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

June 11, 2015

EQT PRODUCTION COMPANY
120 PROFESSIONAL PLACE
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for API Number 10303036, Well #: 514419

Extend Lateral

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,

for Gene Smith

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

EQT

May 12, 2015

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

Re: Modification to 47-10303037, 47-10303036

Dear Mr. Smith,

Enclosed is a new WW-6B, schematics, WW-6A1, Rec plan and mylar plat for the above API #, signed by the inspector. EQT is requesting to modify the lateral length of this well.

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

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.

Received
Office of Oil & Gas
JUN 04 2015

4710303036 MOD

WW - 6B
(4/15)

API NO. 47 - 103 - _____
OPERATOR WELL NO. 514419
Well Pad Name: BIG333

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company

306686	103	4	254
Operator ID	County	District	Quadrangle

2) Operator's Well Number: 514419 Well Pad Name BIG333

3) Farm Name/Surface Owner : Alex Hart et al Public Road Access: CR 20

4) Elevation, current ground: 1,452.0 Elevation, proposed post-construction: 1,452.0

5) Well Type: (a) Gas • Oil _____ Underground Storage _____

Other _____

(b) If Gas: Shallow • Deep _____

Horizontal •

DmH
6-1-15

6) Existing Pad? Yes or No: yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):

Target formation is Marcellus at a depth of 7635 with the anticipated thickness to be 51 feet and anticipated target pressure of 4831 PSI

8) Proposed Total Vertical Depth: 7,635
9) Formation at Total Vertical Depth: Marcellus
10) Proposed Total Measured Depth 15,373
11) Proposed Horizontal Leg Length 7,303
12) Approximate Fresh Water Strata Depths: 581, 753
13) Method to Determine Fresh Water Depth: By offset wells
14) Approximate Saltwater Depths: 2257, 2370, 2657
15) Approximate Coal Seam Depths: 743, 883, 919, 1011, 1240, 1333
16) Approximate Depth to Possible Void (coal mine, karst, other): None reported
17)Does proposed well location contain coal seams directly overlying or adjacent to an active mine?
(a) If Yes, provide Mine Info: Name: _____
Depth: _____
Seam: _____
Owner: _____

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API NO. 47 - 103 -
OPERATOR WELL NO. 514419
Well Pad Name: BIG333

CASING AND TUBING PROGRAM

18)

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill- up (Cu.Ft.)
Conductor	26	New	Varies	Varies	80	80	98 C.T.S.
Fresh Water	13 3/8	New	MC-50	54	1,000	1,000	868 C.T.S.
Coal	12	–	–	–	–	–	–
Intermediate	9 5/8	New	MC-50	40	3,000	3,000	1,172 C.T.S.
Production	5 1/2	New	P-110	20	15,373	15,373	See Note 1
Tubing	2 3/8		J-55	4.6			May not be run, if run will be set 100' less than TD
Liners							

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TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	26	30	0.5	-	18	Construction	1.18
Fresh Water	13 3/8	17 1/2	0.38	2,480	2184	* See Note 2	1.21
Coal							
Intermediate	9 5/8	12 3/8	0.395	3,590	3160	* See Note 2	1.21
Production	5 1/2	8 1/2	0.361	12,640	10112	-	1.27/1.86
Tubing							
Liners							

Packers

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

Note 1: EQT plans to bring the TOC on the production casing cement job 1,000' above kick off point, which is at least 500' above the shallowest production zone, to avoid communication.
Note 2: Reference Variance 2014-17. (Attached)

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MOD

WW - 6B

(10/14)

API NO. 47 - 103 -

OPERATOR WELL NO. 514419

Well Pad Name: BIG333

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:

Drill and complete a new horizontal well in the Marcellus formation. The vertical drill to go down to an approximate depth of 6615.

Then kick off the horizontal leg into the Marcellus using a slick water frac.

20) Describe fracturing/stimulating methods in detail, including anticipated max pressure and max rate:

Hydraulic fracturing is completed in accordance with state regulations using water recycled from previously fractured wells and obtained from freshwater sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, gelling agent, gel breaker, friction reducer, biocide, and scale inhibitor), referred to in the industry as a "slickwater" completion. Maximum anticipated treating pressures are expected to average approximately 8500 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 200,000 barrels of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 200,000 pounds of sand per stage.

21) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): No additional

22) Area to be disturbed for well pad only, less access road (acres): no additional

23) Describe centralizer placement for each casing string.

- Surface: Bow spring centralizers – One at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers– One cent at the shoe and one spaced every 500'.
- Production: One spaced every 1000' from KOP to Int csg shoe

24) Describe all cement additives associated with each cement type. **Surface (Type 1 Cement):** 0-3% Calcium Chloride Used to speed the setting of cement slurries.

0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of the cement slurry to a thief zone.

Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Salt is used in shallow, low temperature formations to speed the setting of cement slurries. 0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry (not filtrate) to a thief zone.

Production:

Lead (Type 1 Cement): 0.2-0.7% Lignosulfonate (Retarder). Lengthens thickening time.

0.3% CFR (dispersant). Makes cement easier to mix.

Tail (Type H Cement): 0.25-0.40% Lignosulfonate (Retarder). Lengthens thickening time.

0.2-0.3% CFR (dispersant). This is to make the cement easier to mix.

60 % Calcuim Carbonate. Acid solubility.

0.4-0.6% Halad (fluid loss). Reduces amount of water lost to formation.

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6-1-15

25) Proposed borehole conditioning procedures. **Surface:** Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back on and circulate hole clean. A constant rate of higher than expected cuttings volume likely indicates washouts that will not clean up.

Intermediate: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhance hole cleaning use a soap sweep or increase injection rate & foam concentration.

Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume. Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across the shakers every 15 minutes.

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*Note: Attach additional sheets as needed.

4710303036

MOD

Well Schematic
EQT Production

Well Name	514419 (BIG333H4)
County	Wetzel
State	West Virgina

Elevation KB:	1465
Target	Marcellus
Prospect	
Azimuth	343
Vertical Section	7862

0'

500'

753' Fresh Water Base

1,000' 919' Base Red Rock

1,500'

2,000'

2,340' Maxton

2,500' 2,496' Big Lime

2,626' Big Injun

3,000' 2,903' Weir

3,000' Int. csg pt

3,070' -Gantz

3,105' -Fifty foot

3,200' -Thirty foot

3,500' 3,266' -Gordon

3,346' -Forth Sand

3,575' -Bayard

4,000' 3,967' -Warren

4,117' -Speechley

4,500' 4,526' -Balltown A

5,000' 4,958' -Riley

5,500'

5,639' -Benson

6,000' 5,962' -Alexander

6,500'

7,000' 7,178' -Sonyea

7,343' -Middlesex

7,392' -Genesee

7,478' -Geneseo

7,500' 7,505' -Tully

7,526' -Hamilton

7,617' -Marcellus

7,668' Onondaga

8,000'

0'

Hole Size 30" - 26" Conductor at 80'

Bit Size 17.5"

500'

TOC @ Surface

13 3/8", MC-50, 54.5# @ 1,000' ft MD

Bit Size 12.375"

1,000'

1,500'

2,000'

2,500'

TOC @ Surface

9 5/8", MC-50, 40# @ 3,000' ft MD

Bit Size 8.5"

3,000'

3,500'

4,000'

4,500'

5,000'

5,500'

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6,000'

6,500'

KOP = 6,615' ft MD

10 Deg DLS

7,000'

Land @ 8,019' ft MD

7,635' ft TVD

7,500'

5 1/2", P-110, 20# 15,379' ft MD

7,635' ft TVD

8,000'

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JUN 04 2015

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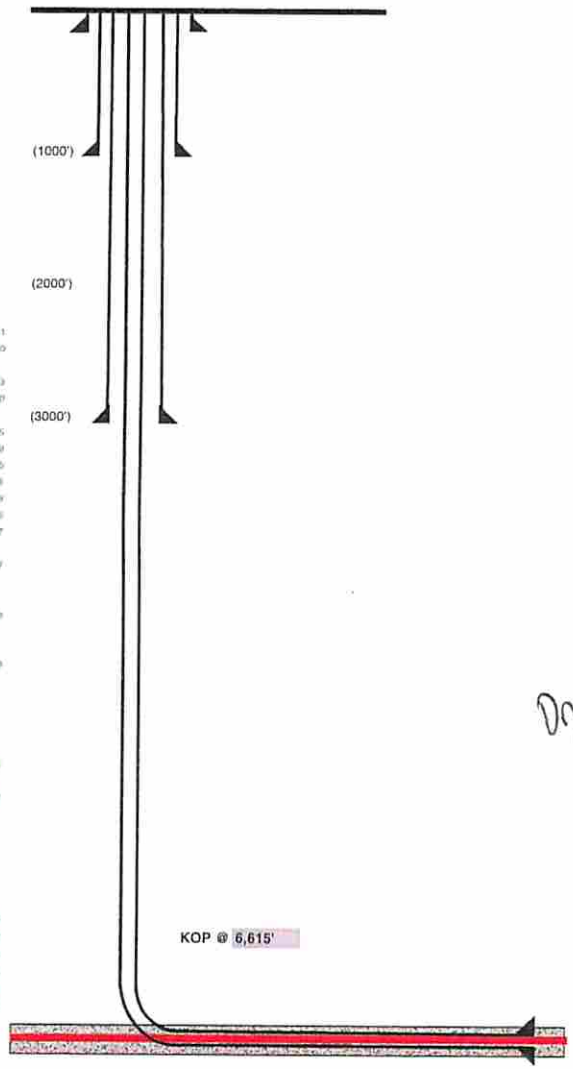
Gom

Well 514419 (BIG333H4)
EQT Production
Big Run
Wetzel West Virgina

Azimuth	343
Vertical Section	7862

TVD Depth (feet)	Formation Tops (TVD)		
0'			
250'			
500'			
750'	Base Fresh Water	753	
	Base Red Rock	819	
1,000'			
1,250'			
1,500'			
1,750'			
2,000'			
2,250'			
	Maxton	2340 -	2351
2,500'	Big Lime	2486 -	2610
2,750'	Big Injun	2526 -	2663
	Weir	2903 -	3020
3,000'	Int. csg pt	3080	
	-Gantz	3078 -	3165
3,250'	-Fifty foot	3105 -	3129
	-Thirty foot	3200 -	3266
3,500'	-Gordon	3268 -	3346
	-Forth Sand	3348 -	3379
3,750'	-Bayard	3675 -	3808
	-Warren	3967	4117
4,000'			
	-Speechley	4117 -	4167
4,250'			
4,500'	-Balltown A	4526	4903
4,750'			
	-Riley	4955 -	5639
5,000'			
5,250'			
5,500'			
	-Benson	5639 -	5982
5,750'			
	-Alexander	5982 -	6917
6,000'			
6,250'			
6,500'			
6,750'	-Sonyea	7178 -	7343
	-Middlesex	7343 -	7392
7,000'	-Genesee	7392 -	7478
	-Geneseo	7478 -	7505
7,250'	-Tully	7505 -	7526
	-Hamilton	7526 -	7612
7,500'	Marcellus top	7617	
	Target inside Marcellus	**7635**	
7,750'	Marcellus Bottom	7660	



Hole Size (inches)	Casing Type	Casing Size (inches)	Wt (ppf)/Grade
30	Conductor	26	
17 1/2	Surface	13 3/8	54#/MC-50
12 3/8	Intermediate	9 5/8	40#/MC-50
8 1/2	Production Casing	5 1/2	20#/P-110

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6-1-15

Land curve @ 7,635' ft TVD
8,019' ft MD

Est. TD @ 7,635' ft TVD
15,373' ft MD

7,303' ft Lateral

Proposed Well Work:
Drill and complete a new horizontal well in the Marcellus formation.
The vertical drill to go down to an approximate depth of 6615'.
Then kick off the horizontal leg into the Marcellus using a slick water frac.

Form WW-9

HART LEASE
BIG333 WELL NO.S
WV 514416 & WV 514419

page of

4710303036

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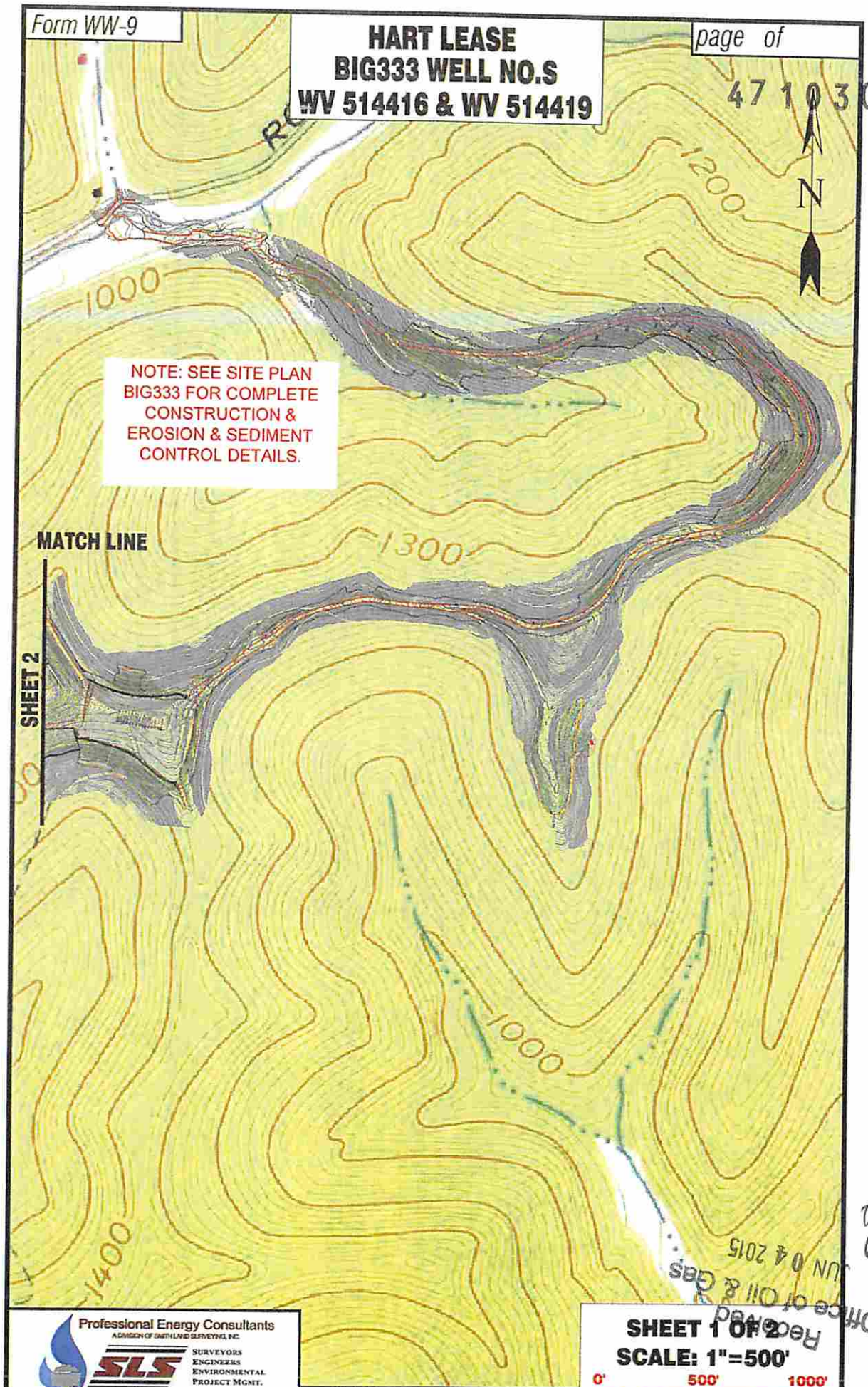

Dm4
6-1-15

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Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING, INC.
SLS
SURVEYORS
ENGINEERS
ENVIRONMENTAL
PROJECT MGMT.
(304) 462-8634
WWW.SLSSURVEYS.COM

DRAWN BY	FILE NO.	DATE	CADD FILE:
K.D.W.	7856	08-21-14	7856REC\BIG333.dwg

TOPO SECTIONS OF BIG RUN 7.5' TOPO QUADRANGLE

SHEET 1 OF 2

SCALE: 1"=500'

0' 500' 1000'

Form WW-9

HART LEASE
BIG333 WELL NO.S
WV 514416 & WV 514419

page of

47 1 0 3 0 3 0 3 6

MAD

NOTE: SEE SITE PLAN BIG333 FOR COMPLETE CONSTRUCTION & EROSION & SEDIMENT CONTROL DETAILS.

N

MATCH LINE

SHEET 1

SHEET 2 OF 2

SCALE: 1"=500'

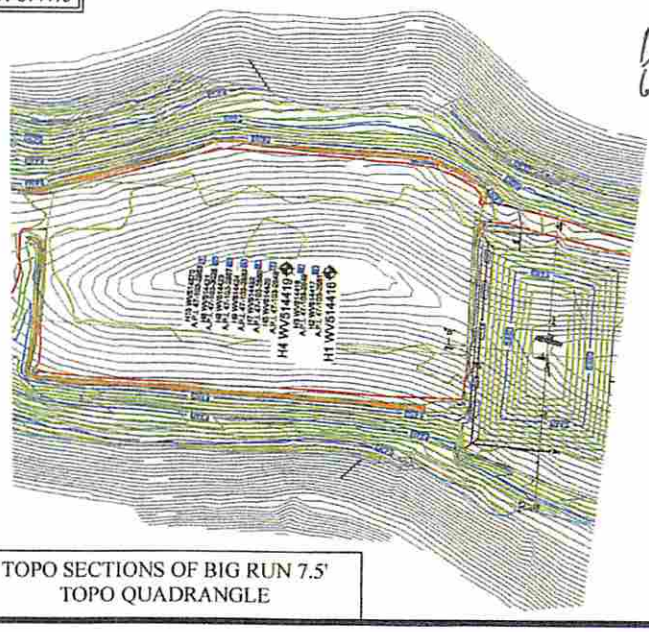
0' 500' 1000'

Detail Sketch for Proposed BIG333 Well No.s WV 514416 & WV 514419

NOTE: SEE SITE PLAN BIG333 FOR COMPLETE CONSTRUCTION & EROSION & SEDIMENT CONTROL DETAILS.

N

Not To Scale



DMH 6-1-15

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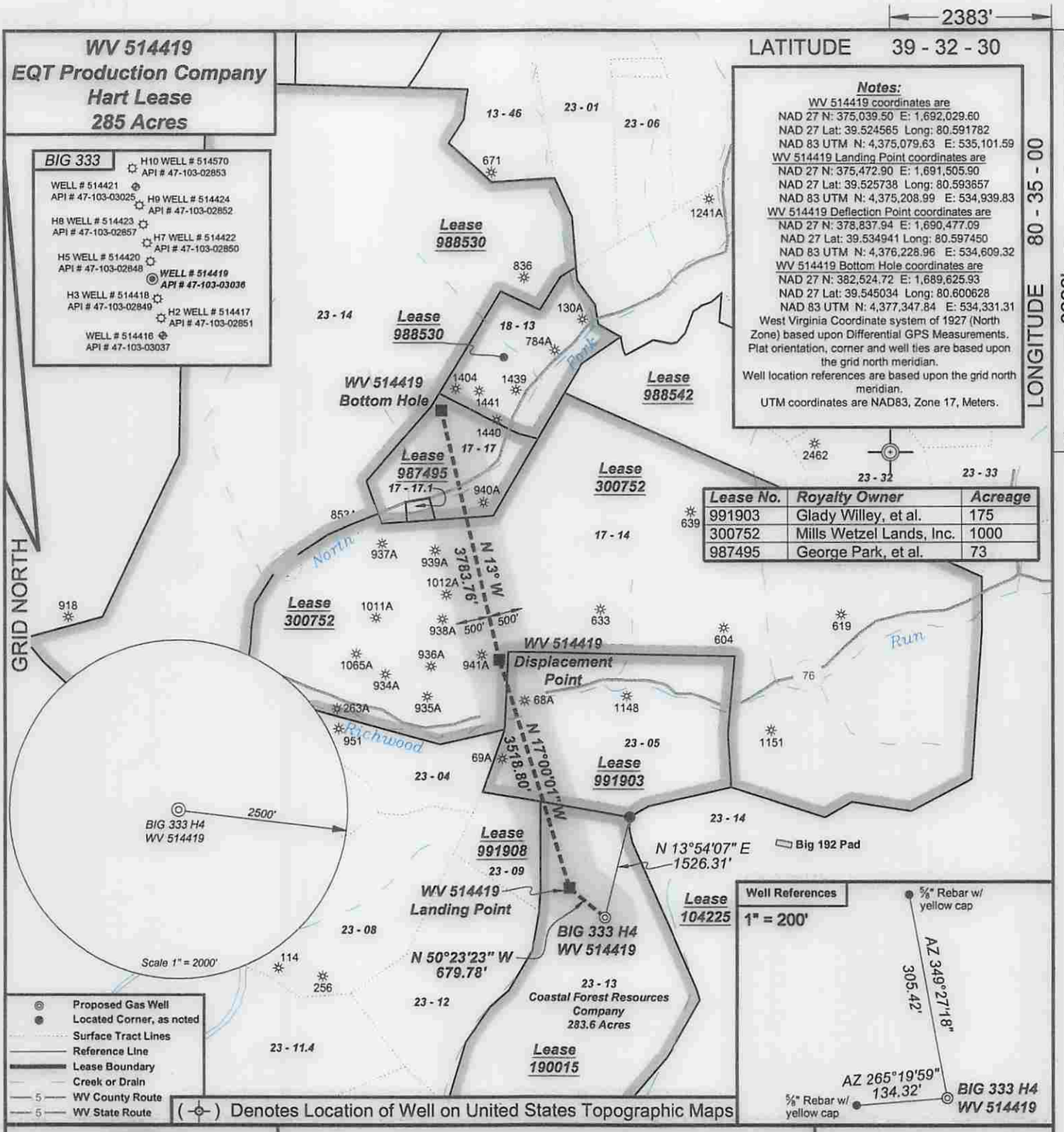
SURVEYORS ENGINEERS ENVIRONMENTAL PROJECT MGMT.
(304) 462-5634
WWW.SLSSURVEYS.COM

DRAWN BY	FILE NO.	DATE	CADD FILE:
K.D.W.	7856	08-21-14	7856REDBIG333.dwg

TOPO SECTIONS OF BIG RUN 7.5' TOPO QUADRANGLE



Lease No.	Royalty Owner	Acreage
991903	Glady Willey, et al.	175
300752	Mills Wetzel Lands, Inc.	1000
987495	George Park, et al.	73

ALLEGHENY SURVEYS, INC.

I, the undersigned, hereby certify that this plat 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 Department of Environmental Protection.

Ben R. Singleton
P.S. 2092

Ben R. Singleton LICENSED NO. 2092 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

SEAL

FILE NO: 33-15
DRAWING NO: 33-15 BIG 333 H4
SCALE: 1" = 2000'
MINIMUM DEGREE OF ACCURACY: 1:2500
PROVEN SOURCE OF ELEVATION: NGS CORS Station

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

DATE: June 9 20 15
OPERATOR'S WELL NO.: 514419

API WELL NO
47 - 103 - 03036 MOD
STATE COUNTY PERMIT

WELL TYPE: ☐ OIL ☒ GAS ☐ LIQUID INJECTION ☐ WASTE DISPOSAL
(IF GAS) PRODUCTION: ☐ STORAGE ☐ DEEP ☒ SHALLOW

LOCATION: ELEVATION: As-Built - 1452' WATERSHED Aunty Run of South Fork Fishing Creek QUADRANGLE: Big Run
DISTRICT: Grant COUNTY: Wetzel
SURFACE OWNER: Coastal Forest Resources Co., d/b/a Coastal Timberlands Co. ACREAGE: 283.6±
ROYALTY OWNER: Alex Hart, et al. LEASE NO: 190015 ACREAGE: 285±
PROPOSED WORK: ☒ DRILL ☐ CONVERT ☐ DRILL DEEPER ☒ FRACTURE OR STIMULATE ☐ PLUG OFF OLD FORMATION
☐ PERFORATE NEW FORMATION ☐ OTHER PHYSICAL CHANGE IN WELL (SPECIFY)
☐ PLUG AND ABANDON ☐ CLEAN OUT AND REPLUG TARGET FORMATION: Marcellus ESTIMATED DEPTH: TVD 6,802

RECEIVED Office of Oil and Gas JUN 10 2015 WV Department of Environmental Protection

WELL OPERATOR: EQT Production Company DESIGNATED AGENT: Rex C. Ray
ADDRESS: 115 Professional Place PO Box 280 ADDRESS: 115 Professional Place PO Box 280
Bridgeport, WV 26330 Bridgeport, WV 26330

103-03036

WW-6A1
(5/13)

Operator's Well No. 514419

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

(1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;

(2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page
Lease 190015			**1/8 min pd**	
	Alex Hart, etal	The Philadelphia Company of West Virginia		93/392
	The Philadelphia Company of West Virginia	Pittsburgh & West Virginia Gas Company		146/98
	Pittsburgh & West Virginia Gas Company	Equitable Gas Company		187/321
	Equitable Gas Company	Equitrans Inc.		71A/453
	Equitrans Inc.	EQT Production Company		192/19 Doddridge
Lease 991903			**1/8 Min Pd**	
	Ehnen Ray Wyatt, et al.	ALAMCO, Inc.		OG 57A/663
	ALAMCO, Inc.	Columbia Natural Resources, Inc.		DB 364/688
	Columbia Natural Resources, Inc.	Columbia Natural Resources, LLC		CB 12/624
	Columbia Natural Resources, LLC	Chesapeake Appalachia, LLC		DB 402/446
	Chesapeake Appalachia, LLC	EQT Production Company		OG 138A/374
Lease 300752			**1/8 Min Pd**	
	Mills-Wetzel Land, Inc.	Consolidated Gas Supply Corporation		LB 52A/421
	Consolidated Gas Supply Corporation	Consolidated Gas Transmission Corporation		LB 66A/69
	Consolidated Gas Transmission Corporation	Alamco Inc.		LB 70A/363
	Alamco Inc.	UMC Petroleum Corporation		LB 73A/656
	UMC Petroleum Corporation	Ashland Exploration Holdings, Inc.		LB 75A/170
	Ashland Exploration Holdings, Inc.	Blazer Energy Corporation		LB 77A/360
	Blazer Energy Corporation	Eastern States Oil and Gas		CB12/261
	Eastern States Oil and Gas Co.	EQT Production Co.		CB13/14
	Equitable Production Co.	EQT Production Company		CB13/14
Lease 987495			**1/8 min pd**	
Alfred L. Arnett, et al.		EQT Production Company		LB 133A/124

Upon information and belief, Operator's lease and/or other real property rights permit it to conduct drilling operations for the subject well in the location shown on the plat, including under any public roads that the well lateral crosses.

Received

JUN - 9 20[illegible]

Office of Oil and Gas
WV Dept. of Environmental Protection

103-03036

Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: EQT Production Company

By: _____

Its: Permitting Supervisor

Page 1 of 1 _____

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Office of Oil and Gas
WV Dept. of Environmental Protection