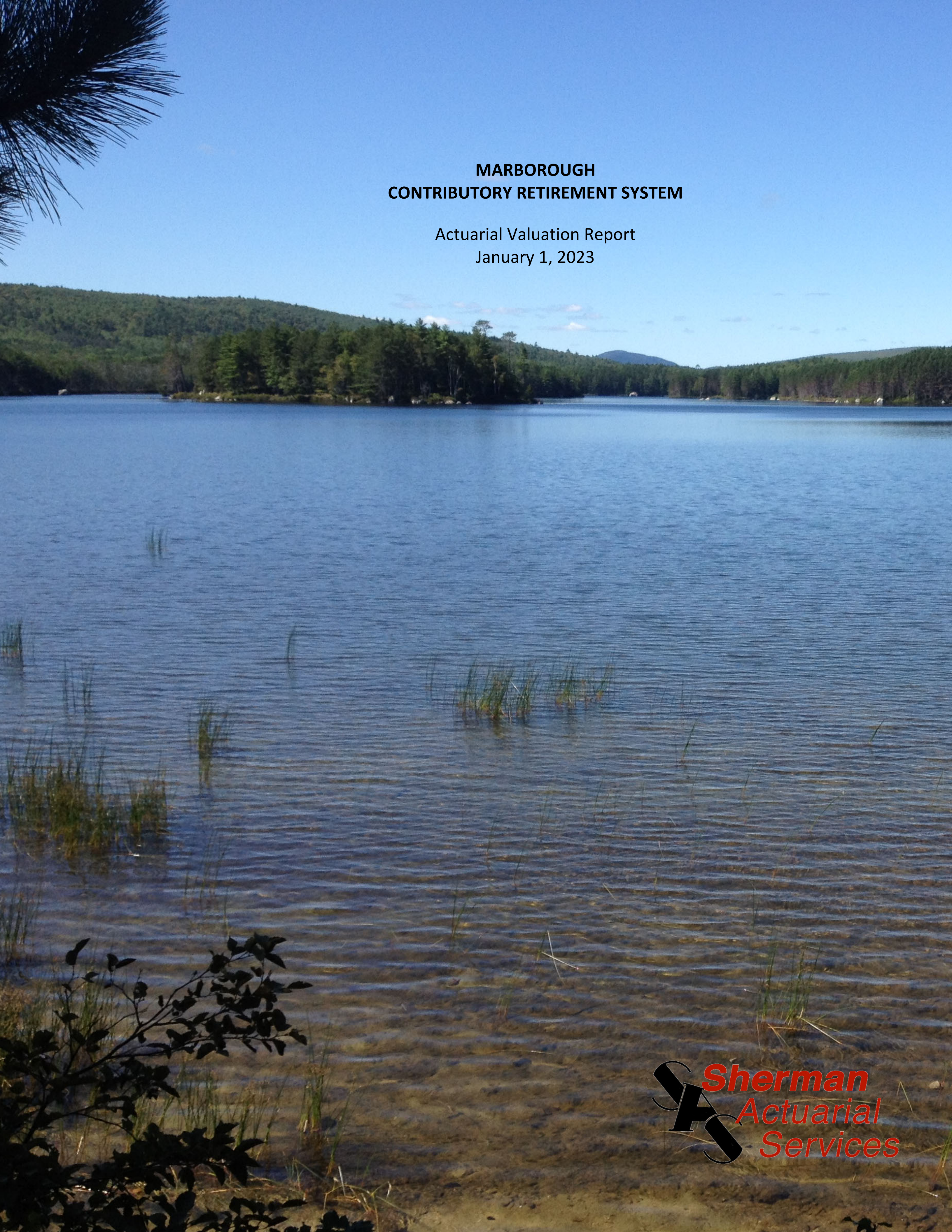
MARBOROUGH
CONTRIBUTORY RETIREMENT SYSTEM

Actuarial Valuation Report
January 1, 2023



Sherman Actuarial Services

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Report Summary:

Highlights	January 1, 2021	January 1, 2023
Contributions		
Funding Schedule FY 2024	$10,650,851	$10,650,851
Funding Schedule FY 2025	11,039,737	$11,219,878
Funded Ratios		
GAS No. 25	79.0%	84.1%
Participants		
Actives	640	610
Retirees and Beneficiaries	419	458
Inactives	237	310
Disabled	37	41
Total	1,333	1,419
Payroll		
Payroll of Active Members	$38,068,187	$38,056,581
Average Payroll	59,482	62,388
Normal Cost		
Employer	874,219	953,877
Employee	3,423,826	3,463,432
Administrative Expenses	297,000	365,000
Total	4,595,045	4,782,309
Actuarial Accrued Liabilities		
Actives	102,745,875	96,183,034
Retirees, Beneficiaries, Disabilities and Inactives	149,026,185	173,788,207
Total	251,772,060	269,971,241
Actuarial Value of Assets	198,863,212	226,935,363
Unfunded Actuarial Accrued Liabilities	$52,908,848	$43,035,878

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2023, of Marlborough Contributory Retirement System.

The actuarial valuation is based on:

- Provisions Chapter 32 of the Massachusetts General Laws, "M.G.L", as of January 1, 2023.
- Employee data provided by the Retirement Board
- Asset information reported to the Public Employee Retirement Administration Commission by the Marlborough Retirement System
- Actuarial assumptions approved by the Retirement Board

The valuation and appropriation forecast are prepared in accordance with Chapter 32 of the M.G.L. as of January 1, 2023.

The valuation and forecast do not account for:

- Any subsequent changes in the law
- Chapter 32 of the M.G.L., Section 3(8)(c) transfers between systems
- State-mandated benefits
- Cost-of-living increases granted to retired members between 1982 and 1997. The cost of these benefits has been assumed by the State under Proposition Two and One-Half.

Actuarial Experience

In performing the actuarial valuation, various assumptions are made regarding such factors as mortality, retirement, disability, and withdrawal rates as well as both payroll, salary increases, and investment returns. A comparison of the current valuation and the prior valuation is made to determine how closely actual experience corresponded to anticipated occurrences. This analysis of the system provides insight into the overall quality of the actuarial assumptions and helps explain any change in the annual appropriation.

During the last two years, based on the 2021 actuarial assumptions and plan provisions, the total unfunded actuarial accrued liability decreased to $36,479,179. The decrease is the result of net favorable actuarial experience during the preceding year, and by payments against the unfunded actuarial liability. The sources of change in the unfunded liability are as follows:

Expected Unfunded Actuarial Accrued Liability	38,541,203
Asset gain	(3,634,944)
Salary loss	(2,405,092)
New Entrants	2,537,397
Actives - Retirements	(2,649,916)
Actives - Terminations	(1,599,008)
Actives – Mortality	2,657
Actives - Disabilities	(399,231)
Inactive Mortality	787,904
Inactive – Data adjustments	3,535,110
Other	(49,114)
Benefit Payments	1,812,211
Unfunded Actuarial Accrued Liability	36,479,179

The system decreased its assumed rate of return to 7.25%. This increased the unfunded actuarial accrued liability by $6,556,699 to $43,035,878. It also increased the employer portion of the Normal Cost by $183,558 to $953,877.

Actuarial Costs and Liabilities:

Normal Costs

The normal cost is the sum of the individual normal costs determined for each member as if the assumptions underlying the cost determinations had been exactly realized. An individual normal cost represents that part of the cost of a member's future benefits which are assigned to the current year as if the costs are to remain level as a percentage of the member's pay. Benefits payable under all circumstances (i.e., retirement, death, disability, and terminations) are included in this calculation. Anticipated employee contributions to be made during the year are subtracted from the total normal cost to determine employer normal cost. The total normal cost is divided by total payroll to determine the normal cost as a percent of pay. The normal cost is shown in Table I.

Table I

	January 1, 2021	January 1, 2023
Superannuation	$2,549,433	$2,618,226
Termination	1,136,221	1,170,215
Death	138,351	142,483
Disability	474,040	486,385
Administrative Expenses	297,000	365,000
Total Normal Cost	4,595,045	4,782,309
% of Pay	12.1%	12.6%
Employee Contributions	3,423,826	3,463,432
% of Pay	9.0%	9.1%
Employer Normal Cost	$1,171,219	$1,318,877
% of Pay	3.1%	3.5%

Present Value of Actuarial Accrued Liabilities

The actuarial accrued liabilities (AAL) represents today's value of all benefits based on the past service of the actives and inactives. The AAL can be compared to the assets to determine the funded status of the Plan. The value of these earned benefits is shown in Table II below.

Table II

	January 1, 2021	January 1, 2023
Actives		
Superannuations	$100,035,367	$93,366,184
Termination	(2,523,234)	(2,365,176)
Death	1,325,472	1,333,290
Disability	3,908,270	3,848,736
Retirees and Inactives		
Retirees and Beneficiaries	125,159,827	146,522,149
Terminated (Refund)	2,643,327	3,834,744
Disabled	21,223,031	23,431,314
Total	$251,772,060	$269,971,241

Present Value of Future Benefits

The present value of future benefits represents today's value of all benefits earned by the inactive participants as well as all benefits earned and expected to be earned in the coming years by the active participants. The difference between the present value of future benefits and the present value of actuarial accrued liabilities is the value of benefits to be earned in the coming years. The value of the total expected benefits is shown in Table III.

Table III

	January 1, 2021	January 1, 2023
Actives		
Superannuation	$118,105,233	$112,649,334
Termination	$6,400,681	7,169,710
Death	$2,316,249	2,391,870
Disability	$7,391,548	7,574,082
Retirees and Inactives		
Retirees and Beneficiaries	125,159,827	146,522,149
Terminated (Refund)	2,643,327	3,834,744
Disabled	21,223,031	23,431,314
Total	$283,239,896	$303,573,203

Funded Status and Appropriations:

Market Value of Plan Assets

The trust fund composition on a market value basis is shown in Table IV.

Table IV

	January 1, 2021	January 1, 2023
Cash equivalents	$2,283,197	$380,115
Short term investments	0	0
Fixed income securities	62,581,375	51,022,535
Equities	84,425,563	69,841,345
International	46,776,479	46,642,184
Real Estate	6,975,593	11,128,772
Venture Capital	0	0
Other	8,989,306	25,705,579
Accounts receivable	61,490	339,778
Accounts payable	(76,725)	(45,653)
Accrued income	20,477	1,295
Total Market Value	$212,036,755	$205,015,950
Total Actuarial Value	$198,863,212	$226,935,363

Actuarial Value of Assets

The actuarial value of assets is determined by projecting the actuarial value of assets as of the beginning of the prior plan year with the assumed rate of return during that year (7.5%) and accounting for deposits and disbursements with interest at the assumed rate of return. An adjustment is then applied to recognize the difference between the actual investment return and expected return over a five year period. This preliminary actuarial value is not allowed to differ from the market value of assets by more than 20%. The calculation of the actuarial value of assets as of January 1, 2023 is presented in Table V.

Table V

		January 1, 2023
(1)	Market value at January 1, 2022	$237,638,004
(2)	2022 Contributions	$15,625,138
(3)	2022 Benefit Payments	($18,251,704)
(4)	Net interest adjustment at 7.5% on (1), (2), and (3) to December 31, 2022	$17,724,354
(5)	Expected market value on January 1, 2023 (1) + (2) + (3) + (4)	$252,735,792
(6)	Actual market value on January 1, 2023	$205,015,950
(7)	2022 (Gain) / Loss	$47,719,842
(8)	80% of 2022 (Gain) / Loss	$38,175,874
(9)	2021 (Gain) / Loss	($13,224,144)
(10)	60% of 2021 (Gain) / Loss	($7,934,486)
(11)	2020 (Gain) / Loss	($12,911,142)
(12)	40% of 2020 (Gain) / Loss	($5,164,457)
(13)	2019 (Gain) / Loss	($15,787,591)
(14)	20% of 2019 (Gain) / Loss	($3,157,518)
(15)	Actuarial value on January 1, 2023, (6) + (8) + (10) + (12) + (14)	$226,935,363
(16)	but not less than 80% nor greater than 120% of (6)	$226,935,363
	Ratio of actuarial value to market value	110.69%
	2022 Market Value Return on investments	-12.69%
	2022 Actuarial Value Return on investments	5.38%
	2021 Market Value Return on investments	13.79%
	2021 Actuarial Value Return on investments	10.32%

Unfunded Actuarial Accrued Liabilities

Under the Entry Age Normal Actuarial Cost Method, the Actuarial Accrued Liability represents what the accumulated assets would have been as of the valuation date if:

- current plan provisions and assumptions had always been in effect,
- experience conformed exactly to assumptions, and
- the normal cost had been contributed each year since inception.

The actuarial value of the Fund's assets as of the end of the prior year are subtracted from the Actuarial Accrued Liability (AAL) to determine the Unfunded Actuarial Accrued Liability (UAAL) as of the valuation date. Over time, annual pension contributions will accumulate Plan assets equal to the AAL, and the UAAL will be eliminated. Thereafter, annual contributions equal to the normal cost will keep the Plan's assets and liabilities in balance. The UAAL is developed in Table VI.

Table VI

	January 1, 2021	January 1, 2023
Actuarial Accrued Liability	$251,772,060	$269,971,241
Actuarial Assets	198,863,212	226,935,363
Unfunded Actuarial Accrued Liability	$52,908,848	$43,035,878
Funded Status	79.0%	84.1%

Appropriations

The pension appropriation for the upcoming fiscal years have been calculated in accordance with the requirements set forth in Sections 22D and 22F of Chapter 32 of the Massachusetts General Laws. These amounts were calculated to comply with the June 30, 2040, full funding mandate for all accrued liabilities. The pension appropriation is the sum of the:

- Employer normal cost,
- Increasing amortization of the unfunded actuarial accrued liability by June 30, 2028
  $ 43,035,878 over 5 years with 4.5% increasing payments
- Interest adjustment for payments deposited at the beginning of the fiscal year.

The pension appropriation is shown in Table VII.

Table VII

	January 1, 2021	January 1, 2023
Normal cost	$1,171,219	$1,318,877
Amortization payment of the accrued liability	8,329,222	9,060,031
Total cost	$9,500,441	$10,378,908
% of Pay	25.0%	27.3%
Fiscal 2024 cost	$9,524,576	$10,650,851
Fiscal 2025 cost	$10,275,549	$11,219,878

Appropriation Forecast

The following exhibit forecasts employer and employee contributions over the next 32 years under the adopted funding schedule.

Note that the forecast is based upon an "open group" method. This method assumes that sufficient employees will be hired each year to keep the number constant. The total payroll of the system is expected to increase 4.0% per year. The employee contribution rate is expected to increase to 10.5% by 2041 as members contributing base percentages 5%, 7%, and 8% are replaced by new members, whose base contribution is 9%. Payments are assumed to be made at the beginning of the year.

The employer total cost is expected to increase during the next 4 years until the unfunded liabilities are substantially paid off, at which time only the normal cost will remain. The total cost represents about 28% of payroll, increasing to 28.5% by the time the unfunded liabilities are fully paid off, leaving only a normal cost of about 3.2% thereafter. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

Appropriation Forecast

Fiscal Year Ending	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Unfunded Liability	Funded Ratio %**
2024	$3,463,432	$1,365,850	$9,285,002	$10,650,852	28.0	$43,035,878	84.1
2025	$3,634,546	$1,386,747	$9,833,131	$11,219,878	28.3	$36,543,890	87.2
2026	$3,813,808	$1,407,130	$10,275,622	$11,682,752	28.4	$29,009,976	90.4
2027	$4,001,596	$1,426,925	$10,738,025	$12,164,950	28.4	$20,471,604	93.6
2028	$4,198,304	$1,446,052	$11,221,236	$12,667,288	28.5	$10,835,327	96.8
2029	$4,404,347	$1,464,426	$0	$1,464,426	3.2	$0	100.0
2030	$4,620,156	$1,481,956	$0	$1,481,956	3.1	$0	100.0
2031	$4,846,183	$1,498,546	$0	$1,498,546	3.0	$0	100.0
2032	$5,082,899	$1,514,092	$0	$1,514,092	2.9	$0	100.0
2033	$5,330,799	$1,528,484	$0	$1,528,484	2.8	$0	100.0
2034	$5,590,398	$1,541,605	$0	$1,541,605	2.7	$0	100.0
2035	$5,862,236	$1,553,329	$0	$1,553,329	2.7	$0	100.0
2036	$6,146,876	$1,563,526	$0	$1,563,526	2.6	$0	100.0
2037	$6,444,908	$1,572,052	$0	$1,572,052	2.5	$0	100.0
2038	$6,756,948	$1,578,759	$0	$1,578,759	2.4	$0	100.0
2039	$7,083,638	$1,583,488	$0	$1,583,488	2.3	$0	100.0
2040	$7,425,653	$1,586,068	$0	$1,586,068	2.2	$0	100.0
2041	$7,783,695	$1,586,322	$0	$1,586,322	2.1	$0	100.0
2042	$8,095,043	$1,649,775	$0	$1,649,775	2.1	$0	100.0
2043	$8,418,845	$1,715,765	$0	$1,715,765	2.1	$0	100.0
2044	$8,755,599	$1,784,396	$0	$1,784,396	2.1	$0	100.0
2045	$9,105,823	$1,855,772	$0	$1,855,772	2.1	$0	100.0
2046	$9,470,056	$1,930,003	$0	$1,930,003	2.1	$0	100.0
2047	$9,848,858	$2,007,203	$0	$2,007,203	2.1	$0	100.0
2048	$10,242,812	$2,087,491	$0	$2,087,491	2.1	$0	100.0
2049	$10,652,525	$2,170,991	$0	$2,170,991	2.1	$0	100.0
2050	$11,078,626	$2,257,830	$0	$2,257,830	2.1	$0	100.0
2051	$11,521,771	$2,348,144	$0	$2,348,144	2.1	$0	100.0
2052	$11,982,642	$2,442,069	$0	$2,442,069	2.1	$0	100.0
2053	$12,461,947	$2,539,752	$0	$2,539,752	2.1	$0	100.0
2054	$12,960,425	$2,641,342	$0	$2,641,342	2.1	$0	100.0
2055	$13,478,842	$2,746,996	$0	$2,746,996	2.1	$0	100.0

** Beginning of Fiscal Year

EXHIBITS

Exhibit 1 - Age/Service Distribution with Salary as of January 1, 2023

Attained Age	Average Salary <5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20	1	0	0	0	0	0	0	0	0	1
	47,511	0	0	0	0	0	0	0	0	47,511
20-24	30	1	0	0	0	0	0	0	0	31
	37,359	0	0	0	0	0	0	0	0	39,090
25-29	54	12	0	0	0	0	0	0	0	66
	46,554	56,693	0	0	0	0	0	0	0	48,398
30-34	39	27	2	0	0	0	0	0	0	68
	54,429	72,136	87,212	0	0	0	0	0	0	62,424
35-39	19	17	23	9	1	0	0	0	0	69
	44,857	74,833	84,545	82,688	0	0	0	0	0	71,301
40-44	21	13	8	6	5	0	0	0	0	53
	38,076	59,380	90,421	55,756	90,403	0	0	0	0	58,141
45-49	20	10	6	6	13	2	0	0	0	57
	38,240	42,729	45,234	86,007	78,975	100,130	0	0	0	56,254
50-54	14	13	9	8	12	13	5	0	0	74
	31,283	42,331	51,700	44,522	81,999	117,121	106,637	0	0	65,534
55-59	9	18	12	17	22	4	10	5	0	97
	46,945	60,774	61,655	54,838	72,537	95,700	107,896	101,701	0	69,635
60-64	8	14	7	14	13	6	2	5	0	69
	51,089	50,638	61,573	36,239	55,372	82,415	78,844	77,532	0	55,300
65-69	2	3	5	4	2	2	2	0	1	21
	31,944	43,051	70,167	42,692	58,769	80,040	42,154	0	80,478	55,098
70+	0	0	0	2	0	0	2	0	0	4
	0	0	0	41,336	0	0	57,710	0	0	49,523
Total Employees	217	128	72	66	68	27	21	10	1	610
Average Salary	44,031	59,232	70,844	55,212	71,998	102,229	93,789	89,616	80,478	60,133

Exhibit 2 - Retiree Distribution as of January 1, 2023

	Number of Employees			Total Payments		
Attained Age	Female	Male	Total	Female	Male	Total
< 20	1	0	0	53,049	0	53,049
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	1	0	0	4147.56	0	4,148
35-39	0	0	0	0	0	0
40-44	0	0	0	0	0	0
45-49	0	1	1	0	34,085	34,085
50-54	0	2	2	0	89,738	89,738
55-59	12	13	25	182,897	711,232	894,128
60-64	23	38	61	496,750	2,088,631	2,585,381
65-69	55	45	100	978,527	2,125,781	3,104,308
70-74	53	41	94	1,147,593	1,810,402	2,957,995
75-79	43	41	84	991,753	1,694,429	2,686,183
80-84	26	19	45	560,778	741,102	1,301,880
85-89	13	11	24	325,433	325,739	651,172
90-94	8	6	14	150,250	135,356	285,606
95+	5	1	6	109,736	22,673	132,409
Total	240	218	456	5,000,915	9,779,166	14,780,081
Average (Age/Payment)	73.08	71.58	72.36	20,837	44,859	32,412
Frequency Percent	52.6	47.4	100.0	33.8	66.2	100.0

Exhibit 3 - Disabled Retiree Distribution as of January 1, 2023

	Number of Employees			Total Payments		
Attained Age	Female	Male	Total	Female	Male	Total
< 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	0	0
40-44	1	1	2	54,783	72,919	127,702
45-49	0	0	0	0	0	0
50-54	1	1	2	36,810	39,956	76,766
55-59	2	6	8	101,295	437,212	538,507
60-64	1	7	8	36,704	355,284	391,989
65-69	0	9	9	0	495,630	495,630
70-74	1	4	5	30,335	146,695	177,030
75-79	1	4	5	17,046	151,989	169,034
80-84	0	1	1	0	34,388	34,388
85-89	0	0	0	0	0	0
90-94	0	0	0	0	0	0
95-99	0	1	1	0	37,662	37,662
Total	7	34	41	276,973	1,771,734	2,048,707
Average (Age/Payment)	60.9	66.3	65.3	39,568	52,110	49,968
Frequency Percent	17.1	82.9	100.0	13.5	86.5	100.0

EXHIBIT 4 - CASHFLOW FORECAST:

The following is a 30 year forecast of benefit payments net of state reimbursable COLA payments, Contribution Income and Investment Returns.

Plan Year Ending	Benefit Payments	Employee Contributions	Employer Contributions	Investment Returns	Net change in plan assets
2023	$8,590,149	$3,463,432	$10,650,852	$16,382,239	$21,906,374
2024	9,331,253	3,634,546	11,219,878	17,964,674	23,487,845
2025	10,088,276	3,813,808	11,682,752	19,653,778	25,062,062
2026	10,828,011	1,765,812	12,164,950	21,458,283	24,561,034
2027	11,571,027	4,198,304	12,667,288	23,389,129	28,683,693
2028	12,322,017	4,404,347	1,464,426	25,039,571	18,586,327
2029	13,117,642	4,620,156	1,481,956	26,355,963	19,340,433
2030	13,857,321	4,846,183	1,498,546	27,728,965	20,216,373
2031	14,512,055	2,680,326	1,514,092	29,168,443	18,850,806
2032	15,197,724	5,330,799	1,528,484	30,681,948	22,343,507
2033	15,915,790	5,590,398	1,541,605	32,273,279	23,489,492
2034	16,667,783	5,862,236	1,553,329	33,946,432	24,694,215
2035	17,455,306	6,146,876	1,563,526	35,705,608	25,960,704
2036	18,280,038	6,444,908	1,572,052	37,555,227	27,292,149
2037	19,143,738	3,676,708	1,578,759	39,499,936	25,611,665
2038	20,048,246	7,083,638	1,583,488	41,544,622	30,163,502
2039	20,995,490	7,425,653	1,586,068	43,694,427	31,710,658
2040	21,987,490	7,783,695	1,586,322	45,954,757	33,337,284
2041	23,026,360	8,095,043	1,649,775	48,329,042	35,047,499
2042	24,114,315	8,418,845	1,715,765	50,825,343	36,845,638
2043	25,253,674	8,755,599	1,784,396	53,449,941	38,736,262
2044	26,446,866	9,105,823	1,855,772	56,209,447	40,724,176
2045	27,696,434	9,470,056	1,930,003	59,110,814	42,814,439
2046	29,005,041	9,848,858	2,007,203	62,161,357	45,012,377
2047	30,375,478	10,242,812	2,087,491	65,368,773	47,323,597
2048	31,810,666	10,652,525	2,170,991	68,741,158	49,754,008
2049	33,313,664	11,078,626	2,257,830	72,287,036	52,309,828
2050	34,887,676	11,521,771	2,348,144	76,015,370	54,997,609
2051	36,536,057	11,982,642	2,442,069	79,935,599	57,824,252
2052	37,626,748	12,461,947	2,539,752	84,080,284	61,455,235

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2023, and does not take into account any subsequent changes.

1. Administration

Each of the 104 contributory retirement systems for public employees of the Commonwealth of Massachusetts are guided by the applicable provisions of Chapter 32 of the Massachusetts General Laws and other applicable statutes. Although these boards operate semi-independently, there is a uniform set of rules governing benefits, eligibility, contributions, financing, and accounting.

2. Participation

Participation is mandatory for all full-time employees whose employment commences prior to age 65. Eligibility with respect to part-time, professional, temporary, or intermittent employment is governed by the local board. Membership is optional for certain elected officials, State officials appointed by the Governor, and certain hospital interns.

There are four classes of membership as follows:

(i) Group 1: Most general employees in State and local government

(ii) Group 2: Certain specified hazardous duty positions

(iii) Group 3: State police officers and inspectors

(iv) Group 4: Local police officers, firefighters, and designated employees of the municipal light department.

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

Chapter 176 of the Acts of 2011 created different plan provisions within these groups for those hired on or after April 2, 2012.

3. Salary

Salary is defined as gross regular compensation. Salary does not include bonuses, overtime, severance pay, unused sick leave credit, or other similar compensation.

4. Member Contributions

Member contributions vary depending upon date hired as follows:

Date of Hire	Member Contribution Rate
Prior to 1975	5.0% of Salary
1975 to 1983	7.0% of Salary
1984 to 1996	8.0% of Salary
1996 and Later plus	9.0% of Salary
1979 and Later	2.0% of Salary in excess of $30,000

For Group 1 employees who become members on or after April 2, 2012, the Contribution Rate shall be 6% after the completion of 30 years of service.

5. Average Salary

Average salary is used to determine a participant's benefit. It is defined as the average salary during the three consecutive-year period that produces the highest average. (Alternatively, if a greater amount results, it is the average rate of salary earned during the period or periods, whether or not consecutive, that constitutes the last three years preceding retirement.). For employees who become members on or after April 2, 2012, the averaging period shall be five years.

6. Creditable Service

In general, creditable service is awarded during the period in which a member contributes to the retirement system.

7. Service Retirement

a. Eligibility:

For an employee to be eligible for service retirement (also referred to as superannuation), one of the following conditions must be met:

(i) completion of 20 years of service, if hired before April 2, 2012

(ii) for an employee hired prior to January 1, 1978, attainment of age 55 as an active member

(iii) for an employee hired on or after January 1, 1978, attainment of age 55 as an active member and completion of ten years of service

(iv) for a Group 1 employee hired on or after April 2, 2012, attainment of age 60 and completion of ten years of service

b. Benefit Amount:

The retirement allowance is determined as a product of the participant's Benefit Rate times Average Salary times Creditable Service, where Benefit Rate is determined from the following table for those hired prior to April 2, 2012:

Age at Retirement	Percentage of Average Salary Group 1	Group 2	Group 4
65 or Over	.025	.025	.025
64	.024	.025	.025
63	.023	.025	.025
62	.022	.025	.025
61	.021	.025	.025
60	.020	.025	.025
59	.019	.024	.025
58	.018	.023	.025
57	.017	.022	.025
56	.016	.021	.025
55	.015	.020	.025
54	.014	.014	.024
53	.013	.013	.023
52	.012	.012	.022
51	.011	.011	.021
50	.010	.010	.020
49	.009	.009	.019
48	.008	.008	.018
47	.007	.007	.017
46	.006	.006	.016
45	.005	.005	.015
44	.004	.004	.004
43	.003	.003	.003
42	.002	.002	.002
41	.001	.001	.001

For those hired after April 1, 2012 who retire with less than 30 years of service, the following rates are applied:

Age at Retirement	Percentage of Average Salary Group 1	Group 2	Group 4
67 or Over	.0250	.0250	.0250
66	.0235	.0250	.0250
65	.0220	.0250	.0250
64	.0205	.0250	.0250
63	.0190	.0250	.0250
62	.0175	.0250	.0250
61	.0160	.0235	.0250
60	.0145	.0220	.0250
59		.0205	.0250
58		.0190	.0250
57		.0175	.0250
56		.0160	.0235
55		.0145	.0220
54			.0205
53			.0190
52			.0175
51			.0160
50			.0145

For those hired after April 1, 2012 who retire with at least 30 years of service, the following rates are applied:

Age at Retirement	Percentage of Average Salary Group 1	Group 2	Group 4
67 or Over	.02500	.02500	.02500
66	.02375	.02500	.02500
65	.02250	.02500	.02500
64	.02125	.02500	.02500
63	.02000	.02500	.02500
62	.01875	.02500	.02500
61	.01750	.02375	.02500
60	.01625	.02250	.02500
59		.02125	.02500
58		.02000	.02500
57		.01875	.02500
56		.01750	.02375
55		.01625	.02250
54			.02125
53			.02000
52			.01875
51			.01750
50			.01625

8. Deferred Vested Retirement

a. Eligibility:

A participant who has completed ten or more years of creditable service is eligible for a deferred vested retirement benefit. If termination is involuntary, the participant is vested after six years.

b. Benefit Amount:

The participant's accrued benefit is payable commencing at age 55, or may be deferred until later at the employee's option.

c. Refund of Contributions:

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

9. Accidental Disability

a. Eligibility:

Participants are eligible for an accidental disability benefit, regardless of service or age, if they become permanently and totally incapacitated for further duty as a result of personal injury sustained while in the performance of duties.

b. Benefit Amount:

The accidental disability amount is 72% of annual salary plus $450 per year for each child plus an additional annuity based upon accumulated Member Contributions with credited interest.

10. Ordinary Disability

a. Eligibility:

An ordinary disability occurs when a member becomes permanently and totally disabled due to sickness or injury that is not job related. In order to be eligible for an ordinary disability benefit, a member must have ten years of service (and be less than age 55 or age 60 if hired on or after April 2, 2012).

b. Benefit Amount:

The ordinary disability amount is equal to the accrued retirement benefit as if the member were age 55 (age 60 if hired on or after April 2, 2012). If the member was a veteran, the benefit is 50% of the member's final rate of Salary during the preceding 12 months, plus an annuity based upon accumulated Member Contributions plus credited interest. If the participant is over age 55 (age 60 if hired on or after April 2, 2012), he will receive not less than the superannuation allowance to which he is entitled.

11. Survivor Benefits

a. Occupational Death:

The survivors of a member who dies due to an occupational injury will be entitled to a lump sum return of contributions plus a pension benefit equal to 72% of the participant's annual Salary.

b. Non-Occupational Death:

Upon the death of a member other than due to an occupational injury, the designated beneficiary will be entitled to a retirement benefit as if Option C had been elected with a minimum of $250 per month to the surviving spouse, plus $120 for the first child, plus $90 for each additional child. If no beneficiary is designated and if the employee worked two years, and is married at least one year, the spouse may elect benefits. 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 $250 per month plus $120 for the first child and $90 for each additional child.

c. Refund of Contributions:

Upon the death of a member not entitled to survivor benefits, the beneficiary is entitled to a refund of all member contributions with interest.

12. Cost-of-Living Increases

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. The maximum amount of pension benefit subject to a COLA is $12,000. 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.

13. Postretirement Death Benefits

Any benefits following the death of a member after retirement are based upon the form of benefit the participant elected at the time of retirement. There are three available forms as follows:

(i) Option A – Life annuity

(ii) Option B – Life annuity with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member

(iii) Option C – Life annuity with 66-2/3% of benefit continued after death of member to designated joint annuitant

EXHIBIT 6 – ACTUARIAL METHODS AND ASSUMPTIONS:

The actuarial cost method, factors, and assumptions used in determining cost estimates are presented below.

1. **Member Data**

   The member data used in the determination of cost estimates consist of pertinent information with respect to the active, inactive, retired, and disabled members of the employer as supplied by the employer to the actuary.

2. **Valuation Date**

   January 1, 2023.

3. **Actuarial Cost Method**

   The costs of the Plan have been determined in accordance with the individual entry age normal actuarial cost method.

4. **Rate of Investment Return**

   It is assumed that the assets of the fund will accumulate at a compound annual rate of 7.5% per annum.

5. **Salary Scale**

   It is assumed that salaries including longevity will increase at a rate of 3.75% per year.

6. **Cost-of-Living Increases**

   Cost-of-living increases have been assumed to be 3.0% of the lesser of the pension amount and $12,000 per year.

7. **Value of Investments**

   Assets held by the fund are valued at market value as reported by the Public Employees' Retirement Administration Commission (PERAC). The actuarial value of assets is determined using a five-year smoothing of asset returns greater than or less than the assumed rate of return.

8. Annual Rate of Withdrawal Prior to Retirement

Based on an analysis of experience, the assumed annual rates of withdrawal may best be illustrated by the following rates at the following ages:

Service	General Employees	Police and Fire Employees
0	0.2080	0.1500
5	0.1020	0.1000
10	0.0650	0.0600
15	0.0417	0.0600
20	0.0400	0.0000
30	0.0000	0.0000

9. Annual Rate of Mortality

It is assumed that mortality for is represented by the various SOA Pub-2010 Public Retirement Plans Mortality Tables specific to the Group, Pre-retirement versus Post, Disabled and Beneficiaries, with Scale MP-2018 improvements until 2025.

10. Service Retirement

Based on an analysis of experience, the assumed annual retirement rates are illustrated at the following ages for those hired prior to April 2, 2012:

Age	Male General Employees	Female General Employees	Male and Female Police and Fire Employees
50	0.0360	0.1019	0.0382
51	0.0405	0.0714	0.0351
52	0.0437	0.0562	0.0436
53	0.0366	0.0448	0.0527
54	0.0451	0.0488	0.0999
55	0.0477	0.0469	0.1110
56	0.0574	0.0518	0.1413
57	0.0632	0.0509	0.1292
58	0.0765	0.0552	0.1499
59	0.0917	0.0645	0.1679
60	0.1057	0.0774	0.1871
61	0.1224	0.1038	0.2073
62	0.1473	0.1168	0.2176
63	0.1777	0.1440	0.3338
64	0.2136	0.1708	0.5664
65	0.2615	0.1939	1.00000
66	0.2682	0.1959	1.00000
67	0.2500	0.2000	1.00000
68	0.2500	0.2000	1.00000
69	0.2500	0.2000	1.00000
70 to 76	0.2500	0.2500	1.00000
77 to 79	0.3500	0.2500	1.00000
80	1.0000	1.0000	1.00000

Based on an analysis of experience, the assumed annual retirement rates are illustrated at the following ages for those hired on or after April 2, 2012:

Age	Male General Employees	Female General Employees	Male and Female Police and Fire Employees
50	0.0000	0.0000	0.0191
51	0.0000	0.0000	0.0176
52	0.0000	0.0000	0.0436
53	0.0000	0.0000	0.0211
54	0.0000	0.0000	0.0266
55	0.0000	0.0000	0.0370
56	0.0000	0.0000	0.1060
57	0.0000	0.0000	0.1938
58	0.0000	0.0000	0.1499
59	0.0000	0.0000	0.1119
60	0.0477	0.0469	0.0936
61	0.0574	0.0518	0.1555
62	0.0632	0.0509	0.1741
63	0.0765	0.0552	0.2670
64	0.0917	0.0645	0.4720
65	0.1057	0.0774	0.2500
66	0.1224	0.1038	0.3000
67	0.1473	0.1168	1.0000
68	0.1777	0.1440	1.0000
69	0.2136	0.1708	1.0000
70	0.2615	0.1939	1.0000
70 to 76	0.2682	0.1959	1.0000
77 to 79	0.2500	0.2000	1.0000
80	0.2500	0.2000	1.0000

12. Annual Rate of Disability Prior to Retirement

Based on an analysis of experience, the assumed annual rates of disability may best be illustrated by the following probabilities at the following ages:

Attained Age	General Employees	Police and Fire Employees
20	0.000100	0.000500
30	0.000152	0.000967
40	0.000663	0.002500
50	0.001271	0.007634

In addition, it is assumed for the general employees that 20% of all disabilities are ordinary (80% are service connected). For police and fire employees, 10% of all disabilities are assumed to be ordinary (90% are service connected).

13. Family Composition

It is assumed that 80% of all members will be survived by a spouse and that females (males) are three years younger (older) than members.

14. Administrative Expenses

The normal cost is increased by an amount equal to the anticipated administrative expenses for the upcoming fiscal year. The amount for fiscal year 2023 is $365,000 and is anticipated to increase at 4.5% per year.

EXHIBIT 7 – GLOSSARY OF TERMS:

This glossary summarizes the technical terms contained in this report.

1. **Actuarial Accrued Liability**

   That portion of the Actuarial Present Value of plan benefits that is not provided for by future employer Normal Costs or employee contributions.

2. **Actuarial Assumptions**
   Assumptions as to the occurrence of future events affecting the Retirement System such as:

   - Rates of investment returns
   - Increases in a member's salary
   - Inflation
   - The probability of mortality, turnover, disablement
   - Retirement at each age and other relevant items

3. **Actuarial Cost Method**

   A procedure for allocating the Actuarial Present Value of pension plan benefits between Normal Cost and Actuarial Accrued Liability.

4. **Actuarial Present Value**

   The single sum amount required at the valuation date that is required to provide for anticipated future events based upon the terms of the plan and the Actuarial Assumptions.

5. **Forecast**

   A projection of future benefit payments or contribution requirements based upon the terms of the plan, the current asset amounts, the Actuarial Assumptions, and additional assumptions as to the replacement of terminating employees with new employees.

6. Normal Cost

That portion of the Actuarial Present Value of future benefits that is assigned to the current year.

7. Unfunded Actuarial Accrued Liability

That portion of the Actuarial Accrued Liability that is not provided for by current actuarial value of assets.

8. Valuation Method

The method used to divide the cost of future benefits among the Actuarial Accrued Liability, the current year's Normal Costs, and future years' Normal Costs. The resulting current funding requirement is then determined as the current year's Normal Cost plus the payment necessary to amortize the Unfunded Actuarial Liability.

9. Vested Liability

That portion of the Actuarial Present Value of Accrued Benefits that a member would be entitled to if the member terminated employment with the employer as of the valuation date.

CERTIFICATION:

This report fairly represents the actuarial position of the Marlborough Retirement System contributing as of January 1, 2023, in accordance with generally accepted actuarial principles applied consistently with the preceding valuation. In our opinion, the actuarial assumptions used to compute actuarial accrued liability and normal cost are reasonably related to plan experience and to reasonable expectations, and represents our best estimate of anticipated plan experience.

The funded status measure is appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations. The funded status measure is appropriate for assessing the need for or the amount of future contributions. The funded status measure would be different if the measure reflected the market value of assets rather than the actuarial value of assets.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such future measurements.

The report was prepared under the supervision of Daniel Sherman, an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries, who takes responsibility for the overall appropriateness of the analysis, assumptions and results. Daniel Sherman is deemed to meet the General Qualification Standard and the basic education and experience requirement in the pension area. Based on over thirty years of performing valuations of similar complexity, Mr. Sherman is qualified by experience. Daniel Sherman has met the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Sherman Actuarial Services, LLC

Daniel W. Sherman

Daniel W. Sherman, ASA, MAAA

August, 2023

BREAKOUTS

https://shermanactuary-my.sharepoint.com/personal/dan_shermanactuary_com/Documents/Recovered Data/Marlborough/Val23/[Marlb2023_Val 7_25.xlsm]Actuarybreak

Breakouts

	Total	City	Fire	Police	School	Water	Sewer	Housing
(1) Payroll of Active Participants	$38,056,581	$10,399,335	$7,238,790	$7,263,033	$10,882,427	$1,395,078	$423,288	$454,631
Pecentage of Total Payroll	100.00%	27.33%	19.02%	19.08%	28.60%	3.67%	1.11%	1.19%
(2) Normal Cost								
(a) Employee	3,463,432	951,279	679,999	675,109	944,383	131,485	40,081	41,095
(b) Employer	953,877	181,757	250,003	214,672	290,341	13,226	(878)	4,761
(c) Expenses	365,000	93,622	76,846	73,522	102,025	11,957	3,239	3,789
(d) Total Employer Normal Cost	1,318,877	275,379	326,849	288,194	392,366	25,183	2,361	8,550
(a) Accrued Liability	269,971,241	67,989,463	68,597,755	65,814,399	52,119,242	12,129,420	1,127,852	2,193,112
(4) Total Employer Contribution								
(a) Amortizations	9,060,031	2,281,675	2,302,089	2,208,682	1,749,082	407,054	37,850	73,599
(b) Employer Normal Cost	953,877	181,757	250,003	214,672	290,341	13,226	(878)	4,761
(c) Administrative Expenses*	365,000	93,622	76,846	73,522	102,025	11,957	3,239	3,789
(d) Total Appropriation	$10,378,908	$2,557,054	$2,628,938	$2,496,876	$2,141,448	$432,237	$40,211	$82,149
(e) As a percentage of Payroll	27.27%	24.59%	36.32%	34.38%	19.68%	30.98%	9.50%	18.07%
(5) Fiscal 2025 Appropriation	$11,219,878	$2,764,244	$2,841,952	$2,699,190	$2,314,962	$467,260	$43,470	$88,805
Percent of Total Appropriation	100.00%	24.64%	25.33%	24.06%	20.63%	4.16%	0.39%	0.79%
(6) Fiscal 2026 Appropriation	$11,682,752	$2,878,283	$2,959,196	$2,810,545	$2,410,466	$486,537	$45,263	$92,469
Percent of Total Appropriation	100.00%	24.64%	25.33%	24.06%	20.63%	4.16%	0.39%	0.79%