Fiscal Year 22/23

3rd QUARTERLY REPORT

Strategic Resource Evaluation Study Highway Construction Materials

Contract BEC18

April 2023

The Balmoral Group

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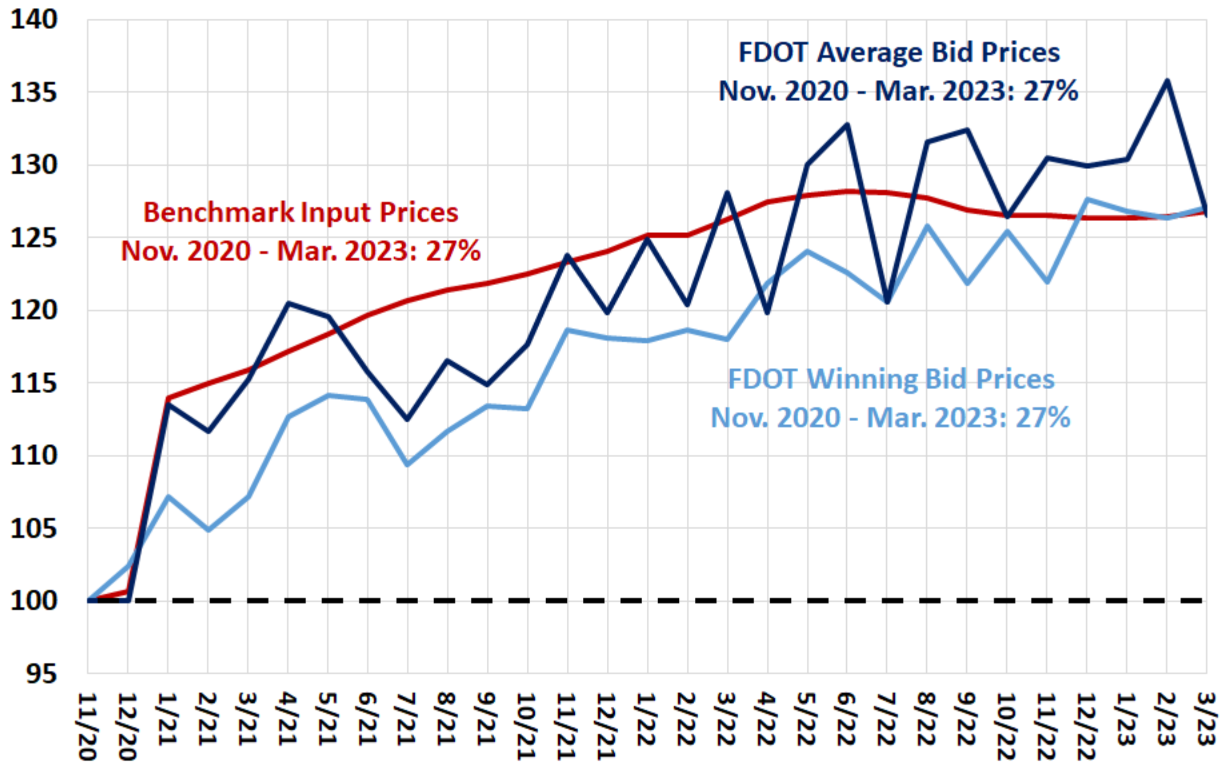
OVERVIEW ➤ FLORIDA'S HIGHWAY CONSTRUCTION MATERIALS

Construction Material	Status
ASPHALT	**Continued high rates of spending in the heavy and civil construction sector are supporting record high asphalt bids.** Although input prices including binder and diesel fuel have declined, contractors report pricing power and bids reflect the intensive market demand. Labor and trucking continue to create issues. Year-to-Date activity is tracking above best estimates – which was already a 12% increase - and toward the upper bound of forecasted HMA costs for Fiscal Year (FY) 2023, although bids may moderate slightly by year-end.
CONCRETE	**Structural concrete prices reflect intense competition for resources – fly ash, cement and aggregate - from the infrastructure sector** that is more than offsetting slowing housing demand. Shocking bid prices persist, and will likely continue. Increased infrastructure spending is supporting higher prices. Disruptions in import arrangements appear to be heading toward resolution but cement producers are expected to increase prices by summer. A key fly ash harvesting firm was sold to a large cement manufacturer, which may increase reclaimed fly ash availability.
STEEL	**Steel product prices continue to be volatile.** Basic items have been declining in prices and lead times, but producers were caught off guard in the past month with substantial price increases for some raw materials. Contractors report some items increasing in lead times again, such as specialized light poles, and concern about fast tracking projects in light of increased lead times. Chinese steel supply and Ukraine War impacts continue to affect global steel prices and erratic price fluctuations.
AGGREGATE	**Aggregate supply disruptions have created an opening for aggressive pricing by producers.** Year-to-date bids overshot best estimate forecasts by 10% - and the forecast already predicted a 15% increase for FY 2023. Continued infrastructure demand is supporting high prices; increased infrastructure funding expected in the next two years is cited in price increases announced in January and April 2023. Producers are very concerned about pending legislation that could allow phosphogypsum to be substituted for base.
EARTHWORK	**Earthwork costs are still up dramatically relative to pre-COVID prices, supported by increased demand.** Excluding two major projects that comprise 90% of bid volumes, FDOT bids year-to-date would reflect an increase of 30%, substantially overshooting forecasts. With input costs down for fuel, parts and labor shortages are still influencing bid behavior.
	The Office of Management and Budget (OMB) put out a **request for comments on Buy America Build America (BABA)** in February 2023, renewing uncertainty over how BABA requirements may be applied to construction materials like aggregate, asphalt, and cement. Existing exemptions for these materials were thought to be settled. Comments on the proposed rule were due March 13, 2023. Contractors and producers are very concerned about the uncertainty associated with the ongoing issue.

The FDOT Cost Index finds that winning bids in March 2023 were **27% higher than November 2020** prices, matching input prices for the second month in a row. Anecdotally, producers report anticipating passing on more than input cost increases as long as the market will bear, to prepare for a period of uncertainty and to "make hay while the sun shines". FDOT's bid prices have been affected by record high asphalt, aggregate, and concrete costs.

The index is calculated by assessing awarded and average bids since November 2020. The share of aggregate, asphalt, concrete, and steel dollars spent on FDOT projects is compared to a baseline industry cost index (**Figure 1**). Benchmark input prices have plateaued at 27% over November 2020 costs.

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.

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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. Markets in the analysis include bituminous, cement, steel, and aggregate materials, and earthwork. 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.

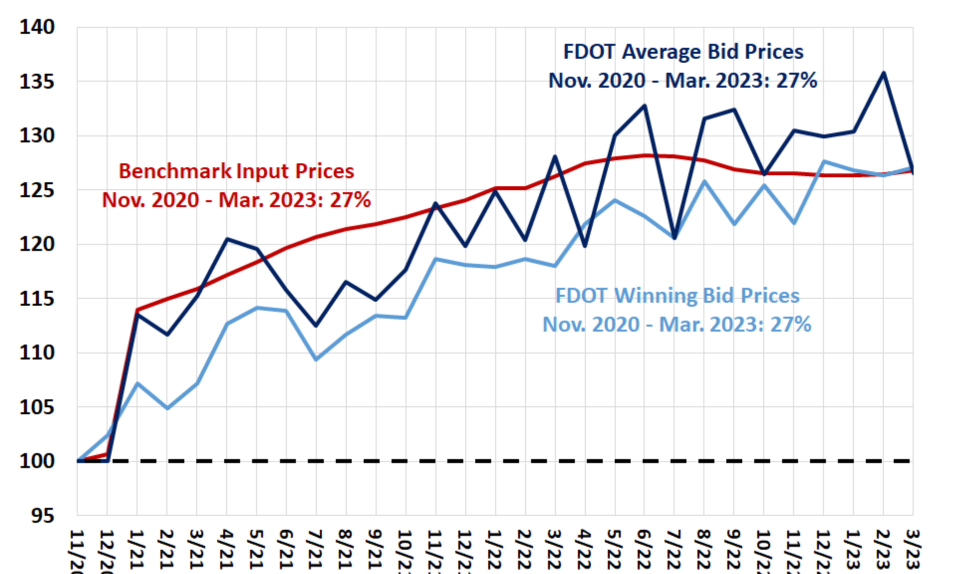
GENERAL OUTLOOK › HIGHWAY CONSTRUCTION MATERIALS

The April 2023 NABE[1] Business Conditions Survey shows mixed conditions for many firms or industries. For instance, while fewer respondents indicated charging higher prices or issues with shortages, and more firms indicated higher sales, fewer firms report increasing employment and capital spending, which are indications of a slowdown. In relation to whether the U.S. is in a recession, 44% believe that there is more than a 50% chance the U.S. will be in a recession within the next 12 months. This is smaller than January's 2023 perceptions; at that time, 52% believed the likelihood was more than 50%.

Input Costs vs. Bid Prices

Regional industry prices plateaued in March 2023, ranging 27% higher compared to November 2020 (**Figure 2**). For awarded (winning) FDOT bids, prices across major materials were also 27% higher compared to the benchmark period. For all FDOT bids (the average of all bids received), prices match benchmark input costs as well. Monthly cost composition by material is provided in **Appendix A**, along with an update on the Bureau of Labor Statistics (BLS) Producer Price Index (PPI).

Figure 2. Florida Benchmark Input Costs vs FDOT Bid Prices



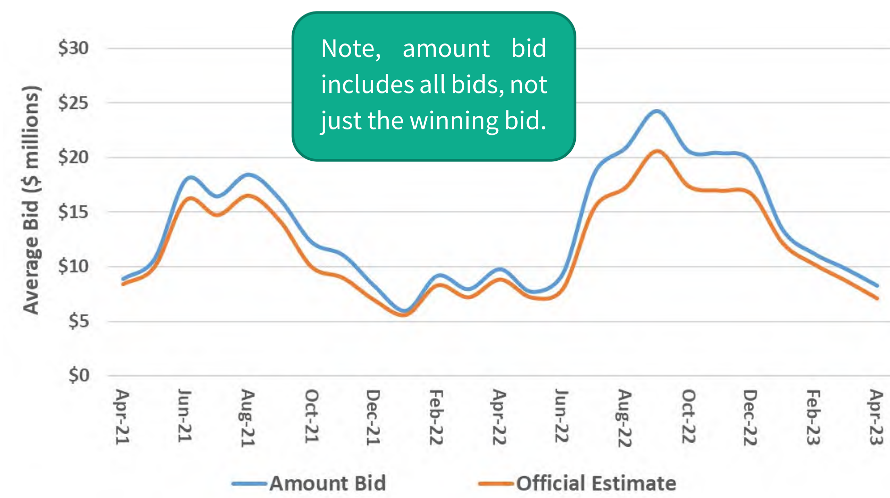
Source: TBG calculated from data provided by FDOT Office of the Work Program and Budget.

[1] National Association for Business Economics

Bid Data

In economic terms, the expected value is the average of all bids. In this analysis, the average of all bids, or the mean, is compared to the official estimate. In the third quarter of 2023 (January 2023 – March 2023), the average deviation of bids from the estimate was 11%. This is a decline from the much larger spread of 19% seen last quarter (**Figure 3**). The spread in April 2023 is similar. Excluding contracts exceeding an official estimate of $100 million from the analysis finds that for the third quarter of FY 2023, the rolling average of all bids (not winning bids) was still 11% higher than the official estimate. For comparison, the spread in the previous quarter was 4%.

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

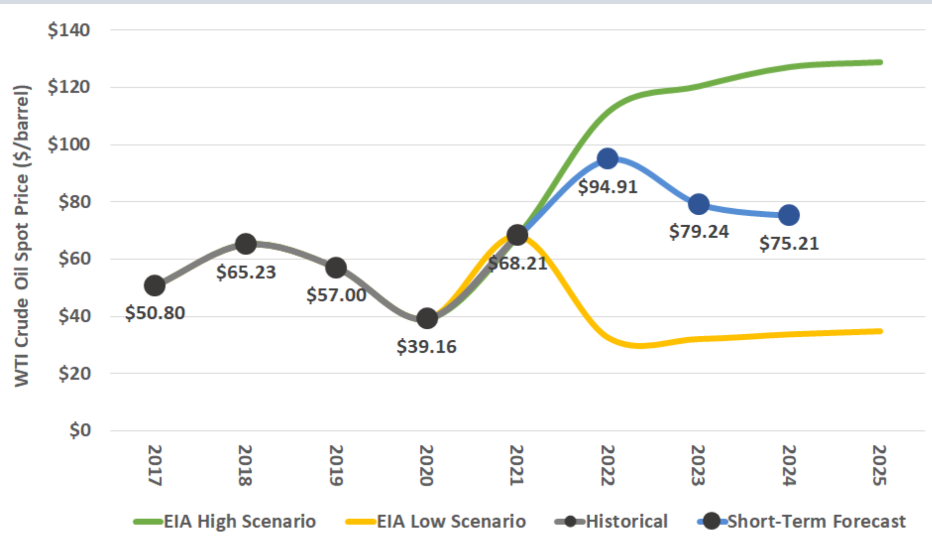


Source: FDOT, TBG Work Product.

Energy Prices

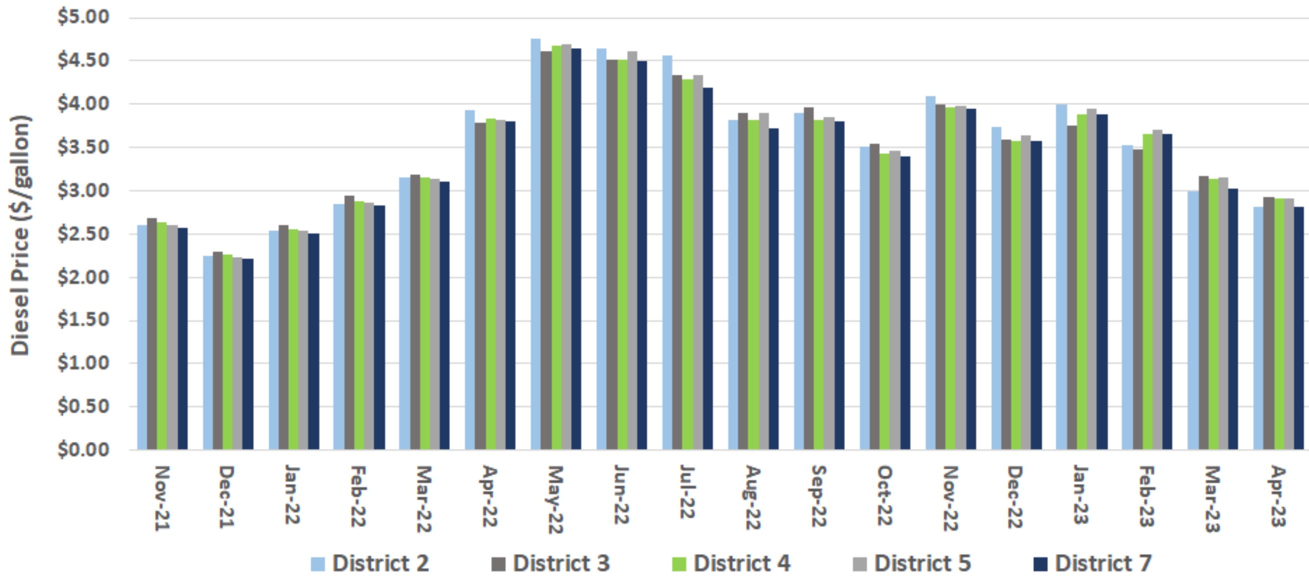
The U.S. Energy Information Administration (EIA) April 2023 Short-term Outlook forecasts 2023 U.S. crude oil prices at $79 per barrel by year-end, a 3% increase from the previous report (**Figure 4**). For 2024, EIA estimates a slight decline to $75 per barrel under current economic conditions. Prices rose 10% in April 2023 compared to the previous month. However, compared to a year ago, U.S. crude oil prices are down 21%. Florida diesel prices have declined significantly through the first four months of 2023 to $2.88 per gallon. Compared to April 2022, the April 2023 price is 25% lower. Price quotes from suppliers at terminals around the state hovered around $3.00 per gallon in April 2023, a noteworthy decline from the $4.00 per gallon cost reported in January 2023 (**Figure 5**).

Figure 4. Monthly Crude Oil Price, 2017 to 2025



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

Figure 5. Average Diesel Price by District



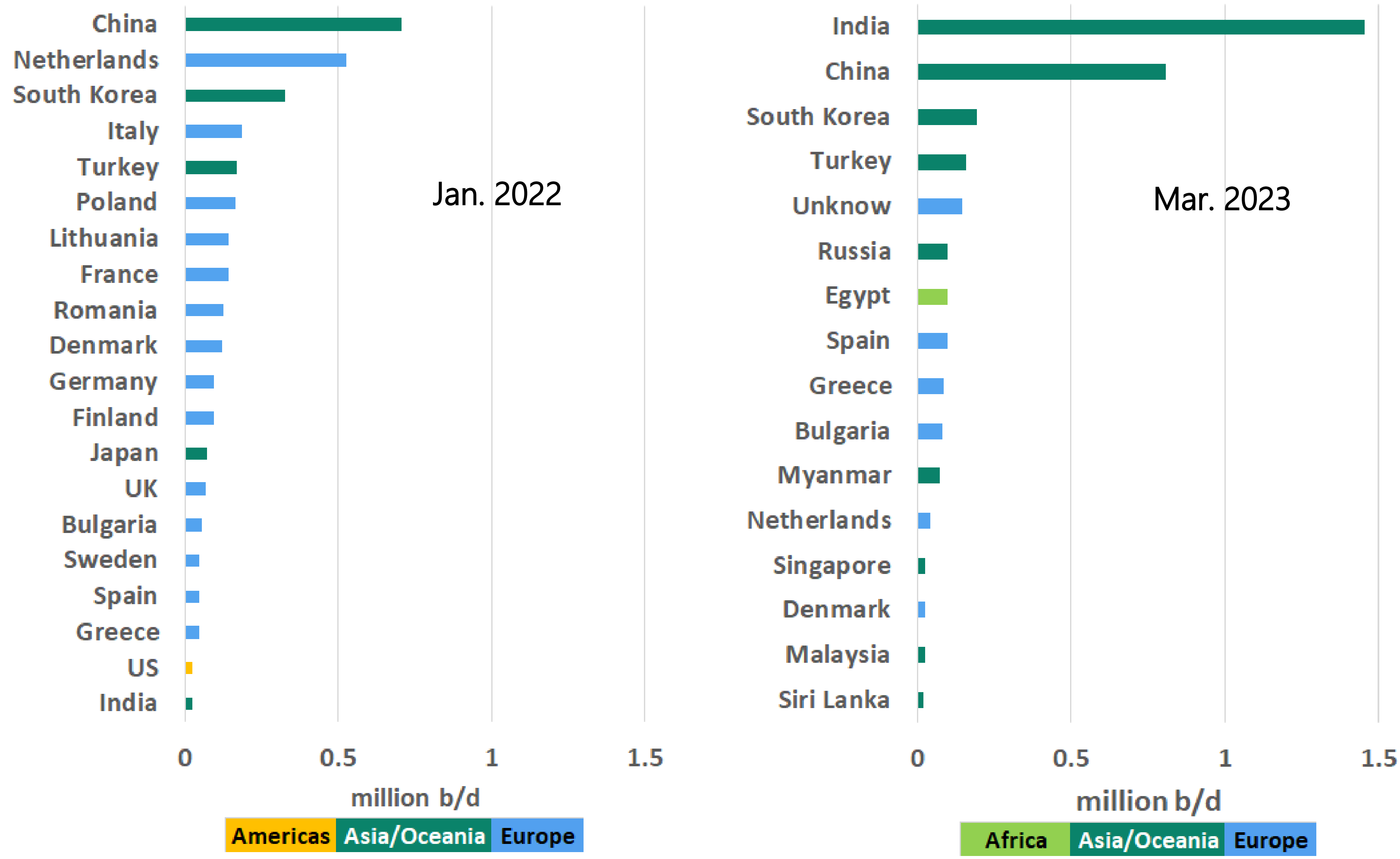
Source: FDOT, TBG Work Product (D1 and D6 terminals did not report data).

The shift in Russian crude oil exports that began in December 2022 due to western sanctions over the war in Ukraine is largely complete. India has taken over as the largest importer of Russian oil in the world, followed by China, South Korea, and Turkey (**Figure 6**). However, according to the International Energy Agency (IEA)[2], Russia's estimated revenue from oil exports is still down 43% compared to the same period last year as Russia must now sell its oil to a smaller pool of customers who are able to negotiate greater discounts.

Another connected change in global oil markets was the unexpected announcement by the Organization of the Petroleum Exporting Countries and its allies (OPEC+) on April 2 the group would slash crude oil output by 1.66 million barrels per day from May 2023 through December 2023. On top of the 2 million barrel-per-day reduction announced in October, OPEC+'s cuts may reduce net global oil supply by about 400,000 barrels per day as other producers attempt to compensate by increasing output. Crude oil demand is expected to climb by 2 million barrels per day in 2023, but under the current circumstance, supply is only expected to increase by 1.2 million barrels per day. The mismatch in supply and demand will likely lead to renewed instability in the crude oil industry as OPEC+ members, including Russia, raise prices amid an increasingly constrained supply and high demand scenario. The U.S. is a net exporter, and supply is not expected to be an issue, but oil prices are global – so supply issues elsewhere still affect U.S. oil prices.

[2] Russia's oil exports are back to pre-war levels | CNN Business

Figure 6. Russian Crude Oil Exports by Destination



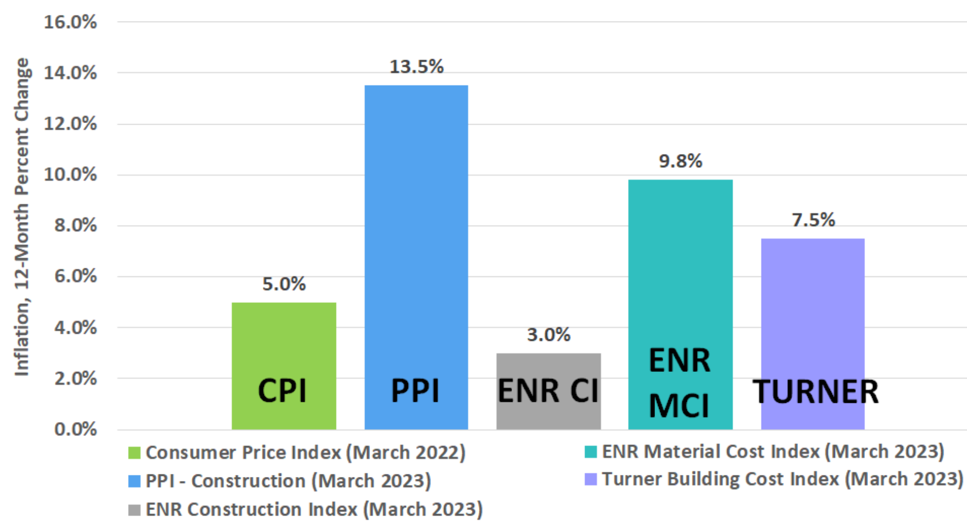
Source: S&P Global[3].

[3] [Interactive: Global oil flow tracker | S&P Global Commodity Insights (spglobal.com)]

Inflation

Construction materials remain elevated compared to a year ago, while general inflation has markedly declined from 2022 highs. The Fed's revised economic projections as of March 2023 increased inflation estimates to 3.3% (vs. 3.1% in December's projections) for calendar year-end 2023. Per **Figure 7**, inflation indices ranged between 3.0% to 13.5%, last quarter. It is important to note that the ENR indices shown below include housing-related materials such as lumber, and as a result are not fully reflective of highway construction materials price trends.

Figure 7. Inflation Estimates, March 2023



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

Funding and Regulation

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

USE OF PHOSPHOGYPSUM AS AGGREGATE

In April 2023, a new bill was introduced in the Florida legislature that would require FDOT to conduct a study to evaluate whether phosphogypsum can be used as aggregate material in road construction. The bill summary indicates that, according to the Florida Industrial and Phosphate Research Institute, there are 1 billion tons of phosphogypsum currently stored in large piles called stacks around the state, with 30 million new tons generated every year. However, if the bill passes and the material is seen as a viable alternative to road base, it would require approval from the U.S. Environmental Protection Agency (EPA) as it is currently prohibited for road construction projects. Therefore, this would not be a short-term solution for aggregate supply.

WATERS OF THE UNITED STATES

The new rule, which passed in December 2022 and took effect in March 2023, remains contentious. In April, President Biden vetoed a resolution that would have rolled back the new rule, but a Federal judge also blocked the rule from taking effect in 24 states (Florida is included). As a result, uncertainty is expected over the upcoming months. On the other hand, the Florida Department of Environmental Protection (FDEP) indicated in February that to avoid extra processing times during WOTUS determinations, applicants should consider all wetlands and surface waters that meet existing Florida statute requiring wetland delineation, to be under the rule's jurisdiction, unless the applicant can produce documentation demonstrating the waters are not WOTUS.

DRONE BANS

Starting April 5th, 2023, the Unmanned Aerial Systems (UAS) Minimum Security Requirements rule went into effect. This rule forbids Florida government agencies from purchasing or using drones from manufacturers in a foreign country of concern. China, which is where many drones are sourced from, is part of the list.

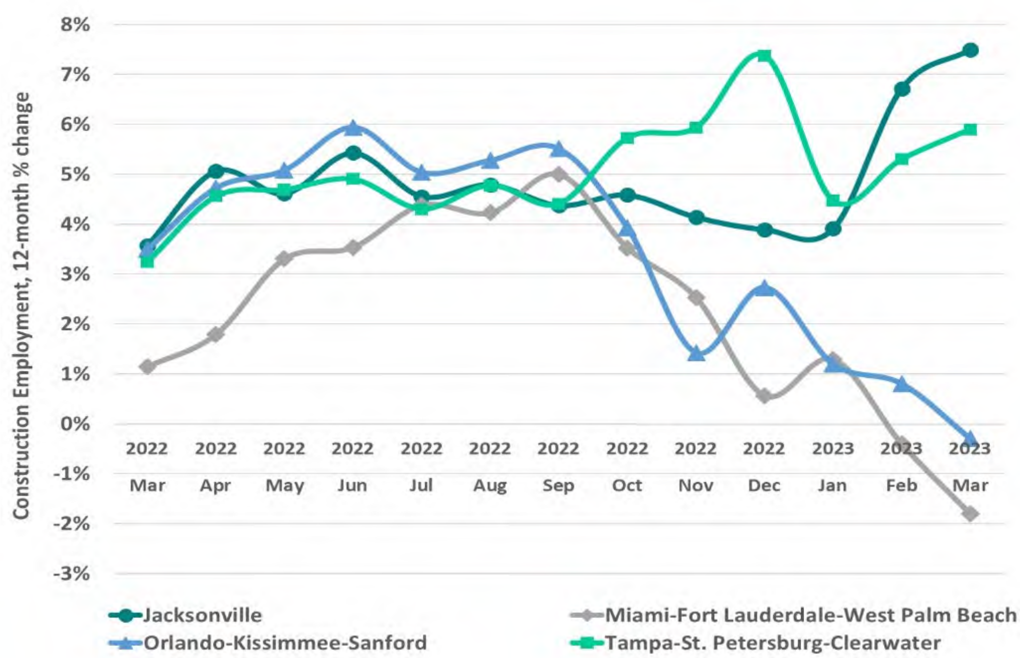
BUILD AMERICA, BUY AMERICA (BABA)

The Office of Management and Budget (OMB) put out a request for comments in February 2023, renewing uncertainty over how BABA requirements may be applied to construction materials like aggregate, asphalt, and cement. Existing exemptions for these materials were thought to be settled. Comments on the proposed rule were due March 13, 2023.

Construction Employment

Statewide construction employment increased 2.6% in March 2023, year-over-year (**Figure 8**). Construction employment grew in the Jacksonville and Tampa metro areas, but continues to decline in Miami and Orlando. While residential housing construction has slowed down in many parts of the state, non-residential construction continues to drive growth. In areas with declining construction employment, wage increases are necessary to secure workforce availability – which further contributes to wage inflation and overall inflation. Additional information on economic conditions and employment forecasts is provided in **Appendix A**.

Figure 8. Changes in Construction Employment in Major FL Markets

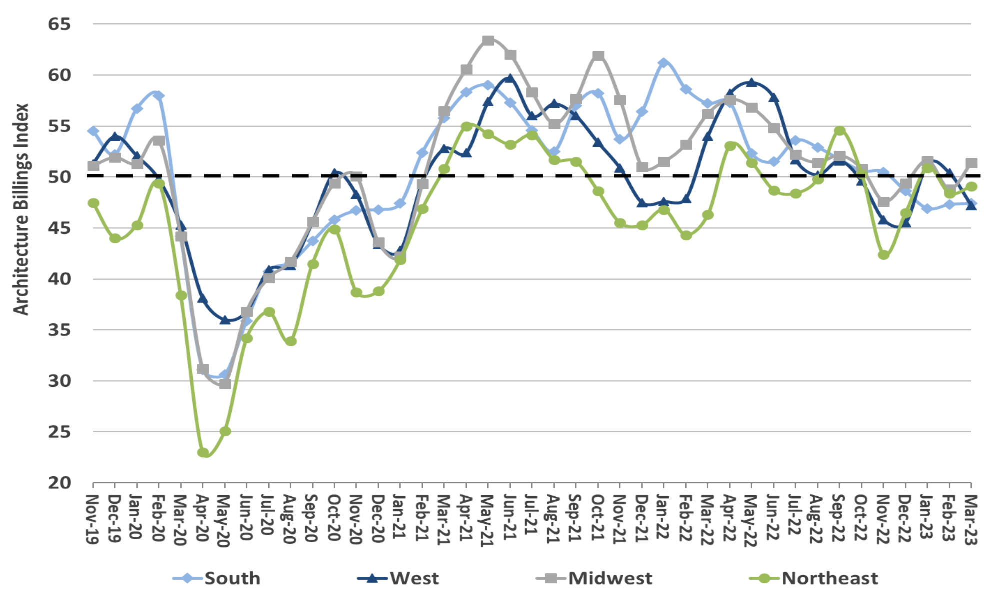


Source: Bureau of Labor Statistics

Billings

The Architecture Billings Index (ABI)[4] is a lagging indicator (between 9 to 12 months) of nonresidential construction activity. Nationally, the ABI score was 50.4 in March, indicating that a slight majority of architecture firms saw increasing billings at their firms. However, this was largely driven by firms in the Midwest, the only region with a score above 50 last month. The South region remained stagnant around the high 40s, while the West and Northeast fared about the same. These results are indicative of the overall slowdown of the economy (**Figure 9**).

Figure 9. ABI Billings Index, Nov. 2019 – Mar. 2023



Source: American Institute of Architects, Architecture Billings Index.

[4] Architecture Billings are considered an important indicator of future construction activity, which generally follows 9-12 months after billings activity is reported. An index score below 50 indicates a decline in firm billings, while a score above 50 indicates an increase.

Rail

Through March of 2023, CSX's headcount for train & engine employees is 7,491, a 6% increase year-over-year, continuing the trend seen at the end of 2022. In their Q1 2023 financial report, CSX reported an increase in fuel expenses by 10% and an increase of 50% in fuel surcharges revenues. Additionally, CSX's average weekly terminal dwell time in Jacksonville has decreased and fluctuated between 16 and 21 hours, aligned with the company's overall system dwell times. However, dwell times in Waycross, GA have remained in the mid 20 hours, representing higher than normal times compared to other major terminals.

Gulf & Atlantic Railways, which operates 430 miles along the I-10 corridor in Florida and purchased from CSX in 2019, recently acquired three short line railroads in Indiana, Illinois, and Ohio. In addition, the railway operates a branch line from Tallahassee to Atapulgus, Georgia and connects with AN Railway and CSX.

There has been no further action on the Short Line Railroad Relief Act that was introduced in Congress in December 2022 at this time. The bill would authorize funds for short line equipment and facilities that suffered or are at risk of suffering catastrophic damage due to an emergency. In February 2023, six rail cars carrying drywall and 30,000 gallons of liquid propane gas derailed in Bradenton. According to Seminole Gulf Railway's VP, the incident was caused by track-related issues. The railway was closed for repairs and the removal of upended rail cars, causing service disruptions.

Flash floods in Fort Lauderdale impeded rail service, shipments out of Port Everglades, and trucking activities in mid-April, disrupting fuel deliveries and commodity imports. As a result, President Biden has declared this portion of South Florida a disaster area. The declaration will allow Broward County residents, businesses, and local governments that suffered damage during the flood to be eligible for loans and other federal relief.

ASPHALT

Summary

- Binder prices have continued decreasing in 2023, but only marginally. However, HMA producers in interviews indicated that this past quarter, they have increased prices between 10% and 25%.
- Producers continue reporting issues securing raw materials as major projects are absorbing large amounts of resources and causing bottlenecks.
- Shipping costs from the Gulf Coast may increase due to high demand for Jones Act compliant ships.

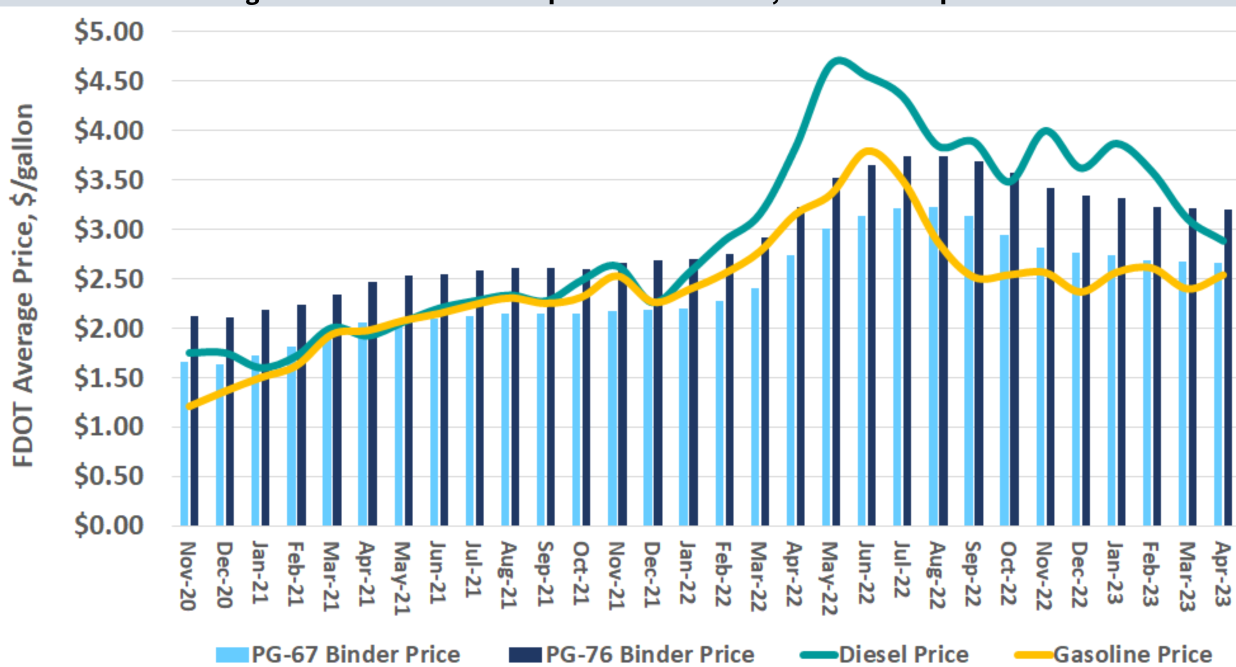
FDOT Impacts

- Continued high rates of spending in the heavy and civil construction sector are supporting high asphalt bids and will continue to do so. However, declining fuel and binder prices should provide some measure of relief.
- Year-to-date FDOT HMA bid price estimates rose 5.6% in 2023 Q3 compared to 2023 Q2 weighted average prices.
- Current models expect year-end results about 12% higher than FY 2022, which would require bids to moderate for the last quarter of the fiscal year. Year-to-date, FY 2023 prices are overshooting the best estimate model by about 8%.

General Trends

FDOT fuel prices have declined significantly in April 2023, compared to the summer of 2022 (**Figure 10**). However, binder prices have remained about 22% higher than the November 2021 benchmark period. Although industry expects global fuel markets to continue to moderate in 2023, binder costs are not declining at the same rate as fuel costs. Demand for asphalt paving is likely to continue climbing over the next few years due to significant increases in infrastructure funding, supporting higher prices.

Figure 10. FDOT Fuel and Asphalt Binder Prices, Nov. 2020 – Apr. 2023



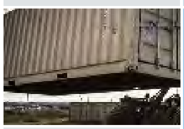
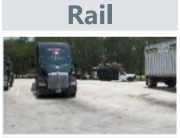
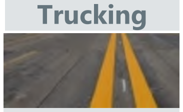
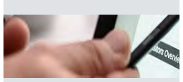
Source: Source: TBG Work Product, FDOT Fuel & Bits Index.

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

SUPPLY CHAIN VARIABLES > ASPHALT PAVEMENT MATERIALS

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

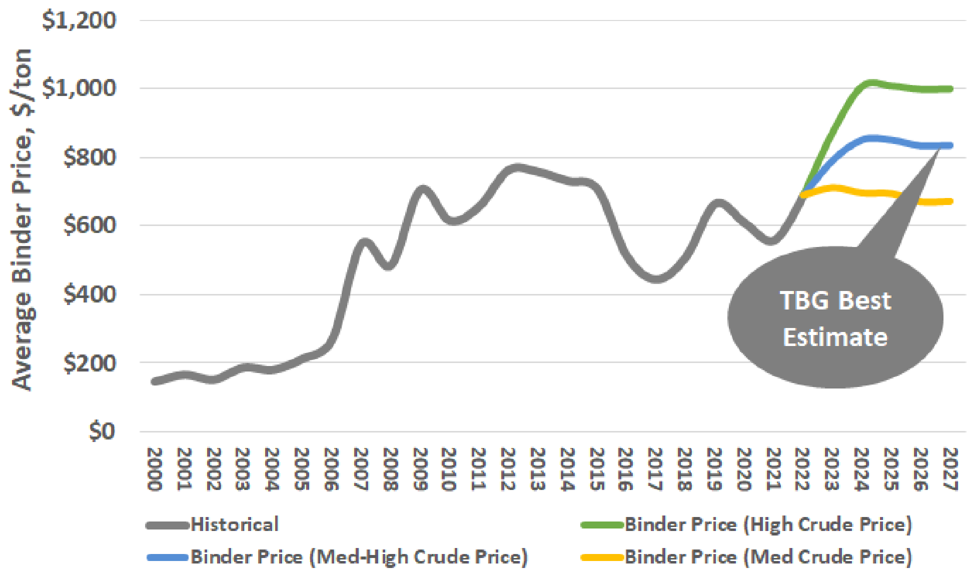
Table 1. Supply Chain Summary: Asphalt Materials

 Aggregate	The U.S. Geological Survey (USGS) reports that Florida's crushed stone production rose 10% in 2022. Securing raw materials in a reliable manner is still a regional issue. Interviews indicate shortages of 57 and 89 stone to be a major concern in the northern half of the state with suspended shipments reported in other parts of the state. Producers report pricing power - raising prices 10-20% this quarter - in an environment of continued strong demand, amid expected transition to lower demand, taking advantage of current import disruptions.	↑
 Refinery Capacity	Refinery utilization in the Gulf Coast has recovered from disruptions in December 2022 and have been around between 86% and 94%. Industry reports indicate higher than expected maintenance during the Spring, which could cause temporary disruptions. Costs have declined from highs seen in 2022, but they will continue to be affected by geopolitical factors, such as OPEC+ decision to cut production until the end of 2023. According to the EIA, U.S. refinery production declined 0.2% in 2022, but asphalt supplied to the East coast rose 9%, indicating high competition for resources.	↑
 Asphalt Binder	Unmodified (PG 67 & lower) asphalt binder prices continued the downward trend seen at the end of 2022. In 2023 they have declined 3%. Argus reports that U.S. asphalt inventories are higher than usual at this time of the year. Rack binder prices in Jacksonville, Miami and Tampa have declined 8%, 7% and 1% year-to-date, respectively. Year-over-year, they have declined 1%, 2% and 4%, respectively. Global oil supply-demand dynamics are changing with Russian oil sanctions. Interviews have indicated a problem with freezing at the port in Nova Scotia causing a redesign in mixes with different aggregate from Georgia.	↑
 Polymers	With very few suppliers, polymers are a source of vulnerability. U.S. production of resins declined 7% in February vs. the previous month but still increased 1% year-over-year . The Chemical Regional Production Index rose in February 2023 after multiple consecutive months declining, indicating a positive trend in chemicals production. Reference prices and volumes from Q4 earnings of a publicly traded company for many polymers continued seeing double digit declines (up to 50%). The average cost per ton of ethylene production also declined 20% quarter-over-quarter, but increased 1% year-over-year.	↑
 Imports	Reports indicate that congestion at ports has decreased significantly. Data from the U.S. International Trade Commission shows no bitumen products imports to Florida ports since November 2022. However, competition for Jones Act ships is expected to increase as exports of renewable diesel from the Gulf coast are expected to increase in 2023. The CEO of a Florida-based shipping company indicated that by the end of 2023, they expect about 20% of their medium range tankers to be used for these shipments. This will increase competition and shipping prices for barges from the Gulf Coast to Florida.	↓
 Rail	In the fourth quarter of 2022, tons of asphalt products shipped declined 2%, but revenue increased 11%, year-over-year. In 2022, tons shipped declined 8%, but revenues rose 4%. Both indicate an increase in prices. CSX has recently opened discussions with Miami-Dade officials about potentially adding freight lines back to 26 miles of now dormant lines. Anecdotally, a producer noted longer periods of empty material yards.	↑
 Trucking	Asphalt suppliers continue facing issues with trucking costs. Diesel prices have decreased significantly in 2023 and were down 25% year-over-year. Trucker shortages still persist, but overall demand has decreased as the economy slows.	↑
 Pavement Markings	As mentioned in the polymers section, supply of plastics has decreased and prices have recently increased, contrary to what some expected to happen early in 2023. While the Chemical Regional Production Index rose in February 2023, production of coatings, adhesives and other specialty chemicals was lower. Overall, pavement markings and other plastics-based/petroleum-based ancillary products remain vulnerable to current supply chain issues and volatility in 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 2.6% year-over-year, but with regional variation. Interviews reported mixed opinions on whether labor availability is improving or worsening. Overall, they reported that not much has changed this quarter.	↑
 Competition	No changes in competition during this quarter. In the last report it was reported that an additional plant was recently permitted in Orange County. This project is to expand capacity from 600,000 tons per year to 800,000 to meet increased demand. Additional plants would increase competition for FDOT projects. While competition from other sectors has slowed down, it hasn't been significant enough to free up resources.	=

Asphalt Binder

Although the changeover of Russian and European oil contacts was relatively smooth this quarter, the global crude oil market remains volatile. Further, asphalt binder prices continue to lag behind decreases in crude oil costs. 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 considered unlikely at this time, barring a major recession or major hit to Florida's economy. Statewide binder price outlooks are shown in **Figure 11**.

Figure 11. FDOT Average Binder Cost, FY 2023 Q3 Forecast



Source: TBG calculated from FDOT Fuel & Bits Index.

Asphalt Forecast

Asphalt prices are projected in **Table 2** 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. The Year-to-Date point (July 2022 through March 2023) shows preliminary FY 2023 costs overshot best estimate models by about 8% (**Figure 12**), and a 14% increase over last quarter. Bid activity has jumped to the upper bound estimate.

Updated binder price forecasts and macroeconomic variables show that volatility is projected to continue over the next few years. The best estimate previously predicted HMA weighted average prices would top FY 2022 record highs in FY 2023, followed by a decrease in FY 2024 due to recessionary conditions. Reset with current data, the decline in FY 2024 is no longer considered likely, barring a drastic recession or major hit to Florida's economy, and reflecting continued strong demand and a seller's market for asphalt.

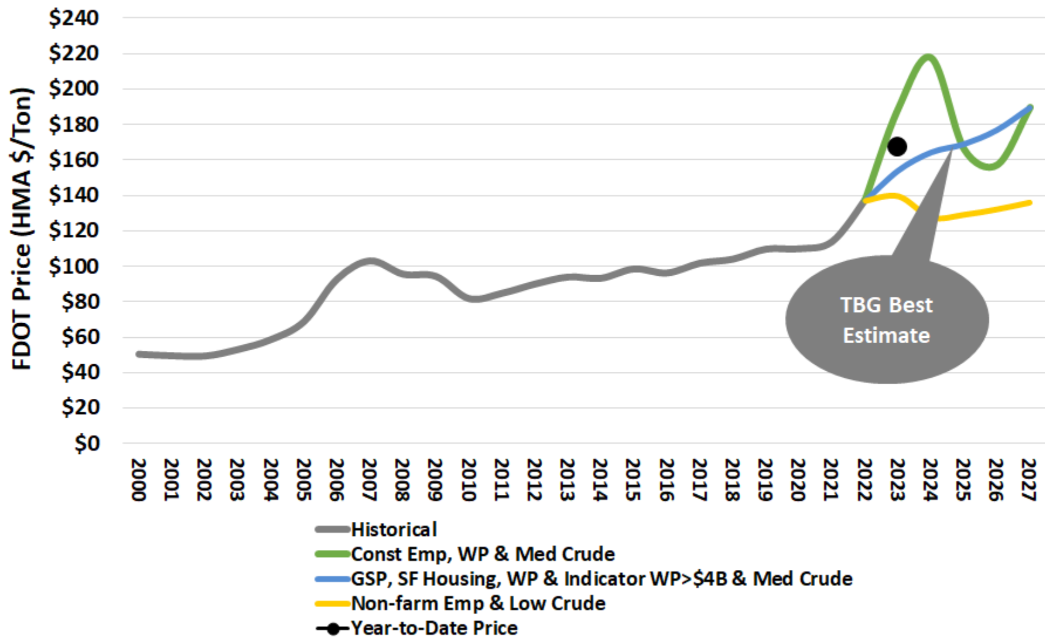
The lower bound scenario reflects drastic recessionary conditions, with asphalt prices resetting to 2021 levels. The upper bound estimate reflects an increased work plan, and increased uncertainty – thus bid volatility - in the market.

Table 2. FDOT HMA Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price HMA, $/Tons	$137.27	$154.33	$164.56	$169.23	$177.18	$189.71
Percent Change, %	20.6%	12.4%	6.6%	2.8%	4.7%	7.1%

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

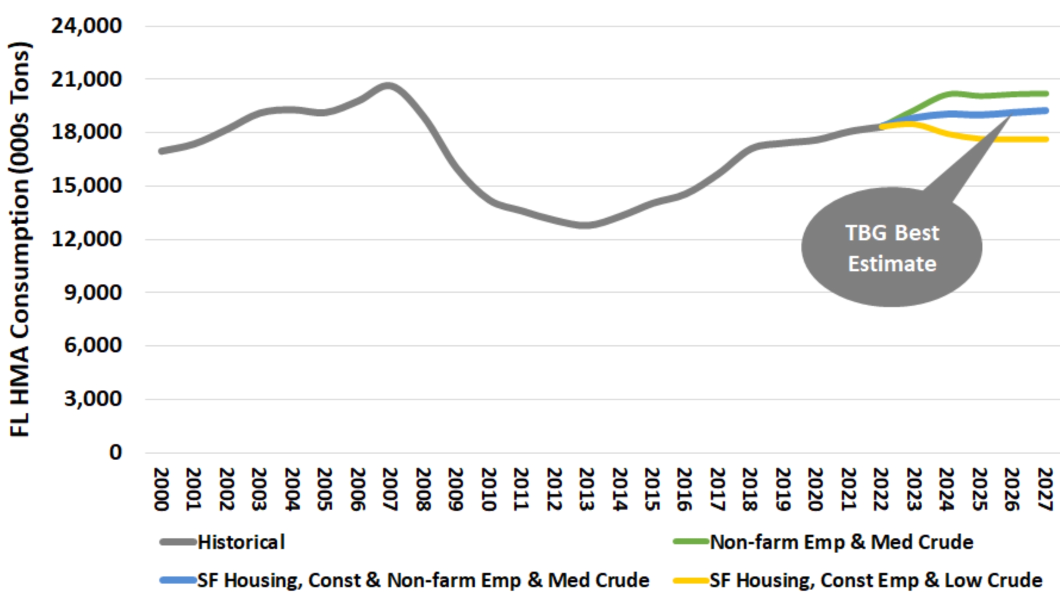
Figure 12. FDOT HMA Price, FY 2023 Q3 Forecast



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

Figure 13 provides a forecast of Florida HMA consumption. The best estimate is based on current economic outlooks, with macroeconomic trends driving increases in production. The slowdown in residential construction markets is expected to be more than offset by state and federal infrastructure funding over the next few years. While economists currently predict the U.S. will not fall into recession until the end of 2023 at the earliest, severe recessionary conditions would shift the trajectory downward, following the lower bound.

Figure 13. Florida HMA Consumption, FY 2023 Q3 Forecast



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

Concrete

Summary

- Producers are capitalizing on the import disruptions and extensive infrastructure spending, to capture COVID losses and increased operating margins while they can.
- Cement prices continued showing significant increases. Producers announced price increases that are expected to kick in for summer 2023.
- According to new data, fly ash production increased in 2021 (the most recent data available). However, it is still expected that more coal-fueled plants will close within the next few years, decreasing availability. SEFA, which harvests fly ash, sold to Heidelburg in a large transaction expected to bring additional fly ash sources to market.
- Cemex and Vulcan had issues regarding the use of Vulcan's port facilities in Mexico.

FDOT Impacts

- Year-to-date weighted average prices have come down 13.4% from $1,339 per cubic yard in Q2 of 2023 to $1,160 in Q3. Year-end results are expected to show a full-year weighted average price close to current pricing, reflecting a 22% increase over last year.
- While FDOT's bids for structural concrete pay items are still presently overshooting forecasts, the decline between recent quarters indicates there's a chance for further moderation in bids.
- Producers report continued issues with rail reliability, affecting lead times and prices.

General Trends

While overall cement consumption is expected to decline in 2023 by about 3.5%, imports of cement have increased significantly over the past few years. According to USGS, imports accounted for 22% of all cement shipments in 2022, up from just 7% in 2012. The leading suppliers were Turkey, Canada, and Mexico (**Figure 14**), with Texas, California, and Florida accounting for one third of U.S. cement shipments in 2022 (**Figure 15**). As demand continues to increase, a higher volume of imported cement may be needed. At this writing, final Build America, Buy America guidance regarding foreign shipments of cement has not been published.

Figure 14. U.S. Cement and Clinker Imports by Country of Origin, 2022

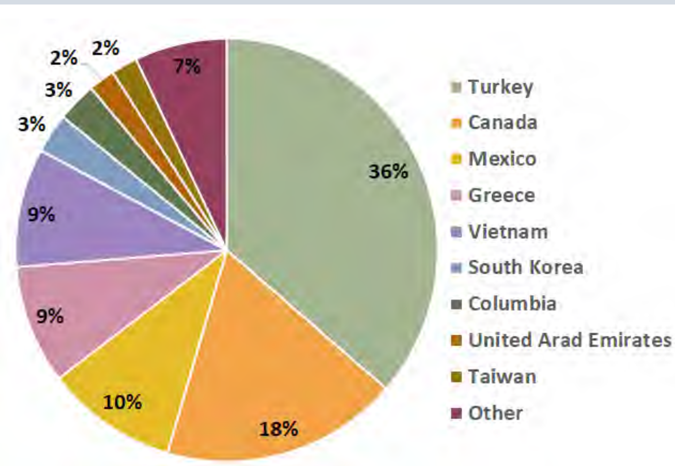
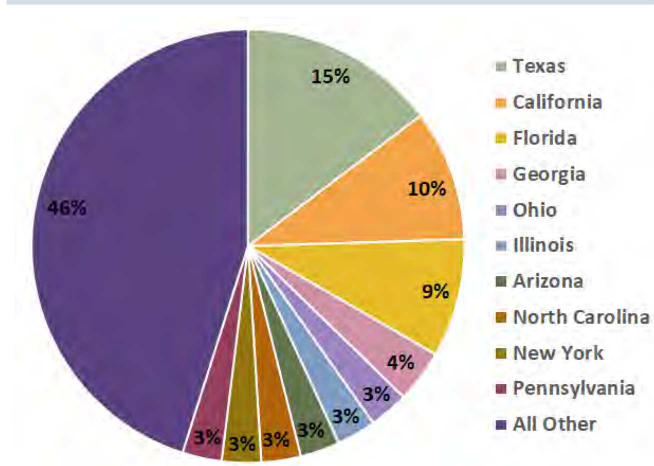


Figure 15. Cement Shipments by Destination, 2022

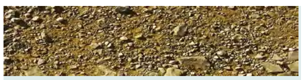
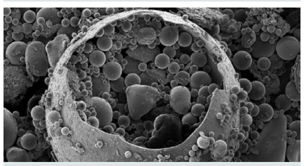
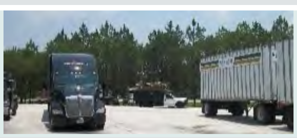
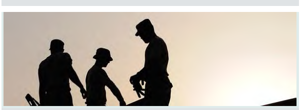


Source: Concrete Financial Insights, USGS.

SUPPLY CHAIN VARIABLES ➤ **CONCRETE MATERIALS**

Table 3 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 3. Structural Concrete Supply Chain Variables & Current Status

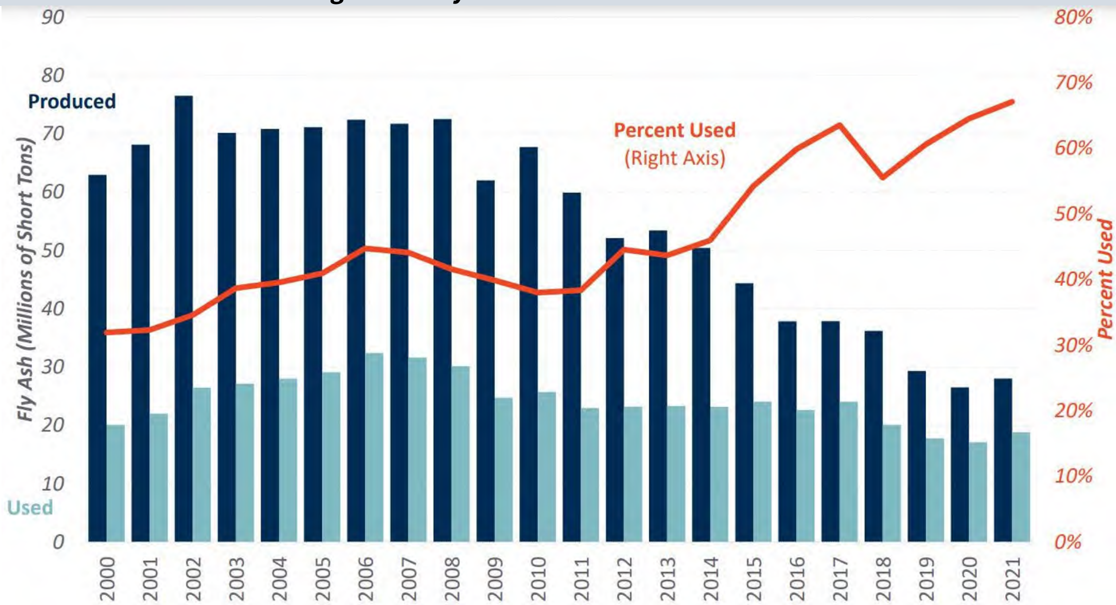
 Cement	As expected, cement prices reported by publicly traded companies showed significant increases for 2022, ranging between 14% and 22%. Volumes in 2022 had slight growth (less than 5%), but decreased in the fourth quarter of 2022 due to weather issues. Suppliers expect prices to continue increasing in 2023. Interviews indicated that cement is still the preferred option to replace fly ash. Cemex and Calica, a subsidiary of Vulcan, had a confrontation earlier in the quarter over the use of Vulcan's port facilities in Mexico. Cemex uses the terminal to transport cement product. It was reported in late March that both companies reached a temporary agreement.	
 Aggregate	Aggregate availability, increased pricing, and transportation continue being an issue. General issues are covered in the Aggregate section.	
 Fly Ash	Fly ash costs increased during the quarter. Supply issues continue, but they have not worsened. While it was previously reported that Seminole Electric was expected to shutter one of their coal-fired units for a natural gas-fired plant in 2023, EIA records show that the new shutdown date is January 2024. Additionally, the share of coal generated electricity in the U.S. continues declining. In 2022, it declined from 23% to 20% and the EIA expects the share to fall to 17% in 2023.	
 Rail	Producers report continued issues with rail reliability that worsen over each quarter. In the fourth quarter of 2022, CSX shipments of cement products declined 12% year-over-year and revenues declined 2%. For the full year, shipments declined 5% and revenues rose 1%, reflecting increased prices and the housing slowdown.	
 Truck	Reports indicate that trucking availability has improved and spot rates have continued declining. Additionally, diesel has decreased since January 2023, all of which lower producers' costs. However, producers indicated same conditions for truck transportation during this quarter.	
 Labor	Producers continue reporting issues with finding skilled labor. Statewide construction employment has increased 2.6% year-to-date, but growth is uneven across the State. Expectations are for continued labor shortages through 2025.	
 Competition	Two new plants are under review for FDOT's producer approved list (in District 1 and in Alabama). Additionally, 12 new non-structural and structural concrete, and precast plants were recently added and are under review. In FY 23 the number of plants in the approved list has increased by 2%. Smaller suppliers continue reporting that difficulties 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.

Raw Materials

The American Coal Ash Association (ACAA) recently published the 2021 Production and Use Survey Report. The results show that there were 77 million tons of coal combustion products produced in 2021, 46.5 million of which were used (**Figure 16**). Of the total, 5.6 million were used for blended cement/feed for clinker, a 14% increase from the previous year. The majority of coal combustion products used for to produce cement in 2021 were fly ash (59%), synthetic gypsum (26%), and bottom ash (14%). While the production of boiler slag increased 44%, its use in cement is still marginal at only 2%.

Figure 16. Fly Ash 2021 Production and Use



Source: ACAA.

Additionally, Heidelberg Materials recently entered into an agreement to buy the SEFA Group. Headquartered in South Carolina, the company is the largest recycler of harvested fly ash in the U.S. Per the release statement, they supply fly ash to 800 concrete plants in 13 states, including Florida. In other supply news, Titan expects the expansion of its terminal in Tampa, which began late in 2021 and includes the construction of a new 70,000-ton capacity dome, to be completed during the second half of 2023. This will help to increase supply for markets in Florida.

Concrete Forecast

Concrete bids through the most recent quarter (ending March 2023) overshot the best estimate by about 5%; see the black dot on **Figure 17**. Previous quarterly bids would have reset the estimate trajectory to more than $1,300 by year-end, but recent bids have moderated the year-to-date estimate to $1,100 – still up double digits from expectations one year ago. Bid behavior has shifted to the upper bound estimate. The upper bound reflects worsening input cost scenarios and continuing high infrastructure spending, now ending up over $1,400 per cubic yard by 2027.

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. provides the updated forecast weighted average price for concrete. **Table 4** summarizes updated model results.

While the best estimate model previously predicted a dip in 2024 due to potential recessionary conditions, we now expect prices to remain high with anticipated increases in infrastructure spending. The lower bound scenario reflects recessionary conditions, which U.S. economists anticipate occurring either in late 2023 or 2024, or a major hit to the Florida economy.

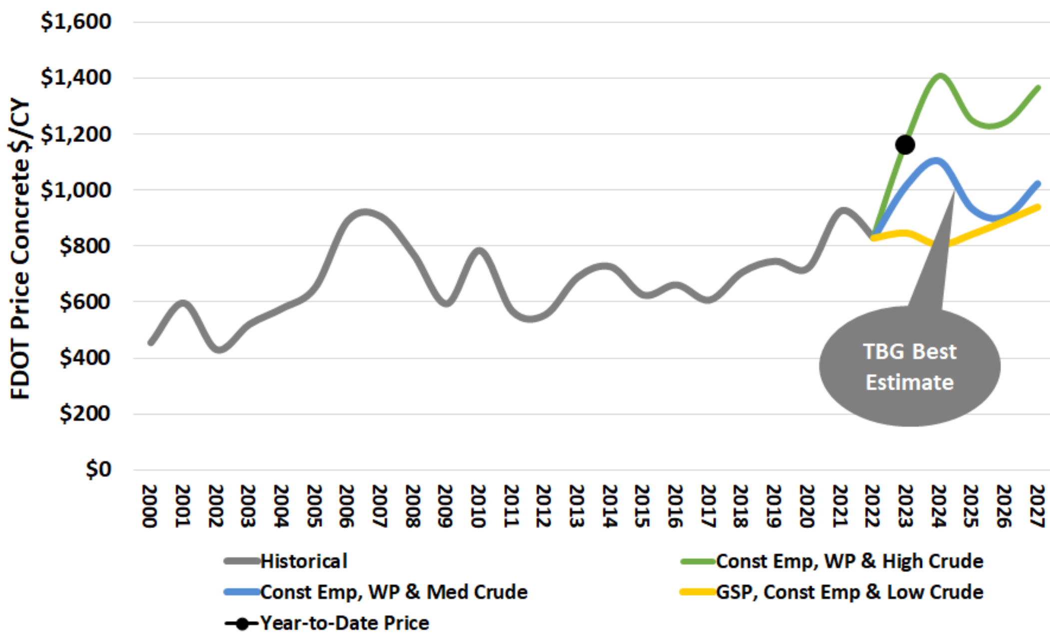
Figure 18 shows the output of several quantity models forecasting statewide consumption of concrete and the scenario identified as the best estimate.

Table 4. FDOT Concrete Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price Concrete, $/CY	$829.82	$1,018.24	$1,103.74	$934.21	$905.97	$1,023.32
Percent Change, %	-10.4%	22.7%	8.4%	-15.4%	-3.0%	13.0%

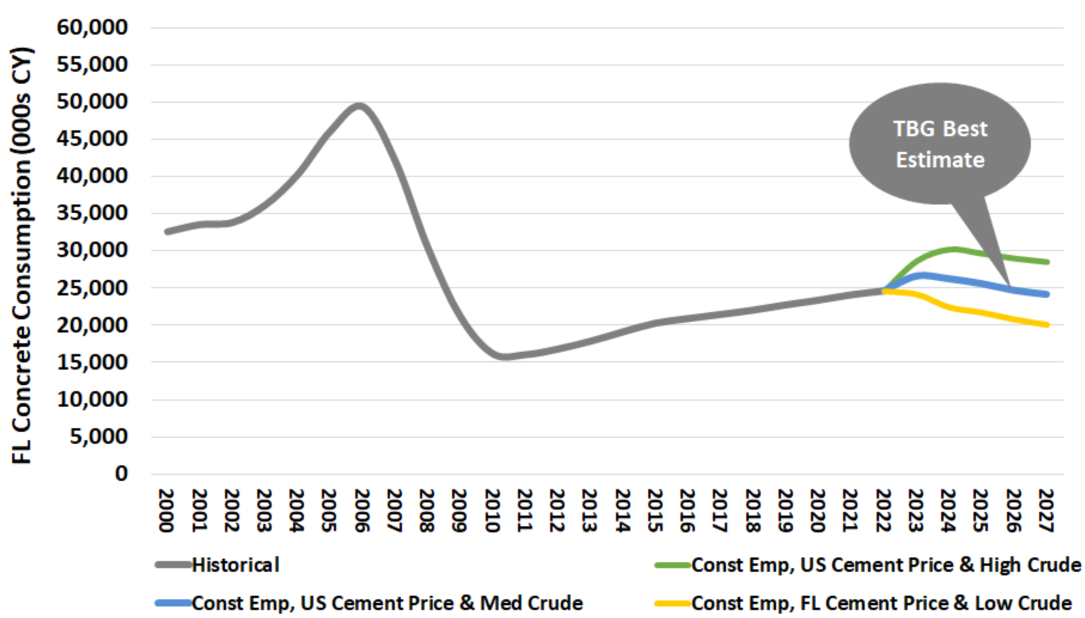
Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.

Figure 17. FDOT Concrete Price, FY 2023 Q3 Forecast



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

Figure 18. Florida Concrete Consumption, FY 2023 Q3 Forecast



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

Steel

Summary

- Price changes for different steel products varied, but some have increased in an unexpected way in 2023.
- Nationally, steel production and utilization rates has been stagnant in 2023 and is still 6% down year-over-year. Ukraine War impacts continue to create global instability in metals markets, which will affect overall pricing. China has ramped up production of steel at extremely discounted prices, which has created its own volatility.
- There are mixed perceptions of what demand will be for the rest of 2023. Some see strong demand, but others expect a decline, which is affecting supply and prices.

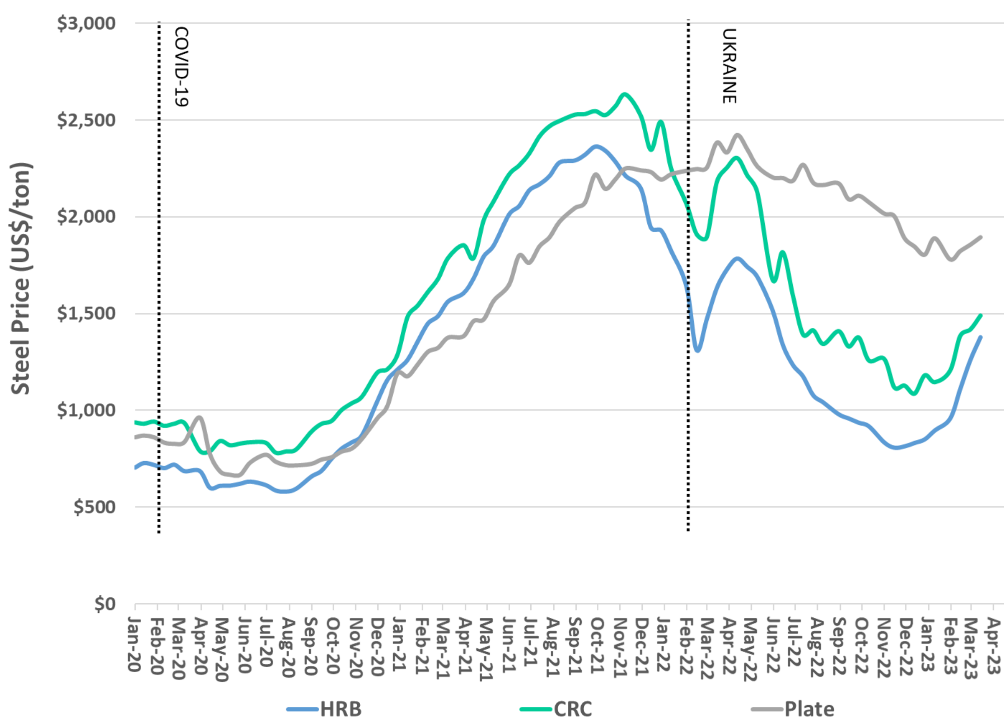
FDOT Impacts

- Fabricators report that unexpected cost increases for some steel products led to large bid price increases to offset potential loses. For more stable products, fabricators increased bid prices by about 2.5% in March 2023 on average, after a period of lower bids.
- Year-to-date reinforcing steel bids, however, have declined below expected estimates.
- According to interviews, perception of the labor market is mixed as some believe conditions have improved, but others believe that conditions are getting worse.

General Trends

Even though U.S. steel prices are far from highs seen in 2021, they have increased once again in 2023 (**Figure 19**). Since January 2023, hot-rolled band (HRB), cold-rolled coil (CRC) and plate prices have increased 64%, 30%, and 11%, respectively. Year-over-year, they have decreased by 20%, 32% and 14%. Supply has decreased as some plants were idled during the second half of 2022 in anticipation of lower demand, but as demand has instead increased, so have prices. Some reports indicate that producers were not expecting these price increases.

Figure 19. U.S. Steel Pricing, 2020 – 2023



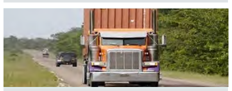
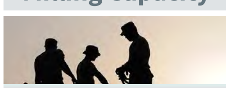
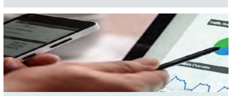
Source: Steel Benchmarker.

Suppliers indicate that lead times have declined, especially for basic steel aluminum and stainless-steel materials. However, some materials like bolt hardware and specialty parts can unexpectedly be difficult to obtain.

SUPPLY CHAIN VARIABLES > **STEEL**

Table 5 shows a summary of select variables that impact the steel supply chain and their current status.

Table 5. Supply Chain Variables for Structural Steel

 Raw Materials	Prices for hot-rolled steel and iron declined significantly through the end of 2022, but they have increased significantly in 2023 (64%). Iron has been more stable in 2023 with smaller increases in 2023 (5%) and a 16% decline year-over-year. returning to around 2019 levels. Rebar prices have also declined, but not to the same extent as hot-rolled. Competition for resources continues being high.	↑
 Scrap Steel	Scrap steel prices have followed the trend of other products with published reports indicating year-over-year declines in 2022 (-24%), but 2023 increases (21%). Some producers believe that under current market conditions, price increases are unsustainable and temporary.	↑
 Galvanizing Steel	Global zinc prices have continued decreasing. From January to March 2023 prices decreased 10% and year-over-year they decreased 25%. Interviews indicate that lead times have improved. The Ukraine War was cited in interviews as a continued source of uncertainty regarding zinc availability.	↑
 China	Chinese steel prices increased 4% to $600 per ton in April 2023, a 24% decline year-over-year. China's domestic demand for steel is expected to continue increasing in 2023 as the effects of the government issued measures to stimulate the real estate sector and eased COVID restrictions start taking place. China's crude steel production was up 7% in March year-over-year.	↑
 Transportation	Overall costs for producers remain higher than in the past. Published reports indicate that driver shortages have improved, while diesel prices have declined significantly in 2023. However, fabricator interviews report that overall transportation costs continued to increase during the last quarter (and year) and remain a major issue.	↑
 Rail	Trucking is the preferred method for transportation of finished product, but raw materials are delivered by rail to some fabricators. Other sectors continue having issues with rail.	↑
 Milling Capacity	Nationally, capacity utilization rates have been stagnant around 74%-75%. Year-to-date production is down 4% and capacity utilization is down 6%. U.S. Steel recently restarted two blast furnaces (in Indiana and Pennsylvania) that were idled late in 2022 as market conditions have improved. In total, these two plants have a capacity of 2.9 million tons per year.	=
 Labor	Interviews indicated mixed perceptions of the labor market as some believe conditions have improved, but others believe that conditions are getting worse. Unfilled job openings remain an issue for suppliers. Labor costs have increased in an attempt to attract workers. No changes during this quarter.	↑
 Competition	Through the first four months of 2023, the change in the number of steel fabricators listed in FDOT's producer approved list is flat compared to the previous year. While less competition for resources from other sectors like commercial and residential may potentially bring down costs for specific products, this hasn't happened yet. However, imports have decreased in 2023 and as mentioned above, production decreased this past quarter, thus reducing supply. Steel products will continue being influenced by global markets.	=

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

Steel Survey

The most recent survey of FDOT steel fabricators finds that price changes were worse than expected in April 2023. Most steel products saw a slight increase in prices, with the exception of steel plate, which increased significantly (**Table 6**). This has continued the trend of previous months where producers indicated unexpected price increases. Production is also expected to increase, but only marginally.

Table 6. April Steel Producer Survey Results

Material	Structural Steel	Steel Plate	Steel Pipe	Round Bar	Square Tubing	Galvanizing
Price Change, March 2023	2.5%	18.0%	2.5%	2.5%	2.5%	2.5%
Expected Price Change, April 2023	2.5%	8.0%	2.5%	2.5%	2.5%	2.5%
Expected Price Change This Quarter (End of June)	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Bid Price Change, March 2023	2.5%	30.5%	2.5%	2.5%	2.5%	2.5%
Production Change, March 2023	2.5%	2.5%	2.5%	8.0%	2.5%	2.5%
Expected Production Change, April 2023	2.5%	2.5%	2.5%	8.0%	2.5%	2.5%
Expected Prod. Change This Quarter (End of June)	2.5%	2.5%	2.5%	8.0%	2.5%	2.5%

Source: TBG Work Product.

Steel Forecasts

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.

Year-to-date, structural steel bids do not comprise a statistically significant sample, but are tracking well below best estimate models for the current year and closer to the lower bound estimate. Interviews with fabricators indicate some were caught by surprise as some raw materials prices increased in the current month (April), so final fiscal year results may show higher overall costs than year-to-date bids currently reflect. Revising the previous lower bound estimate with updated variables for construction employment and crude prices, lower bound estimates would show bids averaging 2020 prices by about FY 2024.

The best estimate continues to show prices relatively flat through 2027. The upper bound reflects continued very high levels of supply chain disruptions and input costs. In the event of a deep recession, the lower bound scenario would set prices back to 2018 levels, but this scenario is considered unlikely at this time. The upper bound reflects continued very high levels of supply chain disruptions and input costs. **Table 7** provides the updated forecast weighted average price for structural steel.

Table 7. FDOT Structural Steel Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price Structural Steel, $/lb.	$4.47	$4.34	$3.96	$4.00	$4.02	$4.09
Percent Change, %	16.4%	-3.0%	-8.7%	0.9%	0.5%	1.7%

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

Reinforcing steel bids year-to-date also declined below expected estimates, to a lower bound estimate. Current models show reinforcing steel costs landing at about $1.38 per pound in 2023, a 10% decrease from last quarter and 7.7% year-over-year (**Table 8**). The best estimate shows prices fluctuating around 2021 rates through 2027. Steel prices in general have been wildly volatile since COVID-19, and Chinese steel production has affected global price volatility. The lower bound reflects cheaper crude prices than are currently expected in a recessionary environment. The upper bound in **Figure 21** includes influences of continued high demand and geopolitical uncertainty, ending around $1.92 per pound.

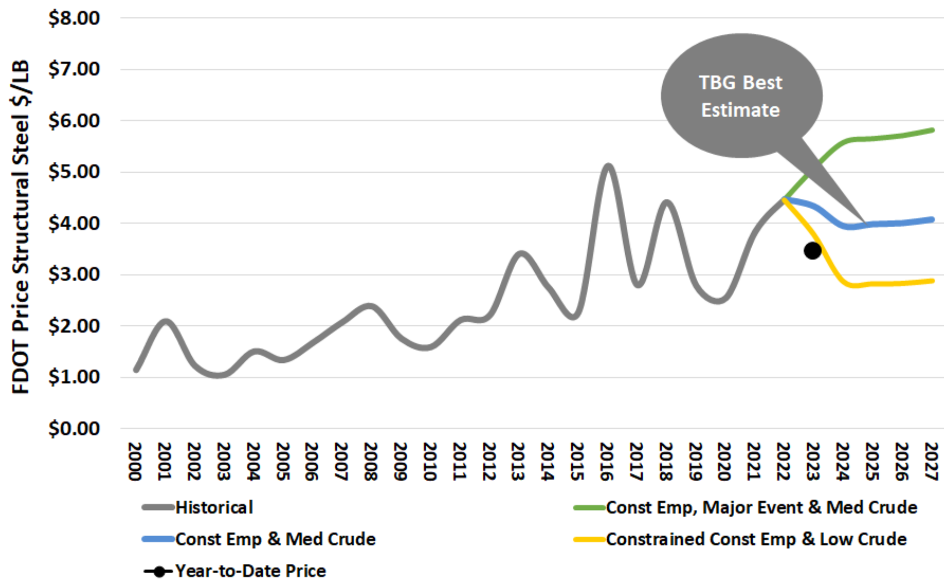
Table 8. FDOT Reinforcing Steel Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price Reinforcing Steel, $/lb.	$1.49	$1.38	$1.39	$1.31	$1.39	$1.47
Percent Change, %	24.1%	-7.7%	1.3%	-6.2%	6.1%	5.8%

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

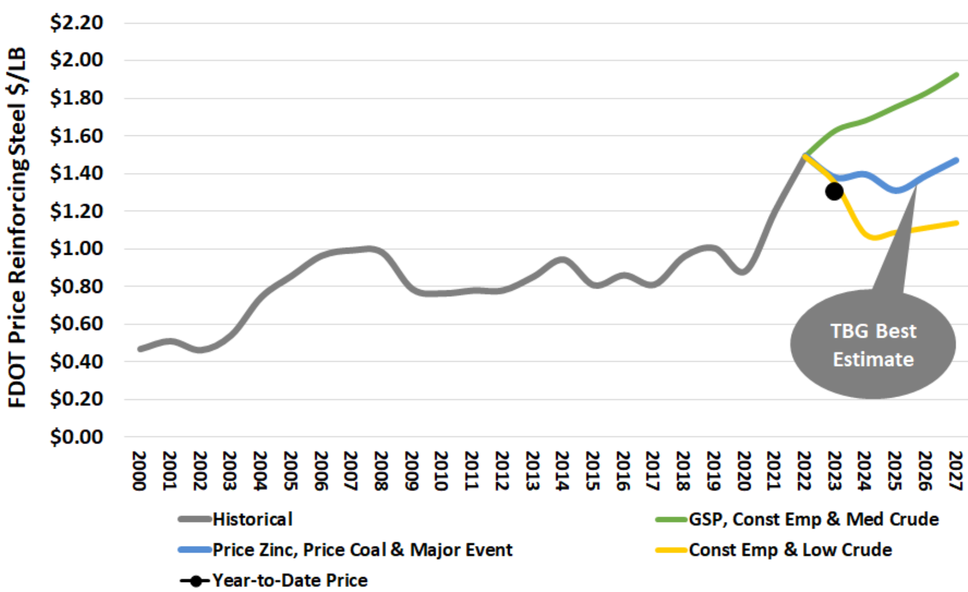
Figure 20 and **Figure 21** show the output of several price models and the scenario identified as best estimate for structural steel and reinforcing steel, respectively.

Figure 20. FDOT Structural Steel Price, FY 2023 Q3 Forecast



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

Figure 21. FDOT Reinforcing Steel Price, FY 2023 Q3 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 10% in 2022, a higher increase when compared to the national production and reflecting increased infrastructure spending.
- As expected, prices have increased significantly and are likely to continue increasing this year. Producers announced double-digit price increases that went into effect in January and April, 2023.
- Industry is optimistic for the rest of 2023 as producers expect continued strong demand from public infrastructure, and extended disruption of Mexican sources.
- Additional overseas supply is expected with a new acquisition in Canada.
- Producers are very concerned about a potential Florida bill allowing substitution of phosphogypsum for base material. If passed, the material that is essentially waste currently would undercut aggregate business models for base material pricing.

FDOT Impacts

- FDOT's baseline year-to-date aggregate bids are running about 8% higher than forecast.
- Supply issues are still causing bottlenecks. Producers can't always source product within range of projects, leading to increased costs.
- Labor and rail issues continue, but at least diesel prices have decreased this quarter, which can lower costs for producers.

General Trends

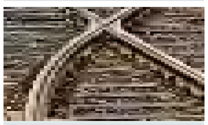
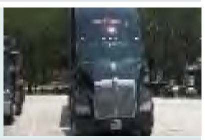
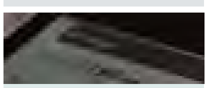
According to quarterly data released by the USGS crushed stone production in Florida for 2022 rose 10% to 93 million metric tons. Production continues showing a higher growth rate than the national average, which was flat. Annual report from publicly traded companies showed that in 2022 aggregate shipments for different regions increased between 1% and 7%. However, they reported decreases in the fourth quarter due to weather issues. Prices had a more significant increase in the fourth quarter (between 17% and 25%) and in 2022 (between 10% and 16%). These increases are similar percentages to what was reported during interviews. For 2023, they expect flat to low increases in volume (-2% to 6% for those that provided an estimate) and price increases up to 14%.

During the ConExpo- Con/Agg conference held in March 2023, aggregate producers expressed similar sentiments for the industry in 2023. Non-residential construction has been steady, but interest rates could change this, residential single-family construction demand has weakened but any slowdown will be offset by public infrastructure projects. Producers indicated that timing of State and Federal projects will be key in terms of quantities and price increases. Some have already increased prices in anticipation of high public demand at the end of the fiscal year.

SUPPLY CHAIN VARIABLES ➤ **AGGREGATE**

Table 9 provides current status of selected supply chain variables.

Table 9. Aggregate Supply Chain Variables

 Raw Materials	The USGS shows that Florida's crushed stone production was flat in the fourth quarter of 2022 and grew 10% in the year. Besides Port Canaveral's previously announced new supply of aggregate, reports indicate that 17,000 tons of aggregate were imported from Jamaica to the Port of Panama City to be used for road projects. The material was imported due to the inability of railroads to keep up with demand, so it's possible that more imports to the region happen in the future. No resolution is expected in the near-term on Vulcan's operations in Mexico.	↑
 Access to Land	Access to land with suitable deposits is key to cost-effective material extraction for FDOT Aggregate. As mentioned elsewhere in the report, everything that's going on with the WOTUS rule creates uncertainty in the industry and delays the permitting process, which was an issue reported by producers in previous reports. Interviews continued indicating environmental or land use rules as one of the main concerns for producers. Cemex announced the purchase of Atlantic Minerals Limited in Newfoundland, Canada. According to the company the acquisition "secures a new long-term aggregates reserve for its extensive Florida operations and the U.S. east coast". Increasing aggregate reserves for the U.S. market by 20%.	=
 Rail	Rail is the primary transportation for aggregates from Georgia, and from Lake Belt to Central and Northeast Florida. In the fourth quarter of 2022, CSX shipments of aggregate products rose by 4%, year-over-year, while revenues rose 20%. For the whole year, shipments rose by 5% and revenues by 20%. This indicates much higher price increases than other materials covered in this report. Interviews indicated that rail reliability hasn't changed this quarter.	↑
 Trucking	Constrained truck/driver availability and fuel are major cost factors as mentioned throughout the report. Diesel prices have declined 25% year-to-date and spot rates have continued declining in 2023. Heavy and tractor-trailer truck driver employment has continued its upward trajectory; however, there have been instances where producers had to truck product from farther away due to supply shortages, which increases costs for producers.	↑
 Labor	Labor demand is high as elevated aggregate demand continues across different construction sectors. There are mixed perceptions on whether the labor market is improving or not. Some producers indicated that it has improved while others they have the same struggles to find qualified candidates. Statewide construction employment has continued increasing year-over-year, but growth is uneven across the State. Nationally, stone mining and quarrying employment was up 5% year-over-year. Interviews have varied in response. Some have stated a worsening labor market, while others have said it has stayed the same over the last quarter. Problems still exist and the supply of skilled labor does not meet the demand for it.	↑
 Competition	Two new mines were recently added to FDOT's approved producer list (in District 4 and in Alabama). Interviews indicated a new pit in District 1 (Lee County), but is not enough to address supply issues due to its limited size and likely being a temporary mine. Palm Beach Aggregates recently sold 60 acres to a real estate investment group.	=
 Capital Costs	During the ConExpo- Con/Agg conference, some equipment producers reported that demand remains strong from aggregate and construction companies. In many cases, equipment producers have indicated that stock is sold out through the second half of 2023, and some products are sold out for the full year. Interviews with aggregate producers confirm that producers are still having issues securing equipment parts.	↑

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

Aggregate Base-Course 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. Year-to-Date bids (July 2022 through March 2023) are tracking well above best estimate models for less than the full year. **Table 10** provides the forecast average price for aggregate base. **Figure 22** shows the output of several price models and the scenario identified as best estimate for aggregate base.

Industry price increases went into effect on January 1st, 2023 with additional increases announced that are effective April 1, 2023. Preliminary FY 2023 data shows bids about 8% higher than forecast. Interviews reflect a "make hay while the sun shines" demeanor among producers, reflecting their pricing power in an environment of heavy infrastructure demand and known resource constraints.

The best estimate model integrating recent pricing data tracks to about 6% net increase by 2027. This track has continued low construction employment growth, increased crushed stone pricing, and infrastructure demand as heavy influences in 2023 and 2024, with a dip in pricing in 2025 due to a potential economic slowdown predicted by numerous economists.

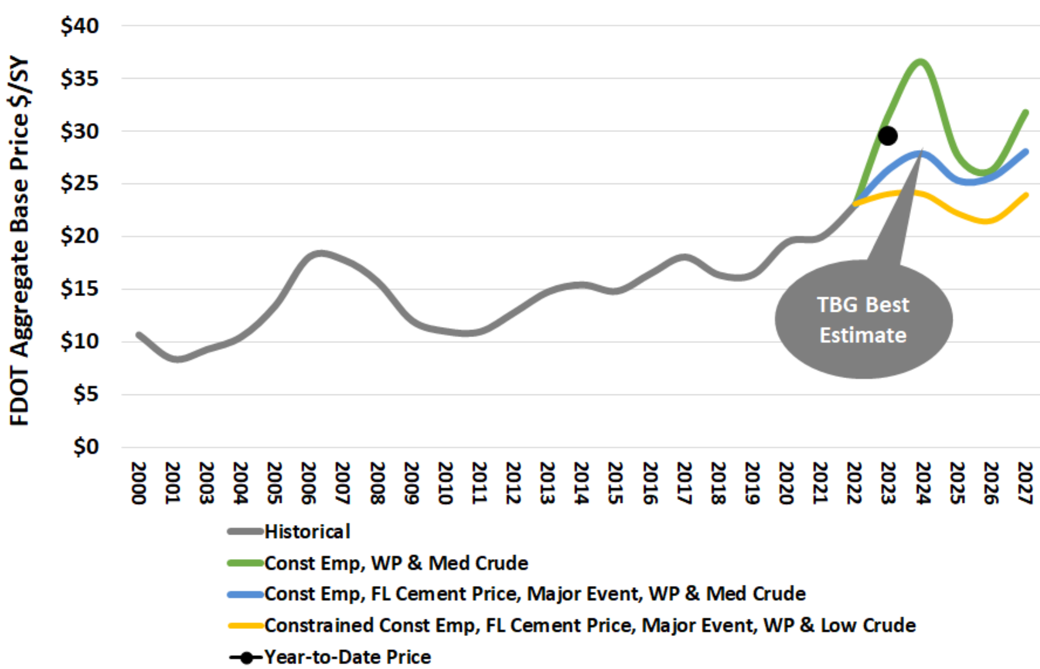
The upper bound estimates reflect additional infrastructure spending, unconstrained construction employment, crushed stone pricing, and continued energy cost instability; this trajectory exceeds $36 (for base material) by 2024 before retreating slightly in subsequent years. Finally, the selected lower bound model shows that energy price declines, attributable to recessionary conditions, would yield lower aggregate base prices throughout the five-year work program, plateauing near current (preliminary year-to-date) levels.

Table 10. FDOT Aggregate Base Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price Aggregate Base, $/SY	$23.11	$26.48	$27.86	$25.37	$25.67	$28.08
Percent Change, %	15.5%	14.6%	5.2%	-8.9%	1.2%	9.4%

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

Figure 22. FDOT Aggregate Base Price, FY 2023 Q3 Forecast



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

EARTHWORK

Summary

- Truck driver employment in Florida continues increasing, although drivers are still in short supply.
- Diesel prices have declined significantly in 2023, and are forecast to continue declining in 2024. Lower housing development and lower fuel costs would drive earthwork costs down, but intensive infrastructure demand is supporting higher prices.
- Equipment and truck costs have continued the downward trend seen at the of 2022, but availability is tight and lead times are still long. Parts can still be hard to come by, and large projects are dominating resource competition.

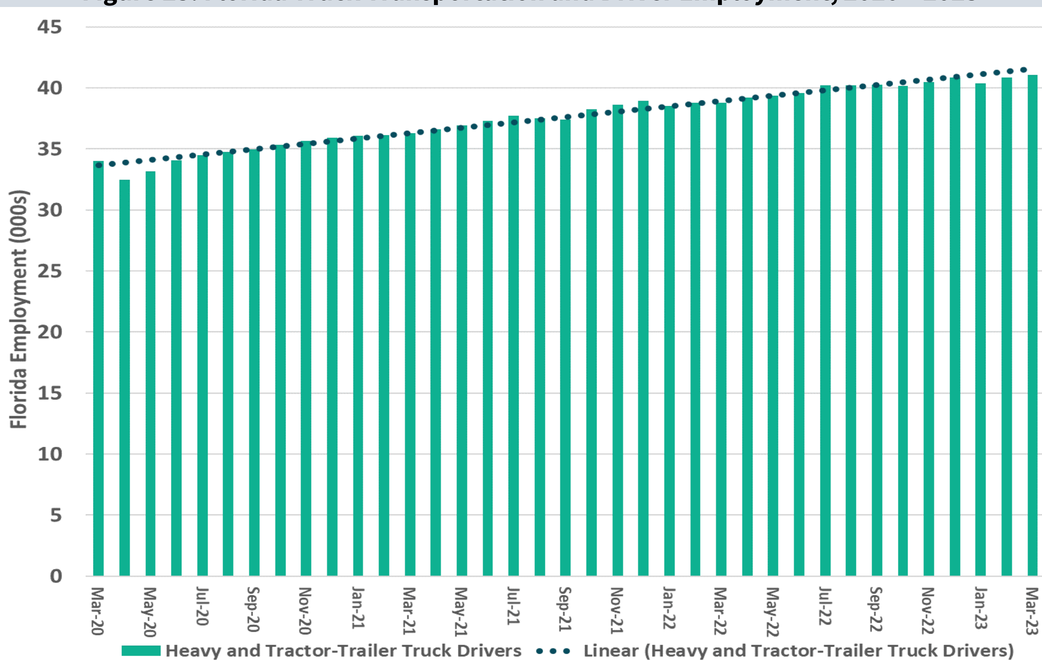
FDOT Impacts

- Year-to-date weighted average prices have increased 67% from $6.56 per cubic yard in Q2 of 2023 to $10.93 per cubic yard in Q3. Excluding two large projects (> 4 million cubic yards each), the remaining 130+ bids would average closer to $29 per cubic yard, a substantial increase. Similar results last quarter would yield a corresponding value of $26/CY.
- Smaller volume jobs may need to allow for substantially higher bid prices than the weighted average price would imply.

General Trends

Overall truck transportation employment started 2023 with the same steady growth seen in 2022. In March 2023, employment rose 6%, year-over-year. 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 23**). As mentioned throughout the report, driver availability has reportedly improved for some sectors, and diesel prices have declined significantly year-to-date, which lowers costs for contractors. Prices for used trucks have declined, which lowers contractor's replacement costs. All the changes could benefit FDOT's costs. However, these could be offset if contractors are forced to move product for longer distances.

Figure 23. Florida Truck Transportation and Driver Employment, 2020 – 2023

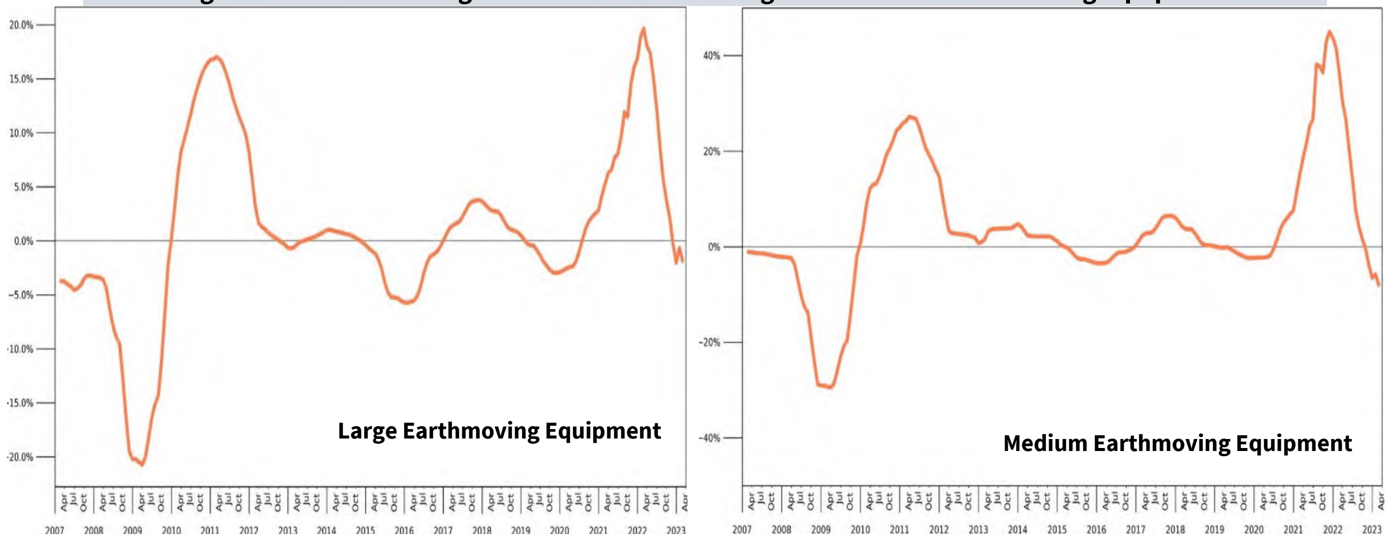


Source: TBG work product, BLS.

Equipment

Prices for used earthmoving equipment have stabilized after steep increases and then declines in 2022. Ritchie Bros.' April 2023 used equipment market trends report shows that the 3-month average prices for large earthmoving equipment were down 1% year-over-year. Prices for medium earthmoving equipment prices were down 5% year-over-year (**Figure 24**). The report indicates that sales of equipment, in general, have increased in 2023 and purchases are trending to newer and lower hours equipment.

Figure 24. Percent Change in Price Indexes for Large and Medium Earthmoving Equipment

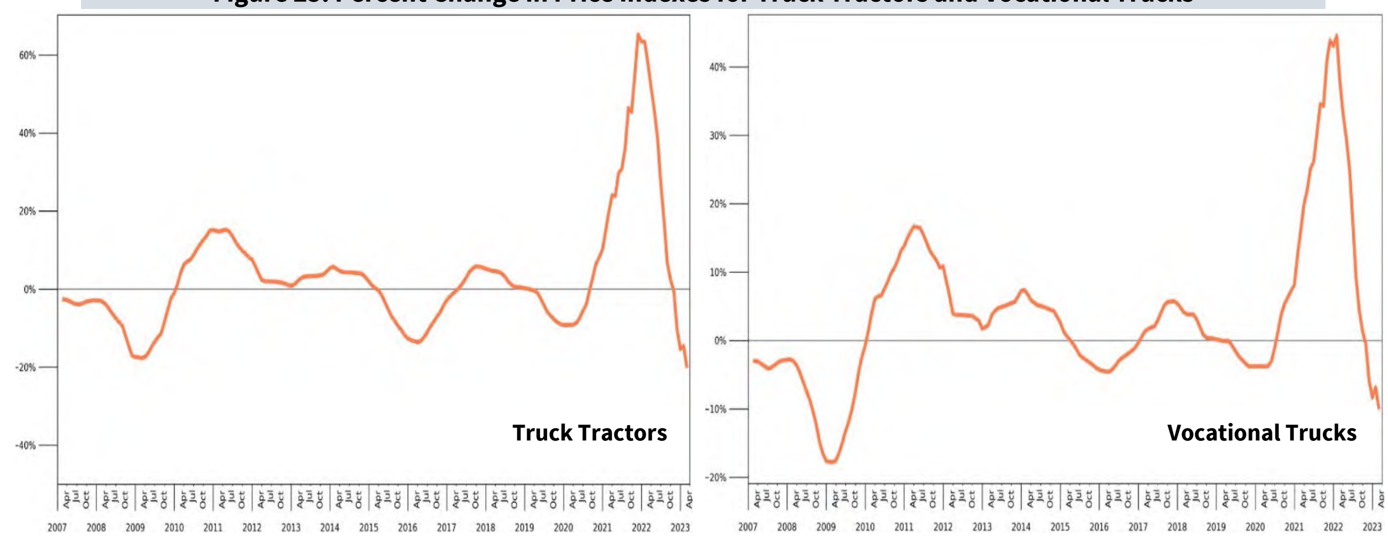


Source: Ritchie & Bros. Used Equipment Market Report.

Trucking

Used trucks prices have had larger declines in 2023. The 3-month average costs of truck tractors and vocational trucks[5] were down 14% and 6% year-over-year, respectively (**Figure 25**).

Figure 25. Percent Change in Price Indexes for Truck Tractors and Vocational Trucks



Source: Ritchie & Bros. Used Equipment Market Report.

[5] Including bulk hauling, heavy hauling, and other construction vehicles

Earthwork Forecast

Regression modeling was performed to estimate FDOT Earthwork costs using pay item data, supply chain variables, and other macroeconomic indicators.

Updated bid data shows that markets contracted more than expected, falling to the lower bound estimate; see **Figure 11**. The lower bound estimate was driven primarily by reduced housing starts and lower crude prices, both of which have occurred. In the Best Estimates scenario, costs were expected to remain higher in FY 2023 before correcting slightly in 2024 due to recessionary effects. With infrastructure construction demand continuing to increase, we anticipate bidding behavior rebounding in most markets, with the markets that have the greatest downturn in housing continuing to enjoy lower earthwork prices. However, housing sales in March 2023 dropped 22% over one year ago, and this dramatic slowdown may dampen earthwork prices more than initially anticipated. **Figure 26** shows the output of potential price models and the scenario identified as best estimate for earthwork.

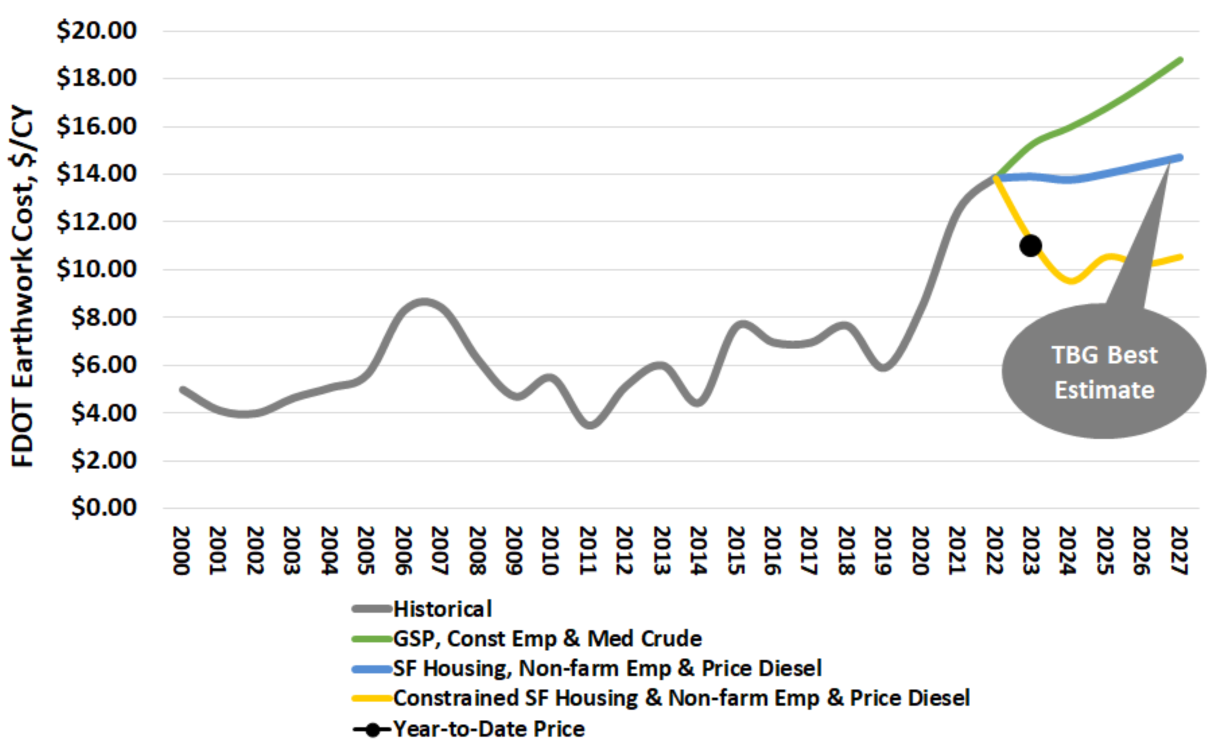
The upper bound is driven by steadily increasing work program spending and adjacent industry demand for the same resources.

Table 11. FDOT Earthwork Price Forecast Results

Fiscal Year	2022	2023	2024	2025	2026	2027
Price Earthwork, $/CY	$13.84	$13.92	$13.79	$14.03	$14.36	$14.69
Percent Change, %	11.1%	0.6%	-1.0%	1.8%	2.3%	2.3%

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

Figure 26. FDOT Earthwork Price Estimates, FY 2023 Q3 Forecast



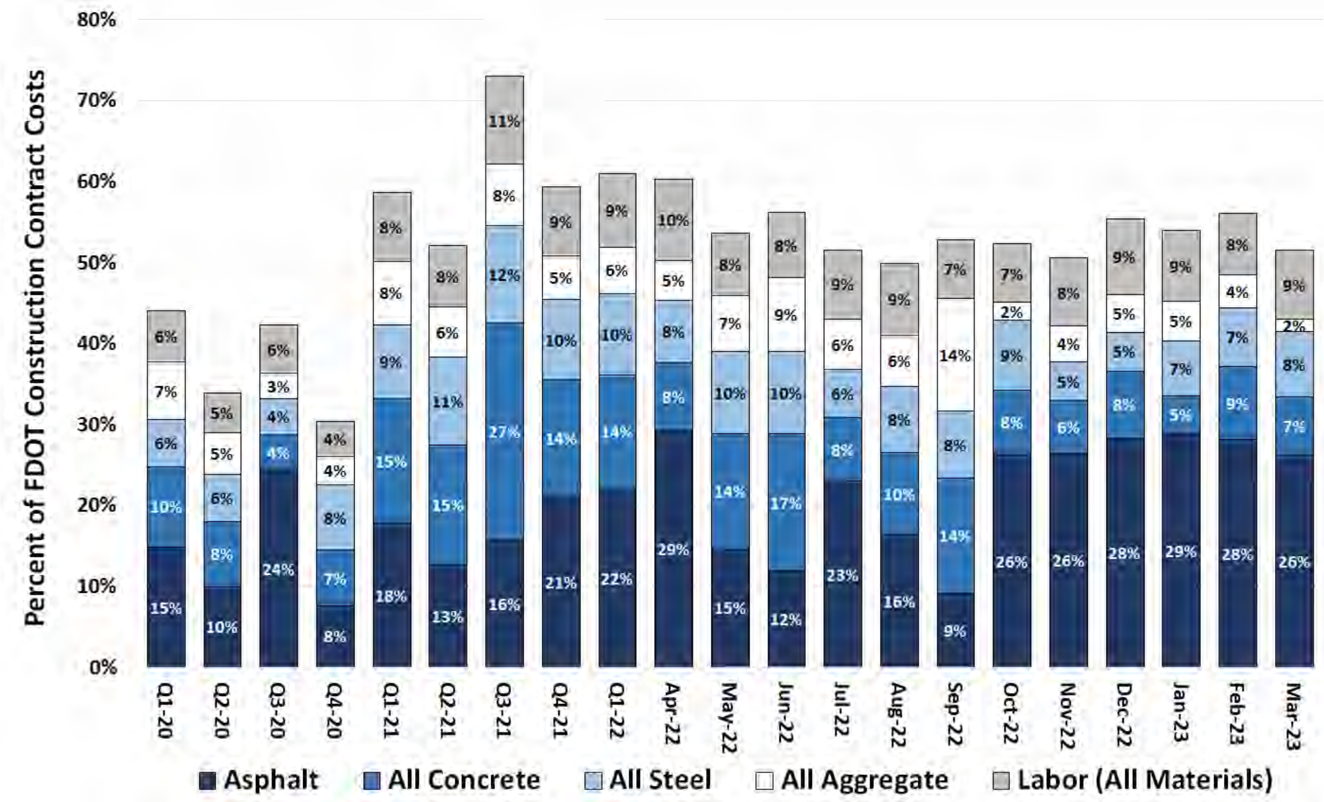
Source: TBG calculated from data provided by FDOT Estimates Office, various industry sources.
(Variable descriptions available in the **Appendix**.)

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**). Concrete and steel costs as a share of total costs moderated in the first three months of 2023. Aggregate costs as a share of total costs have retreated to 2020 levels through March 2023. Asphalt costs maintained the historical majority of total dollars, but at a higher sustained rate than in previous years. Labor costs have remained stable over the few months at about 9%, potentially indicating that the labor market has reached a new normal.

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, with the exception of structural metal for bridges, all products have seen increases less than 6% in 2023. Structural metal for bridges has declined 8%. Year-over-year, crushed stone, ready-mix and precast have increased by 13% in the U.S., while asphalt[6] (refinery production), steel mill products, and structural metal for bridges have all declined by 23%, 15% and 6%, respectively. **Figure A-2** illustrates select PPI in the U.S. for relevant commodity types.

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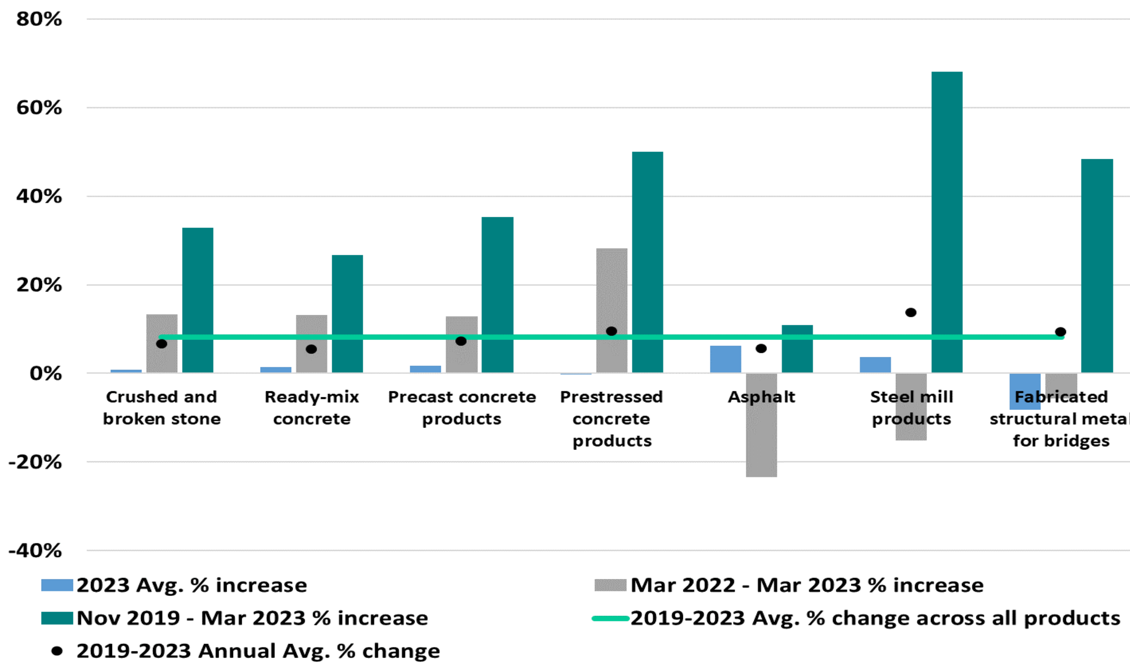
[6] As a processed good for intermediate demand; i.e. asphalt used at refineries as an input by producers and not the final prices seen by FDOT.

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

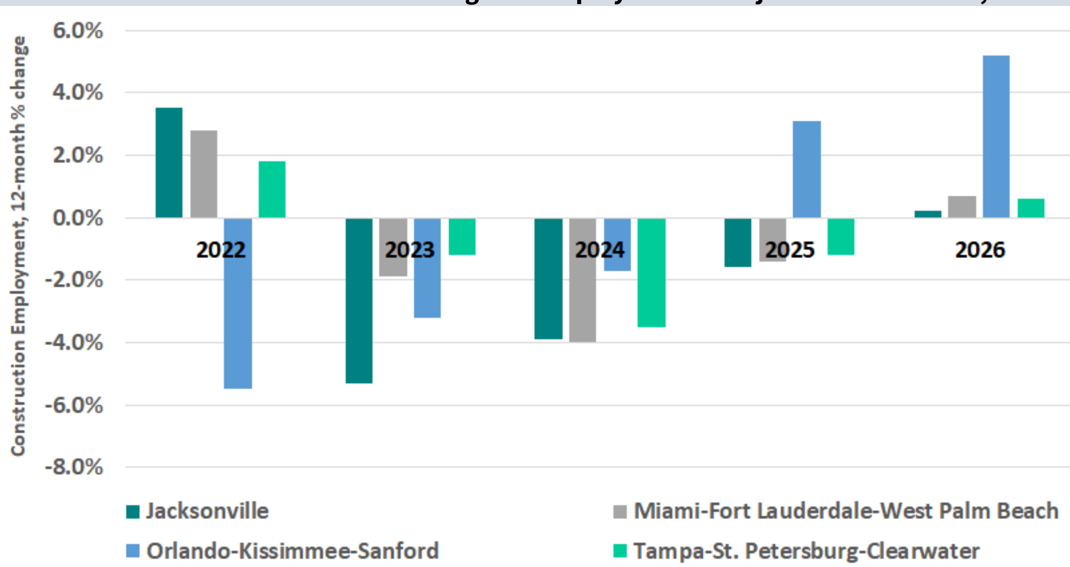


Source: BLS (Producer Price Index, not seasonally adjusted); TBG Work Product.

Construction Employment Forecast

According to the Institute for Economic Forecasting's (IEF) most recent Florida & Metro Forecast, statewide construction employment grew by 3.0% in 2022, revised upward from the previously reported 2.0%. IEF expects construction employment growth to decline over the next three years, with 2023 estimated to fall by 2.4%. At the metro level, IEF projects construction employment declines in most major markets throughout the forecast period, with the biggest loses seen in 2023 and 2024 (**Figure A-3**).

Figure A- 3. Historical and Forecasted Changes in Employment in Major Florida Markets, 2017 - 2026

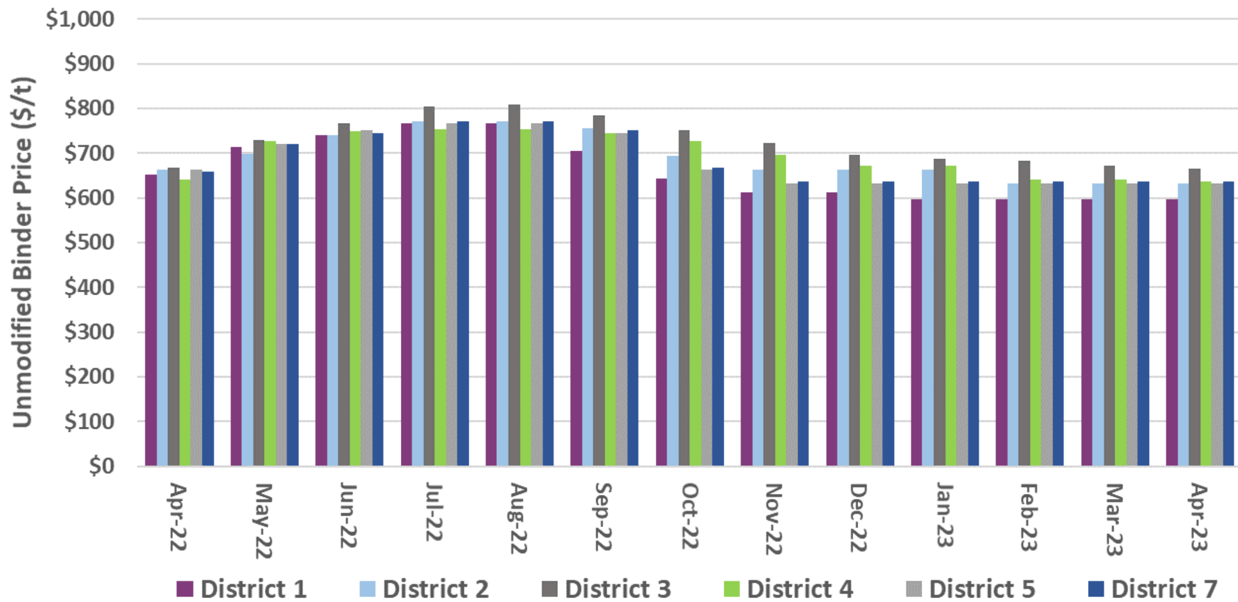


Source: UCF Institute for Economic Forecasting Winter 2023 Florida & Metro Forecast.

Binder Prices by District

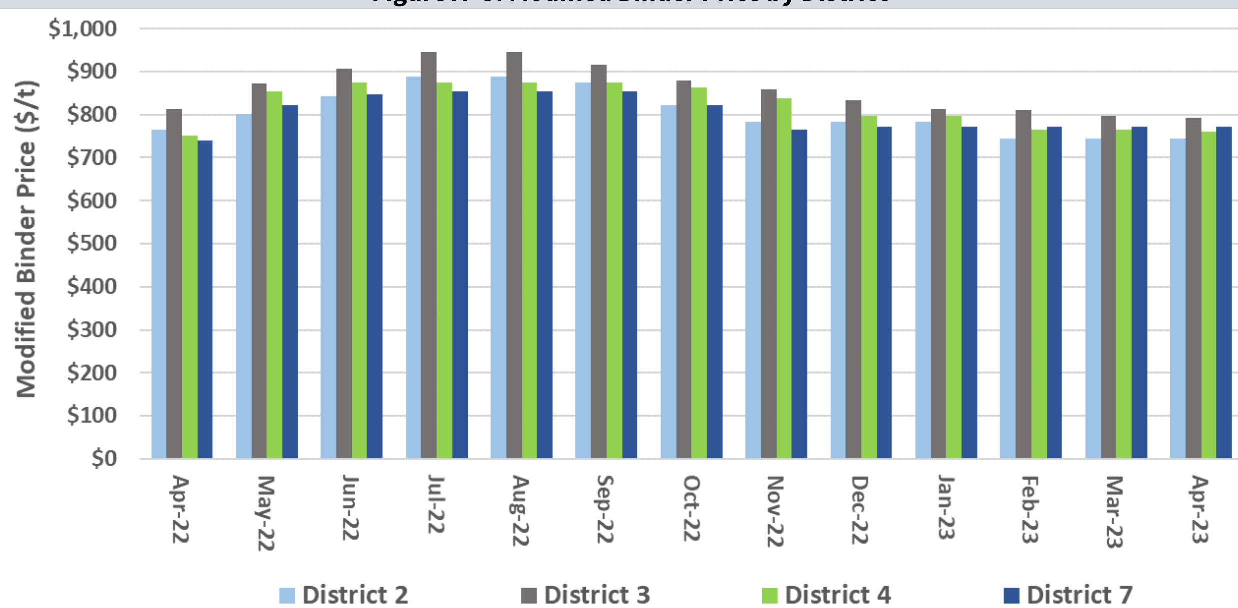
Where available, the average prices for unmodified (**Figure A-4**) and modified (**Figure A-5**) binder were calculated from monthly terminal price quotes at the district level. Unmodified binder is the average of PG 52-28 and PG 58-22 prices, while modified binder is a quote for the price of PG 76-22 (PMA) in the dataset. While unmodified binder prices fell in all districts by as much as 9% higher year-over-year, modified binder prices have been mixed. District 4 and 7 increased by 1% and 4%, and Districts 2 and 3 fell by 3%. Prices in 2023 have been stable for both, with some Districts showing no change and others show a slight decline of 5%.

Figure A- 4. Unmodified Binder Price by District



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

Figure A- 5. Modified Binder Price by District



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

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.
Constrained SF Housing	Lower (less optimistic) FL Single-Family housing starts forecast.
FL Cement Price	Average price of cement in Florida.
GSP	FL Gross State Product.
Historical	Historical pricing or quantity.
Housing Starts	FL housing starts.
Indicator WP>$4B	Indicator variable (0,1) for Work Program years with more than $4 billion in planned work.
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, and the war in Ukraine.
Non-farm Emp	FL Non-Farm employment.
Price Binder	Average price of HMA binder (PG-76 & higher).
Price Coal	Average price of coal.
Price Diesel	Average diesel price.
Price Iron Ore	Average price of iron ore.
Price Stone	Average price of crushed stone.
Price Zinc	Average price of crushed stone.
SF Housing	FL Single-Family housing starts.
US Cement Price	Average price of cement in the U.S.
WP	FDOT Five-Year Work Program.
Year-to-Date Price	FDOT bid prices calculated with July 2022 through preliminary March 2023 data.

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[7], 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.

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

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