



Massachusetts Water Resources Authority
Employees' Retirement System
(a Fiduciary Component Unit of the
Massachusetts Water Resources Authority)



Annual Comprehensive Financial Report
For the Year Ended December 31, 2022

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(a Fiduciary Component Unit of the Massachusetts
Water Resources Authority)



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For the Year Ended December 31, 2022

Prepared by the Staff and Management of the
Massachusetts Water Resources Authority Employees' Retirement System

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Introductory Section



MWRA EMPLOYEES' RETIREMENT SYSTEM

June 27, 2023

Dear Members of the MWRA Employees' Retirement System and interested readers:

On behalf of the MWRA Employees' Retirement Board (MWRAERB), I am pleased to present the Annual Comprehensive Financial Report (ACFR) of the MWRA Employees' Retirement System (MWRAERS) for the year ended December 31, 2022. The report is designed to provide a detailed look at the financial, investment and actuarial aspects of the MWRAERS.

A comprehensive report is being issued in the interest of full disclosure to the MWRAERS's members and to demonstrate the diligent stewardship and internal controls that are in place to protect assets and maintain financial integrity. The MWRAERS has received the Government Finance Officers Association Certificate of Achievement for Excellence in Financial Reporting each year from 2013 through 2021, a very prestigious award that only a few public retirement systems in New England have received. We are confident that we will be awarded another Certificate for 2022.

By statute the MWRA Employees' Retirement Board meets at least once a month to discuss and review benefit and investment issues and to conduct due diligence assessments of the System's investments. We have resumed in-person meetings but continue to allow remote participation by members as needed, and by the public. It is the fiduciary responsibility of the Board to ensure that current and future retirement benefits will be paid. Therefore, safeguarding the MWRAERS' investment portfolio is a top priority. The MWRAERB has developed an investment policy that incorporates an asset allocation with a long-term time horizon and participant demographics. The policy also reflects the impact of the MWRAERS' having one of the highest funded ratios among public pension Systems in the Commonwealth. Our higher than average funded ratio allows the MWRAERS' portfolio to incorporate less risk than those of Systems with lower funded ratios, which often rely on assuming additional risk as a means to maximize returns, in order to reduce funding deficits. Our portfolio is designed to combine asset classes that involve some investment risk with those intended to yield more stable and predictable returns, and to diversify sufficiently the assets to mitigate risks during the inevitable times when certain asset classes experience more volatile returns.

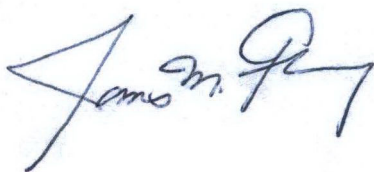
The benefits of diversification were tested and proved in 2022, with the markets experiencing their greatest annual losses since 2008. Equities, both Domestic and International, struggled, with the S&P falling approximately 18% for the year. Diversification within Domestic Equity portfolio benefitted the fund, with Value outperforming Growth. The Fixed Income portfolio outperformed its index by 190 basis points, and the Real Estate portfolio ended the year up 9.2%, contributing to the MWRAERS portfolio's finishing the 2022 year at -12.3% overall.

The recently completed January 1, 2023, Actuarial Study of the MWRA Employees' Retirement System showed an unfunded actuarial liability of \$91 million, which reflects the impact of the asset losses. Actuarial gains and losses are recognized over a period of five years in order to smooth out volatility in asset values caused by market conditions. The Board's previous adoption of a more conservative investment return assumption of 6.9%, as well as more conservative mortality assumptions, helped to mitigate some of the losses as well. In conjunction with modifications to the Board's Investment Objectives and Asset Allocation, the changes were made by the Board to approximate more accurately long-term expectations and are considered a strategic means to reduce risk over the long term. On May 10, 2023, the MWRA Employees' Retirement Board, based on the January 1, 2023, Valuation results adopted a funding schedule which incorporates a one-time retiree cost of living increase of 5% for fiscal year 2023 as well as a 3% cost of living increase for FY2024, both calculated on the first \$17,000 in annual benefits. The funding schedule covers the Employer Normal Cost, and funds the amortization of the Unfunded Actuarial Accrued Liability by FY2030. The Retirement Board chose to adhere to its disciplined approach in spite of universally difficult market conditions in 2022 and avoid the accrual of additional liabilities incurred by extending the schedule's full-funding date.

I would like to thank the other Board members for their work ethic and dedication to their service on the Board, as well as the Board's investment consultant, actuary and independent auditors for their valuable assistance with both the preparation of this report, and with other matters entrusted to them. I offer my gratitude to the Plan Sponsor, MWRA, for their recognition of the benefits of a disciplined and cooperative approach to funding the Retirement System. I would also like to thank the Board's legal representatives for their counsel and acknowledge the Public Employee Retirement Administration Commission for their oversight of our operations.

Finally, I would like to commend the staff of MWRAERS for their diligent work in preparing this report and their commitment to continually improving administrative operations. I encourage members to review this report carefully, as it contains a wealth of information about your retirement system.

Sincerely,

A handwritten signature in blue ink that reads "James M. Fleming". The signature is stylized and cursive.

James M. Fleming, Esq.
Chairman



MWRA EMPLOYEES' RETIREMENT SYSTEM

June 27, 2023

MWRA Employees' Retirement Board
2 Griffin Way
Chelsea, MA 02150

Dear Mr. Chairman and Members of the Board:

I am pleased to submit the Annual Comprehensive Financial Report (ACFR) of the MWRA Employees' Retirement System (MWRAERS) for the year ended December 31, 2022. The Government Finance Officers Association of the United States and Canada (GFOA) awarded a Certificate of Achievement for Excellence in Financial Reporting to the MWRAERS for the year ended December 31, 2021. This award is granted when an organization has submitted an ACFR that satisfies the stringent accounting standards and legal requirements set forth by the GFOA.

GASB Statement No. 34 requires that management provide a narrative introduction, overview and analysis to accompany the basic financial statements in the form of Management's Discussion and Analysis (MD&A). This letter of transmittal is designed to complement the MD&A and should be read in conjunction with it. The MWRAERS's MD&A can be found immediately following the report of the independent auditor.

Management assumes full responsibility for the completeness and reliability of the information contained in this report, based upon a comprehensive framework of internal control that it has established for this purpose. Because the cost of internal control should not exceed anticipated benefits, the objective is to provide reasonable, rather than absolute, assurance that the financial statements are free of any material misstatements.

History of the MWRAERS

The MWRAERS was established as part of the Enabling Act in 1984 and became operative on July 1, 1985. The MWRAERS is a contributory defined benefit plan that covers eligible employees of the Massachusetts Water Resources Authority (MWRA). The MWRAERS is administered by a five member Board consisting of the MWRA's Board of Director's Secretary (Ex-Officio Member), the MWRA's Director of Finance (MWRA Appointed Member), two representatives elected from the membership, and a fifth member chosen by the other four who cannot be an employee, retiree or official of the MWRA. One Board member is elected from the group to serve as Chairman.

Investment Results

The MWRAERS has an Investment Policy Statement which establishes investment objectives and policies providing the framework for investments. This Policy is reviewed on an annual basis. A summary of the Investment Policy is included in the Investment Section. The System uses a custodian bank to safeguard the assets and ensure proper settlement and recording of transactions.

An integral part of the overall investment policy is the asset allocation policy. MWRAERS' asset allocation is designed to provide an optimal mix of asset classes to both preserve principal and provide adequate funds to pay pension benefits. Assets are allocated over various classes such as domestic stocks, domestic bonds, international stocks, real estate, private equity, hedge funds and global assets. The investment market results have consistently demonstrated the importance of a well-diversified asset allocation.

MWRAERS' dollar-weighted investment return of -12.6% for 2022 did not meet the actuarial expected rate of return or the Investment policy benchmark, resulting in an actuarial loss in a year marked by the worst market performance since the 2008 Global Financial Crisis. Please refer to the Investment Section of this ACFR for more information on investment results.

Major Initiatives

Chapter 68 of the Acts of 2007, An Act to Reduce the Stress on local Property Taxes Through Enhanced Pension Fund Investment, was signed into law July 25, 2007. This Act amends MGL Chapter 32 section 22 and directs the Public Employee Retirement Administration Commission (PERAC) to conduct an annual analysis of all Massachusetts public pension plans. The assessment includes the investment performance and funded ratio of each system every January 1st in accordance with the established methodology and standard. Systems failing to meet the standard are mandated to transfer the systems assets to the Massachusetts Pension Reserve Investment Management (PRIM) Board. The MWRAERS has exceeded these standards for each year since 2007, is therefore not subject to the mandatory transfer of system assets.

Benefits

An increase to the base upon which the 3% cost of living adjustment (COLA) for retirees is calculated was voted by the MWRAERB. The COLA base increased from \$13,000 to \$14,000 effective in FY20, from \$14,000 to \$15,000 in FY21, and an increase from \$15,000 to \$17,000 was recently approved to become effective FY23. The MWRAERS has granted the maximum 3% cost-of-living allowed by law since enactment of the legislation in 1997.

The MWRA Employees' Retirement Board approved increases to benefits for survivors of deceased active employees under C. 32, s. 12, as well as for survivors of accidental disability retirees receiving benefits in accordance with C. 32, s. 101. For survivors of active employees, the minimum benefit increased from \$250 to \$500 monthly, while for survivors of accidental disability retirees with effective retirement dates prior to November 1, 1996, the minimum allowance went from \$500 to \$750.

Signed into law on November 18, 2011, Chapter 176 of the Acts of 2011 became effective February 16, 2012, and is thought to reform and modernize the pension laws for Public employees in Massachusetts. The law created a new benefit structure for employees hired on or after April 2, 2012. The new age factors established will increase the minimum age for retirement. Calculation of the pension will use a 5-year average salary and contains anti-spiking provisions for both new members and current employees.

Administration

In May 2021, Mr. James Fleming was re-elected to the first elected Board Member's position and will serve a three-year term ending in 2024. As noted on page 8, Mr. Brian Peña, the Secretary for the Board of Directors of the MWRA, was appointed as the Ex-Officio Member of the Board effective March 15, 2023, and Mr. Matthew Horan assumed the Appointed Member's role February 15, 2023.

Chapter 176 of the Acts of 2011 has a number of corporate governance provisions that require the MWRAERS adhere to specific procurement procedures for investment management and related services. The Act also mandates training and financial disclosures of all Board members, and all MWRA Retirement Board members are in full compliance with these requirements.

The MWRAERS strives to provide quality service and information to active and retired members and their beneficiaries, and to the public. To assist in this effort, we maintain and continually update our internet site, at www.mwraetirement.com, and the web portal which provides employees and retirees direct access to their own information has proven to be a useful tool. Our site was recently updated to reflect new standards and requirements for public records disclosures, in order to facilitate access to public information. Easy access to all of the System's financial data has expanded on the site, and now includes our ACFR, Audits, summary Annual Reports published by PERAC, investment performance, Board meeting materials, and other information. Though we have been able to resume in-person meetings, we have prioritized maintaining continued remote public access to the meetings by publishing in advance meeting access information on our website as well as that of the Secretary of the Commonwealth.

Internal and Budgetary Controls

The MWRAERS management is responsible for maintaining a system of internal controls designed to provide reasonable, but not absolute, assurance that the financial statements are fairly stated in accordance with accounting principles generally accepted in the United States of America while adequately safeguarding the assets. The internal control procedures codified in 2019 are being continually reviewed in order to further strengthen the established safeguards on behalf of our membership, and were updated in 2022 in response to ever-evolving threats. The concept of reasonable assurance recognizes that the cost of internal controls should not exceed their anticipated benefits.

The MWRAERS budget is presented to and approved by the Board each year. All the expenditures are reviewed by the Board at its monthly meeting and compared to the budget on a year-to-date basis.

Accounting

This report has been prepared in accordance with accounting principles generally accepted in the United States of America. The basic financial statements are presented in accordance with the principles of the Government Accounting Standards Board (GASB), including guidelines established by GASB Statements No. 34, Basic Financial Statements - and Management's Discussion and Analysis - for State and Local Governments; No. 37, Basic Financial Statements- and Management's Discussion and Analysis- for State and Local Governments: Omnibus, No. 38, Certain Financial Statement Note Disclosures; No. 40 Deposit and Investment Risk Disclosures (an amendment of GASB No.3); and No. 67 Accounting and Financial Reporting for Pension Plans - an amendment of GASB Statement No. 25.

CliftonLarsonAllen LLP (CLA), a firm of licensed certified public accountants, performed the audit for the MWRAERS. The goal of the independent audit is to provide reasonable assurance that the financial statements for the year ended December 31, 2022, are free of material misstatements. The report of the independent auditors is included in the Financial Section of this report. CLA has issued an unqualified opinion on the MWRAERS's basic financial statements for the year ended December 31, 2022.

Actuarial Funding

After an open and competitive search process conducted in 2020, the MWRAERS retained the services of The Segal Company, an independent actuarial firm, to conduct an actuarial valuation of the MWRAERS as of January 1, 2023. The funded ratio is one measure of the financial condition of the MWRAERS. The funded ratio is calculated by dividing the net assets of the MWRAERS by the projected pension liability. The projected pension liability is a measure of the present value of total pension benefits estimated to be payable in the future to both current and future retirees and/or beneficiaries. A higher funding ratio gives the members a greater degree of assurance that their pension benefits are secure. As of January 1, 2023, the funded ratio of the MWRAERS was calculated at 88.36% using the actuarial value of assets. On a fair value basis the funded ratio was 80.44%. This funded ratio was achieved in the 1/1/23 valuation in spite of the extreme market volatility experienced in 2022. MWRAERB's lowering the assumed rate of return on investments from 7.1% to 6.9% in 2021 and adopting updated mortality tables which more closely mirror recent plan experience both helped reduce actuarial losses.

Acknowledgements

I am pleased to have completed this report in accordance with the GFOA Certificate of Achievement guidelines and proud to provide an annual report to our members that is both easy to read and comprehensive. This publication was prepared with the combined efforts of the auditors, actuaries and investment consultant and I would like to acknowledge and thank them for their hard work and tireless collaboration.

Respectfully submitted,



Carolyn Russo
Executive Director

Retirement Board Members

		Term Expiration
Andrew Pappastergion	Ex-Officio Member ⁽¹⁾	No expiration
Thomas Durkin	Appointed Member ⁽²⁾	6/30/2024
James M. Fleming	Elected Member	6/30/2024
Kevin McKenna	Elected Member	4/29/2026
Frank Zecha	Member Appointed by Other Members	1/24/2025

Retirement Board Staff

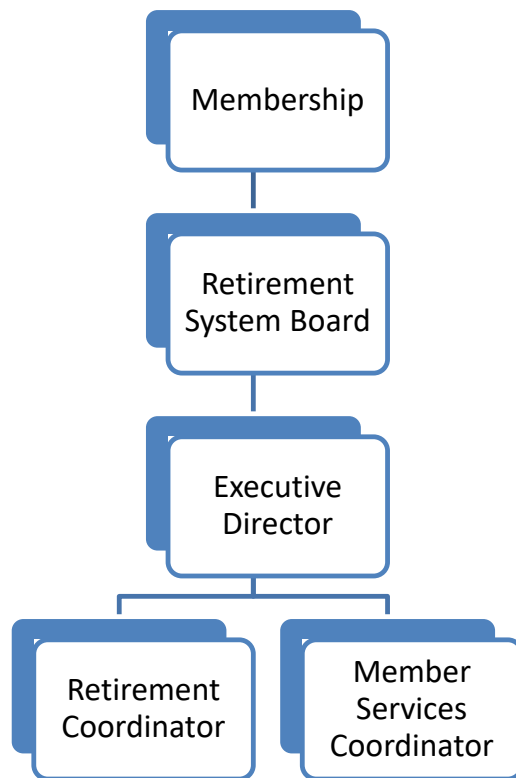
Carolyn M. Russo	Executive Director
Julie McManus	Retirement Coordinator
Danielle DiRuzza	Member Services Coordinator

Organizational Chart

This Chart does not include Investment professionals who provide services to MWREERS.

A list of these investment professionals is located on the following page.

Fee information may be found under the Investment Section on pages 50-52.



1.) Pursuant to C. 32, s. 20 (4 7/8D) the Ex-Officio Member of the MWRA Employees' Retirement Board is the Secretary to the Board of Directors. Upon his appointment as Vice Chairman of the Board of Directors, Mr. Pappastergion was replaced as Secretary by Mr. Brian Peña effective March 15, 2023.

2.) The Appointed Member selected by the Board of Directors, Mr. Thomas Durkin, was replaced by Mr. Matthew Horan effective February 15, 2023. Mr. Horan will serve the remainder of Mr. Durkin's three-year term to expire June 30, 2024.

Consultants, Fund Managers and Professionals	
Fund Managers	Fund Managers (Continued)
ABS Emerging Markets	Park Square New York, New York Private Equity - Credit Opportunities Fund III
Alcentra, New York, NY Private Equity - Alcentra European DLF	Pinebridge, New York, NY Private Equity - Credit Opportunities Fund III
Apogem (formerly PA Capital), Richmond, VA Private Equity -Small Co. Coinvestment Fund	Pension Reserves Investment Trust (PRIT), Boston, Massachusetts PRIT General Allocation Account PRIT Hedge Fund
Ascent Venture Partners, Boston, Massachusetts Private Equity - Ascent Fund IV Private Equity - Ascent Fund IV-B Private Equity - Ascent Fund V Private Equity - Ascent Fund VI	Private Equity - Vintage Year 2008 Private Equity - Vintage Year 2009 Private Equity - Vintage Year 2010 Private Equity - Vintage Year 2011 Private Equity - Vintage Year 2012 Private Equity - Vintage Year 2014 Private Equity - Vintage Year 2017 Private Equity - Vintage Year 2020 Private Equity - Vintage Year 2021 Private Equity - Vintage Year 2022
Axiom, Greenwich, CT Emerging Markets	Polen Capital, Boca Raton, Florida Equities - Large Cap Growth
Baillie Gifford International Equity	Rumblin Advisors, Boston, Massachusetts Large Cap -S&P 500 Index Fund US TIPS
Boston Company/BNY Mellon, Boston, Massachusetts International Equity	Robeco Boston Partners, Boston, Massachusetts Small Cap - Small Cap Value
CarVal New York, NY Private Equity-CVI Credit Value Fin A IV	Select Equity Group International Equity - Baxter Street Fund
Cerberus Capital Management L.P. , New York, New York Real Estate- Institutional Real Estate III	Stepstone (Courtland Partners), Cleveland, Ohio Real Estate - Real Estate Global Fund II
Coho Partners, Berwyn, Pennsylvania Equities - Large Cap Value	TA Realty, Boston, Massachusetts Real estate - Fund X UTP Real estate - Core Real Estate
Constitution Capital Partners, Andover, Massachusetts Private Equity-Ironside Opportunities Fund Private Equity-Co-Investment Fund VI	TerraCap, Bonita Springs, Florida Real Estate - Terracap Partners III Real Estate - Terracap Partners IV Real Estate - Terracap Partners V
Corbin Capital Partners, New York, New York Hedge Fund of Funds	UBS Stamford, Connecticut Hedge Fund of Funds-A&Q Neutral Alpha Strategies
Entrust, New York, New York Hedge Fund of Funds	Custodian M&T Bank (Formerly People's United Bank)/Bank New York Mellon, New York
Foundry Group, Boulder, Colorado Private Equity - Foundry 2007 Private Equity - Foundry 2010 Private Equity - Foundry 2010 Annex	Legal Advisors The Law Offices of Thomas F. Gibson, Cambridge, Massachusetts
Garcia Hamilton, Houston, Texas Fixed Income-Fixed Income Aggregate Strategy	Actuary The Segal Group, Boston, Massachusetts
Hamilton Lane, Cynwyd, PA Private Equity-Fund V	Investment Consultant NEPC, LLC, Boston, Massachusetts
Harbourvest, Boston, MA Private Equity-Dover Street X Private Equity-Co_Investment Fund VI	Independent Auditors CliftonLarsonAllen LLP, Lexington, Massachusetts
Hartford Schroders Investment Management, New York, New York International Equity - Alpha CIT	Commission Recapture Brokers Abel Noser, New York, NY ConvergEx Group, New York, NY
Invesco, New York, New York Fixed Income - Mortgage Recovery AIV Fixed Income - Mortgage Recovery II Private Equity - Invesco Fund VI	Securities Fraud Monitoring Berman Tobacco, Boston, Massachusetts Chimicles Tschwartz Kriner & Donaldson-Smith, Haverford, Pennsylvania Cohen Milstein, Chicago, Illinois Kessler Topaz Melzer & Check, Radnor, Pennsylvania Robbins Geller Rudman & Dowd, Philadelphia, Pennsylvania Scott & Scott, New York, New York
J.F. Lehman, New York, New York Private Equity - JFL Equity Investors IV Private Equity- JFL Equity Investors V	
Kayne Anderson Capital Advisors, Los Angeles, California Private Equity - Energy Fund VII	
Ares (Formerly Landmark Partners), Simsbury, Connecticut Real Estate - Landmark VI Private Equity - Landmark VIII Private Equity - Landmark XV	
Loomis Sayles, Boston, Massachusetts Small Cap - Small Cap Growth Fixed Income - Multi Sector Bonds FDT	
Lord Abbett, Jersey City, New Jersey Fixed Income - Lord Abbett Core Fixed Income	
Morgan Stanley, New York, New York Real Estate - Prime Property	
Octagon, New York, NY Fixed Income-Senior Secured Credit	



Government Finance Officers Association

Certificate of
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Presented to

**Massachusetts Water Resources Authority
Employees' Retirement System**

For its Annual Comprehensive
Financial Report
For the Fiscal Year Ended

December 31, 2021

Christopher P. Morill

Executive Director/CEO



Financial Section



INDEPENDENT AUDITORS' REPORT

To the Honorable Retirement Board
Massachusetts Water Resources Authority Employees' Retirement System

Report on the Audit of the Financial Statements

Opinion

We have audited the accompanying financial statements of the Massachusetts Water Resources Authority Employees' Retirement System (the System), a fiduciary component unit of the Massachusetts Water Resources Authority, as of and for the year ended December 31, 2022, and the related notes to the financial statements, which collectively comprise the System's basic financial statements, as listed in the table of contents.

In our opinion, the financial statements referred to above present fairly, in all material respects, the fiduciary net position of the System as of December 31, 2022, and the changes in fiduciary net position for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Basis for Opinion

We conducted our audit in accordance with auditing standards generally accepted in the United States of America (GAAS) and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. 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 System and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audit. 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 accounting principles generally accepted in the United States of America, 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 System'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 and *Government Auditing Standards* 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 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 and *Government Auditing Standards*, 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 System'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 System'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

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis, schedule of changes in employer net pension liability and related ratios, schedule of employer contributions and schedule of investment returns 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 GAAS, 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 audit 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 audit was conducted for the purpose of forming an opinion on the System's basic financial statements. The schedule of administrative expenses and schedule of investment and consultants' expenses 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 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 GAAS. In our opinion, the schedule of administrative expenses and the schedule of investment and consultants' expenses 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 report. The other information comprises the introductory section, investment section, actuarial section, and statistical section, 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 audit 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.

Other Reporting Required by Government Auditing Standards

In accordance with *Government Auditing Standards*, we have also issued our report dated June 27, 2023 on our consideration of the System's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts, and grant agreements and other matters. The purpose of that report is solely to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on the effectiveness of the System's internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the System's internal control over financial reporting and compliance.

CliftonLarsonAllen LLP

CliftonLarsonAllen LLP

Boston, Massachusetts
June 27, 2023

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
MANAGEMENT'S DISCUSSION AND ANALYSIS
DECEMBER 31, 2022

As management of the Massachusetts Water Resources Authority Employees' Retirement System (System), we offer readers of these financial statements this narrative overview and analysis of the System's financial activities for the year ended December 31, 2022.

Financial Highlights

The System's funding objective is to meet long-term benefit obligations through contributions and investment income. As of January 1, 2023, the latest actuarial valuation, the funded ratio was 88.36% based on the actuarial value of assets at that date. As of December 31, 2022, the plan fiduciary net position was 80.44% of the total pension liability.

The System's net position decreased by \$99,432,838 or 13.6%, when compared to the prior year's net position. Net position is the residual of the System's assets in excess of the System's liabilities as of the statement date. The System's assets are held in trust to meet future benefit payments.

Net investment loss was \$88,672,643. The money-weighted investment return of -12.30% was less than the actuarial expected rate of return and the Investment policy benchmark.

Overview of the Financial Statements

The financial statements are comprised of a Statement of Fiduciary Net Position, Statement of Changes in Fiduciary Net Position, Notes to the Financial Statements and Required Supplementary Information.

The **statement of fiduciary net position** presents information on the System's assets and liabilities and the resulting net position held in trust for pension benefits. This is calculated using the following formula: Assets – Liabilities = Net Position restricted for pensions. This statement reflects the System's investments at fair value, as well as cash, receivables and liabilities. The Statement of Fiduciary Net Position reports the financial position of the System at December 31, 2022. Over time, the increase or decrease in net position serves as a useful indicator of the System's financial health.

The **statement of changes in fiduciary net position** presents information showing how the System's net position changed during the year ended December 31, 2022. It reflects contributions by its individual members and participating employer along with deductions for retirement benefits, refunds, withdrawals, and administrative expenses. Investment income during the period is also presented showing income from investing activities.

The **notes to the financial statements** provide additional information that is essential for the reader to gain a full understanding of the data provided in the financial statements.

The **required supplementary information** includes a schedule of changes in employer net pension liability and related ratios, a schedule of employer contributions and a schedule of investment returns.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
MANAGEMENT'S DISCUSSION AND ANALYSIS
DECEMBER 31, 2022

Financial Analysis

The System's total assets as of December 31, 2022 were \$630,521,256 and were comprised of cash and cash equivalents, investments, and receivables. Total assets decreased \$98,471,096 or 13.5%, from the prior year.

Total liabilities as of December 31, 2022 were \$1,281,405 and represent accounts payable, accrued expenses, due to MWRA, and payables for securities purchased. Total liabilities increased \$961,742 or 300.9%, from the prior year.

The following tables present current and prior year data on the System's financial statements.

Fiduciary Net Position

Net position was \$629,239,851 at the close of the year and is summarized as follows:

Statement of Fiduciary Net Position

	2022	2021
Assets		
Cash and cash equivalents.....	\$ 14,216,277	\$ 19,169,289
Investments.....	615,740,533	703,416,270
Receivables.....	564,446	6,406,793
Total assets.....	630,521,256	728,992,352
Liabilities		
Accounts payable and accrued expenses.....	186,823	147,540
Due to MWRA.....	180,746	-
Payable for securities purchased.....	913,836	172,123
Total liabilities.....	1,281,405	319,663
Fiduciary Net Position		
Restricted for pensions.....	\$ 629,239,851	\$ 728,672,689

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
MANAGEMENT'S DISCUSSION AND ANALYSIS
DECEMBER 31, 2022

Changes in Fiduciary Net Position

The System's net position decreased by \$99,432,838 during the year and is summarized as follows:

Statement of Changes in Fiduciary Net Position

	<u>2022</u>	<u>2021</u>
Additions		
<i>Contributions:</i>		
Employer.....	\$ 12,555,203	\$ 11,205,000
Plan members.....	<u>10,550,990</u>	<u>9,892,233</u>
Total contributions.....	23,106,193	21,097,233
<i>Investment income:</i>		
Net increase (decrease) in fair value of investments.....	(91,625,963)	80,005,390
Interest and dividends.....	9,012,077	14,657,135
Less investment fees.....	<u>(6,058,757)</u>	<u>(5,643,917)</u>
Net investment income (loss).....	(88,672,643)	89,018,608
Reimbursements and transfers from other systems.....	<u>3,224,425</u>	<u>1,994,403</u>
Total additions.....	<u>(62,342,025)</u>	<u>112,110,244</u>
Deductions		
Benefits and refunds paid to plan members and beneficiaries.....	35,419,715	31,000,583
Reimbursements and transfers to other systems.....	1,085,626	487,451
Administrative expenses.....	<u>585,472</u>	<u>325,737</u>
Total deductions.....	<u>37,090,813</u>	<u>31,813,771</u>
Change in fiduciary net position.....	(99,432,838)	80,296,473
Fiduciary net position restricted for pensions - beginning of year.....	<u>728,672,689</u>	<u>648,376,216</u>
Fiduciary net position restricted for pensions - end of year.....	<u>\$ 629,239,851</u>	<u>\$ 728,672,689</u>

Additions to Fiduciary Net Position

The amount needed to finance benefits is accumulated through the collection of employer and plan member contributions, earnings on investments and reimbursements and transfers from other systems. Net additions resulted in a decrease to net position totaling \$62,342,025 during the current year versus an increase of \$112,110,244 in the previous year. The 2022 and 2021 employer contributions represent 100.0% of the respective annual required contributions. The System had a net investment loss of \$88,672,643 in 2022 compared to a gain of \$89,018,608 in 2021 due to unfavorable market conditions.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
MANAGEMENT'S DISCUSSION AND ANALYSIS
DECEMBER 31, 2022

Deductions from Fiduciary Net Position

The primary deductions of the System include the payment of pension benefits to participants and beneficiaries, refunds of contributions, and the costs of administering the System. Deductions to net position totaled \$37,090,813 during the current year versus \$31,813,771 in the previous year. The payment of pension benefits increased by \$4,419,132 or, 14.25%, over the previous year. The increase in these expenses resulted from an increase in benefit payments to newer retirees with higher average compensation.

Overall Financial Position

The System experienced a large decrease in net position for the year ending December 31, 2022, due to investment performance. Management believes the System is in a solid financial position and will be able to meet its obligations in the future.

Requests for Information

This financial report is designed to provide the Board, our membership, taxpayers, investors, and creditors with a general overview of the System's financial results and to demonstrate the System's accountability for the funding it receives. If you have any questions about this report or need additional financial information, contact the Executive Director at 2 Griffin Way, Chelsea, Massachusetts 02150.



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MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
STATEMENT OF FIDUCIARY NET POSITION
DECEMBER 31, 2022

Assets	
Cash and cash equivalents.....	\$ <u>14,216,277</u>
Investments:	
Fixed income.....	126,380,564
Equities.....	286,127,610
Real estate.....	70,329,831
Private equity.....	71,726,436
Hedge funds.....	26,675,187
PRIT (external investment pool).....	<u>34,500,905</u>
Total investments.....	<u>615,740,533</u>
Receivables:	
Accrued interest and dividends.....	240,531
For investments sold.....	282,700
Other.....	<u>41,215</u>
Total receivables.....	<u>564,446</u>
Total assets.....	<u>630,521,256</u>
Liabilities	
Accounts payable and accrued expenses.....	186,823
Due to MWRA.....	180,746
Payable for securities purchased.....	<u>913,836</u>
Total liabilities.....	<u>1,281,405</u>
Fiduciary net position restricted for pensions.....	\$ <u><u>629,239,851</u></u>

See accompanying Notes to Financial Statements.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
STATEMENT OF CHANGES IN FIDUCIARY NET POSITION
FOR THE YEAR ENDED DECEMBER 31, 2022

Additions:

Contributions:	
Employer.....	\$ 12,555,203
Plan members.....	<u>10,550,990</u>
Total contributions.....	<u>23,106,193</u>
Investment income:	
Interest and dividends.....	9,012,077
Net increase (decrease) in fair value of investments.....	(91,625,963)
Less: investment fees.....	<u>(6,058,757)</u>
Net investment income (loss).....	<u>(88,672,643)</u>
Reimbursements and transfers from other systems.....	<u>3,224,425</u>
Total additions.....	<u>(62,342,025)</u>

Deductions:

Benefits and refunds paid to plan members and beneficiaries.....	35,419,715
Reimbursements and transfers to other systems.....	1,085,626
Administrative expenses.....	<u>585,472</u>
Total deductions.....	<u>37,090,813</u>
Change in fiduciary net position.....	(99,432,838)

Fiduciary net position restricted for pensions:

Beginning of year.....	<u>728,672,689</u>
End of year	<u><u>\$ 629,239,851</u></u>

See accompanying Notes to Financial Statements.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

NOTE 1 – SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

A. Reporting Entity

The Massachusetts Water Resources Authority Employees' Retirement System (System) was established to provide pension benefits to Massachusetts Water Resources Authority (Authority) employees and their beneficiaries. The System is governed by a five-member board comprised of the Secretary of the Authority's Board (ex-officio), two members elected by the System's participants, one member appointed by the Authority's Board and one member appointed by the System's Board members.

The System is included as a fiduciary component unit in the Authority's financial statements because of its financial relationship with the Authority.

B. Basis of Accounting

The accompanying financial statements are presented on the accrual basis of accounting as prescribed by the Governmental Accounting Standards Board (GASB).

C. Cash, Cash Equivalents and Investments

Cash and cash equivalents is considered to be cash on hand, demand deposits and short-term investments with an original maturity of three months or less from the date of acquisition.

Investments are reported at fair value. Fair values of investments are based on quotations from a national securities exchange, except for the Systems' investment in the Pension Reserves Investment Trust (PRIT), hedge funds, private equity and real estate investments, for which fair values are estimated as detailed below.

External Investment Pool (PRIT)

PRIT is an external investment pool comprised of securities measured at various fair value measurements. The investment pool is managed by the Pension Reserves Investment Management (PRIM) Board and the System's share of the pool is reported at fair value in the System's financial statements. A complete copy of PRIT's separately issued financial statements can be obtained from PRIM Board at 84 State Street, Boston, MA 02109, or by visiting the PRIM Board's website at <http://www.mapension.com/public-records/records-of-interest/>.

Pooled Equity and Fixed Income Funds, Hedge Funds, Private Equity, and Real Estate Investments

The fair values of these types of investments have been determined by third party investment managers using Net Asset Value (NAV) per share (or its equivalent) on the System's ownership interest in the pool or partner's capital.

D. Basis of Investment Transactions

Purchases and sales of investments are recorded on the trade date. Transactions remaining unsettled as of year-end are recorded as payables for securities purchased and as a receivable for securities sold.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

E. Contributions and investment income

Contributions are recognized as additions in the period when they become due pursuant to formal commitments, statutory or contractual requirements. Investment income is recognized when earned.

F. Benefits and Refunds

Benefits and refunds to System members and beneficiaries are recognized as deductions when due and payable in accordance with the terms of the System.

G. Administrative Expenses

Administrative expenses are financed by investment income.

H. Due to MWRA

MWRA pays the System's employees' payroll. At December 31, 2022, \$180,746 is owed to MWRA from the System for these costs.

I. Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of additions and deductions during the reporting period. Fair values of pooled equity and fixed income funds, real estate funds, private equity funds, and hedge fund investments have been estimated in the absence of readily available fair values, and these estimates may be materially different than values that would have been used had a ready market existed.

NOTE 2 – PLAN DESCRIPTION

A. General

The System is a single employer public employee retirement system established by the Authority on July 1, 1985, under Massachusetts General Laws (MGL), Chapter 32, and is regulated by the Massachusetts Public Employee Retirement Administration Commission (PERAC). The System is a defined benefit pension plan that covers employees of the Authority.

Membership in the System is mandatory immediately upon the commencement of employment for all permanent full-time employees working at least 18.75 hours weekly.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 NOTES TO THE FINANCIAL STATEMENTS
 DECEMBER 31, 2022

Membership in the System was as follows at December 31, 2022:

Active members.....	1,045
Inactive members entitled to but not yet receiving benefits	151
Retirees and beneficiaries currently receiving benefits.....	<u>797</u>
 Total.....	 <u><u>1,993</u></u>

B. Significant Plan Provisions and Requirements

Benefit provisions and state law establishes contribution requirements of the System. Members of the System become vested after 10 years of creditable service. Normal retirement occurs at age 65.

For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by (1) the number of years and full months of creditable service at the time of retirement and (2) a percentage based on age at retirement in accordance with a schedule provided by state law. Assuming normal retirement at age 65, this percentage is 2.5%, which is reduced for individuals who retire prior to age 65 to reflect the longer pay out period.

For employees hired on or after April 2, 2012, the annual amount of the retirement allowance is based on the member's final five-year average salary multiplied by (1) the number of years and full months of creditable service at the time of retirement and (2) a percentage based on age at retirement in accordance with a schedule provided by state law. Assuming normal retirement at age 67, this percentage is 2.5%.

Employees hired prior to April 2, 2012, may elect early retirement after 20 years of service or at any time after attaining age 55 with 10 years of eligible service. Plan members who become permanently and totally disabled may be eligible to receive a disability retirement allowance. The amount of benefits to be received depends on several factors, including the member's age, compensation, veteran status, years of service and whether or not the disability is work-related. In addition, certain death benefits exist for beneficiaries of employees who die in active service.

Under MGL, Chapter 32 Section 3(8)(c), members leaving the Authority's employment to work for other Massachusetts governmental units requires the System transfers their accumulated account balances and creditable service to the retirement system of their new employer. Other such retirement systems are in turn required to make comparable transfers to the System for employees coming to work at the Authority. Per statute, the PERAC actuary shall consider length of service as well as acceptance of military service credit and salary cap provisions if applicable in calculating the liability.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 NOTES TO THE FINANCIAL STATEMENTS
 DECEMBER 31, 2022

NOTE 3 – DEPOSITS AND INVESTMENTS

Investment Policy

Deposits and investments made by the System are governed by Chapter 32 of the MGL. The System has the ability to invest in equity securities, corporate bonds, annuities and other specified investments in accordance with state laws and regulations.

The Board has the authority for establishing and amending investment policy decisions. Based on the investment objectives and constraints of the System, and based on an annual review of the asset allocation and asset classes, the Board will specify a long-term target allocation for each class of permissible assets. These targets will be expressed as a percentage of the total portfolio, and will have ranges surrounding them, allowing for the portfolio to maintain policy through market fluctuations.

The long-term target allocations are intended as strategic goals. Thus, it is permissible for the overall System's asset allocation to deviate from the long-term target, as would likely occur during manager transitions, asset class restructurings, and other temporary changes in the System. Surplus cash flows are utilized to maintain the asset management structure. Should these cash flows not be sufficient to reallocate the plan according to policy, the transfer of assets may occur between managers. At least annually, the Board reevaluates the portfolio weightings by asset class and adjustments are made accordingly. The following identifies the asset allocation policy as of December 31, 2022:

<u>Asset Class</u>	<u>Target</u>	<u>Range</u>
Domestic Equities	31%	20-45%
International Equities	19%	15-30%
Domestic Bonds	20%	15-40%
Real Estate	12%	0-18%
Private Equity	12%	0-18%
Hedge Funds/Absolute Return	6%	0-10%
Cash	0%	0-10%

Rate of Return

For the year ended December 31, 2022, the annual money-weighted rate of return on investments, net of investment expense, was -12.3%. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

Deposits - Custodial Credit Risk

Custodial credit risk for deposits is the risk that, in the event of a bank failure, the System's deposits may not be recovered. The System's policy for custodial credit risk of deposits is to rely on FDIC insurance. As of December 31, 2022, the System was not exposed to custodial credit risk. The carrying value of the System's deposits totaled \$10,000 at December 31, 2022.

Investments Summary

The System's investments at December 31, 2022 are presented below. All investments are presented by investment type, with debt securities presented by maturity (using segmented time distribution).

Investment Type	Total Amount	Investment Maturities (in Years)		
		Less Than 1	6 - 10	More Than 10
<u>Debt Securities:</u>				
Money market mutual funds.....	\$ 14,206,277	\$ 14,206,277	\$ -	\$ -
Fixed income securities.....	126,380,564	94,970,849	10,488,654	20,921,061
Total debt securities.....	140,586,841	<u>\$ 109,177,126</u>	<u>\$ 10,488,654</u>	<u>\$ 20,921,061</u>
<u>Other Investments:</u>				
Equity securities.....	286,127,610			
PRIT (External investment pool).....	34,500,905			
Hedge funds.....	26,675,187			
Real estate.....	70,329,831			
Private equity.....	71,726,436			
Total other investments.....	489,359,969			
Total investments (including cash equivalents).....	\$ 629,946,810			

Investments - Interest Rate Risk of Debt Securities

Interest rate risk for debt securities is the risk that changes in interest rates of debt securities will adversely affect the fair value of an investment. The System's policy for interest rate risk is the duration of the portfolio should be consistent with the appropriate indices. Unless otherwise agreed to, the duration of the portfolio must be within 25% of the appropriate benchmark.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

Investments - Custodial Credit Risk

Custodial credit risk for investments is the risk that, in the event of the failure of the counterparty, the System will not be able to recover the value of its investments or collateral securities that are in the possession of an outside party. The System's policy for custodial credit risk of investments intends that all investments are either insured and/or registered in the name of the System. As of December 31, 2022, the System was not exposed to custodial credit risk.

Investments - Credit Risk of Debt Securities

Credit risk for debt securities is the risk that an issuer or other counterparty to a debt security will not fulfill its obligations. The System's policies for credit risk of debt securities include the minimum quality rating at the time of purchase cannot be below a rating of CCC. Non-rated securities may comprise 10% of the portfolio, provided that the applicable manager determines that, if such an issue was rated, it would be allowed under the above limitation and that the non-rated issue is deemed to be below BAA (investment grade). Compliance with credit ratings provided by Moody's, Standard & Poor's and Fitch is not sufficient for an issue to be deemed an appropriate investment. The managers are responsible for making an independent analysis of the credit-worthiness of securities.

As of December 31, 2022, the credit quality ratings of the System's money market mutual funds are unrated by any nationally recognized statistical rating organization. As of December 31, 2022, the credit quality ratings of the System's fixed income securities, excluding U.S. Treasury securities of \$25,903,072, are as follows:

<u>Quality Ratings *</u>	<u>Fixed Income Securities</u>
A.....	\$ 3,050,224
BBB+.....	2,456,418
Unrated.....	<u>94,970,850</u>
Total.....	<u>\$ 100,477,492</u>

*Per Standard and Poor's, a nationally recognized statistical rating organization.

Deposits and Investments – Foreign Currency Risk

Foreign currency risk is the risk that fluctuations in exchange rates will adversely affect the fair value of an investment or a deposit. The System does not have a policy regarding foreign currency risk. As of December 31, 2022, the System was not exposed to foreign currency risk.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

Investments – Concentration of Credit Risk

Concentration of credit risk is the risk of loss attributed to the magnitude of the System's investment in a single issuer. The System's policy for concentration of credit risk is that not more than 5% of the fair value of the System's portfolio can be invested in the debt obligations of any one issuer, with the exception of securities issued by the U.S. Government, or its agencies, which may be held without limitation. As of December 31, 2022, the System was not exposed to concentration of credit risk.

Fair Value Measurements

The System categorizes its fair value measurements within the fair value hierarchy established by generally accepted accounting principles. The hierarchy is based on the valuation inputs used to measure the fair value of the asset. Level 1 inputs are quoted prices in active markets for identical assets; Level 2 inputs are significant other observable inputs; Level 3 inputs are significant unobservable inputs. The System has the following recurring fair value measurements as of December 31, 2022:

Investments by Fair Value Level	Fair Value	Fair Value Measurements Using	
		Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Other Observable Inputs (Level 2)
<u>Debt Securities:</u>			
Money market mutual funds.....	\$ 14,206,277	\$ 14,206,277	\$ -
Fixed income.....	31,409,714	25,903,072	5,506,642
Total Debt Securities.....	<u>45,615,991</u>	<u>40,109,349</u>	<u>5,506,642</u>
<u>Equity Securities:</u>			
Equity securities.....	125,417,535	125,417,535	-
Total Investments by Fair Value Level	<u>171,033,526</u>	<u>\$ 165,526,884</u>	<u>\$ 5,506,642</u>
<u>Investments measured at the net asset value (NAV)</u>			
Pooled Equity Funds.....	160,710,075		
Pooled Fixed Income Funds.....	94,970,850		
Private equity.....	71,726,436		
Real estate	70,329,831		
Hedge funds.....	26,675,187		
Investments measured at the net asset value (NAV).....	<u>424,412,379</u>		
<u>Other investments measured at fair value</u>			
External investment pool (PRIT)	34,500,905		
Total Investments measured at Fair Value	<u>\$ 629,946,810</u>		

Debt and equity securities classified in Level 1 of the fair value hierarchy are valued using prices quoted in active markets for those securities. Equity securities and fixed income securities classified in Level 2 of the fair value hierarchy are valued using a matrix pricing technique. Matrix pricing is used to value securities based on the securities relationship to benchmark quoted prices.

The valuation method for investments measured at the net asset value (NAV) per share (or its equivalent) is presented on the following table.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

Investments Measured at the NAV

	Fair Value	Unfunded Commitments	Redemption Frequency	Redemption Notice Period
Private equity (1).....	\$ 71,726,436	28,734,801	N/A ⁽¹⁾	N/A ⁽¹⁾
Real estate (2).....	70,329,831	3,658,238	N/A ⁽²⁾	N/A ⁽²⁾
Hedge funds (3).....	26,675,187	-	Quarterly	90-100 days
Pooled Equity Funds (4).....	160,710,075	-	1-30 days	1-60 days
Pooled Fixed Income Funds (5).....	<u>94,970,850</u>	114,794	1-30 days	1-15 days
Total Investments Measured at the NAV.....	<u>\$ 424,412,379</u>			

- (1) Private Equity Funds: This type includes 21 private equity funds that consist primarily of limited partnership interests in corporate finance and venture capital funds. The fair values of the investments in this type have been determined using the NAV per share (or its equivalent) of the System's ownership interest in partners' capital. The investments can never be redeemed with the funds. Distributions from each of these funds will be received as the underlying investments of the funds are liquidated. It is expected that the underlying assets of the funds will be liquidated over the next 1 to 10 years.
- (2) Real Estate Funds: This type includes 11 real estate funds that invest primarily in U.S. commercial real estate and value-added opportunities. The fair values of the investments in this type have been determined using the NAV per share (or its equivalent) of the System's ownership interest in partners' capital. There are two investments with approximate values of \$26,800,000 and \$26,000,000 for which the investments can be redeemed quarterly, with a redemption notice period of 90 days. The remaining investments can never be redeemed with the funds. Distributions from each of these funds will be received as the underlying investments of the funds are liquidated. It is expected that the underlying assets of the funds will be liquidated over the next 1 to 10 years.
- (3) Hedge Funds: This type includes 3 hedge funds that pursue multiple strategies to diversify risks and reduce volatility. The fair values of the investments in this type have been determined using the NAV per share (or its equivalent) of the System's ownership interest in partners' capital. There are three investments with approximate values of \$66,000, \$12,600,000, and \$14,000,000. The investments can be redeemed quarterly, with a redemption notice period of 90 days, 90 days, and 100 days, respectively.
- (4) Pooled Equity Funds: This type includes 7 funds with capital pooled from multiple investors in order to achieve mutual return objectives through investments in various types of equity securities. The fair value of pooled equity funds is measured at NAV by multiplying the pool's share price by the number of shares held.
- (5) Pooled Fixed Income Funds: This type includes 4 funds with capital pooled from multiple investors in order to achieve mutual return objectives through investments in fixed income securities. The fair value of pooled fixed income funds is measured at NAV by multiplying the pool's share price by the number of shares held.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 NOTES TO THE FINANCIAL STATEMENTS
 DECEMBER 31, 2022

NOTE 4 – FUNDING POLICY

Chapter 32 of the MGL governs the contributions of plan members and the Authority. Depending on their employment date, active System members must contribute anywhere between 5%-9% of their gross regular compensation. Members hired after December 31, 1978 must contribute an additional 2% of regular compensation in excess of \$30,000. These deductions earn interest at a rate determined by PERAC that vests based upon years of service. The Authority is required to pay into the System 100% of the actuarially determined employer contribution. For the year ended December 31, 2022, employer contributions totaled \$12,555,203 and plan member contributions totaled \$10,550,990.

Cost-of-living adjustments (COLA's) must be granted by the Board and are the responsibility of the System. COLA may be approved in excess of the Consumer Price Index but not to exceed 3% of the base retirement allowance.

NOTE 5 – NET PENSION LIABILITY

The components of the net pension liability of the System at December 31, 2022, were as follows:

Total pension liability.....	\$ 782,213,695
Plan fiduciary net position.....	<u>(629,239,851)</u>
Net pension liability.....	<u><u>\$ 152,973,844</u></u>
Plan fiduciary net position as a percentage of the total pension liability.....	80.44%

Actuarial Methods and Assumptions

The total pension liability was determined by an actuarial valuation as of January 1, 2023, which was rolled back to the measurement date of December 31, 2022, using the following actuarial methods and assumptions, which apply to all periods included in the measurement:

Methods:

Actuarial cost method	Entry Age Normal Cost Method
Asset valuation method	Fair Value

Assumptions:

Inflation	3.0%
Salary increases	Based on years of service, ranging from 5.75% at 0 years of service decreasing to 4.00% after 9 years of service
Investment rate of return	6.90%, net of pension plan investment expense, including inflation
Cost of living adjustment	5% of the first \$17,000

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
NOTES TO THE FINANCIAL STATEMENTS
DECEMBER 31, 2022

Mortality rates were based on the following:

Pre-Retirement	Pub-2010 General Employee Mortality Tables projected generationally using Scale MP-2021
Healthy Retiree	Pub-2010 Healthy Retiree and Contingent Survivor Amount-Weighted Mortality Tables projected generationally using Scale MP-2021
Disabled Retiree	Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables set forward one year projected generationally using Scale MP-2021

The actuarial assumptions used in the January 1, 2023 valuation were based on the results of an actuarial experience study for the period of January 1, 2016 through December 31, 2016.

The long-term expected rate of return on pension plan 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 plan 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 arithmetic real rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2022 are summarized in the following table:

Asset Class	Long-Term Expected Real Rate of Return (%)
Domestic equity.....	6.59
International developed markets equity.....	6.87
International emerging markets equity.....	8.30
Core fixed income.....	1.53
High-yield fixed income.....	3.54
Real estate.....	3.44
Hedge fund, global tactical asset allocation, risk parity.....	3.06
Private equity.....	9.49

Discount Rate

The discount rate used to measure the total pension liability was 6.90 percent, which was the same as the discount rate used for the net pension liability reported as of December 31, 2021. The projection of cash flows used to determine the discount rate assumed that plan member contributions will be made at the current contribution rate and that contributions will be made at rates equal to the actuarially determined contribution rates. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 NOTES TO THE FINANCIAL STATEMENTS
 DECEMBER 31, 2022

Sensitivity of the Net Pension Liability to Changes in the Discount Rate

The following presents the net pension liability of the MWRA calculated using the discount rate of 6.90 percent, as well as what the MWRA's net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (5.90 percent) or 1-percentage-point higher (7.90 percent) than the current rate:

	1% Decrease (5.90%)	Current Discount Rate (6.90%)	1% Increase (7.90%)
Net pension liability.....	\$ 245,098,415	\$ 152,973,844	\$ 74,869,070

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 REQUIRED SUPPLEMENTARY INFORMATION
 DECEMBER 31, 2022

Schedule of Changes in Employer Net Pension Liability and Related Ratios (1)

	2022	2021	2020	2019	2018
Total pension liability					
Service cost.....	\$ 13,948,669	\$ 14,330,187	\$ 13,338,631	\$ 12,734,657	\$ 11,761,819
Interest.....	51,474,719	49,158,896	46,455,166	44,061,874	41,391,851
Differences between expected and actual experience.....	(1,280,043)	(4,886,704)	(263,516)	3,528,888	3,250,413
Changes of assumptions.....	-	1,161,149	25,031,146	10,507,016	16,401,129
Changes of benefit terms.....	2,649,058	5,567,919	-	-	5,026,543
Benefit payments, including refunds of member contributions and net reimbursements and transfers to/from other systems.....	(33,280,916)	(29,493,631)	(25,313,047)	(24,463,504)	(21,428,414)
Net change in total pension liability.....	33,511,487	35,837,816	59,248,380	46,368,931	56,403,341
Total pension liability - beginning.....	748,702,208	712,864,392	653,616,012	607,247,081	550,843,740
Total pension liability - ending (a).....	\$ 782,213,695	\$ 748,702,208	\$ 712,864,392	\$ 653,616,012	\$ 607,247,081
Fiduciary net position					
Contributions - employer.....	\$ 12,555,203	\$ 11,205,000	\$ 10,000,000	\$ 7,315,000	\$ 7,000,000
Contributions - member.....	10,550,990	9,892,233	10,187,970	9,721,334	9,483,873
Net investment income.....	(88,672,643)	89,018,608	74,947,554	79,556,988	(17,113,462)
Benefit payments, including refunds of member contributions and net reimbursements and transfers to/from other systems.....	(33,280,916)	(29,493,631)	(25,313,047)	(24,463,504)	(21,428,414)
Administrative expense.....	(585,472)	(325,737)	(403,213)	(464,333)	(469,315)
Net change in fiduciary net position.....	(99,432,838)	80,296,473	69,419,264	71,665,485	(22,527,318)
Fiduciary net position - beginning.....	728,672,689	648,376,216	578,956,952	507,291,467	529,818,785
Fiduciary net position - ending (b).....	\$ 629,239,851	\$ 728,672,689	\$ 648,376,216	\$ 578,956,952	\$ 507,291,467
Net pension liability - ending (a) - (b).....	\$ 152,973,844	\$ 20,029,519	\$ 64,488,176	\$ 74,659,060	\$ 99,955,614
Plan's fiduciary net position as a percentage of the total pension liability.....	80.44%	97.32%	90.95%	88.58%	83.54%
Covered payroll.....	\$ 102,316,452	\$ 99,689,252	\$ 102,143,068	\$ 98,145,213	\$ 95,818,684
Net pension liability as a percentage of covered payroll.....	149.51%	20.09%	63.14%	76.07%	104.32%

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 REQUIRED SUPPLEMENTARY INFORMATION
 DECEMBER 31, 2022

Schedule of Changes in Employer Net Pension Liability and Related Ratios (Continued) (1)

	2017	2016	2015	2014
<u>Total pension liability</u>				
Service cost.....	\$ 11,307,822	\$ 11,079,991	\$ 10,637,880	\$ 10,529,508
Interest.....	38,520,217	36,917,053	34,598,348	33,587,256
Differences between expected and actual experience.....	(145,554)	(9,143,704)	-	(8,379,618)
Changes of assumptions.....	7,977,350	13,298,185	-	4,920,735
Changes of benefit terms.....	-	2,050,275	-	-
Benefit payments, including refunds of member contributions and net reimbursements and transfers to/from other systems.....	(18,222,342)	(16,129,253)	(15,389,885)	(12,963,429)
Net change in total pension liability.....	39,437,493	38,072,547	29,846,343	27,694,452
Total pension liability - beginning.....	511,406,247	473,333,700	443,487,357	415,792,905
Total pension liability - ending (a).....	\$ 550,843,740	\$ 511,406,247	\$ 473,333,700	\$ 443,487,357
<u>Fiduciary net position</u>				
Contributions - employer.....	\$ 3,277,369	\$ 4,632,624	\$ 8,159,521	\$ 12,629,474
Contributions - member.....	9,091,378	8,757,540	8,402,138	8,245,328
Net investment income.....	70,516,672	24,182,878	(530,090)	20,483,877
Benefit payments, including refunds of member contributions and net reimbursements and transfers to/from other systems.....	(18,222,342)	(16,129,253)	(15,389,885)	(12,963,429)
Administrative expense.....	(446,465)	(426,053)	(412,416)	(407,574)
Net change in fiduciary net position.....	64,216,612	21,017,736	229,268	28,003,676
Fiduciary net position - beginning.....	465,602,173	444,584,437	444,355,169	416,351,493
Fiduciary net position - ending (b).....	\$ 529,818,785	\$ 465,602,173	\$ 444,584,437	\$ 444,355,169
Net pension liability ending (a) - (b).....	\$ 21,024,955	\$ 45,804,074	\$ 28,749,263	\$ (867,812)
Plan's fiduciary net position as a percentage of the total pension liability.....	96.18%	91.04%	93.93%	100.20%
Covered payroll.....	\$ 92,975,107	\$ 89,755,173	\$ 89,168,911	\$ 88,646,339
Net pension liability as a percentage of covered payroll.....	22.61%	51.03%	32.24%	-0.98%

(1) Data is being accumulated annually to present 10 years of the reported information

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 REQUIRED SUPPLEMENTARY INFORMATION
 DECEMBER 31, 2022

Schedule of Employer Contributions

	<u>2022</u>	<u>2021</u>	<u>2020</u>	<u>2019</u>	<u>2018</u>
Actuarially determined contribution.....	\$ 12,555,203	11,205,000	10,000,000	7,315,000	7,000,000
Contributions in relation to the actuarially determined contribution.....	<u>12,555,203</u>	<u>11,205,000</u>	<u>10,000,000</u>	<u>7,315,000</u>	<u>7,000,000</u>
Contribution deficiency (excess).....	<u>\$ -</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>
Covered payroll.....	\$ 102,316,452	99,689,252	102,143,068	98,145,213	95,818,684
Contributions as a percentage of covered payroll.....	12.27%	11.24%	9.79%	7.45%	7.31%
	<u>2017</u>	<u>2016</u>	<u>2015</u>	<u>2014</u>	<u>2013</u>
Actuarially determined contribution.....	\$ 3,277,369	3,132,624	8,159,521	7,808,155	5,918,931
Contributions in relation to the actuarially determined contribution.....	<u>3,277,369</u>	<u>4,632,624</u>	<u>8,159,521</u>	<u>12,629,474</u>	<u>12,447,338</u>
Contribution deficiency (excess).....	<u>\$ -</u>	<u>(1,500,000)</u>	<u>-</u>	<u>(4,821,319)</u>	<u>(6,528,407)</u>
Covered payroll.....	\$ 92,975,107	89,755,173	89,168,911	88,646,339	84,829,033
Contributions as a percentage of covered payroll.....	3.52%	5.16%	9.15%	14.25%	14.67%

Schedule of Investment Returns (1)

Year-Ended:	Annual Money-Weighted Rate of Return, Net of Investment Expense
2022	-12.30%
2021	16.70%
2020	12.78%
2019	15.58%
2018	-10.03%
2017	15.02%
2016	5.81%
2015	-0.24%
2014	4.40%

(1) Data is being accumulated annually to present 10 years of the reported information

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
 NOTES TO REQUIRED SUPPLEMENTARY INFORMATION
 DECEMBER 31, 2022

Changes of Assumptions

The administrative expense assumption was increased from \$575,000 for calendar 2022 to \$600,000 for calendar 2023.

The System increased the cost-of-living adjustment from 3% to 5% with the current base of \$17,000. This change increased the actuarial accrued liability by approximately \$2.6 million.

Please refer to the Actuarial Section of this report for additional factors impacting trends in the amounts reported.

Methods and Assumptions Used in Calculations of Actuarially Determined Contributions

Actuarial Valuation:

The actuarially determined contribution rates are calculated as of January 1, 2021, two years prior to the end of the fiscal year which contributions are reported.

Methods:

Actuarial cost method	Entry Age Normal Cost Method
Asset valuation method	Fair Value

Assumptions:

Inflation	3.0%
Salary increases	Based on years of service, ranging from 5.75% at 0 years of service decreasing to 4.00% after 9 years of service
Investment rate of return	6.90%, net of pension plan investment expense, including inflation
Cost of living adjustment	3% of the first \$15,000

In addition, mortality rates were based on the following:

Pre-Retirement	Pub-2010 General Employee Mortality Tables projected generationally using Scale MP-2020
Healthy Retiree	Pub-2010 Healthy Retiree and Contingent Survivor Amount-Weighted Mortality Tables projected generationally using Scale MP-2020
Disabled Retiree	Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables set forward one year projected generationally using Scale MP-2020

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
SUPPLEMENTARY INFORMATION
DECEMBER 31, 2022

Schedule of Administrative Expenses

The composition of administrative expenses for the year ended December 31, 2022 is as follows:

Personal services	
Salaries	<u>\$ 428,763</u>
Professional services	
Legal expenses	25,010
Professional services	405
Actuarial Services	28,300
Accounting Services	<u>25,500</u>
Total Professional Services	<u>79,215</u>
Other Expenses	
Fiduciary insurance	13,851
Service contracts	36,543
Education and training	1,670
Administrative expenses	22,780
Furniture and equipment	477
Travel	<u>2,173</u>
Total other expenses	<u>77,494</u>
Total Expenses	<u>\$ 585,472</u>

MASSACHUSETTS WATER RESOURCES AUTHORITY EMPLOYEES' RETIREMENT SYSTEM
SUPPLEMENTARY INFORMATION
DECEMBER 31, 2022

Schedule of Investment and Consultants' Expenses

Total Balanced		
PRIM General Allocation Account	\$	25,460
Large Cap Domestic Equity		
Coho		243,334
Polen		294,923
Rhumblin S&P 500		25,689
Small Cap Domestic Equity		
Loomis Sayles		96,442
Robeco		239,068
International Equity		
ABS		140,848
Baillie Gifford International		119,611
Axiom		79,628
SEG Baxter Street		293,243
Hartford Schroders		142,427
Fixed Income		
Corbin		106,088
Entrust		3,681
Garcia Hamilton		81,687
Invesco Mortgage Recovery II		13,056
Loomis Sayles Fixed Income		274,423
Lord Abbett		65,414
Octagon		55,752
PRIT Hedge		160,353
Rhumblin US TIPS		1,805
UBS		123,390
Real Estate		
Cerberus		(1,660)
Stepstone Real Estate Global Fund II		7,659
Landmark VIII		22,117
Morgan Stanley Prime Property		311,410
TA Realty Fund X		88
TA Core Realty		192,897
TerraCap III		172,114
TerraCap IV		95,401
TerraCap V		1,003,634
Private Equity		
Alcentra		1,172
Ascent V		4,875
Ascent VI		33,750
CarVal		(229,808)
Constitution-Ironsides Opportunities Fund		73,074
Constitution-Co-Investment Fund VI		843,075
Foundry 2007		(73,967)
Foundry 2010		2,910
Foundry 2010 Annex		(3,544)
Hamilton Lane		195,173
Harbourvest Dover Street X		141,291
Harbourvest Co-Investment VI		44,247
Invesco VI		(6,493)
J.F. Lehman IV		7,005
J.F. Lehman V		122,879
Landmark XV		(7,454)
Park Square		44,561
Pinebridge		(1,543)
PRIT VY 2008		924
PRIT VY 2009		207
PRIT VY 2010		2,227
PRIT VY 2011		6,426
PRIT VY 2012		5,662
PRIT VY 2014		13,106
PRIT VY 2017		22,202
PRIT VY 2020		70,199
PRIT VY 2021		68,677
PRIT VY 2022		15,280
PA Capital (formerly Private Advisors)		48,341
TOTAL INVESTMENT MANAGEMENT FEES		<u>5,834,436</u>
CUSTODIAL FEES		
M&T Bank (formerly People's United)		104,321
CONSULTANT FEES		
NEPC		<u>120,000</u>
TOTAL ALL INVESTMENT-RELATED FEES	\$	<u><u>6,058,757</u></u>



Investment Section

REPORT ON INVESTMENT ACTIVITY

The information contained in the Investment Section of the Annual Comprehensive Financial Report (ACFR) has been prepared by NEPC, LLC, acting as the investment consultant for the Massachusetts Water Resources Authority (MWRA) Employees' Retirement System (the 'System'). All investment information herein has been reconciled between the MWRA, the investment managers hired by the MWRA, MWRA's custodian, and NEPC.

OUTLINE OF INVESTMENT POLICIES

The purpose of this document is to set forth the goals and objectives for the explicit purpose of:

- Determining the System's projected financial needs,
- Expressing the Board's position with respect to its risk/reward posture,
- Formulating an appropriate set of goals and objectives for the System's assets,
- Defining the strategy to be implemented by the Board in the endeavor of achieving the goals and objectives,
- Identifying a set of guidelines that the consultant can use in formulating corresponding investment recommendations over the next ten-year time horizon, and
- Establishing procedures and a schedule for monitoring the performance of the System in achieving the stated objectives.

I. MWRA Employees' Retirement System Goals

The MWRA Employees' Retirement System is an employee pension plan established in accordance with Chapter 32 of Massachusetts General Laws ('M.G.L., Chapter 32'). The System and Funds are administered by a Retirement Board (the 'Board') consisting of five members: the Ex-Officio, two appointed members, and two members elected by the general membership of the retirement system. This defined benefit plan is maintained to provide retirement, disability, and/or death benefits, as the case may be, to participants in accordance with Massachusetts General Laws.

The Board of the MWRA Employees' Retirement System has as its primary goal to provide promised benefits to participants and beneficiaries of the system. Plan assets should be equal to or greater than the present value of the projected benefit obligations ('fully funded'). When Plan assets are less than the present value of projected benefit obligations, a schedule will be established, and a plan will be in place to meet a fully funded status.

II. Investment Objectives

The investment goal of the fund is to achieve the assumed rate of return over the long term, through a prudently diversified portfolio. In order to achieve needed returns within the stated risk tolerance and in order to diversify plan assets so as to minimize the risk associated with the independence on the success of one enterprise, a policy asset mix will be utilized.

A. Risk and Return Objectives

- To use diversification to minimize the risk of large losses associated with the dependence on the success of one enterprise.
- The Board has determined that investment growth should be maintained in such a manner that the minimum nominal rate of return does not cause a negative real rate of return over a full market cycle.
- Return volatility of the aggregate asset base of the System will be measured relative to the volatility experienced by a policy benchmark.
- Volatility or risk shall be measured as the annualized standard deviation, utilizing monthly and/or quarterly total rates of return of the aggregate assets of the System.

III. Investment Constraints

A. Legal and Regulatory

The System is a qualified defined benefit pension plan governed by the M.G.L., Chapter 32.

The Board is charged by law with the responsibility for the investment of the assets of the System. To assist the Board in meeting their fiduciary obligation, they are authorized and permitted by the Public Employee Retirement Administration Commission (PERAC) to engage the services of advisors who possess the necessary specialized research facilities and skilled manpower to assure adherence to the 'Prudent Expert Rule' under such statutes as may now or in the future apply to investments of the System. Legal counsel will be retained by the Trustees to review contracts and provide overall advice as to fiduciary compliance to regulatory authorities.

Assets of this Fund shall be invested in a manner consistent with the fiduciary standards established under Code of Massachusetts Regulations 840 ('840 CMR'). The Board shall also use as precedent the Employee Retirement Income Security Act (ERISA).

Every Fiduciary Shall:

- Discharge his or her duties for the exclusive purpose of providing benefits to the participants of the Plan and their beneficiaries.
- Act with the care, skill, prudence, and diligence under the circumstances then prevailing that a prudent person acting in a like capacity and familiar with such matters would use in the conduct of an enterprise of like character and with like aims.
- Diversify by investment of the Plan so as to minimize the risk of large losses unless under the circumstances it is clearly prudent not to do so.
- Operate in accordance with the MWRA Employees' Retirement System's procedures, documents, and instruments.
- Maintain compliance with the Code of Ethics and Standards of Conduct applicable to their assigned duties.

No Fiduciary Shall:

- Deal with the assets of the MWRA Employees' Retirement System for his or her own account or his or her own interest.

- Act in any manner or on behalf of any person or organization whose interests are adverse to the interests of the MWRA Employees' Retirement System, its members, or beneficiaries.
- Cause the MWRA Employees' Retirement System to engage in a transaction which in any way involves a sale, exchange, lease, or transfer of assets to or from, or the use of assets by or for the benefit, or the furnishing of goods, services, or facilities to or by, or the lending of money or extension of credit to or by any party in one's own interest.

B. Time Horizon

Return assumptions will be based on a ten year time horizon, with a review and analysis to be made at least annually to monitor allocations and assumptions. Should a manager deviate from proscribed mandate or expected risk and return profile by a consequential degree, that manager may be reevaluated at any time.

C. Liquidity

Presently, contributions exceed plan withdrawals to provide benefits, payouts, and/or plan expenses. Portfolio liquidity will be managed based on the cash flow needs of the System.

D. Tax Considerations

The System is a tax-exempt entity. Therefore, investments and strategies will be evaluated only on the basis of expected risks and potential returns.

IV. Risk and Return Considerations

When achieving return objectives required to fully fund the system, the Board is intent on controlling risk. Consistency of returns and risk of loss are primary considerations.

The Board also has determined that the annual performance of plan assets should not vary substantially from returns achieved by other public pension funds with similar goals and objectives.

V. Diversification

The System's aggregate equity portfolio (including international equity and emerging market securities) will be diversified by market capitalization, industry, number of issues, and rate of turnover. The System's aggregate fixed income portfolio will be diversified by quality ratings, maturity schedule, industry, number of issues, and rate of turnover. The System's aggregate Global Asset Allocation portfolio allows for enhanced diversification through exposure to new asset categories, enhanced return and reduced volatility in down markets. The System's aggregate real estate portfolio will be invested in both equity and debt, and diversified geographically, by property type, by manager, and by investor. The System's aggregate private equity portfolio will be invested in private equity partnerships, private equity limited liability companies, and discretionary managers investing in private equity partnerships and private equity limited liability companies. The System's aggregate hedge fund portfolio will provide diversified and uncorrelated investments, which will include a broad array of strategies utilizing both liquid and illiquid securities.

The specific degrees of diversification within the above asset classes will be addressed in each manager's investment guidelines.

VI. Asset Allocation

To achieve needed returns within the stated risk tolerance, and to diversify plan assets so as to minimize the risk associated with the dependence on the success of one enterprise, a policy asset mix will be utilized. To accommodate the growth and avoid excess trading costs, the Board also has implemented asset class ranges.

In developing this asset mix, no portion of the portfolio has been allocated to cash. However, when employing a multi-manager investment approach, managers may raise cash balances in accordance with their individual investment guidelines.

A. Permissible Asset Classes

The Board has specifically indicated those asset classes that may be utilized when investing the System’s assets, which are summarized as follows:

Asset Type	Asset Class	Purpose
Equity	Large Cap U.S. Stocks	Total Return Potential
Equity	Small Cap U.S. Stocks	Total Return Potential
Equity	Developed International Stocks	Total Return Potential Diversification
Equity	Emerging Markets Stocks	Total Return Potential Diversification
Equity	Private Equity	Total Return Potential Diversification
Fixed Income	Investment Grade Bonds	Return Stability Income
Fixed Income	High Yield Bonds	Total Return Potential Diversification Income
Fixed Income	Non-U.S. Bonds	Total Return Potential Diversification Income
Real Estate	Real Estate	Total Return Potential Diversification Income
Hedge Funds	Absolute Return Strategies	Return Stability Diversification

B. Expected Returns, Risks, and Correlations for Permissible Asset Classes

The risk and return behavior of the System will be driven primarily by the allocation of investments across asset classes. In determining the appropriate allocation, the expected return and risk behavior of each asset class and the likely interaction of various asset classes in a portfolio must and are examined.

C. Long-Term Target Allocations

Based on the investment objectives and constraints of the MWRA Retirement System, and based on an annual review of the asset allocation and asset classes, the Board will specify a long term target allocation for each class of permissible assets. These targets will be expressed as a percentage of the total portfolio, and will have ranges surrounding them, allowing for the portfolio to maintain policy through market fluctuations.

The long term target allocations are intended as strategic goals. Thus, it is permissible for the overall System's asset allocation to deviate from the long term target, as would likely occur during manager transitions, asset class restructurings, and other temporary changes in the MWRA Retirement System. Deviations from targets that occur due to capital market changes are discussed after the following table:

Asset Allocation Targets
as of 12/31/22

	Target (%)	Range (%)
Domestic Stocks ¹	31%	20-45%
International Stocks ²	19%	15-30%
Domestic Bonds ³	20%	15-40%
Real Estate	12%	0-18%
Private Equity	12%	0-18%
Hedge Funds	6%	0-10%
Cash	0%	0-10%

¹ Includes large and small cap stocks

² Includes developed and emerging markets

³ Includes high yield and non-U.S. bond holdings

D. Rebalancing

Surplus cash flows shall be utilized to maintain the asset management structure. Should these cash flows not be sufficient to reallocate the Plan according to the policy, the transfer of assets may occur between managers.

E. Changes to Asset Allocation

At least annually, the Board will reevaluate the portfolio weightings by asset class and adjustments shall be made accordingly.

VII. Review of Investment Policy, Asset Allocation, and Performance

Policy guidelines will be fixed annually by the Board after consideration of the advice and recommendations of the consultant. All modifications of policy guidelines shall be in writing and signed by each of the acting Board members.

VIII. Trading and Proxy Voting by Investment Managers

All transactions are to be governed by negotiation for execution on a 'best execution basis.' The lowest commission cost may not represent the best execution. Investment managers shall be responsible for determining best execution of trades within their assigned portfolio.

Proxy voting shall be implemented by the manager in compliance to policies established by the manager approved by the Board as well as policies included in the investment policy statement. The manager is to report on all votes that are cast and the reason behind their decisions on a semi-annual basis.

IX. Management Structure

To diversify the System's assets so as to minimize the risk associated with dependence on the success of one enterprise, the Board has decided to employ a multi-manager team approach to investing System assets.

A consultant will be employed whose fiduciary responsibilities will be to provide investment advice, including: 1) risk and return assumptions on investments, 2) diversification of System assets so as to minimize risk, while attempting to achieve the System's return objectives, and 3) evaluating, monitoring, and reporting the total portfolio and investment manager returns and compliance to policy guidelines. The consultant is responsible for monthly and quarterly reporting.

Asset managers will be employed to utilize individual expertise within their assigned area of responsibility. Each manager will be governed by individual investment guidelines.

The Board, in recognition of the benefits of commingled funds (i.e., the ability to diversify more extensively than in a small, direct investment account and the lower costs which can be associated with these funds) may elect to invest in such funds on a case-by-case basis. The Board recognizes that it cannot give specific policy directives to a commingled fund with pre-established policies, outlined in each fund's prospectus or offering documents; therefore, the Board is relying on the investment consultant to assess and monitor the investment policies of any funds used by the Fund to ascertain whether they are appropriate for the System. The Board and its Investment Managers, where applicable, will establish a Side Letter Agreement that sets forth that the manager is aware of the Code of Massachusetts Regulations, Investment Regulations, the applicable provisions of the M.G.L., Chapter 32 and that the Manager will comply with the statute and Investment Regulations wherever possible, consistent with the Manager's trust documents, prospectus, implementation documents, etc. creating the commingled fund vehicle.

X. Implementation

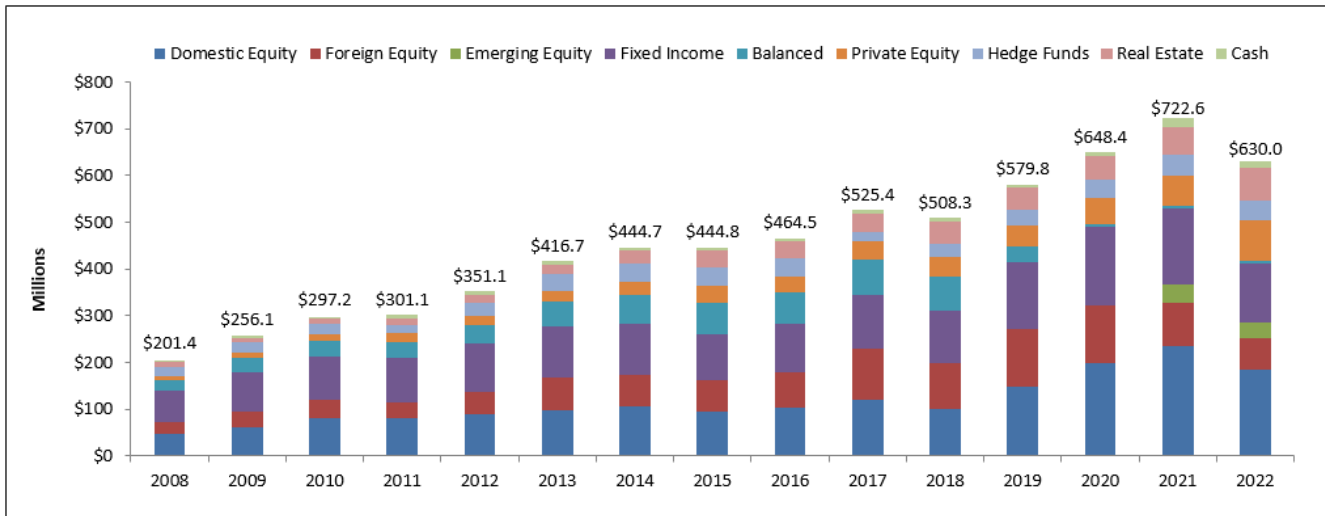
All monies invested for the Board by investment managers after the adoption of this investment policy statement shall conform to this statement. To the extent that the Board shall deliver to an investment manager, in cash or kind, or fund assets here to fore invested for them by other investment managers, within 60 days after the delivery of said prior assets by the Board, the entire portfolio managed by the manager shall conform in all aspects to guidelines established to the investment guidelines established for said manager.

TIME-WEIGHTED INVESTMENT RESULTS⁴ PERIODS ENDING 12/31/22

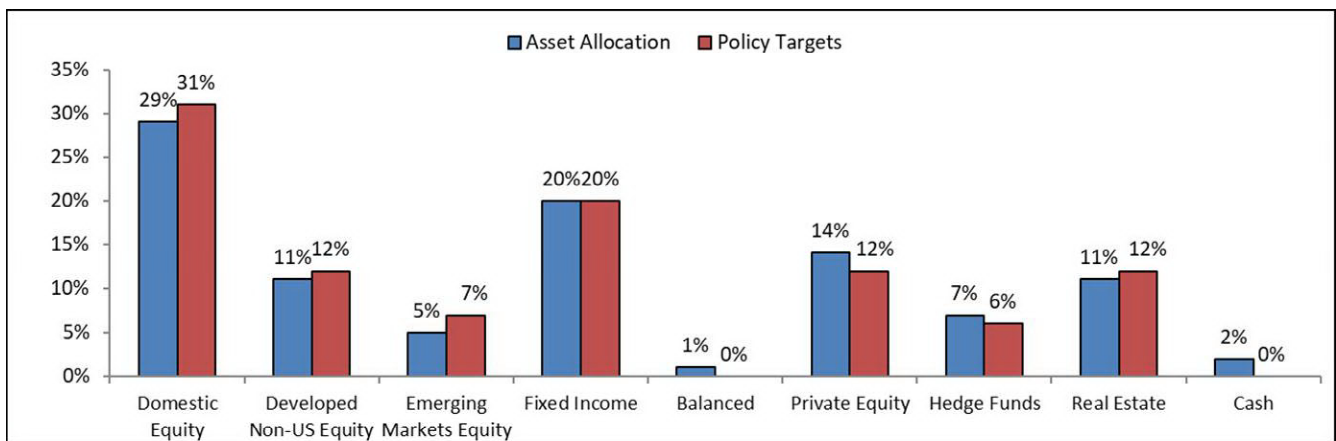
	4Q22	1 YR	3 YR	5 YR	10 YR	Since Inception	Inception Date
Total Composite	4.1	-12.6	3.9	4.7	6.5	6.6	1/1/1986
Allocation Index	4.3	-11.0	4.6	5.2	6.8	--	
Policy Index	4.4	-11.7	5.0	5.6	7.0	--	
Total Balanced	4.1	-11.4	5.5	4.1	4.2	4.4	12/1/2010
60% MSCI ACWI (Net) / 40% FTSE WGBI	7.4	-18.1	0.3	2.4	4.4	4.8	
Total Domestic Equity	7.0	-19.6	5.9	8.6	11.4	7.1	5/1/1999
Russell 3000	7.2	-19.2	7.1	8.8	12.1	6.8	
Total Non-US Equity	11.7	-23.3	-3.4	-1.2	3.0	3.6	3/1/1999
MSCI EAFE	17.3	-14.5	0.9	1.5	4.7	4.0	
Total Fixed Income	2.0	-11.1	-0.5	1.2	2.4	5.6	3/1/1999
Bloomberg Aggregate	1.9	-13.0	-2.7	0.0	1.1	3.9	
Total Hedge Fund	0.1	-3.7	3.9	3.4	3.6	3.3	10/1/2006
HFRI Fund of Funds Composite Index	1.7	-5.3	3.7	3.0	3.5	2.5	
Total Real Estate	-2.1	9.2	11.5	10.0	10.8	8.4	4/1/1999
NCREIF Property Index	-3.5	5.5	8.1	7.5	8.8	8.7	
Total Private Equity	1.0	2.7	18.1	14.3	14.5	10.3	4/1/1999
C A US All PE	1.0	-1.3	18.7	16.0	14.8	13.2	
Cash	0.9	1.4	0.7	1.3	0.8	1.7	2/1/2000
90 Day U.S. T-Bills	0.8	1.5	0.7	1.3	0.8	1.6	

⁴ Net of fees

HISTORICAL ASSET ALLOCATION - ASSET SIZE

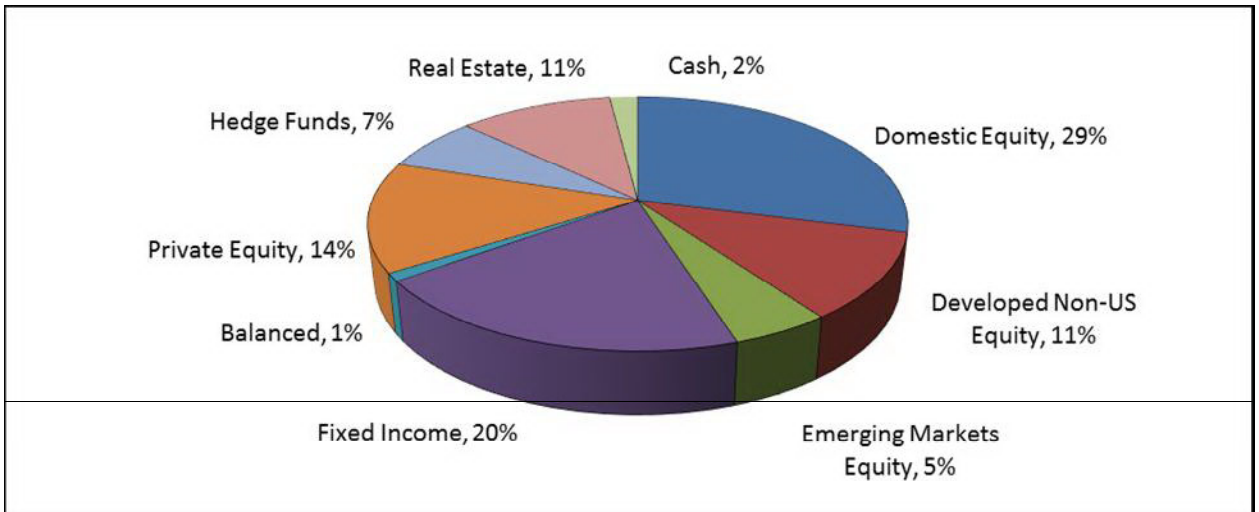


AGGREGATE ASSET ALLOCATION VS. POLICY TARGETS⁵

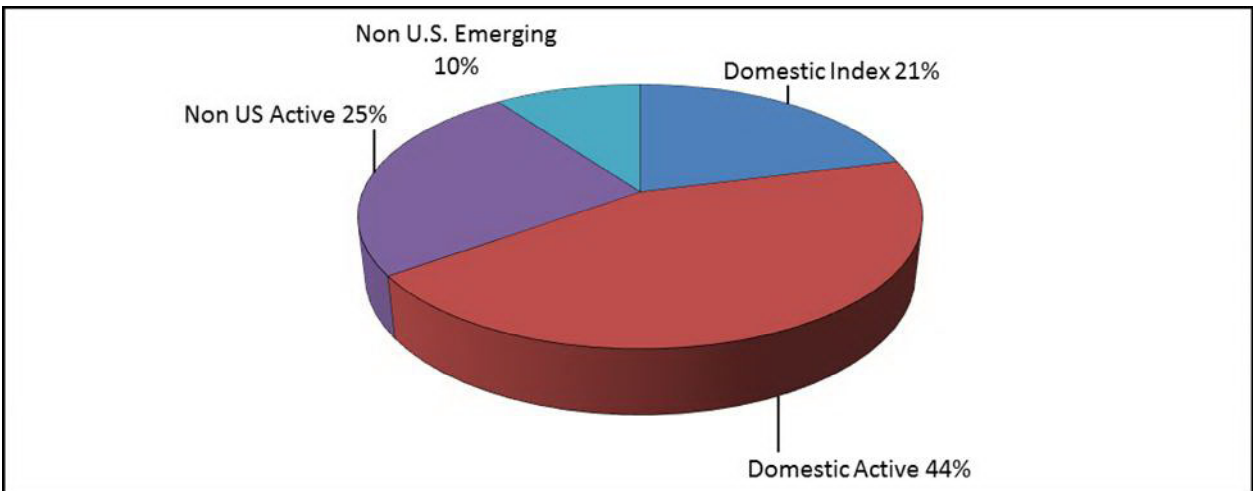


⁵ Percentages may not sum to 100% due to rounding.

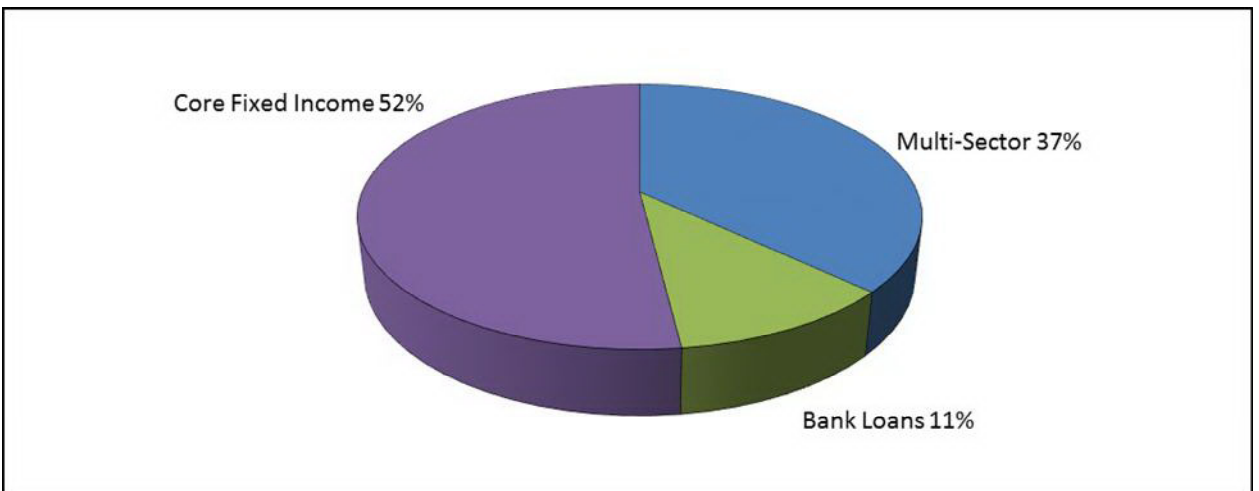
AGGREGATE ASSET ALLOCATION⁶



EQUITY ALLOCATION⁶



FIXED INCOME ALLOCATION⁶



⁶ Percentages may not sum to 100% due to rounding.

TEN LARGEST STOCK HOLDINGS BY FAIR VALUE

Company	Number of Shares	Fair Value (\$MM)	Percentage of Domestic Stock	Industry
MICROSOFT CORP COM	23,648.46	\$5.7	3.0%	Information Technology
AMAZON.COM INC COM	59,317.99	\$5.0	2.6%	Consumer Discretionary
UNITEDHEALTH GROUP INC	8,153.94	\$4.3	2.3%	Health Care
ALPHABET INC CAP STK CL C	53,420.06	\$4.7	2.5%	Communication Services
APPLE INC	27,655.29	\$3.6	1.9%	Information Technology
THERMO FISHER SCIENTIFIC INC	6,369.03	\$3.5	1.9%	Health Care
JOHNSON & JOHNSON	17,113.31	\$3.0	1.6%	Health Care
NETFLIX INC	9,075.91	\$2.7	1.4%	Communication Services
ADOBE INC	7,848.61	\$2.6	1.4%	Information Technology
NIKE INC	21,771.61	\$2.5	1.3%	Consumer Discretionary

LARGEST FIXED INCOME HOLDINGS BY FAIR VALUE

Security	Fair Value (\$mm)	% of Bonds
1 Garcia Hamilton Fixed Income Aggregate	31.6	25.0%
2 Loomis Sayles Fixed Income	46.7	36.9%
3 Lord Abbett Core Fixed Income	34.3	27.1%
4 Octagon Senior Secured Credit Cayman	14.0	11.0%

A complete portfolio is available upon request.

2022 SCHEDULE OF FEES & COMMISSIONS

2022 Investment Manager Fees	
Manager	Fee
ABS(Estimated Fees)	\$140,848
Alcentra (in liquidation)	\$1,172
Ascent IV (Closed)	\$0
Ascent IV-B	\$0
Ascent V	\$4,875
Ascent VI	\$33,750
Axiom (Estimated Fees)	\$79,628
Baillie Gifford (Estimated Fees)	\$119,611
Boston Company (acct closing, residual bal.)	\$0
CarVal	\$(229,808)
Cerberus	\$(1,660)
Coho	\$243,334
Constitution Ironsides	\$73,074
Constitution Co-Investment	\$843,075
Corbin Pinehurst (Estimated Fees)	\$106,088
Entrust	\$3,681
Foundry 2007	\$(73,967)
Foundry 2010	\$2,910
Foundry 2010 Annex	\$(3,544)
Garcia Hamilton	\$81,687
Hamilton Lane V	\$195,173
Harbourvest Dover X	\$141,291
Harbourvest Co-Investment	\$44,247
Hartford Schroders (Estimated Fees)	\$142,427
Invesco Mortgage Recovery AIV	\$0
Invesco Mortgage Recovery II	\$13,056
Invesco VI	\$(6,493)
J.F. Lehman IV	\$7,005
J.F. Lehman V	\$122,879
Kayne Anderson	\$0
Landmark VI	\$0
Landmark VIII	\$22,117
Landmark XV	\$(7,454)
Loomis Sayles Sall Cap	\$96,442
Loomis Sayles Fixed Income FDT	\$274,423
Lord Abbett	\$65,414
Morgan Stanley Prime Property	\$311,410
Octagon (Estimated Fees)	\$55,752
Park Square	\$44,561
Pinebridge	\$(1,543)
Polen Capital	\$294,923
PRIT General Allocation	\$25,460
PRIT Hedge Funds	\$160,353
PRIT VY2008	\$924
PRIT VY2009	\$207
PRIT VY2010	\$2,227
PRIT VY2011	\$6,426

PRIT VY2012	\$5,662
PRIT VY2014	\$13,106
PRIT VY2017	\$22,202
PRIT VY2020	\$70,199
PRIT VY2021	\$68,677
PRIT VY2022	\$15,280
PA Capital (Apogem)	\$48,341
Real Estate Global Partnership II (Stepstone)	\$7,659
Rhumblin S&P 500	\$25,689
Rhumblin US TIPS Trust (closed 8/22)	\$1,805
Robeco/Boston Partners	\$239,068
SEG Baxter Street Fund	\$293,243
TA Realty Fund X	\$88
TA Core Realty	\$192,897
Terracap III	\$172,114
Terracap IV	\$95,401
Terracap V	\$1,003,634
UBS (Estimated Fees)	\$123,390
Total Investment Manager Fees	\$5,834,436
NEPC (Consultant Fee)	\$120,000
M&T Bank (previously People's United Bank)(Custodial Bank Fee)	\$104,321
Total All Investment-Related Fees	\$6,058,757
Plus Administrator Expenses	\$585,472
Total All Investment-Related Fees	\$6,644,229

2022 COMMISSIONS TO BROKERS

Broker Name	Total Commissions (\$)	Total Shares	%/Share
BAIRD, ROBERT W & CO INC, MILWAUKEE	117.54	3,228.00	0.46
BARCLAYS CAPITAL INC./LE, NEW JERSEY	674.53	23,938.00	1.24
BARCLAYS CAPITAL LE, NEW YORK	280.7	7,755.00	0.91
BERNSTEIN SANFORD C & CO, NEW YORK	932.67	27,324.00	1.12
CITIGROUP GLOBAL MARKETS, INC., NEW YORK	95.61	3,360.00	0.53
CLSA AMERICAS, NEW YORK	103.68	3,456.00	0.24
COWEN AND CO LLC, NEW YORK	161.92	4,502.00	0.51
COWEN AND COMPANY, LLC, JERSEY CITY	620.38	17,335.00	2.21
CREDIT SUISSE, NEW YORK (CSUS)	1,146.53	46,626.00	5.47
GOLDMAN SACHS & CO, NY	861.94	33,074.00	2.28
INSTINET CLEARING SER INC, NEW YORK	246.77	9,481.00	0.72
INSTINET CORP, NEW YORK	35.63	3,563.00	0.09
INVESTMENT TECH GROUP INC, NEW YORK	0.54	32.00	0.03
ISI GROUP INC, NEW YORK	257.48	6,437.00	0.40
J.P MORGAN SECURITIES INC, NEW YORK	924.82	47,322.00	2.31
J.P. MORGAN SECURITIES LLC, NEW YORK	1,796.00	70,486.00	6.24
JEFFERIES & CO INC, NEW YORK	951.54	37,539.00	2.61
JONESTRADING INST SVCS LLC, NEW YORK	137.42	6,058.00	0.34
KEEFE BRUYETTE + WOODS INC, NEW YORK	70.8	1,770.00	0.36
LEERINK SWANN AND COMPANY, NEW YORK	11.04	276.00	0.04
LIQUIDNET INC, NEW YORK	300.94	12,957.00	1.18
LUMINEX TRADING AND ANALYTICS, BOSTON	67.15	3,586.00	0.45
MERGER	-	18,953.31	-
MERRILL LYNCH PIERCE FENNER SMITH INC NY	1,371.08	45,922.00	4.59
MIZUHO SECURITIES USA, INC., NEW YORK	87.28	2,182.00	0.04
MORGAN STANLEY & CO INC, NY	463.6	15,070.00	1.26
MORGAN STANLEY AND CO., LLC, NEW YORK	757.65	23,977.00	1.46
NATIONAL FINL SVCS CORP, NEW YORK	505.29	16,419.00	1.51
NEEDHAM AND CO LLC, NEW YORK	0.68	17.00	0.04
OPPENHEIMER & CO INC, NEW YORK	422.14	15,898.00	1.08
PERSHING LLC, JERSEY CITY	238.36	10,394.00	0.46
PIPER JAFFRAY & CO., JERSEY CITY	156.76	3,965.00	0.26
RAYMOND JAMES & ASSOC INC, ST PETERSBURG	231.46	8,322.00	0.16
RBC CAPITAL MARKETS LLC, NEW YORK	1,129.67	40,652.00	4.08
STIFEL NICOLAUS	124.17	3,950.00	0.33
STOCK SPLIT	-	64,904.00	-
SUNTRUST CAPITAL MARKETS INC, NEW YORK	40.72	1,018.00	0.04
UBS SECURITIES LLC, STAMFORD	848.12	37,618.00	6.15
VIRTU AMERICAS LLC, NEW YORK	105.87	4,233.00	0.50
WEDBUSH SECURITIES INC./P3, LOS ANGELES	1,178.82	45,449.00	2.80
WELLS FARGO SECURITIES, LLC, NEW YORK	1,280.00	32,000.00	0.28
WILLIAM BLAIR & CO, CHICAGO	227.08	5,949.00	0.90
TOTAL	18,964.38	766,997.31	-

2022 INVESTMENT SUMMARY⁷

	Fair Value 12/31/2022 (\$mm)	% of Asset Class	% of System
Total System	630.0	NA	100%
Total Domestic Equity Assets	185.5	100%	29%
Info. Tech.	42.1	22.7%	6.5%
Health Care	36.7	19.8%	5.6%
Financials	19.3	10.4%	3.1%
Cons. Disc.	23.7	12.8%	3.6%
Industrials	17.6	9.5%	2.8%
Comm. Svc.	11.7	6.3%	1.9%
Cons. Staples	15.8	8.5%	2.5%
Energy	7.4	4.0%	1.2%
Unclassified	3.5	1.9%	0.6%
Materials	3.2	1.7%	0.5%
Real Estate	2.0	1.1%	0.3%
Utilities	1.9	1.0%	0.3%
Other	0.6	0.3%	0.1%
Total Foreign Equity Assets	100.7	100%	16%
Europe-Developed	40.2	40.0%	6.5%
Pacific Rim/Australia Asia-Developed	9.6	9.5%	1.5%
Emerging Markets	45.7	45.4%	7.2%
Unclassified	0.2	0.2%	0.0%
North America	5.0	4.9%	0.8%
Total Fixed Income Assets	126.4	100%	20%
U.S. Treasury/Agency	35.3	27.9%	5.5%
Corporate	34.2	27.1%	5.4%
Asset Backed	10.1	8.0%	1.6%
Mortgage Backed	39.6	31.3%	6.3%
Foreign	4.4	3.5%	0.7%
Other	2.4	1.9%	0.4%
Muni	0.4	0.3%	0.1%
Total Alternative Assets	203.2	100%	33%
Private Equity	86.3	42.5%	13.9%
Real Estate	70.3	34.6%	11.4%
Hedge Funds	41.7	20.5%	6.8%
Balanced	4.9	2.4%	0.9%
Cash & Cash Equivalents	14.2	100%	2%

⁷ Numbers may not sum to 100% due to rounding.

LIQUIDITY PROFILE

Benefits payments totaled approximately \$36.5 million during the year and along with other payments of \$0.6 million resulted in total cash outflows of \$37.1 million in 2022. These payments were partially offset by contributions of approximately \$23.1 million from employers and plan members and other cash receipts of \$3.3 million for a total of \$26.4 million in 2022. This resulted in a negative cash flow of approximately \$10.7 million for the fiscal year. Note that these figures do not incorporate expected income and asset gains from the MWRA's investments. The MWRA's portfolio is structured with a long-term expected return of 6.90%⁸.

⁸ As of 12/31/22.



Actuarial Section



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June 7, 2023

Massachusetts Water Resources Authority Employees' Retirement Board
MWRA Chelsea Facility
Two Griffin Way
Chelsea, MA 02150

Dear Board Members:

Segal has performed a January 1, 2023 actuarial valuation of the Massachusetts Water Resources Authority Employees' Retirement System. This is the most recent actuarial valuation and has been completed in accordance with generally accepted actuarial principles and practices. To the best of our knowledge, the information supplied in this actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Retirement Board are reasonably related to the experience of and the expectations for the plan.

As part of performing the valuation, Segal was furnished member data by the Massachusetts Water Resources Authority Employees' Retirement System's administrative staff. Although examined for general reasonableness, the data was not audited by the actuary. In addition, the administrative staff furnished financial statements that were not audited by the actuary.

The funding objective of the plan is to provide for the current cost of benefits (*i.e.*, normal cost) and to reduce the unfunded liability to zero by June 30, 2030. The normal cost is expected to remain at a level percentage of payroll. The unfunded liability is amortized over a 7-year period with the appropriation increasing 14.20% per year.

Valuations have been performed either annually or biennially. Biennial valuations are consistent with the guidelines promulgated by PERAC and GASB. Annual valuations provide the Retirement Board with information more quickly and allows for faster response to changes in circumstances. The previous valuation was performed as of January 1, 2022. The assumptions and methods used for funding purposes meet the parameters set by Actuarial Standards of Practice (ASOPs).

Segal has prepared, and included as part of this report, the following supporting schedules for the Actuarial Section of the December 31, 2022 Annual Comprehensive Financial Report:

- I. Summary of Actuarial Assumptions and Actuarial Cost Method
- II. Schedule of Active Member Valuation Data
- III. Schedule of Retirees and Beneficiaries Added to and Removed from Rolls
- IV. Solvency Test
- V. Analysis of Financial Experience
- VI. Summary of Plan Provisions

Massachusetts Water Resources Authority Employees' Retirement Board
June 7, 2023

Please let us know if you have any questions on this material.

Sincerely,



Lisa VanDermark, FSA, MAAA, EA
Vice President and Consulting Actuary

I. Summary of Actuarial Assumptions and Actuarial Cost Method

The actuarial assumptions, as set forth in the accompanying supporting schedules, were selected by the Massachusetts Water Resources Authority Employees' Retirement Board. Unless stated otherwise, the actuarial assumptions are based upon the actuarial valuation as of January 1, 2023.

Mortality Rates

Healthy: Pub-2010 General Employee, Healthy Retiree and Contingent Survivor Amount-Weighted Mortality Tables projected generationally using Scale MP-2021

Disabled: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables set forward one year projected generationally using Scale MP-2021

The underlying tables reasonably reflect the mortality experience of the System as of the measurement date. These mortality tables were then adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

The mortality rates were based on historical and current data, adjusted to reflect estimated future experience and professional judgement.

Mortality and Disability Rates before Retirement

Age	Rate per year (%)		
	Mortality		Disability
	Male	Female	
20	0.04	0.01	0.01
25	0.03	0.01	0.02
30	0.04	0.02	0.03
35	0.05	0.02	0.06
40	0.07	0.04	0.10
45	0.10	0.06	0.15
50	0.15	0.08	0.19
55	0.22	0.12	0.24
60	0.32	0.19	0.28

Notes:

Mortality rates shown do not reflect generational projection.

55% of the disability rates shown represent accidental disability.

40% of the accidental disabilities will die from the same cause as the disability.

55% of the mortality rates shown represent accidental death.

The disability rates were based on historical and current data, adjusted to reflect estimated future experience and professional judgement.

Withdrawal Rates

Years of Service	Rate per year (%)
0	15.0
1	12.0
2	10.0
3	9.0
4	8.0
5	7.6
6	7.5
7	6.7
8	6.3
9	5.9
10	5.4
11	5.0
12	4.6
13	4.1
14	3.7
15	3.3
16 – 20	2.0
21 – 29	1.0
30+	0.0

The withdrawal rates were based on historical and current data, adjusted to reflect estimated future experience and professional judgment.

Retirement Rates

Age	Rate per year (%)			
	Members Hired Before April 2, 2012		Members Hired On or After April 2, 2012	
	Male	Female	Male	Female
50 – 51	0.75	1.125	0	0
52	0.75	1.5	0	0
53	0.75	1.875	0	0
54	1.5	1.875	0	0
55	1.5	4.125	0	0
56 – 57	1.875	4.875	0	0
58	3.75	4.875	0	0
59	4.875	4.875	0	0
60	9	3.75	15	6.25
61	15	9.75	15	9.75

Age	Rate per year (%)			
	Members Hired Before April 2, 2012		Members Hired On or After April 2, 2012	
	Male	Female	Male	Female
62	22.5	11.25	22.5	11.25
63	18.75	9.375	18.75	9.375
64	16.5	13.50	16.5	13.5
65	30	11.25	30	11.25
66 – 67	18.75	15	18.75	15
68	22.5	18.75	22.5	18.75
69	22.5	15	22.5	15
70+	100	100	100	100

The retirement rates were based on historical and current data, adjusted to reflect estimated future experience and professional judgment.

Retirement Age for Inactive Vested Participants

Age 55.

The retirement age for inactive vested participants was based on historical and current data, adjusted to reflect estimated future experience and professional judgment

Unknown Data for Participants

Same as those exhibited by participants with similar known characteristics.

Family Composition:

80% of participants are assumed to be married. Females are assumed to be three years younger than their spouses.

Benefit Election

All participants are assumed to elect Option A. The benefit election reflects the fact that all benefit options are actuarially equivalent.

Net Investment Return

6.90%

Salary Increases

Years of Service	Rate per year (%)
0	5.75%
1	5.25%
2	5.25%
3	5.00%
4	5.00%
5	4.50%
6	4.50%
7	4.25%
8	4.25%
9+	4.00%

Includes allowance for wage inflation of 3.00%.

The salary scale assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment.

Interest on Employee Contributions

3.50%

Administrative Expenses

\$600,000 for calendar 2023, increasing 3.00% per year.

Total Service

Total creditable service reported in the data.

Net 3(8)(c) Liability

Estimated based on anticipated net 3(8)(c) payments and average characteristics of retired participants and beneficiaries.

Actuarial Value of Assets

Market value of assets as reported in the System's Annual Statement less unrecognized return in each of the last five years. Unrecognized return is equal to the difference between the actual market value return and the expected market value return and is recognized over a five-year period, further adjusted, if necessary, to be within 10% of the market value.

Actuarial Cost Method

Entry Age Normal Actuarial Cost Method. Entry Age is the age of the participant less Total Service as defined above. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.

Amortization Method

The employer contribution is set to \$14,068,105 for fiscal 2024 and increases 14.20% per year for fiscal 2024 through fiscal 2029 with a 14.16% increase in fiscal 2030 to fully fund the System by June 30, 2030.

Recent Changes

The following changes were reflected in the January 1, 2015 valuation:

- The net investment return assumption was lowered from 8.00% to 7.75%.
- The administrative expense assumption was increased from \$390,000 for calendar 2013 to \$525,000 for calendar 2015.
- The pre-retirement mortality assumption was changed from the RP-2000 Mortality Table projected 13 years using Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Mortality Table projected 13 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA.
- The mortality assumption for disabled participants was changed from the RP-2000 Mortality Table set forward 2 years projected 13 years using Scale AA to the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA.
- The retirement rates were reduced by 25%.
- The salary increase assumption was changed as follows:

Years of Service	Rate per year (%)	
	Current	Previously
0	6.00	7.00
1	5.50	6.50
2	5.50	6.50
3	5.25	6.00
4	5.25	6.00
5	4.75	5.50
6	4.75	5.50
7	4.50	5.00
8	4.50	5.00
9+	4.25	4.75

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$5.2 million to \$7.2 million based on the average net 3(8)(c) payments in 2013 and 2014.

The following changes were effective January 1, 2017:

- The net investment return assumption was lowered from 7.75% to 7.50%.

- The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D.
- The mortality assumption for disabled participants was changed from the RP-2000 Healthy Annuitant Mortality Table set forward 2 years projected generationally from 2005 with Scale AA to the RP-2000 Employee Mortality Table projected generationally from 2015 with Scale BB2D.
- The salary increase assumption was changed as follows:

Years of Service	Rate per year (%)	
	Current	Previously
0	5.75	6.00
1	5.25	5.50
2	5.25	5.50
3	5.00	5.25
4	5.00	5.25
5	4.50	4.75
6	4.50	4.75
7	4.25	4.50
8	4.25	4.50
9+	4.00	4.25

- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$7.2 million to \$8.7 million based on the average net 3(8)(c) payments in 2015 and 2016.

The following changes were effective January 1, 2018:

- The pre-retirement mortality assumption was changed from the RP-2000 Employee Mortality Table projected generationally from 2009 with Scale BB2D to the RP-2014 Blue Collar Employee Mortality Table projected generationally with Scale MP-2017.
- The post-retirement mortality assumption for non-disabled participants was changed from the RP-2000 Annuitant Mortality Table projected generationally from 2009 with Scale BB2D to the RP-2014 Blue Collar Annuitant Mortality Table projected generationally with Scale MP-2017.
- The mortality assumption for disabled participants was changed from the RP-2000 Annuitant Mortality Table projected generationally from 2015 with Scale BB2D to the RP-2014 Blue Collar Annuitant Mortality Table set forward 1 year projected generationally with Scale MP-2017.
- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$8.7 million to \$9.3 million based on the average net 3(8)(c) payments in 2016 and 2017.

The following changes were effective January 1, 2019:

- The net investment return assumption was lowered from 7.50% to 7.25%.
- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$9.3 million to \$9.7 million based on the average net 3(8)(c) payments in 2017 and 2018.

The following changes were effective January 1, 2020:

- The net investment return assumption was lowered from 7.25% to 7.10%.
- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$9.7 million to \$10.1 million based on the average net 3(8)(c) payments in 2018 and 2019.

The following changes were effective January 1, 2021:

- A one-year floor was placed on the actuarial value of assets equal to 97.0% of the market value of assets.
- The net investment return assumption was lowered from 7.10% to 6.90%.
- The mortality assumption for healthy participants was changed from the RP-2014 Blue Collar Employee and Healthy Annuitant Mortality Tables set forward one year for female participants, projected generationally using Scale MP-2017 to the Pub-2010 General Employee, Healthy Retiree and Contingent Survivor Amount-weighted Mortality Tables projected generationally using Scale MP-2020.
- The mortality assumption for disabled participants was changed from the RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward one year projected generationally using Scale MP-2017 to the Pub-2010 General Disabled Retiree Amount-weighted Mortality Tables set forward one year, projected generationally using Scale MP-2020.
- The retirement rates for members hired on or after April 2, 2012 at age 60 were increased from 9.0% for males and 3.75% for females to 15.0% and 6.25%, respectively.
- The administrative expense assumption was increased from \$525,000 for calendar 2020 to \$550,000 for calendar 2021.
- The reduction in liability to account for anticipated net 3(8)(c) reimbursements was increased from \$10.1 million to \$11.3 million based on average net 3(8)(c) disbursements and average characteristics of retired participants and beneficiaries.

The following changes were effective January 1, 2022:

- The mortality table projection scale was updated to MP-2021.
- The administrative expense assumption was increased from \$550,000 for calendar 2021 to \$575,000 for calendar 2022.

The following changes were effective January 1, 2023:

- The administrative expense assumption was increased from \$575,000 for calendar 2022 to \$600,000 for calendar 2023.

II. Schedule of Active Member Valuation Data

Valuation date	Number	Projected annual payroll (\$)	Annual average pay (\$)	% Increase in average pay per year
1/1/2010	1,108	\$81,962,000	\$73,973	--
1/1/2011	1,110	82,870,000	74,658	0.93
1/1/2013	1,091	84,829,033	77,753	2.05
1/1/2015	1,090	89,168,911	81,806	2.57
1/1/2017	1,095	93,569,377	85,451	2.20
1/1/2018	1,100	96,767,777	87,971	2.95
1/1/2019	1,109	99,700,986	89,902	2.20
1/1/2020	1,105	102,150,661	92,444	2.83
1/1/2021	1,103	106,332,975	96,403	4.28
1/1/2022	1,044	103,781,925	99,408	3.12
1/1/2023	1,045	106,476,814	101,892	2.50

III. Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

Year ended ¹	Added to Rolls		Removed from Rolls		Rolls at end of year		Average annual allowances	% Increase in average annual allowances
	Number	Annual Allowances ²	Number	Annual Allowances	Number	Annual Allowances ²		
2012	61	\$2,380,699	5	\$61,467	397	\$11,069,722	\$27,883	--
2014	91	3,658,868	12	251,979	476	14,581,693	30,634	9.9
2016	80	3,727,766	20	532,663	536	17,977,080	33,539	9.5
2017	53	2,310,558	7	248,508	582	20,234,689	34,768	3.7
2018	51	2,805,364	8	208,025	625	23,031,639	36,851	6.0
2019	54	2,906,730	7	146,076	672	26,098,021	38,836	5.4
2020	40	2,368,729	10	228,794	702	28,452,673	40,531	4.4
2021	79	5,058,972	18	596,963	763	33,055,200	43,323	6.9
2022	56	3,338,656	22	608,676	797	36,372,189	45,636	5.3

¹ Actuarial valuations were not performed using data for the years ended 2011, 2013 and 2015 and that data is not available. Data is being accumulated annually to present the required ten years of information.

² Annual allowances are shown for retirees and beneficiaries in pay status at the end of the year.

IV. Solvency Test

Valuation Date ¹	Actuarial Accrued Liability			Actuarial value of assets	Portion of Actuarial Accrued Liability Covered by Assets		
	(1) Active/Inactive member contributions	(2) Retirees and beneficiaries	(3) Active/Inactive members (Employer financed)		(1)	(2)	(3)
1/1/2013	\$108,978,697	\$106,973,144	\$169,344,232	\$341,515,023	100	100	74
1/1/2015	111,917,112	142,699,213	188,871,032	435,841,439	100	100	96
1/1/2017	118,789,289	179,180,324	213,436,634	493,403,059	100	100	92
1/1/2018	120,629,588	204,979,899	225,234,253	523,135,101	100	100	88
1/1/2019	121,569,575	241,010,131	244,667,375	541,622,416	100	100	73
1/1/2020	122,967,810	274,214,884	256,433,318	566,190,373	100	100	66
1/1/2021	126,370,266	301,307,811	285,186,315	628,924,930	100	100	71
1/1/2022	121,041,709	354,770,931	272,889,568	666,688,320	100	100	70
1/1/2023	122,899,309	388,253,771	271,060,615	691,126,747	100	100	66

¹ Actuarial valuations were not performed as of January 1, 2012, 2014 or 2016 and that data is not available. Data is being accumulated annually to present the required ten years of information.

V. Analysis of Financial Experience

	Year Ended December 31				
	2022	2021	2020	2019	2018
1. Unfunded actuarial accrued liability as of January 1	\$82,013,888	\$83,939,463	\$87,425,639	\$85,624,665	\$27,708,639
2. Normal cost as of January 1	14,523,669	14,880,187	13,863,631	13,259,657	12,286,819
3. Employer and employee contributions during year	(23,106,193)	(21,097,233)	(20,187,970)	(17,036,335)	(16,483,873)
4. Interest					
(a) For whole year on (1) + (2)	6,661,091	6,818,556	7,191,538	5,719,113	2,999,659
(b) For half year on (3)	<u>(721,930)</u>	<u>(659,162)</u>	<u>(648,815)</u>	<u>(558,950)</u>	<u>(559,235)</u>
(c) Total interest	\$5,939,161	\$6,159,394	\$6,542,723	\$5,160,163	\$2,440,424
5. Expected unfunded actuarial accrued liability	79,370,525	83,881,811	87,644,023	67,008,150	25,952,009
6. Actual unfunded actuarial accrued liability	91,086,948	82,013,888	83,939,462	87,425,639	65,624,665
7. Increase/(decrease) in unfunded liability versus expected: (6) – (5)	<u>\$11,716,423</u>	<u>(\$1,867,923)</u>	<u>(\$3,704,561)</u>	<u>\$20,417,489</u>	<u>\$39,672,656</u>
(a) Investment (gain) or loss	\$10,431,645	(\$3,390,620)	(\$10,134,111)	\$6,522,100	\$15,130,942
(b) (Gains) or losses from sources other than investments	(1,364,280)	(5,206,371)	(476,123)	3,388,373	3,114,042
(c) Plan changes	2,649,058	5,567,919	--	--	5,026,543
(d) Assumption and method changes	--	1,161,149	6,905,673	10,507,016	16,401,129

VI. Summary of Plan Provisions

The following summarizes the major provisions of Chapter 32 of the Massachusetts General Laws.

Plan Year

January 1 – December 31

Retirement Benefits

Employees covered by the Contributory Retirement Law are classified into one of four groups depending on job classification. Group 1 comprises most positions in state and local government. It is the general category of public employees. Group 4 comprises mainly police and firefighters. Group 2 is for other specified hazardous occupations. (Officers and inspectors of the State Police are classified as Group 3.)

For employees hired prior to April 2, 2012, the annual amount of the retirement allowance is based on the member's final three-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following table based on the age of the member at retirement:

Age Last Birthday at Date of Retirement			
Percent	Group 1	Group 2	Group 4
2.5	65 or over	60 or over	55 or over
2.4	64	59	54
2.3	63	58	53
2.2	62	57	52
2.1	61	56	51
2.0	60	55	50
1.9	59	--	49
1.8	58	--	48
1.7	57	--	47
1.6	56	--	46
1.5	55	--	45

A member's final three-year average salary is defined as the greater of the highest consecutive three-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last three years of creditable service prior to retirement.

For employees hired on April 2, 2012 or later, the annual amount of the retirement allowance is based on the member's final five-year average salary multiplied by the number of years and full months of creditable service at the time of retirement and multiplied by a percentage according to the following tables based on the age and years of creditable service of the member at retirement:

For members with less than 30 years of creditable service:			
Age Last Birthday at Date of Retirement			
Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50
For members with 30 years of creditable service or greater:			
Age Last Birthday at Date of Retirement			
Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

A member's final five-year average salary is defined as the greater of the highest consecutive five-year average annual rate of regular compensation and the average annual rate of regular compensation received during the last five years of creditable service prior to retirement.

For employees who became members after January 1, 2011, regular compensation is limited to 64% of the federal limit found in 26 U.S.C. 401(a)(17). In addition, regular compensation for members who retire after April 2, 2012 will be limited to prohibit "spiking" of a member's salary to increase the retirement benefit.

For all employees, the maximum annual amount of the retirement allowance is 80 percent of the member's final three-year average salary. Any member who is a veteran also receives an additional yearly retirement allowance of \$15 per year of creditable service, not exceeding \$300. The veteran allowance is paid in addition to the 80 percent maximum.

Employee Contributions

Employees hired before January 1, 1975 contribute 5 percent of their salary; employees hired after January 1, 1975 and before December 31, 1983 contribute 7 percent; employees hired after January 1, 1984 and before June 30, 1996 contribute 8 percent; employees hired after July 1, 1996 contribute 9 percent.

In addition, employees hired after December 31, 1978 contribute an additional 2 percent of salary in excess of \$30,000.

Employees hired after 1983 who leave with less than five years of credited service receive no interest on their contributions, and employees who leave with five but less than ten years receive one-half the rate of regular interest otherwise payable. Commencing July 1, 2010, employees who voluntarily terminate employment, who have less than 10 years of service and request a refund, receive 3% interest on their contributions.

Employees in Group 1 hired on or after April 2, 2012 with 30 years of creditable service or greater will pay a base contribution rate of 6%.

Retirement Benefits (Superannuation)

Members of Group 1, 2 or 4 hired prior to April 2, 2012 may retire upon the attainment of age 55. For retirement at ages below 55, twenty years of creditable service is required.

Members hired prior to April 2, 2012 who terminate before age 55 with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System).

Members of Group 1 hired April 2, 2012 or later may retire upon the attainment of age 60. Members of Group 2 or 4 hired April 2, 2012 or later may retire upon the attainment of age 55. Members of Group 4 may retire upon attainment of age 50 with ten years of creditable service.

Members hired April 2, 2012 or later who terminate before age 55 (60 for members of Group 1) with ten or more years of creditable service are eligible for a retirement allowance upon the attainment of age 55 (60 for members of Group 1) provided they have not withdrawn their accumulated deductions from the Annuity Savings Fund of the System.

Ordinary Disability Benefits

A member who is unable to perform his job due to a non-occupational disability will receive a retirement allowance if he has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.

Accidental Disability Benefit

For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his own contributions, plus additional amounts for surviving children. Benefits are

capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.

Death Benefits

In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of his or her death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. The allowance provided for under this option shall not be less than \$500 per month, and there are additional amounts for surviving children.

If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held by the member at the time of death, and will be eligible for pay increases that would have been awarded to the officer if they were still living.

Upon the death of a job-connected disability retiree who retired prior to November 7, 1996 and could not elect an Option C benefit, a surviving spouse will receive an allowance of \$9,000 if the member dies for a reason unrelated to the cause of disability.

"Heart and Lung Law" and Cancer Presumption

Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman or permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.

Options

Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death contributions not expended for annuity payments will be refunded to his beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have their benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.

Post-Retirement Benefits

The Board has adopted the provisions of Section 51 Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first \$17,000 of a retirement allowance.

Changes in Plan Provisions

The July 1, 2022 Cost of Living Adjustment (COLA) was increased from 3% to 5% with the base of \$17,000.

VII. Schedules of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (A)	Actuarial Accrued Liability (AAL) Entry Age (B)	Unfunded AAL (UAAL) (B-A)	Funded Ratio (A/B)	Covered Payroll (C)	UAAL as a Percentage of Covered Payroll ((B-A)/C)
01/01/23	\$ 691,126,747	\$ 782,213,695	\$ 91,086,948	88.36%	\$ 102,316,452	89.0%
01/01/22	666,688,320	748,702,208	82,013,888	89.05%	99,689,252	82.3%
01/01/21	628,924,930	712,864,392	83,939,462	88.23%	102,143,068	82.2%
01/01/20	566,190,373	653,616,012	87,425,639	86.62%	98,145,213	89.1%
01/01/19	541,622,416	607,247,081	65,624,665	89.19%	95,818,684	68.5%
01/01/18	523,135,101	550,843,740	27,708,639	94.97%	92,975,107	29.8%
01/01/17	493,403,059	511,406,247	18,003,188	96.48%	89,755,173	20.1%
01/01/15	435,841,439	443,487,357	7,645,918	98.28%	88,646,339	8.6%
01/01/13	341,515,023	385,296,073	43,781,050	88.64%	84,829,033	51.6%
01/01/11	299,331,000	341,521,000	42,190,000	87.65%	82,870,000	50.9%

Please refer to the ten-year schedule of employer contributions (page 35) included in the required supplementary information for a comparison between actuarially determined contributions and contributions made.



Statistical Section

Statistical Section

This part of the Massachusetts Water Resources Authority Employees' Retirement System's Annual Comprehensive Financial Report presents information as a context for understanding what the information in the financial statements, note disclosures, and required supplementary information says about the Massachusetts Water Resources Authority Employees' Retirement System's overall financial health

	Page
Financial Trends	75-76
These schedules contain trend information to help the reader understand how the Massachusetts Water Resources Employees' Retirement System's financial performance and well-being have changed over time.	
Schedule of Retired Members by Type of Benefit	77
This schedule presents trend data about retired members by type of benefit.	
Schedule of Average Benefit Payments	78
These schedules present trend data about average benefit payments.	

Schedule of Additions to Fiduciary Net Position by Source (a)

<u>Year</u>	<u>Plan Member Contributions</u>	<u>Employer Contributions</u>	<u>Investment Income (b)</u>	<u>Other (c)</u>	<u>Total</u>
2013	\$ 7,948,445	12,447,338	56,951,114	1,018,293	78,365,190
2014	8,245,328	12,645,474	20,483,877	1,123,092	42,497,771
2015	8,402,138	8,159,521	(530,090)	1,331,481	17,363,050
2016	8,757,540	4,632,624	24,182,878	1,422,400	38,995,442
2017	9,091,378	3,277,369	70,516,672	1,747,392	84,632,811
2018	9,483,873	7,000,000	(17,113,462)	1,715,689	1,086,100
2019	9,721,334	7,315,000	79,556,988	1,955,313	98,548,635
2020	10,187,970	10,000,000	74,947,554	2,095,914	97,231,438
2021	9,892,233	11,205,000	89,018,608	1,994,403	112,110,244
2022	10,550,990	12,555,203	(88,672,643)	3,224,425	(62,342,025)

(a) Information derived from audited financial statements (2013 - 2022)

(b) Net of investment expenses

(c) Includes reimbursements and transfers of employees' contributions from other public pension systems

Schedule of Deductions from Fiduciary Net Position by Type (a)

<u>Year</u>	<u>Benefits</u>	<u>Refunds</u>	<u>Sub-total</u>	<u>Administrative Expenses</u>	<u>Reimbursements and Transfers to Other Systems</u>	<u>Total</u>
2012	\$ 11,773,192	72,299	11,845,491	410,778	622,410	12,878,679
2013	13,614,473	262,148	13,876,621	407,574	209,900	14,494,095
2015	15,385,334	412,481	15,797,815	412,416	923,551	17,133,782
2016	17,052,150	270,000	17,322,150	426,054	229,502	17,977,706
2017	19,143,991	280,035	19,424,026	446,465	545,708	20,416,199
2018	22,150,657	502,246	22,652,903	469,315	491,200	23,613,418
2019	24,777,652	884,188	25,661,840	464,333	756,977	26,883,150
2020	26,889,083	259,266	27,148,349	403,213	260,612	27,812,174
2021	30,547,357	453,226	31,000,583	325,737	487,451	31,813,771
2022	34,996,451	423,264	35,419,715	585,472	1,085,626	37,090,813

(a) Information derived from audited financial statements (2013 - 2022)

Schedule of Total Change in Fiduciary Net Position (a)

<u>Year</u>	<u>Total Change in Fiduciary Net Position</u>
2013	\$ 65,486,511
2014	28,003,676
2015	229,268
2016	21,017,736
2017	64,216,612
2018	(22,527,318)
2019	71,665,485
2020	69,419,264
2021	80,296,473
2022	(99,432,838)

(a) Information derived from audited financial statements (2013 -2022)

Schedule of Benefit Expenses by Type (a)

<u>Year ended December 31</u>	<u>Regular* (\$)</u>	<u>Disability* (\$)</u>	<u>Beneficiary* (\$)</u>	<u>Annuities (\$)</u>	<u>Total (\$)</u>
2013	\$ 6,681,557	1,768,654	685,929	2,637,052	11,773,192
2014	7,817,352	1,832,978	758,469	3,205,675	13,614,473
2015	8,682,348	2,092,721	897,682	3,712,583	15,385,334
2016	9,776,498	2,162,420	992,623	4,120,609	17,052,150
2017	11,277,050	2,203,053	1,037,932	4,625,956	19,143,991
2018	12,868,039	2,673,196	1,212,779	5,396,643	22,150,657
2019	13,879,390	2,972,891	1,803,750	6,121,621	24,777,652
2020	15,197,653	3,108,635	2,020,514	6,562,281	26,889,083
2021	17,648,684	3,209,707	2,151,728	7,537,238	30,547,357
2022	20,619,504	3,219,608	2,489,425	8,667,914	34,996,451

*COLA included in pension benefits

(a) Source: MWRA ERS Staff

Schedule of Retired Members by Type of Benefit (b)(c)

	12/31/2022	12/31/2021	12/31/2020	12/31/2019	12/31/2018	12/31/2017	12/31/2016
Superannuation							
Under \$10,000	6	6	6	8	9	9	9
\$10,000 - \$19,999	54	58	59	65	75	74	77
\$20,000 - \$29,999	101	109	109	113	112	113	112
\$30,000 - \$39,999	91	84	90	93	88	85	75
\$40,000 - \$49,999	94	98	91	85	73	69	57
\$50,000 - \$59,999	82	72	57	47	39	31	29
\$60,000 - \$69,999	60	53	44	35	28	25	18
\$70,000 - \$79,999	63	55	36	30	24	18	17
\$80,000 & over	67	55	39	33	26	17	11
Total	618	590	531	509	474	441	405
Ordinary Disability							
Under \$10,000	0	0	1	1	2	1	1
\$10,000 - \$19,999	5	5	4	4	3	4	4
\$20,000 - \$29,999	2	2	2	3	3	3	3
\$30,000 - \$39,999	1	3	4	5	5	5	5
\$40,000 - \$49,999	3	2	1	0	0	0	0
\$50,000 - \$59,999	1	1	1	1	1	1	1
\$60,000 - \$69,999	0	0	0	0	0	0	0
\$70,000 - \$79,999	0	0	0	0	0	0	0
\$80,000 & over	0	0	0	0	0	0	0
Total	12	13	13	14	14	14	14
Accidental Disability							
Under \$10,000	0	0	0	0	0	0	0
\$10,000 - \$19,999	0	0	0	0	1	1	0
\$20,000 - \$29,999	2	5	4	5	5	5	6
\$30,000 - \$39,999	13	13	14	14	14	15	17
\$40,000 - \$49,999	24	24	24	22	21	21	17
\$50,000 - \$59,999	15	14	14	14	11	8	8
\$60,000 - \$69,999	3	3	3	3	2	2	1
\$70,000 - \$79,999	1	0	0	1	1	0	0
\$80,000 & over	2	2	2	1	1	0	0
Total	60	61	61	60	56	52	49
Beneficiaries							
Under \$10,000	8	9	8	9	12	11	12
\$10,000 - \$19,999	33	37	37	37	32	33	29
\$20,000 - \$29,999	32	29	29	26	23	19	16
\$30,000 - \$39,999	17	12	14	9	8	8	6
\$40,000 - \$49,999	11	9	8	7	5	4	4
\$50,000 - \$59,999	4	1	0	0	0	0	0
\$60,000 - \$69,999	2	2	1	1	1	0	0
\$70,000 - \$79,999	0	0	0	0	0	0	1
\$80,000 & over	0	0	0	0	0	0	0
Total	107	99	97	89	81	75	68
Total Retired Members							
Under \$10,000	14	15	15	18	23	21	22
\$10,000 - \$19,999	92	100	100	106	111	112	110
\$20,000 - \$29,999	137	145	144	147	143	140	137
\$30,000 - \$39,999	122	112	122	121	115	113	103
\$40,000 - \$49,999	132	133	124	114	99	94	78
\$50,000 - \$59,999	102	88	72	62	51	40	38
\$60,000 - \$69,999	65	58	48	39	31	27	19
\$70,000 - \$79,999	64	55	36	31	25	18	18
\$80,000 & over	69	57	41	34	27	17	11
Total	797	763	702	672	625	582	536

(b) Source: Segal Consulting

(c) This table provides for the most comprehensive average benefit payment data available. Data is being accumulated annually to present the required ten years of information.

Schedule of Average Benefit Payments (d)(e)

Years of Credited Service	2022			2021			2020		
	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members
0 - 5	1,991	43,099	7	1,962	43,099	7	1,878	40,642	9
5 - 10	2,212	47,800	17	2,117	47,950	16	2,155	45,317	15
10 - 15	1,977	63,307	160	1,949	61,887	162	1,920	60,489	156
15 - 20	2,663	69,106	126	2,575	67,564	125	2,522	66,646	128
20 - 25	3,471	80,766	133	3,396	79,932	135	3,272	77,239	132
25 - 30	4,430	89,374	156	4,332	88,166	150	4,232	85,832	139
30 - 35	5,665	96,196	144	5,582	95,196	130	5,241	91,005	91
35 - 40	6,339	104,418	48	6,336	104,508	32	6,540	106,252	26
40 - 45	5,644	100,475	5	5,601	100,475	5	5,564	100,475	5
45 - 50	4,626	67,556	1	4,584	67,556	1	4,546	67,556	1

Years of Credited Service	2019			2018			2017		
	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members
0 - 5	1,851	40,642	9	1,825	40,642	9	1,777	40,642	9
5 - 10	2,123	45,317	15	2,109	46,732	15	2,070	45,140	13
10 - 15	1,885	60,348	159	1,818	59,987	158	1,805	59,673	156
15 - 20	2,461	65,643	129	2,395	64,148	126	2,340	63,383	125
20 - 25	3,165	75,222	127	3,088	74,843	122	3,009	73,207	115
25 - 30	4,146	84,073	132	4,081	82,855	119	3,939	81,378	105
30 - 35	5,230	90,231	71	5,031	88,636	50	4,980	85,309	39
35 - 40	6,523	106,688	24	6,744	110,265	21	6,123	101,886	15
40 - 45	5,526	100,475	5	5,544	105,415	4	5,393	88,480	4
45 - 50	4,509	67,556	1	4,474	67,556	1	4,441	67,556	1

Years of Credited Service	2016		
	Average Monthly Benefit (\$)	Final Average Salary (\$)	Number of Retired Members
0 - 5	1,910	42,929	8
5 - 10	2,042	45,140	13
10 - 15	1,792	59,542	152
15 - 20	2,363	63,389	119
20 - 25	2,960	72,292	109
25 - 30	3,906	80,907	90
30 - 35	4,706	82,395	27
35 - 40	5,816	97,648	13
40 - 45	5,368	88,480	4
45 - 50	4,441	67,556	1

(d) Source: Segal Consulting

(e) This table provides for the most comprehensive average benefit payment data available. Data is being accumulated annually to present the required ten years of information.