



Abandoned Coal Mine Methane Opportunities Database

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Background

The U.S. Environmental Protection Agency (EPA) conducts and publishes an annual *Inventory of U.S. Greenhouse Gas Emissions and Sinks* report. This inventory estimates national emissions and sinks, and serves as a critical prerequisite for accounting reductions and evaluating mitigation strategies. It consistently reports that coal mines are a major source of anthropogenic methane emissions in the United States. Methane emitted from active underground and surface coal mines, as well as during post-mining activities, accounts for about 9% of all U.S. methane emissions.

Another source of methane associated with coal mining is abandoned mine methane (AMM). As mines mature and coal seams are mined out, mines are closed and eventually abandoned. Shafts or portals are often filled with gravel and capped with concrete seals; vent pipes and boreholes are often plugged in a similar manner to oil and gas wells. When active mining stops, the mine's gas production decreases but does not stop completely. Following an initial decline, abandoned mines can liberate methane at a near-steady rate over an extended period. The gas can migrate up through conduits, particularly if they have not been sealed adequately. It can also migrate to the surface through cracks and fissures in the strata overlying the coal mine, leading to diffuse emissions. One factor affecting this process is flooding: when a mine floods after groundwater or surface water intrudes into the void, it typically produces gas for only a few years.

Between 2006 and 2015, AMM emissions increased from 5.4 to about 13.3 billion cubic feet (Bcf)—from roughly 1% of U.S. coal mine methane emissions to roughly 13%. The methodology that has been used to estimate AMM emissions resulted from a Coalbed Methane Outreach Program (CMOP) study entitled *Methane Emissions from Abandoned Coal Mines in the United States: Emission Inventory Methodology and 1990–2002 Estimates*. CMOP conducted this study to determine the magnitude of AMM emissions in the United States and to assess the technical feasibility of including this source in the inventory. The methodology incorporates quantitative models with coal-basin-specific parameters, calibrated with field measurements at several mines. For years before 2004, the study uses the methodology in conjunction with a comprehensive database of U.S. mines abandoned since 1972 to generate an aggregate estimate of AMM emissions for each year from 1990 to 2002. (This database—a list of about 400 mines that were considered "gassy" at the time of closure—is provided in the study appendix.)

Opportunities for AMM Utilization

More than just sources of emissions, abandoned mines can also be optimal opportunities for methane utilization projects. In 2015, the United States recovered and productively used about 5.3 Bcf of methane from 40 abandoned mines, according to the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 2015*. Many other mines can host future projects. To encourage project development in this area, CMOP has updated its AMM opportunities database.

The inventory's accuracy on AMM was increased with a follow-up study in 2005: a survey of companies that had been involved in mining, as well as current surface mine owners, gathered anecdotal information to better categorize the abandoned mines used in the inventory calculations. For example, a number of mines that had been classified as unknown with regard to venting, flooding, or sealing were properly categorized. In addition to developing the 2004 study, CMOP developed a generalized, universal AMM emissions estimation methodology that has been incorporated as part of the 2006 Emissions Inventory Guidelines for the International Panel on Climate Change (IPCC). In 2008, CMOP updated the database of 400 mines to include others abandoned between 2003 and 2005, increasing the number of abandoned mines to 443. The 2008 database includes geographic information about the mines, such as location (state and county), status (sealed, venting, flooded, recovering methane, or unknown), date abandoned, and estimated methane emissions in million cubic feet per day (mmcf/d) at the time of abandonment. The data was compiled using U.S. Mine Safety and Health Administration (MSHA) information on active mine methane emissions and abandonment dates. In addition, information on the mine status was compiled from MSHA, state mining authorities, and coal mine companies.

Updating the Abandoned Coal Mines Opportunities Database (2015)

Beginning with the last published update in 2008, CMOP initiated a new database update to identify mines abandoned between 2006 and 2015 and created a list of the top candidate mines for recovery and utilization opportunities. This update adds 71 mines, for a total of 514 abandoned gassy mines. To identify abandoned mines for utilization projects, CMOP conducted a more detailed analysis and identified the top 79 candidate mines (see Table 3 below).

Summary of AMM Project Opportunities

Based on the modeled 2017 AMM emissions rates calculated using California Air Resources Board (ARB) methods (see "Methodology" below), the 79 mines identified could reduce methane emissions by 5.6 Bcf or more than doubling the current AMM methane recovery rate (5.3 Bcf/year). Appendix A shows the 79 mines with their location, active emissions, abandonment date, and methane recovery potential for 2017.

Table 1 shows the potential methane recovery totals for the top 10 states, as well as the number of gassy abandoned mine opportunities included in each state. About 67% of the AMM opportunities are in the Appalachian states of West Virginia, Pennsylvania, Kentucky, and Virginia, with West Virginia and Pennsylvania representing the largest share at 42%. Western states Colorado and Utah offer about 17% of the AMM opportunity. The remaining four states each represent between 2% and 8% of the total AMM opportunity.

Table 1—AMM Recovery Opportunity by State

State	Number of Mines	Methane (mmcf/yr)
West Virginia	22	1,397
Pennsylvania	18	1,176
Kentucky	12	688
Colorado	7	587
Virginia	6	506
Illinois	4	480
Utah	5	346
Ohio	2	176
Oklahoma	2	142
Tennessee	1	88
Total	79	5,587

Table 2 shows the potential methane recovery totals at a county level, as well as the number of gassy abandoned mines included in each county. Seven counties hold nearly half the AMM opportunities, with a total of 37 mines that could generate 300 mmcf/year in 2017. In the Appalachian region, high-potential mines are in the following counties: Raleigh, WV; Washington, PA; Indiana, PA; Pike, KY; and Dickenson, VA. In the Western states, high-potential mines are located in the counties of Pitkin, CO, and Carbon, UT.

Many of the 28 counties shown in Table 2 also contain one to four smaller abandoned mines that could be combined with larger AMM project opportunities, but were not identified as having stand-alone project opportunity. About 30 mines have the potential to add between 100 and 200 mcf/d of methane to larger AMM projects.

Table 2—AMM Recovery Opportunity by County

State	County	Number of Mines	Methane (mmcf/yr)
CO	Pitkin	4	431
	Delta	3	155
IL	Saline	2	213
	Wabash	1	156
	White	1	111
KY	Pike	5	334
	Martin	3	124
	Union	3	117
	Knott	1	113
OH	Belmont	1	88
	Monroe	1	88
OK	Le Flore	2	142
PA	Washington	6	381
	Indiana	8	378
	Cambria	2	228
	Greene	2	189
TN	Rosedale	1	88
UT	Carbon	5	346
VA	Tazewell	2	204
	Dickenson	4	302
WV	Raleigh	5	488
	McDowell	5	171
	Wyoming	3	155
	Boone	3	153
	Barbour	2	146
	Preston	1	117
	Marion	2	90
	Monongalia	1	77
Totals		79	5,587

The following section includes a more detailed description of the methodology and the process of mine elimination used in this database update.

Methodology

The list of abandoned mines used to calculate the inventory (1990–2015) was the basis for updating the AMM opportunities database. The AMM emissions estimation methodology was originally designed for calculating a national AMM emissions inventory; ARB used a slightly modified version as part of the compliance offset protocol *Mine Methane Capture Projects, April 2014* to determine the baseline emissions for an individual mine. For example, only data collected by MSHA (or Bureau of Mines [BOM]) were used as the basis for emissions; this eliminated any methane drainage estimates from baseline calculations. In addition, ARB’s protocol used a single decline curve equation (for sealed and venting

mines) for all of the United States rather than coal-basin-specific decline curves. Mines are identified as sealed or vented, so no calculation method exists for “unknown”-status mines. (For this report, unknown mines were treated as sealed mines.)

Actual methane recovery rates from abandoned mines can vary widely. The decline curve estimate, while meaningful, cannot predict them on its own. Many mines on the list could be flooded to a large degree, compartmentalized, left with little or no reserves in the mine workings, or venting to the atmosphere, all of which would reduce their ability to produce methane at the decline curve rate. Conversely, connectivity between adjacent and/or overlying mines, or a confining overburden, could raise methane production above the decline curve rate.

As part of this update, many of the mine closure dates and initial methane emissions rates were updated to reflect updates and changes in MSHA’s data retrieval system since 2008. As a result, some of the values shown in this report may not exactly match the data activity used to calculate the national AMM emissions inventory.

BOM published average daily methane emissions of gassy mines for the years 1971, 1973, 1975, 1980, 1985, and 1988 in Information Circular reports. Beginning in 1990,¹ MSHA collected and compiled active mine emissions rates, using them for the national coal mine methane emissions inventory. These BOM and MSHA data are the basis for determining the average daily emissions over the active life of the mine—a critical data parameter in calculating annual AMM emissions baselines. This update confirmed, updated, or estimated each mine’s date of abandonment by reviewing the mine’s status date in the MSHA Mine Data Retrieval System and its active emissions. For example, MSHA IDs were not provided for some of the mines and an abandonment date was estimated based on last recorded emissions or last recorded coal production.

Pre-Process Elimination of Mines

As mentioned above, flooded mines do not offer great potential and are not eligible for offset credits under the ARB program. As a result, the first step in the process of eliminating mines from the AMM opportunities list was to exclude 91 flooded mines.

Many older mines were included in the national AMM emissions inventory, with estimates of their emissions rates based on those of nearby known gassy mines. Because no source documentation could be found for those mines, CMOP excluded 35 mines from the AMM opportunities list.

EPA’s abandoned mine database includes all abandoned mines that emitted methane in excess of 100 mcf/d when they were active. However, because abandoned mines emit methane at only a fraction of their active rates, this rate was considered too low of a threshold for economically viable projects. Accordingly, 146 mines with active rates less than or equal to 200 mcf/d were eliminated from the AMM opportunities.

Currently, AMM recovery and use projects exist at about 42 mines in the United States—of which, 32 are identified in the EPA’s 514-mine database of gassy abandoned mines (these mines are not included in the AMM opportunities list, but are shown separately in Appendix B). The other 10 mines hosting AMM projects are from an older group of 125 proxy mines with pre-1972 closure dates that have no methane emissions data. These mines were added to the AMM database to account for historically gassy mines

¹ MSHA did not collect coal mine methane emissions data for 1991 and 1992.

from the 1920s to 1960s. They are suspected to be gassy due to their proximity to neighboring gassy mines, but not specifically identified by name.

Post-Calculation Elimination of Mines

To identify abandoned mines with the greatest project opportunities, 2017 AMM emissions rates for all non-flooded mines were recalculated using ARB methodology. This recalculation from the national inventory more closely aligned the methane emissions with potentially eligible offset credits under the ARB compliance offset program. Following the elimination of low-opportunity mines as described above, 210 mines remained. CMOP calculated the 2017 emission rates for these mines in terms of methane production (mcf/d) and carbon offsets generated (tonnes CO₂e).

From the standpoint of CO₂e emissions, 100 of the mines would generate less than 10,000 tonnes CO₂e for 2017. This was determined to be the threshold for consideration as a viable carbon offset project; those 100 mines were eliminated, leaving 110 on the AMM project opportunities list.

Location can play an important role in AMM opportunities (smaller mines may be combined into a larger project), so the 110 mines’ locations were analyzed at the state and county levels. The mines were located in 56 counties across 10 states. For 28 of these counties, the analysis showed that one to three mines could generate up to 200 mcf of methane per county. For each of the other 28 counties, one to eight mines could generate 200 to 1,300 mcf/d of methane. Table 3 summarizes the process for elimination of mines and the resulting 79 mines considered to have the greatest AMM project opportunity in the United States.

Table 3—Summary of Mine Elimination Parameters

Elimination Parameter	Number of Mines Eliminated	Number of Mines
Total abandoned mines		514
Flooded mines	91	423
Mines with no data	35	388
Mines with recovery projects	32	356
Under 0.21 mmcf/day	146	210
Under 10,000 tCO ₂ e	100	110
Mines in counties <0.20 mmcf/day	31	79
Candidate mine opportunities		79

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Appendix A: 79 U.S. Abandoned Coal Mines with Greatest AMM Recovery Opportunity

State	MSHA ID	County	Mine Name	Status	Date of Abandonment	Active Emissions (mmcf/d)	2017 Emissions mmcf/year
CO	500301	Pitkin	Dutch Creek No 1	Sealed	10/4/1992	3.47 ⁱ	159
	500469	Pitkin	Dutch Creek No. 2	Sealed	7/1/1988	3.27	139
	500300	Pitkin	L.S. Wood	Sealed	12/2/1985	1.94	79
	502342	Pitkin	Coal Basin	Sealed	2/27/1981	1.40	54
	504184	Delta	Bowie #1 Mine	Sealed	7/20/2004	0.99	61
		Delta	Somerset Mine	Sealed	2/16/1989	1.20	52
	504758	Delta	Bowie #3	Sealed	9/30/2005	0.67	43
IL	1103054	Saline	Willow Lake Portal	Sealed	12/31/2013	1.65	171
	1102997	Saline	Big Ridge Portal No. 2	Venting	5/1/2002	0.79	42
	1100877	Wabash	Wabash Mine	Sealed	1/14/2008	2.22	156
	1102662	White	Pattiki Mine	Sealed	1/1/2004	1.84	111
KY	1508079	Pike	Mine No 3	Sealed	9/9/2013	1.01	102
	1507082	Pike	Mine #1	Sealed	4/24/2014	0.90	96
	1502055	Pike	Ovenfork Mine	Sealed	11/28/1991	1.20	54
	1517651	Pike	Mine #1	Sealed	9/30/2013	0.48	48
	1507475	Pike	Mine #1	Sealed	4/14/2014	0.32	34
	1518839	Martin	Van Lear	Sealed	4/23/2015	0.42	51
	1509571	Martin	Mine No. 2	Sealed	7/29/2009	0.56	43
	1508413	Martin	Pontiki No. 1 Mine	Sealed	5/30/2001	0.55	31
	1508357	Union	Camp #11	Sealed	3/1/2005	0.82	52
	1513881	Union	Pyro No. 9 Slope William Station	Sealed	11/15/1991	0.90	41
	1510339	Union	Pyro No. 11 Highway	Sealed	11/15/1991	0.55	25
	1518589	Knott	Jones Fork E-3	Sealed	5/6/2015	0.94	113
OH	3301070	Belmont	Allison Mine / Century Mine	Venting	6/7/2001	1.71	88
	3301157	Monroe	Powhatan 4 Mine	Sealed	5/29/2007	1.28	88
OK	3401787	Le Flore	South Central Mine	Sealed	8/27/2010	1.03	83
	3400145	Le Flore	Howe No 1	Sealed	2/13/1978	1.60	59
PA	3600959	Washington	Somerset No. 60	Sealed	7/11/1990	1.86	82
	3600957	Washington	Marianna No 58	Sealed	8/31/1988	1.88	80
	3600970	Washington	Maple Creek	Sealed	2/8/2006	1.22	79
	3600963	Washington	Mathies	Sealed	5/11/2006	0.94	62
	3600967	Washington	Clyde	Sealed	11/1/2000	0.71	39
	3603425	Washington	Maple Creek No. 2	Sealed	1/1/1986	0.95	39
	3600926	Indiana	Homer City	Sealed	6/30/1994	1.88	89
	3602405	Indiana	Greenwich Collieries No 1	Sealed	8/1/1988	1.40	60
	3607691	Indiana	Lucerne No. 6 Extension	Sealed	5/24/2000	0.92	50
	3604852	Indiana	Urling No. 1	Venting	8/21/2001	0.91	47
	3602404	Indiana	Greenwich Collieries No 2	Sealed	3/19/1993	0.88	41
	3606967	Indiana	Tanoma Mine	Sealed	9/29/2001	0.68	38

	3600929	Indiana	Marion	Sealed	1/16/1997	0.53	27
	3605658	Indiana	Urling No. 3	Venting	1/4/1991	0.65	26
	3600842	Cambria	Bethlehem No 32	Sealed	9/17/1985	4.53	184
	3600836	Cambria	Lancashire No 20	Sealed	9/9/1988	1.02	44
	3604281	Greene	Dilworth	Sealed	9/13/2004	1.67	103
	3600907	Greene	Shannopin Mine	Sealed	5/4/2006	1.31	86
TN		Rosedale	Volunteer No 1	Sealed	6/10/1974	2.50	88
UT	4200077	Carbon	Soldier Canyon	Venting	8/26/1999	2.02 ⁱ	99
	4200093	Carbon	Sunnyside Mine No. 1	Sealed	11/15/2002	1.68	98
	4202113	Carbon	Willow Creek	Venting	8/6/2003	1.17	65
	4200165	Carbon	Castle Gate Mine	Sealed	10/23/1991	1.25	56
		Carbon	Kennilworth	Sealed	6/10/1974	0.80	28
VA	4404251	Dickenson	D-R-1	Sealed	4/8/2009	2.24	167
	4404946	Dickenson	Mine No. 2	Sealed	12/31/2009	0.96	75
	4406864	Dickenson	Cherokee Mine	Sealed	3/30/2015	0.27	32
	4407146	Dickenson	Roaring Fork No. 4	Sealed	12/8/2014	0.25	28
	4604421	Tazewell	Amonate No 31	Sealed	9/26/1994	2.63 ⁱ	125
	4403932	Tazewell	Miles Branch Mine	Sealed	3/9/2011	0.95	79
WV	4604388	Raleigh	No. 4 Mine	Venting	1/29/1991	2.85	114
	4603374	Raleigh	Maple Meadow Mine	Sealed	12/15/1997	2.72 ⁱ	139
		Raleigh	Bonny	Sealed	6/10/1990	2.45	108
	4608436	Raleigh	Upper Big Branch Mine-South	Sealed	9/26/2012	0.90	83
	4605592	Raleigh	Baylor Mine	Sealed	3/4/2004	0.74	45
		McDowell	U.S. Steel No 14-4	Venting	6/10/1987	1.08	40
	4601404	McDowell	Keystone No 1 Mine	Sealed	4/1/1987	1.02	43
		McDowell	U.S. Steel No 2	Venting	6/10/1991	0.90	36
		McDowell	Maitland	Venting	6/10/1982	0.78	27
	4601409	McDowell	Seneca Mine	Sealed	3/5/1987	0.60	25
	4601576	Wyoming	ITMANN #3	Sealed	5/20/1987	1.53	64
	4604581	Wyoming	Beckley No 2	Venting	6/21/1988	1.50	57
	4605907	Wyoming	Shawnee Mine	Venting	11/7/1994	0.80 ⁱ	35
		Boone	Birchfield No 1	Venting	6/10/1992	1.50	62
	4608589	Boone	No 2 Mine	Sealed	4/9/2008	0.87	62
	4608807	Boone	Alma Mine	Sealed	10/5/2001	0.51	29
		Barbour	Kitt No. 1	Sealed	6/10/1987	2.05	86
		Barbour	Diamond No 1	Sealed	6/10/1989	1.40	61
	4608751	Preston	Whitetail Kittanning Mine	Sealed	6/24/2010	1.46	117
	4605829	Marion	Joanne Mine	Venting	3/10/1983	1.75	61
4601432	Marion	No 93	Venting	10/1/1979	0.87	29	
4601454	Monongalia	Pursglove No. 15	Sealed	9/14/1989	1.78	77	

Appendix B: 32 U.S. Abandoned Coal Mines with Existing AMM Recovery Projects

MSHA ID	State	County	Mine Name	Updated Status	Date of Abandonment	Active Emissions (mmcfd)	2017 Emissions Avoided (mmcf)
4403795	VA	Buchanan	VP 8	Sealed	6/26/2006	8.18 ⁱ	540
4400246	VA	Buchanan	VP 1	Sealed	1/31/2003	6.45 ⁱ	378
4601453	WV	Monongalia	Humphrey No. 7	Sealed	9/17/2008	4.66 ⁱ	339
4400238	VA	Buchanan	Beatrice Mine	Sealed	12/5/1995	6.76	330
4401520	VA	Buchanan	VP No 3	Sealed	10/27/1998	6.25 ⁱ	326
4404517	VA	Buchanan	VP No 6	Sealed	6/27/1994	6.67	316
4601867	WV	Monongalia	Blacksville No 1	Sealed	9/3/2009	4.11 ⁱ	314
504452	CO	Delta	Sanborn Creek	Sealed	10/1/2003	5.21	312
4601455	WV	Monongalia	Osage No. 3	Sealed	2/4/2005	4.65 ⁱ	292
502820	CO	Las Animas	Golden Eagle	Sealed	12/30/2004	4.40 ⁱ	275
3600840	PA	Cambria	Cambria Slope No 33	Sealed	7/15/1994 ⁱⁱ	4.73 ⁱ	225
4601452	WV	Monongalia	Arkwright No 1	Sealed	4/1/2005	3.22 ⁱ	203
4202028	UT	Carbon	Aberdeen	Sealed	9/25/2008	2.50	182
4601434	WV	Marion	Consol No 9	Venting	9/11/1978	4.70	153
4401009	VA	Buchanan	Virginia Pocahontas No 2	Sealed	12/11/1996	2.85 ⁱ	142
1514492	KY	Webster	Baker Mine	Sealed	4/4/2005	1.74	110
3600906	PA	Greene	Gateway Mine	Sealed	12/9/1992	2.39	110
1100590	IL	Franklin	Old Ben No 26	Sealed	1/18/2002	1.76	100
1100589	IL	Franklin	Old Ben No 24	Sealed	1/18/2002	1.49	85
1102392	IL	Franklin	Old Ben No 25	Sealed	9/20/1996	1.70	84
4402134	VA	Buchanan	Virginia Pocahontas No 4	Sealed	9/29/1998	1.60	83
4601438	WV	Marshall	Ireland	Sealed	6/10/1994 ⁱⁱ	1.73	82
1100588	IL	Franklin	Old Ben No 21	Sealed	11/13/1995 ⁱⁱⁱ	1.49	72
3300967	OH	Harrison	Nelms #1	Venting	10/1/1979	1.93	64
1100600	IL	Jefferson	Orient #3	Sealed	2/1/1984	1.48	59
4601482	WV	Ohio	Valley Camp No 3	Sealed	9/15/1988	1.38	59
4605722	WV	Marion	Consol No. 20	Venting	6/10/1986	1.38	50
1100599	IL	Jefferson	Orient No 6	Sealed	3/13/1997	0.75	38
4601286	WV	Brooke	Windsor Mine	Sealed	3/22/2005	0.46	29
101322	AL	Tuscaloosa	Blue Creek No 5 Mine	Flooded	4/26/2007	10.77 ⁱ	13
1200323	IN	Gibson	Kings	Sealed	10/29/1973	0.25	9
100758	AL	Jefferson	Blue Creek No. 3	Flooded	10/1/1999	11.39 ⁱ	0

Appendix C: U.S. Abandoned Coal Mine Database

MSHA ID	State	County	Coal Basin	Mine Name	Date of Abandonment	Active Emissions (mmcf/d)
3400148	OK	Haskell	Arkoma	Choctaw Coal	10/29/1990	0.35
3400145	OK	Le Flore	Arkoma	Howe No 1	2/13/1978	1.60
3401787	OK	Le Flore	Arkoma	South Central Mine	8/27/2010	1.03
3401633	OK	Okmulgee	Arkoma	Pollyanna No 4	10/11/1996	0.10
1501994	KY	Harlan	Central Appl.	No. 10 WI Steel Mine	10/10/1974	0.10
1516508	KY	Harlan	Central Appl.	Harlan No.1	7/10/1995	0.13
1507986	KY	Harlan	Central Appl.	Darby Fork No 1	1/27/1997	0.10
1504670	KY	Harlan	Central Appl.	Arch No. 37	5/8/1998	0.69
1512057	KY	Harlan	Central Appl.	Creech No 1	6/24/2013	0.15
1500672	KY	Henderson	Central Appl.	Retiki	5/2/1995	0.18
1502027	KY	Johnson	Central Appl.	White Ash No 1	8/15/1978	0.20
1518589	KY	Knott	Central Appl.	Jones Fork E-3	5/6/2015	0.94
	KY	Leslie	Central Appl.	No. 1 Mine	6/10/1989	0.20
1516262	KY	Leslie	Central Appl.	Unicorn No.2	8/29/1996	0.17
1512941	KY	Leslie	Central Appl.	No. 60	5/7/2001	0.25
1511065	KY	Leslie	Central Appl.	#4	11/18/2008	0.19
1502502	KY	Leslie	Central Appl.	Shamrock #18 Series	8/11/2010	0.23
	KY	Letcher	Central Appl.	Scotia Mine	6/10/1989	0.57
	KY	Letcher	Central Appl.	Upper Taggart Mine	6/10/1989	0.10
1508978	KY	Letcher	Central Appl.	Premium Mine	3/30/2005	0.12
1518340	KY	Letcher	Central Appl.	Mine No 4	10/17/2013	0.31
	KY	Martin	Central Appl.	No 3	6/10/1972	0.30 ^{iv}
1502061	KY	Martin	Central Appl.	Wolf Creek No.3	10/1/1979	0.25
1513349	KY	Martin	Central Appl.	Wolf Creek No 1	8/4/1984	0.50
1502060	KY	Martin	Central Appl.	Peter Cave No 1	1/9/1989	0.10
1508413	KY	Martin	Central Appl.	Pontiki No. 1 Mine	5/30/2001	0.55
1509571	KY	Martin	Central Appl.	Mine No. 2	7/29/2009	0.56
1518839	KY	Martin	Central Appl.	Van Lear	4/23/2015	0.42
1504020	KY	Martin	Central Appl.	Wolf Creek No 4	6/17/2015	0.74 ^v
1502363	KY	McCreary	Central Appl.	Justus	6/15/1994	0.18
1502085	KY	Perry	Central Appl.	HZ4-1	1/19/2007	0.15
	KY	Pike	Central Appl.	Leslie	6/10/1981	0.60
1512097	KY	Pike	Central Appl.	No. 1 Mine (D)	10/20/1982	0.35 ^{iv}
1511272	KY	Pike	Central Appl.	No. 2 Mine (D)	12/16/1982	0.35 ^{iv}
1512945	KY	Pike	Central Appl.	No. 6 Mine (D)	3/4/1983	0.35 ^{iv}
1514081	KY	Pike	Central Appl.	No. 1 Mine (D)	6/14/1983	0.20 ^{iv}
1502092	KY	Pike	Central Appl.	No.26-L	6/19/1986	0.10
	KY	Pike	Central Appl.	Road Fork No 1	6/10/1987	0.30
1516207	KY	Pike	Central Appl.	Big Creek No 2	3/28/1988	0.20

1516432	KY	Pike	Central Appl.	No. 1 Mine	11/14/1988	0.20
	KY	Pike	Central Appl.	Scotts Branch	6/10/1989	0.25
	KY	Pike	Central Appl.	Big Creek No 1	6/10/1989	0.20
	KY	Pike	Central Appl.	No. 4 Mine	6/10/1989	0.10
1502483	KY	Pike	Central Appl.	Unit Mine	9/5/1989	0.10
1502055	KY	Pike	Central Appl.	Ovenfork Mine	11/28/1991	1.20
1516442	KY	Pike	Central Appl.	New ERA No 1	6/10/1992	0.25
1504676	KY	Pike	Central Appl.	Mate Creek No 2	6/10/1994	0.50
1513300	KY	Pike	Central Appl.	No.9	8/25/1995	0.10
1515746	KY	Pike	Central Appl.	No 3	9/23/1997	0.10
1516693	KY	Pike	Central Appl.	Smith Fork	7/23/2001	0.13
1518008	KY	Pike	Central Appl.	PE 2 Underground	12/4/2006	0.11
1508079	KY	Pike	Central Appl.	Mine No 3	9/9/2013	1.01
1517651	KY	Pike	Central Appl.	Mine #1	9/30/2013	0.48
1507475	KY	Pike	Central Appl.	Mine #1	4/14/2014	0.32
1507082	KY	Pike	Central Appl.	Mine #1	4/24/2014	0.90
1513127	KY	Whitley	Central Appl.	No. 1	8/15/1986	0.35 ^{iv}
1512475	KY	Whitley	Central Appl.	Blue Gem No 1	2/27/1997	0.10
	MD	Garrett	Central Appl.	Mettiki	6/10/1992	0.35
	TN	Campbell	Central Appl.	Rex No 1	6/10/1989	0.10
4000520	TN	Clearborne	Central Appl.	Matthews Mine	2/28/2001	0.18
	TN	Rosedale	Central Appl.	Volunteer No 1	6/10/1974	2.50
4000577	TN	Sequatchie	Central Appl.	Kelly's Creek No. 1	8/28/1998	0.10 ^{iv}
4400241	VA	Buchanan	Central Appl.	Lambert Fork	6/18/1985	0.63 ^v
4403440	VA	Buchanan	Central Appl.	Winston Mine No 10	2/25/1992	0.15
4403707	VA	Buchanan	Central Appl.	No 1	4/23/1993	0.15 ^v
4406735	VA	Buchanan	Central Appl.	Jewell No 18	11/17/1993	0.10
4402253	VA	Buchanan	Central Appl.	Big Creek Seaboard No. 1	12/8/1993	0.66
4404517	VA	Buchanan	Central Appl.	VP No 6	6/27/1994	6.67
4405709	VA	Buchanan	Central Appl.	No 4	10/20/1995	0.10 ^v
4400238	VA	Buchanan	Central Appl.	Beatrice Mine	12/5/1995	6.76
4401009	VA	Buchanan	Central Appl.	Virginia Pocahontas No 2	12/11/1996	2.85 ⁱ
4403479	VA	Buchanan	Central Appl.	Big Creek Seaboard No. 2	1/27/1998	0.38
4401717	VA	Buchanan	Central Appl.	Raven No. 1	5/6/1998	0.13 ^v
4402134	VA	Buchanan	Central Appl.	Virginia Pocahontas 4	9/29/1998	1.60
4401520	VA	Buchanan	Central Appl.	VP No 3	10/27/1998	6.25 ⁱ
4406500	VA	Buchanan	Central Appl.	1-A Mine	11/19/2001	0.26
4400246	VA	Buchanan	Central Appl.	VP 1	1/31/2003	6.45 ⁱ
4403795	VA	Buchanan	Central Appl.	VP 8	6/26/2006	8.18 ⁱ
4403317	VA	Buchanan	Central Appl.	Apollo	6/6/2013	0.26
4406718	VA	Buchanan	Central Appl.	Mine No. 26	9/12/2014	0.17
4400269	VA	Dickenson	Central Appl.	Splashdam	12/31/2002	0.18
4404251	VA	Dickenson	Central Appl.	McClure No 1	4/8/2009	2.49
4404251	VA	Dickenson	Central Appl.	D-R-1	4/8/2009	2.24

4404946	VA	Dickenson	Central Appl.	Mine No. 2	12/31/2009	0.96
4407146	VA	Dickenson	Central Appl.	Roaring Fork No. 4	12/8/2014	0.25
4406864	VA	Dickenson	Central Appl.	Cherokee Mine	3/30/2015	0.27
4401643	VA	Dickerson	Central Appl.	Moss No 3	10/1/1979	1.77 ^v
4405186	VA	Lee	Central Appl.	No. 1 Mine	4/28/1992	0.10
4405668	VA	Lee	Central Appl.	#1	3/8/1994	0.75 ^{iv}
4406529	VA	Lee	Central Appl.	Upper Mason No. 1	1/11/2000	0.11
4404197	VA	Lee	Central Appl.	Holton	11/23/2001	0.24 ^v
	VA	Russell	Central Appl.	Chaney Creek No 2	6/10/1974	0.15 ^v
4400281	VA	Russell	Central Appl.	MOSS NO. 2	7/15/1983	1.48 ^v
4401773	VA	Russell	Central Appl.	Hurricane Creek	6/29/1987	0.13 ^v
4401642	VA	Russell	Central Appl.	Moss No 3A2	3/18/1988	0.25 ^v
4401644	VA	Russell	Central Appl.	Moss No 4	1/11/1989	0.45
4407123	VA	Russell	Central Appl.	Deep Mine #35	9/18/2015	0.26
4604421	VA	Tazewell	Central Appl.	Amonate No 31	9/26/1994	2.63 ⁱ
4405772	VA	Tazewell	Central Appl.	No 1	10/14/1997	0.10 ^v
4406227	VA	Tazewell	Central Appl.	#1 Mine	5/14/2003	0.38
4406857	VA	Tazewell	Central Appl.	Mine #2	9/25/2003	0.13
4406895	VA	Tazewell	Central Appl.	Silver Creek Mine	11/12/2003	0.38
4406239	VA	Tazewell	Central Appl.	Greasy Creek Mine	9/28/2007	0.14
4403932	VA	Tazewell	Central Appl.	Miles Branch Mine	3/9/2011	0.95
4405745	VA	Tazewell	Central Appl.	No. 5	2//2011	0.11
	VA	West	Central Appl.	Dixianna	6/10/1972	0.30
4404171	VA	Wise	Central Appl.	Virginia No 1	12/19/1979	0.10
4401688	VA	Wise	Central Appl.	Osaka No 2	9/30/1980	0.20
4400303	VA	Wise	Central Appl.	Prescott No 1 Mine	2/20/1981	0.25 ^v
	VA	Wise	Central Appl.	Wentz B Portal	6/10/1982	0.20 ^v
	VA	Wise	Central Appl.	No 7	6/10/1982	0.10
4401689	VA	Wise	Central Appl.	Prescott No 2 Mine	1/11/1994	0.16
4406652	VA	Wise	Central Appl.	No 1	4/8/1994	0.15 ^v
4406625	VA	Wise	Central Appl.	No. 2	5/24/1995	0.10 ^v
4406585	VA	Wise	Central Appl.	Har-Lee No 3	12/11/1995	0.10
4406594	VA	Wise	Central Appl.	No 1	4/2/1996	0.20 ^v
4406595	VA	Wise	Central Appl.	Deep No 20	1/8/1997	0.25
4400304	VA	Wise	Central Appl.	Bullitt Mine	8/8/1997	0.52
4406423	VA	Wise	Central Appl.	#12	5/21/1999	0.11
4406795	VA	Wise	Central Appl.	Sargent Hollow	7/12/2001	0.18
4406772	VA	Wise	Central Appl.	Mine # 3	9/7/2001	0.27
4400285	VA	Wise	Central Appl.	#1	12/29/2003	0.10
4406883	VA	Wise	Central Appl.	Low Splint No 1 Mine	3/5/2007	0.11
4406990	VA	Wise	Central Appl.	Deep Mine # 6	4/5/2007	0.40
4406832	VA	Wise	Central Appl.	VICC No. 4 Mine	6/26/2007	0.27
4407106	VA	Wise	Central Appl.	Mine No. 1	11/24/2008	0.11
4406973	VA	Wise	Central Appl.	No. 1	12/16/2009	0.14

4400302	VA	Wise	Central Appl.	Wentz No 1	12/30/2009	0.12 ^v
4406206	VA	Wise	Central Appl.	Pierre	3/26/2010	0.08
4407189	VA	Wise	Central Appl.	Low Splint A Mine	10/31/2012	0.12
4406599	VA	Wise	Central Appl.	No. 1	11/3/2014	0.10
4405559	VA	Wise	Central Appl.	Mine No 1	12/10/2015	0.14
	WV	Barbour	Central Appl.	Kitt No. 1	6/10/1987	2.05
	WV	Boone	Central Appl.	Ferrell No 17	6/10/1982	0.40 ^v
4601272	WV	Boone	Central Appl.	Wharton No. 4	3/23/1987	0.17
4602493	WV	Boone	Central Appl.	Quinland No 1	9/1/1987	0.30
4601283	WV	Boone	Central Appl.	Hampton No 3 Mine	12/2/1987	0.90 ^v
4601282	WV	Boone	Central Appl.	Hampton No 4	5/21/1991	0.33 ^v
	WV	Boone	Central Appl.	Birchfield No 1	6/10/1992	1.50
4608807	WV	Boone	Central Appl.	Alma Mine	10/5/2001	0.51
4608055	WV	Boone	Central Appl.	White Knight	10/22/2002	0.09
4601329	WV	Boone	Central Appl.	No. 68	6/20/2005	0.27
4608589	WV	Boone	Central Appl.	No 2 Mine	4/9/2008	0.87
4608429	WV	Boone	Central Appl.	Candice 2	10/5/2012	0.46 ^{iv}
4608890	WV	Boone	Central Appl.	Rivers Edge Mine	9/3/2013	0.21
4601271	WV	Boone	Central Appl.	Harris No 1	2/19/2014	0.41 ^v
4607273	WV	Boone	Central Appl.	Justice #1	4/7/2014	1.40 ^v
	WV	Brooke	Central Appl.	Beech Bottom	6/10/1977	0.17
4601286	WV	Brooke	Central Appl.	Windsor Mine	3/22/2005	0.46
4608560	WV	Clay	Central Appl.	Little Eagle Mine No. 1	11/13/2009	0.13
	WV	Fayette	Central Appl.	Royal No 5	6/10/1977	0.20
4606454	WV	Fayette	Central Appl.	Siltix	6/12/1986	0.27 ^v
4602057	WV	Fayette	Central Appl.	New River	8/31/1996	0.20
	WV	Kanawha	Central Appl.	No 34	6/10/1972	0.40
4601324	WV	Kanawha	Central Appl.	Cannelton No 8	4/5/1983	0.18
4602843	WV	Kanawha	Central Appl.	Madison No 1 Mine	6/14/1984	0.20
	WV	Kanawha	Central Appl.	Morton Mine	6/10/1987	0.73
4601325	WV	Kanawha	Central Appl.	Lady Dunn No 105	11/12/1987	0.48
4604332	WV	Kanawha	Central Appl.	Lightfoot No. 1	11/1/1999	0.21
4609107	WV	Kanawha	Central Appl.	Campbell's Creek #7	5/17/2012	0.29
4609108	WV	Kanawha	Central Appl.	Mammoth #2 Gas	3/26/2014	0.36 ^v
4606317	WV	Lewis	Central Appl.	Mine No 1	7/28/2005	2.40 ^{iv}
4605125	WV	Lincoln	Central Appl.	Five Block No 4 Mine	9/26/1980	0.75 ^{iv}
4608835	WV	Lincoln	Central Appl.	Tiny Creek No. 2 Mine	7/23/2008	0.19
4608763	WV	Lincoln	Central Appl.	Fork Creek No. 1	6/20/2014	0.53
	WV	Logan	Central Appl.	No 4-H	6/10/1974	0.20
	WV	Logan	Central Appl.	Paragon	6/10/1974	0.10 ^v
4601383	WV	Logan	Central Appl.	Guyan No 1	10/1/1979	0.25 ^v
4601592	WV	Logan	Central Appl.	No 1 Cedar Grove	9/26/1980	0.95 ^v
4601381	WV	Logan	Central Appl.	Guyan No 5	9/26/1980	0.20 ^v
4601397	WV	Logan	Central Appl.	Dehue	11/14/1985	0.27

	WV	McDowell	Central Appl.	Pocahontas No 7	6/10/1974	0.10
4601411	WV	McDowell	Central Appl.	Newhall No 6 Mine	10/1/1979	0.30
	WV	McDowell	Central Appl.	Maitland	6/10/1982	0.78
4601400	WV	McDowell	Central Appl.	Bishop #34 Mine	11/10/1982	0.20
4601415	WV	McDowell	Central Appl.	Gary No 10	2/28/1984	0.50
4602154	WV	McDowell	Central Appl.	Bishop No 36	9/7/1985	0.20
4601398	WV	McDowell	Central Appl.	Shannon Branch Mine	11/1/1985	1.40 ^v
4606728	WV	McDowell	Central Appl.	Little B Mine No 2	12/19/1985	2.40 ^{iv}
4601868	WV	McDowell	Central Appl.	BISHOP #33-37 MINE	1/22/1986	0.30
4601403	WV	McDowell	Central Appl.	Cannelton No 3 & 4	9/1/1986	0.17
4601409	WV	McDowell	Central Appl.	Seneca Mine	3/5/1987	0.60
4601404	WV	McDowell	Central Appl.	Keystone No 1 Mine	4/1/1987	1.02
	WV	McDowell	Central Appl.	U.S. Steel No 14-4	6/10/1987	1.08
4601407	WV	McDowell	Central Appl.	Olga	6/17/1988	2.76 ^v
4604189	WV	McDowell	Central Appl.	No 4 Mine	6/27/1988	2.40 ^{iv}
	WV	McDowell	Central Appl.	U.S. Steel No 2	6/10/1991	0.90
4601659	WV	McDowell	Central Appl.	Angus	5/10/2012	0.10
4601450	WV	Mingo	Central Appl.	National No 25	10/1/1979	0.20
4601416	WV	Mingo	Central Appl.	Gary No 20-B	4/16/1980	0.10
4603285	WV	Mingo	Central Appl.	No 19	4/22/1980	0.20 ^{iv}
4605195	WV	Mingo	Central Appl.	Rocky Hollow	3/2/2005	0.10
4606958	WV	Mingo	Central Appl.	Mountaineer Mine	12/10/2005	0.13
4601756	WV	Mingo	Central Appl.	Mine #1	9/28/2010	0.17
4608252	WV	Nicholas	Central Appl.	Sewell No 4	6/10/1972	0.50
4606453	WV	Nicholas	Central Appl.	Mine #3	4/26/1982	2.40 ^{iv}
4605218	WV	Nicholas	Central Appl.	Mine No 4	7/27/1982	2.40 ^{iv}
4606116	WV	Nicholas	Central Appl.	No 24 Mine	9/15/1982	2.40 ^{iv}
4606515	WV	Nicholas	Central Appl.	Mine No 4	9/20/1982	2.40 ^{iv}
4606049	WV	Nicholas	Central Appl.	Coalbank Fork No 9	12/27/1982	2.40 ^{iv}
4604536	WV	Nicholas	Central Appl.	Hewett Fork No 1A	1/5/1983	2.40 ^{iv}
4605395	WV	Nicholas	Central Appl.	Big Foot Coal 4-B Mine	3/21/1983	2.40 ^{iv}
4606479	WV	Nicholas	Central Appl.	Stone Run 6A	6/14/1983	2.40 ^{iv}
4606774	WV	Nicholas	Central Appl.	Birch No 1	2/20/1986	0.30
4606819	WV	Nicholas	Central Appl.	Sewell #1A	4/22/1986	0.35
4605219	WV	Nicholas	Central Appl.	Sewell No 1	9/6/1988	0.37
4602071	WV	Nicholas	Central Appl.	Donegan No 10	10/13/1989	0.30
4607609	WV	Nicholas	Central Appl.	Long Run Deep Mine No 1	8/1/1991	2.40 ^{iv}
4606381	WV	Nicholas	Central Appl.	Mine No 1	6/24/1993	2.40 ^{iv}
4604139	WV	Nicholas	Central Appl.	Bald Eagle No 1	10/13/1994	0.10
4607900	WV	Nicholas	Central Appl.	Bells Creek Mine No. 1	5/12/1998	0.31
4607899	WV	Nicholas	Central Appl.	Hutchinsons Branch Mine No. 1	6/26/2000	0.22
4601483	WV	Ohio	Central Appl.	Valley Camp No 1	9/15/1988	0.30
4602068	WV	Raleigh	Central Appl.	Bethlehem No 46	7/1/1976	0.10 ^v
4601517	WV	Raleigh	Central Appl.	Macalpin #3	10/19/1979	0.37 ^v

4601516	WV	Raleigh	Central Appl.	Eccles No 5	10/1/1981	0.40 ^v
	WV	Raleigh	Central Appl.	East Gulf	6/10/1982	0.50 ^v
4601811	WV	Raleigh	Central Appl.	Keystone No 4-A Mine	7/21/1982	0.15 ^v
4601888	WV	Raleigh	Central Appl.	Slab Fork No 10 Mine	2/6/1984	0.55 ^v
4601504	WV	Raleigh	Central Appl.	Slab Fork No 8	2/6/1984	0.40 ^v
4601515	WV	Raleigh	Central Appl.	Winding Gulf #4	2/6/1984	0.10 ^v
4601514	WV	Raleigh	Central Appl.	Eccles No 6	6/28/1985	0.10 ^v
4601498	WV	Raleigh	Central Appl.	Keystone No 4 Mine	10/1/1985	0.25 ^v
4602067	WV	Raleigh	Central Appl.	Keystone No 5 Mine	12/31/1985	0.15 ^v
4601500	WV	Raleigh	Central Appl.	Skelton Mine	12/8/1986	0.10 ^v
4603092	WV	Raleigh	Central Appl.	Beckley	2/6/1990	2.28 ^v
	WV	Raleigh	Central Appl.	Bonny	6/10/1990	2.45
4604388	WV	Raleigh	Central Appl.	No. 4 Mine	1/29/1991	2.85
4601535	WV	Raleigh	Central Appl.	Keystone No 2 Mine	11/12/1992	0.57 ^v
4603374	WV	Raleigh	Central Appl.	Maple Meadow Mine	12/15/1997	2.72 ^j
4607451	WV	Raleigh	Central Appl.	Tommy Creek #1	11/3/2000	0.15 ^v
4608809	WV	Raleigh	Central Appl.	Mine No. 1	12/5/2002	0.36
4605592	WV	Raleigh	Central Appl.	Baylor Mine	3/4/2004	0.74
4608436	WV	Raleigh	Central Appl.	Upper Big Branch Mine-South	9/26/2012	0.90
4602166	WV	Raleigh	Central Appl.	Sewell Mine	1/13/2015	0.19
4604820	WV	Upshur	Central Appl.	Grand Badger No 1A Mine	8/8/1983	2.40 ^{iv}
	WV	Upshur	Central Appl.	Adrian Mine	6/10/1987	0.13
4606010	WV	Upshur	Central Appl.	Queen # 14 Mine	7/28/2005	2.40 ^{iv}
4608470	WV	Wayne	Central Appl.	Deep Mine No. 3	1/25/2002	0.11
4608523	WV	Wayne	Central Appl.	Camp Creek No. 1	7/19/2007	0.10
4606686	WV	Webster	Central Appl.	Smoot	5/21/2010	0.40
	WV	Wyoming	Central Appl.	Kepler	6/10/1974	0.65
	WV	Wyoming	Central Appl.	Buckeye Coll.	6/10/1974	0.10
4601553	WV	Wyoming	Central Appl.	Otsego	10/1/1979	0.10
4601577	WV	Wyoming	Central Appl.	Itmann No 4	4/16/1980	1.00 ^v
4601552	WV	Wyoming	Central Appl.	Gaston No 2 Mine	11/15/1982	0.10
4601544	WV	Wyoming	Central Appl.	National Pocahontas	1/31/1984	0.51
4601576	WV	Wyoming	Central Appl.	Itmann #3	5/20/1987	1.53
4604581	WV	Wyoming	Central Appl.	Beckley No 2	6/21/1988	1.50
4604947	WV	Wyoming	Central Appl.	Beckley No 1	6/10/1989	0.47
4601540	WV	Wyoming	Central Appl.	Itmann # 1 and Shop	6/12/1992	0.20
4605907	WV	Wyoming	Central Appl.	Shawnee Mine	11/7/1994	0.80 ^j
4608537	WV	Wyoming	Central Appl.	No. 1 Mine	9/10/2002	0.20
4601537	WV	Wyoming	Central Appl.	Koperston No 1	1/9/2014	0.10
4609213	WV	Wyoming	Central Appl.	Wyoming No 1	1/31/2015	0.11
	IL	Christian	Illinois	Peabody No. 10	7/10/1994	0.91
1102371	IL	Clinton	Illinois	Monterey No 1	6/15/2010	0.72
1101845	IL	Douglas	Illinois	Zeigler #5	5/27/1987	0.50
1100586	IL	Douglas	Illinois	Murdock	11/1/1996 ^{vi}	0.50

1102544	IL	Franklin	Illinois	Old Ben No 27	2/5/1987	0.60
1102392	IL	Franklin	Illinois	Old Ben No 25	9/20/1996	1.70
1100590	IL	Franklin	Illinois	Old Ben No 26	1/18/2002	1.76
1100589	IL	Franklin	Illinois	Old Ben No 24	1/18/2002	1.49
1100588	IL	Franklin	Illinois	Old Ben No 21	11/13/1995 ⁱⁱⁱ	1.49
1100597	IL	Gallatin	Illinois	Eagle No 1	5/21/1974	0.25
1102846	IL	Gallatin	Illinois	Eagle Valley Mine	8/12/2002	0.24
1100598	IL	Gallatin	Illinois	Eagle No. 2	1/31/2006	0.68
	IL	Hamilton	Illinois	Inland No 2	6/10/1982	0.20
1100600	IL	Jefferson	Illinois	Orient #3	2/1/1984	1.48
1100587	IL	Jefferson	Illinois	Orient #5	2/1/1984	0.40
1102387	IL	Jefferson	Illinois	Wheeler Creek	4/4/1988	0.75 ^{iv}
1100599	IL	Jefferson	Illinois	Orient No 6	3/13/1997	0.75
1100604	IL	Montgomery	Illinois	Crown	10/1/1979	1.00
1100605	IL	Montgomery	Illinois	Hillsboro Mine	12/2/1983	0.17
1102790	IL	Perry	Illinois	Kathleen	9/8/1999	0.10
1102886	IL	Perry	Illinois	Conant Mine	4/3/2000	0.17
1101008	IL	Randolph	Illinois	Baldwin No 1	4/26/1995	0.20
1100612	IL	Randolph	Illinois	Spartan	8/19/1998	0.10
1100620	IL	Saline	Illinois	No 5	1/26/1973	0.50 ^v
1100619	IL	Saline	Illinois	No 16	10/29/1973	0.20 ^v
1100766	IL	Saline	Illinois	Sahara No 20	10/11/1983	0.17 ^v
1100784	IL	Saline	Illinois	Sahara No 21	9/15/1994	0.32
1102997	IL	Saline	Illinois	Big Ridge Portal No. 2	5/1/2002	0.79
1102879	IL	Saline	Illinois	Big Ridge Mine	7/1/2004	0.38
1103054	IL	Saline	Illinois	Willow Lake Portal	12/31/2013	1.65
1100725	IL	St. Clair	Illinois	River King Underground	5/11/1990	0.15
1100877	IL	Wabash	Illinois	Wabash Mine	1/14/2008	2.22
1102440	IL	Washington	Illinois	Marissa Mine	12/18/2000	0.25
1102662	IL	White	Illinois	Pattiki Mine	1/1/2004	1.84
1100627	IL	Williamson	Illinois	Zeigler #4 UG	11/14/1980	0.47
1100628	IL	Williamson	Illinois	Orient No. 4	3/23/2016	0.42
1200323	IN	Gibson	Illinois	Kings	10/29/1973	0.25
1202103	IN	Knox	Illinois	Monroe City Mine	2/15/2006	0.19
1202316	IN	Knox	Illinois	Freelandville Underground	2/5/2013	0.28
	IN	Sullivan	Illinois	Thunderbird	6/10/1972	0.70
1202033	IN	Sullivan	Illinois	Buck Creek	2/2/1998	0.38
1511408	KY	Davies	Illinois	Pride Mine	11/8/1990	0.10
1502016	KY	Hopkins	Illinois	East Diamond	10/1/1979	0.40 ^v
1502018	KY	Hopkins	Illinois	Fies Mine	11/19/1980	0.97
1502012	KY	Hopkins	Illinois	Zeigler No 9 Mine	11/19/1980	0.43
1506253	KY	Hopkins	Illinois	Drake No 4	4/27/1982	0.20 ^v
1509311	KY	Hopkins	Illinois	Busick Mine	6/29/1983	0.35 ^{iv}
1502157	KY	Hopkins	Illinois	Island Creek No 9	4/6/1989	0.17 ^v

1512024	KY	Hopkins	Illinois	Providence No 1	6/10/1989	0.25 ^v
1513469	KY	Hopkins	Illinois	Green River No.9	5/1/1992	1.13
1517272	KY	Hopkins	Illinois	South Hopkins	5/13/1994	0.20
1515691	KY	Hopkins	Illinois	West Hopkins	9/5/1996	0.30
1517515	KY	Hopkins	Illinois	Island Mine	7/25/2003	0.14
1517071	KY	Hopkins	Illinois	Magic Mine	8/18/2004	0.26
1517232	KY	Hopkins	Illinois	Richland No 9	1/30/2015	0.18
	KY	Muhlenberg	Illinois	Crescent	6/10/1977	0.40 ^v
1502073	KY	Muhlenberg	Illinois	Drake No 1	9/19/1980	0.40
1502070	KY	Muhlenberg	Illinois	River Queen Underground No 1	2/2/1981	0.15 ^v
1511265	KY	Muhlenberg	Illinois	Star Underground	7/31/1989	0.15 ^v
	KY	Muhlenberg	Illinois	Graham No 3	4/27/1990	0.10
1507166	KY	Muhlenberg	Illinois	Sinclair Slope No 2 Mine	7/23/1992	0.10
1514074	KY	Muhlenberg	Illinois	Martwick Mine	2/8/2001	0.25
1505046	KY	Ohio	Illinois	Alston No 3 Mine	2/6/1981	0.20
1502079	KY	Ohio	Illinois	Ken No 4 Mine	9/1/1984	0.20
1513548	KY	Ohio	Illinois	Peacock Coal Mine No.	6/10/1987	0.10
1518552	KY	Ohio	Illinois	Big Run Mine	12/30/2011	0.18
1502131	KY	Union	Illinois	Pyro No 2	10/1/1979	0.25
1512683	KY	Union	Illinois	Hamilton No 1	12/30/1983	0.25
	KY	Union	Illinois	Palco Mine	6/10/1989	0.15
1513881	KY	Union	Illinois	Pyro No. 9 Slope William Station	11/15/1991	0.90
1510339	KY	Union	Illinois	Pyro No. 11 Highway	11/15/1991	0.55
	KY	Union	Illinois	Ohio No 11	6/10/1992	0.10
1502705	KY	Union	Illinois	Camp No.2	8/20/1993	0.32
1502705	KY	Union	Illinois	Peabody Camp No 1	8/20/1993	0.20
1502706	KY	Union	Illinois	Hamilton No 2	3/18/1994	0.12 ^v
1508357	KY	Union	Illinois	Camp #11	3/1/2005	0.82
1517355	KY	Webster	Illinois	Dorea	4/20/1997	0.10
1516020	KY	Webster	Illinois	Smith U/G mine	9/21/2000	0.34
1514492	KY	Webster	Illinois	Baker Mine	4/4/2005	1.74
1513920	KY	Webster	Illinois	Wheatcroft No. 9	4/4/2006	0.80
3300937	OH	Belmont	Northern Appl.	Powhatan No 5 Mine	3/31/1981	0.20
3300938	OH	Belmont	Northern Appl.	Powhatan No 1	2/16/1982	0.48
3300939	OH	Belmont	Northern Appl.	Powhatan No 3	10/31/1983	0.27
3300941	OH	Belmont	Northern Appl.	Saginaw no 1	6/17/1993	0.12
3301070	OH	Belmont	Northern Appl.	Allison Mine / Century Mine	6/7/2001	1.71
3300967	OH	Harrison	Northern Appl.	Nelms #1	10/1/1979	1.93
4601313	OH	Harrison	Northern Appl.	Mars No 2	10/1/1979	0.50 ^v
3300957	OH	Harrison	Northern Appl.	Rose Valley No. 6	8/28/1980	0.50
3300954	OH	Harrison	Northern Appl.	Vail	1/4/1984	0.20
3301158	OH	Harrison	Northern Appl.	Oak Park No 7	5/13/1988	0.44
3300968	OH	Harrison	Northern Appl.	Nelms No 2	6/9/1993 ⁱⁱ	0.79
3300977	OH	Jefferson	Northern Appl.	Jensie	10/1/1979	0.30

	OH	Meigs	Northern Appl.	Meigs No 1	6/10/1989	0.50
3302624	OH	Monroe	Northern Appl.	Powhatan 7 Mine	3/24/2005	0.25
3301157	OH	Monroe	Northern Appl.	Powhatan 4 Mine	5/29/2007	1.28
3301068	OH	Perry	Northern Appl.	Sunnyhill No. 9 South	7/10/1991	0.10
3302308	OH	Vinton	Northern Appl.	Raccoon #3	9/25/1989	0.20
3600803	PA	Allegheny	Northern Appl.	Oakmont	5/1/1980	0.20
3600802	PA	Allegheny	Northern Appl.	Harmar Mine	11/30/1989	0.20
3600807	PA	Allegheny	Northern Appl.	Renton Mine	10/23/1992	0.66
3602581	PA	Allegheny	Northern Appl.	Allegheny No. 2 & Portal No. 3	10/25/1993	0.10
3605132	PA	Allegheny	Northern Appl.	Ocean #5 Mine	4/21/1994	0.10
3600809	PA	Allegheny	Northern Appl.	Newfield	6/26/1995	0.41
3600812	PA	Armstrong	Northern Appl.	Harold No 1	10/1/1979	0.10
3600823	PA	Armstrong	Northern Appl.	Jane	8/22/1996	0.49
3600821	PA	Armstrong	Northern Appl.	Emilie No 1	1/21/2000	0.10
3608255	PA	Armstrong	Northern Appl.	TJS #1	4/9/2002	0.19
3600813	PA	Armstrong	Northern Appl.	David Mine	2/24/2005	0.17
3605708	PA	Armstrong	Northern Appl.	Dianne Mine	5/17/2005	0.18
3609159	PA	Armstrong	Northern Appl.	T.J.S. No. 5 Mine	9/22/2009	0.20
3600843	PA	Cambria	Northern Appl.	Bethlehem No 77	1/11/1982	0.30 ^v
	PA	Cambria	Northern Appl.	Nanty Glo No 31	6/10/1983	0.20
3600842	PA	Cambria	Northern Appl.	Bethlehem No 32	9/17/1985	4.53
3600835	PA	Cambria	Northern Appl.	Lancashire No 25	3/5/1986	0.17
3600836	PA	Cambria	Northern Appl.	Lancashire No 20	9/9/1988	1.02
3600841	PA	Cambria	Northern Appl.	Bethlehem No 31	7/24/1991	0.20
3600834	PA	Cambria	Northern Appl.	Lancashire No 24	2/9/1994	0.40
3600840	PA	Cambria	Northern Appl.	Cambria Slope No 33	7/15/1994 ⁱⁱ	4.73 ⁱ
3600856	PA	Centre	Northern Appl.	Rushton	12/31/1992	0.25
3600899	PA	Fayette	Northern Appl.	Isabella	9/25/1986	0.18
3600909	PA	Greene	Northern Appl.	Robena Mine	12/13/1984	4.05 ^v
3600905	PA	Greene	Northern Appl.	Warwick Mine No. 2	6/10/1989	0.27
3600906	PA	Greene	Northern Appl.	Gateway Mine	12/9/1992	2.39
3608336	PA	Greene	Northern Appl.	Monongahela Resource	6/13/1996	0.40
3607987	PA	Greene	Northern Appl.	Meadow Run	7/19/2000	0.15
3602374	PA	Greene	Northern Appl.	Warwick Mine No 3	10/30/2002	0.63 ^v
3604281	PA	Greene	Northern Appl.	Dilworth	9/13/2004	1.67
3600907	PA	Greene	Northern Appl.	Shannopin Mine	5/4/2006	1.31
3600904	PA	Greene	Northern Appl.	Nemacolin Mine	3/16/2011	0.48 ^v
3600928	PA	Indiana	Northern Appl.	Conemaugh No. 1	9/23/1982	0.10
3602405	PA	Indiana	Northern Appl.	Greenwich Collieries No 1	8/1/1988	1.40
3604853	PA	Indiana	Northern Appl.	Urling No. 2 Mine	12/18/1989	0.10
3600925	PA	Indiana	Northern Appl.	Florence No. 1	3/7/1990	0.28
3605658	PA	Indiana	Northern Appl.	Urling No. 3	1/4/1991	0.65
3602404	PA	Indiana	Northern Appl.	Greenwich Collieries No 2	3/19/1993	0.88
3600926	PA	Indiana	Northern Appl.	Homer City	6/30/1994	1.88

3602448	PA	Indiana	Northern Appl.	Florence No. 2	10/4/1994	0.18
3604597	PA	Indiana	Northern Appl.	Lucerne No 8	3/29/1995	0.10
3605374	PA	Indiana	Northern Appl.	Lucerne No. 9	8/24/1995	0.38
3600929	PA	Indiana	Northern Appl.	Marion	1/16/1997	0.53
3607691	PA	Indiana	Northern Appl.	Lucerne No. 6 Extension	5/24/2000	0.92
3604852	PA	Indiana	Northern Appl.	Urling No. 1	8/21/2001	0.91
3606967	PA	Indiana	Northern Appl.	Tanoma Mine	9/29/2001	0.68
3601629	PA	Luzerne	Northern Appl.	No. 19 Wanamie Colliery	1/11/1972	0.20
3601660	PA	Luzerne	Northern Appl.	Forge Slope	10/1/1979	1.50
3600943	PA	Somerset	Northern Appl.	Bird #2	10/30/1991	0.33 ^v
3600846	PA	Somerset	Northern Appl.	Bird #3	10/30/1991	0.32 ^v
3602398	PA	Somerset	Northern Appl.	Grove No. 1	6/30/2006	0.39
	PA	Washington	Northern Appl.	Beth Ellsworth No 51	6/10/1983	0.37 ^v
3600966	PA	Washington	Northern Appl.	Montour #4	8/1/1983	1.38 ^v
3606133	PA	Washington	Northern Appl.	Westland #2	9/27/1983	0.10
3603425	PA	Washington	Northern Appl.	Maple Creek No. 2	1/1/1986	0.95
3600961	PA	Washington	Northern Appl.	Vesta #5 Mine	6/10/1987	1.40 ^v
3600961	PA	Washington	Northern Appl.	Vesta #4 Mine	6/10/1987	0.23
3600957	PA	Washington	Northern Appl.	Marianna No 58	8/31/1988	1.88
3600959	PA	Washington	Northern Appl.	Somerset No. 60	7/11/1990	1.86
3600965	PA	Washington	Northern Appl.	Westland	5/22/1996	0.43
3600967	PA	Washington	Northern Appl.	Clyde	11/1/2000	0.71
3600970	PA	Washington	Northern Appl.	Maple Creek	2/8/2006	1.22
3600963	PA	Washington	Northern Appl.	Mathies	5/11/2006	0.94
3600972	PA	Westmoreland	Northern Appl.	Hutchinson	5/23/1973	0.20 ^v
3600973	PA	Westmoreland	Northern Appl.	Banning No 4	2/2/1983	0.30 ^v
3606598	PA	Westmoreland	Northern Appl.	Delmont	3/4/1988	0.13 ^v
4604294	WV	Barbour	Northern Appl.	Boulder Mine	3/17/1983	2.20 ^{iv}
4601995	WV	Barbour	Northern Appl.	Badger No. 15 Mine	12/26/1984	0.10
4601254	WV	Barbour	Northern Appl.	Badger No 14 Mine	8/28/1985	0.27
	WV	Barbour	Northern Appl.	Diamond No 1	6/10/1989	1.40
4605930	WV	Gilmer	Northern Appl.	Kanawha #1	7/28/2005	2.40 ^{iv}
4605959	WV	Gilmer	Northern Appl.	Kanawha #2	7/28/2005	2.40 ^{iv}
4604190	WV	Grant	Northern Appl.	Potomac	10/31/1997	0.10
	WV	Harrison	Northern Appl.	Williams	6/10/1978	0.43
4601312	WV	Harrison	Northern Appl.	Compass No 2	10/1/1979	0.60
4602081	WV	Harrison	Northern Appl.	Pioneer Mine	11/12/1982	1.90
4608633	WV	Harrison	Northern Appl.	#3 Mine	6/19/2007	0.17
4601434	WV	Marion	Northern Appl.	Consol No 9	9/11/1978	4.70
4601432	WV	Marion	Northern Appl.	No 93	10/1/1979	0.87
4601426	WV	Marion	Northern Appl.	Bethlehem No 44	10/1/1979	0.30
4601427	WV	Marion	Northern Appl.	Bethlehem No 41	2/15/1983	0.33
4605829	WV	Marion	Northern Appl.	Joanne Mine	3/10/1983	1.75
4601664	WV	Marion	Northern Appl.	Phillip Sporn No 1	12/18/1985	0.30

4605722	WV	Marion	Northern Appl.	Consol No. 20	6/10/1986	1.38
4601429	WV	Marion	Northern Appl.	Federal No 1	3/24/1987	3.84 ^v
	WV	Marion	Northern Appl.	Martinka No 1	6/10/1992	0.20
4603805	WV	Marion	Northern Appl.	Tygart River	3/11/2002	0.23 ^v
4601440	WV	Marshall	Northern Appl.	Alexander	7/10/1981	0.60
4601438	WV	Marshall	Northern Appl.	Ireland	6/10/1994 ⁱⁱ	1.73
4601619	WV	Mason	Northern Appl.	Putnam	12/11/1973	0.20
4601454	WV	Monongalia	Northern Appl.	Pursglove No. 15	9/14/1989	1.78
4601455	WV	Monongalia	Northern Appl.	Osage No. 3	2/4/2005	4.65 ⁱ
4601452	WV	Monongalia	Northern Appl.	Arkwright No 1	4/1/2005	3.22 ⁱ
4601453	WV	Monongalia	Northern Appl.	Humphrey No. 7	9/17/2008	4.66 ⁱ
4601867	WV	Monongalia	Northern Appl.	Blacksville No 1	9/3/2009	4.11 ⁱ
4601482	WV	Ohio	Northern Appl.	Valley Camp No 3	9/15/1988	1.38
4606577	WV	Preston	Northern Appl.	H & H Mine No 2	3/22/1983	2.20 ^{iv}
4602215	WV	Preston	Northern Appl.	#3 Mine	7/19/1983	2.20 ^{iv}
4605716	WV	Preston	Northern Appl.	#1	6/10/1994	0.10
4608285	WV	Preston	Northern Appl.	Whitetail Mine	1/25/2002	0.36
4608751	WV	Preston	Northern Appl.	Whitetail Kittanning Mine	6/24/2010	1.46
4606204	WV	Taylor	Northern Appl.	Keg No 1	11/15/1982	1.70 ^{iv}
4608622	WV	Upshur	Northern Appl.	Spruce Fork Mine No 1	3/31/2006	0.32
4608791	WV	Upshur	Northern Appl.	Sago Mine	6/25/2009	0.25
500293	CO	Delta	Piceance	Hawks Nest East	1/3/1986	0.43
500257	CO	Delta	Piceance	Hawks Nest West	1/3/1986	0.20
	CO	Delta	Piceance	Somerset Mine	2/16/1989	1.20
502898	CO	Delta	Piceance	Cyprus Orchard Valley	6/16/1993	0.53
504452	CO	Delta	Piceance	Sanborn Creek	10/1/2003	5.21
504184	CO	Delta	Piceance	Bowie #1 Mine	7/20/2004	0.99
504758	CO	Delta	Piceance	Bowie #3	9/30/2005	0.67
503013	CO	Garfield	Piceance	Mc Clane Canyon Mine	8/24/2015	0.39
500351	CO	Gunnison	Piceance	Bear Creek Mine	10/12/1979	0.70
500292	CO	Gunnison	Piceance	Bear Mine	5/27/1982	0.23
503787	CO	Gunnison	Piceance	Bear No 3	8/11/1997	0.17 ^v
500266	CO	La Plata	Piceance	King I	3/9/2009	0.15
500281	CO	Mesa	Piceance	Roadside South Portal	4/25/2000	0.55
503012	CO	Mesa	Piceance	Roadside North Portal	1/4/2004	0.67
501370	CO	Moffat	Piceance	Eagle No 5	3/4/1996 ^{vi}	0.10
502342	CO	Pitkin	Piceance	Coal Basin	2/27/1981	1.40
500300	CO	Pitkin	Piceance	L.S. Wood	12/2/1985	1.94
502658	CO	Pitkin	Piceance	Thompson Creek No. 1	9/1/1986	0.15
500469	CO	Pitkin	Piceance	Dutch Creek No. 2	7/1/1988	3.27
500301	CO	Pitkin	Piceance	Dutch Creek No 1	10/4/1992	3.47 ⁱ
500285	CO	Rio Blanco	Piceance	Rienau No 2	8/15/1986	0.10
503455	CO	Fremont	Raton	Southfield Mine	5/10/2001	0.43
	CO	Las Animas	Raton	Allen East & West	6/10/1982	0.43

502820	CO	Las Animas	Raton	Golden Eagle	12/30/2004	4.40 ⁱ
500296	CO	Las Animas	Raton	New Elk Mine	10/1/2015	0.25
2900095	NM	Colfax	Raton	York Canyon Mine	12/19/1996	0.42
2900224	NM	Colfax	Raton	Cimarron	10/20/1997	0.30
	UT	Carbon	Uinta	Kennilworth	6/10/1974	0.80
4200091	UT	Carbon	Uinta	Carbon No 2	6/10/1974	0.15
	UT	Carbon	Uinta	Braztah No 3	6/10/1979	0.20
4200082	UT	Carbon	Uinta	Beehive	3/27/1987	1.70 ^{iv}
	UT	Carbon	Uinta	Price River No. 3	6/10/1987	0.55
4201202	UT	Carbon	Uinta	Price River No. 5	6/10/1987	0.35
4200092	UT	Carbon	Uinta	Sunnyside Mine No. 3	9/20/1990	0.50
4200165	UT	Carbon	Uinta	Castle Gate Mine	10/23/1991	1.25
4200077	UT	Carbon	Uinta	Soldier Canyon	8/26/1999	2.02 ⁱ
4200093	UT	Carbon	Uinta	Sunnyside Mine No. 1	11/15/2002	1.68
4202113	UT	Carbon	Uinta	Willow Creek	8/6/2003	1.17
4202028	UT	Carbon	Uinta	Aberdeen	9/25/2008	2.50
4201211	UT	Emery	Uinta	Trail Mountain Mine	6/29/2001 ^{vi}	0.51
4200080	UT	Grand	Uinta	Wilberg	2/5/1990	0.10
4200079	UT	Sevier	Uinta	Emery	8/1/1995 ⁱⁱⁱ	0.28
101266	AL	Jefferson	Warrior	Nebo Mine	1/1/1983	0.40 ^v
101255	AL	Jefferson	Warrior	Concord No 1	6/10/1983	4.50 ^v
100322	AL	Jefferson	Warrior	Maxine Mine	1/4/1984	0.23 ^v
100327	AL	Jefferson	Warrior	Flat Top	4/8/1991	0.85 ^v
100330	AL	Jefferson	Warrior	Mulga	6/25/1998	1.80 ^v
100758	AL	Jefferson	Warrior	Blue Creek No. 3	10/1/1999	11.39 ^{i, v}
100323	AL	Jefferson	Warrior	Chetopa	9/20/2001	0.44 ^v
100328	AL	Jefferson	Warrior	Bessie Mine	11/5/2012	1.48 ^v
100335	AL	Shelby	Warrior	Segco No 2	11/20/1973	0.40 ^v
102908	AL	Shelby	Warrior	Boone No. 1	10/17/2014	1.33 ^v
103217	AL	Shelby	Warrior	Coke Mine #1	2/10/2009 ^{vi}	0.18 ^v
101322	AL	Tuscaloosa	Warrior	Blue Creek No 5 Mine	4/26/2007	10.77 ^{i, v}
	AL	Walker	Warrior	Segco No 1	6/10/1982	0.75 ^v
101248	AL	Walker	Warrior	Gorgas No 7	10/24/1986	0.23 ^v
100821	AL	Walker	Warrior	Mary Lee No 2	6/25/1998	0.28 ^v
100515	AL	Walker	Warrior	Mary Lee No 1	4/29/2008	1.61 ^v

ⁱ Active emissions are estimated using VAM emissions only for mines with drainage.

ⁱⁱ Current MSHA status is active.

ⁱⁱⁱ Current MSHA status is nonproducing.

^{iv} No active emission data is available; active emissions are an estimate based on location.

^v Flooded mine.

^{vi} Current MSHA status is temporarily idle.