



FLORIDA DEPARTMENT OF TRANSPORTATION



2009 STRATEGIC RESOURCE EVALUATION STUDY: Highway Construction Materials



Aggregate Materials

FINAL REPORT



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Executive Summary

The Florida Department of Transportation initiated research to strategically assess opportunities and risks in the highway construction materials marketplace. The Department faced unprecedented price volatility during the period of 2005-2008, while the overall Florida economy experienced extreme constraints on both ends of the spectrum – high prices followed by tight credit and very low demand. In any major disruption to the balance of supply and demand, movements in either direction tend to overshoot the mark before restriking that balance.

This update provides data on the existing state of the materials marketplace and outlook as of the end of Fiscal Year 2009. Updated work plan data for the next five years has been obtained, including the impacts of federal stimulus funding; interviews have been completed, and plant surveys have been administered. Results show significant shifts in supplier outlook, operating practices and trendline concerns from one year ago. A sampling of these changes is summarized at the end of this section in **Figure 1**. Materials quantities estimates and econometric modeling for cost and consumption forecasts are provided in summary fashion at the end of this section, and in more detail in each materials section.

Key Findings:

- With a recession well underway, industry outlooks vary. Business investment – meaning capital expenditures by the private sector like facilities construction, improvements or upgrades – is expected to be negative until the second half of 2010; by definition, government spending currently has the largest influence on materials usage. The government stimulus package is expected to have the most impact on asphalt via resurfacing projects, concrete through bridge replacements and general improvements requiring structural concrete, and aggregate as a component of the first two. Structural steel is likely to see the least impact, due to the nature of its specialized and somewhat random requirements in infrastructure projects; nonetheless, stimulus spending is expected to be the primary driver of structural steel revenues for the next several years.
- Contractors perceive that bureaucratic delays have added several months to stimulus contract awards and do not expect stimulus funding to affect workloads until the fourth quarter of 2009. Fierce competition over dwindling prospects in the market is restraining prices on materials.
- Future Port/Terminal capacity is of critical importance in coming years. Due to the potential volatility of Lake Belt material, the shift in asphalt binder supplier arrangements, and the increasing reliance on granite for pavement friction courses, current and planned capacity at Florida's ports has been examined closely in this report. Detailed information is provided in the respective materials sections.
- FDOT now appears to consume half to one-third of total highway construction materials in the state; 2 years ago, FDOT was estimated at only ¼ of total State consumption. Industry leaders now expect not to reach 2004-5 levels of growth within the next 5 years; in some cases, not within ten. To put

current events into historical context, the last great housing bust in Florida is generally considered the S&L crisis; the state's economy took about 8 years to resume its long-term average growth of 4% for two years running. At this writing, Florida is in its second year of GSP contraction. While countless differences exist between the current scenario and that of the S&L crisis, **Figure 2** shows that if we use that crisis as a guide, industry is probably correct to expect another 5-6 years of below average growth. Plant-level surveys and interviews with managers in a variety of industries support this expectation; suppliers are making changes in their operations to adapt to a new environment of lower long-term growth expectations. Details are outlined in the respective materials sections.

- Companies which undertook aggressive expansion and now carry debt have different outlooks than those with strong capital. Some of this is already reflected in asset sales to former competitors and debt restructuring. Cement and aggregate companies are most affected. Revised strategic plans may spur more industry consolidation and market entrants in some industries over the five-year work plan. Structural steel and asphalt are expected to gain some new participants over the five-year work plan. New competition includes vertical integration from existing competitors, creating competitive supplier advantages, as well as market participants offering new techniques and products.
- Long-term, expectations are that the work plan is more vulnerable in the next ten years than in the past. There is broad concern among suppliers over the declining Gas Tax Revenues, expected Florida General Revenue Fund shortages, and decline in expected population growth. Public sector work declined outside of the stimulus package, but commercial work, which is normally considered higher profit-margin work, has all but disappeared. Numerous capital projects have been cancelled or deferred in multiple industries, as described further herein. Combined, industry expects to plan for smaller capacity needs in the long-term than prior strategic plans may have anticipated.
- We believe that Florida's business climate is transitioning into a "Big state" from a "Growing state". Growth will resume, but mature industries will begin to look more like mature industries in other states – annual growth from value-added products and services will track the state's overall economic growth, or GSP. Industry recognizes this and anticipates a shift away from infrastructure maintenance, and toward congestion relief, as well as other service sectors of the economy. A frequently voiced perception is that this trend will reduce available funding for traditional FDOT work plan programs. Some have suggested that as Federal work increases in the State, this may also alter materials usage patterns, but many contractors felt this would have no impact.
- The cement industry is particularly concerned about regulatory changes. It already has been hit with limits on mercury emissions. In the near future it expects to be required to build capacity for Type II reclaimed water. In addition, it expects a large impact from cap and trade regulations for carbon emissions.

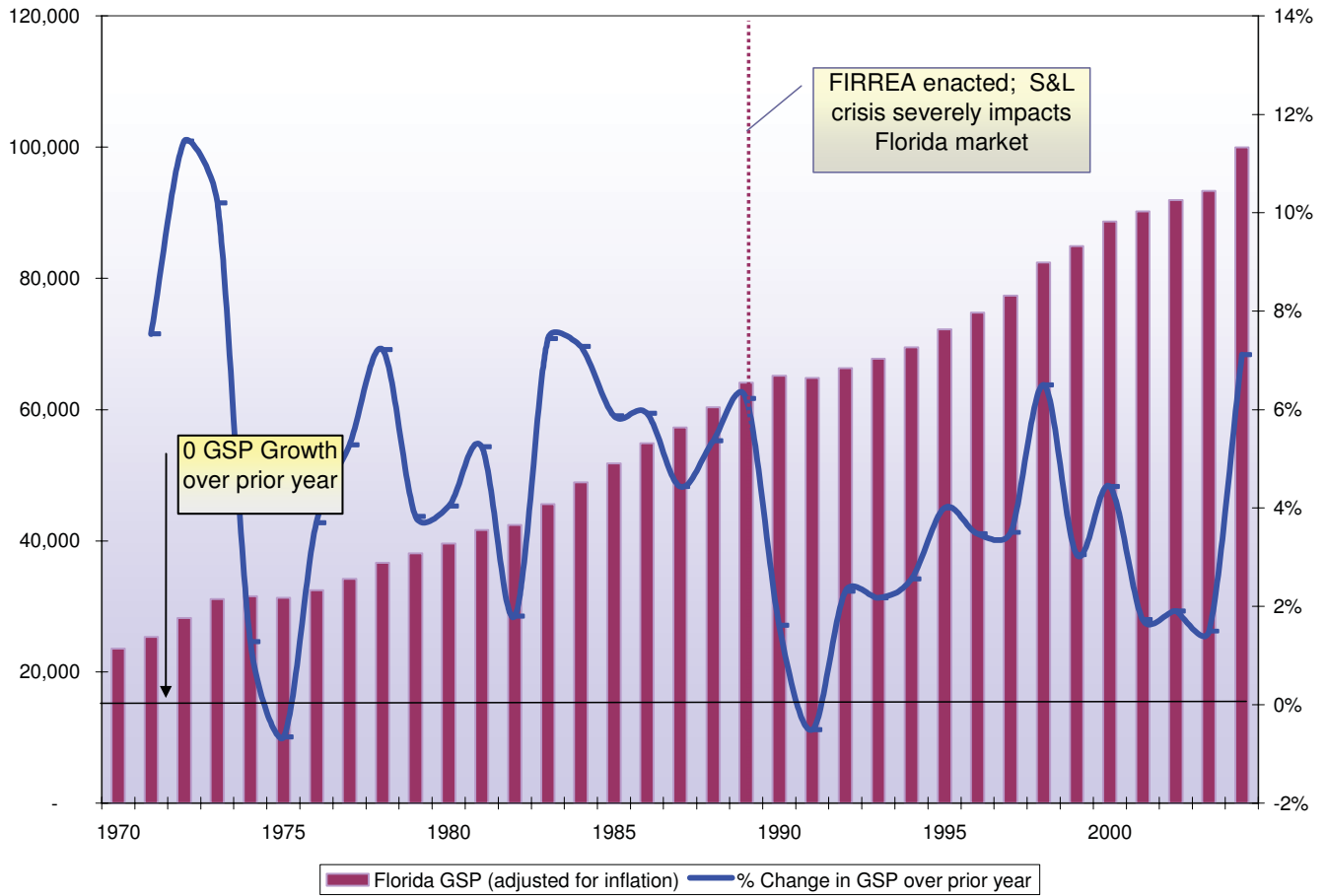
- FDOT's preliminary work plan figures appear to be significantly lower in some areas than the past work plan. While these numbers may disappoint, suppliers can best manage their operating costs, staffing levels and capital investments when equipped with the most accurate information possible. Early and detailed dissemination of planned projects, by work mix category, benefits suppliers by providing flexibility in their options. Suppliers recognize that this information changes over time and can adapt to changes when they are equipped with information on a timely basis. Many firms are working under temporary strategies on the assumption that historical levels of work will resume soon, and these firms will be most vulnerable when those levels are not reached in a one-two year time frame.
- In Florida and across the nation, transportation agencies are experiencing extremely competitive bids; in Florida's case, a projected \$4.2 billion work program in Fiscal Year 2009 required only \$2.7 billion to complete, due to lettings coming in well below engineers' estimates. FDOT redistributed the savings to District Five-Year Work Programs for future lettings. In Fiscal Year 2010, savings of \$392 million have already been recognized (as measured by actual bids versus adopted dollars), and these funds are being used to quickly accelerate projects and let more projects to bid. After FY 2010, the work program is projected to decline by half. FDOT may wish to accelerate some of the projects it had planned to fund with the 2009 savings, both to help "smooth out" the existing rut in the industry and to take advantage of savings while costs are low.

Figure 1. Summary of Industry Perceptions

	In Current Year		Within 5 Years		Within 10 Years	
	Asphalt/Cement/Steel		Asphalt/Cement/Steel		Asphalt/Cement/Steel	
	Last Year	This Year	Last Year	This Year	Last Year	This Year
Planning Horizon	N/N/N	Y/Y/Y	Y/Y/Y	Y/N/N	Y/Y/N	N/N/Y
Estimated Probability of:						
Further Industry Consolidation	0/0/0	0/0/0	0/0/0	50/50/75	0/0/0	0/50/75
Crisis in Iran/ Venezuela/ Nigeria affecting raw material availability	25/0/0	40/0/0	50/0/0	50/0/0	25/0/0	25/0/0
China controlling shipping availability	50/60/25	25/25/50	75/75/50	75/25/75	40/75/75	85/25/100
Relief from Housing Market	45/50/0	50/0/0	50/25/25	50/25/25	25/25/25	75/75/25
Increased Imports	25/0/0	0/0/0	50/50/0	25/0/25	75/0/0	50/25/0

This table summarizes shifting attitudes in the supplier marketplace. It is organized as follows. As an example, using the "further industry consolidation" row of data; last year, on average, respondents indicated a zero percent likelihood of further industry consolidation during the Current year, Five year time frame and Ten year time frame. This year, respondents indicated a zero percent likelihood of further industry consolidation during the Current year, but asphalt and cement industry respondents expect a 50% likelihood of further consolidation within Five years, while steel respondents expect a 75% likelihood of consolidation within Five years, summarized as 50/50/75.

Figure 2. Historical Florida GSP Growth



Percent Cost Composition of Traditional Lettings by Fiscal Year

Figure 3. Cost Composition, using Pay Items included in Weighted Average Price Calculations

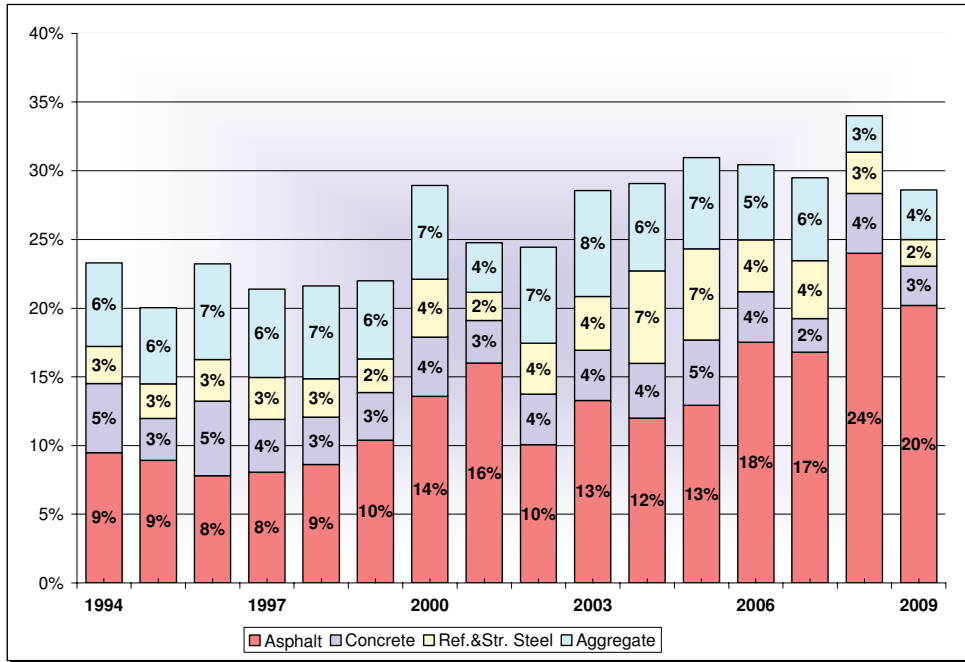
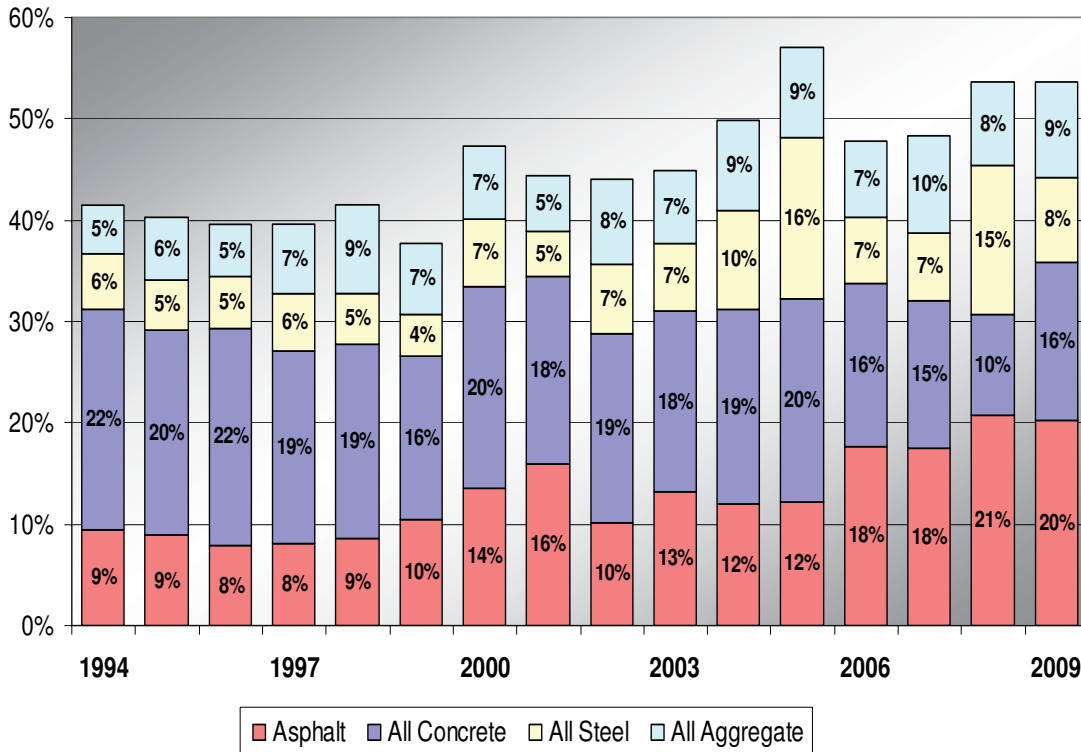


Figure 4. Cost Composition, using all relevant Pay Items



Projected Materials Requirements for 5 year Work Plan

Table 1. 5 Year Estimates of Materials Requirements

	Unit	2010	2011	2012	2013	2014
FDOT Work Program	\$ 000s	\$ 3,266,363	\$ 1,373,847	\$ 1,370,099	\$ 1,597,001	\$1,890,870
Hot Mix Asphalt	1,000 TN	7,860	4,038	4,424	5,340	5,712
Asphalt Binder						
PG 76-22	TN	194,220	99,789	109,321	131,939	141,150
PG 67-22	TN	189,868	97,553	106,871	128,982	137,988
ARB - 5	TN	67,591	34,728	38,045	45,917	49,122
ARB - 12	TN	19,761	10,153	11,123	13,424	14,361
ARB - 20	TN	4,911	2,523	2,764	3,336	3,569
GTR	TN	6,166	3,168	3,471	4,189	4,481
Concrete						
Structural Concrete	CY	303,810	444,101	371,808	369,484	374,940
Ancillary Concrete**	CY	3,162,470	1,505,133	1,612,938	1,542,418	1,436,778
Total Concrete	CY	3,466,279	1,949,234	1,984,747	1,911,902	1,811,718
Steel						
Reinforcing Steel	TN	19,415	5,872	4,722	4,713	9,133
Structural Steel	TN	20,756	6,277	5,048	5,038	9,763
Aggregate						
Base Material and Other Aggregate	TN	2,125,000	987,400	615,200	512,600	1,189,000
Aggregate for Asphalt	TN	6,649,600	3,416,500	3,742,900	4,517,300	4,832,600
Aggregate for Concrete	TN	4,749,700	2,670,900	2,719,600	2,619,800	2,482,500
Total Aggregate	TN	13,524,300	7,074,800	7,077,700	7,649,700	8,504,100
Bridges	Number	146	39	48	38	55

** Concrete Pipe, Sidewalk, Drainage Structures, etc

Source: Calculated, from data provided by FDOT Estimates Office. Projects Scheduled for Letting in later years of the Work Program are in early stages of design, and materials estimates may be understated for the last two years of the Program.

Materials Requirements are calculated in accordance with the methodology established in 2007 and outlined in the Appendix to the November 10, 2007 report and the Aggregates section of this report. Future materials requirements declined considerably from last year's report, as fewer projects are funded due to the decline in Gas Tax Revenues and the expiring Highway Transportation Funding Bill. Various versions of a new highway funding bill are being considered by Congress which, if passed, could significantly increase materials requirements for all materials in the Work Plan.

The jump in concrete requirements from previous calculations is reflective of
a) a shift in work mix away from capacity jobs and
b) the availability of more refined lane-mile data.

Table 2. Preliminary Work Mix for 5-Year Work Program (in thousands of dollars)

Work Mix	2010	2011	2012	2013	2014
Add Lanes	\$ 603,963	\$ 102,510	\$ 87,810	\$114,327	\$ 741,891
Bike Path	27,072	14,056	4,167	3,681	4,147
Bridge Replace/New	390,364	207,519	317,820	175,584	119,824
Drainage	12,251	4,898	15,386	6,434	9,540
Guard Rail	15,942	35,900	26,804	7,438	4,394
Interchange	64,259	130,837	11,371	14,320	78,072
Intersection	24,989	11,421	6,064	1,438	-
ITS	26,510	12,597	37,442	29,891	11,867
Landscaping/Lighting	12,083	16,986	13,278	9,314	7,834
Miscellaneous	25,919	16,847	14,064	11,664	18,065
New Road	60,144	20,735	-	74,876	45,770
Other	18,602	5,629	9,807	4,771	-
Resurfacing	697,727	649,291	754,262	1,133,164	836,670
Rigid Pave	33,436	96,318	18,444	-	-
Signing/Marking	10,424	9,568	7,427	3,256	3,893
Toll Plaza	69,110	11,687	17,914	-	7,342
Traffic Ops	19,269	6,360	12,300	11,614	1,561
Widen/Resurface	35,401	25,818	24,542	-	-
3P projects	1,137,500				
Total	\$3,266,363	\$1,373,847	\$1,370,099	\$1,597,001	\$1,890,870

Glossary of Defined Terms & Acronyms

ARRA – The American Recovery and Reinvestment Act.

BEBR – The Bureau of Economic and Business Research at the University of Florida, which generates detailed estimates of Florida’s population, income and other trends.

Cap and Trade – A regulatory mechanism which requires polluting facilities to acquire a permit or allowance for the amount of pollutant the facility will produce. Facilities must hold allowances adequate to cover all of the pollutant they produce. This scheme was first used to reduce acid rain, through the Clean Air Act legislation of 1990 passed by President Bush. As an incentive for reducing emissions, for each ton of sulfur dioxide reduced below the applicable emissions limit, owners of a generating unit received an emissions allowance they could use at another unit, keep for future use, or sell. EPA reports that as of 2007, total SO₂ emissions achieved the program's long term goal ahead of the 2010 statutory deadline, acid rain levels were estimated to have dropped by 65%, and total costs ended up being about ¼ of what was originally projected by opponents. The European Union adopted a similar program for greenhouse gases in 2005; because of this, foreign-owned firms are expected to have an advantage over U.S. firms in adapting to a cap-and-trade marketplace.

DOR – Florida Department of Revenue

Elasticity – The measure of responsiveness in a quantity of a good or service to a change in another factor. A common example using price elasticity is, if the price of chicken increases by 10%, and people buy 3% less chicken, the elasticity of chicken would be -30% (-3%/10%). In the case of materials, elasticities can be interpreted as the percentage change in the cost of a material that correlates with a percentage change in another variable. A hypothetical example might be a 10% increase in heavy construction employment triggering a 4% increase in structural steel costs, reflecting the high degree of labor involved in structural steel fabrication.

FIRREA – Financial Institutions Reform, Recovery and Enforcement Act of 1989, the S&L Bailout legislation. Overbuilding in the real estate sector prompted the bailout, after housing starts dropped by 44%, causing hundreds of thrifts and savings and loans to become insolvent. The legislation created the funding for RTC (Resolution Trust Corporation), to close the thrifts. In the four years following its passage, over 700 S&L’s and 1600 banks failed, and the 1990-1 recession followed.

OEDR – The Office of Economic and Demographic Research, which produces estimates of Florida’s General Revenues (Tax Revenue) for the Florida Legislature twice a year through the Revenue Estimating Conference. OEDR produces detailed projections of expected employment, income, housing, population and other trends through 2030, which can be accessed at www.edr.state.fl.us.

IEC – The Institute of Economic Competitiveness at the University of Central Florida, which generates detailed projections of housing, employment, income and other demographic data for the State of Florida and subregions.

PCA – Portland Cement Association; a trade association of Portland Cement producers.

Type 2 Water – Is a quality classification of reclaimed water indicating suitability for industrial use and irrigation of processed-food crops.

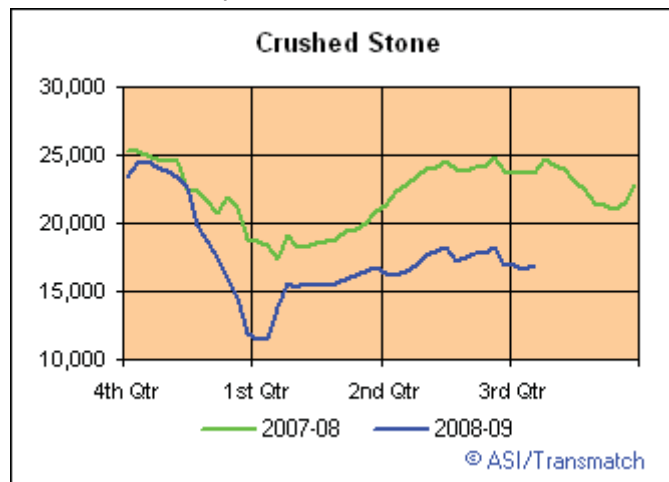
Aggregate

Key Findings - Aggregate

Florida's aggregate industry is reeling from a combination of factors. The industry has fought environmental issues in recent years with the "Lake Belt" litigation. Industry consolidation and acquisition by foreign owners saddled some firms with high debt loads, in an industry whose greatest variable is fixed costs; debt repayments are now a burden with reduced revenues and lower output to spread costs against. Finally, the combined downturn of housing, commercial development and government spending dealt a three-fisted punch to an industry that was preparing for extended growth. Dollars spent on construction contracts were down 39% overall through the end of April. **Figure 5** shows the steep decline in crushed stone shipments throughout North America in the last year.

Including stimulus projects, suppliers expect volumes to decline a further 15% this year, after declining at twice that rate during the second half of last year. Industry insiders now estimate that pre-boom levels of growth are not expected within the five-year work plan, or even within ten years. Currently, public sector work comprises more than half of all revenues in the Florida aggregate industry – Cemex quoted infrastructure as the main driver of demand in most of its markets. This rate is four times higher than the industry planned for, and twice what it was two years ago. Planning horizons have been significantly shortened, and when the economy does recover, expectations are that capacity will be restored slowly and cautiously. However, industry is cautious in providing estimates, both as a competitive/proprietary matter, and because of the contentious nature of ongoing litigation in the Lake Belt area.

Figure 5. Crushed Stone Rail Shipments



Emblematic of industry woes, the following press release was offered in May by one of Florida's large suppliers:

Commenting for the Company, Don James, Vulcan's Chairman and Chief Executive Officer, stated, "The sharp decline in demand for construction

materials is unprecedented. In response to continuing market weakness and the corresponding reduced demand, we remain focused on reducing costs, improving productivity and maintaining unit variable margins. These actions helped mitigate the earnings effect of lower sales volumes. In contrast to typical seasonal operating plans, during the first quarter we reduced production and inventory levels. These decisions penalized first quarter earnings but improved cash generation and better positioned us for improved operating performance going forward.”

Cemex sold a number of facilities, all of its Australian operations, restructured debt, and sold quarries (outside of Florida) to Martin Marietta in June, 2009.

Despite the dire situation, the industry managed to sustain prices for the first part of fiscal year 2009. More recently, reports indicate that smaller quarries gained market share as they lowered price, while larger operators maintained price points longer. Eventually, even large operators conceded pricing, and overall, current pricing appears to be 8-12% lower than one year ago, varying throughout the state.

Supply Chain Variables for Aggregate Materials

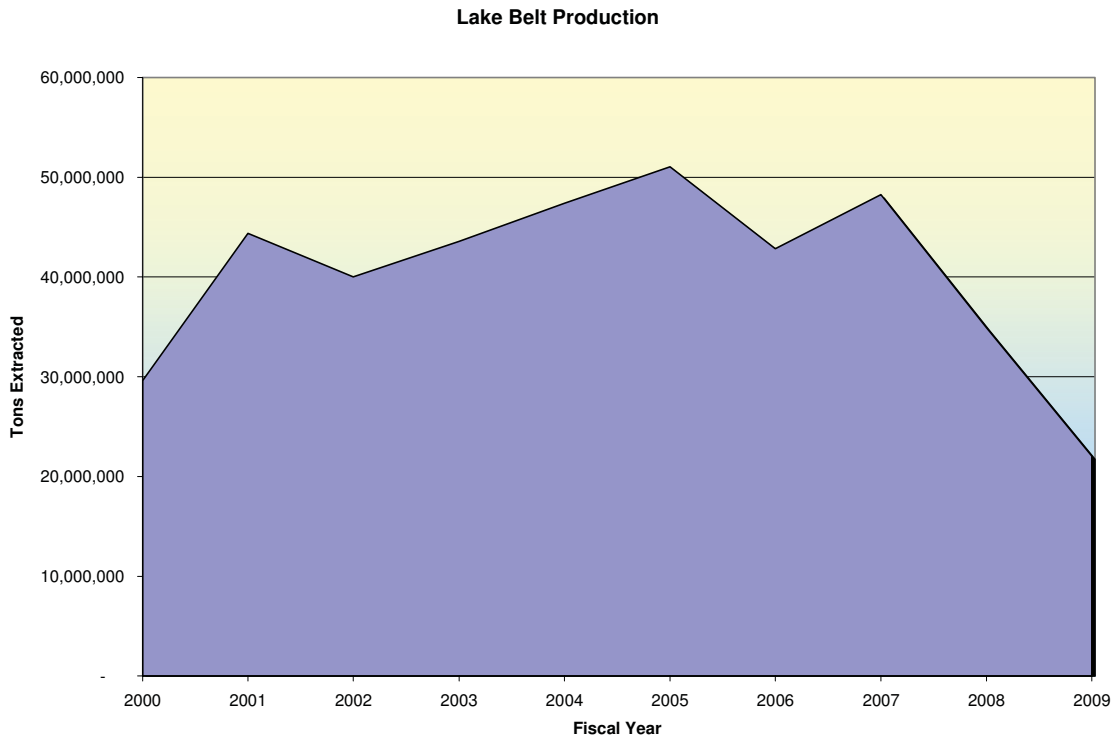
Mining Production Capacity

Florida has four significant resource areas of quality limestone reserves: Lake Belt, Charlotte-Lee County, Sumter-Hernando-Citrus County, and the Taylor-Dixie-Big Bend area. The Lake Belt area has historically produced up to 45% of statewide output, with the remainder split almost evenly between other mines located in South Florida, and those that are north of Tampa.

The U.S. Federal District Court for South Florida issued a ruling on January 30, 2009 canceling all permits for limestone mining in Florida’s Lake Belt region. This was the second time mining companies have been ordered to cease operations in the region over environmental concerns. Companies affected included Titan/Tarmac’s Pennsuco plant, White Rock, Sunshine Rock Inc., Sawgrass Rock, Lowell Dunn, APAC-Southeast Inc., Florida Rock Industries, Kendall Properties and Cemex. The case is under appeal, and the outcome is uncertain.

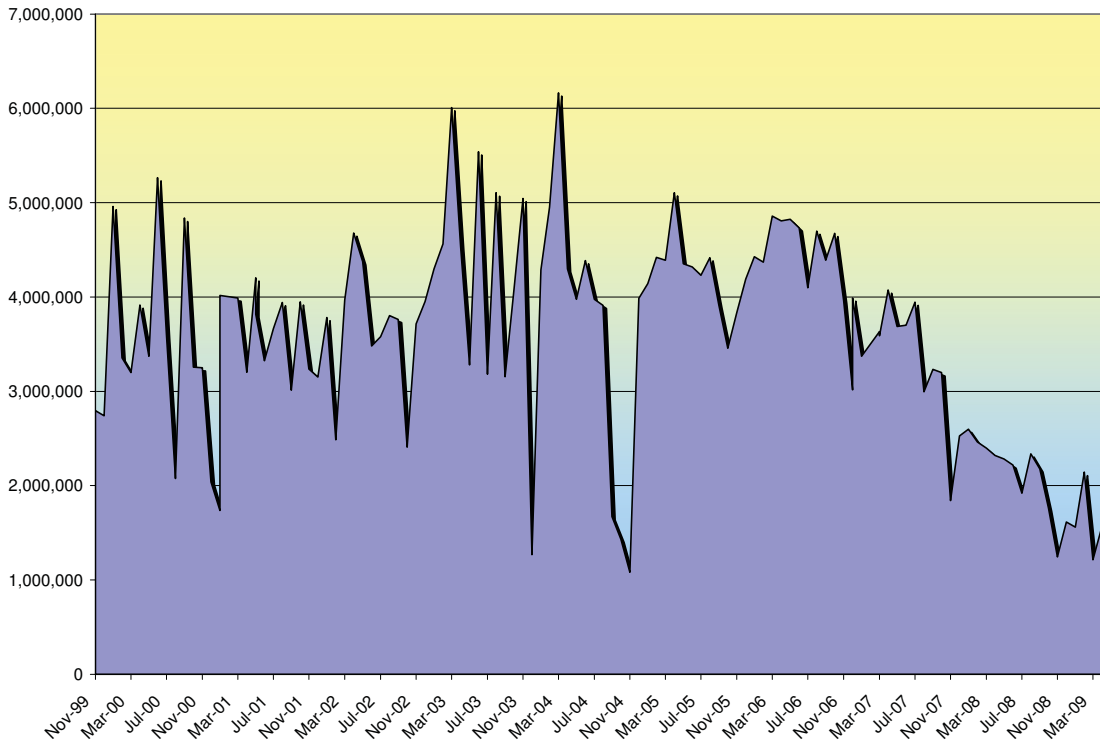
Reported Lake Belt production this year (22 million Tons) is near 40% of peak year production (2005, when 51 million Tons were reported). At these reduced rates, stockpiles were reportedly adequate to cover demand for 12 months following the halt to mining in February, implying that demand has dropped to below 2 million tons per month, averaged over the year. In other words, demand has declined such that supply has now increased relative to demand. This decline in demand would extend the life of these mines by about twice their original expected life. At the same time, the mining areas are expected to be curtailed by the ruling affecting the permits, which will shorten this time period at a rate equivalent to the area lost. If quarries are curtailed by half the permitted area, the remaining life can be expected to be halved as well. Until all appeals are exhausted, it will be difficult to estimate with any certainty whether the amount of supply that is no longer available outweighs the amount of supply that was effectively gained through the recession-induced decline in demand. See **Figure 6** for a history of extraction from Lake Belt mines annually, and **Figure 7** for the same data in monthly volumes.

Figure 6. Annual Lake Belt Production



Source: DOR

Figure 7. Monthly Lake Belt Production



Source: DOR

Transportation

Aside from potential loss of a supply source, there is concern that rail infrastructure would be inadequate to transport rock from other ports or mines if Lake Belt were to become unavailable for an extended period of time. This year, the Florida legislature approved funding for FDOT to explore extending rail infrastructure to Taylor County mining resource areas (**Figure 8**). The Perry quadrangle, which covers most of Taylor County, has been surveyed via FGS/DEP and provides the bulk of information that is publicly available. The geologic mapping information shows deposits of Suwannee limestone, particularly in the Southwest part of the county. While hard cores have been sampled in the region, (most notably by Lampl-Herbert) the sampling was too sparsely scaled to draw any conclusions on the contiguous nature or economic viability of the "hard" material.

Figure 8. Florida Legislation regarding new Rail Infrastructure for Aggregate Materials.

Line 2032 of the General Appropriations Act for FY 2009-10 (Chapter 2009-81, Laws of Florida)

In order to provide and expedite the delivery of aggregate materials in Florida, the department may enter into a public-private partnership with a county or its development authority to develop a four year plan to construct a rail project to be owned by the county or its authority. Subject to Legislative Budget Commission approval, the department may provide up to \$2,000,000 in FY 2009-2010 to the county of its authority for the engineering plans and environmental impact statements, which shall be repaid to the department over a 5 year period. Financial responsibility, such as maintenance and repair costs, or legal liability for the project shall not be borne by the state.

Other areas of mining resources have varied access to rail infrastructure, which affects their potential delivery radius due to cost and shipping times. Generally speaking, trucking costs are estimated at about 3 times higher than rail costs.

Previously, a shortage of rail cars and/or rail congestion was considered a significant concern. Since the recession, rail shipments are down dramatically, and rail contacts report that nearly 30,000 cars are in paid storage as of mid-2009. Many of these cars are "gondola" cars which carry aggregate. With long-term growth forecasts at much lower levels, capital projects to reduce congestion in rail corridors have become a lower priority, and these expenditures are no longer considered justifiable.

Imports

Aggregate imports to Florida arrive from Canada, Georgia, Mexico and the Bahamas. Three years ago, imports were estimated at no more than 15% of Florida's crushed stone consumption. Since then, a shift toward more granite consumption has increased this percentage, as evidenced by survey results of Florida asphalt plants. Outside of Districts 4 & 6, which are directly serviced by Lake Belt and have few alternatives, a distinct shift to granite appears to be taking place. Within Districts 4 & 6, limestone is still dominant. **Figure 9** shows the results of the survey, which was administered in July/August 2009.

Figure 9. Survey Results

District	% Granite	% Limerock
1	73	28
2	95	5
3	43	57
4	-	100
5	80	20
6	-	100
7	90	10
Total	57	43

One question concerning alternative sources of material has been access to rail infrastructure. While extensive rail infrastructure exists to ship material from the Lake Belt region in South Florida to North and Central Florida, the reverse has not been true, and port space to support aggregate imports is limited in South Florida. This is critical because the FDOT 5 year work plan shows that almost ¼ of planned projects are forecast for Districts 4 & 6.

Several ports have published aggressive expansion plans in recent years, and are in various stages of planning, permitting, funding or reconfiguring their sites to accommodate a shifting aggregate market. **Figure 13** shows Port capacities relative to aggregate facilities.

Plans are reportedly underway to acquire land within Palm Beach, Martin and St. Lucie Counties to procure space for barge conveyance of aggregates from the Caribbean. The objective of this strategy would be to access the existing rail infrastructure that reaches both to North and South Florida, and across to the west coast. While multiple parties reported plans similar to this strategy, we were unable to confirm the specific locations or companies that would finalize this project.

The Port of Tampa is another example of expansion plans in place. The Port of Tampa used a linear program transportation cost model in its Master Plan to assess its cost competitiveness in the aggregates market for FDOT District 7 and other markets. The same trucking, shipping and rail costs were applied to other ports (Jacksonville and Canaveral) to determine the geographic sphere of the Port of Tampa's cost competitiveness. The Port determined from the model that they are currently competitively positioned to serve much of the FDOT District 7 market.

Figure 10. Herzog Railcar topper installed to unload 200T aggregate/hour at City Point, near Port Canaveral.



Other announced port expansions or improvements include:

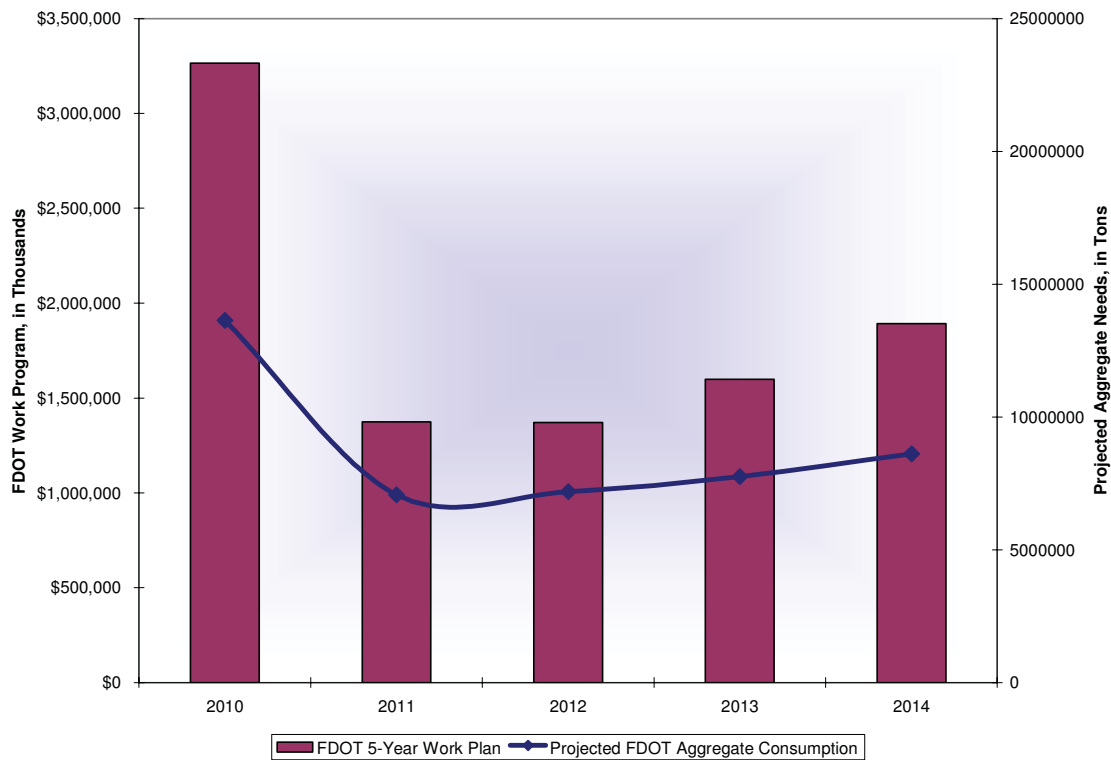
- Port Authority announced an agreement with Gulf Cargo Facilities of Port St. Joe, LLC, a shipper of aggregate materials used in the construction of roads and concrete construction projects. GCF plans to move one million tons of aggregate through the port annually. The materials offloaded at Port St. Joe will be railed throughout North Florida. These aggregate imports would fill a supply gap found in northwestern Florida.
- South Florida's ports and the Florida Ports Council said a key issue is "the ability to nail down or secure state dollars for infrastructure." The ports want legislation that would increase Florida's statutory minimum investment in seaports from \$8 million to \$15 million.
- The federal stimulus package will make available \$14.8 million needed to complete the deepening of the St. Johns River to allow larger ships to call on the Port of Jacksonville. The money received by the U.S. Army Corps of Engineers will make it possible for it to deepen the river's six mile stretch from Dames Point to Talleyrand Terminal to about 40 feet. Economic stimulus funds will also pay for Florida's Port Canaveral to dredge and maintain its channels; the project will receive \$10.2 million.

Port expansions are capital investments, and investors usually want investments to break even within a short period of time – 3 to 5 years. At the same time as these expansions are being considered, Florida's growth is slowing and expected to return to only half its previous growth rates once the economy recovers.

Forecast

The FDOT Work Program is much smaller in the current 5-Year Plan, and consequently requires considerably less aggregate than in the past. The following chart shows the forecast materials requirements over the five year work plan.

Figure 11. Aggregate Needs Forecast



Within the five-year work plan, statewide consumption will hinge on the speed of economic recovery experienced in Florida, as well as other factors, including oil prices. As mentioned throughout this report, future Florida growth is widely expected to reflect growth patterns more closely resembling mature states than high-growth states. As a commodity, aggregates are considered a “mature” industry, whose growth typically reflects overall economic growth, or in Florida’s case, State GSP. One factor which may shift the demand curve for aggregate material is the new EPA rule requiring “scrubbers” in coal-fired power plants, to reduce mercury emissions. The scrubbers use a softer aggregate than highway construction requires, but are expected to increase aggregate sales. **Figure 14** reflects forecast consumption under various growth scenarios.

Under the most aggressive scenario, consumption reaches a level that is about 15% below the previous peak. Under less aggressive growth scenarios, which are currently considered more likely, statewide consumption increases toward 50-60% of previous peaks during the five-year work plan, and does not reach 2006 levels of consumption within ten years. As noted in the Imports section, an increasing share of this consumption is now derived from granite and other out-of-state sources. Consequently, supply constraints which supported high aggregate prices in recent years appear to have loosened. Future costs are likely to reflect the transition of the state and industry into a marketplace that more closely reflects mature industry behavior, tracking overall economic growth. This scenario would allow for price

increases that track overall economic growth, which over the long-term, have averaged 4% annually.

The distribution of FDOT's materials requirements by district is shown in **Figure 12**.

Figure 12. FDOT Aggregate Estimated Usage for 5 Year Work Plan

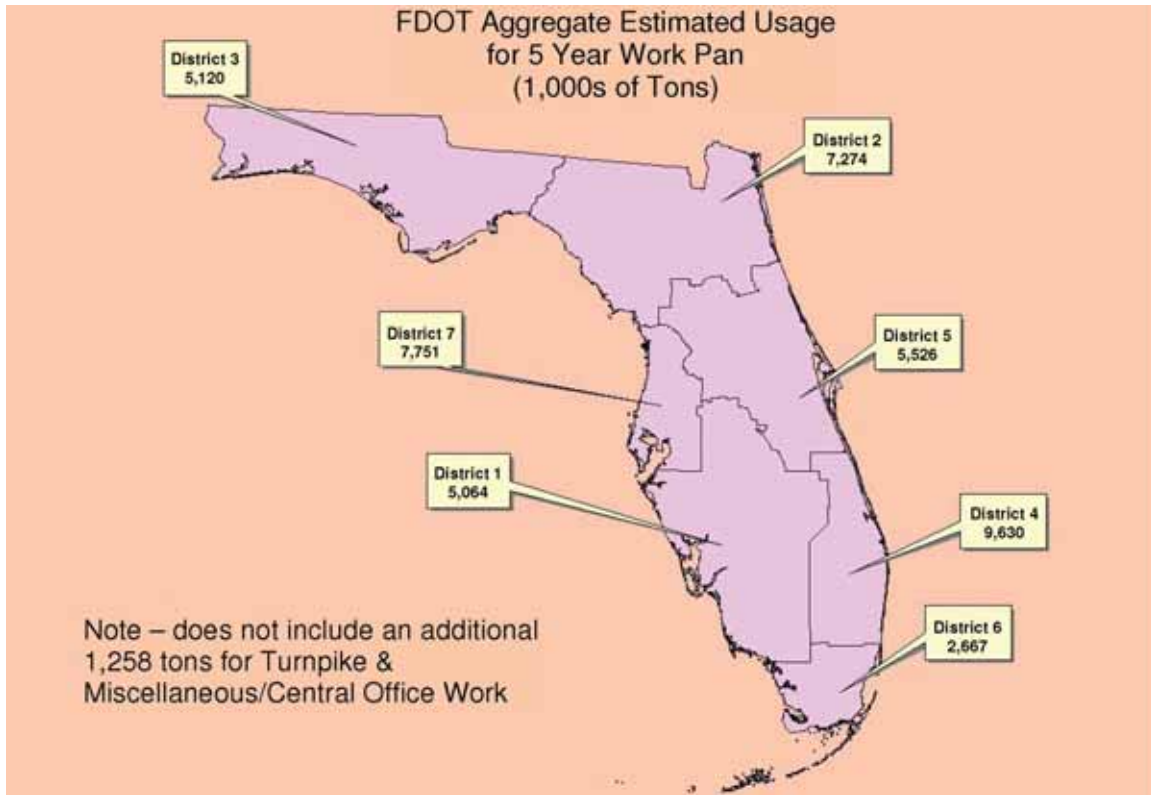


Figure 13. Port Capacity, Aggregates

Location	Current Aggregate Minimum Capacity, Tons Import	Aggregate Minimum Annual Guaranteed Capacity in 5 years (C = In Constructed, P = Permitted, not under construction, or Planned)	Estimated Aggregate Capacity in 5 Years	Notes
Port Canaveral	4.5	8.0 MM P	16.0	Current max capacity is 4.5M ST developed in 2006. (Imported 1M ST in 2008.) Constraint is trucking space. Building additional pier would add 5M ST annually (to 13M ST). Long term: 16 acres available for expansion. \$4-\$5 per ton handling charge to load onto rails (if desired to ship long distance.) Installed Herzog railtop crawler to unload 200T aggregate/hour at nearby City Point.
Port Tampa	2.3	7.9-11.8 C	19.7	Max. capacity 13.9 by 2026. Currently adding at least 28 acres with some on site rail access.
Port Manatee	0.6	0.8 C	1.5	Army corps data, Master plan, verbal confirmation of new company adding 400K up to 800K within 5 yrs min flow guaranteed.
Port Pensacola	0.5	0.5	1.0	M. Marietta owns 4.75 acres.
Port Everglades	3.3	4.3-6 P	10.2	Includes cement, max additional aggregate is 4.3 by 2026 (total dry 8.5M ST annually) Master Plan.
Port of Palm Beach	1.0	1.0	1.0	Master plan: current includes moderate land improvements, otherwise current = .5 and 5 yr = 1.3. Verbal communication shows capacity will not increase and could decrease. When demand recovers could expand but not likely to exceed 1M.
Port of Jacksonville	2.0	2.6	4.0	Previous Port Director interview: M. Marietta and Rinker (Cemex) Bahamas cr. stone, Nova Scotia granite; Army Corp estimate: 2.6M ST. Current min guaranteed flow = 2M tons, actual could be 3.5 - 4M.
Total	14.2	31.3	53.4	

Sources: Army Corps of Engineers, Florida Ports Council, Ports Master Plan

Figure 14. Florida Aggregate Consumption

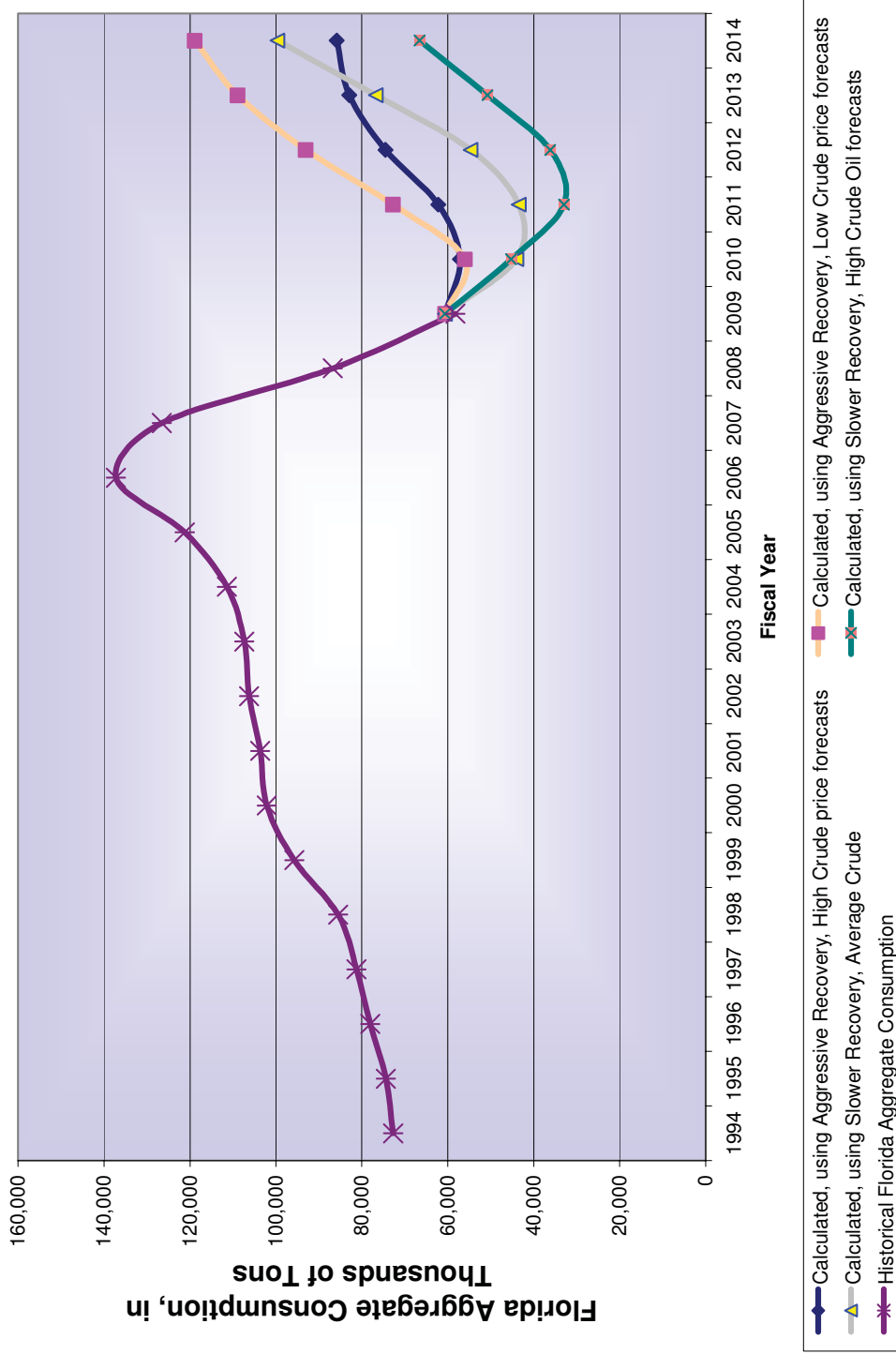


Table 3. Historical Aggregates Data

Aggregates	Units	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Crude Oil (WTI Spot Price) ¹	\$/Barrel	30.38	25.98	26.18	31.08	41.51	56.67	66.05	72.34	99.67	51.18
Total China Imports ²	\$ Billions	225.1	243.6	295.2	412.8	561.2	660	791.6	955.8	1,051.4	1,048.1
Florida Diesel Prices ¹	\$/Gallon	0.89	0.78	0.73	0.92	1.15	1.56	1.73	2.22	2.88	1.51
Estimated Statewide Crushed Stone Produced or Used ³	000s Short Tons	102,486	104,800	107,665	107,004	115,710	126,730	147,668	105,461	67,993	48,488
Average Crushed Stone Price Florida ³	\$/Ton	4.83	4.91	5.32	5.49	5.88	7.84	9.48	10.59	11.18	10.29
FL Heavy Construction Employees/ All FL Construction Employees ⁴	%	14.1%	13.9%	13.3%	12.6%	12.1%	11.7%	11.7%	12.6%	13.1%	13.53%
FL Construction Employees/All Florida Non-Farm Employees ⁴	%	6.4%	6.6%	6.6%	6.8%	7.2%	7.8%	8.1%	7.4%	6.6%	5.83%
FDOT Work Program ⁵	\$ Billions	1.36	1.57	2.1	1.52	2.33	2.87	2.05	3.02	2.8	2.64
Crushed Stone Imports Serving Florida ⁶	Short Tons	9,362	9,950	9,653	11,600	11,655	12,734	14,265	13,070	12,296	8,975
Average Hourly Earnings Mining and Quarrying ⁷	\$/Hour	15.65	16.09	16.56	17.14	17.74	18.10	18.73	18.81	18.83	18.89
FDOT Optional Base Price Index ⁸	\$/Ton	22.23	18.43	25.87	18.74	25.3	26.18	41.99	39.95	36.4	27.02
FDOT Earthwork Cost ⁸	\$/CY	\$4.99	\$4.12	\$4.01	\$4.65	\$5.08	\$5.64	\$8.31	\$8.42	\$6.23	\$4.66

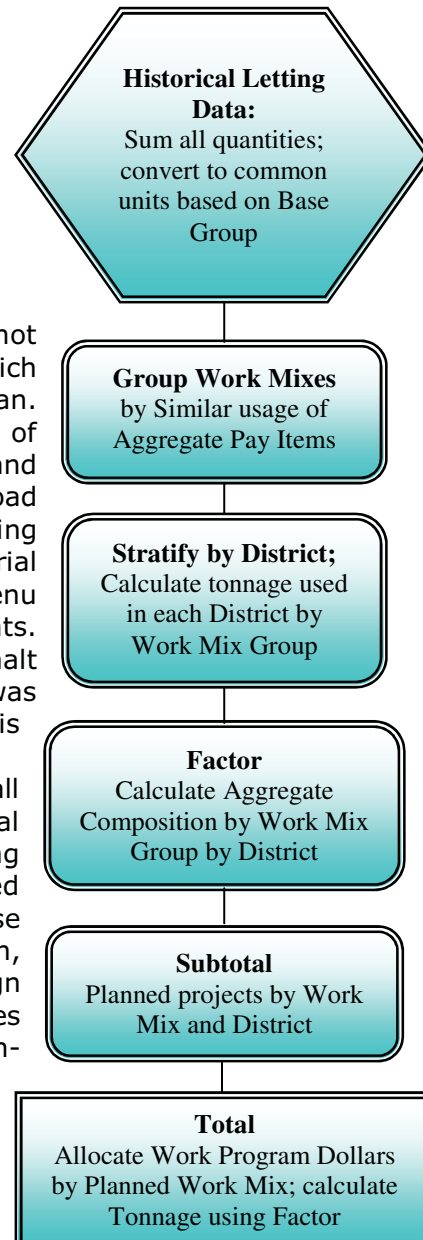
Sources: 1. EIA - Annual Average Spot Prices (2008 is EIA Short Term Energy Outlook price); 2. PRC General Administration of Customs, China's Customs Statistics, the National Bureau of Statistics, and U.S. China Business Council; 3. US Geological Survey; 4. Bureau of Labor Statistics - State and Local Employment; 5. FDOT Estimates Office; 6. U.S. I.T.C.; 7. Bureau of Labor Statistics; 8. Calculated from FDOT Estimates Office data.

Estimates of Future Materials Requirements

Estimates of FDOT's future requirements for aggregate materials have been prepared. These estimates began with a review of the Letting History data available for the past 14 years. Since 2000, letting history data has been maintained for each construction contract let in each District. From 1993-2000, this data was available for Central Office lettings only. For contracts let since 2000, approximately 25% have been lump sum contracts, for which actual materials quantities data is not available. In addition, actual materials quantities are not available for P-3 or Design Build projects, which comprise an increasing proportion of the work plan. FDOT purchases aggregate directly for a number of uses, including Road Base Material, Rip-Rap and associated materials for embankment, etc., For Road Base, materials are "Contractors' choice", meaning design engineers specify the requirements the material must meet, but contractors can choose among a menu of materials that may satisfy those requirements. Aggregate is also purchased indirectly through asphalt pavement and concrete. The following methodology was adopted to estimate total materials usage, and is represented in **Figure 15**:

1. Historical FDOT data was analyzed for all construction projects with associated optional base pay item data that were let using traditional methods. This data provided information about SY of optional base. These quantities were converted into weight by Ton, using crosswalk tables to convert various design depths from FDOT Specs. In addition, quantities of rip-rap, Embankment and other non-excavation pay items were calculated. This data was subtotaled by District and year.
2. All projects were reviewed for work mix. All projects with optional base pay items, let over a two year period, were reviewed by P.E. staff for patterns in base aggregate usage. The determination was made to categorize projects into four work mix groups – Major, Minor, Resurfacing and Miscellaneous. Factors were determined for these work groups for each District. These factors were applied to all projects in LRE, by work mix, for each year in the 5-Year Work Plan. This calculation provides LRE quantities of aggregate consumption.
3. Because LRE data is constantly being updated, it is necessary to make some estimates of variation that can be expected when LRE data is aggregated across the work program; some projects will have design complete and quantities accurately estimated. Other projects will be in early stages of design, and quantities may change dramatically as design progresses. In programmed years 2 and 3, the portion of the Work Plan without complete

Figure 15



LRE data is assumed to reflect similar materials usage to the LRE quantities of aggregate consumption, and the LRE estimates are grossed up accordingly. For Year 4 and 5, the "gap" is attributed to Resurfacing, and is assigned a factor according to each District's historical aggregate usage for Resurfacing projects. Because there is no way to know in advance which material may be chosen for base material in future projects, this quantity should be considered a conservative estimate of total aggregate requirements.

4. Rip-rap, embankment and other aggregate-related materials were subtotaled for each project. Ratios of usage of these materials to optional base were calculated and applied to Optional Base calculations to generate "Other Aggregate" quantities.
5. Aggregate for asphalt was calculated as a ratio of HMA requirements for each year.
6. Aggregate for concrete was calculated as a ratio of concrete requirements for each year.