



west virginia department of environmental protection

Office of Oil and Gas
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Charleston, WV 25304
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Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

April 09, 2014

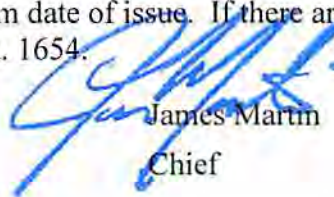
WELL WORK PLUGGING PERMIT

Plugging

This permit, API Well Number: 47-5300423, issued to APPALACHIAN POWER CO DBA AEP, 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.

Upon completion of the plugging well work, the above named operator will reclaim the site according to the provisions of WV Code 22-6-30. The above named operator will also file, as required in WV Code 22-6-23, an affidavit on form WR-38 by two experienced persons in the operator's employment and the Oil and Gas inspector that the work authorized under this permit was performed and a description given. Failure to abide by all statutory and regulatory provisions governing all duties and operations here under may result in suspensions or revocation of this permit and in addition may result in civil and/or criminal penalties being imposed upon the operator.

This permit will expire in two (2) years from date of issue. If there are any questions, please free to contact me at (304) 926-0499 ext. 1654.



James Martin
Chief

Operator's Well No: AEP 1
Farm Name: APPALCHIAN POWER COMPAN'
API Well Number: 47-5300423
Permit Type: Plugging
Date Issued: 04/09/2014

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.

CONDITIONS

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.

5300423P

WW-4B
Rev. 2/01

1) Date _____, 20 13
2) Operator's
Well No. AEP-1
3) API Well No. 47-530 - 0423

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 ____ / Liquid injection ____ / Waste disposal ____ /
(If "Gas, Production ____ or Underground storage ____) Deep X / Shallow ____

5) Location: Elevation 586.7' Watershed Ohio River
District Graham County Mason Quadrangle Graham

6) Well Operator Appalachian Power Company dba 7) Designated Agent Richard D. Thompson
Address American Electric Power Address Rt. 62, PO Box 419
1 Riverside Plaza, Columbus, OH 43215 New Haven, WV 25625-0419

8) Oil and Gas Inspector to be notified 9) Plugging Contractor
Name James Stevens Name Battelle Memorial Institute
Address HC 62, Box 1C Address 505 King Avenue
Kenna, WV 25248 Columbus, OH 43201

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

See attached Plugging summary text, table, and diagram for work order description.

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

Work order approved by inspector _____

OK JMM

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04/11/2014

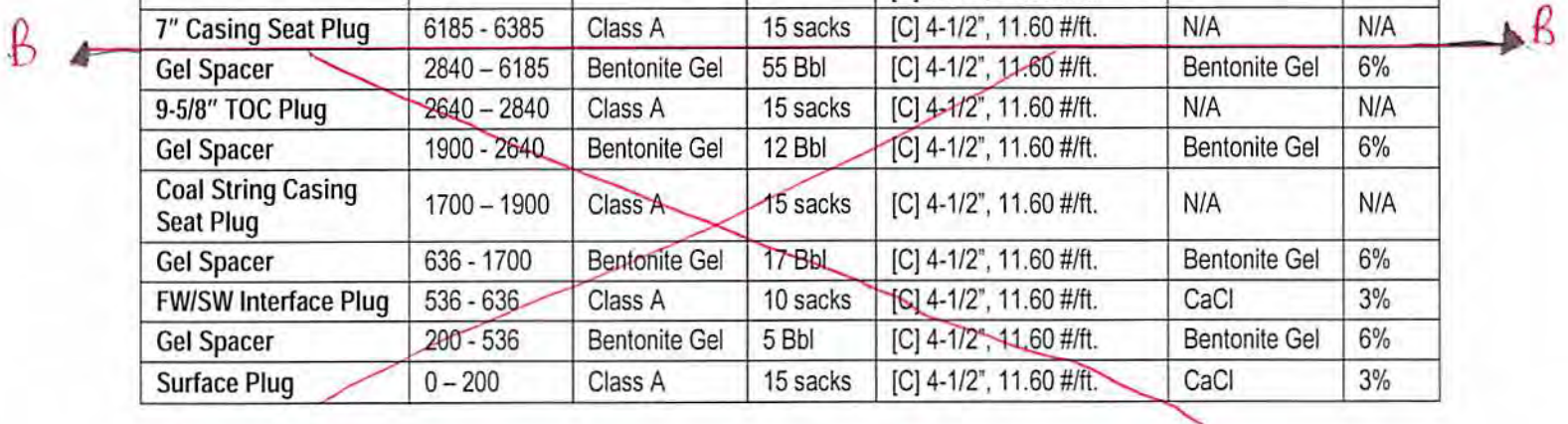
Prior to plugging the AEP-1 well, all equipment such as tubing, packer, gauges and well tree will be removed.

A cement retainer will be set in the 4 ½" casing approximately 50 ft. above the top perforation; the retainer will be set +/- 8,100 ft. The perforations (8,144 to 8,300 ft.) will be squeezed off by pumping 50/50 Pozmix cement through a tubing work string which will be stabbed into the cement retainer. When the squeeze job is complete, the tubing will be pulled out of the cement retainer and the retainer will be closed so that cement cannot come back up hole. A 400 ft. 50/50 Pozmix cement plug will be spotted on top of the retainer from approximately 7,700 ft. to 8,100 ft. The 50/50 pozmix cement blend will be used on these two plugs due to its CO2 corrosion-resistant qualities. A gel spacer will be placed from 6,385 ft. to 7,700 ft. and a Class A cement plug will be spotted across the bottom of the 7" deep intermediate casing string from 6,385 ft. to 6,185 ft. Place gel from 6,185 ft. to 5,040 ft. and set an additional Class A cement plug from 5,040 ft. to 4,840 ft., across the Tuscarora Clinton elevation. Place gel from 4,840 ft. to 2,840 ft. and place a Class A cement plug from 2,840 ft. to 2,640 ft., wait a minimum of 4 hours and check the cement top. If needed add more cement. Trip out of hole with work string and notify Office of Oil and Gas personnel Jeff McLaughlin at 304-206-6769 and Jamie Stevens at 304-206-7775.

Rig up surface equipment to shut in the well to enable measurement of any pressure that may accumulate in the 4 ½" production casing, deep intermediate 7" casing or shallow intermediate 9 5/8" casing. These casing strings need to be shut in for a minimum of twenty-four (24) hours and pressures recorded. Subsequent to this test, the additional plugging procedure will be determined. Please be advised that the goal is zonal isolation with no measureable pressure on any casing string.

The additional procedures could entail washing over production casing so that a portion of it may be cut and removed from the well bore, so as to enable a proper cement plug. Or it could involve an alternative procedure such as removing a section of the 7" and 4 ½" casing simultaneously with a mechanical cutter to allow for a proper cement plug. We will also need to address the disposition of the 9 5/8" casing so as to finalize the plugging work order.

Zone of Interest Description	Depth Interval, ft	Plugging Material		[C]asing / [H]ole Size	Additives	
		Type	Quantity		Type	Grade
AEP-1						
Set Cement Retainer	8100	N/A	N/A	[C] 4-1/2", 18.9 #/ft., Cr13	N/A	N/A
Squeeze Perforations (Perforation Depths)	8100 - 8351 (8144- 8351)	50/50 Pozmix	17 sacks	[C] 4-1/2", 18.9 #/ft., Cr13	Bentonite Gel	2%
Cement Retainer Plug	7700 - 8100	50/50 Pozmix	24 sacks	[C] 4-1/2", 18.9 #/ft., Cr13	Bentonite Gel	2%
Gel Spacer	6385 - 7700	Bentonite Gel	25 Bbl	[C] 4-1/2", 18.9 #/ft., Cr13 [C] 4-1/2", 11.60 #/ft.	Bentonite Gel	6%
7" Casing Seat Plug	6185 - 6385	Class A	15 sacks	[C] 4-1/2", 11.60 #/ft.	N/A	N/A
Gel Spacer	2840 - 6185	Bentonite Gel	55 Bbl	[C] 4-1/2", 11.60 #/ft.	Bentonite Gel	6%
9-5/8" TOC Plug	2640 - 2840	Class A	15 sacks	[C] 4-1/2", 11.60 #/ft.	N/A	N/A
Gel Spacer	1900 - 2640	Bentonite Gel	12 Bbl	[C] 4-1/2", 11.60 #/ft.	Bentonite Gel	6%
Coal String Casing Seat Plug	1700 - 1900	Class A	15 sacks	[C] 4-1/2", 11.60 #/ft.	N/A	N/A
Gel Spacer	636 - 1700	Bentonite Gel	17 Bbl	[C] 4-1/2", 11.60 #/ft.	Bentonite Gel	6%
FW/SW Interface Plug	536 - 636	Class A	10 sacks	[C] 4-1/2", 11.60 #/ft.	CaCl	3%
Gel Spacer	200 - 536	Bentonite Gel	5 Bbl	[C] 4-1/2", 11.60 #/ft.	Bentonite Gel	6%
Surface Plug	0 - 200	Class A	15 sacks	[C] 4-1/2", 11.60 #/ft.	CaCl	3%



RECALCULATE BELOW LINE B.

GEL SPACER	5040'-6185'	BENTONITE GEL	18 BBL	4 1/2" 11.6 #/ft	BENTONITE GEL 6%
TUSCANA GAS SHAL	4840' - 5040'	CLASS A	15 SACKS	4 1/2" 11.6 #/ft.	N/A N/A
GEL SPACER	2840' - 4840'	BENTONITE GEL	31 BBL	4 1/2" 11.6 #/ft.	BENTONITE GEL 6%
9 5/8" TOC PLUG	2640' - 2840'	CLASS A	15 SACKS	4 1/2" 11.6 #/ft.	N/A N/A

Form: WW - 2B

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

1) Well Operator Appalachian Power Co Operator ID Mason County Graham District New Haven Quadrangle

2) Operator's Well Number: CO2 1 3) Elevation: 586' +/-

4) Well Type: (a) Oil NA or Gas NA Other - Test Well - Class V UIC
(b) If Gas: Production / Underground Storage
Deep / Shallow

5) Proposed Target Formation(s): pre-f bedrock; basal sandstone (Mt. Simon equiv.)

6) Proposed Total Depth: 9,300 Feet

7) Approximate fresh water strata depths: 80' (Alluvium)

8) Approximate salt water depths: >80' in bedrock

9) Approximate coal seam depths: E1 460' (12h' bags)

10) Does land contain coal seams tributary to active mine? No (Sporn mine is inactive)

11) Describe proposed well work: Install test boring to assess geologic character of deep saline formations


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12) CASING AND TUBING PROGRAM

TYPE	SPECIFICATIONS			FOOTAGE INTERVALS		CEMENT
	Size	Grade	Weight per ft	For Drilling	Left in Well	
Conductor	20"	H40	94	250	250	Stk - 250 375 ft ³
Fresh Water	13 3/8	K55	68	1800	1800	Stk - 1800 1330 ft ³
Coal Int. 1	9 5/8	M65	40	4600	4600	3600 - 4600 310 ft ³
Intermediate 2	7	M65	23	6300	6300	3300 - 6300 460 ft ³
Production	To be installed at a later date - TD = 6300 ft					
Tubing						
Liners						

Packers: Kind
Sizes
Depths Set NA

\$450
CK# 1019636

 5/22/03

State of West Virginia
Department of Environmental Protection
Office of Oil and Gas

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Well Operator's Report of Well Work

Farm name: AEP Mountaineer Plant Operator Well No.: AEP #1

LOCATION: Elevation: 590 ft Quadrangle: New Haven, WV

District: Graham County: Mason
Latitude: 0 Feet South of 39 Deg. 58 Min. 33.97 Sec.
Longitude: 0 Feet West of 81 Deg. 56 Min. 16.72 Sec.

Company: American Electric Power

	Casing & Tubing	Used in drilling	Left in well	Cement fill up Cu. Ft.
Address: <u>U.S. Rte 33, Mountaineer Plant</u>	0'-25'	30" Conduct	25'	54 (to sfc)
<u>New Haven, WV 25265-0419</u>	0'-84'	26" Carbon St	84'	53 (to sfc)
Agent: <u>Chris Long</u>	0'-293'	20", 94#, X-56	293'	316 (to sfc)
Inspector: <u>Larry Parrish</u>	0'-1796'	13 3/8", 68#, J-55	1796'	244(1390 sks) (351 lf)*
Date Permit Issued: <u>05/22/2003</u>	0'-3852'	9 5/8", 40#, L-80	3852'	18 (300 sks) (57 lf)*
Date Well Work Commenced: <u>05/23/2003</u>	0'-6285'	7", 23#, HC-P110	6285'	11 (414 sks) (87 lf)* *from wireline
Date Well Work Completed: <u>08/01/2003</u>				
Verbal Plugging: <u>NA</u>				
Date Permission granted on: <u>NA</u>				
Rotary X Cable Rig (Union 21)				
Total Depth (feet): <u>9082</u>				
Fresh Water Depth (ft.): <u>85 ft +/-</u>				
Salt Water Depth (ft.): <u>>85 ft +/-</u>				
Is coal being mined in area (N/Y)? <u>N</u>				
Coal Depths (ft.): <u>602-607 ft MSL (Also see attached)</u>				

OPEN FLOW DATA

Producing formation None Pay zone depth (ft) NA
 Gas: Initial open flow NA MCF/d Oil: Initial open flow NA Bbl/d
 Final open flow NA MCF/d Final open flow NA Bbl/d
 Time of open flow between initial and final tests NA Hours
 Static rock Pressure NA psig (surface pressure) after NA Hours

Second producing formation NA 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.

Signed: Christopher Long
 By: Christopher Long
 Date: 12/23/03

SUMMARY OF FORMATIONS, LITHOLOGIES,
And NATURAL SHOWS

5300423P

American Electric Power No. 1 AEP (P-47-053-0423)
Graham District, Mason Co., West Virginia

First Run Logging Program

Gamma ray, compensated neutron, compensated density, photo-electric, array induction, caliper

<u>Lithology or Formation</u>	<u>Depth</u>	<u>Notes</u>
Alluvium	0-85	(estimated)
Top bedrock	85	(estimated)
Bedrock	85-243	
	253	<i>cement 253' 94# H-40 20' casing</i>
Sandstone (probable)	243-284	out of gauge hole
Siltstone	284-326	
Siltstone	326-358	out of gauge
Siltstone & shale	346-358	
Siltstone & shale	358-368	out of gauge
Shale & siltstone	368-417	
Coal	417-418	
Shale & siltstone	418-454	
Sandstone	454-468	
Coal	468-471	
Sandstone, shale, & siltstone	471-554	
Coal (probable)	554-557	not substantiated in cuttings
Shale & siltstone	557-602	
Coal (probable)	602-607	not substantiated in cuttings
Shale	607-610	
Sandstone	610-628	220-unit gas show on air, 10-15% porosity
Shale & Siltstone	628-650	
Sandstone	650-692	
Shale & sandstone	692-743	
Coal	743-748	2-unit gas show on air
Shale & limestone	748-782	
Coal	782-786	4-unit gas show on air
Shale	786-812	
Coal	812-815	
Sandstone & siltstone	815-862	
Coal	862-863	
Shale & sandstone	863-906	
Pyrite (possible)	906-908	no unusual mineralogy in cuttings
Shale & siltstone	908-943	
Coal	943-945	
Siltstone & shale	945-983	
Coal	983-985	
Shale & siltstone	985-1073	
Coal	1073-1076	
Shale	1076-1156	
Keener Sandstone	1156-1196	12-15% porosity, water saturated
Shale	1196-1220	
Injun Sandstone	1220-1235	water & 54 units gas, 5-20% porosity
Limestone	1235-1260	change to fluid drilling @ 1242'
Shale & siltstone	1260-1724	
Sunbury (Coffee) shale	1724-1734	
Berea sandstone	1734-1754	220-unit gas show on 8.9 ppg fluid, 13% porosity
Shale	1754-1806	(no red Bedford shale discernable)
	1796	<i>cement 1796' 64# J-55 13 3/8" casing</i>

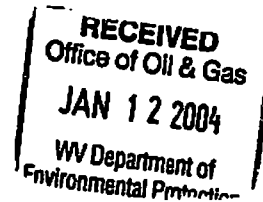
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Second Run Logging Program (cased hole section)

Gamma ray, compensated neutron

<u>Formation/Lithology</u>	<u>StraightHole Depth (1)</u>	<u>Sidetrack Depth (2) (3)</u>	<u>Notes (4)</u>
U & M Huron shale (undiff.)	1760-2670	1754-2822	34 units gas @ 2780'
Lower Huron shale	2670-3180	2822-3188	28 units gas @ 2840'
Upper Olentangy shale	3180-3460	3188-3567	38 units gas @ 2998'
Hanover shale		3188-3471	68 units gas @ 3092'
Pipe Creek shale		3471-3479	18 units gas @ 3270'
Angola shale		3479-3502	
Rhinestreet shale		3502-3567	
Lower Olentangy shale	3460-3567	3567-3608	
Marcellus shale		3567-3608	
Onondaga limestone	3567-	3608-	



- (1) As determined from drillrate and samples in original straight hole
- (2) From measured wireline depths in sidetracked hole. Calculated true vertical depths are provided on page 5
- (3) Original straight hole plugged back from 4296' and sidetracked from 1897'
- (4) Natural shows are correlative to the driller's straight hole depths

Second Run Logging Program (open hole section)

1740-3905: Gamma ray, neutron

3905-6290: Gamma ray, compensated neutron, compensated density, induction, photo-electric, caliper, temperature, acoustic

<u>Lithology or Formation</u>	<u>StraightHole Depth (5)</u>	<u>Sidetrack Depth (7)</u>	<u>Notes</u>
Marcellus shale		3567-3608	
Onondaga limestone	3567-	3608-3765	
Oriskany sandstone	3706-3714	3765-3775	
Helderberg limestone	3714-3770	3775-3940	
		3895	<i>Cement 3895' 40# L-80 9 5/8" casing in sidetracked hole</i>
Salina dolomite	3770-4296(6)	3940-4296	
Newburg sandstone		4296-4306	
Lockport dolomite		4306-4600	
Niagara/Rose Hill shale		4600-4806	
Casing Shell limestone		4806-4813	
Dayton/Packer Shell limestone		4867-4900	
Tuscarora/Clinton sandstone		4942-4962	26 units gas on air
Medina sandstone		5040-5047	4 units gas on air
Queenston shale		5047-5150 (est.)	
Martinsburg Shale		5150 (est.)-	
Trenton limestone			
Total Depth	4296	6290	
		6285	<i>cement 6285' 23# P-110 7" casing in sidetracked hole</i>

- (5) As determined from drillrate and samples in original straight hole
- (6) Straight hole plugged back from 4296'
- (7) From measured wireline depths in sidetracked hole. Calculated true vertical depths are provided on page 5

Third Run Logging Program

Gamma ray, compensated neutron, compensated density, laterlog array and micro-resistivity, photoelectric, caliper, and deviation, with high resolution. Slimhole sonic, elemental capture, and formation micro-imager.

Lithology or Formation	Wireline Depth	Notes
Point Pleasant Shale	6170-6375-	
Trenton limestone	6375-6470	
Black River limestone	6470-6986	
Gull River limestone	6986-7044	
Lower Chazy limestone	7044-7102	
Glenwood/Wells Creek shale	7102-7180	
St. Peter sandstone	7180-7210	
Beekmantown dolomite	7210-7755	320 units gas @ 7330, 290 units @ 7460 (8)
Rose Run sandstone	7755-7871	var. shows to 660 units on fluid (9)
Copper Ridge dolomite	7871-8520	
Nolichucky shale	8520-8624	
Marysville Ls (dolomite)	8624-8912	13 units gas on fluid @ 8720
L. Marysville Ls (dol & ss)	8912-9100	various shows to 40 units on fluid (9)
PreCambrian granite	9100-	
Total depth (driller/logger)	9190/9192	

Conventional Cores (corrected correlation to wireline depth)

- Core 1 – Wells Creek/St. Peter – 7143-7181
- Core 2 – Beekmantown/Rose Run – 7742-7800
- Core 3 – Rose Run/Lower Copper Ridge – 7820-7880
- Core 4 – Marysville/Lower Marysville (transition) – 8894-8952
- Core 5 – Lower Marysville (transition) – 8951-8963
- Core 6 – Lower Marysville (transition and sandstone) – 8963-9005
- Core 7 – Lower Marysville (sandstone) – 9005-9026

Sidewall Core Points

6425 (Trenton), 6825 (Black River), 7025 (Gull River), 7125 (Wells Creek), 7275 & 7700 (Beekmantown), 7821 (Rose Run sand reservoir), 7930 (L Copper Ridge), 8219 & 8250 (possible Beekmantown porosity), 8325 (L Copper Ridge), 8576 (Nolichucky), 8613 (possible Nolichucky porosity), 8675 & 8825 (Marysville), 9032, 9034, 9076, and 9081 (L. Marysville sand reservoir), 9098 (basal L. Marysville), 9125, 9146, & 9175 (PreCambrian)*

* Sidewall cores are generic samplings unless otherwise noted

Fluid Extraction Points (10)

7773 and 7821 (Rose Run sandstone)

- (8) Mudlogger's gas shows are correlated to probable wireline zones and/or depths
- (9) All gas shows were non-sustained, suggesting some combination of overbalanced drilling conditions, low porosity and permeability, or high water saturations.
- (10) Quality of extracted fluid samples is suspect. Extraction attempts in Marysville zones not successful

Summary Of
Points of Interest
American Electric Power No. 1 AEP
Graham Dist., Mason Co., West Virginia

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Depth or Interval	Formation	Note
417-418	Coal	Unidentified coal seam
468-471	Coal	Unidentified coal seam
554-557	Coal (probable)	Not substantiated in cuttings
602-607	Coal (probable)	Not substantiated in cuttings
610-628	Sandstone	220 unit gas show on air, 10-15% porosity
743-748	Coal	Unidentified coal seam, 2 unit gas show on air
782-786	Coal	Unidentified coal seam, 4 unit gas show on air
812-815	Coal	Unidentified coal seam
862-863	Coal	Unidentified coal seam
906-908	Pyrite (poss.)	Not substantiated in cuttings
943-945	Coal	Unidentified coal seam
983-985	Coal	Unidentified coal seam
1073-1076	Coal	Unidentified coal seam
1156-1196	Keener ss.	Water saturated, 12-15% porosity
1220-1235	Injun ss.	Yields high-volume water, 54 units of gas, 5-20% porosity
1734-1754	Berea ss	220 unit gas show on 8.9 ppg fluid, 13% porosity
2780	U & M Huron sh	34 unit gas show
2840	Lower Huron sh	28 unit gas show
2998	Lower Huron sh	38 unit gas show
3092	Lower Huron sh	68 unit gas show, possible fracture zone
3270	U Olentangy sh	18 unit gas show
3765-3775	Oriskany ss	Poor porosity & permeability, yields no fluids or gas
4296-4306	Newburg ss	Poor porosity & permeability, yields no oil, gas, water, or H2S
4898-4900	Dayton ls	Basal hematite marker bed
4942-4962	Tuscarora ss	Four net feet of 5%-porosity sand, 26 unit gas show on air
5040-5047	Medina ss	Two feet of 5%-porosity sand, 4 unit gas show on air
7180-7210	St. Peter ss	Less than 3% average porosity, no permeability
7328-7330	Beekmantown dol	High porosity in dolomite matrix, 320 unit gas show on air over 15 unit background
7382-7418	Beekmantown dol	Probable low-volume source of water that necessitated use of additional soap for drilling
7458-7460	Beekmantown dol	High porosity in dolomite matrix, 340 unit gas show on air over 50 unit background
7586-7587	Beekmantown dol	Bedded pyrite caused drilling difficulties (bit wear and achieving proper hole gauge)
7603-7604		
7755-7871	Rose Run ss	Multiple, short-lived gas shows to 660 units on fluid. Eighteen feet of sand with average porosity of approx. 8% and permeabilities of 4-8 millidarcies. Logs indicate total water saturation
8175-8176	Copper Ridge dol	Extremely high porosity and permeability in dolomite matrix is suspected of making water into the wellbore while drilling on fluid
8218-8219		
8250-8252		
8538-8556	Nolichucky sh	Low-density clay mineralogy gives false impression of porosity. Magnetic resonance indicates no permeability
8604-8622		
9030-9036	L Marysville ss	Four feet of 4-8% porosity & permeabilities to 4 md
9074-9082	L Marysville ss	Four feet of 4-8% porosity & no indicated permeability

BatteDeRun4Highlights.doc

ESTIMATED MAXIMUM LATERAL DEVIATION

5300423P

Operator: American Electric Power
Well: No. 1 AEP (P-046-5300423)
Sect/Lot:
Twp./Co.: Graham District, Mason County

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Depth of Survey	Deviation (Degrees)	Deviation Since Last Survey (In Feet)	Maximum Cumulative Deviation (In Feet)	True Vertical Depth
1900	0.00	0.00	0.00	1900
1959	2.00	2.06	2.06	1959
2021	2.75	2.97	5.03	2021
2083	3.50	3.79	8.82	2083
2145	4.75	5.13	13.95	2145
2201	6.25	6.10	20.05	2200
2301	6.75	11.75	31.80	2300
2394	7.00	11.33	43.14	2392
2454	8.00	8.35	51.49	2451
2527	9.00	11.42	62.91	2523
2766	10.25	42.53	105.44	2759
3100	12.00	69.44	174.88	3085
3609	10.62	93.81	268.68	3586 Onondaga*
3765	7.45	20.23	288.91	3740 Oriskany*
3956	8.00	26.58	315.49	3929
3980	6.00	2.51	318.00	3953
4204	5.00	19.52	337.52	4176
4300	4.50	7.53	345.06	4272
4585	3.00	14.92	359.97	4557 Newburg*
4600	3.00	0.79	360.76	4572 Base Lockport*
4868	2.50	11.69	372.45	4839 Dayton/Packer*
5040	2.13	6.39	378.84	5011 Medina*
5105	2.00	2.27	381.11	5076
6248	0.13	2.59	383.70	6219
6375	0.25	0.55	384.26	6346 Trenton*
6659	1.00	4.96	389.21	6630
6986	1.20	6.85	396.06	6957 Gull River*
7041	1.25	1.20	397.26	7012
7180	1.25	3.03	400.29	7151 St Peter*
7210	1.23	0.64	400.94	7181 Beekmantown*
7755	1.16	11.03	411.97	7726 Rose Run*
7871	1.15	2.33	414.30	7842 Copper Ridge*
8520	1.07	12.12	426.42	8491 Nolichucky*
8912	1.02	6.98	433.40	8883 L Marysville*
9100	1.00	3.28	436.68	9071 PeCambrian

* entry-line is interpolated

4AEPdeviation.xls

William M. Rike Consulting Geologist

04/11/2014

2008

53-00423P

Form: WW - 2B

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

1) Well Operator Appalachian Power Co. Operator ID Mason Graham New Haven
County District Quadrangle

2) Operator's Well Number: AEP 1 3) Elevation: 585 ft +/-

4) Well Type: (a) Oil _____ or Gas _____ **Other: Test Well—Class V**
(b) If Gas: Production _____ / Underground Storage _____
Deep _____ / Shallow _____

5) Proposed Target Formation(s): Rose Run Sandstone/Copper Ridge Dolomite

6) Proposed Total Depth: 8,400 Feet (current TD 9,172, will cement to about 8,400 ft)

7) Approximate fresh water strata depths: <150 ft

8) Approximate salt water depths: > 200 ft

9) Approximate coal seam depths: ~417, 468, 554, 602, 743, 782, 812, 862, 943, 983, 1073 ft

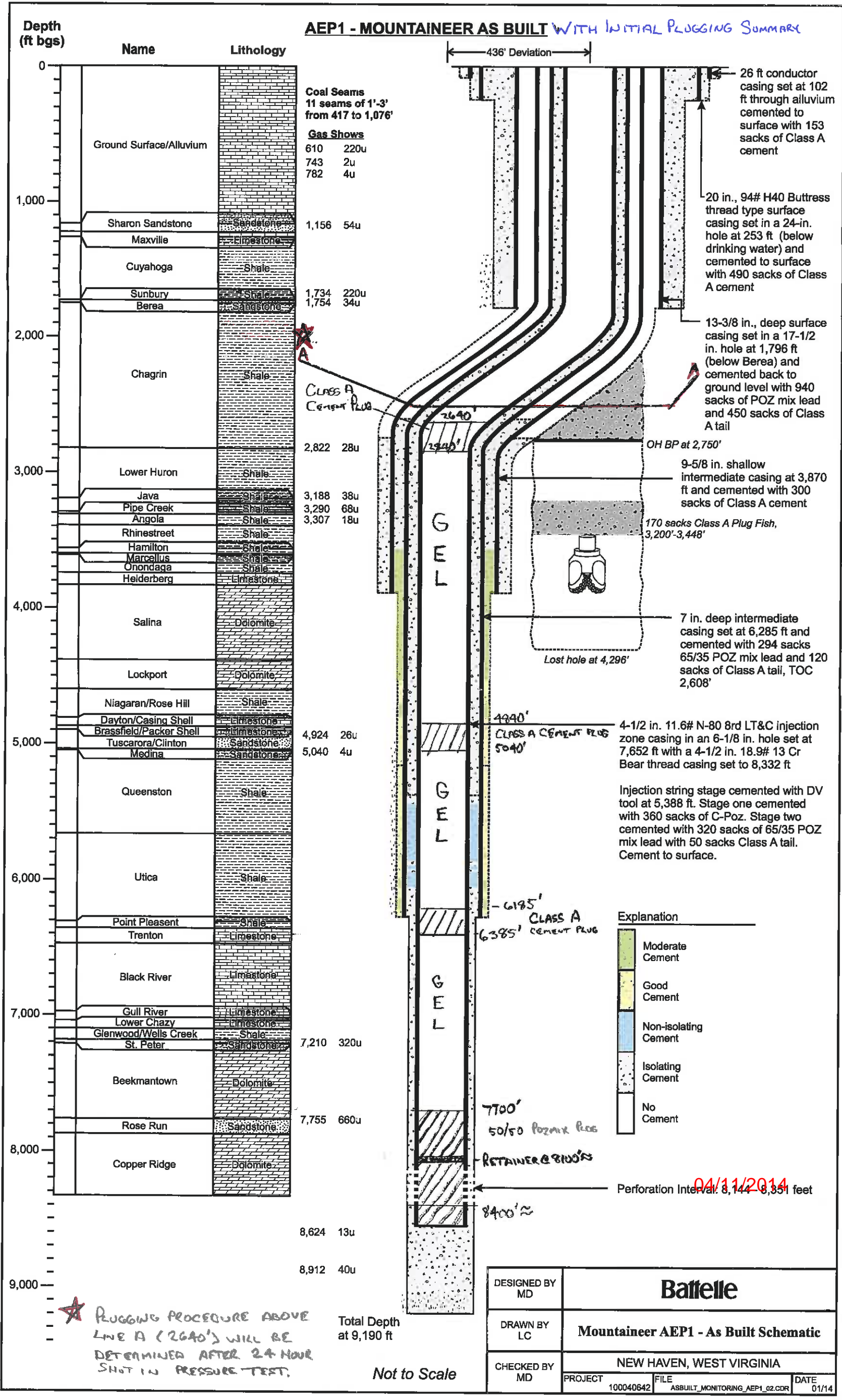
10) Does land contain coal seams tributary to active mine? Yes

11) Describe proposed well work Complete CO₂ injection well to test geologic storage of CO₂ in deep saline formations.

12) CASING AND TUBING PROGRAM

TYPE	SPECIFICATIONS			FOOTAGE INTERVALS		CEMENT
	Size	Grade	Weight per ft	For Drilling	Left in Well	Fill -up (Cu. Ft.)
Conductor (installed)	30" 26"			25' 84'	25' 84'	
Fresh Water (installed)	20"	H40	94	235'	235'	235' - surface, 226 cf Class A (490 sx)
Coal (installed)	13-3/8"	J55	68	1,796'	1,796'	1,796' - surface? 1,235 cf Lite Poz (940 sx), Class A (450 sx)
Intermediate (installed)	9-5/8"	L80	40	3,877'	3,877'	3,877' - 3,820'?? 272 cf Class A (300sx)
Deep Intermediate (installed)	7"	P110	23	6,267'	6,267'	6,267' - 3,700'?? 326 cf 65/35 Blend (294 sx) Gas resistant Class A (120 sx)

[Handwritten Signature]



DESIGNED BY MD	Battelle		
DRAWN BY LC	Mountaineer AEP1 - As Built Schematic		
CHECKED BY MD	NEW HAVEN, WEST VIRGINIA		
PROJECT	FILE	DATE	
100040642	ASBUILT_MONITORING_AEP1_02.CDR	01/14	

53-00423P

Production	4-1/2"	N80, 13Cr	11.6, 15.1	8,400'	8,400'	8,400' - surface, 791 cf Lite Poz Gas resistant Class A (about 755 sx total)
Tubing	2-3/8"			To be installed at a later date		
Bottom Hole Abandonment	6-1/8" open hole	na	na	During completion, plan to abandon open hole from 9,172 to approximately 8,400 ft with Class A cement (~160 cf, 155 sx)		

Packers: Kind Retrievable, coated (selection pending)
 Sizes 4-1/2"
 Depths Set Above/between Rose Run and/or Copper Ridge

*Jamie
8/1/13*



71112
Well to be fractured
by Nov 1, 2008
Jelgs
5300423P

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

Joe Manchin III, Governor
Randy C. Huffman, Cabinet Secretary
www.wvdep.org

August 20, 2008

WELL WORK PERMIT

Re-Work

This permit, API Well Number: 47-5300423, issued to APPALACHIAN POWER CO DBA AEP, 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 of completion of drilling, 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 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.



James Martin
Chief

Operator's Well No: CO2
Farm Name: APPALCHIAN POWER COMPAN
API Well Number: 47-5300423
Permit Type: Re-Work
Date Issued: 08/20/2008

Promoting a healthy environment.

04/11/2014

WR-35
Rev (5-01)

DATE: 6/30/09
API #: 47-5300423W

State of West Virginia
Department of Environmental Protection
Office of Oil and Gas

Well Operator's Report of Well Work

Farm name: Appalachian Power Co. Operator Well No.: AEP-1

LOCATION: Elevation: 585.8 ft. Quadrangle: New Haven

District: Graham County: Mason
Latitude: 8,615 Feet South of 39 Deg. 00 Min. 00 Sec.
Longitude 6,103 Feet West of 81 Deg. 55 Min. 00 Sec.

Company: Appalachian Power Co. DBA AEP

	Casing & Tubing	Used in drilling	Left in well	Cement fill up Cu. Ft.
Address: U.S.Rt. 33, Mountaineer Plant New Haven, WV 25265-0419	20"	235'	235'	295 cf
	10-3/4"	1778'	1778'	1322 cf
Agent: <u>Richard D. Thompson</u>	9-5/8"	3877'	3877'	250 cf
Inspector: <u>Jamie Stevens</u>	7"	6267'	6267'	490 cf
Date Permit Issued: <u>08/08/2008</u>	4-1/2"	8335'	8335'	790 cf
Date Well Work Commenced: <u>09/25/2008</u>	2-3/8"	108'	108'	-
Date Well Work Completed: <u>05/30/2009</u>	1.9"	7999'	7999'	-
Verbal Plugging: <u>n/a</u>				
Date Permission granted on:				
Rotary X Cable Rig: <u>UDI 21</u>				
Total Depth (feet): <u>9,178</u> in 2003, plugged back to <u>8,400</u> with continuous Class A cement plug				
Fresh Water Depth (ft.): <u>205'</u>				
Salt Water Depth (ft.): <u>1232'</u>				
Is coal being mined in area (N/Y)? <u>Yes</u>				
Coal Depths (ft.): <u>417'-1073'</u> layered OPEN FLOW DATA				

RECEIVED
Office of Oil & Gas
JUL 22 2009
WV Department of
Environmental Protection

Formation of interest: Rose Run Pay zone depth (ft): 7,764'
Gas: Initial open flow: 0 MCF/d Oil: Initial open flow: 0 Bbl/d
Final open flow: 0 MCF/d Final open flow: 0 Bbl/d
Time of open flow between initial and final tests: n/a Hours
Static rock Pressure _____ psig (surface pressure) after _____ Hours

Formation of interest: Copper Ridge Pay zone depth (ft): 7,856'
Gas: Initial open flow: 0 MCF/d Oil: Initial open flow: 0 Bbl/d
Final open flow: 0 MCF/d Final open flow: 0 Bbl/d
Time of open flow between initial and final tests: n/a 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.

Signed: Richard D. Thompson
By: Richard D. Thompson
Date: 7/9/09

AEP Mountaineer Plant, AEP-1 Perforations

Perforated Zone	Lithology
8,144 - 8,300	Copper Ridge Dolomite
Shot Density = 4 shots per foot, 400 gallons 15% HCl spotted prior to perforating and swabbed back	
Well treated with 5,000 gal 15% HCl, swabbed back	

AEP Mountaineer Plant, AEP-1 Well Log Summary

Lithology or Formation	Depth
Ground Surface/Alluvium/ Undiff. Pennsylvania Bedrock	0-1,156*
Sharon Sandstone	1,156
Marville Limestone	1,235
Cuyahoga Shale	1,260
Sunbury (Coffee) shale	1,724
Berea sandstone	1,734
Chagrin shale	1,754
Lower Huron shale	2,813
Java shale	3,172
Pipe Creek shale	3,272
Angola shale	3,289
Rhinestreet shale	3,375
Hamilton shale	3,536
Marcellus shale	3,578
Onondaga limestone	3,586
Helderberg limestone	3,714
Salina dolomite	3,805
Lockport dolomite	4,350
Niagaran/Rose Hill shale	4,571
Dayton/Casing Shell limestone	4,777
Brassfield/Packer Shell limestone	4,838
Tuscarora/Clinton sandstone	4,871
Medina sandstone	5,011
Queenston shale	5,018
Utica Shale	5,641
Point Pleasant Shale	6,284
Trenton limestone	6,358
Black River limestone	6,454
Gull River limestone	6,972
Lower Chazy limestone	7,028
Glenwood/Wells Creek shale	7,086
St. Peter sandstone	7,164
Beekmantown dolomite	7,194
Rose Run sandstone	7,746
Copper Ridge dolomite	7,856

* Coal found from 417' - 1,073'

5300423A

WW-4A
Revised 6-07

1) Date: _____
2) Operator's Well Number
AEP-1 _____
3) API Well No.: 47 - 530 - 0423

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>Appalachian Power Company dba American Electric Power</u>	Name	<u>No coal interests with declaration</u>
Address	<u>Electric Power</u> <u>c/o American Electric Power Land Management</u>	Address	_____
(b) Name	<u>1 Riverside Plaza - 16th Floor</u>	(b) Coal Owner(s) with Declaration	
Address	<u>Columbus, OH 43215</u>	Name	<u>No coal interests with declaration</u>
		Address	_____
(c) Name	_____	Name	_____
Address	_____	Address	_____
6) Inspector	<u>James Stevens</u>	(c) Coal Lessee with Declaration	
Address	<u>HC 62, Box 1C</u> <u>Kenna, WV 25248</u>	Name	<u>No coal interests with declaration</u>
Telephone	<u>304-206-7775</u>	Address	_____

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.



LYNNE KAY BROUSSARD
NOTARY PUBLIC
STATE OF OHIO
Comm. Expires
January 05, 2014
Recorded In
Franklin County

Well Operator Appalachian Power Company dba American Electric Power
 By: Dean A. Berry
 Its: Manager, Real Estate Asset Manager
 Address 1 Riverside Plaza - 16th Floor
Columbus, OH 43215
 Telephone 614-716-6830

Subscribed and sworn before me this 4th day of November, 2013
Lynne Kay Broussard Notary Public
My Commission Expires 1-5-2014

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.

RECEIVED
Office of Oil and Gas
WV Department of
Environmental Protection
04/11/2014

SURFACE OWNER WAIVER

Operator's Well
Number

AEP-1

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 57th 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,


Signature

Date 11/4/2013

Name Appalachian Power Company dba American Electric Power
By Dean A. Berry
Its Manager, Real Estate Asset Date

Signature Dean A. Berry

Date 04/11/2014
11/04/2013

WW-4B

API No.	<u>47-530-0423</u>
Farm Name	<u>AEP Mountaineer Plant</u>
Well No.	<u>AEP-1</u>

**INSTRUCTIONS TO COAL OPERATORS
OWNERS AND LESSEE**

The well operator named on the obverse side of WW-4 (B) is about to abandon the well described in the enclosed materials and will commence the work of plugging and abandoning said well on the date the inspector is notified. Which date shall not be less than five days after the day on which this notice and application so mailed is received, or in due course should be received by the Department of Environmental Protection Office of Oil & Gas.

This notice and application is given to you in order that your respective representatives may be present at the plugging and filling of said well. You are further notified that whether you are represented or not the operator will proceed to plug and fill said well in the manner required by Section 24, Article 6, Chapter 22 of the Code and given in detail on obverse side of this application.


NOTE: If you wish this well to be plugged according to 22-6-24(d) then as per Regulation 35CSR4-13.9 you must complete and return to this office on form OB-16 "Request by Coal Operator, Owner, or Lessee for plugging" prior to the issuance of this plugging permit.

WAIVER

The undersigned coal operator ___/ owner X / lessee ___/ of the coal under this well location has examined this proposed plugging work order. The undersigned has no objection to the work proposed to be done at this location, provided, the well operator has complied with all applicable requirements of the West Virginia Code and the governing regulations.

Date: 11/04/2013

Appalachian Power Company dba American Electric Power

By: Dean A. Berry 
Its Manager, Real Estate Asset Manager

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 Appalachian Power Company dba American Electric Power OP Code _____

Watershed Ohio River Quadrangle New Haven

Elevation 586.7' County 530(Mason) District Graham

Description of anticipated Pit Waste: Well brine and freshwater/cement excess

Will a synthetic liner be used in the pit? NA - tanks will be used

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 Qualified third-party hauling and disposal)

Proposed Work For Which Pit Will Be Used:

- Drilling
- Workover
- Other (Explain _____)
- Swabbing
- Plugging

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 *Dean A. Berry*

Company Official (Typed Name) Dean A. Berry

Company Official Title Manager, Real Estate Asset Management, AEP authorized signer

Subscribed and sworn before me this 4th day of November, 20 13

Lynne Kay Broussard

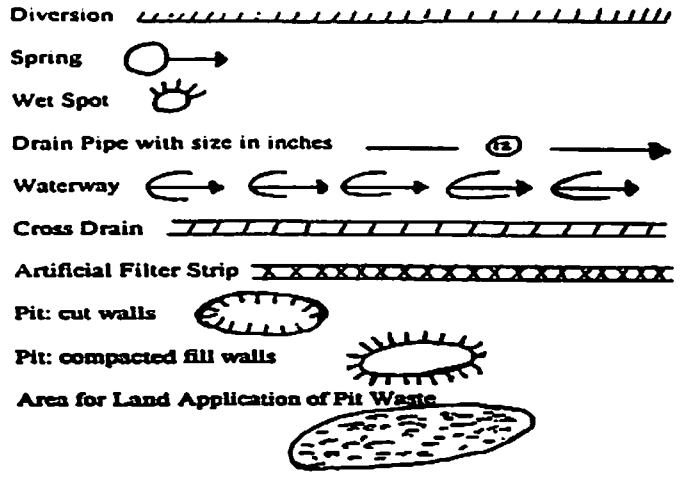
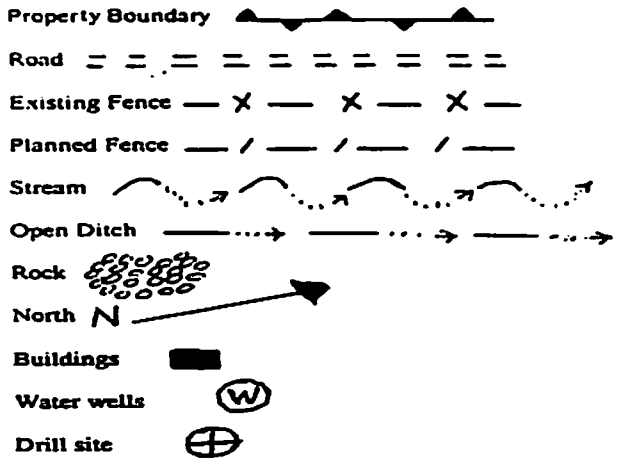
My commission expires 1-5-2013



LYNNE KAY BROUSSARD
NOTARY PUBLIC
STATE OF OHIO
Comm. Expires
January 05, 2014
Recorded in
Franklin County

04/11/2014

LEGEND



Proposed Revegetation Treatment: Acres Disturbed none Prevegetation pH 7-8

Lime NA Tons/acre or to correct to pH NA

Fertilizer (10-20-20 or equivalent) NA lbs/acre (500 lbs minimum)

Mulch NA Tons/acre

Seed Mixtures

Seed Type	Area I		Seed Type	Area II	
		lbs/acre			lbs/acre
<u>NA - work site is a gravel lot.</u>					

Attach:
Drawing(s) of road, location, pit and proposed area for land application.

Photocopied section of involved 7.5' topographic sheet.

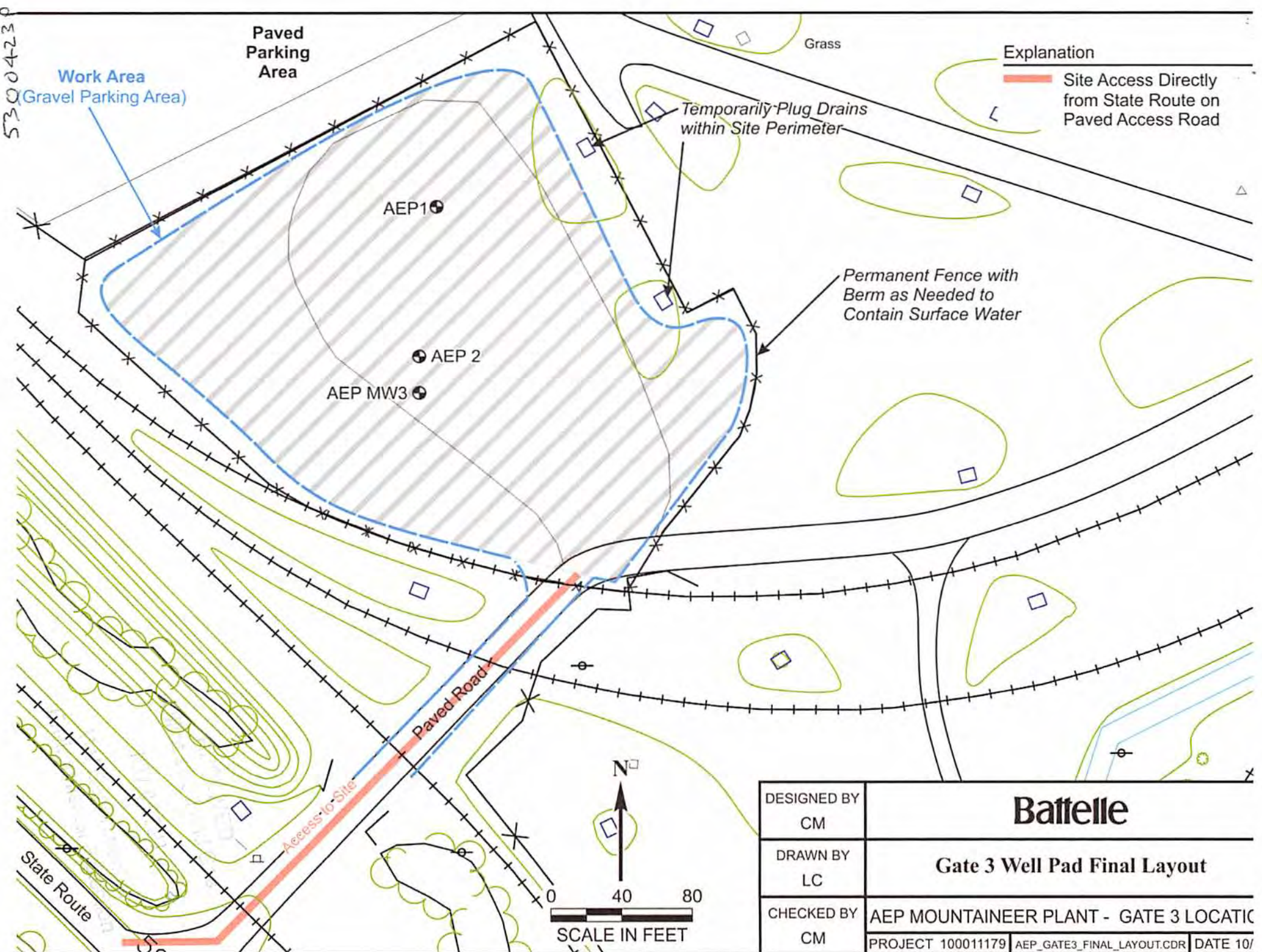
Plan Approved by: _____


Comments: _____

Title: _____ Date: _____

Field Reviewed? () Yes () No

53004239



Explanation	
	Site Access Directly from State Route on Paved Access Road

Work Area
(Gravel Parking Area)

Paved Parking Area

Temporarily Plug Drains within Site Perimeter

Permanent Fence with Berm as Needed to Contain Surface Water

AEP1

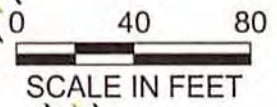
AEP 2

AEP MW3

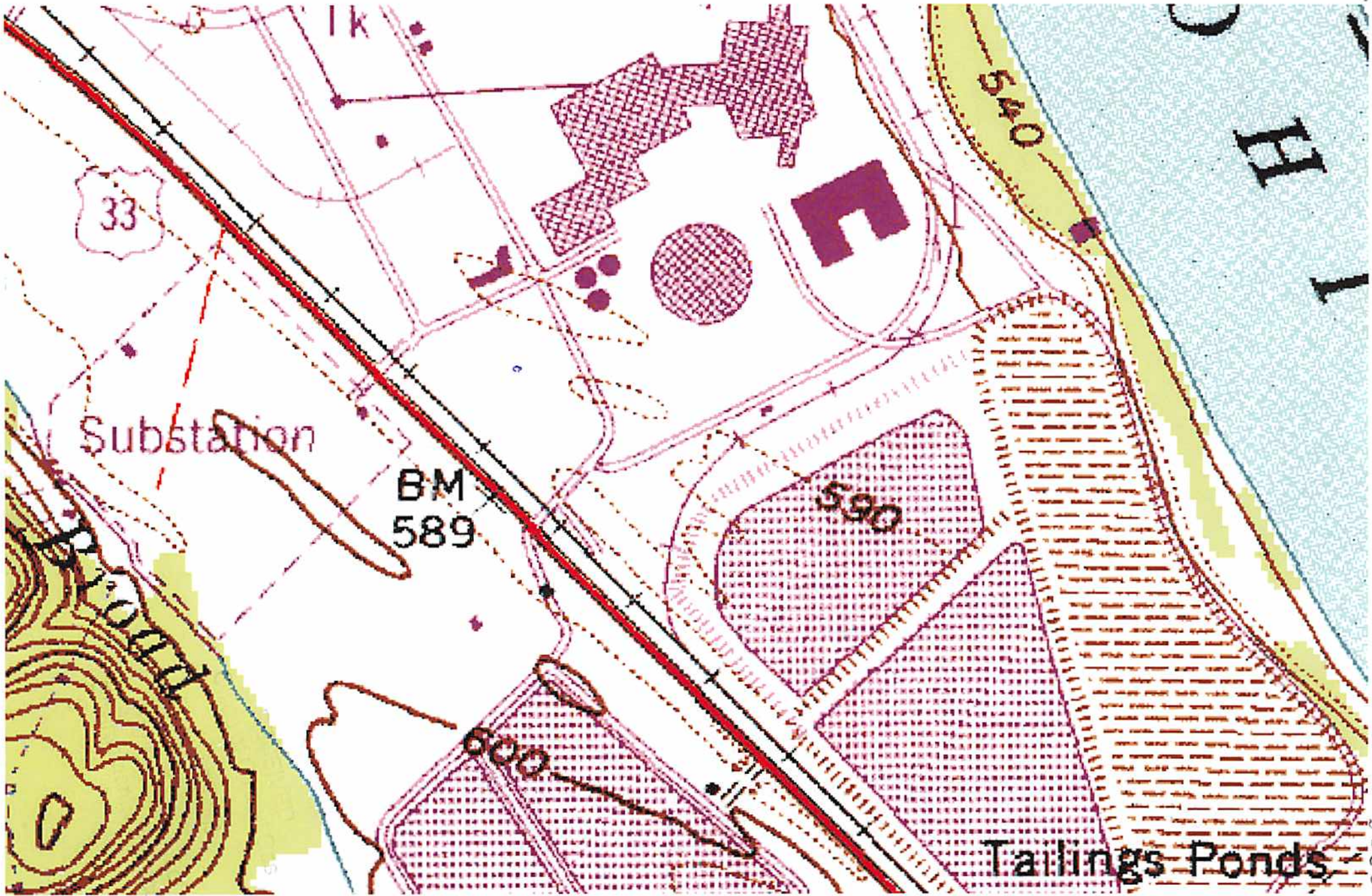
Paved Road

Access to Site

State Route



DESIGNED BY CM	Battelle		
DRAWN BY LC	Gate 3 Well Pad Final Layout		
CHECKED BY CM	AEP MOUNTAINEER PLANT - GATE 3 LOCATIC		
	PROJECT 100011179	AEP_GATE3_FINAL_LAYOUT.CDR	DATE 10/



5300423P

