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west virginia department of environmental protection

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Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

Austin Caperton, Cabinet Secretary  
[www.dep.wv.gov](http://www.dep.wv.gov)

Wednesday, November 7, 2018  
PERMIT MODIFICATION APPROVAL  
Horizontal 6A / New Drill

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

Re: Permit Modification Approval for GLENN DIDRIKSEN OHI 410H  
47-069-00285-00-00

**Freshwater depth updated to 283' and saltwater updated to 800'**

SWN PRODUCTION COMPANY, LLC

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.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin  
Chief

Operator's Well Number: GLENN DIDRIKSEN OHI 410H  
Farm Name: GLEN DIDRIKSEN  
U.S. WELL NUMBER: 47-069-00285-00-00  
Horizontal 6A New Drill  
Date Modification Issued: 11/07/2018

11/09/2018

WW-6B  
(04/15)

API NO. 47-055 - 00285  
OPERATOR WELL NO. Glenn Didriksen OHI 410H  
Well Pad Name: Glenn Didriksen Pad

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 069-Ohio Liberty Valley Grove  
Operator ID County District Quadrangle
- 2) Operator's Well Number: Glenn Didriksen OHI 410H Well Pad Name: Glenn Didriksen Pad
- 3) Farm Name/Surface Owner: Glenn Didriksen Public Road Access: Battle Run Road
- 4) Elevation, current ground: 1383' Elevation, proposed post-construction: 1383'
- 5) Well Type (a) Gas  Oil  Underground Storage   
Other   
(b) If Gas Shallow  Deep   
Horizontal
- 6) Existing Pad: Yes or No Yes *C. T. M. 8.27.18*
- 7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):  
Target Formation- Marcellus, Target Top TVD- 6531', Target Base TVD- 6572', Anticipated Thickness- 41', Associated Pressure- 4272
- 8) Proposed Total Vertical Depth: 6548' at the toe (BHL deepest TVD)
- 9) Formation at Total Vertical Depth: Marcellus
- 10) Proposed Total Measured Depth: 13,355'
- 11) Proposed Horizontal Leg Length: 6005.49'
- 12) Approximate Fresh Water Strata Depths: 283'
- 13) Method to Determine Fresh Water Depths: offset wells: WR-35; Salinity Profile
- 14) Approximate Saltwater Depths: 800' corresponds with Pottsville grid, Salinity Profile suggests this interval to be salt water filled.
- 15) Approximate Coal Seam Depths: 683'
- 16) Approximate Depth to Possible Void (coal mine, karst, other): 683' Possible Void
- 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: \_\_\_\_\_

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WW-6B  
(04/15)

API NO. 47- 069  
OPERATOR WELL NO. Glenn Dirksen OH# 410H  
Well Pad Name: Glenn Dirksen Pad

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#	100'	100'	CTS
Fresh Water	13 3/8"	New	H-40	48#	750'	750'	697 sx/CTS
Coal	See	Surface Casing					
Intermediate	9 5/8"	New	J-55	36#	2102'	2102'	793 sx/CTS
Production	5 1/2"	New	HCP-110	20#	13,355'	13,355'	See 556a Tab 108214 inside Permian
Tubing							
Liners							

*C. BLO 8.27.18*

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	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	See	Surface Casing					
Intermediate	9 5/8"	12 1/4"	0.395	3950	1768	Class A	1.19/50% Excess
Production	5 1/2"	8 3/4"	0.361	12360	9500	Class A	1.20/50% Excess
Tubing							
Liners							

PACKERS

Kind:				
Sizes:				
Depths Set:				

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WW-6B  
(10/14)

API NO. 47- \_\_\_\_\_  
OPERATOR WELL NO. Steve Erickson District  
Well Pad Name: Glen Davidson Pad

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

Drill and stimulate any potential zones between and including the Benson to Marcellus. \*\*If we should encounter a void place basket above and below void area- balance cement to bottom of void and grout from basket to surface or run external casing packer/cementing stage tool above void interval and perform 2 stage cementing operation dependent upon depth of void. Run casing not less than 20' below void nor more than 100' below void. (\*If freshwater is encountered deeper than anticipated it must be protected, set casing a minimum of 50' below freshwater interval and cement to surface.)

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

Well will be perforated within the target formation and stimulated with a slurry of water, sand, and chemical additives at a high rate. This will be performed in stages with the plug and perf method along the wellbore until the entire lateral has been stimulated within the target formation. All stage plugs are then drilled out and the well is flowed back to surface. The well is produced through surface facilities consisting of high pressure production unites, vertical separation units, water and oil storage tanks. Max press and anticipated max rate- 9000 lbs @ 100 barrels a minute.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 9.01

22) Area to be disturbed for well pad only, less access road (acres): 5.79

23) Describe centralizer placement for each casing string:

All casing strings will be ran with a centralizer at a minimum of 1 per every 3 joints of casing.

24) Describe all cement additives associated with each cement type:

See Attachment \*\*\*

25) Proposed borehole conditioning procedures:

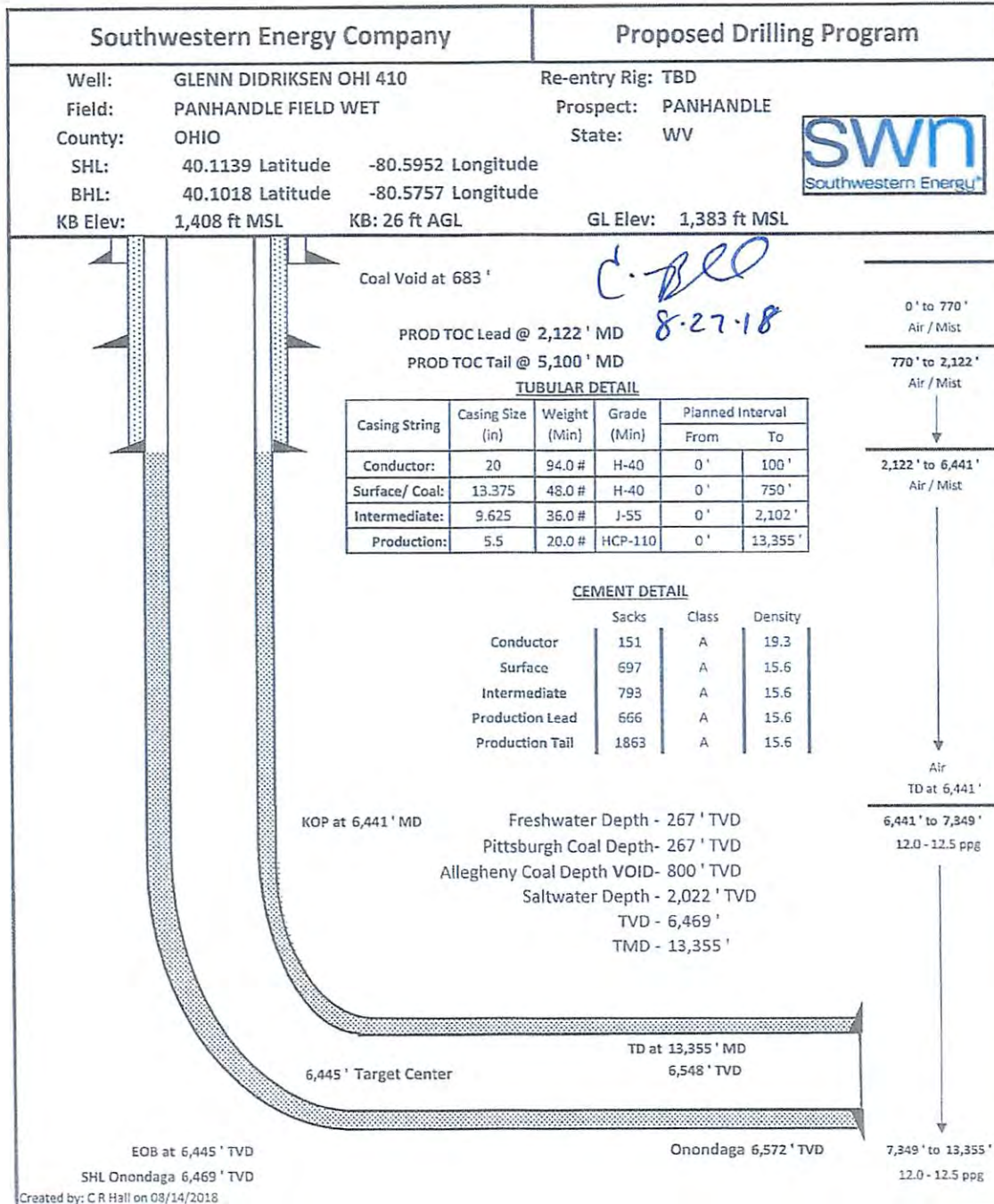
All boreholes will be conditioned with circulation and rotation for a minimum of one bottoms up and continuing until operator is satisfied with borehole conditions.

\*Note: Attach additional sheets as needed.

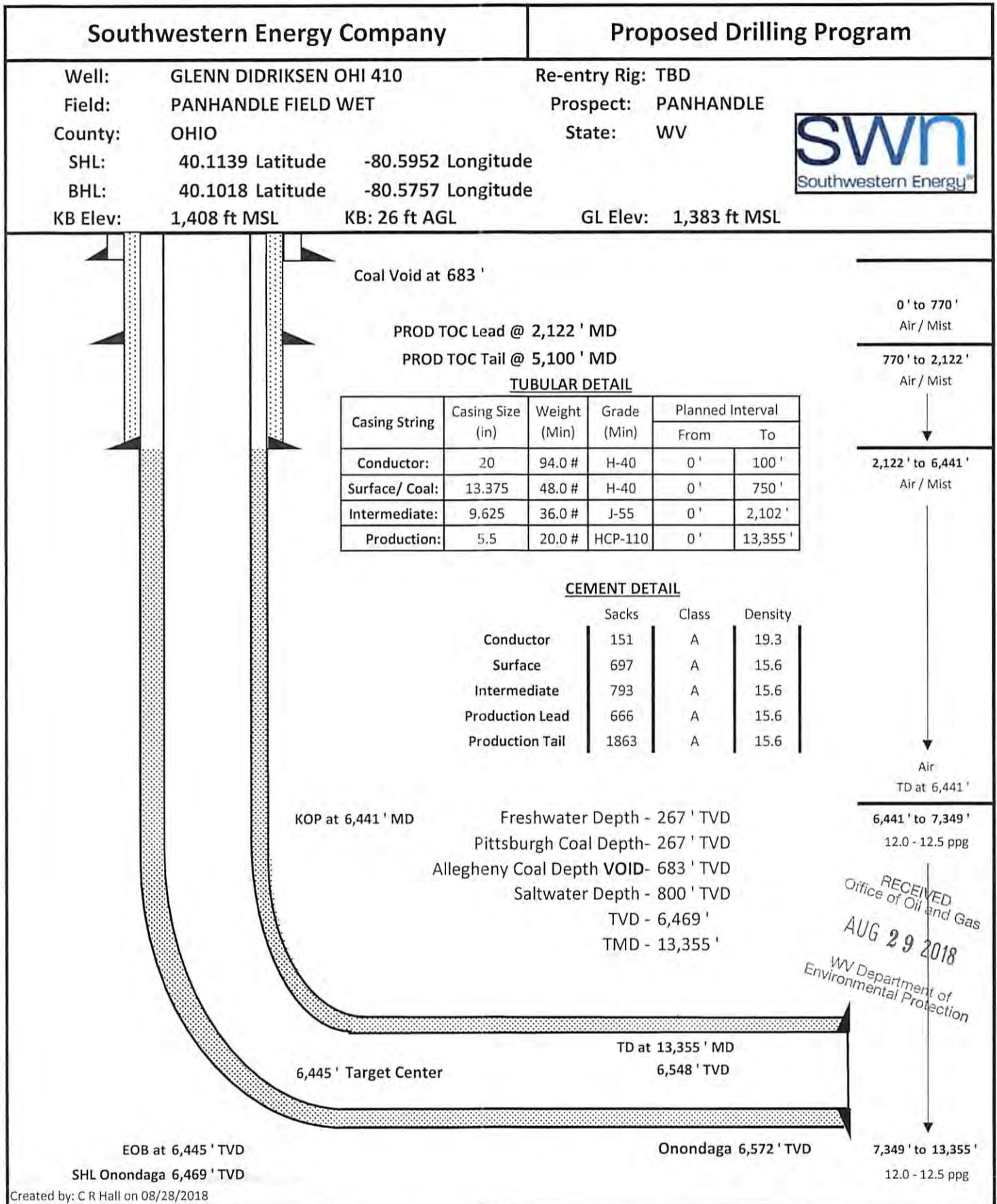
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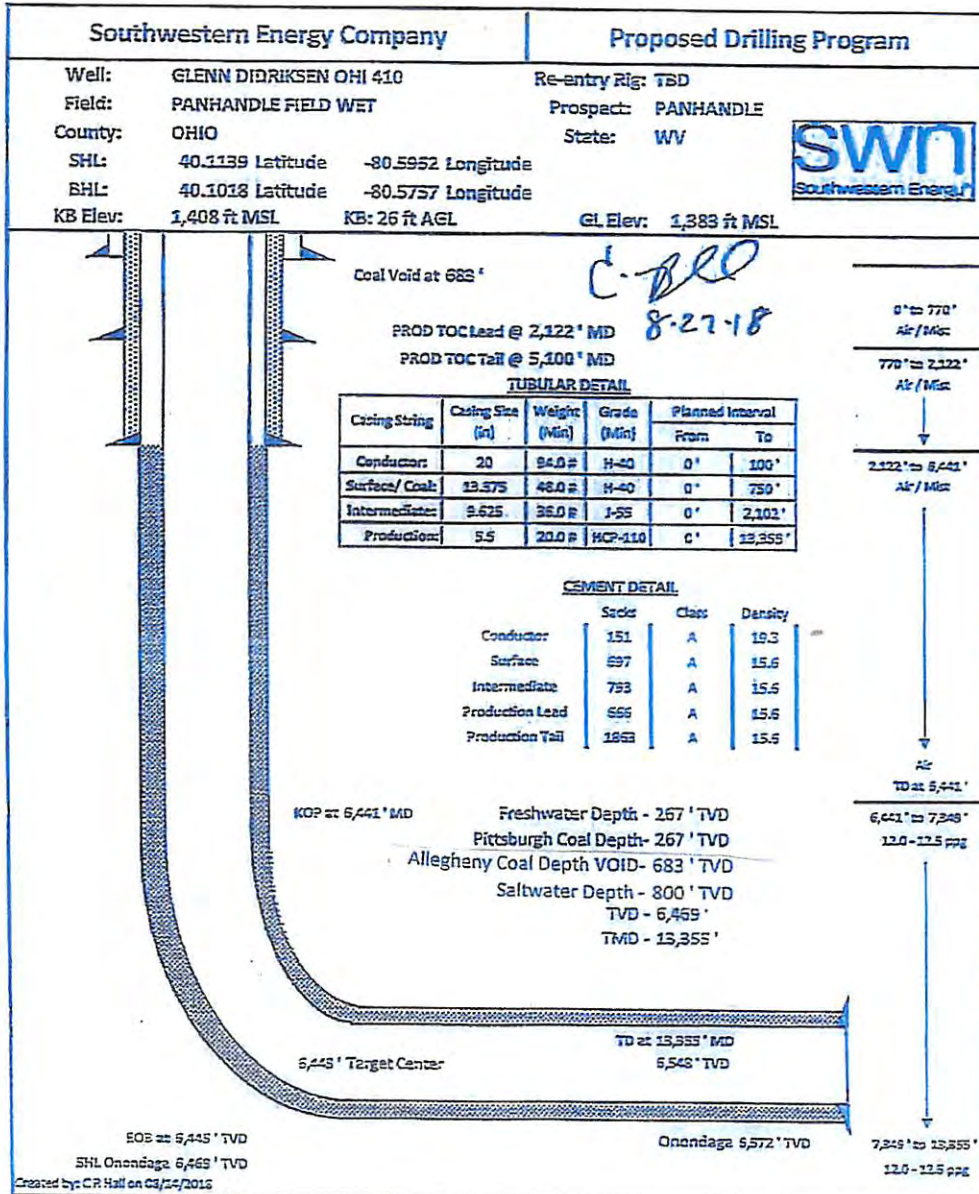
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