



west virginia department of environmental protection

Office of Oil and Gas  
601 57<sup>th</sup> Street, S.E.  
Charleston, WV 25304  
(304) 926-0450  
fax: (304) 926-0452

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

Friday, December 30, 2016  
WELL WORK PERMIT  
Vertical / Plugging

ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET

DENVER, CO 80202

Re: Permit approval for PERKINS 14  
47-017-03649-00-00

This well work permit is evidence of permission granted to perform the specified well work at the location described on the attached pages and located on the attached plat, subject to the provisions of Chapter 22 of the West Virginia Code of 1931, as amended, and all rules and regulations promulgated thereunder, and to any additional specific conditions and provisions outlined in the pages attached hereto. Notification shall be given by the operator to the Oil and Gas Inspector at least 24 hours prior to the construction of roads, locations, and/or pits for any permitted work. In addition, the well operator shall notify the same inspector 24 hours before any actual well work is commenced and prior to running and cementing casing. Spills or emergency discharges must be promptly reported by the operator to 1-800-642-3074 and to the Oil and Gas Inspector.

Please be advised that form WR-35, Well Operators Report of Well Work is to be submitted to this office within 90 days of completion of permitted well work, as should form WR-34 Discharge Monitoring Report within 30 days of discharge of pits, if applicable. Failure to abide by all statutory and regulatory provisions governing all duties and operations hereunder may result in suspension or revocation of this permit and, in addition, may result in civil and/or criminal penalties being imposed upon the operators.

Per 35 CSR 4-5.2.g this permit will expire in two (2) years from the issue date unless 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: PERKINS 14  
Farm Name: FLANAGAN, GEORGE  
U.S. WELL NUMBER: 47-017-03649-00-00  
Vertical / Plugging  
Date Issued: 12/30/2016

Promoting a healthy environment.

12/29/2016

## PERMIT CONDITIONS

West Virginia Code §22-6-11 allows the Office of Oil and Gas to place specific conditions upon this permit. Permit conditions have the same effect as law. Failure to adhere to the specified permit conditions may result in enforcement action.

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### CONDITIONS

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1. All pits must be lined with a minimum of 20 mil thickness synthetic liner.
2. In the event of an accident or explosion causing loss of life or serious personal injury in or about the well or while working on the well, the well operator or its contractor shall give notice, stating the particulars of the accident or explosion, to the oil and gas inspector and the Chief within twenty-four (24) hours.
3. Well work activities shall not constitute a hazard to the safety of persons.

WW-4B  
Rev. 2/01

1) Date December 5, 2016  
2) Operator's  
Well No. Perkins 14  
3) API Well No. 47-017 - 03649

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

APPLICATION FOR A PERMIT TO PLUG AND ABANDON

4) Well Type: Oil \_\_\_ / Gas X / Liquid injection \_\_\_ / Waste disposal \_\_\_ /  
(If "Gas, Production \_\_\_ or Underground storage \_\_\_) Deep \_\_\_ / Shallow X

5) Location: Elevation 1011' Watershed Headwaters Middle Island Creek  
District Central County Doddridge Quadrangle Pennsboro

6) Well Operator Antero Resources Corporation 7) Designated Agent CT Corporation System - Dianna Stamper  
Address 1615 Wynkoop Street Address 5400 D Big Tyler Road  
Denver, CO 80202 Charleston, WV 25313

8) Oil and Gas Inspector to be notified 9) Plugging Contractor  
Name Daniel Flack Name N/A - Antero will plug well  
Address 601 57th Street, SE Address \_\_\_\_\_  
Charleston, WV 25304

10) Work Order: The work order for the manner of plugging this well is as follows:

\*Please see attached Work Order.

*THIS WELL DOES NOT QUALIFY FOR THE GENERAL OFFSET MARKER  
VARIANCE BECAUSE IT PENETRATES COAL.*

*JWM*

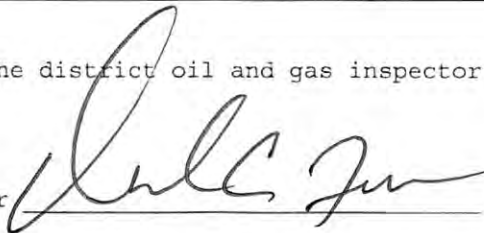
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Notification must be given to the district oil and gas inspector 24 hours before permitted work can commence.

WV Department of  
Environmental Protection

Work order approved by inspector



Date 11/12/16

**Perkins 14**  
**Doddridge County, WV**  
API #47-017-03649



**Antero Resources**  
1615 Wynkoop St.  
Denver, CO 80202  
Office: 303.357.7310  
Fax: 303.357.7315

**Objective:** Plug and Abandon Wellbore.

**Pipe Schedule:**

- 1. 8-5/8" 20# set @ 1,547'. Cemented to surface Elevation: 1,021'
- 2. 4-1/2" 10.5# set @ 5,202' with estimated TOC @ 2,094' (To Be Confirmed)
- 3. 1 1/2" 2.75# tubing set @ 3,426'.

**Oil and Gas Zones:**

- 1. Big Lime: 1,850'-1,912'; Gas/Oil show @ 1,820'/1,825'
- 2. Big Injun: 1,912'-2,008'
- 3. Weir: 2,204'-2,318'
- 4. Warren: 3,289' – 3,342'; perfs from 3,295'-3,340'
- 5. Riley: 4,430-4,460'; perfs from 4,415'-4,443'
- 6. Benson: 4,811' – 4,816'; perfs from 4,812'-4,815'
- 7. Alexander: 5,081' – 5,122'; perfs from 5,083'-5,111'

**Procedure:**

- 1. Check and record all casing/annular pressures into Wellview.
- 2. Coordinate and schedule casing jacks.
- 3. Notify WVDEP prior to commencing work, for plug witnessing (Doddridge County Inspector)
- 4. Move in and rig up flat tank and frac tank (No pits will be utilized).
- 5. Move in rig up service unit.
- 6. NU BOPE and test – check and report surface pressure including bradenhead pressure.
- 7. Kill well.
- 8. Pull and lay down 1 1/2" tubing.
- 9. RU wireline and lubricator.
- 10. Make gauge ring run to casing TD @ 5,202'. Pull out of hole. Note fluid depth tagged.
- 11. MIRU logging crew.
- 12. Load Hole with 6% gel.
- 13. Run CBL from TD (5,202') to surface.
- 14. Locate TOC around 4.5" casing.
- 15. Discuss results with completions engineers before proceeding.
- 16. TIH with 2 3/8" tubing to 5,150'.
- 17. MIRU cement services. Mix and pump 41 sacks for balanced plug from 4,710' – 5,150'. (Class A cement + 2% CaCl2, 20% excess included; yield =1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk)
  - a. Displace to balance plug
  - b. Slowly pull out of cement plug.
  - c. Reverse circulate tubing clear of cement
- 18. Pull up to 4,515'
- 19. Mix and pump 19 sacks for balanced plug from 4,315'-4,515' (Class A cement + 2% CaCl2, 20% excess included; yield =1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk).
  - a. Displace to balance plug
  - b. Slowly pull out of cement plug.
  - c. Reverse circulate tubing clear of cement
- 20. Pull up to 3,375'
- 21. Mix and pump 28 sacks for balanced plug from 3,075'-3,375'. (Class A cement + 2% CaCl2, 20% excess included; yield =1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk)
  - a. Displace to balance plug
  - b. Slowly pull out of cement plug.
  - c. Reverse circulate tubing clear of cement
  - d. Tag TOC @3,075'.
  - e. If top of cement is deeper than 3,075', mix and spot cement so top is a minimum depth of 3,075'.
- 22. POOH with tubing.
- 23. Lubricate and RIH w/ CIBP and set at 3,075'. POOH w/ wireline.
- 24. PT CIBP to 500 psi.
- 25. RIH wireline and run free point above TOC in 4.5" casing.
  - a. Chemical cut just above determined TOC' (exact depth determined via freepoint and CBL)

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- b. RU casing jacks and POOH – LD 4.5" casing.
26. PU and RIH w/ tubing to 3,074' (One foot above CIBP).
  27. Mix and pump 19 sacks for balanced plug from 2,875'-3,075' (Class A cement + 2% CaCl<sub>2</sub>, 20% excess included; yield = 1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk).
    - a. Displace to balance plug
    - b. Slowly pull out of cement plug
    - c. Reverse circulate tubing clear of cement.
  28. Pull up to 2,350'
  29. Mix and pump 55 sacks for balanced plug from 1,750'-2,350'. (Class A cement + 2% CaCl<sub>2</sub>, 20% excess included; yield = 1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk).
    - a. Displace to balance plug
    - b. Slowly pull out of cement plug and LD tubing.
    - c. Reverse circulate tubing clear of cement
  30. Pull up to 1,650'
  31. Mix and pump 90 sacks across from 1,450' – 1,650' (Class A cement + 2% CaCl<sub>2</sub>, 20% excess included; yield = 1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk).
    - a. Displace to balance plug
    - b. Slowly pull out of cement plug and LD tubing.
    - c. Reverse circulate tubing clear of cement
    - d. WOC and tag TOC at 1,450' (200' above cut)
    - e. If TOC is deeper than 1,450', mix and spot cement so TOC is a minimum depth of 1,450'.  
Tag TOC @ 1,450'
  32. Pull up tubing to 990'.
  33. Mix and pump 63 sacks for plug from 790'-990' (Class A cement + 2% CaCl<sub>2</sub>, 20% excess included; yield = 1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk).
    - a. Displace to balance plug
    - b. Slowly pull out of cement plug and LD tubing.
    - c. Reverse circulate tubing clear of cement
  34. Pull up tubing to 300'.
  35. Mix and pump 112 sacks from 300'-surface (Class A cement + 2% CaCl<sub>2</sub>, 20% excess included; yield = 1.18 ft<sup>3</sup>/sk, WR=5.2 gal/sk)
  36. TOOH
  37. Wait on cement 8hrs.
  - ★ 38. Set ~~offsite~~ marker plate with API number ( API No.: 47-017-03649) **MUST HAVE MARKER ON WELL BORE.**
  39. Establish remote dry hole marker & provide direction and distance to DEP. **JMN**

\* **MUST HAVE A MINIMUM OF 100' CLASS A CEMENT PLUG  
ACROSS THE 4 1/2" CASING CUT. JMN**

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# Wellbore Diagram

11/10/2016

Elev.: 1,021'

Spud: 8/27/1988

8 5/8" Conductor Casing  
Set @ 1,547'  
443 Sks cement to surfaces

Plug from 1,750 - 2,350'

7-7/8" hole size

Plug from 3075'-3375'  
across Warren perms

\*Cement plug from 4,315-4,515'

\*Cement plug from 4,710-5,150'

TD @ 5,290'

Plug from 300'-surface

Plug from 790-990' (coal seam)

Plug from 1450' - 1650'

Big Lime (1,850' - 1,912') - Not Perf'd

Big Injun (1,912' - 2,008') - Not Perf'd

Weir (2,204' - 2,318') - Not Perf'd

Plug from 2,875' - 3,075'  
\*Set CIBP @ 3,075'

Warren (3,289' - 3,342')

Perfs from: 3,295-3,340'

Riley (4,430' - 4,460')

Perfs from: 4,415 - 4,443'

Benson (4,811' - 4,816')

Perfs from: 4,812' - 4,815'

Alexander (5,081' - 5,122')

Perfs from: 5,083' - 5,111'

4-1/2" Production Casing  
Set @ 5,202' w/ 708 sks

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Antero Resources Corporation

Perkins 14

API: 47-017-03649

State of West Virginia  
DEPARTMENT OF ENERGY  
Division of Oil and Gas

Well Operator's Report of Well Work

Farm name: FLANAGAN, GEORGE Operator Well No.: PERKINS 14

LOCATION: Elevation: 1021.00 Quadrangle: PENNSBORD

District: CENTRAL County: DODDRIDGE  
Latitude: 9490 Feet South of 39 Des. 17Min. 30 Sec.  
Longitude 9130 Feet West of 80 Des. 52 Min. 30 Sec.

Company: EASTERN AMERICAN ENERGY C  
P. O. BOX N  
GLENVILLE, WV

Agent: DONALD C. SUPCOE

Inspector: MIKE UNDERWOOD  
Permit Issued: 06/30/88  
Well work Commenced: 08/26/88  
Well work Completed: 09/10/88  
Verbal Plugging  
Permission granted on:  
Rotary  Cable \_\_\_\_\_ Rig \_\_\_\_\_  
Total Depth (feet) 5290'  
Fresh water depths (ft) 90'  
Salt water depths (ft) None  
Is coal being mined in area (Y/N)? N  
Coal Depths (ft): 198', 940', 1455'

Casings & Tubing Size	Used in Drilling	Left in Well	Cement Fill Cu. Ft.
8-5/8"	1547.25'	1547.25'	C.T.S.
4-1/2"	5202.2'	5202.2'	708'
1-1/2"	---	3425.95'	---

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DEPARTMENT OF ENERGY

OPEN FLOW DATA

Warren (Commingled)

Producing formation Alexander, Bensen, Riley Pay zone depth (ft) 5112'-3295'  
Gas: Initial open flow 189 MCF/d Oil: Initial open flow N/A Bbl/d  
Final open flow 1302' MCF/d Final open flow N/A Bbl/d  
Time of open flow between initial and final tests 24 Hours  
Static rock Pressure 1610 psig (surface pressure) after 15 Hours

Second producing formation \_\_\_\_\_ Pay zone depth (ft) \_\_\_\_\_  
Gas: Initial open flow \_\_\_\_\_ MCF/d Oil: Initial open flow \_\_\_\_\_ Bbl/d  
Final open flow \_\_\_\_\_ MCF/d Final open flow \_\_\_\_\_ Bbl/d  
Time of open flow between initial and final tests \_\_\_\_\_ Hours  
Static rock Pressure \_\_\_\_\_ psig (surface pressure) after \_\_\_\_\_ Hours

NOTE: ON BACK OF THIS FORM PUT THE FOLLOWING: 1). DETAILS OF PERFORATED INTERVALS, FRACTURING OR STIMULATING, PHYSICAL CHANGE, ETC. 2). THE WELL LOG WHICH IS A SYSTEMATIC DETAILED GEOLOGICAL RECORD OF ALL FORMATIONS, INCLUDING COAL ENCOUNTERED BY THE WELLBORE.

For: Rich Heffelfinger  
EASTERN AMERICAN ENERGY CORP.  
Rich Heffelfinger  
By: Vice President - Regional Operations  
Date: September 26, 1988

12/29/2016

POSD. 3649

(REVERSE)

1703649P

DETAILS OF PERFORATED INTERVALS, FRACTURING OR STIMULATING, PHYSICAL CHANGE, ETC.

4 STAGE FOAM FRAC

Stage 1: 12 holes (5111.5'-5083') Breakdown pressure @ 2000 psi, 60 quality foam, 25,000 lbs. 20/40 sand, 420,000 scf of N<sub>2</sub>

Stage 2: 8 holes (4812'-4815') Breakdown pressure @ 1250 psi, 60 quality foam, 20,000 lbs. of 20/40 sand, 386,000 scf of N<sub>2</sub>

Stage 3: 12 holes (4443.5'-4415.5') Breakdown Pressure @ 1200 psi, 75 quality foam, 30,000 lbs. of 20/40 sand, 560,000 scf of N<sub>2</sub>

Stage 4: 12 holes (3340'-3295') Breakdown pressure @ 1750 psi, 75 quality foam, 25,000 lbs. of 20/40 sand, 562,000 scf of N<sub>2</sub>

WELL LOG

FORMATION	COLOR	HARD OR SOFT	TOP FEET	BOTTOM FEET	REMARKS Including indication of all fresh and salt water, coal, oil and gas
Red Rock, Sand, Shale			0	198	1/2" stream of water @ 90'
Coal			198	202	
Sand, Shale, Red Rock			202	940	
Coal			940	950	
Sand, Shale			950	1455	
Coal			1455	1460	
Sand, Shale			1460	1850	Show of oil @ 1825'
Big Line			1850	1912	
Big Injun			1912	2008	
Shale			2008	2204	<u>GAS CHECKS:</u>
Weir			2204	2318	
Shale			2318	3289	1820' 6/10 through 2" w/water
Warren			3289	3342	2039' 64/10 through 2" w/water
Shale			3342	4430	2300' 30/10 through 2" w/water
Riley			4430	4460	2600' 30/10 through 2" w/water
Shale			4460	4811	2900' 30/10 through 2" w/water
Benson			4811	4816	3200' 50/10 through 2" w/water
Shale			4816	5081	3400' 24/10 through 2" w/water
Alexander			5081	5122	3600' 24/10 through 2" w/water
				5281	3800' 24/10 through 2" w/water
Log T.D.					4100' 24/10 through 2" w/water
					4300' 24/10 through 2" w/water
					4500' 24/10 through 2" w/water
					4700' 24/10 through 2" w/water
					4900' 26/10 through 2" w/water
					5200' 26/10 through 2" w/water
					T.D. 20/10 through 2" w/water
					D.C. 20/10 through 2" w/water

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DEPARTMENT OF ENERGY

(Attach separate sheets as necessary)

12/29/2016

7212



1703649P

WW-4A  
Revised 6-07

1) Date: December 5, 2016

2) Operator's Well Number

Perkins 14

3) API Well No.: 47 - 017 - 03649

**STATE OF WEST VIRGINIA**  
**DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS**  
**NOTICE OF APPLICATION TO PLUG AND ABANDON A WELL**

4) Surface Owner(s) to be served:	5) (a) Coal Operator
(a) Name <u>Antero Resources Corporation* (3-32-1)</u>	Name <u>NO DECLARATIONS ON RECORD WITH COUNTY</u>
Address <u>1615 Wynkoop Street</u>	Address _____
<u>Denver, CO 80202</u>	_____
(b) Name <u>*Purchased from Carol Cogar &amp; Gene &amp; Carol Flanagan</u>	(b) Coal Owner(s) with Declaration
Address _____	Name <u>NO DECLARATIONS ON RECORD WITH COUNTY</u>
_____	Address _____
(c) Name <u>*All other surface owners with existing access road disturbance</u>	Name _____
Address <u>are off-lease and not required to be notified.</u>	Address _____
_____	_____
6) Inspector <u>Daniel Flack</u>	(c) Coal Lessee with Declaration
Address <u>601 57th Street SE</u>	Name <u>NO DECLARATIONS ON RECORD WITH COUNTY</u>
<u>Charleston, WV 25304</u>	Address _____
Telephone <u>304-545-0109</u>	_____

**TO THE PERSONS NAMED ABOVE:** You should have received this Form and the following documents:

- (1) The application to Plug and Abandon a Well on Form WW-4B, which sets out the parties involved in the work and describes the well its and the plugging work order; and
- (2) The plat (surveyor's map) showing the well location on Form WW-6.

The reason you received these documents is that you have rights regarding the application which are summarized in the instructions on the reverses side. However, you are not required to take any action at all.

Take notice that under Chapter 22-6 of the West Virginia Code, the undersigned well operator proposes to file or has filed this Notice and Application and accompanying documents for a permit to plug and abandon a well with the Chief of the Office of Oil and Gas, West Virginia Department of Environmental Protection, with respect to the well at the location described on the attached Application and depicted on the attached Form WW-6. Copies of this Notice, the Application, and the plat have been mailed by registered or certified mail or delivered by hand to the person(s) named above (or by publication in certain circumstances) on or before the day of mailing or delivery to the Chief.

RECEIVED  
Office of Oil and Gas

KARA QUACKENBUSH  
NOTARY PUBLIC  
STATE OF COLORADO  
NOTARY ID 20144028297  
MY COMMISSION EXPIRES JULY 21, 2018

Well Operator Antero Resources Corporation

By: Robert S. Tucker *[Signature]*

Its: Vice President of Geology

Address 1615 Wynkoop Street

Denver, CO 80202

Telephone 303-357-7310

DEC 19 2016

WV Department of  
Environmental Protection

Subscribed and sworn before me this 5<sup>th</sup> day of December 2016  
*[Signature]* Notary Public  
My Commission Expires July 21, 2018

**Oil and Gas Privacy Notice**

The Office of Oil and Gas processes your personal information, such as name, address and phone number, as a part of our regulatory duties. Your personal information may be disclosed to other State agencies or third parties in the normal course of business or as needed to comply with statutory or regulatory requirements, including Freedom of Information Act requests. Our office will appropriately secure your personal information. If you have any questions about our use of your personal information, please contact DEP's Chief Privacy Officer at [depprivacyofficer@wv.gov](mailto:depprivacyofficer@wv.gov).

12/29/2016

1703649P

### SURFACE OWNER WAIVER

Operator's Well  
Number

Perkins 14

#### INSTRUCTIONS TO SURFACE OWNERS NAMED ON PAGE WW4-A

The well operator named on page WW-4A is applying for a permit from the State to plug and abandon a well. (Note: If the surface tract is owned by more than three persons, then these materials were served on you because your name appeared on the Sheriff's tax ticket on the land or because you actually occupy the surface tract. In either case, you may be the only owner who will actually receive these materials.) See Chapter 22 of the West Virginia Code. Well work permits are valid for 24 months. If you do not own any interest in the surface tract, please forward these materials to the true owner immediately if you know who it is. Also, please notify the well operator and the Office of Oil and Gas.

**NOTE: YOU ARE NOT REQUIRED TO FILE ANY COMMENT.**

#### WHERE TO FILE COMMENTS AND OBTAIN ADDITIONAL INFORMATION:

Chief, Office of Oil and Gas  
Department of Environmental Protection  
601 57<sup>th</sup> St. SE  
Charleston, WV 25304  
(304) 926-0450

**Time Limits and methods for filing comments.** The law requires these materials to be served on or before the date the operator files his Application. You have **FIVE (5) DAYS** after the filing date to file your comments. Comments must be filed in person or received in the mail by the Chief's office by the time stated above. You may call the Chief's office to be sure of the date. Check with your postmaster to ensure adequate delivery time or to arrange special expedited handling. If you have been contacted by the well operator and you have signed a "voluntary statement of no objection" to the planned work described in these materials, then the permit may be issued at any time.

**Comments must be in writing.** Your comments must include your name, address and telephone number, the well operator's name and well number and the approximate location of the proposed well site including district and county from the application. You may add other documents, such as sketches, maps or photographs to support your comments.

The Chief has the power to deny or condition a well work permit based on comments on the following grounds:

- 1) The proposed well work will constitute a hazard to the safety of persons.
- 2) The soil erosion and sediment control plan is not adequate or effective;
- 3) Damage would occur to publicly owned lands or resources;
- 4) The proposed well work fails to protect fresh water sources or supplies;
- 5) The applicant has committed a substantial violation of a previous permit or a substantial violation of one or more of the rules promulgated under Chapter 22, and has failed to abate or seek review of the violation..."

If you want a copy of the permit as it is issued or a copy of the order denying the permit, you should request a copy from the Chief.

#### VOLUNTARY STATEMENT OF NO OBJECTION

I hereby state that I have read the instructions to surface owners and that I have received copies of a Notice and Application For A Permit To Plug And Abandon on Forms WW-4A and WW-4B, and a survey plat.

I further state that I have no objection to the planned work described in these materials, and I have no objection to a permit being issued on those materials.

FOR EXECUTION BY A NATURAL PERSON  
ETC.

FOR EXECUTION BY A CORPORATION,

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WV Department of  
Environmental Protection

_____	Date _____	Name <u>Antero Resources Corporation</u>	_____
Signature		By <u>Robert S. Tucker</u>	
		Its <u>Vice President of Geology</u>	Date <u>12-6-16</u>
		Signature <u>[Signature]</u>	Date <u>12/5/2016</u>

12/29/2016

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

CONSTRUCTION AND RECLAMATION PLAN AND SITE REGISTRATION APPLICATION FORM  
GENERAL PERMIT FOR OIL AND GAS PIT WASTE DISCHARGE

Operator Name Antero Resources Corporation OP Code 494507062

Watershed Headwaters Middle Island Creek Quadrangle Pennsboro

Elevation 1011' County Doddridge District Central

Description of anticipated Pit Waste: No pit will be used at this site (All fluids will be stored in tanks and either reused or hauled off site.)

Will a synthetic liner be used in the pit? N/A

Proposed Disposal Method For Treated Pit Wastes:

- Land Application
- Underground Injection ( UIC Permit Number \*UIC Permit # will be provided on Form WR-34 )
- Reuse (at API Number Future permitted well locations when applicable. API# will be provided on Form WR-34 )
- Off Site Disposal (Supply form WW-9 for disposal location) (Meadowfill Landfill Permit #SWF-1032-98)
- Other (Explain Northwestern Landfill Permit #SWF-1025/WV0109410)

Proposed Work For Which Pit Will Be Used:

- Drilling  Swabbing
- Workover  Plugging
- Other (Explain \_\_\_\_\_)

I certify that I understand and agree to the terms and conditions of the GENERAL WATER POLLUTION PERMIT issued on August 1, 2005, by the Office of Oil and Gas of the West Virginia Department of Environmental Protection. I understand that the provisions of the permit are enforceable by law. Violations of any term or condition of the general permit and/or other applicable law or regulation can lead to enforcement action.

I certify under penalty of law that I have personally examined and am familiar with the information submitted on this application form and all attachments thereto and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment.

Company Official Signature \_\_\_\_\_

Company Official (Typed Name) Donald Gray

Company Official Title Senior Environmental & Regulatory Manager

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DEC 19 2016

Subscribed and sworn before me this 5<sup>th</sup> day of December, 2016

Kara Quackenbush Notary Public

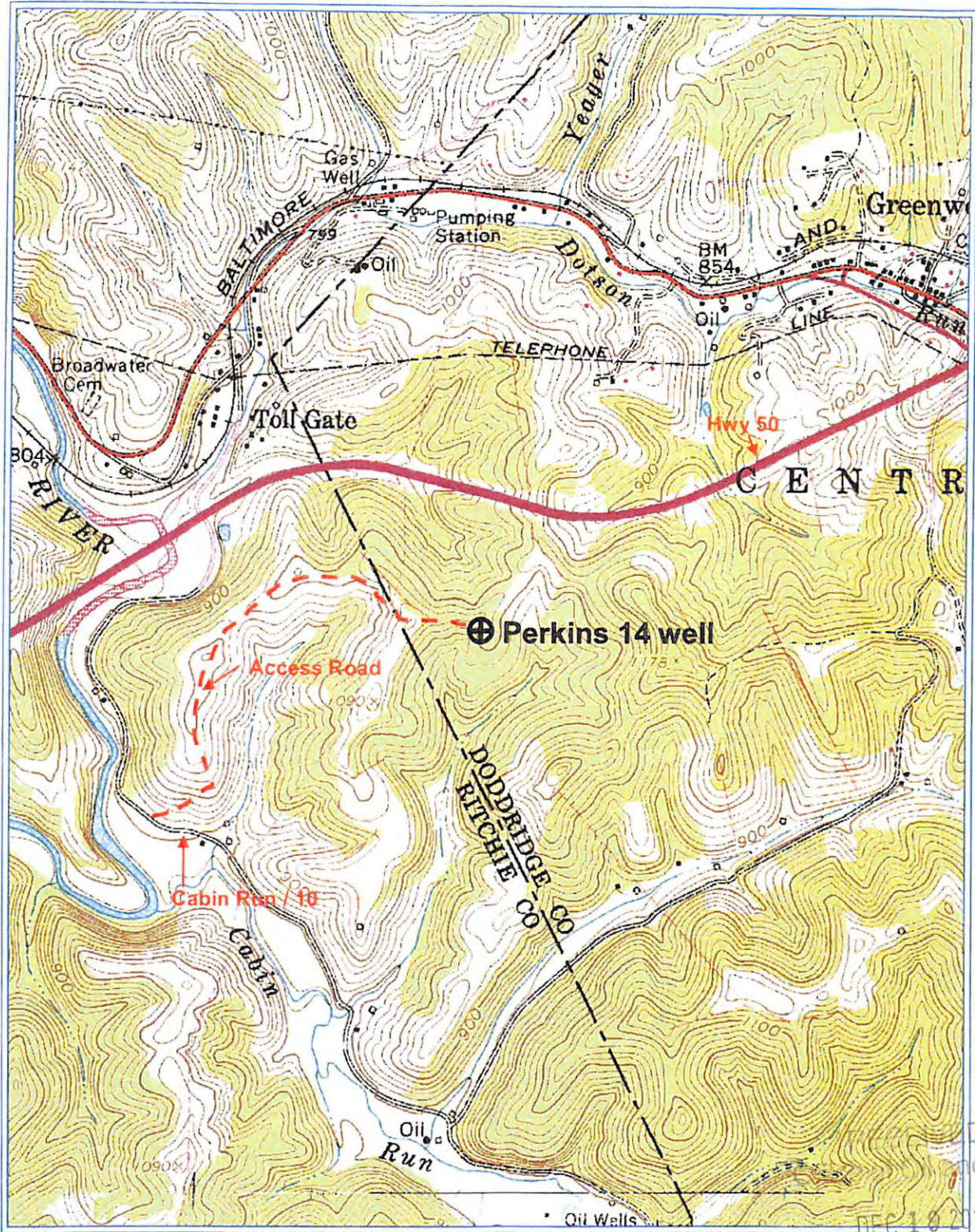
WV Department of Environmental Protection

My commission expires July 21, 2018

KARA QUACKENBUSH  
NOTARY PUBLIC  
STATE OF COLORADO  
NOTARY ID 20144028297  
MY COMMISSION EXPIRES JULY 21, 2018

12/29/2016





**Antero Resources Corporation**  
 Appalachian Basin Environmental Protection  
 Perkins 14  
 Doddridge County

Quadrangle: Pennsboro  
 Watershed: Cabin Run  
 District: Central  
 Date: 11-01-2016

1703649P

WW-7  
8-30-06



West Virginia Department of Environmental Protection  
Office of Oil and Gas

WELL LOCATION FORM: GPS

API: 47-017-03649 WELL NO.: Perkins 14

FARM NAME: Antero Resources Corporation

RESPONSIBLE PARTY NAME: Antero Resources Corporation

COUNTY: Doddridge DISTRICT: Central

QUADRANGLE: Pennsboro

SURFACE OWNER: Antero Resources Corporation

ROYALTY OWNER: W.A. Flanagan et al

UTM GPS NORTHING: 4346253.872

UTM GPS EASTING: 508041.644 GPS ELEVATION: 1011'

The Responsible Party named above has chosen to submit GPS coordinates in lieu of preparing a new well location plat for a plugging permit or assigned API number on the above well. The Office of Oil and Gas will not accept GPS coordinates that do not meet the following requirements:

1. Datum: NAD 1983, Zone: 17 North, Coordinate Units: meters, Altitude: height above mean sea level (MSL) – meters.
2. Accuracy to Datum – 3.05 meters
3. Data Collection Method:

Survey grade GPS  : Post Processed Differential \_\_\_\_\_  
Real-Time Differential

Mapping Grade GPS \_\_\_\_\_ : Post Processed Differential \_\_\_\_\_  
Real-Time Differential \_\_\_\_\_

4. Letter size copy of the topography map showing the well location.

I the undersigned, hereby certify this data 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 Office of Oil and Gas.

Ashley Steele  
Signature

Permitting Supervisor  
Title

12/5/2016  
Date

RECEIVED  
Office of Oil and Gas

DEC 19 2016

WV Department of  
Environmental Protection

12/29/2016

# WELL PLUGGING FOR API #47-017-003649 P GREENWOOD TAX DISTRICT, I



**LOCATION MAP**

SCALE - 1"=200,000'

## GENERAL NOTES

1. THE TOPOGRAPHIC SURVEY UTILIZED FOR THIS BASE WAS PERFORMED BY RETREW, FEBRUARY 2015.
2. THE HORIZONTAL DATUM IS WEST VIRGINIA STATE PLANE, NORTH AMERICAN DATUM 1983 (NAD 83), NORTH ZONE.
3. THE VERTICAL DATUM IS WEST VIRGINIA STATE PLANE, NORTH AMERICAN DATUM 1988 (NAVD 88).
4. THE UTILITIES SHOWN ON THIS PLAN ARE FOR REFERENCE PURPOSES ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THE EXACT LOCATION PRIOR TO EXCAVATION BY NOTIFYING MSS UTILITY OF WEST VIRGINIA AT 1-800-245-4848.
5. A WETLANDS PRESENCE/ABSENCE SURVEY WAS PERFORMED BY GAI ASSOCIATES, INC. IN MAY 2015.
6. THE CUT & FILL SUMMARY CALCULATIONS PRESENTED ON THIS PLAN ARE FOR PERMITTING AND INFORMATIONAL PURPOSES ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING GRADES AND TO VERIFY EARTHWORK VOLUMES, METHODS AND PROCEDURES. ANY ISSUES ARE TO BE BROUGHT TO THE ENGINEERS AND OWNERS ATTENTION PRIOR TO COMMENCEMENT OF WORK.
7. ALL EXISTING UTILITIES HAVE BEEN SHOWN IN ACCORDANCE WITH THE BEST AVAILABLE INFORMATION.



7.5 MIN. QUADRANGLE MAP: PENNSBORO, WV

**LOCATION I**

SCALE - 1"=2000'

## LOCAL ANTERO

175 ELK CREEK ROAD | 535 W  
MT. CLARE, WV 26408 | BRIDGE  
PHONE (304) 622-3842 | PHONE

LOCAL CONTACTS:  
EJ WAGONER-ENVIRONMENTAL  
PHONE (304) 842-4  
CELL (304) 476-97

JOHN KAWCAK-OPERATIONS SUI  
CELL (817) 368-15

SHAWN BENNETT-CONSTRUCTION  
PHONE (304) 842-4  
CELL (304) 641-00

ROBERT WIRKS-DESIGN M.  
PHONE (304) 842-4  
CELL (304) 627-74

12/29/2016

1703649P

# ING PLAN

# PERKINS #14 WELL

# DODDRIDGE COUNTY, WV



## WEST VIRGINIA 811

**CALL BEFORE YOU DIG!** Dial 811 or 800.245.4848  
Miss Utility of West Virginia

AT LEAST 48 HOURS, BUT NOT MORE THAN 10 WORKING DAYS (EXCLUDING WEEKENDS AND HOLIDAYS), PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED IN THESE ACTIVITIES SHALL CONTACT MISS UTILITY OF WEST VIRGINIA AT 811 OR 1-800-245-4848.

### LIST OF DRAWINGS

- 1 OF 4 . . . . . COVER SHEET
- 2 OF 4 . . . . . OVERALL PLAN
- 3 OF 4 . . . . . E&S PLAN
- 4 OF 4 . . . . . NOTES AND DETAILS

### LOCATION COORDINATES

	EXISTING ACCESS ROAD	EXISTING WELL
WV SPCS NORTH, NAD 27	N 282941.513 E 1606302.447	N 283393.848 E 1605762.641
WV SPCS NORTH, NAD 83	N 282975.992 E 1574941.350	N 283428.311 E 1574321.547
UTM (METERS) ZONE 17, NAD83	N 4346585.509 E 509476.682	N 4346720.157 E 509285.560
LAT & LONG, NAD83	LAT 39-16-06.81910 LONG -80-53-24.51330	LAT 39-16-11.19442 LONG -80-53-32.48262

### OFFICE

1000 OAKS BLVD.  
MARTINSBURG, WV 26130  
(304) 842-4100

ENGINEER  
38  
3  
SUPERINTENDENT  
3  
SUPERVISOR  
41  
1  
MANAGER  
01  
5

NO.	DATE	REVISION



FOR RETIEW ASSOCIATES BY:  
MANAGER: ANDREW LEVINE, PE  
DESIGN BY: JDN  
DRAWN BY: JDN  
SURV. CHIEF: FELDBOOK NO. N/A

CLIENT  
ANTERO RESOURCES CORPORATION  
1615 WYNKOOP STREET  
DENVER, COLORADO 80202

**RETIEW**  
RETIEW Associates, Inc.  
One Robinson Plaza, Suite 200, Pittsburgh, PA 15205  
Phone (412) 448-1728 • Fax (412) 446-1733  
Email: retiew@retiew.com  
Website: www.retiew.com

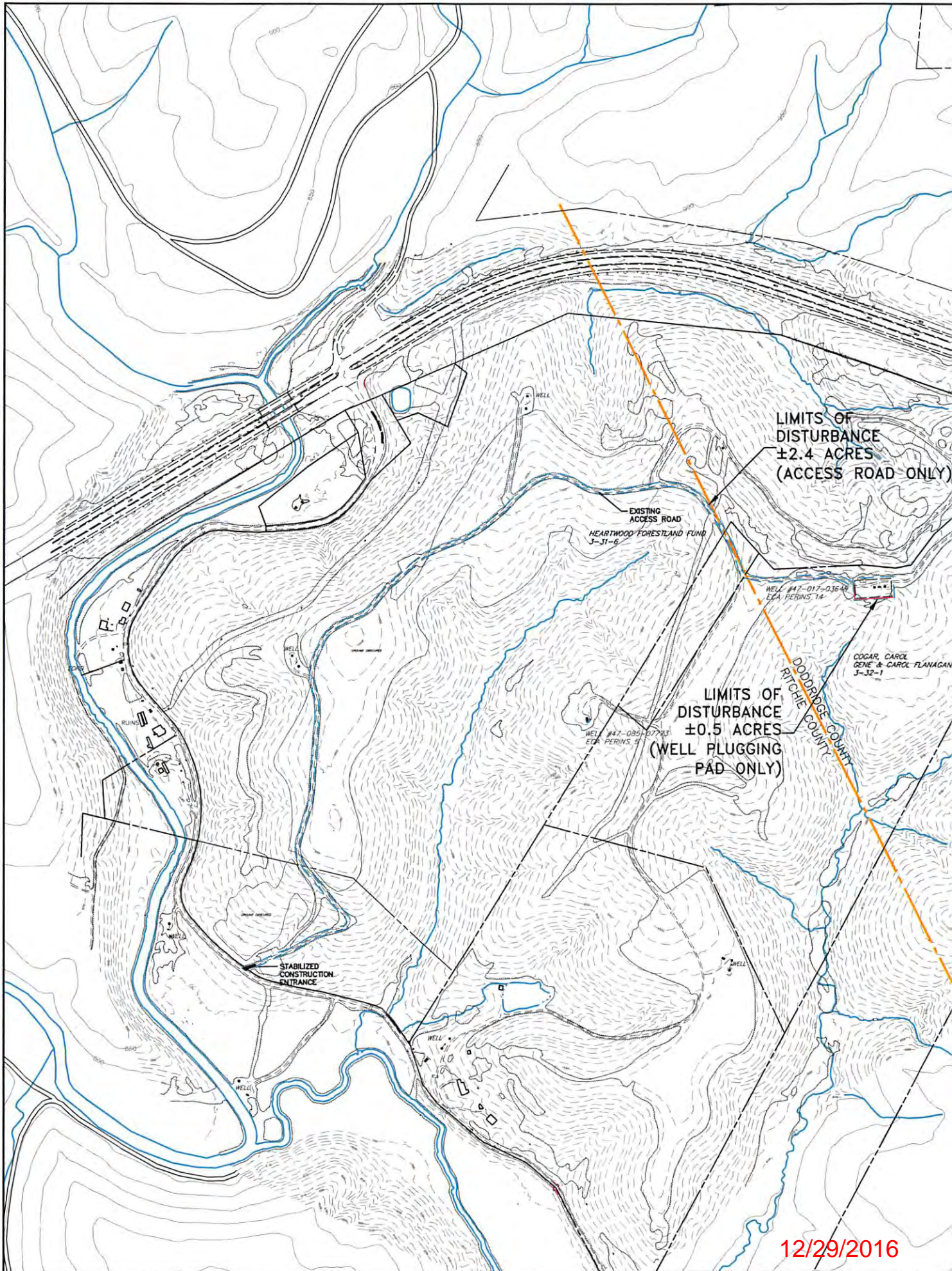
Engineers • Planners • Surveyors • Landscape Architects  
Environmental Consultants

*Handwritten signature: Dale C. Zeller 11/2/16*

RECEIVED  
Office of Oil and Gas  
DEC 2016  
WV Department of Environmental Protection  
COVER SHEET  
WELL PLUGGING PLAN  
FOR  
API #47-017-03649  
PERKINS #14 WELL  
GREENWOOD TAX DISTRICT  
DODDRIDGE COUNTY, WV

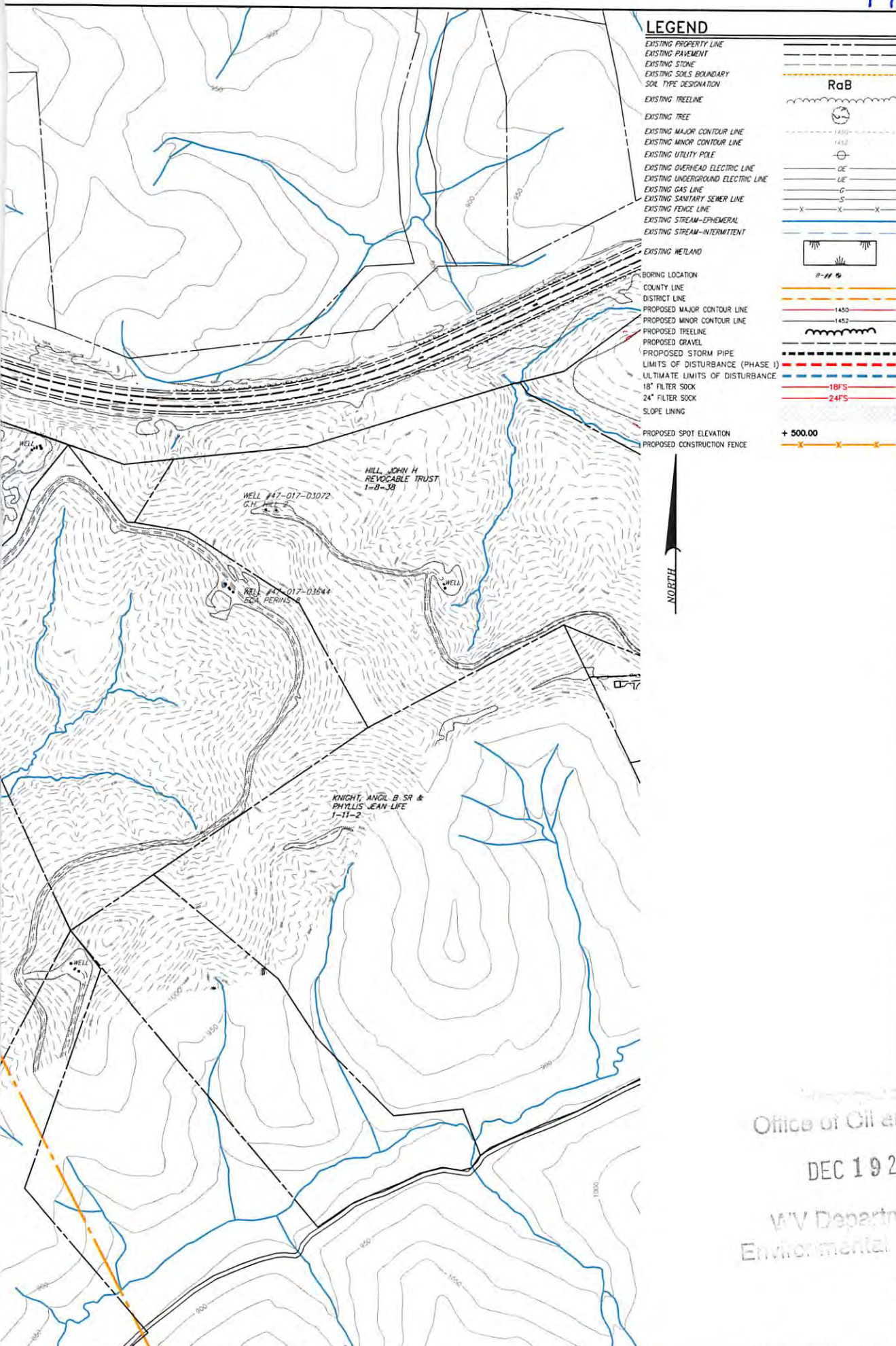
DATE: APRIL 29, 2016  
SHEET NO. 1 OF 4  
DWG. NO. 03649-001





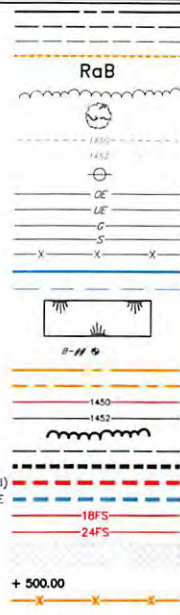
12/29/2016

1703649A



**LEGEND**

- EXISTING PROPERTY LINE
- EXISTING PAVEMENT
- EXISTING STONE
- EXISTING SOILS BOUNDARY
- SOIL TYPE DESIGNATION
- EXISTING TREELINE
- EXISTING TREE
- EXISTING MAJOR CONTOUR LINE
- EXISTING MINOR CONTOUR LINE
- EXISTING UTILITY POLE
- EXISTING OVERHEAD ELECTRIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING SANITARY SEWER LINE
- EXISTING FENCE LINE
- EXISTING STREAM-EPHEMERAL
- EXISTING STREAM-INTERMITTENT
- EXISTING WETLAND
- BORING LOCATION
- COUNTY LINE
- DISTRICT LINE
- PROPOSED MAJOR CONTOUR LINE
- PROPOSED MINOR CONTOUR LINE
- PROPOSED TREELINE
- PROPOSED GRAVEL
- PROPOSED STORM PIPE
- LIMITS OF DISTURBANCE (PHASE 1)
- ULTIMATE LIMITS OF DISTURBANCE
- 18" FILTER SOCK
- 24" FILTER SOCK
- SLOPE LINING
- PROPOSED SPOT ELEVATION
- PROPOSED CONSTRUCTION FENCE



SCALE

1"=300'

0 150' 300' 600' 900'

NO.	DATE	REVISION



FOR RETTEW ASSOCIATES BY:

MANAGER: ANDREW LEVINE, PE	DESIGN BY: JDN	CHKD BY: ASL	DRAWN BY: JDN	SURV. CHIEF: W/A
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CLIENT

**ANTERO RESOURCES CORPORATION**  
 1615 WYNKOOP STREET  
 DENVER, COLORADO 80202

**RETTEW**

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 Website: www.rettew.com

Engineers • Planners • Surveyors • Landscapers • Architects  
 Environmental Consultants

Office of Oil and Gas  
 DEC 19 2016  
 WV Department of Environmental Protection

OVERALL PLAN  
 WELL PLUGGING PLAN  
 FOR  
**API #47-017-03649**  
**PERKINS #14 WELL**

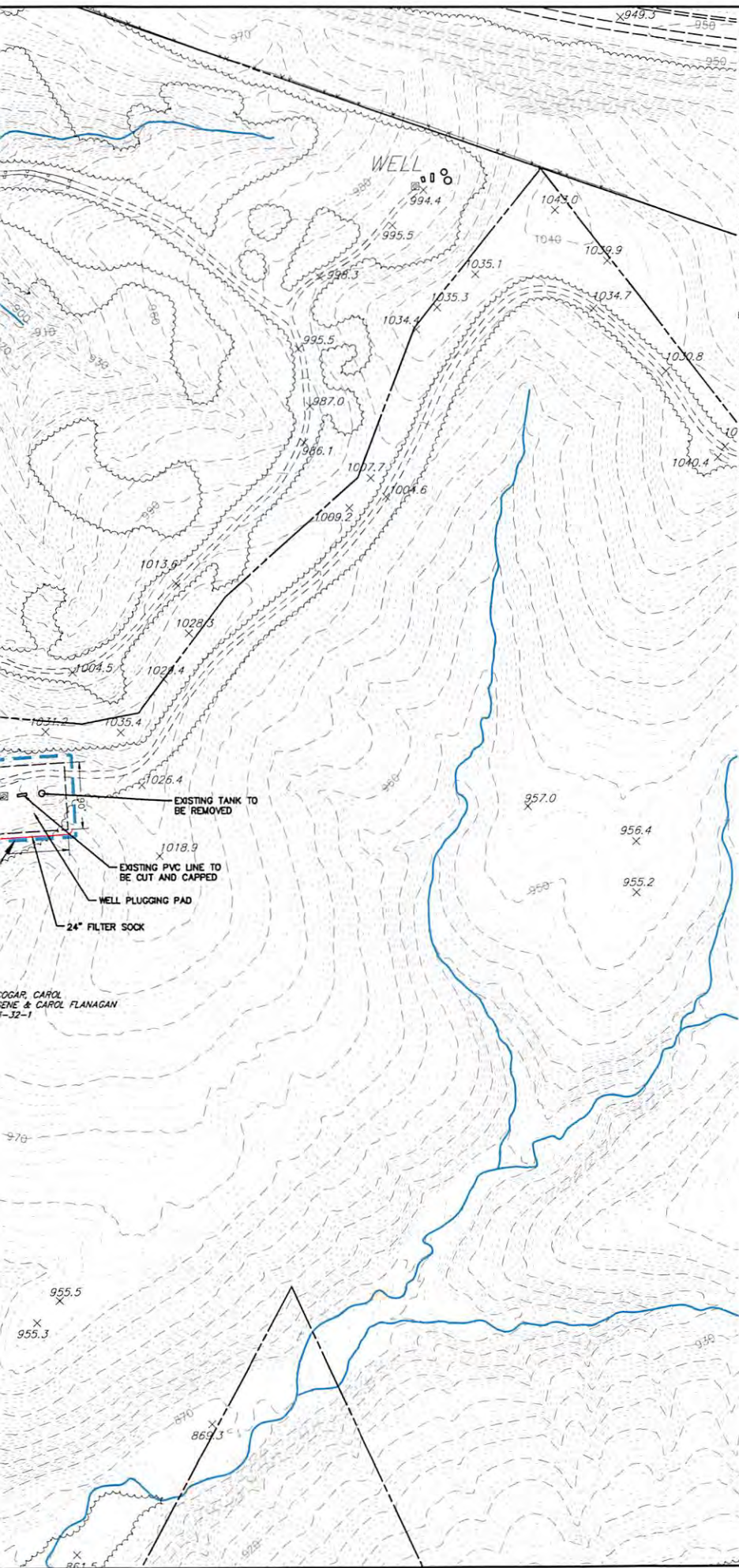
GREENWOOD TAX DISTRICT  
 DODDRIIDGE COUNTY, WV

DATE:	APRIL 29, 2016
SHEET NO.	2 OF 4
DWG. NO.	08646270

NOT FOR CONSTRUCTION/NOT FOR BIDDING

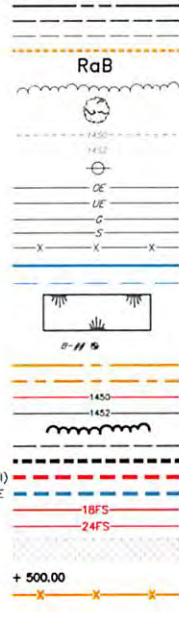


1703649P



**LEGEND**

- EXISTING PROPERTY LINE
- EXISTING PAVEMENT
- EXISTING STONE
- EXISTING SOILS BOUNDARY
- SOIL TYPE DESIGNATION
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- 24" FILTER SOCK
- SLOPE LINING
- PROPOSED SPOT ELEVATION
- PROPOSED CONSTRUCTION FENCE



FOR RETTEW ASSOCIATES BY:

MANAGER: ANDREW LEVINE, PE	CHKD BY: JDN	ASL	CHKD BY: JDN	ASL	SURV. CHIEF: FREDBOOK NO.	N/A
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CLIENT

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FOR  
E&S PLAN  
WELL PLUGGING PLAN  
API #47-017-03649  
PERKINS #14 WELL  
GREENWOOD TAX DISTRICT DODDRIDGE COUNTY, WV

DATE:	APRIL 29, 2016
SHEET NO.	3 OF 4
DWG. NO.	09542270

**TABLE IV-3  
TEMPORARY COVER SUITABLE FOR ESTABLISHMENT IN WEST VIRGINIA**

CROP	RATES IN LBS PER ACRE	OPTIMUM SEEDING DATES	DRAINAGE	pH RANGE
GRASS	40	3/1-6/15 OR 8/15-9/15	WELL-POORLY	5.5-7.5
GRASS	40	3/1-6/15 OR 8/15-9/15	WELL -MOD. WELL	6.0-7.0
GRASS	96	3/1-6/15	WELL-POORLY	5.5-7.0
GRASS	40	5/15-8/15	WELL-POORLY	5.5-7.5
RYE	168	8/15-10/15	WELL-POORLY	5.5-7.5
WHEAT	180	8/15-11/15	WELL -MOD. WELL	5.5-7.0
MILLET	30	6/15-8/15	WELL	4.5-7.0
SP	5	3/1-6/15	WELL	4.0-7.5
GRASS	26	3/1-6/15	WELL-POORLY	5.5-7.5
GRASS	64	3/1-6/15	WELL-POORLY	5.5-7.5

RATES SHOULD BE INCREASED BY 50% IF PLANTED APRIL 15 - AND OCTOBER 1 - MARCH 1.

**TABLE IV-4a  
PERMANENT SEEDING MIXTURES SUITABLE FOR ESTABLISHMENT IN WEST VIRGINIA**

CROP	RATES IN LBS PER ACRE	DRAINAGE	pH RANGE
GRASS/ALFALFA	10-15 30	WELL -MOD. WELL	5.0-7.5
GRASS/ALFALFA	10-15 20	WELL -MOD. WELL	5.0-7.5
OR PEA/CUCU	20 15	WELL -MOD. WELL	4.0-8.0
OVER/PEDEZA/CUCU	30 25 2	WELL -MOD. WELL	4.5-7.5
CUCU/OVER/	40 30 3	WELL -MOD. WELL	5.0-7.5
GRASS/ALFALFA	10 20 3	WELL -MOD. WELL	5.0-7.5
CUCU/REFOIL/	40 10 3	WELL -MOD. WELL	5.0-7.5
PEDEZA/CUCU/	25 30 3	WELL -MOD. WELL	4.5-7.5
GRASS/ALFALFA	30 3 50	WELL -MOD. WELL	5.0-7.5
CUCU/RED	50	WELL -POORLY	4.5-7.5
GRASS/ALFALFA	10 15 20	WELL-POORLY	5.0-8.0

**TABLE IV-4b  
PERMANENT SEEDING MIXTURES SUITABLE FOR ESTABLISHMENT IN WEST VIRGINIA (WILDLIFE & FARM FRIENDLY)**

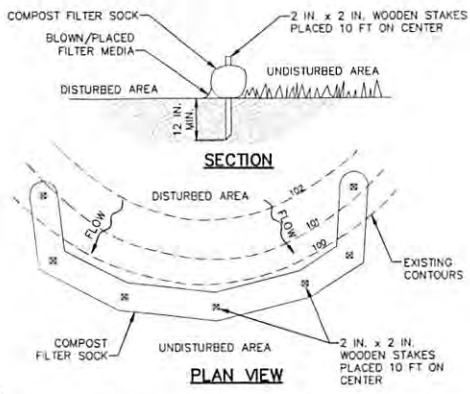
CROP	RATES IN LBS PER ACRE	DRAINAGE	pH RANGE
GRASS/ALFALFA/SP/LOVER OR TREFOIL	20 3 2/10	WELL -MOD. WELL	5.5-7.5
GRASS/ALFALFA/TREFOIL	5 12	WELL -MOD. WELL	6.5-8.0
GRASS/ALFALFA/TREFOIL	5 8	WELL -POORLY	5.5-7.5
GRASS/ALFALFA/LOVER/SP	10 2 3	WELL -MOD. WELL	5.5-7.5
GRASS/ALFALFA/LOVER	10 2	WELL -MOD. WELL	5.5-7.5
GRASS/ALFALFA/ASS	20 10	WELL -MOD. WELL	5.0-7.5
GRASS/ALFALFA/RED/RYEGRASS	30 10	WELL -MOD. WELL	5.0-7.5
GRASS OR GRASS	20	WELL -MOD. WELL	6.0-7.5
GRASS/TREFOIL/SP/GRASS	10 5 20	WELL -MOD. WELL	5.5-7.5
GRASS/AT PEA/RYEGRASS	30 20	WELL -MOD. WELL	5.5-7.5
GRASS/AT PEA/GRASS	30 20	WELL -MOD. WELL	5.5-7.5

**TABLE IV-5  
LIME AND FERTILIZER APPLICATION TABLE**

LIME IN TONS PER ACRE	FERTILIZER, LBS., PER ACRE 10-20-20 OR EQUIVALENT
2	500
3	500
4	500

**TABLE IV-6  
MULCH MATERIALS RATES AND USES**

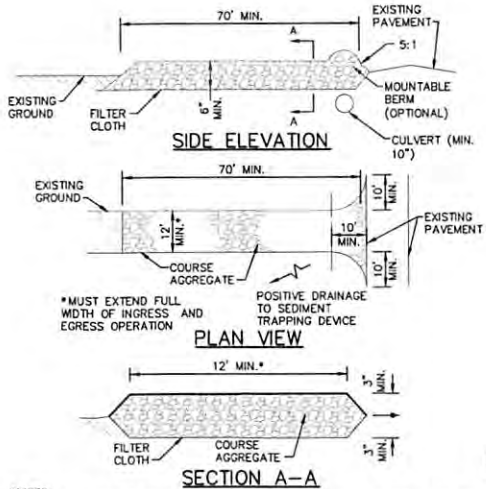
MATERIAL	MINIMUM RATES PER ACRE	COVERAGE	REMARKS
HAY OR STRAW	2 TO 3 TONS 100 TO 150 BALES	COVER 75 TO 90% OF SURFACE	SUBJECT TO WIND BLOWING OR WASHING UNLESS TIED DOWN
WOOD FIBER PULP FIBER WOOD-CELLULOSE RECIRCULATED PAPER	1000 TO 1500 lbs.	COVER ALL DISTURBED AREAS	FOR HYDROSEEDING



**NOTES:**  
 SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.  
 COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA.  
 TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.  
 ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.  
 COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.  
 BIODEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.  
 UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

**COMPOST FILTER SOCK**

NOT TO SCALE



**NOTES:**  
 1. USE 2-4" STONE FOR LOW VOLUME ENTRANCES, LARGER STONE (4-6") FOR HEAVY USE OR MATERIAL DELIVERY ENTRANCES.  
 2. LENGTH IS AS REQUIRED, BUT NOT LESS THAN 70' (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30' MIN. LENGTH WOULD APPLY).  
 3. THICKNESS SHOULD BE NOT LESS THAN 6".  
 4. THE WIDTH SHALL BE A MIN. OF 10', BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS AND EGRESS OCCURS.  
 5. GEOTEXTILE FABRIC SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.  
 6. ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE, IF A CULVERT IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES SHALL BE USED.  
 7. IF NECESSARY, DIVERT ANY WATER RUNNING DOWN ACCESS ROAD TO A SEDIMENT TRAP LOCATED ON EITHER SIDE OF THE STABILIZED CONSTRUCTION ENTRANCE.

**STABILIZED CONSTRUCTION ENTRANCE**

NOT TO SCALE

FOR REVIEW ASSOCIATES BY:

MANAGER: ANDREW LEVINE, PE  
 DESIGN BY: JDN  
 CHECK BY: ASL  
 DRAWN BY: JDN  
 CHECK BY: ASL  
 SURV. CHIEF: W/A  
 FIELDBOOK NO: N/A

CLIENT

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 1615 WYNKOOP STREET  
 DENVER, COLORADO 80202

**RETIEW**

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 Environmental Consultants

NOTES AND DETAILS  
 WELL PLUGGING PLAN

API # 47-017-03649  
 PERKINS #14 WELL

GREENWOOD TAX DISTRICT  
 DODDRIIDGE COUNTY, WV

DATE: APRIL 29, 2016

SHEET NO. 4 OF 4

DWG. NO. 1703649P-04

12/29/2016

**REVEGETATION SPECIFICATIONS:**

**TEMPORARY SEEDING**

**a. GENERAL CONDITIONS WHERE PRACTICE APPLIES:**

WHERE EXPOSED SOIL SURFACES ARE NOT TO BE FINE-GRADED OR WORKED FOR PERIODS LONGER THAN 21 DAYS. TEMPORARY VEGETATIVE COVER WITH SEDIMENT CONTROLS MUST BE ESTABLISHED WHERE RUNOFF WILL GO DIRECTLY INTO A STREAM. IMMEDIATELY UPON CONSTRUCTION OF THE SITE (SITE INCLUDES ROAD AND LOCATION), VEGETATION MUST BE ESTABLISHED ON ROAD BANK AND LOCATION SLOPES. A PERMANENT VEGETATIVE COVER SHALL BE APPLIED TO AREAS THAT WILL BE LEFT UNWORKED FOR A PERIOD OF MORE THAN 6 MONTHS.

**b. SEED MIXTURES AND PLANTING DATES:**

REFER TO TABLES 2-4 FOR RECOMMENDED DATES TO ESTABLISH VEGETATIVE COVER AND THE APPROVED LISTS OF TEMPORARY AND PERMANENT PLANT SPECIES, AND PLANTING RATES. TABLE 3 GIVES RECOMMENDED TYPES OF TEMPORARY VEGETATION, RATES OF APPLICATION, AND OPTIMUM SEEDING DATES. IN SITUATIONS WHERE ANOTHER COVER IS DESIRED CONTACT THE LOCAL SOIL CONSERVATION DISTRICT FOR SEEDING RECOMMENDATIONS.

**c. SEED APPLICATION:**

APPLY SEED BY BROADCASTING, DRILLING, OR BY HYDROSEEDING ACCORDING TO THE RATES INDICATED IN TABLE IV-3. PERFORM ALL PLANTING OPERATIONS AT RIGHT ANGLES TO THE SLOPE. NECESSARY SITE PREPARATION, ROUGHENING OF THE SOIL SURFACE, SHOULD BE DONE JUST PRIOR TO SEEDING. SEEDBED PREPARATION MAY NOT BE REQUIRED ON NEWLY DISTURBED AREAS.

**PERMANENT SEEDING**

**a. GENERAL:**

PERMANENT VEGETATIVE COVER WILL BE ESTABLISHED WHERE NO FURTHER SOIL DISTURBANCE IS ANTICIPATED OR NEEDED. SOIL FERTILITY AND pH LEVEL SHOULD BE TESTED AND ADJUSTED ACCORDING TO SEED SPECIES PLANTED. PLANTING OF PERMANENT VEGETATIVE COVERS MUST BE PERFORMED ON ALL DISTURBED AREAS AFTER THE COMPLETION OF THE DRILLING PROCESS. ANY SITE THAT CONTAINS SIGNIFICANT AMOUNTS OF TOPSOIL SHALL HAVE THE TOPSOIL REMOVED AND STOCKPILED WHEN FEASIBLE. TOPSOIL SHOULD NOT BE ADDED TO SLOPE STEEPER THAN 2:1 UNLESS A GOOD BONDING TO THE SUB-LAYER CAN BE ACHIEVED. AFTER PROPER GRADING AND SEEDBED PREPARATION, THE VEGETATION WILL REESTABLISH GROUND COVER FOR THE CONTROL OF SURFACE WATER RUNOFF AND EROSION.

ALL REQUIRED SEEDBED PREPARATION, LOOSENING OF SOIL BY DISKING OR DOZER TRACKING, SHOULD BE PERFORMED JUST PRIOR TO SEEDING. IF SEEDBED PREPARATION IS NOT FEASIBLE, 50% MORE SEED SHALL BE ADDED TO THE RECOMMENDED RATES SHOWN IN TABLES IV 3-4.

WHEN HYDROSEEDING, SEEDBED PREPARATION MAY NOT BE NECESSARY IF ADEQUATE SITE PREPARATION WAS PERFORMED. INCORPORATE THE APPROPRIATE AMOUNT OF LIME AND/OR FERTILIZER IN THE SLURRY MIX WHEN HYDROSEEDING.

WHEN HYDROSEEDING, FIRST MIX THE LIME, FERTILIZER, AND HYDRO-MULCH IN THE RECOMMENDED AMOUNT OF WATER. MIX THE SEED AND INOCULATE TOGETHER WITHIN ONE HOUR PRIOR TO PLANTING, AND ADD TO THE SLURRY MIX BEFORE SEEDING. APPLY THE SLURRY UNIFORMLY OVER THE PREPARED SITE. ASSURE THAT AGITATION IS CONTINUOUS THROUGHOUT THE SEEDING OPERATION AND THAT THE MIX IS APPLIED WITHIN ONE HOUR OF INITIAL MIXING.

**b. LIME AND FERTILIZER:**

- LIME SHALL BE APPLIED TO ALL PERMANENT SEEDINGS. THE pH OF THE SOIL IS TO BE DETERMINED AND LIME APPLIED ACCORDINGLY. ONCE THE pH IS KNOWN, SELECT THE AMOUNT OF LIME TO BE APPLIED FROM TABLE IV-5.
- FERTILIZER SHALL BE APPLIED IN ALL PERMANENT SEEDINGS. APPLY THE EQUIVALENT OF 500 LBS. MINIMUM 10-20-20 FERTILIZER PER ACRE OR USE THE AMOUNT OF FERTILIZER AND LIME RECOMMENDED BY A CERTIFIED SOIL TEST.
- APPLICATION: FOR BEST RESULTS AND MAXIMUM BENEFITS THE LIME AND FERTILIZER ARE TO BE APPLIED AT THE TIME OF SEEDBED PREPARATION.

**c. PERMANENT SEED MIXTURES:**

PLANNERS SHOULD TAKE INTO CONSIDERATION THE SPECIES MAKEUP OF THE EXISTING PASTURE AND THE LANDOWNER'S FUTURE PASTURE MANAGEMENT PLANS WHEN RECOMMENDING SEED MIXTURES. SELECTION FROM TABLES IV 4A AND B. PERMANENT SEEDING MIXTURES SUITABLE FOR ESTABLISHMENT IN WEST VIRGINIA.

- ALL LEGUMES MUST BE PLANTED WITH THE PROPER INOCULANT PRIOR TO SEEDING.
- 'LATHCO' FLATPEA IS POTENTIALLY POISONOUS TO SOME LIVESTOCK.
- ONLY ENDOPHYTE FREE VARIETIES OF TALL FESCUE SHOULD BE USED. TALL FESCUE AND CROWNVEITCH ARE ALSO A VERY INVASIVE SPECIES NON-NATIVE TO WV.
- FOR UNPREPARED SEEDBEDS OR SEEDING OUTSIDE THE OPTIMUM TIMEFRAMES, ADD 50% MORE SEED TO THE SPECIFIED RATE. MIXTURES IN TABLE 4B ARE MORE WILDLIFE AND FARM FRIENDLY; THOSE LISTED IN BOLD ARE SUITABLE FOR USE IN SHADED WOODLAND SETTINGS. MIXTURES IN ITALICS ARE SUITABLE FOR USE IN FILTER STRIPS.

**d. SEEDING FOR WILDLIFE HABITAT:**

CONSIDER THE USE OF NATIVE PLANTS OR LOCALLY ADAPTED PLANTS WHEN SELECTING COVER TYPES AND SPECIES FOR WILDLIFE HABITAT. WILDLIFE FRIENDLY SPECIES OR MIXES THAT HAVE MULTIPLE VALUES SHOULD BE CONSIDERED. SEE WILDLIFE FRIENDLY SPECIES/MIXTURES IN TABLE IV-4B. CONSIDER SELECTING NO OR LOW MAINTENANCE LONG-LIVED PLANTS ADAPTABLE TO SITES WHICH MAY BE DIFFICULT TO MAINTAIN WITH EQUIPMENT.

**MULCHING**

**a. GENERAL ORGANIC MULCHES**

THE APPLICATION OF STRAW, HAY OR OTHER SUITABLE MATERIALS TO THE SOIL SURFACE TO PREVENT EROSION, STRAW MADE FROM WHEAT OR OATS IS THE PREFERRED MULCH, THE USE OF HAY IS PERMISSIBLE, BUT NOT ENCOURAGED DUE TO THE RISK OF SPREADING INVASIVE SPECIES. MULCH MUST BE APPLIED TO ALL TEMPORARY AND PERMANENT SEEDING ON ALL DISTURBED AREAS, DEPENDING ON SITE CONDITIONS. IN CRITICAL AREAS SUCH AS WATERWAYS, OR STEEP SLOPES, ADDITIONAL OR SUBSTITUTE SOIL PROTECTIVE MEASURES MAY BE USED IF DEEMED NECESSARY. EXAMPLES INCLUDE JUTE MESH, AND SOIL STABILIZATION BLANKETS OR EROSION CONTROL MATTING.

AREAS THAT HAVE BEEN TEMPORARILY OR PERMANENTLY SEEDING SHOULD BE MULCHED IMMEDIATELY FOLLOWING SEEDING. MULCHES CONSERVE DESIRABLE SOIL PROPERTIES, REDUCE SOIL MOISTURE LOSS, PREVENT CRUSTING AND SEALING OF THE SOIL SURFACE AND PROVIDE A SUITABLE MICROCLIMATE FOR SEED GERMINATION.

AREAS THAT CANNOT BE SEEDING BECAUSE OF THE SEASON SHOULD BE MULCHED TO PROVIDE SOME PROTECTION TO THE SOIL SURFACE. AN ORGANIC MULCH, STRAW OR HAY, SHOULD BE USED AND THE AREA THEN SEEDING AS SOON AS WEATHER OR SEASONAL CONDITIONS PERMIT. DO NOT USE FIBER MULCH (CELLULOSE-HYDROSEED) ALONE FOR THIS PRACTICE; AT NORMAL APPLICATION RATES IT WILL NOT GIVE THE SOIL PROTECTION OF OTHER TYPES OF MULCH.

WOOD CELLULOSE FIBER MULCH, IS USED IN HYDROSEEDING OPERATIONS AND APPLIED AS PART OF THE SLURRY, IT CREATES THE BEST SEED-SOIL CONTACT WHEN APPLIED OVER TOP OF (AS A SEPARATE OPERATION) NEWLY SEEDING AREAS. FIBER MULCH DOES NOT ALONE PROVIDE SUFFICIENT PROTECTION ON HIGHLY ERODIBLE SOILS, OR DURING LESS THAN FAVORABLE GROWING CONDITIONS. FIBER MULCH SHOULD NOT BE USED ALONE DURING THE DRY SUMMER MONTHS OR WHEN USED FOR LATE FALL MULCH COVER. USE STRAW MULCH DURING THESE PERIODS, AND FIBER MULCH MAY BE USED TO TACK (ANCHOR) THE STRAW MULCH. FIBER MULCH IS WELL SUITED FOR STEEP SLOPES, CRITICAL AREAS, AND AREAS SUSCEPTIBLE TO WIND.

**b. CHEMICAL MULCHES, SOIL BINDERS AND TACKIFIERS:**

A WIDE RANGE OF SYNTHETIC, SPRAY-ON MATERIALS ARE MARKETED TO STABILIZE AND PROTECT THE SOIL SURFACE. THESE ARE MIXED WITH WATER AND SPRAYED OVER THE MULCH AND TO THE SOIL. THEY MUST BE USED ALONE IN SOME CASES AS TEMPORARY STABILIZERS, OR IN CONJUNCTION WITH FIBER MULCH, STRAW OR HAY.

WHEN USED ALONE MOST CHEMICAL MULCHES DO NOT HAVE THE CAPABILITY TO INSULATE THE SOIL OR RETAIN SOIL MOISTURE THAT ORGANIC MULCHES HAVE.

**c. SPECIFICATIONS:**

FROM TABLE IV-6 SELECT THE TYPE OF MULCH AND RATE OF APPLICATION THAT WILL BEST SUIT THE CONDITIONS AT THE SITE.

**d. ANCHORING:**

DEPENDING ON THE FIELD SITUATION, MULCH MAY NOT STAY IN PLACE BECAUSE OF WIND ACTION OR RAPID WATER RUNOFF. IN SUCH CASES, MULCH IS TO BE ANCHORED MECHANICALLY OR WITH MULCH NETTING.

- MECHANICAL ANCHORING: APPLY MULCH AND PULL A MULCH ANCHORING TOOL OVER THE MULCH. WHEN A DISK IS USED, SET THE DISK STRAIGHT AND PULL ACROSS THE SLOPE. MULCH MATERIAL SHOULD BE TUCKED INTO THE SOIL ABOUT THREE INCHES.
- MULCH NETTING: FOLLOW MANUFACTURER'S RECOMMENDATIONS WHEN POSITIONING AND STAPLING THE MULCH NETTING IN THE SOIL.

**NOTE:**

- NO FESCUE OR TIMOTHY GRASS SHALL BE USED

**EROSION AND SEDIMENTATION CONTROL NOTES**

EROSION AND SEDIMENTATION CONTROL MEASURES SHALL BE IMPLEMENTED DURING THE CONSTRUCTION AND POST-CONSTRUCTION PERIOD TO PREVENT SOIL EROSION, SEDIMENTATION, AND OTHER POLLUTANTS FROM ENTERING STREAMS, NEIGHBORING PROPERTY, ROADS, ETC. THESE MEASURES INCLUDE FILTER SOCKS, TOPSOIL STOCKPILES, ROCK CONSTRUCTION ENTRANCE, ETC. AS SHOWN ON THE DRAWINGS.

THE CONTRACTOR WILL BE REQUIRED TO INCORPORATE ALL APPLICABLE EROSION AND SEDIMENTATION CONTROL FEATURES INTO THE PROJECT AT THE EARLIEST PRACTICAL TIME.

**TEMPORARY EROSION CONTROL MEASURES**

- TEMPORARY VEGETATION SHALL BE ESTABLISHED ON ALL SLOPES, ON STOCKPILED TOPSOIL, AND ON ALL DISTURBED AREAS LEFT UNSTABILIZED, OR DISCONTINUED EARTHMOVING ACTIVITY, WILL BE STABILIZED WITHIN 21 DAYS.
- DURING CONSTRUCTION, THE AMOUNT OF DISTURBED SOILS SHALL BE KEPT TO A MINIMUM AND, WHENEVER POSSIBLE, A SUITABLE VEGETATIVE BUFFER WILL BE MAINTAINED AROUND ALL CONSTRUCTION AREAS.
- ALL EARTHMOVING ACTIVITIES SHALL BE CARRIED OUT IN SUCH A MANNER AS TO MINIMIZE THE AMOUNT OF DISTURBED AREA.
- ALL SOIL STOCKPILES ARE TO BE SEEDING WITH A TEMPORARY GRASS COVER WITHIN 21 DAYS.
- UPON GENERAL COMPLETION OF THE FINAL GRADING, TOPSOIL SHALL BE PLACED AND FINAL-GRADING PASSES SHALL BE MADE PARALLEL TO THE DIRECTION OF RUNOFF.
- RE-SEED AND REESTABLISH ANY BARREN AND DISTURBED AREAS NOT HAVING ESTABLISHED GROUND COVER.
- SILT SOCK SHALL BE PLACED AT CRITICAL EROSION AREAS, AS SHOWN ON THE PLAN, IN ORDER TO PREVENT SEDIMENT FROM ENTERING INTO ADJACENT PROPERTIES, ROADWAY AND WATERWAYS.
- SILT SOCK SHALL BE INSTALLED AND MAINTAINED PER THE SUPPLIER'S INSTRUCTIONS.
- WHERE DUST OR WIND EROSION IS A PROBLEM, THE UNSTABLE SURFACE(S) SHALL BE SPRINKLED WITH WATER OR OTHER SUITABLE DUST SUPPRESSOR; HOWEVER, WASHING OF ROADWAYS IS NOT PERMITTED.
- ANY WATER PUMPED FROM ANY EXCAVATION, FOR ANY REASON, SHALL BE DIRECTED THROUGH A SEDIMENT FILTER BAG (DIRT BAG).
- THE CONTRACTOR SHALL EMPLOY MEASURES DURING CONSTRUCTION TO PREVENT SPILLS OF FUELS OR LUBRICANTS. IF A SPILL OCCURS, IT SHALL BE CONTROLLED IMMEDIATELY TO PREVENT ITS ENTRY INTO NEARBY WATERWAYS. OWNER SHALL BE NOTIFIED IMMEDIATELY IF ANY SPILLS OCCUR.

**CONSTRUCTION SEQUENCE**

DESCRIBED BELOW ARE THE MAJOR CONSTRUCTION ACTIVITIES THAT ARE THE SUBJECT OF THE EROSION AND SEDIMENTATION POLLUTION CONTROL PLAN. THEY ARE PRESENTED IN THE ORDER (OR SEQUENCE) THAT THEY ARE EXPECTED TO BEGIN, BUT EACH ACTIVITY WILL NOT NECESSARILY BE COMPLETED BEFORE THE NEXT BEGINS. ALSO, THESE ACTIVITIES COULD OCCUR IN A DIFFERENT ORDER IF NECESSARY TO MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROL. THE OWNER OR ENGINEER MUST APPROVE DEVIATIONS FROM THE APPROVED PLAN AND CONSTRUCTION SEQUENCE.

A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES.

AT LEAST 48 HOURS BEFORE STARTING ANY EARTH DISTURBANCE ACTIVITY, ALL CONTRACTORS INVOLVED IN THOSE ACTIVITIES SHALL NOTIFY MISS UTILITY OF WEST VIRGINIA AT 1-800-245-4848 FOR LOCATION OF EXISTING UNDERGROUND UTILITIES.

ALL EARTH DISTURBANCE ACTIVITIES ARE EXPECTED TO PROCEED IN ACCORDANCE WITH THE FOLLOWING SEQUENCE. SPECIFIC SITE RESTRICTIONS MAY NECESSITATE THE ACTIVITIES PROCEEDING IN A DIFFERENT ORDER TO MAINTAIN ADEQUATE EROSION AND SEDIMENT CONTROL.

- INSTALL CONSTRUCTION ENTRANCE.
- INSTALL SILT BARRIERS.
- REMOVE EXISTING EQUIPMENT AS SHOWN.
- PLACE TOPSOIL.
- STABILIZE SOIL AND INSTALL PERMANENT SEEDING AS SOON AS POSSIBLE.

**SCHEDULE OF MAINTENANCE OF EROSION & SEDIMENTATION CONTROLS**

THE SOIL EROSION AND SEDIMENTATION CONTROLS UTILIZED IN THE DEVELOPMENT OF THIS PLAN SHALL BE MAINTAINED AND REPAIRED IN ORDER TO KEEP THEM IN EFFECTIVE CONDITION UNTIL PERMANENT STABILIZATION OCCURS. THE CONTRACTOR SHALL PERFORM CERTAIN PERIODIC DUTIES IN ORDER TO ASSURE PROPER FUNCTION. MAINTENANCE OF THE CONTROLS SHALL INCLUDE, AT A MINIMUM, THE FOLLOWING MAINTENANCE PROCEDURES FOR UTILIZED CONTROLS:

**FILTER SOCK**

- THE FILTER SOCK SHALL BE INSPECTED AFTER EVERY RUNOFF EVENT AND WEEKLY. ANY NECESSARY REPAIRS WILL BE MADE IMMEDIATELY.
- ACCUMULATED SEDIMENT WILL BE REMOVED AS REQUIRED TO KEEP THE FILTER SOCK FUNCTIONAL. IN ALL CASES, REMOVE DEPOSITS WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FILTER SOCK.
- ADHERE TO ANY MANUFACTURER'S RECOMMENDATIONS FOR REPLACING FILTER SOCK.
- ACCUMULATED SEDIMENT REMOVED FROM FILTER SOCKS SHALL BE SPREAD, SEEDING & MULCHED IN AN AREA NOT SUBJECT TO EROSION.

**TABLE IV-1  
RECOMMENDED SEEDING DATES FOR PERMANENT AND TEMPORARY COVER UNLESS OTHERWISE SPECIFIED.**

PLANTING DATES	SUITABILITY
MARCH 1 - APRIL 15 AND AUGUST 1 - OCTOBER 1	BEST SEEDING PERIODS
APRIL 15 - AUGUST 1	HIGH RISK - MOISTURE STRESS LIKELY
OCTOBER 1 - DECEMBER 1	HIGH RISK - FREEZE DAMAGE TO YOUNG SEEDLINGS
DECEMBER 1 - MARCH 1	GOOD SEEDING PERIOD. DORMANT SEEDING.

**TABLE IV-2  
ACCEPTABLE FERTILIZER RECOMMENDATION IN ABSENCE OF SOIL TEST**

SPECIES	N(LBS/AC)	P205(LBS/AC)	K20(LBS/AC)	EXAMPLES REC. (PER ACRE)
COOL SEASON GRASS	40	80	80	400LBS 10-20-20
CS GRASS & LEGUME	30	60	60	300LBS 10-20-20
TEMPORARY COVER	40	40	40	200LBS 19-19-19