



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 1706443 , Well #: WV 514390

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,

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas



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 47-01706443

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,

A handwritten signature in blue ink, appearing to read 'Vicki Roark'.

Vicki Roark
Permitting Supervisor-WV

Enc.

Received

AUG 5 2014

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

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: 514390 Well Pad Name WEU49

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

4) Elevation, current ground: 1,166.0 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: yes

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 56 feet and anticipated target pressure of 4484 PSI

8) Proposed Total Vertical Depth: 6,773

9) Formation at Total Vertical Depth: Onondaga

10) Proposed Total Measured Depth 12,874

11) Proposed Horizontal Leg Length 5,270

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: _____

Received

AUG 5 2014

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

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	12,874	12,874	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							

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						

*MSM
12/3/14*

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.

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12/12/14

AUG 5 2014

Office of Oil and Gas
WV Dept. of Environmental Protection

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 6773'.

Tag the Onondaga not more than 100', run logs, then plug back, with a solid cement plug, to approximately 5557'. 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 % Calcium 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.

Page 3 of 3

Received

12/12/14

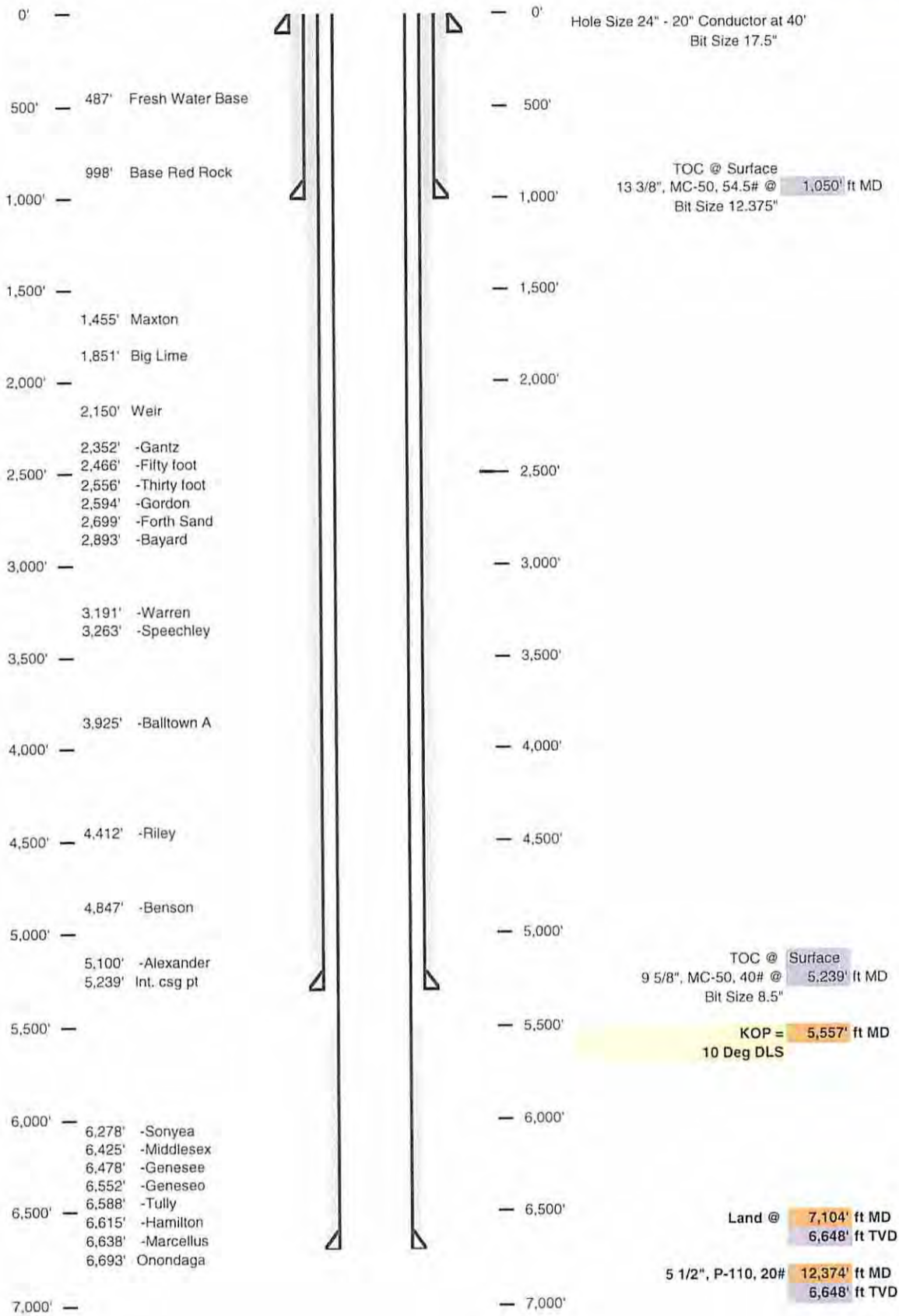
AUG 5 2014

Office of Oil and Gas
NY Dept. of Environmental Protection

Well Schematic
EQT Production

Well Name 514390 (WEU49H1)
County Doddridge
State West Virginia

Elevation KB: 1143
Target Marcellus
Prospect
Azimuth 155
Vertical Section 5652



Received 12/12/14

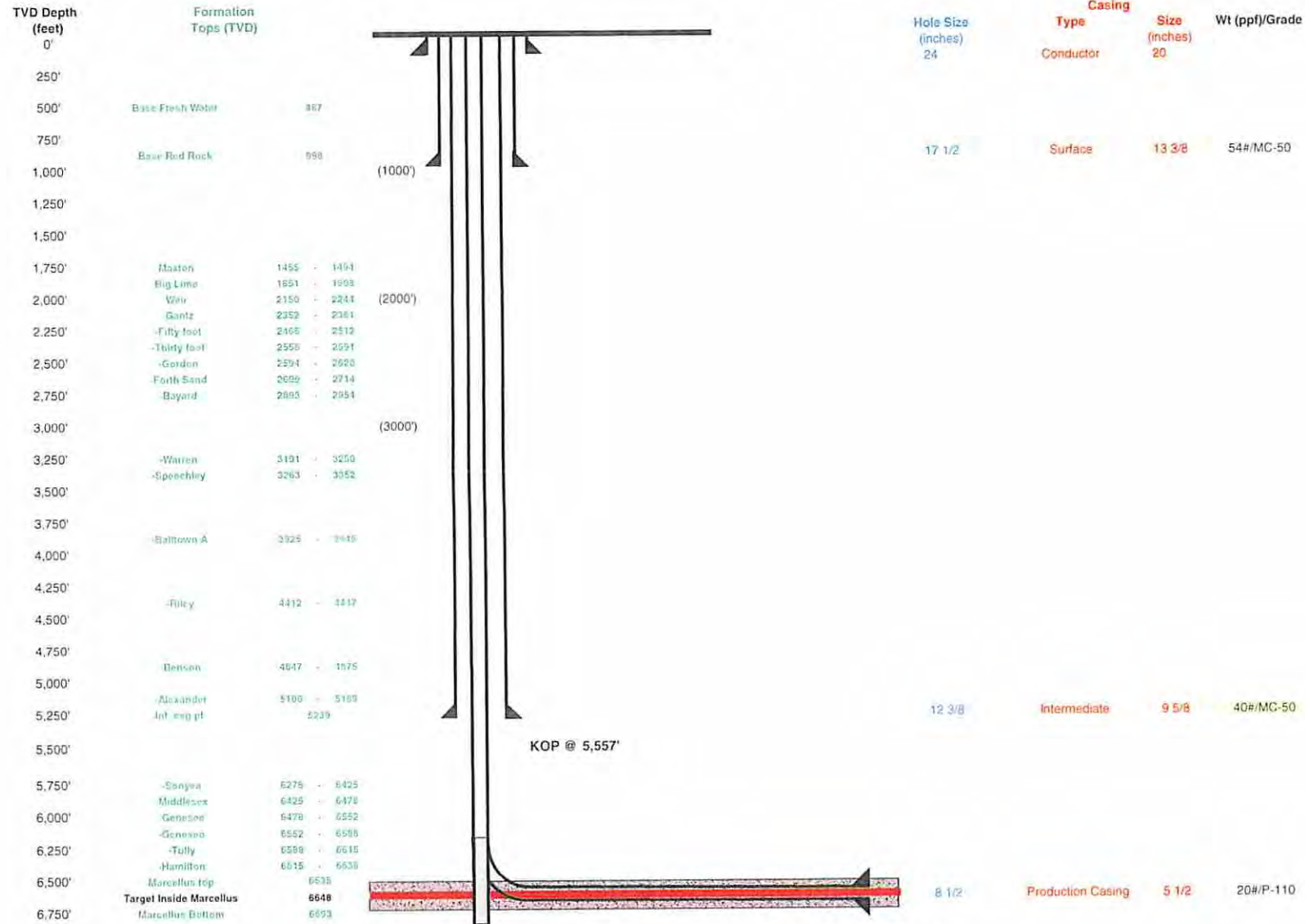
AUG 5 2014

Office of Oil and Gas
WV Dept. of Environmental Protection

4701706443.MD

Well 514390 (WEU49H1)
 EQT Production
 West Union
 Doddridge West Virginia

Azimuth 155
 Vertical Section 5652



KOP @ 5,557'

Land curve @ 6,648' ft TVD
 7,104' ft MD
 Est. TD @ 6,648' ft TVD
 12,374' ft MD

5,270' ft Lateral

Proposed Well Work:
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 Tag the Onondaga not more than 100', run logs, then plug back to approximately 5557'.

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 West Virginia Dept. of Environmental Protection

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.

**EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
2,654 ACRES±
WELL NO. WV 514390**

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

NAD'27 S.P.C.(FT)	N. 277,495.1	E. 1,635,670.5
NAD'27 GEO.	LAT-(N) 39.254725	LONG-(W) 80.786603
NAD'83 UTM (M)	N. 4,344,911.6	E. 518,426.9

LANDING POINT

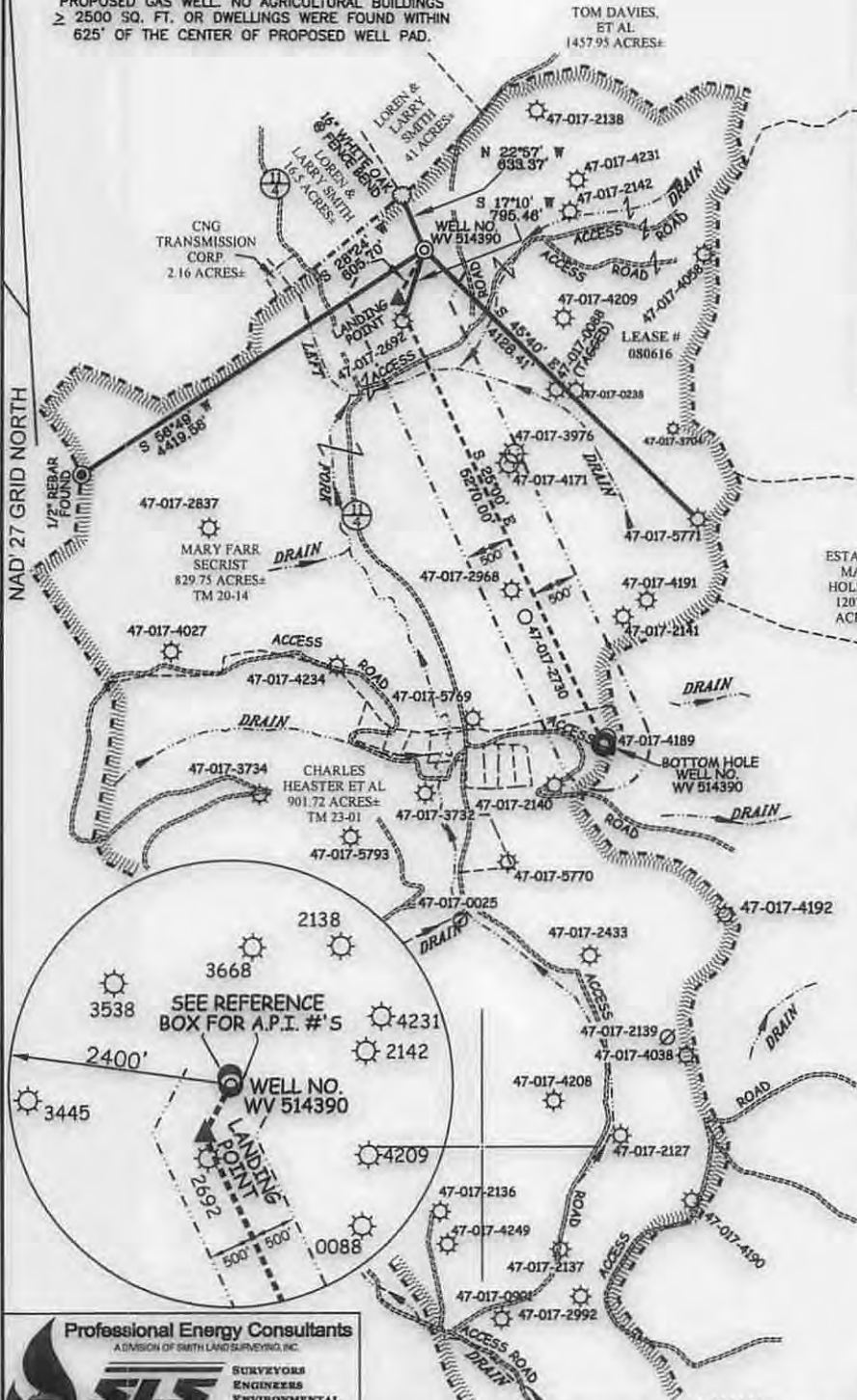
NAD'27 S.P.C.(FT)	N. 276,962.3	E. 1,635,382.5
NAD'27 GEO.	LAT-(N) 39.253251	LONG-(W) 80.787593
NAD'83 UTM (M)	N. 4,344,911.6	E. 518,341.8

BOTTOM HOLE

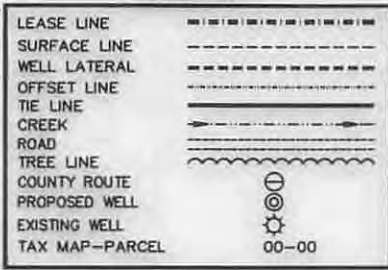
NAD'27 S.P.C.(FT)	N. 272,186.1	E. 1,637,609.7
NAD'27 GEO.	LAT-(N) 39.240226	LONG-(W) 80.779489
NAD'83 UTM (M)	N. 4,343,467.8	E. 519,044.6

LONGITUDE 80°45'00"

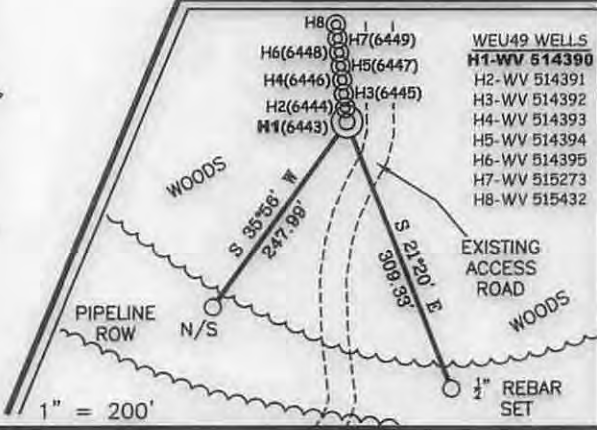
13,455'



LEGEND



REFERENCES



Professional Energy Consultants
A DIVISION OF SMITH LAND SURVEYING, INC.

**SURVEYORS
ENGINEERS
ENVIRONMENTAL
PROJECT MGMT.**

(304) 462-4834 WWW.SLSURVEYS.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. 849 *C. Victor Moyers*



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.
DATE SEPTEMBER 09, 20 13
REVISED 12/02/13, 07/01/14 & 07/31/14
OPERATORS WELL NO. WV 514390
API WELL NO. 47-017-06443 MOD
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 200 FILE NO. 7871P514390R3
HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 2000'

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: ELEVATION 1,166(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± LEASE NO. 080616 **12/12/14**

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 TVD 6,622'

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

COUNTY NAME

PERMIT

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.

TOM DAVIES, ET AL 1457.95 ACRES±

**EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
2,654 ACRES±
WELL NO. WV 514390**

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

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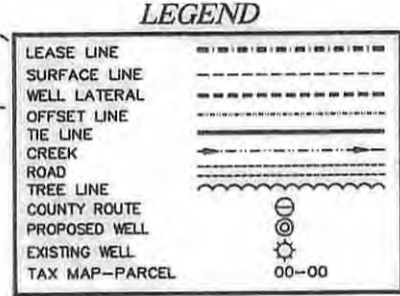
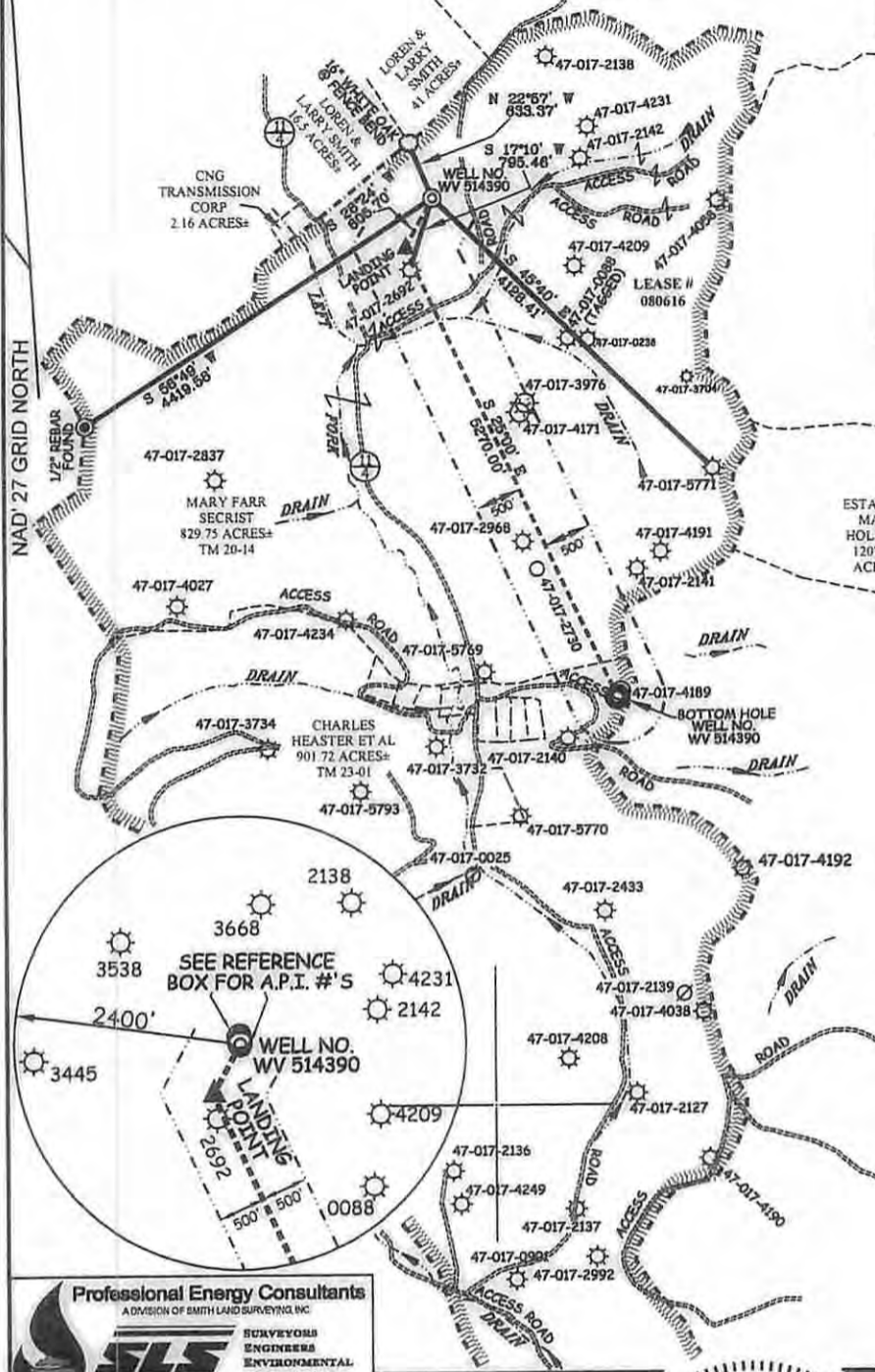
BOTTOM HOLE

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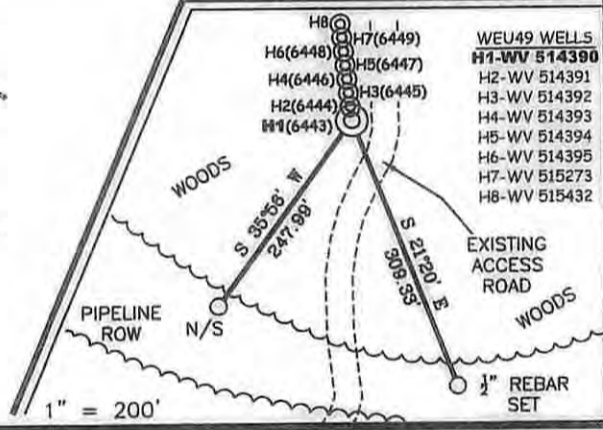
NAD'27 GRID NORTH

LONGITUDE 80°45'00"

13.455



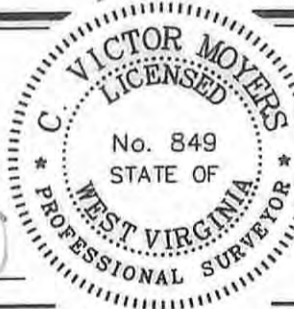
REFERENCES



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 SURVEYORS
 ENGINEERS
 ENVIRONMENTAL
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(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS.
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 OPERATORS WELL NO. WV 514390
 API WELL NO. 47-017-016443 MOD
 STATE 017 COUNTY 016443 PERMIT

MINIMUM DEGREE OF ACCURACY 1/200 FILE NO. 7871P514390R3
 HORIZONTAL & VERTICAL CONTROL DETERMINED BY DGPS (SURVEY GRADE TIE TO CORS NETWORK) SCALE 1" = 2000'

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 DIVISION OF ENVIRONMENTAL PROTECTION
 OFFICE OF OIL AND GAS

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

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 DISTRICT WEST UNION COUNTY DODDRIDGE QUADRANGLE WEST UNION 7.5'

SURFACE OWNER MARY FARR SECRIST ACREAGE 829.75±
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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
 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330 ADDRESS 115 PROFESSIONAL PLACE P.O. BOX 280 BRIDGEPORT, WV 26330

COUNTY NAME PERMIT

EQT PRODUCTION COMPANY LEWIS MAXWELL LEASE WELL NO. WV 514390



50
42

EXISTING GATE

APPROXIMATE END
END OF CO. RT. 50/42

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

EXISTING WELL

EXISTING GAS LINES

TO WEU 2 WELLS

EXISTING WELL

EXISTING ROAD (PREVIOUSLY UTILIZED)
TO BE RESHAPED AND REGARDED

EXISTING GAS LINES

EXISTING WELL

TO WEU 1 WELLS

340' ± @
15-20% GRADE ±

600' ± @
5-10% GRADE ±

PROPOSED
18" CMP

EXISTING GAS LINE

MATCH LINE

Gas Well

Gas Well

SHEET 1 OF 2
SCALE: 1"=500'



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).

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

TOPO SECTION OF WEST UNION 7.5'
USGS TOPO QUADRANGLE



Professional Energy Consultants
A DIVISION OF BARTH LAND SURVEYING

SURVEYORS
PROJECT MGMT.

SLS

ENGINEERS
ENVIRONMENTAL

228 West 44th St.
P.O. Box 150
Greenville, WV 26331
(304) 462-3634

22001 Dulles Bottom Road
Shelbyville, OH 42967
(614) 671-9511

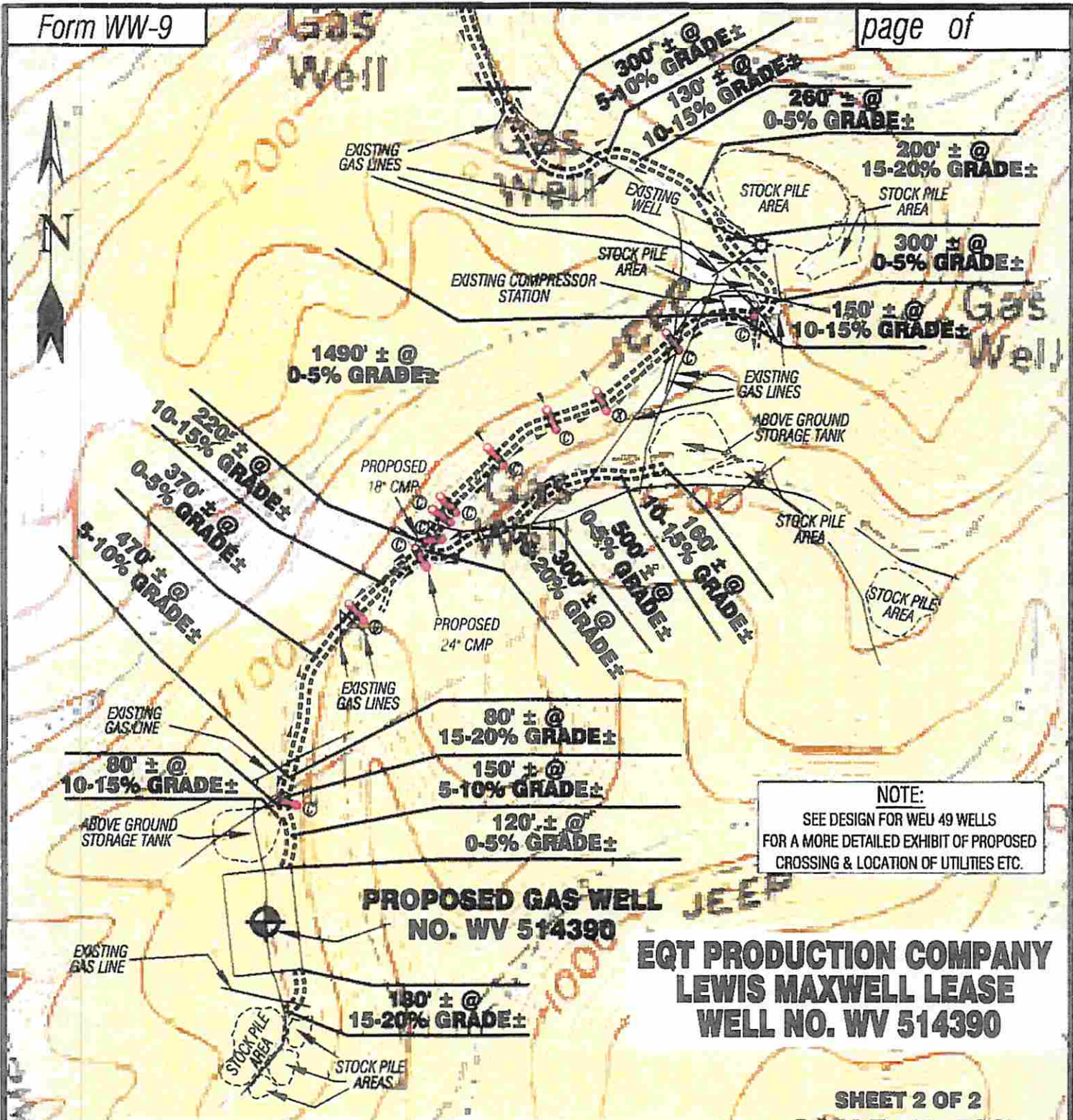
HONESTY. INTEGRITY. QUALITY.

DRAWN BY
K.D.W.

FILE NO.
7871

DATE
12/04/13

CADD FILE:
7871RECS14390.dwg



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

**EQT PRODUCTION COMPANY
LEWIS MAXWELL LEASE
WELL NO. WV 514390**

**SHEET 2 OF 2
SCALE: 1" = 500'**



Detail Sketch for Proposed Well WV 514390

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.

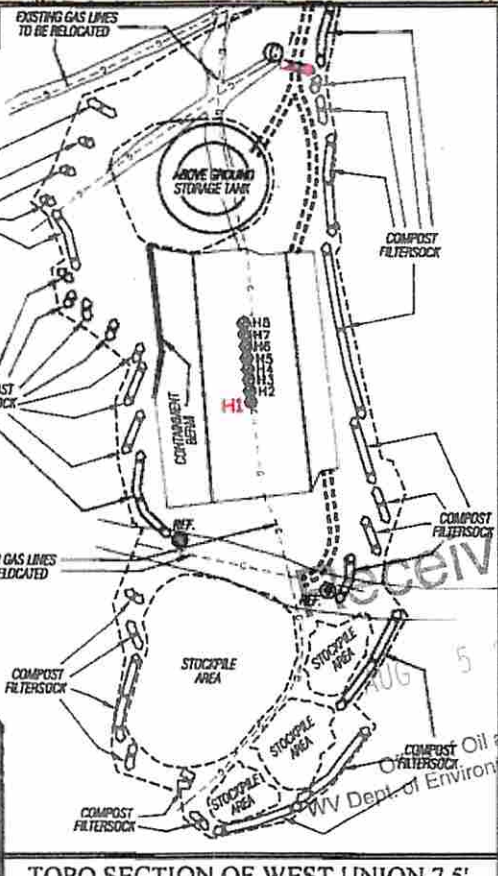
Professional Energy Consultants
 A DIVISION OF SWATH LAND SURVEYING

SLS
 SURVEYORS PROJECT #2011 ENGINEERS ENVIRONMENTAL

225 Third Street SE
 P.O. Box 138
 Okemah, OK 73151
 (581) 412-2514

20009 Olds Gateway Road
 Shawnee, OK 73087
 (781) 971-0811

Integrity. Inter-Grate. Quality.



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Oil and Gas Environmental Protection
 WV Dept. of Environment

12/12/14

① = PROPOSED CULVERT 15' MIN UNLESS OTHERWISE NOTED

② = PROPOSED STREAM CROSSING

○ = APPROXIMATE LIMITS OF DISTURBANCE