



MBTA Retirement Fund

A Pension Trust Fund between the Massachusetts Bay
Transportation Authority and its Employees

2021 Annual Comprehensive Financial Report

For the years ended December 31, 2021 & 2020
Boston, Massachusetts

Issued by:

John P. Barry, Interim-Executive Director

MBTA Retirement Fund

**A Pension Trust Fund administering benefits earned by employees of the
Massachusetts Bay Transportation Authority**

ANNUAL COMPREHENSIVE FINANCIAL REPORT

For the Years Ended December 31, 2021 and 2020

**Prepared By
The MBTA Retirement Fund Staff**



The Massachusetts Bay Transportation Authority Retirement Fund is a private trust created in 1948 by the Metropolitan Transit Authority, the predecessor agency to the Massachusetts Bay Transportation Authority ("MBTA"), and The Boston Carmen's Union, Amalgamated Transit Union Local 589. Our mission then, as now, is to provide retirement benefits to the membership consisting of the transit workers and others employed by the MBTA. To ensure that the pensions earned by active and retired members, and their beneficiaries, remain secure, we are dedicated to managing a strong and diversified investment program.

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INTRODUCTORY SECTION

(Unaudited)



June 21, 2022

Board of Trustees
Massachusetts Bay Transportation Authority Retirement Fund
One Washington Mall, 4th Floor
Boston, MA 02108

On behalf of the Board of Trustees I am pleased to submit the Massachusetts Bay Transportation Authority Retirement Fund's Annual Comprehensive Financial Report (ACFR) for the fiscal year ended December 31, 2021. The ACFR reflects that our commitment to accurate and transparent financial reporting is as strong as our commitment to excellence in customer service. The document presented today is the 6th consecutive ACFR produced by the MBTA Retirement Fund.

The ultimate responsibility for the integrity of the data presented within this report and the fair presentation of the financial statements, in all material respects lies with Management. This report is intended to provide complete and reliable information of the Fund's investments, financial statements, and performance returns.

To provide a reasonable basis for making these representations, management maintains a sufficient set of internal control procedures designed to implement reasonable assurance that assets are properly safeguarded, transactions are properly executed, and reliable information is utilized for the preparation of the Fund's financial statements in conformity with Generally Accepted Accounting Principles (GAAP), as promulgated by the Governmental Accounting Standards Board (GASB). The Fund's transactions are reported on the accrual basis of accounting. The objective of the internal control framework is to obtain reasonable rather than absolute assurance that the financial statements will be free from material misstatement since the cost of controls should not exceed anticipated benefits to be derived.

Our independent external auditors, KPMG LLP have conducted an audit of the Basic Financial Statements in accordance with auditing standards generally accepted in the United States performing tests and procedures as they deem necessary to express opinions on the Basic Financial Statements in their report to the Board.

Within the financial section, the Management Discussion & Analysis (MD&A) follows the independent auditors' report and provides an overview of the Fund's financial statement and financial results. The MD&A complements this letter of transmittal and should be read in conjunction with this letter.

Profile of the MBTA Retirement Fund

The Fund was established on January 1, 1948, under an agreement and declaration of trust (restated on July 19, 2019) by and among the Massachusetts Bay Transportation Authority (the Authority),

(Continued)

and Local 589, Amalgamated Transit Union, Boston Carmen's Union, AFL CIO (collectively, the Union). The Fund is a single employer plan. It was established as a contributory defined benefit retirement plan in accordance with the Pension Agreement; effective July 1, 1970, (restated thereafter) adopted by the Authority and the Union for the purpose of receiving contributions and providing pension benefits for its Members and qualified beneficiaries.

The MBTA Retirement Fund Board seeks to utilize its assets under management to the benefit of the membership by strategically and methodically allocating financial resources to a differentiated portfolio of investments while utilizing the knowledge and experience of a broad range of investment managers. An overview of the Investment Policy Statement is included in the Investment Section, on page 108.

The Board determines investment objectives, strategies, and policies of the Fund. The Executive Director of the Fund is accountable for the Fund's general management and operations and reports to and advises the six-member Board of Trustees. The staff of the Fund work diligently to uphold the original mission of serving Members and their families.

As of December 31, 2021, the Fund had approximately \$1,939.9 million in net position restricted for pension benefits compared to \$1,769.9 million for the prior calendar year, representing an increase of \$170 million in net position. The MBTA Retirement Fund Board utilizes the services of a third-party custodian institution to assist with the settlement and accounting for investment and cash transactions.

Interim-Executive Director Discussion

The financial markets had another exceptional year with most major asset classes posting positive returns. The S&P 500 gained 28.7% and the global public equity markets generated positive, but uneven returns during the year ended December 2021. As U.S. inflation continued to spike and interest rates increased, bonds yields rose, and prices decreased. However, consumer demand helped boost stocks, but also contributed to the supply chain constrictions as prices for food and commodities continued to climb at a fast pace. The recovery of the U.S. economy, strong corporate profits, and the labor market recovery all contributed to the year-end results. This resulted in a positive 2021 gross return of 13.88% on a time-weighted performance basis and the Fund outperformed its benchmark by 73 basis points. The Board continues to monitor the investment environment and makes prudent decisions on behalf of the Members.

Operational Changes

Although the world has found a new sense of normalcy after the pandemic, there are still many unknowns, and as a result the Fund has implemented new office protocols. As of May 1, 2022, the Fund is offering walk-in capabilities for select services and appointments should still be made for services that take longer than 15 minutes. The latest operational amendments are posted on the Fund's website and are continuously updated as needed. The Fund staff looks forward to in-person interaction with the membership as it is safe to do so.

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Objectives and Goals

In an effort to focus on our sustainability for the future and protecting our member's assets, the Fund maintains a Strategic Plan that outlines many goals and objectives. The Retirement Board is at the midpoint of the current 3-year strategic plan that culminates in 2023 with the 75th Anniversary of the MBTARF's founding in 1948.

The Fund seeks to continually improve financial reporting, accountability, and transparency. Our website is regularly updated to add information, such as monthly flash reports, investment documents and additional MBTARF reporting. It is designed to increase transparency into the MBTARF operations and to educate our active and retired Members about the MBTARF's achievements. In addition, the Fund works to cultivate a high-performing, professional and innovative organization, which encourages professional and continuing education for all Board, committee, and staff members.

In 2021 the Standard Operating Procedures (SOPs) for the Benefits Department were enhanced to improve efficient operations, productivity, and uniformity. This document includes written, standard, uniform, objectively measurable and auditable work-flow procedures designed to assure the prompt, consistent and accurate administration of benefits. During this process the Benefits Department updated their forms and template documents to assure consistency and compliance with the Pension Agreement.

The Fund continues to make strides to develop a technologically sophisticated infrastructure to better serve members and retirees. I encourage our membership to visit the Fund's website which can be found at www.mbtarf.com. The employee self-service website continues to offer active members the ability to create their own retirement benefit estimates using the most recent service and earnings history. Furthermore, Members have the capacity to print forms to notify the Fund of certain changes to their personal information. Retired members can review their payment history for the preceding three months and print forms to setup direct deposit. This online platform can be found at www.pensiontechnologygroup.com/mbta.

The Retirement Fund continuously works on IT infrastructure improvements. As reported in the 2020 ACFR, the Fund management recommended, and the Board of Trustees approved, an initiative to move several of the Fund's digital resources to the Microsoft Azure Cloud. The migration to the cloud was completed in 2021 and is expected to reduce operating costs, enhance scalability, and increase data security. There have also been many information security enhancements in connection with the cybersecurity renewal process. We implemented a multifactor authentication (MFA) for access to the MBTARF's network, directory services, switches, endpoints, and servers. The MBTARF also completed its implementation of enhanced mobile device management and email encryption technology.

As a result of upgraded technology platforms, the MBTA Retirement Fund has implemented a Microsoft Teams based VoIP phone system. This solution is designed to support staff in a hybrid work environment and will support business continuity in a disaster situation.

(Continued)

The platform also integrates Microsoft Teams, allowing the seamless sharing of video and information between staff members. As part of the financial reporting goal, the finance department is implementing a new web-based accounting software program, which will offer additional security and functionality for the team. This update was completed in May 2022 and went live on June 1st.

The Fund will continue to work toward its ongoing strategic planning goals of enhancing financial technology capabilities, cultivating a sophisticated organization dedicated to customer service, becoming a recognized leader in pension benefit administration all while sustaining and preserving a financially sound pension fund.

Investment Policy Overview

The Fund's portfolio is broadly diversified, holding investments ranging from publicly traded stocks and bonds to privately held partnerships. The scale and scope of these investments makes oversight of these assets highly complex where an investment policy is required. The Retirement Board of the Fund adopts an Investment Policy Statement (IPS) which establishes investment objectives and policy, obtains expert advice and assistance, and oversees the employment of qualified and competent investment staff. In addition, the IPS is designed to obtain optimal risk-adjusted returns and ensure that investments are made for the exclusive benefits of the Members of the Fund. The Board also monitors the actions of staff, consultants, and advisors to ensure compliance with its policies. In 2021, the Fund convened its Investment Compliance Working Group for their annual review the IPS, Investment Selection Process, Investment Management Compliance Policies and Financial Reporting. The ICWG did not recommend any formal changes to these policies in 2021. The current Investment Policy Statement has been in effect since July 2020. The Board's primary goal is to maintain a financially sound pension fund in order to provide financial security for its Members.

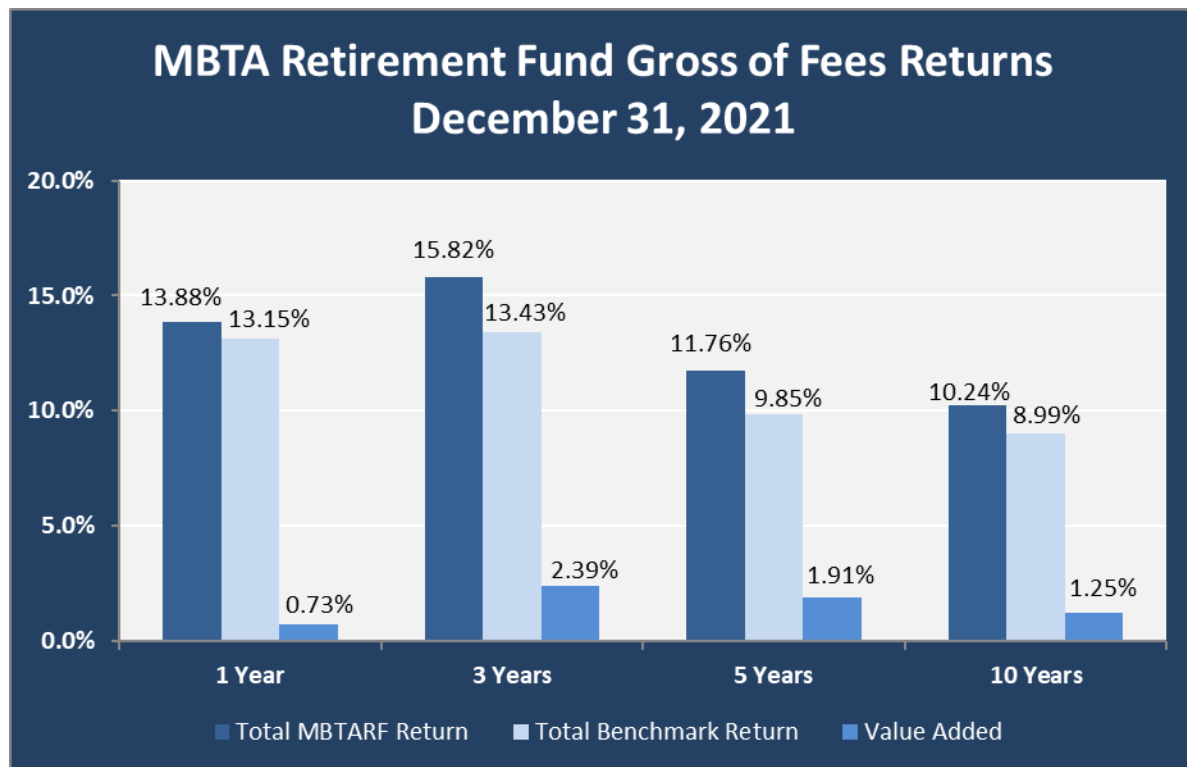
MBTA Retirement Fund Performance

Following another unprecedented year in the financial markets, the Board continues to be focused on long-term performance and is proud to report another strong year of returns in 2021. As of December 31, 2021, the total Fund returns gross of fees with the exception of hedge funds which are net of fees was 13.88% and the annualized three and five-year returns were 15.82% and 11.76% respectively. For more detailed information regarding the Fund's investment policies, guidelines, and results please see the Investment Section of this report, starting on page 68.

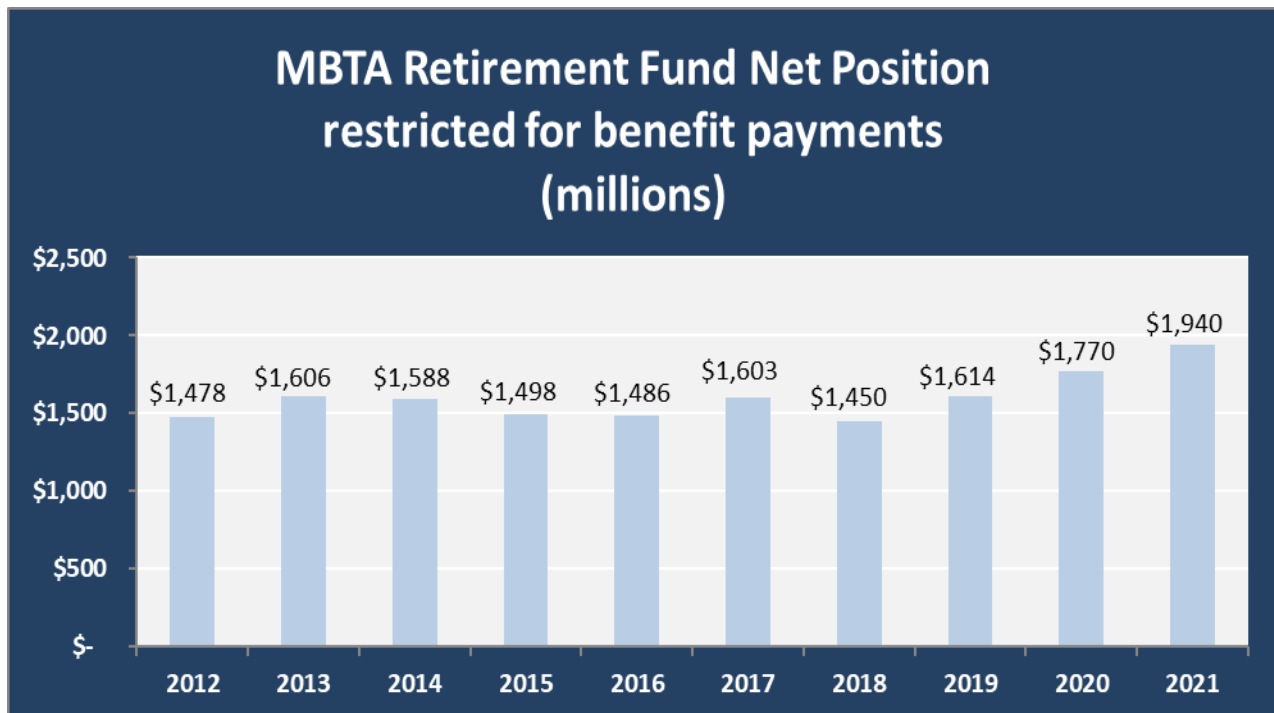
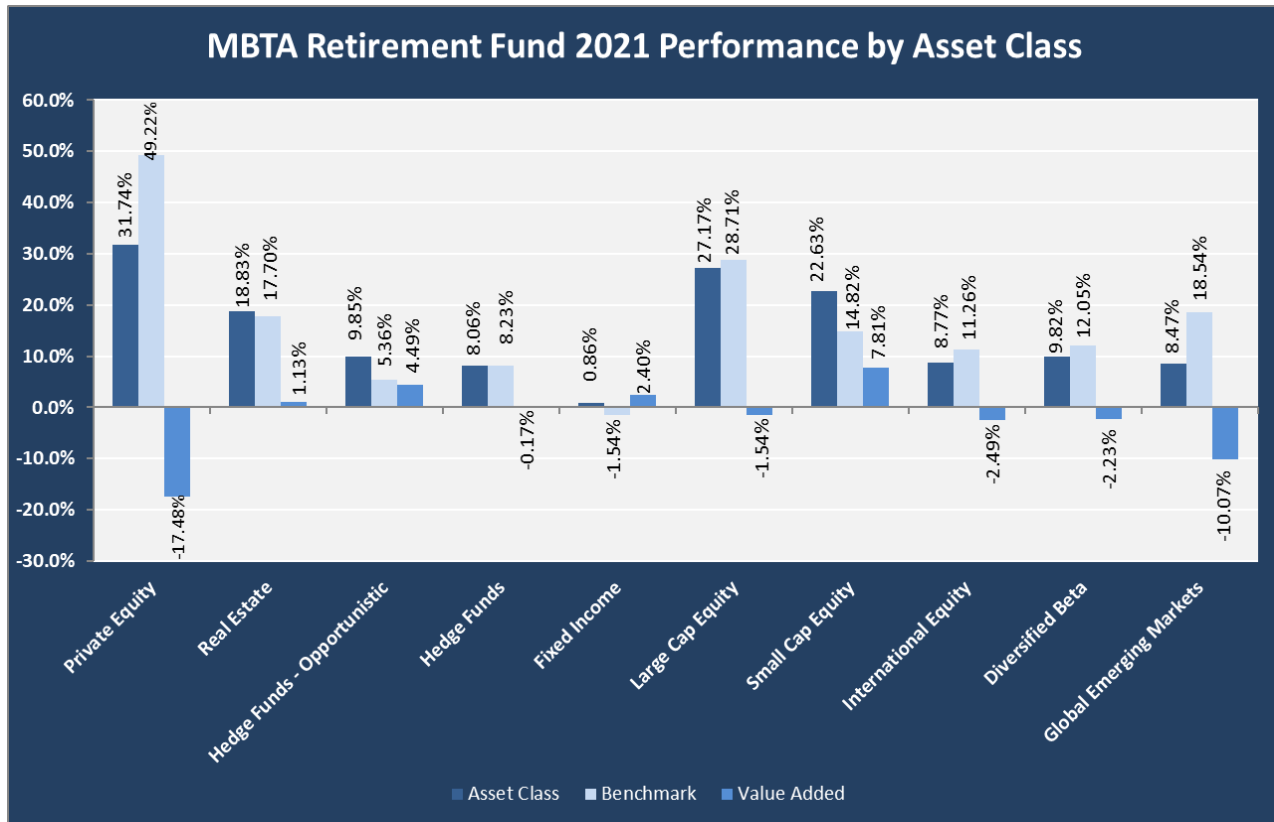
Year Ended December 31, 2021:

- The Fund gained 13.88% outperforming the total policy benchmark of 13.15% by 73 basis points.
- The Fund's inception to date gross return is 9.58%.
- The return equates to an investment gain of \$232.4 million.
- Net total outflows to pay benefits for the calendar year were approximately \$221.6 million.
- The return outperformed the actuarial rate of return of 7.25%.

(Continued)



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Management's Discussion and Analysis

The MD&A beginning on page 29 provides an overview and analysis of the Fund's basic financial statements. This letter of transmittal is intended to complement the MD&A and should be read in conjunction with this letter.

Markets and Outlook

While challenges remained, 2021 was a year of uncertainty and progress. We learned to adapt to a new normal following the pandemic that stopped the world in 2020. Despite significant headlines including an attack on the Capitol, high inflation, supply chain disruptions, and two new COVID-19 variants; the stock market had strong performance. The S&P 500 had significant gains that were offset minimally by bonds as the Bloomberg Aggregate was down 1.54%. Global markets continued to rise alongside the U.S. markets, measured by the MSCI All Country World Index which returned 18.54% in 2021. These strong returns were driven by healthy economic growth and powerful rebound in earnings.

Monthly employment and labor force averages bounced back to their pre-pandemic levels in 2021. The labor market recovery is notable showing the United States adding millions of jobs with new unemployment claims at record lows. Despite the positive news in the markets and labor statistics, the recovery resulted in the increase of prices in areas such as food and energy.

The Federal Reserve kept interest rates near zero throughout 2021 but announced plans to begin tapering its monetary policy in 2022. Inflation is an area that we continue to watch as rates continue to rise. Historically, tightening the Fed's monetary policy has created volatility in the markets.

The first half of 2022 has been volatile, and we do not anticipate returns to be as strong as we have seen in the past few years. It is important that our Members know that the Fund's investment portfolio is broadly diversified, and we expect to perform strong over the long-term.

Asset Allocation/Investments

The Fund is responsible for implementing an asset allocation with an appropriate balance of risk and return. It is a critical component for formulating investment strategies. An asset-liability study is conducted in three to five-year intervals. This approach allows for sufficient flexibility to capture investment opportunities as they may occur yet provide parameters to ensure prudence and care while managing the Fund's assets. The Board approved an updated asset allocation in February 2020, and it has been in effect since April 2020. The Board's primary goal is to maintain a financially sound pension fund in order to provide financial security for its Members.

The applicable asset allocation for year 2021 (below) is the result of an asset-liability study conducted by the Fund's actuary, Buck Global, LLC, and investment advisor, Segal Marco Advisors. At year end the Fund's actual asset allocation was within approved target ranges. (Continued)

Asset Class	Target (%)	Minimum Exposure (%)	Maximum Exposure (%)
Equities	43	38	48
Domestic Large Cap	17	12	22
Domestic Small Cap	7	4	10
International Equity (unhedged)	9	5	13
International Small Cap	2	0	4
Global / Emerging Markets	8	4	12
Fixed Income	23	20	30
Core Fixed Income	8	4	12
Inflation Linked Securities	3	0	5
Mortgages	3	0	5
Global & Multi Sector	6	3	9
Bank Loans	3	0	5
Cash	2	0	3
Alternative Investments	32	20	39
Private Equity	8	4	12
Private Credit	2	0	4
Real Estate	9	5	12
Fund of Hedge Funds	5	2	8
Fund of Hedge Funds - Opportunistic	2	0	4
Risk Parity	6	3	9

The Board of Trustees and Management are responsible for continually reviewing investment manager performance in order to ensure the Fund is utilizing the best investment managers possible.

Some 2021 Investment Highlights include:

- In February 2021, the Board of Trustees voted to invest \$15 million in Hamilton Lane Strategic Opportunities Fund VI.
- In March 2021, the Board committed \$10 million to a new private credit fund, Venture Lending and Leasing X, with a long-standing investment manager, Western Technology Investments.
- At a real estate meeting in May 2021, the Trustees allocated \$15 million to the PRIT Real Estate Segmentation Program as well as \$15 million to the TA Realty Core Property Fund. These investments were made strategically to align with the asset allocation targets as well as increase the Fund's exposure to industrial real estate.
- In September 2021 the Board voted to terminate and fully redeem hedge fund manager, Rock Creek, due to fees, liquidity concerns and underperformance. In December 2021, the Board voted to allocate the funds from the redemption to PRIM Hedge Fund Segmentation. PRIM received \$25 million in April 2022.
- During the annual review of private equity, in November 2021, the Trustees committed \$10 million to the PRIM Private Equity Vintage Year 2022 Segmentation Program (PEVY 2022). In addition to allocating to PEVY 2022, the Board also committed \$5 million to a new private equity fund with a long-standing investment manager, Top Tier Venture Velocity Fund IV.

(Continued)

Administration

The Board of Trustees of the Retirement Fund is the highest authority within the organizational structure. As of December 31, 2021, the date of the Fund's most recent actuarial valuation, the Fund's membership included 5,486 members in active status, 6,713, retirees and beneficiaries receiving benefits and 3 terminated vested members who are not yet receiving benefits. Our pension management software enables the Fund to efficiently track demographics for both active and retired Members as well as facilitate benefit payments via an automated process. In addition, the Fund offers an employee self-service platform for active and retired Members which offers remote access to their personal retirement information. I encourage you to visit the portal at:

www.pensiontechnologygroup.com/mbta

Membership

Membership in the Fund is available to most MBTA employees with the exception of MBTA Police Officers. Employees who are or may become members of the Union are included in the membership of the Fund. Employees who are not members of the Union but who are on the regular payroll of the Authority and Members of the Fund on the date of the execution of the Fund's Pension Agreement are also included in the membership of the Fund. Members whose hire date is on or after December 6, 2012 will be required to complete at least twenty-five (25) years of creditable service and attain age 55 in order to be eligible for an early normal retirement allowance. For those members whose date of hire is prior to December 6, 2012, a completion of at least twenty-three (23) years of creditable service is required to receive compensation under an early normal allowance.

Benefits

The collectively bargained active wage agreement went into effect July 1, 2014. The current Pension Agreement expired on June 30, 2018; the Pension Agreement is currently in arbitration, any changes will be provided on our website when the arbitration becomes available. However, all terms remain in effect until a new agreement is released.

Contributions

Benefits paid to Members are financed by employer contributions, employee contributions, and earnings on investments made by the Fund. Effective July 1, 2020, Members are required to contribute at a rate of 9.3339% of their pensionable salary while the Authority contribution rate is 26.6561%. The 2020 and 2021 Actuarial Reports demonstrated strong investment performance, resulting in a reduction of the unfunded accrued liability. Therefore, there was minimal decrease to the contribution rates effective July 1, 2021 and July 1, 2022. However, on May 26, 2021 and May 20, 2022, the MBTA Retirement Fund Board of Trustees unanimously voted to retain current 2019 contributions rates for the Authority and the Members. This vote was implemented in an effort to pay down the MBTA Retirement Fund's unfunded accrued liability and ultimately provide a more stable financial future for the retirees.

(Continued)

Funding

In setting contribution rates, the Board's principal objectives are to set rates so the unfunded actuarial accrued liability (UAAL) will be amortized over a reasonable period of time from the most recent valuation date and the set rates so they remain relatively level over time. An actuarial valuation is performed annually. No changes were made to the assumptions including the investment return of assumption of 7.25%, the inflation assumption of 2.75% and the wage increase assumption decreasing from 8% per year for newly hired to 2.75% for employees with 15 or more years of service. The most recent actuarial valuation report, dated December 31, 2021, calculated the Fund's unfunded actuarial pension liability at \$1,341,060,444. As of December 31, 2021, the funded ratio is 56.76%. An experience study was performed in 2019 and the current proposed assumptions were adopted by the Board in April 2019. At that time, assumptions for salary increases, mortality tables, termination rates, and retirement rates were revised. The adoption of the most recent asset allocation still supports a 7.25% discount rate. However, the Board of Trustees are mindful of monitoring this rate to help facilitate financial solvency. In addition, investment managers' performance are reviewed monthly and if needed, adjustments to the portfolio are made to help increase and limit decreases to the Fund's overall return.

The actuarial firm, Buck Global, LLC, completed the actuarial reviews and valuations. For more information on the actuarial assumptions of the Fund as part of the December 31, 2021 valuation, please see the Summary of Actuarial Assumptions and Methods found in the Actuarial Section of the ACFR, starting on page 112.

Membership Communications

The MBTA Retirement Fund continues its focus on member communication through Milestones and posting pertinent information to our website at www.mbtarf.com. We place a special emphasis on providing quality customer service to which we encourage feedback and welcome new ideas.

Awards

The Government Finance Officers Association (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to the Fund for its annual comprehensive financial report for the fiscal year that ended December 31, 2020. To be awarded a Certificate of Achievement, the Fund must publish an easily readable and efficiently organized ACFR, the contents of which conform to program standards. This report must satisfy both generally accepted accounting principles and applicable legal requirements. The Fund has received this prestigious award for the last five years.

A Certificate of Achievement is valid for a period of one year only. We believe our current ACFR continues to meet the Certificate of Achievement Program's requirements and we are submitting it to the GFOA to determine its eligibility for another certificate.

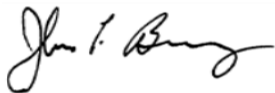
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Acknowledgements

The compilation of the ACFR reflects the combined efforts of the Fund's staff, Actuary, and Investment Advisor. Our goal is to present a thorough and accurate report that is easy for our members to read and understand. It is intended to provide complete and reliable information as a basis for making management decisions.

We would like to take this opportunity to express our appreciation to the Board of Trustees, Staff, Investment Advisor, Actuary, and to the many members who are working diligently to ensure the continued success of the Fund. We recognize and appreciate the dedication of our Board of Trustees who voluntarily provide their expertise and oversight to protect the financial future of our membership.

Yours respectfully,

A handwritten signature in black ink, appearing to read "John P. Barry". The signature is fluid and cursive, with the first name "John" and last name "Barry" clearly distinguishable.

John P. Barry
Interim - Executive Director / Chief Financial Officer



Government Finance Officers Association

**Certificate of
Achievement
for Excellence
in Financial
Reporting**

Presented to

**MBTA Retirement Fund
Massachusetts**

For its Annual Comprehensive
Financial Report
For the Fiscal Year Ended

December 31, 2020

Christopher P. Morill

Executive Director/CEO

MBTA Retirement Fund Board Trustees

Effective January 1, 2022

James Evers, Interim Chairperson, Elected Member

President-Business Agent of Local #589, A.T.U., the Boston Carmen's Union

James Bradley, Elected Member, Local #589

Financial Secretary – Treasurer Agent of Local #589, A.T.U., the Boston Carmen's Union

Craig Hughes, Elected Member, Local #264

Special Representative, Eastern Territory/ International Association of Machinists
& Aerospace Workers

Mary Ann O'Hara, Appointed Member

Chief Financial Officer, MBTA

Betsy Taylor, Appointed Member

Chair of the MBTA Board of Directors

Mass DOT Board Member

Board Member of the Massport Employee Retirement System

Retired Director of Finance, Massachusetts Port Authority

Jacquelyn Carey, Acting Board Secretary

MBTA Retirement Fund

Advisory Committees to the MBTA Retirement Fund Board

Audit and Actuary Committee

James Evers

Board Member

James Bradley

Board Member

Mary Ann O'Hara

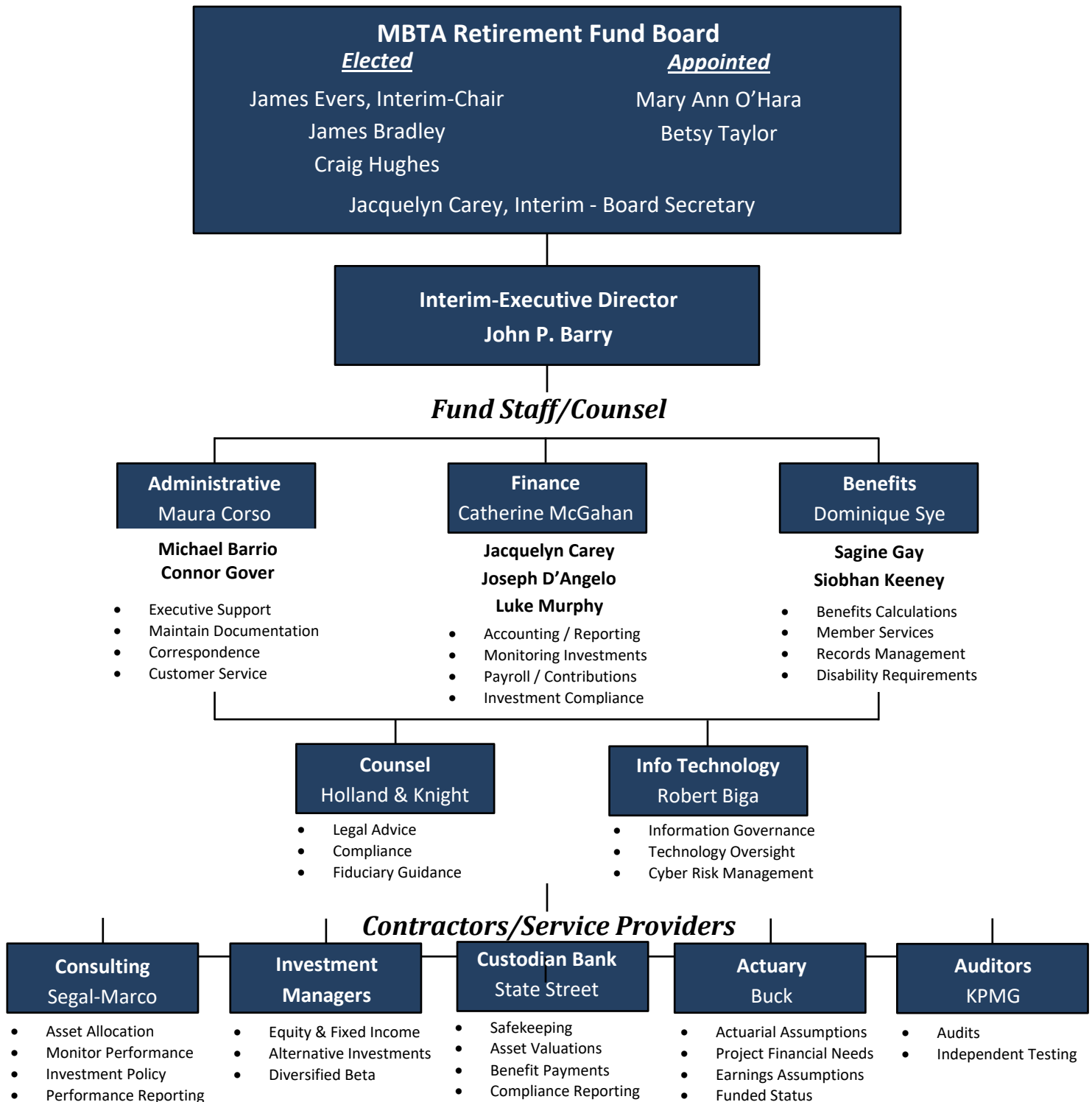
Board Member

Betsy Taylor

Board Member

Organizational Chart

Effective January 1, 2022



Please refer to the Investment Section, page 106 for the Summary Schedule of Broker Commission and Fees and page 107 for the Schedule of Direct Management Fees.

Historical MBTA Retirement Fund Board Members

<i>Period of Service</i>			<i>Period of Service</i>		
	<u>From</u>	<u>To</u>		<u>From</u>	<u>To</u>
(A) Harold Ulrich **	08/48	01/49	(E) James T. Norton	07/80	10/90
(E) Irving F. Murray	08/48	08/49	(E) Paul M. Connolly	01/83	12/86
(E) William A. Roche	08/49	07/56	(A) Paul E. Means	05/83	01/84
(A) Thomas A. Dunbar **	08/48	01/59	(A) William F. Irvin **	05/83	04/91
(A) Charles A. McCarron **	08/48	05/60	(A) James E. Smith, Esq.	05/83	04/91
(E) Thomas P. Dillon	08/48	03/61	(A) Melissa A. Tillman	01/84	04/91
(A) Ernest M. Flint	01/49	01/50	(E) Anthony B. Romano **	12/86	02/92
(E) Bartholomew P. Saunders	08/49	08/52	(E) John J. Connolly **	10/90	08/94
(A) Arthur V. Grimes	07/50	06/52	(A) Domenic M. Bozzotto	04/91	02/97
(A) Augustine Airola	06/52	04/53	(A) Toye L. Brown, Ph.D.	04/91	10/93
(E) James J. Casey	08/52	08/64	(A) James A. Radley	04/91	11/92
(A) Harold Ulrich	04/53	04/57	(E) James W. Duchaney	02/92	01/93
(E) Michael J. Gormley	07/56	12/63	(A) Michael P. Hogan	11/92	12/93
(A) William V. Ward **	08/57	08/64	(E) Richard M. Murphy	01/93	08/96
(A) John J. Sullivan	01/59	07/59	(E) Edward F. Sheckleton **	01/93	12/01
(A) Willis B. Downey **	06/59	08/62	(A) Oliver C. Mitchell, Jr.	10/93	05/98
(A) William E. Ryan	06/60	02/72	(A) Albert Shaw	12/93	10/95
(E) Edward S. Russell	03/61	01/62	(E) Paul V. Buckley	08/94	04/98
(E) Matthew F. Ryan	01/62	12/69	(A) Boyce W. Slayman	10/95	03/00
(A) Edward F. McLaughlin, Jr.	08/62	03/70	(E) James E. Lydon	10/96	12/01
(E) Walter H. Doyle	12/63	12/69	(A) Janice Loux**	10/97	03/15
(E) Thomas F. Holland, Jr.	08/64	08/70	(E) William A. Irvin	04/98	12/05
(A) Philip Kramer **	08/64	04/68	(A) William A. Mitchell, Jr.	12/98	10/00
(A) Richard D. Buck **	04/68	07/79	(A) Joseph M. Trolla	08/00	10/08
(E) John J. Sugrue	12/69	12/71	(A) Hon. Baron H. Martin	11/00	10/04
(E) Albert F. Kelley	12/69	12/75	(E) Stephan G. MacDougall	01/02	12/10
(A) Joseph C. Kelly	03/70	07/70	(E) John P. Barry	01/02	04/06
(A) John R. Launie	07/70	05/83	(A) Jonathan R. Davis	10/04	05/15
(E) Albert J. Fitzpatrick	08/70	07/80	(E) James M. O'Connell	09/07	06/15
(E) Patrick C. Quill	12/71	12/75	(E) Michael F. Mastrocola	07/06	01/12
(A) Joseph H. Elcock	02/72	07/79	(A) Darnell L. Williams	01/09	05/15
(E) John J. Sugrue	01/76	07/76	(E) John J. Lee	01/11	12/13
(E) Redmond R. Condon	01/76	02/78	(E) James M. Evers **	04/12	Present
(E) Joseph D. Fleming, Jr.	07/76	12/77	(E) James M. O'Brien	01/14	12/19
(E) Donald R. Abbott	12/77	08/79	(A) Steven Grossman	06/15	12/19
(E) James J. Slattey	02/78	08/79	(A) Betsy Taylor	06/15	Present
(A) Walter J. Ryan **	07/79	05/83	(A) Michael J. Heffernan	06/15	09/17
(A) Richard L. Taylor	07/79	05/83	(E) Craig S. Hughes	07/15	Present
(E) George P. Adams	08/79	11/79	(A) Steven Kadish	10/17	09/18
(E) Richard J. Guiney	08/79	11/79	(A) Michael Abramo	03/19	04/21
(E) John J. Gallahue, Jr.	11/79	01/83	(E) James Bradley	01/20	Present
(E) John J. O'Leary	03/80	01/93	(A) Mary Ann O'Hara	01/22	Present

(E) Employee Representative (A) Authority Representative ** Chairperson

Historical Executive Directors of the MBTA Retirement Fund

	<i>Period of Service</i>			<i>Period of Service</i>	
	<u>From</u>	<u>To</u>		<u>From</u>	<u>To</u>
John H. Moran	01/48	11/51	Karl E. White	04/02	06/06
Michael J. Powell	11/51	12/82	Michael H. Mulhern	07/06	08/16
John J. "Jack" Gallahue, Jr.	01/83	03/02	John P. Barry - Interim	08/16	Present

1 Prior to 1968 the Executive Director position was referred to as Treasurer

Historical MBTA Retirement Fund Alternate Board Members

	<i>Period of Service</i>			<i>Period of Service</i>	
	<u>From</u>	<u>To</u>		<u>From</u>	<u>To</u>
(A) Joseph Gannon	08/48	01/49	(A) Guido R. Perera, Jr.	10/78	7/79
(A) Richard A. Sullivan	08/48	01/49	(A) Paul E. Means	7/79	5/83
(A) Ernie B. Myott	08/48	08/64	(A) John J. McCarthy	7/79	5/83
(E) Philip E. Doyle	08/48	12/49	(A) Guy F. DeBenedetto	7/79	8/81
(E) John C. Carey	08/48	08/54	(E) Frederick W. Burt III	12/79	3/83
(E) Joseph P. Fahey	08/48	04/54	(E) Charles E. Smyth	7/80	10/90
(A) Edward Dana	01/49	02/51	(E) Donald J. Quinlan	3/83	7/85
(A) Edward R. Kelly	01/49	07/50	(E) Anthony B. Romano	1/84	12/86
(E) Thomas Freeman	12/49	08/52	(A) Melba F. Hamilton	5/84	4/91
(A) Ernest M. Flint	07/50	10/52	(A) Judith H. Robbins	6/84	4/91
(E) Thomas F. Holland, Jr.	08/52	08/64	(E) Stanley V. Stearns	7/85	1/87
(A) John J. Sullivan	10/52	01/59	(E) Albert Mastrocola	1/87	10/97
(A) Horace Schmerhorn	04/53	04/56	(E) Edward F. Sheckleton	1/87	1/93
(E) Edward S. Russell	04/54	03/61	(E) Paul V. Buckley	10/90	8/94
(E) Michael J. Gormley	04/54	07/56	(A) Michael P. Hogan	6/91	11/92
(A) Robert H. Ryan	05/56	08/57	(A) Gregory C. Flynn, Esq.	10/91	3/92
(E) Joseph P. Fahey	07/56	01/58	(A) Arthur D. Shea	11/91	2/92
(A) John J. Graham	08/57	08/64	(A) Wesley G. Wallace, Jr.	2/92	3/94
(E) Thomas J. Rush	01/58	12/69	(A) Esther R. Maletz, Esq.	3/92	3/94
(A) William J. Fitzsimons	01/59	07/70	(E) Robert F. Gosnell	1/93	3/96
(E) Richard R. Rodwell	03/61	01/62	(A) Carol A. Buckley	3/94	1/96
(E) Walter H. Doyle	01/62	12/63	(A) Francis X. McDonough	3/94	8/96
(E) Paul F. Halloran	12/63	12/69	(A) Clifford H. Straw	3/94	1/96
(E) Albert J. Fitzpatrick	08/64	08/70	(E) Robert H. Stearns	8/94	4/98
(A) Frederick J. Sheehan	08/64	03/67	(A) William A. Mitchell, Jr.	1/96	12/98
(A) George L. Anderson	08/64	04/68	(E) Daniel K. Burton	4/96	9/96
(A) Vincent M. Banks	03/67	01/74	(A) Sharna A. Small-Borsellino	4/96	5/00
(A) Forrest I. Neal, Jr.	04/68	01/78	(E) Francis X. Madden	10/96	1/99
(E) Patrick C. Quill	12/69	12/71	(E) James M. O'Connell	4/98	12/05
(E) Dennis F. Guiney	12/69	12/73	(A) Philip Puccia	2/97	3/99
(A) Joseph A. Emerson	07/70	01/74	(E) James D. Wyllie	11/97	12/98
(E) Charles H. Ward	08/70	02/77	(E) Daniel K. Burton	1/99	1/00
(E) Paul F. Sullivan	12/71	12/73	(A) Willie J. Davis	12/98	7/00
(E) Charles F. Cole, Jr.	12/73	12/75	(A) Michael Mulhern	4/99	4/02
(E) Edward J. Doherty	12/73	12/75	(E) Torrie Austin	5/99	4/00
(A) Daniel F. Dullea	01/74	02/76	(E) James D. Wyllie	1/99	11/00
(A) Francis A. Sullivan	01/74	07/79	(E) James M. Evers	5/00	9/00
(E) Joseph A. Dineen	01/76	12/77	(A) Alice A. Fernandes	5/00	12/06
(E) Joseph D. Fleming, Jr.	01/76	07/76	(A) Jonathan R. Davis	8/00	10/04
(E) James T. Norton	03/77	07/80	(E) Stephan G. MacDougall	10/00	11/00
(E) Redmond R. Condon	02/78	01/84	(E) James M. Evers	11/00	12/01
(E) George P. Adams	02/78	08/79	(E) James Knox	8/01	12/01
(A) Troy Y. Murray	10/78	07/79			(Continued)

MBTA RETIREMENT FUND***Introductory Section***

(E) James Crowley	01/02	03/03
(E) Roy L. Chance	02/02	12/02
(A) Wesley G. Wallace, Jr.	05/02	10/06
(E) Robert L. Callahan	03/03	02/06
(E) M. John Burr	03/03	12/03
(E) John S. Murray	01/04	02/05
(A) Brian J. Donohue	10/04	05/09
(E) James M. O'Brien	03/05	12/10
(E) Michael F. Mastrocola	02/06	06/06
(E) Daniel K. Burton	07/06	09/07
(A) Jeanne M. Morrison	10/06	03/15
(E) Lawrence C. Kelly	02/10	04/11
(E) Walter J. Novicki	01/11	12/11

(E) James M. O'Brien	05/11	12/13
(E) John A. Clancy	01/12	12/13
(A) Gerald K. Kelley	06/12	Present
(E) Margaret C. LaPaglia	01/14	02/18
(E) Lawrence C. Kelly	01/14	12/16
(E) Timothy P. Long	07/15	Present
(E) John D. Hunt	01/17	12/19
(E) Patrick Hogan	04/18	12/21
(A) Paul Brandley	03/18	05/19
(A) Mary Ann O'Hara	12/19	12/21
(A) Patrick Landers	01/22	Present
(E) Jose Cruz	01/22	Present
(E) John Mersereau	01/22	Present

(E) Employee Representative (A) Authority Representative

MBTA Retirement Fund Professional Services

KPMG LLP

Audit services

Segal Marco Advisors

Investment consulting services

Buck Global, LLC

Actuarial services

Holland & Knight

Legal Counsel

State Street Bank & Trust Company

Custodian

FINANCIAL SECTION



Independent Auditors' Report

The Retirement Board and Participants
Massachusetts Bay Transportation Authority Retirement Fund:

Opinion

We have audited the financial statements of the Massachusetts Bay Transportation Authority Retirement Fund (the Fund), as of and for the years ended December 31, 2021 and 2020 and the related notes to the financial statements, which collectively comprise the Fund's basic financial statements for the years then ended as listed in the table of contents.

In our opinion, the accompanying financial statements referred to above present fairly, in all material respects, the fiduciary net position of the Fund as of December 31, 2021 and 2020, and the changes in fiduciary net position for the years then ended in accordance with U.S. generally accepted accounting principles.

Basis for Opinion

We conducted our audits in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditors' Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the Fund and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with U.S. generally accepted accounting principles, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Fund's ability to continue as a going concern for twelve months beyond the financial statement date, including any currently known information that may raise substantial doubt shortly thereafter.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material

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KPMG LLP, a Delaware limited liability partnership and a member firm of the KPMG global organization of independent member firms affiliated with KPMG International Limited, a private English company limited by guarantee.



if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with GAAS, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Fund's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the Fund's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control related matters that we identified during the audit.

Required Supplementary Information

U.S. generally accepted accounting principles require that the management's discussion and analysis, the schedule of changes in net pension liability and related ratios, the schedule of investment returns, and the schedule of contributions be presented to supplement the basic financial statements. Such information is the responsibility of management and, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic, or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audits of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Supplementary Information

Our audits were conducted for the purpose of forming an opinion on the financial statements that collectively comprise the Fund's basic financial statements. The schedule of administrative expenses and the schedule of investment expenses and payments of consultants are presented for purposes of additional analysis and are not a required part of the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the basic financial statements. The information has been subjected to the

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auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the basic financial statements or to the basic financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In our opinion, the schedule of administrative expenses and the schedule of investment expenses and payments to consultants are fairly stated, in all material respects, in relation to the basic financial statements as a whole.

Other Information

Management is responsible for the other information included in the annual comprehensive financial report. The other information comprises the Introductory, Investment, Actuarial, Statistical, and the Frequently Asked Questions sections but does not include the basic financial statements and our auditors' report thereon. Our opinion on the basic financial statements does not cover the other information, and we do not express an opinion or any form of assurance thereon.

In connection with our audits of the basic financial statements, our responsibility is to read the other information and consider whether a material inconsistency exists between the other information and the basic financial statements, or the other information otherwise appears to be materially misstated. If, based on the work performed, we conclude that an uncorrected material misstatement of the other information exists, we are required to describe it in our report.

KPMG LLP

Boston, Massachusetts
June 21, 2022

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Management's Discussion and Analysis
December 31, 2021 and 2020
(Unaudited)**

This section presents Management's Discussion and Analysis (MD&A) of the Massachusetts Bay Transportation Authority Retirement Fund's (the Fund or MBTARF) financial activity and performance as of and for the years ended December 31, 2021 and 2020. The MD&A is unaudited and is intended to serve as an introduction to the Fund's basic financial statements, as well as to offer readers of the Fund's financial statements a narrative view and analysis of MBTARF's financial activities.

Financial Reporting Structure

The financial statements include the statements of fiduciary net position and changes in fiduciary net position. They present the financial position of the Fund as of December 31, 2021 and 2020 and its financial activities for the years then ended. The notes to the financial statements provide further information that is essential to a full understanding of the financial statements. The notes describe the significant accounting policies of the Fund and provide detailed disclosures on certain account balances. The required supplementary information includes the schedules of changes in net pension liability and related ratios, investment returns, contributions and related notes as prescribed by the Governmental Accounting Standards Board (GASB).

The Fund's financial statements are prepared on an accrual basis of accounting. This method of accounting requires recognizing and recording financial transactions when they occur and not just in conjunction with the inflows and outflows of cash.

The total assets managed by the Fund are held in the trust for the payment of pension and related benefits to its members. The Fund's Board of Trustees, in its fiduciary capacity, with assistance from its consultants established the Fund's investment policies and oversees their implementation.

Financial Highlights*Year ended December 31, 2021*

The net position of the Fund increased \$170.0 million, or 9.6%, from \$1,769.9 million as of December 31, 2020 to \$1,939.9 million as of December 31, 2021.

Net investment income increased \$3.8 million, or 1.7%, from \$228.6 million for the year ended December 31, 2020 to \$232.4 million for the year ended December 31, 2021. The Fund had a 13.88% rate of return for the year ended December 2021 compared to a 15.26% rate of return for the year ended December 31, 2020. The returns identified in the MD&A are gross of fees with the exception of hedge funds, which are net of fees.

The total contributions received during the year ended December 31, 2021 were \$166.7 million compared to total contributions received during the year ended December 31, 2020 of \$157.1 million.

Employer contributions during the year ended December 31, 2021 increased \$7.2 million or 6.2% to \$123.5 million from \$116.3 million during the year ended December 31, 2020.

Member contributions were \$43.2 million during the year ended December 2021, an increase of \$2.4 million or 5.9% over year ended December 31, 2020 member contributions of \$40.8 million.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
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(Unaudited)**

Benefits paid during the year ended December 31, 2021 were \$221.6 million a slight increase over year ended December 31, 2020 when benefits paid were \$221.4 million.

Year ended December 31, 2020

The net position of the Fund increased \$155.8 million, or 9.7%, from \$1,614.1 million as of December 31, 2019 to \$1,769.9 million as of December 31, 2020.

Net investment income decreased \$25 million, or 9.9%, from \$253.7 million for the year ended December 31, 2019 to \$228.6 million for the year ended December 31, 2020. The Fund had a 15.26% rate of return for the year ended December 2020 compared to a 18.4% rate of return for the year ended December 31, 2019. The returns identified in the MD&A are gross of fees with the exception of hedge funds, which are net of fees.

The total contributions received during the year ended December 31, 2020 were \$157.1 million compared to total contributions received during the year ended December 31, 2019 of \$139.6 million.

Employer contributions during the year ended December 31, 2020 increased \$13 million or 12.6% to \$116.3 million from \$103.3 million during the year ended December 31, 2019.

Member contributions were \$40.8 million during the year ended December 2020, an increase of \$4.4 million or 12.1% over year ended December 31, 2019 member contributions of \$36.4 million.

Benefits paid during the year ended December 31, 2020 were \$221.4 million an increase of \$0.8 million, or 0.4%, over the benefits paid during the year ended December 31, 2019 of \$220.6 million. This increase is not as significant in comparison from 2018 to 2019. The increase in benefits is due to rising final average compensation largely offset by the mortality rates during the pandemic and the ending of the retirement incentives by the Authority.

Year ended December 31, 2019

The net position of the Fund increased \$164.4 million, or 11.34%, from \$1,449.7 million as of December 31, 2018 to \$1,614.1 million as of December 31, 2019.

Net investment income increased \$305.8 million, or 587%, from (\$52.1) million for the year ended December 31, 2018 to \$253.7 million for the year ended December 31, 2019. The Fund had a 18.4% rate of return for the year ended December 2019 compared to a (3.08)% rate of return for the year ended December 31, 2018. The returns identified in the MD&A are gross of fees with the exception of hedge funds, which are net of fees.

The total contributions received during the year ended December 31, 2019 were \$139.6 million compared to total contributions received during the year ended December 31, 2018 of \$124.6 million.

Employer contributions during the year ended December 31, 2019 increased \$11.3 million or 12.3% to \$103.3 million from \$92 million during the year ended December 31, 2018.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Required Supplementary Information
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Member contributions were \$36.4 million during the year ended December 2019, an increase of \$3.8 million or 11.7% over year ended December 31, 2018 member contributions of \$32.6 million.

Benefits paid during the year ended December 31, 2019 were \$220.6 million an increase of \$2.2 million, or 1%, over the benefits paid during the year ended December 31, 2018 of \$218.4 million. This increase is primarily due to the rise in number of retirees and lengthening life span.

Financial Analysis

The following schedules report the condensed comparative fiduciary net position and activities for the Fund as of and for the years ended December 31, 2021.

Condensed Comparative Fiduciary Net Position

(Dollar values expressed in millions)

	December 31		
	2021	2020	2019
Cash	\$ 1.3	2.0	4.2
Receivables	9.4	10.2	7.7
Investments	1,934.3	1,768.1	1,608.9
Cash collateral on securities lending	17.5	26.9	22.5
Total assets	1,962.5	1,807.2	1,643.3
Cash collateral on securities lending	17.5	26.9	22.5
Accounts payable and accrued expenses	2.3	4.7	5.1
Payable for investments purchased	2.8	5.7	1.6
Total liabilities	22.6	37.3	29.2
Net position – restricted for pension benefits	\$ 1,939.9	1,769.9	1,614.1

Total assets at fair value were \$1,962.5 million as of December 31, 2021, an increase of \$155.3 million, or 8.6%, over the year ended December 31, 2020 and were \$1,807.2 million as of December 31, 2020, an increase of \$163.9 million, or 10.0%, over the year ended December 31, 2019. At December 31, 2021, investments at fair value were \$1,934.3 million, an increase of \$166.2 million, or 9.4%, over the year ended December 31, 2020, which were valued at \$1,768.1 million, an increase of \$159.2 million, or 9.9%, over the year ended December 31, 2019. This investment increase in 2021 is due to solid market returns in all asset classes. Private equity, private credit, and real estate investments were significant drivers of this year's performance. Fixed income returns were slightly positive considering the historically low interest rates. The Federal Reserve kept the low rates in effect for all of 2021.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Required Supplementary Information
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As of December 31, 2021, cash collateral on securities lending decreased by \$9.4 million or 34.9%, over the year ended December 31, 2020. The cash collateral on securities lending increased by \$4.4 million or 19.6%, between December 31, 2019 and December 31, 2020. Receivables decreased by \$0.8 million, or 7.8%, over the prior calendar year. Between December 31, 2019 and December 31, 2020 receivables increased by \$2.5 million, or 32.5%.

Total liabilities as of December 31, 2021 decreased by \$14.7 million, or 39.4% over the prior year, and increased by \$8.1 million, or 27.7% during calendar year 2020. The cash collateral on securities lending decreased by \$9.4 million, or 34.9%, in calendar year 2021 and increased by \$4.4 million, or 19.6%, in calendar year 2020. From December 31, 2020 through December 31, 2021, payable for investment purchased decreased by \$2.9 million, or 50.9%. From December 31, 2019 through December 31, 2020, payable for investment purchased increased by \$4.1 million, or 256%.

Condensed Comparative Statement of Changes in Fiduciary Net Position

(Dollar values expressed in millions)

	December 31		
	2021	2020	2019
Additions:			
Employer contributions	\$ 123.5	116.3	103.2
Member contributions	43.2	40.8	36.4
Income from investments	232.4	228.6	253.7
Total additions	399.1	385.7	393.3
Deductions:			
Retirement benefits	221.5	221.4	220.6
Refunds of contributions	3.2	4.0	3.3
Administrative expense	4.4	4.5	5.0
Total deductions	229.1	229.9	228.9
Total changes in fiduciary net position	\$ 170.0	155.8	164.4

Additions to Plan Fiduciary Position

For the calendar year ended December 31, 2021, employer contributions increased by \$7.2 million and member contributions increased by \$2.4 million. For the calendar year ended December 31, 2020, employer contributions increased by \$13.1 million and member contributions increased by \$4.4 million.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Management's Discussion and Analysis**

December 31, 2021 and 2020

(Unaudited)

For the year ending 2021, there were no changes to either the employer or the employee contribution rate and both were held at 26.6561% and 9.3339% respectively. The current rates were effective as of July 1, 2020, based on the 2019 actuarial report recommendation. The Board of Directors voted in 2021 and 2022 to make no change to the contribution rates. Contributions are required to provide benefits and meet administrative expenses and are made jointly by the Massachusetts Bay Transportation Authority (the Authority) and members. The member contribution percentage is negotiated periodically as part of the collective bargaining agreement.

There was a net investment gain in 2021 of \$232.4 million compared to a \$228.6 million net investment gain in 2020 and \$253.7 million net investment gain in 2019. The gain in 2021 is a result of continued increase in the fair value of the investment portfolio from solid markets performance.

Deductions from Fiduciary Net Position

Benefits paid increased by \$0.1 million and \$0.8 million, or 0.05% and 0.36%, over the years ended 2021 and 2020, respectively. These increases are primarily due to the rising final average compensation and lengthening life span. Administrative expenses decreased from \$4.5 million to \$4.4 million, a decrease of \$0.1 million or 2.2% over year 2020 and decreased \$0.5 million, or 10% over year 2019.

Net Pension Liability (NPL)

The Fund retains an independent actuarial firm, Buck Global, LLC, to conduct annual actuarial valuations to monitor the net pension liability.

As of December 31, 2021, and 2020, the fiduciary net position as a percentage of the total pension liability was 62.54% and 57.93%, respectively.

Investment Performance 2021

The Fund began the calendar year 2021 with a net position of \$1,769.9 million and ended the calendar year with a net position of \$1,939.9 million, representing a 9.6% increase. The Fund invests strategically to achieve the actuarial rate of return, while controlling risk through diversification of asset class exposure. The primary determinant of long-term investment performance is the strategic asset allocation policy.

Domestic equity 30.6%, international equity 14.1%, fixed income investments 22.1%, and cash equivalents 3.3% comprise approximately 70.1% of invested assets as of December 31, 2021. The remaining 29.9% of assets are invested in real estate 9.3%, and alternative investments 20.6%, which include private equity, absolute return, and diversified beta. These assets are expected to earn enhanced returns and manage risk through further diversification.

Investment performance results are measured by the relationship of the Fund's portfolio returns for equity and fixed income investment against widely accepted market indices. For the calendar year ended December 31, 2021, the MBTA Retirement Fund's total fund return was 13.9% compared to 15.3% for the calendar year ended December 31, 2020. The 2021 increase in return is attributed to the continued positive gains experienced in all asset classes. Investment classes with significant positive returns were in the small cap growth equity, large cap growth equity, real estate and private equity.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
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December 31, 2021 and 2020

(Unaudited)

The domestic large cap equity returned 27.2% compared to the S&P 500 Index of 28.7%. The domestic small cap equity returned 22.6% compared to the Russell 2000 Growth Index of 2.8% and the Russell 2000 Value Index of 28.3%. The global equity and emerging markets returned 8.5% compared to MSCI All Country World Index of 18.5%. The international equity returned 8.8% compared to the MSCI EAFE Index of 11.3%. Fixed Income returned 0.9% compared to the Bloomberg Aggregate of -1.5%.

The total fund performance of 13.9% for calendar year 2021 outperformed by 36 basis points, the total fund custom index (a blended composition of major market indices in proportion to the Fund's asset allocation), which returned 13.5%.

Additionally, for the year ended December 31, 2021, the real estate portfolio returned 18.8% compared to the NCREIF Property Index of 17.7%. The hedge fund portfolio returned 8.1% compared to the CSFB/Tremont Hedge Fund Index of 8.2%. The opportunistic portfolio returned 9.9% compared to Bank of America/Merrill Lynch High Yield Benchmark return of 5.4%. The private equity portfolio returned 31.7% compared to State Street's Private Equity benchmark return of 49.2%. The private credit portfolio returned 56.2% compared to State Street's Private Credit benchmark return of 25.3%. Diversified Beta returned 9.8% compared to the 60% MSCI World Eq / 40% Barclays Aggregate Bond return of 12.1%.

Investment Performance 2020

The Fund began the calendar year 2020 with a net position of \$1,614.1 million and ended the calendar year with a net position of \$1,769.9 million, representing a 9.7% increase. The Fund invests strategically to achieve the actuarial rate of return, while controlling risk through diversification of asset class exposure. The primary determinant of long-term investment performance is the strategic asset allocation policy.

Domestic equity 31.2%, international equity 15.2%, fixed income investments 23.2%, and cash equivalents 3.8% comprise approximately 73.4% of invested assets as of December 31, 2020. The remaining 26.6% of assets are invested in real estate 7.9%, and alternative investments 18.7%, which include private equity, absolute return, and diversified beta. These assets are expected to earn enhanced returns and manage risk through further diversification.

Investment performance results are measured by the relationship of the Fund's portfolio returns for equity and fixed income investment against widely accepted market indices. For the calendar year ended December 31, 2020, the MBTA Retirement Fund's total fund return was 15.3% compared to 18.4% for the calendar year ended December 31, 2019. The 2020 increase in return is attributed to the continued positive gains experienced in all asset classes. Active management, especially in the small growth and emerging markets area performed extremely well.

The domestic large cap equity returned 17.3% compared to the S&P 500 Index of 18.4%. The domestic small cap equity returned 23.2% compared to the Russell 2000 Growth Index of 34.6% and the Russell 2000 Value Index of 4.6%. The global equity and emerging markets returned 49.7% compared to MSCI All Country World Index of 16.3%. The international equity returned 11.3% compared to the MSCI EAFE Index of 7.8%. Fixed Income returned 7.7% compared to the BC Aggregate of 7.5%.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Management's Discussion and Analysis**

December 31, 2021 and 2020

(Unaudited)

The total fund performance of 15.3% for calendar year 2020 outperformed by 470 basis points, the total fund custom index (a blended composition of major market indices in proportion to the Fund's asset allocation), which returned 10.6%.

Additionally, for the year ended December 31, 2020, the real estate portfolio returned 1.2% compared to the NCREIF Property Index of 1.6%. The hedge fund portfolio returned 4.8% compared to the CSFB/Tremont Hedge Fund Index of 6.4%. The opportunistic portfolio returned 11.5% compared to Bank of America/Merrill Lynch High Yield Benchmark return of 6.2%. The private equity active portfolio returned 31.1% and the legacy private equity portfolio returned 17.0% compared to State Street's Customized Benchmark return of 12.3%. State Street Customized Benchmark consists of 36% buyout, 9% venture, 37% debt and 18% fund of funds. Diversified Beta returned 12.3% compared to the 60% MSCI World Eq / 40% Barclays Aggregate Bond return of 13.3%. The 91 Treasury Bill Plus 300 Basis Points returned 3.7% for the year ended December 31, 2020.

Other Information

As part of a Plan of Reorganization approved on March 27, 2014 in *In re: Fletcher Int'l, Ltd.*, No. 12-12796 (Bankr. S.D.N.Y.) (the Fletcher Bankruptcy), the Fund agreed with the Bankruptcy Trustee, Richard Davis, to pool claims against Alphonse "Buddy" Fletcher, Fletcher related entities, current and former officers, directors and insiders, and various third-party professionals for recovery of the Fund's investment in Fletcher Fixed Income Alpha Fund (Alpha). A Judgement was obtained against Buddy Fletcher personally, which appears to be uncollectible. Confidential settlements were also reached by the Trustee with other Fletcher related defendants. See, e.g., *MBTARF, et al. v. Citco Fund Services (Cayman Islands), Ltd., et al.*, Case No. 651446/2015 (New York Supreme Court).

Following the Trustee's report that the bankruptcy estate had been wound down and distribution of substantially all estate funds and moneys recovered on behalf of the estate had occurred, the Court entered its *Final Decree Pursuant to 11 U.S.C. Section 350 and Fed. R. Bankr. P. 2033 Closing the Chapter 11 Case*, and on March 21, 2019 the Fletcher Bankruptcy was officially closed. In December 2019, the Joint Voluntary Liquidators of Alpha in the Cayman Islands issued their final report and made their final distribution and repayment to the Fund in the sum of \$1,958,840.30. The Fund's only remaining interest in any Fletcher related entity in 2021 was a distributed share from Alpha of the Cayman liquidation of Fletcher Income Arbitrage, Ltd (Arbitrage). On January 10, 2022, the Joint Official Liquidators of Arbitrage issued their final report to creditors declaring a de minimis final dividend (less than a half cent on the dollar) and reported no further projected recoveries. More complete historical reporting about the Fund's investment in Fletcher is found in prior Fund ACFR's. See, e.g., Fund's 2013 ACFR at p. 19.

The Fund was also party to a Pooling and Cooperation Agreement (PCA) with other investors in Weston Capital Partners Fund II (PII) and investors in Wimbledon Financing Master Fund Ltd (WFF). On or about November 9, 2021, the Fund abandoned its interest in the PCA in exchange for a release from PII Investment Liquidation Company, LLC, the liquidator of PII. Both PII and WFF are funds previously managed by Weston Capital Asset Management LLC (Weston) and are now in liquidation. Weston and certain of its principals were the subject of an SEC consensual civil judgement in Florida on June 23, 2014 for an investment unrelated to PII. Civil litigation involving Weston and various related parties including insiders and investors is ongoing but winding down.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Management's Discussion and Analysis**

December 31, 2021 and 2020

(Unaudited)

A turnover proceeding filed by other Weston investors (Class TT) in New York has settled. *The Wimbledon Fund, SPC (Class TT) v. Weston Capital Partners Master Fund II, Ltd*, et al., Supreme Court New York, Index No. 160576/2017. Criminal proceedings involving Weston insiders resulted in guilty pleas and jury verdicts. See, e.g., *USA v. Bergstein, et.al*, No. 1:16-cr-746 (S.D.N.Y.) and *USA v. Galanis, et. al.*, No. 1:16-cr-371 (S.D.N.Y.).

For historical background on the Fund's investments in PII and White Oak Global Advisors, a PII investment assigned in-kind to the Fund, please see the Fund's 2013 ACFR at p. 19 and the Fund's 2015 ACFR at p. 31.

The Fund's investments in Alpha, Weston and White Oak were all written down in full in prior fiscal years. The Weston and White Oak funds remain in liquidations in the Cayman Islands which are expected to conclude without any further distributions in 2022.

The Fund is reporting on the pending litigation, liquidations and recovery efforts because of limited activity anticipated in those cases this coming fiscal year. Prospects for future recoveries are uncertain.

Contacting the MBTA Retirement Fund

This financial report is designed to provide a general overview of the Fund's investment results and financial condition of the Fund for the years ended December 31, 2021 and 2020. Please contact the MBTA Retirement Fund Office by emailing invest@mbtarf.com or by phone to 617-316-3800 for additional financial information or questions related to this report.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Statements of Fiduciary Net Position
December 31, 2021 and 2020

	<u>2021</u>	<u>2020</u>
Assets:		
Investments, at fair value:		
Domestic:		
Cash and cash equivalents	\$ 62,768,979	67,533,335
Fixed income	424,763,531	409,694,097
Common stock and equity funds	592,743,743	551,291,211
Real estate funds	179,905,942	140,448,890
Alternative investments and hedge funds	398,210,575	329,445,081
	<u>1,658,392,770</u>	<u>1,498,412,614</u>
International:		
Cash and cash equivalents	124,510	51,453
Fixed income	2,181,798	415,661
Common stock and equity funds	273,647,873	269,248,015
	<u>275,954,181</u>	<u>269,715,129</u>
Total investments	1,934,346,951	1,768,127,743
Cash and cash equivalents	1,274,199	1,978,002
Contribution receivable from Massachusetts Bay Transportation Authority	6,316,398	5,729,548
Cash collateral on securities lending, invested	17,474,343	26,882,055
Receivable for investments sold	3,063,525	4,511,160
Total assets	<u>1,962,475,416</u>	<u>1,807,228,508</u>
Liabilities:		
Cash collateral on securities lending, due to borrowers	17,474,343	26,882,055
Accounts payable and accrued expenses	2,293,999	4,653,187
Payable for investments purchased	2,764,649	5,751,990
Total liabilities	<u>22,532,991</u>	<u>37,287,232</u>
Net position – restricted for pension benefits	<u>\$ 1,939,942,425</u>	<u>1,769,941,276</u>

See accompanying notes to financial statements.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Statements of Changes in Fiduciary Net Position
For the years ended December 31, 2021 and 2020

	<u>2021</u>	<u>2020</u>
Additions:		
Contributions by Massachusetts Bay Transportation Authority	\$ 123,493,762	116,285,928
Contributions by members	<u>43,224,002</u>	<u>40,774,027</u>
Total contributions	<u>166,717,764</u>	<u>157,059,955</u>
Investment income:		
Income from investments	24,474,091	21,107,184
Less investment expenses, other than from securities lending	(6,537,963)	(5,905,655)
Net appreciation in fair value of investments	<u>214,422,255</u>	<u>213,386,051</u>
Net investment gain	<u>232,358,383</u>	<u>228,587,580</u>
Securities lending activity:		
Securities lending income	117,465	250,755
Less borrower rebates and fees	<u>(58,307)</u>	<u>(167,512)</u>
Net income from securities lending activities	<u>59,158</u>	<u>83,243</u>
Total net investment income	<u>232,417,541</u>	<u>228,670,823</u>
Total additions	<u>399,135,305</u>	<u>385,730,778</u>
Deductions:		
Retirement benefits	221,589,832	221,447,685
Refunds of members' contributions	3,177,839	3,974,655
Administrative expenses	<u>4,366,485</u>	<u>4,511,375</u>
Total deductions	<u>229,134,156</u>	<u>229,933,715</u>
Change in fiduciary net position	170,001,149	155,797,063
Net position restricted for pension benefits:		
Beginning of year	<u>1,769,941,276</u>	<u>1,614,144,213</u>
End of year	<u>\$ 1,939,942,425</u>	<u>1,769,941,276</u>

See accompanying notes to financial statements.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

(1) Description of the Fund

(a) General

The following description of the Massachusetts Bay Transportation Authority Retirement Fund (the Fund), a single employer defined benefit pension plan, provides only general information. Employees (members) should refer to the Pension Agreement for a more complete description of the Fund's provisions.

The Fund was established on January 1, 1948, under an agreement and declaration of trust (restated in October 28, 1980) by and among the Massachusetts Bay Transportation Authority (the Authority), Local 589, Amalgamated Transit Union, Boston Carmen's Union, and AFL CIO (collectively, the Union). The Fund was established as a contributory defined benefit retirement plan in accordance with the Pension Agreement, effective July 1, 1970, adopted by the Authority and the Union for the purpose of receiving contributions and providing pension benefits for its members and qualified beneficiaries.

The general administration and responsibility for the operation of the Fund are vested in a seven-member Retirement Board. The Board consists of three members appointed by the Authority (at least one of whom must be a member of the Authority's Board of Directors), two members appointed by the Boston Carmen's Union, Local Union 589 of the Amalgamated Transit Union, AFL CIO, one member elected by vote conducted by the Authority for a term of three years by members of the Fund who are not members of the Boston Carmen's Union, Local Union 589 of the Amalgamated Transit Union, AFL CIO, and one member, who has no vote and is known as the honorary member, who is elected, for such period as the Retirement Board may determine, by the other six members of the Retirement Board.

(b) Membership

The Fund covers all employees of the Authority except the MBTA Police, who are covered separately, and certain executives who elect coverage under an alternate plan. At December 31, 2021 and 2020, Fund membership consisted of:

	<u>2021</u>	<u>2020</u>
Retired members or beneficiaries currently receiving benefits	\$ 6,713 (1)	6,710 (2)
Active members	5,486	5,674
Active members not presently earning service credit	<u>215</u>	<u>342</u>
Total membership	\$ <u>12,414</u>	<u>12,726</u>

(1) Year 2021 includes 6,572 retirees and beneficiaries and 141 individuals receiving payments under Qualified Domestic Relation Orders (QDROs)

(2) Year 2020 includes 6,576 retirees and beneficiaries and 134 individuals receiving payments under Qualified Domestic Relation Orders (QDROs)

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

(c) Funding Policy

Contributions required to provide benefits and meet administrative expenses are made jointly by the Authority and members. The member contribution rate was increased from 8.8239% to 9.3339% effective July 1, 2020 of pretax compensation. The Authority contribution rate was increased from 25.1261% to 26.6561% effective July 1, 2020. As of July 1, 2022, member contribution and Authority contribution rates remain the same at 9.3339% and 26.6561%, respectively. These contribution rates were calculated based on the 2019 actuarial valuation of plan benefits and the Memorandum of Understanding with the Authority. The terms of the Fund's obligations are part of the Pension Agreement contained in the annual report of the Fund. Only parties to the Pension Agreement can amend the terms. The contributions by members and the Authority have been developed to provide normal contributions, interest on the unfunded accrued liability, and administrative expenses.

(d) Benefits

The Fund provides for retirement, disability and death benefits in accordance with the Pension Agreement, as amended.

A summary of benefits is as follows:

i. Normal Retirement Allowance*Condition for Allowance*

Any member may retire at age 65. A member may remain in service after the stated retirement date.

Amount of Allowance

The normal retirement allowance equals 2.46% of 3-year average annual compensation multiplied by the years of service, such allowance not to exceed 75% of such average annual compensation.

ii. Early Normal Retirement Allowance*Condition for Allowance*

Any member hired prior December 6, 2012 and has completed at least 23 years of service may retire on an early normal retirement allowance.

Any member hired on or after December 6, 2012, has attained age 55 and completed at least 25 years of service may retire on an early normal retirement allowance.

Amount of Allowance

The early normal retirement allowance is computed in the same manner as a normal retirement allowance on the basis of the compensation and service to the time of retirement.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

*iii. Early Reduced Retirement Allowance**Condition for Allowance*

A member who has attained age 55 and has completed at least 20 years of service may be retired on an early reduced retirement allowance.

Amount of Allowance

The early reduced retirement allowance is an immediate allowance, commencing at the date of retirement, and is computed in the same manner as a normal retirement allowance on the basis of compensation and service to the time of early retirement, but reduced by 1/2 of 1% for each month of retirement prior to normal retirement date.

*iv. Disability Retirement Allowance**Condition for Allowance*

Any member who has completed 4 years of service in case of disablement due to an occupational accident or sickness, or who has completed 6 years of service in case of disablement due to any other cause, and who has become totally and permanently incapacitated, mentally or physically, for the further performance of duty may be retired.

Amount of Allowance

Upon disability retirement, a member receives an allowance commencing immediately, which is computed as a normal retirement allowance on the basis of the compensation and service to the time of disability retirement and is not less than 15% of the member's 3-year average annual compensation.

*v. Vested Retirement Allowance**Condition for Allowance*

Any member who has completed 10 years of service and who is not eligible for a retirement allowance is eligible for a vested retirement allowance, in lieu of a refund of his/her contributions with interest, in the event his/her employment terminates for reasons other than voluntary quit or discharge for cause.

Amount of Allowance

The vested retirement allowance is a deferred allowance commencing on the member's normal retirement date and equal to a percentage, not exceeding 100%, of the amount computed as a normal retirement allowance on the basis of the compensation and service to the time of termination; the applicable percentage is 5% multiplied by the number of years of creditable service, not in excess of 20, at the time of termination.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

*vi. Survivor Benefit**Condition for Benefit*

Upon the death of a member who has completed 10 years of service and who is survived by a spouse and/or dependent children designated to receive the deceased member's contributions with interest, a benefit may be elected by such survivor in lieu of the payment of the contributions with interest.

Amount of Benefit

If the deceased member had completed at least 10 but fewer than 23 years of service, the survivor's benefit, payable for life, is equal to the amount which would have become payable if the member had retired as of the date of his/her death and elected a 50% joint and survivor option in effect as of the date of death with the survivor as the designated person under the option. There is no reduction for early commencement.

If the deceased member had completed at least 23 years of service, the survivor's benefit, payable for life, is equal to the amount which would have become payable if the member had retired as of the date of his/her death and elected a 100% joint and survivor option in effect as of the date of death with the survivor as the designated person under the option. There is no reduction for early commencement.

*vii. Accidental Death Benefit**Condition for Benefit*

Upon the death of a member in service whose death results solely from an injury or injuries sustained in the performance of duty, and who is survived by a spouse designated to receive the deceased member's contribution with interest, an allowance shall be payable to said spouse.

Amount of Benefit

The accidental death benefit, payable for life, is equal to the amount which would have become payable to the member if the member had retired as of the date of his/her death on a disability retirement allowance. If there should be insufficient creditable service, the surviving spouse receives the minimum allowance available under the disability retirement provision.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

(e) Fund Termination

In the event of termination of the Fund, all of the assets of the Fund shall be used for the benefit of members and retired members or their beneficiaries, and for no other purpose. Each member, and each retired member or their designated beneficiary in receipt of a retirement allowance, shall be entitled to such proportionate part of the assets of the Fund as the reserve, required for their benefits, bears to the total reserves required under the Fund as determined by the Massachusetts Bay Transportation Authority Retirement Board (the Retirement Board) on the basis of actuarial valuation. The Retirement Board may require all such members, and retired members or designated beneficiaries, to withdraw such amounts in cash or in the form of immediate or deferred annuities as it may determine.

(2) Significant Accounting Policies**(a) Basis of Accounting**

The financial statements have been prepared on the accrual basis of accounting in conformity with U.S. generally accepted accounting principles (GAAP), as promulgated by the Governmental Accounting Standards Board (GASB).

(b) Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the dates of the financial statements and the reported amounts of additions and deductions during the reporting periods. Actual results could differ from estimates.

(c) Cash and Cash Equivalents

Cash and cash equivalents generally consist of cash on deposit with banks and financial institutions and highly liquid short-term investments, which have original maturities of three months or less. The Fund maintains its cash deposits with financial institutions, which management considers being of high credit quality and, by policy, limits the allocation of funds to any single major financial institution to minimize the Fund's amount of credit exposure.

(d) Revenue Recognition

Contributions are recognized pursuant to the contractual requirements of the Pension Agreement. Investment income is recognized as it is earned. Net appreciation (depreciation) in the fair value of investments is recorded as an increase (decrease) to investment income based on the valuation of investments as of the date of the financial statements.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

(e) Retirement Benefits and Refunds

Retirement benefits and refunds are recognized when they become due and payable.

(f) Investments

Investments are stated at fair value. Securities traded on national security exchanges are valued on the basis of the closing price as of the last business day of the reporting period. Securities traded in the over-the-counter market are normally valued at the mean of the closing bid and ask prices. Securities listed or traded on certain foreign exchanges whose operations are similar to the U.S. over-the-counter market are valued at the price within the limits of the latest available current bid and ask prices deemed best to reflect current value. Gains and losses on sales of investments are determined on the basis of average cost.

Investments in real estate represent the Fund's percent ownership in private real estate funds. The Fund's investments are valued based on estimates by the Fund's management as a result of their review of financial information of the underlying real estate investment assets and standards established by the real estate industry, generally using the net asset value of the underlying investment as a practical expedient.

Investments in alternative investments and hedge funds include the Fund's percent ownership in venture capital, leveraged buyouts, private placements, hedge fund-of-funds, and other investments where the structure, risk profile, and return potential differ from traditional equity and fixed income investments. These investments are included in the statement of fiduciary net position at estimated values determined in good faith by the Fund's management, generally using the net asset value of the underlying investment as a practical expedient.

Purchase and sales of investments are selected on a trade-date basis.

(g) Derivatives

A derivative is an investment agreement or security with a value that depends on, or is derived from, the value of an underlying asset, reference rate, or financial index. The Fund has classified its investment in forward exchange contracts as investment in derivative instruments. A forward exchange contract is a commitment to purchase or sell a foreign currency at a future date at a negotiated forward rate. The Fund utilizes forward foreign exchange contracts to minimize the effect of fluctuating foreign currencies. Risk associated with such contracts includes movement in the value of a foreign currency relative to the U.S. dollar. Realized gain or loss on forward exchange contracts is the difference between the original contract and the closing value of such contract and is included in the statement of changes in fiduciary net position. At December 31, 2021 and 2020, the Fund held open forward exchange contracts of varying amounts and currencies. Unrealized gains and losses are not significant to the financial statements.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

(h) Currency Translation

As a result of having assets and liabilities denominated in foreign currencies, the Fund is exposed to the effect of foreign exchange rate fluctuations. Assets and liabilities denominated in foreign currencies and commitments under forward foreign exchange contracts and currency options are translated into U.S. dollars at the mean of the quoted bid and ask prices of such currencies against the U.S. dollar. Changes in foreign exchanges are reflected directly in income. Purchases and sales of portfolio securities are translated at the rates of exchange prevailing when such securities were acquired or sold. Income and expenses are translated at rates of exchange prevailing when accrued. It is not practical to isolate that portion of the results of operations arising as a result of changes in the foreign exchange rates from the fluctuations arising from changes in the market price of securities during the period. Net realized gains on foreign currency transactions represent net foreign exchange gains from holding foreign currencies, currency gains or losses realized between the trade and settlement dates on security transactions, and the difference between the amounts of dividends, interest, and foreign taxes recorded on the Fund's books and the U.S. dollar equivalent amounts actually received or paid.

(i) Income Taxes

The Fund is considered a qualified governmental plan under Internal Revenue Code Section 414(d) and, is generally exempt from federal and state income tax under the Internal Revenue Code Section 115.

(3) Cash Deposits, Investments, and Securities Lending

The Fund, in accordance with the declaration of trust agreement, is authorized to make deposits into checking and savings accounts and to invest in any form or type of investment, financial instrument, or financial transaction deemed prudent in the informed opinion of the Retirement Board. State Street Bank & Trust Company serves as the master custodian for the Fund's assets.

For the years ended December 31, 2021 and 2020, the Fund's essential risk information about deposits and investments is presented on the following tables.

(a) Custodial Credit Risk

Custodial credit risk is the risk that, in the event of failure of a depository financial institution, the Fund's deposits may not be returned. The Fund maintains its cash and cash equivalent deposits with various financial institutions, which management considers being of high quality. The Fund limits the allocation of its cash and cash equivalent deposits to any single financial institution to minimize the Fund's exposure. The Fund's Board has not adopted a formal custodial credit risk policy.

The Fund's cash and cash equivalent deposits that are not collateralized are subject to the Federal Deposit Insurance Corporation (FDIC) insurance limits. At December 31, 2021 and 2020, \$844,214 and \$1,578,002 of the Fund's cash and cash equivalents deposits were in excess of the FDIC insurance limit.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements

December 31, 2021 and 2020

Investment securities are exposed to custodial credit risk if the securities are uninsured, are not registered in the name of the Fund and are held by either the depository financial institution or the depository financial institution's trust department or agent but not in the Fund's name.

All of the Fund's investments are held by the Fund's custodian in the Fund's name, except for investments in hedge funds, real estate and alternative investments, which by their nature are not required to be categorized.

(b) Investment Policy

The Fund's investment objective is to achieve consistent positive real returns and to maximize long term total return within prudent levels of risk through a combination of income and capital appreciation. The Fund's goal is to meet or exceed the Fund's actuarial target rate of return in order to maintain and improve upon its funded status.

The Fund is currently invested in stocks (domestic and foreign), fixed income securities (domestic), real estate, private equity, and hedge funds.

The following was the Board's adopted asset allocation policy as of December 31, 2021 and 2020:

<u>Asset class</u>	<u>2021 Target</u>	<u>2020 Target</u>
Domestic equity	24 %	24 %
International large cap equity	9	9
International small cap equity	2	2
Global/emerging markets	8	8
Fixed income	23	23
Real estate	9	9
Private equity	8	8
Private credit	2	2
Hedge funds	5	5
Hedge funds – opportunistic	2	2
Risk parity/diversified beta	6	6
Cash	2	2
Total	<u>100 %</u>	<u>100 %</u>

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Notes to Financial Statements
December 31, 2021 and 2020

(c) Interest Rate Risk

Interest rate risk is the risk that changes in interest rates will adversely affect the fair value of an investment. The following is a listing of the Fund's fixed income investments and related maturity schedule (in years) as of December 31, 2021 and 2020:

Investment type	2021				
	Fair value	Less than 1	1-5	6-10	More than 10
Agency debt	\$ 3,531,828	-	1,467,090	673,979	1,390,759
U.S. Treasury notes & bonds	113,235,825	7,875,402	61,536,718	28,745,383	15,078,322
Domestic corporate	231,643,225	1,538,703	104,755,312	44,432,047	80,917,164
International corporate	2,181,798	265,402	1,595,586	-	320,810
Asset Backed:					
CMOs	15,480,527	-	168,115	-	15,312,412
Mortgage backed	36,528,750	-	-	752,973	35,775,777
Other	24,343,376	-	6,211,036	2,470,846	15,661,493
	<u>\$ 426,945,329</u>	<u>9,679,507</u>	<u>175,733,857</u>	<u>77,075,228</u>	<u>164,456,737</u>

Investment type	2020				
	Fair value	Less than 1	1-5	6-10	More than 10
Agency debt	\$ 4,154,608	272,989	1,147,771	1,942,033	791,815
U.S. Treasury notes & bonds	96,217,874	381,524	52,886,817	24,407,877	18,541,656
Domestic corporate	238,316,675	1,306,965	102,227,675	41,901,352	92,880,682
International corporate	415,661	—	95,207	138,312	182,142
Asset backed:					
CMOs	15,594,644	—	—	1,409,500	14,185,144
Mortgage backed	32,215,052	—	—	1,056,540	31,158,512
Other	23,195,244	273,682	8,618,988	1,918,713	12,383,862
	<u>\$ 410,109,758</u>	<u>2,235,160</u>	<u>164,976,458</u>	<u>72,774,327</u>	<u>170,123,813</u>

The Fund's guidelines limit its effective exposure to interest rate risk by benchmarking the separately managed fixed income investment accounts to an intermediate duration benchmark with a weighted average duration of four to five years. The Fund further constrains its actively managed fixed income portfolios to maintain a duration that shall not exceed 1.5 times the benchmark duration. The manager of each fixed income portfolio is responsible for determining the maturity and commensurate returns of his/her portfolio. Fixed income managers are also expected to report risk statistics and give a description of portfolio characteristics, including quality, duration, allocation by security type, and yield to maturity.

The collateralized mortgage obligations (CMOs) held by the Fund at December 31, 2021 and 2020 are highly sensitive to changes in interest rates.

(Continued)

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY RETIREMENT FUND

Notes to Financial Statements
December 31, 2021 and 2020

(d) Credit Risk

Credit risk exists when there is a possibility the issuer or other counterparty to an investment may be unable to fulfill its obligations.

The Fund's Board does not have a formal investment policy governing credit risk; each fixed income securities investment manager is given a specific set of guidelines to invest within based on the mandate for which it was hired. The Fund expects all investment managers to perform their fiduciary duties as prudent people would and conform to all state and federal statutes governing the investment of the funds. Managers are to adhere to the philosophy and style that was articulated to the Retirement Board at the time of hire. The fixed income investment managers have full discretion to invest in fixed income securities in order to exceed their strategy specific benchmarks.

The Fund's fixed income investments as of December 31, 2021 and 2020 were rated by Standard and Poor's and/or an equivalent national rating organization, and the ratings are presented below using the Standard & Poor's rating scale:

Investment type	2021								
	Fair value	AAA	AA	A	BBB	BB	B	CCC**	Not Rated
Agency debt	\$ 3,531,828	—	1,625,640	1,060,086	846,102	—	—	—	—
Domestic corporate	231,643,225	53,571,798	903,022	16,095,452	66,137,936	24,480,916	64,138,600	1,789,110	4,526,392
International	2,181,798	—	553,916	—	320,810	467,361	—	72,812	766,899
Asset backed:									
CMOs	15,480,527	5,185,617	207,758	251,959	146,518	—	—	—	9,688,675
Mortgage backed	36,528,750	—	—	—	—	—	—	—	36,528,750
Other	24,343,376	6,149,758	1,137,505	4,109,375	3,875,807	—	172,905	—	8,898,025
Total credit securities risk	313,709,504	64,907,173	4,427,841	21,516,872	71,327,173	24,948,277	64,311,505	1,861,922	60,408,741
U.S. government fixed income securities*	113,235,825								
Total fixed income securities	\$ 426,945,329								

Investment type	2020								
	Fair value	AAA	AA	A	BBB	BB	B	CCC**	Not Rated
Agency debt	\$ 4,154,608	—	2,588,252	1,066,436	499,920	—	—	—	—
Domestic corporate	238,316,674	54,136,939	2,378,546	19,612,591	79,068,867	19,606,833	53,766,074	3,334,690	6,413,134
International	415,661	—	—	—	—	—	—	44,976	370,685
Asset backed:									
CMOs	15,594,644	3,475,345	177,528	79,734	59,626	—	58,499	—	11,743,912
Mortgage backed	32,215,052	—	—	—	—	—	—	—	32,215,052
Other	23,195,245	5,984,670	670,028	3,237,498	3,302,004	—	220,309	—	9,780,736
Total credit securities risk	313,891,884	63,595,954	5,814,354	23,996,259	82,930,417	19,606,833	54,044,882	3,379,666	60,523,519
U.S. government fixed income securities*	96,217,874								
Total fixed income securities	\$ 410,109,758								

* Obligations of the U.S. government or obligations explicitly guaranteed by the U.S. government are not considered to have credit risk.

** The rating associated with this investment grade can be between C to CCC.

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(e) Concentration Risk

Concentration of credit risk is the risk of loss that may be attributed to the magnitude of a government's investment in a single issuer. The Fund places a 5% limit on the individual exposure to any single issuer at the time of purchase. The Fund has no investments with the exception of commingled funds, at fair value, that exceed 5% of the Fund's total investments as of December 31, 2021 and 2020. The Fund does have investments in individual commingled funds and trusts that represent more than 5% of the Fund's assets, but in each case, these investments are in institutional commingled funds that are invested in diversified portfolios.

(f) Foreign Currency Risk

Foreign currency risk is the risk that changes in exchange rates will adversely affect the fair value of an investment or a deposit. The Fund's exposure to foreign currency risk is attributable to its investments in separately managed and commingled international equity mutual funds and trusts that are invested in diversified portfolios of international stocks that are denominated in foreign currencies. The Fund's combined policy target allocation to all non-U.S. securities is currently 19.0% of the Fund's total assets. Currency hedging is permitted for defensive purposes. Currency hedging shall be effected through the use of forward currency contracts, which are described more fully in note 2.

Risk of loss arises from changes in currency exchange rates. The Fund's exposure to foreign currency risk as of December 31, 2021 and 2020 are presented on the following tables:

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Currency	2021			
	Short-Term	Fixed Income	Equity	Total
Argentine peso	\$ 41,347	99,356	—	140,703
Australian dollar	—	—	4,704,003	4,704,003
Brazilian real	—	467,361	—	467,361
Canadian dollar	84,585	—	5,066,734	5,151,319
Danish krone	—	—	732,597	732,597
Euro currency	(1,422)	—	42,728,698	42,727,276
Hong Kong dollar	—	—	7,640,710	7,640,710
Indian rupee	—	792,774	7,227,804	8,020,578
Japanese yen	—	—	31,635,773	31,635,773
Mexican peso	—	822,307	—	822,307
New Israeli sheqel	—	—	284,638	284,638
New Taiwan dollar	—	—	1,327,213	1,327,213
Norwegian krone	—	—	26,962	26,962
Pound sterling	—	—	20,942,924	20,942,924
Singapore dollar	—	—	2,994,924	2,994,924
Swedish krona	—	—	4,370,433	4,370,433
Swiss franc	—	—	2,611,750	2,611,750
Thailand baht	—	—	1,770,442	1,770,442
International equity pooled funds (various currencies)	—	—	139,582,269	139,582,269
	124,510	2,181,798	273,647,874	275,954,182
United States dollars (securities held by international investment managers)	—	—	7,416,106	7,416,106
Total International Investment Securities	\$ 124,510	2,181,798	281,063,980	283,370,288

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
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December 31, 2021 and 2020

		2020			
<u>Currency</u>		<u>Short-Term</u>	<u>Fixed Income</u>	<u>Equity</u>	<u>Total</u>
Argentine peso	\$	10,273	95,207	—	105,480
Australian dollar		—	—	3,882,001	3,882,001
Canadian dollar		33,824	182,142	3,556,441	3,772,407
Danish krone		—	—	850,434	850,434
Euro currency		6,248	—	44,172,069	44,178,317
Hong Kong dollar		—	—	9,467,786	9,467,786
Indian rupee		—	—	7,087,236	7,087,236
Japanese yen		1,148	—	33,610,814	33,611,962
New Israeli sheqel		—	—	347,270	347,270
New Zealand dollar		—	—	169,620	169,620
Norwegian krone		—	—	325,433	325,433
Pound sterling		—	138,312	16,184,353	16,322,665
Singapore dollar		—	—	2,848,819	2,848,819
Swedish krona		—	—	5,820,795	5,820,795
Swiss franc		(40)	—	3,597,883	3,597,843
Thailand baht		—	—	2,783,247	2,783,247
International equity pooled funds (various currencies)		—	—	134,543,814	134,543,814
		51,453	415,661	269,248,015	269,715,129
United States dollars (securities held by international investment managers)		—	—	13,246,888	13,246,888
Total International Investment Securities	\$	<u>51,453</u>	<u>415,661</u>	<u>282,494,903</u>	<u>282,962,017</u>

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(g) Securities Lending Transactions

The Fund participates in the State Street Bank and Trust Company securities lending program by lending securities to borrowers (subject to borrower limits and program guidelines) and earning additional income, which is included in net investment income in the statement of changes in fiduciary net position. The lending program loans domestic and international equities, real estate investment trusts and fixed income securities for collateral with a concurrent agreement to return the collateral for the same securities in the future.

The Fund did not incur any losses on loaned securities during the year ended December 31, 2021 and 2020. The securities are monitored and valued on a daily basis by the custodian to ensure that the loans are properly collateralized. The collateral value is required to be at least 102% of the fair value of loaned domestic investments and a collateral value of at least 105% of the fair value on loaned international investments. Collateral can consist of both cash and securities. Should the collateral percentage levels fall below the stated figures, the borrowers are required to provide additional collateral to proper levels. The indemnification that State Street Bank provides the Fund in regard to loan risk is that should a borrower default on returning a security from loan, the collateral held is used to buy the security to be returned to the Fund. Any shortfall of proceeds to purchase the securities is taken on by State Street Bank. Since loans are terminable at will, loan durations do not generally match the duration of the investments made with the cash collateral.

Loaned securities are included in the statement of fiduciary net position since the Fund maintains ownership. For loans collateralized by cash, the value of the collateral is recorded as a liability offsetting the cash collateral recorded as an asset. The cash collateral as of December 31, 2021 and 2020 was \$17,474,343 and \$26,882,055 respectively. For loans having collateral other than cash, the related collateral securities are not recorded as assets in the statement of fiduciary net position, and a corresponding liability is not recorded, since the Fund cannot pledge or sell the collateral securities, except in the event of a borrower's default.

At December 31, 2021 and 2020, the fair value of loaned securities outstanding, included in investments, was approximately \$17,085,222 and \$26,194,642, respectively.

(h) Commitments

At December 31, 2021 and 2020, the Fund had contractual commitments to provide approximately \$118.4 million and \$104.4 million, respectively, of additional funding for alternative investments and real estate.

(i) Money-Weighted Rate of Return

The annual money-weighted rate of return on the Fund's investments calculated as the internal rate of return on the pension fund net of investment expenses for the years ended December 31, 2021 and 2020 is 13.23% and 14.22%, respectively. A money weighted return expresses investment performance net of pension plan investment expense, adjusted for the changing amounts actually invested.

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
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Notes to Financial Statements

December 31, 2021 and 2020

(4) Fair Value Measurements

The Fund measures and records its investments using fair value measurement guidelines established by generally accepted accounting principles. The fair value gives the highest priority to unadjusted quoted prices in active markets for identical assets and liabilities (Level 1) and the lowest priority to unobservable inputs (Level 3). These levels of the fair value hierarchy are described below:

- Level 1 – Unadjusted quoted prices for identical assets or liabilities in active markets
- Level 2 – Observable inputs other than quoted prices in active markets for identical assets and liabilities. Level 2 inputs include the following:
 - Quoted prices for similar assets and liabilities in active markets
 - Quoted prices for identical or similar assets or liabilities in markets that are not active
 - Inputs other than quoted prices that are observable for the asset or liability, such as:
 1. Interest rates and yield curves observable at commonly quoted intervals
 2. Implied volatilities
 3. Credit spreads
- Level 3 – Unobservable inputs for the asset or liability (i.e., supported by little or no market activity). Level 3 inputs include management's assumptions.

The following tables set forth by fair value hierarchy level, the Fund's assets carried at fair value December 31, 2021 and 2020:

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	Total at December 31, 2021	Fair value measurements using:		
		Quoted prices in active markets for identical assets (Level 1)	Significant other observable inputs (Level 2)	Significant unobservable inputs (Level 3)
Cash equivalents:				
Active cash	9,013,990	9,013,990	-	-
International cash and equivalents	124,510	124,510	-	-
STIF-type instrument	53,754,989	53,754,989	-	-
Total cash equivalents	62,893,489	62,893,489	-	-
U.S. equities:				
Common stock	270,780,183	270,780,183	-	-
Depository receipts	20,097,162	20,097,162	-	-
Mutual funds	296,563,106	296,563,106	-	-
Preferred stock	1,104,336	1,104,336	-	-
Real estate investment trust	4,198,956	4,198,956	-	-
Total U.S. equities	592,743,743	592,743,743	-	-
International equities - common stock	273,647,873	273,647,873	-	-
Fixed income:				
Agency debt	3,531,828	-	3,531,828	-
U.S. treasury notes and bonds	113,235,825	-	113,235,825	-
Domestic corporate	231,643,225	-	230,745,705	897,520
Asset backed:				
CMO	15,480,527	-	15,480,527	-
Mortgage-backed	36,528,750	-	36,528,750	-
Other asset backed	24,343,376	-	24,343,376	-
Total U.S. fixed income	424,763,531	-	423,866,011	897,520
International fixed income - bonds	2,181,798	-	2,181,798	-
Total investments by fair value level	1,356,230,434	929,285,105	426,047,809	897,520
Total investments measured at net asset value (NAV):				
Hedge fund of funds	218,588,765			
Private equity funds	179,621,810			
Private real estate funds	179,905,942			
Total investments measured at NAV	578,116,517			
Total investments	1,934,346,951			

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	Total at December 31, 2020	Fair value measurements using:		
		Quoted prices in active markets for identical assets	Significant other observable inputs	Significant unobservable inputs
		(Level 1)	(Level 2)	(Level 3)
Cash equivalents:				
Active cash	10,580,463	10,580,463	-	-
International cash and equivalents	51,453	51,453	-	-
STIF-type instrument	55,253,032	55,253,032	-	-
Treasury bill	1,699,840	-	1,699,840	-
Total cash equivalents	67,584,788	65,884,948	1,699,840	-
U.S. equities:				
Common stock	253,408,639	253,408,639	-	-
Depository receipts	21,568,498	21,568,498	-	-
Mutual funds	272,909,646	272,909,646	-	-
Preferred stock	1,165,166	1,165,166	-	-
Real estate investment trust	2,239,262	2,239,262	-	-
Total U.S. equities	551,291,211	551,291,211	-	-
International equities - common stock	269,248,015	269,248,015	-	-
Fixed income:				
Agency debt	4,154,608	-	4,154,608	-
U.S. treasury notes and bonds	96,217,874	-	96,217,874	-
Domestic corporate	238,316,674	-	234,153,194	4,163,480
Asset backed:				
CMO	15,594,644	-	15,594,644	-
Mortgage-backed	32,215,052	-	32,215,052	-
Other asset backed	23,195,245	-	23,195,245	-
Total U.S. fixed income	409,694,097	-	405,530,617	4,163,480
International fixed income - bonds	415,661	-	415,661	-
Total investments by fair value level	1,298,233,772	886,424,174	407,646,118	4,163,480
Total investments measured at net asset value (NAV):				
Hedge fund of funds	176,733,000			
Private equity funds	152,712,081			
Private real estate funds	140,448,890			
Total investments measured at NAV	469,893,971			
Total investments	1,768,127,743			

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
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Commingled funds are typically structured as an investment vehicle created by the Investment Manager to execute a specific investment strategy. Some investment strategies are only pursued by commingled accounts. Mutual funds and/or other types of commingled investment vehicles, including, but not limited to, Alternative Investments, may provide lower costs and better diversification than can be obtained with a separate account that pursues the same investment objectives. The fair value of the hedge fund of funds, private equity funds and real estate funds are not rated funds. The fair values of these funds are based on net asset value calculated in accordance with the general partner's fair valuation policy as of the measurement date and are annually audited separately.

The following represents the significant investment strategies and terms on which the Fund may redeem investments for those investments measured at the NAV (or its equivalent) as a practical expedient:

	Fair Value December 31, 2021	Fair Value December 31, 2020	Total Unfunded Commitments as of December 31, 2021	Redemption Frequency if Currently Eligible	Redemption Notice Period
Hedge fund of funds					
Diversified beta ¹	\$ 123,788,181	\$ 112,947,401	\$ -	monthly	15-30 days
Fund of hedge fund ²	81,398,857	56,597,537	25,000,000	quarterly	30-90 days
Opportunistic hedge fund ³	13,401,727	7,188,062	6,191,963	N/A	N/A
Private equity funds ⁴	179,621,810	152,712,081	87,214,737	N/A	N/A
Private real estate funds					
Open-ended real estate funds ⁵	160,291,065	121,676,506	-	quarterly	30 days - 1 year
Closed-end real estate funds ⁶	19,614,877	18,772,384	-	N/A	N/A
Total Investments Measured at NAV	\$ 578,116,517	\$ 469,893,971	\$ 118,406,700		

¹ This category includes two diversified beta investment managers who utilize a risk premium capture strategy that seeks to generate returns by investing in equity, bond and commodity markets using a risk balanced investment process. The managers provide monthly liquidity with either 15 or 30-day notification.

² This category includes two fund of hedge fund managers; the managers provide quarterly liquidity with 30 – 90-day notice.

³ This category includes one opportunistic hedge fund manager who is not subject to redemption and is normally returned through distributions as a result of the liquidation of the underlying assets over a period of approximately three to seven years.

⁴ This type includes private equity funds that invest in nonmarketable securities of private companies, which ultimately may become public in the future and whose strategies include buyout, growth equity, venture, mezzanine debt, distressed debt, secondary fund of funds or special situations. Generally, each fund in this category may not be subject to redemption and is normally returned through distributions as a result of liquidation of the underlying assets over a weighted average period of approximately nine years.

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

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⁵ This category includes six open ended real estate funds that invest directly in real estate and real estate related assets, including retail, industrial, office, residential and hotels. Investments in this category can be redeemed quarterly upon 30 days to one year notice.

⁶ This category includes funds that invest directly in real estate and real estate related assets, including retail, industrial, office, residential and hotels. Generally, investment in each fund in this category may not be subject to redemption and is normally returned through distributions as a result of the liquidation of the underlying assets over a weighted average period of approximately seven or more years.

(5) Related-Party Transactions

The Fund invests certain cash in a money market fund, the State Street Bank and Trust Company Short Term Investment Fund, which is sponsored by the Fund's custodial bank. The total value of the funds held at December 31, 2021 and 2020 was \$53,754,989 and \$55,253,032, respectively.

The Fund invests in the AFL CIO Housing Investment Trust and the AFL CIO Building Investment Trust, two for profit investment programs of the AFL CIO. The total value of AFL CIO Housing Investment Trust at December 31, 2021 and 2020 was \$53,571,798 and \$54,135,939, respectively. The total value of AFL CIO Building Investment Trust at December 31, 2021 and 2020 was \$18,782,796 and \$16,667,032, respectively.

(6) Net Pension Liability

The components of the net pension liabilities of the MBTA Retirement Fund as of December 31, 2021 and 2020 are shown as follows (amounts in thousands):

	<u>2021</u>	<u>2020</u>
Total pension liability	\$ 3,101,704	3,055,123
Plan fiduciary net position	<u>(1,939,942)</u>	<u>(1,769,941)</u>
Fund's net pension liability	<u>\$ 1,161,762</u>	<u>1,285,182</u>
Plan fiduciary net position as a percentage of total pension liability	62.54 %	57.93 %

Actuarial Assumptions

The total pension liability was determined by an actuarial valuation as of December 31, 2021 and 2020, using the following actuarial assumptions:

- As of December 31, 2021, a table of increases based on years of service, with rates of increase declining from 8% per year for the newly hired to 2.75% per year with 15 or more years of service.
- Investment rate of return compounded annually in 2021 and 2020 of 7.25% per annum.
- Inflation rate of 2.75%

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

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For the actuarial valuation as of December 31, 2021 and 2020, the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all active participants and deferred vested participants. 94.5% of the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all retirees. 107.5% of the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all beneficiary participants. The RP 2014 Disabled Mortality Table with fully generational projection using Scale MP 2018 are used for the period after disability retirement. Among pre-retirement deaths, 7.50% are assumed to qualify for accidental death benefits.

The actuarial assumptions used in the December 31, 2021 valuation were based on the results of an actuarial experience study for the period from January 1, 2013, through December 31, 2017. Actuarial valuations attempt to estimate costs associated with the pension fund based on a number of demographic, economic and retirement experience assumptions. Experience studies are required by statute to be conducted every five years to review experience in comparison to these assumptions and to provide recommended changes to assumptions.

The long term expected rate of return on Fund investments was determined using a building block method in which best estimate ranges of expected future real rates of return (expected returns, net of pension Fund investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of long-term arithmetic rates of return for each major asset class included in the Fund's target asset allocation as of December 31, 2020, are summarized in the following table:

Asset class	Target asset allocation		Long-term expected real rate of return	
	2021	2020	2021	2020
Equity	43 %	43 %	6.73 %	6.46 %
Fixed income	23	23	0.57	1.25
Alternatives	32	32	4.31	6.32
Cash	2	2	(0.14)	(0.08)

Nominal long-term expected rates of return for these asset classes are equal to the sum of the above expected long-term real rates and the expected long-term inflation rate of 2.33%.

(a) Discount Rate

The discount rate used to measure the total pension liability at December 31, 2021 and 2020 was 7.25%. The projections of cash flows used to determine the discount rate assumed that contributions will continue to be made in accordance with the current funding policy. Based on those assumptions, the Fund's fiduciary net position was projected to be available to make all projected future benefit payments to current Fund members. Therefore, the long term expected rate of return on the plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

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**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

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(b) Sensitivity of the Net Pension Liability to Changes in the Discount Rate

The following presents the net pension liability as of December 31, 2021 and 2020, calculated using the discount rate of 7.25%, respectively, as well as what the Fund's net pension liability would be if it were calculated using a discount rate that is one percentage point lower 6.25% or one percentage point higher 8.25% than the current rate (amounts in thousands):

	1% Decrease (6.25%)	Current discount rate (7.25%)	1% Increase (8.25%)
2021 Net pension liability	\$ 1,476,768	1,161,762	894,212
2020 Net pension liability	1,596,155	1,285,182	1,021,143

(7) Subsequent Events

There have been no other subsequent events through June 21, 2022 the date that the Fund's financial statements were available to be issued, that require recognition or disclosure.

REQUIRED SUPPLEMENTARY INFORMATION

(Unaudited)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Required Supplementary Information
Schedule of Changes in Net Pension Liability and Related Ratios
(Unaudited)

	2021	2020	2019	2018	2017	2016	2015	2014
Total Pension Liability								
Service cost	55,417,684	52,008,968	47,942,711	46,101,006	31,850,127	31,896,560	37,305,333	34,500,540
Interest	217,508,956	214,772,564	214,112,586	207,497,686	204,779,603	195,768,057	191,392,028	184,667,178
Differences between expected and actual experience	1,811,509	(7,346,171)	(3,179,975)	11,599,381	44,627,096	90,067,566	31,325,149	48,560,391
Changes of assumptions	(3,389,843)	-	69,299,287	43,926,927	128,688,470	-	(6,762,751)	-
Benefit Payments	(224,767,671)	(225,422,340)	(223,864,973)	(221,710,054)	(212,814,757)	(197,561,539)	(188,906,232)	(184,130,187)
Net change in total pension liability	46,580,635	34,013,021	104,309,636	87,414,946	197,130,539	120,170,644	64,353,527	83,597,922
Total pension liability-beginning of year	3,055,123,380	3,021,110,359	2,916,800,723	2,829,385,777	2,632,255,238	2,512,084,594	2,447,731,057	2,364,133,135
Total pension liability-ending (a)	3,101,704,015	3,055,123,380	3,021,110,359	2,916,800,723	2,829,385,777	2,632,255,238	2,512,084,594	2,447,731,057
Change in fiduciary net position:								
Contributions - employer	123,493,762	116,285,928	103,263,763	92,013,124	83,382,882	77,239,279	73,373,672	70,603,285
Contributions - employee	43,224,002	40,774,027	36,366,108	32,606,337	29,775,344	27,791,543	26,510,946	25,318,224
Net investment income	232,417,541	228,670,823	253,730,990	(52,072,879)	221,690,618	86,782,343	4,711,246	73,543,477
Benefit payments	(224,767,671)	(225,422,340)	(223,864,973)	(221,710,054)	(212,814,757)	(197,561,539)	(188,906,232)	(184,130,187)
Administrative expenses	(4,366,485)	(4,511,375)	(5,046,775)	(4,317,624)	(4,463,775)	(6,493,777)	(5,808,086)	(4,052,664)
Net change in fiduciary net position	170,001,149	155,797,063	164,449,113	(153,481,096)	117,570,312	(12,242,151)	(90,118,454)	(18,717,865)
Fund fiduciary net position-beginning of year	1,769,941,276	1,614,144,213	1,449,695,100	1,603,176,196	1,485,605,884	1,497,848,035	1,587,966,489	1,606,684,354
Fund fiduciary net position - end of year (b)	1,939,942,425	1,769,941,276	1,614,144,213	1,449,695,100	1,603,176,196	1,485,605,884	1,497,848,035	1,587,966,489
Fund's net pension liability-ending (a)-(b)	1,161,761,590	1,285,182,104	1,406,966,146	1,467,105,623	1,226,209,581	1,146,649,354	1,014,236,559	859,764,568
Fund fiduciary net position as a percentage of the total pension liability	62.54%	57.93%	53.43%	49.70%	56.66%	56.44%	59.63%	64.88%
Covered payroll	458,857,189	460,921,559	436,828,077	425,862,201	428,830,122	446,740,427	443,237,899	417,957,007
Net pension liability as a percentage of covered payroll	253.19%	278.83%	322.09%	344.50%	285.94%	256.67%	228.82%	205.71%

This schedule is intended to present 10 years of data. Additional years will be presented when available.

See accompanying independent auditors' report.

(Continued)

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Schedule of Changes in Net Pension Liability and Related Ratios
(Unaudited)****Change of Assumptions:**

2021: Participants who have been receiving Workers' Compensation benefits for five or more years are assumed to never receive a Massachusetts Bay Transportation Authority Retirement Fund pension benefit. This decreased the actuarial accrued liability by \$2.76 million.

Participants who are active, but did not contribute to the plan in 2021, are assumed to remain non-contributing to the remainder of their employment and to receive only a refund of their contributions to the Fund with interest. This decreased the actuarial accrued liability by \$0.63 million.

2020: No change of assumptions.

2019: Discount rate decreased from 7.50% to 7.25% resulting in an increased net pension liability totaling \$69.3 million.

2018: Salary scale decreased the net pension liability by \$(59.6) million, mortality rates increased the net pension liability by \$6.0 million, termination rates increased the net pension liability by \$9.4 million, and retirement rates increased the net pension liability by \$88.1 million, resulting in an increased net pension liability totaling \$43.9 million.

2017: Discount rate decreased from 7.75% to 7.5% resulting in an increased net pension liability totaling \$128.7 million.

See accompanying independent auditors' report.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Required Supplementary Information
Schedule of Investment Returns
(Unaudited)**

Annual money-weighted rate of return, net of investment expense

<u>2021</u>	<u>2020</u>	<u>2019</u>	<u>2018</u>	<u>2017</u>	<u>2016</u>	<u>2015</u>	<u>2014</u>
13.23%	14.22%	17.67%	(3.37)%	17.79%	5.88%	0.65%	4.80%

This schedule is intended to present 10 years of data. Additional years will be presented when available.
See accompanying independent auditors' report.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND**

Required Supplementary Information
Schedule of Contributions
(Unaudited)

<u>Year</u>	<u>Actuarially determined contribution</u>	<u>Actual contribution in relation to actuarially determined contribution</u>	<u>Percentage of actuarially required contributions</u>	<u>Covered- payroll</u>	<u>Contribution as a percentage of covered- payroll</u>
2021	\$ 123,493,762	\$ 123,493,762	100.00%	\$ 458,857,189	26.91%
2020	116,285,928	116,285,928	100.00	460,921,559	25.23
2019	103,264,000	103,263,763	100.00	436,828,000	23.64
2018	92,013,000	92,013,124	100.00	425,862,000	21.61
2017	83,383,000	83,382,882	100.00	428,830,000	19.44
2016	77,239,000	77,239,279	100.00	446,740,000	17.29
2015	73,359,000	73,373,372	100.02	443,238,000	16.55
2014	77,594,000	70,603,285	90.99	417,957,000	16.89
2013	67,602,000	58,039,160	85.85	379,071,000	15.31
2012	66,035,000	54,968,325	83.24	370,873,000	14.82

See accompanying independent auditors' report.

**MASSACHUSETTS BAY TRANSPORTATION AUTHORITY
RETIREMENT FUND****Notes to Required Supplementary Information
(Unaudited)****Actuarial Assumption and Methods Used to Determine Contribution Rates**

Actuarially determined contributions are calculated as of the December 31 preceding by six months of the start of the fiscal year in which contributions are made. For example, the contribution calculated in the December 31, 2019 actuarial valuation was to be made during the period from July 1, 2020 through June 30, 2021.

Methods and assumptions used to determine the contributions for calendar 2021 and 2020 (based on 2020 and 2021 actuarial valuations).

- Salary – As of December 31, 2021, a table of increases based on years of service, with rates of increase declining from 8% per year for the newly hired to 2.75% per year with 15 or more years of service.
- Actuarial cost method – Entry Age Normal
- Amortization method – Closed period (specified below); installments increase at the rate of 4% per year.
- Remaining amortization period – 18 years (2021 valuation), 19 years (2020 valuation)
- Asset Valuation method – Five-year phase-in smoothing method
- Investment rate of return – 7.25% net of pension plan investment expense.
- Retirement Age – Probabilities of retirement are based on table that reflects both age and service.
- Mortality
 - For the actuarial valuation as of December 31, 2021 & 2020, the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all active participants and deferred vested participants. 94.5% of the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all retirees. 107.5% of the RP 2014 Blue Collar Mortality Tables with fully generational projection using Scale MP 2018 are used for all beneficiary participants. The RP 2014 Disabled Mortality Table with fully generational projection using Scale MP 2018 are used for the period after disability retirement. Among pre-retirement deaths, 7.50% are assumed to qualify for accidental death benefits.

Schedule of Administrative Expenses

As of December 31,	2021	2020
Wages and Benefits		
Staff Salaries *	\$ 1,093,517	1,136,071
Retiree Payroll	243,915	279,369
Benefits	364,342	344,120
Total Personnel Services	\$ 1,701,775	1,759,560
*Interim Executive Director Salary = \$196,000		
Professional Services		
Actuarial	\$ 143,150	128,075
Audit	134,085	129,800
Legal Counsel	1,294,778	1,433,139
Disability Medical Exams	71,950	58,110
Total Professional Services	\$ 1,643,963	1,749,124
Communication		
Newsletter / Annual Report	\$ 19,592	16,786
Postage	3,615	2,541
Telephone	31,588	33,420
Education and Training	45,005	28,785
Manager Meetings	1,465	5,202
Member Services	6,262	5,957
Total Communication	\$ 107,527	92,691
Miscellaneous		
General and Administrative	\$ 26,364	29,146
Business Insurance	122,522	207,480
Rent	428,040	413,148
Technological Support	336,293	260,225
Total Miscellaneous	\$ 913,220	910,000
Total Administrative Expenses	\$ 4,366,485	4,511,375

See accompanying Independent Auditors' Report

Schedule of Investment Expenses and Payments to Consultants

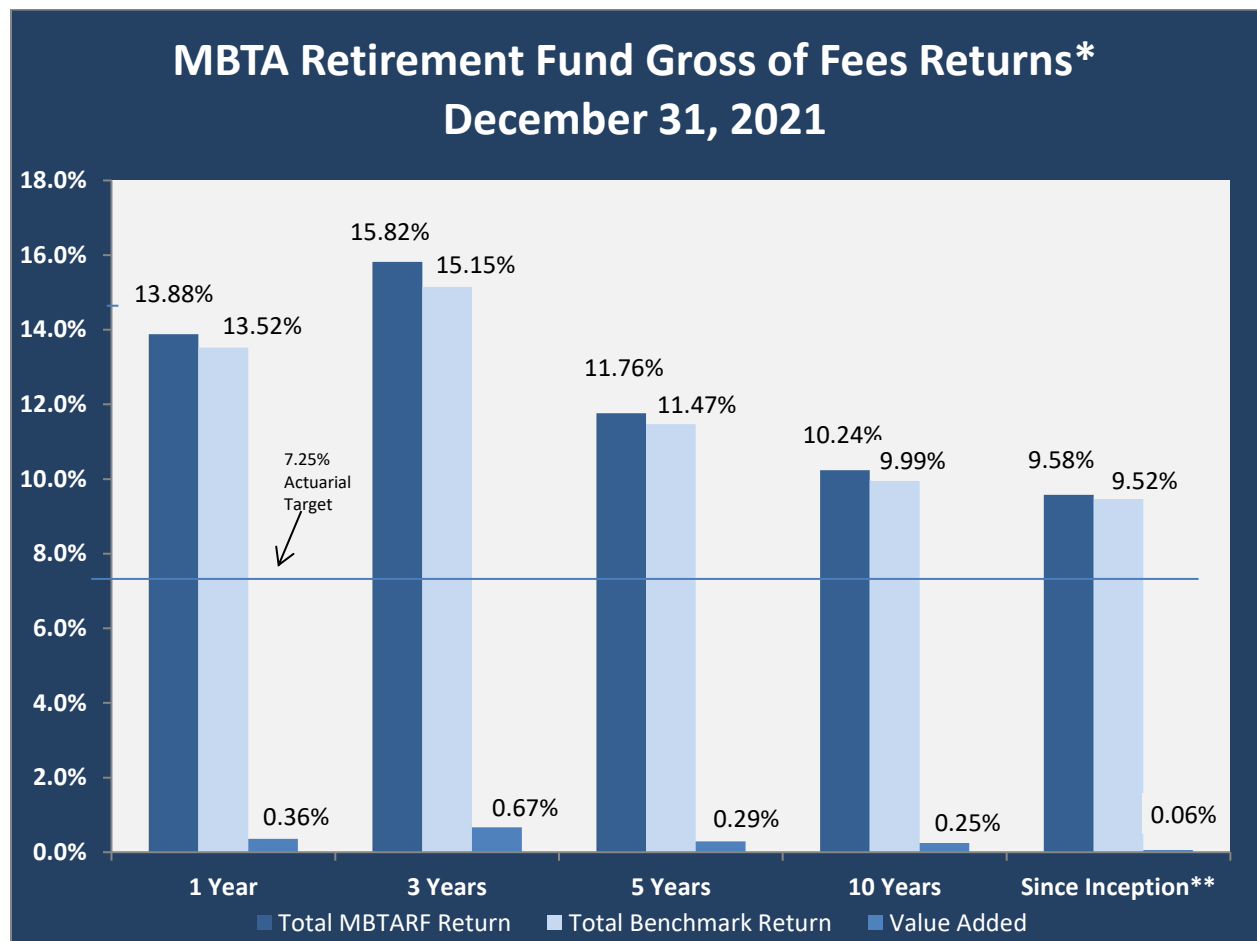
As of December 31,	2021	2020
Schedule of Investment Expenses		
Investment Management Fees	\$ 5,294,960	4,690,081
Investment Consultant Fees	344,000	344,000
Communications / Governmental Services	120,400	146,400
Custodial Fees	778,602	725,174
Total Investment Expenses	\$ 6,537,963	5,905,655
Schedule of Payments to Consultants*		
Independent Auditors	\$ 134,085	129,800
Actuary	143,150	128,075
Legal	1,294,778	1,433,139
Total Payments to Consultants	\$ 1,572,013	1,691,014

*These payments are presented for analytical purposes; each amount is already included in schedules of administrative or investment expenses
See accompanying Independent Auditors' Report

INVESTMENT SECTION

(Unaudited)

2021 Investment Results



* Gross of Fees with the exception of hedge funds which are net of fees

** Performance inception date of January 1, 1982

Report on Investment Activity

The Massachusetts Bay Transportation Authority Retirement Fund (the “Fund” or “MBTARF”) was created to provide retirement benefits for certain employees of the Massachusetts Bay Transportation Authority (the “Authority”). The Fund was established in 1948 pursuant to a Trust Agreement between local 589 ATU AFL-CIO (the “Union”) and the Authority that is governed by the terms of a separately negotiated Pension Agreement between the Authority and the Union. The MBTA Retirement Board is responsible for the general oversight of the MBTA Retirement Fund. The primary goal of the Fund’s investment program is to meet or exceed the Fund’s actuarial target rate of return in order to maintain and improve upon its funded status. The Board of the Fund seeks to maximize return on investments through a diverse group of investment managers with an acceptable level of risk.

The Investment Section was prepared by the MBTA Retirement Fund Finance Staff with assistance of the consultant, Segal Marco Advisors. The Fund’s investment portfolios are presented at fair value which is appropriate industry standard. The accompanying financial statements were prepared in accordance with U.S. generally accepted accounting principles (GAAP). The Fund adheres to the reporting requirements established by the Governmental Accounting Standards Board (GASB).

The investment performance information provided in this section of the Annual Comprehensive Financial Report was calculated by the Fund’s custodian, State Street Bank & Trust Company, using a time-weighted rate of return based on the fair value of assets.

As of December 31, 2021, the Board employed 15 public markets investment managers, 17 private equity market managers, 3 private credit managers, 9 real estate managers, 2 hedge fund-of-funds managers, 1 opportunistic hedge fund manager and 2 risk parity/diversified beta managers. The Fund had approximately \$1,939.9 million in assets under management at December 31, 2021. Each investment manager operates within guidelines that are established by the Board and consultant and are outlined in a detailed investment management or partnership agreement.

The Investment Policy statement adopted by the Fund Board requires that the Board and the Executive Director review the asset allocation at least quarterly to determine if the asset allocation is consistent with the exposure ranges described. A change in the Fund’s liability structure, funded status, or long-term investment prospects may also trigger a revision of the asset allocation. The Executive Director will direct investment managers to transfer funds to rebalance the asset allocation as necessary. The Executive Director shall use appropriate judgment and care when rebalancing portfolios.

Current Allocation as of 12/31/2021

Asset Class	12/31/2021 Allocation %	Target (%)
Equities	44.7	43
US Large Cap	17.9	17
US Small Cap	8.1	7
International Equity (unhedged)	8.8	9
International Small Cap	2.1	2
Global / Emerging Markets	7.8	8
Fixed Income	22.1	23
Core Fixed Income	7.7	8
TIPS	3.1	3
Mortgages	2.8	3
Global & Multi Sector	5.6	6
Bank Loans	2.9	3
Cash*	3.4	2
Alternative Investments	29.8	32
Private Equity & Private Credit	9.2	10
Real Estate	9.3	9
Fund of Hedge Funds	4.2	5
Fund of Hedge Funds - Opportunistic	0.7	2
Risk Parity / Diversified Beta	6.4	6

*Investment manager's cash holdings are reported in cash and cash equivalents

The Year in Review – The World Markets

Fiscal Year 2021 Global Markets Overview

First Quarter 2021:

The U.S. securities market experienced positive returns as the Federal Reserve continued to flood the economy with newly printed money. The additional stimulus checks, an improving employment market and the growing vaccination rate all helped boost the domestic equity stocks with the S&P 500 gaining 6.17% for the quarter. International equities rose, however, more moderately than the U.S. stocks as the vaccination rate in Europe was lagging compared to United States. The emerging equity markets increased by 2.29% as there was hope for global growth. Domestic fixed income was lower and longer-term yields were higher amid U.S. stimulus and an improving economy. Hedge funds increased, particularly event driven strategies which performed best in this asset class. Real Estate and Private Equity had strong positive returns for the first quarter.

The U.S. growth domestic product (GDP) rose 6.41% over the prior quarter, slightly beating market expectations. Nationwide there was a greater pace in receiving COVID vaccinations as well as consumer spending with fiscal stimulus checks boosting the economy in the first quarter. Retail spending was up 9.8% from one year ago and restaurant and bars saw a 13.4% surge in sales due to increased openings. The economic outlook was extremely robust with the economic and employment gains. Unemployment fell from 6.7% to 6.0% in March a decline from its Q4 2020 level and the pandemic low. Despite the drop in unemployment levels the U.S. remains 8.4 million jobs short of February 2020.

The Federal Reserve continues to hold short-term rates at essentially zero. We continue to see signs of inflation with the increased cost of commodities and with the rise in interest rates.

Second Quarter 2021:

The U.S. economy continued to pick up speed as vaccinations increased and businesses reopened. The worldwide economic reopening helped power stocks higher. Domestic Equities had solid positive returns. International markets also had positive returns, however modest compared to U.S. stocks as several European countries were slower to open. U.S. fixed income increased, and longer-term yields were lower as economic activity in the U.S. rebounded. Hedge funds continued to increase especially in the equity hedge strategy. Real Estate and Private Equity maintained strong positive returns during the second quarter.

(Continued)

Consumer spending continued to be strong with a rise in U.S. GDP growth of 6.5% over the prior quarter. Although positive signs of growth the level of Q2 growth fell short of economists' forecasts, as labor shortages and supply chain issues plagued businesses. Additionally, the highly contagious Delta variant of the coronavirus may lead to a slower recovery than expected for the remainder of the calendar year. Unemployment continues to trend in the right direction with a slight decline from the Q1 levels at a rate of 5.9% in June. The U.S. continues remains about 6.8 million jobs short from its February 2020 level. Retail sales continue to climb and a demand for goods was strong, however the motor vehicle industry sales were hit by the lack of supply.

China's GDP grew at a rate of 1.3% showing steady growth as the country tries to recover from the pandemic. However, Japan's GDP dropped by 1% amid a resurgence of COVID cases and a slow vaccine rollout. The Eurozone has been a laggard in the recovery, although it appears to be stabilizing.

Third Quarter 2021:

The third quarter was extremely volatile for equities with the Dow and Nasdaq all losing ground, however the S&P 500 had a small gain. Investors' concerns over global growth and inflation hampered stocks. International equities also declined amid inflation concerns erasing gains after a positive earnings season in the Eurozone. Inflation in the Eurozone region hit a decade high. The emerging market equity tumbled with a selloff in Chinese stocks during concerns about supply chain disruptions. U.S. fixed income was flat and treasury yields, the dollar and crude oil prices ended the third quarter higher, while gold prices dipped lower. Hedge funds increased modestly. The relative strategies performed the best.

Recent inflation indicators have been running above trend due to labor shortages and supply chain issues. Gas prices are also rising due to supply imbalances. Supply and demand challenges are driving the energy prices higher, as the summer season saw record-high gasoline demand. Despite the continued interruption from the Delta variant, the recovery continued to be solid with the U.S. GDP growth rose 2%, however it was a sharp slowdown from the previous quarter's 6.7% growth number. The recent slowdown comes as the government stimulus, which buoyed growth earlier in 2021, has phased out. On the job front, there was improving picture with the unemployment rate dropping to 4.8%.

Consumer confidence declined amid concerns about the state of the economy and short-term growth prospects deepened, while spending intentions for homes, autos, and major appliances all retreated again. Short-term inflation concerns eased but remained elevated.

(Continued)

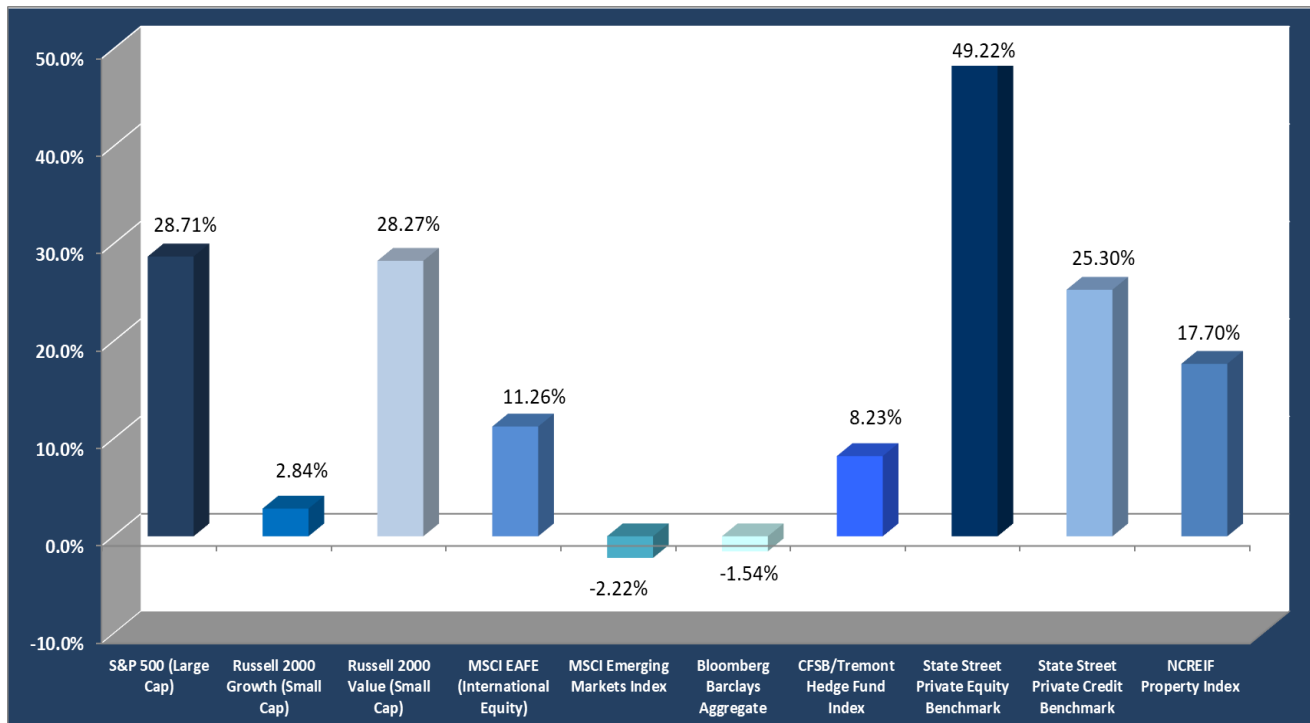
On the global front vaccination rates continued to increase during the third quarter, with several European nations fully vaccinating 75% of their population. However, COVID-19 cases saw another sharp increase when the Delta variant became the dominant strain globally.

Fourth Quarter 2021:

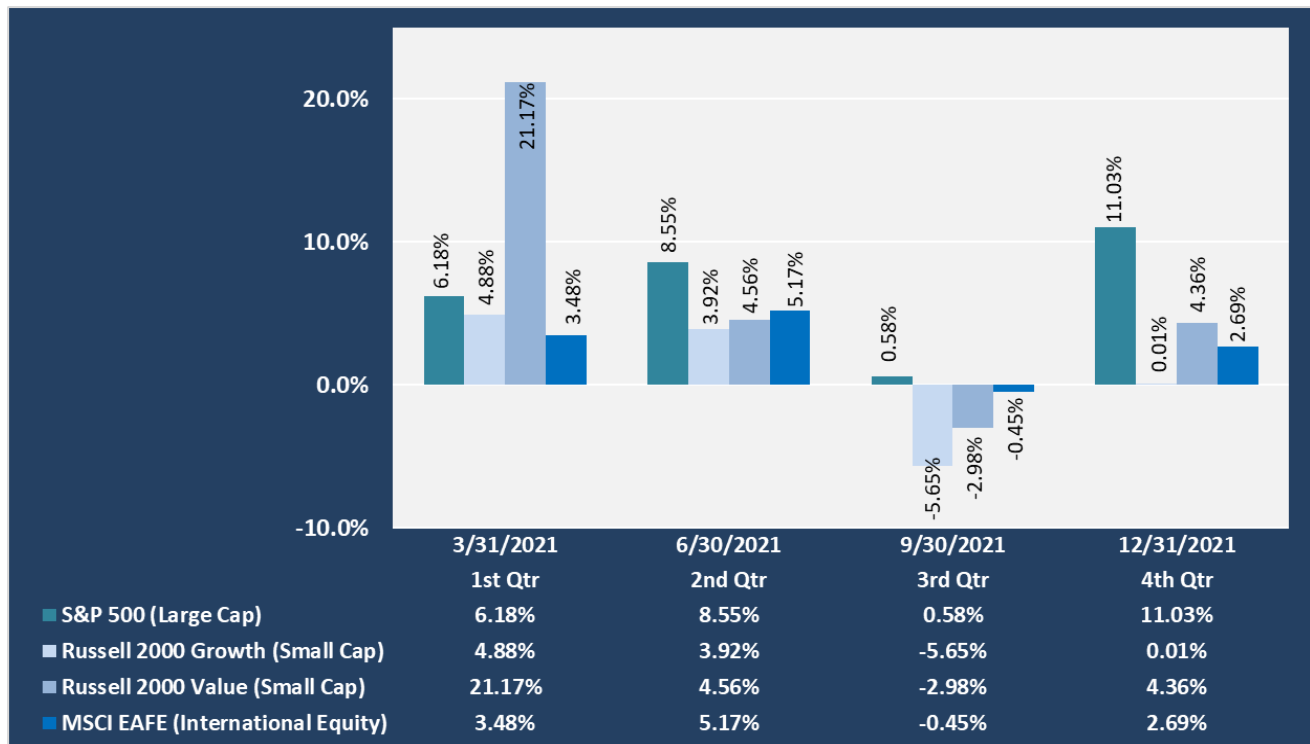
Stocks overcame significant headwinds during the past three months, including a resurgence in COVID cases and the lack of additional stimulus money. The fourth quarter started with a continuation of the volatility that we saw at the end of the third quarter. Corporate earnings were solid and economic growth was steady despite the continued pandemic. Worldwide markets were positive for the quarter. U.S. equities were higher with the U.S. stock market gaining 11% in the fourth quarter as the road to economic normalcy continued to lift equities despite the emergence of a new COVID variant. International equities increased slightly, but not as much as U.S. equities. China stocks struggled and emerging markets declined. Domestic fixed income was flat, and the yields fell for most of the quarter before turning a bit higher in December. Negative Treasury performance was exacerbated by the low coupon levels of the indexes, with offered minimal income protection against declining bond prices. Demand for credit remains strong, bolstered by the generally solid economic outlook and higher all-in corporate yields.

At a Congressional testimony in November, the Federal Reserve Chairman Jerome Powell surprised markets by stating that due to persistent high inflation, the Fed would likely need to accelerate the just announced tapering of QE and endorsed doubling the pace of reduction. Concerns about the Fed policy combined with Omicron uncertainty led to the declines in stocks in late November. The Fed also indicated that it expected to raise interest rates three times in 2022 to combat raising inflation.

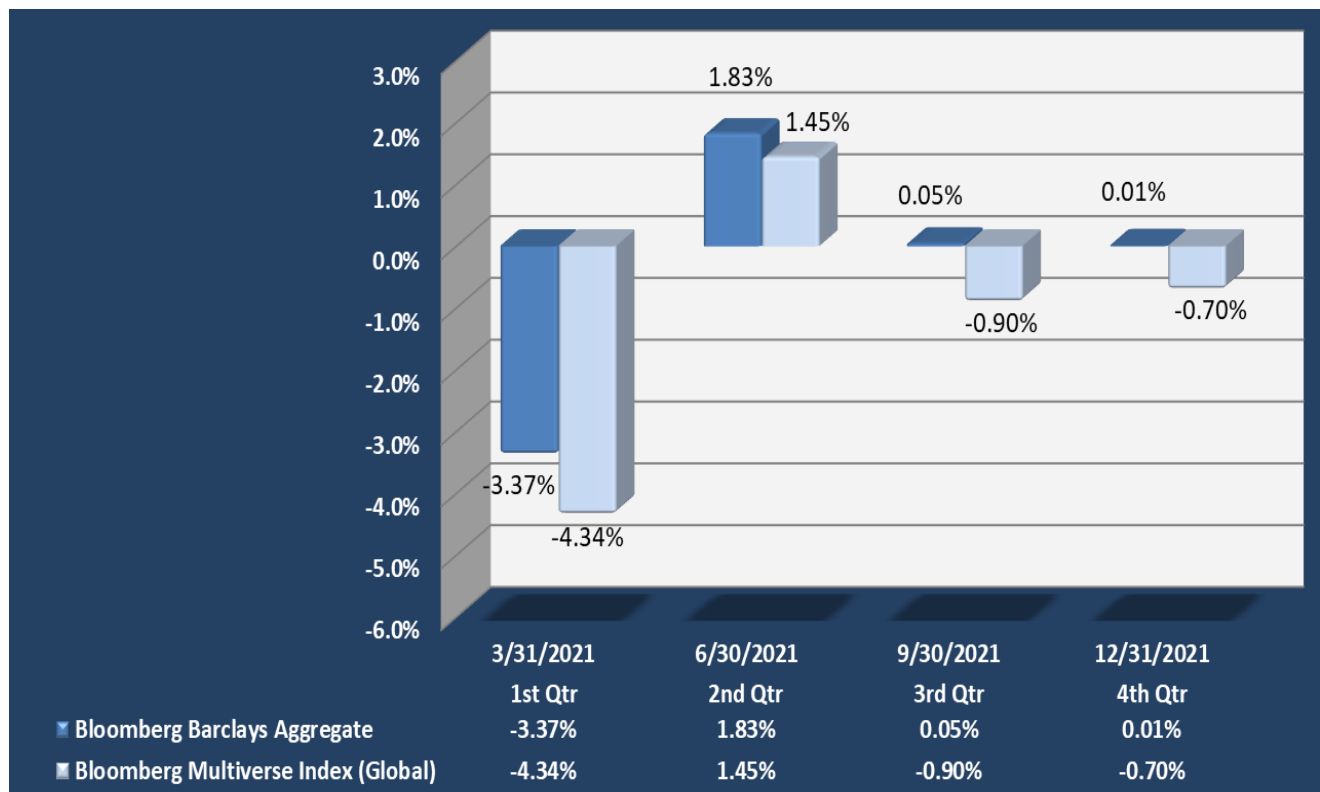
Fiscal Year 2021 Market Indices Returns



Fiscal Year 2021 Equity Indices by Quarter

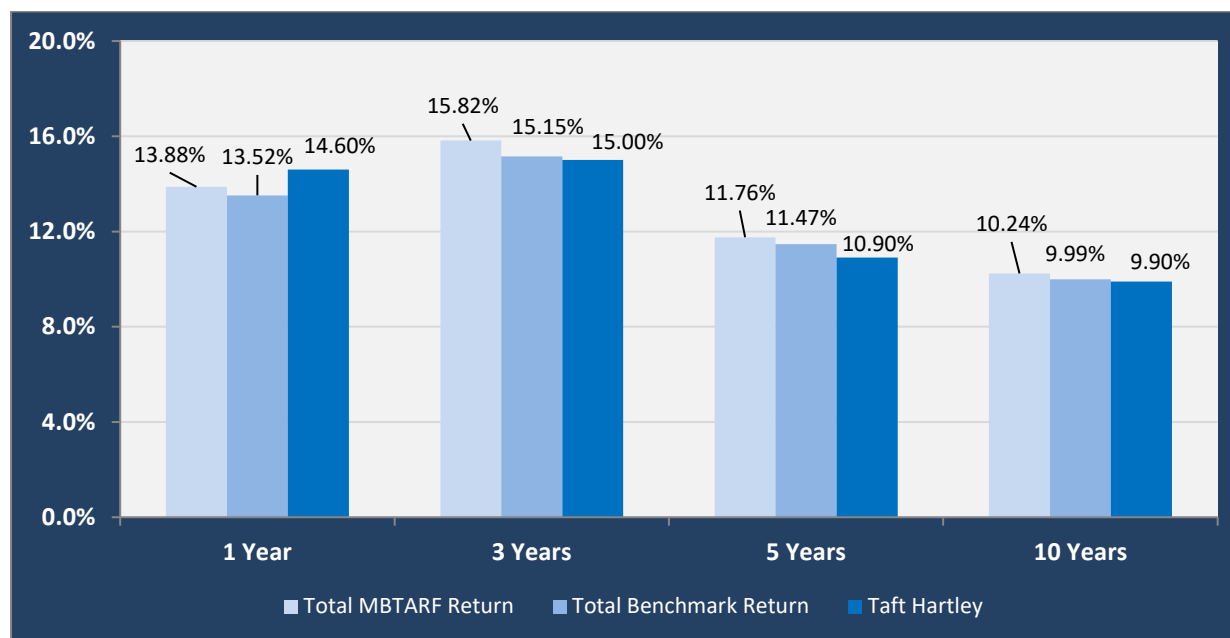


Fiscal Year 2021 Fixed Income Indices by Quarter



MBTARF Core Performance: Fiscal Year 2021

Returns are calculated based on a time-weighted rate of return methodology. The Fund's returns (gross of fees) and benchmarks for the periods ended December 31, 2021:



During fiscal year 2021, the Fund returned 13.88%, outperforming the Policy Benchmark of 13.52% by 36 basis points. The MBTARF began fiscal year 2021 with a net position of \$1,769.9 million and ended with a \$1,939.9 million net position. On a gross basis the Fund increased \$170 million. \$221.6 million in net retirement benefits were dispersed to members of the Fund.

The quarterly returns of the Fund in fiscal year 2021 were as follows:

	MBTARF Return	Policy Benchmark Return
1st Quarter	2.04%	3.67%
2nd Quarter	5.83%	4.34%
3rd Quarter	1.02%	0.92%
4th Quarter	4.40%	3.66%

Amid a lot of uncertainty, 2021 had strong performance in most markets. U.S. stocks reached all-time highs and the global markets rose alongside them. The supply chain issues, and historically high inflation rates did not affect stocks from reaching all-time highs that contributed to the Funds positive performance.

(Continued)

For the full-year period, equities generated returns ranging from 11.26% for the EAFE index of non-U.S. developed markets stocks to 28.71% and 14.82% for the S&P 500 Index of Large Cap U.S. stocks and Russell 2000 Index of Small Cap U.S. stocks, respectively. Core bond index returns ranged from 5.28% for the Bloomberg U.S. Corporate High Yield index to -1.54% for the Bloomberg Barclays Aggregate Index.

Among alternatives, real estate as measured by the NCREIF Property Index gained 17.70%. Diversified hedge funds gained 8.23% for the year based on the CFSB/Tremont Hedge Fund Index.

The MBTA Retirement Fund (the “Fund”) generated a gross return of 13.88% in 2021, which ranked in the 61st percentile of the InvMetrics Taft-Hartley DB Gross Return Universe. The Fund’s long-term investment objective is 7.25%. The Fund’s annualized return since inception is 9.58%. The Fund’s gross annualized return over the ten-year period ended December 2021 was 10.24% and ranked in the top 39% of the InvMetrics Taft-Hartley DB Gross Return Universe. The Fund’s gross returns for the three and five-year periods ended December 2021 were 15.82% and 11.76% and ranked in the 34th and 27th percentiles, respectively.

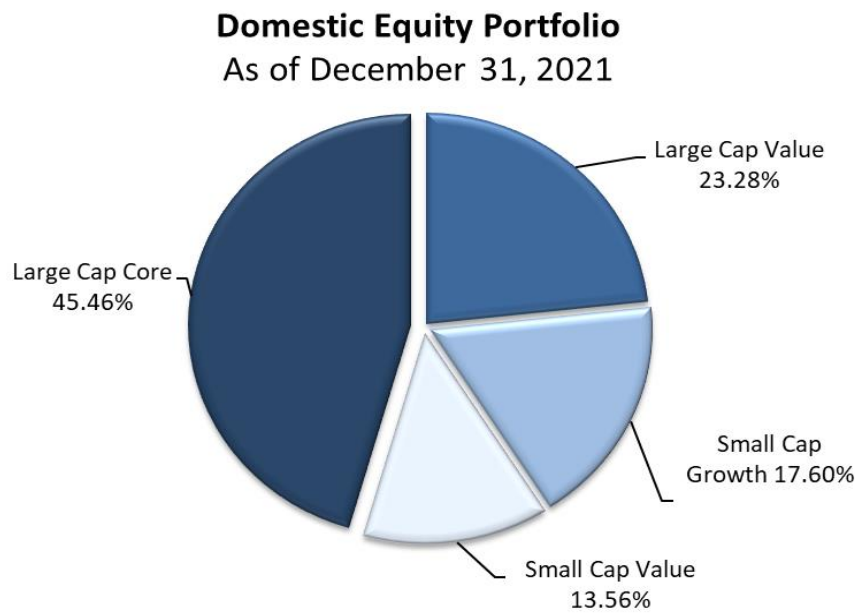
The MBTA Retirement Board authorized the following actions, among others, to position the Fund for long-term risk-adjusted returns, while addressing the Fund’s policy framework and cost effectiveness:

- The Board and Staff continued to operate in a hybrid manner in response to the Governor’s COVID-19 guidance.
- Migrating to the cloud was completed in 2021 and is expected to reduce costs, enhance stability and increase data security.
- Enhanced the Standard Operating Procedures for the Benefits Department in order to assure prompt, consistent and accurate administration of benefits for the membership.
- Committed \$15 million in the opportunistic asset class to Hamilton Lane Strategic Opportunities Fund VI.
- Committed \$10 million to Venture Lending and Leasing Fund X, managed by a long-standing investment manager, Western Technology.
- Allocated \$15 million to PRIM’s Real Estate Segmentation Program along with an additional \$15 million to TA Realty Core Property Fund.
- Committed \$10 million to PRIM’s Private Equity Vintage Year 2022 Segmentation and \$5 million to Top Tier Venture Velocity Fund IV.

Investment Summary by Type

Domestic Equity Portfolio

As of December 31, 2021, the domestic equity portfolio had approximately \$503.3 million in net positions, which represented 26.02% of the Fund portfolio. Approximately 68.8% of the domestic equity portfolio is invested in a large capitalization equity strategy (large cap) with the remaining 31.2% in a small capitalization equity strategy (small cap). The Fund's domestic equity portfolio is actively managed in an attempt to outperform a diverse set of indices. Each investment manager's performance is measured against an assigned index based on the stated investment strategy.



On a three, five and ten-year basis through December 31, 2021, the domestic equity portfolio has returned 24.91%, 17.13% and 15.89% compared to the S&P 500 benchmark, which returned 26.07%, 18.47% and 16.55% respectively.

Style - The Board intends to manage risk and diversify the Fund's portfolio through the selection of money managers with different investment styles and complementary characteristics within each asset class.

Portfolio Risks – Although the performance of equity securities has historically exceeded that of other market assets over an extended period of time, these assets, as all investments carry the risk of loss of principal and are subject to changing market conditions. The value of equities is not only determined by external market factors but by the performance of the firms for which these assets legally represent.

(Continued)

Portfolio Returns - During the fiscal year the domestic equity portfolio produced a return of 25.76% compared to the S&P 500 benchmark, 28.71%. Large cap equity managers returned 27.17% outperforming the benchmark by 0.71% and small cap equity returned 22.63% outperforming the Russell 2000 Index by 7.81%. The Fund had one large cap core indexed manager and one small cap value indexed manager. Of the two active large cap value managers and two small cap growth managers, all outperformed their respective benchmark in 2021. RBC Global Asset Management, a small cap growth manager, exceeded their benchmark by 23.30% in 2021.

The top ten holdings in the domestic equity portfolio at December 31, 2021 are illustrated below. A complete listing of holdings is available upon request.

Shares	Stock	Market Value (\$000's)	% of fair value
7,929	ASML HOLDING NV NY REG SHS	\$ 6,313	1.25%
1,592	AMAZON.COM INC	5,308	1.05
22,428	SEA LTD ADR	5,017	1.00
27,424	NIKE INC CL B	4,571	0.91
11,880	ATLASSIAN CORP PLC CLASS A	4,530	0.90
20,725	VISA INC CLASS A SHARES	4,491	0.89
33,898	EDWARDS LIFESCIENCES CORP	4,391	0.87
3,100	SHOPIFY INC CLASS A	4,270	0.85
7,488	DEXCOM INC	4,021	0.80
6,671	NETFLIX INC	4,019	0.80
	Total Top Ten	\$ 46,931	9.32%

(Continued)

The MBTA Retirement Fund's domestic equity managers at December 31, 2021 are presented in the following table:

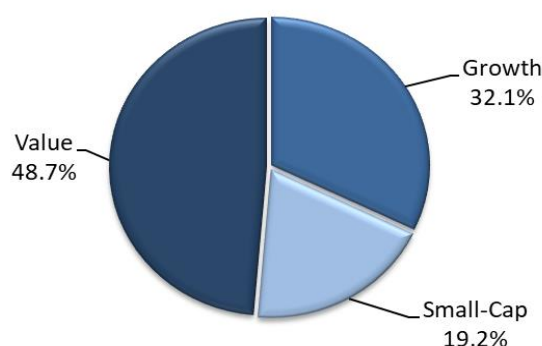
	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
	Alliance Bernstein	Small Cap Growth	\$ 40,486,367
	Aristotle Capital Management	Large Cap Value	59,584,894
	Boston Partners	Large Cap Value	58,589,454
	RBC Global Asset Management	Small Cap Growth	48,109,958
	State Street Global Advisors	Small Cap Value	68,227,222
	State Street Global Advisors	Large Cap Core	228,335,884
Total Portfolio Fair Value:			\$ 503,333,779

International Equity Portfolio

As of December 31, 2021, the international equity portfolio had approximately \$209.9 million in net positions, representing 10.85% of the Fund portfolio. Two of the three actively managed international equity managers are benchmarked against the MSCI EAFE index, which includes the developed markets of Europe, Australia and the Far East. The third international equity manager is benchmarked against the MSCI World Ex US Small Cap index.

International Equity Portfolio

As of December 31, 2021



The primary strategy is to invest in international equity funds to achieve consistent, positive real returns and to maximize long-term total return within prudent levels of risk through a combination of income and capital appreciation.

Style – The Board intends for a group of managers employing various strategies to invest assets in a well-diversified portfolio of Non-U.S. developed market equity securities. This group consists of a broad range of styles and approaches including: core international products, top-down country selectors, bottom-up security selectors, capitalization ranges, growth and value-oriented products and products using various mixtures of these strategies. Certain investment managers may have a guideline limiting exposure to emerging markets.

Portfolio Risks – International assets are subject to additional risks such as changes in foreign currency exchange markets and the environment in which the trading of these securities and associated financial reporting are governed. Differences between reporting standards across jurisdictions also adds to the complexity of these markets.

Portfolio Returns - During the fiscal year, international equity returned 8.77% underperforming the benchmark by 249 basis points. Gryphon International outperformed their benchmark in 2021.

(Continued)

On a three, five and ten-year basis through December 31, 2021, the international equity portfolio has returned 14.18%, 10.32% and 8.77% compared to the MSCI EAFE benchmark, which returned 13.54%, 9.55% and 8.03% respectively.

The top ten holdings in the international equity portfolio at December 31, 2021 are illustrated below. A complete listing of holdings is available upon request.

Shares	Stock	Market Value (\$000's)	% of fair value
1,853	ADYEN NV	\$ 4,871	2.32%
6,900	KEYENCE CORP	4,331	2.06
171,501	ENTAIN PLC	3,909	1.86
40,911	ZALANDO SE	3,310	1.58
89,471	TITAN CO LTD	3,036	1.45
5,370	TELEPERFORMANCE	2,394	1.14
236,400	AIA GROUP LTD	2,383	1.14
19,997	ASTRAZENECA PLC	2,350	1.12
28,901	ASSTEAD GROUP PLC	2,326	1.11
18,400	SONY GROUP CORP	2,313	1.10
Total Top Ten		\$ 31,223	14.88%

The MBTA Retirement Fund's international equity managers at December 31, 2021 are presented in the following table:

	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
	Gryphon International Investment Corp.	Growth	\$ 67,467,447
	Morgan Stanley Investment Management	Large Value	102,141,436
	Principal Global Investors	Small Cap	40,297,075
Total Portfolio Fair Value:			\$ 209,905,958

Global Equity and Emerging Market Portfolio

As of December 31, 2021, the global equity and emerging markets portfolio had approximately \$152.0 million or 7.86% of MBTA Retirement Fund's assets. There are two portfolios in this asset class: Sands Capital Management and PRIM Emerging Market. The MBTA Retirement Fund measures Sands Global Growth performance against the MSCI ALL Country World Index a benchmark comprised of stocks from 47 different countries including 23 countries classified as developed markets (including the United States) and 24 countries that are considered emerging markets. The Fund measures the PRIM Emerging Market portfolio against the MSCI Emerging Markets Index which captures large and mid-cap representation across 24 emerging markets countries.

Portfolio Composition - The portfolio invests a significant percentage of its assets in foreign securities traded on foreign exchanges including the use of derivatives (e.g. LEPOS and p-notes) to gain access to certain foreign markets. The global growth manager is granted full discretion to buy, sell, invest and reinvest its portion of the Fund's assets in stocks contained within the MSCI ALL Country World Index. The maximum allocation to emerging markets is three times the benchmark sector weighting or approximately 30% of the portfolio. The investment objective of the global equity and emerging markets portfolio is to achieve consistent, positive real returns and to maximize long term total return within prudent levels of risk through a combination of income and capital appreciation.

As of December 31, 2021, the Sands Capital, global and emerging markets portfolio's country and regional exposures included an 84.4% allocation to developed market stocks, which included a 52% allocation to U.S. stocks. Approximately 9.4% was allocated to emerging, markets stocks, which included a 6% allocation to holdings in India.

Portfolio Risks – In addition to providing the potential for higher expected returns, emerging markets generally expose investors to higher expected risks due their susceptibility to more volatile economic conditions, potential political instability and, in some cases, an absence of a mature system of corporate governance. These investments also carry all the risks associated with domestic and developed market investments.


(Continued)

Portfolio Returns - During the fiscal year, the Global Equity and Emerging Markets portfolio returned 8.47%. Sands Global Growth returned 11.60%, underperforming the benchmark by 694 basis points. The PRIM Emerging Markets Equity segmentation outperformed its benchmark, the MSCI Emerging Markets Index for the one-year period ending December 31, 2021 by 373 basis points. On a three and five-year basis through December 31, 2021, the global equity and emerging market portfolio has returned 29.16% and 24.21% compared to the MSCI All Country World Index, which returned 20.38% and 14.40% respectively. Due to the fact the MBTA Retirement Fund began investing in this asset class in October 2012, the composite results do not yet include the ten-year period.

The top ten holdings in the global equity and emerging market portfolio at December 31, 2021 are illustrated below. A complete listing of holdings is available upon request.

Shares	Stock	Market Value (\$000's)	% of fair value
7,929	ASML HOLDING NV NY REG SHS NY REG SHRS EUR.09	\$ 6,313	4.15%
1,592	AMAZON.COM INC COMMON STOCK USD.01	5,308	3.49
22,428	SEA LTD ADR ADR	5,017	3.30
1,853	ADYEN NV COMMON STOCK EUR.01	4,871	3.20
27,424	NIKE INC CL B COMMON STOCK	4,571	3.01
11,880	ATLISSIAN CORP PLC CLASS A COMMON STOCK USD.1	4,530	2.98
20,725	VISA INC CLASS A SHARES COMMON STOCK USD.0001	4,491	2.95
33,898	EDWARDS LIFESCIENCES CORP COMMON STOCK USD1.00	4,391	2.89
6,900	KEYENCE CORP COMMON STOCK	4,331	2.85
3,100	SHOPIFY INC CLASS A COMMON STOCK	4,270	2.81
Total Top Ten		\$ 48,093	31.63%

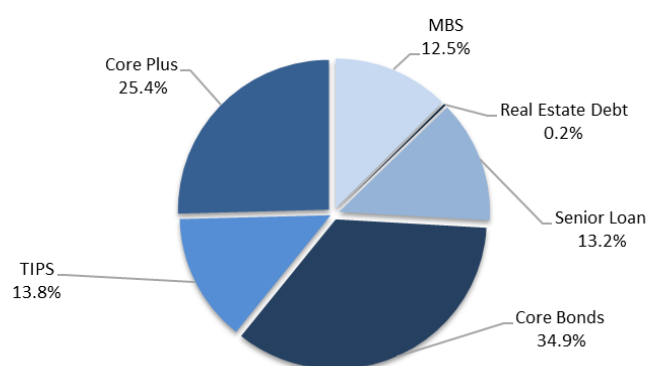
The MBTA Retirement Fund's global equity and emerging market manager at December 31, 2021 is presented in the following table:

	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
	Pension Reserves Investment Management	Emerging	\$ 37,440,833
	Sands Capital Management	Growth	114,606,711
Total Portfolio Fair Value:			\$ 152,047,544

Fixed Income Portfolio

As of December 31, 2021, the fixed income portfolio had approximately \$428.0 million in net positions, which represented 22.13% of the MBTARF portfolio. The Fund's fixed income portfolio is benchmarked against the Barclays Aggregate Bond Index, BC GOV/Credit, BC MBS, S&P/LSTA Leveraged Loan, and BC U.S. TIPS.

Fixed Income Portfolio
As of December 31, 2021



Styles - Fixed income managers serve in a specialist role managing debt securities. Domestic core fixed income managers' investments may include (i) U.S. dollar denominated obligations of the United States Government and its Agencies and instrumentalities, and U.S. corporations, (ii) mortgage-backed securities including CMOs and commercial mortgage backed securities ("CMBS"), (iii) Asset Backed Securities ("ABSs"), (iv) registered 144A securities if applicable, (v) municipal bonds, (vi) short term securities, (vii) securities of foreign companies or foreign countries (sovereigns or supranational) denominated in U.S. dollars, trading in the U.S. markets and capable of settlement in U.S. markets (Yankee bonds), and (viii) dollar denominated obligations of U.S. companies trading outside the U.S. ("Eurobonds").

Portfolio Risk - Risk in bond investments is primarily driven by changing interest rates which cause the value of these investments to fluctuate. The action of the Federal Reserve Bank of the United States through its monetary policy and through the monetary policy of other such institutions significantly affects interest rates. The risk of default is also associated with these investments and is measured by established credit rating firms. Default risks are subject to change.

Portfolio Returns - During the fiscal year, fixed income portfolio returned 0.86% outperforming the Bloomberg Aggregate Bond Index benchmark by 2.40%.

(Continued)

On a three, five and ten-year basis through December 31, 2021, the fixed income portfolio has returned 5.15%, 3.93% and 4.17% compared to the Bloomberg Aggregate Bond Index, which returned 4.79%, 3.57% and 2.90% respectively.

The top ten holdings in the fixed income portfolio at December 31, 2021 are illustrated below. A complete listing of holdings is available upon request.

Shares	Stock		Market Value (\$'000's)	% of fair value
13,669,000	US TREASURY N/B Due 07/31/2026	Rating NR	\$ 13,669	3.19%
6,009,000	US TREASURY N/B Due 08/15/2040	Rating NR	6,009	1.40
4,405,000	US TREASURY N/B Due 09/30/2023	Rating NR	4,405	1.03
4,215,000	US TREASURY N/B Due 11/30/2022	Rating NR	4,215	0.98
3,292,966	TSY INFL IX N/B Due 01/15/2029	Rating NR	3,293	0.77
3,316,631	TSY INFL IX N/B Due 01/15/2026	Rating NR	3,317	0.77
3,712,000	US TREASURY N/B Due 02/15/2031	Rating NR	3,712	0.87
3,265,858	TSY INFL IX N/B Due 01/15/2027	Rating NR	3,266	0.76
3,325,334	TSY INFL IX N/B Due 01/15/2024	Rating NR	3,325	0.78
3,151,779	TSY INFL IX N/B Due 07/15/2025	Rating NR	3,152	0.74
Total Top Ten			\$ 48,363	11.29%

(Continued)

The MBTA Retirement Fund's fixed income managers at December 31, 2021 are presented in the following table:

	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
 AFL-CIO HOUSING INVESTMENT TRUST	AFL-CIO Housing	MBS	\$ 53,571,798
	Amalgamated Bank of New York	Real Estate Debt	897,520
	Eaton Vance	Senior Loan	56,505,952
	Income Research & Management	Core Bonds	149,032,935
	IRM TIPS	TIPS	59,135,595
	Loomis, Sayles & Company	Core Plus	108,905,864
Total Portfolio Fair Value:			\$ 428,049,664

Real Estate Portfolio

As of December 31, 2021, the MBTA Retirement Fund had \$179.9 million invested in real estate. The equity real estate program is comprised primarily of two separate but complementary investment strategies – core and specialty. Core investments include property types in multi-family housing, retail, industrial and office buildings. These assets are characterized by stable and increasing income levels and are located in major metropolitan areas which exhibit reasonable economic diversification. Specialty investments include property types in hotels, assisted-living and congregate care facilities. Specialty strategies enhance returns of assets capable of, but not currently, exhibiting core type characteristics.

Objective - The MBTA Retirement Fund's allocation to real estate equity is intended to enhance the return, risk and portfolio diversification characteristics of the Fund's total portfolio. It is anticipated that investments in equity real estate will, over a full market cycle, produce an income return that is in excess of the yield of an investment grade, core fixed income investment combined with some level of equity appreciation. In addition, it is expected that equity real estate will exhibit a lower correlation with traditional equity and fixed income securities.

Portfolio Risk - Real estate investments expose investors to risks. These include:

- Market risks that may be exacerbated by real estate's sensitivity to economic conditions and/or by the investment manager's utilization of leverage.
- Lower liquidity, especially for closed end, limited partnership and direct investments.
- Operational and credit risks that are higher than those of traditional investments.
- Valuation and appraisal lag which can be exacerbated in times of rapid price changes in the commercial real estate market.

Leverage – Leverage may be utilized at the discretion of the underlying real estate managers in a constrained manner, consistent with the commingled fund documents, in order to enhance

(Continued)

yields of the various investments and/or facilitate the diversification of the portfolio. The total level of debt for any single commingled fund investment is not expected to exceed seventy percent of the value of that fund. However, as a general guideline, the Fund's composite real estate portfolio shall never be more than fifty percent levered on an aggregate basis at any time.

Real Estate Investment Strategies - Private real estate equity strategies include core, core plus, value-added and opportunistic approaches. Core diversified funds have lower risk due to their limited use of leverage and broad diversification across multiple property types, geographic regions, and income generating assets (most properties in core portfolios are fully leased and generating income). Further out on the risk and return continuum, core plus, value-added and opportunistic funds have lower occupancy rates, utilize more leverage and include properties in the development and/or pre-development stage. Due to their higher risk, these strategies are expected to generate returns that exceed that of core real estate.

Open ended and closed end real estate investments are diversified by vintage year, investment manager, geographic region, property type and investment strategy. With respect to vintage year diversification, closed end funds are diversified due to the fact that they are designed to invest over specific, finite time periods, while open-end funds are diversified by definition (i.e. by virtue of always being open and investing in all time periods).

Investment Strategy Allocations - Of the MBTA Retirement Fund's 6 active closed end real estate funds, there are no funds are in the investing stage of their lifecycle; 2 funds accounting for \$17.8 million in fair value is in the harvesting stage, while 2 funds accounting for less than two million in fair value is liquidating its underlying investments.

(Continued)

The MBTA Retirement Fund's investment strategy is diversified across closed and open-end funds as follows:



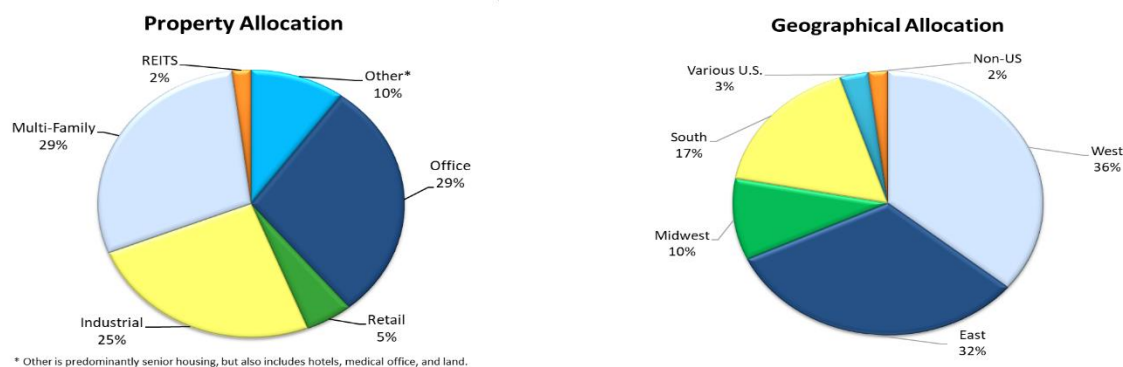
Portfolio Returns – The MBTARF real estate portfolio returned 18.83% during the year. The 3, 5 and 10 year returns for the real estate portfolio are 8.46%, 8.68%, and 11.25%, respectively. The NCREIF Benchmark returned 17.70% during the fiscal year. The benchmark's 3, 5, and 10-year returns are 8.37%, 7.75%, and 9.32%, respectively.

The MBTARF real estate portfolio received \$18.6 million in distributions during the year ended December 31, 2021, compared to the \$3.0 million in distributions received during 2020. This increase was largely due to a \$10 million dollar redemption from JP Morgan Special Situations Property Fund in July and a \$5 million dollar redemption from Intercontinental US Real Estate Fund in October 2021. The MBTARF's real estate managers called \$31.2 million of capital during 2021, compared to \$0.5 million of capital called during 2020. The increase was a result of two new real estate commitments, for \$15 million dollars each, to PRIT Real Estate Segmentation in July 2021 and TA Core Property Fund in October 2021. The net cash flow from the MBTARF's real estate portfolio for the year ended December 31, 2021 was a net cash outflow of \$12.6 million, compared to a net inflow of \$2.5 million for the year ended December 31, 2020.










(Continued)

Geographic Diversification

The following charts illustrate the property type and geographic diversification of the closed end real estate portfolio:



The MBTA Retirement Real Estate managers at December 31, 2021 are presented in the following table:

	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
	AFL CIO BLDG INVST TR	Open Ended	\$ 18,782,796
	COLONY INVESTORS VII LP	Opportunistic	160,700
	INTERCONTINENTAL REAL ESTATE CORP	Open Ended	18,480,093
	JP MORGAN ASSET MANAGEMENT	Open Ended	44,035,376
	BENTALL GREEN OAK	Open Ended	45,655,782
	PRIM REAL ESTATE SEGMENTATION	Open Ended	17,244,324
	PRUDENTIAL REAL ESTATE INVESTORS	Sector Focused	12,959,235
	SIGULER GUFF & COMPANY	Opportunistic	6,494,942
	TA REALTY CORE PROPERTY FUND	Open Ended	16,092,694
Total Portfolio Fair Value:			\$ 179,905,942

Risk Parity / Diversified Beta Portfolio:

As of December 31, 2021, the MBTA Retirement Fund had \$123.8 million invested in the risk parity portfolio, representing 6.40% of the total Fund. The Risk Parity managers utilizes a risk premium capture strategy that seeks to generate returns by investing in equity, bond and commodity markets using a risk-balanced investment process. Specifically, the managers select the appropriate assets for the strategy, allocates them based on their proprietary risk management and portfolio construction techniques, and then applies an active position process to improve expected returns.

The MBTA Retirement Fund invests in Risk Parity / Diversified Beta products because it provides the Fund with diversification and attractive returns. Additionally, the strategy provides daily liquidity, no lock-up, high capacity, and high transparency-all of which are attractive qualities for the Fund.

Portfolio Risks - Investments in Risk Parity / Diversified Beta are subject to various risks, including derivatives and leverage risk. The Risk Parity managers may invest a substantial portion of its assets in “derivatives” –so-called because their value “derives” from the value of an underlying asset, reference rate or index-the value of which may rise or fall more rapidly than other investments. The strategy invests principally in exchange-traded futures across a diverse mix of assets including equities, bonds and commodities. For some derivatives, it is possible to lose more than the amount invested in the derivative. If the portfolio uses derivatives to “hedge” a portfolio risk, it is possible that the hedge may not succeed. This may happen for various reasons, including unexpected changes in the value of the rest of the portfolio. Over the counter derivatives are also subject to counterparty risk, which is the risk that the other party to the contract will not fulfill its contractual obligation to complete the transaction with the Fund. The implementation of a risk parity strategy requires the use of leverage in order to increase the risk of the government bond allocation in the strategy so that it can be balanced against the portfolio’s exposure to stocks and commodities.



(Continued)

The use of derivatives facilitates the ability to create the desired level of leverage in the portfolio. Leverage may cause the portfolio to be more volatile than if the portfolio had not been leveraged because leverage can exaggerate the effect of any increase or decrease in the value of securities held by the portfolio.

Portfolio Returns - For the calendar year 2021, the Risk Parity / Diversified Beta portfolio returned 9.82% underperforming the asset class benchmark, (60% MSCI World Equity / 40% Barclays Aggregate Bond Index) by 2.22%.

On a three and five-year basis through December 31, 2021, the Risk Parity / Diversified Beta portfolio has returned 13.56% and 8.91% compared to its benchmark, which returned 15.07% and 10.62% respectively. The MBTA Retirement Fund began investing in this asset class in 2012. Due to this 10-year returns are not yet available.

The MBTA Retirement Fund's Risk Parity / Diversified Beta managers at December 31, 2021 are presented in the following table:

	Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
	Invesco	Diversified Beta	\$ 66,689,865
 PANAGORA	PanAgora Asset Management	Risk Parity	57,098,316
Total Portfolio Fair Value:			\$ 123,788,181

Fund of Hedge Fund Portfolio

As of December 31, 2021, the MBTARF's fund of hedge fund portfolio held \$81.4 million in net positions, which represented 4.21% of the total MBTARF portfolio. The objective of the MBTARF's hedge fund program is to reduce the volatility of the total fund while attempting to maximize returns in a variety of market conditions. As a group of strategies, hedge funds represent a broad set of investment styles, mandates, and products that focus primarily on the liquid equity, fixed income, and derivatives markets, but that may also include allocations to non-traditional investments, including illiquid securities and investments. There are two primary methods for investing in hedge funds: funds of hedge funds, and single manager funds. The MBTARF primarily utilizes funds of hedge funds in an effort to significantly reduce risk through diversification.

Portfolio Risks - Hedge Funds are subject to various risks inherent in this strategy. Fluctuations in the markets can create market risk. Credit risk due to the fixed income nature of hedge fund strategies. As the MBTARF is invested in fund of fund strategies, liquidity risk is present as managers unwind from underlying positions. Investing in hedge fund exposes operational risks in executing strategies and valuations of positions. The Fund monitors risk by enforcing the investment managers to provide exceptional levels of transparency.

Portfolio Returns - The MBTARF's fund of hedge fund portfolio returned 8.06% for the fiscal year. The MBTARF uses the CSFB/Tremont Hedge Fund Index as a benchmark for hedge fund performance. The benchmark returned 8.23% in the 2021 fiscal year. On a 3, 5, and 10-year basis, the MBTARF hedge fund portfolio returned 9.23%, 3.96%, and 3.81%, respectively. The benchmark returned 7.96%, 5.47%, and 4.90%, respectively, over the same 3, 5, and 10-year periods.

(Continued)

The MBTARF hedge fund portfolio has two active fund of hedge fund investment managers as of December 31, 2021. On September 21, 2021 the Board of Directors voted to terminate Rock Creek due to performance concerns and fee structure. On April 1, 2022 an additional \$25 million was funded to the PRIT Hedge Fund Portfolio.

Manager	Investment Mandate	Portfolio Fair Value @ 12-31-2021
 PENSION RESERVES INVESTMENT MANAGEMENT BOARD	Pension Reserves Investment Management Fund of Funds	\$ 42,839,884
	The Rock Creek Group Fund of Funds	38,558,973
Total Portfolio Fair Value:		\$ 81,398,857

Fund of Hedge Fund - Opportunistic Portfolio

As of December 31, 2021, the MBTARF's fund of hedge fund - opportunistic portfolio held \$13.4 million in net positions, which represented 0.69% of the total MBTARF portfolio. While descriptions vary across investors, opportunistic investments generally encompass non-traditional investment strategies that seek to generate risk-adjusted returns by taking advantage of temporary market inefficiencies or dislocations arising from evolving market conditions, regulatory changes and other factors. Opportunistic investments generally do not fit into other asset class or strategy descriptions and may be viewed as tactical and time constrained. As compared to multi-strategy hedge funds, opportunistic investments generally exhibit higher expected returns, greater market risk, less liquidity and a higher level of concentration. Opportunistic managers may invest across asset classes (e.g. equity, debt, alternatives) and offer funds in different vehicles. Opportunistic investments may also come in the form of hedge funds or long-only investment strategies.


Portfolio Risks – Opportunistic Hedge Funds are subject to various risks inherent in this strategy. Depending on what form they take, opportunistic investments may expose an investor to a range of risks. These include:

- Market risks that impact the underlying value of investments held in underlying equity, fixed income and alternative investments.
- Market risks may include equity, interest rate or currency exchange rate risk and may be impacted by macroeconomic factors such as inflation expectation.
- Credit risk attributable to fixed income securities or private debt investments.
- Liquidity risks, especially for closed end, limited partnership and direct investments.
- Operational risks related to valuation processes, transaction processing, compliance, financial reporting and service providers.

(Continued)

Portfolio Returns - The MBTARF's opportunistic fund of hedge fund portfolio returned 9.85% for fiscal year 2021. The 3-year return for the opportunistic fund of hedge fund portfolio is 12.49%. The MBTARF uses the Bank of America/Merrill Lynch High Yield Index as a benchmark for performance, which returned 5.36% in 2021 and returned 8.57% for the 3-year period. The first full year the MBTA Retirement Fund began investing in this asset class was 2018. Due to this the 5 and 10-year returns are not yet available.

The MBTARF opportunistic hedge fund of fund portfolio held two active investments with one manager as of December 31, 2021. The manager is presented in the following table:

Manager		Investment Mandate	Portfolio Fair Value @ 12-31-2021	
 Hamilton Lane	Hamilton Lane	Fund of Funds - Opportunistic	\$	13,401,727
	Total Portfolio Fair Value:		\$	13,401,727

Private Equity Portfolio

As of December 31, 2021, the private equity portfolio had approximately \$153.5 million in net positions, which represented 7.94% of the MBTARF portfolio. The private equity portfolio is used to increase the expected long-term return of the MBTARF portfolio, while generating cash flow and providing diversification. The private equity portfolio is diversified among sub-classes which include: venture capital, growth equity, buyouts, secondary strategies, distressed, energy, and special situations. The MBTARF private equity portfolio is benchmarked to a State Street Customized Benchmark, which takes into account the portfolio's allocations to the various private equity sub-classes.

Portfolio Risks - Private equity does not lend itself to traditional quantitative measures of risk. Rather, risk is measured through a combination of quantitative and qualitative constraints. These risks include, but are not limited to, the following:

- **Liquidity risk:** Private equity investments are illiquid and typically have expected holding periods of 10-12 years. Investments are typically held until maturity and selling prior to maturity results in a discount to fair value. Liquidity risk is managed by minimizing the possibility of forced sales that may arise from exceeding maximum exposure limits or lowering asset allocation exposure limits.
- **Vintage risk:** Vintage reflects the year of the first capital draw from a fund. Vintage risk refers to the variability of private equity commitments over time. Vintage risk is minimized by pacing investments to provide vintage year diversification.
- **Manager risk:** Manager risk consists of two elements: the exposure within an investment vehicle; and the number of managers in the private equity program. The exposure to a specific manager within an investment vehicle is controlled by limiting the commitment size to a specific investment vehicle. The optimum number of managers in the portfolio varies with time.
- **Firm risk:** Firm risk is the exposure to a private equity firm and is controlled by limiting the maximum commitment to funds actively managed by a firm and its affiliates.

(Continued)

- **Currency risk:** Currency risk is the risk that investments held in a foreign currency will change in value as a result of changes in the currency exchange rates. The private equity program accepts the currency risks consistent with the geographic constraints of the investment opportunity. Private equity investments generally do not hedge currency risk and the private equity program does not implement currency hedges.
- **Industry risk:** Typically, private equity funds are permitted to invest in a wide variety of industries with limited controls. Industry risk is controlled primarily through appropriate diversification across strategies and sub-strategies.
- **Geographic risk:** Geographic risk is controlled through a long-term, international target exposure. Global opportunities generally indicate geographic limits and exposure will be attributed and monitored accordingly.
- **Leverage risk:** Private equity managers invest capital throughout the capital structure of portfolio companies. The capital markets control the maximum leverage available to the private equity managers. Investors control leverage exposure through portfolio construction and private equity fund selection.

Portfolio Returns - The MBTARF's private equity portfolio returned 31.74% during the fiscal year. The 3, 5 and 10 year returns for the private equity portfolio are 25.24%, 18.33%, and 11.55%, respectively. The MBTARF's State Street Private Equity Benchmark returned 49.22% during the fiscal year. The benchmark's 3, 5, and 10-year returns are 22.40%, 19.41%, and 15.19%, respectively. In April 2020, per the asset allocation, private credit was separated from the private equity portfolio. Due to this, the 3-, 5-, and 10-year returns include both private equity and private credit funds while the 1-year return reflects only private equity.

The MBTARF private equity portfolio received \$37.5 million in distributions during the fiscal year 2021, compared to \$29.0 million in the 2020 fiscal year. The private equity portfolio managers called \$23.3 million of capital during the fiscal year 2021, compared to \$14.8 million called in the 2020 fiscal year. The net cash flow from the private equity portfolio was an inflow of \$14.2 million in fiscal year 2021, compared to an inflow of \$14.2 million in fiscal year 2020.

(Continued)

The MBTA Retirement Fund's active private equity investment managers are reported in the summary below:

Manager	Investment Mandate	Portfolio Fair Value 12-31-2021	Manager	Investment Mandate	Portfolio Fair Value 12-31-2021
EUROPEAN STRATEGIC PARTNERS II	Buyout	46,139	PHAROS CAPITAL PARTNERS III	Growth Equity	8,366,119
EUROPEAN STRATEGIC PARTNERS 2006B	Buyout	1,464,696	PRIT PEVY 2020 VINTAGE	Secondary Fund of Funds	12,251,071
EUROPEAN STRATEGIC PARTNERS 2008A	Buyout	566,432	PRIT PEVY 2021 VINTAGE	Secondary Fund of Funds	3,965,776
GROSVENOR OPPOR CREDIT III	Special Situations	329,885	LAVIEN (fka Quadrangle Capital Partners II)	Buyout	489,379
LAZARD TECHNOLOGY II	Venture	1,027,633	SCP PARTNERS II	Venture	601,410
LEXINGTON CAPITAL PARTNERS VIB	Secondary Fund of Funds	397,386	SIGULER GUFF BRIC OPPN FDII	Buyout	1,212,655
LEXINGTON CAPITAL PARTNERS VII	Secondary Fund of Funds	1,928,406	SL CAPITAL ESF I	Buyout	4,110,296
LEXINGTON CAPITAL PARTNERS VIII	Secondary Fund of Funds	7,811,518	SL CAPITAL SOF II	Secondary Fund of Funds	59,797
LEXINGTON CAPITAL PARTNERS IX	Secondary Fund of Funds	9,452,059	STERLING CAPITAL PARTNERS	Growth Equity	163,666
LEXINGTON MIDDLE MARKET II	Secondary Fund of Funds	2,092,628	STERLING CAPITAL PARTNERS II	Growth Equity	325,006
LEXINGTON MIDDLE MARKET III	Secondary Fund of Funds	5,805,389	STERLING CAPITAL PARTNERS III	Growth Equity	431,952
LEXINGTON MIDDLE MARKET	Secondary Fund of Funds	503,329	STERLING CAPITAL PARTNERS IV	Growth Equity	2,294,683
LEXINGTON MIDDLE MARKET IV	Secondary Fund of Funds	8,745,794	SVB STRATEGIC INVESTORS VIII	Venture	13,267,486
NEW MOUNTAIN PARTNERS II	Buyout	28,228	SVB CAPITAL PARTNERS II	Venture	240,868
NEW MOUNTAIN PARTNERS III	Buyout	89,820	SVB CAPITAL PARTNERS III	Venture	12,943,340
NEW MOUNTAIN PARTNERS IV	Buyout	2,543,273	SVB STRATEGIC INVESTORS III	Venture	5,520,054
NEW MOUNTAIN PARTNERS V	Buyout	14,043,382	TOP TIER VENTURE VELOCITY FUND	Secondary Fund of Funds	5,829,163
NEW MOUNTAIN PARTNERS VI	Buyout	1,874,108	WELLINGTON PARTNERS II	Venture	1,168,746
OPUS CAPITAL VENTURE PARTNERS V	Venture	4,989,653	WLR RECOVERY FUND V	Special Situations	2,581,567
PHAROS CAPITAL PARTNERS	Growth Equity	864,123	Z CAPITAL SPECIAL SIT. FD II	Special Situations	7,245,848
PHAROS CAPITAL PARTNERS II	Growth Equity	5,850,619	Total Portfolio Fair Value		\$ 153,523,382

Private Credit Portfolio

As of December 31, 2021, the private credit portfolio had approximately \$26.1 million in net positions, which represented 1.35% of the MBTARF portfolio. The private credit portfolio is used to increase the expected long-term return of the MBTARF portfolio, while generating cash flow and providing diversification. Private Credit is a way for businesses to raise capital, where an investor lends money in exchange for interest payments. The investor can impose covenants, warrants, and/or collateralization to secure the loan. As a comparison private equity is when the investor owns all or part of the company.

In April 2020, per the asset allocation, the Fund separated performance and reporting for the private credit strategy from the private equity portfolio. As of December 31, 2021, the MBTA Retirement Fund's private credit strategy has 10 limited partnerships. The MBTARF private credit portfolio is benchmarked to a State Street Private Credit Benchmark.

Portfolio Risks - Private credit does not lend itself to traditional quantitative measures of risk. Rather, risk is measured through a combination of quantitative and qualitative constraints. These risks include but are not limited to the nonpayment of scheduled interest or principal payments on a debt investment. If a borrower fails to make a payment, or default, this may affect the overall return to the lender. Private Credit investments are generally illiquid and require longer investment horizons. The typical lifespan of an MBTARF investment in private credit can range between 8-12 years.

Portfolio Returns - The MBTARF's active private credit portfolio returned 56.20% during the fiscal year. The MBTARF's State Street PEI Mezzanine - Special Situations Benchmark returned 25.30% during the fiscal year. 2021 was the first full year the MBTA Retirement Fund began reporting in this asset class separate from private equity. Due to this the 3, 5 and 10-year returns are not yet available.

(Continued)

The MBTARF private credit portfolio received \$8.6 million in distributions during the fiscal year 2021. The private credit portfolio managers called \$4.0 million of capital during the fiscal year 2021. The net cash flow from the private credit portfolio was an inflow of \$4.6 million in fiscal year 2021. In 2022 a year over year comparison of cash flows will be provided.

The MBTA Retirement Fund's active private credit investment managers are reported in the summary below:

Manager	Investment Mandate	Portfolio Fair Value 12-31-2021
CRESCENT MEZZ PARTNERS VIIB	Mezzanine	\$ 3,188,385
OAKTREE MEZZANINE FUND - CLASS A	Mezzanine	4,647
OAKTREE MEZZANINE FUND - CLASS B	Mezzanine	85,488
VENTURE LENDING + LEASING IV	Mezzanine	71,100
VENTURE LENDING + LEASING V	Mezzanine	319,688
VENTURE LENDING + LEASING VI	Mezzanine	1,909,144
VENTURE LENDING + LEASING VII	Mezzanine	4,571,325
VENTURE LENDING + LEASING VIII	Mezzanine	7,049,165
VENTURE LENDING + LEASING IX	Mezzanine	7,954,767
WTI FUND X	Mezzanine	944,720
Total Portfolio Fair Value		\$ 26,098,427

SCHEDULE OF TIME-WEIGHTED RETURNS BY ASSET CLASS*

For the Period Ended December 31, 2021

Portfolio	Annualized Returns		Annual Returns				
	3 - Year	5 - Year	2021	2020	2019	2018	2017
Total Fund	15.82	11.76	13.88	15.26	18.36	(3.08)	15.80
Policy Benchmark	15.15	11.47	13.52	10.64	16.29	(2.57)	12.60
Taft Hartley - Median	15.00	10.90	14.60	11.50	18.10	(3.20)	14.30
Domestic Equity Large Cap Composite	24.87	17.47	27.17	17.27	30.55	(5.85)	22.04
S&P 500 Index	26.07	18.47	28.71	18.40	31.49	(4.38)	21.83
Domestic Equity Small Cap Composite	24.95	16.24	22.63	23.15	29.15	(7.34)	17.41
Russell 2000 Growth Index	21.17	14.53	2.84	34.63	28.48	(9.31)	22.17
Russell 2000 Value Index	17.99	9.07	28.27	4.63	22.39	(12.86)	7.84
Global Emerging Markets Composite	29.16	24.21	8.47	49.72	31.95	(1.88)	39.87
MSCI ALL Country World	20.38	14.40	18.54	16.26	26.60	(9.41)	23.97
International Equity Composite	14.18	10.32	8.77	11.32	22.93	(16.14)	30.91
MSCI EAFE	13.54	9.55	11.26	7.82	22.02	(13.79)	25.62
Fixed Income Composite	5.15	3.93	0.86	7.66	7.08	(0.20)	4.51
Bloomberg Aggregate	4.79	3.57	(1.54)	7.51	8.72	0.01	3.54
Diversified Beta	13.56	8.91	9.82	12.30	18.73	(6.29)	11.67
60% MSCI World Eq / 40% BC Agg Bond	15.07	10.62	12.05	13.31	20.01	(5.07)	14.52
Hedge Funds	9.23	3.96	8.06	4.76	15.12	(12.60)	6.62
CSFB/Tremont Hedge Fund Index	7.96	5.47	8.23	6.36	9.31	(3.19)	7.12
Hedge Funds - Opportunistic	12.49	-	9.85	11.47	16.25	7.87	3.46
Bank of America/Merrill Lynch HY Index	8.57	-	5.36	6.17	14.41	(2.26)	1.31
Private Equity Composite	25.24	18.33	31.74	31.10	13.68	4.82	12.66
State Street Private Equity Benchmark	22.40	19.41	49.22	9.27	12.38	8.70	17.59
Private Credit Composite	-	-	56.20	-	-	-	-
State Street Private Credit Benchmark	-	-	25.30	-	-	-	-
Real Estate Composite	8.46	8.68	18.83	1.19	6.11	9.93	8.11
NCREIF Property Index	8.37	7.75	17.70	1.60	6.42	6.72	6.96

Policy Benchmark:

17% S&P 500	6% BBG Barclays Multiuniverse
7% Russell 2000	3% BBG Barclays MBS
9% MSCI EAFE	8% State Street PE Index
2% MSCI World EX US Small Cap	2% State Street Private Credit
4% MSCI AC World Index Net	7% 91 T-Bill One Month Lag Plus 300BP
4% MSCI Emerging Markets Index	9% NCREIF Property Index quarter lag
3% BBG Barclays US TIPS 1-10 year	6% 91 T-Bill Plus 300BP
8% BBG Barclays Aggregate	2% ICE BoFA US 3-Month T-Bill
3% S&P/LSTA	

* All return information is gross of fees, except hedge funds, which are net of fees. Returns are calculated on a time-weighted rate of return methodology.

Investment Summary at Fair Value

As of December 31, 2021

	<u>Fair Value</u>	<u>% of Fair Value</u>
Short-Term:		
Cash and cash equivalents*	\$ 62,893,489	3.25%
Fixed Income:		
U.S. Agencies	3,531,828	0.18
US Treasury	113,235,825	5.85
Domestic fixed income	231,643,226	11.98
International fixed income	2,181,798	0.11
Asset Backed	76,352,652	3.95
Equity:		
Domestic equity securities	592,743,743	30.63
International equity securities	273,647,874	14.15
Real Estate	179,905,942	9.30
Private Equity & Private Credit	179,621,810	9.29
Risk Parity	123,788,180	6.40
Hedge Funds	81,398,857	4.21
Hedge Funds - Opportunistic	<u>13,401,727</u>	<u>0.69</u>
Total Investments	\$ 1,934,346,951	100.00%

*Investment manager's cash holdings are reported in cash and cash equivalents

SUMMARY SCHEDULE OF BROKER COMMISSION

(Top 25 Brokers and Cumulative Fees Paid to Others)
Year Ended December 31, 2021

Brokerage Firm	Shares/Par Value	Fees Paid	% Total	Average \$ per share
MORGAN STANLEY CO INCORPORATED	19,027,216 \$	14,830	10.02%	0.0008
BOFA SECURITIES, INC.	43,725,164	12,072	8.16%	0.0003
GOLDMAN SACHS + CO LLC	17,106,694	9,734	6.58%	0.0006
CREDIT SUISSE SECURITIES (USA) LLC	5,101,560	8,051	5.44%	0.0016
J P MORGAN SECURITIES INC	129,772	5,027	3.40%	0.0387
JEFFERIES LLC	1,048,519	4,565	3.08%	0.0044
DAIWA CAPITAL MARKETS AMERICA INC.	636,421	4,321	2.92%	0.0068
WILLIAM BLAIR & COMPANY L.L.C	100,497	3,642	2.46%	0.0362
J.P. MORGAN SECURITIES PLC	723,130	3,358	2.27%	0.0046
MERRILL LYNCH INTERNATIONAL	446,821	3,285	2.22%	0.0074
EXANE S.A.	150,843	2,976	2.01%	0.0197
JOH. BERENBERG, GOSSLER & CO. KG	64,171	2,705	1.83%	0.0422
J.P. MORGAN SECURITIES LLC	28,714,509	2,695	1.82%	0.0001
BARCLAYS CAPITAL	1,180,662	2,541	1.72%	0.0022
MITSUBISHI UFJ SECURITIES (USA)	67,307	2,498	1.69%	0.0371
CACEIS BANK	17,576	2,403	1.62%	0.1367
CITIGROUP GLOBAL MARKETS INC	492,028	2,398	1.62%	0.0049
UBS SECURITIES ASIA LTD	242,288	2,316	1.56%	0.0096
HSBC SECURITIES (USA) INC.	10,607,804	2,258	1.53%	0.0002
MIRABAUD SECURITIES LLP	31,841	2,216	1.50%	0.0696
BERNSTEIN AUTONOMOUS LLP	211,166	2,161	1.46%	0.0102
COWEN AND COMPANY, LLC	179,519	1,965	1.33%	0.0109
UBS SECURITIES LLC	1,629,855	1,958	1.32%	0.0012
MACQUARIE CAPITAL SECURITIES S	69,432	1,858	1.26%	0.0268
UBS AG	291,293	1,808	1.22%	0.0062
OTHER	35,551,462	44,364	29.97%	0.0012
TOTAL	167,547,551 \$	148,006	100%	0.0009

The Fund Board has a commission recapture agreement with Capital Institutional Services, Inc.
For the year ended December 31, 2021 the Fund earned approximately \$1,800 from the
commission recapture program.

SCHEDULE OF DIRECT MANAGEMENT FEES

Year Ended December 31, 2021

Investment Management Fees by Asset Class:	AUM (\$000s)	Fees (\$000s)
Domestic Equity	\$ 503,334	\$ 1,191
International Equity	209,906	1,399
Global Equity	152,048	819
Fixed Income	428,050	713
Risk Parity / Diversified Beta	123,788	242
Real Estate	454,328	931
Total Investment Management Fees		5,295
Investment Advisory (Consulting) Fees		\$ 344
Communications and Governmental Services		120
Custodian Fees		779
Total Other Fees		1,243
Total Direct Management Fees charged to MBTARF		<u>\$ 6,538</u>

INVESTMENT POLICY STATEMENT

The following are significant fundamentals of the Fund's Investment Policy Statement. The policy delineates the objectives and policies that have been established by the Board to provide a framework for the on-going management of the Fund. It is designed to clearly communicate the directives of the Board to all interested parties. The Policy shall be revised from time to time, as deemed necessary, and will be reviewed annually to ensure its relevance to the Fund's current needs. Any resulting material changes will be communicated to all affected parties. The Policy will apply to the Fund on an aggregate basis.

The purpose of this Investment Policy Statement (this "IPS") is to enumerate for stakeholders clear and concise guidelines by which the Retirement Board administers the Fund. This IPS is designed to allow sufficient flexibility to capture investment opportunities while providing guidance to facilitate compliance with the governing documents of the Fund and Massachusetts law. The Retirement Board periodically reviews this IPS to ensure that it conforms with best practices applicable to the Fund.

In fulfilling the mission of the Trust, the objective of the Retirement Board is to ensure the availability of sufficient assets to pay benefits by achieving the highest level of investment performance compatible with acceptable levels of risk in a cost-effective manner and prudent investment practices in order to lower costs. Specifically, in order to maintain if not improve upon its funded status, the Retirement Board seeks to meet or exceed the actuarial target rate of return. Maintaining if not exceeding the Assumed Rate of Return should have the benefit of stabilizing employer and employee contributions to the Fund. The Fund shall have a risk tolerance consistent with that of other funds created for similar purposes, and the assets of the Fund shall be invested accordingly. The Fund has adopted a Risk Management Framework. As a mature defined benefit plan, the Fund will have a negative cash flow as more participants retire which, in turn, impacts the Fund's tolerance for market volatility.

The Fund's investment program is based on the precepts of the generally accepted capital markets theory followed by institutional investors who, by definition, are long-term-oriented investors with goals and objectives that are similar to the Fund. This philosophy holds that:

- Increasing risk is rewarded with compensating returns over time and therefore, prudent risk-taking is justifiable for long-term investors.
- Risk can be mitigated through diversification of asset class exposure, implementation strategies and individual security holdings.

(Continued)

- Diversification benefits shall be measured by examining the correlation between asset classes, implementation strategies and manager styles, with a goal of maximizing diversification and limiting concentration and overlap in asset classes and strategies that are more highly correlated.
- The primary determinant of long-term investment performance is the strategic or long-term asset allocation strategy.

Rate of Return Assumption

The Retirement Board will, with the assistance of the Actuary and Investment Advisor, establish and annually review the Assumed Rate of Return and may adopt changes over a market cycle or more frequently if warranted. The current Assumed Rate of Return is 7.25% annually, net of all fees and operating expenses.

Relative Return Objectives

The Fund shall seek to achieve a rate of return that ranks in the top half of the appropriate peer fund universes given a comparable level of risk and to achieve a long-term rate of return on investments that is equal to or exceeds both the Asset Allocation Index Return and the Policy Index Return. Given its investment philosophy, the Retirement Board recognizes that the return targets may not be achieved in any single year; the Retirement Board will measure the performance of the Fund over an appropriate longer-term horizon.

Current Asset Allocation Targets & Ranges

Asset allocation herein refers to the establishment of relative percentage allocation guidelines for the investment of assets in equities, fixed income, alternative investments, cash equivalents, and other general forms of investment, and not to individual security selection. This single decision is the most important consideration for the Board. In terms of direct impact on the Fund's performance, the Fund's policy asset mix choice outweighs all other decisions. As a practical matter, the Board understands that while important, portfolio structure decisions and active management strategies involving stock and bond selection, sector weighting, or market timing have been shown to contribute less than long-term asset allocation decisions.

It is generally recognized that asset allocation decisions may account for up to 90% of the investment return for a large pool of assets; in terms of direct impact on the Fund's performance, the Fund's policy asset mix choice outweighs all other decisions. The Retirement Board shall manage the Fund to achieve the Assumed Rate of Return while adhering to fiduciary obligations and ensuring liquidity sufficient to pay benefits.

(Continued)

Factors to be considered include:

- (1) the Fund's assumed rate of return,
- (2) the risk tolerance of the Board,
- (3) the Fund's liquidity requirements,
- (4) Funded status,
- (5) the Fund's liability structure and other characteristics unique to the fund. Following an asset allocation review which considered the impact of a range of asset allocation policies on the Fund.

The Board will review the asset allocation targets at least annually, and may adopt changes over a three- to five-year time horizon or, more frequently, if significant changes occur within the economic or capital market environments. A change in the Fund's liability structure, funded status, or long-term investment prospects may also trigger a revision of the asset allocation.

The Fund may have the opportunity to invest in PRIT. If the Fund invests with a PRIT Segmentation Program, the Investment Advisor will, at the time of the investment is being considered by the Retirement Board, suggest to the Retirement Board allocations to the Fund's asset (sub)classes (if necessary), recognizing that a PRIT Segmentation Account may not fit uniformly into the Fund's asset allocation rubric; this assignment will impact the IM Benchmark(s) applicable to the PRIT Segmentation Account.

Performance Benchmarks

Total Fund Return: The Total Fund Return shall be compared against other corporate, jointly trustee and public pension plans of similar size and circumstances, as identified by the Investment Advisor. The Total Fund Return objective is to meet or exceed the Allocation Index Return and the Policy Index Return, which are each described below.

Allocation Index: The Allocation Index Return shall measure the success of the Fund's current allocation. It shall be calculated by using index rates of return for each asset class invested in by the Fund multiplied by the actual percent allocated to each asset class. The difference between the Allocation Index Return and the Total Fund Return measures the effect of active management. If the Total Fund Return is greater than the Allocation Index Return, then active management has in aggregate added value.

Policy Index: The Policy Index Return shall measure the success of the Fund's target asset allocation. It shall be calculated by using index rates of return for each asset class invested in by the Fund multiplied by the percent targeted to each asset class. The difference between the Allocation Index Return and the Policy Index Return measures the effects of deviating from the target allocation.

(Continued)

If the Allocation Index Return is greater than the Policy Index Return, then deviating from the target allocation has added value. If the Allocation Index Return is less than the Policy Index Return, then deviating from the target allocation has not added value.

Manager Benchmarks: The Investment Managers shall be compared to a combination of passively managed index returns matching the managers' specific investment styles, as well as the median manager in their appropriate peer group universe.

Rebalancing

The actual asset allocation mix will deviate from the targets due to market movements, cash flows, and manager performance. The Retirement Board and Executive Director with the assistance of the Investment Advisor will review asset allocation at least quarterly to determine compliance with the targets and rebalance as warranted. The Executive Director shall report material rebalancing activity to the Retirement Board.

ACTUARIAL SECTION

(Unaudited)

Buck Global, LLC has performed a December 31, 2021 actuarial valuation of the MBTA Retirement Fund. This valuation and report was prepared using generally accepted actuarial principles and practices and meets the parameters set by the Governmental Accounting Standards Board (GASB). To the best of our knowledge, this report is complete and accurate, and the assumptions used represent our best estimate of anticipated experience of the Fund.

Buck Global, LLC has prepared and included as part of this report all of the supporting schedules in the Actuarial Section of the Annual Comprehensive Financial Report (ACFR).



500 Plaza Drive
Secaucus, NJ 07096

May 27, 2022

Retirement Board
Massachusetts Bay Transportation Authority Retirement Fund
One Washington Mall, Fourth Floor
Boston, MA 02108

Dear Board Members:

The Pension Agreement covering the Massachusetts Bay Transportation Authority Retirement Fund provides that the actuary make annual actuarial valuations of the Fund and certify rates of contribution to the Retirement Board. The most recent actuarial valuation of the Fund was prepared as of December 31, 2021.

This valuation reflects the funding policy adopted by the Board effective December 31, 2009. The actuarial cost method used is the entry age normal cost method. The amortization of the unfunded liability is made in installments increasing at the rate of four percent per year over a closed 30-year period beginning December 31, 2009.

This valuation is based on assumptions adopted by the Retirement Board, in April 2019 and effective with the actuarial valuation of December 31, 2018, on the basis of an experience study covering the period January 1, 2013, through December 31, 2017. In April 2020, the Board voted to change the assumed annual rate of return on assets to 7.25% in connection with a revision of the Fund's investment policy. Minor modifications were made effective December 31, 2021, to assumptions concerning the likely return to active service of non-contributing members and members collecting workers' compensation benefits. We believe that these assumptions are reasonable. The assumptions and methods used for funding purposes satisfy the requirements of all applicable Actuarial Standards of Practice. The same actuarial assumptions are used for financial reporting by and for the Fund under GASB Statements 67 and 68.

We performed the valuation using participant data and plan asset data supplied by the Authority and Retirement Fund. Although we did not audit the data, we reviewed the data for reasonableness and consistency with the prior year's information. The accuracy of the results of the valuation is dependent on the accuracy of the data.

The following exhibits from the valuation report were incorporated in the Actuarial Section of the Annual Comprehensive Financial Report (ACFR):

1. Summary of Principal Results
 2. Number and annual retirement allowances of retired members, disabled members and beneficiaries as of December 31, 2021
 3. Schedule of Funding Progress
 4. Outline of Actuarial Assumptions and Methods
- (Continued)

5. Summary of Main Provisions of the Fund as Interpreted for Valuation Purposes
6. Number and Annual Compensation of Active Members Distributed by Fifth Age and Service as of December 31, 2021
7. Number and Annual Retirement Allowances Distributed by Age as of December 31, 2021

The following exhibits were separately prepared by Buck for use in the ACFR:

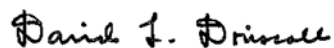
1. Schedule of Retired Members and Beneficiaries Added to and Removed From Rolls
2. Solvency Test

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. An analysis of the potential range of such future differences is beyond the scope of the valuation. However, in accordance with the requirements of Actuarial Standard of Practice No. 51 ("ASOP 51"), a risk assessment is provided in Section X of the valuation report.

Where presented, references to "funded ratio" and "unfunded accrued liability" are typically measured on an actuarial value of assets basis. It should be noted that recomputation of these measurements using the market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but do not provide a basis for the assessment of the funded status of the plan if the plan were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

I am a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. I meet the Qualification Standards of the Academy to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and I am available to answer questions about it.

Buck Global, LLC (Buck)



David L. Driscoll, FSA, EA, MAAA, FCA
Principal, Consulting Actuary

Section II - Summary of Principal Results

1. The principal results of the current and preceding years' valuations are summarized below:

Valuation Date	December 31, 2020	December 31, 2021
Number of active members	5,674	5,486
Annual compensation of all members	\$ 460,921,559	\$ 458,857,189
Annual compensation of active members below normal retirement age	\$ 456,929,998	\$ 454,984,547
Average age (years)	47.99	48.46
Average service (years)	10.66	11.12
Average compensation	\$ 81,234	\$ 83,641
Number of active members not accumulating creditable service	342	215
Number of retired members, beneficiaries and disabled members	6,710 ¹	6,713 ²
Annual retirement allowances	\$ 222,107,742	\$ 225,623,892
Assets for funding purposes	\$ 1,636,054,386	\$ 1,760,643,571
Unfunded accrued liability	\$ 1,419,068,994	\$ 1,341,060,444
Contribution rates required:		
Normal	12.1300%	12.1200%
Accrued liability	22.0200%	21.7500%
Expenses	<u>1.0000%</u>	<u>1.0000%</u>
Total required rate	35.1500%	34.8700%
Member excess rate	<u>0.0000%</u>	<u>0.0000%</u>
Actual contribution rate during following fiscal year	35.1500%	34.8700%

2. Valuation results as of December 31, 2021, are given in Section VI, and contribution levels are set forth in Section VII.
3. Schedule B of this report outlines the actuarial assumptions and methods used in the valuation. The actuarial assumptions were selected on the basis of an experience study covering the five-year period ending December 31, 2017. The Retirement Board voted to adopt these assumptions in April 2019. In addition, the Retirement Board changed the assumed interest rate used in funding calculations from 7.50% to 7.25%, effective with the December 31, 2019 valuation.
4. Schedule C of this report presents a summary of the main provisions of the Fund, as interpreted in preparing the actuarial valuation.

¹ Includes 6,576 retirees and beneficiaries and 134 individuals receiving payments under QDROs.

² Includes 6,572 retirees and beneficiaries and 141 individuals receiving payments under QDROs.

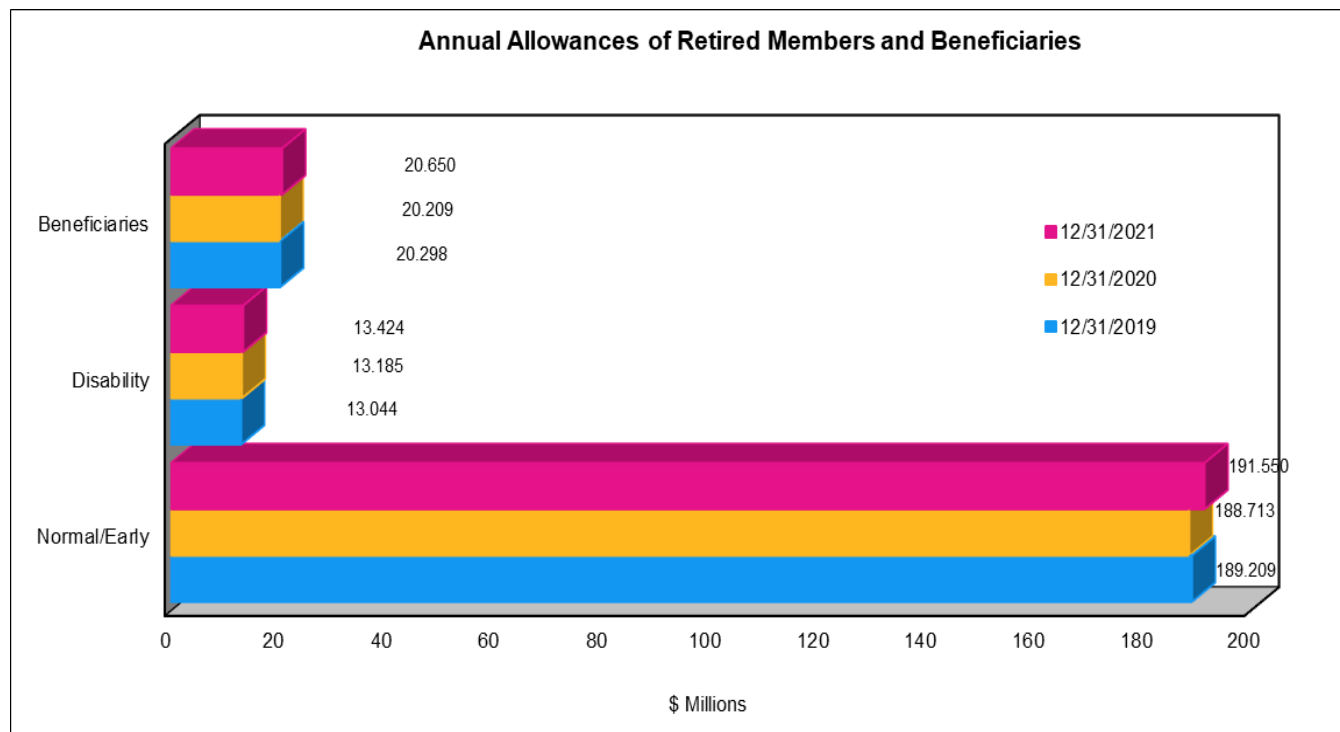
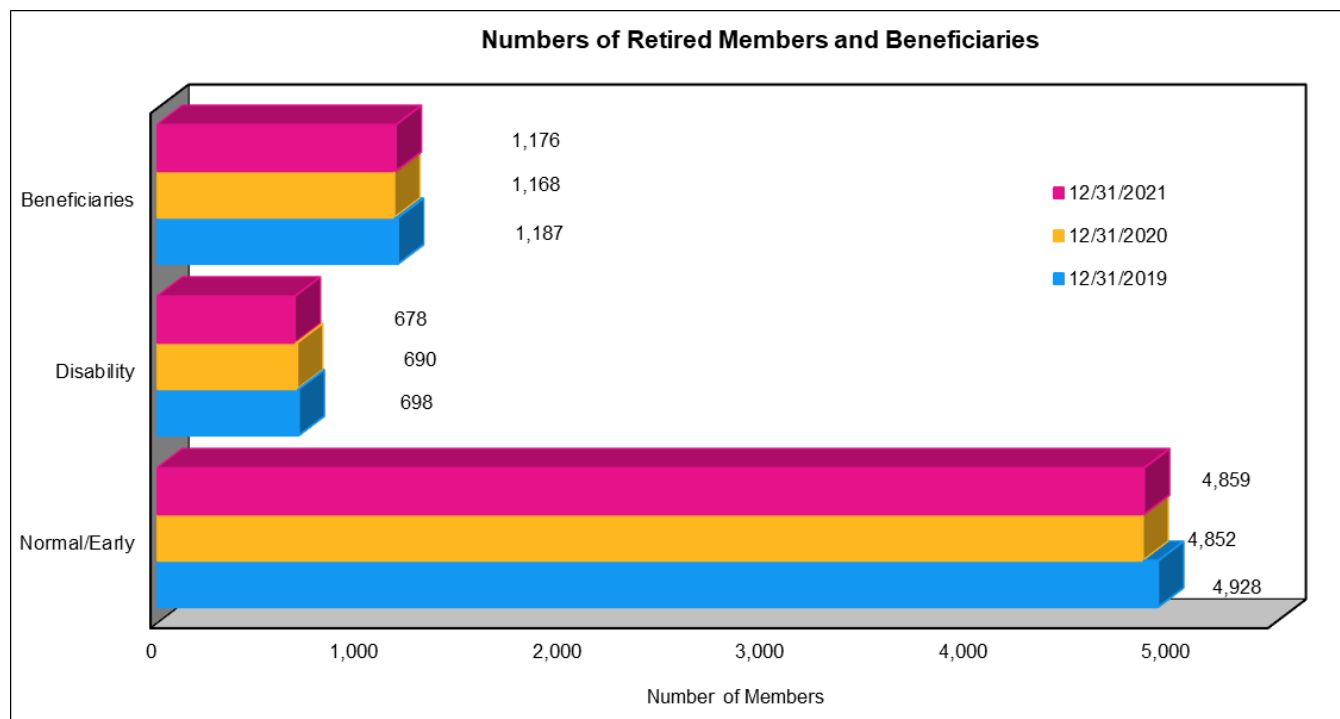
Section III - Membership Data

1. Employee data were furnished by the Authority and Retirement Fund.
2. Table 1 of Schedule D shows the number and annual compensation of active members, while Table 2 of Schedule D shows the number and annual retirement allowances of retired members, disabled members and beneficiaries.
3. The following table summarizes the number and annual retirement allowances of retired members, disabled members and beneficiaries as of December 31, 2021:

Category	Number	Annual Retirement Allowances
Benefits to Members Retired on Normal, Early Normal and Reduced Early Retirement Allowances	4,859	\$ 191,550,280
Benefits to Members Retired on Disability Retirement Allowances	678	13,423,756
Benefits to Beneficiaries of Deceased Members ¹	<u>1,176</u>	<u>20,649,856</u>
Total	6,713	\$ 225,623,892

¹ Includes individuals receiving payments under QDROs.

Section III - Membership Data (continued)



Section IV – Assets

1. Asset information was obtained from the Retirement Fund office.
2. The market value of the Fund's net assets available for benefits as of December 31, 2021, amounted to \$1,939,942,424.
3. The asset method is a five-year phase-in smoothing method under which the value of assets for actuarial purposes equals market value less a five-year phase-in of the differences between actual and assumed investment return. The value of assets for actuarial purposes may not differ from the market value of assets by more than 20%. The smoothing method used to calculate the value of assets for actuarial purposes was restarted as of December 31, 2013, coincident with the change to the present method.
4. The calculation of the actuarial value of assets as of December 31, 2021 is presented below:

Market value as of December 31, 2021	1,939,942,424	(A)
--------------------------------------	---------------	-----

Adjustment to recognize asset gains (losses) over 5 years:

Year Ending	Asset gain (loss)	X	Adjustment factor	=	Adjustment
12/31/2021	106,359,393		0.80		85,087,514
12/31/2020	114,287,041		0.60		68,572,225
12/31/2019	148,351,928		0.40		59,340,771
12/31/2018	(168,508,286)		0.20		<u>(33,701,657)</u>
Total					179,298,853 (B)

Actuarial value of assets, as of December 31, 2021	1,760,643,571
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Asset gain during fiscal year ending December 31, 2021

Actual return on market value and cash flow

Income from investments and securities lending	24,533,250
Net appreciation	<u>214,422,254</u>
Total	238,955,504 (C)

Expected 7.25% return on market value and cash flow	132,596,111 (D)
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Asset gain (loss) (C) – (D)	106,359,393
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The assets for valuation purposes are 90.80% of market value.

5. As of December 31, 2007, members' excess contributions (as discussed in Section V) had been fully depleted to cover the cost of the one-time cost-of-living increases negotiated in collective bargaining related to the benefits provided under the Fund. The actuarial asset value derived above thus requires no additional adjustment for members' excess contributions.

Section V – Member Excess Contributions

1. Effective July 1, 1998, in lieu of a reduction in the 4% contribution rate, members continued to make contributions equal to 4% of covered payroll.
2. To the extent that 4.00% exceeds the actuarially determined member required contribution rate, the excess is characterized as member excess contributions. These amounts are to be accumulated within the Retirement Fund and used to provide additional benefits.
3. The member excess rates developed in prior years are as follows:

Period	Excess Rate	Period	Excess Rate
July 1, 2007 – June 30, 2008	0.39610%	July 1, 2014 – June 30, 2015	0.00000%
July 1, 2008 – June 30, 2009	0.00000%	July 1, 2015 – June 30, 2016	0.00000%
July 1, 2009 – June 30, 2010	0.00000%	July 1, 2016 – June 30, 2017	0.00000%
July 1, 2010 – June 30, 2011	0.00000%	July 1, 2017 – June 30, 2018	0.00000%
July 1, 2011 – June 30, 2012	0.00000%	July 1, 2018 – June 30, 2019	0.00000%
July 1, 2012 – June 30, 2013	0.00000%	July 1, 2019 – June 30, 2020	0.00000%
July 1, 2013 – June 30, 2014	0.00000%	July 1, 2020 – June 30, 2021	0.00000%

4. As of December 31, 2007, members' excess contributions accumulated in prior years had been fully depleted.
5. The member excess rate for the period July 1, 2021 - June 30, 2022 is derived as follows:
 - a. Effective prior member excess rate (December 31, 2020) -4.7789%
 - b. Decrease in total required contribution rate from prior valuation (see Section VII) 0.28%
 - c. Current member excess rate (July 1, 2021) ((a.) + 25% of (b.)) -4.7089%
6. The accumulated value of the excess contributions as of December 31, 2021 is \$0.

Section VI – Comments on Valuation

1. Schedule A of this report presents the results of the valuation as of December 31, 2021.
2. The total entry age normal accrued liability on account of benefits expected to be paid to present retired members, former members, beneficiaries, active and inactive members is \$3,101,704,015. Of this amount, \$2,129,569,570 is on account of retired members and beneficiaries, \$965,739,439 is on account of present active members and \$6,395,006 is on account of active members not accumulating creditable service.
3. The value of Fund assets to be used in developing required contributions to the Fund is \$1,760,643,571, including required contributions made by active members. When \$1,760,643,571 is subtracted from \$3,101,704,015, there remains \$1,341,060,444, which represents the unfunded actuarial accrued liability of the Fund.
4. Amortization of the unfunded liability over the remaining 18 years in the amortization period as of December 31, 2021, in annual installments rising at the rate of 4% per year produces an amortization installment of \$98,957,293 as of December 31, 2021. This amounts to 21.75% of the value of annual compensation of active members below normal retirement age on that date.
5. The total entry age normal cost at December 31, 2021, is \$55,162,629, or 12.12% of the annual compensation of active members below normal retirement age on that date.
6. In addition to the amounts needed to cover amortization of the unfunded liability and normal cost, an allowance of 1.00% of annual compensation of active members below normal retirement age is included in the total required contribution to cover expected administrative expenses. Under the current funding policy of fully covering the actuarially determined contribution, and assuming there are no future experience gains or losses, future expected Fund contributions are expected to remain relatively level as a percent of payroll for 18 years and remain relatively level as a percent of payroll thereafter at the normal cost rate, and the funded status is expected to increase to 100% after 18 years.
7. During 2021, the unfunded actuarial accrued liability decreased \$78.0 million, from \$1,419.1 million to \$1,341.1 million. The expected unfunded actuarial accrued liability at December 31, 2021, was \$1,408.6 million. The \$67.5 million difference consists of a \$66.1 million gain in 2021 of returns on the actuarial value of assets and \$1.4 million in decreased accrued liability due to favorable demographic experience and contribution rate changes. Additional detail is provided in Section IX.

Section VII – Contributions to the Fund

1. Effective December 31, 2009, the contributions by members and the Authority are to provide normal contributions, amortization of the unfunded accrued liability and administrative expenses. It is assumed that investment earnings will be sufficient to cover fiduciary and investment expenses and, in addition, provide the yield assumed for actuarial purposes.
2. The valuation indicates that 12.12% of compensation is required to cover normal cost and 21.75% of compensation is required to cover amortization of the unfunded accrued liability. Adding 1.00% of compensation for anticipated administrative expenses, excluding fiduciary and other investment expenses, results in a total contribution rate of 34.87% of compensation to be paid by the Authority and the members of the Retirement Fund from July 1, 2022, through June 30, 2023.
3. This rate is 0.28% less than the 35.15% rate developed in the December 31, 2020, valuation. Under the adjustment formula contained in the July 1, 2002, Pension Agreement, 75% of the change will be allocated to the Authority as a change in the contribution rate and 25% will be allocated to the member's required contribution rate. This results in the following rates payable during the year beginning July 1, 2022:

Authority	25.8161%
Members' required	<u>9.0539%</u>
Subtotal (Section II)	34.8700%
Members' excess (Section V)	<u>0.0000%</u>
Total	34.8700%

Section VIII – Statement No. 25 of the Governmental Accounting Standards Board

- Statement No. 25 of the Governmental Accounting Standards Board has been superseded by Statement No. 67. Required reporting for the Retirement Fund under Statement No. 67 will be covered in a separate report. The information below is shown nonetheless for informational purposes.
- The following schedule shows funding progress information that would have been required by Statement No. 25 as of December 31, 2021:

Schedule of Funding Progress (,000's)¹

Year Ending December 31	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a Percentage Covered Payroll ((b-a)/c)
2021	1,760,644	3,101,704	1,341,060	56.76%	454,985	294.75%
2020	1,636,054	3,055,123	1,419,069	53.55%	456,930	310.57%
2019	1,561,193	3,021,110	1,459,918	51.68%	433,577	336.72%
2018	1,559,453	2,916,800	1,357,348	53.46%	423,075	320.83%
2017	1,599,505	2,829,386	1,229,881	56.53%	425,658	288.94%
2016	1,607,560	2,694,556	1,086,996	59.66%	444,455	244.57%
2015	1,630,411	2,572,084	941,673	63.39%	440,502	213.77%
2014	1,632,175	2,447,731	815,556	66.68%	415,146	196.45%
2013	1,606,684	2,364,133	757,449	67.96%	379,071	199.82%
2012	1,456,957	2,312,170	855,213	63.01%	370,873	230.59%

¹ Some numbers in the table do not add up due to rounding.

Section IX – Experience

Records are maintained whereby the actual experience of active and retired members is compared to that expected on the basis of the tables adopted by the Retirement Board. In this way, deviations in the experience from that anticipated will be noted and any adjustments believed necessary will be brought to the attention of the Retirement Board in future experience studies.

During the last year, the total unfunded actuarial accrued liability (UAL) was expected to decrease from \$1,419,068,994 to \$1,408,625,679. The actual UAL at the end of the year was \$1,341,060,444. The chart below reconciles the expected to actual UAL. The primary sources of changes were a \$2,324,644 increase in the accrued liability resulting from unfavorable demographic experience in 2021 and returns on assets measured at actuarial value that were \$66,129,458 above expected levels in 2021.

The sources of the (Gains)/Losses are as follows:

Actual UAL as of December 31, 2020		\$ 1,419,068,994
Expected UAL (Prior to Changes) as of December 31, 2021		\$ 1,408,625,679
Salary Increases	\$ (5,041,807)	
New Participants	257,135	
Active – Retirements	4,764,813	
Active – Terminations	(820,547)	
Active – Mortality	531,539	
Active – Disabilities	(328,266)	
Retiree Mortality	1,403,594	
Other (Data Corrections, etc.)	1,558,183	
<hr/>		
Liability (Gain)/Loss – Demographic Experience		\$ 2,324,644
<hr/>		
Change in Accrued Liability Due to Contribution Rate Changes		\$ (370,578)
Change in Accrued Liability Due to Assumption Changes		\$ (3,389,843)
Total of Liability (Gain)/Loss and effects of changes in assumptions and Contribution rates		\$ (1,435,777)
Investment (Gain)/Loss		\$ (66,129,458)
Total Change in UAL		\$ (67,565,235)
Actual UAL as of December 31, 2021		\$ 1,341,060,444

Section X – ASOP 51

Actuarial Standard of Practice No. 51 (“ASOP 51”) Disclosures

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities and the corresponding funded status of the Fund. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the Fund. Understanding the risks to the funding of the Fund is important.

Actuarial Standard of Practice No. 51 (“ASOP 51”) requires certain disclosures of potential risks to the Fund and provides useful information for intended users of actuarial reports that determine Fund contributions or evaluate the adequacy of specified contribution levels to support benefit provisions. While its status as a governmental pension plan (as defined in the Internal Revenue Code) exempts it from the funding provisions of ERISA, the Massachusetts Bay Transportation Authority Retirement Fund uses the information presented to assist in making contribution decisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience.

It is important to note that not all risk is negative, but all risk should be understood and accepted based on knowledge, judgment and educated decisions. Future measurements may deviate in ways that produce positive or negative financial effects on the Fund.

In the actuary’s professional judgment, the following risks may reasonably be anticipated to significantly affect the Fund’s future financial condition.

- Investment risk – the risk that assets will not earn the expected rate of return
- Interest rate risk – the risk that the general level of interest rates will increase or decrease significantly from current levels
- Asset liability mismatch - Potential that changes in asset values are not matched by changes in the value of liabilities
- Longevity and other demographic risk – the risk that mortality or other demographic experience will be different from expected

The following information is provided to comply with ASOP 51 and furnish beneficial information on potential risks to the Fund. This list is not all-inclusive; it is an attempt to identify the most significant risks and how those risks might affect the results shown in this report.

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the sponsor of a pension plan to make contributions to the plan. In addition, this valuation report is not intended to provide investment advice or to provide guidance on the management or reduction of risk. Buck welcomes the opportunity to assist in such matters as part of a separate project or projects utilizing the appropriate staff and resources for those objectives.

Section X – ASOP 51 (continued)

Assessment of Risks

- **Investment return:** Lower assets mean higher unfunded liability and larger contribution amounts. For example, if returns on assets at market value were an additional 1% lower than actual, this would reduce the actuarial value of assets by approximately \$3.5 million, which would increase the 2021 total contribution rate by 0.06% and the member contribution rate by 0.02%.
- **Interest rate risk:** Actuarial liabilities contained in this report are based on the assumption that interest rates will remain at current levels throughout the forecast period. These interest rates are used to discount future expected benefit payments to determine the Fund liability. As interest rates increase, the discounted value of future benefit payments will decrease; similarly, as interest rates decrease, the discounted value of future benefit payments will increase. The duration of the Fund's liability is approximately nine years, which means that every 100-basis point change in interest rates will result in roughly a 9% change in Fund liability.
- **Asset liability mismatch:** Unless assets are explicitly structured to mimic the characteristics of Fund liabilities, there is a risk that economic scenarios that affect interest rates will have a larger impact on liability than on assets. This is because Fund liability is the discounted value of benefit payments that extend way out into future years, i.e. have a long duration. Fund investments, on the other hand, typically have a shorter duration with respect to interest rate changes, often holding fixed income securities with lower durations than Fund liabilities, and typically maintaining some moneys in equity investments that are not as directly sensitive to interest rate changes.
- **Longevity and other demographic risk:** The Fund is subject to longevity risk, the risk that participants will live longer (or shorter) than expected. The most recent experience study showed that actual mortality experience had tracked closely to the current mortality assumption.

In addition, the Fund is subject to risks associated with assumptions with respect to active and deferred vested participants (for example, salary increases, termination prior to retirement, retirement, and optional form election). The current assumptions for these are based on the experience study completed in 2019. Changes in future liabilities will result to the extent actual experience differs from these assumptions. In particular, higher than expected salary increases (including base pay plus short-term incentives) would increase actuarial liabilities. Further, due to the subsidized early retirement reductions for certain groups, retirements earlier than expected could increase liabilities.

Section X – ASOP 51 (continued)

Historical Results

The following table shows selected historical values of key valuation measures. These items illustrate how actual volatility has impacted the Fund in recent years and gives additional context to the risks described above. Further information can be found in the actuarial valuation reports for each year.

	12/31/2017	12/31/2018	12/31/2019	12/31/2020	12/31/2021
Actuarial Value of Assets (AVA)	\$1.60B	\$1.56B	\$1.56B	\$1.64B	\$1.76B
Asset Return on MV in Prior Year	17.79%	(3.37)%	17.67%	14.22%	13.23%
Investment gain/(loss) on AVA	\$(29M)	\$(59M)	\$(28M)	\$33M	\$(66M)
Actuarial Accrued Liability	\$2.83B	\$2.91B	\$3.02B	\$3.06B	\$3.10B
The ratio of retired life* actuarial accrued liability to total actuarial accrued liability	73%	72%	71%	69%	69%
The ratio of benefit payments to actuarial value of assets	13%	14%	14%	14%	13%
The ratio of actuarial value of assets to participant payroll	373%	367%	357%	355%	384%
Normal cost	\$46M	\$48M	\$52M	\$55M	\$55M
Discount rate	7.50%	7.50%	7.25%	7.25%	7.25%
Non-Investment gain/(loss)	\$(31M)	\$(10M)	\$4M	\$8M	\$1M
Funding Policy contribution	\$131M	\$144M	\$156M	\$161M	\$159M

* Retired members, former members and beneficiaries

Commentary on Plan Maturity Measures

The ratio of retired life actuarial accrued liability to total actuarial accrued liability

A mature pension plan will often have a ratio above 60 - 65 percent. A higher percentage will generally indicate an increased need for asset / liability matching due to inability to accept volatility in future returns.

The ratio of benefit payments to actuarial value of assets

Higher benefit payments as a percentage of assets means the fund may need to invest in more liquid assets to cover the benefit payments. More liquid assets may not garner the same returns as less liquid assets and therefore increase the investment risk. However, there may already be enough liquid assets to cover the benefit payments, less investment return is needed to cover the shortfall, or only a small portion of assets will need to be converted to cash. Therefore, the investment risk is likely not amplified at this time. This maturity measure should be monitored for continual upward trend with greater magnitude.

The ratio of actuarial value of assets to participant payroll

Plans that have higher asset-to-payroll ratios experience *more* volatile employer contributions (as a percentage of payroll) due to investment return. For example, if lower than expected asset return increases the unfunded liability of two pension plans by the same percentage, the plan with the higher assets-to-payroll ratio may experience higher contribution volatility than a plan with the lower asset-to-payroll ratio.

Section XI – Alternative Scenarios

What if Active Headcount Remained at its 12/31/2016 Level?

	12/31/2021 Valuation (A)	More Active Employees (B)
1. Normal Cost Rate	12.12%	12.12%
2. Expenses	1.00%	1.00%
3. Amortization	\$98,957,293	\$98,957,293
4. Active Employees 12/31/2021	NA	5,486
5. Active Employees 12/31/2016	NA	5,786
6. New Entrant Salary	NA	\$62,000
7. Payroll (7.A+6.x(5.-4.))	\$454,984,547	\$473,584,547
8. Accrued Liability Amortization Rate (3./7.)	21.75%	20.90%
9. Total Contribution (1.+ 2.+ 8.)	34.87%	34.02%
10. Member Contribution	9.0539%	8.8413%

- In column B, we have assumed the employees who have terminated from 12/31/2016 to 12/31/2021 were replaced by new hires
- The normal cost rate would change with addition of new employees. For the purpose of this illustration, we have assumed the change in normal cost rate is not significant
- Member contribution is calculated as $(34.02\% - 35.15\%) \times 25\% + 9.1239\% = 8.8413\%$

Section XI – Alternative Scenarios (continued)

Contribution as a % of Pay Under Alternative Funding Policies

The current funding policy contribution rates were determined by amortizing the unfunded liability over a 19-year period ending in 2040 in installments escalating at the rate of 4% per year. The table below presents calculations of what the contribution rates developed in this valuation would be if the Fund were to change its current funding policy with respect to the amortization of the unfunded liability.

Amort. (years)	Escalator % per year									
	0%		1%		2%		3%		4%	
	Authority	Member	Authority	Member	Authority	Member	Authority	Member	Authority	Member
11	38.33%	13.22%	37.10%	12.82%	35.92%	12.42%	34.77%	12.04%	33.66%	11.67%
12	36.74%	12.69%	35.48%	12.28%	34.28%	11.87%	33.10%	11.48%	31.97%	11.11%
13	35.41%	12.25%	34.13%	11.82%	32.89%	11.41%	31.70%	11.01%	30.55%	10.63%
14	34.28%	11.87%	32.97%	11.44%	31.70%	11.02%	30.49%	10.61%	29.33%	10.22%
15	33.31%	11.55%	31.97%	11.11%	30.69%	10.68%	29.45%	10.27%	28.27%	9.87%
16	32.48%	11.27%	31.11%	10.82%	29.81%	10.38%	28.55%	9.96%	27.35%	9.56%
17	31.75%	11.03%	30.36%	10.57%	29.03%	10.12%	27.75%	9.70%	26.54%	9.29%
18	31.11%	10.82%	29.69%	10.35%	28.34%	9.90%	27.05%	9.47%	25.82%	9.05%

- The “Years” on the left side denote the years over which the unfunded liability is amortized
- Dollar amounts shown are expressed in \$millions
- Percentages of payroll shown represent total contributions developed as a % of pay
- The red circle represents current funding policy

Section XI – Alternative Scenarios (continued)

2021 Amortization under Alternative Funding Policies

The table below presents calculations of what the contribution for amortization of the unfunded liability developed in this valuation would be if the Fund were to change its current funding policy with respect to the amortization of the unfunded liability

Amort. (years)	Escalator % per year				
	0%	1%	2%	3%	4%
11	\$174.85	\$167.43	\$160.24	\$153.29	\$146.56
12	\$165.21	\$157.61	\$150.26	\$143.16	\$136.31
13	\$157.14	\$149.37	\$141.86	\$134.62	\$127.65
14	\$150.30	\$142.35	\$134.69	\$127.32	\$120.24
15	\$144.43	\$136.32	\$128.52	\$121.02	\$113.83
16	\$139.36	\$131.10	\$123.15	\$115.53	\$108.24
17	\$134.94	\$126.53	\$118.45	\$110.71	\$103.32
18	\$131.07	\$122.50	\$114.29	\$106.44	\$98.96

- The “Years” on the left side denote the years over which the unfunded liability is amortized
- Dollar amounts shown are expressed in \$ millions
- Percentages of payroll shown represent total contributions developed as a % of pay
- The red circle represents current funding policy

Schedule A – Results of the Valuation as of December 31, 2021

1. Present Value of Future Benefits	
(a) Present value of prospective benefits to retired members, former members and beneficiaries	\$ 2,129,569,570
(b) Present value of prospective retirement allowances on account of present active members	1,409,010,391
(c) Present value of prospective retirement allowances or return of members' contributions for members not accumulating creditable service	<u>6,395,006</u>
(d) Total actuarial liabilities	\$ 3,544,974,967
2. Assets of the Fund for purposes of development of contributions	\$ 1,760,643,571
3. Present value of future contributions to the fund (1(d)-2)	\$ 1,784,331,396
4. Present value of future normal contributions to the Fund ¹	\$ 443,270,952
5. Unfunded accrued liability (3) - (4)	\$ 1,341,060,444

¹ Includes future contributions of members at the rate developed in Section VII.

Schedule B – Outline of Actuarial Assumptions and Methods

In 2019, an Experience study was conducted based on the experience from January 1, 2013 to December 31, 2017. Based on the experience study, Buck proposed assumptions for mortality tables, salary increases, termination rates, and retirement rates. All proposed assumptions were approved by the Retirement Board in April 2019. A subsequent change in the assumed rate of return on assets from 7.50% to 7.25% was adopted by the Board in April 2020.

Data

The rate of pay was used for the 2021 valuation (projected 2022 pensionable earnings). Starting with the 2021 valuation, participants who have been receiving Workers' Compensation benefits for 5 or more years are assumed to never commence their Massachusetts Bay Transportation Authority Retirement Fund pension benefit. This decreased the actuarial accrued liability by \$2.76M. In addition, participants who are active but did not contribute to the plan in 2021, are assumed to remain non-contributing for the remainder of their employment. This decreased actuarial accrued liability by \$0.63M.

Interest rate for funding purposes

7.25% per annum, compounded annually, in addition to fiduciary and investment management expenses.

Separations from active service

Representative values of the assumed rates of withdrawal and reduced early retirement and disability are as follows:

Age	Withdrawal ¹	Age	Disability Male ²	Disability – Female ²
20-24	.0478	20	.0007	.0011
25-29	.0712	25	.0008	.0012
30-34	.0040	30	.0010	.0015
35-39	.0348	35	.0013	.0020
40-44	.0313	40	.0017	.0026
45-49	.0287	45	.0015	.0038
50-54	.0251	50	.0025	.0044
55-59	.0282	55	.0046	.0080
60-64	.0424	60	.0090	.0158
		64	.0168	.0294

¹ 100% of future terminated members not eligible for a retirement allowance are assumed to receive a refund of their accumulated employee contributions.

² 50% of disabled employees are assumed to qualify for occupational disability benefits.

Schedule B – Outline of Actuarial Assumptions and Methods (continued)

Unreduced retirement rates

Representative rates of unreduced early normal retirement allowances are as follows:

Age	Unreduced Retirement		Reduced Retirement
	In the year attaining eligibility	In years after first eligibility	
45	30%	20%	N/A
46	30%	15%	N/A
47	25%	15%	N/A
48	25%	10%	N/A
49	25%	10%	N/A
50	25%	15%	N/A
51	25%	15%	N/A
52	25%	15%	N/A
53	25%	20%	N/A
54	25%	20%	N/A
55	30%	15%	3.90%
56	30%	15%	3.66%
57	30%	18%	4.00%
58	30%	18%	4.27%
59	20%	25%	4.74%
60	20%	25%	5.83%
61	35%	25%	6.33%
62	45%	30%	8.27%
63	45%	25%	9.21%
64	45%	25%	11.42%
65	30%	40%	N/A
66	30%	25%	N/A
67	30%	28%	N/A
68	30%	28%	N/A
69	30%	28%	N/A
70+	30%	100%	N/A

Schedule B – Outline of Actuarial Assumptions and Methods (continued)

Inflation:

2.75% per year

Salary increases

Service	Salary Increase %
0-4	8.00%
5-9	4.00%
10-14	3.00%
15-19	2.75%
20-24	2.75%
25-29	2.75%
30-34	2.75%
35-39	2.75%
40+	2.75%

Deaths before and after retirement

The RP-2014 Blue Collar Mortality Tables with fully generational projection using Scale MP-2018 are used for all active participants and deferred vested participants. 94.5% of the RP-2014 Blue Collar Mortality Tables with fully generational projection using Scale MP-2018 are used for all retirees. 107.5% of the RP-2014 Blue Collar Mortality Tables with fully generational projection using Scale MP-2018 are used for all beneficiary participants. The RP-2014 Disabled Mortality Table with fully generational projection using Scale MP-2018 are used for the period after disability retirement. Among pre-retirement deaths, 7.50% are assumed to qualify for accidental death benefits.

Normal retirement

Age 65.

Percent married

90% of male members and 50% of female members under age 55 or who have less than 23 years of service are assumed to be married. 100% of employees age 55 and older or who have 23 or more years of service are assumed to be married. In each case, the female is assumed to be three years younger than the male.

Schedule B – Outline of Actuarial Assumptions and Methods (continued)

Pension options

50% of male members elect a 75% joint and survivor benefit and 10% of female members elect a 50% joint and survivor benefit. All others elect a life annuity.

Fiduciary and investment management expenses

Paid from investment earnings of the Fund.

Loading or contingency reserves

None.

Valuation method

Prior to December 31, 2009, projected benefit method with entry age normal cost and open-end accrued liability. On and after December 31, 2009, individual entry age normal method.

Asset valuation method

A five-year phase-in smoothing method is used, under which the value of assets for actuarial purposes equals market value less a five-year phase-in of the differences between actual and assumed investment return. The value of assets for actuarial purposes may not differ from the market value of assets by more than 20%.

Effective December 31, 2013, the actuarial asset method was changed from a five-year moving average of market values to a five-year phase-in smoothing method, with the smoothing restarted as of December 31, 2013.

Prior to December 31, 2013, a five-year moving average of market values method was used to compute the actuarial value of assets.

Administrative expenses

Administrative expenses are estimated to be 1.0% of covered payroll per year.

Summary of Changes from December 31, 2020 Valuation

- Participants who have been receiving Workers' Compensation benefits for five or more years are assumed to never receive a Massachusetts Bay Transportation Authority Retirement Fund pension benefit. This decreased the actuarial accrued liability by \$2.76 million.
- Participants who are active, but did not contribute to the plan in 2021, are assumed to remain non-contributing for the remainder of their employment and to receive only a refund of their contributions to the Fund with interest. This decreased actuarial accrued liability by \$0.63 million.

Schedule C – Summary of Main Provisions of the Fund as Interpreted for Valuation Purposes

The Massachusetts Bay Transportation Authority Retirement Fund became effective as of January 1, 1948. The following summary describes the current main membership, benefit, and contribution provisions of the Fund as interpreted for the valuation.

1 - Definitions

“Compensation” means the full regular remuneration paid to an employee, excluding any overtime pay. “Service” creditable under the Fund means all service rendered by a member prior to his normal retirement date since he last became a member for which contributions are made by the member and by the Authority. “Union” means Boston Carmen’s Union, Local Division 589 of the Amalgamated Transit Union, AFL-CIO.

2 - Membership

Each employee, including employees on a part-time basis, who is or who may become a member of the Union or any union recognized by the Authority for collective bargaining purposes is included in the membership of the Fund. Any employee who is not a member of the Union but who is in a group which was authorized to participate in the Fund is included in the membership.

3 - Benefits

Normal Retirement Allowance

Condition for Allowance

Any member may retire at age 65. A member may remain in service after the stated retirement date.

Amount of Allowance

The normal retirement allowance equals 2.46% of 3-year average annual compensation multiplied by the years of service, such allowance not to exceed 75% of such average annual compensation.

Early Normal Retirement Allowance

Condition for Allowance

Any member hired prior December 6, 2012 and has completed at least 23 years of service may retire on an early normal retirement allowance.

Any member hired on or after December 6, 2012, has attained age 55 and completed at least 25 years of service may retire on an early normal retirement allowance.

Amount of Allowance

The early normal retirement allowance is computed in the same manner as a normal retirement allowance on the basis of the compensation and service to the time of retirement.

Early Reduced Retirement Allowance

Condition for Allowance

A member who has attained age 55 and has completed at least 20 years of service may be retired on an early reduced retirement allowance.

Amount of Allowance

The early reduced retirement allowance is an immediate allowance, commencing at the date of retirement, and is computed in the same manner as a normal retirement allowance on the basis of compensation and service to the time of early retirement, but reduced by ½ of 1% for each month of retirement prior to normal retirement date.

Schedule C – Summary of Main Provisions of the Fund as Interpreted for Valuation Purposes (continued)

Disability Retirement Allowance

Condition for Allowance

Any member who has completed 4 years of service in case of disablement due to an occupational accident or sickness, or who has completed 6 years of service in case of disablement due to any other cause, and who has become totally and permanently incapacitated, mentally or physically, for the further performance of duty may be retired.

Amount of Allowance

Upon disability retirement, a member receives an allowance commencing immediately, which is computed as a normal retirement allowance on the basis of the compensation and service to the time of disability retirement and is not less than 15% of the member's 3-year average annual compensation.

Vested Retirement Allowance

Condition for Allowance

Any member who has completed 10 years of service and who is not eligible for a retirement allowance is eligible for a vested retirement allowance, in lieu of a refund of his contributions with interest, in the event his employment terminates for reasons other than voluntary quit or discharge for cause.

Amount of Allowance

The vested retirement allowance is a deferred allowance commencing on the member's normal retirement date and equal to a percentage, not exceeding 100 percent, of the amount computed as a normal retirement allowance on the basis of the compensation and service to the time of termination; the applicable percentage is 5 percent multiplied by the number of years of creditable service, not in excess of 20, at the time of termination.

Survivor Benefit

Condition for Benefit

Upon the death of a member who has completed 10 years of service and who is survived by a spouse and/or dependent children designated to receive the deceased member's contributions with interest, a benefit may be elected by such survivor in lieu of the payment of the contributions with interest.

Amount of Benefit

If the deceased member had completed at least 10 but fewer than 23 years of service, the survivor's benefit, payable for life, is equal to the amount which would have become payable if the member had retired as of the date of his death and elected a 50% joint and survivor option in effect as of the date of death with the survivor as the designated person under the option. There is no reduction for early commencement.

If the deceased member had completed at least 23 years of service, the survivor's benefit, payable for life, is equal to the amount which would have become payable if the member had retired as of the date of his death and elected a 100% joint and survivor option in effect as of the date of death with the survivor as the designated person under the option. There is no reduction for early commencement.

Accidental Death Benefit

Condition for Benefit

Upon the death of a member in service whose death results solely from an injury or injuries sustained in the performance of duty, and who is survived by a spouse designated to receive the deceased member's contribution with interest, an allowance shall be payable to said spouse.

Schedule C – Summary of Main Provisions of the Fund as Interpreted for Valuation Purposes (continued)

Amount of Benefit

The accidental death benefit, payable for life, is equal to the amount which would have become payable to the member if the member had retired as of the date of his death on a disability retirement allowance. If there should be insufficient creditable service, the surviving spouse receives the minimum allowance available under the disability retirement provision.

Return of Contributions

On Account of Termination of Service

In the event of a member's termination of employment for any reason other than death or retirement, he is paid the amount of his contributions, with interest.

On Account of Death Prior to Retirement

Upon the death of a member or retired member before his retirement allowance has become effective, the amount of his contributions, with interest, is paid to his beneficiary or estate, unless a survivor benefit is payable.

On Account of Death after Retirement

Upon the death of a retired member, or the survivor of a retired member and his designated beneficiary under an optional benefit, any excess of his contributions at retirement, with interest, over the sum of all retirement allowance payments made is paid to the member's beneficiary or to the survivor's estate.

Our valuation does not include return of contributions on account of death after retirement for current retirees due to negligible impact on the Fund's liabilities.

Optional Benefits in Lieu of Regular Benefits

At retirement, or on his normal retirement date if prior thereto, any member may elect to convert his allowance into an optional benefit of equivalent actuarial value permitted by the Rules and Regulations.

Reinstatement of Creditable Service

If a member's service is interrupted by reason of resignation or dismissal, he has the opportunity upon the completion of 3 years of service after he has been rehired to repay to the Fund all amounts he has withdrawn together with an amount equal to their reasonable earnings. Upon such repayment, the member is to be credited with service for the periods before and after the interruption as though they had been a single period of service.

4 - Contributions

Contributions required to provide benefits and meet administrative expenses are made jointly by the Authority and members. The member contribution rate was increased from 5.1489% to 5.4989% effective August 11, 2012, to 5.5589% effective July 1, 2013, to 5.7989% effective July 1, 2014, to 5.7914% effective July 1, 2015, to 6.4614% effective July 1, 2016, to 7.1189% effective July 1, 2017, to 8.0089% effective July 1, 2018, to 8.8239% effective July 1, 2019, to 9.3339% effective July 1, 2020, to 9.1239% effective July 1, 2021, and to 9.0539% effective July 1, 2022. Member contributions are "picked up" by the Authority pursuant to Section 414(h)(2) of the Internal Revenue Code.

Summary of Changes from December 31, 2020 Valuation

None.

Schedule D – Tables of Employee Data

Table 1 – The Number and Annual Compensation of Active Members Distributed by Fifth Age and Service as of December 31, 2021¹

Attained Age		Completed Years of Service																			
		0 to 4		5 to 9		10 to 14		15 to 19		20 to 24		25 to 29		30 to 34		35 to 39		40 & up		Total	
	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	
Under 25	27	1,542,873	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	1,542,873	
25 to 29	120	7,145,540	13	1,137,968	0	0	0	0	0	0	0	0	0	0	0	0	0	0	133	8,283,508	
30 to 34	272	18,295,206	146	12,276,493	62	5,297,847	3	317,346	0	0	0	0	0	0	0	0	0	0	483	36,186,892	
35 to 39	240	16,335,093	212	18,056,958	183	16,254,139	47	4,248,920	2	174,325	0	0	0	0	0	0	0	0	684	55,069,435	
40 to 44	243	15,506,558	210	17,879,871	165	14,763,786	120	11,010,834	40	3,746,392	0	0	0	0	0	0	0	0	778	62,907,441	
45 to 49	201	12,989,267	185	15,524,650	178	15,793,116	133	11,899,919	102	9,519,765	7	656,427	0	0	0	0	0	0	806	66,383,143	
50 to 54	152	11,119,368	201	17,510,301	195	17,554,214	151	13,545,896	137	12,086,780	39	3,519,011	12	1,016,226	1	97,531	0	0	888	76,449,327	
55 to 59	94	7,219,356	181	16,296,800	197	18,153,932	181	16,497,428	136	11,977,093	51	4,488,586	24	2,048,550	10	916,448	0	0	874	77,598,194	
60 to 64	53	5,009,002	110	9,859,924	151	14,120,696	144	13,544,236	113	10,108,484	33	3,019,515	10	868,130	7	587,246	0	0	621	57,117,233	
65 to 69	13	1,286,817	31	2,903,884	42	3,671,129	24	1,989,125	23	1,972,543	8	767,416	7	605,717	5	460,554	2	194,438	155	13,851,623	
70 & up	2	150,966	9	934,662	7	695,490	4	369,928	9	758,181	2	195,541	1	105,560	0	0	3	257,192	37	3,467,520	
Total	1,417	96,600,046	1,298	112,381,512	1,180	106,304,349	807	73,423,631	562	50,343,563	140	12,646,496	54	4,644,182	23	2,061,779	5	451,630	5,486	458,857,189	

¹ Minor differences between the sums of values shown and the totals shown may arise due to rounding.

Schedule D – Tables of Employee Data (continued)

Table 2 – The Number and Annual Retirement Allowances Distributed by Age as of December 31, 2021¹

Age	Service Retirements		Disabled Members		Beneficiaries	
	Number	Amount	Number	Amount	Number	Amount
<50	37	1,890,683	27	518,869	31	380,288
50	22	1,064,857	8	166,533	8	102,851
51	26	1,381,407	6	111,570	7	104,162
52	29	1,458,205	6	76,583	4	98,735
53	41	2,117,768	9	198,711	4	63,191
54	53	2,623,433	15	251,698	8	126,462
55	62	3,042,179	12	236,595	9	144,903
56	85	4,293,763	13	285,056	9	146,598
57	90	4,497,032	20	489,575	9	95,629
58	116	5,972,165	15	308,442	15	235,735
59	99	4,893,825	25	629,377	19	303,853
60	95	4,720,944	21	448,737	15	250,399
61	117	5,611,357	29	637,254	13	245,831
62	129	6,308,929	35	614,039	16	245,578
63	158	7,332,272	34	777,696	21	267,540
64	126	6,047,603	27	637,804	17	472,020
65	175	7,733,235	19	414,470	28	440,261
66	183	7,895,837	36	739,137	33	527,215
67	189	7,994,572	40	773,091	22	477,268
68	192	7,943,422	24	452,281	22	316,139
69	212	8,739,036	23	400,116	27	575,885
70	187	7,200,729	12	272,202	29	480,560
71	192	7,212,756	30	556,660	26	632,583
72	200	7,670,331	28	504,894	29	623,401
73	214	7,890,079	18	351,591	39	810,857
74	213	7,447,611	21	478,331	36	786,633
75	187	6,529,936	14	247,083	46	888,033
76	168	5,709,906	15	327,977	44	918,263
77	182	6,189,952	17	281,969	43	934,412
78	163	5,293,556	23	298,403	49	921,093
79	148	4,861,086	13	248,082	49	849,983
80	121	3,697,392	12	204,798	40	639,611
81	106	3,139,811	8	144,001	46	790,943
82	91	2,914,259	4	53,602	33	607,404
83	75	2,273,402	7	120,222	34	569,293
84	77	2,193,181	3	51,104	33	613,769
85	60	1,757,361	2	23,083	41	736,563
>85	239	6,006,410	7	92,119	222	3,225,914
Total	4,859	191,550,280	678	13,423,756	1,176	20,649,856
No Option	3,059	121,637,159	559	11,368,889	1,176	20,649,856
Survivor Option	32	1,448,643	2	44,454	0	0
Pop-Up Option	1,768	68,464,477	117	2,010,413	0	0
Total	4,859	191,550,280	678	13,423,756	1,176	20,649,856

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¹ Minor differences between the sums of values shown and the totals shown may arise due to rounding.

Solvency Test

As of December 31, 2021

The MBTA Retirement Fund's funding objective is to meet long-term benefit promises through contributions that remain approximately level from year-to-year as a percent of member payroll. If the contributions to the Fund are level in concept and soundly executed, the Fund will pay all promised benefits when due -- the ultimate test of financial soundness.

A solvency test is one means of checking a fund's progress under its funding program. In a solvency test, the fund's present assets (cash and investments) are compared with:

- i. Active member contributions on deposit;
- ii. The liabilities for future benefits to present retired lives;
- iii. The liabilities for service already rendered by active and inactive members.

In a Fund that has been following the discipline of level percent-of-payroll financing, the liabilities for active member contributions on deposit (liability 1) and the liabilities for future benefits to present retired lives (liability 2) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (liability 3) will be partially covered by the remainder of present assets. The larger the funded portion of liability 3, the stronger the condition of the Fund. Buck prepared the following Solvency Schedule:

Valuation Date			(3) Active/Inactive Members (Employer Financed)		Actuarial Value of Assets	Portion of AAL Covered by Assets		
	(1) Active Member Contributions	(2) Retirees and Beneficiaries				(1)	(2)	(3)
12/31/2021	\$ 325,347,277	\$ 2,129,569,570	\$ 646,787,168	\$ 1,760,643,571	100%	67%	0%	
12/31/2020	298,648,242	2,109,955,052	646,520,086	1,636,054,386	100%	63%	0%	
12/31/2019	266,634,347	2,129,210,443	625,265,569	1,561,192,531	100%	61%	0%	
12/31/2018	240,849,945	2,092,861,364	583,089,414	1,559,452,659	100%	63%	0%	
12/31/2017	221,627,390	2,057,542,739	550,215,648	1,599,505,237	100%	67%	0%	
12/31/2016	219,497,282	1,918,980,542	556,078,499	1,607,560,108	100%	72%	0%	
12/31/2015	219,752,752	1,774,425,407	577,905,849	1,630,411,191	100%	79%	0%	
12/31/2014	211,433,306	1,682,557,007	553,740,744	1,632,174,762	100%	84%	0%	
12/31/2013	196,543,768	1,644,867,542	522,721,825	1,606,684,354	100%	86%	0%	
12/31/2012	183,328,525	1,627,032,223	501,809,615	1,456,956,884	100%	78%	0%	

**Schedule of Retirees and Beneficiaries
Added to and Removed from Rolls**

As of December 31, 2021

Schedule prepared by Buck

Valuation Date	Added to Rolls		Removed from Rolls		Rolls - End of Year		% Increase in Annual Allowances	Average Annual Allowances
	No.	Annual Allowances	No.	Annual Allowances	No.	Annual Allowances		
12/31/2021	205	\$ 8,555,618	202	\$ 5,039,468	6,713	\$ 225,623,892	1.54%	\$ 33,610
12/31/2020	144	5,343,426	247	5,787,592	6,710	222,107,742	1.33%	33,101
12/31/2019	148	6,101,838	176	4,806,046	6,813	222,551,908	1.00%	32,666
12/31/2018	209	8,408,514	191	4,618,807	6,841	221,256,116	1.47%	32,343
12/31/2017	310	14,541,060	171	4,108,386	6,823	217,466,409	2.90%	31,873
12/31/2016	370	18,053,040	158	3,735,177	6,684	207,033,735	4.02%	30,975
12/31/2015	270	11,550,600	205	4,661,828	6,472	192,715,872	2.67%	29,777
12/31/2014	123	5,191,092	87	360,332	6,407	185,827,100	2.09%	29,004
12/31/2013	174	6,687,864	159	3,595,765	6,371	180,996,340	1.50%	28,409
12/31/2012	184	6,926,496	154	3,278,250	6,356	177,904,241	1.61%	27,990

Schedule of Active Member Valuation Data

Valuation Date	Number	Annual Payroll	Average Annual Pay	% Increase In Average Pay
2021	5,486	\$ 458,857,189	\$ 83,641	3.0%
2020	5,674	460,921,559	81,234	2.4%
2019	5,507	436,828,077	79,322	0.4%
2018	5,392	425,862,201	78,980	-0.8%
2017	5,386	428,830,122	79,619	3.1%
2016	5,786	446,740,427	77,211	2.5%
2015	5,885	443,237,899	75,317	4.5%
2014	5,798	417,957,007	72,086	8.2%
2013	5,726	381,380,271	66,605	1.2%
2012	5,668	373,000,972	65,808	2.3%

STATISTICAL SECTION

(Unaudited)

Objectives

The objectives of the Statistical Section are to provide additional historical perspective, context and detail to assist readers in using the information in the Financial Statements, Notes to the Financial Statements, and Required Supplementary Information in order to understand and assess the Plan's economic condition.

Financial Trends

The Schedule of Changes in Net Position presented on page 145 contains historical information related to the Fund's revenues, expenses, changes in net position and net position available for benefits. The Schedule of Additions by Source on page 145 provides employer and employee contribution rates and investment income historical information. The schedules of deductions and benefits by type on page 146 provide a history of annual benefit, withdrawal, and operating expense trends.

Demographic and Economic Information

The schedule of Distribution of Plan Members shown on page 147 provides relevant details about the composition of the Fund's active membership including concentration of Members within various age groups.

Operating Information

The Schedule of Average Benefit Payments on page 148 presents average monthly benefits and average final salary information by years of credited service for new benefit recipients within specified plan years. The Schedule of Benefit Recipients by Type and Option on page 149 illustrates the number of participants and total benefit payments by type and option.

Statistical data is provided from both the Fund's internal resources and from the Fund's Actuary, Buck Global, LLC.

Financial Trends (2012 – 2021 for all reports)**Schedule of Changes in Net Position**

Year Ended Dec 31	Net Position Beginning of Year	Additions	Deductions	Increase (Decrease) in net Position	Net Position End of Year
2021	\$ 1,769,941,276	\$ 399,135,304	\$ 229,134,156	170,001,148	1,939,942,424
2020	1,614,144,213	385,730,778	229,933,715	155,797,063	1,769,941,276
2019	1,449,695,100	393,360,861	228,911,748	164,449,113	1,614,144,213
2018	1,603,176,196	72,546,582	226,027,678	(153,481,096)	1,449,695,100
2017	1,485,605,884	334,848,844	217,278,532	117,570,312	1,603,176,196
2016	1,497,848,035	191,813,165	204,055,316	(12,242,151)	1,485,605,884
2015	1,587,966,489	104,595,864	194,714,318	(90,118,454)	1,497,848,035
2014	1,606,684,354	169,464,986	188,182,851	(18,717,865)	1,587,966,489
2013	1,478,348,978	310,688,826	182,353,450	128,335,376	1,606,684,354
2012	1,394,395,336	262,766,724	178,813,082	83,953,642	1,478,348,978

Schedule of Additions by Source

Year Ended Dec 31	Employee Contributions	Employer Contributions	Employer Contributions as % of Covered Payroll	Investment Income (a)	Total
2021	\$ 43,224,002	\$ 123,493,762	26.91%	\$ 232,417,541	\$ 399,135,304
2020	40,774,027	116,285,928	25.45	228,670,823	385,730,778
2019	36,366,108	103,263,763	23.82	253,730,990	393,360,861
2018	32,606,337	92,013,124	21.61	(52,072,879)	72,546,582
2017	29,775,344	83,382,882	19.44	221,690,618	334,848,844
2016	27,791,543	77,239,279	17.38	86,782,343	191,813,165
2015	26,510,946	73,373,672	16.66	4,711,246	104,595,864
2014	25,318,224	70,603,285	17.00	73,543,477	169,464,986
2013	21,027,548	58,039,160	15.31	231,622,118	310,688,826
2012	20,023,337	54,968,325	14.82	187,775,062	262,766,724

Contributions were made in accordance with actuarially determined contribution requirements

(a) Net of investment expenses

Schedule of Deductions by Type

Year Ended Dec 31	Benefits		Operating Expenses		Withdrawals		Total
2021	\$	221,589,832	\$	4,366,485	\$	3,177,839	\$ 229,134,156
2020		221,447,685		4,511,375		3,974,655	229,933,715
2019		220,553,916		5,046,775		3,311,057	228,911,748
2018		218,385,648		4,317,624		3,324,406	226,027,678
2017		208,999,450		4,463,775		3,815,307	217,278,532
2016		195,707,470		6,493,777		1,854,069	204,055,316
2015		187,148,675		5,808,086		1,757,557	194,714,318
2014		182,499,776		4,052,664		1,630,411	188,182,851
2013		177,311,634		3,948,978		1,092,838	182,353,450
2012		174,627,907		3,384,113		801,062	178,813,082

Schedule of Benefit Deduction by Type

Year Ended Dec 31	Service		Disability		Beneficiary		Total
2021	\$	188,377,526	\$	14,081,012	\$	19,131,295	\$ 221,589,832
2020		188,613,828		13,697,233		19,136,624	221,447,685
2019		189,884,938		13,715,736		16,953,242	220,553,916
2018		188,529,051		13,331,294		16,525,303	218,385,648
2017		179,572,258		12,873,203		16,553,989	208,999,450
2016		165,645,608		13,811,300		16,250,562	195,707,470
2015		158,790,759		12,294,604		16,063,312	187,148,675
2014		153,390,245		10,892,495		18,217,036	182,499,776
2013		149,450,754		10,689,534		17,171,346	177,311,634
2012		146,842,625		10,685,263		17,100,019	174,627,907

Demographic and Economic Information (As of 12/31/21)

Distribution of Fund Members as of December 31, 2021 - Active Members

Age	Years of Service									Total		Average
	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total	Compensation	Compensation
under 25	27	-	-	-	-	-	-	-	-	27	1,542,873	57,143
25-29	120	13	-	-	-	-	-	-	-	133	8,283,508	62,282
30-34	272	146	62	3	-	-	-	-	-	483	36,186,892	74,921
35-39	240	212	183	47	2	-	-	-	-	684	55,069,435	80,511
40-44	243	210	165	120	40	-	-	-	-	778	62,907,441	80,858
45-49	201	185	178	133	102	7	-	-	-	806	66,383,143	82,361
50-54	152	201	195	151	137	39	12	1	-	888	76,449,327	86,092
55-59	94	181	197	181	136	51	24	10	-	874	77,598,194	88,785
60-64	53	110	151	144	113	33	10	7	-	621	57,117,233	91,976
65-69	13	31	42	24	23	8	7	5	2	155	13,851,623	89,365
70+	2	9	7	4	9	2	1	-	3	37	3,467,520	93,717
Total	1,417	1,298	1,180	807	562	140	54	23	5	5,486	458,857,189	83,641

Operating Information

Schedule of Average Benefit Payments - New Benefit Recipients (2012 – 2021)

Years of Service	0-4	5-9	10-14	15-19	20-24	25-29	30+	Total
2012								
Average Monthly Benefit	\$ 311	\$ 840	\$ 1,534	\$ 2,305	\$ 3,165	\$ 4,239	\$ 4,669	\$ 3,137
Average Final Average Salary	43,363	59,592	75,925	73,205	74,644	80,771	85,574	75,643
Number of Retired Members	1	5	13	22	101	32	10	184
2013								
Average Monthly Benefit	\$ 844	\$ 976	\$ 1,460	\$ 2,195	\$ 3,298	\$ 3,969	\$ 4,868	\$ 3,203
Average Final Average Salary	104,387	56,659	69,224	72,730	77,261	77,890	83,824	76,361
Number of Retired Members	2	4	19	12	78	52	7	174
2014								
Average Monthly Benefit	\$ -	\$ 944	\$ 1,565	\$ 2,371	\$ 3,455	\$ 4,103	\$ 4,429	\$ 3,517
Average Final Average Salary	-	60,088	69,079	71,012	80,485	81,816	80,201	79,223
Number of Retired Members	-	1	10	7	55	37	13	123
2015								
Average Monthly Benefit	\$ 813	\$ 951	\$ 1,760	\$ 2,346	\$ 3,720	\$ 4,582	\$ 4,988	\$ 3,565
Average Final Average Salary	143,040	77,667	74,294	76,590	86,810	87,865	88,188	85,090
Number of Retired Members	2	18	27	24	98	70	31	270
2016								
Average Monthly Benefit	\$ 2,754	\$ 1,294	\$ 1,871	\$ 2,708	\$ 4,012	\$ 4,430	\$ 5,222	\$ 4,066
Average Final Average Salary	91,458	82,418	81,622	80,316	85,125	78,969	81,558	81,761
Number of Retired Members	2	15	24	19	111	128	71	370
2017								
Average Monthly Benefit	\$ -	\$ 1,145	\$ 1,703	\$ 2,572	\$ 3,805	\$ 4,776	\$ 5,145	\$ 3,972
Average Final Average Salary	-	87,848	76,222	78,592	83,192	84,360	83,286	82,327
Number of Retired Members	-	7	41	38	52	107	65	310
2018								
Average Monthly Benefit	\$ 535	\$ 1,183	\$ 1,718	\$ 2,392	\$ 3,766	\$ 4,767	\$ 4,939	\$ 3,445
Average Final Average Salary	47,133	67,758	67,861	61,879	81,109	87,896	84,979	77,016
Number of Retired Members	2	6	37	32	55	48	24	204
2019								
Average Monthly Benefit	\$ -	\$ 1,488	\$ 1,821	\$ 2,495	\$ 3,728	\$ 4,904	\$ 5,299	\$ 3,345
Average Final Average Salary	-	68,561	71,079	73,257	80,413	91,264	93,985	79,622
Number of Retired Members	-	13	25	25	50	20	17	150
2020								
Average Monthly Benefit	\$ 655	\$ 1,096	\$ 1,820	\$ 2,832	\$ 3,849	\$ 4,967	\$ 5,073	\$ 3,428
Average Final Average Salary	74,475	60,381	63,869	72,394	79,997	89,472	77,950	76,585
Number of Retired Members	2	9	17	26	53	22	8	137
2021								
Average Monthly Benefit	\$ 1,027	\$ 1,660	\$ 1,875	\$ 2,872	\$ 4,099	\$ 4,952	\$ 5,654	\$ 3,592
Average Final Average Salary	98,776	81,957	63,701	75,170	87,159	82,954	99,055	82,055
Number of Retired Members	1	15	23	39	82	21	14	195

Schedule of Benefit Recipients by Type and Option

December 31, 2021

	Total	Type of Retirement*									Option Selected**					Grand Total
		I	II	III	IV	V	VI	VII	VIII	IX	A	B	C	D	E	
\$0-\$500	209	23	4	0	70	6	1	79	0	26	151	24	8	0	26	209
\$500-\$1,000	440	49	1	2	120	4	24	194	0	46	338	49	7	0	46	440
\$1,000-\$1,500	587	84	18	19	152	4	18	257	4	31	460	69	27	0	31	587
\$1,500-\$2,000	741	140	156	37	163	3	4	181	29	28	499	170	43	1	28	741
\$2,000-\$2,500	957	163	499	46	106	2	1	120	12	8	614	268	65	2	8	957
\$2,500-\$3,000	971	125	693	20	54	2	2	70	4	1	565	320	78	7	1	971
\$3,000-\$3,500	879	87	716	16	21	0	4	34	0	1	513	300	60	5	1	879
\$3,500-\$4,000	700	59	605	8	13	0	1	14	0	0	366	252	74	8	0	700
Over \$4,000	1254	126	1113	3	1	0	2	9	0	0	723	399	121	11	0	1254
Total	6738	856	3805	151	700	21	57	958	49	141	4229	1851	483	34	141	6738

***Type of Retirement**

I Normal
 II Early Normal
 III Early Reduced
 IV Disability
 V Special Disability
 VI Special Survivor
 VII Optionee
 VIII Special early Reduced
 IX QDRO

**** Option Selected**

A Lifetime Annuity
 B Joint Annuity Pop-up
 C Joint Annuity
 D Term Certain
 E QDRO

FREQUENTLY ASKED QUESTIONS

(Unaudited)



Questions & Answers

Q *Who is eligible to become a member of the Retirement Fund?*

A Any person regularly employed by the MBTA is eligible to become a member of the Retirement Fund.

Q *How does an employee contribute to the Retirement Fund?*

A Retirement contributions are deducted from the regular earnings (excluding overtime).

Q *Are the matching contributions made by the Authority applied to the member's balance in the Fund?*

A NO. The Authority's contributions are not applied to the member's balance in the Fund. These contributions become an irrevocable asset of the Fund used for the benefit of its members.

Q *What is the rate of interest earned by the member on his/her contributions? Does the member continue to earn interest after his/her employment with the Authority is terminated by reason of retirement, resignation or discharge?*

A Interest earned on contributions made on or after July 1, 1967, are compounded annually at a rate of three percent (3%). Note: This rate is set by the Pension Agreement and does not reflect the earnings of the Fund. NO. A member stops earning interest on his/her contributions as of the last day of the month prior to his/her separation from the Authority's service.

Q *How do part-time employees accrue creditable service?*

A For the purpose of determining the amount of retirement benefit, creditable service shall accrue at the rate of one month of creditable service, or fraction thereof, for each 173 pay hours received.

Questions & Answers *(Continued)*

Q *Under what circumstances is the spouse of a member required to sign a spousal consent form?*

A When a member is about to retire, a spousal consent is required when the member elects to receive his/her benefit in the following manner:

- No optional benefit for spouse
- 33¹/₃% with no pop-up
- 25% with no pop-up
- 50% with no pop-up
- 33¹/₃% with pop-up
- 25% with pop-up
- 5, 10 or 15-year term certain benefits

Q *Are retirement contributions deducted from Workers' Compensation payments? Does the time out on Workers' Compensation count as creditable membership service?*

A No. There are no retirement contributions deducted from Workers' Compensation payments. As a result, it may exclude that year as a high year in calculating the high 3-year average. Yes. When a member is out of work and receiving Workers' Compensation payments, it does count as creditable membership service.

Q *Workers' Compensation Offset: Does my receipt of Workers' Compensation payments affect my disability retirement benefit?*

A Possibly: If the payments that you receive under Workers' Compensation are based on the same injury that qualified you for disability retirement, your pension benefit will be offset against your Workers' Compensation for that same injury.

This means that your pension benefit will be directly reduced by the amount of the Workers' Compensation benefit that you receive.

Workers' Compensation payments that are based on an injury different from the injury that qualified you for a disability pension will not affect your disability retirement benefit.

Q *Is the employment date with the Authority the same as the membership date in the Fund?*

A NO. Membership in the Fund begins when contributions are made to the Fund and is usually a short time after the employment date, typically 90 days after being employed.

Questions & Answers *(Continued)*

Q *When can a member retire?*

A A member can retire at age 65 or older on a Normal Retirement.

For a member hired before December 6th, 2012, an Early Normal Retirement is available with 23 years of creditable service.

A member hired on or after December 6th, 2012, an Early Normal Retirement is available if the member is age 55 or older and has at least 25 years of creditable service.

An Early Reduced Retirement is available if the member is age 55 or older and has at least 20 years of creditable service; however, the retirement allowance will be reduced by 1/2 of 1% for each month between the age at retirement and age 65.

The plan provides for a Disability Retirement after 4 years of creditable service for an occupational disability or after 6 years for a non-occupational disability.

Q *How is a member's retirement allowance determined?*

A The maximum retirement allowance is determined by using the following formula: The average of the best 3 years of earnings, multiplied by 2.46%, and multiplied by years and months of creditable membership service.

Q *What is the date shown on the monthly retirement checks and when are they mailed to the retirees?*

A The monthly retirement checks are dated for the last business day of the month. The checks are mailed 4 or 5 days before the end of the month in order for them to arrive at the retiree's home by the last day of the month.

Q *If a member leaves the employ of the MBTA, what happens to the contributions made on the employee's behalf (Authority's Contributions) to the Fund?*

A Those contributions, once made, become an irrevocable asset of the Pension Fund and can only be used for the exclusive benefit of the members of the Fund.

Q *If a retirement benefit is sent direct deposit (ACH – wire transfer) to a bank or credit union, when is the benefit deposited into the retiree's account and when are the funds available?*

A The benefit is wired to the retiree's bank or credit union on the last business day of the month. The availability date of these funds is determined by the members banking institution.

Questions & Answers *(Continued)*

Q *Does a member have a decision to make on how the pension will be paid?*

A YES. A member can take the maximum retirement allowance payable and will get a check every month for life in that amount, subject to adjustments from time to time. If a member takes the maximum retirement allowance payable, the member will recover the money contributed to the Fund in three years or less, and after the member dies, no further payments will be made from this Fund. A member can elect to take retirement payments under an option. Options give the retiree a lesser amount for life with the provision that upon their death the person designated as beneficiary will receive a retirement allowance. An example would be the 100% option. Instead of taking the maximum retirement allowance payable, the member elects to take a reduced amount for life and upon the member's death, the designated beneficiary will receive 100% of the allowance the member was receiving for life. The amount of reduction from the maximum is determined by option factors which are based on the member's and designated beneficiary's age and life expectancy. There are several types of options available.

Q *Once a member has retired and elected either the maximum benefit or elected an option, can this election be changed?*

A NO. An option elected by a member can only be changed prior to the effective date of retirement.

Q *How does unused sickleave affect the retirement allowance?*

A At retirement, a member's unused sickleave is converted to creditable membership service, which when multiplied by 2.46% of the average of the three (3) best years, increases the retirement allowance. For example, sickleave of 150 days converts to 7 months of creditable membership service. However, unused sickleave cannot be used to determine service eligibility for retirement.

Q *In the event a retiree is divorced or widowed, can he/she drop the option elected or change it in favor of a new spouse?*

A NO. In the event a retiree is divorced or widowed from his/her spouse, the option elected cannot be dropped or transferred in favor of a new spouse after the effective date of retirement.

Questions & Answers *(Continued)*

Q *Can a member buy any service for which credit is not being received?*

A NO. A member can only get credited for the time in which both the member and the Authority make contributions.

Q *Who can an active or retired member contact with specific questions concerning health and life insurance benefits?*

A Active and retired members of the MBTA may contact the Benefits Department with specific questions about health and life insurance benefits. The telephone number is (617) 222-3244. Written inquiries should be sent to the MBTA Benefits Department, 10 Park Plaza, 4th Floor, Boston, MA 02116.

Q *Can a member withdraw any money from the Fund and pay it back at a later date with interest?*

A NO. A member cannot withdraw any contributions from the Fund. The only way a member can obtain money from the Fund is either by resigning or retiring.

Q *Can I receive creditable service in the MBTA Retirement Fund for service with any other Federal, State or local government agency?*

A NO. Since the MBTA Retirement Fund is a private system, no credit can be given for service other than with the MBTA.

Q *If the surviving spouse is eligible to receive a monthly benefit, how soon does he/she begin receiving the benefit? Does he/she have to wait until the member would have reached age 65?*

A The surviving spouse is eligible to receive the benefit the first month following the member's death. He/She does not have to wait until the member would have reached age 65.

Example: Member passes away June 15th. The surviving spouse is eligible for benefit starting July 1st.

Q *How are changes made in the Pension Plan?*

A All changes and improvements to the Pension Plan are negotiated between Local #589 and the Authority.

Questions & Answers *(Continued)*

Q *If I leave the employ of the Authority and return at a later date, am I eligible to “Buy Back” my prior service?*

A YES. A former member of the Fund who is re-employed by the Authority is eligible, after a 3-year waiting period, to request the Retirement Board to restore his/her previous service by the repayment of the withdrawn funds, plus interest. “Bridging the Gap” restores to the member the creditable service he/she built up during the previous period of employment. There is no credit given for the period between the date the member left the employ of the Authority and the date he/she was re-employed. That gap will always remain. Therefore, any member of the Fund who terminated his/her employment with the Authority and was re-employed should contact the Retirement Board to determine the amount necessary to “Buy Back” the previous service.

Q *How does a member qualify for a benefit under the Vesting Provision of the Fund?*

A Under the Vesting Provision of the Fund, a member who has at least 10 years of creditable membership service may qualify for a benefit provided that his/her employment with the MBTA ended through no fault of their own. If a member resigns or is discharged for cause, he/she is not eligible for a retirement benefit under this provision.

Q *When is a member eligible to receive a benefit under the Vesting Provision of the Fund?*

A Under the Vesting Provision of the Fund, a member is eligible to receive a retirement benefit the first of the month following the member’s 65th birthday provided that the member has 10 years of creditable membership service in the Fund and his/her employment did not end voluntarily or by termination.

Questions & Answers *(Continued)*

Q *Can taxes be withheld from my pension benefit?*

A Federal tax can be withheld and deducted from your pension check each month. The amount of federal tax withheld from your monthly benefit can be changed at anytime by filing a new W-4P form with the Retirement Fund.

The MBTARF Pension is not taxable in the state of Massachusetts. Retirees residing in Massachusetts should not include their pensionable earnings from the MBTA Retirement Fund as income on their Massachusetts return.

Q *If a member has a question concerning the Fund or would like to obtain an estimate of his/her retirement benefit, whom should he/she contact for the correct answer?*

A All questions should be directed to the MBTA Retirement Fund at One Washington Mall, Boston, MA 02108 617-316-3800 or 800-810-6228.



MBTA Retirement Fund

One Washington Mall - 4th Floor
Boston, MA 02108

617-316-3800
www.mbtarf.com