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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

September 04, 2015

SWN PRODUCTION COMPANY, LLC  
POST OFFICE BOX 12359  
SPRING, TX 773914954

Re: Permit Modification Approval for API Number 900155, Well #: LINDA GREATHOUSE  
BRK 5H


*Direction of Wellbore/No new leases*

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

*for*

Promoting a healthy environment.

09/04/2015

9-00155 R



August 25, 2015

Ms. Laura Adkins  
Office of Oil & Gas  
601 57<sup>th</sup> Street  
Charleston, WV 25304

**RE:** Modification Request for the Linda Greathouse BRK 5H

Dear Ms. Adkins

Enclosed please find a modification request for the above captioned well. We would like to modify the curve in our proposed wellbore. This well is situated on the Greathouse's property, Brooke County, West Virginia.

If you have any questions or desire additional information, please me at 304-884-1614

Thank you.

Sincerely,

Dee Southall  
Regulatory Supervisor  
Southwestern Energy Production Company, LLC  
PO Box 1300  
Jane Lew, WV 26378

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The Right People doing the Right Things,  
wisely Investing the cash flow from  
our underlying Assets, will create Value+

09/04/2015

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

- 1) Well Operator: SWN Production Co., LLC 494512924 009-Brooke 1-Buffalo 247-Bethany  
Operator ID County District Quadrangle
- 2) Operator's Well Number: Linda Greathouse BRK 5H Well Pad Name: Linda Greathouse BRK Pad
- 3) Farm Name/Surface Owner: Linda Reeves Greathouse Public Road Access: Hukill Run Road
- 4) Elevation, current ground: 1138' Elevation, proposed post-construction: 1138'
- 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 Thickness and Associated Pressure(s):  
Target Formation- Marcellus, Target Top TVD- 5822', Target Base TVD- 5894' Anticipated Thickness- 72', Associated Pressure- 3784
- 8) Proposed Total Vertical Depth: 5874'
- 9) Formation at Total Vertical Depth: Marcellus
- 10) Proposed Total Measured Depth: 14,838'
- 11) Proposed Horizontal Leg Length: 8016'
- 12) Approximate Fresh Water Strata Depths: 62', 94', & 300'
- 13) Method to Determine Fresh Water Depths: from nearby water wells
- 14) Approximate Saltwater Depths: 1025'
- 15) Approximate Coal Seam Depths: 303'
- 16) Approximate Depth to Possible Void (coal mine, karst, other): Void Expected from 300'-307'
- 17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes  No
- (a) If Yes, provide Mine Info: Name: \_\_\_\_\_  
Depth: \_\_\_\_\_  
Seam: \_\_\_\_\_  
Owner: \_\_\_\_\_

*[Handwritten signature]*  
8-28-15

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18) CASING AND TUBING PROGRAM

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.)/CTS
Conductor	20"	New	H-40	94#	125'	125'	CTS
Fresh Water	13 3/8"	New	J-55	54.5#	450'	450'	446 sx/CTS
Coal	9 5/8"	New	J-55	40#	2075'	2075'	807 sx/CTS
Intermediate	7"	New	J-55	20#	If Needed	If Needed	If Needed/As Needed
Production	5 1/2"	New	HCP-110	20#	14,838'	14,838'	Less 820x 10' 10000 1000 1000
Tubing	2 3/8"	New	P-110	4.7#	Approx. 6411'	Approx. 6411'	
Liners							

← Existing LA  
9/4/15  
Per Dec 5.

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Max. Associated Surface Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	20"	30"	0.25	2120	81	Class A	1.19/50% Excess
Fresh Water	13 3/8"	17.5"	0.380	2740	633	Class A	1.19/50% Excess
Coal	9 5/8"	12 1/4"	0.395	3950	1768	Class A	1.19/50% Excess
Intermediate	7"	8 3/4"	0.317	4360	3250	Class A	1.20/15% Excess
Production	5 1/2"	8 3/4"	0.361	12360	9500	Class A	1.20/15% Excess
Tubing	2 3/8"	4.778"	0.190				
Liners							

PACKERS

Kind:	10K Arrowset AS1-X			
Sizes:	5 1/2"			
Depths Set:				

*En. TLO*  
8.28.15


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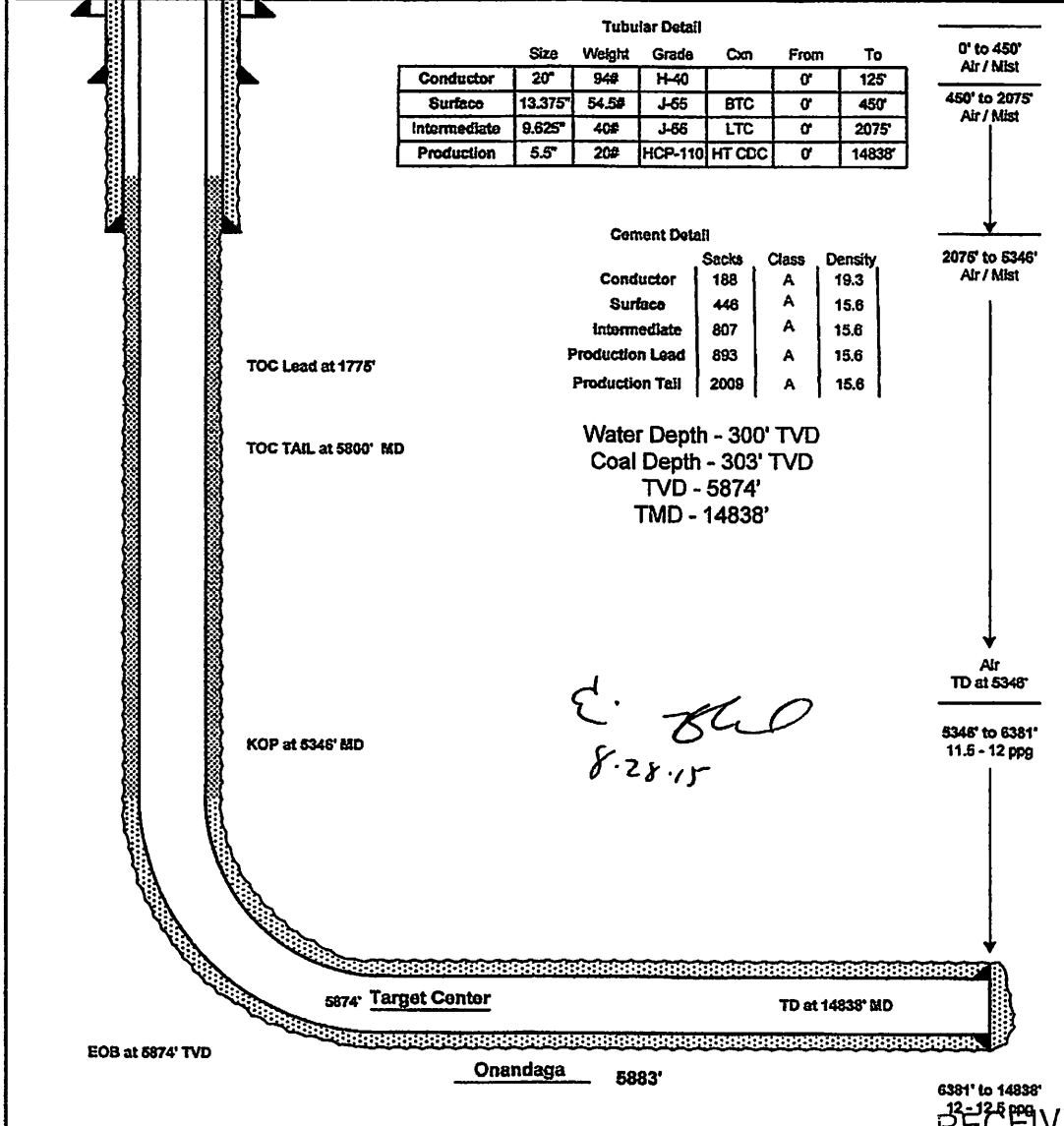
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9-00155R

Southwestern Energy Company		Proposed Drilling Program	
Well	: LINDA GREATHOUSE BRK 5	Re-entry Rig	: TBD
Field	: PANHANDLE FIELD	Prospect	: PANHANDLE
County	: BROOKE	State	: WV
SHL	: 40.204141 Latitude -80.606946 Longitude		
BHL	: 40.226939 Latitude -80.615394 Longitude		
KB Elev	: 1164 ft MSL	KB	: 26 ft AGL
		GL Elev	: 1138 ft MSL



K:\Land\WV\Drilling\Team Data\Drilling\Wells\Linda Greathouse Pad\Linda Greathouse BRK 5H\Drilling Program\Master SWN Well Input Sheet v E-0-1.xdsm

NOTE: This drawing was created for the Reentry Rig. The depths and lengths shown in the plot are referenced to Reentry Rig RIG.


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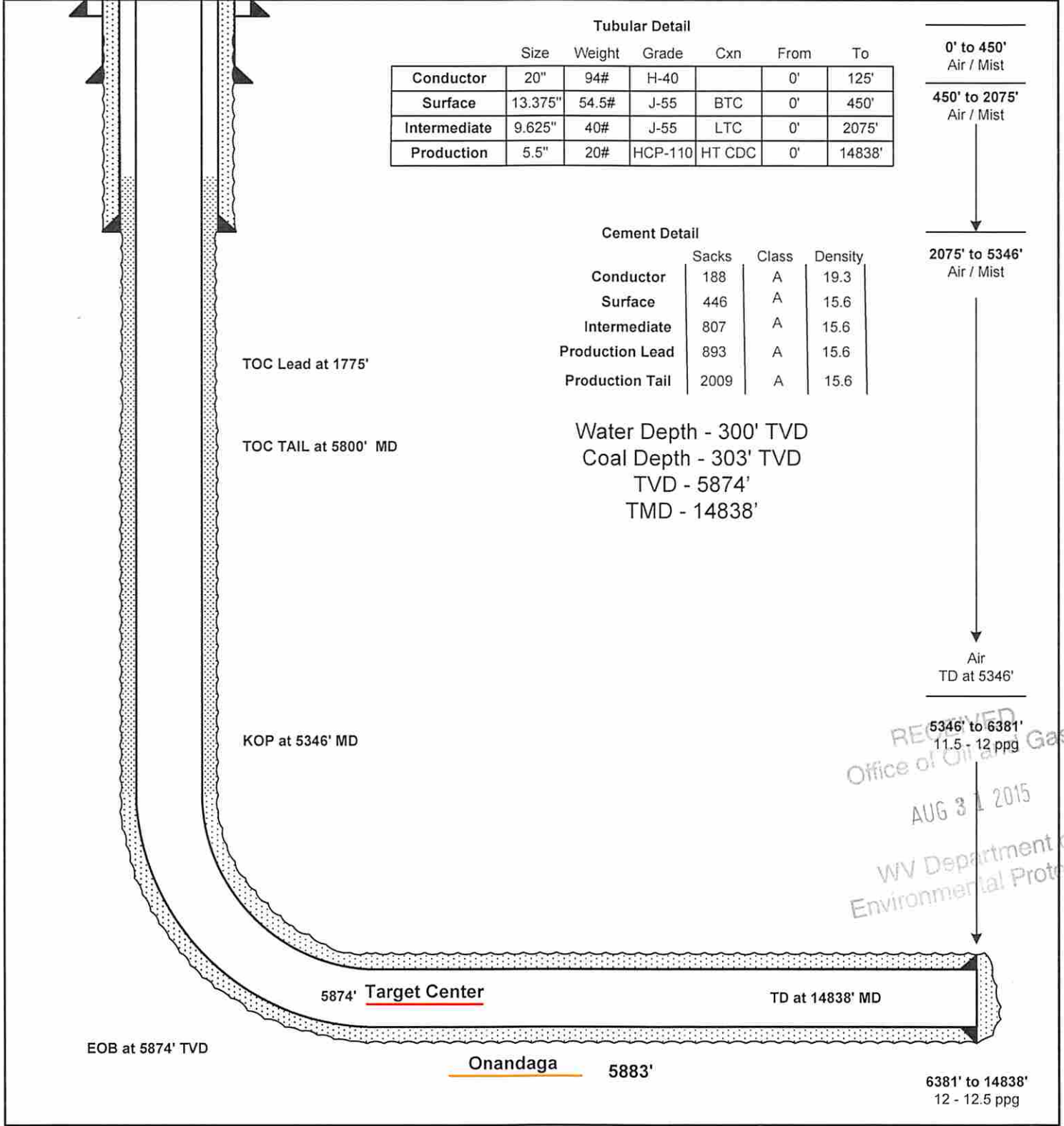
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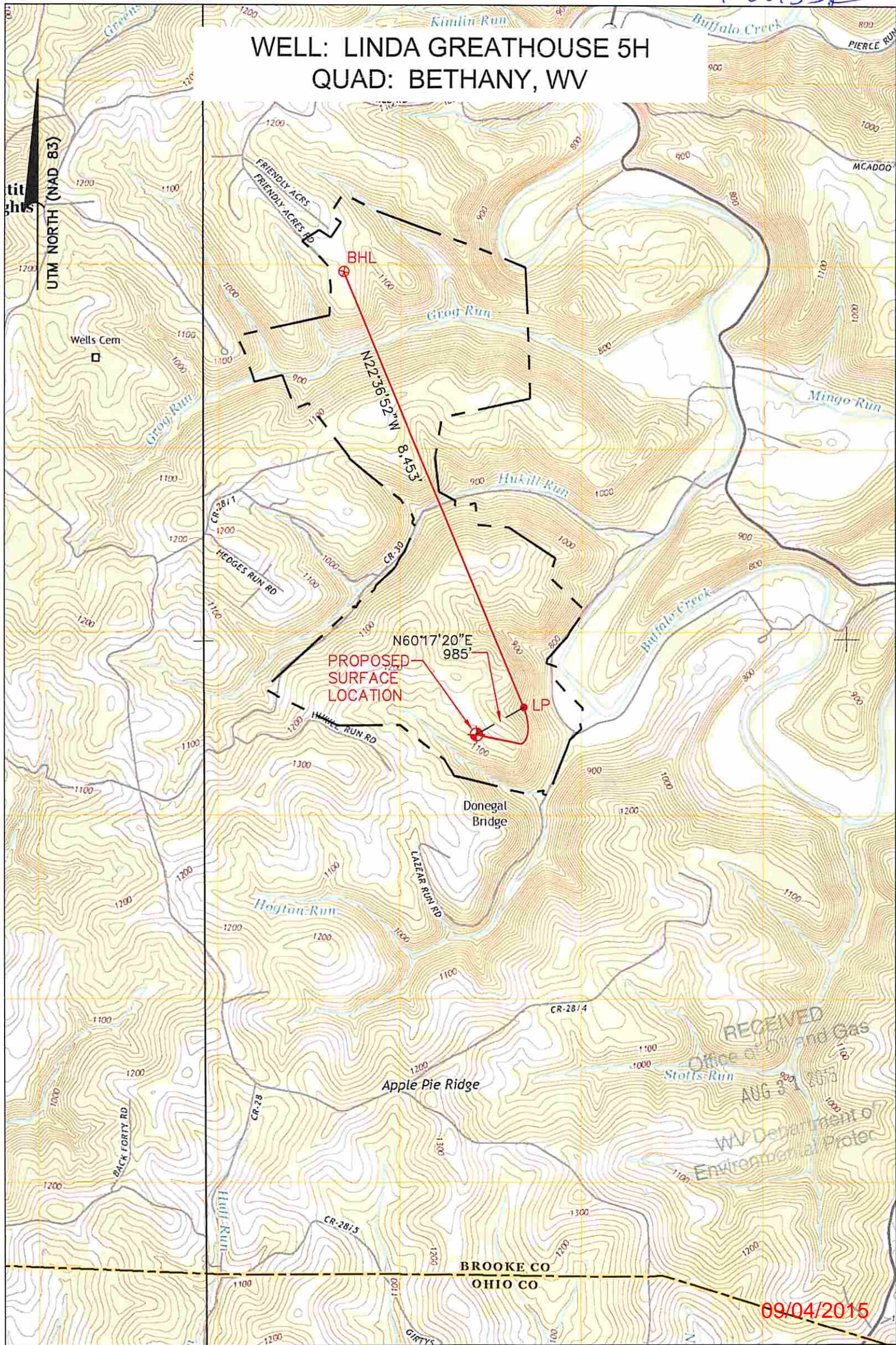
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NOTE: This drawing was created for the Reentry Rig. The depths and lengths shown in the plot are referenced to Reentry Rig RKB.



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# WELL: LINDA GREATHOUSE 5H QUAD: BETHANY, WV



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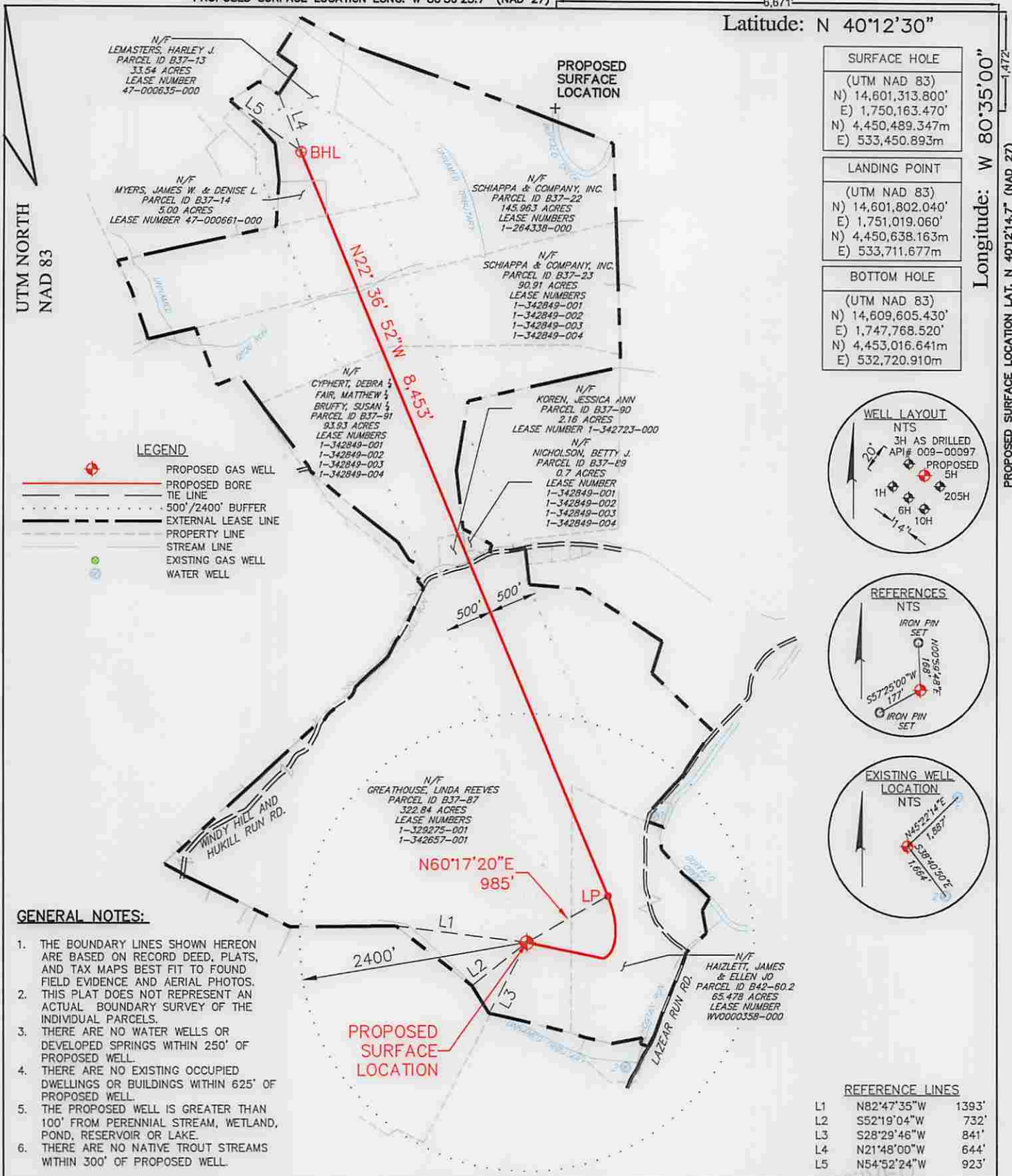
09/04/2015

**NOTE:**  
THE PURPOSE OF THIS PLAT IS FOR THE LOCATION OF PROPOSED GAS WELLS AND DOES NOT REPRESENT A CLOSED BOUNDARY SURVEY. PROPERTY LINES AND OWNERS WERE OBTAINED FROM VARIOUS FIELD EVIDENCE, TAX RECORDS AND AERIAL MAPPING.

**LEGEND**  
 PROPOSED GAS WELL  
 PROPOSED BORE  
 EXTERNAL LEASE LINE

Applicant / Well Operator Name <b>SWN PRODUCTION COMPANY, LLC</b>		Well(Farm) Name <b>LINDA GREATHOUSE BRK</b>		Well # <b>5H</b>	Serial #
Address <b>PO BOX 1300 JANE LEW, WV 26378</b>		County - Code <b>BROOKE - 009</b>	District <b>BUFFALO</b>		
Surface Landowner / Lessor <b>LINDA GREATHOUSE</b>		USGS 71/2 Quadrangle Map Name <b>BETHANY, W.V.A.</b>			





**GENERAL NOTES:**

1. THE BOUNDARY LINES SHOWN HEREON ARE BASED ON RECORD DEED, PLATS, AND TAX MAPS BEST FIT TO FOUND FIELD EVIDENCE AND AERIAL PHOTOS.
2. THIS PLAT DOES NOT REPRESENT AN ACTUAL BOUNDARY SURVEY OF THE INDIVIDUAL PARCELS.
3. THERE ARE NO WATER WELLS OR DEVELOPED SPRINGS WITHIN 250' OF PROPOSED WELL.
4. THERE ARE NO EXISTING OCCUPIED DWELLINGS OR BUILDINGS WITHIN 625' OF PROPOSED WELL.
5. THE PROPOSED WELL IS GREATER THAN 100' FROM PERENNIAL STREAM, WETLAND, POND, RESERVOIR OR LAKE.
6. THERE ARE NO NATIVE TROUT STREAMS WITHIN 300' OF PROPOSED WELL.

FILE #: 087569015

DRAWING #: 087569015-SV-PLAT

SCALE: 1" = 1,400'

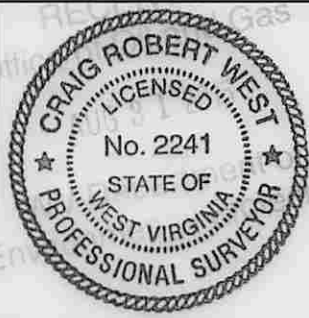
MINIMUM DEGREE OF ACCURACY: 1/200

PROVEN SOURCE OF ELEVATION: SUBMETER MAPPING SURVEY GPS

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 RULES ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

SIGNED: Craig Robert West

R.P.E.: \_\_\_\_\_ L.L.S.: 2241



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS WVDEP  
OFFICE OF OIL & GAS  
601 57TH STREET  
CHARLESTON, WV 25304



DATE: AUGUST 21, 2015

OPERATOR'S WELL #: LINDA GREATHOUSE BRK 5H *Rev.*

API WELL #: 47 09 00155H6A

STATE COUNTY PERMIT

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

WATERSHED: UPPER OHIO SOUTH ELEVATION: 1,138' **09/04/2015**

COUNTY/DISTRICT: BROOKE/ BUFFALO QUADRANGLE: BETHANY, WV

SURFACE OWNER: GREATHOUSE, LINDA REEVES ACREAGE: 322.84±

OIL & GAS ROYALTY OWNER: GREATHOUSE, LINDA REEVES ACREAGE: 864.91±

CONVERT  DRILL DEEPER  REDRILL  FRACTURE OR STIMULATE  PERFORATE NEW FORMATION  PLUG & ABANDON

DRILL  PLUG OFF OLD FORMATION  CLEAN OUT & REPLUG  OTHER CHANGE  (SPECIFY): \_\_\_\_\_

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: TVD: 5,860' TMD: 14,838'

WELL OPERATOR: SWN PRODUCTION COMPANY, LLC DESIGNATED AGENT: DEE SOUTHALL

ADDRESS: P.O. BOX 1300 ADDRESS: P.O. BOX 1300

CITY: JANE LEW STATE: WV ZIP CODE: 26378 CITY: JANE LEW STATE: WV ZIP CODE: 26378