Analysis of Material Source Mergers and Acquisitions on Project Delivery Quality and Costs

PUBLICATION NO. FHWA-HRT-22-082

JUNE 2023

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, VA 22101-2296

FOREWORD

There has been a concern that mergers and acquisitions (M&As) within industries that produce, supply, and install aggregates and plant-produced materials for transportation projects may result in reduced competition and higher prices for public sector construction projects. This report documents research undertaken to analyze relationships and trends that occur when M&As take place in materials supply. The study presents strategies that selected States have employed to minimize adverse impacts and protect taxpayers from unfair pricing and anticompetitive behaviors. These State department of transportation (DOT) practices may limit adverse impacts to competitive market share distribution, bid pricing, and overall project costs.

This report also examines multiyear collections of State DOT construction materials bid prices and processes to monitor and analyze State DOT practices for bidding and letting projects. The research team reviewed data covering a 10-yr period between 2006 and 2016 to explore trends across 31 States. Nine case studies provided additional information to understand better the state of the practice for assessing bid prices and monitoring industry activities. The report and accompanying technical brief (FHWA-HRT-22-081) offer insights into the challenges associated with determining price impacts of M&A activity in the construction materials industry.

Jean Nehme, Ph.D., P.E.
Director, Office of Infrastructure Research
and Development

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. FHWA-HRT-22-082	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Analysis of Material Source Mergers and Acquisitions on Project Delivery Quality and Costs		5. Report Date June 2023	
		6. Performing Organization Code:	
7. Author(s) Hannah Silber (ORCID: 0000-0003-0211-7934) and Jason Bittner (ORCID: 0000-0002-7920-8773)		8. Performing Organization Report No.	
9. Applied Research Associates Inc. 6314 Odana Road Suite 11 Madison, Wisconsin 53719		10. Work Unit No.	
		11. Contract or Grant No. DTFH6117C00002L	
12. Sponsoring Agency Name and Address Federal Highway Administration 6300 Georgetown Pike McLean, VA 22101-2296		13. Type of Report and Period Covered Final Report; February 2017–May 2020	
		14. Sponsoring Agency Code HRDI-20	
15. Supplementary Notes The Contracting Officer's Representative was Matthew Corrigan (HRDI-20; ORCID: 0000-0002-1230-8462).			
16. Abstract State departments of transportation (DOTs) have expressed concern about mergers and acquisitions (M&As) occurring within the industries that produce, supply, and install aggregates and other materials for transportation projects. In particular, State DOTs have suggested the possibility that these construction industry M&As impact price and competition. This research effort targeted a data analysis- and case study-focused approach to find and understand relationships or trends that occur with M&As. The study also presents activities selected States have employed to minimize adverse impacts and protect taxpayers from unfair pricing and anticompetitive behaviors. These State DOT practices limit the adverse impacts of competitive market share distribution, bid pricing, and overall project costs. This study also examined multiyear collections of State DOT construction materials bid prices and processes to monitor and analyze State DOT practices for bidding and letting projects.			
17. Key Words Mergers and acquisitions, pricing impacts, construction costs, road-building materials, market share, competition		18. Distribution Statement No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161. http://www.ntis.gov	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 223	22. Price N/A

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized.

SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1,000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2,000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2,000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	2.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials
ACMs	alternative contracting methods
ADOT	Arizona Department of Transportation
ArDOT	Arkansas Department of Transportation
CCI	construction cost index
CDOT	Colorado Department of Transportation
CPCC	California Portland Cement Company (CalPortland)
CWT	hundredweight
CY	cubic yard
DBE	disadvantaged business enterprise
DOJ	Department of Justice
DOT	department of transportation
DOTD	Department of Transportation and Development
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FTC	Federal Trade Commission
GDOT	Georgia Department of Transportation
GDP	gross domestic product
HCCI	Highway Construction Contract Information
HHI	Herfindahl-Hirschman Index
HMA	hot-mix asphalt
HMAC	hot-mix asphalt concrete
IDOT	Illinois Department of Transportation
ITD	Idaho Transportation Department
LF	linear feet
M&As	mergers and acquisitions
MassDOT	Massachusetts Department of Transportation
MDOT	Michigan Department of Transportation
MnDOT	Minnesota Department of Transportation
MoDOT	Missouri Department of Transportation
NDOT	Nebraska Department of Transportation
NOVA	Northern Virginia
NYSDOT	New York Department of Transportation
ODOT	Oregon Department of Transportation
PennDOT	Pennsylvania Department of Transportation
PG	performance grade
RAMP	Responsible Acceleration of Maintenance and Partnerships
SCDOT	South Carolina Department of Transportation
SY	square yard
TDOT	Tennessee Department of Transportation
USGS	United States Geological Survey
VTrans	Virginia Department of Transportation
WisDOT	Wisconsin Department of Transportation

EXECUTIVE SUMMARY

BACKGROUND

State departments of transportation (DOTs) have regularly expressed concern about the effects of mergers and acquisitions (M&As) within the industries that produce, supply, and install aggregates and other materials for transportation projects. State DOTs have reported market share changes in the companies that bid their projects, pricing increases, or other anomalies in the projects they let to contract. State DOTs also might notice a decrease in bidders for certain project types or other supply chain differences that might occur because of recent M&As of the companies involved with supplying and bidding their contracts.

PURPOSE OF THE REPORT

This research report presents the findings of the investigation into the effects of M&As involving companies that supply construction materials for State DOT transportation projects. In an effort to identify significant consolidation, this study analyzed material pricing data from 31 States by sorting bid data for every year beginning with 2006 through the third quarter of 2016. These findings were then compared against known company mergers or acquisitions and analyzed for construction materials price sensitivity.

GOAL OF THE RESEARCH

The research goal was to find relationships or trends that occur with M&As. The study also aimed to present information on what States have done to monitor and assess activity that can be adverse to competitive market share distribution, bid pricing, and project costs, as well as how they have done so.

DETAILS OF APPROACH

Bid and project data from 31 States were sorted to include materials of interest, including concrete, asphalt, aggregate, and granular backfill materials. Projects were matched to prime contractors and total project costs to investigate price anomalies and consolidation activity. By analyzing each individual State, disproportionately high project costs were identified and compared against historical prices and engineering estimates. Based on the data obtained from these findings, supplemented by literature and legal case reviews, nine States were chosen for further indepth case study. The data analysis and case studies are presented for information exchange. Challenges experienced during this project included appropriate bid item number selection, desired data availability, and inconsistent bid item number use. Subject-matter experts were needed to assist in the bid item number selection and comparisons across States. Due to variations in file formats, initial data sorting was done manually, which was very time-consuming.

IMPORTANT RESULTS

Two primary steps were taken to monitor negative impacts of M&A activity identified through this study. First, States had to systematically identify the M&A activity taking place, and second,

they had to assess the impact (if any) of this activity on pricing, competition, and market share. To identify M&A activity, States should proactively monitor for consolidation activity, use a standardized estimation process to generate bid estimates for projects, track firm names over time to aid in identifying consolidation, utilize regional monitoring, have a set process for analyzing unbalanced bids, and track cost indexes over time. Because not all merger activity has a negative impact, once M&A activity is identified, the impacts must be documented and tracked, which can be done through bid analysis. Measures should be taken to increase competition, if necessary. Such measures could include controlling material supplies at the State level, bidding smaller lettings more often, or utilizing project bundling.

CHAPTER 1. INTRODUCTION AND LITERATURE REVIEW

Mergers and acquisitions (M&As) receive regular attention across divergent industries in the U.S. economy. In most scenarios, synergy and efficiency drive many consolidations. Normal corporate growth, as well as attempts to increase market share and widen market access, comprise other primary drivers.

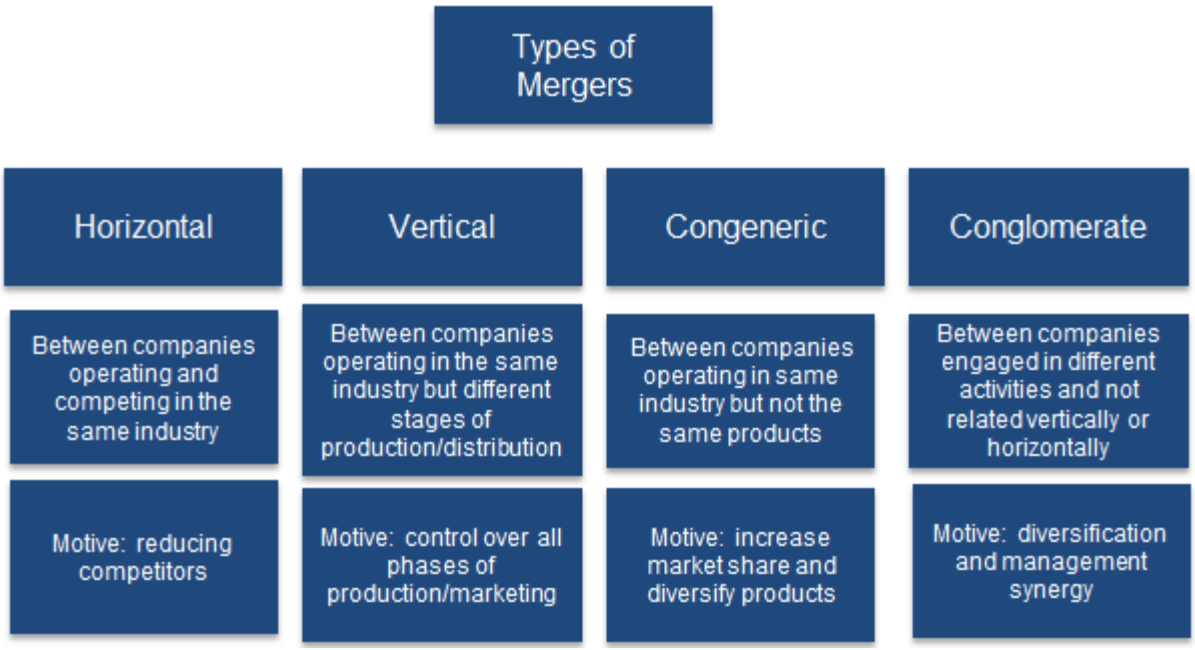
A synergistic combination of business activities can increase performance and decrease costs of doing business. For the most part, a business will attempt to merge with another business that has complementary strengths and weaknesses. Other reasons for consolidation could include diversifying their portfolio, added geographic coverage, and targeting a focused market. In the latter, companies seeking to sharpen focus often merge with companies that have deeper market penetration in key complementary areas of operation. Many consolidations improve business operations and quality without adversely affecting competition.

M&A activity, particularly in the transportation materials and construction industry, is infrequently analyzed, yet it can significantly affect competition, market control, and pricing. The Federal Highway Administration (FHWA) has a role in ensuring cost competitiveness in the transportation industry. While in many cases collaboration between firms with similar goals and corporate growth in a healthy market motivates consolidations, attempts to increase market share and efforts to target wider market access may provide reasons for concern or additional monitoring. Companies may engage in consolidation activity with those other entities that contain complementary strengths and assets, or to increase the diversity of what they can offer to the market.

At times, however, M&A activity results in the elimination of cost brackets, harms competition, creates inequitable market control, or results in price increases. Any of these occurrences within the transportation materials and construction industry can alter bidding processes, consumer behaviors, and market attributes.

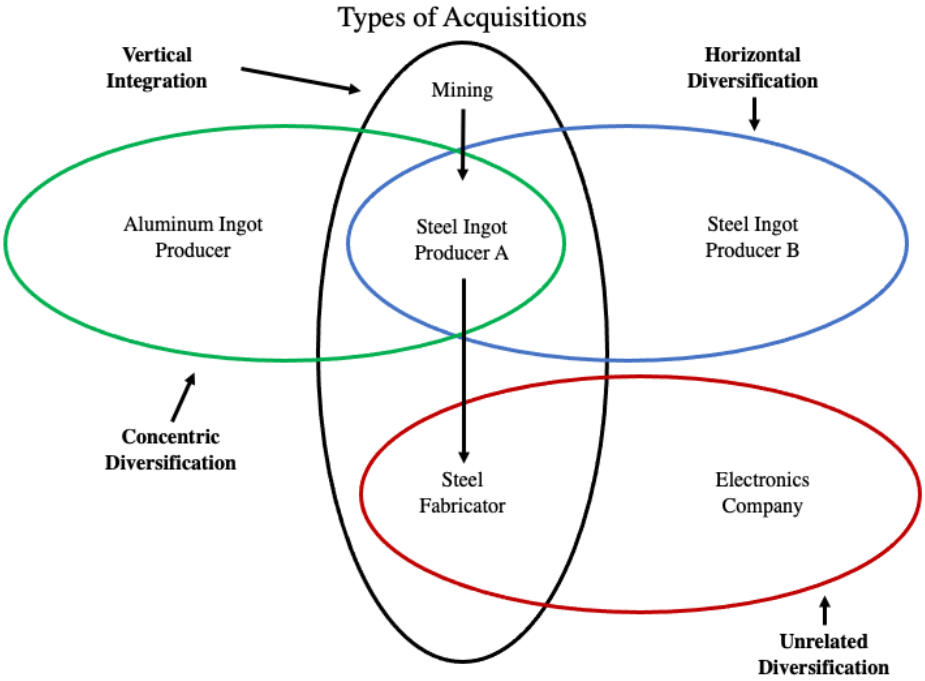
This study's final report examines a series of State department of transportation (DOT) construction materials bid prices and provides processes for monitoring and analyzing State DOT practices for bidding and letting projects. In addition, a set of nine case studies was developed to better understand the state of the practice for assessing bid prices and monitoring industry activities. The final report and accompanying technical brief offer insights into the challenges associated with determining price impacts of M&A activity in the construction materials industry (Corrigan, Bittner, and Silber 2022).

Due to the potentially harmful byproducts of M&A activity, transportation professionals need to be aware of consolidation activities and their immediate and long-term influences. Figure 1 and figure 2 outline the M&A activity types that occur, as well as potential motives and results, respectively.



Source: FHWA.

Figure 1. Chart. Types of mergers.



Source: FHWA.

Figure 2. Diagram. Types of acquisitions.

A 2006 American Association of State Highway and Transportation Officials (AASHTO) survey found that 11 of 38 participating States identified M&A activity as a prime driver behind bid price increases and competition decreases (FHWA 2006). Similarly, in a 2015 AASHTO survey

completed by the Subcommittee on Construction of 32 member States, 17 expressed concerns about negative impacts of merger activity on bid prices.[1] Since due diligence regarding fair bidding processes is necessary, further investigation into M&A activity—particularly for roadway construction material sources—on project costs is needed to examine these effects across different States.

Industry experts identify several issues associated with consolidations beyond pricing. For instance, extensive purchasing of pits, quarries, and mineral rights in large, "controlled" geographic areas by large contractors is forcing smaller contractors without access to these materials to drop their bidding efforts. Contractors that do not have access to materials in these large, controlled geographic areas cannot be competitive on projects within those areas, mainly due to the costs of moving truck materials into work sites within that controlled area. Larger contractors have political influence on local zoning boards, which tend to block new contractors from setting temporary asphalt plants on land within the local area. Purchasing smaller companies in larger, controlled geographic areas creates subsidiaries or standalone divisions. In many States, smaller companies commonly become divisions of the larger company, and only one division within that larger company will bid on a given project, leading many times to a single bid.

Anecdotally, larger contractors underbid within areas where they know a smaller competitor may have an advantage to keep the smaller contractor out of the market. Multiple contractors sometimes form short-term partnerships to bid a project as a single entity. This practice has been evident when comparing bids in regional areas across Wisconsin and other States in the Midwest.[2] Another related issue is the increased use of exclusive subagreements. By using subagreements, larger contractors with market power attempt to control subcontractors who are exclusive, only quoting to their firm.

The research team completed a literature review that provided a preliminary analysis of existing studies on this topic. The research team reviewed dozens of additional news media stories, website information, and trade magazine articles. In several cases, as data were collected, the research team communicated directly with transportation officials in subject States. This collected information helped shape the literature review, guided the data collection efforts, and refined the most relevant topics for project analysis and organization. The study's literature review was arranged in three primary categories: material costs, case studies, and preferred analysis methods. The resulting full document is attached as appendix A.

In addition, the research team reviewed dozens of legal cases and information from ongoing litigation. The researchers based their review on identifying cases and court filings that expand on Copperweld Corp. v. Independence Tube Corp. ("Copperweld") (Burger and Supreme Court of the United States 1983). Copperweld held that coordinated activity of a parent and its wholly owned subsidiary must be viewed as that of a single enterprise for purposes of the Sherman Antitrust Act. These scenarios—whereby acquisitions occur to encourage limiting the number or geographic reach of prospective bidders—held the most promise for identifying any relationships

[1]AASHTO Survey on Merger and Acquisition Activity; reported during Subcommittee on Construction, conference call in August 2015, and personal correspondence between authors and Marc Mastronardi in December 2017.
[2]Conversation with Donald Miller, P.E., former Wisconsin DOT Chief Construction Engineer, on February 23, 2015.

between M&A and actual costs. According to the court's precedent, a parent company and its wholly owned subsidiary(ies) have complete unity of interest and are, therefore, protected. Copperweld's influence on industry consolidations proved substantial. However, as shown in this report, direct impact on pricing for construction materials cannot be easily identified.

Several important elements have set court precedent. Individual names are available here only to illustrate the facts in these cases.

- U.S.A. v. Vulcan Materials Company and Florida Rock Industries, Inc., case 07-cv-02044, D.C. District Court, 2007 (coarse aggregate) ("Vulcan Materials") (U.S.A. v. Vulcan Materials Company and Florida Rock Industries 2008):

  In Vulcan Materials Co., the court was asked to review the merger of two large aggregate producers, Florida Rock Industries, Inc. and Vulcan Materials Co. Perhaps the most interesting aspect of this case is how the court defined the applicable geographic markets. It identified individual quarries that Florida Rock Industries, Inc. owned and then determined what geographic areas the individual quarries served, given the transportation limitations for aggregate. Thus, the geographic markets were several, were narrow (northwest Atlanta, south Atlanta, southwest Atlanta), and were based on the locations of the quarries, customers, and logistical constraints.

  In many of these narrow geographic markets, Florida Rock Industries, Inc. and Vulcan Materials Co. were two of only three or four premerger competitors. Postmerger, the combined entity would have controlled more than 50 percent of the market share in most of the geographic markets. Accordingly, the court ordered divestiture of several mines and quarries.

- U.S.A. v. Martin Marietta Materials, Inc., case 14-cv-01079, D.C. District Court, 2014 (Department of Justice [DOJ]) (complaint filed June 14, 2014) ("Martin Marietta I") (U.S.A. v. Martin Marietta Materials, Inc., and Texas Industries, Inc. 2014):

  This case involved Martin Marietta Materials, Inc., which distributes aggregate to construction companies in 29 States. Martin Marietta Materials, Inc. was set to merge with Texas Industries, Inc., a major regional aggregate supplier. The DOJ was concerned with anticompetitive effects in Dallas, TX. This case is interesting because of how it defines the relevant product market. Generally, the DOJ, Federal Trade Commission (FTC), and U.S. courts identify the relevant product market as simply "aggregate." However, Texas DOT tests aggregate, and, if the aggregate passes, it becomes "qualified" for State DOT projects. The DOJ and the court considered "DOT qualified aggregate" a separate product market than "aggregate" and found that, for State DOT projects (and other projects that required DOT-qualified aggregate), aggregate was not a substitute. Given that this study's focus is State DOT projects, the monitoring State agencies may consider using this narrower product market definition. The court required substantial divestitures from the merged entity, including several quarries and multiple rail yards.

- U.S. v. Cemex S.A.B. de C.V. and Rinker Group Limited, case 07-cv-00640, D.C. District Court, 2007 (DOJ) ("Cemex DOJ") (U.S. v. Cemex 2009):

  This DOJ challenge to the merger of Cemex S.A.B. de C.V. and Rinker Group Ltd. involved three different product markets spread across various geographic regions, including both Florida and Arizona. Analytically, this case outlines how courts deal with mergers involving national (or international) suppliers—they identify all relevant product and geographic markets and resolve all issues collectively. This case is also noteworthy for its detailed discussion of the ready-mix concrete industry and its discussion of the product market for concrete block. Although concrete block is outside this study's scope, it has many of the same market characteristics as other road-building materials, such as high transportation costs, homogeneity, and high barriers to entry. If the FTC/DOJ is dealing with a large company that supplies both ready-mix concrete and aggregate, the concrete block product market may also be implicated in a merger. Ultimately, the court required the merged entity to divest several ready-mix concrete plants, several concrete block plants, and several aggregate plants.

- U.S. v. Oldcastle Northeast, Inc. et al., case 396-cv-01749 District Court of Connecticut, 1996 (DOJ) (complaint filed September 3, 1996) (U.S. v. Oldcastle Northeast et al. 1996):

  Oldcastle Northeast, Inc. involved the merger of two of the largest asphalt producers in the greater Hartford, CT, area. Highlighting the importance of transportation costs and vertical integration in the asphalt industry, the complaint also emphasized that the two merging entities "are the only producers of asphalt in the greater Hartford area that own their own sources of aggregate for manufacturing asphalt for highway projects." This latter fact was important in the court's unilateral effects analysis. Previously, other asphalt producers could purchase their aggregate from either of the merging entities. Because the merged entity would have controlled all aggregate quarries, it allowed the merged entity to unilaterally decrease output in both the aggregate and asphalt product markets. Accordingly, the court ordered divestiture of a major aggregate quarry to supply competing asphalt manufacturers. The court also ordered divestiture of several asphalt plants.

- Cemex, S.A. de C.V., FTC docket No. C-4131 (2005) (FTC 2005):

  This case challenged the proposed merger of Cemex, S.A. de C.V. and RMC Group, PLC, due to anticompetitive effects in the ready-mix concrete product market around Tucson, AZ. This case is interesting because Cemex, S.A. de C.V., preemptively agreed to divest substantial assets to a competitor, California Portland Cement Company (CalPortland®) (CPCC). In reviewing the proposed merger and divestiture, the FTC had to determine whether CPCC would be able to compete in Tucson, AZ, thereby offsetting the competitive effects of the merger. Focusing on CPCC's widespread presence in the western United States, vertical integration, and experience in the ready-mix concrete business, the FTC approved the merger and divestiture. This case illustrates the limitations with market entry in the road-building industry to offset anticompetitive effects. Here, Cemex, S.A. de C.V., was required to find a vertically integrated,

regionally powerful competitor for the FTC to accept the merger. Many geographic locations do not have more than one viable competitor ready to enter the market.

REVIEW OF HOW THE FTC/U. S. DOJ *HORIZONTAL MERGER GUIDELINES* HAVE BEEN APPLIED TO MERGERS IN THE HIGHWAY MATERIALS AND CONSTRUCTION FIELDS

The *Horizontal Merger Guidelines* are a set of internal rules promulgated by the Antitrust Division of the DOJ in conjunction with the FTC (U. S. Department of Justice and Federal Trade Commission 2010). The rules provide guidance regarding the extent to which the DOJ and FTC will scrutinize or challenge a merger based on potential anticompetitive effects.

Section 7 of the Clayton Act, section 1 of the Sherman Act, and section 5 of the Federal Trade Commission Act establish the Federal antitrust laws applicable to mergers (Clayton Antitrust Act 1914; Sherman Antitrust Act 1890; Federal Trade Commission Act 1914). Section 7 of the Clayton Act prohibits any merger for which the effects "may be substantially to lessen competition." The primary concern of section 7 is the creation (or enhancement) of market power. The unifying theme of the *Horizontal Merger Guidelines* "is that mergers should not be permitted to create, enhance, or entrench market power or to facilitate its exercise" (U. S. Department of Justice and Federal Trade Commission 2010).

The guidelines are organized into 13 different sections. Of the 13 guidelines, the following have been consistently applied to M&As in the road-building industry: evidence of adverse competitive effects; targeted customers and price discrimination; market definition; market participants, market shares, and market concentration; unilateral effects; coordinated effects; and market entry analysis (U. S. Department of Justice and Federal Trade Commission 2010).

CRITICAL FINDINGS OF THE LITERATURE REVIEW AND LEGAL GUIDANCE

A number of critical findings resulting from the literature and legal reviews were completed under this study. One principal finding is that States can monitor M&A activity for its impact on market share. A primary tool to calculate strength of market share (and to determine if the market is noncompetitive) is the Herfindahl-Hirschman Index (HHI) (figure 3) (U.S. Department of Justice 2018). The formula for HHI is:

$$HHI = s_1^2 + s_2^2 + s_3^2 + \cdots s_n^2$$

Figure 3. Equation. HHI formula.

Where s_i = the market share percentage of firm i, expressed as a whole number, not a decimal.

The index is used by the DOJ to determine competition. The closer a market is to a monopoly, the higher the market's concentration (and the lower its competition). If, for example, the industry contained only one firm, then that firm would have 100-percent market share, and the HHI would equal 10,000, indicating a monopoly. If thousands of firms were competing, each would have a market share of almost 0 percent, and the HHI would be close to 0, indicating nearly perfect competition. As a general rule, mergers that increase the HHI by more than 200 points in highly concentrated markets raise antitrust concerns, as they are assumed to

enhance market power under section 5.3 of the *Horizontal Merger Guidelines* (U. S. Department of Justice and Federal Trade Commission 2010).

A substantial problem, however, with HHI is that defining a market and considering market share can arise from geographic factors. This problem can occur when companies within an industry have roughly equal market shares, but they each operate only in specific areas of the country, so that each firm, in effect, has a monopoly within the specific marketplace in which it does business. In many of the States assessed, companies dominated particular regions, although, overall, the market contained a fair number of participants. Hence, no quantifiable impacts on construction material pricing occurred.

Retrospective analyses of merger effects are rarely conducted. One leading voice on this issue is Dennis Carlton, a prominent economics professor at the University of Chicago Booth School of Business. Professor Carlton has articulated several concerns with the current state of the data and analysis relating to merger effects (Carlton 2009). Nonetheless, during the course of this study, our research team identified several resources that addressed the retrospective analysis of mergers in general, in the asphalt industry, and in other industries with local geographic markets. More details are provided in appendix A, which is a literature review. Many academics have raised concerns about the methodology, modeling, and data quality that have been "widely noted as impediments to evaluating mergers and merger control" (Kwoka 2013). Despite these methodological concerns from existing studies, Kwoka reviewed hundreds of mergers and studies from 2003 to 2013 to assess the impact that mergers had on prices, as well as the effectiveness of the various potential remedies. Kwoka noted that "price increases characterized merger outcomes in all cases, regardless of the policy action taken" (Kwoka 2013). Essentially, his argument is that all studies showed some increase in pricing. However, the amount of the increase varies considerably by the type of policy action taken. Critical to Kwoka's analysis, however, is the fact that none of the observed information exclusively demonstrated price increases directly attributed to the merger activity.

Furthermore, Kwoka noted, "Transactions opposed outright by the antitrust agencies are found to average a 1.86-percent increase," while "[t]hose subject to divestiture result in a price increase of 6.66 percent" (Kwoka 2013). Mergers that promoted "conduct or conditions remedies have substantially larger price increases—12.82 percent for all transactions, 16.01 for true mergers." Kwoka states, "Notably, transactions that were cleared outright are found to result in price increases averaging 7.40 percent, little different from the most effective remedy, divestiture." Professor Kwoka's findings also suggest "entry conditions would appear to be of critical importance in cases cleared by the agencies." He concludes that "merger control policy in the United States has been considerably more permissive of concentration and the study of mergers" than suggested by the *Horizontal Merger Guidelines*. One additional item of note was that "a very large fraction of carefully studied mergers shows that those mergers resulted in higher prices, even when a remedy was imposed" and that the "studied remedies imposed on problematic mergers do not appear generally effective in preventing postmerger price increases with nonstructural remedies substantially less effective than divestitures." This finding was not readily shown in the bid data used for this study.

In her economics dissertation, one chapter of which studies mergers in the asphalt industry, Duplantis (2010) modeled three common forms of predictive anticompetitive effects with

observed data from three asphalt supplier mergers in Michigan to determine the accuracy of each modeling type. The three modeling types analyzed were a coordinated effects model using the postmerger change in HHI, calculated from revenue from winning bids; a unilateral effects model using price effects predicted from a first/second analysis; and a unilateral effects model using the price effects from a spatial model of competition. The finding of Dr. Duplantis' research is that none of the models really work—"there are no clear winners." The observed postmerger pricing effects that Dr. Duplantis uses as her comparative baseline found that one merger, which was not preemptively challenged but was found post hoc to be anticompetitive by the DOJ, resulted in an 18-percent price increase for asphalt in the 2 yr after the merger. Strikingly, the 18-percent price increase for asphalt in the 2 yr after the merger regressed to statistically insignificant levels over the next 4 yr. The other two mergers did not result in statistically significant price increases. This outcome has emerged as a common theme throughout the published and observed research and mirrors this study's findings.

These findings in the existing literature provided the basis for the research team's continued emphasis on M&A activity. Most literature held that, where market entry is possible, anticompetitive effects resulting from mergers dissipate quickly. To assess this observation, the research team explored data analysis and case studies described in greater detail in the following chapters.

FHWA is ultimately responsible for ensuring the bidding process associated with Federal-aid funding employs fair competition. FHWA's regulations require States to "assure opportunity for free, open, and competitive bidding" (Code of Federal Regulations 2020). This requirement dictated the need for a study of material source M&As on project delivery quality and costs.

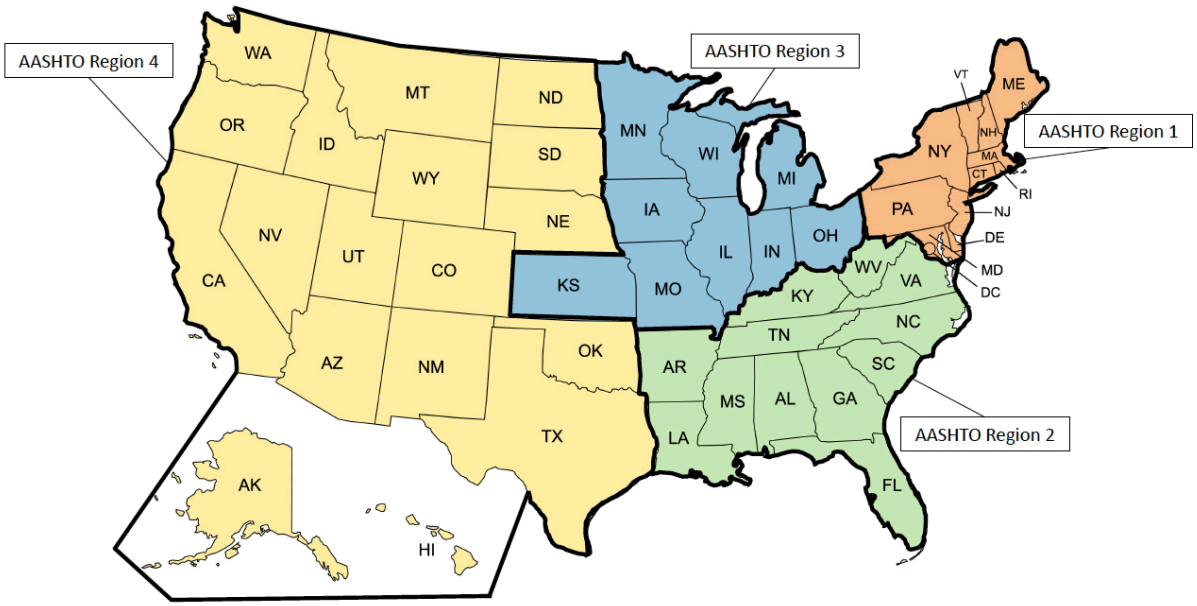
The following chapters provide an overview of the work completed in this study and describe the findings of data processing, case studies, preliminary analysis, challenges and observations, and overall findings.

CHAPTER 2. DATA PROCESSING AND ANALYSIS

Consolidation activity within construction firms can have widespread and long-lasting effects on the industry, as well as on pricing. A single firm that acquires many smaller firms in a geographic area may gain an advantage in that area, which can affect material producers. For example, a geographic region with six plants producing hot-mix asphalt (HMA) and sealant materials may suffer as a result of M&A activity: if one firm begins controlling that area and only sources to one or two of the six plants, the others will lose valuable business. Location is a large contributing factor in supplier selection for firms, as some materials cannot be transported beyond a certain radius because they would be too costly to transport beyond some fixed distance.

To assess the effects of M&A activity, the team examined data across the United States to identify significant consolidation. To begin this study, the team identified 31 States as the initial analysis target, with 22 marked as optional analysis States. Ultimately, only the initial 31 were reviewed in great detail, as the data available for the study did not demonstrate clear changes in pricing and item bid information.

The 31 primary States chosen for analysis are listed with their associated AASHTO region, as depicted in figure 4 and table 1. Analysis of these States required sorting the bid data for every year beginning with 2006 through the third quarter of 2016. Only projects including typical highway project materials were included for each State for each year.



Original map © 2021 MapChart. Modified by FHWA (see Acknowledgments section).

Figure 4. Map. AASHTO regions in the United States (Historical MapChart 2022).

Table 1. Analysis States.

AASHTO Region	States Selected
1	Massachusetts, New York, Pennsylvania, and Vermont
2	Arkansas, Florida, Georgia, Louisiana, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia
3	Illinois, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin
4	Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, and Utah

Bid price data were mined by Oman Systems, Inc., from State DOT bid prices posted on State websites provided by FHWA.[1] Winning projects were sorted to include only those with materials of interest, which were materials commonly appearing in road-building projects, including asphalt, structural concrete, aggregate, and granular backfill materials. For each State, the exact items varied, e.g., one State may have up to 3,000 items with concrete in the item name or description. The projects containing these bid item numbers were then sorted by date for each analysis year (first quarter of 2006 through the third quarter of 2016). Sorting by date allowed the projects to be matched with the corresponding contractor information in Bid Express®, as Bid Express lists bid information in calendar order for each year (Bid Express 2021). The goal was to match each project containing the sorted items by their project number and bid date to find the contractor name and the total project costs for each project, coupled with individual bid item numbers. Historical bid data from some individual State archives were used, as well as online resources such as Bid Express to locate the contractors and project costs. This process was completed for 2006–2016 for each State. Besides project cost and contractor name, the final curated data entry for each project included pay items, descriptions, quantity, units and settled price for each selected item, bid date, project type, county, and region, if applicable.

Curated data examples are provided in this report. The entire dataset was provided to FHWA. The data are arranged by State and sorted by project identification number.

After this initial analysis was completed, a secondary State-by-State investigation was conducted. For each State included, each individual project was listed by year in separate analysis sheets that included the project cost, contractor name, county, and individual State DOT-defined regions. Once each project was identified, the average project cost was calculated for every year as a starting point for comparison. Furthermore, each individual project cost was compared against the average cost to determine the percent cost above the average cost for each project for every year. This cost was identified to determine whether individual projects were out of expected cost ranges.

Table 2 shows an example (using data from Wisconsin) of this State-by-State investigation. The data identify the projects for each year with winning bid project costs that were greater than the average for that particular year. Any projects with winning bid project costs that were more than 100 percent greater than the average cost for that year were selected to analyze the percentage of all projects per year that had costs greater than the average.

[1]FHWA does not collect this bid price information.

Table 2. State individual analysis example.

Contractor	Project Cost (Dollars)	Average (Dollars)	Average (Percent)	County	Region
A	15,190,116.42	3,079,825.71	493	Monroe	5
B	1,479,226.23	3,079,825.71	48	Dodge	5
C	393,338.20	3,079,825.71	13	Monroe	5
D	2,264,001.25	3,079,825.71	74	Outagamie	2
D	4,508,636.78	3,079,825.71	146	Marinette	2
E	309,063.23	3,079,825.71	10	Pierce	3
F	2,410,220.10	3,079,825.71	78	St. Croix	3
G	186,527.49	3,079,825.71	6	Trempealeau	3
H	6,336,493.88	3,079,825.71	206	Milwaukee	4
I	81,496,581.63	3,079,825.71	2,646	Milwaukee	4
J	992,526.34	3,079,825.71	32	Jefferson	5
C	399,186.85	3,079,825.71	13	Monroe	5
K	264,144.30	3,079,825.71	9	Vernon	5
L	167,587.53	3,079,825.71	5	Crawford	5
M	649,158.42	3,079,825.71	21	Dane	5

Additionally, the projects were also analyzed by region. Table 3 shows an example for the Wisconsin data. In this example, the first step is to identify how the State agency (often the DOT) defines the regions or districts of the State. For Wisconsin, the State is divided into five unique regions labeled by geographic location: north central, northeast, northwest, southeast, and southwest (figure 5). For States that divide regions by name, such as Wisconsin, each region is assigned a numerical identifier to allow for sorting in Excel®. The projects in this example were assigned a region number based on the county, which is identified in the original data provided through Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites. Lists showing which counties are included in each region are available from State DOT websites. Finally, the number and percentage of projects occurring in each region per year were analyzed to identify any regional market share changes across the analysis period.

Table 3. Regional analysis example.

Region Key	Identification No.	Projects (No.)	Projects (Percent)
North central	1	51	11.89
Northeast	2	76	17.72
Northwest	3	76	17.72
Southeast	4	126	29.37
Southwest	5	100	23.31

Figure 5. Map. Wisconsin region map (Wisconsin DOT n.d.b.).

By analyzing each individual State for proportions of projects winning bids that were greater than the average project cost for the year, years with disproportionally high projects costs can be identified compared with a performance metric (in this case, project costs). Regional analysis can also aid in identifying if market shares are skewed in individual States. If so, the analysis can identify what companies are operating in those regions, as well as what companies and material producers and providers have control in those areas. Three States were chosen to highlight the analysis work that took place: Wisconsin, Colorado, and Florida. State-specific procedures, data, and results are described in chapter 3.

Unit price data can also be of interest. Many State DOTs keep records of historical unit price data for all bid item numbers included in lettings, sorted by date range. These data were requested for States of interest, including Wisconsin and Florida. As listed previously in this chapter, items of interest identified in the project included granular backfill, aggregate, concrete pavement, and asphalt pavement. These items were selected from the historical unit price datasets for comparison against actual unit prices of those items in bids for corresponding years, as obtained from the dataset, coupled with information from specific State websites.

CHAPTER 3. STATE ASSESSMENTS

This chapter provides introductory information for each State, along with additional analysis if available. The team also collected information on consolidations and merger activity in each State to compare against the State-provided bid information. Comprehensive surveys and telephone interviews with State DOTs were not conducted for this study. When possible, after completing internet-based research, research team members discussed their general observations concerning the available data.

The research team divided the targeted States by AASHTO regions. Based on team conversations and internet-based research, they identified available data sources and consolidation activity in requisite States.

In many cases, the available data provided through Oman Systems, Inc., were not complete enough to conduct substantial trend analyses. Item labels and unit prices were presented inconsistently in their data. When possible, the research team obtained some information from State websites and publicly available resources.

DATA PROCESSING

A cohesive process was developed for the data analysis for all 31 States to ensure consistency in the analysis results. This process is described step by step as follows:

1. The raw data sheet for 1 yr (e.g., 2006) was opened. Filters were added for each column (State, pay item, description, quantity, unit, price, job number, bid date, county, and project type).

2. The State column was filtered to select one State (e.g., Virginia).

3. The description column was sorted to select concrete, asphalt, and aggregate items. This project limited analysis to concrete, asphalt, and aggregate construction materials alone. A different project could be developed to look at other project component costs, including engineering, geotechnical, signs, and testing equipment.

4. This selection was then copied and pasted into its own spreadsheet file.

5. Step 1 through step 3 were repeated with each year's raw data sheet, and each selection was pasted into the State-specific spreadsheet in chronological order.

6. Within each State-specific sheet, the research team attempted to identify the most frequently occurring specific item for three material categories (concrete, asphalt, and aggregate). The more data points available for analysis, the more significant any results would be. However, in some States, no one item was used often enough to yield meaningful analysis. This challenge is described in more detail in chapter 5.

7. The data for each specific item selected within one State were separated by year. The following values were calculated for the one item for each year: average price for the year, maximum price for the year, minimum price for the year, and standard deviation.

8. A graph of each specific item's average price versus year was created for each State, resulting in two to three graphs per State (because some States only yielded two items for detailed analysis).

9. A table for each specific item was then created to display average price, maximum price, minimum price, and standard deviation for each year, resulting in two to three graphs and a corresponding table associated with each graph for every State.

10. Any unusual prices were flagged for further analysis, such as very high average or maximum prices, very low average or minimum prices, or large standard deviations.

11. Further analysis was conducted of unusual prices, which involved finding the item in the State's data sheet. From here, it was determined how often the unusual price(s) occurred. The job number, bid date, and county for these prices were identified. Then the job number and bid dates were used to find more details on this project through a combination of the State's website and Bid Express.

12. The project location was also investigated to see if transportation costs or proximity to large urban areas perhaps played a role in the price. Anecdotal information gathered from the State were analyzed to assess if other factors contributed to the price, such as possible M&A activity, material shortages, or economic conditions.

On completion of these steps, our team provided additional data review of individual practices, such as collection of information on contractors "skewing" their bids: that is, placing high unit bids on items that would overrun DOT estimates and placing low unit bids on items that would underrun them. Such "penny bidding" was represented throughout the data and is shown in the accompanying tables. In many cases, these individual bid item number prices make quantitative assessments of M&A activity impossible.

In compliance with the Paperwork Reduction Act (1995) and in concert with direction from the FHWA project manager, the States were contacted to discuss what data might be available to assist in the study and for general awareness of M&A activity.

AASHTO REGION 1

This section presents States located in AASHTO region 1: Massachusetts, New York, Pennsylvania, and Vermont.

Massachusetts

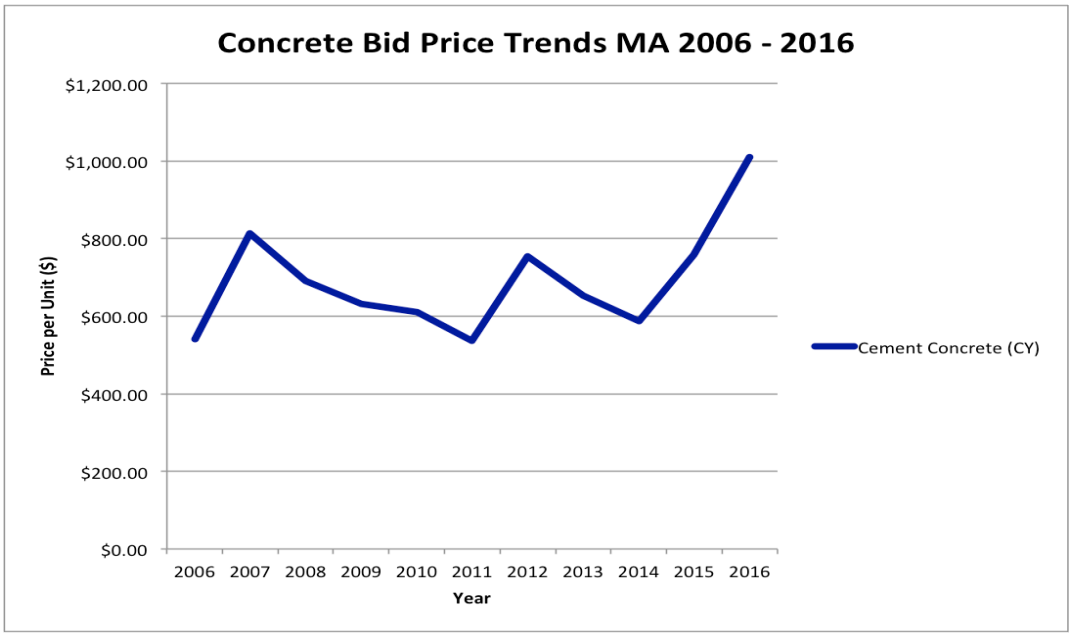
Massachusetts DOT (MassDOT) was contacted by phone and email; no formal script was followed. A general inquiry was made regarding consolidation and bid activity within the State during the analysis period of 2006 through the first three quarters of 2016. No formal questionnaire was developed for these informal contacts. The research team discussed with MassDOT the availability of additional bid price information and general concerns about the competitiveness in their State. Anecdotal evidence provided by MassDOT showed consolidation activity within the paving and aggregate industry around 2000 when a major firm bought several smaller paving firms and aggregate sources. The impact of this activity was felt in the eastern part of the State (districts 3, 4, 5, and 6), where less aggregate was available. However, whether costs were impacted due to this merger was not clear, and activity since then did not raised

concerns. Bid data for Massachusetts for 2006 through the third quarter of 2016 were used for analysis. Analysis of this bid data confirmed no evidence of price increases due to this acquisition.

A total of 136 contractors were included in the bid data for this analysis period. MassDOT also provided weighted bid price data, as well as mean and median bid prices by item and by district for all items included in the data provided by Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites. Some variability across districts was seen in mean and median bid pricing for items such cement concrete and asphalt products. This variability can be attributable to material source location in the State. For example, districts 3, 4, 5, and 6 in the eastern part of the State had less aggregate available than did the western part of the State.

Figure 6, figure 7, and figure 8 show the bid price trends for three materials: 30-MPa, 40-mm, 335-kg cement concrete (item No. 901), HMA (item No. 460), and gravel borrow (item No. 151), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 4, table 5, and table 6, respectively).

Figure 6 shows the average price of this particular concrete item (item No. 901) in Massachusetts during the analysis period. Moderate variation can be seen in the average price from year to year, with a general increase in average price from 2014 onward. Table 4 shows more detailed pricing information by year. Detailed analysis showed that multiple high prices in each year drove the average prices up, which is also reflected in the standard deviation for each year. The team looked up the projects with high prices on the MassDOT website; however, no overt causes or patterns were discovered for the higher prices.



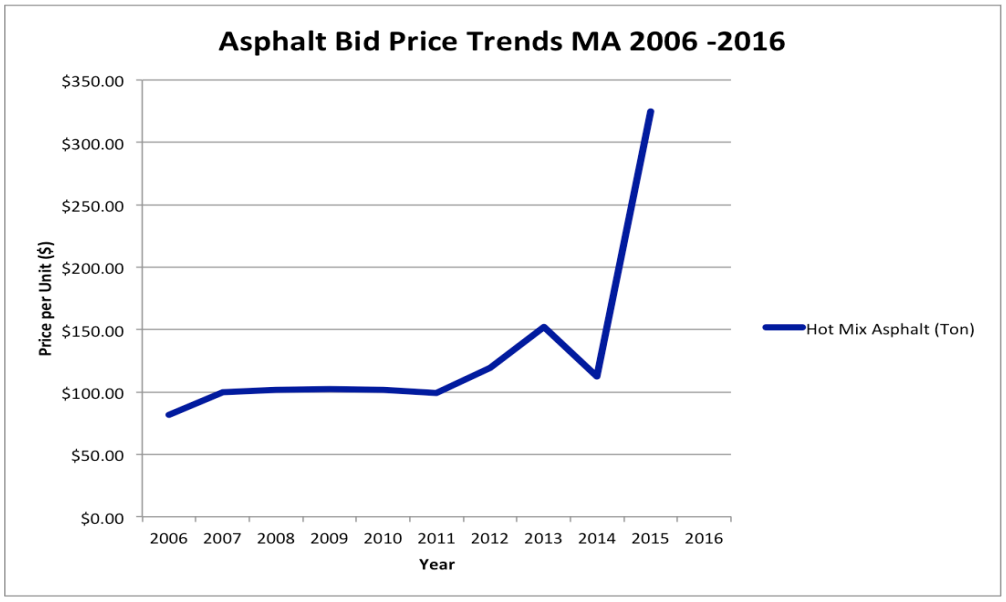
Source: FHWA.
CY = cubic yard.

Figure 6. Graph. Concrete bid price trends—Massachusetts 2006–2016.

Table 4. Concrete price data—Massachusetts.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	27	539.73	1,100.00	200.00	274.7
2007	23	812.99	3,287.59	133.00	658.3
2008	45	690.37	2,000.00	149.09	386.5
2009	31	631.47	2,000.00	137.00	428.1
2010	33	611.04	1,700.00	95.00	333.8
2011	29	536.35	1,271.52	100.00	266.3
2012	31	754.88	1,780.00	110.00	422.6
2013	33	651.92	1,500.00	50.00	370.7
2014	35	586.79	2,000.00	50.00	385.6
2015	32	758.29	1,900.00	100.00	432.4
2016	33	1,009.50	2,000.00	125.00	517.1

Next, the price trends for a specific asphalt item were investigated. Figure 7 shows the price trends for a specific asphalt item (item No. 460) in Massachusetts during the analysis period. Table 5 provides some additional price information. As can be seen, the prices for this asphalt item remained relatively consistent throughout the period except for a slight increase in 2015. However, this higher price only occurred once in one project.



Source: FHWA.

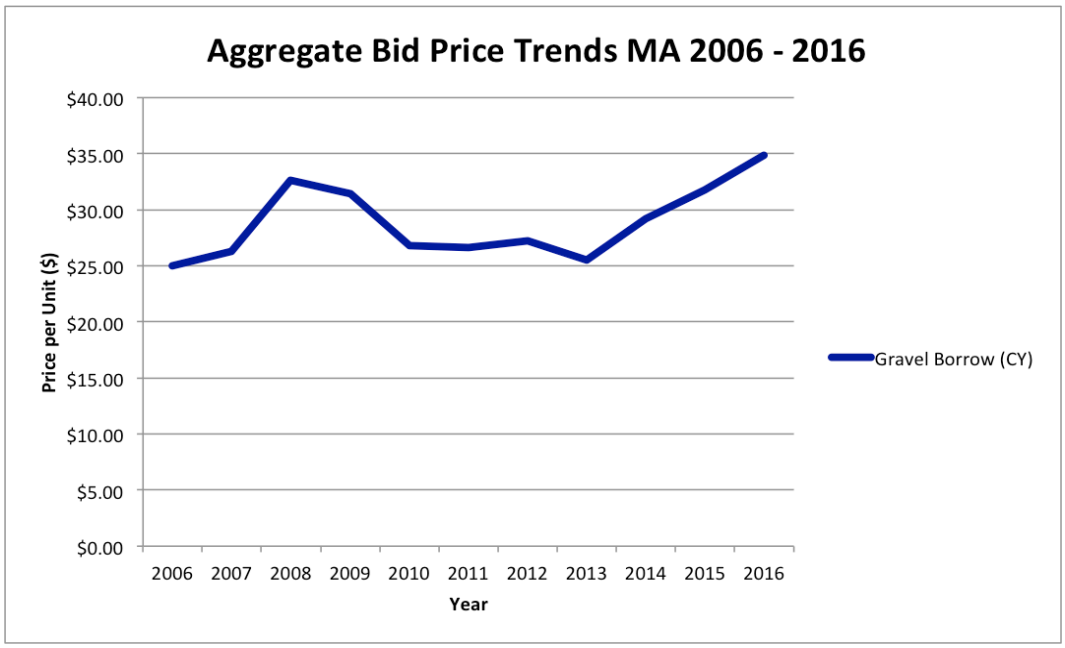
Figure 7. Graph. Asphalt bid price trends—Massachusetts 2006–2016.

Table 5. Asphalt price data—Massachusetts.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	41	81.67	195.00	48.30	28.7
2007	73	99.69	240.00	55.03	36.1
2008	125	101.72	500.00	45.00	63.1
2009	134	102.20	310.00	45.00	42.0
2010	98	101.37	250.00	62.00	41.1
2011	86	99.14	250.00	46.00	37.7
2012	25	119.13	225.00	46.00	43.9
2013	6	152.33	250.00	115.00	46.8
2014	1	112.50	—	—	—
2015	1	325.00	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, the price trends for an aggregate item in Massachusetts were analyzed. Figure 8 and table 6 show price data information for a specific aggregate item (item No. 151) throughout the analysis period. Similar to the asphalt data, no significant fluctuations took place throughout the analysis period, which is reflected in the low standard deviation values. A general increase in average prices occurred toward the end of the analysis period; however, this increase is small and likely due to regular inflation of prices over time.



Source: FHWA.

Figure 8. Graph. Aggregate bid price trends—Massachusetts 2006–2016.

Table 6. Aggregate price data—Massachusetts.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	48	25.00	81.00	0.76	14.7
2007	75	26.25	114.68	1.00	18.1
2008	114	32.59	100.00	1.00	16.0
2009	109	31.40	70.00	0.10	14.7
2010	113	26.77	150.00	0.01	19.7
2011	95	26.67	62.00	0.01	14.6
2012	62	27.21	85.00	1.00	14.1
2013	76	25.50	65.00	0.01	13.7
2014	101	29.16	115.00	0.01	19.0
2015	100	31.77	100.00	0.01	18.2
2016	68	34.84	125.00	0.01	24.2

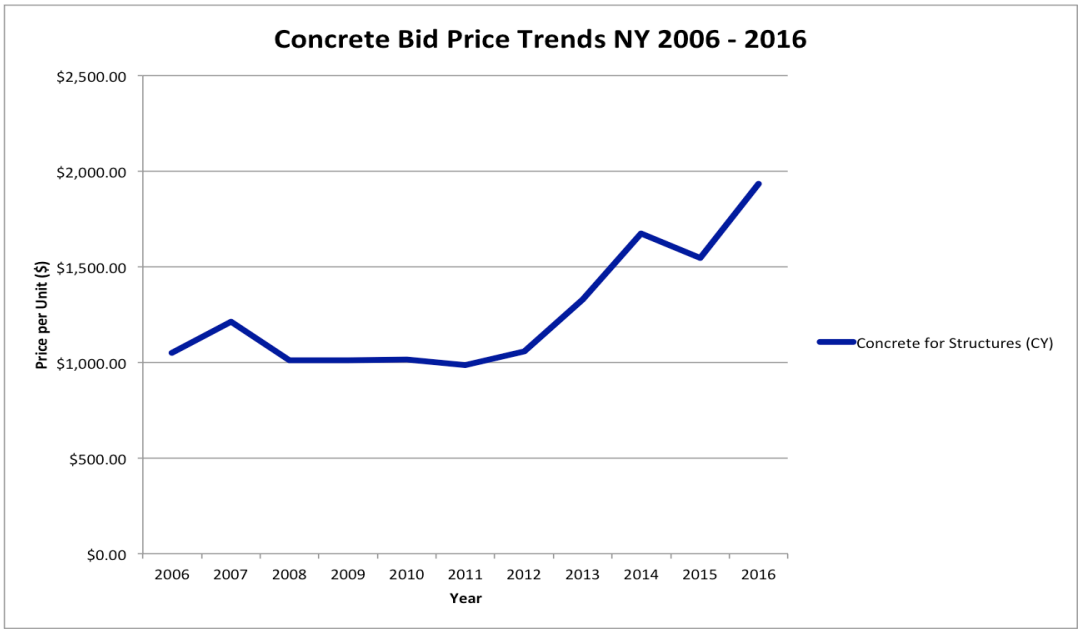
New York

In New York, one large firm serves many major construction markets in ready-mix concrete as well as asphalt. Since 2013, this firm has gained approximately 15 acquisitions of ready-mix concrete plants in the New York City metropolitan area, as well as Washington, DC. New York State DOT's (NYSDOT's) Engineering Division provided weighted average item price reports, as well as regional and statewide average awarded price reports. These reports, used in tandem with the aforementioned dataset, provided analysis of the pricing of ready-mix concrete items in awarded bids for the previous 5 yr.

NYSDOT divides the State into 11 unique regions; region 11 includes the New York City metropolitan area. To assess the effects of the major acquisitions that happened in the previous 5 yr, ready-mix concrete items were targeted for this region specifically to identify any trends in pricing. Prices for these concrete items in the bid data were higher than reported unit prices in region 11 compared with other regions: where a ready-mix concrete item in another region may see prices within $100.00 of the reported unit price; in region 11 the same item was often higher.

Figure 9, figure 10, and figure 11 show the bid price trends for three materials: concrete for structures class HP (item No. 555.09), asphalt concrete 37.5-mm F9 Superpave® (item No. 402.3789016), and aggregate (item No. 623.0551), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 7, table 8, and table 9, respectively).

As can be seen in figure 9 and table 7, the standard deviations for this concrete item (item No. 555.09) was large, indicating a large deviation of values from the mean. This deviation is also reflected in the large differences between minimum and maximum price; for example, in 2007, the maximum price was $11,468.30, whereas the minimum price bid was $328.76. Further analysis of the bids containing this item in 2007 revealed that this maximum price only occurred once. Without the $11,468.30 item, the standard deviation of the remaining data for 2007 was 786.2, which is significantly smaller, indicating that this high price incident was impacting the average price and standard deviation of the data for this item for 2007.



Source: FHWA.

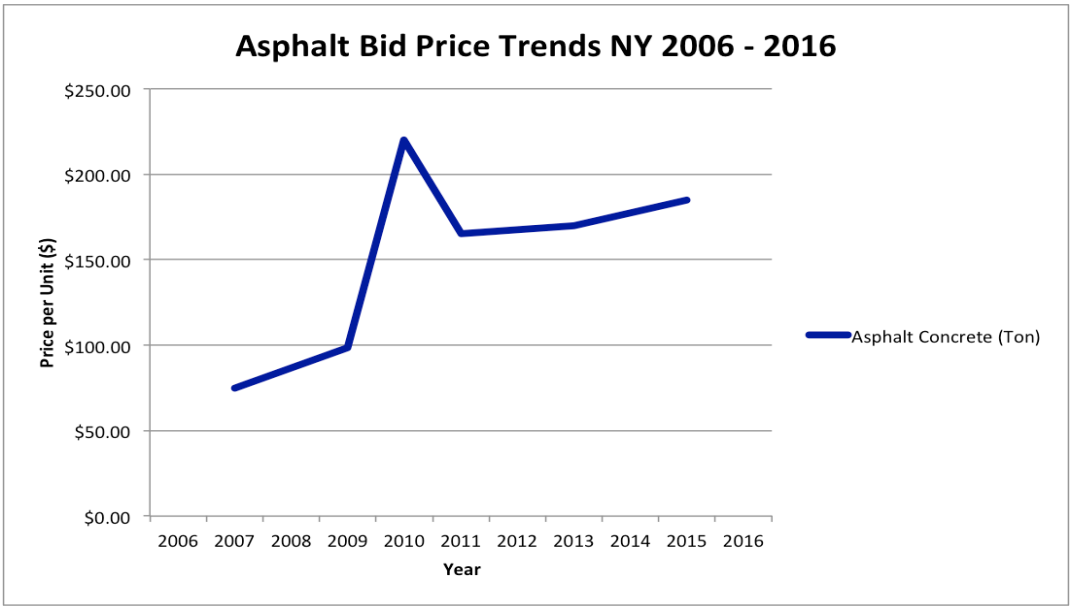
Figure 9. Graph. Concrete bid price trends—New York 2006–2016.

Table 7. Concrete price data—New York.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	35	1,050.06	3,822.77	382.28	781.4
2007	45	1,212.67	11,468.30	328.76	1,730.5
2008	28	1,011.58	3,058.22	292.27	665.2
2009	77	1,010.79	3,822.77	324.94	769.9
2010	27	1,016.05	4,900.00	411.66	904.1
2011	31	986.10	8,000.00	1.00	1344.2
2012	52	1,056.88	3,500.00	240.00	681.2
2013	39	1,327.42	4,000.00	330.00	907.7
2014	42	1,672.81	5,900.00	405.00	1,330.5
2015	40	1,545.00	10,000.00	475.00	1,631.9
2016	14	1,934.86	6,952.00	190.00	1,634.6

Similarly, in 2011 there was a minimum bid price of $1.00. Further analysis of the bids containing this item in 2011 revealed that this minimum price of $1.00 occurred only once, indicating this one low priced item could be impacting the average price and standard deviation.

Next, the price trends for an asphalt item in New York were investigated. Figure 10 shows one noticeable spike in the bid price of a specific asphalt item (item No. 402.198901). However, table 8 shows that the actual data for this item were somewhat limited: the item is not used in each of the analysis years, and, in the years it is present, it is only present several times. The price spike is due to the higher price of $220.00 per ton in 2010 and only occurred once in the data.



Source: FHWA.

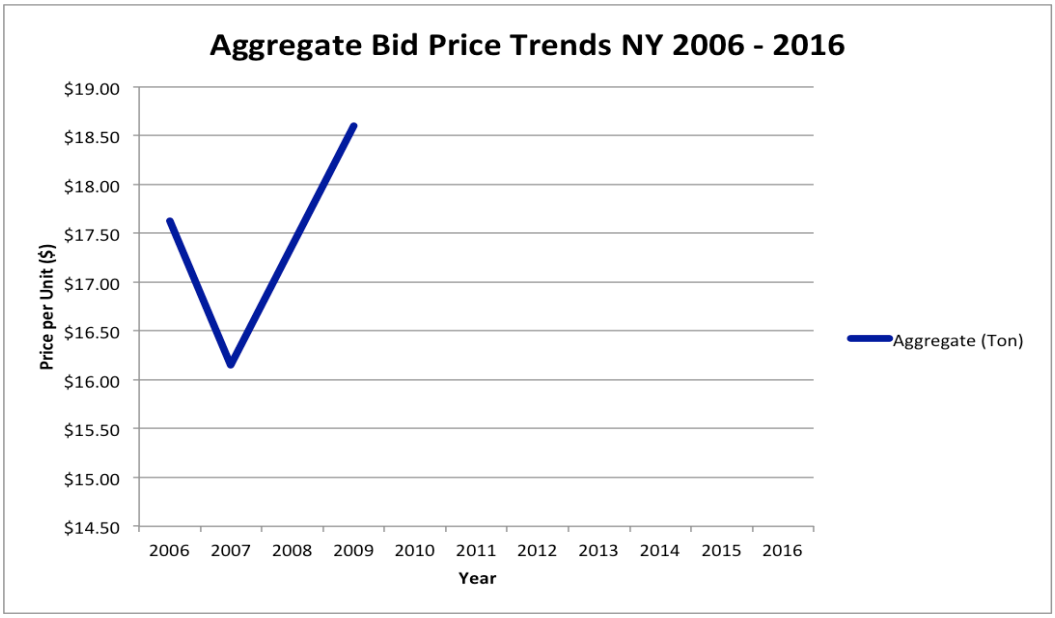
Figure 10. Graph. Asphalt bid price trends—New York 2006–2016.

Table 8. Asphalt price data—New York.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	2	74.84	90.72	58.97	15.9
2008	0	—	—	—	—
2009	2	98.50	127.01	70.00	28.5
2010	1	220.00	—	—	—
2011	1	165.00	—	—	—
2012	0	—	—	—	—
2013	1	170.00	—	—	—
2014	0	—	—	—	—
2015	2	185.00	200.00	170.00	15.0
2016	0	—	—	—	—

—No data.

Lastly, price trends for an aggregate item in New York were analyzed. Similar to the asphalt data, the aggregate data were also limited for New York during the analysis period. The aggregate item that occurred the most during the analysis period was item No. 623.0551 (named "aggregate" in New York). While the graph in figure 11 seems to indicate price fluctuations, the data in table 9 show the variation in price is very low, as indicated by the low standard deviation values.



Source: FHWA.

Figure 11. Graph. Aggregate bid price trends—New York 2006–2016.

Table 9. Aggregate price data—New York.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	8	17.63	21.77	14.15	2.5
2007	5	16.15	18.14	14.52	1.3
2008	0	—	—	—	—
2009	1	18.60	—	—	—
2010	0	—	—	—	—
2011	0	—	—	—	—
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Pennsylvania

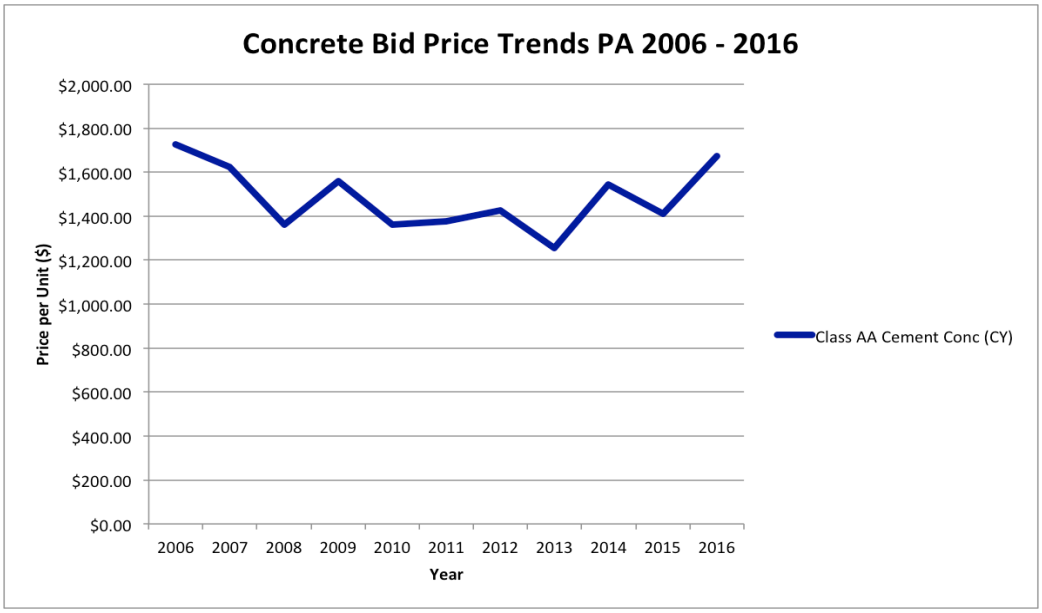
Pennsylvania DOT's (PennDOT's) Bureau of Project Delivery reported that, while some M&A activity had occurred between the analysis years 2006–2016, some larger companies also experienced some splitting. None of the activity seen raised concerns about increased bid prices, the number of bids, or total project costs, and the State did not alter contract language or add additional statutes or bidding processes to control for any cost effects.

Data provided to the research team as well as historical unit price data provided by PennDOT allowed for analysis of average item prices, weighted average prices, low and high prices, and the number of times the item occurred in a letting during the year of interest. Overall, bid prices were within small ranges of report unit prices for the material items of interest, including

aggregate, asphalt, and concrete. Most of the State's concrete and asphalt suppliers were located in the eastern region of the State. In comparison, aggregate suppliers were located primarily in the eastern or western areas, leaving the middle of the State relatively void of suppliers. Some transportation costs associated with projects in the central region were to be expected based on this distribution of materials.

Figure 12, figure 13, and figure 14 show the bid price trends for three materials: class AA cement concrete (item No. 1001-0001), SP asphalt mix dense graded HMA base (item No. 0309-0437), and No. 1 coarse aggregate (item No. 0703-0020), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 10, table 11, and table 12, respectively).

As can be seen in figure 12 and table 10, there is a high maximum price in 2014 of $18,250.00. The minimum bid price for this specific concrete item in 2014 was $135.00, and the average price was $1,544.62. This high maximum bid price is reflected in the standard deviation of 2,160.8. Further analysis of the 2014 data for this concrete item revealed that this maximum price only occurred once in the data for that year.



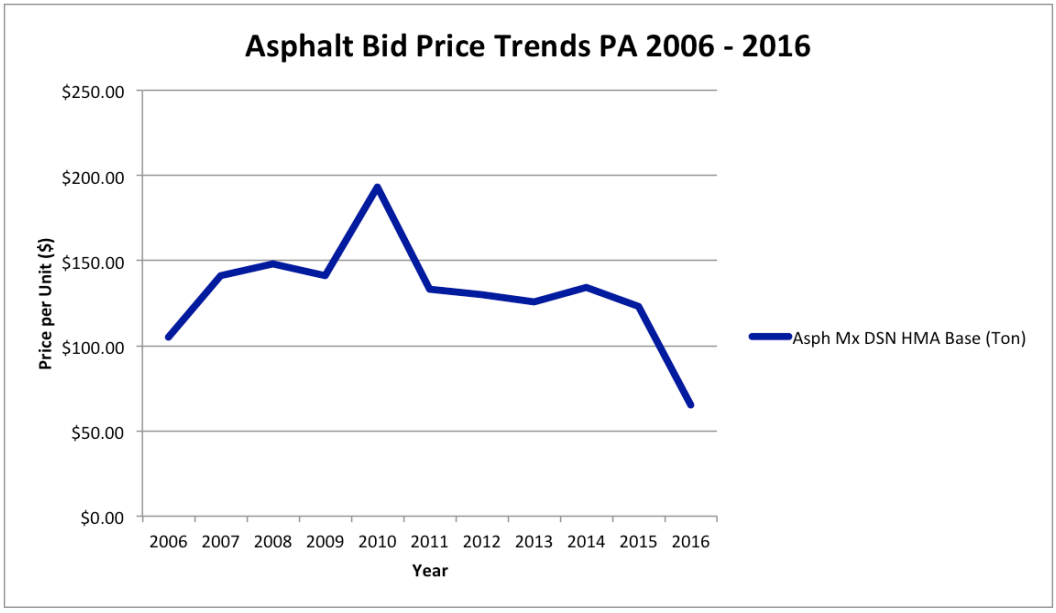
Source: FHWA.
Conc = concrete.

Figure 12. Graph. Concrete bid price trends—Pennsylvania 2006–2016.

Table 10. Concrete price data—Pennsylvania.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	69	1,726.17	7,885.00	311.57	1,458.1
2007	63	1,622.84	4,900.00	440.63	949.1
2008	68	1,362.68	4,000.00	336.00	828.9
2009	96	1,558.94	5,500.00	425.00	979.3
2010	88	1,359.99	7,294.00	260.00	904.9
2011	62	1,376.70	4,680.00	269.00	869.2
2012	55	1,424.38	5,500.00	150.00	942.8
2013	52	1,254.76	3,672.00	107.00	703.3
2014	72	1,544.62	18,250.00	135.00	2,160.8
2015	45	1,412.24	4,500.00	350.00	886.3
2016	35	1,674.35	8,530.00	8.00	1,447.8

Next, the price trends for an asphalt item in Pennsylvania were analyzed (figure 13 and table 11). There was one higher maximum price for this specific asphalt item (item No. 0309-0437) in Pennsylvania in 2010, which drove the average price for that year higher. The spike seen in figure 13 indicates this high price.



Source: FHWA.
Asph Mx DSN = asphalt mix dense graded.

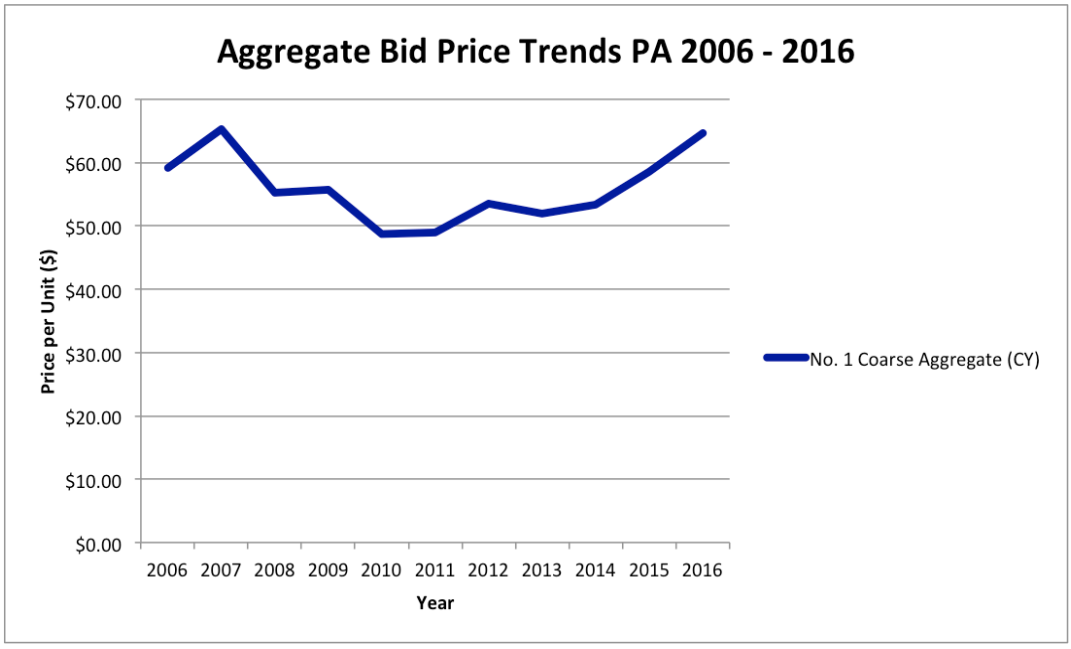
Figure 13. Graph. Asphalt bid price trends—Pennsylvania 2006–2016.

Table 11. Asphalt price data—Pennsylvania.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	52	105.01	600.00	35.00	89.7
2007	53	141.04	600.00	46.83	123.4
2008	56	147.90	1,005.00	44.05	139.8
2009	62	141.31	578.81	51.15	109.3
2010	43	192.97	1,550.00	51.90	239.1
2011	39	133.23	440.40	61.50	81.9
2012	37	130.00	500.00	50.00	100.2
2013	39	126.03	304.62	51.80	55.2
2014	41	134.35	325.00	60.50	67.0
2015	25	123.39	240.00	56.00	48.8
2016	1	65.00	—	—	—

—No data.

Lastly, the price trends for an aggregate item were analyzed. Figure 14 shows the bid price trends for a specific aggregate item in Pennsylvania (item No. 0703-0020). Table 12 gives additional price information, including maximum and minimum prices for each year and the standard deviation. Prices remained consistent throughout the analysis period.



Source: FHWA.

Figure 14. Graph. Aggregate bid price trends—Pennsylvania 2006–2016.

Table 12. Aggregate price data—Pennsylvania.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	61	59.20	315.00	13.00	55.4
2007	96	65.25	600.00	1.00	85.8
2008	96	55.17	260.00	0.01	34.1
2009	155	55.72	500.00	0.01	45.1
2010	164	48.72	190.00	0.01	24.3
2011	119	48.93	150.00	3.00	22.9
2012	152	53.53	314.00	25.00	27.5
2013	120	51.91	150.00	21.64	21.2
2014	129	53.40	200.44	0.01	27.8
2015	119	58.50	160.00	0.10	28.3
2016	82	64.69	247.00	20.00	37.5

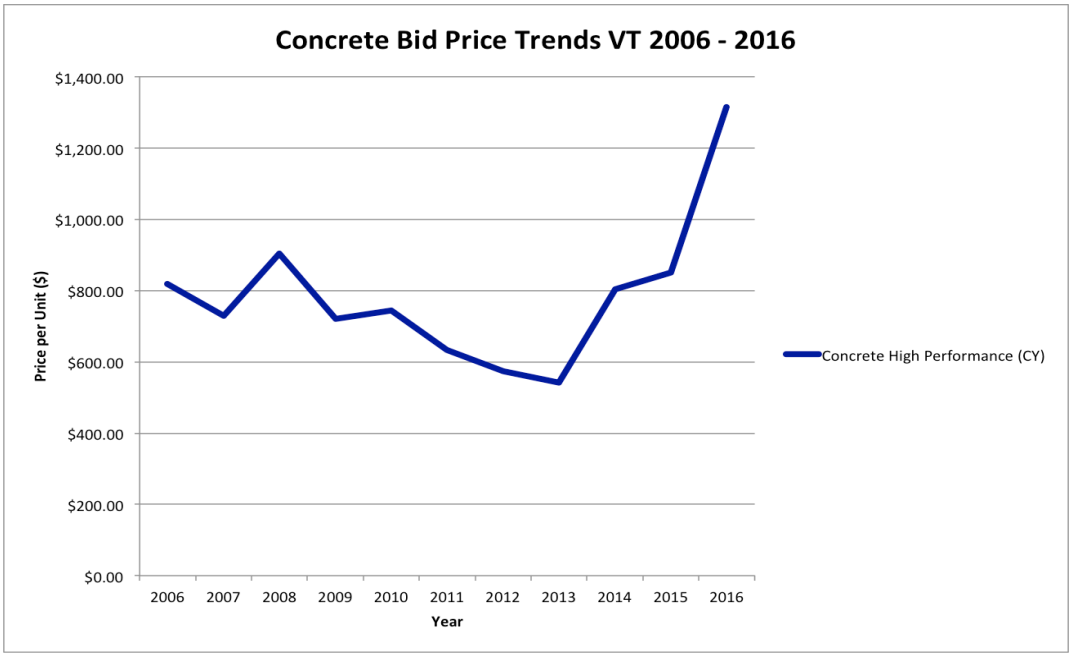
Vermont

Vermont DOT (VTrans) reported a total of 175 locations within the State as well as some in neighboring States, including New Hampshire, that were approved sources for HMA and portland cement concrete. Locations of these suppliers are evenly distributed throughout Vermont and mostly concentrated along interstate corridors, including I–91 and I–89. Aggregate suppliers in the State are also relatively evenly spread from north to south along major interstate corridors.

A total of 674 projects took place during the analysis years. No major or significant consolidation activity of firms in the State was brought to the attention of VTrans, and no significant pricing effects were observed.

Figure 15, figure 16, and figure 17 show the bid price trends for three materials: concrete high performance (item No. 501.34), emulsified asphalt (item No. 404.65), and aggregate surface course (item No. 401.1), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 13, table 14, and table 15, respectively).

Figure 15 shows the price trends for a specific concrete item in Vermont (item No. 501.34). Prices fluctuated throughout the analysis period with a general increase in average price in 2013-2016. The high maximum prices caused larger standard deviation values, shown in table 13; however, no significant anomalies were found.



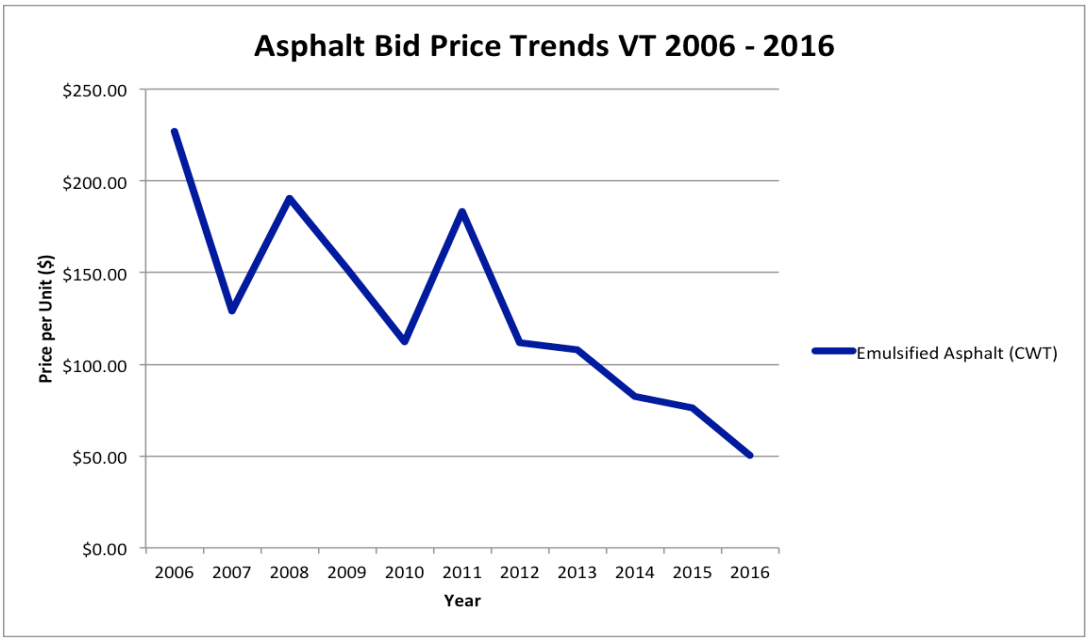
Source: FHWA.

Figure 15. Graph. Concrete bid price trends—Vermont 2006–2016.

Table 13. Concrete price data—Vermont.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	15	819.29	1,820.00	500.00	326.9
2007	12	729.81	1,450.00	500.00	259.1
2008	27	903.03	3,000.00	443.44	565.3
2009	27	720.54	1,720.00	267.59	316.4
2010	11	745.02	1,100.00	500.00	220.1
2011	14	632.80	1,200.00	378.00	189.3
2012	8	573.64	1,000.00	325.00	199.6
2013	12	541.69	821.50	300.00	123.2
2014	13	803.27	1,700.00	505.00	363.9
2015	13	849.74	2,000.00	400.00	407.4
2016	6	1,314.33	3,000.00	650.00	888.8

Next, the asphalt price trends were analyzed for a specific asphalt item (item No. 404.65) in Vermont. Figure 16 shows the asphalt price trends for item No. 404.65 in Vermont during the analysis period. Prices showed a decreasing trend over this period with several spikes in the average price in 2006, 2008, and 2011. However, table 14 shows that the maximum price for this item was highest in those same years, which impacts the average price. This finding is also reflected in the larger standard deviation for those 3 yr.



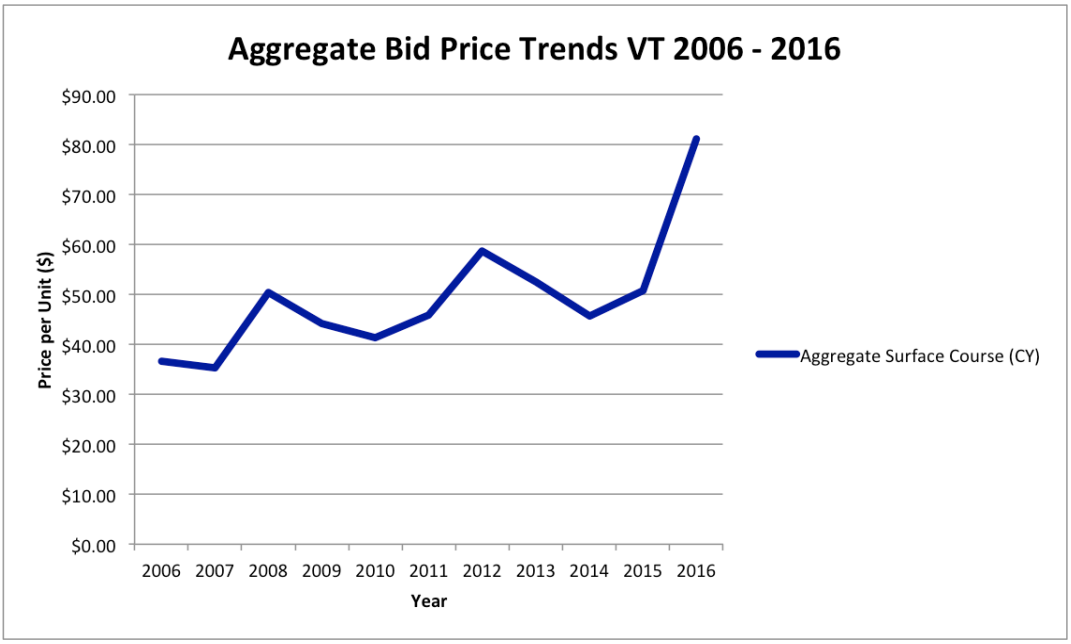
Source: FHWA.
CWT = hundredweight.

Figure 16. Graph. Asphalt bid price trends—Vermont 2006–2016.

Table 14. Asphalt price data—Vermont.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	39	226.80	1,600.00	10.00	298.3
2007	37	129.16	800.00	22.87	154.5
2008	37	190.27	1,250.00	2.00	236.8
2009	60	151.98	929.86	1.00	148.3
2010	39	112.22	593.25	1.54	116.7
2011	26	183.18	1,000.00	3.30	217.4
2012	16	111.56	550.00	18.00	124.6
2013	25	107.75	325.00	44.00	70.9
2014	24	82.68	220.00	8.50	37.0
2015	28	76.10	145.00	33.98	30.6
2016	15	50.20	102.00	10.00	35.5

Finally, an aggregate item for Vermont was analyzed: aggregate surface course (item No. 401.1). The price trends are shown in figure 17, and more detailed price information is provided in table 15. Prices of this aggregate item rose steadily over time but overall remained consistent.



Source: FHWA.

Figure 17. Graph. Aggregate bid price trends—Vermont 2006–2016.

Table 15. Aggregate price data—Vermont.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	9	36.62	57.34	22.94	9.7
2007	6	35.29	43.00	26.76	6.0
2008	18	50.41	250.00	26.00	49.0
2009	15	44.21	163.62	19.11	33.3
2010	7	41.39	55.00	33.00	7.6
2011	10	45.79	100.00	30.00	21.9
2012	8	58.69	159.63	32.88	40.1
2013	14	52.55	95.00	32.00	20.3
2014	10	45.68	100.00	26.00	19.6
2015	18	50.72	75.00	30.00	14.2
2016	8	81.20	213.98	10.00	66.4

AASHTO REGION 2

This section presents States located in AASHTO region 2: Arkansas, Florida, Georgia, Louisiana, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia.

Arkansas

One major merger took place in Arkansas in 2014 during which a large company bought out another. However, the Arkansas DOT (ArDOT) did not report any significant effects on bid prices following this consolidation. Limited sources of aggregate, however, had an impact on prices, particularly in the southern part of the State. These pricing impacts were not due to any merger or acquisition activity, and the pricing impacts have remained stable for some time. ArDOT also reported that Arkansas uses primarily HMA within the State, and that not much

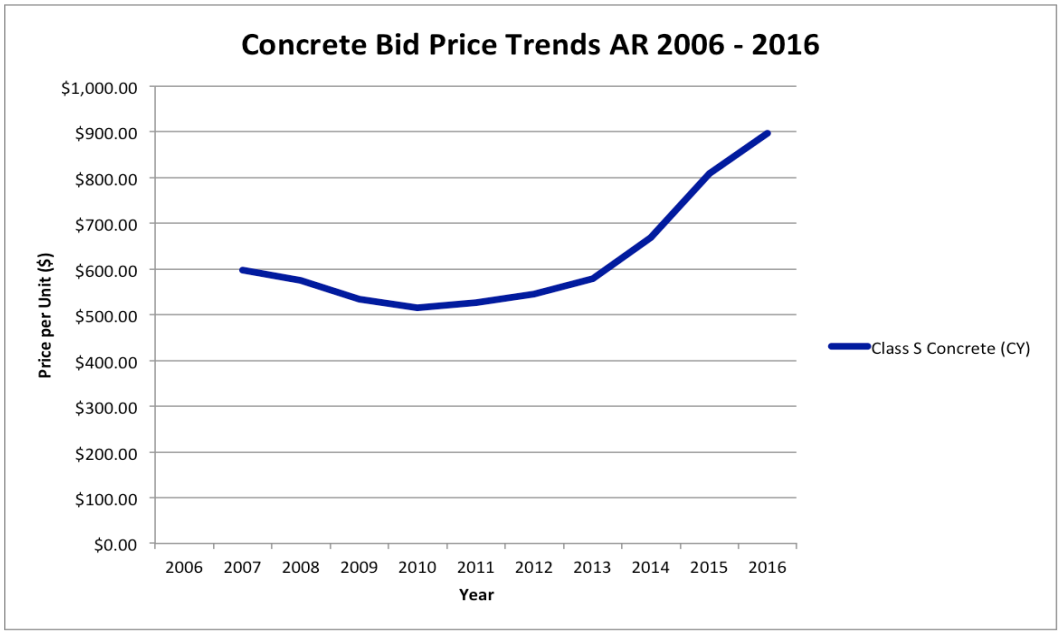
concrete paving is utilized. This usage was reflected in the bid data provided to the research team.

Arkansas region 2 (located in south central and southeastern Arkansas) has a major lack of aggregate. Most aggregate in the State comes from a quarry near Little Rock, AR, which is owned by a firm that also owns two HMA paving companies. Within the region, only one other paving company exists, and it must purchase aggregate from the controlling firm. Due to these conditions, prices on aggregate in region 2 are often 20 percent higher than in other areas of the State. Some of these pricing discrepancies are due to high transportation costs; however, the ArDOT does have some concerns regarding aggregate pricing in this area.

Other parts of the State are believed to have sufficient competition with both in-State and out-of-State firms, as well as sufficient aggregate and material suppliers. One strategy to address the pricing concerns for HMA in region 2 has been to bundle several HMA projects together into a single letting in hopes that increased volume will attract other pavers to bid. After examination of the data, it appeared that a variety of firms were awarded bids containing HMA materials.

Figure 18, figure 19, and figure 20 show the bid price trends for three materials: class S concrete–roadway (item No. 802016), asphalt (performance grade [PG] 64-22) in asphalt concrete hot-mix surface course (½-inch) (item No. 407332), and aggregate base course (class 7) (item No. 303107), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 16, table 17, and table 18, respectively).

Figure 18 shows the price trends for a specific concrete item (item No. 802016) for Arkansas. Table 16 shows more detailed price information for the analysis period. The concrete item price showed a steady increase from 2012 through the end of the analysis period, but no major price anomalies were found.



Source: FHWA.

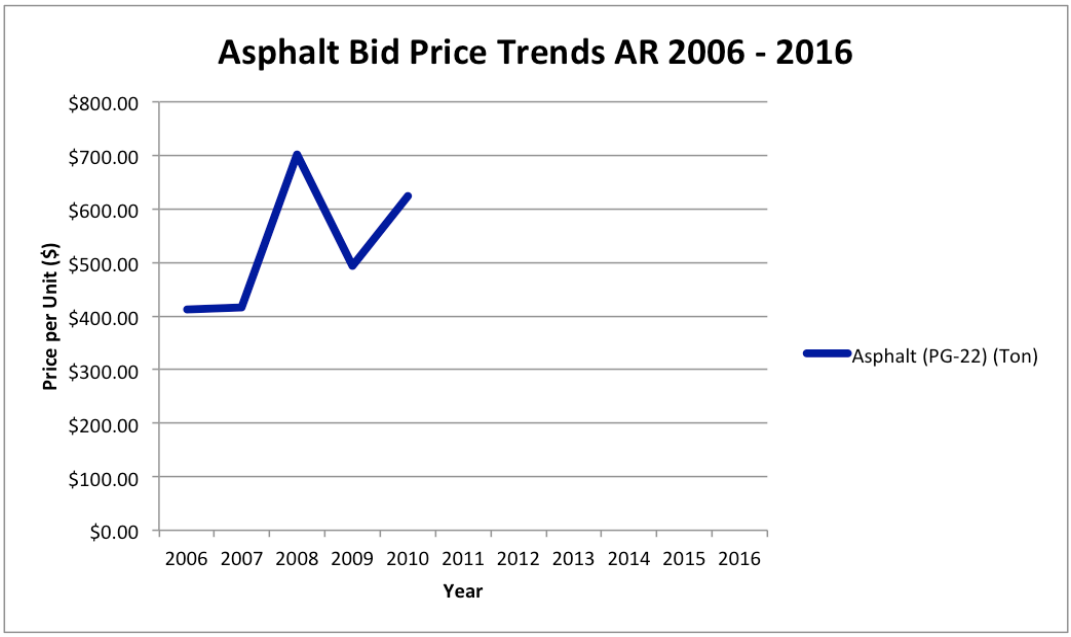
Figure 18. Graph. Concrete bid price trends—Arkansas 2006–2016.

Table 16. Concrete price data—Arkansas.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	16	598.06	950.00	325.00	186.2
2008	24	575.88	1,575.00	404.82	229.2
2009	43	533.66	1,090.00	300.00	156.3
2010	34	514.81	920.00	210.00	138.3
2011	33	526.17	1,080.00	287.00	159.4
2012	24	546.13	1,001.20	199.82	179.7
2013	25	578.18	2,127.10	318.00	338.8
2014	29	668.44	1,500.00	400.00	250.9
2015	22	808.29	3,227.95	360.00	581.5
2016	25	896.68	4,300.73	450.00	733.9

—No data.

Next, the price trends for a specific asphalt item were analyzed. Figure 19 shows the price information for a specific asphalt item (item No. 407332). As reflected in the graph and in table 17, this item was not used in 2011–2016.



Source: FHWA.

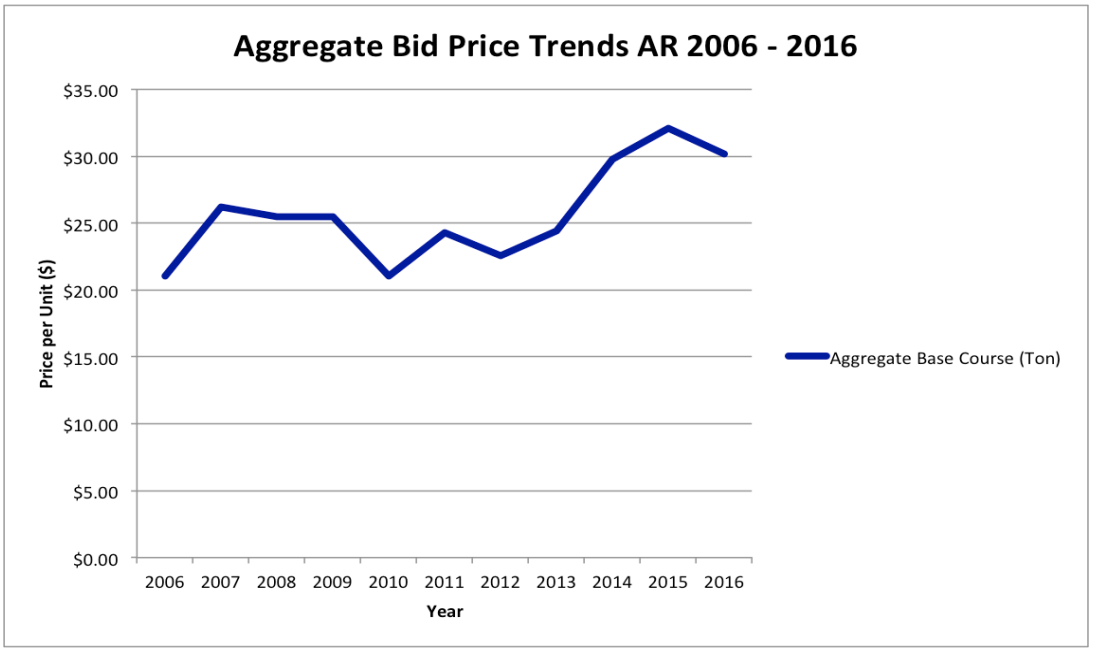
Figure 19. Graph. Asphalt bid price trends—Arkansas 2006–2016.

Table 17. Asphalt price data—Arkansas.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	69	412.14	800.00	120.00	161.7
2007	83	416.11	1,790.00	111.52	216.5
2008	71	701.03	1,760.00	120.00	381.6
2009	100	493.58	1,250.00	108.86	217.7
2010	21	624.15	1,463.40	120.00	313.9
2011	0	—	—	—	—
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Finally, the price trends for a specific aggregate item (item No. 303107) were analyzed. Figure 20 shows the bid prices for this aggregate item throughout the analysis period. The item was used in all years, which yielded a longer available period for analysis. Prices fluctuated throughout the analysis period, but no major anomalies were identified. Additionally, maximum and minimum bid prices did not vary significantly from the average, which is reflected in the low standard deviation values shown in table 18.



Source: FHWA.

Figure 20. Graph. Aggregate bid price trends—Arkansas 2006–2016.

Table 18. Aggregate price data—Arkansas.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	73	21.02	80.00	8.50	11.3
2007	82	26.19	200.00	9.00	23.8
2008	81	25.51	140.00	10.85	15.0
2009	99	25.45	135.00	11.80	15.8
2010	91	21.05	45.15	10.85	6.0
2011	114	24.31	110.00	10.52	14.2
2012	70	22.56	50.00	11.00	8.8
2013	101	24.41	79.80	9.61	11.5
2014	113	29.76	187.50	11.85	20.5
2015	104	32.10	110.00	14.60	15.8
2016	85	30.15	63.20	14.75	10.8

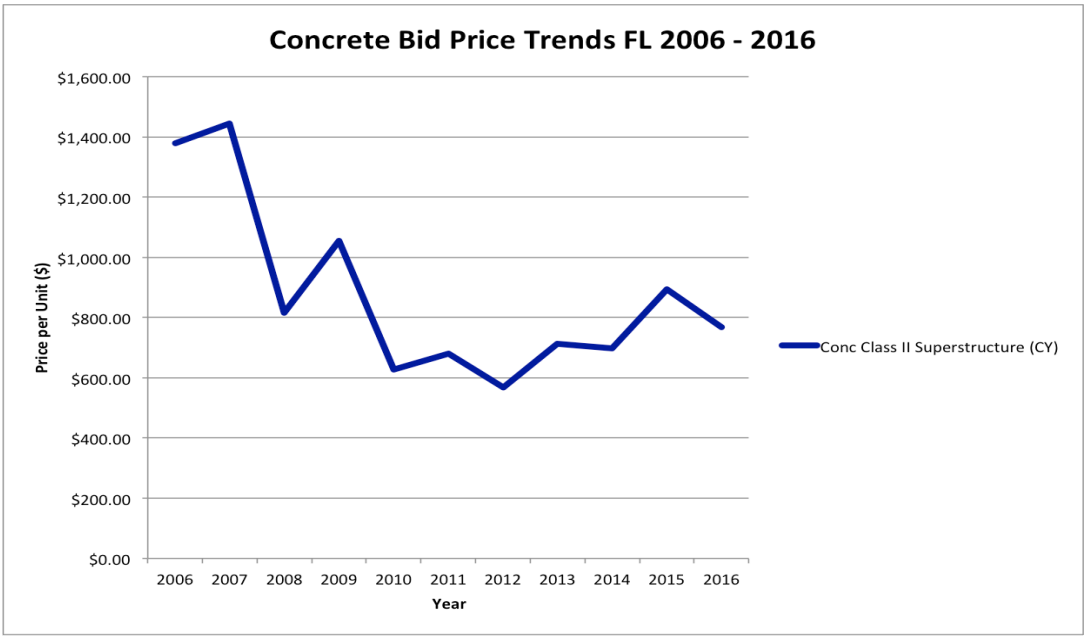
Florida

Several acquisitions and company name changes took place in Florida during the 2006–2016 period. However, Florida DOT (FDOT) reported that there was still adequate competition in the State and that consolidation activity within the asphalt industry was minimal. No initial concerns were voiced regarding bid pricing effects, and action by FDOT to address M&A activity was not necessary. Florida is divided into seven districts. During the analysis period, between 81 and 153 unique firms awarded bids each year.

In 2007, a major company acquired another firm, which at the time was a leading producer of aggregate, cement, and concrete. However, the effects of this activity were not seen in the material prices in Florida following the merger. The purchasing firm has facilities in 21 States, as well as Mexico and the Bahamas, and has a wide distribution network, but these market shares did not show a correlation with price trends or activity within the State during the analysis period. Another acquisition took place in late 2015 of an aggregate supplier in the western part of the State. Examination of aggregate pricing following this activity yielded no significant changes and no significant digressions or variations from the reported unit price for aggregate items. Data from Florida did not reflect any significant changes in pricing, although substantial acquisition activity occurred in the concrete and asphalt industries.

Figure 21 and figure 22 show the bid price trends for two materials: concrete class II superstructure (item No. 40024) and miscellaneous asphalt pavement (item No. 3391), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 19 and table 20, respectively).

Figure 21 shows the price trends for a specific concrete item (item No. 40024). Price fluctuations were observed throughout the analysis period, which is also reflected in the data shown in table 19. Several years had high maximum bid prices, which impacted the average price for the corresponding year, but no anomalies were identified. Also, no fluctuations were linked to merger or acquisition activity.



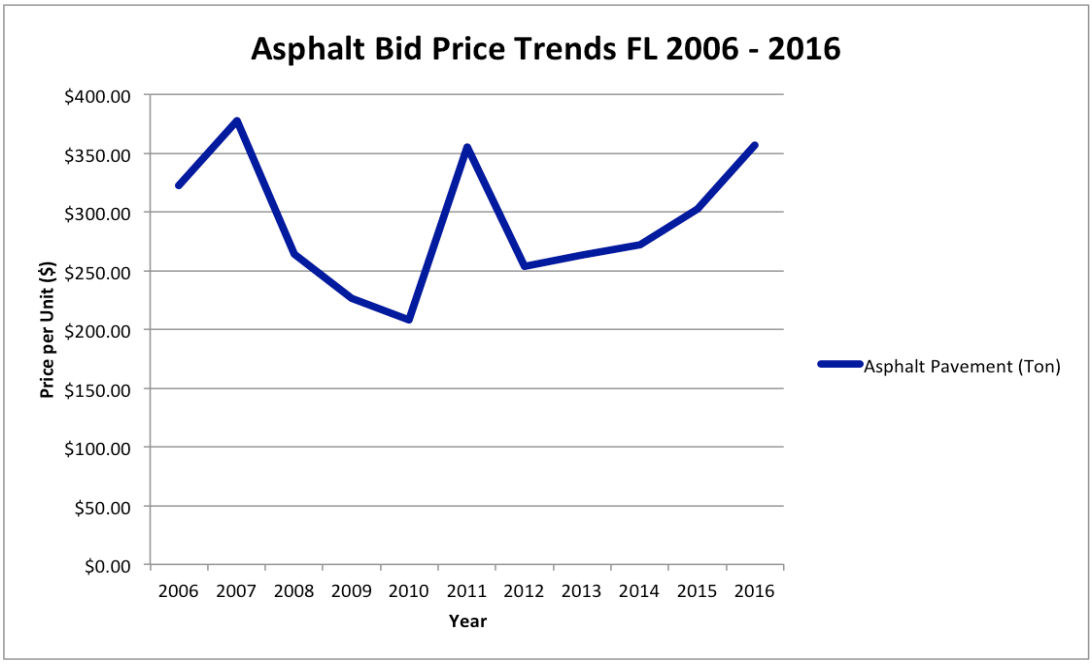
Source: FHWA.

Figure 21. Graph. Concrete bid price trends—Florida 2006–2016.

Table 19. Concrete price data—Florida.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	23	1,378.80	4,500.00	580.00	1,015.6
2007	23	1,444.46	3,499.44	591.00	976.9
2008	14	815.74	1,006.00	620.00	113.8
2009	20	1,055.63	4,500.00	366.84	1,038.9
2010	15	626.15	1,226.44	375.00	236.5
2011	11	680.90	1,177.00	300.00	255.8
2012	12	567.83	883.92	375.00	154.5
2013	20	712.57	1,670.00	450.00	276.8
2014	21	698.11	1,250.00	461.78	195.5
2015	10	894.64	3,096.03	375.00	754.8
2016	17	768.88	1,676.00	478.67	293.6

Next, asphalt price trends were analyzed for one specific asphalt item (item No. 3391). Figure 22 shows the price fluctuations for this asphalt item across the analysis period. In 2011, a price spike that is visible in the graph is attributed to the very high maximum bid price of $11,333.30 in that year; this deviation is also apparent in the high standard deviation value for that year, shown in table 20.



Source: FHWA.

Figure 22. Graph. Asphalt bid price trends—Florida 2006–2016.

Table 20. Asphalt price data—Florida.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	80	322.21	4,140.00	100.00	450.9
2007	81	377.89	2,700.00	85.00	496.0
2008	75	264.16	2,000.00	108.27	237.9
2009	72	226.23	1,000.00	79.70	174.8
2010	94	207.88	1,000.00	82.30	126.3
2011	74	355.12	11,333.30	80.24	1,289.3
2012	54	253.41	3,100.00	76.75	411.9
2013	83	263.20	1,000.00	1.04	147.4
2014	74	271.70	1,500.00	5.00	220.3
2015	69	302.51	1,650.00	10.00	273.2
2016	47	356.47	1,750.00	103.62	304.2

Georgia

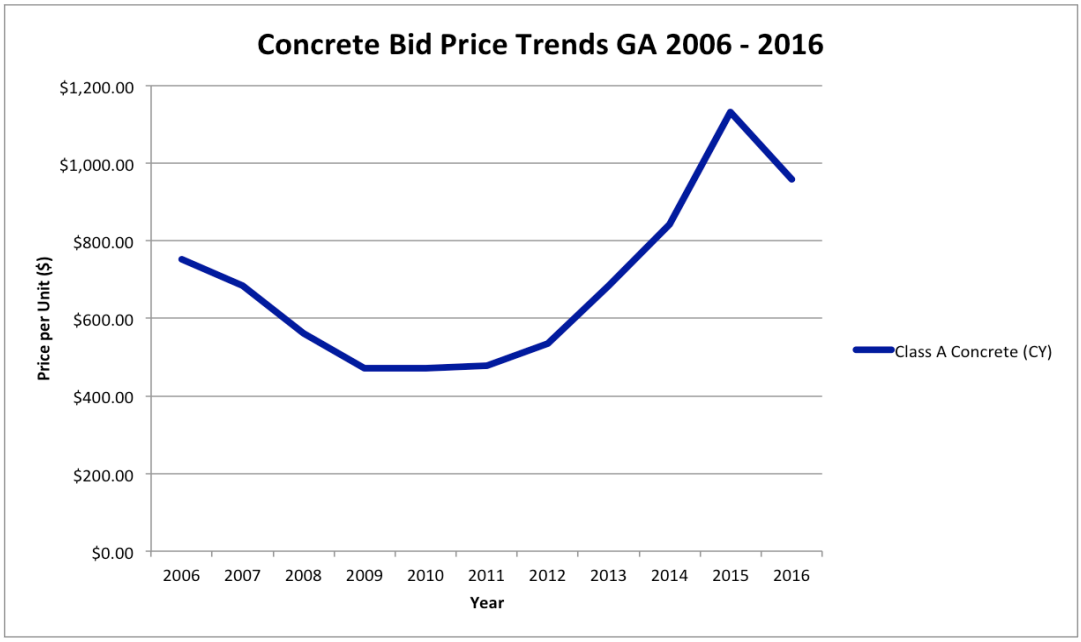
Data revealed that 152 unique firms were awarded bids on projects in Georgia in 2006–2016. Unit price data for all bid item numbers across the analysis period were not available; however, Georgia DOT (GDOT) does publish an asphalt cement price index. These data include awarded contracts beginning in 2009 and report the State's base asphalt prices. Data in this set were compared against bid prices for asphalt products in the dataset; no major anomalies were observed.

Many of the State's concrete and asphalt suppliers are located in the northwestern region, while many of the aggregate material locations are near the Atlanta, GA, area, as well as out of State. Some major firms supplying materials to multiple States—including Tennessee, Georgia,

Florida, and others in the area—also provide materials to many projects included in the data provided through Oman Systems, Inc., and supplemented by research team review of information posted on GDOT websites in 2006–2016. Two of these large firms, which are affiliated with one another, were awarded close to 100 of the total bids across the analysis period in the State. Three major firms that control large market shares in multiple States in the region largely control aggregates within Georgia. Pricing effects were not seen during analysis of the data provided to the research team. However, the perceptions of firms and suppliers in the State on the effects of this activity on competition are unknown.

Figure 23, figure 24, and figure 25 show the bid price trends for three materials: class A concrete (item No. 500-3101), asphalt concrete 12.5-mm porous European mix GP 2 (item No. 400-3624), and aggregate surface course (item No. 318-3000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 21, table 22, and table 23, respectively).

Figure 23 shows the price trends for a specific concrete item (item No. 500-3101) in Georgia. Prices decreased slightly between 2008 and 2011 before they began to rise again. One noticeable price spike is evident in the graph for 2015. In table 21, this price spike is attributed to the high average bid price for that year.



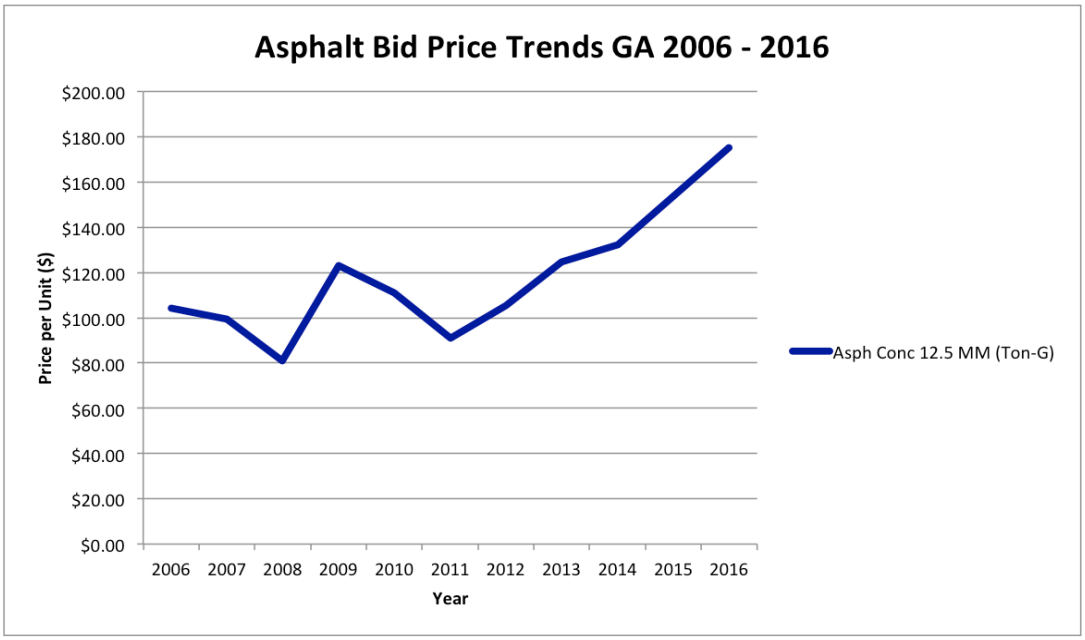
Source: FHWA.

Figure 23. Graph. Concrete bid price trends—Georgia 2006–2016.

Table 21. Concrete price data—Georgia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	103	752.69	3,120.00	0.87	408.7
2007	81	685.26	2,000.00	149.09	310.5
2008	36	562.63	1,344.56	146.00	304.9
2009	58	471.37	1,200.00	140.00	200.4
2010	37	470.76	1,081.61	121.22	224.9
2011	34	479.29	938.80	133.00	226.8
2012	39	534.40	1,217.00	100.00	253.3
2013	71	684.29	3,200.00	210.00	422.4
2014	42	841.48	5,000.00	110.00	736.1
2015	46	1,132.56	3,570.00	244.00	606.1
2016	21	959.34	1,780.00	275.00	450.0

Next, asphalt bid prices were analyzed for a specific asphalt item (item No. 400-3624). Figure 24 shows mild price fluctuations in 2006–2011 before prices rose steadily for the remainder of the analysis period. As can be seen in table 22, there were not as many bids for this asphalt item.



Source: FHWA.
Ton-G = Metric tons.

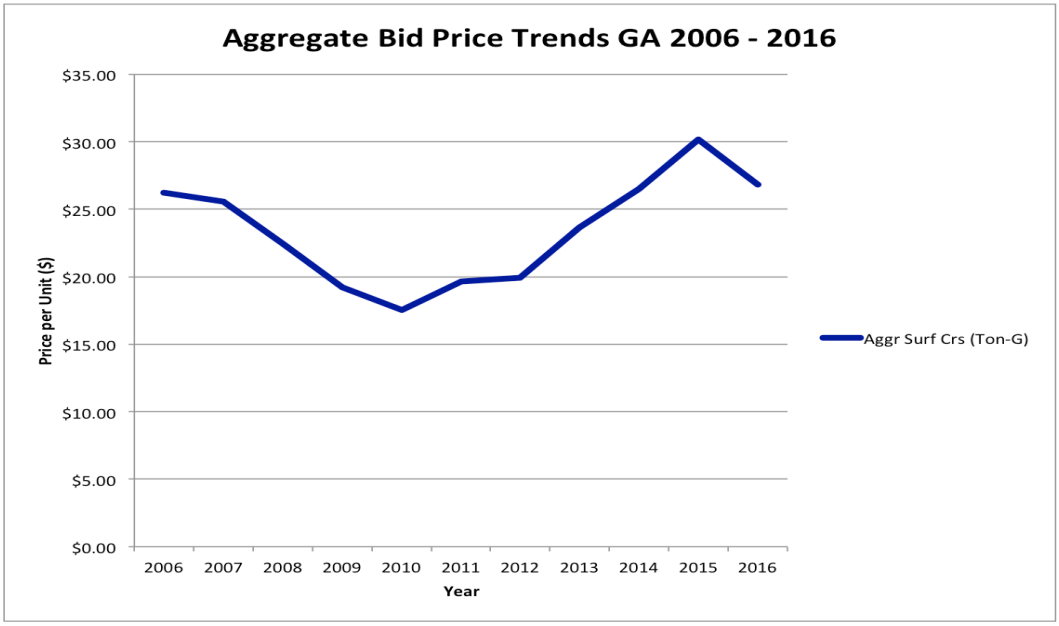
Figure 24. Graph. Asphalt bid price trends—Georgia 2006–2016.

Table 22. Asphalt price data—Georgia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	9	104.13	149.50	77.62	19.1
2007	9	99.56	150.00	70.70	20.6
2008	1	80.94	—	—	—
2009	6	123.07	330.00	71.41	92.9
2010	6	110.87	175.00	77.17	31.6
2011	3	91.17	99.25	83.66	6.4
2012	3	105.40	117.69	98.50	8.7
2013	4	124.71	168.00	96.49	26.9
2014	9	132.13	190.29	95.00	32.9
2015	0	—	—	—	—
2016	1	175.00	—	—	—

—No data.

Finally, bid price trends were analyzed for a specific aggregate item (item No. 318-3000). As can be seen in figure 25 and table 23, several low bids of this specific aggregate item (item No. 318-3000) occurred throughout the analysis period. Both 2008 and 2015 contain $0.01 bids. In 2009 and 2016, there was a low bid price of just over $1 and one that was exactly $1, respectively. Since there were only several of these low bid prices, they were not driving the yearly average prices down dramatically. As can be seen from the standard deviation column, the bid prices for this aggregate item did not vary much from the mean.



Source: FHWA.
Aggr Surf Crs = aggregate surface course.

Figure 25. Graph. Aggregate bid price trends—Georgia 2006–2016.

Table 23. Aggregate price data—Georgia.

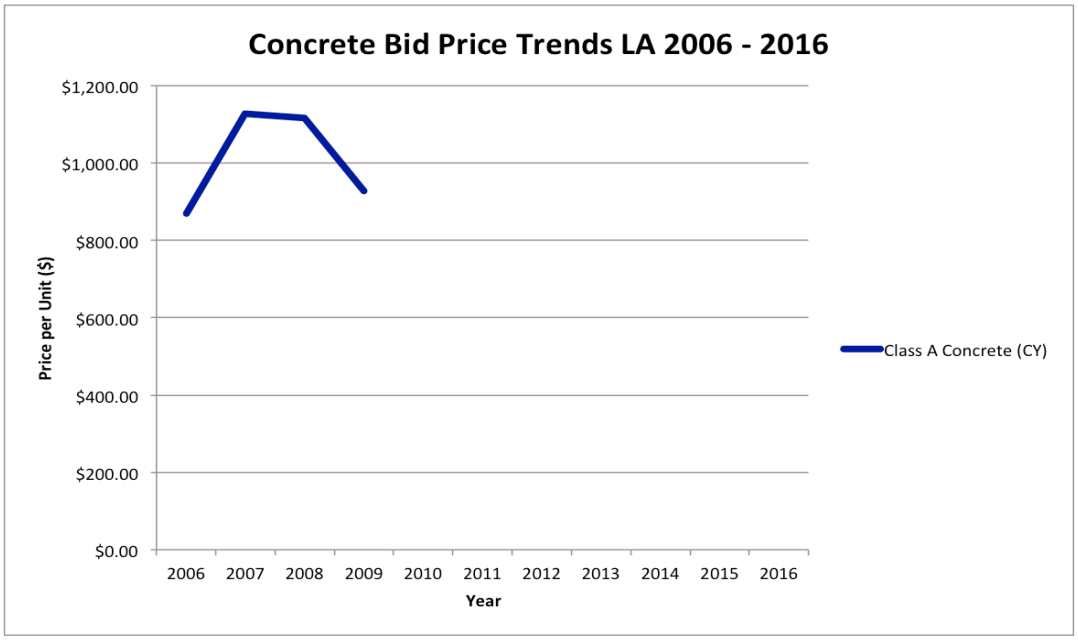
Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	88	26.24	106.71	10.89	12.6
2007	82	25.59	65.00	13.65	8.8
2008	48	22.43	55.00	0.01	9.3
2009	61	19.20	40.00	1.10	6.9
2010	33	17.54	36.20	10.07	5.7
2011	43	19.64	50.00	10.00	7.3
2012	49	19.92	51.64	5.00	8.1
2013	63	23.68	47.91	10.18	8.2
2014	45	26.53	100.00	14.00	13.1
2015	33	30.19	70.55	0.01	12.5
2016	20	26.84	43.00	1.00	7.4

Louisiana

A total of 228 unique firms were awarded bids in Louisiana during the analysis period of 2006-2016. Louisiana DOT and Development (DOTD) divides the State into nine districts. The locations of aggregate plants in the State are relatively evenly spread throughout. Concrete plants are concentrated toward the eastern region of the State, whereas asphalt plants are evenly spread throughout the State. The State does have some major firms that dominated the market throughout the analysis period and continue to thrive today. One such firm was awarded a total of 594 of the 2,215 projects in 2006–2016, accounting for almost 27 percent of the total projects awarded. However, data did not show any significant effects on pricing due to this activity. Weighted averages for contract items are available from the Louisiana DOTD and provide information including items, number of bid item numbers per quarter, minimum and maximum bid prices for that quarter, and average unit prices. Comparison of the bid item number prices against unit prices showed that the bid item number price was not significantly different from the reported unit prices. Unit price analysis was done for aggregate, concrete, and asphaltic materials, and similar variability was seen across all item types.

Figure 26 and figure 27 show the bid price trends for two materials: class A concrete (item No. 805-01-F) and aggregate surface course (item No. 401-02), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 24 and table 25, respectively).

Figure 26 and table 24 show the limited bid price data available for this concrete item (item No. 805-01-F). Finding one specific item that was used in multiple years for all items in Louisiana was challenging. To analyze data of only one specific item at a time, items were selected even though they were only used for several years during the analysis period. Even though these items were not used beyond 2009, the price information for 2006–2009 is still valuable to analyze for potential price anomalies. In the case of this concrete item in Louisiana, no price anomalies were identified, although the maximum and minimum bid prices had a relatively large range, resulting in larger standard deviation values.



Source: FHWA.

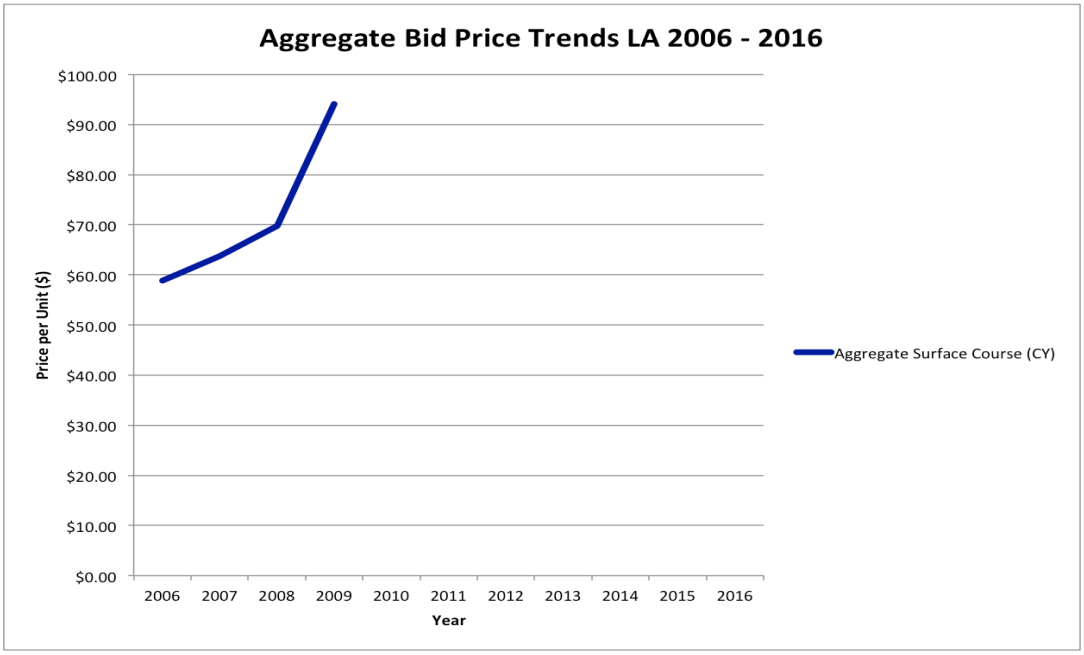
Figure 26. Graph. Concrete bid price trends—Louisiana 2006–2016.

Table 24. Concrete price data—Louisiana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	25	869.67	1,500.00	450.00	322.9
2007	22	1,127.42	2,741.40	450.00	615.1
2008	34	1,115.66	4,500.00	550.00	827.1
2009	3	927.76	1,223.29	560.00	275.6
2010	0	—	—	—	—
2011	0	—	—	—	—
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, a specific aggregate item (item No. 401-02) was analyzed. Again, data were only available for this item for 2006–2009. In that time, average prices showed a general increase (figure 27 and table 25). This item had a smaller range between the maximum and minimum bid prices and less variation of price from the average price.



Source: FHWA.

Figure 27. Graph. Aggregate bid price trends—Louisiana 2006–2016.

Table 25. Aggregate price data—Louisiana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	98	58.84	250.00	1.00	40.6
2007	139	63.67	598.00	0.01	60.8
2008	136	69.81	382.28	0.01	46.8
2009	29	94.14	400.00	21.00	69.2
2010	0	—	—	—	—
2011	0	—	—	—	—
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

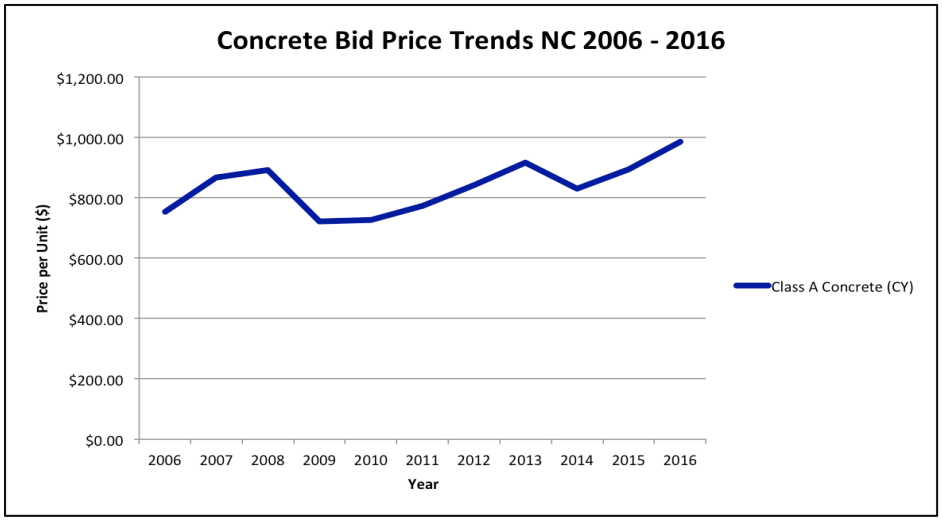
North Carolina

Most of the State's aggregate plants are operated by several large, multistate firms and are concentrated in the Raleigh, NC, area. Suppliers of concrete and asphalt products are relatively spread out throughout the State. A major multistate firm purchased a materials company that was supplying aggregates, asphalt paving materials, and ready-mix concrete to areas of Virginia, as well as the coastal Carolinas in 2016. Another firm purchased three asphalt paving companies in the State in 2011 and another asphalt paving company in the State in 2015. One major vertically integrated firm headquartered in the Raleigh, NC, area is a lead producer of concrete, asphalt, and aggregates. This major firm both mines and manufactures materials in Raleigh, Durham, Wake Forest, Butner, Kittrell, Woodsdale, and Zebulon, NC. In total, 2,029 projects were let in

the State during the analysis period of 2006–2016. Analyzing pricing effects before and after the asphalt paving company purchases in both 2011 and 2015 revealed no significant pricing differences and no significant bid price differences compared with unit pricing data.

Figure 28, figure 29, and figure 30 show the bid price trends for three materials: class A concrete (item No. 8182000000), ultrathin HMA B (item No. 1839110000), and aggregate base course (item No. 1121000000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 26, table 27, and table 28, respectively).

Figure 28 shows the price trends for a specific concrete item in North Carolina (item No. 8182000000). Table 26 shows more detailed price information, including the maximum and minimum bid price for each year. Item No. 8182000000 appeared in bids in all years of the analysis period, providing ample data for analysis. This concrete item had moderate price fluctuations throughout this period, with a moderate range between the maximum and minimum bid prices, leading to slightly high standard deviations.



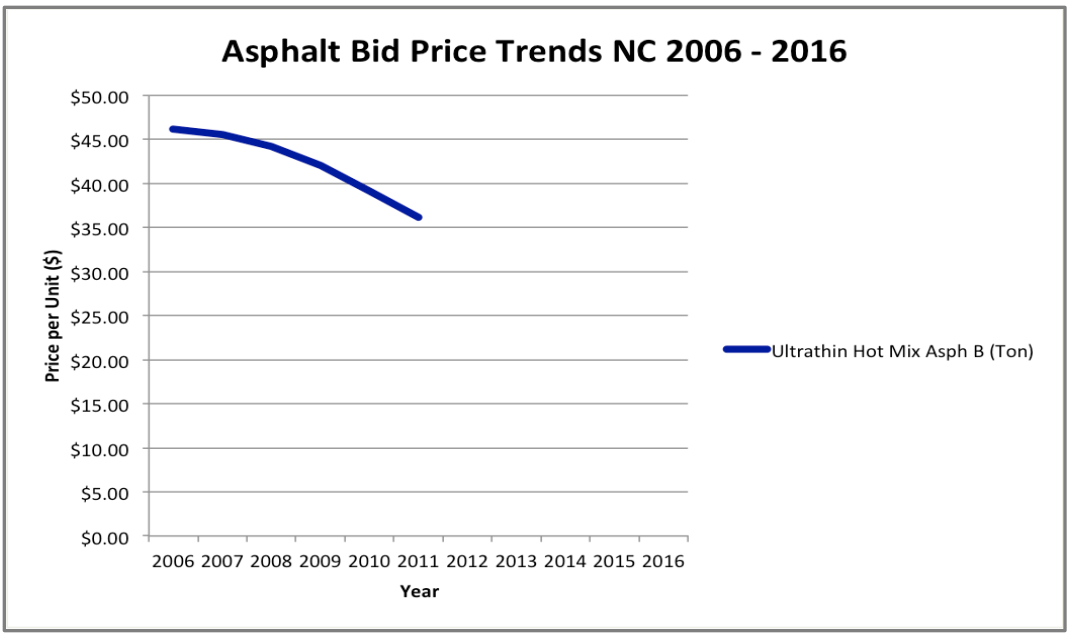
Source: FHWA.

Figure 28. Graph. Concrete bid price trends—North Carolina 2006–2016.

Table 26. Concrete price data—North Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	18	754.35	1,500.00	450.00	238.9
2007	44	868.05	1,450.00	535.19	231.1
2008	115	890.92	2,500.00	500.00	267.2
2009	59	720.50	1,306.00	427.25	169.3
2010	57	727.31	1,500.00	375.00	198.3
2011	33	772.83	1,500.00	522.50	201.1
2012	71	843.32	3,000.00	450.00	336.8
2013	56	917.29	1,600.00	560.00	250.2
2014	27	829.34	1,300.00	568.43	172.4
2015	38	893.11	1,550.00	0.00	377.8
2016	28	984.88	1,715.17	565.00	262.8

Next, a specific asphalt item (item No. 1839110000) was analyzed. Figure 29 and table 27 show the price trends for this item for the years it appeared in the dataset (2006–2011). During this time, the prices of this item steadily decreased and had low variation.



Source: FHWA.

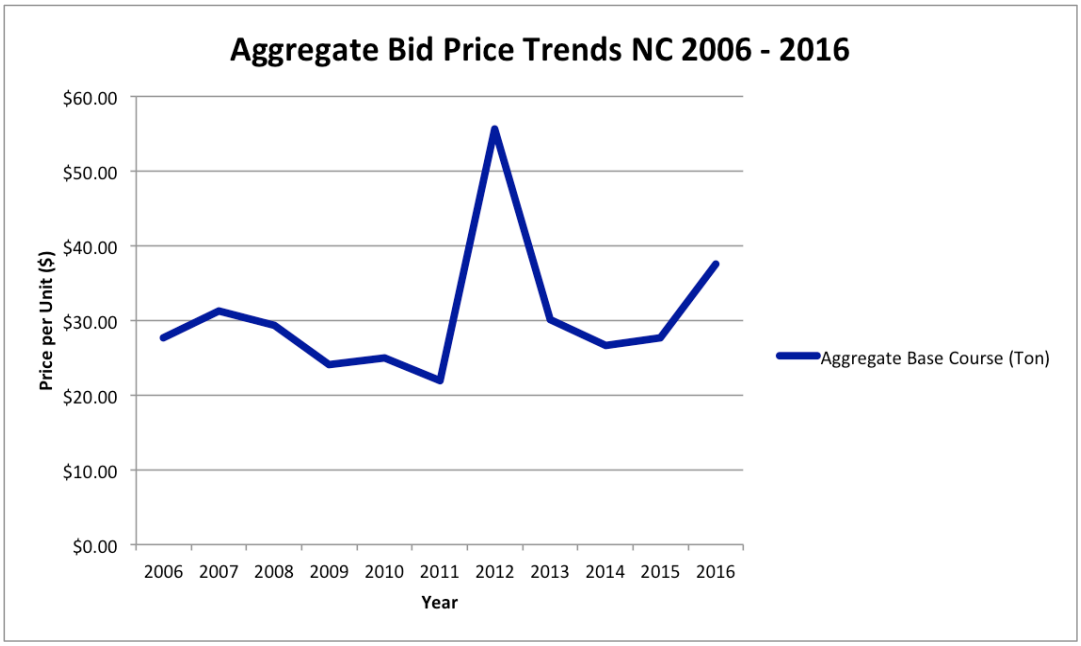
Figure 29. Graph. Asphalt bid price trends—North Carolina 2006–2016.

Table 27. Asphalt price data—North Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	4	46.18	63.50	33.50	11.2
2007	11	45.61	62.69	31.30	7.1
2008	5	44.23	55.00	34.50	6.5
2009	8	42.09	48.50	34.00	5.0
2010	2	39.12	45.00	33.25	5.8
2011	3	36.17	49.50	18.00	13.3
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, a specific aggregate item (item No. 1121000000) was analyzed. Figure 30 shows one notable price spike in 2012. In table 28, this year had a high maximum bid price of $1,420.87 and the highest standard deviation in price. Further investigation into the project containing this high bid price did not reveal any apparent reason for the high price.



Source: FHWA.

Figure 30. Graph. Aggregate bid price trends—North Carolina 2006–2016.

Table 28. Aggregate price data—North Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	22	27.70	58.00	19.00	9.1
2007	39	31.26	100.00	18.17	14.2
2008	71	29.37	50.92	12.88	7.9
2009	47	24.12	60.00	12.23	8.8
2010	48	25.04	65.00	0.00	11.9
2011	45	21.94	37.00	0.00	9.9
2012	51	55.59	1,420.87	0.00	193.6
2013	57	30.16	93.23	0.00	17.4
2014	48	26.62	45.00	0.00	10.1
2015	33	27.74	49.70	0.00	10.2
2016	17	37.55	100.00	22.00	17.8

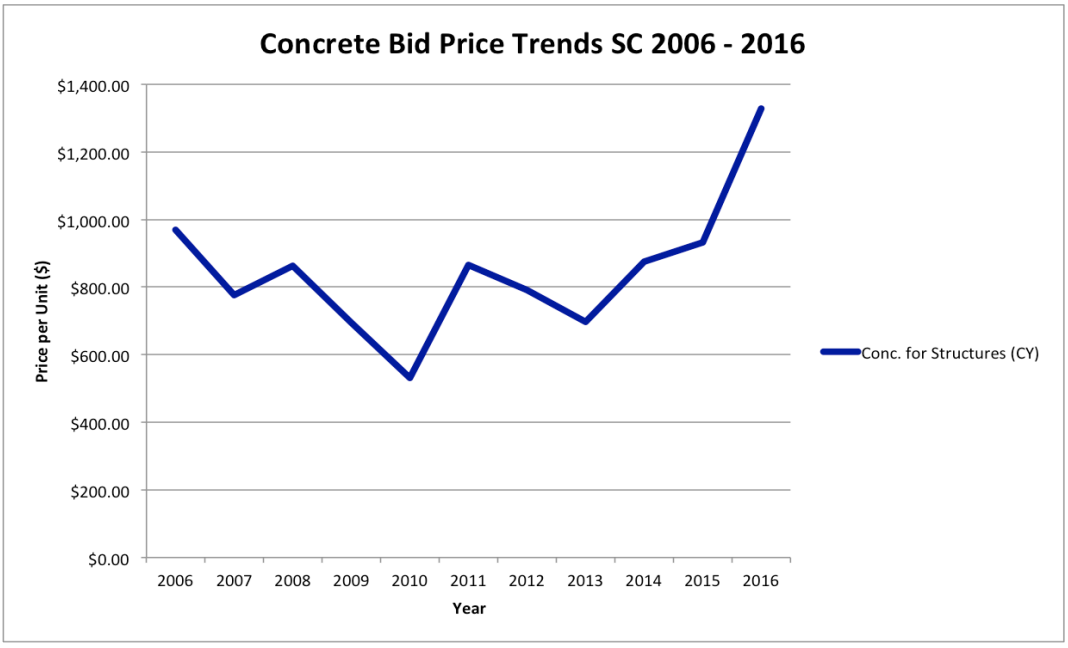
South Carolina

Within South Carolina, many of the asphalt and concrete suppliers are located in the northwestern region. Many of the State's aggregate suppliers operate out of Charleston and Columbia, SC, with some major multistate firms operating in the region. South Carolina DOT (SCDOT) contains unit price adjustment clauses for various construction materials, including asphalt, to help alleviate estimation errors due to price fluctuations. The State is divided into four regions: Upstate, Midlands, Pee Dee, and Lowcountry. Special contract language has not been adopted to alleviate pricing effects. The data provided through Oman Systems, Inc., and supplemented by the research team review of information posted on State DOT websites did not reveal pricing anomalies that could be correlated with any consolidation activity within the State.

A total of 151 unique contractors were awarded bids on projects during the analysis years, and a total of 2,004 projects containing material items of interest took place. Recently, SCDOT was provided with a sustainable, increased revenue source from the General Assembly Act 40, which was passed by the General Assembly and became effective July 2017 (South Carolina Government 2021). As a part of this increased funding, the 10-yr plan for the State includes many construction projects, such as highway improvement, bridge replacement, road resurfacing, and interstate widening. This large influx of construction projects, likely utilizing many of the material items of interest, will provide a variety of new data for any future analyses.

Figure 31, figure 32, and figure 33 show the bid price trends for three materials: concrete for structures class 4000 (item No. 7011400), HMA surface course type C (item No. 4030340), and aggregate No. CR-14 (item No. 3022000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 29, table 30, and table 31, respectively).

Figure 31 shows the price trends for one specific concrete item in South Carolina during the analysis period (item No. 7011400). Prices fluctuated throughout this period with a general increase after 2013. Table 29 shows relatively high standard deviation values for this item and large ranges between the maximum and minimum bid prices.



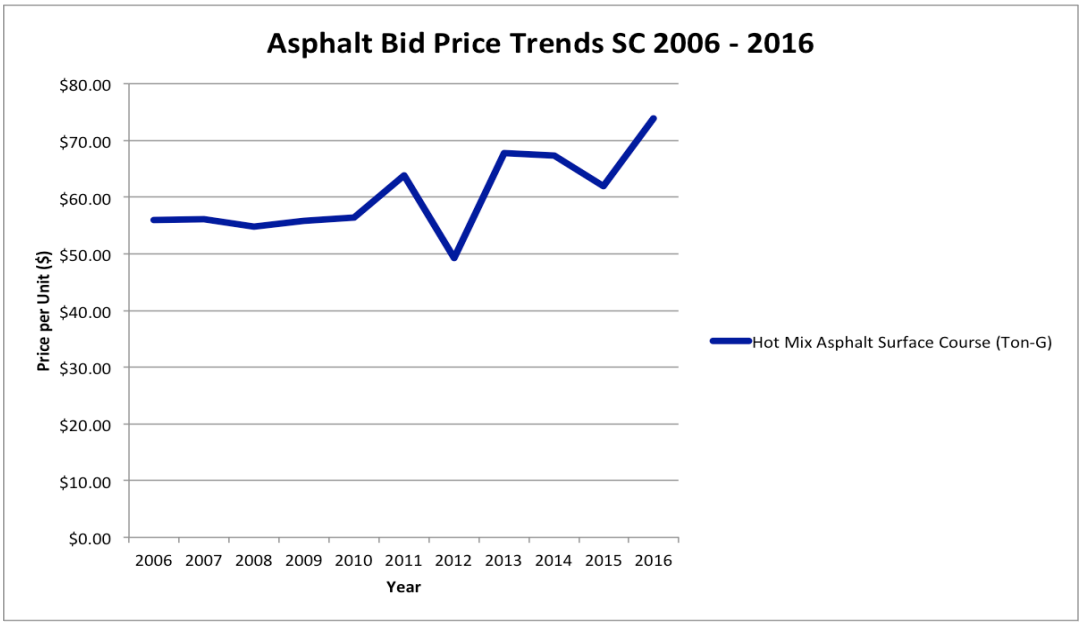
Source: FHWA.

Figure 31. Graph. Concrete bid price trends—South Carolina 2006–2016.

Table 29. Concrete price data—South Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	16	968.82	3,471.54	350.00	775.2
2007	27	776.16	2,500.00	424.40	511.3
2008	8	863.49	2,900.00	498.43	772.8
2009	28	695.92	2,335.00	361.97	398.4
2010	18	530.32	1,006.65	400.00	131.6
2011	18	866.70	5,000.00	117.70	1197.8
2012	9	792.00	2,100.00	480.00	490.2
2013	23	696.20	2,440.00	280.00	468.9
2014	38	876.21	3,000.00	109.00	624.9
2015	31	932.98	4,300.00	400.00	648.9
2016	14	1,327.34	3,750.00	785.00	793.8

Next, the price trends for one specific asphalt item (item No. 4030340) were analyzed. Figure 32 shows the price trends for this asphalt item. Small spikes can be seen in 2011 and 2013. Table 30 shows higher maximum bid prices in these years ($500.00 and $555.00, respectively). Further investigation revealed only one project in 2011 with a bid price of $500.00 per ton, and, similarly, 2013 contained only one project with a bid price of $555.00 per ton.



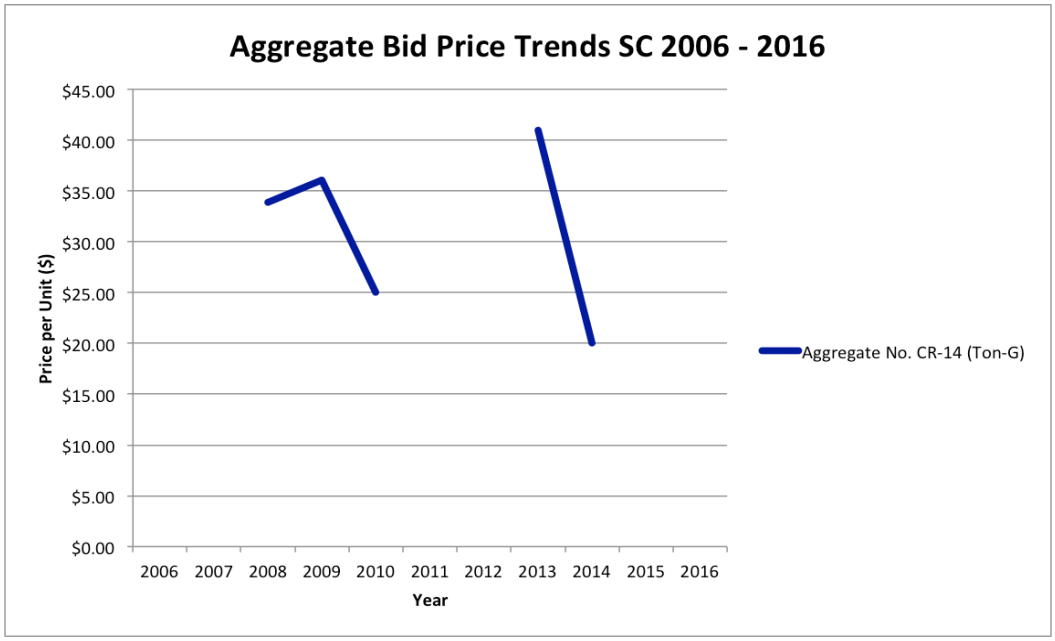
Source: FHWA.

Figure 32. Graph. Asphalt bid price trends—South Carolina 2006–2016.

Table 30. Asphalt price data—South Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	27	55.98	125.00	36.98	18.2
2007	81	56.05	159.55	28.50	25.4
2008	83	54.81	170.00	28.54	22.8
2009	144	55.87	200.00	30.00	25.3
2010	109	56.35	199.00	32.04	29.8
2011	68	63.76	500.00	34.25	58.7
2012	50	49.21	175.00	28.30	23.9
2013	100	67.75	555.00	30.00	67.5
2014	115	67.37	360.00	27.25	58.1
2015	124	61.88	305.00	35.81	38.1
2016	57	73.88	381.25	41.37	61.9

Lastly, price trends for one specific aggregate item (item No. 3022000) were analyzed. This item was not used in all years of the analysis period, as reflected in figure 33 and table 31. For the years it was available, prices did not deviate greatly, and no abnormalities were identified.



Source: FHWA.

Figure 33. Graph. Aggregate bid price trends—South Carolina 2006–2016.

Table 31. Aggregate price data—South Carolina.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	7	33.86	52.00	24.00	11.8
2009	1	36.05	—	—	—
2010	1	25.00	—	—	—
2011	0	—	—	—	—
2012	0	—	—	—	—
2013	2	41.00	55.00	27.00	14.0
2014	1	20.00	—	—	—
2015	0	—	—	—	—
2016	1	38.98	—	—	—

—No data.

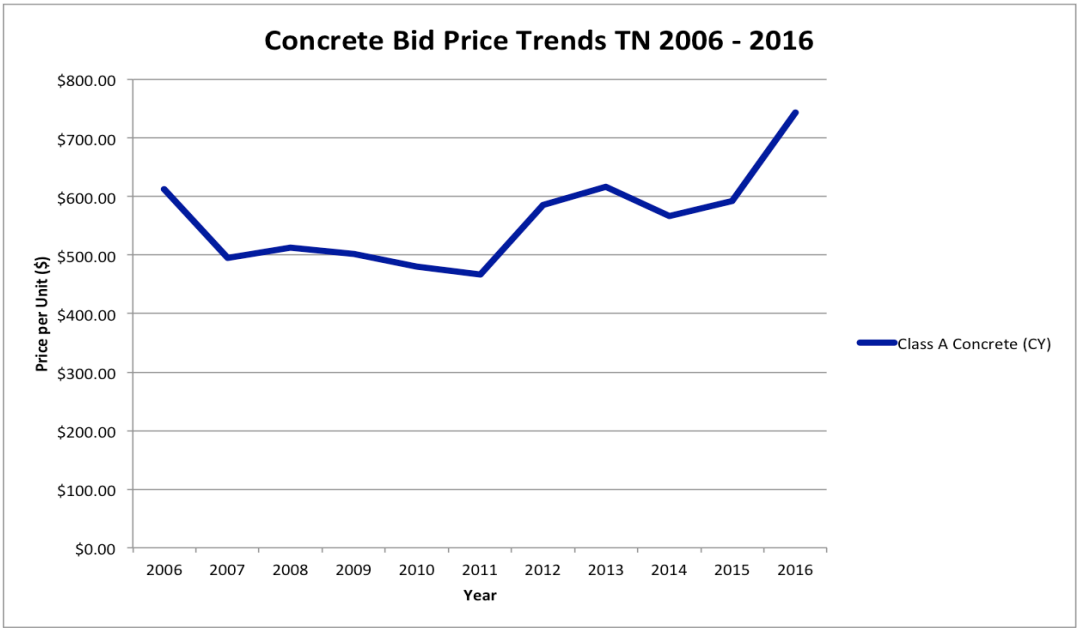
Tennessee

Tennessee DOT (TDOT) saw some consolidation activity during the analysis period. One firm made a purchase that resulted in a controlling share in the supply and cost of river sand in the Nashville, TN, market. This activity was brought to the attention of the U.S. DOJ Antitrust Division. Another firm purchased a company, including their quarries and pits, located in the eastern part of the State, which resulted in a controlling market share in this area. Another firm purchased several local, family owned, ready-mix plants in the middle of Tennessee. Approximately 15 yr earlier, another firm conducted similar purchasing activity. As a result of these acquisitions, these two firms own approximately 75 percent of the approved ready-mix plants in the middle and eastern parts of the State.

Another purchase made between 2010 and 2015 resulted in one firm controlling a majority of the market share of precast pipe and drainage structures. TDOT reported some concerns over the effects of this purchase activity on bid pricing and competition; however, no changes to contract language or statues were made as a result. Precast pipe and drainage structure items in the data provided through Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites were then compared with unit price data reported by TDOT to examine any pricing effects due to the merger activity. This analysis revealed that bid prices for these items were not significantly higher than the unit price reported by TDOT: most were less than or around $50 higher than the reported unit price. Additionally, a variety of firms were seen in the bid data, suggesting that one firm apparently did not hold market control over the others.

Figure 34, figure 35, and figure 36 show the bid price trends for three materials: class A concrete (item No. 604-01.01), asphalt concrete mix (PG 64-22) bituminous plant mix base hot mix (item No. 307-01.08), and mineral aggregate type A base grading D (item No. 303-01), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 32, table 33, and table 34, respectively).

Figure 34 shows the price trends for one specific concrete item (item No. 604-01.01). As can be seen in the graph and in table 32, prices fluctuated throughout the analysis period, but no major abnormalities were identified.



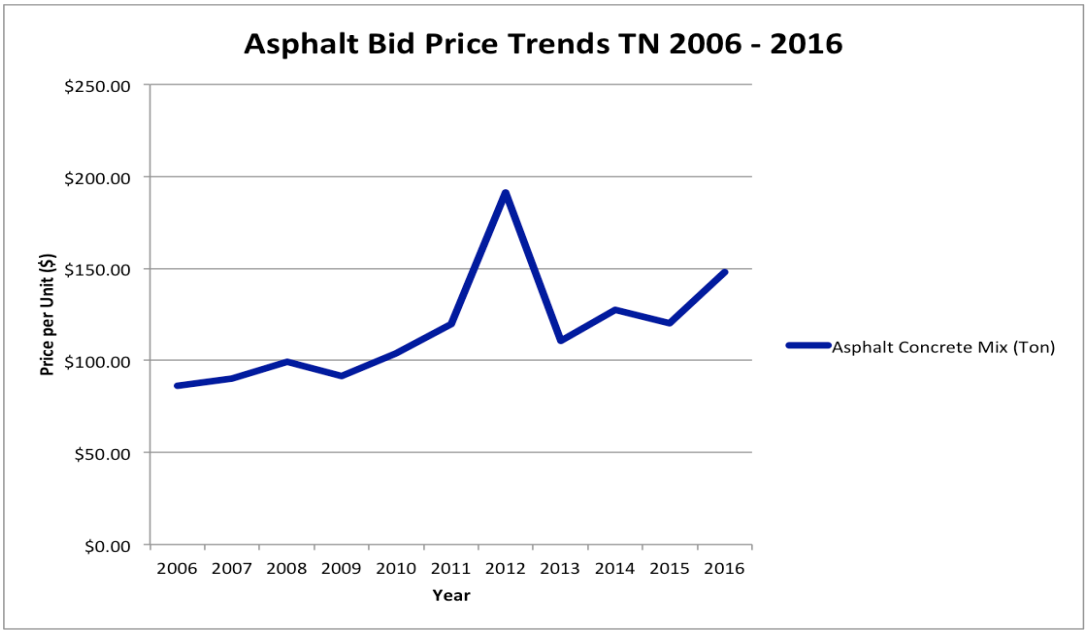
Source: FHWA.

Figure 34. Graph. Concrete bid price trends—Tennessee 2006–2016.

Table 32. Concrete price data—Tennessee.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	29	612.03	1,894.67	340.00	320.2
2007	23	494.87	895.00	100.00	164.4
2008	27	513.21	905.00	217.37	182.6
2009	32	502.23	1,156.51	223.37	212.5
2010	25	480.79	800.00	275.00	137.2
2011	25	466.59	1,006.66	250.00	175.1
2012	13	585.89	1,375.00	350.00	292.7
2013	19	616.18	951.00	360.00	156.8
2014	18	567.08	1,120.00	302.89	212.3
2015	20	592.25	1,150.00	250.00	184.6
2016	11	743.14	2,000.00	306.00	433.1

Next, price trends for one specific asphalt item (item No. 307-01.08) were analyzed. Figure 35 shows one noticeable price spike in 2012. Table 33 shows a very high maximum bid price of $4,200.00 in 2012 for this item. Further analysis did not reveal any identifiable cause for this high price.



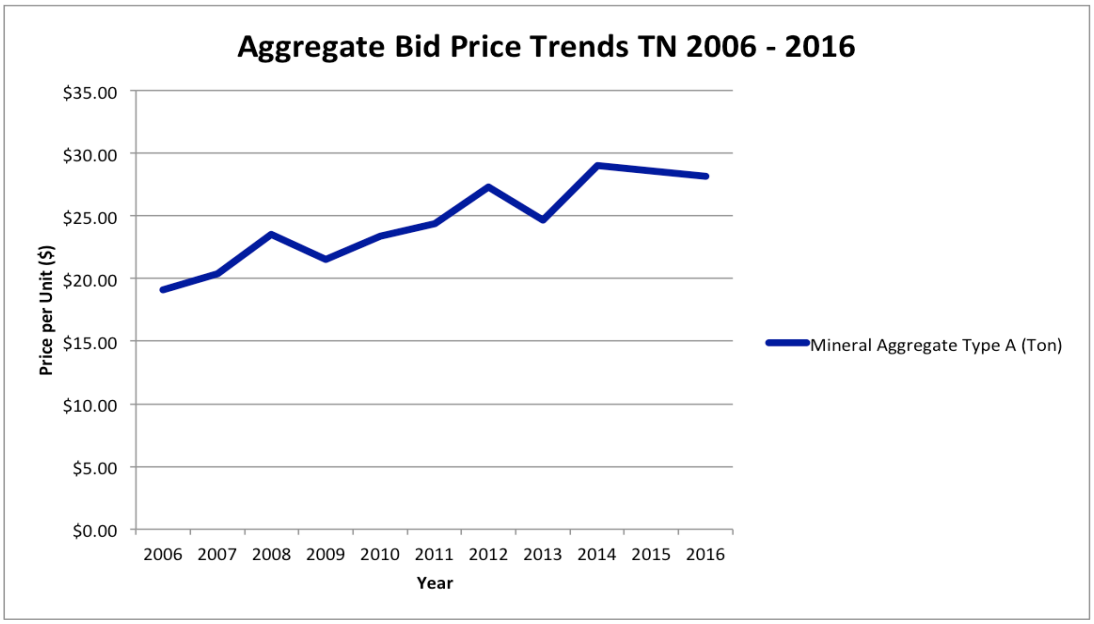
Source: FHWA.

Figure 35. Graph. Asphalt bid price trends—Tennessee 2006–2016.

Table 33. Asphalt price data—Tennessee.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	96	86.26	382.00	34.88	53.8
2007	104	90.17	576.85	40.00	64.3
2008	80	99.19	248.34	29.00	46.8
2009	163	91.37	300.00	35.00	45.3
2010	150	103.74	490.00	45.10	57.7
2011	126	119.90	550.00	49.25	78.5
2012	94	191.46	4,200.00	46.00	459.1
2013	93	110.65	750.00	50.00	88.4
2014	97	127.35	830.00	45.00	113.0
2015	95	120.12	1,150.00	47.32	131.7
2016	90	148.03	2,500.00	50.00	267.6

Lastly, price trends for one specific aggregate item (item No. 303-01) were investigated. Figure 36 shows the price trends for this item throughout the analysis period. Prices fluctuated with an overall rising trend throughout the period. As shown in table 34, this item contained relatively low standard deviation values.



Source: FHWA.

Figure 36. Graph. Aggregate bid price trends—Tennessee 2006–2016.

Table 34. Aggregate price data—Tennessee.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	167	19.06	134.00	8.80	11.6
2007	187	20.38	123.00	5.00	12.4
2008	151	23.51	100.00	9.19	15.6
2009	260	21.51	95.00	9.00	10.6
2010	227	23.34	75.58	5.00	10.2
2011	215	24.35	126.00	3.25	14.0
2012	164	27.28	150.00	5.00	19.4
2013	177	24.66	150.00	8.33	17.0
2014	188	29.00	505.00	10.00	36.9
2015	141	28.59	163.22	12.00	18.0
2016	143	28.18	82.00	10.00	13.4

Virginia

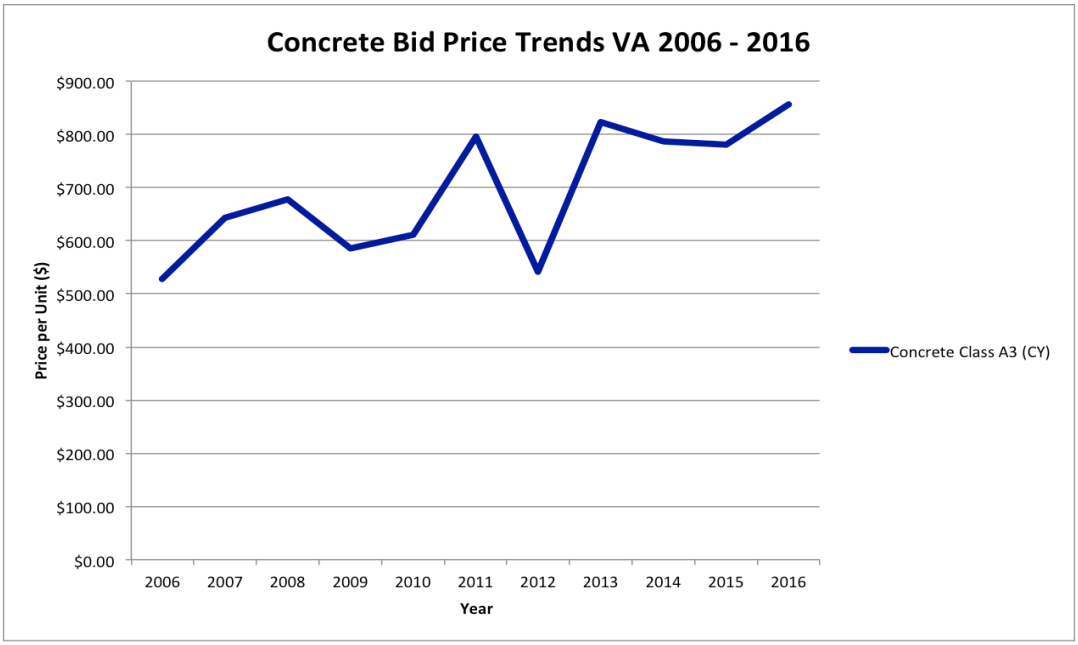
Some consolidation activity took place in various regions of Virginia; however, not many took place during the analysis period. Some M&A activity took place in 2017 and some in the 1990s, which is outside the period that data were made available to the team. Consolidation of a concrete plant in the Culpeper, VA, region took place in 2012, but the plant soon closed. Thus, further analysis was not possible. One aggregate plant in the Culpeper region, based in Stevensburg, VA, was sold in 2002. However, this activity did not affect aggregate prices for projects following the sale.

In the Northern Virginia (NOVA) region of the State, a total of six consolidation activities took place in the asphalt industry just before the analysis period, including 2002, 2003, 2004, and 2006. Asphalt product prices in the NOVA region across the analysis period remained relatively

constant: two projects had a significantly higher bid item number price for asphalt in 2011 and 2013 for projects in Prince William County. No activity with the firms or with asphalt suppliers in the area took place during those periods that would explain the higher prices and fluctuation, which was likely due to transportation costs.

Figure 37, figure 38, and figure 39 show the bid price trends for three materials: concrete class A3 (item No. 65013), asphalt concrete TY BM-25.0A (item No. 10642), and aggregate base material type I, No. 21B (item No. 10128), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 35, table 36, and table 37, respectively).

Figure 37 and table 35 show the price fluctuation of a specific concrete item (item No. 65013) in Virginia during the analysis period. Despite moderate fluctuations, no price anomalies were identified.



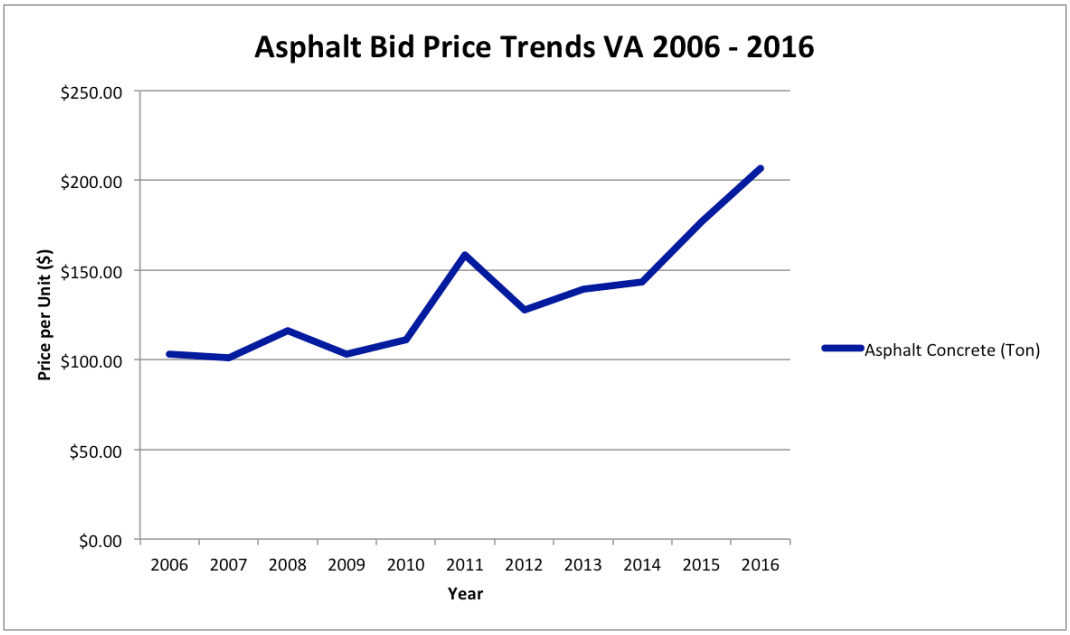
Source: FHWA.

Figure 37. Graph. Concrete bid price trends—Virginia 2006–2016.

Table 35. Concrete price data—Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	22	527.09	1,000.00	284.13	171.9
2007	19	642.42	950.00	452.40	137.4
2008	9	678.06	1,500.00	342.94	343.5
2009	14	584.89	1,312.78	320.00	239.1
2010	21	611.59	1,635.00	312.00	328.7
2011	19	796.20	3,460.00	385.00	746.2
2012	21	541.13	940.00	242.00	211.3
2013	32	822.88	2,500.00	350.00	389.7
2014	32	786.51	1,590.00	445.00	292.6
2015	29	781.02	1,200.00	370.00	232.9
2016	8	856.85	1,500.00	329.79	367.7

Next, the price trends for a specific asphalt item (item No. 10642) were analyzed. Figure 38 and table 36 show one price spike in 2011 and a general increasing trend after 2012. The average price was higher in 2011, but the maximum and minimum prices were not significantly different from those for other years. The highest maximum bid price occurred in 2015 at $2,215.00 per ton. This high price only appeared once in the data for 2015, and no apparent cause of the higher price was identified.



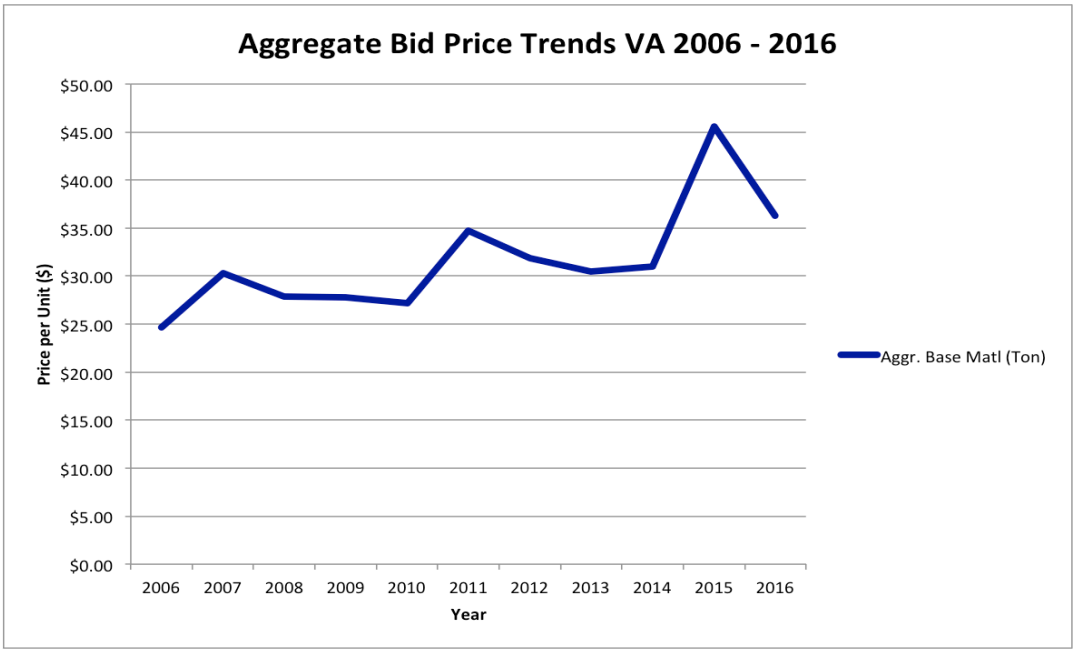
Source: FHWA.

Figure 38. Graph. Asphalt bid price trends—Virginia 2006–2016.

Table 36. Asphalt price data—Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	15	103.17	236.25	51.00	58.4
2007	31	101.04	250.00	18.00	60.9
2008	52	116.01	400.00	54.40	66.9
2009	64	103.10	595.00	49.50	81.2
2010	79	111.09	420.00	52.00	77.4
2011	89	158.33	500.00	56.00	88.2
2012	90	128.00	400.00	62.43	62.8
2013	110	139.47	495.00	58.00	84.9
2014	83	143.19	425.00	61.79	81.9
2015	95	177.16	2,215.00	55.00	224.9
2016	30	206.77	550.00	50.61	158.4

Lastly, price trends for a specific aggregate item (item No. 10128) were analyzed. Figure 39 shows the price trends for this item. One price spike is apparent in 2015. Table 37 shows a high maximum price of $1,000.00 in 2015. Further analysis revealed that only one project had a bid price of $1,000.00 per ton for this item. Several years had minimum prices of $1.00 and $0.01. As noted in the subsection, Inconsistent Bid Item Number Use, at the beginning of this chapter, dollar and penny bids can impact average prices, and, as seen in table 37, the standard deviations for those years are also higher. For each year with low minimum bid prices, the minimum only appeared once per year (one $1.00 per ton price in 2013, one $0.01 per ton price in 2014, and one $0.01 per ton price in 2015).



Source: FHWA.
Matl = material.

Figure 39. Graph. Aggregate bid price trends—Virginia 2006–2016.

Table 37. Aggregate price data—Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	94	24.63	88.00	10.00	12.9
2007	87	30.34	300.00	11.71	33.8
2008	95	27.83	125.00	10.89	18.1
2009	66	27.76	100.00	8.00	18.2
2010	88	27.16	120.00	12.91	15.9
2011	81	34.74	169.95	5.25	26.1
2012	88	31.86	250.00	14.25	26.5
2013	114	30.47	100.00	1.00	13.1
2014	101	30.97	90.00	0.01	13.5
2015	96	45.57	1,000.00	0.01	99.9
2016	33	36.29	100.00	0.01	21.9

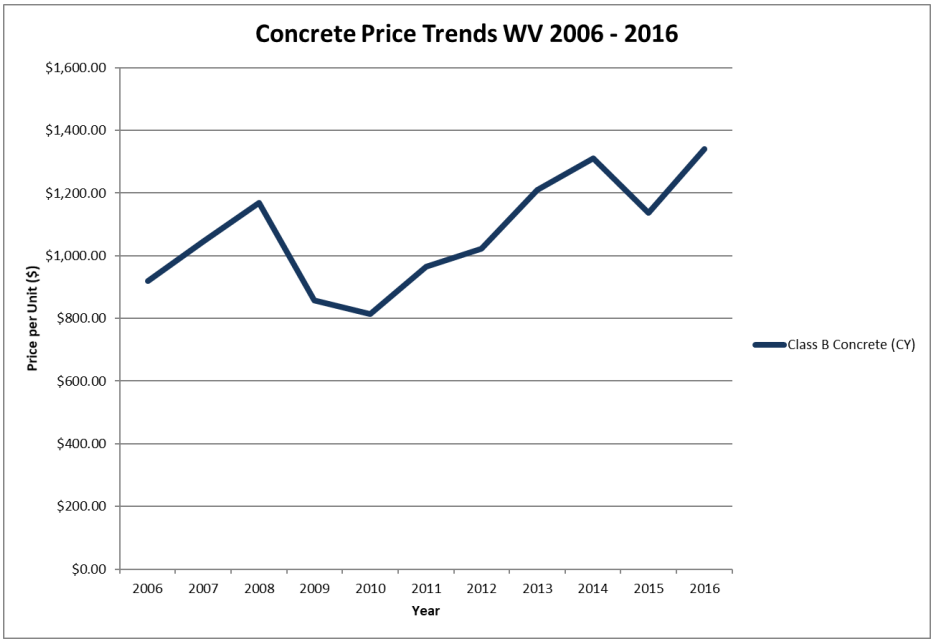
West Virginia

West Virginia DOT was contacted by email in an attempt to set up a case study interview. However, due to an active antitrust investigation at the time of inquiry, information on consolidation activity was not available. A major materials provider of aggregate, HMA, and concrete products has multiple locations in West Virginia. This supplier also owns plants and supplies materials in many other States. Overall aggregate and concrete suppliers in West Virginia are spread through the State. However, many projects during the analysis period relied on asphalt paving materials instead of concrete. Another major firm with multiple locations in multiple States accounts for a large share (approximately one-sixth) of the State's asphalt suppliers.

Despite the large market control by some major firms operating in this region of the country, pricing fluctuations year to year were not unusual. Some higher costs were seen for projects located near Fayetteville and Charleston, WV, likely due to shortened timelines to complete projects, which often lead to increases in pricing. A total of more than 500 unique contractors were included in the bidding data. Unit prices for bid item numbers by year were used to identify any anomalies in bid item number prices. However, items of interest across all years' prices of bid item numbers were consistent with unit prices reported by the State.

Figure 40, figure 41, and figure 42 show the bid price trends for three materials: class B concrete (item No. 601002-001), HMA base course (item No. 401001-001), and aggregate base course stone or gravel (item No. 307005-001), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 38, table 39, and table 40, respectively).

Figure 40 shows the price trends for a specific concrete item in West Virginia (item No. 601002-001). The average price fluctuated throughout the analysis period with a general increasing trend. Table 38 shows two higher maximum bid prices of $10,000.00 in 2008 and 2014.



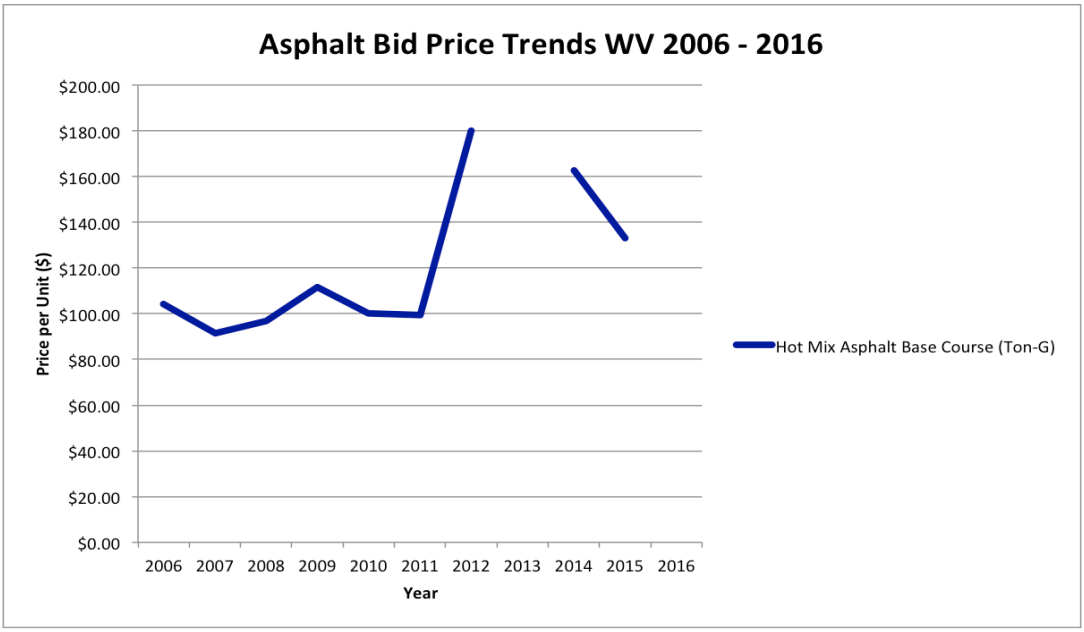
Source: FHWA.

Figure 40. Graph. Concrete bid price trends—West Virginia 2006–2016.

Table 38. Concrete price data—West Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	97	918.27	3,850.00	130.00	692.6
2007	84	1,045.99	9,746.00	190.00	1,252.1
2008	113	1,169.65	10,000.00	200.00	1,249.8
2009	82	856.70	3,400.00	150.00	670.5
2010	98	814.15	2,900.00	120.00	577.6
2011	69	964.11	4,500.00	140.00	827.2
2012	65	1,022.38	3,200.00	160.00	633.1
2013	31	1,211.27	3,725.00	395.00	875.9
2014	55	1,310.01	10,000.00	168.00	1,488.2
2015	31	1,137.43	5,800.00	430.00	931.9
2016	18	1,341.20	5,000.00	135.00	1,179.3

Next the price trends for a specific asphalt item (item No. 401001-001) were investigated. Figure 41 and table 39 show the price trends for a specific asphalt item (item No. 401001-001) in West Virginia. The item did not appear in any bids in 2013 or 2016. Overall, price fluctuations were moderate, and no anomalies were identified.



Source: FHWA.

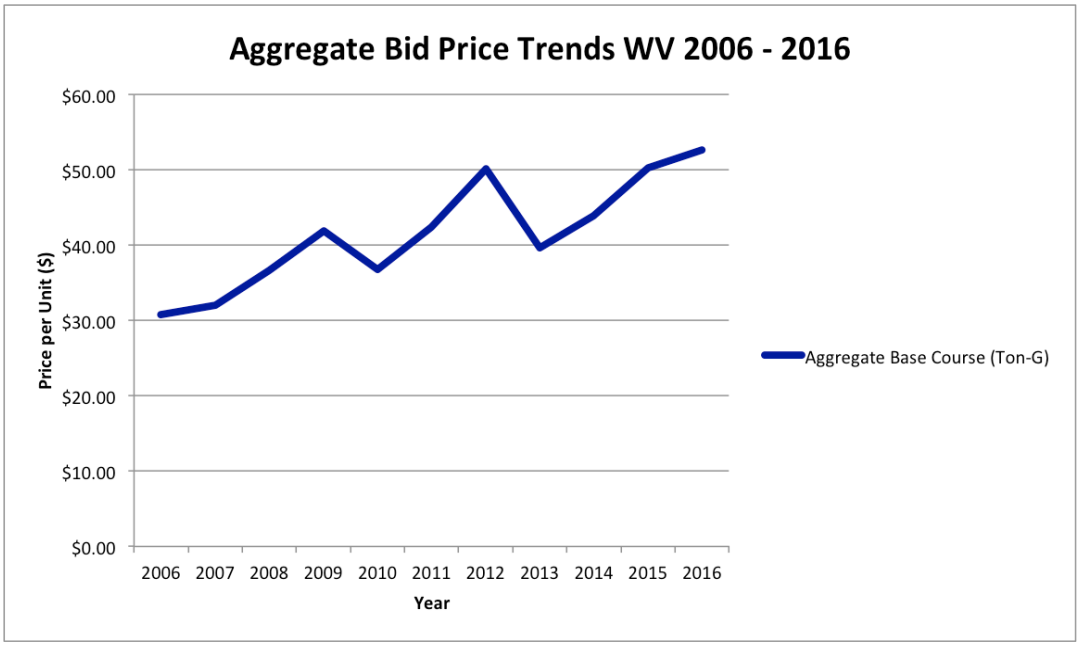
Figure 41. Graph. Asphalt bid price trends—West Virginia 2006–2016.

Table 39. Asphalt price data—West Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	167	104.15	615.00	39.50	82.1
2007	215	91.43	500.00	38.37	59.6
2008	331	96.79	500.00	47.10	56.9
2009	169	111.61	500.00	48.63	70.2
2010	272	99.99	500.00	1.00	55.7
2011	142	99.23	250.00	57.35	34.4
2012	5	179.88	350.00	84.00	93.8
2013	0	—	—	—	—
2014	2	162.50	175.00	150.00	12.5
2015	1	133.00	—	—	—
2016	0	—	—	—	—

—No data.

Finally, the price trends for a specific aggregate item (item No. 307005-001) were analyzed. Figure 42 shows the average prices for this item across the analysis period. Prices showed a generally increasing trend. Although prices were relatively consistent, several years had penny bids, as shown in table 40. These penny bids can impact average price and standard deviation by increasing the range between maximum and minimum bid price.



Source: FHWA.

Figure 42. Graph. Aggregate bid price trends—West Virginia 2006–2016.

Table 40. Aggregate price data—West Virginia.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	297	30.73	125.00	6.00	14.3
2007	209	31.99	150.00	0.01	15.8
2008	346	36.63	175.00	0.01	19.0
2009	206	41.84	200.00	0.01	23.9
2010	201	36.73	150.00	0.01	16.1
2011	170	42.36	250.00	1.00	24.1
2012	115	50.10	400.00	10.00	52.4
2013	170	39.58	135.00	0.01	15.9
2014	215	43.94	155.00	0.01	17.8
2015	176	50.25	600.00	0.01	53.7
2016	168	52.59	500.00	0.01	55.7

AASHTO REGION 3

This section presents States located in AASHTO region 3: Illinois, Indiana, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.

Illinois

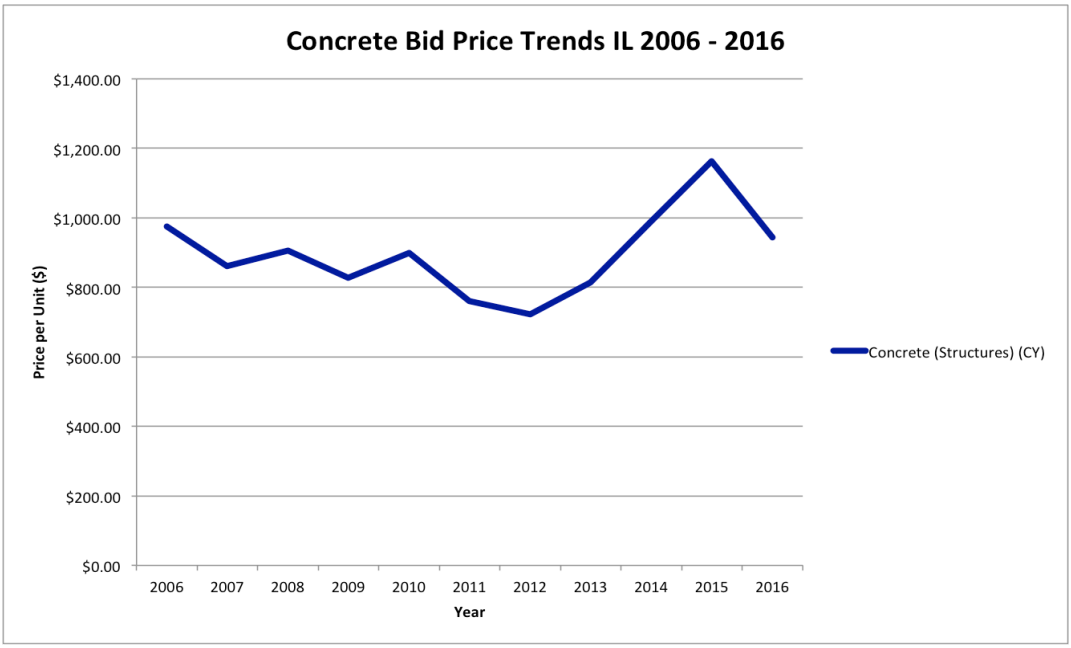
Evidence gathered from Illinois DOT (IDOT) revealed no significant consolidation activity, including M&As. Several HMA pavers in central Illinois joined into one operating company in approximately 2006, and IDOT did not feel that this merger caused any significant impacts on pricing. HMA pavers in southern Illinois receive a large number of single bids due to the limited availability of HMA pavers in that region, but the impact on costs has not been investigated. The Cook County area (district 1) has seen a trend toward joint ventures, which have impacted

competition. However, the only major consolidation occurred in the reinforced concrete pipe industry.

In the past, several smaller companies were producing pipe, but during the analysis period larger suppliers purchased these smaller companies. This activity resulted in only several suppliers providing pipe. Cost impacts from this activity have not been tracked, but IDOT believes that prices may have increased as a result. Impact on competition in district 1 is difficult to attribute to consolidation activity, as many jobs in the metropolitan area of Chicago, IL, include very tight timelines, which increase costs.

Figure 43, figure 44, and figure 45 show the bid price trends for three materials: concrete structures (item No. 50300225), HMA surface course mix including N50 (item No. 40603310), and aggregate surface course type B (item No. 40200800), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 41, table 42, and table 43, respectively).

Figure 43 and table 41 show price trends for a specific concrete item in Illinois (item No. 50300225). A high maximum bid price of $16,666.70 was identified in 2015. The average price in 2015 was also higher, as indicated in the spike on the graph. No cause for this high maximum price was identified.



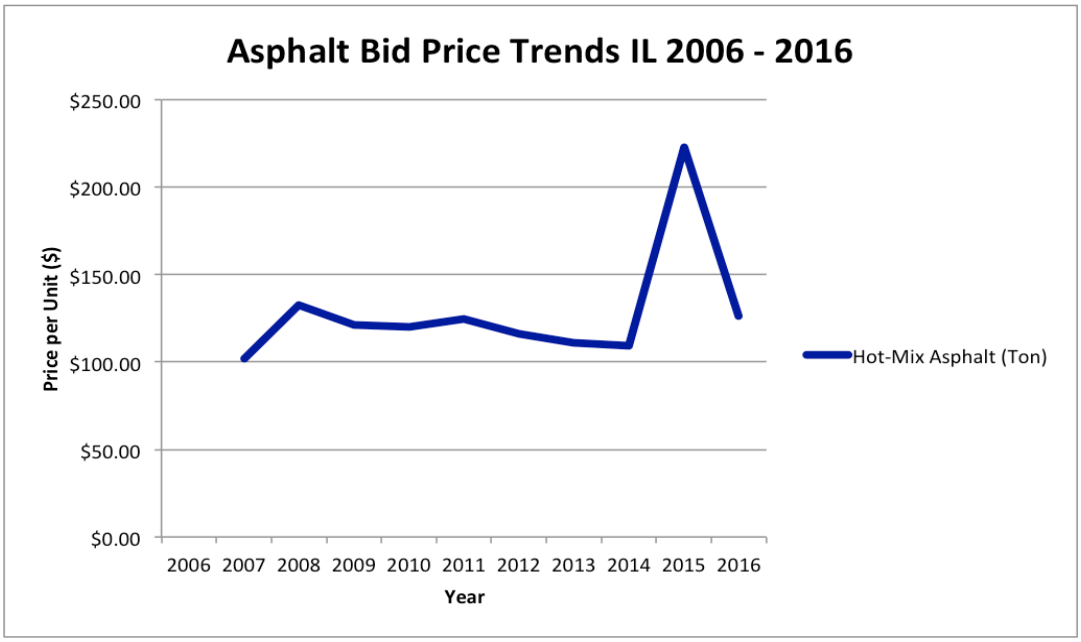
Source: FHWA.

Figure 43. Graph. Concrete bid price trends—Illinois 2006–2016.

Table 41. Concrete price data—Illinois.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	209	975.34	6,650.00	290.00	1,014.8
2007	171	861.29	4,000.00	50.00	579.2
2008	206	904.92	5,700.00	150.00	680.7
2009	200	826.85	3,100.00	190.00	479.8
2010	203	898.14	6,000.00	265.11	773.8
2011	209	760.60	4,300.00	100.00	520.5
2012	132	722.11	2,900.00	1.00	416.1
2013	196	813.72	3,600.00	300.00	525.4
2014	164	989.78	9,255.47	300.00	1,149.6
2015	146	1,163.24	16,666.70	200.00	1,593.8
2016	61	944.64	6,555.00	0.32	852.8

Next, price trends were analyzed for a specific asphalt item (item No. 40603310). Figure 44 shows the price trends for this asphalt item. The item did not appear in the data in 2006. One noticeable price spike is seen in 2015 in the graph. Table 42 shows that both the average price and the maximum bid price were highest in 2015 ($222.96 and $6,600.00 respectively).



Source: FHWA.

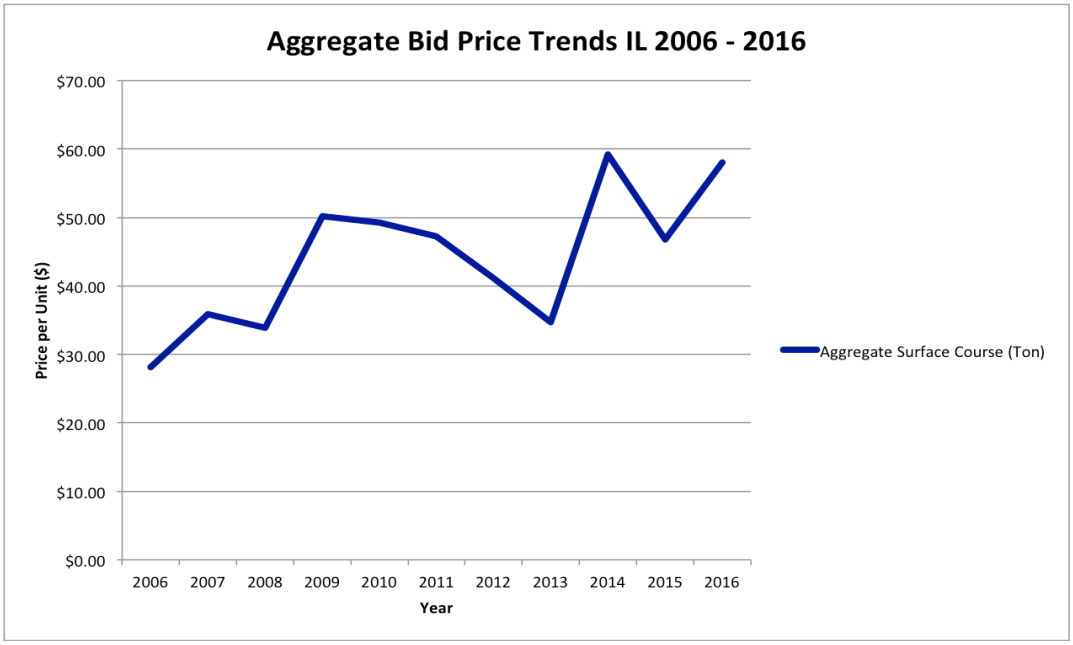
Figure 44. Graph. Asphalt bid price trends—Illinois 2006–2016.

Table 42. Asphalt price data—Illinois.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	196	101.97	562.00	42.64	70.6
2008	176	132.76	560.00	0.01	89.6
2009	306	121.38	4,000.00	27.60	238.8
2010	309	120.04	800.00	49.97	91.6
2011	181	124.48	490.00	15.40	75.8
2012	71	116.33	500.00	11.00	66.3
2013	105	110.90	312.90	54.03	52.1
2014	128	109.56	515.00	56.25	64.4
2015	75	222.96	6,600.00	3.65	748.5
2016	45	126.52	980.00	48.75	138.5

—No data.

Lastly, price trends for a specific aggregate item (item No. 40200800) were investigated. Figure 45 shows moderate fluctuations across the analysis period with a general increase in prices toward the end of the period. The standard deviations shown in table 43 are small, with the largest occurring in 2014 due to the higher maximum bid price of $700.00 per ton.



Source: FHWA.

Figure 45. Graph. Aggregate bid price trends—Illinois 2006–2016.

Table 43. Aggregate price data—Illinois.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	139	28.11	117.36	0.01	18.2
2007	121	35.82	285.75	4.20	33.6
2008	122	33.92	203.00	2.20	25.2
2009	143	50.14	235.00	0.01	43.2
2010	169	49.21	379.04	0.01	46.6
2011	104	47.27	305.23	14.00	47.7
2012	74	41.15	145.26	15.00	28.4
2013	107	34.73	137.45	12.00	19.7
2014	127	59.26	700.00	11.59	93.0
2015	82	46.78	234.61	13.93	33.4
2016	54	58.03	308.12	13.00	51.8

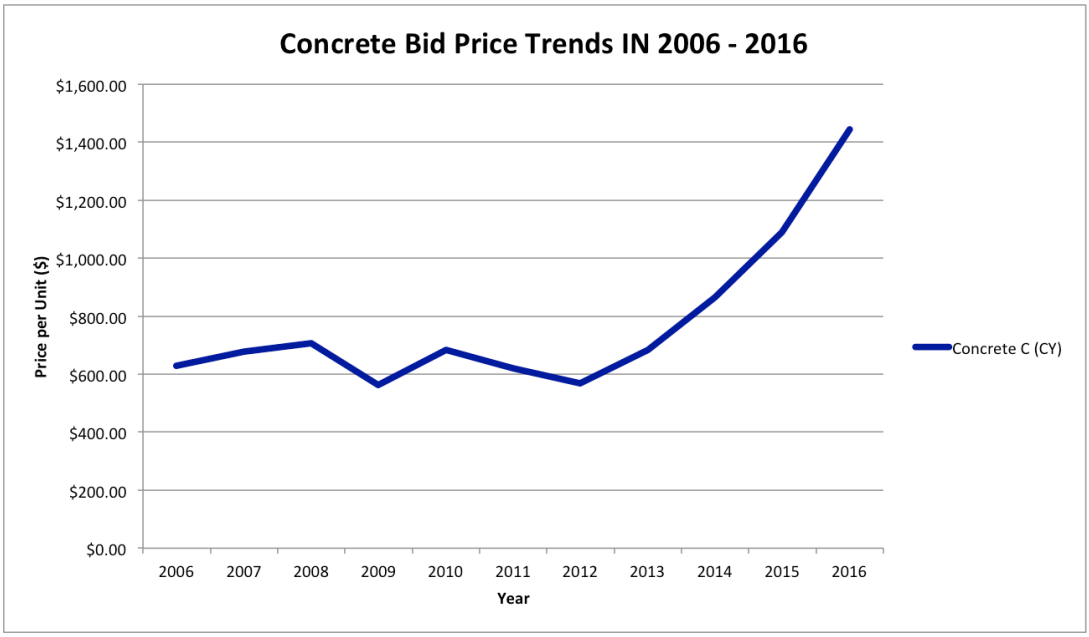
Indiana

A total of 272 unique firms were awarded 3,192 projects containing materials of interest in 2006-2016. A major firm operating in the State purchased aggregate suppliers in several other States during the analysis period. This activity did not show any pricing effects on aggregate in projects in Indiana. Aggregate backfill bid prices were generally within $50.00 of the unit price reported by Indiana DOT and well below the high prices published. Similar trends were observed for other materials, including asphalt and concrete products.

Most of the State's asphalt and concrete suppliers are based near the Indianapolis, IN, area with other locations in close proximity to major routes, including I–65 and I–69. Aggregate supplier locations were observed to be more widespread, with one major firm operating in the State owning several locations. From fiscal year 2005 to fiscal year 2015, a large number of projects were let and completed in the State, including roadway construction and reconstruction, bridge rehabilitation and replacement, and highway safety improvement projects.

Figure 46, figure 47, and figure 48 show the bid price trends for three materials: concrete superstructure (item No. 704-51002), asphalt material (item No. 406-05520), and compacted aggregate No. 53 base (item No. 301-07448), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 44, table 45, and table 46, respectively).

Figure 46 and table 44 show the price trends for a concrete item in Indiana (item No. 704-51002). From 2012 to the end of the analysis period, average prices increased, with the highest identified in 2015 and 2016.



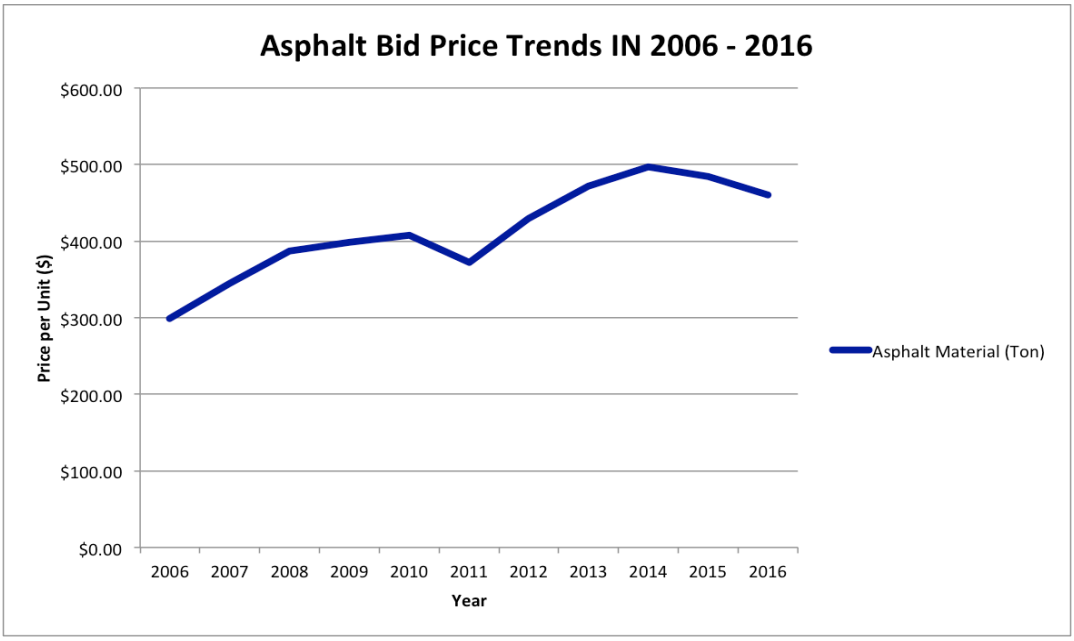
Source: FHWA.

Figure 46. Graph. Concrete bid price trends—Indiana 2006–2016.

Table 44. Concrete price data—Indiana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	63	629.23	3,000.00	300.00	368.9
2007	59	678.82	3,500.00	329.12	563.7
2008	66	706.06	2,100.00	346.40	320.2
2009	89	561.68	2,000.00	275.60	235.4
2010	81	685.09	8,000.00	1.00	861.1
2011	73	618.96	5,400.00	276.90	613.6
2012	55	567.72	1,430.00	317.00	187.1
2013	69	685.15	1,600.00	341.55	248.9
2014	88	864.77	4,500.00	400.00	610.1
2015	90	1,088.60	5,000.00	435.00	717.0
2016	25	1,444.80	5,000.00	475.00	1,016.9

Next, asphalt prices were analyzed for Indiana during the analysis period. Figure 47 shows the average prices of a specific asphalt item (item No. 406-05520). Prices remained relatively consistent and steadily increased over time, except for one price dip in 2011. Average price as well as maximum bid price were lower in 2011. However, the minimum prices for every year were penny bids, as shown in table 45.



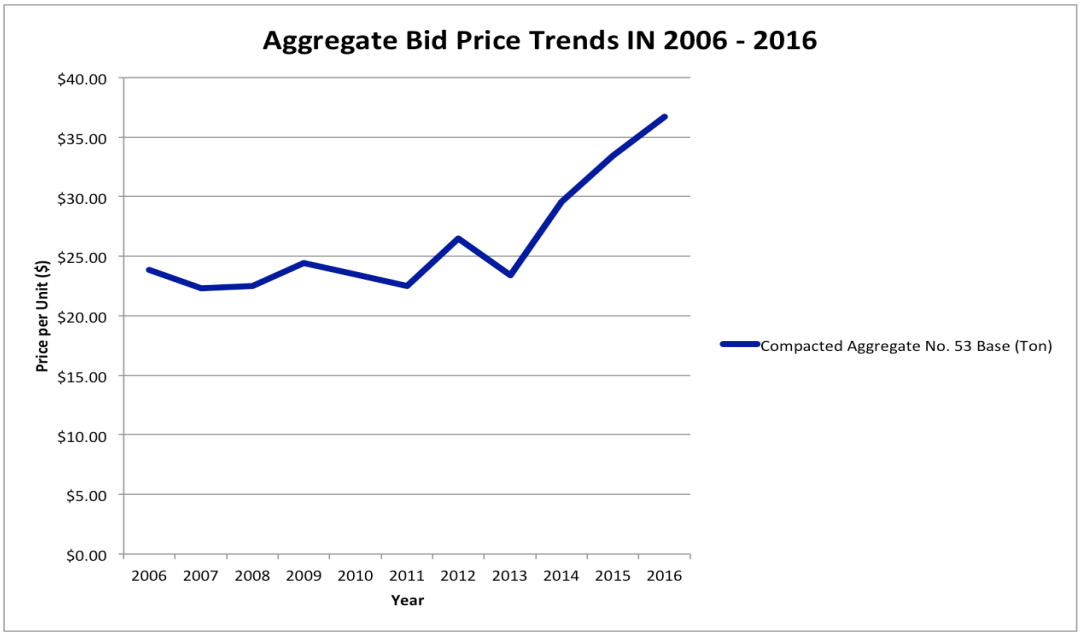
Source: FHWA.

Figure 47. Graph. Asphalt bid price trends—Indiana 2006–2016.

Table 45. Asphalt price data—Indiana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	242	298.82	3,000.00	0.01	313.6
2007	218	344.57	4,000.00	0.01	340.0
2008	273	387.33	2,500.00	0.01	305.4
2009	493	398.08	3,000.00	0.01	357.2
2010	317	407.66	3,800.00	0.01	415.1
2011	194	371.74	1,347.96	0.01	258.2
2012	181	428.89	5,750.00	0.01	598.2
2013	217	472.19	5,000.00	0.01	526.8
2014	235	497.47	5,800.00	0.01	537.9
2015	236	483.84	5,000.00	0.01	511.7
2016	71	460.79	1,267.00	0.01	265.4

Finally, price trends for a specific aggregate item (item No. 301-07448) were analyzed. Figure 48 and table 46 show the price fluctuations for this item across the analysis period. Prices did not vary greatly but increased after 2013. Again, penny and dollar bids were identified, which impact average prices.



Source: FHWA.

Figure 48. Graph. Aggregate bid price trends—Indiana 2006–2016.

Table 46. Aggregate price data—Indiana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	170	23.89	100.00	3.40	14.5
2007	164	22.29	60.00	0.01	9.2
2008	182	22.50	75.00	0.01	11.4
2009	262	24.42	600.00	0.20	38.8
2010	213	23.49	198.36	0.01	21.4
2011	163	22.53	167.83	1.00	15.7
2012	135	26.51	479.58	0.01	41.4
2013	177	23.38	117.45	1.00	14.6
2014	203	29.56	500.00	0.22	38.7
2015	220	33.43	266.18	0.32	27.4
2016	65	36.72	245.00	11.00	37.4

Michigan

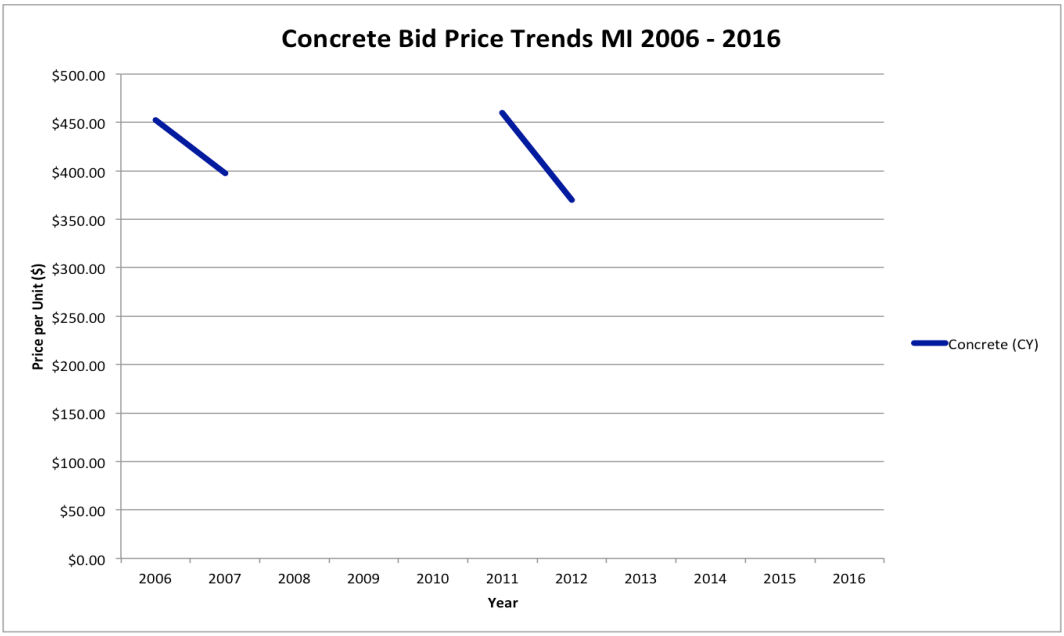
Some consolidation activity in the asphalt industry resulted in an almost 18-percent price increase in the Kalamazoo, MI, area within the 2-yr period following the merger in the early 2000s (Duplantis 2010). Any lasting pricing effects can be largely attributed to the geographic effects of this merger. After the aforementioned merger, one firm owned and/or operated six asphalt plants in five different counties located in southern Michigan. Thus, projects in other areas of the State using asphalt products from this firm saw higher project costs due to material transportation costs.

Analysis of the data for Michigan bids during the 2006–2016 period did not reveal any significant pricing anomalies for materials of interest. Michigan DOT (MDOT) also provided weighted average item pricing reports, which contained item identifications, regions, year, and

quarter used; how many contracts the item appeared in; average quantities in each contract; average awarded bid prices; and average prices of the lowest three bidders. For items such as HMA, asphaltic material, concrete, and aggregates, the unit price data provided by MDOT revealed that most bids included prices that were within a small range of the reported unit prices. Most of the State's asphalt plants are located in the eastern part of State. Therefore, transportation costs for projects further west or in the northern areas of the State are generally higher, resulting in higher overall project costs. Projects with reduced timelines also see increases in total costs. Most of the State's aggregate sources are in the southern half of the State but are spread relatively evenly from west to east. Concrete plants are fairly evenly distributed across the whole State, with one location in the far north.

Figure 49, figure 50, and figure 51 show the bid price trends for three materials: substructure concrete (item No. 7067010), HMA 13A (item No. 5020034), and aggregate base (item No. 3020001), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 47, table 48, and table 49, respectively).

Figure 49 and table 47 show the limited data available for a concrete item (item No. 7067010) in Michigan. This item did not appear in the data in 2008–2010 or 2013–2016. For the years it was identified in the data, the prices were varied, but no anomalies were identified.



Source: FHWA.

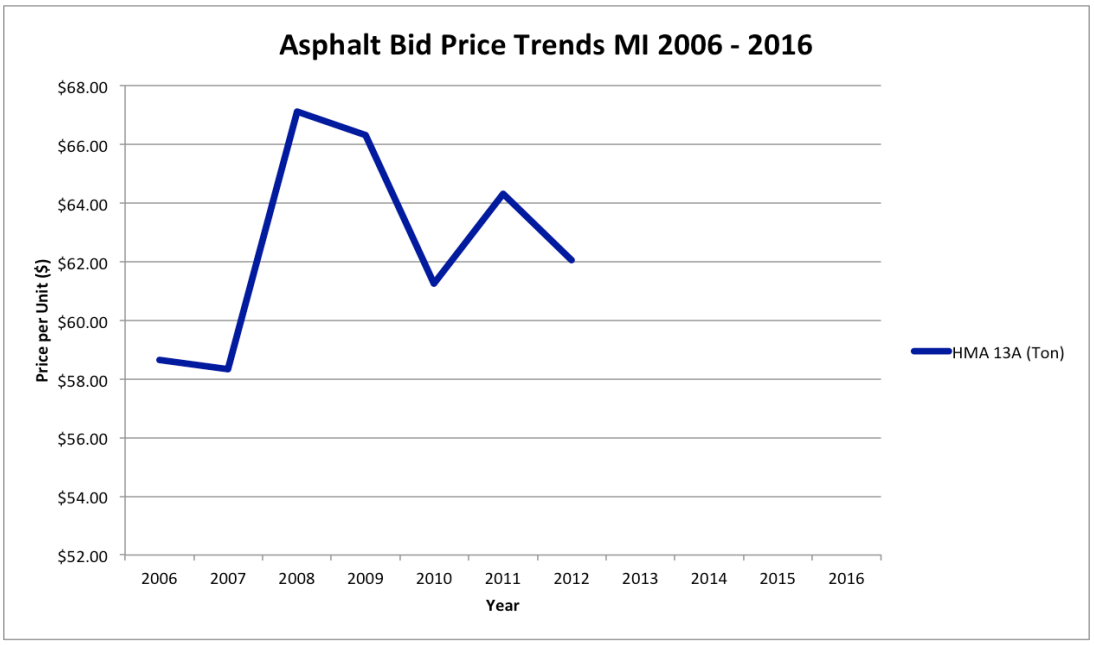
Figure 49. Graph. Concrete bid price trends—Michigan 2006–2016.

Table 47. Concrete price data—Michigan.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	105	452.65	2,000.00	0.01	293.7
2007	14	397.39	1,325.00	50.00	295.8
2008	0	—	—	—	—
2009	0	—	—	—	—
2010	0	—	—	—	—
2011	3	460.00	530.00	350.00	78.7
2012	8	370.00	800.00	100.00	212.3
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Next, price trends for an asphalt item (item No. 5020034) were analyzed. Figure 50 shows the price trends for this item. The item did not appear in the data after 2012. For the years it was analyzed, prices were relatively consistent, which is reflected in the standard deviations shown in table 48.



Source: FHWA.

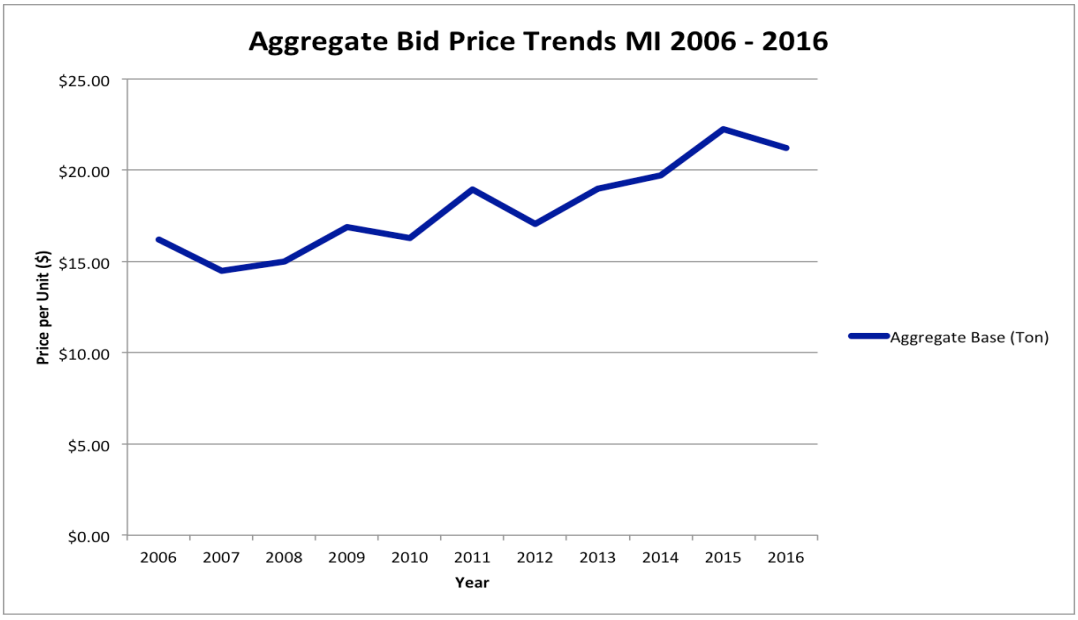
Figure 50. Graph. Asphalt bid price trends—Michigan 2006–2016.

Table 48. Asphalt price data—Michigan.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	230	58.64	535.00	0.01	40.9
2007	236	58.33	186.00	35.93	24.0
2008	151	67.10	232.30	35.82	26.5
2009	158	66.32	350.00	36.82	36.3
2010	209	61.26	227.20	45.25	18.3
2011	112	64.32	250.00	45.30	26.6
2012	1	62.06	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, price trends for an aggregate item (item No. 3020001) were analyzed. Figure 51 and table 49 show the increasing trend in average price for this aggregate item across the analysis period. Prices had very little variation, despite some penny bids in 2008, 2012, 2013, and 2014.



Source: FHWA.

Figure 51. Graph. Aggregate bid price trends—Michigan 2006–2016.

Table 49. Aggregate price data—Michigan.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	106	16.21	85.00	5.25	9.8
2007	125	14.49	50.00	5.00	7.9
2008	80	15.00	54.00	0.01	8.8
2009	87	16.88	100.00	5.00	15.2
2010	100	16.30	65.00	5.50	9.7
2011	64	18.95	300.00	6.00	35.9
2012	68	17.05	100.00	0.01	12.8
2013	93	19.00	280.00	0.01	28.6
2014	80	19.73	65.00	0.01	12.8
2015	66	22.27	87.00	9.00	13.2
2016	71	21.23	65.00	1.00	10.6

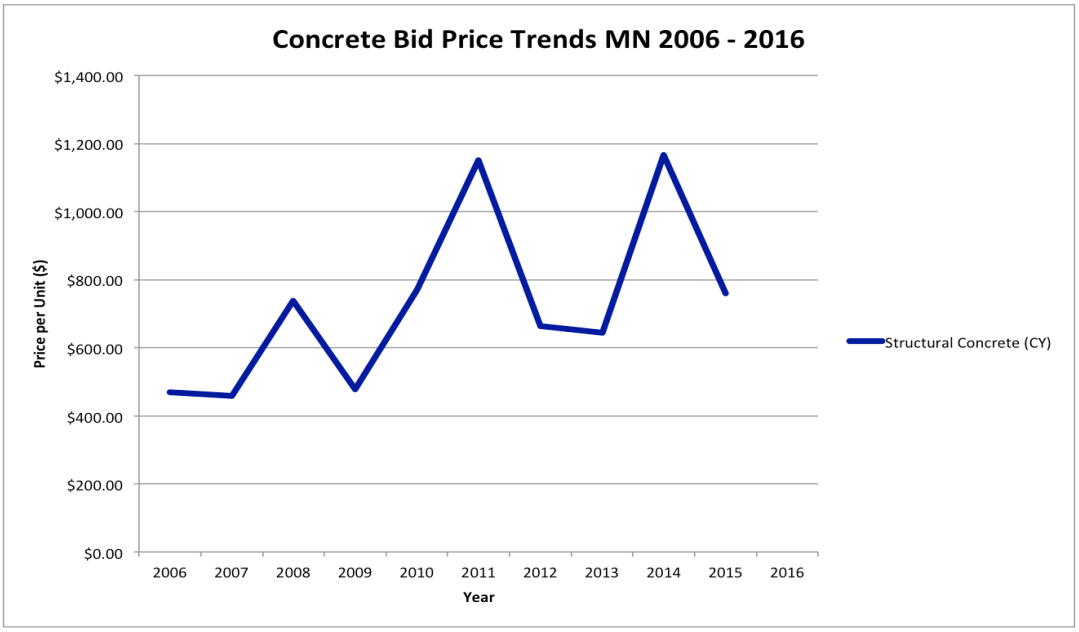
Minnesota

Minnesota's aggregate, asphalt, and concrete suppliers are all largely concentrated near the twin cities (Minneapolis and St. Paul). A total of approximately 2,000 projects took place during the analysis period of 2006–2016. Examining the price trends of key items revealed relatively stable average bid prices for asphalt and aggregate throughout the 10-yr period. The average bid prices of concrete materials showed a gradual increase in price, reaching an all-time high in 2016, with the lowest price occurring in 2006.

Analysis of the bid prices of key materials also included comparison with unit price data provided by Minnesota DOT (MnDOT). These data included items numbers and descriptions, units, quantities, dollars, average prices, and the number of contracts utilizing the item in that particular year. Prices of items such as aggregate, concrete, and asphalt during the 10-yr period were found to be consistent with unit prices provided by MnDOT. Minnesota's Construction Cost Index (CCI) revealed annual price trends for surfacing began to rise steadily starting in 2004, which may explain the rising prices of concrete materials in the bids. Concrete surfacing also showed a gradual cost index increase from 1986 to 2009.

Figure 52, figure 53, and figure 54 show the bid price trends for three materials: structural concrete (3Y43) (item No. 2411501/03243), asphalt cement (item No. 2350609/00020), and aggregate base class 5 (item No. 2211501/00050), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 50, table 51, and table 52, respectively).

Figure 52 shows the price trends for a specific concrete item in Minnesota (item No. 2411501/03243). Three spikes are visible in the graph in 2008, 2011, and 2014. Table 50 shows the higher average prices, as well as the higher maximum prices for these years, which can impact the averages.



Source: FHWA.

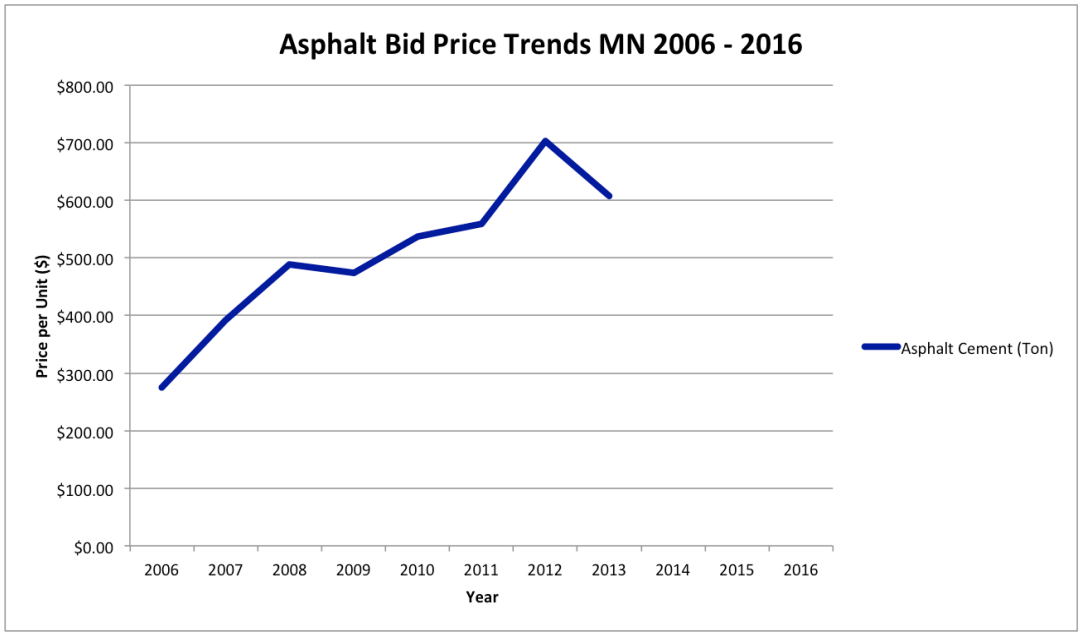
Figure 52. Graph. Concrete bid price trends—Minnesota 2006–2016.

Table 50. Concrete price data—Minnesota.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	3	470.00	575.00	375.00	81.9
2007	7	458.57	735.00	350.00	128.2
2008	9	738.02	2,950.00	324.94	784.8
2009	9	478.84	714.75	307.00	135.9
2010	9	770.20	1,700.00	125.00	436.5
2011	5	1,151.30	2,500.00	375.00	833.6
2012	5	663.32	1,400.00	270.00	392.7
2013	9	644.98	1,500.00	392.84	337.2
2014	6	1,166.83	3,350.00	355.00	1,033.8
2015	8	759.14	1,510.00	240.00	409.4
2016	0	—	—	—	—

—No data.

Next, prices for a specific asphalt item (item No. 2350609/00020) were analyzed. Figure 53 and table 51 show the price information for this item, which did not appear in the data after 2013. For the years the item was available for analysis, prices increased, and the variation in price remained low to moderate.



Source: FHWA.

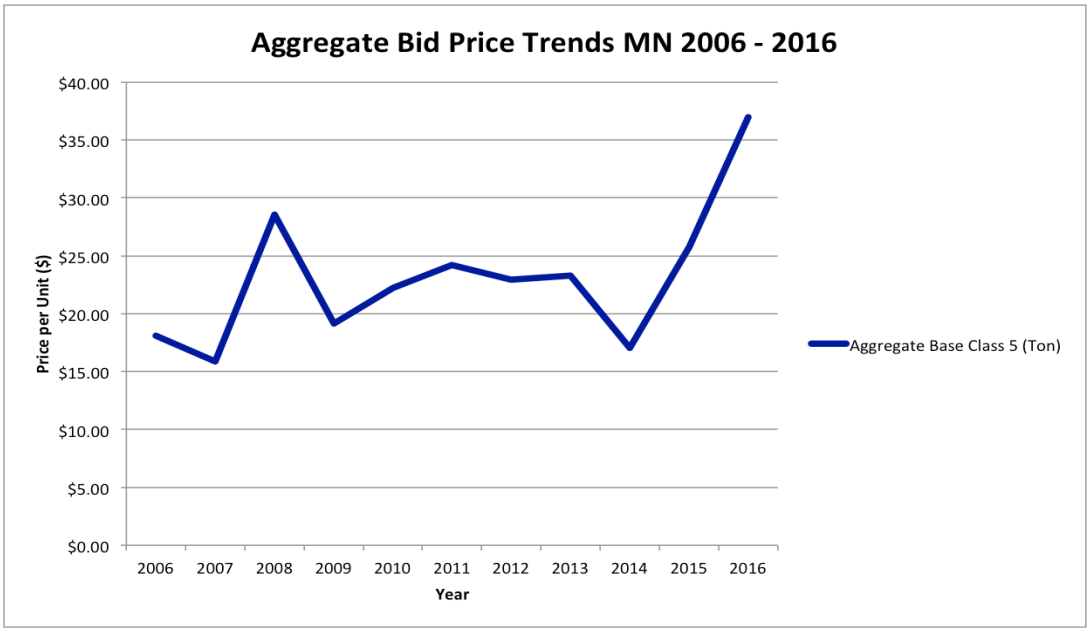
Figure 53. Graph. Asphalt bid price trends—Minnesota 2006–2016.

Table 51. Asphalt price data—Minnesota.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	1	275.00	—	—	—
2007	2	392.50	410.00	375.00	17.5
2008	2	488.14	558.53	417.75	70.4
2009	4	474.75	500.00	449.00	20.9
2010	5	537.60	575.00	500.00	30.1
2011	1	559.15	—	—	—
2012	2	703.65	727.31	680.00	23.6
2013	3	607.00	626.00	585.00	16.9
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, prices for an aggregate item (item No. 2211501/00050) were analyzed. Figure 54 shows moderate changes to the average price across the analysis period, with an increase toward the end of the period. Variation was low, as reflected in the standard deviation values shown in table 52.



Source: FHWA.

Figure 54. Graph. Aggregate bid price trends—Minnesota 2006–2016.

Table 52. Aggregate price data—Minnesota.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	11	18.09	35.38	8.70	7.6
2007	12	15.88	36.00	6.50	9.9
2008	9	28.55	76.00	11.00	18.1
2009	11	19.13	61.50	9.40	14.4
2010	17	22.21	75.00	9.25	16.5
2011	8	24.23	50.00	9.50	13.1
2012	6	22.94	40.00	14.00	9.2
2013	9	23.27	48.26	13.00	11.1
2014	6	17.03	25.11	11.60	4.2
2015	4	25.77	37.00	16.00	7.7
2016	2	37.00	50.00	24.00	13.0

Missouri

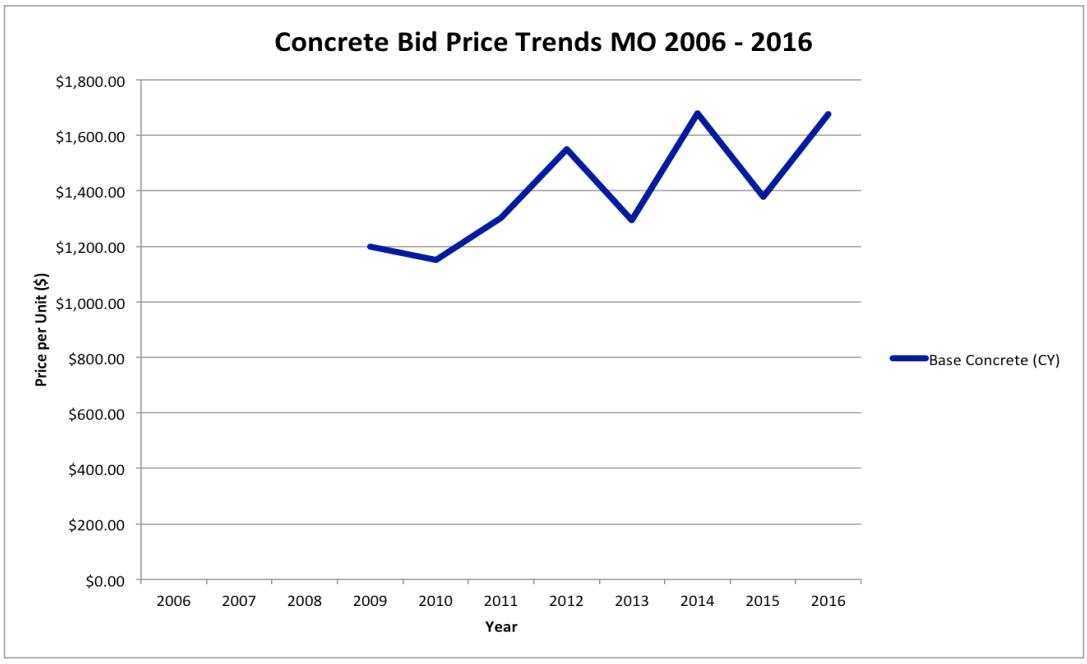
Missouri requires a minimum of 40 percent of the work be performed by the prime contractor. This percentage can be adjusted to the minimum FHWA amount of 30 percent, if required. Missouri DOT (MoDOT) chooses to impose the higher requirement for its prime contractors. Kansas City, St. Louis, and Springfield, MO, are large urban areas that are considered separately due to some unique provisions such as night paving. Obtaining aggregate in these urban areas has become difficult because older quarries in the urban areas of the State are drying up as a result of large commercial projects. Since 2010, MoDOT has seen a major national aggregate producer sell most of its presence to a local company, and many quarries were consolidated as a result. This new firm also specializes in paving. A few quarries are now owned individually, but several contractors own groups of quarries. However, MoDOT monitors the competition.

Regarding trends in these mergers and bid characteristics (including number of bidders and changes in prices), the number of bidders is tracked as a performance measure.

Analysis of the bid prices of key materials also included comparison with unit price data provided by MoDOT. These data included numbers and descriptions, units, quantities, dollars, average prices, and the number of contracts utilizing the item in that particular year. Prices of items such as aggregate, concrete, and asphalt during the 10-yr period were found to be consistent with unit prices provided by MoDOT.

Figure 55, figure 56, and figure 57 show the bid price trends for three materials: base concrete (item No. 9029100), asphaltic concrete mixture PG 64-22 (SP125C mix) (item No. 4030101), and type 5 aggregate for base (4 inches thick) (item No. 3040504), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 53, table 54, and table 55, respectively).

Figure 55 shows the price trends for a specific concrete item (item No. 9029100) in Missouri during the analysis period. The item did not appear in the data in 2006–2008. For the years it was available, prices fluctuated moderately and climbed toward the end of the analysis period. This activity is reflected in larger standard deviations shown in table 53.



Source: FHWA.

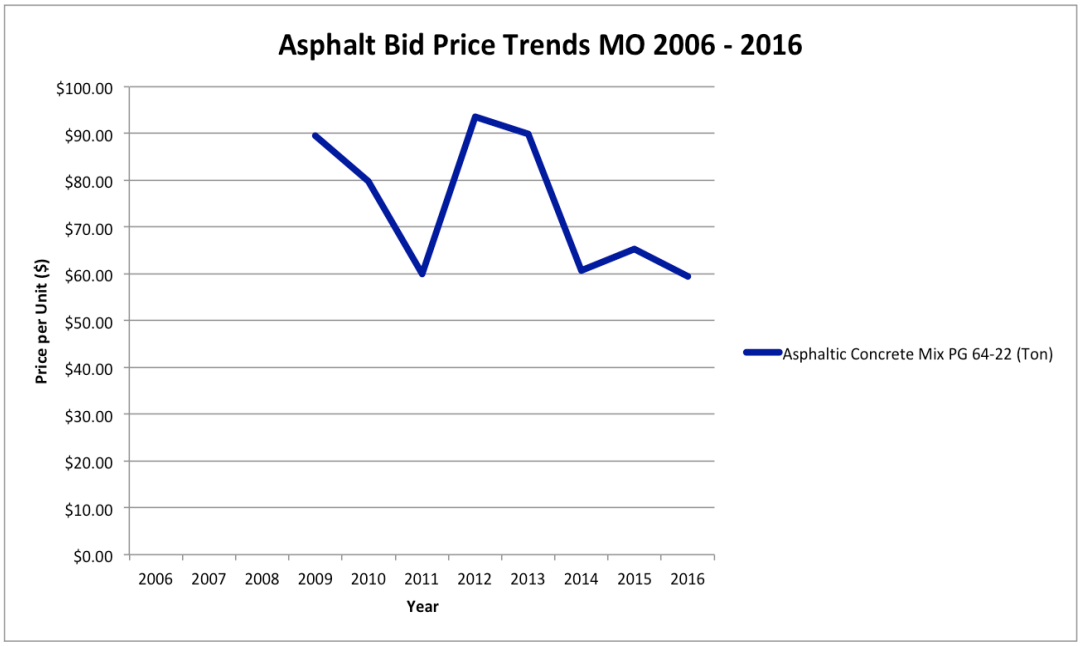
Figure 55. Graph. Concrete bid price trends—Missouri 2006–2016.

Table 53. Concrete price data—Missouri.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	0	—	—	—	—
2009	37	1,199.72	3,480.00	455.05	517.9
2010	37	1,149.81	3,050.00	497.28	588.6
2011	35	1,303.73	2,797.00	670.00	545.1
2012	29	1,548.77	5,000.00	805.00	1,088.3
2013	35	1,292.93	2,600.00	175.00	545.2
2014	45	1,680.41	12,451.60	600.00	1,826.8
2015	31	1,379.41	3,125.85	1.00	642.6
2016	17	1,676.55	4,300.00	689.00	814.9

—No data.

Next, a specific asphalt item (item No. 4030101) was analyzed. Figure 56 shows the price variation for this item during the analysis period. As can be seen in the graph and in table 54, the item was not in the data in 2006, 2007, or 2008. During the years it was available for analysis, average prices were higher in 2012 and 2013 ($93.60 per ton and $89.89 per ton, respectively). The maximum observed bid price occurred in 2013. No apparent cause for this higher price was identified.



Source: FHWA.

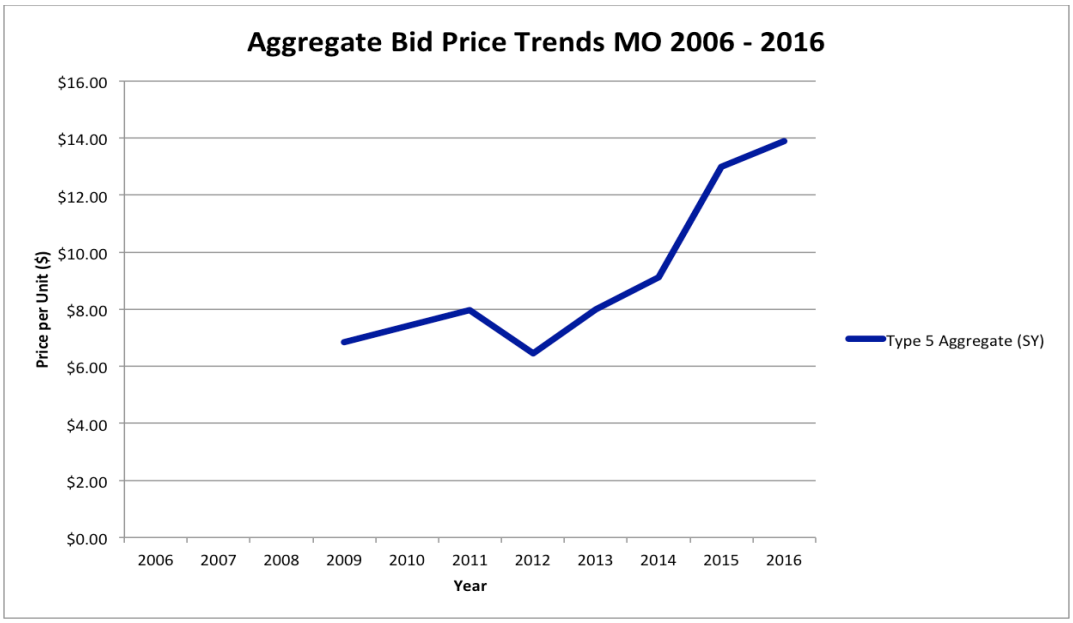
Figure 56. Graph. Asphalt bid price trends—Missouri 2006–2016.

Table 54. Asphalt price data—Missouri.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	0	—	—	—	—
2009	23	89.61	240.00	48.56	56.9
2010	20	79.77	237.10	26.25	58.5
2011	3	60.03	74.90	52.20	10.5
2012	10	93.60	160.00	49.93	37.4
2013	16	89.89	440.00	47.70	91.9
2014	5	60.74	84.95	52.07	12.2
2015	6	65.39	79.00	50.00	9.2
2016	16	59.47	105.00	39.31	20.1

—No data.

Finally, an aggregate item (item No. 3040504) was investigated. Figure 57 shows the price trends for this item during the analysis period. The item was not used before 2009. From 2009 through to the end of the analysis period, the prices rose steadily and overall had low deviation, as reflected in table 55.



Source: FHWA.
SY = square yard 4 inches thick.

Figure 57. Graph. Aggregate bid price trends—Missouri 2006–2016.

Table 55. Aggregate price data—Missouri.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	0	—	—	—	—
2009	62	6.86	26.30	2.15	4.0
2010	36	7.40	30.00	2.65	5.4
2011	43	7.97	35.00	3.65	5.3
2012	43	6.45	20.00	2.90	3.5
2013	77	8.01	65.07	2.85	8.1
2014	73	9.11	32.70	1.50	6.2
2015	48	13.01	200.00	3.80	28.3
2016	32	13.89	127.95	3.50	23.1

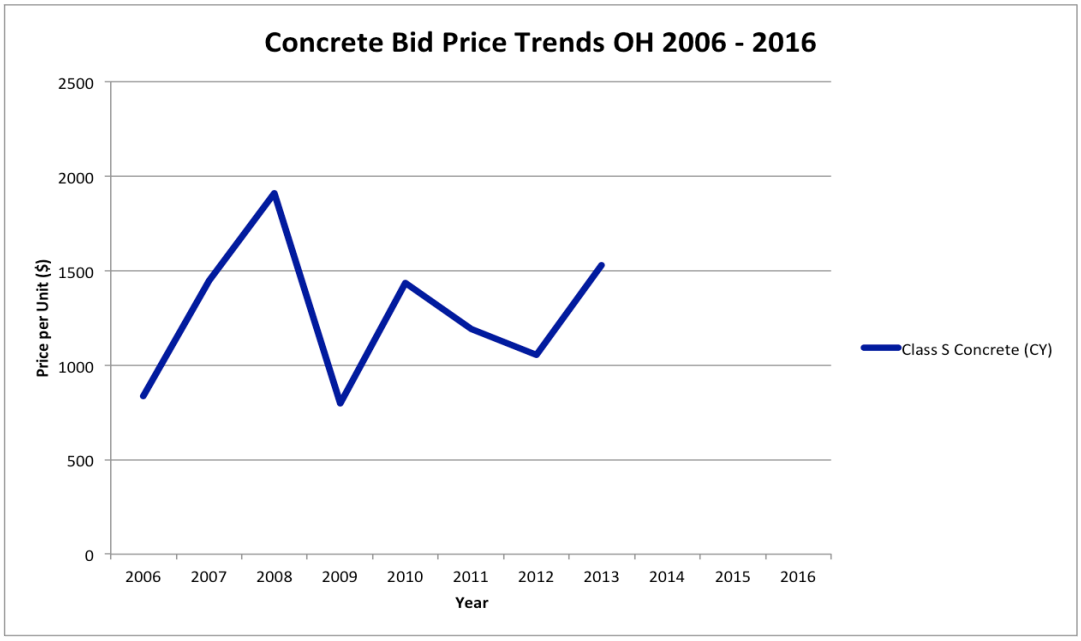
—No data.

Ohio

Most of Ohio's asphalt suppliers are located in the Cincinnati, OH, area, with some located in the State's northeast near Pennsylvania. The State's concrete suppliers are largely located near Columbus, OH, and the aggregate suppliers are relatively evenly distributed throughout the State. Competition in the State is relatively varied, and no initial concerns regarding pricing of materials due to consolidation activity were made known. Prices of aggregate, concrete, and asphalt products across the analysis period of 2006–2016 showed no abnormal price fluctuations.

Figure 58, figure 59, and figure 60 show the bid price trends for three materials: class S concrete superstructure (item No. 511E34400), asphalt concrete base PG 64-22 (item No. 301E46000), and aggregate base (item No. 304E20000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 56, table 57, and table 58, respectively).

Figure 58 and table 56 show the average prices for a concrete item (item No. 511E34400) in Ohio across the analysis period. There was a large range between minimum and maximum price, with a very high maximum price of $10,000.00 per cubic yard (CY) in 2008. The item did not appear in the data after 2013.



Source: FHWA.

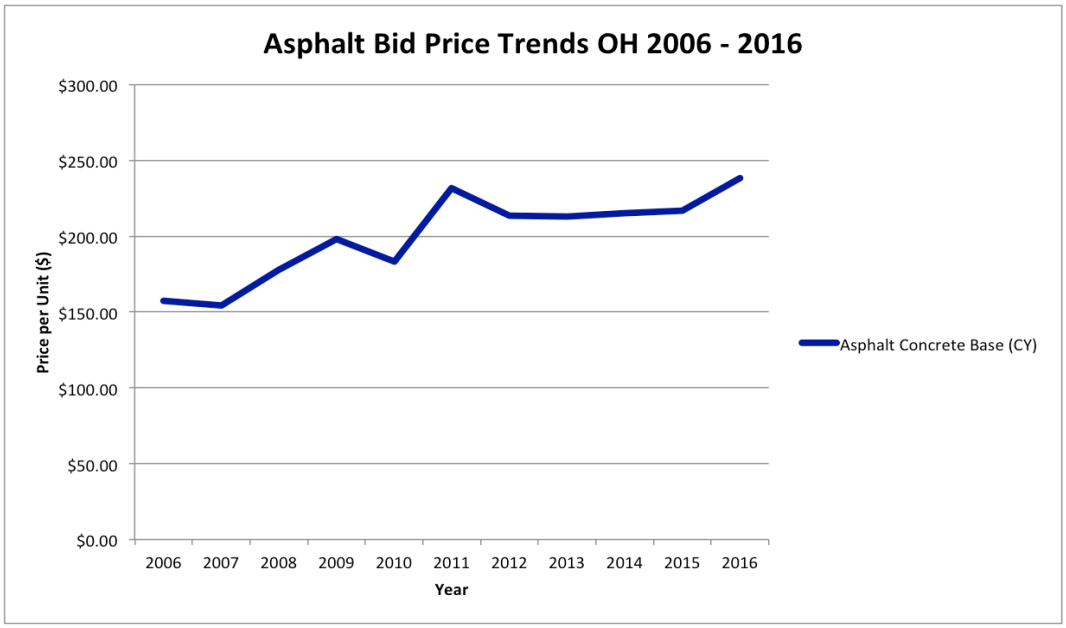
Figure 58. Graph. Concrete bid price trends—Ohio 2006–2016.

Table 56. Concrete price data—Ohio.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	11	835.81	2,425.00	284.00	596.6
2007	15	1,447.72	4,000.00	600.00	832.7
2008	13	1,908.62	10,000.00	640.00	2,464.8
2009	17	796.52	1,355.82	399.40	248.5
2010	25	1,433.06	5,050.00	495.00	913.4
2011	23	1,191.06	3,400.00	230.00	801.7
2012	14	1,052.75	2,500.00	400.00	727.9
2013	16	1,527.56	4,081.00	450.00	1,039.5
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Figure 59 shows the price trends for an asphalt item (item No. 301E46000) in Ohio during the analysis period. Prices rose across the period with moderate variation, as shown in figure 59 and table 57. No significant anomalies were identified.



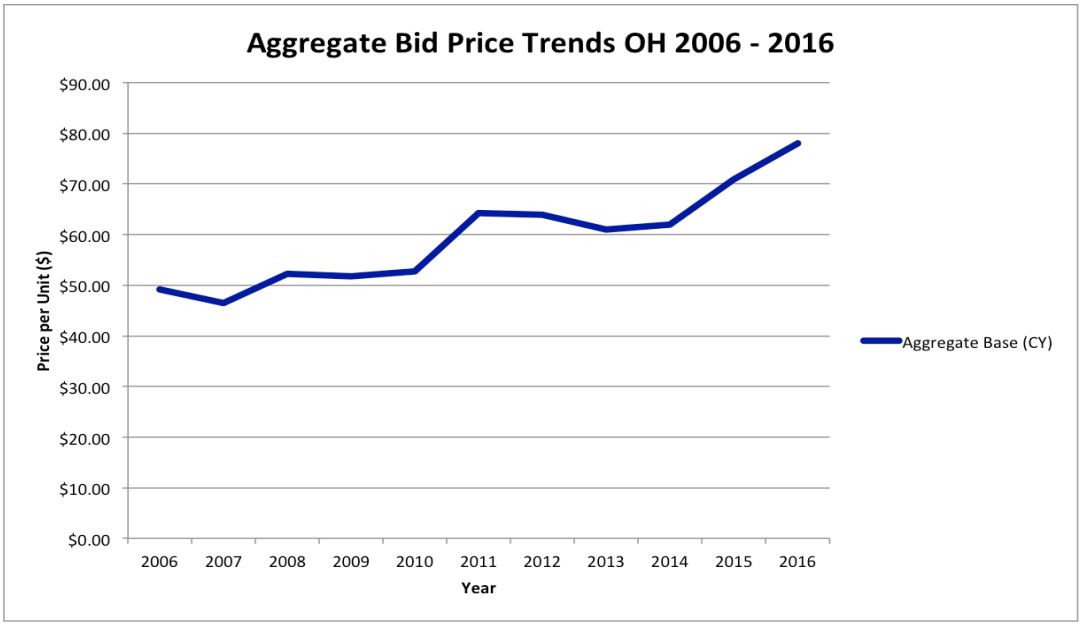
Source: FHWA.

Figure 59. Graph. Asphalt bid price trends—Ohio 2006–2016.

Table 57. Asphalt price data—Ohio.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	199	157.17	1,250.00	59.00	121.5
2007	190	154.35	750.00	50.00	93.8
2008	213	177.69	1,000.00	78.30	114.3
2009	195	198.05	650.00	65.00	110.5
2010	224	183.02	800.00	82.00	107.5
2011	309	231.47	1,473.00	40.00	150.1
2012	186	213.59	875.00	80.00	103.1
2013	243	212.98	1,100.00	65.00	130.2
2014	220	215.27	1,000.00	63.00	109.1
2015	260	216.70	717.00	75.00	101.2
2016	152	238.19	1,115.00	3.50	149.7

Finally, prices for an aggregate item (item No. 304E20000) were analyzed. Like asphalt, prices for this aggregate item increased over time, as shown in figure 60 and table 58. Variation in price was low throughout the analysis period, and no price anomalies were identified.



Source: FHWA.

Figure 60. Graph. Aggregate bid price trends—Ohio 2006–2016.

Table 58. Aggregate price data—Ohio.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	256	49.13	300.00	20.00	32.1
2007	251	46.47	200.00	8.00	20.9
2008	264	52.26	500.00	15.00	40.5
2009	253	51.71	200.00	15.00	27.1
2010	293	52.73	725.00	1.00	47.5
2011	373	64.16	300.00	5.00	37.8
2012	250	63.93	1,061.71	15.00	74.4
2013	321	61.00	425.00	8.00	37.3
2014	310	61.99	300.00	22.00	28.1
2015	347	70.89	350.00	20.00	38.6
2016	205	77.96	450.00	27.60	44.4

Wisconsin

Wisconsin DOT (WisDOT) was contacted via a combination of phone and email regarding perceptions and anecdotal evidence surrounding the pricing effects of M&A activity. Beyond this anecdotal evidence, the research team analyzed data for every quarter in 2006–2015 and for the first three quarters of 2016. Identifying contractor and pricing data for Wisconsin was relatively simple, as the project numbers were sequential, based on date. WisDOT was also very responsive to requests for additional data, including historical unit price data for the analysis period (2006−2016). The number of contractors included in the dataset ranged from 56 to 115 per year during this period.

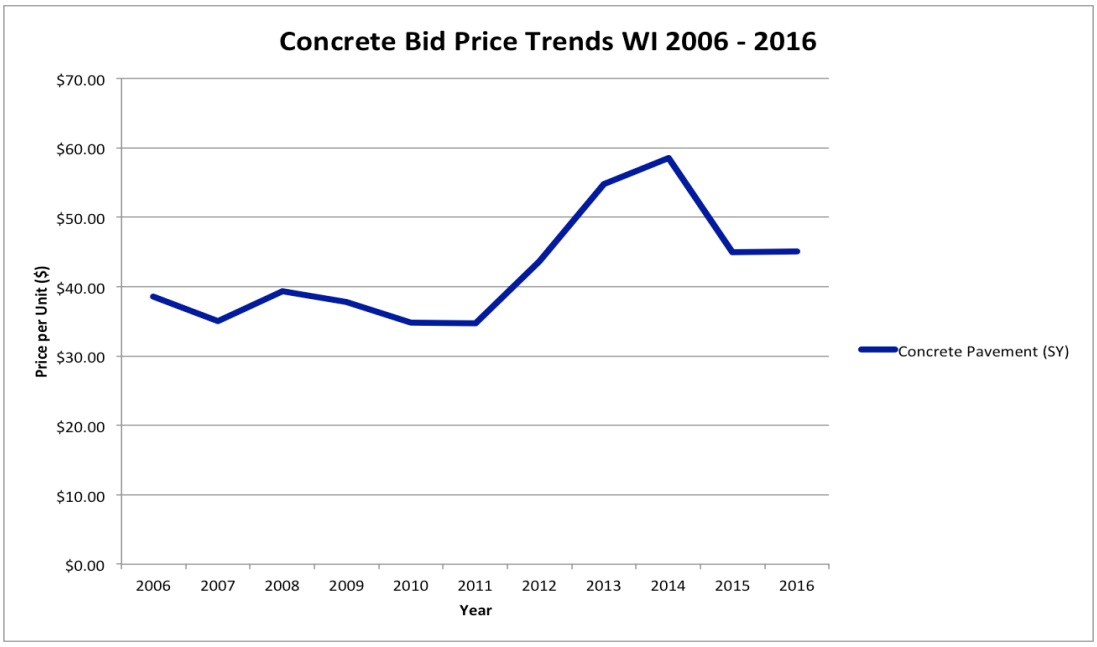
While the unit price data provided were exhaustive, identifying contractors who used items of interest during the analysis period to compare with unit price data for those years was

time-consuming and challenging. Trends of total project prices and bid item number prices in comparison to relevant unit prices yielded no significant price deviations attributable to identified merger or acquisition activity. Many average bid item number prices across all years were higher than unit prices. However, bid prices for singular firms across the analysis period were also compared with unit prices; similar results were found. An individual firm's bid item number prices, as well as average bid item number prices across all firms using that item, were found to be higher than the unit prices reported by WisDOT.

A majority of projects awarded in Wisconsin took place in the northwest and southwest regions of the State. Additionally, these regions saw the greatest disparity in the number of firms awarded bids compared with the northeast and north central regions. WisDOT reported no concerns when asked about M&A activity, as well as how these activities affected bid prices, bid quantity, and project costs. Similarly, Wisconsin did not report altering contract language or statutes to address or minimize any merger or acquisition activity effects on pricing.

Figure 61, figure 62, and figure 63 show the bid price trends for three materials: concrete pavement 9 inches (item No. 415.009), asphaltic material PG 64-28 (item No. 455.012), and base aggregate dense 1¼ inches (item No. 305.012), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 59, table 60, and table 61, respectively).

Figure 61 and table 59 show the price trends for a concrete item (item No. 415.009) in Wisconsin during the analysis period. Prices remained consistent with little variation, despite two slightly higher average and maximum prices in 2013 and 2014.



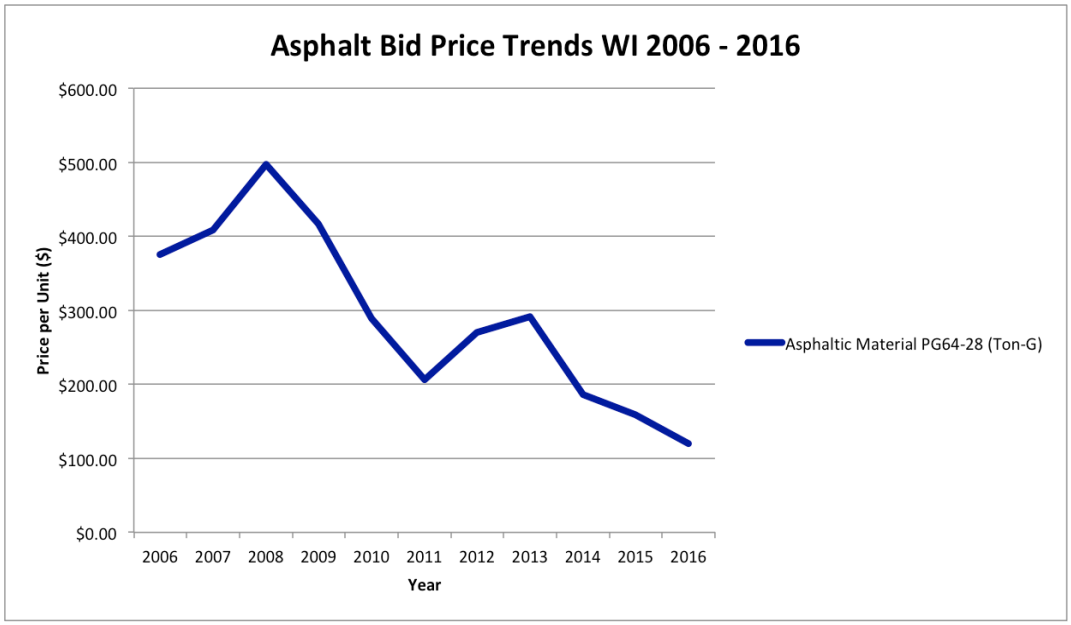
Source: FHWA.

Figure 61. Graph. Concrete bid price trends—Wisconsin 2006–2016.

Table 59. Concrete price data—Wisconsin.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	35	38.61	110.00	17.20	21.0
2007	26	34.98	72.00	17.95	14.8
2008	29	39.38	81.50	24.54	13.2
2009	37	37.76	75.00	22.85	11.0
2010	41	34.83	90.00	18.00	13.2
2011	24	34.71	59.30	21.35	10.0
2012	14	43.68	95.00	26.69	16.4
2013	13	54.83	226.92	29.51	50.1
2014	31	58.50	400.00	30.00	64.4
2015	19	45.00	81.00	33.10	10.8
2016	15	45.10	72.65	29.01	11.8

Figure 62 shows the price trend for an asphalt item (item No. 455.012) in Wisconsin. Observed prices of this asphalt item decreased over time. Several low minimum prices ($1.20 and $1.00) were observed, which impacted the average prices and the deviation, as shown in table 60.



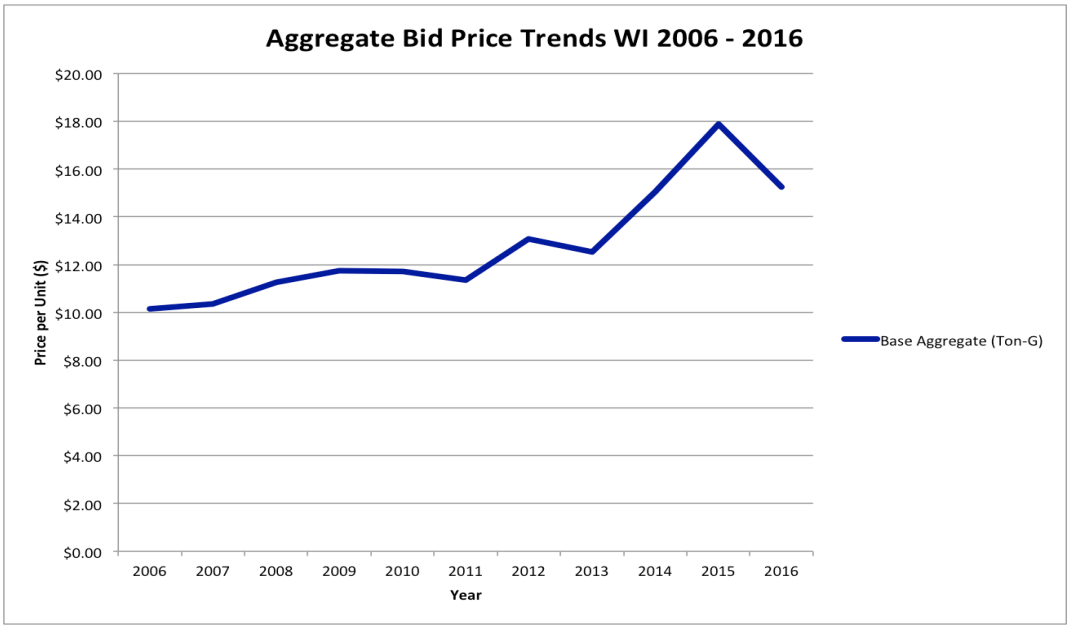
Source: FHWA.

Figure 62. Graph. Asphalt bid price trends—Wisconsin 2006–2016.

Table 60. Asphalt price data—Wisconsin.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	54	375.22	615.00	100.00	145.4
2007	51	408.44	1,000.00	100.00	187.3
2008	52	496.98	1,033.00	120.00	272.6
2009	57	416.69	4,150.00	1.20	545.9
2010	81	289.59	890.00	15.00	231.2
2011	47	206.61	750.00	1.00	163.1
2012	29	270.45	1,800.00	15.00	338.8
2013	35	290.85	1,225.00	15.00	293.7
2014	27	185.83	770.00	10.00	223.9
2015	56	158.70	685.00	1.00	224.4
2016	7	119.57	475.00	1.00	154.9

Lastly, figure 63 and table 61 show the price trend for an aggregate item (item No. 305.012) in Wisconsin. Prices for this aggregate item remained consistent throughout the analysis period, except for a high average and maximum price in 2015. In 2015, the average price was $17.88 per ton-gallon and the maximum price was $423.70 per ton-gallon.



Source: FHWA.

Figure 63. Graph. Aggregate bid price trends—Wisconsin 2006–2016.

Table 61. Aggregate price data—Wisconsin.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	210	10.15	59.00	4.78	4.5
2007	218	10.37	85.00	4.28	6.9
2008	223	11.27	38.00	6.11	4.1
2009	262	11.76	51.10	4.67	5.0
2010	293	11.73	50.00	3.30	5.6
2011	211	11.35	49.00	5.73	4.7
2012	129	13.08	59.36	5.20	7.7
2013	133	12.52	45.00	0.01	6.3
2014	186	15.04	75.00	0.01	8.5
2015	209	17.88	423.70	0.01	30.9
2016	165	15.24	122.55	0.01	10.0

AASHTO REGION 4

This section presents States located in AASHTO region 4: Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oklahoma, Oregon, and Utah.

Arizona

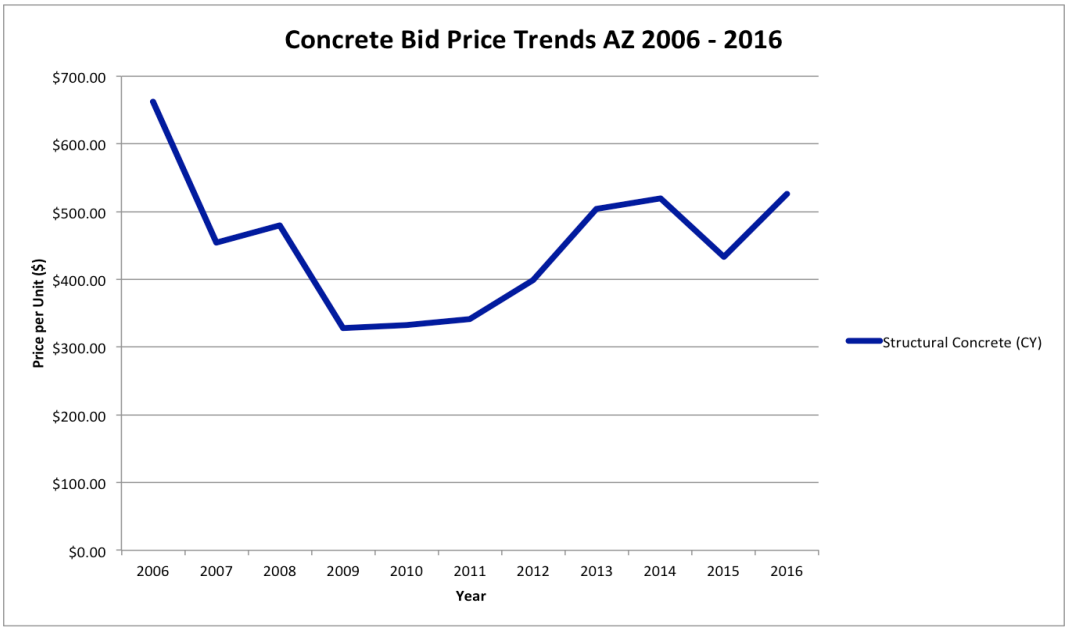
Research on data and information from Arizona DOT (ADOT) revealed that they were not informed of much M&A activity during the analysis period of 2006–2016. Neither contractors nor suppliers brought any issues or concerns regarding consolidation activities to the attention of ADOT for corrective action or legislation. While personnel were observed to move between companies, and some contractors suffered due to the economic recession, the construction industry and particularly the concrete pipe industry were fairly stable.

Within the materials of interest, Arizona saw the most acquisition activity for aggregates, with companies purchasing sources or exclusive rights to control supply in certain geographic areas. However, none of this activity caused ADOT to investigate it further. Limited aggregate sources in the north central district of the State near Flagstaff, AZ, as well as disruptions in aggregate availability resulted due to issues pertaining to the lease agreements with the Bureau of Land Management regarding selling aggregate. Despite these supply disruptions, no direct effects on pricing were observed.

Data revealed a total of 1,090 projects during the analysis period of 2006–2016. Unit price data for bid item numbers of interest were also made available on ADOT's website. These prices were used to analyze how trends in bid item number prices fluctuated over the years compared with State-reported unit prices. As was common in most States, some drops in prices and number of projects were seen during the 18-mo economic recession from 2008 moving into 2010.

Figure 64, figure 65, and figure 66 show the bid price trends for three materials: structural concrete (class S) (item No. 6010002), asphaltic concrete (structural) (item No. 4090003), and aggregate base (item No. 3030022), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 62, table 63, and table 64, respectively).

Figure 64 and table 62 show the price trends for a specific concrete item in Arizona (item No. 6010002). While moderate price fluctuations were observed with a general drop in prices between 2008 and 2011, no price anomalies were identified.



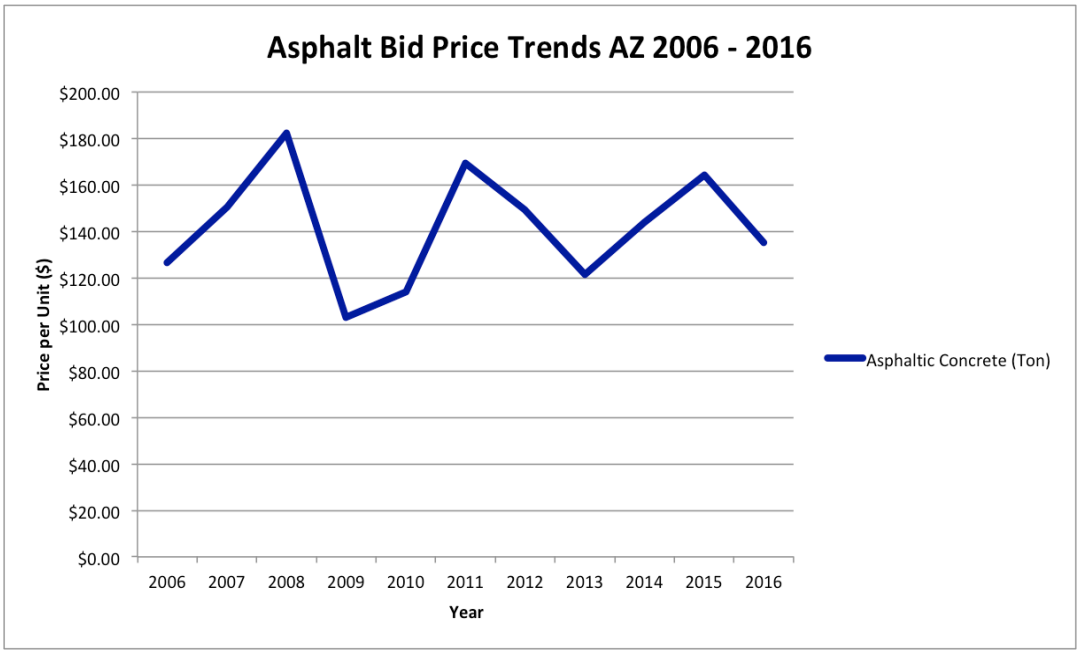
Source: FHWA.

Figure 64. Graph. Concrete bid price trends—Arizona 2006–2016.

Table 62. Concrete price data—Arizona.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	27	662.89	1,300.00	200.00	232.1
2007	103	453.96	1,500.00	190.00	211.0
2008	103	480.26	1,300.00	230.00	165.1
2009	60	327.69	650.00	165.00	112.7
2010	166	332.19	900.00	142.00	111.2
2011	35	341.69	610.00	155.00	134.2
2012	28	398.81	2,500.00	155.00	430.2
2013	48	503.89	2,000.00	210.00	268.6
2014	36	519.81	1,200.00	203.00	204.6
2015	46	432.89	1,800.00	200.00	265.1
2016	15	525.67	700.00	370.00	109.5

Next, the price trends for a specific asphalt item (item No. 4090003) were analyzed. Figure 65 shows the price variations for this asphalt item during the analysis period. Three spikes are apparent in the graph in 2008, 2011, and 2015. Table 63 shows higher average bid prices for these 3 yr, as well as higher maximum bid prices and higher standard deviation values.



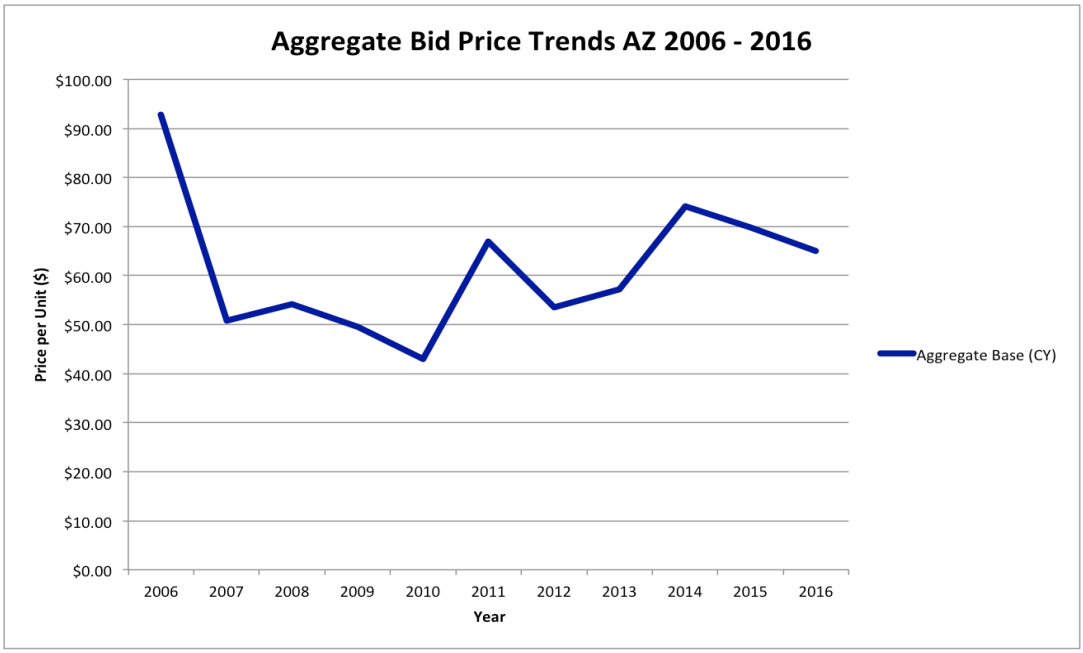
Source: FHWA.

Figure 65. Graph. Asphalt bid price trends—Arizona 2006–2016.

Table 63. Asphalt price data—Arizona.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	16	126.50	500.00	35.00	107.2
2007	35	150.39	619.00	35.00	128.1
2008	20	182.46	1,200.00	54.30	238.9
2009	32	103.00	200.00	47.92	36.4
2010	51	114.19	320.00	60.00	64.7
2011	27	169.39	600.00	59.00	139.1
2012	22	149.23	460.00	60.00	89.9
2013	21	121.40	373.00	61.00	66.0
2014	40	143.84	327.00	75.00	66.2
2015	51	164.39	730.00	55.00	149.3
2016	29	135.13	325.00	55.00	67.9

Lastly, a specific aggregate item (item No. 3030022) was investigated. Figure 66 and table 64 show the price variation for this item throughout the analysis period. Prices varied, but deviation was moderate, and no anomalies were identified in the data.



Source: FHWA.

Figure 66. Graph. Aggregate bid price trends—Arizona 2006–2016.

Table 64. Aggregate price data—Arizona.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	24	92.84	313.00	31.00	87.6
2007	56	50.88	159.00	20.90	30.1
2008	36	54.23	200.00	14.00	39.4
2009	49	49.49	381.00	14.27	66.7
2010	70	42.98	140.00	9.00	28.9
2011	44	66.90	480.00	18.60	75.2
2012	33	53.58	215.00	18.60	36.7
2013	24	57.13	228.00	20.25	51.9
2014	58	74.20	250.00	14.00	58.3
2015	64	69.79	421.00	23.00	59.4
2016	41	64.99	275.00	25.00	49.5

California

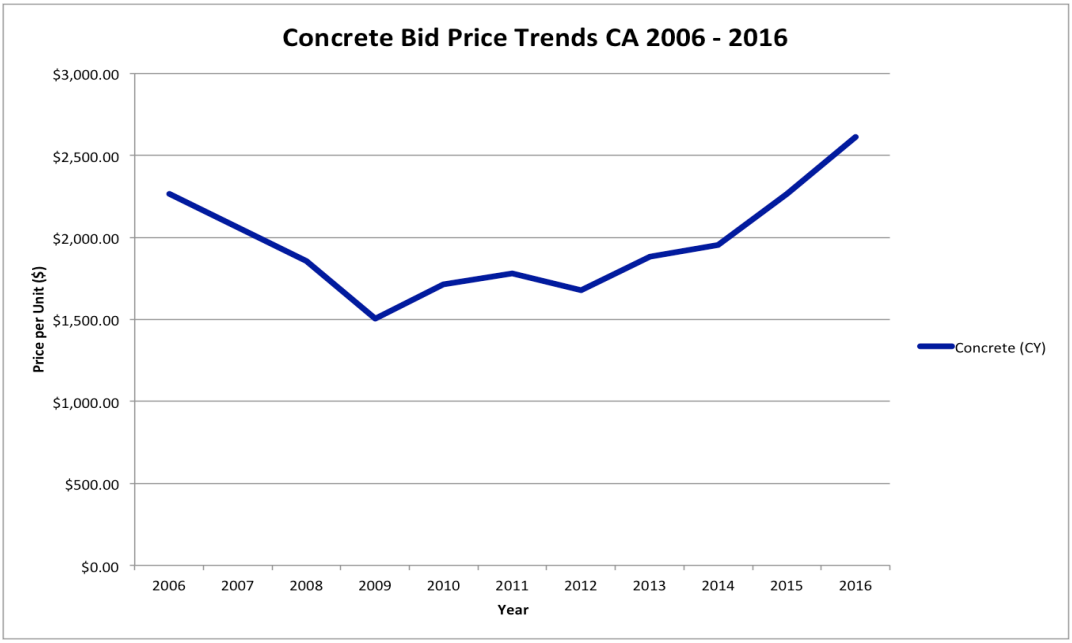
In 2014, a major multistate firm purchased a Texas-based supplier of aggregates, cement, and concrete products, which affected the market in both Texas and California. In 2015, another major firm purchased a ready-mix concrete supplier in the San Francisco, CA, area. Another multistate firm controlling large market shares in California as well as Florida purchased a total of four aggregates companies, including some in the San Francisco and San Diego, CA, areas in 2014.

A total of 5,542 projects took place in California during the analysis period of 2006–2016. Due to the significant activity in the San Francisco, CA, area (district 4 in the State) in these years, prices of ready-mix concrete and aggregates were investigated to assess any pricing effects due

to the acquisition activity. Overall, average prices of aggregates were lower within San Francisco County than in other counties in the State, likely due to availability. After the acquisitions in 2014, only one project used aggregate. This project did list a higher price for the aggregate materials. However, the higher price was within a $50.00 range of the State's reported adjusted unit price for that year. This finding suggests that fluctuations in pricing cannot be attributed to the acquisition activities that occurred in 2014 and 2015. Future analyses, including additional years beyond these sale dates, could be conducted to better assess the impacts of this activity on pricing.

Figure 67, figure 68, and figure 69 show the bid price trends for three materials: minor concrete (minor structure) (item No. 510502), HMA (type A) (item No. 390132), and class 2 aggregate base (item No. 260201), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 65, table 66, and table 67, respectively).

Figure 67 and table 65 show the price trends for a specific concrete item in California (item No. 510502). Overall, prices for this concrete item were relatively high in California, with high maximum bid prices observed, particularly in 2006, 2008, 2013, 2014, and 2015. Further analysis of the bids containing these higher prices did not reveal anything abnormal.



Source: FHWA.

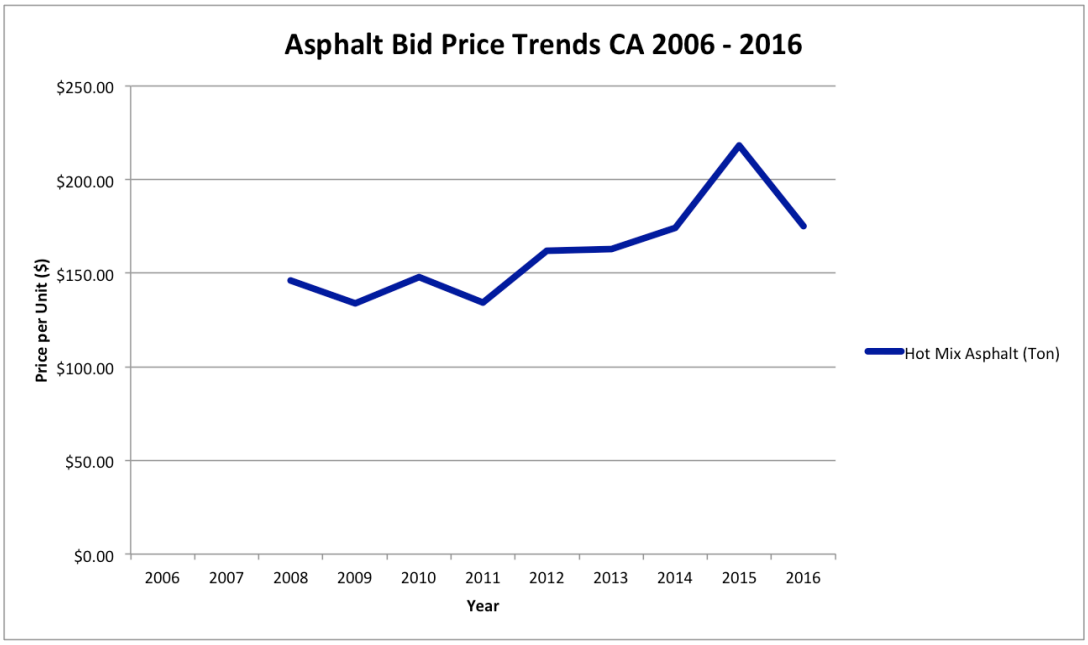
Figure 67. Graph. Concrete bid price trends—California 2006–2016.

Table 65. Concrete price data—California.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	160	2,265.89	13,979.9	191.14	1,833.9
2007	0	—	—	—	—
2008	173	1,855.31	10,000.00	300.00	1,476.1
2009	158	1,504.87	6,280.00	196.66	1,017.8
2010	163	1,713.91	8,000.00	109.84	1,177.8
2011	143	1,780.01	6,200.00	107.28	1,084.9
2012	126	1,679.57	5,900.00	325.00	986.9
2013	112	1,882.68	10,000.00	554.25	1,482.5
2014	135	1,952.24	10,000.00	185.00	1,202.4
2015	135	2,264.21	16,000.00	250.00	1,656.9
2016	81	2,613.36	8,800.00	343.00	1,655.3

—No data.

Next, prices for an asphalt item (item No. 390132) were analyzed. Figure 68 and table 66 show the price variation for this item during the analysis period. Prices rose steadily after 2011 with one notable price spike in 2015. The average price was higher in 2015, and the spread between maximum and minimum price was large, resulting in a higher standard deviation.



Source: FHWA.

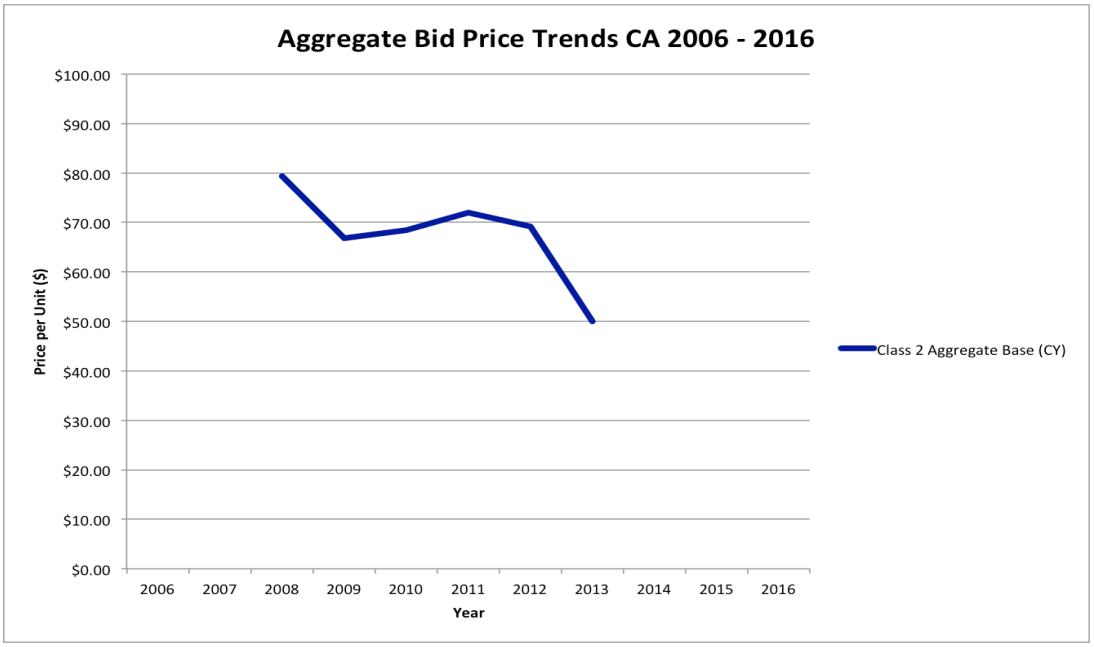
Figure 68. Graph. Asphalt bid price trends—California 2006–2016.

Table 66. Asphalt price data—California.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	137	145.98	600.00	69.00	87.2
2009	198	133.91	650.00	0.01	99.8
2010	198	148.06	1,000.00	48.00	137.9
2011	197	134.53	700.00	59.00	90.2
2012	130	161.94	800.00	50.00	122.2
2013	186	163.02	800.00	66.00	115.3
2014	184	174.23	4,000.00	61.00	307.3
2015	277	218.32	3,420.00	49.00	372.5
2016	167	175.01	1,258.00	55.00	170.8

—No data.

Lastly, prices for a specific aggregate item (item No. 260201) were analyzed. This item did not appear in the data for every year of the analysis period: it was only available for analysis in 2006 and 2008–2013. For the years this item did appear in the data, prices generally decreased over time with moderate variation, as seen in figure 69 and table 67.



Source: FHWA.

Figure 69. Graph. Aggregate bid price trends—California 2006–2016.

Table 67. Aggregate price data—California.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	168	89.76	600.18	25.99	77.1
2007	0	—	—	—	—
2008	154	79.43	500.00	22.00	65.5
2009	149	66.87	536.00	16.06	60.9
2010	135	68.43	476.00	10.70	67.7
2011	118	71.97	480.00	15	60.1
2012	41	69.18	300.00	12	64.7
2013	1	50.00	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Colorado

Between 83 and 130 firms were awarded bids in Colorado in 2006–2016. Throughout this period, the State saw approximately a third of these projects with total project costs that were higher than average. The effects of the economic recession were felt in Colorado, which had a drop in employment rates and a drop in project cost during 2009–2012. A majority of projects occurred in Colorado's region 1, which includes the Denver, CO, metropolitan area.

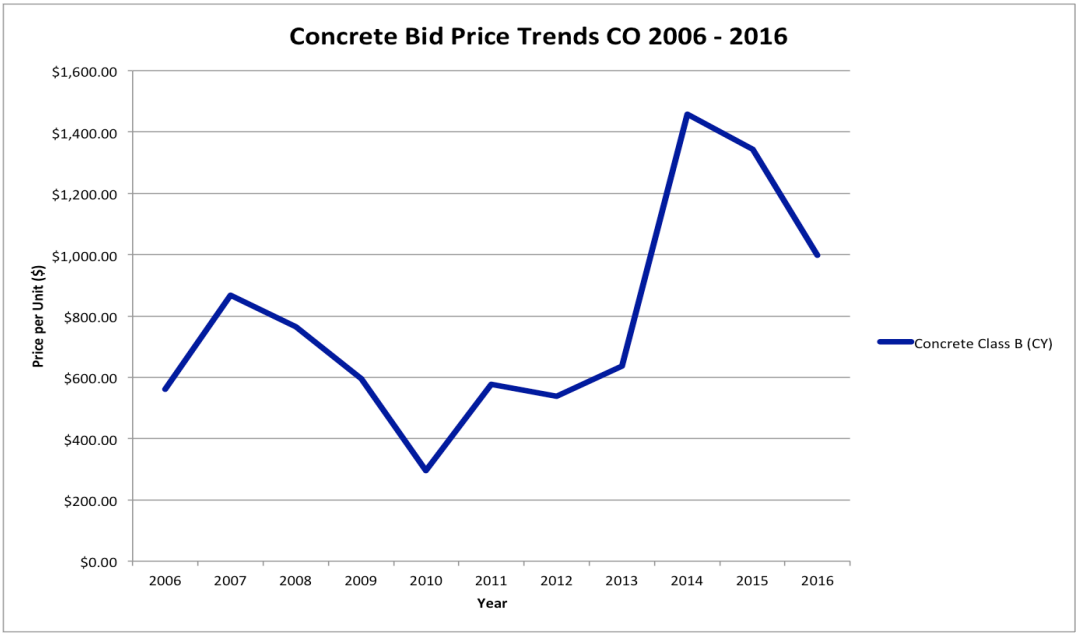
Unit price data were also available from Colorado DOT (CDOT) and were analyzed against bid price data supplied by FHWA. Some projects in the construction cost data book from CDOT also included data regarding the number of total bidders and the comparison between these prices and the engineering estimates. Engineering estimates were largely lacking from the initial data for this project provided through Oman Systems, Inc., and the inclusion of limited engineering estimate data for Colorado allowed for some additional analyses. For example, in 2006, 12 projects included the low bid and other bidders with costs of 10 percent greater than the engineering estimate. Also, for three projects the low bid was greater than 15 percent over the engineering estimate.

Comparison of bid prices of items against unit price as reported for the corresponding year by CDOT did not yield any significant discrepancies. Items such as aggregate, asphalt, and concrete saw prices fluctuate generally by $50 in either direction from the unit price reported by CDOT. Data were also available showing item unit prices, engineering estimates, average bid, and awarded bid prices by item and project for each year. These data were valuable: e.g., for one project completed in 2011, a specific item such as HMA used in the project could be identified in the data. From here, the weighted average for the year of the engineering estimate ($58.83 per ton), average bid price ($63.22 per ton), and the awarded bid price ($56.90 per ton) could be observed. Most price fluctuations were not unusual and could not be linked to any significant consolidation activity within the State. Instead, they were likely due to the location of materials and the transportation costs.

Figure 70, figure 71, and figure 72 show the bid price trends for three materials: concrete class B (item No. 601-01000), hot bituminous pavement (asphalt) (item No. 403-00720), and aggregate

base course (class 6) (item No. 304-06000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 68, table 69, and table 70, respectively).

Figure 70 and table 68 show the price trends for a specific concrete item in Colorado (item No. 601-01000). Prices for this item varied throughout the analysis period with a notable dip in 2010 and higher average prices in 2014 and 2015. The maximum observed bid price in 2014 and 2015 was also higher than that for other years.



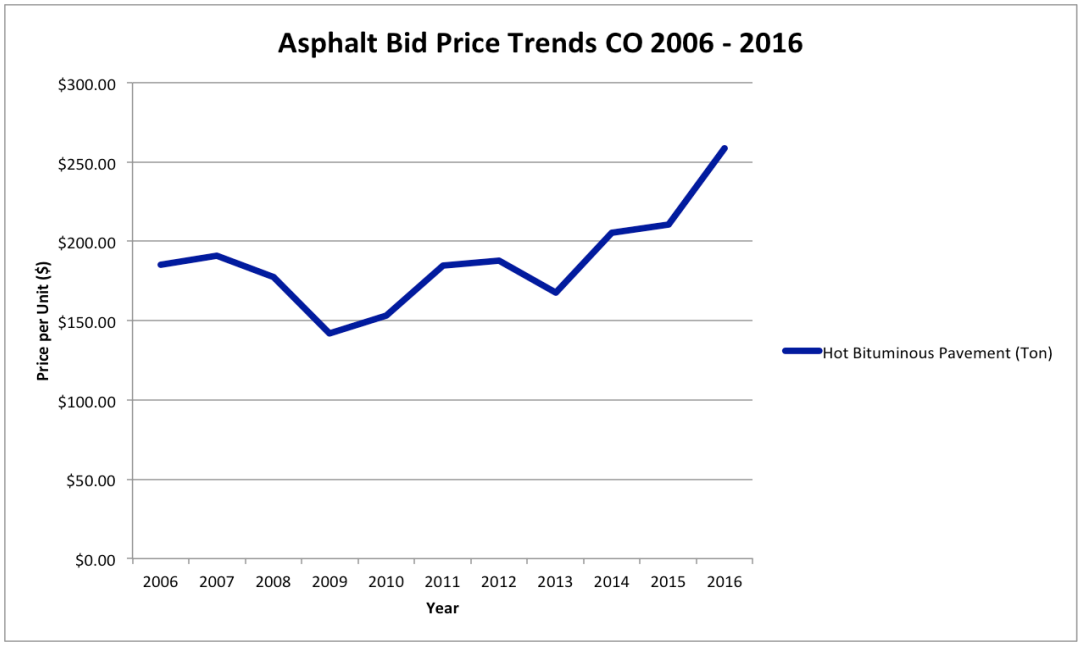
Source: FHWA.

Figure 70. Graph. Concrete bid price trends—Colorado 2006–2016.

Table 68. Concrete price data—Colorado.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	12	560.91	1,764.00	150.00	424.1
2007	14	868.74	1,910.00	165.00	512.7
2008	18	764.70	1,400.00	177.81	384.0
2009	16	595.49	1,840.00	110.00	399.4
2010	13	294.52	840.00	75.00	202.9
2011	16	576.27	1,500.00	200.00	326.9
2012	11	537.68	2,020.13	100.00	528.8
2013	9	636.70	1,146.48	321.88	280.1
2014	15	1,458.61	8,343.45	125.00	1,916.6
2015	10	1,343.97	4,350.00	300.00	1,232.0
2016	6	999.11	1,975.00	360.00	543.0

Next, the price trends for an asphalt item (item No. 403-00720) were analyzed. Figure 71 and table 69 show a general increase in price over time with two lower price averages in 2009 and 2013. Several minimum bid prices were significantly lower than the other bids, resulting in larger deviations.



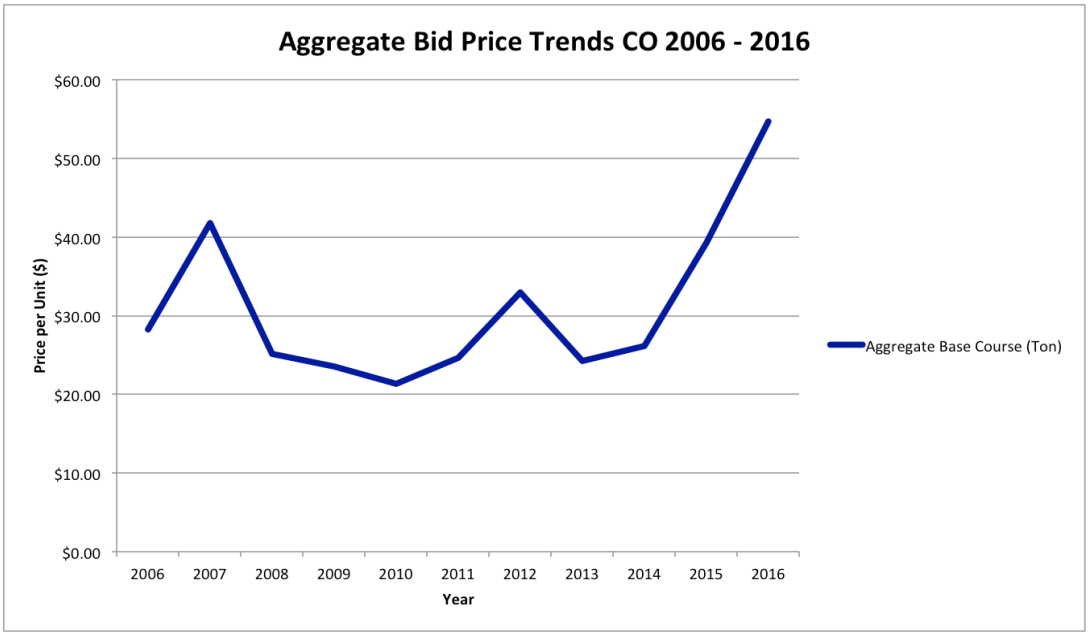
Source: FHWA.

Figure 71. Graph. Asphalt bid price trends—Colorado 2006–2016.

Table 69. Asphalt price data—Colorado.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	93	185.42	695.00	60.35	121.9
2007	71	191.04	1,521.00	10.00	217.1
2008	79	177.64	770.00	69.70	112.2
2009	71	141.94	412.00	20.00	67.2
2010	76	153.29	800.00	10.00	112.6
2011	76	184.90	1,500.00	84.00	171.1
2012	51	187.67	710.00	84.47	115.5
2013	66	167.67	536.75	50.00	84.7
2014	70	205.21	625.00	105.40	95.7
2015	61	210.60	550.00	92.00	80.6
2016	29	258.83	750.00	117.00	137.2

Finally, prices for an aggregate item (item No. 304-06000) were analyzed. Figure 72 and table 70 show the price changes for this item throughout the analysis period. Higher prices were observed in 2007 and 2012 with increasing prices after 2014. In 2007, the average price and the maximum price were both higher than for surrounding years. In 2012, the average price and maximum price were also higher than for surrounding years, but the minimum observed bid price remained consistent. Prices then rose in 2015 and 2016 with higher average prices and higher maximum bid prices. The standard deviation was highest in 2007, 2012, and 2016. The number of observations was lowest in 2016, likely because the data did not contain all of 2016.



Source: FHWA.

Figure 72. Graph. Aggregate bid price trends—Colorado 2006–2016.

Table 70. Aggregate price data—Colorado.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	35	28.29	110.00	12.00	18.8
2007	31	41.77	333.33	8.71	56.2
2008	35	25.16	57.31	13.00	9.3
2009	29	23.55	70.00	10.00	13.4
2010	35	21.30	50.00	0.12	10.2
2011	35	24.62	80.00	11.83	12.5
2012	24	32.97	180.00	12.10	39.4
2013	33	24.24	65.00	5.00	11.6
2014	34	26.17	54.00	10.00	10.9
2015	37	39.29	166.40	15.61	27.0
2016	17	54.73	137.00	14.75	38.2

Idaho

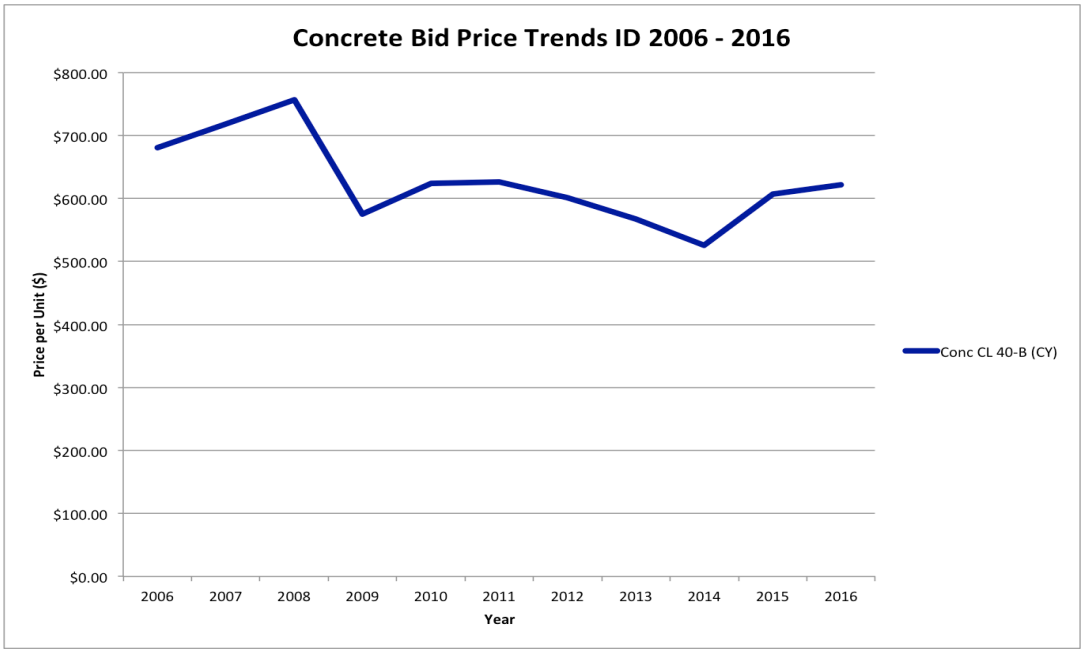
During the analysis period of 2006–2016, a total of 112 unique firms were awarded a total of 597 projects utilizing the material items of interest. The Oman Systems, Inc., data were used to analyze any consolidation activity of interest, bid item number pricing trends, and material supplier locations in the State. Aggregate, concrete, and asphalt suppliers in the State are generally located in the south near Idaho Falls, Twin Falls, and Boise, ID. Also, availability of these materials in the north near Spokane, WA, is limited.

Average bid item number prices of asphalt remained relatively consistent from year to year, except for a slight price drop in 2011–2013 and again in 2016. Concrete prices also saw a slight drop in 2016; these drops are likely due to the exclusion of the fourth-quarter data in 2016, as it was not yet available. Besides 2016, average bid prices for structural concrete were also

relatively stable, showing small fluctuations in most years. Bid price data were then compared against unit price data available from Idaho Transportation Department. Unit price data included item numbers, quantities, unit prices, price averages from the three lowest bids, and associated project numbers. Prices of materials were consistent with unit prices reported by ITD. The higher prices of structural concrete in 2007 and 2008 were also investigated and found to be similar to unit prices for concrete in that year.

Figure 73, figure 74, and figure 75 show the bid price trends for three materials: concrete class 40-B schedule No. 1 (item No. 502-140A), PG 64-34 asphalt cement for Superpave HMA (item No. S405-35A), and 19-mm aggregate TY B for base (item No. 303-022A), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 71, table 72, and table 73, respectively).

Figure 73 and table 71 show the price information for a concrete item (item No. 502-140A) in Idaho. Average price did not vary greatly, but there were large ranges between maximum and minimum bid prices, resulting in larger standard deviations.



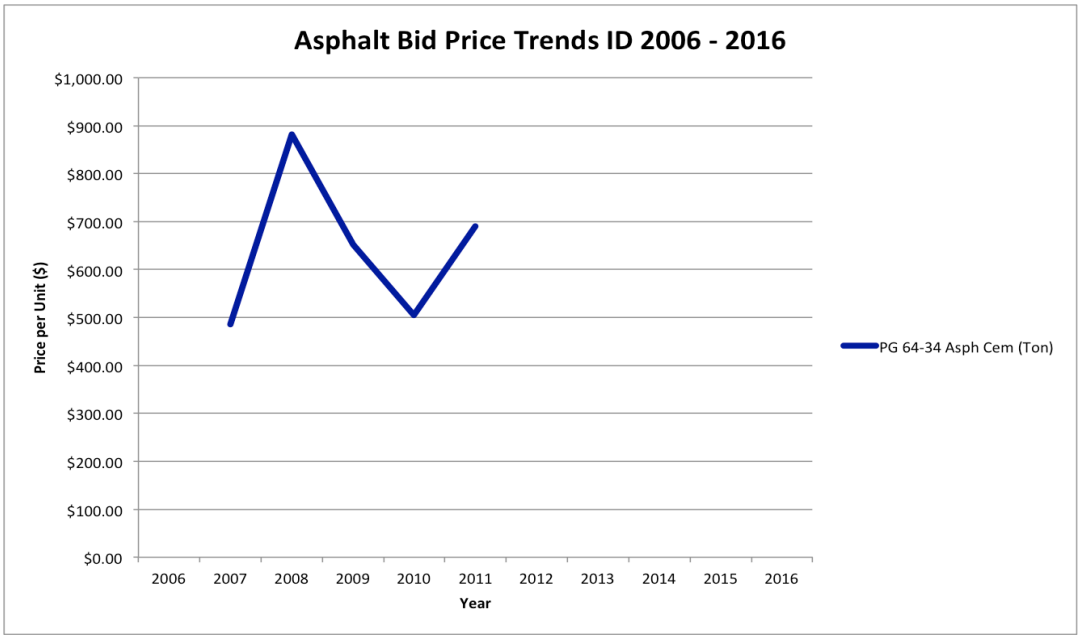
Source: FHWA.

Figure 73. Graph. Concrete bid price trends—Idaho 2006–2016.

Table 71. Concrete price data—Idaho.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	10	681.21	1,050.00	495.00	185.9
2007	7	717.86	1,030.00	401.39	228.6
2008	14	756.50	1,460.00	385.00	244.2
2009	19	575.84	1,000.00	268.00	183.5
2010	14	624.39	1,816.00	279.48	364.4
2011	6	626.17	1,611.00	1.00	494.9
2012	12	600.95	950.00	161.00	207.6
2013	13	567.93	766.35	375.00	124.3
2014	9	525.83	800.00	320.00	124.5
2015	9	607.18	1,050.00	400.00	196.9
2016	5	622.00	850.00	425.00	135.9

Next, the prices of an asphalt item (item No. S405-35) were investigated. This item did not appear in the data for every year of the analysis period; it was only available for 2007–2011, as shown in figure 74. Even in the years it was available, the number of times the item appeared each year was relatively low. Average prices varied, and two minimum prices of $0.01 (penny bids) were observed in 2009 and 2010, which impacted both the average prices and standard deviations in those years, as seen in table 72.



Source: FHWA.

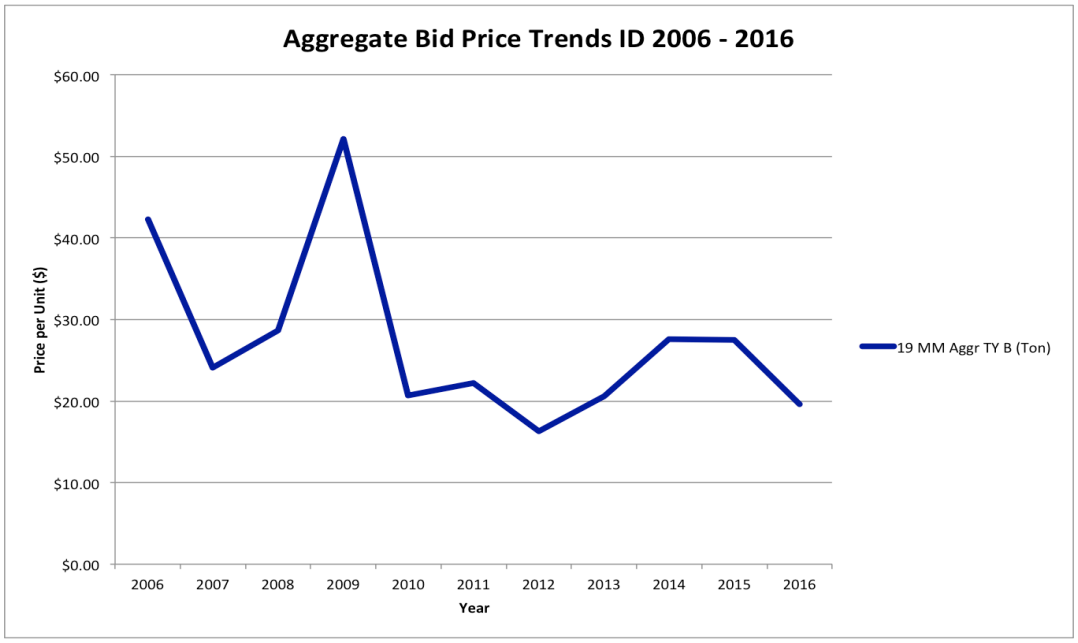
Figure 74. Graph. Asphalt bid price trends—Idaho 2006–2016.

Table 72. Asphalt price data—Idaho.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	1	485.00	—	—	—
2008	4	882.25	1,312.00	692.00	250.3
2009	11	652.56	1,060.00	0.01	416.8
2010	7	504.29	740.00	0.01	321.1
2011	1	690.00	—	—	—
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, an aggregate item (item No. 303-022A) was analyzed. Prices for this item remained consistent with one observable high average price in 2009, as seen in the spike in figure 75. Table 73 shows the higher average price for this year ($52.09 per ton) and a higher maximum bid price ($943.22 per ton) compared with other years.



Source: FHWA.

Figure 75. Graph. Aggregate bid price trends—Idaho 2006–2016.

Table 73. Aggregate price data—Idaho.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	22	42.31	200.00	10.00	43.0
2007	28	24.04	63.00	10.89	14.5
2008	42	28.62	165.00	10.00	27.7
2009	40	52.09	943.22	9.00	148.5
2010	59	20.67	65.00	7.59	11.6
2011	19	22.23	40.00	7.50	9.9
2012	26	16.25	36.00	7.55	6.8
2013	28	20.61	50.00	8.25	9.9
2014	29	27.55	148.50	8.00	24.8
2015	33	27.46	100.00	8.33	17.9
2016	26	19.58	55.00	8.33	9.8

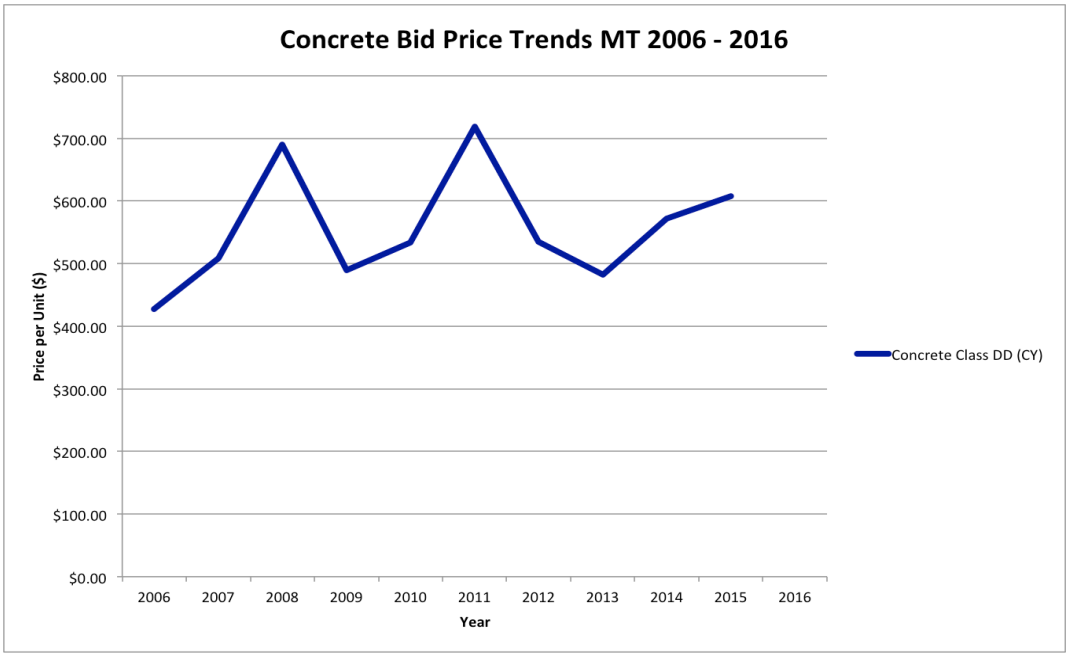
Montana

In Montana, a majority of the material suppliers of concrete, asphalt, and aggregate are distributed throughout the State and concentrated near major interstates, including I–94, I–15, and I–90. The data provided to the research team were analyzed to identify trends in pricing for key materials during the 10-yr period of 2006–2016. Prices of asphalt cement PG 64-28 saw a steady increase from 2006 until 2011; from 2010 to 2013 prices dropped slightly before beginning to rise again.

Structural concrete prices remained stable throughout the analysis period; prices of concrete materials per CY saw several small price increases in 2008 and 2011. Lastly, crushed aggregate average bid prices remained consistent throughout the entire period except for one slight price increase in 2016. Montana DOT's construction cost studies were investigated to identify any concerns or actions taken related to pricing effects of consolidation activities. While some concerns were voiced regarding cost estimation techniques, risk and contingency planning, and letting and award schedules, no pricing effects of M&A activity were outlined.

Figure 76, figure 77, and figure 78 show the bid price trends for three materials: concrete class DD (item No. 551175000), asphalt cement PG 64-28 (item No. 402088000), and crushed aggregate course (item No. 301270000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 74, table 75, and table 76, respectively).

Figure 76 shows the price variation for a concrete item (item No. 551175000) in Montana during the analysis period. Two spikes are seen on the graph in 2008 and 2011. Table 74 shows higher average prices in both of these years, as well as higher maximum bid prices. Further analysis of these higher prices did not reveal any abnormalities.



Source: FHWA.

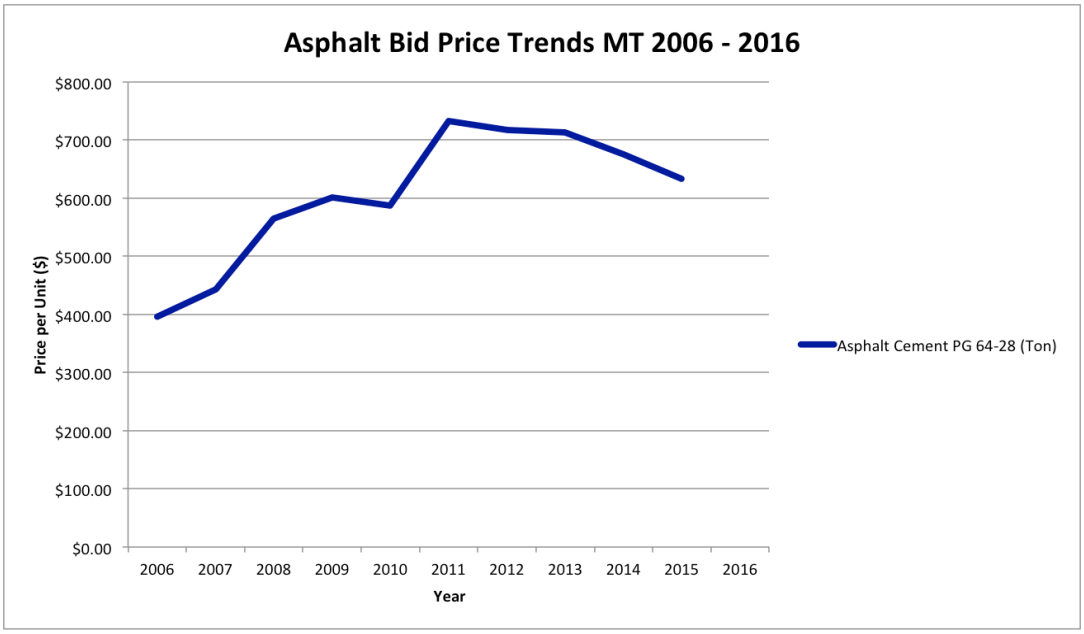
Figure 76. Graph. Concrete bid price trends—Montana 2006–2016.

Table 74. Concrete price data—Montana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	17	427.03	600.18	344.05	81.5
2007	8	508.48	688.10	363.16	113.8
2008	13	690.12	1,452.65	344.05	283.0
2009	21	489.82	840.00	185.34	149.8
2010	8	533.75	1,070.38	344.05	213.4
2011	5	718.25	1,299.74	382.27	334.6
2012	2	535.19	649.87	420.50	114.7
2013	2	482.66	605.92	359.41	123.2
2014	1	571.51	—	—	—
2015	1	607.94	—	—	—
2016	0	—	—	—	—

—No data.

Next, an asphalt item (item No. 402088000) was analyzed. Similar to the concrete item, this item did not appear in the data in 2016. Prices rose in 2006–2011 before decreasing slightly through 2015, as reflected in figure 77 and table 75.



Source: FHWA.

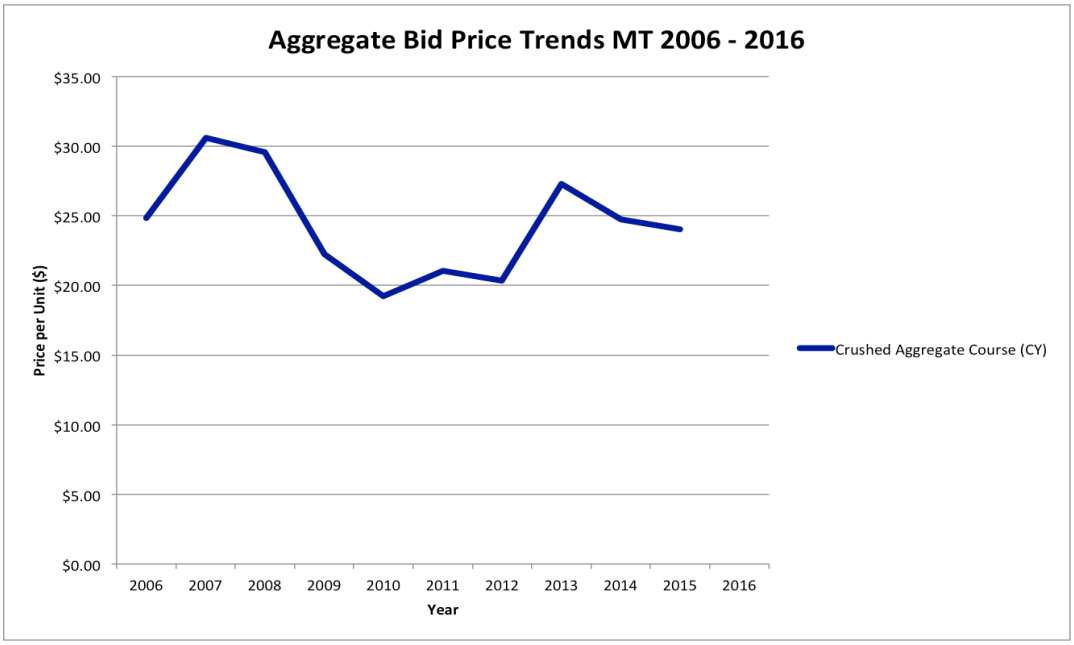
Figure 77. Graph. Asphalt bid price trends—Montana 2006–2016.

Table 75. Asphalt price data—Montana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	11	396.25	526.17	308.44	60.5
2007	8	443.63	540.10	349.27	53.3
2008	10	565.02	889.04	368.72	178.6
2009	19	602.02	680.39	544.31	48.2
2010	10	587.21	648.86	498.95	50.0
2011	3	733.39	777.00	653.17	56.8
2012	2	717.74	720.48	715.00	2.7
2013	2	713.69	747.00	680.38	33.3
2014	1	675.85	—	—	—
2015	1	633.00	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, an aggregate item (item No. 301270000) in Montana was analyzed. Prices fluctuated throughout the analysis period, as seen in figure 78, and no data for this item were available in 2016. Higher prices were seen in 2007 and 2008, as well as in 2013, but overall prices were consistent with low variation, which is reflected in table 76.



Source: FHWA.

Figure 78. Graph. Aggregate bid price trends—Montana 2006–2016.

Table 76. Aggregate price data—Montana.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	33	24.85	57.34	11.47	12.3
2007	26	30.62	160.56	12.23	27.7
2008	26	29.55	64.99	11.47	16.1
2009	45	22.24	76.45	10.86	11.9
2010	20	19.23	61.16	10.80	11.0
2011	11	21.07	30.60	12.23	5.7
2012	6	20.32	35.00	12.04	7.2
2013	7	27.32	37.12	14.53	7.6
2014	3	24.73	30.23	16.82	5.7
2015	2	24.06	27.06	21.06	3.0
2016	0	—	—	—	—

—No data.

Nebraska

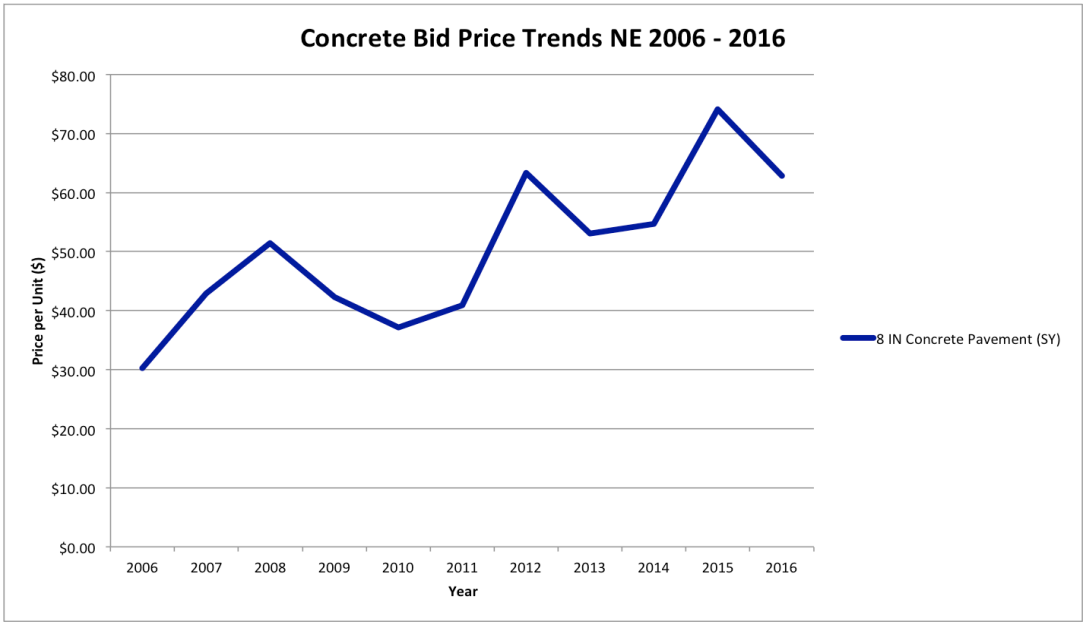
Aggregate suppliers in Nebraska are largely located near Omaha, NE, and the surrounding metropolitan area. Concrete suppliers are generally spread throughout the east and northeast of the State and in close proximity to major interstates, including I–80 and I–29. Asphalt suppliers in the State are concentrated along I–80, which runs east-west through the State.

Data were used to identify trends and anomalies in bid prices of key items, including aggregate, concrete, and asphalt materials, during the analysis period of 2006–2016. Prices of aggregate remained very stable throughout the period, although aggregate (item No. 8008.5) did not appear in bid data in 2008. Average bid prices of 8-inch concrete pavement (item No. 3075.32) slowly increased across the 10-yr period at a steady rate. Asphalt concrete (item No. 9005.23) average

bid prices, on the other hand, saw a slow decrease in prices per ton from 2006 to an all-time-low price in 2016. Unit price summary data from Nebraska DOT (NDOT) were examined to compare these price trends with pricing data reported for the corresponding years. This analysis revealed that prices seen in the bid data were consistent with the unit prices reported by NDOT.

Figure 79, figure 80, and figure 81 show the bid price trends for three materials: 8-inch concrete pavement class 47B-3500 (item No. 3075.32), asphaltic concrete type SPS (item No. 9005.23), and aggregate for microsurfacing (item No. 8008.5), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 77, table 78, and table 79, respectively).

Figure 79 shows the price trends for a concrete item in Nebraska (item No. 3075.32). Prices rose during the analysis period with three higher average prices observable on the graph: $51.43 per square yard (SY) of 8-inch-thick concrete in 2008, $63.35 per SY in 2012, and $74.06 per SY in 2015, as shown in table 77.



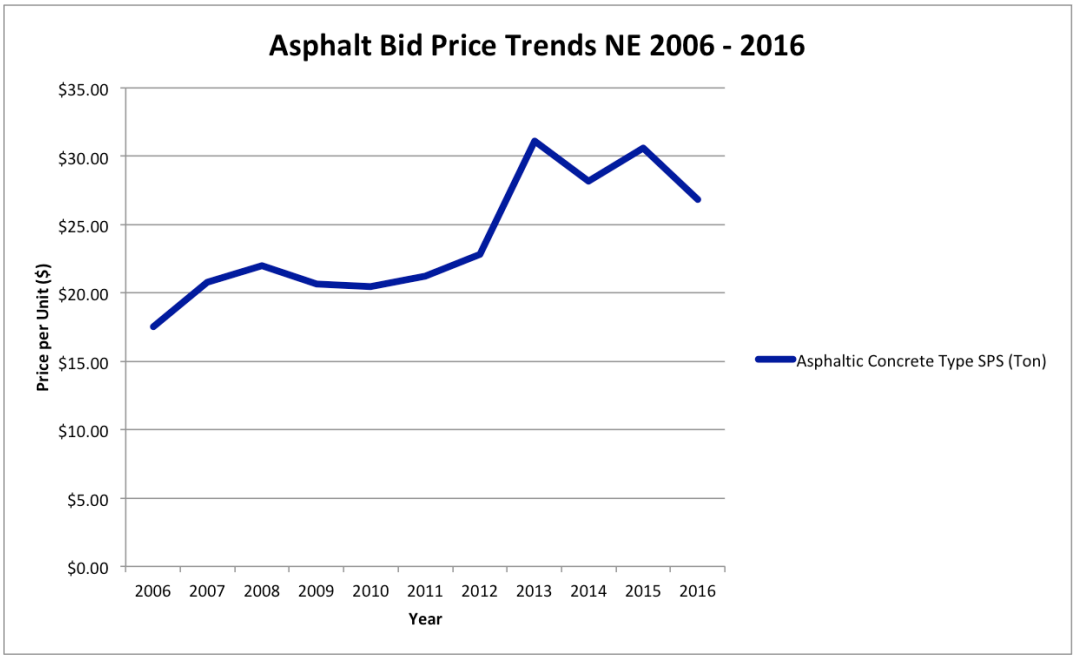
Source: FHWA.

Figure 79. Graph. Concrete bid price trends—Nebraska 2006–2016.

Table 77. Concrete price data—Nebraska.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	6	30.25	38.20	21.26	5.2
2007	7	42.94	51.25	39.00	4.3
2008	7	51.43	100.00	36.00	21.4
2009	9	42.27	65.00	35.80	8.9
2010	20	37.15	55.00	24.21	6.8
2011	7	40.93	50.00	30.40	6.8
2012	4	63.35	90.00	32.50	26.8
2013	22	53.10	86.00	30.00	14.3
2014	23	54.69	80.00	27.00	14.5
2015	18	74.06	210.00	29.50	40.8
2016	8	62.90	83.07	42.10	12.6

Next, the prices for an asphalt item were analyzed (item No. 9005.23). Figure 80 shows the price variation for this asphalt item during the analysis period. Average prices went up after 2010 with two higher average prices in 2013 ($31.08 per ton) and 2015 ($30.59 per ton). Table 78 shows higher maximum prices and standard deviation in 2013 and 2015, but the overall standard deviation in price was low for this item.



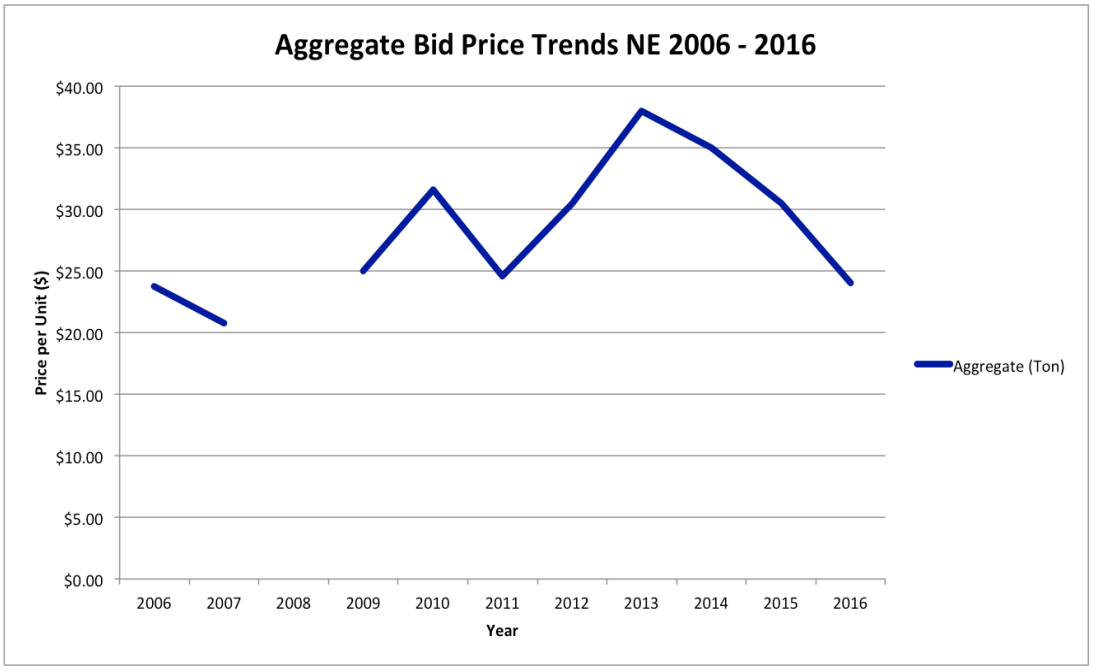
Source: FHWA.

Figure 80. Graph. Asphalt bid price trends—Nebraska 2006–2016.

Table 78. Asphalt price data—Nebraska.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	20	17.53	22.70	13.31	2.5
2007	16	20.76	27.68	15.35	3.8
2008	12	21.98	38.00	17.53	5.5
2009	38	20.68	42.05	14.08	4.9
2010	17	20.47	50.14	11.85	8.1
2011	49	21.21	43.40	14.00	4.8
2012	34	22.80	33.04	17.00	4.0
2013	31	31.08	129.54	17.01	22.0
2014	24	28.18	45.00	14.84	7.6
2015	25	30.59	89.00	16.00	16.9
2016	22	26.85	61.90	15.00	10.0

Lastly, an aggregate item (item No. 8008.5) was investigated. Figure 81 shows the price variation for this item. As can be seen in the graph and verified in table 79, the item did not appear in the data in 2008. For the other years, the standard deviation for the price of this aggregate item was very low.



Source: FHWA.

Figure 81. Graph. Aggregate bid price trends—Nebraska 2006–2016.

Table 79. Aggregate price data—Nebraska.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	9	23.73	44.50	15.00	10.4
2007	7	20.77	25.00	16.00	2.7
2008	0	—	—	—	—
2009	3	25.00	27.00	23.00	1.6
2010	2	31.60	36.00	27.20	4.4
2011	2	24.60	28.00	21.20	3.4
2012	3	30.50	38.00	21.00	7.1
2013	8	38.00	61.00	20.00	12.4
2014	1	35.00	—	—	—
2015	2	30.50	40.00	21.00	9.5
2016	2	24.00	30.00	18.00	6.0

—No data.

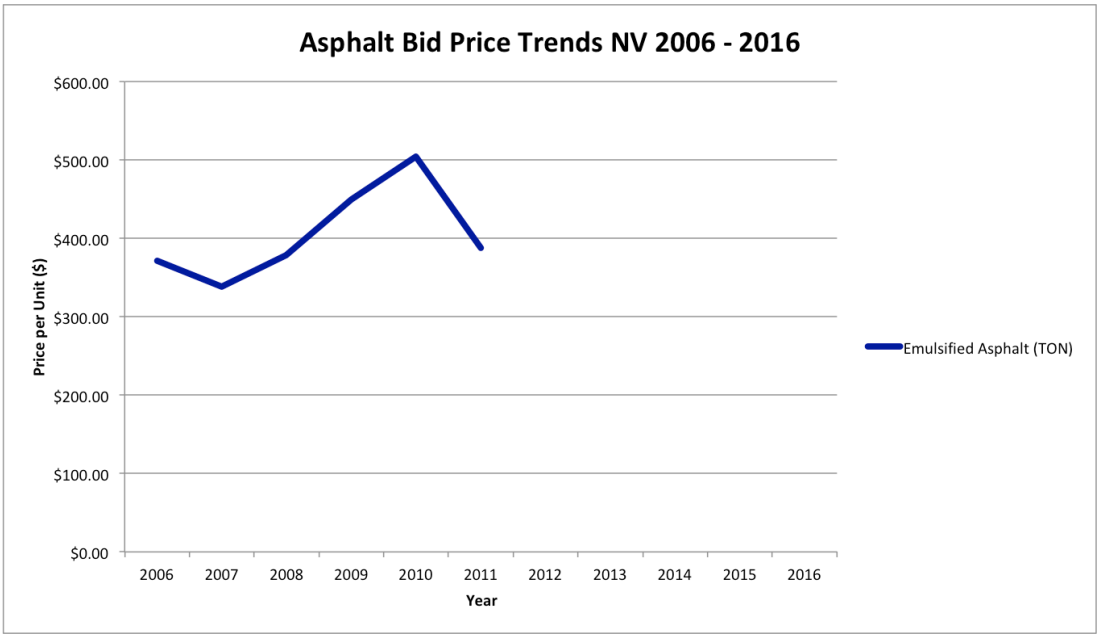
Nevada

A major multistate firm in the markets of Nevada and Utah purchased a ready-mix concrete and aggregate supplier in 2016. Data provided in the Oman Systems, Inc., dataset ended with the third quarter of 2016, and, thus, pricing effects of this activity were not apparent. Nevada DOT resources were also investigated to identify if any special contract language was in use to alleviate any pricing or competition effects of consolidation activity within the State. Bidding requirements and statutes appeared normal, including prequalification of bidder requirements, contents of proposal forms stipulations, and examination of relevant plans and work sites.

A total of 57 unique firms were awarded 247 total projects containing materials of interest during the analysis period of 2006–2016. The State's aggregate, concrete, and asphalt suppliers are largely located in the far southern area of the State and the northwestern area of the State. The middle areas of the State experience higher costs due to transportation of materials from supplier locations. While populations in the middle of the State are sparse, roadways do run throughout. Another unique feature of Nevada is that it contains 32 Indian reservations and colonies of varying size.

Figure 82 and figure 83 show the bid price trends for two materials: emulsified asphalt type SS-1H (item No. 405 0516) and type 1 class B aggregate base (item No. 302 0500), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 80 and table 81, respectively).

Figure 82 shows the price trends for an asphalt item (item No. 405 0516) in Nevada. Finding items that appeared in the data for every year of the analysis period in Nevada was challenging. Even though this asphalt item did not appear in the data after 2011, the price information was still selected for analysis. One high maximum price of $6,000.00 per ton was observed in 2009, and multiple penny bids were present in several years, as seen in table 80, which impacted average price and the standard deviation. No tangible reason for these price fluctuations was identified.



Source: FHWA.

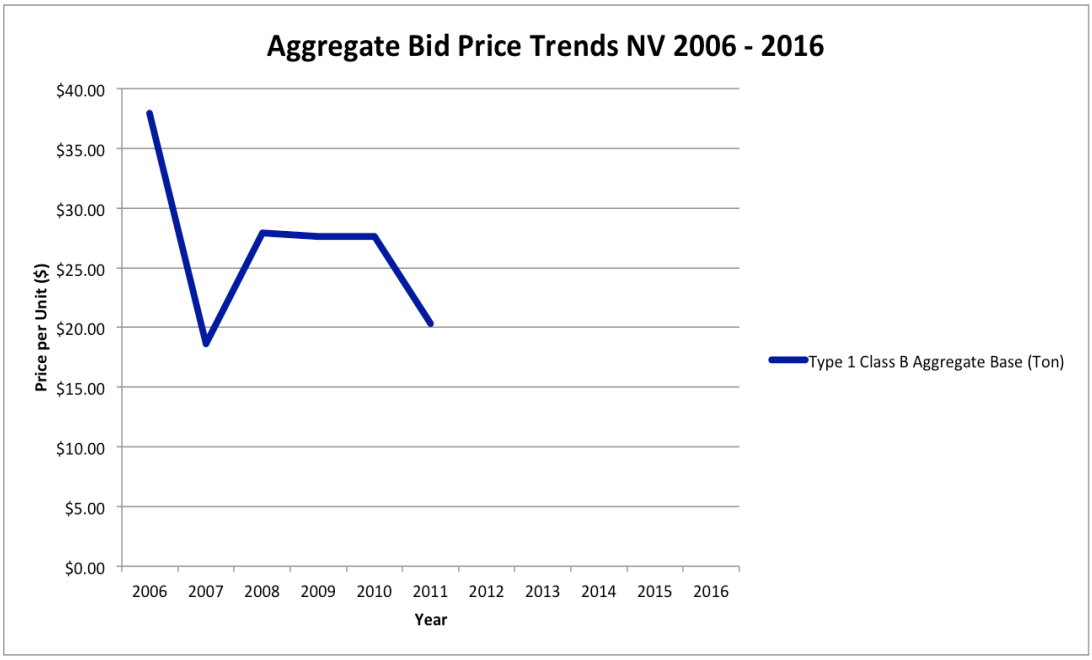
Figure 82. Graph. Asphalt bid price trends—Nevada 2006–2016.

Table 80. Asphalt price data—Nevada.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	18	371.33	770.00	0.01	263.3
2007	10	338.20	550.00	100.00	146.4
2008	17	378.62	980.00	0.01	353.9
2009	35	449.20	6,000.00	0.01	982.9
2010	24	504.03	1,230.00	0.01	384.5
2011	17	387.29	1,200.00	0.01	382.1
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, an aggregate item (item No. 302 0500) was analyzed. Similar to the asphalt item, this item did not appear in the data after 2011, as seen in figure 83 and table 81. For the years of data that were available for analysis, the price fluctuated slightly, but no abnormalities were identified.



Source: FHWA.

Figure 83. Graph. Aggregate bid price trends—Nevada 2006–2016.

Table 81. Aggregate price data—Nevada.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	19	37.97	153.00	5.00	36.9
2007	8	18.63	67.30	5.00	18.6
2008	11	27.94	75.00	4.00	18.9
2009	20	27.61	170.00	0.01	42.6
2010	21	27.63	78.00	2.00	22.4
2011	16	20.29	70.00	0.01	16.3
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

New Mexico

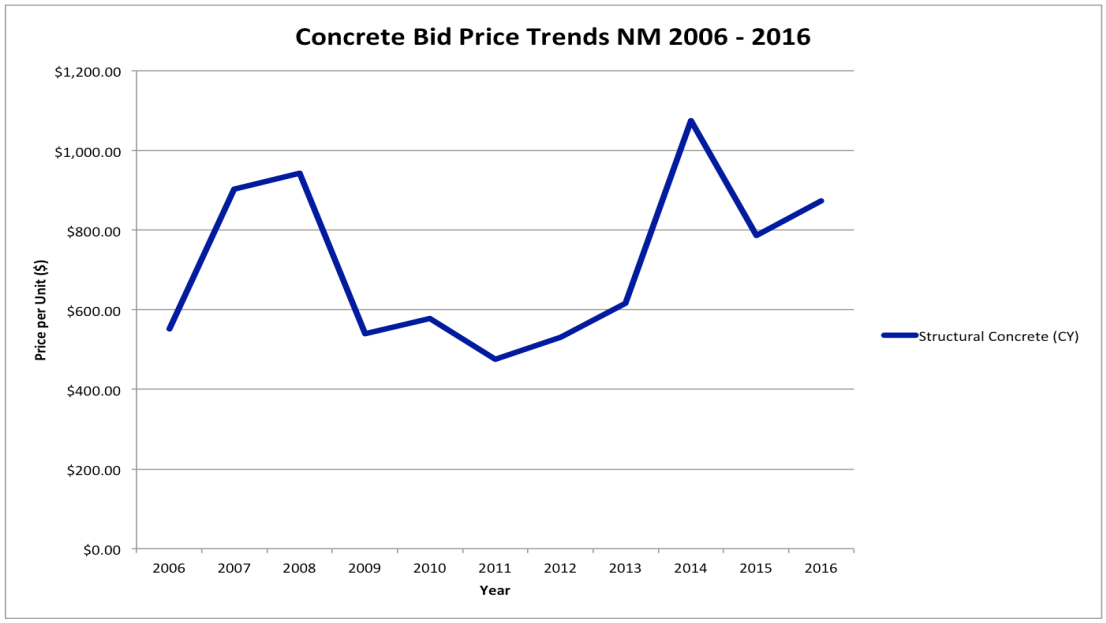
New Mexico DOT divides the State into six unique regions; however, some counties overlap these regions, which made comparison between regions complicated. A total of 68 unique firms were awarded bids, ranging from 25 to 82 per year. In comparison to other States analyzed during the project, New Mexico had significantly fewer projects per year. Years with the highest project costs included 2006, 2008, and 2012. Project distribution across regions saw relatively stable fluctuation throughout the analysis period of 2006–2016.

Before the analysis period, a major construction firm in the State acquired a subsidiary firm from the Oklahoma City, OK, area; however, no major consolidation activity was observed during the

10-yr analysis period. During the economic recession, the State saw a significant drop in construction industry jobs: in 2007 the State had 60,000 construction industry jobs and had not yet regained that number in 2017 for which the number of jobs was reported as 46,000. The 2017 value was the highest since mid-2009 during the height of the economic downturn. Within the State, higher project costs were observed in the Albuquerque, NM, area, likely due to shortened project timelines, which tend to drive costs higher.

Figure 84 and figure 85 show the bid price trends for two materials: structural concrete class A (item No. 511000) and asphalt material (item No. 407000), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 82 and table 83, respectively).

Figure 84 shows the price variation for a concrete item (item No. 511000) in New Mexico. Two noticeable peaks in price are observed on the graph in 2007–2008 and in 2014. Table 82 shows higher average prices and higher maximum prices for these years, resulting in larger spreads between maximum and minimum price and larger standard deviations.



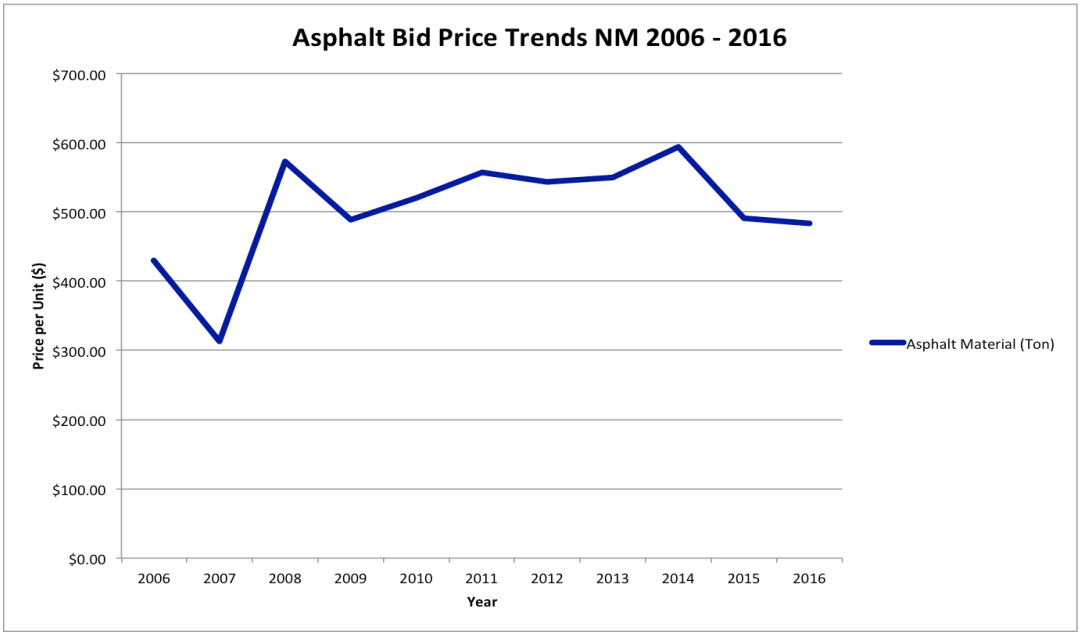
Source: FHWA.

Figure 84. Graph. Concrete bid price trends—New Mexico 2006–2016.

Table 82. Concrete price data—New Mexico.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	46	551.95	1,000.00	190.00	172.2
2007	30	902.44	10,000.00	336.00	1,699.8
2008	39	942.75	5,000.00	211.43	1,024.9
2009	37	539.27	1,361.85	31.20	272.8
2010	37	577.20	1,400.00	200.00	291.2
2011	28	475.63	1,100.00	310.00	144.1
2012	19	531.95	1,000.00	340.00	197.5
2013	24	617.02	2,000.00	306.00	331.4
2014	23	1,074.54	8,848.00	245.00	1,743.4
2015	19	787.14	3,317.00	192.00	701.9
2016	17	873.72	2,640.00	400.00	601.8

Lastly, an asphalt item (item No. 407000) was analyzed. Similar to other States, New Mexico only yielded two items for analysis (concrete and asphalt). Figure 85 and table 83 show the price trends for this asphalt item. Moderate deviation occurred in prices throughout the analysis period, but no significant anomalies were identified in the data.



Source: FHWA.

Figure 85. Graph. Asphalt bid price trends—New Mexico 2006–2016.

Table 83. Asphalt price data—New Mexico.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	51	430.02	2,285.00	150.00	320.7
2007	36	312.65	500.00	150.00	92.7
2008	56	572.29	1,600.00	200.00	246.9
2009	54	488.29	950.00	350.00	106.9
2010	65	519.75	958.72	315.73	147.5
2011	39	556.85	2,000.00	400.00	283.1
2012	51	543.12	1,000.00	263.02	141.1
2013	39	549.12	1,100.00	150.00	188.5
2014	40	593.88	1,108.35	400.00	186.5
2015	24	490.98	700.00	6.30	135.5
2016	20	483.35	965.00	300.00	181.9

Oklahoma

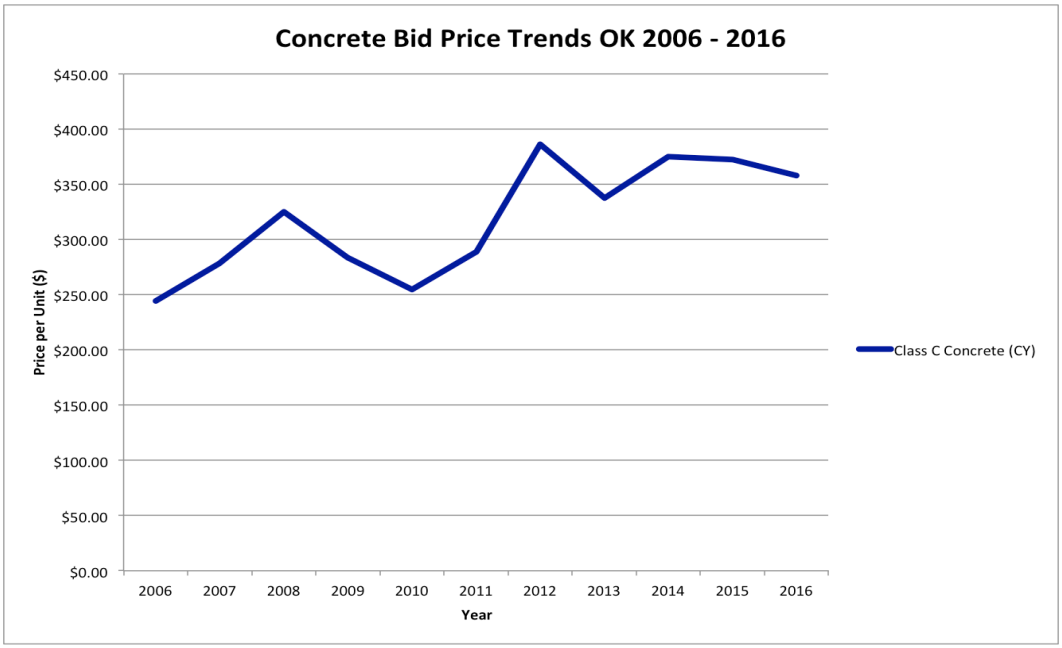
A major firm purchased a ready-mix concrete and aggregate source in the Oklahoma region in 2012. Another change in the Oklahoma market occurred in 2014 when a new mining operation of aggregate was opened by a major firm operating primarily in the midwest region. This same firm also purchased a sand and gravel supplier in 2015. A slight increase in prices of aggregate products was seen in the State after the mining operation was opened in 2014, but the price differences across projects were very low.

Unit price data provided by Oklahoma DOT included items, regions, number of bids, quantities, average awarded prices, and average of the three lowest bidders' pricing for items of interest. When aggregate unit prices were analyzed against aggregates bid prices contained in the data provided through Oman Systems, Inc., and supplemented by the research team's review of information posted on State DOT websites, price fluctuations were found to be minor. However, some regions of the State did see higher prices of aggregate materials after the opening of the mining operation in 2014. These regions included region 4 (north central Oklahoma, including Grant, Kay, Garfield, Noble, Kingfisher, Logan, Payne, Canadian, and Oklahoma Counties), region 5 (southwestern Oklahoma, including Dewey, Blaine, Custer, Roger Mills, Beckham, Washita, Greer, Kiowa, Harmon, Jackson, and Tillman Counties), and region 6 (northwestern Oklahoma, including Cimarron, Texas, Beaver, Harper, Ellis, Woodward, Woods, Major, and Alfalfa Counties). These price differences could be attributed to transportation costs of aggregate materials from the eastern regions of the State or from sources from neighboring States, including Texas.

Figure 86, figure 87, and figure 88 show the bid price trends for three materials: class C concrete (item No. 509(D) 0325), SP asphalt concrete type S4 (item No. 411(S4) 5960), and aggregate base (item No. 303 5912), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 84, table 85, and table 86, respectively).

Figure 86 and table 84 show the price trends for a concrete item (item No. 509(D) 0325) in Oklahoma. Prices rose over time, with lower prices observed in 2009 and 2010 and one higher average price in 2012, as indicated by the spike in the graph. The maximum price of $9,000.00

per CY observed in 2012 caused the average price to be higher. This amount was the highest observed price for this material.



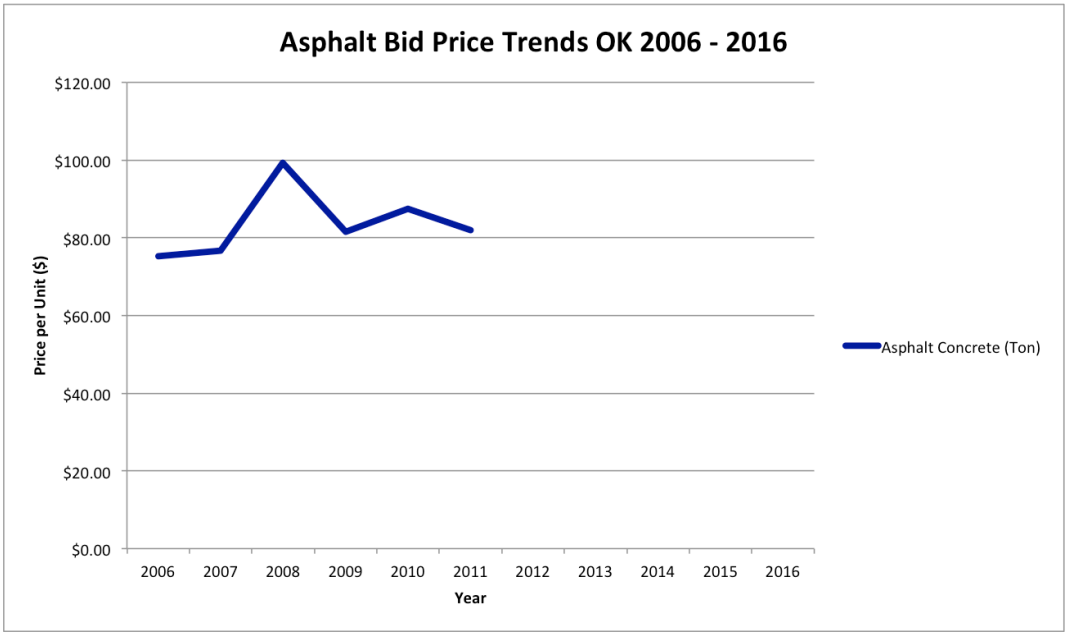
Source: FHWA.

Figure 86. Graph. Concrete bid price trends—Oklahoma 2006–2016.

Table 84. Concrete price data—Oklahoma.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	161	244.37	743.47	100.00	80.3
2007	142	278.51	600.00	110.14	84.3
2008	137	325.25	1,500.00	175.00	147.3
2009	174	283.76	750.00	100.00	93.9
2010	178	255.02	636.00	100.00	80.6
2011	159	288.64	1,000.00	100.00	119.6
2012	122	386.22	9,000.00	100.00	793.1
2013	161	337.71	1,706.59	100.00	171.8
2014	139	374.82	1,485.00	100.00	202.5
2015	141	372.75	1,345.00	150.00	185.5
2016	100	358.14	1,200.00	100.00	161.3

Second, an asphalt item (item No. 411(S4) 5960) was analyzed. This item did not appear in the data after 2011. For the years it was observed in the data, prices remained relatively consistent, with low variation and no anomalies, which is reflected in figure 87 and table 85.



Source: FHWA.

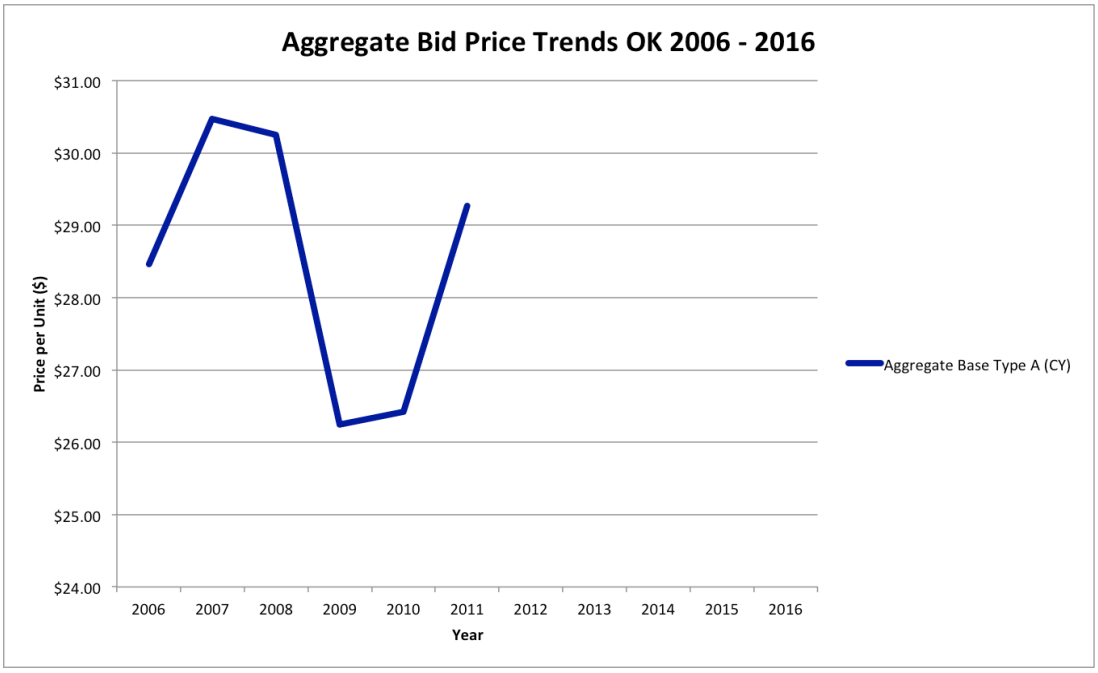
Figure 87. Graph. Asphalt bid price trends—Oklahoma 2006–2016.

Table 85. Asphalt price data—Oklahoma.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	157	75.25	380.00	40.12	40.3
2007	140	76.64	350.00	37.16	40.1
2008	150	99.24	350.00	49.50	47.1
2009	203	81.48	630.00	35.00	49.8
2010	195	87.46	695.00	22.00	58.6
2011	23	81.91	167.81	46.55	30.0
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

Lastly, an aggregate item (item No. 303 5912) was investigated. Figure 88 and table 86 show the price trends for this item for the years it was present in the data (2006–2011). During this time, price deviation was very low, and prices remained consistent except for a slight decrease in average price in 2009 and 2010.



Source: FHWA.

Figure 88. Graph. Aggregate bid price trends—Oklahoma 2006–2016.

Table 86. Aggregate price data—Oklahoma.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	7	28.46	40.00	21.49	5.9
2007	24	30.47	50.00	20.00	8.6
2008	22	30.25	55.00	18.00	8.1
2009	27	26.24	45.00	9.15	7.2
2010	23	26.42	46.20	16.55	7.7
2011	3	29.27	41.00	20.00	8.7
2012	0	—	—	—	—
2013	0	—	—	—	—
2014	0	—	—	—	—
2015	0	—	—	—	—
2016	0	—	—	—	—

—No data.

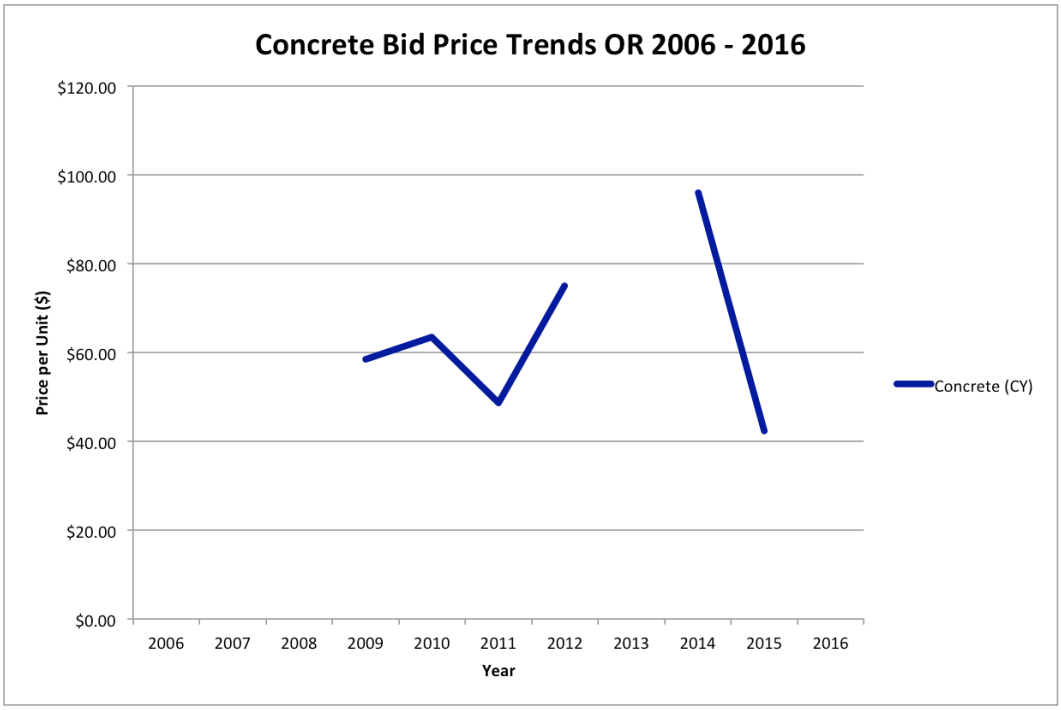
Oregon

Information from Oregon DOT (ODOT) revealed that most M&A activity in the State occurred prior to 2006. Activity during the analysis period of 2006–2016 included two major firms purchasing some aggregate source companies and suppliers. ODOT is able to offer State sources of materials in the eastern part of the State, while in the western part of the State private sources provide fairly robust competition. Currently, ODOT does have mechanisms in place to assess unbalanced bids; however, contract language has not been altered to account for M&A activity within the State.

The State is divided into five regions. Between 43 and 141 projects were awarded each year, and a total of 170 unique firms were involved in the projects across the analysis period. Regions 2 and 3 saw higher project costs during the analysis period. Oregon has quarry and/or gravel pits located in every county. Columbia, Crook, Douglas, Jackson, and Linn Counties contain a larger number of materials pits compared with the other counties. These counties are in regions 2, 3, and 4, located in the western and central part of the State. Wheeler, Wallowa, Sherman, Jefferson, Hood River, Gilliam, and Coos Counties contain the fewest material pit locations.

Figure 89, figure 90, and figure 91 show the bid price trends for three materials: 37-inch asphalt concrete pavement (item No. 0748-0119000J), PG 64-22 asphalt in HMA concrete (HMAC) (item No. 0745-0620000M), and aggregate base (item No. 0640-0100000M), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 87, table 88, and table 89, respectively).

As can be seen in figure 89 and verified in table 87, this concrete item (item No. 0748-0119000J) was not used in Oregon in 2006, 2007, 2008, 2013, or 2016. However, it was still selected for analysis to assess potential M&A activity through price anomalies. For the years the item was used, price was variable. The sharp decrease seen in the graph toward the end of the analysis period is likely due to the low average bid price in 2015. This price drop can be attributed to a penny bid in 2016, which skews the average price.



Source: FHWA.

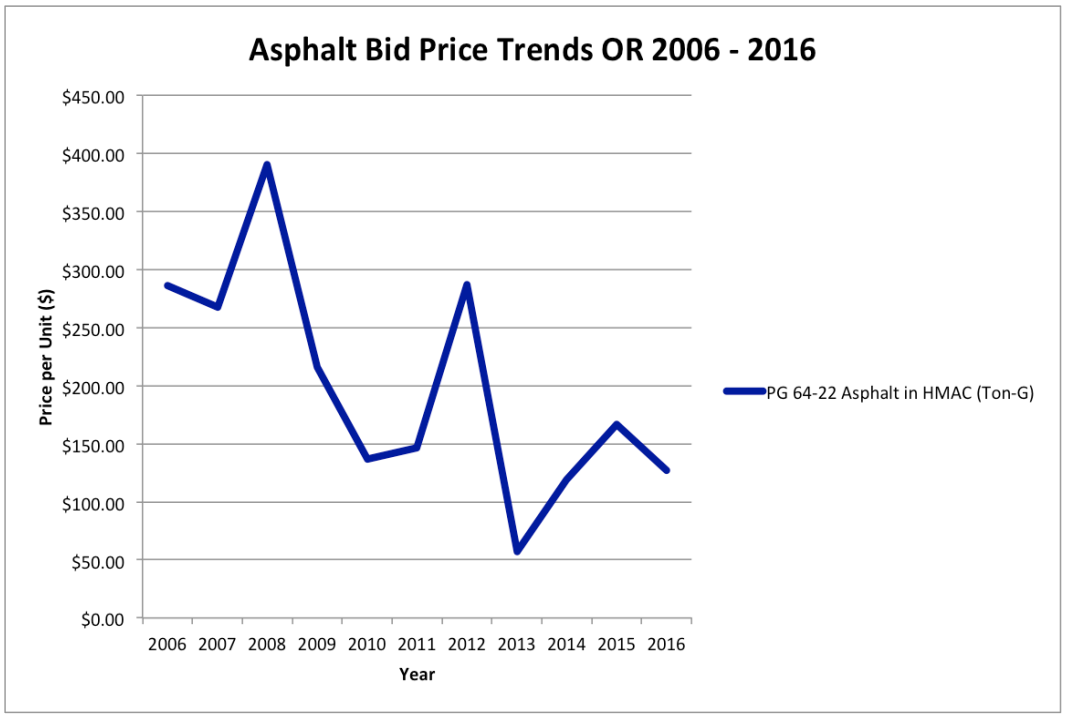
Figure 89. Graph. Concrete bid price trends—Oregon 2006–2016.

Table 87. Concrete price data—Oregon.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	0	—	—	—	—
2007	0	—	—	—	—
2008	0	—	—	—	—
2009	4	58.50	103.00	37.00	26.1
2010	5	63.60	138.00	35.00	38.9
2011	4	48.75	85.00	20.00	25.6
2012	1	75.00	—	—	—
2013	0	—	—	—	—
2014	1	96.00	—	—	—
2015	3	42.34	70.00	0.01	30.4
2016	0	—	—	—	—

—No data.

Next, an asphalt item (item No. 0745-0620000M) was analyzed. Figure 90 shows an overall decreasing trend in bid prices with several visible spikes in prices in 2008 and 2012. However, as can be seen in table 88, the minimum bid prices for this asphalt item indicate the data contain both dollar and penny bids. These bids caused large gaps between the maximum and minimum bid prices, which have impacted the average prices.



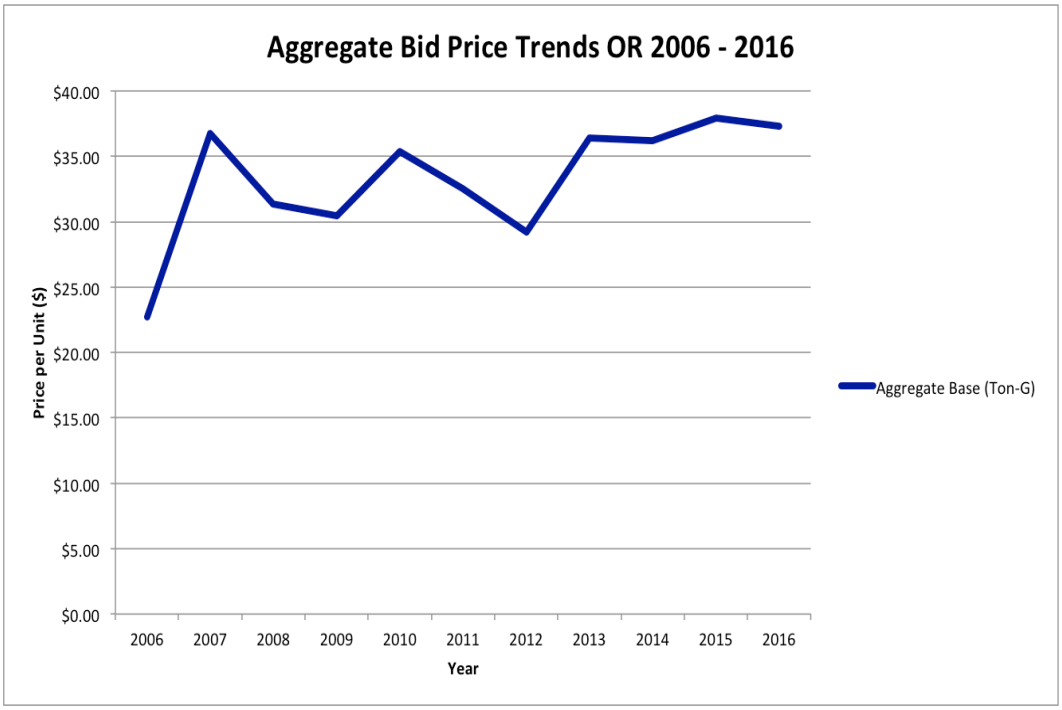
Source: FHWA.

Figure 90. Graph. Asphalt bid price trends—Oregon 2006–2016.

Table 88. Asphalt price data—Oregon.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	10	285.72	703.00	1.00	225.4
2007	13	267.75	470.00	1.00	161.5
2008	17	390.15	901.25	1.00	257.0
2009	27	215.85	580.00	0.01	236.0
2010	22	136.85	510.00	0.01	211.3
2011	18	146.06	583.00	0.01	236.0
2012	15	286.73	770.00	1.00	310.0
2013	20	57.15	630.00	0.01	170.5
2014	21	119.27	780.00	0.01	248.3
2015	16	166.38	600.00	0.01	247.6
2016	13	127.16	510.00	0.01	193.2

Finally, an aggregate item (item No. 0640-0100000M) was analyzed. Lastly, the bid price trends for an aggregate item (item No. 0640-0100000M) in Oregon are shown in figure 91. The trend for the price data for this aggregate base item generally increased throughout the analysis period. The minimum prices in table 89 show penny bids in the data (2010), as well as higher maximum prices for this aggregate item (2009 and 2010). However, when average prices across the analysis period are reviewed, these prices appear to be relatively similar and consistent with other aggregate items used in the State.



Source: FHWA.

Figure 91. Graph. Aggregate bid price trends—Oregon 2006–2016.

Table 89. Aggregate price data—Oregon.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	59	22.72	55.00	10.00	9.9
2007	50	36.78	170.00	11.22	27.6
2008	61	31.36	110.00	10.36	17.0
2009	94	30.48	165.00	7.00	19.4
2010	76	35.34	178.00	0.01	27.6
2011	63	32.51	75.00	10.50	14.5
2012	42	29.18	87.00	4.00	13.1
2013	69	36.42	105.00	4.50	16.3
2014	60	36.22	120.00	10.80	21.8
2015	49	37.93	100.00	14.00	19.7
2016	31	37.27	125.00	10.85	22.5

Utah

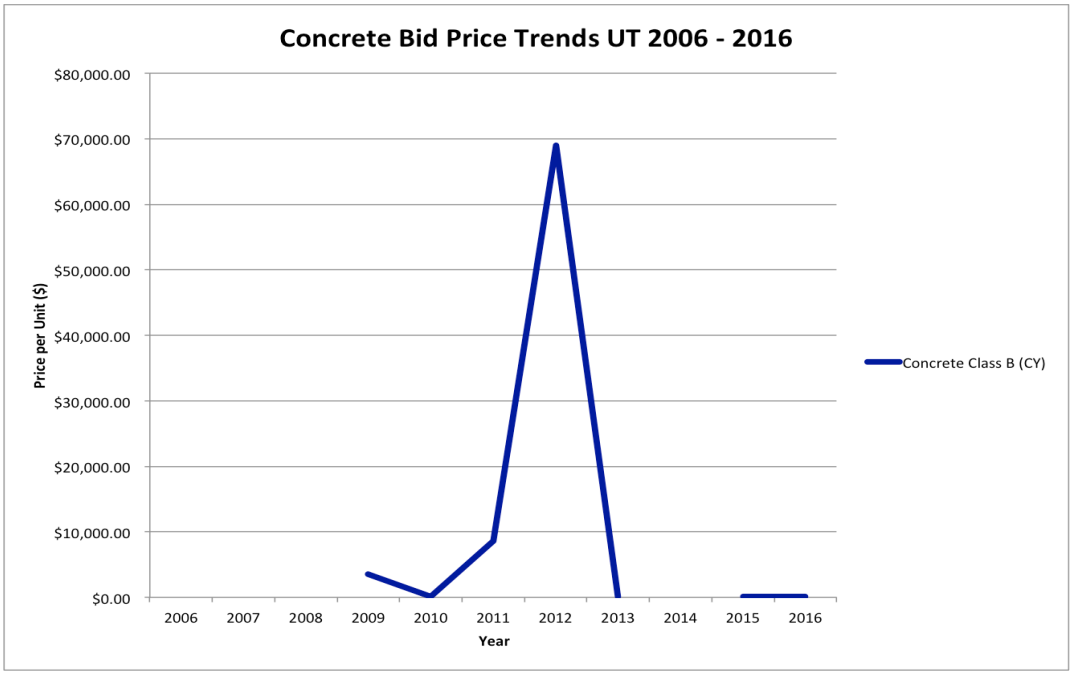
A major multistate firm in the markets of Nevada and Utah purchased a ready-mix concrete and aggregates supplier in 2016. Data in the Oman Systems, Inc., dataset ended with the third quarter of 2016, and, thus, pricing effects of this activity were not apparent. Most of the State's concrete and asphalt suppliers are located in the north central region; aggregate suppliers, including sand and gravel, are also located in the north central region of the State. Three price anomalies were found during initial data processing: in 2010, 2011, and 2012 the average bid prices per CY of aggregate were approximately $12,000.00, $3,000.00, and $15,000.00, respectively. These amounts seem unusually high, especially compared with amounts in previous years (which were around $45.00 per CY). In 2012, one project had an aggregate price that was greater than $950,000.00 per CY. Further inspection of the individual project revealed other pricing inconsistencies that appeared to be due to an error in unit selection (e.g., CY instead of lump sum).

The other abnormally high prices for aggregate found in 2010 and 2011 were also inspected. Again, one project saw costs much higher than any other projects billing aggregate for that year. All projects with pricing abnormalities occurred in Washington County, and the same firm was awarded all three abnormally high projects. Further analysis of this firm revealed that a multistate major firm purchased the original company in 2009. Following this purchase, the Utah-based firm continued to operate out of Draper, UT, but worked on many joint ventures with the purchasing firm subsidiaries, particularly out of California.

Figure 92, figure 93, and figure 94 show the bid price trends for three materials: concrete class B (AE) portland cement (item No. 03310003P), HMA–½ inch (item No. 27410050), and granular borrow (item No. 20560015), respectively. Below each figure, additional pricing data to support the graphical information are provided (table 90, table 91, and table 92, respectively).

Figure 92 shows the price trends for a concrete item (item No. 03310003P) in Utah. As can be seen in the graph, a major price spike is observed in 2012. Table 90 shows the average price in 2012 to be $69,000.00 per CY, which is the only time that item appears in the data for 2012. Further analysis of this high price (job No. S-0007(11) with a bid date of October 4, 2012, in Washington County) revealed that this price was the only occurrence of a price per CY of greater

than $20,000.00. No additional information about this price was identified. Washington County is located in the southwestern corner of Utah, and other price abnormalities were identified associated with projects bid in this county.



Source: FHWA.

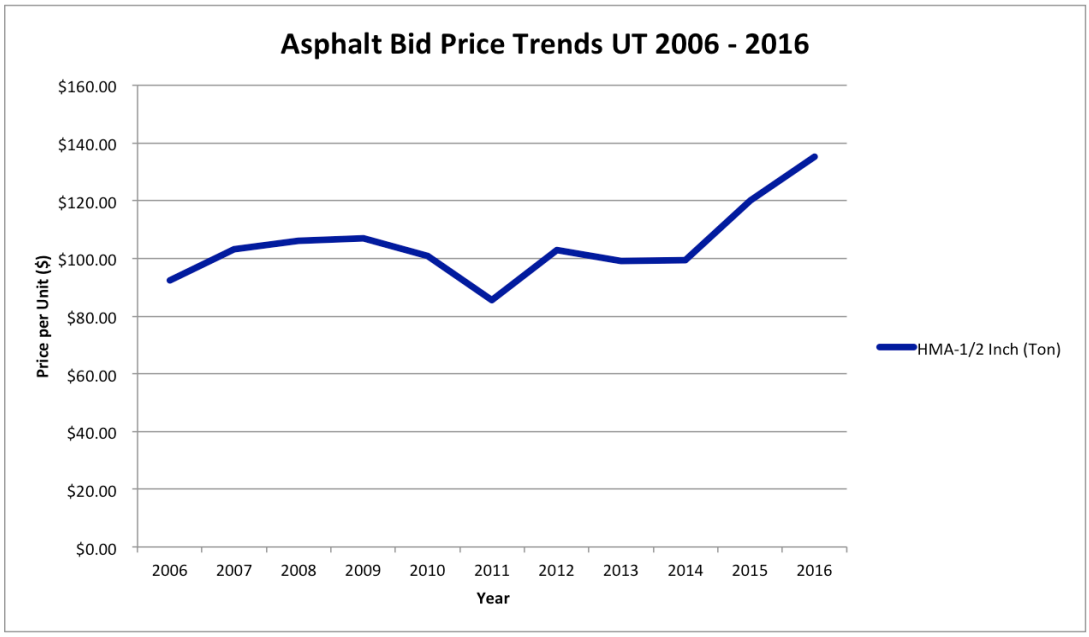
Figure 92. Graph. Concrete bid price trends—Utah 2006–2016.

Table 90. Concrete price data—Utah.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	2	10,841.50	20,000.00	1,683.00	9,158.5
2007	0	—	—	—	—
2008	0	—	—	—	—
2009	1	3,500.00	—	—	—
2010	1	91.80	—	—	—
2011	2	8,600.00	10,280.00	6,920.00	1,680.0
2012	1	69,000.00	—	—	—
2013	3	164.29	380.00	56.41	152.5
2014	0	—	—	—	—
2015	4	154.19	295.00	50.78	88.3
2016	2	98.00	98.00	98.00	0.0

—No data.

Next, the price trends for an asphalt item (item No. 27410050) were analyzed. Prices for this item, shown in figure 93 and table 91, were consistent throughout the analysis period, with a general increasing trend after 2013.



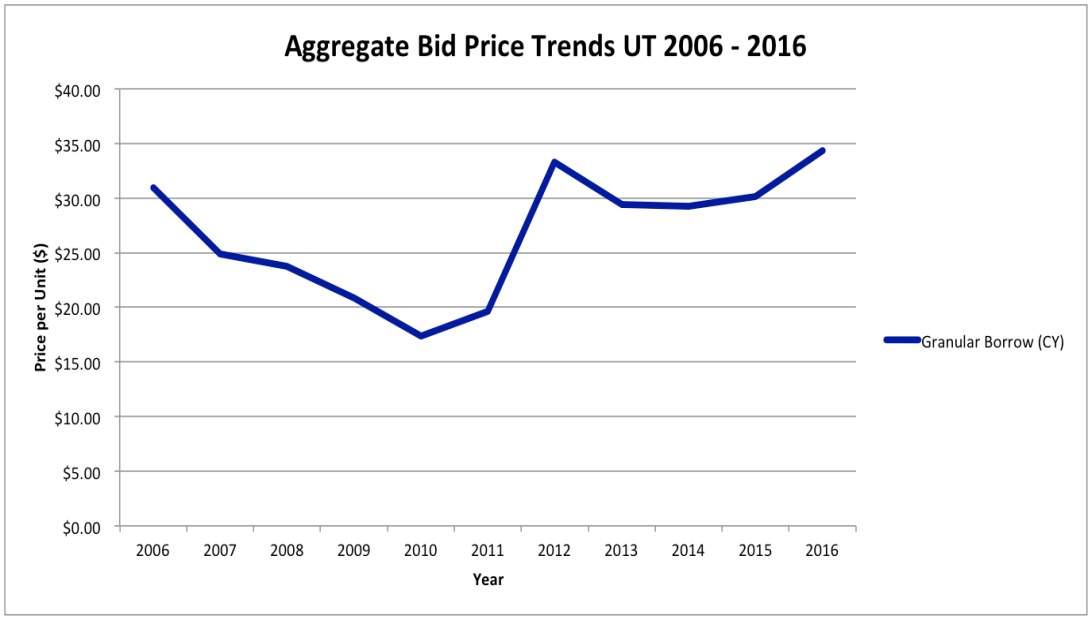
Source: FHWA.

Figure 93. Graph. Asphalt bid price trends—Utah 2006–2016.

Table 91. Asphalt price data—Utah.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	19	92.52	250.00	38.00	47.5
2007	22	103.20	224.00	59.00	45.8
2008	33	106.20	315.00	51.00	53.1
2009	57	107.02	180.00	60.00	34.3
2010	61	100.92	216.00	45.46	36.0
2011	60	85.54	200.00	52.78	26.2
2012	36	102.96	326.00	67.00	49.2
2013	52	99.22	375.00	49.50	56.5
2014	28	99.35	260.00	64.75	43.7
2015	33	120.01	250.00	65.00	52.9
2016	29	135.33	800.00	58.00	136.3

Finally, an aggregate item (item No. 20560015) was analyzed. Figure 94 shows the price variation for this item. Prices decreased from 2006 until 2010 where they reached a low average price of $17.37 per CY. Prices then rose to a peak average price of $33.32 per CY in 2012 and showed an increasing trend again at the end of the analysis period. Table 92 shows low standard deviation values for this aggregate item, indicating most prices did not vary greatly from the calculated average bid price per CY. No abnormal prices were identified for this item during the analysis period.



Source: FHWA.

Figure 94. Graph. Aggregate bid price trends—Utah 2006–2016.

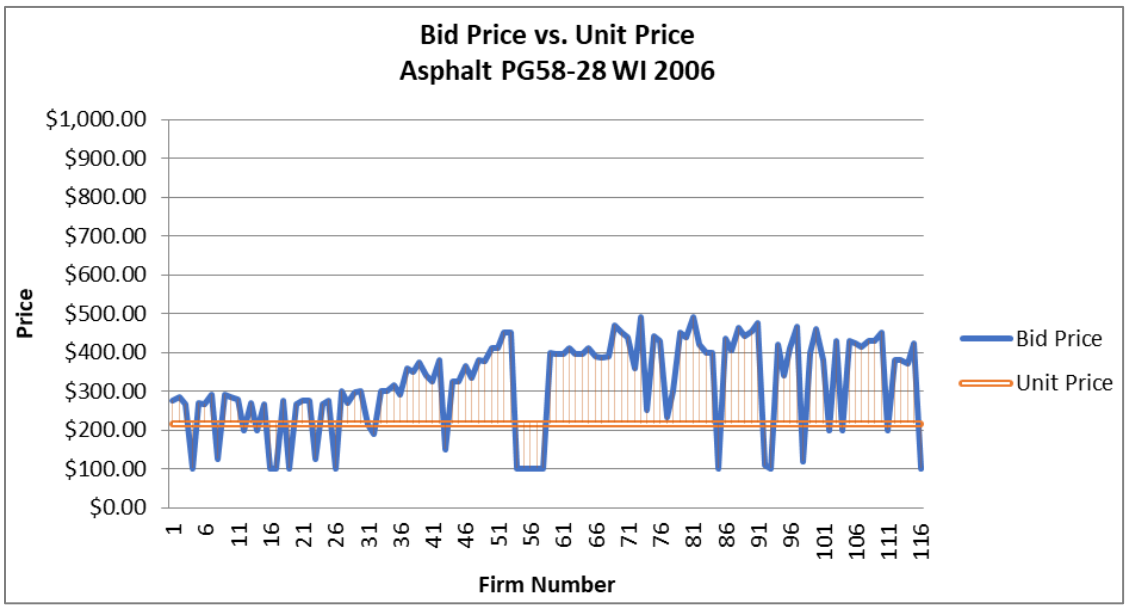
Table 92. Aggregate price data—Utah.

Year	Data Points	Average Price (Dollars)	Maximum Price (Dollars)	Minimum Price (Dollars)	Standard Deviation
2006	22	30.91	55.00	13.50	11.3
2007	20	24.87	67.00	8.45	13.4
2008	26	23.76	52.75	3.50	9.9
2009	30	20.81	50.27	7.76	10.9
2010	30	17.37	38.00	8.00	8.0
2011	31	19.60	47.30	9.26	7.6
2012	21	33.32	140.00	8.90	30.7
2013	26	29.41	83.65	4.50	16.5
2014	40	29.25	79.00	12.00	13.4
2015	23	30.11	52.22	12.25	10.6
2016	20	34.32	75.00	14.5	17.5

CHAPTER 4. UNIT PRICE ANALYSIS

Many State DOTs keep a record of historical unit price data for all bid item numbers included in lettings, sorted by date range. As noted in chapter 3, the research team explored various materials to determine whether trends in unit prices could be attributed to M&A activity. Items identified as being of interest in the project included granular backfill, aggregate, concrete pavement, and asphalt pavement. These items were selected from the historical unit price datasets for comparison against actual unit prices of those items in bids for corresponding years, as obtained from the data provided by Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites.

For each year of bid item number data, the average, maximum, minimum, median, and the first- and third-quartile costs were calculated for each item. For example, in Wisconsin, for item 455.0105, PG 58-28 paving grade asphalt binder, the values were calculated by year. In 2006, the average bid item number cost of item 455.0105 was $317.98 per ton, with a maximum and minimum cost of $490.00 and $100.00 per ton, respectively. The median cost was computed to be $339.50 per ton with a first- and third-quartile cost of $265.00 and $410.00, respectively. Unit price for 2006 as reported by WisDOT was $215.78 per ton. Each firm that included item 455.0105 in their bid in 2006 was assigned a number. The bid item number prices for each firm that included 455.0105 in their project bids were then graphed against the reported unit price. An example of this graphical information is shown in figure 95. Firms are identified by a number to protect the identity of individual companies within each State.



Source: FHWA.

Figure 95. Graph. Bid price versus unit price.

Corresponding average and quartile data for each item can also be presented in tabular form for all 10 yr, as shown in table 93.

Table 93. Bid price versus unit price—Wisconsin.

Item 455.0105	Unit	2006	2007	2008	2009	2010	2011	2012	2013	2014
Unit price (dollars)	Ton	215.78	308.56	386.31	295.37	248.39	172.17	165.98	120.71	184.85
Bid prices (dollars)	Average	317.98	312.46	472.54	349.88	275.84	224.40	155.15	184.53	200.91
	Maximum	490.00	481.24	875.00	620.00	700.00	630.00	645.00	800.00	1,000.00
	Minimum	100.00	100.00	100.00	96.00	10.00	90.00	10.00	5.00	1.00
	Median	339.50	357.00	500.00	460.00	125.00	100.00	100.00	100.00	100.00
	Quartile 1	265.00	212.50	360.00	112.50	100.00	100.00	100.00	100.00	100.00
	Quartile 3	410.00	390.00	677.50	520.00	547.00	461.50	100.00	250.00	250.00

The graphical format (figure 95) of the data provides for easier identification of abnormalities, including significant spikes above or below the unit price for that year. Much variation in the asphalt bid price is seen for 2006. Table 93 reflects that the average bid price is above the unit price reported for that year, as is the median. It also reveals that, for item 455.0105, the average bid price is higher than the unit price every year, except for 2012. The frequency of the price spikes above the unit price line is less in 2012 than in 2006, and the frequency of price drops below the unit price line is greater in 2006 than in 2012.

By using the data provided by the State DOT and supplemented by the research team review of information collected from Wisconsin, these spikes can be attributed to specific projects, regions, and firms within Wisconsin. Here, five identifiable spikes indicate asphalt bid prices that are significantly more than the unit price reported by the State DOT. Of these five price abnormalities, four occurred in projects let in Brown County, located in the northeast region of the State. The fifth spike occurred in Door County, also located in the northeast region of the State. Two of the five were projects won by the same contractor based in Manitowoc, WI (also located in the northeast region), while the other three were unique (based in the southwest, southeast, and northwest regions).

These price spikes can then identify firm- or plant-related activities taking place during the years showing abnormalities. In the example of the exorbitant asphalt prices (item 455.0105), five northeast region projects in 2012 could be related to transportation of asphalt from elsewhere in Wisconsin, as Brown County created a plan to begin producing its own asphalt within the county in 2014. This activity could be related to a desire to lower project costs by reducing transportation of asphaltic materials within the county. Brown County's proposed asphalt initiative in 2014 was projected to save $700,000.00 in costs per year, including savings in production time and transportation costs. Data in the initiative also identified that, without the plant, the county would need to add approximately $225,000.00 to the 2014 budget to account for transportation of asphalt from outside of the county, as well as increases in project timelines due to production times. Use of the unit price data allows for an efficient and logical progression from the processed data provided through Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites to the identification of price spikes. This identification allows for further analysis of key activities contributing to these price spikes, which can be accomplished through the use of another dataset provided by the DOJ.

Other State-by-State data on material source locations were provided by DOJ. These data include plant types, associated parent companies, previous owners and sold dates, as well as locations within the State. The addition of these data to the project has been valuable: identifying plant locations and company history coupled with unit price comparisons helped match spikes in the unit prices of materials with any relevant changes in material availability due to merger activity. Part of this effort involved mapping the locations of plants used in projects for individual States.

Plant location data allow for efficient identification of material locations: compared against project locations, disparities in pricing can be better understood. States acquiring materials from plants generally outside of the State or located some distance away from the projects could explain the higher prices. Transportation of materials, as well as extensions to project timelines due to production and transportation times of materials, may account for abnormally high prices

in certain projects unrelated to any merger activity. Following unit price analysis for key items, use of the DOJ dataset allowed for this deeper analysis to be completed for States of interest.

The worldwide aggregate industry is largely dominated by a handful of major players. In the United States, three major companies are among the leading suppliers of asphalt, aggregates, cement, ready-mix concrete, and paving and construction services. General information about each company is provided in the paragraphs below. A deeper dive into the geographical information on these major companies, such as the many locations where they operate, as well as when these locations were acquired via merger, acquisition, or other means, and then cross-checking that information with any abnormal year-over-year unit price fluctuations would provide conclusions about the effects of M&A on price and market share.

For example, one firm, based in Atlanta, GA, is one of the top vertically integrated suppliers of aggregates, asphalt, ready-mix concrete, and paving services in the United States, with operations at more than 1,300 locations nationwide. It has locations in Massachusetts, Rhode Island, Connecticut, Maine, New Hampshire, and Vermont. Similarly, another notable merger in July 2015 further defined the industry and created another industry leader. With a strong presence in the United States since the 1950s, the purchasing firm's family of companies is the number one building materials and solutions provider in the world and the leading cement producer in the United States. Currently, this company is headquartered in Chicago, IL, with subsidiaries across 43 States operating under multiple names.

Lastly, a major cement supplier has been active in North America since 1977 when it purchased another cement company. The purchased firm was originally founded in 1897 in Pennsylvania and began as a single mill producing portland cement. The purchasing firm acquired its Canadian operations in 1993 and then acquired the other company in 2007. Today, the broad geographic footprint and wide range of products positions the firm favorably to supply construction projects throughout the United States and Canada.

Acquisition of the other firm in the second half of 2016 further strengthened this major cement supplier's presence in the United States. A subsidiary operates in both the United States and Canada. Originally set up in 1866, the subsidiary company started producing cement in 1872 and changed its name in 1989. The major cement supplier serves its cement customers in the United States through 13 strategically located cement plants and a strong distribution terminal network. The company produces a variety of products, including gray, white, custom-colored, and slag cement. While the majority of the cement produced is used in the production of ready-mix concrete, it is also used in the manufacturing of precast concrete products, such as pipes and blocks, and in the oil well industry.

As part of the acquisition of another material supplier in 2007, the firm also gained a dense network of sand, gravel, and hard stone production sites in the United States. With facilities located in key markets throughout the country, the material plants serve these markets through an effective logistics network of distribution terminals, railcars, and barges. The 2007 deal also gave the company a strong ready-mix concrete presence in the United States as well as many asphalt production sites. The current plants are shown in table 94.

Table 94. Number of plants by type—major cement firm.

Plant Type	No. of Plants
Cement	13
Grinding	2
Ground granulated blast furnace slag	3
Cement terminals	53
Aggregates	182
Aggregates terminals	12
Ready-mix concrete	128
Asphalt	51

CHAPTER 5. CHALLENGES AND OBSERVATIONS

Challenges and observations associated with this work are discussed in the following sections.

SELECTING APPROPRIATE BID ITEM NUMBERS

It became evident from the beginning that selecting the relevant bid item numbers from the large datasets for each project to match the materials that were analyzed in this study would be challenging. Subsequently evaluating these items against impacts from known mergers or acquisitions also proved cumbersome. Subject-matter experts in estimating, construction, and bid letting assisted in evaluating the data and bid item number selection process. Second, matching these data items with contractor and price information found through State DOT websites and collected data, as well as online from Bid Express, required manual interventions (Bid Express 2021). Disorganization of the data available on Bid Express as well as the variety of data formats provided by State DOTs (ranging from Excel spreadsheets to PDF documents to text files) made the initial data matching difficult and time-consuming.

DESIRED PARAMETER AVAILABILITY

Information not included in the dataset that would have provided additional analysis capabilities included the total number of bidders and the pricing breakdown of other bids compared with the winning bidder's pricing. While these data could be filled in manually using apparent bid data for each letting from the Bid Express internet bidding database, doing so for all the datasets would have had a serious impact on the project's schedule and cost (Bid Express 2021). That being said, access to this larger amount of data would have allowed for a more thorough analysis of the winning bid prices against other competitors and likely a greater level of identification of abnormal pricing of individual bids. Deeper examination into these abnormal bid amounts could have included an analysis of all bid item numbers within the bid, followed by unit price analysis.

INCONSISTENT BID ITEM NUMBER USE

Many State DOTs keep records of historical unit price data for all bid item numbers included in lettings, sorted by date range. These data were requested for States of interest and were relatively easy to obtain and process. Items of interest include granular backfill, aggregate, concrete pavement, and asphalt pavement. These items were selected from the historical unit price datasets for comparison against actual unit prices of those items in bids for a period of corresponding years, as obtained from the data provided through Oman Systems, Inc., and supplemented by research team review of information posted on State DOT websites.

This bid item number use is also complicated by the use of skewed bidding or "penny bids" on items across the dataset. In almost every State the team reviewed, this approach provides for average prices that may be varied across the years without reflecting actual market conditions for that bid item number. Another major challenge associated with this analysis was identifying which combination of contractor and item number would yield data for a majority of the analysis period (2006-2016). There is no initial sorting that allows for identifying contractors using a particular item of interest that is reported in both the Oman Systems, Inc., and State DOT unit price data across most of the 10-yr analysis period. Consequently, time spent may yield

contractors that did not use the items of interest at all or only used them for 1 or 2 yr, and, thus, analysis for that contractor across the whole 10-yr period was not possible.

Finding a contractor that used a particular item that is in the State's unit price data for at least 6 of the 10 yr was time-consuming and was accomplished mostly by pulling information from the dataset and associated check work. Some insights were considered, including identifying very common or popular items, such as PG 58-28 paving grade asphalt binder in Wisconsin, which yielded three contractors who used this item in projects over multiple years in the analysis period. In retrospect, the above-mentioned analysis could potentially be streamlined using a different analysis methodology, such as using an experienced computer program coder to write scripts that could replicate these data sorting and matching processes in much less time, yielding more time for analysis of data trends and individual State case studies.

Two examples of this challenging sorting process are shown in table 95 and table 96: one in which the unit price analysis was successful (yielding at least one contractor that used a particular item for multiple years) and one that was not successful (not yielding any contractors that used the item for more than a few years or for several nonconsecutive years).

The example in table 95 shows an instance in which two conditions exists: an item of interest (item 455.0105 asphaltic material PG 58-28) is included in the unit price data provided by WisDOT, and one contractor used the item of interest in multiple projects over multiple consecutive years in the analysis period of 2006–2016. Thus, analysis yielded the data shown in table 95, including the average, maximum, minimum, and median bid prices for this item for each year. The unit price as reported by WisDOT is also shown. Based on these data, the average bid price of the item is seen to be higher than the unit price for every year except for 2012. Additionally, both the unit price and bid price of the item increased in 2007–2009 and then generally decreased in 2010–2014. Several cases of minimum bidding, however, are evident, as the price fluctuates between $10.00 per ton and $695.00 per ton.

In contrast, the second example in table 96 shows an instance where only one of the conditions exists: an item of interest (item 305.0110 base aggregate ¾-inch) for this project is included in the unit price data provided by WisDOT, but contractors did not use the item of interest in projects across consecutive years. Table 96 shows some price data available for one contractor. As can be seen for 2009 and 2011–2016, no contractors used the item in any projects in Wisconsin. Contractor K used the item in limited projects: one project in 2006 and in 2008 and two projects in 2007 and in 2010. This data limitation makes the identification of any trends in the data difficult to identify and less significant due to low sample size.

Table 95. Unit price versus contract price for firm L—Wisconsin.

Item 455.0105: Asphaltic Material PG 58-28	Unit	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Unit price (dollars)	Ton	215.78	308.56	386.31	295.37	248.39	172.17	165.98	120.71	184.85	NA
Bid prices (dollars)	Average	328.75	371.43	522.44	499.00	355.00	357.50	100.00	335.00	381.25	186.25
	Maximum	425.00	420.00	735.00	513.00	570.00	630.00	100.00	615.00	695.00	625.00
	Minimum	100.00	290.00	130.00	485.00	100.00	100.00	100.00	10.00	100.00	10.00
	Median	352.50	371.00	567.00	499.00	520.00	350.00	100.00	357.50	365.00	55.00

NA = not applicable.

Table 96. Unit price versus contract price for firm K—Wisconsin.

Item 305.0110: Base Aggregate ¾-inch	Unit	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Unit price (dollars)	Ton	8.34	9.79	10.89	11.05	12.52	11.49	11.43	12.54	13.30	14.41
Bid prices (dollars)	Average	8.65	8.98	15.88	NA	15.95	NA	NA	NA	NA	NA
	Maximum	8.65	10.89	15.88	NA	17.95	NA	NA	NA	NA	NA
	Minimum	8.65	6.57	15.88	NA	13.95	NA	NA	NA	NA	NA
	Median	8.65	10.89	15.88	NA	11.49	NA	NA	NA	NA	NA

NA = not applicable.

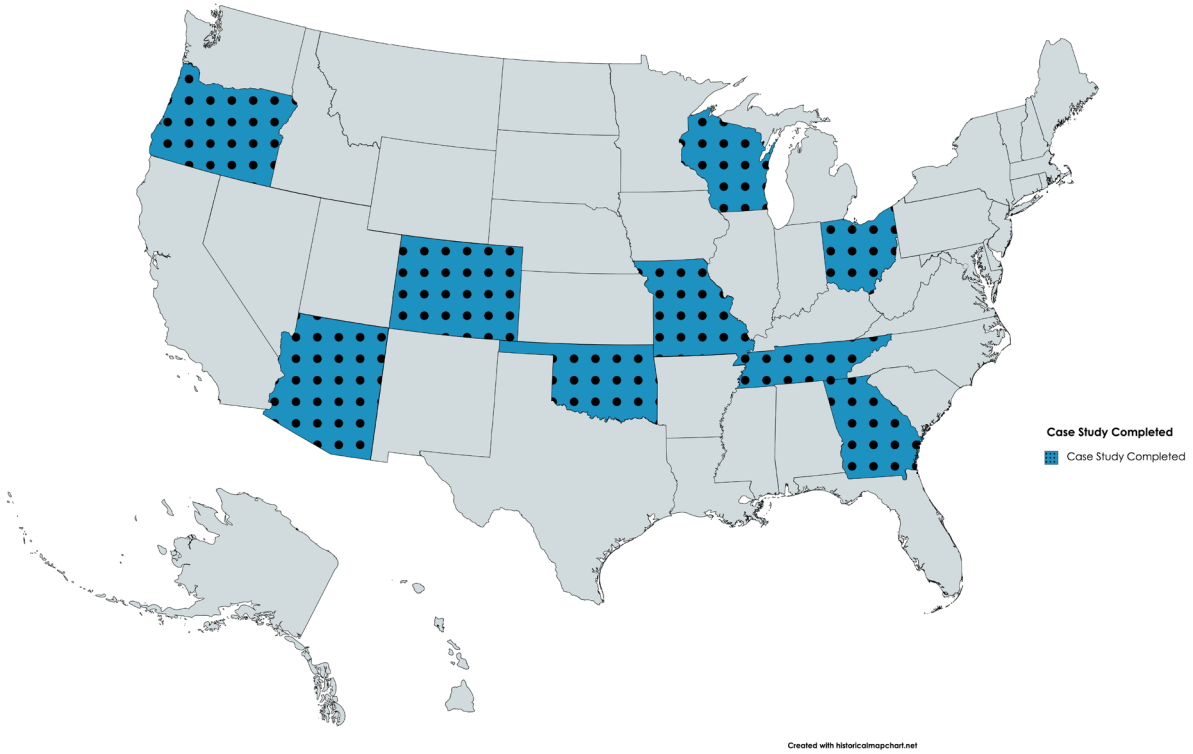
CHAPTER 6. STATE OBSERVATIONS

The research team synthesized findings to provide guidance for State DOTs regarding identifying and assessing M&A activity. Case studies were conducted on nine selected States. Using the data, case law, literature, and case study interview results, a general set of recommended practices was identified.

The information generated from case study results is based on input from case study participants, subject-matter expert observations, literature review, and preferred practices discussed by States.

STATE CASE STUDIES

Additional case studies on selected States were completed to glean further insights on State practices for M&A monitoring, project estimating, and bid letting. Nine States were selected: Arizona, Colorado, Georgia, Missouri, Ohio, Oklahoma, Oregon, Tennessee, and Wisconsin, shown in figure 96. Originally, West Virginia was selected, but declined to participate due to ongoing litigation.



Original map © 2021 MapChart. Modified by FHWA (see Acknowledgments section).

Figure 96. Map. Case study States (Historical MapChart 2022).

The objective was to gain further State-specific information on the state of the practice and gain insights from selected States. The scope included analysis of the market and economic conditions of the local and State transportation region to assess the impact of supply on costs and quality. Case studies were conducted as in-person interviews of representatives from each State and

included questions on prime contractor makeup; M&A activities in the State in aggregate, asphalt, and concrete areas; material supplier information; competition issues or concerns; bidding processes and analysis; unit prices; and general advice or observations.

In general, firm sizes across these States range from small, family owned firms to large, publicly traded firms. While some States noted a decline in the number of firms, the number was generally stable. While limited proactive monitoring of M&A activity is a regular practice in the States, all States reported having some information available to assist. Most States are familiar with providing information for screening when necessary. Some consolidation activity occurred among suppliers in the early 2000s, but there has not been much recent activity. Some issues have arisen due to land use restrictions and zoning, but overall competition appears to be healthy.

Case Study Interview Questions

To address the issues associated with challenges identified in the quantitative analysis, the overall research effort explored several case studies. The questions discussed in these case studies were approved by the FHWA Project Manager/Contracting Officer's Representative and are included in appendix B.

LEGAL ANALYSIS

A desk scan was also completed to review prior merger cases in markets related to the transportation industry. The research team completed a review of State case information and news reports. The goal was to identify issues, antitrust incidents, and related activities. A review was conducted of how the U.S. DOJ and the FTC *Horizontal Merger Guidelines* were applied to these mergers in the highway materials and construction fields (U. S. Department of Justice 2012; U. S. Department of Justice and Federal Trade Commission 2010). Current antitrust and economics literature was also analyzed, including a retrospective merger activity analysis.

The purpose of the legal analysis was to provide resources and documentation for prioritizing possible State and Federal enforcement and monitoring efforts in markets related to highway materials and construction providers. Case law ultimately determines actions taken, and most markets do not have viable spare competitors. Another issue contributing to the impacts of M&A activity is the narrowing of product definitions (such as "aggregate" versus "qualified aggregate"). From case law, some trends were identified. Road-building materials are almost universally regarded as homogenous products, and, accordingly, courts routinely focused on evidence of postmerger control of output capacity when assessing anticompetitive effects.

Similarly, narrow geographies contribute to product costs as well. Product costs may be affected by high transportation costs, barriers to entry, and high sunk costs. No cases were found where the potential entry or creation of a new entity was sufficiently realistic to offset anticompetitive effects. Rather, market entry was only feasible when an established competitor was able to purchase divested assets. Market share can be determined using the HHI by determining individual firms' market shares in the relevant product and geographical market, squaring those shares, and adding them together. This process gives proportionately greater weight to larger market shares, and, in general, an HHI score of greater than 2,500 reflects a highly concentrated market likely to trigger interest from the FTC and the U.S. DOJ. A merger resulting in an

increase in HHI of 100–200 points is also likely to raise competitive concerns sufficient to warrant agency scrutiny. For this study, the research team did not compute market share based on the regional data provided. Individual contractors were identified and assessed by projects won, but individual supplier information was not discussed. Based on the analysis and recommendation of State and subject-matter experts, the researchers believe this to be a potentially useful strategy for States to explore, but it will require additional data.

Price increases accompanied merger outcomes in all cases, regardless of the policy action taken. However, the amount of the increase varied considerably by the type of policy action taken. A Michigan-based researcher found that one merger resulted in an 18.0-percent immediate increase in price, but two other studies found no statistical increase (Duplantis 2010). Additionally, that study found that a 6.0-percent lower price emerged for each doubling in the number of bidders, and 5.6-percent lower prices were found for each doubling in the quantity of asphalt. Conditions that contributed to agency review included an increase in concentration that led to a moderately or highly concentrated market, a market that showed signs of vulnerability to coordinated conduct, and concern that the merger would enhance vulnerability.

IDENTIFYING M&A ACTIVITY AND DETERMINING PROCESSES TO ADDRESS IT

During the course of our data review and the case studies, the team identified specific recommendations and key indicators for States. Two primary steps need to be taken when monitoring the impacts of M&A activity: first, States must identify that the activity is taking place; and, second, they must assess the impacts (if any) this activity is having on pricing, competition, and market share.

A recommended approach and process for States to use would include monitoring proactively, calculating index values, tracking firm information, revising estimation practices, exploring regional differences, tracking bid prices, and exploring unbalanced bids.

Guidance for identification of M&A activity is discussed in the following subsections. Many States reported limited proactive monitoring of M&A activity and reported further investigation only when prices rose dramatically above estimates.

Proactive Monitoring

Learning and documenting are half the battle. Even if no M&A activity has been identified in previous years, States should continually monitor for it via the methods mentioned noted in the individual case studies, with particular notice to Oklahoma. Proactive monitoring allows for more complete datasets and earlier identification of abnormalities in pricing and competition, whether they are related to M&As. Early identification of abnormalities in bidding practices or pricing will allow States to investigate root causes, which may include material shortages or land use restrictions. By monitoring and collecting these data, a more complete dataset can also be created. More complete, standardized, and high-quality data allow for possible future applications in predictive modeling to detect M&A activity and related impacts.

Among the preferred practices that our team identified are close coordination with professional trade associations and assessment of industry health by monitoring company names and certified bidder lists. These two steps allow State agencies to identify market entrants. In many cases,

name changes and ownership changes are synonymous. This monitoring is particularly important in cases with subsidiary or joint ownership activities.

Index Uses

The HHI is a commonly accepted measure of market concentration, regardless of industry. It is calculated by squaring the market share of each firm competing in a market and then summing the resulting numbers. It can range from almost 0 up to 10,000. The U.S. DOJ uses the HHI for evaluating potential merger issues and assigning mitigation techniques. A market (consider aggregates broadly) with an HHI of less than 1,500 is considered to be a competitive marketplace, an HHI of 1,500–2,500 to be a moderately concentrated marketplace, and an HHI of 2,500 or greater to be a highly concentrated marketplace.

The primary disadvantage of the HHI stems from the fact that it is such a simple measure that it fails to take into account the complexities of various markets. For the HHI to be properly used, other factors must be taken into consideration, and markets must be very clearly defined.

The formula for the index is simple to compute and can be shown by calculating market shares. Consider the following hypothetical industry with four total firms:

- Firm 1 market share = 40 percent.
- Firm 2 market share = 30 percent.
- Firm 3 market share = 15 percent.
- Firm 4 market share = 15 percent.

The HHI is calculated as shown (figure 97):

$$HHI = 40^2 + 30^2 + 15^2 + 15^2 = 2{,}950$$

Figure 97. Equation. HHI of hypothetical industry.

While a score of 2,950 shows an already highly concentrated industry (only four firms), a merger between firm 1 and firm 2 would substantially alter the landscape and could warrant additional scrutiny. If the two firms combined, the new HHI index score would be 5,350, and changes greater than 200 points typically justify additional attention.

Estimation Processes

Variation exists in the estimation processes used to generate bid estimates for projects. Neither FHWA nor AASHTO encourages all States to use the same procedures. States that create an in-house estimation team responsible for following the estimation process and generating the estimations can assist in examination of unbalanced bids. This practice allows local expertise to be developed. FHWA (2018) has guidelines in place for preparing engineer estimates, including the following methods: actual cost approach, historic data approach, and the combination approach. These methods can provide an engineering estimate to which to compare bid prices. However, improvement in the estimation of individual components is needed to provide a full picture of pricing before, during, and after M&A activities. Based on the case studies, the

research team found that estimators use historical price information as the starting point for making their estimates. This practice provides for limited ability to reassess based on current market conditions.

The cost approach method considers factors related to actual performance of the work, including cost of labor, equipment, and materials; production rates; and profit. Historical data methods are less preferred as they provide a more lagging measure of prices; however, these methods are less time-consuming to develop, as long as competitive bid prices are used to build the estimates. When M&A activity is viewed, material cost is an item potentially most vulnerable to changes. Regular tracking of material costs by State DOTs can improve the accuracy of these estimates, especially when the actual cost approach for generation is used.

Recently, some State DOTs have developed risk-based estimating methods to account for many of the uncertainties in the project delivery and contracting processes. Chapter 5 of AASHTO's *Practical Guide to Cost Estimating* provides an overview of these procedures (AASHTO 2013).

Tracking Firm Information

It is vital for States to understand the makeup of firms bidding on projects. Many States reported having consistent pools of firms bidding on projects across years. Tracking firm names over time can aid in identifying merger activity. In addition to firm names and size, understanding where contractors are located, what their specializations are, and what projects they work on can help States identify competition issues. Use of project software such as AASHTOWare® Project SiteManager™ or something similar can also allow States to track project status over the project lifetime and evaluate contractor performance (AASHTO 2021).

Regional Monitoring

Many States are divided in regions or districts for DOT purposes. Each region may have its own unique struggles or challenges with, e.g., competition or material sourcing. For States with very diverse regions or districts, monitoring can be broken up into regional offices, where each region creates a team responsible for M&A monitoring and tracking.

Unbalanced Bid Analysis

A key indicator of M&A activity impacts includes abnormal pricing during bidding. Some States reported already using unbalanced bid analysis. FHWA's regulatory policy for Award of Contract and Concurrence in Award requires States to examine the unit bid prices of the apparent low bid for reasonable conformance with the engineer's estimated prices (Code of Federal Regulations 2020). A bid with extreme variations from the engineer's estimate, or where obvious unbalancing of unit prices has occurred, must be evaluated. Where obvious unbalanced bid item numbers exist, the State's decision to award or reject a bid must be supported by written justification.

Tracking Cost Indexes

Construction cost indexes are a useful tool for tracking trends of prices over time and comparing these trends with those seen in bid pricing. Most construction indexes use cost of inputs,

including labor, material, and equipment, when developing the data. The cost indexes can measure price movement for key objects over time or by location. By tracking cost indexes for key materials (Wisconsin, e.g., tracks 100 items), usually common bid item numbers, a State can identify more easily if a bid price change is due to M&A activity or other sources.

DIMINISHING NEGATIVE IMPACTS OF M&A ACTIVITY

Not all M&A activity has negative impacts on a market. After identifying that activity exists, it is equally important to use a clear and systematic process for assessing the impacts of this activity to determine whether the effects are negative. During the case studies, several States observed that associations or agencies such as AASHTO and other trade associations were a reliable source of information on M&A tracking and impacts. In addition, agency oversight of State data and activity can allow for merger effects to be identified throughout the United States. The limited geographic bounds of State construction activities make most State DOT construction activities less transparent to neighboring States.

Bid Analysis

If a State has identified M&A activity as the source of bidding, pricing, or competition issues, several key steps can be taken. First, the State should complete an analysis of any bids identified as unbalanced. Identifying abnormalities in bid pricing not caused by material shortages can allow the State to better understand factors driving the price up (or down). Part of this price analysis should include collaboration and comparison with neighboring States. The steps in the following subsections also assist in rectifying noncompetitive landscapes.

Increasing Competition

Second, on completion of the bid analysis, the State should work to identify which areas of the State or which projects are affected (e.g., all projects involving aggregates, all projects in the southeast region). This step will identify where the competition issues are experienced. If an area is identified as having minimal bidders or suppliers, four main options should be considered to mitigate these impacts:

- Control material supplies at the State or agency level.
- Bid smaller lettings more often.
- Utilize project bundling.
- Utilize alternative contracting methods (ACMs).

If a pricing concern leads to identification of an area with minimal bidders and suppliers due to recent M&A activity, the State could consider providing publicly owned or State-controlled sources for those project materials. This practice can also be beneficial in areas where zoning restrictions or urban settings have limited competition for certain materials.

Areas with minimal bidders can also be aided by bidding projects more often (weekly or biweekly) instead of monthly, such as to provide more bidders by allowing more companies to bid a higher number of proposals in these smaller lettings. Holding more frequent lettings allows the frequency of awards to be increased, thus allowing more bidders to maintain their bonding

capacity to bid on more projects and increase overall competition. Breaking projects apart into smaller projects can increase the number of bidders for cases in which a low number of bids are received on larger projects. During the case study interviews, Oregon reported having success utilizing this method.

Project Bundling and ACM

Project bundling is another method States can use to increase competition in an area with minimal competition or bidding by incentivizing contractors to move into an area in which they may not currently work. Bundling projects together from different geographical regions allows for competition on a combined bid package as opposed to bidding on a smaller project where M&A activity has created geographical market share issues. Bundling can also occur at the bid item number level within a project to increase competition on individual bid item numbers. This option is useful if past bidding analysis has identified limited bidders on particular bid item numbers. Competition can also be increased by using ACMs. Additional work sponsored by FHWA is providing guidance in these areas (FHWA 2022). National Highway Institute training is also under development to support ACMs and project bundling.

In certain situations, project bundling could potentially limit competition by removing the ability of smaller contractors to deliver projects when more are added to the mix. This potential needs to be considered further.

APPENDIX A. ANALYSIS OF MATERIAL SOURCE M&As ON PROJECT DELIVERY QUALITY AND COSTS—LITERATURE AND MARKET REVIEW SUMMARY

INTRODUCTION

In this task, the team completed a review of recent guidance, research, and after-action reports on M&As within the construction materials industry. The research effort focused on identifying and synthesizing the scope, specific industry segments, policy, processes, and regulatory information to determine the challenges and influences these consolidations have.

MATERIAL COSTS

Within the world of construction, cost of materials and operations can be affected by many factors, including land availability, design constraints, materials and required equipment availability, and overhead. Site-specific factors such as climate, soil types, grade, and local regulations may also affect the types of materials used. The prices of various construction materials (e.g., asphalt, concrete, backfill, and aggregate) may vary from region to region as well as throughout and across years. The Associated General Contractors of America has worked extensively to compile construction price and cost indexes from data acquired from the U.S. Bureau of Labor Statistics (Associated General Contractors of America 2022). While costs of processed goods such as concrete block, ready-mix concrete, and precast concrete saw yearly increases, this trend was predicted to continue into 2017 with a 2- to 3-percent increase in overall construction costs (Cavalcante 2016).

Additionally, construction company M&As may affect material pricing, especially if the activity results in one company controlling a majority of projects within a particular State. M&A is a term that broadly describes a consolidation of companies or assets. Mergers take place when two or more firms combine to form a single entity, often run by a single management team. In merger activity, shareholders of smaller entities are able to increase overall net worth through the merge. Additionally, mergers tend to save on costs usually associated with acquisitions due to the lack of asset purchasing. In contrast, acquisitions occur when a company purchases significant amounts of another company's assets, usually for the purpose of restructuring the acquired company (Sassine 2004). Horizontal M&As are of particular interest for this study, as they involve M&A activity by firms operating in the same industry—in this case, construction. Vertical M&A activity is also of interest, as it involves merging with, or acquisition of, a supplier or customer company (Sassine 2004). Conglomerates, consolidations, and sell-offs also occur in the construction industry, with conglomerate M&A activity occurring the most. Construction firms looking to reduce dependence on some unstable source of revenue may choose to merge with or acquire companies in different sectors (Sassine 2004).

While many factors drive M&A activity, geographical expansion and competition consolidation are large driving forces behind many construction M&As and are areas where analysis is needed to determine whether these M&A activities are affecting prices.

Within the construction industry, M&As may affect material pricing as well as total project costs of winning bids. Similarly, market trends may also impact mergers. One such example is the M&A activity within the U.S. domestic airline industry. Passenger demand for airline travel

fluctuates depending on factors such as the economy and national events (Jackson 2015). Several airline M&A activities occurred in response to this changing market environment in an effort to improve competitive positioning. As a result, fewer but larger airlines exist in a monopoly-like structure.

Research regarding airline M&A activity indicates that it has measurable effects that are reflected in stock prices and market power (Jackson 2015). Anecdotal evidence gathered from various States revealed that some State DOTs are concerned that M&A activity has raised bid prices and reduced competition. This concern is particularly true in States where one or more larger entities purchase several smaller entities, resulting in these few, larger entities having a majority of the market share.

Data also suggest that low market valuation can make a firm or entity a target for M&A activity. Investigation of this phenomenon, sometimes referred to as the "trigger effect," has shown that decreases in valuation can lead to up to a 7-percent increase in the likelihood of an acquisition occurring (Edmans, Goldstein, and Jiang 2012). According to the Edmans article, these decreases in valuation are attributable to a variety of factors, including mispricing, mismanagement, or existing monopolization of a market by other entities, particularly if the entity of interest is relatively new or small. Acquiring firms may also experience poor postmerger returns, especially in the case of firms that acquire smaller targets (Franks, Harris, and Titman 1991). Similarly, regarding the effects of M&A activity on shareholders, data support the conclusion that the size of the acquisition affects market returns (Choi and Russell 2004).

Construction growth increased in 2015, and this trend continued into 2016. Additionally, M&A activity reached record levels in 2015 across the United States and was expected to continue to grow (Cavalcante 2016). With regard to merger activity, the U.S. DOJ and FTC stipulate that merger activity should not create or enhance market power, which often occurs if a merger results in price increases, product output reduction, or diminished innovation, or brings undue harm to customers (U.S. Department of Justice and Federal Trade Commission 2010). The elimination of competition between merging parties may also result in a shift in market power, adverse effects such as the elimination of competition, or the increase in the risk of coordination among rival entities.

CASE STUDIES

One case study involving merger activity in the asphalt industry in Michigan examined the price effects resulting from the acquisition of three firms in the Michigan asphalt market by a larger firm between 1999 and 2001 (Duplantis 2010). Of the three mergers, one in the Kalamazoo area had the most significant impact on pricing of asphalt in the market. Based on available Michigan bidding data, that merger was estimated to have raised prices by almost 18 percent in the Kalamazoo, MI, area within the 2-yr period following the merger (Duplantis 2010). In comparison, the other two mergers did not yield statistically significant differences in pricing following those merger activities.

Geographic factors also come into consideration in the analysis of M&A activity on material prices. As some materials are limited in how far they can be transported from their origin plant, the distance of plants may hinder a firm's ability to be involved in a certain project. After the

three aforementioned mergers in Michigan, one firm owned or operated six asphalt plants in five counties in southern Michigan. Considering the geographic variables in the price effects, along with the dollar values for both total project costs and asphalt used in the respective project, the HHI can estimate market concentration based on the comparative size distribution of firms. An HHI will be close to zero in a market that contains a large number of relatively equal size firms. The maximum value for an HHI is 10,000 and occurs when a single firm controls a market (U. S. Department of Justice and Federal Trade Commission 2010).

In the Michigan case where there was limited impact, a merger resulted in a change in HHI of only 250. In contrast, the change in HHI resulting from another detailed merger was greater than 1,700, indicating a large increase in material prices following the merger (Duplantis 2010). The DOJ and FTC place a large weight on postmerger price increases, which they consider to be adverse effects for customers. Thus, a merger with indications of price increases are examined to determine if the merger will result in anticompetitive effects (U. S. Department of Justice and Federal Trade Commission 2010).

Relative market shares and concentration in the market before and after merger activity are also of great interest. Any M&A activity within a market that results in a large increase in concentration in the market can be presumed to enhance the market power. Post-M&A effects may also include share price increases within 1–4 yr after the M&A activity (Carrillo 2001). Data suggested that construction spending in the United States was expected to increase between 2017 and 2020, despite a slight decreasing trend in December 2016 that was likely due to abnormally high spending in the prior month (Baker Tilly Capital 2017).

Analysis of 202 construction projects involving key materials of interest (asphalt, concrete, aggregate, backfill, and sealant) in Wisconsin in 2016 revealed that, of these 202 projects, which occurred in 56 counties, 49 firms were winning bidders. However, more than 58 percent of the total projects were won by just 11 of the 49 firms involved. Additionally, 2 of the 11 firms were operating as divisions of a single firm along with two divisionary firms. These two diversionary firms won 5 percent of the total projects.

WisDOT divides the State into five distinct regions, as noted in figure 5. Of the 11 firms controlling over half of the market, all 5 regions are represented, with some firms having a strong presence in multiple regions. One firm, which won 5 percent of the total projects analyzed in 2016, has a presence in the north central, northeast, and southwest regions. Additionally, while these 11 firms had winning bids on 8–17 projects, the remaining 38 firms only had winning bids on, at a maximum, 6 projects, with the average being 2.2 winning project bids per firm. This apparent geographic control of the State by a small number of firms suggests that market shares may be affected.

One case study in Hawaii involving M&A activity that resulted in a similar market share occurred in 1985 involved a concrete industry consolidation of three firms (Schumann, Rogers, and Reitzes 1992). The State of Hawaii already experienced difficulties in the local cement market, as many buyers at the time chose to purchase cement from foreign suppliers due to the relatively low cost to ship cement products via water compared with land. In this case, the merger was not challenged, despite the creation of a monopoly in the cement industry of Hawaii (Schumann, Rogers, and Reitzes 1992). Following this merger, cement prices fell and then

remained below the premerger levels; however, imports of cement increased substantially after 1982 and continued at higher levels postmerger as well. The consolidation of cement entities in Hawaii resulted in lower prices, while the high level of imported cement products prevented the consolidated firm from monopolizing the market in Hawaii (Schumann, Rogers, and Reitzes 1992).

METHODS OF ANALYSIS

To assess the potential effects of merger activity on market prices and market shares, an assessment of the market structure is required. Most markets are not a perfect monopoly, nor do they contain firms in perfect competition (Schumann, Rogers, and Reitzes 1992). Additionally, when a firm does raise prices, the reactions of the rivals of that firm have a significant impact on whether customers switch to other producers after the price increase. Due to the complex nature of market definition and subsequent price effects, the analysis of these price effects tends to be equally complex.

When methods of analysis on these price trends following M&A activity are considered, statistical modeling can assist in revealing revenue yields based on demand, costs, and market concentration characteristics (Schumann, Rogers, and Reitzes 1992). In the studies examined by the FTC, a reduced-form price equation was developed for each industry without consideration of market concentration in favor of separating effects of discrete events such as M&A activity. In the case of the Hawaii merger and the subsequent effects on the market structure and pricing, limited data availability required multiple assumptions to be made during the modeling process (Schumann, Rogers, and Reitzes 1992). When data availability is limited, modeling constraints become more restrictive, and often the assumptions lead the model results to the conclusion that production is not affected by merger activity. Although this may not be unreasonable, more precise estimates with greater inclusivity of relevant information are ideal.

Despite the isolation of specific M&A activities, the geographic market structure should come into play. Often, the geographic location of a firm or producer is an important factor in the determination of the effects of M&A activity on prices. Some products, such as asphalt, are limited by how far they can be transported due to temperature constraints. Other products may have similar constraints based on the cost of transportation. Thus, M&A activity that significantly alters a market concentration of a specific geographic location can affect market behavior and prices significantly (Choi and Russell 2004).

A similar consideration is the use of weighted average cost indexes when doing a statewide or multistate analysis. Weighted average cost indexes allow the analysis to better exclude price changes caused by underlying differences in the costs of various products and materials. Cost differences are likely preexisting and not caused or affected by M&A activity and, thus, are not the object of analysis. Furthermore, the price changes due to or following M&A activity may not become apparent or statistically significant until 2–5 yr following a merger (Duplantis 2010).

Some States use visualizations of data created in ArcGIS® regarding producer and supplier plant locations with the State, aggregated by type—aggregate (red), HMA (green), precast (purple), prestressed (blue), and ready mix (orange) (Esri™ 2019). Clicking on a dot gives the user the active plant's name, type of plant, identification number, region code, latitude and longitude, and

the address. The use of this visualization across multiple years, as well as year to year, assists in understanding the potential effects and repercussions of M&A activity in a given State. The number of active plants, as well as their locations and the type of supplies produced, can aid in the analysis of market control and regional availability of products.

DATA AVAILABILITY

Bid price data for most States are available through public websites and often include current as well as historical bid tabs. Some States also post their bid tab information on commercial bidding services sites, whereas others may archive their own bid tab data and may be willing to provide the data for analysis. AASHTO member State data can also be of use, as AASHTO has existing datasets built into its project estimating software (AASHTOWare Project™ Estimation) that can be analyzed to extract pertinent information as needed (AASHTO 2021). States may have electronic data, including total bid prices and pay item bid prices, aggregated by project level or State/county levels, whereas other States may not have any of these data readily available. FHWA also stores some bid tab information to use to calculate the National Highway CCI, which includes State-by-State item prices by quarter for various construction projects (FHWA 2021b).

DATABASE COMPILATION

The research team prepared data analyses on 31 States, as presented in the original proposal. Price averages per year for each category for each State were identified. This procedure showed which States and which years had prices outside of 1 or 2 standard deviations, or if any outliers were presented. Complete information was compiled in an Excel format for each State.

With the cooperation of individual State data holders, requests were made to access information on ownership and on asphalt and material plant and pit locations on a State-by-State basis. These data, provided by the individual States to the DOJ under a screening tool (U.S. Department of Justice 2015) were used to complement potential market and price variations identified in the completed dataset for the 30 States.

An option exists to expand the data collection effort to all 52 jurisdictions recognized in the Federal system. The database expansion will allow for more details that are unavailable in the smaller sampling of States.

APPENDIX B. CASE STUDY INTERVIEW QUESTIONS

The interview questions used for the case studies (appendix C) that were conducted on nine selected States are as follows.

GENERAL

1. State interviewed.
2. Name of interviewer.
3. Name of person(s) interviewed.
4. Date of interview.

PRIME CONTRACTOR MAKEUP

5. What is your general makeup of prime contractors? Do you have lists or compilations of those firms?

6. How many firms are prequalified to bid in the functional areas that prequalified are given ratings in? Do you analyze changes in these numbers over the years?

7. Do prime contractors tend to specialize in functional areas in your State and use a lot of subcontractors, or do they perform multiple functions themselves? Has this changed over the years?

8. Do prime contractors tend to use the same subcontractors over time?

9. How often do "subs" also bid as "primes" on the same jobs?

M&A ACTIVITIES

10. Do you monitor the M&A activity in your State in regard to companies that provide aggregates, asphalt, and concrete to your projects? Please describe in detail.

11. Have you noticed any trends or correlation between these M&As and changes in the number of bidders or changes in annual average unit prices or individual project bid prices?

12. Has any agency (State, FHWA, DOJ, etc.) studied M&As in your State, and if so did they report out findings to you?

13. Has there been discussion or actions in your State to remedy or limit the effects of M&A activities on competition and bid pricing?

14. Where do you believe the responsibility for regularly reviewing M&A activity and its influences on bid pricing should rest?

MATERIAL SUPPLIERS

15. Describe how aggregates, asphalt, and concrete materials are obtained by prime contractors to be incorporated into State DOT Projects? Do primes supply a lot of their own materials for the projects they are awarded, or do they rely on outside independent suppliers for these materials?

16. Has this material supply changed significantly over the last 10 yr? If so, have you noticed any changes in the related individual project bid prices or annual average unit prices for the items that incorporate these materials supplied?

17. Were there any shortages of materials during this time that may have affected bid prices?

COMPETITION ISSUES AND CONCERNS

18. Are there other issues that concern your State about competition relating to these materials such as local zoning decisions and/or strategic real estate acquisitions?

19. Have you had any suspensions or debarments in your State relating to the bidding and/or securing materials for the supply of aggregates, asphalt, and concrete incorporated into your projects?

20. Where there any changes in the economy locally, nationally, or worldwide that affected your bids?

BIDDING PROCESS

21. Do you have a bid manual that describes in detail the process you use for bidding your State DOT roadway and bridge projects, including information below? Could you share it with us?

22. Do you have urban or rural areas that need to be considered separately?

23. How difficult is it to obtain aggregate and other inputs in any of these areas?

BID ANALYSIS

24. Do you have a systematic/electronic/software process to evaluate bids prior to award? If so, could you share this tool/guidelines with us?

25. Do you have an unbalanced bid analysis process?

26. What's your percent of single bids? Has it changed over the years?

27. Do you keep track of the number of bids per proposal and analyze that data for trends over time?

28. What are your major bid item numbers for asphalt, aggregate, and concrete? Can you sort the largest bidders in each of these items by firm and by year?

29. What is your first step if you notice a bid item number seems out of alignment?

30. Have you ever encountered complementary bidding? If so, what was your response to this?

AVERAGE UNIT PRICES

31. Do you calculate and publish statewide average unit prices annually for each component of a job? Do you have this data for the past 5–8 yr?

32. Do you have statewide historical bid data from the past 5–8 yr?

33. Do you analyze this data year over year and for extended periods to identify trends in bid pricing and note significant changes in bid pricing over time?

34. If you note significant changes, do you research these changes and try and determine root causes?

OTHER

35. What else can you tell us about things that are occurring in your State that can help us understand a potential correlation between M&As and changes in competition, market share, and bid pricing?

36. Do you have any studies or reports of this nature that you could share with us or describe to us (if they're confidential in nature)?

37. Are you aware of any DOT lawsuits with firms doing business in these bid item numbers?

38. Have you received complaints about anticompetitive bidding? Mergers or acquisitions?

39. Has your State through any body, DOT, State AG, USDOJ Antitrust Division, investigated or brought a possible enforcement action?

40. Are you aware of any reported decisions in your State about these things?

41. What advice do you have for States who are looking into these issues?

APPENDIX C. CASE STUDIES

CASE STUDIES OVERVIEW

This research project helped develop an understanding of the ways in which transportation construction industry mergers, acquisitions, or other consolidations impact the cost and quality of highway construction. The research project examined current conditions, barriers, and program issues related to competition in the highway material supply industry and used this information to create recommendations for appropriate changes and monitoring actions in public agency policy and administration. This research project investigated the challenges, costs, and risks associated with mergers, acquisitions, and other consolidations that impact material supply related to highway construction and maintenance. The scope of the research project involved collecting, organizing, and analyzing data from various regional and local transportation agencies and other data sources within the United States. The goal was to gain State-specific information on the state of the practice and to gather insights from selected States through a series of case studies. The effort also included the analysis of market and economic conditions of the State transportation region to assess the impact of supply costs and quality.

ARIZONA

Case Study Background

The research team reviewed documentation in advance pertaining to ADOT bidding and letting processes and conducted a site visit in November 2018. Participants included the State construction engineer, the assistant State construction engineer, and the deputy State engineer for statewide operations in the Infrastructure Delivery and Operations Division. Resident engineers in the southeast and north central districts provided supplemental information. The Arizona AZ UTRACS Registration is a business registration required for all firms that wish to work on federally funded transportation projects in Arizona (ADOT 2022). This registration is required for prime contractors, prime consultants, subcontractors, subconsultants, disadvantaged business enterprises (DBEs), and small-business concerns. All contractors must register with the site to be included on a bidder's list.

The ADOT Roadway Design Section prepares roadway technical design and construction documents for projects as well as technical expertise and design information during the design development and construction phases. ADOT roadway review supports delivery by reviewing scoping documents, permits, plans, specifications, and estimates to ensure they are constructible, cost-effective, and in compliance with the appropriate policies, standards, and procedures. All ADOT project development efforts incorporate project objective and need statements that document the performance objectives for the project and address practical design methodology that results in the most cost-effective design solution meeting the project objectives. ADOT generally encourages a DBE participation level of approximately 4–6 percent. In many cases, the actual DBE participation rate is 8–11 percent.

Most large contractors in the south central region own their own quarries and asphalt plants. The medium-sized contractors rely on the commercial plants in the area that operate independently. Most large and small prime contractors depend on commercial batching plants. In the southeast

and southwest regions, few prime contractors own their own quarries or plants, and few additions to quarries or asphalt plants have been added in the past several years. No shortages have been reported in recent years, even with increases in project development.

ADOT regularly tracks bid unit price item histories and publishes searchable information on its Estimated Engineering Construction Cost website (ADOT n.d.a.). This system is also their primary system for estimating costs. ADOT did note that several industry mergers have occurred in the Flagstaff region that influence the northern regions. These mergers resulted in the discontinuation of a supply of ground tire rubber by weight of total binder. The "new" suppliers have created some uncertainty in the markets according to ADOT representatives. ADOT is monitoring these recent acquisitions.

ADOT has reported typical price increases consistent with market fluctuations. In the northern region, the price of asphalt binder has been greater than the price of other materials. No specific studies of the acquisitions have been made to date. However, a current research study is underway that is looking at the costs of the 10 largest State projects and identifying individual differences in particular bid item numbers.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[1] Projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by State region to assess any geographical influences on awarded projects. Within the materials of interest, aggregates are the area where Arizona has seen the most acquisition activity, with companies purchasing sources or exclusive rights to control supply in certain geographic areas. However, none of this activity caused ADOT to look more deeply into it. Limited aggregate sources in the north central region of the State near Flagstaff, as well as disruptions in aggregate availability, have been experienced due to issues pertaining to the lease agreements with the Bureau of Land Management regarding selling aggregate. Despite these supply disruptions, no direct effects on pricing have been observed.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, and specifically for these items:

- Aggregate base class 1 (ADOT bid item No. 3030021).
- Aggregate base class 2 (ADOT bid item No. 3030022).
- Aggregate base class 3 (ADOT bid item No. 3030023).

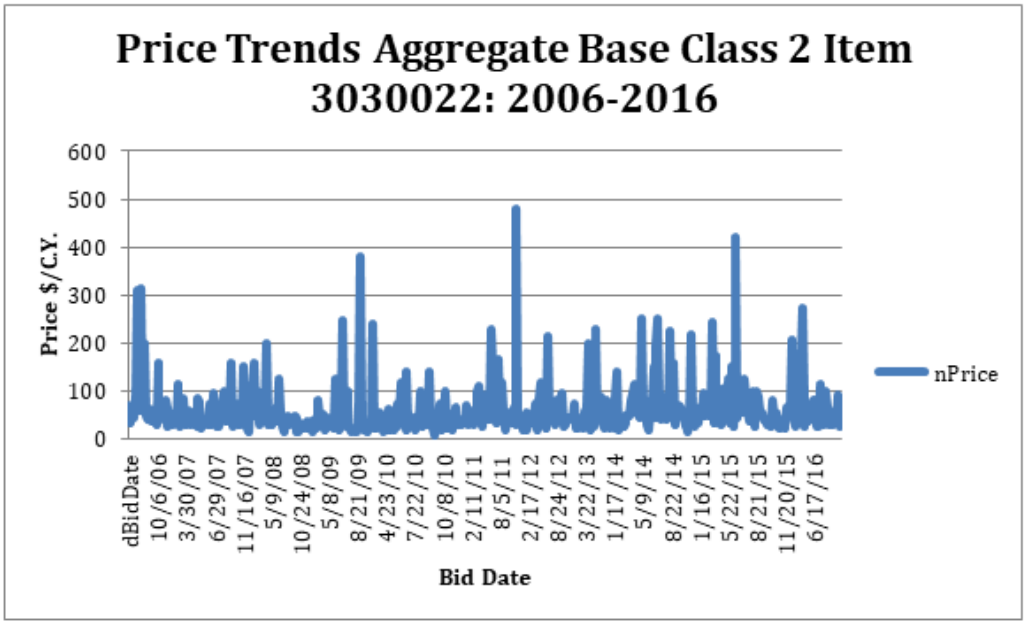
[1]Data were mined by Oman Systems, Inc., and from State DOT bid prices posted on State websites or collected directly from State transportation agency sources.

- Aggregate subbase class 4 (ADOT bid item No. 3030024).
- Aggregate subbase class 5 (ADOT bid item No. 3030025).
- Aggregate subbase class 6 (ADOT bid item No. 3030026).
- Asphaltic concrete, ¾-inch mix end product (ADOT bid item No. 4160002).
- Asphaltic concrete, ¾-inch mix (ADOT bid item No. 4060006).
- Asphaltic concrete, ½-inch mix special mix (ADOT bid item No. 4060015).
- Asphaltic concrete, ½-inch mix end product (ADOT bid item No. 4160001).
- Asphaltic concrete, ¾-inch mix end product special mix (ADOT bid item No. 4160004).
- Asphaltic concrete, 3/8-inch mix (ADOT bid item No. 406001).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects for which the item was in use, whereas others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Aggregate Base Class 2

The price trends for aggregate base class 2 (item No. 3030022) were analyzed for the analysis period. This item appeared 474 times during the analysis period; the minimum observed price was $9.00/CY, and the maximum observed price $480.00/CY, with a mean price of $60.59/CY and a median price of $43.07/CY. The standard deviation in price was $56.20/CY. Figure 98 shows the price trends for aggregate base class 2.



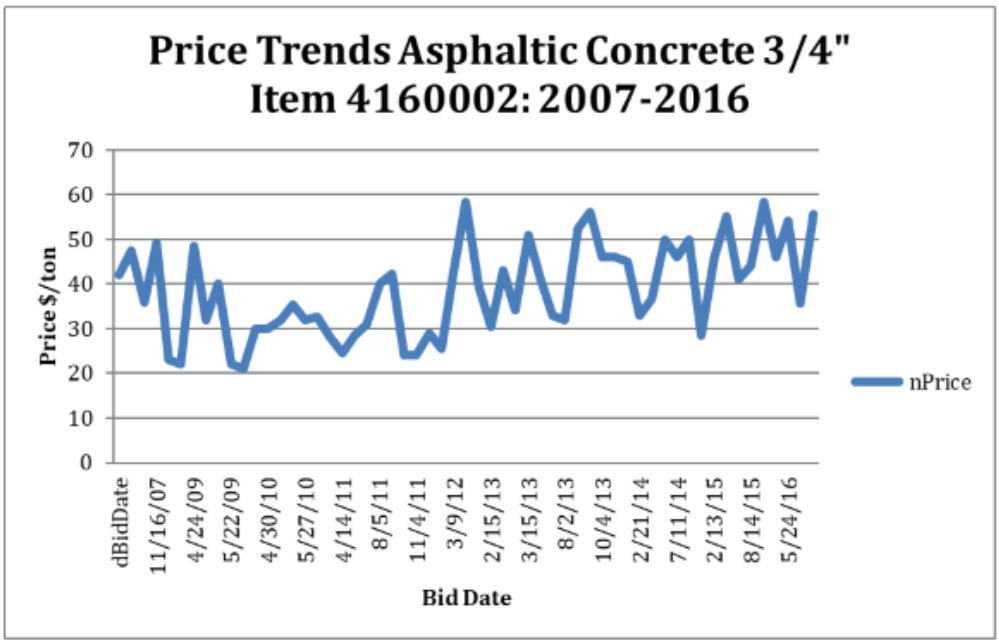
Source FHWA.

Figure 98. Graph. Price trends—aggregate base class 2.

As can be seen in figure 98, several price spikes occur during the analysis period. On 9/25/2009 a price of $381.00/CY was observed on project No. 2006076. The maximum price of $480.00/CY was observed on 10/28/2011 on project No. 2010125. Lastly, on 6/19/2015, a price of $421.00/CY was observed on project No. 2015027.

Asphaltic Concrete ¾-inch Mix

The price trends for asphaltic concrete ¾-inch mix (end product) (item No. 4160002) were analyzed for the analysis period. This item appeared 57 times during the analysis period; the minimum observed price was $21.00/ton, and the maximum observed price was $58.30/ton with a mean price of $38.63/ton and a median price of $39.25/ton. The standard deviation in price was $10.43/ton, which is relatively small. Figure 99 shows the price trends for the analysis period.



Source FHWA.

Figure 99. Graph. Price trends—asphaltic concrete ¾-inch mix.

As can be seen in figure 99, all price deviations for this item were relatively small during the analysis period, although a slight increase seems to have occurred in overall prices from 2011 to 2016.

In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, no apparent link to merger/acquisition activity was evident in that area.

Qualitative Analysis

Bidding Process and Analysis

ADOT publishes a *Preparing the Bid and Other Bid Requirements Guidebook* to encourage openness in its bidding process (ADOT n.d.b.). The guide emphasizes unit pricing and references

searchable historical price index published by ADOT, which includes pricing for all bid item numbers.

ADOT regularly compares bid item number prices with Colorado, New Mexico, and Nevada. Asphalt binder shortages in New Jersey and Wisconsin have influenced pricing in Arizona. Arizona has approximately 140 active projects, which include roughly 20–30 percent of the projects being completed at the local level (managed by ADOT). Projects in the Maricopa Association of Governments and Pima Association of Governments regions generally have higher unit prices, but review processes are the same.

Healthy competition exists for projects. A project with fewer than four bids is rare, although ADOT reported some recent cases where only a single bid was received. In each case, the bid was given additional scrutiny and was awarded. ADOT undertakes a complete bid item analysis if the bid is outside of the engineer's estimates by 15 percent. All estimates are based on historical costs. If the costs of a bid are close to or near the historical costs, additional scrutiny is not provided by ADOT personnel. Most contractors use their own sources for aggregates, asphalt, and concrete materials. Steel prices and concrete prices have been increasing, generally associated with fuel costs. Costs of trucking have substantially increased.

Bid tabs are considered confidential until a job is awarded and then become public information. After award, a copy is sent to each bidder on the project. This process helps keep the entire contractor community informed. With the reliance on historical costs, the engineering estimates are also regularly reviewed to ensure few surprises occur in bid pricing.

M&A Activity

While no formal monitoring of M&A activity in the State has been completed, several recent consolidations and mergers have occurred. These consolidations and mergers have been more evident in the northern part of the State and have influenced the availability of certain materials, although cost information is not evident. ADOT will continue to monitor the activity anecdotally. The influence on costs is not yet available. Labor costs are increasing but not as quickly as right-of-way acquisition costs, making new roadway alignments more challenging for ADOT's overall development process. The growth of the State has required substantial new investments in capacity expansion projects.

Interviewer Observations

ADOT was able to provide a good industry snapshot and economic condition assessment and regularly engages with the contractor community through trade associations. The construction materials industry in Arizona is healthy, with strong bid participation across the State. ADOT regularly monitors bid item number prices and the impact on supply of certain binders and materials following the acquisition of smaller firms. They recommend strong public outreach to explain costs of projects as well as the time frame for project completions.

A more formalized and documented analysis of M&A activity would be important for the State. Engineering estimates rely exclusively on historical costs and, as such, provide limited opportunities to capture influences of the changes over time. Since the recent M&A activity is

still too recent to be reflective in a long-term trend, the research team recommends regular documenting of the bids emerging from these items.

Summary

The objective of this case study was to quantify how construction industry mergers, acquisitions, or other consolidations are impacting the cost and quality of highway construction in the State of Arizona. ADOT regularly tracks bid unit price item histories and publishes searchable information, which is also the primary system used for estimating costs. ADOT did note that several industry mergers have occurred in the Flagstaff region that influence the northern regions. These mergers resulted in the discontinuation of a supply of ground tire rubber by weight of total binder. The "new" suppliers have created some uncertainty in the markets according to ADOT representatives. ADOT is monitoring these recent acquisitions.

Overall, no significant price deviations were observed from the bid data during the analysis period, and ADOT has reported typical price increases consistent with market fluctuations. In the northern region, the price of asphalt binder has been greater than the price of other materials. No specific studies of the acquisitions have been made to date.

COLORADO

Case Study Background

The research team reviewed documentation in advance pertaining to CDOT's bidding and letting processes and conducted a site visit in December 2018. Participants included the State materials engineer, the contracts manager for the engineering support group, project estimators, and the State contracts and markets analyst. Colorado's various regions exhibit substantial differences in geology and geotechnical characteristics, and the Rocky Mountains divide up the various regions: the Front Range contains regions 1, 2, and 4 and covers a corridor running roughly along I–25, the Western Slope contains region 3, and the Central Mountains contain region 5. There are some counties that cross the three general geographic divisions. CDOT has 297 prequalified contractors in its database in a record that is available online (CDOT 2022b). The State holds lettings every Thursday, and responses are generally strong, with at least three bids on nearly all projects. Occasionally, projects in remote regions have fewer than three bidders engaged. The industry is regularly assessed by both State and trade association representatives with a healthy mix of large and small firms.

CDOT's Construction Contracts Team website includes documentation of rules and works through annual renewal processes (CDOT 2022a). Most firms are family owned, with a few publicly traded national firms that have a local presence. As with most States, many specialty firms regularly submit bids only on particular projects, with regional bidding evident in the Western Slope and Front Range regions. Many of the same smaller subcontractor firms appear on multiple teams during the bidding, if there is a specialty service. This situation is regularly monitored for any impact on pricing. In the Western Slope region, suppliers of aggregates are limited. With a limited number of aggregate quarries, several instances have occurred where access issues have raised prices. In the Front Range region, many quarries are available, so there

are fewer issues. In the past, Colorado owned many of its own quarries to help alleviate the concerns in the Western Slope region.

CODOT reported that most contractors use their own sources for aggregates, asphalt, and concrete materials, but they do lease materials as well when necessary. Approximately 70 percent of the contractors have their own quarries and coordinate work in that manner. Over the last 10 yr, material supplies have been challenged by issues associated with land use pressure and local resistance to opening new aggregate quarries. CDOT indicated that its contractor community makes extensive use of mobile asphalt plants. Polymer shortages in 2008–2009 substantially increased prices in some mix designs that resulted in higher bid prices. CODOT noted some fly ash shortages have also occurred since it was included in more mix designs. Three cement producers serve most of the State, but concrete projects account for only 5 percent of all projects statewide. Concrete suppliers vary considerably across the State and range in capacity and output. Dozens of firms provide concrete across the State for vertical and horizontal construction. Varying grades of materials are also evident among concrete suppliers.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[2] Projects containing bid items of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects. Unit price data were also available from CDOT and were analyzed against bid price data. Some projects in the construction cost data book from CDOT also included data regarding the number of total bidders and the comparison between these prices and the engineering estimates. Engineering estimates were largely lacking within the initial data collected for this research project as they were not readily available. The inclusion of limited engineering estimate data for Colorado allowed for some additional analysis. For example, in 2006, 12 projects included the low bid and other bidders with costs of 10 percent over the engineering estimate, and for 3 projects the low bid was greater than 15 percent over the engineering estimate.

Observations of bid prices of items against unit price as reported for the corresponding year by CDOT did not yield any significant discrepancies. Items included in the analysis presented in chapter 2 for aggregate, asphalt, and concrete items saw prices fluctuate generally within $50 above or below the unit price reported by CDOT. Data were also available showing item unit prices, engineering estimates, average bid, and awarded bid prices by item and project for each year. These data were extremely valuable; for example, for one project completed in 2011, a specific item such as HMA used in the project could be identified in the data. From here, the weighted average for the year of the engineering estimate ($58.83/ton), average bid price ($63.22/ton), and awarded bid price ($56.90/ton) could be observed. Most price fluctuations were not unusual and could not be linked to any significant consolidation activity within the State. Fluctuations were instead likely due to location of materials and transportation costs.

[2]Ibid.

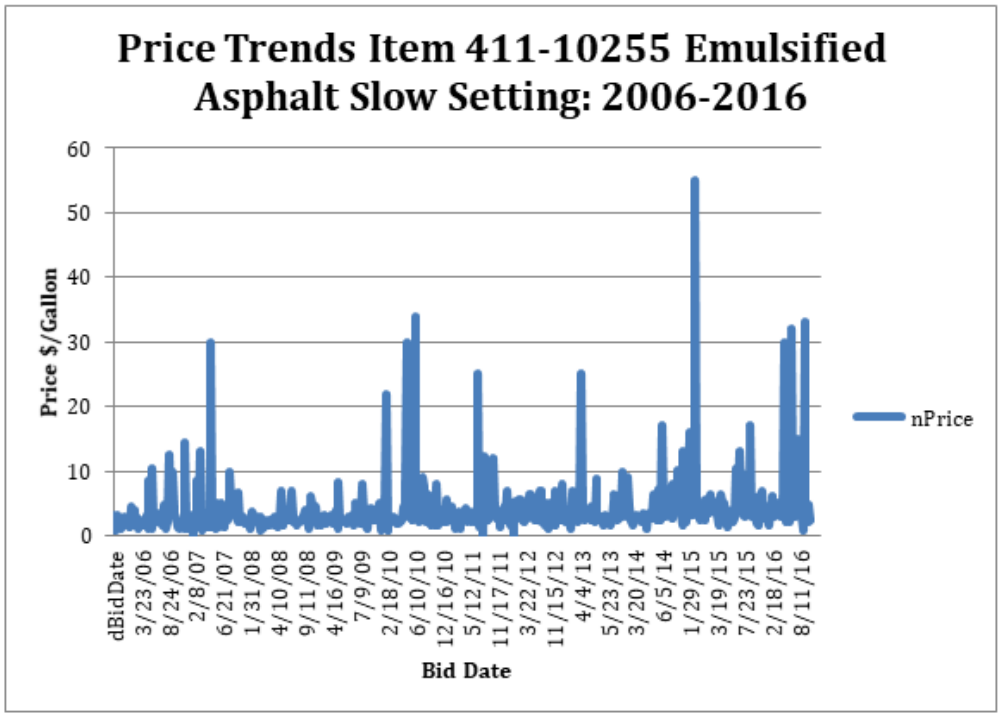
Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, and specifically for these items:

- Structure backfill class 1 (bid item No. 206-00100).
- Structure backfill class 2 (bid item No. 206-00200).
- Structure backfill at specification (bid item No. 206-00050).
- Structure backfill flow-fill (bid item No. 206-00065).
- Emulsified asphalt slow setting (bid item No. 411-10255).
- Asphalt cement performance grade PG 58-28 (bid item No. 411-03352).
- Asphalt cement performance grade PG 58-34 (bid item No. 411-03355).
- Asphalt cement performance grade PG 64-22 (bid item No. 411-03354).
- Asphalt cement performance grade PG 64-28 (bid item No. 411-03342).
- Asphalt cement performance grade PG 76-28 (bid item No. 411-03345).
- Concrete pavement, 6-inch (bid item No. 412-00600).
- Concrete pavement, 8-inch (bid item No. 412-00800).
- Concrete pavement, 9½-inch (bid item No. 412-00950).
- Concrete pavement, 10-inch (bid item No. 412-01000).
- Concrete pavement, 10½-inch (bid item No. 412-01050).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects for which the item was in use, whereas others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Emulsified Asphalt Slow Setting

The price trends of emulsified asphalt slow setting (item No. 411-10255) were analyzed across the analysis period. The item appeared 559 times; the minimum observed price was $0.01/gal, and the maximum observed price was $55.00/gal, with a mean price of $4.04/gal and a median price of $3.00/gal. The standard deviation in price was $4.58/gal. Figure 100 shows the price variation of this item over the analysis period.



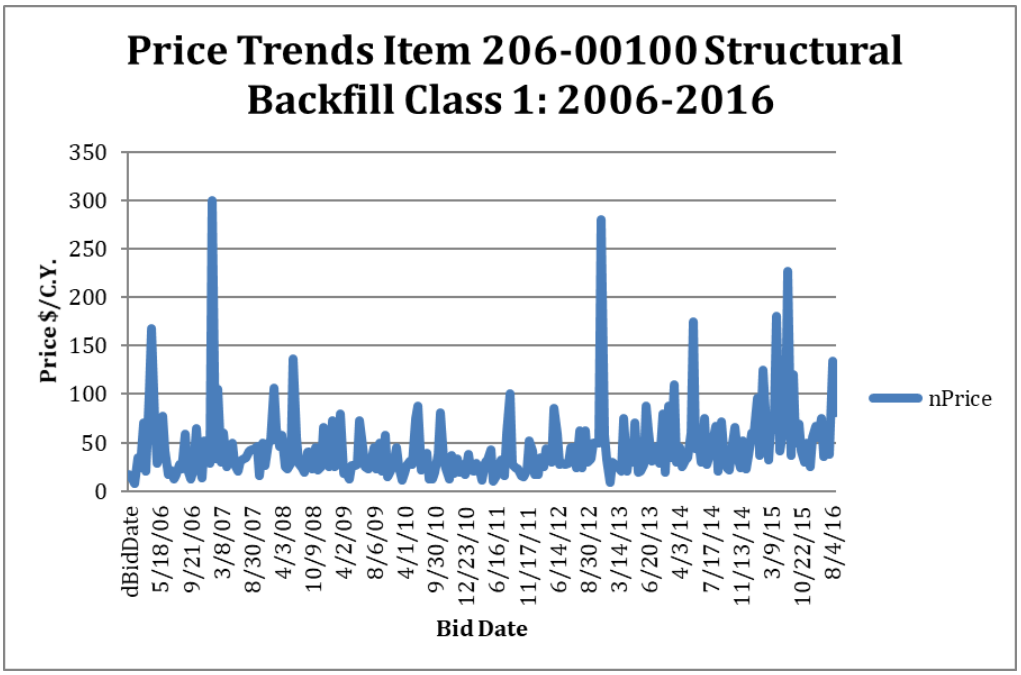
Source: FHWA.

Figure 100. Graph. Price trends—emulsified asphalt slow setting.

As can be seen in figure 100, there is one noticeable price spike, which is the maximum observed price of $55.00/gal. This spike occurred on project No. C20264, which had a bid date of 2/5/2015 and took pace in Eagle County. Eagle County is located in region 3 of the State.

Structural Backfill Class 1

The price trends of structural backfill class 1 (item No. 206-00100) were analyzed across the analysis period. The item appeared 255 times; the minimum observed price was $8.00/CY, and the maximum observed price was $300.00/CY, with a mean price of $44.80/CY and a median price of $32.81/CY. The standard deviation in price was $37.15/CY. Figure 101 shows the price variation of this item over the analysis period.



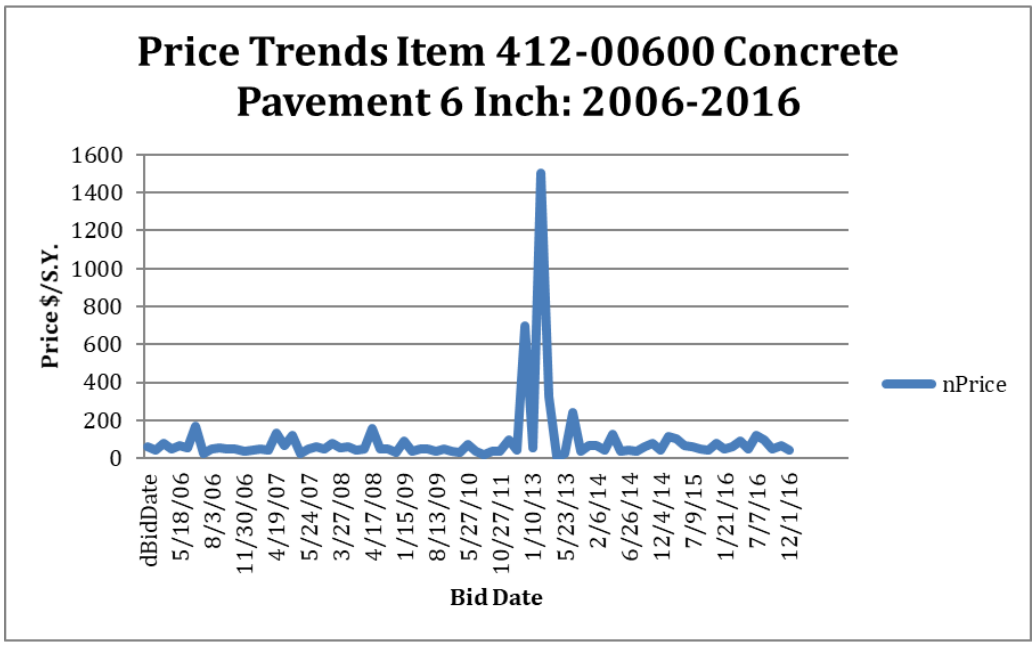
Source: FHWA.

Figure 101. Graph. Price trends—structural backfill class 1.

As can be seen in figure 101, there are two noticeable price spikes, one on 2/8/2007 with the maximum price of $300.00/CY and one on 11/29/2012 with a price of $280.00/CY. The maximum price occurred on project No. C15968R in Mineral County, which is located in the southwest part of the State in region 5. The $280.00/CY price occurred on project No. C18955R in El Paso and Pueblo Counties, which are located in the central area of the State in region 2. This project was identified as a bridge project. No corresponding merger or acquisition activity could be traced to these increased costs.

Concrete Pavement 6-inch

The price trends of concrete pavement 6-inch (item No. 412-00600) were analyzed across the analysis period. The item appeared 81 times; the minimum observed price was $9.00/SY, and the maximum observed price was $1500.00/SY, with a mean price of $91.40/SY and a median price of $52.00/SY. The standard deviation in price was $179.39/SY. Figure 102 shows the price variation of this item over the analysis period.



Source: FHWA.

Figure 102. Graph. Price trends—concrete pavement 6-inch.

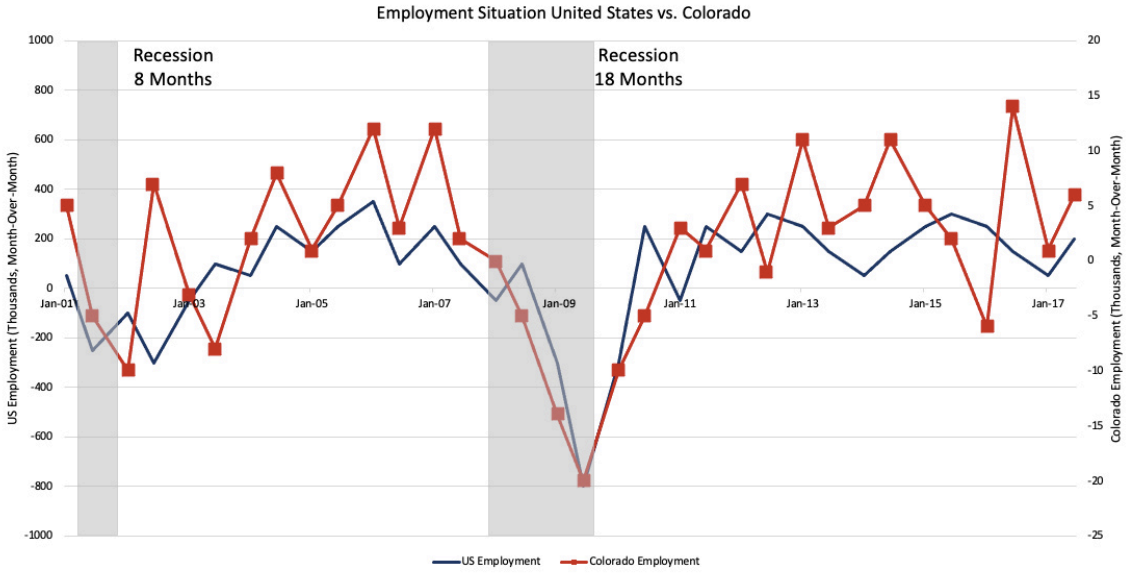
The maximum observed price is the main visible price spike seen in the figure 102; this spike occurred in project No. C18996 bid on 2/21/2013 in Jefferson and Douglas Counties. Jefferson and Douglass Counties are located in the central area of the State in region 1.

Challenges

Similar to challenges experienced with other State data, Colorado had items with disparate naming and item numbers. For emulsified asphalt, item No. 411-10255 includes items named emulsified asphalt slow set, emulsified, emulsified pavement slow set, and emulsified asphalt (slow setting). The same issue occurred with concrete pavement. Bid item No. 412-00600 yields four items: concrete pavement 6 inch, concrete, concrete class 6, and concrete pavement (6 inch). Similarly, the item "concrete" yields 25 unique pay items with disparate units (each, SY, CY, and linear feet (LF)). While the quantitative analysis revealed instances of mathematically unbalanced bid prices, no apparent link to merger/acquisition activity was evident in that area.

Colorado's Economy

Aside from the bid data analysis, considerations were made regarding market health and overall economy conditions in Colorado during the analysis period. As can be seen in figure 103, Colorado experienced a drop in employment during the 18-mo recession experienced in the United States beginning in 2008. During this time, employment in Colorado dropped similarly to the national rate. Moving toward 2016, employment increased in Colorado slightly above the national average, with the exception of one significant drop toward the end of 2016. In June 2017, Colorado had the lowest unemployment rate in the United States at 2.3 percent.

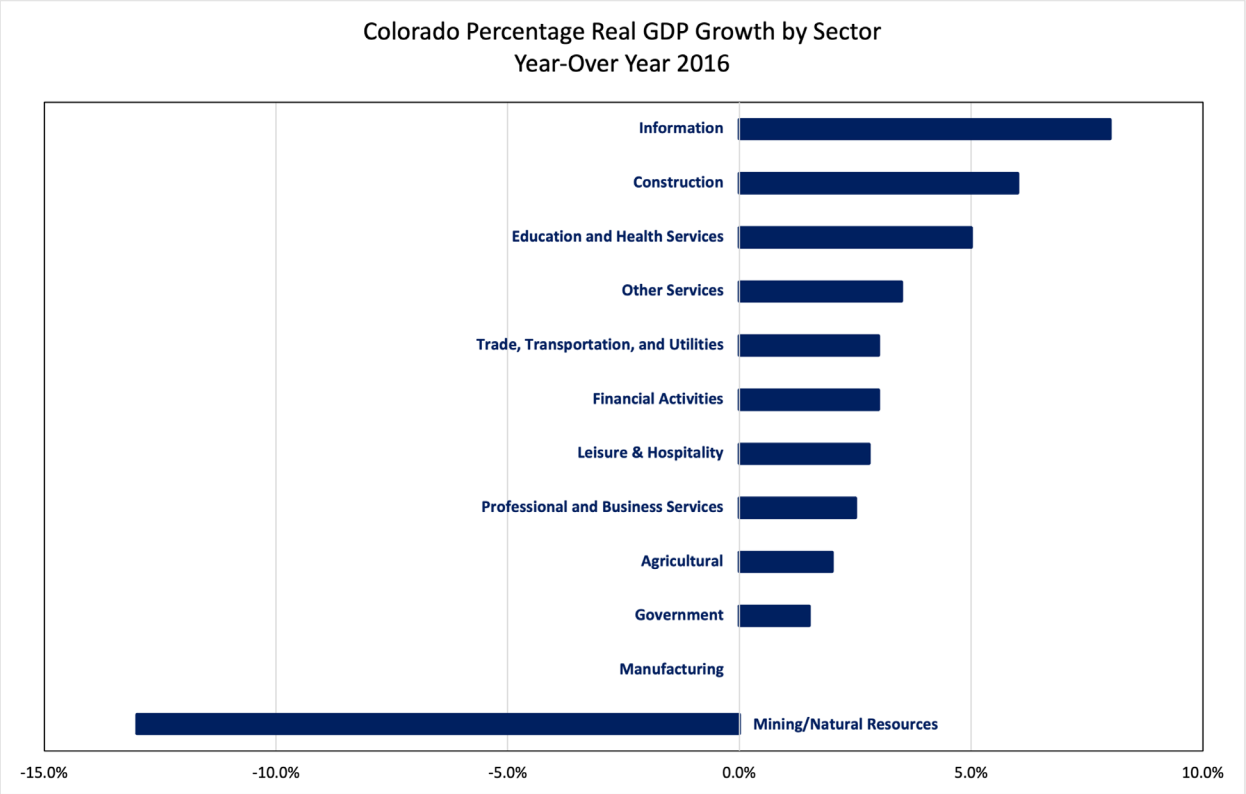


Data source: Bureau of Labor Statistics. Graph source: FHWA.

Figure 103. Graph. Colorado employment statistics (Bureau of Labor and Statistics 2023).

When this information was pieced together with the project cost data, the drop in overall project costs between 2009 and 2012 seen in the data are consistent with the economic recession and its aftermath. The State Demography Office also reported an increase in Colorado's population between 2012 and 2017.

The construction sector also had just over a 5.0-percent increase, second only to the information sector (figure 104). Within the construction sector are three major subdivisions: residential, nonresidential, and nonbuilding (water treatment, highway work, etc.). Total employment in the construction industry in Colorado showed a 0.4-percent year over year decrease in 2017. In 2016, the gross domestic product (GDP) for the construction industry accounted for 5.8 percent of Colorado's total nominal GDP (Colorado State Demography Office 2022). Reports indicate that the construction industry remains healthy; however, a decline in residential construction has led to an overall slowing in the industry.



Data source: Bureau of Economic Analysis. Graph source: FHWA.

Figure 104. Graph. Gross domestic product growth in Colorado (Bureau of Economic Analysis 2023).

Qualitative Analysis

Bidding Process and Analysis

CDOT uses AASHTOWare Project Bids™ software to facilitate the bidding process (AASHTO n.d.). Advertisements are updated every 2 w. This software product allows bidders to receive all proposal item schedules and tracks disadvantaged business enterprise elements. It also provides estimated cost tracking. All projects are submitted using Bid Express (2021). CDOT does publish plan holders lists before each project bid opening. Bid results are also published on the same site.

CDOT did not express concerns to the research team about competition in its industry. They do have concerns about the public's desire to have new quarries established—one of the reasons that CDOT has discontinued many of its internally controlled quarries. There is an emerging trend to require night work in urban areas, which makes asphalt production more expensive and which results in increased citizen complaints about the nighttime operations. CDOT did not report any issues with suspensions or debarments and noted that there have been some issues related to competition when economic times are strong and resort areas are looking for additional project work.

On average, proposals have more than four bids each, with few single bids. When analysis reveals bids out of alignment, the regional team is contacted to investigate details such as accuracy of bid information. When confirmation on the item in question is received, the bid is then analyzed using the unbalanced bid analysis process. The estimators are then brought into the discussion to determine any next actions. Ultimately, the region is responsible for the project and can decide to reject or award a bid following the additional scrutiny. Generally, the regions will also consider contractor capacity when reviewing bid information and discrepancies between bid prices and engineer's estimates.

M&A Activity

Colorado does not formally track merger and acquisition activity in the State. However, in some instances the State adjusted specifications to broaden the number of aggregate providers that would be acceptable to improve competition. CDOT also noted that there have been a number of changes following tariff activities (namely on steel imports). Several years ago (outside of the scope of this review), there were instances of some potential bidding impropriety. These instances were addressed through self-monitoring and trade association inputs.

By statute, CDOT must review all bids against their engineer's estimate and complete additional review if there is a difference of greater than 15 percent before award. This review applies only on projects above $1 million. No more than 20- to 30-percent of bids go to the second level of justification and review under this statute. As such, bid items are not addressed individually in normal review (they are reported, however, and used in the engineer's estimates for future projects).

In the past, CDOT has used its review of pricing to look at impacts of merger activity and changed some specifications to accommodate additional competitors. CDOT officials participating in the case review noted that this review resulted in stable pricing for these items. The contractor's trade association works diligently to ensure that the industry maintains a positive reputation with CDOT and, as such, vocalizes concerns as needed. In one case, the industry took steps to get more competitive bids following an acquisition among aggregate suppliers. In this particular case, a voluntary effort to expand the bidding pool allowed prices to remain stable and inside the awardable range noted in the prior paragraph. The CDOT staff monitors its bidding process and will reject bids that are outside of the range, even on high-priority projects.

Interviewer Observations

The Colorado Project Development Office recommends use of floating start dates for projects to allow for a strong, consistent project-letting schedule. CDOT recognized that their biggest challenges arose when projects were stacked together with limited contractor availability. CDOT also utilized incentive programs to increase the number of projects that contractors were able to work on concurrently, but this approach is not used frequently. Less than 20 percent of bids trigger additional review or concerns regarding bid item pricing or schedule adherence.

One of the largest intervening factors in the ability to get projects out quickly came through the Responsible Acceleration of Maintenance and Partnerships (RAMP) program, which better

coordinated project expenditures and available funding, resulting in projects being initiated more quickly. Under the RAMP program, CDOT funded multiyear projects based on year of expenditure, rather than saving funding for the full amount of a project before construction began. The result saw that overall bid prices increased due to increases in demand. The program did not see an increase in new entrants to the CDOT market, and the agency recognized that it paid a premium on many projects as staffing was constrained among the contractor community.

One additional observation was that CDOT felt strongly about engaging the trade associations and having self-monitoring. These practices allow the industry to police its own activities and encourage additional entrants. CDOT also noted that its ballot measures for infrastructure could increase the volume and timeline for new projects. The RAMP program results indicated that prices were higher during this period of new capital expenditures.

Summary

The objective of this case study was to quantify how construction industry mergers, acquisitions, or other consolidations are impacting the cost and quality of highway construction in the State of Colorado. Colorado has substantial differences among its varied regions, with the Rocky Mountains dividing the State into three distinct areas (Front Range, Western Slope, and Central Mountains regions). Observations of bid prices of items against unit price as reported for the corresponding year by CDOT did not yield any significant discrepancies. Aggregate, asphalt, and concrete items saw prices fluctuate generally within $50 above or below the unit price reported by CDOT. Data were also available showing item unit prices, engineering estimates, average bid, and awarded bid prices by item and project for each year. Colorado does not formally track M&A activity in the State. However, in some instances the State has adjusted specifications to broaden the number of aggregate suppliers that would be acceptable to improve competition.

GEORGIA

Case Study Background

In Georgia, many concrete and asphalt providers are located in the northwestern region of the State, while many of the aggregate materials locations are near the Atlanta metro area and out of State. Some major firms supplying materials to multiple States, including Tennessee, Georgia, Florida, and others in the area, also provided materials to many projects completed in Georgia between 2006 and 2016. Additionally, GDOT reported that prime contractors bidding on projects in the State range from small to very large and include family owned, multigenerational firms. Firms are allowed to bid on projects under $2.0 million without prequalification; however, every 2 yr the number of firms prequalified to bid in functional areas is analyzed. While most firms have a specialization area, prime contractors perform multiple functions and must meet a 30-percent prime requirement. The use of subcontractors varies from firm to firm.

Although, during the recession in 2008, the number of prequalified bidders dipped lower; the number is now growing. In particular, bridge firms are growing in response to available funding, and firms are diversifying to add new skill sets to their qualifications, allowing them to compete for more work and increase their market share. The State's DBE program includes firms representing a broad cross section of work types. GDOT is working to address an

overconcentration in DBE trucking as part of its project development process. Overall, the State is primarily using asphalt pavement with 90-percent asphalt and 10-percent concrete pavements on projects.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[3] Projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items in the data may be related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for these items:

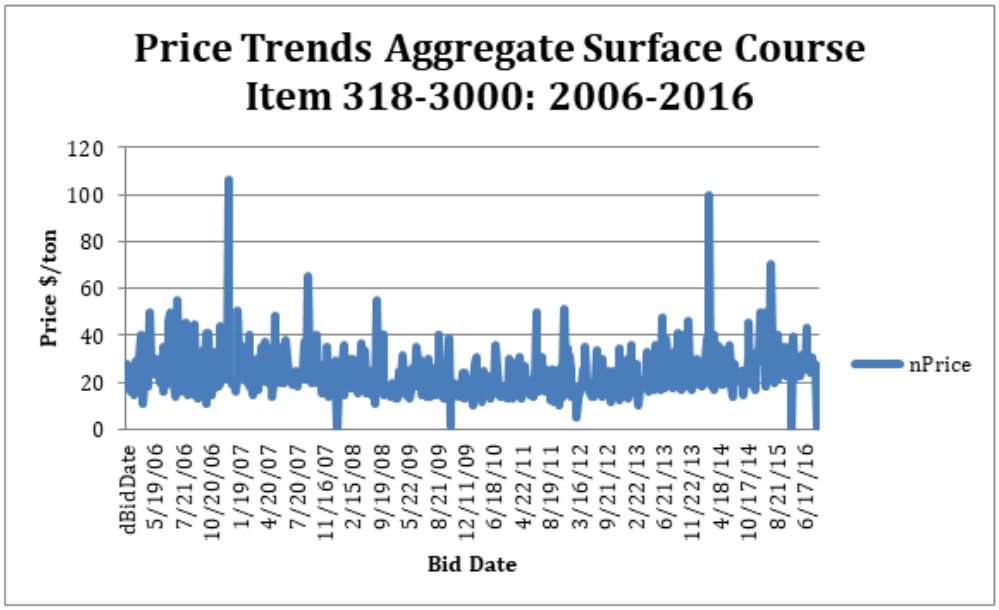
- Plain portland cement concrete pavement class 1 concentration, 10-inch thick (GDOT bid item No. 430-0200).
- Plain portland cement concrete pavement class 1 concentration, 12-inch thick (GDOT bid item No. 430-0220).
- Plain portland cement concrete pavement class 1 concentration, 11-inch thick (GDOT bid item No. 430-0210).
- Aggregate surface course (GDOT bid item No. 318-3000).
- Additional mechanically stabilized earth backfill (GDOT bid item No. 627-1180).
- Grade aggregate base course, 10-inch (GDOT bid item No. 310-5100).
- Grade aggregate base course, 12-inch (GDOT bid item No. 310-5120).
- Grade aggregate base course, 14-inch (GDOT bid item No. 310-5140).
- Grade aggregate base course, 4-inch (GDOT bid item No. 310-5040).
- Grade aggregate base course, 6-inch (GDOT bid item No. 310-5060).
- Grade aggregate base course, 8-inch (GDOT bid item No. 310-5080).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, whereas others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

[3]Ibid.

Aggregate Surface Course

The price trends for aggregate surface course (item No. 318-3000) were completed for the analysis period. The item appeared a total of 565 times; the minimum observed price was $0.01/ton, and the maximum observed price was $106.71/ton, with a mean observed price of $23.50/ton and a median observed price of $21.00/ton. The standard deviation in price was $10.22/ton (figure 105).



Source FHWA.

Figure 105. Graph. Price trends—aggregate surface course.

As can be seen in figure 105, there are two noticeable price spikes during the analysis period. The maximum price of $106.71/ton was observed on 12/15/2006 in project No. B12684-06 in Wheeler County, which is located in district 5 in the eastern area of the State. The second price spike of $100.00/ton was observed on 2/21/2014 in project No. B14343-14 in Fulton County, which is located in the northwestern area of the State near the city of Atlanta.

In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, no link to merger/acquisition activity in that area was apparent.

Qualitative Analysis

Bidding Process and Analysis

GDOT does not use an official bid manual; however, future projects to be let are published 18 mo ahead of time online, and a letting occurs every third Friday of each month. For projects greater than $2.0 million, prequalification is required; Bid Express and AASHTOWare Project SiteManager are used during the letting process (Bid Express 2021; AASHTO 2021). Prime contractors are required to perform a minimum of 30 percent of the work (70 percent on resurfacing projects). Urban and rural areas are not considered separately. Urban areas such as

Atlanta, Savannah, Augusta, Macon, Chattanooga, Columbus, and Valdosta involve their metropolitan planning organizations in the bidding process. Bids are evaluated before award through the use of an elaborate multitiered manual process completed in conjunction with several committees. This process is also used to analyze unbalanced bids. Single bids are rare in Georgia and remained as such during the 10-yr analysis period. GDOT does not track the total number of bids per proposal, but experience suggests the total is an average of four to six bids per proposal. When bids or bid item numbers are identified as out of alignment with the engineer's estimates (±10 percent), an estimation committee completes a manual review of the bid before passing the analysis on to an upper-level bid committee for final decisions.

While total bids per proposal are not tracked, the State does track and calculate average unit prices for each component of projects and has data for the past 5–8 yr. Statewide historical bid data for this period are also available, but the historical bid price data are not used to form current bid estimates. Significant changes in bid item number costs are analyzed if the occurrence lasts for over 12 mo.

M&A Activity

M&A activity in the State is not generally monitored, but if a potentially significant merger or acquisition takes place, the agency may investigate further. No noticeable trends or correlations between any M&A activity and changes in number of bidders or annual average unit prices have been observed, and the prices on individual project bids have not been tied to M&A activity. GDOT does not feel that regularly reviewing M&A activity and any corresponding influences on bid pricing and reporting the data to the DOJ and industry stakeholders are their responsibility. However, no relevant data have been collected or observed.

In terms of material suppliers, aggregates, asphalt, and concrete materials are incorporated into State DOT projects by quoted bid prices. Prime contractors do not own their own source materials but instead rely on independent aggregate suppliers. Material supplies and bid prices have remained relatively consistent over the past 10 yr, and while the State saw a fly ash shortage in 2004, no aggregate shortages were experienced during the analysis period. During this period, however, Georgia saw a growth in contractors due to a growth in their program, which added new funding of more than $1.0 billion per year in State-only fuel taxes.

Two mergers were completed in the State in the last 14 yr in the aggregate market due to increasing program opportunities. However, this merger activity did not result in any issues with competition or bid price increases. While Georgia is not aware of any current lawsuits with firms or complaints regarding anticompetitive bidding, GDOT does recommend that States create an in-house estimation team for tracking such issues. Mergers may also lead to lower prices due to gains in efficiency.

Interviewer Observations

Bidders are prequalified, but not by work type. GDOT has a prequalification list that is evaluated every 2 yr. In the recession of 2008, the number of prequalified bidders dipped lower, but the number is now growing. As mentioned in the Case Study Background section for Georgia, bridge firms are growing in response to additional funding, and firms are diversifying to be able

to compete for more work. Firms accept and use low quotes from subcontractors even when they compete against their own in-house estimates. Competitive aggregate sources outside of the State are brought in, and a large private industry uses the aggregate sources as well.

Summary

The objective of this case study was to quantify how construction industry mergers, acquisitions, or other consolidations are impacting the cost and quality of highway construction in the State of Georgia. M&A activity in the State is not generally monitored, but if a potentially significant merger or acquisition takes place, the agency may investigate further. Two mergers were completed in the State in the last 14 yr in the aggregate market due to increasing program opportunities. However, this merger activity did not result in any issues with competition or bid price increases.

No noticeable trends or correlations between any M&A activity and changes in number of bidders or annual average unit prices have been observed, and the prices on individual project bids have not been tied to M&A activity.

MISSOURI

Case Study Background

In the State of Missouri, some categorical qualifications exist for prime contractor makeup, and prequalified firms are listed by statute. Firm size varies from $15,000 to $150 million in annual revenue. The State has a mixture of small and national firms, and most are privately owned. Firms also include a large number of family owned, multigenerational firms. In general, approximately 200 to 300 firms are prequalified to bid based on given ratings in various functional areas. The changes in prequalification data are not closely scrutinized by MoDOT staff. While prime contractors do not tend to specialize in functional areas, general firms use many subcontractors; these relationships between prime contractors and subcontractors are generally based on regional characteristics, logistics, and specialization areas. At times, subcontractors also bid as prime contractors on the same job, especially in the northwest area of the State.

Methods for obtaining materials such as aggregates, asphalt, and concrete vary, depending on if the prime firm owns the quarries. MoDOT has changed aggregate specifications such that some firms in several areas of the State cannot meet the high-end mix requirements. In the past 10 yr, quarries have consolidated, resulting in fewer family owned, independent quarries. As for individual project bid prices and annual average unit prices, MoDOT has made changes by bundling jobs to obtain more competition. MoDOT reported that, in general, aggregate prices have gone up over time, which could be due to national trends. Because of the rivers in the State, river sand is readily available, and no local shortages of other construction materials during the analysis period were noted.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed for Missouri.[4] From these data, projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects. Statewide average unit prices are also calculated and published annually for each component of a job. The unit price data are available from MoDOT online and are built into the system to use as analysis. Unit price data from the past 5-8 yr have shown the steady effect of inflation as well as inconsistencies during the economic recession in 2008 when contractors left the State and competition suffered. Since that time, prices have risen due to inflation and the return of competition to the State.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for the following items:

- Bituminous pavement mixture PG 64-22 BP-1 (MoDOT bid item No. 4011209).
- Bituminous pavement, 10-inch (MoDOT bid item No. 4010103).
- Asphaltic concrete pavement SP125C, 11-inch (MoDOT bid item No. 4030404).
- Bituminous pavement, 6-inch (MoDOT bid item No. 4010106).
- Bituminous pavement, 8-inch (MoDOT bid item No. 4010101).
- Asphaltic concrete mixture PG 70-22 (SP095CLP mix) (MoDOT bid item No. 4030011).
- Asphaltic concrete mixture PG 64-22 (SP250E mix) (MoDOT bid item No. 4030301).
- Asphaltic concrete mixture PG 64-22 (SP250C mix) (MoDOT bid item No. 4030306).
- Backfill (MoDOT bid item No. 2026040).
- Base concrete (MoDOT bid item No. 9029100).
- Concrete pavement, non-reinforced, 10-inch (MoDOT bid item No. 5021110).

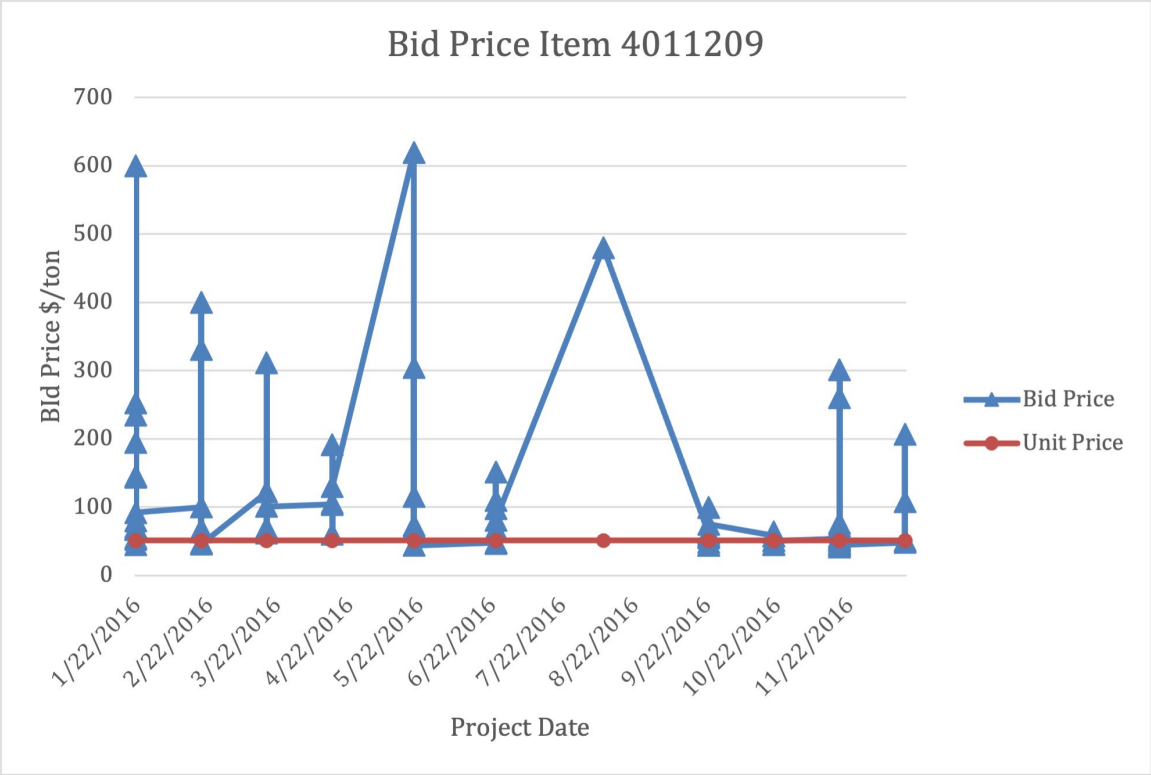
For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use while others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

The following subsections provide information on the bid-item analysis for bituminous pavement mixture PG 64-22 BP-1 as an illustrative example.

[4]Ibid.

Bituminous Pavement Mixture PG 64-22 BP-1

From the unit price data from 2016, item 4011209 (bituminous pavement mixture PG64-22 BP-1) had an average quantity of nearly 17,000 tons with an average unit price of $51.14. The high bid price was $64.00, and the low bid price was $46.90. The item was used in eight bids. From the data mined by Oman Systems, Inc., and from State DOT bid prices posted on State websites or collected directly from State transportation agency sources, the average unit price in projects was $111.51: the highest recorded price per ton of item 4011209 was $619.50, and the lowest price per ton was $41.21.[5] Figure 106 shows the prices compared to the average annual unit price reported by MoDOT.



Source: FHWA.
Note: MoDOT bid prices are posted on their website.

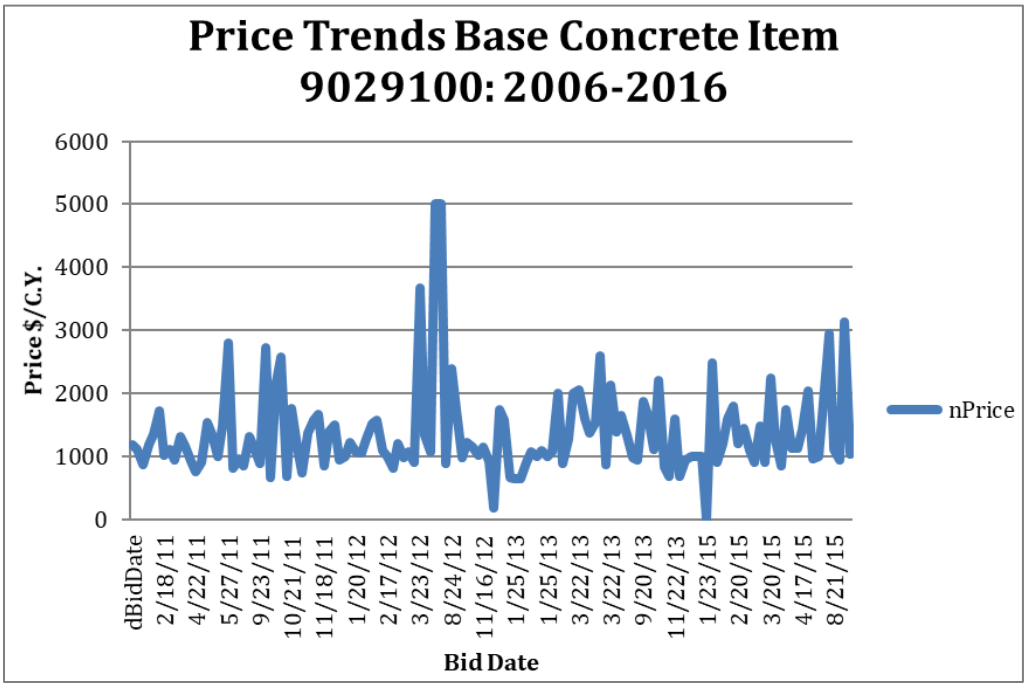
Figure 106. Graph. Unit price per ton versus bid price per ton of asphalt in 2016 (MoDOT 2022).

Base Concrete

The price trends of base concrete (item No. 9029100) were examined for the analysis period. During this time, this bid item number appeared 136 times. The minimum observed price was $1.00/CY and the maximum observed price was $5,000.00/CY, with a mean observed price of $1,362.31/CY and a median observed price of $1,138.50/CY. The standard deviation in price

[5]Ibid.

during the analysis price was $719.71/CY. Figure 107 shows these price trends for the analysis period.



Source FHWA.

Figure 107. Graph. Price trends—base concrete.

The minimum observed price of $1.00/CY occurred in project No. 150220-F05 with a bid date of 2/20/2015 for a total quantity of 6.3 CY. This project occurred in St. Louis County, which is located in the St. Louis District in the eastern area of the State. The maximum observed price of $5,000.00/CY appeared twice in the data, but both are associated with the same project (project No. 120727-H01) bid on 7/27/2012 with a quantity of 0.4 CY in Bollinger County. Bollinger County is located in the southeast district in the southeastern area of the State. While the quantitative analysis revealed instances of mathematically unbalanced bid prices, there was no apparent link to merger/acquisition activity in that area.

The research team identified several cases where wide fluctuations in bid prices were evident. These fluctuations may be a result of unbalanced bidding on some projects.

Qualitative Analysis

Bidding Process and Analysis

Bidding information is published with a link, but no formal manual exists, as the engineering policy guide covers this. Electronic bidding is used for the process and plans, and specifications books are all located online. Future projects are published with a letting schedule of 3-mo look ahead as well as a 1-yr surface transportation improvement plan. Lettings occur every month on Fridays at 11 A.M., and lettings are advertised in newspapers as well as Bid Express (2021). Eligible bidders are not published per proposal but are published if they opt to be. As for the

prime requirement, MoDOT requires a minimum of 40 percent of the work be performed by the prime contractor, which can be adjusted to the minimum FHWA amount of 30 percent, if required. MoDOT chooses to impose the higher requirement of its prime contractors. Kansas City, St. Louis, and Springfield are large urban areas that are considered separately due to concerns for night paving and other unique provisions. Obtaining aggregate in these urban areas is becoming difficult due to older pits in the urban areas of the State drying up as a result of large commercial use.

Oman Systems, Inc., software is used for bid evaluation in conjunction with human analysis (Oman Systems, Inc. 2023). While MoDOT does look at unbalanced bids, these data are not a major concern. If a problem arises, they analyze why the imbalance has occurred. The State does not have many single bids (only about 2 percent), and single bids are not historically tracked. However, the number of bids per proposal is analyzed over time, and trends are investigated by area and work type. Asphalt bids are combined, and alternate pavements are bid based on ranges where mix and thickness types are specified, making these bids hard to track. If an incoming bid seems out of alignment with the engineer's estimates, the first step is to investigate if an error has occurred. This investigation is carried out via a multiple-group review, and the contractor may be interviewed. MoDOT estimation staff will also look into how the price was developed.

M&A Activity

Within the last 5 yr, MoDOT has seen APAC® sell most of its presence to a local company, and many quarries were consolidated as a result. This new firm also specializes in paving. A few quarries are now owned individually, but several contractors own groups of quarries. The competition is monitored. Regarding trends in these mergers and bid characteristics (including number of bidders and changes in prices), the number of bidders is tracked as a performance measure. Earthwork projects receive more than five or six bidders, whereas paving projects only receive three to four bidders. Small bridge projects, however, are quite competitive. Asphalt projects are relatively regional out of fixed plants, whereas larger firms use mobile plants (about half depend on mobile plants). Oftentimes, MoDOT will bundle jobs to create competition, especially in asphalt, by combining several smaller projects into a collective, single project bundle. Project bundling offers a comprehensive and accelerated delivery solution for addressing strategic program goals. It streamlines design, contracting, and construction; allows agencies to capitalize on economies of scale to increase efficiency; and supports greater collaboration during project delivery and construction. MoDOT uses project bundling procurements to award a single contract for multiple projects, thus enticing additional bidders. Generally, MoDOT studies the M&A activity in the State itself, and currently there are no actions taking place to limit M&A activity.

Informally, the effects of M&A activity on bid pricing are observed to gauge what is happening within the industry. Activity is monitored indirectly, and the MoDOT construction office approves job mix formulas for asphalt. The State does not do much concrete pavement work, so a spike in bid prices may correlate to asphalt, since aggregate areas are often consolidated. Opening new pits is difficult in the urban areas of the State, and, thus, areas such as St. Louis and Kansas City are using older quarries. Zoning and air quality standards for these quarries create issues as older quarries may have trouble complying with new standards. No suspensions or debarments have occurred in the State relating to bidding or material supplies. Regarding

economic changes, prices for cement and liquid asphalt have influenced discussions within the State. The State has not received complaints about anticompetitive bidding and has not conducted any investigations into these areas, nor is MoDOT aware of any reported decisions in the State about antitrust.

Interviewer Observations

Large commodities influence the correlation between M&A activity and changes in competition, market share, and bid pricing. The cost of equipment necessary to start a construction business is prohibitive, which results in fewer competitive firms.

Also, labor workforce shortages and expectations shift with changes in the market for workers, especially when new industries emerge quickly, such as shale oil drilling. Some transient asphalt paving is done, but this type of work is not beneficial for attracting workers. Night work in urban areas can cause traffic disruptions and raises noise complaint concerns. MoDOT has worked to increase the diversity of the workforce by including workforce diversity goals into projects.

For States looking into M&A activity and the subsequent effects on pricing and competition, MoDOT recommends understanding the information ownership and contractor makeup and contractor locations. Transparency of information is also important, as is an understanding of what the project entails, necessary specifications, night work in urban areas, and other project-specific information. This type of information is tied into the bundling process that MoDOT relies on. MoDOT does not attempt to influence M&As in any way, but rather stays neutral and observes the process and aftermath effects. At this time, no concerns were expressed to the research team about these effects on competitive bid prices.

Summary

In the State of Missouri, firm sizes vary and include a mixture of small and national firms, as well as a large number of family owned, multigenerational firms. In general, the changes in prequalification data are not heavily analyzed. While prime contractors do not tend to specialize in functional areas, general firms use many subcontractors; these relationships between prime contractors and subcontractors are generally based on regional characteristics, logistics, and specialization areas. The State reports that large commodities influence the correlation between M&A activity and changes in competition, market share, and bid pricing. MoDOT recommends understanding the information ownership and contractor makeup and where contractors are located, as well as transparency of information for monitoring M&A activity and price effects.

OHIO

Case Study Background

In the State of Ohio, prime contractors are prequalified following Ohio's published thresholds for liability, insurance, and other requirements. Approximately 300 contractors bid on projects regularly. In the past 14 yr, the number of bidding prime contractors has not changed dramatically. Most firms are family owned, but there are some publicly traded firms and many family owned, multigenerational firms. Ohio DOT does keep a record of prequalification information from every year. For the past 20 yr, most firms have been general contractors that

have expertise; subcontractors are also used. Prime contractors often work with the same subcontractors over time as relationships build and strengthen. Occasionally, subcontractor firms will bid as prime contractors and vice versa. Some suppliers own their own quarries in Ohio and may even own multiple quarries. Most larger asphalt firms also own their own quarries, while managing smaller quarries with some leasing activity. Most large companies own quarries, which is more profitable, and these larger companies also own their own asphalt terminals. Concrete sources come from ready mix plants, typically located such that transport is about 1 h to any job site. Generally, concrete is not a major material in use for pavements in Ohio.

Opening new quarries in Ohio is difficult due to zoning, and material redistribution yards are now appearing in the eastern part of the State. In the western part of the State, the quality of the quarries allows them to have stone available to ship to the east, where higher quality aggregate is more difficult to obtain. While no shortage has occurred, the transportation costs of material is high, although the State is unsure as to whether this affects bid prices.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed for Ohio.[6] From these data, projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items in the data may be related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials based on the original research project design, specifically for the following items:

- Concrete base, 10-inch (Ohio DOT bid item No. 305E14000).
- Non-reinforced concrete pavement, 10-inch (Ohio DOT bid item No. 452E14010).
- Reinforced concrete pavement, 10-inch (Ohio DOT bid item No. 451E15000).
- Non-reinforced concrete pavement, 11-inch (Ohio DOT bid item No. 452E14100).
- Reinforced concrete pavement, 11-inch (Ohio DOT bid item No. 451E15500).
- Non-reinforced concrete pavement, 13-inch (Ohio DOT bid item No. 452E15010).
- Non-reinforced concrete pavement, 6-inch (Ohio DOT bid item No. 452E10000).
- Aggregate base (Ohio DOT bid item No. 304E20000).
- Aggregate base as per plan (Ohio DOT bid item No. 304E20001).
- Asphalt concrete base PG64-22 (Ohio DOT bid item No. 302E46000).

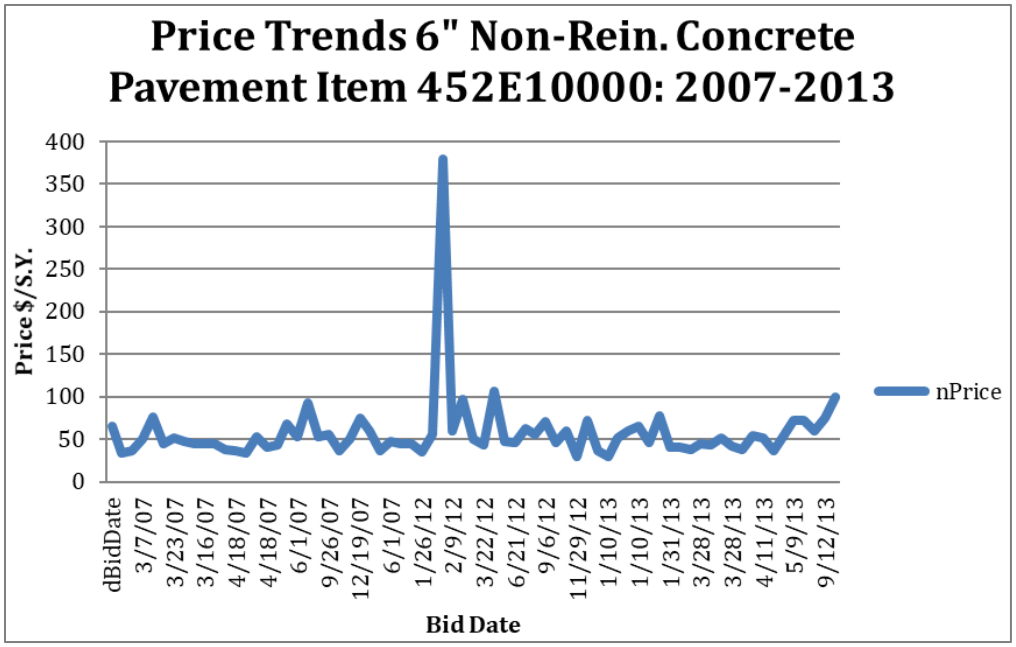
For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, while

[6]Ibid.

others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

6-inch Non-Reinforced Concrete Pavement

The price trends of 6-inch non-reinforced concrete pavement (item 452E10000) were analyzed for the analysis period. The item appeared a total of 71 times during this period. The minimum observed price was $29.55/SY, and the maximum observed price was $378.69/SY with a mean observed price of $57.52/SY and a median observed price of $50.00/SY. The standard deviation in price was $42.02/SY. Figure 108 shows these price trends during the analysis period.



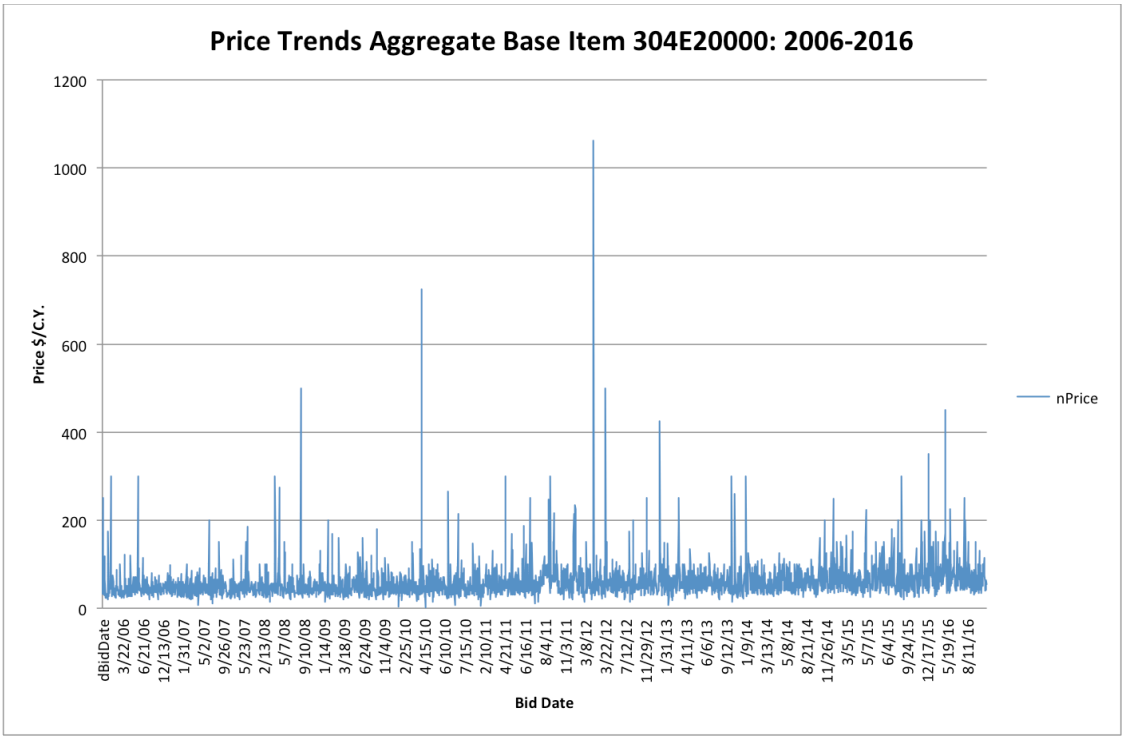
Source FHWA.

Figure 108. Graph. Price trends—6-inch non-reinforced concrete pavement.

As can be seen in figure 108, this maximum price of $378.69/SY is the only significant price spike during the analysis period. This price was observed in project No. 120087 with a bid date of 2/9/2012 in Union County with a total quantity of 5 SY. Union County is located in Ohio DOT district 6 in the central area of the State.

Aggregate Base

The price trends of aggregate base (item No. 304E20000) were analyzed for the analysis period. The item appeared a total of 3,123 times during this period. The minimum observed price was $1.00/CY, and the maximum observed price was $1,061.71/CY. The mean observed price was $59.51/CY with a median observed price of $50.00/CY and a standard deviation price of $41.67/CY. Figure 109 shows the price trends for this item during the analysis period.



Source FHWA.

Figure 109. Graph. Price trends—aggregate base.

The minimum observed price of $1.00/CY occurred in project No. 100210 on 4/15/2010 with a total quantity of 50 CY This project was in Brown County, located in Ohio DOT district 9 in the south central area of the State.

The maximum observed price of $1,061.71/CY occurred in project No. 120087 on 2/9/2012 with a total quantity of 1 CY. This project was in Union County, located in Ohio DOT district 6 in the central area of the State. The other higher price observed was $725.00/CY, which occurred in project No. 100185 on 4/8/2010 with a total quantity of 4 CY. This project was in Clinton County, located in Ohio DOT district 8 in the southwestern area of the State. The research team identified no corresponding merger or acquisition activity in this area during this period. In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, there was no apparent link to merger/acquisition activity in that area.

Qualitative Analysis

Bidding Process and Analysis

Ohio DOT uses AASHTOWare software as well as Bid Express, an online information service for bidding provided by Infotech, Inc., but no internal manual exists (AASHTO 2021; Bid Express 2021). Two years of potential projects are published, and projects are let every 2 w, with an annual average of 22 to 23 lettings per year (with some special lettings). The State law requires advertisement of lettings in the newspapers for 2 w. Prime contractors in Ohio are required to perform a minimum of 50 percent of the work, but at times it may be adjusted down to 30 percent with FHWA approval in accordance with defined policies. FHWA requires a

minimum of 30 percent. Several rural areas are considered single-bid areas for asphalt; additionally, unique aggregate areas in Cleveland acquire materials from Canada. Aggregate sources are plentiful in the western part of the State, but scarcer in the east, which causes some additional transportation costs to be required in that part of the State. Ohio DOT's analysis of their price information finds higher costs of materials for projects in the eastern part of the State as a result. Ohio DOT uses the AASHTOWare software's data analytics to evaluate bids before award.

For irregular bids, Ohio DOT looks at low bids relative to the engineer estimate and then compares them to other projects as well as historical data. Ohio DOT benchmarks this information against the engineer estimate and looks for bid anomalies or deviations that could be causing the issue. There is a low percentage of single bids (approximately 2–3 percent). Major bid item numbers are used per unit (SY for concrete and CY for asphalt). If bids appear out of alignment with expected engineer estimates, the item of work is analyzed and the project manager in the district is contacted. Sometimes contractors will be contacted as well to find the source of the imbalance. Complementary bidding is rare and hard to prove. Ohio DOT calculates and publishes average unit prices annually and calculates construction cost indexes to analyze trends. Every 6 mo, any significant changes are analyzed to identify root causes.

M&A Activity

Ohio DOT uses AASHTOWare Project SiteManager Construction Management System to monitor M&A activity (AASHTO 2021). When Ohio DOT adds a new firm, the competition field changes. The State has many portable plants that move around. These buy-outs are for plants and parts as opposed to consolidation of asphalt companies; the consolidation side does not have much activity in the asphalt industry. More than 10 yr ago, some large acquisitions and some smaller firms were consolidated in the last 10 yr due mostly to firm owners retiring. Two plants at the same location have since become joint ventures, and both are large firms. They decided to close one plant and consolidate into a joint venture. The joint venture firms still compete in areas other than the venture functional area. The State does not utilize much concrete pavement for projects beyond bridges and small incidental work, such as sidewalks.

Ohio DOT reported that in the asphalt industry, national binder price fluctuations drive the prices of the material, but these fluctuations have not been linked to any merger or acquisition activity. In rural areas, Ohio DOT noted that asphalt providers face limited competition, which could lead to higher prices. The concerns over expensive asphalt pricing were reported by Ohio DOT to the DOJ, but no updates are available at this time. Currently, no policies exist within the asphalt area to remedy concerns about the high prices; some project bundling has taken place to effect competition by combining single-bid counties in separate districts for multiple bids. Ohio DOT believes that monitoring M&A activity and the subsequent effects on asphalt pricing should be done close to where the work is taking place, and most of this monitoring is done internally.

Zoning and permitting of quarries is an issue for Ohio DOT. There are a fixed number of quarries; therefore, hauling and distribution centers pop up quite often. Economically, there have been oil shortages and housing and fracking industry issues within the State that have affected bids. Ohio DOT reported that the competing workforce requirements for fracking and fossil fuel extraction have been cited as possible cost factors for past project activities.

Interviewer Observations

Costs seem affected by factors such as supply and demand, and at times aggregate shortages occur due to high use, which is usually a short-term issue. Firms augment their aggregate sources to meet specifications, and much material swapping among firms takes place. Smaller firms then struggle, as they cannot keep their aggregate supplies within specifications, and monitoring this process it costly for them. Again, Ohio has mostly asphalt pavements within the State, and concrete is mostly used in projects for bridges, curbs, and gutters.

Summary

In the State of Ohio in the past 14 yr, the number of bidding prime contractors has not changed dramatically. Most firms are family owned, multigenerational firms, with some publicly traded firms. Ohio DOT does keep a record of prequalification information from every year. Some suppliers own their own quarries in Ohio and may even own multiple quarries. Opening new quarries in Ohio is difficult due to zoning. While no shortages have occurred, material transportation costs are high. The State is unsure whether this circumstance affects prices. Ohio DOT believes that monitoring M&A activity and the subsequent effects on asphalt pricing should be done close to where the work is taking place, and most of this monitoring is done internally. Costs seems most affected by supply and demand, as well as occasional shortages.

OKLAHOMA

Case Study Background

The research team reviewed documentation in advance pertaining to the Oklahoma DOT bidding and letting processes, and a site visit was conducted in February 2019. Participants included the State construction engineer, assistant State construction engineer, an office engineer/division engineer, Oklahoma DOT materials division engineer, and the assistant division engineer, materials. This case study summarizes that visit and describes Oklahoma DOT's approaches to understanding and evaluating the construction materials industry in their State.

In the State of Oklahoma, trends of total project prices from 2006 to 2016 and bid item number prices in comparison to relevant unit prices yielded no significant price deviations attributable to merger or acquisition activity. Additionally, initial contacts with the State showed no significant concerns regarding pricing effects of M&A activity. Just over 250 pre-qualified firms are available for bidding projects in Oklahoma (252 as of May 2019). More than two-thirds of these firms would be categorized as small- to medium-sized companies. Oklahoma DOT does not track whether these firms are publicly traded, but attendees noted that most are family owned, multigenerational firms. Several national firms do have a presence in Oklahoma. This market is relatively steady, with three to four new entrants each year and some minor reduction due to retirements and consolidations.

Contractors generally maintain some common areas of expertise or regional focus. Large pavement jobs attract the most bidders and can attract a cross section of companies from across other regions. The Oklahoma DOT Office of Construction monitors and collects industry information on an anecdotal basis. This information includes some recent acquisitions by pavement companies of bridge contractors and some similar acquisitions by structural

contractors of paving companies entering into the paving business. Oklahoma DOT does not report a regular process of tracking entrants into their prequalified programs. If a name change occurs, it is entered in the AASHTOWare Project SiteManager Construction Management System software that Oklahoma uses (AASHTO 2021).

Oklahoma DOT is currently unaware of any current studies of M&A activity in the State. The Materials Division approves aggregate and sand sources and maintains an approved list of quarries and their source locations on the Oklahoma website (Oklahoma DOT n.d.a.). A list of asphalt plants is also maintained (Oklahoma DOT 2022). Asphalt plants must be reinspected every year, per Oklahoma DOT Asphalt Plant Inspection Policy.

Oklahoma has reported a shortage of acceptable fly ash over the years, but no reported shortages in other construction materials. Oklahoma is very plentiful in high quality material sources and often exports aggregates to Kansas and Texas. The State has three cement plants, and the case study participants generally viewed availability of products as exceptional. Some individual designs for structures relied on a single provider for prestressed beams. However, a design change in the early 2000s eliminated the shortages associated with this particular design.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed for Oklahoma.[7] From these data, projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for the following items:

- Asphalt concrete type S2 (PG 64-22 OK) (Oklahoma DOT bid item No. 411(S2) 5930).
- Asphalt concrete type S3 (PG 70-28 OK) (Oklahoma DOT bid item No. 411(S3) 5940).
- Asphalt concrete type S4 (PG 64-22 OK) (Oklahoma DOT bid item No. 411(S4) 5960).
- Unclassified backfill (Oklahoma DOT bid item No. 501(D) 6353).
- Controlled low-strength material backfill (Oklahoma DOT bid item No. 501(G) 6309).

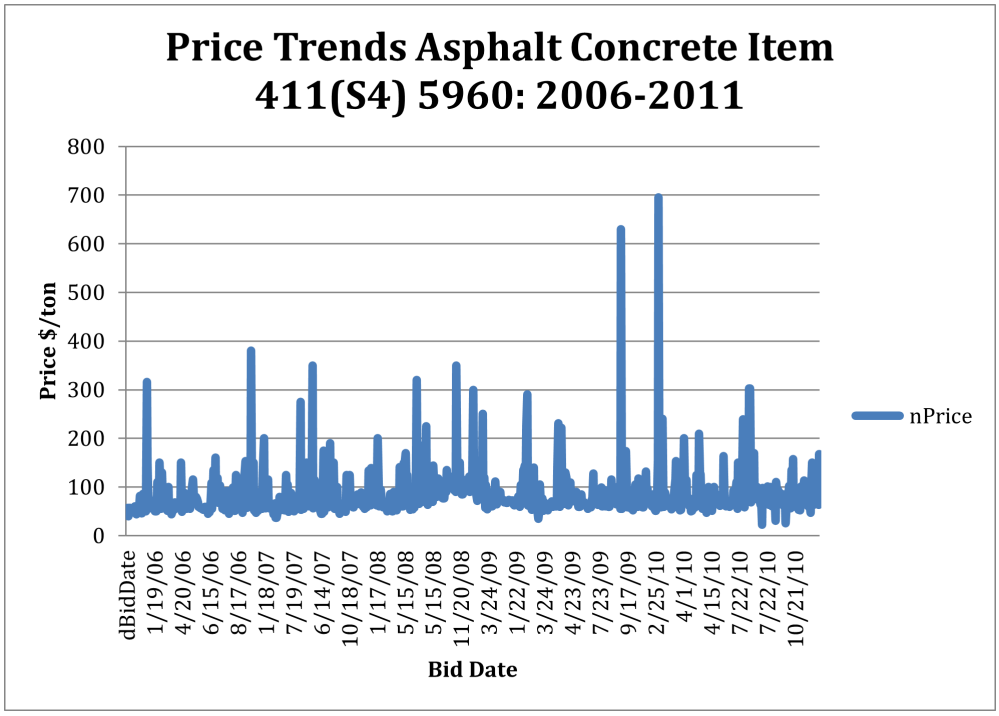
[7]Ibid.

- Asphalt concrete, 4-inch (22) (Oklahoma DOT bid item No. 411 4520).
- Asphalt concrete, 6-inch (23) (Oklahoma DOT bid item No. 411 4540).
- Portland cement concrete for pavement (Oklahoma DOT bid item No. 414(I) 5275).
- Granular backfill BR-1 (Oklahoma DOT bid item No. 501(F) 6352).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, while others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Asphalt Concrete Type S4 (PG-64-22 OK)

Asphalt concrete type S4 (item No. 411(S4) 5960) appeared 872 times during the analysis period. The minimum observed price during this time was $22.00/ton, and the maximum observed price during this time was $695.00/ton, with a mean observed price of $83.87/ton and a median observed price of $70.95/ton. The standard deviation in price during this period was $48.71/ton. Figure 110 shows these price trends for the analysis period, which for this item is only between 2006 through 2011. This item was not used in 2012–2016.



Source FHWA.

Figure 110. Graph. Price trends—asphalt concrete.

The minimum price of $22.00/ton with a quantity of 1,053 tons occurred in a project (job No. 100461) bid on 7/22/2010 in Washita and Custer Counties. Washita and Custer Counties are located in Oklahoma DOT division 5 in the eastern area of the State. The maximum price of

$695.00/ton with a quantity of 25.5 tons occurred in a project (job No. 100040) bid on 1/28/2010 in Marshall County. Marshall County is located in Oklahoma DOT division 2 in the south central area of the State. The other high price of $630.00/ton with a quantity of 5 tons occurred in a project (job No. 90556) bid on 9/17/2009 in McClain County. McClain County is located in Oklahoma DOT division 3 in the central area of the State. In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, there was no apparent link to merger/acquisition activity in that area.

Qualitative Analysis

Bidding Process and Analysis

Oklahoma prepares estimates based on item prices and quantities. They use a weighted average item price report by item, region, and quarter to determine prices during the prior 18-mo period. This engineer's estimate is furnished in compliance with 61 O.S.§ 116 B (OK Stat. 2022). The engineer's estimate is composed of units expressed as mathematical averages for work units that may be required for a project. The mathematical averages are derived by adding dollar amounts bid for work under a specific item code over the preceding 18 mo within a specific field division and dividing the resultant total by the number of bids included. The resultant average unit amount does not and is not intended to portray difficulties or resources, which may be required to perform any specific unit of work on any specific project.

A two-person team analyzes bids independently. These reviewers compared recommendations after the bid opening. A small number of projects receive single bids: often every project will have four to five bids. Additional review and scrutiny is triggered if bids are 10 percent lower or 5 percent higher. In some cases, projects may be rebid rather than awarded if there is a large difference between the estimate and bid prices. Oklahoma strongly discourages "penny bids" and will review these bid item numbers closely for unbalanced bidding.

Historical data on bidding are available on the Oklahoma DOT website, spanning at least 5 yr by every month of lettings (Oklahoma DOT n.d.b.). In general, the Construction Division will watch prices and not intervene unless some level of unacceptable pricing is noted. Some cases where there have been large differences have been explained by revisiting engineering estimates against the actual prices.

M&A Activity

While no formal monitoring of M&A activity in the State is completed, name changes do occasionally occur and are usually identified in the prequalification list generation input into the AASHTOWare Project SiteManager product (AASHTO 2021).

Generally, Oklahoma did not identify name changes as a major issue. The agency noted that competition remains vigorous, and prices have not changed dramatically, even in cases where there were consolidations. New entrants to the market and some external pressures from out-of-State contractors have assisted Oklahoma DOT in keeping costs contained to consistent levels with surrounding States and national benchmarks.

Interviewer Observations

Oklahoma has stable sources of construction materials and regularly monitors pricing changes in its bid processes. Abnormalities are identified quickly, and additional research is completed as needed. A stable contractor pool provides a variety of services, and very few bids attract limited competition. Urban and rural contractors across the regions exhibit economic health, and the results provide strong labor markets. Some concerns arise in specialty contract areas, such as commercial drivers. When markets for oil and gas rise, costs of projects increases as commercial drivers' license holders become scarce or more expensive.

Summary

In the State of Oklahoma, trends of total project prices from 2006 to 2016 and bid item number prices in comparison to relevant unit prices yielded no significant price deviations attributable to merger or acquisition activity. Additionally, initial contacts with the State showed no significant concerns regarding pricing effects of M&A activity. Oklahoma is currently unaware of any current studies of M&A activity in the State. The Materials Division approves aggregate and sand sources and maintains an approved list of quarries and locations. Despite a shortage of acceptable fly ash over the years, the State has no reported shortages in other construction materials. Oklahoma is plentiful in high-quality material sources and often exports aggregates.

OREGON

Case Study Background

During the initial research project analysis (before the formal case study interview described herein), investigation into consolidations in Oregon revealed that most M&A activity in the State occurred more than 14 yr ago. In addition, this activity was not captured in the dataset built by the researchers under this research project, which included an analysis period from the first quarter of 2006 through the third quarter of 2016. Activity during the analysis period included two major firms purchasing aggregate source companies and suppliers. The ODOT offers State sources of materials in the eastern part of the State, whereas the western part of the State has robust competition from private sources.

The State of Oregon is divided into five regions. Between 43 and 141 projects were awarded each year of the study period, and 170 unique firms were awarded contracts during the analysis period. Regions 2 and 3 (in the western portion of the State) saw higher project costs during the analysis period than other regions in the State. The State of Oregon has quarry and/or gravel pits located in every county; Columbia, Crook, Douglas, Jackson, and Linn Counties contained a larger number of quarries than the remaining counties. These counties are in regions 2, 3, and 4, which are located in the western and central part of the State. Wheeler, Wallowa, Sherman, Jefferson, Hood River, Gilliam, and Coos Counties contain the fewest quarry locations. The initial analysis of market conditions and supplier status (condition of the supplier in terms of market share, size, or location that would explain any advantages or correlations to higher costs for bid materials discussed) did not provide a clear explanation for the higher costs outside of the more urbanized and densely populated areas in the western part of the State. The data analyzed

in this case study did not reveal any significant pricing anomalies, as described in the Quantitative Analysis section below.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[8] Projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects. For example, in 2009, more than one-third of projects took place in region 2 of the State (35.8 percent); primary commercial exports from region 2 include gravel, concrete, and asphalt mixtures, indicating robust supplies of these materials.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for these items:

- Emulsified asphalt concrete mixture (ODOT bid item No. 0735-01000000M).
- PG 64-22 asphalt in HMAC (ODOT bid item No. 0745-0620000M).
- PG 70-22 asphalt in HMAC (ODOT bid item No. 0745-0640000M).
- Reinforced concrete pavement (ODOT bid item No. 0755-0109000J).
- Reinforced concrete pavement, 6-inch (ODOT bid item No. 0755-0111000J).
- Reinforced concrete pavement, 8-inch (ODOT bid item No. 0755-0113000J).
- Reinforced concrete pavement, 9-inch (ODOT bid item No. 0755-0114000J).
- Reinforced concrete pavement, 10-inch (ODOT bid item No. 0755-0115000J).
- Reinforced concrete pavement, 12-inch (ODOT bid item No. 0755-0117000J).
- Plant mix aggregate base (ODOT bid item No. 0641-0107000M).
- Aggregate base (ODOT bid item No. 0640-0100000M).
- ¼-inch aggregate base (ODOT bid item No. 0641-0108000M).
- ½-inch aggregate base (ODOT bid item No. 0641-0110000K).
- 1-inch aggregate base (ODOT bid item No. 0641-0115000M).
- 1½-inch aggregate base (ODOT bid item No. 0641-0117000M).
- 2-inch aggregate base (ODOT bid item No. 0641-0119000M).
- 2½ inch aggregate base (ODOT bid item No. 0641-0121000M).

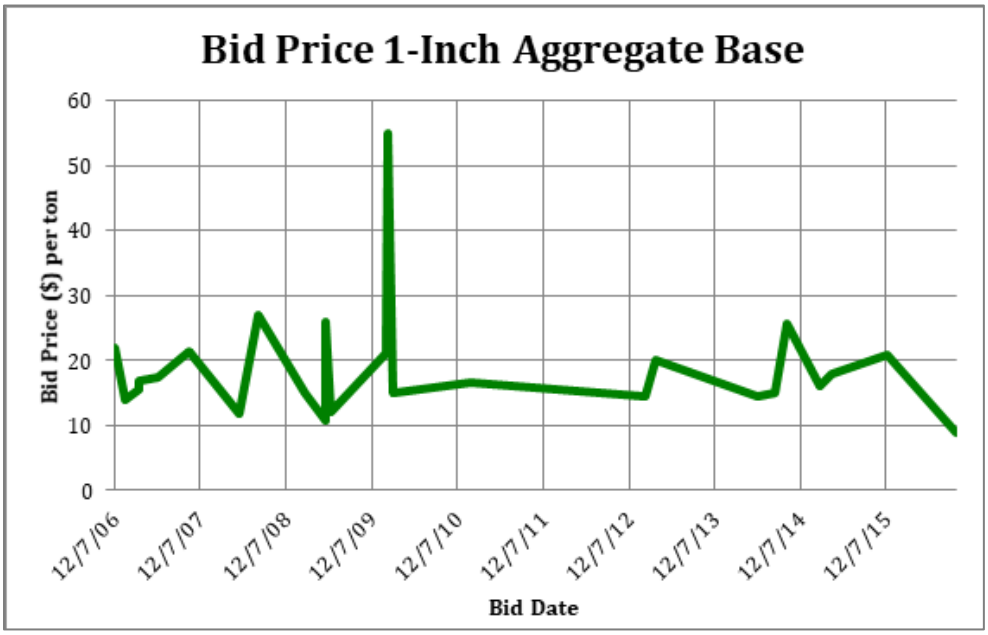
For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, while others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size;

[8]Ibid.

therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Of these aggregate items, 1-inch aggregate base, 1½-inch aggregate base, and 2½-inch aggregate base items yielded enough items for comparative analysis. The 1-inch aggregate base (item No. 0641-0115000M) was used in 25 unique projects across all 10 yr of the analysis period, except for 2012, which is ideal for price trend analysis. Twenty-two of these bids used the unit of tons for the 1-inch aggregate base, whereas three used cubic yards. Due to these discrepancies, the cubic yard items were converted into tons and price per ton using the conversion factor of 1.5 tons per cubic yard. Quantity versus bid price was analyzed, and no apparent correlations surfaced between these two values. A sample variance of $78.86 occurs among all 25 projects bid prices.

Figure 111 shows the bid price variation of 1-inch aggregate base across the 10-yr analysis period. A major price spike was seen in early 2010, where the bid price went up to $55/ton. The United States Geological Survey (USGS) reports included in the FHWA article, *Wherefore Art Thou Aggregate Resources for Highways?*, indicated that production and use of aggregates declined during the economic downturn between 2008 and 2010, whereas aggregate demand and production in 2007 was quite high (Meininger and Stokowski 2011). The USGS also indicated that, as of 2011, the State of Oregon had trap aggregate resources in the State as well as access to some granite sources in neighboring States. The team was unable to determine a specific reason for the price spike. The USGS also reported that many sources of aggregate in parts of the Pacific Northwest do not meet physical and durability requirements, which may limit use and require the State to seek other sources.



Source: FHWA.

Figure 111. Graph. Bid price variation—1-inch aggregate base.

ODOT, which has nearly 700 aggregate sources statewide (including both quarries and gravel and sand sites), also focuses heavily on extracting materials sustainability with the goal to

reduce, reuse, and recycle materials to proactively monitor material availability for construction and maintenance work. Through the State's sustainability efforts, the State analyzed aggregate resources and worked to protect these supplies from competing land uses and protect the natural resources within the State.

Challenges

Reinforced Concrete Pavement

Selecting relevant bid item numbers from the large, unsorted dataset to match the materials being analyzed was challenging. The dataset was built by merging Oman Systems, Inc., and State website bid data, and subject matter experts were needed to assist in the bid item number selection process. Similar bid item numbers were labeled in many different ways in the State-supplied data. Although items such as "structural concrete" were of interest for analysis and comparison, within the Oregon data, "structural concrete" does not appear in bid tabulations. In Oregon, more than 20 unique bid item numbers were determined to be structural concrete items. To explore price trends of these bid item numbers across years, individual items were selected; however, if an individual bid item number was not used in each of the 10 analysis years, assessing price trends covering gaps, varying geographies, and other factors was difficult.

As an example, Oregon uses the bid item number "reinforced concrete pavement" (item No. 0755-0109000J). During the analysis period, this bid item number was used in four winning projects won by four different contractors: two in 2007, one in 2008, and one in 2009. Table 97 shows the bid prices for this item, as well as the quantities used in the projects.

Table 97. Reinforced concrete pavement (item 0755-0109000J) bid prices.

Bid Date	Quantity (SY)	Bid Price (Dollars)	Project County	Total Bid Cost (Dollars)
5/24/07	576.0	79.00	Linn	11,988,520.40
10/11/07	735.3	90.00	Baker	12,487,827.25
3/13/08	231.0	120.00	Lane	9,393,792.92
6/18/09*	1155.0	54.00	Lane	405,082.00
6/18/09*	930.0	88.00	Lane	405,082.00

*These two lines are part of the same project.

Linn and Lane Counties are in ODOT region 2, and Baker County is in ODOT region 5. The highest bid price for reinforced concrete pavement occurred on the project in October 2007. This project also used the smallest quantity of reinforced concrete pavement.

Emulsified Asphalt Concrete Pavement

Another example of the challenge of analyzing trends involves the item "commercial asphalt concrete pavement" (item No. 0740-0100000M). This item was used in three unique projects won by three unique contractors, all in the spring and summer of 2015.

Also, within the data are similar items, such as "emulsified asphalt concrete mixture" (item No. 0735-010000M), which appears seven times in seven unique projects won by five

contractors (one contractor won three of the projects using this item during the analysis period). These seven projects were bid in 2006, 2007, 2008 (three projects), 2009, and 2014. Across these years is a sample variance of $6.23 among all seven projects' bid prices and no apparent trend in prices over time (i.e., prices were not steadily rising or falling, and prices did not have an apparent spike). Prices did not appear to vary based on quantity of the item in the bid, as seen in table 98. Additionally, with so few items across a 10-yr period, assessing trends with such small sample sizes is difficult. While there does seem to be a correlation between item quantity and bid price in table 98 (i.e., least quantity has highest bid price and highest quantity has lowest bid price), with four projects and five total items, the sample size remains quite small.

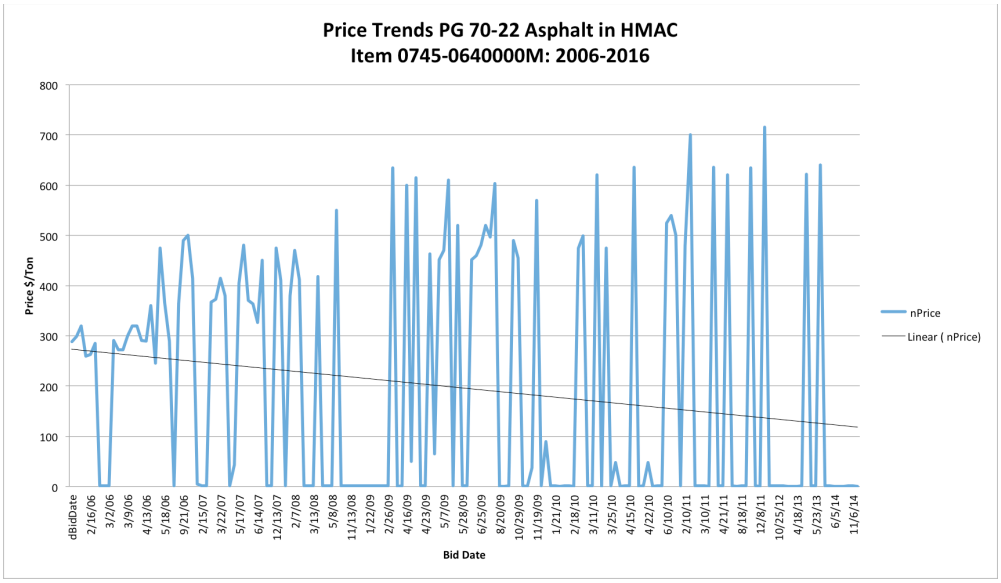
Table 98. Emulsified asphalt concrete mixture bid prices.

Bid Date	Quantity (Ton-G)	Bid Price (Dollars)	Project County	Total Bid Cost (Dollars)
1/26/06	29,500	14.85	Union	4,735,680.28
2/22/07	62,000	19.60	Deschutes	4,967,314.00
2/14/08*	15,720	12.92	Grant	2,498,481.50
2/28/08*	16,000	12.93	Harney	4,494,046.46
4/17/08*	16,000	14.91	Harney, Grant	4,568,615.02
4/16/09	74,000	14.95	Harney	5,562,894.75
10/30/14	43,000	18.00	Malheur	4,485,994.50

*Bids awarded to the same contractor

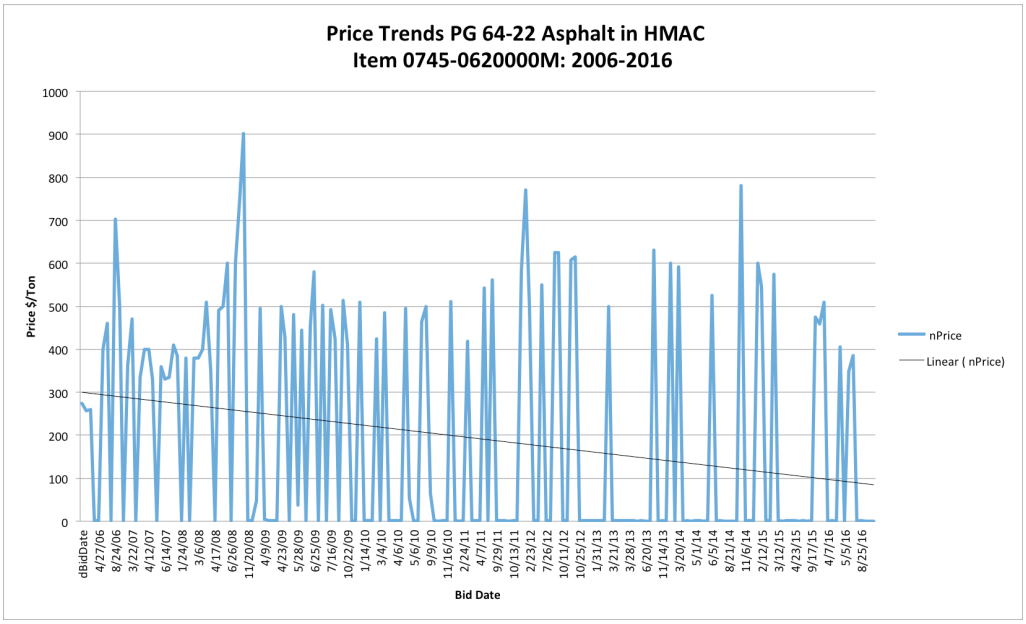
Union, Grant, Harney, and Malheur Counties are in ODOT region 5, and Deschutes County is in ODOT region 4. While the counties in which the projects took place are available in the data, the supplier information for any bid item numbers in the dataset is not available or included in the dataset. Therefore, it is not clear if transportation to the site is a factor in the costs. Without substantial effort for supplier tracking, such granular analysis is not possible on price data alone.

Two other asphalt items were also analyzed to find bid item numbers that occurred more often in the dataset: PG 70-22 asphalt in HMAC (bid item No. 0745-0640000M), which appeared 170 times in the dataset during the analysis period, and PG 64-22 asphalt in HMAC (bid item No. 0745-0620000M), which appeared 192 times in the dataset during the analysis period. Both of these items had frequent price variations during the analysis period, but both showed an overall downward trend in pricing when trend lines were produced on the graphs as shown in figure 112 and figure 113.



Source: FHWA.

Figure 112. Graph. Price trends—70-22 asphalt in HMAC (item No. 0745-0640000M).



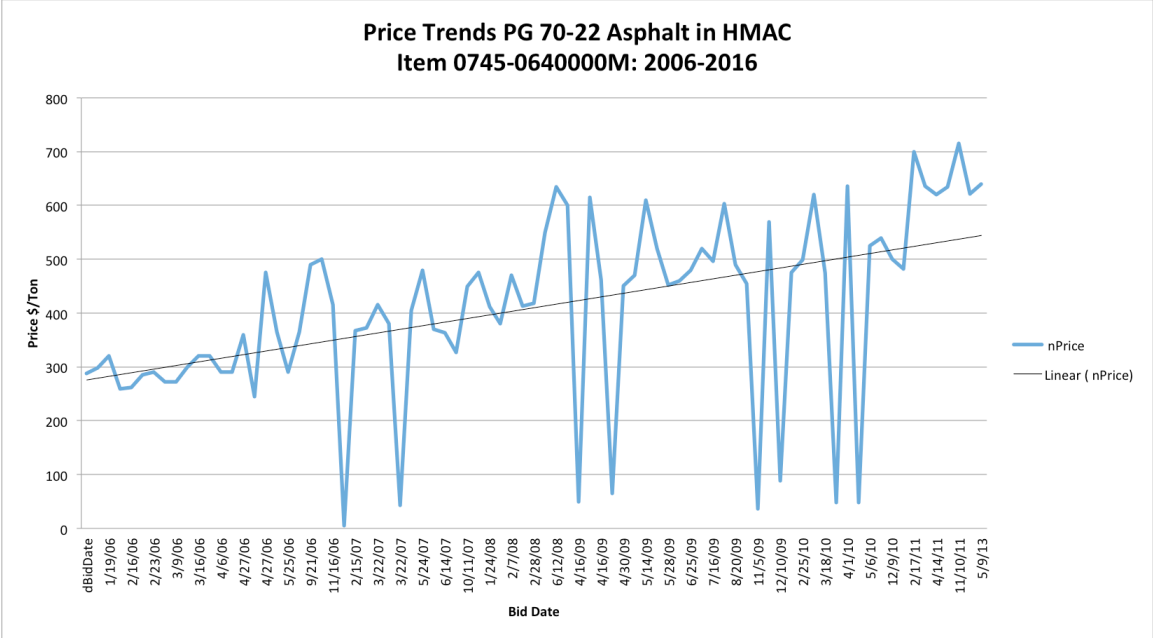
Source: FHWA.

Figure 113. Graph. Price trends—64-22 asphalt in HMAC (item No. 0745-0620000M).

These price variations were analyzed to determine whether any could be attributable to merger or acquisition activity. Many of the apparent drops in price were found to be due to $1.00 and penny bids. For the 70-22 asphalt, for 88 of the 170 times the item appeared, it was bid at $1.00/ton or less; 18 of the projects with these $1.00/ton or less bids had project costs over the average project cost for projects using this item. For the 64-22 asphalt, for 107 of the 192 times the item appeared, it was bid at $1.00/ton or less; 25 of the projects with these $1.00/ton or less bids had project costs over the average project cost for projects using this item. The $1.00/ton and less bids were removed to assess the price trends without these low prices; when this

assessment done for the 70-22 asphalt, the trend in prices appears to increase over the analysis period, as would be expected due to inflation.

As can be seen in figure 114, the item is still bid at a low price in several instances. Ultimately, these variations were determined to be unrelated to M&A activity. While the quantitative analysis revealed instances of mathematically unbalanced bid prices, no apparent link to M&A activity in that area occurred.



Source: FHWA.

Figure 114. Graph. Price trends—70-22 asphalt in HMAC without dollar/penny bids.

Oregon's Economy

Information about the state of the economy and labor market in Oregon during the analysis period was also investigated to see if any economic factors could be linked to items seen in the data. Many States experienced major economic repercussions due to the recession and global economic downturn from December 2007 to June 2009. Oregon's Office of Economic Analysis examines four main sources for job data: the monthly payroll employment survey, the monthly household survey, monthly withholding tax receipts, and the quarterly census of employment and wages.

Each industry's pre-recession peak varied somewhat based on variation in the economic impacts of the recession. For example, the construction industry began losing jobs earlier than other industries and earlier than the recession's official start date, according to the National Bureau of Economic Research (Lehner 2023). Due to the housing bubble during the recession, materials such as wood, construction, and mining were negatively affected, and the effects on material prices during those years are important to consider. Additionally, transportation equipment manufacturing suffered the worst job cuts. No usable correlation with this data and the case study data was found.

Due to the inconclusiveness of these quantitative analyses, the focus shifted to a more qualitative understanding of the impacts of merger activity and how the State of Oregon monitors for, and addresses, these impacts. Additionally, a better understanding of the qualitative side of the project can aid in future data collection and database development to support future exploration into M&A indicators and impacts.

Qualitative Analysis

The data for Oregon did not reveal any major price anomalies or evidence of consolidation activity. For this reason, a more qualitative investigation became the focus of the case study interview. While the data may not display any major trends associated with consolidation activities, the State of Oregon may have other measures and methods for identifying competition issues.

Bidding Process and Analysis

Contractors in Oregon run the gamut from small, family owned firms to large mega-firms. Some large contractors that were once small were publicly traded, and some are multigenerational. The State at one time had more than 400 prequalified contractors but has seen a steady decline of unique bidders over the years to around 90 today. Most prime contractors specialize in one or two functional areas, and prime contractors usually use the same subcontractors over time. Subcontractors do not often also bid as prime contractors on the same jobs, but it has happened. The State does analyze unbalanced bids.

Materials quotes are generally obtained from the nearest producers or suppliers or are created through work with subcontractors by developing the cost of supplying material from ODOT-offered publicly owned or controlled sources. Prime contractors do supply materials themselves, generally through the use of subcontractors for crushing; otherwise, they use major suppliers' quotes for their bids. Material supply has not changed much in the last 10 yr, but in the mid-2000s quite a few acquisitions influenced material supply. In addition, a decrease in supply in some areas has occurred as existing sources have been depleted, and the identification and permitting of new sources has been much more difficult. In areas where major companies come in and buy smaller suppliers, some changes have occurred in project bid prices and annual average unit prices. However, data collected for this project were not conclusive in documenting M&A activity impacts on competition. Increased land use restrictions make permit aggregate sites difficult, and Portland, OR, is an area where materials are transported by barges due to this issue (mostly gravel).

The list of future projects to be let is published on the ODOT website (Oregon.gov. n.d.a.). Twenty-five bid openings per year occur, on average, that are spread out sporadically throughout the year (between zero and three lettings per month) on Thursdays. The prequalification requirements and process are found via the prime contract prequalification link on the Bid and Awards page of the website, and lettings are advertised 3 w prior to bid closing (complex jobs may be advertised earlier) (Oregon.gov. n.d.b.). ODOT has been using Bid Express since 2008 and are trying to move to 100-percent electronic bids; proposals under $1 million are still 50-percent paper bids. Prime contractors are required to do 30 percent of the work with their own forces. The Portland, OR, urban area and the rural areas of the southwest and far eastern part of

the State are often considered separately. Urban areas tend to have more development and zoning restrictions that limit aggregate mining operations. Aggregates and gravel have to be transported by barge into the Portland area.

In rural areas, exclusive farm use zoning and more environmental restrictions and regulations have limited areas of permitted mines. Rural areas have more land available, but big suppliers can buy up smaller firms in these rural areas, which creates bid competition areas as well. Due to this issue, ODOT has provided State-owned aggregate source options on many projects in both the southwest and eastern areas to increase the availability of aggregates to all contractors bidding in these areas.

ODOT uses FHWA's *Guidelines on Preparing Engineering Estimates, Bid Reviews, and Evaluation* as general guidelines for bid evaluation prior to award (FHWA 2021a). During the case study interview, ODOT reported having an extensive homegrown software system that is used for bid analysis and the Federal guidelines policy (Oregon.gov 2022). The makeup of single bids varies, and, in general, a slight increase in single bidders has been seen, as the number of unique prime bidders has declined over the years. Specifically, the number of single bidders can rise in areas of supplier consolidation, and then it can decrease as State-provided sources are implemented to increase competition. There are on average 4 bids per proposal for about 110 proposals per year.

If a bid seems irregular (under or over the engineer's estimate by more than a certain threshold or considerably different than other competitive bids), it will be reviewed. Bid item numbers are automatically reviewed if the price is ±25 percent of the engineer-estimated bid price and if the total dollar amount for an item is ±$20,000 of the engineer-estimated bid total for that item. If a proposal comes in significantly over the estimate, ODOT has a confidential process to evaluate it for award, rejection, or rebid. Statewide average unit prices are calculated and published annually, and the past 5–8 yr of data are available. Additionally, ODOT has statewide historical bid data reports dating back to 2007 available on request. An in-house software system is used to analyze data and identify trends in bid pricing. Many problems in this area have been traced back to M&A activity in various regions of the State.

M&A Activity

ODOT is reactive when unit prices go up. The agency tries to determine the cause (such as reduced number of bidders, reduced number of suppliers, or other factors), and the State's Material Source Program was initially set up to manage a network of publicly owned or controlled material sources across the State. As part of that program, the State looks at distribution of sites, evaluates ownership, and uses history to offer viable publicly owned or controlled sources for use on projects. This program unofficially tracks mergers of aggregate suppliers based on information in the news or information provided by contractors or permitting agencies. Their effort is not focused on price increases or the number of bidders, but rather aims to get a better understanding of the market and who the players are. Trends and correlations between M&A activity and changes in bidders have been noticed when suppliers of aggregates buy up smaller firms and minimize the numbers of suppliers/bidders. ODOT noted that many times these larger firms buy smaller firms and do not change the name, so the smaller firms can

raise supply costs and stay under the radar. ODOT has worked with the DOJ on some M&A activity analysis and supplies information to the DOJ as requested.

When M&A activity limits supply to only one or a few suppliers and unit pricing is affected, ODOT has (where practical) attempted to offer publicly owned or controlled material sources to stimulate competition. While not always used, the existence of a publicly controlled materials source available to all bidders has sometimes resulted in lower material costs. Local zoning has disallowed quarries or asphalt plants to open in various areas, which affects competition. The process to permit a material source in Oregon can be very time- and cost-intensive. Acquisitions were focused on companies that had large reserves; many small companies cannot afford to negotiate the land use process associated with permitting of a new source.

ODOT has studied bid prices and mining permits issued by the Oregon Department of Geology and Mineral Industries to see if there are correlations. In general, where there are fewer permits, there can be a higher price structure. This result occurs many times in rural areas where local suppliers have been bought and consolidated the supply, thereby leading to minimal land available for new companies looking to apply for mining permits. ODOT reported a lawsuit with a firm doing business in construction material supply items about 10 yr ago involving a bid-rigging case, but no recent complaints have been received about anticompetitive bidding or cost issues. Striping companies were also investigated, and the Secretary of State audited ODOT to investigate penny bids 2 yr ago; ODOT is now looking at combining asphalt concrete and mix asphalt items to combat these penny bids. Some methods ODOT has used to deal with these issues include providing publicly owned or controlled aggregate sources for projects in areas with minimal bidders and minimal suppliers. They have also bid projects more often (weekly or biweekly) instead of monthly, which has provided more bidders, as measured by the trends after this change was made (mainly due to bonding companies allowing more companies to bid most proposals in the smaller lettings).

Interviewer Observations

ODOT indicated that companies have spent much money in the last 10 yr targeting acquisitions to secure material reserves to position themselves to better control market pricing in key areas of projected future transportation growth. Five to eight agencies bid their own projects. ODOT is unique in that the agency has an extensive homegrown software system that is used for bid analysis; this software could be used to look into M&A activity correlations and tracking.

ODOT also expects the new AASHTOWare software suite will provide a greater ability to research bid data for investigating and understanding the effects of M&A activity (AASHTO 2021). This analysis would be especially useful in areas that have minimal sources or minimal competition and could be a good organization model and provide example processes that other States could use to increase competition and keep prices in balance.

Summary

The objective of this case study was to quantify how construction industry mergers, acquisitions, or other consolidations are impacting the cost and quality of highway construction in the State of Oregon. During the initial analysis (before the case study interview), investigation into

consolidations in Oregon revealed that most M&A activity in the State occurred more than 14 yr ago and was not captured in the dataset built. The data used in this project did not reveal any significant pricing anomalies. Due to the inconclusiveness of these quantitative analyses, the focus shifted to a more qualitative understanding of the impacts of merger activity and how the State of Oregon monitors and addresses these impacts.

ODOT is reactive when unit prices go up. The agency tries to determine the cause, and the Material Source Program unofficially tracks mergers of aggregate suppliers based on information in the news or information provided by contractors or permitting agencies. When M&A activity limits supply to only one or a few suppliers and unit pricing is affected, ODOT has (where practical) attempted to offer publicly owned or controlled material sources to stimulate competition. The material source information is not available in the bid data, so determining the source of individual bid item numbers is not possible. ODOT has also addressed competition issues by bidding projects more often (weekly or biweekly).

TENNESSEE

Case Study Background

During the analysis period from the first quarter of 2006 through the third quarter of 2016, TDOT has seen some merger and consolidation activity in construction materials. In June 2017, Martin Marietta announced the acquisition of Bluegrass Materials Co., which has 33 locations across the mid-Atlantic and Southeast United States, including locations in Chattanooga and Calhoun, TN. As the data for this study are from 2006 to 2016, the impact of these changes has not yet been determined. TDOT has also provided detailed mapping of quarry locations and producer facilities available on its website (TDOT n.d.b.).

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[9] Projects containing bid item numbers of interest were extracted and sorted to attempt to match the data with contractor names and total project costs. This step was challenging for the Tennessee data due to the lack of bid dates in the data. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by State region to assess any geographical influences on awarded projects.

TDOT has seen some consolidation activity during the analysis period. One firm made a purchase that resulted in a controlling share in the supply and cost of river sand in the Nashville market. This activity was brought to the attention of the DOJ Antitrust Division. Another firm purchased a company, including their quarries and other facilities, located in the eastern part of the State, which resulted in a controlling market share in this area. Another firm purchased several local family owned, ready-mix plants in the middle part of Tennessee; approximately 15 yr prior, another firm performed similar purchasing activity. The results of these acquisitions are that these two firms own approximately 75 percent of the approved ready-mix plants in the

[9]Ibid.

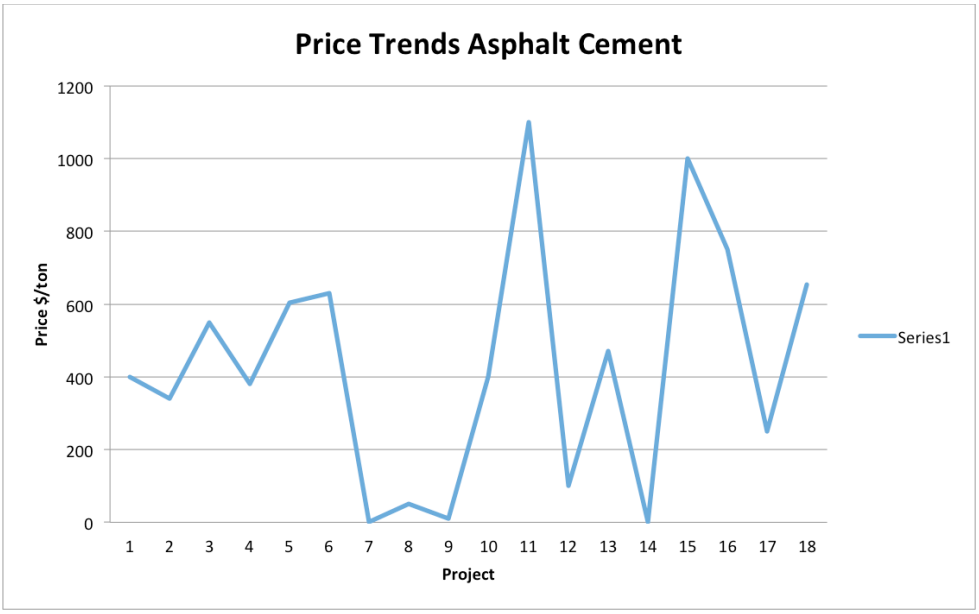
middle and eastern parts of the State. Another purchase made within the past several years resulted in a majority of the market share of precast pipe and drainage structures being controlled by one firm. TDOT reported some concerns of the effects of this activity on bid pricing and competition, but no changes to contract language or statues were made as a result. Precast pipe and drainage structure items in the dataset were then compared to unit price data reported by TDOT to examine any pricing effects due to the merger activity. This analysis revealed that bid prices for these items were not significantly higher than the unit price reported by TDOT; most were right around or up to $50 higher than the reported unit price. Additionally, a variety of firms were seen in the winning bid data, suggesting that one firm does not hold market control over the others.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for these items:

- Portland cement concrete pavement, 8-inch (TDOT bid item No. 501-01.02).
- Portland cement concrete pavement, 10-inch (TDOT bid item No. 501-01.03).
- Portland cement concrete pavement (TDOT bid item No. 501-01.06).
- Portland cement concrete pavement replace (TDOT bid item No. 501-01).
- Portland cement concrete pavement (plain), 14-inch (TDOT bid item No. 501-01.07).
- Fine aggregate no. 10 backfill (TDOT bid item No. 771-05.86).
- Fine aggregate no. 10 backfill (TDOT bid item No. 771-13.56).
- Asphaltic concrete surfaces (hot mix) grade E (TDOT bid item No. 411-01.07).
- Asphalt cement (tack coat (TC)) (TDOT bid item No. 403-02).
- Asphalt cement (BPMB-hot mix) grading A (TDOT bid item No. 307-01.02).
- Asphalt cement (BPMLC-hot mix) grading C (TDOT bid item No. 307-01.11).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, while others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Asphalt cement (TC) (bid item No. 403-02) appears 18 times across the analysis period in 18 unique projects. Figure 115 shows the trend in prices of this item over the analysis period. The data for Tennessee contain 5-digit codes for bid date instead of a day/month/year format, making ascertaining when projects occurred difficult.



Source FHWA.

Figure 115. Graph. Price trends—asphalt cement (TC) (item No. 403-02).

The average bid price per ton of asphalt cement is $427.29/ton, and the median bid price is $399.99/ton, with a minimum bid price of $1.00/ton and a maximum bid price of $1,100.00/ton. The deviation in prices for this item is $330.37/ton. The minimum price of $1.00/ton appeared twice in the dataset on two projects: 3 tons at $1.00/ton in Dickson County, and 38 tons at $1.00/ton in Dyer, Henry, and Weakley Counties.

Dickson County is located in region 3 of the State; Dyer County, Henry County, and Weakley Counties are all located in region 4 of the State. The maximum price of $1,100.00/ton appeared once in the dataset on one project: 2 tons at $1,100.00/ton in Shelby County. Shelby County is located in region 4 of the State.

Challenges

The main challenge in the Tennessee data is that the bid dates are listed as 5-digit numbers instead of dates. There appeared to be no logical mapping of these numerical codes that could be used to match them to specific dates. The job numbers were used to identify the contractor names and total costs. This feature made the initial matching process as well as subsequent sorting by date range efforts difficult. Additionally, like many other States, Tennessee has data items with similar names and different item numbers, making analysis difficult as the differences between these items is unclear. For example, as seen in the item list, two items have the name “fine aggregate no. 10 backfill” with two unique item numbers, as well as two items have the name “fine aggregate no. 10 bedding/backfill” with have two unique item numbers.

In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, no links to merger/acquisition activity were apparent in that area.

Qualitative Analysis

Bidding Process and Analysis

Within Tennessee, prime contractor firms vary from small to large, with 8–10 large, publicly traded prime firms that consistently bid. The State also has some family owned, multigenerational firms that bid. There are 800 prequalified firms; fewer than 50 percent of these firms bid with TDOT, as many get prequalified to meet bid requirements for other local municipality or government agency bids. TDOT has 35 work classification codes listed on the final page of the prequalified contractors list, which is available on the DOT's website (TDOT n.d.a.). Contractors are required to check which work classification(s) applies to their company.

TDOT does not analyze changes in these classifications and does not assign dollar amounts in selected classifications. They instead rely on bonding companies to govern the amount of work they will bond for any given contractor. Contractors are limited in prequalification only if performance issues exist, sanctions exist, or if the contractors self-limit themselves. Many grading contractors have bridge divisions, some with asphalt paving capabilities. Prime contractors are required to perform 30 percent of the contract with their own forces, and many prime contractors use the same subcontractors over time, depending on location, type of work, and past work experience. Sometimes subcontractors also bid as prime contractors on the same jobs, depending on job type. For example, a bridge replacement may need a subcontractor that can pave, but the paving subcontractor may also do the bridge work and bid as a prime.

As for materials, most bidders secure quotes from the geographically nearest producers and suppliers. TDOT noted that the selections then have to trickle down to suppliers (e.g., HMA producers will purchase liquid asphalt from suppliers). Some prime contractors also own quarries for aggregates, and some prime contractors also have their own ready-mix operations. Over the last 14 yr, no noticeable change in the supply of aggregates, HMA, or concrete has occurred. However, the suppliers have changed, and fly ash shortages have occurred. Seeing changes in bid prices for raw materials is difficult since bid item numbers are inclusive of several items (e.g., labor, equipment, materials, overhead). Fly ash shortages during the 10-yr analysis period may have affected bid prices.

TDOT publishes a bid manual on their website, which also includes a 3-yr plan for future projects to be let (Nashville DOT and Multimodal Infrastructure 2021). Each year about eight or nine regular lettings occur approximately every 7 w on Fridays. TDOT requires all prime contractors (except mowing and litter removal contractors) to be licensed with the Tennessee Department of Commerce and Insurance, Board for Licensing Contractors, not for bidding, but before a contract is awarded. Contractors self-proclaim the functional areas they want to bid in during the prequalification process. Eligible bidders are not published in a list. TDOT uses Bid Express during the letting process and moved to AASHTOWare bidding in 2019 to expedite the process (Bid Express 2021; AASHTO 2021). Some rural areas experience less competition, which is generally not an issue.

For bid analysis, a systematic software process is used to create a bid tab. Small groups meet to go over proposals for award, and area engineers assist in the evaluation of bids in their area to make recommendations at the group meeting. TDOT's policy on construction contract awards

addresses unbalancing and provides examples of both mathematically and materially unbalanced bids; however, no other process other than reviewer evaluation occurs. The policy on unbalanced bids is listed on the bidding website. In a letting in December 2018, 29 percent of proposals were single bids; the percentage is usually higher in the February through March lettings when most resurfacing projects are let. Single-bid proposals average about 8–10 percent over the engineering estimate, and some areas with single asphalt plant sources receive more single bids.

Bid data are tracked, but fluctuations in cost of materials (especially bituminous materials) can distort analysis of data trends, especially in the number of bids per proposal. HMA, aggregate base, concrete pavements, and structural concrete are major bid item numbers. If a bid item number seems out of alignment with the engineer's estimates or other bidders submitting on that opportunity, the quantity is checked, and bidders are contacted and queried about bid details of the item(s) in question. Complementary bidding has been encountered, but it is speculative and not much can be done to address it. Average unit prices for the past 5–8 yr are available online, as well as in an internal average price program that can be used (TDOT n.d.c.). Historical bid data from the past 5–8 yr are also available, but these data are not generally analyzed unless a need is identified. In the past, structural concrete was identified as an item of interest, and soon rebar is due to be reviewed because of new tariffs.

M&A Activity

M&A activity is monitored. For example, sand supplier Hunter Materials was acquired by Pine Bluff Materials, Vulcan bought US Aggregates, Bluewater bought Vulcan/US Aggregates through a DOJ agreement, and Bluewater bought Hoover in middle Tennessee. Both M&As and increases in prices of rock products have occurred over the past few years. However, data to define this relationship have not been found. The State has found that rising prices often follow M&A activity, but this activity is not necessarily the cause. TDOT has worked with the DOJ on some M&As, and general discussions on how to minimize impacts on competition and pricing have taken place. However, bids are only rejected if costs are excessive. Projects have been bundled to attract other bidders and to create competition (free enterprise versus monopolization). The State feels that producing good estimates and compiling average unit prices across years for bid analysis and year-over-year comparisons is important.

Local zoning has disallowed quarries or asphalt plants to open in areas that would affect competition. The interview noted that zoning boards may allow some new quarries or asphalt plants that are connected in some way to existing uses, but not others that are located near new aggregate sources. Therefore, maximum competition has not taken place. Hurricane Katrina in 2005 affected bids, and recent shortages on electrical contractors due to Hurricane Maria in 2017 have also affected bids. Tariffs and embargos have also affected steel prices, but there have been no issues with cement supply.

Overall, TDOT believes that competition is good, and while occasional rumors about anticompetitive bidding have surfaced, no complaints have been received. In the interview, it was noted that there was an incident of the U.S. DOJ versus US Aggregates/Vulcan and Bluewater in 2017; the Vulcan acquisition of US Aggregates was approved with conditions including the divestitures of key holdings (material sources) in key areas. TDOT was allowed to

give opinions on the competition issues due to this acquisition, which helped the DOJ identify key divestitures they required to allow the acquisition to occur.

Some ideas that TDOT have used included breaking projects up to increase competition on a smaller set of projects rather than one large project. Alternative bids have been used as well, such as for hot-in-place versus cold-in-place asphalt. TDOT has also tried bundling projects to get contractors to move into an area that has minimal competition.

Interviewer Observations

A few large firms have bought up many smaller firms in the aggregates, concrete, and asphalt paving industry, but much of this activity was more than 14 yr ago. Tennessee reported little difficulty in meeting realistic average percent variance goals compared with State-estimated project pricing. The State has very few concrete paving jobs, as most of the pavement build in the State is asphalt. What little concrete is used is in urban areas and ramps. Contractors can volunteer to participate in constructability reviews during the design phase, typically after 50 percent of the design is complete. These results are then published to aid in material needs planning for future lettings. The State has completed about six or seven design-build projects and two construction manager/general contractor projects.

Summary

During the analysis period from the first quarter of 2006 through the third quarter of 2016, the TDOT has seen some consolidation activity. One firm made a purchase that resulted in a controlling share in the supply and cost of river sand in the Nashville market. Other purchases caused some concerns on the effects on bid pricing and competition, but no changes to contract language or statues were made as a result. Most of the consolidation activity was more than 14 yr ago. Bid data are tracked, but fluctuations in cost of materials (especially bituminous materials) can distort analysis of data trends, especially in the number of bids per proposal.

TDOT has used a variety of strategies to increase competition. In some cases, they have broken up projects to increase competition on a smaller set of projects. Alternative bids have been used as well, such as hot-in-place versus cold-in-place asphalt. TDOT has also tried bundling projects to get contractors to move into an area that has minimal competition.

WISCONSIN

Case Study Background

In the State of Wisconsin, trends of total project prices during the analysis period from the first quarter of 2006 through the third quarter of 2016 and bid item number prices compared to relevant unit prices yielded no significant price deviations attributable to merger or acquisition activity. Initial contacts with the State showed no significant concerns regarding pricing effects of M&A activity. During the case study interview with WisDOT, further investigation into the bidding process, contractor makeup, bidding analysis, and M&A activity was completed. WisDOT reported having a variety of firms, including some family owned, multigenerational firms in specialty areas such as concrete and bridge construction. From year to year, the number of prequalified bidders in one functional area does not vary much, and the ratings given are

identified on the prequalification lists published on the WisDOT website (Wisconsin DOT n.d.c.).

Many prime contractors tend to specialize in functional areas, but several firms do cross over to work in other areas. Generally, firms utilize a large number of subcontractors, but in recent years firms have become more flexible in specialization areas to meet the 30-percent prime requirement. During selection of subcontractors, cost is the greatest determination factor, and at times joint ventures do occur to meet the 30-percent prime requirement.

Quantitative Analysis

Data Analysis

Data from 2006 to 2016 were analyzed.[10] Projects containing bid item numbers of interest were extracted, sorted by date, and matched with contractor names and total project costs. Initial analyses aimed to explore bid item number price trends throughout the analysis period to identify any anomalies. Additionally, projects were analyzed by region to assess any geographical influences on awarded projects. Identifying contractor and pricing for Wisconsin was relatively simple, as the project numbers were sequential based on date. WisDOT was also responsive to requests for additional data, including historical unit price data, for the analysis period. The number of contractors included in the dataset ranged from 56 to 115 per year during this time period.

Data for items of interest were sorted from the larger database and analyzed for any trends. Bid prices, quantities, and counties where work occurred were considered. While the data included multiple items for each material (e.g., 10 or more unique items may be in the data related to structural concrete), many were not used on projects across enough years to provide trend information. This analysis process was repeated across many sets of construction materials, specifically for these items:

- Base aggregate dense, ¾-inch (WisDOT bid item No. 305.011).
- Base aggregate dense, ¾-inch base aggregate (WisDOT bid item No. 305.0115).
- Base aggregate dense, 1¼-inch (WisDOT bid item No. 305.012).
- Base aggregate dense, 1¼-inch (WisDOT bid item No. 305.0125).
- Base aggregate dense, 3-inch (WisDOT bid item No. 305.013).
- Asphaltic material PG58-28 tack coat gal 31.0 (WisDOT bid item No. 455.0105).
- Asphaltic material PG64-28 (WisDOT bid item No. 455.012).
- Asphaltic material PG64-28P (WisDOT bid item No. 455.014).
- Asphaltic material PG64-28P GAL (WisDOT Bid item No. 455.024).
- Concrete pavement, 8-inch (WisDOT bid item No. 415.008).
- High early strength (HES) concrete pavement, 8-inch (WisDOT bid item No. 415.108).
- Concrete pavement, 9-inch (WisDOT bid item No. 415.009).

[10]Ibid.

- HES concrete pavement, 9-inch (WisDOT bid item No. 415.109).
- Concrete pavement, 7½-inch (WisDOT bid item No. 415.0075).
- Asphaltic concrete pavement type E-0.3 (WisDOT bid item No. 460.11).

For each State, bid item numbers of interest were selected for price trend analysis. Of the items of interest, some yielded multiple years and multiple projects where the item was in use, while others did not. For example, some selected items yielded five or fewer projects using the item across the analysis period. Stronger trend information is gleaned with larger sample size; therefore, larger sample size items (items yielding more results) were selected for detailed analysis in this case study.

Base aggregate ¾-inch (item No. 305.011) appeared 1,689 times during the analysis period. The average, median, deviation, and quartile prices for the entire analysis period are shown in Table 99.

Table 99. Bid price statistics for item 305.011, 2006-2016.

Average Price ($/ton)	Deviation ($/ton)	Min. Price ($/ton)	25th Percentile ($/ton)	Median Price ($/ton)	75th Percentile ($/ton)	Max. Price ($/ton)
16.24	10.45	0.01	11.00	14.10	18.00	150.00

The minimum price of $0.01/ton appeared quite low; this low price/ton appeared three total times in the bid data:

- 6,100 tons at $0.01/ton bid on 5/13/14 in Jackson County.
- 8,500 tons at $0.01/ton bid on 3/10/15 in Brown County.
- 5,300 tons at $0.01/ton bid on 4/14/15 in Dane County.

Jackson County is located in the northwest region of the State, Brown County is located in the northeast region of the State, and Dane County is located in the southwest region of the State. The maximum price of $150.00/ton appeared twice in the bid data:

- 2 tons at $150.00/ton on 5/11/10 in Milwaukee County.
- 10 tons at $150.00/ton on 7/14/15 in Dane County.

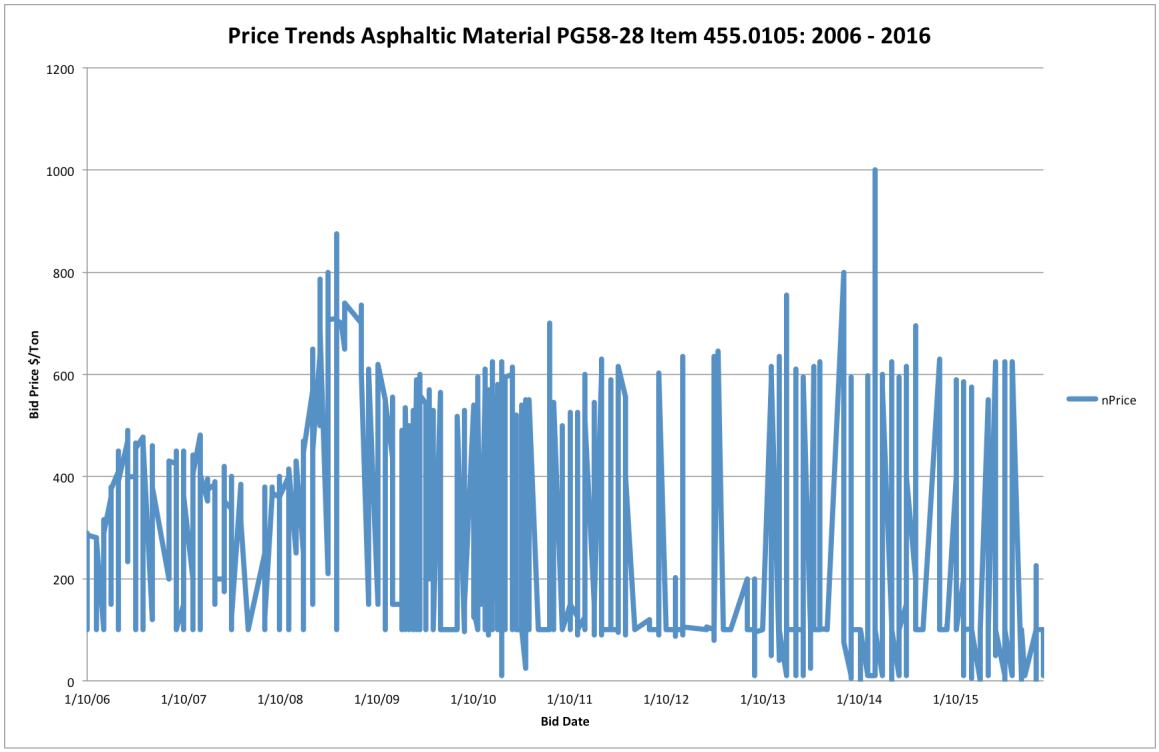
Milwaukee County is located in the southeast region of the State and Dane County is located in the southwest region of the State.

Asphaltic material PG58-28 tack coat gal 31.0 (item 455.0105) appeared 1,046 total times in the bid data during the analysis period. The average, median, deviation and quartile prices for the entire analysis period are shown in Table 100.

Table 100. Bid price statistics for item 455.0105, 2006-2016.

Average Price ($/ton)	Deviation ($/ton)	Min. Price ($/ton)	25th Percentile ($/ton)	Median Price ($/ton)	75th Percentile ($/ton)	Max. Price ($/ton)
279.56	210.42	1.00	100.00	150.00	468.25	1000.00

Figure 116 shows the price trends of item 455.0105 across the analysis period.



Source: FHWA.

Figure 116. Graph. Price trends—item 455.0105 for 2006–2015.

The minimum price of $1.00/ton appeared seven times in the dataset:

- 35 tons at $1.00/ton bid on 1/14/14 in Milwaukee County.
- 1,880 tons at $.100/ton bid on 5/13/14 in Fond Du Lac County.
- 1,595 tons at $1.00/ton bid on 4/14/15 in Dodge County.
- 1,384 tons at $1.00/ton bid on 7/14/15 in Washington County.
- 143 tons at $1.00/ton bid on 9/15/15 in Washington County.
- 155 tons at $1.00/ton bid on 9/15/15 in Washington County.
- 1,254 tons at $1.00/ton bid on 11/10/15 in Washington County.

Milwaukee and Washington Counties are located in the southeast region of the State, Fond Du Lac County is located in the northeast region of the State, and Dodge County is located in the southwest region of the State. The maximum price of $1,000.00/ton appeared one time in the

dataset: 1 ton at $1,000.00/ton bid on 3/11/14 in Dane County. Dane County is located in the Southwest region of the State.

Challenges

A similar challenge was experienced for multiple items of interest in Wisconsin. This challenge is shown by example for concrete items.

During the analysis period, there were 30,963 concrete items. During data analysis, this large volume of concrete items made it difficult to determine which concrete items appeared in the dataset enough for a robust analysis. Additionally, the item name "concrete" is used in the dataset for 12 unique pay item numbers with different units. For example, the following pay items are all labeled simply as "concrete" in the description but appear to all be unique items. The item number is shown along with the reported unit:

- Item No. 517.1010.S (square feet).
- Item No. 603.8 (LF).
- Item No. 603.8125 (LF).
- Item No. 416.101 (CY).
- Item No. 415.041 (SY).
- Item No. 517.1015.S (square feet).
- Item No. 620.01 (SY).
- Item No. 620.03 (SY).
- Item No. SPV.0090-298 (LF).
- Item No. SPV.0090-299 (LF).
- Item No. SPV.0090-300 (LF).
- Item No. 509.15 (SY).

If the database was searched for more specific concrete items, the naming still proved to be problematic. Sorting for "concrete pavement" and looking for different sizes yielded 12 similar items, including 6 with the same description but different pay item numbers:

- Special concrete pavement, 12.5-inch (SPV.0180O).
- Special concrete pavement, 12-inch special high early strength (SPV.0180C).
- 01. Concrete pavement, 12½-inch (SPV.0180-348).
- Concrete pavement, 12-inch special (SPV.0180-243).
- Concrete pavement, 12-inch special (SPV.0180-150).
- Concrete pavement, 12-inch special (SPV.0180-152).
- Concrete pavement, 12-inch special (SPV.0180-329).
- Concrete pavement, 12-inch special (SPV.0180-207).
- Concrete pavement, 12-inch special (SPV.0180-145).
- Concrete pavement, 12½-inch SY (415.0125).
- 0009. Concrete pavement, 12-inch special **p** (SPV.0180-316).
- 0105. Concrete pavement, 12-inch special (SPV.0180-1063).

These occurrences in the dataset were encountered frequently and made price trend and anomaly analysis challenging. In conclusion, while the quantitative analysis revealed instances of mathematically unbalanced bid prices, there was no apparent link to M&A activity in that area.

Qualitative Analysis

Bidding Process and Analysis

A bid manual published via the Highway Construction Contract Information (HCCI) website includes a published list of future projects to be let, the number and frequency of lettings during the year, the prequalification process, advertisements for lettings, a published list of eligible bidders per proposal (which bidders can opt out of), and a published list of plan holders per proposal (Wisconsin DOT n.d.a.). The letting process is conducted electronically using Bid Express (2021). Urban and rural areas are not considered separately. Bids are evaluated before award using AASHTOWare BAMS/DSS™ (AASHTO 2023). Unbalanced bid analysis is conducted using an internal access database where anything that is over by 5 percent or under by 10 percent is analyzed and then passed onto a leadership team for a final decision. Single bids are tracked; in 2018 about 16 percent of bids were single bids, which is standard from year to year.

Most contractors use their own sources for aggregates, asphalt, and concrete materials, but they do purchase materials from suppliers as well. Prime contractors often supply their own materials but use subcontractors for other work and will look for competitive locations for sources if applicable. Over the last 10 yr, material supplies have not changed significantly. No changes in individual project bid prices or annual average unit prices have been identified since the asphalt consolidation in the State 20 yr ago. Currently, the southeast region of the State is experiencing supply versus demand issues due to the arrival of FoxConn.

On average, proposals have three to four bids per proposal. When analysis reveals bids out of alignment with engineer estimates, the regional team is contacted to investigate details such as accuracy of bid information. When confirmation on the item in question is received, the bid is then analyzed using the unbalanced bid analysis process. The HCCI posts lists including statewide average unit prices for all bid item numbers, and this information is available for the preceding 5–8 yr. Historical statewide bid data are also available, and construction cost indexes track these data and look for trends in bid pricing as well as any significant changes in bid pricing over time. If significant changes are identified, the cause is investigated further.

M&A Activity

While no formal monitoring of M&A activity in the State is completed, name changes do occasionally occur and are usually identified in the prequalification list generation. Bid price changes are tracked, but not regarding M&A activity. Thus, no correlations between the two have been identified. While many prime contractors supply their own aggregates, they do at times lease or buy from other firms when it aids in competitive pricing. Timeframe concerns exists for zoning approval for local quarries or portable plants. Additionally, Foxconn influences the sand mining for fracking sand, and some concerns of antitrust of aggregate sourcing did occur where exclusive agreements existed that could be considered antitrust concerns. Despite

these concerns, WisDOT has not experienced any concerns about M&A activity in relation to correlations with this activity and competition, market shares, or bid pricing.

Interviewer Observations

WisDOT's unbalanced bid analysis process is robust, and many in the industry consider it a model for other States to follow. FHWA provides a link to WisDOT's procedure as an example process. Other States have expressed great interest in this process. Tracking the construction cost index (in Wisconsin 100 items are tracked), asphalt index, concrete index, and structures index is done in a manner similar to the process used by the Ohio DOT. Materials specifications are written and disseminated statewide, and these specifications can be tailored as needed.

Summary

In the State of Wisconsin, trends of total project prices during the analysis period from the first quarter of 2006 through the third quarter of 2016 and bid item number prices compared to relevant unit prices yielded no significant price deviations attributable to merger or acquisition activity. Additionally, initial contacts with the State showed no significant concerns regarding pricing effects of M&A activity. During the case study interview, further investigation into the bidding process, contractor makeup, bidding analysis, and M&A activity was completed.

While M&A activity in the State is not formally monitored, name changes do occasionally occur and are usually identified in the prequalification list generation. Bid price changes are tracked, but not regarding M&A activity. Thus, no correlations between the two have been identified. Additionally, no major price anomalies in the data analysis were discovered.

ACKNOWLEDGMENTS

This document would not have been possible without the participation of many dedicated State construction engineers and their teams. In particular, we wish to acknowledge the input of the States of Georgia, Wisconsin, Missouri, Ohio, Arizona, Colorado, Oklahoma, and Tennessee for their access and contributions to this report.

The map in figure 4 was created using MapChart to show the AASHTO regions (Historical MapChart 2022).

The original map in Figure 5 is the copyrighted property of Wisconsin DOT and was modified to enhance the boundaries between regions.

The map in figure 96 was created using MapChart to show the case study States (Historical MapChart 2022).

REFERENCES

AASHTO. n.d. "AASHTOWare Project Bids" (web page). https://www.aashtowareproject.org/bids, last accessed March 8, 2023.

AASHTO. 2013. *Practical Guide to Cost Estimating*. Washington, DC: AASHTO. https://store.transportation.org/Item/CollectionDetail?ID=122, last accessed January 7, 2022.

AASHTO. 2021. *AASHTOWare Project™ 4.6* (software).

AASHTO. 2023. "BAMS/DSS™" (web page). https://www.aashtowareproject.org/bds, last accessed January 10, 2023.

ADOT. n.d.a. "Estimated Engineering Construction Cost E2C2" (web page). https://apps.azdot.gov/e2c2/HistoricalPrice.aspx, last accessed November 28, 2022.

ADOT. n.d.b. "Preparing the Bid and Other Bid Requirements" (web page). https://azdot.gov/business/adot-business-coach-demand/preparing-bid/subcontractor/preparing-bid-and-other-bid, last accessed January 10, 2023.

ADOT. 2022. "AZ UTRACS" (web page). https://utracs.azdot.gov/AzUtracsRegistration/, last accessed November 28, 2022.

Associated General Contractors of America. 2022. "AGC" (web page). https://www.agc.org/, last accessed April 5, 2022.

Baker Tilly Capital. 2017. *Engineering and Construction M&A Update.* Chicago, IL: Baker Tilly Capital. http://bakertilly.com/insights/engineering-and-construction-ma-update-h2-2016/, last accessed March 5, 2021.

Bid Express. 2021. "Bid Express" (web page). https://www.bidexpress.com/login?return_to=%2F, last accessed March 5, 2021.

Bureau of Economic Analysis. 2023. "GDP by State" (web page). https://www.bea.gov/data/gdp/gdp-state, last accessed March 16, 2023.

Bureau of Labor and Statistics. 2023. "Economy at a Glance" (web page). https://www.bls.gov/eag/eag.co.htm, last accessed March 16, 2023.

Burger, W. E., and Supreme Court of the United States. 1983. *U.S. Reports: Copperweld Corp. v. Independence Tube Corp., 467 U.S. 752*. https://www.loc.gov/item/usrep467752/, last accessed January 27, 2021.

Carlton, D. 2009. "Why We Need to Measure Merger Policy and How to Do It." *Competition Policy International* 5, no. 1, 2009.

Carrillo, P. 2001. “Mergers and Acquisitions in the Construction Industry: An Exploratory Study.” Doctoral dissertation. Loughborough University.

Cavalcante, C. 2016. *2017 U.S. Construction Forecast Report*. Atlanta, GA: Oldcastle, Inc.

CDOT. 2022a. “Highway & Bridge Construction Bidding” (web page). https://www.codot.gov/business/bidding, last accessed March 8, 2023.

CDOT. 2022b. “Prequalified Contractors & Work Codes” (web page). https://www.codot.gov/business/bidding/Prequalified%20Contractors, last accessed March 8, 2023.

Choi, J., and J. S. Russell. 2004. “Economic gains around mergers and acquisitions in the construction industry of the United States of America.” *Canadian Journal of Civil Engineering* 31: 513–525. https://doi.org/10.1139/L04-004, last accessed January 27, 2021.

Clayton Antitrust Act. 1914. Pub. L. No. 63–212, 38 Stat. 730, enacted October 15, 1914, codified at 15 U.S.C. §§ 12–27, 29 U.S.C. §§ 52–53.

Code of Federal Regulations. 2020. “Construction and Maintenance,” 23 CFR § 635.104(a).

Colorado State Demography Office. 2022. “Divisions & Programs” (web page). https://demography.dola.colorado.gov/, last accessed March 8, 2023.

Corrigan M., J. Bittner, and H. Silber. 2022. *Analysis of Material Source Mergers and Acquisitions on Project Delivery Quality and Costs*. No. FHWA-HRT-22-081. Washington, DC: Federal Highway Administration.

Duplantis, R. M. 2010. “Estimating and Predicting Merger Effects and Pass-Through Rates.” Doctoral dissertation. Northeastern University. https://www.proquest.com/openview/5b89676bbb76f339f83a0bb5c712aca3/1?pq-origsite=gscholar&cbl=18750, last accessed April 30, 2021.

Edmans, A., I. Goldstein, and W. Jiang. 2012. “The Real Effects of Financial Markets: The Impact of Prices on Takeovers.” *The Journal of Finance* 67, no. 3: 933–971. https://doi.org/10.1111/j.1540-6261.2012.01738.x, last accessed April 30, 2021.

Esri™. 2019. ArcGIS (software). Version 10.7.1.

Federal Trade Commission. 2005. *In the Matter of Cemex, S.A. de C.V. Docket No. C-4131 Federal Trade Commission Application for Approval of Divestiture*. New York: FTC. https://www.ftc.gov/sites/default/files/documents/cases/2005/06/050607cemexapplicdivest.pdf, last accessed April 30, 2021.

Federal Trade Commission Act. 1914. 15 U.S.C. §§ 41-58, as amended.

FHWA. 2006. “Summary of Responses AASHTO/FHWA Survey on Construction Cost Increases and Competition, April 2006 (Revised May 18, 2006, for AL and TX responses)” (web page). https://www.fhwa.dot.gov/programadmin/contracts/priccomp.cfm, last accessed August 26, 2020.

FHWA. 2018. “Major Projects” (web page). https://www.fhwa.dot.gov/majorprojects/cost_estimating/resources.cfm, last accessed August 26, 2020.

FHWA. 2021a. “Guidelines on Preparing Engineer’s Estimate, Bid Reviews, and Evaluation” (web page). https://www.fhwa.dot.gov/programadmin/contracts/ta508046.cfm, last accessed December 6, 2022.

FHWA. 2021b. “National Highway Construction Cost Index (NHCCI)” (web page). https://www.fhwa.dot.gov/policy/otps/nhcci/, last accessed April 5, 2022.

FHWA. 2022. “Center for Accelerating Innovation” (web page). https://www.fhwa.dot.gov/innovation/everydaycounts/edc_5/project_bundling.cfm, last accessed January 5, 2022.

Franks, J., R. Harris, and S. Titman. 1991. “The post-merger share-price performance of acquiring firms.” *Journal of Financial Economics* 29: 81–96.

Historical MapChart. 2022. “MapChart” (web page). https://historicalmapchart.net/, last accessed January 5, 2022.

Jackson, L. A. 2015. “Market Reaction to Bidder Announcements of Horizontal Mergers in an Oligopolistic Industry: Evidence from the US Airline Industry.” *Tourism Economics* 21, no. 6: 1255–1271. https://doi.org/10.5367/te.2014.0401, last accessed August 26, 2022.

Kwoka, J. 2013. “Does Merger Control Work: A Retrospective on U.S. Enforcement Actions and Merger Outcomes.” *Antitrust Law Journal* 78, no. 3: 619–650.

Lehner, J. 2023. “New Housing Under Construction.” *Recession Watch*, Oregon Office of Economic Analysis. January 26, 2023. https://oregoneconomicanalysis.com/, last accessed January 10, 2023.

Meininger, R. C., and Stokowski, S. J. 2011. “Wherefore Art Thou Aggregate Resources for Highways?” *Public Roads* 75, Issue September/October, 2011.

MoDOT. 2022. “Missouri Department of Transportation” (web page). https://www.modot.org/, last accessed December 1, 2022.

Nashville DOT and Multimodal Infrastructure. 2021. *Volume 1: Pre-Construction Project Development Manual.* Nashville, TN: Metropolitan Government of Nashville and Davidson County. https://www.nashville.gov/sites/default/files/2021-08/Pre-Construction-Project-Development-Manual.pdf, last accessed January 10, 2023.

OK Stat. 2022. Disclosure of Terms of Bids. 61 OK Stat § 61-116B. https://accessible.oksenate.gov/sites/default/files/2019-12/os61.pdf, last accessed January 10, 2023.

Oklahoma DOT. n.d.a. "All Aggregate and Stone" (web page). https://www.odot.org/materials/htm-smap/11068-ALL.html, last accessed December 2, 2022.

Oklahoma DOT. n.d.b. "Contracts and Proposals Average Price History" (web page). https://www.odot.org/contracts/avgprices/index.php, last accessed January 10, 2023.

Oklahoma DOT. 2022. "Hot Mix Asphalt (HMA) Plant List" (web page). https://www.odot.org/materials/htm-smap/11067ap.pdf, last accessed December 2, 2022.

Oman Systems, Inc. 2023. "The Construction Software You Need!" (website). https://www.omanco.com/ignite-your-success/?gclid=EAIaIQobChMIq5TUmKnF_AIV0A-tBh3vvADDEAAYASAAEgI6JfD_BwE, last accessed January 10, 2023.

Oregon.gov. n.d.a. "Letting Schedules" (web page). https://www.oregon.gov/odot/business/procurement/pages/letting_schedules.aspx, last accessed January 10, 2023.

Oregon.gov. n.d.b. "Bid and Award Information" (web page). https://www.oregon.gov/odot/business/procurement/pages/bid_award.aspx, last accessed December 6, 2022.

Oregon.gov. 2022. "Electronic Bidding Information Distribution System" (web page). https://ecmnet.odot.state.or.us/ebidse/Account/Login, last accessed January 10, 2023.

Paperwork Reduction Act. 1995. S. Rept. 104-8, H. Rept. 104-99, 104th Cong.

Sassine, E. 2004. "The Valuation of Construction Companies." Master's thesis. Massachusetts Institute of Technology.

Schumann, L., R. P. Rogers, and J. D. Reitzes. 1992. *Case Studies of the Price Effects of Horizontal Mergers*. Washington, DC: Bureau of Economics, Federal Trade Commission.

Sherman Antitrust Act. 1890. 26 Stat. 209, 15 U.S.C. §§ 1–7.

South Carolina Government. 2021. "New Taxes and Fees for Road Maintenance" (web page). https://cg.sc.gov/fiscal-transparency/new-taxes-and-fees-road-maintenance, last accessed March 15, 2021.

TDOT. n.d.a. "Contractor Prequalification" (web page). https://www.tn.gov/tdot/tdot-construction-division/construction-contractor-prequalification.html, last accessed December 6, 2022.

TDOT. n.d.b. “TDOT Producer List Plants List” (web page). https://www.arcgis.com/apps/webappviewer/index.html?id=c47ff0b3c5564754b7b308e814c4703f, last accessed June 21, 2022.

TDOT. n.d.c. “Price Information” (web page). https://www.tn.gov/tdot/tdot-construction-division/transportation-construction-division-resources/transportation-construction-price-information.html, last accessed January 10, 2023.

U.S. Department of Justice. 2012. *A Merger Screening System to Monitor Acquisitions Occurring in the Aggregate, Asphalt Concrete, and Concrete Industries*. Washington, DC: Department of Justice. https://www.justice.gov/sites/default/files/atr/legacy/2012/04/26/279595.pdf, last accessed June 21, 2022.

U.S. Department of Justice. 2015. “Horizontal Merger Guidelines” (web page). https://www.justice.gov/atr/horizontal-merger-guidelines-0, last accessed April 5, 2022.

U.S. Department of Justice. 2018. “Herfindahl-Hirschman Index” (webpage). https://www.justice.gov/atr/herfindahl-hirschman-index, last accessed June 5, 2022.

U.S. Department of Justice and Federal Trade Commission. 2010. *Horizontal Merger Guidelines*. Washington, DC: Department of Justice. https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf, last accessed January 4, 2021.

U.S. v. Cemex S.A.B. de C.V. and Rinker Group Limited, 2009. 74 FR 3640 (U.S. District Court for the District of Columbia). https://www.govinfo.gov/content/pkg/FR-2009-01-21/pdf/FR-2009-01-21.pdf, last accessed January 4, 2021.

U.S. v. Oldcastle Northeast, Inc. et al. 1996. 61 FR 65236 (U.S. District Court for the District of Connecticut). https://www.govinfo.gov/content/pkg/FR-1996-12-11/pdf/FR-1996-12-11.pdf, last accessed January 4, 2021.

U.S.A. v. Martin Marietta Materials, Inc., and Texas Industries, Inc. 2014. 79 FR 38949 (U.S. District Court for the District of Columbia). https://www.govinfo.gov/content/pkg/FR-2014-07-09/pdf/2014-15959.pdf, last accessed January 4, 2021.

U.S.A. v. Vulcan Materials Company and Florida Rock Industries. 2008. 72 FR 68180 (U.S. District Court for the District of Columbia). https://www.govinfo.gov/content/pkg/FR-2007-12-04/pdf/07-5902.pdf, last accessed January 4, 2021.

Wisconsin DOT. n.d.a. “Highway Construction Contract Information” (web page). https://wisconsindot.gov/pages/doing-bus/contractors/hcci/default.aspx, last accessed January 10, 2023.

Wisconsin DOT. n.d.b. “Highway Projects and Studies” (web page). http://wisconsindot.gov/Pages/projects/by-region/default.aspx, last accessed March 15, 2021.

Wisconsin DOT. n.d.c. “Prequalification Information” (web page). https://wisconsindot.gov/Pages/doing-bus/contractors/hcci/prequal.aspx, last accessed January 10, 2023.

Recommended citation: Federal Highway Administration,
Analysis of Material Source Mergers and Acquisitions on Project Delivery Quality and Costs
(Washington, DC: 2023) https://doi.org/10.21949/1521910

HRDI-20/06-23(WEB)E