APPENDIX E

History and Projection of Traffic, Toll Revenues and Expenses and Review of Physical Conditions of the Facilities of Triborough Bridge and Tunnel Authority

Stantec

Prepared for:
Triborough Bridge and Tunnel Authority

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TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

HISTORY AND PROJECTION OF TRAFFIC, TOLL REVENUES AND EXPENSES AND REVIEW OF PHYSICAL CONDITIONS OF THE FACILITIES OF TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY

April 29, 2022

To the Triborough Bridge and Tunnel Authority:

In accordance with your request, Stantec Consulting Services Inc. (Stantec) conducted this annual study to develop projections of traffic, toll revenues, and expenses for the toll bridge and tunnel facilities operated by the Triborough Bridge and Tunnel Authority (TBTA), and to provide an overview of the physical conditions of each facility. We have reviewed the bridge and tunnel inspection reports provided by TBTA and discussed TBTA's ongoing maintenance and capital programs with TBTA's Business Unit engineering staff responsible for those programs.

This report provides a summary of past traffic and revenue performance of the TBTA facilities and information related to potential future traffic and revenue for a ten-year period. The projections presented in this report have taken into account: (1) the general physical condition of TBTA's toll facilities; (2) traffic and toll revenue data, reflecting the twenty (20) toll increases since 1972, including the most recent toll increase effective April 11, 2021; (3) the impact of the E-ZPass electronic toll collection system; (4) the impact of systemwide Cashless Tolling implementation; (5) the toll structure; (6) planned and possible future toll increases; (7) economic, population, employment, and other demographic forecasts in the New York Metropolitan Area; (8) current fuel availability and prices; (9) the traffic capacities of the bridges, tunnels and the existing roadway network that feeds the facilities in terms of the potential for future growth of peak versus non-peak period traffic; (10) current and programmed construction activities on TBTA's facilities and the arterial highway network serving the New York Metropolitan Area, including the toll-free Harlem and East River bridges; (11) mass transit network projects; (12) the implementation of split tolling at the Verrazzano -Narrows Bridge on December 1, 2020; and (13) the ongoing impact of the COVID-19 pandemic and associated governmental restrictions ("pandemic").

The response to the pandemic starting in early 2020 affected the United States and global economy causing unemployment in the United States to rise abruptly to levels not seen in recent history. The national and local governments took a series of actions including work restrictions and pandemic relief packages throughout 2020 and into early 2021. In March 2021, former Mayor Bill de Blasio announced that the 80,000 City municipal workers that had been working remotely could begin to return to the office on May 3, 2021. However, the onset of the delta and omicron ("Omicron") variants of COVID-19 at the end of summer 2021 and December 2021, respectively, delayed the return to office for many private companies. Consequently, many of these firms opened their doors for employees towards the end of winter 2022. As part of the response to the pandemic, many employers have adopted greater flexibility; allowing their staff to work at least part-time from remote locations.

As of the date of this report, preliminary audited traffic and revenue data are available for the period through February 2022, as well as unaudited traffic volumes through April 25, 2022.

The effects of the Central Business District Tolling Program (described later in this report) have not been included in the analysis prepared by Stantec for this report as the program is still under development and insufficient information is available to make realistic assumptions regarding any impacts of the program on the TBTA facilities or projected revenues. However, such a program

could have an observable impact on travel patterns and a tangible impact on TBTA revenue, none of which is reflected in this report.

Stantec's previous Independent Engineer Report entitled "History and Projection of Traffic, Toll Revenues and Expenses and Review of Physical Conditions of the Facilities of Triborough Bridge and Tunnel Authority" (2021 Report), dated April 30, 2021, was published roughly one year into the pandemic. In 2021, actual total toll revenues for the TBTA facilities were $2.150 billion, or 5.4 percent higher than our 2021 forecast of $2.040 billion and 31.1 percent higher than actual 2020 toll revenue; such 2020 revenues having been particularly impacted by the onset of the pandemic. Total revenue traffic in 2021 was 307.3 million vehicles, which was 2.7 percent higher than our 2021 forecast of 299.3 million vehicles and 21.4 percent higher than actual 2020 traffic.

The full set of comprehensive data provided through February 2022 was used in preparing our analysis through 2032. Stantec receives daily preliminary unaudited traffic data from the TBTA. Although the preliminary unaudited data from March 1, 2022, through April 25, 2022, were reviewed, these data were not directly used in the future analysis due to insufficient level of available detail and because preliminary unaudited data are still subject to change.

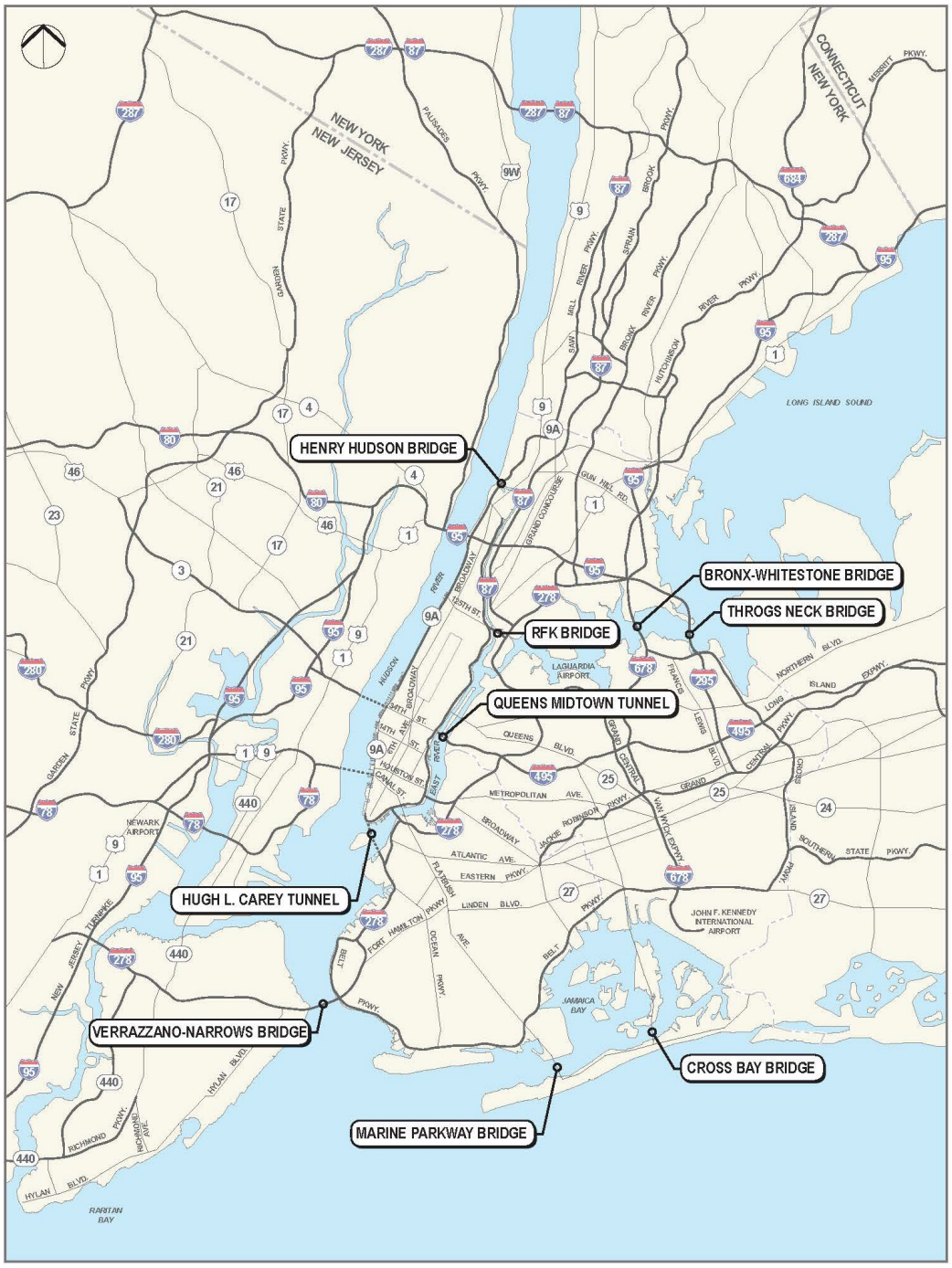
TRANSPORTATION INFRASTRUCTURE

The New York Metropolitan Area's transportation infrastructure consists of an extensive network of highways, tunnels, and bridges (both tolled and toll-free), regional bus and commuter rail, and the transit system in The City of New York ("New York City" or the "City").

TBTA Facilities

TBTA operates nine toll facilities within New York City, consisting of seven bridges and two tunnels that provide vital links across the City's rivers and bays. In 2021, these facilities carried 307.3 million total toll-paying vehicles and generated $2.150 billion in total toll revenue. The locations of the facilities are shown in the context of the regional highway network on the following map (Figure 1).

Figure 1 TBTA Toll Facilities Location Map



The facilities are briefly described as follows:

Verrazzano-Narrows Bridge - a two-level suspension bridge that crosses the entrance to New York Harbor and connects Brooklyn and Staten Island, with seven lanes of traffic on the upper level, including a reversible HOV lane, and six lanes of traffic on the lower level. The fully reversible lane on the upper level was implemented in September 2017. Split tolling on this bridge was implemented on December 1, 2020.

Robert F. Kennedy (RFK) Bridge (formerly the *Triborough Bridge*) - a three-bridge structure with connecting viaducts or elevated expressways, which crosses the East River, the Harlem River, and Bronx Kill connecting the boroughs of Queens, Manhattan, and the Bronx. Opened to traffic in 1936, it generally carries eight traffic lanes between Queens and the Bronx crossing Astoria Park, Wards Island and Randall's Island. The bridge widens out to nine lanes over Astoria Park and Wards Island to provide dedicated exit lanes for Hoyt Avenue and Wards Island from the Queens bound roadway. The bridge also generally carries six traffic lanes between Randall's Island and Manhattan. These three major crossings are interconnected by viaducts and the Randall's Island Interchange, which facilitates traffic flow in two directions. A new ramp was opened to traffic on November 23, 2020, providing an alternate direct connection from the RFK Bridge to the northbound Harlem River Drive.

Bronx-Whitestone Bridge - a suspension bridge, with three lanes of traffic in each direction, which crosses the East River connecting the boroughs of Queens and the Bronx.

Throgs Neck Bridge - a suspension bridge with three lanes of traffic in each direction, which crosses the upper East River connecting the boroughs of Queens and the Bronx.

Queens Midtown Tunnel - a twin-tube tunnel with each tube carrying two lanes of traffic under the East River between the boroughs of Queens and Manhattan. During normal morning commuting hours, three lanes operate inbound into Manhattan.

Hugh L. Carey Tunnel (formerly the *Brooklyn-Battery Tunnel*) - a twin-tube tunnel with each tube carrying two lanes of traffic under the East River connecting the southern tip of Manhattan with Brooklyn. During normal commuting hours, three lanes operate in the peak traffic direction.

Henry Hudson Bridge - a two-level steel arch bridge with three southbound lanes on its lower deck and three northbound lanes on its upper deck, which crosses the Harlem River to connect the northern tip of Manhattan with the Spuyten Duyvil section of the Bronx.

Marine Parkway - Gil Hodges Memorial Bridge (*Marine Parkway*) - a four-lane crossing of the Rockaway Inlet that connects the Rockaway peninsula in Queens with Brooklyn.

Cross Bay Veterans Memorial Bridge (*Cross Bay*) - a precast post-tensioned concrete T-girder bridge connecting the Rockaway peninsula in Queens with the Queens mainland, via Broad Channel. The bridge has three lanes of traffic in each direction crossing Beach Channel in Jamaica Bay, dropping to two lanes to align with the Cashless Tolling gantries and Cross Bay Boulevard.

Metropolitan Area Arterial Network

The New York Metropolitan Area is served by an extensive network of highway facilities. Many of the bridges and tunnels operated by TBTA are links in the Interstate highway network, as these limited-access expressways pass through the City to serve both local and long-distance traffic. These regional facilities are also shown in Figure 1.

The Verrazzano-Narrows Bridge is adjacent to I-278 (Staten Island, Gowanus, and Brooklyn-Queens Expressways), which connects with the Hugh L. Carey Tunnel and the RFK Bridge. The Queens Midtown Tunnel joins I-495 (Long Island Expressway) with Manhattan. The RFK Bridge joins I-87 (Major Deegan Expressway) and I-278 (Bruckner Expressway) with I-278/Grand Central Parkway in Queens and the FDR and Harlem River Drives in Manhattan. The Bronx-Whitestone Bridge carries traffic between the Hutchinson River and Merritt Parkways and Long Island via I-678 (Whitestone and Van Wyck Expressways) and the Cross Island Parkway. The Throgs Neck Bridge carries traffic between I-95 (New England Thruway and George Washington Bridge) and Long Island via I-295. The Henry Hudson Bridge is part of the Henry Hudson Parkway (Route 9A), a major commuter route into Manhattan from the extensive parkway network in western Westchester County and beyond.

In addition to TBTA facilities and their expressway/parkway connections, the City's toll-free East River bridges — Brooklyn, Manhattan, Williamsburg, and Ed Koch Queensboro — also connect Manhattan with Brooklyn and Queens; and nine toll-free bridges over the Harlem River connect Manhattan with the Bronx. Unlike the TBTA facilities, the approaches to these bridges are mostly surface arterials, such as Flatbush Avenue and Queens Boulevard. Only a few have expressway ramp connections (such as the Brooklyn-Queens Expressway connections to the Brooklyn, Manhattan, and Williamsburg Bridges). The Alexander Hamilton Bridge, as part of I-95, connects the Trans-Manhattan Expressway and the Cross Bronx Expressway.

Other Regional Toll Facilities

TBTA is one of a number of toll authorities that operate bridge, tunnel, and highway facilities in the New York Metropolitan Area. The agency whose facilities are geographically closest to TBTA's bridges and tunnels is the Port Authority of New York and New Jersey (the "Port Authority"). The Port Authority's George Washington Bridge is linked to the RFK, Bronx-Whitestone, and Throgs Neck Bridges via the expressway system in the Bronx, to the RFK Bridge via the Harlem River Drive in Manhattan, and to the Henry Hudson Bridge via the Henry Hudson Parkway in Manhattan, while the Bayonne Bridge, Goethals Bridge, and Outerbridge Crossing are linked to the Verrazzano-Narrows Bridge via the expressway system in Staten Island. Motorists using the Port Authority's two tunnels — Holland and Lincoln — must traverse surface streets (in Manhattan) to reach TBTA's and the City's East River crossings. The other toll authorities in the region and the toll facilities they operate are the New York State Thruway Authority's (the "Thruway") Governor Mario M. Cuomo Bridge (formerly Tappan Zee Bridge) and several New York State Thruway System sections, New York State Bridge Authority (five upstate Hudson River bridges), and the New Jersey Turnpike Authority (Garden State Parkway and New Jersey Turnpike).

The E-ZPass System

All of these authorities, together with many others outside of the New York Metropolitan Area, are linked through the E-ZPass Interagency Group ("E-ZPass Group") originally designed to better serve the regional traveler through a common electronic toll collection tag. To further expand its footprint, the E-ZPass Group streamlined its membership categories to align with the future needs of national interoperability. Since March 8, 2018, a "Sponsored Affiliate" membership category was added, permitting public and private toll road operators to become interoperable with E-ZPass Group members by using equipment that is compatible with the E-ZPass system and allowing them to use a sponsoring Full Member's customer service center for transaction processing. The E-ZPass Group is also conducting ongoing discussions about regional electronic toll interoperability with representatives of toll agencies in the central, southeastern, and western states, exploring solutions that would allow the regions to process each other's transactions. E-ZPass and its impact on the TBTA facilities are discussed further in this report.

Cashless Tolling in the Region

All nine of the TBTA's bridges and tunnels are exclusively "Cashless Tolling" crossings as described below. The Port Authority's Staten Island crossings (Bayonne Bridge, Goethals Bridge, and Outerbridge Crossing), Holland Tunnel, and George Washington Bridge's Palisades Interstate Parkway and lower level toll lanes are also cashless. As of April 2022, the cash collection of tolls is temporarily restored at the Lincoln Tunnel and upper level of the George Washington Bridge. Cash collection will continue at these facilities until mid-2022 when the cashless system will be fully installed. Additionally, the entire New York State Thruway System became fully cashless by November 2020. Under Cashless Tolling, toll equipment is mounted on gantries, traditional toll plazas are demolished, and roadways reconfigured so that traffic flows freely across the facilities. Tolls continue to be paid using E-ZPass tags which are mounted on vehicles (typically windshields) and associated with E-ZPass accounts; the gantry-based E-ZPass antennas read the on-board tags and tolls are electronically debited from the associated E-ZPass accounts. For vehicles without E-ZPass tags, license plate images are taken and matched with information from the applicable Department of Motor Vehicles ("DMV") so that toll bills can be sent to registered owners under the authorities' Tolls by Mail program.

Regional Public Transportation

In addition to the TBTA facilities, most of the public transportation facilities within the City and the suburban counties north and east of the City are part of the Metropolitan Transportation Authority ("MTA") system. These include the New York City Transit Authority and the Manhattan and Bronx Surface Transit Operating Authority (its subsidiary), MTA Bus Company, Staten Island Rapid Transit Operating Authority, Metro-North Commuter Railroad Company, and the Long Island Rail Road Company.

For those TBTA facilities directly serving Manhattan — Henry Hudson Bridge, RFK Bridge, Queens Midtown Tunnel, and Hugh L. Carey Tunnel — motorists can, for the most part, choose to use public transit as an alternative. For the outlying bridges, however, the choice is more difficult due to more

limited availability of public transportation options or different trip characteristics (e.g., trip purpose, trip origin and destination).

The Central Business District Tolling Program

In April 2019, New York State enacted the MTA Reform and Traffic Mobility Act, which establishes the Central Business District ("CBD") Tolling Program, the goals of which are to reduce traffic congestion in the Manhattan CBD, improve air quality, and provide a stable and reliable funding source for the repair and revitalization of MTA's public transportation systems. TBTA has been directed to establish the CBD Tolling Program. The program will operate in the CBD, defined as Manhattan south of and inclusive of 60th Street, not including the FDR Drive or the West Side Highway (which includes the Battery Park underpass and or any surface roadway portion of the Hugh L. Carey Tunnel that connects to West Street). TBTA has entered into an MOU with New York City Department of Transportation ("NYCDOT") to coordinate the planning, design, installation, construction and maintenance of the CBD Tolling Program infrastructure.

In October 2019, TBTA awarded to TransCore LLP a contract to design, build, operate, and maintain the toll system equipment and infrastructure required to implement the CBD Tolling Program in NYC ("DBOM contract").

Authorization is required from the Federal Highway Administration ("FHWA") under its Value Pricing Pilot Program ("VPPP") to implement the CBD Tolling Program on federal-aid roadways within the CBD. FHWA approval to participate in the VPPP makes this project subject to National Environmental Policy Act ("NEPA") review. On March 30, 2021, FHWA determined that an Environmental Assessment is the appropriate level of environmental review required under NEPA. Because FHWA regulations provide that final design and construction cannot proceed before FHWA issues an environmental finding, the project is proceeding in two phases – preliminary design and final design – the latter of which is subject to receipt of FHWA approval.

After the early design phase is complete and upon issuance of the second notice to proceed, TransCore will complete the final design, build the infrastructure and install the toll system equipment. Once operational, TransCore will be responsible for operating and maintaining the infrastructure and toll system for an additional six years under the DBOM contract. The total cost of this DBOM contract is $507 million, which includes incentive payments to encourage on-time delivery.

The construction and implementation costs for the CBD Tolling Program are being funded through available sources of money including, among others, the recently enacted Real Estate Transfer Tax (Mansion Tax) and Internet Marketplace Tax, all of which are expected to be reimbursed through net operating revenues generated through the program when it is operational.

The MTA is expected to release its draft Environmental Assessment for the CBD Tolling Program in May 2022. Since details relating to the tolling structure, tolling rates and possible credits, as well as the date of implementation, of the CBD Tolling Program have not been established, Stantec is unable to assess the impact of the future CBD Tolling Program on either transactions or revenues for TBTA at this time.

TOLL COLLECTION ON THE TBTA FACILITIES

The nine TBTA toll facilities are divided into three toll pricing structures: major crossings, minor crossings, and the Henry Hudson Bridge. The major crossings for this purpose include the RFK Bridge, Bronx-Whitestone Bridge, Throgs Neck Bridge, Queens Midtown Tunnel, Hugh L. Carey Tunnel, and the Verrazzano-Narrows Bridge. As of December 1, 2020, the Verrazzano-Narrows Bridge implemented split tolling, with one-way and round-trip toll rates matching those at other major crossings. Previously, tolls at the Verrazzano-Narrows Bridge were only collected in the westbound direction. The minor crossings are the Marine Parkway Bridge and Cross Bay Bridge. The Henry Hudson Bridge is the only facility limited to vehicles that are authorized to use parkways.

Present and Proposed Toll Structures and Operation

The current toll structure, in place since the April 11, 2021, toll increase, is shown in Table 1. Toll rates are determined using a basic rate as modified by variables specific to a number of factors, including:

- crossing used,
- vehicle classification,
- toll payment method, and
- place of residence.

This study uses the phrase "Tolls by Mail" ("TBM") to refer to crossing rates charged for the use of fare media other than E-ZPass by the New York E-ZPass Customer Service Center ("NYCSC") customers, historic cash customers through September 29, 2017, and current TBM customers. (See 21 NYCRR §1021.1). As presented in Table 1, E-ZPass toll rates apply only to properly mounted customer tags issued by the NYCSC (this includes TBTA, the Port Authority, the Thruway, the Buffalo and Fort Erie Public Bridge Authority Peace Bridge, and New York State Bridge Authority).

Effective April 11, 2021, a "NYCSC Mid-Tier" ("Mid-Tier"), toll rate was introduced. The Mid-Tier toll rate is charged to NYCSC E-ZPass customers when their E-ZPass tag is not properly mounted while crossing TBTA toll facilities and are therefore identified through their license plate being matched to their E-ZPass account. The Mid-Tier toll rate is higher than the E-ZPass toll rate that is charged to E-ZPass NYCSC customers when their E-ZPass tag is properly mounted, but lower than the full toll charged to customers without a NYCSC E-ZPass tag or account. The goal of the new Mid-Tier toll rate is to incentivize NYCSC E-ZPass customers to properly mount their E-ZPass tag. The Mid-Tier toll rate will offset the additional costs incurred by TBTA to process these tolls. NYCSC E-ZPass customers subject to the Mid-Tier toll rate that subsequently properly mount their E-ZPass tag will resume paying the lowest E-ZPass toll rate.

TBM toll rates are charged to non-NYCSC E-ZPass customers (effective July 12, 2009), as well as to TBM customers at all nine TBTA facilities, reflecting the systemwide implementation of Cashless Tolling completed in 2017. Under the TBM program, license plate images for vehicles without E-ZPass tags are matched with information from the applicable DMV and a toll bill is mailed to the vehicle's owner. Only NYCSC E-ZPass commercial and passenger customers are eligible for the lower E-ZPass toll rates. Any motorist, regardless of residence, can obtain a NYCSC transponder.

Table 1 Current Toll Rates at TBTA Facilities, Effective Since April 11, 2021

Classification	RFK Bridge Bronx-Whitestone Bridge Throgs Neck Bridge Queens Midtown Tunnel Hugh L. Carey Tunnel Verrazzano-Narrows Bridge[a]			Henry Hudson Bridge			Marine Parkway- Gil Hodges Memorial Bridge Cross Bay Veterans Memorial Bridge		
	TBM/ Non-NYCSC E-ZPass	Mid-Tier (NYCSC)[c]	E-ZPass (NYCSC)[b]	TBM/ Non-NYCSC E-ZPass	Mid-Tier (NYCSC)[c]	E-ZPass (NYCSC)[b]	TBM/ Non-NYCSC E-ZPass	Mid-Tier (NYCSC)[c]	E-ZPass (NYCSC)[b]
Two-axle vehicles, including: Passenger vehicles, SUVs, station wagons, self-propelled mobile homes, ambulances, hearses, vehicles with seating capacity of not more than 15 adult persons (including the driver) and trucks with maximum gross weight of 7,000 lbs. and under	$10.17	$8.36	$6.55	$7.50	$4.62	$3.00	$5.09	$3.77	$2.45
Each additional axle costs	4.28	4.28	4.28	3.21	3.21	3.21	3.21	3.21	3.21
The following reduced rate prepaid charges are presently available for the two-axle vehicles referenced above:									
Charge per crossing for E-Tokens							3.39[d]		
Charge per crossing for E-Tokens for registered Rockaway Peninsula/Broad Channel Residents using an eligible vehicle							2.20[d]		
Registered Rockaway Residents using an eligible vehicle									1.60[e]
Charge per crossing for registered Staten Island Residents using an eligible vehicle			3.68[d]						
Charge per crossing for VNB for registered Staten Island Residents using an eligible vehicle through paying with E-Tokens --	5.24[d]								
All two-axle vehicles greater than 7,000 lbs. and buses (other than franchise buses and motor homes)	20.35	16.10	11.84	(f)			10.17	8.05	5.92
3 Axle	33.51	26.46	19.40				16.76	13.23	9.70
4 Axle	41.89	33.35	24.80				20.94	16.67	12.40
5 Axle	55.05	43.69	32.33		(f)	(f)	27.53	21.85	16.17
6 Axle	63.43	50.58	37.72				31.72	25.29	18.87
7 Axle	78.98	62.12	45.25				39.49	31.06	22.63
Each additional axle above 7	11.97	9.77	7.56				5.99	4.88	3.78
Two-axle franchise buses	9.90	7.32	4.74				4.82	3.60	2.37
Three-axle franchise buses	10.98	8.31	5.63				5.62	4.30	2.97
Motorcycles	4.28	3.57	2.85	4.28	3.17	2.05	4.28	3.17	2.05
Each additional axle	1.80	1.75	1.70	1.80	1.75	1.70	1.80	1.75	1.70

Notes:

(a) Split tolling was implemented at the Verrazzano-Narrows Bridge on December 1, 2020.

(b) E-ZPass crossing charges apply to NYCSC E-ZPass customers only when using their properly mounted NYCSC E-ZPass tag; customers of other E-ZPass CSCs are charged the TBM toll. Any motorist, regardless of residence, can obtain a NYCSC transponder.

(c) Mid-Tier crossing charges apply to NYCSC E-ZPass customers only when not using their properly Mounted NYCSC E-ZPass tag; For crossing charges posted to NYCSC E-ZPass accounts based on license plates; and for NYCSC third-party account providers.

(d) Tolls are charged per transaction for E-Tokens using a registered E-ZPass tag.

(e) Effective April 1, 2012, eligible Rockaway Peninsula and Broad Channel residents ("Rockaway Residents") using E-ZPass at the Cross Bay Bridge (CBB) receive a full rebate of the Rockaway Resident E-ZPass toll from the MTA. It is likely that the MTA will continue the CBB rebate program at its current level only if there is sufficient funding to do so. Should there not be sufficient funding to continue the CBB rebate program at its current level, the rebate program would likely revert to the level that existed prior to April 1, 2012, where Rockaway Residents paid the Rockaway Resident E-ZPass toll for the first two trips and received the rebate only for subsequent trips taken during a calendar day using the same E-ZPass tag.

(f) Passage prohibited except with NYCDOT permit.

Passenger Car Tolls

As noted, TBTA crossings are separated into three categories for toll pricing structure purposes: major crossings, minor crossings, and the Henry Hudson Bridge. The single trip passenger car TBM toll is $10.17 for the major crossings. The minor crossing passenger car TBM toll is $5.09 on the Marine Parkway and Cross Bay Bridges, which is half the level ($10.17) of those on the major crossings. On the Henry Hudson Bridge, the passenger car toll is $7.50 for TBM customers. All tolls are collected in each direction. As of December 1, 2020, the Verrazzano-Narrows Bridge implemented split tolling, with one-way and round-trip toll rates matching those at other major crossings. Starting in 1986, tolls at the Verrazzano-Narrows Bridge were only collected in the westbound (Staten Island-bound) direction in accordance with Section 324(a) of the federal Department of Transportation and Related Appropriations Act of 1986. In December 2019, Section 126 of the federal Further Consolidated Appropriations Act, 2020 eliminated this one-way tolling and restored split tolling.

As noted earlier in this report, on April 11, 2021, TBTA implemented a Mid-Tier toll rate for NYCSC E-ZPass customers with improperly mounted E-ZPass tags. The single trip passenger car NYCSC Mid-Tier toll is $8.36 for the major crossings. The minor crossing passenger car NYCSC Mid-Tier toll is $3.77 on the Marine Parkway and Cross Bay Bridges. On the Henry Hudson Bridge, the passenger car NYCSC Mid-Tier toll is $4.62.

Tolls for passenger cars are reduced by TBTA under the following programs: (1) NYCSC E-ZPass; (2) E-Tokens required by Sections 553-f, 553-h, and 553-i of the New York Public Authorities Law; (3) place of residence/crossing used; (4) place of residence; and (5) some combination of the foregoing. The MTA also has toll rebate programs for certain eligible residents using NYCSC E-ZPass at the Cross Bay and Verrazzano-Narrows Bridges. MTA reimburses TBTA in full for these rebates with a combination of its own funds, New York State appropriated funds, and the Outer Borough Transportation Account ("OBTA") created in 2018 under Public Authorities Law Section 1270-i. Beginning in 2020, the OBTA provides rebates to Queens residents using the Cross Bay Bridge and Bronx residents crossing the Henry Hudson Bridge, and partly funds the Staten Island Resident rebate at the Verrazzano-Narrows Bridge as described in greater detail below under the heading, "Outer Borough Transportation Account Rebates."

Nonstop Cashless Tolling has been implemented at all TBTA crossings, enabling a free flow of traffic past overhead gantries that include vehicle classification equipment, license plate image cameras and E-ZPass sensors. For vehicles without an E-ZPass, a TBM invoice is sent to the vehicle's registered owner. Under the current toll schedule, passenger cars equipped with a properly mounted NYCSC E ZPass tag receive a $3.62 reduction per trip at all major crossings, a $2.64 reduction at the Cross Bay and Marine Parkway Bridges, and a $4.50 reduction at the Henry Hudson Bridge when compared to the standard, undiscounted rate. Passenger cars with NYCSC E-ZPass accounts but improperly mounted or missing tags are subject to the Mid-Tier toll rate and receive a lower toll rate reduction: a $1.81 reduction per trip at major crossings, a $1.32 reduction at the Cross Bay and Marine Parkway Bridges, and a $2.88 reduction at the Henry Hudson Bridge. Passenger cars equipped with a transponder not issued by the NYCSC pay the same standard,

undiscounted toll rate as TBM customers. It should be noted that any motorist, regardless of residence, can obtain a NYCSC transponder and avail themselves of the E-ZPass discounts.

Resident Toll Discounts for Passenger Cars

TBTA provides toll discounts to Rockaway Residents on the Cross Bay and Marine Parkway Bridges and registered residents of Staten Island ("Staten Island Residents") on the Verrazzano-Narrows Bridge by means of resident E-Tokens and NYCSC E- ZPass. Under the current toll schedule, eligible Rockaway Residents paying with an E-Token using a registered E-ZPass tag receive a $1.70 reduction per trip at the Cross Bay and Marine Parkway Bridges. Rockaway Residents using a registered Rockaway Resident E-ZPass tag receive a $3.49 reduction per trip at the Cross Bay and Marine Parkway Bridges. Eligible Staten Island Residents paying with an E-Token using a registered E-ZPass tag receive a $4.93 reduction per trip at the Verrazzano-Narrows Bridge.

Tolls for Vehicles over 7,000 Pounds

The toll charges for vehicles over 7,000 pounds are a function of the number of axles as well as the crossing used. For the major crossings, the present TBM rate for these vehicles is $20.35 for two axles, increasing to $78.98 for a seven-axle vehicle. These vehicles receive a reduction of approximately 42 percent with a properly mounted NYCSC E-ZPass and a 21 percent reduction in the Mid-Tier category. Vehicles with more than seven axles pay a TBM rate of $11.97 for each additional axle over seven, a properly mounted NYCSC E-ZPass rate of $7.56 for each additional axle over seven, and a Mid-Tier rate of $9.77 for each additional axle over seven. Vehicles with three to six axles pay varying rates, which increase with the number of axles, as shown in Table 1.

For the minor crossings, the two-axle TBM rate for vehicles over 7,000 pounds is $10.17, increasing to $39.49 for a seven-axle vehicle. These vehicles presently receive a reduction of approximately 42 percent with a properly mounted NYCSC E-ZPass tag and a 21 percent reduction in the Mid-Tier category. Vehicles with three to six axles pay varying rates, which increase with the number of axles, as shown in Table 1. Vehicles with more than seven axles pay a TBM rate of $5.99 for each additional axle over seven, a properly mounted NYCSC E-ZPass rate of $3.78 for each additional axle over seven, and a Mid-Tier rate of $4.88 for each additional axle over seven. Commercial vehicles are not permitted on the Henry Hudson Bridge without a NYCDOT permit.

The MTA also has a partial toll rebate program for NYCSC E-ZPass business and commercial customers using eligible vehicles at the Verrazzano-Narrows Bridge. As of April 11, 2021, this partial rebate is 15 percent of tolls transacted on eligible vehicles.

MTA's Toll Rebate Programs

Toll rebate programs have been and remain available for: (1) registered Rockaway Residents for use of the Cross Bay Bridge; (2) Staten Island Residents participating in the Staten Island Resident ("SIR") E-ZPass discount program (the "SIR Rebate Program") for use of the Verrazzano-Narrows Bridge; and (3) commercial vehicles participating in the Verrazzano-Narrows Bridge Commercial Rebate Program ("VNB Commercial Rebate Program" and, together with the SIR Rebate Program, the "VNB Rebate Programs"). In this section there is a discussion of the two toll rebate

programs approved by the MTA Board in December 2019 for Queens residents over the Cross Bay Bridge and Bronx residents over the Henry Hudson Bridge. The MTA toll rebate programs are available only to residents with registered NYCSC E-ZPass tags, and to commercial vehicles with more than 20 trips per month across the Verrazzano-Narrows Bridge using the same NYCSC E-ZPass account. These rebate programs do not affect TBTA revenues since TBTA collects the full toll, with a portion paid by the motorist and the remainder paid by the MTA with a combination of its own funds and New York State funds.

Cross Bay Bridge Rebate Program

A toll rebate program for the benefit of E-ZPass customers who are Rockaway Residents was implemented by the MTA on January 1, 1998, for use on the Cross Bay Bridge. This program was modified from July 23, 2010, to March 31, 2012, during which eligible Rockaway Residents were charged the reduced resident toll rate for the first two trips over the Cross Bay Bridge and only subsequent trips during the same calendar day using the same E-ZPass tag were eligible for the rebate. The full rebate was restored on April 1, 2012. In May 2021, the MTA reimbursed the TBTA approximately $4.0 million in toll rebates relating to the Cross Bay Bridge rebate program. In February 2022, the MTA reimbursed the TBTA approximately $4.0 million in toll rebates relating to the Cross Bay Bridge rebate program.

Verrazzano-Narrows Bridge Rebate Programs

Since 2014, MTA has had two toll rebate programs at the Verrazzano-Narrows Bridge: the SIR Rebate Program, available for residents of Staten Island participating in the SIR E-ZPass toll discount plan, and the VNB Commercial Rebate Program, available for commercial vehicles making more than ten trips per month using the same NYCSC E-ZPass account. Since they are partially funded by the State, the VNB Rebate Programs follow the New York State Fiscal Year.

In December 2019, the federal Further Consolidated Appropriations Act 2020 was enacted, eliminating the one-way tolling requirement at the Verrazzano-Narrows Bridge and restoring split tolling so that tolls could be collected in the Staten Island-bound and Brooklyn-bound directions, this was implemented on December 1, 2020. In March 2020, the MTA Board approved changing the method of toll collection at the Verrazzano-Narrows Bridge to split tolling and authorized TBTA to make the required revisions to the toll schedule regulation under the New York State Administrative Procedure Act. As a result, the SIR Rebate Program was changed so that the effective, post-rebate toll for Staten Island residents was $2.75 in each direction (from $5.50 in the Staten Island-bound direction) and the VNB Commercial Rebate Program's eligibility threshold was changed to more than 20 trips per month in either direction for trucks and other commercial vehicles using the same NYCSC E-ZPass account (from ten trips a month, collected Staten-Island bound). In February 2021, the MTA Board adopted increases in the SIR resident discount toll and eliminated the minimum trip threshold so that the resident toll would increase to $3.68 (from $3.44). The State, in the fiscal year 2021-22 budget, appropriated additional funding to keep the effective toll after rebate at $2.75, increasing the rebate to $0.93 (from $0.69).

As a result of the change to the SIR resident toll and MTA rebate program, the projected annualized cost of the 2021-2022 VNB Rebate Program is approximately $33.4 million with $7.0

million for the 2021-2022 VNB Commercial Rebate Program and $26.4 million for the 2021-2022 SIR Rebate Program. The MTA's annual contribution is $7.0 million ($3.5 million for the resident rebate and $3.5 million for the commercial rebate), with the balance provided by the State's contribution via appropriations to MTA.

The money to fund a year's estimated costs for the VNB Rebate Programs is transferred by MTA to TBTA during the New York State Fiscal Year. The 2022-2023 VNB Rebate Programs will be implemented as specified herein only for such periods during which both (a) MTA's total financial responsibility, net of New York State actions or available offsets, does not exceed $7 million for the 2022-2023 SIR Rebate and VNB Commercial Rebate Programs and (b) New York State provides (i) at least $7 million for the 2022-2023 SIR Rebate Program and VNB Commercial Rebate Program and (ii) New York State provides such additional funds as are necessary to keep the effective post-rebate SIR E-ZPass toll at $2.75 under the 2022-2023 SIR Rebate Program. If, as a result of unexpected toll transaction activity, TBTA estimates that such MTA and State funds allocated to MTA for the 2022-2023 VNB Rebate Programs, net of offsets, will be insufficient to fund the 2022-2023 VNB Commercial Rebate Program for the full program year, TBTA may reduce the rebate amount under such program to a percentage that is forecast to be payable in full for the remainder of the program year with the available funds, as allowed by the February 2021 MTA Board resolution. However, in the event that such MTA and State funds allocated to MTA for the 2022-2023 VNB Rebate Programs are fully depleted at any time during the 2022-2023 VNB Rebate Programs annual period, the 2022-2023 VNB Rebate Programs will cease, and Staten Island residents will be charged the applicable resident discount toll and trucks and other commercial vehicles will be charged the applicable NYCSC E-ZPass toll for the Verrazzano-Narrows Bridge.

The VNB Rebate Programs will continue into future years provided that (a) MTA's annual period contribution does not exceed $7 million, (b) the MTA Board approves a budget that includes MTA's contribution to such program, and (c) New York State provides to MTA funds sufficient for at least half the expenses of each continuing annual period.

Under the 2021-2022 SIR Rebate Program, for Staten Island Residents crossing the Verrazzano-Narrows Bridge, MTA will rebate $0.93 of the $3.68 SIR E-ZPass toll paid in each direction. As a result of these MTA toll rebates and due to an appropriation in the New York State Fiscal Year 2021-22 enacted budget, Staten Island residents will pay an effective post-rebate toll of $2.75 per trip under the current SIR toll rates collected at the VNB starting on April 11, 2021.

Under the 2022 2023 SIR Rebate Program, for Staten Island Residents crossing the Verrazzano Narrows Bridge, MTA will rebate $0.93 of the $3.68 SIR E ZPass toll paid in each direction. As a result of these MTA toll rebates and due to an appropriation in the New York State Fiscal Year 2022 23 enacted budget, Staten Island residents will pay an effective post rebate toll of $2.75 per trip under the current SIR toll rates collected at the VNB from April 1, 2022, through March 31, 2023.

Under the 2020-2021 VNB Commercial Rebate Program, the rebate was 15 percent of the E-ZPass toll for trucks and other commercial vehicles with more than twenty trips per month (after implementation of split tolling) across the Verrazzano-Narrows Bridge, using the same NYCSC E-ZPass Account and the $7 million allocation was sufficient in covering the cost of the rebate.

Under the 2022-2023 VNB Commercial Rebate Program, the rebate is 15 percent of the E-ZPass toll for trucks and other commercial vehicles with more than twenty trips per month across the Verrazzano-Narrows Bridge, using the same NYCSC E-ZPass Account. Implementing a 15 percent rebate of the E-ZPass toll for trucks and other eligible commercial vehicles is expected to ensure that the $7 million allocated for the 2022-2023 VNB Commercial Rebate Program is sufficient to provide funding from April 1, 2022, through March 31, 2023.

Outer Borough Transportation Account Rebates

Henry Hudson Bridge Bronx Resident Rebate Program and Cross Bay Bridge Queens Resident Rebate Program

Two new MTA toll rebate programs relating to MTA Bridges and Tunnels' crossings were approved by the MTA Board in December 2019. They are (i) a Queens resident rebate for passenger vehicles with E-ZPass tags using the Cross Bay Bridge, and (ii) a Bronx resident rebate for passenger vehicles with E-ZPass tags using the Henry Hudson Bridge. In each case, the E-ZPass toll will be charged to the customer's NYCSC resident E-ZPass account, and then an immediate credit will be issued by the MTA for the amount of the toll using funds in the OBTA established under Section 1270-i (3) of the Public Authorities Law. Due to the impacts of the pandemic on traffic, the funding for these rebate programs was not available in 2020-2021 and implementation of the two rebate programs has been delayed until a future date when OBTA funds may become available.

Cashless Tolling System

The E-ZPass Electronic Toll Collection ("ETC") system has been fully installed at all TBTA bridges and tunnels since December 1996. When a vehicle with an E-ZPass tag enters the toll payment area, an electronic reader identifies the tag code at the toll facility and the toll is deducted from the customer's account. TBTA had over 5.953 million E-ZPass tags in use in 2020 (compared to 5.826 million in December 2019). As of December 2021, E-ZPass participation rates were 95.0 percent of toll-paying traffic TBTA-wide. The total number of active E-ZPass Group tags in use for all participating agencies as of December 31, 2021, was over 49.0 million.

With the introduction of E-ZPass at all TBTA crossings, toll plaza operations improved, and vehicle-hours of delay were reduced. This, in turn, led to even more motorists enrolling in E-ZPass. With the implementation of Cashless Tolling at all TBTA facilities by fall 2017 and the subsequent removal of TBTA toll plazas, throughput capacity increased to levels comparable to the capacity of a free-flowing lane of traffic (about 1,800 vehicles per hour).

Table 2 lists the year-end TBTA-wide E-ZPass participation rates starting in 2012, the sixteenth year since all nine crossings had E-ZPass in operation. Implementation of E-ZPass started in October 1995 on the Verrazzano-Narrows Bridge and was phased in gradually on the remaining crossings through December 1996. Also shown are the participation rates for each of the facilities for December 2021.

As Cashless Tolling was fully implemented by the end of 2017, E-ZPass participation rates increased considerably, with the year-end TBTA-wide E-ZPass participation rate increasing by 7.4 percent

from 2016 to 2017. This change was far greater than the 0.8 percent decrease to 2.3 percent increase year-end over year-end experienced TBTA-wide over the rest of the previous 10-year period. In 2021, there was a 0.3 percent increase in year-end TBTA-wide E-ZPass participation rates compared to 2020. E-ZPass participation rates continue to be above 90 percent at each facility.

Table 2 Year-End E-ZPass Participation Rates

Year	Year-End E-ZPass Participation Rates for all TBTA Facilities									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Percent Participation (All TBTA Facilities)	81.5%	83.8%	84.5%	85.6%	86.2%	93.6%	94.6%	95.5%	94.7%	95.0%
TBTA Facility	Year-End TBTA E-ZPass Participation Rate by Facility (2021)									
	Throgs Neck	Bronx-Whitestone	Robert F. Kennedy	Queens Midtown	Hugh L. Carey	Verrazzano-Narrows	Henry Hudson	Marine Parkway	Cross Bay	
Percent Participation	94.0%	93.6%	94.6%	95.8%	96.2%	95.7%	95.2%	96.9%	95.8%	

Source: TBTA data.

TBTA's Role in E-ZPass

TBTA was a founding member of the E-ZPass Group. Originally comprised of toll authorities in Delaware, Pennsylvania, New Jersey, and New York, the E-ZPass Group now encompasses 35 toll agencies in 19 states, including five international border crossings. Since the inception of the E-ZPass Group more than 20 years ago, customers of the member E-ZPass Group agencies have been able to use their E-ZPass tags on any E-ZPass-equipped facility operated by another E-ZPass Group member. In 2021, the E-ZPass Group processed over 3.6 billion toll transactions. As the E-ZPass Group has grown, the E-ZPass customer base has increased, helping to increase usage of E-ZPass on TBTA facilities.

The transportation network includes, in addition to TBTA, the following agencies and bridges:

- The six interstate crossings of the Port Authority;
- New Jersey Turnpike and Garden State Parkway operated by the New Jersey Turnpike Authority;
- New York State Thruway including the Governor Mario M. Cuomo Bridge (formerly the Tappan Zee Bridge);
- The five bridges of the New York State Bridge Authority (from Bear Mountain northward);
- The Buffalo and Fort Erie Public Bridge Authority's Peace Bridge;
- The Thousand Island Bridges of the Thousand Island Bridge Authority;
- The three bridges of the Niagara Falls Bridge Commission;
- The Atlantic City Expressway (operated by the South Jersey Transportation Authority);

- The four toll bridges between New Jersey and Pennsylvania operated by the Delaware River Port Authority;
- The seven toll bridges between New Jersey and Pennsylvania operated by the Delaware River Joint Toll Bridge Commission;
- The Delaware Memorial Bridge between New Jersey and Delaware operated by the Delaware River and Bay Authority; and
- The two toll bridges between New Jersey and Pennsylvania operated by the Burlington County Bridge Commission.

Also included are the toll facilities operated by the following agencies and companies across the United States:

- Cape May County Bridge Commission (New Jersey)
- Central Florida Expressway Authority
- Cline Avenue Bridge (Chicago)
- Delaware Department of Transportation
- The Florida Turnpike Enterprise
- Illinois State Toll Highway Authority
- Indiana Toll Road Concession Company, LLC
- Kane County Department of Transportation (Illinois)
- Kentucky Public Transportation Infrastructure Authority
- Maine Turnpike Authority
- Massachusetts Department of Transportation
- Maryland Transportation Authority
- Minnesota Department of Transportation
- New Hampshire Department of Transportation
- North Carolina Turnpike Authority
- Ohio Turnpike and Infrastructure Commission
- The Pennsylvania Turnpike Commission
- Rhode Island Turnpike and Bridge Authority
- State Roads and Toll Authority (Georgia)
- Skyway Concession Company (Chicago)
- Virginia Department of Transportation
- West Virginia Parkway Authority

With the exception of TBTA customers enrolled in the E-ZPass Pay Per Trip plan[1], all TBTA E-ZPass customers must pre-pay their E-ZPass accounts. These pre-payments are based on a customer's E-ZPass usage at both TBTA and other E-ZPass Group member toll facilities. Through the E-ZPass Group inter-operability agreements, TBTA and other member agencies transfer E-ZPass payments to each other on a routine basis. For 2021, TBTA transferred $1.2 billion to, and received $656.1 million from, other members within the E-ZPass Group.

[1] This plan enables customers to set up an E-ZPass account without a pre-paid balance. Those interested in the program pay for their tolls each day through Automated Clearing House deductions from their checking accounts.

Cashless, Open Road Tolling ("Cashless Tolling")

TBTA completed full implementation of Cashless Tolling on September 30, 2017. Cashless Tolling eliminates traditional toll plazas by allowing tolls to be collected in a free-flow environment through E-ZPass sensors and license-plate cameras mounted on overhead gantries. Drivers without E-ZPass receive a TBM invoice mailed to the vehicle's registered owner.

In spring 2016, TBTA began asking the DMV to suspend the vehicle registrations of violators who fail to pay their tolls and violation fees or have them dismissed or transferred in response to violation notices for five toll violations within 18 months, in accordance with the initial DMV regulation for persistent or habitual toll violators. In January 2017, the DMV changed its regulation for persistent or habitual violators so that vehicle registrations can be suspended for three toll violations within five years and commercial vehicle registrations can be suspended for $200.00 or more in unpaid tolls within five years.

TBTA employs and develops measures to enhance collection and enforcement of tolls under the Cashless Tolling system. License plate recognition technology on gantries and in patrol vehicles is used for the detection of persistent toll violators and toll violation enforcement. Additionally, TBTA continues to issue exclusion orders barring the vehicles of out-of-state toll violation scofflaws from TBTA facilities and for those persistent violators, engages in summonsing vehicle operators and towing those vehicles from TBTA facilities.

In April 2017, the New York State DMV received legislative authorization to enter into reciprocal compacts with other states to suspend the vehicle registrations of persistent toll violators. This allows MTA Bridges and Tunnels to have the home states of the out-of-state violators suspended, or place holds on vehicle registrations for toll violations committed on MTA Bridges and Tunnels' facilities. MTA Bridges and Tunnels entered into such an agreement with Massachusetts and began submitting registration hold packages to the Massachusetts Registry of Motor Vehicles in February 2020 to place holds on the registrations of toll-evading Massachusetts owners. In time, MTA Bridges and Tunnels anticipates being able to discontinue issuing exclusion orders to out-of-state toll violators barring their vehicles from MTA Bridges and Tunnels facilities.

TBTA has continually undertaken efforts to increase E-ZPass market share and to assist customers in managing toll bill payments and E-ZPass accounts. The "Tolls NY" is a smartphone application (app), which had a soft launch in mid-June 2020 and was officially launched in December 2020 through a TBTA press release, highlighting the functionality available to E-ZPass and TBM customers for managing their accounts. As of the end of 2021, there were more than 1.4 million installations of Tolls NY.

Passenger Car Toll Rate Trends and Inflation

Since 1971, toll rates have increased periodically on the TBTA facilities. Table 3 displays passenger car toll rates for the nine TBTA bridges and tunnels over the past 50 years. Tolls are shown for cash passenger car transactions from 1971 to implementation of Cashless Tolling at each facility and TBM transactions thereafter and for all E-ZPass transactions from 1996, when E-ZPass was introduced on the TBTA system, until July 12, 2009. Effective July 12, 2009, only NYCSC E-ZPass customers are eligible for the lower E-ZPass rate and non-NYCSC E-ZPass customers paid the TBM toll rate. From 2009 through 2020, Table 3 shows the cash or TBM rate and the NYCSC E-ZPass rate on each of the TBTA's facilities. Beginning in 2021, Table 3 shows the cash or TBM rate, the NYCSC E-ZPass rate, and the Mid-Tier toll rate on each of the TBTA's facilities.

Passenger Car Toll Rate Trends

Since 1982, passenger car toll rates have been separated into four categories, as follows:

- Major crossings – RFK, Bronx-Whitestone, and Throgs Neck Bridges, and the Queens Midtown and Hugh L. Carey Tunnels;
- Minor crossings – Marine Parkway and Cross Bay Bridges;
- Henry Hudson Bridge (treated as a minor crossing prior to the 2008 toll increase) – a crossing restricted to passenger vehicles; and
- Verrazzano-Narrows Bridge – a major crossing with one-way toll collection from 1986 through November 30, 2020. Split tolling was implemented on December 1, 2020.

In general, tolls for vehicles over 7,000 pounds have also been adjusted upward when passenger car toll rates were increased. Notable exceptions occurred in 1987 and 1989 when these toll rates were not raised while there was a general increase for passenger cars.

Over the years, TBTA has implemented various resident toll discount programs at the Cross Bay, Marine Parkway, and Verrazzano-Narrows Bridges. The MTA also has toll rebate programs for certain eligible residents using NYCSC E-ZPass at the Cross Bay and Verrazzano-Narrows Bridges, as well as a toll rebate program for eligible NYCSC E-ZPass commercial customers at the Verrazzano-Narrows Bridge. While the rebate programs do not have an effect on revenues, due to MTA reimbursements as noted above, the toll discount programs have a negative effect on revenues, in part offset by a positive effect on traffic by attracting additional traffic to the facilities.

Table 3 Historical Trends in Cash, TBM and E-ZPass Passenger Car Toll Rates

Year	Verrazzano-Narrows Bridge	RFK, Bronx-Whitestone and Throgs Neck Bridges, and Queens Midtown and Hugh L. Carey Tunnels[a]	Henry Hudson Bridge	Marine Parkway-Gil Hodges Memorial and Cross Bay Veterans Memorial Bridges
1971	$0.50	$0.25	$0.10	$0.10
1972 – 1975	$0.75	$0.50	$0.25	$0.25
1975 – 1980	$1.00	$0.75	$0.50	$0.50
1980 – 1982	$1.00	$1.00	$0.60	$0.75
1982 – 1984	$1.25	$1.25	$0.90	$0.90
1984 – 1986	$1.50	$1.50	$0.90	$0.90
1986 – 1987	$1.75[b]	$1.75	$1.00	$1.00
1987 – 1989	$2.00[b]	$2.00	$1.00	$1.00
1989 – 1993	$2.50[b]	$2.50	$1.25	$1.25
1993 – 1996	$3.00[b]	$3.00	$1.50	$1.50
1996 – 2003[c]	$3.50 / $3.00[b]	$3.50 / $3.00	$1.75 / $1.25	$1.75 / $1.25
2003 – 2005	$4.00 / $3.50[b]	$4.00 / $3.50	$2.00 / $1.50	$2.00 / $1.50
2005 – 2008	$4.50 / $4.00[b]	$4.50 / $4.00	$2.25 / $1.75	$2.25 / $1.50
2008	$5.00 / $4.15[b]	$5.00 / $4.15	$2.75 / $1.90	$2.50 / $1.55
2009[d]	$5.50 / $4.57[b]	$5.50 / $4.57	$3.00 / $2.09	$2.75 / $1.71
2010 – 2013[f]	$6.50 / $4.80[b]	$6.50 / $4.80	$4.00 / $2.20[e]	$3.25 / $1.80
2013-2014[g]	$7.50 / $5.33[b]	$7.50 / $5.33	$5.00 / $2.44	$3.75 / $2.00
2015-2016[h]	$8.00 / $5.54[b]	$8.00 / $5.54	$5.50 / $2.54	$4.00 / $2.08
2017-2018[i]	$8.50 / $5.76[b][l]	$8.50 / $5.76[l]	$6.00 / $2.64[l]	$4.25 / $2.16[l]
2019-2020[j]	$9.50 / $6.12[b]	$9.50 / $6.12	$7.00 / $2.80	$4.75 / $2.29
2020-2022[k]	$10.17 / $8.36 / $6.55[m]	$10.17 / $8.36 / $6.55	$7.50 / $4.62 / $3.00	$5.09 / $3.77 / $2.45

Notes:
(a) At the Hugh L. Carey Tunnel, the cash passenger car toll rates were $0.35 in 1971 and $0.70 in 1972.
(b) From March 20, 1986, through November 30, 2020, round-trip tolls (twice the amount shown) were collected on the Verrazzano-Narrows Bridge in only the westbound direction. During this period of time, eastbound traffic used the bridge toll-free. Amounts shown were the equivalents of collecting tolls in each direction. Split tolling began at the Verrazzano-Narrows Bridge on December 1, 2020. The toll is no longer doubled in the westbound direction and tolls are collected in each direction of travel.
(c) E-ZPass introduced to all TBTA facilities in December 1996. For the periods 1996-2003 through 2020, the cash/TBM toll rate is shown first, followed by the E-ZPass rate.
(d) Effective July 12, 2009, when the lower E-ZPass rate became available only to NYCSC E-ZPass customers.
(e) Beginning November 10, 2012, customers without E-ZPass tags at the Henry Hudson Bridge paid via the TBM program. Full Cashless Tolling began at the Henry Hudson Bridge in November 2016.
(f) Toll increase effective December 30, 2010.
(g) Toll increase effective March 3, 2013.
(h) Toll increase effective March 22, 2015.
(i) Toll increase effective March 19, 2017.
(j) Toll increase effective March 31, 2019.
(k) Toll increase effective April 11, 2021, with Mid-Tier toll introduced. The TBM/non-NYSCS E-ZPass toll rate is shown first, followed by the Mid-Tier rate, and then E-ZPass NYCSC rate.
(l) Customers without E-ZPass tags receive toll bills under the TBM program. Cash collection was eliminated when Cashless Tolling was implemented in 2017 at the Queens Midtown and Hugh L. Carey Tunnels in January, at the Cross Bay and Marine Parkway Bridges in April, at the RFK Bridge in June, at the Verrazzano-Narrows Bridge in July and at the Bronx-Whitestone and Throgs Neck Bridges in September.
(m) Split tolling was implemented on the Verrazzano-Narrows Bridge on December 1, 2020.

Inflation

The Consumer Price Index Urban ("CPI-U"), compiled by the US Department of Labor, Bureau of Labor Statistics ("BLS") for United States Cities, is often used to compare toll rate increases. Since most of the transactions on TBTA facilities are made by customers using an E-ZPass tag registered with the NYCSC, we have compared cumulative CPI-U alongside the TBTA major crossing passenger car NYCSC E-ZPass toll rates. The comparison starts in 1996 when E-ZPass was instituted on TBTA facilities. As indicated in Table 4 TBTA E-ZPass tolls in April 2021 (after the April 11th toll increase) are 2.2 times higher than the 1996 E-ZPass toll rate while the CPI-U is 1.8 times higher than the 1996 level. If adjusted for changes in the CPI-U, current tolls are 1.3 times higher than the 1996 rate.

The beginning of 2022 had the highest inflation increase in several decades. In March 2022, the CPI-U was 305.0, a 4.3 percent increase over the annual 2021 CPI-U of 292.3. This was caused by several factors including supply chain constraints, labor shortages, and sharply higher gas prices.

Table 4 E-ZPass Passenger Toll Rates versus Consumer Price Index

Year	Consumer Price Index [a]	RFK, Bronx-Whitestone, Throgs Neck, and Verrazzano- Narrows [k] Bridges and Queens Midtown and Hugh L. Carey Tunnels	Tolls Adjusted to 1982 - 1984 dollars[b]
1996[c]	166.90	3.00	1.80
2003	197.80	3.50	1.77
2005	212.70	4.00	1.88
2008	235.80	4.15	1.76
2009[d]	236.80	4.57	1.93
2010[e]	240.90	4.80	1.99
2013[f]	256.80	5.33	2.08
2015[g]	260.60	5.54	2.13
2017[h]	268.50	5.76	2.15
2019[i]	278.20	6.12	2.20
2021[j]	286.50	6.55	2.29
Ratio 2021/1996	1.72	2.18	1.27

Notes:
(a) New York Metropolitan Statistical Area: New York–Northern New Jersey-Long Island, NY-NJ-CT-PA, All Urban Consumers, All Items. Base period: 1982-1984 = 100.0. Not seasonally adjusted. Source: BLS.
(b) The current toll divided by the CPI and expressed in dollars.
(c) E-ZPass introduced to all TBTA facilities in December 1996.
(d) Effective July 12, 2009, when the lower E-ZPass rate became available only to NYCSC E-ZPass customers.
(e) Effective December 30, 2010.
(f) Effective March 3, 2013.
(g) Effective March 22, 2015.
(h) Effective March 19, 2017.
(i) Effective March 31, 2019.
(j) Effective April 11, 2021.
(k) Split tolling was implemented on December 1, 2020.

HISTORICAL TRAFFIC, REVENUES AND EXPENSES AND ESTIMATED/BUDGETED NUMBERS FOR 2021

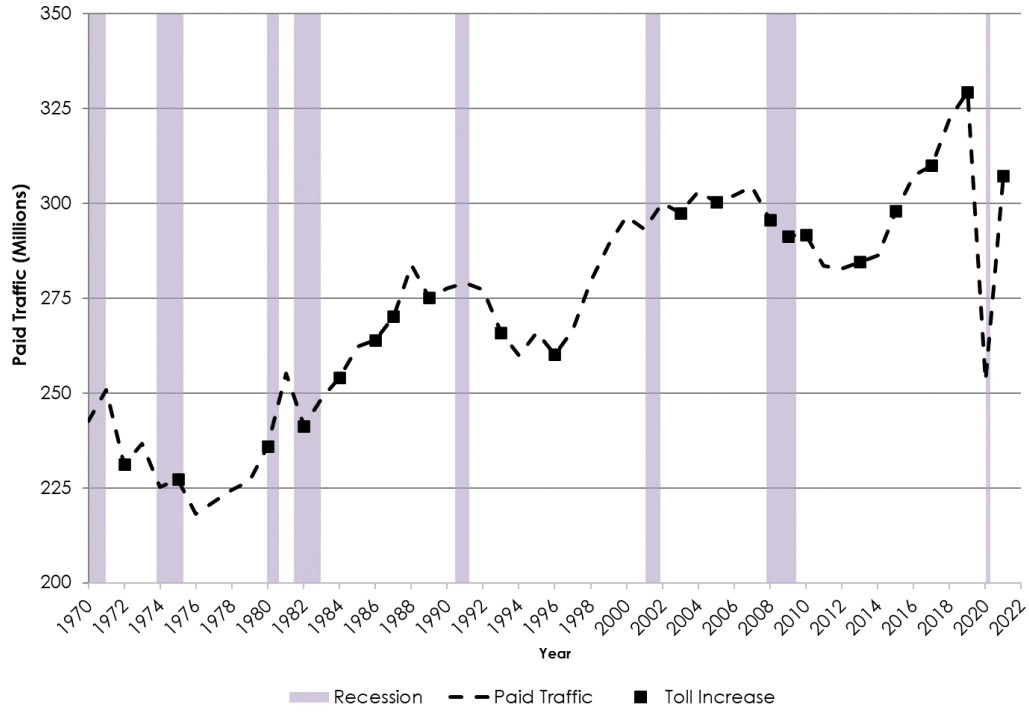
Historical traffic, toll revenues, and expenses were reviewed for the nine TBTA bridges and tunnels. Over the last 51 years from 1970 through 2021, paid traffic volumes on the crossings have ranged from a low of 218 million in 1976 to a high of 329 million in 2019. As displayed in Figure 2A/2B, the growth of traffic and revenue has been affected by the region's overall growth in population and employment, offset by the impact of 20 periodic toll increases (through the end of 2021 and represented by the boxes in the graph). By 2000, after 10 toll increases and 18 percent higher traffic volume, toll revenues had increased more than 13-fold, from $72 million in 1970 to $941 million in 2000. Revenues declined to $915 million in 2001 primarily due to the closures and restrictions on TBTA facilities following the September 11 terrorist attack on the World Trade Center and the regional decline in employment.

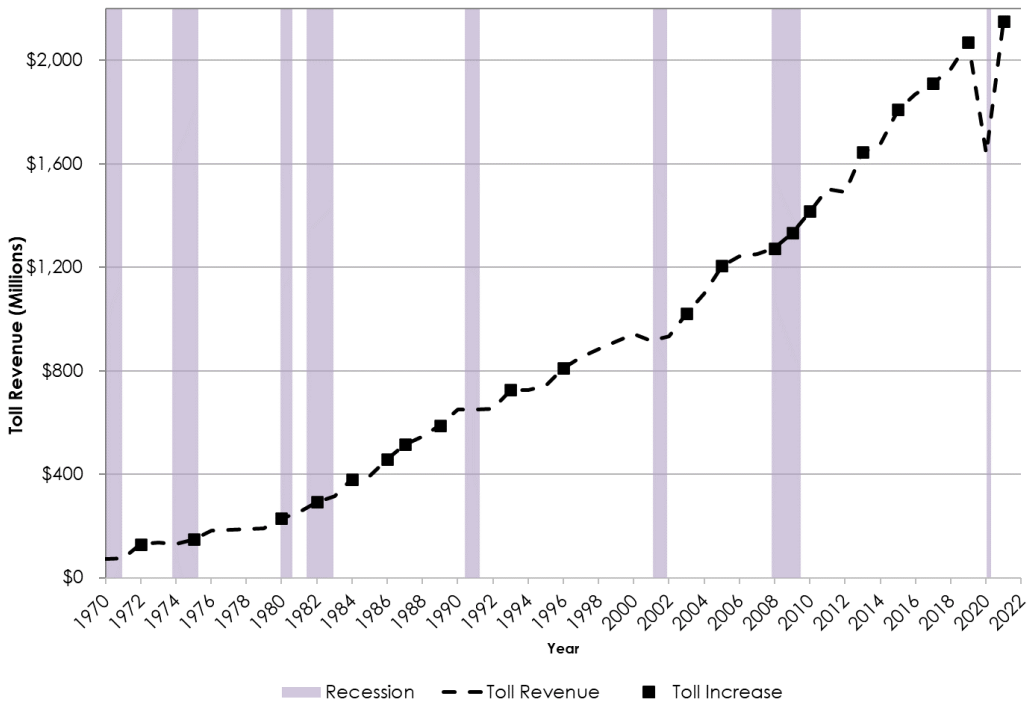
A toll increase in December 2010 resulted in increased annual revenue in 2011. In 2012, toll revenues were $1.491 billion, $11 million less than the 2011 level of $1.502 billion, primarily due to temporary closures caused by Superstorm Sandy, partially offset by modest improvements in the regional and national economies. Toll revenues in 2013 increased to $1.645 billion primarily due to the rebound from Superstorm Sandy and the March 2013 toll increase. In 2014, total toll revenues for the TBTA facilities were $1.676 billion, 1.9 percent higher than 2013 toll revenues. That increase in toll revenue was attributed to a continuing modest economic recovery and the March 2013 toll increase. Toll revenues in 2015 were $1.809 billion (7.9 percent higher than 2014 toll revenues) primarily due to the March 2015 toll increase, generally overall favorable weather conditions, relatively low gas prices, and a continued modest recovery in the economy. In 2016, these conditions continued resulting in traffic reaching a then historical high of 307 million vehicles, which was a 3.2 percent increase from the previous year. Toll revenues in 2016 were $1.870 billion, 3.4 percent higher than 2015 toll revenues. In 2017, with a toll increase in March, traffic surpassed the 2016 historical high with 310 million vehicles, a 0.9 percent increase from the previous year. Toll revenues in 2017 were $1.912 billion, 2.2 percent higher than 2016 toll revenues. In 2018, traffic continued to surpass the historical high with 322 million vehicles, a 4.0 percent increase from the previous year. Toll revenues in 2018 were $1.965 billion, 2.8 percent higher than 2017 toll revenues. In 2019, traffic continued to surpass the historical high with 329 million vehicles, a 2.2 percent increase from the previous year. Toll revenues in 2019 were $2.071 billion, 5.4 percent higher than 2018 toll revenues. In 2020, due to the impact of the pandemic, traffic dropped to 253 million vehicles, a 23.1 percent decrease from the previous year. Toll revenues in 2020 were $1.640 billion, 20.8 percent lower than 2019 toll revenues. Major regional toll facilities such as those operated by the Port Authority and Thruway have experienced similar trends in traffic reduction and recovery throughout the duration of the pandemic. In 2021, significant pandemic related traffic recovery occurred resulting in 307 million vehicles, a 21.4 percent increase from the previous year (6.7 percent below pre-pandemic 2019 traffic). Toll revenues in 2021 were $2.150 billion, 31.1 percent higher than 2020 toll revenue (3.8 percent above pre-pandemic 2019 toll revenues). The April 2021 toll increase contributed to this increase in toll revenue.

Also note in Figure 2A/2B that, prior to the onset of the pandemic, despite the periodic toll increases, the traffic trend through 2019 was generally upward. Tepid economic conditions (related to the 2008-2009 recession) led to modest declines in total transactions in the years through 2012. After 2012, even with the lingering effects of the 2008-2009 recession, the economy began to show positive signs of growth with increasing employment levels and decreases in gasoline prices, resulting in a return to transaction growth. Overall traffic at TBTA facilities continued to increase to historically high levels despite the periodic toll increases implemented in March 2013, March 2015, March 2017, and March 2019. Beginning in March 2020, the impact of the pandemic and associated government-imposed closures along with other actions caused significant decreases in traffic on all TBTA facilities. Although there has been some recovery in traffic, it has not returned to the historically high levels seen in the years immediately prior to the pandemic. According to the National Bureau of Economic Research, a recession began in February 2020 and lasted two months, concluding the longest economic expansion in US history. Overall traffic at TBTA facilities also increased even with the April 2021 toll increase, which occurred in the midst of the pandemic.

Other noticeable declines in traffic have occurred during the fuel crises of the 1970s and during the economic recessions in the late 1980s, early 1990s, all periods of difficult and prolonged economic downturns.

Figure 2A/2B Aggregated TBTA Facilities Paid Traffic and Toll Revenue, 1970 to 2021





Source: TBTA data.

Traffic and Toll Revenue, 2011 to 2021

Table 5 lists the traffic and toll revenue recorded for each of the nine TBTA crossings for the most recent 11-year time period, 2011-2021. Total TBTA traffic and toll revenue are shown in Table 6. Within this 11-year period toll-paying traffic reached historic peaks three times, first in 2017 with 310 million crossings, again in 2018 with 322 million crossings, and once more in 2019 with 329 million crossings. Due to the ongoing pandemic, toll-paying traffic decreased to 253 million crossings in 2020, followed by significant recovery to 307 million vehicles in 2021.

The first toll increase within this most recent 11-year time period occurred on March 3, 2013. In general, the historical pattern has been that when toll rates are increased, traffic declines slightly and then begins to rise until the next rate increase. However, TBTA traffic following the March 2013, March 2015, March 2017, March 2019, and April 2021 toll increases has not followed the typical historical pattern. Lower gasoline prices, among other factors, resulted in a 0.7 percent increase in traffic following the March 2013 toll increase, a 4.0 percent increase in traffic following the March 2015 toll increase, a 0.9 percent increase in traffic following the March 2017 toll increase, a 2.2 percent increase in traffic following the March 2019 toll increase, and a 21.4 percent increase in traffic following the April 2021 toll increase (which of course also included significant traffic recovery from the first year of the pandemic). The five toll increases reflected in Table 5 and Table 6 in 2013, 2015, 2017, 2019, and 2021 are evident in the jump in average tolls in the years following the increase. The historical relationship between toll increases and their effects on TBTA traffic volumes is further discussed in the Toll Impacts and Elasticity section of this report.

In 2011, traffic decreased by 2.8 percent from 291.7 million to 283.5 million whereas toll revenue increased by 6.0 percent from $1.417 billion to $1.502 billion. The reduction in toll traffic was a result of severe winter weather, high gas prices, Tropical Storm Irene in August 2011 (tolls were not collected for approximately two days at the Marine Parkway, Cross Bay, Verrazzano-Narrows, Throgs Neck, and Bronx-Whitestone Bridges) overall flat growth in travel (which occurred nationally in the few years following the Great Recession) and the December 2010 increase in toll rates, among other factors.

In 2012, traffic volumes decreased by 0.3 percent to 282.6 million and toll revenues decreased 0.7 percent to $1.491 billion. The reduction in toll traffic and toll revenue is primarily due to Superstorm Sandy, which occurred on October 29, 2012, and resulted in travel restrictions on transportation facilities in the New York City area.

In 2013, overall traffic volumes increased by 0.7 percent to 284.5 million and toll revenues increased by 10.3 percent to $1.645 billion as a result of the March 3, 2013, toll increase. Traffic and revenue continued to grow slightly in 2014 by 0.6 percent to 286.4 million. 2014 revenue grew by 1.9 percent to $1.676 billion.

Table 5 Annual Toll-Paying Traffic and Toll Revenue by Facility, 2011 to 2021

(000s)[a]

Year	Verrazzano-Narrows Bridge				RFK Bridge				Bronx-Whitestone Bridge			
	Traffic		Revenue	Average Toll[c]	Traffic		Revenue	Average Toll	Traffic		Revenue	Average Toll
	Volume[b]	Percent Change			Volume	Percent Change			Volume	Percent Change		
2011	66,020	-3.1%	$330,886	5.01	57,510	-4.3%	$339,791	5.91	37,643	-8.3%	$230,669	6.13
2012	65,626	-0.6%	$326,797	4.98	57,239	-0.5%	$336,781	5.88	39,478	4.9%	$240,236	6.09
2013	65,035	-0.9%	$352,370	5.42	58,224	1.7%	$376,769	6.47	39,558	0.2%	$264,174	6.68
2014	64,007	-1.6%	$345,466	5.40	59,902	2.9%	$393,622	6.57	38,488	-2.7%	$260,756	6.77
2015	66,215	3.5%	$372,347	5.62	62,227	3.9%	$422,756	6.79	42,062	9.3%	$294,022	6.99
2016	69,756	5.3%	$393,017	5.63	62,921	1.1%	$428,083	6.80	45,816	8.9%	$320,486	7.00
2017	71,922	3.1%	$416,459	5.79	63,810	1.4%	$437,335	6.85	46,023	0.5%	$327,320	7.11
2018	74,809	4.0%	$433,121	5.79	66,398	4.1%	$448,600	6.76	47,958	4.2%	$332,715	6.94
2019	76,102	1.7%	$454,303	5.97	66,880	0.7%	$461,797	6.90	49,561	3.3%	$350,778	7.08
2020	62,789	-17.5%	$386,978	6.16	50,416	-24.6%	$355,004	7.04	38,958	-21.4%	$282,204	7.24
2021	75,255	19.9%	$511,298	6.79	61,178	21.3%	$462,395	7.56	48,459	24.4%	$375,583	7.75

Year	Throgs Neck Bridge				Hugh L. Carey Tunnel				Queens Midtown Tunnel			
	Traffic		Revenue	Average Toll	Traffic		Revenue	Average Toll	Traffic		Revenue	Average Toll
	Volume	Percent Change			Volume	Percent Change			Volume	Percent Change		
2011	40,391	2.6%	$266,307	6.59	16,570	2.9%	$87,879	5.30	28,481	0.1%	$158,668	5.57
2012	39,376	-2.5%	$260,468	6.61	15,902	-4.0%	$83,814	5.27	27,759	-2.5%	$153,825	5.54
2013	39,958	1.5%	$291,433	7.29	16,547	4.1%	$95,549	5.77	27,850	0.3%	$168,982	6.07
2014	40,840	2.2%	$302,110	7.40	16,940	2.4%	$99,135	5.85	28,998	4.1%	$178,631	6.16
2015	42,189	3.3%	$324,702	7.70	17,655	4.2%	$106,881	6.05	28,697	-1.0%	$182,382	6.36
2016	43,245	2.5%	$335,732	7.76	17,961	1.7%	$109,250	6.08	26,824	-6.5%	$171,121	6.38
2017	43,694	1.0%	$344,882	7.89	17,510	-2.5%	$105,649	6.03	25,065	-6.6%	$158,683	6.33
2018	44,347	1.5%	$344,565	7.77	18,799	7.4%	$113,395	6.03	27,552	9.9%	$173,021	6.28
2019	44,182	-0.4%	$356,533	8.07	19,421	3.3%	$121,645	6.26	30,344	10.1%	$199,624	6.58
2020	34,277	-22.4%	$293,274	8.56	14,786	-23.9%	$93,783	6.34	19,875	-34.5%	$134,251	6.75
2021	37,556	9.6%	$345,622	9.20	19,308	30.6%	$132,409	6.86	26,006	30.8%	$190,332	7.32

Year	Henry Hudson Bridge				Marine Parkway-Gil Hodges Memorial Bridge				Cross Bay Veterans Memorial Bridge			
	Traffic		Revenue	Average Toll	Traffic		Revenue	Average Toll	Traffic		Revenue	Average Toll
	Volume	Percent Change			Volume	Percent Change			Volume	Percent Change		
2011	22,185	-3.8%	$59,246	2.67	7,523	-4.0%	$14,003	1.86	7,148	-6.3%	$14,139	1.98
2012	21,939	-1.1%	$57,828	2.64	7,829	4.1%	$15,698	2.00	7,498	4.9%	$15,535	2.07
2013	21,830	-0.5%	$62,444	2.86	7,814	-0.2%	$16,633	2.13	7,712	2.9%	$16,840	2.18
2014	22,235	1.9%	$64,879	2.92	7,399	-5.3%	$15,578	2.11	7,553	-2.1%	$16,269	2.15
2015	23,194	4.3%	$71,388	3.08	7,753	4.8%	$16,906	2.18	7,954	5.3%	$17,517	2.20
2016	24,620	6.2%	$76,309	3.10	7,902	1.9%	$17,263	2.18	8,300	4.3%	$18,431	2.22
2017	25,555	3.8%	$85,424	3.34	7,977	1.0%	$17,451	2.19	8,441	1.7%	$18,655	2.21
2018	25,831	1.1%	$83,836	3.25	8,072	1.2%	$17,396	2.15	8,522	1.0%	$18,575	2.18
2019	26,050	0.8%	$88,947	3.41	8,259	2.3%	$18,421	2.23	8,598	0.9%	$19,361	2.25
2020	17,726	-32.0%	$59,958	3.38	6,968	-15.6%	$16,560	2.38	7,389	-14.1%	$17,741	2.40
2021	23,861	34.6%	$90,857	3.81	7,655	9.9%	$20,189	2.64	8,016	8.5%	$21,185	2.64

Source: TBTA data.

Notes:

(a) Toll rate increases occurred on March 3, 2013, March 22, 2015, March 19, 2017, March 31, 2019, and April 11, 2021.

(b) Split tolling was implemented on December 1, 2020. Previously, westbound toll traffic volume was doubled since traffic was not registered in the eastbound direction.

(c) Prior to December 2020, the average toll was calculated on the basis of revenues divided by doubled westbound volume.

Table 6 Summary of Annual Paid Traffic and Toll Revenue, 2011 to 2021

Year	Total Paying Traffic Volume (000s)	Percent Change	Total Toll Revenue (000s)	Percent Change	Average Toll
2011	283,471	-	1,501,589	-	5.30
2012	282,647	-0.3%	1,490,982	-0.7%	5.28
2013[(a)]	284,528	0.7%	1,645,193	10.3%	5.78
2014	286,361	0.6%	1,676,445	1.9%	5.85
2015[(a)]	297,946	4.0%	1,808,901	7.9%	6.07
2016	307,346	3.2%	1,869,693	3.4%	6.08
2017[(a)]	309,997	0.9%	1,911,857	2.3%	6.17
2018	322,290	4.0%	1,965,223	2.8%	6.10
2019[(a)]	329,397	2.2%	2,071,411	5.4%	6.29
2020	253,184	-23.1%	1,639,753	-20.8%	6.48
2021[(a)]	307,296	21.4%	2,149,869	31.1%	7.00

Source: TBTA data.
Notes:
(a) Toll rate increases occurred on March 3, 2013, March 22, 2015, March 19, 2017, March 31, 2019, and April 11, 2021.

Note that traffic on the Bronx-Whitestone and Throgs Neck Bridges has been of similar magnitude over the years. These two bridges generally serve similar areas in the Bronx and Queens, and historically traffic has shifted back and forth to the crossing providing the better level of service, at times based on lane restrictions due to construction activity. Lane closures associated with the replacement of the Bronx approach spans of the Bronx-Whitestone Bridge, which occurred for most of 2010 and 2011 and resulted in a reduction of travel lanes on the bridge. As a result, some motorists diverted onto the Throgs Neck Bridge in order to avoid congestion. This trend continued in 2013 and 2014 during the Queens approach structure replacement project on the Bronx-Whitestone Bridge where a reduction in travel lanes on the bridge resulted in motorists again diverting to the Throgs Neck Bridge to avoid congestion.

The March 22, 2015, toll increase resulted in an overall increase in toll revenue from $1.676 billion in 2014 to $1.809 billion, an increase of 7.9 percent. The increase in traffic is attributed to a continuing modest economic recovery, generally overall favorable weather conditions, and relatively low gas prices, all of which appeared to offset the impacts associated with the toll increase.

In 2016, traffic volumes increased by 3.2 percent to 307.3 million vehicles. The increase in traffic is attributed to a continued modest recovery of the economy, favorable gas prices, and generally overall favorable weather conditions throughout the year. Another possible factor for the increase in year over year traffic is the substantial increase in housing construction activity throughout the City as developers were motivated to secure 421-a property tax exemptions before the program's expiration in January 2016.

The March 19, 2017, toll increase resulted in an overall increase in toll revenue of 2.3 percent from $1.870 billion in 2016 to $1.912 billion in 2017. Traffic volumes increased by 0.9 percent to a new historical high of 310.0 million vehicles. The increase in traffic is attributed to continued growth of the economy and sustained favorable gasoline prices.

In 2018, traffic volumes increased by 4.0 percent to a new historical high of 322.3 million vehicles. Revenue grew by 2.8 percent from $1.912 billion in 2017 to $1.965 billion in 2018. The increase in traffic is attributed to continued growth of the economy and sustained favorable gasoline prices.

The March 31, 2019, toll increase resulted in an overall increase in toll revenue of 5.4 percent from $1.965 billion in 2018 to $2.071 billion in 2019. Traffic volumes increased by 2.2 percent to a new historical high of 329.4 million vehicles. The increase in traffic is attributed to continued growth of the economy and sustained favorable gasoline prices.

In 2020, traffic volumes decreased by 23.1 percent to 253.2 million vehicles. In 2020, toll revenue decreased by 20.8 percent from $2.071 billion in 2019 to $1.640 billion. The decrease in both traffic and revenue was caused by the ongoing pandemic and related government actions.

The April 11, 2021, toll increase, combined with significant pandemic related recovery, resulted in an overall increase in toll revenue of 31.1 percent from $1.640 billion in 2020 to $2.150 billion in 2021. 2021 annual traffic volumes increased by 21.4 percent to 307.3 million vehicles. The increase in traffic is predominantly attributed to pandemic recovery and related changes in commuting behavior.

Preliminary audited data for January and February 2022 indicate that traffic on the TBTA facilities increased by 15.8 percent over the same period in 2021. It is important to note that January 2022 traffic, although better than January 2021, experienced a more dramatic pandemic-related traffic reduction than the prior several months at the end of 2021 due to a surge of COVID-19 cases related to the Omicron variant. By February and March 2022, the number of pandemic cases diminished to a level not seen since the summer of 2021. When comparing preliminary audited February 2022 and preliminary unaudited March 2022 traffic to February and March 2021 numbers, there is a significantly greater improvement in 2022 over the previous year than seen in January 2022. Pandemic cases began rising again quickly at the beginning of April 2022, but preliminary data show that this has not yet affected traffic on TBTA facilities. Estimated changes by facility are shown below in Table 7.

Table 7 Estimated Changes in January - February Traffic, 2021 to 2022

Facility	Percent Increase January - February 2021 to 2022[a]
Throgs Neck Bridge	13.1%
Bronx-Whitestone Bridge	14.7%
RFK Bridge	12.9%
Queens Midtown Tunnel	29.6%
Hugh L. Carey Tunnel	33.8%
Verrazzano-Narrows Bridge	11.1%
Henry Hudson Bridge	21.5%
Marine Parkway-Gil Hodges Memorial Bridge	15.3%
Cross Bay Veterans Memorial Bridge	6.3%
Total	15.8%

Notes:
(a) Based on preliminary audited traffic data for January and February 2022 (subject to final audit).

Traffic by Facility and Vehicle Class, 2021

TBTA maintains traffic counts for each crossing in 14 categories, ranging from passenger cars to trucks with seven axles. Displayed in Table 8 are the 2021 traffic volumes by facility. Passenger cars totaled 284.5 million crossings and represented 92.6 percent of the total toll-paying vehicles (that percentage has remained relatively constant over time). Of the TBTA facilities, the Verrazzano-Narrows Bridge registered the highest toll-paying traffic volume of 75.3 million vehicles. The lowest toll-paying volume, 7.7 million vehicles, was recorded at the Marine Parkway Bridge.

Table 8 Traffic by Facility and Vehicle Classification, 2021

(000s)[a, b]

Facility	1 Passenger Cars	2 Pass. Cars w/one-axle Trailer	3 Pass. Cars w/two-axle Trailer	4 Trucks 2 Axles	Franchise Buses		6 Trucks 3 Axles	7 Trucks 4 Axles
					5 2 Axles	11 3 Axles		
Throgs Neck Bridge	32,731	81	77	1,884	1	6	373	328
Bronx-Whitestone Bridge	45,180	30	21	1,656	42	115	350	198
RFK Bridge	56,415	37	24	2,992	5	249	609	146
Queens Midtown Tunnel	24,153	9	5	1,287	3	239	225	18
Hugh L. Carey Tunnel	18,061	5	2	542	1	424	188	12
Verrazzano-Narrows Bridge	69,637	51	52	2,781	90	299	648	299
Henry Hudson Bridge[c]	23,575	9	5	220	0	0	4	2
Marine Parkway Bridge	7,360	5	2	214	6	1	23	6
Cross Bay Bridge	7,420	7	3	322	8	111	96	8
Total	284,531	234	192	11,898	155	1,445	2,517	1,018
Percent of Paid Vehicles	92.6%	0.1%	0.1%	3.9%	0.1%	0.5%	0.8%	0.3%

Facility	8 Trucks 5 Axles	9 Motor-cycles	12 Trucks 6 Axles	13 Trucks 7 Axles	14 Other Vehicles	Total Toll- Paying Vehicles	10 Non-Revenue Vehicles[d]	Total Vehicles
Throgs Neck Bridge	1,916	47	65	45	0	37,556	106	37,663
Bronx-Whitestone Bridge	780	67	15	5	0	48,459	113	48,572
RFK Bridge	544	135	18	5	0	61,178	247	61,425
Queens Midtown Tunnel	10	56	0	0	0	26,006	109	26,115
Hugh L. Carey Tunnel	3	69	1	0	0	19,308	126	19,435
Verrazzano-Narrows Bridge	1,213	120	62	3	0	75,255	225	75,480
Henry Hudson Bridge[c]	1	45	0	0	0	23,861	54	23,915
Marine Parkway Bridge	24	14	1	0	0	7,655	28	7,684
Cross Bay Bridge	18	24	0	0	0	8,016	23	8,040
Total	4,508	578	161	58	1	307,296	1,032	308,328
Percent of Paid Vehicles	1.5%	0.2%	0.1%	0.0%	0.0%	100.0%		

Source: TBTA

Notes:

(a) Totals may not add due to rounding.

(b) Based on preliminary actual data, subject to final audit.

(c) Truck passage prohibited except with NYCDOT permit.

(d) Includes police, fire, and other emergency vehicles and TBTA vehicles.

Monthly Traffic, 2021

Monthly variations in traffic volumes on the nine crossings have been attributed to several factors historically, including severe weather, either winter or tropical storms, which result in lower volumes and, conversely, traffic reaches its highest levels during the summer months when recreational travel peaks. Traffic volumes also typically decline, or traffic growth slows in the aftermath of a toll increase. Furthermore, individual facilities can be affected by construction projects on the facility itself or its approaches, and on adjacent arterials or competing bridges. The limited number of crossings in the region, however, largely sustains the overall demand for TBTA's bridges and tunnels. In addition to these normal impacts, there are extraordinary events such as the effects of the September 11th, 2001, attack on the World Trade Center, Superstorm Sandy, and the pandemic.

The data in Table 9 indicate that total traffic on the nine crossings in 2021 peaked in June. August was the second highest month in 2021. The monthly variations on the nine crossings in 2021 ranged from 23 percent and 19 percent below the annual average daily traffic in February and January, respectively, to 10 percent and 8 percent above in June and August, respectively.

Table 9 Monthly Traffic Variations, 2021

Month	Average Daily Toll-Paying Traffic[a]										Ratio to AADT[b], [c]
	Throgs Neck Bridge	Bronx-Whitestone Bridge	RFK Bridge	Queens Midtown Tunnel	Hugh L. Carey Tunnel	Verrazzano-Narrows Bridge	Henry Hudson Bridge	Marine Pkwy Bridge	Cross Bay Bridge	Total	
January	87,841	104,739	136,646	52,889	40,024	175,671	46,547	15,722	17,815	677,893	0.81
February	81,223	100,789	131,836	53,003	39,521	167,586	46,390	14,573	17,063	651,984	0.77
March	97,813	121,192	158,380	66,222	48,847	194,458	59,255	18,014	20,839	785,020	0.93
April	102,816	129,292	167,399	65,894	52,156	204,918	66,223	19,285	21,898	829,881	0.99
May	104,879	138,369	173,249	70,831	52,071	212,571	69,166	21,922	23,008	866,068	1.03
June	109,109	147,651	185,247	78,043	56,581	224,868	73,587	26,432	26,314	927,832	1.10
July	110,684	145,989	179,997	76,246	53,096	219,824	67,194	25,733	25,509	904,272	1.07
August	109,441	146,848	180,131	76,597	54,749	219,337	70,703	24,500	23,827	906,133	1.08
September	107,974	143,144	179,956	79,898	57,909	213,540	73,021	23,028	23,431	901,899	1.07
October	109,665	141,207	177,092	80,064	61,853	217,548	74,397	21,718	22,216	905,758	1.08
November	108,561	141,311	175,246	79,924	60,386	213,808	73,122	21,002	21,286	894,647	1.06
December	103,176	130,532	163,892	74,220	56,800	207,327	63,831	19,328	20,039	839,145	1.00
AADT[c]	102,894	132,765	167,611	71,249	52,899	206,179	65,374	20,974	21,963	841,908	1.00

Notes:
(a) Totals may not add due to rounding.
(b) Annual Average Daily Traffic (AADT).
(c) For total traffic on the nine crossings. The ratio to AADT is the quotient of a month's AADT and the annual average for the year; e.g., a ratio to AADT of 0.77 signifies that the monthly traffic is 23 percent below the AADT for 2021.

Changes in Monthly Traffic, 2020 to 2021

Table 10 lists the monthly average daily traffic changes that have occurred between 2020 and 2021.

Table 10 Changes in Monthly Average Daily Traffic, 2020 to 2021

Month	Percent Change Comparing 2020 Monthly Average Daily Traffic to 2021								
	Throgs Neck Bridge	Bronx-Whitestone Bridge	RFK Bridge	Queens Midtown Tunnel	Hugh L. Carey Tunnel	Verrazzano-Narrows Bridge	Henry Hudson Bridge	Marine Pkwy Bridge	Cross Bay Bridge
January	-17.2%	-17.0%	-16.5%	-29.7%	-17.1%	-9.8%	-27.1%	-19.3%	-15.0%
February	-26.5%	-21.5%	-22.6%	-33.7%	-23.7%	-15.6%	-30.5%	-23.9%	-17.7%
March	18.1%	28.5%	29.5%	30.2%	42.2%	27.5%	43.7%	18.6%	20.5%
April	106.5%	156.8%	168.6%	241.8%	283.9%	123.5%	341.2%	90.3%	79.5%
May	42.0%	88.6%	81.4%	144.5%	130.3%	63.2%	170.6%	43.9%	34.9%
June	12.9%	50.0%	37.0%	71.6%	51.5%	32.8%	82.6%	23.0%	16.8%
July	5.7%	27.8%	21.3%	42.2%	22.1%	19.5%	32.2%	-3.6%	-2.6%
August	2.8%	18.2%	17.3%	29.6%	17.7%	14.2%	26.0%	-3.6%	-2.4%
September	2.0%	15.2%	13.7%	27.2%	17.6%	9.8%	21.5%	2.0%	4.0%
October	6.4%	15.2%	12.0%	24.7%	24.2%	13.9%	23.9%	15.6%	7.6%
November	12.9%	24.7%	19.0%	38.4%	34.6%	19.0%	36.9%	18.3%	9.4%
December	17.2%	21.1%	18.1%	35.2%	31.8%	14.9%	31.7%	17.8%	10.2%
Annual	9.9%	24.7%	21.7%	31.2%	30.9%	20.2%	35.0%	10.2%	8.8%

As previously mentioned, the pandemic was the primary cause of the large reductions in monthly traffic starting in March 2020. The significant growth in traffic seen beginning in March 2021 is related to pandemic recovery. However, in August 2021 and December 2021, the COVID-19 delta and Omicron variants, respectively, tempered some of the recovery.

Operating Expenses, 2011 to 2021

Table 11 displays the historical operating expenses for the TBTA facilities from 2011 through 2021. TBTA divides operating expenses into two major categories: labor and non-labor. Labor includes salaries, overtime and fringe benefits, net of capital reimbursements. Major maintenance, some bridge painting, outside services, insurance, TBTA's share of the NYCSC, and other non-personnel expenses are included in non-labor.

TBTA labor expenses increased from $208.3 million in 2011 to $238.4 million in 2021, an increase of $30.1 million. The increase was entirely due to higher actuarial assessments of pension commitments ($10.8 million) and increases in net costs for fringe benefits including health and welfare benefits for current employees and retirees, workers' compensation, and others ($15.3 million). Payroll costs, including regular wages and overtime pay, declined by $10.1 million over this period. Year-end headcount in 2011 was 1,584, and it fell to 1,114 at year-end 2021. This was the result, over the eleven-year period shown, of numerous managerial initiatives aimed at achieving operational efficiencies, several MTA-wide workforce consolidation efforts, and

headcount reductions achieved solely through attrition that were realized through the move to Cashless Tolling.

Table 11 Historical Operating Expenses, 2011 to 2021

Year	Operating Expenses (000s)[a]			Percent Change
	Labor[b]	Non-Labor[c]	Total	
2011	208,343	150,503	358,846	-6.4%
2012	220,576	157,463	378,039	5.3%
2013	220,692	188,804	409,496	8.3%
2014	238,528	205,224	443,752	8.4%
2015	235,099	217,660	452,759	2.0%
2016	243,436	221,418	464,854	2.7%
2017	248,347	241,838	490,185	5.4%
2018	243,115	258,150	501,265	2.3%
2019	252,269	259,158	511,427	2.0%
2020	227,823	214,389	442,212	-13.5%
2021	238,362	227,651	466,013	5.4%

Source: TBTA
Notes:
(a) Totals may not add due to rounding.
(b) Labor includes salaries, overtime and fringe benefits, net of capital reimbursements.
(c) Non-labor includes the following categories: major maintenance and supplies, bridge painting, outside services, insurance, power, leases and rentals and other expenses.

Non-labor includes the following categories: major maintenance and supplies, bridge painting, outside services, insurance, power, leases and rentals and other expenses. Non-labor expenses increased from $150.5 million in 2011 to $227.7 million in 2021. Most of this growth is attributable to back-office costs for administering E-ZPass toll collection, along with the introduction of TBM at the Henry Hudson Bridge in 2012 and the expansion of TBM to all facilities in 2017. Over this eleven-year period, TBTA has been successful in negotiating lower unit costs for E-ZPass tags and has achieved contracted efficiency savings associated with running the NYCSC, which also administers the TBM program. However, the growth in overall transactions have driven up NYCSC expenses, credit/debit card transaction fees (which have also been impacted by higher E-ZPass and TBM tolls) and the costs of maintaining toll collection equipment. Expenses in other areas have generally grown at rates approximating CPI-U inflation.

The following is a brief discussion of the major year-to-year shifts in operating expenses.

In 2011, total operating expenses decreased for the third year in a row. Expenses in 2011 decreased 6.4 percent from 2010, with the majority of the decrease attributed to reductions in non-labor expenses.

Total operating expenses for 2012 increased $19.2 million, or 5.3 percent from 2011 primarily due to the emergency response and facility restoration efforts associated with Superstorm Sandy totaling $11.7 million. In addition, pension costs were greater by $8.5 million due to a revised

valuation by the New York City Office of the Actuary that included a drop in the assumed rate of investment return, from 8 percent to 7 percent, retroactive to July 2011.

Total operating expenses for 2013 increased $31.5 million, or 8.3 percent above 2012 primarily due to: $12.6 million in additional bond issuance costs associated with the implementation of Government Accounting Standards Bureau 65, which requires that certain expenses that were previously allowed to be amortized over the life of the bonds must now be realized in full when incurred; $5.2 million in Superstorm Sandy restoration costs; $4.4 million in higher insurance premiums; additional credit/debit card fees of $2.7 million due to the March increase in E-ZPass tolls; and another $2.7 million in NYCSC costs stemming from account growth and the first full year of Cashless Tolling at the Henry Hudson Bridge.

Total operating expenses for 2014 increased $34.3 million, or 8.4 percent above 2013 primarily resulting from: $13.3 million in additional wage and associated fringe benefit costs primarily stemming from payments and provisions for actual and projected union contract settlements retroactive to 2009; an actuarial adjustment of $3.8 million for Workers' Compensation; $9.5 million to fund additional major maintenance and bridge painting projects; and a total increase of $6.5 million in property and general liability insurance premiums.

In 2015, total operating expenses were $452.8 million, which was $9.0 million, or 2.0 percent above 2014 expenses. Labor expenses declined by $3.4 million, or 1.4 percent, primarily due to unfilled vacancies throughout the year and the transfer of 53 technology positions to the MTA as part of an agency-wide IT consolidation effort. Non-labor expenses grew by $12.4 million, or 6.1 percent, primarily due to additional major maintenance and bridge painting projects and higher credit card fees associated with the toll increase implemented on March 22, 2015.

In 2016, total operating expenses were $464.9 million, which was $12.1 million, or 2.7 percent above 2015 expenses. Labor expenses increased by $8.3 million, or 3.5 percent, primarily due to wage inflation and actuarial adjustments to pension expenses. Non-labor expenses grew by $3.8 million, or 1.7 percent, which was slightly above the national inflation rate of 1.3 percent. Growth exceeded inflation primarily due to additional major maintenance projects and higher bond issuance costs.

In 2017, total operating expenses were $490.2 million, which was $25.3 million, or 5.4 percent above 2016 operating expenses. Labor expenses increased by $4.9 million, or 2.0 percent, primarily due to wage inflation. Non-labor expenses grew by $20.4 million, or 9.2 percent, primarily due to implementation costs for Cashless Tolling and back-office costs for administering the TBM program.

Total operating expenses in 2018 were $501.3 million, which was 2.3 percent above costs in 2017. Labor expenses declined by 2.1 percent primarily due to vacant positions and headcount reductions achieved solely through attrition that were realized through the move to Cashless Tolling. Non-labor costs increased by 6.7 percent primarily due to a full year's facility-wide impact on back-office and other non-labor costs related to Cashless Tolling operations.

Total operating expenses peaked in 2019 at $511.4 million, which was 2.0 percent above costs in 2018. Labor expenses grew by 3.8 percent primarily due to revised actuarial assessments of pension costs and higher healthcare costs. Non-labor costs increased by only 0.4 percent. Higher tolling operations and collections costs due to increased traffic and the toll increase implemented in March 2019 were almost entirely offset by efficiencies achieved across a variety of maintenance projects and other operating contracts.

Total operating expenses in 2020 were $442.2 million, which was 13.5 percent below costs in 2019. Labor expenses decreased by 9.7 percent primarily due to restricted hiring and attrition. Non-labor costs decreased by 17.3 percent. Most of the non-labor savings are due to a program of significant additional savings actions that reduced reliance on outside consultants and contractors, and non-service-related expenses. In addition, fewer toll transactions due to the pandemic led to reduced toll processing costs. Although total year-over-year operating expenses decreased in 2020, TBTA incurred some new operating expenses because of the pandemic. This includes $1.4 million for Personal Protective Equipment ("PPE"), cleaning and sanitizing contracts, and janitorial supplies for buildings and vehicles to comply with Centers of Disease Control and Prevention guidelines.

Total operating expenses in 2021 were $466.0 million, which was 5.4 percent above costs in 2020. Labor expenses increased by 4.6 percent primarily through lower payroll, overtime, and associated fringe benefits costs associated with vacancies. Non-labor costs increased by 6.2 percent primarily due to increased professional service contract commitments and materials and supplies. These increased non-labor costs were offset by lower costs related to maintenance and other operating contracts (closure of E-ZPass walk-in centers and reduced E-ZPass customer activity) as well as reductions in overall business expenses.

FACTORS AFFECTING TRAFFIC GROWTH

A previous section of this report identified the historical trends in traffic, revenue, and expenses of the nine TBTA bridges and tunnels. Before developing the analyses, past practice has been to consider factors affecting future traffic, including the projected trends in employment and population, fuel availability and prices, TBTA and regional construction impacts, the capacity constraints in the regional highway network, and toll and elasticity impacts.

Urbanomics, Inc. ("Urbanomics") was contracted as a subconsultant to Stantec to prepare short- and long-term employment and population forecasts in the New York Metropolitan Area. Additionally, Urbanomics researched other factors affecting future traffic, including labor force conditions, housing construction conditions, Manhattan office market conditions, motor vehicle registrations, and fuel availability and prices. The information provided by Urbanomics was incorporated into Stantec's traffic and toll revenue analyses.

This section of the report concludes with a summary of the assumptions and conditions upon which the traffic and toll revenue analyses were based.

Employment, Population, and Motor Vehicle Registrations

In keeping with federal requirements mandating the preparation of long-term demographic and socioeconomic forecasts for travel demand modeling purposes, the New York Metropolitan Transportation Council ("NYMTC") prepares and periodically updates employment and population forecasts for the 10-county NYMTC territory[2] and 21 surrounding counties in New York, New Jersey, and Connecticut. The latest forecasts available, which are included in the following tables, were released in October 2020 and range from 2010 to 2055 on a 5-year interval basis.

NYMTC's Socioeconomic and Demographic ("SED") Forecasts are long-term in scope with the intention of providing reliable projections of future socioeconomic conditions over a 40-year period. Due to the structure of forecasts, which are projected in 5-year intervals, NYMTC does not attempt to reliably forecast cyclical trends in the economy as related to business cycles and natural disasters. Development of the forecasts began in 2018 and were finalized at the height and early recovery period of the pandemic and associated recession. Reliable data detailing the extent of the economic damage was not yet available for analysis during the forecasting process, therefore only future NYMTC forecasts will reliably incorporate historic data that fully capture the impact of the pandemic on regional employment and population trends.

Given the unavailability of adequate local data, a near-term adjustment to the 2055 SED Forecasts employment projections was prepared by Urbanomics. This addresses the economic damage associated with the pandemic based on the consensus of key regional stakeholders and informed by near-term trends in unemployment and deaths, reactions from other major metropolitan planning organizations, and professional opinions from several of the nation's leading economists. The agreed-upon uniform adjustment to the 2055 SED Forecasts was applied at the county-level in the employment model to create a "lag" in employment in 2020, roughly back to 2017 levels with full recovery (return to projected employment trend line) occurring over the five-year period from 2025 to 2030. Using inputs from the employment model as part of the population model's labor force sub-model, the population model was adjusted due to pandemic impacts as part of the labor force reconciliation process that establishes the population-employment balance. The NYMTC forecasting approach begins with modeling of the regional growth in employment relative to national trends and forecasts prepared by IHS Global Insight, Moody's Analytics ("Moody's"), and the BLS, calibrated at the county level on an industry-specific basis (IHS Markit, now part of S&P Global and Moody's are major vendors of economic and financial analysis, forecasts, and market intelligence worldwide). Employment then drives population growth which is forecasted at the sub-regional and county levels by a model that includes fertility, mortality, and recent past trends in net migration and induced labor force growth.

Typically, traffic volumes in the region are affected by changes in employment and population. The demand on TBTA facilities normally tends to be influenced less by regional employment and population trends than other toll facilities because available water crossings are limited. Motor

[2] The 10-County NYMTC Territory includes the five boroughs of New York City as well as Nassau, Suffolk, Rockland, Westchester and Putnam Counties.

vehicle registrations are another indicator of trends in traffic volumes. To better understand how these indicators may influence traffic volumes on TBTA crossings over the long term, Stantec first reviewed historical trends and forecasts by NYMTC and others, and then adjusted traffic analyses in the short term to account for current economic conditions.

Employment Trends and Projections

Traditionally, job growth has had an impact on traffic generation. Generally, when the economy is robust and jobs are growing, there is an increase in traffic. Conversely, when employment trends downward, traffic volumes generally decline. However, the rate of decline depends upon the severity of employment losses.

Table 12 depicts the long-term trend in total employment in the region since 1980. The region is defined as consisting of 31 counties that comprised the commuter-shed: the five boroughs of the City; 9 suburban counties of New York State in Long Island and the Mid-Hudson; 14 counties of northern and central New Jersey; and 3 counties of Connecticut.

As Table 12 shows, since 1980, the City has shown consistent employment growth in each decade, having recovered from the mid-1970s losses during the 1990s and reaching a long-term high of 6.0 million jobs in 2019 before swiftly falling during the pandemic to 5.6 million jobs in 2021. The Long Island and Mid-Hudson suburbs have reflected continuous growth in the decades since 1980, expanding from 1.9 million jobs in 1980 to 2.9 million in 2021. Similar rates of suburban growth occurred in New Jersey and Connecticut during those years. Between 1980 and 2021, New Jersey added 1.4 million jobs while Connecticut gained 271,700 jobs and the New York suburbs grew by 954,500 jobs.

While annual employment growth over the past decade through February 2020 exceeded annual growth from 1980 to 2010 in New York City and New Jersey suburban counties, with the New York and Connecticut suburban counties not far behind, significant job losses associated with the pandemic resulted in a sharp reversal of recent trends. Only the City had a higher annual growth rate from 2010 through 2021 while the suburban counties all had significantly lower growth rates versus years past. Among the four sub-regions, the City accounted for the largest employment base in 2021 with 40.2 percent of 13.8 million regional jobs, followed by New Jersey with 30.8 percent, the New York suburbs with 20.8 percent and Connecticut with 8.3 percent.

Due to travel and work restrictions associated with the pandemic, over the months from February to April 2020, the City lost 926,600 wage/salary jobs (-19.8 percent). However, by January 2022, the post-February 2020 decline had been reduced to a loss of 317,400 jobs (-6.8 percent). Job losses were less intense in the suburban regions with wage/salary job reductions from February 2020 to January 2021 of -5.3 percent in the New York suburban counties, -3.5 percent in the New Jersey suburban counties and -2.7 percent in the Connecticut suburban counties.

National survey data from the BLS indicates that the share of workers carrying out their work from home is steadily declining. Monthly survey data from May 2020 to February 2022 indicate that the share among US workers aged 16 or over that reported teleworking due to the pandemic dropped from 35.4 percent in May to just 13.0 percent in February 2022. Although management, professional, and related occupation workers[3] are more likely to telework, the share of such workers at the national level also dropped by nearly 34.5 percentage points over that period from 57.4 percent to 22.9 percent.

As the region's workforce is increasingly becoming vaccinated against COVID-19, local employers expect more workers to return to the City's office buildings. The various waves of COVID-19 infections over the past two years have resulted in periodic setbacks in companies' return to office plans. A sizeable number of workers who had returned to their offices in the early fall of 2021 went back to remote work during December 2021 and January 2022 at the height of the Omicron variant spread. This was followed by the most recent push to return to in-office work in February and March 2022.

According to the Partnership for New York City's monthly Return to Office Survey, in the month of January 2022, just 16 percent of employers reported that average daily attendance at Manhattan offices exceeded 50 percent.[4] The Omicron variant had peaked during this month and the majority of employers (75%) indicated that that they had delayed their return-to-office plans. However, 38 percent of employers indicated that they expected average daily attendance will likely exceed 50% at some point in Q1 2022. A number of major employers announced they would encourage return to office plans or hybrid work schedules in their New York City offices in February and March 2022 including American Express, Meta, Microsoft, Goldman Sachs, JPMorgan Chase, Citigroup, HSBC, Wells Fargo, UBS, and BNY Mellon.[5,6] According to Kastle Systems, an office security firm, roughly 37 percent of New York City workers went into the office in March 2022, a high for the pandemic era but still 80 percent below pre-pandemic occupancy trends[7] and well below the 50 percent attendance anticipated by the Partnership for New York City's monthly Return to Office Survey in that quarter. The Partnership for New York City reported that in their February and March 2022 survey of nearly 10,000 local workers, survey respondents reported that personal safety issues were now the top concern for returning to in-office employment with 43% of respondents indicating it was their top obstacle compared with just 29% that considered COVID-19 the top barrier to in-office work.[8]

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[3] Including workers employed in the industries of Information; Finance & Insurance; Real Estate, Rental & Leasing; Professional & Technical Services; Management, Administrative & Waste Services.

[4] Author Unknown. (2022 January). Return to Office Survey Results. *Partnership for New York City*.

[5] Goldberg, E. (2022, March 10). A Two-Year, 50-Million-Person Experiment in Changing How We Work. *New York Times*.

[6] Lananh, N. (2022, April 4). Wall Street's Rigid Culture Bends to Demands for Flexibility at Work. *New York Times*.

[7] Rubinstein, D. & Hong, N. (2022, April 11). As Remote Work Becomes Permanent, Can Manhattan Adapt? *New York Times*.

[8] Morning Consult. (2022 March). Poll Reveals Employees Will Resist Return to Office until City and Subways are Safe. *Partnership for New York City*. Pg 36.

As of April 12, 2022, the New York Times' Dana Rubinstein and Nicole Hong reported that "the list of companies permanently changing the way they work keeps growing longer, making the five-day-a-week trek into Manhattan an increasingly fading corporate practice." Other firms with sizeable New York City offices have recently announced long term plans for remote-option employment with little pressure to return to in-office employment. These firms include PwC, a global consulting firm headquartered in Manhattan; Quinn Emanuel Urquhart & Sullivan, a large law firm; Verizon; and Penguin Random House, a publisher.[9] JPMorgan Chase, the City's largest employer and a vocal proponent of in-office work, expected half of its 271,000 employees to work in-office five days a week in March, a reversal from the firm's December 2021 intention of a full in-office staff during the early months of 2022.[10]

As of April 22, 2022, over 6.5 million (78%) of New York City residents had been fully vaccinated against COVID-19 and 7.2 million (87%) had received at least one vaccine dose according to the New York City Health Department.

[9] Barron, J. (2022, April 12). Wall The Ups and Downs of Remote Work in New York. *New York Times*.

[10] Rubinstein, D. & Hong, N. (2022, April 11). As Remote Work Becomes Permanent, Can Manhattan Adapt? *New York Times*.

Table 12 Employment Trends

Number of Jobs (000s)[a]

Year	New York City	New York Region[b]	New Jersey Region[c]	Connecticut Region[d]	NYC and All Regions[e]
1980	3,614.0	1,918.6	2,828.2	869.3	9,230.1
1990	3,962.3	2,343.6	3,419.2	1,001.7	10,726.8
2000	4,300.3	2,565.7	3,741.5	1,084.2	11,691.7
2005	4,411.1	2,720.0	3,951.1	1,109.0	12,191.2
2010	4,788.6	2,640.0	3,952.7	1,111.3	12,492.6
2015[f]	5,599.4	2,660.1	4,274.3	1,185.7	13,719.5
2019	6,036.0	2,860.9	4,491.2	1,191.6	14,579.8
2020	5,442.5	2,859.1	4,156.9	1,118.1	13,576.6
2021	5,556.1	2,873.1	4,250.2	1,141.0	13,820.4
Average Annual Percent Change					
1980 to 1990	0.9%	2.0%	1.9%	1.4%	1.5%
1990 to 2000	0.8%	0.9%	0.9%	0.8%	0.9%
2000 to 2005	0.5%	1.2%	1.1%	0.5%	0.8%
2005 to 2010	1.7%	0.5%	0.0%	0.0%	0.7%
2010 to 2015	3.2%	1.5%	1.6%	1.3%	2.2%
2015 to 2019	1.9%	1.8%	1.2%	0.1%	1.5%
2019 to 2020	-9.8%	-0.1%	-7.4%	-6.2%	-6.9%
2020 to 2021	2.1%	0.5%	2.2%	2.0%	1.8%

Source: New York Metropolitan Transportation Council, New York State Department of Labor, Connecticut Department of Labor, New Jersey Department of Labor and Workforce Development, BLS, and United States Bureau of Economic Analysis.

Notes:

(a) Historic employment estimates are modeled using data inputs from the BLS Current Employment Statistics Program (CES) Quarterly Census of Employment and Wages (QCEW) program as well as the Bureau of Economic Analysis' Table 25N Proprietors statistics. Final revisions to statewide and local area CES data, called a "Benchmark," are made each March for the previous five years based on payroll tax reports submitted by employers covered by the Unemployment Insurance program to individual states. In March 2022, the BLS released its 2021 re-benchmarked CES data with revisions to employment of specific industries going back as far as 1990.

(b) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.

(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

(d) Consists of the following counties: Fairfield, Litchfield, and New Haven.

(e) Totals may not add due to rounding.

(f) In 2015, the City of New York changed its methodology of reporting local government workers to reflect the geographic distribution of the workforce more accurately.

NYMTC prepared a series of 40-year employment forecasts, released in final form in October 2020. This is the latest available forecast from NYTMC. Forecasted trends are compressed to 5-year intervals, which masks cyclical trends between these years, a common practice in long term forecasting. Given the unavailability of adequate local data, a near-term adjustment to the 2055 employment forecasts was prepared to address the economic damage associated with the pandemic based on the consensus of key regional stakeholders informed by near-term trends in unemployment and deaths, reactions from other major metropolitan planning organizations, and professional opinions from several of the nation's leading economists. The agreed-upon uniform adjustment to the 2055 employment forecasts was applied at the county-level in the employment model to create a "lag" in employment in 2020, roughly back to 2017 levels with full recovery (return to projected employment trend line) occurring before 2025.

NYMTC projects regional employment growth would increase at an average annual rate of 0.45 percent between 2015 and 2055. From 2020 to 2025, NYMTC projects annual employment growth of 0.38 percent, rising to 0.56 percent from 2025 to 2030. Based on spring 2020 employment trends prior to the job recovery that ensued in the following months, NYMTC forecasted a full recovery to pre-pandemic levels at some point over the five-year period from 2020 to 2025 with a return to the long-term growth trendline expected in 2030. While NYMTC only projects in five-year increments and therefore does not forecast employment on a quarterly or annual basis, Moody's forecasts provide more specific detail. The Q4 2021 forecasts prepared by Moody's, the same source for one of several drivers used in the NYMTC employment model, project a total job increase of 3.9 percent in 2022 and 1.6 percent in 2023 for the New York metropolitan area. Based on the extent of the local monthly job recovery and stimulus activity, Moody's expects a recovery to the 2019 high in 2023. NYMTC's employment projections from its current employment forecast are presented in Table 13.

Table 13 NYMTC Employment Projections

(000s)[a]

Year	New York City	New York Region [b]	New Jersey Region [c]	Connecticut Region [d]	NYC and All Regions
Average Annual Percent Change					
2015 to 2020	1.19%	0.41%	0.35%	0.14%	0.70%
2020 to 2025	0.38%	0.39%	0.39%	0.37%	0.38%
2025 to 2030	0.57%	0.52%	0.60%	0.50%	0.56%
2030 to 2035	0.46%	0.44%	0.48%	0.42%	0.46%
2035 to 2040	0.44%	0.30%	0.33%	0.30%	0.37%
2040 to 2045	0.39%	0.31%	0.36%	0.31%	0.36%
2045 to 2050	0.48%	0.28%	0.38%	0.33%	0.40%
2050 to 2055	0.47%	0.28%	0.37%	0.32%	0.39%
2015 to 2055	**0.55%**	**0.36%**	**0.41%**	**0.33%**	**0.45%**

Source: New York Metropolitan Transportation Council

Notes:

(a) Future employment projections are modeled using an amalgam of data inputs from IHS Global Insight, Moody's, State DOLs, US BLS's Current Employment Statistics Program (CES) Quarterly Census of Employment and Wages (QCEW) program, and the US Census Bureau's American Community Survey.

(b) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.

(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

(d) Consists of the following counties: Fairfield, Litchfield, and New Haven.

Based on national forecasts to 2044, regional forecasts to 2050, and pandemic recovery expectations, the existing regional outlook suggested that jobs would expand by 0.45 percent annually over the period from 2015 to 2055, as mentioned above, roughly half the annual average growth rate of 0.99 percent that occurred between 1980 and 2021. Employment in the City was expected to expand at an annual rate of 0.55 percent, slightly greater than the 0.38 percent annual average gain projected in the suburban regions of New Jersey, Connecticut, and New York. According to NYMTC, with a full pandemic recovery to 2019 levels expected no later than 2025, no sub-regions were projected to experience a period of interim employment losses, as each

tends to grow with cyclical contractions and expansions ranging between 0.14 and 1.19 percent annually on average over the period from 2015 to 2055.

Labor Force Conditions

Prior to the pandemic, the region had nearly recovered from the 2007-2009 recession in terms of unemployment and wages with unemployment rates below 2007 pre-recession levels and rising inflation-adjusted wages nearing 2007 levels. Sharp monthly job losses in 2020 contributed to among the worst short-term unemployment levels the region has seen since the Great Depression, however monthly trends show recovery well underway since the second half of 2020 (see Figure 3). The BLS reported that the City's annual average jobless rate had increased from 3.9 percent in 2019 to 12.3 percent in 2020 and has since fallen to 10.1 percent in 2021. On average in 2021, 401,800 residents were unemployed in a labor force of nearly 4.0 million, with 339,700 of these workers having lost jobs between 2019 and 2021. The City's rate of unemployment in 2021 was considerably higher than that of the three suburban regions. The New York suburban region had the lowest unemployment rate at 4.9 percent, followed by the Connecticut suburban region (6.5 percent) and the New Jersey suburban region (6.7 percent). Recent labor force conditions are summarized in Table 14.

Table 14 Labor Force[a] Conditions, 2019 to 2021

Year	New York City	New York Suburban Region[b]	New Jersey Suburban Region[c]	Connecticut Suburban Region[d]
Labor Force				
2019	4,070,500	2,630,900	3,621,900	1,049,500
2020	3,909,800	2,591,700	3,594,900	1,025,500
2021	3,975,100	2,551,600	3,529,600	986,300
Employed				
2019	3,913,000	2,539,300	3,503,500	1,011,700
2020	3,428,900	2,375,300	3,251,500	944,900
2021	3,573,300	2,426,500	3,291,600	921,700
Unemployed				
2019	157,400	91,600	118,400	37,800
2020	480,900	216,400	343,400	80,600
2021	401,800	125,100	238,100	64,600
Unemployment Rate				
2019	3.9%	3.5%	3.3%	3.6%
2020	12.3%	8.3%	9.6%	7.9%
2021	10.1%	4.9%	6.7%	6.5%

Source: BLS, Local Area Unemployment Statistics (LAUS) Program.

Notes:

(a) This table includes the jobs of self-employed (i.e., non-payroll) workers, some of which are part-time jobs, as reported by the US Department of Commerce and BLS. These non-payroll jobs are added to the payroll employment.

(b) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.

(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

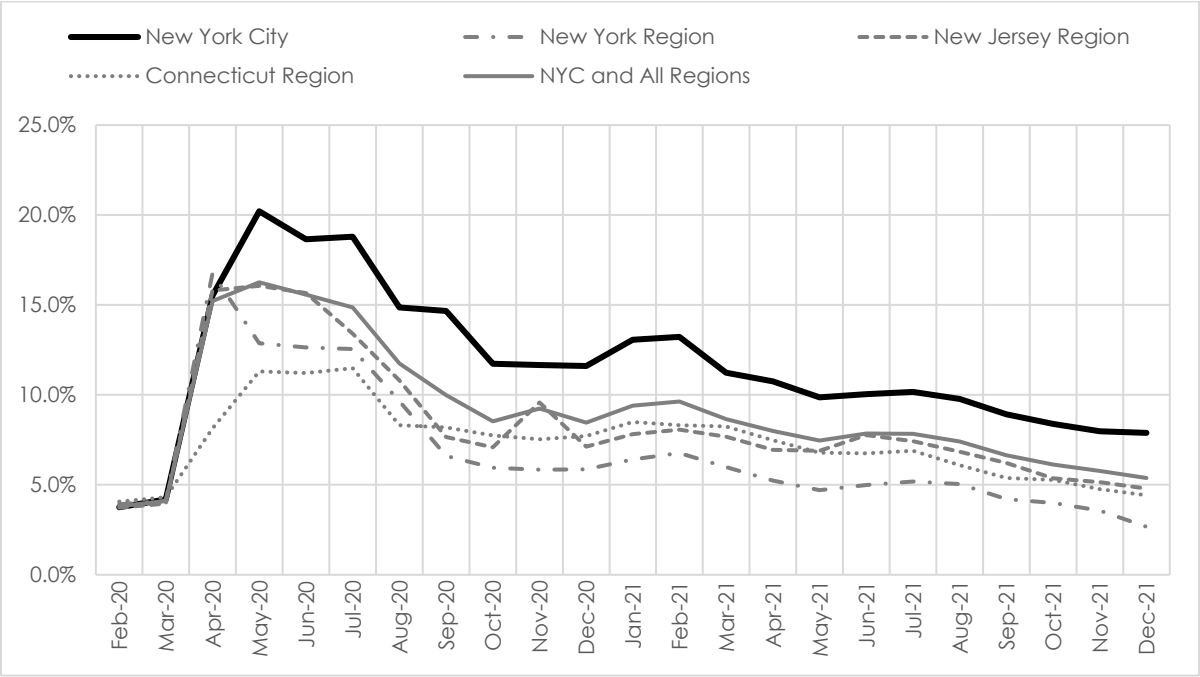
(d) Consists of the following counties: Fairfield, Litchfield, and New Haven.

Monthly unemployment rates shown in Figure 3 illustrate the depth of job losses during the spring of 2020 followed by the expected improvement in unemployment rates from the peak spring 2020 levels. The March 2020 executive orders by the governors of New York State, New Jersey and Connecticut to close non-essential businesses contributed to sharply increased rates of regional unemployment. Over the following year and a half, the City and the suburban counties gradually reopened to business. On July 20, 2021, the City entered Phase 4, the final stage of its reopening strategy. Although most business restrictions loosened over the summer, strict vaccine requirements for adults and older children remained in place for high-risk areas. During fall 2021 many New York City workers returned to in-office employment. By early October 2021, pandemic restrictions had eased for vaccinated workers and consumers while a wide range of indoor activities remained off-limits to unvaccinated residents. At the end of December 2021, the City became the first US city to issue a general vaccine mandate for all private-sector employees, an expansion of the November 2021 mandate for public-sector employees to cover all workers within the City's five boroughs. On March 7, 2022, in response to a sharp decline in Omicron variant cases and widespread participation in vaccination programs, the City suspended its Key to NYC rules, eliminating vaccine requirements for restaurants, fitness facilities, and entertainment venues and mask-wearing requirements for grades K-12 students. Over these months, the City's monthly

unemployment rate climbed from 3.8 percent in February 2020 to 20.2 percent in May 2020, falling back down to 7.9 percent in December 2021.

Among the suburban counties, unemployment rates rose the least in the Connecticut counties during the early months of the pandemic. However, by the later months of 2020, the Connecticut region's unemployment rate increased to levels above that of the New Jersey and New York suburban counties. During the latter half of 2020 and through 2021, the New York suburban counties had the lowest unemployment rate among the five regions, reaching a low of 2.7 percent in December 2021. Unemployment rates declined in all regions from February to December 2021.

Figure 3 Monthly Unemployment Rates, February 2020 to December 2021



Source: BLS, Local Area Unemployment Statistics (LAUS) Program.
Notes:
(a) This figure includes the jobs of self-employed (i.e., non-payroll) workers, some of which are part-time jobs, as reported by the US Department of Commerce and BLS. These non-payroll jobs are added to the payroll employment.
(b) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.
(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.
(d) Consists of the following counties: Fairfield, Litchfield, and New Haven.

Over the 12-month period from January 2021 to January 2022, the City added 312,800 Nonfarm jobs (a measure of the number of U.S. workers in the economy that excludes proprietors, private household employees, unpaid volunteers, farm employees, and the unincorporated self-employed) with 306,300 jobs gained in the private sector. Given the massive losses incurred in 2020, job gains in 2021 largely represented a recovery of recent past losses, rather than serving as evidence of long-term growth trends. Only the major industry sector of Natural Resources, Mining

and Construction saw job losses over this period (-8,100). Job gains were largest in the following sectors: Accommodation and Food Services (+110,900); Professional, Scientific, and Technical Services (+32,200); Health Care and Social Assistance (+32,000); Administrative and Support and Waste Management (+24,900); Information (+24,300); Arts, Entertainment, and Recreation (+23,300); Retail Trade (+20,000); Transportation and Warehousing (+13,900); and Other Services (including Religious, Grant Making, Civic and Professional occupations (+10,100).

Several industries added less than 10,000 jobs including: Educational Services (+8,000); Government Services (+6,500); Wholesale Trade (+5,700); Manufacturing (+4,200); Management of Companies and Enterprises (+2,600); Finance and Insurance (+1,800); Utilities (+300); and Real Estate and Rental and Leasing (+200).

Housing Construction

In the housing market, annual building permits authorizing new housing construction modestly increased in the City to 19,900 units in 2021, a gain of 500 units or +2.7 percent over 2020 (as shown in Table 15). The number of permits approved in 2021 was down 25.0 percent or -6,600 units from the recent peak of 26,500 permits issued in 2019. Annual average growth in housing permits has expanded over the period from 2016 to 2021 by 4.1 percent. The largest number of permits issued in the period since 2016 has occurred in Brooklyn (42,600 units), followed by the Bronx (28,500 units) and Queens (27,600 units).

Table 15 Housing Building Permits Issued within the City, 2016 – 2021

Borough	2016	2017	2018	2019	2020	2021	Total, 2016-2021	Average Annual Growth (2016-2021)	Annual Growth (2020-2021)
Bronx	4,003	5,401	3,698	5,541	4,461	5,348	28,452	6.0%	19.9%
Brooklyn	4,503	6,130	8,445	9,696	6,802	7,013	42,589	9.3%	3.1%
Manhattan	4,024	4,811	3,584	5,512	1,896	3,165	22,992	-4.7%	66.9%
Queens	2,838	5,104	4,577	5,137	5,840	4,087	27,583	7.6%	-30.0%
Staten Island	901	685	606	661	408	310	3,571	-19.2%	-24.0%
Total	16,269	22,131	20,910	26,547	19,407	19,923	125,187	4.1%	2.7%

Source: US Census Bureau, Building Permit Survey.

Office Market

In other property markets, notably office, Cushman & Wakefield reported that leasing activity had recovered modestly in 2021 from an all-time low of 12.8 million square feet in 2020 up to 18.6 million square feet in 2021. Although an improvement, this was down significantly from 34.7 million square feet in 2019. Recovering off a historical high in Manhattan unemployment, demand for office space remained very low in the fourth quarter of 2021 with New York City office-using employment roughly 72,600 jobs below the February 2020 total, despite gains of 66,300 office jobs over the past twelve months. Roughly one-third of new lease activity was drawn from the sectors of technology, advertising, media and information services, primarily in large spaces of 10,000 SF square feet or more. Financial services firms comprised another third of new leasing activity.

Increasing vacancies in sublease space put further pressure on asking rents. The overall vacancy rate, including both direct and sublet vacancies climbed from 11.1 percent in Q4 2019, to 15.2 percent in Q4 2020 and 20.4 percent in Q4 2021 (see Table 16). Manhattan's office submarkets were disproportionately impacted by the pandemic with areas such as Murray Hill, Times Square South, the West Side, Hudson Square/West Village, Madison/Union Square, and the Insurance district of Wall Street hit the hardest. Since Q4 2019, the vacancy rate has increased by 11.3 percentage points in Midtown South compared with a gain of 9.4 percentage points in Downtown and 8.8 percentage points in Midtown as a whole. In both Midtown South and Downtown, sublet vacancies more than doubled in area.

Table 16 Manhattan Office Market Overall Vacancy Rates, Q4 2019- Q4 2021

SUBMARKET	Q4 2019	Q4 2020	Q4 2021	2019-2021 Percentage Point Change
East Side/UN	12.2%	13.5%	19.5%	+7.3%
Grand Central	13.1%	18.2%	22.1%	+9.0%
Madison/Fifth	16.0%	20.9%	22.7%	+6.7%
Murray Hill	10.2%	15.5%	23.0%	+12.8%
Park Avenue	11.0%	15.9%	19.0%	+8.0%
Penn Station	8.3%	11.4%	14.0%	+5.7%
Sixth Avenue/Rock Center	8.7%	10.9%	13.8%	+5.1%
Times Square South	11.3%	18.4%	23.2%	+11.9%
West Side	13.2%	17.2%	26.8%	+13.6%
MIDTOWN TOTALS	**11.6%**	**15.8%**	**20.4%**	**+8.8%**
Chelsea	9.3%	12.9%	16.0%	+6.7%
Greenwich/NoHo	6.2%	12.7%	14.9%	+8.7%
Hudson Square/West Village	6.5%	15.1%	16.7%	+10.2%
Madison/Union Square	8.4%	16.1%	23.8%	+15.4%
SoHo	13.1%	14.8%	19.1%	+6.0%
MIDTOWN SOUTH TOTALS	**8.5%**	**14.8%**	**19.8%**	**+11.3%**
City Hall	8.9%	8.8%	9.9%	+1.0%
Financial East	12.9%	13.0%	21.5%	+8.6%
Financial West	19.9%	18.8%	26.9%	+7.0%
Insurance	9.2%	12.0%	30.6%	+21.4%
TriBeCa	3.0%	6.3%	12.6%	+9.6%
World Trade	11.9%	17.3%	19.3%	+7.4%
DOWNTOWN TOTALS	**11.7%**	**13.7%**	**21.1%**	**+9.4%**
MANHATTAN TOTALS	**11.1%**	**15.2%**	**20.4%**	**+9.3%**

Note: Overall vacancies include both direct and sublet vacancies.
Source: Cushman & Wakefield, Office Marketbeat, Q4 2019, Q4 2020 & Q4 2021.

With reduced demand, Cushman & Wakefield reported that Class A rental rates decreased by 4.4 percent from $79.82 in 2019 to $76.29 per square foot in 2021 (-4.4%), while average rental rates for all classes edged down from $73.41 per square foot in 2019 to $69.67 in 2021 (-5.1%). Net absorption for the borough's office market was down from 2.6 million square feet in 2019 to -19.4 million square feet in 2021 as businesses released no longer needed space. Manhattan's inventory of office space decreased from 408.9 million square feet in 2019 to 408.3 million square feet in 2021, a net loss of 530,000 square feet likely due to renovations and conversions from office to other uses. As of March 2022, City leaders and New York State legislators are continuing to evaluate the feasibility of a proposal to override local zoning regulations to incentivize the

conversion of commercial buildings, including office and hotel properties, in Midtown Manhattan into housing. These incentives would apply to class B and C office buildings as well as hotels with fewer than 150 rooms over a 5-year period.

During the fourth quarter of 2021, Cushman & Wakefield reported that 17.0 million square feet of office space was under construction or proposed to start in Manhattan. Table 17 identifies 14 office buildings being built or announced for development between 2022 and 2025. In the aggregate, these buildings will contribute over 22.1 million gross square feet of space to the Manhattan market if all are completed within the next three years. Four towers are expected to exceed 2.5 million square feet each, while seven others will range between one and two million square feet. In 2022, four buildings were expected to account for 6.0 million square feet of construction, followed by the build out of 5.1 million square feet in 2023, 6.6 million in 2024, and 4.3 million square feet in 2025. This data is current as of 2022; many developers have not yet shared their construction intentions under current pandemic conditions.

Table 17 Major Manhattan Office Buildings Proposed for Completion by 2025[(a)]

Year of Project Completion	Address	Developer/Occupant	Gross Square Feet
2022	50 Hudson Yards (415 10 Ave)	Related	2,900,000
	2 Madison West (435 West 31 St)	Brookfield	1,700,000
	550 Washington St	Oxford Properties	1,300,000
	46 Gansevoort St	Wm Bottliev & Aurora Capital	100,000
2023	66 Hudson Blvd (The Spiral)	Tishman Speyer	2,850,000
	261 11th Ave	L & L & Normandy	500,000
	3 Hudson Blvd (555 West 34th St)	Moinian/Boston Properties	1,800,000
2024	5 World Trade Center (130 Liberty St)	Port Authority of NY & NJ	1,300,000
	200 Greenwich Street (WTC #2)	Silverstein Properties	2,800,000
	1 Madison Ave	SL Green	1,250,000
	99 Hudson Blvd (444 11th Ave)	Tishman Speyer	1,300,000
2025	270 Park Ave	JP Morgan Chase	2,500,000
	424-434 5th Ave (Lord & Taylor)	Amazon	630,000
	4 Hudson Square (137 Varick)	Disney/Silverstein Properties	1,200,000

Source: New York Building Congress & Moody's Analytics REIS.
Notes: (a) Current as of March 2022.

Population Trends and Projections

Since 1980, US Census data indicate that the City's population has increased by 1.7 million persons to 8.8 million residents in 2020 (see Table 18). In recent years, the City has continued to be a desirable place of residence for many young professionals, foreign immigrants and international investors who maintain multiple residences, as well as the City's long-standing residents who have aged in place. All five of the City's boroughs are now more populous than in 1980. While the City's population has recorded historical periods of contraction, the commuter suburbs of New York,

New Jersey and Connecticut have grown largely continuously over the past 40 years. Compared to 8.8 million residents in the City, northern and central New Jersey now houses 7.4 million residents while the nine counties of Long Island and the Mid-Hudson are home to 5.3 million residents. Over the period from 1980 to 2020, the New Jersey region saw an increase of 1.6 million residents and the New York region added 782,700. The Connecticut region, with 2.0 million residents, has added 282,200 residents since 1980. All subregions experienced modest population losses from a peak year in 2017 to 2019 according to annual estimates benchmarked to the 2010 Census. However, the 2020 Census, the latest data available, identified strong growth in the region over the period from 2010 to 2020.

Recent population losses during the latter half of the past decade in the New York City metropolitan area follow national trends for major urban areas where residents have emigrated elsewhere due to increased living costs and slow salary growth. As public spaces, entertainment venues, and restaurants closed and white-collar employment transitioned from office buildings in central business districts to remote home-based work locations during the spring and summer of 2020, outward migration accelerated from the New York metropolitan area, especially among young adults. At that time, realtors reported increased suburban home purchases and rental lease signings in the outer suburban areas of the region as apartment vacancies in Midtown West and the Upper West Side climbed upward.

According to Moody's Analytics REIS, a leading real estate analytics data provider, the most recent low point in apartment rental demand was in March 2021 when a high of 10,111 vacant units was estimated in the City and vacancy rates peaked at 4.3 percent. In the following months, the apartments market experienced a swift recovery as vacancy rates edged down to 3.5% in January 2022, well below 2019 vacancy rates and median asking rents climbed to recent records at $3,943 per unit compared with $3,655 in January 2019. Along with New York City, many major US cities and their central business districts saw multifamily absorption and rent growth in the second half of 2021. During the early months of the pandemic, many of the inner suburban counties experienced household outmigration but this trend ultimately reversed in the fall of 2020 according to Moody's. From Q4 2020 to Q4 2021, both the City and the suburban counties experienced continuous, albeit moderate household formation growth. While areas such as Suffolk and Sullivan counties in New York, Hunterdon and Somerset counties in New Jersey, and Litchfield County in Connecticut saw increases in single-family home sales prices in 2020, it is not yet clear whether increased demand in those areas is the result of a growing appetite for secondary homes or long-term relocations of year-round residents.

Population change was further affected by the direct loss of life due to the pandemic as COVID-19 infections spread quickly in the New York City metropolitan area earlier than in other large urban areas of the United States. The City, in particular, was in effect the laboratory for treatment protocols. According to the Central for Disease Control and Prevention, COVID-19 related deaths, both in total and per capita (39.4 per 10,000), were highest in New York City compared with the surrounding suburban counties. The Connecticut suburban counties (29.6 per 10,000) fared better than the New York and New Jersey suburban counties (35.6 and 34.8 per 10,000, respectively). While the regional death toll early in the pandemic was devastating, the

treatment protocols established, and the rollout of widespread vaccinations have curtailed the excess morbidity rate. As of March 2022, just over half of COVID-19 deaths in the entire Tri-State area occurred in 2020 (52.5%) while another 35.3 percent occurred in 2021, and 12.1 percent in early 2022.

Table 18 Population Trends 1980 to 2020

(000s)

Year	New York City	New York Region [a]	New Jersey Region [b]	Connecticut Region [c]	NYC and All Regions
1980	7,071.6	4,537.1	5,856.8	1,725.2	19,190.8
1990	7,322.6	4,635.2	6,079.5	1,806.0	19,843.2
2000	8,008.3	4,933.1	6,661.8	1,888.8	21,491.9
2005	8,013.4	5,059.8	6,830.6	1,933.7	21,837.5
2010	8,175.1	5,123.7	6,946.4	1,969.2	22,214.5
2015	8,550.4	5,192.8	7,116.4	1,991.1	22,850.8
2016	8,537.7	5,182.0	7,110.1	1,983.6	22,813.4
2017	8,622.7	5,203.6	7,175.3	1,992.5	22,994.2
2018	8,398.7	5,161.4	7,093.1	1,982.6	22,635.8
2019	8,336.8	5,157.3	7,071.1	1,978.4	22,543.7
2020	8,804.2	5,319.8	7,412.6	2,007.4	23,544.0
Average Annual Percent Change					
1980 to 1990	0.3%	0.2%	0.4%	0.5%	0.3%
1990 to 2000	0.9%	0.6%	0.9%	0.4%	0.8%
2000 to 2005	0.0%	0.5%	0.5%	0.5%	0.3%
2005 to 2010	0.4%	0.3%	0.3%	0.4%	0.3%
2010 to 2015	0.9%	0.3%	0.5%	0.2%	0.6%
2015 to 2016	-0.1%	-0.2%	-0.1%	-0.4%	-0.2%
2016 to 2017	1.0%	0.4%	0.9%	0.4%	0.8%
2017 to 2018	-2.6%	-0.8%	-1.1%	-0.5%	-1.6%
2018 to 2019	-0.7%	-0.1%	-0.3%	-0.2%	-0.4%
2019 to 2020	5.6%	3.2%	4.8%	1.5%	4.4%

Source: US Census Bureau.

Notes:

(a) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.

(b) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

(c) Consists of the following counties: Fairfield, Litchfield, and New Haven.

NYMTC prepared a series of 40-year population forecasts, released in final form in October 2020 and presented in Table 19. Between 2015 and 2055, NYMTC projects a 0.33 percent annual rate of growth, compared to the region's annual average historic growth of 0.51 percent from 1980 to 2020. The City is expected to account for an estimated 40 percent of future regional annual growth. The New Jersey suburbs are expected to have 36 percent of the increase, while Long Island and the Mid-Hudson are expected to account for 18 percent of the total. The Connecticut region, by contrast, will likely account for only 6 percent of the regional growth.

Population growth traditionally will positively affect traffic demand on crossings, although employment trends appear to have had a more noticeable effect on traffic volumes at TBTA facilities. However, TBTA traffic variations do not always correlate year by year with regional demographic trends, as in this instance where pandemic impacts on behavior as well as reduced transit service have increased TBTA crossings. As evident, demand for TBTA facilities has been strong overall and NYMTC's long-term regional population projections indicate a trend for such demand to increase over the projected period. Any losses due to short-term fluctuations in employment due to the pandemic were projected to be offset by other years that will be characterized by growth. In general, an upward trend is expected over the long term through the end of NYMTC's current forecast period in 2055.

Table 19 Population Projections

(000s)[a]

Year	New York City	New York Region [b]	New Jersey Region [c]	Connecticut Region [d]	NYC and All Regions
Average Annual Percent Change					
2015 to 2020	0.42%	0.06%	0.25%	-0.02%	0.25%
2020 to 2025	0.64%	0.21%	0.33%	0.16%	0.41%
2025 to 2030	0.40%	0.31%	0.35%	0.24%	0.35%
2030 to 2035	0.24%	0.69%	0.67%	0.52%	0.50%
2035 to 2040	0.20%	0.48%	0.52%	0.33%	0.37%
2040 to 2045	0.19%	0.23%	0.40%	0.16%	0.26%
2045 to 2050	0.15%	0.27%	0.39%	0.12%	0.25%
2050 to 2055	0.11%	0.26%	0.38%	0.12%	0.23%

Source: New York Metropolitan Transportation Council.

Notes:

(a) Forecast is the most recent available, unchanged from the previous year.

(b) Consists of the following counties: Dutchess, Nassau, Orange, Putnam, Rockland, Suffolk, Sullivan, Ulster and Westchester.

(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

(d) Consists of the following counties: Fairfield, Litchfield, and New Haven.

Motor Vehicle Registrations

The trend in motor vehicle registrations in an area has been a predictor of growth or stability in levels of vehicular traffic. Motor vehicle registrations in New York State, New Jersey and Connecticut peaked in 2005 and dropped sharply following the financial crisis. By 2011 Tri-State registrations neared peak 2005 levels though they have declined in recent years. Over the period from 2010 to 2020, registrations in the Tri-State area dropped by 507,900 with a loss of 949,400 registrants in New Jersey while the City added 213,000 registrants, New York State added 721,500 registrants and Connecticut lost 280,000 registrants (see Table 20). From 2020 to 2021, registrations have increased by 3.0 and 3.2 percent in the City and New York State, respectively. Increased personal vehicle travel in urban areas is considered one among many near-term impacts from the pandemic as commuters seek to avoid close contact with others during travel.

Although motor vehicle registrations are not projected for future years, auto sales increased nationally following the 2007-2009 recession due to pent-up demand with a record number of annual sales in 2015 and 2016. According to the United States Bureau of Economic Analysis, monthly auto sales declined marginally in recent years from a peak in 2016 as average monthly finance rates for 48-month new auto loans increased from a 50-year low in November 2015 of 4.0 percent to 5.5 percent in November 2019. A sharp dip in sales occurred in 2020 as consumer confidence plummeted, although sales numbers remained above annual levels from 2008 to 2012. By end of year 2021, consumer confidence had returned to pre-pandemic levels but was declining in the early months of 2022 due to concerns about fast-rising inflation. Global supply constraints, particularly the semiconductor chip shortage, contributed to low vehicle inventories and demand-induced rising prices at US car dealerships from 2020 through the present. In February 2022, total vehicle sales had slumped to 2012 levels while domestic automobile production continued a long-term decline that has been in motion since 2016, now at levels last seen during periods of sharply curtailed demand such as the early months of the 2020 pandemic and the 2009 recession. The outlook for future motor vehicle registrations will continue to depend on a revival of automobile production and stable consumer confidence levels as demand remains strong in the near-term.

Table 20 Motor Vehicle Registrations

(000s)[(a)]

Year	New York City	New York State[(b)]	New Jersey	Connecticut
2010	1,962	10,603	6,956	3,148
2011	1,961	10,431	7,940	2,829
2012	1,978	10,449	7,911	2,706
2013	2,016	10,674	7,061	2,856
2014	2,057	10,904	6,874	2,866
2015	2,107	10,639	5,939	2,842
2016	2,162	11,122	5,941	2,842
2017	2,189	10,857	6,058	2,826
2018	2,186	11,482	6,055	2,880
2019	2,182	11,389	6,033	2,879
2020	2,175	11,325	6,006	2,868
2021	2,242	11,689	N/A	N/A
Average Annual Growth				
2010-2020	1.0%	0.7%	-1.5%	-0.9%
2011-2021	1.3%	1.1%	N/A	N/A

Source: United States Federal Highway Administration and New York State Department of Motor Vehicles

Notes:
(a) This represents the most recent available data for New Jersey and Connecticut.
(b) Including New York City.

Annual year-end motor vehicle registrations for the period from 2016 through 2021 are shown for each of the City's five boroughs in Table 21. The annual change in citywide registrations increased from a 1.2 percent increase from 2016 to 2017 to a 3.0 percent gain from 2020 to 2021 as pandemic-related transit safety concerns drove commuters away from public transit towards personal vehicles. From 2016 to 2021, the City gained 79,200 registrations; Brooklyn saw the largest gain in new registrations (+51,100), followed by the Bronx (+10,700), Staten Island (+9,700), and Queens (+8,700). Only Manhattan saw a decrease in the number of registrations, a drop of 1,000 vehicles. It is worth noting that the availability and usage levels of for-hire services have had impacts on traffic and contributed to a portion of the increase in vehicular travel in recent years although this upward trend appears to be leveling off. For example, the number of unique ride-hailing vehicles dispatched in the City (including for-hire Uber, Lyft, Juno and Via vehicles as well as black car, limo and livery vehicles) increased from 36,800 in 2015 to a peak of 104,670 vehicles in December 2018. Ride-hailing vehicles have since declined to a low of 28,100 vehicles in April 2020, climbing back up to 82,300 vehicles in December 2021.

Table 21 New York City Motor Vehicle Registrations, 2016 to 2021

Borough	2016	2017	2018	2019	2020	2021	2020 - 2021 Growth	2016-2021 Average Annual Rate of Change
Bronx	284,084	288,788	290,055	288,754	287,166	294,792	2.7%	0.7%
Brooklyn	512,374	521,434	524,701	535,265	544,623	563,485	3.5%	1.9%
Manhattan	256,017	254,572	250,270	248,322	251,147	255,005	1.5%	-0.1%
Queens	830,603	841,513	837,319	831,600	817,102	839,323	2.7%	0.2%
Staten Island	279,271	283,067	283,928	277,617	275,154	288,928	5.0%	0.7%
Total	2,162,349	2,189,374	2,186,273	2,181,558	2,175,192	2,241,533	3.0%	0.7%

Source: New York State Department of Motor Vehicles

Fuel Availability and Prices

Traffic and revenue at TBTA crossings have been affected in varying degrees by the availability and price of gasoline since 1970. Volatility driven by major events have contributed to fuel shortages and increases in gasoline prices. Such events include the 1973-1974 period due to the Organization of the Petroleum Exporting Countries ("OPEC") oil embargo and reduced OPEC output in 1979 associated with disruptions during the Iranian Revolution, during the first war in the Persian Gulf in the early 1990's and during the war in Iraq in the 2000's. During the mid to late 2000's reduced local supplies due to damage to refineries caused by Hurricane Katrina in 2005 caused near-record prices followed by a sharp reduction in prices during the 2007-2009 recession as global demand declined. Figures 4A/4B illustrate the trend in rolling average[11] monthly VMT and gas prices since 2011.

[11] 12-month rolling averages (using average values of the past 12 months instead of single months of data) were utilized in Figures 3A/3B to smooth out cyclical and seasonal month-to-month trends.

Major events affecting gas prices over the past decade include the Arab Spring pro-democracy protests and uprisings of 2010 to 2013 that resulted in rapidly rising gas prices amid local toll increases and local economic weakness, during which reductions in traffic volumes at TBTA crossings occurred; the 2014-16 collapse in oil prices due to booming U.S. shale oil production and aggressive regional economic recovery from the Great Recession; and, the current pandemic resulting in an unprecedented short-term decline in global travel activity and energy usage followed by a dramatic recovery in consumption in 2021 and 2022 where oil producers and refineries were unable to keep up to pace with increasing demand.

During the second week of July 2008, the average price of regular grade gasoline was the highest recorded price yet at that time at $4.114 per gallon in the U.S. and $4.179 in the City. Prices then dropped in the second half of 2008, remaining steady through 2009 and increasing through 2010. The next peak, during the second week of May 2011, saw prices at $3.965 per gallon in the U.S. and $4.069 in the City. After falling to the lowest prices in a decade in April 2020 due to a near-halt in travel activity and sharply reduced consumer demand, energy prices rose sharply over the following 23 months as oil producers and refineries were unable to ramp up production to meet rising demand amid geopolitical tensions in the Middle East and Europe. As of April 18, 2022, the U.S. Energy Information Administration ("EIA") stated that the price of regular grade gasoline averaged $4.066 per gallon nationally, and $3.968 in the City, down modestly from all-time highs recorded during the week of March 14, 2022. See the discussion of the factors contributing to changes in price and availability of gasoline below.

Sharp increases in the price of gasoline in 2008 and 2011 resulted in decreases in Vehicle Miles Traveled ("VMT") in the United States and in the New York metropolitan area. Data from the FHWA indicates that VMT decreased between 2007 and 2008 by 1.9 percent nationally and by 4.1 percent in New York State. In 2011, largely in response to the recession, national VMT was 2.6 percent below the 2007 level and New York State VMT was 7.1 percent below 2007. From 2014 to 2019 national travel demand continued to increase by an average annual rate of 1.5 percent as statewide levels decreased by 1.4 percent. At the national level, low gas prices contributed to increased travel, while VMT declined in New York State as average transit ridership increased and new travel options including car shares, bike shares and taxi-booking services emerged.

In 2020, pandemic-related travel restrictions contributed to a sharp drop in travel across the nation with an annual decline in VMT of 13.2 percent nationally and 16.6 percent in New York State where travel restrictions were longer and more intense than in other areas of the country. The recovery in VMT from 2020 to 2021 somewhat made up for the prior year losses, however national and New York State VMT remained 3.2 and 8.3 percent below 2019 levels, respectively. In the City, TBTA total transactions declined by 23.1 percent from 2019 to 2020 following annual average gains of 2.9 percent over the period from 2014 to 2019. In 2021, TBTA transactions increased by 21.4 percent over the previous year, but remained 6.7 percent lower than 2019 levels.

Factors contributing to changes in the price and availability of gasoline are both upward and downward and each has an unknown element that contributes to uncertainty. These factors include:

- Russia's invasion of Ukraine and subsequent sanctions on Russia and other related actions created significant market uncertainties and instability in gasoline availability and prices; these factors are partially reflected in current oil prices. Along with already low oil supplies and increasing demand, the EIA reported that commercial oil inventories in the Organization for Economic Co-operation and Development ended in February at the lowest levels since mid-2014. The EIA has reported that the pandemic had already created "greater-than-usual uncertainty" in its forecasting, and "this uncertainty has increased significantly following Russia's invasion of Ukraine." EIA researchers have noted several potential actions that could significantly impact oil markets in the near-term including additional nations banning imports of Russian energy, the announcement of further sanctions against Russia, independent actions by corporations that may impact Russia's oil production capabilities, and non-Russian producers could also increase output in response to higher prices. On March 31, 2022, President Biden announced the largest release of oil reserves in the history of the United States, putting one million additional barrels on the market per day on average over the months from April through September 2022. Although the Kingdom of Saudi Arabia ("the Kingdom") and the United Arab Emirates have so far not agreed to rapidly increase crude production to offset impacts from sanctions on Russia in a similar response to the 1990s oil shocks, the OPEC+ alliance continues to raise its quotas for the months ahead due to pressure from key customers including the United States. According to the latest data available as of April 18, 2022, the Kingdom's February crude oil exports were the highest on record since April 2020 with exports expected to continue to expand in the months ahead.

- Dependence on imported crude oil – Generally, the United States' dependence on imported fuel has continued to fall as the country continues to increase its reliance on domestic resources. The EIA, in the April 2022 Short-Term Energy Outlook ("STEO"), reported their outlook remains subject to heightened levels of uncertainty resulting from a variety of factors, including Russia's invasion of Ukraine, the production decisions of OPEC, and the rate at which U.S. oil and natural gas producers increase drilling.

- On April 12, 2022, the EIA projected that daily domestic crude oil production will average 12.01 million barrels per day in 2022 and will reach 12.95 million barrels per day in 2023, a record high last exceeded in 2019.

- Use of substitute fuels – Since 2010 the use of biofuels, including biomass-based diesel, ethanol and biofuel losses and co-products, has increased in the United States as domestic production has ramped up following reductions in foreign imports since 2013. In February 2022 the EIA reported that both biofuel and petroleum-based motor fuel consumption would exceed 2019 levels in 2022.

- This trend is expected due to regulatory support such as the federal Renewable Fuel Standard program which sets annual domestic renewable fuel volume targets. Increased levels of domestic production and net imports of biomass-based diesel were expected given the renewal of the biodiesel blender's tax credit in December 2019. Fluctuations in biofuel imports have an impact on the need for gasoline.

- Motor vehicle fuel efficiency – The projected real-world model year 2021 fuel economy of 25.3 miles per gallon ("mpg"), will be slightly less than the 2020 model year fuel economy of 25.4 mpg. However, if achieved, will be second-highest level year, after 2020, of fuel efficiency since the EPA began its analysis of light-duty automotive vehicles in 1975. In April 2010, both the National Highway Traffic Safety Administration and the EPA raised the fleet-wide Corporate Average Fuel Economy requirements to a real-world fuel economy of approximately 36 mpg for new vehicles in 2025. In December 2021, the EPA finalized new greenhouse gas standards for passenger vehicles effective for Model Years 2023 through 2026, resulting in a fleetwide real-world average of about 40 mpg in 2026, considerably higher than the Year 2026 32 mpg requirement under the earlier Trump Administration SAFE Vehicles Rules finalized in 2020. The EPA also proposed stronger standards for heavy-duty vehicles starting in model year 2027 on March 7, 2022, which would reduce nitrogen oxide emissions from trucks by as much as 60 percent in 2045.

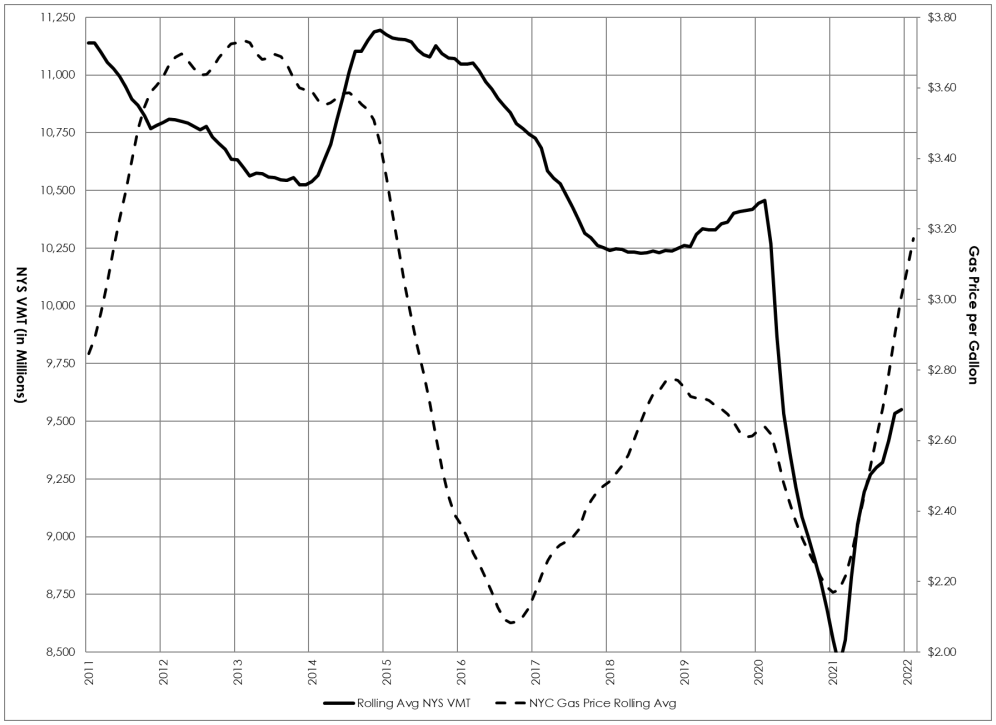
- In recent years, electric vehicles ("EV") have increased in popularity, rising from 0.75 percent of total US light-vehicle deliveries in Q1 2018 to 3.4 percent in Q4 2021 while hybrid, plug-in hybrid, and electric vehicle sales in total increased in share from roughly 6 percent in Q1 2018 to 11 percent in Q4 2021. While the U.S. government had altered its system for regulatory credits associated with the sales of EVs in early 2020 as SAFE emissions regulations were set into policy, in March 2022, the EPA reinstated California's authority under the Clean Air Act to implement its own greenhouse gas emission standards and zero emission vehicle sales mandate, thereby continuing the practice of generating regulatory credits for the sales of EVs now followed by 14 states, including New York, New Jersey, and Connecticut.

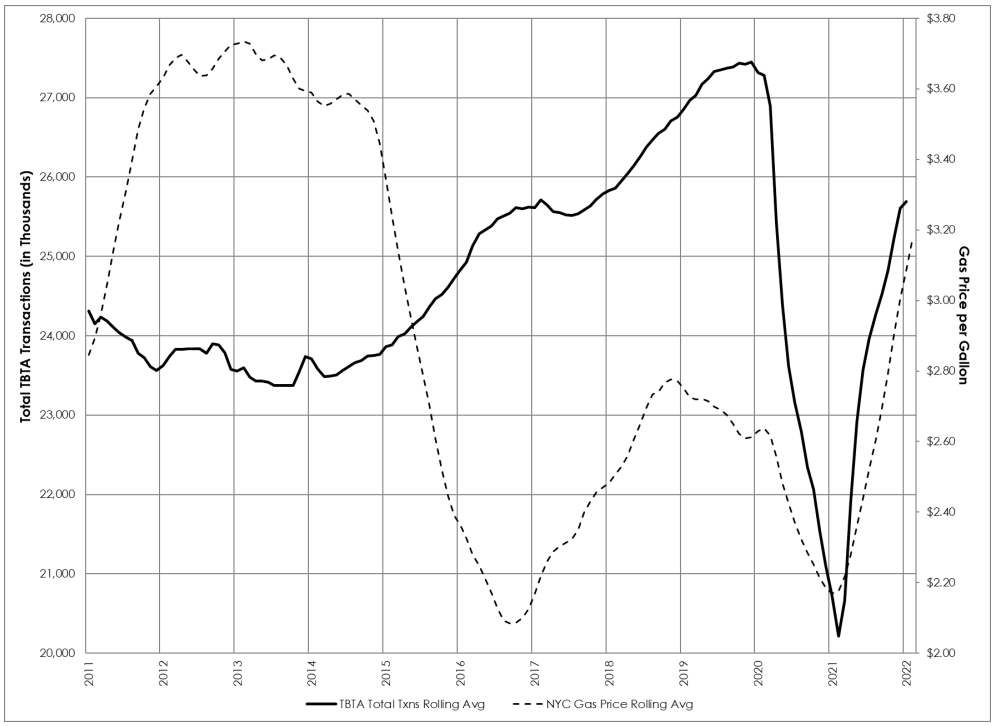
- In its April 2022 STEO, the EIA forecasted the national price of regular grade gasoline to average $3.74 per gallon in 2022, compared with $3.02 per gallon in 2021. Although average prices stood at $4.091per gallon in mid-April, the EIA forecasts the national price of regular grade gasoline to peak on a quarterly basis at $3.97 per gallon during the second quarter of 2022, subject to change based on conditions in Russia's invasion of Ukraine, future events, and sanctions. It is notable that global demand for oil declined somewhat from mid-March to mid-April due to rising pandemic case numbers in Asia, Europe and, Australia followed by total lockdowns in Shanghai and other major Chinese cities.

- The EIA's forecast for the Brent Crude Oil Spot Price, one of the major benchmarks used in pricing oil, is expected to peak in the second quarter of 2022 at $107.65 per barrel, however various investment banks and consultancies have forecasted far higher prices including forecasts of $135 per barrel on average in 2022 by Goldman Sachs as well as worst-case scenario forecasts of $200 per barrel by Barclays and Oslo-based consultancy Rystad Energy. After the U.S. announced it would ban imports of Russian energy and the U.K. said it would phase out Russian products by the end of 2022, the Brent Crude Oil Spot Price rose on March 8, 2022, to a long-term peak of $133.18 per barrel, later falling to $110.39 per barrel on March 14, 2022. Notably, crude oil prices were not expected to peak before sanctions took effect on March 26, 2022.

Depicted on the following page is Figure 4A/4B, which illustrates the historical relationship between gas prices and travel. As shown with both New York State VMT and TBTA Total Transactions, a reduction in the price of gas generally has correlated with a rise in vehicular travel demand. Similarly, a rise in the price of gas generally has correlated with a reduction in vehicular travel demand. However, Figure 4B shows that the rise in monthly transactions began prior to the drop in gas price, indicating that although gas prices can affect travel, the recent increases in transactions cannot entirely be attributed to the movement in gas prices.

Figure 4A/4B New York City Gas Prices Compared to New York State VMT and TBTA Bridges and Tunnels Total Transactions



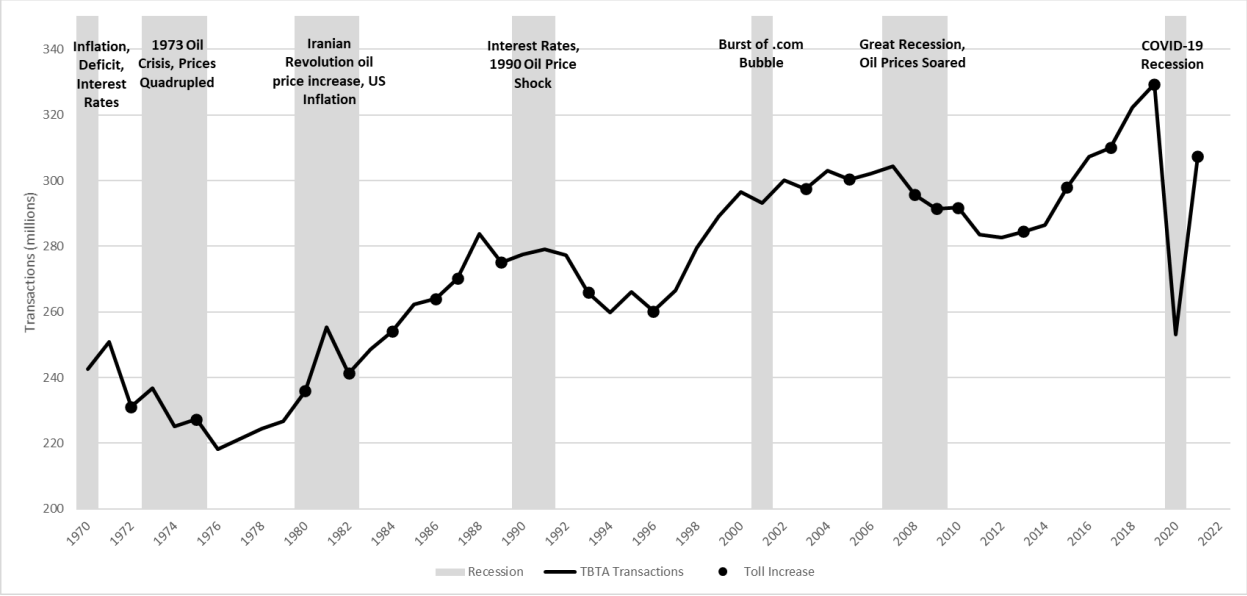


Review of March 2022 Gas Prices

Following a sharp reduction in TBTA transactions throughout most of 2020 due to pandemic travel restrictions, recent trends in the latter half of 2020 and 2021 suggest an extended period of recovery in travel is currently underway. Despite fast-rising fuel prices, this trend continued in the second half of 2021 and early 2022.

As mentioned earlier, among several factors, Russia's invasion of Ukraine and subsequent sanctions on Russia and other related actions created significant market uncertainties about the potential for future oil supply disruptions. Based on travel patterns during previous sharp increases in oil price and disruptions in oil supply, discretionary travel could decline and there may be fewer recreational trips. Also, the reduced non-work travel could also make the toll-free alternatives more competitive. In order to estimate the effects of the sudden spike in oil prices in the first few months of 2022 on our ten-year forecast, Stantec studied how gas prices and TBTA traffic trends have related to one another over the past 50 years. Figure 5 below shows TBTA transactions and recessions from 1970 through 2022 (as shown earlier in the report) with the addition of a brief recession description.

Figure 5 TBTA Transactions Through Recessions

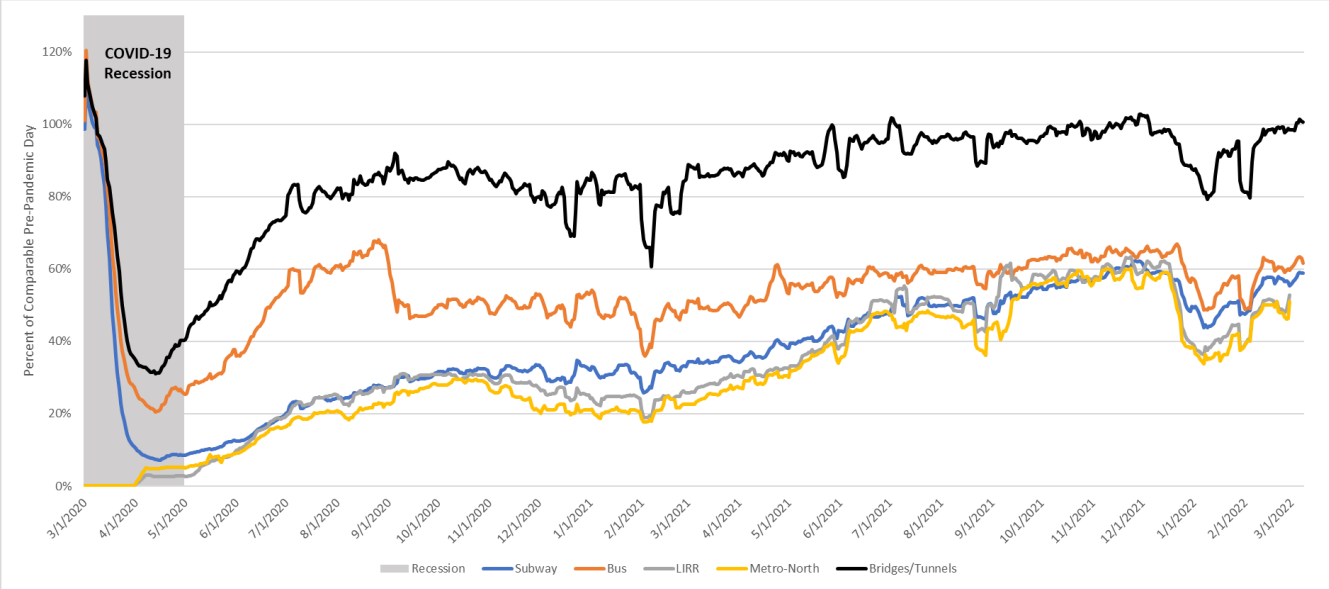


A majority of recessions throughout the last 50 years were adjacent to periods with oil price spikes. Based on this analysis, Stantec's forecast assumes that an economic downturn is approaching as a result of the current sharp gas price increase. The possible extents of this economic downturn will be further studied as part of a series of sensitivities discussed later in this report.

Figure 6 depicts the pandemic related recovery of the various modes of travel in the City compared to a pre-pandemic day. As shown in the graph, there is still a large proportion of people that potentially have yet to return to travel for various reasons. The continued low level of transit

use supports that observation. The strong return of travel on TBTA facilities compared to transit trips also indicates a general preference for personal vehicles. This suggests that there is continued room for increasing vehicle travel on TBTA facilities. Our base forecast assumes that a significant portion of lost vehicular trips due to oil prices will be replaced by the post pandemic return to normal travel.

Figure 6 MTA Ridership and Traffic Estimates – March 2020 through March 2022



Toll Increase Impacts, Collection Methods, and Elasticity

Tolls that are increased periodically can affect traffic usage, especially if they outpace the rate of inflation and in those instances where competing facilities provide a good alternative. Elasticity, as used herein, is the relationship between the change in traffic volume and the toll rate change. It represents the relative decrease in traffic in response to a given increase in toll. Elasticity is expressed as a negative value and the higher the absolute value, the more apt a facility is to lose traffic, which can be attributable to diversions to competing facilities, switches in travel modes, consolidation of trips, and elimination of trips. Elasticity, in this sense, is used to analyze the relationship between tolls and use, i.e., when tolls are increased, motorists react, and travel patterns may change.

Elasticity factors vary, demonstrating that users react differently to toll increases depending on influencing conditions. On the TBTA crossings, elasticity tends to be influenced by the proximity of the toll-free City bridges and other considerations. The low elasticity factors for the Throgs Neck and Bronx-Whitestone Bridges indicate their relative isolation from the nearest toll-free competitor, the Ed Koch Queensboro Bridge. On the East River at the RFK Bridge and at the Queens Midtown and Hugh L. Carey Tunnels, elasticity increases as the degree of toll-free competition increases. The TBTA tunnels tend to lose traffic particularly when the competing crossings are operating under reasonable levels of traffic service and providing motorists with viable toll-free alternatives during

non-peak periods. In addition, trip purpose influences demand; i.e., peak-period, work-related trips are less elastic than off-peak or discretionary trips that have fewer travel-time constraints. The effects of construction on main thoroughfares and feeder routes also affect drivers' choices of toll facilities.

Two sets of forecasts were developed for this report: one at constant (current) tolls and the second factoring in toll increases in March 2023 and March 2025 as included in the MTA 2022-2025 Financial Plan adopted by the MTA Board in February 2022. Elasticity factors used for the analyses in this report are based on factors Stantec developed from analyzing the elasticity exhibited following the March 2017 toll increase. Despite the pandemic, Stantec does not anticipate any changes to the usual driver behavior caused by a toll increase.

To evaluate the impact of any toll increase on transactions, transactional data at each of the TBTA facilities are split into four groups by payment type: NYCSC E-ZPass customers, non- NYCSC E-ZPass customers, NYCSC Mid-Tier E-ZPass customers (effective with the April 11, 2021, toll increase), and TBM customers. Stantec then estimated the revenue split by payment type; this enabled the tracking of the average toll rate throughout the months following the toll increase. The conversion to Cashless Tolling also occurred throughout 2017 at eight of the nine facilities and greatly induced cash customers to switch to E-ZPass. Overall E-ZPass usage increased by 3.4 percent (Throgs Neck Bridge) to 6.6 percent (RFK Bridge) in 2017 with the conversion to Cashless Tolling, which is a combination of background growth and payment method shifts, which vary by facility. Background growth rates were studied using historical and projected population growth, fuel prices, and VMT. Incorporating these various factors, seasonal trends in the data were also reviewed to determine the patterns and length of the toll increase impact. This process, generally, isolated the background growth and Cashless Tolling effects from the toll increase elasticities.

When reviewing changes in usage exhibited after the March 2017 toll increase, Stantec recognizes that it was unlike most prior toll increases in that, generally, total transactions at TBTA facilities continued to increase. This indicated, in Stantec's opinion, that the sensitivity to toll increases was diminishing and the background growth was increasing. Our analysis of the previous toll increases, prior to the existence of Cashless Tolling, found that cash motorists are more sensitive to toll rates when compared to E-ZPass users; indicating a significantly higher elasticity for cash customers than for E-ZPass customers. With regard to tolling elasticities, TBM customers are expected to behave more like E-ZPass customers than traditional cash customers, as there is no direct cash transaction at the toll gantry for either customer. Stantec made separate analyses for both the E-ZPass customers and for the TBM customers. As a result, Stantec has seen that based on historical data, elasticity rates for TBM customers may continue to be closer to those found for E-ZPass customers as behavior stabilizes between the two collection methods. Elasticity factors used to develop Stantec's analyses of toll revenue including the recent toll increase and a future potential toll increase are shown in Table 22.

As discussed earlier, there was a significant shift from cash to E-ZPass in response to the implementation of Cashless Tolling. In 2018, the unprecedented shift to E-ZPass continued with total E-ZPass market share reaching 94.6 percent by December 2018. In December 2019, E-ZPass market share remained at 95.5 percent. In December 2020, E-ZPass market share was 94.7 percent. As of December 2021, E-ZPass market share was 95.0. January 2022 E-ZPass market share increased to 95.2 percent. Stantec estimates that while this shift will continue throughout the duration of the forecast, at these higher participation levels, the incremental changes will be smaller.

Any toll increases or other adjustments are subject to future action by the TBTA Board. However, for purposes of the calculations provided, we have assumed toll increases in accordance with the 2022-2025 MTA Financial Plan. This plan includes projected toll increases on March 1, 2023, and March 1, 2025. Accordingly, the revenue analysis with the toll increase laid out in this report includes a 5.7 percent toll increase on March 1, 2023, and a 5.6 percent toll increase on March 1, 2025, to achieve a 4 percent revenue yield for the years 2023 and 2025. Further, it was assumed that truck tolls would be increased proportionately, and that the relationships between TBM and NYCSC E-ZPass tolls for passenger cars would remain the same as those implemented for the toll increase on April 11, 2021.

As previously noted, the NYCSC Mid-Tier toll is a new toll rate effective with the April 11, 2021, toll increase and is charged to NYCSC E-ZPass customers who do not properly mount their E-ZPass tag when crossing TBTA facilities. It was assumed that these customers will have a similar behavior to E-ZPass customers since they often do not realize their improperly mounted E-ZPass was not read and therefore have the same elasticity. It is also assumed that a small portion NYCSC customers subject to the higher Mid-Tier toll rate will properly mount their E-ZPass tag in order to pay the lowest E-ZPass toll rate.

Table 22 Elasticity Factors

Facility	Elasticity Factors[a]		
	TBM	E-ZPass	Mid-Tier
Throgs Neck Bridge	-0.152	-0.087	-0.087
Bronx-Whitestone Bridge	-0.152	-0.087	-0.087
RFK Bridge	-0.152	-0.134	-0.134
Queens-Midtown Tunnel	-0.188	-0.130	-0.130
Hugh L. Carey Tunnel	-0.226	-0.178	-0.178
Verrazzano-Narrows Bridge	-0.174	-0.011	-0.011
Henry Hudson Bridge	-0.165	-0.099	-0.099
Marine Parkway Bridge	-0.116	-0.033	-0.033
Cross Bay Bridge	-0.163	-0.020	-0.020

Notes:
(a) For each 1% increase in toll, the volume is expected to decrease by the elasticity factor, e.g., for each 1% increase in the TBM toll at the Queens Midtown Tunnel, TBM traffic would decrease by 0.188%.

As for the impacts of the potential future toll increases on traffic demand, the elasticity factors from Table 22, as described previously, were used by Stantec to calculate changes in traffic, as shown in Table 23. These traffic impacts represent the reduction in volume from the corresponding annual traffic levels that would be expected in the constant tolls scenario Future transactions are calculated by adding background growth to existing transactions, and, when there is a toll increase, factoring in traffic loss due to toll elasticity (excluding any additional impacts which might occur as a result of the pandemic).

Table 23 Estimated Percent Change in Average Toll Rates and Traffic in 2023 and 2025

Facility	Elasticity Factors			Estimated Percent Change with 2023 Toll Increase						Estimated Percent Change with Assumed 2025 Toll Increase					
				Average Toll Rate			Traffic			Average Toll Rate			Traffic		
	TBM	E-ZPass	Mid-Tier	TBM	E-ZPass	Mid-Tier	TBM	E-ZPass	Mid-Tier	TBM	E-ZPass	Mid-Tier	TBM	E-ZPass	Mid-Tier
Throgs Neck Bridge	-0.152	-0.087	-0.087	5.7%	5.7%	5.7%	-0.9%	-0.5%	-0.5%	5.6%	5.6%	5.6%	-0.9%	-0.5%	-0.5%
Bronx-Whitestone Bridge	-0.152	-0.087	-0.087	5.7%	5.7%	5.7%	-0.9%	-0.5%	-0.5%	5.6%	5.6%	5.6%	-0.9%	-0.5%	-0.5%
RFK Bridge	-0.152	-0.134	-0.134	5.7%	5.7%	5.7%	-0.9%	-0.8%	-0.8%	5.6%	5.6%	5.6%	-0.9%	-0.8%	-0.8%
Queens-Midtown Tunnel	-0.188	-0.130	-0.130	5.7%	5.7%	5.7%	-1.1%	-0.7%	-0.7%	5.6%	5.6%	5.6%	-1.1%	-0.7%	-0.7%
Hugh L. Carey Tunnel	-0.226	-0.178	-0.178	5.7%	5.7%	5.7%	-1.3%	-1.0%	-1.0%	5.6%	5.6%	5.6%	-1.3%	-1.0%	-1.0%
Verrazzano-Narrows Bridge	-0.174	-0.011	-0.011	5.7%	5.7%	5.7%	-1.0%	-0.1%	-0.1%	5.6%	5.6%	5.6%	-1.0%	-0.1%	-0.1%
Henry Hudson Bridge	-0.165	-0.099	-0.099	5.7%	5.7%	5.7%	-0.9%	-0.6%	-0.6%	5.6%	5.6%	5.6%	-0.9%	-0.6%	-0.6%
Marine Parkway Bridge	-0.116	-0.033	-0.033	5.7%	5.7%	5.7%	-0.7%	-0.2%	-0.2%	5.6%	5.6%	5.6%	-0.6%	-0.2%	-0.2%
Cross Bay Bridge	-0.163	-0.020	-0.020	5.7%	5.7%	5.7%	-0.9%	-0.1%	-0.1%	5.6%	5.6%	5.6%	-0.9%	-0.1%	-0.1%

Availability of Capacity on TBTA Facilities

Stantec's assessment of TBTA's bridges and tunnels indicates that historically during most, if not all hours of the day, most facilities are operating below carrying capacity and more growth can be accommodated. The exception is the Queens Midtown Tunnel where historical data show the capacity is somewhat constrained during specific hours within peak periods. This may limit potential traffic growth during these specific times, but the great majority of the hours have sufficient available capacity to absorb any volume growth that may occur. Overall, wherever capacity constraints are observed, TBTA acts wherever feasible to alleviate those constraints through targeted investments.

TBTA completed the implementation of Cashless Tolling at all of its facilities by fall 2017. The Cashless Tolling system utilizes tolling equipment mounted on overhead gantries to capture E-ZPass tag-reads and license plate images in an environment without traditional toll plazas, enabling customers to traverse tolling areas in free-flow fashion.

Actual traffic observed after the conversion to Cashless Tolling and subsequent removal of traditional toll plazas showed that the removal of the toll booths eliminated any localized queuing and congestion associated with cash collection and E-ZPass interventions. The conversion to Cashless Tolling, however, does not address any recurring upstream or downstream congestion issues that exist at some facilities. These capacity constraints are typically located outside TBTA's jurisdictional boundaries but can impact traffic flow within the tolling areas during peak commuter and recreational periods. Flow through the former plaza areas continues to be affected by these off-site conditions even with the facilities operating in a Cashless Tolling environment. TBTA completed a study to identify post Cashless Tolling traffic improvements that will mitigate some of these off-site constraints to the extent feasible and in coordination with NYCDOT and New York State Department of Transportation (NYSDOT). The results of the study have helped inform TBTA's capital plan with current and future planned capital projects which will address some of the identified post Cashless Tolling traffic bottlenecks that serve to constrain capacity at certain facilities.

TBTA and Regional Operational and Construction Impacts

KC Engineering and Land Surveying, P.C. ("KC Engineering") was contracted as a subconsultant to Stantec to perform an analysis of current and planned projects in the New York City area. Traffic volumes on TBTA facilities are in some instances influenced by construction and rehabilitation projects involving roadways and bridges in the New York City area.

Major projects that result in long-term closures on the competing bridges may increase volumes on TBTA's facilities. Also, long-term lane closures on the roadway network serving the TBTA crossings or on the TBTA crossings themselves may affect TBTA traffic volumes or cause traffic to shift from the affected crossing to either another TBTA facility or to one of the City's toll-free bridges. For example, when replacement of the Queens Approach structure on the Bronx Whitestone Bridge began in 2011, some traffic diverted to the Throgs Neck Bridge, as the Bronx Whitestone Bridge

and the Throgs Neck Bridge serve similar traffic and a delay on one of the bridges results in a shift to the other crossing. A number of roadway construction/rehabilitation projects, over the past few years, have influenced traffic volumes on TBTA facilities, and future construction will also affect traffic. The following descriptions also highlight area construction activities and measures that have influenced TBTA volumes and other planned and proposed projects that may affect traffic during the forecast period. Information on future non-TBTA construction activity was obtained from MTA, NYSDOT, NYCDOT, NYMTC, and the Port Authority.

Construction on TBTA Facilities

TBTA has an active program of regional transportation planning and coordinates closely with regional partners on all projects in common corridors. TBTA is part of a regional Interagency Program Coordination group that meets regularly to discuss ongoing and future projects in order to coordinate and align projects among the regional agencies to minimize adverse regional traffic impacts of construction by different regional agencies.

In general, the majority of construction activities programmed for the TBTA facilities are scheduled to take place during off-peak hours, including nighttime and weekend lane closures in the tunnels. They are expected to have minimal impacts on daily bridge and/or tunnel traffic.

Ongoing construction projects at each of the TBTA facilities include the following:

- The **Verrazzano-Narrows Bridge** is undergoing steel repairs on the suspended spans which are planned for completion in April 2022. Rehabilitation of the Staten Island and Brooklyn approach upper level elevated ramps is ongoing and is planned to be completed in the fall of 2022. Safety fence installation at the upper and lower level suspended spans is ongoing and planned to be completed in late 2022. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items.

- The **Cross Bay Bridge** is undergoing the installation of a power monitoring system which is planned to be completed in the summer of 2022. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items.

- The **Marine Parkway Bridge** is undergoing on-grade light pole replacement and a facility wide painting program both of which are planned to be completed in late 2022. Installation of a power monitoring system is ongoing and planned to be completed in the summer of 2022. Tower elevator replacement is ongoing and planned to be completed in 2023. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items.

- The **Bronx-Whitestone Bridge** is undergoing facility wide painting and miscellaneous structural rehabilitation which are planned to be completed in 2024. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items. As noted below, the Bronx-Whitestone Bridge and the Throgs Neck Bridge serve similar traffic corridors and some of the same traffic, and delays on one of the bridges result in a shift to the other crossing.

- The **Throgs Neck Bridge** suspended span deck replacement construction contract was awarded in late 2018. Staged construction of the roadway deck is in progress with the use of a movable barrier to implement a reversible lane. Three lanes are being maintained throughout construction in the peak direction to maximize traffic flow. This traffic management strategy has been successfully deployed on recent projects at TBTA's other suspension bridges and has been effective in minimizing traffic impacts. The deck replacement and associated painting work is planned to be completed in late 2022. In addition, a construction contract for the Approach Viaducts structural rehabilitation was awarded in 2019 and is planned to be completed in the late summer of 2023. There is also an ongoing bridge preservation program at the TNB which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items. As noted above, the Bronx-Whitestone Bridge and the Throgs Neck Bridge serve similar traffic corridors and some of the same traffic, and a delay on one of the bridges results in a shift to the other crossing.

- The **Henry Hudson Bridge** structural steel repairs and full overcoating of the steel structure were substantially completed in March 2022. A project to upgrade the Dyckman Street and Kappock Street electrical substations is ongoing and is planned to be completed in 2024. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items.

- The **RFK Bridge** power resiliency and flood mitigation project was substantially completed in March 2022. A project to perform superstructure steel upgrades for all facility structures except the suspended spans is ongoing and planned to be substantially complete in the summer of 2022. A project to demolish the remaining occupied spaces beneath the Manhattan Plaza structure is ongoing and planned to be completed in the fall of 2022. A project to perform structural repairs to the Manhattan Plaza and FDR Ramp is also ongoing and planned to be completed in the summer of 2022. A project to paint the Manhattan Plaza and Junction Structure in ongoing and planned to be completed in spring of 2023. A project to construct a new ramp connection to the Harlem River Lift Span sidewalk and to upgrade the lift span fenders is ongoing and planned to be completed in late 2023. In addition, there is also an ongoing bridge preservation program at the RFK which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, and other miscellaneous as needed maintenance items.

- The **Queens Midtown Tunnel** has an ongoing tunnel preservation program which includes cleaning of drainage systems, cleaning of plaza walls, and other miscellaneous as needed maintenance items.

- The **Hugh L. Carey Tunnel** project to rehabilitate the Manhattan Blower Building façade was completed in February 2022. There is an ongoing tunnel preservation program which includes cleaning of drainage systems, cleaning of plaza walls, and other miscellaneous as needed maintenance items.

Competing East River Crossings Construction

Programmed construction along competing East River crossings include:

- **Ed Koch Queensboro Bridge** – The project to replace the upper level roadway deck started in 2018 and is expected to be completed by June 2024. Permanent lane closures began on the Manhattan-bound upper roadway in February 2022, with the right lane closed at all times and left lane closed during off-peak periods. Permanent Queens-bound upper roadway closures are anticipated to follow in winter 2022. This project has resulted in a slight increase in traffic volumes at the Queens Midtown Tunnel.

- **Brooklyn Bridge** – In September 2021, NYCDOT opened a new protected two-way bike lane on the bridge. The bike lane was created by repurposing one of the three Manhattan-bound lanes on the bridge. This permanent change may result in increased usage of the Hugh L. Carey Tunnel and, to a lesser extent, the Queens Midtown Tunnel. Rehabilitation of towers and approach arches on the Brooklyn Bridge began in fall 2019 and is expected to be completed in spring 2024. Occasional lane closures will take place to inspect and repair bridge components. Currently there are weekend single lane closures and weekday off-peak single and double lane closures to do maintenance on the cables. This project may result in increased usage of the Hugh L. Carey Tunnel.

Other Major Bridge and Roadway Construction

During the forecast period, several major roadway and bridge projects, which are part of NYMTC's current Transportation Improvement Program (TIP) for federal Fiscal Years 2020-2024, will potentially have traffic implications for the TBTA facilities.

Other bridges, roads, and overpasses programmed for construction include:

- **Madison Avenue Bridge** – Rehabilitation of the Madison Avenue Bridge over the Harlem River began at the end of 2018 and is expected to end in May 2023. The project includes electrical, mechanical, and miscellaneous operating system-related work. Minimal diversions to the RFK Bridge are anticipated.

- **Broadway Bridge** – Reconstruction of the bridge was scheduled to start in early 2019, however, problems with the operating system of the bridge delayed the start of the project. Installation

of shielding in preparation for demolition work began in late 2019 and is almost complete. The project is scheduled to be completed in July 2027. The project's scope of work includes a major rehabilitation of the roadway deck, superstructure steel and substructure elements of the vertical lift span, as well as the approach spans. It will also include the replacement and rehabilitation of electrical and mechanical components of the vertical lift span, as well as replacement of the existing fender system with a new larger and stronger one. The project will involve single lane closures from 7am-3pm every day. A second lane will be closed during off-peak periods. Minimal diversions to the Henry Hudson Bridge are anticipated.

- **I-87/Major Deegan Expressway** – Rehabilitation of various overpasses along the Major Deegan Expressway from East 160th Street to East 232nd Street is scheduled for design and construction through 2026. Construction of the 138th Street bridge began in summer 2021 and is anticipated to be completed in early 2025.

  The Major Deegan Expressway between West 161st Street and the Alexander Hamilton Bridge project includes the addition of a northbound auxiliary lane and the replacement of the northbound and southbound viaducts to improve traffic flow and safety along the corridor. The Depot Place Bridge over the Expressway will also be rehabilitated as part of this project. This project began in 2019 and is expected to be substantially completed in spring 2022.

  These projects may result in minimal diversions to the RFK Bridge.

- **I-95/Cross Bronx Expressway** – Several rehabilitation projects are in development for the Cross Bronx Expressway.

  The rehabilitation of the six Cross Bronx Expressway bridges (replacement of deck and superstructure) over the Sheridan Expressway and Amtrak right-of-way from Boston Road to the Bronx River Parkway is a potential design-build project with construction currently scheduled to begin in fall 2024 and to be completed in spring 2028.

  A project to replace the ramp structure carrying the northbound Sheridan Blvd to the westbound Cross Bronx Expressway over the Bronx River will address structural deficiencies. This project will also provide maintenance repairs of four Cross Bronx Expressway bridges between Sheridan Blvd. and Crotona Ave. to address flag conditions and assure safety of traveling public. This project began summer 2021 and is anticipated to be completed in winter 2022/2023.

  The rehabilitation of the Arthur Avenue and 176th Street bridges over the Cross Bronx Expressway is currently under development. Construction is scheduled to begin in fall 2030 and be completed in spring 2032.

  The rehabilitation of the E.L. Grant Highway, Nelson Avenue, and Jesup Avenue bridges over the Cross Bronx Expressway is currently under development. The project, which includes deck and bearings replacement and steel repairs to address structural deficiencies and extend the

service life of the structures, is scheduled to begin in spring 2029 and be completed in summer 2031.

The rehabilitation of Jerome Avenue and East 174th Street Bridges over the Cross Bronx Expressway (to extend the service life of the two bridges) is scheduled to begin in winter 2030/2031 and end in fall 2031. The scope of work will include replacement of the bridge decks/slabs, the repair of superstructures, the repair of concrete substructures, the replacement of bearings, and the repair of other deteriorated elements to assure continued safe operations.

The rehabilitation of the Cross Bronx Expressway over Webster Avenue, Third Avenue, and the Metro-North Railroad is scheduled to begin in late 2026 and end in spring 2029. The scope will include replacing the concrete deck and replacing/repairing other deteriorated bridge elements to ensure continued safe operations.

Active Traffic Demand Management strategies are to be implemented along the Cross Bronx Expressway corridor to enhance safety, mobility, and reliability. Construction is scheduled to begin in early 2024 and be completed in fall 2026.

These projects may result in minimal diversions to the RFK, Bronx-Whitestone, and/or the Throgs Neck bridges.

- **I-278/Bruckner Expressway** – The Bruckner Expressway/Sheridan Boulevard Interchange project consists of reconstruction of the Bruckner Expressway viaduct and the related ramps to address the poorly rated deck, deteriorated concrete columns, repair/replacement of the bearings, pedestals and other minor work elements. The project will be completed under three contracts.

  Contract 1 includes two elements:

  A) Bruckner Expressway/Sheridan Boulevard Interchange – The Bruckner Expressway will be widened east of the interchange over the Amtrak Bridge to carry a third lane in both directions of the Bruckner Expressway through the interchange. The bridge deck over Amtrak will need to be widened to accommodate the additional lanes.

  B) Hunts Point Truck Access Improvements – New ramp connections will be constructed between Edgewater Road and both the Sheridan Boulevard (both directions) and the northbound/eastbound Bruckner Expressway. A new deck will be constructed over the Bruckner Expressway and Amtrak to provide the new connections. The Hunts Point Avenue ramp to the northbound Sheridan Expressway would be permanently closed and all on-ramp traffic will be rerouted to Edgewater Road to access the northbound Sheridan Boulevard.

  A design-build contract was awarded in summer 2019 and construction began in early 2020. Contract 1 is scheduled to be substantially completed in winter 2022/2023.

Contract 2 includes deck replacement of the Bruckner Expressway from East 141st Street to Barretto Street, widening of the Bruckner Expressway from East 149th Street to Barretto Street to maintain three lanes in both directions, removal of the westbound Bruckner Expressway off-ramp to East 138th Street, and a new westbound Bruckner Expressway interchange at Leggett Avenue, including new on- and off-ramps for improved access to Hunts Point. Other improvements to Bruckner Boulevard below the viaduct are included in this contract. A design-build contract was awarded in March 2021 and construction is expected to be substantially completed in fall 2023.

Contract 3 includes deck replacement of the Bruckner Expressway between Barretto Street and the Sheridan Boulevard interchange. A third lane will be added along both directions of the Bruckner Expressway between these segments, which would now provide a continuous third lane along both directions of the Bruckner Expressway between the Bronx River and East 149th Street. A pedestrian bridge at Bryant Avenue will also be replaced. Construction on this contract is scheduled to begin in summer 2022 and be completed spring 2026.

These projects may impact traffic at the RFK, Bronx Whitestone, and Throgs Neck bridges.

- **I-95/Bruckner Expressway** – The addition of a fourth northbound lane from Exit 8B (to Orchard Beach/City Island) to Exit 9 (to northbound Hutchinson River Parkway) and a northbound Hutchinson River Parkway exit ramp to Co-Op City at Bartow Avenue in Bronx County, NYC began in winter 2021 and is anticipated to be completed in winter 2023/2024.

  Construction to repair and replace deteriorated components of the Bruckner Expressway Bridge over Rosedale Avenue is expected to begin in winter 2022/2023 and end in summer 2025.

  The Unionport Bridge, which carries the northbound and southbound Bruckner Expressway service roads over the Westchester Creek, is under construction and undergoing a complete replacement. The new bridge would be expanded from four to six lanes and all of the approaches will be completely rebuilt. Traffic flow has been maintained on two temporary vertical lift bridges and is expected to continue uninterrupted through the estimated four-year construction period, which is anticipated to be completed in winter 2023/2024.

  These projects may result in minimal diversions to the RFK, Bronx-Whitestone, and/or the Throgs Neck bridges.

- **Bronx River Parkway** – This project involves the removal and installation of a new Bronx River Parkway Bridge over the Metro-North Railroad near 236th Street. A replacement with highway realignment is being considered. Construction began in spring 2021 and is anticipated to be completed in late summer 2024.

  Replacement of three deteriorated bridges on the Bronx River Parkway, specifically the two-span bridge over AMTRAK/CSX (near the Cross Bronx Expressway interchange), the single

span bridge over East Tremont Avenue and the seventeen-span viaduct over East 180th Street/Morris Park Avenue and along the NYCTA's East 180th Street subway yard is expected to begin in summer 2023 and is expected to be completed in summer 2027. The project will improve the roadway geometry, eliminate the structural deficiencies and provide standard travel lanes and shoulders. In addition, the project will provide a fully ADA compliant shared-use path and a new exit ramp structure spanning over the AMTRAK/CSX tracks.

These projects may result in minimal diversions to the RFK, Bronx-Whitestone, and/or the Throgs Neck bridges.

- **I-278/Gowanus Expressway** – The rehabilitation of the bridge carrying Fort Hamilton Parkway over the Gowanus Expressway will correct structural deficiencies, extend service of the structure and ensure safety. Construction is anticipated to begin in summer 2024 and be completed in summer 2026.

  Minimal impact to traffic at the Verrazano-Narrows Bridge and Hugh L. Carey Tunnel may occur.

- **Hutchinson River Parkway** – The rehabilitation of the Westchester Avenue bridge over the Hutchinson River Parkway will repair abutments, piers, approaches, steel superstructure and replace the reinforced concrete deck. Currently under construction, the project is expected to be completed by fall 2022.

  Minimal impact to traffic at the Bronx-Whitestone Bridge may occur.

- **I-278/Brooklyn-Queens Expressway (BQE)** - The replacement of four bridge decks over the BQE from South 3rd Street to Grand Street in Kings County, which will replace concrete decks, repair concrete substructures, and repair other deteriorated elements, is in development with construction expected to begin in spring 2030 and expected to be completed in fall 2033. This project has potential for lane closures that could impact traffic at the Hugh L. Carey Tunnel and Verrazzano-Narrows Bridge.

  The project to replace the existing concrete deck with a new concrete deck over the BQE at 47th Street (Queens) will repair or replace the existing steel supports to extend the service life of this section of the BQE. Construction is anticipated to begin in spring 2025 and to be completed in summer 2027.

- **BQE Triple Cantilever Project** – The long-term plan for the BQE is being redeveloped following the release of the Expert Panel Report. NYCDOT continues structural monitoring and evaluation of the BQE and conducting repairs on an ongoing basis.

  The project to rehabilitate the Brooklyn-Queens Expressway from Atlantic Avenue to Sands Street in the Borough of Brooklyn implements some of the recommendations of the Expert

Panel Report. It will extend the service life of the structures by preventing further water infiltration. The project will address conditions at joints, soffits substructure and deck. NYCDOT will also install "weigh-in-motion" technology to automatically fine overweight trucks, which put undue strain on the structure. Construction is expected to begin in summer 2022 and anticipated to be completed in 2026. In order to reduce loads on the structure, operational changes were implemented in late August 2021 that reduced lanes down from three to two lanes in each direction between Atlantic Avenue and the Brooklyn Bridge. The lane reductions resulted in traffic back-ups on the Gowanus Expressway that back-up to the Verrazzano-Narrows Bridge. There is an interim repair project identified for the cantilevered section (span 4 & 34) over Grace Court and Clark Street anticipated to begin in spring 2023 which may have additional significant traffic impacts.

- **Belt Parkway** – The rehabilitation of four Belt Shore Parkway bridges over Sheepshead Bay Road, Ocean Avenue, Bedford Avenue and Nostrand Avenue to bring them to state of good repair. The bridges are currently in preliminary design, will move to final design in 2023 and are expected to start construction in 2025.

  Reconstruction of the 17th Avenue Pedestrian Bridge and 27th Avenue Pedestrian Bridge over the Belt Parkway started in the fall of 2021 with an expected date of completion in early summer 2024. The 17th Avenue Bridge was closed in November 2021 and demolition plan is in development. The bridge will be replaced on the same alignment as the existing bridge and is anticipated to be in-place at the end of 2022. The 27th Avenue Bridge will be built on a new alignment allowing the existing bridge to remain open during construction.

  These projects may result in some impacts to traffic at the Verrazzano-Narrows Bridge, Cross Bay Bridge, and Marine Parkway Bridge.

- **I-278 (BQE)/Grand Central Parkway Interchange**- The project to reconstruct the Grand Central Parkway and BQE (east leg) interchange at Astoria Blvd started in summer 2020 and is expected to be completed in summer 2022 while the reconstruction of BQE and Grand Central Parkway (west leg) interchange is expected to start in mid-2024 and be completed in mid-2027.

- **Grand Central Parkway** – The Kew Gardens Interchange reconstruction – Phase IV project will replace highway viaducts and ramp structures; realign ramps and add highway shoulders; install multi-use path for pedestrian and bicycle usage along the Kew Gardens Interchange (an intersection of the Grand Central Parkway, the Van Wyck Expressway, the Jackie Robinson Parkway and Union Turnpike) located in central Queens. The contract was awarded in October 2018 and is estimated to be completed in early summer 2022.

  The planned rehabilitation of the Grand Central Parkway Bridge over Winchester Boulevard and ramp over the Cross Island Parkway is scheduled to begin in late 2024 and be completed in summer 2027.

The safety and mobility improvements project on the eastbound Grand Central Parkway at Long Island Expressway interchange involves construction of an auxiliary lane between the entrance ramp from Eastbound Long Island Expressway (I-495) and 69th Road/Jewel Avenue ramp (Exit 11) on the Eastbound Grand Central Parkway. In addition, pavement will be resurfaced and guiderails, pavement markings and signs panels will be upgraded. Construction is anticipated to begin in winter 2024/2025 and be completed in fall 2026.

These projects may result in minimal impacts to traffic at the RFK Bridge and Queens Midtown Tunnel.

- **I-678/Van Wyck Expressway** – The rehabilitation of the Roosevelt Avenue Bridge began in January 2016 and is expected to be completed in early spring 2023. Major reconstruction plans include installation of new girders, a new deck, new lighting, and an approximate two-foot widening of the sidewalk to allow for a bike lane. One lane in each direction would be available to traffic.

  The Van Wyck Expressway/Long Island Expressway Interchange structural rehabilitation project will replace the concrete deck, perform corrective repairs of bridge steel and concrete elements on the College Point Boulevard ramp and replace the concrete deck and repair concrete piers on selected spans of the Van Wyck Expressway viaduct over the Long Island Expressway. The project began in fall 2020 and is expected to be completed in summer 2024. Three lanes of traffic will be maintained on the Van Wyck Expressway during peak hours and parking will be maintained underneath the viaduct (up to 80 parking spaces will be eliminated/relocated at any one time).

  These projects may result in minimal impacts to traffic at the Bronx-Whitestone Bridge and RFK Bridge.

- **Van Wyck Expressway/JFK Airport Access Improvements** – This project will widen Van Wyck Expressway (VWE) from three to four lanes (five lanes at some locations) in each direction from Queens Boulevard to 133rd Avenue in the vicinity of John F. Kennedy (JFK) Airport located in Queens County, New York City. This project will replace overpass bridges and Long Island Rail Road (LIRR) bridges; install new pavement, noise and retaining walls and other associated elements as part of the contract. The project consists of 3 contracts:
  - Contract 1 - Replace/retrofit 9 bridges between Hillside Avenue and 133rd Avenue, relocate the NB VWE Exit 3 Ramp 400 feet to the south and relocate the North Conduit Avenue Entrance Ramp to WB Belt Parkway 200 feet to the east. Reconstruction of the bridges will accommodate an additional future lane. Construction began in summer 2020 and will end December 2023.
  - Contract 2 - Retrofit and replace three LIRR bridges over the VWE north of Atlantic Avenue and replace the Atlantic Avenue roadway bridge over the VWE. Reconstruction of the bridges will accommodate an additional future lane. Construction began January 2021 and will end summer 2024.

- Contract 3 - Widen the VWE between Federal Circle JFK and Hoover Avenue to add one managed use lane, replace VWE mainline bridges below 133rd Avenue, and construct retaining walls, build new ramps and reconstruct existing ramps. Construction is expected to begin spring 2022 and end spring 2025.

These projects may result in minimal impacts to traffic at the Bronx-Whitestone Bridge, Throgs Neck Bridge, the Queens Midtown Tunnel, and the RFK Bridge.

- **I-495/Long Island Expressway** – A project will construct an auxiliary lane on the eastbound Long Island Expressway to connect the entrance ramp from the Clearview Expressway with the exit ramp to Springfield Boulevard. The provision of a continuous lane for entering and exiting traffic will alleviate congestion and reduce delays. This project will also include the replacement of the Oceania Street Bridge over the Long Island Expressway. Construction is expected to begin in spring 2022 and last until summer 2024.

  An active traffic management system on the Eastbound and Westbound Long Island Expressway, between the Queens Midtown Tunnel and Main Street, Queens is currently under development. The system will result in improved safety, reduced congestion and delays, and improved route choices. Construction is expected to begin in winter 2022/2023 and be completed in summer 2024.

  A safety improvements project is planned for the Long Island Expressway from 48th Street to Little Neck Parkway. Construction is expected began in fall 2021 and will be completed in early 2024. This project includes:
  - Acceleration/deceleration lane improvements at six (6) locations along the expressway corridor: 1) Westbound LIE: Exit Ramp to Kissena Boulevard, 2) Eastbound LIE: Entrance Ramp from Kissena Boulevard, 3) Eastbound LIE: Exit Ramp to Utopia Parkway, 4) Westbound LIE: Entrance Ramp from Utopia Parkway, 5) Eastbound LIE: Entrance Ramp from Utopia Parkway, 6) Westbound LIE: Exit Ramp to Francis Lewis Boulevard.
  - Construction of auxiliary lanes at three (3) locations along the expressway corridor: 1) Westbound LIE: Main Street to College Point Boulevard, 2) Westbound LIE: Kissena Boulevard to Main Street 3) Eastbound LIE: Main Street to Kissena Boulevard.
  - Installation of traffic safety appurtenances or equipment along the expressway corridor at various locations from 48th Street to Little Neck Parkway. (e.g., reflective markers/delineators on guiderail/concrete barriers, object markers on abutments, guiderail/concrete barriers, and impact attenuators).

  These projects may result in minimal impacts to traffic at the Queens Midtown Tunnel and Bronx-Whitestone Bridge.

- **Route 9A/West Side Highway** – Rehabilitation of the ramp to Northbound Henry Hudson Parkway bridge over Amtrak West Site near 158th street in New York County is planned. Project

work includes a reinforced concrete deck, steel stringers, flood beams, pier columns, cap beams, and an electrical system. Construction is estimated to be completed around 2027.

This project may result in minimal impacts to traffic at the Henry Hudson Bridge.

- **Harlem River/FDR Drive** – Rehabilitation of three bridges on the Harlem River Drive between 135th and 139th streets is anticipated to begin fall 2025 and end spring 2028.

  Replacement of the deck on the Trans-Manhattan Expressway Connector ramp is currently in design. Construction is expected to begin in summer 2025 and is projected to be completed in summer 2033.

  FDR Drive, northbound from East 42nd to 49th Street is scheduled for rehabilitation. Currently under design, construction is expected to begin in late 2023 and be completed in 2029.

  The Eastside Coastal Resiliency project from Montgomery Street to 25th Street involves construction of flood walls, tide gates along the FDR and the raising of East River Park as well as storm water work on west side of FDR, east of FDR Drive and replacement of two pedestrian bridges over the FDR. The Delancey Street bridge was replaced March 2022. Construction started in spring 2021 and is anticipated to be completed in 2026.

  These projects may result in minimal adverse impacts to traffic at the RFK Bridge, the Queens Midtown Tunnel and Hugh L. Carey Tunnel.

- **I-278/Staten Island Expressway** – The planned rehabilitation of the bridges carrying the Staten Island Expressway (I-278) over Richmond Avenue in the Borough of Staten Island will correct the bridges' structural deficiencies while extending the service life of the bridges. Construction is expected to begin in spring 2022 and be completed in winter 2024/2025

  The rehabilitation of the Woolley Avenue and Bradley Avenue Bridges over Staten Island Expressway in Richmond County, NY will extend the service life of these bridges to ensure safer travel. Construction is expected to begin in spring 2022 and complete in spring 2024.

  These projects may result in minimal adverse impacts to traffic at the Verrazzano-Narrows Bridge.

- **Holland Tunnel** – In February 2018, the Port Authority authorized $364.2 million for a rehabilitation and resiliency project for the Holland Tunnel to repair and restore critical mechanical, electrical and plumbing systems damaged by Superstorm Sandy, and to install protective measures to mitigate future flooding in the facility. Construction began in April 2020. One tube at a time will be closed for two years overnight (11pm – 5am) all nights except Saturday, which started with the eastbound tunnel. Closures of the westbound tunnel are expected to begin in 2023. Potential lane closures may result in a minimal impact to the traffic at the Hugh L. Carey Tunnel and the Verrazzano-Narrows Bridge.

- **Lincoln Tunnel Helix Replacement** – In 2015, the Lincoln Tunnel Helix went through a three-year rehabilitation program which has extended its estimated service life to 2025. Currently in the planning stage, the Port Authority is evaluating replacement of the Lincoln Tunnel Helix. The purpose of the project is to replace the aging and deteriorated structure with a new roadway that meets current highway and safety standards. If the project proceeds, construction is anticipated to start in 2025 and end in 2032. This project may result in a minimal increase in traffic at the Hugh L. Carey Tunnel and the Verrazzano-Narrows Bridge.

- **George Washington Bridge Rehabilitation** – Ongoing and planned projects include suspender ropes replacement and rehabilitation of the main cables (2017-2026), rehabilitation of Trans-Manhattan Expressway (TME) median barriers (2018-2023), rehabilitation of 178th Street and 179th Street ramps and bus ramps (2017-2025), main span upper level structural steel rehabilitation (2019-2024), upper level eastbound main span pavement rehabilitation (2019-2024), rehabilitation of six TME overpass bridges in Manhattan (starting 2024), Rehabilitation of Structural Steel Lead Paint Removal and Recoating Underside LL (2019-2025 – three contracts of which one was completed and the next starts this year), Rehabilitation of Center and Lemoine Bridges (2022-2026), Intelligent Transportation System Replacement of Signs and Field Devices (2019-2021). Rehabilitation of upper-level spans over Hudson Terrace and New Jersey anchorage which began in 2016 has been completed. Hydrant and Water System B work was also completed. The remaining projects may result in minimal traffic impacts to the RFK Bridge.

- **Gowanus Canal Superfund Site** – In 2010, Gowanus Canal, an EPA Superfund site was added to the National Priorities List as a hazardous waste site requiring clean up. In September 2013, the EPA issued its Record of Decision, which explained the remediation plan for the Gowanus Canal. The project involves removing contaminated sediment from the canal via dredging, installing a cap, and restoring the 5th Street basin. It is anticipated that active construction will occur over a six- to ten-year period. Dredging of the canal began in late 2020 just south of the Carroll Street bridge and will continue between the Carroll and Union Street bridges, followed by dredging north of the Union Street bridge and then between the Carroll and 3rd Street bridges. The project will necessitate frequent bridge openings. Temporary traffic disruptions will occur at 3rd Street, Union Street and 9th Street during bridge openings which will continue through mid-2023, with extended closures during periods of heavy construction activity. Huntington Street east of Smith Street will be closed through September 2021, with additional closures if needed. Proposed plans for Hamilton Avenue over Gowanus Canal are not yet available so it is not possible to assess the impact to traffic at the Hugh L. Carey Tunnel.

Transit Improvements

Significant transit improvements, when completed, are expected to affect TBTA traffic levels during the forecast period through the year 2032.

- **MTA Second Avenue Subway** – Construction of Phase 1 started in April 2007 and service opened to the public on January 1, 2017. Service from new stations at East 96th, East 86th, and East 72nd Streets along Second Avenue now connects to the 63rd Street station at Lexington Avenue. The 2015-2019 Capital Program includes funding to complete design and begin initial construction of Phase 2 (125th Street to 96th Street). The 2020-2024 Capital Program includes funding, which together with anticipated, but not yet approved federal grants, is expected to construct Phase 2 of the Second Avenue Subway. Phase 2 is currently in the engineering stage and construction of the new stations is expected to be completed in 2029.

- **MTA/LIRR East Side Access** – This project will result in a new connection from the LIRR Main and Port Washington lines in Queens to a new LIRR terminal beneath Grand Central Terminal in Manhattan. Project completion is scheduled for December 2022. MTA anticipates that some travelers to Manhattan's East Side will shift to the LIRR from other modes and may result in a decrease in traffic to the Queens Midtown Tunnel and the RFK Bridge.

- **Penn Station Access** – The Penn Station Access project would take Metro-North's New Haven Line directly to Penn Station using Amtrak's Hell Gate line and will add four new stations in the East Bronx (Co-Op City (near I-95), Morris Park (near Jacobi Hospital), Parkchester/Van Nest & Hunts Point). A design-build contract was awarded in December 2021 and construction is expected to be completed in 2027. This project may result in some travelers between Manhattan and the Bronx shifting to the Metro-North from other modes and may result in a decrease in traffic to the RFK Bridge.

- **The Gateway Program (Amtrak)** – The Gateway Program is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, New Jersey, and Penn Station, New York, including a new, two-track Hudson River tunnel. Due to the high level of traffic in the existing Hudson River Tunnel (450 trains per weekday, 600,000 riders), taking one of its two tubes out of service for necessary repairs would reduce total capacity for Amtrak and NJ TRANSIT from 24 trains per hour to approximately six trains per hour in the peak direction. This very significant reduction in capacity would impact New York and New Jersey commuters who cross the Hudson on a daily basis along with Amtrak passengers. This Program will allow NJ TRANSIT and Amtrak to continue to operate and maintain existing levels of passenger rail service in the new tunnel while the North River Tunnel is taken out of service for critical rehabilitation and repairs. This Program is currently in the planning stages and has reached 30% design. Procurement materials for Package 1 (Tunnel Boring & Civil Works) are currently under development.

  The Hudson Tunnel Component of the Gateway Program includes the design and construction of a new Hudson River rail tunnel serving Penn Station, New York, and the rehabilitation and modernization of the existing North River Tunnel which incurred serious and ongoing damage during Super Storm Sandy. This project is currently in the environmental review phase. A Draft Environmental Impact Statement was released in July 2017. A draft Final Environmental Impact

Statement was submitted to USDOT in December 2018 and has been under review since that submittal. The preliminary schedule as of the August 2019 FY21 Financial Plan submittal to USDOT, aims to complete the new tunnel in 2029 to enable the planned rehabilitation of the existing tubes to be completed in 2030. Unexpected closures in existing tubes for emergency repairs during weekday hours may force some rail commuters to switch to PATH trains, buses, or cars. Federal funding is not yet committed to fully finance this project. TBTA facilities may experience a sporadic increase in usage with commuters choosing to travel to/from the City via any of the tolled Hudson River bridges and tunnel facilities or the Verrazzano-Narrows Bridge.

- **AirTrain extension to LGA** – This Port Authority capital project will provide a new AirTrain service between the LGA airport and a new intermodal station at Willets Point with connections to LIRR and MTA-NYCT ("7" Subway line). The project is still in conceptual design stage. LGA AirTrain received Port Authority Board Project Authorization of $2.05 billion in October 2019. In October 2021, Governor Hochul asked the Port Authority to put the project on hold and review alternatives. Fourteen alternative options were released in March 2022 and are currently being reviewed by stakeholders. If the project proceeds, it may reduce traffic at the RFK Bridge and the Queens Midtown Tunnel as some airport travelers and employees may shift to the LIRR or subway.

All of the information presented herein for planned construction dates are based on the best available data.

Summary of Assumptions and Conditions

TBTA traffic, toll revenues and expenses have been analyzed by Stantec on the basis of the historical record of traffic, toll revenues and expenses, the capacities of the TBTA facilities, traffic growth forecasts, the historic traffic elasticity due to toll variations, impacts of construction projects and the following assumptions and conditions, which we believe are reasonable. Stantec accepts the findings of Urbanomics and KC Engineering and remains responsible for the incorporation of their analyses into this study. It is noted, the following presents information related to potential future traffic and revenue for a ten-year period.

Notwithstanding the above, the forecast analyses assume:

- All TBTA facilities will be operated efficiently and maintained in a state of good repair in order to attract customers and to sustain traffic demand levels.
- The TBTA 2020-2024 Capital Program that was approved by the MTA Board on September 25, 2019, will be carried out throughout the analysis period. Future capital programs sufficient to maintain the structural integrity of bridges and tunnels will be adopted and implemented throughout the forecast period.
- Electronic toll payment by E-ZPass will continue to be available on all TBTA crossings, and the payment of revenue in full to TBTA will continue to be in accordance with current interagency agreements. As of the end of 2021, 94.7 percent of all tolls paid on TBTA facilities were E-ZPass

transactions. As a result of the E-ZPass participation rate increases that have been experienced at the TBTA facilities, future growth in E-ZPass market share is planned to be limited. However, a small number of customers are expected to shift to NYCSC accounts so that the toll discounts can be captured. It is projected that E-ZPass participation rates will experience small annual growth until a maximum of 98 percent is reached.

- Since the exact date of activation, tolling structure, tolling rates, and possible credits have not yet been established for the CBD Tolling Program, Stantec cannot draw any meaningful and dependable conclusions about the potential impacts of congestion pricing initiatives on usage of TBTA facilities and, therefore, Stantec is unable to include the effects of the CBD Tolling Program into its forecast.
- Competing East River crossings will continue to operate toll-free and be maintained in efficient operating condition. At this time, it is too uncertain for Stantec to draw any meaningful conclusions about the potential impacts of tolling the competing East River crossings on TBTA facilities.
- For the forecast with current tolls, the present toll schedule that began on April 11, 2021, will be in effect during the remainder of the analysis period through 2032. For the analysis with toll increases, tolls on TBTA facilities will be increased on March 1, 2023, and March 1, 2025, and are projected to yield an estimated 4 percent in revenue compared to the current toll analysis, in accordance with the 2022-2025 MTA Financial Plan.
- Capacity constraints on the local and arterial highway networks which may be somewhat mitigated by stagnant traffic growth in the near term will, however, continue to limit traffic growth on the nine TBTA crossings. This is reflected in conservative growth rates used for TBTA traffic prior to evaluating the adverse effects related to the pandemic.
- Although City and the State of New York budget difficulties continue, highway/crossing improvements, in general, for the competing bridges and highway network will be made in accordance with the plans and schedules described herein.
- Major TBTA roadway and structural improvements will continue to be performed during nighttime and non-peak hours, and/or in the off-peak direction, and approaches to the nine TBTA crossings will not be significantly impaired by construction work.
- Normal background growth assumptions post pandemic are based on trends in regional employment and population, forecast by NYMTC through 2055. This forecast assumes they will be realized in the long term for the Tri-State area and in the City.
- Stantec's forecasts also considered a continued recovery towards pre-pandemic traffic levels. In the near term. The continued lifting of restrictions will result in increased travel on TBTA facilities.
- Stantec's forecast assumes that there is likely to be some level of economic downturn as a result of the current sharp gas price increases. This is consistent with historical patterns back to 1972. The compounding influence of pandemic recovery (positive to traffic levels) and fuel price impacts (negative to traffic growth) offset each other, and our short-term forecast is for flat levels of growth.

- LIRR East Side Access may shift some Long Island auto commuters to rail after its planned completion in December 2022.
- Current TBTA reduced rate toll programs and MTA rebate programs remain in effect at current projected levels, including reduced rates for NYCSC E-ZPass and E-Token customers and for Staten Island residents at the Verrazzano-Narrows Bridge and for Rockaway residents at the Cross Bay and Marine Parkway Bridges. TBTA's reduced rate programs provide, by statute, a toll rate lower than the TBM rate for Staten Island residents using resident E-Tokens to cross the Verrazzano-Narrows Bridge and for Rockaway residents using resident E-Tokens and non-residents using minor E-Tokens to cross the Cross Bay and Marine Parkway Bridges. The reduced rate programs provide, by MTA Board policy, a toll rate lower than the TBM rate to non-resident NYCSC E-ZPass customers. TBTA's reduced rate programs also provide, by MTA Board Policy, a toll rate lower than the NYCSC E-ZPass rate to Staten Island residents crossing the Verrazzano-Narrows Bridge, to Queens residents crossing the Cross Bay Bridge, and to Bronx residents crossing the Henry Hudson Bridge. The MTA's rebate programs lower the effective toll rates below the reduced rates discussed above for Rockaway residents at the Cross Bay Bridge and Staten Island residents and certain commercial vehicles with NYCSC commercial and business accounts at the Verrazzano-Narrows Bridge by using a combination of MTA funds and New York State funds to pay for all or a portion of the toll. TBTA's "reduced rate" programs and MTA's rebate programs both result in increased traffic. TBTA's toll revenue is impacted unfavorably by charging a reduced rate for residents but there are no adverse revenue impacts stemming from the rebate programs because the rebate values are fully reimbursed by MTA and New York State.
- No other reduced rate toll programs will be introduced that would adversely affect the TBTA toll facilities' revenue stream.
- Stantec assumes the economy to be cyclical and thus it will both grow and contract at certain points within the forecast period.
- No future natural disaster or local, state or national emergency will occur that would materially alter travel patterns and divert traffic from the TBTA facilities.
- The forecast accounts for estimated changes in both vehicular demand and transit demand due to the pandemic, related government actions, and economic impacts.
- The forecast does not account for major policy changes that would limit the use of personal vehicles, consequently altering the proportion of vehicle use versus transit use related to the effects of the pandemic.

While the forecast is made and presented year by year by Stantec, this presentation is intended to show trends on the basis of our analysis of historical data as well as the assumptions and conditions set forth above. Variations in the year-to-year forecasted results may occur and such variations may be significant.

PROJECTED TRAFFIC, REVENUES, AND EXPENSES

Current and future traffic and toll revenues are estimated for the 11-year (2022-2032) analysis period for each TBTA facility based on historical trends in traffic and toll revenue, elasticity factors for the future toll increase, toll collection operations, capacities of the nine crossings, facility maintenance, E-ZPass participation levels, externalities such as area bridge and roadway improvement plans and regional demographic projections, and the assumptions and conditions summarized previously. Trends in operating expenses for the toll facilities, TBTA's 2022 budget, 2022-2025 MTA Financial Plan, and growth estimates based on the Consumer Price Index and historical trends are reflected in the future operating expense forecast. Future operating expense estimates are used to develop net toll revenue projections over the forecast period.

Traffic and Toll Revenue, 2022

Stantec's development of the traffic and toll revenue estimates for 2022 considered the previous economic conditions reported for the region, fuel prices, unusual weather events, construction projects, and based on current information, the ongoing pandemic, and post-pandemic projected behavioral changes such as continued remote home-based work.

Actual data through February 2022 was available for use in the analysis. The forecast for the remainder of 2022 estimates that the base traffic levels at TBTA facilities for the remaining ten months of calendar year 2022 will be 2.7 percent more than volumes in the same months of 2021, as traffic continues to recover from the pandemic.

The range of percent changes are shown in Table 24 for the forecast. In January and February 2022, traffic increased at all of the facilities when compared to January and February 2021.

Table 24 Potential Changes in Annual Traffic, 2021 to 2022

Facility	Percent Change January - February 2021 to 2022[(a)]	Percent Change March - December 2021 to Forecast 2022	Percent Change Full Year 2021 to Forecast 2022
Throgs Neck Bridge	13.1%	0.3%	2.0%
Bronx-Whitestone Bridge	14.7%	2.7%	4.2%
RFK Bridge	12.9%	2.8%	4.1%
Queens Midtown Tunnel	29.6%	2.8%	6.0%
Hugh L. Carey Tunnel	33.8%	7.0%	10.2%
Verrazzano-Narrows Bridge	11.1%	2.4%	3.6%
Henry Hudson Bridge	21.5%	4.3%	6.3%
Marine Parkway-Gil Hodges Memorial Bridge	15.3%	2.3%	3.9%
Cross Bay Veterans Memorial Bridge	6.3%	0.5%	1.2%
Total	15.8%	2.7%	4.4%

Notes:

(a) Based on preliminary audited traffic data for January and February 2022 (subject to final audit) and unaudited traffic volumes through April 27, 2022.

As shown in Table 24, total 2022 traffic is forecasted to increase at an average rate of 4.4 percent for the full year.

The resulting traffic and toll revenue is presented in Table 25. The toll revenue in 2022 is based on average toll rates developed from the new toll schedule in effect as of April 11, 2021, and the 2021 and projected 2022 distribution by vehicle class and payment method.

In 2022, Table 25 shows there is a 4.4 percent increase in traffic, a 4.9 percent increase in the systemwide average toll, and a 9.5 percent increase in systemwide revenue over 2021, which reflects actual performance through February 2022 and projected traffic volumes for the remainder of the year.

Table 25 2022 Toll-Paying Traffic and Toll Revenue

Facility	Traffic (millions)	Average Toll	Revenue (millions)
Throgs Neck Bridge	38.3	$9.68	$370.7
Bronx-Whitestone Bridge	50.5	$8.39	$423.4
RFK Bridge	63.7	$8.16	$520.1
Queens Midtown Tunnel	27.6	$7.62	$210.0
Hugh L. Carey Tunnel	21.3	$7.14	$152.1
Verrazzano-Narrows Bridge[(a)]	78.0	$6.68	$520.6
Henry Hudson Bridge	25.4	$4.01	$101.8
Marine Parkway-Gil Hodges Memorial Bridge	8.0	$3.22	$25.6
Cross Bay Veterans Memorial Bridge	8.1	$3.27	$26.5
Total	320.7	$7.33	$2,350.7
Percent Change			
2021-2022 (All Facilities)	4.4%	4.9%	9.5%

Notes:
(a) Split tolling was implemented at the Verrazzano-Narrows Bridge on December 1, 2020.

Table 25 provides the transition between the historical traffic and revenue data presented earlier in the report and the 10-year analyses in Table 26 and Table 27.

Traffic and Toll Revenue at Current Tolls

Traffic and toll revenues were first projected on the basis that the tolls placed into effect on April 11, 2021, will be continued throughout the forecast period. The methodology employed by Stantec to analyze traffic was based on the development of an annual growth rate for each facility (based on historical traffic trends), the construction activity (historical and projected) throughout the highway network (bridges, tunnels, and arterials), and the traffic capacity constraints in the transportation network. From these reference levels, estimates of the impacts of the pandemic and other economic factors, such as a spike in gas prices and consequent economic downturn, were made based on traffic trends since the onset of the pandemic in March 2020. The forecast, represented in Table 26 below, is a projection of traffic and revenue through 2032. The forecast assumes that a "new normal" will occur beginning in 2025. At this point,

the negative effects of the pandemic and economic downturn will be complete, however, there is slightly less traffic utilizing the TBTA facilities than would have been projected if the pandemic had never occurred. This is caused by the increased working from home habits that are becoming a permanent behavioral change for New York City commuters.

Starting with the calculation for 2022 as a reference base, Stantec projected the traffic and toll revenue for the analysis period through 2032 (at constant tolls at the current rates established on April 11, 2021), as shown in Table 26. As previously discussed, this is based on the actual change in traffic on each facility in January and February 2022 and Stantec's projections by facility for the February through December period.

Changes in traffic volumes are in the range of 1.2 to 10.2 percent in 2022 depending on the facility. For 2023, traffic is forecast to increase at 2.0 percent systemwide, with growth rates varying by facility. For 2024, traffic is calculated to increase at 0.3 percent annually, with growth rates varying by facility.

The forecast is based on specific assumptions regarding potential changes in traffic volume, both from pandemic-related behaviors, as well as both shorter-term and longer-term economic impacts. As part of the assumed economic downturn, Stantec is forecasting no additional pandemic related recovery for the remainder of 2022. Once the recovery has occurred, the economy is assumed to be cyclical and thus will both grow and contract in certain periods; this trendline growth assumption accounts for the overall growth pattern through these cycles. Impacts associated with a general increase in total (NYCSC and non-NYCSC) E-ZPass usage and toll increases are computed separately.

Construction related impacts are expected to affect three TBTA facilities during the ten-year forecast period. It's anticipated that additional traffic will reroute to the Hugh L. Carey tunnel due to construction on the BQE and Brooklyn Bridge. After construction is completed, most of the traffic that switched the tunnel are expected to return back to the BQE and Brooklyn Bridge. Additionally, construction on the Throgs Neck Bridge causes a loss of traffic on that facility, some of which reroutes to the Bronx Whitestone Bridge. The effects of this construction are seen through 2022 following by a shift back to the usual split.

Traffic and Toll Revenue with Assumed 2023 and 2025 Toll Increases

The traffic analysis with assumed toll increases in 2023 and 2025 was built upon the base analysis (from Table 26), to which the elasticity impacts (from Table 22) were applied. In accordance with the 2022-2025 MTA Financial Plan, Stantec applied the appropriate projected future increase in toll rates (from Table 23) effective March 1, 2023 (a 5.7 percent toll increase) and March 1, 2025 (a 5.6 percent toll increase) to calculate the corresponding toll revenues. The traffic and revenue analyses with the planned toll increases in 2023 and 2025 are presented in Table 27.

Table 26 Traffic and Toll Revenue Forecast at Current Tolls

Year	Throgs Neck Bridge	Bronx-Whitestone Bridge	RFK Bridge	Queens Midtown Tunnel	Hugh L. Carey Tunnel	Verrazzano-Narrows [(a)] Bridge	Henry Hudson Bridge	Marine Parkway-Gil Hodges Bridge	Cross Bay Bridge	All Facilities
Traffic Change										
2021-2022	1.99%	4.17%	4.13%	6.00%	10.24%	3.59%	6.32%	3.87%	1.22%	4.37%
2022-2023	8.36%	-0.25%	1.38%	1.50%	0.61%	1.22%	2.23%	1.52%	1.70%	1.96%
2023-2024	1.83%	-1.33%	0.39%	0.88%	0.72%	0.22%	0.18%	0.57%	0.45%	0.32%
2024-2025	0.54%	0.28%	0.40%	0.90%	0.72%	0.23%	0.18%	0.58%	0.46%	0.41%
2025-2026	0.10%	0.10%	0.10%	0.10%	0.50%	0.10%	0.10%	0.10%	0.10%	0.13%
2026-2027	0.10%	0.10%	0.10%	0.10%	-8.00%	0.10%	0.10%	0.10%	0.10%	-0.44%
2027-2028	0.10%	0.10%	0.10%	0.10%	-2.00%	0.10%	0.10%	0.10%	0.10%	-0.03%
2028-2029	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2029-2030	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2030-2031	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2031-2032	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Annual Traffic (millions)										
2021	37.6	48.5	61.2	26.0	19.3	75.3	23.9	7.7	8.0	307.3
2022	38.3	50.5	63.7	27.6	21.3	78.0	25.4	8.0	8.1	320.7
2023	41.5	50.4	64.6	28.0	21.4	78.9	25.9	8.1	8.3	327.0
2024	42.3	49.7	64.8	28.2	21.6	79.1	26.0	8.1	8.3	328.1
2025	42.5	49.8	65.1	28.5	21.7	79.3	26.0	8.2	8.3	329.4
2026	42.5	49.9	65.2	28.5	21.8	79.3	26.1	8.2	8.3	329.8
2027	42.6	49.9	65.2	28.5	20.1	79.4	26.1	8.2	8.3	328.4
2028	42.6	50.0	65.3	28.6	19.7	79.5	26.1	8.2	8.4	328.3
2029	42.7	50.0	65.4	28.6	19.7	79.6	26.1	8.2	8.4	328.6
2030	42.7	50.1	65.4	28.6	19.7	79.7	26.2	8.2	8.4	328.9
2031	42.7	50.1	65.5	28.7	19.7	79.7	26.2	8.2	8.4	329.3
2032	42.8	50.2	65.6	28.7	19.8	79.8	26.2	8.2	8.4	329.6
Average Toll										
2021	$9.29	$7.83	$7.63	$7.39	$6.92	$6.53	$3.87	$2.69	$2.69	$6.99
2022	$9.68	$8.39	$8.16	$7.62	$7.14	$6.68	$4.01	$3.22	$3.27	$7.33
2023	$9.33	$8.13	$7.93	$7.45	$7.01	$6.60	$3.88	$2.92	$2.96	$7.15
2024	$9.01	$7.87	$7.69	$7.31	$6.90	$6.54	$3.79	$2.61	$2.64	$6.96
2025	$8.88	$7.77	$7.59	$7.26	$6.86	$6.51	$3.75	$2.50	$2.52	$6.89
2026	$8.85	$7.75	$7.57	$7.24	$6.85	$6.51	$3.74	$2.47	$2.49	$6.87
2027	$8.85	$7.75	$7.57	$7.24	$6.85	$6.50	$3.74	$2.47	$2.49	$6.87
2028	$8.85	$7.75	$7.56	$7.24	$6.85	$6.50	$3.73	$2.47	$2.49	$6.87
2029	$8.85	$7.74	$7.56	$7.24	$6.85	$6.50	$3.73	$2.47	$2.49	$6.87
2030	$8.85	$7.74	$7.56	$7.24	$6.85	$6.50	$3.73	$2.47	$2.49	$6.87
2031	$8.85	$7.74	$7.56	$7.24	$6.85	$6.50	$3.73	$2.47	$2.49	$6.87
2032	$8.85	$7.74	$7.56	$7.24	$6.85	$6.50	$3.73	$2.47	$2.49	$6.87
Toll Revenue (millions)										
2021	$348.9	$379.5	$466.7	$192.2	$133.6	$491.4	$92.3	$20.6	$21.6	$2,146.9
2022	$370.7	$423.4	$520.1	$210.0	$152.1	$520.6	$101.8	$25.6	$26.5	$2,350.7
2023	$387.3	$409.4	$512.0	$208.5	$150.2	$520.6	$100.5	$23.6	$24.4	$2,336.5
2024	$380.7	$391.2	$498.3	$206.4	$148.9	$517.0	$98.4	$21.2	$21.9	$2,284.0
2025	$377.5	$387.4	$494.2	$206.7	$149.1	$516.2	$97.6	$20.4	$21.0	$2,269.9
2026	$376.5	$386.5	$493.1	$206.5	$149.6	$516.2	$97.4	$20.2	$20.8	$2,266.8
2027	$376.8	$386.7	$493.5	$206.6	$137.6	$516.6	$97.4	$20.2	$20.8	$2,256.3
2028	$377.1	$387.1	$493.9	$206.8	$134.8	$517.0	$97.5	$20.2	$20.8	$2,255.3
2029	$377.5	$387.4	$494.3	$207.0	$134.9	$517.5	$97.6	$20.2	$20.8	$2,257.3
2030	$377.8	$387.7	$494.8	$207.2	$135.1	$518.0	$97.7	$20.3	$20.8	$2,259.4
2031	$378.1	$388.1	$495.2	$207.4	$135.2	$518.5	$97.7	$20.3	$20.9	$2,261.4
2032	$378.5	$388.4	$495.7	$207.6	$135.3	$519.0	$97.8	$20.3	$20.9	$2,263.5

Notes:

(a) Split tolling was implemented at the Verrazzano-Narrows Bridge on December 1, 2020.

Table 27 Traffic and Toll Revenue Forecast with Assumed 2023 and 2025 Toll Increases

Year	Throgs Neck Bridge	Bronx-Whitestone Bridge	RFK Bridge	Queens Midtown Tunnel	Hugh L. Carey Tunnel	Verrazzano-Narrows [(a)] Bridge	Henry Hudson Bridge	Marine Parkway-Gil Hodges Bridge	Cross Bay Bridge	All Facilities
Traffic Change										
2021-2022	1.99%	4.17%	4.13%	6.00%	10.24%	3.59%	6.32%	3.87%	1.22%	4.37%
2022-2023	7.89%	-0.68%	0.72%	0.86%	-0.26%	1.14%	1.73%	1.35%	1.57%	1.52%
2023-2024	1.76%	-1.40%	0.28%	0.76%	0.57%	0.21%	0.09%	0.54%	0.43%	0.25%
2024-2025	0.11%	-0.15%	-0.24%	0.27%	-0.14%	0.15%	-0.31%	0.41%	0.34%	-0.01%
2025-2026	0.03%	0.02%	-0.01%	-0.01%	0.36%	0.09%	0.02%	0.07%	0.08%	0.05%
2026-2027	0.10%	0.10%	0.10%	0.10%	-8.00%	0.10%	0.10%	0.10%	0.10%	-0.43%
2027-2028	0.10%	0.10%	0.10%	0.10%	-2.00%	0.10%	0.10%	0.10%	0.10%	-0.03%
2028-2029	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2029-2030	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2030-2031	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
2031-2032	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Annual Traffic (millions)										
2021	37.6	48.5	61.2	26.0	19.3	75.3	23.9	7.7	8.0	307.3
2022	38.3	50.5	63.7	27.6	21.3	78.0	25.4	8.0	8.1	320.7
2023	41.3	50.1	64.2	27.8	21.2	78.8	25.8	8.1	8.2	325.6
2024	42.0	49.4	64.3	28.0	21.4	79.0	25.8	8.1	8.3	326.4
2025	42.1	49.4	64.2	28.1	21.3	79.1	25.8	8.1	8.3	326.4
2026	42.1	49.4	64.2	28.1	21.4	79.2	25.8	8.1	8.3	326.5
2027	42.1	49.4	64.2	28.1	19.7	79.3	25.8	8.1	8.3	325.1
2028	42.2	49.5	64.3	28.1	19.3	79.4	25.8	8.2	8.3	325.0
2029	42.2	49.5	64.4	28.2	19.3	79.4	25.8	8.2	8.3	325.4
2030	42.3	49.6	64.4	28.2	19.3	79.5	25.9	8.2	8.3	325.7
2031	42.3	49.6	64.5	28.2	19.3	79.6	25.9	8.2	8.4	326.0
2032	42.4	49.7	64.6	28.3	19.4	79.7	25.9	8.2	8.4	326.3
Average Toll										
2021	$9.29	$7.83	$7.63	$7.39	$6.92	$6.53	$3.87	$2.69	$2.69	$6.99
2022	$9.68	$8.39	$8.16	$7.62	$7.14	$6.68	$4.01	$3.22	$3.27	$7.33
2023	$9.76	$8.50	$8.29	$7.80	$7.34	$6.91	$4.05	$3.05	$3.09	$7.47
2024	$9.50	$8.30	$8.10	$7.71	$7.28	$6.90	$3.98	$2.75	$2.78	$7.34
2025	$9.80	$8.57	$8.37	$8.01	$7.58	$7.19	$4.12	$2.75	$2.78	$7.60
2026	$9.84	$8.61	$8.41	$8.06	$7.62	$7.24	$4.14	$2.74	$2.76	$7.64
2027	$9.84	$8.61	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.64
2028	$9.84	$8.61	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.64
2029	$9.84	$8.61	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.63
2030	$9.83	$8.61	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.63
2031	$9.83	$8.60	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.63
2032	$9.83	$8.60	$8.41	$8.05	$7.62	$7.24	$4.14	$2.74	$2.76	$7.63
Toll Revenue (millions)										
2021	$348.9	$379.5	$466.7	$192.2	$133.6	$491.4	$92.3	$20.6	$21.6	$2,146.9
2022	$370.7	$423.4	$520.1	$210.0	$152.1	$520.6	$101.8	$25.6	$26.5	$2,350.7
2023	$403.5	$426.3	$532.2	$216.8	$155.9	$544.5	$104.6	$24.6	$25.5	$2,433.8
2024	$399.4	$410.3	$521.4	$216.0	$155.5	$544.9	$102.9	$22.3	$23.0	$2,396.0
2025	$412.5	$423.1	$537.5	$224.9	$161.6	$569.0	$106.2	$22.4	$23.1	$2,480.4
2026	$414.3	$425.1	$539.9	$226.3	$163.1	$573.4	$106.7	$22.3	$23.0	$2,494.2
2027	$414.6	$425.4	$540.3	$226.4	$150.1	$573.8	$106.8	$22.4	$23.0	$2,482.8
2028	$415.0	$425.8	$540.8	$226.7	$147.0	$574.3	$106.8	$22.4	$23.0	$2,481.7
2029	$415.4	$426.2	$541.3	$226.9	$147.2	$574.8	$106.9	$22.4	$23.0	$2,484.0
2030	$415.7	$426.6	$541.8	$227.1	$147.3	$575.4	$107.0	$22.4	$23.0	$2,486.3
2031	$416.1	$426.9	$542.3	$227.3	$147.5	$575.9	$107.1	$22.4	$23.1	$2,488.6
2032	$416.5	$427.3	$542.8	$227.5	$147.6	$576.5	$107.2	$22.5	$23.1	$2,490.9

Notes:

(a) Split tolling was implemented at the Verrazzano-Narrows Bridge on December 1, 2020.

Effects of Second Avenue Subway Construction in Forecast Years

The foregoing tables forecasting traffic and toll revenues incorporate estimated effects of the continued construction of the Second Avenue Subway. Phase 2 of the project, which would extend the Second Avenue Subway north to 125th Street, is currently in the design phase. Environmental reviews are also ongoing.

Activity associated with such construction could result in changes to traffic patterns, possibly resulting in a shift of traffic volumes from the RFK Bridge to other TBTA facilities, as well as the toll-free East River Bridges or a diversion to mass transit. Such changes in traffic patterns could have an adverse effect on the forecasts.

Various stages of the project will result in visible construction activity on segments of Second Avenue at any given time. In addition, tunnel construction, either through the use of a tunnel boring machine or cut-and-cover, will affect vehicular activity not only on Second Avenue, but also on adjacent avenues and streets.

Cashless Tolling Accounting in Forecast Years

Consistent with current TBTA practices, the foregoing tables of traffic and toll revenues assume that revenues associated with TBM transactions will be accounted for within the month that the transaction takes place. A liability on the balance sheet will be maintained to offset the toll revenue associated with TBM revenues and this liability will decrease as tolls are collected. Therefore, there is no delay in revenue collection assumed in our forecast due to the implementation of Cashless Tolling.

Operating Expenses

The projection of operating expenses for 2021 through 2031 is shown in Table 29. Total operating expenses, consisting of labor and non-labor, are estimated to increase from $583.5 million in 2022 to $774.2 million in 2032. Labor expenses consist of wages, salaries, overtime and fringe benefits. Non-labor expenses include items such as maintenance, tolling operations, supplies, utilities and other expenses. The table includes operating expenses budgeted by TBTA for 2022, operating expenses projected by TBTA through 2025 and Stantec's projections of operating expenses from 2026 through 2032. In 2022, expenses have been budgeted by TBTA at $583.5 million, an increase of 25.2 percent over 2021 expenses of $466.0 million. These expenses are split into the following categories: labor expenses of $293.1 million (an increase of 23.0 percent over 2021) and non-labor expenses of $290.4 million (an increase of 27.6 percent over 2021). Labor expenses are higher primarily due to the filling of 2021 vacancies, contractual payroll adjustments, and inflationary increases to fringe benefits. The major factors behind growth in non-labor expenses are anticipated increases in major maintenance, including bridge painting projects that will not be eligible for capital funding, higher E-ZPass expenses associated with expected continued growth in usage, and general inflationary adjustments. Stantec does not project any variation in operating expenses resulting from the reduced traffic levels brought about by periodic toll increases.

At this point Stantec is unable to determine the effects of the pandemic and related government actions on 2022 or future year operating expenses for the TBTA. As a result, Stantec is assuming for purposes of this study that the operating expenses listed in Table 28 and Table 29 will not change throughout the duration of our forecast.

Table 28 Projected Operating Expenses
(millions)

Year	Labor[a]	Non-Labor[b]	Total[c]
2022[d]	$293.1	$290.4	$583.5
2023[d]	$301.3	$293.4	$594.7
2024[d]	$308.6	$300.7	$609.3
2025[d]	$316.7	$312.9	$629.5
2026[e]	$326.2	$322.2	$648.4
2027[e]	$336.0	$331.9	$667.9
2028[e]	$346.0	$341.9	$687.9
2029[e]	$356.4	$352.1	$708.5
2030[e]	$367.1	$362.7	$729.8
2031[e]	$378.1	$373.6	$751.7
2032 [e]	$389.5	$384.8	$774.2

Notes:
(a) Salaries, overtime and fringe benefits, net of capital reimbursement.
(b) Non-labor includes the following categories: maintenance and supplies, outside services, insurance, power, leases, rentals and other expenses.
(c) Totals may not add due to rounding.
(d) Budgeted by TBTA for 2022 and from TBTA estimates for 2023-2025.
(e) Forecasted by Stantec for 2026-2032.

Net Revenues from Toll Operations

Finally, the projected operating expenses were deducted from the respective toll revenue calculations to produce the two sets of estimated net toll revenues (before debt service on outstanding TBTA obligations), one at current tolls and the other with toll increases in 2023 and 2025, as shown in Table 29. For 2022, net toll revenue under either scenario is estimated at $1.77 billion. By 2032, annual net toll revenue is estimated to be between $1.49 to $1.72 billion, depending on the number of toll increases included in the forecast.

Table 29 Net Toll Revenue Forecast
(millions)

Year	Gross Toll Revenues		Operating Expenses	Net Toll Revenues	
	Current Tolls	With 2023 Toll Increase		Current Tolls	With 2023 Toll Increase
2022	$2,350.7	$2,350.7	$583.5	$1,767.2	$1,767.2
2023	$2,336.5	$2,433.8	$594.7	$1,741.8	$1,839.1
2024	$2,284.0	$2,396.0	$609.3	$1,674.7	$1,786.7
2025	$2,269.9	$2,480.4	$629.5	$1,640.4	$1,850.9
2026	$2,266.8	$2,494.2	$648.4	$1,618.4	$1,845.7
2027	$2,256.3	$2,482.8	$667.9	$1,588.5	$1,815.0
2028	$2,255.3	$2,481.7	$687.9	$1,567.4	$1,793.8
2029	$2,257.3	$2,484.0	$708.5	$1,548.8	$1,775.5
2030	$2,259.4	$2,486.3	$729.8	$1,529.6	$1,756.5
2031	$2,261.4	$2,488.6	$751.7	$1,509.7	$1,736.9
2032	$2,263.5	$2,490.9	$774.2	$1,489.2	$1,716.6

Sensitivity Analysis

Stantec performed two sensitivity analyses to estimate the upper and lower range of possible transaction and revenue outcomes resulting from different rates of pandemic recovery and varying levels of economic downturn related to the recent spike in gas prices. Both severity and duration, as well as trends seen throughout the first two years of the pandemic were taken into account when determining the limits of these ranges.

- Sensitivity 1 (Aggressive Recovery): Under this condition, pandemic-related traffic recovery outpaces the effects of a gas spike related economic downturn and a slightly higher level of people returning to work at their offices.

- Sensitivity 2 (Economic Downturn and Longer Duration Recovery): Under this condition, a more severe economic downturn begins later in 2022 and lasts through 2023. Recovery then occurs through 2028 to a lower new normal due to a reduced level of workers returning to the office.

Under both sensitivities, average tolls towards the end of the ten-year forecast will remain roughly 0.2 percent higher than an equivalent scenario without a pandemic or any economic downturn. This is due to Stantec's assumption that, in the long term, personal vehicle trips will permanently be slightly reduced with more person-days of working from home than before the pandemic.

Despite the likelihood that more people will work from home post-pandemic than did in 2019, it is still assumed that many people will drive using the available capacity on TBTA facilities.

Table 30 and Figure 7 below compare the annual revenue under each sensitivity analysis for current and constant tolls. Table 31 and Figure 8 compare the annual revenue under each sensitivity analysis with assumed toll increases in 2023 and 2025.

Table 30 Annual Revenue Sensitivity Analysis, Current Tolls
(millions)

Year	Forecast	Sensitivity 1	Sensitivity 2	Sensitivity 1 vs. Forecast	Sensitivity 2 vs. Forecast
2022	$2,350.7	$2,380.7	$2,334.9	1.3%	-0.7%
2023	$2,336.5	$2,371.8	$2,280.1	1.5%	-2.4%
2024	$2,284.0	$2,315.7	$2,235.0	1.4%	-2.1%
2025	$2,269.9	$2,298.5	$2,222.4	1.3%	-2.1%
2026	$2,266.8	$2,295.3	$2,228.2	1.3%	-1.7%
2027	$2,256.3	$2,284.7	$2,236.1	1.3%	-0.9%
2028	$2,255.3	$2,283.7	$2,238.4	1.3%	-0.7%
2029	$2,257.3	$2,285.7	$2,240.4	1.3%	-0.7%
2030	$2,259.4	$2,287.8	$2,242.5	1.3%	-0.7%
2031	$2,261.4	$2,289.9	$2,244.5	1.3%	-0.7%
2032	$2,263.5	$2,292.0	$2,246.5	1.3%	-0.7%

Figure 7 Annual Revenue Sensitivity Analysis, Constant Tolls
(millions)

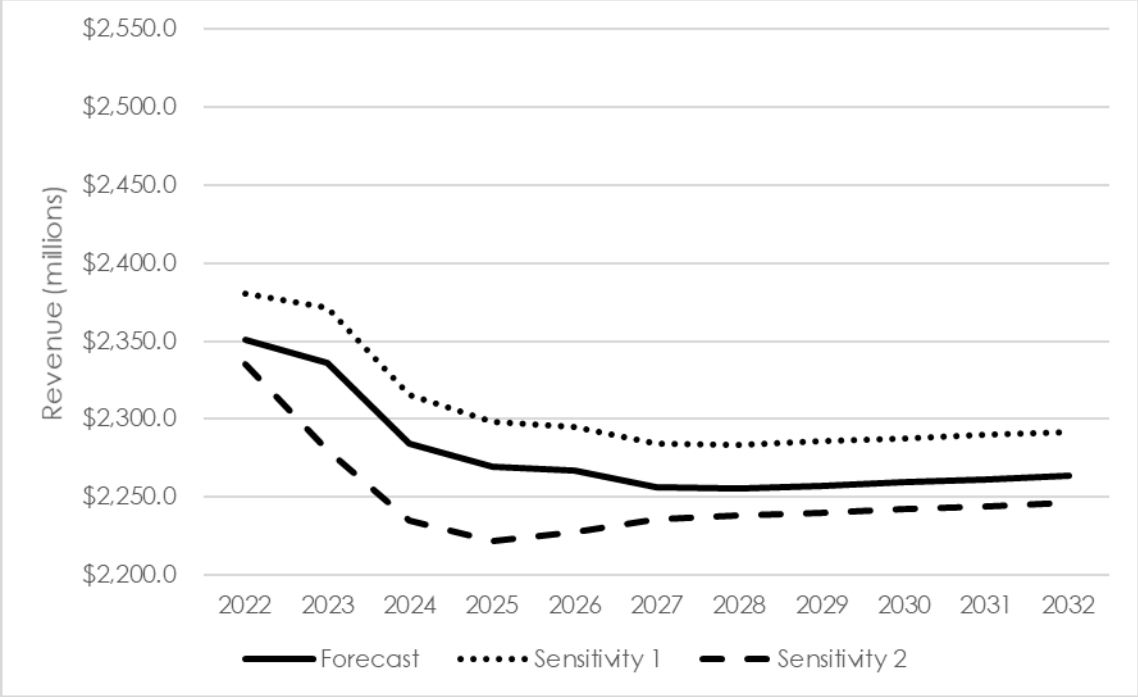


Table 31 Annual Revenue Sensitivity Analysis with Assumed 2023 and 2025 Toll Increases
(millions)

Year	Forecast	Sensitivity 1	Sensitivity 2	Sensitivity 1 vs. Forecast	Sensitivity 2 vs. Forecast
2022	$2,350.7	$2,380.7	$2,334.9	1.3%	-0.7%
2023	$2,433.8	$2,470.6	$2,375.2	1.5%	-2.4%
2024	$2,396.0	$2,429.2	$2,344.6	1.4%	-2.1%
2025	$2,480.4	$2,511.5	$2,428.5	1.3%	-2.1%
2026	$2,494.2	$2,525.5	$2,451.7	1.3%	-1.7%
2027	$2,482.8	$2,514.0	$2,460.5	1.3%	-0.9%
2028	$2,481.7	$2,512.9	$2,463.2	1.3%	-0.7%
2029	$2,484.0	$2,515.2	$2,465.4	1.3%	-0.7%
2030	$2,486.3	$2,517.6	$2,467.7	1.3%	-0.7%
2031	$2,488.6	$2,519.9	$2,470.0	1.3%	-0.7%
2032	$2,490.9	$2,522.2	$2,472.3	1.3%	-0.7%

Notes:
(a) Includes assumed 2023 toll increase on March 1, 2023, and assumed 2025 toll increase on March 1, 2025.

Figure 8 Annual Revenue Sensitivity Analysis with Assumed 2023 and 2025 Toll Increases
(millions)

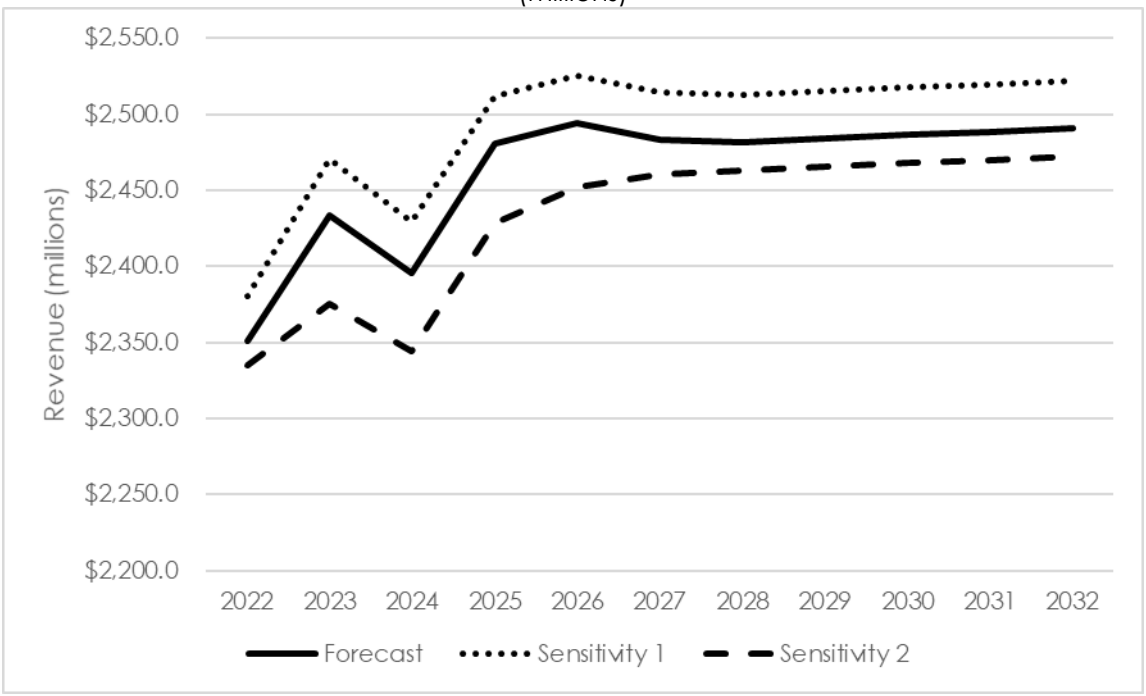
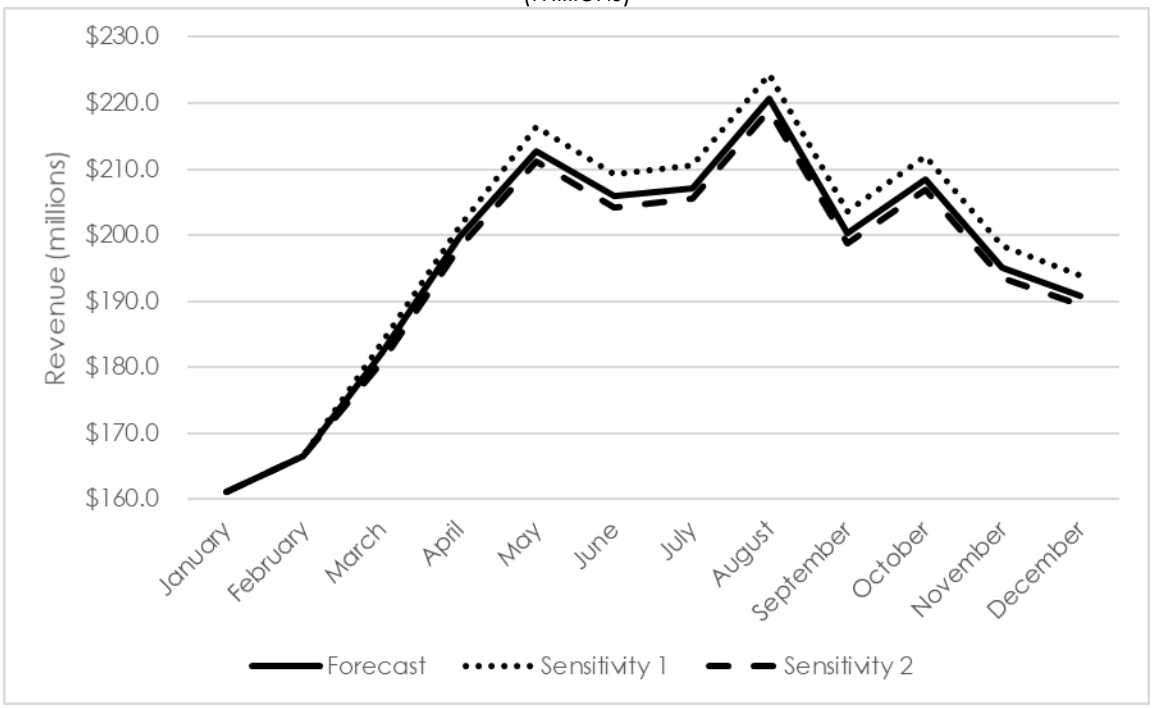


Figure 9 below compares the forecasted monthly distribution of traffic in 2022 to both Sensitivity 1 and Sensitivity 2.

Figure 9 2022 Monthly Revenue Sensitivity Analysis
(millions)



The results of the sensitivity analysis show that the TBTA network is reasonably stable, and the system can absorb additional stress without detrimental effects. The onset of an economic downturn and extended pandemic related recovery, as shown in Sensitivity 2, are not expected to cause significant losses in traffic and revenue.

REVIEW OF PHYSICAL CONDITIONS

The facilities under TBTA's jurisdiction include the two tunnels and seven bridges listed in Table 32, together with facilities on Randall's Island and a parking garage in Manhattan near the Hugh L. Carey Tunnel. Some of these crossings have been in service since the 1930s, i.e., the RFK, Henry Hudson, Marine Parkway-Gil Hodges Memorial, and Bronx-Whitestone Bridges. The Queens Midtown Tunnel opened to traffic in 1940. The Hugh L. Carey Tunnel opened to traffic in 1950. Two bridges opened to traffic in the 1960s: the Throgs Neck in 1961 and the Verrazzano-Narrows in 1964 (lower level in 1969). The present Cross Bay Bridge opened to traffic in 1970 replacing the previous structure that had been in service since 1939. The aging of the TBTA facilities will influence the overall upkeep and capital improvements that will be necessary to maintain the infrastructure over the forecast period and beyond. Table 33 lists TBTA's capital investments for each facility between 1992 and 2021, and within 2021 itself.

Table 32 Opening Dates of TBTA Facilities

Facility	Open to Traffic	Years in Use
RFK Bridge	1936	86
Bronx-Whitestone Bridge	1939	83
Throgs Neck Bridge	1961	61
Henry Hudson Bridge	1936	86
Queens Midtown Tunnel	1940	82
Hugh L. Carey Tunnel	1950	72
Verrazzano-Narrows Bridge	1964	58
Cross Bay Veterans Memorial Bridge	1970	52
Marine Parkway-Gil Hodges Memorial Bridge	1937	85

Stantec reviewed material pertaining to the physical condition of TBTA's seven bridges and two tunnels. The material reviewed includes pertinent sections and updates to the following:

- TBTA's Capital Investments at each facility during the year 2021;
- Ongoing Rehabilitation & Maintenance Projects;
- Biennial and Special In-Lieu of Interim Bridge Inspection Reports;
- Tunnel Inspection Reports;
- Rehabilitation Projects addressing recommendations on previous inspection reports; and
- Repairs to alleviate flagged conditions on previous inspection reports.

Table 33 Capital Investments by Facility, 1992 through 2020[a]

(Millions of dollars – Includes Superstorm Sandy Capital Investments)

Facility	Total by Facility 1992 through 2021[b]
Bronx-Whitestone Bridge	$971.71
Cross Bay Veterans Memorial Bridge	$200.88
Henry Hudson Bridge	$605.34
Marine Parkway-Gil Hodges Memorial Bridge	$390.23
RFK Bridge	$2,209.73
Throgs Neck Bridge	$1,127.50
Verrazzano-Narrows Bridge	$1,546.63
Hugh L. Carey Tunnel	$992.92
Queens Midtown Tunnel	$752.20
Agency Wide[c]	$788.70
Total	$9,585.84

Notes:
(a) Values are as of December 31, 2021.
(b) Data from TBTA.
(c) Agency wide refers to projects that have been, or will be, carried out at two or more facilities.

Inspection Reports, Flagged[12] Conditions and Rehabilitation Projects

The review by Stantec of the pertinent material consists of the following subtasks:

- Comparison of condition ratings of the current inspection reports with the previous inspection reports to note significant changes in observed deterioration, and repairs to priority conditions from previous inspections, if any.
- Review of the current TBTA Capital Program to verify that the repairs recommended by the latest inspection reports are being addressed.
- Review of TBTA's Routine Maintenance Program to verify that the maintenance-related recommendations of the current inspection reports are being addressed.

TBTA's seven bridges and two tunnel facilities undergo periodic condition inspections. Bridges and tunnels are inspected biennially per federal and State mandate, with interim yearly inspections of any components that require monitoring. The purpose of the biennial inspection program is to maintain the safety and structural integrity of bridges and tunnels.

Bridge and Tunnel Inspections. NYSDOT maintains a program of comprehensive bridge and tunnel management, maintenance and inspection applicable to TBTA's bridges and tunnels. That program includes the uniform codes for bridge inspection and tunnel inspection, which:

- meet or exceed applicable federal law;
- require that bridges and tunnels be inspected at least every two years in accordance with the provisions of that code;
- prescribe qualifications for licensed professional engineers who inspect bridges and tunnels; and
- require that all bridge and tunnel inspections be performed or supervised by such persons.

Bridge and tunnel inspection reports must be filed with NYSDOT who may close bridges or tunnels found unsafe for public use. TBTA is in compliance with the NYSDOT program.

TBTA's Bridge Inspection Program was assessed from 2006 to 2007 by an independent engineering firm well known in the field of structural inspection and appraisal, which noted that "the program is meeting the minimum State and federal standards" and "in several respects the program exceeds the minimum standards" and "with respect to the accuracy, clarity, and thoroughness of the reports generated, we find them to be of the highest quality."

[12] The New York State Bridge Inspection Manual defines the following "flags" for reporting purposes: Red Flag – A structural flag that is used to report the failure or potential failure of a primary structural component that is likely to occur within two years from the current inspection. Red Flag PIA (Prompt Interim Action) – A designation that is made when a Red Flag condition is considered extremely serious and in need of immediate attention. This designation requires appropriate action by the responsible party within twenty-four hours. Yellow Flag - A structural flag that is used to report a potentially hazardous structural condition which if left unattended could become a clear and present danger within two years from the current inspection, or the actual or imminent failure of a non-critical structural component, where such failure may reduce the reserve capacity or redundancy of the bridge but would not result in a structural collapse. Safety Flag PIA (Prompt Interim Action) – A flag that is used to report a condition presenting a clear and present danger to vehicular or pedestrian traffic but poses no danger of structural failure or collapse. Safety Flag PIA can be issued on closed bridges where conditions present a threat to vehicular or pedestrian traffic underneath the structure or in the immediate vicinity. This designation requires appropriate action by the responsible party within twenty-four hours.

The TBTA bridges and tunnels were last inspected, and their physical condition appraised in 2020-2021 by various consultants and in-house inspection staff, under the New York State Biennial Bridge and Tunnel Inspection Program, as shown in Table 34. Separate underwater and substructure inspections were performed in accordance with the five-year cycles of NYSDOT to obtain riverbed contours and to assess potential scour conditions at the substructure.

These ongoing inspections, performed by the inspection consultants and, in some cases, in-house inspection staff, consist of close visual examination, 100 percent hands-on inspection of designated critical elements, sounding concrete, and taking appropriate measurements to determine the physical conditions of the bridges and tunnels. All bridge inspections beginning in 2017 and continuing thereafter were performed in accordance with the updated 2017 New York State Bridge Inspection Manual and the AASHTO Manual for Bridge Element Inspection. All tunnel inspections beginning in 2017 and continuing thereafter were performed in accordance with the FHWA's National Tunnel Inspection Standards (NTIS), the 2015 Specifications for the National Tunnel Inventory, and the 2015 Tunnel Operations, Maintenance, Inspection and Evaluation Manual; and NYSDOT Technical Advisory, TA 16-001.

Under these guidelines, all bridge and tunnel components are inspected and assigned a quantitative condition rating. Any priority conditions are reported immediately to the TBTA for prompt attention. The ratings are reviewed by TBTA personnel to assess what components of the bridge or tunnel require more comprehensive inspection and rehabilitation. Required rehabilitation needs are then packaged and awarded as contracts under the Capital and Maintenance Programs. Bridge and tunnel components which warrant more frequent monitoring due to their condition are monitored annually with a special in-lieu of interim inspection.

After performing a comparison of the individual overall ratings of the current inspection reports against the previous inspection reports, it was noted that there has been no significant change in the overall ratings and the bridges and tunnels remain in Fair to Good condition.

TBTA has an ongoing seismic retrofit program to identify and implement necessary seismic retrofits in order to bring critical facilities to current seismic code standards. This program has made substantial progress in identifying necessary seismic upgrades and incorporating them into various capital facility rehabilitation design and construction projects when applicable. This effort was maintained in the 2015-2019 Capital Program and will continue in the approved 2020-2024 Capital Program.

While the majority of the inspection work is performed by consultants, some of the smaller structures are inspected by qualified in-house inspection staff. Table 3 lists the consulting engineering firms as well as the in-house inspection unit who performed the 2020 and 2021 biennial bridge or special in lieu of interim inspections and the 2019 tunnel inspections for each facility.

Table 34 Facility Inspection Firms

Facility	Consulting Firm (Inspection Year)
RFK Bridge	WSP / Hardesty & Hanover / In-House (2020, 2021), WSP / Stantec (2018 & 2019)
Throgs Neck Bridge	Thornton Tomasetti (2021), HNTB (2020, 2019)
Bronx-Whitestone Bridge	Stantec (2021), Thornton Tomasetti (2020, 2019)
Henry Hudson Bridge	HNTB (2021), Hardesty & Hanover (2020, 2019)
Queens Midtown Tunnel	Stantec (2021), HNTB (2019)
Queens Midtown Tunnel facility approach bridges	In-House (2021), Hardesty & Hanover (2020, 2019)
Hugh L. Carey Tunnel	Stantec (2021), HNTB (2019)
Verrazzano-Narrows Bridge	HNTB / Prime (2021), HNTB / Prime (2020), Hardesty & Hanover / AI Engineers (2020, 2019)
Marine Parkway-Gil Hodges Memorial Bridge	Hardesty & Hanover / In-House (2021), WSP (2020, 2019)
Cross Bay Veterans Memorial Bridge	Hardesty & Hanover / In-House (2021), WSP / In-House (2020, 2019)

The firms listed are well known in the field of structural inspection and appraisal. Copies of pertinent sections of the final inspection reports for the various facilities were requested and made available by TBTA.

Current Work Under Both Capital Programs

Funds previously programmed for TBTA's 2015-2019 Capital Program are summarized in Table 35. The plan, which totals $2.935 billion, separates this amount into specific projects by facility as well as agency-wide projects. Comparisons between the 2015-2019 Capital Program planned projects and total repair item lists for each facility, as prepared by inspection consultants in the biennial reports, confirm that the 2015-2019 Capital Program gives high priority to key rehabilitation projects. By prioritizing necessary facility rehabilitation projects, TBTA addressed all high priority recommendations in the current 2015-2019 Capital Program or maintenance programs that were not addressed as part of the previous 2010-2014 Capital Program so that all of these high priority needs will continue to be met. The approved 2020-2024 Capital Program, shown in Table 36 at $3.327 billion, is underway. The CBD Tolling Program is projected to cost approximately $503 million to implement, although TBTA expects to be fully reimbursed from non-toll revenues in the CBD Tolling Lockbox.

Table 35 TBTA 2015-2019 Capital Program by Facility

(In Millions of Dollars) [a]

Facility	2015-2019[b]	Percent
Bronx-Whitestone Bridge	$177.99	6%
Cross Bay Veterans Memorial Bridge	$87.55	3%
Henry Hudson Bridge	$283.73	10%
Marine Parkway-Gil Hodges Memorial Bridge	$21.65	1%
RFK Bridge	$470.14	16%
Throgs Neck Bridge	$681.96	23%
Verrazzano-Narrows Bridge	$602.61	20%
Hugh L. Carey Tunnel	$137.49	5%
Queens Midtown Tunnel	$88.95	3%
Agency Wide[b]	$383.02	13%
Total	$2,935.09	100%

Notes:

(a) Values are as of December 31, 2021.
(b) Agency wide refers to projects that have been, or will be, carried out at two or more facilities.

Table 36 Capital Investments 2020-2024 Capital Program by Facility

(In Millions of Dollars)[a]

Facility	2020-2024	Percent
Bronx-Whitestone Bridge	$110.42	4%
Cross Bay Veterans Memorial Bridge	$52.79	2%
Henry Hudson Bridge	$64.51	2%
Marine Parkway-Gil Hodges Memorial Bridge	$85.08	3%
RFK Bridge	$709.75	25%
Throgs Neck Bridge	$241.43	9%
Verrazzano-Narrows Bridge	$1,127.55	40%
Hugh L. Carey Tunnel	$52.72	2%
Queens Midtown Tunnel	$46.25	1%
Agency Wide[b]	$333.15	12%
Total	$2,823.87	100%

Central Business District Tolling Program (CBDTP)	$503	100%

GRAND TOTAL (2020-2024 Capital Program)	$3,327

Notes:

(a) Values are as of December 31, 2021.
(b) Agency wide refers to projects that have been, or will be, carried out at two or more facilities.

Bronx-Whitestone Bridge ("BWB")

During the 2021 Biennial Bridge Inspection of the BWB, a total of nineteen (19) yellow flags were issued. Of these nineteen (19) yellow flags, three (3) were reissued yellow flags and sixteen (16) were new yellow flags. No red flags were issued during the 2021 Biennial Bridge Inspection. The BWB is in overall good condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing or planned projects in the approved 2020-2024 Capital Program at the BWB include:

- Fender Protection Around Tower Piers and Installation of Fire Standpipe Connection from Tower Pedestals to Roadway Level. Construction was awarded in late 2019 and was completed in late 2021.
- Miscellaneous Structural Rehabilitation and Painting Construction was awarded in late 2021 and is projected to be completed in late 2024.
- Bridge structural lighting, power redundancy and resiliency improvements. Design contract was awarded in May 2020. Construction is under procurement and planned to begin in late 2022.
- Cable Dehumidification and Miscellaneous Work. Funding is programmed for preliminary design and planned to begin later in the 2020-2024 Program. Construction is planned for in the 2025-2029 Capital Program.

Henry Hudson Bridge ("HHB")

During the 2021 Biennial Bridge Inspection of the HHB, a total of three (3) yellow flags were issued. Of the three (3) yellow flags, two (2) were reissued yellow flags and one (1) was new. All three (3) yellow flags were removed before the completion of the inspection. The HHB is in overall fair to good condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the HHB include:

- Structural Rehabilitation Consisting of High Priority Structural Steel Repairs – Phase I is complete. Phase II construction was awarded in late 2019 and was completed in March 2022.
- Replacement of Overcoat System – Construction was awarded in late 2019 and was completed in March 2022.
- Dyckman Street and Kappock Substation Upgrades. Construction was awarded in late 2021, is ongoing and is projected to be completed in 2024.
- Installation of maintenance catwalks and lighting in Dyckman Street Bridge abutments. This project was completed in October 2021.
- Upper Level North Abutment and Retaining Wall Rehabilitation. Design is planned for the 2020-2024 Capital Program. Construction is currently planned to be advanced into the 2020-2024 program to begin in 2023.

Hugh L. Carey Tunnel ("HCT")

The Routine NTIS Tunnel inspection of the HCT was performed in 2021. During the Routine 2021 NTIS inspection, there were no deficiencies noted that required the issue of any flags. During the 2021 Biennial Inspection of the Governor's Island Pedestrian Bridge (part of the HCT Facility), the two (2) yellow flags issued in 2019 were still active. Outstanding flags for this facility remain at two (2). The HCT is in overall fair to good condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the HCT include:

- Rehabilitation of HCT Ventilation Systems – Construction was awarded in 2018 and was completed in the fall of 2021.
- Rehabilitation of the Ventilation Buildings – Design contract was awarded in late 2019 and was completed in late 2021. Identified rehabilitation needs are being addressed in various small construction projects. Funded from the capital program, a construction project to address façade rehabilitation at the Manhattan Blower Building was awarded in March 2021 and was completed in February 2022. Remaining identified needs are being addressed via the operating budget.
- Rehabilitation of Tunnel Entrance/Exit – Manhattan. Design is planned to begin in late 2022. Construction is currently planned to be advanced into the 2020-2024 Capital Program to begin in 2024.
- Installation of Fire Suppression System. Preliminary design funding is programmed for 2023 with construction planned for the 2025-2029 Capital Program.

Queens Midtown Tunnel ("QMT")

The Routine NTIS Tunnel Inspection of the QMT and the Biennial Inspection of the QMT approach bridges were performed in 2021. No flags were issued during the 2021 Routine Inspection. The QMT and the QMT approach bridges are in fair to good conditions.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the QMT include:

- Rehabilitation of the Ventilation Buildings – Design contract was awarded in late 2019 and was completed in late 2021. Identified rehabilitation needs include the Relocation of QMT Refueling Station and QSB Switchgear which will be awarded in mid-2022, funded in the 2020-2024 Capital Program.
- Installation of Fire Suppression System. Preliminary design funding is programmed for 2023 with construction planned for the 2025-2029 Capital Program.

Robert F. Kennedy Bridge ("RFK"))

The Biennial Inspection was performed at the RFK (Group A and Group B) in 2020. For Group A, a total of one-hundred-twenty-four (124) yellow structural flags were issued during the 2020 biennial inspection. This represents a 7% decrease from the previous biennial inspection in 2018 (134 flags). Thirty-five (35) of these flags are new and eighty-nine (89) superseded 2018 yellow structural flags. During the 2021 special in-lieu of interim inspection, six (6) flags were removed, and one hundred eighteen (118) yellow flags remain active.

For Group B, there was a total of 19 flags during the 2020 biennial inspection. This represents a 47% decrease from the previous biennial inspection in 2018 (36 flags). Nine (9) flags issued were new, while the remaining 10 flags were reissued from the previous biennial inspection. During the 2020 Biennial Inspection, one (1) yellow flag was removed. In addition, during the 2021 special in-lieu of interim inspection, four (4) flags were removed, and one (1) yellow flag was issued. A total of fifteen yellow flags remain active.

The RFK is in overall fair to good condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the RFK include:

- Miscellaneous Structural Repair – Phase I construction was substantially completed in 2016. The Phase II construction contract was awarded in late 2019, is ongoing, and is projected to be completed in the summer of 2022.
- Seismic and Wind Load Study – The study was awarded in December 2012 and was completed in 2015. Conceptual design was awarded in 2017 and final design was awarded in 2018. Construction for Phase I (superstructure upgrades for all facility structures except the suspended spans) was awarded in late 2019, is ongoing, and is projected to be completed in summer of 2022.
- Painting of Lift Span and Bronx Truss Steel – Construction contract was awarded in 2019, is ongoing, and is projected to be completed in the summer of 2022.
- Construction of New Harlem River ramp sidewalk connection and Lift Span Fender Upgrades. Design-Build project was awarded in late 2021, is ongoing, and is projected to be completed in late 2023.
- RFK Facility wide painting program – Phase 1 of this project addressing the Junction Structure is ongoing and is projected to be completed in the summer of 2022. Phase 2, Painting of the Queens Approach, is planned to begin construction in the fall of 2022.
- Flood Mitigation at RFK – Installation of flood windows, flood doors, and removable flood barriers at the Robert Moses Building – This project is ongoing and is projected to be completed in the fall of 2022.
- Power Resiliency at RFK Bridge – Substation upgrade. Project was awarded in 2020 and was completed in March 2022.
- Concrete Repairs at Queens Approach Structure – Construction contract was awarded in 2019 and was completed in late 2021.

- Demolition of the Former Bronx Plaza West Widening (Facility Interoperability Improvements) – Construction contract was awarded in 2020 and was completed in the summer of 2021.
- Demolition of the remaining occupied space under the Manhattan Plaza – Project was awarded in late 2021 and is projected to be completed in the fall of 2022.
- Suspended Span Retrofit. Preliminary design was awarded in late 2020 and is ongoing with construction planned for 2023.
- Ward's Island/Queens Anchorage Rehabilitation – In-house design is ongoing with construction planned for 2023.
- Reconstruct/Relocate Randall's Island Ramps (Queens to Randall's Ramp and Randall's to Manhattan Ramp) - In house design is ongoing with construction planned for late 2022. Widening of Southbound FDR Drive (125 St to 116 St) - Design was awarded in 2021. Construction is currently planned to be advanced into the 2020-2024 Capital Program to begin in 2023.

Throgs Neck Bridge ("TNB")

During the 2021 Biennial Bridge Inspection of the Throgs Neck Bridge, a total of one hundred and seventeen (117) structural flags were issued. Of these one hundred and seventeen (117) flags, one (1) was a structural red flag and one hundred and sixteen (116) were structural yellow flags. Ninety-five (95) of the yellow flags were re-issued, along with one (1) structural red flag, and twenty (21) were new yellow flags. During the 2021 Biennial Inspection, fifty-eight (58) flags were removed, including the red flag. The TNB is in overall fair condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the TNB include:

- Approach Viaducts Seismic Retrofit & Structural Rehabilitation Construction contract was awarded in 2019. It is an ongoing project and is projected to be completed summer of 2023.
- Replacement of Grid Decks on Suspended Span and Painting on Suspended Span – Construction contract was awarded in 2018, is ongoing, and is projected to be completed in late 2022.
- Anchorage and Tower Protection – Preliminary design contract was awarded in late 2019 and is ongoing. Construction is funded in the 2020-2024 Capital Program and is projected to begin in 2023.
- Study for Bronx-Queens Viaduct Replacement – Study was awarded in 2017 and was completed in March 2021.
- Miscellaneous Structural Rehabilitation – In house design is ongoing with construction planned for late 2022.
- TNB Facility-Wide Painting Program – Painting of the towers is planned to begin in 2023.
- Flood Mitigation at TNB – Installation of flood doors, flood window and removable flood barriers. This project is ongoing and is projected to be completed in the fall of 2022.

Verrazzano-Narrows Bridge ("VNB")

The Biennial Inspection at the VNB (Group C and Group D) was performed in 2020. For Group C, a total of twelve (12) flags were issued during the 2020 Biennial Inspection. Of the twelve (12), all were yellow structural flags. Eight (8) were issued at the lower level and Four (4) were issued at the upper level. No flags were removed during the Inspection. During the 2021 special in-lieu of interim inspection, a total of six (6) yellow flags were issued, and four (4) yellow flags were removed.

For Group D, a total of four (4) flags were issued. Of these flags, 3 were yellow flags and 1 was a safety flag PIA. The safety flag PIA was removed during the 2020 Biennial Inspection. No red flags were issued. During the 2021 special in-lieu of interim inspection, no new yellow flags were issued.

The VNB is in overall fair condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the VNB include:

- Anchorage & Piers Rehabilitation and Sealing – Construction Contract was awarded in 2018 and was completed in May 2021.
- Painting of Suspended Span Upper & Lower Level Steel – Construction was awarded in 2019 and was completed in late 2021.
- Gowanus Widening at the 92nd Street On-Ramp (EB). Construction was awarded in 2019 and was completed in June 2021.
- Rehabilitation of the Staten Island and Brooklyn Upper Level Approach Ramps – The feasibility study and conceptual design for the reconstruction and reconfiguration of the ramps and approaches was awarded in 2013. Construction for Phase I was awarded in late 2019. It is an ongoing project and is projected to be completed in the fall of 2022. Preliminary design for Phase 2 of the project is ongoing with construction planned to begin in 2024.
- Steel Repair of the Suspended Spans – Construction contract was awarded in 2019. It is an ongoing project and is projected to be completed in April 2022.
- Safety Fence Installation at the Upper and Lower Level Main Suspended Spans. Project was awarded in March 2021 and is projected to be completed in late 2022.
- Miscellaneous Bridge Lighting and Electrical Improvements/Repairs. Design contract was awarded in March 2020. Design is ongoing with construction of electrical improvements planned for late 2022 and lighting improvements planned for 2023.
- Painting of the towers at the VNB – In house design is planned for 2022 with construction planned for 2023.
- Lower Level Main Suspended Span Deck Rehabilitation. Design contract was awarded in 2019 and was completed in early 2022. Construction is funded in the 2020-2024 Capital Program and is planned to begin in late 2022.
- Widening of Belt Parkway. Design was awarded in late 2019 and was completed in early 2022. Construction is funded in the 2020-2024 Capital Program and is projected to begin in late 2022

Marine Parkway Bridge ("MPB")

The Biennial Inspection of the MPB was performed in 2021. No flags were issued during the 2021 biennial inspection. The MPB is in overall fair condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the MPB include:

- Replacement of On Grade Light Poles Construction began in the spring of 2021 and is projected to be completed in the summer of 2022.
- MPB Facility-Wide Painting program began in the spring of 2021 and is projected to be completed in late 2022.
- Installation of Power Monitoring System – project is ongoing and is projected to be completed in the summer of 2022.
- Rehabilitation of Pier Fender System at the MPB and CBB – Construction was awarded in late 2018 and was completed in the fall of 2021.
- Miscellaneous Steel Repairs – Funding is included in the program for any necessary repairs identified under future inspections. This will be awarded as part of the CBB project for structural rehabilitation of the CBB referenced below.
- Electrical Rehabilitation of the Elevator – Construction was awarded in late 2021 and is projected to be completed in late 2023.
- Painting of the Above Roadway Steel – Construction was awarded in mid-2021, is ongoing and is projected to be completed in late 2022.

Cross Bay Bridge ("CBB")

The Biennial Inspection of the CBB and Ramp B were performed in 2021. No flags were issued during the 2021 biennial inspection. The CBB is in overall fair condition.

Recently completed and ongoing projects in the 2015-2019 Capital Program and ongoing and planned projects in the approved 2020-2024 Capital Program at the CBB include:

- Rehabilitation of Pier Fender System at the MPB and CBB – Construction was awarded in late 2018 and was completed in the fall of 2021.
- Structural Rehabilitation of CBB – In house design is ongoing with construction planned for late 2022.
- Installation of Power Monitoring System – project is ongoing and is projected to be completed in the summer of 2022.

Other System Wide Improvements

Agency-Wide ("AW") – Since the September 11th attack on the World Trade Center, TBTA has engaged consultants to assess security risks of their facilities. As a result of these risk assessments, increased security improvements including various monitoring, surveillance and hardening projects have been implemented or will begin construction shortly at TBTA facilities. Video surveillance software and hardware upgrades have been installed at many facilities. TBTA has also

maintained a security department and incorporates mitigation measures into their operations, capital, and maintenance programs.

Recently completed and ongoing AW projects in the 2015-2019 Capital Program and ongoing and planned AW projects in the approved 2020-2024 Capital Program include:

- *Overhaul and Replace Facility Monitoring and Safety Systems* – This project includes upgrades for traffic detection, incident management, operational command, safety systems, and other agency-wide systems. Design is planned to begin in mid-2022, with construction planned for 2023.
- Intelligent *Transportation System Enhancements* – This project completed the installation of CCTV cameras at the TNB, BWB and RFK, improving the monitoring and observation of traffic flow on these bridges. Hardware upgrades will also be made for the Advanced Traffic Management Systems ("ATMS").
- *Hazardous Materials Abatement* – This project will remove hazardous materials at various facility work sites.

Additional projects:

- Structural Health Monitoring
- Fiber Optic Infrastructure and Integration
- Toll Collection System Rehabilitation/Upgrades
- SCADA Systems
- Rehab/Replace Facility Monitoring and Safety Systems
- Service Building Upgrades

As part of the Capital Program planning process for each five-year plan, TBTA personnel conduct a capital needs assessment. The assessment is compiled from data from biennial inspections and system improvements suggested by the Engineering and Construction department and includes factors such as service life of various structural components and normal replacement cycles. Scheduling of Major Maintenance projects is closely coordinated to ensure that the optimal level of service to the traveling public both locally and systemwide is maintained while balancing operating and capital expenditures.

Stantec's consultant team review of pertinent sections of the recent facility inspection reports found them to be extensive and detailed. The reports, based on that limited review, appear, in the opinion of Stantec, to be reasonable. The reviews proved informative. Facility projects and agency-wide projects specific to each structure were discussed. KC Engineering conducted the condition assessment of these facilities for Stantec.

It is important to note, however, that Stantec's consultant team review of portions of the work of other parties shall not relieve such other parties from their responsibility for performing their work in accordance with applicable requirements and the customary standard of care. Stantec and its subconsultants shall not be responsible for the acts or omissions of other parties engaged by TBTA.

Long-Term Outlook for TBTA Facilities

The useful lives of bridges and tunnels, in general, could possibly be cut short for two main reasons: (a) they are geometrically and functionally unsatisfactory because they are too narrow, too steep, lacking in clearance or sufficient spatial capacity to handle the traffic; or (b) they are structurally unsafe because of deterioration or because their load-carrying capacity is inadequate to handle the loads imposed under current conditions. Deterioration may occur for a variety of reasons, including aging, but it will occur sooner if there has been inadequate or improper maintenance.

On the basis of the foregoing review and information available to us from reports of others, it is our opinion that the TBTA bridges, tunnels and approaches are all geometrically and functionally adequate, structurally sound, and generally maintained to good standards. Ongoing maintenance requirements of the structures are assessed, prioritized and addressed in an appropriate manner by TBTA to maintain a high level of safety to the traveling public, and to maintain the structures for many years to come.

TBTA is looking forward, exploring ways to add capacity at its facilities (where possible) while maintaining and rehabilitating its structures in order to ensure their future serviceability. We are of the opinion that all the TBTA facilities are and will be physically capable of accommodating traffic volumes at the levels projected for 2032 through the duration of the outstanding bonds that have been issued and future bonds to be issued based on a pledge of TBTA revenues through 2056, assuming maintenance and rehabilitation consistent with past practice.

CONCLUDING REMARKS

It is Stantec's opinion that the revenue projections presented in this report have been prepared in accordance with accepted industry-wide practice for investment -grade studies. However, given the uncertainties within the current international and economic climate, Stantec considers it is necessary to state that the traffic and revenue projections take into consideration the following caveats:

- This report presents the results of Stantec's consideration of the information available to us as of the date hereof and the application of Stantec's experience and professional judgment to that information. It is not a guarantee of any future events or trends.
- The traffic and revenue forecasts will be subject to future economic and social conditions or demographic developments, which cannot be predicted with certainty.
- The projections contained in this report, while presented with numerical specificity, are based on a number of estimates and assumptions which, though considered reasonable to us, are inherently subject to significant economic and competitive uncertainties and contingencies, many of which will be beyond Stantec's control and that of TBTA. In many instances, a broad range of alternative assumptions could be considered reasonable. Changes in the assumptions used could result in material differences in projected outcomes.

- If, for any reason, any of these stated conditions should change due to changes in the economy or competitive environment, the pandemic conditions and associated actions, or other factors, Stantec's opinions or estimates may require amendment or further adjustments.
- Stantec's toll revenue projections only represent its best judgment and Stantec does not warrant or represent that actual toll revenues will not vary from its projections, estimates, and forecasts.

Many statements contained in this report that are not historical facts are forward-looking statements, which are based on Stantec's opinions, as well as assumptions made by, and information currently available to, the management and staff of Stantec. Because the statements are based on expectations about future events and economic performance and are not statements of fact, actual results may differ materially from those projected. The words "anticipate", "assume", "estimate", "expect", "objective", "projection", "plan", "forecast", "goal", "budget", or similar words are intended to identify forward-looking statements. The words or phrases "to date", "now", "currently", and the like are intended to mean as of the date of this report.

Respectfully,

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