Fiscal Year 22/23

QUARTERLY REPORT

Strategic Resource Evaluation Study Highway Construction Materials

Contract BEC18

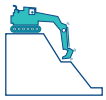
October 2022

Revised

The Balmoral Group

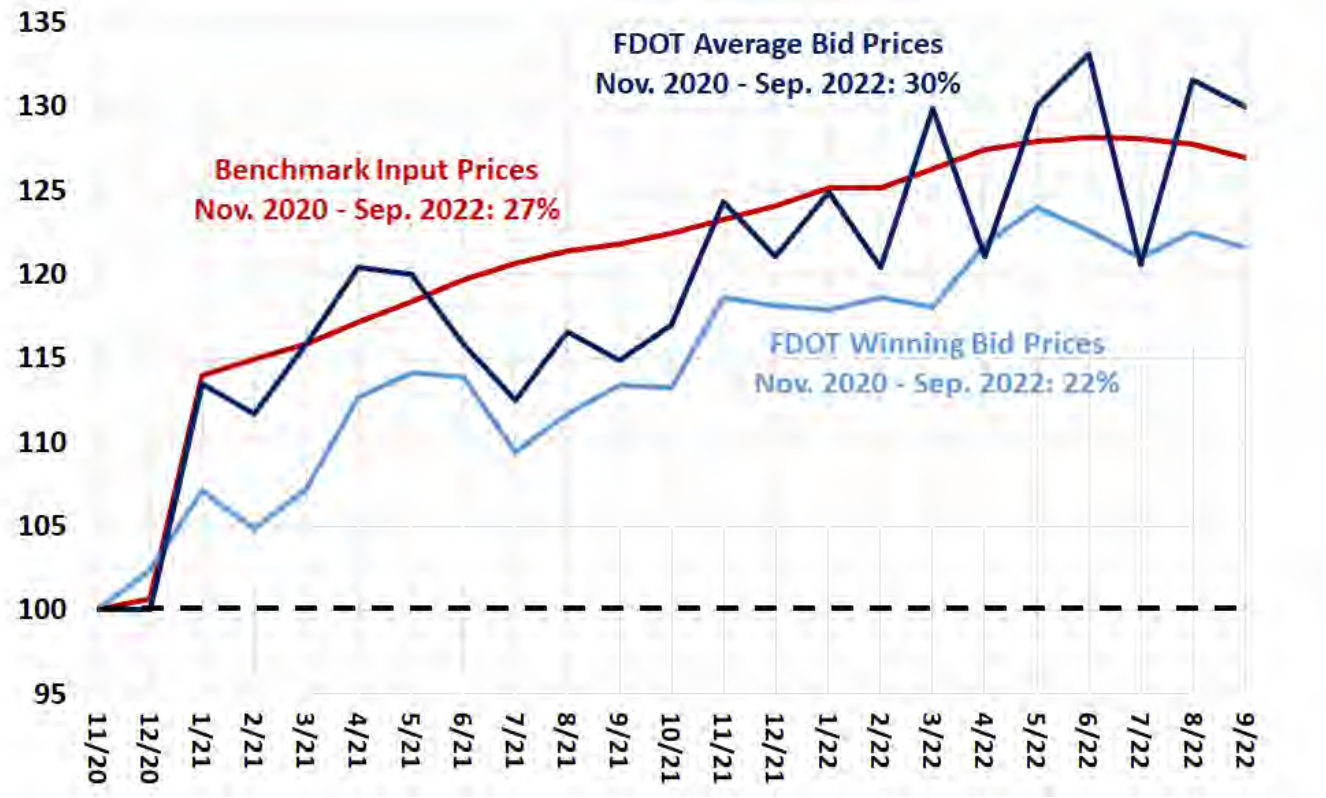
165 Lincoln Avenue
Winter Park, FL 32789

OVERVIEW ➤ FLORIDA'S HIGHWAY CONSTRUCTION MATERIALS

Construction Material	Status
 ASPHALT	**For the quarter, FDOT asphalt binder prices declined slightly, but were still extremely high at the wholesale level, averaging over $800 per ton.** Ongoing crude volatility and infrastructure spending will continue to provide market support for higher asphalt prices, which are up about 20% compared to FY 2021, according to preliminary FY 2023 FDOT bids. Current forecasts do not show moderation in asphalt costs until 2024. Besides high binder costs, aggregate supply is an issue for some asphalt producers as well. Asphalt components like binder and aggregate are largely exempt from recent changes to import requirements, which gives FDOT suppliers room to find new sources.
 CONCRETE	**Cement consumption is expected to pick up over the next few years due to an increase in federal infrastructure funding and concrete-heavy resiliency projects across the state.** Increased demand will likely improve supply but also raise costs. Transportation issues, including fuel costs, trucking shortages, and rail reliability, persisted over the last quarter and are not expected to improve before the end of 2022. FDOT's weighted average price for structural concrete pay items is forecast to increase by 8.6% in 2023 based on current economic conditions. Fly ash alternatives like metakaolin are available, but still more expensive. Producers report using slag or additional cement in place of fly ash as well. FDOT is working on bringing alternative markets online, including ground glass and calcined clay. Disruptions in aggregate supply due to domestic labor shortages and a decline in imports are resulting in longer lead times for some districts, which may impact project schedules and costs.
 STEEL	**Market conditions for steel producers have improved for some products**, including scrap steel, but remain high for steel plate and rebar. Fabricators continue having issues with skilled labor, transportation, and steel and metal products lead times. Lead times now extend to 30 weeks on some items, such as signal poles and mast arms, but do appear to be more on a spot basis for other products. Ongoing geopolitical disruptions are affecting global markets for steel, iron, zinc, and aluminum, among other materials. With the expiration of import waivers in November, fabricators estimate cost increases of 5% on average, but ranging up to 15%. Current forecasts estimate FDOT's weighted average prices to rise 3.5% in FY 2023 before seeing relief in FY 2024. **FDOT's material price adjustment index may help keep bids in check** as fabricators attempt to meet record demand over the five-year work program.
 AGGREGATE	**Even though production has increased in 2022, availability is an issue.** Interviews indicate that disruptions in Mexican imports are expected to persist well beyond this year, affecting 1-2 million tons of annual supply. Prices increased by 15% through the end of the last fiscal year, with current models estimating FY 2023 prices to rise an additional 11%. According to interviews, producers expect a double digit increase from major suppliers in January 2023. Depending on outcomes of the rail union negotiations, a major rail strike could exacerbate current trucking shortages as companies switch deliveries over from rail to trucking to compensate. Lastly, contractors report adding a 5% fuel surcharge on most orders. It's expected that fuel and labor cost moderation would drive any improvement in aggregate bids at this time.
 EARTHWORK	**Earthwork costs are feeling the impact of higher trucking costs and labor availability.** With potential disruptions to rail activities this fall and winter, trucking would be even more in demand, likely increasing costs further. Recent slowing of competing sectors (housing) has been offset by ongoing fuel and parts availability issues. However, equipment prices have eased in recent months. FDOT earthwork costs were 11.1% higher in fiscal year 2022 compared to 2021. Under current models, costs may increase an additional 1% in 2023.
	**The Buy America Build America (BABA) waiver is set to expire in November.** This waiver allowed for a six-month adjustment period that delayed the effective date of BABA's domestic preference requirements for iron and steel, manufactured products, and construction materials used in federally funded infrastructure projects. Construction materials exclude aggregate, asphalt, and concrete products, however. On October 25th, an amendment to the law went into effect that increases the required domestic content of material used in federal projects from 55% to 60%. The domestic requirement is scheduled rise another 5% in 2024. Steel fabricators indicate that their costs will go up 5% on average, but some quoted as much as 15%

An FDOT Cost Index was calculated by accessing awarded and average bids since November 2020. The share of aggregate, asphalt, concrete, and steel dollars spent on FDOT projects was compared to a baseline industry cost index (**Figure 1**). Input prices remain high in September 2022, up about 27% compared to November 2020. Surging demand amid continuing supply constraints and labor availability issues are keeping costs high. Bid prices have seen similar increases, with the average bid 30% higher in September 2022 and winning bids 22% higher compared to November 2020.

Figure 1. Florida Benchmark Input Costs vs FDOT Bid Prices



Source: TBG calculated from data provided by FDOT Office of the Work Program and Budget, TBG Work Product.

Disclaimer

The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the State of Florida Department of Transportation

Prepared in cooperation with the State of Florida Department of Transportation.

Prepared by

The Balmoral Group
Web - www.balmoralgroup.us

Head Office
165 Lincoln Avenue
Winter Park
Florida, 32789, USA
Phone 1 407 629 2185

Prepared for

Florida Department of Transportation

Tallahassee Office
113 S Monroe Street
Tallahassee
Florida, 32301, USA
Phone 1 850 201 7165

Sydney Office
Suite 1, Level 2
210 George St
Sydney, 2000, Australia
Phone +61 2 9247 9670

Report Authors – Valerie Seidel, Alicia Barker, David Osorio, Elizabeth Mandell

Contact
Valerie Seidel
President
407 629 2185
vseidel@balmoralgroup.us

Suggested citation:

The Balmoral Group, 2022. Strategic Resource Evaluation Study: Highway Construction Materials, First Quarterly Report. The Balmoral Group, Winter Park, FL.

TABLE OF CONTENTS

List of Figures

List of Tables

INTRODUCTION

The Florida Department of Transportation commissioned The Balmoral Group (TBG) to evaluate the availability and costs of critical highway construction materials in Florida. The evaluation includes an analysis of existing and planned supply of these materials, and an estimate of future costs and quantity requirements FDOT will face in fulfilling its five-year work program. Materials in the analysis include bituminous, cement, steel, aggregate and earthwork markets. An annual assessment of the materials markets and significant trends affecting FDOT's supply availability and costs is included in this report. The report is organized as follows:

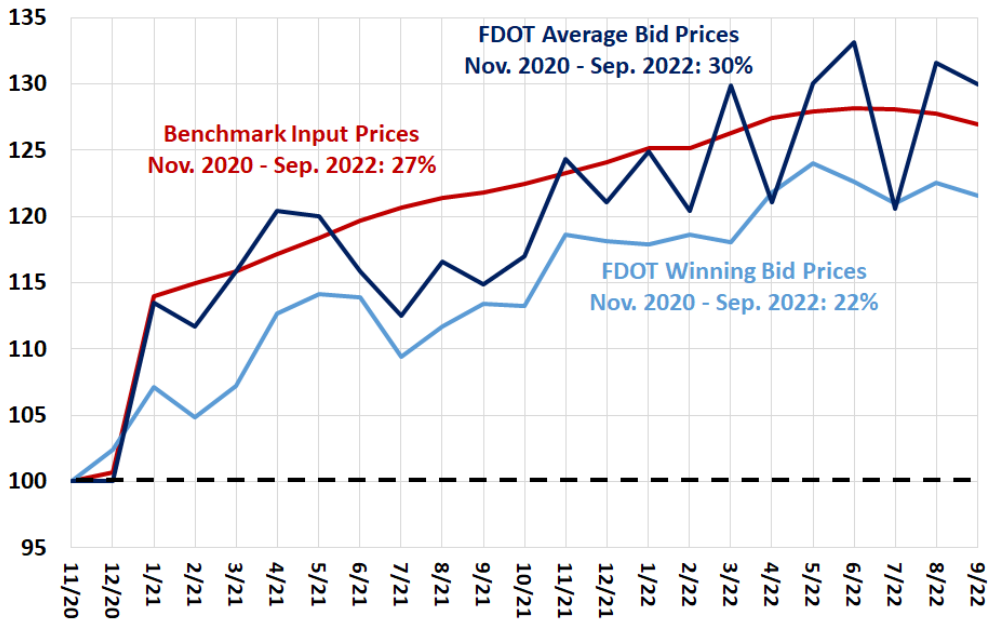
- **General Economic Landscape** for highway construction materials,
- **Work Program Work Mix** allocation and materials quantities estimates,
- **Material-specific findings** for supply chain variables, including
  - raw material sources,
  - existing and likely future transport and distribution methods,
  - potential impact of external forces including global markets, technological change, foreign materials, and environmental regulatory or permitting issues, as relevant,
  - forecasts of likely Florida supply and FDOT costs for the five-year work plan.

GENERAL OUTLOOK ➤ HIGHWAY CONSTRUCTION MATERIALS

Input Costs vs. Bid Prices

Regional industry prices declined slightly in September 2022, but are still 27% higher compared to November 2020 (**Figure 2**). For awarded (winning) FDOT bids, prices across major materials are 22% higher compared to the benchmark period. For all FDOT bids (meaning the average of all bids received), price increases have once again exceeded benchmark input costs at 30%. In AGC's[1] August Workforce Survey, 69% of construction firms in Florida have passed along some or all of the additional costs. Monthly cost composition by material is provided in **Appendix A**, along with an update on the Bureau od Labor Statistics (BLS) Producer Price Index (PPI).

Figure 2. Florida Benchmark Input Costs vs FDOT Bid Prices



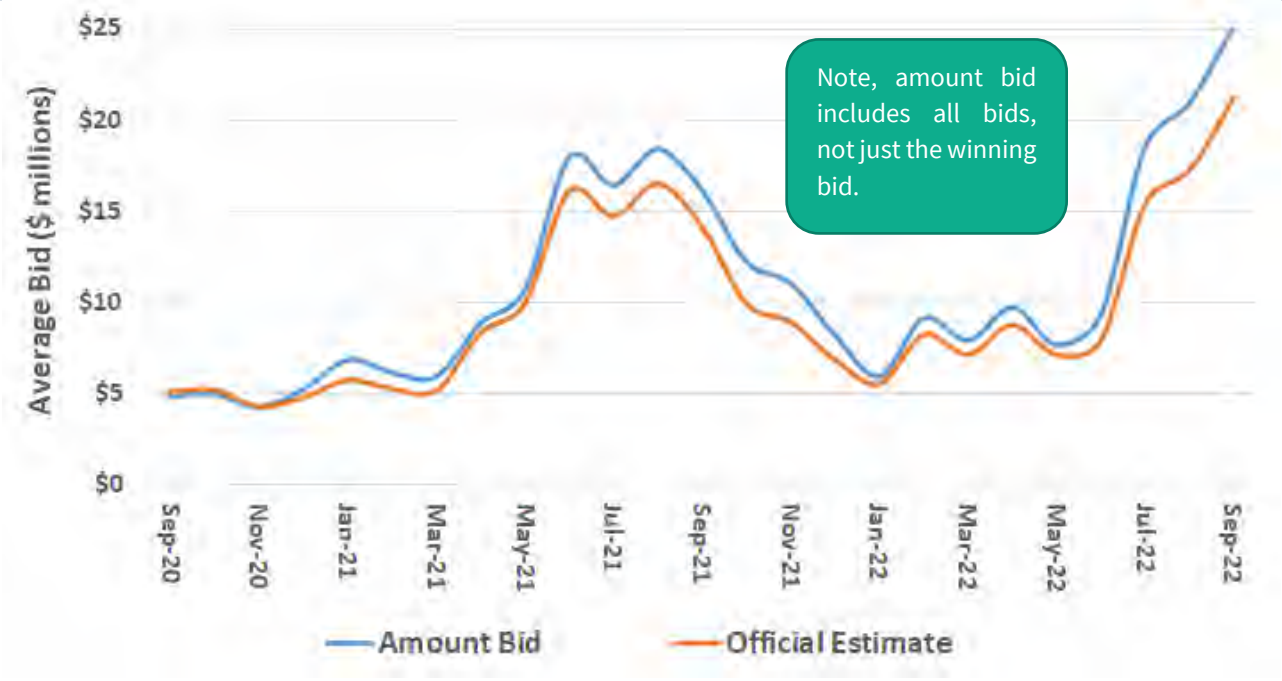
Source: TBG calculated from data provided by FDOT Office of the Work Program and Budget.

[1] Associated General Contractors of America

Bid Data

In economic terms, the expected value is the average. In this analysis, the average of all bids, or the mean, is compared to the official estimate. In the third quarter of 2022, the average deviation of bids from the estimate was 20% (a higher spread from previous quarters that were around 11% higher), as shown in **Figure 3**. However, excluding contracts exceeding an official estimate of $100 million from the analysis shows that for the third quarter the rolling average of all bids were 8% higher than the official estimate, which is similar to the first two quarters of 2022.

Figure 3. Average Bid vs. Official Estimate, 3-month Rolling Average

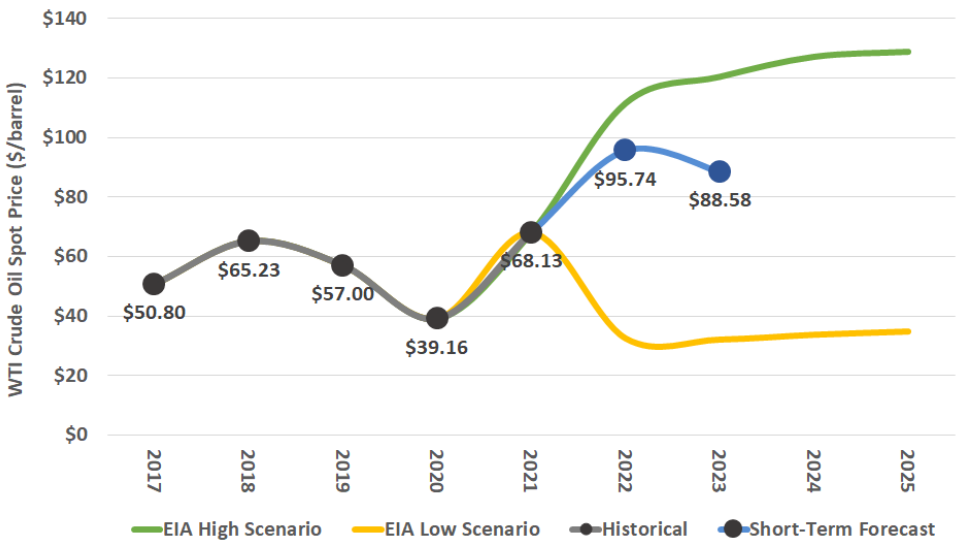


Source: FDOT; TBG Work Product.

Energy Prices

The U.S. Energy Information Administration (EIA) October Short-term Outlook projects U.S. crude oil prices to average $96 in 2022 and fall to $89 in 2023. Under EIA's long-term projections, prices would be above $120 per barrel by 2025 in the high scenario or about $40 per barrel in the low scenario. Crude oil spot prices are currently following the high scenario trend (**Figure 4**). Prices have declined 23% in October 2022 compared to the peak in June, but are still up 8% year-over-year.

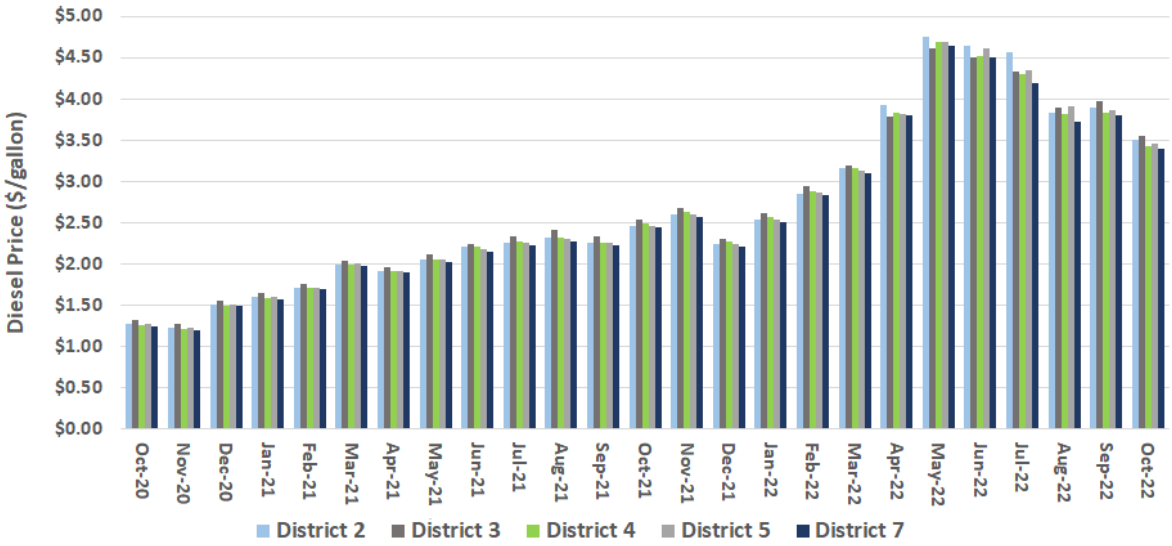
Figure 4. Monthly Crude Oil Price, 2017 to 2025



Source: EIA Annual Energy Outlook and Short-term Forecast.

Although diesel prices remain high compared to 2021, price quotes from suppliers at terminals around the state continued to decline in October 2022, after all districts exceeded $4.50 per gallon in May 2022 (**Figure 5**). Statewide, the Fuel and Bituminous Average Price Index for diesel has increased 73% year-over-year to $3.72. However, prices decreased 10% in October compared to the previous month. Cost reductions for fuel have outpaced asphalt binder price declines. From the peak in May 2022, diesel prices are down 25%, while unmodified binder costs (PG-67 & lower) have only fallen 2% and modified binder costs (PG-76 & higher) are actually up 1%.

Figure 5. Average Diesel Price by District

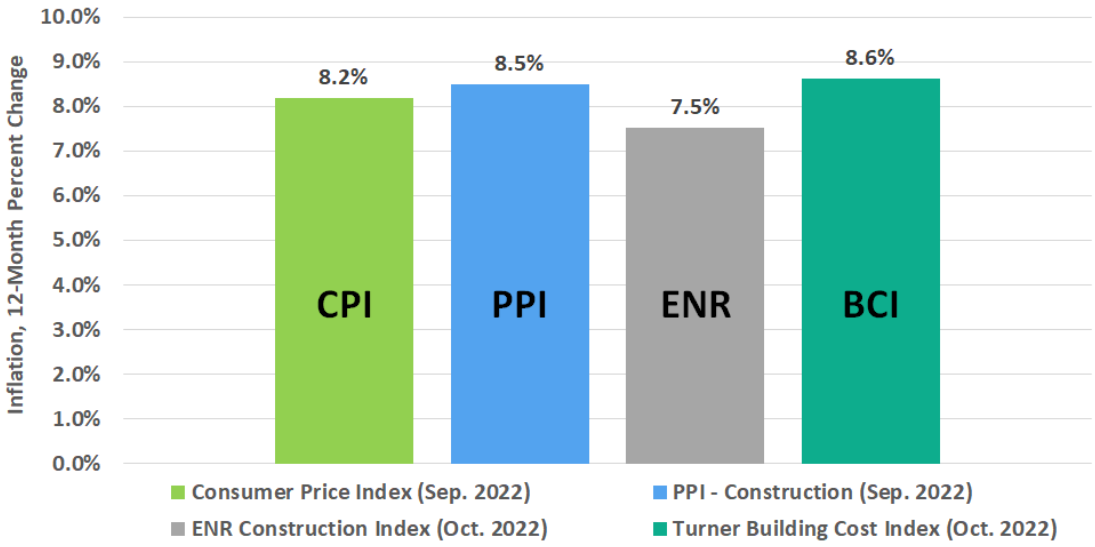


Source: FDOT, TBG Work Product (D1 and D6 terminals did not report data).

Inflation

The Federal Open Market Committee released revised economic projections in September 2022, increasing inflation estimates to 5.4% for calendar year-end 2022, up from an estimate of 4.3% in March. Additional inflation measures by public and private entities are provided in **Figure 6**. Inflation estimates through the last quarter ranged between 7.5% to 8.6%, depending on the source.

Figure 6. Inflation Estimates, 2022



Source: BLS, U.S. Census, ENR, Turner Construction.

Funding and Regulation

Below are recent developments that can affect the transportation construction industry:

CONGRESS PASSES SHORT-TERM SPENDING BILL

On September 30th, 2022, Congress passed a bill that extends the current funding of federal agencies until mid-December. Congress must now agree on long-term appropriations for fiscal year 2023 to avoid another extension

EMERGENCY RELIEF FUNDS

On October 21st, 2022, the Federal Highway Administration announced a quick release of $50 million in emergency funds for FDOT to use for repair work caused by Hurricane Ida.

BUY AMERICA WAIVERS

The waiver of Buy America requirements for construction materials is set to expire on November 10. It is unclear whether another waiver will be issued, but industry groups are advocating for it. Cement and aggregate materials are exempt from the requirements.

WATERS OF THE UNITED STATES

On September 12th, 2022, the EPA sent the final rule to the Office of Management and Budget for review. It is unknown when this will be done. In the meantime, the Supreme Court heard arguments in the Sackett v. EPA case, which aims to determine the extent of Federal authority under the Clean Water Act. This can affect what types of water are protected in construction projects.

PERMITTING REFORMS

There are ongoing efforts to introduce legislation to change the permitting process. The Energy Independence and Security Act of 2022 failed to be included in the short-term spending bill, but it could be reintroduced later on. Additionally, the Simplify Timelines and Assure Regulatory Transparency Act was introduced to the Senate in September. It is unclear if it has any change to advance.

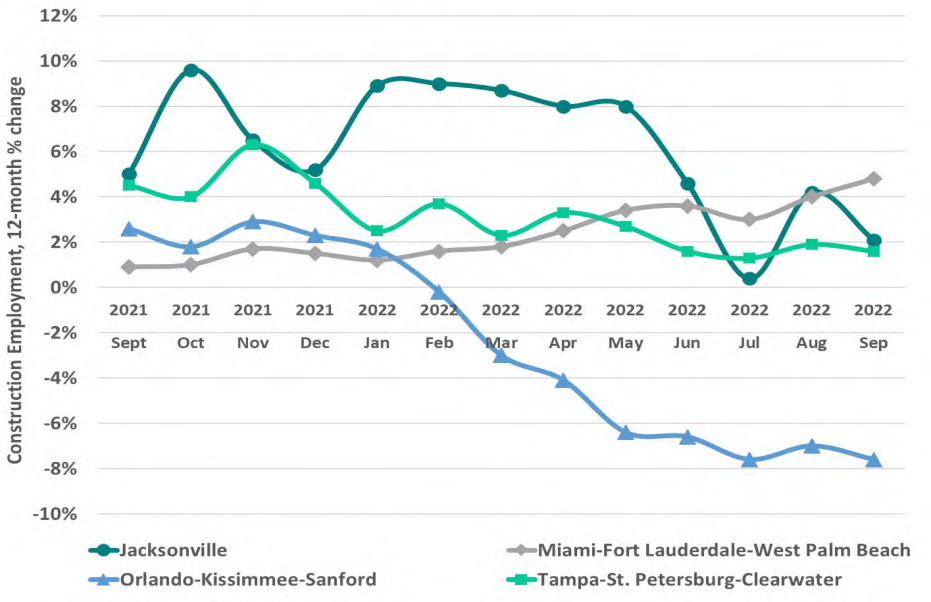
BUY CLEAN INITIATIVE

In September 2022, the Government announced that it will prioritize the purchase of key low carbon construction materials (steel, concrete, asphalt, and flat glass) for federally funded projects. The General Service Administration issued a request for information for manufacturers to collect data on the availability of these types of materials to guide future decisions

Construction Employment

Statewide construction employment increased 4.2% in September, year-over-year (**Figure 7**). However, metro areas had different growth patterns. The Orlando metro area continues the 2022 downward trend, and construction employment was down almost 8% year-over-year in September. Despite high demand, sufficient numbers of workers are simply unavailable. These declines are potentially due to workforce availability e.g., increasingly unaffordable housing, which has driven successive declines in construction employment in Central Florida despite record levels of construction spending. Growth in the Jacksonville metro area continues fluctuating and in September was 2%. The Miami metro area continues with steady growth over the past year and the Tampa metro area remains around the 2% growth rate.

Figure 7. Changes in Construction Employment in Major FL Markets



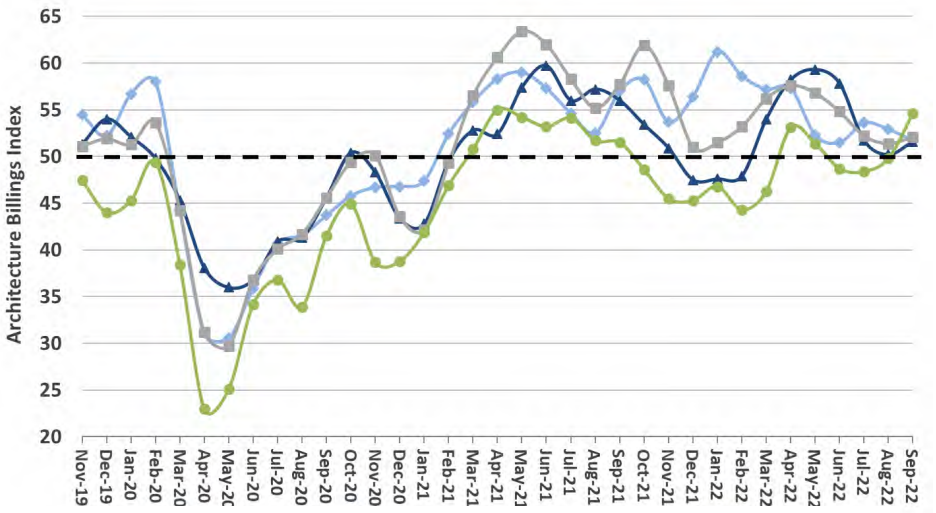
Source: Bureau of Labor Statistics

Additional information on economic conditions and employment forecasts is provided in **Appendix A**.

Production Capacity

The Architecture Billings Index (ABI)[2] is a lagging indicator (between 9 to 12 months) for nonresidential construction activity. Nationally, the ABI score was 51.7 in September, indicating that a majority of architecture firms were still seeing billings growth at their firms. The South region is the only region that saw a decline in billings in September 2022 (**Figure 8**). Continued cost increases and supply chain disruptions may be limiting economic recovery.

Figure 8. ABI Billings Index, Nov. 2019 – Sep. 2022



Source: American Institute of Architects, Architecture Billings Index.

Rail

Nationally, a tentative agreement was struck in September between freight rail carriers and the unions representing tens of thousands of rail workers. Although carriers had begun preparing for potential disruptions, the unions negotiated for a 24 percent pay increase for workers over five years, backdated to 2020, and unpaid time off to attend medical appointments, among other victories. However, two unions have rejected the deal. Members of the third largest union recently rejected the deal and announced that they will hold off any strikes until five days after Congress resumes in November. As of this writing, not all unions have approved the deal as some won't vote until November. The Association of American Railroads estimates that a shutdown would idle more than 7,000 long-distance Class I trains per day, costing the economy $2 billion per day.

In District 1, the Seminole Gulf Railway[3] may be closed for up to six months due to damage sustained during Hurricane Ian. Six bridges were lost in the storm, including three in the Fort Myers area, according to the railway. In addition, Seminole Gulf's yard in Arcadia, where it interchanges with CSX Transportation, is under water, disrupting the 100-mile route between Arcadia and Bonita Springs. **Figure 9** shows a map of the route.

Figure 9. Seminole Gulf Railway Map

Source: Seminole Gulf Railway.

The railroad's traffic usually includes a variety of building materials such as lumber, rebar, and aggregates and carries 2,500 carloads of freight annually. Materials will now have to be rerouted, likely slowing down recovery efforts, and be transloaded to trucks. The disruption to normal operations may impact FDOT producers if the already limited supply of trucks and drivers are diverted for disaster relief. In addition, many materials needed for reconstruction are also used in FDOT projects, likely increasing competition for resources in southern Florida.

[2] ABI Billings are considered a leading indicator, meaning that construction activity 6-12 months from now generally follows the current ABI billings activity. A score below 50 indicates declining firm billings.

[3] Seminole Gulf Railway faces lengthy closure after hurricane - Trains.

ASPHALT

Summary

- While binder prices have eased from highs seen earlier in 2022, they are still elevated compared to pre-pandemic levels at $800 per ton. As binder prices are dependent on crude oil costs, the recent decision by OPEC+ to cut oil production may negatively affect prices and asphalt production costs.
- Year-to-date binder imports have increased significantly in 2022 compared to 2021, which helps to increase availability and lower prices. However, interviews indicate spot shortages for liquid asphalt and tack persist. It should be noted that asphalt binder is exempt from BABA import requirements.
- Demand for polymers from other sectors have started to ease and prices have followed, which should benefit the transportation construction industry.

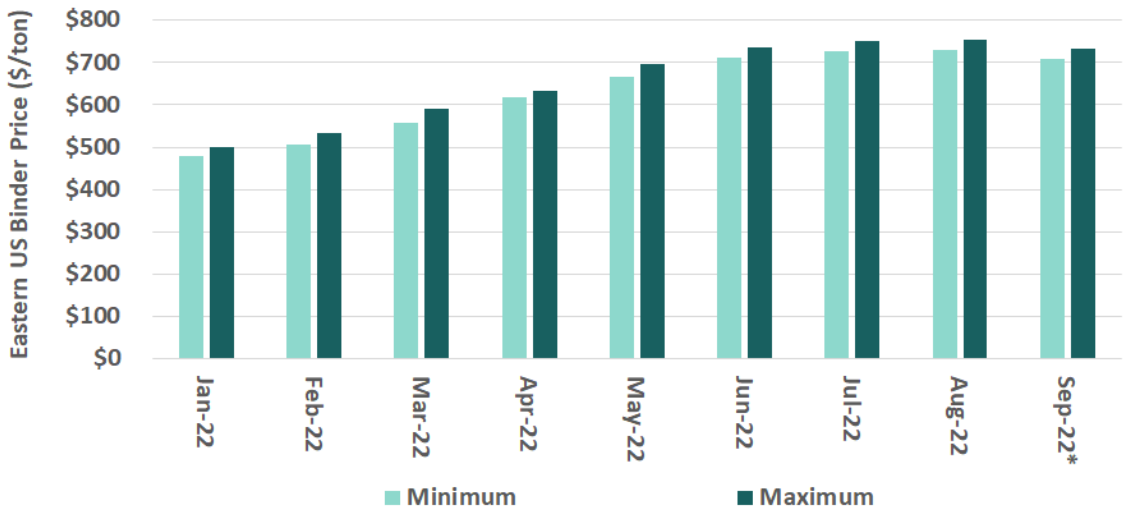
FDOT impacts

- FDOT's resurfacing program is expected to grow dramatically over the next few years. On top of federal infrastructure funding, some producers are not confident the industry can keep up with demand.
- FDOT HMA prices remain at record levels for most of the current fiscal year at $135 per ton. Current forecasts do not show moderation in asphalt costs until 2024. Reduction in costs heavily depends on fuel and labor costs as well as input costs.
- Besides the record high binder market, aggregate supply issues are affecting asphalt producers as well. New sources of FDOT approved materials may be needed to resolve aggregate shortages on the Gulf Coast. Like binder, construction aggregates are exempt from BABA, allowing for increased imports in the future.

General Trends

Asphalt binder prices across the Eastern U.S. have risen by about $200 since the beginning of 2022 (**Figure 10**). Costs exceeded $700 per ton over the summer, following global increases in fuel costs. Recent declines in fuel costs may be short-lived as OPEC recently announced major production changes. Starting in November, OPEC and Non-OPEC participating countries are reducing crude oil production by 2 million barrels per day. A complete list of crude oil reductions by country is available in **Appendix A**.

Figure 10. Eastern U.S. Asphalt Binder Prices, 2022

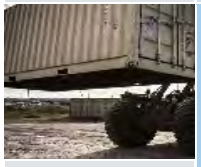
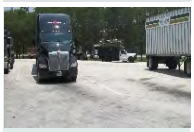


Source: TBG work product, U.S. DOT Federal Highway Administration. *Estimated with partial data.

SUPPLY CHAIN VARIABLES ➤ **ASPHALT PAVEMENT MATERIALS**

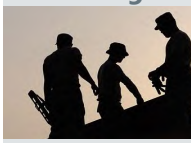
Table 1 provides the current status of selected variables of interest.

Table 1. Supply Chain Summary: Asphalt Materials

 Aggregate	Sources for HMA are dominated by Georgia granite shipments and rock from South Florida's Lake Belt mining area. Several HMA suppliers are vertically integrated to better manage their aggregate supply. The United States Geological Survey (USGS) shows that Florida's crushed stone production for the first half of 2022 rose 13% to 47.8 million metric tons. Nationally, production grew 3%. Securing raw materials in a reliable manner is still an issue.	=
 Refinery Capacity	Refinery utilization in the Gulf Coast continued being above 90% in the last months. Production costs continue to be affected by higher crude oil prices and geopolitical factors. According to the EIA, asphalt production in the Gulf Coast fell 6% in the first half of 2022 and shipments to the east coast fell by 10%. Asphalt production across the east coast also fell 4%. The crude oil market is expected to continue being volatile in the months ahead. While talks with Iran and Venezuela continue, no agreements are expected in the short term.	↑
 Asphalt Binder	Unmodified (PG 67 & lower) asphalt binder prices have slightly eased in September and October, but they have still increased 34% in 2022 and 37% year-over-year. OPEC's recent decision to cut production by 2 million barrels per day (bpd) in November has increased crude oil prices, which will increase production costs and has also increased the premium in asphalt coker yields[4], which incentivize refiners to focus on transportation fuels and use asphalt as feedstock rather than produce it. While competition for material is high, Argus reports that U.S. asphalt inventories at this time of the year are 4% higher than the 5-year average, indicating that availability is not an issue.	↑
 Polymers	With very few suppliers, polymers are a source of vulnerability. Slowdowns in other sectors have decreased demand and prices. U.S. production of resins declined in August compared to the prior month but still up slightly year over year[5]. Additionally, the Chemical Regional Production Index shows that production has been slowing down in all regions since May, with exception of the Gulf Coast. However, these declines have not been across all segments, as production of coatings, adhesives, and other specialty chemicals have increased. Increased availability should help prices as seen in quarterly earnings reports.	↑
 Imports	While freight costs have limited imports for producers, reports indicated that higher U.S. costs and lower shipping rates have decreased due to lower demand from other sectors, have created opportunities to import product from the Mediterranean. Data from the U.S. International Trade Commission shows that imports in 2022 have been significantly higher than in 2021, but still far from pre-2020 imports. Miami has been the main destination and the countries of origin include Canada, Colombia, Turkey and Venezuela.	↓
 Rail	As mentioned in the rail section, the possibility of a strike increased with the third largest union rejecting the deal as well as disruptions in competing industries due to the closure of Seminole Gulf Railway. During the first half of 2022, CSX tons of asphalt products declined by 8% year-over-year, but revenues rose 4%; indicating an increase in pricing. In the third quarter results, CSX reported a 71% increase in locomotive fuel costs and headcount rose to 6,819 active train & engine workers and 730 in training. Commodity specific stats are not available yet. Additionally, CSX's average weekly terminal dwell time in Jacksonville and Waycross, GA continued declining in recent weeks. In Jacksonville, times have been around 20 hours and in Waycross it has been 25.8 hours.	↑
 Trucking	Asphalt suppliers continue facing issues with driver availability and transportation costs, but interviews indicated that these have improved. Governor DeSantis recently announced $20 million for CDL training programs. $8 million for five state colleges to increase capacity by 1,200 students per year and $12 million to start or expand apprenticeship programs.	↑

[4] Argus' coker yields reflect the value of a short ton of asphalt after it has been processed in a delayed coking unit

[5] ACC = American Chemistry Council

 **Pavement Markings**	As mentioned in the polymers section, overall demand for plastics have eased, something that should benefit the industry as prices decrease. However, 80% of U.S. highway and transportation firms in an August AGC survey indicated longer lead times to obtain paints, coatings, highway striping materials. Overall, pavement markings and other plastics-based/petroleum-based ancillary products remain vulnerable to current supply chain issues, production adjustments and crude oil markets.	↑
 **Labor**	Skilled labor is an ongoing concern for asphalt plant operators and additional workers will be needed as increased funding for transportation and infrastructure projects boosts demand over the next few years. Statewide construction employment has increased year-over-year, but not all metro areas are experiencing the same conditions as mentioned in the construction employment section. In AGC's August workforce survey, almost all construction firms indicated having difficulties filling positions and 84% indicated the main reason is candidates were not qualified to work.	↑
 **Competition**	No new plants have been recently added to FDOT's approved producer list and FDEP's air permitted facilities show one asphalt plant under construction (in Alachua County). Additional plants would increase competition for FDOT projects. While competition from other sectors has slowed down, it is full-force in nonresidential, creating competing demand for resources. Producers continue passing off increased costs.	=

↑	Exerting negative influence on FDOT's costs; monitor.
=	Currently stable; not influencing FDOT's costs
↓	Exerting positive influence on FDOT's costs.

Polymers

Petrochemicals production, including products used to make plastics, rubbers, resins, synthetic fibers, and petroleum-derived paints and coatings, is still down compared to previous periods. Although several new facilities are expected to come online over the five-year work program, the few suppliers that currently exist hold tremendous pricing power and material availability. **Table 2** shows reference prices and volumes from the Q2 2022 earnings report of a publicly traded company. On a year-to-date basis, production is still down compared to 2021 and prices are unstable. The average cost per ton of ethylene production in Q2 2022 rose another 26% from the end of Q1 to $617 per ton, which correlates to a massive 97% increase year-to-date. Ethylene is part of the process to make different types of polymers, so higher ethylene costs will lead to higher polymer prices.

Table 2. Petrochemicals Production and Prices, Q2 2022

Type	Q4 2021	Q1 2021	Q1 2022	Q2 2022	Quarterly Change	Year to Date Change
Ethylene produced (ktons)	1,345	1,133	1,100	1,219	11%	-5%
Propylene produced (ktons)	327	300	258	303	17%	-16%
Polyethylene sold (ktons)	818	756	798	795	0%	6%
Polypropylene sold (ktons)	226	213	218	216	-1%	-5%
U.S. weighted average cost of ethylene production (USD per metric ton)	$459	$286	$491	$617	26%	97%
U.S. ethylene (USD per metric ton)	$895	$902	$942	$904	-4%	4%
U.S. polyethylene [high density] (USD per metric ton)	$1,830	$1,521	$1,617	1,720	6%	-4%
U.S. propylene (USD per metric ton)	$1,448	$1,609	$1,396	1,345	-4%	-11%
U.S. polypropylene (USD per metric ton)	$2,491	$2,315	$2,234	2,205	-1%	-8%

Source: Lyondellbasell Q2 Earnings Report.

Asphalt Binder

Crude oil supply disruptions led to higher prices around the world this summer, affecting asphalt binder costs for many FDOT producers. Across the pond, instability in Europe's energy markets have been acerbated by the Russian invasion of Ukraine and are expected to come to a head this winter. After increasing crude oil production in July and August, OPEC+ members have now agreed to cut production by 2 million bpd starting in November. Recent declines may be impacted by this decision and prices will likely begin to creep up again in late 2022 through early 2023.

The deviation between asphalt binder and crude continues to widen, with binder prices remaining high despite recent declines in oil and fuel prices. Statewide, rack binder prices[6] have declined but still exceeded $800 per ton in October 2022 in most major metropolitan areas. Binder costs in Jacksonville are up 39% compared to the same month last year, while prices in Miami are up 38%. Prices in Tampa and Panama City have increased by 35% and 33%, respectively, year-over-year.

In order to forecast future pricing, TBG researched asphalt binder prices from various locations in the Southeast United States[7]. Using price ratios, further analysis was performed to estimate average quarterly PG 76-22 Binder prices until the end of 2022 for Jacksonville, Miami, Tampa, and Panama City over the last few years (**Table 3**). Temporal averages were found using estimated prices from all four locations to yield estimates.

[6] Argus' asphalt rack prices reflect trades of different grades of asphalt within a defined region, which include where the seller commits to deliver to the buyer's truck, typically at a truck-loading rack.

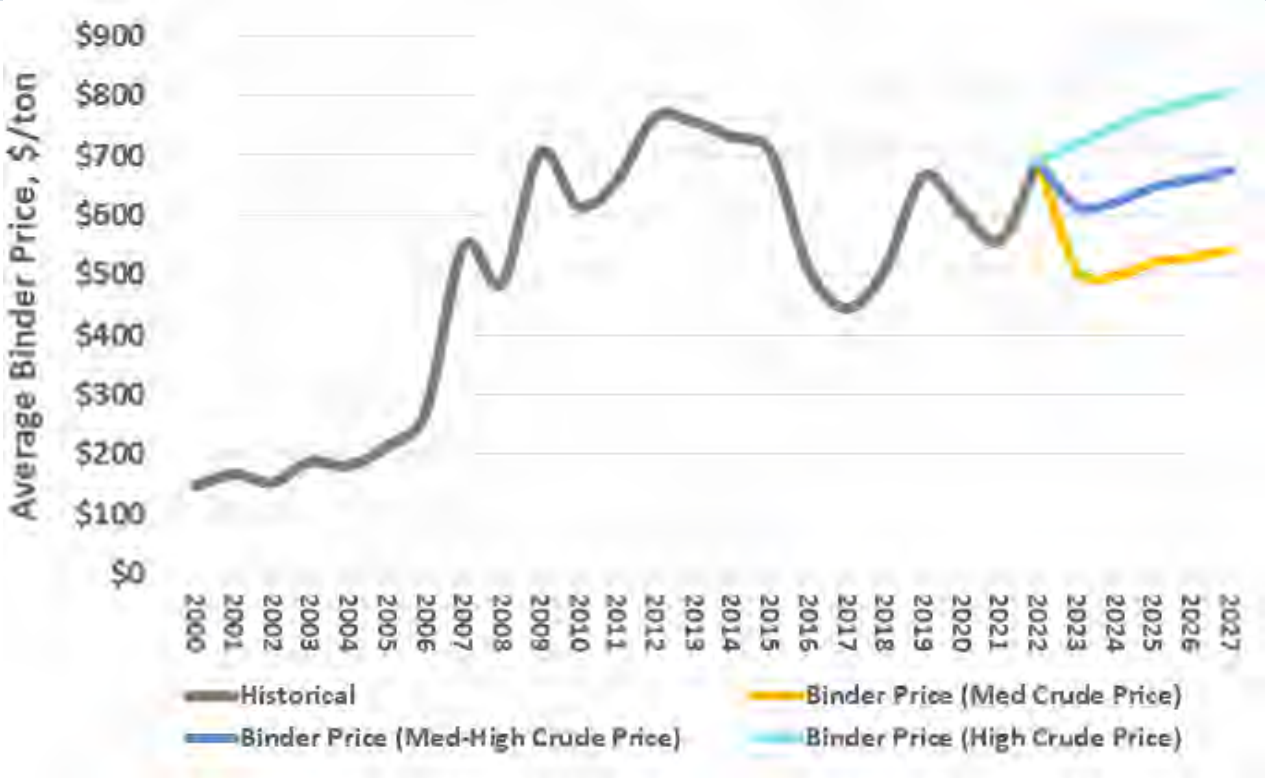
[7] Argus' asphalt rack prices reflect trades of different grades of asphalt within a defined region, which include where the seller commits to deliver to the buyer's truck, typically at a truck-loading rack.

Table 3. Average Binder Prices, $/ton			
Quarter		**Historical**	
Q1 2020		$561.25	
Q2 2020		$511.37	
Q3 2020		$488.65	
Q4 2020		$491.93	
Q1 2021		$532.16	
Q2 2021		$583.22	
Q3 2021		$603.34	
Q4 2021		$607.45	
Q1 2022		$655.40	
Q2 2022		$804.64	
Q3 2022		$851.75	
	Lower Bound Forecast	**Midpoint Forecast**	**Upper Bound Forecast**
Q4 2022	$880.71	$929.10	$977.49
Q1 2023	$955.58	$1,040.19	$1,124.79

Source: TBG calculated from Argus Binder Price Reports.

Using a variety of models for fit, average historical FDOT binder prices were forecasted to 2027 under medium to high crude oil price scenarios. A low crude price scenario is not considered likely at this time. Statewide binder price outlooks are shown in **Figure 11**.

Figure 11. FDOT Average Binder Cost



Source: TBG calculated from FDOT Fuel & Bits Index.

Asphalt Forecast

Asphalt prices are projected in **Table 4** for the five-year construction work program. Regression modeling was performed using pay item data, supply chain variables, and other macroeconomic indicators to identify models that best predicted FDOT's materials costs and quantities.

Asphalt costs estimates during the last fiscal year increased 7% according to year-end data. Compared to 2021, asphalt prices were 20.6% higher in 2022. With updated binder prices, housing starts, and employment data the forecast is relatively flat for the next two fiscal years. The best estimate shows HMA weighted average prices maintaining current record highs in fiscal year 2023, followed by an increase of 2% to 6% in subsequent periods. The estimates are based on continued high levels of infrastructure funding, supply chain disruptions, and input costs.

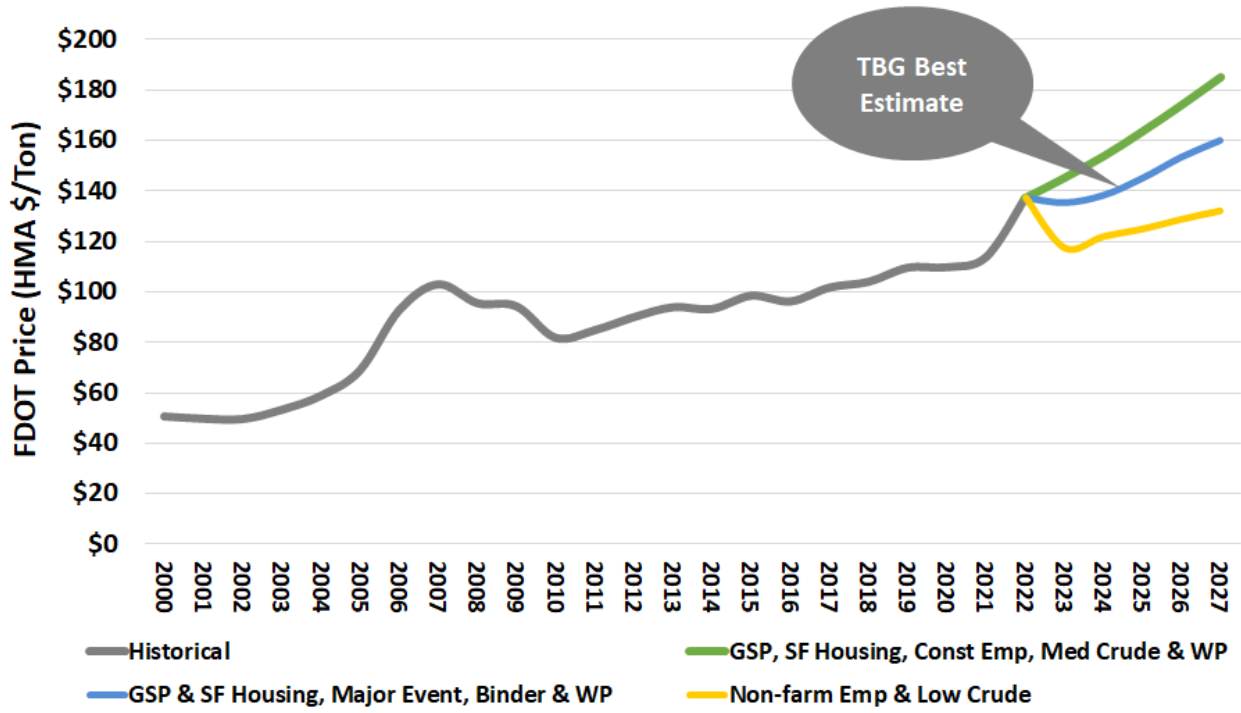
The lower bound scenario reflects recessionary conditions. According to a recent National Association of Business Economics (NABE) survey, 11% of economists[8] indicate that the U.S. is already in a recession, while 53% of respondents think the U.S. may enter a recession within the next 12 months. The upper bound estimate relies on crude, rather than binder prices, reset with updated projections for construction employment and ends at $160 per ton, a slight increase from the previous forecast. **Figure 12** shows the potential range of estimates over the five-year work program.

Table 4. HMA Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price HMA, $/Tons	$137.27	$135.31	$138.26	$145.03	$153.47	$160.12
Percent Change, %	20.6%	-1.4%	2.2%	4.9%	5.8%	4.3%

Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 12. HMA Price, 2022 Forecast

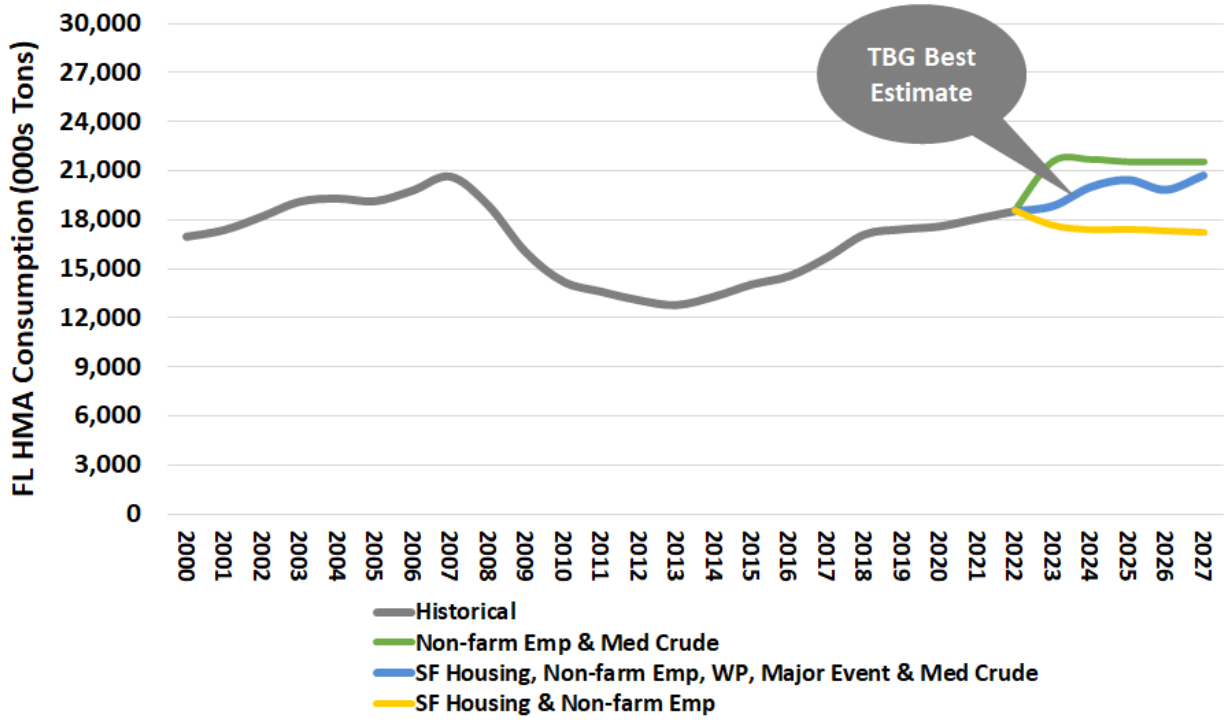


Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

[8] NABE October 2022 Quarterly Survey

Figure 13 provides a forecast of Florida HMA consumption. The best estimate is based on current economic outlooks, which show stable employment, medium crude oil price projections, and declining housing starts. The dip in residential construction is expected to be more than offset by increases in state and federal infrastructure funding over the coming years. In addition, resiliency projects are likely to increasingly compete with highway construction for materials and labor. Recessionary conditions could shift the trajectory downward, however, following the lower bound.

Figure 13. Florida HMA Consumption, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

CONCRETE

Summary

- Residential consumption is expected to continue declining as the market cools and the Federal Reserve increases interest rates.
- Cement consumption is expected to pick up over the next few years due to an increase in concrete-heavy resiliency projects across the state. Increased demand will likely improve supply, but also raise costs.
- Transportation issues, including fuel costs, trucking shortages, and rail reliability, persisted over the last quarter and are not expected to improve before the end of 2022.

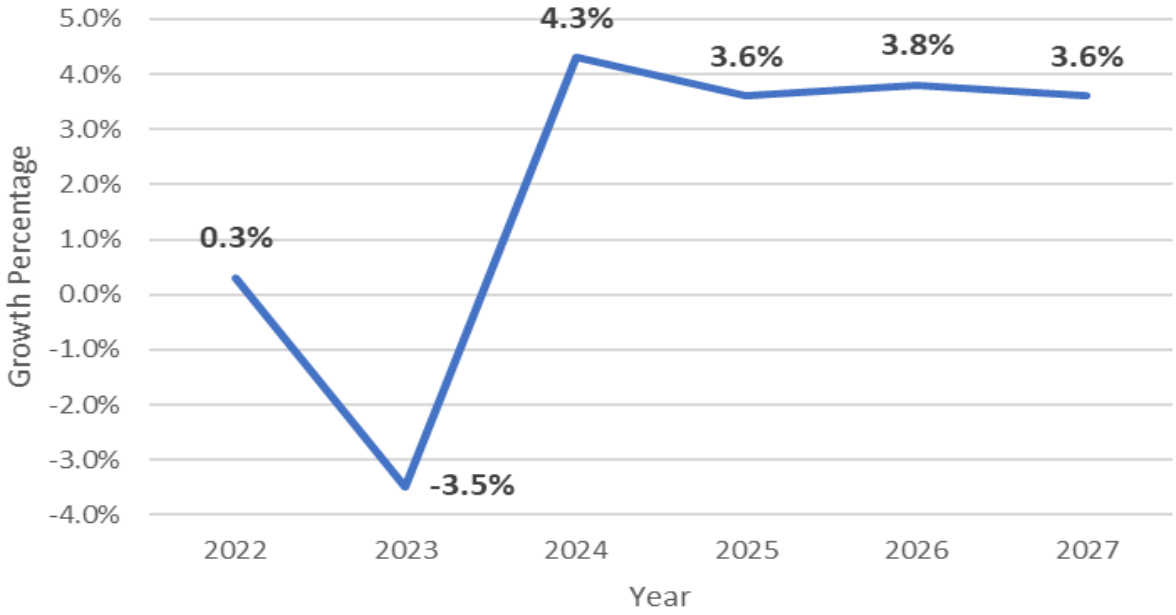
FDOT Impacts

- FDOT's weighted average price for structural concrete pay items is forecast to increase by 8.6% in 2023 based on current economic conditions.
- Disruptions in aggregate supply due to domestic labor shortages and a decline in imports particularly in 57 and 67 stone are resulting in longer lead times for some districts, which may impact project schedules and cost.
- Fly ash supply continues to be an issue for concrete producers, who are using slag or additional cement to make up the difference. FDOT is working on bringing alternative markets online, including ground glass and calcined clay.

General Trends

According to the Portland Cement Association (PCA), U.S. cement consumption is expected to decline in 2023 by -3.5% with growth rebounding in 2024 back to 4.3% (**Figure 14**). The decline in 2023 is due to continuing inflation, high interest rates and a projected increase in the unemployment rate. Residential and nonresidential construction are both expected to decline in 2023, but will recover alongside the release of infrastructure funding from the national infrastructure bill and the projected decline in interest rates.

Figure 14. Portland Cement Association's Fall 2022 Forecast

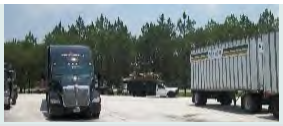


Source: forconstructionpros.com, cementproducts.com, Portland Cement Association.

SUPPLY CHAIN VARIABLES ➤ **CONCRETE MATERIALS**

Table 5 provides an overview of supply chain variables and a summary of their current status; items with current issues are further detailed in the subsequent text.

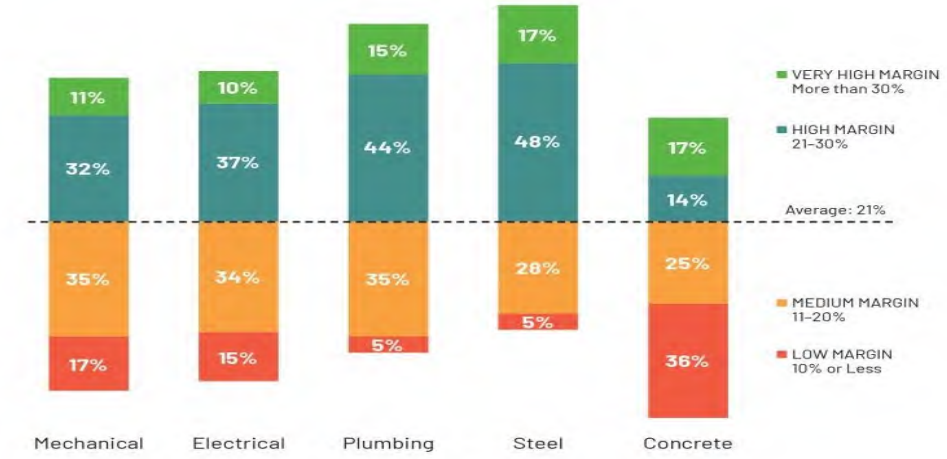
Table 5. Structural Concrete Supply Chain Variables & Current Status

 Cement	Cement prices have increased and availability is an issue as previously reported. In their Q2 earnings, Cemex showed a slight decline in cement volumes in the U.S. due to product shortages and supply chain disruptions. While in Q3 volumes grew 2%, they indicated that "Supply/demand dynamics remain quite tight in our markets with many of our customers still on allocation". Prices increased 19% year-over-year. These results are indicative of industry conditions. Interviews indicated that cement is still the preferred option to replace fly ash, but the costs are still much higher.	↑
 Aggregate	Aggregate availability and transportation continue being an issue. General issues relating to the impact of Vulcan's operations in Mexico are covered in the Aggregate section.	↑
 Fly Ash	Fly ash supplies are constrained and will continue to be as some coal units are expected to be shut down or converted in 2023. In nearby States, Georgia Power recently announced that starting in 2024, 600,000 tons of fly ash per year will be excavated from the ponds at Plant Bowen to be used in construction projects. Alabama Power was sued by an environmental group due to their storage at Plant Barry in Mobile County being too close to Mobile River and not recycling enough fly ash. Additionally, reports indicate that the EPA is increasing enforcement of coal combustion residuals rule to protect groundwater. The agency is reportedly investigating the closure plans of 160 sites, one of which is in Florida (at the decommissioned Smith Plant in Bay County). In regards to alternatives, interviews indicated that metakaolin is not widely used so availability wouldn't be an issue, but fly ash is cheaper. Supply of Silica Fume is tighter as it has multiple uses in different industries and is also more expensive than fly ash.	↑
 Rail	During the first half of 2022, CSX tons and revenues of cement products declined 2% year-over-year, but revenues rose 2%. In the third quarter results, CSX reported a 71% increase in locomotive fuel costs and headcount rose to 6,819 active train & engine workers and 730 in training. Commodity specific stats are not available yet. Additionally, CSX's average weekly terminal dwell time in Jacksonville and Waycross, GA continued declining in recent weeks. Bottlenecks are still expected as mentioned throughout the report.	↑
 Truck	As with other industries, trucking availability is an issue for producers. While fuel costs have decreased, these might be short-lived as crude prices increase. Heavy and tractor-trailer truck driver employment has continued its upward trajectory through 2022, exceeding 40,000 drivers since July and there is an additional $20 million of funding for CDL training programs. Any disruptions with rail would put additional pressure on trucking and driver shortages would be exacerbated.	↑
 Labor	Although producers are offering higher wages, skilled labor availability in Florida continues being an issue. In AGC's August workforce survey, almost all construction firms indicated issues to fill positions and 84% indicated the main reason is candidates were not qualified to work. Statewide, construction employment has increased, but growth is uneven across the State.	↑
 Competition	Smaller suppliers are increasingly reporting that they are having difficulty in securing materials. Larger firms with longer relationships who are able to order product in larger quantities appear to be taking precedence. This situation could lead to less competition in the long run.	↑

↑	Exerting negative influence on FDOT's costs; monitor.
=	Currently stable; not influencing FDOT's costs
↓	Exerting positive influence on FDOT's costs.

As mentioned in the supply chain table, prices for cement have increased and availability is tight. According Dodge Data & Analytics, concrete contractor profit margins are worse compared to other specialty contractors (**Figure 15)**. The main reasons were costs associated with shortages and rework. Additionally, one-third of construction workers are expected to retire within the next five years.

Figure 15. Contractor Profit Margins



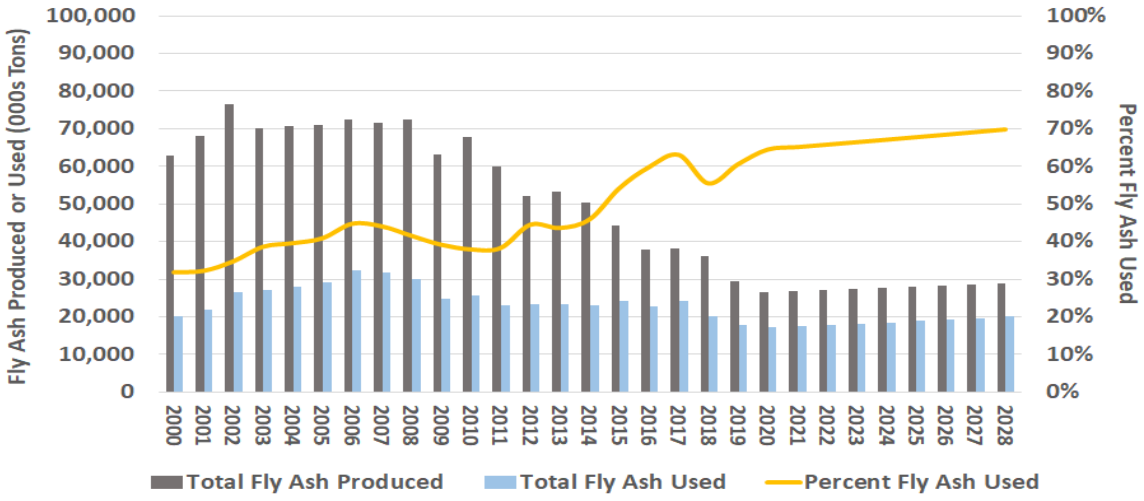
Source: Dodge Data & Analytics

Fly Ash

U.S. fly ash availability is expected to decline as coal-powered plants close, convert their power generating units to natural gas, or adopt solar technology. By 2028, the percent of fly ash used as a share of fly ash produced is expected to reach 70% (**Figure 16**). However, the change is not due to increased use, but production declines in most states. In Florida, Tampa Electric Company is expected to convert their remaining coal-fired unit to natural gas by the end of 2023. Seminole Electric Co-operative plans to shutter one of their coal-fired units in 2023 as well, further limiting local availability.

Georgia Power is undertaking the largest coal ash beneficial use project in U.S. history at Plant Bowen near Cartersville. Infrastructure installation has started and coal ash removal is expected to begin by 2024. Approximately 600 thousand tons of ash will be removed from the ash pond and landfill at Plant Bowen annually. The total amount of useable coal ash is estimated at nine million tons. The excavated coal ash will be used in concrete to construct bridges, roads, and buildings across the state.

Figure 16. U.S. Fly Ash Production and Use, Historical and Forecast



Source: TBG work product, American Coal Ash Association, industry forecasts.

Concrete Forecast

Regression modeling was performed using pay item data, supply chain variables, and other macroeconomic indicators to identify models that best predicted FDOT's materials costs and quantities. **Table 6** provides the updated forecast average price for concrete. Previous forecasts expected fiscal year weighted average prices to end up around $900 in 2023, and there is little change in the current model. The updated forecast continues to show a small dip in 2024, followed by increases of about 5.5% annually through 2027.

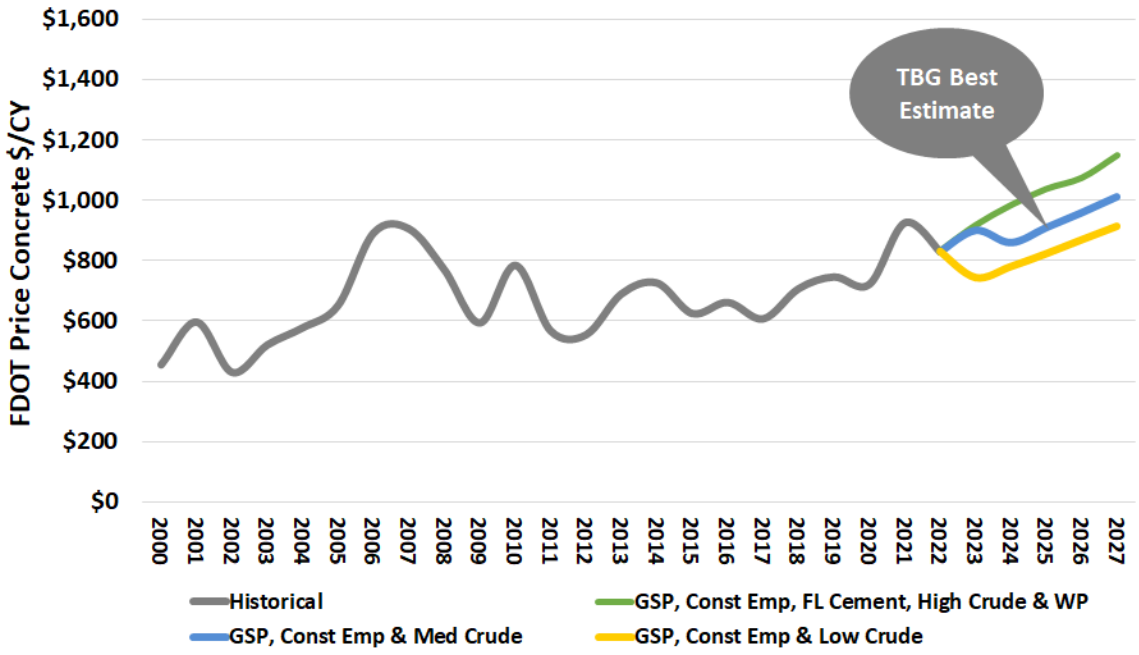
The lower bound scenario reflects recessionary conditions, which a majority of U.S. economists expect to occur within the next 12 months. The upper bound reflects worsening input cost scenarios and supply chain disruption, ending up over $1,150 per cubic yard by 2027 (**Figure 17**). **Figure 18** shows the output of several quantity models forecasting statewide consumption of concrete and the scenario identified as the best estimate.

Table 6. Concrete Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price Concrete, $/CY	$829.82	$901.27	$860.62	$910.15	$959.41	$1,012.08
Percent Change, %	-10.4%	8.6%	-4.5%	5.8%	5.4%	5.5%

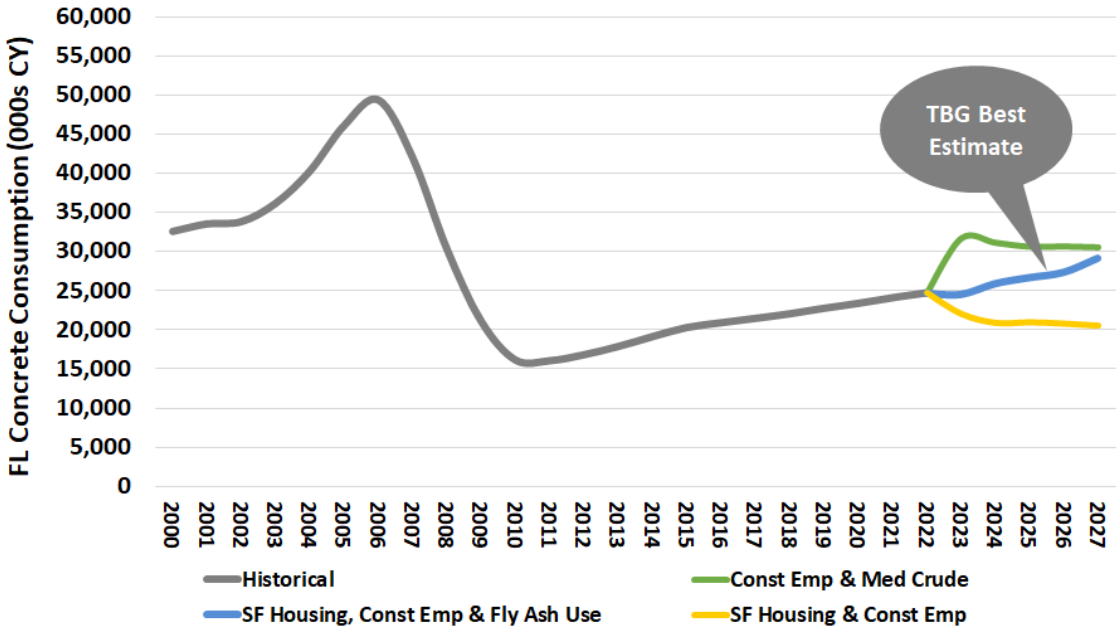
Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 17. Concrete Price, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 18. Florida Concrete Consumption, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

STEEL

Summary

- Prices for different steel products have declined significantly in recent months, but plate steel and rebar prices remain high compared to pre-pandemic levels. Ongoing geopolitical disruptions are affecting global markets for steel, iron, zinc, and aluminum, among other materials, as well.
- National steel production and utilization rates have declined in October 2022, but this is likely to turn around due to increased state and federal funding for infrastructure projects over the next few years.
- Lead times continue being longer than usual but more on a spot basis for most products. However, for shapes like light poles, lead times are reportedly between 16-18 weeks. For signal pole and mast arm orders, deliveries may take 25-30 weeks.

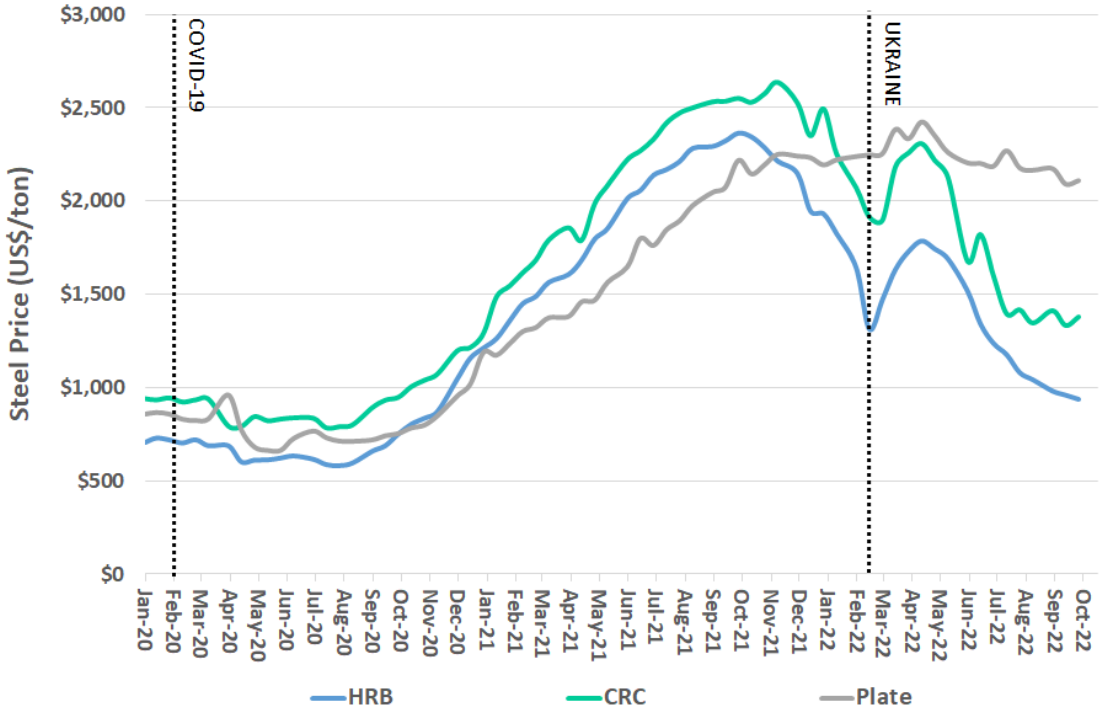
FDOT Impacts

- Fabricators report that costs have come down for some products, including hot-rolled band, cold-rolled coil, and scrap steel. However, bid prices are not necessarily going to follow as steel makers attempt to recoup losses experienced over the past few years.
- With the expiration of the BABA waivers in November, fabricators estimate cost increases of 5% on average, but ranging up to 15%. Current FDOT price forecasts show an overall increase of 3.5% in FY 2023.
- Steel makers are concerned about keeping up with demand over the five-year work program. Fabricators have a positive view on steel cost index adjustments, which could help keep bids in check.

General Trends

Steel prices continue to decline in fiscal year 2023, although the extent depends on the product (**Figure 19**). U.S. hot-rolled band prices are now only 10% higher than benchmark prices in October 2022, while cold-rolled coil is still 31% above November 2020 prices. Current steel plate prices remain high in October 2022, with costs about 155% over November 2020 levels.

Figure 19. U.S. Steel Pricing, 2020 – 2022



Source: Steel Benchmarker.

SUPPLY CHAIN VARIABLES ➤ **STEEL**

Table 7 shows a summary of select variables that impact the steel supply chain and their current status.

Table 7. Supply Chain Variables for Structural Steel

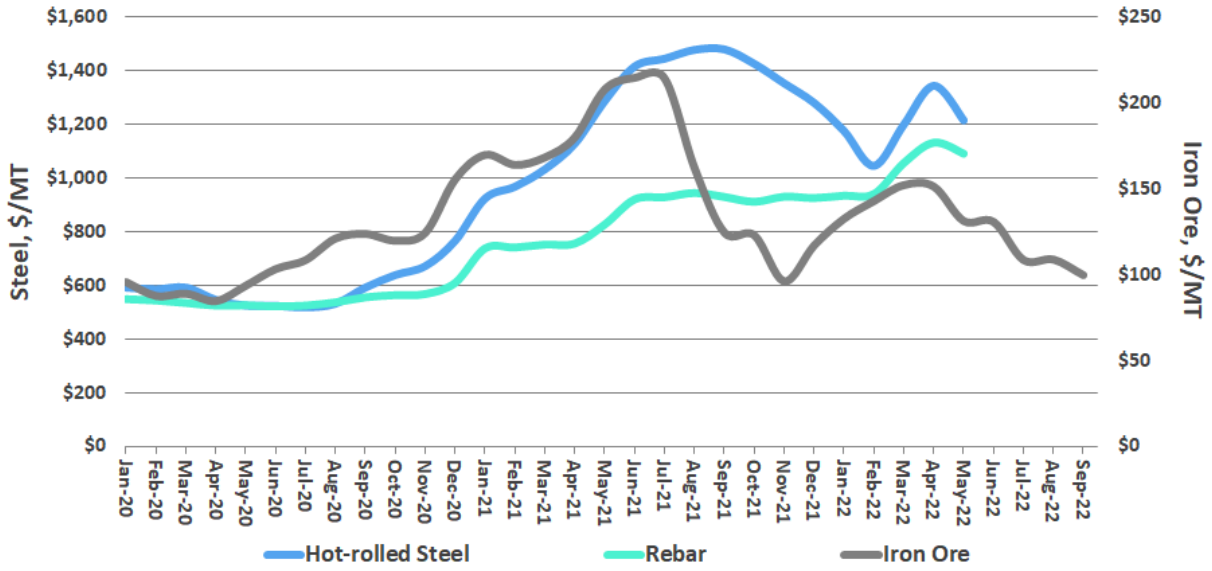
 Raw Materials	Prices for hot-rolled steel and iron have had significant declines in 2022. But while iron has returned to be around 2019 levels, hot-rolled products are still much higher than previous years. Rebar prices haven't had the same declines and they remain steady. There are signs that demand for steel is weakening as U.S. Steel recently decided to temporarily idle two blast furnaces (in Pennsylvania and Indiana) due to market conditions. Argus indicates that if both were shut down for the entire quarter, it would reduce U.S. production by 731,000 short tons.	↑
 Scrap Steel	Scrap steel prices have continued declining in 2022 and while they are still high, they no longer at the highest point they've been since the 2008 peak. Scrap prices have followed steel prices, which have cooled off from the significant increases seen in 2021.	↑
 Galvanizing Steel	Global zinc prices fell 16% in the first quarter of fiscal year 2023 compared to the previous quarter and rose 5% year-over-year. Prices are still high compared to pre-pandemic levels and inflated prices for galvanized products like bolts and hardware are expected to persist through the first six months of fiscal year 2023. Some fabricators are still reporting long lead times for zinc and galvanizing steel.	↑
 China	China's domestic demand for steel has continued slowing down from housing and manufacturing sectors and COVID lockdowns. These conditions are expected to continue through the end of the year. Chinese steel prices continued declining to $556 per ton in October.	↑
 Transportation	Driver shortages persist and recent increases in crude oil prices could also increase fuel costs in the near-term. Issues with trucking are expected to continue. Additionally, any rail disruptions would put additional pressure on trucking and driver shortages would be exacerbated.	↑
 Rail	Producers have previously indicated that they do not use rail and they prefer trucking for transportation. As mentioned elsewhere in the report, other sectors have experienced issues with rail deliveries and it is not definitive that there won't be a railroad strike.	=
 Milling Capacity	Nationally, capacity utilization rates have slightly declined in recent weeks. Year-to-date utilization is at 79.4% (down from previously reported 81.6%). Production in 2022 has also decreased, with year-to-date production at 69.7 million net tons, down 4.4% from 2021.	=
 Labor	Unfilled job openings remain an issue for suppliers, which have led to production and revenues lost. Labor costs have increased in an attempt to attract workers. No changes during this quarter.	↑
 Competition	Competition is not in a place to bring down FDOT's costs and is exacerbated by heavy demand from non-civil sectors for steel products as global markets affect U.S. prices and supply availability. No changes during this quarter.	↑

↑	Exerting negative influence on FDOT's costs; monitor.
=	Currently stable; not influencing FDOT's costs
↓	Exerting positive influence on FDOT's costs.

Raw Materials & Scrap Steel

While still double November 2019 costs, hot-rolled steel prices started falling in late spring (after the war in Ukraine caused a brief interruption), declining by 6% year-over-year through May (**Figure 20**). On the other hand, rebar prices were 32% higher in May 2022 compared to the same period in 2021. The cost of iron ore, a key steel input, fell 20% through September 2022, year-over-year, but is still 17% higher than pre-pandemic levels.

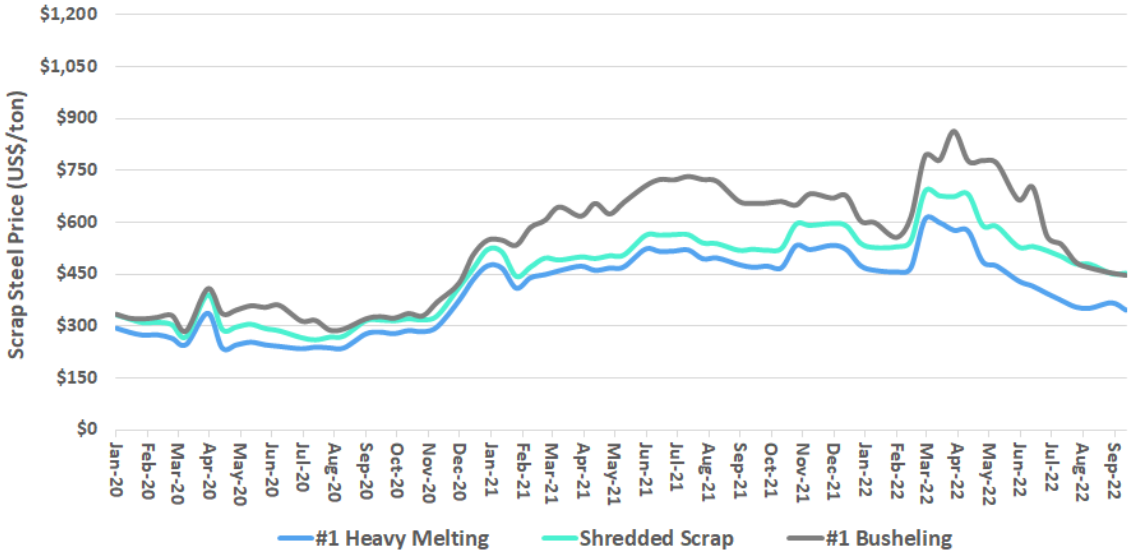
Figure 20. Historical Steel and Iron Ore Prices, 2020 – 2022



Source: World Bank, MEPS.

Scrap steel prices continued declining through September (**Figure 21**). However, prices are still elevated compared to pre-pandemic levels for #1 Heavy Melting Scrap (38%), Shredded Scrap (60%), and #1 Busheling Shredded Scrap (52%). Compared to September 2021, prices are down -26%, -13%, and -32% for #1 Heavy Melting Scrap, Shredded Scrap, and #1 Busheling Shredded Scrap, respectively.

Figure 21. Scrap Steel Prices, 2020 – 2022

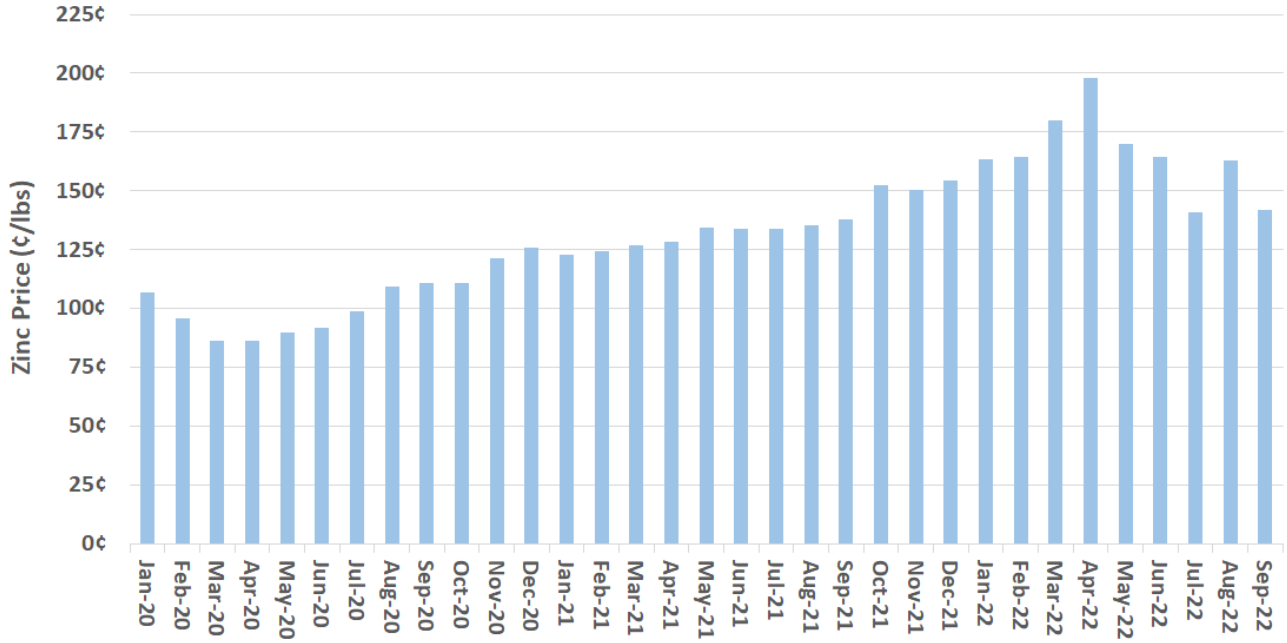


Source: Steelbenchmarker.

Galvanizing Materials

World zinc prices have fallen from the April 2022 peak of $1.98 per pound to $1.42 per pound in September 2022 (**Figure 22**). Year-over-year, zinc prices are only 3% higher than September 2021. Compared to pre-pandemic levels, however, zinc prices are still up 29%. Inflated prices for galvanized products like bolts and hardware are expected to persist through the first six months of fiscal year 2023.

Figure 22. Zinc Prices, 2020 – 2022



Source: World Bank.

Steel Survey

The most recent survey of FDOT steel fabricators finds that price changes were better than expected in September 2022, with some shapes seeing price declines (**Table 8**). However, fabricators are not confident that declines will hold in the long-term. The primary drivers of production changes in September were infrastructure demand and supply chain disruptions. Fabricators indicate some spot shortages are still an issue for some steel products, but conditions have improved compared to 2021.

Table 8. October Steel Producer Survey Results

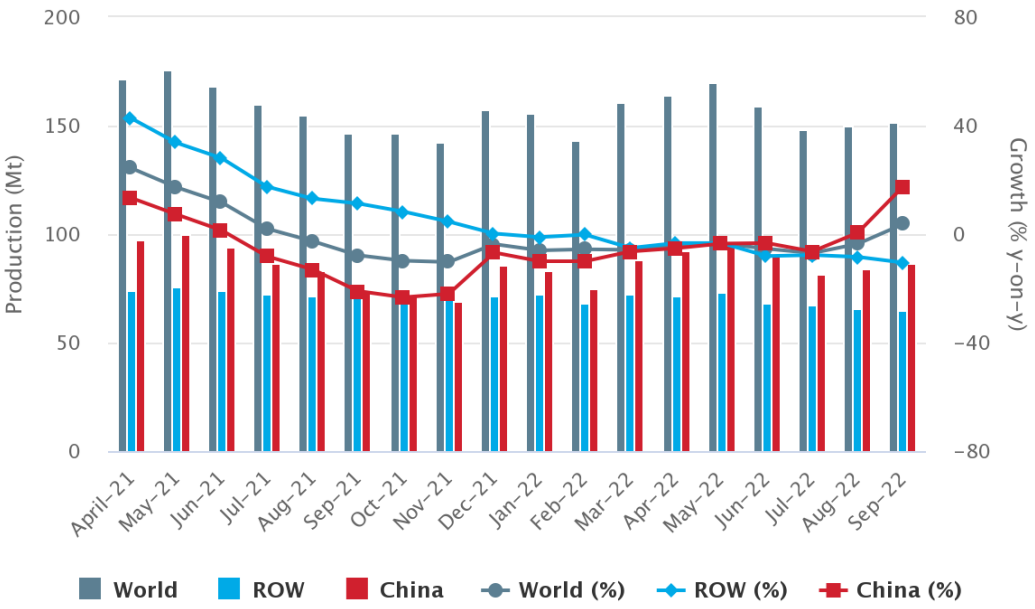
Material	Structural Steel	Steel Plate	Steel Pipe	Round Bar	Square Tubing	Galvanizing
Price Change, September 2022	-3%	-8%	-3%	-3%	-3%	3%
Expected Price Change, October 2022	-3%	3%	-3%	-3%	-3%	3%
Expected Price Change This Quarter (End of Dec.)	-3%	3%	-3%	-3%	-5%	3%
Bid Price Change, September 2022	3%	-3%	-3%	-3%	3%	8%
Production Change, September 2022	3%	3%	3%	-3%	-3%	3%
Expected Production Change, October 2022	3%	3%	3%	-3%	-3%	3%
Expected Prod. Change This Quarter (End of Dec.)	3%	3%	3%	-3%	-3%	8%

Source: TBG Work Product.

China

According to the World Steel Association, global crude steel production was 151.7 million metric tons in September 2022, a 3.7% decrease compared to September 2021 (**Figure 23**). Of the total, China produced 87 metric tons, or 57% of global steel in September 2022, up 17.6%, year-over-year. China's zero-COVID policy continues to limit domestic demand for steel and iron ore manufacturing. Chinese demand for iron ore amounts to about 70% of total global seaborne trade.

Figure 23. Crude Steel Production, China vs the Rest of the World

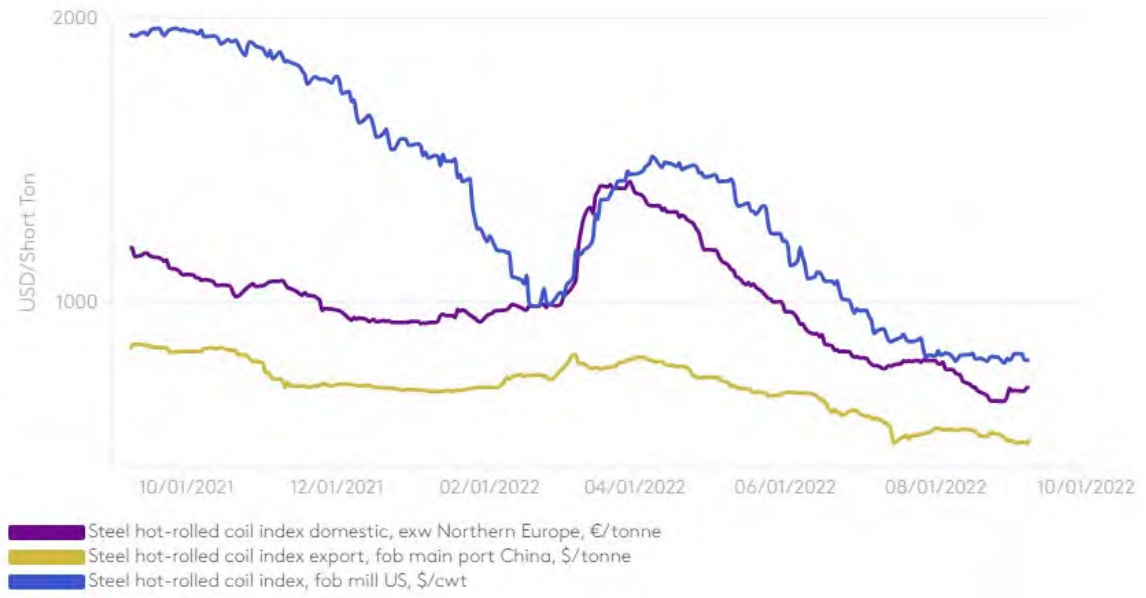


Source: World Steel Association.

Europe

Crude steel production was down 6.9% for European Union member nations in August 2022 compared to the same month last year. Steel production in Russia and other eastern European nations, including Ukraine, declined 18.2% in August 2022. By comparison, North America production was down only 3.6% during the same period. European steel demand continues to slow ahead of a looming energy crisis this winter. Steel prices have declined steeply in Europe since peaking during the initial outbreak of the war in Ukraine (**Figure 24**). In comparison, U.S. steel costs are just now inching closer to European prices, while prices in China have been low throughout the last year.

Figure 24. Steel Prices in Europe vs U.S. and China, Sep. 2021 – Sep. 2022



Source: Fastmarkets.

Steel Forecast

Prices and consumption are forecast for the five-year work program. Regression modeling was performed using pay item data, supply chain variables, and other macroeconomic indicators to identify models that best predicted FDOT's materials costs.

Actual bids averaged $4.47 in fiscal year 2022 according to year-end data, an 8% decline from the previous estimate. Previous forecasts found that global conditions (crude prices, geopolitical concerns) and Florida markets (construction employment) were driving FDOT structural steel costs with bid prices expected to achieve a weighted average price of $5.10 per pound in fiscal year 2023. With the updated 2022 starting point and projections across crude prices and macroeconomic conditions, the revised 2023 estimate is $4.62 per pound (**Table 9**). However, fabricators report that costs could go up between 5% to 15% once the BABA waiver expires in November.

The lower bound scenario reflects a recessionary condition where high prices dampen demand for structural steel, forcing bid prices lower. The upper bound reflects continued very high levels of supply chain disruptions and input costs.

Table 9. Structural Steel Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price Structural Steel, $/lb.	$4.47	$4.62	$3.85	$3.99	$4.07	$4.18
Percent Change, %	16.4%	3.4%	-16.6%	3.4%	2.2%	2.5%

Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Previous forecasts estimated reinforcing steel weighted average prices for fiscal year 2023 of about $1.48 per pound. Current models show reinforcing steel costs reaching $1.66 per pound in 2023, an increase of 4% from the previous estimate (**Table 10**). The best estimate also shows a dip in 2024, likely driven by the gulf between demand and availability of workers (e.g., increasingly unaffordable housing for workers may stagnant construction employment growth).

The lower bound shows further disruption in construction employment, lower crude prices, and recessionary conditions. The upper bound includes influences of higher commodity prices and continued high demand, ending around $1.39 per pound.

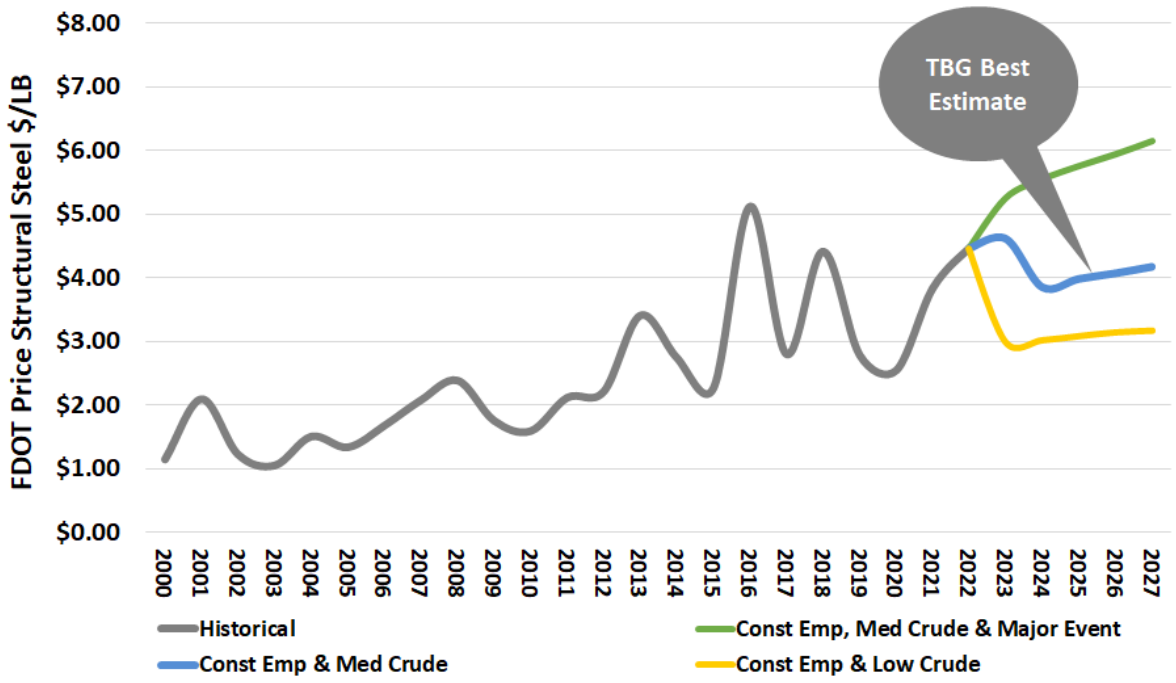
Table 10. Reinforcing Steel Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price Reinforcing Steel, $/lb.	$1.49	$1.54	$1.27	$1.32	$1.35	$1.39
Percent Change, %	24.1%	3.5%	-17.9%	3.9%	2.7%	3.0%

Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

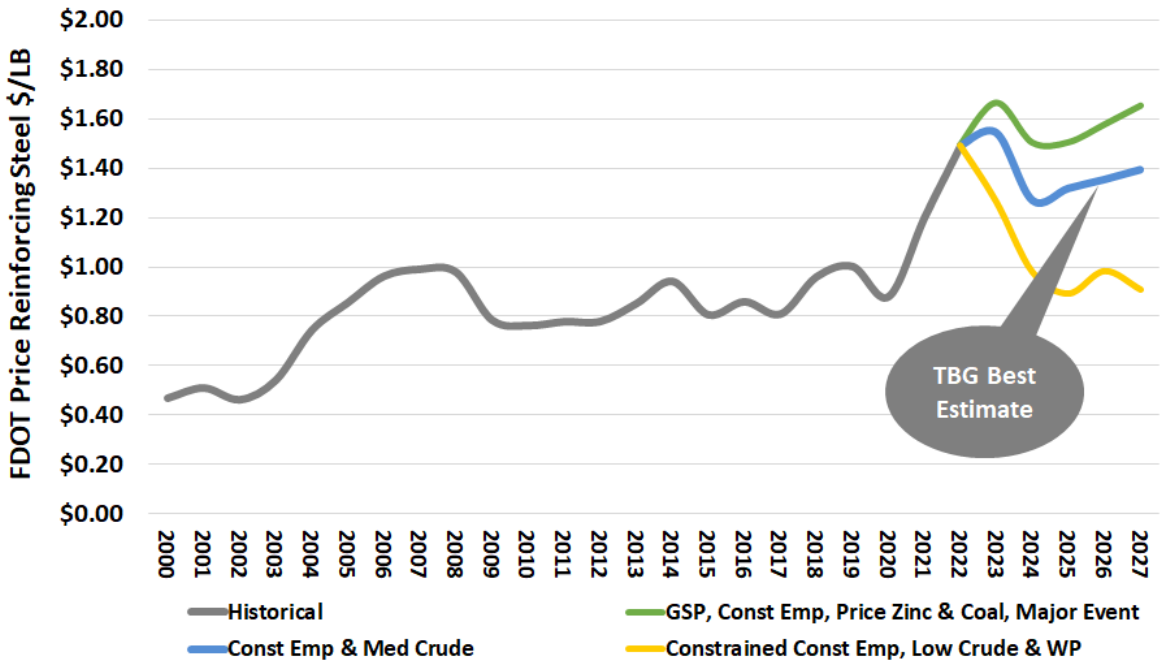
Figure 25 and **Figure 26** show the output of several price models and the scenario identified as best estimate for structural steel and reinforcing steel, respectively.

Figure 25. Structural Steel Price, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.
(Variable descriptions available in the **Appendix**.)

Figure 26. Reinforcing Steel Price, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.
(Variable descriptions available in the **Appendix)**

AGGREGATE

Summary

- Crushed stone production in Florida increased by 12% in the first half of 2022 compared to the same period in 2021.
- Demand and prices for aggregates continues to climb as reflected in the quarterly results of major publicly traded companies. This trend is expected to continue next quarter, with high demand increasing competition for products across construction sectors.
- Interviews indicate that disruptions in Mexican imports are expected to persist for well beyond this year, affecting 1-2 million tons of annual supply. FDOT suppliers are not optimistic about keeping up with demand in 2023.

FDOT Impacts

- FDOT aggregate base costs were 15.5% higher in 2022 compared to 2021. Current models show aggregate costs could increase an additional 10.9% in 2023 due to several macroeconomic factors.
- Producers continue to report issues with aggregate availability and delivery disruptions, whether from truck or rail. A potential rail strike would push trucking demand (and rates) even higher as suppliers look for alternatives for delivering goods and materials.
- Contractors report adding 5% fuel surcharges to most orders to account for fuel cost volatility, increasingly passing on costs to customers. Bid prices may continue rising next quarter as a result.

General Trends

FDOT's aggregate base price increased to $23.11 per square yard in 2022, a 15.5% increase form 2021. A series of factors are supporting high prices. Average crushed stone prices are at all-time highs as imports rose 2% in fiscal year 2022, but these might be restricted in the short term. High demand, issues with rail capacity and timely deliveries continue constraining aggregate availability. Nationally, average hourly earnings of stone mining have steadily increased in recent months from $26 an hour to almost $28 an hour in August.

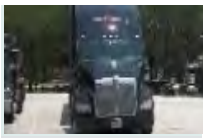
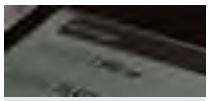
According to quarterly data released by the USGS crushed stone production in Florida rose 12% to 47.8 million metric tons, showing a higher growth rate than the national average (3%). Publicly traded companies continue showing strong demand and prices from different sectors. In the second quarter, aggregate shipments increased 3% to 9% year-over-year while prices had higher increases (between 8% and 17%).

Overall, they expect prices to continue showing similar growth rates (as high as 14%) for the rest of 2022. Interviews show similar price increases (between 10% and 20%) and expect further increases in January 2023. The industry has a positive outlook across all their sectors, with public infrastructure and non-residential leading growth. Disruptions across the supply chain continue and are the same that have affected producers this past year: fuel costs, availability to keep up with demand, and labor and transportation issues.

SUPPLY CHAIN VARIABLES ➤ **AGGREGATE**

Table 11 provides current status of selected supply chain variables.

Table 11. Aggregate Supply Chain Variables

 Raw Materials	The USGS shows that Florida's crushed stone production for the first half of 2022 rose 12%. Nationally, production only grew 3%. There's no update on Vulcan's Mexico operations as the company expects no rulings to be made until 2023. However, Interviews indicate that Florida would lose 1-2 million tons annually if it closes, with no options to replace those quantities. Additionally, some have included cement surcharges for their aggregate base products. Port of Savannah indicated they had their busiest month in August, handled 9.6% more units of cargo and grew intermodal rail lifts by 6.4% in the first quarter of fiscal year 2023. They expect growth to slow down in the coming months.	↑
 Access to Land	Access to land with suitable deposits is key to cost-effective material extraction for FDOT Aggregate. A new Waters of the United States rule is closer to being finalized and there are ongoing efforts to change permitting rules in Congress, but nothing imminent. These are expected to continue through next year, with the industry monitoring carefully.	=
 Rail	The poor and deteriorating service of freight rail shippers has critically strained companies supplying customers around the country. Rail is the primary transportation for aggregates from Georgia, and from Lake Belt to Central and Northeast Florida. During the first half of 2022, CSX tons and revenues of aggregate products rose by 8% and 24% year-over-year, respectively, indicating a significant increase in pricing. In the third quarter results, CSX reported a 71% increase in locomotive fuel costs and headcount rose to 6,819 active train & engine workers and 730 in training. Commodity specific stats are not available yet. Additionally, CSX's average weekly terminal dwell time in Jacksonville and Waycross, GA continued declining in recent weeks. In Jacksonville, times have been around 20 hours and in Waycross it has been 25.8 hours. Issues with rail continue as mentioned throughout the report.	↑
 Trucking	Constrained truck/driver availability is a major cost factor. Fuel costs are a major cost factor and any disruptions with rail will put additional pressure on trucking as producers would have to look for alternative for shipments that would typically be delivered by rail. Heavy and tractor-trailer truck driver employment has continued its upward trajectory through 2022, exceeding 40,000 drivers since July and there is an additional $20 million of funding for CDL training programs.	↑
 Labor	Labor demand is high as aggregate demand continues being high across different construction sectors. AGC's August workforce survey shows how construction firms are struggling finding qualified candidates as 84% indicated it as the main issue to fill open positions. Statewide construction employment increased 4.2% in September, year-over-year, but growth is uneven across the state with the Orlando metro area decreasing almost 8%. Nationally, nonmetallic mineral mining and quarrying employment has been flat up to September 2022.	↑
 Competition	Competition has been steady. Reports indicate that mergers and acquisitions in the U.S. have increased by 28% in 2022 as companies try to increase capacity and market access. However, no new ones have been publicly announced in Florida. There is one new application for an environmental resource permit in August 2022 for a mine in Marion County. FDOT's approved producer list shows a new mine from Alabama under review.	=
 Capital Costs	Strong aggregate demand means that investments for new equipment and maintenance are still expected even with Fed rate hikes and uncertainty over the economy. Reports indicate that purchases of equipment and parts is becoming a more popular choice among producers and dealers than renting. This as producers try to mitigate shortages or lead times for certain items. However, higher interest rates increase the costs for producers.	↑

↑	Exerting negative influence on FDOT's costs; monitor.
=	Currently stable; not influencing FDOT's costs
↓	Exerting positive influence on FDOT's costs.

Aggregate Forecast

Regression modeling was performed to estimate aggregate base costs using pay item data, work program funding, and supply chain variables and other macroeconomic indicators. **Table 12** provides the forecast average price for aggregate base. **Figure 27** shows the output of several price models and the scenario identified as best estimate for aggregate base.

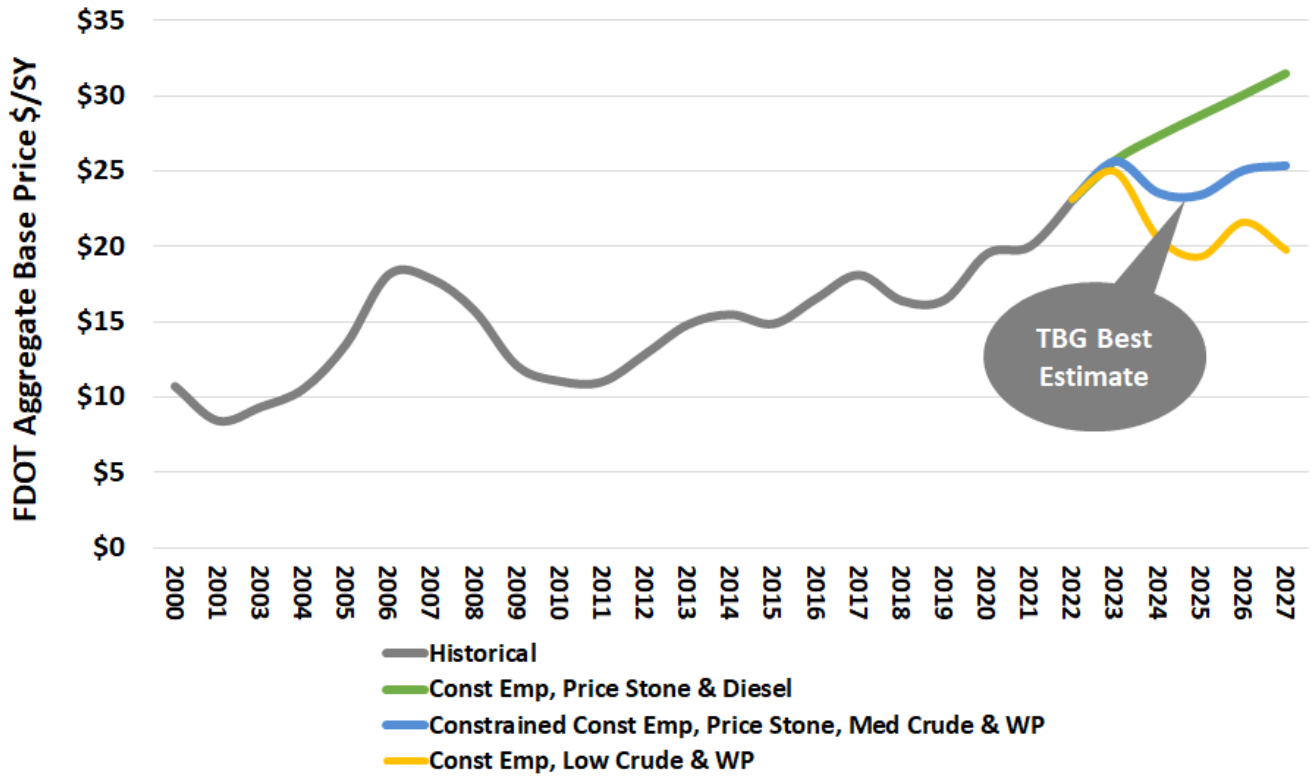
Previous estimates anticipated a 12% increase in fiscal year 2022 aggregate base prices, while actual data updated through year-end show that prices ended the fiscal year 15.5% higher. The most likely trajectory sees continued suppression of construction employment growth, increased crushed stone pricing, and FDOT work program as heavy influences into 2023, with a dip in pricing in 2024 when supply chain disruptions are expected to lessen. The less likely upper bound is measured by unconstrained construction employment, crushed stone pricing, and ever-rising energy costs. Finally, the selected lower bound model shows that energy price declines, attributable to recessionary conditions, would yield lower aggregate base prices throughout the five-year work program.

Table 12. Aggregate Base Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price Aggregate Base, $/SY	$23.11	$25.62	$23.56	$23.42	$25.03	$25.34
Percent Change, %	15.5%	10.9%	-8.0%	-0.6%	6.9%	1.2%

Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 27. Aggregate Base Price, 2022 Forecast



Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.
(Variable descriptions available in the **Appendix**.)

EARTHWORK

Summary

- Driver employment in Florida has steadily increased in 2022 and fuel costs have declined in recent months, both of which are beneficial for earthwork contractors' costs. Declines in fuel costs might be temporary.
- Equipment costs continued with their downward trend to the point where the year-over-year increases are between 4% and 9%. However, parts shortages are still present.

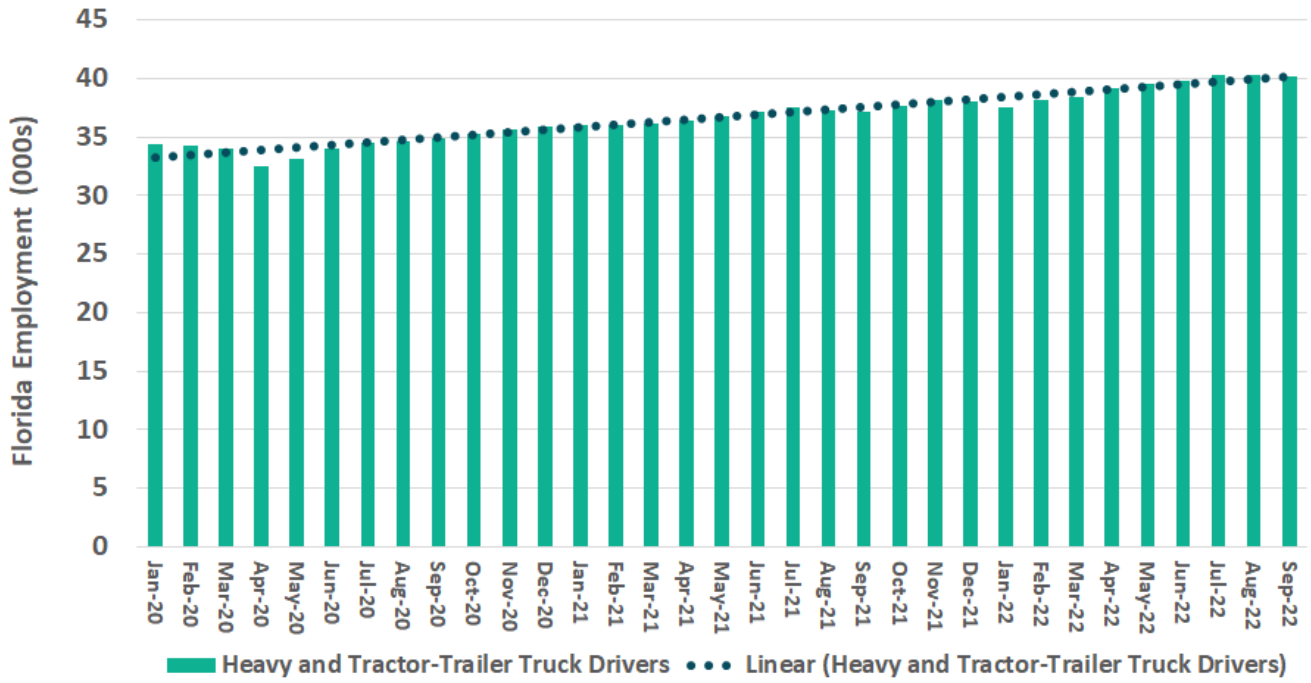
FDOT Impacts

- FDOT earthwork costs were 11.1% higher in fiscal year 2022 compared to 2021. Under current models, costs are not expected to decline in 2023.
- Competition for truck drivers continues to be a constraint statewide, causing longer lead times and cost increases. With potential disruptions to rail activities this fall, trucking will be even more in demand.

General Trends

Overall truck transportation employment surpassed pre-pandemic levels through September 2022, rising 18% compared to the same month in 2019. Heavy and tractor-trailer truck driver employment, which accounts for approximately 57.8% of truck transportation according to BLS, has followed an upward trajectory since 2020 (**Figure 28**). Additional truck drivers will be needed to adequately staff construction projects as state and federal funds are injected into the industry over the next few years, but the rise in trucking employment is a positive indicator**.**

Figure 28. Florida Truck Transportation and Driver Employment, 2020 – 2022



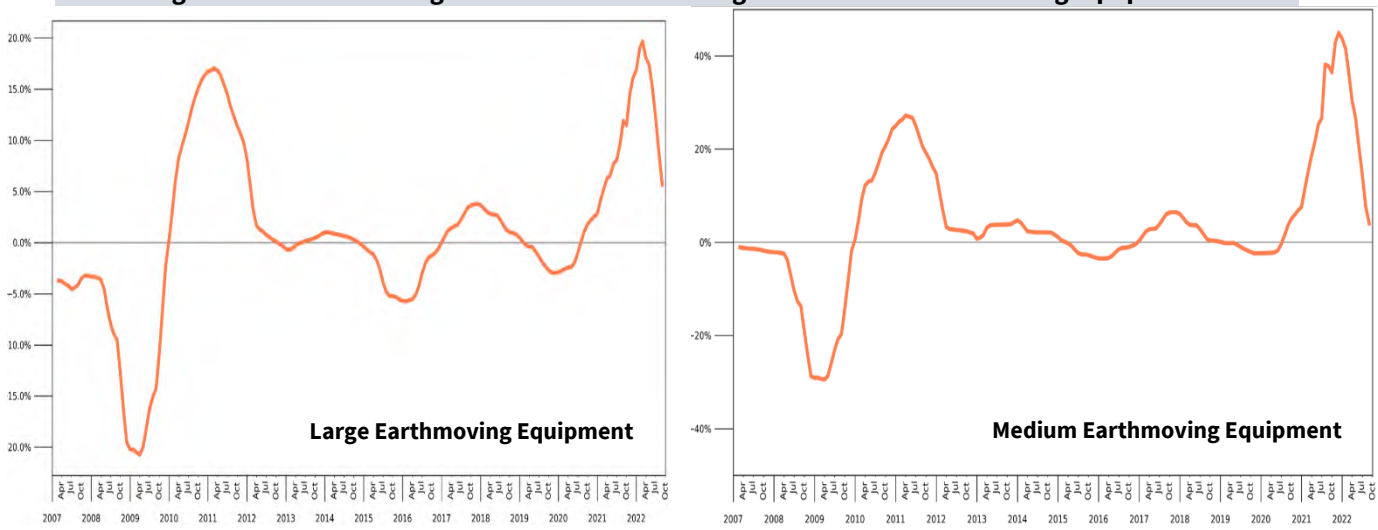
Source: TBG work product, BLS.

Equipment

Inflationary pressures continue to affect the construction equipment industry, but prices have had steep declines. The October 2022 used equipment market trends report released by Ritchie Bros. Auctioneers shows

that prices for large earthmoving equipment are up 6% year-over-year, but only 1% since December 2021. Similarly, used medium earthmoving equipment prices were up 4% year-over-year, but they have declined 3% since December 2021. (**Figure 29**).

Figure 29. Percent Change in Price Indexes for Large and Medium Earthmoving Equipment

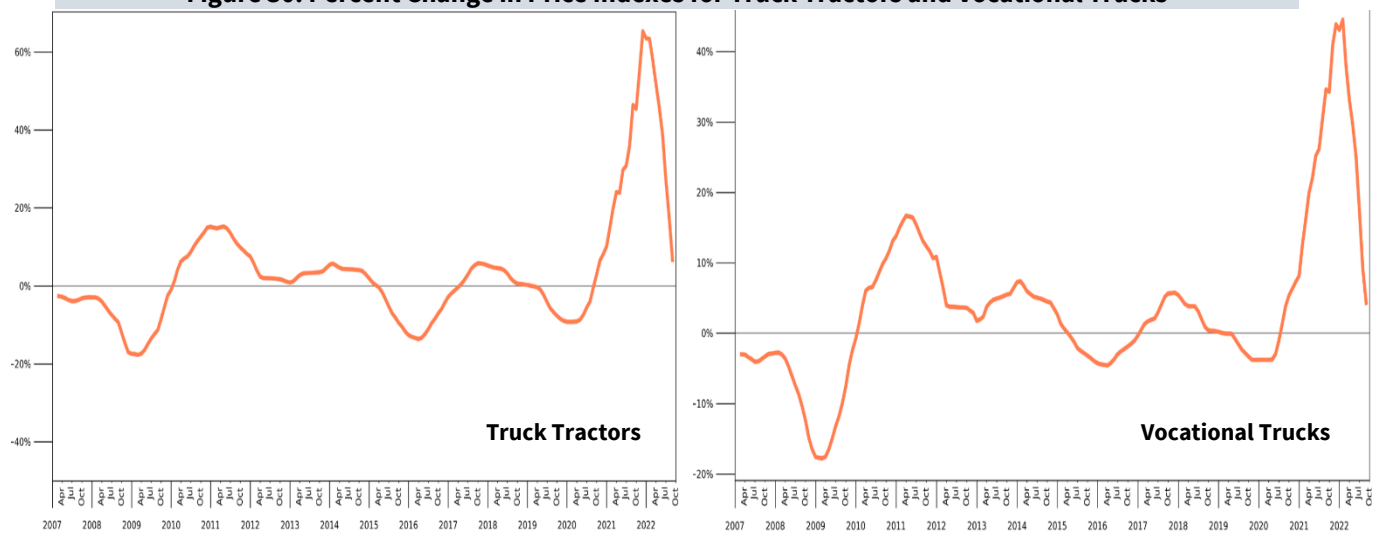


Source: Ritchie & Bros. Used Equipment Market Report.

Trucking

The 3-month average cost of truck tractors was up 7% in October 2022, year-over-year. Vocational truck costs (including bulk hauling, heavy hauling, and other construction vehicles) increased 4% in October compared to the same period last year. High demand and a limited supply of drivers and parts has kept prices high in 2021, but costs have fallen from the peak seen last summer, declining 11% and 5% since December 2021, respectively. (**Figure 30**).

Figure 30. Percent Change in Price Indexes for Truck Tractors and Vocational Trucks



Source: Ritchie & Bros. Used Equipment Market Report.

Earthwork Forecast

Regression modeling was performed to estimate Earthwork costs using pay item data, supply chain variables and other macroeconomic indicators. **Table 13** provides the forecast average price for earthwork. **Figure 31** shows the output of potential price models and the scenario identified as best estimate for earthwork.

Previous forecasts anticipated earthwork costs of over $15 per cubic yard in fiscal year 2023. With year-end 2022 bid data, the forecast has been revised downward 7% to $14 per cubic yard in 2023. In the Best Estimates scenario, costs are expected to correct in fiscal year 2024 as supply chain issues begin to resolve before resuming cost increases of about 2% to 3% annually for the rest of the work program. The trajectory follows similar patterns to the prior forecast, driven by decreasing competition from housing, lower construction employment growth, and some moderation in fuel costs through the end the quarter.

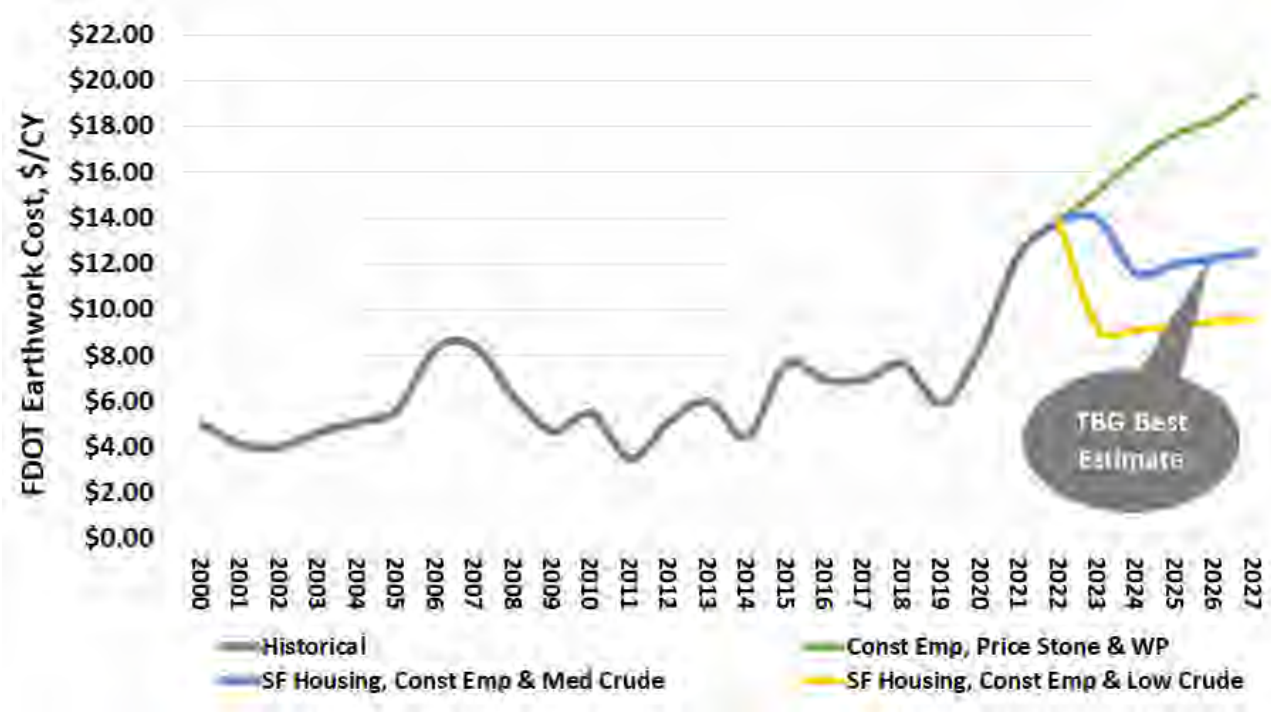
Continued infrastructure funding will constrain bid prices from falling to pre-COVID levels, barring recessionary levels of employment. In the lower bound, reduced housing, crude forecasts, and construction employment drive costs down, while the upper bound is driven by work program and crushed stone/adjacent industry demand.

Table 13. Earthwork Price Forecast Results

Year	2022	2023	2024	2025	2026	2027
Price Earthwork, $/CY	$13.84	$13.98	$11.58	$11.98	$12.22	$12.50
Percent Change, %	11.1%	1.0%	-17.2%	3.4%	2.0%	2.2%

Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 31. Earthwork Price Estimates, 2022 Forecast



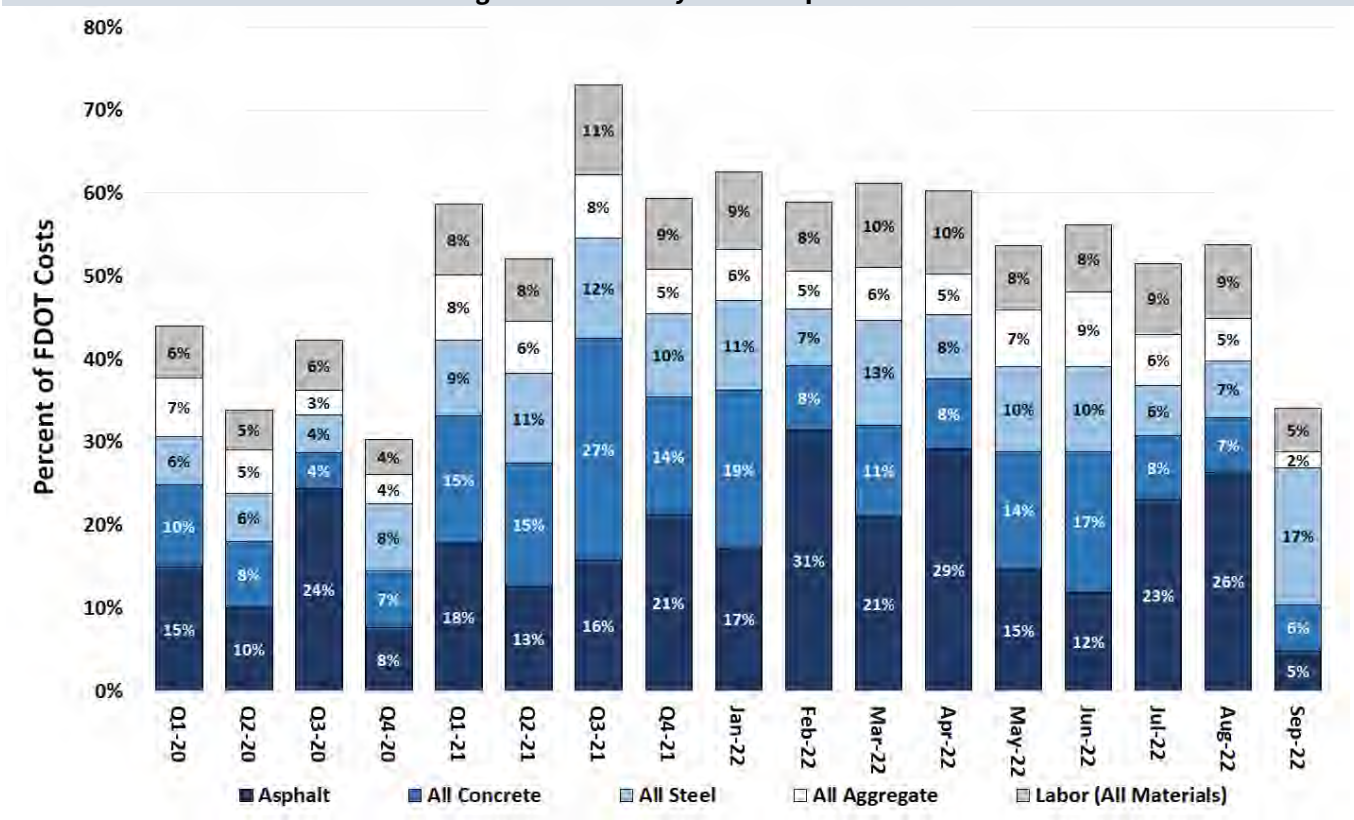
Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.
(Variable descriptions available in the Appendix.)

APPENDIX A ➤ UNDERLYING ECONOMIC CONDITIONS

FDOT Cost Composition

Tracking FDOT's costs by month shows how the cost composition may shift depending on project type, scheduling, and material costs (**Figure A-1**). Aggregate, concrete, and steel costs as a share of total costs moderated in July and August 2022. Asphalt maintained the historical majority of total dollars. According to preliminary data, steel costs appear to be the largest share of total FDOT costs in September. However, this share will likely shift downward with additional data next month. Labor costs remained elevated as construction wages continue to increase statewide in an effort to recruit killed workers.

Figure A- 1. Monthly Cost Composition

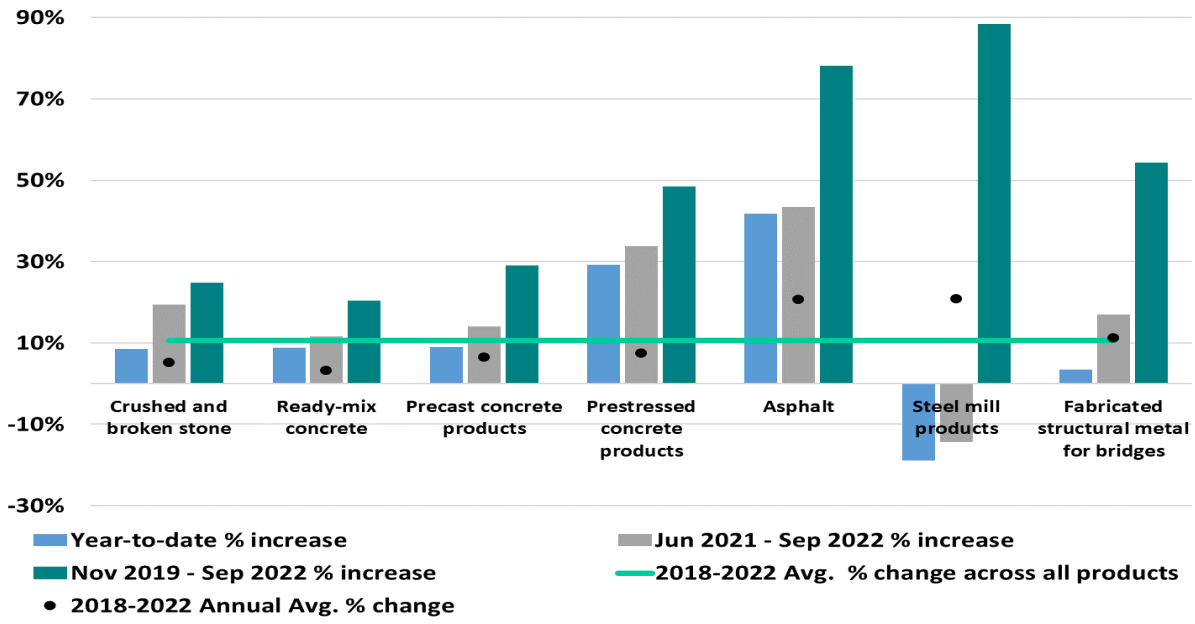


Source: TBG calculated from data provided by FDOT Estimates Office.

U.S. Inflation

Another measure of inflation for the construction industry is the BLS PPI by commodity type. Nationally, asphalt has increased the most year-to-date with a 42% increase. On the other hand, steel mill products are the only ones to decreased in 2022. Aggregate and concrete have had the lowest price increases, with single digit increases in 2022. **Figure A-2** illustrates select PPI in the U.S. for relevant commodity types.

Figure A- 2. Producer Price Index Percent Change by Commodity

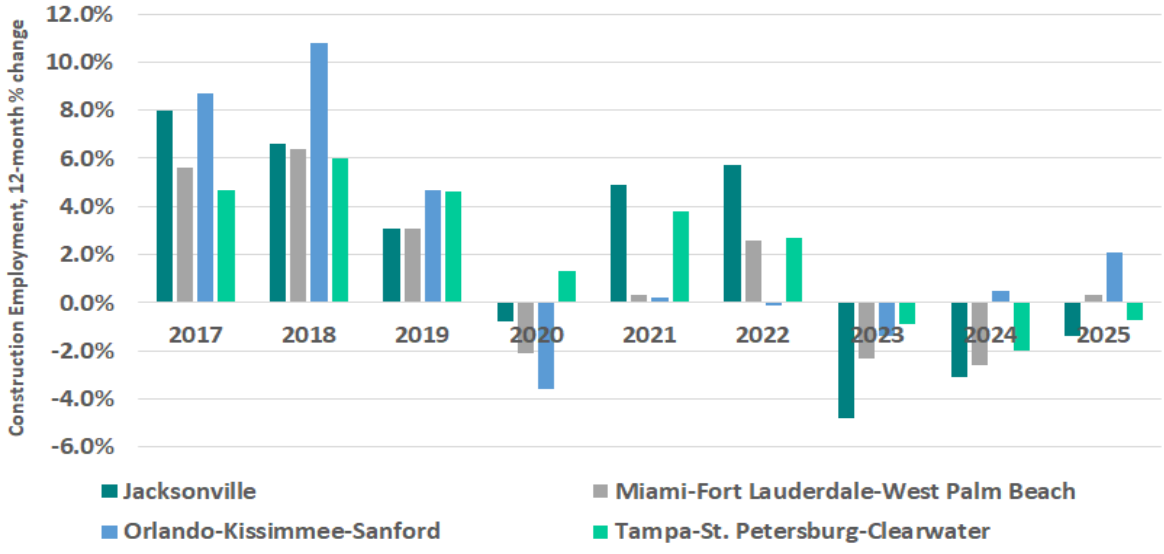


Source: BLS (Producer Price Index, not seasonally adjusted); TBG Work Product.

Construction Employment Forecast

According to the Institute for Economic Forecasting's (IEF) Spring 2022 Florida & Metro Forecast, statewide construction employment is expected to average a growth rate of 2.6% in 2022, revised up slightly from the previously reported 2.5%. IEF expects construction employment growth to decline over the next three years as employment lost during the pandemic is fully recouped. More construction workers will need to be recruited to Florida in order to support transportation and infrastructure demand through the end of the five-year work program. At the metro level, IEF projects construction employment declines in most major markets throughout the forecast period (**Figure 32**).

Figure 32. Historical and Forecasted Changes in Employment in Major Florida Markets, 2017 - 2025

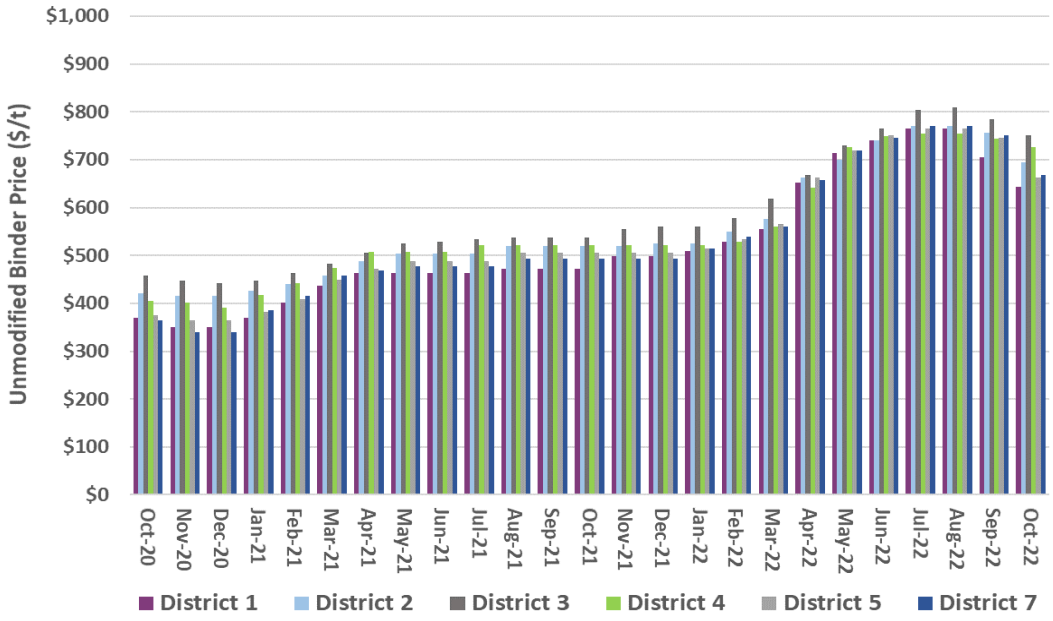


Source: UCF Institute for Economic Forecasting Winter 2022 Florida & Metro Forecast.

Binder Prices by District

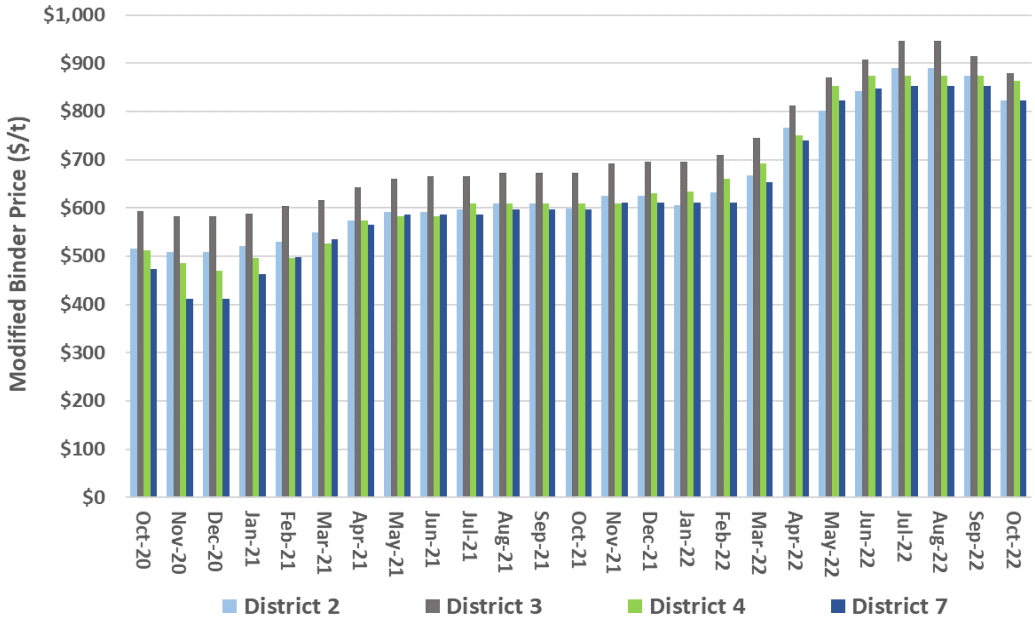
Where available, the average prices for unmodified (**Figure A-7**) and modified (**Figure A-8**) binder were calculated from monthly terminal price quotes at the district level. Unmodified binder is the average of PG 52-28 and PG 58-22 prices, while modified binder is a quote for the price of PG 76-22 (PMA) in the dataset. While unmodified binder prices rose rapidly earlier in 2022, prices in all districts have decreased since August. Modified binder prices have showed a similar trend in 2022, decreasing since August to an average of $847. District 3 continues having higher prices than in other areas of the State.

Figure A-7. Unmodified Binder Price by District



Source: FDOT, TBG Work Product (D6 terminals did not report data).

Figure A-8. Modified Binder Price by District



Source: FDOT, TBG Work Product (D1, D5, and D6 terminals did not report data).

OPEC Crude Oil Production

During the October 5th 2022 OPEC and Non-OPEC Ministerial Meeting, the body agreed to adjust overall crude oil production downward by 2 million barrels per day from August 2022 required production levels. The change will take place in November 2022 for OPEC and Non-OPEC Participating Countries. The largest declines will be seen in Saudi Arabia and Russia (**Table A-1**).

Table A- 1. OPEC and Non-OPEC Production Targets, Nov. 2022 – Dec. 2023

Country	Required Production (August 2022)	Voluntary Adjustment (November 2022)	Voluntary Production (November 2022)
OPEC Countries			
Algeria	1,055	-48	1,007
Angola	1,525	-70	1,455
Congo	325	-15	310
Equatorial Guinea	127	-6	121
Gabon	186	-9	177
Iraq	4,651	-220	4,431
Kuwait	2,811	-135	2,676
Nigeria	1,826	-84	1,742
Saudi Arabia	11,004	-526	10,478
UAE	3,179	-160	3,019
Non-OPEC Participating Countries			
Azerbaijan	717	-33	684
Bahrain	205	-9	196
Brunei	102	-5	97
Kazakhstan	1,706	-78	1,628
Malaysia	594	-27	567
Mexico	1753	0	1,753
Oman	881	-40	841
Russia	11,004	-526	10,478
Sudan	75	-3	72
South Sudan	130	-6	124
OPEC 10	**26,689**	**-1,273**	**25,416**
Non-OPEC	**17,167**	**-727**	**16,440**
OPEC+ Total	**43,856**	**-2,000**	**41,856**

Source: OPEC.

APPENDIX B – FORECAST DETAILS

A description of the variables used in forecasting are provided in **Table B-1**.

Table B- 1. Forecast Variable Descriptions

Variable Reference	Description
Const Emp	Baseline FL construction employment forecast.
Constrained Emp	Lower (less optimistic) FL construction employment forecast.
Diesel	Average diesel price.
GSP	FL Gross State Product.
Historical	Historical pricing or quantity.
Housing Starts	FL housing starts.
Low/Med/High Crude	Average crude price (low, medium, or high forecast).
Major Event	Major geo-political, health, or weather-related events that strongly affect market forces; i.e. 9/11, the Great Recession, Hurricane Katrina, the COVID-19 pandemic.
Non-farm Emp	FL Non-Farm employment.
Price Binder	Average price of HMA binder (PG-76 & higher).
Price Cement	Average price of cement.
Price Coal	Average price of coal.
Price Iron Ore	Average price of iron ore.
Price Stone	Average price of crushed stone.
SF Housing	FL Single-Family housing starts.
WP	FDOT Five-Year Work Program.

Pay items that are partially or wholly used in the analysis are listed in **Table B- 2. Asphalt Pay Items** in the FDOT SRES 2022 July Final Report[9], starting on page 80. It should be noted that the lists may include some pay items that are no longer in use by FDOT, or are not represented in the lettings data every year, but are retained for historical record.

[9] Main page: https://www.fdot.gov/programmanagement/estimates/documents/sresreports

REFERENCES

Al Bari, S. (2022, September). "Industry Report 21232: Sand & Gravel Mining in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/

American Institute of Architects. (2022). Architecture Billings Index (ABI). Retrieved from https://www.aia.org/resources/10046-architecture-billings-index-abi

American Iron & Steel Institute. (2022). U.S. Steel Production, Capacity, Utilization, and Consumption.

Association of American Railroads. (2022). Rail Traffic Data. Retrieved from https://www.aar.org/data-center/rail-traffic-data/

Argus Media Group. (2022). "Americas Asphalt Weekly Reports"

Guirguis, J. (2022, August). "Industry Report 33231: Structural Metal Product Manufacturing in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/

First Research. (2022, October). "Cement & Concrete Products Manufacturing Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, September). "Masonry Contractors Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Primary Metals Manufacturing Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Nonmetallic Mineral Mining & Quarrying Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Asphalt Product Manufacturing Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Poured Concrete Foundation & Structure Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Nonmetallic Mineral Product Manufacturing Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

First Research. (2022, August). "Structural Steel & Precast Concrete Contractors Industry Profile". Retrieved from https://www.firstresearch.com/industry-profiles.aspx

Florida Department of Transportation. Five-Year Work Program, FY2023-2027. Office of Work Program and Budget.

Florida Department of Transportation. Fuel and Bituminous Average Price Index. Retrieved from https://www.fdot.gov/construction/fuel-bit/fuel-bit.shtm

Florida Department of Transportation. Historical Project Extract. Estimating Systems Support.

Florida Department of Transportation. Long Range Estimates Future Project Extract. Estimating Systems Support.

Florida Department of Transportation. Approved Producers List. Materials Acceptance and Certification System.

Florida Highway Safety and Motor Vehicles. Licensed Driver by Type and County. Retrieved from https://www.flhsmv.gov/resources/driver-and-vehicle-reports/

Khaustovich, V. (2022, August). "Industry Report 33111: Iron & Steel Manufacturing in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/

Moreno, A. (2022, August). "Industry Report 32412: Asphalt Manufacturing in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/

MEPS International Ltd. (2022). World Steel Prices. Retrieved from https://www.meps.co.uk/gb/en/products/world-steel-prices

O'Malley, M. (2022, July). "Industry Report 23814: Masonry in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/
Office of Economic and Demographic Research. (2022). Florida Economic Estimating Conference: Long Run Tables. Retrieved from http://edr.state.fl.us/Content/conferences/fleconomic/index.cfm
Portland Cement Association (Summer, 2022). Market Update & Forecast Southeast Region.
Ritchie & Bros. (2022, October). "Market Trends Report Used Equipment & Trucks."
Faber, T. (2022, June). "Industry Report 23811: Concrete Contractors in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/
Ross, G. (2022, July). "Industry Report 33151: Ferrous Metal Foundry Products in the U.S." *IBISWorld.* Retrieved from https://www.ibisworld.com/
SteelBenchMarker. (2022). "Price History: Tables and Charts" [Data set].
Surface Board Transportation. "Carloads & Volume Quarterly data". Retrieved from: https://www.stb.gov/reports-data/economic-data/
Surface Board Transportation. "Rail service data". Retrieved from: https://www.stb.gov/reports-data/rail-service-data/
U.S. Bureau of Economic Analysis, Gross Domestic Product: All Industry Total in Florida [FLNGSP], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/FLNGSP
U.S. Bureau of Labor Statistics. Construction, Heavy and Civil Engineering Construction and Total Non-Farm State and Area Employment, Hours, and Earnings for Florida [Data files]. Retrieved from https://data.bls.gov/cgi-bin/dsrv?sm
U.S. Bureau of Labor Statistics. Mining Employment, Hours, and Earnings National [Data set]. Current Employment Statistics Survey. Retrieved from https://data.bls.gov/cgi-bin/dsrv?ce
U.S. Bureau of Labor Statistics. May 2021 State Occupational Employment and Wage Estimates for Florida [Data set]. Occupational Employment Statistics. https://www.bls.gov/oes/tables.htm
U.S. Bureau of Labor Statistics. Producer Price Indexes Commodity Data. Retrieved from https://data.bls.gov/PDQWeb/wp
U.S. Census Bureau, New Private Housing Units Authorized by Building Permits for Florida [FLBPPRIV], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/FLBPPRIV
U.S. Census Bureau, New Private Housing Units Authorized by Building Permits: 1-Unit Structures for Florida [FLBP1FH], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/FLBP1FH
U.S. Energy Information Administration. Cushing, OK WTI Spot Price FOB Weekly [Data set]. Retrieved from https://www.eia.gov/dnav/pet/hist/RWTCD.htm
U.S. Energy Information Administration. (2022). Annual Energy Outlook.
U.S. Energy Information Administration. (2022). Short-term Energy Outlook.
U.S. International Trade Commission. Materials Imports for Consumption [Data set]. Retrieved from https://dataweb.usitc.gov/
United States Geological Survey. (2022). Second Quarter Cement Statistics and Information. Mineral Industry Surveys. Retrieved from https://www.usgs.gov/centers/nmic/cement-statistics-and-information
United States Geological Survey. (2022). Second Quarter Crushed Stone Statistics and Information. Mineral Industry Surveys. Retrieved from https://www.usgs.gov/centers/nmic/crushed-stone-statistics-and-information
United States Geological Survey. (2022). Second Quarter Iron Ore Statistics and Information. Mineral Industry Surveys. Retrieved from https://www.usgs.gov/centers/nmic/iron-ore-statistics-and-information
World Bank. (2022). Commodity Market prices and forecasts [Data set]. Retrieved from https://www.worldbank.org/en/research/commodity-markets

World Steel Association. (2022). Monthly Steel Production. World Steel Association Yearbook. Retrieved from https://www.worldsteel.org/steel-by-topic/statistics.html

World Trade Organization Data Portal. (2022). International Trade Statistics. World Trade Organization. Retrieved from https://data.wto.org/