BUCK

City of Woburn Contributory Retirement System

Actuarial Valuation Report

Plan Year: January 1, 2022

October 2022

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Section I - Overview

The City of Woburn Retirement Board has engaged Buck to prepare an actuarial valuation of the Retirement System as of January 1, 2022. Employee data and asset information used in the valuation were provided by the Retirement Board.

The valuation was prepared pursuant to Chapter 32 of the Massachusetts General Laws, based upon the acceptance of Section 22D.

The purposes of the valuation are to:

1) analyze the current funded position of the System and determine the level of contributions necessary to assure sound funding;
2) update the Section 22D funding schedule currently in place for the Retirement System; and
3) provide reporting and disclosure information for financial statements, governmental agencies and other interested parties.

Use of this report for any other purpose may not be appropriate and may result in mistaken conclusions due to failure to understand applicable assumptions, methodologies, or inapplicability of the report for that purpose. Buck should be asked to review any statement to be made on the basis of the information presented in this report. Buck will not accept any liability for any such statement made without prior review by Buck.

Schedule A of this report outlines the actuarial assumptions and methods used in the valuation. All assumptions are the same as those used in the previous valuation, except that the mortality assumption was updated to reflect more recently available information and the assumed plan expenses included in the normal cost was updated to better reflect actual plan experience. The economic assumptions are based upon a review of the current portfolio structure and economic environment and represent expectations with respect to future experience.

Schedule B of this report outlines the principal plan provisions reflected in the valuation. All provisions are the same as those reflected in the previous valuation.

Section II provides a summary of the principal valuation results. Section V provides a projection of the Section 22D funding amounts and funded status reflecting the plan sponsor's funding policy of compliance with Section 22D of MGL Chapter 31 and the expectation of no future gains or losses.

Where presented, references to "funded percentage" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded percentages and unfunded accrued liabilities. Also, the "net pension liability" and "plan fiduciary net position as a percentage of the total pension liability" are measured on a market value of assets basis. These items presented may be appropriate for evaluating the need and level of future contributions but make no assessment regarding the cost to settle (i.e., purchase annuities to cover) any portion of the Fund's liabilities.

Actuarial Standard of Practice No. 56 ("ASOP 56") provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses third-party software in the performance of annual actuarial valuations and projections. The model is intended to calculate the liabilities associated with the provisions of the plan using data and assumptions as of the measurement date under the funding methods specified in this report. The output from the third-party vendor software is used as input to an internally developed model that applies applicable funding methods and policies to the liabilities derived and other inputs, such as plan assets and contributions, to generate many of the exhibits found in this report. Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other funding outputs and the internal model are similarly reviewed in detail and at a high level for accuracy, reasonability and consistency with prior results. Buck also reviews the third-party model when significant changes are made to the software. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked and reviewed by multiple experts within the company who are familiar with the details of the required changes.

Section I – Overview (continued)

Actuarial Standard of Practice No. 27 ("ASOP 27") provides guidance to me on economic assumptions for measuring pension obligations. Actuarial Standard of Practice No. 35 ("ASOP 35") provides guidance to me on demographic and other noneconomic assumptions for measuring pension obligations. Under these ASOPs, for each assumption that has a significant effect on the measurement and that I selected, I should disclose the information and analysis used to support my determination that the assumption is reasonable for the purpose of the measurement.

I advised the plan sponsor on the selection of demographic and other noneconomic assumptions that have a significant effect on the measurement: mortality, future mortality improvement, retirement rates, withdrawal rates, disability rates, and frequency of optional payment forms. These assumptions are reasonable given historic gain and loss experience of the plan.

The economic assumption that has a significant effect on the measurement and that I have not selected is expected rate of return on plan assets. The expected return on asset assumption was selected by the City, with advice from its investment manager. I have determined that these economic assumptions do not significantly conflict with what, in my professional judgment, are reasonable for the purpose of the measurement.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this valuation.

This report fairly represents the actuarial position of the City of Woburn Retirement System as of January 1, 2022, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In my opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations and represent my best estimate of anticipated plan experience. The valuation was performed by, and under the supervision of, actuaries who have experience in performing valuations for public retirement systems. I am a Member of the American Academy of Actuaries and meet the Academy's Qualification Standards to issue this Statement of Actuarial Opinion and am available to answer any questions regarding the results.

Respectfully Submitted,

Buck Global, LLC (Buck)

Hilja Viidemann

OCTOBER 27, 2022

Hilja Viidemann, FSA, MAAA, EA
Director, Retirement

Date

Section II - Summary Of Principal Results

1. For convenience of reference, the principal results of the valuation as of January 1, 2022 are summarized below along with a comparison with the amounts in the previous valuation as of January 1, 2020.

Valuation Date		January 1, 2020	January 1, 2022
a)	Active Members:		
	Number	478	529
	Annual compensation	$ 29,406,301	$ 31,737,213
	Average age	49.7	48.8
	Average service	13.6	12.4
	Average compensation	$ 61,519	$ 59,995
b)	Pensioners and beneficiaries:		
	Number	495	492
	Annual benefit payments	$ 15,298,094	$ 16,755,691
	Average benefit	$ 30,905	$ 34,056
c)	Inactive employees:		
	Number	104	102
	Accumulated employee contributions	$ 779,965	$ 1,291,495
d)	Actuarial accrued liability	$ 252,067,065	$ 271,976,092
e)	Market value of assets	$ 159,393,849	$ 204,195,642
f)	Assets for valuation purposes	$ 153,889,068	$ 181,636,510
g)	Unfunded actuarial accrued liability (d. – f.)	$ 98,177,997	$ 90,339,582
h)	Funded percentage (f. / d.)	61.05%	66.78%
i)	Section 22D funding for fiscal 2023	$ 11,474,641	$ 11,474,641
j)	Section 22D funding for fiscal 2024	$ 11,905,504	$ 11,474,641

A projection of Section 22D costs is presented in Section V. Schedule A of this report outlines the actuarial assumptions and methods employed. The provisions of the System are summarized in Schedule B. The valuation includes additional liabilities resulting from Chapter 17 COLA legislation.

Section III - Membership Data

In order to calculate the aggregate liabilities and assets on account of members of the System as of January 1, 2022, data was needed with respect to each active and retired member and beneficiary of the System. The data with respect to active, retired and terminated members and beneficiaries were furnished to the actuary by the Retirement Board.

From the data, tabulations were made showing, as of January 1, 2022, the number and annual compensation of active members classified by age and years of service and the number and annual retirement allowances of retired members and beneficiaries as of January 1, 2022, classified by age. These tables are presented in Schedule C.

The following tables show the number of active and retired members of the Retirement System as of January 1, 2022.

Table I - The Number and Annual Compensation of Active Members as of January 1, 2022

Group	Number	Compensation
General employees	375	$ 18,016,983
Police and Fire	154	$ 13,720,230
Total	529	$ 31,737,213

Table II - The Number and Annual Retirement Allowances of Retired Members and Beneficiaries as of January 1, 2022

Annual Retirement Allowance		
Group	Number	Pension[1]
Service Retirements	363	$ 12,856,206
Disability Retirements	32	$ 1,449,408
Beneficiaries of Deceased Members	97	$ 2,450,077
Grand Total	492	$ 16,755,691

In addition, there are 102 members with estimated deferred benefits valued at $1,291,495.

[1] Pension amounts exclude cost-of-living adjustments applied after July 1, 1981, and prior to July 1, 1998, which are funded by the Commonwealth of Massachusetts.

Section IV - Assets

The amount of assets taken into account in this valuation is based on financial information reported by the Retirement Board. As of January 1, 2022, the reported market value of Retirement System assets amounted to $204,195,642. The actuarial value of assets for valuation funding purposes is $181,636,510. Valuation assets are developed using a smoothing method (described in Schedule A of this report) in order to smooth the year-to-year fluctuations due to deviations of investment returns from expected levels.

Year Ending		December 31, 2020	December 31, 2021
1.	Market value of plan assets, prior year end	$ 159,393,849	$ 173,146,341
2.	Employer and employee contributions, net transfers and reimbursements	$ 12,978,563	$ 15,058,867
3.	Expenses	$ (364,268)	$ (358,704)
4.	Benefits and refunds	$ (16,623,988)	$ (17,319,199)
5.	Expected interest during the year	$ 11,791,646	$ 12,879,577
6.	Expected market value of plan assets, current year	$ 167,175,802	$ 183,406,882
7.	Actual market value of plan assets, current year	$ 173,146,341	$ 204,195,642
8.	Investment gain/(loss) during prior year [7. – 6.]	$ 5,970,539	$ 20,788,760
9.	Investment gain/(loss) during second prior year	$ 15,996,168	$ 5,970,539
10.	Investment gain/(loss) during third prior year	$ (20,263,337)	$ 15,996,168
11.	Investment gain/(loss) during fourth prior year	$ 11,343,662	$ (20,263,337)
12.	Tentative Valuation Assets before reflecting 80% - 120% corridor = [7. – 80% x 8. – 60% x 9. – 40% x 10. – 20% x 11.]	$ 164,608,811	$ 181,636,510
13.	80% of actual market value = 80% x 7.	$ 138,517,073	$ 163,356,514
14.	120% of actual market value = 120% x 7.	$ 207,775,609	$ 245,034,769
15.	Valuation Assets = 12. But not less the 13. or greater than 14.	$ 164,608,811	$ 181,636,510
16.	Ratio of actuarial value to market value	95.07%	88.95%
17.	Actuarial Value Return for prior year	9.70%	12.03%
19.	Market Value Return for prior year	11.29%	19.59%

Section V - Contributions Payable Under the System

Section 22D of MGL Chapter 32 outlines various requirements of a funding schedule that will amortize the unfunded actuarial liability and cover normal costs. The normal cost and unfunded actuarial liability are to be calculated in accordance with the individual entry-age-normal actuarial cost method. The contribution toward amortization of the unfunded actuarial liability may increase by up to 4½% each year.

The following table presents a projection of contributions that satisfy the Section 22D requirements. The forecast is based upon an assumption of a stable population in which the total payroll and normal cost of the system are expected to increase 4.0% per year. The employee contribution rate is expected to increase to 10.5% by 2045 as members contributing base percentages 5%, 7%, and 8% are replaced by new members, whose base contribution is 9%. The unfunded accrued liability contribution is also based on a 4% annual increase and is assumed to be paid each September 1. This schedule incorporates the funding required to provide annual COLAs under Chapter 17 of the Acts of 1997.

Please note that the amounts shown in the following schedule for the 2023 fiscal year represent the actual amounts already appropriated by the City for the 2023 fiscal year.

The 2024 appropriation is approximately $11.5 million, or about 4% lower than the amount shown in the 2020 valuation report. This is the result of generally favorable actuarial experience. The primary factors leading to the decrease are the following:

1. There was a gain on the actuarial value of assets because of the recognition of past investment losses through the asset smoothing method. The effective return on the actuarial value of assets was 12.03%. This accounted for a decrease of approximately $1.3 million.
2. The demographic experience over the past two years was unfavorable. Sources of the loss include inactive mortality that was less than expected and some census adjustments, partially offset by gains from pay increases that were less than expected. This accounted for an increase of about $0.6 million.
3. The mortality improvement assumption was updated to Scale MP-2021 to reflect more recently available information. This assumption change decreased the appropriation by about $0.1 million.
4. The 2024 appropriation has been increased by approximately $0.2 million to ensure that it is not lower than the 2023 appropriation. This is effectively an acceleration of a portion of future amortization payments.

Section V - Contributions Payable Under the System (continued)

Pension Reform Act - Section 22D Funding Requirements

Fiscal Year Ending	Payroll[1]	Unfunded Accrued Liability[2]	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %[2]
2023	31,737,213	90,339,582	2,849,352	2,060,881	9,413,760	11,474,641	36.2%	66.8%
2024	33,006,702	87,454,389	2,986,161	2,125,147	9,349,494	11,474,641	34.8%	69.1%
2025	34,326,970	84,427,260	3,129,357	2,178,744	9,456,563	11,635,307	33.9%	71.8%
2026	35,700,049	81,076,577	3,279,230	2,233,295	9,834,825	12,068,120	33.8%	74.1%
2027	37,128,051	77,087,285	3,436,086	2,288,792	10,228,218	12,517,010	33.7%	76.3%
2028	38,613,173	72,395,995	3,600,243	2,345,224	10,637,346	12,982,570	33.6%	78.2%
2029	40,157,700	66,933,945	3,772,035	2,402,580	11,062,841	13,465,421	33.5%	80.3%
2030	41,764,008	60,626,571	3,951,811	2,460,843	11,505,355	13,966,198	33.4%	82.6%
2031	43,434,568	53,393,046	4,139,933	2,519,999	11,965,569	14,485,568	33.4%	85.0%
2032	45,171,951	45,145,786	4,336,782	2,580,028	12,444,192	15,024,220	33.3%	87.6%
2033	46,978,829	35,789,912	4,542,755	2,640,906	12,941,959	15,582,865	33.2%	90.4%
2034	48,857,982	25,222,676	4,758,267	2,702,609	13,459,638	16,162,247	33.1%	93.4%
2035	50,812,301	13,332,837	4,983,752	2,765,107	13,998,022	16,763,129	33.0%	96.6%
2036	52,844,793	0	5,219,662	2,828,368	0	2,828,368	5.4%	100.0%
2037	54,958,585	0	5,466,471	2,892,356	0	2,892,356	5.3%	100.0%
2038	57,156,928	0	5,724,673	2,957,030	0	2,957,030	5.2%	100.0%
2039	59,443,205	0	5,994,786	3,022,343	0	3,022,343	5.1%	100.0%
2040	61,820,933	0	6,277,347	3,088,251	0	3,088,251	5.0%	100.0%
2041	64,293,770	0	6,572,922	3,154,696	0	3,154,696	4.9%	100.0%
2042	66,865,521	0	6,882,099	3,221,620	0	3,221,620	4.8%	100.0%
2043	69,540,142	0	7,205,494	3,288,957	0	3,288,957	4.7%	100.0%
2044	72,321,748	0	7,543,748	3,356,637	0	3,356,637	4.6%	100.0%
2045	75,214,618	0	7,897,535	3,424,582	0	3,424,582	4.6%	100.0%
2046	78,223,203	0	8,213,436	3,549,501	0	3,549,501	4.5%	100.0%
2047	81,352,131	0	8,541,974	3,679,053	0	3,679,053	4.5%	100.0%
2048	84,606,216	0	8,883,653	3,813,416	0	3,813,416	4.5%	100.0%
2049	87,990,465	0	9,238,999	3,952,769	0	3,952,769	4.5%	100.0%
2050	91,510,084	0	9,608,559	4,097,301	0	4,097,301	4.5%	100.0%
2051	95,170,487	0	9,992,901	4,247,207	0	4,247,207	4.5%	100.0%
2052	98,977,306	0	10,392,617	4,402,690	0	4,402,690	4.4%	100.0%
2053	102,936,398	0	10,808,322	4,563,959	0	4,563,959	4.4%	100.0%

[1]Calendar year basis

[2]As of preceding January 1

Section VI – PERAC Annual Statement

The most recent actuarial valuation of the System was prepared by Buck as of January 1, 2022

The normal cost for employees on that date was:	$2,849,352	9.0% of pay
The normal cost for the employer was:	1,974,953	6.2% of pay

The actuarial liability for active members was:	$103,716,086
The actuarial liability for retired and inactive members was:	168,260,006
Total actuarial accrued liability:	$271,976,092
System assets as of that date:	181,636,510
Unfunded actuarial accrued liability:	$90,339,582

The ratio of system's assets to total actuarial liability was: 66.8%

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

Investment Return:	7.50%
Rate of Salary Increase:	4.00%

Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (b)	Unfunded Actuarial Accrued Liability (b - a)	Funded Ratio (a / b)	Covered Payroll (c)	UAAL as a percent of Covered Payroll (b - a) / c
1/1/2022	$181,636,510	$271,976,092	$90,339,582	66.8%	$31,737,213	284.6%
1/1/2020	$153,889,068	$252,067,065	$98,177,997	61.1%	$29,406,301	333.9%
1/1/2018	$143,513,760	$226,383,224	$82,869,464	63.4%	$30,893,029	268.2%
1/1/2016	129,316,338	205,524,287	$76,207,949	62.9%	29,187,382	261.1%
1/1/2014	115,874,621	179,447,442	$63,572,821	64.6%	28,945,300	219.6%
1/1/2012	106,181,870	162,639,000	$56,457,130	65.3%	27,681,194	204.0%
1/1/2010	104,707,479	154,299,627	$49,592,148	67.9%	27,433,458	180.8%
1/1/2009	110,478,130	141,758,527	$31,280,397	77.9%	24,431,654	128.0%

Section VII – Accounting Information

Information required under Statement No. 67 of the Governmental Accounting Standard Board (GASB) is shown below:

A. Summary of Significant Accounting Policies

Method used to value investments.

Investments are reported at fair value.

B. Plan Description

Plan administration

The City of Woburn, Massachusetts, administers the Contributory Retirement System (Plan), a defined benefit pension plan that covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

Plan membership

Plan membership is summarized in Schedule C.

Benefits provided

Please see Schedule B of the report for a summary of plan provisions.

Contributions

The City establishes contributions based on an actuarially determined contribution recommended by an independent actuary. The actuarially determined contribution is developed using the Entry Age Normal Actuarial Cost Method. For the sponsor fiscal year ended June 30, 2022, the City contributed $11,059,368 to the plan.

C. Investments

Rate of return

For the year ended December 31, 2021, the annual money-weighted rate of return on pension plan investments, net of pension plan investment expense, was 19.59%[1]. The money-weighted rate of return expresses investment performance, net of investment expense, adjusted for the changing amounts actually invested.

D. Receivables

No receivable contributions have been included in plan assets.

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[1] The GASB standard requires a dollar-weighted rate of return calculation with cash flows determined at least monthly. The information provided does not have sufficient detail to perform this calculation, therefore, we used a common standard estimation technique to provide a reasonable representation of the rate of return. A more refined calculation of the rate of return can be determined if the actual dates of contribution and a monthly breakdown of benefit payments and expenses is provided.

Section VII – Accounting Information (continued)

E. Net Pension Liability

The components of the net pension liability at December 31, 2021, were as follows:

Components of Net Pension Liability	
Total pension liability	$ 269,428,016
Plan fiduciary net position	(204,195,642)
City’s net pension liability	$ 65,232,374
Plan fiduciary net position as a percentage of the total pension liability	75.79%

F. Actuarial assumptions

The total pension liability was determined by an actuarial valuation as of December 31, 2021, using the following actuarial assumptions, applied to all periods included in the measurement. The assumptions used to develop the figures presented for GASB 67 and 68 are the same as those set forth in Schedule A of the report except where noted:

Actuarial Assumptions	
Inflation	3.00%
Salary Increases	4.00% per annum
Investment rate of return	7.50%, net of pension plan investment expenses. This is based on an average inflation rate of 3.00% and a real rate of return of 4.50%.

It is assumed that healthy mortality is represented by the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021.

The Board selected 7.50% as the long-term expected rate of return on Fund investments. It was supported using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes. Best estimates of arithmetic rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2021 are summarized in the following table:

Asset Class	Long-Term Expected Rate of Return
Equities	9.13%
Fixed income	3.85%
Alternatives	8.88%

Section VII – Accounting Information (continued)

Discount rate

The discount rate used to measure the total pension liability was 7.50%. The projection of cash flows used to determine the discount rate assumed that City contributions will continue to follow the current funding policy. Based on those assumptions, the pension plan's fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Had there been a point where assets were projected to be depleted, a municipal bond rate of 2.25% would have been used in the development of the blended GASB discount rate after that point. The 2.25% rate is based on the S&P Municipal Bond 20 Year High Grade Rate Index.

Sensitivity of the net pension liability to changes in the discount rate

The following presents the net pension liability, calculated using the discount rate of 7.50%, as well as what the net pension liability would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50%) or 1-percentage-point higher (8.50%) than the current rate:

	1% Decrease (6.50%)	Current Discount Rate (7.50%)	1% Increase (8.50%)
Net Pension Liability	$ 93,686,882	$ 65,232,374	$ 41,001,324

Section VII – Accounting Information (continued)

Schedules of Required Supplementary Information

Schedule of Changes in Net Pension Liability and Related Ratios

Total pension liability	
Service cost	$ 4,071,861
Interest	18,837,900
Differences between expected and actual experience	7,667,036
Changes of assumptions	(700,323)
Benefit payments	(16,469,658)
Net change in total pension liability	$ 13,406,816
Total pension liability-beginning	$ 256,021,200
Total pension liability-ending (a)	$ 269,428,016
Plan fiduciary net pension	
Contributions-employer	$ 11,059,368
Contributions-employee	3,443,480
Net investment income	33,668,338
Benefit payments, including refunds of employee contributions	(16,469,658)
Administrative expense	(358,704)
Other	(293,523)
Net change in plan fiduciary net position	$ 31,049,301
Plan fiduciary net position-beginning	$ 173,146,341
Plan fiduciary net position-ending (b)	$ 204,195,642
Net pension liability	
Net pension liability-ending (a)-(b)	$ 65,232,374
Covered payroll[1]	$ 31,737,213
Net pension liability as a percentage of payroll	205.54%

Notes to Schedule:

Changes of assumptions

The mortality assumption was changed to the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021.

[1] The covered payroll shown here is based off census data provided for the January 1, 2022 actuarial valuation. According to GASB Statement Nos. 67 and 68, as amended by GASB Statement No. 82, this should be payroll on which contributions are based for the measurement period. Therefore, this number may need to be updated for inclusion in financial statements.

Section VII – Accounting Information (continued)

Schedules of Required Supplementary Information (continued)

Schedule of Contributions

	2022	2021
Actuarially determined contribution	$11,059,368	$ 9,071,694
Contributions related to the actuarially determined contribution	(11,059,368)	(9,071,694)
Contribution deficiency (excess)	$ 0	$ 0

Notes to Schedule:

A. Valuation date

Actuarially determined contribution rates are calculated as of January 1 in the fiscal year preceding the fiscal year in which contributions are made. That is, the contribution calculated as of January 1, 2022 will be made during the fiscal year ended June 30, 2023.

B. Methods and assumptions used to determine contribution rates:

Please see Schedule A of the report.

Schedule of Investment Returns

	2021	2020
Annual money-weighted rate of return, net of investment expenses[1]	19.59%	11.29%

[1] The GASB standard requires a dollar-weighted rate of return calculation with cash flows determined at least monthly. The information provided does not have sufficient detail to perform this calculation, therefore, we used a common standard estimation technique to provide a reasonable representation of the rate of return. A more refined calculation of the rate of return can be determined if the actual dates of contribution and a monthly breakdown of benefit payments and expenses is provided.

Schedule A - Actuarial Assumptions and Methods

Actuarial Cost Method

Individual entry-age normal cost method.

Asset Valuation Method for Funding Purposes

For funding calculation purposes, assets are valued according to the following general formula, provided such value is within a 20% corridor of the market value:

VA = $MV - .8I_1 - .6I_2 - .4I_3 - .2I_4$ where

VA = Valuation assets.

MV = Market value of assets as of the valuation date.

I_n = Investment gain (loss) during n^{th} year preceding the valuation date.

Valuation Interest Rate

7.50% per annum, compounded annually, net of investment expenses. The reasonableness of the long-term expected rate of return on Fund investments was determined using best-estimate ranges of expected future nominal rates of return (expected returns, net of investment expense and inflation) developed for each major asset class using an econometric model that forecasts a variety of economic environments and then calculates asset class returns based on functional relationships between the economic variables and the asset classes.

Interest rate for accounting

7.50% per year, compounded annually. Projected benefit payments that are expected to be paid from available plan assets are discounted at the valuation interest rate of 7.50%. After the point where plan assets are not available to pay benefits, projected benefit payments are discounted at the municipal bond rate. The valuation rate for accounting purposes is the effective rate resulting from this process.

Municipal bond rate

2.25%. This rate is based on the S&P Municipal Bond 20 Year High Grade Rate Index as of December 31, 2021 the Measurement date for GASB 67 purposes.

Mortality

It is assumed that healthy mortality is represented by the RP-2014 Total Employee and Healthy Annuitant Mortality Tables, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021. Mortality for disabled members is represented by the RP-2014 Disabled Mortality Table, rolled back to 2006 and projected with Mortality Improvement Scale MP-2021.

It is assumed that 80% of all active deaths are ordinary (20% are service connected).

Schedule A - Actuarial Assumptions and Methods (continued)

Separations from Active Service

Representative values of the assumed annual rates of withdrawal and vesting, disability and service retirement, all based on an analysis of experience, are as follows:

General Employees-Annual Rates of

		Service Retirement	
Age	Disability	Male	Female
25	.02%		
30	.03		
35	.06		
40	.10		
45	.15		
50	.19	1.0%	1.5%
55	.24	2.0	5.5
60	.28	12.0	5.0
62	.30	30.0	15.0
65	.30	40.0	15.0
69		30.0	20.0

Years of Service	Rates of Withdrawal
0	15.0%
1	12.0%
2	10.0%
3	9.0%
4	8.0%
5	7.6%
10	5.4%
15	3.3%
20	2.0%
25	1.0%
30+	0.0%

Police and Fire-Annual Rates of

Age	Disability	Service Retirements
25	0.20%	
30	0.30	
35	0.30	
40	0.30	
45	1.00	1.0%
50	1.25	2.0
55	1.20	15.0
60	0.85	20.0
62	0.75	25.0
65	0.00	100.0
69		

Years of Service	Rates of Withdrawal
0	1.5%
1	1.5
2	1.5
3	1.5
4	1.5
5	1.5
6	1.5
7	1.5
8	1.5
9	1.5
10	1.5
11+	0.0

It is assumed for the general employees that 40% of all disabilities are ordinary (60% are service connected). For police and fire employees, 10% of all disabilities are assumed to be ordinary (90% are service connected). A load was applied to the accidental disability liability to account for the additional benefit payable for each dependent child upon the member’s disability. Loads of approximately 2% and 11.7% were developed for Group 1 and Group 4, respectively, taking into account the higher likelihood of Group 4 accidental disabilities at younger ages, thus the likelihood of Group 4 having more dependent children than Group 1 accidental disability retirees.

These assumptions are commonly used throughout the Massachusetts Public Pension Systems and were selected for this plan since its employees are of similar demographic composition to those in other systems.

Schedule A - Actuarial Assumptions and Methods (continued)

Salary Scale

4.00% per annum.

Cost-of-Living Adjustments

Retirement benefits were assumed to increase annually at the assumed inflation rate of 3.00%, up to the applicable annual maximum. The inflation assumption was developed in the same analysis that supported the valuation interest rate.

Form of Payment

Future retirees are assumed to elect a Life Annuity. Future vested terminations are assumed to elect a refund of contributions unless specifically reported by the plan sponsor to be eligible for an annuity benefit.

Marital Percentage

80% of participants are assumed to be married at death. Husbands are assumed to be 3 years older than their wives.

Loading or Contingency Reserve

None.

Administrative Expenses

The normal cost is increased by an amount equal to the anticipated administrative expenses for the upcoming fiscal year. The amount for plan year 2022 is $600,000 and is anticipated to increase at 3.0% per year.

GASB 67 and 68 Measurement Date

December 31, 2021.

Changes in Assumptions Since the Prior Valuation

- The mortality improvement assumption was updated to Scale MP-2021 to reflect more recently available information

This assumption change decreased the plan's actuarial accrued liability by approximately $699,000.

Schedule B - Summary of System Provisions

Membership

The Retirement System covers all employees of participating units except teachers, elected officials and those employees in service at the time of its establishment who elected not to become members. Eligible employees in the City who enter service on or after the date the System became operative for their classification may become members of the Retirement System on their own application.

Summary of Benefit and Contribution Provisions

A summary of the main benefit and contribution provisions of the Retirement System, as interpreted for the valuation, is presented below.

The terms “Group 1” and “Group 4” are used to denote “general employees” and “police and fire”, respectively.

Member Contributions

Members contribute a percentage of annual regular compensation in accordance with their respective dates of hire, as shown below:

Date of Hire	Rate of Contribution
Prior to January 1, 1975	5%
On or after January 1, 1975	7%
On or after January 1, 1984	8%
On or after July 1, 1996	9%

Members hired on or after January 1, 1979 contribute an additional 2% of compensation in excess of $30,000.

The contribution rate for Group 1 participants hired on or after April 2, 2012 and who attain 30 years of service is reduced by three percentage points.

Benefits

Final Average Salary (FAS)

For those hired prior to April 2, 2012, the average of a member’s three highest consecutive years’ compensation. For those hired on or after April 2, 2012, the average of a member’s five highest consecutive years’ compensation. For those hired on or after January 1, 2011, salary taken into account for benefit purposes is capped at 64% of the IRC Section 401(a)(17) limit (indexed).

Superannuation Retirement

Eligibility

For those hired prior to April 2, 2012: Age 65 for Group 1; Age 55 for Group 4. Maximum retirement age is 70 for Group 1 and 65 for Group 4.

For those hired on or after April 2, 2012: Age 67 for Group1; Age 57 for Group 4 if member has completed 30 years of service, or age 62 otherwise.

Allowance

2.5% per year of service times FAS. Maximum total allowance is 80% of FAS. Veterans receive additional $15 annually per year of service to a maximum of $300 annually.

Schedule B - Summary of System Provisions (continued)

Early Retirement

Eligibility

For those hired prior to April 2, 2012: 20 years of service, or age 55 with 10 years of service.

For those hired on or after April 2, 2012: age 60 and 10 years of service for Group 1; Age 55 and 10 years for Group 4.

Allowance

Calculated as a superannuation retirement allowance (including veteran's benefits) except accrual rate is equal to 2.5% reduced by .1% for each year age at retirement is below either 65 for Group 1 or 55 for Group 4. Those hired on or after April 2, 2012 who retire with fewer than 30 years of service, the accrual rate of 2.5% is reduced by .15% for each year age at retirement precedes age 67 for Group 1 or age 57 for Group 4. Those hired on or after April 2, 2012 who retire with at least 30 years of service, the accrual rate of 2.5% is reduced by .15% for each year age at retirement precedes age 62 for Group 1 or age 57 for Group 4.

The minimum allowance after 30 years of service is equal to:

(1) An annuity which is the actuarial equivalent of member's accumulated deductions; and

(2) A pension equal to 1/3 of FAS and any veteran's benefits as described under superannuation retirement.

Vested Retirement

Eligibility

10 years of service. For certain involuntary terminations, this is reduced to 6 years.

Allowance

A superannuation retirement allowance commencing at age 55 for Group 1 members (age 60 if hired after April 1, 2012) and age 45 for Group 4 members (age 55 if hired after April 1, 2012) or later, where the accrual rate is determined by the age of the member at the time the allowance commences.

In lieu of the deferred pension benefit, a member may elect to receive a refund of their accumulated contributions.

Ordinary Disability

Eligibility

10 years of service

Allowance

An immediate allowance equal to the age 55 rate for Group 1 members or age 45 rate for Group 4 members per year of service times FAS.

Veterans receive an allowance equal to:

(1) An annuity which is the actuarial equivalent of their accumulated deductions; and

(2) A pension which is the greater of 50% of current salary and the service retirement allowance to which they are eligible, if any.

Schedule B - Summary of System Provisions (continued)

Accidental Disability

Eligibility

Permanent incapacity for further duty as a result of personal injury sustained while in the performance of duties.

Allowance

An immediate allowance equal to:

(1) An annuity which is the actuarial equivalent of the member's accumulated deductions; and

(2) A pension equal to 72% of current salary; and

(3) A supplement equal to $1,010.28 per year per child who is under 18 at the time of the member's retirement, with no age limitation if the child is mentally or physically incapacitated from earning. The additional pension may continue up to age 22 for any child who is a full-time student at an accredited educational institution.

The maximum total allowance is 100% of current salary.

Accidental Death Benefit

Eligibility

Death due to an occupational injury.

Allowance

An immediate allowance equal to:

(1) A lump sum payment equal to the accumulated deductions at death; and

(2) A pension equal to 72% of current salary and payable to the surviving spouse, dependent children, or the dependent parents; and

(3) A supplement of $1,010.28 per year per child payable to the spouse or legal guardian until all children reach age 18, or 22 if a full-time student, unless mentally or physically incapacitated.

The maximum total allowance is 100% of current salary.

Death in Active Service

Eligibility

Death of a member due to a non-occupational injury.

Allowance

An immediate allowance that would have been payable had the member retired and elected the 2/3 joint and survivor option on the day before his death. For death occurring prior to the minimum superannuation retirement age, the age 55 (age 60 if hired on or after April 2, 2012) and age 45 (age 55 if hired on or after April 2, 2012) accrual rates are used, respectively, for Group 1 and Group 4 members. The minimum annual allowance payable to the surviving spouse of a member in service who dies with at least two years of creditable service is $6,000, provided that the member and the spouse were married for at least one year and living together on the member's date of death.

For members with at least 2 years of service at death, the surviving spouse receives an additional allowance equal to the sum of $1,440 per year for the first child and $1,080 per year for each additional child until all dependent children reach age 18 or 22 if a full-time student, unless mentally or physically incapacitated. If there is no designated beneficiary or surviving spouse, then member contributions are returned. If there are dependent children but no surviving spouse, they may elect minimum survivor benefits of $3,000 per year plus $1,440 for the first child and $1,080 for each additional child.

The maximum total allowance is 100% of salary at the date of death.

Schedule B - Summary of System Provisions (continued)

Normal Form of Benefit

Reduced modified cash refund annuity.

Optional Forms of Benefit

(1) Option A — Life annuity.

(2) Option B — Modified cash refund annuity.

(3) Option C — 66-2/3% joint and survivor allowance. If the beneficiary predeceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement.

Return of Contribution

If no other benefit is payable upon termination, the member's accumulated deductions are returned.

Post-Retirement Adjustments

In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a cost-of-living adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees, and beneficiaries who have been receiving benefits payments for at least one year as of July 1 are eligible for the adjustment. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the State and are not the liability of the Retirement System. The maximum annual amount of pension benefit subject to a COLA is given by the following schedule:

Year	Annual Maximum
Prior to 2019	$12,000
2019	$13,000
2020	$14,000
2021	$15,000
2022	$16,000
2023	$17,000
2024 and later	$18,000

Schedule C - Membership Tables

Table 1 – Age/Service Distribution with Salary as of January 1, 2022

Attained Age	Average Salary < 5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
20-24	12 20,820	1 63,105								13 24,072
25-29	31 42,122	3 61,184								34 43,804
30-34	31 45,148	17 65,975	2 72,614							50 53,328
35-39	16 43,493	27 83,153	12 86,455	2 72,523						57 72,342
40-44	11 25,024	8 51,186	7 73,716	8 96,740	4 107,802					38 63,313
45-49	14 32,334	9 54,451	3 45,136	14 83,413	14 92,857	3 89,430				57 66,916
50-54	21 30,263	9 37,042	11 57,301	5 77,732	11 86,196	13 92,429	9 74,960			79 60,915
55-59	15 19,447	14 53,143	16 51,750	12 72,997	11 64,273	9 95,114	5 131,241	4 91,231		86 61,905
60-64	10 25,819	11 38,146	10 49,217	14 52,534	20 52,775	3 97,682	8 102,768	6 120,338	1 109,499	83 59,128
65-69	1 12,619	1 31,258	2 78,033	3 63,086	8 56,277	1 42,039	3 61,286	1 120,705	1 126,402	21 62,496
70+	1 5,257		4 52,448	1 12,000	3 76,733	1 71,248		1 40,288		11 51,708
Total Employees Average Salary	163 34,247	100 60,411	67 61,947	59 72,680	71 72,145	30 91,074	25 93,474	12 103,995	2 117,950	529 59,995

Schedule C - Membership Tables (continued)

Table 2 - The Number and Annual Pensions of Retired Members Distributed by Age as of January 1, 2022

	Service Retirements		Disability Retirements		Beneficiaries	
Age	Number	Annual Pension	Number	Annual Pension	Number	Annual Pension
Under 20	0	0	0	0	0	0
20 - 24	0	0	0	0	0	0
25 - 29	0	0	0	0	0	0
30 - 34	0	0	0	0	0	0
35 - 39	0	0	0	0	2	145,576
40 – 44	0	0	1	65,707	0	0
45 - 49	0	0	1	24,380	3	33,153
50 - 54	0	0	1	53,647	1	14,157
55 - 59	22	1,080,044	6	220,639	6	191,498
60 - 64	59	1,780,633	9	426,152	9	190,880
65 - 69	71	2,886,943	3	179,332	18	681,405
70 - 74	85	3,378,353	7	320,385	12	279,045
75 - 79	50	1,822,810	2	81,053	5	92,764
80 - 84	22	685,843	1	29,204	13	327,990
85 - 89	37	848,719	0	0	15	319,898
90 - 94	13	271,120	1	48,909	11	160,536
95 - 99	4	101,741	0	0	2	13,175
100 and over	0	0	0	0	0	0
Total	363	12,856,206	32	1,449,408	97	2,450,077

Schedule D - Projection of Expected Pension Payments

Year	Amount	Year	Amount
2022	$ 19,196,533	2047	$ 25,191,817
2023	18,755,713	2048	24,977,086
2024	19,664,491	2049	24,750,708
2025	20,459,995	2050	24,453,265
2026	21,213,448	2051	24,016,099
2027	21,878,141	2052	23,460,744
2028	22,522,498	2053	22,940,998
2029	23,141,656	2054	22,368,032
2030	23,734,934	2055	21,805,363
2031	24,291,134	2056	21,165,578
2032	24,776,727	2057	20,511,700
2033	25,213,663	2058	19,845,302
2034	25,578,500	2059	19,147,724
2035	25,819,047	2060	18,411,138
2036	25,942,139	2061	17,667,536
2037	26,022,807	2062	16,899,125
2038	26,123,431	2063	16,146,737
2039	26,226,625	2064	15,388,771
2040	26,177,664	2065	14,635,940
2041	26,132,949	2066	13,903,338
2042	26,029,930	2067	13,194,592
2043	25,930,073	2068	12,492,877
2044	25,758,116	2069	11,806,559
2045	25,580,613	2070	11,126,914
2046	25,413,803	2071	10,457,395

Schedule E - GASB 68 Information

1. The determination of the average expected remaining service lives of all members, as follows:

Remaining Service Lives			
Group	**Number**	**Service**	**Average**
Retired paid from fund	492	0	
Terminated with deferred benefit	102	0	
Active	529	5,568	
Total	1,123	5,568	4.96

2. The determination of pension expense for the fiscal year as shown below:

Pension Expense	Fiscal Year Ending June 30, 2022
Service Cost	$ 4,071,861
Interest Cost on Total Pension Liability	18,837,900
Differences between Expected and Actual Experience	4,040,989
Changes of Assumptions	(28,541)
Contributions-Member	(3,443,480)
Projected Earnings on Plan Investments	(12,879,577)
Differences between Projected and Actual Earnings	(6,761,685)
Plan Changes	0
Administrative Expenses	358,704
Other	293,523
Total Pension Expense	$ 4,489,694

3. The schedule of changes in Net Pension Liability:

Change in Net Pension Liability	Fiscal Year Ending June 30, 2022
Net pension liability at June 30, 2021	$ 82,874,859
Changes for the year:	
Service Cost	4,071,861
Interest Cost of Total Pension Liability	18,837,900
Projected Earnings on Plan Investments	(12,879,577)
Contributions-Employer	(11,059,368)
Contributions-Member	(3,443,480)
Administrative Expenses	358,704
Plan Changes	0
Deferred Inflows/(Outflows)	
Changes in Assumptions	(700,323)
Differences between Expected and Actual Liability Experience	7,667,036
Difference between Projected and Actual Earnings	(20,788,761)
Other	293,523
Net Change in Net Pension Liability	(17,642,485)
Net pension liability at June 30, 2022	$ 65,232,374

Schedule F – Schedule of Deferred Inflows and Outflows

Schedule of Differences Between Projected and Actual Earnings

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Amount Established	$ 2,291,299	$ 11,691,609	$ (1,641,920)	$ (11,343,662)	$ 20,275,467	$ (15,996,168)	$ (5,955,292)	$ (20,788,761)			
Recognition Period	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00			
Amount Recognized in FY:											
2015	$ 458,260	-	-	-	-	-	-	-	$ 458,260	$ -	$ 458,260
2016	458,260	$ 2,338,322	-	-	-	-	-	-	2,796,582	-	2,796,582
2017	458,260	2,338,322	$ (328,384)	-	-	-	-	-	2,796,582	(328,384)	2,468,198
2018	458,260	2,338,322	(328,384)	$ (2,268,732)	-	-	-	-	2,796,582	(2,597,116)	199,466
2019	458,259	2,338,322	(328,384)	(2,268,732)	$ 4,055,093	-	-	-	6,851,674	(2,597,116)	4,254,558
2020	-	2,338,321	(328,384)	(2,268,732)	4,055,093	$ (3,199,234)	-	-	6,393,414	(5,796,350)	597,064
2021	-	-	(328,384)	(2,268,732)	4,055,093	(3,199,234)	$ (1,191,058)	-	4,055,093	(6,987,408)	(2,932,315)
2022	-	-	-	(2,268,734)	4,055,093	(3,199,234)	(1,191,058)	$ (4,157,752)	4,055,093	(10,816,778)	(6,761,685)
2023	-	-	-	-	4,055,095	(3,199,234)	(1,191,058)	(4,157,752)	4,055,095	(8,548,044)	(4,492,949)
2024	-	-	-	-	-	(3,199,232)	(1,191,058)	(4,157,752)	-	(8,548,042)	(8,548,042)
2025	-	-	-	-	-	-	(1,191,060)	(4,157,752)	-	(5,348,812)	(5,348,812)
2026	-	-	-	-	-	-	-	(4,157,753)	-	(4,157,753)	(4,157,753)
2027	-	-	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Deferred Balance at 6/30:											
2015	$ 1,833,039	-	-	-	-	-	-	-	$ 1,833,039	$ -	$ 1,833,039
2016	1,374,779	$ 9,353,287	-	-	-	-	-	-	10,728,066	-	10,728,066
2017	916,519	7,014,965	$ (1,313,536)	-	-	-	-	-	7,931,484	(1,313,536)	6,617,948
2018	458,259	4,676,643	(985,152)	$ (9,074,930)	-	-	-	-	5,134,902	(10,060,082)	(4,925,180)
2019	-	2,338,321	(656,768)	(6,806,198)	$ 16,220,374	-	-	-	18,558,695	(7,462,966)	11,095,729
2020	-	-	(328,384)	(4,537,466)	12,165,281	$ (12,796,934)	-	-	12,165,281	(17,662,784)	(5,497,503)
2021	-	-	-	(2,268,734)	8,110,188	(9,597,700)	$ (4,764,234)	-	8,110,188	(16,630,668)	(8,520,480)
2022	-	-	-	-	4,055,095	(6,398,466)	(3,573,176)	$ (16,631,009)	4,055,095	(26,602,651)	(22,547,556)
2023	-	-	-	-	-	(3,199,232)	(2,382,118)	(12,473,257)	-	(18,054,607)	(18,054,607)
2024	-	-	-	-	-	-	(1,191,060)	(8,315,505)	-	(9,506,565)	(9,506,565)
2025	-	-	-	-	-	-	-	(4,157,753)	-	(4,157,753)	(4,157,753)
2026	-	-	-	-	-	-	-	-	-	-	-

Schedule F – Schedule of Deferred Inflows and Outflows (continued)

Schedule of Differences Between Expected and Actual Experience

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Amount Established	$ -	$ 3,531,873	$ -	$ 250,301	$ -	$ 11,094,128	$ -	$ 7,667,036			
Recognition Period	5.63	5.00	5.00	5.42	5.42	4.53	4.53	4.96			
Amount Recognized in FY:											
2015	-	-	-	-	-	-	-	-	$ -	$ -	$ -
2016	-	$ 706,375	-	-	-	-	-	-	706,375	-	706,375
2017	-	706,375	-	-	-	-	-	-	706,375	-	706,375
2018	-	706,375	-	$ 46,181	-	-	-	-	752,556	-	752,556
2019	-	706,375	-	46,181	-	-	-	-	752,556	-	752,556
2020	-	706,373	-	46,181	-	$ 2,449,035	-	-	3,201,589	-	3,201,589
2021	-	-	-	46,181	-	2,449,035	-	-	2,495,216	-	2,495,216
2022	-	-	-	46,181	-	2,449,035	-	$ 1,545,773	4,040,989	-	4,040,989
2023	-	-	-	19,396	-	2,449,035	-	1,545,773	4,014,204	-	4,014,204
2024	-	-	-	-	-	1,297,988	-	1,545,773	2,843,761	-	2,843,761
2025	-	-	-	-	-	-	-	1,545,773	1,545,773	-	1,545,773
2026	-	-	-	-	-	-	-	1,483,944	1,483,944	-	1,483,944
2027	-	-	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Deferred Balance at 6/30:											
2015	-	-	-	-	-	-	-	-	$ -	$ -	$ -
2016	-	$ 2,825,498	-	-	-	-	-	-	2,825,498	-	2,825,498
2017	-	2,119,123	-	-	-	-	-	-	2,119,123	-	2,119,123
2018	-	1,412,748	-	$ 204,120	-	-	-	-	1,616,868	-	1,616,868
2019	-	706,373	-	157,939	-	-	-	-	864,312	-	864,312
2020	-	-	-	111,758	-	$ 8,645,093	-	-	8,756,851	-	8,756,851
2021	-	-	-	65,577	-	6,196,058	-	-	6,261,635	-	6,261,635
2022	-	-	-	19,396	-	3,747,023	-	$ 6,121,263	9,887,682	-	9,887,682
2023	-	-	-	-	-	1,297,988	-	4,575,490	5,873,478	-	5,873,478
2024	-	-	-	-	-	-	-	3,029,717	3,029,717	-	3,029,717
2025	-	-	-	-	-	-	-	1,483,944	1,483,944	-	1,483,944
2026	-	-	-	-	-	-	-	-	-	-	-

Schedule F – Schedule of Deferred Inflows and Outflows (continued)

Schedule of Changes in Assumptions

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Amount Established	$ 6,330,561	$ 3,810,330	$ -	$ 2,400,814	$ -	$ (1,496,268)	$ -	$ (700,323)			
Recognition Period	5.63	5.00	5.00	5.42	5.42	4.53	4.53	4.96			
Amount Recognized in FY:											
2015	$ 1,124,434	-	-	-	-	-	-	-	$ 1,124,434	$ -	$ 1,124,434
2016	1,124,434	$ 762,066	-	-	-	-	-	-	1,886,500	-	1,886,500
2017	1,124,434	762,066	-	-	-	-	-	-	1,886,500	-	1,886,500
2018	1,124,434	762,066	-	$ 442,955	-	-	-	-	2,329,455	-	2,329,455
2019	1,124,434	762,066	-	442,955	-	-	-	-	2,329,455	-	2,329,455
2020	708,391	762,066	-	442,955	-	$ (330,302)	-	-	1,913,412	(330,302)	1,583,110
2021	-	-	-	442,955	-	(330,302)	-	-	442,955	(330,302)	112,653
2022	-	-	-	442,955	-	(330,302)	-	$ (141,194)	442,955	(471,496)	(28,541)
2023	-	-	-	186,039	-	(330,302)	-	(141,194)	186,039	(471,496)	(285,457)
2024	-	-	-	-	-	(175,060)	-	(141,194)	-	(316,254)	(316,254)
2025	-	-	-	-	-	-	-	(141,194)	-	(141,194)	(141,194)
2026	-	-	-	-	-	-	-	(135,547)	-	(135,547)	(135,547)
2027	-	-	-	-	-	-	-	-	-	-	-

Fiscal Year Ending 6/30	2015	2016	2017	2018	2019	2020	2021	2022	Outflows	Inflows	Total
Deferred Balance at 6/30:											
2015	$ 5,206,127	-	-	-	-	-	-	-	$ 5,206,127	$ -	$ 5,206,127
2016	4,081,693	$ 3,048,264	-	-	-	-	-	-	7,129,957	-	7,129,957
2017	2,957,259	2,286,198	-	-	-	-	-	-	5,243,457	-	5,243,457
2018	1,832,825	1,524,132	-	$ 1,957,859	-	-	-	-	5,314,816	-	5,314,816
2019	708,391	762,066	-	1,514,904	-	-	-	-	2,985,361	-	2,985,361
2020	-	-	-	1,071,949	-	$ (1,165,966)	-	-	1,071,949	(1,165,966)	(94,017)
2021	-	-	-	628,994	-	(835,664)	-	-	628,994	(835,664)	(206,670)
2022	-	-	-	186,039	-	(505,362)	-	$ (559,129)	186,039	(1,064,491)	(878,452)
2023	-	-	-	-	-	(175,060)	-	(417,935)	-	(592,995)	(592,995)
2024	-	-	-	-	-	-	-	(276,741)	-	(276,741)	(276,741)
2025	-	-	-	-	-	-	-	(135,547)	-	(135,547)	(135,547)
2026	-	-	-	-	-	-	-	-	-	-	-

Schedule G - Net Pension Liability Allocations as of June 30, 2021 and June 30, 2022 by Employer

Employer Name	Fiscal Year Ended June 30, 2021 Employer Proportion	Fiscal Year Ended June 30, 2021 Net Pension Liability	Fiscal Year Ended June 30, 2022 Employer Proportion	Changes in Proportion	Net Pension Liability	Net Pension Liability: 1% Decrease	Net Pension Liability: 1% Increase
City of Woburn	96.8900%	80,297,451	96.6300%	10,686,667	63,034,043	90,529,634	39,619,579
Woburn Housing Authority	3.1100%	2,577,408	3.3700%	372,701	2,198,331	3,157,248	1,381,745
Woburn Redevelopment Authority	0.0000%	0	0.0000%	0	0	0	0
Total	**100.0000%**	**$ 82,874,859**	**100.0000%**	**$ 11,059,368**	**$ 65,232,374**	**$ 93,686,882**	**$ 41,001,324**

Schedule H - Allocations of Pension Amounts as of June 30, 2022 by Employer

			Deferred Outflows of Resources				
Employer Name	Employer Proportion	Net Pension Liability	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportion
City of Woburn	96.6300%	63,034,043	9,554,467	179,769	0	3,918,438	312,580
Woburn Housing Authority	3.3700%	2,198,331	333,215	6,270	0	136,657	259,316
Woburn Redevelopment Authority	0.0000%	0	0	0	0	0	0
Total	**100.0000%**	**$ 65,232,374**	**$ 9,887,682**	**$ 186,039**	**$ 0**	**$ 4,055,095**	**$ 571,896**

	Deferred Inflows of Resources					
Employer Name	Difference Between Expected and Actual Experience	Changes in Assumptions	Changes in Benefits	Difference Between Projected and Actual Investment Earnings	Changes in Proportion	Difference Between Employer Contributions and Proportionate Share of Total Contributions
City of Woburn	0	(1,028,618)	0	(25,706,142)	(259,316)	0
Woburn Housing Authority	0	(35,873)	0	(896,509)	(312,580)	0
Woburn Redevelopment Authority	0	0	0	0	0	0
Total	**$ 0**	**$ (1,064,491)**	**$ 0**	**$ (26,602,651)**	**$ (571,896)**	**$ 0**

Schedule H - Allocations of Pension Amounts as of June 30, 2022 by Employer (continued)

Employer Name	Pension Expense Recognized: Proportionate Share of Pension Plan Expense	Changes in Proportion	Total
City of Woburn	4,338,391	6,207	4,344,598
Woburn Housing Authority	151,303	(6,207)	145,096
Woburn Redevelopment Authority	0	0	0
Total	**$ 4,489,694**	**$ 0**	**$ 4,489,694**

Schedule I - Employers' Proportionate Share of the June 30, 2022 Deferred Outflows/Inflows

	Fiscal Year Ending						
Employer Name	June 30, 2022	June 30, 2023	June 30, 2024	June 30, 2025	June 30, 2026	Thereafter	Total
City of Woburn	$ (2,650,382)	$ (701,189)	$ (5,760,820)	$ (3,809,188)	$ (2,757,626)	$ -	$ (15,679,205)
Woburn Housing Authority	(98,855)	(63,013)	(259,715)	(135,045)	(51,730)	-	(608,358)
Woburn Redevelopment Authority	-	-	-	-	-	-	-
Total	**$ (2,749,237)**	**$ (764,202)**	**$ (6,020,535)**	**$ (3,944,233)**	**$ (2,809,356)**	**$ -**	**$ (16,287,563)**

Schedule J – ASOP 51 Disclosures

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities and the corresponding funded status of the Plan. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the Plan. Understanding the risks to the funding of the Plan is important. Actuarial Standard of Practice No. 51 ("ASOP 51") requires certain disclosures of potential risks to the Plan and provides useful information for intended users of actuarial reports that determine Plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience. It is important to note that not all risk is negative, but all risk should be understood and accepted based on knowledge, judgment and educated decisions. Future measurements may deviate in ways that produce positive or negative financial effects on the Plan.

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

- Investment risk – the risk that assets will not return as expected
- Longevity and other demographic risk – the risk that mortality or other demographic experience will be different from expected
- Contribution risk —the risk that actual future contributions deviate from expected future contributions, e.g., that actual contributions are not made in accordance with the plan's funding policy

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

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

Investment Risk

Plan costs are very sensitive to the market return. Lower than assumed asset returns will increase costs:

- The lower market return will cause the market value of assets to be lower than expected.
- The plan uses an actuarial value of assets that smooths gains and losses on market returns over a five-year period to help control some of the volatility in costs due to investment risk.

Longevity and Other Demographic Risk

Plan costs will be increased as participants are expected to live longer. This is because:

- Benefits are paid over a longer lifetime when life expectancy is expected to increase. The longer duration of payments leads to higher liabilities.
- Health care has been improving which increases the life expectancy of participants. As health care improves, costs to the plan will increase.
- The mortality assumption for the Plan does assume future improvement in mortality. Any improvement in future mortality greater than that expected by the current mortality assumption would lead to increased costs for the Plan.

Schedule J – ASOP 51 Disclosures (continued)

Contribution Risk

There is a risk associated with the employer's contribution when the actual amount and actuarially determined amount differ.

- When the actual contribution is lower than the actuarially determined contribution, the Plan may not be sustainable in the long term.
- Any underpayment of the contribution will increase future contribution amounts to help pay off the additional Unfunded Actuarial Accrued Liability associated with the underpayment.
- This risk is mitigated by the City's compliance with Section 22D of MGL Chapter 32, which outlines various requirements of a funding schedule that will amortize the unfunded actuarial liability and cover normal costs.

Historical Information

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

Valuation Date	01/01/12	01/01/14	01/01/16	01/01/18	01/01/20	Current Valuation 01/01/22
Liabilities and Assets at Valuation Date						
• Actuarial Accrued Liability (AAL)	162,639,000	179,447,442	205,524,287	226,383,224	252,067,065	271,976,092
- Normal Cost	1,102,851	1,278,863	1,689,532	1,772,183	1,863,524	1,974,953
• Actuarial Value of Assets (AVA)	106,181,870	115,874,621	129,316,338	143,513,760	153,889,068	181,636,510
- Funded Percent (AVA)	65%	65%	63%	63%	61%	67%
• Market Value of Assets (MVA)	99,150,970	125,275,573	123,972,843	148,441,286	159,393,849	204,195,642
- Funded Percent (MVA)	61%	70%	60%	66%	63%	75%
Contributions and Disbursements for Plan Year Ended	2011	2013	2015	2017	2019	2021
• Actuarially Determined Contribution (ADC)	4,913,904	5,338,819	6,000,000	7,616,072	8,820,047	11,059,368
• Actual Contribution	4,913,904	5,338,819	6,000,000	7,616,072	8,820,047	11,059,368
• Disbursements	10,895,318	11,606,884	12,699,684	14,108,756	15,407,137	16,828,362
Rates of Return for Plan Year Ended	2011	2013	2015	2017	2019	2021
• Assumed	8.25%	8.00%	7.75%	7.50%	7.50%	7.50%
• AVA	2.32%	12.95%	7.25%	9.02%	6.52%	12.03%
• MVA	0.10%	18.70%	-1.19%	16.53%	19.36%	19.59%
Maturity Measures at Valuation Date						
• Payroll	27,681,194	28,945,300	29,187,382	30,893,029	29,406,301	31,737,213
- Asset Volatility Ratio (MVA / Payroll)	3.6	4.3	4.2	4.8	5.4	6.4
- Liability Volatilty Ratio (AAL / Payroll)	5.9	6.2	7.0	7.3	8.6	8.6
• Retiree and Beneficiary (In-pay) Liability	79,724,425	87,643,180	110,635,442	125,783,901	153,498,460	166,968,511
- Percent of Total Liability	49%	49%	54%	56%	61%	61%
• Contributions minus Disbursements in Prior Year	(5,981,414)	(6,268,065)	(6,699,684)	(6,492,684)	(6,587,090)	(5,768,994)
- Percent Average Market Value of Assets	N/A	-5.6%	-5.4%	-4.8%	-4.3%	-3.2%

Schedule J – ASOP 51 Disclosures (continued)

Plan Maturity Measures

There are certain measures that may aid in understanding the significant risks to the plan.

Contribution Volatility

Asset Volatility Ratio: Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 10 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 5.

Liability Volatility Ratio: Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to changes in liability. For example, if an assumption change increases the liability of two plans by the same percent the plan with a liability-to-payroll ratio of 10 may experience twice the contribution volatility than a plan with a liability-to-payroll ratio of 5.

Ratio of Retiree and Beneficiary Liability to Total Liability

A mature plan will often have a ratio above 60 - 65 percent. An increasing percentage may indicate a need for a less risky asset allocation which may lead to a lower long-term return on assets assumption and increased costs.

Ratio of Cash Flow to Assets (Contributions minus Disbursements)

When this cash flow ratio is negative more cash is being paid out than deposited in the fund. Negative cash flow means the fund needs to rely on investment returns to cover benefit payments and at the same time may need to invest in more liquid assets to cover the benefit payments. More liquid assets may not garner the same returns as less liquid assets and therefore increase the investment risk.