

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

API 47 - 51 - 01619 County Marshall District Franklin
Quad Powhatan Point 7.5' Pad Name Armstrong Field/Pool Name _____
Farm name CNX Gas Company, LLC Well Number 8H
Operator (as registered with the OOG) Gastar Exploration Inc.
Address 229 West Main Street Suite 301 City Clarksburg State WV Zip 26301

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 4400472.1 Easting 516427.0
Landing Point of Curve Northing 4400912.3 Easting 516341.5
Bottom Hole Northing 4401558.0 Easting 514809.1

Elevation (ft) 1278' GL Type of Well New Existing Type of Report Interim Final
Permit Type Deviated Horizontal Horizontal 6A Vertical Depth Type Deep Shallow
Type of Operation Convert Deepen Drill Plug Back Redrilling Rework Stimulate
Well Type Brine Disposal CBM Gas Oil Secondary Recovery Solution Mining Storage Other _____
Type of Completion Single Multiple Fluids Produced Brine Gas NGL Oil Other _____
Drilled with Cable Rotary

Drilling Media Surface hole Air Mud Fresh Water Intermediate hole Air Mud Fresh Water Brine
Production hole Air Mud Fresh Water Brine
Mud Type(s) and Additive(s)
Synthetic Oil Base Mud

Date permit issued April 15, 2013 Date drilling commenced 1/13/2014 Date drilling ceased 4/26/2014
Date completion activities began 9/9/2014 Date completion activities ceased 4/19/2015
Verbal plugging (Y/N) _____ Date permission granted _____ Granted by _____

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

Freshwater depth(s) ft 55' Open mine(s) (Y/N) depths None
Salt water depth(s) ft 1664' Void(s) (Y/N) depths None
Coal depth(s) ft 815'-825' & 1160'-1190' Coal(s) (Y/N) depths None
Is coal being mined in area (Y/N) No

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CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/N) * Provide details below*
Conductor							
Surface	30"	20"	118'	New	PE / 54.5 #/ft		Yes
Coal	17.5"	13.375"	1234'	New	H-40 / 48 #/ft	80'	Yes
Intermediate 1	12.25"	9.625"	2676'	New	J-55 / 36 #/ft	80'	Yes
Intermediate 2							
Intermediate 3							
Production	8.875" & 8.5"	5.5"	12405'	New	P-110 / 20 #/ft		No
Tubing		2.375"	6751'	New	N80/4.7#		
Packer type and depth set							

Comment Details Production Casing cement top at 1000' (1676' inside the intermediate casing).

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor							
Surface	Class A	295	15.6	1.21	357	Surface	12
Coal	Class A	940	15.6	1.2	1128	Surface	8
Intermediate 1	Class A	874	15.6	1.19	1040	Surface	8
Intermediate 2							
Intermediate 3							
Production	50:50 Class A	2466	14.5	1.21	2984	Surface	8
Tubing							

Drillers TD (ft) 12,420' Loggers TD (ft) N/A
 Deepest formation penetrated Marcellus Plug back to (ft) N/A
 Plug back procedure N/A

Kick off depth (ft) 6097'

Check all wireline logs run caliper density deviated/directional induction
 neutron resistivity gamma ray temperature sonic

Well cored Yes No Conventional Sidewall Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING _____

Surface/Coal Casing - 3 Centralizers at 300' spacing

Intermediate Casing - 7 Centralizers at 300' Spacing

Production Casing - 199 Centralizers total - 1 centralizer every joint in the lateral and curve and 1 centralizer every third joint in the vertical section

WAS WELL COMPLETED AS SHOT HOLE Yes No DETAILS _____

WAS WELL COMPLETED OPEN HOLE? Yes No DETAILS _____

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

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PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
SEE ATTACHED PERF INFO SHEET					

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
			See Attached					

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Please insert additional pages as applicable.

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<u>PRODUCING FORMATION(S)</u>	<u>DEPTHS</u>	
<u>Marcellus</u>	<u>6,470' - 6,511'</u> TVD	<u>6,952' - 12,420'</u> MD
_____	_____	_____
_____	_____	_____
_____	_____	_____

Please insert additional pages as applicable.

GAS TEST Build up Drawdown Open Flow OIL TEST Flow Pump

SHUT-IN PRESSURE Surface 1250 psi Bottom Hole 4073 psi DURATION OF TEST 253 hrs

OPEN FLOW Gas 3875 mcfpd Oil 359 bpd NGL _____ bpd Water 530 bpd GAS MEASURED BY Estimated Orifice Pilot

LITHOLOGY/ FORMATION	TOP DEPTH IN FT NAME TVD	BOTTOM DEPTH IN FT TVD	TOP DEPTH IN FT MD	BOTTOM DEPTH IN FT MD	DESCRIBE ROCK TYPE AND RECORD QUANTITY AND TYPE OF FLUID (FRESHWATER, BRINE, OIL, GAS, H ₂ S, ETC)
	<u>0</u>		<u>0</u>		<u>SEE ATTACHED</u>

Please insert additional pages as applicable.

Drilling Contractor Nomac Drilling
Address 171 Locust Ave. City Mt. Morris State PA Zip 15349

Logging Company Baker Hughes
Address 370 Westec Drive City Mt. Pleasant State PA Zip 15666

Cementing Company Baker Hughes
Address 837 Philippi Pike City Clarksburg State WV Zip 26301

Stimulating Company Baker Hughes
Address 837 Philippi Pike City Clarksburg State WV Zip 26301

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Please insert additional pages as applicable.

Completed by Thomas Rowan Telephone 304-622-4796
Signature *Thomas Rowan* Title Drilling and Completions Engineer Date 7-31-15

Submission of Hydraulic Fracturing Chemical Disclosure Information Attach copy of FRACFOCUS Registry

10/16/2015

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Armstrong #8H Perforation Information

<u>Stage</u>	<u>Date</u>	<u>Perforated interval</u>		<u>Number of Perfs</u>	<u>Formation</u>
		<u>From</u> ft	<u>To</u> ft		
1	9/23/2014	12252	12160	48	Marcellus
2	11/4/2014	12027	11860	48	Marcellus
3	11/5/2014	11804	11635	48	Marcellus
4	11/6/2014	11587	11420	48	Marcellus
5	11/8/2014	11367	11200	48	Marcellus
6	11/9/2014	11119	10998	36	Marcellus
7	11/10/2014	10929	10719	48	Marcellus
8	11/11/2014	10649	10441	48	Marcellus
9	11/12/2014	10370	10177	48	Marcellus
10	11/13/2014	10112	9912	48	Marcellus
11	11/14/2014	9854	9178	48	Marcellus
12	11/15/2014	9675	9530	48	Marcellus
13	11/16/2014	9483	9366	48	Marcellus
14	11/17/2014	9311	9150	48	Marcellus
15	11/18/2014	9089	8963	36	Marcellus
16	11/19/2014	8898	8799	36	Marcellus
17	11/20/2014	8766	8588	48	Marcellus
18	11/21/2014	8542	8373	48	Marcellus
19	11/22/2014	8333	8160	48	Marcellus
20	11/23/2014	8109	7999	48	Marcellus
21	11/23/2014	7961	7834	36	Marcellus
22	11/25/2014	7789	7631	48	Marcellus
23	11/26/2014	7553	7332	36	Marcellus
24	11/27/2014	7286	7185	36	Marcellus

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Fluid & Sand Volume Summary - Armstrong #8H

<u>Stage</u>	<u>Stimulation Date</u>	<u>Avg Pump Rate (BPM)</u>	<u>Avg Pressure (PSI)</u>	<u>Max Break Pres. (PSI)</u>	<u>ISIP (PSI)</u>	<u>Sand Total (lbs)</u>	<u>Total Water (bbls)</u>
1	11/4/2014	80	6547	n/a	4255	134,742	4060
2	11/5/2014	81	6237	4645	4127	257,970	6589
3	11/6/2014	80	6361	5007	4455	259,435	6531
4	11/7/2014	81	6477	5176	4655	256,082	6444
5	11/9/2014	80	6224	4684	4132	257,050	6500
6	11/10/2014	80	6161	5130	4714	257,314	6415
7	11/11/2014	79	6348	5131	4414	252,545	6314
8	11/12/2014	81	6397	4958	4153	254,933	6286
9	11/13/2014	81	6123	4879	4000	259,175	6292
10	11/15/2014	81	6267	4857	3866	260,296	6263
11	11/15/2014	81	6316	4881	4467	263,159	6249
12	11/16/2014	82	6396	6711	4625	260,549	6112
13	11/17/2014	79	6546	5516	4352	264,395	6542
14	11/18/2014	82	6379	5877	4684	226,404	6099
15	11/19/2014	82	6629	6842	4689	276,629	6260
16	11/20/2014	82	6289	5085	4230	254,141	6202
17	11/21/2014	84	6143	4825	4523	260,115	6189
18	11/22/2014	82	6009	4754	4730	255,206	5960
19	11/23/2014	82	6072	4648	4299	256,066	5981
20	11/24/2014	83	6143	4834	4531	256,588	6059
21	11/25/2014	80	6313	4858	4826	255,436	6039
22	11/26/2014	80	5931	4789	4722	256,597	6020
23	11/27/2014	80	5883	4627	4762	256,273	5964
24	11/27/2014	80	6362	4627	4669	253,059	5890

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Formations	Armstrong TOP TVD	Armstrong BASE TVD	Top MD	Base MD
SHALE AND SANDSTONE	0	815	0	815
SEWICKLEY COAL	815	825	815	825
SHALE	825	1160	825	1160
PITTSBURGE COAL	1160	1190	1160	1190
SHALE AND SANDSTONE	1190	1664	1190	1664
3RD SALT SAND	1664	1720	1664	1720
SHALE	1720	1820	1720	1820
MAXTON	1820	1894	1820	1894
SHALE	1894	1914	1894	1914
BIG LIME	1914	2001	1914	2001
BIG INJUN	2001	2251	2001	2251
WEIR SILTSTONE	2251	2524	2251	2524
BEREA SILTSTONE	2524	2724	2524	2724
SAND AND SHALE	2724	2730	2724	2730
GORDON	2730	2787	2730	2787
SILTSTONE AND SANDSTONE	2787	3400	2787	3400
BRAILLER	3400	5280	3400	5325
PIPE CREEK SHALE	5280	5480	5325	5526
SHALE	5480	5905	5526	5958
RHINESTREET	5905	6175	5958	6243
CASHAQUA	6175	6311	6243	6414
MIDDLESEX	6311	6330	6414	6442
WEST RIVER	6330	6389	6442	6538
GENESEO	6389	6416	6538	6588
TULLY LIMESTONE	6416	6452	6588	6666
HAMILTON	6452	6470	6666	6721
MARCELLUS	6470	na	6721	na
ONONDOGA	na	na	na	na

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Welcome Tracy H., Operator - OpNo. G1410907 [Log Out]

Hydraulic Fracturing
DISCLOSURE



Submission to FracFocus using Excel Spreadsheets has been turned off.

FIND A WELL BY STATE

ABOUT PROJECT PARTNERS

(Note: Clicking the FracFocus, FIND A WELL links will open a new window.)

Prepare Disclosure for FracFocus Submission

Disclosure Lists | Dashboard

Note: This window expires with 10 minutes of inactivity. After that you will be taken back to the dashboard.

[Preview Disclosure PDF](#) [Validate Disclosure](#) [Submit To FracFocus](#)

Hydraulic Fracturing Data

[Edit](#)

Job Start Date 11/4/2014 Job End Date 11/28/2014 API Number 47-051-01619-00-00 State & County West Virginia --- Marshall

Well Name ARMSTRONG 8H

Longitude -80.82727 Latitude 39.76373 Datum NAD27 Federal/Tribal Well?

True Vertical Depth (ft) 6491 Total Water Vol (gal) 16188900 Total Non Water Vol 0 Total Mass (lbs) 141418575.7675



MSDS Chemical Ingredients

[New Additive](#) [Select Additive](#) [Add Additive](#)

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
Edit Water	Operator	Carrier	Water	7732-18-5	100%	95.3910686%		134979810.42
Edit Sand, White, 40/70	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	2.56198%		3623120
Edit Sand, White, 30/50	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	1.49277%		2111056
Edit HCl, 10.1 - 15%	Baker Hughes	Acidizing	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.237325%	SmartCare Product	335622
Edit Sand, White, 100 mesh	Baker Hughes	Proppant	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.15242%		68683.89
Edit GW-3LDF	Baker Hughes	Gelling Agent	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0485677%	SmartCare Product	68683.89
Edit FRW-18	Baker Hughes	Friction Reducer	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0349677%	SmartCare Product	49450.96

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Edit Alpha 1427	Baker Hughes	Biocide	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.009151%	SmartCare Product	12941.25
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Edit Enzyme G-NE	Baker Hughes	Breaker	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0087965%	SmartCare Product	12439.9976
Edit ScaleSorb 4 (50# bag)	Baker Hughes	Scale Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0033291%	SmartCare Product	4708
Edit Ferrotrol 300L	Baker Hughes	Iron Control	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0016492%	SmartCare Product	2332.24986
Edit Calcium Chloride	Baker Hughes	Salts	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0012636%		1787
Edit CI-14	Baker Hughes	Corrosion Inhibitor	MSDS and Non-MSDS Ingredients Listed Below	N/A	0%	.0007587%	SmartCare Product	1073

Non-MSDS Chemical Ingredients

[New Ingredients](#)

Trade Name	Supplier	Purpose	Ingredients	CAS #	% High Additive	% HF Job	Comments	Ingredient Mass
Edit Ingredients in Additive(s) (MSDS and non-MSDS)	Baker Hughes	See Trade Name(s) List						
			Crystalline Silica (Quartz)	14808-60-7	100%	4.2047422%		5949774.08
			Water	7732-18-5	95%	.2302581%		325818.68665
			Hydrochloric Acid	7647-01-0	15%	.0355855%		50354.03
			Mineral Oil	8042-47-5	70%	.0339775%		48078.723
			Guar Gum	9000-30-0	60%	.0291236%		41210.334
			Paraffinic Petroleum Distillate	64742-55-8	30%	.0145618%		20605.167
			Petroleum Distillates	64742-47-8	30%	.0145618%		20605.167
			Hydrotreated Light Distillate	64742-47-8	30%	.0104842%		14835.288
			Poly (acrylamide-co-acrylic acid) partial sodium salt	62649-23-4	30%	.0104842%		14835.288
			Diatomaceous Earth, Calcined	91053-39-3	100%	.0033272%		4708
			Glutaraldehyde	111-30-8	30%	.0027437%		3882.375
			Crystalline Silica: Quartz	14808-60-7	5%	.002427%		3434.1945
			1-butoxy-2-propanol	5131-66-8	5%	.002427%		3434.1945
			Isotridecanol, ethoxylated	9043-30-5	5%	.002427%		3434.1945
			Sodium Chloride	7647-14-5	5%	.0018105%		2561.898
			Calcium Chloride	10043-52-4	100%	.0012629%		1787
			Ammonium Chloride	12125-02-9	3%	.0010484%		483.5288
			Citric Acid	77-92-9	60%	.0009889%		1399.34916
			Didecyl Dimethyl Ammonium Chloride	7173-51-5	10%	.0009146%		1294.125
			Methanol	67-56-1	100%	.0007583%		1073
			Oleamide DEA	93-83-4	2%	.0006989%		989.0192

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Alcohols, C12-16, ethoxylated	68551-12-2	2%	.0006989%	989.0192
Sodium Carboxymethyl inulin	430439-54-6	15%	.0004991%	706.2
Sodium chloride	7647-14-5	15%	.0004991%	706.2
Ethanol	64-17-5	5%	.0004573%	647.0625
Quaternary Ammonium Compound	68424-85-1	5%	.0004573%	647.0625
Hemicellulase Enzyme Concentrate	9025-56-3	5%	.0004396%	621.99988
Polyoxyalkylenes	68951-67-7	30%	.0002275%	321.9
Polyoxyethylene Sorbitan Monooleate	9005-65-6	.5%	.0001747%	247.2548
Sorbitan Monooleate	1338-43-8	.5%	.0001747%	247.2548
Sodium glycolate	2836-32-0	5%	.0001664%	235.4
Sodium diglycolate	35249-69-5	5%	.0001664%	235.4
Fatty Acids	61790-12-3	10%	.0000758%	107.3
Potassium Chloride	7447-40-7	5%	.0000631%	89.35
Modified Thiourea Polymer	68527-49-1	7%	.0000531%	75.11
2-butoxy-1-propanol	15821-83-7	.1%	.0000485%	68.68389
Propargyl Alcohol	107-19-7	5%	.0000379%	53.65
Olefin	64743-02-8	5%	.0000379%	53.65
Crystalline Silica (Cristobalite)	14464-46-1	1%	.0000333%	47.08
Formaldehyde	50-00-0	1%	.0000076%	10.73

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Armstrong 8H Cement and additives

Surface: Class A + 3% CaCl + 1/4 # per sack Flake

Coal: Class A + 3% CaCl + ¼ # per sack flake

Intermediate: Class A + 1% EC-1 + .5% SMS + .55% BA-10A

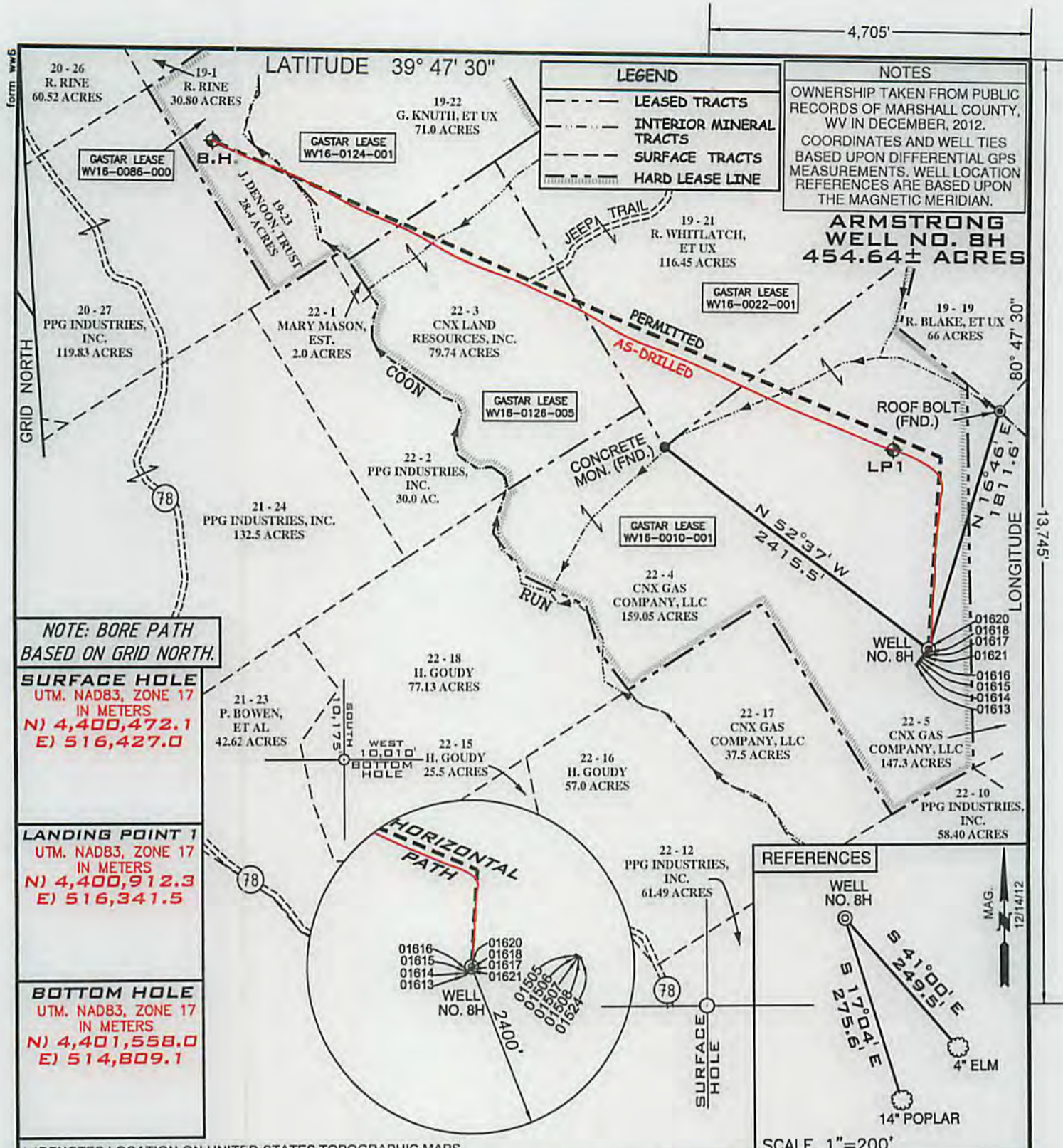
Production: 50:50 Class A + 3 lbs/sk BA-90 + .35% R-3 + .3% MPA-170

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NOTES
 OWNERSHIP TAKEN FROM PUBLIC RECORDS OF MARSHALL COUNTY, WV IN DECEMBER, 2012.
 COORDINATES AND WELL TIES BASED UPON DIFFERENTIAL GPS MEASUREMENTS. WELL LOCATION REFERENCES ARE BASED UPON THE MAGNETIC MERIDIAN.

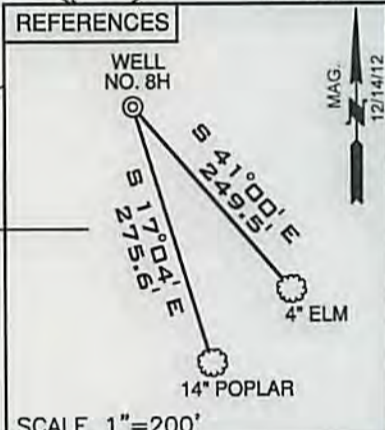
ARMSTRONG WELL NO. 8H
454.64± ACRES

NOTE: BORE PATH BASED ON GRID NORTH.

SURFACE HOLE
 UTM. NAD83, ZONE 17
 IN METERS
 N) 4,400,472.1
 E) 516,427.0

LANDING POINT 1
 UTM. NAD83, ZONE 17
 IN METERS
 N) 4,400,912.3
 E) 516,341.5

BOTTOM HOLE
 UTM. NAD83, ZONE 17
 IN METERS
 N) 4,401,558.0
 E) 514,809.1



FILE NUMBER W0120316 (WB1-56)

DRAWING NUMBER ARMSTRONG_WP_8H-WR35

SCALE 1" = 1000'

MINIMUM DEGREE OF ACCURACY 1/200

PROVEN SOURCE OF ELEVATION SUBMETER MAPPING
GRADE GPS

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

P.S. 2122 *Jonathan N. White*



WVDEP
 OFFICE OF OIL & GAS
 601 57TH STREET
 CHARLESTON, WV 25304



DATE: JULY 27, 2012

OPERATORS WELL NO. ARMSTRONG NO. 8H AS-DRILLED

API WELL NO. 47-051-01619
 STATE COUNTY PERMIT

WELL TYPE: OIL ___ GAS X LIQUID INJECTION ___ WASTE DISPOSAL ___
 (IF "GAS") PRODUCTION X STORAGE ___ DEEP ___ SHALLOW X

LOCATION ELEVATION 1278' WATERSHED ___ TRIBUTARY OF COON RUN

DISTRICT FRANKLIN COUNTY MARSHALL

QUADRANGLE PCWHATAN POINT 7.5' LEASE NUMBER WV16-0086-000, WV16-0124-001, WV16-0010-001, WV16-0022-001, WV16-0126-005

SURFACE OWNER CNX GAS COMPANY, LLC ACREAGE 159.05

OIL & GAS ROYALTY OWNER CNX GAS COMPANY, LLC LEASE ACREAGE 454.64

PROPOSED WORK: DRILL ___ CONVERT ___ DRILL DEEPER ___ REDRILL ___ FRACTURE OR STIMULATE ___ PLUG OFF OLD FORMATION ___
 PERFORATE NEW FORMATION ___ OTHER PHYSICAL CHANGE (SPECIFY) ___

TARGET FORMATION MARCELLUS ESTIMATED DEPTH TVD:6511' TMD:12,420'

WELL OPERATOR GASTAR EXPLORATION INC. DESIGNATED AGENT MICHAEL McCOWN

ADDRESS 229 W MAIN STREET, SUITE 301 CLARKSBURG WV, 26301 ADDRESS 229 W MAIN STREET, SUITE 301 CLARKSBURG WV, 26301

10/16/2015

COUNTY NAME PERMIT