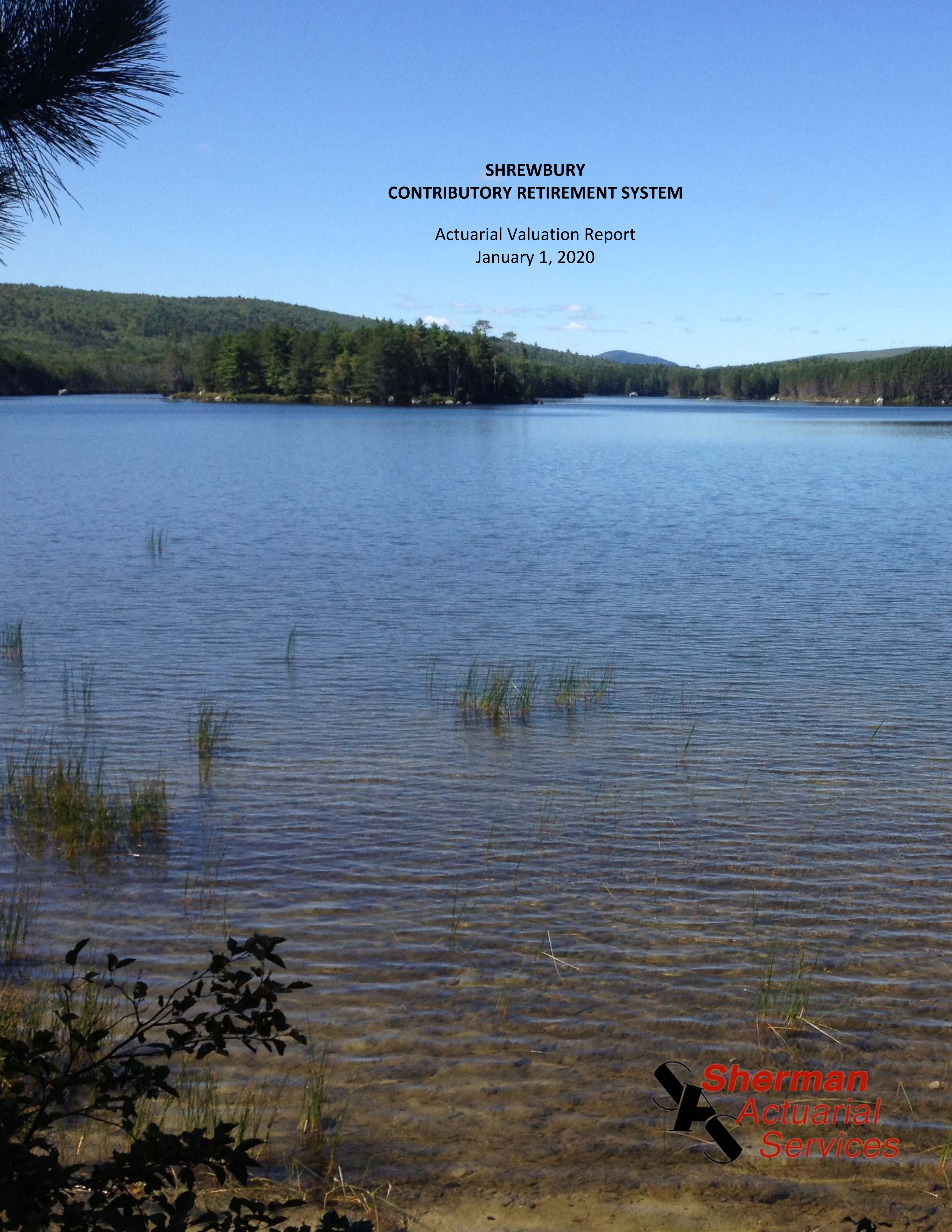

SHREWBURY
CONTRIBUTORY RETIREMENT SYSTEM

Actuarial Valuation Report
January 1, 2020

Sherman Actuarial Services

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Report Summary:

Highlights	**January 1, 2018**	**January 1, 2020**
Contributions		
Funding Schedule FY 2021	$4,902,396	$4,902,396
Funding Schedule FY 2022	520,921	3,300,000
Funded Ratios		
GAS No. 25	92.4%	93.4%
Participants		
Actives	468	453
Retirees and Beneficiaries	243	257
Inactives	138	95
Disabled	29	30
Total	878	835
Payroll		
Payroll of Active Members	$25,216,339	$26,158,858
Average Payroll	53,881	57,746
Normal Cost		
Employer	398,196	405,333
Employee	2,221,147	2,341,327
Administrative Expenses	100,000	150,000
Total	2,719,343	2,896,660
Actuarial Accrued Liabilities		
Actives	59,415,096	64,384,883
Retirees, Beneficiaries, Disabilities and Inactives	69,988,563	81,851,665
Total	129,403,659	146,236,548
Actuarial Value of Assets	119,572,831	136,581,696
Unfunded Actuarial Accrued Liabilities	$9,830,828	$9,654,852

Introduction

This report presents the findings of an actuarial valuation as of January 1, 2020, of Shrewsbury Contributory Retirement System.

The actuarial valuation is based on:

- Provisions Chapter 32 of the Massachusetts General Laws, "M.G.L", as of January 1, 2020.
- Employee data provided by the Retirement Board
- Asset information reported to the Public Employee Retirement Administration Commission by the Shrewsbury 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, 2020.

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 year, based on the 2018 actuarial assumptions and plan provisions, the total unfunded actuarial accrued liability decreased by 75.7% to $2,385,632. The decrease is the result of an aggressive funding schedule, offset by net unfavorable actuarial experience during the preceding year. The sources of actuarial (gains) and losses are as follows:

Assets	1,279,020
Salary Increases	(1,029,999)
New Participants	392,457
Active - Retirements	(2,043,696)
Active - Terminations	538,311
Active - Mortality	(105,011)
Active - Disabilities	(345,952)
Inactive - Mortality and data adjustments	5,662,293
Other, including data changes, service purchases, etc.	(709,477)
Benefit Payments	647,178
Total (Gain) / Loss	4,285,124

The actuarial assumptions on future mortality were changed for this valuation to those from a recent study of Public Sector experience by the Society of Actuaries. The changes increased the Actuarial Accrued Liability and the Normal Cost by $7,269,220 and $44,241, respectively.

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, 2018	January 1, 2020
Superannuation	$1,463,943	$1,582,892
Termination	834,958	869,946
Death	108,567	72,482
Disability	211,875	221,340
Administrative Expenses	100,000	150,000
Total Normal Cost	2,719,343	2,896,660
% of Pay	10.8%	11.1%
Employee Contributions	2,221,147	2,341,327
% of Pay	8.8%	9.0%
Employer Normal Cost	$498,196	$555,333
% of Pay	2.0%	2.1%

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, 2018	January 1, 2020
Actives		
Superannuations	$57,281,455	$62,754,135
Termination	(1,752,048)	(1,902,247)
Death	1,566,892	1,000,141
Disability	2,318,797	2,532,854
Retirees and Inactives		
Retirees and Beneficiaries	59,581,955	69,539,421
Terminated (Refund)	1,566,962	1,631,977
Disabled	8,839,646	10,680,267
Total	$129,403,659	$146,236,548

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, 2018	January 1, 2020
Actives		
Superannuation	$67,652,752	$74,003,783
Termination	4,658,847	4,865,595
Death	2,323,295	1,530,463
Disability	3,864,642	4,165,255
Retirees and Inactives		
Retirees and Beneficiaries	59,581,955	69,539,421
Terminated (Refund)	1,566,962	1,631,977
Disabled	8,839,646	10,680,267
Total	$148,488,099	$166,416,761

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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, 2018	January 1, 2020
Cash equivalents	$940,840	$1,080,982
Short term investments	0	0
Fixed income securities	4,934,607	5,439,162
Equities	30,885,047	36,730,658
International	6,108,568	6,371,663
Real Estate	12,072,749	14,026,614
Venture Capital	0	0
Other	70,209,225	79,572,921
Accounts receivable	25,198	25,198
Accounts payable	0	(124,430)
Accrued income	6	1,088
Total Market Value	$125,176,240	$143,123,856
Total Actuarial Value	$119,572,831	$136,581,696

Actuarial Value of Assets

The actuarial value of assets is determined by projecting the market 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 10%. The calculation of the actuarial value of assets as of January 1, 2020 is presented in Table V.

Table V

		January 1, 2020
(1)	Market value at January 1, 2019	$121,916,203
(2)	2019 Contributions	$8,479,006
(3)	2019 Payments	($9,265,646)
(4)	Net interest adjustment at 7.5% on (1), (2), and (3) to December 31, 2019	$9,114,216
(5)	Expected market value on January 1, 2020 (1) + (2) + (3) + (4)	$130,243,779
(6)	Actual market value on January 1, 2020	$143,123,856
(7)	2019 (Gain) / Loss	($12,880,077)
(8)	80% of 2019 (Gain) / Loss	($10,304,061)
(9)	2018 (Gain) / Loss	$13,108,992
(10)	60% of 2018 (Gain) / Loss	$7,865,395
(11)	2017 (Gain) / Loss	($9,910,140)
(12)	40% of 2017 (Gain) / Loss	($3,964,056)
(13)	2016 (Gain) / Loss	($697,188)
(14)	20% of 2016 (Gain) / Loss	($139,438)
(15)	Actuarial value on January 1, 2020, (6) + (8) + (10) + (12) + (14) but not less than 90% nor greater than 110% of (6)	$136,581,696
(16)	Ratio of actuarial value to market value	95.43%
(17)	Actuarial Value Return for 2018	6.37%
(18)	Actuarial Value Return for 2019	7.64%
(19)	Market Value Return for 2018	-2.95%
(20)	Market Value Return for 2019	18.10%

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, 2018	January 1, 2020
Actuarial Accrued Liability	$129,403,659	$146,236,548
Actuarial Assets	119,572,831	136,581,696
Unfunded Actuarial Accrued Liability	$9,830,828	$9,654,852
Funded Status	92.4%	93.4%

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Appropriations

The pension appropriation for the upcoming fiscal years have been calculated in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws. These amounts were calculated to comply with the June 30, 2030, full funding mandate for all accrued liabilities. The pension appropriation is the sum of the:

- Employer normal cost,
- Level amortization of the unfunded actuarial accrued liability by June 30, 2022
  $ 9,654,852 over 4 years
- Interest adjustment for payments deposited at the various times in the year

The pension appropriation is shown in Table VII.

Table VII

	January 1, 2018	January 1, 2020
Normal cost	$498,196	$555,333
Amortization payment of the prior accrued liability	6,355,293	0
Amortization payment of current (gains)/losses	(1,262,214)	5,001,911
Total cost	$5,591,275	$5,557,244
% of Pay	22.2%	21.2%
Fiscal 2021 cost	$4,420,892	$4,902,396
Fiscal 2022 cost	$520,921	$3,300,000

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 2042 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 12% of payroll, decreasing to 11% by the time the unfunded liabilities are fully paid off, leaving only a normal cost of about 1% thereafter. The decrease in the cost as a percentage of payroll is a result of the increase in member deductions.

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Appropriation Forecast

Fiscal Year Ending	Payroll*	Employee Contribution	Employer Normal Cost with Interest	Amortization Payments with Interest	Employer Total Cost with Interest	Employer Total Cost % of Payroll	Funded Ratio %**
2021	$26,158,858	$2,341,327	$584,522	$4,317,874	$4,902,396	18.7	92.8
2022	$27,205,212	$2,457,168	$584,549	$2,715,451	$3,300,000	12.1	95.6
2023	$28,293,421	$2,578,530	$583,643	$2,716,357	$3,300,000	11.7	97.0
2024	$29,425,158	$2,705,669	$581,729	$2,657,333	$3,239,062	11.0	98.5
2025	$30,602,164	$2,838,854	$578,728	$0	$578,728	1.9	100.0
2026	$31,826,251	$2,978,365	$574,557	$0	$574,557	1.8	100.0
2027	$33,099,301	$3,124,494	$569,125	$0	$569,125	1.7	100.0
2028	$34,423,273	$3,277,549	$562,340	$0	$562,340	1.6	100.0
2029	$35,800,203	$3,437,848	$554,101	$0	$554,101	1.5	100.0
2030	$37,232,212	$3,605,728	$544,304	$0	$544,304	1.5	100.0
2031	$38,721,500	$3,781,537	$532,836	$0	$532,836	1.4	100.0
2032	$40,270,360	$3,965,642	$519,580	$0	$519,580	1.3	100.0
2033	$41,881,174	$4,158,424	$504,411	$0	$504,411	1.2	100.0
2034	$43,556,421	$4,360,284	$487,197	$0	$487,197	1.1	100.0
2035	$45,298,678	$4,571,640	$467,798	$0	$467,798	1.0	100.0
2036	$47,110,625	$4,792,928	$446,069	$0	$446,069	0.9	100.0
2037	$48,995,050	$5,024,604	$421,852	$0	$421,852	0.9	100.0
2038	$50,954,852	$5,267,145	$394,985	$0	$394,985	0.8	100.0
2039	$52,993,047	$5,521,050	$365,293	$0	$365,293	0.7	100.0
2040	$55,112,768	$5,786,841	$332,594	$0	$332,594	0.6	100.0
2041	$57,317,279	$6,018,314	$345,898	$0	$345,898	0.6	100.0
2042	$59,609,970	$6,259,047	$359,733	$0	$359,733	0.6	100.0
2043	$61,994,369	$6,509,409	$374,123	$0	$374,123	0.6	100.0
2044	$64,474,144	$6,769,785	$389,088	$0	$389,088	0.6	100.0
2045	$67,053,110	$7,040,577	$404,651	$0	$404,651	0.6	100.0
2046	$69,735,234	$7,322,200	$420,837	$0	$420,837	0.6	100.0
2047	$72,524,643	$7,615,088	$437,671	$0	$437,671	0.6	100.0
2048	$75,425,629	$7,919,691	$455,178	$0	$455,178	0.6	100.0
2049	$78,442,654	$8,236,479	$473,385	$0	$473,385	0.6	100.0
2050	$81,580,360	$8,565,938	$492,320	$0	$492,320	0.6	100.0
2051	$84,843,575	$8,908,575	$512,013	$0	$512,013	0.6	100.0
2052	$88,237,318	$9,264,918	$532,493	$0	$532,493	0.6	100.0

* Calendar basis

** Beginning of Fiscal Year

EXHIBITS

https://shermanactuary-my.sharepoint.com/personal/dan_shermanactuary_com/Documents/Recovered Data/Shrewsbury/Val20/Report/[ACT1.xls]Actives

Exhibit 1 - Age/Service Distribution with Salary as of January 1, 2020

Attained Age	Average Salary <5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
< 20	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0
20-24	9	0	0	0	0	0	0	0	0	9
	49,451	0	0	0	0	0	0	0	0	49,451
25-29	23	3	0	0	0	0	0	0	0	26
	48,258	68,640	0	0	0	0	0	0	0	50,610
30-34	26	19	6	0	0	0	0	0	0	51
	52,724	61,718	70,686	0	0	0	0	0	0	58,188
35-39	9	14	14	6	0	0	0	0	0	43
	58,474	61,511	70,666	67,959	0	0	0	0	0	64,756
40-44	6	9	4	10	2	0	0	0	0	31
	53,336	69,613	72,403	74,848	64,613	0	0	0	0	68,189
45-49	11	14	10	7	11	2	0	0	0	55
	51,771	60,500	48,098	63,953	76,497	87,823	0	0	0	61,132
50-54	12	24	11	6	7	5	3	1	0	69
	45,136	43,676	57,227	53,656	78,958	85,173	139,673	76,241	0	58,190
55-59	11	13	16	12	7	7	9	4	0	79
	38,650	57,908	33,493	46,806	59,454	70,696	82,769	84,415	0	54,040
60-64	9	7	17	10	3	2	5	1	0	54
	33,828	38,911	28,958	41,971	75,467	58,282	78,246	106,921	0	43,147
65-69	1	3	5	7	4	1	4	0	0	25
	33,110	52,294	53,546	30,652	69,970	67,638	66,530	0	0	51,437
70+	0	0	3	1	1	3	3	0	0	11
	0	0	13,793	19,591	48,863	47,826	47,590	0	0	38,075
Total Employees	117	106	86	59	35	20	24	6	-	453
Average Salary	48,256	56,071	48,265	53,244	71,278	71,203	81,836	86,804	-	55,868

Exhibit 2 - Retiree Distribution as of January 1, 2020

	Number of Employees			Total Payments		
Attained Age	Female	Male	Total	Female	Male	Total
< 20	1	0	1	20,798	0	20,798
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	0	0	0	0	0	0
45-49	1	0	1	26,232	0	26,232
50-54	0	1	1	0	3,916	3,916
55-59	3	3	6	36,800	89,489	126,290
60-64	12	20	32	152,947	865,475	1,018,422
65-69	28	30	58	588,059	1,510,981	2,099,040
70-74	28	30	58	668,487	1,397,114	2,065,601
75-79	21	13	34	385,407	390,558	775,964
80-84	9	5	14	199,784	151,695	351,479
85-89	20	10	30	349,090	194,505	543,596
90-94	9	7	16	84,445	163,032	247,477
95+	5	1	6	34,169	4,194	38,363
Total	137	120	257	2,546,218	4,770,960	7,317,178
Average (Age/Payment)	75.66	72.66	74.26	18,586	39,758	28,472
Frequency Percent	53.3	46.7	100.0	34.8	65.2	100.0

https://shermanactuary-my.sharepoint.com/personal/dan_shermanactuary_com/Documents/Recovered Data/Shrewsbury/Val20/Report/[DIS1.xls]Disabled

Exhibit 3 - Disabled Retiree Distribution as of January 1, 2020

	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	1	1	0	56,890	56,890
40-44	0	0	0	0	0	0
45-49	1	0	1	24,218	0	24,218
50-54	0	3	3	0	130,213	130,213
55-59	1	3	4	12,842	82,724	95,567
60-64	1	4	5	11,574	197,766	209,339
65-69	0	4	4	0	142,779	142,779
70-74	0	4	4	0	140,484	140,484
75-79	0	5	5	0	133,697	133,697
80-84	0	1	1	0	52,575	52,575
85-89	0	2	2	0	60,599	60,599
90-94	0	0	0	0	0	0
95-99	0	0	0	0	0	0
Total	3	27	30	48,634	997,728	1,046,362
Average (Age/Payment)	55.98	67.35	66.22	16,211	36,953	34,879
Frequency Percent	10.0	90.0	100.0	4.6	95.4	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
2020	$0	$2,341,327	$4,902,396	$10,240,629	$17,484,351
2021	11,160,036	2,457,168	3,300,000	11,023,076	5,620,208
2022	9,963,824	2,578,530	3,300,000	11,627,889	7,542,595
2023	10,397,051	2,705,669	3,239,062	12,178,892	7,726,571
2024	10,867,673	2,838,854	578,728	12,687,077	5,236,986
2025	11,271,540	2,978,365	574,557	13,067,808	5,349,190
2026	11,721,396	3,124,494	569,125	13,455,430	5,427,653
2027	12,114,547	3,277,549	562,340	13,851,200	5,576,542
2028	12,529,429	3,437,848	554,101	14,257,523	5,720,043
2029	12,904,603	3,605,728	544,304	14,676,266	5,921,695
2030	13,291,010	3,781,537	532,836	15,109,926	6,133,289
2031	13,688,987	3,965,642	519,580	15,559,246	6,355,480
2032	14,098,882	4,158,424	504,411	16,025,019	6,588,972
2033	14,521,050	4,360,284	487,197	16,508,093	6,834,524
2034	14,955,859	4,571,640	467,798	17,009,371	7,092,950
2035	15,403,688	4,792,928	446,069	17,529,816	7,365,125
2036	15,864,926	5,024,604	421,852	18,070,460	7,651,990
2037	16,339,975	5,267,145	394,985	18,632,404	7,954,558
2038	16,829,249	5,521,050	365,293	19,216,826	8,273,919
2039	17,333,174	5,786,841	332,594	19,824,985	8,611,246
2040	17,852,187	6,018,314	345,898	20,455,772	8,967,796
2041	18,386,742	6,259,047	359,733	21,112,891	9,344,929
2042	18,937,303	6,509,409	374,123	21,797,873	9,744,102
2043	19,504,349	6,769,785	389,088	22,512,362	10,166,885
2044	20,088,375	7,040,577	404,651	23,258,118	10,614,970
2045	20,689,889	7,322,200	420,837	24,037,025	11,090,173
2046	21,309,414	7,615,088	437,671	24,851,106	11,594,451
2047	21,947,490	7,919,691	455,178	25,702,530	12,129,910
2048	22,604,671	8,236,479	473,385	26,593,624	12,698,817
2049	23,279,476	8,565,938	492,320	27,526,960	13,305,742

EXHIBIT 5 – SUMMARY OF PLAN PROVISIONS:

This summary is prepared in accordance with Chapter 32 as of January 1, 2020, 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	Percentage of Average Salary		
Retirement	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, 2020.

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 3.5% 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

The mortality assumptions were changed from the prior valuation. 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 30% of all disabilities are ordinary (70% are service connected). For police and fire employees, 5% of all disabilities are assumed to be ordinary (95% 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 2020 is $150,000 and is anticipated to increase at 4.0% 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 Shrewsbury Retirement System contributing as of January 1, 2020, 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

November, 2020

BREAKOUTS

https://shermanactuary-my.sharepoint.com/personal/dan_shermanactuary_com/Documents/Recovered Data/Shrewsbury/Val20/[Shrew20_Val prop mort v2.xlsm]Actuarybreak

Breakouts

	Total	Housing	Light	Cable	Water	Sewer	Custodians	All Others	School Employees	School Lunch
(1) Participants										
(a) Actives	453	8	38	27	14	3	22	176	149	16
(b) Inactives	95	0	3	10	0	0	3	14	64	1
(c) Retirees and Benefiaries	257	5	25	7	10	2	18	134	41	15
(d) Disabled Retirees	30	0	2	0	0	1	2	22	2	1
(e) Total	835	13	68	44	24	6	45	346	256	33
(2) Payroll of Active Participants	$26,158,858	$517,177	$3,331,610	$2,041,145	$730,655	$153,021	$1,248,454	$12,121,838	$5,618,440	$396,519
(3) Normal Cost										
(a) Total Normal Cost	2,746,660	46,392	340,259	196,795	73,510	13,360	151,562	1,296,937	587,246	40,599
(b) Expected Employee Contributions	2,341,327	48,273	288,019	190,055	61,223	13,601	111,138	1,104,580	490,898	33,541
(c) Administrative Expenses	150,000	2,534	18,582	10,747	4,015	730	8,277	70,828	32,071	2,217
(d) Net Employer Normal Cost (a) - (b) + (c)	555,333	653	70,822	17,487	16,302	489	48,701	263,185	128,419	9,275
(4) Actuarial Accrued Liability	146,236,548	2,738,909	23,241,299	6,610,168	4,553,157	908,982	7,334,020	78,728,884	19,298,076	2,823,054
(5) Assets*	136,581,696	2,469,455	23,378,003	6,643,923	4,105,217	819,556	6,612,498	72,608,195	17,399,528	2,545,322
(6) Unfunded Actuarial Accrued Liability (4) - (5)	9,654,852	269,454	(136,704)	(33,755)	447,940	89,426	721,522	6,120,689	1,898,548	277,732
(7) Amortizations*	5,001,911	139,597	(70,823)	(17,488)	232,065	46,329	373,801	3,170,959	983,585	143,885
(8) Total Required Employer Contributions (3d) + (7)	5,557,244	140,249	(1)	(0)	248,367	46,818	422,502	3,434,146	1,112,003	153,161
(9) Fiscal 2022 Cost	3,300,000	83,283	0	0	147,485	27,801	250,890	2,039,263	660,329	90,950
(10) Fiscal 2023 Cost	3,300,000	83,283	0	0	147,485	27,801	250,890	2,039,263	660,329	90,950
(11) Fiscal 2024 Cost	3,239,062	81,745	0	0	144,762	27,288	246,257	2,001,605	648,135	89,271
(12) Fiscal 2025 Cost	578,728	14,606	0	0	25,865	4,876	43,999	357,630	115,803	15,950
(13) Fiscal 2026 Cost	574,557	14,501	0	0	25,679	4,841	43,682	355,053	114,968	15,835
(14) Fiscal 2027 Cost	569,125	14,364	0	0	25,436	4,795	43,269	351,695	113,881	15,685
(15) Fiscal 2028 Cost	562,340	14,193	0	0	25,133	4,738	42,753	347,501	112,523	15,498
(16) Fiscal 2029 Cost	554,101	13,985	0	0	24,765	4,669	42,127	342,411	110,874	15,271
(17) Fiscal 2030 Cost	544,304	13,738	0	0	24,327	4,586	41,382	336,358	108,914	15,001
(18) Percentage of Total Cost	100.0%	2.5%	0.0%	0.0%	4.5%	0.8%	7.6%	61.8%	20.0%	2.8%
(19) Funded Ratio	93.40%	90.16%	100.59%	100.51%	90.16%	90.16%	90.16%	92.23%	90.16%	90.16%

* Allocation is based on the ratio of the Unfunded Actuarial Accrued Liability, adjusted for additional contributions.