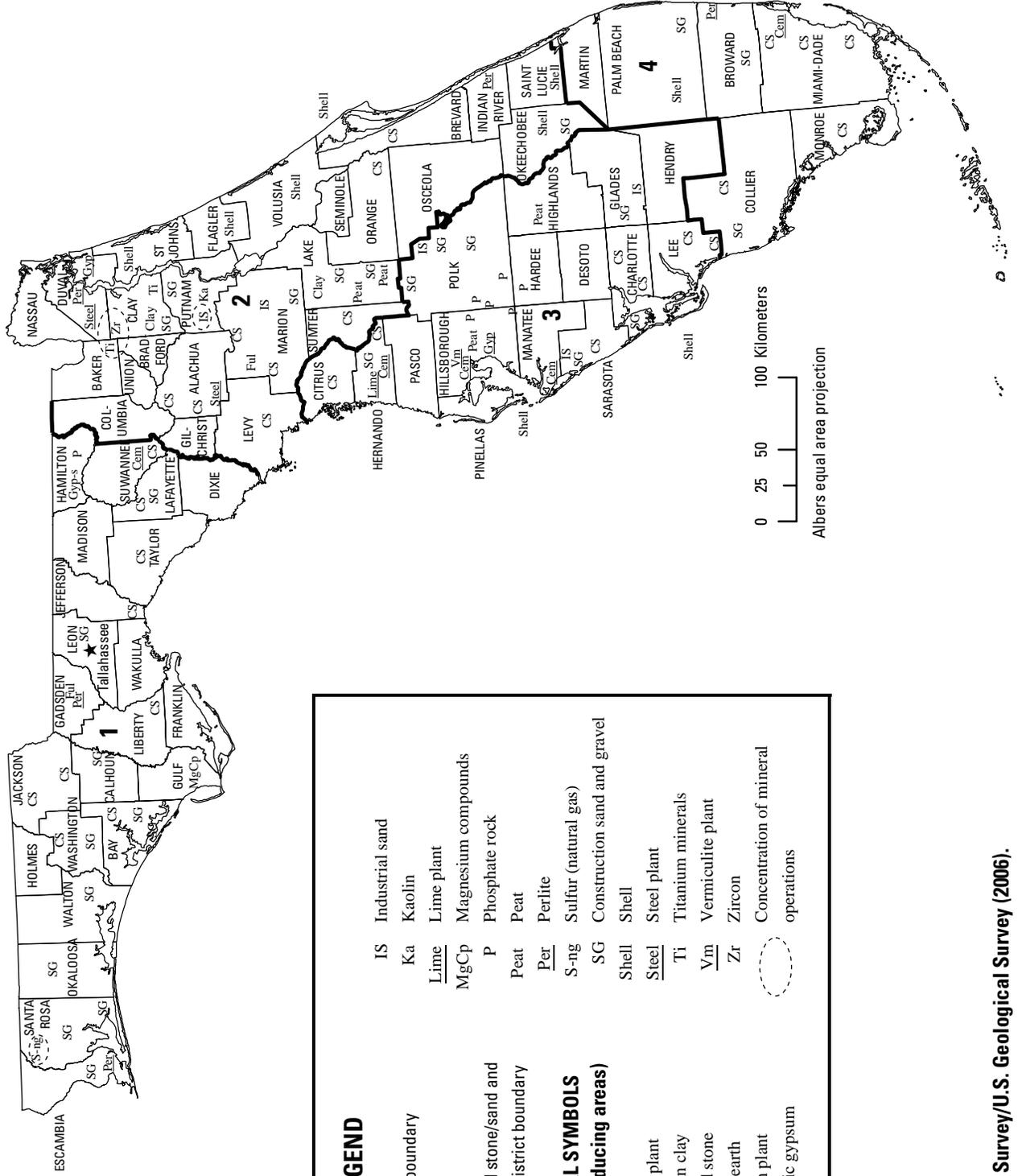




2006 Minerals Yearbook

FLORIDA

FLORIDA



LEGEND

- County boundary
 - ★ Capital
 - City
 - Crushed stone/sand and gravel district boundary
- MINERAL SYMBOLS
(Major producing areas)**
- IS Industrial sand
 - Ka Kaolin
 - Lime Lime plant
 - MgCp Magnesium compounds
 - P Phosphate rock
 - Peat Peat
 - Per Perlite
 - S-ng Sulfur (natural gas)
 - SG Construction sand and gravel
 - Shell Shell
 - Steel Steel plant
 - Ti Titanium minerals
 - Vm Vermiculite plant
 - Zr Zircon
 - Concentration of mineral operations
- Cem Cement plant
 - Clay Common clay
 - CS Crushed stone
 - Ful Fuller's earth
 - Gyp Gypsum plant
 - Gyp-s Synthetic gypsum

THE MINERAL INDUSTRY OF FLORIDA

This chapter has been prepared under a Memorandum of Understanding between the U.S. Geological Survey and the Florida Geological Survey for collecting information on all nonfuel minerals.

In 2006, Florida's nonfuel raw mineral production¹ was valued at \$3.22 billion, based upon annual U.S. Geological Survey (USGS) data. This was a \$310 million, or a 10.7%, increase from the State's total of \$2.91 billion in 2005, which was up \$590 million, or more than 25%, from that of 2004. The State was fifth in rank (fourth in 2005) among the 50 States in total nonfuel mineral production value, of which the State accounted for nearly 5% of the U.S. total.

Florida continued to lead the Nation in phosphate rock mining in 2006 with more than 65% of U.S. production, producing more than four times as much as the next highest producing State. Phosphate rock is produced in only four States. In terms of value, crushed stone continued as Florida's leading nonfuel mineral commodity, followed by phosphate rock, cement (portland and masonry), construction sand and gravel, zirconium concentrates, and industrial sand and gravel, the combined values of which represented 97% of the State's total nonfuel mineral value.

In 2006, increases in the values of crushed stone and cement, up by \$330 million and \$100 million, respectively, led Florida's increase in value for the year. Also up substantially were the value of construction sand and gravel, by \$56 million, and the value of industrial sand and gravel, by \$38 million. The unit values of each of the four nonfuel mineral commodities significantly increased, except industrial sand and gravel, which showed a small increase. A relatively small yet significant increase took place in the value of zircon concentrates in spite of a 15% decrease in the commodity's production. The most significant decrease in value was in phosphate rock, down by more than \$150 million. Decreases that took place in ilmenite, fuller's earth, rutile, magnesium compounds, and lime were significantly less.

In 2006, Florida continued to be the only State to produce rutile (a titanium mineral) and staurolite, and it remained first in the quantity of phosphate rock, masonry cement, and peat (listed in descending order of value). While Florida continued to be 1st of two States that produced zircon concentrates, 2d in the production of crushed stone, 3d in magnesium compounds, and 4th in portland cement, it rose in rank to 10th from 11th in production of construction sand and gravel. The State decreased to second from first of two States that produce ilmenite (a titanium mineral concentrate) and to fifth from fourth in the production of fuller's earth clay.

¹The terms "nonfuel mineral production" and related "values" encompass variations in meaning, depending upon the mineral products. Production may be measured by mine shipments, mineral commodity sales, or marketable production (including consumption by producers) as is applicable to the individual mineral commodity.

All 2006 USGS mineral production data published in this chapter are those available as of March 2008. All USGS Mineral Industry Surveys and USGS Minerals Yearbook chapters—mineral commodity, State, and country—can be retrieved over the Internet at URL <http://minerals.usgs.gov/minerals>.

The Florida Geological Survey² (FGS) provided the following narrative information. Production and other data in the following text are those reported by the FGS, based upon that agency's own surveys and estimates. The FGS data may differ from some production figures reported to the USGS.

Exploration and Development

Florida's phosphate companies own hundreds of thousands of hectares (ha) of property, but only about 1,500 ha was mined in 2006. In 2006, 10 new permits were issued that added 980 ha for mining phosphate. In May 2006, The Mosaic Company, Florida's leading phosphate producer, announced indefinite closure of three of its facilities. These included the Fort Green phosphate mine, the Green Bay diammonium phosphate and monoammonium phosphate concentrates plant, and the South Pierce granular triple superphosphate concentrates plant (Mosaic Company, The, 2006a).

In 2006, the State consumed an estimated 130 million metric tons (Mt) of crushed stone aggregate. Approximately 46% of the crushed stone aggregate produced in the State was derived from the Lake Belt region of Dade County (Lampl-Herbert Consultants, 2007, p. i). Florida continued to experience progressively larger transportation distances for delivery of stone aggregates which, coupled with increasing fuel prices, elevated aggregate costs to the consumer. Owing to rising aggregate production levels and the State's rapid population growth, it was anticipated that the State's reserves might well be exhausted or in economic jeopardy in a relatively short period of time. Several factors were contributing to the concerns regarding remaining reserves. These included community and environmental antimining sentiments, preemption of mining rights because of zoning or deed restrictions, litigation-related land-use constraints, and urban sprawl over potential reserves.

Florida's mineral resources reach beyond those of terrestrial origin, especially for Florida's excessively broad continental margins in the Gulf of Mexico. FGS research on sand resources in Florida's marine waters of the Gulf of Mexico has attained recognition by such agencies as the U.S. Department of the Interior's Minerals Management Service.

Commodity Review

Industrial Minerals

Florida continued to rank among the top ten fastest growing States (9th), with the second leading gain in population as nearly 26,800 new residents were arriving monthly (U.S. Census Bureau, 2006). Owing to Florida's rapid growth, the

²Clint Kromhout, Geologist/Environmental Specialist III, authored the text of the State mineral industry information provided by the Florida Geological Survey.

construction industry was hampered by an inadequate supply of materials, including aggregates, cement, and steel. In 2006, the mining and processing of basic construction materials, termed gravel or crushed stone, sand, and cement from limestone or lime-rock, totaled nearly 65% of the value of all mineral resources mined in the State.

Cement.—Cement was produced in six counties during the year. In Alachua, Dade, Hernando, and Suwannee Counties, the raw materials for producing the cement clinker were acquired from domestic sources, and in Manatee County the clinker was imported. Clinker production continued to rise during the year as construction activity increased.

Clays.—Common clay, fuller's earth, and kaolin were mined in several locations within the State in 2006. Common clay was mined primarily in Clay and Lake Counties, although it was mined in lesser quantities from various other locations throughout the State. Clay is used mainly in the production of brick and cement, and in the production of light aggregate for use in construction. Fuller's earth (attapulgite) was mined solely in Gadsden County and is typically used as an absorbent material in pet waste products. Kaolin was mined solely in Putnam County and is used in the manufacture of paper and refractories.

Phosphate Rock.—In 2006, three companies, CF Industries, Inc., PCS Phosphates, and The Mosaic Company, conducted phosphate rock mining at seven mines in Hamilton, Hardee, Hillsborough, Manatee, and Polk Counties. The State's operating mines represented 66% of the domestic phosphate rock mining capacity. Overall company sales of phosphate products declined slightly during the year compared with that of 2005, as a result of mine and fertilizer plant closures, lower export sales, and higher production costs and natural gas prices, effectively reaching a 40-year low in phosphate rock production (Jasinski, 2007).

Metals

Titanium and Zirconium.—E.I. du Pont de Nemours & Co., Inc. and Iluka Resources, Inc. continued to operate heavy-mineral sand mines in Baker, Bradford, Clay, and Duval Counties. In late 2006, Iluka Resources ceased mining at its Green Cove Springs operation, owing to an increase in operating costs and a decline in deposit grade (Gambogi, 2008a). The company continued to process stockpiled tailings, rich in zircon (zirconium silicate), from its Green Cove Springs Mine. However, Iluka's production of zircon concentrate in the State during the year decreased by 48% compared with that of 2005 (Gambogi, 2008b). Ilmenite, leucosene, and rutile minerals found in the heavy-mineral sand deposits of northeastern Florida are the primary raw materials used in the manufacture of titanium dioxide pigments. Zircon is used mainly in refractories and foundry sands, and in ceramics for opacification.

Environmental Issues and Reclamation

The Mosaic Company received mining permits for its proposed Altman and Ona phosphate rock mine locations along the Charlotte Harbor National Estuary, the Horse

Creek, and the Peace River in Charlotte County (Mosaic Company, The, 2006b). The county had been concerned about the environmental impacts of phosphate mining on creeks, groundwater, and rivers. Legal challenges to the receipt of the permits were dropped after changes to the mining permit request were offered by The Mosaic Company, and monetary constraints had limited the county's continuance of the challenges. The Mosaic Company owned approximately 138,000 ha of land in the State, of which between 41,000 ha and 61,000 ha had been mined.

As a result of the environmental concerns on phosphate rock mining voiced in Charlotte County, the counties of Lee, Manatee, and Sarasota joined with Charlotte County in collectively urging for an area-wide environmental impact statement (EIS) to assess the vulnerability of the surrounding creeks, groundwater, and rivers. Manatee County was particularly interested in the completion of an EIS, after The Mosaic Company had proposed expanding its Four Corners Mine to include the 830-ha Altman tract. Mosaic owns approximately 4,500 ha of land in Manatee County.

The Florida Department of Environmental Protection (FDEP), Bureau of Mine Reclamation, issued 25 nonphosphate permits during the year. Most were environmental resource permits and wetland resource permits that pertained to upland and wetland disturbance and involved about 8,700 ha of land. Some permits also were issued pertaining to mine expansions and modifications.

FDEP records indicated that about 67% of the nearly 72,000 ha of land mined for phosphate since July 1, 1975, had been reclaimed. As of that date, the FDEP had required that all mined lands be reclaimed and that such reclamation be administered by the FDEP's Bureau of Mine Reclamation.

In response to a 2002 lawsuit, further challenging the impacts posed by limerock (crushed stone aggregate) mining in the Dade County Lake Belt region, the U.S. District Court in Miami ordered a reassessment of the mining permits issued for about 2,200 ha of wetlands. Environmental groups had challenged the mining permits issued for this region, arguing that the EIS prepared by the U.S. Army Corp of Engineers and the U.S. Fish and Wildlife Service had not adequately assessed danger posed to Miami-Dade County's drinking water supply and Everglades' wetland habitats. Environmental arguments were further emphasized after benzene was detected in the Miami-Dade County well field in 2005. The challenging environmental groups indicated the possibility that the benzene originated from petroleum-based explosives utilized during the mining process. A supplementary EIS reassessing the issuance of the mining permits was expected to be completed in about 18 months.

Government Programs

The FGS, through a cooperative agreement with the U.S. Department of the Interior's Minerals Management Service (MMS), investigated offshore sand sources suitable for restoration of beaches off Florida's northeast coast. The investigation was in response to a request by MMS to conduct a reconnaissance study offshore from the Eglin Air Force Base to identify desired sands. A report issued on this investigation

included seismic data and representative track lines, maps, grab sample locations, descriptions, and granulometric data for the area in federal waters offshore in Okaloosa County, FL (Phelps and others, 2007).

In response to the legal challenges by environmental groups arguing that mining will endanger Miami-Dade County's drinking water supply and Everglades' wetland habitats, the Florida Department of Transportation contracted for a study to assess the status of Florida's aggregate resources. Addressed in this study were two key questions: 1) What is the future of aggregate material supply in Florida? and 2) What are the potential impacts to Florida's economy from the curtailment of crushed stone production? The study specifically addresses the physical and economic impact should any or all of the Lake Belt aggregate mines be closed (Lampl-Herbert Consultants, 2007).

The FGS continued to be an active participant in the STATEMAP program. STATEMAP is a component of the congressionally mandated National Cooperative Geologic Mapping Program (NCGMP), through which the USGS distributes Federal funds to support geologic mapping efforts through a competitive funding process. The NCGMP has three primary components: (1) FEDMAP, which funds Federal geologic mapping projects, (2) STATEMAP, which is a matching-funds grant program with State geological surveys, and (3) EDMAP, a matching-funds grant program with universities that has a goal to train the next generation of geologic mappers. In 2006, the FGS completed geologic mapping for the western portion of the USGS 1:100,000-scale Lake City quadrangle. The completed products included a geologic map, cross sections, and a physiographic regions map. Four cores and numerous hand samples were archived in the FGS State Geologic Sample Repository for future reference. The completed maps and cross sections are available as part of the FGS Open-File Map Series (Green and others, 2006).

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TABLE 1
NONFUEL RAW MINERAL PRODUCTION IN FLORIDA^{1,2}

(Thousand metric tons and thousand dollars)

Mineral	2004		2005		2006	
	Quantity	Value	Quantity	Value	Quantity	Value
Cement:						
Masonry	763	97,600 ^e	902	129,000 ^e	900	146,000
Portland	5,230	432,000 ^e	5,730	519,000 ^e	5,880	602,000
Clays:						
Common	W	W	4	W	3	W
Fuller's earth	234	W	279	39,700	259	24,400
Kaolin	31	3,280	29	3,510	23	2,900
Gemstones, natural	NA	1	NA	1	NA	1
Lime	24	2,090	23	2,940	W	W
Peat	478	9,710	464	9,450	496	10,000
Sand and gravel:						
Construction	29,300	146,000	37,500	210,000	40,000	266,000
Industrial	679	8,520	715	9,410	3,340	46,500
Stone, crushed	105,000 ³	680,000 ³	116,000 ^{r,3}	1,010,000 ^{r,3}	127,000	1,340,000
Combined values of magnesium compounds, phosphate rock, staurolite, stone [crushed sandstone (2004-05)], titanium concentrates, zirconium concentrates, and values indicated by the symbol W	XX	945,000	XX	971,000 ^r	XX	786,000
Total	XX	2,320,000	XX	2,910,000 ^r	XX	3,220,000

^eEstimated. ^rRevised. NA Not available. W Withheld to avoid disclosing company proprietary data. Withheld values included in "Combined value" data. XX Not applicable.

¹Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

²Data are rounded to no more than three significant digits; may not add to totals shown.

³Excludes certain stones; kind and value included with "Combined values" data.

TABLE 2
FLORIDA: CRUSHED STONE SOLD OR USED, BY KIND¹

Kind	2005			2006		
	Number of quarries	Quantity (thousand metric tons)	Value (thousands)	Number of quarries	Quantity (thousand metric tons)	Value (thousands)
Limestone ²	88 ^r	111,000 ^r	\$980,000 ^r	80	117,000	\$1,250,000
Dolomite	4	982	7,370	4	713	6,770
Shell	4	4,040	24,000	5	8,640	73,900
Sandstone	2	230	2,210	2	312	3,400
Total	XX	116,000 ^r	1,010,000 ^r	XX	127,000	1,340,000

^rRevised. XX Not applicable.

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

²Includes limestone-dolomite reported with no distinction between the two.

TABLE 3
 FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE¹

(Thousand metric tons and thousand dollars)

Use	Quantity	Value
Construction:		
Coarse aggregate (+1½ inch):		
Riprap and jetty stone	154	2,870
Filter stone	W	W
Other coarse aggregate	1,750	26,700
Total	1,910	29,500
Coarse aggregate, graded:		
Concrete aggregate, coarse	3,310	57,200
Bituminous aggregate, coarse	(2)	(2)
Railroad ballast	(2)	(2)
Other graded coarse aggregate	7,930	129,000
Total	11,600	190,000
Fine aggregate (-¾ inch):		
Stone sand, concrete	(3)	(3)
Screening, undesignated	1,570	20,600
Other fine aggregate	6,560	87,200
Total	8,130	108,000
Coarse and fine aggregates:		
Graded road base or subbase	12,700	76,900
Crusher run or fill or waste	3,740	19,100
Other coarse and fine aggregates	4,680	50,900
Total	21,100	147,000
Agricultural:		
Limestone	(4)	(4)
Poultry grit and mineral food	(4)	(4)
Other agricultural uses	121	465
Chemical and metallurgical:		
Cement manufacture	(4)	(4)
Lime manufacture	(4)	(4)
Unspecified: ⁵		
Reported	51,400	560,000
Estimated	27,000	280,000
Total	78,700	841,000
Grand total	127,000	1,340,000

W Withheld to avoid disclosing company proprietary data; included with "Other coarse aggregate."

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

²Withheld to avoid disclosing company proprietary data; included in "Total."

³Withheld to avoid disclosing company proprietary data; included with "Other fine aggregate."

⁴Withheld to avoid disclosing company proprietary data; included in "Grand total."

⁵Reported and estimated production without a breakdown by end use.

TABLE 4
FLORIDA: CRUSHED STONE SOLD OR USED BY PRODUCERS IN 2006, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	Districts 1 and 2 ²		Districts 3 and 4 ²		Unspecified districts	
	Quantity	Value	Quantity	Value	Quantity	Value
Construction:						
Coarse aggregate (+1½ inch) ³	18	440	1,890	29,100	--	--
Coarse aggregate, graded ⁴	857	17,500	10,800	173,000	--	--
Fine aggregate (-¾ inch) ⁵	946	15,000	7,170	92,800	9	104
Coarse and fine aggregates ⁶	11,700	70,900	9,330	75,200	55	782
Agricultural ⁷	W	W	W	W	--	--
Chemical and metallurgical ⁸	W	W	W	W	396	4,420
Unspecified:⁹						
Reported	8,100	88,800	43,300	472,000	--	--
Estimated	3,600	39,000	24,000	240,000	--	--
Total	26,600	236,000	100,000	1,100,000	460	5,310

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

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

²Districts 1 and 2, 3 and 4 are combined to avoid disclosing company proprietary data.

³Includes filter stone, riprap and jetty stone, and other coarse aggregate.

⁴Includes bituminous aggregate (coarse), concrete aggregate (coarse), railroad ballast, and other graded coarse aggregate.

⁵Includes screening (undesignated), stone sand (concrete), and other fine aggregate.

⁶Includes crusher run or fill or waste, graded road base or subbase, and other coarse and fine aggregates.

⁷Includes agricultural limestone, poultry grit and mineral food, and other agricultural uses.

⁸Includes cement and lime manufacture.

⁹Reported and estimated production without a breakdown by end use.

TABLE 5
FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006,
BY MAJOR USE CATEGORY¹

Use	Quantity (thousand metric tons)	Value (thousands)	Unit value
Concrete aggregate (including concrete sand)	9,620	\$76,600	\$7.96
Concrete products (blocks, bricks, pipe, decorative, etc.) ²	1,690	13,500	7.96
Asphaltic concrete aggregates and other bituminous mixtures	748	5,900	7.89
Road base and coverings	1,500	12,500	8.32
Fill	4,860	20,400	4.20
Other miscellaneous uses	1,820	9,680	5.32
Unspecified:³			
Reported	8,390	53,300	6.35
Estimated	11,400	74,100	6.50
Total or average	40,000	266,000	6.64

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

²Includes plaster and gunite sands.

³Reported and estimated production without a breakdown by end use.

TABLE 6
 FLORIDA: CONSTRUCTION SAND AND GRAVEL SOLD OR USED IN 2006, BY USE AND DISTRICT¹

(Thousand metric tons and thousand dollars)

Use	District 1		Districts 2 and 3		District 4	
	Quantity	Value	Quantity	Value	Quantity	Value
Concrete aggregate and concrete products ²	624	2,630	10,700	87,500	--	--
Asphaltic concrete aggregates and road base materials	--	--	2,250	18,400	--	--
Fill	187	636	4,140	16,600	531	3,160
Other miscellaneous uses	127	980	1,690	8,700	--	--
Unspecified: ³						
Reported	--	--	8,390	53,300	--	--
Estimated	4,940	32,100	5,880	38,200	576	3,750
Total or average	5,880	36,400	33,000	223,000	1,110	6,910

-- Zero.

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

²Includes plaster and gunite sands.

³Reported and estimated production without a breakdown by end use.