



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

Monday, June 25, 2018
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

ARSENAL RESOURCES LLC
6031 WALLACE ROAD EXTENSION SUITE 603

WEXFORD, PA 15090

Re: Permit Modification Approval for WILLIAMS 214
47-091-01333-00-00

Lateral Extension

ARSENAL RESOURCES LLC

The Office of Oil and Gas has reviewed the attached permit modification for the above referenced permit. The attached modification has been approved and well work may begin. Please be reminded that the oil and gas inspector is to be notified twenty-four (24) hours before permitted well work is commenced.

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

James A. Martin
Chief

Operator's Well Number: WILLIAMS 214
Farm Name: WILLIAMS, WILLIAM C.
U.S. WELL NUMBER: 47-091-01333-00-00
Horizontal 6A New Drill
Date Modification Issued: June 25, 2018

Promoting a healthy environment.



April 4, 2018

WVDEP
Office of Oil and Gas
ATTN: Laura Adkins
601 57th Street SE
Charleston, WV 25304

RE: Williams Pad – Williams 214 API# 47-091-01333 – Modification due to spacing changes and extending lateral

Dear Laura:

Enclosed please find the modification for the Williams 214 (API# 47-091-01333). This permit is being modified due to adjusting the well bore spacing 1,000ft. The well head locations remained the same. This well was originally permitted to 6,311.00'. We have obtained additional leasing for this site during this modification and request to extend the lateral 1,077.67' for a total of 7,388.67'. Included are the following:

- Plat
- WW-6B, Well Work Permit Application/Casing
- Well Bore Schematic
- WW-6A1, Lease Information
- Road Crossing Letter
- Site Safety Plan
- AOR

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Should you have any questions or need any additional information, please feel free to contact me by phone or email. Thank you!

Sincerely,

A handwritten signature in cursive script that reads 'Kelly Davis'.

Kelly Davis
Permitting Specialist
304-517-8743 mobile
724-940-1218 office
kdavis@arsenalresources.com

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

1) Well Operator: Arsenal Resources 494519412 Taylor Fetterman Gladesville
Operator ID County District Quadrangle

2) Operator's Well Number: Williams 214 Well Pad Name: Williams

3) Farm Name/Surface Owner: William C. Williams Public Road Access: Whiteday Road

4) Elevation, current ground: 1804' Elevation, proposed post-construction: 1800'

5) Well Type (a) Gas Oil _____ Underground Storage _____

Other _____

(b) If Gas Shallow Deep _____

Horizontal

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Target Formation- Marcellus Shale, Top- 7,744.0ft, Bottom- 7,840.0ft, Anticipated Thickness- 96ft, Associated Pressure- 0.5 psi/ft

8) Proposed Total Vertical Depth: 7,826'

9) Formation at Total Vertical Depth: Marcellus Shale

10) Proposed Total Measured Depth: 16,010.7'

11) Proposed Horizontal Leg Length: 7,388.67'

12) Approximate Fresh Water Strata Depths: 245', 600'

13) Method to Determine Fresh Water Depths: Offsetting wells reported water depths (091-00264, 091-00576, 091-01265, 091-01267, 091-01269)

14) Approximate Saltwater Depths: 910'

15) Approximate Coal Seam Depths: Bakerstown - 115', Brush Creek - 216', Upper Freeport - 283', Lower Freeport - 330', Upper Kittanning - 405', Middle Kittanning - 455', Lower Kittanning - 487'

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

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes _____ No None known

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

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

18)

CASING AND TUBING PROGRAM

TYPE	<u>Size (in)</u>	<u>New or Used</u>	<u>Grade</u>	<u>Weight per ft. (lb/ft)</u>	<u>FOOTAGE: For Drilling (ft)</u>	<u>INTERVALS: Left in Well (ft)</u>	<u>CEMENT: Fill-up (Cu. Ft.)/CTS</u>
Conductor	24"	New	H-40	94#	80'	80'	CTS
Fresh Water	13.375"	New	J-55	54.5#	650'	650'	CTS
Coal							
Intermediate	9.625"	New	J-55	40#	1,600'	1,600'	CTS
Production	5.5	New	P-110	20#	16,011'	16,011'	TOC @ 1,450'
Tubing							
Liners							

Ernest L. Ayers
4-4-18

TYPE	<u>Size (in)</u>	<u>Wellbore Diameter (in)</u>	<u>Wall Thickness (in)</u>	<u>Burst Pressure (psi)</u>	<u>Anticipated Max. Internal Pressure (psi)</u>	<u>Cement Type</u>	<u>Cement Yield (cu. ft./k)</u>
Conductor	24"	36"			0	Class A, 3% CaCl2	1.20
Fresh Water	13.375"	17.5"	0.38"	2730	900	Class A, 3% CaCl2	1.20
Coal							
Intermediate	9.625"	12.25"	0.395"	3950psi	1,500	Class A, 2% CaCl2	1.29
Production	5.5"	8.5-8.75	0.361"	12,640psi	9500	Class A/50.50 Poz	1.29/1.34
Tubing					5000		
Liners					N/A		

PACKERS

Kind:			
Sizes:			
Depths Set:			

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of Environmental Protection

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

The well will be started with a conductor rig drilling a 36" hole to Conductor programmed depth then running 26" casing and circulate cement back to surface. The conductor rig will move out and the drilling rig will move in and rig up. The drilling rig will then spud a 17 1/2" hole and drill to fresh water casing (Surface) to the programmed depth, Run 13- 3/8" casing and cement to surface. The rig will continue drilling a 12- 1/4" intermediate hole to the programmed depth, run 9- 5/8" casing and cement to surface. The rig will then continue to drill an 8- 3/4" hole to a designed KOP. We will then start drilling the curve and lateral section to the programmed total measured depth, run 5 1/2" casing and cement according to the program.

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

The well will be completed using a plug and perforation method and stimulated with a slickwater and sand slurry. The anticipated maximum rate will be 90 bpm and the maximum pressure will be 9,500 psi.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 26.19

22) Area to be disturbed for well pad only, less access road (acres): 6.71

23) Describe centralizer placement for each casing string:

26"- No centralizers 13 3/8" – one bow spring centralizer on every other joint 9 5/8" – one bow spring centralizer every third joint from TD to surface 5 1/2" – one semi rigid centralizer on every joint from TD of casing to end of curve. Then every other joint to KOP. Every third joint from KOP to 1,800 there will be no centralizers from 1,800 to surface.

REC'D
Office of Oil and Gas
APR 5 2018

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

WV Department of
Environmental Protection

26" will be circulated to surface. The 13 3/8" casing will be cemented to surface with Class A cement and no greater than 3% CaCl (calcium chloride). The 9 5/8" casing will be cemented to surface with Class A cement, & no greater than 3% calcium chloride. The 5 1/2" production string will be cemented back to 1,450' (+/- 150' above the casing shoe for the 9 5/8") with Class A and 50/50 Poz cement retarded (to extend pumpability) cellophane flaked for fluid loss, Bentonite gel as an extender (increased pumpability and fluid loss), a defoaming agent to decrease cement foaming during mixing to insure the cement is of proper weight to placement and possibly gypsum gas blocking additive to aid in blocking/gas migration (in combination with other additive mentioned here, helps cement achieve a "right angle" set) during the plastic phase of the cement set-up.

25) Proposed borehole conditioning procedures:

Top holes will be drilled with fresh water KOP. At KOP, the wellbore will be loaded with synthetic oil based mud, barite-weighted mud system with such properties as to build a filter-cake on the face of the bore-hole. This will provide lubricity as well as stabilizing the well bore. We will begin rotating the drill string and mud will be circulated upon reaching TD until no further cuttings are observed coming across the shaker screens. Once clean mud is circulated back to surface, we will pull three stands of drill pipe, load the hole, pull three strands and load the hole. The weight indicator on the rig will be monitored for any occurrences of drag and if any are noticed, we will re-run the previous stand of pipe pulled across and circulate 2x bottoms up while watching shakers for signs of cuttings. Once at the base curve, the string will be continuously rotated while pumping 2x bottoms up. We will pull three stands and fill the hole until we reach the vertical section of the well.

*Note: Attach additional sheets as needed.



Arsenal Resources
Williams 214
Casing Design
Directional Plan # 3 QES

Other Names:	N/A
Surface Location:	TBD
Bottom Hole Location:	TBD
Total Depth:	16,011 MD (ft) 7,826 TVD (ft)

County:	Taylor
State:	West Virginia
AFE #:	XX
RKB:	27
Ground Level:	1,800

Logs	Significant Formations (TVD)	Depth (ft) MD	Depth (ft) TVD	Hole Size	Casing and Cement	Mud	Directional & Surveys Drlg /Csg Point
None	Section 1		80	24" 94# H-40 STC	Vertical		
None	Section 2		80	17 1/2" (PDC)	Floc Water		
Possible CBL after cement job		650	650	13 3/8" 54.5# J-55 STC	Vertical		
None	Section 3		650	12 1/4" (PDC)	Floc Water		
Possible CBL after cement job		1,600	1,600	9 5/8" 40# J-55 LTC	Vertical		
	Section 4		1,600				
			1,059				
			4,459				
			7,479				
			7,775				
			7,809				
			16,011 MD 7,826 TVD				

Cement: Class A 489 Sacks w/ 30% Excess
TOC: Surface (top off if needed)
All cement volumes are estimates

Cement: Class A 678 Sacks w/ 50% Excess
TOC: Surface (top off if needed)
All cement volumes are estimates

Mud Data	From	To
Floc Water	60	1,900
Floc Water	1,600	7,622
11.5- 12.0 ppg SOBM	7,622	16,011

BH Data	From	To
17-1/2" & 12 1/4" PDC	60	1,000
8- 3/4" (PDC)	1,600	6,622
6- 1/2" (PDC)	6,622	16,011

Directional Data See Directional Plan

Cement: Class A: 50/50 POZ
1.2 fl3/sack +10% Exs in OH = 2784 sacks
TOC: 1,450 ft
All cement volumes are estimates

5 1/2" 20# P-110 VAR

Revision 1
Note: Not drawn to scale
Cement Outside Casing Seal Assembly in Annulus
Date Last Revised: 27-Mar-18
Jarrett Toms

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

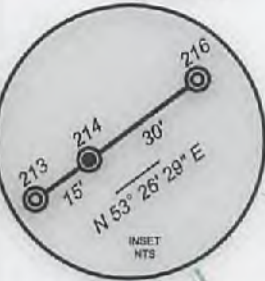
Latitude: 39°27'30" SURFACE HOLE 4135'

Latitude: 39°27'30" BOTTOM HOLE 6390'

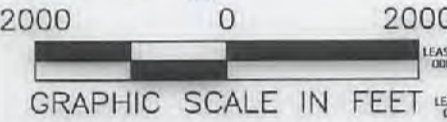
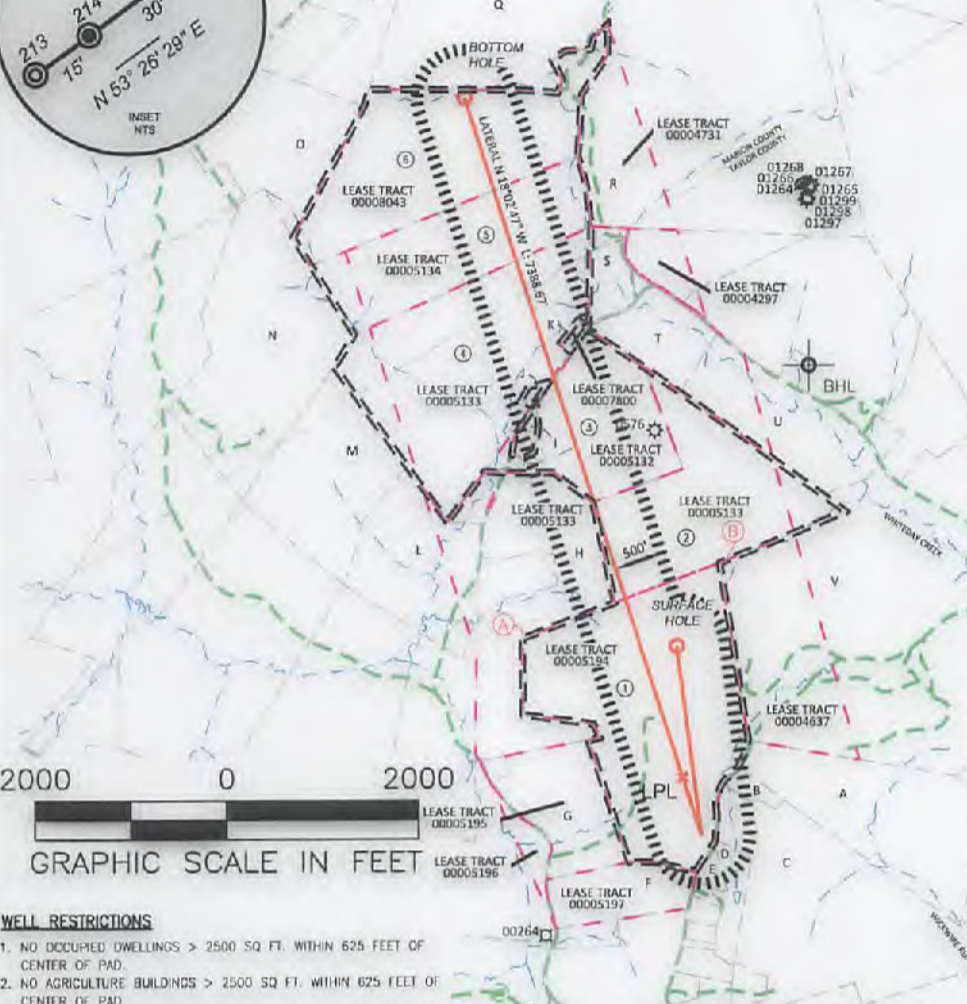
GRID NORTH
UTM, NAD83 DATUM, ZONE 17, US FT



CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
600 MARKETPLACE AVENUE, SUITE 200
BRIDGEPORT, WV 26330
304-933-3119



SURFACE HOLE LOCATION (SHL):
UTM (NAD83, ZONE 17, METERS): NORTHING: 4364251.091 EASTING: 588400.794
LANDING POINT (LPL):
UTM (NAD83, ZONE 17, METERS): NORTHING: 4363837.580 EASTING: 588426.956
BOTTOM HOLE LOCATION (BHL):
UTM (NAD83, ZONE 17, METERS): NORTHING: 4365966.418 EASTING: 587693.927



SURFACE HOLE LOCATION (SHL):
SPC (NAD83, WV NORTH, FEET): NORTHING: 336628.44 EASTING: 1834890.35
GEOGRAPHIC (NAD83): LAT: 39°25'23.74" LONG: 79°58'22.70"
GEOGRAPHIC (NAD83): DEC. LAT: 39.423260 DEC. LONG: -79.972972
LANDING POINT (LPL):
SPC (NAD83, WV NORTH, FEET): NORTHING: 335270.20 EASTING: 1834953.60
GEOGRAPHIC (NAD83): LAT: 39°25'10.32" LONG: 79°58'21.80"
GEOGRAPHIC (NAD83): DEC. LAT: 39.419532 DEC. LONG: -79.972723
BOTTOM HOLE LOCATION (BHL):
SPC (NAD83, WV NORTH, FEET): NORTHING: 342295.40 EASTING: 1832664.70
GEOGRAPHIC (NAD83): LAT: 39°26'19.63" LONG: 79°58'51.45"
GEOGRAPHIC (NAD83): DEC. LAT: 39.438786 DEC. LONG: -79.980958

WELL RESTRICTIONS

1. NO OCCUPIED DWELLINGS > 2500 SQ. FT. WITHIN 625 FEET OF CENTER OF PAD.
2. NO AGRICULTURE BUILDINGS > 2500 SQ. FT. WITHIN 625 FEET OF CENTER OF PAD.
3. WATER WELLS OR DEVELOPED SPRINGS ARE WITHIN 969 FEET OF PROPOSED WELL.
4. PERENNIAL STREAMS, LAKES, PONDS, OR RESERVOIRS WITHIN 800 FEET OF THE LIMITS OF DISTURBANCE.
5. NO NATURALLY PRODUCING TROUT STREAM WITHIN 300 FEET OF LIMITS OF DISTURBANCE.
6. NO GROUND INTAKE OR PUBLIC WATER SUPPLY WITHIN 1000 FEET OF WELL PAD, LIMITS OF DISTURBANCE, E & S CONTROLS OR PUBLIC WATER SUPPLY.

TAX MAP PARCEL SURVEYED LINE COORDINATES (UTM - NAD 83 - ZONE 17, U.S. FOOT)			
	NORTHING	EASTING	LONGITUDE
A	14318435.936	1928845.676	-79.978832°
B	14319262.042	1930917.956	-79.971262°

NOTES ON SURVEY

1. SURFACE AND ROYALTY OWNER INFORMATION AND THEIR BOUNDARIES SHOWN HEREON WERE PLOTTED FROM DEEDS AND/OR TAX PARCEL MAPS PROVIDED BY CLIENT AND/OR FIELD LOCATIONS.
2. THIS PLAT DOES NOT REPRESENT A BOUNDARY SURVEY OF THE PARCELS SHOWN HEREON.
3. ALL INSETS ARE GRID NORTH UNLESS OTHERWISE DEPICTED.

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 REGULATIONS ISSUED AND PRESCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.

P.S. 991



(+) DENOTES LOCATION OF WELL ON UNITED STATES TOPOGRAPHIC MAPS
WVDEP
OFFICE OF OIL & GAS
601 57TH STREET
CHARLESTON, WV 25034

MINIMUM DEGREE OF ACCURACY: 1/200
PROVEN SURVEY SOURCE OF ELEVATION: GRADE GPS (NAVD 88, US FT)

COMPANY: **ARSENAL RESOURCES**

WILLIAMS
OPERATOR'S WELL #: 214
API WELL #: 47 091 01333 MOO
STATE COUNTY PERMIT

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

WATERSHED: WHITEDAY CREEK ELEVATION: 1,804'

DISTRICT: FETTERMAN DISTRICT COUNTY: TAYLOR QUADRANGLE: GLADESVILLE

SURFACE OWNER: WILLIAM C. WILLIAMS ACREAGE: 107.25±

OIL & GAS ROYALTY OWNER: WILLIAM C. WILLIAMS ACREAGE: 107.25±

DRILL DRILL DEEPER REDRILL FRACTURE OR STIMULATE PLUG OFF OLD FORMATION PERFORATE NEW FORMATION

CONVERT PLUG & ABANDON CLEAN OUT & REPLUG OTHER CHANGE (SPECIFY)

TARGET FORMATION: MARCELLUS ESTIMATED DEPTH: 7,826 TWD 16,010.7 TMD

WELL OPERATOR: ARSENAL RESOURCES DESIGNATED AGENT: WILLIAM VEIGEL
ADDRESS: 6031 WALLACE RD, EXT. SUITE 300 ADDRESS: 65 PROFESSIONAL PLACE, SUITE 200
CITY: WEXFORD STATE: PA ZIP CODE: 15090 CITY: BRIDGEPORT STATE: WV ZIP CODE: 26330

LEGEND:	<ul style="list-style-type: none"> ○ PROPOSED SURFACE HOLE / BOTTOM HOLE ⊙ EXISTING / PRODUCING WELLHEAD LPL* LANDING POINT LOCATION ⊕ EXISTING WATER WELL ⊕ EXISTING SPRING — SURVEYED BOUNDARY — PROPOSED PATH == PENETRATED PARCEL - - LEASE BOUNDARY - - MAIN ROAD - - ADJOINER PROPERTY - - WATER ⊕ SURVEYED CORNER 	REVISIONS:	DATE: 04-04-2018
			DRAWN BY: K.E.S.
			SCALE: 1" = 2000'
			DRAWING NO: 154-452
			WELL LOCATION PLAT



CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
 600 MARKETPLACE AVENUE, SUITE 200
 BRIDGEPORT, WV 26330
 304-933-3119

WELL BORE TABLE FOR SURFACE OWNERS		
TRACT	SURFACE OWNER	TAX PARCEL
1	WILLIAM C. WILLIAMS	06-07-09
2	ALVIN L. & JUDY K. LIPSCOMB	06-02-10
3	ALVIN L. & JUDY K. LIPSCOMB	06-02-09
4	MARK D. & KAREN T. WOLF & SURV.	06-02-2.2
5	SAMMY R. & SARA L. JACOBS FAMILY TRUST, ET AL	19-26-12
6	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-11

ADJOINING OWNERS TABLE		
TRACT	SURFACE OWNER	TAX PARCEL
A	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-12
B	WESLEY H. & CAROLYN ANN HAMILTON & SURV.	06-07-13
C	GLENNA LEE EVANS	06-07-14
D	MARGIE M. CURRY	06-07-14.9
E	MARGIE M. CURRY	06-07-14.7
F	MARY ANN & WILLIAM CHRISTOPHER WILLIAMS & SURV.	06-07-15
G	MARY ANN NUZUM	06-07-16
H	ALVIN L. & JUDY K. LIPSCOMB	06-07-08
I	LAWRENCE A. JR & SAMANTHA L. BALDWIN & SURV.	06-02-9.1
J	JEFFREY A. SHAFFER	6-2-2
K	CHARLES C. CATANIA	06-02-2.1
L	PAUL L. SICILIANO	06-07-7
M	CHARLES E. MCDONALD	06-02-1
N	CHARLES E. MCDONALD	19-26-06
O	THE JOHN M. CONNOLLY TRUST	19-26-7.8
P	DAVID L. SR & BONNIE SMITH	19-29-15
Q	THE JOHN M. CONNOLLY TRUST, ET AL	19-26-09
R	ORTHODOX EDUCATIONAL SOCIETY	06-03-41
S	SAMMY R. & SARA L. JACOBS FAMILY TRUST & DANIEL & SONDR & SURV	06-02-03
T	ANTHONY T. DORSEY & LAURA J. TOBIN & SURV.	06-02-8.1
U	CHARLES E. MCDONALD	6-2-11
V	FIREMAN PAYTON TRUSTEE OF MELBA M. ZINN TRUST (HEIRS)	06-07-11

REVISIONS:	COMPANY:			DATE: 04-04-2018
	OPERATOR'S	WILLIAMS		DRAWN BY: K.E.S.
	WELL #:	214		SCALE: N/A
	DISTRICT:	COUNTY:	STATE:	DRAWING NO: 154-452
	FEETTERMAN DISTRICT	TAYLOR	WV	WELL LOCATION PLAT 2

**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
-------------------------	-----------------------	-----------------------	---------	-----------

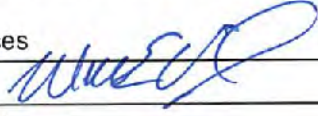
See Attached

**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

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: Arsenal Resources
 By: William Veigel 
 Its: Designated Agent

RECEIVED
 Office of Oil and Gas
 APR 5 2018
 WV Department of
 Environmental Protection

Attachment to WW-6A1, Williams (Puma 75) #214

Letter Designation/Number Designation on Plat	Grantor, Lessor, Assignor, etc.	Grantee, Lessee, Assignee, etc.	Royalty	Book/Page	Acreage
Tract 1 [Lease 00005194 (WVLO1054.000)]	William C. Williams, married, dealing in his sole and separate property	PDC Mountaineer, LLC	15.00%	64/659	107.25
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 2, 4 [Lease 00005133 (WVLO1001.000)]	William M. Compton and Doris L. Compton, his wife (3/4 interest); David S. Summers and Eunetta J. Summers, his wife (1/4 interest)	Pepper Resources, Inc.	12.50%	42/595	264.35
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667 34/575	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 3 [Lease 00005132 (WVLO1000.000)]	Harry L. Summers and Nancy Laressa Summers, his wife	Pepper Resources, Inc.	12.50%	42/504	47
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 5 [Lease 00005134 (WVLO1002.000)]	Virginia G. Rowland, widow	Pepper Resources, Inc.	12.50%	878/609	42.75
	Pepper Resources, Inc.	Pepper Development, LLC		34/397 34/398	
	Pepper Development, LLC	PDC Mountaineer, LLC		31/667	
	PDC Mountaineer, LLC	River Ridge Energy, LLC			
Tract 6 [Lease 00008043]	William M. Compton, divorced	Mar Key LLC	15.00%	69/60	77.6

RECEIVED
Office of Oil and Gas
APR 5 2018
M/V Department of
Environmental Protection

West Virginia Secretary of State — Online Data Services

Business and Licensing

Online Data Services Help

Business Organization Detail

NOTICE: The West Virginia Secretary of State's Office makes every reasonable effort to ensure the accuracy of information. However, we make no representation or warranty as to the correctness or completeness of the information. If information is missing from this page, it is not in the The West Virginia Secretary of State's database.

MAR KEY LLC

Organization Information								
Org Type	Effective Date	Established Date	Filing Date	Charter	Class	Sec Type	Termination Date	Termination Reason
LLC Limited Liability Company	7/11/2011		7/11/2011	Domestic	Profit			

Organization Information			
Business Purpose	2111 - Mining, Quarrying, Oil & Gas Extraction - Oil and Gas Extraction - Crude Oil and Natural Gas Extraction		Capital Stock
Charter County		Control Number	99Q1F
Charter State	WV	Excess Acres	
At Will Term	A	Member Managed	MBR
At Will Term Years		Par Value	

RECEIVED
Office of State
APR 5 2017
WV Department of
Environmental Protection

Authorized Shares

Addresses	
Type	Address
Designated Office Address	65 PROFESSIONAL PLACE SUITE 200 BRIDGEPORT, WV, 26330
Mailing Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Notice of Process Address	CORPORATION SERVICE COMPANY 209 WEST WASHINGTON STREET CHARLESTON, WV, 25302
Principal Office Address	6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090 USA
Type	Address

Officers	
Type	Name/Address
Member	ARSENAL RESOURCES ENERGY LLC 6031 WALLACE ROAD EXTENSION SUITE 300 WEXFORD, PA, 15090
Organizer	PAUL M HERZING 560 EPSILON DR. PITTSBURGH, PA, 15238 USA
Type	Name/Address

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Annual Reports
Date filed

3/30/2017
6/20/2016
6/30/2015
4/28/2014
6/28/2013
5/8/2012
Date filed

For more information, please contact the Secretary of State's Office at 304-558-8000.

Tuesday, November 28, 2017 — 9:44 AM

© 2017 State of West Virginia

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Arsenal Resources LLC, a West Virginia limited liability company ("Arsenal"), River Ridge Energy, LLC, a Delaware limited liability company ("River Ridge"), and River Ridge Energy, Holdings, LLC, a Delaware limited liability company ("River Ridge Holdings"), is effective as of March 1, 2017. (the "Effective Date") and sets forth the terms pursuant to which Arsenal will drill, complete and operate the Wells (as defined below) on behalf of River Ridge and River Ridge Holdings. Arsenal, River Ridge, and River Ridge Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

1. **Term:** This Agreement is effective from the Effective Date until terminated by Arsenal on the one hand or River Ridge and River Ridge Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** River Ridge and River Holdings authorize Arsenal to undertake and perform, on River Ridge and River Ridge Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by River Ridge or River Ridge Holdings. River Ridge, River Ridge Holdings and Arsenal are affiliates with a common parent. Arsenal was formed to operate oil and gas leasehold acreage held by River Ridge, River Ridge Holdings and certain other affiliates. Arsenal agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by River Ridge or River Ridge Holdings from time to time as directed by River Ridge or River Ridge Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

IN WITNESS WHEREOF, Arsenal, River Ridge, and River Ridge Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

ARSENAL RESOURCES LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE ENERGY, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RIVER RIDGE HOLDINGS, LLC

By: Joel E. Symonds
Name: Joel E. Symonds
Title: Vice President - Land

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Agreement to Drill, Complete and Operate Oil & Gas Wells

This Agreement to Drill, Complete and Operate Oil & Gas Wells (this "Agreement"), by and among Mountaineer Keystone LLC, a West Virginia limited liability company ("Mountaineer Keystone"), PDC Mountaineer, LLC, a Delaware limited liability company ("PDC"), and PDC Mountaineer Holdings, LLC, a Delaware limited liability company ("PDC Holdings"), is effective as of October 15, 2014. (the "Effective Date") and sets forth the terms pursuant to which Mountaineer Keystone will drill, complete and operate the Wells (as defined below) on behalf of PDC and PDC Holdings. Mountaineer Keystone, PDC, and PDC Holdings are each a "Party" and are collectively the "Parties". In consideration of the foregoing and the respective agreements hereinafter set forth and the mutual benefits to be derived therefrom, the Parties, intending to be legally bound, hereby agree as follows:

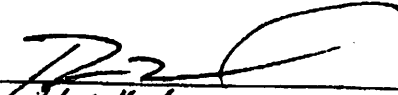
1. **Term:** This Agreement is effective from the Effective Date until terminated by Mountaineer Keystone on the one hand or PDC and PDC Holdings on the other hand with 30 days' written notice to the other Party or Parties, as applicable (the "Term").
2. **Authorization to Operate:** PDC and PDC Holdings authorize Mountaineer Keystone to undertake and perform, on PDC and PDC Holdings behalf, all operations, including without limitation permit applications, well pad preparation, drilling and completing wells, and marketing gas, oil and other hydrocarbons therefrom with respect to all oil and gas wells to be drilled on oil and gas leasehold acreage held by PDC or PDC Holdings. PDC, PDC Holdings and Mountaineer Keystone are affiliates with a common parent. Mountaineer Keystone was formed to operate oil and gas leasehold acreage held by PDC, PDC Holdings and certain other affiliates. Mountaineer Keystone agrees that it shall, in a good and workmanlike manner and in accordance with industry standards as they prevail in the area, drill, complete and operate oil and gas wells on leasehold acreage owned by PDC or PDC Holdings from time to time as directed by PDC or PDC Holdings (collectively, the "Wells").
3. **No Third Party Beneficiary:** This Agreement is for the benefit of the Parties and is not for the benefit of any third party.
4. **Counterparts:** This Agreement may be simultaneously executed in several counterparts and via facsimile or similar electronic transmittal, each of which shall be deemed to be an original and taken together shall constitute one and the same instrument.

[Signature Page Follows]

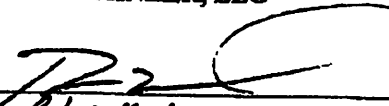
RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

IN WITNESS WHEREOF, Mountaineer Keystone, PDC, and PDC Holdings have caused their duly authorized representatives to execute this Agreement as of the Effective Date.

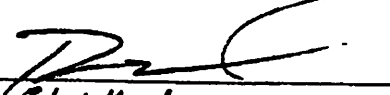
MOUNTAINEER KEYSTONE LLC

By: 
Name: *Robert Koval*
Title: *CEO*

PDC MOUNTAINEER, LLC

By: 
Name: *Robert Koval*
Title: *CEO*

PDC MOUNTAINEER HOLDINGS, LLC

By: 
Name: *Robert Koval*
Title: *CEO*

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection



People Powered. Asset Strong.

March 28, 2018

Mr. James Martin, Chief of Oil and Gas
WV DEP
601 57th Street, SE
Charleston, WV 25301

RE: Ownership of Roadways; Williams Pad

Mr. Martin:

In preparation of filing a permit application for the above referenced well, the Title Department of Arsenal Resources has conducted a thorough title examination in order to determine the ownership of the oil and gas underlying all roadways crossed by the proposed wells. The findings of the title examinations show that the roadways crossed by the proposed wells are right of ways, with the oil and gas being owned and covered by the leaseholds identified on the plat for the proposed wells.

If you have any questions, concerns or need further information, please do not hesitate to contact me at the address listed below.

Sincerely,

A handwritten signature in blue ink that reads 'Coty Brandon'.

Coty Brandon
Title Manager

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

6031 Wallace Road Ext, Suite 300
Wexford, PA 15090
P: 724-940-1100
F: 800-428-0981
www.arsenalresources.com



Purpose

The purpose of this pad-specific Hydraulic Fracturing Monitoring Plan is to identify and notify conventional well operators near Arsenal Resources (ARSENAL RESOURCES) hydraulic fracturing in Taylor County, WV prior to hydraulic fracturing at the following ARSENAL RESOURCES wells on the Williams 214 Pad.

Due to the apparent presence of unique geological conditions, the potential for communication between deep geologic zones exists in this area. This potential communication, via natural gas, water, or both, may occur between hydraulically fractured wells in the Marcellus formation (approximately 7900' TVD) and existing conventional natural gas wells in partially-depleted, relatively high permeability reservoirs at depths shallower than the Marcellus.

ARSENAL RESOURCES has determined there are no existing active or inactive wells within the 500' offset of the Williams 214 wellbore.

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection



ARSENAL
R E S O U R C E S

Arsenal Resources

**Taylor County, West Virginia
Williams PAD
Williams #214**

**Wellbore #1
Design #3**

QES Anticollision Report

14 February, 2018

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection



Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference	Design #3		
Filter type:	NO GLOBAL FILTER: Using user defined selection & filtering criteria		
Interpolation Method:	Stations	Error Model:	ISCWSA
Depth Range:	Unlimited	Scan Method:	Closest Approach 3D
Results Limited by:	Maximum center-center distance of 10,000.0 us	Error Surface:	Pedal Curve
Warning Levels Evaluated at:	2.00 Sigma		

Survey Tool Program	Date 2/14/2018			
From (usft)	To (usft)	Survey (Wellbore)	Tool Name	Description
0.0	16,010.7	Design #3 (Wellbore #1)	MWD default	MWD - Standard

Summary						
Site Name	Reference Measured Depth (usft)	Offset Measured Depth (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
Offset Well - Wellbore - Design						
Williams PAD						
Williams #213 - Wellbore #1 - Design #3	1,500.0	1,500.0	15.0	8.5	2.316	CC, ES, SF
Williams #216 - Wellbore #1 - Design #3	2,000.0	2,000.0	30.0	21.3	3.440	CC, ES
Williams #216 - Wellbore #1 - Design #3	2,100.0	2,100.0	30.9	21.7	3.379	SF

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3											Offset Site Error:	0.0 usft
Survey Program: 0-MWD default											Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore +N-S (usft)	Offset Centre +E-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning
0.0	0.0	0.0	0.0	0.0	0.0	-126.56	-8.9	-12.0	15.0			
100.0	100.0	100.0	100.0	0.1	0.1	-126.56	-8.9	-12.0	15.0	14.8	83.366	
200.0	200.0	200.0	200.0	0.3	0.3	-126.56	-8.9	-12.0	15.0	14.4	23.819	
300.0	300.0	300.0	300.0	0.5	0.5	-126.56	-8.9	-12.0	15.0	13.9	13.894	
400.0	400.0	400.0	400.0	0.8	0.8	-126.56	-8.9	-12.0	15.0	13.5	9.808	
500.0	500.0	500.0	500.0	1.0	1.0	-126.56	-8.9	-12.0	15.0	13.0	7.579	
600.0	600.0	600.0	600.0	1.2	1.2	-126.56	-8.9	-12.0	15.0	12.6	6.175	
700.0	700.0	700.0	700.0	1.4	1.4	-126.56	-8.9	-12.0	15.0	12.1	5.210	
800.0	800.0	800.0	800.0	1.7	1.7	-126.56	-8.9	-12.0	15.0	11.7	4.506	
900.0	900.0	900.0	900.0	1.9	1.9	-126.56	-8.9	-12.0	15.0	11.2	3.970	
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	-126.56	-8.9	-12.0	15.0	10.8	3.547	
1,100.0	1,100.0	1,100.0	1,100.0	2.3	2.3	-126.56	-8.9	-12.0	15.0	10.3	3.206	
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	-126.56	-8.9	-12.0	15.0	9.9	2.925	
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	-126.56	-8.9	-12.0	15.0	9.4	2.689	
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	-126.56	-8.9	-12.0	15.0	9.0	2.489	
1,500.0	1,500.0	1,500.0	1,500.0	3.2	3.2	-126.56	-8.9	-12.0	15.0	8.5	2,316	CC, ES, SF
1,600.0	1,600.0	1,599.5	1,599.5	3.5	3.4	-130.21	-10.6	-12.5	16.4	9.5	2.382	
1,700.0	1,700.0	1,698.8	1,698.7	3.7	3.6	-138.04	-15.5	-14.0	21.0	13.7	2.880	
1,800.0	1,800.0	1,797.7	1,797.1	3.9	3.8	-145.41	-23.8	-16.4	28.0	21.3	3.788	
1,900.0	1,900.0	1,895.8	1,894.5	4.1	4.0	-150.69	-35.1	-19.7	40.7	32.6	5.061	
2,000.0	2,000.0	1,993.0	1,990.6	4.4	4.2	-154.21	-49.5	-23.9	55.8	47.4	6.644	
2,100.0	2,100.0	2,089.4	2,085.2	4.6	4.5	31.53	-66.9	-29.0	72.9	64.2	8.348	
2,200.0	2,199.8	2,185.1	2,178.6	4.7	4.7	31.21	-87.2	-35.0	90.4	81.4	9.995	
2,300.0	2,299.5	2,280.2	2,270.6	4.9	5.1	31.65	-110.3	-41.7	108.3	98.9	11.560	

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning		
2,400.0	2,399.7	2,374.7	2,361.2	5.1	5.5	32.51	-136.1	-49.3	126.4	116.7	13.041			
2,500.0	2,497.5	2,468.6	2,450.2	5.3	5.9	33.61	-164.6	-57.7	144.9	134.8	14.435			
2,600.0	2,495.6	2,461.8	2,437.6	5.5	6.4	34.86	-195.6	-68.7	163.8	153.4	15.731			
2,700.0	2,493.1	2,454.3	2,423.3	5.8	7.0	36.19	-229.1	-76.6	183.1	172.2	16.917			
2,800.0	2,789.6	2,746.2	2,707.3	6.1	7.6	37.57	-265.0	-87.1	202.8	191.5	17.973			
2,900.0	2,885.3	2,837.4	2,789.4	6.5	8.2	38.96	-303.1	-98.3	223.0	211.2	18.880			
3,000.0	2,979.8	2,928.0	2,869.6	7.0	8.9	40.34	-343.4	-110.1	243.8	231.4	19.623			
3,100.0	3,073.2	3,020.1	2,949.8	7.4	9.7	41.75	-386.8	-122.8	264.9	251.8	20.109			
3,200.0	3,165.2	3,117.7	3,034.5	8.0	10.6	43.44	-433.4	-136.5	284.5	270.4	20.987			
3,300.0	3,255.8	3,215.6	3,119.4	8.6	11.5	45.36	-480.2	-150.1	302.0	286.7	19.740			
3,383.1	3,330.0	3,296.9	3,190.0	9.2	12.2	47.15	-519.0	-161.5	315.0	298.7	19.246			
3,400.0	3,345.0	3,313.5	3,204.3	9.3	12.4	47.56	-526.9	-163.8	317.6	301.0	19.126			
3,500.0	3,433.5	3,411.4	3,289.3	10.1	13.3	49.88	-573.7	-177.5	332.9	314.8	18.443			
3,600.0	3,522.1	3,509.4	3,374.3	10.9	14.2	51.99	-620.4	-191.3	348.7	329.1	17.817			
3,700.0	3,610.7	3,607.3	3,459.2	11.7	15.1	53.93	-667.2	-205.0	364.9	343.7	17.251			
3,800.0	3,699.2	3,705.3	3,544.2	12.5	16.1	55.70	-714.0	-218.7	381.5	358.7	16.742			
3,900.0	3,787.8	3,803.2	3,629.2	13.3	17.0	57.32	-760.7	-232.4	398.4	373.9	16.288			
4,000.0	3,876.4	3,901.2	3,714.1	14.1	17.9	58.81	-807.5	-248.1	415.6	389.4	15.863			
4,100.0	3,965.0	3,999.1	3,799.1	15.0	18.9	60.18	-854.3	-259.8	433.1	405.2	15.521			
4,200.0	4,053.5	4,097.1	3,884.1	15.8	19.8	61.44	-901.0	-273.5	450.7	421.1	15.199			
4,300.0	4,142.1	4,195.0	3,969.0	16.7	20.8	62.62	-947.8	-287.2	468.6	437.2	14.910			
4,400.0	4,230.7	4,293.0	4,054.0	17.5	21.7	63.70	-994.6	-300.9	486.7	453.5	14.651			
4,500.0	4,319.2	4,390.9	4,139.0	18.4	22.7	64.71	-1,041.3	-314.6	504.9	469.9	14.419			
4,600.0	4,407.8	4,488.9	4,223.9	19.2	23.7	65.64	-1,088.1	-328.3	523.3	486.4	14.209			
4,700.0	4,496.4	4,586.8	4,308.9	20.1	24.6	66.52	-1,134.9	-342.0	541.8	503.1	14.020			
4,800.0	4,584.9	4,684.8	4,393.9	21.0	25.6	67.34	-1,181.6	-355.7	560.4	519.9	13.848			
4,900.0	4,673.5	4,782.7	4,478.8	21.9	26.5	68.10	-1,228.4	-369.4	579.1	536.8	13.692			
5,000.0	4,762.1	4,880.7	4,563.8	22.8	27.5	68.82	-1,275.2	-383.1	597.9	553.7	13.550			
5,100.0	4,850.7	4,978.6	4,648.8	23.6	28.5	69.49	-1,321.9	-396.8	616.8	570.8	13.420			
5,200.0	4,939.2	5,076.6	4,733.7	24.5	29.4	70.12	-1,368.7	-410.5	635.7	587.9	13.301			
5,300.0	5,027.8	5,174.5	4,818.7	25.4	30.4	70.72	-1,415.5	-424.2	654.8	605.1	13.192			
5,400.0	5,116.4	5,272.5	4,903.7	26.3	31.4	71.28	-1,462.2	-438.0	673.9	622.4	13.091			
5,500.0	5,204.9	5,370.4	4,988.6	27.2	32.3	71.81	-1,509.0	-451.7	693.0	639.7	12.998			
5,600.0	5,293.5	5,468.4	5,073.5	28.1	33.3	72.32	-1,555.8	-465.4	712.2	657.1	12.912			
5,700.0	5,382.1	5,566.3	5,158.6	29.0	34.3	72.80	-1,602.5	-479.1	731.5	674.5	12.832			
5,800.0	5,470.6	5,664.3	5,243.5	29.9	35.2	73.25	-1,649.3	-492.8	750.8	691.9	12.758			
5,900.0	5,559.2	5,762.2	5,328.5	30.8	36.2	73.68	-1,696.1	-506.5	770.2	709.5	12.689			
6,000.0	5,647.8	5,860.2	5,413.4	31.7	37.2	74.09	-1,742.8	-520.2	789.5	727.0	12.624			
6,100.0	5,736.4	5,958.1	5,498.4	32.5	38.1	74.48	-1,789.5	-533.9	809.0	744.5	12.564			
6,200.0	5,824.9	6,056.1	5,583.4	33.4	39.1	74.85	-1,836.4	-547.6	828.4	762.2	12.508			
6,238.9	5,859.4	6,094.2	5,616.5	33.8	39.5	74.99	-1,854.6	-552.9	836.0	769.1	12.487			
6,300.0	5,913.8	6,154.0	5,668.3	34.3	40.1	75.40	-1,883.1	-561.3	848.1	780.1	12.476			
6,400.0	6,004.1	6,251.9	5,753.2	34.9	41.0	75.89	-1,929.8	-575.0	868.6	799.1	12.508			
6,500.0	6,095.8	6,368.3	5,855.2	35.4	41.9	76.22	-1,983.9	-590.8	889.0	818.0	12.533			
6,600.0	6,188.9	6,488.4	5,962.6	36.0	42.7	76.52	-2,035.4	-605.9	907.8	835.5	12.554			
6,700.0	6,283.2	6,609.5	6,073.1	36.5	43.5	76.79	-2,082.9	-619.9	925.1	851.5	12.569			
6,800.0	6,378.6	6,731.4	6,186.3	37.0	44.2	77.03	-2,126.2	-632.5	940.7	865.9	12.581			
6,900.0	6,475.0	6,854.2	6,302.2	37.4	44.8	77.24	-2,165.1	-643.9	954.6	878.8	12.588			
7,000.0	6,572.2	6,977.7	6,420.4	37.8	45.4	77.42	-2,199.3	-654.0	968.8	890.0	12.592			
7,100.0	6,670.2	7,101.8	6,540.6	38.1	45.9	77.57	-2,228.8	-662.6	977.2	899.6	12.593			
7,200.0	6,768.9	7,226.4	6,662.6	38.4	46.4	77.69	-2,253.3	-669.8	985.8	907.6	12.593			
7,300.0	6,868.0	7,351.5	6,786.0	38.7	46.7	77.79	-2,272.8	-675.5	992.7	913.8	12.590			

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	+E/-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
7,400.0	6,967.6	7,477.0	6,910.6	38.9	47.0	77.86	-2,287.2	-679.7	997.7	918.4	12.586		
7,600.0	7,067.4	7,602.7	7,035.9	39.0	47.2	77.91	-2,296.3	-682.4	1,000.9	921.3	12.578		
7,600.0	7,167.4	7,729.5	7,161.7	39.1	47.3	77.93	-2,300.1	-683.5	1,002.2	922.5	12.568		
7,622.0	7,189.4	7,756.2	7,189.4	39.1	47.4	-109.63	-2,300.2	-683.5	1,002.2	922.5	12.565		
7,650.0	7,217.4	7,785.5	7,218.5	39.2	47.4	-91.58	-2,299.6	-683.7	1,002.2	922.5	12.562		
7,700.0	7,267.2	7,837.7	7,270.7	39.1	47.4	-91.57	-2,295.3	-685.2	1,002.2	922.5	12.569		
7,750.0	7,316.5	7,890.0	7,322.2	39.1	47.3	-91.55	-2,288.9	-687.9	1,002.2	922.6	12.591		
7,800.0	7,365.1	7,942.2	7,372.7	38.9	47.2	-91.52	-2,274.6	-691.9	1,002.2	922.9	12.629		
7,850.0	7,412.5	7,994.3	7,422.0	38.8	47.0	-91.48	-2,258.4	-697.2	1,002.2	923.2	12.683		
7,900.0	7,458.6	8,046.4	7,469.5	38.5	46.8	-91.43	-2,238.4	-703.7	1,002.2	923.6	12.753		
7,950.0	7,503.0	8,098.4	7,515.3	38.3	46.6	-91.37	-2,214.9	-711.3	1,002.2	924.1	12.839		
8,000.0	7,545.5	8,150.3	7,558.8	38.0	46.2	-91.30	-2,187.9	-720.1	1,002.1	924.7	12.940		
8,050.0	7,585.8	8,202.0	7,599.7	37.6	45.9	-91.22	-2,157.8	-730.0	1,002.1	925.3	13.056		
8,100.0	7,623.7	8,253.7	7,637.8	37.2	45.5	-91.14	-2,124.6	-740.6	1,002.1	926.1	13.187		
8,150.0	7,658.9	8,305.2	7,672.8	36.8	45.1	-91.05	-2,088.7	-752.4	1,002.0	926.9	13.332		
8,200.0	7,691.2	8,356.6	7,704.7	36.3	44.7	-90.95	-2,050.4	-764.9	1,002.0	927.7	13.490		
8,250.0	7,720.4	8,407.8	7,733.0	35.9	44.3	-90.85	-2,009.9	-778.1	1,002.0	928.6	13.661		
8,300.0	7,746.3	8,458.9	7,757.8	35.4	43.8	-90.74	-1,967.4	-792.0	1,001.9	929.6	13.844		
8,350.0	7,768.8	8,509.8	7,778.9	34.9	43.3	-90.63	-1,923.4	-806.3	1,001.9	930.6	14.038		
8,400.0	7,787.7	8,560.6	7,796.2	34.3	42.8	-90.51	-1,878.0	-821.1	1,001.9	931.5	14.240		
8,450.0	7,802.9	8,611.2	7,809.6	33.8	42.3	-90.39	-1,831.6	-836.2	1,001.9	932.6	14.451		
8,500.0	7,814.3	8,661.6	7,819.0	33.3	41.9	-90.27	-1,784.6	-851.6	1,001.9	933.6	14.668		
8,550.0	7,821.9	8,711.8	7,824.5	32.8	41.4	-90.14	-1,737.1	-867.0	1,001.9	934.6	14.889		
8,600.0	7,825.6	8,761.9	7,826.0	32.3	40.9	-90.02	-1,689.5	-882.5	1,001.9	935.6	15.112		
8,614.7	7,826.0	8,776.6	7,826.0	32.2	40.8	-90.00	-1,675.6	-887.1	1,001.9	935.9	15.176		
8,622.0	7,826.0	8,783.9	7,826.0	32.1	40.7	-90.00	-1,666.6	-888.3	1,001.9	936.0	15.211		
8,700.0	7,826.0	8,861.9	7,826.0	31.3	40.0	-90.00	-1,594.4	-913.5	1,001.9	937.5	15.557		
8,800.0	7,826.0	8,961.9	7,826.0	30.5	39.1	-90.00	-1,499.4	-944.5	1,001.9	939.2	15.985		
8,900.0	7,826.0	9,061.9	7,826.0	29.7	38.3	-90.00	-1,404.3	-975.5	1,001.9	940.7	16.386		
9,000.0	7,826.0	9,161.9	7,826.0	29.0	37.6	-90.00	-1,309.2	-1,006.4	1,001.9	942.0	16.747		
9,100.0	7,826.0	9,261.9	7,826.0	28.5	36.8	-90.00	-1,214.1	-1,037.4	1,001.9	943.1	17.059		
9,200.0	7,826.0	9,361.9	7,826.0	28.0	36.1	-90.00	-1,119.0	-1,068.4	1,001.9	944.0	17.312		
9,300.0	7,826.0	9,461.9	7,826.0	27.7	35.5	-90.00	-1,024.0	-1,099.4	1,001.9	944.5	17.496		
9,400.0	7,826.0	9,561.9	7,826.0	27.5	34.9	-90.00	-928.9	-1,130.3	1,001.9	945.0	17.604		
9,500.0	7,826.0	9,661.9	7,826.0	27.4	34.3	-90.00	-833.8	-1,161.3	1,001.9	945.0	17.631		
9,600.0	7,826.0	9,761.9	7,826.0	27.5	33.8	-90.00	-738.7	-1,192.3	1,001.9	944.9	17.577		
9,700.0	7,826.0	9,861.9	7,826.0	27.7	33.3	-90.00	-643.6	-1,223.3	1,001.9	944.4	17.444		
9,800.0	7,826.0	9,961.9	7,826.0	28.0	32.8	-90.00	-548.6	-1,254.3	1,001.9	943.7	17.237		
9,900.0	7,826.0	10,061.9	7,826.0	28.5	32.4	-90.00	-453.5	-1,285.2	1,001.9	942.8	16.964		
10,000.0	7,826.0	10,161.9	7,826.0	29.1	32.0	-90.00	-358.4	-1,316.2	1,001.9	941.6	16.634		
10,100.0	7,826.0	10,261.9	7,826.0	29.9	31.6	-90.00	-263.3	-1,347.2	1,001.9	940.2	16.254		
10,200.0	7,826.0	10,361.9	7,826.0	30.7	31.6	-90.00	-169.2	-1,378.2	1,001.9	938.7	15.873		
10,300.0	7,826.0	10,461.9	7,826.0	31.7	32.8	-90.00	-73.2	-1,409.2	1,001.9	936.9	15.423		
10,400.0	7,826.0	10,561.9	7,826.0	32.7	34.0	-90.00	21.9	-1,440.1	1,001.9	934.9	14.969		
10,500.0	7,826.0	10,661.9	7,826.0	33.8	35.3	-90.00	117.0	-1,471.1	1,001.9	932.8	14.509		
10,600.0	7,826.0	10,761.9	7,826.0	35.0	36.6	-90.00	212.1	-1,502.1	1,001.9	930.6	14.049		
10,700.0	7,826.0	10,861.9	7,826.0	36.2	37.9	-90.00	307.2	-1,533.1	1,001.9	928.2	13.592		
10,800.0	7,826.0	10,961.9	7,826.0	37.5	39.2	-90.00	402.2	-1,564.0	1,001.9	925.6	13.143		
10,900.0	7,826.0	11,061.9	7,826.0	38.9	40.6	-90.00	497.3	-1,595.0	1,001.9	923.0	12.706		
11,000.0	7,826.0	11,161.9	7,826.0	40.3	42.1	-90.00	592.4	-1,626.0	1,001.9	920.3	12.283		
11,100.0	7,826.0	11,261.9	7,826.0	41.7	43.5	-90.00	687.5	-1,657.0	1,001.9	917.5	11.874		
11,200.0	7,826.0	11,361.9	7,826.0	43.2	45.0	-90.00	782.6	-1,688.0	1,001.9	914.6	11.481		

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #213 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning	
11,300.0	7,826.0	11,461.9	7,826.0	44.7	46.5	-90.00	877.7	-1,718.9	1,001.9	911.6	11.105		
11,400.0	7,826.0	11,561.9	7,826.0	46.3	48.0	-90.00	972.7	-1,748.9	1,001.9	908.6	10.745		
11,500.0	7,826.0	11,661.9	7,826.0	47.8	49.6	-90.00	1,067.8	-1,780.9	1,001.9	905.5	10.401		
11,600.0	7,826.0	11,761.9	7,826.0	49.4	51.1	-90.00	1,162.9	-1,811.9	1,001.9	902.4	10.073		
11,700.0	7,826.0	11,861.9	7,826.0	51.0	52.7	-90.00	1,258.0	-1,842.9	1,001.9	899.2	9.761		
11,800.0	7,826.0	11,961.9	7,826.0	52.7	54.3	-90.00	1,353.1	-1,873.8	1,001.9	896.0	9.464		
11,900.0	7,826.0	12,061.9	7,826.0	54.3	55.9	-90.00	1,448.1	-1,904.8	1,001.9	892.7	9.181		
12,000.0	7,826.0	12,161.9	7,826.0	56.0	57.6	-90.00	1,543.2	-1,935.8	1,001.9	889.4	8.911		
12,100.0	7,826.0	12,261.9	7,826.0	57.7	59.2	-90.00	1,638.3	-1,966.8	1,001.9	886.1	8.654		
12,200.0	7,826.0	12,361.9	7,826.0	59.4	60.9	-90.00	1,733.4	-1,997.8	1,001.9	882.7	8.410		
12,300.0	7,826.0	12,461.9	7,826.0	61.1	62.5	-90.00	1,828.5	-2,028.7	1,001.9	879.3	8.177		
12,400.0	7,826.0	12,561.9	7,826.0	62.8	64.2	-90.00	1,923.5	-2,059.7	1,001.9	875.9	7.955		
12,500.0	7,826.0	12,661.9	7,826.0	64.5	65.9	-90.00	2,018.6	-2,090.7	1,001.9	872.5	7.743		
12,600.0	7,826.0	12,761.9	7,826.0	66.3	67.6	-90.00	2,113.7	-2,121.7	1,001.9	869.0	7.541		
12,700.0	7,826.0	12,861.9	7,826.0	68.0	69.4	-90.00	2,208.8	-2,152.6	1,001.9	865.5	7.349		
12,800.0	7,826.0	12,961.9	7,826.0	69.8	71.1	-90.00	2,303.9	-2,183.6	1,001.9	862.0	7.164		
12,900.0	7,826.0	13,061.9	7,826.0	71.6	72.8	-90.00	2,398.9	-2,214.6	1,001.9	858.5	6.989		
13,000.0	7,826.0	13,161.9	7,826.0	73.3	74.5	-90.00	2,494.0	-2,245.6	1,001.9	855.0	6.820		
13,100.0	7,826.0	13,261.9	7,826.0	75.1	76.3	-90.00	2,589.1	-2,276.6	1,001.9	851.4	6.659		
13,200.0	7,826.0	13,361.9	7,826.0	76.9	78.1	-90.00	2,684.2	-2,307.5	1,001.9	847.9	6.505		
13,300.0	7,826.0	13,461.9	7,826.0	78.7	79.8	-90.00	2,779.3	-2,338.5	1,001.9	844.3	6.358		
13,400.0	7,826.0	13,561.9	7,826.0	80.5	81.6	-90.00	2,874.3	-2,369.5	1,001.9	840.7	6.215		
13,500.0	7,826.0	13,661.9	7,826.0	82.3	83.4	-90.00	2,969.4	-2,400.5	1,001.9	837.1	6.080		
13,600.0	7,826.0	13,761.9	7,826.0	84.1	85.1	-90.00	3,064.5	-2,431.5	1,001.9	833.5	5.950		
13,700.0	7,826.0	13,861.9	7,826.0	85.9	86.9	-90.00	3,159.6	-2,462.4	1,001.9	829.9	5.824		
13,800.0	7,826.0	13,961.9	7,826.0	87.8	88.7	-90.00	3,254.7	-2,493.4	1,001.9	826.2	5.704		
13,900.0	7,826.0	14,061.9	7,826.0	89.6	90.5	-90.00	3,349.7	-2,524.4	1,001.9	822.6	5.588		
14,000.0	7,826.0	14,161.9	7,826.0	91.4	92.3	-90.00	3,444.8	-2,555.4	1,001.9	818.9	5.477		
14,100.0	7,826.0	14,261.9	7,826.0	93.2	94.1	-90.00	3,539.9	-2,586.3	1,001.9	815.3	5.370		
14,200.0	7,826.0	14,361.9	7,826.0	95.1	95.9	-90.00	3,635.0	-2,617.3	1,001.9	811.6	5.266		
14,300.0	7,826.0	14,461.9	7,826.0	96.9	97.7	-90.00	3,730.1	-2,648.3	1,001.9	808.0	5.167		
14,400.0	7,826.0	14,561.9	7,826.0	98.8	99.5	-90.00	3,825.1	-2,679.3	1,001.9	804.3	5.071		
14,500.0	7,826.0	14,661.9	7,826.0	100.6	101.4	-90.00	3,920.2	-2,710.3	1,001.9	800.6	4.978		
14,600.0	7,826.0	14,761.9	7,826.0	102.4	103.2	-90.00	4,015.3	-2,741.2	1,001.9	796.9	4.888		
14,700.0	7,826.0	14,861.9	7,826.0	104.3	105.0	-90.00	4,110.4	-2,772.2	1,001.9	793.2	4.802		
14,800.0	7,826.0	14,961.9	7,826.0	106.1	106.8	-90.00	4,205.5	-2,803.2	1,001.9	789.5	4.718		
14,900.0	7,826.0	15,061.9	7,826.0	108.0	108.7	-90.00	4,300.6	-2,834.2	1,001.9	785.8	4.637		
15,000.0	7,826.0	15,161.9	7,826.0	109.9	110.5	-90.00	4,395.6	-2,865.2	1,001.9	782.1	4.559		
15,100.0	7,826.0	15,261.9	7,826.0	111.7	112.3	-90.00	4,490.7	-2,896.1	1,001.9	778.4	4.483		
15,200.0	7,826.0	15,361.9	7,826.0	113.6	114.2	-90.00	4,585.8	-2,927.1	1,001.9	774.7	4.410		
15,300.0	7,826.0	15,461.9	7,826.0	115.4	115.0	-90.00	4,680.9	-2,958.1	1,001.9	771.0	4.339		
15,400.0	7,826.0	15,561.9	7,826.0	117.3	117.8	-90.00	4,776.0	-2,989.1	1,001.9	767.3	4.270		
15,500.0	7,826.0	15,661.9	7,826.0	119.2	119.7	-90.00	4,871.0	-3,020.1	1,001.9	763.6	4.203		
15,600.0	7,826.0	15,761.9	7,826.0	121.0	121.5	-90.00	4,966.1	-3,051.0	1,001.9	759.8	4.139		
15,700.0	7,826.0	15,861.9	7,826.0	122.9	123.4	-90.00	5,061.2	-3,082.0	1,001.9	756.1	4.076		
15,800.0	7,826.0	15,961.9	7,826.0	124.8	125.2	-90.00	5,156.3	-3,113.0	1,001.9	752.3	4.015		
15,900.0	7,826.0	16,061.9	7,826.0	126.6	127.1	-90.00	5,251.4	-3,144.0	1,001.9	748.6	3.956		
16,000.0	7,826.0	16,161.9	7,826.0	128.5	128.9	-90.00	5,346.4	-3,174.9	1,001.9	744.8	3.898		
16,010.7	7,826.0	16,172.6	7,826.0	128.7	129.1	-90.00	5,356.6	-3,178.3	1,001.9	744.5	3.892		

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD- Williams #216 - Wellbore #1 - Design #3													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N/-S (usft)	Offset Wellbore Centre +E/-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning		
0.0	0.0	0.0	0.0	0.0	0.0	53.44	17.9	24.1	30.0					
100.0	100.0	100.0	100.0	0.1	0.1	53.44	17.9	24.1	30.0	29.8	166.854			
200.0	200.0	200.0	200.0	0.3	0.3	53.44	17.9	24.1	30.0	29.4	47.872			
300.0	300.0	300.0	300.0	0.5	0.5	53.44	17.9	24.1	30.0	28.9	27.809			
400.0	400.0	400.0	400.0	0.8	0.8	53.44	17.9	24.1	30.0	28.5	19.530			
500.0	500.0	500.0	500.0	1.0	1.0	53.44	17.9	24.1	30.0	28.0	15.169			
600.0	600.0	600.0	600.0	1.2	1.2	53.44	17.9	24.1	30.0	27.6	12.360			
700.0	700.0	700.0	700.0	1.4	1.4	53.44	17.9	24.1	30.0	27.1	10.428			
800.0	800.0	800.0	800.0	1.7	1.7	53.44	17.9	24.1	30.0	26.7	9.019			
900.0	900.0	900.0	900.0	1.9	1.9	53.44	17.9	24.1	30.0	26.2	7.945			
1,000.0	1,000.0	1,000.0	1,000.0	2.1	2.1	53.44	17.9	24.1	30.0	25.8	7.100			
1,100.0	1,100.0	1,100.0	1,100.0	2.3	2.3	53.44	17.9	24.1	30.0	25.3	6.417			
1,200.0	1,200.0	1,200.0	1,200.0	2.6	2.6	53.44	17.9	24.1	30.0	24.9	5.855			
1,300.0	1,300.0	1,300.0	1,300.0	2.8	2.8	53.44	17.9	24.1	30.0	24.4	5.382			
1,400.0	1,400.0	1,400.0	1,400.0	3.0	3.0	53.44	17.9	24.1	30.0	24.0	4.981			
1,500.0	1,500.0	1,500.0	1,500.0	3.2	3.2	53.44	17.9	24.1	30.0	23.5	4.635			
1,600.0	1,600.0	1,600.0	1,600.0	3.5	3.5	53.44	17.9	24.1	30.0	23.1	4.334			
1,700.0	1,700.0	1,700.0	1,700.0	3.7	3.7	53.44	17.9	24.1	30.0	22.6	4.070			
1,800.0	1,800.0	1,800.0	1,800.0	3.9	3.9	53.44	17.9	24.1	30.0	22.2	3.836			
1,900.0	1,900.0	1,900.0	1,900.0	4.1	4.1	53.44	17.9	24.1	30.0	21.7	3.627			
2,000.0	2,000.0	2,000.0	2,000.0	4.4	4.4	53.44	17.9	24.1	30.0	21.3	3.440	CC, ES		
2,100.0	2,100.0	2,100.0	2,100.0	4.6	4.6	-121.82	17.9	24.1	30.9	21.7	3.379	SF		
2,200.0	2,199.8	2,199.8	2,199.8	4.7	4.8	-129.29	17.9	24.1	33.9	24.4	3.559			
2,300.0	2,299.5	2,299.5	2,299.5	4.9	5.0	-138.89	17.9	24.1	40.0	30.1	4.030			
2,400.0	2,398.7	2,398.7	2,398.7	5.1	5.3	-148.01	17.9	24.1	49.9	39.5	4.824			
2,500.0	2,497.5	2,497.5	2,497.5	5.3	5.5	-155.35	17.9	24.1	63.7	53.0	5.927			
2,600.0	2,595.6	2,597.1	2,597.1	5.5	5.7	-158.91	16.7	25.3	80.6	69.5	7.233			
2,700.0	2,693.1	2,697.1	2,697.0	5.8	5.9	-161.81	13.1	28.9	99.1	87.6	8.601			
2,800.0	2,789.6	2,797.3	2,796.9	6.1	6.0	-162.20	7.0	35.0	118.9	107.0	9.984			
2,900.0	2,885.3	2,897.7	2,896.4	6.5	6.2	-161.69	-1.6	43.5	140.1	127.7	11.361			
3,000.0	2,979.8	2,998.1	2,995.6	7.0	6.5	-160.63	-12.7	54.6	162.5	149.7	12.718			
3,100.0	3,073.2	3,098.5	3,094.2	7.4	6.7	-159.23	-26.3	68.1	186.2	173.0	14.035			
3,200.0	3,165.2	3,198.9	3,192.0	8.0	7.0	-157.63	-42.2	84.0	211.4	197.6	15.294			
3,300.0	3,255.8	3,299.2	3,288.9	8.6	7.3	-155.92	-60.6	102.3	238.0	223.8	16.471			
3,383.1	3,330.0	3,362.4	3,368.5	9.2	7.6	-154.44	-77.6	119.3	261.3	246.3	17.370			
3,400.0	3,345.0	3,399.3	3,384.6	9.3	7.7	-154.17	-81.3	122.9	266.1	251.0	17.543			
3,500.0	3,433.5	3,499.7	3,479.5	10.1	8.1	-152.42	-104.4	146.0	293.8	277.8	18.367			
3,600.0	3,522.1	3,600.4	3,573.5	10.9	8.6	-150.39	-130.0	171.4	320.3	303.3	18.890			
3,700.0	3,610.7	3,701.2	3,666.3	11.7	9.1	-148.13	-157.9	199.3	345.7	327.6	19.147			
3,800.0	3,699.2	3,799.4	3,755.5	12.5	9.7	-145.79	-187.1	228.3	370.4	351.1	19.208			
3,900.0	3,787.8	3,895.3	3,842.4	13.3	10.3	-143.74	-215.8	256.9	395.6	374.9	19.197			
4,000.0	3,876.4	3,991.1	3,929.2	14.1	11.0	-141.93	-244.5	285.5	421.0	399.0	19.162			
4,100.0	3,965.0	4,087.0	4,015.1	15.0	11.7	-140.33	-273.2	314.1	449.9	423.5	19.112			
4,200.0	4,053.5	4,182.9	4,103.0	15.8	12.4	-138.90	-301.9	342.7	473.1	448.2	19.054			
4,300.0	4,142.1	4,278.7	4,189.9	16.7	13.1	-137.62	-330.6	371.3	499.5	473.2	18.990			
4,400.0	4,230.7	4,374.6	4,276.8	17.5	13.8	-136.47	-359.3	399.9	528.1	498.3	18.925			
4,500.0	4,319.2	4,470.5	4,363.7	18.4	14.5	-135.42	-388.0	428.5	552.9	523.6	18.861			
4,600.0	4,407.8	4,566.4	4,450.6	19.2	15.3	-134.48	-416.7	457.1	579.9	549.0	18.798			
4,700.0	4,496.4	4,662.2	4,537.4	20.1	16.0	-133.61	-445.4	485.7	607.0	574.6	18.737			
4,800.0	4,584.9	4,758.1	4,624.3	21.0	16.8	-132.82	-474.1	514.3	634.2	600.2	18.679			
4,900.0	4,673.5	4,854.0	4,711.2	21.9	17.6	-132.10	-502.8	542.9	661.5	626.0	18.624			
5,000.0	4,762.1	4,949.8	4,798.1	22.8	18.3	-131.43	-531.5	571.5	688.9	651.6	18.572			

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #216 - Wellbore #1 - Design #3													Offset Site Error:	0.0 usft
Survey Program: 0-MWD default													Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	Offset Wellbore Centre +E-W (usft)	Distance Between Centres (usft)	Distance Between Ellipses (usft)	Separation Factor	Warning		
5,100.0	4,850.7	5,045.7	4,885.0	23.6	19.1	-130.81	-560.2	600.1	716.4	677.7	18.522			
5,200.0	4,939.2	5,141.6	4,971.9	24.5	19.9	-130.24	-588.9	628.7	744.0	703.7	18.476			
5,300.0	5,027.8	5,237.4	5,058.7	25.4	20.7	-129.71	-617.6	657.3	771.6	729.7	18.433			
5,400.0	5,116.4	5,333.3	5,145.6	26.3	21.5	-129.22	-646.3	685.9	799.3	755.8	18.392			
5,500.0	5,204.9	5,429.2	5,232.5	27.2	22.3	-128.76	-675.0	714.5	827.0	781.9	18.354			
5,600.0	5,293.5	5,525.1	5,319.4	28.1	23.1	-128.32	-703.8	743.1	854.8	808.1	18.318			
5,700.0	5,382.1	5,620.9	5,406.3	29.0	23.9	-127.92	-732.5	771.7	882.6	834.3	18.284			
5,800.0	5,470.6	5,718.4	5,492.8	29.9	24.6	-127.55	-761.0	800.2	910.5	860.6	18.271			
5,900.0	5,559.2	5,810.6	5,579.2	30.8	25.2	-127.34	-787.7	826.8	938.5	887.3	18.341			
6,000.0	5,647.8	5,904.8	5,666.7	31.7	25.7	-127.34	-812.4	851.4	966.7	914.3	18.440			
6,100.0	5,736.4	5,998.8	5,755.1	32.5	26.2	-127.52	-835.0	873.9	995.1	941.5	18.569			
6,200.0	5,824.9	6,092.5	5,844.2	33.4	26.7	-127.87	-855.5	894.3	1,023.6	969.0	18.729			
6,238.9	5,859.4	6,128.8	5,878.9	33.8	26.8	-128.06	-862.9	901.7	1,034.8	979.8	18.900			
6,300.0	5,913.8	6,185.7	5,933.7	34.3	27.2	-128.62	-873.8	912.6	1,052.1	996.5	18.930			
6,400.0	6,004.1	6,278.9	6,024.1	34.9	27.5	-129.54	-890.1	928.8	1,078.9	1,022.6	19.164			
6,500.0	6,095.8	6,372.3	6,115.3	35.4	27.9	-130.41	-904.2	942.9	1,103.9	1,047.0	19.386			
6,600.0	6,188.9	6,465.7	6,207.2	36.0	28.2	-131.25	-916.3	954.9	1,127.1	1,069.5	19.597			
6,700.0	6,283.2	6,559.2	6,299.6	36.5	28.5	-132.07	-926.2	964.8	1,148.4	1,090.4	19.800			
6,800.0	6,378.6	6,652.5	6,392.2	37.0	28.7	-132.85	-934.0	972.6	1,167.8	1,109.4	19.996			
6,900.0	6,475.0	6,745.8	6,485.2	37.4	28.9	-133.62	-939.7	978.2	1,185.4	1,126.6	20.186			
7,000.0	6,572.2	6,838.9	6,578.1	37.8	29.1	-134.37	-943.2	981.7	1,201.1	1,142.1	20.371			
7,100.0	6,670.2	6,931.8	6,671.0	38.1	29.2	-135.11	-944.5	983.0	1,214.9	1,155.8	20.551			
7,200.0	6,768.9	7,029.7	6,768.9	38.4	29.3	-135.80	-944.5	983.0	1,226.6	1,167.4	20.705			
7,300.0	6,868.0	7,128.8	6,868.0	38.7	29.4	-136.35	-944.5	983.0	1,236.0	1,176.6	20.811			
7,400.0	6,967.6	7,228.4	6,967.6	38.9	29.5	-136.75	-944.5	983.0	1,242.9	1,183.4	20.870			
7,500.0	7,067.4	7,328.2	7,067.4	39.0	29.6	-137.00	-944.5	983.0	1,247.3	1,187.6	20.981			
7,600.0	7,167.4	7,428.2	7,167.4	39.1	29.7	-137.10	-944.5	983.0	1,249.1	1,189.2	20.844			
7,622.0	7,189.4	7,450.2	7,189.4	39.1	29.7	35.34	-944.5	983.0	1,249.2	1,189.2	20.829			
7,650.0	7,217.4	7,450.2	7,189.4	39.2	29.7	53.39	-944.5	983.0	1,249.1	1,189.2	20.850			
7,700.0	7,267.2	7,486.1	7,225.3	39.1	29.8	53.54	-943.6	982.7	1,247.7	1,187.7	20.820			
7,750.0	7,316.5	7,500.0	7,239.2	39.1	29.8	53.77	-942.7	982.4	1,246.1	1,185.3	20.814			
7,800.0	7,365.1	7,532.1	7,271.1	38.9	29.8	54.10	-939.5	981.4	1,241.3	1,181.5	20.771			
7,850.0	7,412.5	7,550.0	7,288.8	38.8	29.8	54.68	-937.1	980.6	1,236.2	1,176.6	20.737			
7,900.0	7,458.6	7,578.1	7,316.4	38.5	29.7	55.36	-932.4	979.1	1,230.0	1,170.5	20.679			
7,950.0	7,503.0	7,600.0	7,337.8	38.3	29.7	56.13	-927.8	977.5	1,222.7	1,163.4	20.616			
8,000.0	7,545.5	7,623.9	7,361.0	38.0	29.7	57.05	-922.1	975.8	1,214.3	1,155.2	20.541			
8,050.0	7,585.8	7,650.0	7,385.9	37.6	29.6	58.13	-915.0	973.4	1,205.0	1,146.0	20.448			
8,100.0	7,623.7	7,669.5	7,404.4	37.2	29.5	59.25	-909.0	971.5	1,194.6	1,136.0	20.355			
8,150.0	7,658.9	7,700.0	7,432.8	36.8	29.5	60.69	-898.5	968.1	1,183.5	1,125.1	20.233			
8,200.0	7,691.2	7,714.8	7,446.5	36.3	29.4	61.95	-893.0	966.3	1,171.6	1,113.4	20.120			
8,250.0	7,720.4	7,737.3	7,466.9	35.9	29.3	63.49	-884.0	963.3	1,159.1	1,101.1	19.985			
8,300.0	7,746.3	7,750.0	7,478.2	35.4	29.3	64.88	-878.6	961.6	1,146.1	1,088.4	19.853			
8,350.0	7,768.8	7,782.1	7,506.4	34.9	29.2	66.88	-864.1	956.9	1,132.7	1,075.1	19.687			
8,400.0	7,787.7	7,800.0	7,521.9	34.3	29.1	68.59	-855.4	954.0	1,119.0	1,061.7	19.529			
8,450.0	7,802.9	7,826.2	7,543.9	33.8	28.9	70.62	-842.0	949.6	1,105.3	1,048.2	19.362			
8,500.0	7,814.3	7,850.0	7,563.4	33.3	28.9	72.65	-829.0	945.4	1,091.5	1,034.8	19.193			
8,550.0	7,821.9	7,869.6	7,579.2	32.8	28.7	74.58	-817.8	941.8	1,078.3	1,021.5	19.032			
8,600.0	7,825.6	7,900.0	7,602.7	32.3	28.6	76.94	-799.6	935.8	1,065.4	1,009.0	18.875			
8,622.0	7,826.0	7,900.0	7,602.7	32.1	28.6	77.45	-799.6	935.8	1,059.9	1,003.5	18.810			
8,700.0	7,826.0	7,935.3	7,628.9	31.3	28.4	78.88	-777.1	928.5	1,042.5	986.5	18.638			
8,800.0	7,826.0	7,966.9	7,664.8	30.5	28.0	80.87	-741.8	917.0	1,025.7	970.4	18.564			
8,900.0	7,826.0	8,050.0	7,704.3	29.7	27.6	83.08	-695.2	901.8	1,014.3	959.9	18.633			

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Offset Design Williams PAD - Williams #216 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default:												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	Centre +E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
9,000.0	7,826.0	8,117.2	7,740.9	29.0	27.2	85.15	-641.6	884.3	1,007.5	954.0	18.934		
9,100.0	7,826.0	8,197.3	7,776.4	28.5	26.6	87.17	-573.4	862.1	1,004.2	951.7	19.136		
9,200.0	7,826.0	8,266.8	7,805.2	28.0	26.0	88.81	-492.9	835.9	1,003.0	951.5	19.478		
9,300.0	7,826.0	8,363.4	7,822.5	27.7	25.4	89.80	-402.6	806.5	1,002.7	952.1	19.795		
9,341.8	7,826.0	8,425.0	7,825.5	27.6	25.2	89.97	-363.2	793.7	1,002.7	952.3	19.901		
9,400.0	7,826.0	8,483.1	7,826.0	27.5	24.8	90.00	-307.9	775.6	1,002.7	952.7	20.034		
9,500.0	7,826.0	8,583.1	7,826.0	27.4	24.3	90.00	-212.8	744.7	1,002.7	953.0	20.160		
9,600.0	7,826.0	8,683.1	7,826.0	27.5	23.9	90.00	-117.7	713.7	1,002.7	953.0	20.171		
9,700.0	7,826.0	8,783.1	7,826.0	27.7	23.6	90.00	-22.7	682.7	1,002.7	952.7	20.061		
9,800.0	7,826.0	8,883.1	7,826.0	28.0	23.4	90.00	72.4	651.7	1,002.7	952.2	19.837		
9,900.0	7,826.0	8,983.1	7,826.0	28.5	23.4	90.00	167.5	620.8	1,002.7	951.3	19.510		
10,000.0	7,826.0	9,083.1	7,826.0	29.1	23.6	90.00	262.6	589.8	1,002.7	950.2	19.095		
10,100.0	7,826.0	9,183.1	7,826.0	29.9	24.1	90.00	357.7	558.8	1,002.7	948.9	18.608		
10,200.0	7,826.0	9,283.1	7,826.0	30.7	24.8	90.00	452.7	527.8	1,002.7	947.2	18.070		
10,300.0	7,826.0	9,383.1	7,826.0	31.7	25.7	90.00	547.8	496.8	1,002.7	945.4	17.495		
10,400.0	7,826.0	9,483.1	7,826.0	32.7	26.7	90.00	642.9	465.9	1,002.7	943.4	16.901		
10,500.0	7,826.0	9,583.1	7,826.0	33.8	27.9	90.00	738.0	434.9	1,002.7	941.2	16.299		
10,600.0	7,826.0	9,683.1	7,826.0	35.0	29.1	90.00	833.1	403.9	1,002.8	939.9	15.700		
10,700.0	7,826.0	9,783.1	7,826.0	36.2	30.4	90.00	928.2	372.9	1,002.8	936.4	15.111		
10,800.0	7,826.0	9,883.1	7,826.0	37.5	31.7	90.00	1,023.2	342.0	1,002.8	933.8	14.539		
10,900.0	7,826.0	9,983.1	7,826.0	38.9	33.2	90.00	1,118.3	311.0	1,002.8	931.1	13.988		
11,000.0	7,826.0	10,083.1	7,826.0	40.3	34.6	90.00	1,213.4	280.0	1,002.8	928.2	13.457		
11,100.0	7,826.0	10,183.1	7,826.0	41.7	35.1	90.00	1,308.5	249.0	1,002.8	925.3	12.951		
11,200.0	7,826.0	10,283.1	7,826.0	43.2	37.7	90.00	1,403.6	218.1	1,002.8	922.3	12.470		
11,300.0	7,826.0	10,383.1	7,826.0	44.7	39.2	90.00	1,498.6	187.1	1,002.8	919.3	12.013		
11,400.0	7,826.0	10,483.1	7,826.0	46.3	40.8	90.00	1,593.7	156.1	1,002.8	916.2	11.581		
11,500.0	7,826.0	10,583.1	7,826.0	47.8	42.4	90.00	1,688.8	125.1	1,002.8	913.0	11.171		
11,600.0	7,826.0	10,683.1	7,826.0	49.4	44.1	90.00	1,783.9	94.1	1,002.8	909.8	10.784		
11,700.0	7,826.0	10,783.1	7,826.0	51.0	45.7	90.00	1,879.0	63.2	1,002.8	906.5	10.417		
11,800.0	7,826.0	10,883.1	7,826.0	52.7	47.4	90.00	1,974.0	32.2	1,002.8	903.2	10.071		
11,900.0	7,826.0	10,983.1	7,826.0	54.3	49.1	90.00	2,069.1	1.2	1,002.8	899.9	9.744		
12,000.0	7,826.0	11,083.1	7,826.0	56.0	50.8	90.00	2,164.2	-29.8	1,002.8	896.5	9.434		
12,100.0	7,826.0	11,183.1	7,826.0	57.7	52.6	90.00	2,259.3	-60.7	1,002.8	893.1	9.141		
12,200.0	7,826.0	11,283.1	7,826.0	59.4	54.3	90.00	2,354.4	-91.7	1,002.8	889.6	8.863		
12,300.0	7,826.0	11,383.1	7,826.0	61.1	56.0	90.00	2,449.5	-122.7	1,002.8	886.2	8.600		
12,400.0	7,826.0	11,483.1	7,826.0	62.8	57.8	90.00	2,544.5	-153.7	1,002.8	882.7	8.351		
12,500.0	7,826.0	11,583.1	7,826.0	64.5	59.6	90.00	2,639.6	-184.6	1,002.8	879.2	8.114		
12,600.0	7,826.0	11,683.1	7,826.0	66.3	61.3	90.00	2,734.7	-215.6	1,002.8	875.7	7.889		
12,700.0	7,826.0	11,783.1	7,826.0	68.0	63.1	90.00	2,829.8	-246.6	1,002.8	872.1	7.675		
12,800.0	7,826.0	11,883.1	7,826.0	69.8	64.9	90.00	2,924.9	-277.6	1,002.8	868.6	7.472		
12,900.0	7,826.0	11,983.1	7,826.0	71.6	66.7	90.00	3,019.9	-308.6	1,002.8	865.0	7.278		
13,000.0	7,826.0	12,083.1	7,826.0	73.3	68.5	90.00	3,115.0	-339.5	1,002.8	861.4	7.093		
13,100.0	7,826.0	12,183.1	7,826.0	75.1	70.3	90.00	3,210.1	-370.5	1,002.8	857.8	6.917		
13,200.0	7,826.0	12,283.1	7,826.0	76.9	72.1	90.00	3,305.2	-401.5	1,002.8	854.2	6.749		
13,300.0	7,826.0	12,383.1	7,826.0	78.7	74.0	90.00	3,400.3	-432.5	1,002.8	850.6	6.589		
13,400.0	7,826.0	12,483.1	7,826.0	80.5	75.8	90.00	3,495.3	-463.4	1,002.8	847.0	6.435		
13,500.0	7,826.0	12,583.1	7,826.0	82.3	77.6	90.00	3,590.4	-494.4	1,002.8	843.3	6.288		
13,600.0	7,826.0	12,683.1	7,826.0	84.1	79.5	90.00	3,685.5	-525.4	1,002.8	839.7	6.147		
13,700.0	7,826.0	12,783.1	7,826.0	85.9	81.3	90.00	3,780.6	-556.4	1,002.8	836.0	6.013		
13,800.0	7,826.0	12,883.1	7,826.0	87.8	83.1	90.00	3,875.7	-587.3	1,002.8	832.4	5.883		
13,900.0	7,826.0	12,983.1	7,826.0	89.6	85.0	90.00	3,970.8	-618.3	1,002.8	828.7	5.759		
14,000.0	7,826.0	13,083.1	7,826.0	91.4	86.8	90.00	4,065.8	-649.3	1,002.8	825.0	5.640		

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

CC - Min centre to center distance or convergent point, SF - min separation factor, ES - min ellipse separation

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

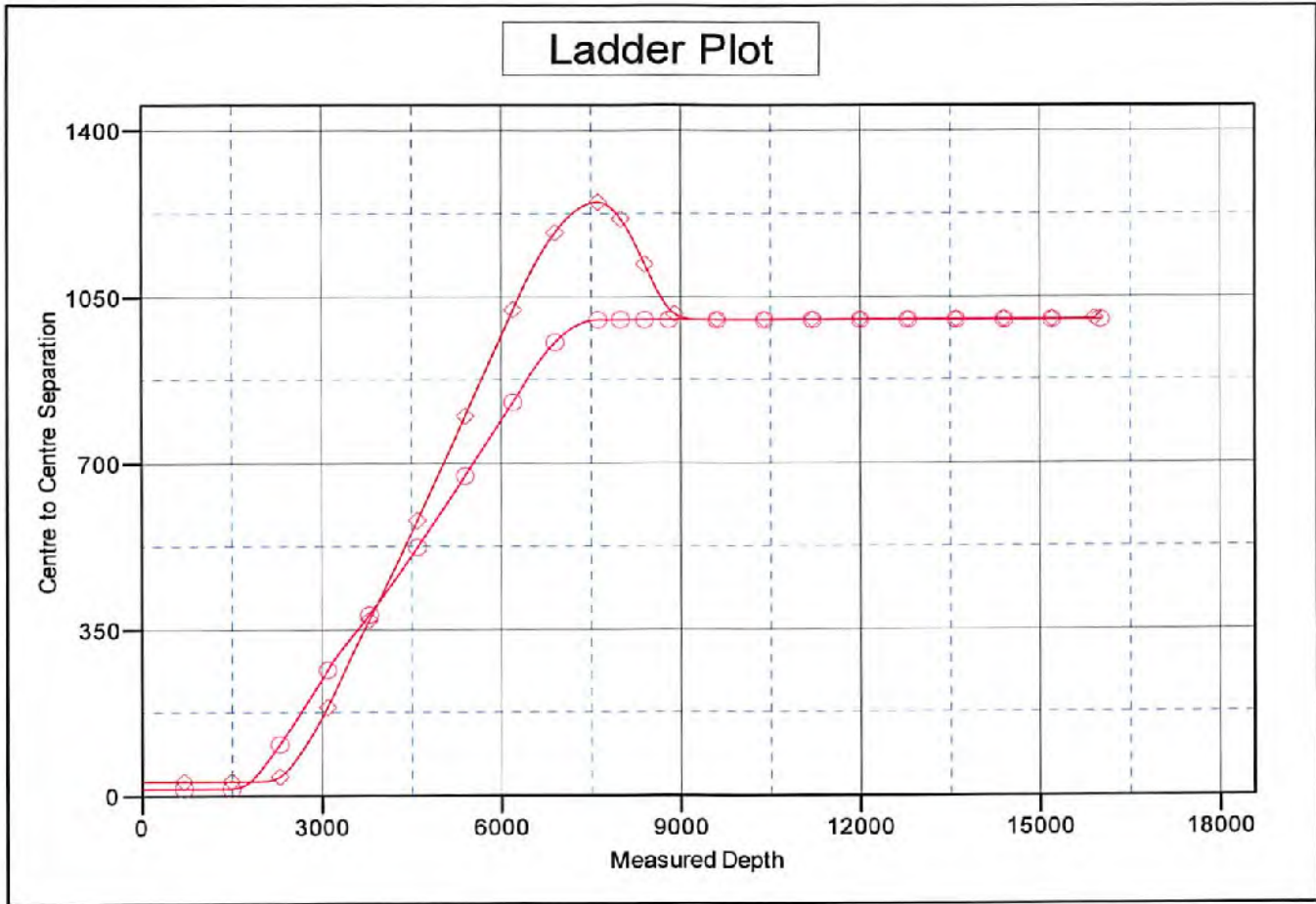
Offset Design Williams PAD - Williams #216 - Wellbore #1 - Design #3												Offset Site Error:	0.0 usft
Survey Program: 0-MWD default												Offset Well Error:	0.0 usft
Reference Measured Depth (usft)	Vertical Depth (usft)	Offset Measured Depth (usft)	Vertical Depth (usft)	Semi Major Axis Reference (usft)	Offset (usft)	Highside Toolface (°)	Offset Wellbore Centre +N-S (usft)	+E-W (usft)	Distance Between Centres (usft)	Between Ellipses (usft)	Separation Factor	Warning	
14,100.0	7,826.0	13,183.1	7,826.0	93.2	88.7	90.00	4,180.9	-680.3	1,002.8	821.3	5.525		
14,200.0	7,826.0	13,283.1	7,826.0	95.1	90.5	90.00	4,256.0	-711.3	1,002.8	817.6	5.415		
14,300.0	7,826.0	13,383.1	7,826.0	96.9	92.4	90.00	4,351.1	-742.2	1,002.8	813.9	5.309		
14,400.0	7,826.0	13,483.1	7,826.0	98.8	94.2	90.00	4,446.2	-773.2	1,002.8	810.2	5.207		
14,500.0	7,826.0	13,583.1	7,826.0	100.6	96.1	90.00	4,541.2	-804.2	1,002.8	806.5	5.109		
14,600.0	7,826.0	13,683.1	7,826.0	102.4	98.0	90.00	4,636.3	-835.2	1,002.8	802.8	5.014		
14,700.0	7,826.0	13,783.1	7,826.0	104.3	99.8	90.00	4,731.4	-866.1	1,002.8	799.1	4.922		
14,800.0	7,826.0	13,883.1	7,826.0	106.1	101.7	90.00	4,826.5	-897.1	1,002.8	795.4	4.834		
14,900.0	7,826.0	13,983.1	7,826.0	108.0	103.6	90.00	4,921.6	-928.1	1,002.8	791.7	4.749		
15,000.0	7,826.0	14,083.1	7,826.0	109.9	105.4	90.00	5,016.6	-959.1	1,002.8	787.9	4.666		
15,100.0	7,826.0	14,183.1	7,826.0	111.7	107.3	90.00	5,111.7	-990.0	1,002.8	784.2	4.587		
15,200.0	7,826.0	14,283.1	7,826.0	113.6	109.2	90.00	5,206.8	-1,021.0	1,002.8	780.5	4.510		
15,300.0	7,826.0	14,383.1	7,826.0	115.4	111.0	90.00	5,301.9	-1,052.0	1,002.8	776.7	4.435		
15,400.0	7,826.0	14,483.1	7,826.0	117.3	112.9	90.00	5,397.0	-1,083.0	1,002.8	773.0	4.363		
15,500.0	7,826.0	14,583.1	7,826.0	119.2	114.8	90.00	5,492.1	-1,114.0	1,002.8	769.2	4.293		
15,600.0	7,826.0	14,683.1	7,826.0	121.0	116.7	90.00	5,587.1	-1,144.9	1,002.8	765.5	4.225		
15,700.0	7,826.0	14,783.1	7,826.0	122.9	118.6	90.00	5,682.2	-1,175.9	1,002.9	761.7	4.159		
15,800.0	7,826.0	14,883.1	7,826.0	124.8	120.4	90.00	5,777.3	-1,206.9	1,002.9	758.0	4.095		
15,839.5	7,826.0	14,922.6	7,826.0	125.5	121.2	90.00	5,814.9	-1,219.1	1,002.8	756.5	4.071		
15,900.0	7,826.0	14,922.6	7,826.0	126.6	121.2	90.00	5,814.9	-1,219.1	1,004.6	757.4	4.063		
16,000.0	7,826.0	14,922.6	7,826.0	128.5	121.2	90.00	5,814.9	-1,219.1	1,015.6	768.8	4.115		
16,010.7	7,826.0	14,922.6	7,826.0	128.7	121.2	90.00	5,814.9	-1,219.1	1,017.3	770.7	4.125		

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 1820.0usft
 Offset Depths are relative to Offset Datum
 Central Meridian is 79° 30' 0.000 W

Coordinates are relative to: Williams #214
 Coordinate System is US State Plane 1983, West Virginia Northern Zone
 Grid Convergence at Surface is: -0.30°



LEGEND

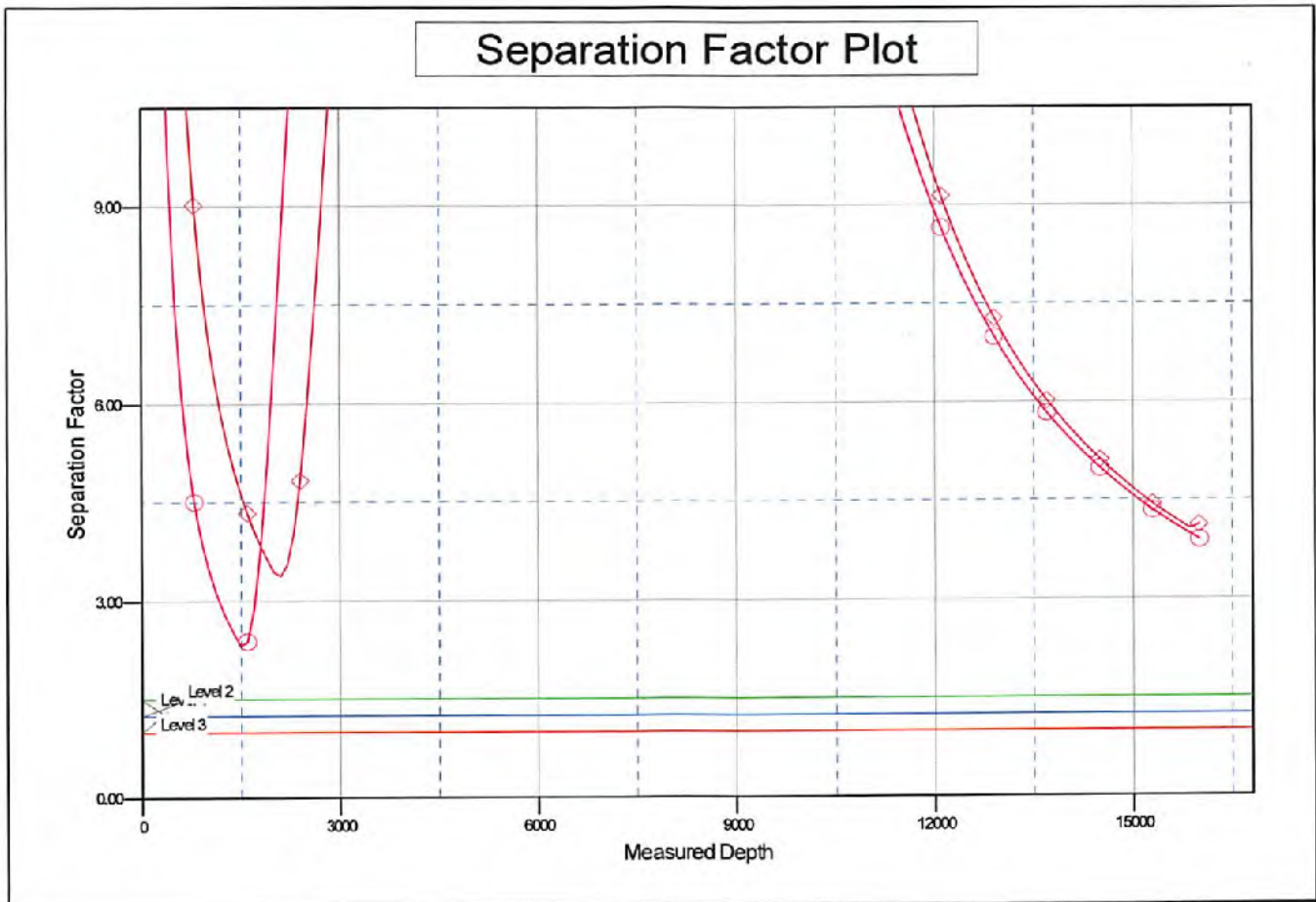
○ Williams #213, Wellbore #1, Design #3 V0
 ◇ Williams #216, Wellbore #1, Design #3 V0

RECEIVED
 Office of Oil and Gas
 APR 5 2018
 WV Department of
 Environmental Protection

Company:	Arsenal Resources	Local Co-ordinate Reference:	Well Williams #214
Project:	Taylor County, West Virginia	TVD Reference:	WELL @ 1820.0usft
Reference Site:	Williams PAD	MD Reference:	WELL @ 1820.0usft
Site Error:	0.0 usft	North Reference:	Grid
Reference Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Well Error:	0.0 usft	Output errors are at	2.00 sigma
Reference Wellbore	Wellbore #1	Database:	EDM 5000.1 Single User Db
Reference Design:	Design #3	Offset TVD Reference:	Offset Datum

Reference Depths are relative to WELL @ 1820.0usft
 Offset Depths are relative to Offset Datum
 Central Meridian is 79° 30' 0.000 W

Coordinates are relative to: Williams #214
 Coordinate System is US State Plane 1983, West Virginia Northern Zone
 Grid Convergence at Surface is: -0.30°



LEGEND

○ Williams #213, Wellbore #1, Design #3 V0
 ◇ Williams #216, Wellbore #1, Design #3 V0

RECEIVED
 Office of Oil and Gas
 APR 5 2018
 WV Department of
 Environmental Protection



ARSENAL
R E S O U R C E S

Arsenal Resources

Taylor County, West Virginia

Williams PAD

Williams #214

Wellbore #1

Plan: Design #3

QES Well Planning Report

14 February, 2018

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection



Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #214
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Project	Taylor County, West Virginia		
Map System:	US State Plane 1983	System Datum:	Mean Sea Level
Geo Datum:	North American Datum 1983		
Map Zone:	West Virginia Northern Zone		

Site	Williams PAD				
Site Position:		Northing:	336,619.51 usft	Latitude:	39° 25' 23.647 N
From:	Map	Easting:	1,834,878.31 usft	Longitude:	79° 58' 22.853 W
Position Uncertainty:	0.0 usft	Slot Radius:	13-3/16 "	Grid Convergence:	-0.30 °

Well	Williams #214					
Well Position	+N/-S	8.9 usft	Northing:	336,628.44 usft	Latitude:	39° 25' 23.736 N
	+E/-W	12.0 usft	Easting:	1,834,890.35 usft	Longitude:	79° 58' 22.700 W
Position Uncertainty		0.0 usft	Wellhead Elevation:	0.0 usft	Ground Level:	1,800.0 usft

Wellbore	Wellbore #1				
-----------------	-------------	--	--	--	--

Magnetics	Model Name	Sample Date	Declination (°)	Dip Angle (°)	Field Strength (nT)
	IGRF2010	3/21/2016	-9.12	66.64	52,046.42382418

Design	Design #3				
---------------	-----------	--	--	--	--

Audit Notes:					
Version:	Phase:	PLAN	Tie On Depth:	0.0	
Vertical Section:	Depth From (TVD) (usft)	+N/-S (usft)	+E/-W (usft)	Direction (°)	
	0.0	0.0	0.0	338.56	

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
0.0	0.00	0.00	0.0	0.0	0.0	0.00	0.00	0.00	0.00	
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.00	0.00	0.00	0.00	
3,383.1	27.66	172.44	3,330.0	-324.6	43.1	2.00	2.00	0.00	172.44	
6,238.9	27.66	172.44	5,859.4	-1,638.9	217.4	0.00	0.00	0.00	0.00	
7,622.0	0.00	360.00	7,189.4	-1,963.5	260.5	2.00	-2.00	0.00	180.00	VP Williams #214 C
8,622.0	90.00	341.95	7,826.0	-1,358.2	63.2	9.00	9.00	-1.80	341.95	LP Williams #214 D
16,010.7	90.00	341.95	7,826.0	5,667.0	-2,225.6	0.00	0.00	0.00	0.00	PBHL Williams #21

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #214
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
0.0	0.00	0.00	0.0	0.0	0.0	0.0	0.00	0.00	0.00	
100.0	0.00	0.00	100.0	0.0	0.0	0.0	0.00	0.00	0.00	
200.0	0.00	0.00	200.0	0.0	0.0	0.0	0.00	0.00	0.00	
300.0	0.00	0.00	300.0	0.0	0.0	0.0	0.00	0.00	0.00	
400.0	0.00	0.00	400.0	0.0	0.0	0.0	0.00	0.00	0.00	
500.0	0.00	0.00	500.0	0.0	0.0	0.0	0.00	0.00	0.00	
600.0	0.00	0.00	600.0	0.0	0.0	0.0	0.00	0.00	0.00	
700.0	0.00	0.00	700.0	0.0	0.0	0.0	0.00	0.00	0.00	
800.0	0.00	0.00	800.0	0.0	0.0	0.0	0.00	0.00	0.00	
900.0	0.00	0.00	900.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,000.0	0.00	0.00	1,000.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,100.0	0.00	0.00	1,100.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,200.0	0.00	0.00	1,200.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,300.0	0.00	0.00	1,300.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,400.0	0.00	0.00	1,400.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,500.0	0.00	0.00	1,500.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,600.0	0.00	0.00	1,600.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,700.0	0.00	0.00	1,700.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,800.0	0.00	0.00	1,800.0	0.0	0.0	0.0	0.00	0.00	0.00	
1,900.0	0.00	0.00	1,900.0	0.0	0.0	0.0	0.00	0.00	0.00	
Start Build 2.00										
2,000.0	0.00	0.00	2,000.0	0.0	0.0	0.0	0.00	0.00	0.00	
2,100.0	2.00	172.44	2,100.0	-1.7	0.2	-1.7	2.00	2.00	0.00	
2,200.0	4.00	172.44	2,199.8	-6.9	0.9	-6.8	2.00	2.00	0.00	
2,300.0	6.00	172.44	2,299.5	-15.6	2.1	-15.2	2.00	2.00	0.00	
2,400.0	8.00	172.44	2,398.7	-27.6	3.7	-27.1	2.00	2.00	0.00	
2,500.0	10.00	172.44	2,497.5	-43.1	5.7	-42.3	2.00	2.00	0.00	
2,600.0	12.00	172.44	2,595.6	-62.1	8.2	-60.8	2.00	2.00	0.00	
2,700.0	14.00	172.44	2,693.1	-84.4	11.2	-82.6	2.00	2.00	0.00	
2,800.0	16.00	172.44	2,789.6	-110.0	14.6	-107.7	2.00	2.00	0.00	
2,900.0	18.00	172.44	2,885.3	-139.0	18.4	-136.1	2.00	2.00	0.00	
3,000.0	20.00	172.44	2,979.8	-171.3	22.7	-167.7	2.00	2.00	0.00	
3,100.0	22.00	172.44	3,073.2	-206.8	27.4	-202.5	2.00	2.00	0.00	
3,200.0	24.00	172.44	3,165.2	-245.5	32.6	-240.4	2.00	2.00	0.00	
3,300.0	26.00	172.44	3,255.8	-287.4	38.1	-281.5	2.00	2.00	0.00	
Start 2855.8 hold at 3383.1 MD										
3,383.1	27.66	172.44	3,330.0	-324.6	43.1	-317.9	2.00	2.00	0.00	
3,400.0	27.66	172.44	3,345.0	-332.4	44.1	-325.5	0.00	0.00	0.00	
3,500.0	27.66	172.44	3,433.5	-378.4	50.2	-370.6	0.00	0.00	0.00	
3,600.0	27.66	172.44	3,522.1	-424.4	56.3	-415.6	0.00	0.00	0.00	
3,700.0	27.66	172.44	3,610.7	-470.4	62.4	-460.7	0.00	0.00	0.00	
3,800.0	27.66	172.44	3,699.2	-516.5	68.5	-505.8	0.00	0.00	0.00	
3,900.0	27.66	172.44	3,787.8	-562.5	74.6	-550.8	0.00	0.00	0.00	
4,000.0	27.66	172.44	3,876.4	-608.5	80.7	-595.9	0.00	0.00	0.00	
4,100.0	27.66	172.44	3,965.0	-654.5	86.8	-641.0	0.00	0.00	0.00	
4,200.0	27.66	172.44	4,053.5	-700.6	92.9	-686.0	0.00	0.00	0.00	
4,300.0	27.66	172.44	4,142.1	-746.6	99.0	-731.1	0.00	0.00	0.00	
4,400.0	27.66	172.44	4,230.7	-792.6	105.1	-776.2	0.00	0.00	0.00	
4,500.0	27.66	172.44	4,319.2	-838.6	111.2	-821.2	0.00	0.00	0.00	
4,600.0	27.66	172.44	4,407.8	-884.6	117.3	-866.3	0.00	0.00	0.00	
4,700.0	27.66	172.44	4,496.4	-930.7	123.5	-911.4	0.00	0.00	0.00	
4,800.0	27.66	172.44	4,584.9	-976.7	129.6	-956.5	0.00	0.00	0.00	
4,900.0	27.66	172.44	4,673.5	-1,022.7	135.7	-1,001.5	0.00	0.00	0.00	
5,000.0	27.66	172.44	4,762.1	-1,068.7	141.8	-1,046.6	0.00	0.00	0.00	

RECEIVED
Office of Oil and
APR 5 20
WV Department
Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #214
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey									
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
5,100.0	27.66	172.44	4,850.7	-1,114.8	147.9	-1,091.7	0.00	0.00	0.00
5,200.0	27.66	172.44	4,939.2	-1,160.8	154.0	-1,136.7	0.00	0.00	0.00
5,300.0	27.66	172.44	5,027.8	-1,206.8	160.1	-1,181.8	0.00	0.00	0.00
5,400.0	27.66	172.44	5,116.4	-1,252.8	166.2	-1,226.9	0.00	0.00	0.00
5,500.0	27.66	172.44	5,204.9	-1,298.8	172.3	-1,271.9	0.00	0.00	0.00
5,600.0	27.66	172.44	5,293.5	-1,344.9	178.4	-1,317.0	0.00	0.00	0.00
5,700.0	27.66	172.44	5,382.1	-1,390.9	184.5	-1,362.1	0.00	0.00	0.00
5,800.0	27.66	172.44	5,470.6	-1,436.9	190.6	-1,407.1	0.00	0.00	0.00
5,900.0	27.66	172.44	5,559.2	-1,482.9	196.7	-1,452.2	0.00	0.00	0.00
6,000.0	27.66	172.44	5,647.8	-1,529.0	202.8	-1,497.3	0.00	0.00	0.00
6,100.0	27.66	172.44	5,736.4	-1,575.0	208.9	-1,542.3	0.00	0.00	0.00
6,200.0	27.66	172.44	5,824.9	-1,621.0	215.0	-1,587.4	0.00	0.00	0.00
Start Drop -2.00									
6,238.9	27.66	172.44	5,859.4	-1,638.9	217.4	-1,605.0	0.00	0.00	0.00
6,300.0	26.44	172.44	5,913.8	-1,666.5	221.1	-1,631.9	2.00	-2.00	0.00
6,400.0	24.44	172.44	6,004.1	-1,709.0	226.7	-1,673.6	2.00	-2.00	0.00
6,500.0	22.44	172.44	6,095.8	-1,748.5	231.9	-1,712.2	2.00	-2.00	0.00
6,600.0	20.44	172.44	6,188.9	-1,784.7	236.7	-1,747.7	2.00	-2.00	0.00
6,700.0	18.44	172.44	6,283.2	-1,817.7	241.1	-1,780.0	2.00	-2.00	0.00
6,800.0	16.44	172.44	6,378.6	-1,847.4	245.1	-1,809.1	2.00	-2.00	0.00
6,900.0	14.44	172.44	6,475.0	-1,873.8	248.6	-1,835.0	2.00	-2.00	0.00
7,000.0	12.44	172.44	6,572.2	-1,896.8	251.6	-1,857.5	2.00	-2.00	0.00
7,100.0	10.44	172.44	6,670.2	-1,916.5	254.2	-1,876.8	2.00	-2.00	0.00
7,200.0	8.44	172.44	6,768.9	-1,932.8	256.4	-1,892.7	2.00	-2.00	0.00
7,300.0	6.44	172.44	6,868.0	-1,945.6	258.1	-1,905.3	2.00	-2.00	0.00
7,400.0	4.44	172.44	6,967.6	-1,955.0	259.3	-1,914.5	2.00	-2.00	0.00
7,500.0	2.44	172.44	7,067.4	-1,960.9	260.1	-1,920.3	2.00	-2.00	0.00
7,600.0	0.44	172.44	7,167.4	-1,963.4	260.4	-1,922.8	2.00	-2.00	0.00
Start DLS 9.00 TFO 341.95									
7,822.0	0.00	360.00	7,189.4	-1,963.5	260.5	-1,922.8	2.00	-2.00	0.00
7,850.0	2.52	341.95	7,217.4	-1,962.9	260.3	-1,922.2	9.00	9.00	0.00
7,700.0	7.02	341.95	7,267.2	-1,959.0	259.0	-1,918.1	9.00	9.00	0.00
7,750.0	11.52	341.95	7,316.5	-1,951.3	256.5	-1,910.0	9.00	9.00	0.00
7,800.0	16.02	341.95	7,365.1	-1,940.0	252.8	-1,898.2	9.00	9.00	0.00
7,850.0	20.52	341.95	7,412.5	-1,925.1	248.0	-1,882.5	9.00	9.00	0.00
7,900.0	25.02	341.95	7,458.6	-1,906.7	242.0	-1,863.2	9.00	9.00	0.00
7,950.0	29.52	341.95	7,503.0	-1,885.0	234.9	-1,840.4	9.00	9.00	0.00
8,000.0	34.02	341.95	7,545.5	-1,859.9	226.7	-1,814.1	9.00	9.00	0.00
8,050.0	38.52	341.95	7,585.8	-1,831.8	217.5	-1,784.6	9.00	9.00	0.00
8,100.0	43.02	341.95	7,623.7	-1,800.8	207.4	-1,752.0	9.00	9.00	0.00
8,150.0	47.52	341.95	7,658.9	-1,767.0	196.4	-1,716.5	9.00	9.00	0.00
8,200.0	52.02	341.95	7,691.2	-1,730.7	184.6	-1,678.4	9.00	9.00	0.00
8,250.0	56.52	341.95	7,720.4	-1,692.2	172.0	-1,637.9	9.00	9.00	0.00
8,300.0	61.02	341.95	7,746.3	-1,651.5	158.8	-1,595.3	9.00	9.00	0.00
8,350.0	65.52	341.95	7,768.8	-1,609.1	145.0	-1,550.7	9.00	9.00	0.00
8,400.0	70.02	341.95	7,787.7	-1,565.1	130.6	-1,504.5	9.00	9.00	0.00
8,450.0	74.52	341.95	7,802.9	-1,519.8	115.9	-1,457.0	9.00	9.00	0.00
8,500.0	79.02	341.95	7,814.3	-1,473.5	100.8	-1,408.4	9.00	9.00	0.00
8,550.0	83.52	341.95	7,821.9	-1,426.6	85.5	-1,359.1	9.00	9.00	0.00
8,600.0	88.02	341.95	7,825.6	-1,379.2	70.1	-1,309.3	9.00	9.00	0.00
Start 7388.7 hold at 8622.0 MD									
8,622.0	90.00	341.95	7,826.0	-1,358.2	63.2	-1,287.4	9.00	9.00	0.00
8,700.0	90.00	341.95	7,826.0	-1,284.1	39.1	-1,209.5	0.00	0.00	0.00

RECEIVED
 State of West Virginia
 Department of Oil and Gas
 5 2018
 WV Department of Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #214
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey										
Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)	
8,800.0	90.00	341.95	7,826.0	-1,189.0	8.1	-1,109.7	0.00	0.00	0.00	
8,900.0	90.00	341.95	7,826.0	-1,093.9	-22.9	-1,009.8	0.00	0.00	0.00	
9,000.0	90.00	341.95	7,826.0	-998.8	-53.8	-910.0	0.00	0.00	0.00	
9,100.0	90.00	341.95	7,826.0	-903.8	-84.8	-810.2	0.00	0.00	0.00	
9,200.0	90.00	341.95	7,826.0	-808.7	-115.8	-710.4	0.00	0.00	0.00	
9,300.0	90.00	341.95	7,826.0	-713.6	-146.8	-610.5	0.00	0.00	0.00	
9,400.0	90.00	341.95	7,826.0	-618.5	-177.8	-510.7	0.00	0.00	0.00	
9,500.0	90.00	341.95	7,826.0	-523.4	-208.7	-410.9	0.00	0.00	0.00	
9,600.0	90.00	341.95	7,826.0	-428.4	-239.7	-311.1	0.00	0.00	0.00	
9,700.0	90.00	341.95	7,826.0	-333.3	-270.7	-211.2	0.00	0.00	0.00	
9,800.0	90.00	341.95	7,826.0	-238.2	-301.7	-111.4	0.00	0.00	0.00	
9,900.0	90.00	341.95	7,826.0	-143.1	-332.7	-11.6	0.00	0.00	0.00	
10,000.0	90.00	341.95	7,826.0	-48.0	-363.6	88.2	0.00	0.00	0.00	
10,100.0	90.00	341.95	7,826.0	47.0	-394.6	188.0	0.00	0.00	0.00	
10,200.0	90.00	341.95	7,826.0	142.1	-425.6	287.9	0.00	0.00	0.00	
10,300.0	90.00	341.95	7,826.0	237.2	-456.6	387.7	0.00	0.00	0.00	
10,400.0	90.00	341.95	7,826.0	332.3	-487.6	487.5	0.00	0.00	0.00	
10,500.0	90.00	341.95	7,826.0	427.4	-518.5	587.3	0.00	0.00	0.00	
10,600.0	90.00	341.95	7,826.0	522.5	-549.5	687.2	0.00	0.00	0.00	
10,700.0	90.00	341.95	7,826.0	617.5	-580.5	787.0	0.00	0.00	0.00	
10,800.0	90.00	341.95	7,826.0	712.6	-611.5	886.8	0.00	0.00	0.00	
10,900.0	90.00	341.95	7,826.0	807.7	-642.4	986.6	0.00	0.00	0.00	
11,000.0	90.00	341.95	7,826.0	902.8	-673.4	1,086.5	0.00	0.00	0.00	
11,100.0	90.00	341.95	7,826.0	997.9	-704.4	1,186.3	0.00	0.00	0.00	
11,200.0	90.00	341.95	7,826.0	1,092.9	-735.4	1,286.1	0.00	0.00	0.00	
11,300.0	90.00	341.95	7,826.0	1,188.0	-766.4	1,385.9	0.00	0.00	0.00	
11,400.0	90.00	341.95	7,826.0	1,283.1	-797.3	1,485.8	0.00	0.00	0.00	
11,500.0	90.00	341.95	7,826.0	1,378.2	-828.3	1,585.6	0.00	0.00	0.00	
11,600.0	90.00	341.95	7,826.0	1,473.3	-859.3	1,685.4	0.00	0.00	0.00	
11,700.0	90.00	341.95	7,826.0	1,568.3	-890.3	1,785.2	0.00	0.00	0.00	
11,800.0	90.00	341.95	7,826.0	1,663.4	-921.3	1,885.1	0.00	0.00	0.00	
11,900.0	90.00	341.95	7,826.0	1,758.5	-952.2	1,984.9	0.00	0.00	0.00	
12,000.0	90.00	341.95	7,826.0	1,853.6	-983.2	2,084.7	0.00	0.00	0.00	
12,100.0	90.00	341.95	7,826.0	1,948.7	-1,014.2	2,184.5	0.00	0.00	0.00	
12,200.0	90.00	341.95	7,826.0	2,043.7	-1,045.2	2,284.4	0.00	0.00	0.00	
12,300.0	90.00	341.95	7,826.0	2,138.8	-1,076.1	2,384.2	0.00	0.00	0.00	
12,400.0	90.00	341.95	7,826.0	2,233.9	-1,107.1	2,484.0	0.00	0.00	0.00	
12,500.0	90.00	341.95	7,826.0	2,329.0	-1,138.1	2,583.8	0.00	0.00	0.00	
12,600.0	90.00	341.95	7,826.0	2,424.1	-1,169.1	2,683.7	0.00	0.00	0.00	
12,700.0	90.00	341.95	7,826.0	2,519.1	-1,200.1	2,783.5	0.00	0.00	0.00	
12,800.0	90.00	341.95	7,826.0	2,614.2	-1,231.0	2,883.3	0.00	0.00	0.00	
12,900.0	90.00	341.95	7,826.0	2,709.3	-1,262.0	2,983.1	0.00	0.00	0.00	
13,000.0	90.00	341.95	7,826.0	2,804.4	-1,293.0	3,083.0	0.00	0.00	0.00	
13,100.0	90.00	341.95	7,826.0	2,899.5	-1,324.0	3,182.8	0.00	0.00	0.00	
13,200.0	90.00	341.95	7,826.0	2,994.5	-1,355.0	3,282.6	0.00	0.00	0.00	
13,300.0	90.00	341.95	7,826.0	3,089.6	-1,385.9	3,382.4	0.00	0.00	0.00	
13,400.0	90.00	341.95	7,826.0	3,184.7	-1,416.9	3,482.3	0.00	0.00	0.00	
13,500.0	90.00	341.95	7,826.0	3,279.8	-1,447.9	3,582.1	0.00	0.00	0.00	
13,600.0	90.00	341.95	7,826.0	3,374.9	-1,478.9	3,681.9	0.00	0.00	0.00	
13,700.0	90.00	341.95	7,826.0	3,470.0	-1,509.9	3,781.7	0.00	0.00	0.00	
13,800.0	90.00	341.95	7,826.0	3,565.0	-1,540.8	3,881.6	0.00	0.00	0.00	
13,900.0	90.00	341.95	7,826.0	3,660.1	-1,571.8	3,981.4	0.00	0.00	0.00	
14,000.0	90.00	341.95	7,826.0	3,755.2	-1,602.8	4,081.2	0.00	0.00	0.00	
14,100.0	90.00	341.95	7,826.0	3,850.3	-1,633.8	4,181.0	0.00	0.00	0.00	

RECEIVED
Office of Oil and Gas
APR 5 2018
West Virginia Department of Environmental Protection

Database:	EDM 5000.1 Single User Db	Local Co-ordinate Reference:	Well Williams #214
Company:	Arsenal Resources	TVD Reference:	WELL @ 1820.0usft
Project:	Taylor County, West Virginia	MD Reference:	WELL @ 1820.0usft
Site:	Williams PAD	North Reference:	Grid
Well:	Williams #214	Survey Calculation Method:	Minimum Curvature
Wellbore:	Wellbore #1		
Design:	Design #3		

Planned Survey

Measured Depth (usft)	Inclination (°)	Azimuth (°)	Vertical Depth (usft)	+N/-S (usft)	+E/-W (usft)	Vertical Section (usft)	Dogleg Rate (°/100usft)	Build Rate (°/100usft)	Turn Rate (°/100usft)
14,200.0	90.00	341.95	7,826.0	3,945.4	-1,664.7	4,280.9	0.00	0.00	0.00
14,300.0	90.00	341.95	7,826.0	4,040.4	-1,695.7	4,380.7	0.00	0.00	0.00
14,400.0	90.00	341.95	7,826.0	4,135.5	-1,726.7	4,480.5	0.00	0.00	0.00
14,500.0	90.00	341.95	7,826.0	4,230.6	-1,757.7	4,580.3	0.00	0.00	0.00
14,600.0	90.00	341.95	7,826.0	4,325.7	-1,788.7	4,680.1	0.00	0.00	0.00
14,700.0	90.00	341.95	7,826.0	4,420.8	-1,819.6	4,780.0	0.00	0.00	0.00
14,800.0	90.00	341.95	7,826.0	4,515.8	-1,850.6	4,879.8	0.00	0.00	0.00
14,900.0	90.00	341.95	7,826.0	4,610.9	-1,881.6	4,979.6	0.00	0.00	0.00
15,000.0	90.00	341.95	7,826.0	4,706.0	-1,912.6	5,079.4	0.00	0.00	0.00
15,100.0	90.00	341.95	7,826.0	4,801.1	-1,943.6	5,179.3	0.00	0.00	0.00
15,200.0	90.00	341.95	7,826.0	4,896.2	-1,974.5	5,279.1	0.00	0.00	0.00
15,300.0	90.00	341.95	7,826.0	4,991.2	-2,005.5	5,378.9	0.00	0.00	0.00
15,400.0	90.00	341.95	7,826.0	5,086.3	-2,036.5	5,478.7	0.00	0.00	0.00
15,500.0	90.00	341.95	7,826.0	5,181.4	-2,067.5	5,578.6	0.00	0.00	0.00
15,600.0	90.00	341.95	7,826.0	5,276.5	-2,098.4	5,678.4	0.00	0.00	0.00
15,700.0	90.00	341.95	7,826.0	5,371.6	-2,129.4	5,778.2	0.00	0.00	0.00
15,800.0	90.00	341.95	7,826.0	5,466.6	-2,160.4	5,878.0	0.00	0.00	0.00
15,900.0	90.00	341.95	7,826.0	5,561.7	-2,191.4	5,977.9	0.00	0.00	0.00
16,000.0	90.00	341.95	7,826.0	5,656.8	-2,222.4	6,077.7	0.00	0.00	0.00
TD at 16010.7									
16,010.7	90.00	341.95	7,826.0	5,667.0	-2,225.6	6,088.3	0.00	0.00	0.00

Design Targets

Target Name	Dip Angle (°)	Dip Dir. (°)	TVD (usft)	+N/-S (usft)	+E/-W (usft)	Northing (usft)	Easting (usft)	Latitude	Longitude
VP Williams #214 D#1 - hit/miss target - Shape - Point	0.00	360.00	7,189.4	-1,963.5	260.5	334,664.92	1,835,150.81	39° 25' 4.343 N	79° 58' 19.249 W
LP Williams #214 D#2 - plan hits target center - Point	0.00	360.00	7,826.0	-1,358.2	63.2	335,270.20	1,834,953.60	39° 25' 10.315 N	79° 58' 21.803 W
PBHL Williams #214 - plan hits target center - Point	0.00	360.00	7,826.0	5,667.0	-2,225.6	342,295.40	1,832,664.70	39° 26' 19.630 N	79° 58' 51.449 W

Plan Annotations

Measured Depth (usft)	Vertical Depth (usft)	Local Coordinates		Comment
		+N/-S (usft)	+E/-W (usft)	
2,000.0	2,000.0	0.0	0.0	Start Build 2.00
3,383.1	3,330.0	-324.6	43.1	Start 2855.8 hold at 3383.1 MD
6,238.9	5,859.4	-1,638.9	217.4	Start Drop -2.00
7,622.0	7,189.4	-1,963.5	260.5	Start DLS 9.00 TFO 341.95
8,622.0	7,826.0	-1,358.2	63.2	Start 7388.7 hold at 8622.0 MD
16,010.7	7,826.0	5,667.0	-2,225.6	TD at 16010.7

RECEIVED
Office of Oil and Gas
APR 5 2018
WV Department of
Environmental Protection



Arsenal Resources
Taylor County, West Virginia
Williams PAD
Williams #214
Design #3

ANNOTATIONS

MD	Inc	Azi	TVD	+N/-S	+E/-W	Vsect	Departure	Annotation
2000.0	0.00	0.00	2000.0	0.0	0.0	0.0	0.0	Start Build 2.00
3383.1	27.66	172.44	3330.0	-324.6	43.1	-317.9	327.4	Start 2855.8 hold at 3383.1 MD
6238.9	27.66	172.44	5859.4	-1638.9	217.4	-1605.0	1653.3	Start Drop -2.00
7622.0	0.00	360.00	7189.4	-1963.5	260.5	-1922.8	1980.7	Start DLS 9.00 TFO 341.95
8622.0	90.00	341.95	7826.0	-1358.2	63.3	-1287.4	2617.3	Start 7388.7 hold at 8622.0 MD
16010.7	90.00	341.95	7826.0	5667.0	-2225.6	6088.3	10006.0	TD at 16010.7

