



2016 Minerals Yearbook

MINING AND QUARRYING TRENDS [ADVANCE RELEASE]

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Domestic survey data were prepared by the author and the statistical assistants who have responsibility for the mineral commodities covered in this report.

The mining and quarrying trends shown in this report were calculated from nonfuel mineral data reported to the U.S. Geological Survey (USGS) by mining and quarrying companies operating in the United States in 2016. The data for 2016 were reported on the “Mine, Development, and Mineral Exploration Supplement” statistical survey conducted by the USGS and on the USGS production surveys for some widely produced nonfuel mineral commodities, such as sand and gravel. Additional data for 2016 were derived from annual USGS production and consumption surveys of nonfuel mineral producers; these surveys accounted for 44 nonfuel mineral commodities produced in the United States. Nonfuel minerals do not include coal, oil and gas, petroleum coke, uranium, and related products.

The data in the following tables are reported according to the primary or principal product of a mine or operation. The primary product is the product with the highest total value for the year. A product of lesser value is considered to be a byproduct (a joint product not needed to make the operation economically viable); in some instances, the values of two products at the same operation are so similar that the products are considered to be coproducts (joint products that are both needed to make the operation economically viable) (Schulz and others, 2017, p. A5).

Total domestic mining and waste removal for nonfuel mineral materials production was estimated to be 5.29 billion metric tons (Gt) in 2016, a 2.6% increase compared with the revised amount for 2015 (table 1). These materials included about 3.96 Gt of crude ore mined at surface and underground mines and 1.34 Gt of waste, including ore and waste from development operations. Of the nonfuel mineral materials (ore and waste) removed, 59% was for the production of industrial minerals and 41% was for the production of metals. Overall, 96% of nonfuel mineral

materials was mined and quarried using surface methods, and 4% was mined using underground methods (table 1).

Total surface mining and waste removal to obtain metals amounted to 2.15 Gt, unchanged from the revised 2015 total. Of the 2.15 Gt, 1.34 Gt was crude ore mined, and 813 million metric tons (Mt) was ore and waste, including that from development operations. Underground mining and waste removal for metal mining amounted to 20 Mt (table 1). Total surface mining, quarrying, and waste removal for industrial minerals production was estimated to be 2.95 Gt, a 5% increase from the revised 2015 total. Crude ore mined at these surface operations was 2.45 Gt, and 498 Mt of waste was removed, including ore and waste from development operations. Underground mining and waste removal for industrial minerals production was 167 Mt, nearly all of which was crude ore (table 1).

The leading States in which mining for nonfuel mineral materials took place were, in descending order of total material handled, Nevada, Arizona, Texas, Florida, Minnesota, California, Michigan, Pennsylvania, Ohio, and Missouri (table 2). These 10 States accounted for 58% of the tonnage removed in the production of nonfuel mineral materials mined in the United States. About 98% of mine production of nonfuel minerals in these States was from surface operations (table 2).

Reference Cited

Schulz, K.J., DeYoung, J.H., Jr., Bradley, D.C., and Seal, R.R., II, 2017, Critical mineral resources of the United States—An introduction, chap. A of Schulz, K.J., DeYoung, J.H., Jr., Seal, R.R., II, and Bradley, D.C., eds., Critical mineral resources of the United States—Economic and environmental geology and prospects for future supply: U.S. Geological Survey Professional Paper 1802, p. A1–A14. (Accessed March 29, 2023, at <https://doi.org/10.3133/pp1802A>.)

TABLE 1
MATERIAL HANDLED AT SURFACE AND UNDERGROUND MINES IN THE UNITED STATES, BY TYPE¹

(Million metric tons)

Type of ore and year	Surface ²			Underground ³			All mines		
	Crude ore	Waste ⁴	Total	Crude ore	Waste ⁴	Total	Crude ore	Waste ⁴	Total
Metals:									
2012	1,400	1,110	2,510	17	3	20	1,420	1,110	2,530
2013	1,440	1,140	2,570	17	3 ^r	20 ^r	1,450	1,140	2,590
2014	1,270 ^r	777 ^r	2,040 ^r	17	3 ^r	20 ^r	1,280 ^r	780 ^r	2,060 ^r
2015 ^e	1,330 ^r	816 ^r	2,150 ^r	17 ^r	3 ^r	20 ^r	1,350 ^r	819 ^r	2,170 ^r
2016 ^e	1,340	813	2,150	17	3	20	1,360	817	2,170
Industrial minerals:									
2012	2,110	462 ^{r,e}	2,580 ^{r,e}	130	19 ^{r,e}	149 ^{r,e}	2,240	481 ^{r,e}	2,720 ^{r,e}
2013	2,140	455 ^{r,e}	2,590 ^{r,e}	134	19 ^{r,e}	153 ^{r,e}	2,270	474 ^{r,e}	2,750 ^{r,e}
2014	2,210	467 ^{r,e}	2,670 ^{r,e}	150 ^r	20 ^{r,e}	170 ^{r,e}	2,360	487 ^{r,e}	2,840 ^{r,e}
2015 ^e	2,320 ^r	498 ^r	2,810 ^r	157 ^r	20 ^r	177 ^r	2,470 ^r	518 ^r	2,990 ^r
2016 ^e	2,450	498	2,950	145	22	167	2,600	519	3,120
All mineral commodities:									
2012	3,510	1,570 ^r	5,080 ^r	147 ^r	22 ^{r,e}	169 ^{r,e}	3,660	1,590 ^{r,e}	5,250 ^{r,e}
2013	3,580 ^r	1,590 ^r	5,170 ^r	151	22 ^{r,e}	173 ^{r,e}	3,730	1,610 ^{r,e}	5,340 ^{r,e}
2014	3,470 ^r	1,240 ^r	4,720 ^r	167	23 ^{r,e}	190 ^{r,e}	3,640 ^r	1,270 ^{r,e}	4,910 ^{r,e}
2015 ^e	3,650 ^r	1,310 ^r	4,960 ^r	174 ^r	23 ^r	198 ^r	3,820 ^r	1,340 ^r	5,160 ^r
2016 ^e	3,790	1,310	5,110	162	25	187	3,960	1,340	5,290

^eEstimated. ^rRevised.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes materials from wells, ponds, and pumping operations.

³Includes solution mining.

⁴Includes ore and waste from development operations.

TABLE 2

ESTIMATED MATERIAL HANDLED AT SURFACE AND UNDERGROUND MINES IN THE UNITED STATES IN 2016, BY COMMODITY AND STATE¹

(Thousand metric tons, unless otherwise specified)

Commodity or State	Number of mines ²	Surface ³			Underground ⁴			All mines		
		Crude ore	Waste ⁵	Total	Crude ore	Waste ⁵	Total	Crude ore	Waste ⁵	Total
Commodity:										
Metal ore:										
Copper ⁶	25	375,000	77,900	453,000	W	W	W	375,000 ⁷	77,900 ⁷	453,000 ⁷
Gold	38	613,000	548,000	1,160,000	5,890	2,420	8,300	619,000	550,000	1,170,000
Iron	14	144,000	127,000	271,000	--	--	--	144,000	127,000	271,000
Other ⁸	28	208,000	61,300	269,000	11,100	724	11,800	219,000	62,100	281,000
Total	105	1,340,000	813,000	2,150,000	17,000	3,140	20,100	1,360,000	817,000	2,170,000
Industrial minerals:										
Clays	465	23,900	W	23,900 ⁹	W	W	W	23,900 ⁷	W	23,900 ^{7,9}
Feldspar ¹⁰	10	856	W	856 ⁹	--	--	--	856	W	856 ⁹
Gypsum	48	17,000	W	17,000 ⁹	W	W	W	17,000 ⁷	W	17,000 ^{7,9}
Phosphate rock ¹¹	10	130,000	W	130,000 ⁹	--	--	--	130,000	W	130,000 ⁹
Pumice ¹²	10	374	W	374 ⁹	--	--	--	374	W	374 ⁹
Salt	62	6,430	--	6,430	33,700	--	33,700	40,200	--	40,200
Sand and gravel:										
Construction ¹¹	9,338	888,000	46,700	935,000	--	--	--	888,000	46,700	935,000
Industrial	330	77,700	--	77,700	W	--	W	77,700 ⁷	--	77,700 ⁷
Soda ash	6	--	--	--	11,800	--	11,800	11,800	--	11,800
Stone:										
Crushed ¹¹	3,711	1,270,000	318,000	1,590,000	85,200	21,300	107,000	1,360,000	340,000	1,700,000
Dimension	275	2,790	W	2,790 ⁹	W	W	W	2,790 ⁷	W	2,790 ^{7,9}
Talc	5	536	W	536 ⁹	--	--	--	536	W	536 ⁹
Other ¹³	87	33,900	133,000	167,000	14,300	297	14,600	48,200	133,000	181,000
Total	14,357	2,450,000	498,000	2,950,000	145,000	21,600	167,000	2,600,000	519,000	3,120,000
Grand total	14,462	3,790,000	1,310,000	5,110,000	162,000	24,700	187,000	3,960,000	1,340,000	5,290,000
State:										
Alabama	134	50,200	9,700	59,900	W	W	W	50,200 ⁷	9,700 ⁷	59,900 ⁷
Alaska	194	49,600	W	49,600 ⁹	2,520	W	2,520 ⁹	52,100	W	52,100 ⁹
Arizona	337	350,000	85,300	436,000	--	--	--	350,000	85,300	436,000
Arkansas	142	38,900	7,840	46,800	W	W	W	38,900 ⁷	7,840 ⁷	46,800 ⁷
California	485	154,000	W	154,000 ⁹	W	W	W	154,000 ⁷	W	154,000 ^{7,9}
Colorado	434	61,700	W	61,700 ⁹	W	W	W	61,700 ⁷	W	61,700 ^{7,9}
Connecticut	101	15,200	2,750	18,000	--	--	--	15,200	2,750	18,000
Delaware ¹⁴	11	2,810	148	2,950	--	--	--	2,810	148	2,950
Florida	147	199,000	W	199,000 ⁹	--	--	--	199,000	W	199,000 ⁹
Georgia	164	64,500	13,200	77,700	3,320	627	3,940	67,800	13,800	81,600
Hawaii	30	5,550	1,320	6,870	--	--	--	5,550	1,320	6,870
Idaho	507	24,400	W	24,400 ⁹	W	W	W	24,400 ⁷	W	24,400 ^{7,9}
Illinois	221	72,800	11,400	84,300	10,800	2,710	13,500	83,600	14,100	97,800
Indiana	236	58,700	11,200	70,000	8,770	1,450	10,200	67,500	12,700	80,200
Iowa	381	47,800	8,250	56,100	7,810	1,950	9,770	55,700	10,200	65,900
Kansas	260	27,700	4,830	32,600	3,080	W	3,080 ⁹	30,800	4,830	35,700
Kentucky	113	42,100	8,830	50,900	15,600	3,900	19,500	57,700	12,700	70,400
Louisiana ¹⁴	108	18,300	906	19,200	13,200	--	13,200	31,500	906	32,400
Maine	239	13,200	1,520	14,800	--	--	--	13,200	1,520	14,800
Maryland	77	29,300	5,850	35,100	W	W	W	29,300 ⁷	5,850 ⁷	35,100 ⁷
Massachusetts	160	22,400	3,670	26,100	--	--	--	22,400	3,670	26,100
Michigan	446	121,000	W	121,000 ⁹	W	W	W	121,000 ⁷	W	121,000 ^{7,9}
Minnesota	911	165,000	W	165,000 ⁹	--	--	--	165,000	W	165,000 ⁹
Mississippi	62	13,400	1,090	14,500	--	--	--	13,400	1,090	14,500
Missouri	295	74,800	14,800	89,600	20,100	W	20,100 ⁹	94,900	14,800	110,000
Montana	321	27,600	W	27,600 ⁹	W	W	W	27,600 ⁷	W	27,600 ^{7,9}
Nebraska	183	16,500	1,530	18,100	W	W	W	16,500 ⁷	1,530 ⁷	18,100 ⁷
Nevada	716	813,000	528,000	1,340,000	3,620	923	4,540	816,000	529,000	1,350,000
New Hampshire	144	12,600	1,780	14,300	--	--	--	12,600	1,780	14,300
New Jersey	63	29,900	4,800	34,700	--	--	--	29,900	4,800	34,700
New Mexico	513	50,500	1,690	52,200	W	W	W	50,500 ⁷	1,690 ⁷	52,200 ⁷
New York	582	68,600	11,100	79,700	7,840	W	7,840 ⁹	76,400	11,100 ⁷	87,500

See footnotes at end of table.

TABLE 2—Continued

ESTIMATED MATERIAL HANDLED AT SURFACE AND UNDERGROUND MINES IN THE UNITED STATES IN 2016, BY COMMODITY AND STATE¹

(Thousand metric tons, unless otherwise specified)

Commodity or State	Number of mines ²	Surface ³			Underground ⁴			All mines		
		Crude ore	Waste ⁵	Total	Crude ore	Waste ⁵	Total	Crude ore	Waste ⁵	Total
State:—Continued										
North Carolina	231	82,200	14,900	97,000	--	--	--	82,200	14,900	97,000
North Dakota	206	13,700	867	14,600	--	--	--	13,700	867	14,600
Ohio	334	89,200	15,900	105,000	11,900	W	11,900 ⁹	101,000	15,900 ⁷	117,000
Oklahoma	177	47,400	9,660	57,100	W	W	W	47,400 ⁷	9,660 ⁷	57,100 ⁷
Oregon	348	33,100	5,820	38,900	--	--	--	33,100	5,820	38,900
Pennsylvania	382	83,100	19,000	102,000	13,700	3,240	17,000	96,800	22,300	119,000
Rhode Island	27	4,420	682	5,100	--	--	--	4,420	682	5,100
South Carolina	87	38,300	7,520	45,800	--	--	--	38,300	7,520	45,800
South Dakota	247	20,500	W	20,500 ⁹	--	--	--	20,500	W	20,500 ⁹
Tennessee	198	49,600	10,500	60,000	7,310	W	7,310 ⁹	56,900	10,500 ⁷	67,300
Texas	721	260,000	45,800	306,000	8,530	W	8,530 ⁹	269,000 ⁷	45,800 ⁷	314,000
Utah	349	100,000	W	100,000 ⁹	W	W	W	100,000 ⁷	W	100,000 ^{7,9}
Vermont	191	11,700	1,480	13,100	--	--	--	11,700	1,480	13,100
Virginia	174	66,300	13,900	80,200	W	W	W	66,300 ⁷	13,900 ⁷	80,200 ⁷
Washington	313	51,200	5,820	57,000	W	W	W	51,200 ⁷	5,820 ⁷	57,000 ⁷
West Virginia	31	11,000	2,650	13,700	5,230	W	5,230 ⁹	16,200	2,650 ⁷	18,900
Wisconsin	643	63,300	6,990	70,200	W	W	W	63,300 ⁷	6,990 ⁷	70,200 ⁷
Wyoming	671	24,200	3,010	27,200	9,120	--	9,120	33,300	3,010	36,300
Undistributed ¹⁵	442	4,040	405,000	409,000	9,540	9,940	19,500	13,600	415,000	429,000
Total	14,489	3,790,000	1,310,000	5,110,000	162,000	24,700	187,000	3,960,000	1,340,000	5,290,000

W Withheld to avoid disclosing company proprietary data; included with "Other" or "Undistributed." -- Zero.

¹Data are rounded to no more than three significant digits except "Number of mines"; may not add to totals shown.²Includes quarries and other mineral operations.³Includes materials from wells, ponds, and pumping operations.⁴Includes solution mining.⁵Includes ore and waste from development operations.⁶Includes copper-molybdenum. With increased adoption of leaching technology, there may be less distinction between ore and waste. Significant tonnages of low-grade material, formerly classified as waste, are now considered to be low-grade leachable ore by some companies, resulting in a large shift in the ore-to-waste ratios and a reduction in ore value.⁷Excludes materials from underground operations.⁸Includes beryllium, gold-silver, lead, magnesium metal, molybdenum, nickel ore, platinum and palladium, silver, titanium, zinc, zinc-lead, and zinc-silver and metals indicated by symbol W.⁹Excludes waste from mining operations.¹⁰Includes aplite.¹¹Reported data.¹²Excludes volcanic cinder and scoria, which are included with "Stone: Crushed."¹³Includes abrasives, barite, boron minerals, bromine, diatomite, garnet, iodine, iron oxide pigments, kyanite, lithium carbonate, magnesite, magnesium compounds, mica, perlite, potash, tripoli, vermiculite, wollastonite, zeolites, and industrial minerals indicated by symbol W.¹⁴Does not include crushed stone.¹⁵Includes material from States with production indicated by symbol W.

TABLE 3
UNIT VALUE OF PRINCIPAL MINERAL PRODUCTS AND BYPRODUCTS OF SURFACE AND UNDERGROUND MINES IN
THE UNITED STATES IN 2016¹

(Dollars per metric ton)

Commodity	Surface			Underground			All mines		
	Principal mineral product	Byproduct	Total	Principal mineral product	Byproduct	Total	Principal mineral product	Byproduct	Total
Metal ore:									
Copper ²	25.36	W	25.36 ³	W	W	W	25.36	W	25.36 ³
Gold	NA	NA	NA	NA	NA	NA	26.98	W	26.98 ³
Iron	21.15 ⁴	--	21.15 ⁴	--	--	--	21.15 ⁴	--	21.15 ⁴
Average, metals ⁵	NA	NA	NA	W	W	W	26.48	W	26.48 ³
Industrial minerals:									
Clays	62.34	W	62.34 ³	W	W	W	62.34	W	62.34 ³
Feldspar ⁶	38.72	W	38.72 ³	--	--	--	38.72	W	38.72 ³
Gypsum	NA	--	NA	NA	--	NA	8.00 ⁴	--	8.00 ⁴
Phosphate rock	W	--	W	--	--	--	W	--	W
Pumice ⁷	38.26	--	38.26	--	--	--	38.26	--	38.26
Salt	NA	--	NA	NA	--	NA	54.47	--	54.47
Sand and gravel:									
Construction	8.40	NA	8.40	--	--	--	8.40	NA	8.40
Industrial	NA	NA	NA	W	--	W	33.79	NA	33.79
Soda ash	--	--	--	149.83	--	149.83	149.83	--	149.83
Stone:									
Crushed	11.16	--	11.16	10.80	--	10.80	11.14	--	11.14
Dimension	159.53	--	159.53	W	--	W	159.53	--	159.53
Talc	30.38	--	30.38	--	--	--	30.38	--	30.38
Average, industrial minerals ⁸	NA	NA	NA	NA	NA	NA	13.44	NA	13.44
Average, industrial minerals, excluding construction sand and gravel, and crushed stone ⁸	NA	NA	NA	NA	NA	NA	38.22	NA	38.22
Average, metals and industrial minerals ^{5,8}	NA	NA	NA	NA	NA	NA	16.43	NA	16.43
Average, metals and industrial minerals, excluding construction sand and gravel and crushed stone ^{5,8}	NA	NA	NA	NA	NA	NA	29.82	NA	29.82

W Withheld to avoid disclosing company proprietary data; included in appropriate "Average." -- Zero.

¹Values calculated from unrounded data; may not add to totals shown because of independent rounding.

²Includes copper-molybdenum. With increased adoption of leaching technology, there may be less distinction between ore and waste. Significant tonnages of low-grade material, formerly classified as waste, are now considered to be low-grade leachable ore by some companies, resulting in a large shift in the ore-to-waste ratios and a reduction in ore value.

³Value of principal mineral product only.

⁴Average value at mines only (crude ore).

⁵Includes beryllium, gold-silver, lead, magnesium, molybdenum, nickel ore, palladium and platinum, silver, titanium, zinc, zinc-lead, and zinc-silver.

⁶Includes apatite.

⁷Excludes volcanic cinder and scoria, which are included with "Stone: Crushed."

⁸Includes values of abrasives, barite, boron minerals, bromine, diatomite, garnet, iodine, iron oxide pigments, kyanite, lithium carbonate, magnesite, magnesium compounds, mica, perlite, potash, tripoli, vermiculite, wollastonite, zeolites, and industrial minerals indicated by symbol W.

TABLE 4
 TWENTY-FIVE LEADING METAL AND INDUSTRIAL MINERAL MINES AND QUARRIES IN THE UNITED STATES IN 2016,
 IN ORDER OF OUTPUT OF CRUDE ORE¹

Name of mine, quarry, or operation	State	Operator	Commodity	Mining method
Metals:				
Nevada Operations ²	Nevada	Newmont Mining Corp.	Gold	Open pit and underground.
Bingham Canyon	Utah	Rio Tinto Kennecott Corp. ³	Copper-molybdenum	Open pit.
Cortez Operations	Nevada	Barrick Gold Corp.	Gold	Open pit and underground.
Goldstrike	do.	do.	do.	Do.
Minntac	Minnesota	United States Steel Corp.	Iron ore	Open pit.
Fort Knox	Alaska	Kinross Gold Corp.	Gold	Do.
Hibbing Taconite	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Round Mountain	Nevada	Kinross Gold Corp. ⁴	Gold	Do.
Tilden	Michigan	Cliffs Natural Resources Inc.	Iron ore	Do.
Ray	Arizona	ASARCO LLC ⁵	Copper	Do.
Rochester	Nevada	Coeur Mining, Inc.	Silver	Do.
Mesquite	California	New Gold Inc.	Gold	Do.
Mission Complex	Arizona	ASARCO LLC ⁵	Copper	Do.
Marigold	Nevada	Silver Standard Resources Inc.	Gold	Do.
Bald Mountain	do.	Kinross Gold Corp. ⁴	do.	Do.
Cripple Creek	Colorado	Newmont Mining Corp.	do.	Do.
Northshore	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Silver Bell	Arizona	ASARCO LLC ⁵	Copper	Do.
Minorca	Minnesota	ArcelorMittal S.A.	Iron ore	Do.
Wharf	South Dakota	Coeur Mining, Inc.	Gold	Do.
Empire	Michigan	Cliffs Natural Resources Inc.	Iron ore	Do.
Mesabi Chief Plant #4	Minnesota	Magnetation LLC	do.	Do.
Hycroft	Nevada	Hycroft Mining Corp.	Gold	Do.
Red Dog	Alaska	Teck Alaska Inc.	Zinc-lead	Do.
United Taconite	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Industrial minerals:⁶				
Florida (four mines)	Florida	The Mosaic Co.	Phosphate rock	Do.
Swift Creek	do.	PCS Phosphate Co., Inc.	do.	Do.
Aurora	North Carolina	do.	do.	Do.
Balcones	Texas	CEMEX S.A.B. de C.V.	Stone, crushed	Quarry.
White Rock	Florida	Vecellio & Grogan, Inc.	do.	Do.
FEC	do.	CEMEX S.A.B. de C.V.	do.	Do.
Beckmann	Texas	Martin Marietta Aggregates	do.	Do.
Georgetown	do.	Texas Crushed Stone Co.	do.	Do.
Pennsuco	Florida	Titan America LLC	do.	Do.
Bridgeport	Texas	Martin Marietta Aggregates	do.	Do.
Do.	do.	Lehigh Hanson, Inc.	do.	Do.
Marble Falls	do.	Oldcastle Materials, Inc.	do.	Do.
Ste. Genevieve	Missouri	Mississippi Lime Co.	do.	Underground.
Hunter	Texas	Colorado Materials, Ltd.	do.	Quarry.
Port Inland	Michigan	Carmeuse Lime & Stone Inc.	do.	Do.
Servtex	Texas	Lehigh Hanson, Inc.	do.	Do.
Presque Isle	Michigan	LafargeHolcim Ltd	do.	Do.
Ste. Genevieve	Missouri	Tower Rock Stone Co.	do.	Do.
Calcite Operation	Michigan	Carmeuse Lime & Stone Inc.	do.	Do.
Spec Agg	Colorado	Martin Marietta Aggregates	do.	Do.
Cape Sandy	Indiana	Mulzer Crushed Stone, Inc.	do.	Do.
Carey	Ohio	National Lime & Stone Co.	do.	Do.
New Braunfels	Texas	Martin Marietta Aggregates	do.	Do.
Richards	Oklahoma	Dolese Brothers Co.	do.	Do.
McCook	Illinois	Vulcan Materials Co.	do.	Do.

See footnotes at end of table.

TABLE 4—Continued
 TWENTY-FIVE LEADING METAL AND INDUSTRIAL MINERAL MINES AND QUARRIES IN THE UNITED STATES IN 2016,
 IN ORDER OF OUTPUT OF CRUDE ORE¹

Do., do. Ditto.

¹Where data are not reported for individual mining operations, ranking is on the basis of production as reported for a group of operations.

²Includes the Carlin Mines Operations (four open pit operations and four underground operations), the Long Canyon Mine (open pit), the Phoenix property operations (two open pit operations), and the Twin Creeks Mine (open pit).

³Wholly owned subsidiary of Rio Tinto plc.

⁴On January 11, 2016, Kinross Gold Corp. acquired the remaining 50% interest in the Round Mountain Mine and 100% of Bald Mountain Mine from Barrick Gold Corp.

⁵Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

⁶Includes private-sector operations only; excludes Bureau of Land Management and U.S. Forest Service operations.

TABLE 5
 TWENTY-FIVE LEADING METAL AND INDUSTRIAL MINERAL MINES AND QUARRIES IN THE UNITED STATES IN 2016,
 IN ORDER OF OUTPUT OF TOTAL MATERIAL HANDLED¹

Name of mine, quarry, or operation	State	Operator	Commodity	Mining method
Metals:				
Nevada Operations ²	Nevada	Newmont Mining Corp.	Gold	Open pit and underground.
Cortez Operations	do.	Barrick Gold Corp.	do.	Do.
Bingham Canyon	Utah	Rio Tinto Kennecott Corp. ³	Copper-molybdenum	Open pit.
Goldstrike	Nevada	Barrick Gold Corp.	Gold	Open pit and underground.
South Arturo ⁴	do.	do.	do.	Open pit.
Marigold	do.	Silver Standard Resources Inc.	do.	Do.
Mesquite	California	New Gold Inc.	do.	Do.
Fort Knox	Alaska	Kinross Gold Corp.	do.	Do.
Minntac	Minnesota	United States Steel Corp.	Iron ore	Do.
Round Mountain	Nevada	Kinross Gold Corp. ⁵	Gold	Do.
Hibbing Taconite	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Tilden	Michigan	do.	do.	Do.
Hycroft	Nevada	Hycroft Mining Corp.	Gold	Do.
Ray	Arizona	ASARCO LLC ⁶	Copper	Do.
Rochester	Nevada	Coeur Mining, Inc.	Silver	Do.
Mission Complex	Arizona	ASARCO LLC ⁶	Copper	Do.
Cripple Creek	Colorado	Newmont Mining Corp.	Gold	Do.
Bald Mountain	Nevada	Kinross Gold Corp. ⁵	do.	Do.
Northshore	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Silver Bell	Arizona	ASARCO LLC ⁶	Copper	Do.
Minorca	Minnesota	ArcelorMittal S.A.	Iron ore	Do.
Wharf	South Dakota	Coeur Mining, Inc.	Gold	Do.
Empire	Michigan	Cliffs Natural Resources Inc.	Iron ore	Do.
Red Dog	Alaska	Teck Alaska Inc.	Zinc-lead ore	Do.
United Taconite	Minnesota	Cliffs Natural Resources Inc.	Iron ore	Do.
Industrial minerals:⁷				
Florida (five mines)	Florida	The Mosaic Co.	Phosphate rock	Do.
Boron	California	U.S. Borax, Inc. ³	Boron	Do.
Swift Creek	Florida	PCS Phosphate Co., Inc.	Phosphate rock	Do.
Aurora	North Carolina	do.	do.	Do.
Balcones	Texas	CEMEX S.A.B. de C.V.	Stone, crushed	Quarry.
White Rock	Florida	Vecellio & Grogan, Inc.	do.	Do.
FEC	do.	CEMEX S.A.B. de C.V.	do.	Do.
Beckmann	Texas	Martin Marietta Aggregates	do.	Do.
Georgetown	do.	Texas Crushed Stone Co.	do.	Do.
Pennsuco	Florida	Titan America LLC	do.	Do.
Bridgeport	Texas	Martin Marietta Aggregates	do.	Do.
Do.	do.	Lehigh Hanson, Inc.	do.	Do.
Marble Falls	do.	Oldcastle Materials, Inc.	do.	Do.
Ste. Genevieve	Missouri	Mississippi Lime Co.	do.	Underground.
Hunter	Texas	Colorado Materials, Ltd.	do.	Do.
Port Inland	Michigan	Carmeuse Lime & Stone Inc.	do.	Do.
Servtex	Texas	Lehigh Hanson, Inc.	do.	Do.
Presque Isle	Michigan	LafargeHolcim Ltd	do.	Do.
Ste. Genevieve	Missouri	Tower Rock Stone Co.	do.	Do.
Calcite Operation	Michigan	Carmeuse Lime & Stone Inc.	do.	Do.
Spec Agg	Colorado	Martin Marietta Aggregates	do.	Do.
Cape Sandy	Indiana	Mulzer Crushed Stone, Inc.	do.	Do.
Carey	Ohio	National Lime & Stone Co.	do.	Do.
New Braunfels	Texas	Martin Marietta Aggregates	do.	Do.
Richards	Oklahoma	Dolese Brothers Co.	do.	Do.

See footnotes at end of table.

TABLE 5—Continued
TWENTY-FIVE LEADING METAL AND INDUSTRIAL MINERAL MINES AND QUARRIES IN THE UNITED STATES IN 2016,
IN ORDER OF OUTPUT OF TOTAL MATERIAL HANDLED¹

Do., do. Ditto.

¹Where data are not reported for individual mining operations, ranking is on the basis of production as reported for a group of operations.

²Includes the Carlin Mines Operations (four open pit operations and four underground operations), the Long Canyon Mine (open pit), the Phoenix property operations (two open pit operations), and the Twin Creeks Mine (open pit).

³Wholly owned subsidiary of Rio Tinto plc.

⁴Joint venture between Barrick Gold Corp. (60%) and Premier Gold Mines Ltd. (40%).

⁵On January 11, 2016, Kinross Gold Corp. acquired the remaining 50% interest in the Round Mountain Mine and 100% of Bald Mountain Mine from Barrick Gold Corp.

⁶Wholly owned subsidiary of Grupo México, S.A.B. de C.V.

⁷Includes private-sector operations only; excludes Bureau of Land Management and U.S. Forest Service operations.

TABLE 6
MARKETABLE PRODUCT AND ORE TREATED OR SOLD AT SURFACE AND UNDERGROUND MINES
IN THE UNITED STATES IN 2016, BY SELECTED COMMODITY AND STATE¹

(Thousand metric tons, unless otherwise specified)

Commodity or State	Marketable product			Ore treated or sold		
	Surface	Underground	Total	Surface	Underground	Total
Commodity:						
Metal ore:						
Copper ²	1,430	(3)	1,430	279,000	(4)	279,000
Gold	(5)	(5)	228,000 ⁶	332,000	(4)	332,000
Iron, usable	41,800	--	41,800	137,000	--	137,000
Industrial minerals:						
Clays	23,900	(3)	23,900	23,900	(4)	23,900
Feldspar ⁷	470	--	470	856 ^c	--	856 ^c
Gypsum	(5)	(5)	17,000	(8)	(8)	17,000
Phosphate rock	27,100	--	27,100	130,000	--	130,000
Pumice ⁹	374	--	374	374	--	374
Salt	(10)	40,200	40,200	(11)	40,200	40,200
Sand and gravel:						
Construction	888,000	--	888,000	888,000	--	888,000
Industrial	77,700	(3)	77,700	77,700	(4)	77,700
Soda ash	--	11,800	11,800	--	11,800	11,800
Stone:						
Crushed	1,270,000	85,200	1,360,000	1,270,000	85,200	1,360,000
Dimension	2,790	(3)	2,790	2,790	(4)	2,790
Talc	536	--	536	536	--	536
State:^{e, 12}						
Alabama	51,100	(3)	51,100	50,500	(4)	50,500
Alaska	9,870	(3)	9,870	9,470	(4)	9,470
Arizona	53,000 ¹³	--	53,000 ¹³	51,700	--	51,700
Arkansas	40,300	(3)	40,300	41,000	(4)	41,000
California	137,000	(3)	137,000	145,000	(4)	145,000
Colorado	49,300	(3)	49,300	49,900	(4)	49,900
Connecticut	15,200 ^{13, 14}	--	15,200 ^{13, 14}	15,200	--	15,200
Delaware ¹⁵	2,810 ^{13, 14}	--	2,810 ^{13, 14}	2,810	--	2,810
Florida	109,000 ¹³	--	109,000 ¹³	206,000	--	206,000
Georgia	63,400	3,140	66,500 ¹³	66,500	2,510	69,000
Hawaii	5,550 ¹³	--	5,550 ¹³	5,560	--	5,560
Idaho	19,700	(3)	19,700	25,000	(4)	25,000
Illinois	75,000	8,400	83,400 ^{13, 14}	75,400	10,800	86,200
Indiana	64,500	(3)	64,500	59,300	(4)	59,300
Iowa	47,900	5,920	53,900 ^{13, 14}	47,200	8,260	55,500
Kansas	27,200	2,780	29,900 ^{13, 14}	28,700	3,090	31,800
Kentucky	45,600	12,100	57,700 ^{13, 14}	42,400	15,600	58,000
Louisiana ¹⁵	21,500	9,240	30,700 ^{13, 14}	20,700	13,500	34,200
Maine	13,200 ^{13, 14}	--	13,200 ^{13, 14}	13,200	--	13,200
Maryland	30,400	(3)	30,400	29,300	(4)	29,300
Massachusetts	22,600 ¹³	--	22,600 ¹³	22,600	--	22,600
Michigan	83,100	(3)	83,100	73,800	2,680	76,500
Minnesota	88,200 ¹³	--	88,200 ¹³	60,500	--	60,500
Mississippi	14,300 ¹³	--	14,300 ¹³	13,500	--	13,500
Missouri	77,000	12,500	89,500 ¹³	72,800	18,800	91,600
Montana	13,700	(3)	13,700	14,800	(4)	14,800
Nebraska	19,300	(3)	19,300	17,400	(4)	17,400
Nevada	25,600	(3)	25,600	31,600	4,460	36,100
New Hampshire	12,600 ¹³	--	12,600 ¹³	12,600	--	12,600
New Jersey	29,900 ¹³	--	29,900 ¹³	30,000	--	30,000
New Mexico	13,300	(3)	13,300	15,200	(4)	15,200
New York	69,300	7,200	76,500 ^{13, 14}	70,100	7,960	78,100
North Carolina	71,200 ^{13, 14}	--	71,200 ^{13, 14}	83,500	--	83,500
North Dakota	13,800 ¹³	--	13,800 ¹³	13,700	--	13,700
Ohio	84,700	11,000	95,700 ^{13, 14}	93,700	7,890	102,000

See footnotes at end of the table.

TABLE 6—Continued
MARKETABLE PRODUCT AND ORE TREATED OR SOLD AT SURFACE AND UNDERGROUND MINES
IN THE UNITED STATES IN 2016, BY SELECTED COMMODITY AND STATE¹

(Thousand metric tons, unless otherwise specified)

Commodity or State	Marketable product			Ore treated or sold		
	Surface	Underground	Total	Surface	Underground	Total
State: ^{6, 12} —Continued						
Oklahoma	49,900	(3)	49,900	51,100	(4)	51,100
Oregon	33,500 ¹³	--	33,500 ¹³	33,600	--	33,600
Pennsylvania	84,200	12,200	96,400 ^{13, 14}	84,100	13,000	97,000
Rhode Island	4,420 ^{13, 14}	--	4,420 ^{13, 14}	4,570	--	4,570
South Carolina	37,700 ^{13, 14}	--	37,700 ^{13, 14}	38,700	--	38,700
South Dakota	17,600 ¹³	--	17,600 ¹³	17,300	--	17,300
Tennessee	50,700	3,020	53,700 ¹³	50,500	6,500	57,000
Texas	268,000	8,250	276,000 ¹³	273,000	8,690	282,000
Utah	42,400	(3)	42,400	49,400	(4)	49,400
Vermont	10,300 ¹³	--	10,300 ¹³	10,400	--	10,400
Virginia	61,300	(3)	61,300	63,400	(4)	63,400
Washington	51,400	(3)	51,400	51,700	(4)	51,700
West Virginia	11,400	4,020	15,500 ^{13, 14}	11,700	4,460	16,200
Wisconsin	65,300	(3)	65,300	77,600	(4)	77,600
Wyoming	24,900	9,520	34,400 ¹³	23,800	8,930	32,700

⁶Estimated. -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes copper-molybdenum.

³Withheld to avoid disclosing company proprietary data; included in "Marketable product, surface."

⁴Withheld to avoid disclosing company proprietary data; included in "Ore treated or sold, surface."

⁵Withheld to avoid disclosing company proprietary data; included in "Marketable product, total."

⁶Kilograms.

⁷Includes aplite.

⁸Withheld to avoid disclosing company proprietary data; included in "Ore treated or sold, total."

⁹Excludes volcanic cinder and scoria, which are included with "Stone: Crushed."

¹⁰Withheld to avoid disclosing company proprietary data; included in "Marketable product, underground."

¹¹Withheld to avoid disclosing company proprietary data; included in "Ore treated or sold, underground."

¹²Estimated "Marketable product" and "Ore treated or sold" State data based on percent change from State data in table 5 of the Minerals Yearbook statistical summary chapter.

¹³Reported data.

¹⁴Partial data to avoid disclosing company proprietary data.

¹⁵Does not include crushed stone.

TABLE 7
MINING METHODS USED AT SURFACE OPERATIONS IN THE UNITED STATES
IN 2016, BY COMMODITY

(Percentage of total material handled)

Commodity	Preceded by drilling and blasting	Not preceded by drilling and blasting ¹
Metal ore:		
Copper ²	98	2
Gold ³	89	11
Iron	95	5
Magnesium	--	100
Molybdenum	100	--
Platinum	100	--
Silver	100	--
Titanium	--	100
Zinc	100	--
Industrial minerals:		
Abrasives	100	--
Barite	100	--
Boron minerals	100	--
Bromine	--	100
Clays	--	100
Diatomite	3	97
Feldspar ⁴	100	--
Garnet	75	25
Greensand marl	--	100
Gypsum	100	--
Iodine	--	100
Iron oxide pigments	--	100
Kyanite	100	--
Lithium minerals	--	100
Magnesite	100	--
Magnesium compounds	--	100
Mica, scrap	17	83
Perlite	NA	NA
Phosphate rock	--	100
Potash	--	100
Pumice ⁵	--	100
Salt	--	100
Sand and gravel:		
Construction	--	100
Industrial	NA	NA
Stone:		
Crushed	100	--
Dimension	--	100
Talc	100	--
Tripoli	62	38
Vermiculite	16	84
Wollastonite	83	17
Zeolites	100	--

NA Not available. -- Zero.

¹Includes drilling and cutting without blasting, dredging, mechanical excavation and nonfloat washing, and other surface mining methods.

²Includes copper-molybdenum.

³Includes gold-silver.

⁴Includes aplite.

⁵Excludes volcanic cinder and scoria, which are included with "Stone: Crushed."

TABLE 8
EXPLORATION ACTIVITY IN THE UNITED STATES IN 2016, BY METHOD, COMMODITY, AND STATE¹

(Meters, unless otherwise specified)

Commodity or State	Churn and diamond drilling	Rotary and reverse circulation drilling	Percussion drilling, other drilling, and trenching	Grand total
Commodity:				
Copper ²	W	W	--	W
Gold	50,000	W	--	50,000
Lead	W	W	--	W
Silver	W	--	--	W
Other ³	211,000	76,800	W	288,000
Total	261,000	76,800	W	338,000
Percentage of grand total	77	23	W	100
State:				
Montana	155,000	W	--	W
Undistributed ⁴	106,000	76,800	W	338,000
Total	261,000	76,800	W	338,000

W Withheld to avoid disclosing company proprietary data; included with "Other" or "Undistributed." -- Zero.

¹Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes copper-molybdenum.

³Includes nickel ore, platinum and palladium, and commodities indicated by symbol W.

⁴Includes Arizona, California, Colorado, Michigan, Missouri, Nevada, South Dakota, Utah, Washington, and States indicated by symbol W.