

State of West Virginia
Department of Environmental Protection - Office of Oil and Gas
Well Operator's Report of Well Work

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Office of Oil and Gas

OCT 23 2019

WV Department of
Environmental Protection

API 47-085-10365 County Ritchie District Clay
Quad Middlebourne 7.5' Pad Name Lettie Pad Field/Pool Name -----
Farm name Daniel M. Haymond IV et al Well Number Hayes Unit 1H
Operator (as registered with the OOG) Antero Resources Corporation
Address 1615 Wynkoop Street City Denver State CO Zip 80202

As Drilled location NAD 83/UTM Attach an as-drilled plat, profile view, and deviation survey
Top hole Northing 4357277m Easting 507728m
Landing Point of Curve Northing 4357278.60m Easting 507959.78m
Bottom Hole Northing 4355339m Easting 508704m

Elevation (ft) 970' GL Type of Well New Existing Type of Report Interim Final
Permit Type Deviated Horizontal Horizontal 6A Vertical Depth Type Deep Shallow
Type of Operation Convert Deepen Drill Plug Back Redrilling Rework Stimulate
Well Type Brine Disposal CBM Gas Oil Secondary Recovery Solution Mining Storage Other _____
Type of Completion Single Multiple Fluids Produced Brine Gas NGL Oil Other _____
Drilled with Cable Rotary

Drilling Media Surface hole Air Mud Fresh Water Intermediate hole Air Mud Fresh Water Brine
Production hole Air Mud Fresh Water Brine
Mud Type(s) and Additive(s)
Air - Foam & 4% KCL
Mud - Polymer

Date permit issued 10/24/2018 Date drilling commenced 7/5/2018 Date drilling ceased 12/25/2018
Date completion activities began 4/19/2019 Date completion activities ceased 6/21/2019
Verbal plugging (Y/N) N/A Date permission granted N/A Granted by N/A

Please note: Operator is required to submit a plugging application within 5 days of verbal permission to plug

Freshwater depth(s) ft 85, 156, 408 Open mine(s) (Y/N) depths No
Salt water depth(s) ft 1158, 1760, 1840 Void(s) encountered (Y/N) depths No
Coal depth(s) ft 320, 348, 390, 500 Cavern(s) encountered (Y/N) depths No
Is coal being mined in area (Y/N) No

Reviewed by:

Reviewed

API 47- 085 - 10365 Farm name Daniel M. Haymond IV et al Well number Hayes Unit 1H

CASING STRINGS	Hole Size	Casing Size	Depth	New or Used	Grade wt/ft	Basket Depth(s)	Did cement circulate (Y/ N) * Provide details below*
Conductor	24"	20"	95'	New	94#, H-40	N/A	Y
Surface	17-1/2"	13-3/8"	511'	New	48#, H-40	N/A	Y
Coal							
Intermediate 1	12-1/4"	9-5/8"	2575'	New	36#, J-55	N/A	Y
Intermediate 2							
Intermediate 3							
Production	8-3/4"/8-1/2"	5-1/2"	13642'	New	23#, P-110	N/A	Y
Tubing		2-3/8"	6537'		4.7#, N-80		
Packer type and depth set		N/A					

Comment Details _____

CEMENT DATA	Class/Type of Cement	Number of Sacks	Slurry wt (ppg)	Yield (ft ³ /sks)	Volume (ft ³)	Cement Top (MD)	WOC (hrs)
Conductor	Class A	204 sx	15.6	1.18	120	0'	8 Hrs.
Surface	Class A	425 sx	15.6	1.18	826	0'	8 Hrs.
Coal							
Intermediate 1	Class A	885 sx	15.6	1.18	1181	0'	8 Hrs.
Intermediate 2							
Intermediate 3							
Production	Class H	665 sx (Lead) 1110 sx (Tail)	14.0 (Lead), 15.2 (Tail)	1.47 (Lead), 1.83 (Tail)		~500' into Intermediate Casing	8 Hrs.
Tubing							

Drillers TD (ft) 13661' MD, 6355' TVD (BHL), 6364 (Deepest Point Drilled) Loggers TD (ft) 13661' MD RECEIVED
 Deepest formation penetrated Marcellus Plug back to (ft) N/A Office of Oil and Gas
 Plug back procedure N/A **OCT 23 2019**

Kick off depth (ft) 5630' WV Department of Environmental Protection

Check all wireline logs run caliper density deviated/directional induction
 neutron resistivity gamma ray temperature sonic

Well cored Yes No Conventional Sidewall Were cuttings collected Yes No

DESCRIBE THE CENTRALIZER PLACEMENT USED FOR EACH CASING STRING _____

Conductor - 0
 Surface - 1 above guide shoe, 1 above insert float, 1 every 4th joint to surface
 Intermediate - 1 above float joint, 1 above float collar, 1 every 4th joint to surface
 Production - 1 above float joint, 1 below float collar, 1 every 3rd joint to top of cement

WAS WELL COMPLETED AS SHOT HOLE Yes No DETAILS _____

WAS WELL COMPLETED OPEN HOLE? Yes No DETAILS _____

WERE TRACERS USED Yes No TYPE OF TRACER(S) USED N/A

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PERFORATION RECORD

Stage No.	Perforation date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formation(s)
*PLEASE SEE ATTACHED EXHIBIT 1					

Please insert additional pages as applicable.

STIMULATION INFORMATION PER STAGE

Complete a separate record for each stimulation stage.

Stage No.	Stimulations Date	Ave Pump Rate (BPM)	Ave Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/other (units)
*PLEASE SEE ATTACHED EXHIBIT 2								

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Please insert additional pages as applicable.

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EXHIBIT 1

Stage No.	Perforation Date	Perforated from MD ft.	Perforated to MD ft.	Number of Perforations	Formations
1	4/19/2019	13534.3		60	Marcellus
2	4/19/2019	13403.715	13239.29	60	Marcellus
3	4/19/2019	13204.005	13039.58	60	Marcellus
4	4/20/2019	13004.295	12839.87	60	Marcellus
5	4/20/2019	12804.585	12640.16	60	Marcellus
6	4/21/2019	12604.875	12440.45	60	Marcellus
7	4/21/2019	12405.165	12240.74	60	Marcellus
8	4/21/2019	12205.455	12041.03	60	Marcellus
9	4/22/2019	12005.745	11841.32	60	Marcellus
10	4/22/2019	11806.035	11641.61	60	Marcellus
11	4/23/2019	11606.325	11441.9	60	Marcellus
12	4/23/2019	11406.615	11242.19	60	Marcellus
13	4/23/2019	11206.905	11042.48	60	Marcellus
14	4/24/2019	11007.195	10842.77	60	Marcellus
15	4/24/2019	10807.485	10643.06	60	Marcellus
16	4/24/2019	10607.775	10443.35	60	Marcellus
17	4/25/2019	10408.065	10243.64	60	Marcellus
18	4/25/2019	10208.355	10043.93	60	Marcellus
19	4/25/2019	10008.645	9844.22	60	Marcellus
20	4/25/2019	9808.935	9644.51	60	Marcellus
21	4/26/2019	9609.225	9444.8	60	Marcellus
22	4/26/2019	9409.515	9245.09	60	Marcellus
23	4/26/2019	9209.805	9045.38	60	Marcellus
24	4/26/2019	9010.095	8845.67	60	Marcellus
25	4/27/2019	8810.385	8645.96	60	Marcellus
26	4/27/2019	8610.675	8446.25	60	Marcellus
27	4/27/2019	8410.965	8246.54	60	Marcellus
28	4/28/2019	8211.255	8046.83	60	Marcellus
29	4/28/2019	8011.545	7847.12	60	Marcellus
30	4/29/2019	7811.835	7647.41	60	Marcellus
31	4/29/2019	7612.125	7447.7	60	Marcellus
32	4/29/2019	7412.415	7247.99	60	Marcellus
33	4/30/2019	7212.705	7048.28	60	Marcellus
34	4/30/2019	7012.995	6848.57	60	Marcellus
35	4/30/2019	6813.285	6648.86	60	Marcellus

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EXHIBIT 2

Stage No.	Stimulations Date	Avg Pump Rate	Avg Treatment Pressure (PSI)	Max Breakdown Pressure (PSI)	ISIP (PSI)	Amount of Proppant (lbs)	Amount of Water (bbls)	Amount of Nitrogen/ other (units)
1	4/19/2019	76.8	7396		3773	270115	6932	N/A
2	4/19/2019	78.1	7660	5930	4250	402200	8819	N/A
3	4/19/2019	78.93	7557	5835	4255	403280	8922	N/A
4	4/20/2019	80.5	7767	5572	3895	402060	8812	N/A
5	4/20/2019	78.9	7477	5955	3739	401540	8677	N/A
6	4/21/2019	77.5	7660	6316	3893	403340	8696	N/A
7	4/21/2019	79.1	7688	5744	3831	403880	8750	N/A
8	4/21/2019	78.2	7655	5786	3628	402220	8662	N/A
9	4/22/2019	76.4	7572	5685	3618	403740	8715	N/A
10	4/22/2019	79.43	7424	5997	3875	381050	8838	N/A
11	4/23/2019	79.36	7403	5670	3751	395705	8846	N/A
12	4/23/2019	78.64	7246	5965	3976	414900	8785	N/A
13	4/23/2019	79.74	7253	6144	3564	423055	8880	N/A
14	4/24/2019	77.53	7116	5967	3956	433990	9295	N/A
15	4/24/2019	80.73	7269	5763	3709	411580	8958	N/A
16	4/24/2019	69.15	7289	6015	3719	406540	10388	N/A
17	4/25/2019	79.97	7104	5760	3894	411540	8718	N/A
18	4/25/2019	80.4	7218	6193	3850	415960	8810	N/A
19	4/25/2019	76.76	7191	6207	3686	410640	8767	N/A
20	4/25/2019	76.77	7255	6391	3875	409340	8680	N/A
21	4/26/2019	69.65	7523	5817	3849	409520	9445	N/A
22	4/26/2019	73.81	7420	5537	3737	408060	8668	N/A
23	4/26/2019	76.81	7393	5446	3922	410140	8640	N/A
24	4/26/2019	68.3	7621	5851	4284	412640	8750	N/A
25	4/27/2019	60.79	7731	5875	3855	407020	9196	N/A
26	4/27/2019	76.85	6928	5655	3959	411160	8742	N/A
27	4/27/2019	77.93	7001	5598	3842	410120	8834	N/A
28	4/28/2019	76.11	7233	5930	5131	398965	9033	N/A
29	4/28/2019	75.29	7206	5571	3534	423315	8386	N/A
30	4/29/2019	77.54	7106	5927	3700	410200	8586	N/A
31	4/29/2019	79.04	6863	5917	3877	407800	8670	N/A
32	4/29/2019	75.9	6796	6201	3852	410020	8693	N/A
33	4/30/2019	78.63	7160	5973	3739	413680	8650	N/A
34	4/30/2019	68.87	7779	6135	3750	418340	8673	N/A
35	4/30/2019	77.87	6873	5956	3487	412140	8677	N/A
	AVG	76.5	7,338	5,891	3,864	14,169,795	307,593	TOTAL

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EXHIBIT 3

LITHOLOGY/ FORMATION	TOP DEPTH (TVD)	BOTTOM DEPTH (TVD)	TOP DEPTH (MD)	BOTTOM DEPTH (MD)
	From Surface	From Surface	From Surface	From Surface
Silty Sandstone	75	215	75	215
Silty Shale	215	255	215	255
shaly sand	255	395	255	395
Shale	395	455	395	455
Dolomitic Shale	455	735	455	735
Shaly Siltstone	735	855	735	855
Silty Sandstone	855	895	855	895
Shaly Sand	895	1,015	895	1,015
Sandstone	1,015	1,055	1,015	1,055
Silty, Shaly, Sandstone	1,055	1,095	1,055	1,095
Sandstone, Tr Shale, Tr Coal	1,095	1,495	1,095	1,495
Silty Sandstone	1,495	1,675	1,495	1,675
Shaly Siltstone	1,675	1,837	1,675	1,839
Big Lime	1,862	2,625	1,864	2,627
Fifty Foot Sandstone	2,625	2,708	2,627	2,709
Gordon	2,708	3,018	2,709	3,021
Fifth Sandstone	3,018	3,075	3,021	3,078
Bayard	3,075	3,806	3,078	3,826
Speechley	3,806	4,104	3,826	4,132
Balltown	4,104	4,509	4,132	4,549
Bradford	4,509	4,746	4,549	4,920
Benson	4,746	5,167	4,920	5,360
Alexander	5,167	6,178	5,360	6,330
Sycamore	6,045	6,153	6,162	6,305
Middlesex	6,153	6,253	6,305	6,464
Burkett	6,253	6,288	6,464	6,534
Tully	6,288	6,314	6,534	6,602
Marcellus	6,314	NA	6,602	NA

*Please note Antero determines formation tops based on mud logs that are only run on one well on a multi-well pad. The measured depth (MD) data on subsequent wells may be slightly different due to the well's unique departure.

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Hydraulic Fracturing Fluid Product Component Information Disclosure

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Frac Focus
Chemical Disclosure Registry



Job Start Date:	4/19/2019
Job End Date:	4/29/2019
State:	West Virginia
County:	Ritchie
API Number:	47-085-10365-00-00
Operator Name:	Antero Resources Corporation
Well Name and Number:	Hayes 1H
Latitude:	39.36530000
Longitude:	-80.91230000
Datum:	NAD83
Federal Well:	NO
Indian Well:	NO
True Vertical Depth:	6,364
Total Base Water Volume (gal):	13,307,269
Total Base Non Water Volume:	52,165

Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (% by mass)**	Maximum Ingredient Concentration in HF Fluid (% by mass)**	Comments
Fresh Water	Halliburton	Base Fluid					
			Water	7732-18-5	100.00000	88.43921	Density = 8.34
Ingredients	Listed Above	Listed Above					
			Water	7732-18-5	100.00000	0.23012	

WG-36 GELLING AGENT	Halliburton	Gelling Agent		Listed Below				
HYDROCHLORIC ACID	Halliburton	Solvent		Listed Below				
SCALECHECK LP-70	Halliburton	Scale Inhibitor		Listed Below			RECEIVED Office of Oil and Gas OCT 23 2019	
SP BREAKER	Halliburton	Breaker		Listed Below			WV Department of Environmental Protection	
Sand-Common White-100 Mesh, SSA-2	Halliburton	Proppant		Listed Below				
MC B-8614	Halliburton	Biocide		Listed Below				
FDP-S1296-17	Halliburton	Acid Corrosion Inhibitor		Listed Below				
Excelerate PS-2	Halliburton	Friction Reducer		Listed Below				
Sand-Premium White-40/70	Halliburton	Proppant		Listed Below				

Sand-Premium White-30/50	Halliburton	Proppant			Listed Below			
					Listed Below			
Items above are Trade Names with the exception of Base Water . Items below are the individual ingredients.								
			Crystalline silica, quartz	14808-60-7	100.00000	11.29155		
			Hydrochloric acid	7647-01-0	15.00000	0.02705		
			Hydrotreated light petroleum distillate	64742-47-8	30.00000	0.01649		
			Inorganic salt	Proprietary	30.00000	0.01649		
			Acrylamide acrylate polymer	Proprietary	30.00000	0.01649		
			Guar gum	9000-30-0	100.00000	0.01163		
			Ethylene glycol	107-21-1	60.00000	0.00765		
			Glutaraldehyde	111-30-8	30.00000	0.00275		
			Telomer	Proprietary	10.00000	0.00127		
			Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl chlorides	68424-85-1	5.00000	0.00046		
			Sodium persulfate	7775-27-1	100.00000	0.00027		
			Methanol	67-56-1	100.00000	0.00022		
			Sodium polyacrylate	9003-04-7	1.00000	0.00013		
			Ethanol	64-17-5	1.00000	0.00009		
			Mixture of dimer and trimer fatty acids of indefinite composition derived from tall oil	61790-12-3	30.00000	0.00004		
			Modified thiourea polymer	Proprietary	30.00000	0.00004		
			Phosphoric acid	7664-38-2	0.10000	0.00001		
			Ethoxylated alcohols	Proprietary	5.00000	0.00001		
			Hexadecene	629-73-2	5.00000	0.00001		
			Propargyl alcohol	107-19-7	5.00000	0.00001		

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		Acrylic acid	79-10-7	0.01000	0.00000
		Sodium sulfate	7757-82-6	0.10000	0.00000

* Total Water Volume sources may include various types of water including fresh water, produced water, and recycled water

** Information is based on the maximum potential for concentration and thus the total may be over 100%

*** If you are calculating a percentage of total ingredients do not add the water volume below the green line to the water volume above the green line

Note: For Field Development Products (products that begin with FDP), MSDS level only information has been provided. Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

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10,026' TO TOP HOLE

LATITUDE 39°22'30"

6,833' LATITUDE 39°22'30"

LONGITUDE 80°52'30"

LONGITUDE 80°52'30"

10,067' TO BOTTOM HOLE

Antero Resources Corporation Well No. Hayes Unit 1H

AS DRILLED DATA: WELL 1H TOP HOLE INFORMATION: N: 318,123ft E: 1,601,230ft LAT: 39°21'53.43" LON: 80°54'37.65" BOTTOM HOLE INFORMATION: N: 311,708ft E: 1,604,325ft LAT: 39°20'50.50" LON: 80°53'56.98" WEST VIRGINIA COORDINATE SYSTEM OF 1927 NORTH ZONE. ZONE WAS DERIVED FROM MEASUREMENTS TAKEN WITH TRIMBLE GEOXT SUBMETER 1H TOP MAPPING GRADE GPS UNIT. HOLE PLAT ORIENTATION, CORNER, AND WELL REFERENCE TIE LINES ARE BASED ON GRID NORTH.

(NAD) 83 (UTM) ZONE 17 COORDS: WELL 1H TOP HOLE INFORMATION: N: 4,357,277m E: 507,728m BOTTOM HOLE INFORMATION: N: 4,355,339m E: 508,704m

PAD LAYOUT

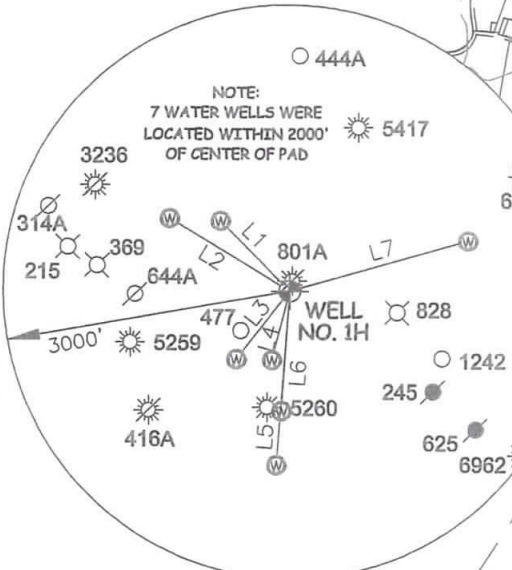


Table with 3 columns: LINE, BEARING, DIST. Contains data for lines L1 through L7.

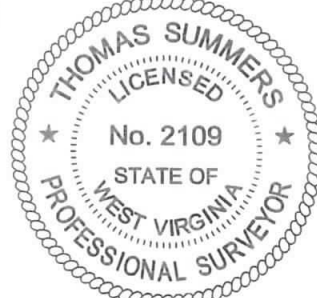
Table with 4 columns: TM-Par, Surface Owner, Book/Pg, Acreage. Lists various land parcels and their owners.

Table with 2 columns: Royalty Owner, Name. Lists royalty owners for various parcels.

I THE UNDERSIGNED, HEREBY CERTIFY THAT THIS PLAT IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF AND SHOWS ALL THE INFORMATION REQUIRED BY LAW AND THE RULES ISSUED AND PERSCRIBED BY THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.



STATE OF WEST VIRGINIA, DIVISION OF ENVIRONMENTAL PROTECTION, OFFICE OF OIL AND GAS. WILLOW LAND SURVEYING PLLC, 220 MASONIC AVE. PENNSBORO WEST VIRGINIA 26415



Form containing JOB # 17-014WA, DRAWING # HAYES1HAD, SCALE 1" = 2000', MINIMUM DEGREE OF ACCURACY SUBMETER, PROVEN SOURCE OF ELEV. SUBMETER MAPPING GRADE GPS, STATE OF WEST VIRGINIA DEPARTMENT OF ENERGY DIVISION OF OIL AND GAS, LEGEND, THOMAS SUMMERS P.S. 2109, DATE 09/04/19, OPERATOR'S WELL# HAYES UNIT #1H

NOTE: 1. NO OCCUPIED DWELLINGS OR BUILDINGS TWO THOUSAND FIVE HUNDRED (2,500) SQUARE FEET OR LARGER USED TO HOUSE OR SHELTER DAIRY CATTLE OR POULTRY HUSBANDRY ARE LOCATED WITHIN SIX HUNDRED TWENTY-FIVE (625) FEET OF THE CENTER OF THE WELL PAD. 2. TOP HOLE DATA SHOWN HEREON WAS PROVIDED BY ANTERO RESOURCES CORPORATION. 3. AS DRILLED DATA WAS PROVIDED BY ANTERO RESOURCES CORPORATION. 4. WLS IS NOT CERTIFYING THE DATA AND INFORMATION PROVIDED LISTED IN NOTES 2 AND 3, ONLY THE RELATIONSHIP TO THE DATA AND INFORMATION PROVIDED TO THE LEASE BOUNDARIES. 5. WLS IS BY NO MEANS RESPONSIBLE FOR ANY ERRORS OR INACCURACIES WITH THE DATA AND INFORMATION THAT HAS BEEN PROVIDED.

Form containing WELL TYPE: OIL GAS X LIQUID INJECTION WASTE DISPOSAL 47 085 10365, (IF "GAS") PRODUCTION X STORAGE DEEP SHALLOW X, LOCATION: ELEVATION 970' AS BUILT WATERSHED NORTH FORK HUGHES RIVER, QUADRANGLE PENNSBORO 7.5' DISTRICT CLAY COUNTY RITCHIE, SURFACE OWNER DANIEL M. HAYMOND IV ET AL ACREAGE 111.48 ACRES +/-, OIL & GAS ROYALTY OWNER THE IRENE NUTTER HAYMOND TRUST; PERKINS OIL & GAS; LEASE ACREAGE 375 AC +/-; 94.0 AC +/-; CANDICE WINZELER NIGOLIAN; NORMAN FLEMING; L. S. TAGGART ET AL; 35.89 AC +/-; 49.5 AC +/-; 151 AC +/-; CARL W. RIDGWAY ET UX; MICHAEL A. TOOTHMAN ET UX; 40 AC +/-; 34 AC +/-, PROPOSED WORK: DRILL CONVERT DRILL DEEPER REDRILL FRACTURE OR STIMULATE, PLUG OFF OLD FORMATION PERFORATE NEW FORMATION OTHER PHYSICAL CHANGE IN WELL (SPECIFY) AS DRILLED, TARGET FORMATION MARCELLUS ESTIMATED DEPTH 6,355' TVD 13,661' MD, WELL OPERATOR ANTERO RESOURCES CORP. DESIGNATED AGENT DIANNA STAMPER - CT CORPORATION SYSTEM, ADDRESS 1615 WYNKOOP ST. ADDRESS 5400 D BIG TYLER ROAD CHARLESTON, WV 25313, FORM WW-6 DENVER, CO 80202