

State Retirement System Actuarial Valuation Report

January 1, 2023



**PUBLIC EMPLOYEE RETIREMENT
ADMINISTRATION COMMISSION**
COMMONWEALTH OF MASSACHUSETTS

PERAC ACTUARIAL VALUATION REPORT

State Retirement System

January 1, 2023

TABLE OF CONTENTS

Section	Page
1. Introduction & Certification.....	1
2. Executive Summary	
A. Principal Valuation Results.....	2
B. Comparison with Prior Valuation and Experience Analysis.....	3
C. Funding Progress.....	9
D. Risk.....	11
3. Summary of Valuation Results.....	16
4. Development of the Actuarial Gain or Loss.....	17
5. Plan Assets	
A. Summary of Assets.....	18
B. Actuarial Value of Assets.....	19
6. Information on System Membership	
A. Active Members.....	20
B. Retirees and Survivors.....	22
7. Valuation Cost Methods	
A. Actuarial Cost Method.....	24
B. Asset Valuation Method.....	24
C. Actuarial Models.....	24
8. Actuarial Assumptions.....	25
9. Summary of Plan Provisions.....	29
10. Glossary of Terms.....	36

I. INTRODUCTION & CERTIFICATION

This report presents the results of the actuarial valuation of the State Retirement System. The valuation was performed as of January 1, 2023, pursuant to Chapter 32 of the General Laws of the Commonwealth of Massachusetts and based on the plan provisions at that time. The actuarial assumptions used to calculate the accrued liability and the normal cost primarily reflect our most recent Experience Study Analysis report which we issued in 2014 and subsequent retiree mortality analysis in 2015 and 2017. The actuarial assumptions used in this valuation are the same as those used in the January 1, 2022 actuarial valuation except the mortality improvement scale was update to MP-2021.

This valuation was based on member data as of December 31, 2022, which was supplied by the State Retirement Board. Such tests as we deemed necessary were performed on the data to ensure accuracy. Asset information as of December 31, 2022 was provided by the Pension Reserves Investment Management Board. Both the membership data and financial information were reviewed for reasonableness but not audited by us.

This report was prepared by PERAC for the exclusive use of the State Retirement Board, its staff and its auditors. The report was performed to determine the funded status of the System and the contribution requirements to ensure that System assets along with the contributions are sufficient to provide the prescribed benefits. Use of this report by other parties may not be appropriate and may result in mistaken conclusions because of the failure to understand applicable assumptions, methods or the inapplicability of the report for purposes other than those intended. PERAC should be asked to review any statement to be made based on the results presented in this report. PERAC will accept no responsibility for any such statement made without its prior review.

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. As part of this valuation, we have not performed an analysis of the potential range of future measurements.

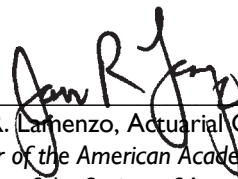
We, the undersigned actuaries, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report. In our opinion, the actuarial assumptions used in this report are reasonable, are related to plan experience and expectations, and represent our best estimate of anticipated experience. We believe this report represents an accurate appraisal of the actuarial status of the State Retirement System performed in accordance with generally accepted actuarial principles and practices relating to pension plans.

Respectfully submitted,

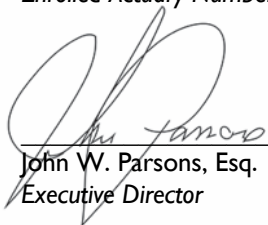
Public Employee Retirement Administration Commission



John F. Boorack, Actuary
Member of the American Academy of Actuaries
Fellow of the Conference of Consulting Actuaries
Enrolled Actuary Number 23-8562



James R. Lamenza, Actuarial Consultant
Member of the American Academy of Actuaries
Associate of the Society of Actuaries
Enrolled Actuary Number 23-4709



John W. Parsons, Esq.
Executive Director

September 20, 2023

2. EXECUTIVE SUMMARY

A | PRINCIPAL VALUATION RESULTS

The provisions of Chapter 32, Section 22C mandate the establishment of a funding schedule for the Commonwealth of Massachusetts' pension obligation. The State Retirement System (SRS) reflects one component of the Commonwealth schedule. The other components are the Massachusetts Teachers' Retirement System, liabilities for Boston teachers, and State reimbursements to local systems to reflect COLAs granted from 1982 through 1996 (determined on an actuarial basis). Beginning in FY18, Chapter 5 of the Acts of 2017 required that several additional items be included in the development of the Commonwealth funding schedule but shown separately. These items include the administrative expenses of the Public Employee Retirement Administration Commission (PERAC), the employer contribution to the Optional Retirement Plan (ORP) under Section 40 of Chapter 15A, and a modification to the COLA reimbursement to local systems described above to reflect actual reimbursements. Beginning in FY24, Chapter 126 of the Acts of 2022 required the inclusion of the administrative expenses for the Department of Higher Education's deferred compensation plan (403(b) plan). The schedule, as mandated by law, calls for payment of the Normal Cost plus an amortization payment on the Unfunded Actuarial Liability (UAL).

The Commonwealth's current funding schedule was filed in January, 2023 and was based on the results of the January 1, 2022 Commonwealth Actuarial Valuation. The FY24 appropriation under the schedule is \$4.105 billion. The total appropriation under the schedule increases 9.63% each year until FY28. Beginning in FY29, the remaining UAL is amortized on a 4.0% annual increasing basis to FY36. The amortization of the 2015 Early Retirement Incentive (ERI) will be completed in FY27. The next schedule will be adopted in early 2026 based on the results of the 2025 Commonwealth actuarial valuation.

The SRS's share of the FY24 Commonwealth appropriation is \$1.471 billion. The 2015 ERI amortization payment is \$28.4 million and is included in this figure.

The principal results of the January 1, 2023 actuarial valuation are as follows (in thousands):

Total Normal Cost	\$1,080,315
Expected Employee Contributions	<u>\$661,615</u>
Net Normal Cost	\$418,700
Total Expenses and Transfers	<u>\$86,515</u>
Net Normal Cost Plus Expenses and Transfers	<u>\$505,215</u>

Total Actuarial Liability	\$49,200,205
Assets	<u>\$35,079,598</u>
Unfunded Actuarial Liability	<u>\$14,120,607</u>
Funded Ratio	71.3%

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS

A comparison of the current valuation and the January 1, 2022 valuation is shown below (in thousands).

	1/1/23	1/1/22	Increase/ (Decrease)	Increase/ (Decrease)
Total Normal Cost	\$1,080,315	\$1,016,368	\$63,947	6.3%
Expected Employee Contributions	<u>661,615</u>	<u>616,405</u>	<u>45,210</u>	7.3%
Net Normal Cost	\$418,700	\$399,963	\$18,737	4.7%
Expenses	\$48,750	\$41,400	\$7,350	17.8%
Optional Retirement Plan Payment	18,200	14,700	3,500	23.8%
Deferred Comp (403(b)) Plan Payment	365	N/A	N/A	N/A
3(8)(c) Amounts Transferred to Other Systems	<u>19,200</u>	<u>16,800</u>	<u>2,400</u>	14.3%
Total Expenses and Transfers	\$86,515	\$72,900	\$13,615	18.7%
Net Normal Cost plus Expenses and Transfers	<u>\$505,215</u>	<u>\$472,863</u>	<u>\$32,352</u>	6.8%
Actuarial Liability				
Actives	\$19,662,761	\$18,988,965	\$673,796	3.5%
Retirees and Inactives	<u>29,537,444</u>	<u>28,286,191</u>	<u>1,251,253</u>	4.4%
Total	\$49,200,205	\$47,275,156	\$1,925,049	4.1%
Assets (Actuarial Value)	<u>\$35,079,598</u>	<u>\$34,467,610</u>	<u>\$611,988</u>	1.8%
Unfunded Actuarial Liability	<u>\$14,120,607</u>	<u>\$12,807,546</u>	<u>\$1,313,061</u>	10.3%
Funded Ratio	71.3%	72.9%	(1.6%)	

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Total Expenses and Transfers

In our 2017 valuation, we began showing the expense and transfer items separately from the normal cost. Expenses reflect the administrative expenses from the most recent Annual Statement and include a small portion of investment related expenses, PERAC's administrative expenses, the Optional Retirement Plan (ORP) payment and expenses for administering the deferred compensation plan. The ORP payment is the amount transferred by statute from the Commonwealth (previously from SRS) to the ORP for higher education employees. By including this payment as part of the normal cost, we have treated it as a reimbursement to the pension trust fund. Finally, \$19.2 million is included for amounts transferred to other systems under Section 3(8)(c) for members with State service who retired from another system. Section 3(8)(c) receipts from other systems are transferred to the State's general account. By including the Section 3(8)(c) disbursements in normal cost, the net Section 3(8)(c) cash flow is zero for funding purposes.

Actives	1/1/23	1/1/22	Increase/ (Decrease)
Number	87,554	85,999	1.8%
Total Payroll	\$7,088,063,387	\$6,651,010,292	6.6%
Average Salary	\$80,956	\$77,338	4.7%
Average Age	46.9	47.0	(0.2%)
Average Service	11.8	12.2	(3.3%)

Retirees and Survivors	1/1/23	1/1/22	Increase/ (Decrease)
Number	69,167	68,280	1.3%
Total Benefits	\$2,836,218,382	\$2,704,015,668	4.9%
Average Benefits	\$41,005	\$39,602	3.5%
Average Age	72.5	72.3	0.3%

Gain/Loss

The development of the actuarial gain/(loss) is shown on page 17. During 2022, there was an overall actuarial loss of \$1.3 billion. There was a non-investment related loss (loss on actuarial accrued liability) of \$265 million. This loss is quite small and reflects that the assumptions are reasonable. There was a loss of \$996 million on the actuarial value of assets (AVA). The return on assets for 2022 was approximately 4.1% on an AVA basis, compared to -10.8% on a market value basis.

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Gain/Loss (continued)

There were 76,160 active members as of January 1, 2022 who remained in active status as of January 1, 2023. Pay for these members increased approximately 7.1% over the one year which is greater than assumed and generated a loss. Gains and losses from all other sources, including data corrections, resulted in a small overall loss.

We value system assets using a smoothing technique which spreads gains and losses over short periods (5 years) and employs a “corridor” so that the actuarial value is within 10% of the market value of assets (MVA). The calculated AVA as of January 1, 2023 is 105.2% of the market value.

The UAL increased from \$12.81 billion as of January 1, 2022 to \$14.12 billion as of January 1, 2023.

Actuarial Assumptions

Investment Return

The January 1, 2023 valuation reflects a 7.0% investment return assumption (the same as the of January 1, 2022 assumption). The investment return assumption has decreased several times since January 1, 2012 (see detail on page 10). As part of this valuation, we considered whether to maintain the 7.0% assumption or reduce it further. Although a case could be made to reduce this assumption, the Commission decided to maintain this assumption.

Early this year, NEPC, the Pension Reserves Investment Trust’s (PRIT) investment consultant, provided figures for 30-year expected return projections using a building block approach, the target allocation and expected long-term returns by asset class. The expected annual return is 7.7% in this study (7.2% if we assume expenses of 50 basis points and the expected return reflects a gross return). This figure is 80 basis points greater than the figure from the 2022 study. Note that the 7.7% average expected return does not mean that the expected return each year will be 7.7%. In fact, over the shorter term (10 years) the average expected return is 7.0% (130 basis points greater than last year). Greater expected returns in later years determine NEPC’s long-term projection. The NEPC projected returns are the first measure we use to determine a reasonable range for the long-term investment return assumption.

A comparison of recent expected return projections as well as historical PRIT returns is shown below and on the next page.

	Expected Annual Return (gross)						
	2017	2018	2019	2020	2021	2022	2023
10 year expected return*	6.8%	6.6%	6.8%	6.2%	5.8%	5.7%	7.0%
30 year expected return	7.8%	7.7%	7.9%	7.3%	6.8%	6.9%	7.7%

* In years prior to 2020, NEPC’s short-term horizon was 5-7 years

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Actual Returns as of December 31, 2022	
2022	-10.8%
5 years (2018-2022)	6.8%
10 years (2013-2022)	8.3%
20 years (2003-2022)	8.5%
38 years (1985-2022)	9.3%

Besides the NEPC analysis, we review the capital market assumptions (CMAs) of other investment consultants for comparison. We estimate the short-term and/or long-term expected returns using these capital market assumptions and PRIT's asset allocation. The results of these CMAs are generally consistent with NEPC. We also review the Horizon Actuarial Services Survey of Capital Market Assumptions. This study compares the assumptions of 40 different investment consultants including NEPC. The Horizon study used in our analysis was published in August 2022. Since it reflects 2022 capital market assumptions, there is a lag between the Horizon results and the NEPC study. The Horizon short-term (10 years) expected return increased by 25 basis points from 5.38% to 5.63% in this survey. The Horizon long-term (20 years) expected return increased by only 4 basis points from 6.25% to 6.29%. At first glance, the results of the Horizon survey indicate a potential bottoming of the long-term expected returns. It may be a one-year anomaly but is something we will monitor over the next few years.

In addition to the NEPC and other capital market analyses, NASRA periodically publishes a survey of investment return assumptions used by over 100 large public plans. The most recent study available at the time of our analysis was published in November 2022. In that study, the average investment return assumption was 6.93%, a decrease from the 7.04% figure published in January 2022. In an updated study as of March 2023, the average investment return assumption was still 6.93%. Although the NASRA study does not consider different asset allocations between the plans, it demonstrates the continuing reduction in this assumption.

As part of our analysis, we considered whether to recommend maintaining the 7.0% assumption adopted in 2021 (and maintained in 2022) or reducing the assumption further. We recommend maintaining this assumption as part of this valuation.

Despite the increase in NEPC's long-term expectations, we do not recommend increasing the assumption this year. This year's results could be an anomaly. We would want to see results like this year's results over the next few years before we consider increasing this assumption.

We could make a reasonable argument to reduce the assumption this year. NEPC is just one of many investment consultants. Past analyses have indicated that NEPC's expectations are in the middle of the pack when compared to the expectations of other investment consultants. Thus, using CMAs from the more conservative end of the spectrum would result in a reduction in the investment return assumption.

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Over the past ten years, we have taken a measured approach regarding our recommendation of this assumption. We review this assumption annually, and generally we have not recommended a decrease in this assumption of more than 25 basis points between any two successive years. Until a few years ago, our assumption was between the NEPC short-term and long-term expectations. However, with the significant decreases in the NEPC expectations in 2020 and 2021, many of our recommendations for 2020 and 2021 ended up being greater than NEPC's long-term expectation (6.8% and 6.9% respectively). Because of our measured approach regarding this assumption, the assumption might exceed the NEPC long-term expectation for a limited period, but we expect it would return to being between the two expectations over time. With the increase in the NEPC expectations in 2023, most of our recommendations will be closer to the short-term expectation.

We generally prefer that this assumption be between the NEPC short and long-term expectations, but not exceed the NEPC long-term expectation for two reasons. First, although the assumption is a long-term assumption, we want to reflect the fact that over the short term, returns are expected to be lower. Second, we noted earlier that the 30-year expected return would be 7.2% if we assume expenses to be 50 basis points. Although actual PRIM returns are reported gross of expenses, our understanding is that NEPC considers the expectations to be net of expenses because their methodology models indexed funds with negligible fees and that active management has historically at least offset fees. However, the Actuarial Standards of Practice, which provide guidance in developing assumptions, note that anticipating superior performance may be unduly optimistic. We are inclined to be conservative in developing the investment return assumption, to reflect both short-term returns and investment expenses.

We recommended maintaining the 7.0% assumption for this valuation and the Commission agreed.

Mortality

In our 2011 actuarial valuation, we began reflecting future mortality improvement (increasing life expectancy). Each year we modified this assumption as we moved closer to a fully generational mortality assumption (a two-dimensional table based on a member's age and calendar year that includes all expected future mortality improvements). Based on our analysis of State retiree mortality during 2012, 2013, and 2014, we adopted a fully generational assumption in the 2015 actuarial valuation. In early 2017, we analyzed retiree mortality experience during 2015 and 2016. We adopted a blue-collar version of the RP-2014 table for superannuation retirees as it best matched our experience. We maintained the base mortality table but we updated to the MP-2021 mortality improvement scale (from MP-2020) in this valuation. This change increased the actuarial liability by approximately \$110 million.

2. EXECUTIVE SUMMARY *(continued)*

B | COMPARISON WITH PRIOR VALUATION AND EXPERIENCE ANALYSIS *(continued)*

Job Groups

We noted several issues relating to job group as part of the valuation data we received from SRS and made similar adjustments as we have in the past. As we have done in previous years, we changed the job group for several University of Massachusetts Police members from Group 1 to Group 2.

In the 2017 valuation, we analyzed costs for certain members of the Department of Mental Health (DMH) and Social Services who were coded as job Group 1. We determined plan liabilities for these members based on both Group 1 and Group 2 status. DMH members with certain titles and Social Services workers with 10 years of service in certain capacities are eligible to be in Group 2. Based on our discussions with SRS, most of these members will ultimately be eligible for Group 2 status. By assuming these members will ultimately be in Group 2, we are being somewhat conservative. We used the results of our 2017 work to estimate the increase in actuarial liability due to this adjustment to be approximately \$144 million in this valuation.

Chapter 176 of the Acts of 2011

There are several other changes under Chapter 176 that we have discussed in previous valuations that have the most impact on decreasing plan liabilities over the longer term. These include an increase in the normal retirement age by two years (for example, from age 65 to age 67 for Group 1 members), an increase in the age (early retirement) reduction factor for ages below the maximum age (from a 4.0% to a 6.0% annual reduction), and an increase in the period for determining a member's average annual compensation (from 3 years to 5 years). These changes are effective only for members hired after April 1, 2012.

As of January 1, 2023, there were approximately 48,900 members hired after April 1, 2012. The employer normal cost is approximately \$67 million lower than it would have been if the prior provisions were in place for these members. The actuarial liability is approximately \$552 million lower than it would have been if the prior provisions were in place.

2. EXECUTIVE SUMMARY *(continued)*

C | FUNDING PROGRESS

The UAL and funded ratio are measures of the plan's funded status. These measures reflect the plan's position as of January 1, 2023. We believe these measures alone are not appropriate for assessing the sufficiency of assets to cover the estimated cost of settling the State Retirement System's benefit obligations or assessing the need for or the amount of future contributions. However, we believe these measures, in conjunction with maintaining the appropriations required under the Commonwealth funding schedule, are appropriate for assessing the amount of future contributions.

The nature of actuarial funding is that assets gradually catch up to the actuarial liability. When pension funding was adopted in 1987, the initial amortization period was established as 40 years. Based on the amortization basis of the schedules adopted, the UAL was expected to increase for a period of time. However, due to actual investment returns significantly exceeding the expected return in the 1990s, the UAL actually decreased until January 1, 2000.

It is important to note that plan assets have grown faster than plan liabilities. As of January 1, 1990, the actuarial liability was \$7.5 billion and assets were \$3.7 billion. As of January 1, 2023, the actuarial liability is \$49.2 billion and the actuarial value of assets is \$35.1 billion. The actuarial liability has grown 6.6 times over this period (\$49.2B / \$7.5B). But assets have grown 9.5 times over this same period (\$35.1B / \$3.7B). For this reason, we believe the funded ratio represents a better measure of the Commonwealth's funding progress.

There have been a number of plan and assumption changes since 2009 that have increased the State's actuarial liability. These changes include five other reductions in the investment return assumption and adjustments to the mortality assumption prior to the change to a fully generational assumption as of January 1, 2015, with subsequent adjustments in 2017, 2018, 2021, and 2023. The other changes include the adoption of a \$13,000 COLA base, the transfer of active members of sheriff departments in six counties to the SRS, the transfer of former members of the Massachusetts Turnpike Authority Retirement System to the SRS, the transfer of ORP members to the SRS, the 2015 Early Retirement Incentive (ERI), and the 2016 toll collector's ERI. Including the changes as of January 1, 2023, the unfunded actuarial liability is approximately \$5.97 billion greater than it would have been using the 2009 valuation assumptions and plan provisions.

2. EXECUTIVE SUMMARY *(continued)*

C | FUNDING PROGRESS *(continued)*

The chart below provides further detail on these changes.

Change in Unfunded Actuarial Liability since 2009 Valuation (in millions)

	State
Assumption Changes	\$4,829
Plan Amendments	<u>1,139</u>
Total	\$5,968

Assumption changes (with valuation date reflected)

(in millions)

Reduction in investment return assumption from 8.25% to 8.0% (2013)	\$703
Reduction in investment return assumption from 8.0% to 7.75% (2015)	804
Reduction in investment return assumption from 7.75% to 7.50% (2016)	933
Reduction in investment return assumption from 7.50% to 7.35% (2018)	613
Reduction in investment return assumption from 7.35% to 7.25% (2019)	434
Reduction in investment return assumption from 7.25% to 7.0% (2021)	1,168
Adoption of fully generational mortality assumption (2015)	593
Other mortality adjustments (2012, 2013, 2014)	324
Mortality adjustment (2017)	304
Mortality adjustment (2018)	9
Mortality adjustment (2021)	(625)
Mortality adjustment (2023)	110
Other experience study changes (2013)	<u>(541)</u>
Total	4,829

Plan amendments (with valuation date reflected)

Transfer of Massachusetts Turnpike Authority (2010)	136
Transfer of sheriff departments (2011)	225
\$13,000 COLA base (2012)	138
Early Retirement Incentive (2016)	230
Transfer of ORP members (2016)	400
Early Retirement Incentive for toll collectors (2017)	<u>10</u>
Total	1,139

2. EXECUTIVE SUMMARY *(continued)*

D | RISK

Risk is defined as the potential for differences in future plan measurements resulting from actual future experience deviating from actuarial assumed experience. The plan is subject to a number of risks that could affect its future financial condition. Examples of risks include the following:

Investment risk- the potential that investment returns will be different than expected;

Asset/liability mismatch risk- the potential that changes in asset values are not matched by changes in the value of liabilities;

Interest rate risk- the potential that interest rates will be different than expected;

Longevity and demographic risk- the potential that mortality or other demographic experience will be different than expected;

Contribution risk- the potential that employer contributions to the plan will not be made, or will not be made at the assumed level.

In this section, we provide a brief analysis of several risk measures that we believe are most significant for the plan. A more detailed risk assessment that includes further scenario testing (assessing the impact of one or several events on the plan's financial condition, for example projecting plan investment returns), stress testing (assessing the impact of an adverse change in one or several factors), sensitivity testing (assessing the impact of a change in an actuarial assumption), or stochastic modeling (generating numerous possible outcomes by allowing for random variations in input items to assess the distribution of the outcomes) may provide a better understanding than the analysis in this section.

Unfunded Actuarial Liability and Funded Ratio

The plan's unfunded actuarial liability (UAL) and the funded ratio for the past 10 years are shown below. The UAL is the Actuarial Liability less the Actuarial Value of Assets. The funded ratio is the Actuarial Value of Assets divided by the Actuarial Liability. The retirement system is said to be fully funded when the UAL is zero, or said another way, when the funded ratio is 100%. Actuarial valuations have been performed every year over this period (except in 2020) and the valuation results are determined as of January 1.

	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
UAL (in billions)	\$9.1	\$9.1	\$11.0	\$13.5	\$13.5	\$14.2	\$15.5	\$15.3	\$12.8	\$14.1
Funded Ratio	69.1%	70.3%	67.5%	63.5%	64.7%	64.9%	63.7%	66.5%	72.9%	71.3%

The UAL has generally increased over this period. The 2013 valuation was the fifth actuarial valuation after the significant market value loss in 2008. The 2008 investment loss was fully recognized in this valuation. Reductions in the investment return assumption and changes to the mortality assumption in the past 10 years have increased the plan's actuarial liability and therefore the UAL. The plan has reduced its investment return assumption several times from 8.0% in the 2013 valuation to the current assumption. The mortality assumption has also been updated several times including the adoption of a fully generational table in 2016 and other updates described in this report. For comparison, using the January 1, 2013 plan assumptions, the UAL as of January 1, 2023 would be approximately \$8.9 billion.

2. EXECUTIVE SUMMARY *(continued)*

D | RISK

The funded ratio has generally decreased through 2016, remained fairly consistent through 2019, but has generally increased since 2021. The assumption changes described above have also significantly impacted the funded ratio. For comparison, using the 2013 plan assumptions, the 2023 funded ratio would be approximately 80%.

The UAL on an AVA basis is \$14.1 billion and the funded ratio is 71.3%. On a market value basis, the UAL is \$15.9 billion and the funded ratio is 67.8%.

Investment Return Assumption

The investment return assumption of 7.0% is consistent with our 2023 recommended assumption. Currently 72 Chapter 32 systems use an assumption of 7.0% or lower.

Funding Schedule and Amortization Basis

Amortization of UAL basis: 9.63% total appropriation increase to FY28, then 4.0% increasing amortization of the remaining UAL to FY36

It is important to note that our emphasis since 2013 has been for systems to establish funding schedules that complete the amortization of the UAL no later than FY35. This allows systems some flexibility in the event of another market downturn. In 2011, the Commonwealth adopted a schedule that extended the amortization of the UAL to FY40 due to the 2008 investment loss. In 2014, the schedule reduced the amortization period to FY36. The 2017 and 2020 schedules maintained the FY36 date by increasing the level of future appropriations. The 2023 schedule maintained the 9.63% increases until FY28 but reverts to a traditional increasing amortization schedule in FY29 and maintains the FY36 payoff date.

A related priority to fully funding the System by FY35 is limiting the amount and period of “negative amortization”. Negative amortization occurs while the UAL increases in the funding schedule. The reason it occurs is that the amortization payment for a given year is not large enough to pay the interest on the UAL. Negative amortization often occurs in amortization schedules with annual increasing payments. Negative amortization is acceptable as long as it is only for a limited period of time. We believe the goal for all systems should be to eliminate negative amortization as soon as possible. The current schedule has no negative amortization.

A large number of Massachusetts systems have adopted schedules that increase the total appropriation by a set percentage for a period of time (or the entire length of the schedule). The Commonwealth schedule reflects this methodology. Since the level of annual increase exceeds 6.0% for the next few years, there is some risk in whether such a level of annual increase is sustainable. However, the Commonwealth has consistently met (and increased as necessary) the higher level of appropriations since the 2011 schedule was adopted.

2. EXECUTIVE SUMMARY *(continued)*

D | RISK *(continued)*

Maturity and Volatility Measures

There are a number of plan maturity and volatility ratios that can provide significant insight into the level of a plan's risk. To illustrate, we are providing two such measures. In both cases, we show the 10-year history of the ratio. In addition, we comment on how the results compare with local systems. We believe that these measures are more useful when compared to historical averages and the results of other plans. See our comments in PART C with respect to assumption changes and plan amendments over this period, which significantly affect these results.

Retiree Actuarial Liability / Total Actuarial Liability

This ratio measures the percentage of actuarial liability due to the plan's retirees. Higher ratios and/or an increase in this ratio indicate a system that is more mature or becoming more mature. As this ratio increases, it generally indicates the retired population is increasing faster than the active member population and there is a greater likelihood of negative cash flow (benefit payments exceeding employer and employee contributions). Retirees in pay status are more expensive than younger members. As a plan matures, it becomes more sensitive to investment volatility and the plan will have more difficulty recovering from losses even with increases in employer contributions.

Retiree Actuarial Liability / Total Actuarial Liability

Valuation Date									
2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
0.49	0.50	0.50	0.53	0.54	0.54	0.55	0.56	0.57	0.57

The ratios for this system show a steady increase indicating the plan has become more mature. Public sector plans often have aging populations generating an increase in this ratio. We have found this to be generally true for the systems for which PERAC is the actuary. In 2013, this ratio ranged from .33 to .61. In recent valuations this range has increased to .47 to .67. This plan has consistently been within these ranges. Most systems have seen an increase in this ratio over the past 10-15 years as the number of retirees, and specifically the retiree liability has increased as a percentage of the total. A number of systems have had fairly consistent ratios and a few have had decreasing ratios. Such systems have already reached and or maintained a more mature level.

2. EXECUTIVE SUMMARY *(continued)*

D | RISK *(continued)*

Actuarial Liability / Pay

This measure reflects how a change in actuarial liability (and therefore UAL) may impact the adequacy of contributions. As this ratio increases, plan contributions (using a traditional amortization schedule) increase as a percentage of pay. Furthermore, like the Retiree Liability ratio noted above, higher ratios exacerbate the impact of investment losses on plan contributions.

Actuarial Liability / Pay

Valuation Date									
2013	2014	2015	2016	2017	2018	2019	2021	2022	2023
5.7	5.7	6.0	6.4	6.5	6.6	6.7	7.0	7.1	6.9

The State Retirement System (SRS) shows gradually increasing rates through 2022 with a decrease in 2023. For comparison with other PERAC systems, in 2012, this ratio ranged from 4.6 to 7.3. For recent valuations, this range has increased. The ratios currently range from 5.1 to 8.8. Again, the SRS has been consistently within these ranges. Higher ratios indicate an increased level of risk for the plan.

Impact of Investment Returns on Unfunded Liability and Funded Ratio (Market Value Basis)

We have prepared a simple 5-year projection illustrating the potential impact of actual investment returns on funding levels. For this estimate, we used the market value of assets and did not attempt to develop an actuarial value of assets in future years. In projecting the actuarial liability, we assumed the January 1, 2023 actuarial assumptions are exactly realized over the next 5 years and that there are no changes in assumptions over this period.

We first projected the market value of assets assuming the actual return for each of the next 5 years is 7.0% (the assumption used in the valuation). For comparison, we have also shown the results if the return were 3.0% each year. The 3.0% assumption is not intended to be a worst-case basis, but only to reflect the impact of a lower short-term return than the current plan assumption. As discussed earlier in the Executive Summary, projected returns are lower over the next 10 years than over the next 30 years.

	Valuation Date					
	2023	2024	2025	2026	2027	2028
UAL (in billions)						
7.0%	\$15.9	\$16.0	\$16.2	\$16.2	\$16.2	\$16.2
3.0%	\$15.9	\$17.3	\$18.9	\$20.5	\$22.1	\$23.8
Funded Ratio						
7.0%	67.8%	68.5%	69.3%	70.1%	71.0%	72.0%
3.0%	67.8%	65.9%	64.1%	62.3%	60.5%	58.8%

2. EXECUTIVE SUMMARY *(continued)*

D | RISK *(continued)*

For the comparison on the prior page, we assumed that for the 3.0% projections, the appropriation for the next 5 years would remain as in the current funding schedule (and the same as that if the actual returns were 7.0% per year). If actual returns were in fact 3.0% per year, the funding schedule would almost certainly need to be increased before FY28.

This analysis shows that if the fund exactly meets expectations on a market value basis for the next few years, the UAL will remain fairly consistent before decreasing after 2028. In past years, the plan was subject to negative amortization discussed earlier in this section. Note that under the 7.0% analysis, the funded ratio gradually increases over the next few years. The funded ratio will begin to increase more rapidly over the last 8 years of the schedule, assuming that all assumptions are exactly realized.

Cash Flow

Cash flow reflects receipts (primarily employee and employer contributions) less disbursements (primarily benefit payments and expenses). We use the information provided in the Annual Statement but subtract any investment income credit or excess investment income entries from the total receipts. Then we measure the ratio of receipts to disbursements. A ratio greater than 1.0 means receipts are greater than disbursements (positive cash flow). Likewise, a ratio less than 1.0 means receipts are less than disbursements (negative cash flow).

Most Massachusetts public systems have negative cash flow. This is not a significant issue for long-term funding but presents potential issues for short-term funding. All else being equal, over the short term, a negative cash flow produces a yearly funded ratio lower than it would have been if there were positive cash flow. This is because a portion of the investment earnings are being used to pay the net benefits and expenses. Therefore, less of the investment earnings are included in the end of the year value of the plan assets resulting in a lower MVA and a lower funded ratio. This may dampen funded ratio expectations somewhat when reviewing 5-year projections. This plan has a ratio of 0.67, 0.68 and 0.74 using the 2020, 2021 and 2022 Annual Statements respectively. Since the ratio is significantly less than 1.0, there is an appreciable impact on our 5-year funded ratio projections.

3. SUMMARY OF VALUATION RESULTS

(Dollars in thousands)

A. Number of Members	
Active	87,554
Vested Terminated	5,221
Non-Vested Terminated Members	29,372
Retirees and Survivors	<u>69,167</u>
Total	191,314
B. Total Payroll	\$7,088,063
C. Normal Cost	
Total Normal Cost	1,080,315
Expected Employee Contributions	<u>661,615</u>
Net Employer Normal Cost	\$418,700
Total Expenses and Transfers	<u>\$86,515</u>
Net Normal Cost plus Expenses and Transfers	<u>\$505,215</u>
D. Actuarial Liability	
Active	\$19,662,761
Vested Terminated	1,173,016
Non-Vested Terminated Members	349,372
Retirees and Survivors	<u>28,015,056</u>
Total Actuarial Liability	\$49,200,205
E. Actuarial Value of Assets	35,079,598
F. Unfunded Actuarial Liability: D – E	\$14,120,607
G. Funded Ratio: E/D	71.3%

4. DEVELOPMENT OF THE ACTUARIAL GAIN OR LOSS

(in millions)

A. Gain/(Loss) on Actuarial Liability

1. Actuarial Liability 1/1/22	47,275
2. Total Normal Cost 1/1/22	1,016
3. Interest on (1) and (2) at 7.0%	3,380
4. Benefits paid during 2022 [a]	2,750
5. Interest on (4) at 7.0% assuming mid-year payment	96
6. Expected Actuarial Liability 1/1/23:	48,825
7. Increase due to change in assumptions	110
8. Expected actuarial liability 1/1/23 (6)+(7)	48,935
9. Actuarial Liability 1/23	49,200
10. Total gain/(loss) (8)-(9)	(265)

[a] Estimated

B. Gain/(Loss) on Assets

1. Actuarial Value of Assets (AVA) 1/1/22	34,468
2. Interest on (1) at 7.0%	2,413
3. Net Receipts [b]	909
4. Net Disbursements [b]	1,687
5. Net Cash Flow: (3)-(4)	(778)
6. Interest on (5) at 7.0% assuming mid-year payment	(27)
7. Expected AVA 1/1/23: (1)+(2)+(5)+(6)	36,076
8. AVA 1/1/23	35,080
9. Gain/(Loss) during 2022: (8)-(7)	(996)

C. **Total Gain/(Loss): (A10)+(B9)** (1,260)

[b] Amounts actually received or disbursed by the fund

5. PLAN ASSETS

A | SUMMARY OF ASSETS (dollars in thousands unless otherwise specified)

Pension Reserves Investment Trust (State Retirement System)	
Market value	\$33,346,387
Actuarial value	\$35,079,598

The actuarial value of assets (AVA) is determined so that 20% of the investment gain or loss in a given year is recognized annually for the ensuing five years. Therefore, these investment gains and losses are fully recognized after five years. In addition to this treatment of gains and losses, we use a “corridor” approach so that the AVA can never be too far from the market value of assets. Under our approach for the Commonwealth, the AVA cannot be less than 90% nor greater than 110% of the market value. As of January 1, 2023, the calculated AVA is 105.2% of the MVA.

5. PLAN ASSETS *(continued)*

B | ACTUARIAL VALUE OF ASSETS

A. Development of total investment income including appreciation

(Dollars in thousands)

	<u>2023</u>
1. Beginning of Year Market value of assets	38,297,344
2a. Net Receipts *	909,188
b. Net disbursements *	1,686,886
c. Cash flow: (a) – (b)	(777,698)
3. End of Year Market value of assets	33,346,387
4. Investment income including appreciation: (3) – (1) – (2(c))	(4,173,259)

B. Expected market value development

1. Beginning of Year Market value of assets	38,297,344
2. Cash flow (A2(c))	(777,698)
3. Expected Return on (1) BI × 0.07	2,680,814
4. Expected return on cash flow A2(c) × 0.07 / 2	(27,219)
5. Expected market value End of Year (1)+(2)+(3)+(4)	40,173,241

C. Gain/(loss) for year: A3-B5 (6,826,854)

D. Development of Actuarial Value of Assets

1. End of year market value	33,346,387
2a. Asset gain/(loss) in current year	(6,826,854)
b. Asset gain/(loss) in 1 st prior year	4,342,176
c. Asset gain/(loss) in 2 nd prior year	1,564,805
d. Asset gain/(loss) in 3 rd prior year	2,485,222
3. Unrecognized gain/(loss) .8 × [2a] + .6 × [2b] + .4 × [2c] + .2 × [2d]	(1,733,211)
4. End of year actuarial value of assets: [1] - [3]	35,079,598
5. Actuarial value / Market value	105.2%
6. Adjusted actuarial value: (4) but not less than 90% nor greater than 110% of market value	35,079,598

*Reflects actual cash flow of PRIT fund

6. INFORMATION ON SYSTEM MEMBERSHIP

A critical element of an actuarial valuation is accurate and up-to-date membership information. PERAC conducted an extensive review of member data submitted for this valuation.

A | ACTIVE MEMBERS

	Actives	Vested Terminations
Number of Members	87,554	5,221
Average Age	46.9	53.1
Average Service	11.8	15.1
Average Salary	\$80,956	\$72,546
Average Annuity Savings Fund Balance	\$73,511	\$79,516

Age by Service Distribution of Active Members

Present Age	Years of Service							Total
	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	
0 - 24	2,358	2						2,360
25 - 29	5,909	760	3					6,672
30 - 34	5,451	3,446	567	8				9,472
35 - 39	4,073	3,357	2,289	762	4			10,485
40 - 44	3,112	2,579	1,907	2,264	495	5		10,362
45 - 49	2,468	1,926	1,584	1,725	1,800	413	6	9,922
50 - 54	2,353	1,797	1,544	1,877	2,049	1,716	666	12,002
55 - 59	1,962	1,602	1,402	1,660	1,616	1,483	2,028	11,753
60 - 64	1,155	1,279	1,134	1,299	1,289	1,105	1,726	8,987
65+	559	761	720	849	822	642	1,186	5,539
Total	29,400	17,509	11,150	10,444	8,075	5,364	5,612	87,554

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

A | ACTIVE MEMBERS *(continued)*

Salary by Age Distribution of Active Members

Present Age	Number of Members	Total Salary	Average Salary
0 - 24	2,360	115,328,733	48,868
25 - 29	6,672	400,759,194	60,066
30 - 34	9,472	655,316,146	69,185
35 - 39	10,485	801,594,014	76,452
40 - 44	10,362	849,475,975	81,980
45 - 49	9,922	844,752,767	85,139
50 - 54	12,002	1,054,720,687	87,879
55 - 59	11,753	1,047,913,909	89,161
60 - 64	8,987	806,951,453	89,791
65+	5,539	511,250,509	92,300
Total	87,554	7,088,063,387	80,956

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

B | RETIREES AND SURVIVORS

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Number of Members	58,610	544	3,438	6,575	69,167
Average Age	72.7	64.5	65.7	74.8	72.5
Average Annual Benefit	42,767	22,877	46,785	23,783	41,005

Benefit by Payment and Retirement Type

	Superannuation	Ordinary Disability	Accidental Disability	Survivors	Total
Annuity	528,022,065	2,239,644	14,650,859	26,998,302	571,910,870
Pension	1,978,535,345	10,205,179	146,194,543	129,372,445	2,264,307,512
Total	2,506,557,410	12,444,823	160,845,402	156,370,747	2,836,218,382

6. INFORMATION ON SYSTEM MEMBERSHIP *(continued)*

B | RETIREES & SURVIVORS *(continued)*

Benefit by Age Distribution

Present Age	Number of Members	Total Benefits	Average Benefits
Less than 40	202	6,387,005	31,619
40 - 44	144	5,558,944	38,604
45 - 49	445	17,924,164	40,279
50 - 54	1,365	65,272,527	47,819
55 - 59	3,796	170,226,388	44,844
60 - 64	8,342	371,161,789	44,493
65 - 69	13,572	599,315,701	44,158
70 - 74	14,932	638,460,175	42,758
75 - 79	11,977	479,374,844	40,025
80 - 84	7,209	264,528,429	36,694
85 - 89	4,168	136,324,353	32,707
90+	3,015	81,684,063	27,093
Totals	69,167	2,836,218,382	41,005

7. VALUATION COST METHODS

A | ACTUARIAL COST METHOD

The Actuarial Cost Method which was used to determine pension liabilities in this valuation is known as the *Entry Age Normal Cost Method*. Under this method, the *Normal Cost* for each active member on the valuation date is determined as the level percent of salary, which, if paid annually from the date the employee first became a member of the retirement system, would fully fund by retirement, death, disability or termination, the projected benefits which the member is expected to receive. The *Actuarial Liability* for each member is determined as the present value as of the valuation date of all projected benefits which the member is expected to receive, minus the present value of future annual Normal Cost payments expected to be made to the fund. Since only active members have a Normal Cost, the Actuarial Liability for inactives, retirees and survivors is simply equal to the present value of all projected benefits. The sum of Normal Cost and Actuarial Liability for each member is equal to the Normal Cost and Actuarial Liability for the Plan. The *Unfunded Actuarial Liability* is the Actuarial Liability less current assets.

The Normal Cost for a member will remain a level percent of salary for each year of membership, except for changes in provisions of the Plan or the actuarial assumptions employed in projection of benefits and present value determinations. The Normal Cost for the entire system will also change due to the addition of new members or the retirement, death or termination of members. The Actuarial Liability for a member will increase each year to reflect the additional accrual of Normal Cost. It will also change if the Plan provisions or actuarial assumptions are changed.

Differences each year between the actual experience of the Plan and the experience projected by the actuarial assumptions are reflected by adjustments to the Unfunded Actuarial Liability. An experience difference which increases the Unfunded Actuarial Liability is called an *Actuarial Loss* and one which decreases the Unfunded Actuarial Liability is called an *Actuarial Gain*.

B | ASSET VALUATION METHOD

The AVA is determined in accordance with the deferred recognition method under which 20% of the gains or losses occurring in the prior year are recognized, 40% of those occurring 2 years ago, etc., so that 100% of gains or losses occurring 5 years ago are recognized. The actuarial value of assets will be adjusted, if necessary, in order to remain between 90% and 110% of market value. The actuarial value of assets as of January 1, 2023 is 105.2% of the market value.

C | ACTUARIAL MODELS

The software we used in our actuarial valuations measures the present value of the plan's actuarial liabilities from which we develop funding schedules that determine annual appropriations for each system. The software was created and is maintained by a national vendor of actuarial software and we have used this software for over 20 years. We periodically review the results of the software by analyzing detailed individual test lives and have compared our results to those of other actuaries using the same data set. The valuation output is prepared before a final review by our actuary.

In addition, we used a simple projection model prepared in a spreadsheet, to perform a rough analysis of the impact of investment returns on the unfunded actuarial liability and funded ratio for the next five years. The work is tailored to each valuation and reviewed by the actuary.

8. ACTUARIAL ASSUMPTIONS

Investment Return

7.0% per year net of investment expenses (*same as prior assumption*)

The investment return assumption is a long-term assumption and is based on capital market expectations by asset class, historical returns, and professional judgment. We considered analysis prepared by PRIM's investment advisor using a building block approach which included expected returns by asset class, risk analysis, and the determination of a 30-year expected target rate of return.

Inflation

2.5% per year

Interest Rate Credited to the Annuity Savings Fund

3.5% per year

Assumed Rate of Cost of Living Increases (COLA)

3.0% per year (on the first \$13,000 of an allowance)

Mortality

Pre-retirement mortality reflects RP-2014 Blue Collar Employees table projected generationally with Scale MP-2021, set forward 1 year for females. (*Prior assumption used mortality improvement scale MP-2020.*)

Post-retirement mortality reflects RP-2014 Blue Collar Healthy Annuitant table projected generationally with Scale MP-2021, set forward 1 year for females. (*Prior assumption used mortality improvement scale MP-2020.*)

For disabled retirees, mortality reflects the post-retirement mortality described in the previous paragraph, set forward 1 year.

It is assumed that 75% of pre-retirement deaths are job-related for Group 1 and 2 members and 90% are job-related for Group 4 members. For members retired under an Accidental Disability, 40% of deaths are assumed to be from the same cause as the disability.

The mortality assumptions reflect our recent experience analysis published in 2014 (based on the years 2006-2011), updated to reflect actual experience from 2012 through 2016 for post-retirement mortality, and professional judgment. As such, this assumption reflects observed current mortality as well as expected mortality improvement.

8. ACTUARIAL ASSUMPTIONS *(continued)*

Salary Increase

Based on an analysis of past experience. Annual rates are shown below.

<u>Service</u>	<u>Groups 1 & 2</u>	<u>Group 3</u>	<u>Group 4</u>
0	7.00%	7.00%	9.00%
1	6.50%	7.00%	8.00%
2	6.00%	7.00%	7.50%
3	5.50%	7.00%	7.00%
4	5.50%	6.75%	6.75%
5	5.25%	6.25%	6.25%
6	5.00%	5.25%	5.75%
7	4.75%	4.75%	5.25%
8-12	4.75%	4.75%	4.75%
13-15	4.50%	4.75%	4.75%
16-19	4.25%	4.75%	4.75%
20+	4.00%	4.50%	4.50%

The salary increase assumption reflects both prior experience (2014 study) and professional judgment.

Disability

Based on an analysis of past experience. Sample annual rates are shown below.

<u>Age</u>	<u>Group 1</u>	<u>Group 2</u>	<u>Group 3</u>	<u>Group 4</u>
20	0.00010	0.00052	0.0010	0.0020
30	0.00010	0.00072	0.0016	0.0021
40	0.00068	0.00210	0.0036	0.0071
50	0.00133	0.00420	0.0094	0.0110
60	0.00120	0.00500	0.0430	0.0080

It is also assumed that 75% of disabilities will be job-related for Group 1 and 2 members, and 95% will be job-related for Group 3 and 4 members.

Disability rates are based on our most recent experience analysis (2014) which reviewed age, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

8. ACTUARIAL ASSUMPTIONS *(continued)*

Retirement

Age	Group 1		Group 2	Group 3	Group 4
	Male	Female			
45	0.000	0.000	0.000	0.020	0.060
46	0.000	0.000	0.000	0.020	0.060
47	0.000	0.000	0.000	0.050	0.060
48	0.000	0.000	0.000	0.050	0.060
49	0.000	0.000	0.000	0.050	0.060
50	0.030	0.030	0.020	0.050	0.060
51	0.030	0.030	0.020	0.060	0.060
52	0.030	0.030	0.020	0.070	0.060
53	0.030	0.030	0.030	0.080	0.075
54	0.030	0.035	0.040	0.090	0.150
55	0.035	0.050	0.075	0.100	0.250
56	0.035	0.050	0.075	0.100	0.150
57	0.040	0.055	0.080	0.110	0.150
58	0.050	0.060	0.100	0.110	0.150
59	0.060	0.065	0.120	0.120	0.150
60	0.090	0.075	0.150	0.140	0.200
61	0.110	0.100	0.150	0.150	0.200
62	0.150	0.150	0.150	0.150	0.200
63	0.150	0.150	0.150	0.150	0.200
64	0.160	0.150	0.200	0.250	0.300
65	0.200	0.200	0.200	0.250	0.500
66	0.200	0.200	0.200	0.250	0.250
67	0.200	0.200	0.200	0.250	0.250
68	0.200	0.200	0.200	0.250	0.250
69	0.200	0.200	0.200	0.250	0.250
70	1.000	1.000	1.000	1.000	1.000

See page 28 for an explanation of retirement rates for employees hired on or after April 2, 2012.

Retirement rates are based on our most recent experience analysis (2014) which reviewed age, service, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

8. ACTUARIAL ASSUMPTIONS *(continued)*

Withdrawal

Based on an analysis of past experience. For Groups 1 and 2, rates are both age and service based for service up to 10 years. After 10 years of service, rates are age based. For groups 3 and 4 rates are service based. Sample annual rates are shown below.

Groups 1 & 2

Age	Service		
	<u>0</u>	<u>5</u>	<u>10+</u>
20	0.270	0.120	0.045
30	0.230	0.100	0.045
40	0.160	0.080	0.030
50	0.180	0.060	0.030

Groups 3 & 4

<u>Service</u>	<u>Group 3</u>	<u>Group 4</u>
0	0.007	0.090
5	0.007	0.060
10	0.005	0.035
15	0.005	0.020
20+	0.005	0.015

See below for an explanation of withdrawal rates for employees hired on or after April 2, 2012.

Withdrawal rates are based on our most recent experience analysis (2014) which reviewed age, service, gender and job group. Final assumptions reflect this analysis as well as professional judgment.

Members Hired on or After April 2, 2012

Chapter 176 of the Acts of 2011 changed the retirement eligibility for the different job groups. For example, Group 1 eligibility changed from 55 years old with 10 years of service to 60 years old with 10 years of service (Chapter 176 removed the provision that allowed retirement at any age with 20 years of service). Our software system is currently programmed such that at any given age, a member is assumed to either retire or terminate, but not both. Therefore, we adjusted the retirement and termination rates for members impacted by Chapter 176. For example, for Group 1 members, we removed retirement rates for ages 50-59. Termination rates remain in effect for those years. We will monitor these assumptions going forward.

Loading and Administrative Expenses

We increased the normal cost by 2% and the actuarial accrued liability of active members by \$336 million to account for certain Chapter 32 benefits that cannot be readily valued with our software system. Such benefits include, but are not limited to, benefits provided under Sections 10, 28M, 28N, 65D, and 100. In addition, we increased the normal cost by 1.5% and the actuarial accrued liability of active members by \$144 million to estimate the impact of potential changes in job group status for certain members of DMH and Social Services.

9. SUMMARY OF PLAN PROVISIONS

ADMINISTRATION

There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

PARTICIPATION

Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are 4 classes of membership in the retirement system:

Group 1:

General employees, including clerical, administrative, technical and all other employees not otherwise classified.

Group 2:

Certain specified hazardous duty positions.

Group 3:

Officers and inspectors of the Department of State Police.

Group 4:

Corrections officers, and other specified hazardous positions.

MEMBER CONTRIBUTIONS

Member contributions vary depending on the most recent date of membership:

Prior to 1975:	5% of regular compensation
1975 – 1983:	7% of regular compensation
1984 to 6/30/96:	8% of regular compensation
7/1/96 to present:	9% of regular compensation
1979 to present:	12% of regular compensation for State Police officers an additional 2% of regular compensation in excess of \$30,000.

In addition, members of Group 1 who join the system on or after April 2, 2012 will have their withholding rate reduced to 6% after achieving 30 years of creditable service.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

RATE OF INTEREST

Interest on regular deductions made after January 1, 1984 is at a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least 10 financial institutions.

RETIREMENT AGE

The mandatory retirement age for some Group 2 and Group 4 employees is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 2 and Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for employees in Group 1.

SUPERANNUATION RETIREMENT

A person who became a member before April 2, 2012 is eligible for a superannuation retirement allowance (service retirement) upon meeting the following conditions:

- completion of 20 years of service, or
- attainment of age 55 if hired prior to 1978, or if classified in Group 4, or
- attainment of age 55 with 10 years of service, if hired after 1978, and if classified in Group 1 or 2

A person who became a member on or after April 2, 2012 is eligible for a superannuation retirement allowance (service retirement) upon meeting the following conditions:

- attainment of age 60 with 10 years of service if classified in Group 1, or
- attainment of age 55 with 10 years of service if classified in Group 2, or
- attainment of age 55 if classified in Group 4.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

AMOUNT OF BENEFIT

A member's annual allowance is determined by multiplying average salary by a benefit rate related to the member's age and job classification at retirement, and the resulting product by his or her creditable service. The amount determined by the benefit formula cannot exceed 80% of the member's highest three-year (or five-year salary as discussed below) average salary. For veterans as defined in G.L. c. 32, s. 1, there is an additional benefit of \$15 per year for each year of creditable service, up to a maximum of \$300.

- Salary is defined as gross regular compensation. For employees who become 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 persons who became members prior to April 2, 2012, average salary is the average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

- For persons who became members on or after April 2, 2012, average salary is the average annual rate of regular compensation received during the 5 consecutive years that produce the highest average, or, if greater, during the last 5 years (whether or not consecutive) preceding retirement.

- The benefit rate varies with the member's retirement age. For persons who became members prior to April 2, 2012 the highest rate of 2.5% applies to Group 1 employees who retire at or after age 65, Group 2 employees who retire at or after age 60, and Group 4 employees who retire at or after age 55. A .1% reduction is applied for each year of age under the maximum age for the member's group. For Group 2 employees who terminate from service under age 55, the benefit rate for a Group 1 employee shall be used.

- For persons who became members on or after April 2, 2012 and retire with less than 30 years of creditable service, the highest rate of 2.5% applies to Group 1 employees who retire at or after age 67, Group 2 employees who retire at or after age 62, and to Group 4 employees who retire at or after age 57. A .15% reduction is applied for each year of age under the maximum age for the member's group.

- For persons who became members on or after April 2, 2012 and retire with more than 30 years of creditable service, the highest rate of 2.5% applies to Group 1 employees who retire at or after age 67, Group 2 employees who retire at or after age 62, and Group 4 employees who retire at or after age 55. A .125% reduction is applied for each year of age under the maximum age for the member's group.

The allowance of state police officers is calculated using a slightly different formula. Information regarding this formula can be obtained directly from the State Retirement Board.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

DEFERRED VESTED BENEFIT

A participant who has attained the requisite years of creditable service can elect to defer his or her retirement until a later date. Group 4 employees cannot defer beyond age 65. All participants must begin to receive a retirement allowance or withdraw their accumulated deductions no later than April 15 of the calendar year following the year they reach age 70½.

WITHDRAWAL OF CONTRIBUTIONS

Member contributions may be withdrawn upon termination of employment. The interest rate for employees who first become members on or after January 1, 1984 who voluntarily withdraw their contributions with less than 10 years of service will be 3%. Interest payable on all other withdrawals will be set at regular interest.

DISABILITY RETIREMENT

The Massachusetts Retirement Plan provides two types of disability retirement benefits:

ORDINARY DISABILITY

Eligibility: Non-veterans who become totally and permanently disabled by reason of a non-job related condition with at least ten years of creditable service.

Veterans with ten years of creditable service who become totally and permanently disabled by reason of a non-job related condition prior to reaching “maximum age”. “Maximum age” applies only to employees classified in Group 4 who are subject to mandatory retirement.

Retirement Allowance: For persons who became members prior to April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member were age 55. If the member is a veteran, the benefit is 50% of the member’s final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

For persons in Group 1 who became members on or after April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member were age 60. If the member is a veteran, the benefit is 50% of the member’s final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 60, he or she will receive not less than the superannuation allowance to which he or she would have been entitled had they retired for superannuation.

For persons in Group 2 and Group 4 who became members on or after April 2, 2012, the benefit is equal to the accrued superannuation retirement benefit as if the member was age 55. If the member is a veteran, the benefit is 50% of the member’s final rate of salary during the preceding 12 months, plus an annuity based upon accumulated member contributions plus credited interest. If the member is over age 55, he or she will receive not less than the superannuation allowance to which he or she is entitled.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

ACCIDENTAL DISABILITY

Eligibility: Applies to members who become permanently and totally unable to perform the essential duties of the position as a result of a personal injury sustained or hazard undergone while in the performance of duties. There is no minimum age or service requirement.

Retirement Allowance: 72% of salary plus an annuity based on accumulated member contributions, with interest. This amount is not to exceed 100% of pay. For those who became members-in-service after January 1, 1988 or who have not been members-in-service continually since that date, the amount is limited to 75% of pay. There is an additional pension of \$1,060.80 per year per child who is under 18 at the time of the member's retirement, with no age limitation if the child is mentally or physically incapacitated from earning. The additional pension may continue up to age 22 for any child who is a full-time student at an accredited educational institution. Veterans, as defined in G.L. c. 32, s. 1, receive an additional benefit of \$15 per year for each year of creditable service, up to a maximum of \$300.

ACCIDENTAL DEATH

Eligibility: Applies to members who die as a result of a work-related injury or if the member was retired for accidental disability and the death was the natural and proximate result of the injury or hazard undergone on account of which such member was retired.

Allowance: An immediate payment to a named beneficiary equal to the accumulated deductions at the time of death, plus a pension equal to 72% of current salary and payable to the surviving spouse, dependent children or the dependent parent, plus a supplement of \$1,060.80 per year, per child payable to the spouse or legal guardian until all dependent children reach age 18 or 22 if a full-time student, unless mentally or physically incapacitated.

The surviving spouse of a member of a police or fire department or any corrections officer who, under specific and limited circumstances detailed in the statute, suffers an accident and is killed or sustains injuries while in the performance of his duties that results in his death, may receive a pension equal to the maximum salary for the position held by the member upon his death.

In addition, an eligible family member of such a firefighter, public prosecutor, police officer or corrections officer may receive a one-time payment of \$300,000 from the State Retirement Board.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

DEATH AFTER ACCIDENTAL DISABILITY RETIREMENT

Effective November 7, 1996, Accidental Disability retirees were allowed to select Option C at retirement and provide a benefit for an eligible survivor. For Accidental Disability retirees prior to November 7, 1996, who could not select Option C, if the member's death is from a cause unrelated to the condition for which the member received accidental disability benefits, a surviving spouse will receive an annual allowance of \$12,000.

DEATH IN ACTIVE SERVICE *(OPTION D)*

Allowance: An immediate allowance equal to the Option C benefit that would have been payable had the member retired and selected Option C on the day before his or her death. For a member who became a member prior to April 2, 2012 whose death occurred prior to the member's superannuation retirement age, the age 55 benefit rate is used. If the member died after age 55, the rate for the actual age is used. For a member classified in Group I who became a member on or after April 2, 2012 whose death occurred prior to the member's superannuation retirement age, the age 60 benefit rate is used. If the member died after age 60, the rate for the actual age is used. The minimum annual allowance payable to the surviving spouse of a member-in-service who dies with at least two years of creditable service is \$6,000, provided that the member and the spouse were married for at least one year and living together on the member's date of death.

The surviving spouse of such a member-in-service receives an additional allowance equal to the sum of \$1,440 per year for the first child and \$1,080 per year for each additional child until all dependent children reach age 18 or 22 if a full-time student, unless mentally or physically incapacitated.

COST OF LIVING

A cost of living adjustment (COLA) is determined based upon the increase in the Consumer Price Index (CPI) used for indexing Social Security benefits, but cannot exceed 3.0% on the first \$13,000 of a retiree's benefit.

9. SUMMARY OF PLAN PROVISIONS *(continued)*

METHODS OF PAYMENT

A member may elect to receive his or her retirement allowance in one of 3 forms of payment.

Option A: Total annual allowance, payable in monthly installments, commencing at retirement and terminating at the member's death.

Option B: A reduced annual allowance, payable in monthly installments, commencing at retirement and terminating at the death of the member, provided, however, that if the total amount of the annuity portion received by the member is less than the amount of his or her accumulated deductions, including interest, the difference or balance of his accumulated deductions will be paid in a lump sum to the retiree's beneficiary or beneficiaries of choice.

Option C: A reduced annual allowance, payable in monthly installments, commencing at retirement. At the death of the retired employee, 2/3 of the allowance is payable to the member's designated beneficiary (who may be the spouse, or former spouse who is unmarried at the time of retirement for a member whose retirement becomes effective on or after February 2, 1992, the child, parent, or sibling of the employee) for the life of the beneficiary. If the beneficiary predeceases the retiree, the benefit payable to the retiree increases (or "pops up") to Option A based on the factor used to determine the Option C benefit at retirement. The Option C became available to accidental disability retirees on November 7, 1996.

ALLOCATION OF PENSION COSTS

If a member's total creditable service was partly earned by employment in more than one retirement system, the cost of the "pension portion" is allocated between the different systems pro rata based on the member's service within each retirement system. If a member received regular compensation concurrently from two or more systems on or after January 1, 2010, and was not vested in both systems as of January 1, 2010, and did not meet certain other requirements as set forth in the statute, such a pro-ration will be undertaken. This is because such a person will receive a separate retirement allowance from each system.

10. GLOSSARY OF TERMS

ACTUARIAL ACCRUED LIABILITY

That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

ACTUARIAL ASSUMPTIONS

Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the amount and duration of pension benefits, such as: mortality, withdrawal, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

ACTUARIAL COST METHOD (OR FUNDING METHOD)

A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the Normal Cost and the Actuarial Accrued Liability.

ACTUARIAL GAIN OR LOSS (OR EXPERIENCE GAIN OR LOSS)

A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between two Actuarial Valuation dates.

Note: The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or pension plan provisions would be described as such, not as an Actuarial Gain/(Loss).

ACTUARIAL PRESENT VALUE

The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

AMORTIZATION PAYMENT

That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

10. GLOSSARY OF TERMS *(continued)*

ANNUAL STATEMENT

The statement submitted to PERAC each year that describes the asset holdings and Fund balances as of June 30 and the transactions during the calendar year that affected the financial condition of the retirement system.

ANNUITY RESERVE FUND

The fund into which total accumulated deductions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

ANNUITY SAVINGS FUND

The fund in which employee contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).

ASSETS

The value of securities held by the plan.

COST OF BENEFITS

The estimated payment from the pension system for benefits for the fiscal year.

FUNDING SCHEDULE

The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22C of M.G.L. Chapter 32.

GASB

Governmental Accounting Standards Board

10. GLOSSARY OF TERMS *(continued)*

NORMAL COST

Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits, which is to be paid in a single fiscal year. The Employee Normal Cost is the amount of the expected employee contributions for the fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

PENSION FUND

The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

PENSION RESERVE FUND

The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

SPECIAL FUND FOR MILITARY SERVICE CREDIT

The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

UNFUNDED ACCRUED LIABILITY

The excess of the Actuarial Accrued Liability over the Assets.

COMMONWEALTH OF MASSACHUSETTS

Public Employee Retirement Administration Commission

Five Middlesex Avenue, Suite 304 | Somerville, MA 02145

Phone: 617-666-4446 | Fax: 617-628-4002

TTY: 617-591-8917 | Web: www.mass.gov/perac