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GASB STATEMENTS NO. 67 AND 68 REPORTS

FOR THE

TEACHERS RETIREMENT ASSOCIATION

OF MINNESOTA

FOR ACCOUNTING PURPOSES

MEASUREMENT DATE: JUNE 30, 2017





Cavanaugh Macdonald

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December 1, 2017

Mr. Jay Stoffel
Ms. Laurie Hacking
Teachers Retirement Association of Minnesota
60 Empire Drive, Suite 400
St. Paul, MN 55103

Dear Mr. Stoffel and Ms. Hacking:

This report has been prepared to assist the Teachers Retirement Association of Minnesota (TRA) in meeting the requirements of the Governmental Accounting Standards Board Statement No. 67 (GASB 67) for the June 30, 2017 Measurement Date. The calculations in this report have been made on a basis that is consistent with our understanding of this accounting standard. Please note that the discount rate used to determine the Total Pension Liability (TPL) changed from 4.66% at the Prior Measurement Date to 5.12% at the current Measurement Date.

The annual funding actuarial valuation used as the basis for much of the information presented in this report was performed as of July 1, 2017, although the TPL was determined using a discount rate of 5.12%. The funding valuation was based upon data, furnished by the TRA staff, concerning active, inactive and retired members along with pertinent financial information. This information was reviewed for completeness and internal consistency, but was not audited by us. The valuation results depend on the integrity of the data. If any of the information is inaccurate or incomplete our results may be different and our calculations may need to be revised. Please see the actuarial valuation for additional details on the funding requirements for TRA including the actuarial assumptions and methods and the System's funding policy.

To the best of our knowledge, the information contained in this report is complete and accurate. The calculations were performed by, and under the supervision of, independent qualified actuaries with experience in performing valuations for public retirement systems. In addition, the valuation was prepared in accordance with generally accepted actuarial principles and practices, as well as in conformity with applicable Actuarial Standards of Practice, issued by the Actuarial Standards Board. The calculations are based on the current provisions of TRA and on actuarial assumptions that are internally consistent and individually reasonable based on the actual experience of TRA.



Mr. Jay Stoffel
Ms. Laurie Hacking
December 1, 2017
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The calculation of the liability associated with the benefits described in this report was performed for the purpose of providing reporting and disclosure information that satisfies the requirements of GASB 67 for accounting valuation purposes and may not be appropriate for funding purposes or other types of analysis. Calculations for purposes other than satisfying the requirements of GASB 67 may produce significantly different results. Future actuarial results may differ significantly from the current results presented in this report due to such factors as changes in plan experience or changes in economic or demographic assumptions.

We, Patrice A. Beckham, FSA and Brent A. Banister, FSA, are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in this report or to provide explanations or further details as may be appropriate.

Respectfully submitted,

A handwritten signature in blue ink that reads 'Patrice Beckham'.

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Brent A. Banister'.

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Actuary



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REPORT OF THE ANNUAL GASB STATEMENT NO. 67

TEACHERS RETIREMENT ASSOCIATION OF MINNESOTA

SUMMARY OF PRINCIPAL RESULTS
(\$ IN THOUSANDS)

Valuation Date (VD):	July 1, 2017
Prior Measurement Date:	June 30, 2016
Measurement Date (MD):	June 30, 2017
Membership Data:	
Retirees and Beneficiaries	64,774
Inactive Vested Members	14,030
Inactive Nonvested Members	33,344
Active Employees	<u>81,811</u>
Total	193,959
Single Equivalent Interest Rate (SEIR):	
Long-Term Expected Rate of Return	7.50%
Municipal Bond Index Rate at Prior Measurement Date	3.01%
Municipal Bond Index Rate at Measurement Date	3.56%
Year in which Fiduciary Net Position is Projected to be Depleted	2053
Single Equivalent Interest Rate at Prior Measurement Date	4.66%
Single Equivalent Interest Rate at Measurement Date	5.12%
Net Pension Liability:	
Total Pension Liability (TPL)	\$41,219,904
Fiduciary Net Position (FNP)	<u>21,258,090</u>
Net Pension Liability (NPL = TPL – FNP)	\$19,961,814
FNP as a percentage of TPL	51.57%



INTRODUCTION

The Governmental Accounting Standards Board issued Statement No. 67 (GASB 67), *Financial Reporting for Pension Plans*, in June 2012. The effective date for reporting under GASB 67 for the Teachers Retirement Association of Minnesota (System) was the fiscal year ending June 30, 2014. Based on the provisions of GASB 67, the Teachers Retirement Association of Minnesota is a cost-sharing multiple employer defined benefit pension plan.

This report, prepared as of June 30, 2017 (the Measurement Date), presents information to assist the Teachers Retirement Association of Minnesota in meeting the requirements of GASB 67. Much of the material provided in this report is based on the data, assumptions and results of the annual funding actuarial valuation of the System performed as of July 1, 2017 (the Valuation Date). The results of that valuation were detailed in a separate report dated November 29, 2017.

GASB 67 discloses the Total Pension Liability (TPL) utilizing the Entry Age Normal actuarial cost method. The Net Pension Liability (NPL) is equal to the TPL minus the System's Fiduciary Net Position (FNP) (basically the fair (market) value of assets). The benefit provisions recognized in the calculation of the TPL are summarized in Appendix B.

Among the items needed for the liability calculation is the discount rate, or Single Equivalent Interest Rate (SEIR), as described by GASB 67. To determine the SEIR, the FNP must be projected, using GASB 67 guidelines, into the future for as long as there are anticipated benefits payable under the plan's provisions applicable to the members and beneficiaries of the System on the Measurement Date. If the FNP is not projected to be depleted at any point in the future, the long-term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR. In 2017, the TRA Board commissioned Cavanaugh Macdonald to perform a review of the economic assumptions used in the valuation process. The findings and recommendations of that report were provided to the Board at their November 2017 meeting and included a long-term rate of return on plan assets of 7.50%. This is a change from the 8.00% long-term rate of return used for the prior Measurement Date.

If, however, the FNP is projected to be depleted at a future measurement date, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long-term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate. The rate used, if necessary, for this purpose is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate (formerly published monthly by the Board of Governors of the Federal Reserve System).



Our calculations indicate that the FNP is projected to be depleted in the year 2053, so the Municipal Bond Index Rate is used in the determination of the SEIR for the June 30, 2017 TPL. Our calculations as of the Prior Measurement Date indicated that the FNP was projected to be depleted in the year 2052, so the Municipal Bond Index Rate was used in the determination of the SEIR for the June 30, 2016 TPL. The SEIR as of the Measurement Date is 5.12% while it was 4.66% at the Prior Measurement Date. Please see Paragraph 31.b.(1) for more explanation of the development of the SEIR. The decrease in the TPL from the change in the SEIR from 4.66% to 5.12% is \$2.773 billion.

There were other changes to the actuarial assumptions that are reflected in the TPL at June 30, 2017. The assumptions for the combined service annuity load were modified based on analysis performed by the actuary retained by the Legislative Commission on Pensions and Retirement. This change resulted in a small decrease in the TPL. As discussed earlier, the TRA Board commissioned Cavanaugh Macdonald to perform a review of the economic assumptions used in the valuation. The recommended set of economic assumptions in that report represent our best estimate for the assumptions to be used to measure the System's obligations. Therefore, the recommended changes to the economic assumptions in that experience study were used to determine the TPL at the current Measurement Date. The impact of these assumption changes, based on the 4.66% SEIR at the prior Measurement Date, was a decrease in the TPL of \$583 million.

The FNP projections are based upon the Teachers Retirement Association of Minnesota's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the fund will actually run out of money, the financial condition of the System, or the System's ability to make benefit payments in future years.

The sections that follow provide the results of all the necessary calculations, presented in the order laid out in GASB 67 for note disclosure and Required Supplementary Information (RSI).



SECTION I – NOTES TO FINANCIAL STATEMENTS

The material presented herein will follow the order presented in GASB 67. Paragraph numbers are provided for ease of reference.

Paragraphs 30.a. (1)-(3): This information will be supplied by the System.

Paragraph 30.a. (4): The data required regarding the membership of the System were furnished by the System. The following table summarizes the membership of the System as of July 1, 2017, the date of the valuation used to determine the June 30, 2017 Total Pension Liability.

Membership

Number as of July 1, 2017	
Retirees Or Their Beneficiaries Currently Receiving Benefits	64,774
Inactive Members Entitled To But Not Yet Receiving Benefits	14,030
Inactive Nonvested Members	33,344
Active Members	81,811
Total	193,959

Paragraphs 30.a. (5)-(6) and Paragraphs 30.b.-f.: This information will be supplied by the System.

Paragraph 31.a. (1)-(4): As stated earlier, the NPL is equal to the TPL minus the FNP. That result, as of June 30, 2017, is presented in the following table.

(\$ in Thousands)	
Total Pension Liability	\$ 41,219,904
Fiduciary Net Position	<u>21,258,090</u>
Net Pension Liability	\$ 19,961,814
Ratio of Fiduciary Net Position to Total Pension Liability	51.57%



Paragraph 31.b.: This paragraph requires information to be disclosed regarding the actuarial assumptions and other inputs used to measure the TPL. The complete set of actuarial assumptions and other inputs utilized in developing the TPL are outlined in Appendix C. Please note that the actuarial assumptions used in this report changed from those used in the prior GASB 67 report. The SEIR at the June 30, 2017 Measurement Date is 5.12% compared to 4.66% at the prior Measurement Date of June 30, 2016.

The TPL as of June 30, 2017 was determined based on an actuarial valuation prepared as of July 1, 2017, using the following key actuarial assumptions and other inputs:

Price inflation	2.50 percent
Salary increases, including price inflation	2.85 to 8.85 percent for 10 years and 3.25 to 9.25 percent, thereafter
Wage growth rate	2.85 percent for 10 years and 3.25 percent, thereafter
Payroll growth rate	3.00 percent
Long-term rate of return, net of investment expense, including price inflation	7.50 percent
Municipal Bond Index Rate	
Prior Measurement Date	3.01 percent
Measurement Date	3.56 percent
Year FNP is projected to be depleted	2053
Single Equivalent Interest Rate, net of investment expense, including price inflation	
Prior Measurement Date	4.66 percent
Measurement Date	5.12 percent
Cost of Living Adjustment	Once the funded ratio reaches 90% on a fair (market) value basis for two consecutive years, the COLA is scheduled by statute to increase from 2.0% to 2.5%. Based on modeling of future valuation results assuming all assumptions are met in the future, the funded ratio is not projected to reach 90% within the 50-year projection period, so the COLA is not assumed to increase to 2.5%.



Mortality

Pre-retirement mortality rates were based on the RP-2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.

Post-retirement mortality rates were based on the RP-2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.

Post-disability mortality rates were based on the RP-2014 disabled retiree mortality table, without adjustment.

The actuarial assumptions used in the July 1, 2017 actuarial funding valuation are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the TRA Board of Trustees. Many of these assumptions are based on an experience study report, dated June 5, 2015, that covered the six-year period beginning July 1, 2008 and ending June 30, 2014. The TRA Board commissioned a review of the economic assumptions used in the actuarial valuation and the findings and recommendations were provided to the Board at their November 2017 meeting. Those recommendations are reflected in the TPL at the current Measurement Date.

Paragraph 31.b.(1)

(a) Discount rate (SEIR): The discount rate used to measure the TPL as of the Measurement Date was 5.12%. The projection of cash flows used to determine the discount rate was performed in accordance with GASB 67. On that basis, the System's FNP was projected to be depleted in 2053 and, as a result, the Municipal Bond Index Rate was used in the determination of the SEIR. The long-term expected rate of return of 7.50% on plan investments was applied to periods before 2053 and the Municipal Bond Index Rate of 3.56% was applied to periods on and after 2053, resulting in a SEIR of 5.12%. There was a change in the Municipal Bond Index Rate from the Prior Measurement Date (3.01%).

(b) Projected cash flows: The projection of cash flows used to determine the discount rate assumed that plan contributions from members and employers will be made at the current contribution rates as set out in state statute and supplemental aid will be received as currently provided in statute:

- a. Employee contribution rates: 11.00% for Basic members and 7.50% for Coordinated members.



- b. Employer contribution rates: 11.50% for Basic members and 7.50% for Coordinated members. In addition, a supplemental amount equal to 3.64% of Salary for Special School District #1 members until the System is fully funded.
- c. Supplemental aid: \$3,256,410 every year until the amortization date of July 1, 2039, plus \$32,331,000 every year until the System is fully funded.
- d. The TRA Board has legislative authority to increase contribution rates at their discretion, subject to review by the Legislative Commission on Pensions and Retirement (referred to as the “contribution stabilizer”). Given that there is no past history or formal Board policy relating to the use of the contribution stabilizer option, no change in either the employee or employer contributions were considered in the projections. If future contribution rates were assumed to increase it would likely impact the determination of the SEIR.
- e. Administrative expenses in the prior year were projected forward with price inflation as an estimate for administrative expenses in current and future years. The portion of expenses in future years allocated to the current members was based on the proportionate share of covered payroll in each year for the remainder of the existing members to the total covered payroll for all members.

The FNP projections are based upon the System’s financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 67. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing System basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the fund will actually run out of money, the financial condition of the System, or the System’s ability to make benefit payments in future years.

- (c) **Long-term rate of return:** The long-term expected rate of return on pension plan investments is reviewed regularly as part of the experience study. An experience study of the economic assumptions was prepared in 2017 that resulted in a recommendation to reduce the long-term rate of return to 7.50%. Generally, several factors are considered in evaluating the long-term rate of return assumption including long-term historical data, estimates inherent in current market data, and an analysis in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expense and inflation) were developed using assumptions for each major asset class, as well as estimates of variability and correlations, provided by the System’s investment consultant (the State Board of Investment). These ranges were combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and then adding expected inflation. The assumption is intended to be a long-term assumption (30 to 50 years) and is not expected to change absent a significant change in the asset allocation, a change in



the inflation assumption, or a fundamental change in the market that alters expected returns in future years.

- (d) **Municipal bond rate:** the SEIR (discount rate) determination uses the Municipal Bond Index Rate. The rate used is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate, formerly published monthly by the Board of Governors of the Federal Reserve System. The rate was 3.01% on the Prior Measurement Date and 3.56% on the Measurement Date.
- (e) **Periods of projected benefit payments:** Projected future benefit payments for all current plan members were projected through 2116.
- (f) **Assumed asset allocation:** The target asset allocation and best estimates of geometric real rates of return for each major asset class, as provided by the Minnesota State Board of Investment (SBI), are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return*
Domestic Equities	39%	5.10%
International Equities	19%	5.00%
Domestic Bonds	20%	0.75%
Private Markets	20%	5.90%
Cash	<u>2%</u>	0.00%
Total	100%	

*Geometric mean



(g) **Sensitivity analysis:** This paragraph requires disclosure of the sensitivity of the NPL to changes in the discount rate. The following presents the NPL of the System, calculated using the discount rate of 5.12 percent, as well as the System's NPL calculated using a discount rate that is 1-percentage-point lower (4.12 percent) or 1-percentage-point higher (6.12 percent) than the current rate:

(\$ in Thousands)	1% Decrease (4.12%)	Current Discount Rate (5.12%)	1% Increase (6.12%)
Net Pension Liability	\$26,345,748	\$19,961,814	\$14,759,381

Paragraph 31.c.: The TPL at June 30, 2017 is based upon an actuarial valuation prepared as of July 1, 2017.



SECTION II – REQUIRED SUPPLEMENTARY INFORMATION

There are several tables of Required Supplementary Information (RSI) that need to be included in the System's financial statements:

Paragraphs 32.a.-c.: The required tables of schedules are provided in Appendix A.

Paragraph 32.d.: The money-weighted rates of return will be supplied by the System.

Paragraph 34: The following information should be noted regarding the RSI, particularly for the *Schedule of Employer Contributions*. The required table for paragraphs 32.a.-b. uses assumptions specifically for developing the GASB TPL. The required table for paragraph 32.c. uses the same assumptions as the actuarial funding valuation. When the GASB valuation assumptions differ from the funding valuation assumptions, those differences are noted below.

Changes of benefit and funding terms: The following changes were made by the Minnesota Legislature and reflected in the valuation performed as of July 1 listed below:

- 2015: The Duluth Teachers Retirement Fund Association was merged into TRA on June 30, 2015. This also resulted in an additional state-provided contribution stream of \$14.377 million until the System becomes fully funded.
- 2014: The increase in the post-retirement benefit adjustment (COLA) is to be made once the System is 90% funded (on a market value basis) in two consecutive years, rather than just one year.
- 2013: The early retirement factors applicable to plan members were changed.
- 2010: The post-retirement benefit increases were suspended for 2011 and 2012, resuming in 2013 at 2.0%, and returning to 2.5% once the funding ratio of the plan reaches 90%. Also in 2010, changes were made to the interest rate credited on employee contributions, future increases on deferred vested benefits, and the requirement to receive a full post-retirement benefit adjustment. In addition, employee and employer contribution rates were increased 0.50% per year beginning July 1, 2011 through July 1, 2014. The legislation also created the "stabilizer" whereby the Board was also granted the authority to adjust contribution rates under certain conditions.



Changes in actuarial assumptions:

7/1/2017 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2045.
- Adjustments were made to the combined service annuity loads. The active load was reduced from 1.4% to 0.0%, the vested inactive load increased from 4.0% to 7.0% and the non-vested inactive load increased from 4.0% to 9.0%.

For GASB valuation:

- The investment return assumption was changed from 8.00% to 7.50%.
- The COLA was not assumed to increase to 2.5%, but remain at 2.0% for all future years.
- The price inflation assumption was lowered from 2.75% to 2.50%.
- The payroll growth assumption was lowered from 3.50% to 3.00%.
- The general wage growth assumption was lowered from 3.50% to 2.85% for 10 years followed by 3.25%, thereafter.
- The salary increase assumption was adjusted to reflect the changes in the general wage growth assumption.

7/1/2016 valuation:

- The Cost of Living Adjustment was not assumed to increase (it remained at 2% for all future years).
- The price inflation assumption was lowered from 3.00% to 2.75%.
- The general wage growth and payroll growth assumptions were lowered from 3.75% to 3.50%.
- Minor changes at some durations for the merit scale of the salary increase assumption.
- The pre-retirement mortality assumption was changed to the RP-2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
- The post-retirement mortality assumption was changed to the RP-2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.
- The post-disability mortality assumption was changed to the RP-2014 disabled retiree mortality table, without adjustment.



- Separate retirement assumptions for members hired before or after July 1, 1989 were created to better reflect each group's behavior in light of different requirements for retirement eligibility.
- Assumed termination rates were changed to be based solely on years of service in order to better fit the observed experience.
- A minor adjustment and simplification of the assumption regarding the election of optional forms of payment at retirement were made.

7/1/2015 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2037

For GASB valuation:

- The COLA was not assumed to increase to 2.5%, but remain at 2.0% for all future years.
- The investment return assumption was changed from 8.25% to 8.00%.

7/1/2014 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually once the legally specified criteria was met. This was estimated to occur July 1, 2031.

For GASB valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2034.

7/1/2012 valuation:

- The investment return assumption was changed from 8.50% for all years to 8.00% for the next five years and 8.50% thereafter. This applies to funding calculations only.

7/1/2011 valuation:

- The salary increase assumption was changed to a service based assumption.
- The payroll growth assumption was decreased from 4.00% to 3.75%.
- The post-retirement mortality assumption was changed to the RP-2000 Mortality Tables, with white collar adjustments and male rates setback 2 years and female rates setback 3 years.
- The disabled mortality assumption was changed to the RP-2000 Disabled Retiree Mortality Tables.



- Assumed disability rates were changed to more closely reflect actual experience.
- Assumed retirement rates for Coordinated members were changed to more closely reflect actual experience.
- Assumed form of annuity election were changed to more closely reflect actual experience.
- Assumed difference in ages between spouses were changed to more closely reflect actual experience.

7/1/2008 valuation:

- Ultimate salary increase rates were lowered.
- The payroll growth assumption was lowered.
- Retirement rates were revised.



Method and assumptions used in calculations of actuarially determined contributions.

The System is funded with fixed contribution rates that vary by Basic vs. Coordinated members and employers as well as some supplemental state aid. The Actuarially Determined Contributions in the *Schedule of Employer Contributions* are calculated as of the beginning of the fiscal year in which contributions are reported.

The following actuarial methods and assumptions were used to determine the Actuarially Determined Contribution reported in the *Schedule of Employer Contributions* for the most recent Measurement Date, June 30, 2017 (based on the July 1, 2016 valuation).

Actuarial cost method	Entry Age Normal
Amortization method	Level percentage of payroll, closed
Remaining amortization period	23 years
Asset valuation method	5-year moving average
Price Inflation	2.75 percent
Wage growth rate	3.50 percent
Salary increases, including inflation	3.50 to 9.50 percent
Long-term Rate of Return, net of investment expense, including price inflation	8.47 percent compounded annually to reflect an 8.00 percent assumption for one year and 8.50 percent thereafter.
Cost of Living Adjustment	2.00 percent per year.

Please see the information presented earlier in regard to Paragraph 34 for detailed information on the benefit changes and assumption changes that may have impacted the Actuarially Determined Contributions shown in the *Schedule of Employer Contributions*.



APPENDIX A

**REQUIRED
SUPPLEMENTARY INFORMATION**



Exhibit A

GASB 67 Paragraph 32(a) and (b) SCHEDULE OF CHANGES IN THE EMPLOYERS' NET PENSION LIABILITY Fiscal Year Ended June 30 (\$ in Thousands)

	2017	2016	2015	2014
Total Pension Liability				
Service Cost	\$1,267,304	\$438,938	\$399,228	\$367,621
Interest	1,975,771	2,062,775	2,019,707	1,895,469
Benefit term changes	0	0	0	0
Differences between expected and actual experience*	(167,572)	(798)	7,113	475,265
Assumption changes**	(3,355,602)	15,871,845	576,075	0
Benefit payments, including member refunds	<u>(1,776,814)</u>	<u>(1,728,023)</u>	<u>(1,669,607)</u>	<u>(1,592,686)</u>
Net change in Total Pension Liability	(2,056,913)	\$16,644,737	\$1,332,516	\$1,145,669
Total Pension Liability - beginning	\$43,276,817	\$26,632,080	\$25,299,564	\$23,755,943
Total Pension Liability - ending (a)	\$41,219,904	\$43,276,817	\$26,632,080	\$24,901,612
Plan Fiduciary Net Position				
Employer contributions	\$367,791	\$354,961	\$340,208	\$299,300
Non-employer contributions - Direct Aid (State/City/District)	35,587	35,587	41,587	21,001
Employee contributions	361,175	347,256	334,826	294,632
Net investment income	2,855,218	(23,672)	887,280	3,257,693
Benefit payments, including member refunds	(1,776,814)	(1,728,023)	(1,669,607)	(1,592,686)
Administrative expenses	(11,702)	(11,338)	(11,509)	(9,430)
Other	<u>2,404</u>	<u>3,569</u>	<u>3,550</u>	<u>3,855</u>
Net change in Plan Fiduciary Net Position	\$1,833,659	(\$1,021,660)	(\$73,665)	\$2,274,365
Plan Fiduciary Net Position - beginning	\$19,424,431	\$20,446,091	\$20,519,756	\$18,019,319
Plan Fiduciary Net Position - ending (b)	\$21,258,090	\$19,424,431	\$20,446,091	\$20,293,684
Net Pension Liability - ending (a) - (b)	\$19,961,814	\$23,852,386	\$6,185,989	\$4,607,928
Plan Fiduciary Net Position as a percentage of the Total Pension Liability	51.57%	44.88%	76.77%	81.50%
Covered payroll	\$4,688,875	\$4,515,699	\$4,306,426	\$4,056,482
Employers' Net Pension Liability as a percentage of covered payroll	425.73%	528.21%	143.65%	113.59%

Note: Schedule is intended to show 10-year trend. Additional years will be reported as they become available.

* Includes impact of date change for expected increase in COLA to 2.50%.

** 2017 Assumption changes include (\$2,772,688) due to the change in the SEIR and (\$582,914) due to other assumption changes.



Exhibit B

GASB 67 Paragraph 32(c) SCHEDULE OF EMPLOYER AND NON-EMPLOYER CONTRIBUTIONS Fiscal Year Ended June 30 (\$ in Thousands)

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Actuarially determined employer contribution*	516,582	459,699	495,235	492,731	463,788	401,725	384,943	421,813	355,189	280,327
Actual non-employer contributions	35,587	35,587	41,587	21,001	19,954	21,726	21,510	21,550	20,448	21,845
Actual employer contributions	<u>367,791</u>	<u>354,961</u>	<u>340,208</u>	<u>299,300</u>	<u>270,708</u>	<u>244,935</u>	<u>222,723</u>	<u>220,538</u>	<u>220,270</u>	<u>209,717</u>
Total contributions	403,378	390,548	381,795	320,301	290,662	266,661	244,233	242,088	240,718	231,562
Annual contribution deficiency (excess)	<u>113,204</u>	<u>69,151</u>	<u>113,440</u>	<u>172,430</u>	<u>173,126</u>	<u>135,064</u>	<u>140,710</u>	<u>179,725</u>	<u>114,471</u>	<u>48,765</u>
Covered-employee payroll	4,688,875	4,515,699	4,306,426	4,056,482	3,917,310	3,871,809	3,838,111	3,787,757	3,761,484	3,645,230
Actual contributions as a percentage of covered-employee payroll	8.60%	8.65%	8.87%	7.90%	7.42%	6.89%	6.36%	6.39%	6.40%	6.35%

* The 2015 Actuarially determined employer contribution includes the required amount for both DTRFA (\$11,039) and TRA (\$484,196).



APPENDIX B

SUMMARY OF BENEFIT PROVISIONS VALUED

BASIC MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

Plan year July 1 through June 30

Eligibility Teachers first hired prior to July 1, 1978 employed by the Board of Education of Special School District No. 1, other than a charter school, and not covered by the Social Security Act. Certain part-time licensed employees of Special School District No. 1 are also covered. These members were transferred to TRA as part of the merger of the Minneapolis Teachers Retirement Fund Association (MTRFA) effective June 30, 2006.

Contributions Shown as a percent of Salary:

<u>Member</u>	<u>Employer</u>
11.00%	15.14%

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2017 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).

Teaching service A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.



BASIC MEMBERS

Salary

Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary

Average of the five highest successive years of Salary.

Retirement

Normal retirement

Age/Service requirements

Age 60, or any age with 30 years of Teaching Service

Amount

2.50% of Average Salary for each year of Teaching Service.

Early retirement

Age/Service requirements

Age 55 with less than 30 years of Teaching Service.

Amount

The greater of (a) or (b):

- (a) 2.25% of Average Salary for each year of Teaching Service with reduction of 0.25% for each month before the Member would first be eligible for a normal retirement benefit.
- (b) 2.50% of Average Salary for each year of Teaching Service assuming augmentation to the age of first eligibility for a normal retirement benefit at 3.00% per year and actuarial reduction for each month before the member would be first eligible for a normal retirement benefit.

An alternative benefit is available to members who are at least age 50 and have seven years of Teaching Service. The benefit is based on the accumulation of the 6.50% "city deposits" to the Retirement Fund. Other benefits are also provided under this alternative depending on the member's age and Teaching Service.

Form of payment

Life annuity. Actuarially equivalent options are:

- (a) 10 or 15 year Certain and Life
- (b) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.



BASIC MEMBERS

Disability

Age/service requirement

Total and permanent disability with three years of Teaching Service

Amount

An annuity actuarially equivalent to the continued accumulation of member and city contributions at the current rate for a period of 15 years (but not beyond age 65) plus an additional benefit equal to the smaller of 100% of the annuity provided by city contributions only or \$150 per month. A member with 20 years of Teaching Service also receives an additional \$7.50 per month.

Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.

Form of payment

Same as for retirement.

Benefit increases

Same as for retirement.

Death

Choice of Benefit A, Benefit B or Benefit C

Benefit A

Age/Service requirements

Death before retirement.

Amount

The accumulation of member and city contributions plus 6.00% interest. Paid as a life annuity, 15-year Certain and Life, or lump sum. If an annuity is chosen the beneficiary also receives additional benefits.

Benefit B

Age/Service requirements

An active member with seven years of Teaching Service. A former member age 60 with seven years of Teaching Service who dies before retirement or disability benefits begin.

Amount

The actuarial equivalent of any benefits the member could have received if resignation occurred on the date of death.

Benefit C

Age/Service requirements

As an active member who dies and leaves surviving children.

Amount

A monthly benefit of \$248.30 to the surviving widow while caring for a child and an additional \$248.30 per month for each surviving dependent child. The maximum family benefit is \$579.30 per month.

Benefits to the widow cease upon death or when no longer caring for an eligible child. Benefits for dependent children cease upon marriage or age 18 (age 22 if a full time student).

Benefit Increases

Same as for retirement.



BASIC MEMBERS

Withdrawal

Refund of contribution

Age/Service requirements

Termination of Teaching Service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service Requirements

Seven years of Teaching Service

Amount

The benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% beginning July 1, 2012.

In addition, the interest earned on the member and city contributions between termination and age 60 can be applied to provide an additional annuity.



COORDINATED MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

Plan year July 1 through June 30

Eligibility A public school or MNSCU teacher who is covered by the Social Security Act, except for teachers employed by St. Paul public schools or by the University of Minnesota. Charter school teachers employed statewide are covered by TRA.

No MNSCU teacher will become a new Member unless that person elects coverage as defined by Minnesota Statutes under Chapter 354B.

Contributions

Shown as a percent of Salary:

<u>Member</u>	<u>Employer</u>
7.50%	7.50%

Employer also contributes Supplemental amount equal to 3.64% of Salary (members employed by Special School District #1 only).

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2017 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).

Teaching service

A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.



COORDINATED MEMBERS

Salary

Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary

Average of the five highest successive years of Salary. Average salary is based on all Allowable Service if less than five years.

Retirement

Normal retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 65 and three years of Allowable Service; or
- (b) Age 62 and 30 years of Allowable Service.

Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.

First hired after June 30, 1989:

The age when first eligible for full Social Security retirement benefits (but not to exceed age 66) and three years of Allowable Service.

Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.

Early retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 55 and three years of Allowable Service; or
- (b) Any age and 30 years of Allowable Service; or
- (c) Rule of 90: Age plus Allowable Service totals 90.

First hired after June 30, 1989:

- (a) Age 55 with three years of Allowable Service.



COORDINATED MEMBERS

Retirement(continued)

Amount

First hired before July 1, 1989:

The greater of (a), (b) or (c):

- (a) 1.20% of Average Salary for each of the first ten years of Allowable Service.
1.70% of Average Salary for each year of Allowable Service in excess of 10 prior to July 1, 2006, and
1.90% of Average Salary for years of Allowable Service after July 1, 2006.
No actuarial reduction if age plus years of service totals 90. Otherwise reduction of 0.25% for each month the member is under age 65 (or 62 if 30 years of Allowable Service) at time of retirement.
- (b) 1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.
- (c) For eligible members: the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

First hired after June 30, 1989:

1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.



Early Retirement Reduction Factors

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
55	43.56%	51.55%	54.08%
58	33.59%	40.46%	42.74%
60	24.65%	30.75%	32.74%
62	13.68%	18.96%	20.53%
65	0.00%	4.21%	4.68%
66	0.00%	0.00%	0.00%

Members who are age 62 with 30 years of service are eligible for a special set of reduction factors:

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
62	10.40%	14.46%	16.11%
63	6.64%	10.40%	11.70%
64	3.18%	6.64%	7.55%
65	0.00%	3.18%	3.65%
66	0.00%	0.00%	0.00%

All of the early retirement reduction factors shown are the ultimate factors. These are being phased in from the prior factors over a five-year period beginning July 1, 2015.

Form of Payment

Life annuity. Actuarially equivalent options are:

- (a) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).
- (b) 15 year Certain and Life
- (c) Guaranteed Refund.



COORDINATED MEMBERS

Retirement(continued)

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.

Disability

Age/service requirement

Total and permanent disability before Normal Retirement Age with three years of Allowable Service.

Amount

Normal Retirement Benefit based on Allowable Service and Average Salary at disability without reduction for commencement before Normal Retirement Age unless an optional annuity plan is selected.

Payments stop at Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.

Form of payment

Same as for retirement.

Benefit increases

Same as for retirement.

Retirement after disability

Age/service requirement

Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later.

Amount

Any optional annuity continues. Otherwise, the larger of the disability benefit paid before Normal Retirement Age or the normal retirement benefit available at Normal Retirement Age, or an actuarially equivalent optional annuity.

Benefit increases

Same as for retirement.



COORDINATED MEMBERS

Death

Surviving spouse optional annuity

Age/Service requirements

Member or former member with three years of Allowable Service who dies before retirement or disability benefits commence.

Amount

Survivor's payment of the 100% Joint and Survivor benefit or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced for early retirement with half the applicable reduction factor used from age 55 to actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer.

Benefit increase

Same as for retirement.

Withdrawal

Refund of contributions

Age/Service requirements

Thirty days following termination of teaching service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service requirements

Vested at date of termination. Current requirement is three years of Allowable Service.



COORDINATED MEMBERS

Withdrawal (continued)

Amount

For members first hired prior to July 1, 2006, the benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% from July 1, 2012 forward.

Amount is payable as a normal or early retirement.

A member who terminated service before July 1, 1997 whose benefit does not commence until after June 30, 1997 shall receive an actuarially equivalent increase to reflect the change from 5.00% to 6.00% in the post-retirement interest assumption; or

For eligible members; the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

For members first hired July 1, 2006 and after, the benefit computed under law in effect at termination is increased by 2.50% compounded annually until June 30, 2012 and increased by 2.00% from July 1, 2012 forward until the annuity begins.



APPENDIX C

STATEMENT OF ACTUARIAL ASSUMPTIONS

The following assumptions were used in valuing the liabilities and benefits under the plan. For funding purposes, all assumptions are prescribed by Statutes, the LCPR, or the Board of Trustees. The assumptions prescribed are based on the experience study dated June 10, 2015 and current statutes which set the investment return assumption. For GASB 67 purposes, the economic assumptions are based on an experience study of those assumptions performed in 2017.

The Allowance for Combined Service Annuity was based on the recommendation of Deloitte Consulting LLP, the actuary for the Legislative Commission on Pensions and Retirement (LCPR). We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work which is beyond the scope of this assignment so we have relied on Deloitte’s findings.

<i>Investment Return (Long-term Assumed Rate of Return)</i>	8.50% compounded annually. <u>For GASB 67 purposes:</u> 7.50% for June 30, 2017 measurement date.
<i>Future post-retirement adjustments</i>	2.00% per year. Once the funded ratio reaches 90% on a market value basis for two consecutive years, the COLA is scheduled by statute to revert back from 2.00% to 2.50%. Future assets and liabilities were projected using the 2017 valuation results as a starting point and assuming all actuarial assumptions are met in future years. These assumptions include a rate of return on the market value of assets of 8.5%. Further, there is an assumption that the stabilizer provisions will not be utilized by the Board. Based on this methodology, as of July 1, 2017, the COLA is expected to increase with the July 1, 2045 valuation. For the July 1, 2016 valuation, the increased COLA was not expected to be implemented during the next 40 years, and so it was assumed it would not occur. <u>For GASB 67 purposes:</u> no increase is assumed.
<i>Salary Increases</i>	Reported salary for prior fiscal year, with new hires annualized, is increased according to the salary increase table shown in the rate table for current fiscal year and annually for each future year. See table of sample rates.
<i>Payroll Growth</i>	3.50% per year <u>For GASB 67 purposes:</u> 3.00% per year
<i>Future Service</i>	Members are assumed to earn future service at a full-time rate.
<i>Mortality: Pre-retirement</i>	RP 2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
<i>Post-retirement</i>	RP 2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.
<i>Post-disability</i>	RP 2014 disabled retiree mortality, without adjustment



Summary of Actuarial Assumptions *(continued)*

<i>Disability</i>	Age-related rates based on experience; see table of sample rates.
<i>Withdrawal</i>	Rates vary by service based on actual plan experience, as shown in the rate table.
<i>Expenses</i>	Prior year administrative expenses expressed as percentage of prior year payroll.
<i>Retirement Age</i>	Graded rates beginning at age 55 as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.
<i>Percentage Married</i>	85% of male members and 65% of female members are assumed to be married. Members are assumed to have no children.
<i>Age Difference</i>	Females two years younger than males.
<i>Allowance for Combined Service Annuity</i>	Liabilities for vested former members are increased by 7.00% and liabilities for non-vested former members are increased by 9.00% to account for the effect of some Participants being eligible for a Combined Service Annuity.
<i>Refund of Contributions</i>	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.
<i>Interest on member contributions</i>	Members and former members who are eligible for the money purchase annuity are assumed to receive interest credits equal to the Pre-Retirement interest rate. All other members and former members receive the interest crediting rate as specified in statutes.
<i>Commencement of deferred benefits</i>	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at unreduced retirement age.
<i>Form of payment</i>	Members are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10.0% elect 50% J&S option 10.0% elect 75% J&S option 60.0% elect 100% J&S option 20.0% elect Straight Life option Females: 13.5% elect 50% J&S option 6.5% elect 75% J&S option 35.0% elect 100% J&S option 45.0% elect Straight Life option Members eligible for deferred annuities (including current terminated deferred members) and future disability benefits are assumed to elect a life annuity.



Summary of Actuarial Assumptions *(continued)*

Missing data for members

Membership data was supplied by TRA as of the valuation date. This information has not been audited by CMC. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy. In the small number of cases where submitted data was missing or incomplete and could not be recovered from prior years, the following assumptions were applied, if needed:

Data for active members:

Salary, Service, and Date of Birth	Based on current active demographics.
Gender	Female

Data for terminated members:

Date of birth	July 1, 1969
Average salary	\$38,500
Date of termination	Derived from date of birth, original entry age, and service

Data for in-pay members:

Beneficiary date of birth	Wife two years younger than husband
Gender	Based on first name
Form of payment	Life annuity for retirees and beneficiaries, 100% J&S option for disabled retirees.

Termination Rates

Service	Males	Females
Less than 1	32.00%	29.00%
1	15.00%	13.00%
2	11.00%	11.00%
3	8.50%	9.00%
4	6.25%	7.00%
5	5.25%	5.50%
6	4.60%	4.00%
7	4.10%	3.50%
8	2.80%	3.00%
9	2.30%	2.50%
10	2.00%	2.10%
15	1.10%	1.10%
20	0.60%	0.60%
25 or more	0.50%	0.50%



<u>Age</u>	<u>Rate (%)</u>			
	<u>Pre-retirement Mortality*</u>		<u>Disability</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
20	0.023	0.013	0.00	0.00
25	0.026	0.014	0.00	0.00
30	0.036	0.014	0.00	0.00
35	0.031	0.018	0.01	0.01
40	0.035	0.024	0.03	0.03
45	0.041	0.033	0.05	0.05
50	0.061	0.055	0.10	0.10
55	0.105	0.092	0.16	0.16
60	0.175	0.140	0.25	0.25
65	0.292	0.204	0.00	0.00

**Rates shown are for 2014, the base year of the tables.*

<u>Age</u>	<u>Annuitant Mortality Rates (%)</u>			
	<u>Retirement *</u>		<u>Disability</u>	
	<u>Male</u>	<u>Female</u>	<u>Male</u>	<u>Female</u>
55	0.267	0.196	2.337	1.448
60	0.353	0.267	2.660	1.700
65	0.486	0.430	3.169	2.086
70	0.945	0.706	4.035	2.820
75	2.015	1.352	5.429	4.105
80	4.126	2.682	7.662	6.104
85	7.358	5.456	11.330	9.042
90	13.560	9.947	17.301	13.265
95	24.351	18.062	24.717	19.588
100	38.292	29.731	32.672	27.819

** Rates shown are for 2014, the base year of the tables.*



Summary of Actuarial Assumptions *(continued)*

Salary Scale	
Service	Salary Increase
1	9.50%
2	7.75%
3	7.25%
4	7.00%
5	7.00%
6	6.85%
7	6.70%
8	6.55%
9	6.40%
10	6.25%
11	6.00%
12	5.75%
13	5.50%
14	5.25%
15	5.00%
16	4.75%
17	4.50%
18	4.30%
19	4.20%
20	4.10%
21	4.00%
22	3.90%
23	3.80%
24	3.70%
25	3.60%
26 or more	3.50%

For GASB 67 purposes, the salary scale above is reduced by 0.65% at each age for the first ten years following the Measurement Date and reduced by 0.25% at each age, thereafter.



Retirement Rate (%)

<u>Age</u>	<u>Coordinated Members</u>				<u>Basic Members</u>	
	<u>Tier 1</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 2</u>	<u>Eligible for</u>	<u>Not Eligible for</u>
	<u>Early</u>	<u>Unreduced</u>	<u>Early</u>	<u>Unreduced</u>	<u>30 and Out</u>	<u>30 and Out</u>
					<u>Provision</u>	<u>Provision</u>
55	5	35	5		40	5
56	10	35	5		40	5
57	10	35	5		40	5
58	10	35	5		40	5
59	14	35	5		40	5
60	17	35	6		25	25
61	20	35	15		25	25
62	25	35	15		25	25
63	25	35	15		25	25
64	25	35	20		25	25
65		40	30		40	40
66		35		35	40	40
67		30		30	40	40
68		30		25	40	40
69		30		25	40	40
70		35		35	60	60
71-74		100		100	60	60
75-79		100		100	60	100
80 & Over		100		100	100	100

Coordinated Tier 2 Members age 62 or older with 30 or more years of service have 5% added to their early retirement rates.

Changes in actuarial assumptions and methods since the previous valuation

The Combined Service Annuity liability loads were updated for active, vested inactive members and non-vested inactive members.

For GASB 67 purposes: in addition, economic assumptions were updated based on recommendations in the 2017 experience study.



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GASB STATEMENT NO. 68 REPORT
FOR THE
TEACHERS RETIREMENT ASSOCIATION OF
MINNESOTA

MEASUREMENT DATE: JUNE 30, 2017





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

January 25, 2018

Mr. Jay Stoffel
Executive Director
Teachers Retirement Association of Minnesota
60 Empire Drive, Suite 400
St. Paul, MN 55103

Dear Mr. Stoffel:

Presented in this report is information to assist the Teachers Retirement Association of Minnesota (TRA) in providing information required under the Governmental Accounting Standards Board (GASB) Statement No. 68 to participating employers. GASB Statement No. 68 establishes accounting and financial reporting requirements for governmental employers who provide pension benefits to their employees through a trust. This report has been prepared as of June 30, 2017, the Measurement Date. Please note that the discount rate used to determine the Total Pension Liability (TPL) changed from 4.66% at the Prior Measurement Date to 5.12% at the current Measurement Date.

The annual funding actuarial valuation used as the basis for much of the information presented in this report was performed as of July 1, 2017, although the TPL was determined using a discount rate of 5.12%. The funding valuation was based upon data, furnished by the TRA staff, concerning active, inactive and retired members along with pertinent financial information. This information was reviewed for completeness and internal consistency, but was not audited by us. The valuation results depend on the integrity of the data. If any of the information is inaccurate or incomplete, our results may be different and our calculations may need to be revised. Please see the actuarial valuation for additional details on the funding requirements for TRA, including the actuarial assumptions and methods and the System's funding policy.

To the best of our knowledge, the information contained in this report is complete and accurate. The calculations were performed by, and under the supervision of, independent qualified actuaries with experience in performing valuations for public retirement systems. In addition, the valuation was prepared in accordance with generally accepted actuarial principles and practices, as well as in conformity with applicable Actuarial Standards of Practice, issued by the Actuarial Standards Board. The calculations are based on the current provisions of TRA and on actuarial assumptions that are internally consistent and individually reasonable based on the actual experience of TRA. We note that the allocation of Net Pension Liability, Pension Expense, and Deferred Inflows and Outflows of Resources to participating employers under GASB 68 will be provided by TRA, and therefore, is not included in this report.



Mr. Jay Stoffel
January 25, 2018
Page 2

The calculation of the liability associated with the benefits described in this report was performed for the purpose of providing reporting and disclosure information that satisfies the requirements of GASB 68 for accounting valuation purposes and may not be appropriate for funding purposes or other types of analysis. Calculations for purposes other than satisfying the requirements of GASB 68 may produce significantly different results. Future actuarial results may differ significantly from the current results presented in this report due to such factors as changes in plan experience or changes in economic or demographic assumptions.

We, Patrice A. Beckham, FSA and Brent A. Banister, FSA, are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in this report or to provide explanations or further details as may be appropriate.

Respectfully submitted,

A handwritten signature in blue ink that reads 'Patrice Beckham' in a cursive script.

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink that reads 'Brent A. Banister' in a cursive script.

Brent A. Banister, PhD, FSA, EA, FCA, MAAA
Chief Actuary



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GASB STATEMENT NO. 68

TEACHERS RETIREMENT ASSOCIATION OF MINNESOTA

SECTION I - SUMMARY OF PRINCIPAL RESULTS

(\$ IN THOUSANDS)

Valuation Date (VD):	July 1, 2017
Prior Measurement Date:	June 30, 2016
Measurement Date (MD):	June 30, 2017
Membership Data:	
Retirees and Beneficiaries	64,774
Inactive Vested Members	14,030
Inactive Nonvested Members	33,344
Active Employees	<u>81,811</u>
Total	193,959
Single Equivalent Interest Rate (SEIR):	
Long-Term Expected Rate of Return	7.50%
Municipal Bond Index Rate at Prior Measurement Date	3.01%
Municipal Bond Index Rate at Measurement Date	3.56%
Year in which Fiduciary Net Position is Projected to be Depleted	2053
Single Equivalent Interest Rate at Prior Measurement Date	4.66%
Single Equivalent Interest Rate at Measurement Date	5.12%
Net Pension Liability:	
Total Pension Liability (TPL)	\$41,219,904
Fiduciary Net Position (FNP)	<u>21,258,090</u>
Net Pension Liability (NPL = TPL – FNP)	\$19,961,814
FNP as a percentage of TPL	51.57%
Pension Expense:	\$3,466,111
Deferred Outflows of Resources:	\$12,284,836
Deferred Inflows of Resources:	\$4,371,752



SECTION II – INTRODUCTION

The Governmental Accounting Standards Board issued Statement No. 68 (GASB 68), *Accounting and Financial Reporting for Pensions* in June 2012. GASB 68's effective date for employers is the first fiscal year beginning after June 15, 2014. The Teachers Retirement Association of Minnesota (TRA or System) is a cost-sharing multiple-employer defined benefit pension plan as defined by GASB 68.

This report, prepared as of June 30, 2017 (the Measurement Date), presents information to assist the Teachers Retirement Association of Minnesota in providing the required information under GASB 68 to participating employers. Much of the material provided in this report, including the Net Pension Liability, is based on the results of the GASB 67 report for TRA, which was issued December 1, 2017. See that report for more information on the member data, actuarial assumptions and methods used in developing the GASB 67 results.

GASB 68 requires the inclusion of a portion of the System's Net Pension Liability (NPL) on each participating employer's Statement of Net Position and a determination of a proportionate share of the System's Pension Expense (PE) in the Notes to the Financial Statements that may bear little relationship to the funding requirements for TRA. In fact, it is possible in some years for the NPL to be an asset or the PE to be an income item. The NPL is set equal to the Total Pension Liability (TPL) minus the Fiduciary Net Position (FNP). The benefit provisions recognized in the calculation of the TPL are summarized in Appendix B. TRA is a cost-sharing multiple employer plan so the NPL and PE are allocated among the participating employers and non-employer entities. Those amounts, which are needed for the participating employers' financial statements, will be determined by TRA.

PE includes amounts for Service Cost (the Normal Cost under Entry Age Normal (EAN) for the year), interest on the TPL, employee contributions, administrative expenses, other cash flows during the year, recognition of increases/decreases in the TPL due to changes in the benefit structure, actual versus expected experience, actuarial assumption changes, and recognition of investment gains/losses. The actual experience and assumption change impacts are recognized over the average expected remaining service life of the System membership as of the beginning of the measurement period, while investment gains/losses are recognized equally over five years. The development of the PE is shown in Section III. The unrecognized portions of each year's experience, assumption changes and investment gains/losses are used to develop Deferred Inflows of Resources and Deferred Outflows of Resources. A proportionate share of these items must also be included on each employer's Statement of Net Position.

Among the items needed for the liability calculation is the discount rate, or Single Equivalent Interest Rate (SEIR), as described by GASB. To determine the SEIR, the FNP must be projected, using GASB guidelines, into the future for as long as there are anticipated benefits payable under the plan's provisions applicable to the members and beneficiaries of the System on the Measurement Date. If the FNP is not projected to be depleted at any point in the future, the long-term expected rate of return on plan investments expected to be used to finance the benefit payments may be used as the SEIR. In 2017, the TRA Board commissioned Cavanaugh Macdonald to perform a review of the economic assumptions used in the valuation process. The findings and recommendations of that report were provided to the Board at their November 2017



meeting and included a long-term rate of return on plan assets of 7.50%. This is a change from the 8.00% long-term rate of return used for the prior Measurement Date.

If, however, the FNP is projected to be depleted at a future measurement date, the SEIR is determined as the single rate that will generate a present value of benefit payments equal to the sum of the present value determined by discounting all projected benefit payments through the date of depletion by the long-term expected rate of return, and the present value determined by discounting those benefits after the date of depletion by a 20-year tax-exempt municipal bond (rating AA/Aa or higher) rate. The rate used, if necessary, for this purpose is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate (formerly published monthly by the Board of Governors of the Federal Reserve System).

Our calculations indicate that the FNP is projected to be depleted in the year 2053, so the Municipal Bond Index Rate is used in the determination of the SEIR for the June 30, 2017 TPL. Our calculations as of the Prior Measurement Date indicated that the FNP was projected to be depleted in the year 2052, so the Municipal Bond Index Rate was used in the determination of the SEIR for the June 30, 2016 TPL. The SEIR as of the Measurement Date is 5.12% while it was 4.66% at the Prior Measurement Date. The decrease in the TPL from the change in the SEIR from 4.66% to 5.12% is \$2.773 billion.

There were other changes to the actuarial assumptions that are reflected in the TPL at June 30, 2017. The assumptions for the combined service annuity load were modified based on analysis performed by the actuary retained by the Legislative Commission on Pensions and Retirement. This change resulted in a small decrease in the TPL. As discussed earlier, the TRA Board commissioned Cavanaugh Macdonald to perform a review of the economic assumptions used in the valuation. The recommended set of economic assumptions in that report represent our best estimate for the assumptions to be used to measure the System's obligations. Therefore, the recommended changes to the economic assumptions in that experience study were used to determine the TPL at the current Measurement Date. The impact of these assumption changes, based on the 4.66% SEIR at the prior Measurement Date, was a decrease in the TPL of \$583 million.

The FNP projections are based upon the Teachers Retirement Association of Minnesota's financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing plan basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the fund will actually run out of money, the financial condition of the System, or the System's ability to make benefit payments in future years.

The sections that follow provide the results of all the required aggregate calculations, presented in the order laid out in GASB 68 for note disclosure and Required Supplementary Information (RSI). **TRA will prepare the calculation of the proportionate share of the NPL, Pension Expense, Deferred Inflows of Resources and Deferred Outflows of Resources for each participating employer or non-employer contributing entity.**



SECTION III – PENSION EXPENSE

As noted earlier, the collective Pension Expense (PE) consists of a number of different items. GASB 68 refers to the first as Service Cost, which is the Normal Cost using the Entry Age Normal (EAN) actuarial funding method. The second item is interest on the TPL at the SEIR in effect as of the Prior Measurement Date, 8.00%.

The next three items refer to any changes that occurred in the TPL (i.e., actuarial accrued liability (AAL) under EAN) due to:

- benefit changes,
- actual versus expected experience, or
- changes in actuarial assumptions or other inputs.

Benefit changes, which are reflected immediately, will increase PE if there is a benefit improvement for existing System members, or decrease PE if there is a benefit reduction. For the year ended June 30, 2017, there were no benefit changes to be recognized.

The next item to be recognized is the portion of current year changes in TPL due to actual versus expected experience for the year. The portion to recognize in the current year is determined by spreading the total change over the average expected remaining service life of the entire System membership at the beginning of the measurement period. The average expected remaining service life of active members is the average number of years the active members are expected to remain in covered employment. At the beginning of the measurement period, this number is 15.25 years. The average expected remaining service life of the inactive members is zero. Therefore, the recognition period is the weighted average of these two amounts, rounded to the nearest integer, or 6 years.

The last item under changes in TPL is changes in actuarial assumptions or other inputs. There were a number of changes in the actuarial assumptions or other inputs since the Prior Measurement Date, including an increase in the SEIR from 4.66% to 5.12%. The resulting change in the TPL will be recognized over the average expected remaining service life of the entire System membership, using the same approach that applied to experience gains and losses as described earlier.

Employee contributions for the year and projected earnings on the FNP at the long-term rate of return are subtracted from the amount determined thus far. One-fifth of current-period differences between projected and actual earnings on the FNP is recognized in the PE.

The current year portions of previously determined experience, assumption and earnings amounts, recognized as Deferred Outflows of Resources and Deferred Inflows of Resources are included next. Deferred Outflows of Resources are added to the PE while Deferred Inflows of Resources are subtracted from the PE. Finally, administrative expenses and other miscellaneous items are included.

The calculation of the collective PE for the year ended June 30, 2017 is shown in the following table.



Collective Pension Expense
For the Year Ended June 30, 2017
(\$ in Thousands)

Service Cost	\$1,267,304
Interest on the Total Pension Liability	1,975,771
Current-period Benefit Changes	0
Expensed portion of current-period difference between expected and actual experience in the total pension liability	(27,929)
Expensed portion of current-period changes of assumptions	(559,267)
Member Contributions	(361,175)
Projected Earnings on Plan Investments	(1,513,878)
Expensed portion of current-period differences between actual and projected earnings on plan investments	(268,268)
Administrative Expense	11,702
Other	(2,404)
Recognition of beginning deferred outflows of resources as pension expense	3,306,560
Recognition of beginning deferred inflows of resources as pension expense	(362,305)
Total Pension Expense	\$3,466,111

Note: Average expected remaining service life for all members is 6 years.



SECTION IV – NOTES TO FINANCIAL STATEMENTS

The material presented herein will follow the order presented in GASB 68. Paragraph numbers are provided for ease of reference. Amounts are shown in the aggregate. TRA will determine the proportionate share of certain amounts for individual employers as required by GASB 68.

Paragraph 74: The information required is to be prepared by TRA and/or the individual employer.

Paragraph 75: The information required is to be prepared by the individual employer.

Paragraph 76(a) – (d): The information required is to be supplied by TRA.

Paragraph 77: This paragraph requires information to be disclosed regarding the actuarial assumptions and other inputs used to measure the TPL. The complete set of actuarial assumptions and other inputs utilized in developing the TPL are outlined in Appendix C. Please note that the actuarial assumptions used in this report changed from those used in the prior GASB 68 report. The SEIR at the June 30, 2017 Measurement Date is 5.12% compared to 4.66% at the prior Measurement Date of June 30, 2016.

The TPL as of June 30, 2017 was determined by an actuarial valuation performed as of July 1, 2017, using the following key actuarial assumptions and other inputs:

Price Inflation	2.50 percent
Salary increases, including price inflation	2.85 to 8.85 percent for 10 years and 3.25 to 9.25 percent, thereafter
Wage growth rate	2.85 percent for 10 years and 3.25 percent, thereafter
Payroll growth rate	3.00 percent
Long-term Rate of Return, net of investment expense, including price inflation	7.50 percent
Municipal Bond Index Rate	
Prior Measurement Date	3.01 percent
Measurement Date	3.56 percent
Year FNP is projected to be depleted	2053



Single Equivalent Interest Rate, net of investment expense, including price inflation

Prior Measurement Date	4.66 percent
Measurement Date	5.12 percent

Cost of Living Adjustment

Once the funded ratio reaches 90% on a fair (market) value basis for two consecutive years, the COLA is scheduled by statute to increase from 2.0% to 2.5%. Based on modeling of future valuation results assuming all assumptions are met in the future, the funded ratio is not projected to reach 90% within the 50-year projection period, so the COLA is not assumed to increase to 2.5%.

Mortality

Pre-retirement mortality rates were based on the RP-2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.

Post-retirement mortality rates were based on the RP-2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.

Post-disability mortality rates were based on the RP-2014 disabled retiree mortality table, without adjustment.

The actuarial assumptions used in the July 1, 2017 actuarial funding valuation are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the TRA Board of Trustees. Many of these assumptions are based on an experience study report, dated June 5, 2015, that covered the six-year period beginning July 1, 2008 and ending June 30, 2014. The TRA Board commissioned a review of the economic assumptions used in the actuarial valuation and the findings and recommendations were provided to the Board at their November 2017 meeting. Those recommendations are reflected in the TPL at the current Measurement Date.

Paragraph 78

(a) Discount rate (SEIR). The discount rate used to measure the TPL as of the Measurement Date was 5.12%. The projection of cash flows used to determine the discount rate was performed in accordance with GASB 68. On that basis, the System's FNP was projected to be depleted in 2053 and, as a result, the Municipal Bond Index Rate was used in the determination of the SEIR. The long-term expected rate of return of 7.50% on plan investments was applied to periods before 2053 and the Municipal Bond Index Rate of 3.56% was applied to periods on and after 2053, resulting



in a SEIR of 5.12%. There was a change in the Municipal Bond Index Rate from the Prior Measurement Date (3.01%).

(b) Projected cash flows. The projection of cash flows used to determine the discount rate assumed that plan contributions from members and employers will be made at the current contribution rates as set out in state statute and supplemental aid will be received as currently provided in statute:

- a. Employee contribution rates: 11.00% for Basic members and 7.50% for Coordinated members.
- b. Employer contribution rates: 11.50% for Basic members and 7.50% for Coordinated members. In addition, a supplemental amount equal to 3.64% of Salary for Special School District #1 members until the System is fully funded.
- c. Supplemental aid: \$3,256,410 every year until the amortization date of July 1, 2039, plus \$32,331,000 every year until the System is fully funded.
- d. The TRA Board has legislative authority to increase contribution rates at their discretion, subject to review by the Legislative Commission on Pensions and Retirement (referred to as the “contribution stabilizer”). Given that there is no past history or formal Board policy relating to the use of the contribution stabilizer option, no change in either the employee or employer contributions were considered in the projections. If future contribution rates were assumed to increase it would likely impact the determination of the SEIR.
- e. Administrative expenses in the prior year were projected forward with price inflation as an estimate for administrative expenses in the current and future years. The portion of expenses in future years allocated to the current members was based on the proportionate share of covered payroll in each year for the remainder of the existing members to the total covered payroll for all members.

The FNP projections are based upon the System’s financial status on the Measurement Date, the indicated set of methods and assumptions, and the requirements of GASB 68. As such, the FNP projections are not reflective of the cash flows and asset accumulations that would occur on an ongoing System basis, reflecting the impact of future members. Therefore, the results of this test do not necessarily indicate whether or not the fund will actually run out of money, the financial condition of the System, or the System’s ability to make benefit payments in future years.

(c) Long-term rate of return. The long-term expected rate of return on pension plan investments is reviewed regularly as part of the experience study. An experience study of the economic assumptions was prepared in 2017 that resulted in a recommendation to reduce the long-term rate of return to 7.50%. Generally, several factors are considered in evaluating the long-term rate of return assumption including long-term historical data, estimates inherent in current market data, and an analysis in which best-estimate ranges of expected future real rates of return (expected returns, net of investment expense and inflation) were developed using assumptions for each major asset class, as well as estimates of variability and correlations, provided by the System’s investment consultant (the State Board of Investment). These ranges were combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset



allocation percentage and then adding expected inflation. The assumption is intended to be a long-term assumption (30 to 50 years) and is not expected to change absent a significant change in the asset allocation, a change in the inflation assumption, or a fundamental change in the market that alters expected returns in future years.

(d) Municipal bond rate. The SEIR (discount rate) determination uses the Municipal Bond Index Rate. The rate used is the monthly average of the Bond Buyers General Obligation 20-year Municipal Bond Index Rate, formerly published monthly by the Board of Governors of the Federal Reserve System. The rate was 3.01% on the Prior Measurement Date and 3.56% on the Measurement Date.

(e) Period of projected benefit payments. Projected future benefit payments for all current plan members were projected through 2116.

(f) Assumed asset allocation. The target asset allocation and best estimates of geometric real rates of return for each major asset class, as provided by the Minnesota State Board of Investment (SBI), are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return*
Domestic Equities	39%	5.10%
International Equities	19%	5.00%
Domestic Bonds	20%	0.75%
Private Markets	20%	5.90%
Cash	<u>2%</u>	0.00%
Total	100%	

*Geometric mean



(g) Sensitivity analysis. This paragraph requires disclosure of the sensitivity of the NPL to changes in the discount rate. The following presents the NPL of the System, calculated using the discount rate of 5.12 percent, as well as the System's NPL calculated using a discount rate that is 1-percentage-point lower (4.12 percent) or 1-percentage-point higher (6.12 percent) than the current rate:

(\$ in Thousands)	1% Decrease (4.12%)	Current Discount Rate (5.12%)	1% Increase (6.12%)
Net Pension Liability	\$26,345,748	\$19,961,814	\$14,759,381

Paragraph 79: The required information will be supplied by TRA.

Paragraph 80:

(a)-(b) This information will be supplied by TRA.

(c) The Measurement Date of the collective NPL is June 30, 2017. The TPL as of June 30, 2017 was determined based upon the annual actuarial funding valuation report performed as of the Valuation Date, July 1, 2017.

(d) There were a number of changes in the actuarial assumptions that affected the measurement of the TPL since the Prior Measurement Date. The most notable was the SEIR increasing from 4.66% to 5.12%. Additional details on the other assumption changes can be found in Section V of this report.

(e) There were no changes in the benefit terms since the Prior Measurement Date.

(f) The information will be supplied by TRA.

(g) Please see Section III of this report for the development of the collective PE. TRA will provide the individual employer amounts.

(h) Since certain expense items are recognized over closed periods each year, the deferred portions of these items must be tracked annually. If the amounts serve to reduce PE they are labeled Deferred Inflows of Resources. If they will increase PE they are labeled Deferred Outflows of Resources. The recognition of these amounts is accomplished on a level dollar basis, with no interest included in the deferred amounts. Experience gains/losses and the impact of changes in actuarial assumptions, if any, are recognized over the average expected remaining service life of the active and inactive Plan members at the beginning of the measurement period. Investment gains and losses are recognized equally over a five-year period.



The following tables provide a summary of the amounts of the collective Deferred Outflows of Resources and collective Deferred Inflows of Resources as of the Measurement Date (June 30, 2017). Per GASB 68, reporting of the differences between projected and actual earnings should be on a net basis, with only one Deferred Outflow or Inflow. These are shown separately in the tables below to provide additional detail.

Collective Deferred Outflows of Resources						
	June 30, 2016	Additions	Recognition			June 30, 2017
Differences between expected and actual experience						
FY 2014 Base	\$ 229,013	\$ 0	\$ 82,084	\$		\$ 146,929
FY 2015 Base	4,631	0	1,241			3,390
FY 2016 Base	0	0	0			0
FY 2017 Base	<u>0</u>	<u>0</u>	<u>0</u>			<u>0</u>
Total	\$ 233,644	\$ 0	\$ 83,325	\$		\$ 150,319
Changes of assumptions						
FY 2014 Base	\$ 0	\$ 0	\$ 0	\$		\$ 0
FY 2015 Base	375,001	0	100,537			274,464
FY 2016 Base	13,226,537	0	2,645,308			10,581,229
FY 2017 Base	<u>0</u>	<u>0</u>	<u>0</u>			<u>0</u>
Total	\$ 13,601,538	\$ 0	\$ 2,745,845	\$		\$ 10,855,693
Differences between projected and actual earnings						
FY 2014 Base	\$ 0	\$ 0	\$ 0	\$		\$ 0
FY 2015 Base	460,048	0	153,349			306,699
FY 2016 Base	1,296,166	0	324,041			972,125
FY 2017 Base	<u>0</u>	<u>0</u>	<u>0</u>			<u>0</u>
Total	\$ 1,756,214	\$ 0	\$ 477,390	\$		\$ 1,278,824
Total	\$ 15,591,396	\$ 0	\$ 3,306,560	\$		\$ 12,284,836



Collective Deferred Inflows of Resources								
	June 30, 2016		Additions		Recognition		June 30, 2017	
Differences between expected and actual experience								
FY 2014 Base	\$	0	\$	0	\$	0	\$	0
FY 2015 Base		0		0		0		0
FY 2016 Base		665		0		133		532
FY 2017 Base		<u>0</u>		<u>167,572</u>		<u>27,929</u>		<u>139,643</u>
Total	\$	665	\$	<u>167,572</u>	\$	<u>28,062</u>	\$	<u>140,175</u>
Changes of assumptions								
FY 2014 Base	\$	0	\$	0	\$	0	\$	0
FY 2015 Base		0		0		0		0
FY 2016 Base		0		0		0		0
FY 2017 Base		<u>0</u>		<u>3,355,602</u>		<u>559,267</u>		<u>2,796,335</u>
Total	\$	0	\$	<u>3,355,602</u>	\$	<u>559,267</u>	\$	<u>2,796,335</u>
Differences between projected and actual earnings								
FY 2014 Base	\$	724,342	\$	0	\$	362,172	\$	362,170
FY 2015 Base		0		0		0		0
FY 2016 Base		0		0		0		0
FY 2017 Base		<u>0</u>		<u>1,341,340</u>		<u>268,268</u>		<u>1,073,072</u>
Total	\$	724,342	\$	<u>1,341,340</u>	\$	<u>630,440</u>	\$	<u>1,435,242</u>
Total	\$	725,007	\$	4,864,514	\$	1,217,769	\$	4,371,752

TRA will provide the individual employers' balances of the collective Deferred Inflows of Resources and collective Deferred Outflows of Resources.



(i): Collective amounts reported as Deferred Outflows of Resources and Deferred Inflows of Resources related to pensions will be recognized in PE in future fiscal years as follows:

Year Ended June 30:	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/(Inflows) of Resources
2018	\$3,306,560	\$1,217,767	\$2,088,793
2019	3,289,322	855,597	2,433,725
2020	3,043,649	855,597	2,188,052
2021	2,645,305	855,597	1,789,708
2022	0	587,194	(587,194)
Thereafter	0	0	0

TRA will provide the individual employers' balances of the collective Deferred Inflows of Resources and collective Deferred Outflows of Resources.

(j). This information will be provided by TRA.



SECTION V – REQUIRED SUPPLEMENTARY INFORMATION

There are several tables of Required Supplementary Information (RSI) that need to be included in the System's financial statements:

Paragraphs 81(a) and (b): This information will be provided by TRA.

Paragraph 82: Information about factors that significantly affect trends in the amounts reported in the schedules required by paragraph 81 should be presented as notes to the schedules. At this point only three years are being reported, but comments on additional years will be added as they occur.

Changes of benefit and funding terms: The following changes were made by the Minnesota Legislature and reflected in the valuation performed as of July 1 listed below:

2017: None.

2016: None.

2015: The Duluth Teachers Retirement Fund Association was merged into TRA on June 30, 2015. This also resulted in a state-provided contribution stream of \$14.377 million until the System becomes fully funded.

2014: The increase in the post-retirement benefit adjustment (COLA) will be made once the System is 90% funded (on a market value basis) in two consecutive years, rather than just one year.

Changes in actuarial assumptions:

7/1/2017 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2045.
- Adjustments were made to the combined service annuity loads. The active load was reduced from 1.4% to 0.0%, the vested inactive load increased from 4.0% to 7.0% and the non-vested inactive load increased from 4.0% to 9.0%.

For GASB valuation:

- The investment return assumption was changed from 8.00% to 7.50%.
- The COLA was not assumed to increase to 2.5%, but remain at 2.0% for all future years.
- The price inflation assumption was lowered from 2.75% to 2.50%.
- The payroll growth assumption was lowered from 3.50% to 3.00%.



- The general wage growth assumption was lowered from 3.50% to 2.85% for 10 years followed by 3.25%, thereafter.
- The salary increase assumption was adjusted to reflect the changes in the general wage growth assumption.

7/1/2016 valuation:

- The Cost of Living Adjustment was not assumed to increase (it remained at 2% for all future years).
- The price inflation assumption was lowered from 3.00% to 2.75%.
- The general wage growth and payroll growth assumptions were lowered from 3.75% to 3.50%.
- Minor changes at some durations for the merit scale of the salary increase assumption.
- The pre-retirement mortality assumption was changed to the RP-2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
- The post-retirement mortality assumption was changed to the RP-2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.
- The post-disability mortality assumption was changed to the RP-2014 disabled retiree mortality table, without adjustment.
- Separate retirement assumptions for members hired before or after July 1, 1989 were created to better reflect each group's behavior in light of different requirements for retirement eligibility.
- Assumed termination rates were changed to be based solely on years of service in order to better fit the observed experience.
- A minor adjustment and simplification of the assumption regarding the election of optional forms of payment at retirement were made.

7/1/2015 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2037

For GASB valuation:

- The COLA was not assumed to increase to 2.5%, but remain at 2.0% for all future years.
- The investment return assumption was changed from 8.25% to 8.00%.



7/1/2014 valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually once the legally specified criteria was met. This was estimated to occur July 1, 2031.

For GASB valuation:

- The Cost of Living Adjustment was assumed to increase from 2.0% annually to 2.5% annually on July 1, 2034.



Method and assumptions used in calculations of actuarially determined contributions.

The System is funded with fixed contribution rates that vary by Basic vs. Coordinated members and employers, as well as some supplemental state aid. The Actuarially Determined Contributions in the *Schedule of Employer Contributions* are calculated as of the beginning of the fiscal year in which contributions are reported.

The following actuarial methods and assumptions were used to determine the Actuarially Determined Contribution reported in the *Schedule of Employer Contributions* for the most recent Measurement Date, June 30, 2017 (based on the July 1, 2016 valuation).

Actuarial cost method	Entry Age Normal
Amortization method	Level percentage of payroll, closed
Remaining amortization period	23 years
Asset valuation method	5-year moving average
Price Inflation	2.75 percent
Wage growth rate	3.50 percent
Salary increases, including inflation	3.50 to 9.50 percent
Long-term Rate of Return, net of investment expense, and including price inflation	8.47 percent compounded annually to reflect an 8.00 percent assumption for one year and 8.50 percent thereafter.
Cost of Living Adjustment	2.00 percent per year



APPENDIX A

ADDITIONAL INFORMATION

SCHEDULE OF CHANGES IN THE NET PENSION LIABILITY

Fiscal Year Ended June 30, 2017
(\$ in Thousands)

(\$ in thousands)	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) – (b)
Balances at June 30, 2016	\$43,276,817	\$19,424,431	\$23,852,386
Changes for the year:			
Service cost	1,267,304		1,267,304
Interest	1,975,771		1,975,771
Benefit changes	0		0
Difference between expected and actual experience	(167,572)		(167,572)
Changes in assumptions	(3,355,602)		(3,355,602)
Contributions - employer		367,791	(367,791)
Contributions - non-employer		35,587	(35,587)
Contributions - member		361,175	(361,175)
Net investment income		2,855,218	(2,855,218)
Benefit payments, including refunds of employee contributions	(1,776,814)	(1,776,814)	0
Administrative expense		(11,702)	11,702
Other changes		2,404	(2,404)
Net changes	<u>(2,056,913)</u>	<u>1,833,659</u>	<u>(3,890,572)</u>
Balances at June 30, 2017	\$41,219,904	\$21,258,090	\$19,961,814



APPENDIX B

SUMMARY OF BENEFIT PROVISIONS VALUED

BASIC MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

Plan year July 1 through June 30

Eligibility Teachers first hired prior to July 1, 1978 employed by the Board of Education of Special School District No. 1, other than a charter school, and not covered by the Social Security Act. Certain part-time licensed employees of Special School District No. 1 are also covered. These members were transferred to TRA as part of the merger of the Minneapolis Teachers Retirement Fund Association (MTRFA) effective June 30, 2006.

Contributions Shown as a percent of Salary:

<u>Member</u>	<u>Employer</u>
11.00%	15.14%

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2017 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).

Teaching service A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.



BASIC MEMBERS

Salary

Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary

Average of the five highest successive years of Salary.

Retirement

Normal retirement

Age/Service requirements

Age 60, or any age with 30 years of Teaching Service

Amount

2.50% of Average Salary for each year of Teaching Service.

Early retirement

Age/Service requirements

Age 55 with less than 30 years of Teaching Service.

Amount

The greater of (a) or (b):

- (a) 2.25% of Average Salary for each year of Teaching Service with reduction of 0.25% for each month before the Member would first be eligible for a normal retirement benefit.
- (b) 2.50% of Average Salary for each year of Teaching Service assuming augmentation to the age of first eligibility for a normal retirement benefit at 3.00% per year and actuarial reduction for each month before the member would be first eligible for a normal retirement benefit.

An alternative benefit is available to members who are at least age 50 and have seven years of Teaching Service. The benefit is based on the accumulation of the 6.50% "city deposits" to the Retirement Fund. Other benefits are also provided under this alternative depending on the member's age and Teaching Service.

Form of payment

Life annuity. Actuarially equivalent options are:

- (a) 10 or 15 year Certain and Life
- (b) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.



BASIC MEMBERS

Disability

Age/service requirement

Total and permanent disability with three years of Teaching Service

Amount

An annuity actuarially equivalent to the continued accumulation of member and city contributions at the current rate for a period of 15 years (but not beyond age 65) plus an additional benefit equal to the smaller of 100% of the annuity provided by city contributions only or \$150 per month. A member with 20 years of Teaching Service also receives an additional \$7.50 per month.

Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.

Form of payment

Same as for retirement.

Benefit increases

Same as for retirement.

Death

Choice of Benefit A, Benefit B or Benefit C

Benefit A

Age/Service requirements

Death before retirement.

Amount

The accumulation of member and city contributions plus 6.00% interest. Paid as a life annuity, 15-year Certain and Life, or lump sum. If an annuity is chosen the beneficiary also receives additional benefits.

Benefit B

Age/Service requirements

An active member with seven years of Teaching Service. A former member age 60 with seven years of Teaching Service who dies before retirement or disability benefits begin.

Amount

The actuarial equivalent of any benefits the member could have received if resignation occurred on the date of death.

Benefit C

Age/Service requirements

As an active member who dies and leaves surviving children.

Amount

A monthly benefit of \$248.30 to the surviving widow while caring for a child and an additional \$248.30 per month for each surviving dependent child. The maximum family benefit is \$579.30 per month.

Benefits to the widow cease upon death or when no longer caring for an eligible child. Benefits for dependent children cease upon marriage or age 18 (age 22 if a full time student).

Benefit Increases

Same as for retirement.



BASIC MEMBERS

Withdrawal

Refund of contribution

Age/Service requirements

Termination of Teaching Service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service Requirements

Seven years of Teaching Service

Amount

The benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% beginning July 1, 2012.

In addition, the interest earned on the member and city contributions between termination and age 60 can be applied to provide an additional annuity.



COORDINATED MEMBERS

This summary of provisions reflects our interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to provide a basis for administering the Plan.

Plan year July 1 through June 30

Eligibility A public school or MNSCU teacher who is covered by the Social Security Act, except for teachers employed by St. Paul public schools or by the University of Minnesota. Charter school teachers employed statewide are covered by TRA.

No MNSCU teacher will become a new Member unless that person elects coverage as defined by Minnesota Statutes under Chapter 354B.

Contributions

Shown as a percent of Salary:

<u>Member</u>	<u>Employer</u>
7.50%	7.50%

Employer also contributes Supplemental amount equal to 3.64% of Salary (members employed by Special School District #1 only).

After June 30, 2015, the member and employer contribution rates may be adjusted if there is a sufficiency of at least 1.00% or a deficiency of at least 0.50%. The Board has discretion to adjust this rate based on discussion with the actuary and consideration of various metrics. The resulting rate may not go below the normal cost plus administrative expenses.

Potential contribution increases after June 30, 2017 are not reflected in this valuation report.

Employee contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).

Teaching service

A year is earned during a calendar year if the member is employed in a covered position and employee contributions are deducted. Certain part-time service and military service is also included.



COORDINATED MEMBERS

Salary

Periodic compensation used for contribution purposes excluding lump sum annual or sick leave payments, severance payments, any payments made in lieu of employer paid fringe benefits or expenses, and employer contributions to a Section 457 deferred compensation plan.

Average salary

Average of the five highest successive years of Salary. Average salary is based on all Allowable Service if less than five years.

Retirement

Normal retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 65 and three years of Allowable Service; or
- (b) Age 62 and 30 years of Allowable Service.

Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.

First hired after June 30, 1989:

The age when first eligible for full Social Security retirement benefits (but not to exceed age 66) and three years of Allowable Service.

Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.

Early retirement

Age/Service requirements

First hired before July 1, 1989:

- (a) Age 55 and three years of Allowable Service; or
- (b) Any age and 30 years of Allowable Service; or
- (c) Rule of 90: Age plus Allowable Service totals 90.

First hired after June 30, 1989:

- (a) Age 55 with three years of Allowable Service.



COORDINATED MEMBERS

Retirement(continued)

Amount

First hired before July 1, 1989:

The greater of (a), (b) or (c):

- (a) 1.20% of Average Salary for each of the first ten years of Allowable Service.
1.70% of Average Salary for each year of Allowable Service in excess of 10 prior to July 1, 2006, and
1.90% of Average Salary for years of Allowable Service after July 1, 2006.
No actuarial reduction if age plus years of service totals 90. Otherwise reduction of 0.25% for each month the member is under age 65 (or 62 if 30 years of Allowable Service) at time of retirement.
- (b) 1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.
- (c) For eligible members: the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

First hired after June 30, 1989:

1.70% of Average Salary for each year of Allowable Service prior to July 1, 2006 and 1.90% for each year of Allowable Service beginning July 1, 2006, assuming augmentation to normal retirement age at 3.00% per year (2.50% per year for members hired after June 30, 2006) and actuarial reduction for each month the member is under the full Social Security benefit retirement age (not to exceed age 66). Beginning July 1, 2015, new early retirement reduction factors will apply, including special factors for members retiring at age 62 or later with at least 30 years of service.



Early Retirement Reduction Factors

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
55	43.56%	51.55%	54.08%
58	33.59%	40.46%	42.74%
60	24.65%	30.75%	32.74%
62	13.68%	18.96%	20.53%
65	0.00%	4.21%	4.68%
66	0.00%	0.00%	0.00%

Members who are age 62 with 30 years of service are eligible for a special set of reduction factors:

Age	Hired before 7/1/89	Hired from 7/1/89 to 6/30/06	Hired after 6/30/06
62	10.40%	14.46%	16.11%
63	6.64%	10.40%	11.70%
64	3.18%	6.64%	7.55%
65	0.00%	3.18%	3.65%
66	0.00%	0.00%	0.00%

All of the early retirement reduction factors shown are the ultimate factors. These are being phased in from the prior factors over a five-year period beginning July 1, 2015.

Form of Payment

Life annuity. Actuarially equivalent options are:

- (a) 50%, 75% or 100% Joint and Survivor with bounce back feature (option is canceled if member is predeceased by beneficiary).
- (b) 15 year Certain and Life
- (c) Guaranteed Refund.



COORDINATED MEMBERS

Retirement(continued)

Benefit increases

Under current law, the annual post-retirement increase on January 1 is 2.0 percent. When the funded ratio reaches 90 percent (on a market value of assets basis) for two consecutive years, the annual increase will rise to 2.5 percent. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 preceding the increase date will receive a full increase. Members receiving benefits for at least one full month but less than 12 full months as of the June 30 preceding the increase date will receive a prorated increase.

Disability

Age/service requirement

Total and permanent disability before Normal Retirement Age with three years of Allowable Service.

Amount

Normal Retirement Benefit based on Allowable Service and Average Salary at disability without reduction for commencement before Normal Retirement Age unless an optional annuity plan is selected.

Payments stop at Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be reduced on resumption of partial employment.

Form of payment

Same as for retirement.

Benefit increases

Same as for retirement.

Retirement after disability

Age/service requirement

Normal Retirement Age or the five year anniversary of the effective date of the disability benefit, whichever is later.

Amount

Any optional annuity continues. Otherwise, the larger of the disability benefit paid before Normal Retirement Age or the normal retirement benefit available at Normal Retirement Age, or an actuarially equivalent optional annuity.

Benefit increases

Same as for retirement.



COORDINATED MEMBERS

Death

Surviving spouse optional annuity

Age/Service requirements

Member or former member with three years of Allowable Service who dies before retirement or disability benefits commence.

Amount

Survivor's payment of the 100% Joint and Survivor benefit or an actuarial equivalent term certain annuity. If commencement is prior to age 65 (age 62 if 30 years of service), the benefit is reduced for early retirement with half the applicable reduction factor used from age 55 to actual commencement age. If no surviving spouse, then an actuarial equivalent dependent child benefit is paid to age 20 or for five years if longer.

Benefit increase

Same as for retirement.

Withdrawal

Refund of contributions

Age/Service requirements

Thirty days following termination of teaching service.

Amount

Member's contributions earn 4.00% interest compounded annually. For vested members, a deferred annuity may be elected in lieu of a refund.

Deferred annuity

Age/Service requirements

Vested at date of termination. Current requirement is three years of Allowable Service.



COORDINATED MEMBERS

Withdrawal (continued)

Amount

For members first hired prior to July 1, 2006, the benefit is computed under law in effect at termination and increased by the following percentage compounded annually:

- (a) 3.00% therefore until the earlier of January 1 of the year following attainment of age 55 and June 30, 2012;
- (b) 5.00% thereafter until the earlier of June 30, 2012 and when the annuity begins; and
- (c) 2.00% from July 1, 2012 forward.

Amount is payable as a normal or early retirement.

A member who terminated service before July 1, 1997 whose benefit does not commence until after June 30, 1997 shall receive an actuarially equivalent increase to reflect the change from 5.00% to 6.00% in the post-retirement interest assumption; or

For eligible members; the monthly benefit that is actuarially equivalent to 2.2 times the members' accumulated deductions plus interest thereon.

For members first hired July 1, 2006 and after, the benefit computed under law in effect at termination is increased by 2.50% compounded annually until June 30, 2012 and increased by 2.00% from July 1, 2012 forward until the annuity begins.



APPENDIX C

STATEMENT OF ACTUARIAL ASSUMPTIONS

The following assumptions were used in valuing the liabilities and benefits under the plan. For funding purposes, all assumptions are prescribed by Statutes, the LCPR, or the Board of Trustees. The assumptions prescribed are based on the experience study dated June 10, 2015 and current statutes which set the investment return assumption. For GASB 67 purposes, the economic assumptions are based on an experience study of those assumptions completed in November 2017.

The Allowance for Combined Service Annuity was based on the recommendation of Deloitte Consulting LLP, the actuary for the Legislative Commission on Pensions and Retirement (LCPR). We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work which is beyond the scope of this assignment so we have relied on Deloitte’s findings.

<i>Investment Return (Long-term Assumed Rate of Return)</i>	8.50% compounded annually. <u>For GASB 67 purposes:</u> 7.50% for June 30, 2017 measurement date.
<i>Future post-retirement adjustments</i>	2.00% per year. Once the funded ratio reaches 90% on a market value basis for two consecutive years, the COLA is scheduled by statute to revert back from 2.00% to 2.50%. Future assets and liabilities were projected using the 2017 valuation results as a starting point and assuming all actuarial assumptions are met in future years. These assumptions include a rate of return on the market value of assets of 8.5%. Further, there is an assumption that the stabilizer provisions will not be utilized by the Board. Based on this methodology, as of July 1, 2017, the COLA is expected to increase with the July 1, 2045 valuation. For the July 1, 2016 valuation, the increased COLA was not expected to be implemented during the next 40 years, and so it was assumed it would not occur. <u>For GASB 67 purposes:</u> no increase is assumed.
<i>Salary Increases</i>	Reported salary for prior fiscal year, with new hires annualized, is increased according to the salary increase table shown in the rate table for current fiscal year and annually for each future year. See table of sample rates.
<i>Payroll Growth</i>	3.50% per year <u>For GASB 67 purposes:</u> 3.00% per year
<i>Future Service</i>	Members are assumed to earn future service at a full-time rate.
<i>Mortality: Pre-retirement</i>	RP 2014 white collar employee table, male rates set back 6 years and female rates set back 5 years. Generational projection uses the MP-2015 scale.
<i>Post-retirement</i>	RP 2014 white collar annuitant table, male rates set back 3 years and female rates set back 3 years, with further adjustments of the rates. Generational projection uses the MP-2015 scale.
<i>Post-disability</i>	RP 2014 disabled retiree mortality, without adjustment



Summary of Actuarial Assumptions (*continued*)

<i>Disability</i>	Age-related rates based on experience; see table of sample rates.
<i>Withdrawal</i>	Rates vary by service based on actual plan experience, as shown in the rate table.
<i>Expenses</i>	Prior year administrative expenses expressed as percentage of prior year payroll.
<i>Retirement Age</i>	Graded rates beginning at age 55 as shown in rate table. Members who have attained the highest assumed retirement age will retire in one year.
<i>Percentage Married</i>	85% of male members and 65% of female members are assumed to be married. Members are assumed to have no children.
<i>Age Difference</i>	Females two years younger than males.
<i>Allowance for Combined Service Annuity</i>	Liabilities for vested former members are increased by 7.00% and liabilities for non-vested former members are increased by 9.00% to account for the effect of some Participants being eligible for a Combined Service Annuity.
<i>Refund of Contributions</i>	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.
<i>Interest on member contributions</i>	Members and former members who are eligible for the money purchase annuity are assumed to receive interest credits equal to the Pre-Retirement interest rate. All other members and former members receive the interest crediting rate as specified in statutes.
<i>Commencement of deferred benefits</i>	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at unreduced retirement age.
<i>Form of payment</i>	Members are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10.0% elect 50% J&S option 10.0% elect 75% J&S option 60.0% elect 100% J&S option 20.0% elect Straight Life option Females: 13.5% elect 50% J&S option 6.5% elect 75% J&S option 35.0% elect 100% J&S option 45.0% elect Straight Life option Members eligible for deferred annuities (including current terminated deferred members) and future disability benefits are assumed to elect a life annuity.



Summary of Actuarial Assumptions *(continued)*

Missing data for members

Membership data was supplied by TRA as of the valuation date. This information has not been audited by CMC. We have reviewed the information for internal consistency and we have no reason to doubt its substantial accuracy. In the small number of cases where submitted data was missing or incomplete and could not be recovered from prior years, the following assumptions were applied, if needed:

Data for active members:

Salary, Service, and Date of Birth	Based on current active demographics.
Gender	Female

Data for terminated members:

Date of birth	July 1, 1969
Average salary	\$38,500
Date of termination	Derived from date of birth, original entry age, and service

Data for in-pay members:

Beneficiary date of birth	Wife two years younger than husband
Gender	Based on first name
Form of payment	Life annuity for retirees and beneficiaries, 100% J&S option for disabled retirees.

Termination Rates

Service	Males	Females
Less than 1	32.00%	29.00%
1	15.00%	13.00%
2	11.00%	11.00%
3	8.50%	9.00%
4	6.25%	7.00%
5	5.25%	5.50%
6	4.60%	4.00%
7	4.10%	3.50%
8	2.80%	3.00%
9	2.30%	2.50%
10	2.00%	2.10%
15	1.10%	1.10%
20	0.60%	0.60%
25 or more	0.50%	0.50%



Age	Rate (%)			
	Pre-retirement Mortality*		Disability	
	Male	Female	Male	Female
20	0.023	0.013	0.00	0.00
25	0.026	0.014	0.00	0.00
30	0.036	0.014	0.00	0.00
35	0.031	0.018	0.01	0.01
40	0.035	0.024	0.03	0.03
45	0.041	0.033	0.05	0.05
50	0.061	0.055	0.10	0.10
55	0.105	0.092	0.16	0.16
60	0.175	0.140	0.25	0.25
65	0.292	0.204	0.00	0.00

*Rates shown are for 2014, the base year of the tables.

Age	Annuitant Mortality Rates (%)			
	Retirement *		Disability	
	Male	Female	Male	Female
55	0.267	0.196	2.337	1.448
60	0.353	0.267	2.660	1.700
65	0.486	0.430	3.169	2.086
70	0.945	0.706	4.035	2.820
75	2.015	1.352	5.429	4.105
80	4.126	2.682	7.662	6.104
85	7.358	5.456	11.330	9.042
90	13.560	9.947	17.301	13.265
95	24.351	18.062	24.717	19.588
100	38.292	29.731	32.672	27.819

* Rates shown are for 2014, the base year of the tables.



Summary of Actuarial Assumptions *(continued)*

Salary Scale	
Service	Salary Increase
1	9.50%
2	7.75%
3	7.25%
4	7.00%
5	7.00%
6	6.85%
7	6.70%
8	6.55%
9	6.40%
10	6.25%
11	6.00%
12	5.75%
13	5.50%
14	5.25%
15	5.00%
16	4.75%
17	4.50%
18	4.30%
19	4.20%
20	4.10%
21	4.00%
22	3.90%
23	3.80%
24	3.70%
25	3.60%
26 or more	3.50%

For GASB 67 purposes, the salary scale above is reduced by 0.65% at each age for the first ten years following the Measurement Date and reduced by 0.25% at each age, thereafter.



Retirement Rate (%)

<u>Age</u>	<u>Coordinated Members</u>				<u>Basic Members</u>	
	<u>Tier 1</u>	<u>Tier 1</u>	<u>Tier 2</u>	<u>Tier 2</u>	<u>Eligible for</u>	<u>Not Eligible for</u>
	<u>Early</u>	<u>Unreduced</u>	<u>Early</u>	<u>Unreduced</u>	<u>30 and Out</u>	<u>30 and Out</u>
					<u>Provision</u>	<u>Provision</u>
55	5	35	5		40	5
56	10	35	5		40	5
57	10	35	5		40	5
58	10	35	5		40	5
59	14	35	5		40	5
60	17	35	6		25	25
61	20	35	15		25	25
62	25	35	15		25	25
63	25	35	15		25	25
64	25	35	20		25	25
65		40	30		40	40
66		35		35	40	40
67		30		30	40	40
68		30		25	40	40
69		30		25	40	40
70		35		35	60	60
71-74		100		100	60	60
75-79		100		100	60	100
80 & Over		100		100	100	100

Coordinated Tier 2 Members age 62 or older with 30 or more years of service have 5% added to their early retirement rates.

Changes in actuarial assumptions and methods since the previous valuation

The Combined Service Annuity liability loads were updated for active, vested inactive members and non-vested inactive members.

For GASB 67 purposes: in addition, economic assumptions were updated based on recommendations in the 2017 experience study.