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west virginia department of environmental protection

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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 1706445 , Well #: WV 514392

**Modify landing point and bottom hole.**

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 47-01706445

Dear Mr. Smith,

EQT would like to modify the landing point and bottom hole 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 12/12/14  
WV Dept. of Environmental Protection



**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	11,990	11,990	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							

M.S.H.  
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.

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12/12/14  
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(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 5590'.  
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.

Received 12/12/14

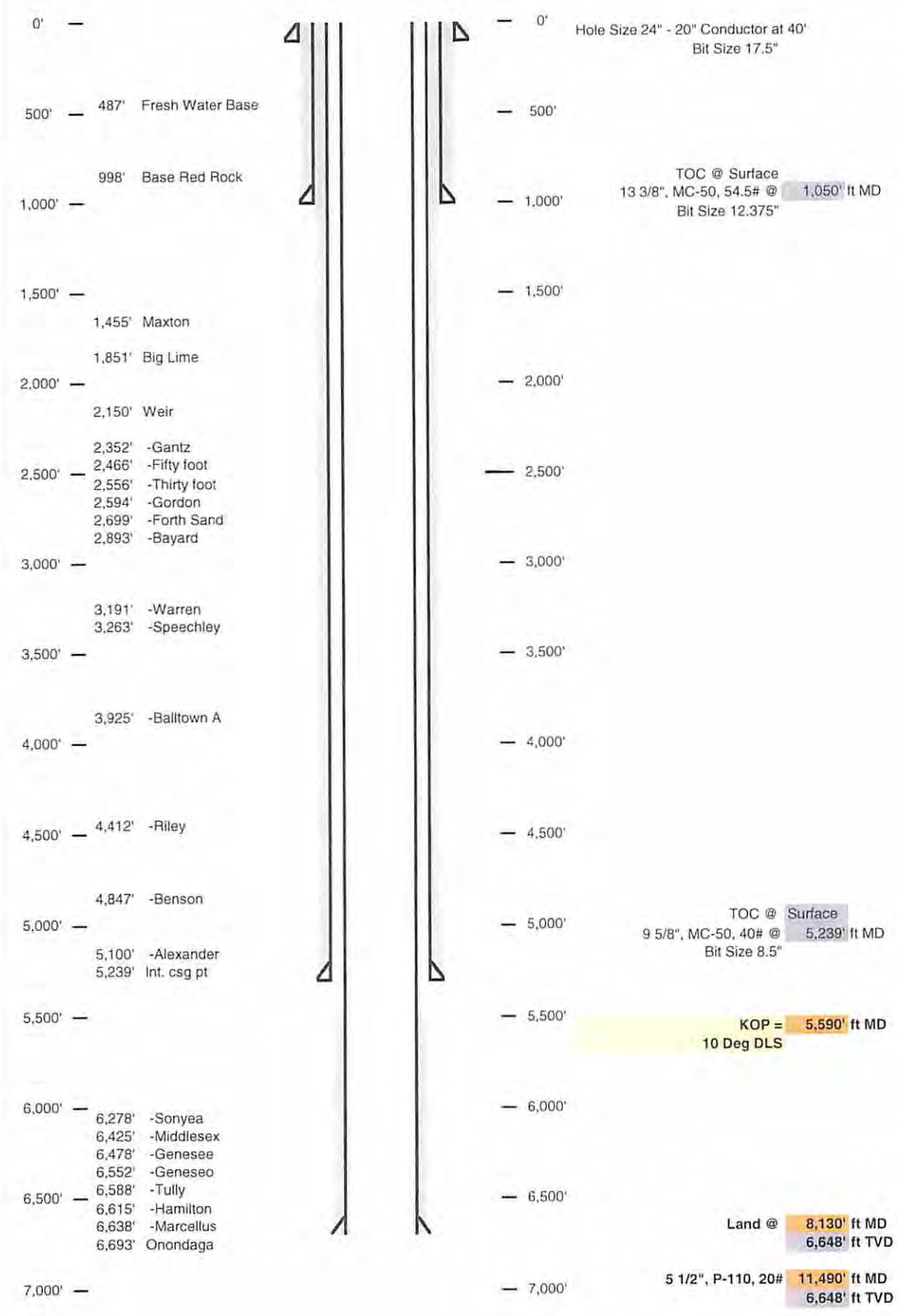
AUG 5 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection

Well Schematic  
EQT Production

Well Name 514392 (WEU49H3)  
County Doddridge  
State West Virginia

Elevation KB: 1143  
Target Marcellus  
Prospect  
Azimuth 155  
Vertical Section 4152



Received

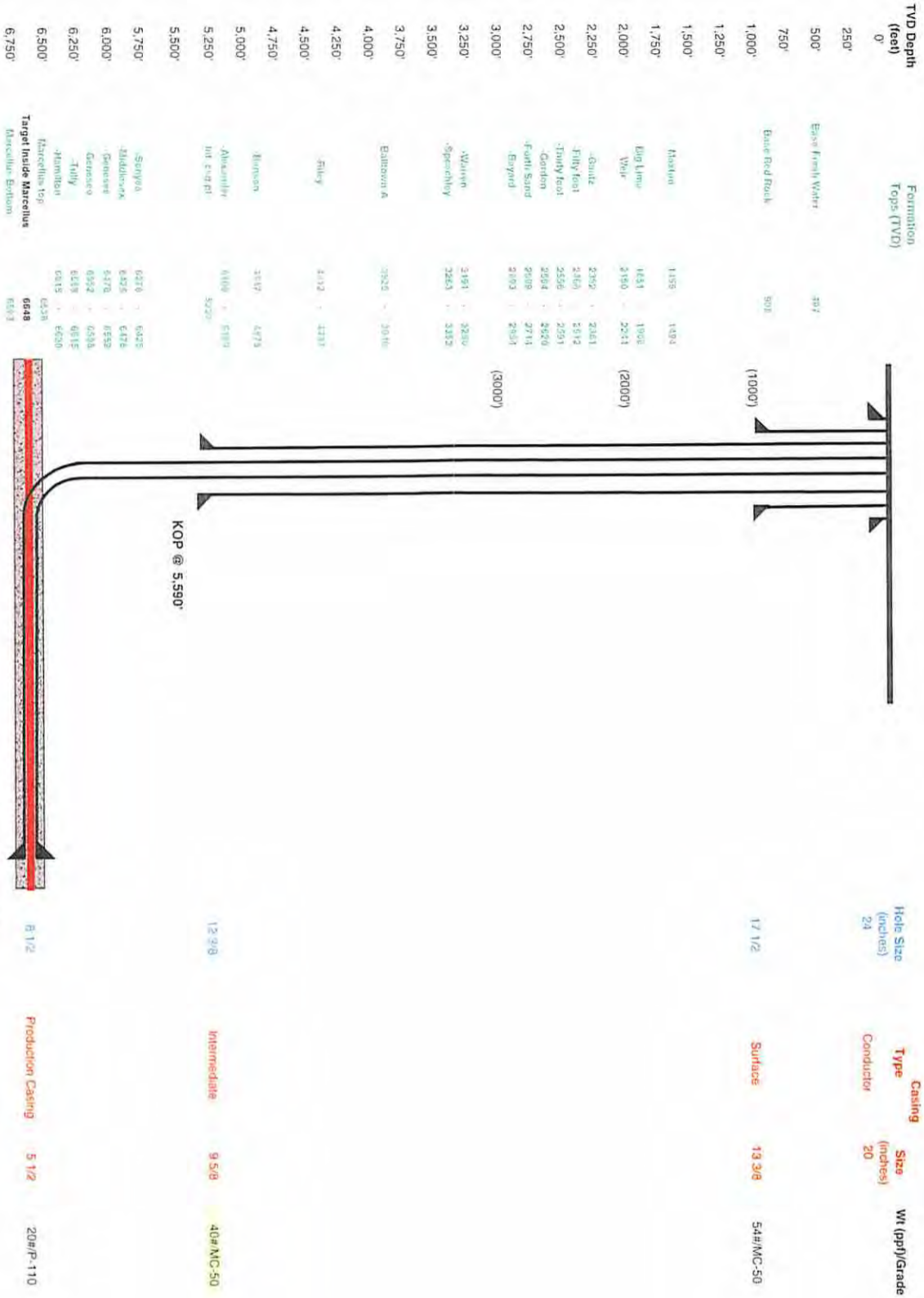
12/12/14

AUG 5 2014

Office of Oil and Gas  
WV Dept. of Environmental Protection

Well: 514392 (WEU49H3)  
EOT Production  
West Union  
Doddridge  
West Virginia

Asbunh 155  
Vertical Section 4152



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 5590'.  
Then kick off the horizontal leg into the Marcellus using a slick water frac.

Land curve @ 6,648' H TVD  
R=130' H MD

Est. TD @ 6,648' H TVD  
7,490' H MD

3,360' H Lateral

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12/12/14



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 514392

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

NAD'27 S.P.C.(FT) N. 277,524.9 E. 1,635,667.1 NAD'27 GEO. LAT.(N) 39.254807 LONG.(W) 80.786616 NAD'83 UTM (M) N. 4,345,084.4 E. 518,425.7

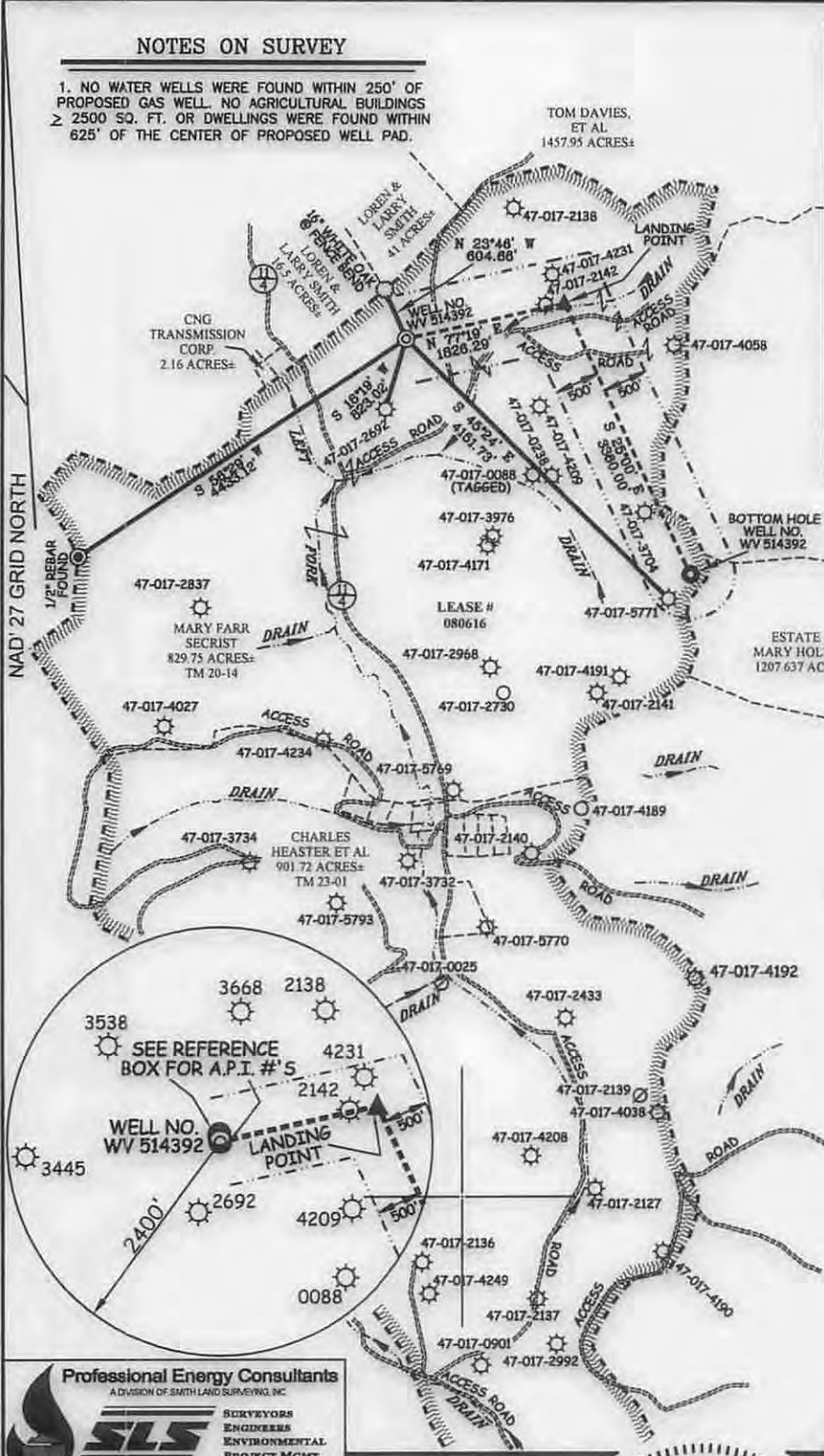
LANDING POINT

NAD'27 S.P.C.(FT) N. 277,925.9 E. 1,637,448.8 NAD'27 GEO. LAT.(N) 39.255978 LONG.(W) 80.780345 NAD'83 UTM (M) N. 4,345,215.7 E. 518,966.5

BOTTOM HOLE

NAD'27 S.P.C.(FT) N. 274,880.7 E. 1,638,868.8 NAD'27 GEO. LAT.(N) 39.247673 LONG.(W) 80.775178 NAD'83 UTM (M) N. 4,344,295.2 E. 519,414.6

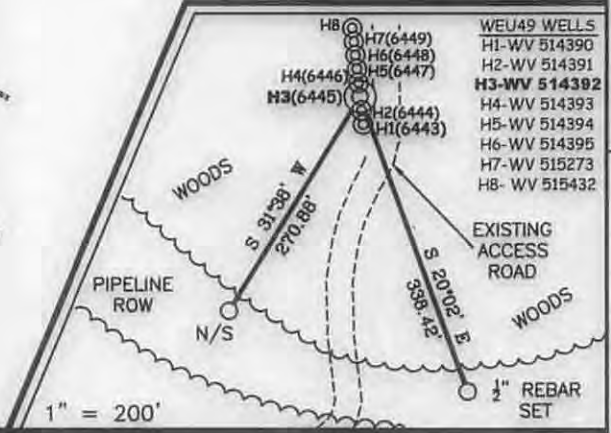
NAD'27 GRID NORTH



LEGEND

Legend table with symbols for LEASE LINE, SURFACE LINE, WELL LATERAL, OFFSET LINE, TIE LINE, CREEK, ROAD, TREE LINE, COUNTY ROUTE, PROPOSED WELL, EXISTING WELL, TAX MAP-PARCEL.

REFERENCES



Professional Energy Consultants logo and contact info: SLS SURVEYS, ENGINEERS, ENVIRONMENTAL PROJECT MGMT.



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 514392. API WELL NO. 47-017-06445. STATE COUNTY PERMIT.

MINIMUM DEGREE OF ACCURACY 1/200 FILE NO. 7871P514392R3 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 X INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION X STORAGE DEEP SHALLOW X. LOCATION: ELEVATION 1,164'(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±. PROPOSED WORK: 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'

WELL OPERATOR EQT PRODUCTION COMPANY DESIGNATED AGENT REX C. RAY 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 514392

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

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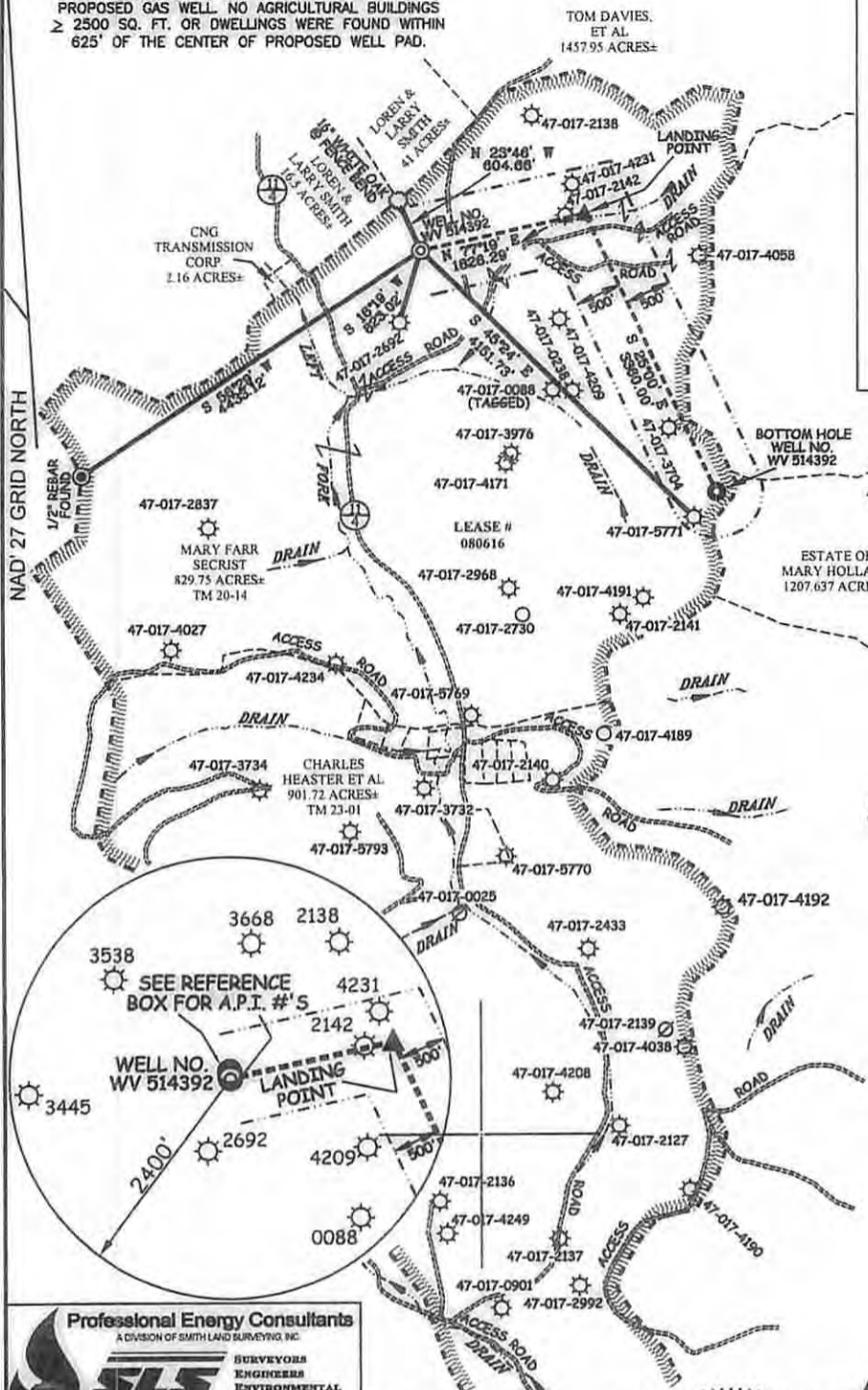
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NAD'27 S.P.C.(FT) N. 274,880.7 E. 1,638,868.8 NAD'27 GEO. LAT-(N) 39.247673 LONG-(W) 80.775178 NAD'83 UTM (M) N. 4,344,295.2 E. 519,414.6

NAD'27 GRID NORTH

LONGITUDE 80°45'00"

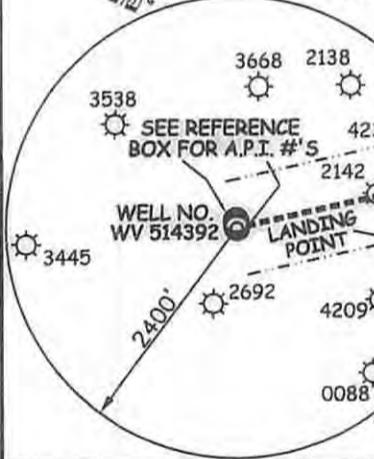
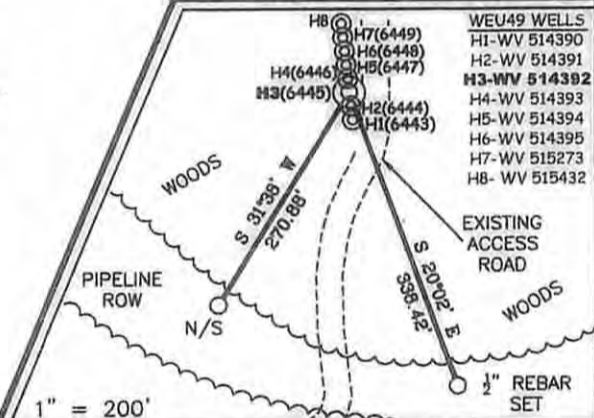
13,425'



LEGEND

Legend table with symbols for LEASE LINE, SURFACE LINE, WELL LATERAL, OFFSET LINE, TIE LINE, CREEK, ROAD, TREE LINE, COUNTY ROUTE, PROPOSED WELL, EXISTING WELL, TAX MAP-PARCEL.

REFERENCES



Professional Energy Consultants logo and contact information: A DIVISION OF SMITH LAND SURVEYING, INC. SURVEYORS ENGINEERS ENVIRONMENTAL PROJECT MGMT. (304) 432-5534 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. 849 C. Victor Moyers

Form fields for DATE (SEPTEMBER 09, 20 13), REVISED (12/02/13, 07/01/14 & 07/31/14), OPERATORS WELL NO. (WV 514392), API WELL NO. (47-017-06445), STATE (STATE), COUNTY (COUNTY), PERMIT (MOD 06445).

Form fields for MINIMUM DEGREE OF ACCURACY (1 / 200), FILE NO. (7871P514392R3), 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

Form fields for WELL TYPE (OIL, GAS, INJECTION, WASTE DISPOSAL, "GAS" PRODUCTION, STORAGE, DEEP, SHALLOW), LOCATION (ELEVATION, WATERSHED, DISTRICT, COUNTY, QUADRANGLE), SURFACE OWNER (MARY FARR SECRIST), ROYALTY OWNER (LEWIS MAXWELL HRS), PROPOSED WORK (DRILL, CONVERT, DRILL DEEPER, REDRILL, PLUG AND ABANDON, CLEAN OUT AND REPLUG, OTHER), PHYSICAL CHANGE IN WELL (SPECIFY), TARGET FORMATION (MARCELLUS), ESTIMATED DEPTH (TVD 6,622').

Form fields for WELL OPERATOR (EQT PRODUCTION COMPANY), ADDRESS (115 PROFESSIONAL PLACE, BRIDGEPORT, WV 26330), DESIGNATED AGENT (REX C. RAY), ADDRESS (115 PROFESSIONAL PLACE, BRIDGEPORT, WV 26330).

Received stamp

AUG 5 2014 stamp

12/12/14 stamp

COUNTY NAME PERMIT



# EQT PRODUCTION COMPANY LEWIS MAXWELL LEASE WELL NO. WV 514392



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 ±

350' ± @  
0-5% 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)

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 SURVEY LAND SURVEYING

SURVEYORS  
PROJECT MGMT.



ENGINEERS  
ENVIRONMENTAL

774 Third Street SE  
P.O. Box 130  
Channahon, WV 26031  
(304) 462-7634

16000 Olders Bottom Road  
Shawsville, OH 43087  
(740) 671-9911

INTEGRITY. INTEGRITY. QUALITY

TOPO SECTION OF WEST UNION 7.5'  
USGS TOPO QUADRANGLE

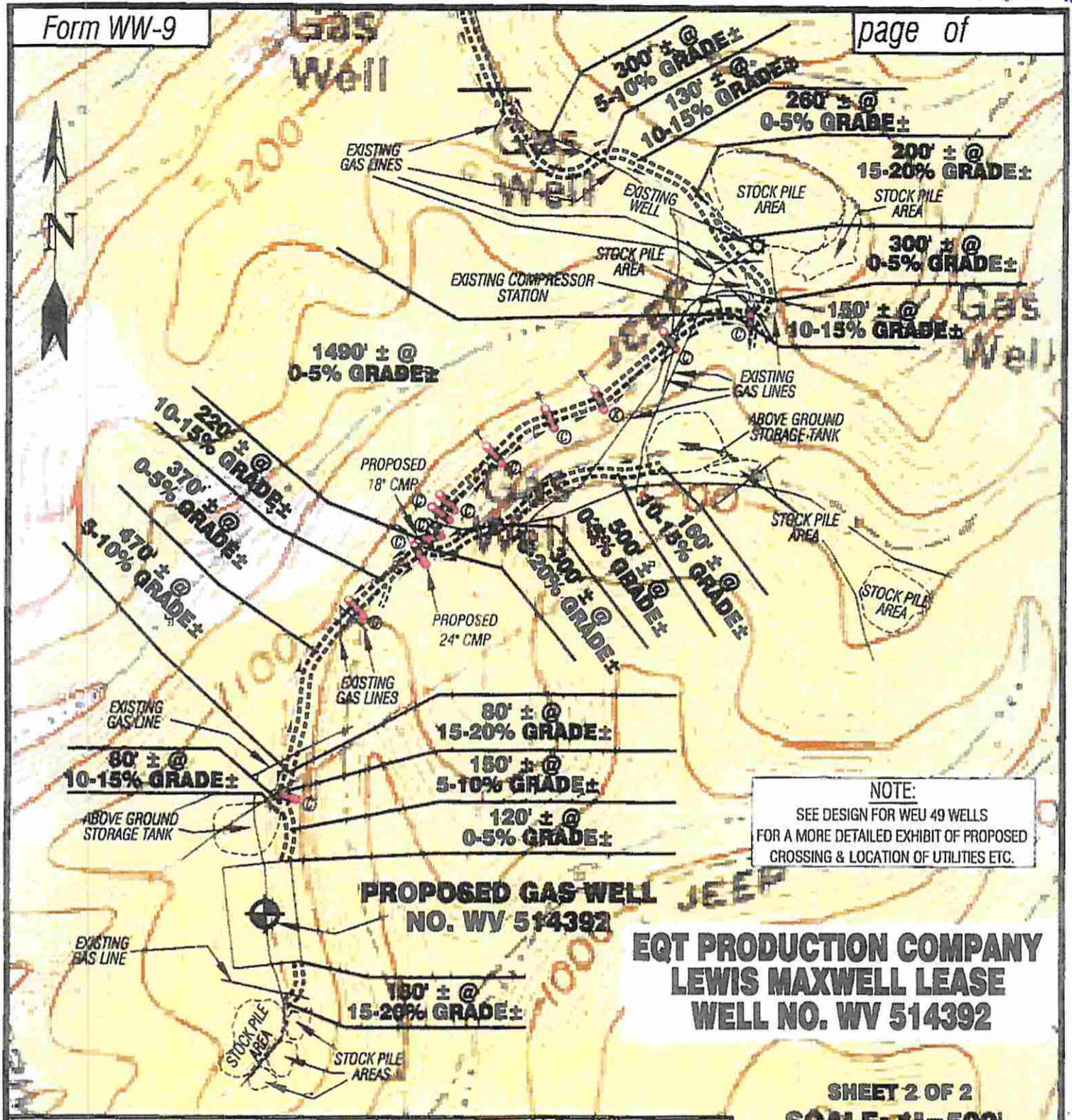
DRAWN BY  
K.D.W.

FILE NO.  
7871

DATE  
12/04/13

CADD FILE:  
7871RECS14392.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 514392**

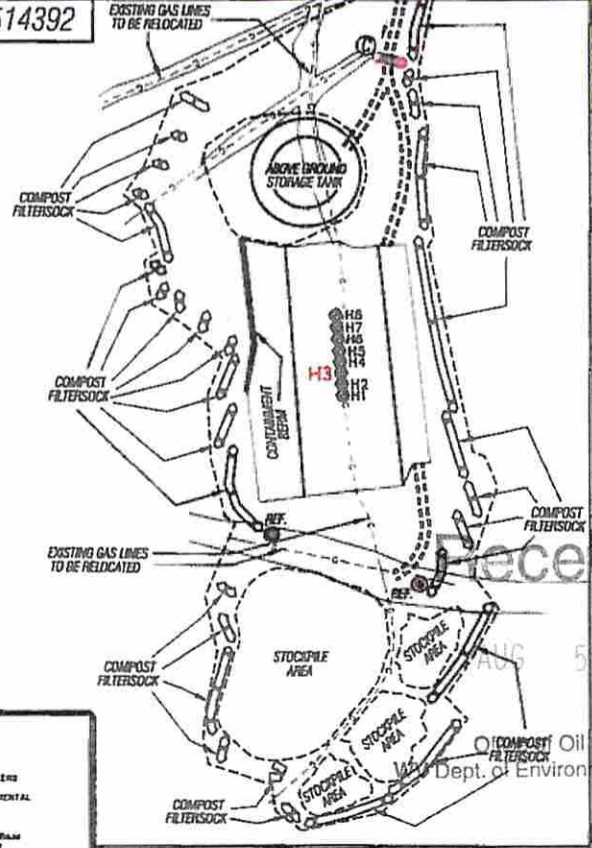
**SHEET 2 OF 2  
SCALE: 1" = 500'**



Detail Sketch for Proposed Well WV 514392

- 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.



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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

- Oil and Gas Dept. of Environmental Protection
- ⊕ = PROPOSED CULVERT 15' MIN UNLESS OTHERWISE NOTED
- ⊗ = PROPOSED STREAM CROSSING
- = APPROXIMATE LIMITS OF DISTURBANCE

Not To Scale

**Professional Energy Consultants**  
 A DIVISION OF SMITH LAND SURVEYING

Surveyors Project Mgrt. **SLS** Engineers Environmental

228 E. 11th St. P.O. Box 158 Okemuh, WV 26039 (206) 462-8634

3668 Dunes Summit Road Sharpsburg, OH 43087 (724) 671-0111

Integrity. Integrity. Quality.

DRAWN BY: K.D.W. FILE NO.: 7871 DATE: 12/04/13 CADD FILE: 7871REC214392.dwg

TOPO SECTION OF WEST UNION 7.5' USGS TOPO QUADRANGLE