U.S. Surface Transportation Public-Private Partnerships: Objectives and Evidence – Extended Findings

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ABSTRACT

Effective public-private partnership (P3) policy evaluations must acknowledge the multiple and varied reasons why public agencies pursue alternative procurement approaches. While economic efficiency typically ranks high among evaluation criteria, it rarely represents a public agency's sole or primary P3 objective. As a result, the following research expands a U.S. surface transportation P3 case study series to nine, from six, to further identify the objectives pursued and the evidence available for effectiveness evaluations. The case findings demonstrate that the studied agencies pursued 1) private sector financing; 2) private sector expertise and innovation; 3) accelerated project delivery; 4) cost, schedule, and quality certainty; 5) risk transfer and management; and 6) broader transit and development opportunities. The state and local public agencies largely achieved these goals but might benefit by a) pursuing private-sector expertise and innovation earlier; b) elevating risk transfer objectives; c) incorporating broader transit, local development, and value capture opportunities; and d) improving outcome measurement, analysis, and transparency practices. The U.S. government may also benefit from reconsidering the statutory authority granted to U.S. Department of Transportation to lead bankruptcy reorganizations when they are the largest debt holders.

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INTRODUCTION

As the public sector struggles to keep pace with growing infrastructure maintenance, rehabilitation, and improvement requirements, public-private partnerships (P3s) can offer a potential solution by leveraging scarce public funding and delivering infrastructure improvements (and associated public benefits) through the innovation, efficiency, and capital resources available in the private sector. P3 approaches allow private-sector partners to take on design, construction, financing, operations, and/or maintenance responsibilities through more inclusive contractual agreements, including, but not limited to, design-build (DB), design-build-finance (DBF), design-build-finance-operate (DBFO), and design-build-finance-operate-maintain (DBFOM).

Given public agencies' desire to consolidate contracting steps, shift design and operational risks to private partners, improve cost certainty, incorporate operations and maintenance, and accelerate project completion, P3s have become an increasingly popular delivery approach for infrastructure and related services within the United States. Nevertheless, P3 procurement remains a relatively new approach in the United States. Only 35 states have enacted P3 enabling legislation and surface transportation P3 project construction has concentrated in just 12 of those states in the last decade (see Appendix A). Such limited U.S. P3 experience, paired with the federal government's supportive rather than active role in P3 development, has produced limited evaluation literature for policymakers considering P3 approaches for infrastructure development. Given P3s' wide ranging objectives, available P3 evaluations focusing solely on financial and/or economic outcomes risk overlooking public agencies' primary objectives and underestimating true outcomes.

Given the P3 evaluation literature's limitations, the George Mason University Center for Transportation Public-Private Partnership Policy (the Center) has undertaken a P3 Evidence project, employing case study research to a) identify and analyze the broad range of public-sector objectives underlying surface transportation P3 projects in the U.S., and b) identify and evaluate the data sources available for measuring output and outcome measures for each of these public-sector objectives. Without a large U.S. P3 project population with comparable non-P3 projects, rigorous statistical evaluations remain limited, particularly given many P3 project's highly complex natures. For example, although a frontier analysis suggested that increased U.S. highway P3 project complexity leads to higher construction costs compared to non-P3 highway projects,[1] data limitations prevented further exploration. As a result, case studies appear to offer the most productive approach for exploring P3 objectives and outcomes at the present time.

The research team first identified twenty-one US surface transportation P3 projects for analysis (see Appendix A). To make best use of the research center´s expertise and to provide insights for the U.S. decision-making audience, the resulting database focused solely on U.S. surface transportation infrastructure projects, namely highways, bridges, tunnels, and transit projects. In addition, the Center recognized the role that market maturity plays in introducing new policy tools[2] and focused the project database on projects reaching financial close after 2003 to reflect the more mature P3 markets that followed first-stage discovery processes and legal framework developments in pioneering states like Virginia and Texas. This limited scope also

produced projects with more publicly available documentary information and more engaged public officials for participant interviews. Third, the study team limited the database to the construction contracts and long-term engagements that provide the greatest latitude for private engagement and innovation, namely design-build-finance-operate-maintain (DBFOM), DBFM, and DBOM contracts.

The research team then selected six of the twenty-two database projects to evaluate for initial exploratory study (Phase I), weighing evaluation feasibility and costs when making the selections.[3] The six cases included Virginia's I-495 Express Lanes; Colorado's U.S. 36 Express Lanes; Virginia's I-95 Express Lanes; Florida's Port of Miami Tunnel; California's Presidio Parkway, Phase II; and Texas' LBJ TEXpress Lanes. Following a case study methodology developed to measure European P3 outcomes [4], this preliminary Phase I study found that public agencies pursue a range of objectives through P3 procurement approaches. The public-sector actors participating in the six study cases collectively demonstrated six objective categories:

1) accessing private sector funding and financing;
2) accessing private sector expertise and innovation;
3) accelerating project delivery;
4) ensuring cost, schedule, and facility and/or service quality certainty;
5) transferring risks to the private sector; and
6) incorporating broader transit, local development, and value capture opportunities.

The public agencies participating in the six Phase I study cases were largely successful in achieving their goals through P3 procurement approaches. Despite this general success, however, the Phase I study findings also suggested that public agencies may benefit by

1) doing more to access private-sector expertise and innovation earlier in the project-development process, particularly through competition;
2) placing more emphasis on access to private-sector expertise and innovation, cost and schedule certainty, risk transfer, and broader transit objectives when conducting P3 projects and when communicating with the public;
3) identifying best-practices and risky-practices that may help manage political risk;
4) incorporating broader transit, local development, and value capture opportunities into their P3 projects; and
5) improving outcome measurement, analysis, and transparency practices.

Nonetheless, given the study's preliminary nature and the small number of cases analyzed, the Phase I research could not support sweeping claims regarding universal P3 objectives, outcomes, and evidence. The six study cases presented similar objective profiles, outcomes, and limitations, but other projects would likely offer a more diverse picture. As a result, evaluations of the remaining database projects appeared necessary for understanding P3 objectives in the U.S. surface transportation sector.

In response, the Center selected three additional cases from its U.S. surface transportation P3 database for study (Phase II): Virginia's Midtown Tunnel – Elizabeth River Crossings; Indiana's Ohio River Bridges, East End Crossing – Lewis and Clark Bridge; and Texas' State

Highway 130 – Segments 5 and 6 (see Appendix B). The research team selected these projects to represent more varied infrastructure types (tunnel, bridge, and highway), geographic locations (Virginia, Indiana, and Texas), operating statuses (currently operating, to assess construction costs and schedule), and delivery troubles (concessionaire bankruptcy). The last criterion was suggested to the research team by the Center´s Advisory Board.

METHODS

Like the Center's Phase I research, the Phase II case study methodology follows an approach used to measure European P3 outcomes, although the present research does not develop performance indicators.[4] Analytical data for this study derived from two sources: documentary resources and participant interviews. Documentary sources included academic articles, news reports, and government records as available. Public-sector documents - including environmental impact statements, cost-benefit analyses, audits, value-for-money studies, and court documents - received particular attention when available. Unfortunately, the public record can be very limited and can vary greatly by project and jurisdiction. In addition, public records might not always reflect the nuanced and informal processes underlying public decision-making. As a result, the research team also conducted semi-structured interviews (see Appendix C for the interview instrument) to solicit project objectives, results, and perceptions from key stakeholders, focusing primarily on sponsoring agencies and concessionaires.

Employing an extensive contact network, the team identified senior public officials responsible for project oversight, public engagement, and financial evaluation (e.g. secretaries of transportation, chief financial officers, and project managers), conducting semi-structured interviews with as many as possible (hereafter referred to as "interview respondents" or "interviewees"). While issues of memory, personal interest, and professional interest can introduce data limitations, such interviews can provide valuable perspective when considered carefully and in combination with other sources. When a project involved multiple public partners, the team endeavored to contact officials from all relevant agencies. Although the present research focused on public-sector objectives, high-level officials from pertinent private concessionaires were also contacted and interviewed when possible to provide a more exhaustive view. Appendix D provides a full interview participant list for the Phase II study. To encourage forthright discussion, the research team did not record the interviews or attribute specific statements to particular interviewees.

RESULTS

The following section provides case study findings for the three U.S. surface transportation projects investigated under the present Phase II research:

- Virginia's Midtown Tunnel – Elizabeth River Crossings
- Indiana's Ohio River Bridges, East End Crossing – Lewis and Clark Bridge
- Texas' State Highway 130 – Segments 5 and 6

Each case provides a summary of the project's origins and P3 history, followed by an analysis of the project's objectives and outcomes as described by the available documentation and interview respondents. The case studies then conclude by discussing objectives identified for future projects based on the case experience. Appendix E provides summary tables for each case's location, participants, contract characteristics, funding and financial characteristics, procurement history, and risk allocation structure.

MIDTOWN TUNNEL – ELIZABETH RIVER CROSSINGS

Project Origin

With its natural, temperate harbor located where the James, the York, and the Elizabeth rivers flow into the Chesapeake Bay, Virginia's Hampton Roads metropolitan area represents a strategically significant shipping and ship building hub. The area proved particularly important during the first and second World Wars, with military agencies remaining an important regional employer.[5,6] At the metropolitan area's official formation in 1950, its principal cities – Norfolk and Portsmouth, VA, separated by the Elizabeth River – possessed nearly 300 thousand inhabitants. By 1970, these cities had experienced a 43% population increase and the Elizabeth River Tunnel District (ERTD) – a quasi-governmental entity created in 1942 by the Virginia General Assembly to build tunnels connecting both cities – had built several tunnels under the Elizabeth River to facilitate intercity travel. The first, the 2-lane Downtown Tunnel, opened in 1952. The second, the 2-lane Midtown Tunnel, opened in 1962.[7,8] To repay the associated construction bonds, the ERTD levied tolls on both tunnels, following the Chesapeake Bay Ferry District's earlier strategy employing toll revenue bonds to acquire and improve existing ferry services on Virginia's Eastern Shore and in the Hampton/Newport News area.[9] The ERTD removed the tolls in 1986 upon the bonds' repayment.

After 1970, Norfolk and Portsmouth experienced population declines; as of 2010, populations had risen just 14% compared to 1950 levels. Neighboring areas like Virginia Beach City and Chesapeake City, by contrast, experienced population growth. As these neighboring areas grew, traffic congestion under the Elizabeth River grew as well. To address increasing tunnel congestion, a second, non-tolled, 2-lane Downtown Tunnel opened in 1987 as a federally funded interstate highway project. At the same time, increasing container traffic from the Portsmouth Marine Terminal and from Route 164 and Route I-664 roadway developments increased congestion considerably on both sides of the Midtown Tunnel. Without any physical separation between its two one-way lanes, the Midtown Tunnel also presented accident risks.

To address these issues, the Federal Highway Administration (FHWA), in partnership with the Virginia Department of Transportation (VDOT), approved a draft Environmental Impact Statement (EIS) in 1989 for developing a second, 2-lane Midtown Tunnel and constructing a corresponding approach highway, US-58, named the Martin Luther King (MLK) Freeway. In addition to reducing congestion, the project would divert heavy truck traffic away from neighborhood streets and improve logistical efficiency for container traffic accessing the adjacent Portsmouth Marine Terminal, increasing the facility's economic attractiveness. When the parties failed reach final EIS agreements within the three-year legal deadline, a re-evaluation was conducted, including a Major Investment Study/Congestion Management System (MIS/CMS), in compliance with recently approved federal legislation. The final EIS (FEIS), issued in 1996, recognized that while some roadway construction could begin as early as 1998, funding constraints would delay or prevent the second Midtown Tunnel and MLK Freeway's construction.[10]

P3 Origin

While VDOT developed the project's FEIS, the Virginia General Assembly authorized the agency to procure infrastructure projects using public-private partnerships (P3s) via the Public-Private Transportation Act of 1995 (PPTA).[11] Significantly, the state statutes allow public agencies to accept unsolicited proposals from private-sector entities. As a result, following the 1996 FEIS, two private entities presented VDOT with unsolicited proposals to build the new Midtown Tunnel, the MLK Extension, and the related Pinners Point project: Eastern Virginia Public-Private Facilities Partners, L.L.C. and Hampton Roads Infrastructure Development Group. A newly formed Hampton Roads Public-Private Development entity subsequently presented a merged proposal in 1999. The private parties withdrew their proposal one year later, after Portsmouth authorities opposed its primary funding mechanism: re-tolling the existing Midtown and Downtown tunnels.[12]

After four years passed without project developments, VDOT decided to evaluate whether the private sector remained interested in developing the Midtown Tunnel Corridor Project (MTCP) through a P3 approach. In November 2004, VDOT began by issuing a Request for Information (RFI) and reviewing the three, generally positive responses. Like the earlier unsolicited proposals, two RFI responses suggested that to make the project financially viable, the state should bundle the Midtown and Downtown tunnels and install tolls on both.[13] VDOT also worked with FHWA to issue a Record of Decision (ROD) for the project, including both the second Midtown tunnel and the US Route 58 extension. FHWA issued the resulting ROD in May 2007. VDOT then proceeded to issue a Solicitation for Conceptual Proposals (SCP) in May 2008.[14] The project, variously named the Downtown Tunnel/Midtown Tunnel/MLK Freeway Extension and the Elizabeth River Tunnels, would include 1) the new Midtown Tunnel's construction; 2) the MLK Freeway Extension's construction; and 3) improvements to the existing Midtown Tunnel and Downtown Tunnels for fire safety, traffic control, ventilation, lighting, power, communications, and drainage.[15]

Elizabeth River Crossings OPCO, LLC (ERC) – a Special Purpose Vehicle (SPV) company created to isolate the P3 project and its parent companies from one another's risks – including both Skanska Infrastructure Development, Inc. and Macquarie Financial Holding Limited, responded four months later. This was the project's only bidder. The 2007-2008 global financial crisis may have affected potential bidders' capacities given interest rate increases, decreased credit availability, and the crisis' expected revenue stream impacts.[16] Following PPTA procurement guidelines, the Secretary of Transportation then appointed an Independent Review Panel (IRP) to evaluate the ERC proposal and provide recommendations to the Commonwealth Transportation Board (CTB) overseeing VDOT regarding proposal rejection or acceptance. The IRP made a positive recommendation in June 2009. The CTB subsequently gave VDOT a positive recommendation for project advancement.

Since VDOT possessed only one conceptual proposal bid, it started direct negotiations with ERC – with support from an Independent Review Panel and the Commonwealth Transportation Review Board[17] – rather than issuing a Request for Detailed Proposals (RFDP). The parties signed an interim agreement in January 2010. This agreement gave ERC exclusive rights to develop the project if it proved viable and allowed both counterparties to assess existing

asset conditions and tunnel construction challenges, evaluate overall project deliverability, and define comprehensive agreement characteristics. While ERC conducted its analysis, FHWA and VDOT conducted an Environmental Assessment (EA), updating the environmental clearances received two years prior to: a) add tolling and structural and safety improvements to the Downtown Tunnel as suggested by the private sector proposal; b) add tolling, a new curvilinear alignment, a different ventilation system, and new dredging construction techniques to the Midtown Tunnel to avoid damaging the existing tunnel; and c) add tolling and an Interstate 265 Interchange ramp reconfiguration to the MLK Freeway Extension while removing a planned pedestrian bridge.[18] At this time, Virginia did not consider providing public funds for the project; based on ERC's proposal submission, tolls on the new tunnel would cover project revenue needs once the new tunnel opened. However, believing that tolls equaling $2.86 per trip per automobile (and three times that for trucks) would generate public opposition, VDOT and ERC agreed to explore other funding alternatives.[13]

As this procurement process unfolded, traffic conditions worsened. As the 2000s closed, VDOT ranked the existing Midtown Tunnel as the state's "most heavily traveled two-lane highway."[19] The Hampton Roads Planning District Commission gave the three existing tunnels an F rating for poor service levels characterized by constant traffic jams.[19] Hampton Roads congestion delays equaled 3.2 million workdays lost per year, or 3 workdays lost per driver per year, amounting to 0.8% of the annual gross regional product lost annually.[20] Truck traffic also continued to present special motivation for MLK Freeway Extension construction considering the Portsmouth Marine Terminal's increasing demand.[15] Lifetime extension improvement needs for the existing tunnels also provided increasing motivation for project development.[21]

The partners signed the final comprehensive agreement, or commercial close, in December 2011. Four months later, in April 2012, the project reached financial close. The resulting DBFOM contract made Elizabeth River Crossings OPCO, LLC responsible for the tunnel and highway's design, construction, financing, operation, and maintenance for 58 years following construction. The four project components included:

1. designing, constructing, financing, operating and maintaining a new two-lane Midtown Tunnel via a 3,800 foot long immersed tube tunnel;
2. designing, constructing, financing, operating and maintaining a 0.8 mile, four-lane MLK Freeway extension connecting State route 164 to Interstate 264 in Portsmouth, including a new interchange;
3. rehabilitating, operating, and maintaining the two Downtown Tunnels and the existing Midtown Tunnel; and
4. installing, operating, and maintaining an electronic tolling system compatible with the regional tolling network.[19]

At financial close, the Elizabeth River Crossing project's total required financing reached nearly $2.1 billion, divided into 13.0% private equity, 32.3% Private Activity Bonds (tax-exempt bonds issued by the private concessionaire), 22.3% TIFIA loan (to the concessionaire), 17.6% toll revenues collected from existing facilities during construction (starting in August 2012) , and 14.8% public sector funds (see Appendix E for the financial information of the project). To reduce toll rates during the construction of the project, the state agreed to commit $308 million in public sector funds. This reduced the toll rate by 40%, to $1.84 during peak times and $1.54

during off-peak times. As a result, the project's financing relies on time-of-day congestion pricing tolls imposed on the existing tunnels during the new Midtown Tunnel's construction. The funding of the project came from tolls imposed on the two Downtown and the two Midtown Tunnels during the duration of the concession. Based on a TIFIA- and VDOT-defined revenue-sharing mechanism, the concessionaire will begin repaying the TIFIA loan prior to the loan agreement's 2030 payment commencement date if it generates more revenue than originally projected or if surplus revenues remain after the concessionaire covers a predefined group of expenses, the lesser of the two options.[19] In addition, if cumulative gross revenues exceed the project's base case projections, or if the private partners refinance the project, VDOT can claim an increasing percentage of any additional revenue from the concessionaire, defined by five revenue band floors up to 60%, as a "permit fee."

The project's 2011 Environmental Assessment had indicated no particular tolling opposition concerns and previous NEPA studies conducted for the MLK freeway extension had considered community tolling concerns but had not recognized any particular challenges.[18] However, some affected users, regional residents and business owners with support from the Portsmouth City Council, opposed the tolling proposition, filing suit against VDOT and the concessionaire in July 2012.[22] They argued that tolls were unconstitutional taxes because commuters had no alternative but to use the tolled tunnels and that VDOT had "unfettered power" to set the rates.[23–25] A Portsmouth Circuit Judge agreed with the plaintiffs, ruling that Virginia General Assembly "exceeded its authority" by: (1) "ceding the setting of toll rates and taxes in the circumstances of this case for the use of facilities that have been bundled solely for revenue-producing purposes in violation of Article IV, § 1 of the Constitution of Virginia," and (2) giving "unfettered power to [VDOT] to set toll rates without any real or meaningful parameters in violation of Article IV, § 1 of the Constitution of Virginia."[26] This ruling that could have affected tolling in existing and future toll facilities in Virginia and influenced similar challenges elsewhere in the U.S. The suit reached the Supreme Court of Virginia, which ruled in VDOT's favor in October 2012. The finding held that tolls were not unconstitutional taxes since reasonable, free alternatives existed, particularly Gilmerton Bridge and High-Rise Bridge, 6 and 12 miles away, respectively, from the Downtown tunnels.[22] As these events progressed, VDOT acted to reduce users' tolling burden by renegotiating the project's financial aspects with the concessionaire five months after the April 2012 financial close, paying $100 million to delay tolls until January 2014.

Project construction commenced in October 2012. As construction progressed, a new governor, Terry McAuliffe, took office in January 2014 – coinciding with the tolls' delayed commencement as renegotiated in 2012 – after having expressed his opposition to the project's tolls during his electoral campaign.[27] In keeping with the governor's campaign promises, the state immediately renegotiated a 50% toll rate cut in exchange for a $82.5 million payment to the concessionaire.[28] An additional tolling renegotiation took place in July 2015 where VDOT bought out another $78 million in tolls.[29–31] In total, the five renegotiations that took place before the project finished construction shifted the project's funding breakdown, diminishing construction-phase toll revenues from $368 million down to zero by increasing public-sector contributions to $581 million from $308 million. The new two-lane Midtown Tunnel ultimately opened in June 2016 with the Downtown Tunnel's rehabilitation completed two months later. MLK extension construction completed in November 2016 and the existing Midtown Tunnel's

improvements concluded in June 2017. In the year 2017, some of the renegotiated toll reduction benefits expired, raising tolls from $1.50 to $1.95. To minimize opposition from residents in the area, in October 2016 another renegotiation of the comprehensive agreement took place to cut rates to $1.20 for low-income people living in Portsmouth and Norfolk. This program started in 2017 and will continue for 10 years, costing the state $500,000 annually.[32]

P3 Objectives & Outcomes

The research team could not locate any reports describing final effectiveness measures or presenting resulting outcomes data for this project. Consequently, the following analysis relies primarily on interview responses rather than documentary sources.

Congestion Management, User Experience, and Safety

During the P3 procurement process, VDOT defined four project objectives for the new Midtown Tunnel, Downtown and Midtown Tunnel improvements, and MLK Freeway Extension (see Appendix for more). First, the project should increase capacity, reduce congestion and provide safe and efficient operations. Second, it should develop a multi-modal transportation facility integrating regional transportation network operations and providing an emergency evacuation route. Third, the project should reduce and mitigate traffic-related environmental and community impacts while supporting commercial traffic movement. Finally, the project should coordinate with adjacent land uses and support anticipated personal and commercial traffic growth.[14]

The concessionaire also clarified its project objectives as part of the procurement process, including: i) urban congestion relief; ii) safe, reliable journeys; iii) affordable tolls; iv) economic development and accommodating resultant traffic growth; v) on-time and on-budget project delivery; vi) positive environmental and community impacts; vii) VDOT partnership; and viii) improved emergency evacuation capabilities.[20]

Although the Project Management Plan submitted to FHWA by VDOT in March 2011 described effectiveness measures, the research team could not locate any reports quantifying their values before or after the project was constructed. In addition, the project began operating as a system only five months before this case study commenced, making thorough congestion management, user experience, and safety impact assessments difficult beyond noting some design improvements enabled by the P3 structure's access to private sector expertise.

For example, as discussed in the P3 Evidence Project's I-495 case study, Virginia had pursued private sector support for implementing tolling solutions, managing toll collection, and improving traffic flow through toll collection points. Prior to commencing the ERC project, both Macquarie and Skanska had experience deploying electronic tolling in Canada and Chile.[20] As a result, by tapping this experience for the ERC project and implementing electronic tolling, thereby eliminating tollbooth congestion, the P3 project promised to improve user experiences beyond what VDOT could likely provide under traditional procurement. Additional information

regarding congestion, user experience, and safety outcomes will develop as the facility continues operations over time.

Access to Financial Resources & Project Acceleration

Beginning with its 1996 final EIS, VDOT recognized that it lacked sufficient funds to advance the project, although the state attempted to generate resources for the Hampton Roads region for the next two decades. For example, while VDOT explored P3 procurement for the tunnel project in 2006, the Virginia General Assembly created the Hampton Roads Transportation Authority with regional taxing authority for generating revenue for transportation projects. However, in February 2008, the Virginia Supreme Court declared this delegation of the state legislature's taxing authority unconstitutional. This coincided with fresh resource concerns at VDOT as the department laid off nearly one thousand employees and cut billions of dollars from its six-year improvement plan in the wake of the Great Recession.[17] Three months later, VDOT issued its Solicitation for Conceptual Proposals (SCP).[14] Only in 2014, two years into the P3 project's construction, did Virginia's General Assembly create special regional taxes – managed by the newly created Hampton Roads Transportation Accountability Commission (HRTAC) – to finance Hampton Roads transportation projects.

As the state struggled to produce public funds, P3-enabled financing and funding sources proved essential for addressing the Hampton Roads region's increasingly salient congestion concerns. Although the total ERC project cost reached $2.1 billion, the P3 approach allowed the public sector to commit just $308 million when it signed the comprehensive agreement. Crucial P3-enabled private equity and financing sources (PABs, TIFIA loan) covered the remainder. Even considering the project's subsequent toll-related contract renegotiations, the P3 approach generated more than two thirds of the total project funding from the private sector, producing a $2.1 billion project for Virginia while requiring just $581 million in public funds.

These additional sources also likely accelerated the project by nearly a decade compared to traditional procurement. Although the state had committed $581 million in state funds by July 2015, HRTAC could not have accumulated the remaining $1.46 billion until 2018, if, that is, its 2016-2022 funding plan included no other projects. As a result, the P3 delivery approach probably accelerated this tunnel project by at least 6 years. An estimate recognizing other regional transportation projects would push the ERC project's acceleration to a decade or more.

Although HRTAC's conventional revenue stream has helped revive traditional delivery mechanisms in recent years – producing, for example, the $3.3 billion I-64 Hampton Roads Bridge-Tunnel Expansion design-build project (construction expected in 2019) – this public sector funding remained uncertain during the ERC project's P3 decision-making process. Moreover, access to private-sector financial resources remains important beyond the design and construction phases. Given the high risks involved with insufficient long-term tunnel structure maintenance, especially considering the Downtown Tunnels' eventual need for fire hazard upgrades, VDOT, according to one interviewee, placed a high priority on dedicated revenue sources for maintenance. Like most toll road projects, the ERC P3 comprehensive agreement prioritized spending for operations and maintenance ahead of bond repayment, loan repayment, and revenue sharing provisions. This contrasts to typical traditional procurement financing where operations and maintenance appropriations depend on uncertain public budgets.

Cost and Schedule Certainty

Given the ERC project's technical challenges, several interviewees agreed that cost and schedule certainty provided important drivers behind Virginia's choice to pursue P3 procurement. For instance, tunnel construction could have involved geotechnical risks (i.e., soil conditions) and/or the discovery of historic artifacts (i.e., sunken ships) that would slow construction and drive up costs. Alternatively, the new immersed tunnel's construction might have damaged the existing tunnel, also contributing to cost and schedule overruns. The literature recognizes that P3s can help the public sector manage cost and scheduling risks,[33–35] particularly through design-build contracts that bundle design and construction activities into single, fixed cost contracts, in contrast to traditional design-bid-build (DBB) approaches that separate these activities into two separate contracts. By consolidating responsibility for component delivery with one party for a fixed sum, such contracts tend to reduce the contractor claims and change orders arising from discrepancies and uncertain events.[36] As a result, the P3 arrangement incorporated a fixed price, lump sum design-build contract for $1.46 billion. The resulting facility was delivered within budget.

By incentivizing the private partner to finish construction quickly to collect tolls at the earliest possible date, the DBFOM contract also motivated the private concessionaire to deliver the project ahead of schedule. Project construction commenced in October 2012 and the project opened the first of the new Midtown Tunnel's 2 lanes in June 2016, nine months ahead of the tunnel's Substantial Completion date. The concessionaire completed the Downtown Tunnel's in August 2016, three months ahead of schedule. It completed the MLK extension's construction in November 2016, five months ahead of schedule. Ultimately, ERC finished the existing Midtown Tunnel's improvements in June 2017, fourteen months ahead of the August 2018 scheduled Substantial Completion Date.

Objectives for Future Projects

Despite much success, the Midtown Tunnel/Elizabeth River Tunnels project and its partners faced problems when it came to manage the political risks associated with tolling the region's existing tunnels. While the project stayed within budget, the public-sector's funding allocation increased after the P3 partners did not properly identify, allocate, or address their project's political risks, risks that threaten to affect tolling for both current and future P3 projects.[37] Considering how tolling concerns undermined the project's original 1999 unsolicited proposal, and almost did so again with a lawsuit filed by regional residents and business owners that proceeded all the way to the Virginia Supreme Court, both partners exposed themselves to substantial risk. VDOT and ERC risked losing the primary source of revenue for the project and it is unclear the impact this would have had for both parties. Furthermore, VDOT risked losing toll revenue-based solutions for all P3 projects.[38] At the time, however, the tunnel tolls were essential for the project's financial viability, particularly early on, before the Hampton Roads area possessed a dedicated revenue source for transportation projects. Although the partners undertook some public communication and education efforts to address future risks,[39] they proved insufficient. One way the project sought to increase political support was through the $308 million awarded to Small, Women and Minority Businesses (SWaM) and Disadvantaged Business Enterprise (DBE).[40] Considering the efforts displayed by the partners, the political risk

exposure suffered by ERC might be understood as an unavoidable project cost required to accelerate the project while buying time for the public sector to generate sufficient resources to reduce and/or remove the tolls.

In addition, drawing from the P3 Evidence Project's Phase I case studies, the ERC P3 project might have benefitted from several additional objectives. First, as noted in the I-495 Express Lanes case, the ERC project might have introduced special tax districts to capture capital gains from the surrounding real estate and dedicated the resulting resources toward diminishing VDOT´s public sector contribution and/or diminishing the corridor's tolls. Similarly, as discussed in the Port of Miami Tunnel case study, the ERC project might have leveraged successful congestion management efforts to support local redevelopment projects. Pairing redevelopment efforts with value capture mechanisms might have provided a powerful avenue for diminishing the project's considerable toll opposition. Finally, as Colorado's US 36 phase 2 project and Virginia's recent I-95 HOV/HOT Lanes extension project have shown, transit components can provide project benefits and generate increased public support. While the ERC project includes a $2.1 million annual subsidy for bus and ferry services between Portsmouth and Norfolk, this represents a very small transit component and one that lacks a significant public profile. As a result, a stronger transit component might have improved public sentiments for the ERC project and reduced political pressure regarding tolls.

OHIO RIVER BRIDGES, EAST END CROSSING – LEWIS AND CLARK BRIDGE

Project Origin

Louisville, Kentucky's largest city, lies within Jefferson County in north-central Kentucky, directly across the Ohio River from Jeffersonville in southern Indiana's Clark County. Both counties fall within the Louisville/Jefferson County, KY–IN Metropolitan Statistical Area,. The George Rogers Clark Memorial Bridge (previously the Louisville Municipal Bridge) joined the two counties North-South in 1929, with the John F. Kennedy Memorial Bridge added in 1963. The Sherman Minton Bridge also opened nearby in 1962, connecting Louisville with Indiana's City of New Albany to the West.

Facing population growth, and in compliance with the Federal-Aid Highway Act of 1962, Jefferson County and the City of Louisville formed the Louisville Metropolitan Comprehensive Transportation and Development Program (LMCTDP) in 1963 to develop a cooperative transportation-planning program among the metropolitan area's state and local agencies. The program released its first long-range plan in 1969. Anticipating future mobility needs, the plan proposed a new, northeastern river crossing connecting Indiana's I-265 with Kentucky's then-proposed I-265/KY 841, forming a partial beltway circumventing Louisville's downtown area.[41] The proposed crossing would improve cross-river movement and provide transportation alternatives for Jefferson County residents. After the Kentuckiana Regional Planning and Development Agency (KIPDA) – involving seven Kentucky counties and two Indiana counties – assumed authority over transportation planning in 1973,[42,43] the river crossing proposal reappeared in the agency's subsequent 1978 and 1993 long-range plans.

As cross-river mobility needs became pressing, KPDIA initiated a Major Investment Study in 1995 to evaluate potential development alternatives, including a Louisville light rail proposal known as Transportation Tomorrow (T2), improvements to the Kennedy Interchange operating south of the Kennedy Bridge, new highway bridge corridors, and enhanced bus service.[44] One year later, the study recommended a two-bridge solution including first, a new Downtown bridge connecting Louisville, Kentucky with Jeffersonville, Indiana, and second, a new East End bridge eight miles upstream, connecting Prospect, Kentucky with Utica, Indiana.[41] The Indiana Department of Transportation (INDOT) and Kentucky Transportation Cabinet (KYTC) then signed a cooperative Memorandum of Agreement in 1997 to improve "cross-river mobility."[45]

The Federal Highway Administration (FHWA) then issued a notice of intent to start the Environmental Impact Statement (EIS) process in March 1998, finishing the draft EIS (DEIS) in February 2002. The DEIS described how the metropolitan area's existing transportation network failed to handle current population and employment needs efficiently, a problem that would persist with expected population and employment growth. It also confirmed that the existing facilities - particularly the Kennedy Bridge and Kennedy Interchange - produced traffic congestion and safety concerns.[44]

The DEIS also evaluated several development alternatives, including:

1. taking no action;
2. implementing a multi-faceted program including mass-transit, employer-based trip reduction programs, and an expanded Intelligent Transportation System providing drivers with travel time, crash location, and transit service interruption information;
3. adding two new highway bridges – a Downtown Bridge and an East End Bridge – with Kennedy Interchange reconstruction;
4. adding just one new highway bridge (either Downtown or East End) without Kennedy Interchange reconstruction;
5. constructing an East Corridor River Tunnel (rather than adding new bridge crossings); and
6. reconstructing the Kennedy Interchange without new bridge or tunnel additions.

FHWA released its Final Environmental Impact Statement (FEIS) in 2003 and also issued its Record of Decision (ROD) selecting the two-bridge option as the preferred development alternative.[46] Other alternatives either failed to handle transportation needs efficiently (mass transit; single, standalone bridge projects) or proved too expensive (East Corridor River Tunnel).

INDOT and KYTC then formed the Louisville-Southern Indiana Ohio River Bridges (LSIORB) Project in 2009 with a Joint board including high-ranking officials including the KYTC Secretary, the Chairman of the Kentucky Public Transportation Infrastructure Authority (KPTIA), the INDOT Commissioner, and the Indiana Finance Authority's (IFA) Public Finance Director. LSIORB was formed to improve cross-river mobility, reduce congestion, and improve safety through a three-part project. First, an Ohio River East End Crossing bridge, later named the Lewis and Clark Bridge, would connect KY 841/I-265 in northeastern Jefferson County with S.R. 265 in southeastern Clark County. Second, a Downtown Crossing bridge would provide a new crossing parallel to the existing Kennedy Bridge. Finally, relocation and reconstruction work would improve the existing Kennedy Interchange. Project design commenced in 2004 using a traditional design-bid-build (DBB) procurement process, ultimately producing a $2.1 billion estimated total project cost.[42] At this point, limited funding prevented the project from proceeding.[47]

By 2008, inflation, construction contingency costs, and construction material and equipment operation cost increases had raised the project's total cost to $4.1 billion, presented in year-of-expenditure format, ignoring discount rates in accordance with FHWA guidelines ($3.0 billion presented in present-value format).[4141,48] According to the Louisville Metropolitan Planning Organization´s Metropolitan Transportation Plan (MTP) Horizon 2030, available federal and state funds amounted to just $1.9 billion.[46] Given this financial gap and the public backlash the projected cost ignited, Kentucky and Indiana focused on revenue and expenditure solutions, creating the Louisville and Southern Indiana Bridges Authority (LSIBA) in 2009 to identify innovative financial strategies for delivering the LSIORB project.[49] In December 2010, LSIBA decided that project funding would derive from tolls.

In addition to exploring funding alternatives, the project's sponsors also modified its cost structure. FHWA, KYTC, and INDOT's November 2011 supplemental draft environmental

impact statement (SDEIS) and final April 2012 statement included several cost-saving design modifications. For example, the revised project would reconstruct the Kennedy Interchange in its existing location rather than relocate it. Similarly, the revised project design reduced the planned East End Bridge from six lanes to four and eliminated the Downtown Bridge's planned pedestrian/bike path. These design modifications reduced the estimated project cost to $2.9 billion. The revised plan also introduced tolls on both new bridges to generate $800 million to $1.2 billion in revenue.

Finally, the revised LSIORB plan divided the project into six design sections. Three sections pertained to the new Ohio River East End Bridge, including the new East End Bridge Section and its corresponding East End Kentucky Approach Section roadways and East End Indiana Approach Section roadways. The remaining sections encompassed the new Downtown Ohio River Bridge crossing (later named the Abraham Lincoln Bridge) and its corresponding Kennedy Interchange roadway reconstruction (south end) and Downtown Indiana Approach Section roadways (north end).

Project need, particularly regarding the East End Bridge, had continued to increase during this decade-long planning process. On the Indiana side, for example, an industrial complex had attracted firms, including Amazon.com, interested in accessing the United Parcel Service (UPS) WorldPort freight hub located at Kentucky's Louisville International Airport.[50,51] An economic impact study mandated by Indiana Code 8-15.5-4-1.5 estimated that between 2012 and 2042, the three East End Bridge components would generate 17,800 new jobs, a net present labor income value equivalent to $27.3 billion, and a net present business output value equivalent to $78.0 billion for five counties – Indiana's Clark and Floyd counties; Kentucky's Bullit, Jefferson, and Oldham counties – per year, on average, as a result of project construction, tolling, and resultant market access, transportation efficiency, and land use improvements.[52]

Community concerns regarding the East End Crossing had also developed during the project's planning phase, particularly regarding historic property protections and storm water management. The National Trust for Historic Preservation (NTHP) and River Fields, Inc., sued INDOT and KYTC in 2009 over the project's predicted environmental and community impacts.[53,54] INDOT opted to keep the litigation-related risk with the public sector during P3 procurement and the parties eventually reached a settlement agreement in January 2013, two months before the P3 project reached financial close.[55]

P3 Origin

According to one interviewee, Kentucky and Indiana could not reach an agreement to move the project into the procurement stage using a bi-state entity like LSIBA. As a result, by the end of 2011, they agreed to deliver separate LSIORB project portions and to consider alternative procurement methods based on their particular state statutes. Specifically, Indiana would deliver the new Ohio River East End Bridge including: 1) the East End Kentucky Approach section extending Kentucky's I-265 towards the bridge; 2) the East End Bridge Section; and 3) the East End Indiana Approach section extending Indiana's S.R. 265 towards the bridge. Kentucky would deliver the Downtown Crossing, Kennedy Interchange, and Downtown

Indiana Approach sections. Despite dividing project delivery, bi-state cooperation continued. For example, both states agreed to compensate each other with $80,000 to $100,000 in daily liability if they could not acquire the necessary bridge rights of way by mid-2013.

Kentucky had not yet enacted P3 legislation and thus proceeded with the Downtown Bridge under a design-build (DB) approach. The state eventually enacted P3 legislation in April 2016. The Indiana General Assembly, by contrast, had authorized the Indiana Finance Authority (IFA) to procure infrastructure projects using public-private partnerships (P3s) in 2006, leaving INDOT to develop technical project aspects.[56] Given the state's P3 enabling legislation, strong political support for P3s, and limited financial resources, INDOT and IFA explored P3 delivery for the East End Bridge. Interviewees noted, in particular, Governor Mitchell Daniels's strong support for P3s – he had previously promoted the Indiana Toll Road O&M concession – and his important role in promoting a P3 approach for this project.

IFA and INDOT began their P3 procurement process by holding an industry forum in early March 2012. A few weeks later, they issued a Request for Qualifications (RFQ), to which six teams responded. Four were short-listed for the following round: 1) Ohio River Transportation Partners: Infrared Capital Partners Limited, Balfour Beatty Capital, Kiewit Development Company; 2) East End Mobility Partners: SNC-Lavalin Capital, John Laing Investments Limited; Zachery Resources, Inc.; 3) Ohio River Mobility Group: ACS Infrastructure Development, Inc., Hochtief PPP Solutions North America, Inc., Skanska Infrastructure Development, Inc.; and 4) WVB East End Partners: VINCI Concessions S.A.S, Walsh Investors, LLC, and Bilfinger Berger PI International Holdings GmbH. IFA and INDOT then issued a Request for Proposals (RFP) four months later, in July 2012, selecting WVB East End Partners as the preferred bidder in November 2012. IFA, INDOT, and the WVB East End Partners joint venture signed a Public Private Agreement (PPA) in December 2012. The joint venture represented a Special Purpose Vehicle (SPV) – a company created to isolate the P3 project and its parent companies from one another's risks – including VINCI Concessions, Walsh Investors, and Bilfinger Berger PI International Holdings. The partners reached financial close in March 2013.

The PPA made WVB East End Partners responsible for the East End Bridge sections' design, construction, financing, operation, and maintenance (DBFOM) for 35 years following construction. This included the design, construction, and financing of: a) the 2,500-foot, four-lane East End cable stay bridge; b) the 4.1-mile, four-lane East End Indiana Approach Section extending I-265/SR 265 on the Indiana side; and c) the 3.3 mile, four lane East End Kentucky Approach Section extending KY 841 on the Kentucky side, with a 1,680 foot long tunnel. The project also included operations and maintenance (O&M) of the East End Bridge Section and the East End Indiana Approach Section but did not include O&M for the Kentucky highway and tunnel portions. KDOT took charge of these portions following construction. Construction began in June 2013 and the project opened 3.5 years later in December 2016, renamed the Lewis and Clark Bridge.[57]

During the construction phase, IFA paid the concessionaire milestone payments upon the satisfactory completion of eight pre-scheduled construction milestones. These included completing the main span pier foundations (milestone 1); completing tunnel excavations and the

initial liner (milestone 2); completing the final tunnel liner (milestone 6); and substantial completion (milestone 8). Payment deductions took effect if outcomes did not comply with agreed specifications. During the following O&M phase, IFA pays the concessionaire availability payments – where the public agency conditions compensation payments on the concessionaire´s service performance – beginning with a Maximum Availability Payment totaling $32.9 million in 2012 dollars. All subsequent payments are adjusted annually according to two elements. First, the payments grow each year by 2.5% plus inflation. Second, the payment shrinks according to the facility's unavailability and/or to penalize lapses in the concessionaire's comprehensive agreement fulfillment.

Total East End Crossing project funding came to $1.3 billion, divided into 5.9% private equity, 38.5% Private Activity Bonds (borrowed by the public sector), 12.3% TIFIA loan (borrowed by the public sector), and 43.3% in federal and state public sector funds (see Appendix E for the project´s financial characteristics). The project's financing relies on a fixed-price toll although the revenue does not pass directly to the private sector. Instead, Indiana and Kentucky divide the overall LSIORB project toll revenue, including both the Downtown Crossing and the East End Crossing, equally. Indiana uses its portion to pay WVB East End Partners availability payments totaling up to $32.9 million per year, in 2012 dollars. Since the East End Crossing payments do not vary with toll revenue, demand risk remains with the public sector. By the end of the first year of operations, toll revenues coming from both bridges, Downtown Crossing and East End Crossings, reached $160 million, surpassing the $150 million projection.[58]

P3 Objectives & Outcomes

Prior to the LSIORB project, Indiana´s only previous experience employing its P3 legislation included its Indiana Toll Road (ITR) brownfield project. In that case, the state had generated $3.8 billion in 2006 from a private concessionaire in exchange for a 75-year lease concession with toll revenues and O&M responsibilities. The ITR operator eventually filed for bankruptcy in 2014, emerging a year later after a new concessionaire, pension fund IFM Investors, purchased the asset for $5.7 billion.

The Ohio River East End Bridge, in contrast, represented a greenfield project funded through availability payments. Despite concerns regarding a potential ITR default prior to the East End Bridge's 2013 financial close, INDOT and IFA did not conduct Value for Money (VfM) analyses for the bridge project, nor did they make public any analyses comparing project delivery alternatives. Without such analyses, the present case study relies primarily on participant interviews to explore the public sector's P3 delivery objectives. INDOT and IFA do maintain their P3 documents online however, including the FEIS, comprehensive agreement, and settlement related progress reports.

Congestion Management and User Experience

The LSIORB project ultimately aimed to improve mobility across the Ohio River for Jefferson and Clark County's current and future populations. As of November 2017, just

eleven months following the East End Bridge's opening, no studies or reports yet describe the project's impacts. In the interim, early numbers suggest that the project underestimated actual demand. The 2013 and 2016 annual traffic projections for the year 2017 expected 10.8 and 9.4 million bridge crossings, respectively, across the Downtown and East End bridges.[59] Toll revenue projections equaled $33.8 and $32.9 million respectively. Actual Downtown and East End Bridge crossings as of 2017's third quarter totaled 22.5 million crossings[60] with revenue reaching $56.4 million. Such preliminary numbers likely indicate improved traffic congestion and cross-river mobility outcomes for the region.

Access to Private Sector Expertise, Financial Resources & Project Acceleration

By employing a P3 approach, Indiana accessed key private-sector technical expertise and financial resources, accelerating the project beyond the timeline expected under traditional procurement. First, the WVB consortium's proposed $763 million construction price came in 23% below IFA and INDOT's original estimate, lowering the project's costs significantly compared to estimates based on traditional procurement. Out of the almost $220 million in savings, $81.5 million corresponded to alternative technical concepts (ATC) including, for example, a roundabout interchange, uncoated weathering steel, shortened and optimized tunnel geometry, and redesigned shoulder pavement. According to interviewees, the concessionaire also generated savings from temporary traffic control or maintenance of traffic (MOT), lifecycle cost considerations, and management efficiencies.

Second, the P3-enabled milestone payment approach allowed Indiana to spread project costs over time, rather than paying upfront. The state paid $392 million in milestone payments during the project's construction period, greatly reducing the project's short-term financial impact for the public sector. Third, the P3 procurement approach allowed the state to access federal and private sector funds not available via traditional procurement. Specifically, the P3 project obtained $78 million in private equity, over $500 million in Private Activity Bonds (PABs), and, after financial close, a $162 million Transportation Infrastructure Finance and Innovation Act (TIFIA) loan to help INDOT finance the milestone payments. Such resources ultimately totaled 57% of the project's total financing and allowed the project to advance.

Cost and Schedule Certainty

Since INDOT tended to deliver projects on time and within budget under traditional procurement – over 80% of the time according to one interviewee – cost and schedule certainty did not rank highly among the state's primary objectives for pursuing P3 delivery. Nevertheless, the P3 contract structure promoted these benefits by tying the eight milestone payments to construction delivery events. The first seven payments totaled $297 million; the final substantial completion payment equaled $95 million.[61] If the concessionaire did not deliver each milestone on time and according specifications, it could see its payments decreased. In an extreme situation, IFA could abstain from payment altogether. Extreme weather and floods,[62] force majeure events, ultimately delayed project delivery by 47 days, shifting project completion from October to December 2016. Since the contract deemed these conditions release events, the state did not penalize the private partners for the completion delay, providing the full substantial

completion payment. Despite the 47-day delay, the concessionaire still completed the project 6 months earlier than INDOT had originally anticipated during the procurement process.

Since the P3 milestone payment approach transferred project risks (i.e., construction) to the private sector and forced the concessionaire to absorb all cost increases not accepted by the public sector through the change order negotiation process, the P3 approach also delivered the project within budget. This likely limited concessionaire-driven change orders that would have inflated costs. In fact, of the project's $14 million in change orders, $9 million, or roughly two thirds, derived from state-requested changes. According to one interviewee, change order-related cost increases amounted to just to 2% of original cost estimates – generally considered a success. By comparison, U.S. construction projects usually experience 5% to 10% cost increases from change orders, although some studies have found values as high as 15% and 46%.[63,64] As an additional comparison, over the past decade, Maryland has aimed to keep its change-order costs below 8%; California and Missouri aim for 2% or less.[65] In addition, by bundling the project's design and construction phases with the concessionaire, the DBFOM P3 contract likely allowed the concessionaire to adjust designs quickly, helping to avoid lengthy change order renegotiations. Since the concessionaire also depended on availability payments, bundling O&M components into P3 contract may also have helped limit change orders by incentivizing early completion.

The availability payment approach, with a maximum annual availability payment of $32.9 million in 2012 dollars, also supported public sector budget certainty for future operations and maintenance. In addition, while several interviewees felt that the LSIORB project's East End (P3-DBFOM) and Downtown Crossing (DB) bridge sections differed sufficiently to prevent meaningful comparison,[61] when asked whether the projects presented relevant construction differences, one interviewee noted the East End Crossing's use of concrete for paving and bridge decking, a more expensive and longer-lasting material, compared to the asphalt applied for the Downtown Crossing. This matches theoretical expectations, along with U.S. and European empirical evidence, suggesting that P3s prefer maintenance-cost-saving technologies, despite higher construction costs, since the private partners internalize future operations and maintenance cost.[1,66,67]

Objectives for Future Projects

Overall, the project interviewees felt that the East End project was quite successful considering the coordination needed to conduct a bi-state project. However, they did suggest that future projects consider involving the private sector earlier in the procurement process. Kentucky and Indiana had developed their bridge designs long before they selected their delivery methods, potentially limiting some opportunities for private sector ATC proposals during the P3 procurement process. Had the LISORB project incorporated private-sector expertise earlier in the procurement process, it might have incorporated greater technical and financial innovations into its infrastructure development, producing greater economic, safety, environmental, and/or value capture benefits for the region. Such early ATC proposals introduced important cost saving techniques in Texas' LBJ TEXpress Lanes, for example, and helped Florida's Port of Miami Tunnel comply with environmental regulations, see Phase I report.[68]

STATE HIGHWAY 130 – SEGMENTS 5 AND 6

Project Origin

Built during the 1950s to improve mobility through Austin, TX and San Antonio, TX, US Interstate 35 (I-35) experienced congestion increases and severely deteriorating levels of service starting in the late 1990s as regional populations and economic activities grew.[69] For example, as a consequence of the North American Free Trade Agreement (NAFTA) taking effect in January 1994, truck traffic through the corridor increased five times between 1993 and 1997. Similarly, population forecasts estimated the region's population to double from 2.6 million to 5.4 million between 1998 and 2030. With such growth, traffic accidents also increased; accidents involving injuries increased by 24% between 1993 and 1999, and accidents involving fatalities increased by 22% during the same period.

The Texas Department of Transportation (TxDOT) had considered alternative routes to I-35 starting in 1986, focusing on three objectives. First, the alternative route would need to relieve congestion on I-35 and other nearby facilities. Second, it would need to improve regional mobility. Third, it would need to increase accessibility for the region's tourist attractions, numerous colleges and universities, and other significant facilities.[69] TxDOT's 1997 Major Investment Study (MIS) suggested that viable alternatives include: a) multimodality and inter-modality; b) limited access points; c) minimal negative externalities for existing neighborhoods and businesses; d) a realistic and comprehensive design and financial plan that preserved unique ecological resources; and e) minimal urban sprawl.[69] In addition, TxDOT had chosen to develop any alternative routes as toll roads. By June 2001, the Federal Highway Administration (FHWA) had signed a Record of Decision (ROD) selecting the easternmost route (Alternative 2) connecting I-35 north of Austin to I-10 east of Seguin, TX. According to the Final Environmental Impact Statement (FEIS) this route would: i) relieve congestion on I-35; ii) avoid taking public park lands as required for the best competing alternative (Alternative Route 3, west of Round Rock city and the Lake Walter E. Long); iii) benefit from strong public support; and iv) avoid affecting historic properties, another issue present for Alternative 3. Since TxDOT's governing body, the Transportation Commission, opposed the proposal – it would give Austin too large a proportion of the state's motor fuel taxes – the project did not obtain public-sector funding. Nevertheless, the ROD recognized that the roadway project could proceed in phases.

TxDOT felt that the prosperous counties along the proposed route presented sufficient demand, local funding, and tolling potential to build the first 49 miles connecting SH 195 north of Georgetown, TX with US 183 at Mustang Ridge, TX. As a result, the department divided the project into six segments, with the Turnpike Division undertaking the first four sections connecting SH 195 with US 183. To do so, TxDOT took advantage of the state's 2003 House Bill 3588 – which allowed Comprehensive Development Agreements (CDAs) for implementing innovative transportation infrastructure delivery mechanisms – to develop the project using a design-build approach. To finance the project, TxDOT bundled the 49-mile State Highway 130 (SH 130) Segments 1-4 project with two additional projects – Austin's Loop 1-MoPac Expressway and a 13-mile SH 34 extension East of Dallas – to issue bonds and access federal Transportation Infrastructure Finance and Innovation Act (TIFIA) funding. Total costs for the

bundled projects came to $3.25 billion, with $1.282 billion dedicated to the SH 130 DB portion, making it the largest revenue bond financed highway project in the nation at the time [70]. The resulting SH 130 toll road segments 1-4 opened to traffic between 2006 and 2008 under TxDOT operation.

P3 Origin

In 2001, TxDOT commenced discussions to develop the Trans-Texas Corridor (TTC), a 4,000 mile, cross-Texas project including toll roads, rail lines, and utility facilities. As part of this over-arching project, TxDOT signed a CDA with the Spanish Concesiones de Infraestructuras de Transporte, S.A (Cintra) and the Texan Zachry Construction Corporation partnership in 2005 to plan TTC-35: a TTC subcomponent stretching from the Texas-Oklahoma state border through central Texas along the I-35 corridor to the Texas/Mexico border on the Texas Gulf Coast. The CDA allowed Cintra-Zachry to identify development-ready projects within that corridor and gave it the right to negotiate additional CDAs to develop them. Although the broader TTC-35 initiative never reached development – TxDOT and FHWA settled on "no action" in 2010 after facing strong tolling and environmental concerns[71,72] – Cintra-Zachry presented an unsolicited proposal in early 2006, as allowed by the TTC-35 CDA, to develop SH 130's remaining segments 5 and 6.

The proposal surprised many inside TxDOT since the department's prior studies predicted that segments 5 and 6 would be financially unsustainable. The 41-mile route between Mustang Ridge and Seguin traversed two poor, rural counties that, according to TxDOT, lacked the financial resources or demand to support toll road construction. The total expected cost for the extension's design and construction reached $1.35 billion; available public funding equaled just half this amount.[73] Nevertheless, expecting favorable economic growth, Cintra-Zachry offered to design, build, finance, operate, and maintain (DBFOM) the project in its entirely and to provide the state with a $25 million upfront payment and a revenue share component. Because the state lacked unsolicited proposal procedures and the CDA allowed for proposal negotiations without establishing a competitive process, TxDOT did not issue Requests for Qualifications (RFQ) or Requests for Proposals (RFP). TxDOT and SH 130 Concession Company, LLC, the special purpose vehicle created by Cintra-Zachry for the project, signed the resulting DBFOM public-private partnership (P3) contract in March 2007. The parties reached financial close in March 2008 for a 50-year concession, including a third private partner – Hastings Funds Management – which had joined the project in March 2007 (see Appendix E for the project´s timeline).

Financing totaled $1.327 billion, including 15.8% private equity, 51.6% senior bank loans, 0.2% interest income, and 32.4% TIFIA loans. Funding would derive from tolls collected along the segments 5 and 6, with rates varying by distance and by vehicle type, subject to TxDOT review. The agreement also included a revenue-sharing mechanism where if cumulative gross revenues exceeded the project's base case projections, or if the private partners refinanced the project, TxDOT could claim an increasing percentage of these additional revenues as defined by three revenue band floors up to 50%. Furthermore, if TxDOT chose to increase the concession corridor's maximum speed to attract users, it could increase either the up-front

payment it received from the concessionaire or the gross revenue proportion it received from the revenue-sharing mechanism. TxDOT ultimately decided to increase the corridor's maximum speed to 85 miles per hour, receiving an $100 million upfront payment and making the corridor the fastest in the U.S.[74] This was paired with a corresponding maximum speed reduction, from 65 mph to 55 mph, on the neighboring U.S. 183. Construction began in April 2009 and the facility opened to traffic in October 2012.

By the end of 2014 however, toll revenue had reached just 30% of original revenue projections. As occurred with many US P3s from the period, the real estate development and robust demand the partners expected prior to the 2008 Great Recession failed to materialize. At the time, the TxDOT-operated SH 130 segments (1-4) also faced limited success attracting traffic and the TxDOT-approved 85 mph speed limit for the P3 segments proved insufficient for attracting users away from I-35. Since highway tolls appear to be price-inelastic, slashing toll rates in an effort to attract demand would only have decreased revenues further.[75] Having already delayed bank payments that year, such revenue shortfalls challenged the project's financial sustainability [76].

The SH 130 segment 5-6 project also suffered from some risky financial decisions. Like the troubled South Bay Expressway (California) and Indiana Toll Road (Indiana) P3 cases, the SH 130 partners financed their project largely with bank loans, keeping only 15.8% in equity contributions. Such bank support might have encouraged over-leveraging, with equity holders willing to bear larger risks.[77] In addition, like the Indiana Toll Road and Chicago Skyway P3 cases, the partners paired large debts with an interest rate swap that, while aimed at minimizing interest rate-related cost increases, ultimately increased the project's financial costs when interest rates dropped in response to the Great Recession.[76] These projects, developed during the financial crisis of 2007-2008, which was not a hospitable time and affected the P3 industry regardless of the characteristic of the project or the experience of the transportation agency. By March 2016, the concessionaire had accrued $1.59 billion in debt, up from the $1.117 billion it owed at the time of financial close.

Facing such financial strain, the SPV concessionaire, SH 130 Concession Company, LLC, filed for bankruptcy in March 2016. Five months later, the concessionaire's owners, Cintra-Zachry, ceded it to its creditors. The project emerged from bankruptcy in June 2017 with the project's lenders taking over the SPV along with the concession agreement's rights and responsibilities. Final equity composition information has not been disclosed. The lenders became owners of the SPV after bankruptcy. Some lenders sold their equity participation to Strategic Value Partners, an investment firm that now holds the majority of the shares. The SPV took on a new $260 million loan from Goldman Sachs to provide working capital. The new owners also brought on Louis Berger – which had conducted traffic analyses and projections for lenders evaluating the project prior to the bankruptcy filing – as the new operator with a seven-year contract. The transfer took place without any contract renegotiation with TxDOT.

Concerns emerged a few months after opening related to increased flooding in Lockhart, TX, connected to the highway´s runoff. In response, TxDOT requested that the concessionaire construct retention ponds and claimed that the concessionaire had not obtained required drainage features approval from the City of Lockhart.[73] Further concerns arose two years after the road

opened regarding deteriorating pavement conditions. Disputes over these matters continued through the project's bankruptcy process.[76,78] An independent engineering firm ultimately found 160 pavement defects in 2014. One interviewee suggested that the extreme and unusual drought conditions prevailing during the project's construction may have left pavements vulnerable once rains began. By August 2016, five months after filing for bankruptcy, the concessionaire had accumulated more than 52 defects per year, the contract threshold defining a Persistent Developer Default, allowing TxDOT to impose a $428,905 penalty on the concessionaire in addition to outstanding repair requirements, as shown in docket 737 of the bankruptcy court case. The concessionaire, by then in the hands of the project lenders, then presented a remedial plan in October 2016, which TxDOT approved in January 2017. Starting from that date, the concessionaire, now led by Strategic Value Partners, has up to 720 days to reach "substantial completion" according to the terms of the remedial plan, costing the concessionaire an estimated $60 million to $70 million according to interviewees.

On March 1, 2018, the SH 130 Concession Company SPV, under its new owners, filed suit against Cintra and Zachry, as shown in docket 824 of the bankruptcy court case. The suit alleges that Cintra and Zachry paid $329 million to Central Texas Highway Constructors (CTHC), an affiliate company in charge of the road's design and construction, despite knowing of the road's design and construction defects. The plaintiff argues that this payment and use of faulty revenue projections increased the project's insolvency risk, shifting financial consequences to the lenders. However, it may not have been possible to stop the construction work without costly penalties imposed by TxDOT.[79] As of this writing, the dispute remains unresolved.

P3 Objectives & Outcomes

The Center could not locate any reports describing final effectiveness measures or presenting resulting outcomes data for this project. In part this may reflect the conflict surrounding the bankruptcy of the SPV concessionaire. Consequently, the following analysis relies primarily on interview responses rather than documentary sources.

Congestion Management and User Experience

TxDOT wished primarily to reduce congestion, improve regional mobility, and improve facility access when developing the 90.1-mile SH 130 highway, although congestion proved pressing only along sections 1 through 4, not sections 5 and 6. Without sufficient congestion to support tolling, the department had chosen not to develop the final sections under traditional procurement; it deemed it not feasible within the department´s available and expected resources. As a result, while the extension may have increased mobility and accessibility, especially for freight traffic, it was unlikely to affect congestion enough to make the project financially sustainable. One reason why demand was lower than expected is that the eastern-most route, the route farther away from the I-35, was selected for construction. In addition, although trucks composed 20% of SH 130´s traffic, the truck toll rate, set at $33.83 at the time of the bankruptcy filing, may have proved too high to attract more traffic.[80] However, toll rates may have not been the whole story. Demand shortfalls appear to have transcended the 5th and 6th segments

developed under the P3 contract; segments 1 through 4, controlled by TxDOT, also faced limited success attracting traffic.[75]

Although the SH 130 85 mph maximum speed aimed to improve user experiences and thereby attract traffic, roadway safety and quality conditions quickly undercut this strategy. An early fatality, for example, suggested that speed differences between the SH 130 corridor and the neighboring U.S. 183 might have affected safety near intersections.[81] Other incidents, including four opening day accidents caused by wild hog crossings, further suggest the need for additional safety and roadway design analyses before the state raised the speed limit.[82] However, as was mentioned before, segments 1-4, not delivered as a P3, faced initially low demand. This changed, though. By the end of 2016, after the P3 concessionaire had filed for bankruptcy, traffic demand in SH 130 segments 1-4 picked up. The following year, a $36.7 million expansion was approved, so by the year 2020 it is expected that the number of lanes increase from 4 to 6 in segments 2 and 3.

Access to Private Sector Financial Resources & Project Acceleration

The SH 130 project documents and interviewees agreed that TxDOT lacked sufficient resources to complete segments 5 and 6. Using traditional municipal bond funding, the state could muster only $600 million,[83] or half the design-build cost. Toll revenue projections also suggested that the project would require continuous subsidies for maintenance, funds the public-sector was unwilling to commit. The project's DBFOM contract eliminated these obstacles by substituting private-sector resources, paying TxDOT a $25 million up-front payment, establishing a revenue-sharing mechanism, and enabling an additional $100 million payment linked with the corridor's maximum speed increase. As a result, in the absence of strong demand pressures on the state, the P3 structure likely accelerated project delivery for segments 5 and 6 by at least a decade or more.

Cost, Schedule, and Quality Certainty

The literature recognizes that P3s can help the public sector manage cost and scheduling risks,[33–35] particularly through design-build contracts that bundle design and construction activities into single, fixed cost contracts, in contrast to traditional design-bid-build (DBB) approaches that separate these activities into two separate contracts. By consolidating responsibility for component delivery with one party for a fixed sum, such contracts tend to reduce the contractor claims and change orders arising from discrepancies and uncertain events.[36] Furthermore, by incentivizing private partners to finish construction quickly in order to collect tolls at the earliest possible date, DBFOM contracts also motivate private concessionaires to deliver their projects ahead of schedule.

While TxDOT did not explicitly identify cost, schedule, or quality certainty as P3 project goals, the contract agreement included these benefits and the concessionaire generally delivered. For example, the agreement included a $25,000 per-day penalty for each day the project was delayed from its scheduled opening. Given this incentive, the concessionaire opened the project to traffic one month ahead of the scheduled November 2012 opening date. In addition, TxDOT was not liable for the project's financial liabilities or any construction change order costs.

Regarding quality of the infrastructure provided, concerns developed a few months after opening. There was an on-going process where TxDOT required the original concessionaire to repair the 160 defects found. This process was not completed before bankruptcy. After the bankruptcy, with an improving economy, the new concession company has basically assumed all risks of repairing defects and moving forward with SH-130 operations, so TxDOT and driving public suffered limited hardship.

Risk Management

In commencing the SH 130 segments 5 and 6 project through a DBFOM P3 structure, Texas transferred demand and financing risk entirely to the private sector and the federal government. Hence, while the state of Texas protected itself from the project's financial risks, U.S. DOT may consider changing TIFIA requirements to increase projects' equity ratios, as done for Virginia's I-66 Outside the Beltway project (equity ratio of 41%, versus 15.8% equity for SH 130 segments 5 and 6).

Objectives for Future Projects

Texas' SH 130 segments 5 and 6 project demonstrated the project acceleration, cost and schedule certainty, and risk transfer benefits offered by P3 procurement approaches. Although demand and quality concerns developed, the DBFOM contract approach taken kept any associated costs and responsibilities with the private sector. After acknowledging the demand and quality concerns, it is important to recognize that Texas obtained a substantial 41-mile extension of SH 130 and $125 million payment at little or no cost to TxDOT. For the future, the public sector might consider linking economic development and value capture objectives with future transportation P3 projects, although the Texas state legislature allowed its P3-enabling CDA statutes to expire in 2017, limiting potential for future P3s in the Texas market.

The SH 130 Concession Company, LLC bankruptcy process suggests the U.S. government may want to reconsider its statutory provisions regarding its powers as a lender to projects that go bankrupt. Despite TIFIA being the largest single lender in the project, it was not able to take the lead in the bankruptcy reorganization because it lacked the statutory authority to do so.[79] Evaluating whether reforms are needed to the appropriate sections of U.S.C. Title 23 to allow for this in future situations may be fruitful.

DISCUSSION

P3 Project Objective Formation and Evaluation

Congestion, Safety, & Service Quality

In the six Phase I cases, public-sector agencies tended to develop project concepts addressing a practical transportation problem or set of problems, primarily traffic congestion and the safety and service quality issues that stem from it. The Phase I sponsoring agencies were also largely successful in employing P3 approaches to meet these original congestion management and user experience goals. Congestion reduction presented the primary objective for the Phase II cases as well, but outcomes remain inconclusive across these cases. Preliminary demand and revenue data for the Ohio River East End Bridge, for example, suggest successful traffic congestion and cross-river mobility outcomes for the Louisville region. Virginia's Midtown Tunnel project, however, has not operated long enough to provide conclusive findings, although additional capacity and the electronic tolling will likely reduce congestion. For Texas' SH 130 case, traffic projections never materialized. In addition, construction quality issues have emerged, although the P3 structure shifted construction quality risks to the concessionaire; no state public sector funds have been allocated to solve the quality problems.

Overcoming Financial & Technical Barriers

Beyond addressing traffic congestion, the Phase I public agencies encountered barriers that prevented them from procuring project solutions through traditional means. Two general barriers applied across the six study cases: 1) financial limitations (both short- and long-term), often exacerbated by debt limits; and 2) project design and/or technical limitations related to environmental and legal challenges, eminent domain opposition, aesthetic opposition, tolling challenges, and/or the technical challenges related to tunnel construction. As such, primary Phase I public-sector P3 objectives included accessing private-sector funding and financing; accessing private sector expertise and innovation; and accelerating project delivery. Private-sector funding, financing, expertise, and/or innovations played a significant role in nearly all the Phase I study cases and helped public-sector agencies successfully employ P3 approaches to accelerate their projects compared to the timelines expected under traditional procurement.

Access to private-sector funding and financing proved similarly important for all three Phase II cases. In the Texas SH 130 case, for example, the P3 approach enabled private sector equity and bonds, together with federal loans, to advance the otherwise suspended fifth and sixth project segments while providing TxDOT with two upfront payments from the concessionaire. P3-enabled private equity, PAB, and TIFIA resources similarly reduced Virginia's public-sector commitment to $308 million when VDOT signed the comprehensive agreement, compared to the tunnel projects' $2.1 billion expected cost. Even accounting for later state resource infusions for decreasing, delaying, and/or removing tolls, the P3 approach enabled the project while costing the state $581 million. Moreover, the P3 delivery mechanism provided essential resources as VDOT adjusted to a dire financial situation following the Great Recession. Finally, P3 procurement allowed Indiana to considerably reduce the upfront financing costs for its Ohio River Bridges project. The P3-enabled milestone payment approach, for example, required $392

million in milestone payments during the project's construction period, compared to $763 million in total construction costs. The remaining funds for construction, operations, and maintenance derived from P3-enabled equity contributions, PABs, and a TIFIA loan.

Private sector expertise and innovation also proved salient in Virginia's Phase II Elizabeth River Crossings case, where the private sector proposed a construction price 23% below the public sector´s original estimate. Of the almost $220 million in savings, $81.5 million corresponded to alternative technical concepts (ATC) including, for example, a roundabout interchange, use of uncoated weathering steel, shortened and optimized tunnel geometry, and redesigned shoulder pavement. According to interviewees, the concessionaire also generated savings from temporary traffic control or maintenance of traffic (MOT), lifecycle cost considerations, and management efficiencies.

Such private-sector funding, financing, expertise, and innovation ultimately accelerated project delivery in at least two of the Phase II cases. In Texas' SH 130 segments 5 and 6 case, for instance, the P3 structure likely accelerated project delivery by a decade or more. In the Midtown Tunnel case, the P3 delivery approach probably accelerated the tunnel project by at least 6 years. If the Hampton Roads Transportation Accountability Commission (HRTAC), the region's transportation project funder, planned additional projects in its 2016-2022 funding plan, the tunnel project might have been further delayed without P3 delivery. In the Ohio River Bridges case, P3-enabled cost reductions and private sector financing may have accelerated project delivery but it is not clear by how much.

Cost, Schedule, and Risk Management

Beyond funding, financing, expertise, innovation, and project acceleration, many Phase I case agencies constructed P3 agreements to achieve a broader range of benefits including: cost, schedule, and facility or service quality certainty. The Phase I projects were also largely successful in generating greater cost, schedule, and quality certainty for the public sector. The Phase II cases present similar findings, with all three greatly benefiting from P3 contractual mechanisms that increased certainty about cost, schedule, and facility or service quality. The Ohio River Bridges case, for example, experienced just $14 million in change orders (2% of the original cost estimates), two-thirds of which reflected state-requested changes. According to one interviewee this is generally considered a success. By comparison, U.S. construction projects usually experience 5% to 10% cost increases from change orders, although some studies have found values as high as 15% and 46%.[63,64] As an additional comparison, over the past decade, Maryland has aimed to keep its change-order costs below 8%; California and Missouri aim for 2% or less.[65]

Regarding schedule certainty, the Ohio River Bridges project opened 47 days late, but as a consequence of extreme, force majeure weather and floods.[62] Despite the 47-day delay, the concessionaire still completed the project 6 months earlier than INDOT had originally anticipated during the procurement process. The P3 concessionaire for Virginia's Elizabeth River Crossings tunnel, similarly, delivered the project within budget and 14 months ahead of schedule, despite the tunnel construction facing: geotechnical risks; historic artifact discovery

risks; and damage risks for the existing tunnel during the new tunnel's immersion. Texas's SH 130 segments 5 & 6 were also delivered within budget and one month ahead of schedule.

The Phase I cases also demonstrated successful risk transfer efforts across the studied projects, especially regarding tolling, revenue, construction, and technical risks. The Phase II cases presented comparable findings. For example, the P3 process allowed VDOT to shift geotechnical risks, historic artifact discovery risks, and damage risks to the private sector concessionaire. TxDOT, similarly, successfully transferred demand and financing risk entirely to the SH 130 segment 5 & 6 private sector equity holders and lenders, protecting the state from the project's ultimate bankruptcy, although it is still unclear how much the bankruptcy affected the federal government´s TIFIA loan. The case of Ohio River Bridges may require a few decades to assess its full impact of transferring the risk of construction and maintenance of East End Crossing by comparing it with the performance of the Downtown bridge, delivered as a DB project.

Other Objectives

Several Phase I P3 cases incorporated broader economic development and/or transportation features, particularly transit, into their project objectives. None of the Phase II cases appear to have done similarly, although Midtown Tunnel did have a transit component, but it was relatively small and lacked a significant public profile. The case study research did not identify any additional P3 objectives from the Phase II cases that were not identified in the Phase I research.

Finally, while transportation agencies did not consider minimizing procurement time as an objective for using P3 delivery method, the research showed that procurement time has been decreasing (see Appendix F). It appears that it is the combination of increased public and private sector experience. But also, it is because some of the early projects were affected by the Great Recession.

Evidence and Methodology

During the Phase I documentary analyses, the availability of project documents varied greatly across projects, sponsors and time. Projects often lacked readily available documentation elaborating on the P3 approach's marginal impact compared to traditional delivery. For instance, some state departments of transportation either did not require or did not develop full Value for Money (VfM) analyses, removing a valuable information source from consideration.[84] Many agencies were not subject to legislative audits which, leaving political considerations aside, sometimes provide valuable information on the project. Additionally, many agencies did not develop project performance analyses and many objectives lacked clear efforts to evaluate achievement and communicate findings with the public. No VfM analysis were available for the Phase II cases, although the Ohio River Bridges project conducted an Economic Impact Study that provided important information for understanding the project's expected impacts.

In addition, in many of the Phase I cases, limited evaluation efforts were exacerbated by transparency practices that varied widely by project and jurisdiction. Some public agencies, like the Texas Department of Transportation, developed comprehensive project websites including environmental studies, document timelines, presentations from public meetings, approval documents, RFP and RFQ documents, proposal documents, and comprehensive agreements. Such sites provide ready public access to essential information and encourage evaluation efforts. Other agencies and projects, in contrast, lacked readily accessible, targeted digital portals and/or distributed documentation across several locations. This was particularly true for older projects, although legal disputes also affected document availability.

Finally, the interview respondents provided valuable insights during the Phase I research, particularly in cases and jurisdictions lacking analyses and/or readily accessible documents. First, they often identified and/or provided key documents for analysis. In the Phase II SH 130 case, for example, TxDOT personnel provided access to FEIS documentation not available online given the document's size. Second, they noted high priority objectives when documentary sources offered long lists of objectives and they highlighted secondary objectives not stressed in the available literature. Third, they provided process-related insights, identified obstacles, and supplied information regarding goal achievement. While valuable, such insights were considered carefully and in relation to the documentary record. Many stakeholders had relocated or refocused in the years following their projects and their corporate, institutional, and/or personal interests may have colored their perspectives.

Lessons & Recommendations

At the most general level, the case study findings reveal that public agencies pursue P3 procurement approaches for a variety of reasons. While private funding and financing was important in nearly all the study cases, it provided only one of several motivations for P3 selection. Also important were access to private sector expertise and innovation, project acceleration, risk management, and cost, delivery, and quality certainty. The P3 agreements studied in this analysis were largely successful in meeting these goals. In the case of Texas's SH 130 segments 5&6, while construction quality issues have emerged, the current concessionaire is absorbing the costs of repairs, not TxDOT. Regarding this project´s bankruptcy, the problem created was not for TxDOT but for the lenders. Overoptimistic traffic estimations, paired with the Great Recession, appear to be the responsible for the results. However, the lawsuit that is currently taking place between the current owners of the concession and the previous owner may provide additional information regarding what drove the concessionaire in this direction.

The study cases also demonstrated the potential for broader P3 objectives when public agencies select procurement approaches and formulate P3 comprehensive agreements. First, public agencies could do more to access private sector expertise and innovations earlier in the project development process. In the Ohio River Bridges case, for instance, Kentucky and Indiana developed their bridge designs long before they selected their delivery methods, potentially limiting some opportunities for private sector ATC proposals during the P3 procurement process.

Second, although risk-transfer featured in nearly all cases, it often appeared as a secondary goal compared to financial, technical, and/or project acceleration goals. Risk transfer can offer significant benefits for public stakeholders and should probably rank higher among the public-sector's primary P3 objectives. Public agencies should focus additional attention on political risk in particular. Political risk generates special drawbacks for P3 delivery methods, especially, as seen with Virginia's Midtown Tunnel case, when they involve tolling or other user fees. To fulfill the project´s objectives, public and private entities pursuing P3 approaches should work to increase and maintain public support.

Third, public agencies might consider expanding their P3 project scopes beyond simple highway expansion plans to incorporate broader transit, local development, and value capture opportunities. In the Elizabeth River Crossings case, for example, value capture might have diminished tensions surrounding tolling during construction and the tolling of low-income neighborhoods. The competitive procurement processes noted with respect to accessing additional private sector expertise and innovation would likely generate innovation in this respect as well.

The case study findings also suggest the need for improved outcome measurement, analysis, and transparency practices for P3 project documentation, particularly through comprehensive public-sector websites. Public agencies might also consider standardizing data and analyses across projects with access to related documentation. Such recommendations apply particularly to older P3 projects and become increasingly relevant as longer-term contracts make documents relevant for many decades beyond financial close, a situation not typically presented by traditional design-bid-build procurement. Life cycle asset management evaluations in particular suggest special challenges. Furthermore, "citizens' guides" explaining comprehensive agreements, as some agencies provide for FEIS, may help improve communication and citizen engagement. Agencies might also consider developing outreach materials, such as the Ohio River Bridges middle school "lesson plans," available in their website, that help explain P3 transportation projects, their governance, and their relevance for the wider public. In addition, although the Texas Department of Transportation developed valuable and comprehensive P3 project websites, its SH 130 web pages suffered from several broken links during the Phase II study and lacked access to the Facility Concession Agreement and its amendments for several weeks. Although these issues were resolved in early 2018, the Phase II research experience also suggests that Texas, other U.S. states, and even FHWA conduct website audits to ensure information availability and minimize information disruptions.

Finally, the SH 130 segments 5 & 6 bankruptcy process suggests the U.S. government may want to reconsider its statutory provisions regarding its powers as a lender to projects that go bankrupt. despite TIFIA acting as the project's largest single lender, it lacked the statutory authority to lead the bankruptcy reorganization.[79] As a result, federal decision makers may wish to evaluate reforms to the appropriate U.S.C. Title 23 sections.

Study Limits & Insights for Further Study

Given the Phase I and Phase II studies' preliminary nature and still incomplete coverage of the universe of surface transportation P3 projects in the U.S., with 43% of the 21 projects, the research offers intriguing findings but cannot support sweeping claims regarding universal P3 objectives, outcomes, and evidence. The nine total study cases present similar objective profiles, outcomes, and limitations, but other projects will likely offer a more diverse picture. As a result, continued research evaluating the remaining projects listed in Appendix A will be necessary to expand knowledge regarding P3 objectives in the U.S. surface transportation sector. Future research efforts might also revise the study methodology, weighing the relative advantages and disadvantages presented by limiting the project universe to projects already reaching "final acceptance." While the final acceptance criteria help ensure information availability, it might also omit projects demonstrating alternative P3 challenges that offer valuable lessons for future projects. In addition, further efforts might pursue information from federal TIFIA and FHWA sources.

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APPENDIX A: U.S. SURFACE TRANSPORTATION P3s

State	Year of Financial Close	Project	Project Type	Contract Type	Project Status as of July 2018
California	2012	Presidio Parkway Phase II*	Road	DBFOM	Operating (pending landscaping)
Colorado	2010	Eagle P3	Commuter Rail	DBFOM	Under Construction (Sections are operational)
Colorado	2014	US-36 and I-25 Managed Lanes Phase II, US 36 Express Lanes/BRT Phase II*	Road	DBFOM	Operating
Florida	2009	I-595 Managed Lanes P3	Road	DBFOM	Operating
Florida	2009	Port of Miami Tunnel*	Tunnel	DBFOM	Operating
Florida	2014	I-4 Ultimate Improvements	Road	DBFOM	Under construction
Indiana	2013	Ohio River Bridges Project, East End Crossing	Bridge	DBFOM	Operating
Indiana	2014	I-69 Section 5	Road	DBFOM	Under Construction
Maryland	2016	Maryland Purple Line	Commuter Rail	DBFOM	Under Construction
New York - New Jersey	2013	Goethals Bridge	Bridge	DBFM	Under Construction (Sections are operational)
North Carolina	2015	I-77 HOT Lanes	Road	DBFOM	Under construction
Ohio	2015	Portsmouth Bypass, Southern Ohio Veterans Memorial Highway, SR 823	Road	DBFOM	Under Construction
Pennsylvania	2016	Pennsylvania Rapid Bridge Replacement Project	Bridge	DBFM	Under Construction
Texas	2008	State Highway 130, Segments 5 & 6	Road	DBFOM	Operating
Texas	2009	North Tarrant Express Segments 1 & 2A	Road	DBFOM	Operating
Texas	2010	I-635 LBJ TEXpress Managed Lanes*	Road	DBFOM	Operating
Texas	2013	North Tarrant Express Segment 3A, I-35	Road	DBFOM	Under Construction
Texas	2014	State Highway 183 Managed Lanes, Midtown Express	Road	DBOM	Under Construction
Virginia	2007	I-495 Capital Beltway HOT Lanes*	Road	DBFOM	Operating
Virginia	2012	Elizabeth River Tunnels, Midtown Tunnel	Tunnel	DBFOM	Operating
Virginia	2012	I-95 HOV/HOT Lanes, Express Lanes*	Road	DBFOM	Operating

* Selected for initial evaluation with feedback from the Virginia Department of Transportation. See the Study Scope section in the body text for selection criteria.

APPENDIX B: SELECTED PROJECTS

	State	Project	Project Type	Contract Type	Project Status as of June 2017	Unsolicited Proposal	O&M Duration	Funding
Phase I	California	Presidio Parkway Phase II*	Road	DBFOM	Operating	No	30 years	Availability payments
	Colorado	US-36 and I-25 Managed Lanes Phase II, US 36 Express Lanes/BRT Phase II*	Road	DBFOM	Operating	No	50 years	Demand risk + federal, state, regional contribution
	Florida	Port of Miami Tunnel*	Tunnel	DBFOM	Operating	No	30 years	Availability payments
	Texas	I-635 LBJ TEXpress Managed Lanes*	Road	DBFOM	Operating	No	48 years	Demand risk + state contribution
	Virginia	I-495 Capital Beltway HOT Lanes*	Road	DBFOM	Operating	Yes	75 years	Demand risk + state contribution
	Virginia	I-95 HOV/HOT Lanes, Express Lanes*	Road	DBFOM	Operating	Yes	73 years	Demand risk
Phase II	Indiana	Ohio River Bridges Project, East End Crossing	Bridge	DBFOM	Operating	No	35 years	Availability payments
	Texas	State Highway 130, Segments 5 & 6	Road	DBFOM	Operating	Yes	50 years	Demand risk
	Virginia	Elizabeth River Tunnels, Midtown Tunnel	Tunnel	DBFOM	Operating	No	58 years	Demand risk + state contribution

* Phase 1: Selected for initial evaluation with feedback from the Virginia Department of Transportation. See the Study Scope section in the body text for selection criteria.

APPENDIX C: INTERVIEW GUIDE

Thank you for taking the time to respond to our interview. The objective of this interview is to develop evidence for evaluating the efficacy of the P3 approach by examining the different policy objectives that project sponsors pursue in concert with available project parameters and your view of project outcomes to date. Neither your identity nor your affiliation will be revealed when we summarize the responses provided to us in our research report.

1. Background on Individual(s) Interviewed:

Name and Date	
Interviewed by	
Contact	
Position and Project Role	
Suggested By	

2. Origin of the Project:

What was the origin of the project?	
Which agency was in charge and when was planning initiated?	
Was the project put on long-range plan? When was it put on?	
Was the project considered for traditional funding?	

3. Origin of the Project as a P3:

Were other Alternative Delivery Methods (ADM) considered? Which ADMs were considered? When?	
How were the delivery options screened?	
How was the P3 approach selected? By the Governor? DOT Secretary? Congressional delegation?	
Was the P3 approach urged by groups outside the government?	

4. P3 Objectives:

What were the original agency´s objectives when opting for the P3 delivery method? Options to discuss: Expedited Project Completion. Cost certainty. Certainty of Project Completion. Consolidated contracting. Reduced Design and Construction Costs. Reduced Life-Cycle Costs. Shift risks to contractor. Overcome public budget shortfalls. Avoid public debt ceiling. Assured maintenance.	
Were the objectives modified once the P3 delivery method was selected? If so, how?	
If applicable: how were objectives affected by competitive bid? By unsolicited proposal? By public hearings?	

5. P3 Outcomes to date:

Were the agency´s objectives achieved?	
How is the agency measuring if the objectives are achieved?	
Which are the top benefits of the P3 approach for this project?	
Which are the top shortcomings of the P3 approach for this project?	
Was the P3 approach pivotal into achieving the objectives of the project vis a vis the DBB approach? How?	
Any Alternative Technical Concepts realized? Provide examples.	
Suggested sources for more detailed quantitative data?	

6. Project Estimated and Actual Costs and Time to Completion

Category	Estimated originally using Traditional Procurement	Estimated originally using the P3s approach	Actual
Design and construction costs			
Maintenance costs			
Financing costs			
Time to completion			

7. Project risks

What risks were shifted to the private sector?	
Any risks actually suffered by contractor and absorbed?	
Did risk stick where assigned (or renegotiated)?	
Expected value of transferred risks?	

8. Retrospective

Would you do the project again, regardless of the delivery method?	
Would you do the project again, as a P3?	
What are the lessons learned from the project?	
Has the State embarked on further P3 projects? Why or why not?	

Thank you very much for participating in our survey.
We hope we can contact you again for clarification of your responses.

APPENDIX D. LIST OF INTERVIEW RESPONDENTS (PHASE II)

Midtown Tunnel / Elizabeth River Tunnels

Name	Relation to the project
Ryan Pedraza	Former Program Manager, Virginia Office of Transportation Public-Private Partnerships
Christ Gutchkelch	Former Project Director, Skanska Infrastructure Development
Karl H. Reichelt	Senior Managing Director, AECOM Capital

Ohio River Bridges (East End Crossing - Lewis and Clark Bridge)

Name	Relation to the project
Jim Stark	Executive Director-P3 Infrastructure, Indiana Finance Authority (IFA)
Gregory A. Ciambrone	Vice President, The Walsh Group
Corey A. Boock	Attorney at Law, Nossaman

Texas SH 130 (Segments 5 & 6)

Name	Relation to the project
James Bass	Executive Director, TxDOT
Beau Buchanan	PPP Project Manager, TxDOT
Javier Gutiérrez Villanueva	Former CEO, SH130 Concession Company Former VP Asset Management Cintra US
Andrew V. Bailey II	CEO, SH 130 Concession Company, LLC

APPENDIX E. PROJECT SNAPSHOTS (PHASE II)

Midtown Tunnel / Elizabeth River Tunnels

Location	
State	Virginia
County	Cities of Norfolk and Portsmouth

Participants	
Public-Sector Agencies	Virginia Department of Transportation (VDOT)
Special Purpose Vehicle (SPV)	Elizabeth River Crossings OPCO, LLC
Private-Sector Partners	Skanska Infrastructure Development. Inc. Macquarie Financial Holding Limited

Contract Characteristics	
Contract Type	DBFOM – Design, Build, Finance, Operate, Maintain
Infrastructure Type	Tunnel and highway
Infrastructure Details	Maintenance and improvements to the Midtown and Downtown Tunnels. Construction and maintenance of a new two-lane tunnel parallel to the existing Midtown tunnel. Extending 0.8 miles the Martin Luther King (MLK) Freeway south to I-265 in Portsmouth
Unsolicited Proposal	No
Financial Close	2012
Duration	58 years after construction

Financial Characteristics 1 at financial close -April 2012 [39,85,86]	
Equity	$272 million
TIFIA Loan (and capitalized interest)	$465 million
Private Activity Bonds	$675 million
Public Funds	$308 million
Tolling during Construction	$368 million
Total	$2,088 million

Financial Characteristics 2, after VDOT purchased tolls during construction, includes all fund increases included in Amendments 1, 3 and 5 of the Comprehensive Agreement –September 2015 [39,85,86]	
Equity	$272 million
TIFIA Loan (and capitalized interest)	$465 million
Private Activity Bonds	$675 million
Public Funds	$581 million
Total	$2,088 million

Funding Characteristics	
Funding	Demand risk with VDOT contributions
Managed Lanes	No
Toll Type	Time-of-day congestion tolling

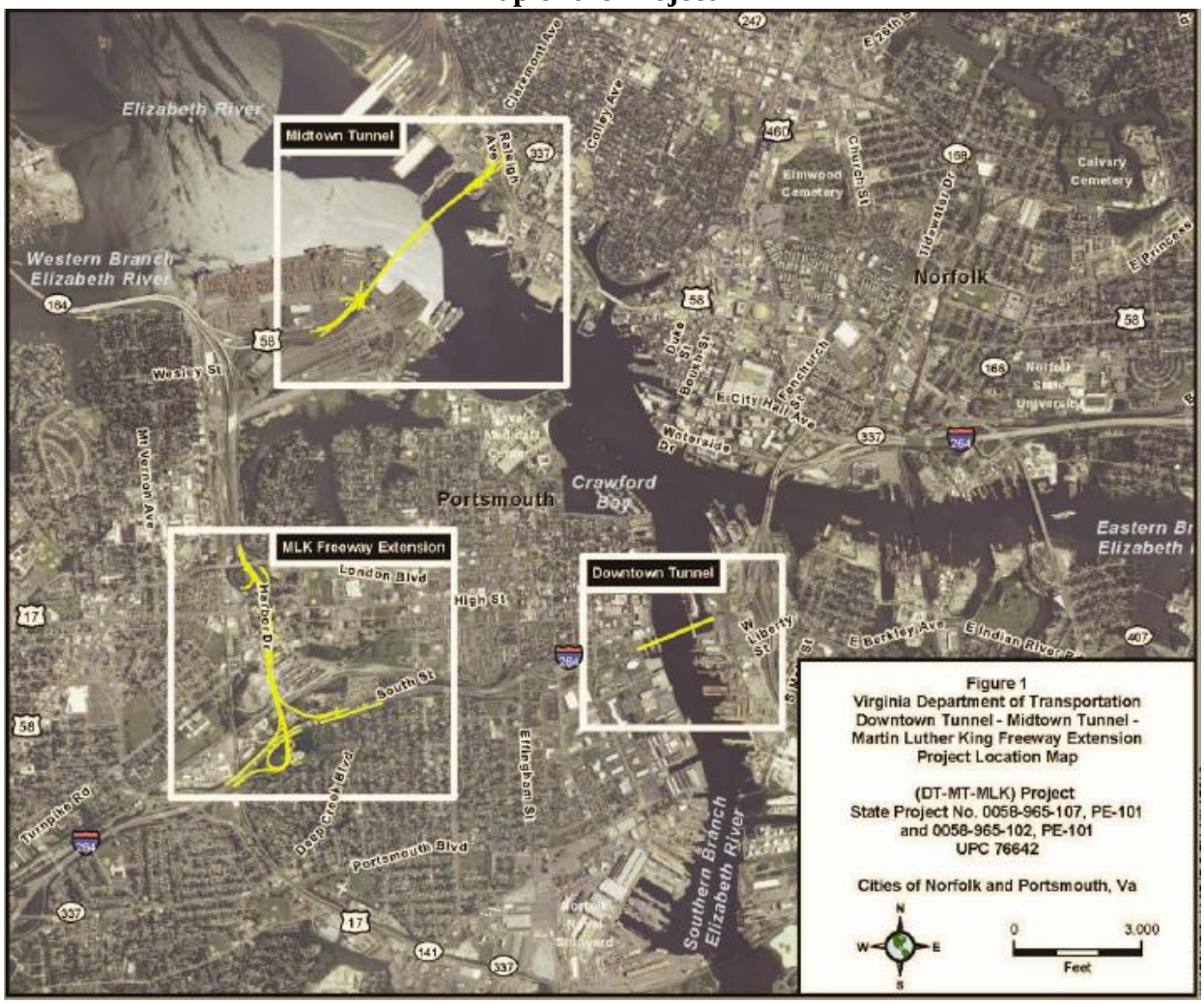
Procurement event	
May 2008	Call for Conceptual Proposals
September 2008	Conceptual Proposals submitted
October 2008	Selection of best value proposal
January 2010	Interim Agreement
December 2011	Commercial close
April 2012	Financial close
October 2012	Construction starts
June 2016	New Midtown Tunnel opens to traffic

Risk Allocation[19]		
VDOT	Regulatory	• VDOT design and construction approval process
	Financing	
	Design Build	
	Operations and Maintenance	
Shared	Regulatory	• Permits and approvals.
	Financing	
	Design Build	• Geotechnical conditions. •Site conditions. •Utilities. •Right of Way (ROW). •SWAM/DBE participation. •Structural risk. •Construction cost escalation.
	Operations and Maintenance	
Private Partner	Regulatory	
	Financing	• Debt repayment • Equity • TIFIA financing • Revenue
	Design Build	• Design build cost • Construction schedule • Project completion
	Operations and Maintenance	• Operating performance and meeting required standards • Major maintenance • Tolling system operation, upgrades • Toll enforcement • Return O&M Segments in specified condition when concession ends • Incident response • Snow removal

Official Data Sources	
Project webpage	https://www.driveert.com/
VDOT webpage	http://www.p3virginia.org/projects/elizabeth-river-tunnels/
FHWA webpage	https://www.fhwa.dot.gov/ipd/project_profiles/va_midtown_tunnel.aspx

Document	Readily Available on Project from VDOT Website
RFP	N/A * (Solicitation for Conceptual Proposals)
RFQ	N/A * (Solicitation for Conceptual Proposals)
DEIS	For Midtown
FEIS	Yes (bundled)
VfM	
Comprehensive Agreement?	Yes (there are six amendments)
Traffic and revenue studies?	
Public meeting presentation?	
Project management plan	Yes
Other documents	
Economic impact study	
Bond official statement	Yes

Map of the Project[18]



Ohio River Bridges (East End Crossing - Lewis and Clark Bridge)

Location	
State	Indiana and Kentucky
County	Clark County (IN) and Jefferson County (KY)

Participants	
Public-Sector Agencies	Indiana Finance Authority and Indiana Department of Transportation
Special Purpose Vehicle (SPV)	WVB East End Partners
Private-Sector Partners	Walsh Infrastructure, LLC VINCI Highways SAS Bilfinger Project Investments International Holding GmbH

Contract Characteristics	
Contract Type	DBFOM – Design, Build, Finance, Operate, Maintain
Infrastructure Type	Bridge and highway
Infrastructure Details	2,500 foot long four-lane bridge, a pedestrian and bicycle path, a 4.1 mile extension of I-265/SR 265 in Indiana.
Unsolicited Proposal	No
Financial Close	2013
Duration	35 years after construction

Financial Characteristics at financial close[85]	
Equity	$78.1 million
TIFIA Loan	$162 million
Private Activity Bonds	$507.8 million
Public Funds (state and federal)	$526.1 million
Relief Events Reserve Account*	$45 million
Total	$1,319 million

* The Relief Events Reserve Account was to be used as a contingency in case of relief events during construction. By the end of the construction period, the remaining funds would be split between the project sponsor and the concessionaire. It was to work as an incentive to minimize the use of resource to pay for relief events.

Financial Characteristics after construction (2017)	
Equity	$78.1 million
TIFIA Loan	$162 million
Private Activity Bonds	$507.8 million
Public Funds (state and federal)	$537.1 million
Relief Events Reserve Account*	$21.9 million
Total	$1,306.9 million

* Only $21.9 million of the total $45 million were used. See above for an explanation.

Funding Characteristics	
Funding	Availability payment
Managed Lanes	No
Toll Type	Fixed toll

Procurement event	
September 2011	RFI issued
March 2012	RFQ issued
April 2012	Deadline to submit qualifications.
April 2012	Teams shortlisted
July 2012	RFP issued
November 2012	Preferred bidder selected
December 2012	Commercial close
March 2013	Financial close
June 2013	Construction starts
December 2016	Open to traffic

Risk Allocation		
INDOT	Regulatory	• National Environmental Policy Act (NEPA) • Compensation if NEPA litigation • Coordination with Kentucky
	Financing	• Revenue • TIFIA financing
	Design Build	• ROW acquisition • Utility relocation
	Operations and Maintenance	
Shared	Regulatory	
	Financing	
	Design Build	• Relief events during construction (relief events allowance account): delays, weather, force majeure
	Operations and Maintenance	
Private Partner	Regulatory	
	Financing	• IFA resource appropriation (the State of any subdivision is not liable)
	Design Build	• Design build cost • Construction schedule • Project completion
	Operations and Maintenance	• Operating performance and meeting required standards • Major maintenance • Tolling system operation, upgrades • Toll enforcement • Return O&M Segments in specified condition when concession ends

Official Data Sources	
Project webpage	http://eastendcrossing.com
Indiana Gov webpage	http://www.in.gov/ifa/2750.htm
FHWA webpage	https://www.fhwa.dot.gov/ipd/project_profiles/ky_downtowncrossing.aspx

Relevant Project Document	Readily Available on Project of DOT Website
RFP	Yes
RFQ	
DEIS	Yes (supplemental DEIS)
FEIS	Yes (supplemental FEIS)
VfM	
Comprehensive Agreement?	Yes
Traffic and revenue studies?	Yes
Public meeting presentation?	Yes
Project management plan	Yes
Other documents	
Economic impact study	Yes
Bond official statement	Yes

Map of the Project[49]

Note: Ohio River Bridges East End Crossing involves section 4, 5, and 6.

Texas SH 130 (Segments 5 & 6)

Location	
State	Texas
Counties	Caldwell, Guadalupe and Travis

Participants	
Public-Sector Agencies	Texas Department of Transportation (TxDOT)
Special Purpose Vehicle (SPV)	SH 130 Concession Company, LLC
Private-Sector Partners	Originally: Cintra Concesiones de Infraestructuras de Transporte, S.A., Zachry American Infrastructure. Hastings Funds Management becomes a partner before financial close, in March 2007. After bankruptcy: Strategic Value Partners LLC, also Build America Bureau (TIFIA)

Contract Characteristics	
Contract Type	DBFOM – Design, Build, Finance, Operate, Maintain
Infrastructure Type	Highway
Infrastructure Details	Construction of a 41-mile highway linking Mustang Ridge to Seguin, between Austin and San Antonio, in Central Texas.
Unsolicited Proposal	Yes
Financial Close	2008
Duration	50 years after construction

Financial Characteristics[85]	
Equity	$209.8 million
TIFIA Loan	$430.0 million
Senior bank loans	$684.8 million
Interest income	$2.3 million
Total	$1,326.9 million

Funding Characteristics	
Funding	Demand risk
Managed Lanes	No
Toll Type	Fixed Variable: Rate varies by distance and type of vehicle

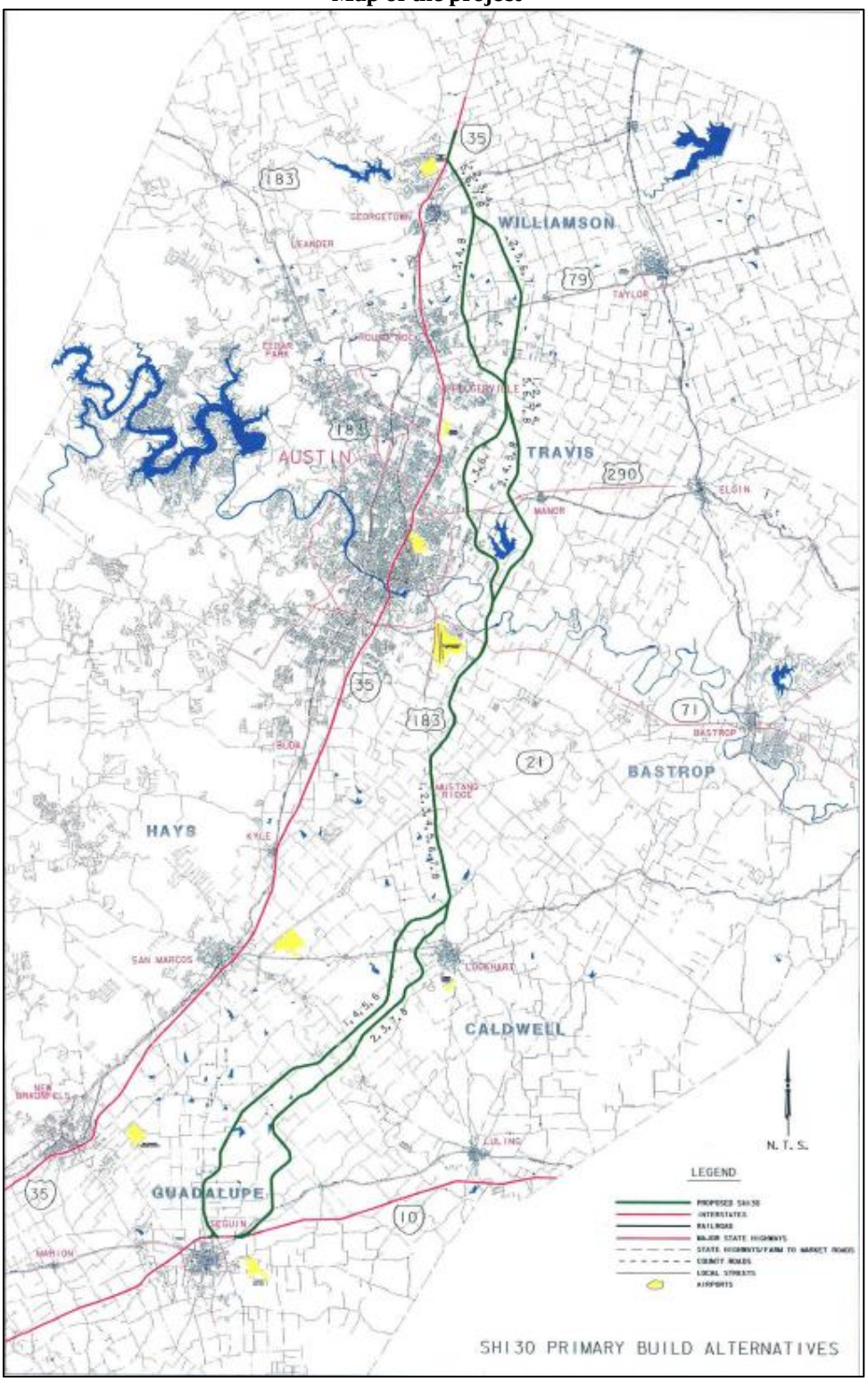
Procurement event	
March 2005	TT-35 Comprehensive development agreement (ACS-Zachry)
Early 2006	Unsolicited proposal for SH-130
March 2007	CDA for SH 130
March 2008	Financial close
April 2009	Construction starts
October 2012	Open to traffic
March 2016	Concession Company Filed for bankruptcy
August 2016	Cintra-Zachry ceded control of SPV to creditors
June 2017	Exited bankruptcy under a new company formed by debt holders

Risk Allocation		
TxDOT	Regulatory	• National Environmental Policy Act (NEPA)
	Financing	Took no financial risk
	Design Build	• Right of Way (ROW).
	Operations and Maintenance	• Force Majeure
Shared	Regulatory	
	Financing	
	Design Build	
	Operations and Maintenance	• Revenue shared after a revenue levels are met.
Private Partner	Regulatory	• Environmental Permitting & Licensing Updates
	Financing	• Debt repayment • Equity • TIFIA financing • Revenue
	Design Build	• Design build cost • Construction schedule • Project completion
	Operations and Maintenance	• Operating performance and meeting required standards • Major maintenance • Tolling system operation, upgrades • Revenue risk (toll revenue insufficient for debt service)

Official Data Sources	
Project webpage	https://www.mysh130.com/
TxDOT webpage	http://www.txdot.gov/government/partnerships/current-cda/sh-130.html
FHWA webpage	https://www.fhwa.dot.gov/ipd/project_profiles/tx_sh130.aspx

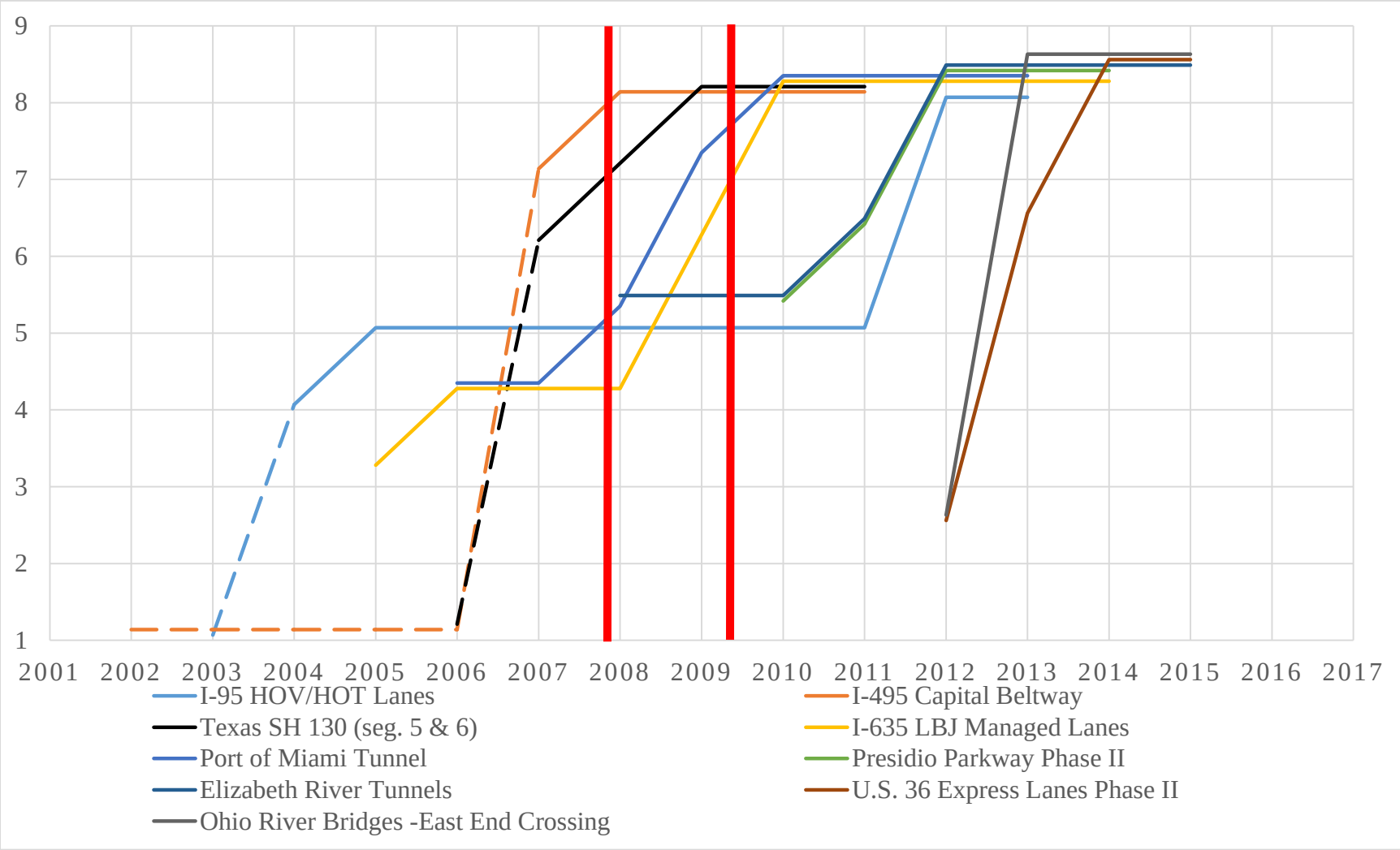
Relevant Project Document	Readily Available on Project of DOT Website
RFP	N/A
RFQ	N/A
DEIS	
FEIS	Yes
VfM	No
Comprehensive Agreement?	Yes (with the 22 amendments)
Traffic and revenue studies?	No
Public meeting presentation?	No
Project management plan	
Other documents	
Bond official statement	N/A

Map of the project[69]



Note: Alternative 2 was the preferred alternative. SH 130 Segments 5 and 6 go from north of Mustang Ridge, following the US 183 alignment), to Seguin in the South.

APPENDIX F: P3 PROJECTS PROCUREMENT TIME



Note: (1) Unsolicited proposal (2) RFQ issued (3) Teams shortlisted (4) RFP issued (5) Preferred Bidder selected (6) Commercial close (7) Financial close (8) Construction starts. Dashed lines, used for projects with unsolicited proposal, are used to recognize that they do not go through all of the expected procurement phases. The lines are slightly shifted in the y-axis to make them visible. The vertical red lines represent the Great Recession

APPENDIX G: SUMMARY OF FINDINGS FOR PHASE 1 & 2

Project	Congestion Management and User Experience	Private Sector Expertise	Cost, Schedule & Quality Certainty	Project Acceleration	Other objectives
Presidio Parkway Phase II	N/A	N/A	Landscaping unfinished. Savings: $150 million present value using DBFOM. Cost overrun: P3 $91 million (lawsuit). DBB expectation: $482 million	P3 financing accelerated project. Unclear by how much (i.e., Phase I had a 2-year delay	N/A
US-36 Express Lanes Phase II	Higher peak hour travel speeds by 20 to 29% -all lanes.	N/A	Two-week delay: flooding – under dispute. Delivered within budget.	P3 financing accelerated project 10-20 years.	Bus rides increased 45% along the corridor. Higher bus travel time reliability. Expanded bikeways
Port of Miami Tunnel	Diminished traffic volume (Downtown Miami) by 35% and truck traffic by 77% vs. prev. year	N/A	Three-months delay due to technical problems (penalties: $31.5 million). Delivered within budget.	N/A	Transfer of key risks: geotechnical risks (i.e. seabed conditions); hurricane risk (i.e. hurricane damages); community impacts (i.e., cruise operations)
I-635 LBJ TEXpress Managed Lanes	Increased driving-time certainty on managed lanes. GP lanes: vehicles driving below 50 mph (23 to 5%).	Trench-cantilever design diminished cost by $900 million	Opened 3 months ahead of deadline. Delivered within budget	P3 financing accelerated project 10-19 years.	Transfer of construction risk (excavation may have affected near-by structures -lawsuit may affect concessionaire not TxDOT)
I-495 Capital Beltway HOT Lanes	Increased driving-time certainty. 17 min. av. time saving on HOT. Increased use of HOV lanes.	Transfer toll management. Only 3% of all Express Lanes trips go unpaid.	Opened 2 months ahead of deadline. Delivered within budget.	P3 financing accelerated I-495 & I-95 projects at least 6 years.	Transfer of construction risk (busy corridor).
I-95 HOV/HOT Lanes			Delivered on-time. Delivered within-budget		N/A
Ohio River Bridges, East End Crossing	Bridges demand above revenue projections.	23% cheaper than original costs.	On-time, although 47-day force majeure delay (6 months ahead of original estimates).	P3 diminished project's short-term financial impact.	N/A
SH 130, Segments 5 & 6	Increased accessibility. Demand below projections.	N/A	Opened 1 month ahead of deadline. Delivered within budget. Quality problems (concessionaire absorbs costs)	No public sector contribution. $125 million paid to TxDOT.	Bankruptcy: financial risk transferred to equity & lenders. TIFIA: financial impact not disclosed.
Elizabeth River Tunnels	Too early to evaluate (<1 after opening.	N/A	Opened 14 months ahead of deadline. Delivered within budget.	P3 financing accelerated project at least 6 years.	Transfer of key risks: geotechnical risks (i.e. soil conditions); historic artifacts (i.e. sunken ships); and damage to existing tunnel.