A Portal to Future Collaboration: Connecting Public-Private Interests and Mitigating Risk on Complex Infrastructure Projects The Port of Miami (Florida, USA) and Midtown (Virginia, USA) Tunnel Projects

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Abstract

This case study examines how public-private partnership (P3) contractual agreements are being used to implement two complex underwater tunnels in the United States – the Port of Miami Tunnel (POMT) in Miami-Dade County in southeast Florida, and the Midtown (Elizabeth River) Tunnel Corridor (MTC) project in the Hampton Roads region of southeast Virginia. Both P3 contracts require the concessionaire to design, build, finance, operate, and maintain (DBFOM) the project facilities; however the POMT concessionaire is compensated through availability payments, while the MTCP concessionaire is receives payment through the collection of tolls. The POMT project is on schedule for opening in May 2014, while the POMT has encountered legal challenges to its toll concession which expose the Commonwealth of Virginia to financial liability, threatening their ability to deliver the Midtown Tunnel and potentially jeopardizing other Virginia PPTA and toll projects. This paper looks at P3 legislation and transportation planning in both Florida and Virginia, and at the opportunities, risks, and lessons learned from utilizing P3 contractual agreements on these complex infrastructure projects.

Keywords: public-private partnerships, P3, tunnel, Port of Miami Tunnel, Midtown Tunnel, Florida, Virginia.

Highlights:

- Port of Miami Tunnel:
  - Port of Miami located on Dodge Island in Biscayne Bay is the world's busiest cruise port and the largest container port in Florida generating an estimated $18 billion annually.
  - 35-year DBFOM concession agreement signed between FDOT and MAT Concessionaire LLC in 2009.
  - Construction begun in May 2010 with opening scheduled for May 2014.
  - Concession is based on performance-based availability payments to begin on completion and run through October 2044. Maximum availability payment is $32.5 million per year in 2009 dollars.
  - POMT is the second U.S. DBFOM P3 contract with availability payments and is the first project in the United States which employs availability payments without tolls.

- Midtown (Elizabeth River) Tunnel Corridor Project:
  - Current Midtown Tunnel between Portsmouth and Norfolk, Virginia carries a million vehicles per month, making it the most heavily traveled two-lane road east of the Mississippi River.
  - Expansion of the Midtown Tunnel top priority of Hampton Roads MPO and VDOT.
  - 58-year DBFOM toll concession agreement signed between VDOT and Elizabeth River Crossing (ERC) LLC on April 12, 2012.
  - Concession allowed ERC to immediately begin tolling on existing Downtown and Midtown Tunnels and on the Midtown Tunnel Expansion when completed.
  - Lawsuit to halt tolling filed in July 2012, and in May 2013 judge ruled that tolling was unconstitutional.
  - Construction began in January 2013 and, pending resolution of legal issues, is scheduled to be completed in 2016.

1. Introduction

Can public-private partnerships (P3) be used to accelerate the financing, design and construction of complex infrastructure projects in the United States? Further, is construction, operations and maintenance on P3 projects best paid for through toll or availability concessions? This case study looks at how design-build-finance-operations-maintenance (DBFOM) public-private partnerships (P3) were used to implement two complex underwater tunnel projects in the United States – the Port of Miami Tunnel (POMT) in Florida, and the Midtown (Elizabeth River)

Tunnel Corridor (MTC) project in Virginia.

The POMT project, currently under construction in southeast Florida, will connect the Port of Miami located on Dodge Island in Biscayne Bay with the mainland. Its primary purpose is to relieve congestion on the downtown Miami roads leading to the only access path to the port, the MacArthur Causeway Bridge, by providing a second access road to the island. The project is being managed by the Florida Department of Transportation (FDOT) under a 35-year DBFOM concession with Miami Access Tunnel LLC, and is the first DBFOM P3 concession in the United States which employs availability payments without tolls.

The MTC is currently being constructed under the Elizabeth River between Portsmouth and Norfolk in the Hampton Roads region of southeast Virginia through a DBFOM P3 agreement between the Virginia Department of Transportation (VDOT) and the concessionaire, Elizabeth River Crossing LLC (ERC). Unlike the POMT, the MTC involves a 58-year toll concession that includes tolling not only on the new tunnel expansion, but also two existing tunnels that have not been tolled since 1986. This has created considerable public opposition to the project, as well as a lawsuit and subsequent court decision that could jeopardize project financing.

This remainder of this paper will include a brief description of the analytical framework (Section 2); review of the transportation planning and P3 legislation in Florida and Virginia (Section 3); detailed descriptions of the planning, demand, procurement, concession, financing, risk allocation, construction and lessons learned for the Port of Miami Tunnel (Section 4) and Midtown Tunnel (Section 5) projects; discussion of the key findings (Section 6); and finally conclusions (Section 7).

2. Analytical Framework & Hypotheses

This paper will follow the framework of Yin, who recommends that researchers base their case studies on the theories and previous studies on the subject [5] (A more detailed overview of

this framework including literature review can be found in *An Introduction to Transportation Public-Private Partnerships in the United States: Analytical Framework & Scope* which precedes this Case Studies in Transport Policy special George Mason University special edition).

The structure of the analysis will follow Levy, who authored several P3 case studies [6]. This case study will utilize both primary and secondary data and information from public sources including Florida and Virginia state legislative bills; state and regional strategic transportation plans; traffic demand and environmental studies ; public and private activity bond descriptions; concession and construction agreements including draft and final Environmental Impact Statements (EIS); and data from key project websites and participant presentations to look at how P3 models have been implemented in Florida and Virginia toll and availability concessions, and what political, financial, and risk factors have impacted decision-making and project success.

Several hypotheses will be explored. The first hypothesis is that the use of P3 capabilities, including P3 financing and design-build project delivery, makes it possible for complex infrastructure projects to proceed to financial close and construction more quickly and cost effectively than conventional public finance and design-bid-build methods. The second hypothesis is that the public partner should consider alternatives to traditional toll based concession agreements such as performance based availability payments or other types of compensation to private partners in order to pay for complex infrastructure projects. The third hypothesis is that the availability of existing P3 legislation, P3 institutions, and P3 experience helps to move complex infrastructure projects to financial close and construction more quickly than in states without this institutional background and experience. Finally, the fifth hypothesis is that, while established P3 principles call for risks being allocated to the party best suited to

manage them, the reality is that in P3 agreements, not all risks can be clearly defined and insolated, potentially leaving both parties vulnerable to financial loss and liability.

3. State Transportation Planning and P3 Policy

3.1. Florida Transportation Planning and P3 Policy

In the State of Florida, primary responsibility for intermodal transportation planning and development is with the Florida Department of Transportation (FDOT), an executive agency formed by the Florida legislature (Ch. 69-106, Laws of Florida) on July 1, 1969 [1]. FDOT, which is comprised of a central office, seven districts and the Florida Turnpike Enterprise ("FTE"), owns and operates 12,079 centerline miles (19,439 kilometers) of State highways; as well as works with local governments and transit agencies on overseeing non-state roads, bridges, tunnels, airports, rail lines, seaports, spaceports, and public transit systems. FDOT produces and updates both a 5-year work program and a 10-year Strategic Intermodal Plan which by federal planning codes and regulations (23 USC 135(b) and 35 CFR 450.214(b)(4)) must be coordinated with Florida's 26 Metropolitan Planning Organizations (MPOs) [3].

In southeast Florida, the Port of Miami is owned and operated by Miami-Dade County, an MPO which resides within FDOT District 6, and which allied with neighboring MPOs in Broward and Palm Beach Counties in 2003 to form the South Florida Regional Transportation Authority (SFRTA) [4]. Under the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991, FDOT and MPOs are required to conduct Major Investment Studies (MIS) where the need for major transportation infrastructure investment has been identified and there is the possibility that federal funds might be needed to fund the project [5]. Further, ISTEA also mandated that MPOs produce economically constrained long range plans (CLRPs) that contain only those projects that can reasonably be expected to receive funding. Thus any major transportation infrastructure project for the Port of Miami involving possible federal funding

would require the completion of one or more MIS, and the inclusion of the project in the CLRPs of the Miami-Dade MPO, and ultimately the SFRTA strategic plan and the FDOT 5-year work program and 10-year Strategic Intermodal Plan for District 6.

In 1991, the same year that ISTEA was passed by the U.S. Congress, the Florida Legislature, recognizing the public's need for "safe, convenient, and economical transportation facilities" enacted Florida Statute §334.30 granting FDOT the authority to enter into partnerships with private entities in order to infuse private resources into its highway construction projects [6]. That legislation was subsequently amended several times over the next twenty years ultimately giving FDOT comprehensive authority, with legislative approval, to enter into agreements with private entities to build, operate, own or finance transportation facilities [7]. The legislation as amended in 2004, required that projects submitted for P3 legislative approval must have been included in either FDOT's five-year work plan or 10-year Strategic Intermodal System Plan, and that FDOT provide an independent project analysis to the Florida Legislative Budget Commission for review and approval prior to awarding a contract on a lease of an existing toll facility (Fla. Stat. Ann. §334.30(2)(d))[7]. The legislation also allows FDOT, with legislative approval, to accept both solicited and unsolicited bids, lease existing toll facilities, allowed FDOT to use a combination of funding sources for project development including federal funds, and negotiate P3s based on availability payments or shadow tolls [7]. The legislation also prohibits non-compete clauses; requires adequate safeguards be in place to ensure that FDOT can develop new tolling facilities and increase capacity for transportation corridors serving similar origins and destinations; and limits the terms of P3 concessions to 50-years without special approval [8]. Also, no more than 15 percent of the total annual state and federal funding for the state transportation trust fund can be obligated to P3 projects [9].

On April 11, 2002, Florida Governor Jeb Bush signed F.S. §338.222 , creating the Florida Turnpike Enterprise (FTE), a department within the FDOT which operates like private-sector business and is authorized to work with both public and private partners to in order to plan, develop, own, maintain, operate and manage Florida's Turnpike System. Under enacted Florida P3 legislation and with the guidance of the FTE, several P3 projects have been proposed by FDOT and approved by the Florida Legislature including the improvement of I-595 roadway in Broward County [9] and the construction of the Port of Miami Tunnel – both scheduled for completion in 2014.

3.2. Virginia Transportation Planning and P3 Policy

In the Commonwealth of Virginia the Virginia Department of Transportation (VDOT) is the agency responsible for planning, constructing, maintaining, and operating state roads, highways, bridges, and tunnels. As of October 2012, VDOT was maintaining 57,867 miles (93,128 kilometers) of state roads including 1,118 miles (1,799 kilometers) of interstate highways [10], making it the third largest system in the country behind North Carolina and Texas [11]. In addition, VDOT also maintains over 12,000 bridges, and four underwater tunnel crossings located in the Hampton Roads region of the state [12].

VDOT is overseen by the Commonwealth Transportation Board (CTB), a 17-member committee, chaired by the Secretary of Transportation, which has responsibility for regulating and funding transportation in Virginia. Under Virginia law (Code of Virginia § 33.1-23.03), the CTB is required to develop a multimodal long-range transportation plan that assesses transportation needs and assigns priorities on a statewide basis [11]. This 25-year financially unconstrained transportation plan is Virginia's strategic, conceptual framework for moving into the future. It is put together in coordination with Virginia's five statewide transportation agencies – Department of Aviation (DOAV), Department of Motor Vehicles (DMV),

Department of Rail and Public Transportation (DRPT), Virginia Port Authority (VPA), and Department of Transportation (VDOT), as well as representatives from the state's fourteen Metropolitan Planning Organizations (MPOs). The last state long range transportation plan, *VTrans2035*, was released in January 2010.

Federal law mandates that each MPO regularly develop 20-year long range transportation plans that identify critical transportation needs for their metropolitan areas. Further, MPO long-range plans must be financially constrained, including only projects that can be built with anticipated revenue over the life of the plan. Anticipated revenue includes primarily federal highway funds, but also can include other sources including bonds and other legally permitted funding from private entities.

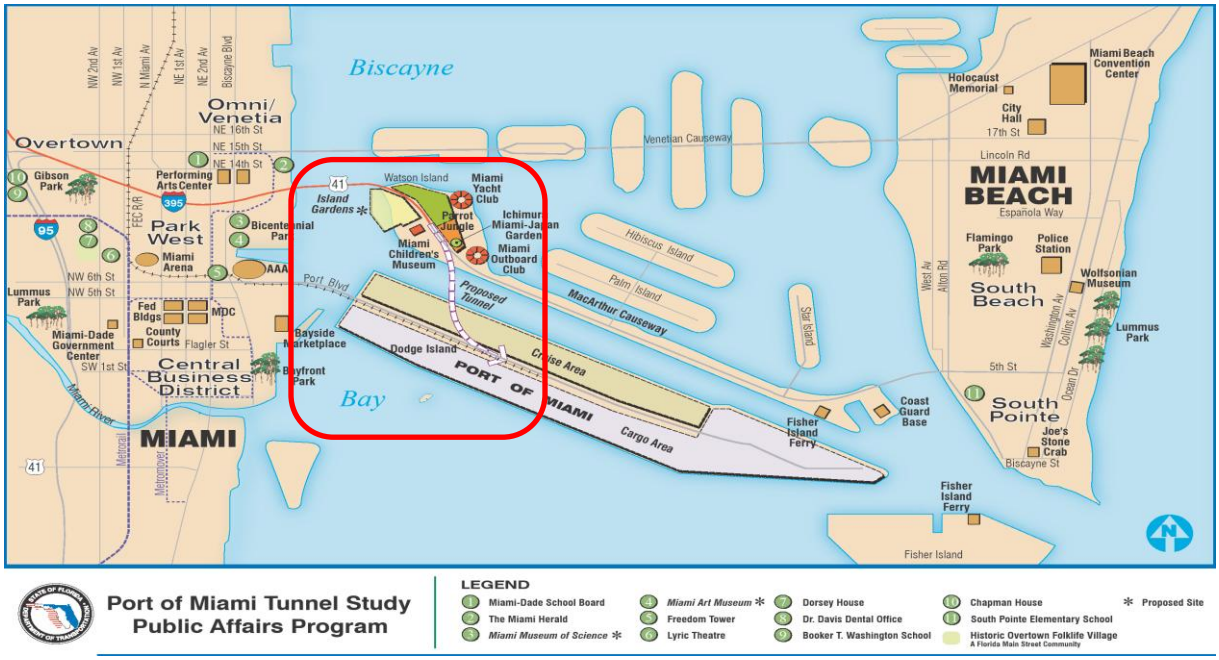
In 1995, the Virginia legislature passed Public-Private Transportation Act (PPTA), which authorizes state or local entities such as the VDOT to make "contracts with private entities to develop and/or operate transportation facilities … when it is more timely, more efficient, or less costly" [13]. The goal was to "reduce the up-front costs to government by attracting private sources of funding and to tap into private sector creativity and efficiency through competitive bidding to speed and improve building projects" [14]. The Act authorized VDOT to consider both solicited and unsolicited private proposals; and allows them to accept and consider Alternative Technical Concepts (ATCs) when reviewing bids.

However, despite the PPTA's purpose, very few P3 projects were completed during the first sixteen years of the legislation's existence. Subsequently, In June 2011, Virginia Governor Bob McDonnell established the Office of Transportation Public-Private Partnerships (OTP3), with the goal of developing and implementing a statewide program for transportation project delivery via the PPTA. With the establishment of the OTP3, Virginia P3 transportation activity increased significantly. In 2012, OTP3 estimates that nearly $3 billion in greenfield

transportation P3s closed, placing Virginia second in the world behind the United Kingdom in the value of projects closed by a government jurisdiction during that year [15]. Also in 2012, groundbreaking occurred on the Midtown Tunnel Corridor Project – the largest transportation project in the Hampton Roads region of Virginia in past 30 years [16] and the most costly P3 to-date to break ground in Virginia [17].

4. Port of Miami Tunnel Project (Florida, USA)

The Port of Miami, located on 518-acre (210-hectare) Dodge Island in the heart of downtown Miami in Biscayne Bay, is the world's busiest cruise port and the largest container port in the State of Florida [18]. In 2010, the port handled more than 4.1million cruise passengers and 7.3 million tons of cargo generating an estimated $18 billion annually to the South Florida economy [18]. Currently all traffic enters and exits the island along Port Boulevard Bridge, a six-lane elevated bridge over the Intracoastal Waterway that connects to downtown Miami. The bridge , which carries an estimated 16,000 vehicles a day, empties truck traffic, buses and other vehicles into Biscayne Boulevard, a major downtown artery, causing daily weekday congestion, presenting safety hazards, and limiting redevelopment of the northern portion of Miami's Central Business District [19]. In response to restricted port access and worsening downtown congestion, local leaders explored proposed access improvements that would both support port growth and downtown redevelopment, while reducing traffic congestion [20]. Since the late-1970s many studies were conducted leading to the preferred solution to build a tunnel (Figure 1) connecting the Port of Miami to I-395 on Watson Island, providing direct Interstate access.



[Figure 1] Port of Miami Tunnel Map
Source: Port of Miami Tunnel, www.portofmiaitunnel.com

The Port of Miami Tunnel (POMT) project is designed to connect Watson Island to Dodge Island through the Main Shipping Channel in Biscayne Bay, a length of approximately 3 miles. In addition to this tunnel connection, the project has two additional components: widening the MacArthur Causeway Bridge and linking the Port of Miami roadway system. It is expected that the tunnel will increase access to the Port of Miami, improve traffic flow in downtown Miami by allowing heavy trucks and cruise related vehicles to bypass the congested Downtown Miami area, and ultimately aid ongoing and future development in the northern portion of Miami's Central Business District.

4.1. POMT Project Planning & Demand

Concerns about vehicle access to the Port of Miami have been around since at least the late-1970s. In 1979, an Application for Development Approval for a Development of Regional Impact (ADA-DRI) prepared for the Port of Miami Master Development Plan concluded that the then current two-lane bridge access was inadequate especially in light of anticipated growth in both cruise passenger and cargo traffic [21]. Later that year a Seaport Development Order

was issued by the City of Miami that included the mandate that a traffic study be conducted looking at vehicle access to the port [21]. Subsequently, in July 1981, a Draft Executive Summary of a Vehicular Access Study was released which identified four alternatives to improving access to the port – none of these alternatives included a tunnel [21]. In response to this study, in October 1981 the Transportation Planning Committee of the Dade County Metropolitan Planning Organization established the Port of Miami Access Task Force [22] to examine the alternatives and make recommendations. It was this group which initially recommended adding a tunnel alternative in January 1982, leading to the commissioning of a tunnel cost and feasibility study that was completed in June 1983 [21]. This report included an alternative to build a tunnel from the port crossing under the main channel to MacArthur Causeway on Watson Island providing direct access to S.R. 836 and I-395 [21], an alternative which was eventually endorsed by the Miami-Dade Board of County Commissioners when they approved the Port of Miami Transportation Improvement Plan (TIP) in August 1984 [23].

In September 1989 FDOT District 6 began a Port of Miami Tunnel Project Design and Engineering Study which evaluated eight cost-effective alternatives to link the Port of Miami to the nearby Interstate highway system [23]. Ultimately a Watson Island tunnel alignment similar to that proposed in the 1983 feasibility study was selected as the Preferred Alternative and endorsed by the Federal Highway Administration (FHWA), FDOT, the City of Miami and the Port of Miami in March 1991[23]. This approval triggered the initiation of an environmental impact study. A Draft Environmental Impact Statement (DEIS) was approved by the FHWA in March 1996 and was followed by public hearings [21]. Concerns we raised by the Florida Department of Environmental Protection concerning potential impacts to Biscayne Bay due to blasting and dredging, leading to the downgrade of the DEIS to an Environmental Assessment (EA)/Finding of No Significant Impact (FONSI) by the FHWA in May 1997 [8]. Revisions were

made to the project documents proposing the use of a tunnel boring machine in place of blasting and dredging. This solution was accepted with the EA/FONSI being approved by the FHWA in November 2000 and a Location and Design Concept Acceptance, similar to a Record of Decision, being issued by FHWA on December 13, 2000 [21].

Several new traffic studies were conducted in the early-2000s to determine the continued need for additional access to the port. The Port of Miami – Traffic and Demand Study published by URS Corporation in December 2005 estimated the average annual daily traffic to and from the Port of Miami for various types of vehicles for the period 2005 through 2035(Table 1).

Year	Motor-cycles	Passenger Cars	Taxis	Buses	2-Axle Trucks	Heavy Trucks	Total
2005	92	17,716	525	412	3,652	3,525	25,924
2010	109	20,945	621	488	4,318	4,168	30,649
2015	128	24,661	731	574	5,084	4,907	36,086
2020	151	28,945	858	674	5,967	5,760	42,354
2035	176	33,889	1,004	789	6,987	6,744	49,590
2030	206	39,603	1,174	922	8,165	7,881	57,950
2035	241	46,210	1,369	1,076	9,527	9,196	67,618

Table 1: Port of Miami Average Daily Vehicular Traffic Forecast Medium Growth 2005-2035
Source: FDOT Port of Miami Tunnel – Project Information Memorandum February 17, 2006 [21]

It was during this period that the Florida Turnpike Enterprise (FTE) was created under FDOT to pursue innovation and best private-sector business practices. They subsequently implemented their own traffic study that looked not only at vehicle traffic to and from the Port of Miami but also it's possible impact on roadway segments leading into and out of the proposed project corridor. Its study, the Revised Traffic Operational Analysis Evaluation (RTOAE) published in May 2004 estimated that 54% of port traffic would utilize the new tunnel with this percentage possibly growing over time [21].

The FTE also updated the project documents and examined the construction methods for delivering the tunnel project. Based, in part on this reevaluation, FDOT in October 2005 assumed sponsorship of the project and in February 2006 issued a Project Information

Memorandum and a Request for Qualifications (RFQ) outlining plans to implement the POMT using a P3 Design-Build-Finance-Operate-Maintain (DBFOM) concession agreement [23].

4.2. POMT Procurement and Concession Agreement

On February 17, 2006, based on a comparison between P3 and other methods of infrastructure delivery, FDOT issued a Request for Qualifications (RFQ) for a DBFOM P3 delivery of the POMT project. As outlined in the Project Information memorandum, FDOT's major objectives in pursuing a P3 were to "(1) achieve the most efficient design, construction, and maintenance of the Project; (2) receive a high-level of quality, availability, upkeep, safety, and user service; (3) share risks with a private partner(s) that is experienced in mitigating such risks; (4) agree to a long-term, guaranteed cost structure for the Project; and (5) facilitate a predictable and efficient implementation process" [21].

After review of the RFQ responses, FDOT announced a short-list of three qualified proposers and issued a formal Request for Proposal (RFP) on November 1, 2006. On March 5, 2007 FDOT received proposals from the three short-listed proposal teams: 1) FCC Construction, 2) Miami Access Tunnel (MAT) and 3) Miami Mobility Group (MMG). All respondents were required to include a $10 million proposal bond with their responses.

The PMOT procurement process was somewhat unique in that it actively involved local, state, and federal agencies. In addition to FDOT, Florida's Turnpike Enterprise (FTE), the Port of Miami, and Miami-Dade County were all represented on the scoring and project selection committees [8]. The scoring committee evaluated each proposal based on the size of the proposer's Maximum Availability Payment (MAP), together with a technical and financial feasibility score. The project selection committee then made the final recommendation to FDOT. Table 2 summarizes each company's proposal with their assigned score. Although the technical score of MAT was less than that of MMG, the annual payment amount and financial feasibility

of MAT were better than those of other companies. Based on the highest composite score of 92.515, MAT was finally announced as a "best value" proposer on May 2, 2007.

	Annual Map Amount in 2007 Dollars	Map Score (45 PTS.)	Average Technical Score (45 PTS.)	Average Financial Feasibility Score (10 PTS.)	Composite Score (100 PTS.)
FCC Construction	$63,250,000	0.00	33.305	5.125	38.430
***Miami Access Tunnel**	$33,234,692	45.0	38.578	8.938	92.515
Miami Mobility Group	$39,794,750	9.471	40.834	8.688	58.992

Table 2: Summary of Proposal Score
Note: *Selected bidder
Source: Port of Miami Tunnel, "Notice of Intent to Award," 2007 [24]

In order to secure local and state financial commitments for the project a Master Agreement between FDOT, Miami-Dade County, and City of Miami was signed in July 2007. In February 2008 FDOT formally announced it had awarded the 35-year concession to the Miami Access Tunnel (MAT) consortium. The awarding of the project came at a very inopportune time. Soon after, FDOT's proposed concessionaire became overwhelmed by the economic crisis. MAT's 90% equity partner, Babcock and Brown, withdrew from the project due to severe financial difficulties and was eventually forced into bankruptcy in 2009 [8]. In response, on December 12, 2008 FDOT announced that agreement with MAT could not be reached and withdrew from the project. Ultimately, MAT was able to find a new 90% equity partner, Meridiam Infrastructure, and FDOT agreed to return to negotiations in April 2009 [23]. FDOT and MAT finally reached commercial close in June 2009 and financial close on October 15, 2009 [23]. Meridiam Infrastructure Finance (Luxembourg) is contributing 90 percent of equity under Meridiam Infrastructure Miami (Delaware) and Bouygues Travaux Publics is contributing 10 percent of equity under Dragages Concession Florida [25].

The project is a 35-year concession agreement that includes 55 months for design and construction, as well as operating and maintaining the tunnel once construction is completed. The MAT Concessionaire LLC (formerly Miami Access Tunnel LLC) team is comprised of Bouygues Civil Works Florida (BCWF) which is the design-build contractor and Transfield Services Infrastructure (TSI) which is the tunnel operator (see Figure 2) [26]. Under the concession contract, FDOT will repay MAT through construction milestone payments at various stages of project development. In addition, the department will provide availability payments to the concessionaire that start at the completion of construction and will continue until the end of the 35-year agreement in October 2044 [25]. If the tunnel is unavailable for use, or if the company underperforms, it will not receive a full payment. The POMT represents the second U.S. design-build-finance-operate-maintain (DBFOM) P3 contract with availability payments and is the first project in the United States which employs availability payments without tolls [27]. Availability payments are monthly payments that are provided to the concessionaire based on availability and quality of facilities for public use. The maximum availability payment is $32.5 million per year in 2009 dollars [26]. FDOT adjusts payments to inflation rates to encourage the private sector to care about the infrastructure in the long-run. Through the availability payment mechanism, FDOT tries to prohibit private partners' incentives from deviating from public interests [28]. In addition to availability payments, FDOT will also offer High Traffic Payments, so that if traffic exceeds certain levels agreed upon in the contract, the concessionaire will be paid to address increased maintenance [21].

On May 24, 2010, approximately six months after financial close, FDOT issued a Notice to Proceed allowing the contractor, Bouygues Civil Works Florida (BCWF), to begin construction.

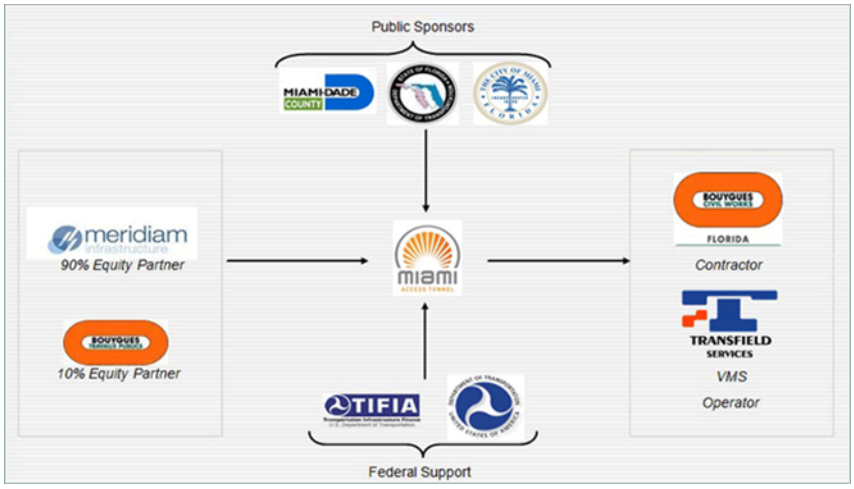


Figure 2: POMT Concession Participants
Source: FDOT, Port of Miami Project Website [xx]

4.3. POMT Financing & Risk Allocation

The financial cost planned by MAT (Table 3) was $903.0 million in 2009 dollars. The plan can be divided in two parts: 1) construction with milestone payments, and 2) operation and maintenance with availability payments. It follows the baseline of construction from 2010 to 2014. Operation and maintenance will end on October 15, 2044. During the construction period, FDOT is providing milestone payments of $100 million. In addition to these payments, at the end of the construction FDOT will also provide up to $350 million as a final milestone payment based on achievement [26]. Since delays will increase costs of debts, milestone payments will motivate concessionaire MAT to deliver construction in an efficient way as well as reduce up-front investments. FDOT is not the only sponsor. The Miami-Dade County and the City of Miami are also providing funding and right of way donations for the project totaling $452.5 million [29].

Other sources of funds are senior bank debt, TIFIA, and equities. Senior bank debts and TIFIA loans comprise nearly 80% of the total funding. Bank debt provides $313.4 million, which were rated a Baa3 by Moody's {30]. Senior bank debt providers include ten banks: BNP Paribas, Banco Bilbao Bizcaya Argentina, RBS Citizens, Banco Santander, Bayerische Hypo,

Calyon, Dexia, ING Capital, Societe Generale, and WestLB. TIFIA provides $341 million with $40 million interests during construction. TIFIA loans are one of reasons that the POMT has successfully delivered availability payments. They provided long-term debt at low interest-rates and debt structure [27]. These loans are rated Ba1 by Moody's with a fixed rate of 4.30%, plus a 0.01% spread [30]. MAT is providing $80 million in equities. The TIFIA loan holds a second priority security interest in project revenues after the senior obligations of the 10 bank group [31]. Senior debt is scheduled to be fully repaid by 2015, providing the TIFIA loan with sole claim on post-2015 project revenue for debt service [31].

Uses of Funds			
Construction Cost	$607.0		
O&M/G&A/Insurance costs	$59.7		
Transaction Fees and Other Soft Costs	$87.1		
Total Non-Financial Capital Costs	$753.8		
Reserves	$41.2		
Interest During Construction	$108.0		
Total Uses of Funds	**$903.0**		
Sources of Funds			
Senior Bank Debt			
Milestone Debt	$313.4	43.4%	34.7%
MAP Debt	$28.1	3.9%	3.1%
TIFIA Loan	$381.1	52.7%	42.2%
Total Debt (90% of Total Financing)	$722.7	100.0%	80.0%
Total Equity (10% of Total Financing)	$80.3		8.9%
Total Financing	$803.0		88.9%
FDOT Milestone Payments	$100.0		11.1%
Total Sources of Funds	**$903.0**		100.0%

Table 3: 2009 DBFOM (Actual) Construction Period Sources and Uses ($ million)
Source: Port of Miami Tunnel, "Value for Money Analysis," 2010 [30]

In addition to design, construction, and financing costs, the state also paid $209 million for development costs bring the total cost of the project to $1.113 billion [32].

As already noted, before the commercial and financial close, the POMT project was affected by the financial crisis in 2008. Prior to the financial crisis, FDOT initially preferred to use Private Activity Bonds (PAB) rather than Transportation Infrastructure Finance and Innovation Act of 1998 (TIFIA) to finance the project. Also, Lehman Brothers offered "an underwritten commitment for a wrapped bond" to sponsor the project [33]. However, because

of the unstable international finance market conditions and the failure of Lehman Brothers, FDOT and MAT started to seriously consider financing through bank debts and TIFIA loans. MAT finally applied for TIFIA loans for the project in October 2008.

The financial crisis also impacted the City of Miami. Declines in sales tax revenues had left the city with a $118 million deficit causing them to delay a vote scheduled for September 25, 2009 approving a $50 million letter of credit needed to fulfill their financial commitment [8]. The approval was one of the requirements of securing the TIFIA loan. The city finally approved the letter of credit on October 8, 2009 and the project then was able to move to financial closure on October 15, 2009 [8].

The project has not been without its public critics. Concerns were raised that the POMT project was a waste of taxpayers' money and could be Miami's version of the "Big Dig" in Boston with potentially massive cost overruns [34]. A traffic study conducted by Parsons Brickerhoff in 2009 showed that only 16,000 vehicles would use the POMT at opening – far less than the nearly 26,000 vehicles predicted in the December 2005 URS study published in the Project Information Memorandum February 17, 2006 [35]. With lower traffic demand some Miami business leaders have question the need for the POMT calling it a "tunnel to nowhere" [34]. Then there are also the ongoing concerns about the environmental impact that the project could have on the Biscayne Bay ecosystem.

One of FDOT's goals in pursuing a P3 for the POMT was to transfer a significant part of the design and construction risk to the concessionaire. Unlike other highway projects, the tunnel construction is a difficult and complex project which requires sophisticated technologies. Specifically, the construction of a tunnel under Biscayne Bay faces high unexpected geotechnical risk influenced by subsurface conditions [33].Therefore, FDOT transferred to the concessionaire most of its geotechnical risk, except for some unexpected risks associated with

changing conditions (Table 4). FDOT stated that "FDOT will accept risk sharing for uninsured losses if the Concessionaire's technical approach is appropriate for the project scope and the conditions in Baseline Geotechnical Report" [36].

Uninsured Losses (x)	Risk Allocation
x <$10 million	100% Concessionaire
$10 million < x < $160 million	100% FDOT
$160 million < x <$180 million	100% Concessionaire
x > $180 million	90% FDOT / 10% Concessionaire

Table 4: Preliminary Changed Conditions Risk Allocation

Source: Port of Miami Tunnel, "Project Information Memorandum Supplement," 2006 [36]

In addition to geotechnical risk, environmental, political, financial, and revenue risks also could negatively affect the project implementation and results. There are also some risks related to the procurement process including permits, right-of-way, utility and railroad relocation, maintenance, financial structure, and handover. Of these identified risks, substantial risks were transferred to the concessionaire, including design, construction, finance, operation and maintenance [37]. It should be noted that this risk sharing is not just to transfer risks but to allocate risks to a party that has the ability to mitigate them. Moreover, some risks are shared by both parties. Table 4 shows the risk allocations between parties.

The P3s not only transfer risks but also encourage private partners to bring about an innovative way to provide construction, which improves efficiency and reduces costs of the project. In the POMT, a new tunnel boring machine having the largest diameter was introduced to the U.S. [38], a technology that made it possible to construct tunnels at reduced construction costs. The efficiency of the POMT was evaluated by FDOT through Value for Money (VfM) analysis. VfM is "the side-by-side comparison of DBFOM contract, a form of P3, versus a Public Sector Comparator (PSC) representing a conventional project delivery approach [30].

According to Value for Money (VfM) analysis, the P3 can help FDOT reduce costs by $398 million in 2009 dollars, compared to the traditional procurement [30].

Table 4.
Preliminary Risk Allocation Matrix
(Actual risk allocation to be specified in the RFP)

Risk Category	Description	Risk Allocation		
		FDOT	Concessionaire	Shared
Political	Intergovernmental Agreements needed for award of concession	X		
Financial	Appropriation risk for Const. Milestone Payments and Avail. Payments		X	
	Equity and debt funding (financial close, interest rate and currency risk)		X	
Right-of-Way	Areas within Preliminary Right of Way Plan	X		
	Areas outside Preliminary Right of Way Plan		X	
Permits	Obtaining Federal, State and Local Permits		X	
Utilities	Agreements, schedules and relocations			X
Procurement	Legislative and regulatory authorities for award of concession	X		
Construction	Unforeseen conditions			X
	Impacts on vehicle traffic and POM operations beyond agreed levels		X	
	Impact to adjacent communities during construction above agreed levels		X	
	Unforeseen increases in material costs and labor		X	
Operations & Maintenance	Meeting availability and O&M criteria		X	
	Inflation during the Operating Period			X
	Traffic exceeding specified levels			X
Hand-Back	Return O&M Segments in specified condition when concession ends		X	
Force Majeure	Specified events not covered by insurance or performance specifications			X

Table 4: Preliminary Risk Allocation Matrix
Source: Port of Miami Tunnel, "Project Information Memorandum," 2006 [36]

4.4. POMT Construction & Future Operations

Construction of the POMT, which will provide a dedicated roadway connector linking the Port of Miami with the MacArthur Causeway (State Road A1A) and I-395, began in May 2010. There are three primary components to the project: 1) widening of the MacArthur Causeway Bridge, 2) a tunnel connection between Watson Island and Dodge Island (the Port of Miami), and 3) connections to the Port of Miami ("POM") roadway system [21]. During construction it is estimated that the POMT project will generate $1.3 billion in economic output and create or preserve 14,000 jobs [8].

The first phase of construction, which involved roadwork on Watson Island and widening of the MacArthur Causeway Bridge began on May 24, 2010 [39]. The MacArthur Causeway

Bridge is being expanded from three to four 12-foot (3.7 meter) wide traffic lanes in each direction with ten foot (3.05 meter) inner and outer shoulders, as well as a six foot (1.83 meter) sidewalk [34]. On the eastbound side of the causeway, two of the four lanes will lead to the tunnel entrance. The expanded width will create acceleration and deceleration lanes for trucks and buses using the tunnel, allowing them direct access as they enter and exit the tunnel portals [39].This phase also included site preparation for the tunnel dig-in site, road improvements and ramp connections to the MacArthur Causeway Bridge on Watson Island.

The second phase of the project involved boring of the eastbound and westbound tunnels between Dodge and Watson Islands. Each tunnel will be approximately 4200 feet (1280 meters) in length and 39 feet (11.9 meters) in diameters and will have two traffic lanes, curbs, walkways, ventilation fans and additional safety features [40]. The tunnels beneath the main shipping channel ("the government cut") in the Biscayne Bay Aquatic Preserve, will have a maximum grade of 5 percent, and be approximately 120 feet (36.6 meters) below the surface of the government cut at their deepest point [21]. A special tunnel boring machine with a 42.3 foot (12.9 meter) diameter cutter head was ordered from Germany and delivered to Miami in June 2011 [40]. Boring on the eastbound tunnel began on November 11, 2011 and completed on July 31, 2012. Boring was then begun on the westbound tunnel on October 29, 2012 and completed on May 6, 2013 [40]. Precast tunnel segments were placed as boring progressed [41].

The third phase of construction involves road improvements on Dodge Island where the Port of Miami is located. This construction includes site preparation for the tunnel portal entrance and exit, and roadway and bridge improvements. Initial construction was begun in December 2010 and is scheduled for completion in spring 2014 in time for the POMT scheduled opening in May 2014. Following completion MAT will operate and maintain the

POMT for 30 years. When the partnership is completed, the POMT will be returned to the public sectors, making the POMT officially a part of the intra-state highway system.

4.5. POMT Lessons Learned

Although the POMT project is in the middle of construction, it provides valuable lessons for policy makers:

Economic Conditions: Since the financial crisis caused unstable financial market conditions, FDOT changed its financial plan from PABs to TIFIA loans. In this perspective, the relationship between economic conditions and financial structure should be well understood by policy makers. There is a possibility that the unstable financial market influence the financial structure of P3 projects. Contingency plans for unexpected market conditions should be prepared.

Innovative Finance: Availability payments were introduced in the POMT. Although the construction of the project is not yet completed, it is expected that this type of payment with fixed dates will motivate contractors to provide construction without delays. It is also anticipated that availability payments can reduce the private partner's revenue risks, thereby maintaining long-term stability of the concession contract. Since payments will be made based on availability and quality, FDOT can motivate the private partners to deliver a high quality of operations and maintenance.

Risk Sharing: One of the main reasons for delivering the POMT through a P3 was to share risks. In the POMT project, FDOT transferred substantial risks to private partners in the POMT. FDOT also shared specific risks to maintain the project's sustainability. Since risks can be allocated to parties that have ability to mitigate in P3s, it is important for policy makers to identify and analyze risks before reaching agreement.

Patience &Flexibility: The Port of Miami project was very complex and involved multiple local, state, and federal agencies. From its original conception in the early eighties, the project has endured multiple environmental, technical and financial setbacks including disruptions caused by the financial crisis of 2008. FDOT's patience and flexibility in dealing with environmental concerns by using a tunnel boring machine instead of blasting and dredging help relieve concerns over damaging the fragile Biscayne Bay ecosystem. Likewise their willingness to allow MAT to find a new 90% equity partner when Babcock and Brown dropped out of the concession, and their patience in dealing with the City of Miami when they almost withdrew financial support helped to keep the project alive during a time of financial crisis when many other projects fell apart. Ultimately this patience and flexibility may result in a project that is on time and in budget.

5. Midtown (Elizabeth River) Tunnel Corridor Project (Virginia, USA)

The cities of Norfolk and Portsmouth are located in the southeastern portion of the Commonwealth of Virginia (Figure 3) within the Hampton Roads Metropolitan Planning Organization (MPO) – the largest MPO by both geographic size and population totally within Virginia (Figure 4) [42]. The two cities are separated by the Elizabeth River, a 6-mile-long (10 km) tidal estuary forming an arm of Hampton Roads harbor at the southern end of Chesapeake Bay. The region has a major military presence – Naval Station Norfolk is the largest Navy base in the world and is one of NATO's two Strategic Command headquarters [43] - and Portsmouth is home to the Norfolk Naval Shipyard, the U.S. Navy's oldest and largest facility for building and repairing ships [44].

The two cities are connected by the Berkley Bridge and the Downtown Tunnel which carry traffic for Interstate 264 and which were both completed in 1952; and the two-lane Midtown Tunnel completed in 1962 which carries traffic for U.S. Highway 58. The Midtown Tunnel was

built by the Elizabeth River Tunnel Commission using toll revenue bonds. When I-264 was expanded in late-1980s, both the Downtown Tunnel and Berkley Bridge were renovated and widened and, on completion in 1986, tolls were removed from both tunnel facilities. However, the Midtown Tunnel has never been expanded. Since it was built, its usage has gone up by 600 percent and now carries a million vehicles per month, making it the most heavily traveled two-lane road east of the Mississippi River [71]. For this reason, expansion of the Midtown Tunnel has been listed as the region's top priority by the Hampton Roads Transportation Planning Organization (HRTPO) – formal name of the MPO responsible for transportation planning in the region. The core part of the project is to expand the capacity of the Midtown tunnel roads by building a new tunnel with two additional lanes, parallel to the existing one, under the Elizabeth River connecting the cities of Norfolk and Portsmouth.

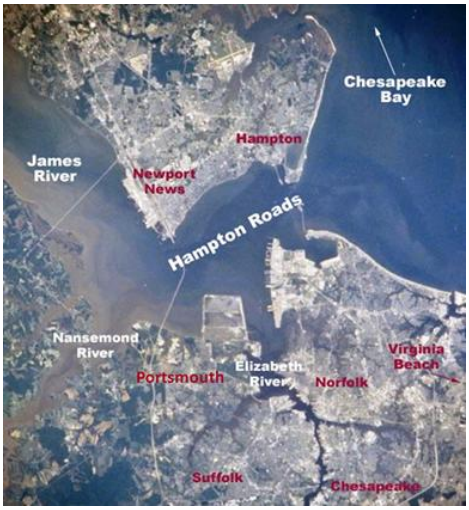


Figure 3: Southeast Virginia/Hampton Roads [45] **Figure 4 Hampton Roads Region [46]**

5.1. Midtown Tunnel Project Planning & Demand

The need for expansion of the Midtown Tunnel has been recognized for over twenty five years; however a lack of available funding along with the complexity of the traffic demand issues left the project in limbo for many years.

During the late-1980s considerable changes took place to the traffic patterns around and approaching the Midtown tunnel. As previously noted, with the completion of the expansion of the Downtown Tunnel and Berkley Bridge, tolls were removed from both the Midtown and Downtown tunnels. Gradual expansion of Interstate 664 along with a steady increase in container traffic from the Portsmouth Marine Terminal/Sealand facility caused a significant increase in traffic volumes on most major roads in the Port Norfolk area including the Martin Luther King Freeway (Route 58) through the tunnel and tunnel access approaches from both the Portsmouth and Norfolk sides, causing long traffic queues and delays in both directions [47]. In response VDOT engineers initiated a study to look at alternatives to relieve the congestion and subsequently issued a Draft Environmental Impact Statement (DEIS) which was approved by FHWA in December 1989. The DEIS went through public review in the spring of 1990 and was subsequently approved by the Commonwealth Transportation Board in September 1990 [47]. The DEIS included a preferred alternative project that included construction of a second Midtown tunnel parallel to and downstream from the existing tunnel and improvements to the tunnel access including construction of the Pinners Point Interchange and Connector in Portsmouth [47]. This solution was also included in the Hampton Roads 2010 Long Range Plan issued in 1990 [48].

Unfortunately little action was taken over the next few years. More than three years lapsed requiring the FHWA to reevaluate the project. Further passage of the Intermodal Surface Transportation Efficiency Act in 1991 required that a Major Investment Study/Congestion Management System (MIS/CMS) review be conducted and that the Hampton Roads MPO include the project in the now required economically Constrained Long Range Plan (CLRP) [47]. The MIS/CMS was subsequently conducted and approved by the Hampton Roads MPO in August 1996; however funding was not available and the project could not be included in the

2015 Hampton Roads CLRP (1995). Thus when the Final Environmental Impact Statement (FEIS) was approved by FHWA in October 1996 and the Record of Decision (ROD) issued in March 1997, it did not include approval for a new tunnel, effectively putting the project on hold [47]. The project was briefly resurrected in June 1999 when a private group, the Hampton Roads Public-Private Development, made an unsolicited offer to provide 90% or more of the funds needed to build the Midtown Tunnel using private investment capital under the provisions of Virginia's Public-Private Transportation Act (PPTA). In return, the group would recoup its investment through revenues collected by re-tolling of the Midtown and the Downtown Tunnels [49]. However, political opposition to re-tolling the tunnels eventually resulted in the proposal being withdrawn in 2000.

Throughout this period, several traffic demand studies were conducted by VDOT and the HRTPO. In 1994, a traffic study was conducted as part of reevaluation of the DEIS and ISTEA required MIS/CMS. The study showed a Midtown Tunnel baseline average daily traffic (ADT) volume of 35,000 vehicles growing to 50,000 vehicles in 2015 if no new tunnel was built [49]. With the addition of the parallel tunnel, projections showed that Midtown Tunnel usage would grow to ADT of 78,000 vehicles [49] but would substantially reduce traffic volumes on Port Norfolk streets [47] and decrease congestion on Route 58, resulting in significantly improve commute times during rush hour conditions. This data was referenced in the HRTPO's 2015 CLRP but the tunnel expansion project was not included in the plan due to the lack of available funding [47]. HRTPO conducted another traffic study in 2004 for its 2026 CLRP showing that then current traffic volumes had risen to ADT of 38,000 vehicles, and projections showing the ADT rising to 64,000 vehicles by 2026; however, once again the project was excluded from the plan due to fiscal constraints [50].

Then, in November 2004, VDOT issued a Request for Information (RFI) under authority of the PPTA, to determine interest by private firms in designing, building, maintaining and operating "expansion of the Midtown Tunnel Corridor (Route 58 under the Elizabeth River and approach roadways) in the Cities of Norfolk and Portsmouth in Virginia" [50]. Sufficient interest was raised to reinvigorate the project. With the prospect of available funding, the HRPTO amended their 2026 CLRP, making the project its highest priority [51]. The FHWA then initiated a reevaluation of the FEIS approved in 1997, eventually concluding in May 2007 that a Supplemental EIS would not be required, and then issued a revised ROD on July 9, 2007 [52]. This then led to VDOT issuing a formal Solicitation for Conceptual Proposals (SFP) in May 2008 [53].

5.2. Midtown Tunnel Procurement and Concession Agreement

Under the Public-Private Transportation Act (PPTA) of 1995 Implementation Guidelines VDOT is required to follow strict six-phase proposal process when soliciting and evaluation P3 bids and negotiating and consummating P3 concession agreements [54].

The SFP requested submittal of Conceptual Proposals for the financing, design, construction, operation, and maintenance of a project "comprised of a new two-lane tunnel under the Elizabeth River parallel to the existing Midtown Tunnel; maintenance and safety improvements to the existing Midtown Tunnel; minor modifications to the interchange at Brambleton/Hampton Boulevard in Norfolk; maintenance and safety improvements to the existing Downtown Tunnel; and extending the MLK from London Boulevard to Interstate 264 (I-264), with an interchange at High Street" [53]. The SCP specified VDOT's intent to make the tunnel a toll facility and encouraged potential bidders to explore innovative financing methods including private activity bonds (PABs) and TIFIA loans [53].

Following PPTA Guidelines VDOT posted and published notice of the SFP establishing a September 29 deadline for proposal submission. Initially three firms expressed interest in bidding on the project but ultimately only one group, Elizabeth River Crossing (ERC) LLC, a joint venture of Skanska Infrastructure Development (50%) and Macquarie Financial Holdings Limited (50%), responded by the proposal deadline. Continuing to follow PPTA Guidelines, the ERC proposal then went through a quality control review to ensure compliance with the PPTA requirements and the solicitation criteria before being formally accepted for further consideration. Subsequently the Virginia Secretary of Transportation appointed an Independent Review Board (IRB) to evaluate the proposal and collected public comments in order to develop recommendations for the Commonwealth Transportation Board (CTB). Ultimately CTB accepted the IRB's recommendations and the CTB Commissioner then directed staff to begin to negotiate an interim agreement with ERC. An interim agreement was signed in January 2010, leading to the signing of a Comprehensive Agreement with ERC and commercial close on December 5, 2011; and financial close for a toll concession public-private partnership on April 12, 2012.

Under the terms of the Comprehensive Agreement, ERC is responsible for the design, build, finance, operation, and maintenance (DBFOM) for the project. In addition, ERC agreed to invest a substantial portion of the projects equity (about $221 million), and borrowed about $1.1 billion through PABs, at its own risk. ERC is solely responsible for repaying and obtaining all project-related debts. Moreover, the comprehensive agreement does not guarantee any profit to ERC [55]. In return, ERC was granted a 58-year concession that includes the exclusive right to electronically collect tolls using time-of-day congestion pricing for the existing Midtown Tunnel and Downtown Tunnels, the new Midtown Tunnel (when completed), as well as the MLK extension. The comprehensive agreement specifies that VDOT does not have any

obligation to collect and control collecting tolls by explicating stating that “the risk of enforcement and collection of tolls and related charges remains with the concessionaire” and that VDOT will have no liability to the concessionaire for the loss of toll revenues or increase in cost” [56].The department also does not have any risk or liability in the actual traffic volume and revenue.

Because I-264, a U.S. interstate highway, runs through the Downtown Tunnel, VDOT was required to secure special permission from FWHA under the Value Pricing Pilot Program before agreeing to allow ERC to toll the Downtown Tunnel. Originally under the Interim Agreement signed in January 2010 the staring tolls were set at $2.86 and tolling was scheduled to begin in September 2012 [57]. However, tolling on the two tunnels, which had been free since 1986, met with severe political opposition. To try and quell opposition and build political support, the Comprehensive Agreement signed in December 2011 reduced starting tunnel tolls to $1.84 for the peak period and $1.59 during off-peak times, delayed the start of tunnel tolling until February 1, 2014, and eliminated tolls on the MLK Extension for local traffic [58]. The state invested $308 million at financial close to lower toll levels, plus an additional $112.5 million to delay the beginning of toll collection [59]. Despite these changes, a law suit was filed on July 12, 2012, against VDOT and ERC to overturn the Midtown tunnel concession on the grounds that imposing tolls on the existing tunnel facilities is an unconstitutional tax. On May 1, 2013, a judge in the case ruled in favor of the plaintiffs ruling that the Virginia General Assembly had exceeded its authority in giving VDOT "unfettered power" to set toll rates under the 1995 Public-Private Transportation Act [60]. Virginia is in the process of appealing this ruling; however there are concerns that if VDOT is unable to reestablish tolling that it could expose them to financial liability, threatening their ability to deliver the Midtown Tunnel and potentially jeopardizing other Virginia PPTA and toll projects [58].

5.3. Financing & Risk Allocation

The total cost of the project, including financing, is approximately $2.1 billion (Figure 5). Under the terms of the Comprehensive Agreement (Exhibit E), VDOT negotiated a fixed price of $1.46 billion to design and construct the project [61]. This includes $1.164 billion for the new Midtown Tunnel, $94 million for rehabilitation of the existing Midtown and Downtown tunnels, and $192 million for the extension of the Martin Luther King Freeway [59]. In addition, operations and maintenance is expected to cost an additional $2.2 billion over the life of the project [62].

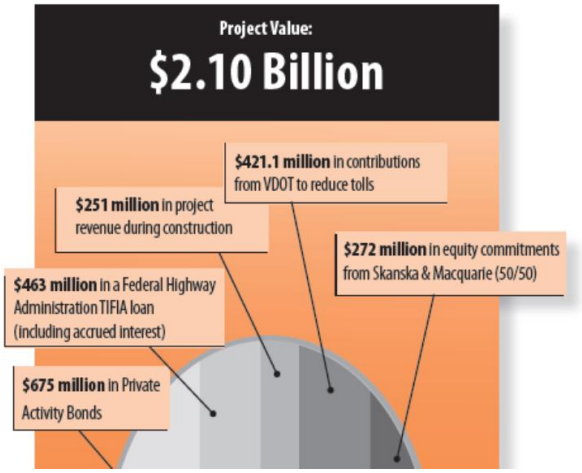


Figure 5: Midtown Tunnel Project Finance Breakdown [62]

Financing for the project comes from a number of sources. A total of $675 million is funded by 30- year senior- lien Private Activity Bonds (PABs) rated BBB- by Standard and Poors with an estimated interest rate of 5.47%. These bonds are tax exempt and expected to be paid back by toll revenues [63].

A Transportation Infrastructure Finance and Innovation Act (TIFIA) loan, also secured by toll revenue, provided $422 million in funding to the project. The TIFIA loan, which was executed on April 12, 2012, is further secured by a fully funded debt service reserve fund [64]. This 35-year loan, which also has an S&P BBB- rating, has deferred interest payments for the first 10 years of the loan. Permitting deferral of the payment allowed greater credit support to

other types of the debt, including the PAB. Taking the deferral into account the interest rate for TIFIA loan is estimated to be 3.18% for 35 years [63].

ERC partner Skanska and Macquarie contributed a total of $272 million in equity funding of which $51 million is classified as the contingent equity. In additional to their equity stake, ERC will also be responsible for debt service on $422 million in federal TIFIA loans and $664 million in private activity bonds. In exchange for the $1.3 billion equity and financial risk that it is assuming, ERC wants to achieve a private sector market rate of return [59]. Under the terms of the concession agreement, once the new tunnel is completed, ERC is guaranteed an annual increase in toll rates of 3.5% or the increase in the CPI, whichever is greater [59]. Likewise, if the project exceeds specified thresholds, VDOT will be able to receive a revenue-share of up to 60% [59].

VDOT‘s contribution to the project was $410 million, of which $308 million was contributed at the time of financial close and another $103 million was requested by Virginia Governor McDonnell two weeks after the financial close to delay the toll collection of the existing Midtown Tunnel in to response to the large public protests regarding tolls on the existing tunnels.

The final source of planned financing was toll revenue. VDOT’s original intent was to have about 17.5% of the $1.45 billion construction cost (around $251 million) funded by tolling the existing free tunnels during the five-year construction period [65]. Further, repayment of the PAB and the TIFIA loans were guaranteed through anticipated toll revenue. With the lawsuit and court decision, serious concerns were raised by the U.S. Department of Transportation on the ability of the concessionaire, and ultimately the Commonwealth of Virginia, to be able to repay the loans and raising the possibility of a VDOT contractual default and termination of the concession agreement [58].

In their proposal, ERC contemplated that project risk and responsibility be shared between VDOT and ERC according to an established P3 principles, with risks being allocated to the party best suited to manage them [66]. As recognized by ERC and reflected in the Comprehensive Agreement, ERC assumed major risks in areas including traffic and revenue, asset operations and maintenance and management of design, construction, and financing risk. Similarly, VDOT assume risks for policy, legislative and environmental approvals, as well as certain site and asset conditions and surveys, and for such other risks that they would have the best ability to cost-efficiently manage. Some of the major risk categories and their assignment to VDOT (V), Concessionaire (C) or are Shared (S) in the Comprehensive Agreement are outlined in Table 5 below. It should be noted that the lawsuit and subsequent decision by the court to declare tolling on the existing tunnels unconstitutional significantly increases the shared tolling risks to both VDOT and ERC, and also the legislative and political risks to VDOT and the Commonwealth of Virginia if the court's decision is not overturned. Under a worst case scenario, the state could be obligated to pay about $2 billion, including damages to ERC, if tolling revenue is permanently stopped and construction continues to completion [67].

Table 5: A Potential Risk Matrix after Financial Close

Risk Category	Risk Topic	Assignment (V,C,S)	Severity (H,M,L)	Probability (H,M,L)
Planning/Approvals	Permit/approvals	S	H	L
Legislative/Policy	Legislative Change (P3 legislation)	V	H	L
	Regional/Local Support	S	M	L
	Political/Policy Change	V	H	L
Commercial	Contract Failure/Dispute	S	H	L
	Traffic/Revenue	C	H	M
Environmental	Subsurface Condition	S	H	L
Design	Design Criteria/ Technical provisions	V	H	L
Construction	Differing Site Conditions	V	H	M
Operations	Capacity Improvement	C	M	L
	Tolling	V,C	M	L
Maintenance	Latent Defects in Existing Facilities	V	H	L

Source: ERC, Public Private Transportation: Conceptual Proposal, Midtown Tunnel 2008.

5.4. Midtown Tunnel Construction & Future Operations

Notwithstanding the concern generated by the lawsuit and the uncertainty regarding the future of tolling, construction has begun on the Midtown Tunnel Corridor Project. Groundbreaking was announced by VDOT on January 10, 2013 [68] and, as of April 30, 2013 over $360 million of design-build work had been completed including 90% of the design work, implementation of utility relocation and construction drainage systems, and dredging of the tunnel's Portsmouth approach [58].

Within ERC, design work for the project is being led by Parsons Brinckerhoff, with Skanska USA Civil Southeast (45%), Kiewit Infrastructure Co. (40%), and Weeks Marine (15%) engaged in the construction [65]. The construction, which will be done in phases and is scheduled for completion in 2017 (Figure 6), involves three components (Figure 7): 1) adding a new two-lane tube next to the existing Midtown Tunnel under the Elizabeth River between Portsmouth and Norfolk; 2) extending the Martin Luther King Freeway approach to Portsmouth including a new I-264 interchange that will allow drivers to choose either tunnel depending on traffic conditions; and 3) performing maintenance and safety improvements on the existing Downtown and Midtown Tunnels [65].

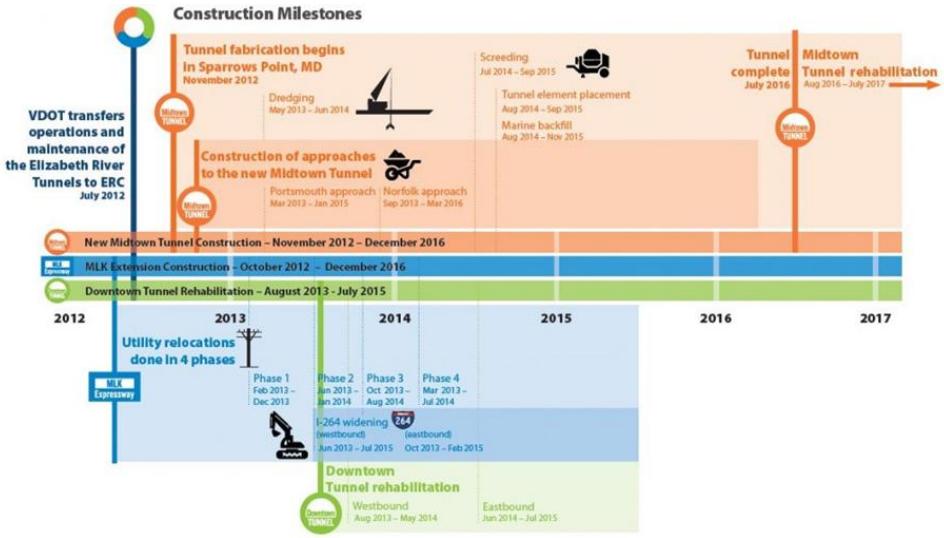


Figure 6: Midtown Tunnel Corridor Project Construction Schedule [69]

The new tunnel will be have a length of approximately 4200 feet (1280 meters) and a minimum height of 18 feet (5.49 meters). It will be constructed out of 300 foot (91.4 meter) prefabricated sunken tube tunnel segments that will be assembled in Baltimore, Maryland and floated into position [65]. Construction on the new tunnel portion of the project is expected to be completed in 2016.

Figure 7: Map showing Midtown Tunnel Corridor Project Components [58]

The MLK Extension consists of extending MLK south approximately 0.8 mile (1.29 kilometers) and constructing a new interchange at I-264 (four lane limited access freeway) to provide a direct freeway-to-freeway connection from I-264 to the Midtown Tunnel between the Cities of Portsmouth and Norfolk [53]. The improvements to the existing Midtown Tunnel facility include new roadways, new parallel tunnel, drainage, communications/intelligent transportation systems, lighting, flood protection, fire detection and suppression, ventilation, and power systems [53]. The improvements to the Downtown Tunnel include modifications to the existing northbound and southbound tunnels necessary for the existing facility to conform to the NFPA fire protect standards for road tunnel and include upgrades to the existing water supply, ventilation, electrical, and emergency response systems [53]

The system will be equipped with electronic tolling that will allow vehicles to use the toll facility at posted speed [70]. The system is interoperable with VDOT's E-Z Pass transponder system that is being used on other toll roads within the state. The system will also have a Pay by Plate payment option that uses license plate recognition to identify and invoice customers who have used the toll facility. There will not be a cash option or traditional toll booths available for payment [70].

During construction, local subcontractors will benefit from over $1 billion worth of work and more that 500 project-direct and 1000 project-indirect jobs are expected to be created [71]. Once the project is completed the region is expected to reap many economic benefits. The new tunnel will require the hiring of 200 new permanent employees to handle maintenance and operations. Further it is estimated that the average commuter will save approximately 30 minutes daily round-trip [71], reduce commuters' fuel costs by an average of $200 per year [71], and increase Hampton Roads gross economic productivity from $170 million to $254 million annually [71].

Operations and maintenance on the existing tunnels was transferred to ERC on July 13, 2012. Once the remainder of the Midtown Tunnel Corridor Project is completed, these sections will also be operated and maintained under the remaining years of the 58-year concession agreement.

5.5. Midtown Tunnel Lessons Learned

The Midtown Tunnel project presents both positive and negative lessons that can be used by policy makers.

Existing P3 Legislation, Institutions and Experience: Certainly the existence of the PPTA legislation, the creation of the OTP3 office, and recent VDOT P3 experience has help to drive P3 activity on the Midtown Tunnel and many other projects in the Commonwealth of Virginia.

PPTA gives state agencies and local governments the authority to make agreements with private entities to design, develop, finance, and operate the transportation facilities. Because of this law, private firms that are interested in the public-oriented projects can submit unsolicited proposals to VDOT [72]. The Office of Transportation Public Private Partnerships (OTP3) provides guidance on soliciting, screening, and procuring P3 project accelerating development of the important transportation P3 projects in accordance with PPTA guidelines. Further the experience of both VDOT and ERC working on other P3 projects in Virginia helped move along negotiations on sensitive issues like the allocation of risk.

Tolling Benefits & Liabilities: In the past, tolling revenue has been perceived as a stable source of funding for long–term transportation development especially in cases where governments cannot afford major infrastructure improvements using traditional tax resources. Tolling also relieves the burden of the capitalized interests and increases the ability for an accurate revenue forecasts for debt financing [65]. As in the case of the Midtown Tunnel Project it can also be used to attract private equity investment into public infrastructure projects. On the other hand, the tolling provisions in the Midtown concession agreement have created local political opposition and perceived negative social costs. The tolls on existing facilities reversed a decision from nearly 30 years ago to remove tolls from those facilities. Imposing tolls on both existing and new tunnel facilities may also limit commuters' mobility choices. Indeed, the clear difference in Midtown tunnel project from other similar types of the project in Virginia (such as I-495 project) is that there are no viable alternatives to using the tolled facilities. In fact, the Midtown Tunnel Comprehensive Agreement includes a non-compete clause that requires the state to pay the concessionaire a fee if competing toll or non-toll facilities are put into service during the term of the concession [59].

The Need for Transparency and Competition: Throughout the procurement, negotiation, and contracting process, VDOT adhered to the processes defined in the PPTA Implementation Guidelines. Yet despite having a competitive bidding process, only one bid was submitted; and notwithstanding requirements for public support, the agreement resulted in the almost immediate filing of a lawsuit by fifty citizens of Portsmouth and a court ruling declaring tolling provisions of the concession agreement unconstitutional. It is actually surprising that VDOT proceeded with tolling on the existing Downtown and Midtown tunnels given the opposition to a similar plan that killed a P3 proposal in 2000 and the results of a tolling survey conducted in 2008 that showed that only 11% of respondents supported instituting tolling on those facilities [73]. Further, VDOT seemed extremely hesitant to release this information as evidenced by a letter posted on the project website exempting the results from public disclosure [74]. Ultimately, it could lead to the state having to pay as much as $2 billion to cover full cost of construction and financing should the court's decision not be overturned. Thus, it would appear VDOT may be in the process of learning a tough lesson on the need for transparency and true competition in order to build public support.

6. Discussion

The POMT and MTC case studies offer insights into testing the hypotheses outlined in Section 2.

The first hypothesis is that the use of P3 capabilities, including P3 financing and design-build project delivery, makes it possible for complex infrastructure projects to proceed to financial close and construction more quickly and cost effectively than conventional public finance and design-bid-build methods. Both the POMT and MTC are critical projects that have been in the planning stages for over 25 years. However, it was the innovation and financial capabilities provided by the private partners that helped to move these projects forward from

conceptual planning to reality. The POMT project benefited from the introduction of new tunnel boring equipment that helped overcome environmental opposition. Likewise, up until the introduction of a P3 solution, the MTC was not included in the Hampton Roads MPO's economically constrained plan. Once a P3 option was proposed by VDOT in 2004, the MPO was able to amend its plan and the project moved forward to bidding in a fairly timely manner. Further, both projects were able to secure funding and proceed to construction despite the poor economic conditions that existed at the time of financial close.

The second hypothesis is that the public partner should consider alternatives to traditional toll based concession agreements such as performance based availability payments or other types of compensation to private partners in order to pay for complex infrastructure projects. This is the biggest difference between these two infrastructure projects. The MTC decided to go with a toll based concession, despite significant public opposition. Further their decision included reimposing tolls on the existing tunnels, thus further exacerbating public outrage and eventually leading to litigation and a negative court decision. In the case of the POMT, FDOT opted to utilize performance-based availability payments, thus avoiding a toll controversy. While these are only two isolated projects it does demonstrate that securing public support is critical to P3 success.

The third hypothesis is that the availability of existing P3 legislation, P3 institutions, and P3 experience helps to move complex infrastructure projects to financial close and construction more quickly than traditional design-bid-build project delivery mechanisms. Once again, both Florida and Virginia have had existing P3 legislation on the books for many years; have established P3 institutions in the FTE and OTP3; and are generally considered national leaders in implementing P3 projects. Both states utilized this experience and established guidelines to propel these projects forward despite harsh economic times and challenging political

circumstances. While there has been criticism of the power P3s have given to transportation authorities in making multibillion dollar project commitments and long-term concession agreements, it is clear, as demonstrated in both Florida and Virginia, that such power can result in the introduction of innovation and the securing of the private funds needed to implement otherwise stalled critical infrastructure projects.

Finally, the forth hypothesis is that, while established P3 principles call for risks being allocated to the party best suited to manage them, the reality is that in P3 agreements, not all risks can be clearly defined and isolated, potentially leaving both parties vulnerable to financial loss and liability. Since both projects are still under construction, it is still not totally clear if this hypothesis can be proven. Undoubtedly, the litigation involved in the MTC has jeopardized the financial viability of the project and created uncertainty regarding the liability VDOT and ERC may have to bear if tolling is not reestablished by the courts. One the other hand, based on the success of the POMT project to date FDOT and MAT seem relatively well prepared to be able to handle unexpected risks. Further, the case study findings suggest that the P3 has successfully achieved most of FDOT's initial policy goals—(1) an efficiency of construction; (2) a high-level of quality and availability; (3) risk sharing; (4) a long-term, guaranteed cost structure; and (5) a predictable implementation process. Still, FDOTs innovative decision to implement a non-tolled, performance-based availability concession still waits to be tested when the POMT opens in May 2014.

7. Conclusions

The POMT and MTC projects are both excellent examples of how P3 contractual agreements are currently being used on complex infrastructure projects in the United States.

When comparing these two projects one can see many similarities. Both projects were implemented by transportation authorities with substantial P3 experience in states with strong

P3 laws. Both involved a DBFOM P3 contracts with multi-billion dollar long-term commitments for construction, financing, operations, and maintenance; and the use of TIFIA loans and other creative financing sources, organized during a period of economic crisis. Both are technologically challenging projects with geotechnical and environmental risk unique to underwater projects. Also, once the decision was made to implement these projects using P3, both proceeded relatively quickly through the procurement and contractual processes to the timely initiation of construction.

However, there are also a few stark differences between these two projects. The most obvious is the decision by VDOT to proceed with a toll concession with ERC versus FDOT's performance-based availability payment concession choice with MAT. VDOT's decision to toll and subsequent litigation has introduced a high level of political risk to the MTC project, where the POMT has proceeded with minimal public opposition. Consequently, the POMT project was named "Deal of the Year" in 2010 by *The Bond Buyer* magazine, and is proceeding to completion on-time and in-budget for opening in May 2014. The MTC faces a more uncertain future with continued litigation possibly impacting project financing, the concession agreement with ERC, and potentially other toll projects in Virginia.

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