west virginia department of environmental protection

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

Austin Caperton, Cabinet Secretary
www.dep.wv.gov

Wednesday, June 26, 2019
WELL WORK PERMIT
Horizontal 6A / New Drill

TUG HILL OPERATING, LLC
380 SOUTHPOINTE BLVD

CANONSBURG, PA 15317

Re: Permit approval for OLD CROW N-4HM
47-051-02227-00-00

This well work permit is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to any additional specific conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas Inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days of completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

Per 35 CSR 4-5.2.g this permit will expire in two (2) years from the issue date unless 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: OLD CROW N-4HM
Farm Name: DONNA VIVIAN YOHO (TOD)
U.S. WELL NUMBER: 47-051-02227-00-00
Horizontal 6A New Drill
Date Issued: 6/26/2019

API Number: _____

PERMIT CONDITIONS 4705102227

West Virginia Code § 22-6A-8(d) allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACE). Through this permit, you are hereby being advised to consult with USACE regarding this proposed activity.

2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than one hundred (100) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.

3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95 % compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.

4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.

5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health set forth in its Legislative rule entitled *Water Well Regulations,* 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.

6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.

7. 24 hours prior to the initiation of the completion process the operator shall notify the Chief or his designee.

8. During the completion process the operator shall monitor annular pressures and report any anomaly noticed to the chief or his designee immediately.

9. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.

10. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.

API Number: _____

PERMIT CONDITIONS 4705102227

11. The operator shall provide to the Office of Oil and Gas the dates of each of the following within 30 days of their occurrence: completion of construction of the well pad, commencement of drilling, cessation of drilling, completion of any other permitted well work, and completion of the well. Such notice shall be provided by sending an email to DEPOOGNotify@wv.gov.

4705 02227

WW-6B
(04/15)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

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

1) Well Operator: Tug Hill Operating, LLC | 494510851 (Operator ID) | Marshall (County) | Franklin (District) | Powhatan Point 7 (Quadrangle)

2) Operator's Well Number: Old Crow N-4HM Well Pad Name: Old Crow

3) Farm Name/Surface Owner: Donna Yoho Public Road Access: Rines Ridge Road (County Route 76)

4) Elevation, current ground: 1286' Elevation, proposed post-construction: 1264.99'

5) Well Type (a) Gas x Oil ____ Underground Storage ____
Other ____
(b)If Gas Shallow x Deep ____
Horizontal x

6) Existing Pad: Yes or No No

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus is the target formation at a depth of 6543' - 6594', thickness of 51' and an anticipated approximate pressure of 3800 psi.

8) Proposed Total Vertical Depth: 6,694'

9) Formation at Total Vertical Depth: Onondaga

10) Proposed Total Measured Depth: 17,638'

11) Proposed Horizontal Leg Length: 9,915.56'

12) Approximate Fresh Water Strata Depths: 70'; 886'

13) Method to Determine Fresh Water Depths: Use shallow offset wells to determine deepest freshwater, or determine using pre-drill tests, testing while drilling or petrophysical evaluation of resistivity.

14) Approximate Saltwater Depths: 1,740'

15) Approximate Coal Seam Depths: Sewickley Coal - 788' and Pittsburgh Coal - 880'

16) Approximate Depth to Possible Void (coal mine, karst, other): None

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes ____ No x

(a) If Yes, provide Mine Info: Name: ____
Depth: ____
Seam: ____
Owner: ____

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WW-6B
(04/15)

4705102227

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

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	30"	NEW	BW	BW	120'	120'	259ft^3(CTS)
Fresh Water	13 3/8"	NEW	J55	54.5#	980'	980'	1031ft^3(CTS)
Coal	13 3/8"	NEW	J55	54.5#	980'	980'	1031ft^3(CTS)
Intermediate	9 5/8"	NEW	J55	36#	2,829'	2,829'	934ft^3(CTS)
Production	5 1/2"	NEW	P110	20#	17,638'	17,638'	4507ft^3(CTS)
Tubing	2 3/8"	NEW	N80	4.7#	7,524'		
Liners							

1/25/19

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	30"	36"	1.0	2,333	1,866	CLASS A	1.2
Fresh Water	13 3/8"	17.5"	.33	2,740	2,192	SEE #24	1.2
Coal	13 3/8"	17.5"	.33	2,740	2,192	SEE #24	1.2
Intermediate	9 5/8"	12 1/4"	.352	3,520	2,816	SEE #24	1.19
Production	5 1/2"	8 7/8"_8 3/4"	.361	12,640	10,112	SEE #24	1.17/1.19
Tubing	2 3/8"		.19	11,200	8,960		
Liners							

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PACKERS

Kind:	N/A			
Sizes:	N/A			
Depths Set:	N/A			

47 05 02227

WW-6B
(10/14)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

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

Drill through the Marcellus tagging less than 100' from the top of the Onondaga to get depths and log data. Plug back to proposed kick off point. Drill the horizontal section to planned and proposed TD. Run casing and cement to surface. Run Bond Log from app. 60 deg to surface. Make clean out run and stimulate.

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

Well to completed with approximately 24,785,000 lb. proppant and 383,194 barrels of water.
Max rate = 80bpm; max psi = 9,000#.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 19.18 acres

22) Area to be disturbed for well pad only, less access road (acres): 6.64 acres

23) Describe centralizer placement for each casing string:

Will run 3 centralizers on surface casing at equal distance. Intermediate will have 1 centralizer every other joint. Production casing will have one centralizer every other joint in lateral, one centralizer every joint through curve, one centralizer every other joint to surface.

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

*See attachment

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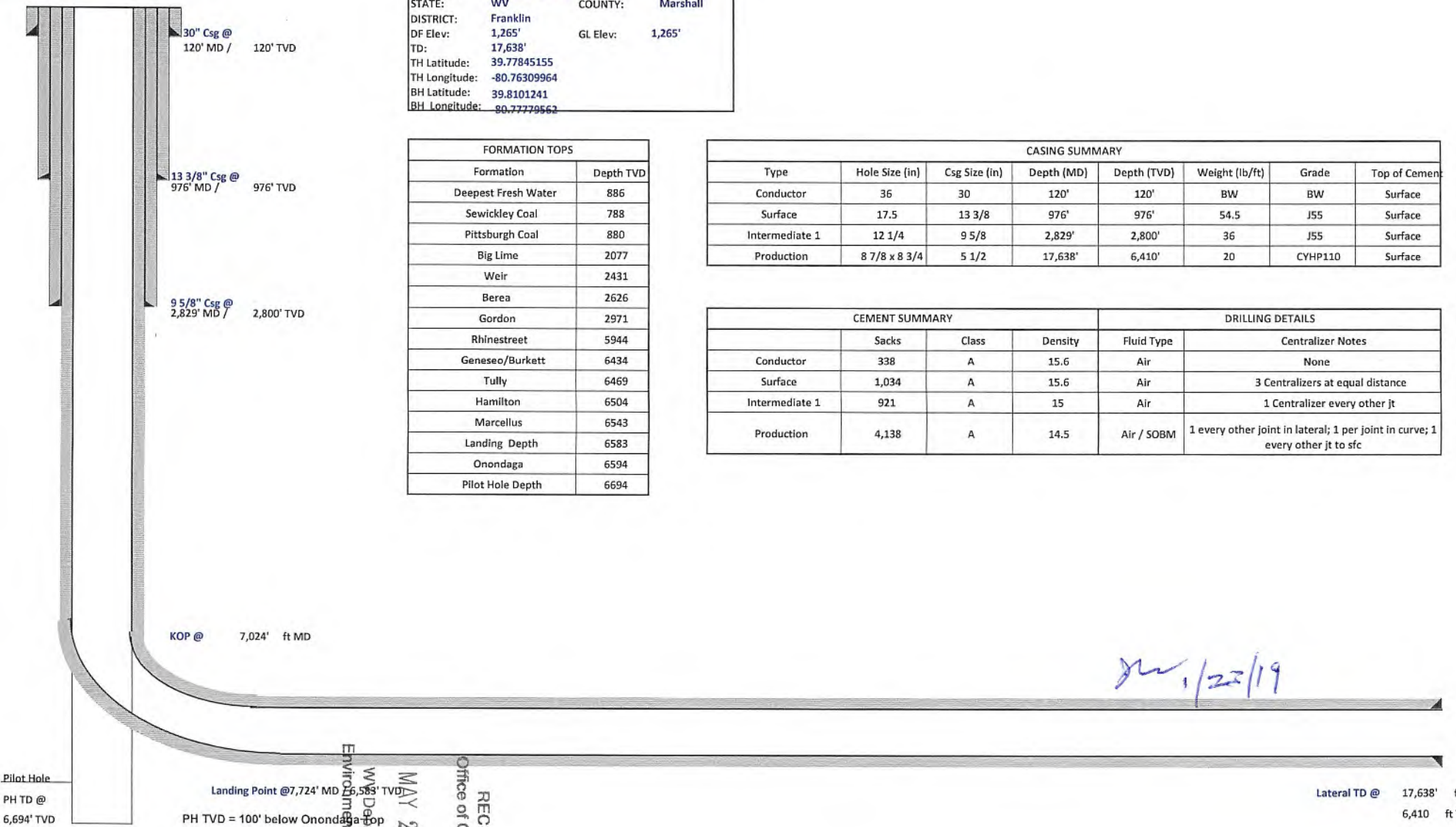
25) Proposed borehole conditioning procedures:

Will circulate a minimum of 3 hours at TD, short trip to curve, circulate bottoms up, check for flow, POOH.

*Note: Attach additional sheets as needed.

TUG HILL OPERATING

WELL NAME:	Old Crow N-4HM		
STATE:	WV	COUNTY:	Marshall
DISTRICT:	Franklin		
DF Elev:	1,265'	GL Elev:	1,265'
TD:	17,638'		
TH Latitude:	39.77845155		
TH Longitude:	-80.76309964		
BH Latitude:	39.8101241		
BH Longitude:	80.77779562		



FORMATION TOPS	
Formation	Depth TVD
Deepest Fresh Water	886
Sewickley Coal	788
Pittsburgh Coal	880
Big Lime	2077
Weir	2431
Berea	2626
Gordon	2971
Rhinestreet	5944
Geneseo/Burkett	6434
Tully	6469
Hamilton	6504
Marcellus	6543
Landing Depth	6583
Onondaga	6594
Pilot Hole Depth	6694

CASING SUMMARY							
Type	Hole Size (in)	Csg Size (in)	Depth (MD)	Depth (TVD)	Weight (lb/ft)	Grade	Top of Cement
Conductor	36	30	120'	120'	BW	BW	Surface
Surface	17.5	13 3/8	976'	976'	54.5	J55	Surface
Intermediate 1	12 1/4	9 5/8	2,829'	2,800'	36	J55	Surface
Production	8 7/8 x 8 3/4	5 1/2	17,638'	6,410'	20	CYHP110	Surface

CEMENT SUMMARY				DRILLING DETAILS	
	Sacks	Class	Density	Fluid Type	Centralizer Notes
Conductor	338	A	15.6	Air	None
Surface	1,034	A	15.6	Air	3 Centralizers at equal distance
Intermediate 1	921	A	15	Air	1 Centralizer every other jt
Production	4,138	A	14.5	Air / SOBM	1 every other joint in lateral; 1 per joint in curve; 1 every other jt to sfc

1/22/19

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TUG HILL OPERATING

Tug Hill Operating, LLC Casing and Cement Program

Old Crow N-4HM

Casing

	String	Grade	Bit Size	Depth (Measured)	Cement Fill Up
Conductor	30"	BW	36"	120'	CTS
Surface	13 3/8"	J55	17 1/2"	976'	CTS
Intermediate	9 5/8"	J55	12 1/4"	2,829'	CTS
Production	5 1/2"	CYHP110	8 7/8 x 8 3/4	17,638'	CTS

Cement

Conductor:	Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Conductor Cement mixed at 15.6 ppg, Y=1.2
Surface:	Premium NE-1 + 2% bwoc CaC12 + 46.5% Fresh Water – Surface Cement mixed at 15.6 ppg, Y=1.2
Intermediate:	Premium NE-1 + 1% bwoc CaC12 + 46.5% Fresh Water – Intermediate Cement mixed at 15.6 ppg, Y=1.19
Kick Off Plug:	Class H Cement + 1% CD-32 + .7% Sodium Metasilicate + .1% R-3 + .75 gal/100sk FP-13L - KOP Plug
Production:	50:50 Poz: Premium NE-1 + .1% bwoc ASA-301 + 60lb/sk ASCA-1 + .35% bwoc BA-10A + .25% bwoc MPA-170, 44 lb sack + .5% bwoc R-3 + .75 gals/100sk FP-13L – Production Cement mixed at 15.2ppg, Y = 1.19

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TUG HILL OPERATING

Well: Old Crow N-04 HM (slot N)
Site: Old Crow Pad
Project: Marshall County, West Virginia
Design: rev1

SECTION DETAILS

Sec	MD	Inc	Azi	TVD	+N/-S	+E/-W	Dleg	TFace	VSect	Annotation
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
2	1700.00	0.00	0.00	1700.00	0.00	0.00	0.00	0.00	0.00	KOP Begin 2°/100' build
3	3462.01	35.24	21.67	3353.00	487.91	193.83	2.00	21.67	393.16	Begin 35.24° tangent
4	7023.95	35.24	21.67	6262.18	2397.96	952.65	0.00	0.00	1932.28	Begin 10°/100' build/turn
5	7724.21	91.00	329.75	6583.00	2959.88	835.98	10.00	-56.86	2500.44	Begin 91.00° lateral section
6	17637.83	91.00	329.75	6410.00	11522.28	-4157.53	0.00	0.00	12249.41	PBHL/TD 17637.90 MD/6410.00 TVD

Geodetic System: Universal Transverse Mercator (US Survey Feet)
Datum: NAD83 West Virginia - HARN
Ellipsoid: GRS 1980
Zone: Zone 17N (84 W to 78 W)

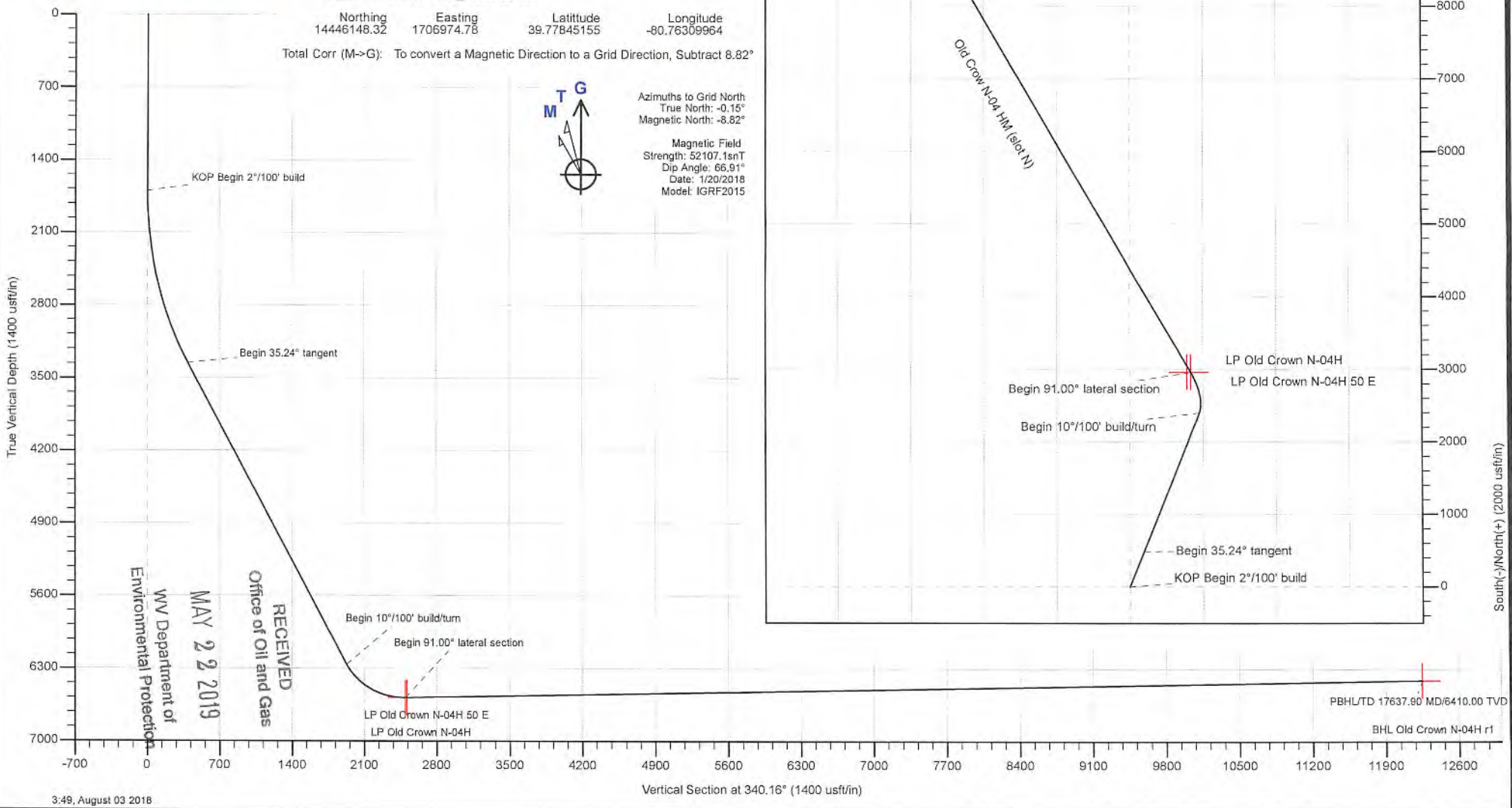
System Datum: Mean Sea Level
Depth Reference: GL @ 1265.00usft

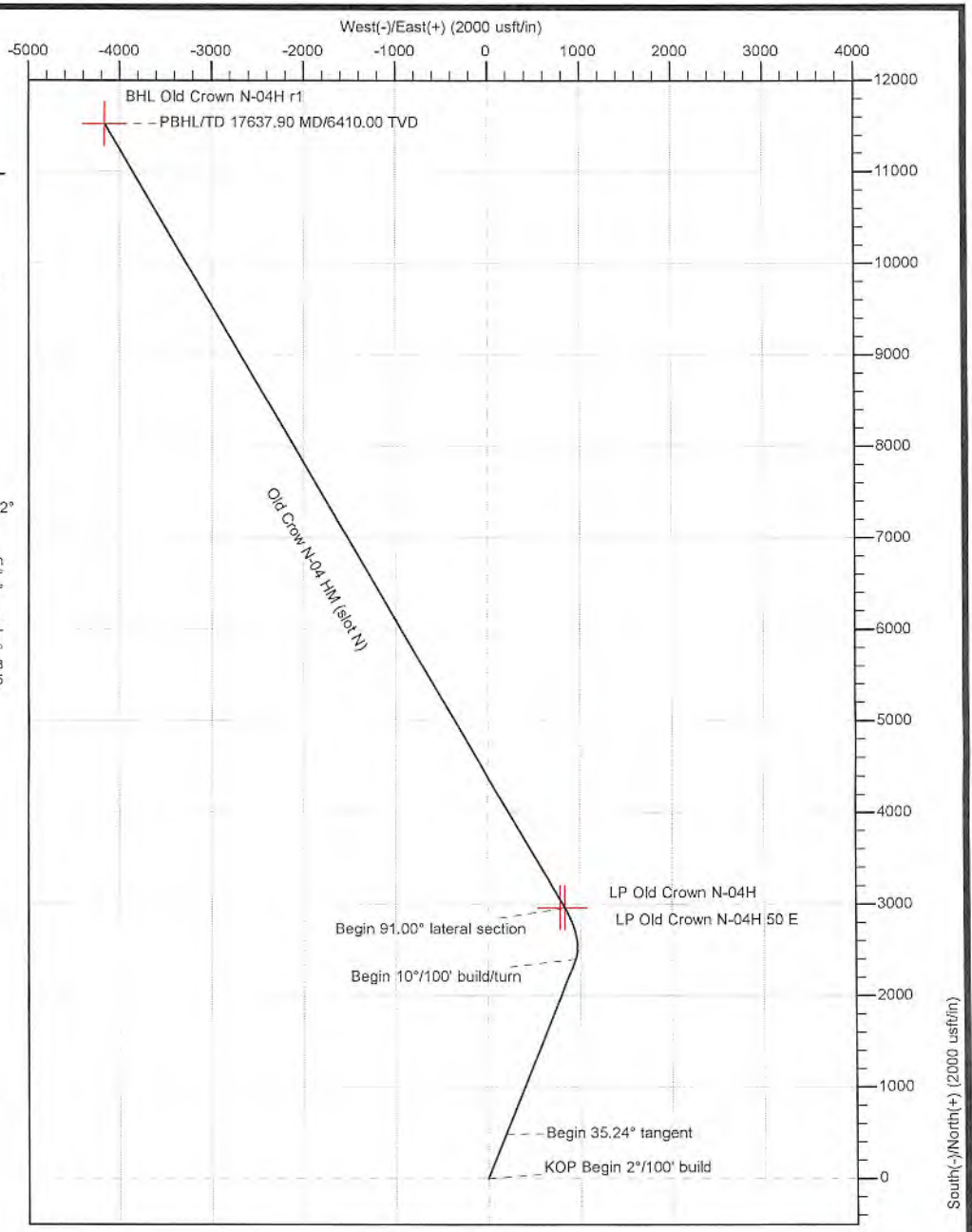
Northing	Easting	Latittude	Longitude
14446148.32	1706974.78	39.77845155	-80.76309964

Total Corr (M->G): To convert a Magnetic Direction to a Grid Direction, Subtract 8.82°

Azimuths to Grid North
True North: -0.15°
Magnetic North: -8.82°

Magnetic Field
Strength: 52107.1snT
Dip Angle: 66.91°
Date: 1/20/2018
Model: IGRF2015





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3:49, August 03 2018

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TUG HILL OPERATING

Planning Report - Geographic

4705102227

Database:	DB_Aug0116_LT_v14	**Local Co-ordinate Reference:**	Well Old Crow N-04 HM (slot N)
Company:	Tug Hill Operating LLC	**TVD Reference:**	GL @ 1265.00usft
Project:	Marshall County, West Virginia	**MD Reference:**	GL @ 1265.00usft
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-04 HM (slot N)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Project Marshall County, West Virginia

Map System:	Universal Transverse Mercator (US Survey Feet)	**System Datum:**	Mean Sea Level
Geo Datum:	NAD83 West Virginia - HARN		
Map Zone:	Zone 17N (84 W to 78 W)		

Site Old Crow Pad

Site Position:		**Northing:**	14,446,179.89 usft	**Latitude:**	39.77853828
From:	Lat/Long	**Easting:**	1,706,970.33 usft	**Longitude:**	-80.76311519
Position Uncertainty:	0.00 usft	**Slot Radius:**	13-3/16 "	**Grid Convergence:**	0.15 °

Well Old Crow N-04 HM (slot N)

Well Position	**+N/-S**	0.00 usft	**Northing:**	14,446,148.32 usft	**Latitude:**	39.77845155
	+E/-W	0.00 usft	**Easting:**	1,706,974.78 usft	**Longitude:**	-80.76309964
Position Uncertainty		0.00 usft	**Wellhead Elevation:**		**Ground Level:**	1,265.00 usft

Wellbore Original Hole

Magnetics	**Model Name**	**Sample Date**	**Declination (°)**	**Dip Angle (°)**	**Field Strength (nT)**
	IGRF2015	1/20/2018	-8.67	66.91	52,107.06680126

Design rev1

Audit Notes:

Version:		**Phase:**	PLAN	**Tie On Depth:**	0.00

Vertical Section:	**Depth From (TVD) (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Direction (°)**
	0.00	0.00	0.00	340.16

Plan Survey Tool Program **Date** 8/3/2018

	Depth From (usft)	**Depth To (usft)**	**Survey (Wellbore)**	**Tool Name**	**Remarks**
1	0.00	17,637.83	rev1 (Original Hole)	MWD MWD - Standard	

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Plan Sections

Measured Depth (usft)	**Inclination (°)**	**Azimuth (°)**	**Vertical Depth (usft)**	**+N/-S (usft)**	**+E/-W (usft)**	**Dogleg Rate (°/100usft)**	**Build Rate (°/100usft)**	**Turn Rate (°/100usft)**	**TFO (°)**	**Target**
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
1,700.00	0.00	0.00	1,700.00	0.00	0.00	0.00	0.00	0.00	0.00	
3,462.01	35.24	21.67	3,353.00	487.91	193.83	2.00	2.00	0.00	21.67	
7,023.95	35.24	21.67	6,262.18	2,397.96	952.65	0.00	0.00	0.00	0.00	
7,724.21	91.00	329.75	6,583.00	2,959.88	835.98	10.00	7.96	-7.41	-56.86	LP Old Crown N-04H
17,637.83	91.00	329.75	6,410.00	11,522.28	-4,157.53	0.00	0.00	0.00	0.00	BHL Old Crown N-04H

4705102227

TUG HILL OPERATING

Planning Report - Geographic

Database:	DB_Aug0116_LT_v14	**Local Co-ordinate Reference:**	Well Old Crow N-04 HM (slot N)
Company:	Tug Hill Operating LLC	**TVD Reference:**	GL @ 1265.00usft
Project:	Marshall County, West Virginia	**MD Reference:**	GL @ 1265.00usft
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-04 HM (slot N)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
0.00	0.00	0.00	0.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
100.00	0.00	0.00	100.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
200.00	0.00	0.00	200.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
300.00	0.00	0.00	300.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
400.00	0.00	0.00	400.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
500.00	0.00	0.00	500.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
600.00	0.00	0.00	600.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
700.00	0.00	0.00	700.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
800.00	0.00	0.00	800.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
900.00	0.00	0.00	900.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,000.00	0.00	0.00	1,000.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,100.00	0.00	0.00	1,100.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,200.00	0.00	0.00	1,200.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,300.00	0.00	0.00	1,300.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,400.00	0.00	0.00	1,400.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,500.00	0.00	0.00	1,500.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,600.00	0.00	0.00	1,600.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
1,700.00	0.00	0.00	1,700.00	0.00	0.00	14,446,148.32	1,706,974.78	39.77845155	-80.76309964
KOP Begin 2°/100' build									
1,800.00	2.00	21.67	1,799.98	1.62	0.64	14,446,149.94	1,706,975.43	39.77845600	-80.76309733
1,900.00	4.00	21.67	1,899.83	6.49	2.58	14,446,154.80	1,706,977.36	39.77846934	-80.76309041
2,000.00	6.00	21.67	1,999.45	14.58	5.79	14,446,162.90	1,706,980.58	39.77849156	-80.76307888
2,100.00	8.00	21.67	2,098.70	25.91	10.29	14,446,174.23	1,706,985.08	39.77852263	-80.76306276
2,200.00	10.00	21.67	2,197.46	40.45	16.07	14,446,188.77	1,706,990.85	39.77856251	-80.76304207
2,300.00	12.00	21.67	2,295.62	58.18	23.11	14,446,206.50	1,706,997.90	39.77861116	-80.76301683
2,400.00	14.00	21.67	2,393.05	79.08	31.42	14,446,227.40	1,707,006.20	39.77866851	-80.76298707
2,500.00	16.00	21.67	2,489.64	103.13	40.97	14,446,251.45	1,707,015.76	39.77873449	-80.76295284
2,599.99	18.00	21.67	2,585.26	130.30	51.77	14,446,278.62	1,707,026.55	39.77880903	-80.76291416
2,699.99	20.00	21.67	2,679.81	160.56	63.79	14,446,308.88	1,707,038.57	39.77889203	-80.76287109
2,799.99	22.00	21.67	2,773.16	193.86	77.02	14,446,342.18	1,707,051.80	39.77898339	-80.76282369
2,899.99	24.00	21.67	2,865.21	230.17	91.44	14,446,378.49	1,707,066.22	39.77908301	-80.76277200
2,999.99	26.00	21.67	2,955.84	269.45	107.04	14,446,417.77	1,707,081.83	39.77919075	-80.76271610
3,099.99	28.00	21.67	3,044.93	311.64	123.80	14,446,459.95	1,707,098.59	39.77930649	-80.76265605
3,199.99	30.00	21.67	3,132.39	356.69	141.70	14,446,505.01	1,707,116.49	39.77943009	-80.76259191
3,299.99	32.00	21.67	3,218.10	404.55	160.72	14,446,552.87	1,707,135.50	39.77956139	-80.76252378
3,399.99	34.00	21.67	3,301.96	455.16	180.83	14,446,603.48	1,707,155.61	39.77970024	-80.76245174
3,462.01	35.24	21.67	3,353.00	487.91	193.83	14,446,636.23	1,707,168.62	39.77979007	-80.76240513
Begin 35.24° tangent									
3,499.99	35.24	21.67	3,384.02	508.28	201.93	14,446,656.59	1,707,176.71	39.77984595	-80.76237613
3,599.99	35.24	21.67	3,465.70	561.90	223.23	14,446,710.22	1,707,198.01	39.77999306	-80.76229980
3,699.99	35.24	21.67	3,547.37	615.52	244.53	14,446,763.84	1,707,219.31	39.78014017	-80.76222347
3,799.99	35.24	21.67	3,629.04	669.15	265.84	14,446,817.47	1,707,240.62	39.78028728	-80.76214713
3,899.99	35.24	21.67	3,710.72	722.77	287.14	14,446,871.09	1,707,261.92	39.78043439	-80.76207080
3,999.99	35.24	21.67	3,792.39	776.40	308.44	14,446,924.71	1,707,283.22	39.78058150	-80.76199447
4,099.99	35.24	21.67	3,874.06	830.02	329.75	14,446,978.34	1,707,304.53	39.78072861	-80.76191813
4,199.99	35.24	21.67	3,955.74	883.64	351.05	14,447,031.96	1,707,325.83	39.78087572	-80.76184180
4,299.99	35.24	21.67	4,037.41	937.27	372.35	14,447,085.59	1,707,347.13	39.78102283	-80.76176546
4,399.99	35.24	21.67	4,119.09	990.89	393.66	14,447,139.21	1,707,368.44	39.78116994	-80.76168913
4,499.99	35.24	21.67	4,200.76	1,044.51	414.96	14,447,192.83	1,707,389.74	39.78131705	-80.76161279
4,599.99	35.24	21.67	4,282.43	1,098.14	436.26	14,447,246.46	1,707,411.05	39.78146416	-80.76153646
4,699.99	35.24	21.67	4,364.11	1,151.76	457.57	14,447,300.08	1,707,432.35	39.78161127	-80.76146012
4,799.99	35.24	21.67	4,445.78	1,205.39	478.87	14,447,353.70	1,707,453.65	39.78175838	-80.76138378
4,899.99	35.24	21.67	4,527.45	1,259.01	500.17	14,447,407.33	1,707,474.96	39.78190549	-80.76130745
4,999.99	35.24	21.67	4,609.13	1,312.63	521.48	14,447,460.95	1,707,496.26	39.78205260	-80.76123111

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Database:	DB_Aug0116_LT_v14	**Local Co-ordinate Reference:**	Well Old Crow N-04 HM (slot N)
Company:	Tug Hill Operating LLC	**TVD Reference:**	GL @ 1265.00usft
Project:	Marshall County, West Virginia	**MD Reference:**	GL @ 1265.00usft
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-04 HM (slot N)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
5,099.99	35.24	21.67	4,690.80	1,366.26	542.78	14,447,514.58	1,707,517.56	39.78219971	-80.76115477
5,199.99	35.24	21.67	4,772.48	1,419.88	564.08	14,447,568.20	1,707,538.87	39.78234682	-80.76107843
5,299.99	35.24	21.67	4,854.15	1,473.50	585.39	14,447,621.82	1,707,560.17	39.78249393	-80.76100209
5,399.99	35.24	21.67	4,935.82	1,527.13	606.69	14,447,675.45	1,707,581.47	39.78264104	-80.76092576
5,499.99	35.24	21.67	5,017.50	1,580.75	627.99	14,447,729.07	1,707,602.78	39.78278815	-80.76084942
5,599.99	35.24	21.67	5,099.17	1,634.38	649.30	14,447,782.70	1,707,624.08	39.78293526	-80.76077308
5,699.99	35.24	21.67	5,180.85	1,688.00	670.60	14,447,836.32	1,707,645.38	39.78308237	-80.76069674
5,799.99	35.24	21.67	5,262.52	1,741.62	691.90	14,447,889.94	1,707,666.69	39.78322947	-80.76062040
5,899.99	35.24	21.67	5,344.19	1,795.25	713.21	14,447,943.57	1,707,687.99	39.78337658	-80.76054406
5,999.99	35.24	21.67	5,425.87	1,848.87	734.51	14,447,997.19	1,707,709.29	39.78352369	-80.76046772
6,099.99	35.24	21.67	5,507.54	1,902.50	755.81	14,448,050.81	1,707,730.60	39.78367080	-80.76039138
6,199.99	35.24	21.67	5,589.21	1,956.12	777.12	14,448,104.44	1,707,751.90	39.78381791	-80.76031504
6,299.99	35.24	21.67	5,670.89	2,009.74	798.42	14,448,158.06	1,707,773.20	39.78396502	-80.76023869
6,399.99	35.24	21.67	5,752.56	2,063.37	819.72	14,448,211.69	1,707,794.51	39.78411213	-80.76016235
6,499.99	35.24	21.67	5,834.24	2,116.99	841.03	14,448,265.31	1,707,815.81	39.78425924	-80.76008601
6,599.99	35.24	21.67	5,915.91	2,170.61	862.33	14,448,318.93	1,707,837.11	39.78440635	-80.76000967
6,699.99	35.24	21.67	5,997.58	2,224.24	883.63	14,448,372.56	1,707,858.42	39.78455346	-80.75993332
6,799.99	35.24	21.67	6,079.26	2,277.86	904.94	14,448,426.18	1,707,879.72	39.78470056	-80.75985698
6,899.99	35.24	21.67	6,160.93	2,331.49	926.24	14,448,479.81	1,707,901.02	39.78484767	-80.75978064
6,999.99	35.24	21.67	6,242.60	2,385.11	947.54	14,448,533.43	1,707,922.33	39.78499478	-80.75970429
7,023.95	35.24	21.67	6,262.18	2,397.96	952.65	14,448,546.28	1,707,927.43	39.78503004	-80.75968600
Begin 10°/100' build/turn									
7,099.99	39.84	11.71	6,322.51	2,442.26	965.71	14,448,590.58	1,707,940.49	39.78515160	-80.75963908
7,199.99	46.91	1.38	6,395.24	2,510.31	973.11	14,448,658.63	1,707,947.89	39.78533842	-80.75961210
7,299.99	54.72	353.29	6,458.44	2,587.54	969.20	14,448,735.86	1,707,943.99	39.78555056	-80.75962526
7,399.99	62.96	346.66	6,510.18	2,671.63	954.12	14,448,819.94	1,707,928.90	39.78578158	-80.75967815
7,499.99	71.47	340.96	6,548.89	2,760.00	928.31	14,448,908.32	1,707,903.10	39.78602447	-80.75976917
7,599.98	80.14	335.81	6,573.41	2,849.98	892.57	14,448,998.29	1,707,867.35	39.78627183	-80.75989555
7,699.98	88.88	330.92	6,582.97	2,938.82	847.97	14,449,087.14	1,707,822.75	39.78651616	-80.76005345
7,724.21	91.00	329.75	6,583.00	2,959.88	835.98	14,449,108.19	1,707,810.76	39.78657406	-80.76009594
Begin 91.00° lateral section									
7,799.98	91.00	329.75	6,581.68	3,025.32	797.81	14,449,173.64	1,707,772.60	39.78675407	-80.76023117
7,899.98	91.00	329.75	6,579.93	3,111.69	747.44	14,449,260.01	1,707,722.23	39.78699164	-80.76040965
7,999.98	91.00	329.75	6,578.19	3,198.06	697.07	14,449,346.38	1,707,671.86	39.78722920	-80.76058813
8,099.98	91.00	329.75	6,576.44	3,284.43	646.70	14,449,432.75	1,707,621.49	39.78746677	-80.76076661
8,199.98	91.00	329.75	6,574.70	3,370.80	596.33	14,449,519.12	1,707,571.12	39.78770433	-80.76094510
8,299.98	91.00	329.75	6,572.95	3,457.17	545.96	14,449,605.49	1,707,520.75	39.78794190	-80.76112358
8,399.98	91.00	329.75	6,571.21	3,543.54	495.59	14,449,691.86	1,707,470.38	39.78817946	-80.76130207
8,499.98	91.00	329.75	6,569.46	3,629.91	445.22	14,449,778.23	1,707,420.01	39.78841702	-80.76148055
8,599.98	91.00	329.75	6,567.72	3,716.28	394.85	14,449,864.60	1,707,369.64	39.78865459	-80.76165904
8,699.98	91.00	329.75	6,565.97	3,802.65	344.48	14,449,950.97	1,707,319.27	39.78889215	-80.76183753
8,799.98	91.00	329.75	6,564.23	3,889.02	294.11	14,450,037.34	1,707,268.90	39.78912971	-80.76201602
8,899.98	91.00	329.75	6,562.48	3,975.39	243.74	14,450,123.71	1,707,218.53	39.78936728	-80.76219451
8,999.98	91.00	329.75	6,560.74	4,061.76	193.37	14,450,210.08	1,707,168.16	39.78960484	-80.76237301
9,099.98	91.00	329.75	6,558.99	4,148.13	143.00	14,450,296.45	1,707,117.79	39.78984240	-80.76255150
9,199.98	91.00	329.75	6,557.25	4,234.50	92.63	14,450,382.82	1,707,067.42	39.79007996	-80.76273000
9,299.98	91.00	329.75	6,555.50	4,320.87	42.26	14,450,469.19	1,707,017.05	39.79031753	-80.76290849
9,399.98	91.00	329.75	6,553.76	4,407.24	-8.11	14,450,555.56	1,706,966.68	39.79055509	-80.76308699
9,499.98	91.00	329.75	6,552.01	4,493.61	-58.48	14,450,641.93	1,706,916.30	39.79079265	-80.76326549
9,599.98	91.00	329.75	6,550.27	4,579.98	-108.85	14,450,728.30	1,706,865.93	39.79103021	-80.76344399
9,699.98	91.00	329.75	6,548.52	4,666.35	-159.22	14,450,814.67	1,706,815.56	39.79126777	-80.76362249
9,799.98	91.00	329.75	6,546.78	4,752.72	-209.59	14,450,901.04	1,706,765.19	39.79150533	-80.76380100
9,899.98	91.00	329.75	6,545.03	4,839.09	-259.96	14,450,987.41	1,706,714.82	39.79174289	-80.76397950
9,999.98	91.00	329.75	6,543.29	4,925.46	-310.33	14,451,073.78	1,706,664.45	39.79198045	-80.76415801

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Database:	DB_Aug0116_LT_v14	**Local Co-ordinate Reference:**	Well Old Crow N-04 HM (slot N)
Company:	Tug Hill Operating LLC	**TVD Reference:**	GL @ 1265.00usft
Project:	Marshall County, West Virginia	**MD Reference:**	GL @ 1265.00usft
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-04 HM (slot N)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
10,099.98	91.00	329.75	6,541.54	5,011.83	-360.70	14,451,160.15	1,706,614.08	39.79221801	-80.76433651
10,199.98	91.00	329.75	6,539.80	5,098.20	-411.07	14,451,246.52	1,706,563.71	39.79245557	-80.76451502
10,299.98	91.00	329.75	6,538.05	5,184.57	-461.44	14,451,332.89	1,706,513.34	39.79269313	-80.76469353
10,399.98	91.00	329.75	6,536.31	5,270.94	-511.81	14,451,419.26	1,706,462.97	39.79293069	-80.76487204
10,499.98	91.00	329.75	6,534.56	5,357.31	-562.18	14,451,505.63	1,706,412.60	39.79316824	-80.76505055
10,599.98	91.00	329.75	6,532.82	5,443.68	-612.55	14,451,592.00	1,706,362.23	39.79340580	-80.76522906
10,699.98	91.00	329.75	6,531.07	5,530.05	-662.92	14,451,678.37	1,706,311.86	39.79364336	-80.76540758
10,799.98	91.00	329.75	6,529.33	5,616.42	-713.29	14,451,764.74	1,706,261.49	39.79388092	-80.76558609
10,899.98	91.00	329.75	6,527.58	5,702.79	-763.66	14,451,851.11	1,706,211.12	39.79411847	-80.76576461
10,999.98	91.00	329.75	6,525.84	5,789.16	-814.03	14,451,937.48	1,706,160.75	39.79435603	-80.76594313
11,099.98	91.00	329.75	6,524.09	5,875.53	-864.40	14,452,023.85	1,706,110.38	39.79459359	-80.76612165
11,199.98	91.00	329.75	6,522.35	5,961.90	-914.77	14,452,110.22	1,706,060.01	39.79483114	-80.76630017
11,299.98	91.00	329.75	6,520.60	6,048.27	-965.14	14,452,196.59	1,706,009.64	39.79506870	-80.76647869
11,399.98	91.00	329.75	6,518.86	6,134.64	-1,015.51	14,452,282.96	1,705,959.27	39.79530626	-80.76665721
11,499.98	91.00	329.75	6,517.11	6,221.01	-1,065.88	14,452,369.33	1,705,908.90	39.79554381	-80.76683573
11,599.98	91.00	329.75	6,515.37	6,307.38	-1,116.25	14,452,455.70	1,705,858.53	39.79578137	-80.76701426
11,699.98	91.00	329.75	6,513.62	6,393.75	-1,166.62	14,452,542.07	1,705,808.16	39.79601892	-80.76719278
11,799.98	91.00	329.75	6,511.88	6,480.12	-1,216.99	14,452,628.44	1,705,757.79	39.79625648	-80.76737131
11,899.98	91.00	329.75	6,510.13	6,566.49	-1,267.36	14,452,714.81	1,705,707.42	39.79649403	-80.76754984
11,999.98	91.00	329.75	6,508.39	6,652.86	-1,317.73	14,452,801.18	1,705,657.05	39.79673158	-80.76772837
12,099.98	91.00	329.75	6,506.64	6,739.23	-1,368.10	14,452,887.55	1,705,606.68	39.79696914	-80.76790690
12,199.98	91.00	329.75	6,504.90	6,825.60	-1,418.47	14,452,973.92	1,705,556.31	39.79720669	-80.76808543
12,299.98	91.00	329.75	6,503.15	6,911.97	-1,468.84	14,453,060.29	1,705,505.94	39.79744424	-80.76826397
12,399.98	91.00	329.75	6,501.41	6,998.34	-1,519.21	14,453,146.66	1,705,455.57	39.79768180	-80.76844250
12,499.98	91.00	329.75	6,499.66	7,084.71	-1,569.58	14,453,233.03	1,705,405.20	39.79791935	-80.76862104
12,599.98	91.00	329.75	6,497.92	7,171.08	-1,619.95	14,453,319.40	1,705,354.83	39.79815690	-80.76879958
12,699.97	91.00	329.75	6,496.17	7,257.45	-1,670.32	14,453,405.77	1,705,304.46	39.79839445	-80.76897811
12,799.97	91.00	329.75	6,494.42	7,343.82	-1,720.69	14,453,492.14	1,705,254.09	39.79863201	-80.76915665
12,899.97	91.00	329.75	6,492.68	7,430.19	-1,771.06	14,453,578.51	1,705,203.72	39.79886956	-80.76933519
12,999.97	91.00	329.75	6,490.93	7,516.56	-1,821.43	14,453,664.88	1,705,153.35	39.79910711	-80.76951374
13,099.97	91.00	329.75	6,489.19	7,602.93	-1,871.80	14,453,751.25	1,705,102.98	39.79934466	-80.76969228
13,199.97	91.00	329.75	6,487.44	7,689.30	-1,922.17	14,453,837.62	1,705,052.61	39.79958221	-80.76987082
13,299.97	91.00	329.75	6,485.70	7,775.67	-1,972.54	14,453,923.99	1,705,002.24	39.79981976	-80.77004937
13,399.97	91.00	329.75	6,483.95	7,862.04	-2,022.91	14,454,010.36	1,704,951.87	39.80005731	-80.77022792
13,499.97	91.00	329.75	6,482.21	7,948.41	-2,073.28	14,454,096.73	1,704,901.50	39.80029486	-80.77040647
13,599.97	91.00	329.75	6,480.46	8,034.78	-2,123.65	14,454,183.10	1,704,851.13	39.80053241	-80.77058502
13,699.97	91.00	329.75	6,478.72	8,121.15	-2,174.02	14,454,269.47	1,704,800.76	39.80076996	-80.77076357
13,799.97	91.00	329.75	6,476.97	8,207.52	-2,224.39	14,454,355.84	1,704,750.39	39.80100751	-80.77094212
13,899.97	91.00	329.75	6,475.23	8,293.89	-2,274.76	14,454,442.21	1,704,700.02	39.80124506	-80.77112067
13,999.97	91.00	329.75	6,473.48	8,380.26	-2,325.13	14,454,528.58	1,704,649.65	39.80148261	-80.77129923
14,099.97	91.00	329.75	6,471.74	8,466.63	-2,375.50	14,454,614.95	1,704,599.28	39.80172015	-80.77147778
14,199.97	91.00	329.75	6,469.99	8,553.00	-2,425.87	14,454,701.32	1,704,548.91	39.80195770	-80.77165634
14,299.97	91.00	329.75	6,468.25	8,639.37	-2,476.24	14,454,787.69	1,704,498.54	39.80219525	-80.77183490
14,399.97	91.00	329.75	6,466.50	8,725.74	-2,526.61	14,454,874.06	1,704,448.17	39.80243280	-80.77201346
14,499.97	91.00	329.75	6,464.76	8,812.11	-2,576.98	14,454,960.43	1,704,397.80	39.80267034	-80.77219202
14,599.97	91.00	329.75	6,463.01	8,898.48	-2,627.35	14,455,046.80	1,704,347.43	39.80290789	-80.77237058
14,699.97	91.00	329.75	6,461.27	8,984.85	-2,677.72	14,455,133.17	1,704,297.06	39.80314544	-80.77254914
14,799.97	91.00	329.75	6,459.52	9,071.22	-2,728.09	14,455,219.54	1,704,246.69	39.80338298	-80.77272770
14,899.97	91.00	329.75	6,457.78	9,157.59	-2,778.46	14,455,305.91	1,704,196.32	39.80362053	-80.77290627
14,999.97	91.00	329.75	6,456.03	9,243.96	-2,828.83	14,455,392.28	1,704,145.95	39.80385808	-80.77308484
15,099.97	91.00	329.75	6,454.29	9,330.33	-2,879.20	14,455,478.64	1,704,095.58	39.80409562	-80.77326340
15,199.97	91.00	329.75	6,452.54	9,416.70	-2,929.57	14,455,565.01	1,704,045.21	39.80433317	-80.77344197
15,299.97	91.00	329.75	6,450.80	9,503.07	-2,979.94	14,455,651.38	1,703,994.84	39.80457071	-80.77362054
15,399.97	91.00	329.75	6,449.05	9,589.44	-3,030.31	14,455,737.75	1,703,944.47	39.80480825	-80.77379912
15,499.97	91.00	329.75	6,447.31	9,675.81	-3,080.68	14,455,824.12	1,703,894.10	39.80504580	-80.77397769

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Database:	DB_Aug0116_LT_v14	**Local Co-ordinate Reference:**	Well Old Crow N-04 HM (slot N)
Company:	Tug Hill Operating LLC	**TVD Reference:**	GL @ 1265.00usft
Project:	Marshall County, West Virginia	**MD Reference:**	GL @ 1265.00usft
Site:	Old Crow Pad	**North Reference:**	Grid
Well:	Old Crow N-04 HM (slot N)	**Survey Calculation Method:**	Minimum Curvature
Wellbore:	Original Hole		
Design:	rev1		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Map Northing (usft)	Map Easting (usft)	Latitude	Longitude
15,599.97	91.00	329.75	6,445.56	9,762.18	-3,131.05	14,455,910.49	1,703,843.73	39.80528334	-80.77415626
15,699.97	91.00	329.75	6,443.82	9,848.55	-3,181.42	14,455,996.86	1,703,793.36	39.80552089	-80.77433484
15,799.97	91.00	329.75	6,442.07	9,934.92	-3,231.79	14,456,083.23	1,703,742.99	39.80575843	-80.77451341
15,899.97	91.00	329.75	6,440.33	10,021.29	-3,282.16	14,456,169.60	1,703,692.62	39.80599597	-80.77469199
15,999.97	91.00	329.75	6,438.58	10,107.66	-3,332.53	14,456,255.97	1,703,642.25	39.80623352	-80.77487057
16,099.97	91.00	329.75	6,436.84	10,194.03	-3,382.90	14,456,342.34	1,703,591.88	39.80647106	-80.77504915
16,199.97	91.00	329.75	6,435.09	10,280.40	-3,433.27	14,456,428.71	1,703,541.51	39.80670860	-80.77522773
16,299.97	91.00	329.75	6,433.35	10,366.77	-3,483.64	14,456,515.08	1,703,491.14	39.80694614	-80.77540631
16,399.97	91.00	329.75	6,431.60	10,453.14	-3,534.01	14,456,601.45	1,703,440.77	39.80718368	-80.77558490
16,499.97	91.00	329.75	6,429.86	10,539.51	-3,584.38	14,456,687.82	1,703,390.40	39.80742123	-80.77576348
16,599.97	91.00	329.75	6,428.11	10,625.88	-3,634.75	14,456,774.19	1,703,340.03	39.80765877	-80.77594207
16,699.97	91.00	329.75	6,426.37	10,712.25	-3,685.12	14,456,860.56	1,703,289.66	39.80789631	-80.77612066
16,799.97	91.00	329.75	6,424.62	10,798.62	-3,735.49	14,456,946.93	1,703,239.29	39.80813385	-80.77629925
16,899.97	91.00	329.75	6,422.88	10,884.99	-3,785.86	14,457,033.30	1,703,188.92	39.80837139	-80.77647784
16,999.97	91.00	329.75	6,421.13	10,971.36	-3,836.23	14,457,119.67	1,703,138.55	39.80860893	-80.77665643
17,099.97	91.00	329.75	6,419.39	11,057.72	-3,886.60	14,457,206.04	1,703,088.18	39.80884647	-80.77683502
17,199.97	91.00	329.75	6,417.64	11,144.09	-3,936.97	14,457,292.41	1,703,037.81	39.80908401	-80.77701361
17,299.97	91.00	329.75	6,415.90	11,230.46	-3,987.34	14,457,378.78	1,702,987.44	39.80932155	-80.77719221
17,399.97	91.00	329.75	6,414.15	11,316.83	-4,037.71	14,457,465.15	1,702,937.07	39.80955909	-80.77737080
17,499.97	91.00	329.75	6,412.41	11,403.20	-4,088.08	14,457,551.52	1,702,886.70	39.80979662	-80.77754940
17,599.97	91.00	329.75	6,410.66	11,489.57	-4,138.45	14,457,637.89	1,702,836.33	39.81003416	-80.77772800
17,637.83	91.00	329.75	6,410.00	11,522.28	-4,157.53	14,457,670.60	1,702,817.26	39.81012411	-80.77779563

PBHL/TD 17637.90 MD/6410.00 TVD

Design Targets

Target Name - hit/miss target - Shape	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
BHL Old Crown N-04H r	0.00	0.00	6,410.00	11,522.24	-4,157.63	14,457,670.56	1,702,817.15	39.81012400	-80.77779600
- plan misses target center by 0.11usft at 17637.83usft MD (6410.00 TVD, 11522.28 N, -4157.53 E)									
- Point									
LP Old Crown N-04H 50	0.00	0.00	6,583.00	2,959.88	835.98	14,449,108.19	1,707,810.76	39.78657406	-80.76009594
- plan hits target center									
- Point									
LP Old Crown N-04H	0.00	0.00	6,583.00	2,959.88	785.98	14,449,108.19	1,707,760.76	39.78657443	-80.76027393
- plan misses target center by 43.20usft at 7749.40usft MD (6582.56 TVD, 2981.63 N, 823.29 E)									
- Point									

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Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates +N/-S (usft)	Local Coordinates +E/-W (usft)	Comment
1,700.00	1,700.00	0.00	0.00	KOP Begin 2°/100' build
3,462.01	3,353.00	487.91	193.83	Begin 35.24° tangent
7,023.95	6,262.18	2,397.96	952.65	Begin 10°/100' build/turn
7,724.21	6,583.00	2,959.88	835.98	Begin 91.00° lateral section
17,637.83	6,410.00	11,522.28	-4,157.53	PBHL/TD 17637.90 MD/6410.00 TVD

Area of Review

Sources of information to Support 35CSR8 - 5.11: 9.3 et seq.

Description of process to identify potential pathways for well communication during hydraulic fracturing activities.

Data Sources Reviewed:

1. IHS Well Data service: Public nationwide data service that pulls directly from State agency Oil and Gas databases

2. Farm Maps

3. Topo Maps: Recent and older (contact WVGES)

4. Check with DPS

Contacted Devin Ducoeur 724-705-0444, dducoeur@dpslandservices.com DPS GIS (12/10/2018) to have him make maps of the wellbores with his information. DPS utilizes WVGES maps for their mapping seems it as the best publicly available. See attached map he provided.

Request maps for:

1. Wellbore with IHS All Wells Layer

2. Map with Farm lines overlain and any well spots identified on Farm Maps

3. More recent (1970s vintage) topos and older topos

Discussion with Phil Dinterman WVGES GIS Department (7/15/2016)

- WVGES has plotted every well spot they have access to and are aware of with that contains a coordinate. 30000, 70000, and 90000 series wells are available via the WVGES online map. Some locations aren't great due to vintage and manipulation of maps through time
- 30000 series – any well drilled prior to 1929 – APIs were not assigned to original wells
- 70000 series – Well spots pulled from old Farm line maps that the WVGES has access to
- 90000 series – Any sources that the WVGES has access that shows a well spot but has no additional supporting information. DEP does not have 90000 series on their maps.
- There can be duplication between wells in the 3 series
- Phil indicated that other Operators are providing a screenshot of the WVGES map with their planned well and using that for permits

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Permit well - Old Crow N-4HM
Wells within 500' Buffer
Note: Well spots depicted on Area of Review map (page 3) are derived from State held coordinates. The spots may differ from those depicted on the Well Plat because the Plat locations represent actual field surveyed locations. Please refer to the Plat for surveyed well spots

API Number	Operator Name	Total Depth	Perforated Fms	Producing zones not perforated	Is this well "known or reasonably expected to penetrate a depth that could be within the range of Fracture propagation"? 1000' is max limit I would assign to wells that might be within in range of fracture propagation	Comments
4705102040	Tug Hill Operating	6689' TVD	None	None	No, existing Marcellus permit. Proper casing and cement should prevent migration of fluids from new wellbore to existing wellbore	Currently a permit.
4705102023	Tug Hill Operating	6681' TVD	None	None	No, existing Marcellus permit. Proper casing and cement should prevent migration of fluids from new wellbore to existing wellbore	Currently a permit.
4705102042	Tug Hill Operating	6693' TVD	None	None	No, existing Marcellus permit. Proper casing and cement should prevent migration of fluids from new wellbore to existing wellbore	Currently a permit.
4705102043	Tug Hill Operating	6699' TVD	None	None	No, existing Marcellus permit. Proper casing and cement should prevent migration of fluids from new wellbore to existing wellbore	Currently a permit.

WV Geological & Economic Survey

Well: County = 51 Permit = 02040

Location information: View Map

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_15	QUAD_15	LAT_DD	LON_DD	UTME	UTMN
4705102040	Marshall	2040	Franklin	Reynolds Point	Claysville	39.779344	-80.782401	520288	4403169.3

Bottom Hole Location information:

API	BP	FLAG	UTME	UTMN	LON_DD	LAT_DD
4705102040	1	As Proposed	520287.5	4401980.9	-80.782403	39.768476

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD	PROP_TRGT_FM	TFM_EST_PR
4705102040	...	Pvd Drill Loc	Permitted	Donna Vivian Vaccaro	4-HM	51-0040	Old Crow	D-LL-1905 & al	Tug Hill Operating LLC		6681	Marcellus Fm	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD	NEW_FTG	ROD	G_BEF	G_APT	O_BEF	O_APT	NGL_BEF	NGL_
4705102040	...	...		DRILL	Grandville																	

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Production Water data for this well

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

There is no Sample data for this well

WV Geological & Economic Survey

Well: County = 51 Permit = 02023

Location information: View Map

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_15	QUAD_15	LAT_DD	LON_DD	UTME	UTMN
4705102023	Marshall	2023	Franklin	Reynolds Point	Claysville	39.779344	-80.782408	520300.0	4403162.8

Bottom Hole Location information:

API	BP	FLAG	UTME	UTMN	LON_DD	LAT_DD
4705102023	1	As Proposed	520287.7	4401946.7	-80.782404	39.768476

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD	PROP_TRGT_FM	TFM_EST_PR
4705102023	...	Pvd Drill Loc	Permitted	Donna Vivian Vaccaro	3-HM	51-0040	Old Crow	Donna Vivian Vaccaro	Tug Hill Operating LLC		6681	Marcellus Fm	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD	NEW_FTG	ROD	G_BEF	G_APT	O_BEF	O_APT	NGL_B
4705102023	...	...		DRILL	Grandville																

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Production Water data for this well

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

There is no Sample data for this well

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WV Geological & Economic Survey

Well: County = 51 Permit = 02042

Location Information: View Map

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LON_DD	UTMN	UTMX
4705102042	Marion	2042	Fairmon	Fairmont-East	Shinston	39.179106	-80.195806	4340326.6	4341152.1

Bottom Hole Location Information:

API	BP_FLAG	UTMN	UTMX	LON_DD	LAT_DD
4705102042 1	As Proposed	4341247.1	4342081	-80.194014	39.184173

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD	PROP_TRGT_FM	TFM_EST_PB
4705102042	---	---	Dry/Plugged	Permitted Zone Under Lease Term		5-15-64	Dry Oil		Surface Owner	Unknown Operator Log		Red Mesaverde	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD	NEW_FTG	ROD	G_BBF	G_APT	O_BBF	O_APT	NGL_BBF	NGL_A
4705102042	---	---		1000	Ground Level																	

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Production Water data for this well

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

There is no Sample data for this well

WV Geological & Economic Survey

Well: County = 51 Permit = 02043

Location Information: View Map

API	COUNTY	PERMIT	TAX_DISTRICT	QUAD_75	QUAD_15	LAT_DD	LON_DD	UTMN	UTMX
4705102043	Marion	2043	Fairmon	Fairmont-East	Shinston	39.1793	-80.195874	4340326.3	4341152.1

Bottom Hole Location Information:

API	BP_FLAG	UTMN	UTMX	LON_DD	LAT_DD
4705102043 1	As Proposed	4341247	4342081	-80.194014	39.184173

Owner Information:

API	CMP_DT	SUFFIX	STATUS	SURFACE_OWNER	WELL_NUM	CO_NUM	LEASE	LEASE_NUM	MINERAL_OWN	OPERATOR_AT_COMPLETION	PROP_VD	PROP_TRGT_FM	TFM_EST_PB
4705102043	---	---	Dry/Plugged	Permitted Zone Under Lease Term		5-15-64	Dry Oil		Surface Owner	Unknown Operator Log		Red Mesaverde	

Completion Information:

API	CMP_DT	SPUD_DT	ELEV	DATUM	FIELD	DEEPEST_FM	DEEPEST_FMT	INITIAL_CLASS	FINAL_CLASS	TYPE	RIG	CMP_MTHD	TVD	TMD	NEW_FTG	ROD	G_BBF	G_APT	O_BBF	O_APT	NGL_BBF	NGL_A
4705102043	---	---		1000	Ground Level																	

There is no Pay data for this well

There is no Production Gas data for this well

There is no Production Oil data for this well ** some operators may have reported NGL under Oil

There is no Production NGL data for this well ** some operators may have reported NGL under Oil

There is no Production Water data for this well

There is no Stratigraphy data for this well

There is no Wireline (E-Log) data for this well

There is no Plugging data for this well

There is no Sample data for this well

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4705102227

CR 27

CR 76

MARSHALL

FRANKLIN

MEADE

CR 7/4

CR 76

Legend

- Well Locations (ims.wvgs.wvnet.edu)
- Major Highways
- Major Roads
- Old Crow N-4HM
- 500 Ft. Buffer
- Counties
- Districts

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Old Crow N - 4HM
Franklin District
Marshall County, WV

0 1,050 2,100 4,200 Feet

N
S

Map Prepared by:
DPS LAND SERVICES

Map Created: December 5, 2018

Notes:
All locations are approximate and are for visualization purposes only

WW-9
(4/16)

API Number 47 - 051 - 4705102227
Operator's Well No. Old Crow N-4HM

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

FLUIDS/ CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Tug Hill Operating, LLC OP Code 494510851

Watershed (HUC 10) Fish Creek Quadrangle Powhatan Point 7.5'

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes ☑ No ☐

Will a pit be used? Yes ☐ No ☑

If so, please describe anticipated pit waste: AST Tanks with proper containment will be used for staging fresh water for frac and flow back water

Will a synthetic liner be used in the pit? Yes ☐ No ☑ If so, what ml.? AST Tanks will be used with proper contain

Proposed Disposal Method For Treated Pit Wastes:

- ____ Land Application
- ■ Underground Injection (UIC Permit Number UIC 2459, UIC 965, UIC 359, UIC 2D0732540, UIC 2D0732523)
- ____ Reuse (at API Number ____)
- ____ Off Site Disposal (Supply form WW-9 for disposal location)
- ____ Other (Explain ____

Will closed loop system be used? If so, describe: Yes - For Vertical and Horizontal Drilling

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Air for vertical / Oil for Horizontal

-If oil based, what type? Synthetic, petroleum, etc. Synthetic Oil Base

Additives to be used in drilling medium? Barite for weight

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. All drill cuttings to be disposed of in a Landfill

-If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

-Landfill or offsite name/permit number? Wetzel County Sanitary Landfil (SWF-1021 / WV0109185) and Westmoreland Sanitary Landfill, LLC (SAN1405 / PA DEP EC#1386426)

Permittee shall provide written notice to the Office of Oil and Gas of any load of drill cuttings or associated waste rejected at any West Virginia solid waste facility. The notice shall be provided within 24 hours of rejection and the permittee shall also disclose where it was properly disposed.

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

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Company Official Signature James Pancake

Company Official (Typed Name) James Pancake

Company Official Title Vice President - Geoscience

Subscribed and sworn before me this 23 day of JANUARY, 2019

Maureen A Stead Notary Public

My commission expires 1/28/19

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
MAUREEN A STEAD
Notary Public
CECIL TWP, WASHINGTON COUNTY
My Commission Expires Jan 28, 2019

4705 102227

Form WW-9

Operator's Well No. Old Crow N-4HM

Tug Hill Operating, LLC

Proposed Revegetation Treatment: Acres Disturbed 19.18 Prevegetation pH 6.0

Lime 3 Tons/acre or to correct to pH 6.5

Fertilizer type 10-20-20

Fertilizer amount 500 lbs/acre

Mulch 2.5 Tons/acre

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Ryegrass	40	Orchard Grass	12
Spring Oats	96	Ladino	3
		White Clover	2

Attach:
Maps(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided). If water from the pit will be land applied, include dimensions (L x W x D) of the pit, and dimensions (L x W), and area in acreage, of the land application area.

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: Jim Umlebar

Comments:

Title: Oil and Gas Inspector Date: 1/23/19

Field Reviewed? (✓) Yes ( ) No

WW-9

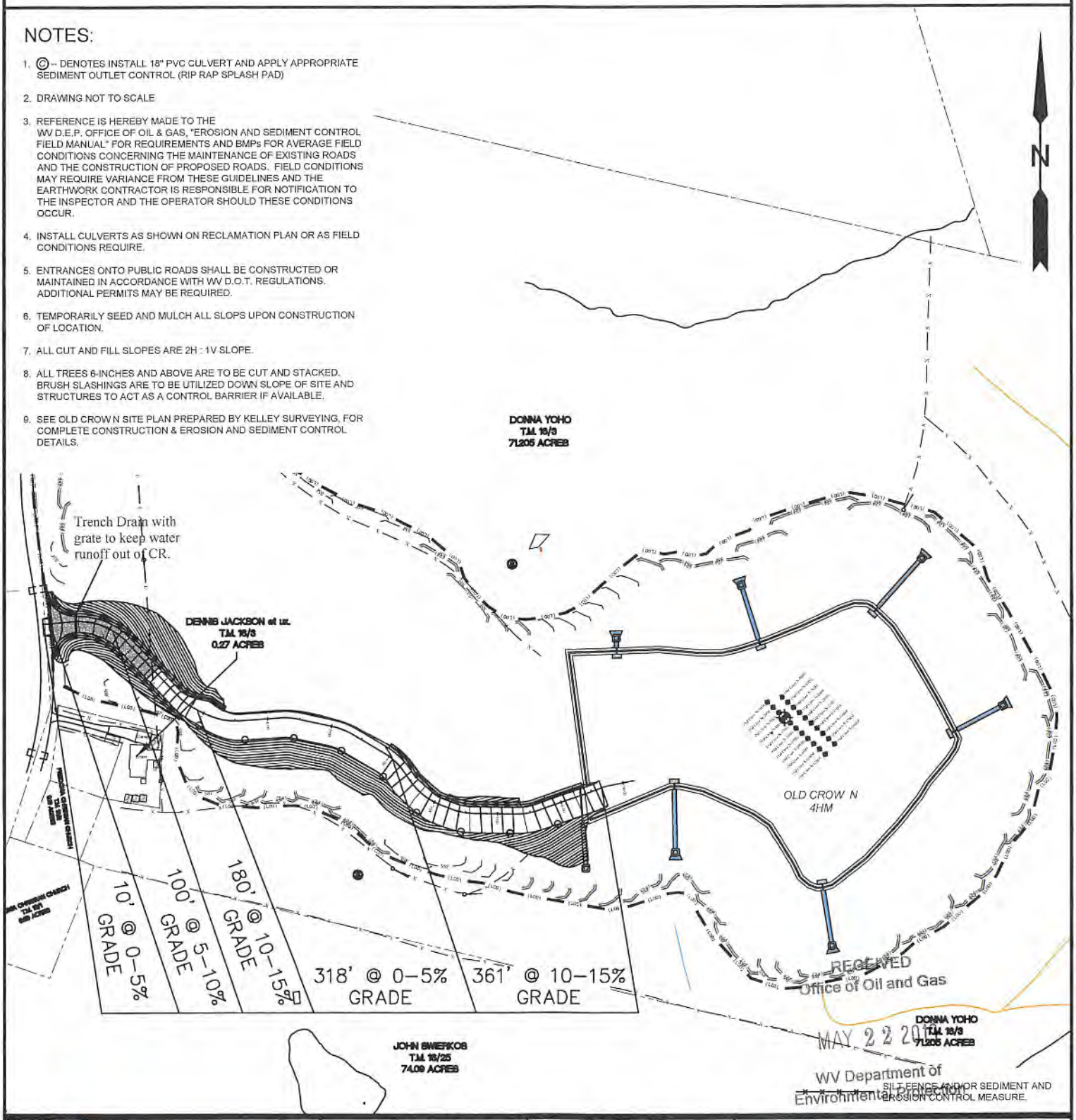
PROPOSED
OLD CROW N - 4HM

SUPPLEMENT PG. 1

4705102227

NOTES:

1. ⓒ -- DENOTES INSTALL 18" PVC CULVERT AND APPLY APPROPRIATE SEDIMENT OUTLET CONTROL (RIP RAP SPLASH PAD)
2. DRAWING NOT TO SCALE
3. REFERENCE IS HEREBY MADE TO THE WV D.E.P. OFFICE OF OIL & GAS, "EROSION AND SEDIMENT CONTROL FIELD MANUAL" FOR REQUIREMENTS AND BMPs FOR AVERAGE FIELD CONDITIONS CONCERNING THE MAINTENANCE OF EXISTING ROADS AND THE CONSTRUCTION OF PROPOSED ROADS. FIELD CONDITIONS MAY REQUIRE VARIANCE FROM THESE GUIDELINES AND THE EARTHWORK CONTRACTOR IS RESPONSIBLE FOR NOTIFICATION TO THE INSPECTOR AND THE OPERATOR SHOULD THESE CONDITIONS OCCUR.
4. INSTALL CULVERTS AS SHOWN ON RECLAMATION PLAN OR AS FIELD CONDITIONS REQUIRE.
5. ENTRANCES ONTO PUBLIC ROADS SHALL BE CONSTRUCTED OR MAINTAINED IN ACCORDANCE WITH WV D.O.T. REGULATIONS. ADDITIONAL PERMITS MAY BE REQUIRED.
6. TEMPORARILY SEED AND MULCH ALL SLOPS UPON CONSTRUCTION OF LOCATION.
7. ALL CUT AND FILL SLOPES ARE 2H : 1V SLOPE.
8. ALL TREES 6-INCHES AND ABOVE ARE TO BE CUT AND STACKED. BRUSH SLASHINGS ARE TO BE UTILIZED DOWN SLOPE OF SITE AND STRUCTURES TO ACT AS A CONTROL BARRIER IF AVAILABLE.
9. SEE OLD CROW N SITE PLAN PREPARED BY KELLEY SURVEYING, FOR COMPLETE CONSTRUCTION & EROSION AND SEDIMENT CONTROL DETAILS.



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Office of Oil and Gas
MAY 22 2018
WV Department of
Environmental Protection

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www.slssurveys.com

TOPO SECTION:		OPERATOR:	
POWHATAN POINT 7.5'		PREPARED FOR: TUG HILL OPERATING, LLC 380 SOUTHPOINTE BLVD SUITE 200 CANONSBURG, PA 15317	
COUNTY	DISTRICT		
MARSHALL	FRANKLIN		
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8769	06/22/18	NONE

TUG HILL OPERATING

4705 102227

TUG HILL OPERATING

Well Site Safety Plan

Tug Hill Operating, LLC

1/22/19

Well Name:Old Crow N-4HM

Pad Location: Old Crow Pad

Marshall County, West Virginia

UTM (meters), NAD83, Zone 17:
Northing: 4,403,194.81
Easting: 520,286.96

January 2019

RECEIVED
Office of Oil and Gas

MAY 22 2019

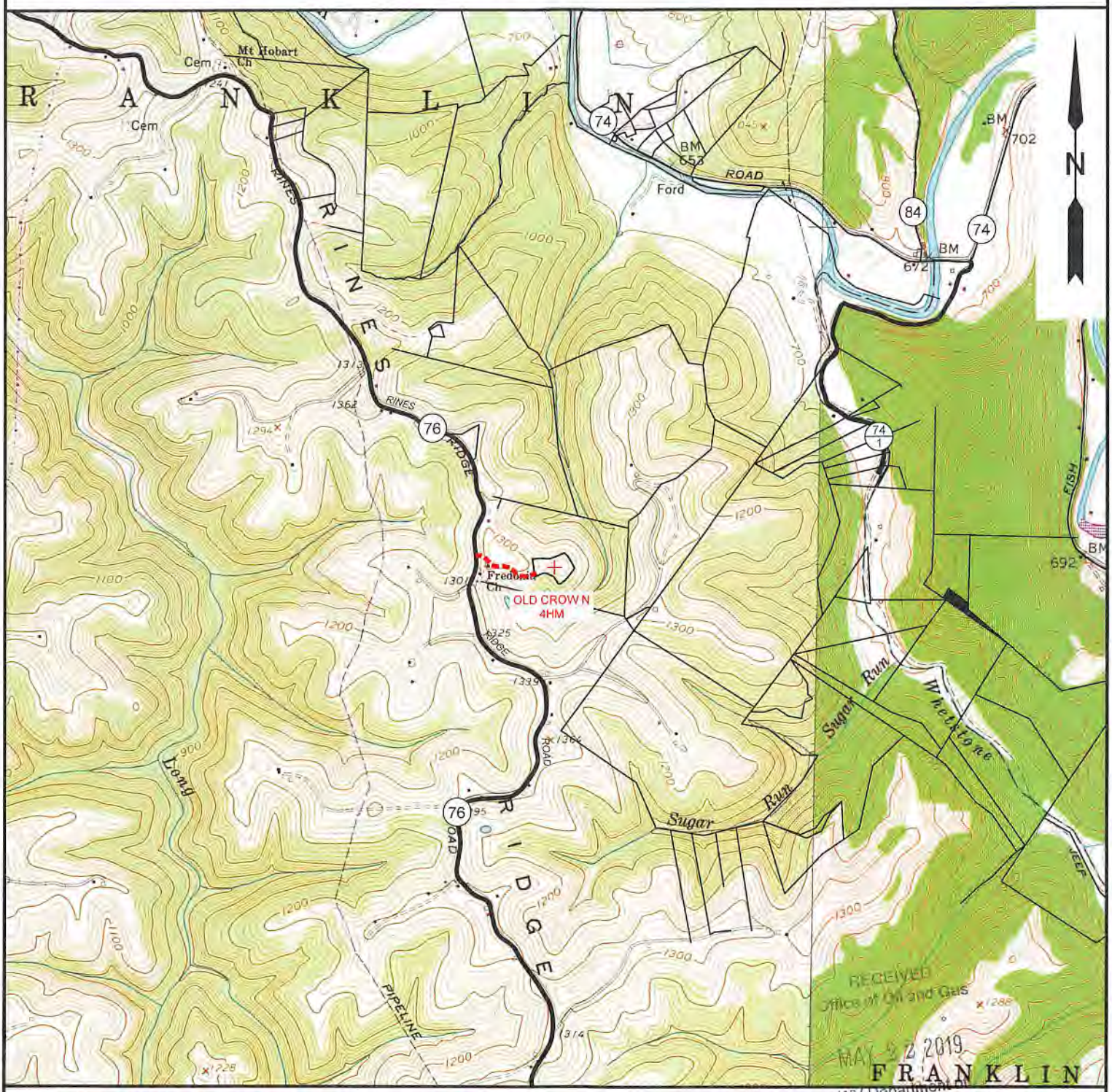
WV Department of
Environmental Protection

4705 02227

WW-9

PROPOSED
OLD CROW N - 4HM

SUPPLEMENT PG. 2



NOTE: CLOSEST WATER PURVEYOR
GRANDVIEW - DOOLIN PUBLIC SERVICE DISTRICT
PROCTOR, WV

LAT: 39.7137712
LON: -80.8258327
LOCATED: S 37°39'00" W AT 29,404.13' FROM OLD CROW N - 4HM SURFACE LOCATION

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TOPO SECTION:		OPERATOR:	
GLEN EASTON & POWHATAN POINT 7.5'		PREPARED FOR: TUG HILL OPERATING, LLC 380 SOUTHPOINTE BLVD SUITE 200 CANONSBURG, PA 15317	
COUNTY	DISTRICT		
MARSHALL	FRANKLIN		
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8796	06/22/18	1" – 2000'

TUG HILL OPERATING

FORM WW 6 – SHEET 1 OF 2

OLD CROW N LEASE
WELL 4HM
TUG HILL OPERATING

7,808' B.H. — 3,682' T.H.

T.H. LATITUDE 39°47'30"
B.H. LATITUDE 39°50'00"

(S.P.C. NORTH ZONE) (UTM(M) ZONE 17 NORTH)		
NAD'83 S.P.C.(FT)	N. 468,147.23	E. 1,613,516.69
NAD'83 GEO.	LAT-(N) 39.778452	LONG-(W) 80.763100
NAD'83 UTM (M)	N. 4,403,194.81	E. 520,286.96
	LANDING POINT	
NAD'83 S.P.C.(FT)	N. 471,093.7	E. 1,614,402.3
NAD'83 GEO.	LAT-(N) 39.786574	LONG-(W) 80.760096
NAD'83 UTM (M)	N. 4,404,097.0	E. 520,541.8
	BOTTOM HOLE	
NAD'83 S.P.C.(FT)	N. 479,741.4	E. 1,609,550.8
NAD'83 GEO.	LAT-(N) 39.810124	LONG-(W) 80.777796
NAD'83 UTM (M)	N. 4,406,706.8	E. 519,019.7

T.H. LONGITUDE 80°45'00"
B.H. LONGITUDE 80°45'00"

4,814' T.H.

8,455' B.H.

T.H.

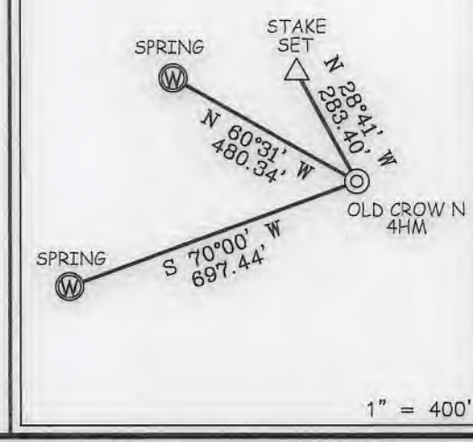
B.H.

MAP/PARCEL	ADJOINING SURFACE OWNER LIST	ACRES
5-9-4.3	HARRY E. KARR, JR., ET UX	1.471
5-9-4.5	DYLAN AULENBACHER	0.991 & PCL 10x40x50
5-9-4.7	FRANCIS D. BARR, ET UX	0.481
5-9-4.9	THOMAS MIDCAP, ET UX	0.375
5-9-4.12	SAMUEL L. & DEBRA N. CANTERBURY	0.650
5-9-4.13	SAMUEL LEE CANTERBURY, ET UX	0.9284
5-9-4.14	PAUL G. BROWN	0.500
5-9-4.15	PAUL G. BROWN	0.500
5-9-4.18	PAUL G. BROWN	0.657
5-9-23	DELBERT K. & LINDA K. MYERS	7.00
5-9-26	EDWIN C. MILLER	1.00
5-9-28	WILLIAM N. & DOLORES E. MCDONOUGH - LIFE	4.01
5-9-29	JAMES M. & ROBERTA L. STERN	3.1777
5-9-30	MATTHEW B. GRIFFITH	2.708
5-9-30.1	DAVID JR., & MELISSA LOVE	2.518
5-9-30.3	MATTHEW B. GRIFFITH	0.82
5-9-32	SANDRA J. BONNETTE	2.321
5-9-32.5	GARNET D. MIDCAP	PCL 270 x 390
5-9-32.8	TIMMOTHY Q. HOYT, ET UX	0.711
5-9-32.9	LIONEL E. HENRY SR., ET AL	1.269
5-9-32.10	TIMMOTHY Q. HOYT, ET UX	0.588
5-9-32.11	TIMMOTHY Q. HOYT, ET UX	1.717
5-9-33.1	KEITH D. & BEVERLY A. DANIELS	1.00
5-9-33.2	KEITH D. DANIELS, ET UX	1.534
5-9-33.4	DAVID D. & CHRISTINE S. DANIELS	1.025
5-9-36	FRANK T. & ANNA M. WALKER	PARCEL
5-9-38	SHIRLEY A. HILL EST.	3.331
5-9-40	SHIRLEY A. HILL EST.	PCL 368 x 425

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.
2. WELL SPOT CIRCLE & TOPO MARK SCALE ARE 1"=2000'

REFERENCES



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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.

1/25/19

P.S. 849 C. Victor Moyers

C. VICTOR MOYERS LICENSED No. 849 STATE OF WEST VIRGINIA PROFESSIONAL SURVEYOR

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

DATE JUNE 22, 20 18
REVISED JANUARY 17, 20 19
OPERATORS WELL NO. OLD CROW N-4HM
API WELL NO. 47 — 51 — 02227
STATE COUNTY PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 8796P4HMR.dwg
OLD CROW NORTH 4HM REV1
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 LIQUID INJECTION ____ WASTE DISPOSAL ____ IF "GAS" PRODUCTION X STORAGE ____ DEEP ____ SHALLOW X

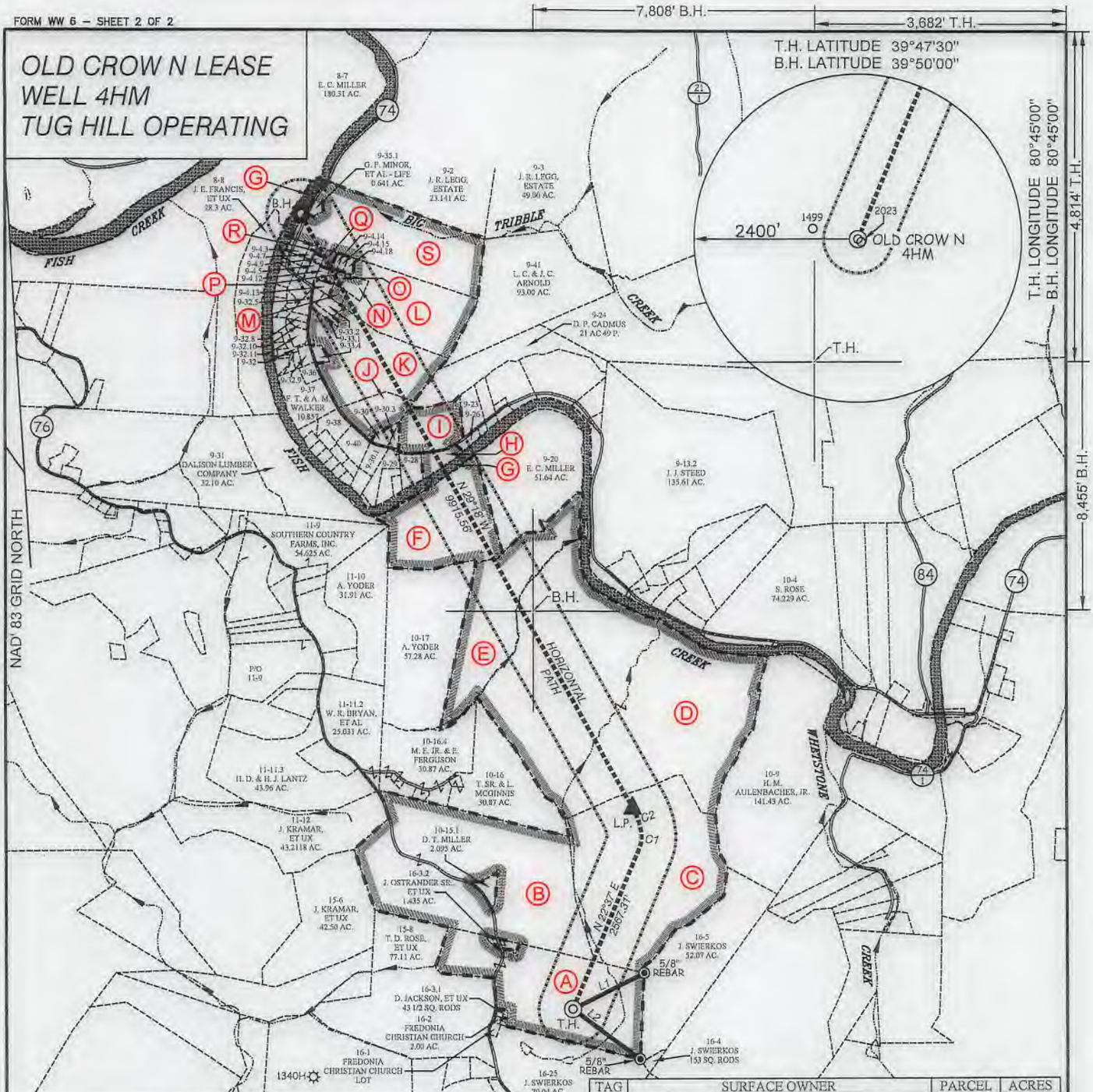
LOCATION:
ELEVATION GROUND = 1,286.40' PROPOSED = 1,264.99' WATERSHED TRIBUTARY OF FISH CREEK (HUC-10)
DISTRICT FRANKLIN COUNTY MARSHALL QUADRANGLE POWHATAN POINT 7.5'
SURFACE OWNER DONNA VIVIAN YOHO (TOD) GARY LANCE YOHO ACREAGE 71.205±
ROYALTY OWNER DONNA VIVIAN YOHO, ET AL ACREAGE 71.205±
PROPOSED WORK: LEASE NO. SEE WW-6A1
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: 6,694' / TMD: 17,638'

COUNTY NAME
PERMIT

WELL OPERATOR TUG HILL OPERATING, LLC
ADDRESS 1320 SOUTH UNIVERSITY DRIVE, SUITE 500
FORT WORTH, TX 76107

DESIGNATED AGENT DIANNA STAMPER
CT CORPORATION SYSTEM
ADDRESS 5400 D BIG TYLER ROAD
CHARLESTON, WV 25313

OLD CROW N LEASE
WELL 4HM
TUG HILL OPERATING



TAG	SURFACE OWNER	PARCEL	ACRES
A	DONNA VIVIAN YOHO (TOD) GARY LANCE YOHO	5-16-3	71.205
B	PAUL ANDREW & DEBRA A. RINE	5-10-15	120.805
C	JOHN SWIERKOS	5-10-14	100.00

CURVE	ARC LENGTH	RADIUS	CHORD BEARING	CHORD LENGTH
C1	247.71'	433.60'	N 04°36' E	244.35'
C2	356.40'	1036.87'	N 20°03' W	354.65'

LINE	BEARING	DISTANCE
L1	N 63°00' E	1174.92'
L2	S 53°50' E	1217.93'

TAG	SURFACE OWNER	PARCEL	ACRES
D	HERBERT M. AULENBACHER, JR.	5-10-3	225.50
E	WILLIAM A. PRASCIK, ET AL	5-10-2	52.00
F	EDWIN C. MILLER	5-10-1	49.96
G	STATE OF WEST VIRGINIA (FISH CREEK)	N/A	N/A
H	JOHN F. KAZEMKA	5-9-27	4.02
I	DELBERT K. & LINDA K. MYERS	5-9-25	14.49
J	DENNIS P. CADMUS	5-9-39	9.50
K	KEITH D. DANIELS, ET UX	5-9-33	40.331
L	LLOYD C. & JUDITH C. ARNOLD	5-9-4	18.854
M	GARY PORTER	5-9-4.11	1.00
N	SAMUEL L. CANTERBURY, ET UX	5-9-4.19	2.078
O	SAMUEL L. CANTERBURY, ET UX	5-9-4.17	0.500
P	SAMUEL L. CANTERBURY, ET UX	5-9-4.16	0.517
Q	DEBORAH S. MIDCAP	5-9-4.10	0.819
R	THOMAS MIDCAP, ET UX	5-9-4.8	0.376
S	LLOYD C. & JUDITH C. ARNOLD	5-9-35	47.00

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

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NAD'83 UTM (M)	N. 4,406,706.8	E. 519,019.7

C. VICTOR MOYERS
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No. 849
STATE OF WEST VIRGINIA
PROFESSIONAL SURVEYOR

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

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SCALE 1" = 2000'
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DATE JUNE 22, 20 18
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OPERATORS WELL NO. OLD CROW N-4HM
API WELL NO. 47 — — —
STATE COUNTY PERMIT

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

LEGEND

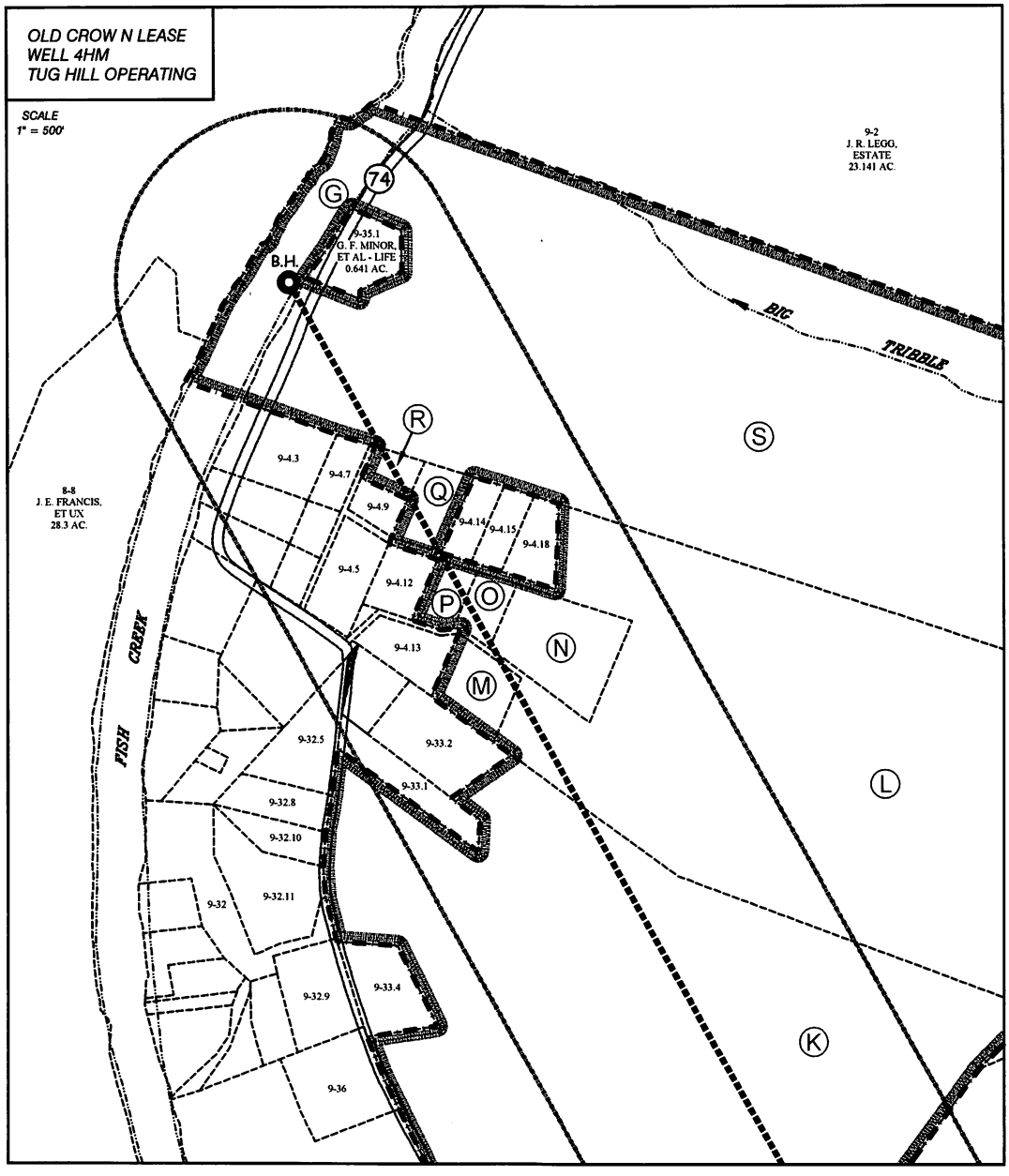
LEASE LINE
SURFACE LINE
WELL LATERAL
OFFSET LINE
TIE LINE
CREEK
ROAD
COUNTY ROUTE
PROPOSED WELL
EXISTING WELL
PERMITTED WELL
TAX MAP–PARCEL 00–00
SURFACE OWNER (SEE TABLE) (A)
LEASE # (SEE WW–6A1)

COUNTY NAME
PERMIT

WELL OPERATOR TUG HILL OPERATING, LLC
ADDRESS 1320 SOUTH UNIVERSITY DRIVE, SUITE 500
FORT WORTH, TX 76107

DESIGNATED AGENT DIANNA STAMPER
CT CORPORATION SYSTEM
ADDRESS 5400 D BIG TYLER ROAD
CHARLESTON, WV 25313

4705102227



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Office of Oil and Gas

JUN 20 2019

WV Department of
Environmental Protection

WW-6A1
(5/13)

Operator's Well No. Old Crow N-4HM

INFORMATION SUPPLIED UNDER WEST VIRGINIA CODE
Chapter 22, Article 6A, Section 5(a)(5)
IN LIEU OF FILING LEASE(S) AND OTHER CONTINUING CONTRACT(S)

Under the oath required to make the verification on page 1 of this Notice and Application, I depose and say that I am the person who signed the Notice and Application for the Applicant, and that –

(1) the tract of land is the same tract described in this Application, partly or wholly depicted in the accompanying plat, and described in the Construction and Reclamation Plan;

(2) the parties and recordation data (if recorded) for lease(s) or other continuing contract(s) by which the Applicant claims the right to extract, produce or market the oil or gas are as follows:

Lease Name or Number	Grantor, Lessor, etc.	Grantee, Lessee, etc.	Royalty	Book/Page

*See attached pages

Acknowledgement of Possible Permitting/Approval
In Addition to the Office of Oil and Gas

The permit applicant for the proposed well work addressed in this application hereby acknowledges the possibility of the need for permits and/or approvals from local, state, or federal entities in addition to the DEP, Office of Oil and Gas, including but not limited to the following:

- WV Division of Water and Waste Management
- WV Division of Natural Resources WV Division of Highways
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- County Floodplain Coordinator

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WV Department of
Environmental Protection

The applicant further acknowledges that any Office of Oil and Gas permit in no way overrides, replaces, or nullifies the need for other permits/approvals that may be necessary and further affirms that all needed permits/approvals should be acquired from the appropriate authority before the affected activity is initiated.

Well Operator: Tug Hill Operating, LLC
By: Amy L. Miller
Its: Permitting Specialist - Appalachia Region

WW-6A1 Supplement

4705102227

Operator's Well No. Old Crow N - 4HM

Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
10*19340	5-16-3	A	DONNA V YOHO	GASTAR EXPLORATION USA INC	1/8+	665	407	N/A	N/A	Gastar Exploration USA, Inc. to Atinum Marcellus I LLC: 23/353	Gastar & Atinum to AB Resources LLC: 23/617	AB Resources to Chief Exploration et al: 24/319	Chief Exploration et al to Chevron: 25/1 & 25/105	Chevron USA Inc to TH Exploration LLC: 40/57
10*19017	5-10-15	B	PAUL A RINE AND DEBRA A RINE	CHEVRON USA INC	1/8+	796	24	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19673	5-10-14	C	CHESTNUT HOLDINGS INC	TH EXPLORATION LLC	1/8+	949	313	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19673	5-10-3	D	CHESTNUT HOLDINGS INC	TH EXPLORATION LLC	1/8+	949	313	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	E	WILLIAM A PRASCIK	TH EXPLORATION LLC	1/8+	879	302	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	E	CATHERINE A PRASCIK, A SINGLE WOMAN	TH EXPLORATION LLC	1/8+	936	549	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	E	FRANCIS C PRASCIK, A MARRIED MAN DEALING IN HIS SOLE AND SEPARATE PROPERTY	TH EXPLORATION LLC	1/8+	943	535	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.260.0	5-10-2	E	LORI J PRASCIK, A SINGLE WOMAN	TH EXPLORATION LLC	1/8+	936	551	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18970	5-10-1	F	DONALD E BERISFORD	TH EXPLORATION LLC	1/8+	941	287	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19036	5-10-1	F	HAROLD W HOWARD JR	CHEVRON USA INC	1/8+	813	91	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19037	5-10-1	F	NEVELLE SEELEY	CHEVRON USA INC	1/8+	813	116	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19039	5-10-1	F	RALPH B RUSSELL MARY ANN RUSSELL	CHEVRON USA INC	1/8+	813	106	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19040	5-10-1	F	RUTHANNE RUSSELL TOPPING	CHEVRON USA INC	1/8+	813	79	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19041	5-10-1	F	CHERYL L HILL	CHEVRON USA INC	1/8+	813	101	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19043	5-10-1	F	JACK R BERISFORD LINDA JO BERISFORD	CHEVRON USA INC	1/8+	813	96	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19045	5-10-1	F	JOHN W MURDOCK HELEN CAROLINA MURDOCK	CHEVRON USA INC	1/8+	814	327	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19049	5-10-1	F	RUTH ANN FERRIS	CHEVRON USA INC	1/8+	814	313	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19050	5-10-1	F	LARRY F JEFFERSON CATHY L JEFFERSON	CHEVRON USA INC	1/8+	814	473	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19059	5-10-1	F	MARY VANESSA GILSON	CHEVRON USA INC	1/8+	815	464	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19060	5-10-1	F	ALYSIA JORDAN	CHEVRON USA INC	1/8+	815	135	N/A	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to TH Exploration LLC: 40/127
10*19503	5-10-1	F	FRANK DALE BERISFORD AND KATHLEEN BERISFORD	TH EXPLORATION LLC	1/8+	942	625	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19610	5-10-1	F	BRENT BERISFORD AND JEAN MARIE COSTA	TH EXPLORATION LLC	1/8+	944	207	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22637	5-10-1	F	HOWARD T CONNER AND NANETTE CONNER	TH EXPLORATION LLC	1/8+	968	219	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22639	5-10-1	F	EDWIN MARK KNABENSHUE	TH EXPLORATION LLC	1/8+	968	217	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22640	5-10-1	F	JESSICA M CREMEANS	TH EXPLORATION LLC	1/8+	984	532	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22641	5-10-1	F	CHRISTOPHER STALEY & MICHAEL ANNE STALEY	TH EXPLORATION LLC	1/8+	968	221	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22772	5-10-1	F	BILLIE J STALEY AND APRIL STALEY	TH EXPLORATION LLC	1/8+	970	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23040	5-10-1	F	MARY L WHITTINGTON	TH EXPLORATION LLC	1/8+	977	300	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23725	5-10-1	F	GRAYSVILLE CALVARY UNITED METHODIST	TH EXPLORATION LLC	1/8+	1011	550	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24072	5-10-1	F	MICHAEL L STEWART	TH EXPLORATION LLC	1/8+	1020	188	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24260	5-10-1	F	GREG STEWART	TH EXPLORATION LLC	1/8+	1020	352	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24511	5-10-1	F	DAVID W HALE JR	TH EXPLORATION LLC	1/8+	1024	260	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24512	5-10-1	F	GAYLE F BRITTON TRUST	TH EXPLORATION LLC	1/8+	1026	250	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24513	5-10-1	F	AARON M BROWN	TH EXPLORATION LLC	1/8+	1024	272	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24526	5-10-1	F	DAVID E BOWYER	TH EXPLORATION LLC	1/8+	1027	287	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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10*24553	5-10-1	F	JOSH D AND LAUREN K HALE	TH EXPLORATION LLC	1/8+	1024	251	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24557	5-10-1	F	BETTY L KEAN	TH EXPLORATION LLC	1/8+	1024	266	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.1	5-10-1	F	EDWIN C MILLER AND KIMBERLY ANN MILLER	TH EXPLORATION LLC	1/8+	885	61	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.2	5-10-1	F	JANE S BLANEY	TH EXPLORATION LLC	1/8+	898	547	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.3	5-10-1	F	JOANNE SCHALL FOSTER	TH EXPLORATION LLC	1/8+	895	29	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.4	5-10-1	F	RAYMOND E SCHALL	TH EXPLORATION LLC	1/8+	898	550	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.5	5-10-1	F	FIRST CHRISTIAN CHURCH OF MOUNDSVILLE BY ROGER FRANCIS AND ROBERT ALBERT TRUSTEES	TH EXPLORATION LLC	1/8+	898	600	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*47051.127.6	5-10-1	F	BARBARA GODWIN AND CHARLES RODNEY GODWIN	TH EXPLORATION LLC	1/8+	902	419	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*25617	5-10-1	F	GLEN DALE UNITED METHODIST CHURCH	AMERICAN PETROLEUM PARTNERS OPERATING LLC	1/8+	1031	610	N/A	N/A	N/A	N/A	N/A	N/A	American Petroleum Partners Operating LLC to TH Exploration LLC: 43/503
PENDING	5-10-1	F	FORREST O MILLER	HG ENERGY II APPALACHIA, LLC	1/8+	1029	581	N/A	N/A	N/A	N/A	N/A	N/A	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q091960000	FISH CREEK	G	WEST VIRGINIA DIVISION OF NATURAL RESOURCES	NOBLE ENERGY INC	1/8+	865	558	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*17512	5-9-27	H	BONNIE LOU POSTLEWAIT	TH EXPLORATION LLC	1/8+	917	68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17530	5-9-27	H	WOODROW N WARD AND HILDA A WARD	TH EXPLORATION LLC	1/8+	916	208	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17916	5-9-27	H	MARY E BISHOP	TH EXPLORATION LLC	1/8+	927	167	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18270	5-9-27	H	GERALD L BISHOP III	TH EXPLORATION, LLC	1/8+	943	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18796	5-9-27	H	DWG OIL & GAS ACQUISITIONS LLC	TH EXPLORATION LLC	1/8+	938	476	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18836	5-9-27	H	JOHN W MIDCAP AND ELDA FAYE MIDCAP	TH EXPLORATION LLC	1/8+	941	450	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19572	5-9-27	H	DOUGLAS R BISHOP	TH EXPLORATION LLC	1/8+	943	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21478	5-9-27	H	CHILDRENS HOME SOCIETY OF WEST VIRGINIA	TH EXPLORATION LLC	1/8+	960	173	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21937	5-9-27	H	WHEELING SOCIETY FOR CRIPPLED CHILDREN JAY E PRAGER PRESIDENT	TH EXPLORATION LLC	1/8+	960	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22044	5-9-27	H	MICHAEL A BISHOP	TH EXPLORATION LLC	1/8+	960	421	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22296	5-9-27	H	NOAH BAKER AND ALISA BAKER	TH EXPLORATION LLC	1/8+	962	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22326	5-9-27	H	RACHEL SONDA AND SCOTT SONDA	TH EXPLORATION LLC	1/8+	962	532	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22407	5-9-27	H	BRADLEY MURPHY	TH EXPLORATION LLC	1/8+	962	575	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22430	5-9-27	H	DEBORAH VANVRANKEN	TH EXPLORATION LLC	1/8+	964	510	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22492	5-9-27	H	FAITH MARIE FREESTONE AND ERIC FREESTONE	TH EXPLORATION LLC	1/8+	972	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22547	5-9-27	H	LAWRENCE EDWARD MURPHY AND JOAN MARIE MURPHY	TH EXPLORATION LLC	1/8+	966	628	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22606	5-9-27	H	ROBERT B MURPHY AND LINDA MURPHY	TH EXPLORATION LLC	1/8+	966	469	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22636	5-9-27	H	CHANDA WILSON AND DANIEL WILSON	TH EXPLORATION LLC	1/8+	968	226	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23035	5-9-27	H	DEAN S CARR	TH EXPLORATION LLC	1/8+	977	364	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23508	5-9-27	H	MICHAEL A MURPHY	TH EXPLORATION LLC	1/8+	1009	98	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24888	5-9-27	H	ARTHUR LEE MILLER ET AL	TH EXPLORATION LLC	1/8+	1027	187	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24985	5-9-27	H	JONATHAN BAKER	TH EXPLORATION LLC	1/8+	1027	558	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PENDING	5-9-27	H	SANDRA PARDINI AKA KATHERINE S PARDINI AND ALLEN F PARDINI	TH EXPLORATION LLC	1/8+	1031	540	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17600	5-9-27	H	CARLA JO ALLEN AND KENNETH ALLEN	TH EXPLORATION LLC	1/8+	916	129	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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Q090332002	5-9-27	H	LORETTA JEAN RIGGLE ET VIR	NOBLE ENERGY INC	1/8+	860	538	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332003	5-9-27	H	PATTY BERISFORD ET VIR	NOBLE ENERGY INC	1/8+	860	555	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332007	5-9-27	H	ROBERT RANDOLPH WOODBURN ET UX	NOBLE ENERGY INC	1/8+	860	568	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*17512	5-9-25	I	BONNIE LOU POSTLEWAIT	TH EXPLORATION LLC	1/8+	917	68	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17530	5-9-25	I	WOODROW N WARD AND HILDA A WARD	TH EXPLORATION LLC	1/8+	916	208	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17916	5-9-25	I	MARY E BISHOP	TH EXPLORATION LLC	1/8+	927	167	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18270	5-9-25	I	GERALD L BISHOP III	TH EXPLORATION, LLC	1/8+	943	10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*18796	5-9-25	I	DWG OIL & GAS ACQUISITIONS LLC	TH EXPLORATION LLC	1/8+	938	476	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*19572	5-9-25	I	DOUGLAS R BISHOP	TH EXPLORATION LLC	1/8+	943	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21478	5-9-25	I	CHILDRENS HOME SOCIETY OF WEST VIRGINIA	TH EXPLORATION LLC	1/8+	960	173	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*21937	5-9-25	I	WHEELING SOCIETY FOR CRIPPLED CHILDREN JAY E PRAGER PRESIDENT	TH EXPLORATION LLC	1/8+	960	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22044	5-9-25	I	MICHAEL A BISHOP	TH EXPLORATION LLC	1/8+	960	421	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22296	5-9-25	I	NOAH BAKER AND ALISA BAKER	TH EXPLORATION LLC	1/8+	962	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22326	5-9-25	I	RACHEL SONDA AND SCOTT SONDA	TH EXPLORATION LLC	1/8+	962	532	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22407	5-9-25	I	BRADLEY MURPHY	TH EXPLORATION LLC	1/8+	962	575	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22430	5-9-25	I	DEBORAH VANVRANKEN	TH EXPLORATION LLC	1/8+	964	510	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22492	5-9-25	I	FAITH MARIE FREESTONE AND ERIC FREESTONE	TH EXPLORATION LLC	1/8+	972	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22547	5-9-25	I	LAWRENCE EDWARD MURPHY AND JOAN MARIE MURPHY	TH EXPLORATION LLC	1/8+	966	628	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22606	5-9-25	I	ROBERT B MURPHY AND LINDA MURPHY	TH EXPLORATION LLC	1/8+	966	469	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*22636	5-9-25	I	CHANDA WILSON AND DANIEL WILSON	TH EXPLORATION LLC	1/8+	968	226	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PENDING	5-9-25	I	SANDRA PARDINI AKA KATHERINE S PARDINI AND ALLEN F PARDINI	TH EXPLORATION LLC	1/8+	1031	540	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*17600	5-9-25	I	CARLA JO ALLEN AND KENNETH ALLEN	TH EXPLORATION LLC	1/8+	916	129	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Q090332002	5-9-25	I	LORETTA JEAN RIGGLE ET VIR	NOBLE ENERGY INC	1/8+	860	538	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
Q090332003	5-9-25	I	PATTY BERISFORD ET VIR	NOBLE ENERGY INC	1/8+	860	555	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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Q090332007	5-9-25	I	ROBERT RANDOLPH WOODBURN ET UX	NOBLE ENERGY INC	1/8+	860	568	N/A	N/A	N/A	N/A	N/A	Noble Energy Inc to HG Energy II Appalachia LLC: 39/1	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
10*23035	5-9-25	I	DEAN S CARR	TH EXPLORATION LLC	1/8+	977	364	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*23508	5-9-25	I	MICHAEL A MURPHY	TH EXPLORATION LLC	1/8+	1009	98	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24888	5-9-25	I	ARTHUR LEE MILLER ET AL	TH EXPLORATION LLC	1/8+	1027	187	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*24985	5-9-25	I	JONATHAN BAKER	TH EXPLORATION LLC	1/8+	1027	558	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10*25250	5-9-25	I	THE ESTATE OF DELBERT K MYERS BY LINDA KAY MYERS ACTING AS EXECUTRIX AND LINDA KAY MYERS, WIDOW	TH EXPLORATION LLC	1/8+	1030	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CVX935271	5-9-39	J	CHARLES W. MILLER AND ESTHER JEAN MILLER, HUSBAND AND WIFE	CHEVRON U.S.A., INC.	1/8+	853	59	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935273	5-9-39	J	PAUL PARSONS ET UX	CHEVRON U.S.A., INC.	1/8+	853	430	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935276	5-9-39	J	SHARON LYN RUSSELL	CHEVRON U.S.A., INC.	1/8+	853	422	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935969	5-9-39	J	TIMOTHY HUFF ET UX	CHEVRON U.S.A., INC.	1/8+	864	47	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936053	5-9-39	J	LLOYD C. ARNOLD ET UX	CHEVRON U.S.A., INC.	1/8+	864	39	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936054	5-9-39	J	MARY JO CRONIN	CHEVRON U.S.A., INC.	1/8+	864	43	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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CVX936058	5-9-39	J	RICHARD KURPIL ET UX	CHEVRON U.S.A., INC.	1/8+	863	594	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936061	5-9-39	J	CLARA MAE CLIFTON	CHEVRON U.S.A., INC.	1/8+	853	426	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936062	5-9-39	J	GEORGE EDWARDS ET UX	CHEVRON U.S.A., INC.	1/8+	853	418	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936112	5-9-39	J	DONNA FAE KYLE	CHEVRON U.S.A., INC.	1/8+	853	449	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936113	5-9-39	J	JUDITH MAY CONNER	CHEVRON U.S.A., INC.	1/8+	853	445	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX866959	5-9-39	J	PAUL SCHEIBELHOOD AND DELORIS LEE SCHEIBELHOOD, HUSBAND AND WIFE, AND GEORGE FRANKLIN MINOR, A SINGLE MAN	AB RESOURCES LLC	1/8+	695	629	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & DevelopmentLLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX866958	5-9-39	J	ANITA L SLOUGH, A SINGLE WOMAN, AND WILLIAM O JOBES, A SINGLE MAN	AB RESOURCES LLC	1/8+	696	7	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & DevelopmentLLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
PENDING	5-9-33	K	STONE HILL MINERALS HOLDINGS LLC	TH EXPLORATION LLC	1/8+	1034	626	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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CVX939752	5-9-4	L	LLOYD C ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	915	582	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936589	5-9-4.11	M	LLOYD C. ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	863	511	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936591	5-9-4.11	M	CHARLES W. MILLER AND ESTHER JEAN MILLER	CHEVRON U.S.A., INC.	1/8+	861	595	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936589	5-9-4.19	N	LLOYD C. ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	863	511	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936591	5-9-4.19	N	CHARLES W. MILLER AND ESTHER JEAN MILLER	CHEVRON U.S.A., INC.	1/8+	861	595	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936589	5-9-4.17	O	LLOYD C. ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	863	511	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936591	5-9-4.17	O	CHARLES W. MILLER AND ESTHER JEAN MILLER	CHEVRON U.S.A., INC.	1/8+	861	595	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936589	5-9-4.16	P	LLOYD C. ARNOLD AND JUDITH C ARNOLD	CHEVRON U.S.A., INC.	1/8+	863	511	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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WW-6A1 Supplement 4705102227 **Operator's Well No. Old Crow N - 4HM**

Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
CVX936591	5-9-4.16	P	CHARLES W. MILLER AND ESTHER JEAN MILLER	CHEVRON U.S.A., INC.	1/8+	861	595	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX868468	5-9-4.10	Q	DEBORAH S. MIDCAP	TRIENERGY HOLDINGS, LLC	1/8+	737	260	N/A	N/A	N/A	TriEnergy Holdings LLC to NPAR LLC: 25/449	NPAR LLC to Chevron USA Inc: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/145	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX868688	5-9-4.8	R	THOMAS E. MIDCAP FREDA M MIDCAP	TRIENERGY HOLDINGS, LLC	1/8+	738	482	N/A	N/A	N/A	TriEnergy Holdings LLC to NPAR LLC: 25/449	NPAR LLC to Chevron USA Inc: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/145	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935271	5-9-35	S	CHARLES W. MILLER AND ESTHER JEAN MILLER, HUSBAND AND WIFE	CHEVRON U.S.A., INC.	1/8+	853	59	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935273	5-9-35	S	PAUL PARSONS ET UX	CHEVRON U.S.A., INC.	1/8+	853	430	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935276	5-9-35	S	SHARON LYN RUSSELL	CHEVRON U.S.A., INC.	1/8+	853	422	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX935969	5-9-39	S	TIMOTHY HUFF ET UX	CHEVRON U.S.A., INC.	1/8+	864	47	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936053	5-9-35	S	LLOYD C. ARNOLD ET UX	CHEVRON U.S.A., INC.	1/8+	864	39	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
CVX936054	5-9-35	S	MARY JO CRONIN	CHEVRON U.S.A., INC.	1/8+	864	43	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936058	5-9-35	S	RICHARD KURPIL ET UX	CHEVRON U.S.A., INC.	1/8+	863	594	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936061	5-9-35	S	CLARA MAE CLIFTON	CHEVRON U.S.A., INC.	1/8+	853	426	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936062	5-9-35	S	GEORGE EDWARDS ET UX	CHEVRON U.S.A., INC.	1/8+	853	418	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936112	5-9-35	S	DONNA FAE KYLE	CHEVRON U.S.A., INC.	1/8+	853	449	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX936113	5-9-35	S	JUDITH MAY CONNER	CHEVRON U.S.A., INC.	1/8+	853	445	N/A	N/A	N/A	N/A	N/A	Chevron USA Inc to HG Energy II Appalachia LLC: 41/154	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286
CVX866959	5-9-35	S	PAUL SCHEIBELHOOD AND DELORIS LEE SCHEIBELHOOD, HUSBAND AND WIFE, AND GEORGE FRANKLIN MINOR, A SINGLE MAN	AB RESOURCES LLC	1/8+	695	629	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & DevelopmentLLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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Lease ID	Parcel	Tag	Grantor, Lessor, Etc.	Grantee, Lessee, Etc.	Royalty	Deed Book/Page		Assignment	Assignment	Assignment	Assignment	Assignment	Assignment	Assignment
CVX866958	5-9-35	S	ANITA L SLOUGH, A SINGLE WOMAN, AND WILLIAM O JOBES, A SINGLE MAN	AB RESOURCES LLC	1/8+	696	7	AB Resources LLC to Chief Exploration & Development LLC & Radler 2000 LP: 24/484	Chief Exploration & DevelopmentLLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/1	Chief Exploration & Development LLC, Radler 2000, & Enerplus Resources Corp to Chevron USA Inc: 25/105	AB Resources LLC to NPAR LLC: 25/484	NPAR LLC to Chevron USA: 756/332	Chevron USA Inc to HG Energy II Appalachia LLC: 41/155	Memorandum of Operating Agreement between TH Exploration LLC and HG Energy II Appalachia, LLC: 988/286

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STATE OF WEST VIRGINIA §
§
COUNTY OF MARSHALL §

ASSIGNMENT AND BILL OF SALE

This **ASSIGNMENT AND BILL OF SALE** (this "Assignment") dated as of August 1, 2017 (the "Signing Date"), but effective from and after 7:00 a.m., Eastern Standard Time on August 2, 2017 being the day immediately following the Signing Date (the "Effective Date"), is made by **Chevron U.S.A. Inc.**, a Pennsylvania corporation, with an address at 700 Cherrington Parkway, Coraopolis, PA 15108 ("Chevron" or "Assignor") to **TH Exploration II, LLC** and **TH Exploration, LLC**, Texas limited liability companies, with an address at 1320 S. University Drive, Suite 500, Fort Worth, TX 76107 (collectively "Assignee") and is accepted by Assignee upon the following terms and conditions.

RECITALS

A. Assignor desires to sell, convey, transfer, assign and deliver to Assignee Assignor's Bryan 1H well and certain related assets, including certain leasehold interests, located in Marshall County, West Virginia.

B. Through an Acreage Trade Agreement to be executed contemporaneously with this Assignment, Assignor desires to transfer, convey and assign to Assignee certain of Assignor's oil and gas leasehold interests located in Marshall County, West Virginia in exchange for the transfer, conveyance and assignment to Assignor by Assignee certain of Assignee's oil and gas leasehold interests located in Marshall County, West Virginia and Greene County, West Virginia.

C. In consideration of the mutual promises set out in this Assignment, including execution of the Acreage Trade Agreement, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the Parties agree to be bound by the terms of this Assignment.

1. DEFINITIONS

1.1 **Definitions.** As used in this Assignment, these words and expressions have the following meanings:

"Acreage Trade Agreement" means that certain Acreage Trade Agreement by and between Chevron U.S.A. Inc. and TH Exploration, LLC with an Effective Date of August 1, 2017 to be contemporaneously executed with this Assignment.

"Act" has the meaning given to such term in Section 9.1(C).

"Affiliate" means any legal entity which controls, is controlled by, or is under common control with, another legal entity. An entity is deemed to "control" another if it owns directly or indirectly at least fifty percent of either of the following: (A) the shares entitled to vote at a general election of directors of such other entity or (B) the voting interest in such other entity if such entity does not have either shares or directors.

"Applicable Law(s)" means all laws, principles of common law, regulations, statutes, codes, rules, orders, ordinances, permits, enforceable policies, licenses, certifications, decrees, constitutions, standards or other requirements with similar effect of any Government Entity and any binding interpretations of the foregoing.

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"Assets" has the meaning given to such term in Section 2.1 of this Assignment.

"Assigned Hydrocarbons" means all Hydrocarbons produced and severed from, or allocable, after severance, to the Leases, Units, and Wells on and after the Effective Date.

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BOOK 0040 PAGE 0127

MICHAEL MORAN
BRIGHTON RESOURCES
5951 ELLSWORTH AVENUE, #1
PITTSBURGH PA 15232-1707

STATE OF WEST VIRGINIA §
§
COUNTY OF MARSHALL §

Marshall County
Jan Pest, Clerk
Instrument 1428356
08/16/2017 @ 12:08:49 PM
ASSIGNMENTS
Book 40 @ Page 127
Pages Recorded 25
Recording Cost $ 33.00

ASSIGNMENT AND CONVEYANCE

THIS ASSIGNMENT AND CONVEYANCE (the "**Assignment**") is made and entered into this 1 day of August, 2017 (the "**Effective Date**"), by and between **CHEVRON U.S.A. INC.** (hereinafter "**Assignor**") and **TH EXPLORATION, LLC** (hereinafter "**Assignee**") pursuant to the terms of that certain Acreage Trade Agreement between the Assignor and the Assignee dated the 1st day of August, 2017 (the "Acreage Trade Agreement"). Capitalized terms used but not defined herein and defined in the Acreage Trade Agreement shall have the meanings given to such terms in the Acreage Trade Agreement.

WITNESSETH:

WHEREAS, Assignor desires to assign, set over, and transfer to Assignee all of Assignor's right, title, and interest in and to those certain Oil and Gas Leases situated in Marshall County, West Virginia, as described in **Exhibit "A"**, attached hereto and made a part hereof (hereinafter the "**Leases**"), less and except certain overriding royalty interests and exclusions; and

WHEREAS, Assignor desires to assign, set over, and transfer to Assignee all of Assignor's right, title, and interest in and to the Leases as described below, subject to certain overriding royalty interests and less and except certain exclusions.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and subject to the limited warranties, restrictions and conditions hereinafter mentioned, the parties hereto, intending to be legally bound, do covenant and agree as follows:

1. Assignment. Assignor does hereby grant, bargain, sell, convey, deliver, assign, set over and transfer, as of the Effective Date, to Assignee, its respective successors and assigns, forever, all of Assignor's right, title and interest in and to the Leases, and the lands covered thereby, together with all rights incident thereto and appurtenances thereon, except that Assignor excepts and reserves from this Assignment the following:

A. The Chevron ORRI previously conveyed to Assignor and as described in that certain Memorandum of Assignment of Oil and Gas Lease Interests dated November 6, 2012 by and between Cornell Holdings Incorporated and Chevron U.S.A. Inc., which is recorded at Book 0028, Page 0239 in the Office of the County Clerk of Marshall County, West Virginia, and

B. As to each of the Leases and all oil, gas, and associated hydrocarbons produced, saved and sold thereunder, an overriding royalty interest equal to the difference between 82% and the

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STATE OF WEST VIRGINIA §
§
COUNTY OF MARSHALL §

Marshall County
Jan Pest, Clerk
Instrument 1453305
04/24/2019 @ 11:51:22 AM
ASSIGNMENTS
Book 43 @ Page 503
Pages Recorded 10
Recording Cost $ 17.00

ASSIGNMENT AND CONVEYANCE

THIS ASSIGNMENT AND CONVEYANCE (the "**Assignment**") is made and entered into this 23rd day of April, 2019 (the "**Effective Date**"), by and between **AMERICAN PETROLEUM PARTNERS OPERATING, LLC**, (hereinafter "**Assignor**") and **TH EXPLORATION, LLC** (hereinafter "**Assignee**") pursuant to the terms of that certain Acreage Trade Agreement between the Assignor and the Assignee dated November 15, 2018 (the "**Acreage Trade Agreement**"). Capitalized terms used but not defined herein and defined in the Acreage Trade Agreement shall have the meanings given to such terms in the Acreage Trade Agreement.

WITNESSETH:

WHEREAS, Assignor desires to assign, set over, and transfer to Assignee all of Assignor's right, title, and interest in and to those certain Oil and Gas Leases situated in Marshall County, West Virginia, as described in **Exhibit A-2**, attached hereto and made a part hereof (hereinafter the "**Leases**"); and

WHEREAS, Assignor desires to assign, set over, and transfer to Assignee all of Assignor's right, title, and interest in and to the Leases as described below.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, and subject to the limited warranties, restrictions and conditions hereinafter mentioned, the parties hereto, intending to be legally bound, do covenant and agree as follows:

1. Assignment. Assignor does hereby grant, bargain, sell, convey, deliver, assign, set over and transfer, as of the Effective Date, to Assignee, its respective successors and assigns, forever, all of Assignor's right, title and interest in and to the Leases, and the lands covered thereby, together with all rights incident thereto and appurtenances thereon.

TO HAVE AND TO HOLD such right, title and interest in and to the Leases unto Assignee or its designee, and their respective successors and assigns, forever, in accordance with the provisions of this Assignment.

2. Special Warranty. Assignor represents and warrants that Assignor has not conveyed or otherwise encumbered (other than Permitted Encumbrances) its interest in the Leases since the time that Assignor obtained its interests in the Leases. Assignor does covenant, promise and agree, to and with the Assignee, its respective successors and assigns, to forever specially warrant and defend the title to the Leases or portions thereof included under this Assignment, unto the Assignee and its respective successors and assigns, against the lawful claims of Assignor, and all persons claiming, or to claim, the same or any part thereof, by, through or under Assignor.

Assignor represents and warrants that Assignor has paid any and all bonuses, rentals, royalties, overriding royalties, and other payments required by the Leases which were due for the period in which Assignor held its interests in the Leases, and that Assignor has fully performed all conditions necessary to maintain the Leases in full force and effect during such period, free and clear of all Encumbrances, except for and subject only to Permitted Encumbrances.

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3. Successors and Assigns. The terms of this Assignment shall be binding upon and inure to the benefit of the parties hereto and each of their respective successors

DPS LAND SERVICES CORP
6000 TOWN CENTER BOULEVARD, SUITE 145
CANONSBURG PA 15317-5841

MEMORANDUM OF OPERATING AGREEMENT AND FINANCING STATEMENT

This Memorandum of Operating Agreement and Financing Statement (hereinafter referred to as "Memorandum") is executed to be effective concurrently with that certain Operating Agreement (the "Operating Agreement") by and between TH Exploration, LLC, as Operator, and HG Energy II Appalachia, LLC and TH Exploration II, LLC, as Non-Operators, covering, among other things, the development and production of crude oil, natural gas and associated substances from the leases (hereinafter called the "Contract Area") described on Exhibit "A-1" and Exhibit "A-2" attached hereto and owned by Operator and Non-Operator in the respective percentages of shares indicated on Exhibit "A" to the Operating Agreement.

The Operating Agreement contains an Accounting Procedure, along with provisions giving the parties hereto mutual liens and security interests where one or more parties hereto are or may become Debtors to one or more other parties hereto. This Memorandum incorporates by reference all of the terms and conditions of the Operating Agreement, including but not limited to the lien and security interest provisions.

The purpose of this Memorandum is to place third parties on notice of the Operating Agreement, and to secure and perfect the mutual liens and security interests of the parties hereto.

The Operating Agreement specifically provides and the parties do hereby confirm and agree that:

1. The Operator shall conduct and direct and have full control of all operations on the Contract Area as permitted and required by, and within the limits of, the Operating Agreement.

2. The liability of the parties under the Operating Agreement shall be several, not joint or collective. Each party shall be responsible only for its obligations and shall be liable only for its proportionate share of costs.

3. Each Non-Operator grants to Operator a lien upon its oil and gas rights, oil and gas leases and mineral interests in the Contract Area, and a security interest in its share of oil and/or gas when extracted and its interest in all fixtures, inventory, personal property and equipment located on or used on the Contract Area and in all its contract rights and receivables related thereto and arising therefrom to secure payment of its present and future share of costs and expenses, together with interest thereon at the rate provided in the Accounting Procedure referred to above. To the extent that Operator has a security interest under the Uniform Commercial Code ("Code") of the state or states in which the Contract Area is located, Operator without prejudice and in addition to all other legal, equitable and contractual remedies which are expressly reserved, shall be entitled to exercise the rights and remedies of a secured party under the Code. The bringing of a suit and the obtaining of judgment by Operator for the secured indebtedness shall not be deemed an election of remedies or otherwise affect the rights or security interests for the payment thereof.

4. The Operator grants to Non-Operator a lien and security interest equivalent to that granted to Operator as described in Paragraph 3 above, to secure payment by Operator of its own share of costs and expenses when due.

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TUG HILL

April 26, 2019

WV Department of Environmental Protection
Office of Oil & Gas
601 57th Street, SE
Charleston, WV 25304
Attention: Laura Adkins

RE: Old Crow N-4HM

Subject: Marshall County Route 74 Road Crossing Letter

Dear Laura:

Tug Hill Operating, LLC (THO) hereby submits this letter as confirmation that THO has obtained the right to drill, extract and produce the minerals under Marshall County Route 74 in the area reflected on the Old Crow N-4HM well plat. THO has conducted a full title search in the relevant Court House to confirm its ownership under said County Routes and is not currently aware of any recorded document that would suggest an ownership other than THO.

If your office has any questions or concerns regarding the contents of this letter, please do not hesitate to contact me directly at 304-376-0111, or by email at amiller@tug-hillop.com.

Sincerely,

Amy Miller

Amy Miller
Permit Specialist – Appalachia Region
Cell 304-376-0111
Email: amiller@tug-hillop.com

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STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE CERTIFICATION

Date of Notice Certification: 04/24/2019

API No. 47- 051 -
Operator's Well No. Old Crow N-4HM
Well Pad Name: Old Crow

Notice has been given:
Pursuant to the provisions in West Virginia Code § 22-6A, the Operator has provided the required parties with the Notice Forms listed below for the tract of land as follows:

State:	West Virginia	UTM NAD 83	Easting:	520,286.96
County:	Marshall		Northing:	4,403,194.81
District:	Franklin	Public Road Access:		Rines Ridge Road (CR 76)
Quadrangle:	Powhatan Point 7.5'	Generally used farm name:		Donna Yoho
Watershed:	Fish Creek (HUC 10)			

Pursuant to West Virginia Code § 22-6A-7(b), every permit application filed under this section shall be on a form as may be prescribed by the secretary, shall be verified and shall contain the following information: (14) A certification from the operator that (i) it has provided the owners of the surface described in subdivisions (1), (2) and (4), subsection (b), section ten of this article, the information required by subsections (b) and (c), section sixteen of this article; (ii) that the requirement was deemed satisfied as a result of giving the surface owner notice of entry to survey pursuant to subsection (a), section ten of this article six-a; or (iii) the notice requirements of subsection (b), section sixteen of this article were waived in writing by the surface owner; and Pursuant to West Virginia Code § 22-6A-11(b), the applicant shall tender proof of and certify to the secretary that the notice requirements of section ten of this article have been completed by the applicant.

Pursuant to West Virginia Code § 22-6A, the Operator has attached proof to this Notice Certification that the Operator has properly served the required parties with the following: *PLEASE CHECK ALL THAT APPLY	OOG OFFICE USE ONLY
☐ 1. NOTICE OF SEISMIC ACTIVITY or ■ NOTICE NOT REQUIRED BECAUSE NO SEISMIC ACTIVITY WAS CONDUCTED	☐ RECEIVED/ NOT REQUIRED
■ 2. NOTICE OF ENTRY FOR PLAT SURVEY or ☐ NO PLAT SURVEY WAS CONDUCTED	☑ RECEIVED
☐ 3. NOTICE OF INTENT TO DRILL or ■ NOTICE NOT REQUIRED BECAUSE NOTICE OF ENTRY FOR PLAT SURVEY WAS CONDUCTED or ☐ WRITTEN WAIVER BY SURFACE OWNER (PLEASE ATTACH)	☐ RECEIVED/ NOT REQUIRED
■ 4. NOTICE OF PLANNED OPERATION	☑ RECEIVED
■ 5. PUBLIC NOTICE	☑ RECEIVED
■ 6. NOTICE OF APPLICATION	☑ RECEIVED

Required Attachments:
The Operator shall attach to this Notice Certification Form all Notice Forms and Certifications of Notice that have been provided to the required parties and/or any associated written waivers. For the Public Notice, the operator shall attach a copy of the Class II Legal Advertisement with publication date verification or the associated Affidavit of Publication. The attached Notice Forms and Certifications of Notice shall serve as proof that the required parties have been noticed as required under West Virginia Code § 22-6A. Pursuant to West Virginia Code § 22-6A-11(b), the Certification of Notice to the person may be made by affidavit of personal service, the return receipt card or other postal receipt for certified mailing.

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WW-6AC
(1/12)

Certification of Notice is hereby given:

THEREFORE, I Amy L. Miller, have read and understand the notice requirements within West Virginia Code § 22-6A. I certify that as required under West Virginia Code § 22-6A, I have served the attached copies of the Notice Forms, identified above, to the required parties through personal service, by registered mail or by any method of delivery that requires a receipt or signature confirmation. I certify under penalty of law that I have personally examined and am familiar with the information submitted in this Notice Certification and all attachments, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator:	Tug Hill Operating, LLC	Address:	380 Southpointe Boulevard, Plaza II, Suite 200
By:	Amy L. Miller		Canonsburg, PA 15317
Its:	Permitting Specialist - Appalachia Region	Facsimile:	724-338-2030
Telephone:	724-749-8388	Email:	amiller@tug-hillop.com

NOTARY SEAL

Commonwealth of Pennsylvania - Notary Seal
MAUREEN A STEAD - Notary Public
Washington County
My Commission Expires Jan 28, 2023
Commission Number 1259926

Subscribed and sworn before me this 24 day of APRIL, 2019.

Maureen A Stead Notary Public

My Commission Expires 1/28/23

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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WV Department of
Environmental Protection

4705 02227

WW-6A
(9-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF APPLICATION

Notice Time Requirement: notice shall be provided no later than the **filing date of permit application.**

Date of Notice: 3/10/2019 **Date Permit Application Filed:** 3/20/2019

Notice of:

☑ PERMIT FOR ANY WELL WORK ☐ CERTIFICATE OF APPROVAL FOR THE CONSTRUCTION OF AN IMPOUNDMENT OR PIT

Delivery method pursuant to West Virginia Code § 22-6A-10(b)

☐ PERSONAL SERVICE ☐ REGISTERED MAIL ☑ METHOD OF DELIVERY THAT REQUIRES A RECEIPT OR SIGNATURE CONFIRMATION

Pursuant to W. Va. Code § 22-6A-10(b) no later than the filing date of the application, the applicant for a permit for any well work or for a certificate of approval for the construction of an impoundment or pit as required by this article shall deliver, by personal service or by registered mail or by any method of delivery that requires a receipt or signature confirmation, copies of the application, the erosion and sediment control plan required by section seven of this article, and the well plat to each of the following persons: (1) The owners of record of the surface of the tract on which the well is or is proposed to be located; (2) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for roads or other land disturbance as described in the erosion and sediment control plan submitted pursuant to subsection (c), section seven of this article; (3) The coal owner, operator or lessee, in the event the tract of land on which the well proposed to be drilled is located [sic] is known to be underlain by one or more coal seams; (4) The owners of record of the surface tract or tracts overlying the oil and gas leasehold being developed by the proposed well work, if the surface tract is to be used for the placement, construction, enlargement, alteration, repair, removal or abandonment of any impoundment or pit as described in section nine of this article; (5) Any surface owner or water purveyor who is known to the applicant to have a water well, spring or water supply source located within one thousand five hundred feet of the center of the well pad which is used to provide water for consumption by humans or domestic animals; and (6) The operator of any natural gas storage field within which the proposed well work activity is to take place. (c)(1) If more than three tenants in common or other co-owners of interests described in subsection (b) of this section hold interests in the lands, the applicant may serve the documents required upon the person described in the records of the sheriff required to be maintained pursuant to section eight, article one, chapter eleven-a of this code. (2) Notwithstanding any provision of this article to the contrary, notice to a lien holder is not notice to a landowner, unless the lien holder is the landowner. W. Va. Code R. § 35-8-5.7.a requires, in part, that the operator shall also provide the Well Site Safety Plan ("WSSP") to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

☑ Application Notice ☑ WSSP Notice ☑ E&S Plan Notice ☑ Well Plat Notice is hereby provided to:

☑ SURFACE OWNER(s)
Name: Donna Yoho
Address: 3682 Rines Ridge Road
Proctor, WV 26055
Name:
Address:

☐ SURFACE OWNER(s) (Road and/or Other Disturbance)
Name:
Address:
Name:
Address:

☐ SURFACE OWNER(s) (Impoundments or Pits)
Name:
Address:

☑ COAL OWNER OR LESSEE
Name: Consol Energy, Inc. Leatherwood, Inc. Attn: Casey Saunders
Address: 1000 CONSOL Energy DRive
Canonsburg, PA 15317

☐ COAL OPERATOR
Name:
Address:

☑ SURFACE OWNER OF WATER WELL AND/OR WATER PURVEYOR(s)
Name: *See attached list
Address:

☐ OPERATOR OF ANY NATURAL GAS STORAGE FIELD
Name:
Address:

*Please attach additional forms if necessary

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Environmental Protection

WW-6A
(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

Notice is hereby given:
Pursuant to West Virginia Code § 22-6A-10(b), notice is hereby given that the undersigned well operator has applied for a permit for well work or for a certificate of approval for the construction of an impoundment or pit.

This Notice Shall Include:
Pursuant to W. Va. Code § 22-6A-10(b), this notice shall include: (1) copies of the application; (2) the erosion and sediment control plan required by section seven of this article; and (3) the well plat.

Pursuant to W. Va. Code § 22-6A-10(f), this notice shall include: (1) a statement of the time limits for filing written comments; (2) who may file written comments; (3) the name and address of the secretary for the purpose of filing the comments and obtaining additional information; and (4) a statement that the persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

Pursuant to W. Va. Code R. § 35-8-5.7.a, the operator shall provide the Well Site Safety Plan to the surface owner and any water purveyor or surface owner subject to notice and water testing as provided in section 15 of this rule.

Pursuant to W. Va. Code R. § 35-8-15.2.c, this notice shall: (1) contain a statement of the surface owner's and water purveyor's right to request sampling and analysis; (2) advise the surface owner and water purveyor of the rebuttable presumption for contamination or deprivation of a fresh water source or supply; advise the surface owner and water purveyor that refusal to allow the operator to conduct a pre-drilling water well test constitutes a method to rebut the presumption of liability; (3) advise the surface owner and water purveyor of his or her independent right to sample and analyze any water supply at his or her own expense; advise the surface owner and water purveyor whether or not the operator will utilize an independent laboratory to analyze any sample; and (4) advise the surface owner and or water purveyor that he or she can obtain from the Chief a list of water testing laboratories in the subject area capable of and qualified to test water supplies in accordance with standard acceptable methods.

Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Well Location Restrictions
Pursuant to W. Va. Code § 22-6A-12, Wells may not be drilled within two hundred fifty feet measured horizontally from any existing water well or developed spring used for human or domestic animal consumption. The center of well pads may not be located within six hundred twenty-five feet of an occupied dwelling structure, or a building two thousand five hundred square feet or larger used to house or shelter dairy cattle or poultry husbandry. This limitation is applicable to those wells, developed springs, dwellings or agricultural buildings that existed on the date a notice to the surface owner of planned entry for surveying or staking as provided in section ten of this article or a notice of intent to drill a horizontal well as provided in subsection (b), section sixteen of this article was provided, whichever occurs first, and to any dwelling under construction prior to that date. This limitation may be waived by written consent of the surface owner transmitted to the department and recorded in the real property records maintained by the clerk of the county commission for the county in which such property is located. Furthermore, the well operator may be granted a variance by the secretary from these distance restrictions upon submission of a plan which identifies the sufficient measures, facilities or practices to be employed during well site construction, drilling and operations. The variance, if granted, shall include terms and conditions the department requires to ensure the safety and protection of affected persons and property. The terms and conditions may include insurance, bonding and indemnification, as well as technical requirements. (b) No well pad may be prepared or well drilled within one hundred feet measured horizontally from any perennial stream, natural or artificial lake, pond or reservoir, or a wetland, or within three hundred feet of a naturally reproducing trout stream. No well pad may be located within one thousand feet of a surface or ground water intake of a public water supply. The distance from the public water supply as identified by the department shall be measured as follows: (1) For a surface water intake on a lake or reservoir, the distance shall be measured from the boundary of the lake or reservoir. (2) For a surface water intake on a flowing stream, the distance shall be measured from a semicircular radius extending upstream of the surface water intake. (3) For a groundwater source, the distance shall be measured from the wellhead or spring. The Chief of Oil and Gas may, in its discretion, waive these distance restrictions upon submission of a plan identifying sufficient measures, facilities or practices to be employed during well site construction, drilling and operations to protect the waters of the state. A waiver, if granted, shall impose any permit conditions as the secretary considers necessary. (c) Notwithstanding the foregoing provisions of this section, nothing contained in this section prevents an operator from conducting the activities permitted or authorized by a Clean Water Act Section 404 permit or other approval from the United States Army Corps of Engineers within any waters of the state or within the restricted areas referenced in this section. (d) The well location restrictions set forth in this section shall not apply to any well on a multiple well pad if at least one of the wells was permitted prior to the effective date of this article. (e) The secretary shall, by December 31, 2012, report to the Legislature on the noise, light, dust and volatile organic compounds generated by the drilling of horizontal wells as they relate to the well location restrictions regarding occupied dwelling structures pursuant to this section. Upon a finding, if any, by the secretary that the well location restrictions regarding occupied dwelling structures are inadequate or otherwise require alteration to address the items

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examined in the study required by this subsection, the secretary shall have the authority to propose for promulgation legislative rules establishing guidelines and procedures regarding reasonable levels of noise, light, dust and volatile organic compounds relating to drilling horizontal wells, including reasonable means of mitigating such factors, if necessary.

Water Well Testing:
Pursuant to West Virginia Code § 22-6A-10(d), notification shall be made, with respect to surface landowners identified in subsection (b) or water purveyors identified in subdivision (5), subsection (b) of this section, of the opportunity for testing their water well. The operator shall provide an analysis to such surface landowner or water purveyor at their request.

Water Testing Laboratories:
Pursuant to West Virginia Code § 22-6A-10(i), persons entitled to notice pursuant to subsection (b) of this section may contact the department to ascertain the names and locations of water testing laboratories in the subject area capable and qualified to test water supplies in accordance with standard accepted methods. In compiling that list of names the department shall consult with the state Bureau for Public Health and local health departments. A surface owner and water purveyor has an independent right to sample and analyze any water supply at his or her own expense. The laboratory utilized by the operator shall be approved by the agency as being certified and capable of performing sample analyses in accordance with this section.

Rebuttable Presumption for Contamination or Deprivation of a Fresh Water Source or Supply:

W. Va. Code § 22-6A-18 requires that (b) unless rebutted by one of the defenses established in subsection (c) of this section, in any action for contamination or deprivation of a fresh water source or supply within one thousand five hundred feet of the center of the well pad for horizontal well, there is a rebuttable presumption that the drilling and the oil or gas well or either was the proximate cause of the contamination or deprivation of the fresh water source or supply. (c) In order to rebut the presumption of liability established in subsection (b) of this section, the operator must prove by a preponderance of the evidence one of the following defenses: (1) The pollution existed prior to the drilling or alteration activity as determined by a predrilling or prealteration water well test. (2) The landowner or water purveyor refused to allow the operator access to the property to conduct a predrilling or prealteration water well test. (3) The water supply is not within one thousand five hundred feet of the well. (4) The pollution occurred more than six months after completion of drilling or alteration activities. (5) The pollution occurred as the result of some cause other than the drilling or alteration activity. (d) Any operator electing to preserve its defenses under subdivision (1), subsection (c) of this section shall retain the services of an independent certified laboratory to conduct the predrilling or prealteration water well test. A copy of the results of the test shall be submitted to the department and the surface owner or water purveyor in a manner prescribed by the secretary. (e) Any operator shall replace the water supply of an owner of interest in real property who obtains all or part of that owner's supply of water for domestic, agricultural, industrial or other legitimate use from an underground or surface source with a comparable water supply where the secretary determines that the water supply has been affected by contamination, diminution or interruption proximately caused by the oil or gas operation, unless waived in writing by that owner. (f) The secretary may order the operator conducting the oil or gas operation to: (1) Provide an emergency drinking water supply within twenty-four hours; (2) Provide temporary water supply within seventy-two hours; (3) Within thirty days begin activities to establish a permanent water supply or submit a proposal to the secretary outlining the measures and timetables to be used in establishing a permanent supply. The total time in providing a permanent water supply may not exceed two years. If the operator demonstrates that providing a permanent replacement water supply cannot be completed within two years, the secretary may extend the time frame on case-by-case basis; and (4) Pay all reasonable costs incurred by the real property owner in securing a water supply. (g) A person as described in subsection (b) of this section aggrieved under the provisions of subsections (b), (e) or (f) of this section may seek relief in court... (i) Notwithstanding the denial of the operator of responsibility for the damage to the real property owner's water supply or the status of any appeal on determination of liability for the damage to the real property owner's water supply, the operator may not discontinue providing the required water service until authorized to do so by the secretary or a court of competent jurisdiction.

Written Comment:
Pursuant to West Virginia Code § 22-6A-11(a), all persons described in subsection (b), section ten of this article may file written comments with the secretary as to the location or construction of the applicant's proposed well work within thirty days after the application is filed with the secretary. All persons described in West Virginia Code § 22-6A-10(b) may file written comments as to the location or construction of the applicant's proposed well work to the Secretary at:

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Chief, Office of Oil and Gas
Department of Environmental Protection
601 57th St. SE
Charleston, WV 25304
(304) 926-0450

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WV Department of
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Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water. **NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.**

WW-6A
(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

Time Limits and Methods for Filing Comments.

The law requires these materials to be served on or before the date the operator files its Application. You have **THIRTY (30) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

Pursuant to West Virginia Code § 22-6A-11(c)(2), Any objections of the affected coal operators and coal seam owners and lessees shall be addressed through the processes and procedures that exist under sections fifteen, seventeen and forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article. The written comments filed by the parties entitled to notice under subdivisions (1), (2), (4), (5) and (6), subsection (b), section ten of this article shall be considered by the secretary in the permit issuance process, but the parties are not entitled to participate in the processes and proceedings that exist under sections fifteen, seventeen or forty, article six of this chapter, as applicable and as incorporated into this article by section five of this article.

Comment Requirements

Your comments must be in writing and include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

Disclaimer: All comments received will be placed on our web site http://www.dep.wv.gov/oil-and-gas/Horizontal-Permits/Pages/default.aspx and the applicant will automatically be forwarded an email notice that such comments have been submitted. The applicant will be expected to provide a response to comments submitted by any surface owner, water purveyor or natural gas storage operator noticed within the application.

Permit Denial or Condition

The Chief has the power to deny or condition a well work permit. Pursuant to West Virginia Code § 22-6A-8(d), the permit may not be issued or be conditioned, including conditions with respect to the location of the well and access roads prior to issuance if the director determines that:

(1) The proposed well work will constitute a hazard to the safety of persons;
(2) The plan for soil erosion and sediment control is not adequate or effective;
(3) Damage would occur to publicly owned lands or resources; or
(4) The proposed well work fails to protect fresh water sources or supplies.

A permit may also be denied under West Virginia Code § 22-6A-7(k), the secretary shall deny the issuance of a permit if the secretary determines that the applicant has committed a substantial violation of a previously issued permit for a horizontal well, including the applicable erosion and sediment control plan associated with the previously issued permit, or a substantial violation of one or more of the rules promulgated under this article, and in each instance has failed to abate or seek review of the violation within the time prescribed by the secretary pursuant to the provisions of subdivisions (1) and (2), subsection (a), section five of this article and the rules promulgated hereunder, which time may not be unreasonable.

Pursuant to West Virginia Code § 22-6A-10(g), any person entitled to submit written comments to the secretary pursuant to subsection (a), section eleven of this article, shall also be entitled to receive from the secretary a copy of the permit as issued or a copy of the order modifying or denying the permit if the person requests receipt of them as a part of the written comments submitted concerning the permit application. Such persons may request, at the time of submitting written comments, notice of the permit decision and a list of persons qualified to test water.

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4705 02227

WW-6A
(8-13)

API NO. 47- 051 -
OPERATOR WELL NO. Old Crow N-4HM
Well Pad Name: Old Crow

Notice is hereby given by:

Well Operator: Tug Hill Operating, LLC
Telephone: 724-749-8388
Email: amiller@tug-hillop.com

Address: 380 Southpointe Boulevard, Plaza II, Suite 200
Canonsburg, PA 15317
Facsimile: 724-338-2030

Oil and Gas Privacy Notice:

The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

Commonwealth of Pennsylvania - Notary Seal
MAUREEN A STEAD - Notary Public
Washington County
My Commission Expires Jan 28, 2023
Commission Number 1259926

Subscribed and sworn before me this 11 day of MARCH, 2019.

Maureen A Stead Notary Public

My Commission Expires 1/28/23

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Exhibit WW-6A

Tug Hill Operating, LLC
380 Southpointe Blvd, Suite 200
Cannonsburg, PA 15137

Residences within Two-Thousand Feet (2,000')

Well: Old Crow N – 4HM
District: Franklin (Residence #'s 1-7)
State: WV

There are seven (7) residences, no businesses, no churches, no schools or no emergency facilities within two-thousand feet (2,000') of the above referenced well location.

Residence 1 TM 16 Pcl. 3.1 Dennis Jackson, Et Ux Phone: 304-843-1762 **Physical Address:** 4004 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** P.O. Box 109 Woodsfield, OH 43793	**Residence 2** TM 16 Pcl. 3 Donna Vivian Yoho - TOD Phone: 304-845-5590 (Rev. Address) **Physical Address:** 3862 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 3** TM 16 Pcl. 3.2 Jimmy Ostrander, Sr., Et Ux Phone: 304-845-5599, 304-845-5590 **Physical Address:** 3810 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 4 TM 16 Pcl. 6 John Swierkos Phone: 304-810-4092 **Physical Address:** 110 Rahm Dr. Proctor, WV 26055 **Tax Address:** Same	**Residence 5** TM 16 Pcl. 23.3 Greg & Christina Riddle Phone: 304-843-0173 **Physical Address:** 4205 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same	**Residence 6** TM 16 Pcl. 23.1 Ray E. Minor, Et Ux Phone: 304-843-1713 **Physical Address:** 4193 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same
Residence 7 TM 16 Pcl. 24 Alan M. Beyser, Et Ux Phone: 304-810-0617 **Physical Address:** 4271 Rines Ridge Rd. Proctor, WV 26055 **Tax Address:** Same		RECEIVED Office of Oil and Gas MAY 22 2019 WV Department of Environmental Protection

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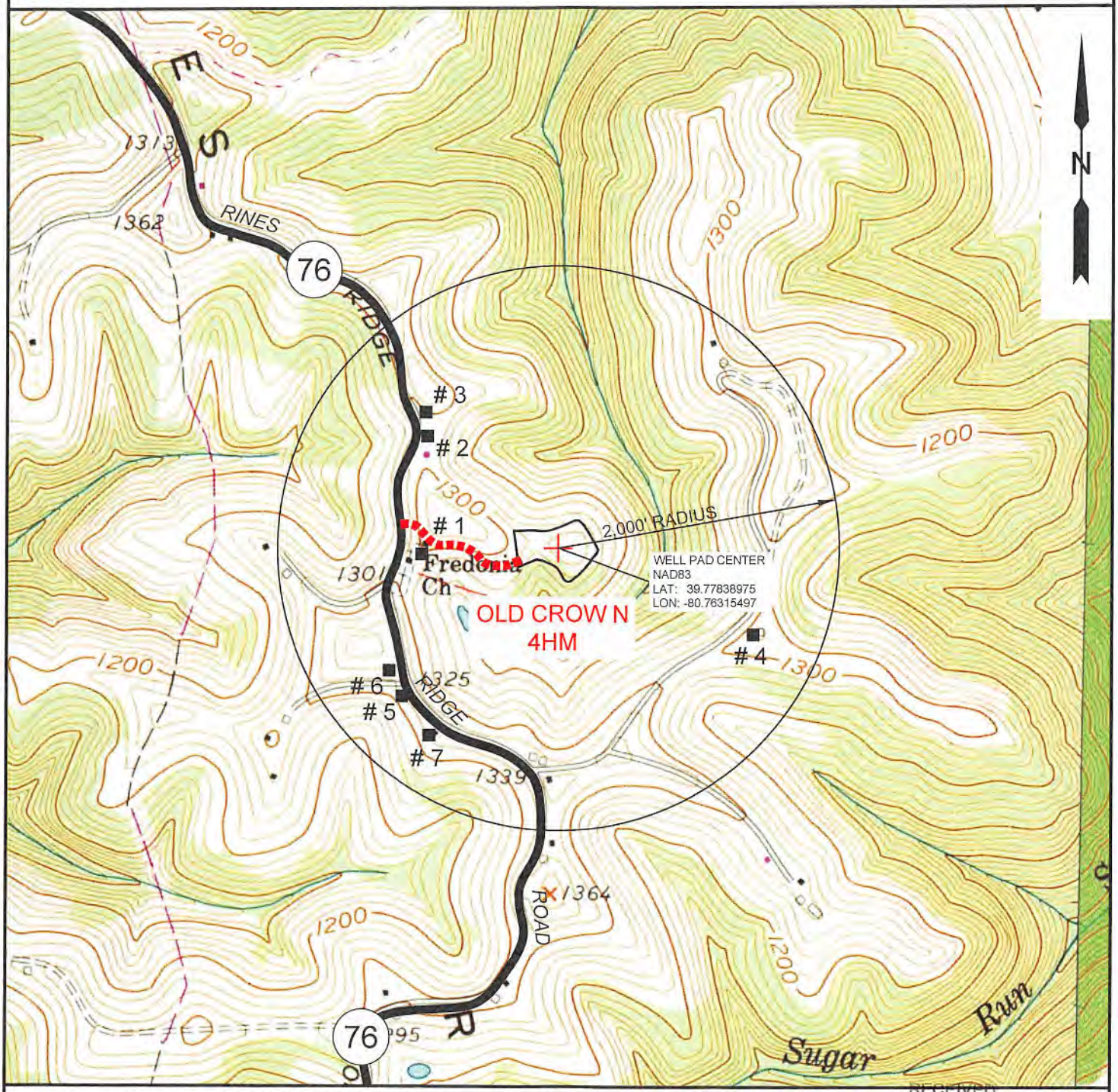
WW-6A

SUPPLEMENT PG. 1B

PROPOSED
OLD CROW N - 4HM



NOTE: THERE APPEARS TO BE SEVEN (7) POSSIBLE WATER SOURCES WITHIN 2,000'.

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SLS
Land & Energy Development
Solutions from the ground up.
P.O. Box 150 ♦ 12 Vanhorn Drive ♦ Glenville, WV 26351 ♦ (304) 462-5634
www.slssurveys.com

TOPO SECTION:		OPERATOR:	
GLEN EASTON & POWHATAN POINT 7.5'		PREPARED FOR: TUG HILL OPERATING, LLC 380 SOUTHPOINTE BLVD SUITE 200 CANONSBURG, PA 15317	
COUNTY	DISTRICT		
MARSHALL	FRANKLIN		
DRAWN BY	JOB NO.	DATE	SCALE
K.G.M.	8796	06/22/18	1" – 1000'

TUG HILL OPERATING

WW-6A3
(1/12)

4705102227
Operator Well No. Old Crow N-4HM

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF ENTRY FOR PLAT SURVEY

Notice Time Requirement: Notice shall be provided at least **SEVEN (7)** days but no more than **FORTY-FIVE (45)** days prior to entry

Date of Notice: 11/16/2018 **Date of Planned Entry:** 11/17/2018

Delivery method pursuant to West Virginia Code § 22-6A-10a

☐ PERSONAL SERVICE ☐ REGISTERED MAIL ☒ METHOD OF DELIVERY THAT REQUIRES A RECEIPT OR SIGNATURE CONFIRMATION

Pursuant to West Virginia Code § 22-6A-10(a), Prior to filing a permit application, the operator shall provide notice of planned entry on to the surface tract to conduct any plat surveys required pursuant to this article. Such notice shall be provided at least seven days but no more than forty-five days prior to such entry to: (1) The surface owner of such tract; (2) to any owner or lessee of coal seams beneath such tract that has filed a declaration pursuant to section thirty-six, article six, chapter twenty-two of this code; and (3) any owner of minerals underlying such tract in the county tax records. The notice shall include a statement that copies of the state Erosion and Sediment Control Manual and the statutes and rules related to oil and gas exploration and production may be obtained from the Secretary, which statement shall include contact information, including the address for a web page on the Secretary's web site, to enable the surface owner to obtain copies from the secretary.

Notice is hereby provided to:

☒ SURFACE OWNER(s)
Name: Donna Yoho
Address: 3682 Rines Ridge Road
Proctor, WV 26055
Name:
Address:
Name:
Address:

☒ COAL OWNER OR LESSEE
Name: Consol Energy, Inc. Leatherwood, Inc. Attn: Casey Saunders
Address: 1000 CONSOL Energy Drive
Canonsburg, PA 15317

☐ MINERAL OWNER(s)
Name:
Address:

*please attach additional forms if necessary

Notice is hereby given:
Pursuant to West Virginia Code § 22-6A-10(a), notice is hereby given that the undersigned well operator is planning entry to conduct a plat survey on the tract of land as follows:

State:	West Virginia	Approx. Latitude & Longitude:	39.7784004; -80.7631353
County:	Marshall	Public Road Access:	Rines Ridge Road (County Route 76)
District:	Franklin	Watershed:	Truibutary of Fish Creek (HUC 10)
Quadrangle:	Powhatan Point 7.5'	Generally used farm name:	Donna Yoho

Copies of the state Erosion and Sediment Control Manual and the statutes and rules related to oil and gas exploration and production may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450). Copies of such documents or additional information related to horizontal drilling may be obtained from the Secretary by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Notice is hereby given by:

Well Operator:	Tug Hill Operating, LLC	Address:	380 Southpointe Boulevard, Plaza II, Suite 200
Telephone:	724-749-8388		Canonsburg, PA 15317
Email:	amiller@tug-hillop.com	Facsimile:	724-338-2030

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WV Department of Environmental Protection

Oil and Gas Privacy Notice:
The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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WW-6A5
(1/12)

Operator Well No. Old Crow N-4HM

STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
NOTICE OF PLANNED OPERATION

Notice Time Requirement: notice shall be provided no later than the **filing date of permit application.**
Date of Notice: 03/12/2019 **Date Permit Application Filed:** 03/20/2019

Delivery method pursuant to West Virginia Code § 22-6A-16(c)

☒ CERTIFIED MAIL RETURN RECEIPT REQUESTED ☐ HAND DELIVERY

Pursuant to W. Va. Code § 22-6A-16(c), no later than the date for filing the permit application, an operator shall, by certified mail return receipt requested or hand delivery, give the surface owner whose land will be used for the drilling of a horizontal well notice of the planned operation. The notice required by this subsection shall include: (1) A copy of this code section; (2) The information required to be provided by subsection (b), section ten of this article to a surface owner whose land will be used in conjunction with the drilling of a horizontal well; and (3) A proposed surface use and compensation agreement containing an offer of compensation for damages to the surface affected by oil and gas operations to the extent the damages are compensable under article six-b of this chapter. (d) The notices required by this section shall be given to the surface owner at the address listed in the records of the sheriff at the time of notice.

Notice is hereby provided to the SURFACE OWNER(s)
(at the address listed in the records of the sheriff at the time of notice):

Name: Donna Yoho
Address: 3862 Rines Ridge Road
Proctor, WV 26055

Name:
Address:

Notice is hereby given:
Pursuant to West Virginia Code § 22-6A-16(c), notice is hereby given that the undersigned well operator has developed a planned operation on the surface owner's land for the purpose of drilling a horizontal well on the tract of land as follows:

State: West Virginia
County: Marshall
District: Franklin
Quadrangle: Powhatan Point 7.5'
Watershed: Tributary of Fish Creek (HUC 10)

UTM NAD 83 Easting: 520,286.96
Northing: 4,403,194.81
Public Road Access: Rines Ridge Road (County Route 76)
Generally used farm name: Donna Yoho

This Notice Shall Include:
Pursuant to West Virginia Code § 22-6A-16(c), this notice shall include: (1)A copy of this code section; (2) The information required to be provided by **W. Va. Code § 22-6A-10(b)** to a surface owner whose land will be used in conjunction with the drilling of a horizontal well; and (3) A proposed surface use and compensation agreement containing an offer of compensation for damages to the surface affected by oil and gas operations to the extent the damages are compensable under article six-b of this chapter. Additional information related to horizontal drilling may be obtained from the Secretary, at the WV Department of Environmental Protection headquarters, located at 601 57th Street, SE, Charleston, WV 25304 (304-926-0450) or by visiting www.dep.wv.gov/oil-and-gas/pages/default.aspx.

Well Operator: Tug Hill Operating, LLC
Telephone: 724-749-8388
Email: amiller@tug-hillop.com

Address: 380 Southpointe Boulevard, Plaza II, Suite 200
Canonsburg, PA 15317
Facsimile: 724-338-2030

Oil and Gas Privacy Notice:
The Office of Oil and Gas processes your personal information, such as name, address and telephone number, as part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use or your personal information, please contact DEP's Chief Privacy Officer at depprivacyofficer@wv.gov.

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Office of Oil and Gas
MAY 22 2019
WV Department of
Environmental Protection

4705 02227

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION

Division of Highways

1900 Kanawha Boulevard East • Building Five • Room 110
Charleston, West Virginia 25305-0430 • (304) 558-3505

Byrd E. White, III
Secretary of Transportation

Jimmy Wriston, P. E.
Deputy Secretary/
Acting Commissioner

May 6, 2019

James A. Martin, Chief
Office of Oil and Gas
Department of Environmental Protection
601 57th Street, SE
Charleston, WV 25304

Subject: DOH Permit for the Old Crow Pad, Marshall County
Old Crow N-4HM Well site

Dear Mr. Martin,

This well site will be accessed from a DOH permit #06-2018-0130 which has been issued to Tug Hill Operating, LLC for access to the State Road for a well site located off of Marshall County Route 76 SLS.

The operator has signed a STATEWIDE OIL AND GAS ROAD MAINTENANCE BONDING AGREEMENT and provided the required Bond. This operator is currently in compliance with the DOH OIL AND GAS POLICY dated January 3, 2012.

Very Truly Yours,

Gary K. Clayton

Gary K. Clayton, P.E.
Regional Maintenance Engineer
Central Office O&G Coordinator

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Office of Oil and Gas

MAY 22 2019

WV Department of
Environmental Protection

Cc: Amy Miller
Tug Hill Operating, LLC
CH, OM, D-6
File

TUG HILL

PLANNED ADDITIVES TO BE USED IN FRACTURING OR STIMULATION

Well No. Old Crow N-4HM

PRODUCT NAME:	CHEMICAL DESCRIPTION:	PRODUCT USE:	HAZARDOUS COMPONENT:
GBW-20C	Hemicellulase Breaker	Breaker - Water	None
ALPHA 1427		Biocide	Glutaraldehyde – CAS#000111-30-8 Quatemary ammonium chloride CAS# 007173-51-5 Alky dimethyl benzyl ammonium Chloride (C12-16) – CAS#068424-85-1 Ethanol – CAS# 000064-17-5 Water – CAS# 007732-18-5
FRAC SAND	Silica Sand (various Mesh sizes)	Proppant	Crystalline silica (quartz) CAS# 14808-60-7
S-8C, Sand	Silica Sand (100 mesh)	Sand	Silica – CAS# 14808-60-7
GW-3LDF		Gellant - Water	Petroleum Distillate Blend – Proprietary, (Not Associated with Diesel Fuel) Guar gum – CAS# 009000-30-0
FRW-18		Friction Reducer	Hydrotreated light distillate CAS# 064742-47-8
Scaletrol		Scale Inhibitor	Ethylene glycol – CAS# 000107-21-1 Diethylene glycol – CAS# 000111-46-6

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Office of Oil and Gas

MAY 22 2019

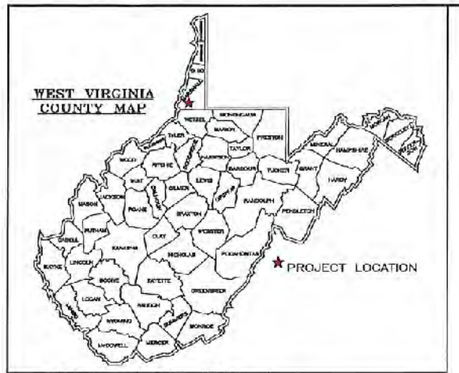
WV Department of
Environmental Protection

Old Crow Well Site

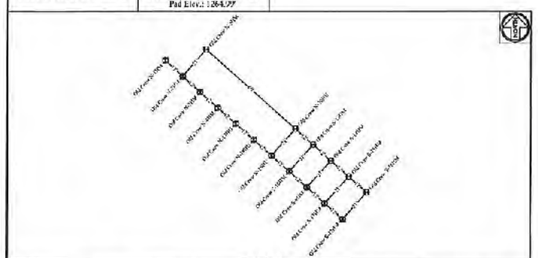
Site Design, Construction Plan, &
Erosion and Sediment Control Plans
Tug Hill Operating
Marshall County
Franklin District
Latitude 39.77838678°
Longitude -80.76316840°
Lower Fish Creek Watershed

WVDEP OOG ACCEPTED AS-BUILT
WJ 3 / 4 / 2019

Pertinent Site Information
Old Crow Well Site
Emergency Number: 304-845-1920
Franklin District, Marshall County, WV
Watershed: Lower Fish Creek Watershed
Tug Hill Contact Number: 1-817-632-3400



Site Entrance	Center of Well Pad
WV-N NAD 83 N: 468283.78	WV-N NAD 83 N: 468123.90
WV-N NAD 83 E: 1612377.51	WV-N NAD 83 E: 1618.97.03
WV-N NAD 27 N: 468257.51	WV-N NAD 27 N: 468087.62
WV-N NAD 27 E: 1541815.36	WV-N NAD 27 E: 1541931.43
Lat. NAD 83: 39.77838983	Lat. NAD 83: 39.77838678
Lon. NAD 83: -80.76715831	Lon. NAD 83: -80.76316840
Lat. NAD 27: 39.77837284	Lat. NAD 27: 39.77838911
Lon. NAD 27: -80.76734651	Lon. NAD 27: -80.76337625
UTM 17 NAD 83 N: 4405439.67	UTM 17 NAD 83 N: 4405187.61
UTM 17 NAD 83 E: 519939.28	UTM 17 NAD 83 E: 520281.09
	Pad Elev.: 1264.59



Well Table

Old Crow N-1BM1	Old Crow N-2BM1	Old Crow N-3BM1	Old Crow N-4BM1	Old Crow N-5BM1	Old Crow N-6BM1
WV-N NAD 83 N: 468011.29	WV-N NAD 83 N: 468002.28	WV-N NAD 83 N: 468016.22	WV-N NAD 83 N: 397412.23	WV-N NAD 83 N: 468126.24	WV-N NAD 83 N: 397412.25
WV-N NAD 83 E: 1618469.83	WV-N NAD 83 E: 1618.09.78	WV-N NAD 83 E: 1618299.22	WV-N NAD 83 E: 1618.98.69	WV-N NAD 83 E: 1618255.64	WV-N NAD 83 E: 1618.55.15
WV-N NAD 27 N: 468011.22	WV-N NAD 27 N: 468028.92	WV-N NAD 27 N: 468118.99	WV-N NAD 27 N: 397411.09	WV-N NAD 27 N: 468112.94	WV-N NAD 27 N: 397411.09
WV-N NAD 27 E: 1648693.22	WV-N NAD 27 E: 1649536.18	WV-N NAD 27 E: 1649815.33	WV-N NAD 27 E: 1648695.68	WV-N NAD 27 E: 1648626.94	WV-N NAD 27 E: 1648691.89
Lat. NAD 83: 39.77838983	Lat. NAD 83: 39.77838919	Lat. NAD 83: 39.77838919	Lat. NAD 83: 39.76939	Lat. NAD 83: 39.77838919	Lat. NAD 83: 39.77838919
Lon. NAD 83: -80.76715831	Lon. NAD 83: -80.76688185	Lon. NAD 83: -80.76657416	Lon. NAD 83: -80.76696968	Lon. NAD 83: -80.76705899	Lon. NAD 83: -80.76705314
Lat. NAD 27: 39.77837284	Lat. NAD 27: 39.77837147	Lat. NAD 27: 39.77837147	Lat. NAD 27: 39.77837182	Lat. NAD 27: 39.77837182	Lat. NAD 27: 39.77837182
Lon. NAD 27: -80.76734651	Lon. NAD 27: -80.76707995	Lon. NAD 27: -80.76676975	Lon. NAD 27: -80.76737306	Lon. NAD 27: -80.76745911	Lon. NAD 27: -80.76737306
UTM 17 NAD 83 (m) N: 4405439.67	UTM 17 NAD 83 (m) N: 4405439.67	UTM 17 NAD 83 (m) N: 4405439.67	UTM 17 NAD 83 (m) N: 4405439.67	UTM 17 NAD 83 (m) N: 4405439.67	UTM 17 NAD 83 (m) N: 4405439.67
UTM 17 NAD 83 (m) E: 520281.61	UTM 17 NAD 83 (m) E: 520281.61	UTM 17 NAD 83 (m) E: 520281.61	UTM 17 NAD 83 (m) E: 520281.61	UTM 17 NAD 83 (m) E: 520281.61	UTM 17 NAD 83 (m) E: 520281.61
Old Crow N-7BM1	Old Crow N-8BM1	Old Crow N-9BM1	Old Crow N-10BM1	Old Crow N-11BM1	Old Crow N-12BM1
WV-N NAD 83 N: 468115.26	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468109.27	WV-N NAD 83 N: 468109.28	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27
WV-N NAD 83 E: 1618.55.46	WV-N NAD 83 E: 1618.55.50	WV-N NAD 83 E: 1618.55.41	WV-N NAD 83 E: 1618.55.29	WV-N NAD 83 E: 1618.55.29	WV-N NAD 83 E: 1618.55.75
WV-N NAD 27 N: 468006.56	WV-N NAD 27 N: 468006.58	WV-N NAD 27 N: 468002.98	WV-N NAD 27 N: 468002.99	WV-N NAD 27 N: 468005.00	WV-N NAD 27 N: 468115.58
WV-N NAD 27 E: 1649693.94	WV-N NAD 27 E: 1649693.95	WV-N NAD 27 E: 1649693.85	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.75	WV-N NAD 27 E: 1649693.76
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Old Crow N-13BM1	Old Crow N-14BM1	Old Crow N-15BM1	Old Crow N-16BM1	Old Crow N-17BM1	Old Crow N-18BM1
WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27
WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75
WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58
WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76
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Old Crow N-19BM1	Old Crow N-20BM1	Old Crow N-21BM1	Old Crow N-22BM1	Old Crow N-23BM1	Old Crow N-24BM1
WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27	WV-N NAD 83 N: 468115.27
WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75	WV-N NAD 83 E: 1618.55.75
WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58	WV-N NAD 27 N: 468115.58
WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76	WV-N NAD 27 E: 1649693.76
Lat. NAD 83: 39.77838928	Lat. NAD 83: 39.77838928	Lat. NAD 83: 39.77838928	Lat. NAD 83: 39.77838928	Lat. NAD 83: 39.77838928	Lat. NAD 83: 39.77838928
Lon. NAD 83: -80.76705314	Lon. NAD 83: -80.76705314	Lon. NAD 83: -80.76705314	Lon. NAD 83: -80.76705314	Lon. NAD 83: -80.76705314	Lon. NAD 83: -80.76705314
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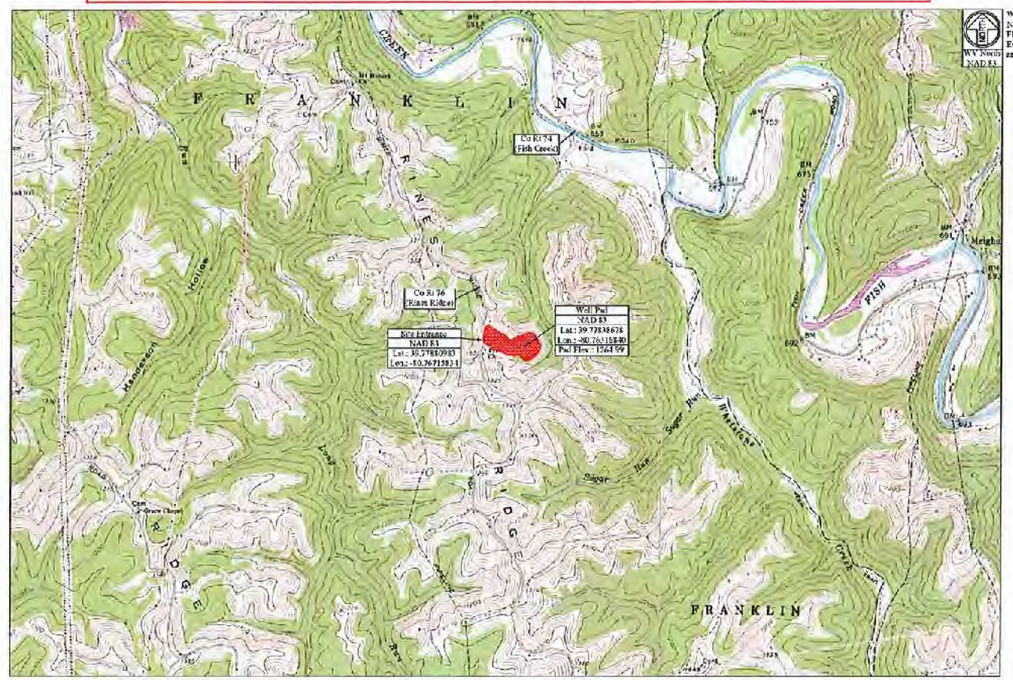
Exhibit A: Site As-Built



Site Locations (NAD 27)		
Structure	Latitude (DD)	Longitude (DD)
Site Entrance	39.77837284	-80.76734651
Center of Well Pad	39.77838911	-80.76337625

Site Locations (NAD 83)		
Structure	Latitude (DD)	Longitude (DD)
Site Entrance	39.77838983	-80.76715831
Center of Well Pad	39.77838678	-80.76316840

Property Owner Information - Old Crow Well Site						
Franklin District - Marshall County						
Owner	TM - Parcel	Well Pad	Access Road	Topsoil/Excess	Add. Clearing	Total Disturbed
Donna Yoho	16-3	6.64	1.71	1.91	8.92	19.18
Site Totals (Ac)		6.64	1.71	1.91	8.92	19.18

Access Road			
Surface Owner	TM - Parcel	Road Length	Type
Donna Yoho	16-3	1,017.41'	New Access Road Construction

Disturbed Area	
Well Pad Construction	6.64 Ac
Access Road Construction	1.71 Ac
Topsoil / Excess Material	1.91 Ac
Additional Clearing	8.92 Ac
Total Disturbed Area	19.18 Ac
Additional Information	
Total Wooded Acres Disturbed	9.59 Ac
Total Linear Feet of Access Road	1,017.41'

Old Crow Well Site Quantities						
Description	Cut (CY)	Fill (CY)	Spoil (CY)	Borrow (CY)	Max. Slope	Length of Slope
Well Pad	52,415.25	36,413.87	16,001.38		N/A	N/A
Access Road	8,439.31	8,718.95		288.71	14.00%	179.99'
Topsoil/Excess Material Stockpile	0.00	17,908.29		17,908.29	N/A	N/A
Totals	60,854.56	52,130.71	16,001.38	17,797.01		
	Total Spoil (CY) =		-1,293.65	(Excess Spoil Capacity)		

EXISTING API NUMBERS
47-051-02023
47-051-02040
47-051-02042
47-051-02043
47-051-02122
47-051-02123

JW 2/20/19

Project Contacts

Tug Hill Operating	Survey and Engineer
Jonathan White - Regulatory Analyst 724-183-2000 Off. 304-689-7676 Cell	Kenneth Kelly 304-338-6515 Off.
Geoff Keller - V.P. Production 817-632-5200 Off.	John P. See 304-607-0220 Off.
	Zachary Sumerfield 304-338-6787 Off.

Tug Hill Operating, LLC
168 Southpointe Blvd
Southpointe Plaza II, Suite 200
Canonsburg, PA 15317

Environmental:
Wetland Delineations as provided by Allstar Ecology dated November 6, 2017

Topographic Information:
The topographic information shown hereon is based on aerial photography by Blue Mountain Aerial Mapping, Burton, WV

MISS UTILITY OF WEST VIRGINIA
1-800-245-4848
West Virginia State Law Section XIV: Chapter 24-6 requires that you call two business days before you dig in the state of West Virginia.
IT'S THE LAW
811 Know what's below. Call before you dig.

Tug Hill Operating will obtain an Encroachment Permit (Form MM-109) from the WV Department of Transportation, Division of Highways, prior to the commencement of any construction activities

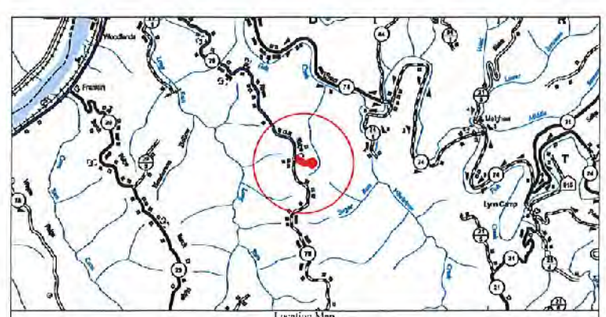
The WV Mines Website was consulted. Previous (Current) mining activities are not within the AOI.

WVDEP Website files show that there are no active and/or abandoned gas wells within the AOI

Floodplain Conditions	
Does site construction activities take place in a floodplain	NO
Permit needed from county floodplain coordinator	NO
Flood Hazard Zone	X
HEC-RAS Study completed:	N/A
Floodplain shown on drawings:	N/A
FIRM Map Number(s) for site:	54051C0145E
Acreage of construction in floodplain:	N/A

Approach Routes:

From the intersection of OH Rt 7 and WV Rt 2 near New Martinsville, WV. Travel North on WV Rt 2 for 13.0 mi. Turn right onto Co Rt 77 (Woodland and Grogsville). Follow Co Rt 77 for 1.0 mi. Turn Right onto Co Rt 76 (Rines Ridge). Follow Co Rt 76 for 4.0 mi. The site entrance will be on the Left (East) side of the road.



Location Map
Scale: 1" = 1 Mile

Well Location Restrictions

All pad and construction complies with the following restrictions.

*250' from an existing well or developed spring used for human or domestic animals.

*625' from an occupied dwelling or barn greater than 2,500 SF used for poultry or dairy increased from the center of the pad.

*100' from the edge of disturbance to wetlands, perennial streams, natural or artificial lake, pond or reservoir.

*300' from the edge of disturbance to a naturally reproducing trout stream.

*1,000' of a surface or ground water intake to a public water supply.

(Well Location Restrictions of WV Code 22-6A-12)

KENNETH C. SUMMERFIELD REGISTERED 22214 STATE OF WEST VIRGINIA PROFESSIONAL ENGINEER

As-Built Certification

This as-built certification certifies that the gas well built as-built pad was constructed substantially close conformance with the design drawings. It is recommended that gas well drilling pads included in the existing emergency maintenance and inspection program for gas well drilling pads so that a emergency response and operation plan can be developed in case the pad is in distress from the continued use of operators.

Zachary C. Summerfield
REE 22214
Kelly Surveying P.L.C.
COA C0025510
Date 01/25/2019

Sheet	Description
1	Cover Sheet
V1	Schedule of Quantities
N1-N4	Site Notes
2	Pre-Construction Site Conditions
3	Site Soil Map
4	Overall Plan View
5	Plan View
6-8	Cross Sections - Well Pad
9	Cross Sections - Access Road
G1-G2	Geotechnical Exhibit
L1	Landowner Disturbed Area Exhibit
S1	Site Reclamation
M1-M3	Production Exhibit
D1-D2	Erosion and Sediment Control Details
R1	Access Road Details
P1	Pad Details

Revision	Date
Design	02-26-2018
Design	03-27-2018
Design: WVDEP Corrections	01-25-2019
As-Built	

TUG HILL OPERATING

THIS DOCUMENT PREPARED FOR TUG HILL OPERATING

Kelly Surveying

Cover Sheet
Old Crow Well Site
Franklin District
Marshall County, WV

Date:	02/28/2018
Scale:	As Shown
Designed By:	ZS
File No.	
Sheet 1 of 9	

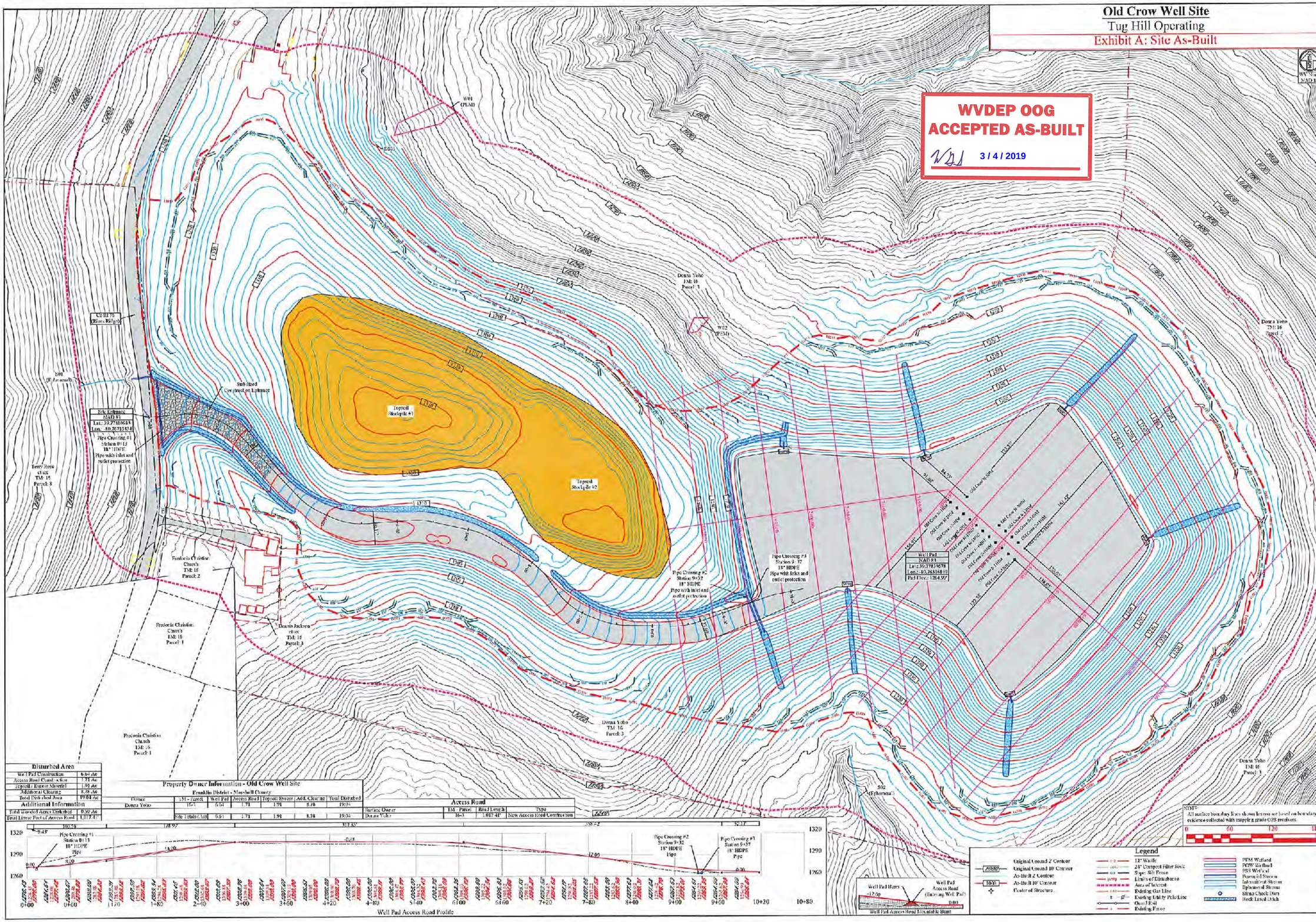
Old Crow Well Site

Tug Hill Operating

Exhibit A: Site As-Built

WVDEP OOG ACCEPTED AS-BUILT

3 / 4 / 2019



Disturbed Area	
Well Pad Construction	6.64 Ac
Access Road Construction	1.71 Ac
Topsoil/ Equip Material	1.91 Ac
Additional Clearing	8.78 Ac
Total Disturbed Area	19.04 Ac
Additional Information	
Total Wooded Acres Disturbed	0.59 Ac
Total Linear Feet of Access Road	1,017.41'

Property Owner Information - Old Crow Well Site

Franklin District - Marshall County

Owner	TM - Parcel	Well Pad	Access Road	Topsoil Recept.	Add. Clearing	Total Disturbed
Donna Yoho	16-3	6.64	1.71	1.91	8.78	19.04
	Site Totals (Ac)	6.64	1.71	1.91	8.78	19.04

Access Road

Surface Owner	TM - Parcel	Road Length	Type
Donna Yoho	16-3	1,017.41'	New Access Road Construction

TUG HILL OPERATING

THIS DOCUMENT PREPARED FOR TUG HILL OPERATING

Kelly Surveying

Revision	Date
Design	02-25-2018
As-Built	01-21-2019

Overall Plan View

Old Crow Well Site

Franklin District
Marshall County, WV

Date: 02/28/2018
Scale: As Shown
Designed By: ZS
File No.
Sheet 3 of 9