January 1, 2024

Actuarial Valuation Report

Massachusetts Port Authority Employees' Retirement System

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October 18, 2024

Massachusetts Port Authority Employees' Retirement Board
One Harborside Drive, Suite 200S
East Boston, MA 02128-2909

Dear Members of the Board:

Stone Consulting, Inc. has performed a January 1, 2024 actuarial valuation of the Massachusetts Port Authority Employees' Retirement System (MPAERS, the System). This valuation and report were prepared using generally accepted actuarial principles and practices. To the best of our knowledge, this report is complete and accurate, and the assumptions used were chosen by the Retirement Board in conjunction with Stone Consulting Inc.'s recommendations. We believe the assumptions represent a reasonable estimate of anticipated experience of the system. The assumptions and methods used for funding purposes in this valuation meet the parameters set by the Actuarial Standards of Practice as set forth by the Actuarial Standards Board.

As part of performing the valuation, Stone Consulting, Inc. was furnished member data by the administrative staff of MPAERS. 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.

This report was prepared using our proprietary valuation model and DBVAL version 12.24. In our professional judgment, this software has the capability to provide results which are consistent with the purposes of the valuation. Output from the software is tested to ensure that the model reasonably represents that which is intended to be modeled. The valuation output is prepared and analyzed using proprietary Excel spreadsheets followed by a final review by an actuary.

Stone Consulting, Inc. prepares an actuarial valuation of the MPAERS annually. This satisfies the requirements under Chapter 32 of the Massachusetts General Laws.

The funding objective of the plan is to provide for the current cost of benefits (i.e., normal cost) as a level percentage of payroll over time and this objective is currently being realized. The employer contribution rate is determined by adding the normal cost plus a level dollar amortization of the frozen entry age liability. The normal cost is projected to remain at a level percentage of payroll. While the statute which created the MPAERS did not anticipate the effect of assumption or plan changes on the funding schedule, we have amortized these effects over 20 years, consistent with the original amortization period contained in the Enabling Act of the Massachusetts Port Authority Employees' Retirement System (Enabling Act).

MPAERS continued to absorb the impact of investment losses from calendar 2022, now offset by a gain for calendar 2023. Net of investment expenses, the actual return on the market value of assets was 12.34%, compared to a projected return of 6.75%; the return on the actuarial value of assets was 7.12%. The Massachusetts Port Authority (Authority)'s FY 2025 (7/1/2024) contribution of $13,327,849 is $1,888,964 more than the Authority's FY 2024 contribution and $1,002,151 less than the expected contribution based upon last year's actuarial valuation. The decrease is mainly due to investment gains.

Prepared and included in the actuarial valuation report for use in the Actuarial Section of the Annual Comprehensive Financial Report are the following:

- Schedule of Active Member Valuation Data;
- Schedule of Retirees and Beneficiaries Added to and Removed from Rolls;
- Solvency Test; and
- Schedules of Funding Progress.

Additionally, for use in the Statistical and Financial sections for the Annual Report, we have included and prepared the following:

- Distribution of Plan Members;
- Schedule of Average Benefit Payments; and
- Schedule of Benefit Recipients by Type and Option.

We are pleased to present the results of this valuation. If the MPAERS Board has any questions on the content of this report, we would be glad to respond. Please note that this report is meant to be used in its entirety. Use of excerpts of this report may result in a misleading or inaccurate understanding of the results.

The undersigned are consultants for Stone Consulting, Inc. and are members of the American Academy of Actuaries; they meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,
STONE CONSULTING, INC.
Actuaries for the Plan

Joan Moreau, ASA, FCA, MAAA
Member,
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SECTION I : RESULTS SUMMARY

Management Summary

Funding		
▪ Contribution for Fiscal 2025		
▪ Contribution for Fiscal 2024	$11,438,885	
Assets		
▪ Market Value at January 1, 2024	$838,593,923	
▪ Market Value at January 1, 2023	$766,073,097	
▪ Growth in Market Value		9.5%
▪ Actuarial Value at January 1, 2024 (15% corridor)	$880,837,559	
▪ Actuarial Value at January 1, 2023 (15% corridor)	$839,625,273	
▪ Growth in Actuarial Asset Value		4.9%
Members		
▪ Actives	1,245	8.7%
▪ Retired, Disabled and Beneficiaries	1,005	0.9%
▪ Terminated Vested	86	3.6%
▪ Inactives	237	12.3%
Payroll of Active Members		
▪ Total	$131,089,118	13.3%
▪ Average	$105,292	4.2%
Present Value of Future Benefits		
▪ Actives		
▪ Retirees, Terminated Vested, Inactives, 3(8)(c)	525,286,444	2.9%
▪ Total	$1,113,583,267	6.8%
Funding Ratio Using Entry Age Normal Actuarial Cost Method and Frozen Entry Age		
▪ Entry Age Normal Actuarial Accrued Liability	$914,041,758	
▪ Frozen Entry Age Accrued Liability	$957,346,358	
▪ Market Value of Assets	$838,593,923	
▪ Entry Age Funded Ratio using Market Value as of January 1, 2024	91.7%	
▪ Entry Age Funded Ratio using Market Value as of January 1, 2023	88.3%	
▪ Entry Age Funded Ratio using Actuarial Value as of January 1, 2024	96.4%	
▪ Entry Age Funded Ratio using Actuarial Value as of January 1, 2023	96.8%	
▪ Frozen Entry Age Funded Ratio using Actuarial Value as of January 1, 2024	92.0%	

Percentages in the right column above reflect change since the January 1, 2023 Valuation.
Note: Amounts shown in this report may not total due to rounding

Funding Schedule

The funding schedule is based on the Frozen Entry Age Actuarial Cost Method, consistent with the requirements of Section 2 of Chapter 487 of the Acts of 1978. The funding schedule is composed of the normal cost, the amortization of the initial unfunded liability, and the amortization of the liability associated with plan changes such as early retirement incentives, actuarial assumption changes, and asset valuation method changes.

The contribution increased by less than projected in the previous valuation, due primarily to an investment gain of $42 million for calendar year 2023. Annual investment gains and losses are recognized periodically over five years. The market value of assets investment return was 12.34%, and the actuarial value investment return was 7.12%. There were approximately $74 million in unrecognized actuarial asset losses as of the prior valuation; including the effect of 2023 investment gains a net total of $10.9 million in gains were recognized this year, with $42.2 million in losses remaining to be recognized in the next four years. The details of the asset smoothing method are shown later in the report.

The breakdown of the funding schedule appropriation is as follows:

Net Employer Normal Cost including interest	$ 4,109,858
Amortization including interest	9,217,990
Sum of Net Normal Cost and Amortization	$ 13,327,848
Employer Contribution (Not less than zero)	$ 13,327,848

The details of the calculation of the normal cost and the amortization are shown in later sections of the report.

Valuation Assumptions and Methodology

The main economic actuarial assumptions used in this valuation were consistent with those used in the January 1, 2023 valuation, with the exception of a COLA Base of $15,000 and the increase of benefits for some retirees related to vacation buybacks. Valuation assumptions included the following:

- Interest Rate: The interest rate assumption is 6.75%. The interest rate is used to project earnings on assets and to discount the value of future liabilities to the present day. The investment return assumption is a long term assumption and is based on capital market expectations by asset class, historical returns, and professional judgment. Analysis prepared by Wilshire (MPAER's investment advisor) and other investment consultants was considered, using a building block approach which included expected returns by asset class, risk analysis, and the determination of a 30-year projected target rate of return.
- Salary Assumption: The salary increase assumption is 4.25%. It reflects prior experience, current expectations and professional judgement.
- Pension Adjustment Base and Pension Adjustment: This valuation assumes that the Board will annually grant a 3% pension adjustment to retirees for the first $15,000 of benefits going forward.
- Asset-Smoothing Methodology: The Massport Retirement Board uses an asset-smoothing methodology as part of the actuarial valuation. This methodology is used to lower the potential volatility of retirement contributions by smoothing investment gains and losses. Asset gains and losses in excess of the interest rate assumption are recognized over a period of 5 years. The result of this smoothing is called the actuarial value of assets and is used in calculating the valuation results. The actuarial value of assets must be between 85% and 115% of the market value of assets. This ensures that the actuarial value of assets is valued within reasonable bounds of market value. The above range is referred to as a 15% corridor.
- Mortality Table: The mortality table is the Pub-2010 Table (Sex-Distinct) projected with MP-2021 Generational Mortality. This assumption is based on the results of a study of the MPAERS' mortality experience for 2010 through 2019, dated July 12, 2022.
- Vacation Buyback Effect: Vacation Buybacks are now considered regular compensation for some members. This change only affected retirees in the current valuation, as some of them were given the option of having their benefit re-calculated to reflect the pensionable status of their buybacks upon payment of the contributions they would have made on that compensation. For active employees: those whose buybacks are now considered pensionable will make contributions on that compensation just as with all other categories of pensionable pay, and employee data in future valuations will include those contributions in the calculation of active payroll.
- Calculation of 3(8)(c) Liability: The calculation assumes no COLA increases on 3(8)(c) payments.
- Other Assumptions: Withdrawal, disability and retirement rates are the same as the prior valuation.
- Contribution Timing: Contributions into the plan are assumed to be made as of July 1.

The main actuarial assumptions used in the valuation are summarized below. Increased benefits for those retirees eligible for a benefit adjustment based on the pensionable status of vacation buybacks increased retiree payroll by $172 thousand, and increased both the Present Value of Future Benefits and Actuarial Accrued Liability liability by $1.4 million.

Assumption	January 1, 2024 Valuation
Interest Rate	6.75%
Salary Increase	4.25%
Pension Adjustment Base	$15,000
Pension Adjustment	3.00%
Retirement	
Hired prior to April 2, 2012	
Group 1	Age 50-70 and 10 years of service
Group 2	Age 50-65 and 10 years of service
Group 4	Age 50-65
Hired after April 1, 2012	
Group 1	Age 60-70 and 10 years of service
Group 2	Age 55-65 and 10 years of service
Group 4	Age 55-65
Administrative Expense	Estimated budgeted amount: $1,744,000

Assets

We were furnished with a copy of a draft of the System's annual financial report by the Board's administrative staff. The draft financial report was not audited by Stone Consulting, Inc. or the System's auditors. The market value of assets was $838,593,923 as of December 31, 2023. Assets were invested 51% in equities and pooled domestic and international equity funds, 24% in fixed income, cash, payables, receivables and interest accrued, 8% in real estate funds, with the remaining 17% in alternative investments (opportunistic credit and private equity).

The following is a breakdown of the market value of assets by category:

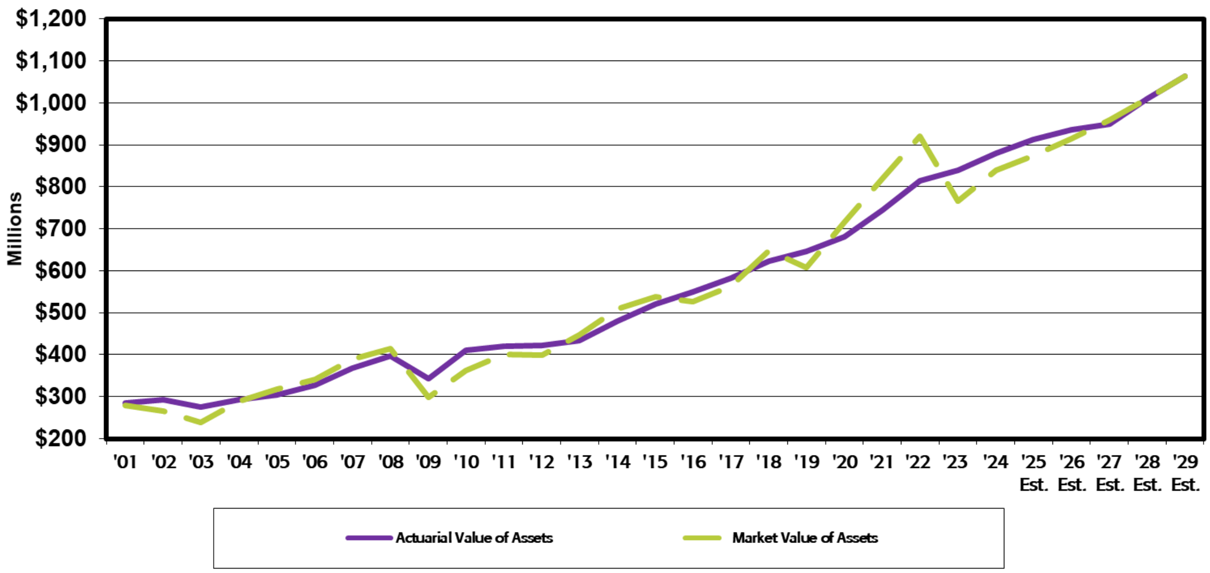
a.	Cash	$	1,506,528
c.	Pooled Domestic Equities Funds		187,249,309
e.	Pooled Opportunistic Credit		45,693,403
g.	Real Estate		64,611,018
i.	Subtotal	$	837,410,679
j.	Interest Due and Accrued	$	21,584
k.	Accounts Receivable		3,084,998
l.	Accounts Payable		(1,922,410)
m.	Right of use Asset		77,928
n.	Lease liability		(78,856)
o.	Subtotal	$	1,183,244
p.	Market Value of Assets [(i) + (o)]	$	838,593,923

The actuarial value of assets as of December 31, 2023 is $880,837,559. The actuarial value of assets reflects the use of an asset-smoothing technique. The difference between the actual return and the expected investment return is phased in equally over five years. Applying asset-smoothing is intended to minimize the effect of short-term fluctuations in the market value of assets. To ensure that the actuarial value of assets is not too dissimilar from the market value of assets, we employ a 15% corridor. The actuarial value of assets must be within 15% of the market value of assets. The corridor did not affect the actuarial value of assets this year. The rate of return on the actuarial value of assets was 7.12% during 2023.

The actuarial value of assets is $42.2 million more than the market value of assets. Under the current method, this difference will be recognized over the next 4 years. Based on the investments returning 6.75% in calendar 2024, we anticipate that next year's actuarial value of assets will be $38.2 million higher than market value. If the market value of assets method was used the contribution would be $17.6 million for Fiscal 2025.

The chart below shows the effect of the asset smoothing. We have compared the actuarial value of assets to the market value of assets from 2001 to the present with estimated values for 2025 through 2029. As the chart illustrates, the asset smoothing method has been successful in lowering the volatility of the assets used for the actuarial valuation.

The calculation of the actuarial value of assets is shown in the Summary of Valuation Results in Section II of the report.



Analysis of Valuation Results

The Frozen Entry Age Actuarial Cost Method does not explicitly recognize actuarial gains or losses. Actuarial gains or losses are spread over the future working lifetime of active members as part of the normal cost. Therefore, an actuarial loss would increase the normal cost while an actuarial gain would lower the normal cost. For informational purposes, we have calculated an actuarial loss for 2023 of $10.3 million as shown on page 20, arising from losses in experience and benefit changes, offset by investment gains for calendar year 2023. The asset gain/loss is calculated by comparing actual values to those projected based on the January 1, 2023 valuation and its asset return assumption of 6.75%.

The chart on the following page shows the sources of gain/loss under Entry Age Normal as opposed to Frozen Entry Age.

Source	Gain/(Loss) 2023	Gain/(Loss) 2022	Gain/(Loss) 2021	Gain/(Loss) 2020	Gain/(Loss) 2019	Gain/(Loss) 2018	Gain/(Loss) 2017
Actives							
Withdrawal	$1.0M	$0.7M	$4.8M	$0.2M	$3.6M	$3.9M	$5.4M
Mortality	$0.6M	$0.6M	$2.1M	$0.6M	$0.6M	$0.5M	$0.5M
Disability	$1.2M	$1.1M	$1.3M	$1.1M	$1.0M	$1.0M	$1.0M
Retirement	$0.3M	$(0.9)M	$4.5M	$(2.9)M	$(0.04)M	$(1.8)M	$(1.5)M
Salary	($12.4)M	$(3.5)M	$15.9M	$(7.6)M	$(3.3)M	$0.5M	$(1.5)M
Retirees							
Mortality	$4.9M	$(0.9)M	$(0.3)M	$3.7M	$4.4M	$0.6M	$(1.3)M

The normal cost development for 2024 is shown on page 17. A comparison of normal costs from 2021 to 2024 is shown on page 18. The present value of future normal costs has increased by $28.9 million from 2023, following a $22.6 million increase in the prior year. The gross normal cost rate increased from 10.63% of pay in 2023 to 11.42% in 2024. The net normal cost is adjusted with interest from January 1 to July 1. Anticipated administrative expenses of the System are added to the adjusted net normal cost. The administrative expenses exclude custodial and investment manager expenses as these are reflected in the interest assumption that is net of these fees. Administrative fees increased from $1,527,000 to $1,744,000.

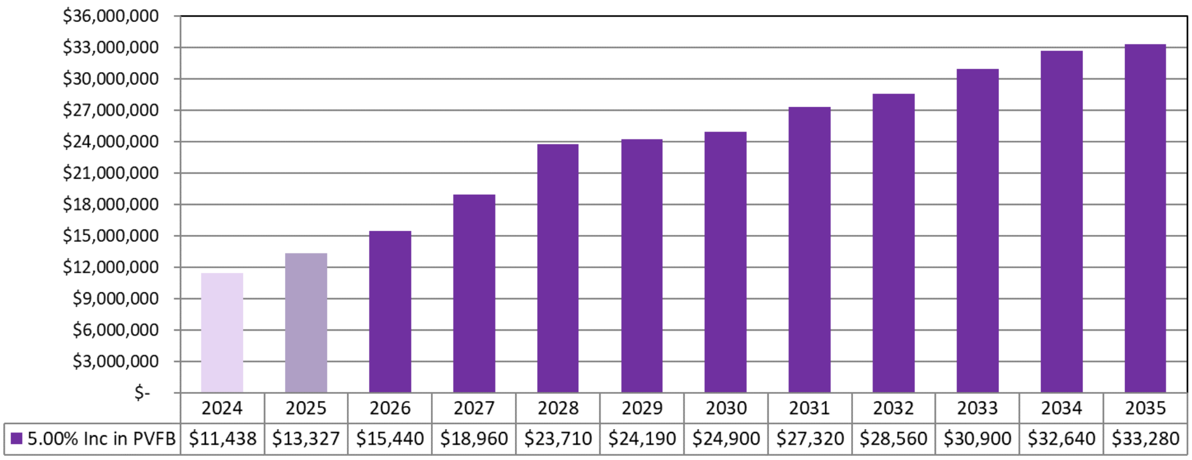
The employer retirement contribution is composed of two parts: the adjusted net normal cost with administrative expenses and an amortization of any changes in the liability (measured using the entry age actuarial funding method) due to changes in assumptions or methodologies or benefit provisions. These changes are amortized over 20 years to be consistent with the Massachusetts Port Authority Employees' Retirement System's Enabling Act.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions, changes in economic or demographic assumptions, increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status, and changes in plan provisions or applicable law.

We have calculated projections assuming the present value of future benefits increases each year by 5%. This estimates that the contribution level for 2026 will increase by $2.1 million compared to 2025, followed by increases of $3.5 million in 2027, $4.8 million in 2028, $0.5 million in 2029, and $0.7 million in 2030. Note that these projections may be significantly affected by future liability and investment experience.

The chart below illustrates the contribution projection discussed above, with contribution amounts shown in thousands.

Contribution Projection

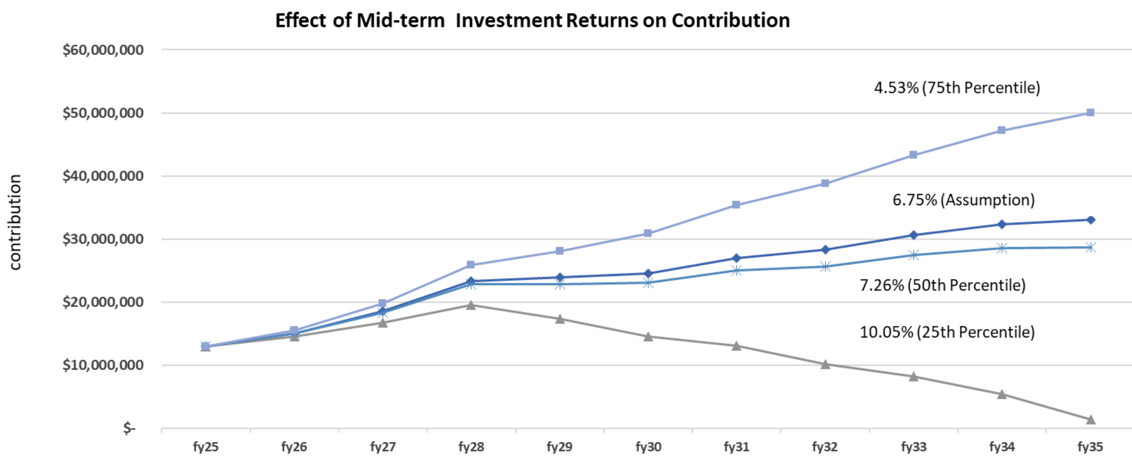


The Frozen Entry Age Actuarial Cost Method has been used in this valuation as required under the Enabling Act. This funding method does not separately value past service liabilities so we are unable to show how well funded the plan is in comparison to liabilities in a meaningful way under this method. A common measure used to illustrate plan funding is the funding ratio. The funding ratio compares the actuarial value of assets to the actuarial accrued liability. We have calculated a funding ratio of 96.4% using the Entry Age Normal Actuarial Cost Method (EAN). If the market value of assets was used the funding ratio would be 91.7%. The EAN method is used by almost all Chapter 32 Retirement Systems and has been shown for illustration purposes only. This shows that the plan is well-funded compared to other Massachusetts public sector retirement systems.

Risk

The effect of different future investment returns can result in widely varying levels of funding as well as on contribution requirements.

The following chart projects the contribution requirement based on 25th to 75th percentile expected investment earnings over the next five years. These returns were provided by the MPAERS's investment adviser, Wilshire. This chart illustrates the volatility of the contribution requirements. Note that 50% of possible scenarios lie outside of the 25th-75th percentile range. So the potential for even more extreme results is a distinct possibility.



The above contribution projection is based on Wilshire 5-year quartiles for market value returns for calendar years 2024 through 2028. Due to asset smoothing, unrecognized gains and losses remaining after the years shown would range between $69 million in gains to $40 million in losses.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as:

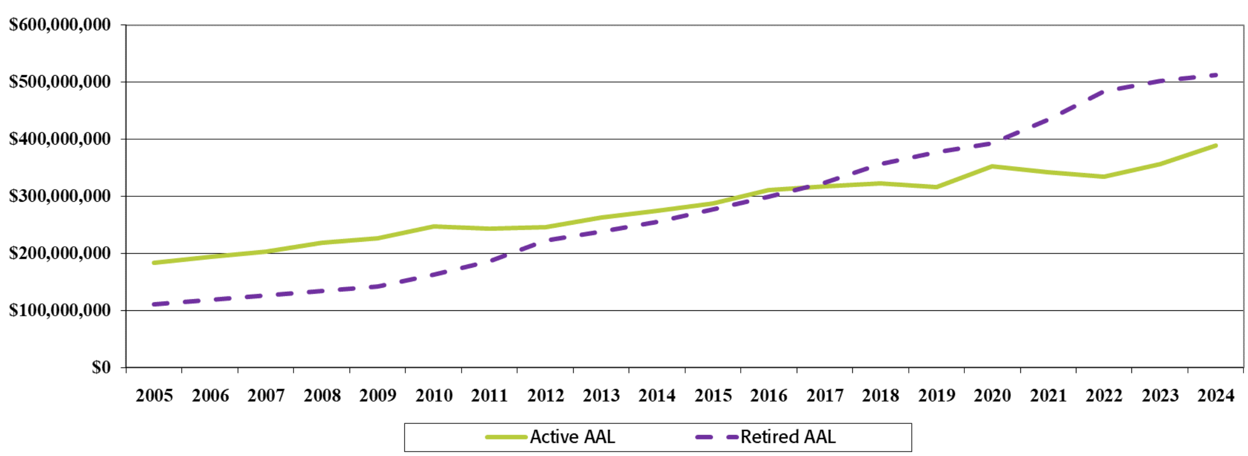
- Plan experience differing from that anticipated by the economic or demographic assumptions,
- Changes in economic or demographic assumptions,
- Increases or decreases expected as part of natural operation of the methodology used for these measurements such as additional contribution requirements based on the plan's funded status,
- Changes in plan provisions or applicable law.

As part of the valuation, we have not performed an analysis of the potential range of future measurements. GASB Statement 67 and 68 reports for the Massachusetts Port Authority Employees Retirement System (MPAERS) contain alternate results to measure the impact of increases or decreases in the discount rate.

Maturity

One important concern is the maturity of the system. Systems with a greater portion of their liability stemming from current retirees whose benefits are already being paid are likely to experience greater impact from short-term asset experience, as high payouts in the near future means less of the current assets will be available to benefit from investment returns further in the future.

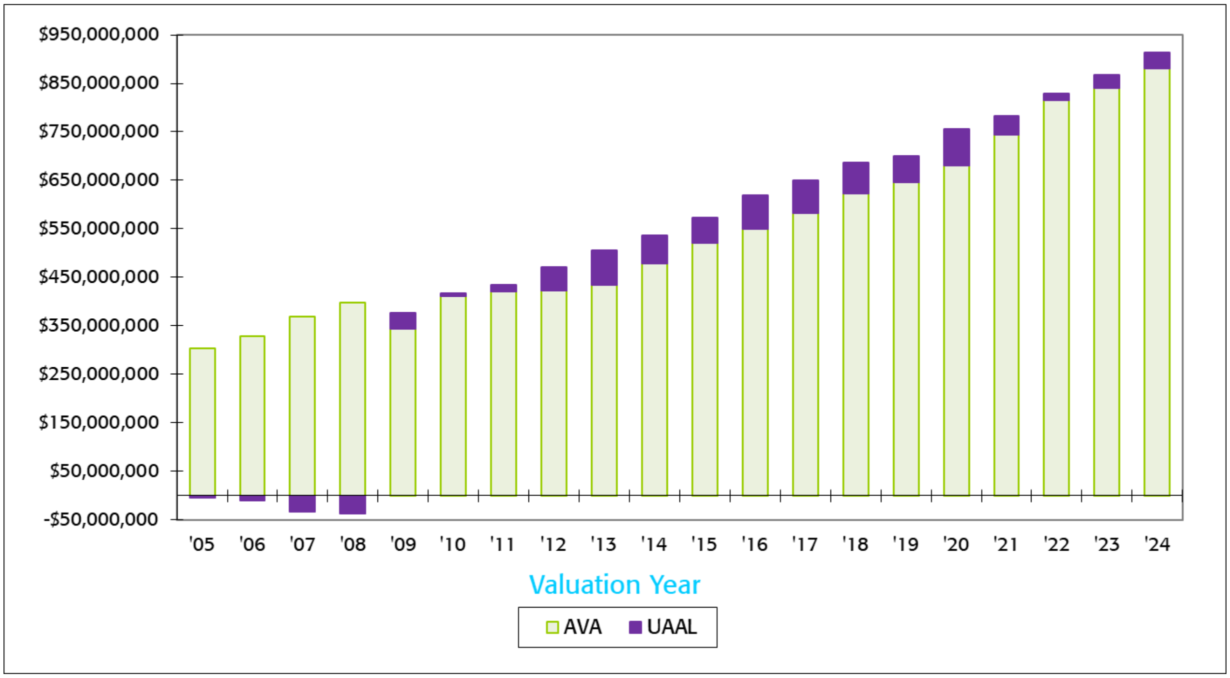
The graph below compares the history of the accrued liability for active employees and retirees. The retiree share of the accrued liability for MPAERS has grown steadily and significantly since 2005.



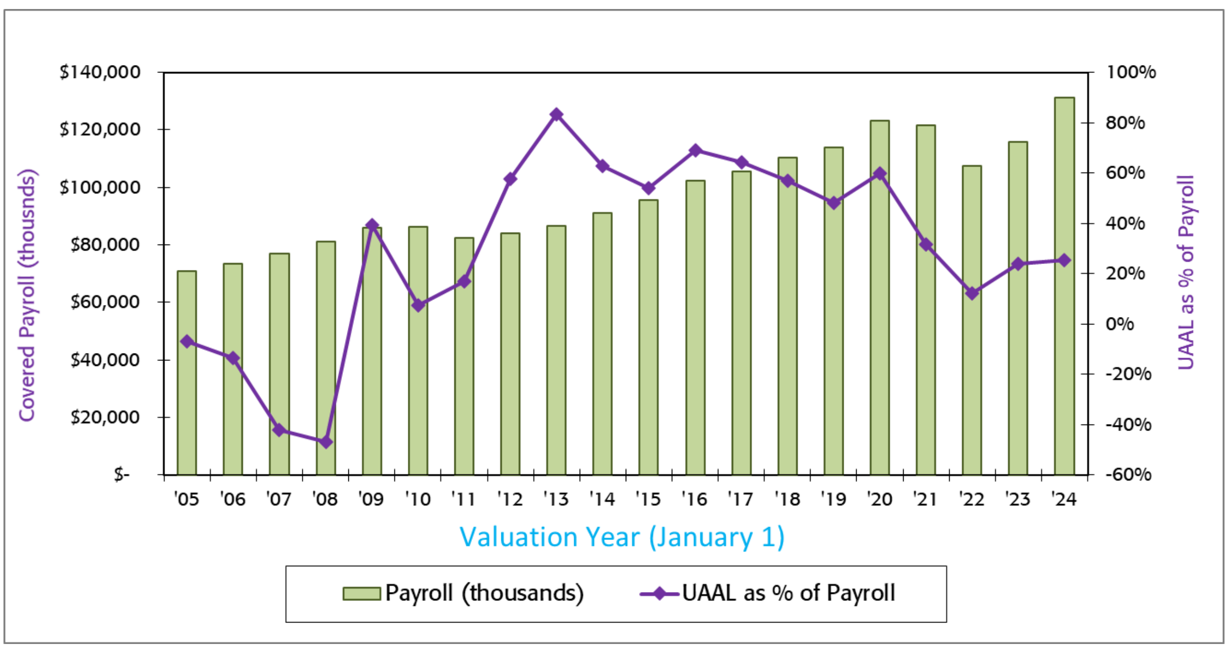
Historical Experience

The following chart displays MPAERS's history of Actuarial Assets and Unfunded Entry Age Actuarial Accrued Liability (UAAL); the second chart compares the UAAL to payroll.

History of Assets and Unfunded Actuarial Accrued Liability



History of Unfunded Actuarial Accrued Liability and Payroll



SECTION II : ACTUARIAL VALUATION RESULTS
Summary of Valuation Results

MEMBER DATA	January 1, 2023	January 1, 2024
1. Active Members		
a. Number	1,145	1,245
b. Annual Compensation	$115,710,152	$131,089,118
c. Average Annual Compensation	101,057	105,292
d. Average Attained Age	47.4	46.9
e. Average Past Service	13.4	12.7
2. Retired Members and Beneficiaries		
a. Number	996	1,005
b. Total Annual Retirement Allowance including COLA	$44,587,488	$45,857,533
c. Average Annual Retirement Allowance including COLA	$45,629	$44,767
d. Average Age	71.1	70.5
3. Terminated Vested Members		
a. Number	83	86
b. Deferred Benefit Amount	$2,801,632	$3,213,754
4. Inactives		
a. Number	211	237
b. Annuity Savings Fund Balance	$5,267,499	5,738,408
ACTUARIAL COMPONENTS		
1. Present Value of Future Benefits		
a. Active Members	$531,738,569	$588,296,823
b. Inactive Members	5,267,499	5,738,408
c. Retired Members, Terminated Vesteds, and Beneficiaries	519,241,233	532,701,054
d. 3(8)(c)	(13,825,011)	(13,153,018)
e. Total	$1,042,422,290	$1,113,583,267
2. Actuarial Value of Assets		
a. Market Value as of December 31	$766,073,097	$838,593,923
b. Calendar year prior to valuation date Excess Return	(191,981,332)	42,241,564
c. Past Year - 1 Excess Return	66,031,729	(191,981,332)
d. Past Year - 2 Excess Return	63,696,101	66,031,729
e. Past Year - 3 Excess Return	74,677,060	63,696,101
f. Actuarial Value of Assets (a)-(.8)(b)-(.6)(c)-(.4)(d)-(.2)(e) (w/o corridor)	$839,625,273	$880,837,559
g. Actuarial Value of Assets within 15% corridor of Market Value	$839,625,273	$880,837,559

Note: Amounts shown in this exhibit may not total due to rounding

Summary of Valuation Results (Continued)

		January 1, 2023	January 1, 2024
3.	Frozen Entry Age Actuarial Liability		
a.	Previous Valuation Frozen Liability		
	(i) 2003 Valuation Assumption Change	(1,322,694)	-
	(ii) Base due to 2003 Valuation Assumption Changes/ERI 2003	728,711	376,251
	(iii) Assumption Change 2004 Valuation	(247,760)	(127,924)
	(iv) Assumption change 2006 valuation for 3(8)(c)	(127,122)	(98,384)
	(v) Assumption change 2008	(1,842,561)	(1,583,351)
	(vi) Method change 2008 valuation	2,206,683	1,896,248
	(vii) Assumption change 2009 valuation	(3,002,681)	(2,653,051)
	(viii) Assumption change 2010 valuation	6,853,895	6,179,822
	(ix) Assumption change 2011 valuation	477,829	437,520
	(x) Assumption and benefit provision change 2012 valuation	9,825,617	9,106,022
	(xi) Assumption and benefit provision change 2013 valuation	7,879,892	7,373,994
	(xii) Assumption and benefit provision change 2015 valuation	6,230,359	5,915,969
	(xiii) Assumption and benefit provision change 2016 valuation	12,841,846	12,262,208
	(xiv) Benefit Provision Change 2018 valuation	2,588,309	2,493,549
	(xv) Assumption and Benefit change 2019 valuation	(14,290,406)	(13,816,555)
	(xvi) Assumption and Benefit change 2020 valuation	15,042,519	14,589,345
	(xvii) Assumption and Benefit change 2021 valuation	(7,714,636)	(7,502,895)
	(xviii) Assumption change 2022 valuation	39,092,720	38,112,795
	(xix) Benefit change 2023 valuation	N/A	2,537,888
	(xx) Total	$75,220,520	$75,499,451
b.	Normal Cost for Prior Year	1,244,063	2,700,063
c.	Employer Contribution (Adjusted to January 1)	8,116,517	11,115,280
d.	Interest	4,613,494	4,528,186
e.	January 1 Frozen Liability prior to additional bases	$72,961,560	$71,612,420
f.	Benefit change 2023 valuation	2,537,888	-
g.	Benefit change 2024 valuation	N/A	4,896,380
h.	Total	$75,499,448	$76,508,799

Summary of Valuation Results (Continued)

		January 1, 2023	January 1, 2024
4.	Amortization of Bases as of January 1, 2024		
a.	ERI 2003: 0 years remaining	376,251	376,251
b.	Assum. Change 2004 Valuation: 0 years remaining	(127,924)	(127,924)
c.	Assum. Change 2006 Valuation: $(67,706) and 2 years remaining	(34,959)	(34,959)
d.	Assum. Change 2008 Valuation: $(1,306,645) and 4 years remaining	(359,328)	(359,328)
e.	Method Change 2008 Valuation: $1,564,859 and 4 years remaining	430,338	430,338
f.	Assum. Change 2009 Valuation: $(2,279,821) and 5 years remaining	(517,387)	(517,387)
g.	Assum. Change 2010 Val: $5,460,249 and 6 years remaining	1,064,835	1,064,835
h.	Assum. Change 2011 Val: $394,490 and 7 years remaining	67,974	67,974
i.	Assum. & Ben prov Change 2012 Val: $8,337,854 and 8 years remaining	1,295,386	1,295,386
j.	Assum. & Ben prov Change 2013 Val: $6,833,948 and 9 years remaining	972,169	972,169
k.	Assum. Change 2015 Val: $5,580,357 and 11 years remaining	688,468	688,468
l.	Assum. Change 2016 Val: $11,643,445 and 12 years remaining	1,355,000	1,355,000
m.	Benefit Change 2018 Val: $2,392,392 and 14 years remaining	252,432	252,432
n.	Assum & Bene Change 2019 Val: $(13,310,719) and 15 years remaining	(1,347,497)	(1,347,497)
o.	Assum. Change 2020 Val: $14,105,582 and 16 years remaining	1,375,685	1,375,685
p.	Assum. Change 2021 Val: $(7,276,861) and 17 years remaining	(686,163)	(686,163)
q.	Assum. Change 2022 Val: $37,066,725 and 18 years remaining	3,389,868	3,389,868
r.	Benefit Change 2023 Val: $2,474,272 and 19 years remaining	220,069	220,069
s.	Benefit Change 2024 Val: $4,896,380 and 20 years remaining	-	424,582
t.	Total	$8,415,217	$8,839,799
5.	Contribution		
a.	Net Normal Cost (Including Admin Expense, Without Interest)	$2,700,063	$4,109,858
b.	Amortization	8,415,217	8,839,799
c.	Interest Adjustment for 1/1 to 7/1	323,605	378,191
d.	Total (Not less than zero)	$11,438,885	$13,327,848

Note: Amounts shown in this exhibit may not total due to rounding

Development of Normal Cost

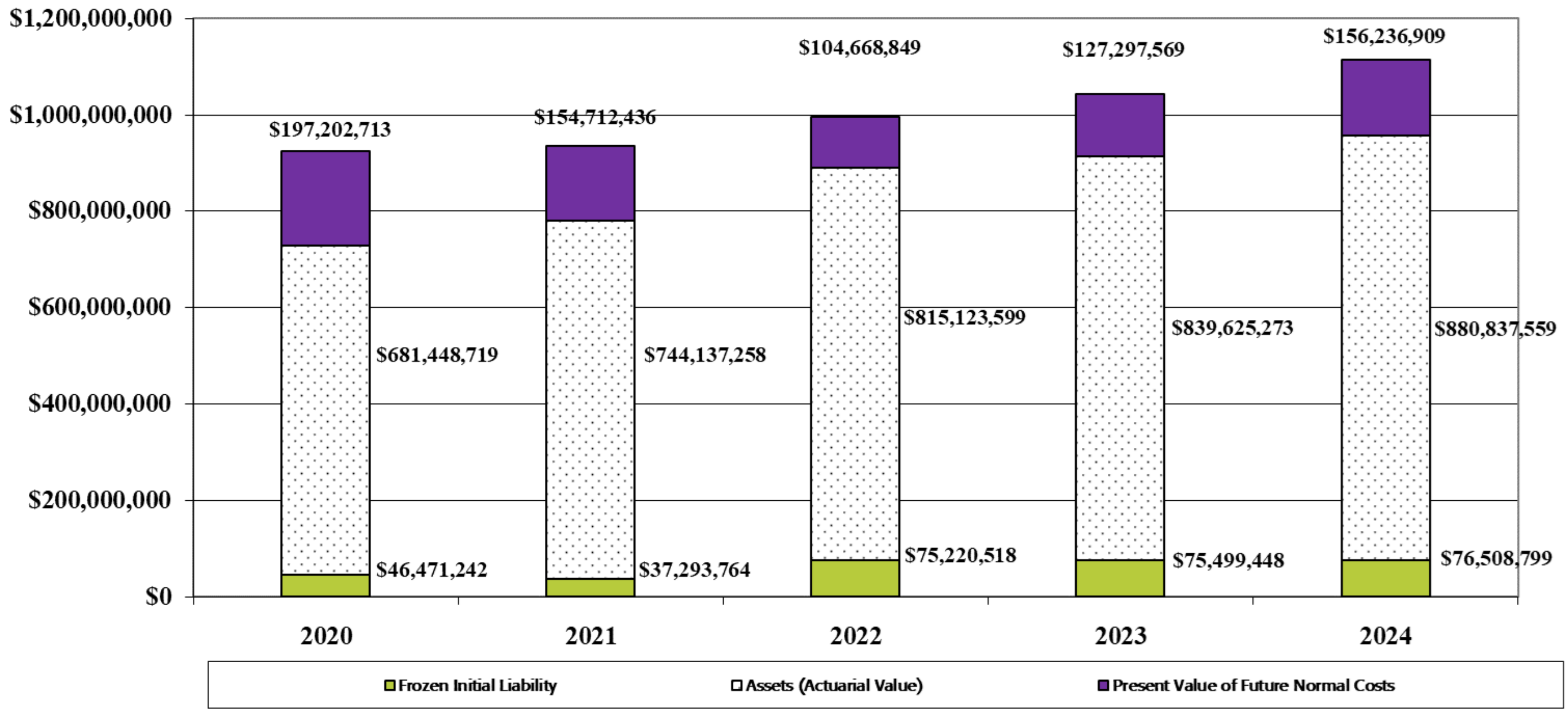
	January 1, 2024
1. Present Value of Future Benefits	$1,113,583,267
2. Frozen Initial Liability	76,508,799
3. Assets (Actuarial Value)	$880,837,559
4. Present Value of Future Normal Costs (1 -2 -3)	$156,236,909
5. Present Value of Future Salaries	1,367,745,586
6. Normal Cost Percentage (4 / 5)	11.42%
7. Pay (excluding Employees at Retirement Age)	$134,769,871
8. Gross Normal Cost (6 x 7)	$15,394,696
9. Anticipated Employee Contributions	13,028,838
10. Net Normal Cost (8 – 9)	$2,365,858
11. Interest Adjustment (1/1 to 7/1)	$79,848
12. Interest Adjustment for Contribution Timing	-
13. Administrative Expense Assumption	$1,744,000
14. Normal Cost (With Adjustments) (10 + 11 + 12 + 13)	$4,189,706

Note: Amounts shown in this exhibit may not total due to rounding

Comparison of 2021, 2022, 2023, and 2024 Normal Cost

	1/1/2021	1/1/2022	1/1/2023	1/1/2024
Present Value of Future Benefits	$936,143,458	$995,012,966	$1,042,422,290	$1,113,583,267
Frozen Initial Liability	$37,293,764	$75,220,518	$75,499,448	76,508,799
Assets (Actuarial Value) [Uses a 15% corridor]	$744,137,258	$815,123,599	$839,625,273	$880,837,559
Present Value of Future Normal Costs	$154,712,436	$104,668,849	$127,297,569	$156,236,909
Present Value of Future Salaries	$1,128,200,160	$1,129,235,194	$1,197,690,286	1,367,745,586
Normal Cost Percentage	13.71%	9.27%	10.63%	11.42%
Pay (excluding Employees at Retirement age)	$125,797,143	$112,199,412	$119,247,730	$134,769,871
Gross Normal Cost	$17,250,824	$10,399,767	$12,674,350	$15,394,696
Anticipated Employee Contributions	10,856,315	10,637,704	$11,501,287	13,028,838
Net Normal Cost	$6,394,509	$(237,937)	$1,173,063	$2,365,858
Interest Adjustment (1/1 to 7/1)	$223,808	$(8,030)	$39,591	$79,848
Interest Adjustment for Contribution Timing	$0	$0	$0	-
Administrative Expense Assumption	$1,424,000	$1,482,000	$1,527,000	$1,744,000
Normal Cost (With Adjustments)	$8,042,317	$1,236,033	$2,739,654	$4,189,706

Breakdown of Present Value of Future Benefits



Derivation of Experience Gain or (Loss)

1.	Normal Cost Rate Last Year	10.63%
2.	Normal Cost Rate This Year	11.42%
3.	Increase (Decrease) in Normal Cost Rate (2-1)	0.79%
4.	Actuarial Present Value of Future Salaries	$1,367,745,586
5.	Increase (Decrease) in Actuarial Present Value of Future Normal Cost (3 x 4)	$10,864,862
6.	Increase (Decrease) due to Change in Assumptions, Benefits and Methods	$547,098
7.	Net Actuarial Gain/(Loss) [6-5]	($10,317,764)

Analysis of Financial Experience

The Frozen Entry Age Actuarial Cost Method does not explicitly recognize actuarial gains or losses. Actuarial gains and losses are spread over the future working lifetime of the active members as part of the normal cost. Therefore, an actuarial loss would increase the normal cost as a percentage of payroll while an actuarial gain would lower the normal cost as a percentage of payroll.

Gross Normal Cost as a Percentage of Payroll
(prior to Employee Contributions and Expenses)

	1/1/2023	1/1/2024
Prior Year's Gross Normal Cost (1/1/2022, 1/1/2023)	9.27%	10.63%
Increases/(Decreases) due to:		
▪ Liability experience	0.72%	0.98%
▪ Investment experience	0.64%*	-0.23%*
▪ Changes in benefits, assumptions and methods	0.00%	0.04%
Total	1.36%	0.79%
Current Valuation	10.63%	11.42%

*Includes recognition of previously deferred gains and losses.

Calculation of Valuation Assets as of January 1, 2024

5-YEAR PHASE-IN OF ASSET GAINS AND LOSSES

1. Market value of assets including receivable/payable as of January 1, 2024 — $838,593,923
2. Phase-in of asset gains and losses

	Plan Year (1)	Original Amt (2)	Pct Unrecognized (3)	Amt Unrecognized (2) x (3)
a.	2023	42,241,564*	80%	33,793,251
b.	2022	(191,981,332)	60%	(115,188,799)
c.	2021	66,031,729	40%	26,412,692
d.	2020	63,696,101	20%	12,739,220
e.	2019	74,677,060	0%	0
f.	Total			(42,243,636)

3.	Valuation assets without corridor as of January 1, 2024: (1. - 2.f.)	$880,837,559
4.	Corridor Check	
	a. 85% of Market Value	$712,804,835
	b. 115% of Market Value	$964,383,011
5.	Greater of 3. And 4.a.	$880,837,559
6.	Valuation assets with corridor as of January 1, 2024: Lesser of 5. And 4.b.	$880,837,559
7.	Calculation of return on valuation assets	
	a. Valuation assets as of January 1, 2023	$839,625,273
	b. ER contribs + EE contribs - Ben Pymts - Expenses	(20,731,001)
	c. Actual return on valuation assets 6. - (7.a. + 7.b.)	$61,943,287
	d. Weighted value of valuation assets	$870,472,059
	e. Return on valuation assets: 7.c. / 7.d.	7.12%

*Equal to current year market value of $838,593,923 minus: the prior year market value of $766,073,097 plus Employer and Employee contributions of $24,609,661 less benefit payments and expenses of $45,340,662 plus expected investment earnings of $51,010,263.

Schedule of Benefit Recipients by Type and Option

		Type of Retirement*							Option Selected**			
	Total	1	2	3	4	5	6	7	A	B	C	D
Deferred	86											
$0- $500	6	3	1	0	0	0	0	2			4	2
$500- $1,000	49	27	3	0	1	5	1	12	15	3	14	17
$1,000- $1,500	62	42	13	1	0	2	0	4	19	4	33	6
$1,500- $2,000	96	76	12	1	1	0	1	5	31	14	46	5
$2,000- $2,500	128	88	22	1	2	0	9	6	42	18	62	6
$2,500- $3,000	82	60	10	0	4	0	2	6	19	10	47	6
$3,000- $3,500	91	69	7	0	7	0	6	2	36	15	38	2
$3,500- $4,000	76	55	6	2	8	1	3	1	12	15	47	2
Over $4,000	415	363	11	0	24	1	9	7	95	42	270	8
	1091	783	85	5	47	9	31	45	269	121	561	54

* Types of retirement:

1 – Service
2 – Survivors from service-related retirements
3 – Non-occupational disability
4 – Occupational disability
5 – Accidental death
6 – Termination allowance
7 – In-service death

** Option selected by original retiree:

Option A – Life annuity
Option B – Beneficiary receives lump sum payment of remainder of member contributions
Option C – 66 2/3% Joint and survivor annuity
Option D – Life annuity survivor benefit

Schedule of Average Benefit Payments for New Recipients

From 1/1/2023 — 12/31/2023	0-5	5-10	10-15	15-20	20-25	25-30	30+	Total
Average Monthly Benefit	-	$1,446	$1,822	$3,834	$4,101	$3,388	$5,562	$4,103
Average Final Average Salary	-	$87,399	$86,012	$112,851	$107,266	$85,838	$110,201	$103,850
Number of Retired Members	-	1	6	10	3	4	15	39

Disclosures

- Stone Consulting, Inc. was furnished member data by the administration staff of the MPAERS. Although examined under broad parameters for reasonableness, the data was not audited by the actuary. In addition, the administrative staff furnished financial statements that were not audited by the actuary or by the plan's auditors. With the assistance of the staff of MPAERS, we were able to develop a database sufficient for valuation purposes.

- The investment return assumption is a long-term assumption and is based on capital market expectations by asset class, historical returns, and professional judgement.

- Historically, 7% to 10% has been the expected long-term rate of return for equities, and 3% to 7% has been the expected long-term rate of return for fixed income securities. Many economists and investment professionals are projecting lower returns; in light of these projections, as well as historical investment returns, the 6.75% interest rate assumption is within the reasonable assumption range. We encourage close monitoring for changes in investment performance against expectations.

- The salary increase assumption reflects prior experience, current expectations, and professional judgement.

- The UAAL and funded ratio are measures of the plan's funded status. These measures reflect the plan's position as of January 1, 2024. We believe these measures, by themselves, are not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations or assessing the need for or the amount of future contributions. However, we believe these measures, in conjunction with the plan's projections at multiple discount rates, maturity measures, and solvency, are appropriate for assessing the amount of future contributions.

Disclosure Information

This disclosure information is based on GASB Statement 25 prior to the issuance of GASB Statement 67. The Retirement Board has requested this be included in the valuation report. Information with regards to GASB Statements 67 and 68 can be found in a separate report issued by Stone Consulting, Inc. as well as the MPAERS's Financial report and the Massachusetts Port Authority's Financial Statement.

The most recent actuarial valuation of the System was prepared by Stone Consulting, Inc. as of January 1, 2024.

The normal cost for employees on that date was	$13,028,838	9.67% of expected payroll
The normal cost for the employer was	$4,109,858	3.05% of expected payroll
The actuarial accrued liability for active members was*	N/A	
The actuarial accrued liability for retired members was*	N/A	
Total actuarial accrued liability*	$957,346,358	
System assets as of that date	$880,837,559	
[Market value of assets]	[$838,593,923]	
Unfunded actuarial accrued liability*	$76,508,799	

*Frozen entry age. Per Q&A – 88 of the GASB Statement 25 Implementation Guide requires you to illustrate the funding progress using the frozen initial unfunded amounts. The actuarial liability shown is the frozen initial unfunded amount plus the assets. The funding method does not explicitly calculate an actuarial accrued liability and therefore it cannot be broken down by active and retired members.

The ratio of system's valuation assets to total actuarial liability was 92.0%

The principal actuarial assumptions used in the valuation are as follows:

Investment Return: 6.75% per annum

Rate of Salary Increase: 4.25% per annum

Disclosure Information (Continued)

SCHEDULE OF FUNDING PROGRESS

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b a)/c)
1/1/2024	$880,837,559	$957,346,358	$76,508,799	92.0%	$131,089,118	58.4%
1/1/2023	$839,625,273	$915,124,721	$75,499,448	91.7%	$115,710,152	65.2%
1/1/2022	$815,123,599	$890,344,117	$75,220,518	91.6%	$107,625,335	69.9%
1/1/2021	$744,137,258	$781,431,022	$37,293,764	95.2%	$121,713,779	30.6%
1/1/2020	$681,448,719	$727,919,961	$46,471,242	93.6%	$123,193,742	37.7%
1/1/2019	$645,818,828	$677,247,590	$31,428,762	95.4%	$114,017,778	27.6%
1/1/2018	$623,436,483	$671,450,058	$48,013,575	92.8%	$110,221,357	43.6%
1/1/2017	$582,816,054	$628,806,367	$45,990,313	92.7%	$105,659,425	43.5%
1/1/2016	$549,104,708	$596,057,447	$46,952,739	92.1%	$102,262,879	45.9%
1/1/2015	$520,740,990	$552,644,012	$31,903,022	94.2%	$95,475,718	33.4%

Notes to Schedule

Valuation Date:	1/1/2024
Actuarial Cost Method:	Frozen Entry Age
Amortization Method:	Level. Closed amortization
Remaining Amortization Period:	Multiple bases with remaining periods ranging from 1 year to 20 years.
Asset Valuation Method:	5 year asset smoothing with a 15% corridor
Actuarial Assumptions:	Investment Rate of Return 6.75% per annum
	Projected Salary Increases 4.25% per annum

ASOP 4 Disclosures

Low Default Risk Obligation Measure (LDROM)

In compliance with ASOP 4 Section 3.11, we have calculated a Low Default Risk Obligation Measure (LDROM) for projected benefits. These benefits were discounted using the FTSE Pension Liability Index, which includes yields from hypothetical AA zero coupon bonds with maturities from 6 months to 30 years. This calculation yielded a single equivalent discount rate of 4.81%.

Based on this discount rate, the LDROM of the Entry Age Actuarial Accrued Liability is $1,148,611,579. All other assumptions and methods used in calculating the LDROM are consistent with those applied in this valuation.

Based on the assumptions and methods used, the LDROM reflects the liability that would have to be funded if the Trust were invested entirely in assets corresponding to the FTSE Index. The difference between the two measures reflects the anticipated value of taking on investment risk by investing in securities which have historically experienced both greater returns and greater volatility than the assets represented by the FTSE rates. The use of a higher discount rate for pension funding reflects higher projected returns results in a reduction in the required funding appropriations for the Plan. Realization of higher returns is contingent on future asset performance; lower than expected returns will result in increased required contributions, while higher than expected returns could produce surpluses that reduce future contribution requirements.

Reasonable Actuarially Determined Contribution (RADC)

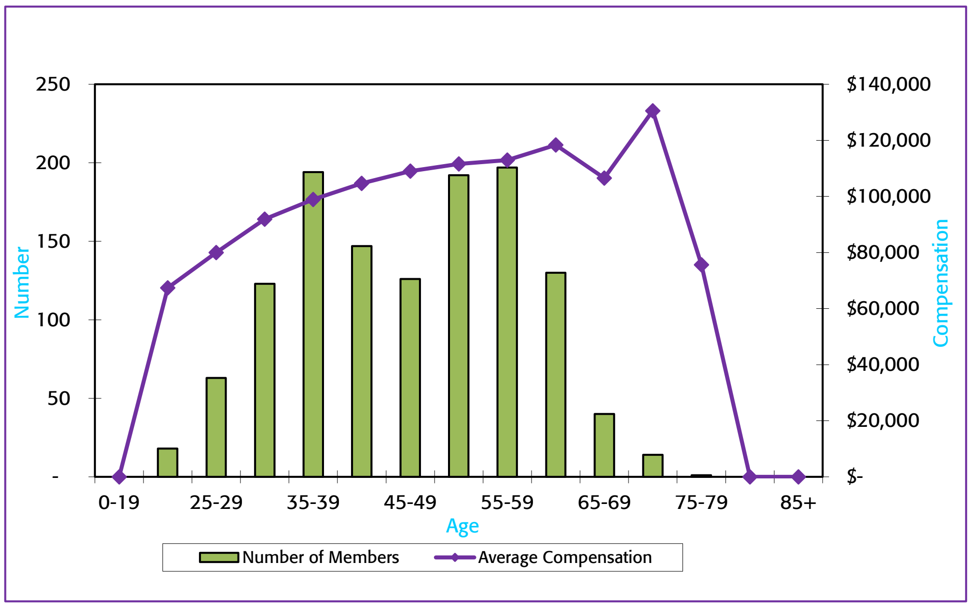
In accordance with ASOP 4 Section 3.21, pension obligation valuations must include a "reasonable" Actuarially Determined Contribution (ADC). An ADC is deemed reasonable if it either funds accrued liabilities within an acceptable time frame or annually reduces the unfunded liability by a reasonable amount.

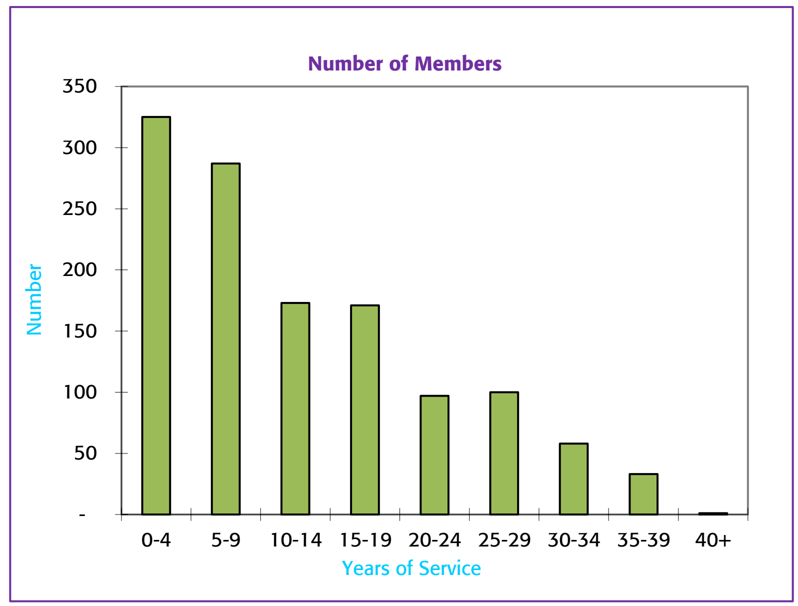
The pattern of contributions shown in this valuation meets these criteria by aiming to accumulate assets adequate to make benefit payments when due. The funding contribution for FY2026 aligns with these standards and qualifies as a reasonable Actuarially Determined Contribution.

Distribution of Plan Members as of January 1, 2024

ACTIVE MEMBERS

AGE	0 4 Years	5 9 Years	10 14 Years	15 19 Years	20 24 Years	25 29 Years	30 34 Years	35 39 Years	40 + Years	Total	Total Compensation	Average Compensation
0-19	-	-	-	-	-	-	-	-	-	-	$ -	$ -
20-24	18	-	-	-	-	-	-	-	-	18	$ 1,213,157	$ 67,398
25-29	51	12	-	-	-	-	-	-	-	63	$ 5,039,902	$ 79,998
30-34	65	49	9	-	-	-	-	-	-	123	$ 11,303,160	$ 91,896
35-39	67	66	50	11	-	-	-	-	-	194	$ 19,193,005	$ 98,933
40-44	36	39	34	33	5	-	-	-	-	147	$ 15,379,283	$ 104,621
45-49	26	25	16	26	25	8	-	-	-	126	$ 13,739,186	$ 109,041
50-54	23	35	28	32	26	35	11	2	-	192	$ 21,416,198	$ 111,543
55-59	27	28	16	30	23	26	30	17	-	197	$ 22,259,727	$ 112,994
60-64	9	22	11	23	14	23	13	14	1	130	$ 15,381,188	$ 118,317
65-69	3	7	6	12	3	6	3	-	-	40	$ 4,261,025	$ 106,526
70-74	-	3	3	4	1	2	1	-	-	14	$ 1,827,695	$ 130,550
75-79	-	1	-	-	-	-	-	-	-	1	$ 75,590	$ 75,590
80-84	-	-	-	-	-	-	-	-	-	-	$ -	$ -
85+	-	-	-	-	-	-	-	-	-	-	$ -	$ -
TOTAL	**325**	**287**	**173**	**171**	**97**	**100**	**58**	**33**	**1**	**1,245**	**$ 131,089,118**	**$ 105,292**





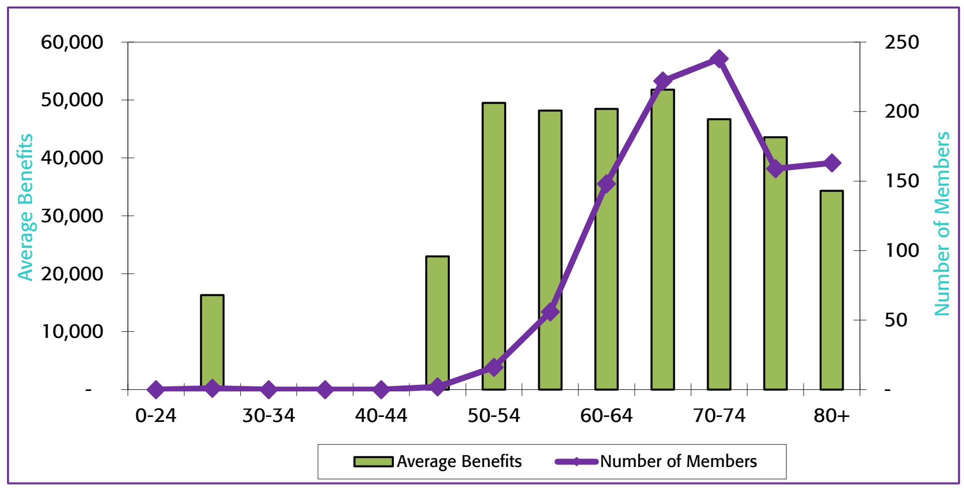
Distribution of Plan Members as of January 1, 2024

RETIRED MEMBERS

Retired Members and Beneficiaries			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	1	16,326	16,326
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	2	23,005	46,010
50-54	11	37,361	410,969
55-59	55	48,209	2,651,485
60-64	132	49,040	6,473,253
65-69	214	51,321	10,982,743
70-74	229	46,811	10,719,679
75-79	153	43,653	6,678,944
80+	156	33,882	5,285,656
TOTAL	953	$ 45,399	$ 43,265,066

Disabled Members			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	-	-	-
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	-	-	-
50-54	5	76,196	380,978
55-59	1	47,530	47,530
60-64	16	43,880	702,079
65-69	8	63,975	511,800
70-74	9	43,634	392,705
75-79	6	41,553	249,319
80+	7	44,008	308,056
TOTAL	52	$ 49,855	$ 2,592,467

Total			
Age	Number	Average Benefit	Total Benefit
0-24	-	-	-
25-29	1	16,326	16,326
30-34	-	-	-
35-39	-	-	-
40-44	-	-	-
45-49	2	23,005	46,010
50-54	16	49,497	791,947
55-59	56	48,197	2,699,015
60-64	148	48,482	7,175,332
65-69	222	51,777	11,494,543
70-74	238	46,691	11,112,384
75-79	159	43,574	6,928,263
80+	163	34,317	5,593,712
TOTAL	1,005	$ 45,629	$ 45,857,533



stoneconsulting,inc

Schedule of Active Member Valuation Data

Valuation Date	Number	Annual Payroll	Annual Average Pay	Increase In Average Pay
1/1/2023	1,145	$115,710,152	$101,057	2.7%
1/1/2021	1,263	$121,713,779	$96,369	5.4%
1/1/2019	1,304	$114,017,778	$87,437	2.2%
1/1/2017	1,268	$105,659,425	$83,328	1.4%
1/1/2015	1,191	$95,475,718	$80,164	2.3%

Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

	Added to Rolls		Removed from Rolls		Rolls: End of Year			
Valuation Date	No.	Annual Allowances	No.	Annual Allowances	No.	Annual Allowances	% Increase in Annual Allowances	Average Annual Allowances
1/1/2024	39	$1,920,046	30	$1,425,169	1,005	$45,857,533	2.8%	$45,629
1/1/2023	46	$2,422,926	26	$1,002,900	996	$44,587,488	4.6%	$44,767
1/1/2022	85	$3,931,490	39	$1,330,086	976	$42,618,818	6.7%	$43,667
1/1/2021	93	$4,946,456	35	$1,337,745	930	$39,938,345	10.9%	$42,944
1/1/2020	40	$1,754,095	26	$982,527	872	$35,998,539	3.3%	$41,283
1/1/2019	56	$2,864,801	24	$773,963	858	$34,856,114	7.1%	$40,625
1/1/2018	75	$3,373,043	28	$853,171	826	$32,553,942	9.3%	$39,412
1/1/2017	47	$2,447,748	17	$470,350	779	$29,780,717	8.3%	$38,229
1/1/2016	52	$2,312,489	21	$676,452	749	$27,498,124	7.1%	$36,713
1/1/2015	51	$2,070,732	19	$586,503	718	$25,678,308	7.4%	$35,764

Notes:

Additional changes to annual retirement allowances can be due to various factors including:

1. Cost of living increases under Massachusetts General Laws Chapter 103
2. Retroactive benefit changes
3. Post-retirement COLA under Massachusetts General Laws Chapter 32, Sections 90A, 90C and 90D
4. Suspension of benefits
5. Changes in worker's compensation offsets
6. Data corrections
7. Change in dependents' allowance due to dependents exceeding age limit.

Solvency Test

A solvency test is a method of checking the short-term progress towards funding. The plan's present actuarial value of assets is compared to:

1. Active members' contributions;
2. Liabilities for retirees and beneficiaries; and
3. Liabilities for service accrued for active members and inactive members

	Actuarial Accrued Liability (AAL)				Portion of AAL Covered by Assets		
Valuation Date	Active Member Contributions (1)	Retirees and Beneficiaries (2)	Active/Inactive Members (Employer Financed) (3)	Actuarial Value of Assets	(1)	(2)	(3)
1/1/2024	$122,835,090	$498,828,889	$335,682,379	$880,837,559	100%	100%	77.2%
1/1/2023	$115,444,633	$488,141,162	$311,538,926	$839,625,273	100%	100%	75.8%
1/1/2022	$109,611,292	$484,407,070	$296,325,755	$815,123,599	100%	100%	74.6%
1/1/2021	$115,968,476	$424,960,701	$240,501,845	$744,137,258	100%	100%	84.5%
1/1/2020	$117,046,783	$385,176,782	$225,696,396	$681,448,719	100%	100%	79.4%
1/1/2019	$108,465,873	$368,316,861	$200,464,856	$645,818,828	100%	100%	84.3%
1/1/2018	$105,900,611	$348,123,401	$217,426,046	$623,436,483	100%	100%	77.9%
1/1/2017	$104,130,296	$317,558,267	$207,117,804	$582,816,054	100%	100%	77.8%
1/1/2016	$100,448,530	$293,058,960	$202,549,957	$549,104,708	100%	100%	76.8%
1/1/2015	$97,096,332	$270,897,577	$184,650,103	$520,740,990	100%	100%	82.7%

Notes:

- Under the Frozen Entry Age cost method actuarial accrued liability is not directly calculated. Actuarial accrued liability, as determined here, is that portion of the present value of future benefits that will not be paid by future employer normal costs.
- January 1, 2015 numbers reflect a change in assumptions. The interest rate was changed to 7.50% (from 7.625%).
- January 1, 2016 numbers reflect a change in assumptions. The interest rate was changed to 7.25% (from 7.50%) and retirement age is delayed until age 60 for post 9/30/2009 hires who are not eligible for post-retirement medical insurance until age 60.
- January 1, 2018 numbers reflect a change in the pension increase adjustment base (COLA Base) to $14,000 (from $13,000)

- January 1, 2019 numbers reflect a change in assumptions. Mortality is based on the RP2014 at 2006 Table Healthy Employees (sex-distinct) projected with MP2018 Generational Mortality and a change to retirement, disability and withdrawal assumptions. Also reflects a change in the treatment of vacation buybacks.
- January 1, 2020 numbers reflect a change in assumptions. The interest rate was changed to 7.00% (from 7.25%). The salary increase assumption was changed to 4.25% (from 4.50%). Compensation limits under Section 401 (a) (17) were recognized.
- January 1, 2021 numbers reflect a change in assumptions. The mortality table was changed to MP2020 mortality projection (from MP2018 projection). The withdrawal and retirement rates were also modified.
- January 1, 2022 numbers reflect a change in assumptions. The interest rate was changed to 6.75% (from 7.00%). The mortality table was changed to the Pub-2010 Table with MP2021 mortality projection.
- January 1, 2023 numbers reflect a change in the pension increase adjustment base; for FY23 only, an increase of 5% was granted on a Base of $14,000, an increase of 2% compared to the typical 3% increase.
- January 1, 2024 numbers reflect a change in the pension increase adjustment base (COLA Base) to $15,000 (from $14,000), as well as a change in the pensionable status of vacation buybacks.

Actuarial Methods and Assumptions

The assumptions used for the actuarial valuation are recommended by the actuary and adopted by the Retirement Board on an annual basis in conjunction with guidance provided by the actuary. Refer to number 16 of this section to see changes in assumptions and methods. In addition, Massachusetts State Law specifies the actuarial cost method to be used.

ACTUARIAL METHODS

1. Actuarial Cost Method	The Frozen Entry Age Actuarial Cost Method has been used in this valuation. Under this method, the present value of all future benefits is determined for each individual participant as of each valuation date. The unfunded frozen actuarial liability represents the unfunded portion of the initial actuarial accrued liability as adjusted for plan changes and changes in assumptions. The annual normal cost is then determined as the amount necessary to fund, as a level percentage of pay of the participants included in the valuation, the excess of the present value of future benefits over the sum of the assets and the unfunded actuarial accrued liability. Actuarial gains and losses are not directly recognized under this method, but are spread over future years as a portion of the annual normal cost.
2. Asset Valuation Method	The Asset Valuation Method is the market value of assets (adjusted by payables and receivables) adjusted to phase in investment gains or losses above or below the expected rate of investment return. A five-year rolling period is used. The phase-in is 20% for year one, 40% for year two, 60% for year three, 80% for year four and 100% for year five. The actuarial value of assets must be within a corridor of 85% to 115% of the adjusted market value of assets.

ACTUARIAL ASSUMPTIONS

1. Investment Return Rate	6.75% per year
2. Mortality	▪ Pre-Retirement: Pub-2010 Table Healthy Employees (sex-distinct) projected with MP2021 Generational Mortality. Separate tables for Groups 1 & 2 (General Employees) and for Group 4 (Public Safety). ▪ Post-Retirement: Pub-2010 healthy annuitant and contingent survivor Tables (sex-distinct) projected with MP2021 Generational Mortality. Group distinctions apply as with actives.

Actuarial Methods and Assumptions (Continued)

Mortality (cont'd)

- Disabled: Pub-2010 Table for disabled lives (sex-distinct) projected with MP2021 Generational Mortality was used. Mortality for accidental disability is assumed to be 50% from the same cause as the disability. Separate tables for Groups 1 & 2 and for Group 4.

3a. Rates of Retirement

Group 1, 2 and 4 employees are assumed to retire at the following rates upon attainment of 10 years of service. If hired after 9/30/2009 and not eligible for post-retirement medical insurance until age 60, retirement begins at age 60 with 10 years of service.

Rates of Retirement
(Employees Hired pre- April 2, 2012)

Age	Group 1	Group 2*	Group 4
50	2%	2%	2%
51	2	2	2
52	2	2	2
53	3	3	3
54	3	3	5
55	5	5	9
56	5	5	9
57	5	5	11
58	7	7	13
59	7	7	13
60	15	15	20
61	18	18	15
62	18	18	15
63	18	18	20
64	15	15	20
65	30	35	100
66	35	35	N/A
67	35	35	N/A
68	35	35	N/A
69	35	35	N/A
70	100	100	N/A

Actuarial Methods and Assumptions (Continued)

3b. Rates of Retirement

Employees Hired after April 1, 2012

Rates of Retirement

Age	Group 1	Group 2*	Group 4
50	-	-	-
51	-	-	-
52	-	-	-
53	-	-	-
54	-	-	-
55	-	10%	3%
56	-	6	3
57	-	5	9
58	-	7	11
59	-	9	13
60	22%	12	20
61	18	15	15
62	18	23	15
63	19	19	20
64	15	16	20
65	15	30	100
66	20	35	N/A
67	35	35	N/A
68	35	35	N/A
69	35	35	N/A
70	100	100	N/A

Actuarial Methods and Assumptions (Continued)

4. Withdrawal Prior to Retirement

The rates shown at the following sample ages illustrate the ultimate withdrawal assumption. There is a 10 year select period for Groups 1 and 2.

Rate of Withdrawal

Age	Groups 1 and 2*	Group 4*
25	7.0%	6.0%
30	7.0	0.5
35	6.0	0.5
40	4.0	0.4
45	3.0	0.1
50	0.5	N/A
55	0.5	N/A

*Groups 1, 2 and 4 are assigned based on employee class, as described in the Summary of Principal Plan Provisions, Section 1.

Actuarial Methods and Assumptions (Continued)

5. Disability Prior to Retirement

The rates shown at the following sample ages illustrate the assumption regarding the incidence of disability:

Rate of Disability

Age	Group 1*	Group 2*	Group 4*
25	.01%	.01%	.40%
30	.01	.01	.40
35	.34	.34	.40
40	.68	.68	.40
45	.10	.10	.50
50	.133	.133	.65
55	.14	.14	.65
60	.12	.12	.20

Disability is assumed to be 25% ordinary and 75% accidental for Groups 1 and 2 and 10% ordinary and 90% accidental for Group 4.

*Groups 1, 2 and 4 are assigned based on employee class, as described in the Summary of Principal Plan Principal Plan Provisions, Section 1

Actuarial Methods and Assumptions (Continued)

6.	Salary Increases	4.25% per year.
7.	Regular Interest Rate Credited to Annuity Savings Account	2% per year.
8.	Family Composition	Members are assumed to be married with two dependent children - one male and one female both age 15; age difference between member and spouse assumed to be three years (the male being the older).
9.	Pension Adjustments	For purposes of the valuation, it is assumed that the Massachusetts Port Authority Employees' Retirement Board will fund 3% annual pension adjustment (cost-of-living increases).
10.	Pension Adjustment Base	The pension adjustment base (cost-of-living base) is assumed to be $15,000 (previously $14,000).
11.	Expenses	Budgeted amount for the fiscal year, excluding investment management fees and custodial fee, is added to the Normal Cost.
12.	Credited Service	An active member's credited service is attributed to Massachusetts Port Authority employment.
13.	Vacation Buybacks	Vacation Buybacks are now considered regular compensation for some members. Some retirees were given the option of having their benefit re-calculated to reflect the pensionable status of their buybacks upon payment of the contributions they would have made on that compensation. For active employees: those whose buybacks are now considered pensionable will make contributions on that compensation just as with all other categories of pensionable pay, and employee data in future valuations will include those contributions in the calculation of active payroll.
14.	Valuation Date	January 1, 2024.
15.	Inflation Rate Assumption	2.50%

Actuarial Methods and Assumptions (Continued)

16.	Recent Changes	As of January 1, 2024 the benefit adjustment base (COLA base) was increased to $15,000 (from $14,000) As of January 1, 2023 the retiree benefits reflect a 5% COLA that was granted for FY23 (an additional 2% compared to the typical 3% increase). As of January 1, 2022 the interest rate changed to 6.75% (from 7.00%) and the mortality assumption was changed to the Pub-2010 Table with MP-2021 generational mortality projection. As of January 1, 2021 the mortality projection was changed to MP2020 (from 2018) and the retirement and withdrawal rates were modified to by adding a multiplier for the 2021 year to reflect short-term experience expected due to the impact of financial stress on the Authority arising from the SARS-CoV-2 pandemic. Rates in 2022 onward were not changed. As of January 1, 2020 the interest rate changed to 7.00% (from 7.25%) and salary rate to 4.25% (from 4.50%). The salary maximum under section 401(a)(17) was recognized. As of January 1, 2019 the mortality assumption was changed to the RP2014 at 2006 Table Healthy Employees (sex-distinct) projected with MP2018 Generational Mortality. The withdrawal, retirement and disability assumptions were also changed. Vacation buybacks were assumed not to be regular compensation. As of January 1, 2018 the benefit adjustment base (COLA base) was increased to $14,000 (from $13,000) As of January 1, 2016 the interest rate changed to 7.25% (from 7.50%) and employees hired after 9/30/2009 and not eligible for post-retirement medical insurance until age 60, retirement begins at age 60 with 10 years of service. As of January 1, 2015 the interest rate changed to 7.50% (from 7.625%).
17.	Date of Adoption	All assumptions and methods were adopted by the MPAERS Board on April 24, 2024 for use in the January 1, 2024 actuarial valuation and thereafter.
18.	Contribution Timing	Contributions are assumed to be made at the beginning of the fiscal year, July 1.

Summary of Principal Plan Provisions

1. Participant

Participation is mandatory for all full-time employees whose employment commences before age 65. There are three classes of members in the retirement system:

Group 1: general employees

Group 2: employees in specified hazardous occupations (e.g., guards)

Group 4: firefighters and electricians

2. Member Contributions

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5% of Pay
1975 - 1983	7% of Pay
1984 - June 30, 1996	8% of Pay
After June 30, 1996	9% of Pay

Chapter 697 provision requires members hired after 1978 to contribute an additional 2% of pay over $30,000.

3. Pay

   a. Pay

   Gross regular compensation excluding bonuses, overtime, severance pay, unused sick pay, and other similar compensation.

   b. Average Pay

   The average of pay during the three consecutive years (or five consecutive years if hired after April 1, 2012) that produce the highest average or, if greater, during the last three years (or five years if hired after April 1, 2012), (whether or not consecutive) preceding retirement.

4. Credited Service

Period during which an employee contributes to the retirement system plus certain periods of military service and "purchased" service.

Summary of Principal Plan Provisions (Continued)

5. Service Retirement

a. Eligibility

1) Attainment of age 55 and completion of ten years of credited service or at any age with completion of 20 years of service. If hired prior to 1978 or a member of Group 4, the completion of ten years of service is not required.

2) Hired after April 1, 2012 and Group 1 – Age 60 and Completion of 10 years of credited service. Group 2 – Age 55 and completion of 10 years of service. Group 4 – Age 55.

b. Retirement Allowance

Determined as the product of the member's benefit percentage, average pay and credited service, where the benefit percentage is shown below (maximum allowance of 80% of average pay):

Benefit Percentage	Group 1	Group 2	Group 4
2.5%	65+	60+	55+
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	N/A	49
1.8	58	N/A	48
1.7	57	N/A	47
1.6	56	N/A	46
1.5	55	N/A	45
	Hired after April 1, 2012*		
2.5%	67+	62+	57+
2.35	66	61	56
2.20	65	60	55
2.05	64	59	N/A
1.90	63	58	N/A
1.75	62	57	N/A
1.60	61	56	N/A
1.45	60	55	N/A

*Reduction is .125% for each year early instead of .15% per year for employees with over 30 years of service.

In addition, veterans receive an additional $15 per year for each year of credited service up to 20 years

Summary of Principal Plan Provisions (Continued)

6. Deferred Vested Retirement

a. Eligibility	Completion of ten years of credited service.
b. Retirement Allowance	Determined in the same manner as "Service Retirement" section above with the member eligible to start collecting a benefit at age 55, (or age 57 for post-April 1, 2012 hires) or defer until later at his or her discretion. If a member chooses, his or her contributions with interest may be withdrawn. The amount of interest he or she will receive depends on length of service and whether or not the termination of employment was voluntary.

7. Ordinary Disability Retirement

a. Eligibility	Non-job related disability after completion of ten years of credited service.
b. Retirement Allowance	Determined in the same manner as "Service Retirement" section and calculated as if the member had attained age 55 (or age 57 for those hired after April 1, 2012), if younger. Veterans receive 50% of pay (during final year) plus an annuity based on accumulated member contributions with interest.

8. Accidental Disability Retirement

a. Eligibility	Disabled as a result of an accident in the performance of duties. No age or service requirement.
b. Retirement Allowance	72% of pay plus an annuity based on accumulated member contributions with interest. Also, a dependent's allowance per year for each child. Total allowance not to exceed 100% of pay (75% for members hired after 1987).

Summary of Principal Plan Provisions (Continued)

9. Non-Occupational Death

a.	Eligibility	Dies while in active service, but not due to occupational injury.
b.	Retirement Allowance	Benefit as if Option C had been elected (see below) and member had attained age 55 (or age 57 for those hired after April 1, 2012) if younger. Minimum monthly benefits provided as follows: spouse - $500, first child - $120, each additional child - $90

10. Occupational Death

a.	Eligibility	Dies as a result of an occupational injury.
b.	Retirement Allowance	72% of pay plus refund of annuity savings fund balance. In the case of an accidental disability retiree who dies of the same cause, the beneficiary receives 72% of the last 12 months salary or the current pension amount, whichever is greater.

11. Cost-of-Living Increases	Applied to the first $15,000 of annual benefit. Funded by the Authority.

12. Optional Forms of Payment

a.	Option A	Allowance payable monthly for the life of the member.
b.	Option B	Allowance payable monthly for the life of the member with a guarantee of any remaining member contributions with interest.
c.	Option C	Allowance payable monthly for the life of the member with 66-2/3% continuing to the member's beneficiary upon the member's death. If the beneficiary pre-deceases the member, the allowance amount "pops-up" to the non-reduced amount (Option A).

Glossary of Terms

1. Present Value of Future Benefits - Represents the dollar value today of all benefits expected to be earned by current members if all actuarial assumptions are exactly realized.

2. Actuarial Cost Method - The procedure used to allocate the Present Value of Future Benefits to past and future periods of employee service.

3. Actuarial Assumptions - Estimates are made as to the occurrence of certain events that determine the level of benefits to be provided and how long they will be provided. The more important actuarial assumptions include the investment return on assets, salary increases and the rates of turnover, disability, retirement and mortality.

4. Unfunded Frozen Actuarial Liability - The liability set under the Entry Age Actuarial Cost Method at plan inception, adjusted at each valuation to reflect the addition of interest and the amortization of liability since the previous valuation. The amount is adjusted by any increases or decreases in the actuarial liability (determined under the Entry Age Method) due to changes in benefits or actuarial assumptions after plan inception.

5. Normal Cost - That portion of the Present Value of Future Benefits that is attributable to benefits to be earned in the coming year. Under the Frozen Entry Age Method, the Normal Cost is the portion of the Unfunded Present Value of Future Benefits which is not attributable to the Unfunded Frozen Actuarial Liability. This amount is then funded as a level percentage of pay.

6. Actuarial Value of Assets - Value of the funds set aside through Authority and member contributions to provide for benefits, as measured by the actuary for valuation purposes.

7. Unfunded Present Value of Future Benefits - That portion of the present value of Future Benefits, not covered by the Actuarial Value of Assets.

8. PERAC - Public Employee Retirement Administration Commission, a division of the State government which has regulatory authority over the administration of the retirement system.

9. GASB - Government Accounting Standards Board, which issues guidance for disclosure of retirement system liabilities.