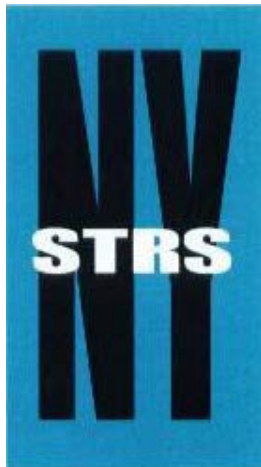


ACTUARIAL VALUATION REPORT

as of

JUNE 30, 2017



New York State Teachers' Retirement System

Office of the Actuary
July 23, 2018

NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

Actuarial Valuation Report as of June 30, 2017

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NEW YORK STATE TEACHERS' RETIREMENT SYSTEM

Actuarial Valuation Report as of June 30, 2017

A. INTRODUCTION

This report presents the results of the annual actuarial valuation of assets and liabilities of the New York State Teachers' Retirement System as of June 30, 2017. The purpose of this report is to summarize the determination of the Employer Contribution Rate which will be applied to member salaries earned during the July 1, 2018 to June 30, 2019 fiscal year and to review the funded status of the Retirement System. Use of the valuation results contained herein for purposes other than those stated above may not be appropriate.

B. EMPLOYER CONTRIBUTION RATE

The Employer Contribution Rate to be applied to member salaries for the July 1, 2018 to June 30, 2019 fiscal year and collected in the fiscal year ending June 30, 2020 consists of four components. These components may be described as follows:

The **Normal Rate** represents the annual cost of accruing active member benefits as well as incorporating actuarial gains and losses. The active member component includes the cost of benefits accruing on account of retirement, withdrawal, disability, death (except for the first \$50,000 of death benefits which are funded by the group life insurance rate) and the cost-of-living benefit provided during retirement. The Normal Rate is calculated in accordance with the Aggregate Actuarial Cost Method.

The **Expense Rate** is a pay-as-you-go rate representing the administrative cost of the Retirement System for the fiscal year July 1, 2019 to June 30, 2020, and is set during the budget process.

The **Group Life Insurance Rate** is a pay-as-you-go rate representing the expected benefit payments of the first \$50,000 of member death benefits for the fiscal year July 1, 2019 to June 30, 2020.

The **Excess Benefit Plan Rate** is a pay-as-you-go rate representing the expected benefit payments in excess of the Internal Revenue Code Section 415 limits for the fiscal year July 1, 2019 to June 30, 2020.

The actuarially computed Employer Contribution Rate to be applied to the member salaries for the fiscal year ending June 30, 2019 is **10.62%**. The Employer Contribution Rates determined by the actuarial valuations as of June 30, 2017 and June 30, 2016 and the changes between the two are summarized below:

	<u>As of 6/30/2017</u>	<u>As of 6/30/2016</u>	<u>Change</u>
Normal Rate	10.23%	9.40%	0.83%
Expense Rate	0.26	0.27	-0.01
Group Life Insurance Rate	0.13	0.13	0.00
Excess Benefit Plan Rate	<u>0.00</u>	<u>0.00</u>	<u>0.00</u>
Employer Contribution Rate	10.62%	9.80%	0.82%

The actuarial assumptions in use for the June 30, 2017 actuarial valuation were developed primarily based upon Retirement System experience and were adopted by the Retirement Board on October 29, 2015. On October 26, 2017, the Retirement Board lowered the valuation rate of interest assumption from 7.50% to 7.25%. In accordance with Sections 501, 508 and 517 of the Education Law, the Retirement Board has the authority to adopt the actuarial assumptions as recommended by the Actuary.

As in prior years, the actual employer contributions made by participating employers during the fiscal year ending June 30, 2017 were equal to the employer contributions determined in accordance with the annual actuarial valuation.

C. GAIN/LOSS IN THE EMPLOYER CONTRIBUTION RATE

The Employer Contribution Rate of 10.62% represents an 82 basis point increase from the prior year’s rate of 9.80%.

NORMAL RATE

The Normal Rate component of the Employer Contribution Rate of 10.23% represents an 83 basis points increase over the prior year’s rate of 9.40%. This change may be broken down as follows:

<u>New Assumption:</u>	The new lower valuation rate of interest assumption was adopted by the Retirement Board on October 26, 2017.	+3.38%
<u>Salary/Service:</u>	This loss is due to salary and service data coming in higher than expected.	+0.16
<u>Net Investment Gain:</u>	The recognition of prior investment gains and losses over a five year period in accordance with the asset valuation method resulted in a net investment gain.	-2.38
<u>New Entrants:</u>	New entrants joined the Retirement System as Tier 6 members with a long-term expected normal rate of approximately 4.7% which compares favorably to the current normal rate.	-0.08
<u>Withdrawal:</u>	More members withdrew than expected.	-0.03
<u>Mortality:</u>	Members are living slightly longer than expected and receiving benefits for a longer period.	+0.03
<u>Retirement:</u>	There were fewer retirements than expected.	-0.15
<u>Pension Payments:</u>	Actual payments to retirees were less than expected.	-0.02
<u>Cost of Living Adjustment:</u>	The actual COLA increase of 1.0% was lower than the expected increase of 1.50%.	<u>-0.08</u>
<u>TOTAL CHANGE IN THE NORMAL RATE</u>		+0.83%

OTHER COMPONENTS

The **Expense Rate** is set during the budget process. For the past eight actuarial valuations the expense rate has been 0.27%. As of June 30, 2017, the expense rate has been reduced one basis point and is now 0.26%.

The **Group Life Insurance Rate** is unchanged from the previous year. Contributions collected have generally been more than sufficient to cover payments over the past several years, resulting in an accumulated Group Life Insurance Fund of approximately \$301 million as of June 30, 2017. The Group Life Insurance Rate is being held constant, however, in anticipation of rising payouts in the future due to the Tier 2, 3, 4, 5, and 6 post-retired death benefit and the inactive death benefit.

The **Excess Benefit Plan Rate** remains equal to 0.00% this year. This rate represents the retirement benefits paid in excess of the Internal Revenue Code Section 415 limits. These payments are made exclusively from the Excess Benefit Plan. This fund was established in accordance with the Excess Benefit Plan which received final IRS approval in August 2001. The fund has accumulated assets of approximately \$3.1 million as of June 30, 2017. The rate has been set to 0.00% this year in order to utilize the existing fund balance.

D. EMPLOYER CONTRIBUTION RATE HISTORY

The following chart summarizes the Employer Contribution Rate for the last 20 years:

<i>Salary Year</i>	<i>Employer Contribution Rate</i>	<i>Salary Year</i>	<i>Employer Contribution Rate</i>
1999-2000	1.43%	2009-2010	6.19%
2000-2001	0.43	2010-2011	8.62
2001-2002	0.36	2011-2012	11.11
2002-2003	0.36	2012-2013	11.84
2003-2004	2.52	2013-2014	16.25
2004-2005	5.63	2014-2015	17.53
2005-2006	7.97	2015-2016	13.26
2006-2007	8.60	2016-2017	11.72
2007-2008	8.73	2017-2018	9.80
2008-2009	7.63	2018-2019	10.62

The complete Employer Contribution Rate history is presented in Appendix 14.

E. EMPLOYER CONTRIBUTION RATE INCREASE

The Employer Contribution Rate has increased this year from 9.80% to 10.62%, representing an increase of approximately 8%. The Normal Rate component equals 10.23%, an increase of approximately 9% from the prior year's Normal Rate of 9.40%. The rate of return on the System's market value of assets for the fiscal year ending June 30, 2017 was 12.5%, and the System's five-year market value rate of return now stands at 10.2%. Continued strength in the System's five-year rate of return led to an actuarial gain on investments. The lowering of the System's valuation rate of interest assumption led to the increase in the Employer Contribution Rate.

The Normal Rate component of the Employer Contribution Rate is calculated in accordance with the Aggregate Actuarial Cost Method, as required by statute (New York State Education Law Section 517). Under the Aggregate Actuarial Cost Method gains and losses resulting from differences between actual and expected experience, as well as changes to assumptions or plan provisions, are amortized as part of the normal cost rate, over the expected future working lifetime of active members. Aggregate is a reasonable and accepted actuarial cost method to use for ongoing plan funding purposes and is consistent with the System's goal of accumulating sufficient assets to pay benefits as they come due.

F. LOWERING OF VALUATION RATE OF INTEREST ASSUMPTION

At the Retirement Board Meeting on October 26, 2017 the Retirement Board adopted, based upon the Actuary's recommendation, a resolution to lower the System's valuation rate of interest assumption from 7.50% to 7.25%. This change was first effective with the actuarial valuation as of June 30, 2017.

The recommendation to lower this assumption was based on the System's investment consultant's (AON Hewitt) lowered expectations with respect to future investment returns. AON's expected annual return for the System's asset allocation based on their capital market assumptions was 6.7% on a geometric basis and 7.4% on an arithmetic basis.

Additionally, stochastic simulations were performed for the System by Segal Consulting.

Over ten thousand different future investment outcomes were generated based on the System’s asset allocation. The stochastic simulation run using AON’s capital market assumptions produced a return set with a distribution that had a 50th percentile of around 6.8% in 20 years. A stochastic simulation run using the Horizon Survey capital market assumptions produced a return set with a distribution that had a 50th percentile of around 7.5% in 20 years.

Based on this analysis and the results of the stochastic simulations, it was decided to lower the System’s valuation rate of interest assumption to 7.25%. This breaks down into an assumed real rate of return of 5.00% and an inflation assumption of 2.25%. No change to the salary scale or to the assumed rate of COLA increase was recommended at this time. The complete analysis and explanation for the change can be found in the Memo from R. Young to the Retirement Board dated October 26, 2017.

G. MEMBER DATA

The member data for the valuation was determined as of June 30, 2017. Compared with the previous year, the total number of members increased slightly from 427,498 to 428,579; the number of active members decreased from 266,350 to 264,761; the number of retired members increased from 155,163 to 157,703; and the number of beneficiaries receiving monthly benefits increased from 5,985 to 6,115.

The number of retirements increased from 6,245 during the 2015-2016 fiscal year to 6,396 during the 2016-2017 fiscal year. There was no early retirement incentive offered in the 2016-2017 fiscal year. The number of retirements over each of the last ten years is as follows:

<i>Fiscal Year</i>	<i>Total Number of Retirements</i>	<i>Fiscal Year</i>	<i>Total Number of Retirements</i>
2007-2008	6,330	2012-2013	6,330
2008-2009	5,644	2013-2014	6,547
2009-2010	5,501	2014-2015	6,161
2010-2011*	8,423	2015-2016	6,245
2011-2012	6,033	2016-2017	6,396

*Denotes an early retirement incentive offered during that fiscal year.

Historical member statistics, including statistics specific to retired members, appear in the appendices to this report. Additional member statistics may also be found in the Retirement System's most recent Comprehensive Annual Financial Report.

H. FUNDED STATUS

As of June 30, 2017, the actuarial value of plan assets was equal to \$113.1 billion. The accrued pension benefit liability calculated in accordance with the Entry Age Normal Cost Method was equal to \$115.7 billion. These two values produced a funded ratio of 97.7% as of June 30, 2017. If the market value of plan assets is used instead of the actuarial value of plan assets, the funded ratio as of June 30, 2017 would be equal to 99.8%.

For purposes of this funded ratio calculation, the plan liabilities have been calculated in accordance with the Entry Age Normal Cost Method as required by Governmental Accounting Standards Board (GASB) Statement No. 67. The Retirement System is funded in accordance with the Aggregate Cost Method. GASB Statement No. 67 requires that the Entry Age Normal Cost Method be used to calculate the accrued liability for purposes of presenting the funded ratio calculation for all plans, regardless of the cost method being used for funding purposes. Both Aggregate and Entry Age Normal are appropriate contribution allocation procedures for purposes of ongoing plan funding and are accepted actuarial cost methods.

The funded ratios provided here are an appropriate measurement of the System's funded status. While the funded ratios will fluctuate from year to year, a funded ratio of 100% is desirable and indicative of a well-funded System. It does not, however, imply that future contributions will not be required. The funded status measurement provided here is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the System's benefit obligations such as in a plan termination situation.

Future actuarial measurements such as the funded ratio and employer contribution rate may differ significantly from the current measurements presented in this report due to such factors as: future plan experience that differs significantly from that predicted by the actuarial

assumptions; changes in the actuarial assumptions or methods; and changes in plan provisions or applicable law.

A history of the Retirement System's funded status is provided in Appendix 4 of this report.

I. ACTUARIAL EXPERIENCE

Each year the Retirement System completes an experience study in order to regularly monitor the reasonableness and appropriateness of the actuarial assumptions used in the actuarial valuation. These assumptions are used to estimate the probability a member will cease teaching due to retirement, withdrawal, disability, or death. In addition, the assumptions are used to estimate future salary increases, future investment earnings, and the probability of death for retired members and beneficiaries. A listing of the actuarial assumptions is provided in Appendix 17. A summary of the results of the most recent experience study is contained in Appendix 10. The current actuarial assumptions were adopted by the Retirement Board on October 29, 2015, and first effective with the actuarial valuation of the Retirement System's assets and liabilities as of June 30, 2015. Specific details regarding the development of the present actuarial assumptions can be found in the "*Report on the 2015 Recommended Actuarial Assumptions*".

J. ASSET ALLOCATION

The Retirement Board, in consultation with Retirement System staff and the System's external investment consultant AON Hewitt, annually reviews the asset allocation to determine if any changes are appropriate. In response to this review, on August 2, 2017 the Retirement Board approved two changes to the asset allocation as follows: 1) An allocation of 1% to a new asset class Private Debt; and 2) A reduction of 1% in the System's allocation to Real Estate Debt, bringing its target allocation to 7%. Additionally, on April 26, 2018 the Retirement Board approved three changes to the asset allocation as follows: 1) An allocation of 4% to a new asset class Global Equity; 2) A reduction of 2% in the System's allocation to Domestic Equity, bringing its target allocation to 33%; and 3) A reduction of 2% in the System's allocation to International Equity, bringing its target allocation to 16%. According to AON Hewitt, the System's adopted asset allocation produces a long-term (30-year) expected annual geometric rate of return of 6.6%,

and an expected annual arithmetic rate of return of 7.2% based on their most recent report (1st quarter 2018 return assumptions).

The Retirement System's asset allocation, including targets and ranges, can be found in Appendix 12. Historical rate of return information can be found in Appendix 11. Detailed investment information is available in the System's Comprehensive Annual Financial Report.

K. NEW LEGISLATION

The following legislation affecting the Retirement System was signed into law during the 2017 Legislative Session:

Transfers In Bill:

Chapter 438 of the Laws of 2017 eliminated the one year limitation for members to provide notice of their intention to transfer between retirement systems and eliminates the requirement for a transferee to acquire three years of service in the second retirement system in order to earn the better benefit.

L. SENSITIVITY ANALYSIS

Included in Appendix 13 is a Sensitivity Analysis. The purpose of this exhibit is to illustrate what the Employer Contribution Rate would have been had various actuarial assumptions been altered. The chart also gives the reader a feel for the significance of the assumptions on the valuation results, and the potential impact of modifying them.

M. FUTURE EXPECTATIONS

The next employer contribution rate will be based upon the actuarial valuation as of June 30, 2018. No changes in actuarial assumptions for that valuation are forecast at this time. The capital markets had a decent year during the fiscal year ending June 30, 2018, with the System's main domestic equity index, the S&P1500, returning 14.5% for the year. The System's main international equity index, the ACWI ex-US, returned 7.3% for the fiscal year. Our fixed income index, the Barclay's US Aggregate Float Adjusted Bond index, returned -0.5% for the year. The System's five-year rate of return will decrease from last year's 10.2%, but will still be above the assumed rate of return of 7.25%.

N. CERTIFICATION

This actuarial valuation relies on member data provided by the participating employers to the Retirement System's administrative staff. The actuarial staff reviews this data for reasonability and completeness as well as reconciles it against prior data. In addition, the valuation relies on financial data provided by the Retirement System's Finance Department. Data is reviewed by the Retirement System's independent auditors as part of the annual audit. We believe the data to be reasonable and appropriate for purposes of this valuation.

The benefits recognized in this actuarial valuation are prescribed by New York State statute (Article 11 of the Education Law and Articles 11, 14, 15, 18, 19, and 20 of the Retirement and Social Security Law), and are summarized in Appendix 18. All benefits are included in the actuarial valuation. The actuarial methods, calculations, and actuarial assumptions are in accordance with standards of practice prescribed by the Actuarial Standards Board and generally accepted actuarial principles and procedures. The assumptions used in determining the liabilities and costs are internally consistent and reasonably related to actual and anticipated future experience of the Retirement System. The undersigned are members of the American Academy of Actuaries and the Society of Actuaries and meet the qualification standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.



Richard A. Young, ASA, EA, MAAA, FCA
Actuary



Sandra V. Pangburn, ASA, EA, MAAA
Manager, Office of the Actuary



New York State Teachers' Retirement System
Office of the Actuary
July 23, 2018

APPENDIX 1

RECONCILIATION OF THE MARKET VALUE OF ASSETS

From June 30, 2016 to June 30, 2017

	Market Value* <u>(in thousands)</u>
1. Market Value of Assets as of June 30, 2016	\$107,506,142
2. Contributions and Transfers	
Employer contributions	1,857,359
Member contributions	129,770
Net transfers in/(out)	<u>7,845</u>
Subtotal	1,994,974
3. Net Investment Income/(Loss)	12,951,892
4. Distributions	
Benefit payments	6,923,037
Administrative expenses	<u>61,611</u>
Subtotal	6,984,648
5. Market Value of Assets as of June 30, 2017	\$115,468,360

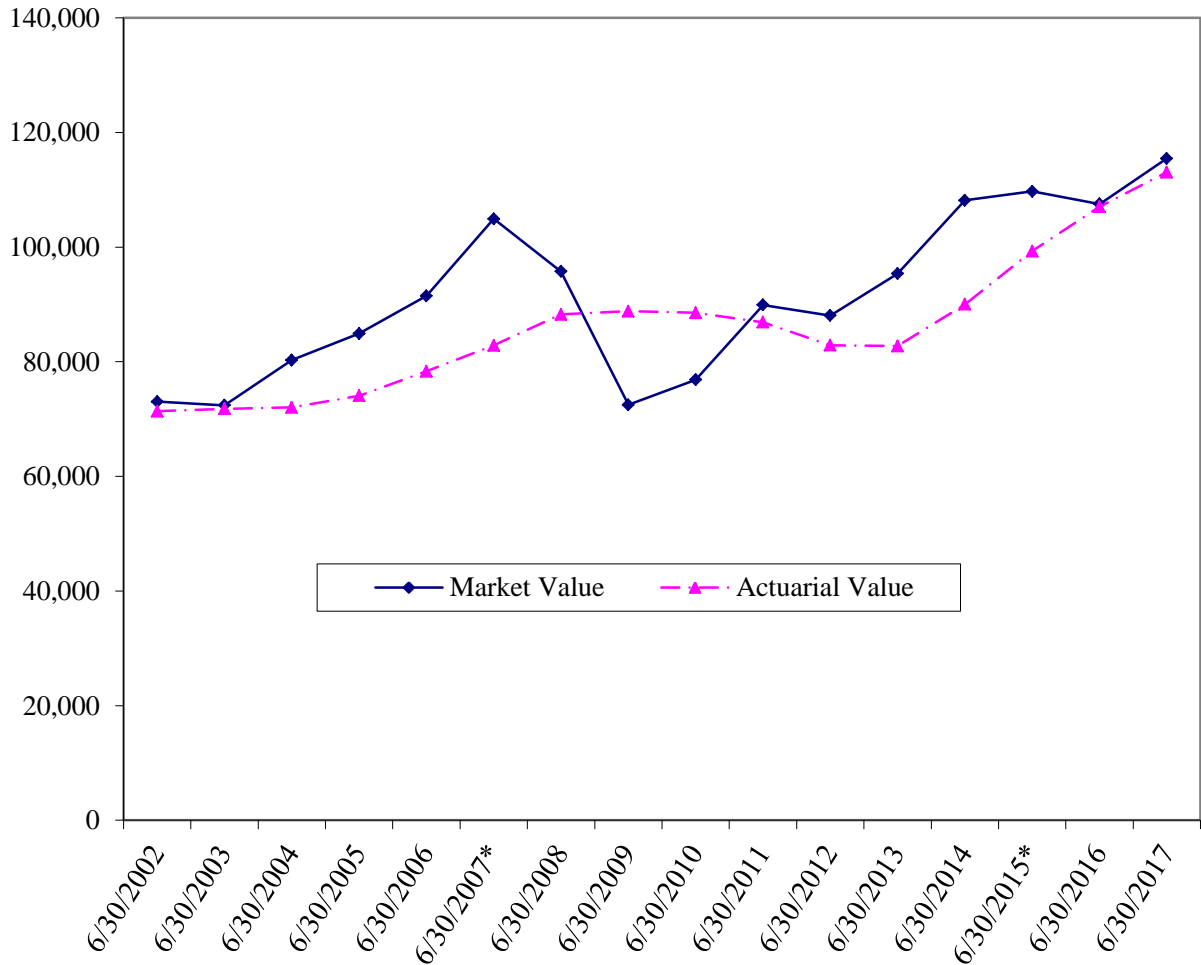
* Totals may not add due to rounding.

APPENDIX 2

COMPARISON OF MARKET VALUE TO ACTUARIAL VALUE OF ASSETS
(in Millions)

<u>Fiscal Year</u> <u>Ending</u>	<u>Market</u> <u>Value</u>	<u>Actuarial</u> <u>Value</u>	<u>Fiscal Year</u> <u>Ending</u>	<u>Market</u> <u>Value</u>	<u>Actuarial</u> <u>Value</u>
6/30/2002	\$73,041.2	\$71,374.4	6/30/2010	\$76,844.9	\$88,544.4
6/30/2003	72,391.5	71,780.4	6/30/2011	89,889.7	86,892.2
6/30/2004	80,276.2	72,044.4	6/30/2012	88,056.3	82,871.4
6/30/2005	84,908.5	74,074.3	6/30/2013	95,367.0	82,742.5
6/30/2006	91,492.2	78,335.8	6/30/2014	108,155.1	90,007.1
6/30/2007*	104,912.9	82,858.9	6/30/2015*	109,718.9	99,301.8
6/30/2008	95,769.3	88,254.7	6/30/2016	107,506.1	107,039.2
6/30/2009	72,471.8	88,805.5	6/30/2017	115,468.4	113,059.7

Market Value vs. Actuarial Value
(in Millions)



* The Retirement System's asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations.

APPENDIX 3

ACTUARIAL PRESENT VALUE OF FUTURE BENEFITS

as of June 30, 2017 and June 30, 2016

(in Thousands)

Each year an actuarial valuation determines the actuarial present value of future benefits (PVB), which is the present value of retirement and ancillary benefit payments, excluding group life insurance benefits, that the Retirement System can expect to pay in the future to current retirees and members. The PVB is based upon both service and salary projected to retirement. The results of the two most recent actuarial valuations are displayed in the following table.

	2017	2016
Present Value of Benefits Currently Being Paid:		
Service Retirement Benefits.....	\$61,860,357	\$59,300,507
Disability Retirement Benefits.....	348,674	331,309
Death Benefits.....	1,892	1,866
Survivor Benefits.....	1,006,708	932,669
Cost-of-Living Allowance.....	<u>5,190,639</u>	<u>5,013,195</u>
Total Present Value of Benefits Presently Being Paid	68,408,270	65,579,546
Present Value of Benefits Payable in the Future to Current Active Members:		
Service Retirement Benefits.....	54,353,782	50,051,245
Disability Retirement Benefits.....	225,220	209,350
Termination Benefits.....	2,142,148	2,001,472
Death and Survivor Benefits.....	379,665	362,916
Cost-of-Living Allowance.....	<u>1,393,242</u>	<u>1,276,730</u>
Total Active Member Liabilities	58,494,057	53,901,713
Present Value of Benefits Payable in the Future to Current Inactive (Vested) Members:		
Retirement Benefits.....	368,451	338,520
Death Benefits.....	317	311
Cost-of-Living Allowance.....	<u>31,411</u>	<u>28,275</u>
Total Vested Liabilities	400,179	367,106
Unclaimed Funds.....	16,617	15,082
Total Actuarial Present Value of Future Benefits	\$127,319,123	\$119,863,447

Note: Totals may not sum due to rounding

APPENDIX 4

FUNDING PROGRESS

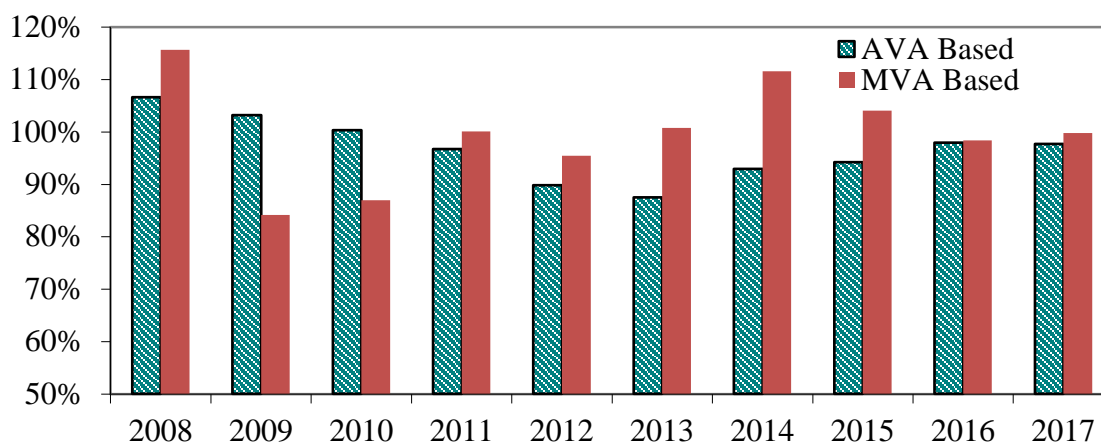
The portion of the actuarial present value of future benefits that is attributed to service rendered as of the valuation date is known as the actuarial accrued liability. In order to effectively assess the funding progress of a retirement system, it is necessary to compare the actuarial value of assets and the actuarial accrued liabilities over a period of time.

The Retirement System's funding method has allowed the accumulation of assets appropriate for the funding of its liabilities in a systematic and reasonable manner.

Analysis of Funding Progress (in Millions)

<u>Fiscal Year Ended</u>	<u>Market Value of Assets (MVA)</u>	<u>Actuarial Value of Assets (AVA)¹</u>	<u>Actuarial Accrued Liability²</u>	<u>Percent Funded based on</u>	
				<u>MVA</u>	<u>AVA</u>
2008	\$95,769.3	\$88,254.7	\$82,777.5	115.7%	106.6%
2009	72,471.8	88,805.5	86,062.0	84.2	103.2
2010	76,844.9	88,544.4	88,318.8	87.0	100.3
2011	89,889.7	86,892.2	89,824.9	100.1	96.7
2012	88,056.3	82,871.4	92,250.9	95.5	89.8
2013	95,367.0	82,742.5	94,583.8	100.8	87.5
2014	108,155.1	90,007.1	96,904.5	111.6	92.9
2015	109,718.9	99,301.8	105,401.8	104.1	94.2
2016	107,506.1	107,039.2	109,305.1	98.4	97.9
2017	115,468.4	113,059.7	115,672.5	99.8	97.7

Percent Funded



¹ The Retirement System's asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations.

² Effective June 30, 2006, the Actuarial Accrued Liability is calculated under the Entry Age Normal Cost Method as was required by Governmental Accounting Standards Board (GASB) Statement No. 50 prior to its replacement by GASB Statement No. 67. The Retirement System is funded in accordance with the Aggregate Cost Method. GASB Statement No. 50 required that the Entry Age Normal Cost Method be used to calculate the accrued liability for purposes of presenting the funded percentage.

APPENDIX 5

EMPLOYER CONTRIBUTION RATE

2017 Valuation

7.25% Interest

Normal Rate	10.23%
Group Life Insurance Rate	0.13
Excess Benefit Plan Rate	0.00
Expense Rate	0.26
Computed Contribution Rate as of June 30, 2017	10.62%

NORMAL RATE CALCULATION

2017 Valuation

7.25% Interest

Liabilities**Active Tier 1**

Service Pension	\$300,877,148
Disability Pension	0
Vested Pension	0
Active Death over \$50,000	2,880,134
Death Benefit After 10-Yr Withdrawal over \$50,000	0
Annuity Savings Fund	0
COLA	3,569,678
Total	<u>\$307,326,960</u>

Active Tier 2

Service Pension	\$375,831,494
Post Retired Death over \$50,000	242,490
Disability Pension	0
Post Disabled Death over \$50,000	0
Vested Pension	0
Active Death over \$50,000	1,114,613
Death Benefit After 10-Yr Withdrawal over \$50,000	0
COLA	5,850,070
Total	<u>\$383,038,667</u>

Active Tier 3

Service Pension	\$2,270,153,013
Post Retired Death over \$50,000	1,235,378
Disability Pension	22,390
Post Disabled Death over \$50,000	300
Refund on Active Death	1,743,217
Active Death over \$50,000	5,344,117
Refund on Quit	26,536
Vested Pension	195,425
Death Benefit After 10-Yr Withdrawal over \$50,000	40
Refund on Death after Vested Withdrawal	19
COLA	43,720,220
Total	<u>\$2,322,440,655</u>

NORMAL RATE CALCULATION (Cont'd)

2017 Valuation

7.25% Interest

Liabilities (Cont'd)**Active Tier 4**

Service Pension	\$48,821,470,058
Post Retired Death over \$50,000	29,107,953
Disability Pension	207,438,261
Post Disabled Death over \$50,000	3,887,869
Refund on Active Death	37,385,043
Active Death over \$50,000	245,006,365
Refund on Quit	41,518,374
Vested Pension	1,877,932,465
Death Benefit After 10-Yr Withdrawal over \$50,000	2,534,812
Refund on Death after Vested Withdrawal	1,161,645
COLA	1,230,928,314
Total	\$52,498,371,159

Active Tier 5

Service Pension	\$805,888,867
Post Retired Death over \$50,000	562,844
Disability Pension	6,456,583
Post Disabled Death over \$50,000	118,763
Refund on Active Death	3,251,776
Active Death over \$50,000	8,461,049
Refund on Quit	29,397,091
Vested Pension	46,811,697
Death Benefit After 10-Yr Withdrawal over \$50,000	129,692
Refund on Death after Vested Withdrawal	121,574
COLA	23,759,154
Total	\$924,959,090

Active Tier 6

Service Pension	\$1,254,892,147
Post Retired Death over \$50,000	1,062,002
Disability Pension	11,283,360
Post Disabled Death over \$50,000	197,918
Refund on Active Death	10,297,115
Active Death over \$50,000	18,436,968
Refund on Quit	76,303,891
Vested Pension	64,376,454
Death Benefit After 10-Yr Withdrawal over \$50,000	210,620
Refund on Death after Vested Withdrawal	265,055
COLA	40,699,689
Total	\$1,478,025,219

NORMAL RATE CALCULATION (Cont'd)

2017 Valuation

7.25% Interest

Liabilities (Cont'd)**Retirees**

Retired Pension	\$61,747,120,639
Retired Annuity	113,235,888
Disability Pension	348,075,600
Disability Annuity	598,531
Beneficiary Pension	993,745,342
Beneficiary Annuity	7,924,489
DBA Pension	4,738,487
DBA Annuity	299,577
Escalation	4,575,760
Post Retired Death over \$50,000	1,851,709
COLA	4,832,526,456
Catch-Up & Prior §532 Supp	<u>353,536,953</u>
Total	\$68,408,229,431

Vesteds

Inactive Vested	\$368,451,408
Death Benefit After 10-Yr Withdrawal over \$50,000	316,780
Active Vested	521,806,327
Death Benefit After 10-Yr Withdrawal over \$50,000	1,134,404
COLA	<u>75,895,703</u>
Total	\$967,604,622

TIAA

Service Pension	\$2,862,695
Disability Pension	19,647
Vested Pension	28,547
Active Death over \$50,000	3,909
COLA	<u>229,828</u>
Total	\$3,144,626

Miscellaneous

Incurred Death but not Paid	\$9,364,917
Unclaimed Non-Member Funds	<u>16,617,495</u>
Total	\$25,982,412

Total Liabilities\$127,319,122,841

NORMAL RATE CALCULATION (Cont'd)2017 Valuation
7.25% Interest**Assets for Valuation**

Current Total Assets (excluding contributions receivable)	\$113,516,789,802
Less: Expense Fund	\$62,353,800
Less: Group Life Insurance Fund	\$301,191,094
Plus: Assets Receivable from Normal Rate in 2017-2018 Fiscal Year	
(15,846,705,313)(0.1131)(1.0725) ^{-7/24}	\$1,756,045,269
Plus: Member Contributions Receivable in 2017-2018 Fiscal Year	
Tier 4: (36,575,611)(1.0725) ^{-7/24}	\$35,836,510
Tier 5: (17,273,353)(1.0725) ^{-7/24}	\$16,924,302
Tier 6: (47,226,065)(1.0725) ^{-7/24}	<u>\$46,271,745</u>
Adjusted Market Value of Assets	\$115,008,322,734
Less: 5 Year Smoothing Adjustment	<u>\$2,249,852,982</u>
Actuarial Value of Assets for Normal Rate Valuation Purposes	\$112,758,469,752

Receivables

Assets Receivable from Normal Rate in 2018-2019 Fiscal Year (2017-2018 Paybase)(2016 Normal Rate)(1.0725) ^{-1 7/24} (15,326,424,064)(0.0940)(1.0725) ^{-1 7/24}	\$1,316,150,373
Present Value of Future Member Contributions (Tier 4 Present Value of Future Employee Contributions)(1.0725) ^{-7/24} (64,299,321 – 36,575,611)(1.0725) ^{-7/24}	\$27,163,484
(Tier 5 Present Value of Future Employee Contributions)(1.0725) ^{-7/24} (238,371,516 – 17,273,353)(1.0725) ^{-7/24}	\$216,630,327
(Tier 6 Present Value of Future Employee Contributions)(1.0725) ^{-7/24} (763,524,632 – 47,226,065)(1.0725) ^{-7/24}	<u>\$701,823,980</u>
Total Receivables	\$2,261,768,164

NORMAL RATE CALCULATION (Cont'd)

2017 Valuation
7.25% Interest

Present Value of Future Salaries

	<u>Total PVFS</u>	
Tier 1	\$71,110,780	
Tier 2	116,438,703	
Tier 3	721,481,528	
Tier 4	102,294,709,238	
Tier 5	5,862,204,108	
Tier 6	<u>13,585,155,479</u>	
	\$122,651,099,836	$\times (1.0725)^{-7/24} =$
		\$120,172,630,458

Normal Rate

Total Liabilities - (Assets + Receivables)
Present Value of Future Salaries

$$\frac{\$12,298,884,925}{\$120,172,630,458} = 10.2343\%$$

10.23% (rounded)

APPENDIX 5 (Cont'd)

GROUP LIFE INSURANCE FUND

2017 Valuation

7.25% Interest

GLIF Balance as of June 30, 2016	\$264,891,751
Benefit Payments During 2016 - 2017	\$17,553,086
Contributions During 2016 - 2017	\$20,060,311
GLIF Net Investment Income During 2016 - 2017 (Based on 2016 - 2017 Market Value of Assets Rate of Return of 12.50%)	\$33,792,118
GLIF Balance as of June 30, 2017	\$301,191,094
Estimated Benefit Payments During 2017 - 2018	\$20,000,000
Contributions During 2017 - 2018	\$20,600,717
GLIF Estimated Net Investment Income During 2017-2018 (Based on Estimated 2017 - 2018 Market Value of Assets Rate of Return of 7.25%)	\$22,171,122
Estimated GLIF Balance as of June 30, 2018	\$323,962,933

Calculation of the GLIF Rate for the June 30, 2017 Actuarial Valuation:

Expected Salaries for the 2017 - 2018 Fiscal Year	\$16,276,000,000
GLIF Rate	0.13%
Expected Contribution for the 2018 - 2019 Fiscal Year	\$21,158,800

Keep GLIF Rate at 0.13% as expected contribution will likely cover expected GLIF benefit payments, and once that is no longer true (as death benefits increase) GLIF balance can begin to be used.

APPENDIX 5 (Cont'd)

EXCESS BENEFIT PLAN FUND*
2017 Valuation

Excess Benefit Plan Balance as of June 30, 2016	\$2,062,410
Final Adjustment for the Fiscal Year Ending June 30, 2016	\$113,982
Benefit Payments during 2016 – 2017	\$600,000
Contribution during 2016 – 2017	\$1,538,670
Net Investment Income (including miscellaneous adjustments) during 2016 - 2017 *	\$0
Excess Benefit Plan Balance as of June 30, 2017	\$3,115,062
Final Adjustment for the Fiscal Year Ending June 30, 2017	\$44,345
Estimated Benefit Payments during 2017 - 2018	\$600,000
Contribution during 2017 – 2018	\$1,584,671
Expected Net Investment Income during 2017 - 2018 *	\$0
Expected Excess Benefit Plan Balance as of June 30, 2018	\$4,144,078

Calculation of the Excess Benefit Plan Rate for the June 30, 2017 Actuarial Valuation:

Set the Excess Benefit Plan rate to 0.00% in order to use up the balance that has built up in the fund.

* Fund is in a zero-interest checking account

The Administrative Rate and Employer Contributions¹

The administrative portion (Rate) of the employer contribution rate is adopted annually by the Retirement Board in the amount necessary to defray Retirement Administration related expenses for the following fiscal year. The first step in determining the rate is to divide the projected Retirement Administration related expenses by the projected member salary base. Consideration is also given to the overall status of the fund balance.

Based on the fall collection period for employer contributions, the preferred fund balance has been established to be 2½ to 4½ months of estimated member-related expenses. Since 2009, the fund balance has exceeded the preferred range largely due to a combination of aggressive cost saving measures immediately after the financial crisis of 2008 and additional cost containment initiatives. To bring the fund balance gradually back down within the preferred range, the administrative rate will be lowered from 0.27% to 0.26% beginning in 2019-20.

A 10-year forecast was performed to analyze the impact on reducing the Administrative Rate from 0.27% to 0.26%. Using a conservative growth model for increases to both annual expenses and the Member Salary Base, the forecast shows that the System can reduce the rate without having a negative impact.

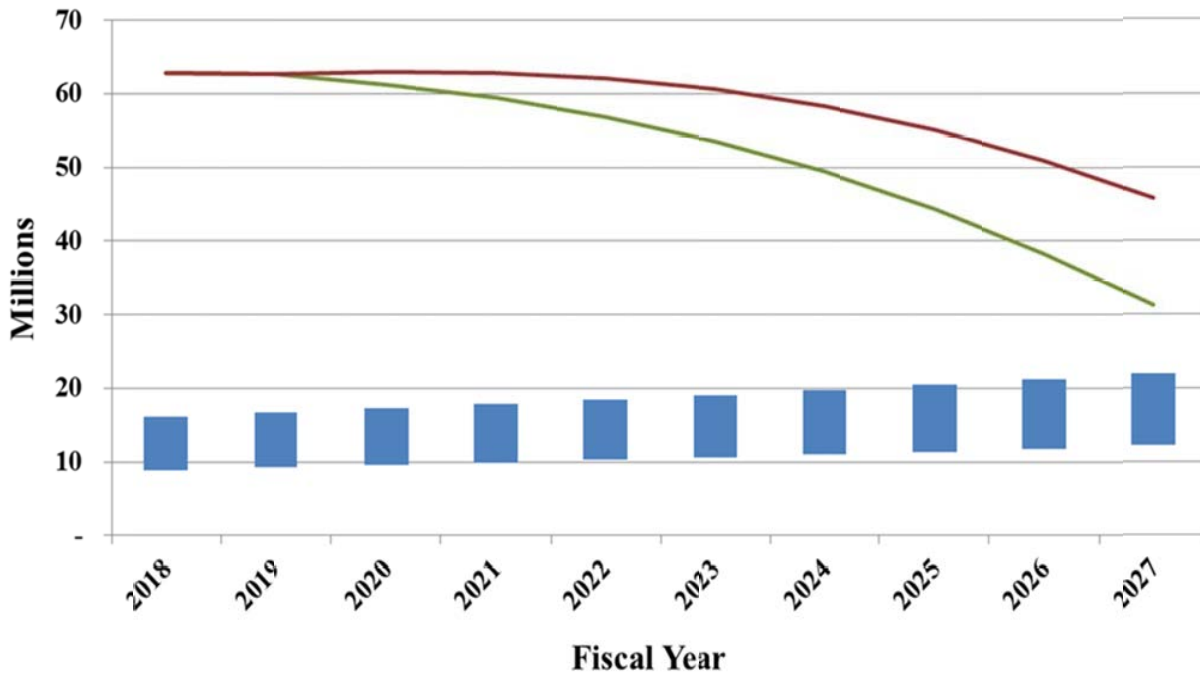


Chart Legend

- Preferred Fund Balance Range (2½ to 4½ months of Member Expenses)
- Administrative Expense Rate of 0.27% of Member Salary Base
- Administrative Expense Rate of 0.26% of Member Salary Base

APPENDIX 5 (Cont'd)

<i>(in thousands)</i>			Employer Contributions (Net of Billing Adjustments)		Increase/(Decrease) in Contributions to the Administrative Fund	
Year	Amount	Rate (%)	Year Collected	Amount		
2019-20	\$16,910,000 *	0.26% *	2020-21	\$43,966 *	1.79%	*
2018-19	16,613,000 *	0.26%	2019-20	43,194 *	(1.71%)	*
2017-18	16,276,000 *	0.27%	2018-19	43,945 *	2.71%	*
2016-17	15,846,700	0.27%	2017-18	42,786	2.62%	
2015-16	15,431,000	0.27%	2016-17	41,695	2.80%	
2014-15	15,021,400	0.27%	2015-16	40,558	1.65%	
2013-14	14,771,300	0.27%	2014-15	39,899	0.85%	
2012-13	14,647,800	0.27%	2013-14	39,561	0.08%	

*Estimated

Estimated Member Salary Base

The member salary base is actuarially determined; it increases as new members join the System and as members receive pay increases from their employers. Annual retirements and other forms of separation from service lessen this increase. The member salary base is projected to increase 2.0% on average per year from 2018 through 2020.

¹ This entire section comes from the NYSTRS 2018-19 Operating Budget Report

APPENDIX 5 (Cont'd)

Asset Valuation Method

Development of Smoothing Adjustment

<u>FYE</u>	<u>Market Value</u>	<u>Contributions</u>	<u>Benefit Payments</u>	<u>Average Market Value</u> ¹
6/30/2012	86,303,987,073	1,479,186,529	5,979,984,123	
6/30/2013	93,531,255,172	1,765,812,556	6,194,057,011	84,457,742,461
6/30/2014	105,671,560,226	1,858,234,634	6,399,153,913	91,647,927,748
6/30/2015	106,997,313,385	2,499,130,479	6,588,088,885	104,147,733,206
6/30/2016	105,357,811,418	2,726,314,201	6,780,291,815	105,538,306,703
6/30/2017	113,516,789,802	2,165,955,433	6,984,647,124	103,399,706,288

<u>FYE</u>	<u>Actual Gain</u> ²	<u>Expected Gain</u> ³	<u>Unexpected Gain</u> ⁴	<u>Smoothing Adjustment</u> ⁵
6/30/2012	659,956,804			
6/30/2013	9,635,631,237	2,533,732,274	7,101,898,963	
6/30/2014	14,601,733,266	2,749,437,832	11,852,295,434	
6/30/2015	5,400,265,487	7,811,079,990	(2,410,814,503)	
6/30/2016	2,392,354,248	7,915,373,003	(5,523,018,755)	
6/30/2017	12,951,891,658	7,754,977,972	5,196,913,686	2,249,852,982

¹ Average Market Value = Market Value_(previous yr) - (.5 x Benefit Payments) + ((8.5/12) x Contributions)

² Actual Gain = Net Appreciation for fiscal years ending prior to 6/30/2015

Actual Gain = Net Investment Income for fiscal years ending on or after 6/30/2015

³ Expected Gain = 3.0% x Average Market Value for fiscal years ending prior to 6/30/2015

Expected Gain = 7.5% x Average Market Value for fiscal years ending on or after 6/30/2015

⁴ Unexpected Gain = Actual Gain - Expected Gain

⁵ Smoothing Adjustment = (.20 x Unexpected Gain 6/30/2014)

+ (.40 x Unexpected Gain 6/30/2015)

+ (.60 x Unexpected Gain 6/30/2016)

+ (.80 x Unexpected Gain 6/30/2017)

APPENDIX 6

MEMBER RECONCILIATION

ACTIVE MEMBERS:

	<u>Male</u>	<u>Female</u>	<u>Total</u>
June 30, 2016.....	63,297	203,053	266,350
Changes During Year:			
Added.....	2,435	9,088	11,523
Withdrawn.....	1,715	4,828	6,543
Retired.....	1,347	5,049	6,396
Died.....	61	112	173
June 30, 2017.....	62,609	202,152	264,761

MEMBERS RETIRED FOR:

	<u>Service *</u>			<u>Disability</u>			<u>Total</u>		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
June 30, 2016.....	49,999	103,037	153,036	470	1,657	2,127	50,469	104,694	155,163
Changes During Year:									
Retired.....	1,329	4,970	6,299	18	79	97	1,347	5,049	6,369
Died.....	1,494	2,049	3,543	28	86	114	1,522	2,135	3,657
Lump Sum.....	46	149	195	0	0	0	46	149	195
Restored to Active Membership....	0	0	0	1	3	4	1	3	4
June 30, 2017.....	49,788	105,809	155,597	459	1,647	2,106 **	50,247	107,456	157,703

BENEFICIARIES OF DECEASED:

	<u>Service Annuitants</u>			<u>Disability Annuitants</u>			<u>Active Members</u>			<u>Total</u>		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
June 30, 2016.....	1,257	4,324	5,581	103	169	272	27	105	132	1,387	4,598	5,985
Changes During Year:												
Added.....	122	354	476	4	4	8	0	0	0	126	358	484
Died.....	89	242	331	5	9	14	2	7	9	96	258	354
June 30, 2017.....	1,290	4,436	5,726	102	164	266	25	98	123	1,417	4,698	6,115

SUMMARY:

	<u>Male</u>	<u>Female</u>	<u>Total</u>
Active Members.....	62,609	202,152	264,761
Retired Members.....	50,247	107,456	157,703
Beneficiaries.....	<u>1,417</u>	<u>4,698</u>	6,115
Total.....	114,273	314,306	428,579

*Also includes vested retirees.

**Includes 19 males and 47 females retired for disability who receive a service benefit.

APPENDIX 7

DISTRIBUTION OF ACTIVE MEMBERS

Distribution by Age as of June 30, 2017

<u>Age</u>	<u>Male</u>	<u>Female</u>	<u>Total Members</u>
15-19	13	58	71
20-24	1,068	3,762	4,830
25-29	5,236	17,676	22,912
30-34	7,896	25,227	33,123
35-39	9,455	28,489	37,944
40-44	10,004	28,706	38,710
45-49	10,169	30,749	40,918
50-54	8,172	27,079	35,251
55-59	5,662	21,968	27,630
60-64	3,290	13,342	16,632
65-69	1,202	4,084	5,286
70-74	325	773	1,098
75-79	72	189	261
80-84	34	43	77
85 or older	<u>11</u>	<u>7</u>	<u>18</u>
Total	62,609	202,152	264,761

Average Male age is 43 years 7 months

Average Female age is 44 years 1 month

APPENDIX 7 (Cont'd)

Distribution by Age and Tier of Membership as of June 30, 2017

<u>Age</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total Members</u>
15-19	0	0	0	0	0	71	71
20-24	0	0	0	3	39	4,788	4,830
25-29	0	0	0	1,604	4,525	16,783	22,912
30-34	0	0	0	19,506	6,113	7,504	33,123
35-39	0	0	0	30,846	2,120	4,978	37,944
40-44	0	0	0	33,652	1,301	3,757	38,710
45-49	0	0	0	36,123	1,275	3,520	40,918
50-54	0	0	32	31,768	1,012	2,439	35,251
55-59	0	6	1,288	24,063	665	1,608	27,630
60-64	20	241	2,122	13,016	426	807	16,632
65-69	300	426	358	3,747	184	271	5,286
70-74	199	34	63	695	46	61	1,098
75-79	64	9	13	151	12	12	261
80-84	18	3	4	43	4	5	77
85 or older	6	1	1	9	0	1	18
Total	607	720	3,881	195,226	17,722	46,605	264,761
Average Age (yrs. – mos.)	70-3	65-6	61-0	46-5	36-6	34-4	43-11

APPENDIX 7 (Cont'd)

Distribution of Active Members by Age and New York State Service as of June 30, 2017

Male

<u>Age</u>	<u>Less Than 10 Years New York State Service</u>	<u>10 or More Years New York State Service</u>	<u>Total New York State Service</u>
15-19	13	0	13
20-24	1,068	0	1,068
25-29	5,236	0	5,236
30-34	6,948	948	7,896
35-39	4,045	5,410	9,455
40-44	2,424	7,580	10,004
45-49	1,919	8,250	10,169
50-54	1,505	6,667	8,172
55-59	1,133	4,529	5,662
60-64	852	2,438	3,290
65-69	416	786	1,202
70-74	160	165	325
75-79	38	34	72
80-84	23	11	34
85 or older	<u>7</u>	<u>4</u>	<u>11</u>
Total	25,787	36,822	62,609

Female

<u>Age</u>	<u>Less Than 10 Years New York State Service</u>	<u>10 or More Years New York State Service</u>	<u>Total New York State Service</u>
15-19	58	0	58
20-24	3,762	0	3,762
25-29	17,674	2	17,676
30-34	22,273	2,954	25,227
35-39	13,021	15,468	28,489
40-44	9,101	19,605	28,706
45-49	9,293	21,456	30,749
50-54	7,381	19,698	27,079
55-59	4,835	17,133	21,968
60-64	2,429	10,913	13,342
65-69	942	3,142	4,084
70-74	247	526	773
75-79	60	129	189
80-84	20	23	43
85 or older	<u>2</u>	<u>5</u>	<u>7</u>
Total	91,098	111,054	202,152

APPENDIX 7 (Cont'd)

Distribution of Active Members by Total Service and by Gender as of June 30, 2017

<u>Years of Service</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>
0-4	16,647	56,098	72,745
5-9	8,598	32,603	41,201
10-14	10,552	35,887	46,439
15-19	11,879	35,905	47,784
20-24	7,694	21,138	28,832
25-29	4,299	12,574	16,873
30-34	2,225	6,491	8,716
35 or more	<u>715</u>	<u>1,456</u>	<u>2,171</u>
Total	62,609	202,152	264,761

Average Male has 13 Years of Total Service

Average Female has 12 Years of Total Service

APPENDIX 7 (Cont'd)

Distribution of Active Members by Total Service and Tier of Membership as of June 30, 2017

<u>Years of Service</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total</u>
0-4	55	33	37	16,529	11,230	44,861	72,745
5-9	34	42	102	32,938	6,431	1,654	41,201
10-14	50	66	187	46,038	47	51	46,439
15-19	43	62	265	47,376	11	27	47,784
20-24	50	82	399	28,289	2	10	28,832
25-29	70	99	536	16,165	1	2	16,873
30-34	89	101	806	7,720	0	0	8,716
35 or more	216	235	1,549	171	0	0	2,171
Total	607	720	3,881	195,226	17,722	46,605	264,761
Average Service (yrs. – mos.)	28-3	27-0	29-4	15-0	3-2	1-5	12-1

APPENDIX 7 (Cont'd)

Total and Average Earnings by Tier of Membership
for Active Members as of June 30, 2017

	<u>Total Earnings</u>	<u>Average Earnings*</u>	<u>Average Earnings of Full-Time members *</u>
Tier 1	\$50,959,064	\$99,142	\$109,402
Tier 2	\$62,045,576	\$100,074	\$106,806
Tier 3	\$361,751,634	\$100,738	\$103,871
Tier 4	\$13,461,864,519	\$81,510	\$85,831
Tier 5	\$493,524,388	\$49,220	\$58,504
Tier 6	<u>\$1,232,272,354</u>	<u>\$33,757</u>	<u>\$49,243</u>
Total	\$15,662,417,535	\$72,373	\$80,951

* Average earnings calculated using only those active members with earnings during the 2016-17 school year.

APPENDIX 8

HISTORICAL MEMBER STATISTICS**Active Members and Annuitants 1925-2017**

<u>As of June 30</u>	<u>Active Members</u>	<u>Retirees & Beneficiaries</u>
1925	29,057	1,815
1930	39,663	2,732
1935	45,031	3,919
1940	48,193	4,771
1945	52,359	5,637
1950	56,504	6,374
1955	71,273	7,897
1960	99,555	10,796
1965	129,543	16,043
1970	186,914	22,700
1975	227,038	35,252
1980	203,330	46,812
1985	178,516	57,366
1990	195,194	69,127
1995	199,398	82,459
2000	224,986	100,839
2005	260,356	125,325
2010	285,774	141,716
2015	267,715	158,458
2017	264,761	163,818

Number of Active Members by Tier

<u>As of June 30</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 3</u>	<u>Tier 4</u>	<u>Tier 5</u>	<u>Tier 6</u>	<u>Total</u>
1998	49,266	15,860	23,302	120,652	--	--	209,080
1999	50,859	15,776	20,726	128,906	--	--	216,267
2000	47,234	15,700	20,159	141,893	--	--	224,986
2001	41,169	15,472	19,914	157,795	--	--	234,350
2002	35,601	15,121	19,674	172,438	--	--	242,834
2003	28,327	14,463	19,083	185,374	--	--	247,247
2004	22,986	13,947	18,835	198,747	--	--	254,515
2005	17,901	13,210	18,535	210,710	--	--	260,356
2006	13,621	12,084	18,173	220,532	--	--	264,410
2007	10,838	10,178	17,743	231,286	--	--	270,045
2008	8,630	8,171	17,007	241,093	--	--	274,901
2009	6,943	6,752	16,111	250,532	--	--	280,338
2010	5,582	5,706	14,942	255,966	3,578	--	285,774
2011	3,814	4,137	12,690	247,530	12,264	--	280,435
2012	2,756	3,253	11,180	239,199	19,969	916	277,273
2013	1,968	2,447	9,450	231,258	19,452	8,753	273,328
2014	1,439	1,810	7,753	222,545	19,124	17,368	270,039
2015	1,116	1,348	6,222	214,020	18,878	26,131	267,715
2016	832	974	4,920	204,912	18,540	36,172	266,350
2017	607	720	3,881	195,226	17,722	46,605	264,761

APPENDIX 9

RETIREMENT STATISTICS

RETIREMENT STATISTICS 2016-2017 MEMBERS RETIRED FOR:

	Service*	Disability
Number Retired.....	6,299	97
Age at Retirement:		
Average.....	61 yrs., 3 mos.	50 yrs., 10 mos.
Median.....	61 yrs., 6 mos.	52 yrs., 2 mos.
Years of Service:		
Average.....	25 yrs., 0 mos.	19 yrs., 1 mo.
Median.....	27 yrs., 2 mos.	18 yrs., 2 mos.
**Benefit:		
Average.....	\$45,049	\$29,520
Median.....	\$46,622	\$26,521
Final Average Salary (FAS):		
Average.....	\$85,242	\$80,450
Median.....	\$84,902	\$74,854
***Benefit as % of FAS:		
Average.....	47.25%	35.74%
Median.....	53.33%	33.33%

2016-2017 MEMBERS RETIRED FOR SERVICE* WITH:

	Less Than 20 Yrs. N.Y.	Between 20 Yrs. N.Y. and 35 Yrs. Total	35 Yrs. Total or More
Number Retired.....	1,551	4,143	605
Age at Retirement:			
Average.....	62 yrs., 2 mos.	60 yrs., 8 mos.	63 yrs., 0 mos.
Median.....	62 yrs., 0 mos.	61 yrs., 0 mos.	62 yrs., 3 mos.
Years of Service:			
Average.....	11 yrs., 6 mos.	28 yrs., 0 mos.	38 yrs., 5 mos.
Median.....	12 yrs., 0 mos.	30 yrs., 0 mos.	37 yrs., 3 mos.
**Benefit:			
Average.....	\$9,338	\$52,704	\$84,180
Median.....	\$6,417	\$52,005	\$81,366
Final Average Salary (FAS):			
Average.....	\$47,658	\$94,935	\$115,213
Median.....	\$39,755	\$91,643	\$112,661
***Benefit as % of FAS:			
Average.....	17.78%	54.54%	72.91%
Median.....	17.50%	59.56%	71.50%

**Also includes vested retirees.*

***The Maximum, even though the member may have chosen an option.*

****The average and median of individual benefits as percentages of final average salary.*

APPENDIX 9 (Cont'd)

RETIREMENT STATISTICS ALL RETIREES AS OF JUNE 30, 2017 RETIRED FOR:

	Service*	Disability
Number Retired.....	155,663	2,040
Age at Retirement:		
Average.....	58 yrs., 9 mos.	49 yrs., 6 mos.
Median.....	57 yrs., 8 mos.	50 yrs., 4 mos.
Years of Service:		
Average.....	28 yrs., 1 mo.	18 yrs., 4 mos.
Median.....	30 yrs., 3 mos.	17 yrs., 6 mos.
**Benefit:		
Average.....	\$41,703	\$20,343
Median.....	\$41,819	\$18,566
Final Average Salary (FAS):		
Average.....	\$71,173	\$55,911
Median.....	\$69,909	\$53,992
***Benefit as % of FAS:		
Average.....	54.29%	35.64%
Median.....	60.33%	33.33%

ALL RETIREES AS OF JUNE 30, 2017 RETIRED FOR SERVICE* WITH:

	Less Than 20 Yrs. N.Y.	Between 20 Yrs. N.Y. and 35 Yrs. Total	35 Yrs. Total or More
Number Retired.....	26,729	93,581	35,353
Age at Retirement:			
Average.....	59 yrs., 1 mo.	58 yrs., 7 mos.	58 yrs., 11 mos.
Median.....	57 yrs., 7 mos.	57 yrs., 4 mos.	58 yrs., 4 mos.
Years of Service:			
Average.....	13 yrs., 5 mos.	28 yrs., 7 mos.	37 yrs., 5 mos.
Median.....	13 yrs., 7 mos.	30 yrs., 0 mos.	36 yrs., 8 mos.
**Benefit:			
Average.....	\$8,416	\$42,150	\$65,686
Median.....	\$6,258	\$41,166	\$61,493
Final Average Salary (FAS):			
Average.....	\$40,159	\$73,574	\$88,262
Median.....	\$33,772	\$71,018	\$83,250
***Benefit as % of FAS:			
Average.....	20.46%	56.44%	74.18%
Median.....	19.44%	59.98%	73.50%

*Also includes vested retirees.

**The Maximum, even though the member may have chosen an option.

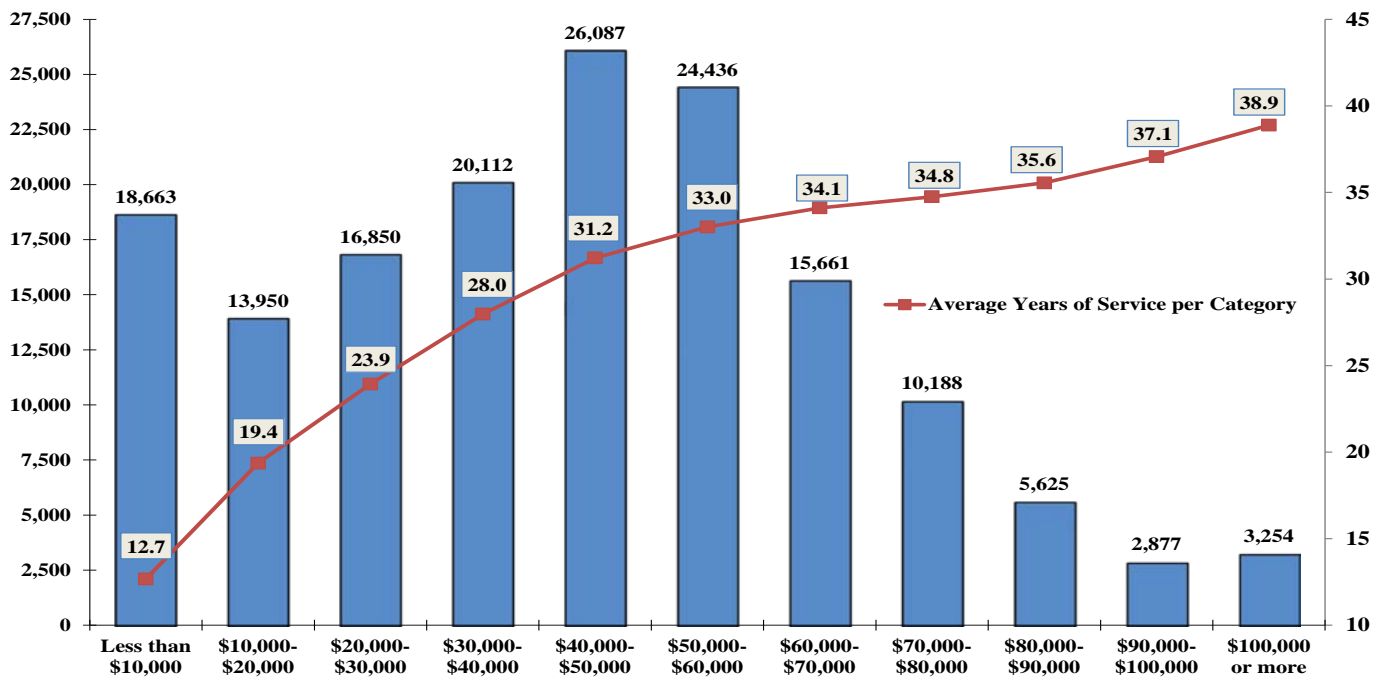
***The average and median of individual benefits as percentages of final average salary.

APPENDIX 9 (Cont'd)

**Retired Members' Characteristics¹
By Year of Retirement**

Retired in Fiscal <u>Year Ended</u>	Number of <u>Retired Members</u>	Average Age at Retirement (yrs.- mos.)	Average Service at Retirement (yrs.- mos.)	Average Final <u>Average Salary</u>	Average Maximum <u>Annual Benefit</u>
2008	6,330	58-11	27-8	\$77,066	\$45,779
2009	5,644	59-6	27-7	78,050	46,061
2010	5,501	60-0	27-5	79,615	46,489
2011	8,423	60-3	28-7	85,010	51,200
2012	6,033	60-9	26-3	82,461	45,759
2013	6,330	60-10	25-6	81,987	44,768
2014	6,547	61-0	25-4	84,545	44,978
2015	6,161	60-11	25-4	84,362	44,487
2016	6,245	61-2	25-0	84,308	44,215
2017	6,396	61-3	25-0	85,242	45,049

Distribution of the Annual Benefit² of All Retired Members



¹ Averages are for service and vested retirees.

² Maximum annual retirement benefit as of June 30, 2017 including supplementation and COLA.

APPENDIX 10

2013-2017 EXPERIENCE STUDY
 NUMBER OF SERVICE RETIREMENTS
 TIER 1 AND TIERS 2, 3, 4 AT LEAST AGE 62 OR WITH 30 YEARS OF SERVICE
 AND TIER 5 AT LEAST AGE 62
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	EXPOSURES	MALE			FEMALE			RATIO OF ACTUAL TO EXPECTED
		ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	
50	7	0	0.00	N/A	22	0	0.00	N/A
51	31	0	0.00	N/A	78	0	0.00	N/A
52	288	0	0.00	N/A	689	0	0.00	N/A
53	666	0	0.00	N/A	1,741	0	0.00	N/A
54	1,076	53	0.00	N/A	2,780	116	0.00	N/A
55	1,419	490	435.20	1.126	3,612	1,283	1,134.14	1.131
56	1,281	383	359.68	1.065	3,166	1,047	912.18	1.148
57	1,207	300	304.70	0.985	2,795	762	753.18	1.012
58	1,198	315	310.81	1.013	2,671	700	697.17	1.004
59	1,124	298	322.08	0.925	2,596	750	697.77	1.075
60	1,087	301	338.07	0.890	2,422	775	676.73	1.145
61	990	297	317.03	0.937	2,233	699	618.91	1.129
62	2,802	717	757.39	0.947	12,546	3,472	3,226.29	1.076
63	2,088	450	478.89	0.940	8,891	2,023	2,071.13	0.977
64	1,641	338	339.47	0.996	6,581	1,339	1,442.72	0.928
65	1,317	294	276.15	1.065	5,016	1,245	1,195.18	1.042
66	946	271	205.70	1.317	3,534	994	864.14	1.150
67	673	176	145.99	1.206	2,273	582	538.23	1.081
68	490	119	102.07	1.166	1,515	360	333.86	1.078
69	352	81	65.85	1.230	1,097	246	253.33	0.971
70	244	60	39.90	1.504	789	192	180.91	1.061
71	183	35	26.85	1.304	560	135	118.75	1.137
72	140	29	23.74	1.222	396	87	71.46	1.217
73	95	27	15.90	1.698	314	68	57.50	1.183
74	72	16	11.82	1.354	227	44	43.61	1.009
75	54	8	7.23	1.107	165	28	31.45	0.890
76	239	56	239.00	0.234	480	103	480.00	0.215
TOTAL	21,710	5,114	5,123.52	0.998	69,189	17,050	16,398.64	1.040

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF SERVICE RETIREMENTS
 TIERS 2,3,4 LESS THAN AGE 62 AND WITH LESS THAN 30 YEARS OF SERVICE
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

<u>AGE</u>	<u>EXPOSURES</u>	MALE			FEMALE			
		<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>	
50	6,329	0	0.00	N/A	20,059	0	0.00	N/A
51	6,096	0	0.00	N/A	20,399	0	0.00	N/A
52	5,667	0	0.00	N/A	20,050	0	0.00	N/A
53	5,065	0	0.00	N/A	19,077	0	0.00	N/A
54	4,566	33	0.00	N/A	18,048	126	0.00	N/A
55	4,067	126	130.00	0.969	17,273	579	597.04	0.970
56	3,640	111	115.69	0.959	16,036	528	573.46	0.921
57	3,296	86	119.52	0.720	15,109	486	630.80	0.770
58	3,020	111	132.57	0.837	14,520	579	672.99	0.860
59	2,731	120	154.02	0.779	13,837	645	834.91	0.773
60	2,462	120	156.53	0.767	13,047	807	918.70	0.878
61	2,293	193	165.59	1.166	11,989	1,003	990.17	1.013
TOTAL	49,232	900	973.92	0.924	199,444	4,753	5,218.07	0.911

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF SERVICE RETIREMENTS
 TIER 5 LESS THAN AGE 62 AND WITH LESS THAN 30 YEARS OF SERVICE
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	EXPOSURES*	MALE			FEMALE			
		ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	
50	1	0	0.00	N/A	6	0	0.00	N/A
51	0	0	0.00	N/A	6	0	0.00	N/A
52	1	0	0.00	N/A	2	0	0.00	N/A
53	0	0	0.00	N/A	2	0	0.00	N/A
54	0	0	0.00	N/A	5	0	0.00	N/A
55	0	0	0.00	N/A	8	0	0.14	0.000
56	0	0	0.00	N/A	7	1	0.13	7.692
57	1	0	0.02	0.000	6	0	0.13	0.000
58	1	0	0.02	0.000	5	0	0.12	0.000
59	1	0	0.03	0.000	6	0	0.18	0.000
60	1	0	0.03	0.000	4	1	0.14	7.143
61	0	0	0.00	N/A	4	1	0.17	5.882
TOTAL	6	0	0.10	0.000	61	3	1.01	2.970

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF SERVICE RETIREMENTS
 TIER 6
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

AGE	MALE				FEMALE			
	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	EXPOSURES	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
50	1	0	0.00	N/A	2	0	0.00	N/A
51	0	0	0.00	N/A	2	0	0.00	N/A
52	0	0	0.00	N/A	5	0	0.00	N/A
53	0	0	0.00	N/A	7	0	0.00	N/A
54	0	0	0.00	N/A	2	0	0.00	N/A
55	0	0	0.00	N/A	1	0	0.02	0.000
56	0	0	0.00	N/A	1	0	0.02	0.000
57	0	0	0.00	N/A	2	0	0.04	0.000
58	0	0	0.00	N/A	0	0	0.00	N/A
59	0	0	0.00	N/A	0	0	0.00	N/A
60	0	0	0.00	N/A	2	0	0.07	0.000
61	0	0	0.00	N/A	1	0	0.04	0.000
62	0	0	0.00	N/A	4	0	0.19	0.000
63	0	0	0.00	N/A	0	0	0.00	N/A
64	0	0	0.00	N/A	0	0	0.00	N/A
65	1	1	0.25	4.000	2	0	0.54	0.000
66	0	0	0.00	N/A	1	0	0.26	0.000
67	1	1	0.29	3.448	0	0	0.00	N/A
68	0	0	0.00	N/A	1	0	0.28	0.000
69	0	0	0.00	N/A	0	0	0.00	N/A
70	0	0	0.00	N/A	0	0	0.00	N/A
71	0	0	0.00	N/A	0	0	0.00	N/A
72	0	0	0.00	N/A	0	0	0.00	N/A
73	1	0	0.21	0.000	0	0	0.00	N/A
74	1	0	0.22	0.000	0	0	0.00	N/A
75	0	0	0.00	N/A	0	0	0.00	N/A
76	0	0	0.00	N/A	0	0	0.00	N/A
TOTAL	5	2	0.97	2.062	33	0	1.46	0.000

* Exposures have at least 10 years of service.

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF DEATHS AMONG ACTIVE MEMBERS
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
20	0	0.20	0.000	1	0.37	2.703
25	6	4.58	1.310	5	6.12	0.817
30	8	8.38	0.955	15	11.34	1.323
35	11	13.67	0.805	18	16.24	1.108
40	16	20.79	0.770	17	25.41	0.669
45	28	28.10	0.996	50	45.46	1.100
50	28	28.69	0.976	57	63.22	0.902
55	33	32.64	1.011	85	81.22	1.047
60	29	39.58	0.733	92	83.29	1.105
65	21	29.80	0.705	36	40.58	0.887
70	9	12.76	0.705	17	11.71	1.452
75	4	3.71	1.078	7	3.18	2.201
TOTAL	193	222.90	0.866	400	388.14	1.031

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF DISABILITY RETIREMENTS
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>	<u>ACTUAL</u>	<u>EXPECTED</u>	<u>RATIO OF ACTUAL TO EXPECTED</u>
30	0	0.01	0.000	0	0.02	0.000
35	2	1.64	1.220	8	5.03	1.590
40	11	7.55	1.457	46	18.54	2.481
45	15	16.35	0.917	62	43.53	1.424
50	27	25.90	1.042	124	86.19	1.439
54	16	13.04	1.227	55	50.30	1.093
TOTAL	71	64.49	1.101	295	203.61	1.449

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
COMPARISON OF SALARY SCALE TO ACTUAL SALARY INCREASES
ASSUMPTIONS ADOPTED OCTOBER 2015

MALE

PREVIOUS YEAR'S <u>SERVICE</u>	PREVIOUS YEAR'S <u>DURATION</u> ¹	PREVIOUS YEAR'S <u>SALARIES</u>	ACTUAL <u>SALARIES</u>	EXPECTED <u>SALARIES</u> ²	RATIO OF ACTUAL TO <u>EXPECTED</u>
0-0 to 0-4	0	158,514,687	197,294,551	174,366,156	1.131
0-5 to 1-4	1	375,072,796	419,346,854	412,580,076	1.016
1-5 to 2-4	2	340,061,432	369,051,334	363,865,732	1.014
2-5 to 3-4	3	336,862,341	359,006,290	357,276,199	1.005
3-5 to 4-4	4	351,951,530	371,442,901	370,323,400	1.003
4-5 to 5-4	5	409,004,962	428,079,971	428,309,996	0.999
5-5 to 6-4	6	478,678,588	499,421,058	499,979,785	0.999
6-5 to 7-4	7	539,216,012	559,789,177	562,456,222	0.995
7-5 to 8-4	8	615,154,083	638,695,357	641,113,585	0.996
8-5 to 9-4	9	694,206,075	720,470,762	723,015,627	0.996
9-5 to 10-4	10	777,915,737	805,219,006	809,576,908	0.995
10-5 to 11-4	11	854,112,984	882,918,575	888,106,681	0.994
11-5 to 12-4	12	940,382,906	971,336,696	976,775,724	0.994
12-5 to 13-4	13	992,724,617	1,023,614,886	1,029,951,790	0.994
13-5 to 14-4	14	1,031,174,274	1,062,630,909	1,068,399,665	0.995
14-5 to 15-4	15	1,022,364,262	1,053,645,103	1,057,738,065	0.996
15-5 to 16-4	16	999,719,784	1,028,661,886	1,032,810,509	0.996
16-5 to 17-4	17	929,753,704	954,565,018	959,226,896	0.995
17-5 to 18-4	18	857,760,703	879,778,841	883,836,628	0.995
18-5 to 19-4	19	774,215,104	794,651,354	796,899,607	0.997
19-5 to 20-4	20	693,068,349	710,103,169	712,612,876	0.996
20-5 to 21-4	21	598,185,896	611,445,712	614,456,552	0.995
21-5 to 22-4	22	540,372,329	552,283,566	554,584,121	0.996
22-5 to 23-4	23	499,288,506	509,619,994	511,970,434	0.995
23-5 to 24-4	24	470,135,322	480,632,311	481,653,637	0.998
24-5 to 25-4	25	437,735,861	445,730,263	448,110,201	0.995
25-5 to 26-4	26	435,020,281	443,139,108	444,982,245	0.996
26-5 to 27-4	27	417,336,974	424,667,156	426,601,855	0.995
27-5 to 28-4	28	397,947,555	404,295,571	406,503,427	0.995
28-5 to 29-4	29	364,209,521	370,448,712	371,857,921	0.996
29-5 to 30-4	30	288,216,428	290,704,399	294,153,686	0.988
30-5 to 31-4	31	222,982,524	225,900,018	227,486,771	0.993
31-5 to 32-4	32	177,075,147	177,585,271	180,616,650	0.983
32-5 to 33-4	33	139,816,609	140,448,799	142,543,033	0.985
33-5 to 34-4	34	112,213,602	112,925,327	114,379,325	0.987
34-5 to 35-4	35	96,970,778	97,321,752	98,813,223	0.985
35-5 to 36-4	36	75,589,054	75,929,321	76,995,010	0.986
36-5 to 37-4	37	59,103,439	59,081,931	60,167,301	0.982
37-5 to 38-4	38	47,303,253	46,553,225	48,135,790	0.967
38-5 or more	39	159,650,849	158,519,534	162,460,704	0.976
TOTAL		19,711,068,858	20,356,955,668	20,415,694,016	0.997

¹For service less than 5 months duration is set to one.

²Totals may not add due to rounding.

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
COMPARISON OF SALARY SCALE TO ACTUAL SALARY INCREASES
ASSUMPTIONS ADOPTED OCTOBER 2015

FEMALE

PREVIOUS YEARS <u>SERVICE</u>	PREVIOUS YEAR'S <u>DURATION</u> ¹	PREVIOUS YEAR'S <u>SALARIES</u>	ACTUAL <u>SALARIES</u>	EXPECTED <u>SALARIES</u> ²	RATIO OF ACTUAL TO <u>EXPECTED</u>
0-0 to 0-4	0	473,558,915	594,218,509	520,914,807	1.141
0-5 to 1-4	1	1,161,988,752	1,316,005,001	1,278,187,627	1.030
1-5 to 2-4	2	1,057,631,379	1,151,979,647	1,131,665,576	1.018
2-5 to 3-4	3	1,026,903,394	1,094,488,540	1,089,133,740	1.005
3-5 to 4-4	4	1,095,097,406	1,154,933,169	1,152,261,491	1.002
4-5 to 5-4	5	1,264,937,412	1,325,039,268	1,324,642,458	1.000
5-5 to 6-4	6	1,470,856,345	1,533,376,899	1,536,309,452	0.998
6-5 to 7-4	7	1,664,415,252	1,732,252,874	1,736,151,549	0.998
7-5 to 8-4	8	1,876,997,263	1,950,215,864	1,956,206,548	0.997
8-5 to 9-4	9	2,073,045,704	2,149,956,593	2,159,077,101	0.996
9-5 to 10-4	10	2,252,302,837	2,334,696,038	2,343,971,562	0.996
10-5 to 11-4	11	2,443,699,684	2,530,981,671	2,540,958,931	0.996
11-5 to 12-4	12	2,643,254,873	2,734,202,716	2,745,548,837	0.996
12-5 to 13-4	13	2,763,676,108	2,859,706,047	2,867,313,962	0.997
13-5 to 14-4	14	2,813,283,089	2,907,512,887	2,914,842,609	0.997
14-5 to 15-4	15	2,747,004,694	2,833,187,121	2,842,051,056	0.997
15-5 to 16-4	16	2,606,620,620	2,683,292,356	2,692,899,763	0.996
16-5 to 17-4	17	2,363,990,734	2,431,457,001	2,438,929,240	0.997
17-5 to 18-4	18	2,164,395,715	2,223,835,947	2,230,193,345	0.997
18-5 to 19-4	19	1,979,452,326	2,032,519,981	2,037,450,279	0.998
19-5 to 20-4	20	1,777,651,621	1,821,782,293	1,827,781,397	0.997
20-5 to 21-4	21	1,584,425,443	1,621,320,906	1,627,521,815	0.996
21-5 to 22-4	22	1,488,074,011	1,521,430,548	1,527,210,357	0.996
22-5 to 23-4	23	1,397,599,308	1,426,687,854	1,433,098,330	0.996
23-5 to 24-4	24	1,329,411,413	1,357,547,145	1,361,981,993	0.997
24-5 to 25-4	25	1,300,147,907	1,326,446,311	1,330,961,412	0.997
25-5 to 26-4	26	1,270,083,828	1,294,410,054	1,299,168,748	0.996
26-5 to 27-4	27	1,208,465,968	1,230,130,807	1,235,293,912	0.996
27-5 to 28-4	28	1,123,855,514	1,143,707,669	1,148,018,408	0.996
28-5 to 29-4	29	1,008,413,577	1,026,147,736	1,029,590,262	0.997
29-5 to 30-4	30	769,743,765	776,156,861	785,600,487	0.988
30-5 to 31-4	31	547,776,252	554,004,211	558,841,332	0.991
31-5 to 32-4	32	422,498,645	425,976,148	430,948,618	0.988
32-5 to 33-4	33	302,654,532	304,586,638	308,556,295	0.987
33-5 to 34-4	34	222,567,555	223,566,826	226,863,109	0.985
34-5 to 35-4	35	173,958,907	175,312,933	177,264,126	0.989
35-5 to 36-4	36	131,398,846	132,726,991	133,842,865	0.992
36-5 to 37-4	37	89,277,536	90,203,747	90,884,532	0.993
37-5 to 38-4	38	61,658,669	62,248,780	62,743,862	0.992
38-5 or more	39	180,769,581	181,555,219	183,951,126	0.987
TOTAL		54,333,545,380	56,269,807,806	56,318,832,916	0.999

¹For service less than 5 months duration is set to one.

²Totals may not add due to rounding.

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF WITHDRAWALS
 EXPOSURE BASED ON ACTIVE TEACHERS
 ASSUMPTIONS ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
20	187	227.63	0.822	608	706.26	0.861
25	2,797	2,718.62	1.029	8,800	8,715.76	1.010
30	2,409	2,104.73	1.145	7,287	7,203.21	1.012
35	1,466	1,323.02	1.108	5,318	5,135.49	1.036
40	1,037	961.69	1.078	3,722	3,593.81	1.036
45	895	863.33	1.037	3,495	3,408.73	1.025
50	725	727.11	0.997	3,281	2,953.29	1.111
54	262	262.25	0.999	1,092	1,031.54	1.059
TOTAL	9,778	9,188.38	1.064	33,603	32,748.09	1.026

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF DEATHS AMONG MEMBERS RETIRED FOR DISABILITY
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
30	0	0.00	0.000	0	0.00	0.000
35	1	0.46	2.174	3	2.24	1.339
40	4	4.43	0.903	10	12.70	0.787
45	4	7.88	0.508	19	18.94	1.003
50	10	9.93	1.007	34	36.35	0.935
55	15	14.01	1.071	48	52.68	0.911
60	16	12.78	1.252	51	49.29	1.035
65	20	19.66	1.017	53	53.30	0.994
70	13	19.78	0.657	45	41.32	1.089
75	17	15.76	1.079	28	26.29	1.065
80	14	12.90	1.085	39	26.50	1.472
85	11	14.53	0.757	20	24.14	0.829
90	11	5.01	2.196	17	20.43	0.832
95	1	0.27	3.704	5	8.35	0.599
100	0	0.00	0.000	2	1.38	1.449
105	0	0.00	0.000	0	0.00	0.000
110	0	0.00	0.000	0	0.00	0.000
TOTAL	137	137.40	0.997	374	373.91	1.000

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF DEATHS AMONG MEMBERS RETIRED FOR SERVICE
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
55	14	12.74	1.099	52	28.58	1.819
60	97	89.67	1.082	196	191.03	1.026
65	375	383.12	0.979	560	631.82	0.886
70	693	734.56	0.943	812	883.81	0.919
75	858	893.77	0.960	919	982.35	0.936
80	1,295	1,330.92	0.973	1,306	1,318.76	0.990
85	1,656	1,687.71	0.981	1,907	2,000.93	0.953
90	1,324	1,329.09	0.996	2,059	2,124.42	0.969
95	527	461.86	1.141	1,549	1,547.67	1.001
100	89	78.62	1.132	566	509.99	1.110
105	4	5.77	0.693	92	82.55	1.114
110	0	0.00	0.000	1	0.89	1.124
TOTAL	6,932	7,007.83	0.989	10,019	10,302.80	0.972

APPENDIX 10 (Cont'd)

2013-2017 EXPERIENCE STUDY
 NUMBER OF DEATHS AMONG BENEFICIARIES
 MORTALITY ADOPTED OCTOBER 2015

CENTRAL AGE	MALE			FEMALE		
	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED	ACTUAL	EXPECTED	RATIO OF ACTUAL TO EXPECTED
5	0	0.00	0.000	0	0.00	0.000
10	0	0.00	0.000	0	0.00	0.000
15	0	0.00	0.000	0	0.00	0.000
20	0	0.00	0.000	0	0.00	0.000
25	0	0.00	0.000	0	0.00	0.000
30	0	0.00	0.000	0	0.00	0.000
35	0	0.00	0.000	0	0.00	0.000
40	0	0.00	0.000	0	0.00	0.000
45	0	0.04	0.000	0	0.05	0.000
50	0	0.12	0.000	0	0.14	0.000
55	3	0.41	7.317	0	0.53	0.000
60	4	1.56	2.564	3	2.46	1.220
65	12	5.56	2.158	12	9.27	1.294
70	20	12.69	1.576	34	25.19	1.350
75	19	20.18	0.942	65	57.16	1.137
80	50	43.49	1.150	138	117.04	1.179
85	110	87.16	1.262	238	232.85	1.022
90	99	115.95	0.854	325	353.76	0.919
95	76	79.16	0.960	273	261.84	1.043
100	26	31.41	0.828	75	80.51	0.932
105	1	2.08	0.481	10	13.62	0.734
110	0	0.00	0.000	2	2.76	0.725
TOTAL	420	399.81	1.050	1,175	1,157.18	1.015

APPENDIX 11

RATES OF RETURN

Investment Rate of Return
on
Market and Actuarial Value of Assets

as of June 30, 2017

Annualized rates of return over the last:

	<u>Based Upon Market Value of Assets</u>	<u>Based Upon Actuarial Value of Assets¹</u>
1 Year:	12.5%	10.2%
3 Years:	6.6%	11.7%
5 Years:	10.2%	11.0%
10 Years:	5.6%	7.9%
15 Years:	7.8%	8.2%
20 Years:	7.2%	
25 Years:	8.7%	
30 Years:	8.8%	

Annualized inflation over the last:

	<u>Inflation Assumption</u>		<u>COLA Benefit</u>	
	<u>Actual</u>	<u>Expected</u>	<u>Actual</u>	<u>Expected²</u>
1 Year:	2.38%	2.25%	1.2 %	1.5%
3 Years:	1.05%	2.25%	1.1%	1.5%
5 Years:	1.22%	2.25%	1.0%	1.5%

¹ The Retirement System's asset valuation method was changed effective with the June 30, 2007 and June 30, 2015 actuarial valuations.

² The annual percentage for estimating future COLA benefit payments is 1.5%. The COLA percentage is one-half of the increase in the CPI with a floor of 1.0% and a cap of 3.0%. Therefore the estimate of inflation for the COLA benefit is the result of analyzing available CPI data with percentages bounded between 2.0% and 6.0%, and reduced by 50%. The COLA benefit was first initiated in 2001.

APPENDIX 11 (Cont'd)

RATES OF RETURN (Cont'd)

Annual Rates of Return through June 30, 2017

<u>Year Ending June 30th</u>	<u>Annual Rate of Return</u>	<u>Year Ending June 30th</u>	<u>Annual Rate of Return</u>
1983	37.1%	2006	11.8%
1984	-4.8%	2007	19.4%
1985	31.3%	2008	-6.3%
1986	28.4%	2009	-20.5%
1987	14.6%	2010	12.1%
1988	-1.5%	2011	23.2%
1989	16.8%	2012	2.8%
1990	11.4%	2013	13.7%
1991	8.3%	2014	18.2%
1992	13.0%	2015	5.2%
1993	13.6%	2016	2.3%
1994	1.8%	2017	12.5%
1995	19.3%		
1996	18.8%		
1997	22.0%		
1998	21.5%		
1999	14.0%		
2000	6.8%		
2001	-5.7%		
2002	-6.8%		
2003	4.0%		
2004	16.1%		
2005	10.6%		

APPENDIX 12

ASSET ALLOCATION

The table below displays the Retirement System's asset allocation targets, actual allocation percentages, and ranges as of June 30, 2017.

	Target	Actual	Range
Domestic Equity	35%	37.2%	31-39%
International Equity	18%	19.2%	14-22%
Real Estate Equity	11%	10.1%	6-16%
Private Equity	<u>8%</u>	<u>7.4%</u>	3-13%
<i>Total Equities</i>	72%	73.9%	
Domestic Fixed Income	16%	15.4%	12-20%
High Yield Bonds	1%	0.0%	0-3%
Global Bonds	2%	2.2%	0-3%
Real Estate Debt	8%	4.5%	4-12%
Cash Equivalents	<u>1%</u>	<u>4.0%</u>	0-4%
<i>Total Debt</i>	28%	26.1%	

APPENDIX 13

SENSITIVITY ANALYSIS

Valuation results are highly dependent on the actuarial assumptions used to project future events. If actual experience emerges differently from the assumptions used in the valuation process, actuarial gains or losses will result, and future Employer Contribution Rates will be higher or lower. In this section, results of a sensitivity analysis are presented in order to illustrate how deviations in specific assumptions would have changed the current Employer Contribution Rate of 10.62%.

It is important to note that the results displayed here, with the exception of those for the investment return, are the consequence of altering each assumption individually without accounting for possible correlation between assumptions. Therefore, these results are presented in order to provide an illustration as to the order of magnitude that a variation in key assumptions could have on valuation results. There is no guarantee that future experience will be consistent with either our current or the following alternative set of assumptions.

<u>Assumption</u>	<u>Adjustment Made</u>	<u>Calculated Employer Contribution Rate</u>
Current Assumptions		10.62%
Valuation Rate of Interest¹	Decrease from 7.25% to 7.00%	13.53%
Valuation Rate of Interest¹	Decrease from 7.25% to 6.75%	16.49%
Valuation Rate of Interest¹	Decrease from 7.25% to 6.25%	22.70%
Salary Scale	Decrease of 10%	9.73%
Salary Scale	Increase of 10%	11.52%
Service Retirement Rates	Decrease of 10%	9.77%
Service Retirement Rates	Increase of 10%	11.36%
Healthy Annuitant Mortality	Decrease of 10%	12.34%
Healthy Annuitant Mortality	Increase of 10%	9.03%
Active Mortality	Decrease of 10%	10.64%
Active Mortality	Increase of 10%	10.61%

¹ In the event that a change to the long term investment return assumption would be warranted, it is likely that a related change to the salary scale assumption would also be necessary in order for these assumptions to remain consistent with overall inflation. Therefore, for the results presented here, the salary scale assumption was decreased by one-half of the reduction in the investment return assumption.

APPENDIX 14

HISTORY OF THE EMPLOYER CONTRIBUTION RATE

<u>Salary Year</u>	<u>Employer Contribution Rate</u>	<u>Salary Year</u>	<u>Employer Contribution Rate</u>	<u>Salary Year</u>	<u>Employer Contribution Rate</u>
1921-22	5.10 %	1956-57	10.90 %	1991-92	6.64 %
1922-23	5.10	1957-58	11.20	1992-93	8.00
1923-24	5.20	1958-59	13.40	1993-94	8.41
1924-25	5.20	1959-60	14.00	1994-95	7.24
1925-26	5.20	1960-61	18.35	1995-96	6.37
1926-27	5.20	1961-62	18.55	1996-97	3.57
1927-28	5.20	1962-63	19.55	1997-98	1.25
1928-29	5.30	1963-64	21.13	1998-99	1.42
1929-30	5.50	1964-65	17.67	1999-00	1.43
1930-31	5.50	1965-66	17.70	2000-01	0.43
1931-32	5.50	1966-67	17.72	2001-02	0.36
1932-33	5.50	1967-68	18.50	2002-03	0.36
1933-34	5.50	1968-69	18.80	2003-04	2.52
1934-35	5.60	1969-70	18.60	2004-05	5.63
1935-36	5.70	1970-71	18.80	2005-06	7.97
1936-37	5.80	1971-72	18.80	2006-07	8.60
1937-38	5.93	1972-73	18.80	2007-08	8.73
1938-39	6.03	1973-74	18.80	2008-09	7.63
1939-40	6.13	1974-75	18.80	2009-10	6.19
1940-41	6.23	1975-76	19.40	2010-11	8.62
1941-42	6.33	1976-77	19.40	2011-12	11.11
1942-43	6.43	1977-78	20.40	2012-13	11.84
1943-44	6.53	1978-79	21.40	2013-14	16.25
1944-45	7.10	1979-80	22.49	2014-15	17.53
1945-46	7.20	1980-81	23.49	2015-16	13.26
1946-47	7.50	1981-82	23.49	2016-17	11.72
1947-48	7.80	1982-83	23.49	2017-18	9.80
1948-49	8.00	1983-84	22.90	2018-19	10.62
1949-50	8.40	1984-85	22.80		
1950-51	8.80	1985-86	21.40		
1951-52	9.60	1986-87	18.80	Average	10.95 %
1952-53	9.90	1987-88	16.83		
1953-54	9.90	1988-89	14.79		
1954-55	10.30	1989-90	6.87		
1955-56	10.40	1990-91	6.84		

APPENDIX 15

HISTORY OF THE MEMBER CONTRIBUTION RATE

<u>Year of Membership</u>	<u>Required Contribution</u>
1921	4%
1948	5% (new members - 1948 and after)
1948	Voluntary 4% <u>could</u> be contributed (all members eligible)
1951	If member elected special retirement allowance: 4% went to 6.5%, 5% went to 8% (all members eligible)
1957	If member elected 1/120th plan: 6.5% went to 9%, 8% went to 11% (all members eligible)
1968	0%
1976	3% (new members - 1976 and after)
2000	3% employee contribution ceases after ten years of service or membership
2010	3.5% throughout career for members joining 1/1/2010 – 3/31/2012
2012	Throughout career for members joining on or after 4/1/2012: <ul style="list-style-type: none"> - 3.0% if salary less than or equal to \$45,000 - 3.5% if salary greater than \$45,000 and less than or equal to \$55,000 - 4.5% if salary greater than \$55,000 and less than or equal to \$75,000 - 5.75% if salary greater than \$75,000 and less than or equal to \$100,000 - 6.0% if salary greater than \$100,000 and less than or equal to \$179,000

As of August 1, 1921, when the Retirement System was established, members contributed 4% of salary. These contributions were used to fund a separate annuity, over and above the regular pension. New members on or after July 1, 1948 were required to contribute 5% of salary. Additional contributions, not in excess of 4% of salary, were permitted during the five-year period beginning July 1, 1948.

Under the provisions of a law passed in 1950, members could elect before July 1, 1951, or within one year of their date of membership, if later, to contribute towards a special service retirement allowance that would allow them to retire up to five years earlier. If their rate of contribution had been 4%, their new rate would be 6.5%. If their rate of contribution had been 5%, their new rate would be 8%. In 1956, an amendment was passed which provided additional benefits for service in excess of 25 years, but not in excess of 35 years, for those members who elected to contribute an additional 2.5% or 3% of their salaries. This increased the rate of contribution to 9% or 11% depending on whether the member's rate of contribution had been 6.5% or 8%.

Throughout the 1960's the advent of the "take-home pay" program effectively reduced the required contribution rate to zero for many members. As of July 1, 1968, all members were no longer required to make contributions, nor permitted to make voluntary contributions unless they had been making them previously.

HISTORY OF THE MEMBER CONTRIBUTION RATE (Cont'd)

The law that created Tier 3 in 1976 reinstated member contributions and required members who joined the System after July 26, 1976 to contribute 3% of their annual salary. This money, however, helps fund the member's pension and does not fund a separate annuity as before. Effective October 1, 2000, however, in accordance with Chapter 126 of the Laws of 2000, the 3% required member contribution ceases upon the attainment of the earlier of 10 years of service credit or 10 years of membership.

In accordance with Tier 5, enacted in 2009, members joining on or after January 1, 2010 and prior to April 1, 2012 must contribute 3.5% of salary throughout their working career towards the funding of their pension. Tier 6, enacted in 2012, requires members joining on or after April 1, 2012 to contribute between 3.0% and 6.0% of salary throughout their working career towards the funding of their pension. The contribution percentage for Tier 6 members can vary during their working career depending on the salary received.

ACTUARIAL VALUATION INFORMATION

1. Actuarial Cost Method

The cost method used to determine the liabilities and normal cost in this valuation is the Aggregate Cost Method. This funding method is required by statute, specifically Section 517 of the New York State Education Law.

Each year a normal rate percentage is developed as a level percentage of total member compensation. This percentage equals the portion of the actuarial present value of projected benefits which exceeds the actuarial value of assets divided by one percent of the present value of future compensation of the active members, as of the valuation date.

The cost of death benefits up to \$50,000, Retirement System administrative expenses, and benefits in excess of the IRC §415 limits are each determined using the pay-as-you-go method which is not considered to be an actuarial cost method.

Each year, actuarial gains and losses will occur because actual experience will vary from the actuarial assumptions. All gains and losses are automatically amortized as part of the normal rate, over the expected future working lifetime of active members.

The average expected future working lifetime for our active population as determined by the actuarial valuation as of June 30, 2017 is 13.12 years.

2. Asset Valuation Method

The actuarial value of assets for the normal rate is determined by recognizing each year's net investment income/loss in excess of (or less than) 7.25% at a rate of 20% per year, until fully recognized after five years. For fiscal years ending prior to June 30, 2015, realized and unrealized appreciation in excess of (or less than) the assumed inflationary rate of 3% is recognized at a rate of 20% per year, until fully recognized after five years.

The actuarial value of assets for the expense, group life insurance, and excess benefit plan rates is equal to the fair market value of assets, excluding contributions receivable.

3. Actuarial Assumptions

The valuation rate of interest of 7.25% was adopted by the Board on October 26, 2017 and was effective starting with the June 30, 2017 actuarial valuation. The remaining actuarial assumptions were adopted by the Retirement Board on October 29, 2015 and were effective with the June 30, 2015 actuarial valuation. Specific details regarding the development of the present actuarial assumptions can be found in the *“Report on the 2015 Recommended Actuarial Assumptions.”*

APPENDIX 16 (Cont'd)

ACTUARIAL VALUATION INFORMATION (Cont'd)

The withdrawal rates are the assumed rates of termination of employment from all causes other than death, disability or retirement. The withdrawal rates vary by gender, age and service. The withdrawal rates for active members age 55 or older are set to the age 54 withdrawal rates.

The healthy annuitant mortality rates are the assumed rates of death for service and deferred retired members and beneficiaries. The healthy annuitant mortality rates vary by gender and age. Future mortality improvement was projected on a generational basis using the Society of Actuaries Mortality Projection Scale MP-2014. For determining the present value of future COLA and supplementation for current retirees and vested, an approximation is made to estimate the impact of future mortality improvement.

The salary scale is the assumed annual rate of increase in compensation. The rates are based upon salary experience for members, vary by service and are independent of the member's gender. Cost-of-living, merit and productivity increases are included in these rates.

PRESENT ACTUARIAL ASSUMPTIONS

Actuarial assumptions have been developed based upon actual member experience. Various actuarial and graduation techniques are applied to experience data and tables are developed. An experience study is performed annually and assumptions are revised when warranted. The current actuarial assumptions were adopted by the Retirement Board on October 29, 2015. Specific details regarding the development of the present actuarial assumptions can be found in the “*Report on the 2015 Recommended Actuarial Assumptions*”.

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APPENDIX 17 (Cont'd)

Mortality Rates
for Active Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
20	0.000189	20	0.000108
21	0.000212	21	0.000112
22	0.000233	22	0.000112
23	0.000258	23	0.000112
24	0.000281	24	0.000112
25	0.000286	25	0.000112
26	0.000286	26	0.000112
27	0.000287	27	0.000112
28	0.000288	28	0.000119
29	0.000290	29	0.000124
30	0.000293	30	0.000129
31	0.000298	31	0.000132
32	0.000305	32	0.000135
33	0.000314	33	0.000137
34	0.000326	34	0.000140
35	0.000342	35	0.000144
36	0.000361	36	0.000151
37	0.000384	37	0.000160
38	0.000410	38	0.000174
39	0.000441	39	0.000191
40	0.000474	40	0.000213
41	0.000510	41	0.000239
42	0.000548	42	0.000269
43	0.000586	43	0.000302
44	0.000624	44	0.000338
45	0.000661	45	0.000374
46	0.000697	46	0.000412
47	0.000732	47	0.000450
48	0.000765	48	0.000487
49	0.000800	49	0.000523
50	0.000836	50	0.000559
51	0.000876	51	0.000595
52	0.000923	52	0.000632
53	0.000979	53	0.000671
54	0.001050	54	0.000711

APPENDIX 17 (Cont'd)

Mortality Rates
for Active Members
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.001139	55	0.000755
56	0.001251	56	0.000802
57	0.001391	57	0.000854
58	0.001565	58	0.000911
59	0.001779	59	0.000973
60	0.002039	60	0.001042
61	0.002349	61	0.001117
62	0.002716	62	0.001199
63	0.003143	63	0.001291
64	0.003636	64	0.001393
65	0.004197	65	0.001509
66	0.004828	66	0.001642
67	0.005370	67	0.001797
68	0.006058	68	0.001981
69	0.006834	69	0.002350
70	0.007709	70	0.002550
71	0.008696	71	0.002864
72	0.009810	72	0.003217
73	0.011066	73	0.003613
74	0.012483	74	0.004058
75	0.014082	75	0.004558

APPENDIX 17 (Cont'd)

Disability Retirement Rates
for Active Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
30	0.000003	30	0.000005
31	0.000008	31	0.000008
32	0.000015	32	0.000010
33	0.000024	33	0.000037
34	0.000040	34	0.000076
35	0.000062	35	0.000098
36	0.000091	36	0.000102
37	0.000126	37	0.000105
38	0.000164	38	0.000126
39	0.000196	39	0.000159
40	0.000226	40	0.000214
41	0.000245	41	0.000274
42	0.000278	42	0.000310
43	0.000330	43	0.000376
44	0.000398	44	0.000452
45	0.000470	45	0.000501
46	0.000530	46	0.000522
47	0.000569	47	0.000568
48	0.000611	48	0.000666
49	0.000707	49	0.000818
50	0.000889	50	0.000986
51	0.001091	51	0.001187
52	0.001190	52	0.001325
53	0.001250	53	0.001380
54	0.001225	54	0.001375

APPENDIX 17 (Cont'd)

Withdrawal Rates
for Active Members

Males

Age	10 or more Years of Service										
	0 Years of Service	1 Year of Service	2 Years of Service	3 Years of Service	4 Years of Service	5 Years of Service	6 Years of Service	7 Years of Service	8 Years of Service	9 Years of Service	10 Years of Service
20	0.254275	0.165892	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
21	0.254275	0.139607	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
22	0.258777	0.126464	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
23	0.267780	0.124274	0.116327	0.094647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
24	0.281285	0.133035	0.119082	0.088647	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
25	0.294790	0.168083	0.124171	0.081761	0.057858	0.035354	0.020319	0.011763	0.010924	0.007796	0.008873
26	0.308295	0.185606	0.128845	0.077761	0.057858	0.036379	0.020319	0.011763	0.011922	0.007796	0.008873
27	0.319549	0.194368	0.131962	0.080715	0.059296	0.036635	0.020319	0.011763	0.012975	0.007796	0.008873
28	0.325176	0.196558	0.134039	0.083668	0.061071	0.036892	0.020319	0.011763	0.013931	0.007796	0.008873
29	0.328927	0.194368	0.135424	0.086621	0.064622	0.037533	0.021368	0.012912	0.014537	0.007796	0.008873
30	0.330803	0.190091	0.136168	0.089575	0.068227	0.040481	0.025825	0.019809	0.015106	0.007796	0.008873
31	0.322070	0.187568	0.131286	0.093049	0.069540	0.043533	0.031397	0.022317	0.015955	0.007796	0.008873
32	0.313337	0.185045	0.125654	0.096523	0.070854	0.046585	0.039699	0.023571	0.018078	0.007796	0.008873
33	0.304605	0.182523	0.123777	0.099997	0.072167	0.049638	0.039754	0.023884	0.020201	0.008513	0.008873
34	0.295872	0.180000	0.126812	0.103470	0.073481	0.052690	0.041147	0.023963	0.022323	0.011216	0.008873
35	0.287140	0.177477	0.133047	0.105207	0.074794	0.055742	0.041993	0.023963	0.023738	0.015946	0.008508
36	0.286690	0.171821	0.138075	0.104196	0.077092	0.060321	0.041209	0.023963	0.024021	0.019585	0.008299
37	0.286241	0.166165	0.135561	0.101447	0.076326	0.064899	0.040425	0.023963	0.024163	0.020908	0.008091
38	0.285791	0.160509	0.130616	0.098699	0.075560	0.067189	0.039641	0.025293	0.024233	0.021664	0.007882
39	0.285342	0.154853	0.130202	0.095950	0.074219	0.067761	0.038857	0.034440	0.024269	0.021916	0.007673
40	0.284892	0.152025	0.129787	0.093202	0.069959	0.067904	0.038073	0.037085	0.025711	0.021664	0.007464
41	0.289068	0.152732	0.132358	0.094006	0.067933	0.064863	0.035133	0.037747	0.027438	0.021286	0.007534
42	0.293244	0.156266	0.134928	0.094810	0.066920	0.057260	0.033664	0.037747	0.029166	0.020625	0.007638
43	0.297420	0.159800	0.137499	0.095614	0.065907	0.053458	0.035133	0.037747	0.030893	0.018971	0.007795
44	0.301596	0.163334	0.140070	0.096418	0.064894	0.052983	0.038073	0.037747	0.032620	0.016781	0.008147
45	0.303684	0.166868	0.142640	0.086769	0.063881	0.052698	0.045610	0.037747	0.033484	0.015314	0.008659
46	0.297917	0.169216	0.142902	0.077120	0.064110	0.054366	0.053147	0.037747	0.032404	0.014047	0.008915
47	0.290062	0.171564	0.143164	0.073904	0.067541	0.055072	0.060684	0.037747	0.029166	0.014943	0.009043
48	0.282207	0.173912	0.143426	0.077120	0.070973	0.057785	0.064453	0.038438	0.027546	0.020435	0.009106
49	0.274352	0.176260	0.143687	0.092398	0.072689	0.059956	0.065709	0.042311	0.028356	0.022630	0.009170
50	0.266497	0.178609	0.143949	0.099585	0.072689	0.061041	0.065709	0.044893	0.032404	0.023728	0.009227
51	0.258643	0.178609	0.144211	0.106772	0.072689	0.061041	0.065709	0.045754	0.036452	0.023728	0.009227
52	0.250788	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.047475	0.037465	0.023728	0.009227
53	0.246860	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.048336	0.037754	0.023728	0.009227
54	0.246860	0.178609	0.144211	0.110366	0.072689	0.061041	0.065709	0.051133	0.037754	0.023728	0.009227

APPENDIX 17 (Cont'd)

Withdrawal Rates
for Active Members

Females

<u>Age</u>	<u>0 Years Of Service</u>	<u>1 Year of Service</u>	<u>2 Years of Service</u>	<u>3 Years of Service</u>	<u>4 Years of Service</u>	<u>5 Years of Service</u>	<u>6 Years of Service</u>	<u>7 Years of Service</u>	<u>8 Years of Service</u>	<u>9 Years of Service</u>	<u>10 or more Years of Service</u>
20	0.221624	0.111743	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
21	0.222584	0.102302	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
22	0.227539	0.100414	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
23	0.241991	0.107967	0.100290	0.059871	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
24	0.306350	0.130625	0.100290	0.059474	0.079156	0.057015	0.041279	0.030151	0.037037	0.022766	0.019527
25	0.332325	0.175943	0.102290	0.064680	0.042156	0.051015	0.040469	0.030151	0.037037	0.022766	0.019527
26	0.353217	0.189852	0.106684	0.072489	0.048382	0.047684	0.039012	0.030151	0.037037	0.022766	0.019527
27	0.360933	0.198520	0.127538	0.080297	0.051495	0.039255	0.037846	0.030151	0.037037	0.022766	0.019527
28	0.360817	0.202853	0.141441	0.088106	0.054608	0.042029	0.037458	0.030151	0.035810	0.022766	0.019527
29	0.354235	0.205020	0.141602	0.095915	0.057721	0.048963	0.039012	0.031232	0.032407	0.022766	0.019527
30	0.346747	0.202316	0.139988	0.099819	0.073286	0.053123	0.042120	0.033722	0.029005	0.022766	0.019527
31	0.343752	0.199612	0.136830	0.106115	0.076094	0.060404	0.051611	0.036984	0.029725	0.024035	0.019527
32	0.335848	0.195888	0.133673	0.109263	0.078901	0.067684	0.056356	0.040686	0.032607	0.026574	0.019527
33	0.327944	0.192164	0.130516	0.112411	0.081709	0.071845	0.058505	0.043387	0.035489	0.027589	0.019527
34	0.320040	0.188440	0.127358	0.113290	0.084516	0.072885	0.060654	0.045088	0.038371	0.030635	0.019527
35	0.312137	0.181656	0.124201	0.113729	0.087323	0.073130	0.061088	0.046793	0.039811	0.033681	0.018793
36	0.304496	0.174543	0.122312	0.110640	0.086076	0.070552	0.058894	0.048497	0.040833	0.035204	0.017327
37	0.296856	0.167429	0.120422	0.105598	0.084828	0.067974	0.056701	0.048838	0.040413	0.034443	0.015860
38	0.289215	0.160316	0.118533	0.100557	0.082956	0.065396	0.054507	0.049179	0.039994	0.033681	0.014393
39	0.281575	0.153202	0.116644	0.095515	0.080149	0.062819	0.052314	0.049213	0.039574	0.031777	0.012192
40	0.273935	0.146089	0.114754	0.092994	0.073750	0.060241	0.050120	0.049359	0.039155	0.030254	0.011459
41	0.269779	0.144793	0.111172	0.091252	0.074162	0.059860	0.048675	0.044929	0.037437	0.030242	0.011182
42	0.265623	0.143498	0.107590	0.092030	0.074575	0.059479	0.047230	0.040499	0.035718	0.030230	0.010905
43	0.261467	0.142203	0.104009	0.092809	0.074987	0.059098	0.045785	0.036070	0.034000	0.030218	0.010628
44	0.257311	0.140908	0.100427	0.093587	0.075400	0.058717	0.044339	0.035516	0.032282	0.030207	0.010351
45	0.253155	0.140260	0.098636	0.094366	0.075812	0.058336	0.043617	0.038284	0.030564	0.030195	0.010074
46	0.257124	0.142616	0.099349	0.095174	0.074383	0.058048	0.044604	0.038381	0.030284	0.029256	0.009941
47	0.267047	0.143794	0.101854	0.095983	0.072954	0.057761	0.046315	0.038478	0.030004	0.028317	0.009808
48	0.276970	0.147033	0.104358	0.096791	0.071525	0.057474	0.048025	0.038574	0.029724	0.027377	0.009675
49	0.286893	0.151626	0.106862	0.097600	0.070096	0.057187	0.049735	0.038671	0.029444	0.026438	0.009542
50	0.296815	0.154630	0.109367	0.098408	0.068667	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
51	0.299296	0.157633	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
52	0.299296	0.160636	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
53	0.299296	0.162138	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409
54	0.299296	0.162138	0.111871	0.098408	0.067238	0.056900	0.051446	0.038767	0.029164	0.025499	0.009409

APPENDIX 17 (Cont'd)

Service Retirement Rates
 For Tier 1 Members and Tier 2, 3, and 4 Members
 at Least Age 62 or with 30 Years of Service
 and Tier 5 Members at Least Age 62

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.306695	55	0.313992
56	0.280779	56	0.288116
57	0.252448	57	0.269473
58	0.259437	58	0.261016
59	0.286545	59	0.268785
60	0.311011	60	0.279410
61	0.320232	61	0.277166
62	0.270303	62	0.257157
63	0.229352	63	0.232947
64	0.206863	64	0.219224
65	0.209678	65	0.238272
66	0.217437	66	0.244523
67	0.216934	67	0.236791
68	0.208294	68	0.220367
69	0.187086	69	0.230935
70	0.163555	70	0.229295
71	0.146721	71	0.212056
72	0.169602	72	0.180451
73	0.167377	73	0.183107
74	0.164226	74	0.192125
75	0.133890	75	0.190633
76+	1.000000	76+	1.000000

APPENDIX 17 (Cont'd)

Service Retirement Rates
 For Tier 2, 3, and 4 Members Less Than Age 62
 and with Less Than 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.031965	55	0.034565
56	0.031782	56	0.035761
57	0.036262	57	0.041750
58	0.043899	58	0.046349
59	0.056398	59	0.060339
60	0.063578	60	0.070415
61	0.072217	61	0.082590

APPENDIX 17 (Cont'd)

Service Retirement Rates
 For Tier 5 Members Less Than Age 62
 and with Less Than 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.018131	57	0.020875
58	0.021950	58	0.023175
59	0.028199	59	0.030170
60	0.031789	60	0.035208
61	0.036109	61	0.041295

APPENDIX 17 (Cont'd)

Service Retirement Rates
 For Tier 5 Members Less Than Age 62
 and with 30 Years of Service

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.306695	57	0.313992
58	0.280779	58	0.288116
59	0.252448	59	0.269473
60	0.259437	60	0.261016
61	0.286545	61	0.268785

APPENDIX 17 (Cont'd)

Service Retirement Rates
For Tier 6 Members

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
55	0.015983	55	0.017283
56	0.015891	56	0.017881
57	0.018131	57	0.020875
58	0.021950	58	0.023175
59	0.028199	59	0.030170
60	0.031789	60	0.035208
61	0.036109	61	0.041295
62	0.039942	62	0.046683
63	0.306695	63	0.313992
64	0.280779	64	0.288116
65	0.252448	65	0.269473
66	0.259437	66	0.261016
67	0.286545	67	0.268785
68	0.311011	68	0.279410
69	0.320232	69	0.277166
70	0.270303	70	0.257157
71	0.229352	71	0.232947
72	0.206863	72	0.219224
73	0.209678	73	0.238272
74	0.217437	74	0.244523
75	0.216934	75	0.236791
76+	1.000000	76+	1.000000

APPENDIX 17 (Cont'd)

Mortality Base Rates for Service
and Deferred Annuitants and Beneficiaries

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
1	0.000410	1	0.000361
2	0.000277	2	0.000236
3	0.000230	3	0.000176
4	0.000179	4	0.000132
5	0.000157	5	0.000119
6	0.000141	6	0.000110
7	0.000124	7	0.000102
8	0.000105	8	0.000094
9	0.000085	9	0.000087
10	0.000072	10	0.000082
11	0.000076	11	0.000084
12	0.000113	12	0.000097
13	0.000149	13	0.000110
14	0.000183	14	0.000121
15	0.000218	15	0.000132
16	0.000253	16	0.000142
17	0.000290	17	0.000150
18	0.000256	18	0.000144
19	0.000288	19	0.000148
20	0.000317	20	0.000148
21	0.000351	21	0.000148
22	0.000381	22	0.000148
23	0.000397	23	0.000152
24	0.000403	24	0.000155
25	0.000378	25	0.000158
26	0.000361	26	0.000164
27	0.000351	27	0.000171
28	0.000347	28	0.000179
29	0.000348	29	0.000189
30	0.000353	30	0.000199

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for Service
and Deferred Annuitants and Beneficiaries
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
31	0.000361	31	0.000211
32	0.000372	32	0.000223
33	0.000384	33	0.000236
34	0.000397	34	0.000249
35	0.000408	35	0.000262
36	0.000418	36	0.000275
37	0.000430	37	0.000291
38	0.000445	38	0.000310
39	0.000464	39	0.000334
40	0.000490	40	0.000362
41	0.000524	41	0.000396
42	0.000566	42	0.000436
43	0.000619	43	0.000484
44	0.000684	44	0.000539
45	0.000760	45	0.000601
46	0.000849	46	0.000671
47	0.000949	47	0.000747
48	0.001060	48	0.000829
49	0.001183	49	0.000916
50	0.001316	50	0.001008
51	0.001461	51	0.001104
52	0.001618	52	0.001203
53	0.001951	53	0.001419
54	0.002311	54	0.001645
55	0.002522	55	0.001805
56	0.002753	56	0.001980
57	0.003004	57	0.002172
58	0.003279	58	0.002382
59	0.003579	59	0.002613
60	0.003906	60	0.002866

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for Service
and Deferred Annuitants and Beneficiaries
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
61	0.004264	61	0.003053
62	0.004654	62	0.003298
63	0.005050	63	0.003604
64	0.005564	64	0.003976
65	0.006204	65	0.004417
66	0.006976	66	0.004931
67	0.007886	67	0.005524
68	0.008942	68	0.006203
69	0.010151	69	0.006979
70	0.011524	70	0.007864
71	0.013074	71	0.008874
72	0.014821	72	0.010029
73	0.016788	73	0.011349
74	0.019009	74	0.012863
75	0.021524	75	0.014602
76	0.024380	76	0.016603
77	0.027633	77	0.018909
78	0.031346	78	0.021567
79	0.035590	79	0.024631
80	0.040445	80	0.028162
81	0.045997	81	0.032228
82	0.052342	82	0.036904
83	0.059585	83	0.042268
84	0.067844	84	0.048410
85	0.077246	85	0.055421
86	0.087929	86	0.063404
87	0.100040	87	0.072465
88	0.113741	88	0.082724
89	0.129208	89	0.094308
90	0.141713	90	0.107360

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for Service
and Deferred Annuitants and Beneficiaries
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
91	0.158130	91	0.122037
92	0.175288	92	0.138518
93	0.193131	93	0.157000
94	0.211674	94	0.177701
95	0.230976	95	0.191477
96	0.251106	96	0.210235
97	0.272113	97	0.229998
98	0.293848	98	0.250723
99	0.313988	99	0.270858
100	0.334365	100	0.291040
101	0.354599	101	0.311444
102	0.374524	102	0.331900
103	0.393982	103	0.352232
104	0.412831	104	0.372273
105	0.430946	105	0.391860
106	0.448227	106	0.410849
107	0.464592	107	0.429112
108	0.479987	108	0.446544
109	0.494376	109	0.463061
110	0.500000	110	0.478604

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for
Disabled Annuitants

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
30	0.180013	30	0.106487
31	0.180013	31	0.106487
32	0.180013	32	0.106487
33	0.180013	33	0.103280
34	0.173269	34	0.100083
35	0.166522	35	0.096905
36	0.159773	36	0.093763
37	0.153024	37	0.090676
38	0.146284	38	0.087665
39	0.139576	39	0.084746
40	0.132936	40	0.081925
41	0.126401	41	0.079198
42	0.120012	42	0.076550
43	0.113802	43	0.073965
44	0.107801	44	0.071430
45	0.102029	45	0.068936
46	0.096503	46	0.066480
47	0.091236	47	0.064061
48	0.086231	48	0.061677
49	0.081479	49	0.059314
50	0.076958	50	0.056949
51	0.072640	51	0.054543
52	0.068494	52	0.052046
53	0.064498	53	0.049422
54	0.060638	54	0.046664
55	0.056938	55	0.043813
56	0.053442	56	0.040949
57	0.050216	57	0.038174
58	0.047308	58	0.035582
59	0.044759	59	0.033251

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for
Disabled Annuitants
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
60	0.042595	60	0.031256
61	0.040829	61	0.029665
62	0.039455	62	0.028522
63	0.038461	63	0.027851
64	0.037830	64	0.027664
65	0.037550	65	0.027957
66	0.037620	66	0.028701
67	0.038040	67	0.029851
68	0.038798	68	0.031348
69	0.039890	69	0.033140
70	0.041328	70	0.035196
71	0.043137	71	0.037505
72	0.045337	72	0.040079
73	0.047925	73	0.042938
74	0.050890	74	0.046105
75	0.054216	75	0.049628
76	0.057882	76	0.053557
77	0.061871	77	0.057934
78	0.066162	78	0.062794
79	0.070742	79	0.068155
80	0.075602	80	0.074002
81	0.080733	81	0.080289
82	0.086134	82	0.086960
83	0.087929	83	0.093972
84	0.100040	84	0.101322
85	0.113741	85	0.109018
86	0.129208	86	0.117066
87	0.141713	87	0.122037
88	0.158130	88	0.138518
89	0.175288	89	0.157000

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Mortality Base Rates for
Disabled Annuitants
(cont'd)

<u>Males</u>		<u>Females</u>	
<u>Age</u>	<u>Rate</u>	<u>Age</u>	<u>Rate</u>
90	0.193131	90	0.177701
91	0.211674	91	0.191477
92	0.230976	92	0.210235
93	0.251106	93	0.229998
94	0.272113	94	0.250723
95	0.293848	95	0.270858
96	0.313988	96	0.291040
97	0.334365	97	0.311444
98	0.354599	98	0.331900
99	0.374524	99	0.352232
100	0.393982	100	0.372273
101	0.412831	101	0.391860
102	0.430946	102	0.410849
103	0.448227	103	0.429112
104	0.464592	104	0.446544
105	0.479987	105	0.463061
106	0.494376	106	0.478604
107	0.500000	107	0.478604
108	0.500000	108	0.478604
109	0.500000	109	0.478604
110	0.500000	110	0.478604

Society of Actuaries Mortality Improvement Scale MP-2014 will be applied on a generational basis to base table rates.

APPENDIX 17 (Cont'd)

Salary Scale

<u>Duration</u>	<u>Rate</u>	<u>Duration</u>	<u>Rate</u>
1	1.1000	21	1.0272
2	1.0700	22	1.0263
3	1.0606	23	1.0254
4	1.0522	24	1.0245
5	1.0472	25	1.0237
6	1.0445	26	1.0229
7	1.0431	27	1.0222
8	1.0422	28	1.0215
9	1.0415	29	1.0210
10	1.0407	30	1.0206
11	1.0398	31	1.0202
12	1.0387	32	1.0200
13	1.0375	33	1.0195
14	1.0361	34	1.0193
15	1.0346	35	1.0190
16	1.0331	36	1.0186
17	1.0317	37	1.0180
18	1.0304	38	1.0176
19	1.0293	39	1.0176
20	1.0282		

Valuation Rate of Interest Assumption

The interest rate for valuation purposes is a level 7.25%. This valuation rate of interest is made up of a 2.25%¹ annual rate of inflation and a 5.0% real rate of return.

The valuation rate of interest assumption represents our best estimate of the anticipated annual rate of return on plan assets over a very long-term horizon.

The valuation rate of interest assumption is developed based upon the Retirement System's specific asset allocation, and capital market assumptions, based upon recommendations from AON Hewitt, the System's investment consultant. Using expected returns and standard deviations for each asset class, and including anticipated correlation between the classes, a long-term anticipated rate of return is developed. Based on their 1st quarter 2018 capital market return assumptions, AON Hewitt has estimated the geometric annual rate of return to be 6.6%, and the arithmetic annual rate of return to be 7.2%, given the System's asset allocation. This analysis is performed annually, and intended to be over a 30-year time horizon.

For a complete explanation of the rationale behind the System's valuation rate of interest assumption, please see pages 28 through 33 of the "*Report on the 2015 Recommended Actuarial Assumptions*" and a memo from R. Young dated October 26, 2017.

Projected COLA Assumption

The annual percentage for estimating future COLA benefit payments is 1.5%.²

IRC Section 415(b) and 401(a)(17)

For purposes of the normal rate, the limitations under IRC Section 415(b) were not reflected due to immateriality. The IRC Section 401(a)(17) limit for the fiscal year ending June 30, 2017 was reflected for members with a membership date on or after July 1, 1996.

¹ The average annual rate of increase in the Consumer Price Index (CPI) for 1925 – 2017 was 2.92%.

² The COLA percentage is one-half of the increase in the CPI with a floor of 1.0% and a cap of 3.0%. Therefore the estimate of inflation for the COLA benefit is the result of analyzing available CPI data with percentages bounded between 2.0% and 6.0%, and reduced by 50%.

SUMMARY OF BENEFIT PROVISIONS

1. Membership

Membership is mandatory for all full-time New York State public school teachers, outside New York City, except those employed under the Comprehensive Employment and Training Act (CETA). Membership is optional for teachers employed on other than a full-time basis and for certain employees of the State University of New York, community colleges, and the State Education Department. Generally, the membership of any person credited with less than 5 years of service will terminate when seven years have elapsed since (s)he last rendered at least 20 days of credited service in a school year.

Tiers are determined by a member's most recent date of membership in the Retirement System as follows:

Tier 1:	Membership prior to 7/1/1973;
Tier 2:	Membership 7/1/1973 – 7/26/1976;
Tier 3:	Membership 7/27/1976 – 8/31/1983;
Tier 4:	Membership 9/1/1983 – 12/31/2009;
Tier 5:	Membership 1/1/2010 – 3/31/2012;
Tier 6:	Membership on or after 4/1/2012.

Tier 3 members are entitled to receive the benefits of either Tier 3 or Tier 4, however, they may not mix the provisions of the two tiers. For valuation purposes, Tier 3 members are assumed to receive the Tier 4 benefit at retirement, as that is generally always the larger benefit.

2. Service Retirement

The service retirement benefits are payable for life generally as follows:

Tier 1:

Non-Contributory Plan

For Tier 1 members with a date of membership prior to July 1, 1970 the benefit is generally calculated as:

For New York State service prior to 7/1/1959 and all out-of-state service:

1/100th of final average salary (FAS) per year for each of the first 25 years of service, plus 1/120th of FAS per year for each of the next 10 years of service, plus 1/140th of FAS per year for each year of NYS service in excess of 35, *plus*

For New York State service subsequent to 7/1/1959:

1/50th of final average salary (FAS) per year for each of the first 25 years of NYS service, plus 1/60th of FAS per year for each of the next 10 years of NYS service, plus 1/70th of FAS per year for each year of NYS service in excess of 35.

APPENDIX 18 (Cont'd)

Non-Contributory Plan members generally may retire at:

- Age 55 with 20 years of total service or
- Any age with 35 years of total service.

Career Plan

If 20 or more years of NYS service: 2% of final average salary (FAS) per year of NYS service after July 1, 1959, plus 1.8% of FAS per year of NYS service prior to that date, plus 1% of FAS per year of out-of-state service. Out-of-state service is allowed only up to a maximum of 10 years, and only to the extent that it does not raise the total service credit to greater than 35 years. The maximum pension permitted is 75% of FAS.

If less than 20 years of NYS service, the above formula is used except the benefit is reduced by 5% for each year of service less than 20, subject to a maximum reduction of 50%.

Career Plan members generally may retire at:

- Age 55 with 2 years of NYS service or
- Any age with 35 years of total service.

The provisions of Article 19 of the Retirement and Social Security Law, effective July 11, 2000, provides to eligible Tier 1 and 2 members additional service credit of one-twelfth of a year of service for each year of retirement credit as of the date of retirement or death, up to a maximum of two additional years. The maximum pension, as a result of Article 19, can be 79% of FAS.

Tier 2: Computed under the Tier 1 Career Plan formula, but may be reduced for early retirement, as noted below.

Tier 2 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by 6% for each of the first 2 years under age 62 and 3% for each of the next 5 years.

Tier 3: $1\frac{2}{3}\%$ of FAS per year of NYS service (if less than 20 years) or 2% of FAS per year of NYS service (if 20 to 30 years). There is no additional benefit for more than 30 years of service. At age 62 the benefit is reduced by 50% of the primary Social Security benefit accrued while in NYS public employment. A member may be eligible for automatic cost-of-living adjustments.

Tier 3 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by $\frac{1}{15}$ th for each of the first 2 years under age 62 and $\frac{1}{30}$ th for each of the next 5 years.

APPENDIX 18 (Cont'd)

Tier 4: $1\frac{2}{3}\%$ of FAS per year of NYS service (if less than 20 years), or 2% of FAS per year of NYS service (if 20 to 30 years), plus $1\frac{1}{2}\%$ of FAS per year of NYS service in excess of 30 years.

Tier 4 members generally may retire at:

- Age 62 with 5 years of service,
- Age 55 with 30 years of service, or
- Age 55 with 5 years of service, with benefit reduced by 6% for each of the first 2 years under age 62 and 3% for each of the next 5 years.

Tier 5: $1\frac{2}{3}\%$ of FAS per year of NYS service (if less than 25 years), or 2% of FAS per year of NYS service (if 25 to 30 years), plus $1\frac{1}{2}\%$ of FAS per year of NYS service in excess of 30 years.

Tier 5 members generally may retire at:

- Age 62 with 10 years of service,
- Age 57 with 30 years of service, or
- Age 55 with 10 years of service, with benefit reduced by $6\frac{2}{3}\%$ for each of the first 2 years under age 62 and 5% for each of the next 5 years.

Tier 6: $1\frac{2}{3}\%$ of FAS per year of NYS service (if less than 20 years), 1.75% of FAS per year of NYS service (if credited with 20 years) or 35% plus 2% per year of NYS service in excess of 20 years (if beyond 20 years).

Tier 6 members generally may retire at:

- Age 63 with 10 years of service,
- Age 55 with 10 years of service, with benefit reduced by 6.5% for each year under age 63.

3. Disability Retirement

Generally a member with at least 10 years of service may qualify for a disability retirement benefit of the smaller of 1) $1\frac{2}{3}\%$ of FAS per year of projected service to age 60 or 2) $\frac{1}{3}$ of FAS; but the benefit shall not be less than $1\frac{2}{3}\%$ of FAS per year of completed service.

4. Death Benefits

a) Active Service

The Tier 1 death benefit is generally equal to the greater of 1) 3 times annual salary after 36 years of service (proportionately reduced for less than 36 years) or 2) for members who are at least age 55 with 20 years of service, the pension reserve calculated under a prior, lower service retirement formula.

APPENDIX 18 (Cont'd)

The death benefit for Tier 2, 3, 4, 5 and 6 members is generally equal to one of the following two options based on the member's election at entry: 1) 3 times annual salary after 3 years of service (proportionately reduced for service under 3 years) or 2) the greater of (1) above or the Tier 1 death benefit.

b) Not in Active Service

The death benefit for members of all tiers with at least ten years of service credit who die when not in active service is equal to one-half the active member death benefit.

5. Deferred Retirement

Tiers 1-4:

A member with at least 5 years of credited service who ceases teaching has a vested right to receive a deferred service retirement benefit. A member with at least five, but less than ten years of service credit, has the choice of receiving a refund of their member contributions with interest or a deferred service retirement benefit. A member with ten or more years of service credit will receive the deferred service retirement benefit.

Tiers 5 and 6:

A member with at least 10 years of credited service who ceases teaching has a vested right to receive a deferred service retirement benefit. Members with less than 10 years of credited service who cease teaching may receive a refund of their member contributions with interest.

6. Member Contributions

Certain Tier 1 and 2 members may elect to contribute in order to receive an additional benefit upon retirement. Tier 3 and 4 members are required to contribute 3% of pay to fund a portion of their benefit. Effective October 1, 2000, such contributions cease upon the attainment of the earlier of 10 years of service credit or 10 years of membership. Tier 5 members are required to contribute 3.5% of their salary throughout their active membership.

Tier 6 members are required to contribute throughout their active membership. From 4/1/2012 through 3/31/2013, all Tier 6 members were required to contribute 3.5%. Beginning 4/1/2013 members are required to contribute in accordance with the following schedule:

<u>Salary</u>	<u>Contribution Rate</u>
\$45,000 and less	3.00%
More than \$45,000 to \$55,000	3.50%
More than \$55,000 to \$75,000	4.50%
More than \$75,000 to \$100,000	5.75%
More than \$100,000 to \$179,000 (the limit currently equal to the NYS governor's salary)	6.00%

APPENDIX 18 (Cont'd)

For purposes of administration, a Tier 6 member's contribution rate in any given year is based on regular compensation earned two years prior. During the member's first three years of membership, he/she will contribute a percentage based on a salary projection provided by the employer.

7. Cost-of-Living Adjustment (COLA)

A permanent, annually-adjusted cost-of-living benefit is provided to both current and future retired members. This benefit was first paid commencing September 2001, and is increased every September thereafter, to retired members who meet one of the following eligibility criteria:

- Age 62 and retired for 5 years,
- Age 55 and retired for 10 years, or
- Retired for 5 years under a disability retirement.

The annual COLA percentage is equal to 50% of the increase in the annual CPI; not to exceed 3% nor be lower than 1%. It is applied to the first \$18,000 of annual benefit. Additionally, commencing September 2000, members retired before 1997 are eligible for a "Catch-Up" supplemental benefit upon satisfaction of the above eligibility criteria.