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**west virginia** department of environmental protection

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

Earl Ray Tomblin, Governor  
Randy C. Huffman, Cabinet Secretary  
www.dep.wv.gov

February 27, 2015

**WELL WORK PERMIT**

**Horizontal 6A Well**

This permit, API Well Number: 47-10303069, issued to STATOIL USA ONSHORE PROPERTIES, INC., 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 all 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 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.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-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) 926-0499 ext. 1654.

James Martin

Chief

Operator's Well No: NORTH HENDERSON NORTH 5H  
Farm Name: HENDERSON, HOWARD

**API Well Number: 47-10303069**

**Permit Type: Horizontal 6A Well**

Date Issued: 02/27/2015

## PERMIT CONDITIONS

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

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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 fifty (50) 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. 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.
8. 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.
9. Operator shall provide the Office of Oil & Gas notification of the date that drilling commenced on this well. Such notice shall be provided by sending an email to [DEPOOGNotify@wv.gov](mailto:DEPOOGNotify@wv.gov) within 30 days of commencement of drilling.

WW-6B  
(9/13)

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

1) Well Operator: Statoil USA Onshore Properties Inc.

<u>494505083</u>	<u>Wetzel</u>	<u>Center</u>	<u>Littleton</u>
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Operator ID County District Quadrangle

2) Operator's Well Number: North Henderson North Unit 5H Well Pad Name: North Henderson (existing pad)

3) Farm Name/Surface Owner: Howard Henderson Public Road Access: Low Gap Rocky Run Road

4) Elevation, current ground: 1,342' Elevation, proposed post-construction: 1,342' (existing pad)

5) Well Type (a) Gas \_\_\_\_\_ Oil \_\_\_\_\_ Underground Storage \_\_\_\_\_

Other \_\_\_\_\_

(b) If Gas Shallow  Deep \_\_\_\_\_

Horizontal

6) Existing Pad: Yes or No Yes

*DMH 2-23-15*

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):

Marcellus: Formation Top-7465' TVD, Target Depth-7484' TVD, 47' thick, 5258 psi, \*Intermediate Casing MASP 2300

8) Proposed Total Vertical Depth: 7484' TVD

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 15,417 MD/7400' TVD

11) Proposed Horizontal Leg Length: 7257'

12) Approximate Fresh Water Strata Depths: 619' TVD

13) Method to Determine Fresh Water Depths: offset wells

14) Approximate Saltwater Depths: 2074'

15) Approximate Coal Seam Depths: 755-764, 822-834, 882-919, 1102-1160, 1182-1183, 1222-1287

16) Approximate Depth to Possible Void (coal mine, karst, other): NA

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

(a) If Yes, provide Mine Info: Name: \_\_\_\_\_

Depth: \_\_\_\_\_

Seam: \_\_\_\_\_

Owner: \_\_\_\_\_

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(9/13)

18)

CASING AND TUBING PROGRAM

<u>TYPE</u>	<u>Size</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling</u>	<u>INTERVALS: Left in Well</u>	<u>CEMENT: Fill-up (Cu. Ft.)</u>
Conductor	20"	New	H-40	94#	100'	100'	Cmt to surface-150 cu ft
Fresh Water	13.375"	New	J-55	54.4#	700'	700'	Cmt to surface-512 cuft
Coal							
Intermediate	9.625"	New	J-55	36#	2750'	2750'	Cmt to surface-965 cuft
Production	5.5"	New	P-110	20#	15417'	15417'	Cmt to 2250'-3150 cuft
Tubing							
Liners							

DMH 2-23-15

<u>TYPE</u>	<u>Size</u>	<u>Wellbore Diameter</u>	<u>Wall Thickness</u>	<u>Burst Pressure</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	20"	26"	.438"	1530 psi	Class A	1.3 cu ft/sk
Fresh Water	13.375"	17.5"	.380"	2730 psi	Class A	1.29 cu ft/sk
Coal						
Intermediate	9.625"	12.25"	.352"	*3520 psi	Class A	1.29 cu ft/sk
Production	5.5	8.5"	.361"	12640 psi	Class A	2.42 cu ft/sk
Tubing						
Liners						

PACKERS

Kind:				
Sizes:				
Depths Set:				

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

See Attached

DMH 2-23-15

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

Well will fractured through the plug-n-perf method with +/- 25 fracturing stages per well. Each fracturing treatment will have 400,000 lbs of sand mixed in 7500 Bbls. of fresh water. The fracturing rate will be between 80 and 100 bpm at a pressure lower than a maximum pressure of 10,000 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 3.3 acres

22) Area to be disturbed for well pad only, less access road (acres): 2.9 acres

23) Describe centralizer placement for each casing string:

See attached

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

See attached

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25) Proposed borehole conditioning procedures:

Surface – Drilled with fresh water to section total depth. Prior to tripping, hole will circulated clean of cuttings and back-reamed if necessary.  
Intermediate – Drilled with 9.0 ppg 5% KCL Polymer Water Based Mud (WBM) to section total depth. At section total depth, pump 40bbl viscous pill and circulate hole clean.  
Production - Drilled with 12.5-13.0 ppg Synthetic Based Mud (SBM) to section total depth. At section total depth pump 2-3 20bbl heavy weighted pill sweeps to transport excess cutting from the hole until clean. Pump rates will be maintained in excess of 600 GPM, and rotation in excess of 100 RPM to assist cuttings transport. A 60 bbl tuned weighted spacer will be pumped ahead of the cement to assist in mud cake removal and water wett both casing and formation.

\*Note: Attach additional sheets as needed.

4710303069

## CEMENT ADDITIVES

Surface - Class A + 3% CaCl<sub>2</sub>

Intermediate - Class A cmt, 0.05% Retarder, 0.25% Defoamer, 1% Accelerator, 0.25% Dispersant, 0.65% Retarder, 9.10 gal/sk Fresh Water.

Production - Class A cmt, 10% bwow Dispersant, 0.6% bwoc Fluid Loss, 0.4% bwoc Retarder, 0.1% bwoc Free water control agent, 0.25% bwoc Defoamer, 0.1% bwoc Fluid Loss, 6.32 gal/sk Fresh Water.

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02/27/2015

# Marcellus - Drilling Well Schematic

Well Name: North Henderson 5H  
 Field Name: Marcellus  
 County: Wetzel Co., WV  
 API #: 0

BHL: X = 534729.2 Y = 4395741.0  
 SHL: X = 536199.8 Y = 4393817.0

GLE (R): 1,340  
 DF (R): 0  
 TVD (ft): 7,400  
 TMD (ft): 15,417  
 Profile: Horizontal  
 AFE No.: 0

Formations & Csg Points	Depth, ft			Form. Temp. (F)	Pore Press. (EMW)	Frac Gradient (EMW)	Planned MW	Measure Depth (ft)	Program	Details
	MD	TVD	SS							
<b>Conductor</b>	100	100	1,240	-	-	-	-	100		<b>20" Conductor</b>
							Fresh Water			<b>17-1/2" Surface</b>
Red Clay		0					8.6		Profile: Vertical Bit Type: 17-1/2" Tri-Cone BHA: Rotary Assembly Mud: 8.6 ppg Fresh Water Surveys: n/a Logging: n/a Casing: 13.375 54.5 J-55 BTC at 700' MD/700' TVD Centralizers: 1 centralizer w/ stop collar 10 ft above float shoe. One Single Bow every joint to 100ft below surface. Cement: 15.8 ppg Tail slurry w/ TOC @ Surface Potential Drilling Problems: <b>Stuck Pipe, Floating, Collision,</b>	
Approximate Fresh Water Strata ~619'										
<b>Casing Point</b>	700	700	640	65	-	-	8.6	700		
							5% KCl			<b>12-1/4" Intermediate</b>
1st Salt Sand		0					9.1			
2nd Salt Sand		0								
3rd Salt Sand		0								
Pittsburgh Coal		1,222								
Maxton Sand		0								
Keener Sand		0								
Big Lime		2,364						TOC @ 2250' MD		
Big Injun		2,464								
Berea Sand		2,966					9.1			
<b>Casing Point</b>	2,750	2,750	-1,410	82	-	-	>18.0	2,750		
<b>Gordon Sand</b>		3,244					SBM			<b>8-1/2" Production</b>
							8.6			
Java		5,674					8.6			
Angola		0					8.6			
Rhinestreet		0					8.6			
Cashaqua		0					8.6			
Middlesex		0					8.6			
<b>KOP</b>	7,293	6,988					12.0			
West River		7,244					12.0			
Genesco		7,314					12.0			
Marcellus		7,465					12.0			
Cherry Valley		7,494					12.0			
<b>Landing point</b>	8,161	7,484					12.0			
Onondaga		7,512					12.0			

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 TMD: 15,417  
 TVD: 7,400  
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 11-5-14

Last Revision Date: 9/23/2014  
 Revised by: TB Gilbert

Note: Depths are referenced to RKB  
 Note: Not Drawn to Scale

WV Department of Environmental Protection  
 Cement Outside Casing

WW-9  
(9/13)

API Number 47 -  
Operator's Well No. North Henderson North 5H

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

FLUIDS/CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name Statoil USA Onshore Properties Inc. OP Code 494505083

Watershed (HUC 10) Lower West Virginia Fork Fish Creek Quadrangle Littleton

Elevation 1342' County Wetzel District Center

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: \_\_\_\_\_

Will a synthetic liner be used in the pit? Yes  No  If so, what ml.? \_\_\_\_\_

Proposed Disposal Method For Treated ~~Pit~~ Wastes:

- Land Application
- Underground Injection ( UIC Permit Number Green Hunter API 34-121-23I95 )
- Reuse (at API Number \_\_\_\_\_ )
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain \_\_\_\_\_)

Dmit  
11-5-14

Will closed loop system be used? If so, describe: Yes

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc. Air/fresh water vert. section based mud for horiz. sec.

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

Additives to be used in drilling medium? emulsifier, food grade oil, barite, surfactant, calcium carbonate, gilsonite, lubricant, graphite, lime

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Landfill

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

-Landfill or offsite name/permit number? Wetzel County Landfill

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.

Company Official Signature Bekki Winfree

Company Official (Typed Name) Bekki Winfree

Company Official Title Sr. Regulatory Advisor

Subscribed and sworn before me this 21 day of October, 2014

Wally Anthony Stuka  
My commission expires April 16, 2017

Notary Public  
WALLY ANTHONY STUKA  
My Commission Expires  
April 16 2017

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Form WW-9

Operator's Well No. North Henderson North 5H

Statoil USA Onshore Properties Inc.

Proposed Revegetation Treatment: Acres Disturbed 3.3 Prevegetation pH Contractor to test

Lime 2-4 Tons/acre or to correct to pH See E&S Notes

Fertilizer type 10-20-20

Fertilizer amount 500 lbs/acre

Mulch Hay or Straw 2-3, Wood Fiber 0.5-0.75, Pulp Fiber 0.5-0.75 Tons/acre

Seed Mixtures

Temporary		Permanent	
Seed Type	lbs/acre	Seed Type	lbs/acre
Annual Ryegrass	26 or 40	White Clover	15
Spring Oats	64 or 96	Red Top	15
Rye Grain	140	Orchard Grass	20

Attach:

Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [Signature]

Comments: \_\_\_\_\_

Title: Oil + Gas Inspector Date: 11-5-14

Field Reviewed?  Yes  No

02/27/2015

4710303069



## North Henderson Pad – Site Safety Plan

Statoil USA Onshore Properties, Inc.

DMH  
11-5-14

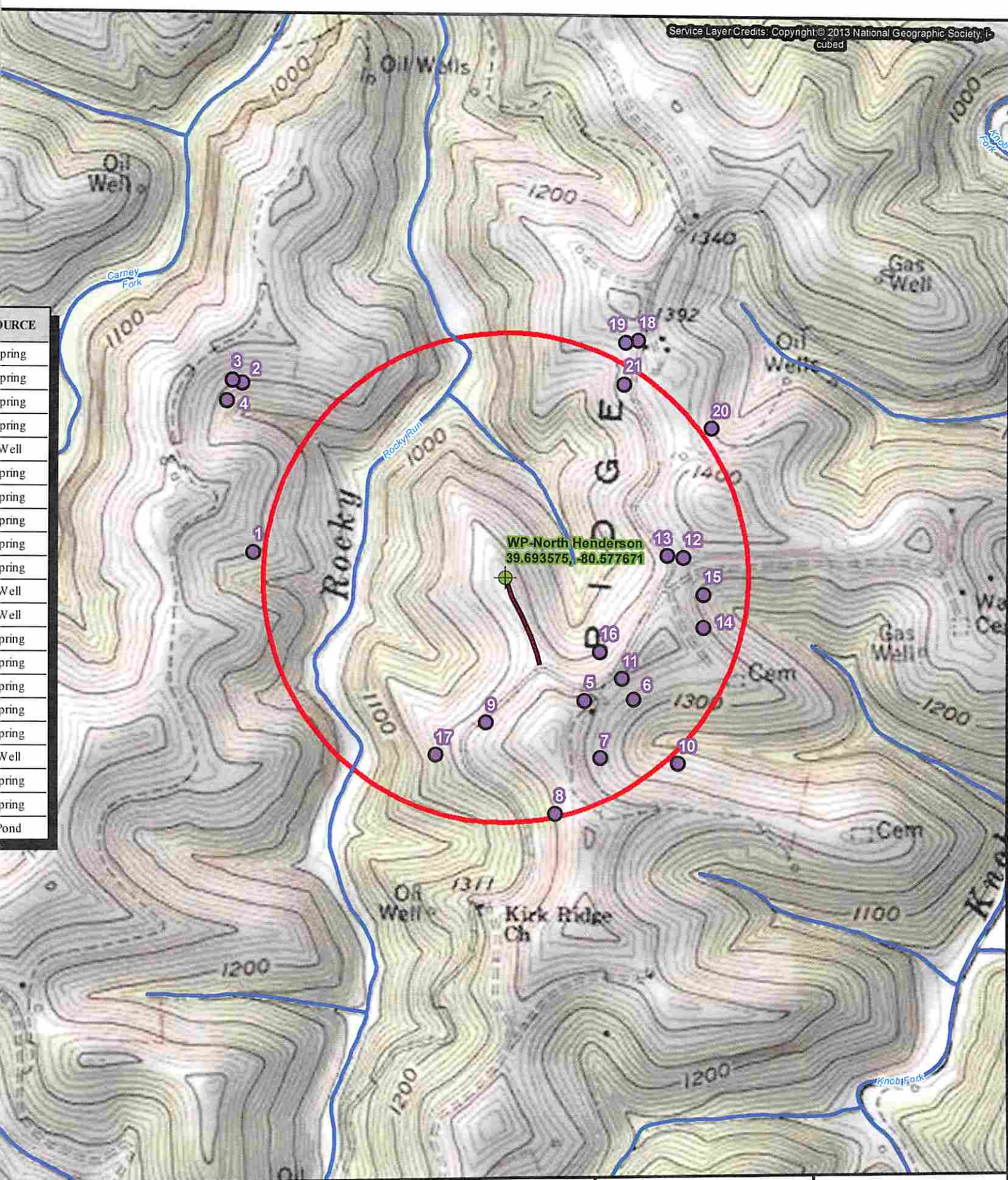
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- Source
- Spring
- Spring
- Spring
- Spring
- Well
- Spring
- Spring
- Spring
- Spring
- Spring
- Well
- Well
- Spring
- Spring
- Spring
- Spring
- Spring
- Well
- Spring
- Spring
- Pond



Access Road

NHD Stream

2000' Well Pad Radius

Lake/Pond (None Present)

0 1,000 Feet

1 inch = 1,000 feet

Littleton, WV USGS 7.5' Topographic Quadrangle

Drawn By: JPM

02/27/2015

