February 26, 2014

WELL WORK PERMIT
Horizontal 6A Well

This permit, API Well Number: 47-5101704, issued to CHEVRON APPALACHIA, LLC, 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 all 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 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.

In addition to the applicable requirements of this permit, and the statutes and rules governing oil and gas activity in WV, this permit may contain specific conditions which must be followed. Permit conditions are attached to this cover letter.

Per 35CSR-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) 926-0499 ext. 1654.

Operator's Well No: BERGER 4H
Farm Name: BERGER, GARY & LINDA
API Well Number: 47-5101704
Permit Type: Horizontal 6A Well
Date Issued: 02/26/2014

Promoting a healthy environment.
PERMIT CONDITIONS

West Virginia Code § 22-6A-8(d) 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.

CONDITIONS

1. This proposed activity may require permit coverage from the United States Army Corps of Engineers (USACOE). Through this permit, you are hereby being advised to consult with USACOE regarding this proposed activity.

2. If the operator encounters an unanticipated void, or an anticipated void at an unanticipated depth, the operator shall notify the inspector within 24 hours. Modifications to the casing program may be necessary to comply with W. Va. Code § 22-6A-5a (12), which requires drilling to a minimum depth of thirty feet below the bottom of the void, and installing a minimum of twenty (20) feet of casing. Under no circumstance should the operator drill more than fifty (50) feet below the bottom of the void or install less than twenty (20) feet of casing below the bottom of the void.

3. When compacting fills, each lift before compaction shall not be more than 12 inches in height, and the moisture content of the fill material shall be within limits as determined by the Standard Proctor Density test of the actual soils used in specific engineered fill, ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort, to achieve 95% compaction of the optimum density. Each lift shall be tested for compaction, with a minimum of two tests per lift per acre of fill. All test results shall be maintained on site and available for review.

4. Operator shall install signage per § 22-6A-8g (6) (B) at all source water locations included in their approved water management plan within 24 hours of water management plan activation.

5. Oil and gas water supply wells will be registered with the Office of Oil and Gas and all such wells will be constructed and plugged in accordance with the standards of the Bureau for Public Health established in its Legislative rule entitled Water Well Regulations, 64 C.S.R. 19. Operator is to contact the Bureau of Public Health regarding permit requirements. In lieu of plugging, the operator may transfer the well to the surface owner upon agreement of the parties. All drinking water wells within fifteen hundred feet of the water supply well shall be flow tested by the operator upon request of the drinking well owner prior to operating the water supply well.

6. Pursuant to the requirements pertaining to the sampling of domestic water supply wells/springs the operator shall, no later than thirty (30) days after receipt of analytical data provide a written copy to the Chief and any of the users who may have requested such analyses.

7. If any explosion or other accident causing loss of life or serious personal injury occurs in or about a well or well work on a well, the well operator or its contractor shall give notice, stating the particulars of the explosion or accident, to the oil and gas inspector and the Chief, within 24 hours of said accident.

8. During the casing and cementing process, in the event cement does not return to the surface, the oil and gas inspector shall be notified within 24 hours.
STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS
WELL WORK PERMIT APPLICATION

1) Well Operator: Chevron Appalachia, LLC 49449835
Operator ID 51 Clay County District
49449835

2) Operator's Well Number: 4H Well Pad Name: Berger

3) Elevation, current ground: 1292'
Elevation, proposed post-construction: 1292'

4) Well Type: (a) Gas
(b) Oil
Underground Storage

5) Existing Pad? Yes or No: YES

6) Proposed Target Formation(s), Depth(s), Anticipated Thicknesses and Associated Pressure(s):
MARCELLUS 4249 psi, Utica 9760 psi

7) Proposed Total Vertical Depth: 6,535'

8) Formation at Total Vertical Depth: MARCELLUS

9) Proposed Total Measured Depth: 13,378'

10) Approximate Fresh Water Strata Depths: 165'

11) Method to Determine Fresh Water Depth: Local stream base, offset well data

12) Approximate Saltwater Depths: 2,565'

13) Approximate Coal Seam Depths: 825'

14) Approximate Depth to Possible Void (coal mine, karst, other): None Anticipated

15) Does proposed well location contain coal seams directly overlying or adjacent to an active mine? If so, indicate name and depth of mine: Ireland, 625'

16) Describe proposed well work: Drill 17-1/2" hole to 300' then run and cement 13-3/8" casing to surface covering the fresh water. Drill 12-3/8" hole to 2,665' then run and cement to surface 9 5/8" casing, covering the Berea. Drill 8 1/2" hole to KOP at 6,764'. Drill 8 1/2" curve and lateral to 13,378' MD and 6,535 TVD. Run 5 1/2" production casing and cement back to surface. If a void is encountered: (see attachment)

17) Describe fracturing/stimulating methods in detail:
Complete, 4 of the Marcellus wells utilizing 300,000 lbs of 40/70 and frac'd at 100 bpm.
Complete, 2 of the Marcellus wells utilizing 25,000 lbs 100 mesh, 125,000 lbs 40/70, and 300,000 lbs 30/50 sand meshing totaling 450,000 lbs of sand frac'd at 100 bpm.
Complete, 2 of the Marcellus wells utilizing 75,000 lbs 100 mesh, and 375,000 lbs 30/50 sand meshing totaling 450,000 lbs of sand frac'd at 100 bpm.

18) Total area to be disturbed, including roads, stockpile area, pits, etc, (acres): 23.4 ac.

19) Area to be disturbed for well pad or direct access road (acres): 2.2 ac.

Page 1 of 3
# CASING AND TUBING PROGRAM

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Size</th>
<th>New or Used</th>
<th>Grade</th>
<th>Weight per ft</th>
<th>FOOTAGE: For Drilling</th>
<th>INTERVALS: Left in Well</th>
<th>CEMENT: Fill-up (Cu. Ft.)</th>
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<td>40'</td>
<td>CTS</td>
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<td>Intermediate</td>
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<th>Burst Pressure</th>
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<th>Cement Yield</th>
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<td>Fresh Water</td>
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<td>17-1/2&quot;</td>
<td>0.380&quot;</td>
<td>2,730 psi</td>
<td>Class A</td>
<td>1.18</td>
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<td>Intermediate</td>
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<td>12-1/4&quot;</td>
<td>0.395&quot;</td>
<td>5,750 psi</td>
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<td>8-1/2&quot;</td>
<td>0.361&quot;</td>
<td>12,640 psi</td>
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## PACKERS

- **Kind:** None
- **Sizes:**
- **Depths Set:**

Page 2 of 3

02/28/2014
21) Describe centralizer placement for each casing string.

There will be a bow spring centralizer every two joints on the Water string and Intermediate.

The production string will have two centralizer every joint in the lateral and curve, then one every two joints from KOP to surface.

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

For the Water String the blend will contain class A cement, 3% CaCl2, and flake.

The intermediate will contain class A cement, 10% CaCl2, Salt, and flake.

The Production cement will have a lead, middle, and tail cement.

The lead will contain class A cement, KCl, dispersant, suspension agent, and retarder.

The middle will contain class A cement, KCl, dispersant, Aluminum Silicate, suspension agent, and retarder.

The tail will contain class A cement, Calcium Carbonate, KCl, dispersant, de-foamer, suspension agent, and friction reducer.

23) Proposed borehole conditioning procedures.

Well will be circulated a minimum of 3 bottoms up once casing point has been reached on all hole sections and until uniform mud properties are achieved.

*Note: Attach additional sheets as needed.
Cement Additives Berger Unit 1, 2, 4, 5, 6, 8, 9, 10

For the Water String the blend will contain class A cement, 3% CaCl2, and flake.

The intermediate will contain class A cement, 10% CaCl2, Salt, and flake.

The Production cement will have a lead, middle, and tail cement.

The lead will contain class A cement, KCl, dispersant, suspension agent, and retarder.

The middle will contain class A cement, KCl, dispersant, Aluminum Silicate, suspension agent, and retarder.

The tail will contain class A cement, Calcium Carbonate, KCl, dispersant, de-foamer, suspension agent, and friction reducer.

Cement Additives Berger Unit 3, 7

The Water String the blend will contain class A cement, 3% CaCl2, and flake.

The 1st intermediate will contain class A cement, 10% CaCl2, Salt, and flake.

The 2nd intermediate will have lead and tail cement. The lead will contain class G cement, Poz Mix, Latex, Friction reducer, defoamer, suspension agent, and 1% CaCl2. The Tail will contain class G cement and 1/2% CaCl2.

The production will have a lead and tail cement. The lead will contain Class A cement, KCl, Fluid loss additive, suspension agent, and retarder. The tail will contain Class G cement, Calcium Carbonate, KCl, Fluid loss additive, Suspension Agent, and Retarder.
WW-6B Attachment Berger 2H, 4H, 5H, 6H, 8H, 9H, 10H, / H

If a void is encountered the contingency will be the following:

- If a void is encountered drill 12-1/4" hole to 100' below bottom of void.
- Run 9-5/8", 36 lb/ft, J-55 casing with cement basket 20' above void.
- Cement casing using displacement method to bottom of void using 100 percent excess.
- Grout from surface to cement basket using whatever volume of cement is necessary to get cement to surface.
- Drill 8-3/4" hole to 2665'.
- Run 7", 23 lb/ft, N-80 casing.
- Cement casing to surface using the displacement method with 30% excess.
- Drill 6-1/4" hole to TD.
- Run 4-1/2" 13.5 lb/ft, P-110 casing to TD.
- Cement to surface using displacement method with 10% excess.
### Berger 4H

<table>
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<tr>
<th>Formation</th>
<th>MD</th>
<th>TVD</th>
<th>Inclination</th>
<th>HOLE SIZE</th>
<th>CASING INFO</th>
<th>CEMENT INFO</th>
<th>GENERAL INFO</th>
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<td>Conductor</td>
<td>40'</td>
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<td>Minimum 40 ft from GL or at least 10 ft into bedrock</td>
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**Bow Spring:** 1-shoe jt, 1-every 2nd jt, 1 on ea 2-3 lts across previous shoe, Rigid 2:within 100 ft of surface

<table>
<thead>
<tr>
<th>Depth Details</th>
<th>MD</th>
<th>TVD</th>
<th>Inclination</th>
<th>HOLE SIZE</th>
<th>CASING INFO</th>
<th>CEMENT INFO</th>
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<td>Deepest Aquifer</td>
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**13 5/8' Casing:** 300' to 310'

- **Basket Top Coal:** 780'
- **Deep Coal:** 825'
- **Deepest Coal:** 835'
- **Red Beds:** 1,185'
- **Berea:** 2,565'

---

**17-1/2'** Minimum 35 ft - Optimum 50 ft past deepest coal

- **Intermediate Casing:** 9-5/8' 4/40 N-50 BTC
  - 8.835 ID - 8.678 OD DD
  - Capacity = 6755 bbl/t
  - Annulus = 0597 bbl/t
  - 
  - Duty = 750 psi
  - Collapse = 2600 psi

- **Prod Casing:** 5-1/2', 20# P-110, VAM Top
  - Capacity = 0221 bbl/t
  - 
  - Duty = 12,944 psi
  - Collapse = 11,005 psi
  - ID = 4.73'
  - OD = 4.653'
  - Centralization
  - See Drilling Program
  - 1 Turbolator per joint for 3 joints above and 3 joints below 9-5/8’ shoe

- **Landm Point**: 6,696'
- **Basal Marcellus Omendaga**: 6,658'
- **Marcellus**: 6,663'

---

**5-1/2' Casing**: 13,378’ - 6,658'

- **Landing Point**: 6,696'
- **Basal Marcellus**: 6,663’

---

**3-1/2' Casing**: 13,378’ - 8,128’

- **3-1/2' Casing**: 8,128’
STATE OF WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF OIL AND GAS

FLUIDS/CUTTINGS DISPOSAL & RECLAMATION PLAN

Operator Name: Chevron Appalachia, LLC
OP Code: 4944935

Watershed (HUC 10): Middle Grave Creek - Grave Creek
Quad: Powhatan, OH - WV 7.5

Elevation: 1287.47
County: Marshall
District: Clay

Do you anticipate using more than 5,000 bbls of water to complete the proposed well work? Yes ☑ No

Will a pit be used? Yes ☐ No ☑

If so, please describe anticipated pit waste: N/A

Will a synthetic liner be used in the pit? Yes ☐ No ☑ If so, what ml?

Proposed Disposal Method For Treated Pit Wastes:
- Land Application
- Underground Injection (UIC Permit Number _______)
- Reuse (at API Number _______)
- Off Site Disposal (Supply form WW-9 for disposal location)
- Other (Explain)

Will closed loop system be used? If so, describe: N/A

Drilling medium anticipated for this well (vertical and horizontal)? Air, freshwater, oil based, etc.

- If oil based, what type? Synthetic, petroleum, etc., Highly refined mineral oil based mud

Additives to be used in drilling medium? Emulsifiers, drilling mud, organomarine clay, barite, calcium chloride (for internal phase of latex) glisnata

Drill cuttings disposal method? Leave in pit, landfill, removed offsite, etc. Removed offsite

- If left in pit and plan to solidify what medium will be used? (cement, lime, sawdust) N/A

- Landfill or offsite name/permit number? [ucid][Llandfill permit #: PA DEP 100172]

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: [Signature]
Company Official (Typed Name): Jeremy Hutz
Company Official Title: Permitting Team Lead

Subscribed and sworn before me this 27th day of September 2013.

[Signature]
Notary Public
My commission expires January 12, 2016

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Rodney Lee Potts, Notary Public
Henry Clay Twp., Fayette County
My Commission Expires Jan. 12, 2016

MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

02/28/2014
Form WW-9

Chevron Appalachia, LLC

Operator's Well No. Berger 4H

Proposed Revegetation Treatment: Acres Disturbed 21.2

Prevegetation pH 7

Lime 1 Tons/acre or to correct to pH 6.5-7

Fertilizer type 10-20-20

Fertilizer amount 1000 lbs/acre

Mulch 3 Tons/acre

Seed Mixtures

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<th>Permanent</th>
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<tr>
<td>Seed Type</td>
<td>Seed Type</td>
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<tr>
<td>Annual Ryegrass Mixture 48.4 lbs/acre</td>
<td>Perennial Ryegrass Mixture 435.6 lbs/acre</td>
</tr>
<tr>
<td></td>
<td>Creeping Red Fescue or Chewings Fescue</td>
</tr>
<tr>
<td></td>
<td>Kentucky Bluegrass Mixture</td>
</tr>
</tbody>
</table>

Attach:
Drawing(s) of road, location, pit and proposed area for land application (unless engineered plans including this info have been provided)

Photocopied section of involved 7.5' topographic sheet.

Plan Approved by: [Signature]

Comments:

Field Reviewed? (X) Yes ( ) No
West Virginia Well Site Safety Plan

Berger Site
Well 4H
Marshall County, West Virginia

Prepared in Conformance with:

West Virginia’s Code §22-6A, and Legislative Rules §35-8-3.4 and §35-8-5.7
and
West Virginia Department of Environmental Protection’s, Office of Oil and Gas documents:
“Well Site Safety Plan Standards” (issued August 25, 2011), and
“Deep Well Drilling Procedures and Site Safety Plan Requirements” (issued October 22, 2012)

Original: September 2012
Revised: June 2013
Important:
For each proposed primary water source (including source intakes for purchased water sources) identified in your water management plan, and summarized herein, DEP has made an evaluation concerning water availability over the specified date range. DEP's assessment is based on the following considerations:

- Statistical analysis of historical USGS stream gauge data (transferred to un-gauged locations as necessary);
- Identification of sensitive aquatic life (endangered species, mussels, etc.);
- Quantification of known existing demands on the water supply (Large Quantity Users);
- Minimum flows required by the Army Corps of Engineers; and
- Designated stream uses.

Based on these factors, DEP has provided, for each intake location (and origination point for purchased water), a reference gauge location and discharge flow reading which must be surpassed prior to withdrawals. Additionally, DEP has established a minimum passby flow at the withdrawal location which must also be surpassed prior to withdrawals. These thresholds are considered terms of the permit and are enforceable as such.

DEP is aware that some intake points will be used for multiple wells and well sites. In these cases, the thresholds set by the Water Management Plan are to be interpreted as total withdrawal limits for each location over the specified date range regardless of how many wells are supported by that intake.

For all purchased water intakes, determinations of water availability are made at the original source intake location. It is the responsibility of the Oil and Gas Operator, not the seller, to cease withdrawal of water from the seller when flows are less than the minimum gauge reading at the stream gauge referenced by the Water Management Plan in order to protect stream uses.

Note that the determinations made herein are based on the best available data, but it is impossible to predict water availability in the future. While the DEP has carefully established these minimum withdrawal thresholds, it remains the operator's responsibility to protect aquatic life at all times. Approval to withdrawal is contingent upon permission from the land owner. It is the responsibility of the operator to secure and maintain permission prior to any withdrawals.

The operator is reminded that 24-48 hours prior to withdrawing (or purchasing) water, DEP must be notified by email at DEP.water.use@wv.gov.
## Source Summary

**WMP-01632**  
API Number: 047-051-01704  
Operator: Chevron Appalachia, LLC  
Berger 4H

### Stream/River

- **Source**: Grave Creek @ Cochran-Pearson Withdrawal Site  
  Marshall  
  Owner: Diana Lynn Cochran

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<th>End Date</th>
<th>Total Volume (gal)</th>
<th>Max. daily purchase (gal)</th>
<th>Intake Latitude</th>
<th>Intake Longitude</th>
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- **Regulated Stream?**: Yes  
  Ohio River Min. Flow  
  Ref. Gauge ID: 9999999  
  Ohio River Station: Willow Island Lock & Dam

- **Max. Pump rate (gpm)**: 1,200  
  Min. Gauge Reading (cfs): 6,468.00  
  Min. Passby (cfs)

**DEP Comments**: Refer to the specified station on the National Weather Service's Ohio River forecasts at the following website: [http://www.erh.noaa.gov/ohrfc//flows.shtml](http://www.erh.noaa.gov/ohrfc//flows.shtml)
Source Detail

WMP: 01632  API/ID Number: 047-051-01704  Operator: Chevron Appalachia, LLC

Berger 4H

Source ID: 30445  Source Name: Grave Creek @ Cochran-Pearson Withdrawal Site
Diana Lynn Cochran

HUC-8 Code: 5030106
Drainage Area (sq. mi.): 25000  County: Marshall

☐ Endangered Species?  ✔ Mussel Stream?
☐ Trout Stream?  ☐ Tier 3?
☑ Regulated Stream?  Ohio River Min. Flow
☐ Proximate PSD?
☑ Gauged Stream?

Source Latitude: 39.905103  Source Longitude: -80.757019

Anticipated withdrawal start date: 4/25/2014
Anticipated withdrawal end date: 4/25/2015
Total Volume from Source (gal): 8,000,000

Max. Pump rate (gpm): 1,200
Max. Simultaneous Trucks: 0
Max. Truck pump rate (gpm): 0

Reference Gaug 9999999  Ohio River Station: Willow Island Lock & Dam
Drainage Area (sq. mi.) 25,000.00  Gauge Threshold (cfs): 6468

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<th>Month</th>
<th>Median monthly flow (cfs)</th>
<th>Threshold (+ pump)</th>
<th>Estimated Available water (cfs)</th>
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</tr>
<tr>
<td>12</td>
<td>41,300.00</td>
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</table>

Water Availability Profile

![Graph showing water availability profile](image)

"Threshold", as depicted in the chart above is meant only to indicate the calculated base threshold at the proposed withdrawal location. This value does not include the proposed pump rate or existing demand on the stream. Refer to the monthly breakdown above for a more complete estimation of water availability by month.
Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

• For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

• For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

Purchased Water

Source ID: 30446  Source Name: Southwestern Pennsylvania Water Authority Public Water Provider

Source Lat:  Source Long:  Total Volume from Source (gal): 8,000,000

Max. Daily Purchase (gal): 100,000  Source start date: 4/25/2014  Source end date: 4/25/2015

DEP Comments: Please ensure that purchases from this provider are in accordance with the terms established by PADEP in WMP-279986-5.
Important:

For each proposed secondary water source identified in your water management plan (i.e., groundwater well, lake/reservoir, recycled frac water, multi-site impoundment, out-of-state source), DEP makes no estimation of the availability of water. These sources may prove to be unsuitable water supplies. Please review the following notes:

- For groundwater supply wells, DEP recommends that the operator contact the local health department prior to drilling any new well; and reminds the operator that all drinking water wells within 1,500 feet of a water supply well shall be flow- and quality-tested by the operator at the request of the drinking well owner prior to operation of the water supply well.

- For each proposed multi-site impoundment water source identified in your water management plan (if applicable), DEP will review the withdrawal limits established in the referenced Water Management Plan for current suitability and provide to the operator these limits for each identified intake. Note that withdrawal limits may be modified as necessary based on changing demands upon that water supply.

<table>
<thead>
<tr>
<th>Source ID:</th>
<th>Source Name</th>
<th>Source start date</th>
<th>Source end date</th>
<th>County</th>
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</thead>
<tbody>
<tr>
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<td>Public Water Provider</td>
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<tr>
<td>Source Lat:</td>
<td>Source Long:</td>
<td>Max. Daily Purchase (gal)</td>
<td>Total Volume from Source (gal):</td>
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<td></td>
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<td>8,000,000</td>
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DEP Comments: Please ensure that purchases from this provider are in accordance with the terms established by PADEP in WMP-279986-5.