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

December 08, 2014

EQT PRODUCTION COMPANY
303 SAND CUT ROAD
CLARKSBURG, WV 26301

Re: Permit Modification Approval for API Number 1706446 , Well #: WV 514393
Modify landing point, bottom hole and lateral length.

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,

MLS for Gene Smith

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

12/12/14

EQT

July 30, 2014

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

Re: Modification of 47-01706446

Dear Mr. Smith,

EQT would like to modify the landing point, bottom hole and lateral length on the above API #. No additional leases were affected. I have enclosed a new WW-2B, well schematics, mylar plat and copy of rec plan for your review.

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

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.

Received
AUG 5 2014
Office of Oil and Gas
WV Dept. of Environmental Protection

12/12/14

WW - 6B
(9/13)

017 06446

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
W.VA. CODE §22-6A - WELL WORK PERMIT APPLICATION

1) Well Operator: EQT Production Company | | 017 | 8 | 671
Operator ID | County | District | Quadrangle

2) Operator's Well Number: 514393 Well Pad Name: WEU49

3) Farm Name/Surface Owner : Mary Farr Secrist Farm Public Road Access: 50/42

4) Elevation, current ground: 1,162.0 Elevation, proposed post-construction: 1,130.0

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

Other _____

(b) If Gas: Shallow • Deep _____

Horizontal •

6) Existing Pad? Yes or No: no

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

Target formation is Marcellus at a depth of 6648 with the anticipated thickness to be 57 feet and anticipated target pressure of 4474 PSI

8) Proposed Total Vertical Depth: 6,648

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth 16,618

11) Proposed Horizontal Leg Length 8,390

12) Approximate Fresh Water Strata Depths: 243, 292, 352, 487

13) Method to Determine Fresh Water Depth: By offset wells

14) Approximate Saltwater Depths: 1,542

15) Approximate Coal Seam Depths: 340, 483

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: _____

Doug Newlon
1-31-2014

12/12/14
Received
FEB 5 2014

Office of Oil and Gas
WV Dept. of Environmental Protection

WW - 6B
(3/13)

4701706446
Mod

CASING AND TUBING PROGRAM

18)

TYPE	Size	New or Used	Grade	Weight per ft.	FOOTAGE: for Drilling	INTERVALS: Left in Well	CEMENT: Fill- up (Cu.Ft.)
Conductor	20	New	Varies	Varies	40	40	38
Fresh Water	13 3/8	New	MC-50	81	1,050	1,050	910
Coal							
Intermediate	9 5/8	New	MC-50	40	5,239	5,239	2,056
Production	5 1/2	New	P-110	20	16,955	16,955	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							

MSH
12/3/14

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20	24	0.375	-	Construction	1.18
Fresh Water	13 3/8	17 1/2	0.38	2,480	1	1.21
Coal						
Intermediate	9 5/8	12 3/8	0.395	3,590	1	1.21
Production	5 1/2	8 1/2	0.361	12,640	-	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.

12/12/14

WW - 6B

(3/13)

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 5,803'.

Then kick off the horizontal leg 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): 37.4

22) Area to be disturbed for well pad only, less access road (acres): 16.3

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.

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.

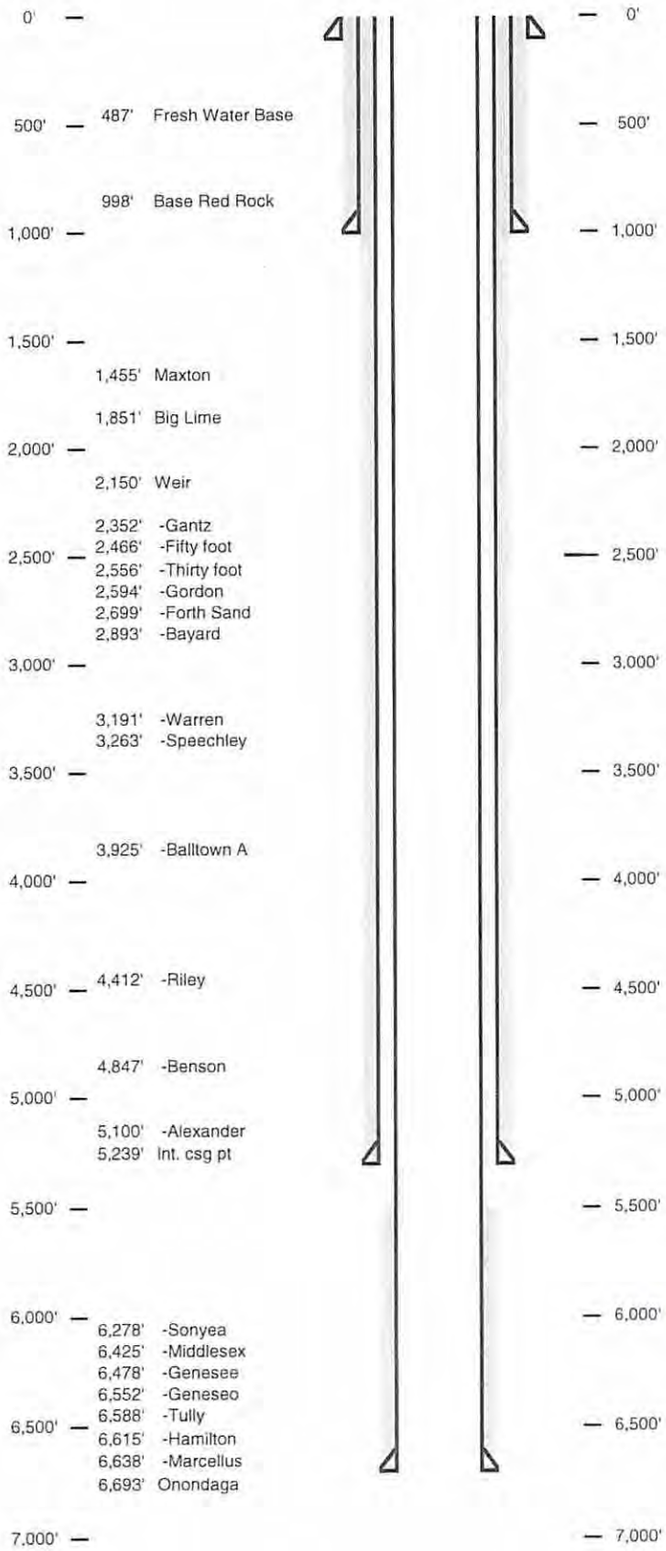
*Note: Attach additional sheets as needed.

4701706446
MOD

Well Schematic
EQT Production

Well Name	514393 (WEU49H4)
County	Doddridge
State	West Virgina

Elevation KB:	1143
Target	Marcellus
Prospect	
Azimuth	155
Vertical Section	9329



Hole Size 24" - 20" Conductor at 40'
Bit Size 17.5"

TOC @ Surface
13 3/8", MC-50, 54.5# @ 1,050' ft MD
Bit Size 12.375"

TOC @ Surface
9 5/8", MC-50, 40# @ 5,239' ft MD
Bit Size 8.5"

KOP = 5,803' ft MD
10 Deg DLS

Land @ 7,766' ft MD
6,648' ft TVD

5 1/2", P-110, 20# 16,455' ft MD
6,648' ft TVD

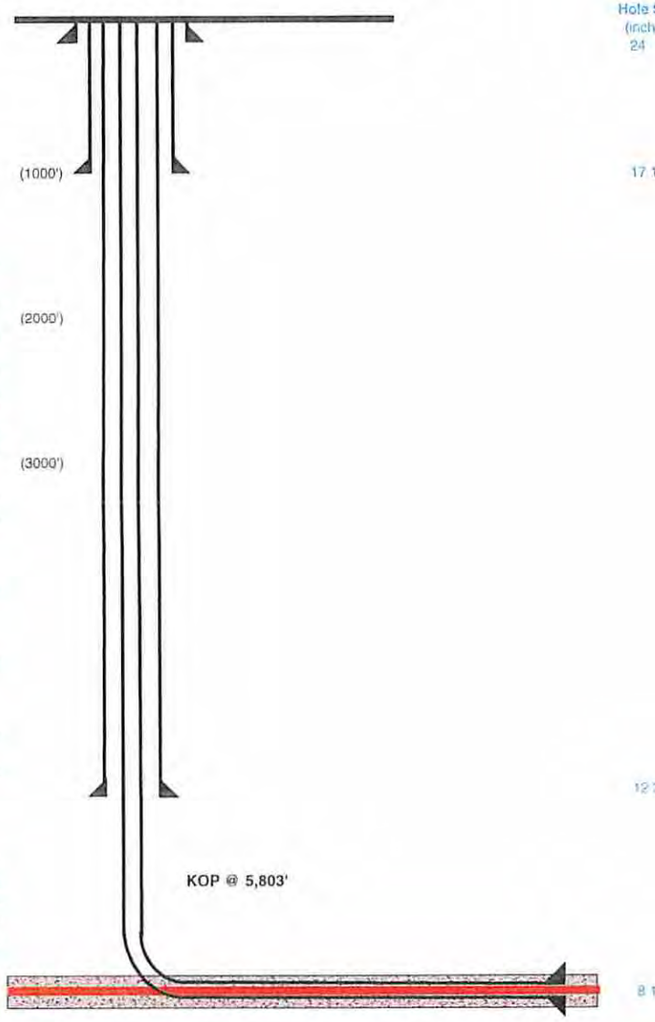
12/12/14

4701706446

Well 514393 (WEU49H4)
EQT Production
West Union
Doddridge West Virgina

Azimuth 155
Vertical Section 9329

TVD Depth (feet)	Formation Tops (TVD)		
0'			
250'			
500'	Base Fresh Water	467	
750'			
1,000'	Base Red Rock	993	
1,250'			
1,500'	Maxton	1456	1491
1,750'			
2,000'	Big Lime	1851 -	1966
2,250'	Weir	2150	2281
	-Gantz	2362 -	2381
	-Fifty foot	2466 -	2512
2,500'	-Thirty foot	2555 -	2591
	-Gordon	2594 -	2620
2,750'	-Forth Sand	2699 -	2714
	-Bayard	2893 -	2951
3,000'			
3,250'	-Warren	3191 -	3259
	-Speechley	3263 -	3352
3,500'			
3,750'			
	-Balltown A	3925 -	3946
4,000'			
4,250'			
	-Riley	4412 -	4447
4,500'			
4,750'			
	-Benson	4642 -	4675
5,000'			
	-Alexander	5100 -	5189
5,250'	Int. Csg pt	5200	
5,500'			
5,750'	-Sonyea	6278 -	6425
	-Middlesex	6425 -	6478
6,000'	-Genesee	6479 -	6552
	-Geneseo	6552 -	6598
6,250'	-Tully	6598 -	6615
	-Hamilton	6615 -	6638
6,500'	Marcellus top	6638	
	Target Inside Marcellus	**6648**	
6,750'	Marcellus Bottom	6693	



Hole Size (inches)	Casing Type	Size (inches)	Wt (ppf)/Grade
24	Conductor	20	
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

Land curve @ 6,648' ft TVD
7,766' ft MD

Est. TD @ 6,648' ft TVD
16,455' ft MD

8,690' 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 5803'.
Then kick of the horizontal leg into the Marcellus using a slick water frac.

FORM WW 6

10,371'

LATITUDE 39°17'30"

LONGITUDE 80°45'00"

13,410'

NAD '27 GRID NORTH

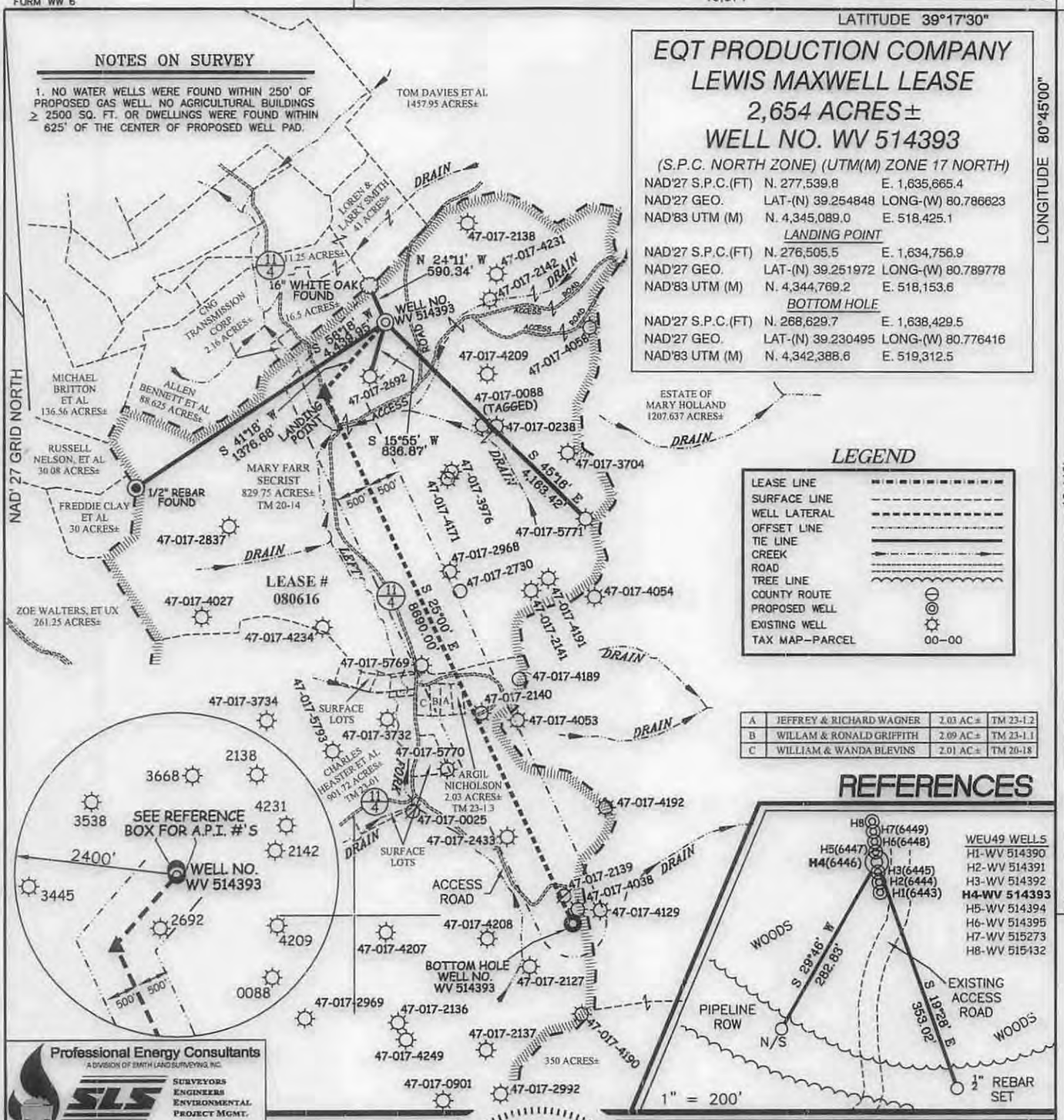
EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
2,654 ACRES±
WELL NO. WV 514393

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

NAD'27 S.P.C.(FT)	N. 277,539.8	E. 1,635,665.4
NAD'27 GEO.	LAT-(N) 39.254848	LONG-(W) 80.786623
NAD'83 UTM (M)	N. 4,345,089.0	E. 518,425.1
LANDING POINT		
NAD'27 S.P.C.(FT)	N. 276,505.5	E. 1,634,756.9
NAD'27 GEO.	LAT-(N) 39.251972	LONG-(W) 80.789778
NAD'83 UTM (M)	N. 4,344,769.2	E. 518,153.6
BOTTOM HOLE		
NAD'27 S.P.C.(FT)	N. 268,629.7	E. 1,638,429.5
NAD'27 GEO.	LAT-(N) 39.230495	LONG-(W) 80.776416
NAD'83 UTM (M)	N. 4,342,388.6	E. 519,312.5

NOTES ON SURVEY

1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL. NO AGRICULTURAL BUILDINGS ≥ 2500 SQ. FT. OR DWELLINGS WERE FOUND WITHIN 625' OF THE CENTER OF PROPOSED WELL PAD.



LEGEND

LEASE LINE	
SURFACE LINE	
WELL LATERAL	
OFFSET LINE	
TIE LINE	
CREEK	
ROAD	
TREE LINE	
COUNTY ROUTE	
PROPOSED WELL	
EXISTING WELL	
TAX MAP–PARCEL	00–00

A	JEFFREY & RICHARD WAGNER	2.03 AC±	TM 23-1.2
B	WILLAM & RONALD GRIFFITH	2.09 AC±	TM 23-1.1
C	WILLIAM & WANDA BLEVINS	2.01 AC±	TM 20-18

REFERENCES

WEU49 WELLS
H1-WV 514390
H2-WV 514391
H3-WV 514392
H4-WV 514393
H5-WV 514394
H6-WV 514395
H7-WV 515273
H8-WV 515432

Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING, INC.
SLS SURVEYORS ENGINEERS ENVIRONMENTAL PROJECT MGMT.
(304) 462-8434 WWW.SLSSURVEYS.COM

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 DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 677 Gregory A Smith

GREGORY A. SMITH LICENSED No. 677 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

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

DATE SEPTEMBER 09 , 20 13

REVISED 12/02/13 & 07/01/14

OPERATORS WELL NO. WV 514393

API WELL NO. 47 — 017 — 06446 MAD

STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 200

FILE NO. 7871P514393R4

SCALE 1" = 2000'

HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK)

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

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

LOCATION :

ELEVATION 1,162'(GROUND) 1,130'(PROPOSED) WATERSHED LEFT FORK OF ARNOLD CREEK

DISTRICT WEST UNION COUNTY DODDRIDGE QUADRANGLE WEST UNION 7.5'

SURFACE OWNER MARY FARR SECRIST ACREAGE 829.75±

ROYALTY OWNER LEWIS MAXWELL HRS ACREAGE 2654± 12/12/14

PROPOSED WORK : LEASE NO. 080616

DRILL X CONVERT ___ DRILL DEEPER ___ REDRILL FRACTURE OR STIMULATE X 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 TVD 6,622'

COUNTY NAME

PERMIT

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY

ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

FORM WW-6

10,371'

LATITUDE 39°17'30"

LONGITUDE 80°45'00"

13,410'

NAD' 27 GRID NORTH

EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
2,654 ACRES±
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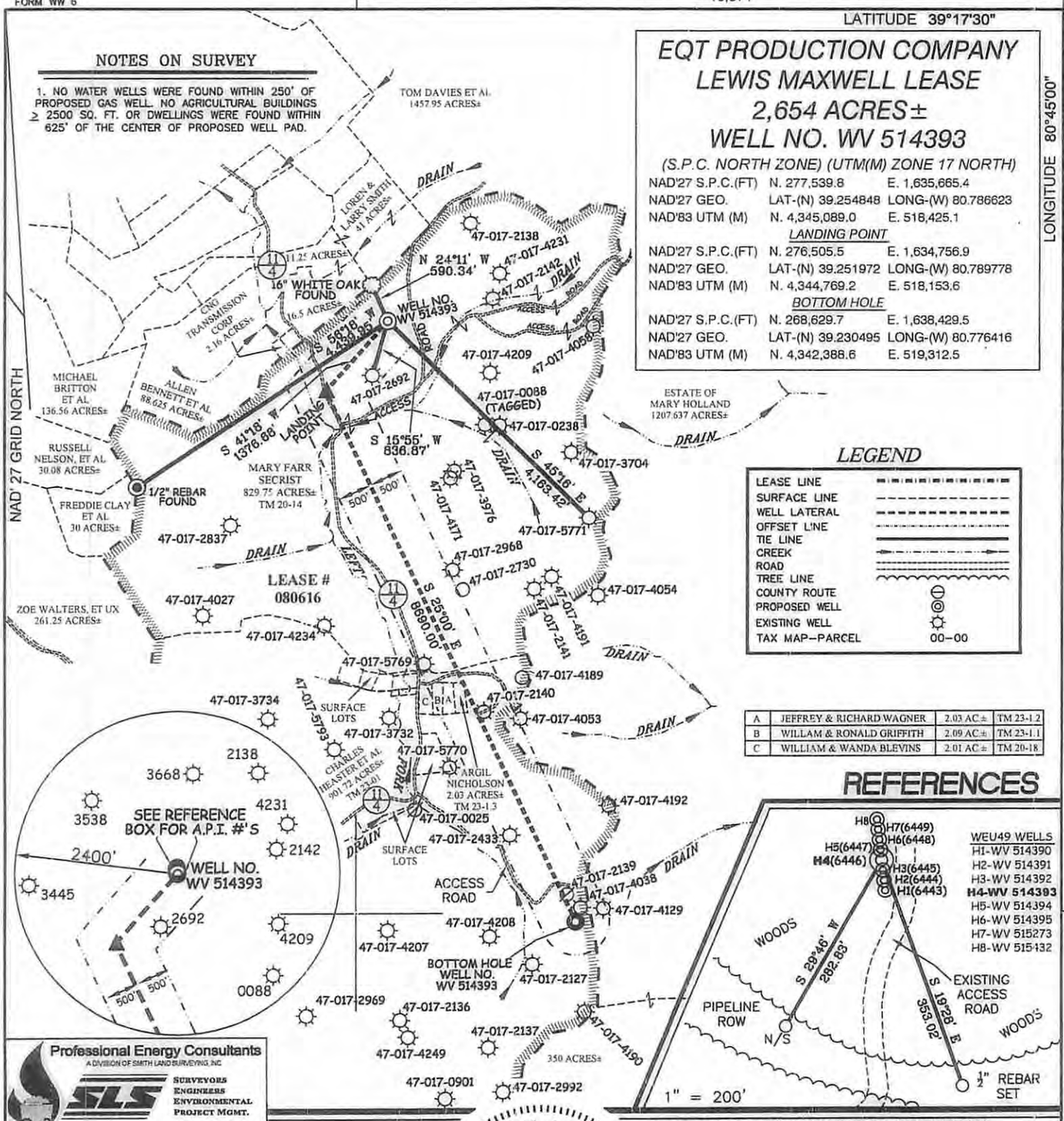

LEGEND

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H6-WV 514395
H7-WV 515273
H8-WV 515432

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

Received AUG 5 2014

Office of Oil & Gas WV Department of Environmental Protection

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PHYSICAL CHANGE IN WELL (SPECIFY) ___ TARGET FORMATION MARCELLUS

ESTIMATED DEPTH TVD 6,622'

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY

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ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

COUNTY NAME

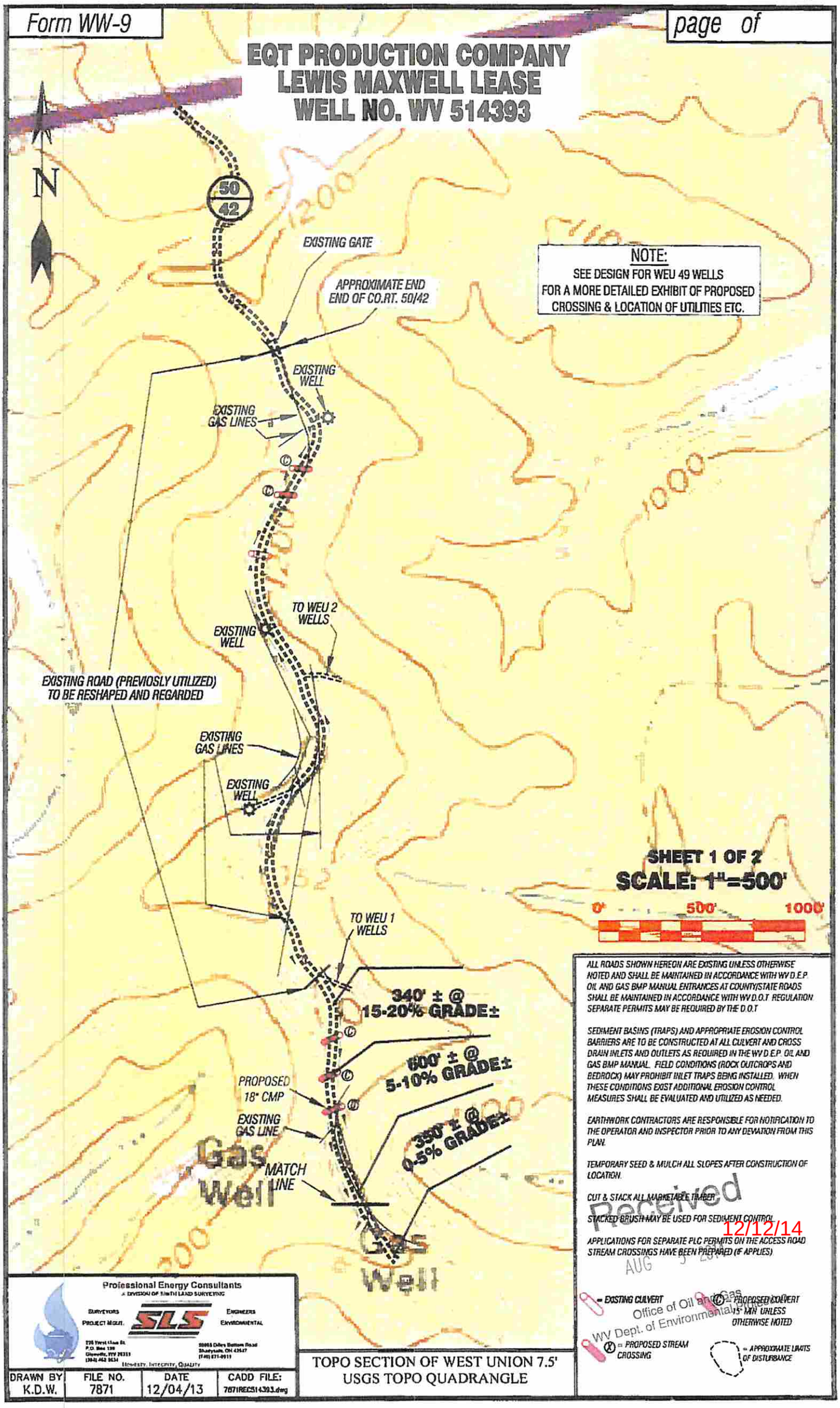
PERMIT

4701706446

Form WW-9

page of

EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
WELL NO. WV 514393



NOTE:
SEE DESIGN FOR WEU 49 WELLS
FOR A MORE DETAILED EXHIBIT OF PROPOSED
CROSSING & LOCATION OF UTILITIES ETC.

SHEET 1 OF 2
SCALE: 1"=500'
0' 500' 1000'

ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P. OIL AND GAS BMP MANUAL ENTRANCES AT COUNTY/STATE ROADS SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATION. SEPARATE PERMITS MAY BE REQUIRED BY THE D.O.T.

SEDIMENT BASINS (TRAPS) AND APPROPRIATE EROSION CONTROL BARRIERS ARE TO BE CONSTRUCTED AT ALL CULVERT AND CROSS DRAIN INLETS AND OUTLETS AS REQUIRED IN THE WV D.E.P. OIL AND GAS BMP MANUAL. FIELD CONDITIONS (ROCK OUTCROPS AND BEDROCK) MAY PROHIBIT INLET TRAPS BEING INSTALLED. WHEN THESE CONDITIONS EXIST ADDITIONAL EROSION CONTROL MEASURES SHALL BE EVALUATED AND UTILIZED AS NEEDED.

EARTHWORK CONTRACTORS ARE RESPONSIBLE FOR NOTIFICATION TO THE OPERATOR AND INSPECTOR PRIOR TO ANY DEVIATION FROM THIS PLAN.

TEMPORARY SEED & MULCH ALL SLOPES AFTER CONSTRUCTION OF LOCATION.

CUT & STACK ALL MARKETABLE TIMBER.

STACKED BRUSH MAY BE USED FOR SEDIMENT CONTROL.

APPLICATIONS FOR SEPARATE PLC PERMITS ON THE ACCESS ROAD STREAM CROSSINGS HAVE BEEN PREPARED (IF APPLIES)

Received
AUG 5 2014
12/12/14
Office of Oil and Gas
WV Dept. of Environmental Protection

= EXISTING CULVERT
= PROPOSED CULVERT 15" MIN UNLESS OTHERWISE NOTED
= PROPOSED STREAM CROSSING
= APPROXIMATE LIMITS OF DISTURBANCE

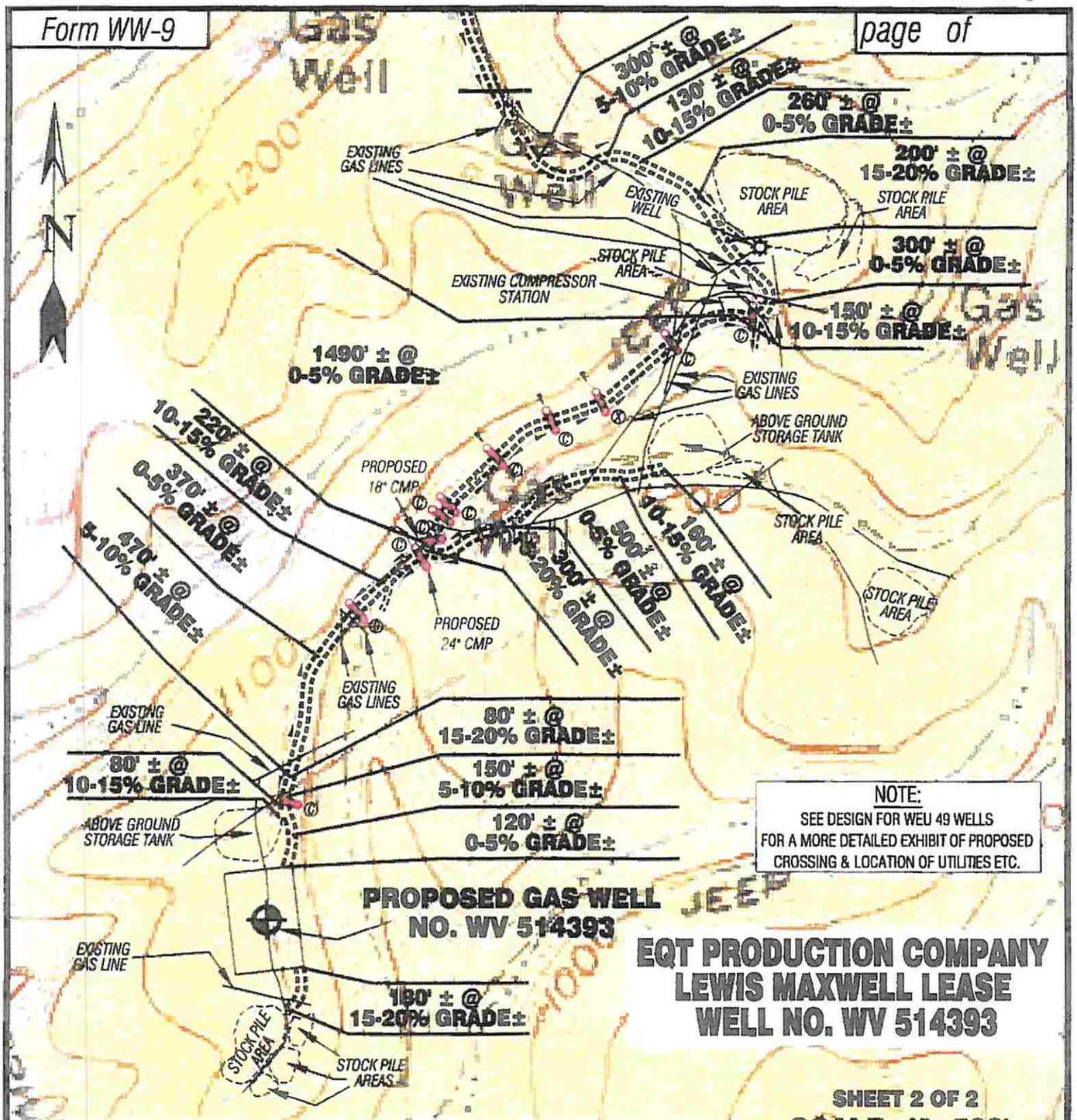
Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING
SURVEYORS PROJECT MGMT. SLS ENGINEERS ENVIRONMENTAL
P.O. Box 150 Glenville, WV 26351 (304) 462 5634
10065 Cider Bottom Road Shadyside, OH 43947 (740) 671-0011
INTEGRITY, INTEGRITY, QUALITY

DRAWN BY	FILE NO.	DATE	CADD FILE:
K.D.W.	7871	12/04/13	7871REC514393.dwg

TOPO SECTION OF WEST UNION 7.5'
USGS TOPO QUADRANGLE

4701706446

Form WW-9 page of



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EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
WELL NO. WV 514393

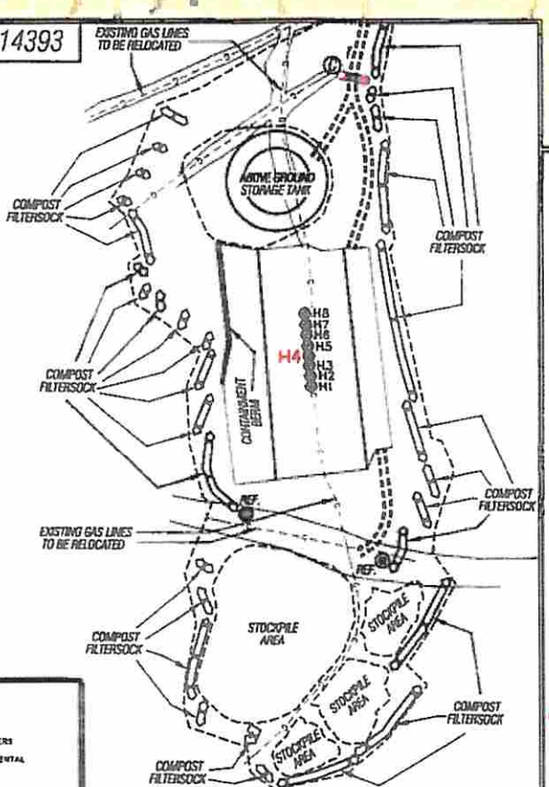
SHEET 2 OF 2

SCALE: 1"=500'

0' 500' 1000'

Detail Sketch for Proposed Well WV 514393

WEU49 WELLS
H1-WV 514390
H2-WV 514391
H3-WV 514392
H4-WV 514393
H5-WV 514394
H6-WV 514395
H7-WV 515273
H8- NOT YET DETERMINED



NOTE:
SEE DESIGN FOR WEU 49 WELLS FOR A MORE DETAILED EXHIBIT OF PROPOSED CROSSING & LOCATION OF UTILITIES ETC.

Not To Scale

ALL ROADS SHOWN HEREON ARE EXISTING UNLESS OTHERWISE NOTED AND SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.E.P OIL AND GAS BMP MANUAL ENTRANCES AT COUNTY/STATE ROADS SHALL BE MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATION SEPARATE PERMITS MAY BE REQUIRED BY THE D.O.T.

SEDIMENT BASINS (TRAPS) AND APPROPRIATE EROSION CONTROL BARRIERS ARE TO BE CONSTRUCTED AT ALL CULVERT AND CROSS DRAIN INLETS AND OUTLETS AS REQUIRED IN THE WV D.E.P. OIL AND GAS BMP MANUAL. FIELD CONDITIONS (ROCK OUTCROPS AND BEDROCK) MAY PROHIBIT INLET TRAPS BEING INSTALLED. WHEN THESE CONDITIONS EXIST ADDITIONAL EROSION CONTROL MEASURES SHALL BE EVALUATED AND UTILIZED AS NEEDED

EARTHWORK CONTRACTORS ARE RESPONSIBLE FOR NOTIFICATION TO THE OPERATOR AND INSPECTOR PRIOR TO ANY DEVIATION FROM THIS PLAN

TEMPORARY SEED & MULCH ALL SLOPES AFTER CONSTRUCTION OF LOCATION

CUT & STACK ALL MARKETABLE TIMBER

STACKED BRUSH MAY BE USED FOR SEDIMENT CONTROL

APPLICATIONS FOR SEPARATE PLC PERMITS ON THE ACCESS ROAD STREAM CROSSINGS HAVE BEEN PREPARED (IF APPLIES).

Received
12/12/14
Office of Oil and Gas
WV Dept. of Environmental Protection

- EXISTING CULVERT
- PROPOSED CULVERT 15" MIN UNLESS OTHERWISE NOTED
- PROPOSED STREAM CROSSING
- APPROXIMATE LIMITS OF DISTURBANCE

Professional Energy Consultants
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K.D.W.	7871	12/04/13	7871REC514393.dwg

TOPO SECTION OF WEST UNION 7.5' USGS TOPO QUADRANGLE