BROCKTON CONTRIBUTORY RETIREMENT SYSTEM

ACTUARIAL VALUATION
as of
January 1, 2022

KMS Actuaries, LLC
52 Hunt Road
Kingston, NH 03848

July, 2022

KMS

ACTUARIES

LLC

July 28, 2022

Brockton Contributory Retirement Board
1322 Belmont Street
Suite 101
Brockton, MA 02301

Dear Board Members:

We are pleased to present the enclosed report providing the results of our actuarial valuation of the Brockton Contributory Retirement System as of January 1, 2022. Our valuation was performed in accordance with the provisions contained in Chapter 32 of the Massachusetts General Laws, "M.G.L.", as of January 1, 2022. Disclosures under GASB Statement No. 67, Financial Reporting for Pension Plans (GASB 67) and GASB Statement No. 68, Accounting and Financial Reporting for Pensions (GASB 68) are provided in a separate report.

The principal results of our valuation are summarized in Section 2. The Summary of Plan Provisions and Actuarial Assumptions and Methods are shown in Sections 5 and 6, respectively. Section 7 summarizes the demographic profile of active members, retired plan members and beneficiaries and disabled plan members. Asset information and actuarial liabilities are presented in Section 2. The development of the required appropriations pursuant to Chapter 32 of the M.G.L. is shown in Section 3, including a 30-year forecast of the required appropriations and projected cash flows. Section 4 includes a summary of valuation information for PERAC as well as information relating to the primary risks to the System and an assessment of those risks.

This valuation is based upon member data provided by the Brockton Contributory Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Retirement Board. Although we did not audit the data used in the valuation, we believe that the information is complete and reliable.

This valuation reflects the City's issuance of a $300 million Pension Obligation Bond that significantly increased the funded status of the Retirement System from 60.6% as of January 1, 2020 to 94.5% as of January 1, 2022.

Liabilities presented in this report are based on a long-term investment return rate assumption of 6.75%, net of investment expense, compounded annually. Previously, the investment return rate assumption was 7.75%.

This report was completed in accordance with generally accepted actuarial standards and procedures, and conforms to the Code of Professional Conduct of the American Academy of Actuaries. The actuarial assumptions used in the determination of costs are reasonably related to the experience of the System and to reasonable expectations, and represent our best estimate of anticipated long-term experience under the System.

Future actuarial valuation results may differ significantly from the current results presented in this report. Examples of potential sources of volatility include plan experience differing from that anticipated by the economic or demographic assumptions, the effect of new entrants, changes in economic or demographic assumptions, the effect of law changes and the delayed effect of smoothing techniques.

Our valuation follows generally accepted actuarial methods and we perform such tests as we consider necessary to assure the accuracy of the results. The amounts presented in this report have been appropriately determined according to the actuarial assumptions and methods stated herein.

This report is intended for the sole use of the Brockton Contributory Retirement Board and is intended to provide information to comply with the stated purpose of the report. It may not be appropriate for other purposes.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinion contained herein. They are available to answer any questions with regard to this report.

Respectfully submitted,

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SECTION 1 - EXECUTIVE SUMMARY

Background

We have completed the Actuarial Valuation of the Brockton Contributory Retirement System as of January 1, 2022. This valuation is based upon census data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Brockton Contributory Retirement Board. Information for the prior valuation completed as of January 1, 2020 was obtained from the valuation report prepared by KMS Actuaries.

Massachusetts General Laws

The valuation was prepared in accordance with Chapter 32 of the Massachusetts General Laws ("M.G.L."). The results are based on the active, inactive and retired members and beneficiaries as of December 31, 2021, the assets as of December 31, 2021 and assumptions regarding investment returns, salary increases, mortality, turnover, disability and retirement.

The valuation does not take into consideration:

- Changes in the law after the valuation date,
- Transfers between retirement systems pursuant to Section 3(8)(c) of Chapter 32,
- State-mandated benefits and
- Cost-of-living increases granted to members in pay status between 1982 and 1997.

GASB Statement Numbers 67 and 68

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, Financial Reporting for Pension Plans, replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, Accounting and Financial Reporting for Pensions, replaced the requirements of Statement No. 27.

The pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

The required disclosures and notes under GASB Statement Number 67 and 68 for the fiscal year ending December 31, 2021 are provided in a separate report.

Pension Obligation Bond

In 2021, the City of Brockton issued $300 million in Pension Obligation Bond (POB) debt. The City considered and ultimately decided to issue a POB because of substanstial increases in projected future contributions that represented over 90% of the total System appropriations. The required payments under the POB will replace a large portion of the Retirement System appropriations needed to fully fund the City's remaining unfunded actuarial accrued liability by 2032. The remaining entities who are also part of the Brockton Retirement System, Brockton Redevelopment Authority, Brockton Housing Authority and Brockton Area Transit, did not participate in the POB; the unfunded actuarial accrued liability attributed to these entities is expected to be fully funded by 2035.

As a result of the POB issuance, the funded status of the System increased overall from 60.6% in 2020 to 94.5% in 2022. The funded status of the City's portion of the liabilities is 97% while the funded status of the remaining entities is 31%.

Assets

This valuation is based upon asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Brockton Contributory Retirement Board. The market value of assets increased from $437,753,909 as of December 31, 2019 to $824,714,538 as of December 31, 2021. The December 31, 2021 market value of assets includes the proceeds from the $300 million pension obligation bond issued in 2021. During the plan years ended 2020 and 2021, the market value rates of return were 9.87% and 17.84%, respectively.

The actuarial value of assets increased from $435,232,670 as of January 1, 2020 to $791,697,092 as of January 1, 2022. During the plan years ended 2020 and 2021, the rates of return on the actuarial value of assets were 8.22% and 9.32%, respectively.

Changes Since the Last Valuation

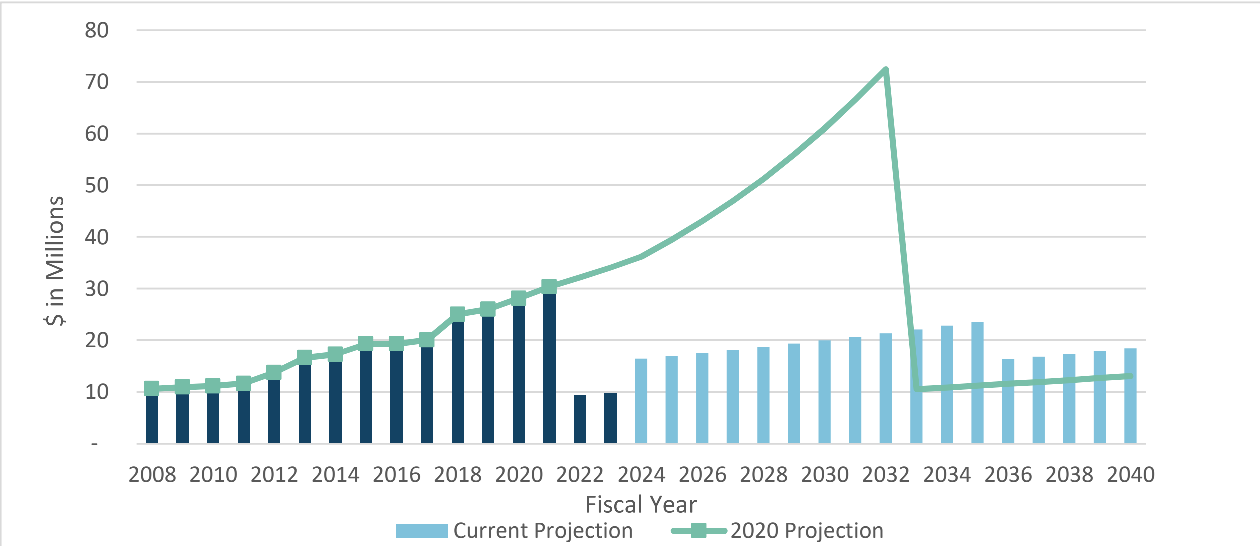
During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease from $282,936,209 as of January 1, 2020 to a surplus of $19,739,502 as of January 1, 2022, for a total decrease of $302,675,711. The actual unfunded actuarial accrued liability, before any assumption or plan changes, was a surplus of $29,484,621, resulting in an actuarial gain of $9,745,119. The actuarial gain was primarily due to an asset gain of approximately $11,573,000 and a demographic experience loss of approximately $1,828,000. The details of the gain and loss analysis are provided in Section 2, Actuarial Experience.

Appropriations

The funding appropriation for each year is computed as the sum of the normal cost, net 3(8)(c) transfers and an amortization payment to pay off the Unfunded Actuarial Liability, adjusted for annual payments of the appropriation made July 1. The appropriation calculated as of the January 1, 2022 valuation is $15,288,198, and is made up of a normal cost payment of $9,852,901, net 3(8)(c) transfers of $822,688, and an amortization payment of $4,612,609. The amortization method is an increasing amortization of the unfunded actuarial accrued liability at 4% over 10 years for the City of Brockton and 13 years for all other entities and is expected to fully pay the unfunded actuarial accrued liability by the year 2032 for the City of Brockton and 2035 for all other entities. The development of the appropriation as of January 1, 2022 is presented in Section 3, Annual Appropriations.

For fiscal year 2023, we show the actual appropriation developed under the previous funding schedule and reported on the PERAC "Required Fiscal Year 2023 Appropriation" letter dated January 26, 2022 of $9,759,503. For fiscal year 2024, we developed an annual appropriation of $16,397,514, which is made up of a normal cost of $10,510,858, net 3(8)(c) transfers of $850,000 and payment toward the unfunded actuarial accrued liability of $5,036,656. The unfunded actuarial accrued liability is expected to be fully paid by 2032 for the City of Brockton and 2035 for all other entities. The Board adopted a schedule that limits the annual increase in appropriation to 8% for all entities other than the City of Brockton. The current funding schedule is shown in Section 3, Exhibit 3.1.

The chart below shows the historical (navy bars) and projected (blue bars) annual appropriations compared to the projected amounts shown in the prior valuation and funding schedule (green line). FY2022 does not include the proceeds from the Pension Obligation Bond issued by the City.



Plan Provisions

All Plan provisions used in this valuation are the same as those used in the prior valuation. The Plan provisions used in this valuation are summarized in Section 5, Summary of Plan Provisions.

Actuarial Assumptions and Methods

Some Actuarial Assumptions and Methods used in this valuation have changed since the last valuation, including decreasing the discount rate from 7.75% to 6.75%, decreasing the payroll growth rate from 3.50% to 3.25%, decreasing 3(8)(c) transfers from $1,200,000 to $850,000, and updating the mortality improvement rates. Changing these assumptions resulted in a net increase in the unfunded actuarial accrued liability of $75,580,445 and an increase in the employer normal cost of $3,802,206. The Actuarial Assumptions and Methods utilized in this valuation are detailed in Section 6, Actuarial Assumptions and Methods.

Census Data

As of January 1, 2022, there are 1,948 active members who may be eligible for benefits in the future, 1,119 retirees and beneficiaries, 826 inactives and 200 disabled retirees. Summaries of the active, retired and disabled employees are included in Section 7, Plan Member Information.

SECTION 1 - EXECUTIVE SUMMARY

A summary of principal valuation results from the current valuation and the prior valuation follows.

Valuation Date	January 1, 2022	January 1, 2020	% Change
Census Data			
Active Members	1,948	1,779	9.5%
Valuation Salary	$117,362,996	$105,044,030	11.7%
Average Salary	$60,248	$59,047	2.0%
Retired Members and Beneficiaries	1,119	1,097	2.0%
Total Annual Retirement Allowance	$38,032,620	$35,366,053	7.5%
Average Annual Retirement Allowance	$33,988	$32,239	5.4%
Disabled Members	200	196	2.0%
Total Annual Retirement Allowance	$10,045,258	$9,438,274	6.4%
Average Annual Retirement Allowance	$50,226	$48,154	4.3%
Inactive Members	826	699	18.2%
Annuity Savings Fund	$6,679,823	$4,426,676	50.9%
Funded Status			
Actuarial Accrued Liability (AAL)	$837,792,916	$718,168,879	16.7%
Market Value of Assets (MVA)	$824,714,538	$437,753,909	88.4%
Unfunded Accrued Liability on MVA	$13,078,378	$280,414,970	(95.3%)
Funded Status on MVA	98.4%	61.0%	61.3%
Actuarial Value of Assets (AVA)	$791,697,092	$435,232,670	81.9%
Unfunded Accrued Liability on AVA	$46,095,824	$282,936,209	(83.7%)
Funded Status on AVA	94.5%	60.6%	55.9%
Appropriations			
Fiscal Year 2022	N/A	$309,409,945	N/A
Fiscal Year 2023	$9,759,503	$34,113,604	(71.4%)
Fiscal Year 2024	$16,752,600	$36,160,421	(53.7%)
Fiscal Year 2025	$17,409,797	$39,458,250	(55.9%)

Market Value of Assets

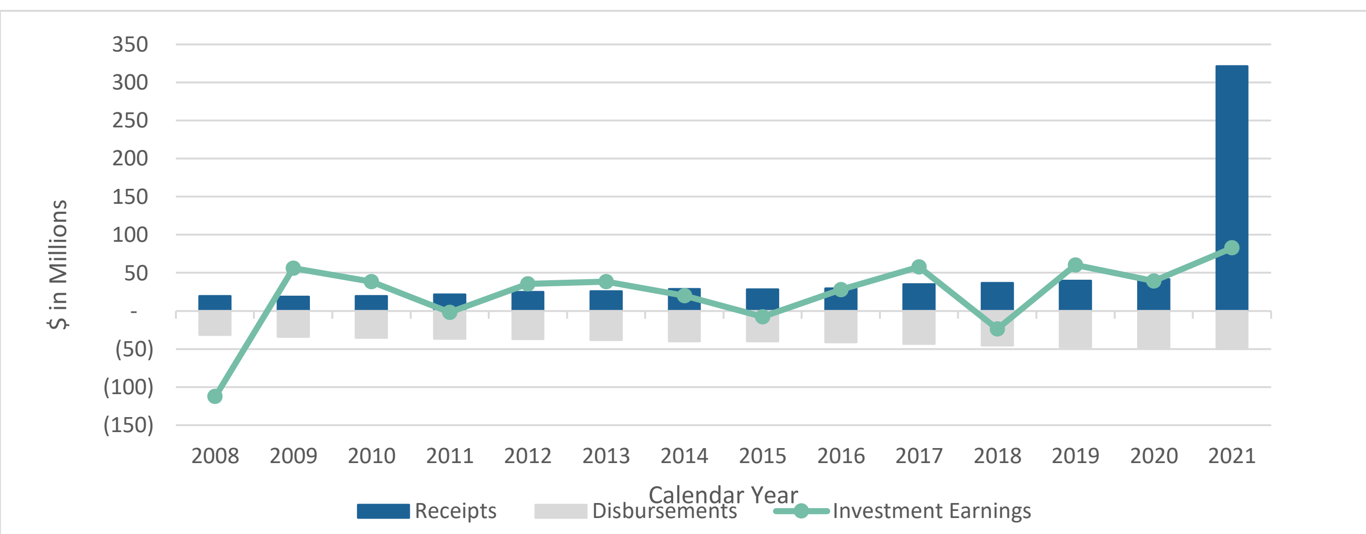
Asset information is reported annually to the Public Employee Retirement Administration Commission by the Brockton Contributory Retirement Board. The Market Value of Assets for the three most recent calendar years are as follows:

Calendar Year	2021	2020	2019
Trust Fund Composition at Year-End			
Cash	$1,262,607	$1,010,810	$1,477,338
Short-Term Investments	0	0	0
Fixed Income Securities	0	0	0
Equities	28,936	17,519	13,370
Pooled Short Term Funds	0	0	0
Pooled Domestic Equity Funds	192,995,879	98,336,501	87,816,767
Pooled International Equity Funds	32,967,356	30,840,708	27,259,494
Pooled Global Equity Funds	141,004,378	163,926,037	154,344,211
Pooled Domestic Fixed Income Funds	324,210,526	64,327,362	62,539,786
Pooled International Fixed Income Funds	15,077,787	13,760,287	24,852,603
Pooled Global Fixed Income Funds	0	0	0
Pooled Alternative Investments	50,050,811	40,434,717	40,721,956
Pooled Real Estate Funds	46,725,838	40,366,901	22,174,954
Pooled Domestic Balanced Funds	20,029,779	17,297,809	16,238,992
Pooled International Balanced Funds	0	0	0
Hedge Funds	0	0	0
PRIT Cash	0	0	0
PRIT Fund	0	0	0
Interest Due & Accrued	397,738	151,951	184,486
Prepaid Expenses	0	916	916
Accounts Receivable	0	371,234	163,042
Land	0	0	0
Buildings	0	0	0
Accumulated Depreciation - Buildings	0	0	0
Accounts Payable	(37,097)	(18,595)	(34,006)
Total Market Value of Assets	**$824,714,538**	**$470,824,157**	**$437,753,909**

Market Value of Assets

Calendar Year	2021	2020	2019
Funds			
Annuity Savings Fund	$111,654,236	$108,029,784	$103,271,133
Annuity Reserve Fund	26,049,034	26,496,801	27,141,105
Special Military Service Fund	100,343	100,243	100,143
Pension Fund	310,503,415	32,149,965	31,293,446
Expense Fund	0	0	0
Pension Reserve Fund	376,407,510	304,047,364	275,948,082
Total Market Value of Assets	**$824,714,538**	**$470,824,157**	**$437,753,909**
Asset Activity			
Market Value as of Beginning of Year	$470,824,157	$437,753,909	$385,591,525
Contributions and Receipts	$321,254,387	41,951,404	39,688,559
Benefit Payments and Expenses	($50,114,495)	(48,054,114)	(47,748,272)
Investment Return	$82,750,489	39,172,958	60,222,097
Total Market Value of Assets	**$824,714,538**	**$470,824,157**	**$437,753,909**
Rate of Return	17.84%	9.87%	17.92%

Below are the receipts and disbursements during the last 14 years. The green line reflects investment earnings, which vacillate as investment markets fluctuate. Blue bars indicate contributions, from employees and employers, and grey bars show benefit payments and administrative expenses. The City issued $300 million in Pension Obligation Bonds in 2021.



Actuarial Value of Assets

The Actuarial Value of Assets is the market value of assets as of the valuation date adjusted to phase in investment gains and losses over a 5-year period, further constrained to be within 20% of the market value of assets. Investment gains and losses are the excess or deficiency of the expected returns over the actual returns.

Valuation Date	January 1, 2022	January 1, 2021	January 1, 2020
1. Expected Market Value of Assets			
a. Market Value of Assets as of prior January 1	$470,824,157	$437,753,909	$385,591,525
b. Prior Year Contributions and Receipts	321,254,387	41,951,404	39,688,559
c. Prior Year Benefit Payments and Expenses	(50,114,495)	(48,054,114)	(47,748,272)
d. Expected Investment Return Rate	7.75%	7.75%	7.75%
e. Expected Investment Return	46,995,543	33,689,448	29,571,029
f. Expected Market Value of Assets	$788,959,592	$465,340,647	$407,102,841
2. Prior Year Gain/(Loss)			
a. Market Value of Assets as of January 1	$824,714,538	$470,824,157	$437,753,909
b. Expected Market Value of Assets	788,959,592	465,340,647	407,102,841
c. Prior Year Gain /(Loss)	$35,754,946	$5,483,510	$30,651,068

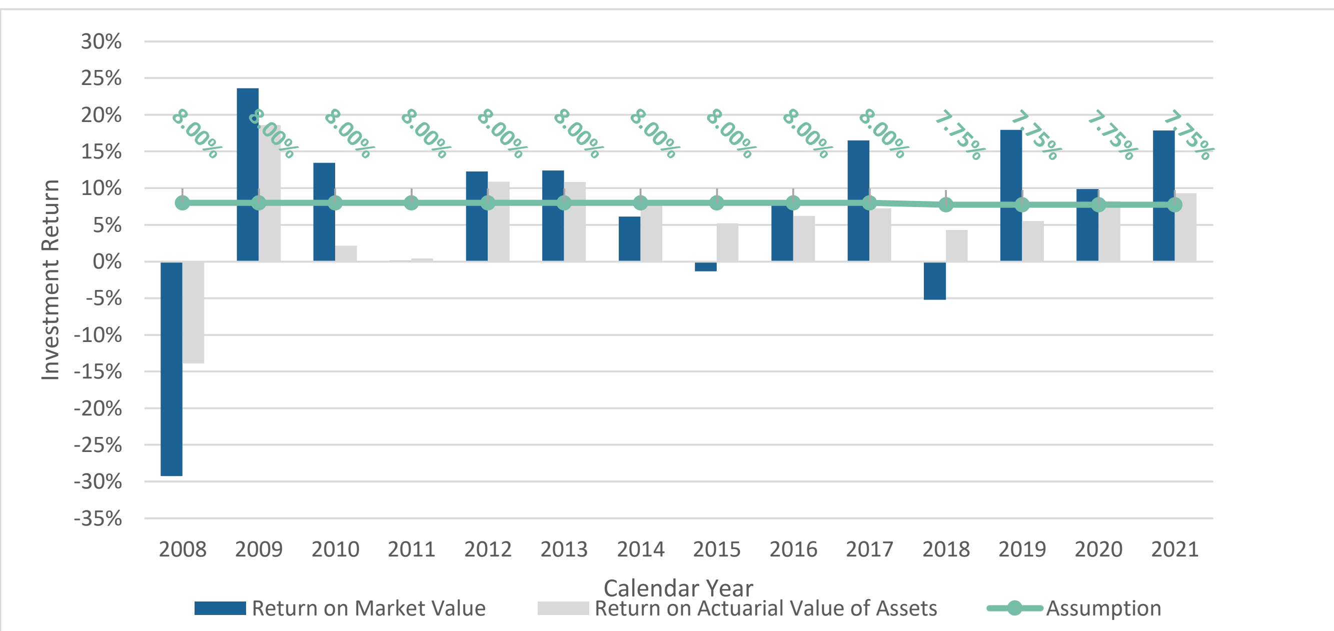
3. Phase-In of Asset Gains and Losses

	Calendar Year	Gain / (Loss)	Unrecognized Gain / (Loss)	Unrecognized Gain / (Loss)	Unrecognized Gain / (Loss)
a.	2021	$35,754,946	$28,603,957	$0	$0
b.	2020	5,483,510	3,290,106	4,386,808	0
c.	2019	30,651,068	12,260,427	18,390,641	24,520,854
d.	2018	(55,685,222)	(11,137,044)	(22,274,089)	(33,411,133)
e.	2017	28,393,939	0	5,678,788	11,357,576
f.	2016	269,710	0	0	53,942
g.	Total Deferred Gains/(Losses)		$33,017,446	$6,182,148	$2,521,239

Actuarial Value of Assets

Valuation Date	January 1, 2022	January 1, 2021	January 1, 2020
4. Actuarial Value of Assets			
a. Market Value of Assets	$824,714,538	$470,824,157	$437,753,909
b. Deferred Gains/(Losses)	33,017,446	6,182,148	2,521,239
c. Market Value of Assets Less Deferred Gains/(Losses)	$791,697,092	$464,642,009	$435,232,670
d. 80% of Market Value of Assets	659,771,630	376,659,326	350,203,127
e. 120% of Market Value of Assets	989,657,446	564,988,988	525,304,691
f. Actuarial Value of Assets, a., but not less than b. and not greater than c.	$791,697,092	$464,642,009	$435,232,670
g. Ratio of Actuarial Value of Assets to Market Value of Assets	96.0%	98.7%	99.4%
5. Rate of Return on Actuarial Value of Assets for Prior Calendar Year	9.32%	8.22%	5.51%

Below are the investment returns during the last 14 years. The green line reflects the investment return actuarial assumption. Blue bars indicate investment return rates on market value of assets, and grey bars show investment return rates on actuarial value of assets.



Actuarial Liabilities

The **Actuarial Present Value of Future Benefits** is the present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money. Below is the Actuarial Present Value of Future Benefits from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Actives	$543,416,585	$429,487,781
Retired Members and Beneficiaries	367,535,544	320,288,694
Disabled Members	114,595,162	98,122,668
Inactive Members	6,679,823	4,426,676
Total Present Value of Future Benefits	**$1,032,227,114**	**$852,325,819**

The **Actuarial Accrued Liability** is the portion of the Actuarial Present Value of Future Benefits which is allocated to all periods prior to a valuation year and therefore is not provided for by future Normal Costs. Below is the Actuarial Accrued Liability from the current valuation and the prior valuation:

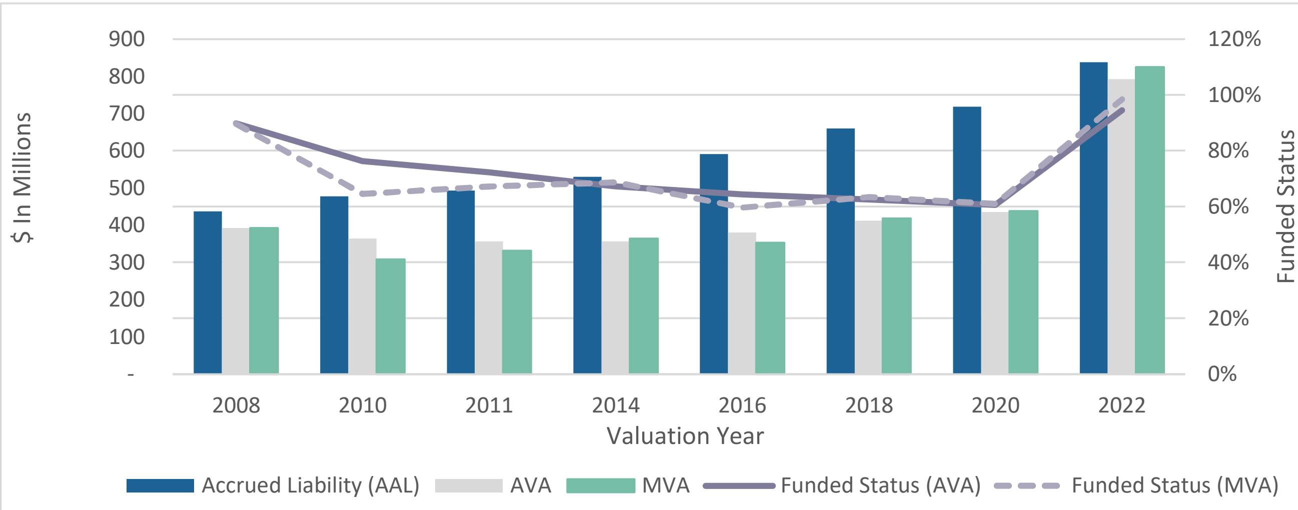
Valuation Date	January 1, 2022	January 1, 2020
Actives	$348,982,387	$295,330,841
Retired Members and Beneficiaries	367,535,544	320,288,694
Disabled Members	114,595,162	98,122,668
Inactive Members	6,679,823	4,426,676
Total Actuarial Accrued Liability	$837,792,916	$718,168,879

The **Unfunded Actuarial Accrued Liability** is the difference between the Actuarial Accrued Liability and the Actuarial Value of Assets as of the valuation date. The **Funded Status** is the Actuarial Value of Assets divided by the Actuarial Accrued Liability and is a point-in-time measurement of the amount of assets set aside to cover actuarial accrued liabilities. Below is the Unfunded Actuarial Accrued Liability and Funded Status from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Unfunded Actuarial Accrued Liability		
a. Actuarial Accrued Liability	$837,792,916	$718,168,879
b. Actuarial Value of Assets	791,697,092	435,232,670
c. Unfunded Actuarial Accrued Liability (a. - b.)	$46,095,824	$282,936,209
d. Funded Status (b. divided by a.)	94.5%	60.6%

Actuarial Liabilities

Below are the accrued liabilities, asset values (actuarial and market) and funded status for each of the last 8 valuations. The purple solid line reflects the funded status on an actuarial value of assets (AVA) basis and the purple dotted line reflects the funded status on a market value (MVA) basis. Blue bars indicate actuarial accrued liabilities, grey bars indicate actuarial value of assets and green bars indicate market value of assets.



The **Normal Cost** is the portion of the Actuarial Present Value of Future Benefits which is allocated to a valuation year. Only active employees who have not reached Normal Retirement Age incur a Normal Cost. Below is the Normal Cost from the current valuation and the prior valuation:

Valuation Date	January 1, 2022	January 1, 2020
Total Normal Cost	$20,258,171	$15,082,781
As of Percentage of Salary	17.3%	14.4%
Employee Normal Cost	$11,165,046	$9,878,478
As of Percentage of Salary	9.5%	9.4%
Administrative Expenses	$759,776	$756,242
As a Percentage of Salary	0.6%	0.7%
Net Employer Normal Cost	$9,852,901	$5,960,545
As a Percentage of Salary	8.4%	5.7%

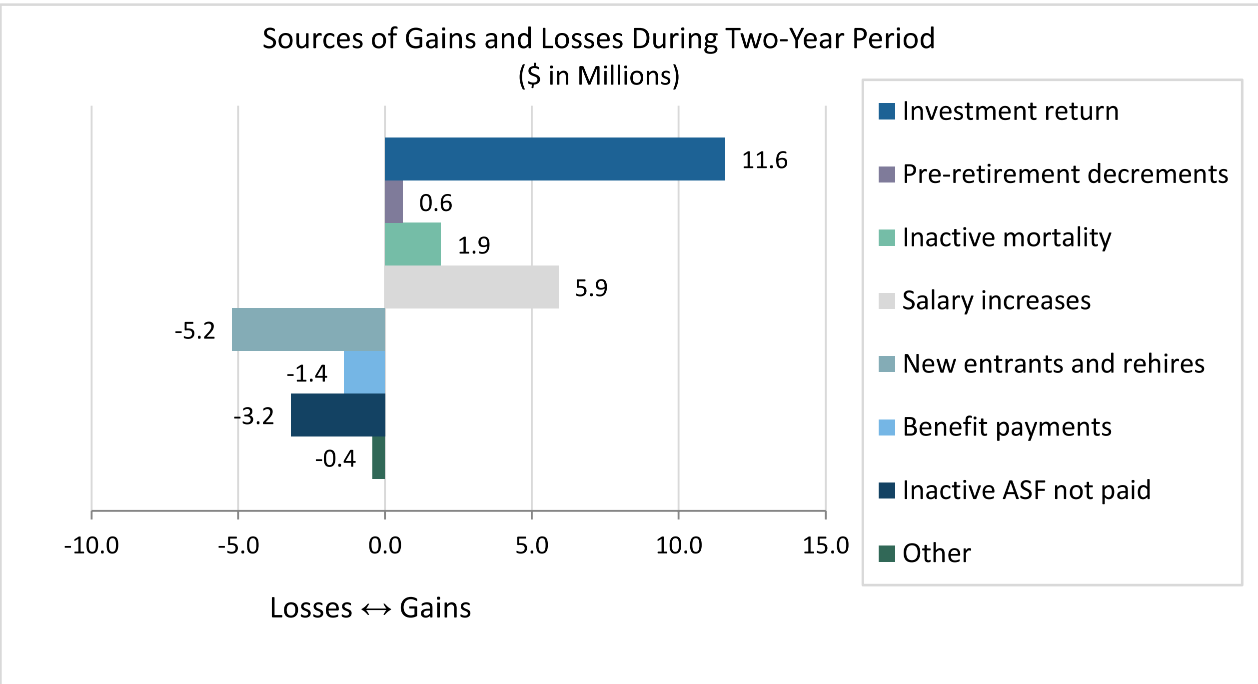
Actuarial Experience

In performing the actuarial valuation, various assumptions are made regarding mortality, retirement, disability and withdrawal rates as well as salary increases and investment returns. A comparison of the results of the current valuation and the prior valuation is made to determine how closely actual experience relates to expected. During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to decrease by $302,675,711. Below is the development of the Actuarial Gain for the current 2-year period:

Calendar Year Ending		December 31, 2021	December 31, 2020
Expected Unfunded Actuarial Accrued Liability			
1.	Unfunded Actuarial Accrued Liability, Beginning of Year	$277,538,441	$282,936,209
2.	Normal Cost, Beginning of Year	13,842,991	15,082,781
3.	Total Contributions	321,254,387	41,951,404
4.	Interest (full year on 1. and 2., one-half year on 3.)	10,133,453	21,470,855
5.	Expected Unfunded Actuarial Accrued Liability	($19,739,502)	$277,538,441
6.	Unfunded Actuarial Accrued Liability (before changes)	(29,484,621)	
7.	(Gain)/Loss (6. - 5.)	($9,745,119)	
Asset Gain/(Loss)			
1.	Actuarial Value of Assets, Beginning of Year	$464,642,009	$435,232,670
2.	Contributions and Receipts	321,254,387	41,951,404
3.	Benefit Payments and Expenses	(50,114,495)	(48,054,114)
4.	Assumed Rate of Return (prior valuation)	7.75%	7.75%
5.	Expected Return	46,516,427	33,494,052
6.	Actuarial Value of Assets, End of Year	$791,697,092	$464,642,009
7.	Actual Return	55,915,191	35,512,049
8.	Actual Rate of Return	9.32%	8.22%
9.	Asset Gain/(Loss) (7. - 5.)	9,398,764	2,017,997
10.	Total Asset Gain/(Loss), 2-Year Period	$11,573,156	

Actuarial Experience

Below are the various sources of gains and losses over the 2-year period. The asset gain during the period was $11,573,156, and the total demographic loss during the period was $1,828,037, which totals to an overall gain of $9,745,119.



Unfunded Actuarial Accrued Liability

1. Changes due to:	
a. Asset Gain	($11,573,156)
b. Demographic Experience Loss	1,828,037
c. Total Gain Prior to Changes	(9,745,119)
d. Plan Change	-
e. Assumption and Method Changes	
Mortality and Mortality Improvement Rates	(5,442,734)
Investment Return Rate	81,023,179
Total	75,580,445
f. Total Increase (including changes)	65,835,326
2. Unfunded Actuarial Accrued Liability, End of Year	$46,095,824

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Annual Appropriations

The Annual Appropriation is determined in accordance with the requirements set forth in Sections 22D and 22F of Chapter 32 of the Massachusetts General Laws ("M.G.L."). The appropriation is comprised of the annual employer normal cost and amortization payments to pay the unfunded actuarial accrued liability. Below are the details of the annual appropriations for the current and prior valuations, adjusted for annual payments made July 1. The appropriations shown are based on the results of the valuation and do not account for any adjustments made to appropriations in the selected funding schedule.

	Valuation Date	January 1, 2022	January 1, 2020
1.	Unfunded Actuarial Accrued Liability (All Others)		
	Fully Funded Year	2035	2032
	Balance as of Valuation Date	$24,628,601	$20,726,380
	Amortization Amount	$2,205,134	$2,083,108
	Increasing Rate	4.00%	4.00%
	Remaining Payment Period from Valuation Date	13	12
2.	Unfunded Actuarial Accrued Liability (City)		
	Fully Funded Year	2032	2032
	Balance as of Valuation Date	$21,467,223	$262,209,829
	Amortization Amount	$2,407,475	$26,353,442
	Increasing Rate	4.00%	4.00%
	Remaining Payment Period from Valuation Date	10	12
3.	Total Amortization Payments	$4,612,609	$28,436,550
4.	Normal Cost	$9,852,901	$5,960,545
5.	Net 3(8)(c) Transfers	$822,688	$1,156,039
6.	Total Appropriation as of January 1	$15,288,198	$35,553,134
7.	**Adjusted for Annual Payments as of July 1**	**$15,795,750**	**$36,905,113**

SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibit 3.1 - 30-Year Forecast of Annual Appropriations

	City of Brockton						All Others							
Fiscal Year Ending	Employer Normal Cost	Net 3(8)(c) Transfers	Amortization Payment of UAL	Total Employer Cost	Increase Over Prior Year	Unfunded Actuarial Accrued Liability	Employer Normal Cost	Net 3(8)(c) Transfers	Amortization Payment of UAL	Total Employer Cost	Increase Over Prior Year	Unfunded Actuarial Accrued Liability	Total Appropriation	Increase Over Prior Year
2023	$9,851,276	$1,149,363	($3,462,044)	$7,538,595		$21,467,223	$328,730	$50,637	$1,841,541	$2,220,908		$24,628,601	$9,759,503	
2024	10,171,445	814,132	3,368,442	14,354,019	90.41%	26,493,241	339,413	35,868	2,023,300	2,398,581	8.00%	24,388,354	16,752,600	71.70%
2025	10,502,017	814,132	3,503,180	14,819,329	3.24%	24,801,264	350,445	35,868	2,204,155	2,590,468	8.00%	23,944,097	17,409,797	3.90%
2026	10,843,332	814,132	3,643,307	15,300,771	3.25%	22,855,868	361,833	35,868	2,400,003	2,797,704	8.00%	23,282,993	18,098,475	4.00%
2027	11,195,739	814,132	3,789,039	15,798,910	3.26%	20,634,378	373,593	35,868	2,612,060	3,021,521	8.00%	22,374,914	18,820,431	4.00%
2028	11,559,601	814,132	3,940,601	16,314,334	3.26%	18,112,368	385,736	35,868	2,841,639	3,263,243	8.00%	21,186,443	19,577,577	4.00%
2029	11,935,289	814,132	4,098,225	16,847,646	3.27%	15,263,528	398,272	35,868	3,090,163	3,524,303	8.00%	19,680,550	20,371,949	4.10%
2030	12,323,186	814,132	4,262,154	17,399,472	3.28%	12,059,535	411,215	35,868	3,271,551	3,718,634	5.51%	17,816,234	21,118,106	3.70%
2031	12,723,690	814,132	4,432,640	17,970,462	3.28%	8,469,900	424,580	35,868	3,402,413	3,862,861	3.88%	15,638,667	21,833,323	3.40%
2032	13,137,210	814,132	4,609,947	18,561,289	3.29%	4,461,819	438,378	35,868	3,538,509	4,012,755	3.88%	13,178,908	22,574,044	3.40%
2033	13,564,169	814,132	-	14,378,301	-22.54%	-	452,625	35,868	3,680,050	4,168,543	3.88%	10,412,501	18,546,844	-17.80%
2034	14,005,005	814,132	-	14,819,137	3.07%	-	467,336	35,868	3,827,252	4,330,456	3.88%	7,313,121	19,149,593	3.20%
2035	14,460,167	814,132	-	15,274,299	3.07%	-	482,525	35,868	3,980,341	4,498,734	3.89%	3,852,444	19,773,033	3.30%
2036	14,930,123	814,132	-	15,744,255	3.08%	-	498,207	35,868	-	534,075	-88.13%	-	16,278,330	-17.70%
2037	15,415,353	814,132	-	16,229,485	3.08%	-	514,399	35,868	-	550,267	3.03%	-	16,779,752	3.10%
2038	15,916,352	814,132	-	16,730,484	3.09%	-	531,117	35,868	-	566,985	3.04%	-	17,297,469	3.10%
2039	16,433,633	814,132	-	17,247,765	3.09%	-	548,379	35,868	-	584,247	3.04%	-	17,832,012	3.10%
2040	16,967,727	814,132	-	17,781,859	3.10%	-	566,201	35,868	-	602,069	3.05%	-	18,383,928	3.10%
2041	17,519,178	814,132	-	18,333,310	3.10%	-	584,603	35,868	-	620,471	3.06%	-	18,953,781	3.10%
2042	18,088,551	814,132	-	18,902,683	3.11%	-	603,602	35,868	-	639,470	3.06%	-	19,542,153	3.10%
2043	18,676,429	814,132	-	19,490,561	3.11%	-	623,219	35,868	-	659,087	3.07%	-	20,149,648	3.10%
2044	19,283,413	814,132	-	20,097,545	3.11%	-	643,474	35,868	-	679,342	3.07%	-	20,776,887	3.10%

Forecast Notes

Exhibit 3.1:

- The Employer Normal Cost is expected to increase 3.25% per year.
- The Unfunded Actuarial Accrued Liability ("UAL") is computed as of January 1 of each year assuming no future gains or losses.
- The Amortization Payment of UAL is an increasing payment at 4% paid over 10 years through 2032 for the City of Brockton and 13 years through 2035 for all other entities.
- Net 3(8)(c) transfers are a level dollar amount based on the net transfers expected to be paid by the Brockton Contributory Retirement Board during the current year offset by the amount received during the same period.
- Total Employer Cost is the sum of the Employer Normal Cost, net 3(8)(c) transfers and the Amortization of the UAL, all computed as of January 1 of each year and adjusted for annual payments made on July 1.
- For fiscal year 2023, we show $9,759,503, the actual appropriation made which was developed under the previous funding schedule and adjusted due for the City's issue of $300 million of Pension Obligation Bonds. For fiscal years 2024 and later, the Board has selected a funding schedule that fully amortizes the unfunded actuarial accrued liability by 2032 for the City of Brockton and 2035 for all other entities, with annual employer costs limited to increases of 8% for all entities other than the City of Brockton.

Exhibit 3.2:

- Expected benefit payments include payments expected to be made to retired members, beneficiaries, disabled members and active members expected to retire. In addition, expected benefit payments include distribution of the annuity savings fund attributed to inactive members.
- Benefit payments exclude cost-of-living increases granted to members in pay status between 1982 and 1997. In addition, benefit payments are as expected for the first ten years of the forecast, then increase by the greater of 4.5% per year thereafter or the expected future payments for the current population projected by our computer model.
- Calendar year cash flow entries are developed as of each January 1.

Exhibit 3.2 - 30-Year Forecast of Cash Flow

Calendar Year	Market Value of Assets, BOY	Benefit Payments	Employee Contributions	Employer Contributions	Investment Return	Market Value of Assets, EOY
2022	$824,714,538	$57,377,851	$11,165,046	$9,445,909	$55,122,968	$843,070,610
2023	843,070,610	52,518,760	11,527,910	16,214,302	57,007,357	875,301,419
2024	875,301,419	54,296,307	11,902,567	16,850,381	59,191,169	908,949,229
2025	908,949,229	56,235,232	12,289,400	17,516,932	61,468,061	943,988,390
2026	943,988,390	58,300,656	12,688,806	18,215,690	63,837,623	980,429,853
2027	980,429,853	60,232,478	13,101,192	18,948,506	66,309,524	1,018,556,597
2028	1,018,556,597	62,309,979	13,526,981	19,717,353	68,893,601	1,058,384,553
2029	1,058,384,553	64,188,105	13,966,608	20,439,535	71,597,023	1,100,199,614
2030	1,100,199,614	66,181,861	14,420,523	21,131,770	74,429,616	1,143,999,662
2031	1,143,999,662	68,184,847	14,889,190	21,848,690	77,398,545	1,189,951,240
2032	1,189,951,240	70,104,331	15,373,089	17,950,893	80,205,056	1,233,375,947
2033	1,233,375,947	73,259,026	15,872,714	18,534,274	83,102,856	1,277,626,765
2034	1,277,626,765	76,555,682	16,388,577	19,137,682	86,054,075	1,322,651,417
2035	1,322,651,417	80,000,688	16,921,206	15,755,272	88,784,610	1,364,111,817
2036	1,364,111,817	83,600,719	17,471,145	16,240,581	91,531,565	1,405,754,389
2037	1,405,754,389	87,362,751	18,038,957	16,741,663	94,287,620	1,447,459,878
2038	1,447,459,878	91,294,075	18,625,223	17,259,030	97,044,554	1,489,094,610
2039	1,489,094,610	95,402,308	19,230,543	17,793,212	99,793,162	1,530,509,219
2040	1,530,509,219	99,695,412	19,855,536	18,344,754	102,523,172	1,571,537,269
2041	1,571,537,269	104,181,706	20,500,841	18,914,221	105,223,150	1,611,993,775
2042	1,611,993,775	108,869,883	21,167,118	19,502,196	107,880,400	1,651,673,606
2043	1,651,673,606	113,769,028	21,855,049	20,109,280	110,480,856	1,690,349,763
2044	1,690,349,763	118,888,634	22,565,338	20,736,094	113,008,964	1,727,771,525
2045	1,727,771,525	124,238,623	23,298,711	21,383,280	115,447,559	1,763,662,452
2046	1,763,662,452	129,829,361	24,055,919	22,051,500	117,777,725	1,797,718,235
2047	1,797,718,235	135,671,682	24,837,736	22,741,437	119,978,656	1,829,604,382
2048	1,829,604,382	141,776,908	25,644,962	23,453,796	122,027,491	1,858,953,723
2049	1,858,953,723	148,156,869	26,478,423	24,189,307	123,899,154	1,885,363,738
2050	1,885,363,738	154,823,928	27,338,972	24,948,723	125,566,164	1,908,393,669
2051	1,908,393,669	161,791,005	28,227,489	25,732,819	126,998,447	1,927,561,419

SECTION 4 - DISCLOSURES

4.1 - GASB 67 and GASB 68 Disclosures

In June 2012, the GASB approved two related Statements that significantly changed the way pension plans and governments account and report pension liabilities. Effective for plans with fiscal years beginning after June 15, 2013, GASB Statement No. 67, *Financial Reporting for Pension Plans* , replaced the requirements of Statement No. 25 and effective for employers with fiscal years beginning after June 15, 2014, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions* , replaced the requirements of Statement No. 27.

The pension standards reflect changes from those previously in place regarding how governments calculate total pension liability and pension expense. Further, the standards contain requirements for disclosing information in the notes to financial statements and presenting required supplementary information following the notes.

GASB 67 requires defined benefit pension plans, such as the Brockton Contributory Retirement System, to present a statement of fiduciary net position (pension plan assets) and a statement of changes in fiduciary net position. Further, the statement requires that notes to financial statements include descriptive information such as the types of benefits provided, the classes of plan members covered and the composition of the pension plan's retirement board. Finally, GASB 67 requires pension plans to present in required supplementary information the sources of the changes in the net pension liability and information about the actuarially determined contributions compared with the actual contributions made to the plan and related ratios.

GASB 67 and GASB 68 require projected benefit payments be discounted to their actuarial present value using the single rate that reflects:

(1) a long-term expected rate of return on pension plan investments *to the extent that the pension plan's assets are sufficient to pay benefits and pension plan assets are expected to be invested using a strategy to achieve that return and*

(2) a tax-exempt, high-quality municipal bond rate *to the extent that the conditions for use of the long-term expected rate of return are not met.*

GASB 68 establishes standards for measuring and recognizing liabilities, deferred outflows of resources, deferred inflows of resources and pension expense by state and local governments.

The effective date for GASB 67 is for plan years beginning after June 15, 2013, which is the fiscal year ending December 31, 2014 for the Brockton Contributory Retirement System. The effective date for GASB 68 is for employers' fiscal years beginning after June 15, 2014. The GASB report, submitted under separate cover and prepared as of December 31, 2021 (the measurement date), presents information to assist the Brockton Contributory Retirement Board in providing the required information under GASB 68 to participating employers.

4.2 - PERAC Disclosure Information

The most recent actuarial valuation of the System was prepared by KMS Actuaries, LLC as of January 1, 2022.

Normal Cost - Employees	$11,165,046	9.5% of payroll
Normal Cost - Employers	$9,852,901	8.4% of payroll
Actuarial Liability - Active Members	$348,982,387	42% of total AAL
Actuarial Liability - Retired and Inactive Members	488,810,529	58% of total AAL
Total Actuarial Liability (AAL)	$837,792,916	
System Assets	$791,697,092	
Unfunded Actuarial Accrued Liability	$46,095,824	
Funded Status	94.5%	

Principal actuarial assumptions used in the valuation:

Investment Return	6.75%
Rate of Salary Increase	Based on service, 6% graded down to 4.25% for Group 1
	Based on service, 7% graded down to 4.75% for Group 4

4.3 - Risk Measures

The Brockton Contributory Retirement System is subject to certain risks that could affect the plan's future financial condition. Here we identify the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks in accordance with Actuarial Standards of Practice (ASOP) 51.

Risk is the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience. Examples of potential risks that may be reasonably anticipated to significantly affect the future financial condition of the plan include the following:

- **Investment Risk** - the potential that investment returns will be different than expected.
- **Asset/Liability Mismatch Risk** - the potential that changes in asset values are not matched by changes in the value of liabilities.
- **Interest Rate Risk** - the potential that interest rates will be different than expected.
- **Longevity and Other Demographic Risks** - the potential that mortality or other demographic experience will be different than expected.
- **Contribution Risk** - the potential of actual future contributions deviating from expected future contributions. For example, that actual contributions are not made in accordance with the plan's funding policy, that other anticipated payments to the plan are not made, or that material changes occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base.

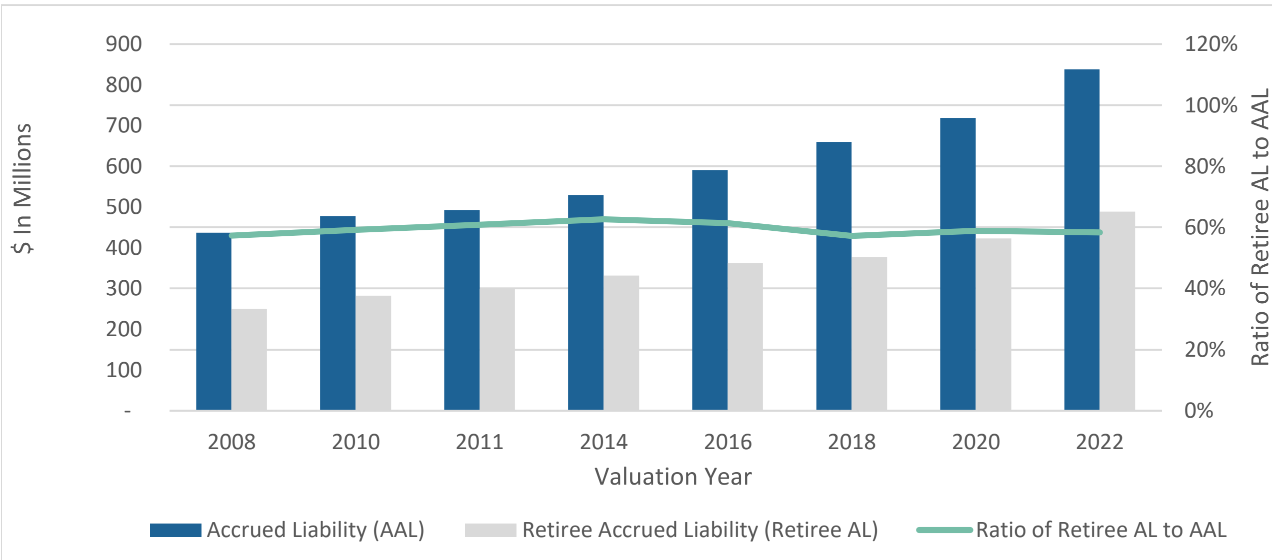
We have provided several risk measures in this section that we believe are most significant for the plan. However, we believe that a more rigorous assessment of risk would be beneficial to the Board to understand the risks identified above, such as:

- Scenario Test - a process for assessing the impact of one possible event, or several simultaneous or sequentially occurring possible events, on a plan's financial condition.
- Sensitivity Test - a process for assessing the impact of a change in an actuarial assumption on an actuarial measurement.
- Stochastic Modeling - a process for generating numerous potential outcomes by allowing for random variations in one or more inputs over time for the purpose of assessing the distribution of those outcomes.
- Stress Test - a process for assessing the impact of adverse changes in one or relatively few factors affecting a plan's financial condition.

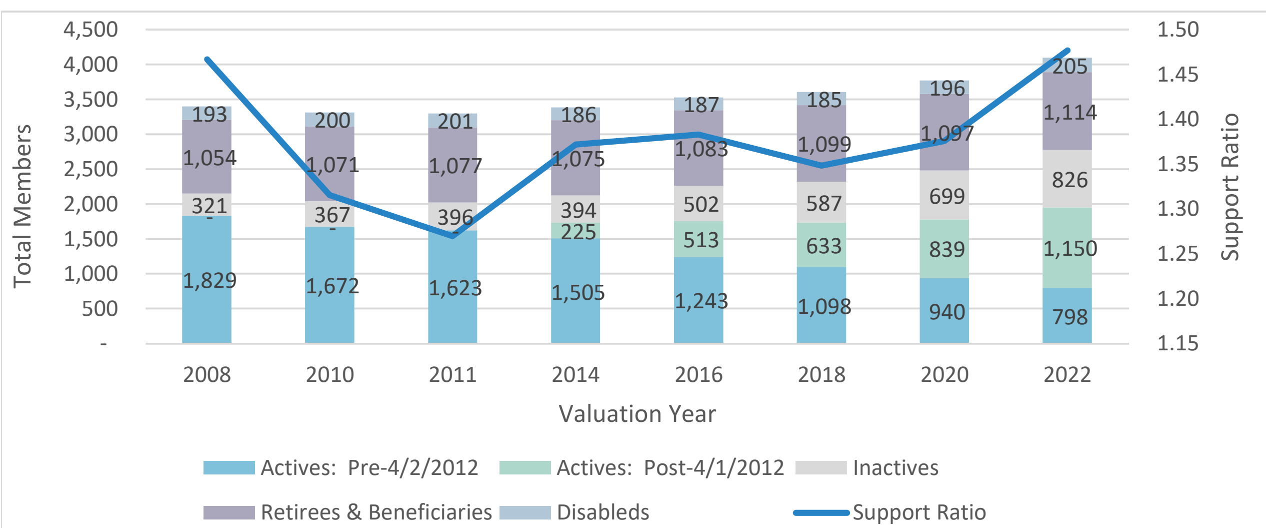
4.3 - Risk Measures

Maturity Measures

As retirement systems mature they become much more sensitive to risks. This is because a higher proportion of the actuarial liability is attributable to participants who are no longer active. Plan maturity measures are helpful in understanding the risks associated with a plan. One such maturity measure is the ratio of the system's retiree liability to its total liabiity. A retirement system in its infancy will have a very low ratio of retiree liability to total liability. As the system matures, the ratio starts increasing. A mature plan will often have a ratio above 60%. For the Brockton Contributory Retirement System and other retirement systems in the United States these ratios have been steadily increasing in recent years.



Another maturity measure is the ratio of actives to retirees, or support ratio. A retirement system in its infancy will have a very high ratio of active to retired members. As the system matures, and members retire, the support ratio starts declining. A mature system will often have a support ratio near or below one.



4.3 - Risk Measures

Volatility Indices

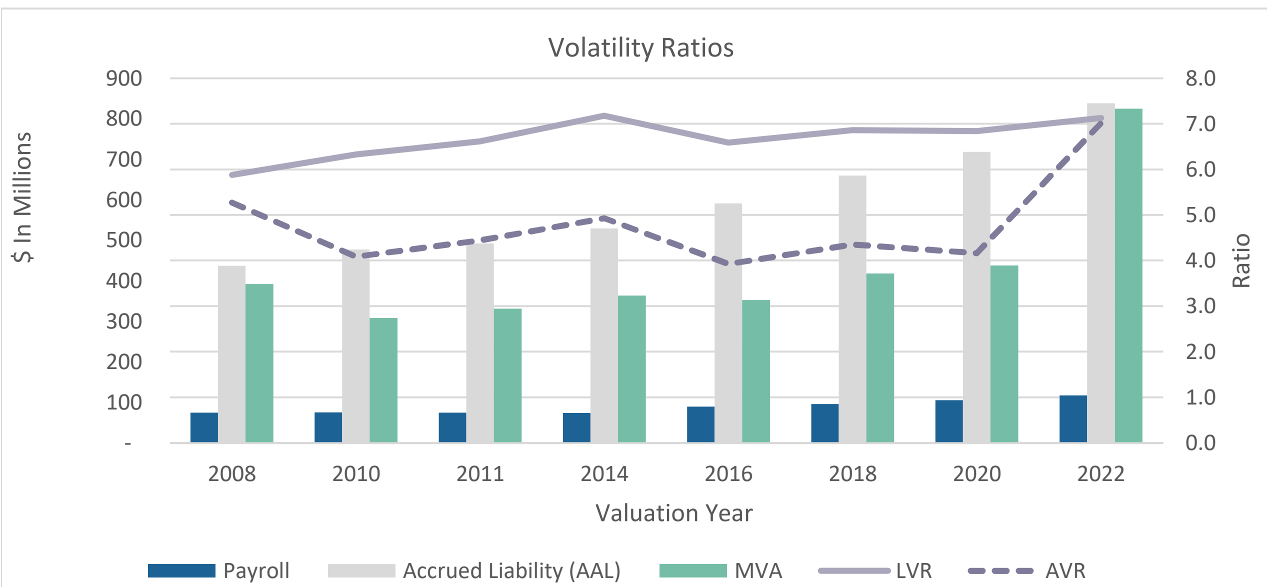
Volatility indices are measures of the relative sensitivity of employer contributions to changes in assets or liabilities. Below we present two such indices - the Asset Volatility Ratio (AVR) and the Liability Volatility Ratio (LVR):

Asset Volatility Ratio (AVR)

The Asset Volatility Ratio (AVR) is the ratio of the Market Value of Assets (MVA) to Payroll. Systems with a higher AVR experience more volatile employer contributions (as a percentage of payroll) due to investment return. This ratio indicates a measure of the system's current contribution volatility. The AVR increases over time but generally tends to stabilize as the system matures.

Liability Volatility Ratio (LVR)

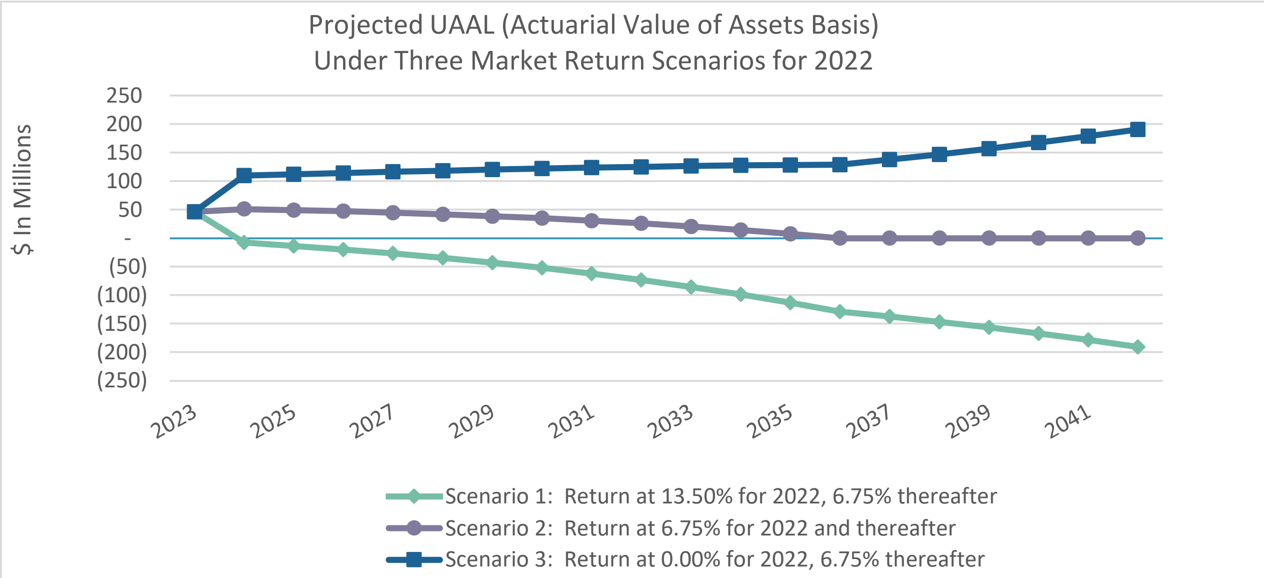
The Liability Volatility Ratio (LVR) is the ratio of the Actuarial Accrued Liability (AAL) to Payroll. Systems with a higher LVR experience more volatile employer contributions (as a percentage of payroll) due to the investment return assumption and changes in liability. This ratio indicates a longer-term potential for contribution volatility. The AVR, described above, will tend to move close to the LVR as the system matures.



4.3 - Risk Measures

Market Return Scenarios

Below we illustrate the projected effect on funding levels of a single year of investment return above or below the assumed investment return. Scenario 1 assumes a one-year return of 2 times the assumed return and the expected return thereafter, Scenario 2 assumes assets earn the expected return every year and Scenario 3 assumes a one-year return of 0% and the expected return thereafter.



Sensitivity Analysis

The following presents the Actuarial Accrued Liability and Funded Status calculated using the investment return rate of 6.75%, as well as what the Actuarial Accrued Liability and Funded Status would be if it were calculated using an investment return rate 1-percentage point lower (5.75%) or 1-percentage point higher (7.75%) than the assumed investment return rate:

	1% Decrease (5.75%)	Current Investment Return Rate (6.75%)	1% Increase (7.75%)
Actuarial Accrued Liability	$933,156,399	$837,792,916	$757,067,600
% Change	11%		-10%
Actuarial Value of Assets	$791,697,092	$791,697,092	$791,697,092
Unfunded Actuarial Accrued Liability	141,459,307	46,095,824	(34,629,492)
% Change	207%	N/A	-175%
Funded Status	84.8%	94.5%	104.6%

4.3 - Risk Measures

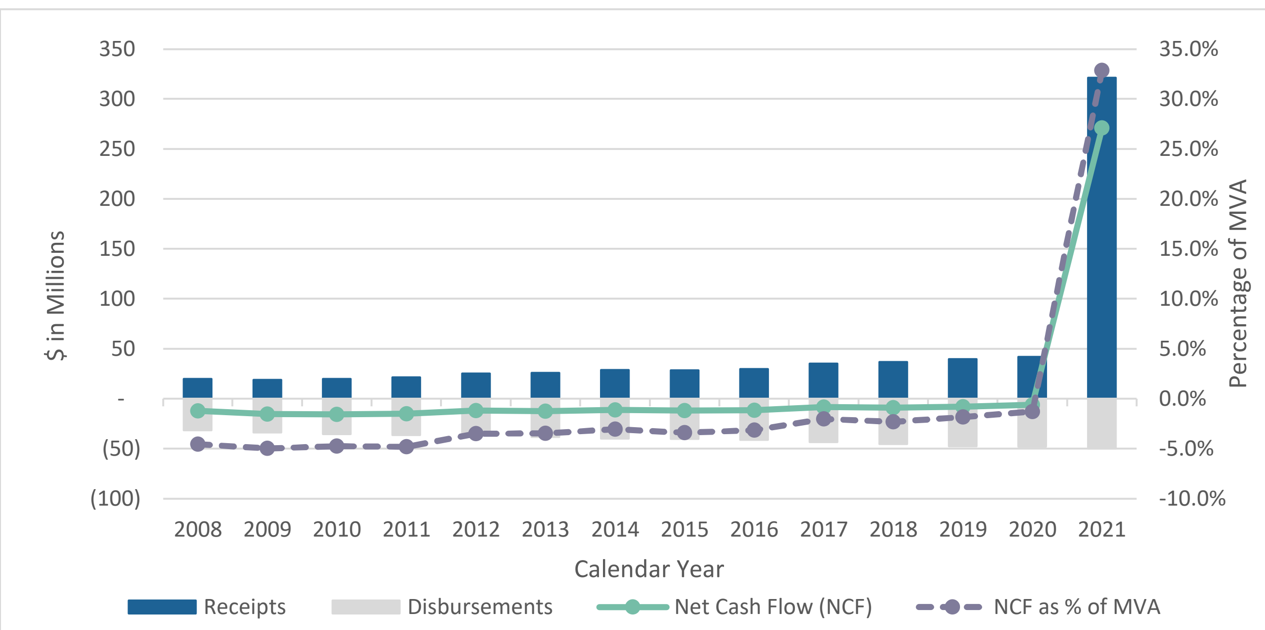
Duration

Duration is another measure that is used to describe how the present value of a cash flow series changes when small changes are made to the underlying interest rates. The duration of the Brockton Contributory Retirement System is 11, and this represents an approximate percentage change in the Actuarial Accrued Liability for each 1% change to the investment return rate.

Net Cash Flow (NCF)

Net cash flow (NCF) during a year is the difference between contributions, both employer and employee, paid into the System and benefit payments and expenses paid from the System. If the level of benefit payments plus expenses is greater than contributions, then the System has negative NCF. Mature plans generally have a negative NCF as the number of retirees grows. When a System has negative NCF, then additional cash from existing assets are needed to pay the pension benefits.

Historical NCF since 2008 is shown in the next graph. Blue bars indicate contributions, from employees and employers, and grey bars show benefit payments and administrative expenses. The NCF is represented by the green line. The dashed purple line (which corresponds to the right-hand axis) provides the NCF as a percentage of the Market Value of Assets. As of December 31, 2021, the NCF was positive $271.1 million (due to the Pension Obligation Bond), which represents 32.9% of the Market Value of Assets. The NCF falls within the range of -5.0% to 32.9% of total assets over the 14-year period.



SECTION 5 - SUMMARY OF PLAN PROVISIONS

Administration	There are 104 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws and other applicable statutes. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.
Participation	Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the local retirement board, and approved by PERAC. Membership is optional for certain elected officials.
Membership Groups	There are four membership groups in the Retirement System:

Group 1	General employees, including clerical, administrative, technical and all other employees not otherwise classified.
Group 2	Certain specified hazardous duty positions.
Group 3	State police officers and inspectors.
Group 4	Local police officers, firefighters and other specified hazardous positions.

For members in more than one group, participation will be proportional.

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

Prior to 1975	5% of Salary
1975 – 1983	7% of Salary
1984 – June 30, 1996	8% of Salary
July 1, 1996 – present	9% of Salary
1979 – present	An additional 2% of Salary in excess of $30,000.
Group 1 members hired on or after April 2, 2012	6% of Salary with 30 or more years of creditable service.

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

Retirement Age	The mandatory retirement age for some Group 2 and Group 4 members is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for members in Group 1.
Salary	Gross regular compensation. This does not include bonuses, overtime, severance pay, unused sick leave credit or other similar compensation. 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). For 2022, the limit is 64% of $305,000, or $195,200.
Average Salary	Membership before April 2, 2012: ♦ Average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement. Membership on or after April 2, 2012: ♦ Average annual rate of regular compensation received during the five consecutive years that produce the highest average, or, if greater, during the last five years (whether or not consecutive) preceding retirement.
Creditable Service	The period during which a member contributes to the retirement system plus certain periods of military service and “purchased” service.
Benefit Rate	The benefit rate varies with the member's retirement age, Group, membership date and years of creditable service at retirement. Each year a member retires prior to the age at which the 2.5% maximum benefit rate applies, a reduction is applied to each year of age under the maximum age. The maximum age and reduction for each Group and membership date is as follows:

	Group 1	Group 2	Group 4
2.5% for Membership before April 2, 2012:			
Maximum age:	65	60	55
Reduction:	0.1%	0.1%	0.1%
2.5% for Membership on or after April 2, 2012 (less than 30 years of service):			
Maximum age:	67	62	57
Reduction:	0.15%	0.15%	0.15%
2.5% for Membership on or after April 2, 2012 (30+ years of service):			
Maximum age:	67	62	57
Reduction:	0.125%	0.125%	0.125%

Superannuation Retirement	Eligibility if membership before April 2, 2012	♦ completion of 20 years of Creditable Service, or ♦ attainment of age 55 if hired prior to 1978, or ♦ attainment of age 55 with 10 years of Creditable Service, if hired after 1978.
	Eligibility if membership on or after April 2, 2012	♦ attainment of age 60 with 10 years of Creditable Service if classified in Group 1 ♦ attainment of age 55 with 10 years of Creditable Service if classified in Group 2 ♦ attainment of age 55 if classified in Group 4
	Benefit Amount	Product of the member's Benefit Rate, Average Salary and Creditable Service.
	Maximum Benefit	80% of the member's Average Salary.
	Veteran's Benefit	Additional benefit of $15 per year of Creditable Service, up to a maximum of $300.
Deferred Vested	Eligibility	♦ completion of ten or more years of Creditable Service. ♦ elected officials hired prior to 1978, completion of six years of Creditable Service.
	Benefit Amount	Accrued benefit payable commencing at age 55, or the completion of 20 years of Creditable Service, or may be deferred until later at the participant's option.
Withdrawal of Contributions		Contributions may be withdrawn upon termination of employment. ♦ Members hired on or after January 1, 1984 who terminate with less than ten years of Creditable Service receive contributions plus interest on the Annuity Savings Account at an annual rate of 3%. ♦ All other withdrawals receive contributions plus 100% of the regular interest that has accrued to the Annuity Savings Account.

Ordinary Disability Retirement	Eligibility	Non-job related disability after completion of ten years of Creditable Service.
	Benefit Amount for Group 1 membership before April 2, 2012 or Group 2 or Group 4	Superannuation benefit determined if the member is age 55, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
	Benefit Amount for Group 1 membership on or after April 2, 2012	Superannuation benefit determined if the member is age 60, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
Accidental Disability Retirement	Eligibility	Disabled as a result of an accident in the performance of duties. There is no minimum age or service requirement.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of $15 per year of Creditable Service, up to a maximum of $300.
	Supplemental Dependent Allowance	Additional allowance of $1,010.28 per year for each child until age 18 (or age 22 if a full-time student).
Non-Occupational Death	Eligibility	For members with at least two years of creditable service who die while in active service, but not due to occupational injury.
	Benefit Amount	Benefit as if Option C had been elected. Minimum benefit of $250 per month for surviving spouse, $120 per month for first child and $90 per month for each additional child.

Accidental Death	Eligibility	For members who die as a result of an occupational injury.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of $15 per year of creditable service, up to a maximum of $300.
	Supplemental Dependent Allowance	Additional allowance of $312 per year for each child until age 18 (or age 22 if a full-time student).

Cost-of-Living Adjustment (COLA)

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 benefit payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is currently $13,000 and will increase to $14,000 effective July 1, 2022. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the Commonwealth of Massachusetts and are not the liability of the Retirement System.

Optional Forms of Payment

A member may elect to receive his or her retirement allowance, payable in monthly installments, in one of three forms of payment:

♦ Option A – Total annual allowance commencing at retirement and terminating at member's death.

♦ Option B – A reduced annual allowance commencing at retirement with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member.

♦ Option C – A reduced annual allowance commencing at retirement with 66⅔% of benefit continued to designated beneficiary upon death of member. For members who retired on or after January 12, 1988, if the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement. For members who retired prior to January 12, 1988, if the System has accepted Section 288 of Chapter 194 of the Acts of 1998 and the beneficiary pre-deceases the retiree, the benefit payable increases based on the factor used to determine the Option C benefit at retirement.

Valuation Date

January 1, 2022

Investment Return

6.75% per year. Previously, 7.75% per year.

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

Annuity Savings Fund Interest Rate

2.00% per year

Amortization Method

Unfunded Actuarial Accrued Liability (UAL):

Increasing dollar amount at 4% to reduce the Unfunded Actuarial Accrued Liability to zero on or before June 30, 2032. For fiscal years 2024 and later, the Board has selected a funding schedule that fully amortizes the unfunded actuarial accrued liability by 2032 for the City of Brockton and 2035 for all other entities, with annual employer costs limited to increases of 8% for all entities other than the City of Brockton.

Salary Scale

The assumed annual rates for salary increases including longevity are illustrated by the following rates:

Years of Service	Groups 1 and 2	Group 4
0	6.00%	7.00%
1	5.50%	6.50%
2	5.50%	6.00%
3	5.25%	5.75%
4	5.25%	5.25%
5	4.75%	5.25%
6	4.75%	4.75%
7	4.50%	4.75%
8	4.50%	4.75%
9+	4.25%	4.75%

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

Cost-of-Living Allowance

Cost-of-Living Allowances (COLA) are assumed to be 3% of the pension amount capped at a maximum amount of pension benefit of $13,000 and will increase to $14,000 effective July 1, 2022.

Inflation

2.4% per year, based on current economic data, analyses from economists and other experts, and professional judgment.

Payroll Growth

3.25% per year, based on historical data, current and recent market expectations and professional judgment.

Mortality Rates

RP-2014 Blue Collar Mortality Table with full generational mortality improvement using Scale MP-2020. For disabled members, RP-2014 Blue Collar Mortality Table set forward one year with full generational mortality improvement using Scale MP-2020.

General Employees: 55% of deaths are job-related.

Police and Fire : 90% of deaths are job-related.

PERAC completed a local system retiree mortality study in 2019 and selected the RP-2014 Blue Collar Mortality Table with full generational mortality improvement using Scale MP-2018 and subsequently updated the mortality improvement scale to MP-2020 in 2022. The underlying tables with generational mortality improvement selected reasonably reflect the mortality experience of the System as of the valuation date based on historical and current demographic data as well as professional judgement.

Turnover Rates

Illustrative turnover rates are shown below:

Creditable Service	Groups 1 and 2	Group 4
0	0.1500	0.0150
10	0.0540	0.0150
20	0.0200	0.0000
30	0.0000	0.0000

Disability Rates

Illustrative disability rates are shown below:

Attained Age	Groups 1 and 2	Group 4
20	0.0001	0.0010
30	0.0003	0.0030
40	0.0010	0.0030
50	0.0019	0.0125
60	0.0028	0.0085

General Employees: 55% of disabilities are accidental and 45% are ordinary.

Police and Fire : 90% of disabilities are accidental and 10% are ordinary.

Retirement Rates

Illustrative retirement rates are shown below:

Attained Age	Groups 1 and 2		Group 4
	Male	Female	Male & Female
50	0.0100	0.0150	0.0200
51	0.0100	0.0150	0.0200
52	0.0100	0.0200	0.0200
53	0.0100	0.0250	0.0500
54	0.0200	0.0250	0.0750
55	0.0200	0.0550	0.1500
56	0.0250	0.0650	0.1000
57	0.0250	0.0650	0.1000
58	0.0500	0.0650	0.1000
59	0.0650	0.0650	0.1500
60	0.1200	0.0500	0.2000
61	0.2000	0.1300	0.2000
62	0.3000	0.1500	0.2500
63	0.2500	0.1250	0.2500
64	0.2200	0.1800	0.3000
65	0.4000	0.1500	1.0000
66	0.2500	0.2000	1.0000
67	0.2500	0.2000	1.0000
68	0.3000	0.2500	1.0000
69	0.3000	0.2000	1.0000
70	1.0000	1.0000	1.0000

The turnover, disability and retirement rates are based on PERAC's most recent experience analysis of local retirement systems which reviewed age, gender and job group. The assumptions reflect this analysis as well as professional judgment.

Actuarial Cost Method

Individual Entry Age Normal.

Actuarial Asset Method

The Actuarial Value of Assets is the market value of assets as of the valuation date reduced by the sum of:

a) 80% of gains and losses of the prior year,
b) 60% of gains and losses of the second prior year,
c) 40% of gains and losses of the third prior year, and
d) 20% of gains and losses of the fourth prior year.

Investment gains and losses are determined by the excess or deficiency of the expected return over the actual return on the market value. The actuarial valuation of assets is further constrained to be not less than 80% or more than 120% of market value.

Asset Data	Asset information is reported annually to the Public Employee Retirement Administration Commission by the Brockton Contributory Retirement Board.
Dependents	80% of all members will be survived by a spouse. Age assumption for spouses is that males are assumed to be three years older than females.
Net Section 3(8)(c) Transfers	Reimbursements paid to and received from other retirement systems for that portion of a retiree's pension that is based on service earned in another retirement system. Net 3(8)(c) transfers are assumed to be $850,000 per year.
Administrative Expenses	The anticipated administrative expenses for the fiscal year. For Fiscal Year 2023, the administrative expenses were assumed to be $785,000 and are anticipated to increase 3.25% per year. The administrative expense assumption is based on information relating to the System's administrative expenses provided by the Retirement System.

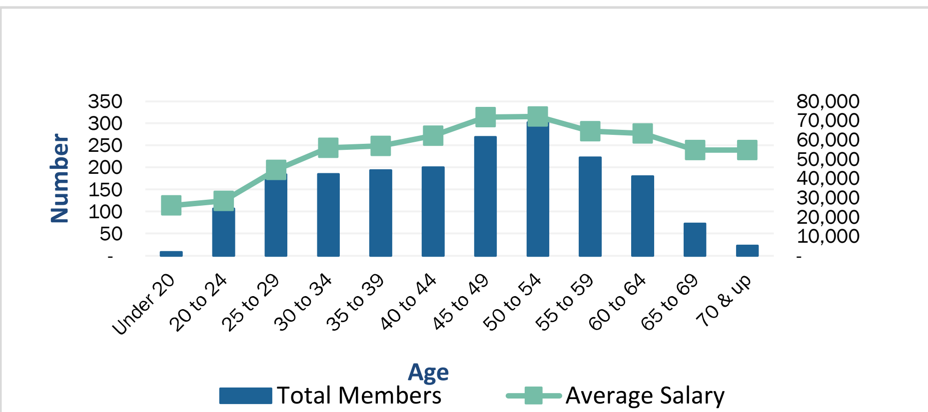
Exhibit 7.1 - Summary of Census Data as of January 1, 2022

Census data as of December 31, 2021 was provided to us by the Retirement Board. We performed edits on the data to ensure that it is reasonable and complete and made certain assumptions regarding any missing or invalid data so that results are not materially affected. Presented on the following pages are summaries of the demographic profile of active members (Exhibit 7.2) and retired plan members and beneficiaries and disabled plan members (Exhibit 7.3). Below, we present a comparison of the census data from the current and prior valuations:

Valuation Date	January 1, 2022	January 1, 2020	% Change
Census Data			
Active Members	1,948	1,779	9.5%
Average Age	45.6	46.6	(2.2%)
Average Service	10.2	11.3	(9.9%)
Valuation Salary	$117,362,996	$105,044,030	11.7%
Average Salary	$60,248	$59,047	2.0%
Retired Members and Beneficiaries	1,119	1,097	2.0%
Average Age	75.4	75.2	0.3%
Total Annual Retirement Allowance	$38,032,620	$35,366,053	7.5%
Average Annual Retirement Allowance	$33,988	$32,239	5.4%
State Reimbursed COLAs	$157,133	$198,752	(20.9%)
Total System-Funded Retirement Allowance	$37,875,487	$35,167,301	7.7%
Disabled Members	200	196	2.0%
Average Age	67.3	67.2	0.1%
Total Annual Retirement Allowance	$10,045,258	$9,438,274	6.4%
Average Annual Retirement Allowance	$50,226	$48,154	4.3%
State Reimbursed COLAs	$43,563	$61,540	(29.2%)
Total System-Funded Retirement Allowance	$10,001,695	$9,376,734	6.7%
Inactive Members	826	699	18.2%
Annuity Savings Fund	$6,679,823	$4,426,676	50.9%

Exhibit 7.2 - Active Members by Age and Years of Service as of January 1, 2022

	Years of Service											
Attained Age	0 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total	Total Salary	Average Salary
Under 20	8	-	-	-	-	-	-	-	-	8	208,301	26,038
20 to 24	106	1	-	-	-	-	-	-	-	107	3,041,798	28,428
25 to 29	170	14	-	-	-	-	-	-	-	184	8,164,160	44,370
30 to 34	113	61	11	-	-	-	-	-	-	185	10,346,306	55,926
35 to 39	101	47	33	12	1	-	-	-	-	194	11,041,096	56,913
40 to 44	92	37	27	31	12	1	-	-	-	200	12,428,337	62,142
45 to 49	79	49	25	36	60	20	-	-	-	269	19,319,114	71,818
50 to 54	82	47	28	34	51	44	15	1	-	302	21,791,592	72,158
55 to 59	46	29	24	31	43	32	8	10	-	223	14,359,739	64,393
60 to 64	27	26	18	31	45	13	12	7	1	180	11,410,547	63,392
65 to 69	10	10	8	17	11	10	4	1	2	73	3,995,056	54,727
70 & up	4	4	1	3	3	3	1	-	4	23	1,256,949	54,650
Total	838	325	175	195	226	123	40	19	7	1,948	117,362,996	60,248
Average Salary	40,771	57,913	63,965	68,385	86,700	102,804	120,621	114,654	86,238			
					Average Age:		45.6	Average Service:		10.2		



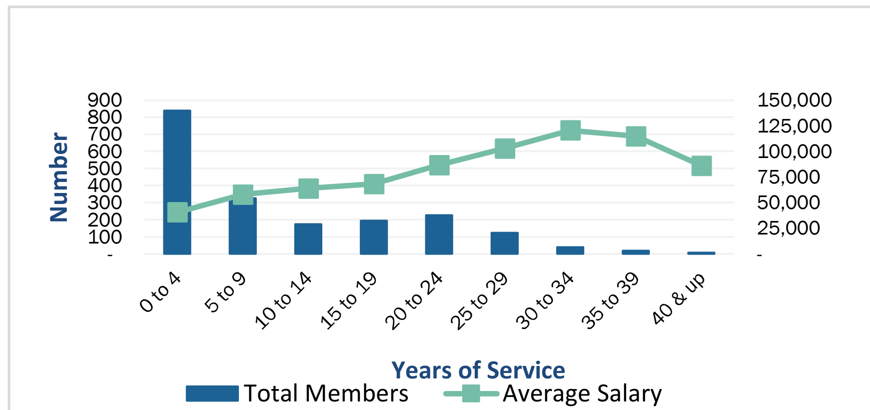
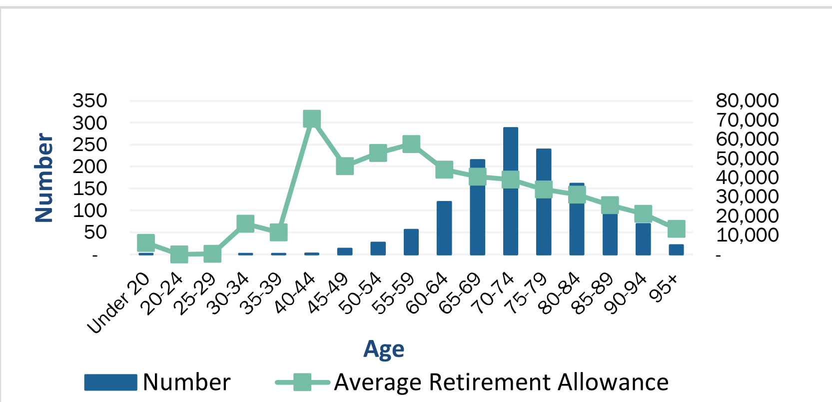
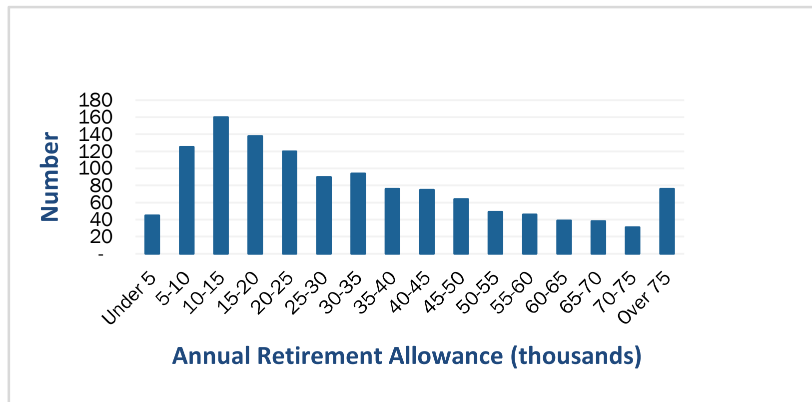


Exhibit 7.3 - Annual Retirement Allowances as of January 1, 2022

	Service Retirements		Disability Retirements		Beneficiaries	
Attained Age	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance	Number	Annual Retirement Allowance
Under 20	0	0	0	0	1	6,019
20-24	0	0	0	0	0	0
25-29	0	0	0	0	1	329
30-34	0	0	1	15,984	0	0
35-39	0	0	0	0	1	11,406
40-44	0	0	2	141,143	0	0
45-49	1	32,966	10	429,591	2	133,591
50-54	2	116,712	21	1,188,146	4	119,219
55-59	28	1,551,116	21	1,496,635	7	165,118
60-64	79	3,715,401	29	1,239,345	11	290,690
65-69	165	6,459,453	33	1,733,064	17	518,533
70-74	226	8,857,524	27	1,413,692	35	945,185
75-79	172	5,804,110	27	1,141,591	40	1,122,091
80-84	115	3,471,497	22	971,602	24	557,356
85-89	80	2,173,269	3	139,449	22	377,336
90-94	41	774,096	4	135,016	24	549,658
95+	15	200,983	0	0	6	78,962
Total	924	33,157,127	200	10,045,258	195	4,875,493
Average Age	75.1		67.3		76.8	
Average Retirement Allowance		35,884		50,226		25,003





SECTION 8 - GLOSSARY OF TERMS

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

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

Actuarial Cost Method (or Funding Method) – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the current year (Normal Cost) and the past (Actuarial Accrued Liability).

Actuarial Gain or Loss (or Experience Gain or Loss) – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between the valuation date and the most recent immediately preceding valuation date.

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

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

Annual Statement – The statement submitted by the local retirement board to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

Annuity Reserve Fund – The fund into which total accumulated Member Contributions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

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

Assets – The total value of the investments held by the Plan trust that are for the payment of promised benefits. Employer appropriations and Member Contributions, as well as investment earnings, are added to the Plan trust. Benefit payments and other disbursements are withdrawn from the Plan trust. For valuation purposes, assets are usually measured at market value.

Cost of Benefits – The estimated payment from the pension system for benefits for the fiscal year.

Expense Fund – The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

Funded Ratio – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

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

GASB – Governmental Accounting Standards Board.

Normal Cost – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is expected to accrue in the current fiscal year. The Employee Normal Cost is the amount of the expected Member Contributions for the current fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

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

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

Present Value of Future Benefits – The actuarial present value of the cost to finance benefits payable in the future, discounted to reflect the expected effects of the time value of money and the probabilities of payment.

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

Total Pension Liability – The portion of the Actuarial Present Value attributable to past service in accordance with the Entry Age cost method as stipulated by GASB Statement Number 67 (GASB 67).

Unfunded Actuarial Accrued Liability – The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

Group	All Others & City of Brockton	Brockton Redevelopment Authority	Brockton Housing Authority	Brockton Area Transit	Total
Summary of Member Data as of January 1, 2022					
Active Members	1,861	9	70	8	1,948
Average Age	45.4	33.9	52.2	45.8	45.6
Average Service	10.1	2.7	12.5	8.6	10.2
Salary	111,366,515	549,992	4,800,877	645,612	117,362,996
Average Salary	59,842	61,110	68,584	80,702	60,248
Retired Members and Survivors	1,066	2	48	3	1,119
Annual Pensions	36,157,813	58,365	1,630,364	186,080	38,032,621
Average Age	75.3	76.1	76.1	69.8	75.4
Disabled Members	197	0	3	0	200
Annual Pensions	9,891,289	0	153,969	0	10,045,258
Average Age	67.2	0.0	74.7	0.0	67.3
Inactive Members	814	4	5	3	826
Annuity Savings Fund	6,410,088	58,347	195,798	15,590	6,679,823
Normal Cost as of January 1, 2022					
1.1 Total Normal Cost	19,401,150	71,463	701,731	83,827	20,258,171
1.2 Employee Normal Cost	10,601,658	53,576	445,723	64,090	11,165,046
1.3 Net Employer Normal Cost = 1.1 - 1.2	8,799,492	17,887	256,008	19,737	9,093,125
Actuarial Accrued Liability as of January 1, 2022					
2.1 Active Employees	332,164,821	350,446	15,225,503	1,241,617	348,982,387
2.2 Retired Members and Survivors	350,285,239	570,660	14,448,019	2,231,626	367,535,544
2.3 Disabled Members	113,163,161	0	1,432,001	0	114,595,162
2.4 Inactive Members	6,410,088	58,347	195,798	15,590	6,679,823
2.5 Total = 2.1 + 2.2 + 2.3 + 2.4	802,023,309	979,453	31,301,321	3,488,833	837,792,916
2005 Pension Bond Obligation Credit - City of Brockton					
3.1 Credit as of January 1, 2020	217,004,615				217,004,615
3.2 Credit with Interest - 2020 - (9.87%)	238,422,971				238,422,971
3.3 Credit with Interest - (2021 - 17.84%)	280,957,629				280,957,629
2021 Pension Bond Obligation Credit - City of Brockton					
4.1 Credit with Interest - (2021 - 17.84%)	303,222,658				303,222,658

Group	All Others & City of Brockton	Brockton Redevelopment Authority	Brockton Housing Authority	Brockton Area Transit	Total
Transfer of Assets Credit - Brockton Area Transit (BAT)					
5.1 Market Value as of January 1, 2020				1,931,121	1,931,121
Employer contribution - 2020				83,609	83,609
Employee contribution - 2020				59,070	59,070
Transfers - 2020				0	0
Benefit payments - 2020				(201,602)	(201,602)
Administrative expenses - 2020				(2,813)	(2,813)
Interest - 2020 at 9.87%				187,627	187,627
5.2 Market Value as of January 1, 2021				2,057,013	2,057,013
Employer contribution - 2021				96,941	96,941
Employee contribution - 2021				60,675	60,675
Transfers - 2021				0	0
Benefit payments - 2021				(185,495)	(185,495)
Administrative expenses - 2021				(2,090)	(2,090)
Interest - 2021 at 17.84%				364,407	364,407
5.3 Market Value as of January 1, 2022				2,391,451	2,391,451
Actuarial Value of Plan Assets as of January 1, 2022					
6.1 Actuarial Value of Assets					791,697,092
6.2 Actuarial Value of Assets to City (Credit only) and BAT	560,792,630			2,295,709	563,088,339
6.3 Actuarial Value of Assets to All Others	219,763,456	268,381	8,576,916		228,608,753
6.4 Actuarial Value of Assets	780,556,086	268,381	8,576,916	2,295,709	791,697,092
Unfunded Actuarial Accrued Liability (UAAL) as of January 1, 2022					
7.1 UAL = 2.5 - 5.4	21,467,223	711,072	22,724,405	1,193,124	46,095,824
7.2 Funded Status	97.32%	27.40%	27.40%	65.80%	94.50%
FY2023 Appropriation					
8.1 Employer Normal Cost, July 1	9,091,626	18,481	264,507	20,393	9,395,007
8.2 Administrative Expenses	759,651	1,544	22,101	1,704	785,000
8.3 Amortization Payment of UAL*	(3,462,045)	55,450	1,709,675	76,416	(1,620,504)
8.4 Net 3(8)(c) Transfers	1,149,363	1,457	44,536	4,644	1,200,000
8.5 Total = 8.1 + 8.2 + 8.3 + 8.4	7,538,595	76,932	2,040,819	103,157	9,759,503
FY2024 Appropriation					
9.1 Employer Normal Cost, July 1	9,387,104	19,082	273,103	21,056	9,700,345
9.2 Administrative Expenses	784,341	1,594	22,819	1,759	810,513
9.3 Amortization Payment of UAL**	3,368,442	58,221	1,865,964	99,115	5,391,742
9.4 Net 3(8)(c) Transfers	814,132	1,032	31,546	3,290	850,000
9.5 Total = 9.1 + 9.2 + 9.3 + 9.4	**14,354,019**	**79,929**	**2,193,432**	**125,220**	**16,752,600**
Increase over prior year	90.407%	3.896%	7.478%	21.388%	71.654%

Group	All Others & City of Brockton	Brockton Redevelopment Authority	Brockton Housing Authority	Brockton Area Transit	Total
FY2025 Appropriation					
10.1 Employer Normal Cost, July 1	9,692,185	19,702	281,979	21,740	10,015,606
10.2 Administrative Expenses	809,832	1,646	23,561	1,816	836,855
10.3 Amortization Payment of UAL	3,503,180	63,425	2,032,756	107,974	5,707,335
10.4 Net 3(8)(c) Transfers	814,132	1,032	31,546	3,290	850,000
10.5 Total = 10.1 + 10.2 + 10.3 + 10.4	**14,819,329**	**85,805**	**2,369,842**	**134,820**	**17,409,796**
Increase over prior year	3.242%	7.352%	8.043%	7.667%	3.923%

Notes:

1. Actuarial Value of Plan Assets (6.4) is derived from allocation of assets, adjusted for City Pension Obligation Bonds (issued in 2005 and 2021) increased with investment returns through December 31, 2021.

2. FY2024 and FY2025 Appropriation is based on Funding Schedule D-3.

3. 2023 Employer Normal Cost (8.1) is the Employer Normal Cost as of January 1, 2022 (1.4), adjusted for payment timing. 2024 Employer Normal Cost (9.1) is based on 2023 Employer Normal Cost (8.1) increased by 3.25%.

*4. Amortization Payment of UAL (8.3) equals fiscal year 2023 budgeted appropriation (8.5) developed in the January 1, 2020 actuarial valuation less Employer Normal Cost (8.1) and Net 3(8)(c) transfers (8.4). The City's payment has been adjusted for the $300m POB issued in 2021.

**5. Amortization Payment of UAL (9.3) is the total Amortization Payment of UAL (9.5) allocated to each department in the proportion that the UAL (7.1) less 2023 Amortization Payment of UAL (8.3) bears to the total UAL (7.1) less total Amortization Payment of UAL (9.3).