



Middlesex County Retirement System

**Governmental Accounting Standards Board
(GASB) Statements No. 67 and 68
Accounting Valuation Report
as of December 31, 2018**

This report has been prepared at the request of the Middlesex County Retirement Board to assist the Board and the member units in preparing their financial report for their liabilities associated with the Middlesex County Retirement System. This valuation report may not otherwise be copied or reproduced in any form without the consent of the Middlesex County Retirement Board and may only be provided to other parties in its entirety. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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May 29, 2019

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

Dear Board Members:

We are pleased to submit this Governmental Accounting Standards Board (GASB) Statements No. 67 and 68 Accounting Valuation as of December 31, 2018 for the Middlesex County Retirement System, a cost-sharing multiple employer defined benefit pension plan. It contains the actuarial information that will need to be disclosed in order to comply with GASB 67 and 68. Except as otherwise noted, please refer to the Middlesex County Retirement System Actuarial Valuation Report as of January 1, 2018, dated July 31, 2018, for the data, assumptions and plan of benefits underlying these calculations.

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

The measurements shown in this actuarial valuation may not be applicable for other purposes. 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; and changes in plan provisions or applicable law.

The actuarial calculations were completed under my supervision. I am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of my knowledge, the information supplied in the actuarial valuation is complete and accurate. Further, in my opinion, the assumptions as approved by the Board are reasonably related to the experience of and expectations for the Middlesex County Retirement System.

I look forward to reviewing this report with you and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By:


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

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Section 1: Actuarial Valuation Summary

Purpose

This report has been prepared by Segal Consulting to present certain disclosure information required by Governmental Accounting Standards Board (GASB) Statements No. 67 and 68 as of December 31, 2018. This report is based on financial information as of December 31, 2018 and the Middlesex County Retirement System Actuarial Valuation and Review as of January 1, 2018, dated July 31, 2018, which reflects:

- The benefit provisions of Massachusetts General Law Chapter 32;
- The characteristics of covered active participants, inactive participants, and retired participants and beneficiaries as of December 31, 2017;
- The assets of the System as of December 31, 2017;
- Economic assumptions regarding future salary increases and investment earnings; and
- Other actuarial assumptions, regarding employee terminations, retirement, death, etc.

Significant Issues

The following key findings were the result of this actuarial valuation:

- The Net Pension Liability (NPL) is equal to the difference between the Total Pension Liability (TPL) and the Plan's Fiduciary Net Position. The Plan Fiduciary Net Position is equal to the market value of assets and therefore, the NPL measure is very similar to an Unfunded Actuarial Accrued Liability (UAAL) on a market value basis. The NPL increased from \$1.419 billion as of December 31, 2017 to \$1.559 billion as of December 31, 2018 and the Plan's Fiduciary Net Position as a percent of the TPL decreased from 49.27% to 46.40%.
- The NPL measured as of December 31, 2018 and December 31, 2017 was determined based upon the results of the actuarial valuation as of January 1, 2018.
- The discount rate used to measure the TPL and NPL as of December 31, 2018 and December 31, 2017 was 7.50%.
- For 2018, military service contributions reported in the employer cash flow detail exceeded those reported in the Annual Statement by \$79,463. The employer contributions shown in this report include the additional military service contributions.

Important Information about Actuarial Valuations

In order to prepare an actuarial valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

Plan of Benefits:	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan description in this report (as well as the plan summary included in our funding valuation report) to confirm that Segal has correctly interpreted the plan of benefits.
Participant Data:	An actuarial valuation for a plan is based on data provided to the actuary by the Middlesex County Retirement System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets:	The valuation is based on the market value of assets as of the valuation date, as provided by the Middlesex County Retirement System. The Middlesex County Retirement System uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial Assumptions:	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, that does not mean that the previous assumptions were unreasonable.

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

- The valuation is prepared at the request of the Middlesex County Retirement System to assist the Board and the member units in preparing items related to the pension plan in their financial reports. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- Sections of this report may include actuarial results that are not rounded, but that does not imply precision.
- If the Middlesex County Retirement System is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The Board should look to their other advisors for expertise in these areas.

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



Section 2: GASB Information

Exhibit 1 – Net Pension Liability

	December 31, 2018	December 31, 2017
Components of the Net Pension Liability		
Total Pension Liability	\$2,909,506,224	\$2,797,535,970
Plan Fiduciary Net Position	1,350,039,767	1,378,351,219
Net Pension Liability	1,559,466,457	1,419,184,751
Plan Fiduciary Net Position as a percentage of the Total Pension Liability*	46.40%	49.27%

* These funded percentages are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.

Actuarial assumptions. The total pension liability as of December 31, 2018 was measured by an actuarial valuation as of January 1, 2018, using the following actuarial assumptions, applied to all periods included in the measurement:

Wage Inflation:	3.25%
Salary Increases:	Varies by length of service with ultimate rates of 4.00% for Group 1, 4.25% for Group 2 and 4.50% for Group 4
Net Investment Return:	7.50%
Cost of Living Adjustment:	3% of first \$14,000
Mortality Rates:	<i>Pre-Retirement:</i> RP-2014 Blue Collar Employee Mortality Table projected generationally with Scale MP-2017 <i>Healthy Retiree:</i> RP-2014 Blue Collar Healthy Annuitant Mortality Table projected generationally with Scale MP-2017 <i>Disabled Retiree:</i> RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward one year and projected generationally with Scale MP-2017

Target Asset Allocation

The long-term expected rate of return on pension plan investments was determined using a building-block method in which expected future real rates of return (expected returns, net of inflation) are developed for each major asset class. These returns are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and adding expected inflation. The target allocation (approved by the Board) and projected arithmetic real rates of return for each major asset class, after deducting inflation, but before investment expenses, used in the derivation of the long-term expected investment rate of return assumption are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
Domestic equity	21.00%	6.16%
International developed markets equity	13.00%	6.69%
International emerging markets equity	5.00%	9.47%
Core fixed income	15.00%	1.89%
High-yield fixed income	8.00%	4.00%
Real estate	10.00%	4.58%
Commodities	4.00%	4.77%
Hedge fund, GTAA, Risk parity	11.00%	3.68%
Private equity	<u>13.00%</u>	10.00%
Total	100.00%	

Note: Some asset classes included in the pension plan's target asset allocation have been combined.

Discount rate. The discount rate used to measure the Total Pension Liability (TPL) was 7.50% as of December 31, 2018 and December 31, 2017. The projection of cash flows used to determine the discount rate assumed plan member contributions will be made at the current contribution rate and that employer contributions will be made at rates equal to the actuarially determined contribution rates. For this purpose, only employer contributions that are intended to fund benefits for current plan members and their beneficiaries are included. Projected employer contributions that are intended to fund the service costs for future plan members and their beneficiaries, as well as projected contributions from future plan members, are not included. Based on those assumptions, the Plan Fiduciary Net Position (FNP) was projected to be available to make all projected future benefit payments for current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the TPL as of both December 31, 2018 and December 31, 2017.

Discount Rate Sensitivity

Sensitivity of the Net Pension Liability to changes in the discount rate. The following presents the Net Pension Liability (NPL) of the Middlesex County Retirement System as of December 31, 2018 calculated using the discount rate of 7.50%, as well as what the Middlesex County Retirement System's NPL would be if it were calculated using a discount rate that is 1-percentage-point lower (6.50%) or 1-percentage-point higher (8.50%) than the current rate.

Net Pension Liability	1% Decrease (6.50%)	Current Discount Rate (7.50%)	1% Increase (8.50%)
Middlesex County Retirement System's net pension liability as of December 31, 2018	\$1,891,702,743	\$1,559,466,457	\$1,279,342,565

Exhibit 2 – Schedule of Changes in Net Pension Liability – Last Two Fiscal Years

	December 31, 2018	December 31, 2017
Total Pension Liability		
Service cost	\$64,615,910	\$60,585,598
Interest	208,614,148	200,298,121
Change of benefit terms	0	0
Differences between expected and actual experience	0	-9,059,393
Changes of assumptions	0	97,195,824
Benefit payments, including refunds of member contributions	-161,259,804	-150,780,931
Net change in Total Pension Liability	\$111,970,254	\$198,239,219
Total Pension Liability – beginning	<u>2,797,535,970</u>	<u>2,599,296,751</u>
Total Pension Liability – ending	\$2,909,506,224	\$2,797,535,970
Plan Fiduciary Net Position		
Contributions – employer	\$120,614,676	\$115,426,815
Contributions – employee	46,670,212	44,841,008
Net investment income	-31,062,801	189,678,278
Benefit payments, including refunds of member contributions	-161,259,804	-150,780,931
Administrative expense	-3,273,735	-3,234,147
Net change in Plan Fiduciary Net Position	-\$28,311,452	\$195,931,023
Plan Fiduciary Net Position – beginning	<u>1,378,351,219</u>	<u>1,182,420,196</u>
Plan Fiduciary Net Position – ending	\$1,350,039,767	\$1,378,351,219
Net Pension Liability – ending	\$1,559,466,457	\$1,419,184,751
Plan Fiduciary Net Position as a percentage of the Total Pension Liability	46.40%	49.27%
Covered employee payroll ¹	\$471,115,185	\$451,777,105
Plan Net Pension Liability as percentage of covered employee payroll	331.02%	314.13%

¹ Covered employee payroll for 2018 and 2017 as estimated in the January 1, 2018 funding valuation report.

Notes to Schedule:

Changes in Actuarial Assumptions:	Effective January 1, 2018: • The mortality tables for non-disabled participants were changed from the RP-2000 Employee and Healthy Annuitant Mortality Tables projected generationally using Scale BB2D from 2009 to the RP-2014 Blue Collar Employee and Healthy Annuitant Mortality Tables projected generationally using Scale MP-2017. • The mortality tables for disabled participants were changed from the RP-2000 Healthy Annuitant Mortality Table projected generationally using Scale BB2D from 2015 to the RP-2014 Blue Collar Healthy Annuitant Mortality Table set forward 1 year projected generationally using Scale MP-2017. • The long-term salary increase assumption was lowered by 0.25%, to 4.00% for Group 1 participants, 4.25% for Group 2 participants, and 4.50% for Group 4 participants. • The investment rate of return assumption was lowered from 7.75% to 7.5%.
Changes in Plan Provisions:	None

Exhibit 3 – Schedule of Contributions – Last Five Fiscal Years

Year Ended December 31	Actuarially Determined Contributions ¹	Contributions in Relation to the Actuarially Determined Contributions	Contribution Deficiency / (Excess)	Covered-Employee Payroll	Contributions as a Percentage of Covered Employee Payroll
2014	\$92,826,743	\$93,400,946	-\$574,203	\$415,752,810	22.47%
2015	98,792,642	99,820,481	-1,027,839	432,382,921	23.09%
2016	105,246,797	107,067,707	-1,820,910	439,644,322	24.35%
2017	112,017,087	115,426,815	-3,409,728	451,777,105	25.55%
2018	119,298,291	120,614,676	-1,316,385	471,115,185	25.60%

Notes to Schedule:

Valuation date:	Actuarially Determined Contribution for 2018 was determined with the January 1, 2016 actuarial valuation.				
Actuarial cost method:	Entry Age Normal Cost Method				
Amortization method:	Prior year's total contribution increased by 6.5% for fiscal 2018 through fiscal 2024, and thereafter the remaining unfunded liability will be amortized on a 4.0% annual increasing basis; ERI liability amortized in level payments				
Remaining amortization period:	As of July 1, 2016, 3 years remaining for 2002 ERI liability, 4 years remaining for 2003 ERI liability, 6 years remaining for 2010 ERI liability and 19 years for remaining unfunded liability.				
Asset valuation method:	The difference between the expected return and the actual investment return on a market value basis is recognized over a five-year period. Asset value is adjusted as necessary to be within 20% of the market value.				
Actuarial assumptions:					
• Investment rate of return	7.75%				
• Discount rate	7.75%				
• Wage inflation	3.50%				
• Projected salary increases	Varies by length of service with ultimate rates of 4.25% for Group 1, 4.50% for Group 2, and 4.75% for Group 4				
• Cost of living adjustments	3% of first \$14,000				
Plan membership:					
• Retired participants and beneficiaries receiving benefits	5,327				
• Inactive participants entitled to a return of their employee contributions	2,640				
• Inactive participants with a vested right to a deferred or immediate benefit	321				
• Active participants	9,072				
• Total	17,360				

¹ The Actuarially Determined Contributions for 2018 and 2017 are based on the results of the January 1, 2016 actuarial valuation. The Actuarially Determined Contributions for 2016 and 2015 are based on the results of the January 1, 2014 actuarial valuation. The Actuarially Determined Contribution for 2014 is based on the results of the January 1, 2012 actuarial valuation.

Exhibit 4 – Pension Expense

Reporting Date for Employer under GASB 68	June 30, 2019	June 30, 2018
Measurement Date for Employer under GASB 68	December 31, 2018	December 31, 2017
Components of Pension Expense		
Service cost	\$64,615,910	\$60,585,598
Interest on the Total Pension Liability	208,614,148	200,298,121
Expensed portion of current-period changes in proportion and differences between employer's contributions and proportionate share of contributions	0	0
Expensed portion of current-period benefit changes	0	0
Expensed portion of current-period difference between expected and actual experience in the Total Pension Liability	0	-1,811,879
Expensed portion of current-period changes of assumptions or other inputs	0	19,439,165
Member contributions	-46,670,212	-44,841,008
Projected earnings on plan investments	-103,479,517	-91,879,859
Expensed portion of current-period differences between actual and projected earnings on plan investments	26,908,462	-19,559,684
Administrative expense	3,273,735	3,234,147
Other	0	0
Recognition of beginning of year deferred outflows of resources as pension expense	59,469,300	40,030,134
Recognition of beginning of year deferred inflows of resources as pension expense	-21,371,563	0
Net amortization of deferred amounts from changes in proportion and differences between employer's contributions and proportionate share of contributions	0	0
Pension Expense	\$191,360,263	\$165,494,735

Deferred Outflows of Resources and Deferred Inflows of Resources

Reporting Date for Employer under GASB 68	June 30, 2019	June 30, 2018
Measurement Date for Employer under GASB 68	December 31, 2018	December 31, 2017
Deferred Outflows of Resources		
Changes in proportion and differences between employer's contributions and proportionate share of contributions ¹	\$41,415,998	\$40,343,902
Changes of assumptions or other inputs	96,917,795	135,657,111
Net difference between projected and actual earnings on pension plan investments	69,511,142	0
Difference between expected and actual experience in the Total Pension Liability	<u>3,190,580</u>	<u>4,785,871</u>
Total Deferred Outflows of Resources	\$211,035,515	\$180,786,884
Deferred Inflows of Resources		
Changes in proportion and differences between employer's contributions and proportionate share of contributions ¹	\$41,415,998	\$40,343,902
Changes of assumptions or other inputs	0	0
Net difference between projected and actual earnings on pension plan investments	0	38,547,705
Difference between expected and actual experience in the Total Pension Liability	<u>5,435,635</u>	<u>7,247,514</u>
Total Deferred Inflows of Resources	\$46,851,633	\$86,139,121
Deferred outflows of resources and deferred inflows of resources related to pension will be recognized as follows:		
Reporting Date for Employer under GASB 68 Year Ended June 30:		
2019	N/A	\$38,097,737
2020	\$63,991,967	37,083,503
2021	48,307,383	21,398,919
2022	24,976,068	-1,932,396
2023	26,908,464	0
Thereafter	0	0

¹ Calculated in accordance with Paragraphs 54 and 55 of GASB 68.

Exhibit 5 – Determination of Proportionate Share

Employer Name	FY 2018 Total Contributions	Share of NPL as of January 1, 2018	Percent of Total NPL as of January 1, 2018	FY 2019 Total Contributions	Share of NPL as of January 1, 2019	Percent of Total NPL as of January 1, 2019
Middlesex County Retirement Board	\$345,861	\$0	0.000000%	\$368,576	\$0	0.000000%
Middlesex County	0	0	0.000000%	0	0	0.000000%
Middlesex Hospital	0	0	0.000000%	0	0	0.000000%
Town of Acton	3,454,129	48,182,609	3.395091%	3,690,854	53,545,751	3.433594%
Town of Ashby	147,365	1,780,532	0.125462%	155,917	2,175,376	0.139495%
Town of Ashland	2,787,173	32,308,841	2.276578%	2,923,952	36,199,958	2.321304%
Town of Ayer	1,363,375	17,999,043	1.268266%	1,450,939	20,317,285	1.302836%
Town of Bedford	3,920,935	49,661,979	3.499331%	4,185,942	55,208,123	3.540193%
Town of Billerica	10,790,894	140,303,356	9.886195%	11,555,045	150,770,372	9.668074%
Town of Boxborough	791,841	10,225,882	0.720546%	843,801	11,266,225	0.722441%
Town of Burlington	8,877,933	117,368,093	8.270108%	9,454,623	127,441,167	8.172102%
Town of Carlisle	877,464	9,435,767	0.664872%	932,452	11,157,139	0.715446%
Town of Chelmsford	8,022,651	103,993,778	7.327713%	8,579,114	110,995,199	7.117512%
Town of Dracut	4,506,526	60,106,114	4.235256%	4,835,041	65,601,775	4.206681%
Town of Dunstable	206,969	2,563,856	0.180657%	219,591	2,958,745	0.189728%
Town of Groton	1,966,279	21,402,700	1.508098%	2,081,699	23,290,688	1.493504%
Town of Holliston	2,132,624	23,773,972	1.675185%	2,183,620	27,349,059	1.753745%
Town of Hopkinton	1,984,635	20,653,839	1.455331%	2,105,634	25,369,330	1.626795%
Town of Hudson	5,016,882	63,161,014	4.450514%	5,347,292	69,719,052	4.470699%
Town of Lincoln	2,015,466	24,841,810	1.750428%	2,153,104	27,722,484	1.777690%
Town of Littleton	3,555,064	21,432,789	1.510218%	2,185,944	25,332,249	1.624418%
Town of North Reading	3,627,495	48,035,495	3.384725%	3,861,918	52,331,338	3.355721%

Employer Name	FY 2018 Total Contributions	Share of NPL as of January 1, 2018	Percent of Total NPL as of January 1, 2018	FY 2019 Total Contributions	Share of NPL as of January 1, 2019	Percent of Total NPL as of January 1, 2019
Town of Pepperell	1,254,044	16,341,195	1.151449%	1,346,506	17,953,081	1.151232%
Town of Sherborn	916,985	10,500,304	0.739883%	975,181	11,725,506	0.751892%
Town of Shirley	755,576	8,406,745	0.592364%	801,553	9,113,056	0.584370%
Town of Stow	826,612	10,459,477	0.737006%	881,015	11,645,337	0.746751%
Town of Sudbury	4,191,182	58,772,716	4.141301%	4,468,265	63,931,576	4.099580%
Town of Tewksbury	7,504,649	98,006,180	6.905808%	7,972,598	104,461,551	6.698544%
Town of Townsend	764,434	8,090,096	0.570052%	812,598	9,256,011	0.593537%
Town of Tyngsborough	1,832,388	20,897,452	1.472497%	1,955,622	23,277,997	1.492690%
Town of Wayland	4,364,388	53,697,606	3.783694%	4,648,984	59,255,947	3.799758%
Town of Westford	4,619,903	51,698,881	3.642858%	4,902,690	59,376,424	3.807483%
Town of Weston	4,792,481	61,375,790	4.324722%	5,114,630	66,869,588	4.287979%
Town of Wilmington	7,120,056	83,422,615	5.878207%	7,037,178	90,145,064	5.780507%
Acton-Boxborough RSD	2,318,753	27,084,083	1.908425%	2,467,453	29,957,174	1.920989%
Acton Water Supply	203,213	3,370,594	0.237502%	218,063	3,740,627	0.239866%
Bedford Housing Authority	29,026	313,455	0.022087%	31,094	341,646	0.021908%
Billerica Housing Authority	101,238	1,359,538	0.095797%	107,677	1,441,037	0.092406%
Chelmsford Housing Authority	194,843	2,029,608	0.143012%	179,217	2,441,133	0.156536%
Chelmsford Water District	607,500	391,160	0.027562%	506,218	708,793	0.045451%
Dracut Housing Authority	122,310	2,055,364	0.144827%	131,218	2,173,260	0.139359%
Dracut Water Supply	162,034	3,031,987	0.213643%	173,855	3,288,228	0.210856%
E. Chelmsford Water	28,517	317,151	0.022347%	30,295	381,924	0.024491%
E. Middlesex Mosq Control	43,626	509,331	0.035889%	46,515	662,694	0.042495%

Employer Name	FY 2018 Total Contributions	Share of NPL as of January 1, 2018	Percent of Total NPL as of January 1, 2018	FY 2019 Total Contributions	Share of NPL as of January 1, 2019	Percent of Total NPL as of January 1, 2019
Greater Lowell RVTSD	1,179,775	15,614,520	1.100246%	1,252,691	16,800,249	1.077307%
Groton-Dunstable RSD	859,466	10,714,454	0.754972%	913,825	12,305,499	0.789084%
Hudson Housing Authority	100,489	1,155,540	0.081423%	107,481	1,223,133	0.078433%
Lincoln Sudbury	605,786	8,466,429	0.596570%	646,913	9,231,680	0.591977%
Nashoba Vally THSD	254,429	3,512,891	0.247529%	271,217	3,632,610	0.232939%
N. Chelmsford Water	41,187	814,336	0.057381%	44,274	1,048,622	0.067242%
North Middlesex RSD	914,940	11,610,214	0.818090%	974,640	12,930,464	0.829159%
Shawsheen Valley RVS	619,993	7,940,619	0.559520%	662,826	8,565,024	0.549228%
South Middlesex RVTS	540,790	6,492,906	0.457510%	577,388	7,146,118	0.458241%
Sudbury Water District	119,483	1,701,694	0.119906%	128,447	2,025,843	0.129906%
Tewksbury Housing Authority	123,408	1,527,710	0.107647%	131,057	1,647,987	0.105676%
Wayland Housing Authority	42,233	611,202	0.043067%	45,169	719,713	0.046151%
Hopkinton Housing Authority	35,639	458,176	0.032284%	38,114	512,474	0.032862%
Sudbury Housing Authority	28,513	436,617	0.030765%	30,394	485,854	0.031155%
Wilmington Housing Authority	28,468	335,690	0.023654%	30,100	365,221	0.023420%
Acton Housing Authority	69,639	741,792	0.052269%	74,503	844,128	0.054129%
Burlington Housing Authority	6,473	56,771	0.004000%	6,786	145,929	0.009358%
Ayer Housing Authority	68,956	792,328	0.055830%	73,633	800,823	0.051352%
Holliston Housing Authority	18,523	142,446	0.010037%	19,726	158,430	0.010159%
Littleton Housing Authority	38,079	465,317	0.032788%	40,349	487,306	0.031248%
Westford Housing Authority	43,578	517,839	0.036488%	46,011	561,187	0.035986%

Employer Name	FY 2018 Total Contributions	Share of NPL as of January 1, 2018	Percent of Total NPL as of January 1, 2018	FY 2019 Total Contributions	Share of NPL as of January 1, 2019	Percent of Total NPL as of January 1, 2019
Shirley Water District	19,480	335,341	0.023629%	21,013	406,103	0.026041%
Tyngsboro Housing Authority	37,587	496,440	0.034981%	39,858	526,614	0.033769%
Pepperell Housing Authority	13,494	175,037	0.012334%	14,362	187,001	0.011991%
Groton Housing Authority	3,071	-15,094	-0.001064%	3,223	-9,522	-0.000611%
Tyngsboro Water District	31,677	380,399	0.026804%	33,753	463,086	0.029695%
North Reading Housing Authority	15,481	139,940	0.009861%	16,393	159,024	0.010197%
West Groton Water	967	21,871	0.001541%	1039	39,007	0.002501%
Ayer-Shirley RSD	419,892	4,178,529	0.294432%	446,008	5,157,881	0.330747%
Grand Totals:	\$115,426,815	\$1,419,184,751	100.000000%	\$120,614,676	\$1,559,466,457	100.000000%

Notes: Net Pension Liability for each employer was determined on an individual basis.

The NPL for the Middlesex County Retirement Board, Middlesex County and the Middlesex Hospital has been allocated amongst the other units in the System in proportion to the remaining units' NPL because the obligation to fund these units is a shared responsibility of these other units.

Exhibit 6 – Determination of Proportionate Share Amounts by Employer

Employer Name	2019 Share of Cost Allocator (1)	Net Pension Liability (2)	Covered Employee Payroll (3)	Discount Rate Sensitivity		
				1% Decrease (6.50%) (4)	Current Discount Rate (7.50%) (5)	1% Increase (8.50%) (6)
Middlesex County Retirement Board	0.000000%	\$0	\$1,232,048	\$0	\$0	\$0
Middlesex County	0.000000%	0	0	0	0	0
Middlesex Hospital	0.000000%	0	0	0	0	0
Town of Acton	3.433594%	53,545,751	14,701,201	64,953,397	53,545,751	43,927,433
Town of Ashby	0.139495%	2,175,376	1,141,989	2,638,829	2,175,376	1,784,617
Town of Ashland	2.321304%	36,199,958	13,243,425	43,912,172	36,199,958	29,697,431
Town of Ayer	1.302836%	20,317,285	6,637,666	24,645,778	20,317,285	16,667,731
Town of Bedford	3.540193%	55,208,123	19,636,949	66,969,929	55,208,123	45,291,196
Town of Billerica	9.668074%	150,770,372	34,022,034	182,891,222	150,770,372	123,687,789
Town of Boxborough	0.722441%	11,266,225	2,973,629	13,666,436	11,266,225	9,242,495
Town of Burlington	8.172102%	127,441,167	33,783,442	154,591,850	127,441,167	104,549,161
Town of Carlisle	0.715446%	11,157,139	5,350,293	13,534,110	11,157,139	9,153,004
Town of Chelmsford	7.117512%	110,995,199	26,145,209	134,642,154	110,995,199	91,057,350
Town of Dracut	4.206681%	65,601,775	15,326,864	79,577,895	65,601,775	53,817,857
Town of Dunstable	0.189728%	2,958,745	1,256,546	3,589,090	2,958,745	2,427,271
Town of Groton	1.493504%	23,290,688	7,545,657	28,252,649	23,290,688	19,107,028
Town of Holliston	1.753745%	27,349,059	10,756,680	33,175,635	27,349,059	22,436,401
Town of Hopkinton	1.626795%	25,369,330	14,508,629	30,774,135	25,369,330	20,812,287
Town of Hudson	4.470699%	69,719,052	22,297,722	84,572,336	69,719,052	57,195,556
Town of Lincoln	1.777690%	27,722,484	10,130,693	33,628,616	27,722,484	22,742,749
Town of Littleton	1.624418%	25,332,249	12,191,742	30,729,154	25,332,249	20,781,867
Town of North Reading	3.355721%	52,331,338	13,135,392	63,480,260	52,331,338	42,931,163

Employer Name	2019 Share of Cost Allocator (1)	Net Pension Liability (2)	Covered Employee Payroll (3)	Discount Rate Sensitivity		
				1% Decrease (6.50%) (4)	Current Discount Rate (7.50%) (5)	1% Increase (8.50%) (6)
Town of Pepperell	1.151232%	17,953,081	4,672,305	21,777,892	17,953,081	14,728,204
Town of Sherborn	0.751892%	11,725,506	4,115,258	14,223,565	11,725,506	9,619,276
Town of Shirley	0.584370%	9,113,056	1,774,737	11,054,546	9,113,056	7,476,096
Town of Stow	0.746751%	11,645,337	3,736,697	14,126,316	11,645,337	9,553,508
Town of Sudbury	4.099580%	63,931,576	16,560,368	77,551,869	63,931,576	52,447,673
Town of Tewksbury	6.698544%	104,461,551	22,741,155	126,716,546	104,461,551	85,697,328
Town of Townsend	0.593537%	9,256,011	3,184,331	11,227,956	9,256,011	7,593,372
Town of Tyngsborough	1.492690%	23,277,997	8,478,467	28,237,254	23,277,997	19,096,616
Town of Wayland	3.799758%	59,255,947	19,166,003	71,880,121	59,255,947	48,611,918
Town of Westford	3.807483%	59,376,424	25,307,496	72,026,265	59,376,424	48,710,754
Town of Weston	4.287979%	66,869,588	19,704,147	81,115,809	66,869,588	54,857,935
Town of Wilmington	5.780507%	90,145,064	23,536,318	109,350,005	90,145,064	73,952,483
Acton-Boxborough RSD	1.920989%	29,957,174	13,431,428	36,339,395	29,957,174	24,576,026
Acton Water Supply	0.239866%	3,740,627	1,188,771	4,537,548	3,740,627	3,068,706
Bedford Housing Authority	0.021908%	341,646	164,645	414,432	341,646	280,277
Billerica Housing Authority	0.092406%	1,441,037	303,046	1,748,043	1,441,037	1,182,186
Chelmsford Housing Authority	0.156536%	2,441,133	2,487,822	2,961,204	2,441,133	2,002,637
Chelmsford Water District	0.045451%	708,793	1,390,459	859,798	708,793	581,474
Dracut Housing Authority	0.139359%	2,173,260	390,058	2,636,262	2,173,260	1,782,882
Dracut Water Supply	0.210856%	3,288,228	638,374	3,988,768	3,288,228	2,697,570
E. Chelmsford Water	0.024491%	381,924	201,450	463,291	381,924	313,320
E. Middlesex Mosq Control	0.042495%	662,694	330,632	803,878	662,694	543,656

Employer Name	2019 Share of Cost Allocator (1)	Net Pension Liability (2)	Covered Employee Payroll (3)	Discount Rate Sensitivity		
				1% Decrease (6.50%) (4)	Current Discount Rate (7.50%) (5)	1% Increase (8.50%) (6)
Greater Lowell RVTSD	1.077307%	16,800,249	4,461,921	20,379,455	16,800,249	13,782,453
Groton-Dunstable RSD	0.789084%	12,305,499	4,516,101	14,927,122	12,305,499	10,095,086
Hudson Housing Authority	0.078433%	1,223,133	269,655	1,483,715	1,223,133	1,003,424
Lincoln Sudbury	0.591977%	9,231,680	3,070,023	11,198,442	9,231,680	7,573,411
Nashoba Vally THSD	0.232939%	3,632,610	1,029,331	4,406,519	3,632,610	2,980,091
N. Chelmsford Water	0.067242%	1,048,622	581,217	1,272,026	1,048,622	860,260
North Middlesex RSD	0.829159%	12,930,464	5,070,233	15,685,233	12,930,464	10,607,790
Shawsheen Valley RVS	0.549228%	8,565,024	2,666,605	10,389,758	8,565,024	7,026,506
South Middlesex RVTs	0.458241%	7,146,118	2,430,243	8,668,562	7,146,118	5,862,475
Sudbury Water District	0.129906%	2,025,843	877,884	2,457,438	2,025,843	1,661,945
Tewksbury Housing Authority	0.105676%	1,647,987	448,977	1,999,082	1,647,987	1,351,962
Wayland Housing Authority	0.046151%	719,713	294,119	873,044	719,713	590,432
Hopkinton Housing Authority	0.032862%	512,474	70,880	621,654	512,474	420,419
Sudbury Housing Authority	0.031155%	485,854	147,169	589,363	485,854	398,581
Wilmington Housing Authority	0.023420%	365,221	130,465	443,029	365,221	299,617
Acton Housing Authority	0.054129%	844,128	384,874	1,023,965	844,128	692,499
Burlington Housing Authority	0.009358%	145,929	128,572	177,018	145,929	119,716
Ayer Housing Authority	0.051352%	800,823	114,235	971,434	800,823	656,973
Holliston Housing Authority	0.010159%	158,430	59,614	192,183	158,430	129,972
Littleton Housing Authority	0.031248%	487,306	88,268	591,124	487,306	399,772
Westford Housing Authority	0.035986%	561,187	125,299	680,745	561,187	460,382

Employer Name	2019 Share of Cost Allocator (1)	Net Pension Liability (2)	Covered Employee Payroll (3)	Discount Rate Sensitivity		
				1% Decrease (6.50%) (4)	Current Discount Rate (7.50%) (5)	1% Increase (8.50%) (6)
Shirley Water District	0.026041%	406,103	205,648	492,621	406,103	333,156
Tyngsboro Housing Authority	0.033769%	526,614	161,241	638,806	526,614	432,019
Pepperell Housing Authority	0.011991%	187,001	97,327	226,841	187,001	153,410
Groton Housing Authority	-0.000611%	-9,522	32,885	-11,551	-9,522	-7,812
Tyngsboro Water District	0.029695%	463,086	206,601	561,744	463,086	379,903
North Reading Housing Authority	0.010197%	159,024	86,451	192,903	159,024	130,459
West Groton Water	0.002501%	39,007	118,199	47,317	39,007	32,000
Ayer-Shirley RSD	0.330747%	5,157,881	3,719,371	6,256,741	5,157,881	4,231,381
Grand Totals:	100.000000%	\$1,559,466,457	\$471,115,185	\$1,891,702,743	\$1,559,466,457	\$1,279,342,565

Notes: Net Pension Liability for each employer was determined on an individual basis.

The NPL for the Middlesex County Retirement Board, Middlesex County and the Middlesex Hospital has been allocated amongst the other units in the System in proportion to the remaining units' NPL because the obligation to fund these units is a shared responsibility of these other units.

Employer Name	Schedule of Contributions					Pension Expense	
	Statutory Required Contribution (7)	Contributions In Relation to the Statutory Required Contribution (8)	Contribution Deficiency/ (Excess) (9)	Contributions as a Percentage of Covered Employee Payroll (10)	Proportionate Share of Plan Pension Expense (11)	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (12)	Total Employer Pension Expense (13)
Middlesex County Retirement Board	\$368,576	\$368,576	\$0	29.92%	\$368,576	\$0	\$368,576
Middlesex County	0	0	0	0.00%	0	0	0
Middlesex Hospital	0	0	0	0.00%	0	0	0
Town of Acton	3,685,376	3,690,854	-5,478	25.11%	6,557,880	-145,590	6,412,290
Town of Ashby	155,917	155,917	0	13.65%	266,424	75,658	342,082
Town of Ashland	2,922,071	2,923,952	-1,881	22.08%	4,433,498	806,262	5,239,760
Town of Ayer	1,450,939	1,450,939	0	21.86%	2,488,308	-20,083	2,468,225
Town of Bedford	4,180,613	4,185,942	-5,329	21.32%	6,761,475	-368,151	6,393,324
Town of Billerica	11,509,447	11,555,045	-45,598	33.96%	18,465,217	-1,276,356	17,188,861
Town of Boxborough	843,801	843,801	0	28.38%	1,379,802	249,197	1,628,999
Town of Burlington	9,454,623	9,454,623	0	27.99%	15,608,032	-263,259	15,344,773
Town of Carlisle	932,452	932,452	0	17.43%	1,366,442	196,207	1,562,649
Town of Chelmsford	8,329,114	8,579,114	-250,000	32.81%	13,593,854	-632,255	12,961,599
Town of Dracut	4,804,354	4,835,041	-30,687	31.55%	8,034,409	226,833	8,261,242
Town of Dunstable	219,591	219,591	0	17.48%	362,365	39,260	401,625
Town of Groton	2,081,699	2,081,699	0	27.59%	2,852,467	-162,415	2,690,052
Town of Holliston	2,183,620	2,183,620	0	20.30%	3,349,506	93,501	3,443,007
Town of Hopkinton	2,105,634	2,105,634	0	14.51%	3,107,044	759,204	3,866,248
Town of Hudson	5,344,369	5,347,292	-2,923	23.98%	8,538,663	172,148	8,710,811
Town of Lincoln	2,148,246	2,153,104	-4,858	21.25%	3,395,241	-81,445	3,313,796
Town of Littleton	2,185,944	2,185,944	0	17.93%	3,102,503	687,506	3,790,009
Town of North Reading	3,861,918	3,861,918	0	29.40%	6,409,148	-350,507	6,058,641

Employer Name	Schedule of Contributions					Pension Expense	
	Statutory Required Contribution (7)	Contributions In Relation to the Statutory Required Contribution (8)	Contribution Deficiency/ (Excess) (9)	Contributions as a Percentage of Covered Employee Payroll (10)	Proportionate Share of Plan Pension Expense (11)	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (12)	Total Employer Pension Expense (13)
Town of Pepperell	1,337,920	1,346,506	-8,586	28.82%	2,198,758	405,615	2,604,373
Town of Sherborn	975,181	975,181	0	23.70%	1,436,052	-40,154	1,395,898
Town of Shirley	801,553	801,553	0	45.16%	1,116,098	-264,419	851,679
Town of Stow	881,015	881,015	0	23.58%	1,426,233	75,176	1,501,409
Town of Sudbury	4,468,265	4,468,265	0	26.98%	7,829,857	-187,906	7,641,951
Town of Tewksbury	7,971,708	7,972,598	-890	35.06%	12,793,663	-237,888	12,555,775
Town of Townsend	812,598	812,598	0	25.52%	1,133,606	130,978	1,264,584
Town of Tyngsborough	1,951,803	1,955,622	-3,819	23.07%	2,850,913	345,568	3,196,481
Town of Wayland	4,648,984	4,648,984	0	24.26%	7,257,221	-760,411	6,496,810
Town of Westford	4,902,690	4,902,690	0	19.37%	7,271,977	847,094	8,119,071
Town of Weston	5,114,630	5,114,630	0	25.96%	8,189,683	-859,992	7,329,691
Town of Wilmington	6,535,038	7,037,178	-502,140	29.90%	11,040,287	-68,862	10,971,425
Acton-Boxborough RSD	2,467,453	2,467,453	0	18.37%	3,668,929	352,580	4,021,509
Acton Water Supply	218,063	218,063	0	18.34%	458,124	13,411	471,535
Bedford Housing Authority	31,094	31,094	0	18.89%	41,842	7,696	49,538
Billerica Housing Authority	107,677	107,677	0	35.53%	176,487	14,383	190,870
Chelmsford Housing Authority	119,217	179,217	-60,000	7.20%	298,972	194,789	493,761
Chelmsford Water District	115,058	506,218	-391,160	36.41%	86,807	227,021	313,828
Dracut Housing Authority	131,218	131,218	0	33.64%	266,164	-34,480	231,684
Dracut Water Supply	173,855	173,855	0	27.23%	402,718	4,872	407,590
E. Chelmsford Water	30,295	30,295	0	15.04%	46,775	10,842	57,617
E. Middlesex Mosq Control	46,515	46,515	0	14.07%	81,161	20,608	101,769

Employer Name	Schedule of Contributions					Pension Expense	
	Statutory Required Contribution (7)	Contributions In Relation to the Statutory Required Contribution (8)	Contribution Deficiency/ (Excess) (9)	Contributions as a Percentage of Covered Employee Payroll (10)	Proportionate Share of Plan Pension Expense (11)	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (12)	Total Employer Pension Expense (13)
Greater Lowell RVTSD	1,250,787	1,252,691	-1,904	28.08%	2,057,567	-219,944	1,837,623
Groton-Dunstable RSD	913,825	913,825	0	20.23%	1,507,085	388,053	1,895,138
Hudson Housing Authority	107,481	107,481	0	39.86%	149,800	-83,500	66,300
Lincoln Sudbury	646,913	646,913	0	21.07%	1,130,626	-110,445	1,020,181
Nashoba Vally THSD	271,217	271,217	0	26.35%	444,894	-64,033	380,861
N. Chelmsford Water	44,274	44,274	0	7.62%	128,427	21,354	149,781
North Middlesex RSD	974,640	974,640	0	19.22%	1,583,626	-40,937	1,542,689
Shawsheen Valley RVS	661,694	662,826	-1,132	24.86%	1,048,980	-105,507	943,473
South Middlesex RVTS	577,388	577,388	0	23.76%	875,203	-112,327	762,876
Sudbury Water District	128,447	128,447	0	14.63%	248,110	18,695	266,805
Tewksbury Housing Authority	131,057	131,057	0	29.19%	201,834	20,054	221,888
Wayland Housing Authority	45,169	45,169	0	15.36%	88,145	27,307	115,452
Hopkinton Housing Authority	38,114	38,114	0	53.77%	62,764	-2,670	60,094
Sudbury Housing Authority	30,394	30,394	0	20.65%	59,504	27,202	86,706
Wilmington Housing Authority	30,100	30,100	0	23.07%	44,730	7,097	51,827
Acton Housing Authority	74,503	74,503	0	19.36%	103,382	-19,491	83,891
Burlington Housing Authority	6,786	6,786	0	5.28%	17,873	14,961	32,834
Ayer Housing Authority	73,633	73,633	0	64.46%	98,079	17,805	115,884
Holliston Housing Authority	19,726	19,726	0	33.09%	19,404	-9,398	10,006
Littleton Housing Authority	40,349	40,349	0	45.71%	59,682	4,404	64,086
Westford Housing Authority	46,011	46,011	0	36.72%	68,730	10,860	79,590

Employer Name	Schedule of Contributions					Pension Expense	
	Statutory Required Contribution (7)	Contributions In Relation to the Statutory Required Contribution (8)	Contribution Deficiency/ (Excess) (9)	Contributions as a Percentage of Covered Employee Payroll (10)	Proportionate Share of Plan Pension Expense (11)	Net Amortization of Deferred Amounts from Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (12)	Total Employer Pension Expense (13)
Shirley Water District	21,013	21,013	0	10.22%	49,736	-7,881	41,855
Tyngsboro Housing Authority	39,858	39,858	0	24.72%	64,496	3,205	67,701
Pepperell Housing Authority	14,362	14,362	0	14.76%	22,903	10,546	33,449
Groton Housing Authority	3,223	3,223	0	9.80%	-1,166	-1,073	-2,239
Tyngsboro Water District	33,753	33,753	0	16.34%	56,716	5,994	62,710
North Reading Housing Authority	16,393	16,393	0	18.96%	19,476	11,830	31,306
West Groton Water	1,039	1,039	0	0.88%	4,778	5,336	10,114
Ayer-Shirley RSD	446,008	446,008	0	11.99%	631,698	-19,733	611,965
Grand Totals:	\$119,298,291	\$120,614,676	-\$1,316,385	25.60%	\$191,360,263	\$0	\$191,360,263

Employer Name	Deferred Outflows of Resources					Deferred Inflows of Resources			
	Differences Between Expected and Actual Experience (14)	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments (15)	Changes of Assumptions (16)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (17)	Total Deferred Outflows of Resources (18)	Differences Between Expected and Actual Experience (19)	Changes of Assumptions (20)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (21)	Total Deferred Inflows of Resources (22)
Middlesex County Retirement Board	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Middlesex County	0	0	0	0	0	0	0	0	0
Middlesex Hospital	0	0	0	0	0	0	0	0	0
Town of Acton	109,552	2,386,731	3,327,764	1,777,916	7,601,963	186,638	0	1,712,622	1,899,260
Town of Ashby	4,451	96,964	135,195	410,745	647,355	7,582	0	141,446	149,028
Town of Ashland	74,063	1,613,565	2,249,757	1,870,821	5,808,206	126,178	0	0	126,178
Town of Ayer	41,568	905,616	1,262,680	963,144	3,173,008	70,817	0	749,594	820,411
Town of Bedford	112,953	2,460,829	3,431,077	453,855	6,458,714	192,432	0	1,136,939	1,329,371
Town of Billerica	308,471	6,720,388	9,370,081	1,430,707	17,829,647	525,520	0	5,510,549	6,036,069
Town of Boxborough	23,050	502,177	700,174	589,053	1,814,454	39,269	0	74,565	113,834
Town of Burlington	260,737	5,680,520	7,920,220	1,244,565	15,106,042	444,206	0	1,991,934	2,436,140
Town of Carlisle	22,827	497,315	693,394	836,534	2,050,070	38,889	0	306,636	345,525
Town of Chelmsford	227,090	4,947,463	6,898,135	1,979,825	14,052,513	386,882	0	3,473,354	3,860,236
Town of Dracut	134,218	2,924,112	4,077,022	1,298,644	8,433,996	228,660	0	764,548	993,208
Town of Dunstable	6,053	131,882	183,880	328,900	650,715	10,313	0	154,201	164,514
Town of Groton	47,651	1,038,151	1,447,471	457,076	2,990,349	81,181	0	853,434	934,615
Town of Holliston	55,955	1,219,048	1,699,691	1,236,646	4,211,340	95,327	0	768,650	863,977
Town of Hopkinton	51,904	1,130,804	1,576,654	2,524,042	5,283,404	88,427	0	413,500	501,927
Town of Hudson	142,641	3,107,634	4,332,903	618,486	8,201,664	243,011	0	143,038	386,049
Town of Lincoln	56,719	1,235,693	1,722,898	361,685	3,376,995	96,629	0	566,145	662,774
Town of Littleton	51,828	1,129,151	1,574,350	3,155,407	5,910,736	88,297	0	1,382,261	1,470,558
Town of North Reading	107,067	2,332,600	3,252,290	250,561	5,942,518	182,405	0	1,062,881	1,245,286

Employer Name	Deferred Outflows of Resources					Deferred Inflows of Resources			
	Differences Between Expected and Actual Experience (14)	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments (15)	Changes of Assumptions (16)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (17)	Total Deferred Outflows of Resources (18)	Differences Between Expected and Actual Experience (19)	Changes of Assumptions (20)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (21)	Total Deferred Inflows of Resources (22)
Town of Pepperell	36,731	800,235	1,115,749	948,213	2,900,928	62,577	0	263,669	326,246
Town of Sherborn	23,990	522,649	728,717	276,455	1,551,811	40,870	0	321,500	362,370
Town of Shirley	18,645	406,202	566,359	157,949	1,149,155	31,764	0	760,707	792,471
Town of Stow	23,826	519,075	723,735	240,660	1,507,296	40,591	0	72,881	113,472
Town of Sudbury	130,800	2,849,665	3,973,223	1,243,640	8,197,328	222,838	0	1,601,817	1,824,655
Town of Tewksbury	213,722	4,656,235	6,492,081	2,351,574	13,713,612	364,108	0	2,940,083	3,304,191
Town of Townsend	18,937	412,574	575,243	782,056	1,788,810	32,263	0	588,962	621,225
Town of Tyngsborough	47,625	1,037,586	1,446,682	1,550,510	4,082,403	81,137	0	1,089,334	1,170,471
Town of Wayland	121,234	2,641,255	3,682,641	293,783	6,738,913	206,541	0	2,040,065	2,246,606
Town of Westford	121,481	2,646,625	3,690,129	2,957,496	9,415,731	206,961	0	696,089	903,050
Town of Weston	136,811	2,980,623	4,155,814	0	7,273,248	233,079	0	2,243,489	2,476,568
Town of Wilmington	184,432	4,018,096	5,602,340	1,061,186	10,866,054	314,207	0	1,216,680	1,530,887
Acton-Boxborough RSD	61,291	1,335,301	1,861,780	948,454	4,206,826	104,418	0	212,867	317,285
Acton Water Supply	7,653	166,733	232,473	146,109	552,968	13,038	0	137,090	150,128
Bedford Housing Authority	699	15,228	21,233	17,415	54,575	1,191	0	1,898	3,089
Billerica Housing Authority	2,948	64,232	89,558	66,150	222,888	5,023	0	52,792	57,815
Chelmsford Housing Authority	4,994	108,810	151,712	627,700	893,216	8,509	0	27,066	35,575
Chelmsford Water District	1,450	31,594	44,050	1,356,463	1,433,557	2,471	0	707,300	709,771
Dracut Housing Authority	4,446	96,870	135,064	80,256	316,636	7,575	0	159,310	166,885
Dracut Water Supply	6,728	146,568	204,357	257,123	614,776	11,461	0	211,159	222,620
E. Chelmsford Water	781	17,024	23,736	31,954	73,495	1,331	0	2,727	4,058
E. Middlesex Mosq Control	1,356	29,539	41,185	97,139	169,219	2,310	0	47,553	49,863

Employer Name	Deferred Outflows of Resources					Deferred Inflows of Resources			
	Differences Between Expected and Actual Experience (14)	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments (15)	Changes of Assumptions (16)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (17)	Total Deferred Outflows of Resources (18)	Differences Between Expected and Actual Experience (19)	Changes of Assumptions (20)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (21)	Total Deferred Inflows of Resources (22)
Greater Lowell RVTSD	34,372	748,849	1,044,103	378,386	2,205,710	58,559	0	817,584	876,143
Groton-Dunstable RSD	25,176	548,501	764,763	971,231	2,309,671	42,892	0	44,670	87,562
Hudson Housing Authority	2,502	54,520	76,015	14,608	147,645	4,263	0	231,953	236,216
Lincoln Sudbury	18,887	411,490	573,731	153,101	1,157,209	32,178	0	365,458	397,636
Nashoba Vally THSD	7,432	161,919	225,760	136,724	531,835	12,662	0	279,761	292,423
N. Chelmsford Water	2,145	46,741	65,170	175,940	289,996	3,655	0	92,145	95,800
North Middlesex RSD	26,455	576,358	803,603	144,238	1,550,654	45,070	0	238,946	284,016
Shawsheen Valley RVS	17,524	381,775	532,300	129,212	1,060,811	29,854	0	467,997	497,851
South Middlesex RVTS	14,621	318,529	444,117	91,490	868,757	24,908	0	439,569	464,477
Sudbury Water District	4,145	90,299	125,902	252,239	472,585	7,061	0	228,531	235,592
Tewksbury Housing Authority	3,372	73,457	102,419	62,887	242,135	5,744	0	25,542	31,286
Wayland Housing Authority	1,472	32,080	44,729	79,630	157,911	2,509	0	18,872	21,381
Hopkinton Housing Authority	1,048	22,843	31,849	20,011	75,751	1,786	0	36,618	38,404
Sudbury Housing Authority	994	21,656	30,195	71,282	124,127	1,693	0	11,188	12,881
Wilmington Housing Authority	747	16,279	22,698	19,161	58,885	1,273	0	2,700	3,973
Acton Housing Authority	1,727	37,626	52,461	64,872	156,686	2,942	0	137,107	140,049
Burlington Housing Authority	299	6,505	9,069	75,800	91,673	509	0	30,277	30,786
Ayer Housing Authority	1,638	35,696	49,770	501,861	588,965	2,791	0	682,110	684,901
Holliston Housing Authority	324	7,062	9,846	16,454	33,686	552	0	48,541	49,093
Littleton Housing Authority	997	21,721	30,285	25,773	78,776	1,699	0	19,968	21,667
Westford Housing Authority	1,148	25,014	34,877	30,375	91,414	1,956	0	5,327	7,283

Employer Name	Deferred Outflows of Resources					Deferred Inflows of Resources			
	Differences Between Expected and Actual Experience (14)	Net Difference Between Projected and Actual Investment Earnings on Pension Plan Investments (15)	Changes of Assumptions (16)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (17)	Total Deferred Outflows of Resources (18)	Differences Between Expected and Actual Experience (19)	Changes of Assumptions (20)	Changes in Proportion and Differences Between Employer Contributions and Proportionate Share of Contributions (21)	Total Deferred Inflows of Resources (22)
Shirley Water District	831	18,102	25,239	28,772	72,944	1,416	0	43,186	44,602
Tyngsboro Housing Authority	1,077	23,473	32,728	27,769	85,047	1,836	0	18,409	20,245
Pepperell Housing Authority	383	8,335	11,622	26,151	46,491	652	0	5,105	5,757
Groton Housing Authority	-19	-424	-592	12,084	11,049	-33	0	15,431	15,398
Tyngsboro Water District	947	20,641	28,780	35,126	85,494	1,614	0	16,921	18,535
North Reading Housing Authority	325	7,088	9,883	29,457	46,753	554	0	4,049	4,603
West Groton Water	80	1,739	2,424	20,125	24,368	136	0	6,963	7,099
Ayer-Shirley RSD	10,553	229,906	320,552	540,342	1,101,353	17,978	0	479,735	497,713
Grand Totals:	\$3,190,580	\$69,511,142	\$96,917,795	\$41,415,998	\$211,035,515	\$5,435,635	\$0	\$41,415,998	\$46,851,633

Employer Name	Deferred Inflows/(Outflows) Recognized In Future Pension Expense (Year Ended June 30)					
	2020 (23)	2021 (24)	2022 (25)	2023 (26)	2024 (27)	Thereafter (28)
Middlesex County Retirement Board	\$0	\$0	\$0	\$0	\$0	\$0
Middlesex County	0	0	0	0	0	0
Middlesex Hospital	0	0	0	0	0	0
Town of Acton	2,051,624	1,495,350	1,217,386	938,343	0	0
Town of Ashby	164,921	120,685	140,373	72,348	0	0
Town of Ashland	2,291,709	1,779,970	840,705	769,644	0	0
Town of Ayer	813,626	576,761	543,196	419,014	0	0
Town of Bedford	1,897,291	1,354,518	830,879	1,046,655	0	0
Town of Billerica	4,910,436	3,822,327	1,051,184	2,009,631	0	0
Town of Boxborough	711,498	579,928	214,756	194,438	0	0
Town of Burlington	4,966,229	3,855,220	1,983,489	1,864,964	0	0
Town of Carlisle	654,037	462,234	247,348	340,926	0	0
Town of Chelmsford	3,922,378	3,110,661	1,796,743	1,362,495	0	0
Town of Dracut	2,918,771	2,259,718	1,250,706	1,011,593	0	0
Town of Dunstable	160,670	117,813	134,348	73,370	0	0
Town of Groton	793,309	593,903	248,143	420,379	0	0
Town of Holliston	1,215,757	816,085	620,544	694,977	0	0
Town of Hopkinton	1,800,226	1,235,129	824,261	921,861	0	0
Town of Hudson	3,033,035	2,273,121	1,258,700	1,250,759	0	0
Town of Lincoln	1,056,131	722,077	382,345	553,668	0	0
Town of Littleton	1,726,999	1,269,588	657,433	786,158	0	0
Town of North Reading	1,796,888	1,352,211	756,637	791,496	0	0

Employer Name	Deferred Inflows/(Outflows) Recognized In Future Pension Expense (Year Ended June 30)					
	2020 (23)	2021 (24)	2022 (25)	2023 (26)	2024 (27)	Thereafter (28)
Town of Pepperell	1,142,315	905,577	225,150	301,640	0	0
Town of Sherborn	441,000	298,743	201,351	248,347	0	0
Town of Shirley	109,532	25,391	65,919	155,842	0	0
Town of Stow	553,036	421,995	195,421	223,372	0	0
Town of Sudbury	2,435,497	1,916,089	1,120,738	900,349	0	0
Town of Tewksbury	4,048,643	3,321,338	1,802,451	1,236,989	0	0
Town of Townsend	510,796	359,412	55,677	241,700	0	0
Town of Tyngsborough	1,300,771	976,502	147,363	487,296	0	0
Town of Wayland	1,671,126	1,069,239	670,947	1,080,995	0	0
Town of Westford	3,283,577	2,398,159	1,305,438	1,525,507	0	0
Town of Weston	1,883,969	1,321,465	543,053	1,048,193	0	0
Town of Wilmington	3,630,199	2,904,971	1,486,098	1,313,899	0	0
Acton-Boxborough RSD	1,581,855	1,227,867	498,122	581,697	0	0
Acton Water Supply	166,904	132,888	46,315	56,733	0	0
Bedford Housing Authority	21,713	16,636	6,764	6,373	0	0
Billerica Housing Authority	73,515	62,326	14,039	15,193	0	0
Chelmsford Housing Authority	294,961	257,553	228,986	76,141	0	0
Chelmsford Water District	256,105	192,895	124,853	149,933	0	0
Dracut Housing Authority	54,701	48,374	30,932	15,744	0	0
Dracut Water Supply	139,805	120,647	98,286	33,418	0	0
E. Chelmsford Water	26,510	18,876	11,615	12,436	0	0
E. Middlesex Mosq Control	47,801	29,812	13,722	28,021	0	0

Employer Name	Deferred Inflows/(Outflows) Recognized In Future Pension Expense (Year Ended June 30)					
	2020 (23)	2021 (24)	2022 (25)	2023 (26)	2024 (27)	Thereafter (28)
Greater Lowell RVTSD	469,444	340,287	299,259	220,577	0	0
Groton-Dunstable RSD	893,002	693,027	340,390	295,690	0	0
Hudson Housing Authority	-33,310	-36,603	-34,476	15,818	0	0
Lincoln Sudbury	268,377	199,473	157,586	134,137	0	0
Nashoba Vally THSD	85,030	75,037	57,086	22,259	0	0
N. Chelmsford Water	64,384	43,240	49,672	36,900	0	0
North Middlesex RSD	489,660	336,238	192,783	247,957	0	0
Shawsheen Valley RVS	245,953	185,680	10,321	121,006	0	0
South Middlesex RVTs	180,910	110,892	-18,041	130,519	0	0
Sudbury Water District	101,823	84,368	-5,091	55,893	0	0
Tewksbury Housing Authority	87,677	72,017	27,143	24,012	0	0
Wayland Housing Authority	56,840	44,823	16,344	18,523	0	0
Hopkinton Housing Authority	18,360	9,954	-1,059	10,092	0	0
Sudbury Housing Authority	47,137	37,867	18,240	8,002	0	0
Wilmington Housing Authority	22,083	18,000	8,761	6,068	0	0
Acton Housing Authority	15,146	2,891	-22,780	21,380	0	0
Burlington Housing Authority	20,953	7,638	16,479	15,817	0	0
Ayer Housing Authority	50,670	42,793	-193,732	4,333	0	0
Holliston Housing Authority	-2,894	-7,744	-9,330	4,561	0	0
Littleton Housing Authority	24,404	21,709	6,112	4,884	0	0
Westford Housing Authority	33,887	25,813	15,532	8,899	0	0

Employer Name	Deferred Inflows/(Outflows) Recognized In Future Pension Expense (Year Ended June 30)					
	2020 (23)	2021 (24)	2022 (25)	2023 (26)	2024 (27)	Thereafter (28)
Shirley Water District	8,784	3,444	4,778	11,336	0	0
Tyngsboro Housing Authority	24,813	22,435	11,827	5,727	0	0
Pepperell Housing Authority	18,223	15,492	4,711	2,308	0	0
Groton Housing Authority	-1,464	-2,269	-2,446	1,830	0	0
Tyngsboro Water District	24,995	16,485	10,223	15,256	0	0
North Reading Housing Authority	18,358	15,560	3,769	4,463	0	0
West Groton Water	6,937	3,307	4,203	2,822	0	0
Ayer-Shirley RSD	191,919	101,475	115,388	194,858	0	0
Grand Totals:	\$63,991,967	\$48,307,383	\$24,976,068	\$26,908,464	\$0	\$0

APPENDIX – GLOSSARY OF TERMS

Definitions of certain terms *as they are used in Statement 68*. The terms may have different meanings in other contexts.

Active Employees:	Individuals employed at the end of the reporting or measurement period, as applicable.
Actual Contributions:	Cash contributions recognized as additions to a pension Plan Fiduciary Net Position.
Actuarial Present Value of Projected Benefit Payments:	Projected benefit payments discounted to reflect the expected effects of the time value (present value) of money and the probabilities of payment.
Actuarial Valuation:	The determination, as of a point in time (the actuarial valuation date), of the service cost, Total Pension Liability, and related actuarial present value of projected benefit payments for pensions performed in conformity with Actuarial Standards of Practice unless otherwise specified by the GASB.
Actuarial Valuation Date:	The date as of which an actuarial valuation is performed.
Actuarially Determined Contribution:	A target or recommended contribution to a defined benefit pension plan for the reporting period, determined in conformity with Actuarial Standards of Practice based on the most recent measurement available when the contribution for the reporting period was adopted.
Ad Hoc Cost-of-Living Adjustments (Ad Hoc COLAs):	Cost-of-living adjustments that require a decision to grant by the authority responsible for making such decisions.
Ad Hoc Postemployment Benefit Changes:	Postemployment benefit changes that require a decision to grant by the authority responsible for making such decisions.
Agent Employer:	An employer whose employees are provided with pensions through an agent multiple-employer defined benefit pension plan.
Agent Multiple-Employer Defined Benefit Pension Plan (Agent Pension Plan):	A multiple-employer defined benefit pension plan in which pension plan assets are pooled for investment purposes but separate accounts are maintained for each individual employer so that each employer's share of the pooled assets is legally available to pay the benefits of only its employees.
Allocated Insurance Contract:	A contract with an insurance company under which related payments to the insurance company are currently used to purchase immediate or deferred annuities for individual employees. Also may be referred to as an annuity contract.
Automatic Cost-of-Living Adjustments (Automatic COLAs):	Cost-of-living adjustments that occur without a requirement for a decision to grant by a responsible authority, including those for which the amounts are determined by reference to a specified experience factor (such as the earnings experience of the pension plan) or to another variable (such as an increase in the consumer price index).

Automatic Postemployment Benefit Changes:	Postemployment benefit changes that occur without a requirement for a decision to grant by a responsible authority, including those for which the amounts are determined by reference to a specified experience factor (such as the earnings experience of the pension plan) or to another variable (such as an increase in the consumer price index).
Closed Period:	A specific number of years that is counted from one date and declines to zero with the passage of time. For example, if the recognition period initially is five years on a closed basis, four years remain after the first year, three years after the second year, and so forth.
Collective Deferred Outflows of Resources and Deferred Inflows of Resources Related to Pensions:	Deferred outflows of resources and deferred inflows of resources related to pensions arising from certain changes in the collective Net Pension Liability.
Collective Net Pension Liability:	The Net Pension Liability for benefits provided through (1) a cost-sharing pension plan or (2) a single-employer or agent pension plan in circumstances in which there is a special funding situation.
Collective Pension Expense:	Pension expense arising from certain changes in the collective Net Pension Liability.
Contributions:	Additions to a pension Plan Fiduciary Net Position for amounts from employers, non-employer contributing entities (for example, state government contributions to a local government pension plan), or employees. Contributions can result from cash receipts by the pension plan or from recognition by the pension plan of a receivable from one of these sources.
Cost-of-Living Adjustments:	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-Sharing Employer:	An employer whose employees are provided with pensions through a cost-sharing multiple-employer defined benefit pension plan.
Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (Cost-Sharing Pension Plan):	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
Covered-Employee Payroll:	The payroll of employees that are provided with pensions through the pension plan.
Deferred Retirement Option Program (DROP):	A program that permits an employee to elect a calculation of benefit payments based on service credits and salary, as applicable, as of the DROP entry date. The employee continues to provide service to the employer and is paid for that service by the employer after the DROP entry date; however, the pensions that would have been paid to the employee (if the employee had retired and not entered the DROP) are credited to an individual employee account within the defined benefit pension plan until the end of the DROP period.
Defined Benefit Pension Plans:	Pension plans that are used to provide defined benefit pensions.

Defined Benefit Pensions:	Pensions for which the income or other benefits that the employee will receive at or after separation from employment are defined by the benefit terms. The pensions may be stated as a specified dollar amount or as an amount that is calculated based on one or more factors such as age, years of service, and compensation. (A pension that does not meet the criteria of a defined contribution pension is classified as a defined benefit pension for purposes of Statement 68.)
Defined Contribution Pension Plans:	Pension plans that are used to provide defined contribution pensions.
Defined Contribution Pensions:	Pensions having terms that (1) provide an individual account for each employee; (2) define the contributions that an employer is required to make (or the credits that it is required to provide) to an active employee's account for periods in which that employee renders service; and (3) provide that the pensions an employee will receive will depend only on the contributions (or credits) to the employee's account, actual earnings on investments of those contributions (or credits), and the effects of forfeitures of contributions (or credits) made for other employees, as well as pension plan administrative costs, that are allocated to the employee's account.
Discount Rate:	The single rate of return that, when applied to all projected benefit payments, results in an actuarial present value of projected benefit payments equal to the total of the following: 1. The actuarial present value of benefit payments projected to be made in future periods in which (a) the amount of the pension Plan Fiduciary Net Position is projected (under the requirements of Statement 68) to be greater than the benefit payments that are projected to be made in that period and (b) pension plan assets up to that point are expected to be invested using a strategy to achieve the long-term expected rate of return, calculated using the long-term expected rate of return on pension plan investments. 2. The actuarial present value of projected benefit payments not included in (1), calculated using the municipal bond rate.
Entry Age Actuarial Cost Method:	A method under which the actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis over the earnings or service of the individual between entry age and assumed exit age(s). The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is called the actuarial accrued liability.
Inactive Employees:	Terminated individuals that have accumulated benefits but are not yet receiving them, and retirees or their beneficiaries currently receiving benefits.
Measurement Period:	The period between the prior and the current measurement dates.
Multiple-Employer Defined Benefit Pension Plan:	A defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Net Pension Liability (NPL):	The liability of employers and non-employer contributing entities to employees for benefits provided through a defined benefit pension plan.

Non-Employer Contributing Entities:	Entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of Statement 68, employees are not considered non-employer contributing entities.
Other Postemployment Benefits:	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits, regardless of the manner in which they are provided. Other postemployment benefits do not include termination benefits.
Pension Plans:	Arrangements through which pensions are determined, assets dedicated for pensions are accumulated and managed and benefits are paid as they come due.
Pensions:	Retirement income and, if provided through a pension plan, postemployment benefits other than retirement income (such as death benefits, life insurance, and disability benefits). Pensions do not include postemployment healthcare benefits and termination benefits.
Plan Members:	Individuals that are covered under the terms of a pension plan. Plan members generally include (1) employees in active service (active plan members) and (2) terminated employees who have accumulated benefits but are not yet receiving them and retirees or their beneficiaries currently receiving benefits (inactive plan members).
Postemployment:	The period after employment.
Postemployment Benefit Changes:	Adjustments to the pension of an inactive employee.
Postemployment Healthcare Benefits:	Medical, dental, vision, and other health-related benefits paid subsequent to the termination of employment.
Projected Benefit Payments:	All benefits estimated to be payable through the pension plan to current active and inactive employees as a result of their past service and their expected future service.
Public Employee Retirement System:	A special-purpose government that administers one or more pension plans; also may administer other types of employee benefit plans, including postemployment healthcare plans and deferred compensation plans.
Real Rate of Return:	The rate of return on an investment after adjustment to eliminate inflation.
Service Costs:	The portions of the actuarial present value of projected benefit payments that are attributed to valuation years.
Single Employer:	An employer whose employees are provided with pensions through a single-employer defined benefit pension plan.
Single-Employer Defined Benefit Pension Plan (Single-Employer Pension Plan):	A defined benefit pension plan that is used to provide pensions to employees of only one employer.

Special Funding Situations:	Circumstances in which a non-employer entity is legally responsible for making contributions directly to a pension plan that is used to provide pensions to the employees of another entity or entities and either of the following conditions exists: 1. The amount of contributions for which the non-employer entity legally is responsible is not dependent upon one or more events or circumstances unrelated to the pensions. 2. The non-employer entity is the only entity with a legal obligation to make contributions directly to a pension plan.
Termination Benefits:	Inducements offered by employers to active employees to hasten the termination of services, or payments made in consequence of the early termination of services. Termination benefits include early-retirement incentives, severance benefits, and other termination-related benefits.
Total Pension Liability (TPL):	The portion of the actuarial present value of projected benefit payments that is attributed to past periods of employee service in conformity with the requirements of Statement 68.

