

Middlesex County Retirement System

Actuarial Valuation and Review as of January 1, 2022



This report has been prepared at the request of the Retirement Board to assist in administering the System. This valuation report may not otherwise be copied or reproduced in any form without the consent of the Retirement Board and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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Segal



116 Huntington Ave., Suite 901
Boston, MA 02116-5749
segalco.com
T 617.424.7300

August 8, 2022

Middlesex County Retirement Board
Middlesex County Retirement System
25 Linnell Circle
Billerica, MA 01865

Dear Board Members:


We are pleased to submit this Actuarial Valuation and Review as of January 1, 2022. It summarizes the actuarial data used in the valuation, analyzes the preceding two years' experience, and establishes the funding requirements for fiscal 2023 and later years.

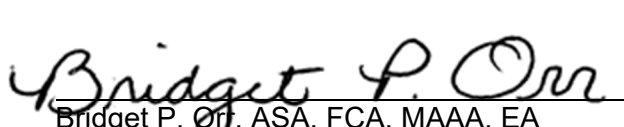
This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the Middlesex County Retirement System. That assistance is gratefully acknowledged.

The actuarial calculations were directed under the supervision of Bridget P. Orr, ASA, MAAA, EA. She is a member of the American Academy of Actuaries and she meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of her knowledge, the information supplied in this actuarial valuation is complete and accurate. The assumptions used in this actuarial valuation were selected by the Board based upon her analysis and recommendations. In her opinion, the assumptions are reasonable and take into account the experience of the Middlesex County Retirement System and reasonable expectations.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,
Segal


Kathleen A. Riley, FSA, MAAA, EA
Senior Vice President and Actuary


Bridget P. Orr, ASA, FCA, MAAA, EA
Consulting Actuary


Andrew R. Luongo
Associate Actuarial Consultant

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Section 1: Actuarial Valuation Summary

Purpose and basis

This report was prepared by Segal to present a valuation of the Middlesex County Retirement System as of January 1, 2022. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the System's benefit obligations. 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 the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law.

The contribution requirements presented in this report are based on:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of December 31, 2021, provided by the staff of the Retirement System;
- The assets of the Plan as of December 31, 2021, provided by the staff of the Retirement System;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions regarding employee terminations, retirement, death, etc.

Certain disclosure information required by GASB Statements No 67 and 68 as of December 31, 2021 for the Retirement System is provided in a separate report.

Section 1: Actuarial Valuation Summary

Valuation highlights

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and the principal balance. The funding policy adopted by the Middlesex County Retirement Board meets this standard and funds the unfunded actuarial accrued liability of the plan by June 30, 2036.
2. The funded ratio (the ratio of the actuarial value of assets to actuarial accrued liability) is 54.54%, compared to the prior year funded ratio of 48.13%. This ratio is one measure of funding status, and its history is a measure of funding progress. Using the market value of assets, the funded ratio is 61.14%, compared to 49.45% as of the prior valuation date. These measurements are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the Middlesex County Retirement System's benefit obligation or the need for or the amount of future contributions.
3. The rate of return on the market value of assets was 11.83% and 19.31% for the plan years ended December 31, 2020 and December 31, 2021, respectively. The rate of return on the actuarial value of assets (which gradually recognizes market fluctuations) was 9.21% and 11.89% for the plan years ended December 31, 2020 and December 31, 2021, respectively. This resulted in an actuarial gain when measured against the assumed rate of return of 7.30%.
4. The actuarial value of assets as of December 31, 2021 was \$1.88 billion, or 89.19% of the market value of assets of \$2.11 billion reported in the Annual Statement. As of December 31, 2019, the actuarial value of assets was 97.33% of the market value.
5. The investment experience in the past years has only been partially recognized in the actuarial value of assets. As the deferred net gain of \$228.0 million is recognized in future years, the cost of the Plan is likely to decrease unless the net gain is offset by future experience. This implies that earning the assumed rate of investment return (net of expenses) on a market value basis will result in investment gains on the actuarial value of assets in the next few years. The unrecognized investment gains are not reflected in the funding schedule shown in Section 2.
6. With this valuation we have changed the following assumptions:
 - The investment return assumption was lowered from 7.30% to 7.15%.
 - The mortality projection scale for future longevity improvement was updated from MP-2017 to MP-2021.
 - The administrative expense assumption was increased from \$3,500,000 for calendar year 2020 to \$3,650,000 for calendar year 2022.

Changing these assumptions increased the unfunded liability by approximately \$27.2 million and increased the normal cost by \$2.2 million.

Section 1: Actuarial Valuation Summary

7. The unfunded liability was expected to increase by \$4.7 million from \$1,641.8 million as of January 1, 2020 to \$1,646.5 million as of January 1, 2022. The actual unfunded liability of \$1,568.7 million is \$77.8 million less than expected, primarily due to investment gains, partially offset by the decrease in the investment return assumption. The sources of the net experience gain are detailed in Section 2.
8. The funding schedule included in this report fully funds the System by fiscal 2036, one year earlier than the prior funding schedule. In fiscal 2024 through fiscal 2028, the appropriation increases 6.5% per year. Thereafter, the amortization payment on the unfunded liability will increase 4.0% per year. The prior funding schedule fully funded the System by fiscal 2037, with the appropriation increasing 6.5% per year through 2028 and then the amortization payment on the unfunded liability increasing 4.0% thereafter.
9. It is important to note that this actuarial valuation is based on plan assets as of December 31, 2021. The plan's funded status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the plan year. Moreover, this actuarial valuation does not include any possible short-term or long-term impacts on mortality of the covered population that may emerge after December 31, 2021 due to the COVID-19 pandemic. Segal is available to prepare projections of potential outcomes of market conditions and other demographic experience upon request.
10. Since the actuarial valuation results are dependent on a given set of assumptions, there is a risk that emerging results may differ significantly as actual experience proves to be different from the assumptions. We have not been engaged to perform a detailed analysis of the potential range of the impact of risk relative to the System's future financial condition but have included a brief discussion of some risks that may affect the System in Section 2. A more detailed assessment would provide the Board with a better understanding of the inherent risks. This could be important because relatively small changes in investment performance can produce large swings in the contribution requirements.

Section 1: Actuarial Valuation Summary

Summary of key valuation results

		2022	2020
Contributions for fiscal year beginning July 1:	• Actuarially Determined Contributions for fiscal year 2023 and 2021	\$156,350,175	\$137,847,583
	• Actuarially Determined Contributions for fiscal year 2024 and 2022	166,512,936	146,807,676
	• Actuarially Determined Contributions for fiscal year 2025 and 2023	177,336,277	156,350,175
Actuarial accrued liability for plan year beginning January 1:	• Retired participants and beneficiaries	\$1,902,403,168	\$1,650,074,999
	• Inactive vested participants	48,639,439	44,546,428
	• Inactive participants due a refund of employee contributions	25,073,000	19,938,302
	• Active participants	1,474,382,904	1,451,024,547
	• Total	3,450,498,511	3,165,584,276
	• Normal cost including administrative expenses for plan year beginning January 1	82,533,633	77,091,386
Assets for plan year beginning January 1:	• Market value of assets (MVA)	\$2,109,770,999	\$1,565,528,261
	• Actuarial value of assets (AVA)	1,881,791,125	1,523,736,765
	• Actuarial value of assets as a percentage of market value of assets	89.19%	97.33%
Funded status for plan year beginning January 1:	• Unfunded actuarial accrued liability on market value of assets	\$1,340,727,512	\$1,600,056,015
	• Funded percentage on MVA basis	61.14%	49.45%
	• Unfunded actuarial accrued liability on actuarial value of assets	\$1,568,707,386	\$1,641,847,511
	• Funded percentage on AVA basis	54.54%	48.13%
Key assumptions	• Net investment return	7.15%	7.30%
	• Long-term wage inflation rate	3.25%	3.25%
Demographic data for plan year beginning January 1:	• Number of retired participants and beneficiaries	6,284	5,862
	• Number of inactive vested participants	403	381
	• Number of inactive participants due a refund of employee contributions	3,581	3,082
	• Number of active participants	9,432	9,282
	• Total payroll ¹	\$519,239,588	\$492,109,775
	• Average payroll	55,051	53,018

¹ Payroll figures are for the prior year and reflect annualized salaries for participants hired during the year.

Section 1: Actuarial Valuation Summary

Important information about actuarial valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by the Retirement System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the market value of assets as of the valuation date, as provided by the Retirement System. The Retirement System uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results that does not mean that the previous assumptions were unreasonable.
Models	Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are presented to meet regulatory, legislative and client requirements. Deterministic cost projections are based on a proprietary forecasting model. Our Actuarial Technology and Systems unit, comprised of both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.

Section 1: Actuarial Valuation Summary

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

The actuarial valuation is prepared at the request of the Retirement Board. Segal is not responsible for the use or misuse of its report, particularly by any other party.

An actuarial valuation is a measurement of the Plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the Plan will be determined by the actual benefits and expenses paid and the actual investment experience of the Plan.

Actuarial results in this report are not rounded, but that does not imply precision.

If the Retirement Board is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.

Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the Plan's provisions, but they may be subject to alternative interpretations. The Retirement Board should look to their other advisors for expertise in these areas.

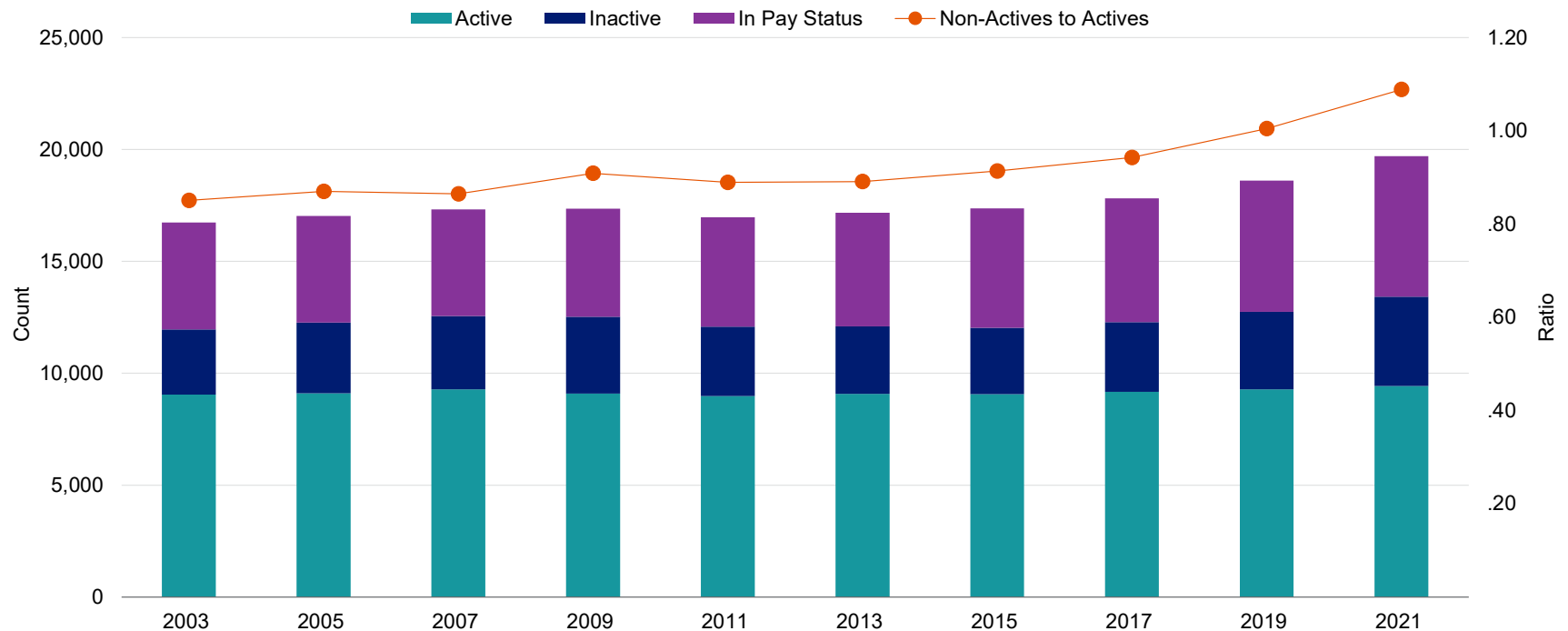
As Segal has no discretionary authority with respect to the management or assets of the Retirement System, it is not a fiduciary in its capacity as actuaries and consultants with respect to the Retirement System.

Section 2: Actuarial Valuation Results

Participant data

This section presents a summary of significant statistical data on covered participants.

Participant Population: 2003 – 2021



In Pay Status	4,780	4,763	4,764	4,833	4,886	5,077	5,327	5,531	5,862	6,284
Inactive ¹	2,913	3,158	3,267	3,430	3,102	3,016	2,961	3,114	3,463	3,984
Active	9,043	9,106	9,285	9,093	8,979	9,082	9,072	9,168	9,282	9,432
Ratio of Non-Actives to Actives	0.85	0.87	0.86	0.91	0.89	0.89	0.91	0.94	1.00	1.09

More detailed information for this valuation year and the preceding valuation can be found in *Section 4, Exhibits A and B*.

¹ Includes terminated participants due a refund of employee contributions

Section 2: Actuarial Valuation Results

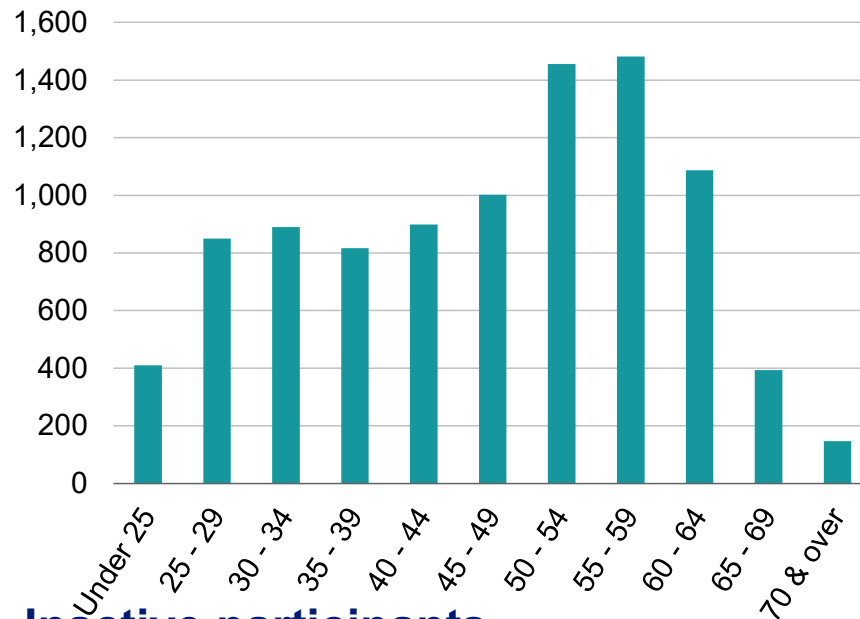
Active participants

As of December 31,	2021	2019	Change
Active participants	9,432	9,282	1.6%
Average age	47.2	47.9	-0.7
Average years of service	10.6	11.2	-0.6
Average compensation	\$55,051	\$53,018	3.8%

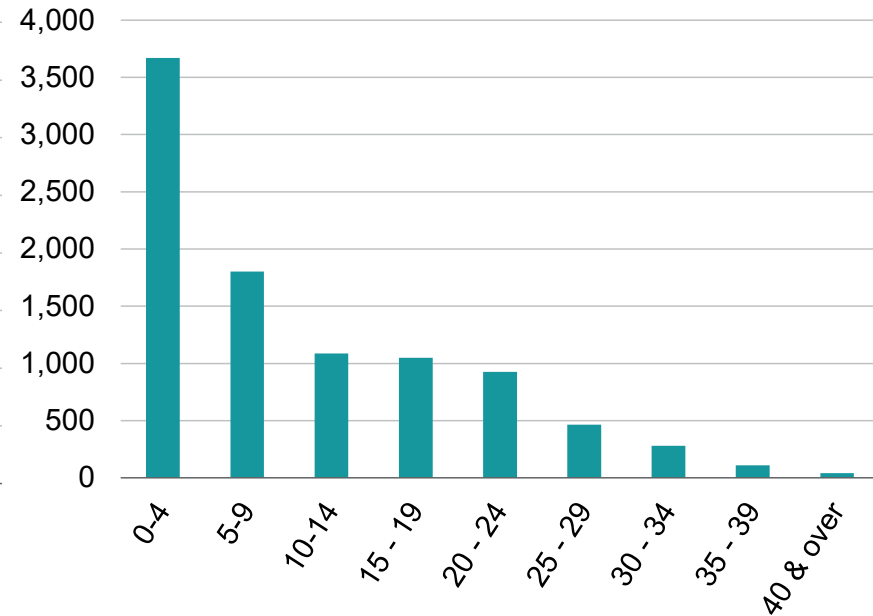
Among the active participants, there were none with unknown age and/or service information.

Distribution of Active Participants as of December 31, 2021

Actives by Age



Actives by Years of Service



Inactive participants

In this year's valuation, there were 403 participants with a vested right to a deferred or immediate vested benefit.

In addition, there were 3,581 participants entitled to a return of their employee contributions.

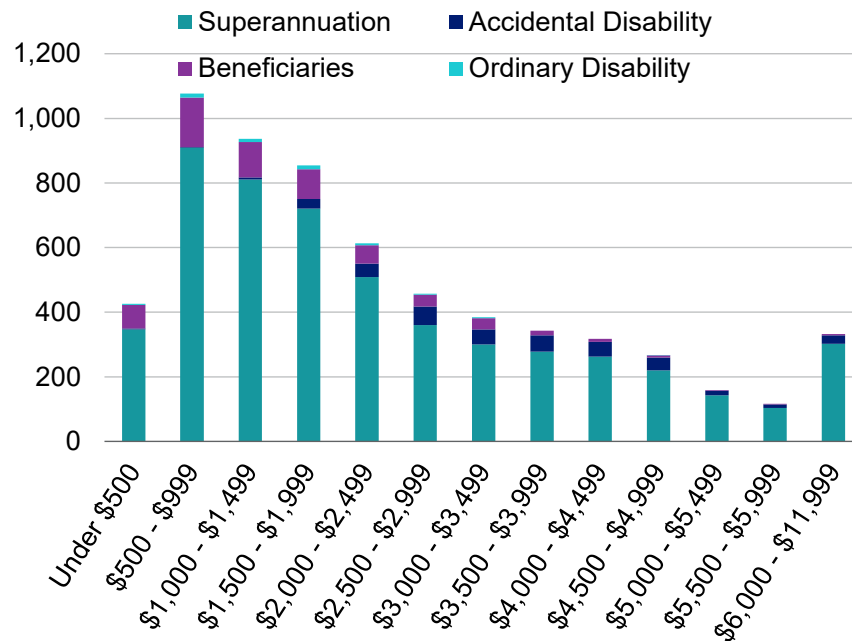
Section 2: Actuarial Valuation Results

Retired participants and beneficiaries

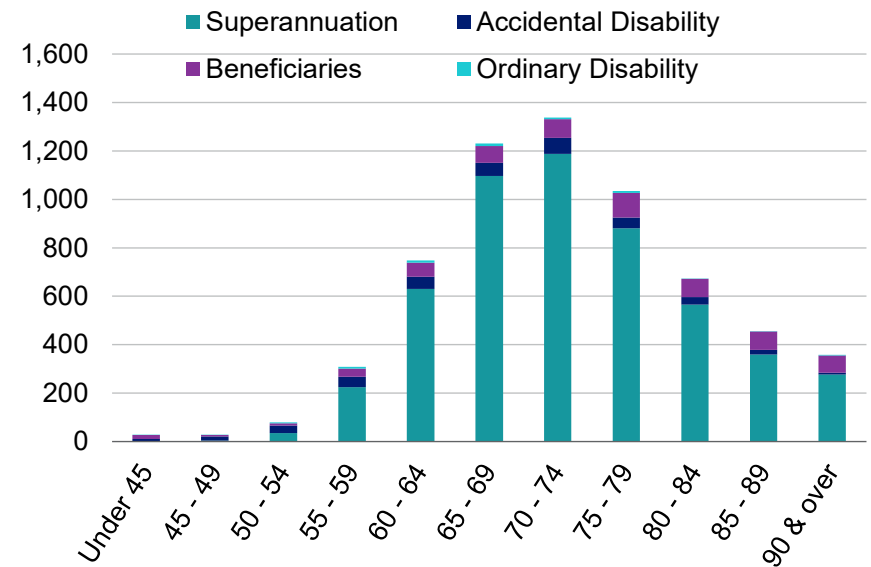
As of December 31,	2021	2019	Change
Retirees	5,690	5,278	7.8%
Beneficiaries	594	584	1.7%
Average age	72.8	73.0	-0.2
Average amount	\$2,445	\$2,291	6.7%
Total monthly amount ¹	\$15,363,381	\$13,430,415	14.4%

Distribution of Retired Participants and Beneficiaries as of December 31, 2021

by Type and Monthly Amount



by Type and Age



¹ Excludes COLAs reimbursed by the Commonwealth.

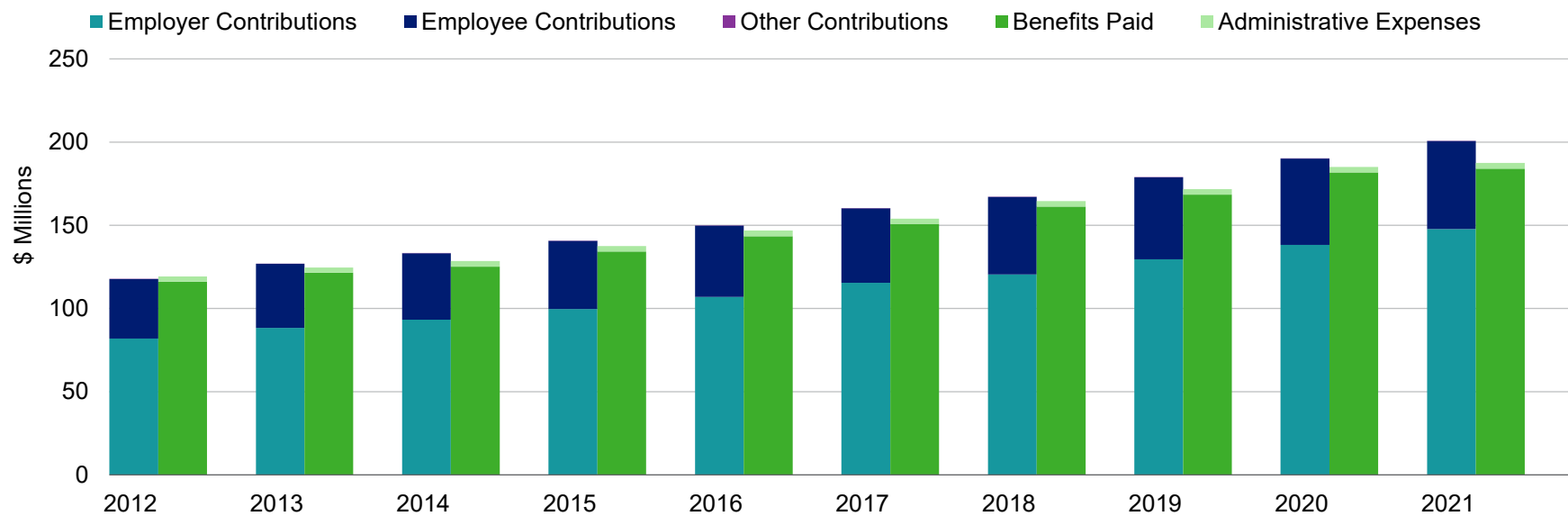
Section 2: Actuarial Valuation Results

Financial information

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of transactions for the valuation year, is presented in *Section 4, Exhibits C and D*.

Comparison of Contributions with Benefits and Expenses for Years Ended December 31, 2012 – 2021



Section 2: Actuarial Valuation Results

It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

Determination of Actuarial Value of Assets

		Year Ended		
		December 31, 2021		December 31, 2020
1	Market value of assets	\$2,109,770,999		\$1,756,138,330
2	Calculation of unrecognized return	Original Amount¹	Percent Deferred	Unrecognized Amount²
				Unrecognized Amount
(a)	Year ended December 31, 2021	\$211,787,556	80%	\$169,430,045
(b)	Year ended December 31, 2020	71,100,312	60%	42,660,186
(c)	Year ended December 31, 2019	106,954,044	40%	42,781,618
(d)	Year ended December 31, 2018	-134,459,875	20%	-26,891,975
(e)	Year ended December 31, 2017	97,658,911	0%	<u>0</u>
(f)	Total unrecognized return			<u>19,531,782</u>
3	Preliminary actuarial value: (1) - (2f)			\$227,979,874
4	Adjustment to be within 20% corridor			<u>0</u>
5	Final actuarial value of assets: (3) + (4)			\$1,881,791,125
6	Actuarial value as a percentage of market value: (5) ÷ (1)			89.2%
7	Amount deferred for future recognition: (1) - (5)			\$1,669,337,821
				89.2%
				95.1%
				\$227,979,874
				\$86,800,509

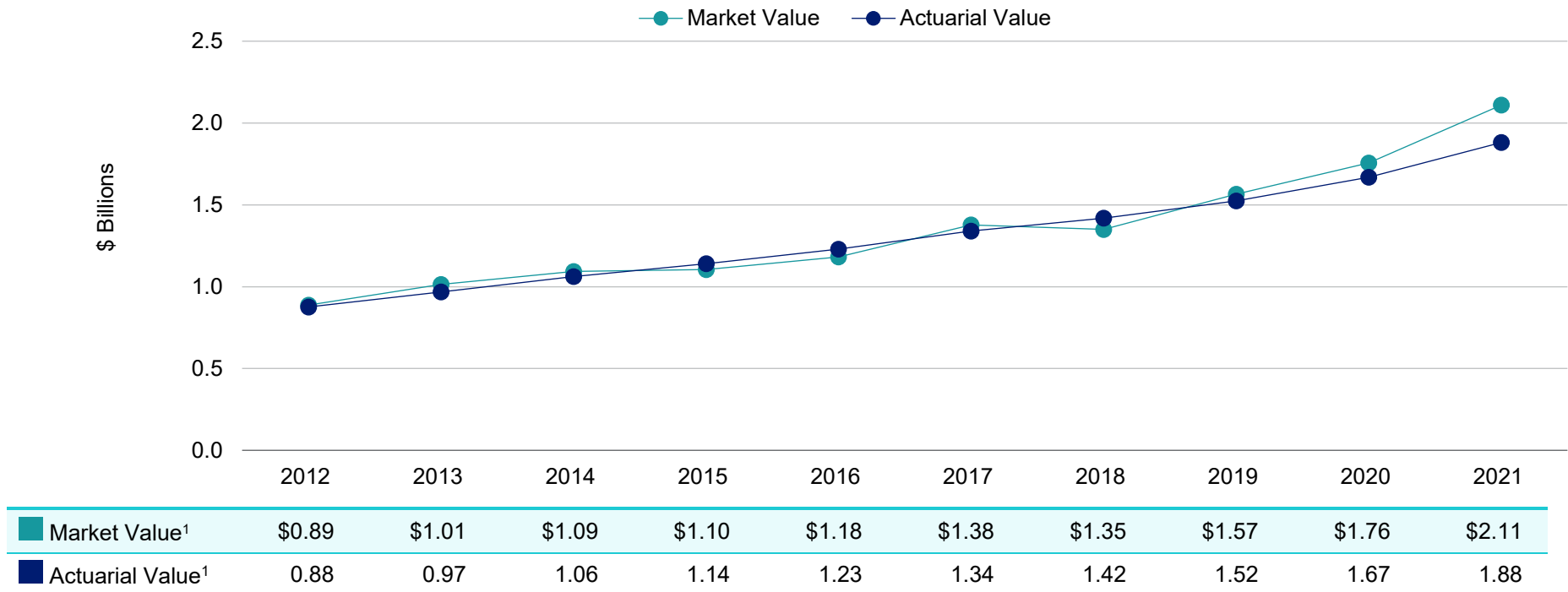
¹ Total return minus expected return on a market value basis.

² Recognition at 20% per year over five years.

Section 2: Actuarial Valuation Results

Both the actuarial value and market value of assets are representations of the Middlesex County Retirement System's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the Middlesex County Retirement System's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

Market Value of Assets vs. Actuarial Value of Assets



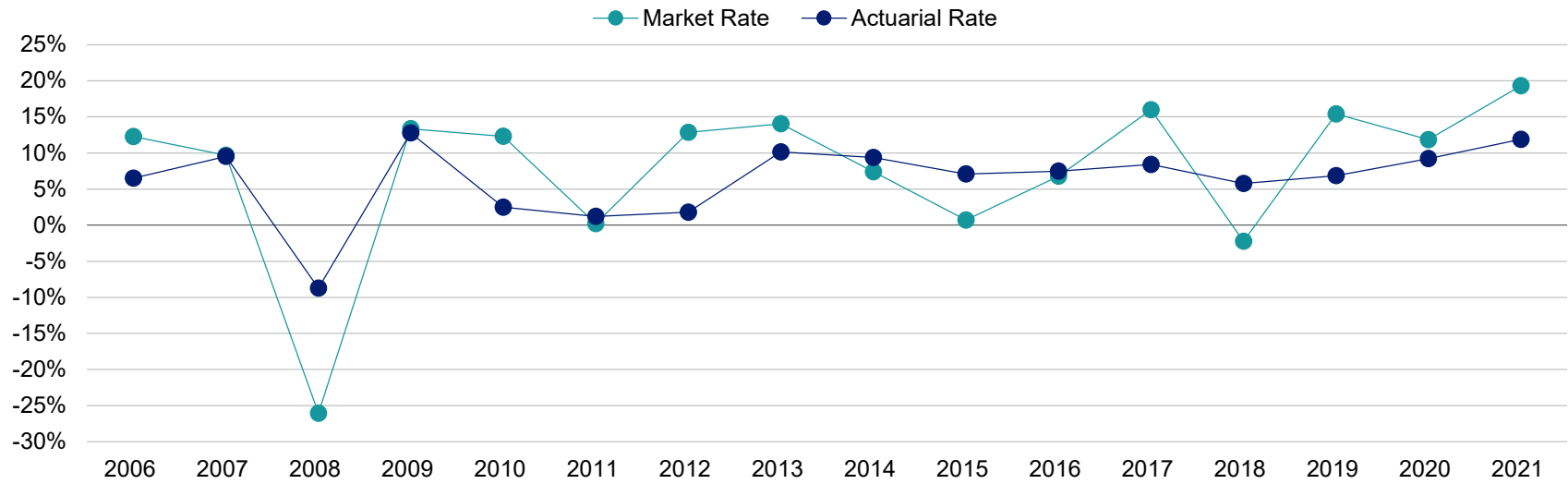
¹ In \$ billions

Section 2: Actuarial Valuation Results

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 16 years, including averages over select time periods.

As described earlier in this section, the actuarial asset valuation method gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

Market and Actuarial Rates of Return for Years Ended December 31, 2006 - 2021



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Market rate	12.26%	9.66%	-26.04%	13.34%	12.32%	0.19%	12.86%	14.05%	7.38%	0.71%	6.77%	15.99%	-2.25%	15.40%	11.83%	19.31%
Actuarial rate	6.49%	9.53%	-8.73%	12.77%	2.49%	1.22%	1.77%	10.14%	9.36%	7.10%	7.46%	8.38%	5.76%	6.87%	9.21%	11.89%
Assumed rate	8.25%	8.25%	8.25%	8.25%	8.125%	8.125%	8.00%	8.00%	7.875%	7.875%	7.75%	7.75%	7.50%	7.50%	7.30%	7.30%

Average Rates of Return	Actuarial Value	Market Value
Most recent five-year average return:	8.59%	12.32%
Most recent ten-year average return:	8.04%	10.52%
Most recent fifteen-year average return:	6.85%	8.29%
16-year average return:	6.84%	8.45%

Section 2: Actuarial Valuation Results

Actuarial experience

To calculate any actuarially determined contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), any contribution requirement will decrease from the previous year. On the other hand, any contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience. If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The net experience gain is \$105.0 million, which includes \$106.1 million from investment gains and \$1.1 million in losses from all other sources. The net experience variation from individual sources other than investments was negligible compared to the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

Actuarial Experience for Two-Year Period Ended December 31, 2021

1	Net gain from investments ¹	\$106,086,707
2	Net gain from administrative expenses	553,128
3	Net loss from other experience	<u>-1,674,946</u>
4	Net experience gain: 1 + 2 + 3	\$104,964,889

¹ Details on next page

Section 2: Actuarial Valuation Results

Investment experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Middlesex County Retirement System's investment policy. The rate of return on the market value of assets for the 2021 and 2020 plan years was 19.31% and 11.83%, respectively.

For valuation purposes, the assumed rate of return on the actuarial value of assets was 7.30% for the 2021 and 2020 plan years. The actual rate of return on an actuarial basis was 11.89% for the 2021 plan year and 9.21% for the 2020 plan year. Since the actual return for the two years was greater than the assumed return, the Middlesex County Retirement System experienced an actuarial gain during the two-year period ending December 31, 2021 with regard to its investments.

Based on this experience and future expectations, we have lowered the assumed rate of return from 7.30% to 7.15%.

Investment Experience

	Year Ended December 31, 2021		Year Ended December 31, 2020	
	Market Value	Actuarial Value	Market Value	Actuarial Value
1 Net investment income	\$340,466,229	\$199,286,864	\$185,567,914	\$140,558,901
2 Average value of assets	1,762,721,550	1,675,921,041	1,568,049,339	1,526,257,843
3 Rate of return: 1 ÷ 2	19.31%	11.89%	11.83%	9.21%
4 Assumed rate of return	7.30%	7.30%	7.30%	7.30%
5 Expected investment income: 2 x 4	128,678,673	122,342,236	114,467,602	111,416,823
6 Actuarial gain/(loss): 1 - 5	\$211,787,556	\$76,944,628	\$71,100,312	\$29,142,078

Section 2: Actuarial Valuation Results

Non-investment experience

Administrative expenses

- Administrative expenses for the years ended December 31, 2020 and 2021 totaled \$3,311,597 and \$3,403,912, respectively, as compared to the assumption of \$3,500,000 for calendar year 2020 and \$3,613,750 for calendar year 2021. This resulted in a gain of \$553,128 for the two-year period, including an adjustment for interest. Based on information on expenses provided by the Retirement System, we have increased the assumption to \$3,650,000 for calendar year 2022.

Mortality experience

- Mortality experience (more or fewer than expected deaths) yields actuarial gains or losses.
- The number of deaths for nondisabled pensioners over the past two years was 348 compared to 326.8 projected deaths. The number of deaths for disabled pensioners over the past two years was 47 compared to 25.8 projected deaths. The number of deaths for beneficiaries over the past two years was 59 compared to 57.4 projected deaths.

Other experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- the number of disability retirements (more or fewer than projected), and
- salary increases (greater or smaller than projected).

The net loss from this other experience for the two-year period ending December 31, 2021 amounted to \$1,674,946, which is 0.05% of the actuarial accrued liability.

Liability Changes Due to Demographic Experience for Two-Year Period Ended December 31, 2021

Gain due to salaries increasing less than expected for continuing actives	\$21,390,523
Gain due to mortality experience among retired members and beneficiaries	3,483,122
Miscellaneous loss, primarily from increase in liability due to new active participants with high service amounts	<u>-26,548,591</u>
Total	<u>-\$1,674,946</u>

Section 2: Actuarial Valuation Results

Actuarial assumptions

The assumption changes reflected in this report are:

- The investment return assumption was lowered from 7.30% to 7.15%.
- The mortality projection scale for future longevity improvement was updated from MP-2017 to MP-2021.
- The administrative expense assumption was increased from \$3,500,000 for calendar year 2020 to \$3,650,000 for calendar year 2022.

These changes increased the actuarial accrued liability by 0.8% and the normal cost by 2.9%.

Details on actuarial assumptions and methods are in *Section 5, Exhibit I*.

Plan provisions

There were no changes in plan provisions since the prior valuation.

A summary of plan provisions is in *Section 5, Exhibit II*.

Section 2: Actuarial Valuation Results

Development of Unfunded Actuarial Accrued Liability

	Year Ended	
	December 31, 2021	December 31, 2020
1 Unfunded actuarial accrued liability at beginning of year	\$1,648,017,952	\$1,641,847,511
2 Normal cost at beginning of year	79,596,856	77,091,386
3 Total contributions	-200,598,476	-190,123,197
4 Interest on 1, 2 & 3	<u>119,489,568</u>	<u>119,202,252</u>
5 Expected unfunded actuarial accrued liability	\$1,646,505,900	\$1,648,017,952
6 Changes due to:		
(a) Net experience gain	-\$104,964,889	--
(b) Assumptions	<u>27,166,375</u>	--
Total changes	<u>-\$77,798,514</u>	--
7 Unfunded actuarial accrued liability at end of year	\$1,568,707,386	--

Section 2: Actuarial Valuation Results

Actuarially determined contribution

The Actuarially Determined Contribution is equal to the employer normal cost payment and a payment on the unfunded actuarial accrued liability. For fiscal 2023, the Actuarially Determined Contribution has been set equal to the previously budgeted amount of \$156,350,175. The detail of the Actuarially Determined Contribution is shown below.

The funding schedule included in this report fully funds the System by fiscal 2036, one year earlier than the prior funding schedule. In fiscal 2024 through fiscal 2028, the appropriation increases 6.5% per year. Thereafter, the amortization payment on the unfunded liability will increase 4.0% per year. The prior funding schedule fully funded the System by fiscal 2037, with the appropriation increasing 6.5% per year through 2028 and then the amortization payment on the unfunded liability increasing 4.0% thereafter.

Actuarially Determined Contribution for Year Beginning January 1

	2022		2020	
	Amount	% of Projected Payroll	Amount	% of Projected Payroll
1 Total normal cost	\$78,883,633	14.57%	\$73,591,386	14.34%
2 Administrative expenses	3,650,000	0.67%	3,500,000	0.68%
3 Expected employee contributions	<u>-53,477,004</u>	<u>-9.88%</u>	<u>-50,243,061</u>	<u>-9.79%</u>
4 Employer normal cost: (1) + (2) + (3)	\$29,056,629	5.37%	\$26,848,325	5.23%
5 Actuarial accrued liability	\$3,450,498,511		\$3,165,584,276	
6 Actuarial value of assets	<u>1,881,791,125</u>		<u>1,523,736,765</u>	
7 Unfunded actuarial accrued liability: (5) - (6)	\$1,568,707,386		\$1,641,847,511	
8 Employer normal cost projected to July 1, 2022 and 2020, adjusted for timing	30,039,196	5.46%	27,765,926	5.32%
9 Projected unfunded actuarial accrued liability	1,623,820,534		1,700,719,456	
10 Payment on projected unfunded actuarial accrued liability, adjusted for timing	126,310,979	22.97%	110,081,657	21.11%
11 Actuarially determined contribution: (8) + (10)	\$156,350,175	28.43%	\$137,847,583	26.43%
12 Projected payroll as of July 1	\$549,958,073		\$521,474,124	

Notes:

Actuarially Determined Contributions are assumed to be paid on July 1 and December 31.

Actuarially Determined Contributions are set equal to the budgeted amounts determined with the prior valuation.

Section 2: Actuarial Valuation Results

Funding schedule

(1) Fiscal Year Ended June 30	(2) Employer Normal Cost	(3) Amortization of Unfunded Liability	(4) Actuarially Determined Contribution (ADC): (2) + (3)	(5) Total Unfunded Accrued Liability at Beginning of Fiscal Year	(6) Percent increase in ADC over prior year
2023	\$30,039,196	\$126,310,979	\$156,350,175	\$1,623,820,534	--
2024	31,141,771	135,371,165	166,512,936	1,606,898,100	6.50%
2025	32,284,481	145,051,796	177,336,277	1,579,223,892	6.50%
2026	33,468,776	155,394,359	188,863,135	1,539,375,730	6.50%
2027	34,696,159	166,443,080	201,139,239	1,485,786,056	6.50%
2028	35,968,186	178,245,104	214,213,290	1,416,728,655	6.50%
2029	37,286,471	187,370,157	224,656,628	1,330,304,237	4.88%
2030	38,652,685	194,864,963	233,517,648	1,228,090,337	3.94%
2031	40,068,560	202,659,562	242,728,122	1,110,674,918	3.94%
2032	41,535,884	210,765,944	252,301,828	976,655,341	3.94%
2033	43,056,520	219,196,582	262,253,102	824,516,051	3.94%
2034	44,632,388	227,964,446	272,596,834	652,619,996	3.94%
2035	46,265,481	237,083,023	283,348,504	459,199,414	3.94%
2036	47,957,866	246,566,344	294,524,210	242,345,945	3.94%
2037	49,711,681	0	49,711,681	0	-83.12%
2038	51,529,140	0	51,529,140	0	3.66%

Notes:

Actuarially determined contribution for fiscal year 2023 is set equal to the amount determined with the prior valuation.

Actuarially determined contributions are assumed to be paid in two equal installments on July 1 and December 31.

Item (2) reflects 3.25% growth in payroll and a 0.15% adjustment to total normal cost to reflect the effect of mortality improvements due to the generational mortality assumption.

Item (3) increases at 4% per year beginning in fiscal 2030.

Projected normal cost does not reflect the future impact of pension reform for new hires.

Projected unfunded actuarial accrued liability does not reflect the recognition of deferred investment gains.

Section 2: Actuarial Valuation Results

Risk

Since the actuarial valuation results are dependent on a given set of assumptions and data as of a specific date, there is a risk that emerging results may differ significantly as actual experience differs from the assumptions.

This report does not contain a detailed analysis of the potential range of future measurements, but does include a brief discussion of some risks that may affect the System. We recommend a more detailed assessment to provide the Board with a better understanding of the risks inherent in the System. This assessment may include scenario testing, sensitivity testing, stress testing and stochastic modeling.

- Investment Risk (the risk that returns will be different than expected)

The market value rate of return over the last 16 years has ranged from a low of -26.04% to a high of 19.31%.

- Longevity Risk (the risk that mortality experience will be different than expected)

The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution.

- Contribution Risk (the risk that actual contributions will be different from actuarially determined contribution)

Massachusetts General Law Chapter 32 requires payment of the actuarially determined contribution. If future experience matches current assumptions, we project the unfunded actuarial accrued liability will be paid off in 14 years.

- Demographic Risk (the risk that participant experience will be different than assumed)

Examples of this risk include:

- Actual retirements occurring earlier or later than assumed.
- More or less active participant turnover than assumed.
- Disability retirement experience different than assumed.
- Salary increases greater or less than projected.

- Actual Experience in Recent Years and Implications for the Future

Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience. Over the past ten years:

The investment gain/(loss) for a year has ranged from a loss of \$134,459,875 to a gain of \$211,787,556

The non-investment gain/(loss) for a year has ranged from a loss of \$46,443,263 to a gain of \$16,974,209

The funded percentage on the actuarial value of assets has ranged from a low of 43.7% as of January 1, 2012 to a high of 54.5% as of January 1, 2022.

Section 2: Actuarial Valuation Results

- Maturity Measures

As pension plans mature, the cash need to fulfill benefit obligations will increase over time. Therefore, cash flow projections and analysis should be performed to assure that the Plan's asset allocation is aligned to meet emerging pension liabilities.

For the prior year, benefits and administrative expenses were \$13,166,400 less than contributions received. In future years, cash may be needed from the investment portfolio to meet benefit payments.

Section 3: Unit Results

Summary of Actuarial Valuation Results

	Total
The valuation was made with respect to the following data supplied to us:	
1 Retired participants as of the valuation date (including 594 beneficiaries in pay status)	6,284
2 Participants active during the year ended December 31, 2021	9,432
3 Inactive participants entitled to a return of their employee contributions	3,581
4 Inactive participants with a vested right to a deferred or immediate benefit	403

The actuarial factors as of January 1, 2022 are as follows:

1 Normal cost		\$78,883,633
2 Administrative expenses		3,650,000
3 Expected employee contributions		<u>-53,477,004</u>
4 Employer normal cost: (1) + (2) + (3)		\$29,056,629
5 Actuarial accrued liability		3,450,498,511
Retired participants and beneficiaries	\$1,902,403,168	
Active participants	1,474,382,904	
Inactive participants	<u>73,712,439</u>	
6 Actuarial value of assets		1,881,791,125
7 Unfunded actuarial accrued liability: (5) – (6)		1,568,707,386
8 Reallocated unfunded actuarial accrued liability		<u>0</u>
9 Total unfunded actuarial accrued liability: (7) + (8)		\$1,568,707,386

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1 Projected employer normal cost	\$30,039,196	5.46%
2 Projected unfunded actuarial accrued liability	1,623,820,534	
3 Payment on projected unfunded actuarial accrued liability	<u>126,310,979</u>	
4 Total FY23 Actuarially Determined Contribution: (1) + (3)	\$156,350,175	28.43%
5 Total FY23 Actuarially Determined Contribution, payable on July 1	153,620,238	27.93%
6 Projected payroll	549,958,073	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1 Projected employer normal cost	\$31,141,771	\$32,284,481
2 Payment on projected unfunded actuarial accrued liability	<u>135,371,165</u>	<u>145,051,796</u>
3 Total Actuarially Determined Contribution: (1) + (2)	\$166,512,936	\$177,336,277
4 Total Actuarially Determined Contribution, payable on July 1	163,662,787	174,300,864

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Middlesex County Retirement Board

1

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	16
2	Participants active during the year ended December 31, 2021	16
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$157,968
2	Administrative expenses		7,309
3	Expected employee contributions		-140,015
4	Employer normal cost: (1) + (2) + (3)		\$25,262
5	Actuarial accrued liability		11,489,985
	Retired participants and beneficiaries	\$5,613,234	
	Active participants	5,876,751	
	Inactive participants	0	
6	Actuarial value of assets		6,488,085
7	Unfunded actuarial accrued liability: (5) – (6)		5,001,900
8	Reallocated unfunded actuarial accrued liability		62,280
9	Total unfunded actuarial accrued liability: (7) + (8)		\$5,064,180

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	1.84%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	32.99%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	32.41%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$28,364
2	Payment on projected unfunded actuarial accrued liability	465,084
3	Total Actuarially Determined Contribution: (1) + (2)	\$493,448
4	Total Actuarially Determined Contribution, payable on July 1	485,002

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Middlesex County

100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 32 beneficiaries in pay status)	83
2	Participants active during the year ended December 31, 2021	0
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$0
2	Administrative expenses		0
3	Expected employee contributions		0
4	Employer normal cost: (1) + (2) + (3)		\$0
5	Actuarial accrued liability		11,735,340
	Retired participants and beneficiaries	\$11,735,340	
	Active participants	0	
	Inactive participants	0	
6	Actuarial value of assets		0
7	Unfunded actuarial accrued liability: (5) – (6)		11,735,340
8	Reallocated unfunded actuarial accrued liability		-11,735,340
9	Total unfunded actuarial accrued liability: (7) + (8)		\$0

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$0	0.00%
2	Projected unfunded actuarial accrued liability	0	
3	Payment on projected unfunded actuarial accrued liability	0	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$0	0.00%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	0	0.00%
6	Projected payroll	0	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$0	\$0
2	Payment on projected unfunded actuarial accrued liability	0	0
3	Total Actuarially Determined Contribution: (1) + (2)	\$0	\$0
4	Total Actuarially Determined Contribution, payable on July 1	0	0

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Middlesex Hospital

200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 4 beneficiaries in pay status)	55
2	Participants active during the year ended December 31, 2021	0
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$0
2	Administrative expenses		0
3	Expected employee contributions		0
4	Employer normal cost: (1) + (2) + (3)		\$0
5	Actuarial accrued liability		6,866,672
	Retired participants and beneficiaries	\$6,866,672	
	Active participants	0	
	Inactive participants	0	
6	Actuarial value of assets		0
7	Unfunded actuarial accrued liability: (5) – (6)		6,866,672
8	Reallocated unfunded actuarial accrued liability		-6,866,672
9	Total unfunded actuarial accrued liability: (7) + (8)		\$0

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$0	0.00%
2	Projected unfunded actuarial accrued liability	0	
3	Payment on projected unfunded actuarial accrued liability	0	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$0	0.00%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	0	0.00%
6	Projected payroll	0	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$0	\$0
2	Payment on projected unfunded actuarial accrued liability	0	0
3	Total Actuarially Determined Contribution: (1) + (2)	\$0	\$0
4	Total Actuarially Determined Contribution, payable on July 1	0	0

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Acton

300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 25 beneficiaries in pay status)	192
2	Participants active during the year ended December 31, 2021	194
3	Inactive participants entitled to a return of their employee contributions	26
4	Inactive participants with a vested right to a deferred or immediate benefit	8

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,317,525
2	Administrative expenses		107,233
3	Expected employee contributions		<u>-1,559,715</u>
4	Employer normal cost: (1) + (2) + (3)		\$865,043
5	Actuarial accrued liability		115,835,005
	Retired participants and beneficiaries	\$63,324,468	
	Active participants	51,218,298	
	Inactive participants	<u>1,292,239</u>	
6	Actuarial value of assets		64,461,819
7	Unfunded actuarial accrued liability: (5) – (6)		51,373,186
8	Reallocated unfunded actuarial accrued liability		<u>627,864</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$52,001,050

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$894,295	5.65%
2	Projected unfunded actuarial accrued liability	53,827,995	
3	Payment on projected unfunded actuarial accrued liability	<u>4,330,227</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$5,224,522	33.03%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	5,133,300	32.46%
6	Projected payroll	15,816,409	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$927,070	\$961,037
2	Payment on projected unfunded actuarial accrued liability	<u>4,474,716</u>	<u>4,794,711</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$5,401,786	\$5,755,748
4	Total Actuarially Determined Contribution, payable on July 1	5,309,325	5,657,229

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Ashby

400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	10
2	Participants active during the year ended December 31, 2021	17
3	Inactive participants entitled to a return of their employee contributions	9
4	Inactive participants with a vested right to a deferred or immediate benefit	3

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$185,513
2	Administrative expenses		8,584
3	Expected employee contributions		-104,535
4	Employer normal cost: (1) + (2) + (3)		\$89,562
5	Actuarial accrued liability		6,132,568
	Retired participants and beneficiaries	\$2,586,294	
	Active participants	3,032,281	
	Inactive participants	<u>513,993</u>	
6	Actuarial value of assets		4,267,894
7	Unfunded actuarial accrued liability: (5) – (6)		1,864,674
8	Reallocated unfunded actuarial accrued liability		<u>33,241</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$1,897,915

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	8.75%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	24.44%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	24.01%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$99,321
2	Payment on projected unfunded actuarial accrued liability	<u>174,253</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$273,574
4	Total Actuarially Determined Contribution, payable on July 1	268,891

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Ashland

500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 14 beneficiaries in pay status)	149
2	Participants active during the year ended December 31, 2021	318
3	Inactive participants entitled to a return of their employee contributions	150
4	Inactive participants with a vested right to a deferred or immediate benefit	18

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,339,683
2	Administrative expenses		108,259
3	Expected employee contributions		<u>-1,581,453</u>
4	Employer normal cost: (1) + (2) + (3)		\$866,489
5	Actuarial accrued liability		87,689,103
	Retired participants and beneficiaries	\$44,617,072	
	Active participants	40,315,323	
	Inactive participants	<u>2,756,708</u>	
6	Actuarial value of assets		52,765,425
7	Unfunded actuarial accrued liability: (5) – (6)		34,923,678
8	Reallocated unfunded actuarial accrued liability		<u>475,304</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$35,398,982

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$895,790	5.47%
2	Projected unfunded actuarial accrued liability	36,642,649	
3	Payment on projected unfunded actuarial accrued liability	<u>2,964,624</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$3,860,414	23.58%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	3,793,010	23.17%
6	Projected payroll	16,371,734	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$928,649	\$962,704
2	Payment on projected unfunded actuarial accrued liability	<u>3,044,602</u>	<u>3,262,327</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$3,973,251	\$4,225,031
4	Total Actuarially Determined Contribution, payable on July 1	3,905,242	4,152,712

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Ayer

600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 13 beneficiaries in pay status)	82
2	Participants active during the year ended December 31, 2021	99
3	Inactive participants entitled to a return of their employee contributions	9
4	Inactive participants with a vested right to a deferred or immediate benefit	7

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$1,147,958
2	Administrative expenses		53,117
3	Expected employee contributions		<u>-770,282</u>
4	Employer normal cost: (1) + (2) + (3)		\$430,793
5	Actuarial accrued liability		47,569,146
	Retired participants and beneficiaries	\$26,203,849	
	Active participants	20,528,818	
	Inactive participants	<u>836,479</u>	
6	Actuarial value of assets		28,370,398
7	Unfunded actuarial accrued liability: (5) – (6)		19,198,748
8	Reallocated unfunded actuarial accrued liability		<u>257,840</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$19,456,588

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$445,361	5.74%
2	Projected unfunded actuarial accrued liability	20,140,153	
3	Payment on projected unfunded actuarial accrued liability	<u>1,649,591</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,094,952	27.02%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,058,373	26.55%
6	Projected payroll	<u>7,753,396</u>	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$461,673	\$478,578
2	Payment on projected unfunded actuarial accrued liability	<u>1,671,640</u>	<u>1,791,182</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$2,133,313	\$2,269,760
4	Total Actuarially Determined Contribution, payable on July 1	2,096,798	2,230,909

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Bedford

700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 15 beneficiaries in pay status)	217
2	Participants active during the year ended December 31, 2021	365
3	Inactive participants entitled to a return of their employee contributions	214
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,804,512
2	Administrative expenses		129,767
3	Expected employee contributions		<u>-2,007,624</u>
4	Employer normal cost: (1) + (2) + (3)		\$926,655
5	Actuarial accrued liability		126,827,959
	Retired participants and beneficiaries	\$67,796,625	
	Active participants	56,527,308	
	Inactive participants	<u>2,504,026</u>	
6	Actuarial value of assets		74,516,122
7	Unfunded actuarial accrued liability: (5) – (6)		52,311,837
8	Reallocated unfunded actuarial accrued liability		<u>687,449</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$52,999,286

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$957,990	4.62%
2	Projected unfunded actuarial accrued liability	54,861,302	
3	Payment on projected unfunded actuarial accrued liability	<u>4,424,334</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$5,382,324	25.97%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	5,288,347	25.52%
6	Projected payroll	20,724,558	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$993,615	\$1,030,551
2	Payment on projected unfunded actuarial accrued liability	<u>4,559,640</u>	<u>4,885,708</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$5,553,255	\$5,916,259
4	Total Actuarially Determined Contribution, payable on July 1	5,458,202	5,814,992

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Billerica

800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 57 beneficiaries in pay status)	477
2	Participants active during the year ended December 31, 2021	679
3	Inactive participants entitled to a return of their employee contributions	158
4	Inactive participants with a vested right to a deferred or immediate benefit	16

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$5,962,764
2	Administrative expenses		275,901
3	Expected employee contributions		-3,919,219
4	Employer normal cost: (1) + (2) + (3)		\$2,319,446
5	Actuarial accrued liability		294,109,847
	Retired participants and beneficiaries	\$163,387,844	
	Active participants	126,917,997	
	Inactive participants	<u>3,804,006</u>	
6	Actuarial value of assets		142,660,612
7	Unfunded actuarial accrued liability: (5) – (6)		151,449,235
8	Reallocated unfunded actuarial accrued liability		<u>1,594,172</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$153,043,407

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$2,397,882	5.91%
2	Projected unfunded actuarial accrued liability	158,420,254	
3	Payment on projected unfunded actuarial accrued liability	<u>12,344,525</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$14,742,407	36.35%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	14,484,999	35.71%
6	Projected payroll	40,558,314	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$2,485,352	\$2,576,006
2	Payment on projected unfunded actuarial accrued liability	<u>13,204,923</u>	<u>14,149,226</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$15,690,275	\$16,725,232
4	Total Actuarially Determined Contribution, payable on July 1	15,421,709	16,438,951

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Boxborough

900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 4 beneficiaries in pay status)	47
2	Participants active during the year ended December 31, 2021	53
3	Inactive participants entitled to a return of their employee contributions	10
4	Inactive participants with a vested right to a deferred or immediate benefit	2

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$583,376
2	Administrative expenses		26,993
3	Expected employee contributions		-367,316
4	Employer normal cost: (1) + (2) + (3)		\$243,053
5	Actuarial accrued liability		24,258,215
	Retired participants and beneficiaries	\$14,261,417	
	Active participants	9,738,267	
	Inactive participants	<u>258,531</u>	
6	Actuarial value of assets		12,675,624
7	Unfunded actuarial accrued liability: (5) – (6)		11,582,591
8	Reallocated unfunded actuarial accrued liability		<u>131,488</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$11,714,079

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$251,272	6.71%
2	Projected unfunded actuarial accrued liability	12,125,628	
3	Payment on projected unfunded actuarial accrued liability	<u>989,143</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,240,415	33.14%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,218,757	32.56%
6	Projected payroll	<u>3,743,469</u>	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$260,372	\$269,800
2	Payment on projected unfunded actuarial accrued liability	<u>1,006,788</u>	<u>1,078,785</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,267,160	\$1,348,585
4	Total Actuarially Determined Contribution, payable on July 1	1,245,470	1,325,502

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Burlington

1000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 34 beneficiaries in pay status)	396
2	Participants active during the year ended December 31, 2021	588
3	Inactive participants entitled to a return of their employee contributions	234
4	Inactive participants with a vested right to a deferred or immediate benefit	18

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$5,548,606
2	Administrative expenses		256,738
3	Expected employee contributions		-3,882,223
4	Employer normal cost: (1) + (2) + (3)		\$1,923,121
5	Actuarial accrued liability		263,921,941
	Retired participants and beneficiaries	\$145,856,456	
	Active participants	114,683,047	
	Inactive participants	<u>3,382,438</u>	
6	Actuarial value of assets		131,237,460
7	Unfunded actuarial accrued liability: (5) – (6)		132,684,481
8	Reallocated unfunded actuarial accrued liability		<u>1,430,544</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$134,115,025

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,988,152	5.04%
2	Projected unfunded actuarial accrued liability	138,826,867	
3	Payment on projected unfunded actuarial accrued liability	<u>10,778,188</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$12,766,340	32.35%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	12,543,435	31.79%
6	Projected payroll	39,458,454	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$2,061,651	\$2,137,842
2	Payment on projected unfunded actuarial accrued liability	<u>11,575,250</u>	<u>12,403,016</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$13,636,901	\$14,540,858
4	Total Actuarially Determined Contribution, payable on July 1	13,403,482	14,291,966

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Carlisle

1100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 3 beneficiaries in pay status)	55
2	Participants active during the year ended December 31, 2021	112
3	Inactive participants entitled to a return of their employee contributions	38
4	Inactive participants with a vested right to a deferred or immediate benefit	4

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$963,269
2	Administrative expenses		44,571
3	Expected employee contributions		<u>-622,921</u>
4	Employer normal cost: (1) + (2) + (3)		\$384,919
5	Actuarial accrued liability		35,059,172
	Retired participants and beneficiaries	\$16,891,503	
	Active participants	17,361,625	
	Inactive participants	<u>806,044</u>	
6	Actuarial value of assets		23,549,458
7	Unfunded actuarial accrued liability: (5) – (6)		11,509,714
8	Reallocated unfunded actuarial accrued liability		<u>190,032</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$11,699,746

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$397,935	6.11%
2	Projected unfunded actuarial accrued liability	12,110,791	
3	Payment on projected unfunded actuarial accrued liability	<u>889,890</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,287,825	19.77%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,265,339	19.42%
6	Projected payroll	6,514,456	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$412,410	\$427,409
2	Payment on projected unfunded actuarial accrued liability	<u>1,014,254</u>	<u>1,086,785</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,426,664	\$1,514,194
4	Total Actuarially Determined Contribution, payable on July 1	1,402,244	1,488,276

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Chelmsford

1200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 43 beneficiaries in pay status)	449
2	Participants active during the year ended December 31, 2021	565
3	Inactive participants entitled to a return of their employee contributions	192
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$4,648,252
2	Administrative expenses		215,078
3	Expected employee contributions		-3,075,813
4	Employer normal cost: (1) + (2) + (3)		\$1,787,517
5	Actuarial accrued liability		206,036,129
	Retired participants and beneficiaries	\$116,125,679	
	Active participants	87,157,303	
	Inactive participants	<u>2,753,147</u>	
6	Actuarial value of assets		95,816,812
7	Unfunded actuarial accrued liability: (5) – (6)		110,219,317
8	Reallocated unfunded actuarial accrued liability		<u>1,116,784</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$111,336,101

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$1,847,963	5.81%
2	Projected unfunded actuarial accrued liability	115,247,655	
3	Payment on projected unfunded actuarial accrued liability	<u>8,877,439</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$10,725,402	33.75%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	10,538,132	33.16%
6	Projected payroll	31,780,167	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$1,915,464	\$1,985,413
2	Payment on projected unfunded actuarial accrued liability	<u>9,615,459</u>	<u>10,303,077</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$11,530,923	\$12,288,490
4	Total Actuarially Determined Contribution, payable on July 1	11,333,552	12,078,152

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Dracut

1300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 20 beneficiaries in pay status)	269
2	Participants active during the year ended December 31, 2021	323
3	Inactive participants entitled to a return of their employee contributions	78
4	Inactive participants with a vested right to a deferred or immediate benefit	14

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,827,257
2	Administrative expenses		130,819
3	Expected employee contributions		-1,779,118
4	Employer normal cost: (1) + (2) + (3)		\$1,178,958
5	Actuarial accrued liability		137,250,049
	Retired participants and beneficiaries	\$84,532,576	
	Active participants	50,729,076	
	Inactive participants	<u>1,988,397</u>	
6	Actuarial value of assets		67,897,299
7	Unfunded actuarial accrued liability: (5) – (6)		69,352,750
8	Reallocated unfunded actuarial accrued liability		<u>743,941</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$70,096,691

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,218,825	6.65%
2	Projected unfunded actuarial accrued liability	72,559,387	
3	Payment on projected unfunded actuarial accrued liability	<u>5,452,044</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$6,670,869	36.41%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	6,554,393	35.77%
6	Projected payroll	18,322,787	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$1,262,964	\$1,308,691
2	Payment on projected unfunded actuarial accrued liability	<u>6,066,016</u>	<u>6,499,808</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$7,328,980	\$7,808,499
4	Total Actuarially Determined Contribution, payable on July 1	7,203,532	7,674,843

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Dunstable

1400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	10
2	Participants active during the year ended December 31, 2021	23
3	Inactive participants entitled to a return of their employee contributions	2
4	Inactive participants with a vested right to a deferred or immediate benefit	2

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$251,088
2	Administrative expenses		11,618
3	Expected employee contributions		-146,891
4	Employer normal cost: (1) + (2) + (3)		\$115,815
5	Actuarial accrued liability		7,881,754
	Retired participants and beneficiaries	\$2,614,533	
	Active participants	4,807,330	
	Inactive participants	<u>459,891</u>	
6	Actuarial value of assets		5,013,794
7	Unfunded actuarial accrued liability: (5) – (6)		2,867,960
8	Reallocated unfunded actuarial accrued liability		<u>42,722</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$2,910,682

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$119,731	7.89%
2	Projected unfunded actuarial accrued liability	3,012,943	
3	Payment on projected unfunded actuarial accrued liability	<u>276,624</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$396,355	26.11%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	389,434	25.65%
6	Projected payroll	1,518,291	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$124,025	\$128,471
2	Payment on projected unfunded actuarial accrued liability	<u>247,427</u>	<u>265,121</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$371,452	\$393,592
4	Total Actuarially Determined Contribution, payable on July 1	365,094	386,855

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Groton

1500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 5 beneficiaries in pay status)	68
2	Participants active during the year ended December 31, 2021	110
3	Inactive participants entitled to a return of their employee contributions	16
4	Inactive participants with a vested right to a deferred or immediate benefit	6

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$1,339,015
2	Administrative expenses		61,957
3	Expected employee contributions		-870,121
4	Employer normal cost: (1) + (2) + (3)		\$530,851
5	Actuarial accrued liability		54,076,308
	Retired participants and beneficiaries	\$26,771,228	
	Active participants	25,683,386	
	Inactive participants	<u>1,621,694</u>	
6	Actuarial value of assets		31,364,943
7	Unfunded actuarial accrued liability: (5) – (6)		22,711,365
8	Reallocated unfunded actuarial accrued liability		<u>293,111</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$23,004,476

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$548,802	6.28%
2	Projected unfunded actuarial accrued liability	23,812,689	
3	Payment on projected unfunded actuarial accrued liability	<u>2,035,226</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,584,028	29.57%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,538,910	29.06%
6	Projected payroll	8,737,332	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$568,782	\$589,484
2	Payment on projected unfunded actuarial accrued liability	<u>1,968,935</u>	<u>2,109,737</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$2,537,717	\$2,699,221
4	Total Actuarially Determined Contribution, payable on July 1	2,494,280	2,653,019

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Holliston

1600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 11 beneficiaries in pay status)	131
2	Participants active during the year ended December 31, 2021	280
3	Inactive participants entitled to a return of their employee contributions	215
4	Inactive participants with a vested right to a deferred or immediate benefit	19

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$1,757,275
2	Administrative expenses		81,310
3	Expected employee contributions		<u>-1,177,654</u>
4	Employer normal cost: (1) + (2) + (3)		\$660,931
5	Actuarial accrued liability		71,572,466
	Retired participants and beneficiaries	\$35,485,423	
	Active participants	32,754,798	
	Inactive participants	<u>3,332,245</u>	
6	Actuarial value of assets		47,907,491
7	Unfunded actuarial accrued liability: (5) – (6)		23,664,975
8	Reallocated unfunded actuarial accrued liability		<u>387,946</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$24,052,921

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$683,281	5.53%
2	Projected unfunded actuarial accrued liability	24,897,968	
3	Payment on projected unfunded actuarial accrued liability	<u>2,120,527</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,803,808	22.70%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,754,852	22.30%
6	Projected payroll	12,354,141	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$708,301	\$734,230
2	Payment on projected unfunded actuarial accrued liability	<u>2,059,332</u>	<u>2,206,599</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$2,767,633	\$2,940,829
4	Total Actuarially Determined Contribution, payable on July 1	2,720,260	2,890,492

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Hopkinton

1700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 8 beneficiaries in pay status)	140
2	Participants active during the year ended December 31, 2021	350
3	Inactive participants entitled to a return of their employee contributions	126
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,761,242
2	Administrative expenses		127,765
3	Expected employee contributions		<u>-1,908,074</u>
4	Employer normal cost: (1) + (2) + (3)		\$980,933
5	Actuarial accrued liability		87,264,322
	Retired participants and beneficiaries	\$43,045,729	
	Active participants	41,732,813	
	Inactive participants	<u>2,485,780</u>	
6	Actuarial value of assets		63,170,716
7	Unfunded actuarial accrued liability: (5) – (6)		24,093,606
8	Reallocated unfunded actuarial accrued liability		<u>473,001</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$24,566,607

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,014,104	5.16%
2	Projected unfunded actuarial accrued liability	25,429,702	
3	Payment on projected unfunded actuarial accrued liability	<u>2,128,224</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$3,142,328	16.00%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	3,087,462	15.72%
6	Projected payroll	19,635,347	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$1,051,483	\$1,090,228
2	Payment on projected unfunded actuarial accrued liability	<u>2,106,648</u>	<u>2,257,298</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$3,158,131	\$3,347,526
4	Total Actuarially Determined Contribution, payable on July 1	3,104,074	3,290,227

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Hudson

1800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 21 beneficiaries in pay status)	245
2	Participants active during the year ended December 31, 2021	428
3	Inactive participants entitled to a return of their employee contributions	232
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$3,627,608
2	Administrative expenses		167,852
3	Expected employee contributions		<u>-2,361,254</u>
4	Employer normal cost: (1) + (2) + (3)		\$1,434,206
5	Actuarial accrued liability		151,823,015
	Retired participants and beneficiaries	\$86,961,255	
	Active participants	61,992,210	
	Inactive participants	<u>2,869,550</u>	
6	Actuarial value of assets		82,905,083
7	Unfunded actuarial accrued liability: (5) – (6)		68,917,932
8	Reallocated unfunded actuarial accrued liability		<u>822,931</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$69,740,863

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,482,705	6.12%
2	Projected unfunded actuarial accrued liability	72,191,058	
3	Payment on projected unfunded actuarial accrued liability	<u>5,432,366</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$6,915,071	28.53%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	6,794,331	28.03%
6	Projected payroll	24,237,317	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$1,536,701	\$1,592,649
2	Payment on projected unfunded actuarial accrued liability	<u>6,034,514</u>	<u>6,466,053</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$7,571,215	\$8,058,702
4	Total Actuarially Determined Contribution, payable on July 1	7,441,621	7,920,764

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Lincoln

1900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 12 beneficiaries in pay status)	119
2	Participants active during the year ended December 31, 2021	204
3	Inactive participants entitled to a return of their employee contributions	112
4	Inactive participants with a vested right to a deferred or immediate benefit	7

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$1,632,449
2	Administrative expenses		75,535
3	Expected employee contributions		<u>-1,174,465</u>
4	Employer normal cost: (1) + (2) + (3)		\$533,519
5	Actuarial accrued liability		68,174,516
	Retired participants and beneficiaries	\$35,041,319	
	Active participants	31,569,374	
	Inactive participants	<u>1,563,823</u>	
6	Actuarial value of assets		39,313,003
7	Unfunded actuarial accrued liability: (5) – (6)		28,861,513
8	Reallocated unfunded actuarial accrued liability		<u>369,528</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$29,231,041

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$551,560	4.57%
2	Projected unfunded actuarial accrued liability	30,258,011	
3	Payment on projected unfunded actuarial accrued liability	<u>2,251,845</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,803,405	23.24%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,754,456	22.84%
6	Projected payroll	12,061,893	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$572,100	\$593,396
2	Payment on projected unfunded actuarial accrued liability	<u>2,531,518</u>	<u>2,712,551</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$3,103,618	\$3,305,947
4	Total Actuarially Determined Contribution, payable on July 1	3,050,494	3,249,360

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Littleton

2000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 10 beneficiaries in pay status)	128
2	Participants active during the year ended December 31, 2021	248
3	Inactive participants entitled to a return of their employee contributions	102
4	Inactive participants with a vested right to a deferred or immediate benefit	13

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,279,031
2	Administrative expenses		105,452
3	Expected employee contributions		<u>-1,562,536</u>
4	Employer normal cost: (1) + (2) + (3)		\$821,947
5	Actuarial accrued liability		81,260,180
	Retired participants and beneficiaries	\$41,293,660	
	Active participants	36,610,677	
	Inactive participants	<u>3,355,843</u>	
6	Actuarial value of assets		55,262,346
7	Unfunded actuarial accrued liability: (5) – (6)		25,997,834
8	Reallocated unfunded actuarial accrued liability		<u>440,457</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$26,438,291

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$849,742	5.37%
2	Projected unfunded actuarial accrued liability	27,367,143	
3	Payment on projected unfunded actuarial accrued liability	<u>2,101,834</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,951,576	18.66%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,900,040	18.33%
6	Projected payroll	15,820,140	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$881,007	\$913,413
2	Payment on projected unfunded actuarial accrued liability	<u>2,283,876</u>	<u>2,447,200</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$3,164,883	\$3,360,613
4	Total Actuarially Determined Contribution, payable on July 1	3,110,711	3,303,090

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of North Reading

2100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 25 beneficiaries in pay status)	195
2	Participants active during the year ended December 31, 2021	249
3	Inactive participants entitled to a return of their employee contributions	53
4	Inactive participants with a vested right to a deferred or immediate benefit	8

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,178,005
2	Administrative expenses		100,778
3	Expected employee contributions		<u>-1,448,121</u>
4	Employer normal cost: (1) + (2) + (3)		\$830,662
5	Actuarial accrued liability		105,868,788
	Retired participants and beneficiaries	\$57,146,947	
	Active participants	47,466,484	
	Inactive participants	<u>1,255,357</u>	
6	Actuarial value of assets		55,354,945
7	Unfunded actuarial accrued liability: (5) – (6)		50,513,843
8	Reallocated unfunded actuarial accrued liability		<u>573,844</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$51,087,687

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$858,751	5.74%
2	Projected unfunded actuarial accrued liability	52,882,543	
3	Payment on projected unfunded actuarial accrued liability	<u>4,082,060</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$4,940,811	33.03%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	4,854,543	32.46%
6	Projected payroll	14,956,480	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$890,148	\$922,684
2	Payment on projected unfunded actuarial accrued liability	<u>4,411,390</u>	<u>4,726,857</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$5,301,538	\$5,649,541
4	Total Actuarially Determined Contribution, payable on July 1	5,210,793	5,552,840

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Pepperell

2200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 5 beneficiaries in pay status)	68
2	Participants active during the year ended December 31, 2021	79
3	Inactive participants entitled to a return of their employee contributions	16
4	Inactive participants with a vested right to a deferred or immediate benefit	5

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$905,950
2	Administrative expenses		41,919
3	Expected employee contributions		-577,911
4	Employer normal cost: (1) + (2) + (3)		\$369,958
5	Actuarial accrued liability		38,853,450
	Retired participants and beneficiaries	\$23,236,869	
	Active participants	14,405,650	
	Inactive participants	<u>1,210,931</u>	
6	Actuarial value of assets		21,172,254
7	Unfunded actuarial accrued liability: (5) – (6)		17,681,196
8	Reallocated unfunded actuarial accrued liability		<u>210,599</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$17,891,795

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$382,468	6.58%
2	Projected unfunded actuarial accrued liability	18,520,385	
3	Payment on projected unfunded actuarial accrued liability	<u>1,428,656</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,811,124	31.17%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,779,501	30.63%
6	Projected payroll	5,810,405	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$396,349	\$410,730
2	Payment on projected unfunded actuarial accrued liability	<u>1,545,030</u>	<u>1,655,518</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,941,379	\$2,066,248
4	Total Actuarially Determined Contribution, payable on July 1	1,908,149	2,030,881

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Sherborn

2300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	53
2	Participants active during the year ended December 31, 2021	80
3	Inactive participants entitled to a return of their employee contributions	46
4	Inactive participants with a vested right to a deferred or immediate benefit	9

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$764,523
2	Administrative expenses		35,375
3	Expected employee contributions		-479,314
4	Employer normal cost: (1) + (2) + (3)		\$320,584
5	Actuarial accrued liability		26,827,024
	Retired participants and beneficiaries	\$15,192,160	
	Active participants	10,205,043	
	Inactive participants	<u>1,429,821</u>	
6	Actuarial value of assets		16,418,823
7	Unfunded actuarial accrued liability: (5) – (6)		10,408,201
8	Reallocated unfunded actuarial accrued liability		<u>145,411</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$10,553,612

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$331,425	6.76%
2	Projected unfunded actuarial accrued liability	10,924,390	
3	Payment on projected unfunded actuarial accrued liability	<u>801,259</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,132,684	23.09%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,112,907	22.69%
6	Projected payroll	4,905,037	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$343,420	\$355,847
2	Payment on projected unfunded actuarial accrued liability	<u>915,025</u>	<u>980,460</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,258,445	\$1,336,307
4	Total Actuarially Determined Contribution, payable on July 1	1,236,905	1,313,434

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Shirley

2400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 8 beneficiaries in pay status)	45
2	Participants active during the year ended December 31, 2021	33
3	Inactive participants entitled to a return of their employee contributions	22
4	Inactive participants with a vested right to a deferred or immediate benefit	3

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$368,988
2	Administrative expenses		17,073
3	Expected employee contributions		-202,336
4	Employer normal cost: (1) + (2) + (3)		\$183,725
5	Actuarial accrued liability		18,065,413
	Retired participants and beneficiaries	\$12,776,305	
	Active participants	4,690,410	
	Inactive participants	<u>598,698</u>	
6	Actuarial value of assets		8,546,203
7	Unfunded actuarial accrued liability: (5) – (6)		9,519,210
8	Reallocated unfunded actuarial accrued liability		<u>97,921</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$9,617,131

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$189,938	9.20%
2	Projected unfunded actuarial accrued liability	9,955,008	
3	Payment on projected unfunded actuarial accrued liability	<u>691,760</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$881,698	42.70%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	866,303	41.96%
6	Projected payroll	2,064,707	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$196,702	\$203,705
2	Payment on projected unfunded actuarial accrued liability	<u>837,236</u>	<u>897,109</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,033,938	\$1,100,814
4	Total Actuarially Determined Contribution, payable on July 1	1,016,240	1,081,972

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Stow

2500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 3 beneficiaries in pay status)	46
2	Participants active during the year ended December 31, 2021	58
3	Inactive participants entitled to a return of their employee contributions	5
4	Inactive participants with a vested right to a deferred or immediate benefit	1

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$580,909
2	Administrative expenses		26,879
3	Expected employee contributions		-399,603
4	Employer normal cost: (1) + (2) + (3)		\$208,185
5	Actuarial accrued liability		27,246,694
	Retired participants and beneficiaries	\$16,940,593	
	Active participants	10,177,119	
	Inactive participants	<u>128,982</u>	
6	Actuarial value of assets		14,349,305
7	Unfunded actuarial accrued liability: (5) – (6)		12,897,389
8	Reallocated unfunded actuarial accrued liability		<u>147,686</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$13,045,075

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$215,225	5.32%
2	Projected unfunded actuarial accrued liability	13,503,386	
3	Payment on projected unfunded actuarial accrued liability	<u>953,113</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,168,338	28.86%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,147,938	28.35%
6	Projected payroll	4,048,883	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$223,150	\$231,364
2	Payment on projected unfunded actuarial accrued liability	<u>1,134,351</u>	<u>1,215,470</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,357,501	\$1,446,834
4	Total Actuarially Determined Contribution, payable on July 1	1,334,265	1,422,069

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Sudbury

2600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 18 beneficiaries in pay status)	231
2	Participants active during the year ended December 31, 2021	325
3	Inactive participants entitled to a return of their employee contributions	113
4	Inactive participants with a vested right to a deferred or immediate benefit	16

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,850,770
2	Administrative expenses		131,907
3	Expected employee contributions		-1,937,323
4	Employer normal cost: (1) + (2) + (3)		\$1,045,354
5	Actuarial accrued liability		125,454,861
	Retired participants and beneficiaries	\$72,262,329	
	Active participants	50,353,434	
	Inactive participants	<u>2,839,098</u>	
6	Actuarial value of assets		63,989,360
7	Unfunded actuarial accrued liability: (5) – (6)		61,465,501
8	Reallocated unfunded actuarial accrued liability		<u>680,007</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$62,145,508

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,080,703	5.42%
2	Projected unfunded actuarial accrued liability	64,328,856	
3	Payment on projected unfunded actuarial accrued liability	<u>5,019,687</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$6,100,390	30.62%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	5,993,875	30.09%
6	Projected payroll	19,921,740	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$1,120,391	\$1,161,523
2	Payment on projected unfunded actuarial accrued liability	<u>5,361,429</u>	<u>5,744,834</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$6,481,820	\$6,906,357
4	Total Actuarially Determined Contribution, payable on July 1	6,370,873	6,788,143

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Tewksbury

2700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 30 beneficiaries in pay status)	335
2	Participants active during the year ended December 31, 2021	412
3	Inactive participants entitled to a return of their employee contributions	123
4	Inactive participants with a vested right to a deferred or immediate benefit	13

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$3,940,679
2	Administrative expenses		182,338
3	Expected employee contributions		<u>-2,564,672</u>
4	Employer normal cost: (1) + (2) + (3)		\$1,558,345
5	Actuarial accrued liability		193,723,846
	Retired participants and beneficiaries	\$123,990,576	
	Active participants	67,160,536	
	Inactive participants	<u>2,572,734</u>	
6	Actuarial value of assets		85,673,903
7	Unfunded actuarial accrued liability: (5) – (6)		108,049,943
8	Reallocated unfunded actuarial accrued liability		<u>1,050,047</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$109,099,990

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$1,611,041	6.17%
2	Projected unfunded actuarial accrued liability	112,932,983	
3	Payment on projected unfunded actuarial accrued liability	<u>8,351,010</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$9,962,051	38.15%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	9,788,110	37.48%
6	Projected payroll	26,115,660	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$1,669,710	\$1,730,500
2	Payment on projected unfunded actuarial accrued liability	<u>9,453,226</u>	<u>10,129,242</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$11,122,936	\$11,859,742
4	Total Actuarially Determined Contribution, payable on July 1	10,932,548	11,656,742

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Townsend

2800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 4 beneficiaries in pay status)	33
2	Participants active during the year ended December 31, 2021	58
3	Inactive participants entitled to a return of their employee contributions	19
4	Inactive participants with a vested right to a deferred or immediate benefit	3

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$670,483
2	Administrative expenses		31,024
3	Expected employee contributions		<u>-375,432</u>
4	Employer normal cost: (1) + (2) + (3)		\$326,075
5	Actuarial accrued liability		21,300,200
	Retired participants and beneficiaries	\$11,679,301	
	Active participants	9,064,909	
	Inactive participants	<u>555,990</u>	
6	Actuarial value of assets		14,812,194
7	Unfunded actuarial accrued liability: (5) – (6)		6,488,006
8	Reallocated unfunded actuarial accrued liability		<u>115,454</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$6,603,460

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	8.80%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	26.33%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	25.87%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$361,588
2	Payment on projected unfunded actuarial accrued liability	<u>597,271</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$958,859
4	Total Actuarially Determined Contribution, payable on July 1	942,446

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Tyngsborough

2900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 12 beneficiaries in pay status)	101
2	Participants active during the year ended December 31, 2021	175
3	Inactive participants entitled to a return of their employee contributions	57
4	Inactive participants with a vested right to a deferred or immediate benefit	9

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$1,497,493
2	Administrative expenses		69,290
3	Expected employee contributions		-931,165
4	Employer normal cost: (1) + (2) + (3)		\$635,618
5	Actuarial accrued liability		57,844,917
	Retired participants and beneficiaries	\$31,624,878	
	Active participants	24,417,916	
	Inactive participants	<u>1,802,123</u>	
6	Actuarial value of assets		33,028,811
7	Unfunded actuarial accrued liability: (5) – (6)		24,816,106
8	Reallocated unfunded actuarial accrued liability		<u>313,539</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$25,129,645

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$657,112	6.85%
2	Projected unfunded actuarial accrued liability	26,012,521	
3	Payment on projected unfunded actuarial accrued liability	<u>2,006,814</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$2,663,926	27.78%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,617,413	27.29%
6	Projected payroll	9,590,848	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$680,866	\$705,473
2	Payment on projected unfunded actuarial accrued liability	<u>2,170,029</u>	<u>2,325,211</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$2,850,895	\$3,030,684
4	Total Actuarially Determined Contribution, payable on July 1	2,802,097	2,978,809

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Wayland

3000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 19 beneficiaries in pay status)	249
2	Participants active during the year ended December 31, 2021	400
3	Inactive participants entitled to a return of their employee contributions	199
4	Inactive participants with a vested right to a deferred or immediate benefit	22

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$3,226,732
2	Administrative expenses		149,303
3	Expected employee contributions		-2,181,274
4	Employer normal cost: (1) + (2) + (3)		\$1,194,761
5	Actuarial accrued liability		127,172,170
	Retired participants and beneficiaries	\$70,117,906	
	Active participants	52,866,678	
	Inactive participants	<u>4,187,586</u>	
6	Actuarial value of assets		72,882,397
7	Unfunded actuarial accrued liability: (5) – (6)		54,289,773
8	Reallocated unfunded actuarial accrued liability		<u>689,315</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$54,979,088

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$1,235,163	5.50%
2	Projected unfunded actuarial accrued liability	56,910,660	
3	Payment on projected unfunded actuarial accrued liability	<u>4,595,264</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$5,830,427	25.98%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	5,728,625	25.53%
6	Projected payroll	22,443,023	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$1,280,472	\$1,327,429
2	Payment on projected unfunded actuarial accrued liability	<u>4,729,465</u>	<u>5,067,677</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$6,009,937	\$6,395,106
4	Total Actuarially Determined Contribution, payable on July 1	5,907,067	6,285,643

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Westford

3100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 16 beneficiaries in pay status)	284
2	Participants active during the year ended December 31, 2021	545
3	Inactive participants entitled to a return of their employee contributions	188
4	Inactive participants with a vested right to a deferred or immediate benefit	23

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$4,102,529
2	Administrative expenses		189,827
3	Expected employee contributions		-2,731,239
4	Employer normal cost: (1) + (2) + (3)		\$1,561,117
5	Actuarial accrued liability		161,449,429
	Retired participants and beneficiaries	\$80,098,008	
	Active participants	77,804,380	
	Inactive participants	<u>3,547,041</u>	
6	Actuarial value of assets		104,685,695
7	Unfunded actuarial accrued liability: (5) – (6)		56,763,734
8	Reallocated unfunded actuarial accrued liability		<u>875,109</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$57,638,843

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$1,613,907	5.72%
2	Projected unfunded actuarial accrued liability	59,663,859	
3	Payment on projected unfunded actuarial accrued liability	<u>4,760,474</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$6,374,381	22.58%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	6,263,082	22.19%
6	Projected payroll	28,227,119	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$1,672,928	\$1,734,090
2	Payment on projected unfunded actuarial accrued liability	<u>4,963,331</u>	<u>5,318,267</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$6,636,259	\$7,052,357
4	Total Actuarially Determined Contribution, payable on July 1	6,522,668	6,931,644

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Weston

3200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 23 beneficiaries in pay status)	271
2	Participants active during the year ended December 31, 2021	375
3	Inactive participants entitled to a return of their employee contributions	202
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$3,157,995
2	Administrative expenses		146,123
3	Expected employee contributions		-2,250,247
4	Employer normal cost: (1) + (2) + (3)		\$1,053,871
5	Actuarial accrued liability		142,498,324
	Retired participants and beneficiaries	\$78,637,944	
	Active participants	60,194,461	
	Inactive participants	<u>3,665,919</u>	
6	Actuarial value of assets		75,054,913
7	Unfunded actuarial accrued liability: (5) – (6)		67,443,411
8	Reallocated unfunded actuarial accrued liability		<u>772,388</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$68,215,799

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$1,089,508	4.73%
2	Projected unfunded actuarial accrued liability	70,612,414	
3	Payment on projected unfunded actuarial accrued liability	<u>5,311,158</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$6,400,666	27.79%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	6,288,908	27.31%
6	Projected payroll	23,030,993	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$1,129,974	\$1,171,926
2	Payment on projected unfunded actuarial accrued liability	<u>5,902,768</u>	<u>6,324,885</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$7,032,742	\$7,496,811
4	Total Actuarially Determined Contribution, payable on July 1	6,912,365	7,368,490

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Town of Wilmington

3300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 40 beneficiaries in pay status)	299
2	Participants active during the year ended December 31, 2021	424
3	Inactive participants entitled to a return of their employee contributions	146
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$3,820,398
2	Administrative expenses		176,772
3	Expected employee contributions		-2,615,585
4	Employer normal cost: (1) + (2) + (3)		\$1,381,585
5	Actuarial accrued liability		184,508,330
	Retired participants and beneficiaries	\$104,108,973	
	Active participants	77,631,318	
	Inactive participants	<u>2,768,039</u>	
6	Actuarial value of assets		97,671,377
7	Unfunded actuarial accrued liability: (5) – (6)		86,836,953
8	Reallocated unfunded actuarial accrued liability		<u>1,000,096</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$87,837,049

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$1,428,304	5.35%
2	Projected unfunded actuarial accrued liability	90,923,014	
3	Payment on projected unfunded actuarial accrued liability	<u>7,042,508</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$8,470,812	31.71%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	8,322,908	31.16%
6	Projected payroll	26,712,765	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$1,480,841	\$1,535,293
2	Payment on projected unfunded actuarial accrued liability	<u>7,582,540</u>	<u>8,124,781</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$9,063,381	\$9,660,074
4	Total Actuarially Determined Contribution, payable on July 1	8,908,246	9,494,725

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Acton-Boxborough RSD

3400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 7 beneficiaries in pay status)	164
2	Participants active during the year ended December 31, 2021	343
3	Inactive participants entitled to a return of their employee contributions	120
4	Inactive participants with a vested right to a deferred or immediate benefit	15

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$2,173,726
2	Administrative expenses		100,580
3	Expected employee contributions		<u>-1,475,589</u>
4	Employer normal cost: (1) + (2) + (3)		\$798,717
5	Actuarial accrued liability		71,629,215
	Retired participants and beneficiaries	\$34,642,390	
	Active participants	34,067,187	
	Inactive participants	<u>2,919,638</u>	
6	Actuarial value of assets		42,087,484
7	Unfunded actuarial accrued liability: (5) – (6)		29,541,731
8	Reallocated unfunded actuarial accrued liability		<u>388,254</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$29,929,985

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$825,726	5.31%
2	Projected unfunded actuarial accrued liability	30,981,510	
3	Payment on projected unfunded actuarial accrued liability	<u>2,553,760</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$3,379,486	21.75%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	3,320,479	21.37%
6	Projected payroll	15,537,676	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$856,043	\$887,463
2	Payment on projected unfunded actuarial accrued liability	<u>2,570,039</u>	<u>2,753,827</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$3,426,082	\$3,641,290
4	Total Actuarially Determined Contribution, payable on July 1	3,367,439	3,578,963

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Acton Water Supply

3500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	9
2	Participants active during the year ended December 31, 2021	15
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	2

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$123,863
2	Administrative expenses		5,731
3	Expected employee contributions		<u>-130,852</u>
4	Employer normal cost: (1) + (2) + (3)		<u>-\$1,258</u>
5	Actuarial accrued liability		9,236,029
	Retired participants and beneficiaries	\$3,567,115	
	Active participants	5,368,132	
	Inactive participants	<u>300,782</u>	
6	Actuarial value of assets		5,391,705
7	Unfunded actuarial accrued liability: (5) – (6)		3,844,324
8	Reallocated unfunded actuarial accrued liability		<u>50,062</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$3,894,386

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	<u>-\$1,301</u>	<u>-0.10%</u>
2	Projected unfunded actuarial accrued liability	4,031,207	
3	Payment on projected unfunded actuarial accrued liability	<u>294,663</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$293,362	22.28%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	288,240	21.89%
6	Projected payroll	1,316,944	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	<u>-\$1,144</u>	<u>-\$977</u>
2	Payment on projected unfunded actuarial accrued liability	<u>337,743</u>	<u>361,895</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$336,599	\$360,918
4	Total Actuarially Determined Contribution, payable on July 1	330,838	354,740

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Bedford Housing Authority

3600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	2
2	Participants active during the year ended December 31, 2021	2
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$17,229
2	Administrative expenses		797
3	Expected employee contributions		<u>-12,637</u>
4	Employer normal cost: (1) + (2) + (3)		\$5,389
5	Actuarial accrued liability		831,673
	Retired participants and beneficiaries	\$229,054	
	Active participants	585,857	
	Inactive participants	<u>16,762</u>	
6	Actuarial value of assets		517,716
7	Unfunded actuarial accrued liability: (5) – (6)		313,957
8	Reallocated unfunded actuarial accrued liability		<u>4,508</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$318,465

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	4.36%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	24.53%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	24.10%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$5,996
2	Payment on projected unfunded actuarial accrued liability	<u>29,434</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$35,430
4	Total Actuarially Determined Contribution, payable on July 1	34,824

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Billerica Housing Authority

3700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	4
2	Participants active during the year ended December 31, 2021	6
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	1

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$51,217
2	Administrative expenses		2,370
3	Expected employee contributions		-40,003
4	Employer normal cost: (1) + (2) + (3)		\$13,584
5	Actuarial accrued liability		2,534,456
	Retired participants and beneficiaries	\$1,190,080	
	Active participants	1,189,336	
	Inactive participants	<u>155,040</u>	
6	Actuarial value of assets		1,346,800
7	Unfunded actuarial accrued liability: (5) – (6)		1,187,656
8	Reallocated unfunded actuarial accrued liability		<u>13,738</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$1,201,394

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$14,043	3.44%
2	Projected unfunded actuarial accrued liability	1,243,602	
3	Payment on projected unfunded actuarial accrued liability	<u>125,366</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$139,409	34.15%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	136,975	33.55%
6	Projected payroll	408,249	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$14,582	\$15,140
2	Payment on projected unfunded actuarial accrued liability	<u>101,134</u>	<u>108,366</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$115,716	\$123,506
4	Total Actuarially Determined Contribution, payable on July 1	113,735	121,392

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Chelmsford Housing Authority

3800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	5
2	Participants active during the year ended December 31, 2021	39
3	Inactive participants entitled to a return of their employee contributions	7
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$387,258
2	Administrative expenses		17,919
3	Expected employee contributions		<u>-328,331</u>
4	Employer normal cost: (1) + (2) + (3)		\$76,846
5	Actuarial accrued liability		9,035,908
	Retired participants and beneficiaries	\$1,639,312	
	Active participants	7,322,607	
	Inactive participants	<u>73,989</u>	
6	Actuarial value of assets		6,607,149
7	Unfunded actuarial accrued liability: (5) – (6)		2,428,759
8	Reallocated unfunded actuarial accrued liability		<u>48,978</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$2,477,737

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	2.43%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	8.22%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	8.07%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$85,974
2	Payment on projected unfunded actuarial accrued liability	<u>230,060</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$316,034
4	Total Actuarially Determined Contribution, payable on July 1	310,625

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Chelmsford Water District

3900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 2 beneficiaries in pay status)	13
2	Participants active during the year ended December 31, 2021	22
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$186,251
2	Administrative expenses		8,618
3	Expected employee contributions		<u>-157,437</u>
4	Employer normal cost: (1) + (2) + (3)		\$37,432
5	Actuarial accrued liability		9,320,817
	Retired participants and beneficiaries	\$4,203,148	
	Active participants	5,117,669	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		9,195,415
7	Unfunded actuarial accrued liability: (5) – (6)		125,402
8	Reallocated unfunded actuarial accrued liability		<u>50,522</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$175,924

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	2.37%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	4.67%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	4.59%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$41,870
2	Payment on projected unfunded actuarial accrued liability	<u>14,045</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$55,915
4	Total Actuarially Determined Contribution, payable on July 1	54,958

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Dracut Housing Authority

4000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	5
2	Participants active during the year ended December 31, 2021	6
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$47,955
2	Administrative expenses		2,219
3	Expected employee contributions		<u>-42,613</u>
4	Employer normal cost: (1) + (2) + (3)		\$7,561
5	Actuarial accrued liability		3,375,926
	Retired participants and beneficiaries	\$1,561,444	
	Active participants	1,814,482	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,517,405
7	Unfunded actuarial accrued liability: (5) – (6)		1,858,521
8	Reallocated unfunded actuarial accrued liability		<u>18,299</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$1,876,820

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$7,817	1.79%
2	Projected unfunded actuarial accrued liability	1,942,758	
3	Payment on projected unfunded actuarial accrued liability	<u>178,005</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$185,822	42.55%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	182,577	41.81%
6	Projected payroll	436,709	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$8,148	\$8,492
2	Payment on projected unfunded actuarial accrued liability	<u>159,574</u>	<u>170,986</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$167,722	\$179,478
4	Total Actuarially Determined Contribution, payable on July 1	164,851	176,406

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Dracut Water Supply

4100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 2 beneficiaries in pay status)	9
2	Participants active during the year ended December 31, 2021	13
3	Inactive participants entitled to a return of their employee contributions	2
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$74,719
2	Administrative expenses		3,457
3	Expected employee contributions		-64,529
4	Employer normal cost: (1) + (2) + (3)		\$13,647
5	Actuarial accrued liability		6,447,765
	Retired participants and beneficiaries	\$4,114,231	
	Active participants	2,311,571	
	Inactive participants	<u>21,963</u>	
6	Actuarial value of assets		2,941,409
7	Unfunded actuarial accrued liability: (5) – (6)		3,506,356
8	Reallocated unfunded actuarial accrued liability		34,949
9	Total unfunded actuarial accrued liability: (7) + (8)		\$3,541,305

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$14,108	2.12%
2	Projected unfunded actuarial accrued liability	3,665,721	
3	Payment on projected unfunded actuarial accrued liability	<u>261,359</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$275,467	41.47%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	270,657	40.75%
6	Projected payroll	664,203	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$14,687	\$15,288
2	Payment on projected unfunded actuarial accrued liability	<u>307,706</u>	<u>329,711</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$322,393	\$344,999
4	Total Actuarially Determined Contribution, payable on July 1	316,875	339,094

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for E. Chelmsford Water

4200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	2
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$29,919
2	Administrative expenses		1,384
3	Expected employee contributions		<u>-21,789</u>
4	Employer normal cost: (1) + (2) + (3)		\$9,514
5	Actuarial accrued liability		1,194,062
	Retired participants and beneficiaries	\$275,969	
	Active participants	918,093	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		904,443
7	Unfunded actuarial accrued liability: (5) – (6)		289,619
8	Reallocated unfunded actuarial accrued liability		<u>6,472</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$296,091

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$9,836	4.32%
2	Projected unfunded actuarial accrued liability	306,494	
3	Payment on projected unfunded actuarial accrued liability	<u>30,925</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$40,761	17.91%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	40,049	17.60%
6	Projected payroll	227,587	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$10,203	\$10,584
2	Payment on projected unfunded actuarial accrued liability	<u>24,923</u>	<u>26,705</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$35,126	\$37,289
4	Total Actuarially Determined Contribution, payable on July 1	34,525	36,651

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for E. Middlesex Mosq Control

4300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	4
2	Participants active during the year ended December 31, 2021	6
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$44,110
2	Administrative expenses		2,041
3	Expected employee contributions		<u>-41,077</u>
4	Employer normal cost: (1) + (2) + (3)		\$5,074
5	Actuarial accrued liability		2,619,116
	Retired participants and beneficiaries	\$1,657,482	
	Active participants	961,634	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,927,959
7	Unfunded actuarial accrued liability: (5) – (6)		691,157
8	Reallocated unfunded actuarial accrued liability		<u>14,196</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$705,353

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	1.25%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	15.13%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	14.87%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$5,738
2	Payment on projected unfunded actuarial accrued liability	<u>65,076</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$70,814
4	Total Actuarially Determined Contribution, payable on July 1	69,602

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Greater Lowell RTSD

4400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 8 beneficiaries in pay status)	82
2	Participants active during the year ended December 31, 2021	92
3	Inactive participants entitled to a return of their employee contributions	23
4	Inactive participants with a vested right to a deferred or immediate benefit	5

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$599,360
2	Administrative expenses		27,733
3	Expected employee contributions		-478,580
4	Employer normal cost: (1) + (2) + (3)		\$148,513
5	Actuarial accrued liability		34,369,158
	Retired participants and beneficiaries	\$20,415,573	
	Active participants	13,468,675	
	Inactive participants	<u>484,910</u>	
6	Actuarial value of assets		15,521,668
7	Unfunded actuarial accrued liability: (5) – (6)		18,847,490
8	Reallocated unfunded actuarial accrued liability		<u>186,292</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$19,033,782

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$153,535	3.07%
2	Projected unfunded actuarial accrued liability	19,702,493	
3	Payment on projected unfunded actuarial accrued liability	<u>1,428,027</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,581,562	31.60%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,553,947	31.05%
6	Projected payroll	5,004,397	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$159,485	\$165,660
2	Payment on projected unfunded actuarial accrued liability	<u>1,651,791</u>	<u>1,769,914</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,811,276	\$1,935,574
4	Total Actuarially Determined Contribution, payable on July 1	1,780,273	1,902,443

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Groton-Dunstable RSD

4500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 4 beneficiaries in pay status)	111
2	Participants active during the year ended December 31, 2021	119
3	Inactive participants entitled to a return of their employee contributions	68
4	Inactive participants with a vested right to a deferred or immediate benefit	9

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$594,952
2	Administrative expenses		27,529
3	Expected employee contributions		-417,991
4	Employer normal cost: (1) + (2) + (3)		\$204,490
5	Actuarial accrued liability		31,844,670
	Retired participants and beneficiaries	\$22,259,381	
	Active participants	8,444,733	
	Inactive participants	<u>1,140,556</u>	
6	Actuarial value of assets		18,402,494
7	Unfunded actuarial accrued liability: (5) – (6)		13,442,176
8	Reallocated unfunded actuarial accrued liability		<u>172,609</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$13,614,785

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$211,405	4.73%
2	Projected unfunded actuarial accrued liability	14,093,111	
3	Payment on projected unfunded actuarial accrued liability	<u>1,060,940</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,272,345	28.47%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,250,129	27.97%
6	Projected payroll	4,469,380	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$219,228	\$227,338
2	Payment on projected unfunded actuarial accrued liability	<u>1,178,017</u>	<u>1,262,259</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,397,245	\$1,489,597
4	Total Actuarially Determined Contribution, payable on July 1	1,373,329	1,464,100

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Hudson Housing Authority

4600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	5
2	Participants active during the year ended December 31, 2021	8
3	Inactive participants entitled to a return of their employee contributions	2
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$52,873
2	Administrative expenses		2,446
3	Expected employee contributions		-44,664
4	Employer normal cost: (1) + (2) + (3)		\$10,655
5	Actuarial accrued liability		1,925,793
	Retired participants and beneficiaries	\$1,420,967	
	Active participants	451,342	
	Inactive participants	<u>53,484</u>	
6	Actuarial value of assets		1,219,494
7	Unfunded actuarial accrued liability: (5) – (6)		706,299
8	Reallocated unfunded actuarial accrued liability		<u>10,438</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$716,737

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$11,015	2.44%
2	Projected unfunded actuarial accrued liability	741,918	
3	Payment on projected unfunded actuarial accrued liability	<u>52,319</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$63,334	14.03%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	62,228	13.78%
6	Projected payroll	451,420	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$11,458	\$11,918
2	Payment on projected unfunded actuarial accrued liability	<u>62,329</u>	<u>66,786</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$73,787	\$78,704
4	Total Actuarially Determined Contribution, payable on July 1	72,524	77,357

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Lincoln Sudbury

4700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 2 beneficiaries in pay status)	42
2	Participants active during the year ended December 31, 2021	59
3	Inactive participants entitled to a return of their employee contributions	27
4	Inactive participants with a vested right to a deferred or immediate benefit	2

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$388,695
2	Administrative expenses		17,985
3	Expected employee contributions		-306,479
4	Employer normal cost: (1) + (2) + (3)		\$100,201
5	Actuarial accrued liability		19,345,249
	Retired participants and beneficiaries	\$10,151,696	
	Active participants	8,652,064	
	Inactive participants	<u>541,489</u>	
6	Actuarial value of assets		9,970,850
7	Unfunded actuarial accrued liability: (5) – (6)		9,374,399
8	Reallocated unfunded actuarial accrued liability		<u>104,858</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$9,479,257

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$103,589	3.27%
2	Projected unfunded actuarial accrued liability	9,812,290	
3	Payment on projected unfunded actuarial accrued liability	<u>719,099</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$822,688	25.95%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	808,324	25.49%
6	Projected payroll	3,170,751	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$107,578	\$111,718
2	Payment on projected unfunded actuarial accrued liability	<u>821,928</u>	<u>880,706</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$929,506	\$992,424
4	Total Actuarially Determined Contribution, payable on July 1	913,596	975,437

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Nashoba Vally THSD

4900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	13
2	Participants active during the year ended December 31, 2021	25
3	Inactive participants entitled to a return of their employee contributions	6
4	Inactive participants with a vested right to a deferred or immediate benefit	2

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$162,904
2	Administrative expenses		7,538
3	Expected employee contributions		-105,253
4	Employer normal cost: (1) + (2) + (3)		\$65,189
5	Actuarial accrued liability		5,474,618
	Retired participants and beneficiaries	\$2,532,348	
	Active participants	2,568,042	
	Inactive participants	<u>374,228</u>	
6	Actuarial value of assets		1,867,616
7	Unfunded actuarial accrued liability: (5) – (6)		3,607,002
8	Reallocated unfunded actuarial accrued liability		<u>29,674</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$3,636,676

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	6.11%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	32.18%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	31.62%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$72,384
2	Payment on projected unfunded actuarial accrued liability	<u>336,791</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$409,175
4	Total Actuarially Determined Contribution, payable on July 1	<u>402,171</u>

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for N. Chelmsford Water

5000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 2 beneficiaries in pay status)	4
2	Participants active during the year ended December 31, 2021	7
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$63,740
2	Administrative expenses		2,949
3	Expected employee contributions		<u>-57,785</u>
4	Employer normal cost: (1) + (2) + (3)		\$8,904
5	Actuarial accrued liability		4,009,053
	Retired participants and beneficiaries	\$1,865,389	
	Active participants	2,101,636	
	Inactive participants	<u>42,028</u>	
6	Actuarial value of assets		3,024,540
7	Unfunded actuarial accrued liability: (5) – (6)		984,513
8	Reallocated unfunded actuarial accrued liability		<u>21,730</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$1,006,243

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$9,205	1.51%
2	Projected unfunded actuarial accrued liability	1,041,595	
3	Payment on projected unfunded actuarial accrued liability	<u>76,776</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$85,981	14.10%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	84,480	13.85%
6	Projected payroll	609,858	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$9,606	\$10,024
2	Payment on projected unfunded actuarial accrued liability	<u>87,210</u>	<u>93,447</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$96,816	\$103,471
4	Total Actuarially Determined Contribution, payable on July 1	95,159	101,700

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for North Middlesex RSD

5100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 8 beneficiaries in pay status)	90
2	Participants active during the year ended December 31, 2021	168
3	Inactive participants entitled to a return of their employee contributions	84
4	Inactive participants with a vested right to a deferred or immediate benefit	11

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$794,884
2	Administrative expenses		36,780
3	Expected employee contributions		-569,520
4	Employer normal cost: (1) + (2) + (3)		\$262,144
5	Actuarial accrued liability		30,645,889
	Retired participants and beneficiaries	\$13,925,785	
	Active participants	14,971,200	
	Inactive participants	<u>1,748,904</u>	
6	Actuarial value of assets		17,466,806
7	Unfunded actuarial accrued liability: (5) – (6)		13,179,083
8	Reallocated unfunded actuarial accrued liability		<u>166,111</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$13,345,194

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$271,009	4.42%
2	Projected unfunded actuarial accrued liability	13,814,049	
3	Payment on projected unfunded actuarial accrued liability	<u>1,051,566</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$1,322,575	21.58%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	1,299,482	21.20%
6	Projected payroll	6,128,854	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$281,089	\$291,540
2	Payment on projected unfunded actuarial accrued liability	<u>1,153,658</u>	<u>1,236,159</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$1,434,747	\$1,527,699
4	Total Actuarially Determined Contribution, payable on July 1	1,410,189	1,501,550

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Shawsheen Valley RVS

5300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 6 beneficiaries in pay status)	51
2	Participants active during the year ended December 31, 2021	61
3	Inactive participants entitled to a return of their employee contributions	28
4	Inactive participants with a vested right to a deferred or immediate benefit	4

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$390,834
2	Administrative expenses		18,084
3	Expected employee contributions		-303,312
4	Employer normal cost: (1) + (2) + (3)		\$105,606
5	Actuarial accrued liability		17,718,720
	Retired participants and beneficiaries	\$10,036,541	
	Active participants	6,948,651	
	Inactive participants	<u>733,528</u>	
6	Actuarial value of assets		8,702,487
7	Unfunded actuarial accrued liability: (5) – (6)		9,016,233
8	Reallocated unfunded actuarial accrued liability		<u>96,041</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$9,112,274

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$109,177	3.47%
2	Projected unfunded actuarial accrued liability	9,432,414	
3	Payment on projected unfunded actuarial accrued liability	<u>677,899</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$787,076	25.05%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	773,333	24.61%
6	Projected payroll	3,142,162	

The actuarial factors projected to FY24 and FY25 are as follows:

		FY24	FY25
1	Projected employer normal cost	\$113,351	\$117,682
2	Payment on projected unfunded actuarial accrued liability	<u>791,293</u>	<u>847,880</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$904,644	\$965,562
4	Total Actuarially Determined Contribution, payable on July 1	889,159	949,035

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for South Middlesex RVTS

5400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 3 beneficiaries in pay status)	45
2	Participants active during the year ended December 31, 2021	44
3	Inactive participants entitled to a return of their employee contributions	23
4	Inactive participants with a vested right to a deferred or immediate benefit	1

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$304,565
2	Administrative expenses		14,092
3	Expected employee contributions		<u>-227,964</u>
4	Employer normal cost: (1) + (2) + (3)		\$90,693
5	Actuarial accrued liability		15,089,502
	Retired participants and beneficiaries	\$9,961,831	
	Active participants	4,857,327	
	Inactive participants	<u>270,344</u>	
6	Actuarial value of assets		8,027,631
7	Unfunded actuarial accrued liability: (5) – (6)		7,061,871
8	Reallocated unfunded actuarial accrued liability		81,790
9	Total unfunded actuarial accrued liability: (7) + (8)		\$7,143,661

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$93,760	3.94%
2	Projected unfunded actuarial accrued liability	7,394,638	
3	Payment on projected unfunded actuarial accrued liability	<u>536,899</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$630,659	26.53%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	619,647	26.07%
6	Projected payroll	2,377,106	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$97,295	\$100,961
2	Payment on projected unfunded actuarial accrued liability	<u>619,858</u>	<u>664,186</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$717,153	\$765,147
4	Total Actuarially Determined Contribution, payable on July 1	704,878	752,050

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Sudbury Water District

5500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	3
2	Participants active during the year ended December 31, 2021	10
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$88,146
2	Administrative expenses		4,079
3	Expected employee contributions		<u>-99,785</u>
4	Employer normal cost: (1) + (2) + (3)		<u>-\$7,560</u>
5	Actuarial accrued liability		6,624,789
	Retired participants and beneficiaries	\$1,202,481	
	Active participants	5,422,308	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		4,681,629
7	Unfunded actuarial accrued liability: (5) – (6)		1,943,160
8	Reallocated unfunded actuarial accrued liability		<u>35,909</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		<u>\$1,979,069</u>

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	<u>-\$7,816</u>	<u>-0.74%</u>
2	Projected unfunded actuarial accrued liability	2,048,599	
3	Payment on projected unfunded actuarial accrued liability	<u>203,346</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$195,530	18.52%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	192,116	18.19%
6	Projected payroll	1,056,042	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	<u>-\$7,929</u>	<u>-\$8,040</u>
2	Payment on projected unfunded actuarial accrued liability	<u>166,880</u>	<u>178,814</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$158,951	\$170,774
4	Total Actuarially Determined Contribution, payable on July 1	156,230	167,851

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Tewksbury Housing Authority

5600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	7
2	Participants active during the year ended December 31, 2021	8
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	1

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$61,972
2	Administrative expenses		2,867
3	Expected employee contributions		<u>-50,752</u>
4	Employer normal cost: (1) + (2) + (3)		\$14,087
5	Actuarial accrued liability		3,431,597
	Retired participants and beneficiaries	\$1,960,335	
	Active participants	1,293,763	
	Inactive participants	<u>177,499</u>	
6	Actuarial value of assets		1,767,170
7	Unfunded actuarial accrued liability: (5) – (6)		1,664,427
8	Reallocated unfunded actuarial accrued liability		<u>18,600</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$1,683,027

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$14,563	2.84%
2	Projected unfunded actuarial accrued liability	1,742,157	
3	Payment on projected unfunded actuarial accrued liability	<u>137,465</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$152,028	29.63%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	149,374	29.11%
6	Projected payroll	513,163	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$15,136	\$15,730
2	Payment on projected unfunded actuarial accrued liability	<u>145,063</u>	<u>155,437</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$160,199	\$171,167
4	Total Actuarially Determined Contribution, payable on July 1	157,457	168,237

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Wayland Housing Authority

5700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	4
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$40,155
2	Administrative expenses		1,858
3	Expected employee contributions		<u>-33,570</u>
4	Employer normal cost: (1) + (2) + (3)		\$8,443
5	Actuarial accrued liability		2,111,415
	Retired participants and beneficiaries	\$195,494	
	Active participants	1,915,921	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,557,622
7	Unfunded actuarial accrued liability: (5) – (6)		553,793
8	Reallocated unfunded actuarial accrued liability		<u>11,445</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$565,238

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	2.48%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	17.87%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	17.56%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$9,438
2	Payment on projected unfunded actuarial accrued liability	<u>51,448</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$60,886
4	Total Actuarially Determined Contribution, payable on July 1	59,844

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Hopkinton Housing Authority

5800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$18,332
2	Administrative expenses		848
3	Expected employee contributions		<u>-12,397</u>
4	Employer normal cost: (1) + (2) + (3)		\$6,783
5	Actuarial accrued liability		1,053,994
	Retired participants and beneficiaries	\$972,354	
	Active participants	81,640	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		503,194
7	Unfunded actuarial accrued liability: (5) – (6)		550,800
8	Reallocated unfunded actuarial accrued liability		<u>5,713</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$556,513

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	5.35%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	35.70%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	35.08%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$7,536
2	Payment on projected unfunded actuarial accrued liability	<u>51,934</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$59,470
4	Total Actuarially Determined Contribution, payable on July 1	58,452

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Sudbury Housing Authority

6000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	3
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	2
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$24,389
2	Administrative expenses		1,128
3	Expected employee contributions		<u>-16,198</u>
4	Employer normal cost: (1) + (2) + (3)		\$9,319
5	Actuarial accrued liability		893,500
	Retired participants and beneficiaries	\$705,283	
	Active participants	170,897	
	Inactive participants	<u>17,320</u>	
6	Actuarial value of assets		395,042
7	Unfunded actuarial accrued liability: (5) – (6)		498,458
8	Reallocated unfunded actuarial accrued liability		<u>4,843</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$503,301

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$9,634	5.79%
2	Projected unfunded actuarial accrued liability	520,983	
3	Payment on projected unfunded actuarial accrued liability	<u>37,196</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$46,830	28.17%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	46,012	27.68%
6	Projected payroll	166,256	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$9,986	\$10,351
2	Payment on projected unfunded actuarial accrued liability	<u>43,728</u>	<u>46,855</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$53,714	\$57,206
4	Total Actuarially Determined Contribution, payable on July 1	52,795	56,227

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Wilmington Housing Authority

6100

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	5
2	Participants active during the year ended December 31, 2021	1
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$11,336
2	Administrative expenses		525
3	Expected employee contributions		-6,669
4	Employer normal cost: (1) + (2) + (3)		\$5,192
5	Actuarial accrued liability		595,424
	Retired participants and beneficiaries	\$415,634	
	Active participants	160,801	
	Inactive participants	<u>18,989</u>	
6	Actuarial value of assets		368,376
7	Unfunded actuarial accrued liability: (5) – (6)		227,048
8	Reallocated unfunded actuarial accrued liability		<u>3,227</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$230,275

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	7.99%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	
5	Total FY23 Actuarially Determined Contribution, payable on July 1	57.31%
6	Projected payroll	56.31%

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$5,760
2	Payment on projected unfunded actuarial accrued liability	<u>18,579</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$25,667
4	Total Actuarially Determined Contribution, payable on July 1	<u>23,726</u>

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Acton Housing Authority

6200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 1 beneficiary in pay status)	6
2	Participants active during the year ended December 31, 2021	7
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$57,200
2	Administrative expenses		2,647
3	Expected employee contributions		<u>-49,544</u>
4	Employer normal cost: (1) + (2) + (3)		\$10,303
5	Actuarial accrued liability		2,395,476
	Retired participants and beneficiaries	\$1,405,092	
	Active participants	986,771	
	Inactive participants	<u>3,613</u>	
6	Actuarial value of assets		1,504,080
7	Unfunded actuarial accrued liability: (5) – (6)		891,396
8	Reallocated unfunded actuarial accrued liability		<u>12,984</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$904,380

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	2.11%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	16.39%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	16.11%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$11,544
2	Payment on projected unfunded actuarial accrued liability	<u>83,676</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$95,220
4	Total Actuarially Determined Contribution, payable on July 1	87,654

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Burlington Housing Authority

6300

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$29,464
2	Administrative expenses		1,363
3	Expected employee contributions		<u>-23,279</u>
4	Employer normal cost: (1) + (2) + (3)		\$7,548
5	Actuarial accrued liability		1,193,256
	Retired participants and beneficiaries	\$627,226	
	Active participants	566,030	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,060,757
7	Unfunded actuarial accrued liability: (5) – (6)		132,499
8	Reallocated unfunded actuarial accrued liability		<u>6,468</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$138,967

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	3.37%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	16.51%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	16.22%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$8,416
2	Payment on projected unfunded actuarial accrued liability	<u>11,018</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$19,434
4	Total Actuarially Determined Contribution, payable on July 1	19,101

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Ayer Housing Authority

6400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	1
2	Participants active during the year ended December 31, 2021	4
3	Inactive participants entitled to a return of their employee contributions	3
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$28,449
2	Administrative expenses		1,316
3	Expected employee contributions		<u>-20,188</u>
4	Employer normal cost: (1) + (2) + (3)		\$9,577
5	Actuarial accrued liability		1,090,905
	Retired participants and beneficiaries	\$691,569	
	Active participants	359,402	
	Inactive participants	<u>39,934</u>	
6	Actuarial value of assets		366,862
7	Unfunded actuarial accrued liability: (5) – (6)		724,043
8	Reallocated unfunded actuarial accrued liability		<u>5,913</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$729,956

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	4.75%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	34.29%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	33.69%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$10,649
2	Payment on projected unfunded actuarial accrued liability	<u>67,223</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$77,872
4	Total Actuarially Determined Contribution, payable on July 1	76,539

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Holliston Housing Authority

6500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	1
2	Participants active during the year ended December 31, 2021	2
3	Inactive participants entitled to a return of their employee contributions	2
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$15,447
2	Administrative expenses		715
3	Expected employee contributions		-8,768
4	Employer normal cost: (1) + (2) + (3)		\$7,394
5	Actuarial accrued liability		479,873
	Retired participants and beneficiaries	\$111,981	
	Active participants	365,999	
	Inactive participants	<u>1,893</u>	
6	Actuarial value of assets		346,084
7	Unfunded actuarial accrued liability: (5) – (6)		133,789
8	Reallocated unfunded actuarial accrued liability		<u>2,601</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$136,390

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$7,644	8.39%
2	Projected unfunded actuarial accrued liability	141,182	
3	Payment on projected unfunded actuarial accrued liability	<u>13,875</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$21,519	23.62%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	21,143	23.21%
6	Projected payroll	91,098	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$7,917	\$8,200
2	Payment on projected unfunded actuarial accrued liability	<u>11,513</u>	<u>12,336</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$19,430	\$20,536
4	Total Actuarially Determined Contribution, payable on July 1	19,097	20,184

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Littleton Housing Authority

6600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	3
2	Participants active during the year ended December 31, 2021	0
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$0
2	Administrative expenses		0
3	Expected employee contributions		0
4	Employer normal cost: (1) + (2) + (3)		\$0
5	Actuarial accrued liability		683,678
	Retired participants and beneficiaries	\$683,678	
	Active participants	0	
	Inactive participants	0	
6	Actuarial value of assets		26,456
7	Unfunded actuarial accrued liability: (5) – (6)		657,222
8	Reallocated unfunded actuarial accrued liability		3,706
9	Total unfunded actuarial accrued liability: (7) + (8)		\$660,928

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$0	0.00%
2	Projected unfunded actuarial accrued liability	684,148	
3	Payment on projected unfunded actuarial accrued liability	51,652	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$51,652	0.00%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	50,750	0.00%
6	Projected payroll	0	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$0	\$0
2	Payment on projected unfunded actuarial accrued liability	57,173	61,262
3	Total Actuarially Determined Contribution: (1) + (2)	\$57,173	\$61,262
4	Total Actuarially Determined Contribution, payable on July 1	56,194	60,213

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Westford Housing Authority

6700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	1
2	Participants active during the year ended December 31, 2021	5
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$38,661
2	Administrative expenses		1,789
3	Expected employee contributions		<u>-27,788</u>
4	Employer normal cost: (1) + (2) + (3)		\$12,662
5	Actuarial accrued liability		1,302,169
	Retired participants and beneficiaries	\$510,323	
	Active participants	791,846	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		911,259
7	Unfunded actuarial accrued liability: (5) – (6)		390,910
8	Reallocated unfunded actuarial accrued liability		<u>7,058</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$397,968

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	4.66%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	20.31%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	19.95%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$14,083
2	Payment on projected unfunded actuarial accrued liability	<u>35,670</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$49,753
4	Total Actuarially Determined Contribution, payable on July 1	48,901

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Shirley Water District

6800

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 2 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$21,236
2	Administrative expenses		983
3	Expected employee contributions		<u>-22,952</u>
4	Employer normal cost: (1) + (2) + (3)		<u>-\$733</u>
5	Actuarial accrued liability		1,696,971
	Retired participants and beneficiaries	\$400,388	
	Active participants	1,296,583	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,241,771
7	Unfunded actuarial accrued liability: (5) – (6)		455,200
8	Reallocated unfunded actuarial accrued liability		<u>9,198</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		<u>\$464,398</u>

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	<u>-\$758</u>	<u>-0.31%</u>
2	Projected unfunded actuarial accrued liability	480,714	
3	Payment on projected unfunded actuarial accrued liability	<u>39,761</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$39,003	16.08%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	38,322	15.80%
6	Projected payroll	242,570	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	<u>-\$748</u>	<u>-\$738</u>
2	Payment on projected unfunded actuarial accrued liability	<u>39,865</u>	<u>42,716</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$39,117	\$41,978
4	Total Actuarially Determined Contribution, payable on July 1	38,447	41,259

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Tyngsboro Housing Authority

6900

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	1

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$28,058
2	Administrative expenses		1,298
3	Expected employee contributions		-18,909
4	Employer normal cost: (1) + (2) + (3)		\$10,447
5	Actuarial accrued liability		907,058
	Retired participants and beneficiaries	\$390,711	
	Active participants	394,883	
	Inactive participants	<u>121,464</u>	
6	Actuarial value of assets		366,815
7	Unfunded actuarial accrued liability: (5) – (6)		540,243
8	Reallocated unfunded actuarial accrued liability		<u>4,917</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$545,160

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$10,800	5.65%
2	Projected unfunded actuarial accrued liability	564,313	
3	Payment on projected unfunded actuarial accrued liability	<u>40,455</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$51,255	26.79%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	50,360	26.33%
6	Projected payroll	191,299	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$11,196	\$11,607
2	Payment on projected unfunded actuarial accrued liability	<u>47,350</u>	<u>50,736</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$58,546	\$62,343
4	Total Actuarially Determined Contribution, payable on July 1	57,544	61,276

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Pepperell Housing Authority

7000

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	2
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$17,669
2	Administrative expenses		818
3	Expected employee contributions		<u>-10,173</u>
4	Employer normal cost: (1) + (2) + (3)		\$8,314
5	Actuarial accrued liability		414,519
	Retired participants and beneficiaries	\$397,540	
	Active participants	16,979	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		183,216
7	Unfunded actuarial accrued liability: (5) – (6)		231,303
8	Reallocated unfunded actuarial accrued liability		<u>2,247</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$233,550

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	8.18%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	24.77%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	24.34%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$9,221
2	Payment on projected unfunded actuarial accrued liability	<u>21,726</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$30,947
4	Total Actuarially Determined Contribution, payable on July 1	30,417

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Tyngsboro Water District

7200

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	7
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$30,486
2	Administrative expenses		1,411
3	Expected employee contributions		<u>-23,342</u>
4	Employer normal cost: (1) + (2) + (3)		\$8,555
5	Actuarial accrued liability		1,693,007
	Retired participants and beneficiaries	\$625,495	
	Active participants	1,067,512	
	Inactive participants	<u>0</u>	
6	Actuarial value of assets		1,185,529
7	Unfunded actuarial accrued liability: (5) – (6)		507,478
8	Reallocated unfunded actuarial accrued liability		<u>9,177</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$516,655

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	3.58%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	19.12%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	18.79%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$9,529
2	Payment on projected unfunded actuarial accrued liability	<u>48,081</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$57,610
4	Total Actuarially Determined Contribution, payable on July 1	56,624

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for North Reading Housing Authority

7400

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	2
2	Participants active during the year ended December 31, 2021	2
3	Inactive participants entitled to a return of their employee contributions	0
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$9,709
2	Administrative expenses		449
3	Expected employee contributions		-5,769
4	Employer normal cost: (1) + (2) + (3)		\$4,389
5	Actuarial accrued liability		334,113
	Retired participants and beneficiaries	\$170,809	
	Active participants	163,304	
	Inactive participants	0	
6	Actuarial value of assets		275,182
7	Unfunded actuarial accrued liability: (5) – (6)		58,931
8	Reallocated unfunded actuarial accrued liability		1,811
9	Total unfunded actuarial accrued liability: (7) + (8)		\$60,742

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll
1	Projected employer normal cost	7.13%
2	Projected unfunded actuarial accrued liability	
3	Payment on projected unfunded actuarial accrued liability	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	37.30%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	36.65%
6	Projected payroll	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25
1	Projected employer normal cost	\$4,869
2	Payment on projected unfunded actuarial accrued liability	4,255
3	Total Actuarially Determined Contribution: (1) + (2)	\$9,124
4	Total Actuarially Determined Contribution, payable on July 1	8,968

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for West Groton Water

7500

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	0
2	Participants active during the year ended December 31, 2021	3
3	Inactive participants entitled to a return of their employee contributions	1
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$17,850
2	Administrative expenses		826
3	Expected employee contributions		<u>-19,159</u>
4	Employer normal cost: (1) + (2) + (3)		<u>-\$483</u>
5	Actuarial accrued liability		605,621
	Retired participants and beneficiaries	\$0	
	Active participants	593,286	
	Inactive participants	<u>12,335</u>	
6	Actuarial value of assets		575,149
7	Unfunded actuarial accrued liability: (5) – (6)		30,472
8	Reallocated unfunded actuarial accrued liability		<u>3,283</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		<u>\$33,755</u>

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	<u>-\$499</u>	<u>-0.25%</u>
2	Projected unfunded actuarial accrued liability	34,941	
3	Payment on projected unfunded actuarial accrued liability	<u>3,512</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$3,013	1.48%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	2,960	1.46%
6	Projected payroll	202,991	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	<u>-\$487</u>	<u>-\$473</u>
2	Payment on projected unfunded actuarial accrued liability	<u>2,842</u>	<u>3,046</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$2,355	\$2,573
4	Total Actuarially Determined Contribution, payable on July 1	2,315	2,529

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for Ayer-Shirley RSD

7600

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 3 beneficiaries in pay status)	30
2	Participants active during the year ended December 31, 2021	122
3	Inactive participants entitled to a return of their employee contributions	62
4	Inactive participants with a vested right to a deferred or immediate benefit	10

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$548,676
2	Administrative expenses		25,388
3	Expected employee contributions		-402,346
4	Employer normal cost: (1) + (2) + (3)		\$171,718
5	Actuarial accrued liability		17,279,806
	Retired participants and beneficiaries	\$6,462,074	
	Active participants	9,555,824	
	Inactive participants	<u>1,261,908</u>	
6	Actuarial value of assets		13,573,389
7	Unfunded actuarial accrued liability: (5) – (6)		3,706,417
8	Reallocated unfunded actuarial accrued liability		<u>93,662</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$3,800,079

The actuarial factors projected to FY23 are as follows:

		Amount	% of Payroll
1	Projected employer normal cost	\$177,525	4.13%
2	Projected unfunded actuarial accrued liability	3,933,587	
3	Payment on projected unfunded actuarial accrued liability	<u>377,565</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	\$555,090	12.92%
5	Total FY23 Actuarially Determined Contribution, payable on July 1	545,398	12.69%
6	Projected payroll	4,296,913	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$184,173	\$191,067
2	Payment on projected unfunded actuarial accrued liability	<u>321,576</u>	<u>344,572</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$505,749	\$535,639
4	Total Actuarially Determined Contribution, payable on July 1	497,092	526,471

Note: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

Section 3: Actuarial Valuation Results

Summary of Actuarial Valuation Results for NMRECC

7700

The valuation was made with respect to the following data supplied to us:

1	Retired participants as of the valuation date (including 0 beneficiaries in pay status)	0
2	Participants active during the year ended December 31, 2021	17
3	Inactive participants entitled to a return of their employee contributions	3
4	Inactive participants with a vested right to a deferred or immediate benefit	0

The actuarial factors as of January 1, 2022 are as follows:

1	Normal cost		\$107,499
2	Administrative expenses		4,974
3	Expected employee contributions		<u>-93,560</u>
4	Employer normal cost: (1) + (2) + (3)		\$18,913
5	Actuarial accrued liability		1,416,583
	Retired participants and beneficiaries	\$0	
	Active participants	1,383,897	
	Inactive participants	<u>32,686</u>	
6	Actuarial value of assets		975,908
7	Unfunded actuarial accrued liability: (5) – (6)		440,675
8	Reallocated unfunded actuarial accrued liability		<u>7,678</u>
9	Total unfunded actuarial accrued liability: (7) + (8)		\$448,353

The actuarial factors projected to FY23 are as follows:

	Amount	% of Payroll	
1	Projected employer normal cost	\$19,553	2.03%
2	Projected unfunded actuarial accrued liability	464,105	
3	Payment on projected unfunded actuarial accrued liability	<u>N/A</u>	
4	Total FY23 Actuarially Determined Contribution: (1) + (3)	N/A	N/A
5	Total FY23 Actuarially Determined Contribution, payable on July 1	N/A	N/A
6	Projected payroll	963,711	

The actuarial factors projected to FY24 and FY25 are as follows:

	FY24	FY25	
1	Projected employer normal cost	\$20,360	\$21,200
2	Payment on projected unfunded actuarial accrued liability	<u>43,628</u>	<u>46,748</u>
3	Total Actuarially Determined Contribution: (1) + (2)	\$63,988	\$67,948
4	Total Actuarially Determined Contribution, payable on July 1	62,893	66,785

Notes: Actuarially Determined Contributions are assumed to be paid on July 1 and December 31, unless otherwise noted.

The total fiscal year 2023 Actuarially Determined Contribution has been set equal to the previously budgeted amount, which was developed prior to NMRECC becoming a unit in the Retirement System.

Section 4: Supplemental Information

Exhibit A: Table of Plan Demographics

Category	Year Ended December 31		Change From Prior Year
	2021	2019	
Active participants in valuation:			
• Number	9,432	9,282	1.6%
• Average age	47.2	47.9	-0.7
• Average years of service	10.6	11.2	-0.6
• Total payroll ¹	\$519,239,588	\$492,109,775	5.5%
• Average payroll	55,051	53,018	3.8%
• Member contributions	469,661,019	453,462,416	3.6%
• Number with unknown age	0	2	-100.0%
Inactive participants with a vested right to a deferred or immediate benefit	403	381	5.8%
Inactive participants due a refund of employee contributions	3,581	3,082	16.2%
Retired participants:			
• Number in pay status	5,265	4,840	8.8%
• Average age	73.1	73.3	-0.2
• Average monthly benefit	\$2,466	\$2,319	6.3%
Disabled participants:			
• Number in pay status	425	438	-3.0%
• Average age	67.0	67.1	-0.1
• Average monthly benefit	\$3,383	\$3,146	7.5%
Beneficiaries:			
• Number in pay status	594	584	1.7%
• Average age	74.9	75.0	-0.1
• Average monthly benefit	\$1,587	\$1,420	11.8%

¹ Payroll figures are for the prior year and reflect annualized salaries for participants hired during the year.

Section 4: Supplemental Information

Exhibit B: Participants in Active Service as of December 31, 2021 by Age, Years of Service, and Average Payroll

Age	Years of Service									
	Total	0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	410	405	5	--	--	--	--	--	--	--
	\$35,688	\$35,636	\$39,918	--	--	--	--	--	--	--
25 - 29	850	731	117	2	--	--	--	--	--	--
	\$46,720	\$44,808	\$58,389	\$63,278	--	--	--	--	--	--
30 - 34	890	490	340	57	3	--	--	--	--	--
	\$56,461	\$48,438	\$65,355	\$72,698	\$50,520	--	--	--	--	--
35 - 39	816	354	215	178	64	5	--	--	--	--
	\$58,426	\$44,220	\$60,976	\$75,421	\$79,440	\$80,570	--	--	--	--
40 - 44	899	390	169	110	166	60	4	--	--	--
	\$56,672	\$36,872	\$56,885	\$71,658	\$81,082	\$87,185	\$101,121	--	--	--
45 - 49	1,002	390	176	107	121	159	48	1	--	--
	\$56,630	\$37,072	\$46,539	\$61,834	\$73,839	\$88,463	\$91,514	\$85,122	--	--
50 - 54	1,456	369	283	198	158	199	171	74	4	--
	\$61,112	\$38,791	\$45,227	\$49,248	\$70,741	\$80,014	\$98,531	\$105,645	\$86,978	--
55 - 59	1,482	306	253	226	236	190	100	116	50	5
	\$57,076	\$38,394	\$43,470	\$48,304	\$53,363	\$64,114	\$89,196	\$102,867	\$95,801	\$101,121
60 - 64	1,087	172	176	151	206	187	79	60	46	10
	\$53,235	\$37,849	\$45,563	\$48,295	\$48,619	\$55,341	\$70,559	\$83,813	\$89,700	\$95,063
65 - 69	393	44	55	48	76	93	44	17	6	10
	\$53,446	\$41,299	\$47,281	\$48,452	\$55,381	\$52,840	\$63,676	\$57,103	\$89,506	\$82,834
70 & over	147	18	13	10	20	33	21	13	4	15
	\$46,552	\$34,045	\$33,442	\$48,559	\$59,471	\$42,959	\$46,070	\$48,796	\$37,752	\$63,343
Total	9,432	3,669	1,802	1,087	1,050	926	467	281	110	40
	\$55,051	\$40,996	\$52,729	\$57,926	\$63,633	\$69,638	\$85,425	\$94,197	\$90,475	\$80,794

Section 4: Supplemental Information

Exhibit C: Summary Statement of Income and Expenses on a Market Value Basis

	Year Ended December 31, 2021	Year Ended December 31, 2020
Net assets at market value at the beginning of the year	\$1,756,138,330	\$1,565,528,261
Contribution income:		
• Employer contributions	\$147,785,846	\$138,229,422
• Employee contributions	52,748,793	51,832,960
• Federal grant reimbursement and other contributions	63,837	60,815
• Less administrative expenses	<u>-3,403,912</u>	<u>-3,311,597</u>
<i>Net contribution income</i>	<i>\$197,194,564</i>	<i>\$186,811,600</i>
Investment income:		
• Investment income	\$349,894,244	\$193,010,093
• Less investment fees	<u>-9,428,015</u>	<u>-7,442,179</u>
<i>Net investment income</i>	<i>\$340,466,229</i>	<i>\$185,567,914</i>
Total income available for benefits	\$537,660,793	\$372,379,514
Less benefit payments:		
• Pensions, annuities, refunds, and transfers	<u>-\$180,787,020</u>	<u>-\$170,401,433</u>
• Net 3(8)(c) reimbursements	<u>-3,241,104</u>	<u>-11,368,012</u>
<i>Net benefit payments</i>	<i>-\$184,028,124</i>	<i>-\$181,769,445</i>
Change in reserve for future benefits	\$353,632,669	\$190,610,069
Net assets at market value at the end of the year	\$2,109,770,999	\$1,756,138,330

Section 4: Supplemental Information

Exhibit D: Development of the Fund through December 31, 2021

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return ¹	Administrative Expenses	Benefit Payments	Market Value of Assets at Year-End	Actuarial Value of Assets at Year-End	Actuarial Value as a Percent of Market Value	Employee Contributions as a Percent of Total Contributions
2012	\$81,896,208	\$35,766,080	\$37,240	\$101,170,082	\$3,051,893	\$116,194,523	\$887,019,156	\$875,989,750	98.8%	30.39%
2013	88,252,356	38,568,968	34,756	124,783,005	3,170,834	121,473,992	1,014,013,415	967,146,018	95.4%	30.40%
2014	93,368,685	39,806,980	32,261	74,962,895	3,540,884	125,082,678	1,093,560,674	1,062,517,426	97.2%	29.88%
2015	99,792,642	40,870,163	27,839	7,817,250	3,290,167	134,295,505	1,104,482,897	1,141,122,663	103.3%	29.05%
2016	107,032,211	42,841,461	35,496	74,917,549	3,460,782	143,428,636	1,182,420,196	1,229,393,319	104.0%	28.58%
2017	115,377,205	44,841,008	183,914	189,543,974	3,234,147	150,780,931	1,378,351,219	1,339,085,622	97.2%	27.96%
2018	120,499,451	46,670,212	35,762	-30,983,338	3,273,735	161,259,804	1,350,039,767	1,419,015,659	105.1%	27.91%
2019	129,610,441	49,170,931	75,313	208,470,212	3,352,400	168,486,003	1,565,528,261	1,523,736,765	97.3%	27.49%
2020	138,229,422	51,832,960	60,815	185,567,914	3,311,597	181,769,445	1,756,138,330	1,669,337,821	95.1%	27.26%
2021	147,785,846	52,748,793	63,837	340,466,229	3,403,912	184,028,124	2,109,770,999	1,881,791,125	89.2%	26.30%

¹ On a market basis, net of investment fees.

Section 4: Supplemental Information

Exhibit E: Definition of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The equivalent of the accumulated normal costs allocated to the years before the valuation date.
Actuarial Accrued Liability for Retirees and Beneficiaries:	Actuarial Present Value of lifetime benefits to existing retirees and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the actuarially determined contribution.
Actuarial Gain or Loss:	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results yield actuarial liabilities that are larger than projected.
Actuarially Equivalent:	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	<p>The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is:</p> <p>Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.)</p> <p>Multiplied by the probability of the occurrence of an event (such as survival, death, disability, withdrawal, etc.) on which the payment is conditioned, and</p> <p>Discounted according to an assumed rate (or rates) of return to reflect the time value of money.</p>
Actuarial Present Value of Future Benefits:	The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive members entitled to either a refund of member contributions or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.

Section 4: Supplemental Information

Actuarial Valuation:	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan, as well as Actuarially Determined Contributions.
Actuarial Value of Assets (AVA):	The value of the Plan's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the Actuarially Determined Contribution.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the Plan.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the Employer Normal Cost and the Amortization Payment.
Amortization Method:	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the Amortization Payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is intended to pay off the Unfunded Actuarial Accrued Liability.
Assumptions or Actuarial Assumptions:	The estimates upon which the cost of the Plan is calculated, including: <u>Investment return</u> - the rate of investment yield that the Plan will earn over the long-term future; <u>Mortality rates</u> - the rate or probability of death at a given age for employees and retirees; <u>Retirement rates</u> - the rate or probability of retirement at a given age or service; <u>Disability rates</u> - the rate or probability of disability retirement at a given age; <u>Withdrawal rates</u> - the rate or probability at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement; <u>Salary increase rates</u> - the rates of salary increase due to inflation, real wage growth and merit and promotion increases.
Closed Amortization Period:	A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 20 years, it is 19 years at the end of one year, 18 years at the end of two years, etc. See Open Amortization Period.
Decrements:	Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or withdrawal.

Section 4: Supplemental Information

Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula based on the member's compensation, age and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Plan that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified based on recommendations from the Actuary.
Funded Ratio:	The ratio of the Actuarial Value of Assets AVA to the Actuarial Accrued Liability (AAL). Plans sometimes also calculate a market funded ratio, using the Market Value of Assets (MVA), rather than the AVA.
GASB 67 and GASB 68:	Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.
Investment Return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.
Net Pension Liability (NPL):	The Net Pension Liability is equal to the Total Pension Liability minus the Plan Fiduciary Net Position.
Normal Cost:	The portion of the Actuarial Present Value of Future Benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment with respect to an Unfunded Actuarial Accrued Liability is not part of the Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of member contributions and employer Normal Cost unless otherwise specifically stated.
Open Amortization Period:	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in each future year in determining the Amortization Period.
Plan Fiduciary Net Position:	Market value of assets.
Total Pension Liability (TPL):	The actuarial accrued liability under the entry age normal cost method and based on the blended discount rate as described in GASB 67 and 68.

Section 4: Supplemental Information

Unfunded Actuarial Accrued Liability:	The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus or an Overfunded Actuarial Accrued Liability.
Valuation Date or Actuarial Valuation Date:	The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Section 5: Actuarial Valuation Basis

Exhibit I: Actuarial Assumptions, Methods and Models

Net Investment Return: 7.15% (previously, 7.30%).
 The net investment return assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio's asset classes, as well as the Plan's target asset allocation.

Salary Increases:	Years of Service	Group 1	Group 2	Group 4
	0	6.00%	6.00%	7.00%
	1	5.50%	5.50%	6.50%
	2	5.50%	5.50%	6.00%
	3	5.25%	5.25%	5.75%
	4	5.25%	5.25%	5.25%
	5	4.75%	4.75%	5.25%
	6	4.75%	4.75%	4.75%
	7	4.50%	4.50%	4.75%
	8	4.50%	4.50%	4.50%
	9	4.25%	4.25%	4.50%
	10	4.25%	4.25%	4.50%
	11	4.00%	4.25%	4.50%
	12+	4.00%	4.25%	4.50%

Includes an allowance for wage inflation of 3.25%.

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

Interest on Employee Contributions: 3.5%

Section 5: Actuarial Valuation Basis

Administrative Expenses: \$3,650,000 for calendar 2022, increasing 3.25% per year (previously, \$3,500,000 for calendar 2020, increasing 3.25% per year)

The administrative expense assumption is based on information on expected expenses provided by the Retirement System.

Mortality Rates: *Pre-Retirement:* RP-2014 Blue Collar Employee Mortality Table projected generationally with Scale MP-2021 (previously MP-2017)

Healthy Retiree: RP-2014 Blue Collar Healthy Annuitant Mortality Table projected generationally with Scale MP-2021 (previously MP-2017)

Disabled Retiree: RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward one year and projected generationally with Scale MP-2021 (previously MP-2017)

The mortality tables reasonably reflect the projected mortality experience of the Plan as of the measurement date based on historical and current demographic data. As part of the analysis, a comparison was made between the actual number of retiree deaths and the projected number based on the prior years' assumptions over the most recent ten years. The mortality tables were then adjusted to future years using generational projection under Scale MP-2021 to reflect future mortality improvement.

Termination Rates before Retirement:

Age	Groups 1 and 2 - Rate (%)		
	Mortality		
	Male	Female	Disability
20	0.05	0.02	0.02
25	0.06	0.02	0.02
30	0.06	0.02	0.03
35	0.07	0.03	0.06
40	0.08	0.04	0.10
45	0.13	0.07	0.15
50	0.22	0.12	0.19
55	0.36	0.19	0.24
60	0.61	0.27	0.28

Notes:

Mortality rates do not reflect generational projection.

55% of the disability rates shown represent accidental disability.

20% of the accidental disabilities will die from the same cause as the disability.

55% of the death rates shown represent accidental death.

Section 5: Actuarial Valuation Basis

Group 4 - Rate (%)			
Mortality			
Age	Male	Female	Disability
20	0.05	0.02	0.20
25	0.06	0.02	0.20
30	0.06	0.02	0.30
35	0.07	0.03	0.30
40	0.08	0.04	0.30
45	0.13	0.07	1.00
50	0.22	0.12	1.25
55	0.36	0.19	1.20
60	0.61	0.27	0.85

Notes:

Mortality rates do not reflect generational projection.

90% of the disability rates shown represent accidental disability.

60% of the accidental disabilities will die from the same cause as the disability.

90% of the death rates shown represent accidental death.

Section 5: Actuarial Valuation Basis

Withdrawal Rates:

Years of Service	Rate per year (%)		
	Groups 1 and 2	Years of Service	Group 4
0	15.0	0 – 10	1.5
1	12.0	11+	0.0
2	10.0		
3	9.0		
4	8.0		
5 – 9	7.6		
10 – 14	5.4		
15 – 19	3.3		
20 – 24	2.0		
25 - 29	1.0		
30+	0.0		

The termination rates and disability rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of terminations and disability retirements and the projected number based on the prior years' assumption over the most recent ten years.

Section 5: Actuarial Valuation Basis

Retirement Rates:	Rate per year (%)			
	Groups 1 and 2			
	Age	Male	Female	Group 4
	45 – 49	--	--	1.0
	50 – 54	--	--	2.0
	55 – 59	2.0	5.5	15.0
	60 – 61	12.0	5.0	20.0
	62 – 64	30.0	15.0	25.0
	65 – 68	40.0	15.0	100.0
	69	50.0	20.0	--
	70	100.0	100.0	--

The retirement rates were based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment. As part of the analysis, a comparison was made between the actual number of retirements by age and the projected number based on the prior years' assumption over the most recent ten years.

Retirement Rates for Inactive Vested Participants:	Age 60 for Group 1 and Group 2 members and age 55 for Group 4 members hired prior to April 2, 2012. For participants hired April 2, 2012 or later, 60 for Group 1, 55 for Group 2 and 50 for Group 4. The retirement age for inactive vested participants was based on historical and current demographic data, adjusted to reflect economic conditions of the area and estimated future experience and professional judgment.
Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics. If not specified, participants are assumed to be male.
Family Composition:	75% of participants are assumed to be married. None are assumed to have dependent children. Females are assumed to be three years younger than their male spouses.
Benefit Election:	All participants are assumed to elect Option A. The benefit election reflects the fact that all benefit options are actuarially equivalent.
2021 Salary:	2021 salaries are equal to salaries provided in the data, except for actives missing salary and employees with less than one year of service, where salaries are calculated from annualized contributions divided by the contribution rates provided.
Total Service:	Total creditable service reported in the data.
Net 3(8)(c) Liability:	No liability is valued for benefits paid to or received from other municipal systems.

Section 5: Actuarial Valuation Basis

Actuarial Value of Assets:	Market value of assets as reported in the System's Annual Statement less unrecognized return in each of the last five years. Unrecognized return is equal to the difference between the actual market value return and the expected market value return and is recognized over a five-year period, further adjusted, if necessary, to be within 20% of the market value.
Actuarial Cost Method:	Entry Age Normal Actuarial Cost Method. Entry Age is the attained age of the participant less Total Service as defined above. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary. Normal Cost is determined using the plan of benefits applicable to each participant.
Actuarial Models:	Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are presented to meet regulatory, legislative and client requirements. Our Actuarial Technology and Systems unit, comprised of both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.
Justification for Change in Actuarial Assumptions:	<p>Based on past experience and future expectations, the following actuarial assumption was changed as of January 1, 2022:</p> <ul style="list-style-type: none">• The investment return assumption was lowered from 7.30% to 7.15%.• The mortality projection scale for future longevity improvement was updated from MP-2017 to MP-2021.• The administrative expense assumption was increased from \$3,500,000 for calendar year 2020 to \$3,650,000 for calendar year 2022.

Section 5: Actuarial Valuation Basis

Exhibit II: Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Plan Year:	January 1 through December 31
Plan Status:	Ongoing

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

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

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

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

Section 5: Actuarial Valuation Basis

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

**For members with less than 30 years of creditable service:
Age Last Birthday at Date of Retirement**

Percent	Group 1	Group 2	Group 4
2.50	67 or over	62 or over	57 or over
2.35	66	61	56
2.20	65	60	55
2.05	64	59	54
1.90	63	58	53
1.75	62	57	52
1.60	61	56	51
1.45	60	55	50

**For members with 30 years of creditable service or greater:
Age Last Birthday at Date of Retirement**

Percent	Group 1	Group 2	Group 4
2.500	67 or over	62 or over	57 or over
2.375	66	61	56
2.250	65	60	55
2.125	64	59	54
2.000	63	58	53
1.875	62	57	52
1.750	61	56	51
1.625	60	55	50

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

Section 5: Actuarial Valuation Basis

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

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

Employee Contributions:

Date of Hire	Contribution Rate
Prior to January 1, 1975	5%
January 1, 1975 – December 31, 1983	7%
January 1, 1984 – June 30, 1996	8%
July 1, 1996 onward	9%

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

Employees hired after 1983 who voluntarily withdraw their contributions with less than 10 ten years of credited service receive 3% interest on their contributions.

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

Retirement Benefits (Superannuation):

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

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

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

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

Section 5: Actuarial Valuation Basis

Ordinary Disability Benefit:	A member who is unable to perform his or her job due to a non-occupational disability will receive a retirement allowance if he or she has ten or more years of creditable service and has not reached age 55. The annual amount of such allowance shall be determined as if the member retired for superannuation at age 55 (age 60 for Group 1 members hired on or after April 2, 2012), based on the amount of creditable service at the date of disability. For veterans, there is a minimum benefit of 50 percent of the member's most recent year's pay plus an annuity based on his or her own contributions.
Accidental Disability Benefit:	For a job-connected disability, the benefit is 72 percent of the member's most recent annual pay plus an annuity based on his or her own contributions, plus additional amounts for surviving children. Benefits are capped at 75 percent of annual rate of regular compensation for employees who become members after January 1, 1988.
Death Benefits:	<p>In general, the beneficiary of an employee who dies in active service will receive a refund of the employee's own contributions. Alternatively, if the employee were eligible to retire on the date of death, a spouse's benefit will be paid equal to the amount the employee would have received under Option C. The surviving spouse of a member who dies with two or more years of credited service has the option of a refund of the employee's contributions or a monthly benefit regardless of eligibility to retire, if they were married for at least one year. There is also a minimum widow's pension of \$500 per month, and there are additional amounts for surviving children.</p> <p>If an employee's death is job-connected, the spouse will receive 72 percent of the member's most recent annual pay, in addition to a refund of the member's accumulated deductions, plus additional amounts for surviving children. However, in accordance with Section 100 of Chapter 32, the surviving spouse of a police officer, firefighter or corrections officer is killed in the line of duty will be eligible to receive an annual benefit equal to the maximum salary held by the member at the time of death.</p> <p>Upon the death of a job-connected disability retiree who retired prior to November 7, 1996 and could not elect an Option C benefit, a surviving spouse will receive an allowance of \$12,000 per year if the member dies for a reason unrelated to cause of disability.</p>
"Heart And Lung Law" And Cancer Presumption:	Any case of hypertension or heart disease resulting in total or partial disability or death to a uniformed fireman, permanent member of a police department, or certain employees of a county correctional facility is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. Any case of disease of the lungs or respiratory tract resulting in total disability or death to a uniformed fireman is presumed to have been suffered in the line of duty, unless the contrary is shown by competent evidence. There is an additional presumption for uniformed firemen that certain types of cancer are job-related if onset occurs while actively employed or within five years of retirement.
Options:	Members may elect to receive a full retirement allowance payable for life under Option A. Under Option B a member may elect to receive a lower monthly allowance in exchange for a guarantee that at the time of death any contributions not expended for annuity payments will be refunded to the beneficiary. Option C allows the member to take a lesser retirement allowance in exchange for providing a survivor with two-thirds of the lesser amount. Option C pensioners will have benefits converted from a reduced to a full retirement if the beneficiary predeceases the retiree.

Section 5: Actuarial Valuation Basis

Post-Retirement Benefits:	The Board has adopted the provisions of Section 51 of Chapter 127 of the Acts of 1999, which provide that the Retirement Board may approve an annual COLA in excess of the Consumer Price Index but not to exceed a 3% COLA on the first \$16,000 of a retirement allowance. Cost-of-living increases granted prior to July 1, 1998 are reimbursed by the Commonwealth and not reflected in this report.
Changes in Plan Provisions:	None.