

State of West Virginia
Department of Environmental Protection - Office of Oil and Gas
Well Operator's Report of Well Work

API 47 - 001 - 03267 County Barbour District Cove
Quad Thornton 7.5' Pad Name Mackey Wolfe Field/Pool Name _____
Farm name Mackey Wolfe Well Number 203
Operator (as registered with the OOG) Mountaineer Keystone, LLC
Address 1111 Van Voorhis Road, Suite G City Morgantown State WV Zip 26505

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 14257569.236 Easting 1955594.199
Landing Point of Curve Northing 14258006.32 Easting 1954852.76
Bottom Hole Northing 14264387.87 Easting 1951984.35

Elevation (ft) 1647.6 GL Type of Well New Existing Type of Report Interim Final
Permit Type Deviated Horizontal Horizontal 6A Vertical Depth Type Deep Shallow
Type of Operation Convert Deepen Drill Plug Back Redrilling Rework Stimulate
Well Type Brine Disposal CBM Gas Oil Secondary Recovery Solution Mining Storage Other _____
Type of Completion Single Multiple Fluids Produced Brine Gas NGL Oil Other _____
Drilled with Cable Rotary

Drilling Media Surface hole Air Mud Fresh Water Intermediate hole Air Mud Fresh Water Brine
Production hole Air Mud Fresh Water Brine
Mud Type(s) and Additive(s)
Fresh water on surface and intermediate, light WBM on vertical. SOBM on curve and lateral

Date permit issued 8-6-2013 Date drilling commenced 9-23-2013 Date drilling ceased 10-16-2013
Date completion activities began 10/28/2013 Date completion activities ceased 12/2/2013
Verbal plugging (Y/N) N Date permission granted _____ Granted by _____

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft None noted Open mine(s) (Y/N) depths N
Salt water depth(s) ft None noted Void(s) encountered (Y/N) depths N
Coal depth(s) ft None noted - see tops Cavern(s) encountered (Y/N) depths N
Is coal being mined in area (Y/N) N

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Reviewed by: _____

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Reviewed

Timothy L. Hayward
7-23-19

API 47-001 - 03267

Farm name Mackey Wolfe

Well number 203

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor	20"	20"	40	New	78.6 - J-55	None	N/A
Surface	17 1/2"	13 3/8"	800	New	54.5 - J-55	None	Y
Coal							
Intermediate 1	12 1/4"	9 5/8"	1939	New	36 - J-55	None	Y
Intermediate 2							
Intermediate 3							
Production	8 3/4"	5.5"	15378	New	20 - P110	None	Y
Tubing							
Packer type and depth set							

Comment Details Conductor pipe was driven in. Surface cement job had full returns throughout job with 40 bbls of cement returned to surface. Intermediate casing also had full returns throughout job with 23 bbls of cement returned at surface. Production cement job and top of cement at 1,800' and full returns throughout job. Cement spacer was returned at surface to confirm top of cement.

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	NA	NA	NA	NA	NA	NA	NA
Surface	Type -1	808	15.6	1.18	953.4	Surface	8
Coal							
Intermediate 1	Type-1	655	15.6	1.2	786	Surface	8
Intermediate 2							
Intermediate 3							
Production	50/50 Poz	3152	14.5	1.2	3782.4	1,800	8
Tubing							

Drillers TD (ft) 15,398'

Loggers TD (ft) NA

Deepest formation penetrated Marcellus Shale

Plug back to (ft)

Plug back procedure

Kick off depth (ft) 6,800'

Check all wireline logs run

- caliper density deviated/directional induction
 neutron resistivity gamma ray temperature sonic

Well cored Yes No

Conventional Sidewall

Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING 20" - No centralizers

13 3/8" - one bow spring centralizer on every joint.

9 5/8" - one bow spring centralizer every third joint from TD to surface

5 1/2" - one semi-rigid centralizer on every other joint from TD of casing to end of curve. Then every other joint from KOP to 3,000' TOC will be 3,000'. There will be no centralizers from 3,000' to surface.

WAS WELL COMPLETED AS SHOT HOLE Yes No

DETAILS 1,400 shots of Titan 22.7 gr charges in a 3 1/8" gun shot at 60 degrees phasing.

WAS WELL COMPLETED OPEN HOLE? Yes No

DETAILS

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WERE TRACERS USED Yes No TYPE OF TRACER(S) USED

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PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
1	11/1/13	15090	15248	40	Marcellus
2	11/2/13	14890	15048	40	Marcellus
3	11/2/13	14690	14848	40	Marcellus
4	11/3/13	14490	14648	40	Marcellus
5	11/4/13	14290	14445	40	Marcellus
6	11/4/13	14095	14248	40	Marcellus
7	11/4/13	13890	14048	40	Marcellus
8	11/4/13	13690	13848	40	Marcellus
9	11/5/13	13490	13648	40	Marcellus
10	11/5/13	13290	13448	40	Marcellus
11	11/5/13	13090	13248	40	Marcellus
12	11/5/13	12890	13048	40	Marcellus
13	11/6/13	12690	14845	40	Marcellus
14	11/6/13	12495	12648	40	Marcellus
15	11/6/13	12290	12448	40	Marcellus
16	11/6/13	12090	12248	40	Marcellus

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
1	11/2/13	75	8409	6194	5585	259560	8247	0
2	11/2/13	76	8501	5859	5614	375100	7557	0
3	11/2/13	76	8322	6824	5682	402700	8959	0
4	11/3/13	76	8263	7469	5671	397300	7867	0
5	11/3/13	76	8241	5882	5833	290820	6691	0
6	11/3/13	80	8158	6012	5235	402540	8063	0
7	11/3/13	75	8196	6183	5304	403200	8801	0
8	11/4/13	82	8090	5992	5917	395880	7948	0
9	11/4/13	82	8308	6226	6081	391840	7721	0
10	11/4/13	81	8242	6135	6298	399220	7612	0
11	11/4/13	81	8325	6381	6230	399840	7768	0
12	11/5/13	77	8490	7181	6136	214860	6210	0
13	11/5/13	80	8284	6583	6143	296700	7049	0
14	11/5/13	81	8415	6976	5952	28660	7222	0
15	11/5/13	81	8177	6435	6114	400260	7459	0
16	11/6/13	81	8170	6309	5563	400600	7596	0

Please insert additional pages as applicable.

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PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
17	11/6/13	11890	12048	40	Marcellus
18	11/7/13	11690	11846	40	Marcellus
19	11/7/13	11493	11648	40	Marcellus
20	11/7/13	11290	11448	40	Marcellus
21	11/7/13	11090	11248	40	Marcellus
22	11/8/13	10890	11048	40	Marcellus
23	11/8/13	10690	10848	40	Marcellus
24	11/8/13	10490	10648	40	Marcellus
25	11/8/13	10288	10450	40	Marcellus
26	11/8/13	10090	10250	40	Marcellus
27	11/9/13	9890	10048	40	Marcellus
28	11/9/13	9690	9848	40	Marcellus
29	11/9/13	9490	9648	40	Marcellus
30	11/9/13	9290	9448	40	Marcellus
31	11/9/13	9090	9248	40	Marcellus
32	11/10/13	8890	9048	40	Marcellus

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
17	11/6/13	80	7817	6212	6105	399960	7935	0
18	11/6/13	80	7827	6086	6201	376560	7982	0
19	11/6/13	80	8229	6543	5538	391700	7647	0
20	11/6/13	81	8033	6394	6313	397120	8822	0
21	11/7/13	80	8194	6452	6082	380205	7846	0
22	11/7/13	80	8097	6482	5196	398520	7313	0
23	11/7/13	80	8019	7134	5996	384500	7384	0
24	11/7/13	82	8037	6659	5970	387030	7239	0
25	11/8/13	81	8110	6381	6316	347500	8301	0
26	11/8/13	79	8378	6515	5671	267235	6273	0
27	11/8/13	80	7963	6835	6269	406480	8341	0
28	11/8/13	81	7958	7254	6320	319240	6840	0
29	11/8/13	77	8258	7688	5462	311520	8670	0
30	11/9/13	80	8259	7754	6536	324060	7869	0
31	11/9/13	80	8195	7109	6432	401720	7733	0
32	11/9/13	80	8023	7113	6514	348390	6642	0

Please insert additional pages as applicable.

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<u>Formations Encountered:</u>	<u>Top Depth</u>	<u>Bottom Depth</u>
<u>Surface: CONEMAUGH GROUP</u>		
<u>BAKERSTOWN</u>	<u>184 MD</u>	<u>202 MD</u>
<u>BRUSH CREEK</u>	<u>282 MD</u>	<u>302 MD</u>
<u>FREEPART</u>	<u>334 MD</u>	<u>404 MD</u>
<u>KITTANNING</u>	<u>472 MD</u>	<u>578 MD</u>
<u>GREENBRIER GROUP</u>	<u>1,405 MD</u>	<u>1,635 MD</u>
<u>WEIR SS</u>	<u>1,814 MD</u>	<u>1,854 MD</u>
<u>BEREA SS</u>	<u>1,886 MD</u>	<u>1,914 MD</u>
<u>PRICE FORMATION</u>	<u>1,914 MD</u>	<u>2,216 MD</u>
<u>HAMPSHIRE GROUP</u>	<u>2,216 MD</u>	<u>2,468 MD</u>
<u>GREENLAND GAP (FOREKNOBS)</u>	<u>2,468 MD</u>	<u>4,604 MD</u>
<u>BRAILIER FORMATION</u>	<u>4,604 MD</u>	<u>7,525 MD</u>
<u>BURKETT SHALE</u>	<u>7,596 MD</u>	<u>7,616 MD</u>
<u>TULLY LIMESTONE</u>	<u>7,616 MD</u>	<u>7,682 MD</u>
<u>MAHANTANGO SHALE</u>	<u>7,682 MD</u>	<u>8,024 MD</u>
<u>UPPER MARCELLUS</u>	<u>8,024 MD</u>	<u>8,132 MD</u>
<u>PURCELL LIMESTONE</u>	<u>8,132 MD</u>	<u>8,180 MD</u>
<u>LOWER MARCELLUS</u>	<u>8,180 MD</u>	<u>15,398 MD</u>

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Hydraulic Fracturing Fluid Product Component Information Disclosure

Job Start Date:	11/3/2013
Job End Date:	11/9/2013
State:	West Virginia
County:	Barbour
API Number:	47-001-03267-00-00
Operator Name:	Arsenal Resources
Well Name and Number:	Mackey Wolfe 203
Latitude:	39.25610000
Longitude:	-79.88710000
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	7,894
Total Base Water Volume (gal):	8,788,587
Total Base Non Water Volume:	10,074,180



Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Sand	U.S. Well Services, Inc.	Proppant					
				Listed Below			
HCL Acid (12.6%-18.0%)	U.S. Well Services, Inc.	Bulk Acid					
				Listed Below			

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AI-302	U.S. Well Services, Inc.	Acid Corrosion Inhibitors					
				Listed Below			
Water	Arsenal Resources	Base Fluid					
				Listed Below			
AP One	USWS	Gel Breaker					
				Listed Below			
LGC-15	USWS	Gelling Agent					
				Listed Below			
WFRA-405	USWS	Friction Reducer					
				Listed Below			

Items above are Trade Names with the exception of Base Water . Items below are the individual ingredients.

			H2O	7732-18-5	100.00000	83.78461	
			Crystalline Silica, Quartz	14808-60-7	100.00000	14.12296	
			Water	7732-18-5	87.50000	1.32462	
			Hydrogen Chloride	7647-01-0	18.00000	0.55099	
			Distillate, petroleum, hydrotreated, light	64742-47-8	60.00000	0.06188	
			Water	7732-18-5	40.00000	0.02885	
			Distillate, petroleum, hydrotreated, light	64742-47-8	22.00000	0.01277	
			Ethylene glycol	107-21-1	31.00000	0.00779	
			Guar gum	9000-30-0	50.00000	0.00768	
			Ammonium chloride	12125-02-9	5.00000	0.00361	

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			Tar bases, quinoline derivs, benzyl chloride-quaternized	72480-70-7	13.00000	0.00304	
			N,N-dimethylformamide	68-12-2	15.00000	0.00304	
			Ammonium persulfate	7727-54-0	100.00000	0.00191	
			2-Butoxyethanol	111-76-2	7.00000	0.00144	
			Ethoxylated nonylphenol	68412-54-4	5.00000	0.00121	
			Cinnamaldehyde	104-55-2	5.00000	0.00118	
			Triethyl phosphate	78-40-0	3.00000	0.00073	
			Isopropyl alcohol	67-63-0	3.00000	0.00054	
			Water	7732-18-5	95.00000		
			2-Propyn-1-olcompound with methyloxirane	38172-91-7	15.00000		

* Total Water Volume sources may include various types of water including fresh water, produced water, and recycled water

** Information is based on the maximum potential for concentration and thus the total may be over 100%

*** If you are calculating a percentage of total ingredients do not add the water volume below the green line to the water volume above the green line

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided.

Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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NOTES ON SURVEY

1. NO WATER WELLS WERE FOUND WITHIN 250' OF PROPOSED GAS WELL.
2. ONE DWELLING IS LOCATED WITHIN 625' OF THE CENTER OF WELL PAD.
3. WELL SPOT CIRCLE & TOPO MARK SCALE IS 1"=2000'
4. AS-DRILLED DATA PROVIDED BY ARSENAL RESOURCES.

ARSENAL RESOURCES
MACKEY WOLFE 203

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

NAD'83 S.P.C.(FT) N. 275,392.7 E. 1,859,031.1
 NAD'83 GEO. LAT-(N) 39.255454 LONG-(W) 79.886583
 NAD'83 UTM (M) N. 4,345,715.9 E. 596,066.3

LANDING POINT

NAD'83 S.P.C.(FT) N. 275,841.6 E. 1,858,313.6
 NAD'83 GEO. LAT-(N) 39.256678 LONG-(W) 79.889124
 NAD'83 UTM (M) N. 4,345,849.0 E. 595,845.4

BOTTOM HOLE

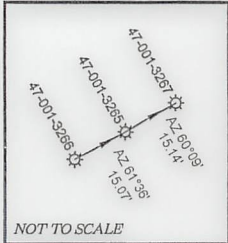
NAD'83 S.P.C.(FT) N. 283,160.7 E. 1,855,085.8
 NAD'83 GEO. LAT-(N) 39.276734 LONG-(W) 79.900638
 NAD'83 UTM (M) N. 4,348,062.7 E. 594,824.9

TAG	SURFACE OWNER	TAX MAP / PCL	ACREAGE
A	MARGARET WOLFE MACKEY (LIFE EST) & JOHN M. WOLFE	7-21	226.815±
B	STATE OF WEST VIRGINIA - MORGANTOWN-BEVERLY TURNPIKE	N/A	N/A
C	SCOT L. & DENISE E. HARSHBERGER	7-11.3	187.83±
D	CATHARINE WOLFE	7-13	65.00±
E	ZACKARY S. BERGDORF	7-12	180.25±
F	ZACKARY BERGDORF	7-3	65.15±
G	LAWRENCE BOYCE, JR.	4-28	169.66±

203 WELL TIES

LINE	BEARING	DISTANCE
L1	N 42°52' E	469.39'
L2	S 40°22' E	1064.79'

MACKEY WOLFE
PAD LAYOUT



NOT TO SCALE

LEGEND
 AS DRILLED (Red solid line)
 PROPOSED (Green dashed line)

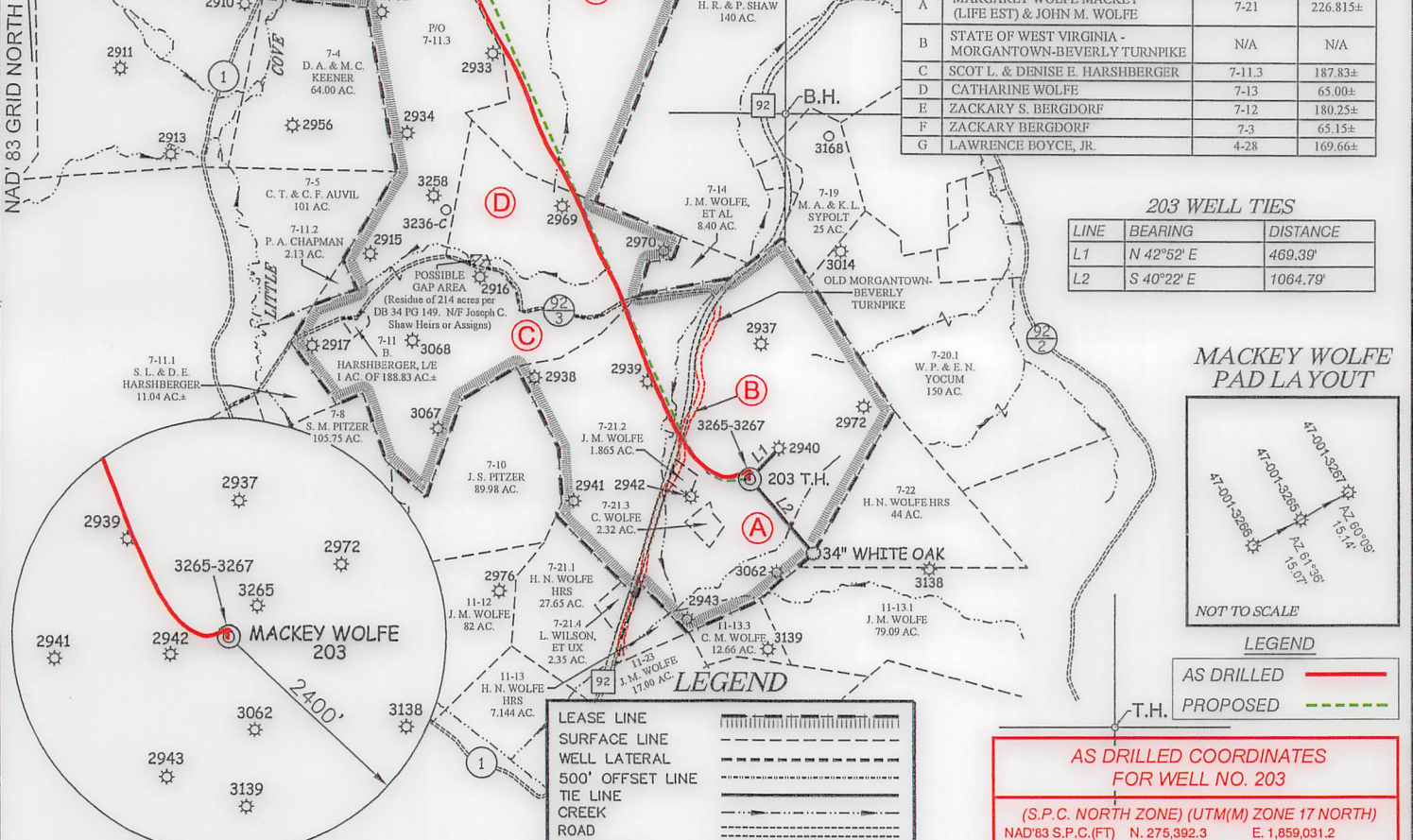
NAD'83 GRID NORTH

B.H. LONGITUDE 79°52'30"

AS-DRILLED

13,190' T.H.

AS-DRILLED



LEGEND

- LEASE LINE
- SURFACE LINE
- WELL LATERAL
- 500' OFFSET LINE
- TIE LINE
- CREEK
- ROAD
- FENCE LINE
- COUNTY ROUTE
- STATE ROUTE
- PROPOSED WELL
- EXISTING WELL
- PERMITTED WELL
- LEASE TAG

AS DRILLED COORDINATES FOR WELL NO. 203

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

NAD'83 S.P.C.(FT) N. 275,392.3 E. 1,859,031.2
 NAD'83 GEO.(DD) LAT-(N) 39.255453 LONG-(W) 79.886583
 NAD'83 GEO.(DMS) LAT-(N) 39°15'19.6" LONG-(W) 79°53'11.7"
 NAD'83 UTM (M) N. 4,345,715.8 E. 596,066.3

BOTTOM HOLE

NAD'83 S.P.C.(FT) N. 282,162.3 E. 1,855,446.9
 NAD'83 GEO.(DD) LAT-(N) 39.273997 LONG-(W) 79.899347
 NAD'83 GEO.(DMS) LAT-(N) 39°16'26.4" LONG-(W) 79°53'57.6"
 NAD'83 UTM (M) N. 4,347,760.4 E. 594,940.0

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GREGORY A. SMITH
LICENSED
No. 677
STATE OF
WEST VIRGINIA
PROFESSIONAL SURVEYOR

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAN IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE REGULATIONS ISSUED AND PRESCRIBED BY THE DIVISION OF ENVIRONMENTAL PROTECTION.

P.S. 677 Gregory A. Smith

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

DATE JUNE 19, 20 18

REVISED _____

OPERATORS WELL NO. MACKEY WOLFE 203

API WELL NO. 47 - 001 - 03267

STATE STATE COUNTY COUNTY PERMIT PERMIT

MINIMUM DEGREE OF ACCURACY 1 / 2500 FILE NO. 7968NADP203.dwg

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 LIQUID INJECTION WASTE DISPOSAL IF "GAS" PRODUCTION STORAGE DEEP SHALLOW

LOCATION: ELEVATION 1,626' WATERSHED LITTLE COVE RUN

DISTRICT COVE COUNTY BARBOUR QUADRANGLE THORNTON 7.5'

SURFACE OWNER MARGARET WOLFE MACKEY (LIFE EST) & JOHN M. WOLFE ACREAGE 226.185±

ROYALTY OWNER MARGARET WOLFE MACKEY (LIFE EST) & JOHN M. WOLFE ET AL ACREAGE 226.185±

PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION PLUG AND ABANDON CLEAN OUT AND REPLUG OTHER

PHYSICAL CHANGE IN WELL (SPECIFY) _____ TARGET FORMATION MARCELLUS

PROPOSED DEPTH 16,340' TMD / 8,025' TVD

AS-DRILLED DEPTH 15,341' TMD / 7,894' TVD

WELL OPERATOR ARSENAL RESOURCES DESIGNATED AGENT WILLIAM VEIGEL

ADDRESS 6031 WALLACE RD. EXT. SUITE 300 ADDRESS 65 PROFESSIONAL PLACE

WEXFORD, PA 15090 BRIDGEPORT, WV 26330

COUNTY NAME

PERMIT