



2018 Minerals Yearbook

LEAD [ADVANCE RELEASE]

LEAD

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In 2018, domestic mine production of recoverable lead was 271,000 metric tons (t), 10% less than that in 2017 (table 1). The value of domestic mine production of recoverable lead in 2018 (based on the North American Market price) decreased by 13% to \$661 million. In the United States, lead in concentrate was produced at 10 mines that employed 1,870 people. Alaska and Missouri were the principal lead-producing States, accounting for most of the domestic mine production. Primary lead metal had 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 1.17 million metric tons (Mt), 3% more than that in 2017 (table 1). Recycled lead accounted for 100% of refined lead production in the United States in 2018.

World mine production of lead decreased by 7% to 4.56 Mt in 2018 from 4.90 Mt (revised) in 2017 (table 11). The United States was the fourth-leading producer and accounted for 6% of global lead mine production. China, Australia, and Peru were the three leading producers in 2018, accounting for 46%, 9%, and 6%, respectively, of global lead mine production. World production of refined lead (primary and secondary) was 11.4 Mt in 2018, essentially unchanged from the revised 11.4 Mt in 2017 (table 12). The United States continued to be the second-leading global producer, accounting for 10% of global total refined lead production and 18% of global secondary refined production. China was the leading producer of refined lead, accounting for 43% of global total refined lead production, 64% of primary refined lead production, and 32% of secondary refined lead production in 2018.

Lead metal was consumed domestically by more than 60 companies to manufacture such products as ammunition; building-construction materials; coverings for power and communication cables; 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 92% of reported lead consumption (table 4). In 2018, North American producers shipped 137 million SLI automotive-type original equipment and replacement batteries, 1.7 million more than the amount shipped in 2017 (SmithBucklin Statistics Group, 2019b).

According to the International Lead and Zinc Study Group (ILZSG), global consumption of refined lead in 2018 was 11.9 Mt, slightly more than the revised 11.6 Mt in 2017. The leading refined-lead-consuming countries in 2018 were China (42%); the United States (14%); India (5%); the Republic of Korea (5%); and Germany (3%) (International Lead and Zinc Study Group, 2019b, p. 9–10).

The 2018 average annual London Metal Exchange Ltd. (LME) cash price for lead was \$1.02 per pound, a 3% decrease from that in 2017. The Platts Metals Week North American Market price was \$1.11 per pound, 3% less than that in 2017 (table 1).

Production

Mine.—In 2018, domestic mine production of recoverable lead was 271,000 t, 10% less than that in 2017 (table 1). There were 10 lead-producing mines operating in the United States in 2018 (table 2).

Alaska and Missouri accounted for most of the U.S. mine output of lead. Lead also was 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 2018, accounting for about 90% of U.S. production. Production data for nonreporting mines were obtained from publicly available data.

The Doe Run Resources Corp. (St. Louis, MO) operated four mills that produced lead concentrates from ore supplied from six underground mines along the Viburnum Trend in southeast Missouri, which were considered to be among the leading lead-mining districts in the world. In Doe Run's 2018 sustainability report, the company announced increasing exploration efforts and that it would add new ore bodies to Doe Run's resources (Doe Run Resources Corp., The, 2019, p. 4, 22–23). The 350-meter-deep Big Bear vent shaft, located at the southern point of the Fletcher Mine, was nearly completed at the end of 2018 and would help ventilate the mine after each blast. Doe Run also operated a secondary smelter, Resource Recycling, which recycled approximately 13.5 million batteries per year (Doe Run Co., The, 2019, p. 5).

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., an Alaska Native-owned corporation organized under the provisions of the Alaska Native Claims Settlement Act and the sole owner of the property. Teck Resources Ltd. reported that production of lead in concentrates at Red Dog decreased to 98,400 t in 2018 from 111,300 t in 2017 owing to lower lead grades and recoveries (Teck Resources Ltd., 2019, p. 27).

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 2018, Hecla produced 17,200 t of lead in concentrates at Greens Creek, 5% more than that in 2017. Hecla reported that proven and probable reserves at yearend 2018 totaled 240,000 t of lead, and the company

estimated that the remaining mine life was 11 years (Hecla Mining Co., 2019, p. HL10–K19). In 2018, the Lucky Friday Mine produced 1,030 t of lead in concentrates, about one-fourth of the quantity produced in 2017 owing to an ongoing employee strike which started in March 2017. Hecla reported that proven and probable lead reserves at yearend 2018 totaled 460,000 t of lead and the estimated remaining mine life at the Lucky Friday Mine was 17 years (Hecla Mining Co., 2019, p. HL10–K20–21).

Primary Refined.—There was no primary refined lead production in 2018. Doe Run closed the only domestic primary lead smelter in Herculaneum, MO, at yearend 2013.

Secondary Refined.—Domestic production of secondary refined lead in 2018 increased slightly to 1.17 Mt from 1.14 Mt in 2017 (table 3). 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 secondary lead. Lead recovered from lead-acid batteries continued to be the dominant source of recoverable lead scrap, accounting for 98% of all secondary lead. The domestic secondary lead data were derived by the USGS from monthly and annual surveys of secondary producers. In 2018, 15 smelters that produced secondary lead, exclusive of that recovered in copper-base scrap, were surveyed; 8 responded, representing 82% of the total production of secondary lead. Production for the nonrespondents was estimated from prior-years' production. Of the total lead recycled in 2018, most was recovered by companies operating plants in Alabama, California, Florida, Indiana, Minnesota, Missouri, New York, Pennsylvania, South Carolina, and Tennessee.

Consumption

In 2018, reported U.S. consumption of refined lead was 2.02 Mt, 4% less than the revised 2.11 Mt in 2017 (table 4). Consumption of lead in SLI batteries and industrial-type lead-acid storage batteries accounted for 92% of the total reported consumption of lead (tables 4, 5). Demand for lead was heavily reliant on the automotive sector. The Battery Council International reported that 137 million lead-acid automotive batteries containing an estimated 1.14 Mt of lead (based on an average of 8.33 kilograms of lead content per battery) (SmithBucklin Statistics Group, 2019a, b) were shipped by North American producers in 2018, a slight increase from battery shipments in 2017 (136 million batteries containing an estimated 1.13 Mt of lead). Shipments of replacement lead-acid automotive batteries (116 million) increased slightly from those in 2017, and shipments of original equipment lead-acid automotive batteries (20.9 million) essentially were unchanged from those in 2017 (SmithBucklin Statistics Group, 2019a).

Prices and Stocks

In 2018, the average annual North American Market price and the LME cash price for lead decreased by 3% from those in 2017 (table 1). The average monthly LME cash price for lead

was \$1.17 per pound in January and trended downward during the year to \$0.89 per pound in December. According to CRU International Ltd. (2018), LME lead prices decreased owing to wider metal price drivers and investor disinterest despite a lead-concentrate deficit and a Chinese supply disruption owing to that country's continuing environmental audits.

Scrap prices also decreased during 2018. 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) decreased from \$0.43 per pound in January to \$0.31 per pound in December. Global LME lead stocks at the end of December 2018 were 107,375 t, 25% less than those at the end of December 2017 (London Metal Exchange Ltd., 2017, 2018).

Foreign Trade

In 2018, U.S. imports for consumption of unwrought (refined) lead metal in pigs and bars totaled 448,000 t, 17% less than those in 2017 (table 10). There was a considerable decrease in imports from India, by 32,200 t; the Republic of Korea, by 21,600 t; and Canada, by 12,200 t. The leading sources of unwrought lead metal imports were Canada, accounting for 33%, and the Republic of Korea and Mexico, each accounting for 24%.

Total domestic exports of unwrought lead and lead alloys in 2018 were 66,900 t, almost triple those in 2017 (table 9). Exports of unwrought lead significantly increased to China and the Republic of Korea, by 37,300 t and 10,000 t, respectively. China (56%), Mexico (17%), and the Republic of Korea (15%) were the leading destinations for the unwrought lead and lead alloys exported in 2018.

Domestic exports of lead in concentrates equaled 251,000 t, 6% less than 2017 (table 9). Exports of lead in concentrates significantly decreased to China, by 60,300 t, and increased to Mexico, by 18,300 t, and Canada, by 14,700 t. The leading destinations in 2018 were China (29%), Canada (20%), and the Republic of Korea (19%). All lead concentrates have been exported since the closure of Doe Run's Herculaneum primary smelter at yearend 2013.

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 2018, the United States imported about 35 million SLI lead-acid batteries for consumption, a 6% decrease from those in 2017. Mexico was the leading provider of SLI batteries, accounting for 52% of those imported in 2018. SLI batteries also were imported from the Republic of Korea (20%), China (9%), and Vietnam (5%). The United States exported 26.8 million spent SLI lead-acid batteries in 2018, 36% more than in 2017. Spent batteries were shipped mainly to Mexico (96%) for recycling. Much of the lead recovered from the exported spent batteries was used to manufacture lead-acid batteries in Mexico, which were in turn exported back to the United States.

World Review

World mine production of lead decreased by 7% to 4.56 Mt in 2018 from 4.90 Mt (revised) in 2017, owing primarily to a 330,000-t decrease in production in China (table 11). The

United States was the fourth-leading producer and accounted for 6% of global lead mine production. The three leading lead mine producers were China (46%), Australia (9%), and Peru (6%). Globally, approximately 153,000 t/yr of lead mine production capacity was opened in 2018, and 10,000 t/yr of capacity was reported as closed (International Lead and Zinc Study Group, 2019a, p. 25–26).

World production of refined lead (primary and secondary) was 11.4 Mt, essentially unchanged from that in 2017 (table 12). 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 2017.

According to the ILZSG, global consumption of refined lead in 2018 was 11.9 Mt, slightly more than that in 2017. The leading refined-lead-consuming countries in 2018 were China (42%), the United States (14%), India (5%), the Republic of Korea (5%), and Germany (3%) (International Lead and Zinc Study Group, 2019b, p. 9–10).

Outlook

At its October 2018 meeting in Lisbon, Portugal, the ILZSG forecast a 0.7% increase in global lead consumption in 2019 while consumption in China is expected to fall by 1.3%, owing to decreased use of lead-acid batteries in motorcycles and e-bikes (International Lead and Zinc Study Group, 2018). Global lead mine production in 2019 is forecast to increase by 4.1% from that in 2018 owing to the new mine projects opening in Canada and South Africa in 2019. Global refined lead production is forecast to increase by 2.2% in 2019. The ILZSG forecasts that global refined lead production will exceed consumption by about 50,000 t in 2019 (International Lead and Zinc Study Group, 2018).

References Cited

- CRU International Ltd., 2018, Lead market outlook: London, United Kingdom, CRU International Ltd., November, 95 p. (Accessed March 23, 2021, via <https://www.crugroup.com/>.)
- Doe Run Resources Corp., The, 2019, 2018 sustainability report: St. Louis, MO, Doe Run Resources Corp., 57 p. (Accessed March 19, 2021, at <https://doerun.com/wp-content/uploads/2019/09/Doe-Run-2018-Sustainability-Report-02.pdf>.)
- Hecla Mining Co., 2019, 2018 annual report: Coeur d'Alene, ID, Hecla Mining Co., 124 p. (Accessed March 19, 2021, at https://s1.q4cdn.com/702437152/files/doc_financials/2018/ar/hl2018_download.pdf.)

- International Lead and Zinc Study Group, 2018, ILZSG fall 2018 session—Forecasts: Lisbon, Portugal, International Lead and Zinc Study Group press release, October 8, 6 p. (Accessed March 23, 2021, via <http://www.ilzsg.org/static/home.aspx>.)
- International Lead and Zinc Study Group, 2019a, Lead and zinc—New mine and smelter projects: Lisbon, Portugal, International Lead and Zinc Study Group, January 28, 78 p. (Accessed March 23, 2021, via <http://www.ilzsg.org/static/home.aspx>.)
- International Lead and Zinc Study Group, 2019b, World lead and zinc statistics—Monthly bulletin of the International Lead and Zinc Study Group: Lisbon, Portugal, International Lead and Zinc Study Group, v. 59, no. 12, December, 43 p. (Accessed March 19, 2021, via <http://www.ilzsg.org/static/home.aspx>.)
- London Metal Exchange Ltd., 2017, Lead stocks: London, United Kingdom, London Metal Exchange Ltd., December 30, 3 p.
- London Metal Exchange Ltd., 2018, Lead stocks: London, United Kingdom, London Metal Exchange Ltd., December 30, 3 p.
- SmithBucklin Statistics Group, 2019a, BCI 2018 monthly shipment reports for press distribution prepared for Battery Council International: Chicago, IL, SmithBucklin Statistics Group.
- SmithBucklin Statistics Group, 2019b, National recycling rate study prepared for Battery Council International: Chicago, IL, SmithBucklin Statistics Group, November, 7 p. (Accessed May 5, 2020, at https://cdn.ymaws.com/batterycouncil.org/resource/resmgr/2020/BCI_482347-20_2019-Study.pdf.)
- Teck Resources Ltd., 2019, Beyond—2018 annual report: Vancouver, British Columbia, Canada, Teck Resources Ltd., 148 p. (Accessed March 19, 2021, at <https://www.teck.com/media/2018-Teck-Annual-Report.pdf>.)

GENERAL SOURCES OF INFORMATION

U.S. Geological Survey Publications

- Historical Statistics for Mineral and Material Commodities in the United States. Data Series 140.
- Lead. Ch. in Mineral Commodity Summaries, annual.
- Lead. Ch. in United States Mineral Resources, Professional Paper 820, 1973.
- Lead. Mineral Industry Surveys, monthly.
- Lead (Pb). Ch. in Metal Prices in the United States Through 2010, Scientific Investigations Report 2012–5188, 2013.

Other

- China Metal Market—Lead, Zinc & Tin. Beijing Antaika Information Development Co., Ltd., monthly.
- International Lead and Zinc Study Group.
- Lead. Ch. in Mineral Facts and Problems, U.S. Bureau of Mines Bulletin 675, 1985.

TABLE 1
SALIENT LEAD STATISTICS¹

		2014	2015	2016	2017	2018
United States:						
Production:						
Mine, lead content	metric tons	378,000	370,000	346,000	310,000	280,000
Mine, recoverable lead content: ²						
Quantity	do.	368,000 †	360,000	336,000	302,000	271,000
Value	thousands	\$860,000	\$724,000	\$699,000	\$761,000	\$661,000
Primary lead, refined content, domestic ores and base bullion	metric tons	--	--	--	--	--
Secondary lead, lead content	do.	1,060,000	1,050,000	1,110,000	1,140,000	1,170,000
Exports:						
Lead ore and concentrates, lead content	do.	357,000	350,000	341,000	269,000	251,000
Lead materials, excluding scrap, gross weight	do.	55,300	55,700	42,700	23,900	66,900
Imports for consumption, gross weight:						
Lead in base bullion	do.	1,180	342	237	--	860
Refined lead, unwrought	do.	464,000	417,000	416,000	538,000	448,000
Stocks, December 31, lead content, at consumers and secondary smelters	do.	56,400 †	60,100 †	60,300 †	64,400 †	66,500
Consumption of metal, primary and secondary, lead content	do.	1,960,000	1,960,000 †	1,970,000 †	2,110,000 †	2,020,000
Price: ³						
North American Market	cents per pound	106.17	91.20	94.39	114.45	110.89
London Metal Exchange, pure lead, cash average	do.	95.04	81.02	84.84	105.10	101.76
World production, lead content:						
Mine	metric tons	5,250,000 †	4,900,000 †	4,720,000 †	4,900,000 †	4,560,000
Refinery:						
Primary	do.	4,630,000	4,510,000 †	4,640,000 †	4,630,000 †	4,300,000
Secondary	do.	5,650,000	5,660,000	5,870,000	6,310,000 †	6,600,000
Undifferentiated		382,000 †	397,000 †	448,000 †	489,000 †	545,000

†Revised. do. Ditto. -- Zero.

¹Table includes data available through May 4, 2021. 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 2018, 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	Viburnum (#29 and #35)	Washington and Iron, MO	Doe Run Resources Corp.	Lead ore.
3	Brushy Creek	Fletcher, MO	do.	Do.
4	Fletcher	Reynolds, MO	do.	Do.
5	Sweetwater	do.	do.	Do.
6	Greens Creek	Southeastern Region, AK	Hecla Mining Co.	Zinc-silver ore.
7	Galena Complex	Shoshone, ID	Americas Silver Corp.	Silver ore.
8	Pend Oreille	Pend Oreille, WA	Teck American Inc.	Zinc-lead ore.
9	Lucky Friday	Shoshone, ID	Hecla Mining Co.	Silver ore.
10	Buick	Iron, MO	Doe Run Resources Corp.	Lead ore.

Do., do. Ditto.

¹Table includes data available through May 4, 2021. The mines on this list accounted for 100% of the U.S. lead mine production in 2018.

²For Alaska, mines are located by geographic region, as delineated by the Alaska Division of Geological & Geophysical Surveys in its Special Report 74, Alaska's mineral industry 2018.

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)

	2017	2018
Kind of scrap:		
New scrap:		
Lead-base	W	W
Tin-base	W	W
Total	20,000	20,900
Old scrap:		
Battery-lead ²	1,120,000	1,150,000
Grand total	1,140,000	1,170,000
Form of recovery:		
As soft lead	920,000	960,000
In antimonial lead	W	W
In other lead alloys	W	W
Total:		
Quantity	1,140,000	1,170,000
Value ³ thousands	\$2,870,000	\$2,860,000

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

¹Table includes data available through May 4, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²May include small amounts of other lead-base scrap.

³Value 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	2017	2018
Metal products:			
3482	Ammunition, shot and bullets	67,000	71,100
Bearing metals:			
35	Machinery except electrical	--	--
371	Motor vehicles and equipment	W	W
37	Other transportation equipment	W	W
Total		1,010	1,010
3351	Brass and bronze, billets and ingots	1,600 ^r	1,710
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		12,700	14,000
Pipes, traps, other extruded products:			
15	Building construction	W	W
3443	Storage tanks, process vessels, etc.	W	W
Total		6,560	7,170
Sheet lead:			
15	Building construction	W	W
3443	Storage tanks, process vessels, etc.	W	W
3693	Medical radiation shielding	W	5,490
Total		5,110	7,070
Solder:			
15	Building construction	W	W
367	Electronic components, accessories and other electrical equipment	W	W
371	Motor vehicles and equipment	W	W
Total		6,590 ^r	6,720
Storage batteries:			
3691	Storage battery grids, post, etc.	813,000 ^r	781,000
3691	Storage battery oxides	1,130,000 ^r	1,080,000
Total storage batteries		1,940,000 ^r	1,860,000
27	Type metal, printing and allied industries	(4)	(4)
34	Other metal products ⁵	W	80
Grand total		2,070,000 ^r	2,000,000
Other oxides:			
285	Paint	W	W
32	Glass and ceramics products	W	W
28	Other pigments and chemicals	W	W
Total		11,100	10,900
Miscellaneous uses			
Grand total		2,110,000 ^r	2,020,000

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

¹Table includes data available through May 4, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Standard Industrial Classification.

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

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

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

TABLE 5
U.S. CONSUMPTION OF LEAD IN 2018, 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	61,000	74,300	5,700	(3)	141,000
Storage batteries	1,150,000	347,000	362,000	--	1,860,000
Other oxides	W	--	--	--	W
Miscellaneous	21,200	--	(4)	--	21,200
Total	1,230,000	421,000	368,000	(3)	2,020,000

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

¹Table includes data available through May 4, 2021. 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."

⁴Withheld to avoid disclosing company proprietary data; not included in "Total."

TABLE 6
STOCKS OF LEAD AT CONSUMERS AND SECONDARY SMELTERS IN THE UNITED STATES, DECEMBER 31¹

(Metric tons, lead content)

Year	Refined soft lead	Lead in antimonial lead	Lead in alloys	Lead in copper-base scrap	Total
2017	36,000 ^r	19,400 ^r	9,020 ^r	W	64,400 ^r
2018	32,400	26,100	7,940	W	66,500

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

¹Table includes data available through May 4, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

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

(Metric tons and dollars)

Product	2017				2018			
	Production		Shipments ^c		Production		Shipments ^c	
	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	3,110	2,890	2,890 ^r	8,580,000	3,170	2,940	2,940	8,530,000
Lead oxide	961,000 ^r	913,000 ^r	NA	NA	933,000	887,000	NA	NA
Total	965,000 ^r	916,000 ^r	NA	NA	936,000	889,000	NA	NA

^cEstimated. ^rRevised. NA Not available.

¹Table includes data available through May 4, 2021. 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)
2017:		
White lead carbonate	(2)	\$3
Red and orange lead	10	85
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,630	6,850
Litharge	941	3,550
Glass frits (undifferentiated)	41,900	75,100
2018:		
White lead carbonate	2	5
Red and orange lead	30	236
Chrome yellow, molybdenum orange pigments, lead-zinc chromates	1,390	6,890
Litharge	898	3,500
Glass frits (undifferentiated)	43,800	93,700

¹Table includes data available through May 4, 2021. Data are rounded to no more than three significant digits; may not add to totals shown.

²Less than ½ unit.

Source: U.S. Census Bureau.

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

Country or locality	2017		2018	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Ore and concentrates, lead content:				
Australia	7,370	\$14,700	7,310	\$13,100
Canada	36,600	76,300 ^r	51,200	95,200
China	134,000	258,000	73,600	147,000
Germany	14,800	27,400	15,100	27,400
Italy	7,470	13,500	7,170	14,500
Japan	24,400	46,800	19,100	33,700
Korea, Republic of	43,300	83,400	48,700	91,900
Mexico	868	1,990	19,100	39,900
Netherlands	--	--	7,100	15,500
Thailand	--	--	2,900	1,970
Other	44 ^r	66 ^r	27	25
Total	269,000	522,000	251,000	480,000
Base bullion, gross weight:				
Canada	1,520	3,670	1,890	4,660
Other	23 ^r	60 ^r	162	299
Total	1,540 ^r	3,730	2,060	4,960
Refined lead and lead alloys, unwrought, gross weight:²				
Belgium	7,430	13,400	6,280	13,400
Brazil	--	--	113	82
Canada	124	191	238	512
China	13	23	37,400	74,200
Ecuador	--	--	108	114
India	144	265	130	218
Japan	161	117	1,310	2,750
Korea, Republic of	13	10	10,000	22,300
Mexico	14,400	27,100	11,100	23,400
Taiwan	--	--	64	39
Other	1,680 ^r	3,720 ^r	178	234
Total	23,900	44,800	66,900	137,000
Wrought lead and other products, gross weight:³				
Canada	2,500	10,100	1,070	5,380
China	305	615	133	938
France	157	1,080	133	1,270
Germany	183	4,370	249	26,000
India	1,120	2,430	1,350	3,060
Kuwait	31	450	329	5,820
Mexico	541	2,850	584	3,700
Peru	96	680	181	1,210
Philippines	123	258	266	467
United Arab Emirates	1,070	2,150 ^r	406	877
Other	1,420 ^r	8,710 ^r	1,270	10,700
Total	7,550	33,700	5,980	59,400
Scrap, gross weight:⁴				
Bangladesh	--	--	124	60
Cayman Islands	126	50	136	62
Colombia	1	8	73	22
Guyana	--	--	58	17
Honduras	55	16	571	171
India	3,820	1,670	1,090	544
Korea, Republic of	12,800 ^r	18,300 ^r	7,340	11,900
Mexico	252	81	174	54
Pakistan	509 ^r	561 ^r	1,550	1,340
United Arab Emirates	1,200	732	225	68
Other	4,000 ^r	3,530 ^r	675	381
Total	22,700 ^r	24,900 ^r	12,000	14,600

See footnotes at end of table.

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

¹Revised. -- Zero.

¹Table includes data available through May 4, 2021. 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), containing by weight antimony as the principal other element (Schedule B export code 7801.91.0000), lead alloys (Schedule B export code 7801.99.9030), and other unwrought lead (Schedule B export code 7801.99.9050).

³Includes lead plates, sheets, strip and foil (Schedule B export codes 7804.11.0000, 7804.19.0000); lead bars, rods, profiles and wire (Schedule B export code 7806.00.0300); lead tubes, pipes and tube or pipe fittings (Schedule B export code 7806.00.0500); and other wrought lead (schedule B export code 7806.00.8000).

⁴Includes 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	2017		2018	
	Quantity (metric tons)	Value (thousands)	Quantity (metric tons)	Value (thousands)
Base bullion, gross weight:				
Chile	--	--	785	\$1,710
Ecuador	--	--	75	201
Total	--	--	860	1,910
Refined lead, unwrought, gross weight:²				
Argentina	2,880	\$6,520	6,050	13,900
Australia	7,570	17,300	2,780	5,620
Bolivia	889	1,920 ^r	--	--
Brazil	20,800	47,600	15,500	38,000
Canada	160,000	363,000	148,000	327,000
China	12	57	--	--
Colombia	1,500 ^r	3,520	491	1,320
Dominican Republic	693	1,560	250	595
Ecuador	14,400	35,000	10,900	26,500
Germany	(3)	2	--	--
Honduras	--	--	199	487
India	55,400	130,000	23,200	59,100
Israel	1,990	4,410	1,820	4,660
Kazakhstan	5,550	13,100	5,130	12,300
Korea, Republic of	127,000	305,000	106,000	271,000
Mexico	103,000	182,000	107,000	188,000
Nigeria	1,480	3,450	47	98
Peru	3,900	9,460	3,350	7,670
Russia	14,700	35,000	6,460	16,800
Saudi Arabia	999	2,230	--	--
South Africa	654	1,420	174	398
Sri Lanka	2,500	5,630	625	1,630
Thailand	3,590	8,780	7,500	19,000
United Arab Emirates	148	366	--	--
United Kingdom	532	1,330	485	1,230
Venezuela	3,030	6,710	2,460	5,730
Other	4,380 ^r	10,000	325	761
Total	538,000	1,200,000	448,000	1,000,000
Wrought lead and other products, gross weight:⁴				
Argentina	150	399	109	299
Canada	2,680	14,800	3,190	11,700
China	821	4,360	887	4,850
France	319	973	2	35
Germany	733	4,500	589	4,700
Mexico	766	1,300	148	514
Peru	105	248	120	319
United Kingdom	561	2,330	843	2,390
Venezuela	775	1,520 ^r	55	133
Vietnam	199	774	229	999
Other	369	2,340	718	4,450
Total	7,480	33,600	6,890	30,400
Scrap, lead content:⁵				
Canada	34	86	1	12
Dominican Republic	2,270	3,250	--	--
Honduras	206	363	--	--
Suriname	--	--	728	1,270
Other	1,670	2,580	934	917
Total	4,180	6,280	1,660	2,200

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 May 4, 2021. 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].

³Less than ½ unit.

⁴Includes lead plates, sheets, strip and foil (HTS codes 7804.11.0000, 7804.19.0000); lead bars, rods, profiles and wire (HTS code 7806.00.0300); lead tubes, pipes and tube or pipe fittings (HTS code 7806.00.0500); and other wrought lead (HTS code 7806.00.8000).

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	2014	2015	2016	2017	2018
Argentina	29,911	29,834	28,016	40,135 ^r	27,000 ^e
Australia	727,954	653,488	441,338	459,487	432,000 ^e
Bolivia	78,509 ^r	75,273	89,510	111,566 ^r	112,140
Bosnia and Herzegovina ^e	6,000 ^r	6,200 ^r	6,800 ^r	7,400 ^r	7,400
Brazil	11,000 ^e	9,440 ^r	9,000 ^e	7,000 ^e	7,000 ^e
Bulgaria	15,461	18,700 ^r	23,600 ^r	21,100 ^r	26,500
Burkina Faso	1,100	1,100	--	--	--
Burma ^e	18,000	13,600	14,000	20,900	35,000
Canada	3,579	3,699	12,020	13,494 ^r	18,947
Chile	2,678	2,979	1,110	1,562	712
China	2,609,000 ^r	2,335,000	2,337,500 ^r	2,430,000 ^r	2,100,000 ^e
Congo (Kinshasa)	764	653	101	--	--
Greece	11,800	9,200	11,300	8,700 ^r	9,800
Guatemala	10,359	10,193	4,181	13,803	264
Honduras	15,509	9,844	4,400	6,760	9,893
India	106,000 ^e	136,000	147,000	175,000 ^r	192,496
Indonesia ^e	5,000	5,000	5,000	8,000	11,000
Iran ^{e,3}	44,000	40,800	47,000	48,000	48,000
Ireland	40,500 ^e	31,300	19,600	17,083	16,712
Kazakhstan	37,800	40,700	70,500 ^r	111,200 ^r	86,000 ^e
Korea, North ^e	30,000	35,000 ^r	42,000 ^r	35,000	30,000
Korea, Republic of	2,764	2,921	2,839	3,762	2,341
Kosovo	7,900 ^r	6,400 ^r	8,100 ^r	6,500 ^r	6,800
Laos	--	--	510	-- ^r	--
Macedonia	33,154	28,698	23,487	24,823	32,100 ^e
Mexico	250,462	263,772	241,271	243,022 ^r	240,000 ^e
Montenegro	3,400 ^e	3,476	5,188	4,447	4,427
Morocco	27,300 ^e	32,165 ^r	28,670 ^r	38,041 ^r	50,000 ^e
Namibia ^e	11,200	9,300	7,500 ^r	7,100 ^r	8,200
Nigeria ^e	11,400	8,000	13,000 ^r	5,000	10,000
Pakistan	NA	NA	1,280 ^{r,e}	3,250 ^e	5,140 ^e
Peru	277,294	315,525	314,422	306,794	289,195
Poland	24,000	20,000	17,000	12,706 ^r	13,234
Portugal	3,192	3,077	4,126	5,164	17,571
Russia	239,000	171,200	204,300 ^r	199,000 ^r	220,000 ^e
Serbia ^e	3,700	3,300	3,500 ^r	3,200 ^r	3,200
South Africa	29,348	34,573	39,344	48,150 ^r	35,000 ^e
Spain	1,223 ^r	1,490 ^r	4,946 ^r	3,268 ^r	21,000 ^e
Sweden	70,848	79,354	76,066	71,112 ^r	64,751
Turkey ^e	65,400 ^r	74,000	65,000 ^r	68,000	76,000
United Kingdom	100	100	100	100	100
United States	378,000	370,000	346,000	310,000	280,000
Vietnam ^e	2,980 ^r	1,890	810	4,560	7,530
Total	5,250,000 ^r	4,900,000 ^r	4,720,000 ^r	4,900,000 ^r	4,560,000

^eEstimated. ^rRevised. NA Not available. -- Zero.

¹Table includes data available through December 4, 2019. 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, Tajikistan and Uzbekistan may have produced lead, but available information was inadequate to make reliable estimates of output.

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

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

(Metric tons, lead content)

Country or locality	2014	2015	2016	2017	2018
Argentina:^c					
Primary	12,000	8,000	8,000	10,000	14,000
Secondary	28,000	33,000	33,000	35,000	26,000
Total	40,000	41,000	41,000	45,000	40,000
Australia:					
Primary	175,842	182,258	182,830	168,300	155,000 ^c
Secondary	16,567	15,891	13,811	15,670	33,000 ^c
Total	192,000	198,000	197,000	184,000	188,000 ^c
Austria, secondary	25,136	24,399	24,000 ^c	24,000 ^c	24,000 ^c
Belgium, secondary	130,000 ^c	130,000	141,000	136,000	129,000 ^c
Bolivia, primary	300 ^c	459	41	1,160 ^r	635
Bosnia and Herzegovina, secondary	1,227	145	182	25	25
Brazil, secondary	160,393	176,216	180,000 ^c	180,000 ^c	195,000 ^c
Bulgaria, primary and secondary	93,394	96,900	100,817	103,105	102,808
Burma, primary ^c	200 ^r	600 ^r	5,900 ^r	12,000 ^r	12,000
Canada:					
Primary	130,827	127,264	142,076	130,000 ^c	110,000 ^c
Secondary	150,629	141,600	132,150	149,506	141,000 ^c
Total	281,000	269,000	274,000	280,000 ^c	251,000 ^c
China:					
Primary	3,210,000	2,870,000	3,017,000	3,050,000 ^c	2,770,000 ^c
Secondary	1,530,000	1,552,000	1,663,000	2,000,000 ^c	2,140,000 ^c
Total	4,740,000	4,420,000	4,680,000	5,050,000 ^c	4,910,000 ^c
Czechia, secondary	44,000	45,000	43,000	45,000 ^r	45,000
Estonia, secondary	8,588	8,329	8,348	9,606	7,393
France, secondary	72,000 ^c	72,000 ^c	70,000	70,000	70,000
Germany:					
Primary	159,000	125,000	115,000	113,000	101,000
Secondary	249,000	253,000	224,000	241,000	214,000
Total	408,000	378,000	339,000	354,000	315,000
Ghana, secondary	2,817	3,048	1,800	1,150	1,000 ^c
India:					
Primary	129,000	143,000	134,000	165,122	195,000 ^c
Secondary	348,000	358,000	385,000	404,900	428,000 ^c
Total	477,000	501,000	519,000	570,000	623,000 ^c
Indonesia, secondary ^c	46,000	46,000	48,000	46,000	54,000
Iran:^c					
Primary	17,000	18,000	14,000	20,000 ^r	17,000
Secondary	55,000	60,000	72,000	80,000 ^r	68,000
Total	72,000	78,000	86,000	100,000 ^r	85,000
Ireland, secondary	17,200	17,200	18,000	17,500 ^r	15,000
Israel, secondary	26,426	26,000 ^c	24,128	25,261	28,700
Italy:					
Primary	50,000 ^c	52,100	47,300	30,400 ^r	32,900
Secondary	159,600	157,800	139,900	143,300 ^r	134,600
Total	210,000 ^c	210,000	187,000	174,000 ^r	168,000
Japan:					
Primary	87,303	85,655	84,660	87,366	78,223
Secondary	115,370	108,736	114,430	112,052	118,338
Total	203,000	194,000	199,000	199,000	197,000
Kazakhstan, primary and secondary	127,064	120,108	134,192	149,129	153,000 ^c
Kenya, secondary ^c	1,000	1,100	1,100	1,400	1,400
Korea, North, primary ^c	3,000	1,000	2,000	2,000	2,000

See footnotes at end of table.

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

(Metric tons, lead content)

Country or locality	2014	2015	2016	2017	2018
Korea, Republic of:					
Primary	299,000	291,000	441,000	423,320	410,294
Secondary	340,000	350,000	390,000	380,000 ^r	390,000
Total	639,000	641,000	831,000	803,000 ^r	800,000
Lebanon, secondary ^c	10,000	10,600	11,300	11,900	6,000
Mexico:					
Primary ²	118,490 ^r	263,772	94,725	92,535	104,000 ^c
Secondary	245,000 ^c	230,000 ^c	230,000	230,000 ^c	330,000 ^c
Total	363,000	494,000	325,000	323,000	434,000 ^c
Morocco:^c					
Primary	20,000	20,000	20,000	19,600	10,000
Secondary	5,000	5,000	5,000	5,000	8,000
Total	25,000	25,000	25,000	24,600	18,000
Mozambique, secondary	1,933	2,310	2,494	3,828	3,000 ^c
Netherlands, secondary ^c	30,000	30,000	33,000	36,000	36,000
Nigeria, secondary ^c	14,000	2,000	9,000	9,000	6,000
Pakistan, secondary	9,000	5,000	8,000	1,000 ^r	1,000
Peru, primary	142	1,494	--	--	--
Philippines, secondary ^c	30,000	28,000	14,000 ^r	10,000 ^r	10,000
Poland:					
Primary	36,000	40,000	40,000	41,000	40,000
Secondary	112,000	114,000	115,000	119,000	120,000
Total	148,000	154,000	155,000	160,000	160,000
Portugal, secondary ^c	5,000	5,000	5,000	5,000	9,000
Romania:					
Primary	1,300	1,300	290 ^r	--	--
Secondary	12,000 ^c	12,000	13,000 ^r	18,000 ^r	15,000
Total	13,300	13,300	13,300 ^r	18,000 ^r	15,000
Russia, primary and secondary	96,500 ^c	106,000	113,400	122,000	201,000 ^c
Senegal, secondary	2,187	1,857	3,576	3,424	3,693
Serbia, primary and secondary ^c	15,000	15,000	15,000	15,000	15,000
Slovenia, secondary ^c	11,000	12,000	12,000	12,000	12,000
South Africa, secondary ^c	52,000	52,000	54,000	54,000	56,000
Spain, secondary ^c	166,000	165,000	166,000	168,000	175,000
Sri Lanka, secondary	4,500	2,500	3,000	3,500	3,700
Sweden:					
Primary	69,000 ^c	79,354 ^r	75,830 ^r	71,112 ^r	64,751
Secondary	44,000	44,800 ^r	46,000	50,200 ^r	47,200
Total	113,000 ^c	124,000 ^r	122,000	121,000	112,000
Taiwan, secondary	40,000	46,000	48,000	48,000	58,000
Tajikistan	50,000 ^c	59,295	84,749	99,700	73,100
Turkey, secondary ^c	55,000	56,000	58,000	58,000	58,000
Uganda, secondary ^c	800	800	800	800	800
Ukraine, secondary	30,000 ^c	30,000 ^c	28,465	33,633	30,000 ^c
United Kingdom:					
Primary ³	110,000	199,200 ^r	216,600 ^r	193,800 ^r	186,000
Secondary ⁴	157,000	158,000	158,000	160,000	168,000
Total	267,000	357,000 ^r	375,000 ^r	354,000 ^r	354,000
United States, secondary	1,060,000	1,050,000	1,110,000	1,140,000	1,170,000
Venezuela, secondary ^c	20,000	20,000	16,000	16,000	9,000
Grand total	10,700,000 ^r	10,600,000 ^r	11,000,000 ^r	11,400,000 ^r	11,400,000
Of which:					
Primary	4,630,000	4,510,000 ^r	4,640,000 ^r	4,630,000 ^r	4,300,000
Secondary	5,650,000	5,660,000	5,870,000	6,310,000 ^r	6,600,000
Undifferentiated	382,000 ^r	397,000 ^r	448,000 ^r	489,000 ^r	545,000

See footnotes at end of table.

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

⁰Estimated. ¹Revised. -- Zero.

¹Table includes data available through December 4, 2019. 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.

²Includes lead content in antimonial lead.

³Produced entirely from imported bullion and includes the lead content of alloys.

⁴Includes a small quantity of primary lead from domestic concentrate.