	0.06	-0.03	12.10
3,310.0	0.23	189.53	3,309.9	2,318.9	-4.5	-8.5	-1.8	0.01	0.00	-2.77
3,410.0	0.25	175.09	3,409.9	2,418.9	-5.0	-8.6	-1.5	0.06	0.02	-14.44
3,510.0	0.20	187.97	3,509.9	2,518.9	-5.3	-8.6	-1.2	0.07	-0.05	12.88
3,610.0	0.19	196.70	3,609.9	2,618.9	-5.7	-8.6	-1.0	0.03	-0.01	8.73
3,710.0	0.32	228.18	3,709.9	2,718.9	-6.0	-8.9	-0.9	0.19	0.13	31.48
3,810.0	0.42	257.48	3,809.9	2,818.9	-6.3	-9.5	-1.1	0.21	0.10	29.30
3,910.0	0.72	274.87	3,909.9	2,918.9	-6.3	-10.4	-1.6	0.34	0.30	17.39
4,010.0	0.91	282.48	4,009.9	3,018.9	-6.1	-11.8	-2.7	0.22	0.19	7.61
4,110.0	1.14	287.67	4,109.9	3,118.9	-5.6	-13.6	-4.2	0.25	0.23	5.19
4,210.0	1.30	293.78	4,209.9	3,218.9	-4.9	-15.6	-6.0	0.21	0.16	6.11
4,310.0	1.49	299.50	4,309.9	3,318.9	-3.8	-17.7	-8.2	0.24	0.19	5.72
4,410.0	1.74	300.63	4,409.8	3,418.6	-2.3	-20.2	-10.8	0.25	0.25	1.13
4,510.0	1.95	304.89	4,509.8	3,518.8	-0.6	-22.9	-13.9	0.25	0.21	4.26
4,610.0	2.11	311.19	4,609.7	3,618.7	1.6	-25.6	-17.3	0.27	0.16	6.30
4,710.0	2.22	314.83	4,709.6	3,718.6	4.2	-28.4	-21.1	0.18	0.11	3.64
4,810.0	2.49	315.50	4,809.5	3,818.5	7.1	-31.3	-25.2	0.27	0.27	0.67
4,910.0	2.80	318.04	4,909.4	3,918.4	10.4	-34.5	-29.8	0.33	0.31	2.54



**Phoenix Technologies**  
Survey Report

<b>Database:</b>	EDM 5000.1 Single User Lib	<b>Local Co-ordinate Reference:</b>	Site Doddridge County 513148
<b>Company:</b>	EOT Production - Marcus	<b>TVD Reference:</b>	KB @ 991 0usft
<b>Project:</b>	Doddridge County, WV Grid	<b>MD Reference:</b>	KB @ 991 0usft
<b>Site:</b>	Doddridge County 513148	<b>North Reference:</b>	Grid
<b>Well:</b>	Well #513148	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Main Wellbore		
<b>Design:</b>	As Drilled Surveys		

**Survey**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
Gyro Tie In: 5010 MD										
5,010.0	3.02	314.99	5,009.3	4,018.3	14.1	-38.0	-34.8	0.27	0.22	-3.05
5,054.0	3.20	315.20	5,053.2	4,062.2	15.8	-39.6	-37.2	0.41	0.41	0.48
5,086.0	3.50	329.50	5,085.2	4,094.2	17.3	-40.8	-39.1	2.77	0.94	44.69
5,117.0	6.20	354.80	5,116.1	4,125.1	19.8	-41.4	-41.4	10.91	8.71	81.61
5,149.0	9.10	357.60	5,147.8	4,156.8	24.0	-41.7	-44.9	9.13	9.06	8.75
5,180.0	10.00	359.40	5,178.4	4,187.4	29.2	-41.8	-48.9	3.06	2.90	5.81
5,212.0	11.00	7.40	5,209.8	4,218.8	35.0	-41.4	-53.2	5.52	3.13	25.00
5,243.0	13.00	17.30	5,240.2	4,249.2	41.2	-40.0	-57.2	9.24	6.45	31.94
5,275.0	14.50	21.50	5,271.2	4,280.2	48.4	-37.5	-61.2	5.63	4.69	13.13
5,306.0	17.10	25.90	5,301.1	4,310.1	56.1	-34.1	-65.1	9.23	8.39	14.19
5,338.0	19.60	28.70	5,331.4	4,340.4	65.1	-29.4	-69.1	8.28	7.81	8.75
5,369.0	21.80	30.50	5,360.4	4,369.4	74.6	-24.0	-73.1	7.39	7.10	5.81
5,401.0	24.00	33.40	5,389.9	4,398.9	85.1	-17.4	-77.2	7.72	6.88	9.06
5,432.0	26.30	36.10	5,418.0	4,427.0	95.9	-9.9	-80.9	8.29	7.42	8.71
5,464.0	28.80	37.80	5,446.3	4,455.3	107.8	-1.0	-84.5	8.19	7.81	5.31
5,495.0	31.70	41.00	5,473.1	4,482.1	119.8	8.9	-87.6	10.70	9.35	10.32
5,527.0	34.70	42.70	5,499.9	4,508.9	132.9	20.6	-90.4	9.82	9.38	5.31
5,558.0	36.30	44.00	5,525.1	4,534.1	145.9	33.0	-92.8	5.71	5.16	4.19
5,590.0	39.40	43.60	5,550.4	4,559.4	160.1	46.6	-95.3	9.72	9.69	-1.25
5,652.0	41.50	42.30	5,597.6	4,606.6	189.6	74.0	-101.0	3.65	3.39	-2.10
5,747.0	43.50	42.20	5,667.6	4,676.6	237.1	117.1	-110.9	2.11	2.11	-0.11
5,842.0	43.10	41.70	5,736.7	4,745.7	285.5	160.7	-121.2	0.55	-0.42	-0.53
5,936.0	42.20	47.30	5,805.9	4,814.9	330.9	205.3	-128.6	4.15	-0.96	5.96
5,967.0	41.90	47.40	5,828.9	4,837.9	345.0	220.5	-129.9	0.99	-0.97	0.32
5,999.0	41.90	46.90	5,852.7	4,861.7	359.5	236.2	-131.4	1.04	0.00	-1.56
6,030.0	41.80	49.50	5,875.8	4,884.8	373.3	251.6	-132.4	5.60	-0.32	8.39
6,062.0	41.80	54.70	5,899.7	4,908.7	386.4	268.4	-132.0	10.83	0.00	16.25
6,093.0	42.30	60.10	5,922.7	4,931.7	397.6	285.9	-129.8	11.78	1.61	17.42
6,124.0	42.30	63.60	5,945.7	4,954.7	407.4	304.3	-125.9	7.60	0.00	11.29
6,156.0	42.20	68.20	5,969.4	4,978.4	416.2	323.9	-120.4	9.67	-0.31	14.38
6,187.0	41.80	71.70	5,992.4	5,001.4	423.3	343.4	-113.7	7.66	-1.29	11.29
6,219.0	41.80	76.50	6,016.3	5,025.3	429.1	363.9	-105.3	10.00	0.00	15.00
6,250.0	41.00	81.30	6,039.5	5,048.5	433.1	384.0	-95.8	10.56	-2.58	15.48
6,282.0	40.50	85.30	6,063.8	5,072.8	435.5	404.8	-84.6	8.31	-1.56	12.50
6,313.0	40.40	89.20	6,087.4	5,096.4	436.5	424.8	-72.8	8.17	-0.32	12.58
6,344.0	40.70	92.80	6,110.9	5,119.9	436.2	445.0	-59.9	7.61	0.97	11.61
6,376.0	41.10	95.30	6,135.1	5,144.1	434.7	465.9	-45.6	5.27	1.25	7.81
6,408.0	43.60	97.80	6,158.8	5,167.8	432.2	487.3	-30.2	9.42	7.81	7.81
6,439.0	46.40	101.30	6,180.7	5,189.7	428.5	508.9	-13.8	12.05	9.03	11.29
6,470.0	48.70	105.20	6,201.6	5,210.6	423.3	531.1	4.3	11.88	7.42	12.58
6,502.0	50.20	108.00	6,222.4	5,231.4	416.3	554.4	24.3	8.13	4.69	8.75
6,533.0	51.80	113.40	6,241.9	5,250.9	407.8	577.0	45.1	14.48	5.16	17.42

# Phoenix Technologies

## Survey Report

<b>Database:</b>	EDM 5000 1 Single Use; Db	<b>Local Co-ordinate Reference:</b>	Site De Doddridge County 513148
<b>Company:</b>	EOT Production - Marcal us	<b>TVD Reference:</b>	KB @ 991.0usft
<b>Project:</b>	Doddridge County WV Grid	<b>MD Reference:</b>	KB @ 991.0usft
<b>Site:</b>	Doddridge County 513148	<b>North Reference:</b>	On
<b>Well:</b>	Well #513148	<b>Survey Calculation Method:</b>	Minimum Curvature
<b>Wellbore:</b>	Main Wellbore		
<b>Design:</b>	As Drilled Surveys		

**Survey**

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
6,565.0	53.90	117.10	6,261.3	5,270.3	396.9	600.0	68.0	11.31	6.56	11.56
6,596.0	56.10	119.40	6,279.0	5,288.0	384.9	622.4	91.4	9.34	7.10	7.42
6,627.0	59.70	122.30	6,295.5	5,304.5	371.4	644.9	116.1	14.06	11.61	9.35
6,659.0	62.50	124.90	6,311.0	5,320.0	355.9	668.2	142.8	11.28	8.75	8.13
6,690.0	64.20	128.30	6,324.9	5,333.9	339.4	690.5	169.6	11.23	5.48	10.97
6,722.0	66.20	132.50	6,338.3	5,347.3	320.6	712.6	198.2	13.45	6.25	13.13
6,753.0	67.80	135.50	6,350.4	5,359.4	300.8	733.1	226.5	10.29	5.16	9.68
6,784.0	69.50	138.00	6,361.7	5,370.7	279.7	752.9	255.3	9.30	5.48	8.06
6,816.0	71.60	140.80	6,372.4	5,381.4	256.8	772.5	285.4	10.54	6.56	8.75
6,847.0	73.50	143.80	6,381.7	5,390.7	233.4	790.6	315.0	11.08	6.13	9.68
6,879.0	74.80	145.90	6,390.4	5,399.4	208.3	808.3	345.7	7.51	4.06	6.56
6,910.0	77.80	147.60	6,397.7	5,406.7	183.1	824.8	375.7	11.05	9.68	5.48
6,942.0	81.40	148.10	6,403.5	5,412.5	156.4	841.5	406.9	11.35	11.25	1.56
6,973.0	84.00	149.30	6,407.5	5,416.5	130.2	857.5	437.4	9.22	8.39	3.87
7,004.0	85.90	149.60	6,410.2	5,419.2	103.6	873.2	467.9	6.20	6.13	0.97
<b>IP - 1067 MOM 114 TVD</b>										
7,067.0	86.70	149.60	6,414.3	5,423.3	49.3	905.0	530.1	1.27	1.27	0.00
7,161.0	86.80	152.70	6,419.6	5,428.6	-32.9	950.3	622.5	3.29	0.11	3.30
7,255.0	87.00	151.50	6,424.7	5,433.7	-115.8	994.2	714.6	1.29	0.21	-1.28
7,349.0	89.60	155.40	6,427.5	5,436.5	-199.8	1,036.2	806.4	4.98	2.77	4.15
7,431.0	89.10	153.40	6,428.4	5,437.4	-273.8	1,071.6	886.2	2.51	-0.61	-2.44
7,525.0	88.20	154.80	6,430.6	5,439.6	-358.3	1,112.7	977.7	1.77	-0.96	1.49
7,619.0	90.10	157.70	6,432.0	5,441.0	-444.3	1,150.5	1,068.4	3.69	2.02	3.09
7,714.0	92.00	157.90	6,430.3	5,439.3	-532.3	1,186.4	1,159.4	2.01	2.00	0.21
7,776.0	90.30	156.70	6,429.0	5,438.0	-589.4	1,210.3	1,218.9	3.36	-2.74	-1.94
7,808.0	89.60	156.90	6,429.0	5,438.0	-618.9	1,222.9	1,249.7	2.28	-2.19	0.63
7,902.0	89.30	157.80	6,429.9	5,438.9	-705.6	1,259.1	1,340.0	1.01	-0.32	0.96
7,965.0	88.00	157.50	6,431.4	5,440.4	-763.8	1,283.1	1,400.3	2.12	-2.06	-0.48
7,996.0	88.00	158.90	6,432.5	5,441.5	-792.6	1,294.6	1,429.9	4.51	0.00	4.52
8,090.0	83.60	159.30	6,439.4	5,448.4	-880.2	1,328.0	1,519.1	4.70	-4.68	0.43
8,185.0	86.60	157.80	6,447.5	5,456.5	-968.3	1,362.6	1,609.3	3.53	3.16	-1.58
8,279.0	89.60	156.90	6,450.6	5,459.6	-1,054.9	1,398.8	1,699.5	3.33	3.19	-0.96
8,373.0	89.60	155.00	6,451.3	5,460.3	-1,140.8	1,437.1	1,790.4	2.02	0.00	-2.02
8,468.0	90.50	155.20	6,451.2	5,460.2	-1,226.9	1,477.1	1,882.5	0.97	0.95	0.21
8,563.0	92.10	156.20	6,449.0	5,458.0	-1,313.5	1,516.2	1,974.4	1.99	1.68	1.05
8,657.0	90.10	154.90	6,447.2	5,456.2	-1,399.1	1,555.1	2,065.4	2.54	-2.13	-1.38
8,751.0	88.80	152.80	6,448.1	5,457.1	-1,483.4	1,596.5	2,157.1	2.63	-1.38	-2.23
8,845.0	87.20	150.40	6,451.4	5,460.4	-1,566.0	1,641.2	2,249.5	3.07	-1.70	-2.55
8,939.0	87.70	150.00	6,455.6	5,464.6	-1,647.5	1,687.9	2,342.2	0.68	0.53	-0.43
9,034.0	87.80	150.30	6,459.3	5,468.3	-1,729.9	1,735.1	2,435.9	0.33	0.11	0.32
9,128.0	88.80	150.30	6,462.1	5,471.1	-1,811.5	1,781.7	2,528.7	1.06	1.06	0.00
9,222.0	89.90	153.20	6,463.2	5,472.2	-1,894.3	1,826.2	2,621.0	3.30	1.17	3.09
9,317.0	90.50	153.10	6,462.9	5,471.9	-1,979.0	1,869.1	2,713.9	0.64	0.63	-0.11



# Phoenix Technologies

## Survey Report

<b>Database:</b> EDM 5111 1 Single User Db <b>Company:</b> EQT Production - Marcellus <b>Project:</b> Doddridge County WV Grid <b>Site:</b> Doddridge County 513148 <b>Well:</b> Well 2513148 <b>Wellbore:</b> Main Wellbore <b>Design:</b> As Drilled Surveys	<b>Local Co-ordinate Reference:</b> <b>TVD Reference:</b> <b>MD Reference:</b> <b>North Reference:</b> <b>Survey Calculation Method:</b>	Site Doddridge County 513148 KB @ 991 0usft KB @ 991 0usft Grid Minimum Curvature
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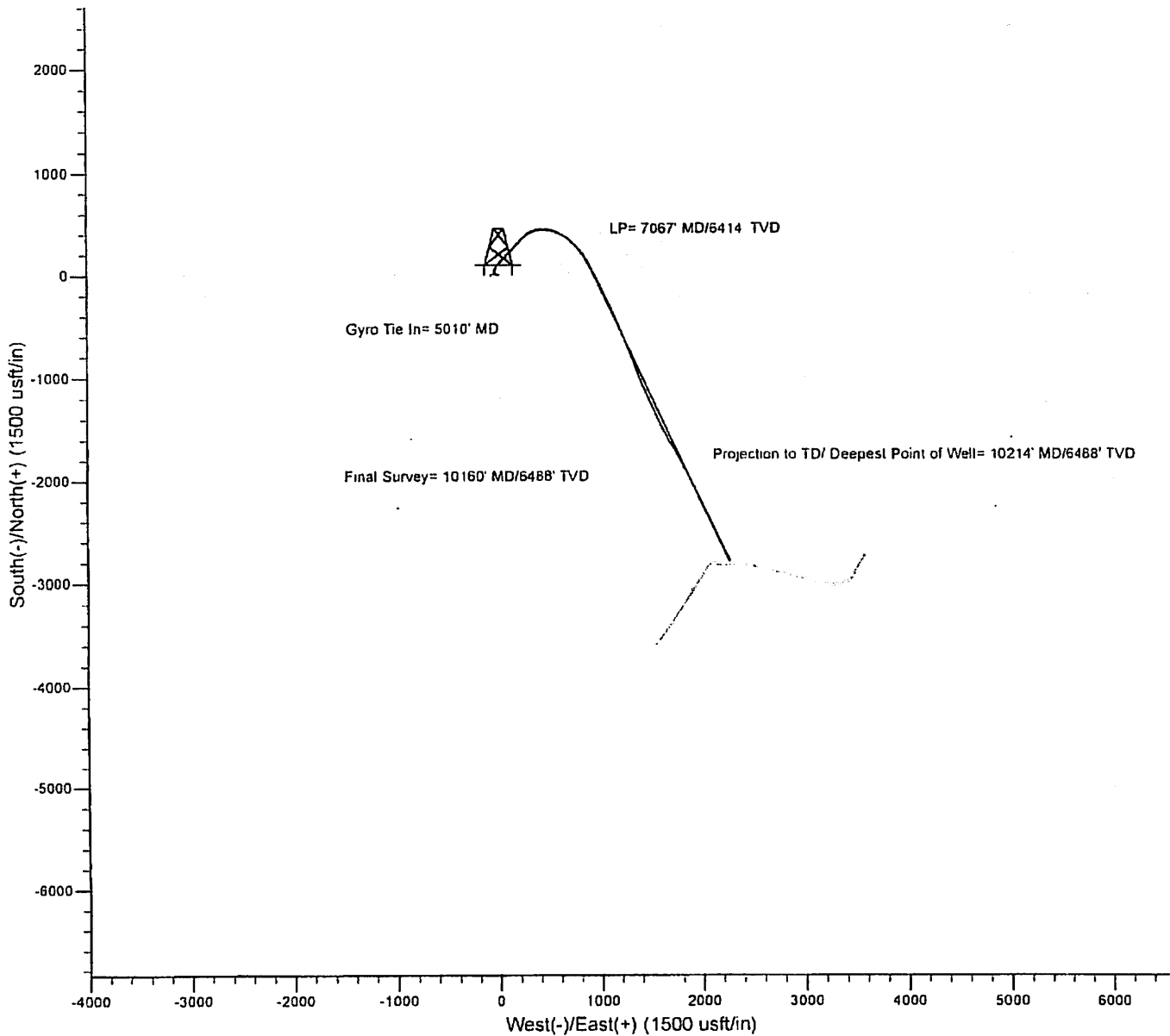
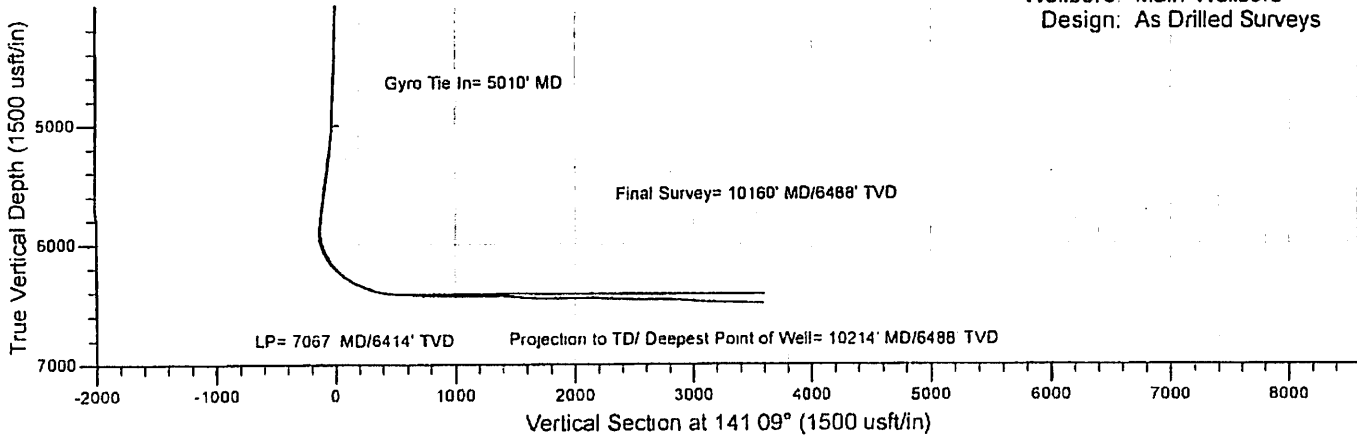
Survey											
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
9,412.0	89.40	153.20	6,462.9	5,471.9	-2,063.8	1,912.0	2,806.8	1.16	-1.16	0.11	
9,506.0	86.50	151.90	6,466.3	5,475.3	-2,147.1	1,955.3	2,898.9	3.38	-3.09	-1.38	
9,601.0	86.40	154.40	6,472.2	5,481.2	-2,231.7	1,998.1	2,991.6	2.63	-0.11	2.63	
9,695.0	87.20	156.10	6,477.4	5,486.4	-2,317.0	2,037.4	3,082.6	2.00	0.85	1.81	
9,789.0	88.30	153.80	6,481.1	5,490.1	-2,402.0	2,077.1	3,173.8	2.71	1.17	-2.45	
9,884.0	88.50	154.60	6,483.8	5,492.8	-2,487.6	2,118.3	3,266.2	1.07	0.21	1.05	
9,978.0	89.80	154.80	6,485.2	5,494.2	-2,572.7	2,158.3	3,357.5	1.38	1.38	0.00	
10,072.0	88.60	154.30	6,486.5	5,495.5	-2,657.5	2,198.7	3,448.9	1.38	-1.28	-0.53	
Final Survey= 10160' MD/6488' TVD											
10,160.0	89.70	154.20	6,487.8	5,496.8	-2,736.8	2,237.0	3,534.6	1.26	1.25	-0.11	
Projection to TD/ Deepest Point of Well= 10214' MD/6488' TVD											
10,214.0	90.30	154.10	6,487.8	5,496.8	-2,785.4	2,260.5	3,587.2	1.13	1.11	-0.19	

Design Annotations					
Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment	
		+N/-S (usft)	+E/-W (usft)		
5,010.0	5,009.3	14.1	-38.0	Gyro Tie In= 5010' MD	
7,067.0	6,414.3	49.3	905.0	LP= 7067' MD/6414' TVD	
10,160.0	6,487.8	-2,736.8	2,237.0	Final Survey= 10160' MD/6488' TVD	
10,214.0	6,487.8	-2,785.4	2,260.5	Projection to TD/ Deepest Point of Well= 10214' MD/6488' TVD	

Checked By: \_\_\_\_\_ Approved By: \_\_\_\_\_ Date: \_\_\_\_\_

# EQT Production - Marcellus

Project: Doddridge County, WV Grid  
Site: Doddridge County 513148  
Well: Well #513148  
Wellbore: Main Wellbore  
Design: As Drilled Surveys









# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	5/5/2015
Job End Date:	5/9/2015
State:	West Virginia
County:	Doddridge
API Number:	47-017-06462-00-00
Operator Name:	EQT Production
Well Name and Number:	513148
Longitude:	-80.76644700
Latitude:	39.23594400
Datum:	NAD83
Federal/Tribal Well:	NO
True Vertical Depth:	6,377
Total Base Water Volume (gal):	5,290,992
Total Base Non Water Volume:	0



## Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Water	Keane Group	Carrier/Base Fluid	Water	7732-18-5	100.00000	89.22628	None
Sand (Proppant)	Keane Group	Proppant	Silica Substrate	14808-60-7	100.00000	10.42066	None
MC MX 437-5	Multi-Chem	Calcium nitrate solution	Calcium nitrate	10124-37-5	60.00000	0.05635	None
FFR760	Keane Group	Friction Reducer	Hydrotreated Light Distillate	64742-47-8	30.00000	0.02682	None
			Alkyl Alcohol	Proprietary	10.00000	0.00894	None
			Oxyalkylated alcohol A	Proprietary	5.00000	0.00447	None
Hydrochloric Acid (15%)	Keane Group	Acidizing	Hydrochloric Acid	7647-01-0	15.00000	0.02057	None
EC6330A	Keane Group	Scale Inhibitor	Sodium Phosphate, Tribasic	7601-54-9	5.00000	0.00124	None
AI600	Keane Group	Corrosion Inhibitor	Ethylene Glycol	107-21-1	40.00000	0.00014	None
			N, N-Dimethylformamide	68-12-2	20.00000	0.00007	None
			Cinnamialdehyde	104-55-2	15.00000	0.00005	None

			Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	15.00000	0.00005	None
			2-Butoxyethanol	111-76-2	15.00000	0.00005	None
			1-Decanol	112-30-1	5.00000	0.00002	None
			Poly (oxy-1,2-ethanediyl), alpha -(4-nonylphenyl)- omega -hydroxy-, branched	127087-87-0	5.00000	0.00002	None
			1-Octanol	111-87-5	2.50000	0.00001	None
			Triethyl Phosphate	78-40-0	2.50000	0.00001	None
			Isopropyl alcohol	67-63-0	2.50000	0.00001	None
FFR730	Keane Group	Friction Reducer					
			Oxyalkylated alcohol A	Proprietary	5.00000	0.00034	None
LEB-10X	Keane Group	Gel Breaker					
			Ethylene Glycol	107-21-1	30.00000	0.00017	None
Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS.							

\* Total Water Volume sources may include fresh water, produced water, and/or recycled water

\*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided.

Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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**i** Disclosure has been submitted.

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**Hydraulic Fracturing Data**

Job Start Date 5/5/2015    Job End Date 5/9/2015    API Number 47-017-06462-00-00    State & County West Virginia --- Doddridge

Well Name 513148

Longitude -80.766447    Latitude 39.235944    Datum NAD83    Federal/Tribal Well?

True Vertical Depth (ft) 6376.6    Total Water Vol (gal) 5290992    Total Non Water Vol 0    Total Mass (lbs) 49484667



**MSDS Chemical Ingredients**

	Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
<input type="button" value="Edit"/>	Water	Keane Group	Carrier/Base Fluid	Water	7732-18-5	100%	89.226281163%	None	44153328.24
<input type="button" value="Edit"/>	Sand (Proppant)	Keane Group	Proppant	Silica Substrate	14808-60-7	100%	10.4206621918%	None	5156630
<input type="button" value="Edit"/>	MC MX 437-5	Multi-Chem	Calcium nitrate solution	Calcium nitrate	10124-37-5	60%	.056346143%	None	27882.701
<input type="button" value="Edit"/>	FFR760	Keane Group	Friction Reducer	Hydrotreated Light Distillate	64742-47-8	30%	.0268168467%	None	13270.227
				Alkyl Alcohol	Proprietary	10%	.0089389489%	None	4423.409
				Oxyalkylated alcohol A	Proprietary	5%	.0044694745%	None	2211.705
<input type="button" value="Edit"/>	Hydrochloric Acid (15%)	Keane Group	Acidizing	Hydrochloric Acid	7647-01-0	15%	.0205671457%	None	10177.584
<input type="button" value="Edit"/>	EC6330A	Keane Group	Scale Inhibitor	Sodium Phosphate, Tribasic	7601-54-9	5%	.0012429302%	None	615.06
<input type="button" value="Edit"/>	AI 600	Keane Group	Corrosion Inhibitor	Ethylene Glycol	107-21-1	40%	.0001372087%	None	67.897
				N, N-Dimethylformamide	68-12-2	20%	.0000686043%	None	33.949

			Cinnamialdehyde	104-55-2	15%	.0000514533%	None	25.461
			Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	15%	.0000514533%	None	25.461
			2-Butoxyethanol	111-76-2	15%	.0000514533%	None	25.461
			1-Decanol	112-30-1	5%	.0000171511%	None	8.487
			Poly (oxy-1,2-ethanedyl), .alpha.-(4-nonylphenyl) .omega.-hydroxy-, branched	127087-87-0	5%	.0000171511%	None	8.487
			1-Octanol	111-87-5	2.5%	.0000085755%	None	4.244
			Triethyl Phosphate	78-40-0	2.5%	.0000085755%	None	4.244
			Isopropyl alcohol	67-63-0	2.5%	.0000085755%	None	4.244
<input type="button" value="Edit"/>	FFR730	Keane Group	Friction Reducer					
			Oxyalkylated alcohol A	Proprietary	5%	.0003435158%	None	169.988
<input type="button" value="Edit"/>	LEB-10X	Keane Group	Gel Breaker					
			Ethylene Glycol	107-21-1	30%	.0001712014%	None	84.718

**Non-MSDS Chemical Ingredients**

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
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**\*\*CELLS WITH BLUE BACKGROUND ARE THE ONLY CELLS TO BE EDITED\*\***

Fracture Start Date/Time:	5/5/15 18:17
Fracture End Date/Time:	5/9/15 23:29
State:	West Virginia
County:	Doddridge
API Number:	47-017-06462-00-00
Operator Number:	E1210363
Well Name:	513148
Federal Well:	No
Longitude:	-80.766447
Latitude:	39.235944
Long/Lat Projection:	NAD83
True Vertical Depth (TVD):	6,377'
Total Clean Fluid Volume* (gal):	5,290,992



Additive	Specific Gravity	Additive Quantity	Mass (lbs)
Water	1.00	5,290,992	44,153,328
Sand (Proppant)	2.65	5,156,630	5,156,630
Hydrochloric Acid (15%)	1.07	7,599	67,851
AF600	1.07	19	170
PFR760	1.09	4,863	44,234
PFR730	1.05	388	3,400
EC6330A	1.11	1,328	12,301
MC MX 437-S	1.33	4,179	46,471
LEB-10X	1.20	28	282

Keanek

**Ingredients Section:**

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass) <sup>1,2,3</sup>	Mass per Component (LBS)	Maximum Ingredient Concentration in HF Fluid (% by mass) <sup>1,2,3</sup>
Water	Keane Group	Carrier/Base Fluid	Water	7732-18-5	100.00%	44,153,328	89.22628%
Sand (Proppant)	Keane Group	Proppant	Silica Substrate	14808-60-7	100.00%	5,156,630	10.42066%
Hydrochloric Acid (15%)	Keane Group	Acidizing	Hydrochloric Acid	7647-01-0	15.00%	10,178	0.02057%
EC6330A	Keane Group	Scale Inhibitor	Sodium Phosphate, Tribasic	7601-54-9	5.00%	615	0.00124%
AF600	Keane Group	Corrosion Inhibitor	Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	15.00%	25	0.00005%
			Ethylene Glycol	107-21-1	40.00%	68	0.00014%
			Cinnaminaldehyde	104-55-2	15.00%	25	0.00005%
			1-Decanol	112-30-1	5.00%	8	0.00002%
			2-Butoxyethanol	111-76-2	15.00%	25	0.00005%
			Isopropyl alcohol	67-63-0	2.50%	4	0.00001%
			Triethyl Phosphate	78-40-0	2.50%	4	0.00001%
			N, N-Dimethylformamide	68-12-2	20.00%	34	0.00007%
			1-Octanol	111-87-5	2.50%	4	0.00001%
			Poly (oxy-1,2-ethanediyl), alpha-(4-nonylphenyl)-, omega-hydroxy-, branched	127087-87-0	5.00%	8	0.00002%
PFR730	Keane Group	Friction Reducer	Oxyalkylated alcohol A	Proprietary	5.00%	170	0.00034%
MC MX 437-S	Muldi Chem	Calcium nitrate solution	Calcium nitrate	10194-37-5	60.00%	27,883	0.05635%
PFR760	Keane Group	Friction Reducer	Hydrotreated Light Distillate	64742-17-8	30.00%	13,270	0.02682%
			Alkyl Alcohol	Proprietary	10.00%	4,423	0.00894%
			Oxyalkylated alcohol A	Proprietary	5.00%	2,212	0.00447%
LEB-10X	Keane Group	Gel Breaker	Ethylene Glycol	107-21-1	30.00%	85	0.00017%

\*Total Water Volume sources may include fresh water, produced water, and/or recycled water  
 \*\* Information is based on the maximum potential for concentration and thus the total may be over 100%

All component information listed was obtained from the supplier's Material Safety Data Sheets (MSDS). As such, the Operator is not responsible for inaccurate and/or incomplete information. Any questions regarding the content of the MSDS should be directed to the supplier who provided it. The Occupational Safety and Health Administration's (OSHA) regulations govern the criteria for the disclosure of this information. Please note that Federal Law protects "proprietary", "trade secret", and "confidential business information" and the criteria for how this information is reported on an MSDS is subject to 29 CFR 1910.1200(i) and Appendix D.



