west virginia department of environmental protection

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

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

PERMIT MODIFICATION APPROVAL

January 12, 2015

EQT PRODUCTION COMPANY
303 SAND CUT ROAD
CLARKSBURG, WV 26301

Re: Permit Modification Approval for API Number 10302906, Well #: 513982
Modify depth of 13-3/8" and 9-5/8" casing

Oil and Gas Operator:
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.

Please call James Martin at 304-926-0499, extension 1654 if you have any questions.

Sincerely,

for Gene Smith

Gene Smith
Assistant Chief of Permitting
Office of Oil and Gas

47 10 3 0 2 9 0 6 MOD

August 14, 2014

Mr. Gene Smith
West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304

Re: Modification of 47-10302906

Dear Mr. Smith,

EQT would like to modify the above well, due to a change in the casing depths (please see attached letter).

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.

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Office of Oil and Gas

SEP 09 2014

WV Department of
Environmental Protection

47 10302906 MOD

August 12, 2014

Mr. Gene Smith
West Virginia Department of Environmental Protection
Office of Oil and Gas
601 57th Street SE
Charleston, WV 25304

Re: Casing on Well 513982 (PNG103)

Dear Mr. Smith,

EQT is requesting the 13-3/8" surface casing be set at 1299' KB, 50' below the red rock base at 1249' without setting below elevation. The previous wells drilled on this pad set 13-3/8" casing at approximately 850' KB. This will cover up red rock formations that have given EQT drilling issues in the past. We will set the 9-5/8" intermediate string at 3367' KB, 50' below the base of the Gordon formation.

If you have any questions, please do not hesitate to contact me at (304) 848-0076.

Sincerely,

Vicki Roark
Permitting Supervisor

Enc.

DMH 9-4-14

EQT Production 115 Professional Place I P.O. Box 280 I Bridgeport, WV 26330
T 304.848.0000 I F 304.848.0040 I www.eqt.com

WW-6B
(9/13)

4710302906 MOD

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

1) Well Operator:	EQT Production Company		103	4	548
		Operator ID	County	District	Quadrangle

2) Operator's Well Number: 513982 Well Pad Name: PNG103

3) Farm Name/Surface Owner: Scyoc Public Road Access: Hwy 20

4) Elevation, current ground: 1458 Elevation, proposed post-construction: 1458

5) Well Type (a) Gas ■ Oil _____ Underground Storage _____
Other _____
(b)If Gas Shallow ■ Deep _____
Horizontal ■

6) Existing Pad: Yes or No yes DMH 9-4-14

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Associated Pressure(s):
Target formation is Marcellus at a depth of 7470 with the anticipated thickness to be 50 feet and anticipated target pressure of 4724 PSI

8) Proposed Total Vertical Depth: 7470

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 14562

11) Proposed Horizontal Leg Length: 5280

12) Approximate Fresh Water Strata Depths: 66, 141, 777

13) Method to Determine Fresh Water Depths: by offset wells

14) Approximate Saltwater Depths: 2187, 2487

15) Approximate Coal Seam Depths: 1054, 1161

16) Approximate Depth to Possible Void (coal mine, karst, other): none reported

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

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

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WW-6B
(9/13)

4710302906 MOD

18) **CASING AND TUBING PROGRAM**

TYPE	Size	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling	INTERVALS: Left in Well	CEMENT: Fill-up (Cu. Ft.)
Conductor	20	new	MC-50	81	40	40	38 CTS
Fresh Water	13 3/8	new	MC-50	54	1299	1299	1118 CTS
Coal							
Intermediate	9 5/8	new	MC-50	40	3367	3367	1307 CTS
Production	5 1/2	new	P-110	20	14562	14562	see note 1
Tubing	2 3/8		J-55	4.6			If run will be set 100' less than TD
Liners							

DMH 9-4-14

TYPE	Size	Wellbore Diameter	Wall Thickness	Burst Pressure	Cement Type	Cement Yield (cu. ft./k)
Conductor	20	24	.375	-	construction	1.18
Fresh Water	13 3/8	17 1/2	.38	2480	see note 2	1.21
Coal						
Intermediate	9 5/8	12 3/8	.395	3590	see note 2	1.21
Production	5 1/2	8 1/2	.361	12640	-	1.27/1.86
Tubing						
Liners						

PACKERS

Kind:	n/a			
Sizes:	n/a			
Depths Set:	n/a			

WW-6B
(9/13)

47 10302906 MOD

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

Drill and complete a new horizontal well in the Marcellus formation. The vertical drill to go down to an approximate depth of 4,170'. Then kick off the horizontal lef into the Marcellus using a slick water frac.

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

Hydraulic fracturing is completed in accordance with state regs using water recycled from previously fractured wells and obtained from fresh water sources. This water is mixed with sand and a small percentage (less than 0.3%) of chemicals (including 15% Hydrochloric acid, gelling agent, gel breaker, friction reducer, biocide, and scale inhibitor). Stage lengths vary from 150 to 450 feet. Avg approx 400,000 gl of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Avg approx 400,000 lb of sand per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Avg approx 400,000 lbs/stage.

DMH 9-4-14

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): no additional disturbance

22) Area to be disturbed for well pad only, less access road (acres): no additional disturbance

23) Describe centralizer placement for each casing string:

- Surface: Bow spring centralizers – One at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers– One cent at the shoe and one spaced every 500'.
- Production: One spaced every 1000' from KOP to Int csg shoe

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

see attached

25) Proposed borehole conditioning procedures:

see attached

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*Note: Attach additional sheets as needed.

47 10302906 MOD

WW2B

FROM CASING PLAN

Note 1: EQT plans to bring the TOC on the production casing cement job 1,000' above kick off point, which is at least 500' above the shallowest production zone, to avoid communication.
Note 2: Reference Variance 2014-17. (Attached)

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

Surface (Type 1 Cement): 0-3% Calcium Chloride used to spped the setting of cement slurries.
0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of the cement slurry to a thief zone.
Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Salt is used in shallow, low temperature formations to speed the setting of cement slurries. 0.4% flake. Loss Circulation Material (LCM) is used to combat the loss of whole drilling fluid or cement slurry (not filtrate) to a theif zone.
Production:
Lead (Type 1 Cement): 0.2-0.7% Lignosulfonate (Retarder). Lengthens thickening time.
0.3% CFR (dispersant). Makes cement easier to mix.
Tail (Type H Cement): 0.25-0.40% Lignosulfonate (Retarder). Lengthens thickening time.
0.2-0.3% CFR (dispersant). This is to make the cement easier to mix.
60 % Calcuim Carbonate. Acid solubility.
0.4-0.6% Halad (fluid loss). Reduces amount of water lost to formation.

25) Proposed borehole conditioning procedures.

Surface: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cuttings diminish at surface. When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. To ensure that there is no fill, short trip two stands with no circulation. If there is fill, bring compressors back on and circulate hole clean. A constant rate of higher than expected cuttings volume likely indicates washouts that will not clean up.
Intermediate: Circulate hole clean (Approximately 30-45 minutes) rotating & reciprocating one full joint until cutting deminish at surface.
When cuttings returning to surface diminish, continue to circulate an additional 5 minutes. If foam drilling, to enhance hole cleaning use a soap sweep or increase injection rate & foam concentration.
Production: Pump marker sweep with nut plug to determine actual hole washout. Calculate a gauge holes bottoms up volume. Perform a cleanup cycle by pumping 3-5 bottoms up or until the shakers are clean. Check volume of cuttings coming across the shakers every 15 minutes

DMH 9-4-14

4710302906 MOD

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

IN THE MATTER OF A VARIANCE FROM	)	**ORDER NO. 2014 - 17**
REGULATION 35 CSR § 4-11.4/11.5/14.1	)	
AND 35 CSR § 8-9.2.h. 4/5/6/8 OF THE	)	
THE OPERATIONAL	)	
REGULATIONS OF CEMENTING OIL	)	
AND GAS WELLS	)	

REPORT OF THE OFFICE

Nabors Completion & Production Services Co. requests approval of a different cement blend for use in cementing surface and coal protection casing of oil and gas wells.

FINDINGS OF FACT

1.) Nabors Completion & Production Services Co. proposes the following cement blend:

- 2% Calcium Chloride (Accelerator)
- 0.25 % Super Flake (Lost Circulation)
- 94% Type "1" Cement
- 5.20 % Water

2.) Laboratory testing results indicate that the blend listed in Fact No.1 will achieve a 500 psi compressive strength within 6 hours and a 2,435 psi compressive strength within 24 hours.

CONCLUSIONS OF LAW

Pursuant to Articles 6 and 6A, Chapter 22 of the Code of West Virginia, the Office of Oil and Gas has jurisdiction over the subject matter embraced in said notice, and the persons interested therein, and jurisdiction to promulgate the hereinafter prescribed Order.

Pursuant to 35 CSR § 4-11.5 and 35 CSR § 8-9.2.h.8 the Chief of the Office of Oil and Gas may approve different cement blends upon the well operator providing satisfactory proof that different cement types are adequate.

ORDER

It is ordered that Nabors Completion & Production Services Co. may use the cement blend listed in Findings of Fact No.1 for the cementing of surface and coal protection casing of oil and gas wells in the State as may be requested by oil and gas operators. The waiting time on the cement blend shall be 8 hours. The cement blend shall be mixed in strict accordance with the specifications for each blend and weight measurements made on-site to assure the cement slurries meet the minimum weight specifications. A sample shall be collected and, if after 8 hours the cement is not set up, additional time will be required. Nabors Completion & Production Services Co. shall keep a record of cement blend jobs in which the cement blend approved under this order is to be used and made available to the Office of Oil and Gas upon request.

Dated this, the 18th day of March, 2014.

IN THE NAME OF THE STATE OF WEST VIRGINIA

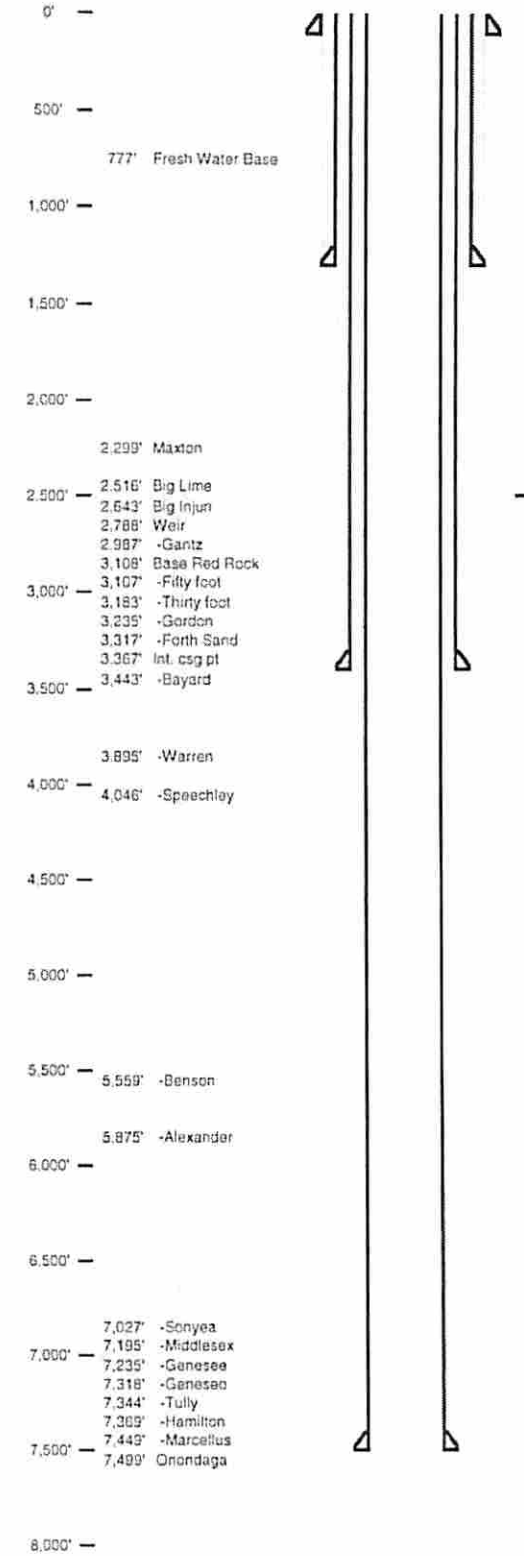
OFFICE OF OIL AND GAS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OF THE STATE OF WEST VIRGINIA

James Martin, Chief
Office of Oil and Gas

47 10302906 MOD

Well Schematic
EQT Production

Well Name	513983(PNG103H13)
County	Wetzel
State	West Virginia
Elevation KB:	1453
Target	Marcellus
Prospect	
Azimuth	156.9
Vertical Section	6533



Hole Size 24" - 20" Conductor at 40'
Bit Size 17.5"

TOC @ Surface
13 3/8", MC-50, 54.5# @ 1,339 ft MD
Bit Size 12.375"

TOC @ Surface
9 5/8", MC-50, 40# @ 3,367 ft MD
Bit Size 8.5"

KOP = 4,170 ft MD
10 Deg DLS

DMH 9-4-14

Land @ 8,781 ft MD
7,470 ft TVD

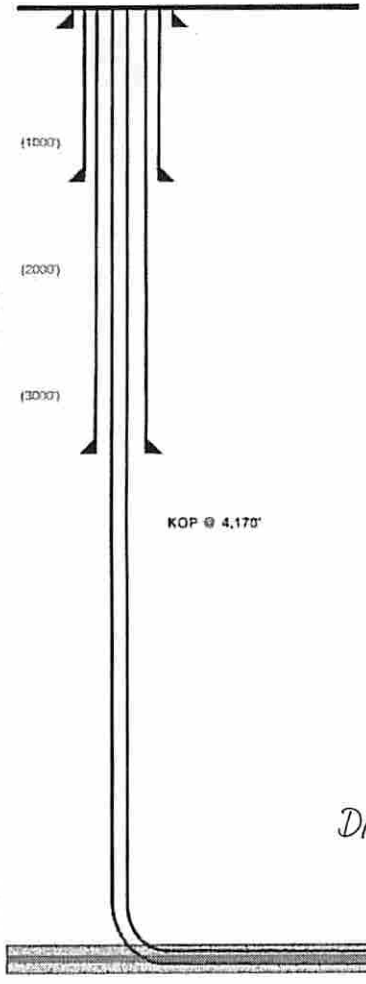
5 1/2", P-110, 20# 14,062 ft MD
7,470 ft TVD

4710302906 MM

Well 513982(PNG103H13)
EQT Production
Pine Grove
Wetzel West Virgina

Azimuth 166.5
Vertical Section 4523

TVD Depth (feet)	Formation Tops (TVD)		
0'			
250'			
500'			
750'	Base Fresh Water	777	
1,000'			(1000)
1,250'			
1,500'			
1,750'			
2,000'			(2000)
2,250'	Maxton	2209 - 2516	
	Big Lime	2516 - 2643	
	Big Injun	2643 - 2788	
2,500'	Weir	2788 - 2987	
	Gantz	2987 - 3157	
2,750'	Base Red Rock	3109	
	Fifty foot	3157 - 3193	
3,000'	Thirty foot	3193 - 3235	(3000)
	Gordon	3235 - 3317	
3,250'	Fourth Sand	3317 - 3443	
	Int. Big pf	3347	
3,500'	Bayard	3443 - 3502	
3,750'			
	Warren	3955 - 4046	
4,000'	Speechley	4046 - 5559	
4,250'			
4,500'			
4,750'			
5,000'			
5,250'			
5,500'	Benson	5559 - 5675	
5,750'			
	Alexander	5675 - 5916	
6,000'			
6,250'			
6,500'	Sonyea	7027 - 7155	
	Middlesex	7155 - 7235	
6,750'	Genesee	7235 - 7318	
	Geneseo	7318 - 7344	
7,000'	Tully	7344 - 7369	
	Hamilton	7369 - 7449	
7,250'	Marcellus top	7449	
	Target Inside Marcellus	**7470**	
7,500'	Marcellus Bottom	7489	



Hole Size (inches)	Casing Type	Size (inches)	Wt (ppf)/Grade
24	Conductor	20	
17 1/2	Surface	13 3/8	54#/MC-50
12 3/8	Intermediate	9 5/8	40#/MC-50
8 1/2	Production Casing	5 1/2	20#/P-110

DMH 9-4-14

Land curve @ 7,470' ft TVD
8,781' ft MD

Est. TD @ 7,470' ft TVD
14,062' ft MD

5,280' ft Lateral

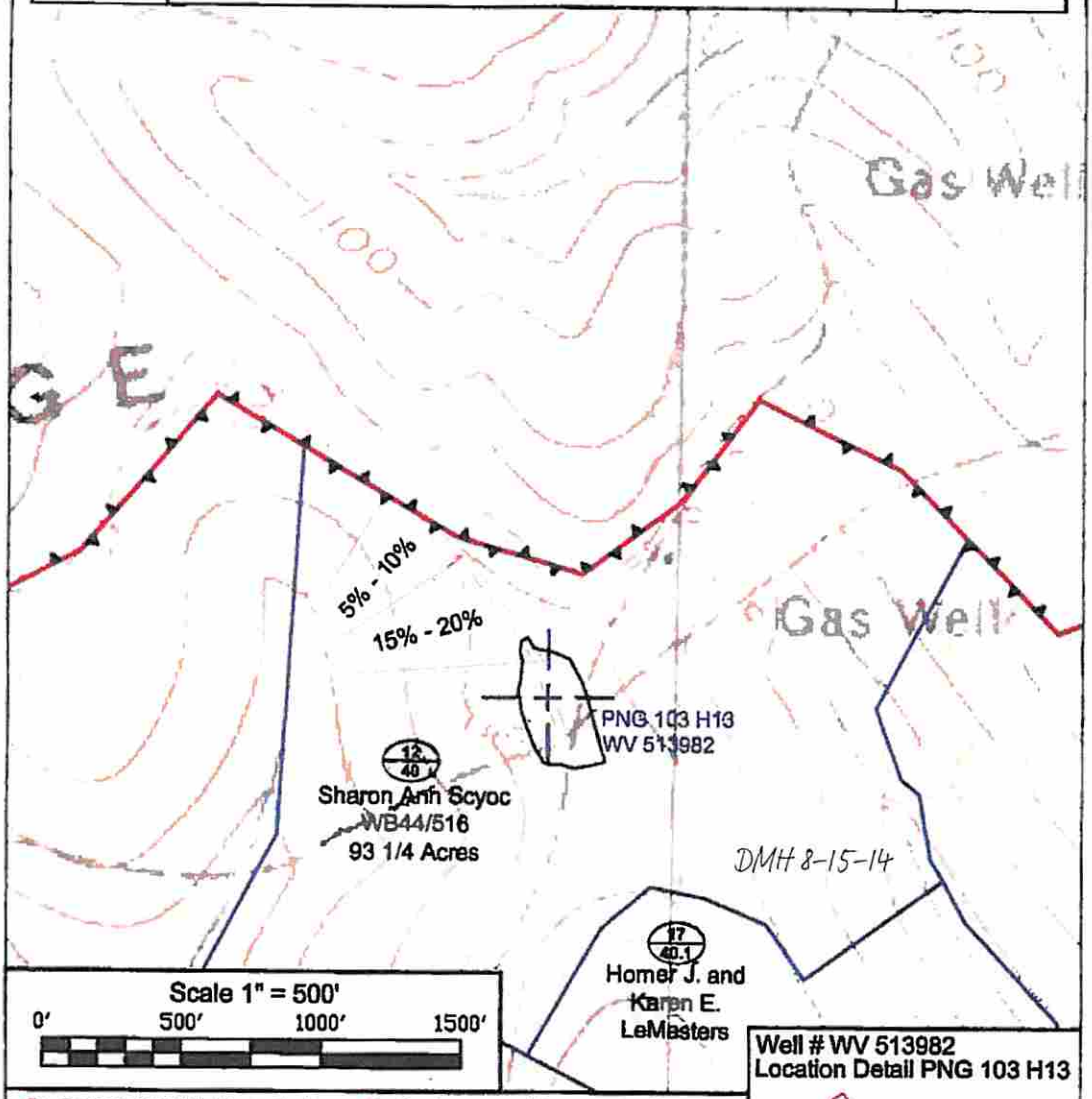
Proposed Well Work:
Drill and complete a new horizontal well in the Marcellus formation.
The vertical drill to go down to an approximate depth of 4170'.
Then kick off the horizontal leg into the Marcellus using a slick water frac.

4710302906 MOD

WW-9

PNG 103 H13 WV 513982

Sheet 1 of 1



Ⓒ Denotes to install 12" minimum culvert

Ⓧ Denotes a proposed stream crossing (if applies) *see table for culvert detail*

Unless otherwise noted, all roads shown hereon are existing and shall be maintained in accordance with WV D.E.P., Office of Oil and Gas Erosion and Sediment Control Field Manual as revised 2/08

Entrances upon county/state roads shall be maintained in accordance with WV D.O.T. regulations, however, separate permits may be required by the WV D.O.T.

Sediment basins (traps) and appropriate erosion control barriers are to be constructed at all culverts and cross-drains as required in the aforementioned Erosion and Sediment Control Field Manual. Where field conditions dictate, alternative erosion control measures shall be enacted as required.

Earthwork contractors are responsible for notification to the operator and inspector prior to any deviation from this plan.

Temporary seed and mulch all slopes after construction of location.

Cut and stack all marketable timber.

Stacked brush may be used for sediment control.

Applications for separate Public Land Corporation Permits on the access roads stream crossings have been prepared (if applies).

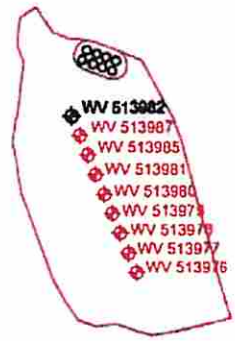
Additional culverts and/or other drainage structures and sediment control devices may be required by the WV D.E.P. Oil & Gas Inspector.

Operator is responsible for the coordination with contractor and Allegheny Surveys regarding any changes or additions the state may require

SECTION OF THE Pine Grove 7.5' USGS QUADRANGLE	
Projected culvert inventory. (for bid purposes only)	
12" minimum diameter culverts	0 Culverts
15" minimum diameter culverts	0 Culverts

DRAWN BY:	DATE:	FILE NO.	DRAWING FILE NO.
Scott Brown	April 18, 2013	212-34-G-10	212-10 PNG103 H13 Rec Plan

Well # WV 513982
Location Detail PNG 103 H13



DRAWING IS NOT TO SCALE

LEASE BOUNDARY
PROPERTY BOUNDARY
ROAD PATH
ROAD
DITCH
SILT FENCE
PROPOSED WELL LOCATION
BROAD BASED DIP
EXISTING GATE
EXISTING CULVERT
PROPOSED CULVERT
CREEK CROSSING
PIT-CUT WALLS
PIT-COMPACTED WALLS
AREA OF LAND APPLICATION OF PIT WASTE

SURVEYING AND MAPPING SERVICES PERFORMED BY:

ALLEGHENY SURVEYS, INC.

1-800-482-8606

Birch River Office
Phone: (304) 649-8606
Fax: (304) 649-8608

237 Birch River Road
P.O. Box 436
Birch River, WV 26610