



2016 Minerals Yearbook

LEAD [ADVANCE RELEASE]

LEAD

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In 2016, domestic mine production of recoverable lead was 336,000 metric tons (t), 7% less than that in 2015 (table 1). The value of domestic mine production in 2016 (based on the North American Market price) decreased by 3% to \$699 million. In the United States, lead in concentrate was produced at 10 mines that employed about 1,970 people. Alaska and Missouri were the principal producing States, accounting for most of the domestic mine production. Primary lead metal has not been produced in the United States since the closure of the last operating smelter at yearend 2013.

Secondary (recycled) lead, derived principally from scrapped lead-acid batteries, was 1.11 million metric tons (Mt), 6% more than that in 2015. Recycled lead accounted for 100% of refined lead production in the United States in 2016 (table 1). Nearly all the secondary lead was produced by six companies operating 11 smelters.

World mine production of lead decreased by 5% to 4.75 Mt in 2016 from revised 5.00 Mt in 2015 owing primarily to a decrease of production in Australia. The United States continued to be the third-leading producer and accounted for about 7% of global lead mine production. China and Australia were the two leading producers in 2016, accounting for 49% and 10%, respectively, of global lead mine production (table 11). World production of refined lead (primary and secondary) was 11 Mt in 2016, about 3% more than that in 2015. The United States continued to be the second-leading global producer, accounting for 10% of global total refined lead production and 19% of global secondary refined production. China was the leading producer of refined lead, accounting for 42% of global total refined lead production, 69% of primary refined lead production, and 28% of secondary refined lead production in 2016 (table 12).

Lead metal was consumed domestically by more than 60 companies to manufacture such products as ammunition; building-construction materials; covering for power and communication cable; lead-acid storage batteries; lead oxides for ceramics, chemicals, glass, and pigments; lead sheet; and solders for construction, electronic components and accessories, metal containers, and motor vehicles.

Lead-acid batteries, including starting-lighting-ignition (SLI) and industrial batteries, continued to be the dominant use of lead, accounting for about 91% of reported lead consumption (table 4). In 2016, North American producers shipped 129 million SLI automotive-type original equipment and replacement batteries, 1.7 million more than the amount shipped in 2015 (Battery Council International, 2016, 2018).

According to the International Lead and Zinc Study Group (ILZSG), global consumption of refined lead in 2016 was 11.2 Mt, slightly more than that revised in 2015. The leading refined-lead-consuming countries in 2016 were China, 41%; the United States, 14%; India, 5%; the Republic of Korea, 5%; and

Germany, 3% (International Lead and Zinc Study Group, 2017b, p. 10–11).

The 2016 average annual London Metal Exchange Ltd. (LME) cash price for lead was 84.8 cents per pound, a 5% increase from that of 2015. The Platts Metals Week North American Market price was 94.4 cents per pound, 3% more than that in 2015 (table 1).

Legislation and Government Programs

In late 2013, California Assembly Bill 711 was signed into law requiring the use of nonlead ammunition when taking any wildlife with a firearm in California. The law required that the California Fish and Game Commission adopt regulations to phase in the statute's requirements by July 1, 2015, with full implementation by July 1, 2019. In April 2015, the Fish and Game Commission adopted proposed regulations from the California Department of Fish and Wildlife (CDFW) to implement the nonlead requirement in three phases: phase one, effective July 1, 2015, required nonlead ammunition when taking Nelson bighorn sheep and all wildlife on CDFW wildlife areas and ecological reserves; phase two, effective July 1, 2016, would require nonlead shot when taking most upland game birds with a shotgun; and phase three, effective July 1, 2019, would require nonlead shot when taking any wildlife with a firearm anywhere in California (California Department of Fish and Wildlife, undated).

Production

Mine.—In 2016, domestic mine production of recoverable lead was 336,000 t, 7% less than that in 2015 (table 1) and about 25% less than production in 2000. There were 10 lead-producing mines operating in the United States in 2015 (table 2), compared with 19 mines in 2000.

Alaska and Missouri accounted for most of the U.S. mine output of lead. Lead was also mined in Idaho and Washington. Domestic mine production data were collected by the U.S. Geological Survey (USGS) from a voluntary survey of lode mines. Eight lead-producing mines responded to the survey in 2016, accounting for about 90% of U.S. production. Production data for nonreporting mines were obtained from publicly available data.

The Doe Run Company (St. Louis, MO) operated four mills that produced lead concentrates from ore supplied from six underground mines along the Viburnum Trend in southeast Missouri. Doe Run operations are considered to be among the second largest lead mining districts in the world. In January 2016, the company announced that it was reducing its mine production owing to lower metal prices and declining ore grades (Salem News Online, The, 2016). All the concentrates produced at the mines were exported.

Teck Alaska Inc. (a wholly owned subsidiary of Teck Resources Ltd., Canada) operated the Red Dog zinc-lead mine in northwestern Alaska under a royalty agreement with NANA Regional Corp., the sole owner of the property. NANA is an Alaska Native-owned corporation organized under the provisions of the Alaska Native Claims Settlement Act. Teck reported that production of lead in concentrates at Red Dog increased by 4% to about 122,000 t in 2016 from 118,000 t in 2015 owing to increased mill processing of the softer ores (Teck Resources Ltd., 2017, p. 22).

Hecla Mining Co. (Coeur d'Alene, ID) operated the Greens Creek gold, lead, silver, and zinc mine near Juneau, AK, and the Lucky Friday lead, silver, and zinc mine in the Coeur d'Alene mining district in northern Idaho. In 2016, Hecla produced 18,700 t of lead in concentrates at Greens Creek, 5% less than that in 2015. Hecla reported that proven and probable reserves at yearend 2016 totaled 197,000 t of lead, and the company estimated that the remaining mine life was 10 years. In 2016, Lucky Friday produced 19,900 t of lead in concentrates, 19% more than the amount that was produced in 2015. Hecla reported that proven and probable lead reserves at yearend 2016 totaled 424,000 t of lead, and the estimated remaining mine life at Lucky Friday was 22 years (Hecla Mining Co., 2017, p. HL10–K17–20).

Primary Refined.—There was no primary refined lead production in 2015. Doe Run closed the only domestic primary lead smelter in Herculaneum, MO, at yearend 2013.

Secondary Refined.—Domestic production of secondary refined lead in 2016 increased by 6% to 1.11 Mt from 1.05 Mt in 2015. The domestic secondary lead industry consisted of several vertically integrated battery producers that operated secondary lead smelters to supply lead for their lead-acid battery plants and several companies that operated stand-alone secondary smelters. The latter typically had tolling agreements with battery manufacturers to recycle their used lead-acid batteries and supply them with secondary lead. Lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 96% of all secondary lead (table 3). The domestic secondary lead data were derived by the USGS from monthly and annual surveys of secondary producers. In 2016, 12 smelters that produced secondary lead, exclusive of that recovered in copper-base scrap, were surveyed; 8 responded, representing about 90% of the total production of secondary lead. Production for the nonrespondents were estimated from prior-years' production. Of the total lead recycled in 2016, most was recovered by six companies operating 11 plants in Alabama, California, Florida, Indiana, Minnesota, Missouri, New York, Pennsylvania, South Carolina, and Tennessee (tables 1, 3).

In March 2015, Aqua Metals Inc. (Alameda, CA) announced plans to build a new secondary lead refinery in McCarran, NV, that would be capable of producing high-purity lead for use in advanced lead-acid batteries. The plant would use an electrochemical battery recycling technology that differed from traditional smelting methods used by most existing secondary lead smelter-refineries. In the fourth quarter of 2016, the company announced that it had produced its first lead from recycled lead-acid batteries which would be sent to several U.S.

battery manufacturing companies for testing (MacAulay, 2015; Aqua Metals Inc., 2016).

Consumption

In 2016, reported U.S. consumption of refined lead was 1.97 Mt, a slight increase from that in 2015 (table 4). Consumption of lead in SLI and industrial-type lead-acid storage batteries accounted for 91% of the total reported consumption of lead (tables 4, 5). Demand for lead was heavily reliant on the automotive sector. The Battery Council International (BCI) reported that 129 million lead-acid automotive batteries containing an estimated 1.08 Mt of lead (based on an average of 8.39 kilograms of lead content per battery) (SmithBucklin Statistics Group, 2017, p. 4) were shipped by North American producers in 2016, a slight increase from battery shipments (127 million batteries containing an estimated 1.07 Mt of lead) in 2015. Shipments of replacement lead-acid automotive batteries (108 million) increased slightly from that in 2015, and shipments of original equipment lead-acid automotive batteries (21.3 million) remained essentially unchanged from that in 2015 (Battery Council International, 2016, 2018).

Prices and Stocks

In 2016, the average annual North American Market price and the LME cash price for lead increased by 3% and 5%, respectively, from those in 2015 (table 1). The average monthly LME cash price for lead was \$0.75 per pound in January and generally trended upward during the year to a peak of \$1.01 per pound in December.

Scrap prices also increased during 2016. According to Platts Metals Week, the average monthly price paid by domestic smelters for whole spent lead-acid batteries (the most prevalent form of lead scrap) increased from \$0.28 per pound in January to \$0.34 per pound in December.

Global LME lead stocks at the end of December 2016 were 194,900 t, slightly more than those at the end of December 2015 (London Metal Exchange Ltd., 2015, 2016).

Foreign Trade

In 2016, U.S. imports for consumption of unwrought (refined) lead metal in pigs and bars totaled 416,000 t, essentially unchanged from those in 2015. A decrease in imports from Mexico of 33,000 t was offset by a 36,300-t increase from the Republic of Korea. The leading sources were Canada, accounting for 42% of unwrought lead metal imports, followed by the Republic of Korea (21%) and Mexico (17%) (table 10).

Total domestic exports of unwrought lead and lead alloys in 2016 were 36,400 t, 27% less than those in 2015. Mexico and Belgium were the leading destinations for the unwrought lead and lead alloys exported in 2016, accounting for about 71% and 24%, respectively, of the total. Domestic exports of lead in concentrates were 341,000 t, slightly less than those of 2015; China (47%), the Republic of Korea (15%), and Canada (14%) were the leading destinations (table 9). In 2016, essentially all

lead concentrates were exported following the yearend 2013 closure of Doe Run's Herculanum primary smelter.

A substantial quantity of lead contained in new and spent lead-acid batteries is traded annually. U.S. Census Bureau trade data indicated that, in 2016, the United States imported about 22.1 million SLI lead-acid batteries for consumption, a 28% increase from that in 2015. Mexico was the leading provider of SLI batteries, accounting for 32% of those imported in 2016. SLI batteries were also mainly imported from the Republic of Korea (18%), China (17%), Taiwan (10%), and Colombia (6%). The United States exported about 24.2 million spent SLI lead-acid batteries in 2016, 7% less than those in 2015. Spent batteries were shipped to Mexico (90%) and Canada (10%) for recycling. Much of the lead recovered from the exported spent batteries was used to manufacture lead-acid batteries at plants in Canada and Mexico, which were in turn exported back to the United States.

World Review

World mine production of lead decreased by 5% to 4.75 million metric tons (Mt) in 2016 from 5.00 Mt in 2015 owing primarily to a 200,000-t decrease in production in Australia (table 11). The United States was the third-leading producer (unchanged from 2015) and accounted for about 7% of global lead mine production. Globally, 83,000 t/yr of lead mine production capacity was closed in 2016, and about 24,000 t/yr of capacity opened. Most of the capacity shutdown was in Australia and, to a lesser extent, Peru (International Lead and Zinc Study Group, 2017a, p. 22–23).

World production of refined lead (primary and secondary) was 11 Mt, about 3% more than that in 2015. The United States was the second-leading global producer of refined lead after China and accounted for 10% of global production, the same as in 2015.

According to the International Lead and Zinc Study Group (ILZSG), global consumption of refined lead in 2016 was 11.2 Mt, slightly more than that in 2015. The leading refined-lead-consuming countries in 2016 were China, 41%; the United States, 14%; India, 5%; the Republic of Korea, 5%; and Germany, 3% (International Lead and Zinc Study Group, 2017b, p. 10–11).

Australia.—In 2016, lead mine production in Australia decreased by 31% as a result of the closure of Glencore plc's (Switzerland) Black Star Mine, which had a lead production capacity of 75,000 t/yr and was a part of the Mount Isa mining complex. Black Star was placed on care-and-maintenance status in November 2016 owing to reserve depletion (Harvey, 2016; International Lead and Zinc Study Group, 2017a, p. 23).

China.—In 2016, China continued to be the leading global producer and consumer of lead and the leading producer of lead-acid batteries. China produced 4.67 Mt of refined lead, essentially unchanged from that in 2015 and accounting for about 42% of global refined lead (table 12). China's secondary lead production was about 28% of total secondary world refined lead production in 2016, slightly less than that in 2015. China's refined lead production consisted of 64% primary and 36% secondary lead production. In 2016, two lead refineries opened—a 40,000-t/yr secondary smelter owned by Yunnan

Xiangyun Feilong Nonferrous Metal Co. Ltd. in China and Aqua Metal's 30,000-t/yr secondary plant in the United States (International Lead and Zinc Study Group, 2017a, p. 26). Lead-in-concentrate production in 2016 was estimated to be about 2.34 Mt, unchanged from that in 2015 (table 11). According to the ILZSG, consumption of lead in China decreased slightly to 4.64 Mt in 2016 from 4.71 Mt in 2015 (International Lead and Zinc Study Group, 2015; 2017b, p. 11).

Outlook

Domestic lead mine production was expected to decline in 2017. In late January, Doe Run announced that it was reducing production at its mines in southeastern Missouri in 2016 by about 18,100 t of lead in concentrate, equivalent to 10% of the company's annual production. Copper and zinc production would also be reduced. The cutbacks continued in 2017. Price declines for metals and increased operational and regulatory costs were cited as the reasons for the cutbacks.

At its October 2016 meeting in Lisbon, Portugal, the ILZSG forecast global increases in lead consumption and refined and mine production in 2017. Global lead consumption in 2017 is expected to increase slightly, primarily owing to increased consumption in China, Europe, and the United States. China's consumption is expected to increase, owing to increased use of lead-acid batteries for automobiles and industrial applications, partially offset by declines in use for electric bicycles. Global lead mine production in 2017 is forecast to increase by 3% from that in 2016 owing to an increase in mine production in China that will be partially offset by a decline in Australia. Global refined lead production is forecast to increase slightly in 2017 owing to increases in Belgium, China, Mexico, and the United States. The ILZSG forecast that global refined lead production would exceed consumption by about 23,000 t in 2017 (International Lead and Zinc Study Group, 2016).

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TABLE 1
 SALIENT LEAD STATISTICS¹

		2012	2013	2014	2015	2016
United States:						
Production:						
Mine, recoverable lead content: ²						
Quantity	metric tons	336,000	331,000	367,000	360,000	336,000
Value	thousands	\$845,000	\$837,000	\$860,000	\$724,000	\$699,000
Primary lead, refined content, domestic ores and base bullion	metric tons	111,000	114,000	--	--	--
Secondary lead, lead content	do.	1,150,000 ^r	1,160,000 ^r	1,060,000 ^r	1,050,000	1,110,000
Exports:						
Lead ore and concentrates, lead content	do.	211,000	210,000 ^r	357,000 ^r	350,000 ^r	341,000
Lead materials, excluding scrap, gross weight	do.	51,700 ^r	46,200 ^r	59,400 ^r	53,600 ^r	40,300
Imports for consumption, gross weight:						
Lead in base bullion	do.	1,400 ^r	1,940 ^r	1,180 ^r	342 ^r	237
Refined lead, unwrought	do.	183,000	324,000	464,000	417,000	416,000
Stocks, December 31, lead content:						
Primary lead	do.	W	W	--	--	--
At consumers and secondary smelters	do.	63,000 ^r	61,100 ^r	56,400 ^r	60,100 ^r	60,300
Consumption of metal, primary and secondary, lead content	do.	1,820,000 ^r	1,810,000 ^r	1,960,000 ^r	1,960,000 ^r	1,970,000
Price:³						
North American Market	cents per pound	NA	109.98	106.17	91.20	94.39
North American Producer	do.	114.16	NA	NA	NA	NA
London Metal Exchange, pure lead, cash average	do.	93.53	97.15	95.04	81.02	84.84
World production, lead content:						
Mine	metric tons	5,060,000 ^r	5,270,000 ^r	5,290,000 ^r	5,000,000 ^r	4,750,000
Refinery:						
Primary	do.	4,700,000 ^r	4,930,000 ^r	4,550,000 ^r	4,410,000 ^r	4,360,000
Secondary	do.	5,580,000 ^r	5,640,000 ^r	5,750,000 ^r	5,850,000 ^r	5,850,000
Undifferentiated	do.	297,000 ^r	292,000 ^r	332,000 ^r	342,000 ^r	367,000

^rRevised. do. Ditto. NA Not available. W Withheld to avoid disclosing company proprietary data. -- Zero.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits, except prices.

²Lead recoverable after smelting and refining. Data in table 11 represent lead in concentrate.

³Source: Platts Metals Week.

TABLE 2
LEADING LEAD-PRODUCING MINES IN THE UNITED STATES IN 2016, IN ORDER OF OUTPUT¹

Rank	Mine	County and State ²	Operator	Source of lead
1	Red Dog	Northern Region, AK	Teck Alaska Inc.	Zinc-lead ore.
2	Fletcher	Reynolds, MO	Doe Run Resources Corp.	Lead ore.
3	Viburnum (#29 and #35)	Washington and Iron, MO	do.	Do.
4	Brushy Creek	Reynolds, MO	do.	Do.
5	Sweetwater	do.	do.	Do.
6	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
7	Greens Creek	Southeastern Region, AK	do.	Zinc-silver ore.
8	Galena Complex	Shoshone, ID	Americas Silver Corp.	Silver ore.
9	Pend Oreille	Pend Oreille, WA	Teck American Inc.	Zinc-lead ore.
10	Buick	Iron, MO	Doe Run Resources Corp.	Lead ore.

Do., do. Ditto.

¹Table includes data available through November 20, 2019. The mines on this list accounted for 100% of the U.S. lead mine production in 2016.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 73, Alaska's mineral industry 2016—Exploration activity.

TABLE 3
LEAD RECOVERED FROM SCRAP PROCESSED IN THE UNITED STATES BY KIND OF SCRAP AND FORM OF RECOVERY¹

(Metric tons, lead content, unless otherwise specified)

	2015	2016
Kind of scrap:		
New scrap:		
Lead-base	W	W
Tin-base	W	W
Total	18,400 ^r	19,200
Old scrap:		
Battery-lead	W	W
All other lead-base	W	W
Total	1,030,000	1,090,000
Grand total	1,050,000	1,110,000
Form of recovery:		
As soft lead	827,000	877,000
In antimonial lead	214,000 ^r	223,000
In other lead alloys	4,810 ^r	5,710
Total:		
Quantity	1,050,000	1,110,000
Value ² thousands	\$2,110,000	\$2,210,000

^rRevised. W Withheld to avoid disclosing company proprietary data; included in appropriate totals.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Value based on average quoted price of common lead.

TABLE 4
U.S. CONSUMPTION OF LEAD, BY PRODUCT¹

(Metric tons, lead content)

SIC ² code	Product	2015	2016
	Metal products:		
3482	Ammunition, shot and bullets	78,400 ^r	69,800
	Bearing metals:		
35	Machinery except electrical	W	W
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	--
	Total bearing metals	1,090 ^r	1,060
3351	Brass and bronze, billets and ingots	1,580 ^r	1,580
36	Cable covering, power and communication	(3)	(3)
15	Calking lead, building construction	(3)	(3)
	Casting metals:		
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
3443	Nuclear radiation shielding	W	W
	Total casting metals	14,200 ^r	15,000
	Pipes, traps, other extruded products:		
15	Building construction	W	W
3443	Storage tanks, process vessels, etc.	W	W
	Total pipes, traps, other extruded products	7,060 ^r	7,160
	Sheet lead:		
15	Building construction	W	W
3443	Storage tanks, process vessels, etc.	W	W
3693	Medical radiation shielding	4,390 ^r	4,130
	Total sheet lead	9,020 ^r	6,510
	Solder:		
15	Building construction	45	W
367	Electronic components, accessories and other electrical equipment	W	W
371	Motor vehicles and equipment	W	W
	Total solder	6,490 ^r	6,520
	Storage batteries:		
3691	Storage battery grids, post, etc.	672,000 ^r	680,000
3691	Storage battery oxides	1,100,000 ^r	1,120,000
	Total storage batteries	1,770,000 ^r	1,800,000
27	Type metal, printing and allied industries	(4)	(4)
34	Other metal products ⁵	31,100 ^r	31,100
	Grand total metal products	1,920,000 ^r	1,940,000
	Other oxides:		
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
	Total	11,500	11,700
	Miscellaneous uses	20,300 ^r	18,100
	Grand total	1,960,000 ^r	1,970,000

^rRevised. W Withheld to avoid disclosing company proprietary data; included in appropriate totals. -- Zero.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²SIC Standard Industrial Classification.

³Withheld to avoid disclosing company proprietary data; included in "Grand total metal products."

⁴Withheld to avoid disclosing company proprietary data; included in "Other metal products."

⁵Includes lead consumed in foil, collapsible tubes, annealing, galvanizing, plating, electrowinning, fishing weights, andterne metal.

TABLE 5
U.S. CONSUMPTION OF LEAD IN 2016, BY CLASS OF PRODUCT^{1,2}

(Metric tons, lead content)

Product	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
Metal products	57,400	75,600	W	(3)	133,000
Storage batteries	1,120,000	331,000	357,000	--	1,800,000
Other oxides	W	--	--	--	W
Gasoline additives	W	--	--	--	W
Miscellaneous	28,400	--	7,740	--	36,100
Total	1,200,000	406,000	364,000	(3)	1,970,000

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

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes lead that went directly from scrap to fabricated products.

³Data for lead in copper-base scrap are withheld to avoid disclosing company proprietary data; included in "Lead in alloys."

TABLE 6
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS IN THE UNITED STATES, DECEMBER 31^{1,2}

(Metric tons, lead content)

Year	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap ³	Total
2015	30,800 ^r	18,400 ^r	10,900 ^r	W	60,100 ^r
2016	36,500	16,500	7,410	W	60,300

^rRevised. W Withheld to avoid disclosing company proprietary data; included in "Lead in alloys."

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes stocks at primary refineries.

³Data for lead in copper-base scrap are withheld to avoid disclosing company proprietary data; included in "Lead in alloys."

TABLE 7
PRODUCTION AND SHIPMENTS OF LEAD PIGMENTS AND OXIDES IN THE UNITED STATES^{1,2}

(Metric tons and dollars)

Product	2015				2016			
	Production		Shipments ^e		Production		Shipments ^e	
	Gross weight	Lead content	Quantity (lead content)	Value ³	Gross weight	Lead content	Quantity (lead content)	Value ³
Litharge, red lead and white lead, dry	3,900	3,610	3,900	8,770,000	3,540	3,290	3,540	7,950,000
Lead oxide	938,000 ^r	891,000 ^r	NA	NA	969,000	920,000	NA	NA
Total	942,000 ^r	895,000 ^r	NA	NA	972,000	923,000	NA	NA

^eEstimated. ^rRevised. NA Not available.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Excludes basic lead sulfate to avoid disclosing company proprietary data.

³At plant, exclusive of container.

TABLE 8
U.S. IMPORTS FOR CONSUMPTION OF LEAD PIGMENTS AND COMPOUNDS, BY KIND¹

Kind	Quantity (metric tons, gross weight)	Value (thousands)
2015:		
White lead carbonate	7	\$21
Red and orange lead	6	18
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,360 ^r	7,940 ^r
Litharge	1,340 ^r	3,600 ^r
Glass frits (undifferentiated)	37,800	62,300
2016:		
White lead carbonate	5	14
Red and orange lead	5	42
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,580	6,220
Litharge	936	2,910
Glass frits (undifferentiated)	38,800	59,900

^rRevised.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits.

Source: U.S. Census Bureau.

TABLE 9
U.S. EXPORTS OF LEAD, BY COUNTRY OR LOCALITY¹

Country or locality	2015		2016	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ore and concentrates, lead content:				
Belgium	20,100	\$29,400	8,940	\$10,800
Canada	41,900 ^r	60,100 ^r	48,100	77,400
China	206,000	268,000	161,000	226,000
Germany	15,700	21,800	32,700	44,300
Italy	15,900	21,700	17,700	19,000
Japan	15,400	20,300	20,200	27,900
Korea, Republic of	34,200	45,700	51,700	74,000
Mexico	1,050	1,320	535	965
Other	260	93	--	--
Total	350,000 ^r	469,000 ^r	341,000	480,000
Base bullion, gross weight:				
Canada	596	1,470	1,290	3,200
Other	--	--	20	36
Total	596	1,470	1,310	3,230
Refined lead and lead alloys, unwrought, gross weight:²				
Belgium	12,000	12,000	8,770	7,660
Canada	1,040 ^r	1,450 ^r	59	84
China	54	41	76	81
Japan	2,150	1,310	69	42
Korea, Republic of	13	8	--	--
Mexico	11,400 ^r	34,000 ^r	26,000	23,000
Netherlands	50	273	--	--
United Kingdom	(3) ^r	4 ^r	35	31
Venezuela	--	--	63	55
Other	23,400 ^r	369 ^r	1,310	1,350
Total	50,100 ^r	49,400 ^r	36,400	32,300
Wrought lead and other products, gross weight:⁴				
Canada	674	2,400	433	1,710
Chile	1	31	4	22
China	34	290	60	387
Colombia	5 ^r	26 ^r	2	12
India	916	1,340	1,100	1,820
Korea, Republic of	35	208	75	345
Mexico	217	833	168	670
Singapore	128	1,120	74	571
United Kingdom	81 ^r	487 ^r	43	240
Other	765 ^r	3,260 ^r	626	2,360
Total	2,850 ^r	10,000 ^r	2,590	8,130
Scrap, gross weight:⁵				
Canada	70 ^r	40 ^r	52	32
China	1,930 ^r	1,120 ^r	506	152
Dominican Republic	1,470 ^r	549 ^r	1,060	323
Ecuador	4,860 ^r	6,760 ^r	788	600
India	797 ^r	754 ^r	1,780	1,260
Korea, Republic of	18,100 ^r	20,800 ^r	11,000	13,000
United Arab Emirates	788 ^r	464 ^r	21	35
Other	1,120 ^r	566 ^r	1,520	803
Total	29,100 ^r	31,100 ^r	16,700	16,200

^rRevised. -- Zero.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes refined lead (Schedule B export code 7801.10.0000) and lead alloys (Schedule B export code 7801.99.9030).

³Less than ½ unit.

⁴Includes lead plates, sheets, strip and foil (Schedule B export codes 7804.11.0000, 7804.19.0000), and lead powder and flakes (Schedule B export code 7804.20.0000).

⁵Includes lead waste and scrap obtained from scrap lead-acid batteries (Schedule B export code 7802.00.0030).

Source: U.S. Census Bureau.

TABLE 10
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY OR LOCALITY¹

Country or locality	2015		2016	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Base bullion, gross weight:				
Chile	--	--	39	\$67
Mexico	202 ^r	\$212	--	--
Saudi Arabia	--	--	99	167
Senegal	94	211	99	163
Venezuela	46 ^r	70	--	--
Total	342 ^r	492 ^r	237	396
Refined lead, unwrought, gross weight:²				
Argentina	--	--	281	563
Australia	4,590	8,950	3,820	14,700
Bolivia	--	--	511	876
Brazil	--	--	8,090	15,900
Canada	162,000	311,000	176,000	334,000
China	802	324	273	109
Colombia	--	--	2,020	4,050
Dominican Republic	50	102	317	642
Ecuador	11,500	22,100	4,280	8,170
France	79	247	--	--
Germany	9,630	18,300	1,230	2,220
India	21,700	43,000	20,500	39,000
Indonesia	1,050	2,170	--	--
Israel	1,180	2,370	--	--
Kazakhstan	22,700	57,400	10,600	19,900
Korea, Republic of	53,000	102,000	89,300	196,000
Mexico	105,000	147,000	71,800	121,000
Netherlands	6,020	11,700	--	--
Nigeria	75	158	1,040	1,920
Peru	--	--	1,410	4,160
Russia	10,300	20,200	13,200	23,500
Saudi Arabia	--	--	608	1,290
South Africa	--	--	677	1,180
Sri Lanka	1,290	2,690	1,730	3,160
Sweden	--	--	4,000	7,910
Thailand	--	--	200	431
Ukraine	275	533	79	154
United Arab Emirates	--	--	682	1,260
United Kingdom	2,560	5,400	289	634
Venezuela	3,340	6,240	3,480	6,600
West Bank	78	112	--	--
Other	--	--	--	--
Total	417,000	762,000	416,000	809,000
Wrought lead and other products, gross weight:³				
Argentina	48	125	66	174
Canada	42	210	98	299
Germany	481	2,690	327	1,790
India	60	196	19	55
Japan	(4) ^r	4 ^r	(4)	16
Sweden	14	278	6	141
United Kingdom	844	2,390	904	2,250
Other	173 ^r	536 ^r	1,420	2,410
Total	1,660	6,420	2,840	7,130
Scrap, gross weight:⁵				
Canada	9	12	70	21
Colombia	97	151	--	--
Dominican Republic	1,810	1,310	394	308
Germany	19	6	--	--
Honduras	--	--	118	91
Other	1,600	843	1,400	668
Total	3,530	2,310	1,980	1,090

See footnotes at end of table.

TABLE 10—Continued
U.S. IMPORTS FOR CONSUMPTION OF LEAD, BY COUNTRY OR LOCALITY¹

¹Revised. -- Zero.

¹Table includes data available through November 20, 2019. Data are rounded to no more than three significant digits; may not add to totals shown.

²Includes refined lead [Harmonized Tariff Schedule of the United States (HTS) code 7801.10.0000].

³Includes lead plates, sheets, strip and foil (HTS codes 7804.11.0000, 7804.19.0000), and lead powder and flakes (HTS code 7804.20.0000).

⁴Less than ½ unit.

⁵Includes lead waste and scrap obtained from scrap lead-acid batteries (HTS code 7802.00.0030).

Source: U.S. Census Bureau.

TABLE 11
LEAD: WORLD MINE PRODUCTION OF LEAD IN CONCENTRATE, BY COUNTRY OR LOCALITY¹

(Metric tons, lead content)

Country or locality ²	2012	2013	2014	2015	2016
Argentina	26,475	28,673 ^r	29,911 ^r	29,834 ^r	29,800 ^e
Australia	620,598 ^r	711,210 ^r	727,954 ^r	653,488 ^r	453,374
Bolivia	81,095 ^r	82,131 ^r	75,571 ^r	75,273 ^r	75,000
Bosnia and Herzegovina ^e	4,000	4,500 ^r	4,200 ^r	5,000	5,000
Brazil	8,922 ^r	8,020 ^r	10,978 ^r	11,000 ^{r,e}	11,000
Bulgaria	14,366	15,986	15,461 ^r	16,456 ^r	19,688
Burkina Faso	--	1,017	1,100	1,100	-- ^e
Burma	9,800	11,700 ^e	12,000 ^{r,e}	10,000 ^{r,e}	10,000 ^e
Canada	62,014 ^r	22,895 ^r	3,579 ^r	3,699 ^r	12,658
Chile	410	1,829 ^r	2,678 ^r	2,979 ^r	2,980 ^e
China	2,613,200 ^r	2,696,500 ^r	2,608,600 ^r	2,335,000	2,340,000 ^e
Congo (Kinshasa)	95	621	764	653	101
Greece	13,100 ^r	13,000 ^r	11,800 ^r	9,200 ^r	9,200 ^e
Guatemala	--	863	10,359	10,193	10,200 ^e
Honduras	12,400	11,600	15,509 ^r	9,844 ^r	9,840 ^e
India	100,000 ^r	105,000 ^r	106,000 ^e	136,000	147,000 ^e
Indonesia ^e	5,000	5,000	5,000	5,000	5,000
Iran ³	45,000 ^r	42,000	44,000 ^r	40,800 ^r	40,800 ^e
Ireland	47,000 ^r	43,000 ^r	40,500 ^{r,e}	31,300 ^{r,e}	31,300 ^e
Kazakhstan	38,100	40,100 ^r	37,800 ^r	40,700 ^r	40,700 ^e
Korea, North ^e	38,000	30,000	30,000	35,000	35,000
Korea, Republic of	1,940 ^r	2,500 ^r	2,764 ^r	2,921 ^r	2,920 ^e
Kosovo	5,300	6,400	7,700	5,500	5,500 ^e
Laos	4,510	1,000	--	--	--
Macedonia	29,653 ^r	32,409 ^r	33,154 ^r	28,698 ^r	23,487
Mexico	238,091 ^r	253,361 ^r	250,462 ^r	260,798 ^r	232,082
Montenegro	2,800	3,350	3,400	3,476	3,480 ^e
Morocco	27,370 ^r	30,590 ^r	27,349 ^r	31,955 ^r	--
Namibia ^e	10,000 ^r	11,000	11,200 ^r	9,300 ^r	9,300
Nigeria	11,300	11,500	11,400	8,000	9,700
Peru	249,236	266,472	277,294 ^r	315,525 ^r	314,000 ^e
Poland	17,100 ^r	16,000 ^r	15,600 ^r	13,000 ^r	11,100
Russia, recoverable	195,600	223,300	239,000 ^{r,e}	250,000 ^{r,e}	250,000 ^e
Saudi Arabia	396	--	--	--	--
Serbia	2,500	3,100	3,700	2,400	2,400 ^e
South Africa	52,489	41,848 ^r	29,348 ^r	34,573 ^r	39,344
Spain	3,763	6,000 ^e	7,000 ^e	10,000 ^e	10,000 ^e
Sweden	63,551	59,556	70,848 ^r	79,354 ^r	79,400 ^e
Tajikistan	16,000 ^r	17,000 ^r	28,000 ^r	36,000 ^r	51,000
Turkey	47,350 ^r	65,630 ^r	94,900 ^r	75,900 ^r	75,900 ^e
United Kingdom	61 ^r	100 ^r	100 ^r	100 ^r	100
United States	345,000	339,000 ^r	378,000 ^r	370,000 ^r	346,000
Vietnam ^e	360 ^r	1,870 ^r	2,840 ^r	1,890 ^r	1,890
Total	5,060,000 ^r	5,270,000 ^r	5,290,000 ^r	5,000,000 ^r	4,750,000

^eEstimated. ^rRevised. -- Zero.

¹Table includes data available through November 13, 2017. All data are reported unless otherwise noted. Totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown.

²In addition to the countries and (or) localities listed, Uzbekistan may have produced lead, but information was inadequate to make reliable estimates of output.

³Production is based on the fiscal year, with a starting date of March 21.

TABLE 12
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, lead content)

Country or locality ²	2012	2013	2014	2015	2016
Argentina:					
Primary	16,445	13,800 ^c	12,000 ^c	8,000 ^c	8,000 ^c
Secondary ^c	73,800 ^r	69,900	28,000	33,000	33,000
Total	90,265	83,700	40,000	41,000	41,000
Australia:					
Primary	160,046 ^r	177,456	175,842 ^r	182,258 ^r	182,830
Secondary	50,000 ^{r,c}	55,000 ^{r,c}	50,000 ^c	40,000 ^{r,c}	41,000
Total	210,046 ^r	232,456 ^r	225,842 ^r	222,258 ^r	223,830
Austria, secondary	24,500 ^r	24,971 ^r	25,136 ^r	24,399 ^r	24,000 ^c
Belgium, secondary	120,000 ^{r,c}	130,000 ^{r,c}	130,000 ^{r,c}	136,000 ^r	141,000
Bolivia, primary ^c	250	330	300 ^r	459 ^r	41
Bosnia and Herzegovina, secondary	3,327	2,382	1,227	145 ^r	182
Brazil, secondary	165,397	151,964 ^r	160,393 ^r	176,216 ^r	180,000 ^c
Bulgaria, primary and secondary	86,156	90,742	93,394 ^r	96,889 ^r	100,817
Burma, primary ^c	2,000	2,000	2,000	2,000	2,000
Canada:					
Primary	133,495	128,706	130,827 ^r	127,264 ^r	142,076
Secondary	165,655 ^r	153,075 ^r	150,629 ^r	141,600 ^r	132,150
Total	299,150 ^r	281,781 ^r	281,456 ^r	268,864 ^r	274,226
China:					
Primary	3,220,000	3,440,000 ^r	3,210,000 ^r	3,080,000 ^r	3,003,000
Secondary	1,370,000	1,500,000	1,530,000 ^r	1,620,000 ^r	1,663,000
Total	4,590,000	4,940,000 ^r	4,740,000	4,700,000 ^r	4,666,000
Czechia, secondary	41,000 ^r	42,000 ^r	44,000	45,000 ^r	43,000
Estonia, secondary	8,046	7,581 ^r	8,588 ^r	8,329 ^r	12,000
France, secondary ^c	83,000	71,000	72,000	72,000	70,000
Germany:					
Primary	134,000 ^{r,c}	151,000	132,000 ^r	130,000 ^r	117,000
Secondary	290,000 ^c	249,000	248,000	248,000	222,000
Total	424,000 ^{r,c}	400,000	380,000 ^r	378,000 ^r	339,000
Ghana, secondary	2,961	3,076	2,817	3,048	3,000
India:					
Primary	119,000 ^r	120,000 ^r	129,000 ^r	143,000	133,000
Secondary	341,000 ^r	343,000 ^r	348,000 ^r	358,000	386,000
Total	460,000	463,000 ^r	477,000	501,000	519,000
Indonesia, secondary ^c	45,000	45,000 ^r	45,000 ^r	45,000 ^r	48,000
Iran:^c					
Primary	25,000	20,000	23,000	16,000	14,000
Secondary	56,000	56,000	47,000	60,000	72,000
Total	81,000	76,000	70,000	76,000	86,000
Ireland, secondary ^c	20,000	20,000	17,200 ^r	17,200 ^r	17,500
Israel, secondary	21,791	22,418	26,426 ^r	26,000 ^{r,c}	27,000
Italy:					
Primary	--	30,000 ^c	50,000 ^c	50,000 ^c	47,000
Secondary	138,000 ^{r,c}	150,000 ^c	160,000 ^c	160,000 ^{r,c}	140,000
Total	138,000 ^{r,c}	180,000 ^c	210,000 ^c	210,000 ^{r,c}	187,000
Japan:					
Primary	91,037	92,227 ^r	87,303 ^r	85,655 ^r	84,660
Secondary	117,957	115,888 ^r	115,370 ^r	108,736 ^r	114,430
Total	208,994	208,115 ^r	202,673 ^r	194,391 ^r	199,090
Kazakhstan, primary and secondary	88,099	91,072 ^r	127,064 ^r	120,108 ^r	134,000
Kenya, secondary ^c	1,000 ^r	940 ^r	1,000 ^r	1,100 ^r	1,100
Korea, North, primary ^c	3,000	3,000	3,000	3,000	3,000
Korea, Republic of:					
Primary	280,000	227,700	299,000 ^c	291,000	441,000
Secondary	180,000	200,000	340,000 ^c	350,000	390,000
Total	460,000	427,700	639,000 ^c	641,000	831,000
Lebanon, secondary ^c	5,000	6,000	10,000	10,000	10,000

See footnotes at end of table.

TABLE 12—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, lead content)

Country or locality ²	2012	2013	2014	2015	2016
Mexico:					
Primary ³	129,000 ^{r,e}	121,000 ^{r,e}	118,000 ^{r,e}	113,881 ^r	111,000
Secondary ^c	255,000 ^r	250,000 ^r	245,000	230,000 ^r	230,000
Total	384,108 ^r	371,215 ^r	363,490 ^r	343,881 ^r	341,000
Morocco:					
Primary	10,000 ^{r,e}	--	--	--	--
Secondary ^c	1,000 ^r	14,000	15,000	14,000	11,000
Total	11,000 ^r	14,000	15,000	14,000	11,000
Mozambique, secondary	892	1,704	1,933 ^r	2,310 ^r	2,494
Netherlands, secondary ^c	30,000 ^r	30,000 ^r	30,000 ^r	30,000 ^r	33,000
New Zealand, secondary	9,000 ^e	-- ^r	--	--	--
Nigeria, secondary ^c	15,000	15,000	15,000	15,000	15,000
Pakistan, secondary	3,000 ^r	1,000 ^r	-- ^r	-- ^r	--
Peru, primary	--	467 ^r	142 ^r	1,494 ^r	--
Philippines, secondary	32,000	32,000 ^e	32,000 ^r	28,000 ^r	18,000
Poland:					
Primary	47,000	40,000 ^r	36,000	40,000 ^r	40,000
Secondary	87,000	103,000	112,000	114,000	115,000
Total	134,000	143,000 ^r	148,000	154,000 ^r	155,000
Portugal, secondary ^c	5,000	4,000	5,000	5,000	5,000
Romania:					
Primary ^c	1,500 ^r	1,100 ^r	1,300 ^r	1,300 ^r	1,300
Secondary	13,200 ^r	14,000 ^{r,e}	12,000 ^e	12,000 ^{r,e}	11,000
Total	14,700 ^r	15,100 ^r	13,300 ^r	13,300 ^r	12,300
Russia, primary and secondary ^c	110,000 ^r	95,400 ^r	96,500 ^r	110,000 ^r	117,000
Senegal, secondary	2,385	2,607	2,187	1,857	3,576 ^r
Serbia, primary and secondary ^c	13,000	15,000	15,000	15,000	15,000
Slovenia, secondary ^c	14,000	12,000	11,000	12,000	12,000
South Africa, secondary ^c	54,000	52,000 ^r	52,000	52,000	52,000
Spain, secondary ^c	160,000	157,000	166,000	172,000	170,000
Sri Lanka, secondary	3,800	4,800	4,500	2,500	2,100
Sweden: ^c					
Primary	62,000	69,000	25,000	26,000	26,000
Secondary	45,000 ^r	45,000	45,000 ^r	45,000	46,000
Total	107,000 ^r	114,000	70,000 ^r	71,000	72,000
Taiwan, secondary ^c	35,000	35,000	35,000 ^r	30,000	48,000
Thailand, secondary	86,507 ^r	87,385 ^r	79,250 ^r	90,000 ^{r,e}	90,000
Turkey, secondary ^c	50,000	50,000	55,000	56,000	58,000
Uganda, secondary ^c	800	800	800	800	800
Ukraine, secondary ^c	20,000 ^r	30,000 ^r	30,000 ^r	30,000	30,000
United Kingdom:					
Primary ⁴	156,930 ^r	174,200 ^r	110,000 ^e	110,000 ^{r,e}	NA
Secondary ⁵	155,000	155,000	157,000	157,000 ^{r,e}	NA
Total	311,930 ^r	329,200 ^r	267,000	267,000 ^{r,e}	374,600
United States:					
Primary	111,000	114,000	--	--	--
Secondary	1,150,000 ^r	1,160,000 ^r	1,060,000 ^r	1,050,000	1,110,000
Total	1,260,000 ^r	1,270,000 ^r	1,060,000 ^r	1,050,000	1,110,000
Venezuela, secondary	25,000	22,000	20,000	20,000	16,000
Grand total	10,600,000 ^r	10,900,000 ^r	10,600,000	10,600,000 ^r	11,000,000
Of which:					
Primary	4,700,000 ^r	4,930,000 ^r	4,550,000 ^r	4,410,000 ^r	4,360,000
Secondary	5,580,000 ^r	5,640,000 ^r	5,750,000 ^r	5,850,000 ^r	5,850,000
Undifferentiated	297,000 ^r	292,000 ^r	332,000 ^r	342,000 ^r	367,000

See footnotes at end of table.

TABLE 12—Continued
LEAD: WORLD REFINERY PRODUCTION, BY COUNTRY OR LOCALITY¹

(Metric tons, lead content)

⁶Estimated. ⁷Revised. NA Not available. -- Zero.

¹Table includes data available through November 13, 2017. All data are reported unless otherwise noted. Grand totals, U.S. data, and estimated data are rounded to no more than three significant digits; may not add to totals shown. Data represent the total output of refined lead by each country, whether derived from ores and concentrates (primary) or scrap (secondary), and include the lead content of antimonial lead but exclude, to the extent possible, simple remelting of scrap.

²In addition to the countries and (or) localities listed, Algeria, Colombia, Egypt, El Salvador, Iraq, Malaysia, Saudi Arabia, Trinidad and Tobago, and Zambia produced secondary lead, but output was not officially reported; available information was inadequate to make reliable estimates of output.

³Includes lead content in antimonial lead.

⁴Produced entirely from imported bullion and includes the lead content of alloys.

⁵Includes a small quantity of primary lead from domestic concentrate.