

Well Operator's Report of Well Work



Where energy meets innovation.

Well Number: 515277

API: 47 - 085 - 10095

Submission:  Initial  Amended

Notes: -Revised Plat  
-Revised "As Drilled" Coordinates

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WV Department of  
Environmental Protection

**APPROVED**

NAME: Michael Doff

DATE: 12-21-2016

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

API 47-085-10095 County RITCHIE District CLAY  
Quad PENNSBORO Pad Name PEN15 Field/Pool Name \_\_\_\_\_  
Farm name DEWAYNE BRITTON ET UX Well Number 515277  
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 4,345,848.8 Easting 504,200.6  
Landing Point of Curve Northing 4,346,101.8 Easting 504,812.2  
Bottom Hole Northing 4,347,609.5 Easting 504,076.0

Elevation (ft) 1119 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 05/22/2014 Date drilling commenced 06/18/2014 Date drilling ceased 04/11/2015  
Date completion activities began 5/25/2015 Date completion activities ceased 6/2/2015  
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

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Freshwater depth(s) ft 83',163',242',394',770',873' Open mine(s) (Y/N) depths N  
Salt water depth(s) ft 1652',1943',2521' Void(s) encountered (Y/N) depths N  
Coal depth(s) ft 14',273',379',744' Cavern(s) encountered (Y/N) depths N  
Is coal being mined in area (Y/N) N

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

API 47-085-10095 Farm name DEWAYNE BRITTON ET UX Well number 515277

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"	40'	NEW	A-500 40LB/FT	NONE	Y
Surface	17.5"	13.375"	1,077'	NEW	J-55 54.5LB/FT	826',289'	Y
Coal							
Intermediate 1	12.375"	9.625"	5,354'	NEW	P-110 40LB/FT	3373',2907'	Y
Intermediate 2							
Intermediate 3							
Production	8.5"	5.5"	13,679'	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	38	15.6	1.19	45.22	0	8
Surface	CLASS A	936	15.6	1.18	1104.48	0	8
Coal							
Intermediate 1	CLASS A / CLASS A / CLASS A	345 / 308 / 1182	14.2 / 15.6 / 15.6	1.24 / 1.19 / 1.19	2200.9	0	8
Intermediate 2							
Intermediate 3							
Production	Class H / Class H	492/685	14.2/15.2	1.23/2.18	2098.5	4,556'	72
Tubing							

Drillers TD (ft) 13,679' MD Loggers TD (ft) N/A  
 Deepest formation penetrated Marcellus Plug back to (ft) N/A  
 Plug back procedure N/A

Kick off depth (ft) 4,488' MD

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: 1,11,22  
 INTERMEDIATE- RAN AT LEAST EVERY 500' FEET  
 PRODUCTION- 191 Composite Centralizers. One on every joint from TD to 5,000'

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 \_\_\_\_\_

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API # 47-088 10095 Farm name DEWAYNE BRITTON ET UX Well number 515277

**PERFORATION RECORD**

Stage No	Perforation date	Perforated from MD R	Perforated to MD R	Number of Perforations	Formation(s)
					Please See Attached

Please insert additional pages as applicable.

**STIMULATION INFORMATION PER STAGE**

Complete a separate record for each stimulation stage.

Stage No	Stimulation Date	Ave Pump Rate (BPD)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (Gals)	Amount of Nitrogen/Oiler (units)
						Please	See	Attached

Please insert additional pages as applicable.

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API 47- 085 - 10095 Farm name DEWAYNE BRITTON ET UX Well number 515277

<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>		
Marcellus	6,378'	TVD	7,887' MD

Please insert additional pages as applicable.

GAS TEST  Build up  Drawdown  Open Flow OIL TEST  Flow  Pump

SHUT-IN PRESSURE Surface 1,913 psi Bottom Hole N/A psi DURATION OF TEST 62.0 hrs

OPEN FLOW Gas 6,721 mcfpd Oil N/A bpd NGL 158.3 bpd Water 512.9 bpd  
GAS MEASURED BY  Estimated  Orifice  Pilot

LITHOLOGY/ FORMATION	TOP DEPTH IN FT NAME TVD	BOTTOM DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H <sub>2</sub> S, ETC)
	0		0		

Please insert additional pages as applicable.

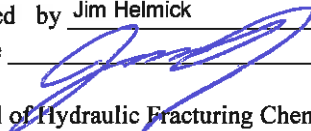
Drilling Contractor ALPHA HUNTER DRILLING (RIG 5)  
Address P.O. BOX 430 City RENO State OH Zip 45773

Logging Company HOSSCO SERVICES, LLC  
Address 614 TROTTERS LANE City CHARLESTON State WV Zip 25312

Cementing Company ALLIED OIL & GAS SERVICES  
Address 1036 EAST MAIN ST. City BRIDGEPORT State WV Zip 26330

Stimulating Company Stingray Energy  
Address 66680 Executive Drive City Saint Clairsville State OH Zip 43950

Please insert additional pages as applicable.

Completed by Jim Helmick Telephone (412) 395-5518  
Signature  Title VP Completions Date 8/24/2016

Submittal of Hydraulic Fracturing Chemical Disclosure Information

Attach copy of FRACFOCUS Registry  
OH Department of Environmental Protection

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Drilling Contractor Savanna Drilling  
Address 2204 Timberloch Place Suite 230 City Woodlands State TX Zip 77380

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

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

Cementing Company Baker Hughes  
Address 837 Phillips Pike City Clarksburgh State WV Zip 26301

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API 47 - 085 - 10095

Formation Name	Final Top MD (ftGL) (ft)	Final Top TVD (ft)	Final Btm MD (ftGL) (ft)	Final Btm TVD (ft)
FRESH WATER ZONE	0	0	876	876
SAND/SHALE	0	0	17	17
WASHINGTON COAL	17	17	19	19
SAND/SHALE	19	19	276	276
COAL	276	276	284	284
SAND/SHALE	284	284	382	382
COAL	382	382	387	387
SAND/SHALE	387	387	747	747
COAL	747	747	751	751
SAND/SHALE	751	751	1,750	1,750
MAXTON	1,750	1,750	1,969	1,969
BIG LIME	1,969	1,969	2,037	2,037
KEENER	2,037	2,037	2,376	2,376
WEIR	2,376	2,376	2,581	2,581
GANTZ	2,581	2,581	2,721	2,721
50F	2,721	2,721	2,802	2,802
30F	2,802	2,802	2,846	2,846
GORDON	2,846	2,846	2,927	2,927
4TH	2,927	2,927	3,073	3,073
5TH	3,073	3,073	3,116	3,116
BAYARD	3,116	3,116	3,465	3,465
WARREN	3,465	3,465	3,508	3,508
B-5	3,508	3,508	3,546	3,546
SPEECHLEY	3,546	3,546	3,931	3,931
BALLTOWN A	3,931	3,931	4,197	4,197
BALLTOWN B	4,197	4,197	4,340	4,340
BRADFORD	4,340	4,340	4,582	4,582
RILEY	4,582	4,582	4,950	4,946
JAVA	4,950	4,946	4,953	4,949
BENSON	4,953	4,949	5,213	5,196
ALEXANDER	5,213	5,196	5,260	5,240
ANGOLA	5,260	5,240	5,739	5,636
RHINESTREET	5,739	5,636	7,077	6,124
SONYEA	7,077	6,124	7,336	6,221
MIDDLESEX	7,336	6,221	7,472	6,268
GENESEE	7,472	6,268	7,659	6,327
GENESEO	7,659	6,327	7,780	6,357
TULLY	7,780	6,357	7,845	6,370
HAMILTON	7,845	6,370	7,887	6,378
MARCELLUS	7,887	6,378	13,679	6,416

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**PHOENIX**  
TECHNOLOGY SERVICES



## **EQT Production - Marcellus**

**Ritchie County, WV**

**Ritchie County 515277**

**Well #515277**

**Main Wellbore**

**Design: As Drilled Surveys**

## **Standard Survey Report**

**14 April, 2015**

**EQT**

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Survey Report



Database: EQT 2015 - Survey Data	Local Co-ordinate Reference: WGS 1984 Zone 18N	MD Reference: NAD 1983 Zone 18N
Company: EQT Production Services	TVD Reference: Mean Sea Level	North Reference: Mean Sea Level
Project: Wilcox County, WV	Survey Calculation Method: Minimum Curvature	
Site: Wilcox County 515277		
Well: Well #1-517		
Wellbore: Main Wellbore		
Design: IGRF2015		

Project: Wilcox County, WV

Map System: US State Plane 1927 (Exact solution)	System Datum: Mean Sea Level
Geo Datum: NAD 1927 (NADCON CONUS)	
Map Zone: West Virginia North 4701	Using geodetic scale factor

Site: Wilcox County 515277

Site Position: Northing: 280,813.50 usft	Latitude: 39 26
From: Map Easting: 1,589,028.30 usft	Longitude: -80 95
Position Uncertainty: 0.0 usft	Slot Radius: 13-3/16 "
	Grid Convergence: -0 93 "

Well: Well #1-517

Well Position: +N-S 0.0 usft	Northing: 280,813.50 usft	Latitude: 39° 15' 42.781 N
+E-W 0.0 usft	Easting: 1,589,028.30 usft	Longitude: 80° 57' 5.323 W
Position Uncertainty: 0.0 usft	Wellhead Elevation: usft	Ground Level: 1,119.0 usft

Wellbore: Main Wellbore

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2015	3/16/2015	-8.33	66.77	52,196

Design: IGRF2015

Audit Notes:

Version: 1.0	Phase: ACTUAL	Tie On Depth: 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	356.98

Survey Program: Date: 6/14/2015

From (°)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.00	4,228.0	515277 Gyrodatta Gyros (Main Wellbore)	GYD_DP_MS	Gyrodatta gyro-compassing and drop
0.00	13,670.0	515277 PHX MWD (Main Wellbore)	MWD+IGRF	MWD+IGRF v3 standard declination

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)
0.0	0.00	0.00	0.0	-1,135.0	0.0	0.0	0.0	0.00	0.00	0.00
103.0	0.14	210.38	103.0	-1,032.0	-0.1	-0.1	-0.1	0.14	0.14	0.00
203.0	0.09	227.33	203.0	-932.0	-0.3	-0.2	-0.3	0.06	-0.05	16.95
303.0	0.09	222.88	303.0	-832.0	-0.4	-0.3	-0.4	0.01	0.00	-4.45
403.0	0.07	250.61	403.0	-732.0	-0.5	-0.4	-0.4	0.04	0.02	0.00
503.0	0.09	226.51	503.0	-632.0	-0.5	-0.5	-0.5	0.01	0.02	-24.10
603.0	0.06	247.20	603.0	-532.0	-0.6	-0.6	-0.6	0.01	0.03	20.69
703.0	0.03	313.36	703.0	-432.0	-0.6	-0.7	-0.6	0.06	-0.03	66.16

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COMPASS 5000.1 Build 73



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Survey Report



Database:	ESDA 0001 - Eagle Well 01	Local Co-ordinate Reference:	ESDA 0001 - Eagle Well 01
Company:	EQT Production, Midcon	TVD Reference:	ESDA 0001 - Eagle Well 01
Project:	McClellan County, WV	MD Reference:	ESDA 0001 - Eagle Well 01
Site:	McClellan County, WV	North Reference:	ESDA 0001 - Eagle Well 01
Well:	Well #1 (327)	Survey Calculation Method:	Minimum Curvature
Wellbore:	Main Wellbore		
Design:	As Drilled Survey		

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+NES (usft)	+E-W (usft)	Vertical Section (usft)	Dogleg Rate (1/100usft)	Build Rate (1/100usft)	Turn Rate (1/100usft)
803.0	0.10	104.01	803.0	-332.0	-0.6	-0.6	-0.6	0.13	0.07	150.65
903.0	0.14	154.62	903.0	-232.0	-0.7	-0.5	-0.7	0.11	0.04	50.61
1,003.0	0.05	148.67	1,003.0	-132.0	-0.9	-0.4	-0.9	0.09	-0.09	-5.95
1,103.0	0.32	150.71	1,103.0	-32.0	-1.2	-0.3	-1.2	0.27	0.27	2.04
1,203.0	0.48	157.97	1,203.0	68.0	-1.8	0.0	-1.8	0.17	0.16	7.26
1,303.0	0.50	164.44	1,303.0	168.0	-2.6	0.3	-2.6	0.06	0.02	6.47
1,403.0	0.47	173.09	1,403.0	268.0	-3.4	0.5	-3.5	0.08	-0.03	8.65
1,503.0	0.34	171.17	1,503.0	368.0	-4.1	0.6	-4.2	0.13	-0.13	-1.92
1,603.0	0.41	167.23	1,603.0	468.0	-4.8	0.7	-4.8	0.07	0.07	-3.94
1,703.0	0.45	169.63	1,703.0	568.0	-5.5	0.8	-5.6	0.04	0.04	2.40
1,803.0	0.46	173.13	1,803.0	668.0	-6.3	1.0	-6.3	0.03	0.01	3.50
1,903.0	0.45	176.71	1,903.0	768.0	-7.1	1.0	-7.1	0.03	-0.01	3.58
2,003.0	0.46	187.33	2,003.0	868.0	-7.9	1.0	-7.9	0.08	0.01	10.62
2,103.0	0.46	186.47	2,103.0	968.0	-8.7	0.9	-8.7	0.01	0.00	-0.86
2,203.0	0.55	187.14	2,203.0	1,068.0	-9.6	0.8	-9.6	0.09	0.09	0.67
2,303.0	0.50	192.83	2,303.0	1,168.0	-10.5	0.7	-10.5	0.07	-0.05	5.69
2,403.0	0.46	201.60	2,403.0	1,268.0	-11.3	0.4	-11.3	0.08	-0.04	8.77
2,503.0	0.40	193.72	2,503.0	1,368.0	-12.0	0.2	-12.0	0.08	-0.06	-7.88
2,603.0	0.45	189.51	2,603.0	1,468.0	-12.7	0.0	-12.7	0.06	0.05	-4.21
2,703.0	0.51	191.16	2,702.9	1,567.9	-13.5	-0.1	-13.5	0.06	0.06	1.65
2,803.0	0.50	194.01	2,802.9	1,667.9	-14.4	-0.3	-14.3	0.03	-0.01	2.85
2,903.0	0.47	202.65	2,902.9	1,767.9	-15.2	-0.6	-15.1	0.08	-0.03	8.64
3,003.0	0.48	215.80	3,002.9	1,867.9	-15.9	-1.0	-15.8	0.11	0.01	13.15
3,103.0	0.46	224.36	3,102.9	1,967.9	-16.5	-1.5	-16.4	0.07	-0.02	8.56
3,203.0	0.27	235.73	3,202.9	2,067.9	-16.9	-2.0	-16.8	0.20	-0.19	11.37
3,303.0	0.30	251.42	3,302.9	2,167.9	-17.2	-2.4	-17.0	0.08	0.03	15.69
3,403.0	0.36	246.86	3,402.8	2,267.9	-17.4	-3.0	-17.2	0.07	0.08	-4.56
3,503.0	0.34	240.28	3,502.9	2,367.9	-17.6	-3.5	-17.4	0.04	-0.02	-6.58
3,603.0	0.29	255.81	3,602.9	2,467.8	-17.8	-4.0	-17.6	0.10	-0.05	15.33
3,703.0	0.32	258.13	3,702.9	2,567.9	-18.0	-4.5	-17.7	0.03	0.03	2.52
3,803.0	0.27	250.99	3,802.9	2,667.9	-18.1	-5.0	-17.8	0.06	-0.05	-7.14
3,903.0	0.29	255.07	3,902.9	2,767.9	-18.2	-5.5	-17.9	0.03	0.02	4.08
4,003.0	0.29	256.08	4,002.9	2,867.9	-18.4	-6.0	-18.0	0.01	0.00	0.99
4,103.0	0.34	259.65	4,102.9	2,967.9	-18.5	-6.5	-18.1	0.05	0.05	3.59
4,203.0	0.48	268.97	4,202.9	3,067.9	-18.5	-7.2	-18.1	0.15	0.14	9.32
4,228.0	0.48	279.03	4,227.9	3,092.9	-18.5	-7.4	-18.1	0.34	0.00	40.24
4,297.0	0.30	259.90	4,296.9	3,161.9	-18.5	-7.9	-18.1	0.32	-0.26	-27.72
4,339.0	0.20	300.30	4,338.9	3,203.9	-18.5	-8.1	-18.0	0.47	-0.24	96.19
4,382.0	0.10	350.90	4,381.9	3,246.9	-18.4	-8.1	-18.0	0.36	-0.23	117.67
4,425.0	0.20	72.80	4,424.9	3,289.9	-18.4	-8.1	-17.9	0.49	0.23	190.47
4,468.0	0.70	75.80	4,467.9	3,332.9	-18.3	-7.8	-17.8	1.16	1.16	6.98



PHX  
Survey Report



Database:	PHX Survey Data	Local Co-ordinate Reference:	North American Datum 83
Company:	PHX Technology Services	TVD Reference:	Mean Sea Level
Project:	Illinois County, 2015	MD Reference:	Mean Sea Level
Site:	Illinois County, 2015	North Reference:	Mean Sea Level
Well:	W-10000000	Survey Calculation Method:	Minimum Curvature
Wellbore:	W-10000000		
Design:	W-10000000		

Measured Depth (ustf)	Inclination (°)	Azimuth (°)	Vertical Depth (ustf)	Subsea Depth (ustf)	+N/S (ustf)	+E/W (ustf)	Vertical Section (ustf)	Dogleg Rate (°/100ustf)	Build Rate (°/100ustf)	Turn Rate (°/100ustf)
4,511.0	1.40	70.90	4,510.9	3,375.9	-18.0	-7.0	-17.6	1.64	1.63	-11.40
4,554.0	2.50	77.60	4,553.9	3,418.9	-17.7	-5.6	-17.3	2.61	2.56	15.58
4,597.0	3.20	82.70	4,596.8	3,461.8	-17.3	-3.5	-17.1	1.73	1.63	11.86
4,640.0	4.40	84.00	4,639.7	3,504.7	-17.0	-0.7	-16.9	2.80	2.79	3.02
4,683.0	5.80	82.20	4,682.6	3,547.6	-16.5	3.1	-16.7	3.28	3.26	-4.19
4,726.0	7.00	85.00	4,725.3	3,590.3	-16.0	7.9	-16.4	2.88	2.79	6.51
4,769.0	8.00	90.40	4,767.9	3,632.9	-15.8	13.5	-16.5	2.84	2.33	12.56
4,813.0	9.10	95.30	4,811.4	3,676.4	-16.1	20.0	-17.2	3.00	2.50	11.14
4,856.0	10.30	96.20	4,853.8	3,718.8	-16.9	27.2	-18.3	2.81	2.79	2.09
4,900.0	11.70	95.10	4,897.0	3,762.0	-17.7	35.6	-19.5	3.22	3.18	-2.50
4,944.0	12.80	88.80	4,940.0	3,805.0	-18.0	44.9	-20.3	3.93	2.50	-14.32
4,987.0	14.70	88.30	4,981.8	3,846.8	-17.7	55.1	-20.6	4.43	4.42	-1.16
5,030.0	16.70	88.90	5,023.2	3,888.2	-17.4	66.8	-20.9	4.67	4.65	1.40
5,073.0	18.00	89.00	5,064.2	3,929.2	-17.2	79.6	-21.4	3.02	3.02	0.23
5,115.0	18.80	90.40	5,104.1	3,969.1	-17.1	92.8	-22.0	2.18	1.90	3.33
5,158.0	20.80	90.40	5,144.5	4,009.5	-17.2	107.4	-22.9	4.65	4.65	0.00
5,201.0	20.80	90.40	5,184.7	4,049.7	-17.3	122.7	-23.8	0.00	0.00	0.00
5,245.0	21.50	89.60	5,225.8	4,090.8	-17.3	138.5	-24.6	1.72	1.59	-1.82
5,288.0	22.40	89.01	5,265.6	4,130.6	-17.1	154.6	-25.3	2.15	2.09	-1.37
5,332.0	22.90	89.20	5,306.2	4,171.2	-16.9	171.6	-25.9	1.15	1.14	0.43
5,365.0	23.00	89.80	5,336.6	4,201.6	-16.8	184.4	-26.5	0.77	0.30	1.82
5,398.0	22.60	90.90	5,365.2	4,230.2	-16.8	196.4	-27.2	1.89	-1.29	3.55
5,428.0	22.00	91.40	5,394.8	4,259.8	-17.1	208.6	-28.0	1.97	-1.88	1.56
5,459.0	23.50	90.80	5,423.4	4,288.4	-17.3	220.6	-28.9	4.90	4.84	-1.94
5,490.0	27.10	91.30	5,451.4	4,316.4	-17.6	233.8	-29.8	11.63	11.61	1.61
5,522.0	31.00	91.50	5,479.4	4,344.4	-17.9	249.3	-31.0	12.19	12.19	0.63
5,554.0	34.90	91.30	5,506.2	4,371.2	-18.4	266.7	-32.4	12.19	12.19	-0.63
5,585.0	38.70	90.20	5,531.1	4,396.1	-18.6	283.3	-33.6	12.44	12.26	-3.55
5,617.0	41.90	90.00	5,555.5	4,420.5	-18.6	306.0	-34.7	10.01	10.00	-0.63
5,648.0	45.00	90.50	5,578.0	4,443.0	-18.7	327.3	-35.9	10.06	10.00	1.61
5,680.0	48.90	90.80	5,599.8	4,464.8	-19.0	350.7	-37.4	12.21	12.19	0.94
5,711.0	52.40	91.30	5,619.5	4,484.5	-19.4	374.7	-39.1	11.36	11.29	1.61
5,743.0	55.50	90.70	5,638.3	4,503.3	-19.9	400.5	-40.9	9.81	9.69	-1.88
5,774.0	57.50	90.30	5,655.4	4,520.4	-20.1	426.4	-42.5	6.54	6.45	-1.29
5,806.0	59.80	89.40	5,672.0	4,537.0	-20.0	453.7	-43.9	7.58	7.19	-2.81
5,838.0	62.20	88.80	5,687.6	4,552.6	-19.6	481.7	-44.9	7.68	7.50	-1.88
5,869.0	64.80	88.10	5,701.4	4,566.4	-19.1	509.4	-45.9	8.43	8.39	0.97
5,901.0	66.60	89.50	5,714.6	4,579.6	-18.7	538.6	-47.1	5.74	5.63	1.25
5,964.0	67.50	88.60	5,739.1	4,604.1	-17.8	596.6	-49.2	1.94	1.43	-1.43
6,027.0	67.30	89.20	5,763.3	4,628.3	-16.7	654.7	-51.1	0.93	-0.32	0.95
6,090.0	67.40	90.10	5,787.6	4,652.6	-16.3	712.9	-53.8	1.33	0.16	1.43
6,154.0	68.00	89.60	5,811.9	4,676.9	-16.1	772.1	-56.8	1.18	0.94	-0.76

Database:	Wellbore Survey Data - DB	Local Co-ordinate Reference:	North Reference:
Company:	EQ Production Services	TVD Reference:	North Reference:
Project:	WATER QUALITY WY	MD Reference:	Survey Calculation Method:
Site:	Mackinac County, MI 49777	North Reference:	Wellbore Curves
Well:	MACK 8213277	Survey Calculation Method:	
Wellbore:	Mass Wellbore		
Design:	A Direct Analysis		

Measured Depth (usf)	Inclination (°)	Azimuth (°)	Vertical Depth (usf)	Subsea Depth (usf)	+N/S (usf)	+E/W (usf)	Vertical Section (usf)	Dogleg Rate (°/100usf)	Bend Rate (°/100usf)	Turn Rate (°/100usf)
6,216.0	67.90	89.60	5,835.2	4,700.2	-15.7	829.5	-59.4	0.16	-0.16	0.00
6,279.0	68.90	90.20	5,858.3	4,723.3	-15.6	888.1	-62.4	1.82	1.59	0.95
6,342.0	69.80	90.10	5,880.6	4,745.6	-15.8	947.1	-65.6	1.44	1.43	-0.16
6,405.0	69.70	90.40	5,902.4	4,767.4	-16.1	1,006.2	-69.0	0.47	-0.16	0.48
6,468.0	70.00	89.70	5,924.1	4,789.1	-16.1	1,065.3	-72.2	1.15	0.48	-1.11
6,532.0	70.40	90.30	5,945.7	4,810.7	-16.1	1,125.5	-75.3	1.08	0.63	0.94
6,594.0	70.40	89.90	5,966.5	4,831.5	-16.2	1,183.9	-78.5	0.61	0.00	-0.65
6,658.0	70.70	89.50	5,987.9	4,852.9	-15.9	1,244.3	-81.4	0.75	0.47	-0.63
6,721.0	70.60	89.80	6,008.7	4,873.7	-15.5	1,303.7	-84.2	0.48	-0.16	0.48
6,784.0	71.30	89.40	6,029.3	4,894.3	-15.1	1,363.3	-86.9	1.26	1.11	-0.63
6,847.0	71.40	89.60	6,049.4	4,914.4	-14.6	1,423.0	-89.5	0.34	0.16	0.32
6,910.0	71.60	90.20	6,069.4	4,934.4	-14.5	1,482.7	-92.5	0.96	0.32	0.95
6,973.0	72.60	89.70	6,088.8	4,953.8	-14.4	1,542.7	-95.6	1.76	1.59	-0.79
7,005.0	72.30	88.90	6,098.4	4,963.4	-14.1	1,573.2	-96.9	2.56	-0.94	-2.30
7,036.0	69.40	85.40	6,108.6	4,973.6	-12.6	1,602.4	-97.0	14.19	-9.35	-11.29
7,068.0	66.70	79.60	6,120.6	4,985.6	-8.8	1,631.8	-94.7	18.81	-8.44	-18.13
7,099.0	65.40	75.00	6,133.2	4,998.2	-2.5	1,659.4	-89.9	14.19	-4.19	-14.84
7,131.0	65.70	74.50	6,146.4	5,011.4	5.1	1,687.5	-83.7	1.70	0.94	-1.56
7,162.0	67.20	73.90	6,156.8	5,023.8	12.9	1,714.9	-77.4	5.15	4.84	-1.94
7,194.0	68.70	71.20	6,170.8	5,035.8	21.8	1,743.2	-70.1	9.12	4.69	-8.44
7,225.0	69.30	68.20	6,181.9	5,046.9	31.8	1,770.3	-61.5	9.24	1.94	-9.68
7,257.0	69.60	65.90	6,193.2	5,058.2	43.5	1,797.9	-51.2	6.80	0.94	-7.19
7,288.0	69.90	62.90	6,203.9	5,068.9	56.1	1,824.1	-40.1	9.13	0.97	-9.68
7,319.0	69.80	59.50	6,214.6	5,079.6	70.1	1,849.6	-27.4	10.30	-0.32	-10.97
7,351.0	69.60	55.80	6,225.7	5,090.7	86.1	1,875.0	-12.7	10.88	-0.63	-11.56
7,383.0	69.50	51.90	6,236.9	5,101.9	103.8	1,899.2	3.7	11.42	-0.31	-12.19
7,414.0	69.50	48.50	6,247.7	5,112.7	122.4	1,921.5	21.0	10.27	0.00	-10.97
7,446.0	69.20	44.40	6,259.0	5,124.0	143.0	1,943.2	40.5	12.03	-0.94	-12.81
7,477.0	69.10	40.40	6,270.1	5,135.1	164.4	1,962.7	60.8	12.06	-0.32	-12.90
7,509.0	69.80	37.00	6,281.5	5,146.3	187.8	1,981.4	83.2	10.19	2.19	-10.63
7,540.0	71.10	34.20	6,291.7	5,156.7	211.5	1,998.4	106.0	9.49	4.19	-9.03
7,572.0	71.80	31.10	6,301.8	5,166.8	237.1	2,014.8	130.7	9.44	2.19	-9.69
7,603.0	72.40	27.90	6,311.4	5,176.4	262.7	2,029.3	155.5	10.01	1.94	-10.32
7,635.0	74.60	25.20	6,320.5	5,185.5	290.2	2,043.0	182.2	10.62	6.88	-8.44
7,667.0	74.60	22.30	6,329.0	5,194.0	318.4	2,055.5	209.8	8.74	0.00	-9.06
7,698.0	74.50	18.40	6,337.2	5,202.2	346.4	2,065.9	237.2	12.13	-0.32	-12.58
7,729.0	75.50	15.00	6,345.3	5,210.3	375.1	2,074.5	265.4	11.07	3.23	-10.97
7,761.0	77.20	13.30	6,352.8	5,217.8	405.3	2,082.1	295.1	7.41	5.31	-5.31
7,793.0	78.30	10.30	6,359.8	5,224.6	435.9	2,088.4	325.3	9.79	3.44	-9.38
7,824.0	78.70	6.30	6,365.8	5,230.8	465.9	2,092.8	355.1	12.71	1.29	-12.90
7,856.0	79.00	2.50	6,372.0	5,237.0	497.2	2,095.2	386.2	11.69	0.94	-11.88
7,887.0	79.90	359.60	6,377.6	5,242.6	527.7	2,095.8	416.6	9.64	2.90	-9.35
7,918.0	80.50	356.20	6,382.9	5,247.9	558.2	2,094.7	447.1	10.98	1.94	-10.97



PHX  
Survey Report



Database:	EDM North Range Survey (1)	Local Coordinate Reference:	North American 1983 (NAD83)
Company:	QF Production (Margolis)	TVD Reference:	Mean Sea Level
Project:	Indus County, WV	MD Reference:	Mean Sea Level
Site:	Indus County 013277	North Reference:	Mean Sea Level
Well:	Indus 013277	Survey Calculation Method:	Minimum Curvature
Wellbore:	Indus 013277		
Design:	Indus 013277		

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)
7,950.0	81.50	352.60	6,387.9	5,252.9	589.7	2,091.6	478.7	11.54	0.13	-11.25
7,982.0	82.30	349.50	6,392.4	5,257.4	620.0	2,080.7	510.2	0.91	2.50	-0.59
8,013.0	83.20	346.60	6,396.4	5,261.4	651.0	2,069.0	540.9	12.51	2.50	-12.58
8,045.0	83.80	342.10	6,400.0	5,265.0	681.5	2,057.2	571.5	11.09	2.19	-10.94
8,076.0	85.03	339.50	6,402.9	5,267.9	710.6	2,045.2	601.1	12.09	3.55	-11.81
8,108.0	82.30	333.60	6,405.4	5,270.4	739.9	2,033.3	631.1	0.91	4.06	-0.60
8,171.0	83.60	332.00	6,406.1	5,273.1	786.6	2,021.0	660.1	0.85	3.67	-4.46
8,234.0	80.40	335.00	6,406.8	5,275.8	833.3	1,992.7	706.6	2.69	2.54	1.55
8,297.0	81.10	351.10	6,407.7	5,272.7	889.5	1,985.0	753.7	1.21	1.11	0.49
8,360.0	81.80	334.10	6,408.2	5,271.2	955.1	1,977.5	802.9	0.78	0.73	0.00
8,423.0	80.50	334.50	6,408.0	5,270.0	1,022.0	1,970.2	850.0	1.86	-1.75	0.63
8,486.0	80.20	351.00	6,404.7	5,266.7	1,070.3	1,962.8	898.0	0.00	-0.45	-0.76
8,549.0	80.00	338.50	6,404.0	5,266.0	1,128.6	1,955.9	1,007.3	2.40	-0.32	2.39
8,612.0	80.30	337.40	6,405.0	5,270.0	1,184.3	1,950.6	1,096.3	3.27	-1.37	3.02
8,676.0	80.00	337.70	6,406.0	5,271.0	1,253.5	1,946.3	1,186.6	0.56	-0.31	0.47
8,739.0	88.60	335.00	6,407.4	5,272.2	1,311.4	1,791.5	1,215.0	2.67	-0.32	-2.66
8,802.0	89.60	335.10	6,404.1	5,273.1	1,369.7	1,785.4	1,274.4	1.80	1.27	-1.27
8,865.0	80.10	335.00	6,408.3	5,278.3	1,428.0	1,779.9	1,332.8	0.61	0.79	-0.19
8,928.0	80.10	335.10	6,409.7	5,279.7	1,482.9	1,772.2	1,391.3	1.60	-1.50	0.10
8,992.0	85.70	333.50	6,409.8	5,274.3	1,541.0	1,675.4	1,450.7	0.70	-0.65	0.31
9,054.0	89.20	334.50	6,411.1	5,276.1	1,607.3	1,649.3	1,505.2	1.03	0.81	-0.89
9,117.0	89.60	334.00	6,411.8	5,276.6	1,674.1	1,622.2	1,563.4	1.06	0.95	-1.11
9,180.0	80.40	333.00	6,411.8	5,276.5	1,740.8	1,604.7	1,621.4	1.00	0.90	-0.49
9,243.0	80.20	334.90	6,411.2	5,276.2	1,797.6	1,587.4	1,682.6	1.62	-0.32	1.59
9,306.0	83.80	333.90	6,411.7	5,276.7	1,824.9	1,541.2	1,741.2	2.73	-2.22	1.89
9,369.0	89.00	334.00	6,413.8	5,278.5	1,892.1	1,515.0	1,799.6	2.08	-1.27	-1.39
9,432.0	88.30	351.20	6,415.5	5,280.5	1,959.0	1,487.9	1,858.0	1.21	0.49	-1.11
9,495.0	80.70	333.20	6,416.1	5,281.1	1,995.9	1,481.0	1,919.2	4.73	3.61	1.59
9,558.0	82.60	335.20	6,414.1	5,279.1	2,053.1	1,434.0	1,974.7	3.49	3.49	0.60
9,621.0	91.30	335.20	6,411.8	5,276.8	2,110.2	1,406.2	2,033.2	2.54	-2.54	0.00
9,684.0	80.30	334.90	6,410.7	5,275.7	2,167.4	1,381.6	2,091.6	1.21	-1.11	-0.46
9,747.0	81.20	334.70	6,409.7	5,274.7	2,224.4	1,354.0	2,149.9	1.00	0.99	-0.32
9,810.0	89.80	335.50	6,409.2	5,274.2	2,281.5	1,326.5	2,208.4	2.82	-2.23	1.27
9,873.0	82.70	336.10	6,408.5	5,274.5	2,338.0	1,302.5	2,267.1	0.97	-0.16	0.93
9,936.0	89.90	335.60	6,409.7	5,275.7	2,393.4	1,276.7	2,325.2	0.66	0.32	-0.79
9,999.0	80.40	335.30	6,409.5	5,276.5	2,449.7	1,250.5	2,384.5	0.39	0.79	-0.48
10,063.0	80.00	335.00	6,408.6	5,273.6	2,511.8	1,223.6	2,443.0	0.21	0.78	-0.47
10,126.0	81.50	335.20	6,407.5	5,272.5	2,563.9	1,197.1	2,502.4	1.09	0.95	0.32
10,189.0	90.50	333.60	6,406.4	5,271.4	2,625.6	1,170.0	2,560.6	2.73	-1.59	-2.22
10,252.0	89.70	332.50	6,408.3	5,271.3	2,682.0	1,141.5	2,619.2	2.42	-1.27	-2.09
10,315.0	88.80	331.70	6,406.5	5,271.5	2,737.7	1,112.0	2,675.3	1.29	0.15	1.27



PHX  
Survey Report



Database:	LAKEWAY 1 Dept 1201-02	Local Co-ordinate Reference:	1201-02
Company:	EQT PHOENIX - MICHIGAN	TVD Reference:	1201-02
Project:	TRIPLE CROWN, WY	MD Reference:	1201-02
Site:	Rockwell Dr 115777	North Reference:	1201-02
Well:	WEL 115777	Survey Calculation Method:	Minimum Curvature
Wellbore:	WEL 115777		
Design:	WEL 115777		

Survey

Measured Depth (ustf)	Inclination (°)	Azimuth (°)	Vertical Depth (ustf)	Subsea Depth (ustf)	+N/S (ustf)	+E/W (ustf)	Vertical Section (ustf)	Colln Rate (+100ustf)	Build Rate (+100ustf)	Turn Rate (+100ustf)
10,378.0	88.70	333.60	6,407.4	5,272.4	2,793.6	1,083.1	2,732.7	3.48	-1.75	3.02
10,441.0	88.40	334.10	6,409.0	5,274.0	2,850.2	1,055.3	2,790.6	0.93	-0.48	0.79
10,504.0	88.70	333.70	6,410.6	5,275.6	2,906.7	1,027.6	2,848.6	0.79	0.48	-0.63
10,567.0	89.20	333.90	6,411.7	5,276.7	2,963.2	999.8	2,906.5	0.85	0.79	0.32
10,630.0	89.50	335.10	6,412.4	5,277.4	3,020.1	972.7	2,964.7	1.96	0.48	1.90
10,693.0	89.80	334.10	6,412.8	5,277.8	3,077.0	945.7	3,022.9	1.66	0.48	-1.59
10,756.0	91.30	334.90	6,412.2	5,277.2	3,133.9	918.6	3,081.2	2.70	2.38	1.27
10,820.0	91.90	334.60	6,410.4	5,275.4	3,191.7	891.3	3,140.4	1.05	0.94	-0.47
10,883.0	90.80	336.30	6,408.9	5,273.9	3,249.0	865.1	3,199.0	3.21	-1.75	2.70
10,945.0	90.60	336.30	6,408.2	5,273.2	3,305.8	840.2	3,257.0	0.32	-0.32	0.00
11,009.0	89.80	336.30	6,407.9	5,272.9	3,364.4	814.5	3,316.6	1.25	-1.25	0.00
11,072.0	89.50	335.60	6,408.3	5,273.3	3,421.9	788.8	3,375.6	1.21	-0.48	-1.11
11,135.0	89.70	335.80	6,408.8	5,273.8	3,479.3	762.9	3,434.3	0.45	0.32	0.32
11,198.0	89.90	336.10	6,409.0	5,274.0	3,536.9	737.2	3,493.1	0.57	0.32	0.48
11,261.0	90.20	336.50	6,408.9	5,273.9	3,594.5	711.9	3,552.1	0.79	0.48	0.63
11,324.0	90.90	336.80	6,408.3	5,273.3	3,652.4	686.9	3,611.1	1.21	1.11	0.48
11,387.0	89.80	336.20	6,407.9	5,272.9	3,710.2	661.8	3,670.2	1.99	-1.75	-0.95
11,450.0	89.60	335.20	6,408.3	5,273.3	3,767.6	635.9	3,728.9	1.62	-0.32	-1.59
11,513.0	89.60	334.80	6,408.7	5,273.7	3,824.7	609.2	3,787.3	0.63	0.00	-0.63
11,576.0	89.90	334.60	6,409.0	5,274.0	3,881.6	582.3	3,845.6	0.57	0.48	-0.32
11,639.0	90.10	334.40	6,409.0	5,274.0	3,938.5	555.2	3,903.8	0.45	0.32	-0.32
11,702.0	90.50	333.90	6,408.7	5,273.7	3,995.2	527.7	3,961.9	1.02	0.63	-0.79
11,765.0	89.40	334.80	6,408.7	5,273.7	4,052.0	500.4	4,020.0	2.26	-1.75	1.43
11,828.0	89.00	334.50	6,409.6	5,274.6	4,108.9	473.5	4,078.3	0.79	-0.63	-0.48
11,891.0	88.40	334.80	6,410.5	5,275.5	4,165.8	446.5	4,136.5	0.79	0.63	0.48
11,954.0	89.80	334.80	6,410.9	5,275.9	4,222.8	419.7	4,194.9	0.63	0.63	0.00
12,017.0	89.90	334.60	6,411.1	5,276.1	4,279.8	392.8	4,253.2	0.35	0.16	-0.32
12,081.0	90.50	334.60	6,410.9	5,275.9	4,337.6	365.3	4,312.4	0.94	0.94	0.00
12,144.0	90.70	335.00	6,410.2	5,275.2	4,394.6	338.5	4,370.7	0.71	0.32	0.63
12,207.0	90.90	334.20	6,409.3	5,274.3	4,451.5	311.5	4,428.9	1.31	0.32	-1.27
12,270.0	89.60	334.60	6,409.0	5,274.0	4,508.3	284.2	4,487.1	2.16	-2.06	0.63
12,333.0	89.70	334.80	6,409.4	5,274.4	4,565.3	257.3	4,545.4	0.35	0.16	0.32
12,397.0	89.80	334.90	6,409.7	5,274.7	4,623.2	230.1	4,604.7	0.22	0.16	0.16
12,460.0	90.20	334.80	6,409.7	5,274.7	4,680.2	203.4	4,663.0	0.65	0.63	-0.16
12,523.0	90.30	334.80	6,409.4	5,274.4	4,737.2	176.5	4,721.4	0.16	0.16	0.00
12,586.0	90.60	334.80	6,408.9	5,273.9	4,794.2	149.7	4,779.7	0.48	0.48	0.00
12,649.0	89.20	334.80	6,409.0	5,274.0	4,851.2	122.9	4,838.0	2.22	-2.22	0.00
12,712.0	89.10	335.10	6,410.0	5,275.0	4,908.3	96.2	4,896.4	0.50	-0.16	0.48
12,775.0	89.50	335.50	6,410.8	5,275.8	4,965.5	69.9	4,955.0	0.90	0.63	0.63
12,838.0	89.80	335.80	6,411.1	5,276.1	5,022.9	43.9	5,013.7	0.67	0.48	0.48
12,902.0	90.10	335.50	6,411.2	5,276.2	5,081.2	17.5	5,073.3	0.66	0.47	-0.47
12,965.0	90.40	335.40	6,410.9	5,275.9	5,138.5	-8.7	5,131.8	0.50	0.48	-0.16

Database:	EDM 5000 1 Build 73	Local Co-ordinate Reference:	OK - Phoenix County 516277
Company:	EOT Production - Marcellus	TVD Reference:	USG 18 @ 1120.00ft
Project:	Phoenix County, WV	MD Reference:	CR @ 10 @ 1120.00ft
Site:	Phoenix County 516277	North Reference:	Grid
Well:	Well #516277	Survey Calculation Method:	Minimum Curvature
Wellbore:	Main Wellbore		
Design:	As Ordered Surveys		

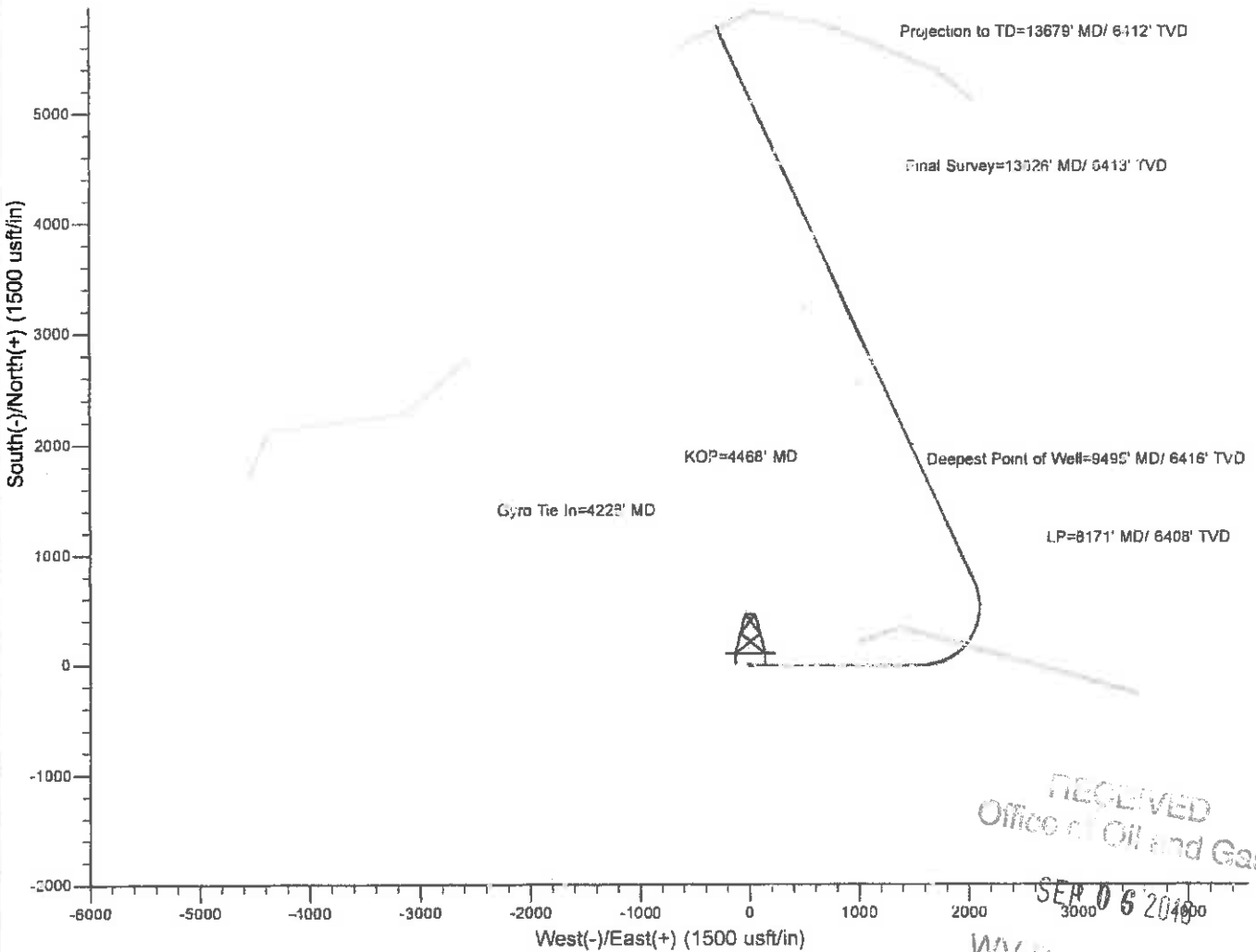
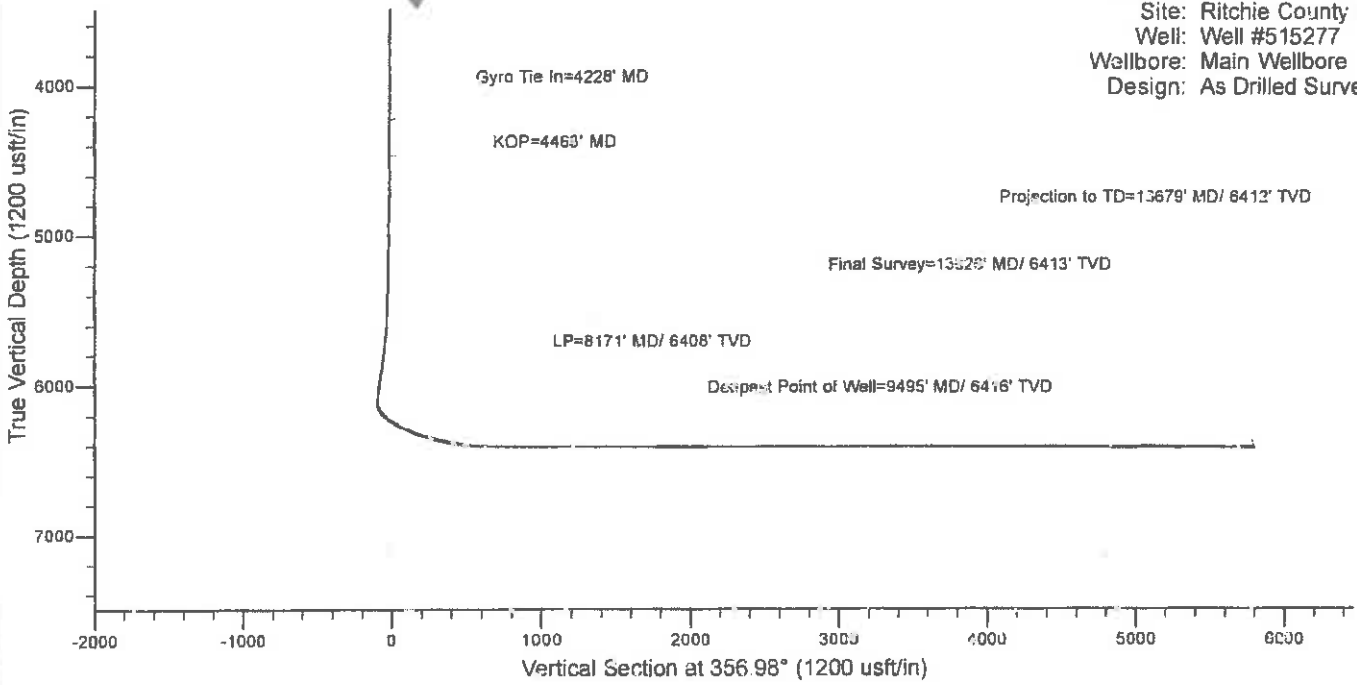
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	Subsea Depth (usft)	+N/S (usft)	+E/W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
13,028.0	90.70	335.40	6,410.3	5,275.3	5,195.8	-34.9	5,190.6	0.48	0.48	0.00
13,091.0	91.00	334.80	6,409.4	5,274.4	5,253.0	-61.4	5,248.9	1.06	0.48	-0.95
13,154.0	89.70	335.20	6,409.0	5,274.0	5,310.1	-88.0	5,307.3	2.16	-2.06	0.63
13,217.0	89.00	334.10	6,409.7	5,274.7	5,367.0	-115.0	5,365.6	2.07	-1.11	-1.75
13,280.0	89.30	334.20	6,410.6	5,275.6	5,423.7	-142.5	5,423.7	0.50	0.46	0.16
13,343.0	89.10	335.20	6,411.5	5,276.5	5,480.6	-169.4	5,481.9	1.62	-0.32	1.59
13,406.0	89.50	335.40	6,412.3	5,277.3	5,537.9	-195.7	5,540.5	0.71	0.63	0.32
13,469.0	89.60	335.30	6,412.6	5,277.6	5,595.1	-222.0	5,598.0	0.22	0.16	-0.16
13,532.0	90.00	334.70	6,413.0	5,278.0	5,652.2	248.6	5,657.5	1.14	0.53	-0.95
13,595.0	90.40	334.30	6,412.8	5,277.8	5,709.1	-275.7	5,715.7	0.90	0.63	-0.63
13,626.0	90.50	334.10	6,412.5	5,277.5	5,737.0	-289.2	5,744.3	0.72	0.32	-0.35
13,679.0	90.50	334.10	6,412.1	5,277.1	5,784.7	-312.4	5,793.1	0.00	0.00	0.00

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/S (usft)	+E/W (usft)	Comment
4,228.0	4,227.9	-18.5	-7.4	Gyro Tie in=4228' MD
4,468.0	4,467.9	-18.3	-7.8	KOP=4468' MD
8,171.0	6,408.1	796.6	2,021.0	LP=8171' MD/ 6408' TVD
9,495.0	6,416.1	1,995.9	1,461.0	Deepest Point of Well=8495' MD/ 6416' TVD
13,626.0	6,412.5	5,737.0	-289.2	Final Survey=13626' MD/ 6413' TVD
13,679.0	6,412.1	5,784.7	-312.4	Projection to TD=13679' MD/ 6412' TVD

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

RECEIVED  
Office of Oil and Gas  
SEP 06 2016  
WV Department of  
Environmental Protection

Project: Ritchie County, WV  
Site: Ritchie County 515277  
Well: Well #515277  
Wellbore: Main Wellbore  
Design: As Drilled Surveys



RECEIVED  
Office of Oil and Gas

SEP 06 2010

WV Department of  
Environmental Protection



515277- 47-085-10095-0000- Perforations

Stage Number:	Perforation Date	Top Perf Depth (ftKS)	Bottom Perf Depth (ftKB)	Number of Shots	Formation
Initiation Sleeve	4/29/2015	13,677.00	13,679.00	10	MARCELLUS
1	5/26/2015	13,532.00	13,624.00	32	MARCELLUS
2	5/26/2015	13,382.00	13,504.00	40	MARCELLUS
3	5/26/2015	13,232.00	13,354.00	40	MARCELLUS
4	5/26/2015	13,079.00	13,204.00	40	MARCELLUS
5	5/27/2015	12,932.00	13,054.00	40	MARCELLUS
6	5/27/2015	12,782.00	12,904.00	40	MARCELLUS
7	5/27/2015	12,662.00	12,754.00	40	MARCELLUS
8	5/28/2015	12,508.00	12,634.00	40	MARCELLUS
9	5/28/2015	12,362.00	12,484.00	40	MARCELLUS
10	5/28/2015	12,212.00	12,334.00	40	MARCELLUS
11	5/28/2015	12,062.00	12,184.00	40	MARCELLUS
12	5/28/2015	11,912.00	12,030.00	40	MARCELLUS
13	5/28/2015	11,762.00	11,884.00	40	MARCELLUS
14	5/29/2015	11,612.00	11,734.00	40	MARCELLUS
15	5/29/2015	11,466.00	11,584.00	40	MARCELLUS
16	5/29/2015	11,312.00	11,434.00	40	MARCELLUS
17	5/29/2015	11,162.00	11,284.00	40	MARCELLUS
18	5/29/2015	11,012.00	11,134.00	40	MARCELLUS
19	5/29/2015	10,862.00	10,984.00	40	MARCELLUS
20	5/30/2015	10,712.00	10,831.00	40	MARCELLUS
21	5/30/2015	10,562.00	10,684.00	40	MARCELLUS
22	5/30/2015	10,412.00	10,534.00	40	MARCELLUS
23	5/30/2015	10,262.00	10,384.00	40	MARCELLUS
24	5/30/2015	10,112.00	10,234.00	40	MARCELLUS
25	5/31/2015	9,962.00	10,084.00	40	MARCELLUS
26	5/31/2015	9,812.00	9,930.00	40	MARCELLUS
27	5/31/2015	9,662.00	9,782.00	40	MARCELLUS
28	5/31/2015	9,512.00	9,634.00	40	MARCELLUS
29	5/31/2015	9,366.00	9,484.00	40	MARCELLUS
30	6/1/2015	9,212.00	9,334.00	40	MARCELLUS
31	6/1/2015	9,062.00	9,184.00	40	MARCELLUS
32	6/1/2015	8,912.00	9,034.00	40	MARCELLUS
33	6/1/2015	8,762.00	8,884.00	40	MARCELLUS
34	6/1/2015	8,612.00	8,734.00	40	MARCELLUS
35	6/1/2015	8,462.00	8,584.00	40	MARCELLUS
36	6/2/2015	8,316.00	8,434.00	40	MARCELLUS
37	6/2/2015	8,162.00	8,284.00	40	MARCELLUS
38	6/2/2015	8,012.00	8,134.00	40	MARCELLUS

**515277- 47-085-10095-0000- Stimulated Stages**

Stage Number	Stimulation Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
Initiation Sleeve	5/25/2015	24.3	6,901.00	8,550.00	4,567.00	0	510	0
1	5/26/2015	96.7	8,471.00	8,846.00	3,718.00	200,440	6123	0
2	5/26/2015	95.8	8,325.00	9,053.00	3,808.00	200,760	5715	0
3	5/26/2015	92.8	8,027.00	8,456.00	3,713.00	202,720	5752	0
4	5/26/2015	95.3	8,226.00	8,457.00	4,107.00	199,260	6348	0
5	5/27/2015	90.9	8,186.00	8,417.00	3,154.00	199,760	5581	0
6	5/27/2015	58.5	6,069.00	9,727.00	4,488.00	98,540	6869	0
7	5/27/2015	88.2	7,989.00	8,386.00	3,350.00	304,800	8297	0
8	5/28/2015	94.5	8,100.00	8,514.00	4,217.00	203,660	6120	0
9	5/28/2015	94.2	8,324.00	8,557.00	3,389.00	201,480	5409	0
10	5/28/2015	94.1	8,220.00	8,441.00	3,509.00	200,480	5450	0
11	5/28/2015	95.6	8,251.00	8,575.00	4,078.00	200,620	5413	0
12	5/28/2015	96.2	7,980.00	8,268.00	3,342.00	201,460	5626	0
13	5/29/2015	93.8	8,137.00	8,689.00	3,675.00	203,340	5598	0
14	5/29/2015	96.4	8,158.00	8,589.00	4,137.00	203,140	5314	0
15	5/29/2015	94.5	8,335.00	8,553.00	3,031.00	203,320	5356	0
16	5/29/2015	95.4	8,192.00	8,489.00	2,914.00	200,260	5284	0
17	5/29/2015	98.6	8,193.00	8,538.00	2,839.00	201,220	5369	0
18	5/29/2015	96.1	8,202.00	8,790.00	4,413.00	201,500	5379	0
19	5/30/2015	93.4	8,114.00	8,582.00	3,098.00	204,440	5579	0
20	5/30/2015	93	8,326.00	8,938.00	3,104.00	202,000	5272	0
21	5/30/2015	94.5	8,348.00	8,766.00	3,724.00	202,660	5289	0
22	5/30/2015	95.5	8,198.00	8,529.00	2,937.00	200,760	5294	0
23	5/30/2015	97.5	8,101.00	8,435.00	3,369.00	200,800	5479	0
24	5/30/2015	93.9	7,935.00	8,972.00	4,092.00	202,980	5507	0
25	5/31/2015	98.3	8,164.00	8,597.00	3,662.00	203,640	5420	0
26	5/31/2015	96.4	8,186.00	8,477.00	3,432.00	201,840	5172	0
27	5/31/2015	94.9	8,182.00	8,474.00	3,595.00	200,180	7546	0
28	5/31/2015	94.6	8,083.00	8,687.00	3,752.00	203,820	5441	0
29	6/1/2015	96.8	8,035.00	9,382.00	4,830.00	203,040	5161	0
30	6/1/2015	93.60	7,900.00	8,162.00	3,745	203,600	5,322	0
31	6/1/2015	96.40	8,230.00	8,707.00	3,662	200,860	5,131	0
32	6/1/2015	95.90	8,249.00	8,503.00	4,063	200,200	5,127	0
33	6/1/2015	96.10	8,243.00	8,529.00	3,746	201,790	5,137	0
34	6/1/2015	96.70	8,019.00	8,519.00	4,132	203,340	5,103	0
35	6/1/2015	90.30	8,020.00	8,691.00	3,275	202,140	5,145	0
36	6/2/2015	95.10	8,023.00	8,284.00	3,768	203,540	5,039	0
37	6/2/2015	93.10	8,226.00	8,663.00	3,579	201,060	5,282	0
38	6/2/2015	98.9	8,131.00	8,525.00	3,408.00	200,680	5014	0

# Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date	5/25/2015
Job End Date	6/2/2015
State	West Virginia
County	Ritchie
API Number	47-085-10095-00-00
Operator Name	EQT Production
Well Name and Number	515277
Longitude	-80.95147900
Latitude	39.26188400
Datum	NAD83
Federal Label Well	NO
Total Water Volume (gal)	6,378
Total Base Water Volume (gal)	8,944,866
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	Singray Pressure Pumping, LLC	Carrier/Base Fluid	Water	7732-18-5	100.00000	90.37180	None
Sand (Proppant)	Singray Pressure Pumping, LLC	Proppant	Silica Substrate	14808-60-7	100.00000	9.28615	None
MC MX 437-5	Multi-Chem	Calcium nitrate solution	Calcium nitrate	10124-37-5	60.00000	0.05801	None
Hydrochloric Acid (15%)	Singray Pressure Pumping, LLC	Acidizing	Hydrochloric Acid	7647-01-0	15.00000	0.03163	None
FRA-405	Singray Pressure Pumping, LLC	Friction reducer	Petroleum distillates	64742-47-8	40.00000	0.00320	None
			Sodium chloride	7647-14-5	10.00000	0.00080	None
			Alcohols, C12-16, Ethoxylated	68551-12-2	7.00000	0.00050	None
			Ammonium chloride	12125-02-9	7.00000	0.00050	None
ScaleClear 325	Singray Pressure Pumping, LLC	Scale inhibitor	Phosphonemethylated polyimine compd. w/ substituted amine	Proprietary	15.00000	0.00373	None
			Ammonium chloride	12125-02-9	2.50000	0.00062	None

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AI 606	Singray Pressure Pumping, LLC	Acid corrosion inhibitor					
		Ethylene glycol	107-21-1	40.00000	0.00061	None	
		N,N-Dimethylformamide	88-12-2	20.00000	0.00030	None	
		Cinnamaldehyde	104-55-2	15.00000	0.00023	None	
		Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	15.00000	0.00023	None	
		2-Butoxyethanol	111-76-2	15.00000	0.00023	None	
		Poly(oxy-1,2-ethanedyl)-alpha-(4-nonylphenyl)-omega-hydroxy-branched	127087-87-0	5.00000	0.00000	None	
		1-Decanol	112-30-1	5.00000	0.00000	None	
		Isopropanol	67-63-0	2.50000	0.00000	None	
		Triethyl phosphate	78-40-0	2.50000	0.00000	None	
		1-Octanol	111-87-5	2.50000	0.00000	None	
Plexgel 907L-EB	Singray Pressure Pumping, LLC	Slurried Guar					
		Distillates (petroleum), hydrotreated light	34742-47-8	50.00000	0.00000	None	
		Organophylic Clay	Proprietary	2.00000	0.00000	None	
		Alcohol alkoxyolate	34398-01-1	1.00000	0.00000	None	
		Crystalline Silica	14808-60-7	0.10000	0.00000	None	

Ingredients shown above are subject to 29 CFR 1910.120(b) 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)



June 8, 2016

Mr. Gene Smith  
West Virginia Department of Environmental Protection  
Office of Oil and Gas  
601 57th Street SE  
Charleston, WV 25304

Re: Modification of 47-085-10095

Dear Mr. Smith,

Please accept the attached updates for the above referenced permit. Upon inspection of our as-drilled plat, we noted the curve geometry crossed into an additional tract, for which EQT had acquired a subsurface agreement. Enclosed is an updated WW-6A1, WW-6B, mylar plat and rec plan reflecting corrections to update the permit file to be consistent with the as-drilled well bore.

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Vicki Roark', is written over the word 'Sincerely,'.

Vicki Roark  
Permitting Supervisor-WV

Enc.

# EQT PRODUCTION COMPANY TAYLOR LEASE 1,600 ACRES±

## WELL NO. WV 515277 (PEN15 H8)

### AS DRILLED COORDINATES

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)

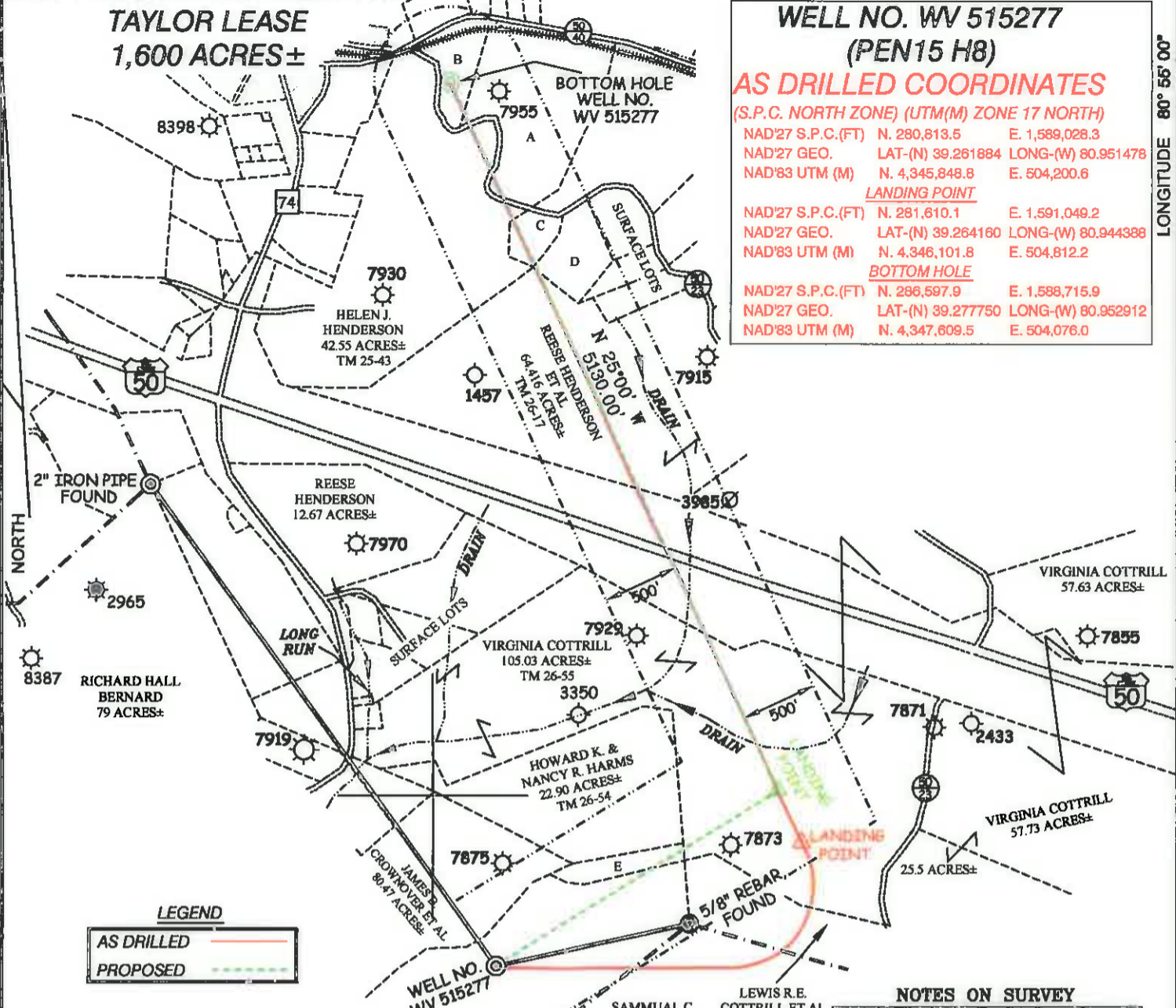
NAD'27 S.P.C.(FT)	N. 280,813.5	E. 1,589,028.3
NAD'27 GEO.	LAT-(N) 39.261884	LONG-(W) 80.951478
NAD'83 UTM (M)	N. 4,345,848.8	E. 504,200.6

#### LANDING POINT

NAD'27 S.P.C.(FT)	N. 281,610.1	E. 1,591,049.2
NAD'27 GEO.	LAT-(N) 39.264160	LONG-(W) 80.944388
NAD'83 UTM (M)	N. 4,346,101.8	E. 504,812.2

#### BOTTOM HOLE

NAD'27 S.P.C.(FT)	N. 286,597.9	E. 1,588,715.9
NAD'27 GEO.	LAT-(N) 39.277750	LONG-(W) 80.952912
NAD'83 UTM (M)	N. 4,347,609.5	E. 504,076.0



#### LEGEND

AS DRILLED —  
PROPOSED —

SUBSURFACE AGREEMENT  
SAMUEL C. HAMMETT ET AL | 110.637 AC± | TM 31-3

DEWAYNE R. & JUDITH D. BRITTON  
140.421 ACRES±  
TM 31-02

SAMMUAL C. HAMMETT ET AL  
110.637 ACRES±  
TM 31-03

LEWIS R.E. COTTRILL ET AL  
16.34 ACRES±  
TM 31-01

A	KARL E. & KAREN M. KNUTSEN	14.35 AC±	TM 43A-14
B	KARL E. & KAREN M. KNUTSEN	2.97 AC±	TM 43A-13
C	JAMES E. & SANDRA L. LEVOS	1.777 AC±	TM 26-59
D	JAMES E. & SANDRA L. LEVOS	4.092 AC±	TM 26-17.7
E	HOWARD K. & NANCY R. HARMS	1.39 AC±	TM 31-01.1

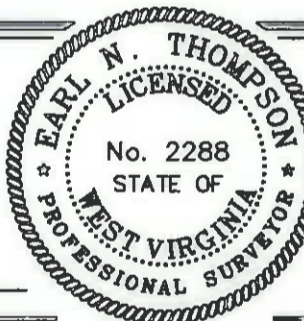
#### NOTES ON SURVEY

1. TIES TO WELLS, CORNERS AND REFERENCES ARE BASED ON GRID NORTH FOR THE WV STATE PLANE COORDINATE SYSTEM NORTH ZONE NAD '27.
2. WELL LAT./LONG. (NAD'27) ESTABLISHED BY DGPS(SURVEY GRADE TIE TO CORS NETWORK).
3. NO WATER WELLS WERE FOUND WITHIN 250 FEET OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS (GREATER THAN 2500 SQUARE FEET) OR DWELLINGS WERE FOUND WITHIN 625 FEET OF CENTER OF PROPOSED WELL PAD.
4. AS DRILLED INFORMATION PROVIDED BY EQT.

**Professional Energy Consultants**  
A DIVISION OF SMITH LAND SURVEYING, INC.  
**SLS**  
SURVEYORS  
ENGINEERS  
ENVIRONMENTAL  
PROJECT MANAGERS.  
(304) 482-8884  
WWW.SLSURVEYS.COM

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAN IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. *Earl N. Thompson*  
2288



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.

DATE JANUARY 10, 20 14

REVISED APRIL 17, 2015, MAY 16, 2016 & JUNE 06, 2016

OPERATORS WELL NO. WV 515277

API WELL NO. 47 - 085 - 10095 H  
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1/200 FILE NO. 7496AD515277R2  
PROVEN SOURCE OF ELEVATION DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 1000'

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



WELL TYPE: OIL  GAS  LIQUID INJECTION  WASTE DISPOSAL  IF "GAS" PRODUCTION  STORAGE  DEEP  SHALLOW

LOCATION: PAD ELEVATION 1,118.7' WATERSHED LONG RUN OF NORTH FORK HUGHES RIVER  
DISTRICT CLAY COUNTY RITCHIE QUADRANGLE PENNSBORO 7 5'

SURFACE OWNER DEWAYNE BRITTON ET UX ACREAGE 140.421  
ROYALTY OWNER E. R. TAYLOR HEIRS ACREAGE 1,600±  
LEASE NO. 105804

PROPOSED WORK:  
DRILL  CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE  PLUG OFF OLD FORMATION   
PERFORATE NEW FORMATION  PLUG AND ABANDON  CLEAN OUT AND REPLUG  OTHER

PHYSICAL CHANGE IN WELL (SPECIFY) \_\_\_\_\_ TARGET FORMATION MARCELLUS  
ESTIMATED DEPTH 6,374'

WELL OPERATOR EQT PRODUCTION COMPANY  
ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

DESIGNATED AGENT REX C. RAY  
ADDRESS 115 PROFESSIONAL PLACE BRIDGEPORT, WV 26330

LONGITUDE 80° 55' 00" COUNTY NAME PERMIT