

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, April 1, 2019 PERMIT MODIFICATION APPROVAL Horizontal 6A / New Drill

HG ENERGY II APPALACHIA, LLC 5260 DUPONT ROAD PARKERSBURG, WV 26101

Re: Permit Modification Approval for NAYS 1209 N-1H

47-033-05930-00-00

Extend intermediate string, 17.5", by 150' through storage field.

HG ENERGY II APPALACHIA, 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.

Operator's Well Number: NAYS 1209 N-1H

Farm Name: HG ENERGY II APPALACHIA, LLC

James A. Martin

Chief

U.S. WELL NUMBER: 47-033-05930-00-00

Horizontal 6A New Drill Date Modification Issued: 04/01/2019

Promoting a healthy environment.

API NO. 47- 033 _ 05930

OPERATOR WELL NO. Nays 1209 N-1H
Well Pad Name: Nays 1209

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

1) Well Operator:	HG Energy	/ II Appala	achia, 🛔	494519932	Harrison	Union	West Milford 7.5'
		i - rr		Operator ID	County	District	Quadrangle
2) Operator's We	ll Number: N	ays 1209	N-1H	Well	Pad Name: Na	ys 1209	
3) Farm Name/Su	rface Owner:	Nays / HG Er	nergy II App	palachia Public	Road Access: K	incheloe Ru	ın Rd/SLS 35
4) Elevation, curr	ent ground:	1002'	El	evation, propos	sed post-constru	ction: 1007	
) Gas <u>x</u> ther		Oil		nderground Sto		
(b		San Laboratoria	x x	Deep	-		- 50W 2/7/2
6) Existing Pad: Y							2/7/2
7) Proposed Targe Marcellus at 686						Pressure(s):	
8) Proposed Total	Vertical Dept	h: 6900'					
9) Formation at To	otal Vertical D	Depth: Ma	arcellus				
10) Proposed Tota	l Measured D	epth: 20	,145'				
11) Proposed Hori	zontal Leg Le	ength: 12	,119'			ū	
12) Approximate	Fresh Water S	trata Deptl	hs:	135', 500'			
13) Method to Det	ermine Fresh	Water Dej	oths: N	learest offset	well data		
14) Approximate 5	Saltwater Dep	ths: None	e noted	in offsets			
15) Approximate (Coal Seam De	pths: 660	to 665	1			
16) Approximate 1	Depth to Possi	ble Void (coal min	ne, karst, other	: None		RECEIVED Office of Oil and Gas
17) Does Proposed directly overlying				rs Yes	Ď	Io X	FEB 1 2 2019
(a) If Yes, provid	le Mine Info:	Name;					WV Department of Environmental Protection
		Depth:					
					~		
		Seam:					

WW-6B (04/15)

API NO. 47		
OPERATOR WELL	NO.	Nays 1209 N-1H
Well Pad Name:	Nays	1209

18)

CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	<u>Grade</u>	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	30"	New	LS	157.5	100'	100'	Drilled In
Fresh Water	20"	NEW	J-55	94	600'	600'	40% excess,yleld =1.20,CTS
Coal	13 3/8"	NEW	J-55	68	1735'	1735' 🗸	40% excess yield = 1.20,CTS
Intermediate	9 5/8"	NEW	J-55	40	2500'		40% excess yield Lead/ 0% Excess Talk
Production	5 1/2"	NEW	P-110	23	20145'		20% excess yield = 1.15, tail yield = 1.04
Tubing							
Liners			1				

50W 21.7/2019

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	30"	30"	.500				CTS
Fresh Water	20"	24"	.438	2110	1200	Type 1, Class A	
Coal	13 3/8"	17 1/2"	.480 /	3450 🗸		Type 1/Class A	40% excess yield = 1.20, CTS
Intermediate	9 5/8"	12 1/4"	.395	3950		Type 1/Class A	
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	20%-expess yield = 1.19, tail yield 1.84 0
Tubing				11020	12000	Type (relation)	1
Liners	a. Ti						

PACKERS

Kind:	PACKERS	RECEIVED Office of Oil and Gas
Sizes:		FEB 1 2 2019
		WV Department of Environmental Protection
Depths Set:		

API NO. 47		
OPERATOR WEL	L NO.	Nays 1209 N-1H
Well Pad Name	: Nays	1209

04/05/2010

19) Describe proposed well work, including the drilling and plugging back of any pilot h	ole:
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Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6900 feet. Drill horizontal leg to estimated 12119 TMD, stimulate and be capable of producing from the Marcellus Formation. Should we encounter an unanticipated void in the coal, we will install a minimum of 20' of casing below the void but not more than 100' below the void, set a basket and grout to surface.

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

The stimulation will be completed with multiple stages divided over the lateral length of the well. Stage spacing is dependent upon engineering design. Slickwater fracturing technique will be utilized on each stage using sand, water, and chemicals. See attached list. Maximum pressure not to exceed 12,500 psi.

- 21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 16.148 acres
- 22) Area to be disturbed for well pad only, less access road (acres): 10.834 acres

23) Describe centralizer placement for each casing string:

No contralizers will be used with conductor casing.
Freshwater - centralized every 3 joints to surface.
Coal - Bow Spring on every joint.
Coal - Bow Spring on every joint.
Intermediate - Bow Spring on first 2 joints then every third joint to 100' from surface.
Production - Run 1 spiral centralizer every 5 joints from the top of the curve to surface. Run 1 spiral centralizer every 3 joints from the 1st 5.5" long joint to the top of the curve

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

Conductor-MA, Casing to be diffed on will bus Moraly Mg.
Final Mater: 16,5 ppg PME-1 + 93% bence 23 (rate 12.0, CTS
Coal - Lead: 15.4 ppg PME-4 × 3% bence 26.1,4 6% Excess Yield = 1.20, CTS
Coal - Lead: 15.4 ppg PME-4 × 2.5% bence 26.1,4 6% Excess Yield = 1.20, CTS
Intermediate - Lead: 15.4 ppg PME-1 + 2.5% bence 26.1,4 6% Excess Yield = 1.20, ETS
Production - Lead: 16.4 ppg PME-1 + 2.5% bence 26.1,4 6% Excess Yield = 1.25% bence 26.1,4 6% Excess Yield = 1.20% bence 26.1,4 6% Excess Yiel

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25) Proposed borehole conditioning procedures:

FEB 1 2 2019

Conductor - Ensure the hole is clean at TD.

Fresh Water - Conce casing is at setting depth, circulate a minimum of one hole volume with Frosh Water prior to pumping cement.

Coal - Once casing is at setting depth, Circulate and condition at TD. Circulate a minimum of one hole volume prior to pumping cement.

Intermediate - Once casing is at setting depth, Circulate and condition and at TD. Circulate a minimum of one hole volume prior to pumping cement.

Production - Conce on brighter TDW this casing, circulate and exact at max advantable pump rate for at least 2c bottoms up, or until returns and pump passures indicate the hole is clean. Circulate a minimum of one hole volume prior to pumping cement.

WV Department of Environmental Protection

^{*}Note: Attach additional sheets as needed.



1209 N-1H Marcellus Shale Horizontal Harrison County, WV

_								narrison Co	71						
					1209 N	I-1H SH	L		237349.95N 17323	74E					
Ground Elevation		1007			1209	N-1H LF	9	237041.13N 1729956.49E		6.49E					
Azm		341.49	3°					48533.57N 172610	109.52E						
WELLBORE DIAGRAM	HOLE	CASING	GEOLOGY	TOP	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS					
		30" 157.5#					N/A, Casing to be drilled		Ensure the hole is clean at	Conductor casing = 0.5" wa					
x	30"	LS	Conductor	0	100	AIR	in w/ Dual Rotary Rig	N/A	TD.	thickness					
							15.6 ppg PNE-1 + 3%		Once casing is at setting depth, circulate a minimum	Surface casing = 0.438" wa					
x	24"	20" 94# J-55	Fresh Water	0	135	AIR	bwoc CaCl 40% Excess	Centralized every 3 joints to surface	of one hole volume with	thickness					
x			Fresh Water	0	600		Yield=1.20 / CTS		Fresh Water prior to pumping cement.	Burst=2110 psi					
			Kittaning Coal	660	665		Lead: 15.4 ppg PNE-1 +	joint	Once casing is at setting						
		13-3/8" 68#	Little/Big Lime	1126 / 1167	1151 / 1243	AIR / KCL	2.5% bwoc CaCl 40% Excess / Tail: 15.9		depth, Circulate and condition at TD, Circulate a	Intermediate casing = 0.480"					
x x	17.5"	J-55 BTC	Injun / Gantz (Storage)	1243 / 1535	1349 / 1585	Salt Polymer	ppg PNE-1 + 2.5% bwoc							minimum of one hole	wall thickness Burst=3450 psi
	/		Intermediate 1 /	0	1735 /	. a.ya.	CaCl zero% Excess. CTS		volume prior to pumping cement.	23.31 2.33 [,37					
x x			Fifty / Thirty Foot	1650 / 1730	1697 / 1742		Lead: 15.4 ppg PNE-1 +		ts then every third condition mud at TD. Circulate a minimum of one bole volume prior to	Once profes is at a the					
			Gordon Stray / Gordon	1785 / 1850	1850 / 1940	AIR / KCL	2.5% bwoc CaCl	Bow Spring on first 2		Intermediate casing = 0.395" wall thickness Burst=3950 psi					
	12.25"	9-5/8" 40# J-55 BTC	5th Sand	2035	2070	Salt	40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc	joint to 100' form							
x		5-55 610	Bayard Sand	2125	2160	Polymer	CaCl								
			Intermediate 2	0	2500		zero% Excess, CTS		pumping cement.						
x x			Speechley	2745	2763			Run 1 spiral centralizer every 5 joints from the top of the curve to							
	0.501/		Balltown	2965	3005	9.0ppg	11.								
	8.5" Vertical		Benson	4050	4083	SOBM	<u>Lead</u> : 14.5 ppg POZ:PNE-1 + 0.3%		R						
	11 ==-		West Falls	4620	5865		bwoc R3 + 1% bwoc	surface.		Production casing = 0.415"					
			Rhinestreet	5865	6140		EC1 + 0.75 gal/sk FP13L + 0.3% bwoc		Once on bottom/TD with casing, circulate at max						
			Cashaqua	6140	6341		MPA170		allowable pump rate for at						
x x	Land.	5-1/2" 23#	Middlesex	6341	6421	11.5ppg-	Tail: 14.8 ppg PNE-1 + 0.35% bwoc R3 + 0.75		least 2x bottoms up, or until returns and pump	wall thickness Burst=14520 psi					
	8,5" Curve	P-110 HC	West River	6421	6514	12.5ppg	gal/sk FP13L + 50%		pressures indicate the hole	Note:Actual centralizer					
		CDC HTQ	Burkett	6514	6540	SOBM	bwoc ASCA1 + 0.5% bwoc MPA170	Run 1 spiral centralizer every 3 joints from the	is clean. Circulate a minimum of one hole	schedules may be change due to hole conditions					
			Tully Limestone	6540	6644		20% Excess	1st 5.5" long joint to the top of the curve.	volume prior to pumping	and is their container					
			Hamilton	6644	6863		Lead Yield=1.19 Tail Yield=1.94		cement.						
			Marcellus	6863	6914	11 Enna	CTS								
	8.5" Lateral		TMD / TVD (Production)	20145	6900	11.5ppg- 12.5ppg SOBM									
[88] [88]			Onondaga	6914		CODIM									

Diane White

From: James H Moore Iii < James.H.Moore.Iii@dominionenergy.com>

Sent: Wednesday, February 06, 2019 11:55 AM

To: Diane White; Ronald L. Walden

Cc: Josh Hinton

Subject: RE: Revisions to the Nays 1209 N Lateral Permits for the Dominion Energy Natural Gas

Storage Field

Diane,

DETI agrees/approves of HG Energy setting the 13-3/8" casing shoe 150' below the base of the Gantz Sand (Storage Zone) for the NAYS 1209 wells 1H,2H,3H,4H,5H,6H.

Thanks,

Jamie.

Jamie Moore
Geologist II
Gas Storage Department
Dominion Energy Transmission, Inc.
925 White Oaks Boulevard
Bridgeport, WV 26330
Office-681-842-3372
Work Cell-304-859-1561
Personal Cell 540-641-4044



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FEB 1 2 2019

WV Department of

Environmental Protection

From: Diane White [mailto:dwhite@hgenergyllc.com]

Sent: Tuesday, February 05, 2019 4:32 PM

To: James H Moore Iii (GasInfrastructure - 2); Ronald L. Walden (GasInfrastructure - 2)

Cc: Josh Hinton

Subject: [External] Revisions to the Nays 1209 N Lateral Permits for the Dominion Energy Natural Gas Storage Field

Jamie and Ron,

Attached are the well schematics for the Nays 1209 N laterals. The revisions which will be requested are to allow for the 150 feet additional casing through the storage field as per your conversations with Josh Hinton.

If you can send back approval via email I'll include that with my request to the DEP for the permit revisions.

Thank You,

Diane

WW-6B (04/15) API NO. 47-33 - 05930

OPERATOR WELL NO. Nays 1209 N-1H

Well Pad Name: Nays 1209

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

1) Well Operator: HG Energy	II Appalachia,	494519932	Harrison	Union	West Milford 7.5'
		Operator ID	County	District	Quadrangle
2) Operator's Well Number: Na	ys 1209 N-1H	Well P	ad Name: Nay	rs 1209	
3) Farm Name/Surface Owner:	Nays / HG Energy II App	palachia Public Ro	oad Access: Ki	ncheloe Ru	n Rd/SLS 35
4) Elevation, current ground:	1002' El	evation, propose	d post-construc	tion: 1007	
5) Well Type (a) Gas X Other	Oil	Un	derground Stor	age	
	llow ×	Deep			SDW
6) Existing Pad: Yes or No No					50W 10/22/2018
 Proposed Target Formation(s) Marcellus at 6863'/6914' and 5 				Pressure(s):	117-10
8) Proposed Total Vertical Depti	h: 6900'				
9) Formation at Total Vertical D	epth: Marcellus	i i			
10) Proposed Total Measured De	epth: 20,145'				
11) Proposed Horizontal Leg Le	ngth: 12,119'				
12) Approximate Fresh Water St	trata Depths:	135', 500'			
13) Method to Determine Fresh	Water Depths:	Vearest offset w	ell data		
14) Approximate Saltwater Dept					
15) Approximate Coal Seam De	pths: 660' to 665	5'			
16) Approximate Depth to Possi	ble Void (coal mi	ine, karst, other):	None		
17) Does Proposed well location directly overlying or adjacent to		ms Yes	N	No X	
(a) If Yes, provide Mine Info:	Name:				
	Depth:				
	Seam:				
	Owner:				

WW-6B (04/15) API NO. 47-33-05930 OPERATOR WELL NO. Nays 1209 N-1H

Well Pad Name: Nays 1209

18)

CASING AND TUBING PROGRAM

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	30"	New	LS	157.5	100'	100'	Drilled In
Fresh Water	20"	NEW	J-55	94	600'	600,	40% excess, yield =1.20,CTS
Coal	13 3/8"	NEW	J-55	54.5	1635'	1635'	40% excess yield = 1.20,CTS
Intermediate	9 5/8"	NEW	J-55	40	2500'	2500'	40°% extons yield Lond/0% Excess T
Production	5 1/2"	NEW	P-110	23	20145'	20145'	20% excess yield = 1.19, tak yeld = 1.6
Tubing							
Liners							

50W 10/22/2018

TYPE	Size (in)	Wellbore Diameter (in)	<u>Wall</u> <u>Thickness</u> (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	<u>Cement</u> <u>Yield</u> (cu. ft./k)
Conductor	30"	30"	.500				CTS
Fresh Water	20"	24"	.438	2110	1200	Type 1, Class A	30 % excess yield = 1,20, CTS
Coal	13 3/8"	17 1/2"	.380	2730		Type 1/Class A	40% excess yield = 1.20, CTS
Intermediate	9 5/8"	12 1/4"	.395	3950		Type 1/Class A	40% excess yield = 0% Exces. Lose 40 Des
Production	5 1/2"	8 1/2"	.415	14520	12500	Type 1/ClassA	OCT; excess yield * 1 19; tailyidd 1.54 C
Tubing							
Liners							·

PACKERS

Kind:		
Sizes:		
Depths Set:		

API NO. 47-33-05930

OPERATOR WELL NO. Nays 1209 N-1H

Well Pad Name: Nays 1209

19) Describe proposed well work, including the drilling and plugging back of any pilot hole:
Drill the vertical depth to the Marcellus at an estimated total vertical depth of approximately 6900 feet.
Drill horizontal leg to estimated 12119 TMD, stimulate and be capable of producing from the Marcellus
Formation. Should we encounter an unanticipated void in the coal, we will install a minimum of 20' of

casing below the void but not more than 100' below the void, set a basket and grout to surface.

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

The stimulation will be completed with multiple stages divided over the lateral length of the well. Stage spacing is dependent upon engineering design. Slickwater fracturing technique will be utilized on each stage using sand, water, and chemicals. See attached list. Maximum pressure not to exceed 12,500 psi.

- 21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 16.148 acres
- 22) Area to be disturbed for well pad only, less access road (acres): 10.834 acres
- 23) Describe centralizer placement for each casing string:

he contributions will be used with connection cashing Empirical expenditual event 3 pints to surface. Case 366, Seption of the 12 pints are not a pend just to 100 from surface. Case 366, Seption 30 ping and 15th 2) pints are not ay pind just to 100 from surface. Production - Run 1 spans controllent every 5 pints from the sup of the curve to surface. Run 1 of scientifications of Joseph from the 100 GP long for the two the curve. Production - Run 1 spans controllent every 5 pints from the sup of the curve to surface. Run 1 of scientifications of Joseph from the 100 GP long for the two the curve.

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

Concessor Alia Coung to be critical in white a Record Reco

25) Proposed borehole conditioning procedures:

Conductor - Employ the Ideas of TD.

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*Note: Attach additional sheets as needed.



1209 N-1H Marcellus Shale Horizontal Harrison County, WV

Name of the second								Harrison County, WV				
1209							N-1H SH	1L		237349.95N 17323	374E	
Ground Elevation 1007'					1209 N-1H LP				2	237041.13N 172995	6.49E	
Α	zm	341.493°			1209 N-1H BHL				248533.57N 1726109,52E			
WELLBORE DIAGRAM		HOLE	CASING	GEOLOGY	TOP	BASE	MUD	CEMENT	CENTRALIZERS	CONDITIONING	COMMENTS	
×	X X X X X X X	30°	30" 157.5# LS	Conductor	0	100	AIR	N/A, Casing to be drilled in w/ Dual Rotary Rig	N/A	Ensure the hole is clean at TD.	Conductor casing = 0.5" wa thickness	
		24°	20" 94# J-55				AIR	15.6 ppg PNE-1 + 3% bwoc CaCl 40% Excess Yield=1.20 / CTS	Centralized every 3 joints to surface	Once casing is at setting depth, circulate a minimum of one hote volume with Fresh Water prior to pumping cement.	Surface casing = 0.438" wai thickness Burst=2110 psi	
X				Fresh Water	0	135, 500						
X				Fresh Water	0	600						
		17.5*	13-3/8" 54.5# J-55 BTC	Kittaning Coal	650	665	AIR / KCL Salt Polymer	Lead: 15.4 ppg PNE-1 + 2.5% bwoc CaCl 40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc CaCl zero% Excess. CTS	Bow Spring on every Johnt	Once casing is at setting depth, Circulate and condition at TD. Circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.380 wall thickness Burst=2730 psi	
				Little/Big Llme	1126 / 1167	1151 / 1243						
X				Injun / Gantz (Storage)	1243 / 1 505	1349 / 1695						
				Intermediate 1 (Shoe 50' below storage)	0	1635						
X		12.25"	9-5/8" 40# J-55 BTC	Fifty / Thirty Foot	1650 / 1730	1697 / 1742	[Lead: 15.4 ppg PNE-1 + 2.5% bwoc CaCl 40% Excess / Tail: 15.9 ppg PNE-1 + 2.5% bwoc CaCl zero% Excess. CTS	Bow Spring on first 2 joints then every third	Once casing is at setting depth, Circulate and condition mud at TD. Circulate a minimum of one hole volume prior to pumping cement.	Intermediate casing = 0.39 wall thickness Burst=3950 psi	
				Gordon Stray / Gordon	1785 / 1850	1850 / 1940						
				5th Sand	2035	2070						
X				Bayard Sand	2125	2160						
				Intermediate 2	0	2500						
×		8,5" Vertical	5-1/2" 23# P-110 HC CDC HTQ	Speechley	2745	2763	9.0ppg SOBM	Lead: 14.5 ppg POZ:PNE-1 + 0.3% bwoc R3 + 1% bwoc EC1 + 0.75 gal/sk FP13L + 0.3% bwoc MPA170 Tail: 14.8 ppg PNE-1 + 0.35% bwoc R3 + 0.75 gal/sk FP13L + 50% bwoc ASCA1 + 0.5% bwoc ASCA1 + 0.5% bwoc MPA170 20% Excess Lead Yield=1.19 Tail Yield=1.94 CTS	Run 1 spiral centralizer every 5 joints from the top of the curve to surface.	Once on bottom/TD with casing, circulate at max allowable pump rate for at least 2x bottoms up, or until returns and pump pressures indicate the hole is clean. Circulate a minimum of one hole	Burst=14520 psi	
				Balltown	2965	3005						
				Benson	4050	4083						
				West Falls	4620	5865						
		8.5" Curve		Rhinestreet	5865	6140	11.5ppg- 12.5ppg SOBM		Run 1 spiral centralizer every 3 joints from the 1st 5.5" long joint to the lop of the curve.			
X				Cashaqua	6140	6341						
	X			Middlesex	6341	6421						
	X			West River	6421	6514						
				Burkett	6514	6540						
				Tully Limestone	6540	6644						
				Hamilton	6644	6863						
		8.5" Lateral		Marcellus	6863	8914	11.5ppg- 12.5ppg SOBM					
				TMD / TVD (Production)	20145	6900						
X				Onondaga	6914							
	LP @ 690	0' TVD / 8028' MD		8		d Long String		 		j tipe distalanti 19' fi Lateral	TD @ +/-6900' TVD +/-20145' MD	

3-0<u>5</u>930