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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April 28, 2023

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 travel behavior impacts since the beginning of the COVID-19 pandemic ("pandemic") and associated governmental restrictions. It should be noted that traffic levels are considered to have recovered from pandemic impacts, and recovery is no longer an element in the forecast.

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 New York 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 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. This greater flexibility is assumed to have longer-term travel behavior impacts, including changes in trip purpose, trip frequency, and time of day patterns.

As of the date of this report, preliminary audited traffic and revenue data are available for the period through February 2023, as well as unaudited traffic volumes through April 16, 2023.

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 impact on both travel patterns and TBTA revenue, none of which is reflected in this report.

Stantec wrote the 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" (2022 Report), dated April 29, 2022. In 2022, actual total toll revenues for the TBTA facilities were $2.332 billion, or 0.8 percent lower than our 2022 forecast of $2.351 billion and 8.5 percent higher than actual 2021 toll revenue. Total revenue traffic in 2022 was 326.3 million vehicles, which was 1.7 percent higher than our 2022 forecast of 320.7 million vehicles and 6.2 percent higher than actual 2021 traffic.

The full set of comprehensive data provided through February 2023 was used in preparing our analysis through 2033. Stantec receives daily preliminary unaudited traffic data from the TBTA. Although the preliminary unaudited data from March 1, 2023, through April 16, 2023, 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.

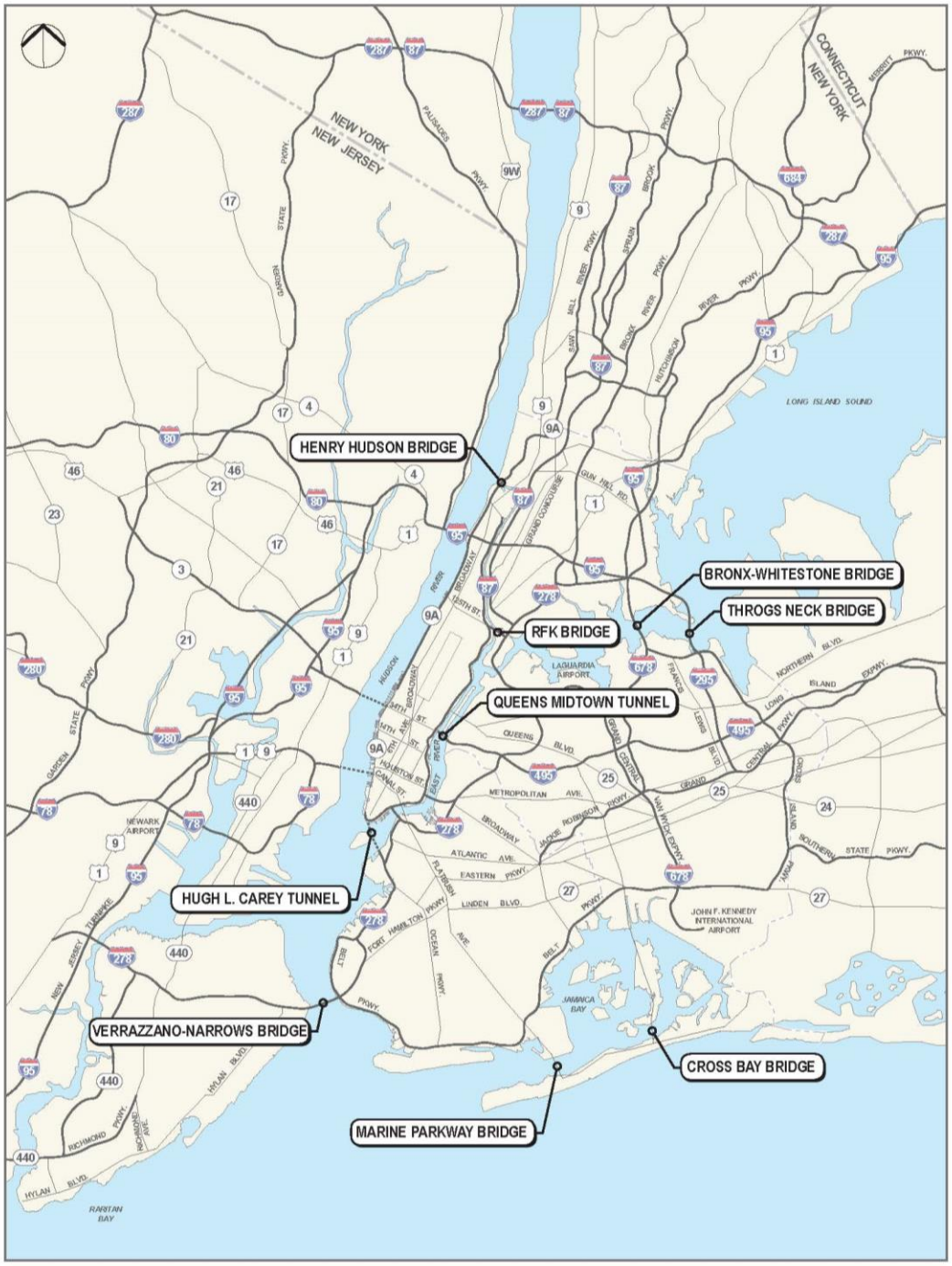
TRANSPORTATION INFRASTRUCTURE

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 (7) bridges and two (2) tunnels that provide vital links across and under New York City's rivers and bays. In 2022, these facilities carried 326.3 million total toll-paying vehicles and generated $2.332 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 travel lanes on the upper level, including a reversible HOV lane, and six (6) travel lanes 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 (8) travel lanes between Queens and the Bronx crossing Astoria Park, Wards Island and Randall's Island. The bridge widens out to nine (9) 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 (6) travel lanes between Randall's Island and Manhattan. These three (3) 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 travel lanes in each direction, which crosses the East River connecting the boroughs of Queens and the Bronx.

Throgs Neck Bridge - a suspension bridge with three travel lanes 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 travel lanes 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 travel lanes 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 travel lanes on its lower deck and three northbound travel 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 bridge with two travel lanes in each direction, which crosses 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 travel lanes 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 New York 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, New York 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 New York 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 the regional toll 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 and developed an interface control document 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 developing an E-ZPass Hub whereby each E-ZPass agency will exchange files with the Southeast US, Central US, and Western US Region Hubs in supporting national interoperability. 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), as well as the Holland Tunnel and portions of the George Washington Bridge (Palisades Interstate Parkway and lower level toll lanes) are also cashless. As of April 2022, the cash collection of tolls was temporarily restored at the Lincoln Tunnel and upper level of the George Washington Bridge. Cash collection continued at the George Washington Bridge until July 10, 2022 and at the Lincoln Tunnel until December 11, 2022 when the cashless system was fully installed. Additionally, the entire New York State Thruway System became fully cashless in November 2020. Under Cashless Tolling, toll equipment is mounted on gantries, traditional toll plazas are demolished, and roadways are 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 New York City and the suburban counties north and east of New York 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), the 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 the 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 any surface roadway portion of the Hugh L. Carey Tunnel that connects to West Street). TBTA has entered into a Memorandum of Understanding ("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 ("EA") is the appropriate level of environmental review required under NEPA. The EA for the CBD Tolling Program was made available to the public on August 10, 2022. The comment period, which included six public hearings between August 25 and August 31, 2022, was extended for an additional two weeks and ended on September 23, 2022. Comments received are being reviewed, categorized, and responded to, and will be made available to the public.

On July 27, 2022, the mandated Traffic Mobility Review Board ("TMRB") was established. The TMRB is required to make recommendations regarding the CBD toll structure including credits, discounts, and/or exemptions, then to present its recommendations to the TBTA Board for consideration before the CBD Tolling Program is implemented. As the EA process is still ongoing, it is too early for the TMRB to issue recommendations at this time.

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. Should the CBD Tolling Program receive FHWA approval, 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 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.

TBTA continues to work with FHWA to complete the NEPA process. If the CBD Tolling Program receives a Finding of No Significant Impact, TransCore would have up to 310 days from the date of such approval to complete the design, development, installation, and testing required to get the program operational. TBTA anticipates a federal decision in early 2023. Since details relating to an adopted tolling structure, tolling rates and possible credits, as well as the date of implementation, of the CBD Tolling Program have not been established, Stantec did not 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 (9) 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.

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, in order to offset the additional costs incurred by TBTA to process these tolls. 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 TBM customers. The goal of the new Mid-Tier toll rate is to incentivize NYCSC E-ZPass customers to properly mount their E-ZPass tag. 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 (9) 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)	(f)	(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				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 earlier in this report, 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 amount ($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) 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. The 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."

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 an approximately 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 TBTA and MTA Boards 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. Approximately once a year, the MTA reimburses the TBTA for toll rebates relating to the Cross Bay Bridge rebate program for that calendar year. The amount and timing for that reimbursement varies from year to year. In February 2022, the MTA reimbursed the TBTA approximately $4.0 million in toll rebates for 2022 and in January 2023, the MTA reimbursed the TBTA approximately $4.0 million in toll rebates for 2023.

Verrazzano-Narrows Bridge Rebate Programs

Since 2014, the 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 meeting a minimum number of trips per month using the same NYCSC E-ZPass tag. 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 change 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 tag (from ten trips a month, collected Staten-Island bound). In February 2021, the TBTA Board eliminated the minimum trip threshold and adopted toll increases effective April 11, 2021 that changed the SIR rebate to $3.68 (from $3.44) in each direction. The State, in the fiscal year 2021-2022 budget, appropriated additional funding to keep the effective post-rebate toll at $2.75 per trip, increasing the rebate to $0.93 (from $0.69).

As a result of the change to the SIR resident toll and the MTA rebate program, the annualized cost of the 2021-2022 VNB Rebate Program was approximately $28.3 million with $6.3 million for the 2021-2022 VNB Commercial Rebate Program and $22.0 million for the 2021-2022 SIR Rebate

Program. The annualized cost of the 2022-2023 VNB Rebate Program was approximately $30 million with $7 million for the 2022-2023 VNB Commercial Rebate Program and $23 million for the 2022-2023 SIR Rebate Program. The projected annualized cost of the 2023-2024 VNB Rebate Program is approximately $31 million with $8 million for the 2023-2024 VNB Commercial Rebate Program and $23 million for the 2023-2024 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 the MTA.

The money to fund a year's estimated costs for the VNB Rebate Programs is transferred by the MTA to TBTA during the New York State Fiscal Year. The 2023-2024 VNB Rebate Programs will be implemented as specified herein only for such periods during which both (a) the MTA's total financial responsibility, net of New York State actions or available offsets, does not exceed $7 million for the 2023-2024 SIR Rebate and VNB Commercial Rebate Programs and (b) New York State provides (i) at least $7 million for the 2023-2024 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 2023-2024 SIR Rebate Program. If, as a result of unexpected toll transaction activity, TBTA estimates that such MTA and State funds allocated to the MTA for the 2023-2024 VNB Rebate Programs, net of offsets, will be insufficient to fund the 2023-2024 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 the MTA for the 2023-2024 VNB Rebate Programs are fully depleted at any time during the 2023-2024 VNB Rebate Programs annual period, the 2023-2024 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) the MTA's annual period contribution does not exceed $7 million, (b) the MTA Board approves a budget that includes the MTA's contribution to such program, and (c) New York State provides to the MTA funds sufficient for at least half the expenses of each continuing annual period.

Under the 2021-2022 and 2022-2023 SIR Rebate Programs, for Staten Island Residents crossing the Verrazzano-Narrows Bridge, the rebate was $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 appropriations in each enacted New York State Fiscal Year budget, Staten Island residents have paid an effective post-rebate toll of $2.75 per trip under the current SIR toll rates collected at the VNB since April 11, 2021. Under the 2023-2024 SIR Rebate Program, Staten Island residents will continue to pay an effective post rebate toll of $2.75 per trip under the current SIR toll rates collected at the VNB from April 1, 2023 through March 31, 2024.

Under the 2020-2021, 2022-2023, and 2023-2024 VNB Commercial Rebate Programs, the rebate was and will continue to be 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 Tag. The $7 million allocation was sufficient in covering the cost of the rebate for the past two fiscal years. It is expected that the $7 million allocated for the 2023-2024 VNB Commercial Rebate Program is sufficient to provide funding from April 1, 2023 through March 31, 2024.

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 TBTA's crossings were approved by the MTA Board in December 2019. They are (i) a Bronx resident rebate for passenger vehicles with E-ZPass tags using the Henry Hudson Bridge, and (ii) a Queens resident rebate for passenger vehicles with E-ZPass tags using the Cross Bay 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 6.557 million E-ZPass tags in use in 2022 (compared to 5.826 million in December 2019). As of December 2022, E-ZPass participation rates were 94.2 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, 2022, was over 54 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 2013. 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 2022.

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 from 86.2 to 93.6 percent between 2016 and 2017, an increase of 7.4 percent. In 2022, there was a 1 percent decrease in year-end (December) TBTA-wide E-ZPass participation rates compared to 2021. 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									
	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Percent Participation (All TBTA Facilities)	83.8%	84.5%	85.6%	86.2%	93.6%	94.6%	95.5%	94.7%	95.2%	94.2%
TBTA Facility	Year-End TBTA E-ZPass Participation Rate by Facility (December 2022)									
	Throgs Neck	Bronx-Whitestone	Robert F. Kennedy	Queens Midtown	Hugh L. Carey	Verrazzano-Narrows	Henry Hudson	Marine Parkway	Cross Bay	
Percent Participation	93.1%	92.6%	93.5%	95.5%	95.6%	95.1%	94.6%	96.5%	95.3%	

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 38 toll agencies in 19 states, including five international border crossings. Since the inception of the E-ZPass Group more than 25 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 2022, the E-ZPass Group processed over 3.9 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 (6) 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 (5) 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 (3) bridges of the Niagara Falls Bridge Commission;
- The Atlantic City Expressway (operated by the South Jersey Transportation Authority);
- The four (4) toll bridges between New Jersey and Pennsylvania operated by the Delaware River Port Authority;
- The seven (7) 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 (2) 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 (Indiana)
- Delaware Department of Transportation
- The Florida Turnpike Enterprise
- Houbolt Road (Illinois)
- Illinois State Toll Highway Authority
- Indiana Toll Road Concession Company, LLC
- Kane County Department of Transportation (Illinois)
- Kentucky Public Transportation Infrastructure Authority
- Lee County (Florida)
- 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 (Illinois)
- UBP Bay City (Michigan)
- Virginia Department of Transportation
- West Virginia Parkways 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 2022, TBTA transferred $1.29 billion to, and received $723.6 million from, other members within the E-ZPass Group.

Cashless, Open Road Tolling ("Cashless Tolling")

TBTA completed full implementation of Cashless Tolling on September 30, 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. Drivers without E-ZPass receive a TBM invoice mailed to the vehicle's registered owner.

In spring 2016, TBTA began asking the New York State DMV to suspend the vehicle registrations of violators who fail to pay their tolls and violation fees or have them dismissed or transferred in

[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.

response to violation notices for five toll violations within 18 months, in accordance with the initial New York State DMV regulation for persistent or habitual toll violators. In January 2017, the New York State 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 or place holds on the vehicle registrations of persistent toll violators who reside is such other states. TBTA 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, TBTA anticipates being able to discontinue issuing exclusion orders to out-of-state toll violators barring their vehicles from TBTA 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. "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 2022, there were more than 2.5 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 (9) 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 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 the 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
2020-2023[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.

Since late 2021, inflation has been consistently higher than it has been in several decades, exceeding 5 percent every month. In March 2023, the CPI-U was 319.0, a 9.1 percent increase over the annual 2021 CPI-U of 292.3 and a 2.9 percent increase over the annual 2022 CPI-U of 310.1. This was caused by several factors including supply chain constraints, labor shortages, and 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]	166.9	3.00	1.80
2003	197.8	3.50	1.77
2005	212.7	4.00	1.88
2008	235.8	4.15	1.76
2009[d]	236.8	4.57	1.93
2010[e]	240.9	4.80	1.99
2013[f]	256.8	5.33	2.08
2015[g]	260.6	5.54	2.13
2017[h]	268.5	5.76	2.15
2019[i]	278.2	6.12	2.20
2021[j]	292.3	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 2022

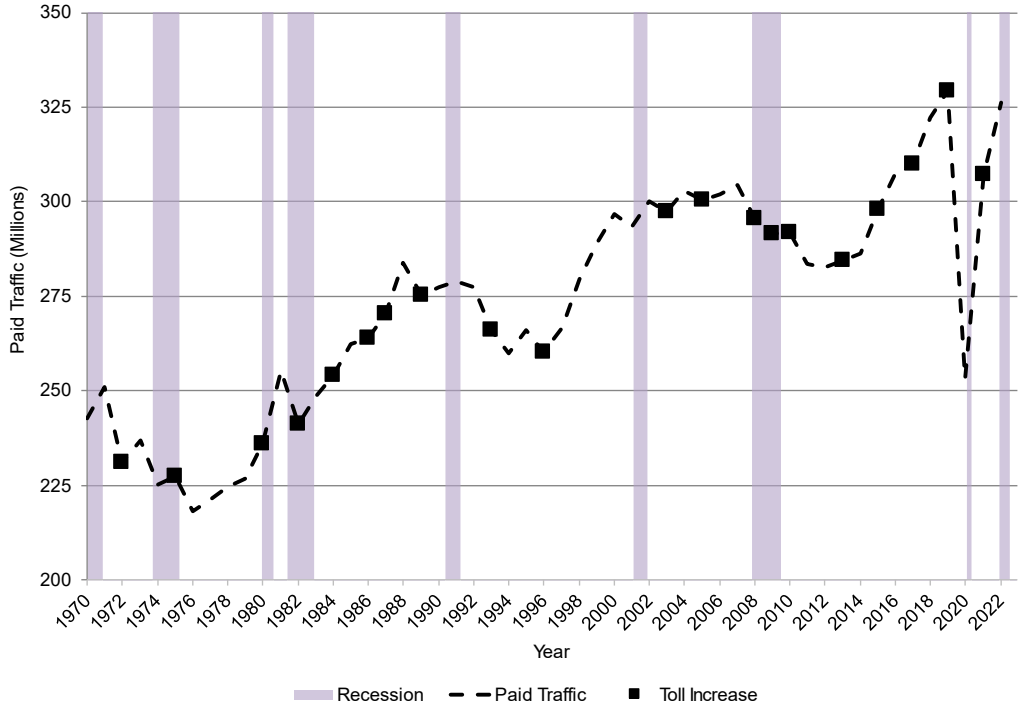
Historical traffic, toll revenues, and expenses were reviewed for the nine TBTA bridges and tunnels. Over the last 52 years from 1970 through 2022, paid traffic volumes on the crossings have ranged from a low of 218 million in 1976 to a high of 329 million in 2019. As displayed in Figure 2A/2B, the growth 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 transactions, 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.

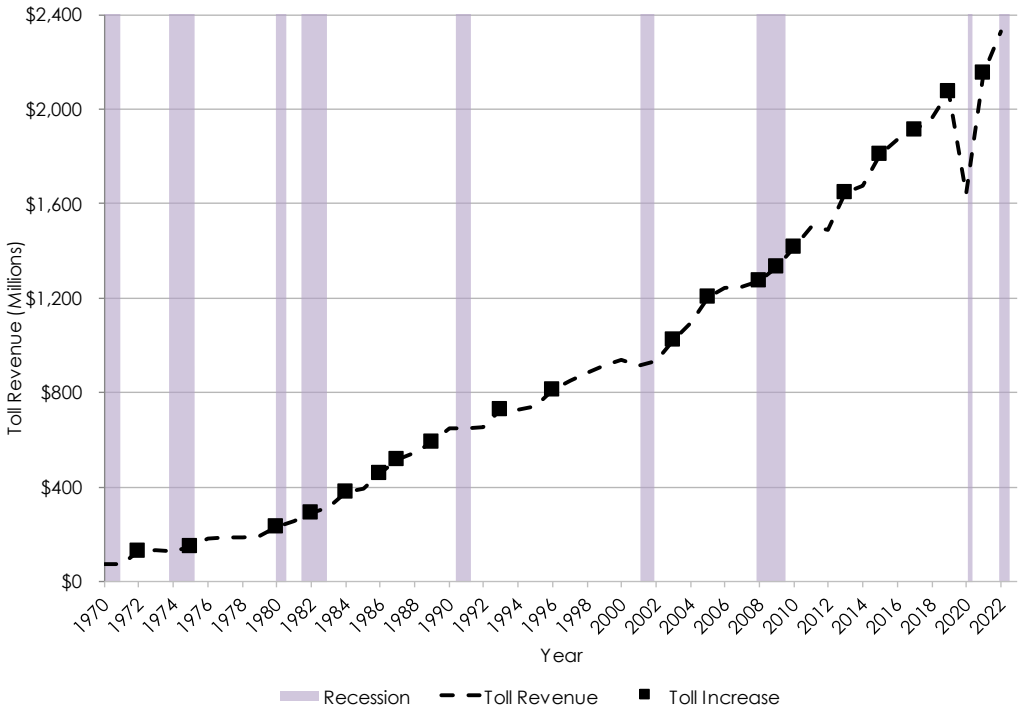
Since the 2008-2009 recession, toll revenues have increased each year with the exception of 2012, when there were temporary closures caused by Superstorm Sandy, and 2020, when the pandemic resulted in significant reductions in traffic. In 2020, traffic dropped to 253 million vehicles, a 23.1 percent 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 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. Toll revenues in 2022 were $2.332 billion, 8.5 percent higher than 2021 toll revenue (12.6 percent above pre-pandemic 2019 toll revenues).

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 2022





Source: TBTA data.

Traffic and Toll Revenue, 2012 to 2022

Table 5 lists the toll-paying traffic and toll revenue recorded for each of the nine TBTA crossings for the most recent 11-year time period, 2012-2022. Total TBTA traffic and toll revenue are shown in Table 6. Within this 11-year period toll-paying traffic reached historic peaks three (3) 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 pandemic, toll-paying traffic decreased to 253 million crossings in 2020, followed by significant recovery to 307 million vehicles in 2021. Toll-paying traffic increased in 2022 to 326 million vehicles, or within 1 percent of 2019 levels.

The first toll increase within this most recent 11-year time period occurred on March 3, 2013. When toll rates are increased on toll facilities, traffic typically declines slightly and then grows until the next rate increase. However, TBTA traffic did not decrease following the March 2013, March 2015, March 2017, March 2019, and April 2021 toll increases. 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 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 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, 2012 to 2022

Year	Verrazzano-Narrows Bridge				RFK Bridge				Bronx-Whitestone Bridge			
	Traffic		Revenue ($000s)	Average Toll[c]	Traffic		Revenue ($000s)	Average Toll	Traffic		Revenue ($000s)	Average Toll
	Volume (000s)[b]	Percent Change			Volume (000s)	Percent Change			Volume (000s)	Percent Change		
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[a]	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[a]	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[a]	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[a]	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[a]	75,255	19.9%	$511,298	6.79	61,178	21.3%	$462,395	7.56	48,459	24.4%	$375,583	7.75
2022	78,237	4.0%	$544,498	6.96	65,216	6.6%	$503,558	7.72	50,880	5.0%	$401,886	7.90

Year	Throgs Neck Bridge				Hugh L. Carey Tunnel				Queens Midtown Tunnel			
	Traffic		Revenue ($000s)	Average Toll	Traffic		Revenue ($000s)	Average Toll	Traffic		Revenue ($000s)	Average Toll
	Volume (000s)	Percent Change			Volume (000s)	Percent Change			Volume (000s)	Percent Change		
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[a]	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[a]	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[a]	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[a]	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[a]	37,556	9.6%	$345,622	9.20	19,308	30.6%	$132,409	6.86	26,006	30.8%	$190,332	7.32
2022	39,604	5.5%	$368,095	9.29	21,870	13.3%	$152,407	6.97	29,826	14.7%	$221,528	7.43

Year	Henry Hudson Bridge				Marine Parkway-Gil Hodges Memorial Bridge				Cross Bay Veterans Memorial Bridge			
	Traffic		Revenue ($000s)	Average Toll	Traffic		Revenue ($000s)	Average Toll	Traffic		Revenue ($000s)	Average Toll
	Volume (000s)	Percent Change			Volume (000s)	Percent Change			Volume (000s)	Percent Change		
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[a]	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[a]	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[a]	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[a]	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[a]	23,861	34.6%	$90,857	3.81	7,655	9.9%	$20,189	2.64	8,016	8.5%	$21,185	2.64
2022	24,878	4.3%	$97,575	3.92	7,900	3.2%	$21,210	2.68	7,893	-1.5%	$21,627	2.74

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, 2012 to 2022

Year	Total Paying Traffic Volume (000s)	Percent Change	Total Toll Revenue ($000s)	Percent Change	Average Toll
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
2022	326,304	6.2%	2,332,384	8.5%	7.15

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 New York 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 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.

In 2022, traffic volumes increased by 6.2 percent to 326.3 million vehicles. In 2022, toll revenue increased by 8.5 percent from $2.150 billion in 2021 to $2.332 billion. The increase in traffic and revenue is predominantly attributed to pandemic recovery during the first half of the year followed by modest growth during the second half of the year as drivers settled into their 'new normal' travel behaviors.

Preliminary audited data for January and February 2023 indicate that traffic on the TBTA facilities increased by 9.2 percent over the same period in 2022. Estimated changes by facility are shown below in Table 7, with a low of 2.6 percent on the Cross Bay Bridge and a high of 12.3 percent on the Queens Midtown Tunnel.

Table 7 Estimated Changes in January - February Traffic, 2022 to 2023

Facility	Percent Increase January - February 2022 to 2023[(a)]
Throgs Neck Bridge	10.3%
Bronx-Whitestone Bridge	8.4%
RFK Bridge	11.1%
Queens Midtown Tunnel	12.3%
Hugh L. Carey Tunnel	8.4%
Verrazzano-Narrows Bridge	7.6%
Henry Hudson Bridge	10.0%
Marine Parkway-Gil Hodges Memorial Bridge	5.1%
Cross Bay Veterans Memorial Bridge	2.6%
Total	9.2%

Notes:
(a) Based on preliminary audited traffic data for January and February 2023 (subject to final audit).

Traffic by Facility and Vehicle Class, 2022

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 2022 traffic volumes by facility. Passenger cars totaled 302.4 million crossings and represented 92.7 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 78.2 million vehicles. The lowest toll-paying volume, 7.9 million vehicles, was recorded at the Cross Bay Bridge.

Table 8 Traffic by Facility and Vehicle Classification, 2022

(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	34,659	78	69	1,967	0	5	399	344
Bronx-Whitestone Bridge	47,492	29	20	1,752	40	115	374	199
RFK Bridge	60,195	44	24	3,142	2	211	699	186
Queens Midtown Tunnel	27,726	9	5	1,465	2	202	314	28
Hugh L. Carey Tunnel	20,506	5	3	630	1	426	208	12
Verrazzano-Narrows Bridge	72,457	48	55	2,834	96	318	663	325
Henry Hudson Bridge[c]	24,517	8	5	296	0	1	4	3
Marine Parkway Bridge	7,568	5	2	233	21	0	25	7
Cross Bay Bridge	7,269	7	3	346	10	107	99	10
Total	302,390	232	187	12,665	171	1,385	2,786	1,114
Percent of Paid Vehicles	92.7%	0.1%	0.1%	3.9%	0.1%	0.4%	0.9%	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	1,912	48	73	49	0	39,604	106	39,710
Bronx-Whitestone Bridge	763	68	19	7	0	50,880	113	50,993
RFK Bridge	542	146	21	4	0	65,216	247	65,464
Queens Midtown Tunnel	10	63	0	0	0	29,826	109	29,935
Hugh L. Carey Tunnel	3	76	1	0	0	21,870	126	21,996
Verrazzano-Narrows Bridge	1,253	129	57	3	0	78,237	225	78,462
Henry Hudson Bridge[c]	1	43	0	0	0	24,878	54	24,932
Marine Parkway Bridge	24	14	1	0	0	7,900	28	7,928
Cross Bay Bridge	18	24	0	0	0	7,893	23	7,916
Total	4,526	611	173	63	1	326,304	1,032	327,336
Percent of Paid Vehicles	1.4%	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, 2022

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 2022 peaked in June. August was the second highest month in 2022. The monthly variations on the nine crossings in 2022 ranged from 21 percent below the annual average daily traffic in January to 8 percent above in June.

Table 9 Monthly Traffic Variations, 2022

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	87,799	110,245	139,367	61,608	48,089	179,131	50,141	16,469	17,713	710,561	0.79
February	104,638	126,520	165,405	76,430	58,914	204,109	63,490	18,654	19,479	837,639	0.94
March	103,221	137,506	177,308	82,478	61,856	211,522	67,556	20,228	20,940	882,615	0.99
April	106,631	145,887	184,554	84,614	61,315	217,570	71,662	20,123	20,863	913,218	1.02
May	110,079	147,023	186,818	85,097	61,269	220,649	73,159	23,672	23,533	931,299	1.04
June	115,758	149,980	191,039	87,728	63,857	228,153	74,762	25,673	24,726	961,676	1.08
July	113,553	148,457	182,441	82,397	58,583	220,832	67,970	26,898	24,980	926,109	1.04
August	113,789	150,590	188,750	85,090	61,312	223,207	69,747	25,352	23,898	941,734	1.05
September	115,243	145,705	188,520	86,636	62,205	222,000	72,032	23,078	22,635	938,055	1.05
October	113,344	138,969	183,932	86,653	61,730	216,028	72,200	20,176	20,946	913,978	1.02
November	111,093	138,280	180,379	82,715	60,389	213,855	70,049	19,971	20,274	897,005	1.00
December	106,996	133,069	175,267	79,107	59,653	214,919	65,200	19,214	19,351	872,777	0.98
AADT[c]	108,504	139,396	178,675	81,715	59,917	214,349	68,159	21,644	21,623	893,983	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 0.79 signifies that the monthly traffic is 21 percent below the AADT for 2022.

Changes in Monthly Traffic, 2021 to 2022

Table 10 lists the monthly average daily traffic changes that have occurred between 2021 and 2022.

Table 10 Changes in Monthly Average Daily Traffic, 2021 to 2022

Month	Percent Change Comparing 2021 Monthly Average Daily Traffic to 2022								
	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	0.0%	5.3%	2.0%	16.5%	20.2%	2.0%	7.7%	4.8%	-0.6%
February	28.8%	25.5%	25.5%	44.2%	49.1%	21.8%	36.9%	28.0%	14.2%
March	5.5%	13.5%	12.0%	24.5%	26.6%	8.8%	14.0%	12.3%	0.5%
April	3.7%	12.8%	10.2%	28.4%	17.6%	6.2%	8.2%	4.3%	-4.7%
May	5.0%	6.3%	7.8%	20.1%	17.7%	3.8%	5.8%	8.0%	2.3%
June	6.1%	1.6%	3.1%	12.4%	12.9%	1.5%	1.6%	-2.9%	-6.0%
July	2.6%	1.7%	1.4%	8.1%	10.3%	0.5%	1.2%	4.5%	-2.1%
August	4.0%	2.5%	4.8%	11.1%	12.0%	1.8%	-1.4%	3.5%	0.3%
September	6.7%	1.8%	4.8%	8.4%	7.4%	4.0%	-1.4%	0.2%	-3.4%
October	3.4%	-1.6%	3.9%	8.2%	-0.2%	-0.7%	-3.0%	-7.1%	-5.7%
November	2.3%	-2.1%	2.9%	3.5%	0.0%	0.0%	-4.2%	-4.9%	-4.8%
December	3.7%	1.9%	6.9%	6.6%	5.0%	3.7%	2.1%	-0.6%	-3.4%
Annual	5.5%	5.0%	6.6%	14.7%	13.3%	4.0%	4.3%	3.2%	-1.5%

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 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. For the first half of 2022, traffic growth was still significant due to continued recovery from the pandemic. The growth has gradually slowed, as drivers settled into their 'new normal' travel behaviors.

Operating Expenses, 2012 to 2022

Table 11 displays the historical operating expenses for the TBTA facilities from 2012 through 2022. 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 $220.6 million in 2012 to $222.3 million in 2022, an increase of $1.7 million. The increase was due to increases in net costs for health and welfare benefits for current employees and retirees ($17.1 million) which were partially offset by lower actuarial assessments of pension commitments ($4.6 million) and reduced costs for other fringe benefits ($2.0 million). Payroll costs, including regular wages and overtime pay, also declined by $8.1 million over this period. Year-end headcount in 2012 was 1,545, and it fell to 1,036 at year-end 2022. 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 transition to Cashless Tolling.

Table 11 Historical Operating Expenses, 2012 to 2022

Year	Operating Expenses ($000s)[a]			Percent Change
	Labor[b]	Non-Labor[c]	Total	
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	219,390	227,651	447,041	1.1%
2022[d]	222,300	251,962	474,262	6.1%

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.
(d) Based on preliminary unaudited financial data for 2022 (subject to final audit).

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 $157 million in 2012 to $252 million in 2022. A large part of this growth is attributable to major maintenance and bridge painting, maintaining E-ZPass equipment, and operating the NYCSC, which include 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 some 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.

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 $447.0 million, which was 1.1 percent above costs in 2020. Labor expenses decreased by 3.7 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 other business expenses including credit card processing fees, partially offset by lower costs related to maintenance and other operating contracts (lower E-ZPass Customer Service Center costs and lower major maintenance and painting expenses).

Total operating expenses in 2022 were $474.3 million, which was 6.1 percent above costs in 2021. Labor expenses increased by 1.3 percent primarily due to higher overtime expenses due to several factors including, increased vacancy and absentee coverage resulting from additional vacancies created by attrition, employee use of personal leave balances, absentee coverage due to the Omicron variant at the start of 2022, weather-related overtime, security enhancements, and maintenance requirements. Higher overtime costs were partially offset through lower payroll and associated fringe benefits costs associated with vacancies. Non-labor costs increased by 10.7 percent primarily due to increased maintenance, other operating contracts (higher major maintenance and painting and facilities expenses), and other business expenses including credit card processing fees. These increased non-labor costs were partially offset by lower costs related to professional service contract commitments.

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 used 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

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

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 for 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 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 New York City; nine suburban counties of New York State in Long Island and the Mid-Hudson; 14 counties of northern and central New Jersey; and three counties of Connecticut.

As Table 12 shows, since 1980, New York 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 5.1 million jobs in 2019 before swiftly falling during the pandemic to a low of 4.7 million jobs in 2020 and recovering to 5.0 million jobs in 2022. 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 2.5 million in 2022 (+31.9 percent). Similar rates of suburban growth occurred in New Jersey (+30.1 percent) while job growth in Connecticut was significantly slower paced during those years (+15.0 percent). Between 1980 and 2022, New Jersey added 851,800 jobs while Connecticut gained 130,600 jobs, and the New York suburbs grew by 612,800 jobs.

While annual employment growth over the past decade through 2019 exceeded annual growth from 1980 to 2010 in New York City as well as the New York and New Jersey suburban counties, with the Connecticut suburban counties not far behind, significant job losses associated with the pandemic resulted in a sharp reversal of recent trends. Only the New Jersey suburban counties had a higher annual growth rate from 2010 through 2022 while New York City and the New York

and Connecticut suburban counties all had significantly lower growth rates versus years past. Among the four sub-regions, New York City accounted for the largest employment base in 2022 with 41.0 percent of 12.2 million regional jobs, followed by New Jersey with 30.1 percent, the New York suburbs with 20.7 percent, and Connecticut with 8.2 percent.

Due to travel and work restrictions associated with the pandemic, over the months from February to April 2020, New York City lost 962,400 wage/salary jobs (-20.4 percent) according to the BLS Current Employment Statistics Program and New York State Department of Labor. However, by January 2023, the post-February 2020 decline had been reduced to a loss of 34,300 jobs (-0.7 percent). The job recovery has been somewhat uneven in the suburban sub-regions with wage/salary job reductions from February 2020 to January 2023 of 1.9 percent in the New York suburbs and full recoveries in the New Jersey (+1.3 percent) and Connecticut (+0.1 percent) 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 estimated that the share of US workers aged 16 or over that reported teleworking due to the pandemic dropped from 35.4 percent in May 2020 to just 5.2 percent in September 2022. Management, professional, and related occupation workers[3] are more likely to telework. The share of such workers at the national level also dropped by 48.2 percentage points over that period from 57.4 percent to 9.2 percent.

Other non-government surveys confirmed the continuation of the nationwide return to work trend. In LinkedIn's latest Workforce Confidence Index, a monthly survey of nearly 6,000 U.S. professionals, the share of workers employed remotely dropped from 42 percent in January 2021 to 28 percent in January 2023. Kastle Systems, a building security services firm, reported that office attendance had finally reached 50 percent in January 2023 for the first time since the start of the pandemic based on data from 10 major metro areas. Kastle Systems reported that the occupancy rate in New York City was 46.2 percent for the week of March 15, 2023 continuing an upward trend.[4] According to the Partnership for New York City's monthly Return to Office Survey, in January 2023, 52 percent of Manhattan office workers were working on-site on an average weekday, up from 49 percent in September 2022. The share of office workers that are working fully remote dropped from 16 percent in September 2022 to 10 percent in late January 2023.[5] The Partnership reported that 82 percent of New York City employers surveyed in their monthly poll indicated that a hybrid work model would be their predominant policy through 2023. Additionally, the Real Estate Board of New York's Analysis of Location Data, a dataset generated by anonymized location intelligence data from 250 towers in Manhattan, reported that average Manhattan visit rates in 2022 reached 60 percent of levels in pre-pandemic 2019, compared with levels of 48 percent in 2021.[6]

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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. (2023 March). Kastle Back to Work Barometer. *Kastle Systems*.

[5] Author Unknown. (2023 January). Return to Office Survey Results. *Partnership for New York City*.

[6] REBNY Press. (2023 February). New REBNY Analysis of Manhattan Office Visits Shows Increasing Activity, Particularly in Certain Segments of the Market. *Real Estate Board of New York*.

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	4,527.2	2,189.5	3,348.9	954.9	11,020.5
2015[f]	4,728.3	2,433.9	3,481.7	985.3	11,629.1
2019	5,087.5	2,518.6	3,631.2	988.9	12,226.2
2020	4,733.4	2,389.6	3,476.3	955.6	11,555.0
2021	4,807.0	2,471.1	3,582.3	978.6	11,839.0
2022	5,012.7	2,531.4	3,680.0	999.9	12,224.0
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	0.5%	-4.2%	-3.3%	-2.9%	-2.0%
2010 to 2015	0.9%	2.1%	0.8%	0.6%	1.1%
2015 to 2019	1.8%	0.9%	1.1%	0.1%	1.3%
2019 to 2020	-7.0%	-5.1%	-4.3%	-3.4%	-5.5%
2020 to 2021	1.6%	3.4%	3.0%	2.4%	2.5%
2021 to 2022	4.3%	2.4%	2.7%	2.2%	3.3%

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, US Census Bureau American Community Survey Workplace estimates, 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 2023, the BLS released its 2022 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, New York City 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 NYMTC. 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 latest employment estimates prepared by Moody's, the same source for one of several drivers used in the NYMTC employment model, estimated a total job increase of 7.1 percent in 2021 and 3.6 percent in 2022 for New York City, resulting in a full recovery to the 2019 employment levels in 2022. Moody's projects reduced employment growth in the years ahead, increasing by 2.5 percent from 2023 to 2027. NYMTC's employment projections from its current employment forecast are presented in Table 13.

Table 13 NYMTC Employment Growth Projections

Year	New York City	New York Region [b]	New Jersey Region [c]	Connecticut Region [d]	NYC and All Regions
Average Annual Percent Change[a]					
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 New York 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 sub-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. A re-benchmark of the latest NYMTC forecast series is under consideration as of 2023.

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 the region nearing a full employment recovery at end of 2022 (see Figure 3). The BLS reported that New York City's annual average unemployment rate had increased from 3.8 percent in 2019 to 12.4 percent in 2020 and has since fallen to 6.0 percent in 2022 (see the summary of recent labor force conditions in Table 14). On average in 2022, 238,200 residents in New York City were unemployed in a labor force of nearly 4.0 million, with 385,100 of these workers having lost jobs between 2019 and 2022. New York City's rate of unemployment in 2022 was considerably higher than that of the three suburban sub-regions. The New York suburban sub-region had the lowest unemployment rate at 2.9 percent, followed by the New Jersey suburban sub-region (3.0 percent) and the Connecticut suburban sub-region (3.5 percent).

Table 14 Labor Force[a] Conditions, Annual Average 2019 to 2022

Year	New York City	New York Suburban Sub-Region[b]	New Jersey Suburban Sub-Region[c]	Connecticut Suburban Sub-Region[d]
Labor Force				
2019	4,298,900	1,524,500	1,176,400	3,753,800
2020	4,104,700	1,489,200	1,147,800	3,713,100
2021	4,043,700	1,484,600	1,132,800	3,723,800
2022	3,986,800	1,522,200	1,158,000	3,725,900
Employed				
2019	4,133,700	1,472,300	1,134,400	3,632,600
2020	3,595,800	1,369,200	1,058,100	3,369,600
2021	3,645,300	1,417,600	1,080,100	3,491,900
2022	3,748,600	1,477,400	1,122,800	3,594,700
Unemployed				
2019	165,200	52,300	42,000	121,100
2020	508,900	120,000	89,800	343,500
2021	398,400	67,000	52,700	232,000
2022	238,200	44,800	35,200	131,200
Unemployment Rate				
2019	3.8%	3.4%	3.6%	3.2%
2020	12.4%	8.1%	7.8%	9.3%
2021	9.9%	4.5%	4.7%	6.2%
2022	6.0%	2.9%	3.0%	3.5%

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.

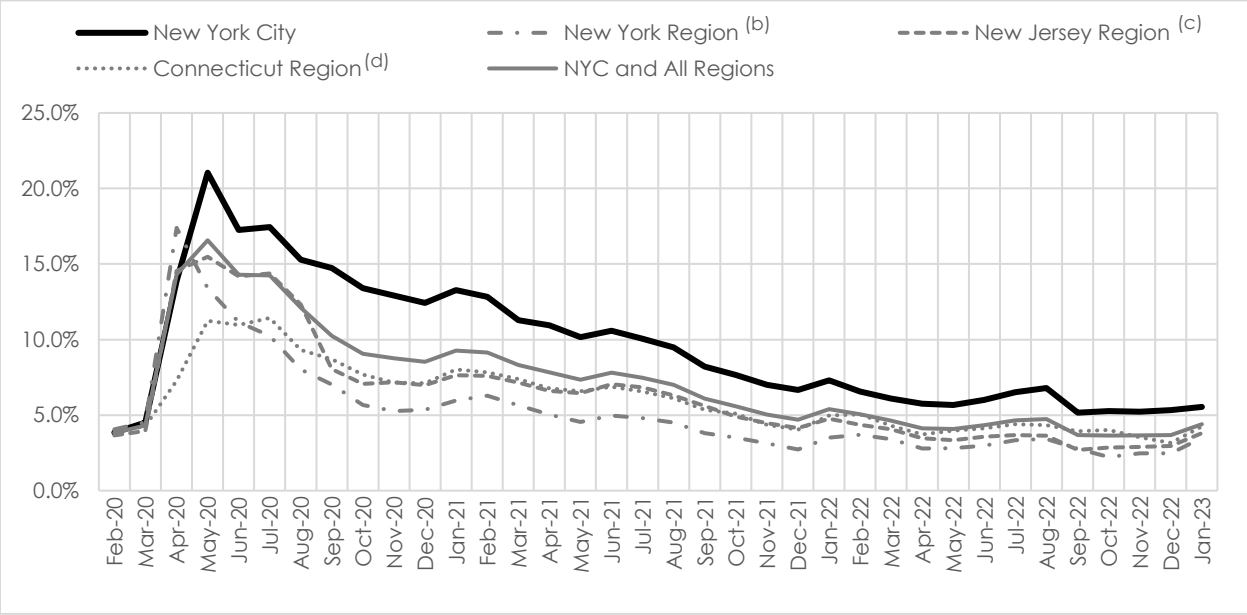
(c) Consists of the following counties: The 13 counties of the North Jersey Transportation Planning Authority (Bergen, Essex, Hudson, Hunterdon, Middlesex, Monmouth, Morris, Ocean, Passaic, Somerset, Sussex, Union, Warren) plus Mercer County of the Delaware Valley Regional Planning Commission.

(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 nonessential businesses contributed to sharply increased rates of regional unemployment. Over the following year and a half, New York City and the suburban counties gradually reopened to business. On March 7, 2022, in response to a sharp decline in Omicron variant cases and widespread participation in vaccination programs, New York 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. During the course of the entire pandemic, New York City's monthly unemployment rate climbed from 3.8 percent in February 2020 to 21.0 percent in May 2020, falling back down to 5.5 percent in January 2023, the latest data available.

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 2022, the New York suburban counties had the lowest unemployment rate among the five regions, reaching a low of 2.2 percent in October 2022. Unemployment rates declined in all regions over the twelve months from January 2022 to January 2023, with the exception of the New York suburban sub-region which remained unchanged over that period.

Figure 3 Monthly Unemployment Rates, February 2020 to January 2023



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 2022 to January 2023, New York City added 239,700 Non-farm 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 235,400 jobs gained in the private sector. Given the massive losses incurred in 2020, three-year job gains to some extent represented a recovery of recent past losses with additional evidence of long-term growth trends in a few key sectors (Health Care & Social Assistance (+75,700); Professional, Scientific, & Technical Services (+17,600); Finance & Insurance (+14,700); and Information (+4,800) employment all exceeded January 2020 levels by January 2023).

None of New York City's major industry sectors lost jobs over the 12-month period from February 2022 to January 2023. Job gains were greatest in the following sectors: Health Care and Social Assistance (+83,200); Accommodation and Food Services (+58,900); Professional, Scientific, and Technical Services (+21,100); Finance and Insurance (+16,000); Other Services (including Religious, Grant Making, Civic and Professional occupations (+10,100); Administrative and Support and Waste Management (+9,700); Real Estate and Rental and Leasing (+4,400); Government Services as well as Natural Resources, Mining and Construction (both +4,300); Wholesale Trade (+4,100); Management of Companies and Enterprises (+4,200). All other major industry sectors added fewer than 4,000 jobs.

Housing Construction

Annual building permits authorizing new housing construction increased in New York City to 21,500 units in 2022, a gain of over 1,500 units or +7.9 percent over 2021 (as shown in Table 15). The number of permits approved in 2022 was down 19.0 percent or -5,100 units from the recent peak of 26,500 permits issued in 2019. Annual average growth in housing permits has decreased over the period from 2017 to 2022 by 0.6 percent. The largest number of permits issued in the period since 2017 has occurred in Brooklyn (+47,500 units), followed by Queens (+29,900 units), the Bronx (+28,400 units), Manhattan (+21,600), and Staten Island (+3,100), with only Brooklyn and Queens back to pre-pandemic levels.

Table 15 Housing Building Permits Issued within New York City, 2017 – 2022

Borough	2017	2018	2019	2020	2021	2022	Total, 2017-2022	Average Annual Growth (2017-2022)	Annual Growth (2021-2022)
Bronx	5,401	3,698	5,541	4,461	5,348	3,930	28,379	-6.2%	-26.5%
Brooklyn	6,130	8,445	9,696	6,802	7,013	9,423	47,509	+9.0%	+34.4%
Manhattan	4,811	3,584	5,512	1,896	3,165	2,584	21,552	-11.7%	-18.4%
Queens	5,104	4,577	5,137	5,840	4,087	5,161	29,906	+0.2%	+26.3%
Staten Island	685	606	661	408	310	392	3,062	-10.6%	+26.5%
Total	22,131	20,910	26,547	19,407	19,923	21,490	130,408	-0.6%	+7.9%

Source: US Census Bureau, Building Permit Survey.

Office Market

In other property markets, notably office, Cushman & Wakefield reported that leasing activity continues to recover from the pandemic, from an all-time low of 12.8 million square feet in 2020 up to 24.3 million square feet in 2022, just below the 10-year historic average of 26.6 million square feet. Although an improvement compared with the prior year, leasing activity was down significantly from 34.7 million square feet in 2019. Recovering off a historical high in Manhattan unemployment, demand for office space remained high in the fourth quarter of 2022 with New York City office-using employment surpassing the December 2019 peak with more than 1.5 million jobs. Roughly 40 percent of new lease activity for the full year of 2022 was drawn from the financial services sector, followed by technology, advertising, media, and information services (TAMI sector) at 18.2 percent, primarily in large spaces of 10,000 square feet or more.

The supply of vacant office space reached an all-time high of 92.1 million square feet, increasing by 2.5 percent from Q3 2022 to Q4 2022. 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 22.2 percent in Q4 2022 (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 doubled from 11.1 percent to 22.2 percent across Manhattan, with Midtown South increasing the most from 8.5 percent to 22.2 percent. Sublet vacancies increased significantly across Manhattan with a gain in floorspace of 180.7 percent in Downtown, 90.5 percent in Midtown South, and 78.0 percent in Midtown.

Table 16 Manhattan Office Market Overall Vacancy Rates, Q4 2019- Q4 2022

SUBMARKET	Q4 2019	Q4 2020	Q4 2021	Q4 2022	2019-2022 Percentage Point Change
East Side/UN	12.2%	13.5%	19.5%	23.4%	+11.2%
Grand Central	13.1%	18.2%	22.1%	23.8%	+10.7%
Madison/Fifth	16.0%	20.9%	22.7%	25.0%	+9.0%
Murray Hill	10.2%	15.5%	23.0%	25.0%	+14.8%
Park Avenue	11.0%	15.9%	19.0%	18.6%	+7.6%
Penn Station	8.3%	11.4%	14.0%	22.6%	+14.3%
Sixth Avenue/Rock Center	8.7%	10.9%	13.8%	14.8%	+6.1%
Times Square South	11.3%	18.4%	23.2%	23.8%	+12.5%
West Side	13.2%	17.2%	26.8%	24.8%	+11.6%
MIDTOWN TOTALS	**11.6%**	**15.8%**	**20.4%**	**22.1%**	**+10.5%**
Chelsea	9.3%	12.9%	16.0%	20.9%	+11.6%
Greenwich/NoHo	6.2%	12.7%	14.9%	25.4%	+19.2%
Hudson Square/West Village	6.5%	15.1%	16.7%	20.5%	+14.0%
Madison/Union Square	8.4%	16.1%	23.8%	23.5%	+15.1%
SoHo	13.1%	14.8%	19.1%	18.2%	+5.1%
MIDTOWN SOUTH TOTALS	**8.5%**	**14.8%**	**19.8%**	**22.2%**	**+13.7%**
City Hall	8.9%	8.8%	9.9%	11.2%	+2.3%
Financial East	12.9%	13.0%	21.5%	24.2%	+11.3%
Financial West	19.9%	18.8%	26.9%	34.2%	+14.3%
Insurance	9.2%	12.0%	30.6%	31.5%	+22.3%
TriBeCa	3.0%	6.3%	12.6%	16.1%	+13.1%
World Trade	11.9%	17.3%	19.3%	18.1%	+6.2%
DOWNTOWN TOTALS	**11.7%**	**13.7%**	**21.1%**	**22.7%**	**+11.0%**
MANHATTAN TOTALS	**11.1%**	**15.2%**	**20.4%**	**22.2%**	**+11.1%**

Note: Overall vacancies include both direct and sublet vacancies.
Source: Cushman & Wakefield, Office Marketbeat, Q4 2019, Q4 2020, Q4 2021 & Q4 2022.

With reduced demand, Cushman & Wakefield reported that Class A rental rates decreased by 1.4 percent from $79.82 in 2019 to $78.72 per square foot in 2022 (-1.4 percent), while average rental rates for all classes edged down from $73.41 per square foot in 2019 to $71.62 in 2022 (-2.4 percent). Net absorption for the borough's office market was down from 2.6 million square feet in 2019 to -816,100 square feet in 2022 as businesses released no longer needed space. Manhattan's inventory of office space increased from 408.9 million square feet in 2019 to 414.6 million square feet in 2022, a net gain of 5.7 million square feet due to new construction completions.

As of March 2023, New York 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. Current recommendations from Mayor Eric Adams' administration include the loosening of regulations to allow up to 336 million square feet of existing office space to be available for conversion, up from 200 million square feet of space under current regulations.

During the fourth quarter of 2022, Cushman & Wakefield reported that 9.6 million square feet of office space were under construction or proposed to start in Manhattan. Table 17 identifies 13 office buildings currently under construction with completions expected from 2023 to 2025. In the aggregate, these buildings will contribute more than 20.3 million gross square feet of space to the Manhattan market if all are completed within the next three years. Three towers are expected to exceed 2.5 million square feet each, while seven others will range between one and two million square feet. In 2023, six buildings were expected to account for 10.9 million square feet of construction, followed by the build-out of 5.4 million square feet in 2024, and 4.1 million square feet in 2025. This data is current as of 2023.

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

Year of Project Completion	Address	Developer/Occupant	Gross Square Feet
2023	66 Hudson Blvd (The Spiral)	Tishman Speyer	2,850,000
	550 Washington St	Oxford Properties	1,300,000
	1 Madison Ave	SL Green, NPSR & Hines	1,400,000
	401 West 31st St	Brookfield Property Partners	2,000,000
	111 Wall Street	Wafra Capital Partners & Nightingale Group	1,500,000
	3 Hudson Blvd (555 West 34th Street)	Moinian/Boston Properties	1,800,000
2024	5 World Trade Center (130 Liberty Street)	Port Authority of NY & NJ	1,300,000
	200 Greenwich Street (WTC #2)	Silverstein Properties	2,800,000
	99 Hudson Blvd (444 11th Ave)	Tishman Speyer	1,300,000
2025	125 W 57th St	Alchemy & Cain International	185,000
	520 5th Ave	Rabina Properties	184,000
	270 Park Avenue	JP Morgan Chase	2,500,000
	4 Hudson Square (137 Varick)	Silverstein Properties / Disney	1,200,000

Source: New York Building Congress & Moody's Analytics REIS.
Notes: (a) Current as of 2023.

Population Trends and Projections

Since 1980, US Census data indicate that New York City's population has increased by 1.4 million persons to total 8.5 million residents in 2021 (see Table 18). In recent years, New York City has continued to be a desirable place of residence for many professionals and creative thinkers, domestic and international immigrants, trendsetters, and investors, as well as New York City's

long-standing residents who have aged in place. All five of New York City's boroughs are now more populous than in 1980. While New York 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 8.5 million residents in New York 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 2021, the New Jersey region saw an increase of 1.5 million residents, and the New York region added 779,600. The Connecticut region, with 2.0 million residents, has added 283,200 residents since 1980. All sub-regions 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. In 2022, it was announced that New York State was overcounted in the 2020 Census by 700,000 residents. The Census Bureau has not yet announced which communities in the region were overcounted.

Estimated 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 10,046 vacant units was estimated in New York 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 percent in January 2023, well below 2019 vacancy rates and median asking rents climbed to recent records at $4,354 per unit compared with $3,655 in January 2019. Along with New York City, many major U.S. cities and their central business districts saw multifamily absorption and strong rent growth in the second half of 2021 and 2022. 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 2022, both New York 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 and population gains from 2020 to 2021 it is not yet clear whether increased demand and recent relocations to those areas are the results 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. New York City, in particular, was in effect the laboratory

for treatment protocols. According to the Central for Disease Control and Prevention, pandemic related deaths, both in total and per capita (53.2 per 10,000), were highest in New York City compared with the surrounding suburban counties. The Connecticut suburban counties (33.5 per 10,000) fared better than the New York and New Jersey suburban counties (34.0 and 39.7 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.

Table 18 Population Trends 1980 to 2021

(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
2021	8,467.5	5,316.7	7,385.3	2,008.5	23,178.0
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 2020	0.4%	0.1%	0.3%	0.0%	0.2%
2019 to 2020	5.6%	3.2%	4.8%	1.5%	4.4%
2020 to 2021	-3.8%	-0.1%	-0.4%	0.1%	-1.6%

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. New York 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. A re-benchmark of the latest NYMTC forecast series is under consideration in 2023.

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

(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 the tri-state area of New York, New Jersey, and Connecticut have remained largely stable in number over the past two decades with variations due to changing economic conditions and preferences for public transit. Total registrations peaked in 2005 and dropped sharply following the financial crisis. By 2011, Tri-State

registrations neared peak 2005 levels though they declined in following years reaching a near-term low in 2015 (see Table 20). Since then, registrations have trended upward primarily due to gains in New York and New Jersey.

Increased personal vehicle travel in urban areas is considered one among many near-term impacts of the pandemic as commuters seek to avoid close contact with others during travel. Registrations in the tri-state area increased by 1.9 percent from 2019 to 2021, led by growth in New Jersey (+3.6 percent) and New York State (+2.6 percent), while Connecticut registrations dropped by 4.2 percent. In the past year, registrations decreased in number in New York City (-0.2 percent) and New York State (-3.1 percent). 2021 Registrations at 20,695 were near the 20-year average for the tri-state area of 20,626.

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 2021, consumer confidence had returned to pre-pandemic levels but declined through 2022 and early 2023 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 2023, 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	6,250	2,756
2022	2,238	11,328	N/A	N/A
Average Annual Growth				
2010-2022	1.1%	-0.2%	-0.4%	-0.9%
2021-2022	-0.2%	-3.1%	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 2017 through 2022 are shown for each of New York City's five boroughs in Table 21. The annual change in citywide registrations shifted from declining annual registrations in the years preceding the pandemic to a 3.0 percent gain from 2020 to 2021 as transit safety concerns drove commuters away from public transit towards personal vehicles followed by a return to declines in 2022 (-0.2 percent) as public transit ridership levels rebounded from pandemic lows. From 2017 to 2022, New York City gained 48,600 registrations; Brooklyn saw the largest gain in new registrations (+34,300), followed by Queens (+5,500), the Bronx (+4,500), Staten Island (+3,000), and Manhattan (+1,400).

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 New York City (including for-hire Uber, Lyft, Juno, and Via vehicles as well as black car, limo, and livery vehicles) increased from 39,900 in 2015 to a peak of 166,900 vehicles in 2019. The total number of ride-hailing vehicles has since declined to a low of 89,000 vehicles in 2020, climbing back up to 125,800 vehicles on average in the first six months of 2022.

Table 21 New York City Motor Vehicle Registrations, 2017 to 2022

Borough	2017	2018	2019	2020	2021	2022	2021 - 2022 Growth	2017-2022 Average Annual Rate of Change
Bronx	288,788	290,055	288,754	287,166	294,792	293,292	-0.5%	+0.31%
Brooklyn	521,434	524,701	535,265	544,623	563,485	555,700	-1.4%	+1.28%
Manhattan	254,572	250,270	248,322	251,147	255,005	255,968	+0.4%	+0.11%
Queens	841,513	837,319	831,600	817,102	839,323	846,976	+0.9%	+0.13%
Staten Island	283,067	283,928	277,617	275,154	288,928	286,063	-1.0%	+0.21%
Total	2,189,374	2,186,273	2,181,558	2,175,192	2,241,533	2,237,999	-0.2%	+0.44%

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 has 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 1990s, and the war in Iraq in the 2000s. During the mid to late 2000s 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[7] monthly VMT and gas prices since 2011.

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 the aggressive regional economic recovery from the Great Recession;
- the short-term decline in global travel activity in 2020 and the following shifts in consumption patterns associated with the pandemic where oil producers and refineries were unable to keep up pace with increasing demand;
- short-term energy spikes due to refinery damage from Hurricane Ida;

[7] 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.

- and most recently, the Russian invasion of Ukraine and subsequent sanctions on Russia which led to price instability in 2022 and 2023 due to shifts in supplies.

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 New York 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 New York 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 March 13, 2023, the U.S. Energy Information Administration ("EIA") stated that the price of regular-grade gasoline averaged $3.456 per gallon nationally, and $3.303 in New York City, down considerably from all-time highs recorded during the week of June 13, 2022. See the discussion of the factors contributing to changes in the 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 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 2023 somewhat made up for earlier losses, however, national and New York State VMT remain 0.5 and 9.5 percent below 2019 levels, respectively. In New York 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 2022, TBTA transactions increased by 6.2 percent over the previous year but remained 0.9 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:

- 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. Domestic production is projected to reach an expected high by 2027 then level off at the end of the decade according to the EIA. In order to maintain long-term output levels, the Biden administration has been approving new domestic energy ventures such as the recently approved Willow oil drilling project in Alaska, a project expected to produce more

than 600 million barrels of oil over a 30-year period. The EIA, in the March 2023 Short-Term Energy Outlook ("STEO"), reported that despite upward revisions to increasing its forecast of global liquid fuels consumption, the EIA still expects consistent global oil inventory builds over 2023 and 2024 as global oil production continues to outpace consumption.

- On April 11, 2023, the EIA estimated that daily domestic crude oil production averaged 11.7 million barrels per day in 2022 and will reach 12.4 million barrels per day in 2023, which would exceed a record high set 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 March 2023, the EIA reported that while both biodiesel and fuel ethanol production levels were expected to decline from 2019 levels in 2023, total production of renewable fuels would increase by 11.4% over that period. 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 2022 fuel economy of 26.4 miles per gallon ("mpg"), will be slightly higher than the 2021 model year fuel economy of 25.4 mpg. However, if achieved, will be the highest level year, after 2021, 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. In December 2022, the EPA finalized stronger standards for heavy-duty vehicles starting in model year 2027, which would reduce nitrogen oxide emissions from trucks by as much as 60 percent by 2045. The EPA plans to release two additional proposals in 2023 as part of its "Clean Trucks Plan" including heavy-duty "Phase 3" GHG emission standards for Model Years 2027 and later, and a multi-pollutant standards proposal for light- and medium-duty vehicles for Model Years 2027 and later.

- In recent years, electric vehicles ("EV") have increased in popularity, rising from 2.1 percent of total US light-vehicle deliveries in 2018 to 5.8 percent in 2022. 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

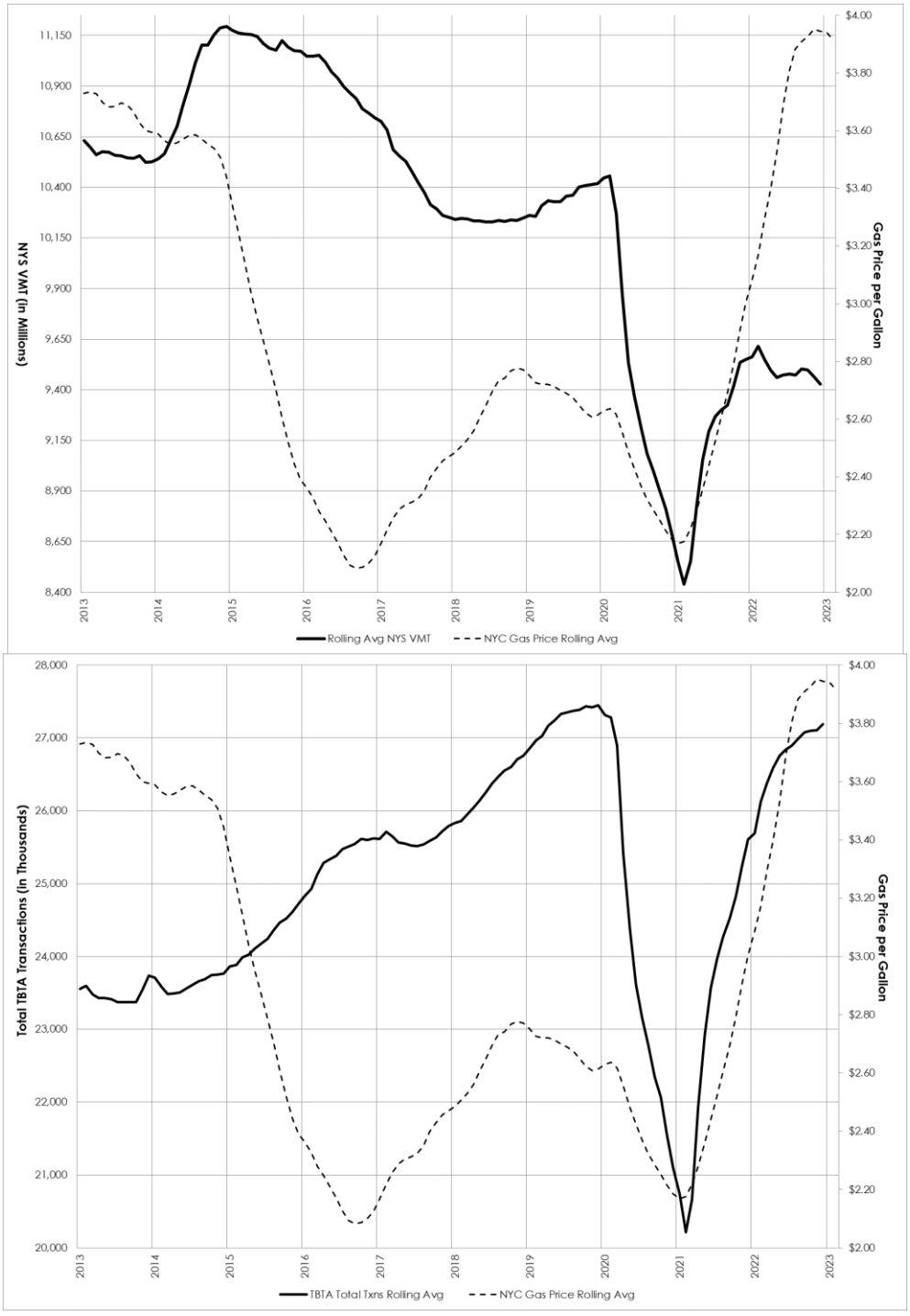
regulatory credits for the sales of EVs now followed by 14 states, including New York, New Jersey, and Connecticut.

- In its March 2023 STEO, the EIA forecasted the national price of regular-grade retail gasoline to average $3.36 per gallon in 2023, compared with $3.97 per gallon in 2022. Although average prices stood at $ 3.456 per gallon in mid-March, the EIA forecasts the national price of regular-grade gasoline to decline throughout the year due to rising gasoline inventories and falling crude oil prices. Major contributors to rising inventories include ExxonMobil's planned startup of a 250,000 b/d capacity expansion at its Beaumont, Texas refinery.

- The EIA's forecast for the Brent Crude Oil Spot Price, one of the major benchmarks used in pricing oil, peaked in the second quarter of 2022 at $108.93 per barrel and has since followed a sharp downward trend that is expected to continue through 2023 and 2024, ultimately reaching $69.36 by Q4 2024. The EIA forecasts an average price of $82.95 per barrel, down 18 percent from 2022, however, various investment banks and consultancies have forecasted somewhat higher prices, including forecasts of $87 per barrel on average in 2023, according to Reuters market analyst John Kemp's annual survey of 1,000 energy market professionals dated January 8, 2023. Among them, Goldman Sachs and JP Morgan have forecasted Brent crude prices of $110 and $90 per barrel in 2023, respectively.

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 has historically been 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 prices, 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



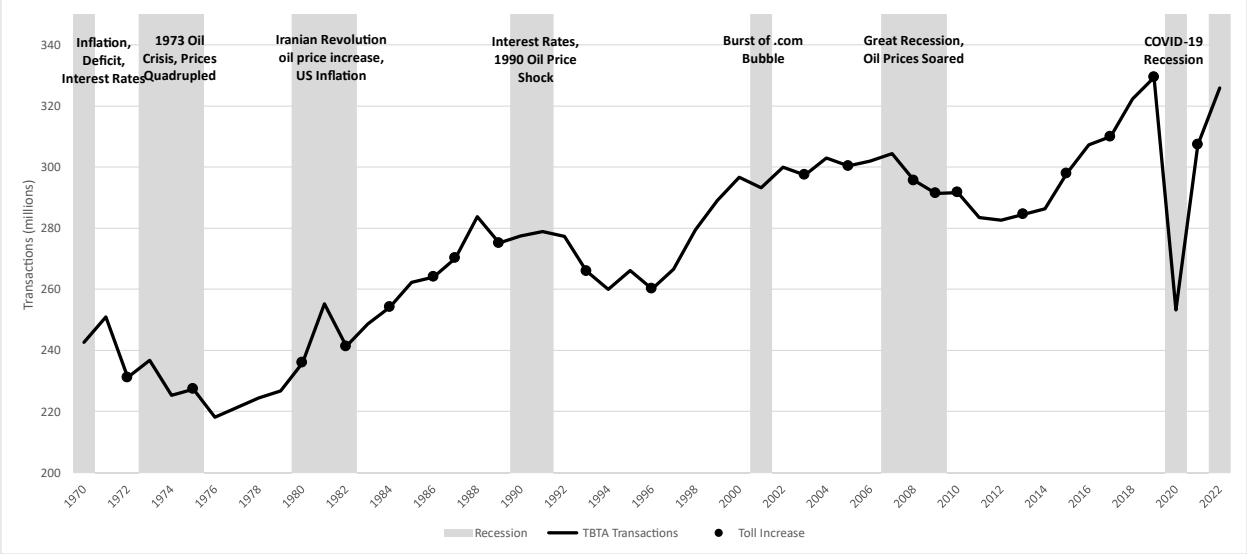
Source: United States Energy Information Administration, United States Federal Highway Administration, and Metropolitan Transportation Authority

Review of Gas Price Impacts to Traffic & Revenue Forecasting

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

As mentioned earlier, among several factors, Russia's invasion of Ukraine, 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. 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 brief recession descriptions.

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 a slight economic downturn will continue as a result of the current trend of higher gas prices.

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 New York 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 bridges and 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 with constant (current) tolls and the second factoring in toll increases in June 2023 and April 2025 as included in the MTA 2023-2026 Financial Plan adopted by the MTA Board in February 2023. Elasticity factors used for the analyses in this report were developed in cooperation with TBTA and are based on factors developed primarily from analyzing the elasticity exhibited following the March 2017 toll increase. Despite the pandemic, Stantec does not anticipate significant changes in driver behavior as it relates to reactions to toll increases.

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 a range of 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 expected June 2023 toll increase and the future April 2025 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 2022, E-ZPass market share was 94.2 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 2023-2026 MTA Financial Plan. This plan includes projected toll increases on June 1, 2023 and April 1, 2025. Accordingly, Stantec assumes at least a 6.7 percent toll increase on June 1, 2023 is needed to achieve a 5.5 percent revenue yield and an additional 4.9 percent toll increase on April 1, 2025 to achieve a 4 percent revenue yield. 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 behave similarly 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 of 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	-0.125	-0.098	-0.098
Bronx-Whitestone Bridge	-0.125	-0.098	-0.098
RFK Bridge	-0.146	-0.114	-0.114
Queens-Midtown Tunnel	-0.221	-0.173	-0.173
Hugh L. Carey Tunnel	-0.412	-0.322	-0.322
Verrazzano-Narrows Bridge	-0.147	-0.115	-0.115
Henry Hudson Bridge	-0.324	-0.254	-0.254
Marine Parkway Bridge	-0.116	-0.091	-0.091
Cross Bay Bridge	-0.158	-0.123	-0.123

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 0.221%.

The elasticity factors in Table 22 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 a scenario without a toll increase. 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.

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

Facility	Elasticity Factors			Estimated Percent Change with Assumed 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	-0.125	-0.098	-0.098	6.7%	6.7%	6.7%	-0.8%	-0.7%	-0.7%	4.9%	4.9%	4.9%	-0.6%	-0.5%	-0.5%
Bronx-Whitestone Bridge	-0.125	-0.098	-0.098	6.7%	6.7%	6.7%	-0.8%	-0.7%	-0.7%	4.9%	4.9%	4.9%	-0.6%	-0.5%	-0.5%
RFK Bridge	-0.146	-0.114	-0.114	6.7%	6.7%	6.7%	-1.0%	-0.8%	-0.8%	4.9%	4.9%	4.9%	-0.7%	-0.6%	-0.6%
Queens-Midtown Tunnel	-0.221	-0.173	-0.173	6.7%	6.7%	6.7%	-1.5%	-1.2%	-1.2%	4.9%	4.9%	4.9%	-1.1%	-0.8%	-0.8%
Hugh L. Carey Tunnel	-0.412	-0.322	-0.322	6.7%	6.7%	6.7%	-2.7%	-2.1%	-2.1%	4.9%	4.9%	4.9%	-2.0%	-1.6%	-1.6%
Verrazzano-Narrows Bridge	-0.147	-0.115	-0.115	6.7%	6.7%	6.7%	-1.0%	-0.8%	-0.8%	4.9%	4.9%	4.9%	-0.7%	-0.6%	-0.6%
Henry Hudson Bridge	-0.324	-0.254	-0.254	6.7%	6.7%	6.7%	-2.2%	-1.7%	-1.7%	4.9%	4.9%	4.9%	-1.6%	-1.2%	-1.2%
Marine Parkway Bridge	-0.116	-0.091	-0.091	6.7%	6.7%	6.7%	-0.8%	-0.6%	-0.6%	4.9%	4.9%	4.9%	-0.6%	-0.4%	-0.4%
Cross Bay Bridge	-0.158	-0.123	-0.123	6.7%	6.7%	6.7%	-1.1%	-0.8%	-0.8%	4.9%	4.9%	4.9%	-0.8%	-0.6%	-0.6%

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 alleviates those constraints through targeted investments wherever feasible.

As discussed in an earlier section, TBTA completed the implementation of Cashless Tolling at all of its facilities by fall 2017. 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

Dinmore Engineering ("Dinmore") and KC Engineering and Land Surveying, P.C. ("KC Engineering") were contracted as subconsultants 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 New York 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 the 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** recently completed the reconstruction and rehabilitation of the Staten Island and Brooklyn upper level approach ramps, including anchorage span decks in October 2022. The rehabilitation of the lower level suspended span deck is planned for award in spring 2023 with completion planned for 2026. Improvements to the Verrazzano Narrows Bridge/Belt Parkway merge are underway and planned for completion in late 2024. When completed, this project will improve traffic flow and safety by eliminating the downstream Belt Parkway bottleneck that backs traffic up on to the main span of the bridge. Upgrades to the bridge electrical system are also ongoing with completion planned for late 2026. A contract to paint the towers and perform electrical upgrades and lighting replacement at the towers is currently advertised for bid with an anticipated completion date in 2026. 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 rehabilitation of its main spans (3 to 7), structural repairs to the approach spans, and the replacement of the existing pedestrian ramp with an ADA compliant shared use ramp to improve pedestrian and bicycle accessibility, which is anticipated to be completed in late 2024. In addition, there is an ongoing bridge preservation program which includes bridge washing, cleaning of drainage systems, joint repairs, roadway striping, lighting improvements, and other miscellaneous as needed maintenance items.

- The **Marine Parkway Bridge** recently completed the replacement of the on-grade light pole as well as the painting of the above roadway steel in late 2022. Tower elevator replacement is ongoing and is planned to be completed in late 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 is planned to be completed in 2024. Electrical resiliency upgrades are also ongoing and planned for completion in late 2026. 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 a delay on one of the bridges results in a shift to the other crossing.

- The **Throgs Neck Bridge** suspended span deck replacement construction contract was completed in late 2022. In addition, the approach viaducts are undergoing structural rehabilitation which is planned to be completed in fall 2023. A contract to replace the tower pedestal fender protection system, paint the towers, rehabilitate the tower elevators and inspect the main cables is currently advertised for bid with an anticipated completion date in 2027. There is also 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 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** is undergoing upgrades at the Dyckman Street and Kappock Street electrical substations which are planned to be completed in 2024. A project to retrofit the north abutment, widen the lower level sidewalk, and construct new ramps connecting the sidewalk on the bridge to the at-grade walkways will be awarded in summer 2023 and is planned to be completed in late 2024. This will result in an ADA compliant pedestrian/bicycle path across the Henry Hudson Bridge. 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 as well as superstructure steel upgrades for all facility structures, except the suspended spans, were substantially completed in 2022. A project to paint the Manhattan Plaza and Junction Structure was completed in March 2023, and a project to paint the Queens Approach is ongoing and planned to be completed in summer 2023. The construction of a new ramp connection to the Harlem River Lift Span sidewalk along with replacement of the lift span fenders is ongoing and planned to be completed in late 2023. The construction of two new vehicular ramps to improve traffic flow on the Manhattan Plaza Interchange and three new ADA compliant bicycle/pedestrian ramps connecting the Harlem River Lift Span and the Bronx Kills Crossing to Randall's Island is ongoing with completion planned in spring 2025. A contract for rehabilitation of the East River Suspended Spans (ERSS) is currently advertised with an anticipated completion date in 2028. In addition to rehabilitating/strengthening the roadway stringers, this upcoming contract will

replace the existing solid side barriers with open steel railing systems and relocate and widen the walkways on both sides of the ERSS, which will improve the bridge's aerodynamic performance. A new ADA compliant ramp will be constructed on the Queens Approach which, along with the new widened walkway on the ERSS and the Queens Viaduct, will result in an ADA compliant bicycle/pedestrian path connecting Queens to Randall's Island. In addition, this project includes repairs to and waterproofing of the anchorages, and a dehumidification system will be installed on the main cables. A contract to improve the merge of the RFK with the southbound FDR is currently advertised with an anticipated completion date in 2025. In addition, there is also 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 **Queens Midtown Tunnel** is undergoing the relocation of the refueling station from within the service building to an outside location along with the relocation of service build switchgear to a new location above 500-year flood levels. A contract to upgrade the integrated electronic monitoring and detection systems at the Queens Midtown Tunnel (bundled with the Hugh L. Carey Tunnel work under one contract) is currently advertised with an anticipated completion date in 2027. In addition, there is 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** has an ongoing tunnel preservation program which includes cleaning of drainage systems, cleaning of plaza walls, and other miscellaneous as needed maintenance items. A contract to expand and upgrade the integrated electronic monitoring and detection systems at the Hugh L. Carey Tunnel is currently advertised (bundled with the Queens Midtown Tunnel work under one contract) with an anticipated completion date in 2027.

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 early 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 in late spring/summer 2023. 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 some 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 still ongoing. The current anticipated completion date is summer 2023.

  Rehabilitation of West Tremont Avenue Bridges over the Major Deegan Expressway and Metro North Railroad is currently under development and is anticipated to be completed in summer 2027.

These projects will have minimal impacts on TBTA facilities.

- **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 spring 2026 and to be completed in fall 2030.

  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 summer 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 spring 2031 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 fall 2028 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 spring 2030 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 fall 2027 and end in summer 2030. 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 fall 2024 and be completed in fall 2026.

  These projects may result in minimal traffic impacts 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 consists of three contracts.

  Contract 1 was completed late October 2022. It involved improvements to the Bruckner Expressway/Sheridan Boulevard Interchange and Hunts Point truck access improvements.

  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 began in summer 2022 and is expected to be completed in fall 2025.

  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 began in winter 2021 and is anticipated to be completed in early Winter 2024.

  Construction to repair and replace deteriorated components of the Bruckner Expressway Bridge over Rosedale Avenue is expected to begin in spring 2023 and end in early winter 2026.

  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 (4) to six (6) 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.

  The rehabilitation of the Logan Avenue bridge over the Bruckner Expressway will extend the service lives of the bridges and ensure safety of the traveling public. Construction is expected to begin in winter 2025/2026 and completed in winter 2027/2028.

The Southbound Bruckner Expressway Mobility Improvements project will extend the southbound I-95 lanes from Hutchinson River Parkway (HRP)/Gun Hill Road (GHR) entry ramp to Westchester Avenue. The entry ramp from HRP and GHR to southbound I-95 will be reconfigured for alternating merge. Southbound I-95 entrance ramp at Erskine Place (from Co-Op City) will be maintained and reconfigured to a larger radius. The exit ramp connector from southbound I-95 to northbound HRP to Erskine Place (serving Co-Op City) will be eliminated. A new entry ramp to southbound HRP from Bartow Avenue will be constructed and bikeway/walkway system will be upgraded. The project also includes new pavement construction, wetland mitigation, installation/replacement of concrete barriers and guiderails. Construction is expected to begin in spring 2025 and be completed in summer 2028.

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.

  The existing two span Bronx River Parkway bridge over Amtrak/CSX will be replaced with a single span bridge carrying six lanes of Bronx River Parkway traffic, and a new single span bridge carrying one lane of exiting traffic from southbound Bronx River Parkway to East 177th Street will be constructed. The project also includes the associated construction of wider, standard lanes and shoulders, and new stormwater drainage facilities. Construction began in March 2023 and is anticipated to end in summer 2026.

  The two existing Bronx River Parkway bridges over East Tremont Avenue and East 180th Street/Morris Park Avenue/NYCTA Rail Yard will be replaced, and a new bridge carrying one lane of exiting traffic from southbound Bronx River Parkway to East 177th Street will be constructed. This project also includes the associated final design and construction of standard lanes and shoulders, improvements to vertical and horizontal geometry, queuing storage space for exiting traffic, new stormwater drainage facilities, safety enhancements to the NYCDPR's Bronx River Greenway (BRG), improvements to the site drainage at the Ranaqua Facility, and a shared use path from Bronx River Avenue to the BRG in Bronx Park. Construction is expected to begin fall 2024 and is anticipated to end in summer 2028.

  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 summer 2023.

  The Northbound Bruckner Expressway Mobility Improvements project will extend the northbound I-95 lane from Exit 9 (Hutchinson River Parkway) to Exit 11 (Bartow Avenue). I northbound I-95 stone-faced bridge over Hutchinson River Parkway will also be widened. The project also includes widening of pavement, profile correction, resurfacing, stripping, relocation of drainage structures and reconstruction of retaining wall of the east of the highway. Construction is expected to begin in early winter 2027 and be completed in summer 2030.

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

- **I-278/Brooklyn-Queens Expressway (BQE)** – The replacement of four (4) 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. Construction began in summer 2022 and is anticipated to be completed in 2026. NYCDOT has completed installation of "weigh-in-motion" technology to automatically fine overweight trucks, which put undue strain on the structure. NYCDOT is in the process of working out enforcement details. 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 which have resulted in some diversions to the Hugh L. Carey Tunnel. There is an interim repair project identified for the cantilevered section (span 4 & 34) over Grace Court and Clark Street, which will require full weekend closures between Atlantic Avenue and Sands Street, anticipated to begin in summer 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 fall 2021. The 17th Avenue Bridge was closed in November 2021 and was demolished in fall 2022. The bridge will be replaced on the same alignment as the existing bridge and is anticipated to be in-place in fall 2024. The 27th Avenue Bridge will be built on a new alignment allowing the existing bridge to remain open during construction and is anticipated to be completed in early summer 2025.

  The rehabilitation of Owls head viaduct carrying 907C Belt Parkway from 61st street to Belt Parkway Exit 1 is scheduled to begin in fall 2026 and completed in fall 2029.

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

- **I-278 (BQE)/Grand Central Parkway Interchange** – The reconstruction of the BQE and Grand Central Parkway (west leg) interchange at Astoria Blvd is expected to start in mid-2024 and be completed in winter 2026/2027.

- **Grand Central Parkway** – The rehabilitation of seven Grand Central Parkway bridges (GCP bridge over Winchester Blvd and Cross Island Parkway (CIP); Ramp H – from northbound CIP to westbound GCP; Bridge over Vanderbilt Parkway shared use path; GCP bridge over Union Turnpike; Ramp G – ramp from southbound CIP to eastbound GCP; westbound GCP service road bridge over southbound and northbound CIP) to extend the service life. Project is expected to begin in spring 2024 and be completed in fall 2025.

  The planned rehabilitation of the Grand Central Parkway Bridge over Winchester Boulevard and ramp over the Cross Island Parkway is scheduled to begin in spring 2023 and be completed in summer 2027/2028.

  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 sign panels will be upgraded. Construction is anticipated to begin in spring 2024 and be completed in fall 2025.

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 summer 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 2023. Three travel lanes 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).

  A flood mitigation project will address flooding that is occurring on the Van Wyck Expressway mainline southbound and C-D roadway between the Long Island Expressway and Kew Gardens Interchange by adjusting the profile of the roadway, cleaning of drainage structures and pipes, and replacing undersized pipes. Construction is expected to begin in spring 2024 and be completed in early 2026.

  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 is expected to 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 is expected to 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 began in spring 2022 and is expected to end summer 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 began in spring 2022 and is expected to last until fall 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 2023 and be completed in summer 2025.

  A safety improvements project is planned for the Long Island Expressway from 48th Street to Little Neck Parkway. Construction began in fall 2021 and will be completed in summer 2023. 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).

  The rehabilitation of the bridge carrying Van Wyck Expressway over the Long Island Expressway and nine ramps located in Queens County, New York City. This project will also correct bridge structural deficiencies, replace bridge barriers and armed joints. Construction is expected to begin in summer 2029 and be completed in fall 2033.

A flood mitigation project will address flooding that is occurring on the Long Island Expressway between Van Wyck Expressway and Grand Central Parkway, and Eastbound Grand Central Parkway (907M) under the 49th Street over pass in Queens County by adjusting the profile of the roadway, cleaning of drainage structures and pipes, replacing undersized pipes. Construction is expected to begin in spring 2024 and be completed in early 2026.
These projects may result in minimal impacts to traffic at the Queens Midtown Tunnel and Bronx-Whitestone Bridge.

- **Cross Island Parkway** – Rehabilitation of the Hempstead Avenue Bridges over the Cross Island Parkway and NB Ramp is currently under development and construction is anticipated to be completed in summer 2030.

  This project may result in minimal impacts to traffic at the Bronx-Whitestone Bridge and Throgs Neck 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 (3) bridges on the Harlem River Drive between 135th and 139th streets is anticipated to begin fall 2025 and end fall 2027.

  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 spring 2035.

  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 is projected to be completed in 2029.

  The Eastside Coastal Resiliency (ESCR) projects from Montgomery Street to 25th Street involve construction of flood walls, tide gates along the FDR and the raising of East River Park as well as storm water work on the west side of the FDR, east of the FDR Drive and replacement of three pedestrian bridges (Delancey Street, Corlears Hook, and E. 10th Street bridges) over the FDR. Construction started in spring 2021 and is anticipated to be completed in 2026. The Delancey Street and Corlears Hook bridges were removed in 2022 and are anticipated to be replaced in summer 2023. The ESCR project from Montgomery Street to the Brooklyn Bridge involves flood protection measures along the East River Waterfront and South Street. Construction started in fall 2022 and will be completed in fall 2026.

These projects may result in minimal 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 began in spring 2022 and is expected to be completed in fall 2024.

  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 began in spring 2022 and is expected to be completed 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 – 5:30am) on all nights except Saturday, which started with the eastbound tunnel. Work on the eastbound tunnel has been completed and closures of the New Jersey bound tunnel began in February 2023. During the closures traffic is diverted to the Lincoln Tunnel. Lane closures may result in minimal impacts 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** – Of the eleven projects starting in 2017, three have been completed. The remaining projects include suspender ropes replacement and rehabilitation of the main cables (2017-2027), 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 (currently forecasted to start in 2025), rehabilitation of structural steel lead paint removal and recoating underside lower level (2019-2025 – three contracts of which one was completed and the second started in 2022), rehabilitation of Center and Lemoine bridges (original contract was cancelled and reissued in 2023)(2023-2027). These

remaining projects may result in minimal traffic impacts to the RFK Bridge and Henry Hudson 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 continued to north of the Union Street bridge followed by dredging between the Carroll and 3rd Street bridges. Construction in the area north of the 3rd Street bridge, remedial target area 1 (RTA1), is expected to be complete around the end of 2023. The Carroll Street bridge suffered some damage and has remained in the open position (closed to cars) since early 2022 and will continue to remain in the open position until it can be repaired. The project has necessitated frequent closures of the Union, 3rd Street and 9th Street bridges with temporary traffic disruptions occurring at 3rd Street, Union Street, and 9th Street during bridge openings. These disruptions will continue until the RTA1 remedy construction is complete, with extended closures during periods of heavy construction activity. These closures have resulted in minimal traffic impacts to the Hugh L. Carey Tunnel. Construction in remedial target area 2 (RTA2), which is between the 3rd Street and Hamilton Avenue bridges, will begin late 2023 /early 2024 and will take four to five years to complete. Frequent closures of the 9th Street bridge will continue until RTA2 construction is complete. There may be limited closures of the Hamilton Ave bridge which may have minimal impacts 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 included 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 design stage, and construction of the new stations is expected to be completed in 2030.

  Work is being coordinated with ongoing work at the RFK and will have minimal traffic impacts at the RFK.

- **MTA/LIRR East Side Access** – This project implemented a new connection from the LIRR Main and Port Washington lines in Queens to a new LIRR terminal beneath Grand Central Terminal in Manhattan. The project was completed in early 2023. The traffic impacts at the Queens Midtown Tunnel and the RFK Bridge are being evaluated.

- **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. Construction began in winter 2022 and 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)** – This is a comprehensive program of strategic rail infrastructure improvements designed to improve current services and ultimately create new capacity that will allow the doubling of passenger trains running under the Hudson River. The program will improve reliability, redundancy, and resiliency and ultimately increase track, tunnel, bridge, and station capacity, eventually creating four mainline tracks between Newark, New Jersey and Penn Station, New York.

  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 Superstorm Sandy. Due to the high level of traffic in the existing North River Tunnel (450 trains per weekday, 200,000 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 River on a daily basis along with Amtrak passengers. This project will allow NJ TRANSIT and Amtrak to continue to operate and maintain existing levels of passenger rail service in the new tunnel and fully rehabilitate the North River Tunnel one tube at a time.

  The Hudson Tunnel Component of the Gateway Program is currently in design and early works phases. A Draft Environmental Impact Statement ("EIS") was released in July 2017. A Draft Final EIS was submitted to USDOT in December 2018, and a Final EIS was approved in January 2022. The schedule as of 2022, aims to complete the new tunnel in 2035 to enable the planned rehabilitation of the existing tubes to be completed in 2038. Unexpected closures in existing tubes for emergency repairs during weekday hours would force many rail commuters to switch to PATH trains, buses, or cars. The project is currently undergoing a process with the FTA to reach a Full Funding Grant Agreement for a Capital Investment Grant for the project. In addition, the States of New Jersey and New York, the Port Authority of NY/NJ, and Amtrak are committed to substantial funding for the project. The project has received a $292M MEGA grant to complete the Hudson Yards Concrete Casing, and $700M has been included in the FY2024 Presidential budget for the project. TBTA facilities may experience a sporadic increase

in usage with commuters choosing to travel to/from New York City via any of the tolled Hudson River bridges and tunnel facilities or the Verrazzano-Narrows Bridge.

- **JFK Terminal Redevelopment** – This is a suite of terminal redevelopments for Terminals 4, 6, 8, and the "New Terminal One" at JFK Airport in Queens, New York.

  Terminal 4 is expected to be completed by Summer 2023 including new aircraft parking positions, gate areas, and seating space.

  Terminal 6 is expected to be completed by 2028, with the first gates opening in 2026. The redevelopment includes improvements to the terminal complex, adjacent roadways, utilities, tarmac, and ground transportation center.

  Terminal 8 was completed in December 2022, including new aircraft gates and aircraft parking spaces, along with a new baggage handling system.

  The New Terminal One started construction in September 2022, with the first gates expected to be open in 2026. The terminal redevelopment includes an overhaul of the dining, retail, lounges, and recreational space for travelers.

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, KC Engineering, and Dinmore 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 2022, 94.2 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 did not 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 2033. For the analysis with toll increases, tolls on TBTA facilities are assumed to be increased on June 1, 2023 and April 1, 2025, in accordance with the 2023-2026 MTA Financial Plan. Stantec assumes that at least a 6.7 percent toll increase on June 1, 2023 is needed to achieve a 5.5 percent revenue yield and an additional 4.9 percent toll increase on April 1, 2025 to achieve a 4 percent revenue yield.
- 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 New York 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 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 New York City.
- Current TBTA reduced rate toll programs and the 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 the 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 the 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 the 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 the 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 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.

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 (2023-2033) 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 2023 budget, 2023-2026 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, 2023

Stantec's development of the traffic and toll revenue estimates for 2023 considered the previous economic conditions reported for the region, fuel prices, unusual weather events, construction projects, current traffic data, and post-pandemic behavior changes such as continued remote home-based work.

Actual data through February 2023 was available for use in the analysis. The forecast for the remainder of 2023 estimates that the base traffic levels at TBTA facilities for the remaining ten months of calendar year 2023 will be 1.4 percent more than volumes in the same months of 2022.

The range of percent changes are shown in Table 24 for the forecast. In January and February 2023, traffic increased at all of the facilities when compared to January and February 2022.

Table 24 Potential Changes in Annual Traffic, 2022 to 2023

Facility	Percent Change January - February 2022 to 2023[a]	Percent Change March - December 2022 to Forecast 2023	Percent Change Full Year 2022 to Forecast 2023
Throgs Neck Bridge	10.3%	3.5%	4.5%
Bronx-Whitestone Bridge	8.4%	-2.0%	-0.6%
RFK Bridge	11.1%	3.5%	4.5%
Queens Midtown Tunnel	12.3%	5.0%	6.0%
Hugh L. Carey Tunnel	8.4%	2.0%	2.9%
Verrazzano-Narrows Bridge	7.6%	0.7%	1.7%
Henry Hudson Bridge	10.0%	-0.8%	0.6%
Marine Parkway-Gil Hodges Memorial Bridge	5.1%	-2.8%	-1.7%
Cross Bay Veterans Memorial Bridge	2.6%	-2.8%	-2.1%
Total	9.2%	1.4%	2.5%

Notes:

(a) Based on preliminary audited traffic data for January and February 2023 (subject to final audit) and unaudited traffic volumes through April 16, 2023.

As shown in Table 24, total 2023 traffic is forecasted to increase at an average rate of 2.5 percent for the full year.

The resulting traffic and toll revenue is presented in Table 25. The toll revenue in 2023 is based on average toll rates developed from the new toll schedule assumed to go into effect in June 2023, and the 2022 and projected 2023 distribution by vehicle class and payment method.

In 2023, Table 25 shows there is a 2.5 percent increase in traffic, a 4.1 percent increase in the systemwide average toll, and a 6.6 percent increase in systemwide revenue over 2022, which reflects actual performance through February 2022 and projected traffic volumes for the remainder of the year.

Table 25 2023 Toll-Paying Traffic and Toll Revenue

Facility	Traffic (millions)	Average Toll	Revenue (millions)
Throgs Neck Bridge	41.4	$9.73	$402.7
Bronx-Whitestone Bridge	50.6	$8.18	$413.7
RFK Bridge	68.2	$7.97	$543.2
Queens Midtown Tunnel	31.6	$7.72	$244.1
Hugh L. Carey Tunnel	22.5	$7.25	$163.1
Verrazzano-Narrows Bridge[a]	79.6	$7.23	$575.3
Henry Hudson Bridge	25.0	$4.10	$102.5
Marine Parkway-Gil Hodges Memorial Bridge	7.8	$2.77	$21.5
Cross Bay Veterans Memorial Bridge	7.7	$2.68	$20.7
Total	334.4	$7.44	$2,487.0
Percent Change			
2022-2023 (All Facilities)	2.5%	4.1%	6.6%

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 current tolls placed into effect on April 1, 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 recent and 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. The forecast, represented in Table 26 below, is a projection of traffic and revenue through 2033. The forecast assumes that traffic has already recovered from pandemic levels to a 'new normal' level. At this point, the more significant negative effects of the pandemic are assumed to 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 behavior change for New York City commuters.

Starting with the calculation for 2023 as a reference base, Stantec projected the traffic and toll revenue for the analysis period through 2033 (at constant tolls using the current rates), as shown in Table 26. As previously discussed, this is based on the actual change in traffic on each facility in January and February 2023 and Stantec's projections by facility for the February through December period.

Changes in traffic volumes are in the range of -2 to 7 percent in 2023 depending on the facility. For 2024, traffic is forecast to increase by 0.04 percent systemwide, with growth rates varying by facility. For 2025, traffic is calculated to increase at 0.13 percent, with growth rates varying by

facility. By 2029, all facilities are assumed to grow at 0.1 percent annually for the duration of the forecast.

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. Stantec is forecasting no additional pandemic related recovery for the remainder of 2023. 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 is 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, current construction on the Throgs Neck Bridge causes a loss of traffic on that facility, some of which has been rerouted to the Bronx Whitestone Bridge.

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 2023-2026 MTA Financial Plan, Stantec applied the assumed future increases in toll rates (from Table 23) effective June 1, 2023 (an assumed 6.7 percent toll increase) and April 1, 2025 (an assumed 4.9 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 Bridge	Henry Hudson Bridge	Marine Parkway-Gil Hodges Bridge	Cross Bay Bridge	All Facilities
Traffic Change										
2022-2023	4.93%	-0.17%	4.98%	6.78%	4.23%	2.18%	1.68%	-1.36%	-1.57%	3.05%
2023-2024	1.40%	-1.50%	0.09%	0.09%	0.50%	0.10%	0.09%	0.11%	0.10%	0.04%
2024-2025	0.10%	0.10%	0.10%	0.10%	0.50%	0.10%	0.10%	0.10%	0.10%	0.13%
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%	-0.46%
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%
2032-2033	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Annual Traffic (millions)										
2022	39.6	50.9	65.2	29.8	21.9	78.2	24.9	7.9	7.9	326.3
2023	41.6	50.8	68.5	31.8	22.8	79.9	25.3	7.8	7.8	336.3
2024	42.1	50.0	68.5	31.9	22.9	80.0	25.3	7.8	7.8	336.4
2025	42.2	50.1	68.6	31.9	23.0	80.1	25.3	7.8	7.8	336.8
2026	42.2	50.1	68.7	31.9	23.1	80.2	25.4	7.8	7.8	337.3
2027	42.3	50.2	68.7	32.0	21.3	80.3	25.4	7.8	7.8	335.7
2028	42.3	50.2	68.8	32.0	20.9	80.3	25.4	7.8	7.8	335.6
2029	42.3	50.3	68.9	32.0	20.9	80.4	25.4	7.8	7.8	335.9
2030	42.4	50.3	68.9	32.1	20.9	80.5	25.5	7.8	7.8	336.3
2031	42.4	50.4	69.0	32.1	20.9	80.6	25.5	7.9	7.8	336.6
2032	42.5	50.4	69.1	32.1	20.9	80.7	25.5	7.9	7.8	337.0
2033	42.5	50.5	69.2	32.2	21.0	80.7	25.5	7.9	7.8	337.3
Average Toll										
2022	$9.29	$7.90	$7.72	$7.43	$6.97	$6.96	$3.92	$2.68	$2.74	$7.15
2023	$9.37	$7.88	$7.68	$7.43	$6.98	$6.96	$3.95	$2.67	$2.59	$7.16
2024	$9.61	$7.90	$7.60	$7.38	$6.92	$7.02	$3.94	$2.71	$2.52	$7.19
2025	$9.61	$7.90	$7.60	$7.38	$6.92	$7.01	$3.94	$2.71	$2.52	$7.18
2026	$9.61	$7.89	$7.59	$7.38	$6.92	$7.01	$3.93	$2.71	$2.52	$7.18
2027	$9.60	$7.89	$7.59	$7.38	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2028	$9.60	$7.89	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2029	$9.60	$7.89	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2030	$9.60	$7.89	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2031	$9.60	$7.89	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2032	$9.60	$7.88	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.18
2033	$9.60	$7.88	$7.59	$7.37	$6.92	$7.01	$3.93	$2.71	$2.51	$7.17
Toll Revenue (millions)										
2022	$368.1	$401.9	$503.6	$221.5	$152.4	$544.5	$97.6	$21.2	$21.6	$2,332.4
2023	$389.2	$400.1	$525.5	$236.6	$159.1	$556.4	$99.8	$20.8	$20.1	$2,407.6
2024	$405.1	$395.2	$520.9	$235.3	$158.6	$561.5	$99.8	$21.2	$19.6	$2,417.1
2025	$405.4	$395.4	$521.1	$235.4	$159.4	$561.8	$99.8	$21.2	$19.6	$2,419.0
2026	$405.6	$395.6	$521.5	$235.6	$160.1	$562.2	$99.8	$21.2	$19.6	$2,421.2
2027	$405.9	$395.9	$521.8	$235.8	$147.3	$562.7	$99.8	$21.2	$19.6	$2,410.0
2028	$406.3	$396.2	$522.3	$236.0	$144.3	$563.1	$99.9	$21.2	$19.6	$2,408.9
2029	$406.6	$396.6	$522.8	$236.2	$144.5	$563.7	$100.0	$21.2	$19.6	$2,411.1
2030	$407.0	$396.9	$523.2	$236.4	$144.6	$564.2	$100.1	$21.2	$19.7	$2,413.3
2031	$407.4	$397.3	$523.7	$236.7	$144.7	$564.7	$100.1	$21.3	$19.7	$2,415.5
2032	$407.8	$397.7	$524.2	$236.9	$144.9	$565.2	$100.2	$21.3	$19.7	$2,417.7
2033	$408.1	$398.0	$524.7	$237.1	$145.0	$565.8	$100.3	$21.3	$19.7	$2,420.0

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 Bridge	Henry Hudson Bridge	Marine Parkway-Gil Hodges Bridge	Cross Bay Bridge	All Facilities
Traffic Change										
2022-2023	4.51%	-0.57%	4.50%	6.03%	2.89%	1.71%	0.64%	-1.73%	-2.06%	2.47%
2023-2024	1.13%	-1.76%	-0.21%	-0.38%	-0.39%	-0.21%	-0.60%	-0.13%	-0.23%	-0.34%
2024-2025	-0.27%	-0.27%	-0.33%	-0.55%	-0.72%	-0.33%	-0.86%	-0.25%	-0.37%	-0.40%
2025-2026	-0.01%	-0.01%	-0.03%	-0.10%	0.13%	-0.03%	-0.19%	0.00%	-0.04%	-0.03%
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%
2032-2033	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%	0.10%
Annual Traffic (millions)										
2022	39.6	50.9	65.2	29.8	21.9	78.2	24.9	7.9	7.9	326.3
2023	41.4	50.6	68.2	31.6	22.5	79.6	25.0	7.8	7.7	334.4
2024	41.9	49.7	68.0	31.5	22.4	79.4	24.9	7.8	7.7	333.2
2025	41.7	49.6	67.8	31.3	22.3	79.1	24.7	7.7	7.7	331.9
2026	41.7	49.6	67.8	31.3	22.3	79.1	24.6	7.7	7.7	331.8
2027	41.8	49.6	67.8	31.3	20.5	79.2	24.7	7.7	7.7	330.3
2028	41.8	49.7	67.9	31.4	20.1	79.3	24.7	7.7	7.7	330.2
2029	41.9	49.7	68.0	31.4	20.1	79.4	24.7	7.8	7.7	330.6
2030	41.9	49.8	68.0	31.4	20.1	79.4	24.7	7.8	7.7	330.9
2031	41.9	49.8	68.1	31.5	20.2	79.5	24.8	7.8	7.7	331.2
2032	42.0	49.9	68.2	31.5	20.2	79.6	24.8	7.8	7.7	331.6
2033	42.0	49.9	68.2	31.5	20.2	79.7	24.8	7.8	7.7	331.9
Average Toll										
2022	$9.29	$7.90	$7.72	$7.43	$6.97	$6.96	$3.92	$2.68	$2.74	$7.15
2023	$9.73	$8.18	$7.97	$7.72	$7.25	$7.23	$4.10	$2.77	$2.68	$7.44
2024	$10.24	$8.41	$8.09	$7.86	$7.37	$7.47	$4.19	$2.88	$2.68	$7.65
2025	$10.60	$8.70	$8.38	$8.14	$7.64	$7.74	$4.33	$2.99	$2.77	$7.93
2026	$10.71	$8.79	$8.46	$8.22	$7.72	$7.82	$4.37	$3.01	$2.80	$8.01
2027	$10.70	$8.79	$8.46	$8.22	$7.72	$7.82	$4.37	$3.01	$2.79	$8.01
2028	$10.70	$8.79	$8.46	$8.22	$7.72	$7.82	$4.37	$3.01	$2.79	$8.01
2029	$10.70	$8.79	$8.46	$8.22	$7.72	$7.82	$4.36	$3.01	$2.79	$8.00
2030	$10.70	$8.79	$8.46	$8.22	$7.71	$7.82	$4.36	$3.01	$2.79	$8.00
2031	$10.70	$8.79	$8.46	$8.22	$7.71	$7.82	$4.36	$3.01	$2.79	$8.00
2032	$10.70	$8.78	$8.46	$8.22	$7.71	$7.82	$4.36	$3.01	$2.79	$8.00
2033	$10.70	$8.78	$8.46	$8.22	$7.71	$7.82	$4.36	$3.01	$2.79	$8.00
Toll Revenue (millions)										
2022	$368.1	$401.9	$503.6	$221.5	$152.4	$544.5	$97.6	$21.2	$21.6	$2,332.4
2023	$402.7	$413.7	$543.2	$244.1	$163.1	$575.3	$102.5	$21.5	$20.7	$2,487.0
2024	$428.4	$417.9	$550.2	$247.6	$165.3	$593.4	$104.2	$22.4	$20.7	$2,550.0
2025	$442.5	$431.4	$567.9	$255.1	$170.0	$612.9	$106.8	$23.1	$21.3	$2,631.0
2026	$446.8	$435.7	$573.4	$257.4	$172.0	$618.8	$107.6	$23.3	$21.5	$2,656.6
2027	$447.2	$436.0	$573.8	$257.6	$158.2	$619.3	$107.6	$23.3	$21.5	$2,644.7
2028	$447.6	$436.4	$574.3	$257.9	$155.0	$619.9	$107.7	$23.3	$21.5	$2,643.6
2029	$448.0	$436.8	$574.8	$258.1	$155.2	$620.5	$107.8	$23.4	$21.5	$2,646.0
2030	$448.4	$437.2	$575.4	$258.3	$155.3	$621.0	$107.9	$23.4	$21.5	$2,648.5
2031	$448.8	$437.6	$575.9	$258.6	$155.5	$621.6	$108.0	$23.4	$21.5	$2,650.9
2032	$449.2	$438.0	$576.4	$258.8	$155.6	$622.2	$108.1	$23.4	$21.6	$2,653.4
2033	$449.6	$438.4	$577.0	$259.1	$155.7	$622.8	$108.2	$23.5	$21.6	$2,655.8

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 2023 through 2033 is shown in Table 29. Total operating expenses, consisting of labor and non-labor, are estimated to increase from $575.8 million in 2023 to $727.0 million in 2033. 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 2023, operating expenses projected by TBTA through 2026, and Stantec's projections of operating expenses from 2027 through 2033. In 2023, expenses have been budgeted by TBTA at $575.8 million, an increase of 21.4 percent over 2022 expenses of $474.3 million. These expenses are split into the following categories: labor expenses of $276.7 million (an increase of 24.5 percent over 2022) and non-labor expenses of $299.1 million (an increase of 18.7 percent over 2022). Labor expenses are higher primarily due to the filling of 2022 vacancies, contractual payroll adjustments, higher pension costs to conform with latest NYCERS actuarial update, and higher fringe benefit costs due to the filling of vacancies and inflationary adjustments. 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 professional services and energy costs, as well as general inflationary

adjustments. Stantec does not project any variation in operating expenses resulting from the reduced traffic levels brought about by periodic toll increases.

Table 28 Projected Operating Expenses
(millions)

Year	Labor[a]	Non-Labor[b]	Total[c]
2023[d]	$276.7	$299.1	$575.8
2024[d]	$285.0	$304.2	$589.2
2025[d]	$293.7	$315.8	$609.5
2026[d]	$302.3	$322.4	$624.6
2027[e]	$308.6	$331.8	$640.4
2028[e]	$312.3	$342.9	$655.2
2029[e]	$315.1	$355.7	$670.8
2030[e]	$318.0	$366.4	$684.4
2031[e]	$320.8	$377.4	$698.2
2032[e]	$323.7	$388.7	$712.4
2033 [e]	$326.6	$400.4	$727.0

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 2023 and from TBTA estimates for 2024-2026.
(e) Forecasted by Stantec for 2027-2033.

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 constant tolls and the other with toll increases in 2023 and 2025, as shown in Table 29. For 2023, net toll revenue for the constant toll scenario is estimated at $2.41 billion. For the scenario with a 2023 toll increase, net toll revenue is estimated at $2.49 billion in 2023. By 2033, annual net toll revenue is estimated to be $2.42 and $2.66 billion, for the constant toll and the two-toll increase scenarios, respectively.

Table 29 Net Toll Revenue Forecast
(millions)

Year	Gross Toll Revenues		Operating Expenses	Net Toll Revenues	
	Constant Tolls	With 2023 and 2025 Toll Increase		Constant Tolls	With 2023 and 2025 Toll Increase
2023	$2,407.6	$2,487.0	$0.6	$2,407.0	$2,486.4
2024	$2,417.1	$2,550.0	$0.6	$2,416.5	$2,549.4
2025	$2,419.0	$2,631.0	$0.6	$2,418.4	$2,630.4
2026	$2,421.2	$2,656.6	$0.6	$2,420.6	$2,655.9
2027	$2,410.0	$2,644.7	$0.6	$2,409.4	$2,644.0
2028	$2,408.9	$2,643.6	$0.7	$2,408.3	$2,642.9
2029	$2,411.1	$2,646.0	$0.7	$2,410.5	$2,645.4
2030	$2,413.3	$2,648.5	$0.7	$2,412.6	$2,647.8
2031	$2,415.5	$2,650.9	$0.7	$2,414.8	$2,650.2
2032	$2,417.7	$2,653.4	$0.7	$2,417.0	$2,652.7
2033	$2,420.0	$2,655.8	$0.7	$2,419.2	$2,655.1

REVIEW OF PHYSICAL CONDITIONS

The facilities under TBTA's jurisdiction include the two tunnels and seven bridges listed in Table 30, 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 31 lists TBTA's capital investments for each facility between 1992 and 2022, and within 2022 itself.

Table 30 Opening Dates of TBTA Facilities

Facility	Open to Traffic	Years in Use
RFK Bridge	1936	87
Bronx-Whitestone Bridge	1939	84
Throgs Neck Bridge	1961	62
Henry Hudson Bridge	1936	87
Queens Midtown Tunnel	1940	83
Hugh L. Carey Tunnel	1950	73
Verrazzano-Narrows Bridge	1964	59
Cross Bay Veterans Memorial Bridge	1970	53
Marine Parkway-Gil Hodges Memorial Bridge	1937	86

Dinmore, subconsultant to Stantec, reviewed material pertaining to the physical condition of TBTA's seven (7) bridges and two (2) tunnels. The material reviewed includes pertinent sections and updates to the following:

- TBTA's Capital Investments at each facility during the year 2022;
- 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 31 Capital Investments by Facility, 1992 through 2022[(a)]

(Millions)

Facility	Total by Facility 1992 through 2022[(b,c)]
Bronx-Whitestone Bridge	$1,040.23
Cross Bay Veterans Memorial Bridge	$231.20
Henry Hudson Bridge	$609.96
Marine Parkway-Gil Hodges Memorial Bridge	$400.72
RFK Bridge	$2,345.49
Throgs Neck Bridge	$1,129.35
Verrazzano-Narrows Bridge	$1,606.08
Hugh L. Carey Tunnel	$993.27
Queens Midtown Tunnel	$781.09
Agency Wide[(d)]	$805.57
Total	$9,926.10

Notes:

(a) Values are as of December 31, 2022.
(b) Includes Superstorm Sandy Capital Investments
(c) Data from TBTA.
(d) Agency wide refers to projects that have been, or will be, carried out at two or more facilities.

Inspection Reports, Flagged[8] Conditions and Rehabilitation Projects

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

[8] The New York State Bridge Inspection Manual defines the following "flags" for reporting purposes: 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. 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. Yellow Flag - A structural flag that is used to report a potentially hazardous structural condition that 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.

- 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."

The TBTA bridges and tunnels were last inspected, and their physical condition appraised in 2021-2022 by various consultants and in-house inspection staff, under the New York State Biennial Bridge and Tunnel Inspection Program, as shown in Table 32. 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 32lists the consulting engineering firms as well as the in-house inspection unit who performed the 2021 and 2022 biennial bridge or special in lieu of interim inspections and the 2021 tunnel inspections for each facility.

Table 32 Facility Inspection Firms

Facility	Consulting Firm (Inspection Year)
RFK Bridge	HNTB-Group A / AECOM-Group B / In-House (2022). WSP / In-House – Group A / Hardesty & Hanover / In-House – Group B (2020, 2021)
Throgs Neck Bridge	Thornton Tomasetti (2021/ 2022), HNTB (2019 / 2020)
Bronx-Whitestone Bridge	Stantec (2021 / 2022), Thornton Tomasetti (2019 / 2020)
Henry Hudson Bridge	HNTB (2021 / 2022), Hardesty & Hanover (2019 / 2020)
Queens Midtown Tunnel	Stantec (2021)
Queens Midtown Tunnel facility approach bridges	In-House (2021), Hardesty & Hanover (2019)
Hugh L. Carey Tunnel	Stantec (2021)
Hugh L. Carey-Battery Park Garage	HNTB (2021)
Hugh L. Carey-Morris St. & Govenors Island Ped. Br.	In-House (2021/2022)
Verrazzano-Narrows Bridge	Stantec-Bridge Main Line / WSP-Ramps (2022), HNTB / Prime (2021), HNTB / Prime and In-House (2020), Hardesty & Hanover / AI Engineers (2018 / 2019
Marine Parkway-Gil Hodges Memorial Bridge	Hardesty & Hanover (2021), WSP (2019)
Marine Parkway-Riis Park Pedestrian Bridge	In-House (2021)
Cross Bay Veterans Memorial Bridge	Hardesty & Hanover / In-House (2021), WSP / In-House (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 33. 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 34 at $3.313 billion, is underway. The CBD Tolling Program is projected to cost approximately $503 million to implement. TBTA expects that capital costs associated with the planning, design, installation, and construction of the CBD Tolling Program will be paid or reimbursed from funds available in the CBD Tolling Capital Lockbox Fund that are generated by CBD Tolling Program revenues, if the CBD Tolling Program receives federal approval. Pending the availability of CBD Tolling Program revenues, the most cost-effective method of funding the capital costs is being used, such as the

existing TBTA Second Subordinate Bond Anticipation Notes that were issued, but with the intent that CBD Tolling Program revenues will reimburse those cost outlays.

Table 33 TBTA 2015-2019 Capital Program by Facility

(Millions) [a]

Facility	2015-2019[b]	Percent
Bronx-Whitestone Bridge	$158.54	5%
Cross Bay Veterans Memorial Bridge	$76,24	3%
Henry Hudson Bridge	$246.94	9%
Marine Parkway-Gil Hodges Memorial Bridge	$17.84	1%
RFK Bridge	$447.38	15%
Throgs Neck Bridge	$657.56	22%
Verrazzano-Narrows Bridge	$566.35	19%
Hugh L. Carey Tunnel	$123.53	4%
Queens Midtown Tunnel	$77.84	3%
Agency Wide[b]	$544.87	19%
Total	$2,935.09	100%

Notes:

(a) Values are as of December 31, 2022.
(b) Agency wide refers to projects that have been, or will be, carried out at two or more facilities.

Table 34 Capital Investments 2020-2024 Capital Program by Facility

(Millions)[a]

Facility	2020-2024	Percent
Bronx-Whitestone Bridge	$113.49	4%
Cross Bay Veterans Memorial Bridge	$44,46	2%
Henry Hudson Bridge	$74.11	3%
Marine Parkway-Gil Hodges Memorial Bridge	$71.53	3%
RFK Bridge	$878.38	31%
Throgs Neck Bridge	$246.00	9%
Verrazzano-Narrows Bridge	$1,035.05	37%
Hugh L. Carey Tunnel	$59.66	2%
Queens Midtown Tunnel	$51.76	2%
Agency Wide[b]	$248.80	8%
Total	$2,823.24	100%

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

GRAND TOTAL (2020-2024 Capital Program)	$3,326.24

Notes:

(a) Values are as of December 31, 2022.
(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. During the 2022 Special inspection one (1) additional new yellow flag was issued, for a total of 20 outstanding yellow flags. 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:

- 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. A design contract was awarded in May 2020. Construction was awarded in late 2022, is ongoing, and is planned for completion in late 2026.
- Cable Dehumidification and Miscellaneous Work. Preliminary design is 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:

- Dyckman Street and Kappock Substation Upgrades. Construction was awarded in late 2021, is ongoing and is projected to be completed in 2024.
- Walkway widening and North Abutment and Retaining Wall Rehabilitation. Design was completed in the 2020-2024 Capital Program. Construction was advanced into the 2020-2024 program and is planned to begin by fall 2023 with completion planned for late 2024.

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 the Ventilation Buildings – Design contract was awarded in late 2019 and was completed in late 2021. Identified immediate rehabilitation needs have been addressed via various small construction projects, primarily funded from the operating program. The one capital funded project to address facade rehabilitation at the Manhattan Blower Building was completed in February 2022. Preliminary design for the seismic retrofit and miscellaneous structural repairs of the ventilation buildings is planned to begin in summer 2023 funded from the 2015-2019 Capital Program. Construction is planned for the 2025-2029 Capital Program and the following capital program.
- Rehabilitation of Tunnel Entrance/Exit in Manhattan – Design is ongoing under the 2020-2024 Capital Program. Construction was advanced into the 2020-2024 Capital Program and is planned to begin in 2024.
- Installation of Fire Suppression System. Preliminary design is planned to begin in spring 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 was awarded in mid-2022, funded in the 2020-2024 Capital Program. Preliminary design for the seismic retrofit and miscellaneous structural repairs of the ventilation buildings is planned to begin in spring 2023 funded from the 2015-2019 Capital Program. Construction is planned for the 2025-2029 Capital Program and the following capital program.
- Installation of Fire Suppression System. Preliminary design is planned to begin in spring 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 2022. For Group A, a total of one-hundred-twenty-three (123) yellow structural flags were issued during the 2022 biennial inspection. This represents a slight decrease from the previous biennial inspection in 2020 (124 flags). Forty-six (46) of these flags are new and seventy-seven (77) superseded 2020 yellow structural flags. One yellow flag was removed during the 2022 biennial inspection. A total of 122 yellow flags remain active.

For Group B, there were a total of 18 new flags issued during the 2022 biennial inspection. In addition, there were 4 yellow flags remaining active from the 2020 biennial inspection. Of the eighteen (18) flags issued in 2022, fourteen (14) were yellow flags, two (2) red flags, and two (2) red P.I.A. flags, compared to the previous 2020 inspection which had nineteen (19) yellow flags, zero (0) red flags and zero (0) safety P.I.A. flags issued. The two (2) red flags and two (2) red P.I.A. flags were removed during the inspection and reissued as yellow flags. A total of 22 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 2019and was completed in summer 2022.
- Demolition of the remaining occupied space under the Manhattan Plaza – Project was awarded in late 2021 and was completed in fall 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 (addressing flag repairs and superstructure upgrades for all facility structures except the suspended spans) was awarded in late 2019 and was completed in summer 2022. Phase 2 is for structural rehabilitation of the ERSS and anchorages at the RFK Bridge and is planned to begin late 2023/early 2024 with completion projected for 2028.
- Construction of New Harlem River SUP Ramp and Fender Replacement. Construction 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 was completed in the spring 2023. Phase 2, Painting of the Queens Approach, is ongoing, and is projected to be complete in late 2023.
- Reconstruction of Randall's Island Ramps – Construction was awarded late 2022, is ongoing, and is projected to be completed in 2025.
- Widening of Southbound FDR Drive (125 St to 116 St) –Design was awarded in 2021. Construction was advanced into the 2020-2024 Capital Program and is planned to begin in late 2023 with completion projected for 2025.

Throgs Neck Bridge ("TNB")

During the 2021 Biennial Bridge Inspection of the TNB, 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. One hundred and one (101) of the yellow flags were re-issued, along with one (1) structural red flag, and fifteen (15) yellow flags were new. During the 2022 Special Inspection, seventy-four (74) flags were removed, including the red flag. During the 2022 Special Inspection, fourteen (14) new yellow flags were issued. A total of fifty-six (56) yellow flags remain active.

The TNB 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 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 in fall 2023.
- 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 late 2023/ early 2024 with a projected completion in 2027.

Verrazzano-Narrows Bridge ("VNB")

The Biennial Inspection at the VNB (Group C and Group D) was performed in 2022. For Group C, a total of nine (9) flags were issued during the 2022 Biennial Inspection. Of the nine (9), all were yellow structural flags. Seven (7) were issued at the lower level and Two (2) were issued at the upper level. No flags were removed during the Inspection.

For Group D, a total of six (6) yellow flags were issued. No red flags were issued. No flags were removed during the inspection.

The VNB 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 VNB include:

- 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 and was completed in fall 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 2019and was completed in April 2022.
- Safety Fence Installation at the Upper and Lower Level Main Suspended Spans - Construction was awarded in March 2021 and was completed in late 2022.

- Miscellaneous Bridge Lighting and Electrical Improvements/Repairs. Design contract was awarded in March 2020. Construction is planned for award in fall 2023 and projected to be complete in 2026.
- Painting of the towers at the VNB – In house design was completed in 2022. Construction is planned for award in fall 2023 and projected to be complete in 2026.
- Lower Level Main Suspended Span Deck Rehabilitation. Design contract was awarded in 2019 and was completed in early 2022. Construction is planned to begin spring 2023 funded in the 2020-2024 Capital Program and projected for completion in 2026.
- Widening of Belt Parkway. Construction was awarded late 2022, with completion planned for late 2024.

Marine Parkway Bridge ("MPB")

The Biennial Inspection of the MPB was performed in 2022. No flags were issued during the 2022 biennial inspection. The MPB 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 MPB include:

- Replacement of On Grade Light Poles Construction began in spring 2021 and was completed in late 2022.
- Miscellaneous Steel Repairs – Funding is included in the program for any necessary repairs identified under future inspections. This has been 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 and was completed in late 2022.

Cross Bay Bridge ("CBB")

The Biennial Inspection of the CBB and Ramp B was performed in 2021. No flags were issued during the 2021 biennial inspection. The CBB 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 CBB include:

- Structural Rehabilitation of CBB – Construction was awarded in fall 2022, is ongoing, and planned for completion in late 2024.
- Installation of Power Monitoring System – project is ongoing and is projected to be completed in late 2024.

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 agencywide systems at the two tunnels. Design began in mid-2022, with construction planned for award in late 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:

- Fiber Optic Infrastructure and Integration
- Toll Collection System Rehabilitation/Upgrades
- SCADA Systems

As part of the Capital Program planning process for each five-year plan, TBTA and the MTA C&D personnel conduct a capital needs assessment. The assessment is compiled from data from biennial inspections and system improvements suggested by the TBTA Business Unit of MTA C&D (formerly Engineering and Construction) 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. Dinmore 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 obsolescent because they are too narrow, too steep, lacking in clearance or sufficient spatial capacity to handle the traffic; or (b) they are structurally deficient 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 provided and prepared by 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 2033 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 2057, 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, 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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