Minnesota State Retirement System

State Patrol Retirement Fund

Actuarial Valuation Report as of July 1, 2017

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Minnesota State Retirement System
State Patrol Retirement Fund
St. Paul, Minnesota

Dear Board of Directors:

The results of the July 1, 2017 annual actuarial valuation of the State Patrol Retirement Fund are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Fund only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report by persons other than intended users as described above.

The purpose of the valuation is to measure the Fund's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2017 based on the prescribed assumptions. Note that we have not attempted to quantify the impact of GASB Statements No. 67 and No. 68 in this report.

The required contribution rate shown on page one was designed to comply with Minnesota Statutes. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

Actuarial assumptions, including discount rates, mortality tables and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Board of Directors. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report. MSRS is solely responsible for communicating to GRS any changes required thereto.

In our professional judgement, the statutory discount rate of 8.0% used in this report deviates materially from the guidance set forth in Actuarial Standards of Practice No. 27 (ASOP No. 27). In a 2017 analysis of long-term rate of investment return and inflation assumptions, GRS suggested that an investment return assumption in the range of 6.85% to 7.68% would be reasonable. Please see our letter dated September 11, 2017 for additional information. If a discount rate within the reasonable range were used in this valuation instead of 8.0%, the unfunded liability and contribution deficiency would be higher than shown. Note that estimated results based on a 7.0% discount rate are shown on page six.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in the Actuarial Basis section of this report. This report includes risk metrics on pages six and seven, but does not include a more robust assessment of the risks of future experience differing materially from the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

The valuation was based upon information furnished by the Minnesota State Retirement System (MSRS), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

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

This report should not be relied on for any purpose other than the purpose described herein. Determinations of the financial results associated with the benefits described in this report in a manner other than the intended purpose may produce significantly different results.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

Brian B. Murphy and Bonita J. Wurst are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report is accurate and presents the actuarial position of the State Patrol Retirement Fund as of the valuation date according to prescribed assumptions, and was performed in accordance with the requirements of Minnesota Statutes Section 356.215, and the requirements of the Standards for Actuarial Work established by the LCPR. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board and with applicable statutes.

We are available to answer any questions or provide further details.

Respectfully submitted,

Brian B. Murphy

Brian B. Murphy, FSA, EA, FCA, MAAA

Bonita J. Wurst

Bonita J. Wurst, ASA, EA, FCA, MAAA

BBM/BJW:sc

Other Observations

General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the statutory assumption of the plan earning 8.00%), it is expected that:

(1) The unfunded actuarial accrued liabilities will be fully amortized after approximately 50 years,

(2) The funded status of the plan will increase gradually towards a 100% funding ratio, and

(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

As noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. Unfunded liabilities based on a lower earnings assumption have the potential to grow indefinitely.

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words, of transferring the obligations to an unrelated third party in an arm's length market value type transaction.

(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).

(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets.

Limitations of Project Scope

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

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Summary of Valuation Results

Contributions

The following table summarizes important contribution information as described in the Development of Costs section.

Contributions	Actuarial Valuation as of July 1, 2017	Actuarial Valuation as of July 1, 2016
Statutory Contributions - Chapter 352B (% of Payroll)	37.31%	37.37%
Required Contributions - Chapter 356 (% of Payroll)	42.64%	40.45%
Sufficiency / (Deficiency)	(5.33)%	(3.08)%

The contribution deficiency increased from 3.08% of payroll to 5.33% of payroll. The primary reason for the increased contribution deficiency was the change in assumptions described in the Effects of Changes section. On a market value of assets basis, contributions are deficient by 4.72% of payroll.

Based on the actuarial value of assets, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 22 years. Based on current statutory contributions, the actuarial value of assets, and other statutory methods and assumptions described in this report, the unfunded liability will be eliminated in approximately 50 years. We recommend utilizing the contribution stabilizer provisions described in the Summary of Plan Provisions and/or modifying benefits to address the contribution deficiency.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately 15.1% for the plan year ending June 30, 2017. The AVA earned approximately 9.6% for the plan year ending June 30, 2017 as compared to the assumed rate of 8.00%. The assumed rate is a prescribed assumption mandated by Minnesota Statutes. The assumed rate is a prescribed assumption mandated by Minnesota Statutes, and is outside the upper end of the reasonable range. According to the NASRA survey, the most common assumption for statewide plans is currently 7.50%. Use of a 7.50% return assumption would produce a deficiency greater than shown above.

Participant reconciliation and statistics are detailed in the Membership Data section. The Actuarial Basis section includes a summary of plan provisions and actuarial methods and assumptions used for the calculations in this report.

Accounting and financial reporting information prepared according to GASB Statements No. 67 and No. 68 has been provided in a separate report dated December 1, 2017.

Summary of Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in plan provisions, actuarial assumptions or valuation methods and procedures between the two valuations are described after the summary.

	Actuarial Valuation as of	
	July 1, 2017	**July 1, 2016**
Contributions (*% of Payroll*)		
Statutory - Chapter 352B	37.31%	37.37%
Required - Chapter 356	42.64%	40.45%
Sufficiency / (Deficiency)	(5.33)%	(3.08)%
Funding Ratios (*dollars in thousands*)		
Assets		
- Current assets (AVA)	$ 685,077	$ 654,842
- Current assets (MVA)	$ 691,599	$ 629,992
Accrued Benefit Funding Ratio		
- Current benefit obligations	$ 859,510	$ 812,659
- Funding ratio (AVA)	79.71%	80.58%
- Funding ratio (MVA)	80.46%	77.52%
Accrued Liability Funding Ratio		
- Actuarial accrued liability	$ 880,846	$ 833,886
- Funding ratio (AVA)	77.77%	78.53%
- Funding ratio (MVA)	78.52%	75.55%
Projected Benefit Funding Ratio		
- Current and expected future assets	$ 1,001,263	$ 955,976
- Current and expected future benefit obligations	$ 1,058,358	$ 987,460
- Projected benefit funding ratio (AVA)	94.61%	96.81%
Participant Data		
Active members		
- Number	902	892
- Annual valuation earnings *(000s)*	72,287	69,663
- Projected annual earnings *(000s)*	76,532	73,134
- Average projected annual earnings	84,847	81,989
- Average age	40.7	40.7
- Average service	11.2	11.1
Service retirements	847	844
Survivors	148	151
Disability retirements	57	53
Deferred retirements	59	55
Terminated other non-vested	28	20
Total	**2,041**	**2,015**

Summary of Valuation Results

Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2017 (based on an experience study dated July 26, 2016):

- Assumed increases in member salaries were changed.
- Adjusted assumed retirement rates. The net effect is fewer assumed early retirements.
- Reduced rates of withdrawal during first three years of employment.
- Increased rates of disability for ages 35 to 51.
- The base mortality table for annuitants and employees was changed from RP-2000 to RP-2014, fully generational, white collar adjustments with age adjustments. The mortality improvement scale was changed from Scale AA to Scale MP-2015.
- Form of payment assumptions were modified.
- The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2044, 1.50% from 2045 through 2061 and 2.50% thereafter to 1.00% through 2034, 1.50% from 2035 through 2053 and 2.50% thereafter.
- Loading factors to account for members with Combined Service Annuities were updated as follows:
    - Deferred Vested Members: Reduced from 30% of liabilities to 13% of liabilities
    - Non-Vested Terminated Members: Reduced from 30% of liabilities to 0% of liabilities
    - The Combined Service Annuity (CSA) assumption changes were approved by the LCPR based on an analysis completed by the LCPR actuary and documented in a report dated October 2016. The prior CSA assumptions were based on a 2001 study performed by a prior actuary.
- As a result of the additional liability resulting from the changes described above, the amortization date was changed from June 30, 2038 to June 30, 2039 per Minnesota Statute 356.215, Subd. 11(c).

Refer to the Actuarial Basis section of this report for a complete description of these changes.

Summary of Valuation Results

Effects of Changes

The combined impact of the changes on the previous page was to increase the accrued liability by $27.0 million and increase the required contribution by 3.3% of pay, as follows:

	Before Changes	Reflecting Assumption Changes	Reflecting Amortization Change
Normal Cost Rate, % of Pay	22.7%	24.1%	24.1%
Amortization of Unfunded Accrued Liability, % of Pay	16.3%	18.8%	18.2%
Expenses (% of Pay)	0.3%	0.3%	0.3%
Total Required Contribution, % of Pay	39.3%	43.2%	42.6%
Accrued Liability Funding Ratio	80.2%	77.8%	77.8%
Projected Benefit Funding Ratio	98.0%	94.6%	94.6%
Unfunded Accrued Liability (in millions)	$168.8	$195.8	$195.8

Summary of Valuation Results

Valuation of Future Annual Post-Retirement Benefit Increases

Benefit recipients receive a future annual compounding 1.00% post-retirement benefit increase. If the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 85% (based on a 1.50% post-retirement increase assumption) for two consecutive years, the benefit increase will revert to 1.50%. Similarly, if the accrued liability funding ratio reaches or exceeds 90% (based on a 2.50% post-retirement increase assumption) for two consecutive years, the benefit increase will revert to 2.50%. If, after reverting to a 1.50% benefit increase, the accrued liability funding ratio declines to 75% or less for one year or 80% or less for two consecutive years, the benefit increase rate will decrease to 1.00%. Benefit increases already granted, however, will not be affected.

To determine an assumption regarding future changes in the post-retirement benefit increase, we performed a projection of liabilities and market value of assets based on the following methods and assumptions:

- Future investment returns and liability discount rates of 8.00%;
- Open group; stable active population (new member profile based on average new members hired in recent years);
- The post-retirement benefit increase rate is assumed to be 1.00% per year until the accrued liability funding ratio threshold required to pay a 1.50% post-retirement benefit increase is reached; and similarly, the post-retirement benefit increase is assumed to be 1.50% per year until the accrued liability funding ratio threshold required to pay a 2.50% post-retirement benefit increase is reached.
- Current statutory contribution levels (i.e., not including potential contribution increases under the contribution stabilizer statutes).

Based on these assumptions and methods, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 1.50% benefit increase in the year 2034 and the plan would begin paying 1.50% benefit increases on January 1, 2035. Similarly, the projection indicates this plan is expected to attain the accrued liability funding ratio threshold to pay the 2.50% benefit increase in the year 2053 and the plan would begin paying 2.50% benefit increases on January 1, 2054. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

As noted elsewhere in this report, we do not expect the earnings assumption of 8.00% to be met. The funding ratio thresholds would be achieved later (if at all) if they were based upon an investment return assumption that meets the requirements of ASOP No. 27.

Summary of Valuation Results

Sensitivity Tests

During the 2017 legislative session, the Legislative Commission on Pensions and Retirement (LCPR) enacted a new sensitivity disclosure requirement for MSRS' 2017 valuations. Per the LCPR's requirement, we have calculated the liabilities associated with the following scenarios:

1) 7% interest rate assumption
2) 9% interest rate assumption
3) 1.0% post-retirement benefit increase for all future years
4) 2.5% post-retirement benefit increase for all future years

In each case, all other assumptions were unchanged from those used to develop the final valuation results in this report. Note that we believe the 9% interest rate assumption is an unrealistic assumption.

	Final Valuation Assumptions	Final Valuation Assumptions with 7% interest	Final Valuation Assumptions with 9% interest	Final Valuation Assumptions with 1.0% COLA for all future years	Final Valuation Assumptions with 2.5% COLA for all future years
Normal Cost Rate, % of Pay	24.1%	30.6%	19.2%	22.8%	27.2%
Amortization of Unfunded Accrued Liability, % of Pay	18.2%	25.7%	11.0%	17.0%	30.2%
Expenses (% of Pay)	0.3%	0.3%	0.3%	0.3%	0.3%
Total Required Contribution, % of Pay	42.6%	56.6%	30.5%	40.1%	57.7%
Contribution Sufficiency/(Deficiency), % of Pay	(5.3)%	(19.3)%	6.8 %	(2.8)%	(20.4)%
Accrued Liability Funding Ratio	77.8%	69.5%	86.3%	79.0%	67.9%
Actuarial Accrued Liability (in millions)	$880.8	$986.1	$793.7	$867.3	$1,008.7
Unfunded Accrued Liability (in millions)	$195.8	$301.0	$108.6	$182.3	$323.7

Summary of Valuation Results

Risk Measures (Dollars in Thousands)

Valuation Date (July 1)	(1) Accrued Liabilities (AAL)	(2) Market Value of Assets	(3) Market Value Unfunded AAL (1) - (2)	(4) Valuation Payroll	(5) Market Value Funded Ratio (2) / (1)	(6) Retiree Liabilities	(7) RetLiab/ AAL (6) / (1)	(8) AAL/ Payroll (1) / (4)	(9) Assets/ Payroll (2) / (4)
2010	$683,360	$488,870	$194,490	$63,250	71.5%	$441,901	64.7%	1080.4%	772.9%
2011	$700,898	$568,279	$132,619	$63,250	81.1%	$454,811	64.9%	1108.1%	898.5%
2012	$760,955	$549,956	$210,999	$62,524	72.3%	$513,106	67.4%	1217.1%	879.6%
2013	$741,850	$593,201	$148,649	$62,121	80.0%	$507,005	68.3%	1194.2%	954.9%
2014	$800,421	$667,340	$133,081	$63,952	83.4%	$537,866	67.2%	1251.6%	1043.5%
2015	$833,033	$664,530	$168,503	$68,463	79.8%	$570,541	68.5%	1216.8%	970.6%
2016	$833,886	$629,992	$203,894	$69,343	75.6%	$581,343	69.7%	1202.6%	908.5%
2017	$880,846	$691,599	$189,247	$73,056	78.5%	$611,782	69.5%	1205.7%	946.7%

Valuation Date (July 1)	(10) Portfolio StdDev	(11) Std Dev % of Pay (9) x (10)	(12) Unfunded / Payroll (3) / (4)	(13) Non-Investment Cash Flow (NICF)	(14) NICF/ Assets (13) / (2)	(15) SBI Market Rate of Return	(16) SBI 5-year Average
2010			307.5%	$(29,374)	-6.0%	15.2%	3.4%
2011			209.7%	$(31,499)	-5.5%	23.3%	5.3%
2012			337.5%	$(31,067)	-5.6%	2.4%	2.3%
2013			239.3%	$(33,070)	-5.6%	14.2%	6.2%
2014			208.1%	$(33,048)	-5.0%	18.6%	14.5%
2015	14.1%	136.9%	246.1%	$(31,713)	-4.8%	4.4%	12.3%
2016	14.1%	128.1%	294.0%	$(33,764)	-5.4%	-0.1%	7.7%
2017	14.1%	133.5%	259.0%	$(31,470)	-4.6%	15.1%	10.2%

Notes pertaining to numbered columns:

(5) The Funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.

(6) and (7). The ratio of Retiree liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.

(8) and (9). The ratios of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 500% and 700%. Ratios significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.

(10) and (11). The portfolio standard deviation measures the volatility of investment return. When multiplied by the ratio of assets to payroll it gives the effect of a one standard deviation asset move as a percent of payroll. This figure helps users understand the difficulty of dealing with investment volatility and the challenges volatility brings to sustainability.

(12) The ratio of unfunded liability to payroll gives an indication of the plan sponsor's ability to actually pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.

(13) and (14). The ratio of non-investment cash flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.

(15) and (16). Investment return is probably the largest single risk that most systems face. The year by year return and the 5-year geometric average give an indicator of the realism of the systems assumed return. Of course, past performance is not a guarantee of future results. The performance data for the Combined Funds (pooled investments of major Minnesota Public Retirement Systems) is presented in these columns. The source of this data is the Minnesota State Board of Investment.

Information prior to 2012 provided by prior actuary. See prior reports for additional detail.

Supplemental Information

The remainder of the report includes information supporting the results presented in the previous sections.

- **Plan assets** presents information about the plan's assets as reported by the Minnesota State Retirement System. The assets represent the portion of total fund liabilities that has been funded.
- **Membership data** presents and describes the membership data used in the valuation.
- **Development of costs** shows the liabilities for plan benefits and the derivation of the contribution amount.
- **Actuarial basis** describes the plan provisions, as well as the methods and assumptions used to value the plan. The valuation is based on the premise that the plan is ongoing.
- **Additional Schedules** includes a summary of funding progress and contributions over the long term.
- **Glossary** defines the terms used in this report.

Plan Assets

Statement of Fiduciary Net Position *(Dollars in Thousands)*

Assets	Market Value June 30, 2017	June 30, 2016
Cash, equivalents, short term securities	$ 18,849	$ 14,684
Fixed income	133,670	155,056
Equity	538,064	459,515
Other*	71,169	89,099
Total cash, investments, and other assets	**$ 761,752**	**$ 718,354**
Amounts receivable	$ 1,391	$ 1,136
Total Assets	**$ 763,143**	**$ 719,490**
Amounts payable*	$ (71,544)	$ (89,498)
Net Position Restricted for Pensions	**$ 691,599**	**$ 629,992**

** Includes $71,169 in Securities Lending Collateral as of June 30, 2017 and $89,099 as of June 30, 2016.*

Plan Assets

Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Minnesota State Retirement System for the Plan's prior two fiscal years.

Change in Assets	**Market Value**	
Year Ending	**June 30, 2017**	**June 30, 2016**
1. Fund balance at market value at beginning of year	**$ 629,992**	**$ 664,530**
2. Contributions		
a. Member	10,520	9,292
b. Employer	15,783	13,938
c. Other sources - Supplemental State Aid	1,000	1,000
d. Total contributions	$ 27,303	$ 24,230
3. Investment income		
a. Investment income/(loss)	$ 93,798	$ 73
b. Investment expenses	(721)	(847)
c. Net investment income/(loss)	$ 93,077	$ (774)
4. Other	$ -	$ -
5. Total income: *(2.d.) + (3.c.) + (4.)*	**$ 120,380**	**$ 23,456**
6. Benefits Paid		
a. Annuity benefits	(58,560)	(57,695)
b. Refunds	(5)	(79)
c. Total benefits paid	$ (58,565)	$ (57,774)
7. Expenses		
a. Other	-	-
b. Administrative	(208)	(220)
c. Total expenses	$ (208)	$ (220)
8. Total disbursements: *(6.c.) + (7.c.)*	**$ (58,773)**	**$ (57,994)**
9. Fund balance at market value at end of year: *(1.) + (5.) + (8.)*	**$ 691,599**	**$ 629,992**
10. State Board of Investment calculated investment return	15.1%	-0.1%

Plan Assets

Actuarial Asset Value *(Dollars in Thousands)*

	June 30, 2017	June 30, 2016
1. Market value of assets available for benefits	**$ 691,599**	**$ 629,992**
2. Determination of average balance		
a. Total assets available at beginning of year	629,992	664,530
b. Total assets available at end of year	691,599	629,992
c. Net investment income for fiscal year	93,077	(774)
d. Average balance *[a. + b. - c.] / 2*	614,257	647,648
3. Expected return *[8.0% x 2.d.]*	49,141	51,812
4. Actual return	93,077	(774)
5. Current year asset gain/(loss) *[4. - 3.]*	43,936	(52,586)
6. Unrecognized asset returns		

	Original Amount	Unrecognized Amount %	Unrecognized Amount $	Unrecognized Amount %	Unrecognized Amount $
a. Year ended June 30, 2017	$ 43,936	80%	$ 35,149	N/A	N/A
b. Year ended June 30, 2016	(52,586)	60%	(31,552)	80%	$ (42,069)
c. Year ended June 30, 2015	(23,216)	40%	(9,286)	60%	(13,930)
d. Year ended June 30, 2014	61,053	20%	12,211	40%	24,421
e. Year ended June 30, 2013	33,641		N/A	20%	6,728
f. Unrecognized return adjustment			**$ 6,522**		**$ (24,850)**

	June 30, 2017	June 30, 2016
7. **Actuarial value at end of year** *(1. - 6.f.)*	**$ 685,077**	**$ 654,842**
8. Approximate return on actuarial value of assets during fiscal year	9.6%	7.8%
9. Ratio of actuarial value of assets to market value of assets	0.99	1.04

Membership Data

Distribution of Active Members

Age	Years of Service as of June 30, 2017									
	<3*	3 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35+	Total
< 25	23									**23**
Avg. Earnings	$ 39,024									**$ 39,024**
25 - 29	67	30	3							**100**
Avg. Earnings	$ 53,957	$ 71,090	$ 83,892							**$ 59,995**
30 - 34	41	33	49	3						**126**
Avg. Earnings	$ 58,251	$ 71,711	$ 79,424	$ 88,331						**$ 70,726**
35 - 39	34	15	36	49	5					**139**
Avg. Earnings	$ 65,520	$ 70,533	$ 77,359	$ 89,108	$ 94,881					**$ 78,499**
40 - 44	14	11	23	67	65	3				**183**
Avg. Earnings	$ 72,519	$ 78,872	$ 84,130	$ 89,522	$ 91,592	$103,776				**$ 87,872**
45 - 49	7	7	10	30	67	29	8			**158**
Avg. Earnings	$ 67,094	$ 78,523	$ 84,161	$ 87,174	$ 88,699	$ 88,258	$ 88,256			**$ 86,611**
50 - 54	1	3	8	11	37	26	33	7		**126**
Avg. Earnings	$ 84,268	$ 94,278	$ 84,991	$ 90,138	$ 90,437	$ 92,243	$ 93,408	$ 94,915		**$ 91,507**
55 - 59	2	3	1	10	11	9	4	5		**45**
Avg. Earnings	$ 80,126	$ 94,512	$ 94,168	$ 92,941	$ 85,807	$ 88,046	$ 93,743	$ 96,776		**$ 90,278**
60 - 64			1			1				**2**
Avg. Earnings			$ 94,352			$115,838				**$105,095**
65 - 69										
Avg. Earnings										
70+										
Avg. Earnings										
Total	**189**	**102**	**131**	**170**	**185**	**68**	**45**	**12**		**902**
Avg. Earnings	**$ 57,450**	**$ 73,929**	**$ 80,713**	**$ 89,208**	**$ 90,058**	**$ 90,844**	**$ 92,522**	**$ 95,691**		**$ 80,141**

* *This exhibit does not reflect service earned in other MSRS Plans or Combined Service Annuity benefits. It should not be relied upon as an indicator of non-vested status.*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

Membership Data

Distribution of Service Retirements

	Years Retired as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
<50		1						**1**
Avg. Benefit		$ 16,799						**$ 16,799**
50 - 54	2	26						**28**
Avg. Benefit	$ 55,573	$ 47,889						**$ 48,438**
55 - 59	20	96	24					**140**
Avg. Benefit	$ 63,000	$ 58,864	$ 49,820					**$ 57,904**
60 - 64	5	39	100	27				**171**
Avg. Benefit	$ 26,920	$ 50,785	$ 58,812	$ 49,425				**$ 54,566**
65 - 69		2	29	85	25			**141**
Avg. Benefit		$ 34,592	$ 54,682	$ 54,296	$ 55,481			**$ 54,306**
70 - 74			3	27	114	3		**147**
Avg. Benefit			$ 36,285	$ 54,983	$ 62,445	$ 49,310		**$ 60,273**
75 - 79		1		1	41	51	1	**95**
Avg. Benefit		$ 34,781		$ 57,855	$ 66,255	$ 67,636	$ 71,480	**$ 66,632**
80 - 84					5	15	42	**62**
Avg. Benefit					$ 64,555	$ 73,989	$ 74,487	**$ 73,566**
85 - 89						2	33	**35**
Avg. Benefit						$ 68,988	$ 69,544	**$ 69,512**
90+							27	**27**
Avg. Benefit							$ 75,780	**$ 75,780**
Total	**27**	**165**	**156**	**140**	**185**	**71**	**103**	**847**
Avg. Benefit	**$ 55,768**	**$ 54,530**	**$ 56,227**	**$ 53,515**	**$ 62,405**	**$ 68,242**	**$ 73,213**	**$ 59,856**

In each cell, the top number is the count of retired participants for the age/years retired combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Survivors

Age	<1	1 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25+	Total
	Years Since Death as of June 30, 2017							
<45				5	4			**9**
Avg. Benefit				$ 18,089	$ 13,847			**$ 16,203**
45 - 49				1				**1**
Avg. Benefit				$ 12,965				**$ 12,965**
50 - 54	1	1		1	1			**4**
Avg. Benefit	$ 55,648	44,826		$ 16,399	$ 32,820			**$ 37,423**
55 - 59	2			1	1			**4**
Avg. Benefit	$ 43,055			$ 14,407	$ 62,975			**$ 40,873**
60 - 64		2	1	4	2			**9**
Avg. Benefit		$ 23,833	$ 27,098	$ 36,501	$ 27,969			**$ 30,745**
65 - 69	4	3	2	7	1	2		**19**
Avg. Benefit	$ 54,320	$ 44,343	$ 53,325	$ 25,208	$ 6,110	$ 52,447		**$ 39,180**
70 - 74	2	4	2	8	5	3	1	**25**
Avg. Benefit	$ 55,811	$ 21,532	$ 37,529	$ 27,456	$ 50,802	$ 46,927	$ 33,088	**$ 36,813**
75 - 79	1	1	2	6	3	1	2	**16**
Avg. Benefit	$ 33,340	$ 56,662	$ 25,548	$ 49,832	$ 31,020	$ 43,930	$ 11,064	**$ 37,450**
80 - 84	1	9	3	2	3	2	2	**22**
Avg. Benefit	$ 20,901	$ 34,601	$ 52,902	$ 30,274	$ 48,588	$ 34,858	$ 36,010	**$ 38,139**
85 - 89	1	5	5	3	7	1	3	**25**
Avg. Benefit	$ 61,803	$ 33,229	$ 35,289	$ 26,222	$ 45,311	$ 7,326	$ 25,071	**$ 35,311**
90+	1		4	3	3	2	1	**14**
Avg. Benefit	$ 42,957		$ 34,812	$ 22,402	$ 33,588	$ 37,876	$ 59,511	**$ 34,674**
Total	**13**	**25**	**19**	**41**	**30**	**11**	**9**	**148**
Avg. Benefit	**$ 48,436**	**$ 33,835**	**$ 38,648**	**$ 28,823**	**$ 37,467**	**$ 40,218**	**$ 29,107**	**$ 35,270**

In each cell, the top number is the count of survivors for the age/years since death combination and the bottom number is the average annual benefit amount.

Membership Data

Distribution of Disability Retirements

	Years Disabled as of June 30, 2017							
Age	**<1**	**1 - 4**	**5 - 9**	**10 - 14**	**15 - 19**	**20 - 24**	**25+**	**Total**
< 45	2	1						**3**
Avg. Benefit	$ 44,068	$ 50,765						**$ 46,300**
45 - 49	2	3	2	1				**8**
Avg. Benefit	$ 43,077	$ 41,853	$ 34,706	$ 31,080				**$ 39,026**
50 - 54	1	4	2	2	1			**10**
Avg. Benefit	$ 66,578	$ 50,845	$ 43,473	$ 54,130	$ 31,275			**$ 49,644**
55 - 59	1	2	5	1				**9**
Avg. Benefit	$ 43,489	$ 48,293	$ 55,517	$ 44,291				**$ 51,328**
60 - 64		1		3	3	1		**8**
Avg. Benefit		$ 29,827		$ 41,135	$ 31,164	$ 44,055		**$ 36,347**
65 - 69				3	3	2	1	**9**
Avg. Benefit				$ 56,024	$ 36,119	$ 49,704	$ 43,641	**$ 46,609**
70 - 74				3	2	2		**7**
Avg. Benefit				$ 41,578	$ 14,261	$ 61,339		**$ 39,419**
75+							3	**3**
Avg. Benefit							$ 54,067	**$ 54,067**
Total	**6**	**11**	**9**	**13**	**9**	**5**	**4**	**57**
Avg. Benefit	**$ 47,393**	**$ 46,011**	**$ 48,216**	**$ 46,142**	**$ 29,072**	**$ 53,228**	**$ 51,461**	**$ 44,875**

In each cell, the top number is the count of disabled participants for the age/years since disability combination and the bottom number is the average annual benefit amount.

Membership Data

Reconciliation of Members

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2016	**892**	**55**	**20**	**844**	**53**	**151**	**2,015**
New members	54	0	0	0	0	0	**54**
Return to active	1	(1)	0	0	0	0	**0**
Terminated non-vested	(8)	0	8	0	0	0	**0**
Service retirements	(24)	(1)	0	25	0	0	**0**
Terminated deferred	(6)	6	0	0	0	0	**0**
Terminated refund/transfer	(1)	0	(1)	0	0	0	**(2)**
Deaths	0	0	0	(23)	(2)	(14)	**(39)**
New beneficiary	0	0	0	0	0	12	**12**
Disabled	(6)	0	0	0	6	0	**0**
Unexpected status change	0	0	1	1	0	(1)	**1**
Net change	10	4	8	3	4	(3)	**26**
Members on 6/30/2017	**902**	**59**	**28**	**847**	**57**	**148**	**2,041**

Terminated Member Statistics on June 30, 2017	Deferred Retirement	Other Non-Vested	Total
Number	59	28	87
Average age	44.2	34.7	41.1
Average service	7.8	0.5	5.5
Average annual benefit, with augmentation to Normal Retirement Date and 13% CSA load	$ 24,546	N/A	$ 24,546
Average refund value, with 13% CSA load (0% for Non-Vested Members)	$ 88,660	$ 3,134	$ 61,134

Development of Costs

Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. **A Projected Benefit Funding Ratio less than 100% indicates that contributions are insufficient.** The resources available to meet projected obligations for current members consist of current fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 37.31% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

			June 30, 2017
A. Actuarial Value of Assets			$ 685,077
B. Expected Future Assets			
1. Present value of expected future statutory supplemental contributions*			138,674
2. Present value of future normal cost contributions			177,512
3. Total expected future assets: *(1.) + (2.)*			$ 316,186
C. Total Current and Expected Future Assets			1,001,263
D. Current Benefit Obligations**			
1. Benefit recipients	**Non-Vested**	**Vested**	**Total**
a. Service retirements	$ -	$ 536,074	$ 536,074
b. Disability retirements	-	31,626	31,626
c. Survivors	-	44,082	44,082
2. Deferred retirements with augmentation	-	9,430	9,430
3. Former members without vested rights***	38	-	38
4. Active members	7,016	231,244	238,260
5. Total Current Benefit Obligations	$ 7,054	$ 852,456	$ 859,510
E. Expected Future Benefit Obligations			198,848
F. Total Current and Expected Future Benefit Obligations****			1,058,358
G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)*			174,433
H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)*			57,095
I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)*			79.71%
J. Projected Benefit Funding Ratio: *(C.)/(F.)*			94.61%

* *Per the LCPR Standards for Actuarial Work, calculated assuming the current contribution toward the unfunded liability continues for the entire amortization period. Includes $1,000,000 state contribution.*

** *Present value of credited projected benefits (projected compensation, current service).*

*** *Former members who have not satisfied vesting requirements and have not collected a refund of member contributions as of the valuation date.*

**** *Present value of projected benefits (projected compensation, projected service).*

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate (*Dollars in Thousands)*

	Actuarial Present Value of Projected Benefits	Actuarial Present Value of Future Normal Costs	Actuarial Accrued Liability
A. Determination of Actuarial Accrued Liability (AAL)			
1. Active members			
a. Retirement annuities	$ 407,143	$ 156,088	$ 251,055
b. Disability benefits	20,414	13,800	6,614
c. Survivor's benefits	4,078	2,785	1,293
d. Deferred retirements	4,846	4,082	764
e. Refunds*	627	757	(130)
f. Total	$ 437,108	$ 177,512	$ 259,596
2. Deferred retirements with future augmentation	9,430	-	9,430
3. Former members without vested rights	38	-	38
4. Benefit recipients	611,782	-	611,782
5. Total	$ 1,058,358	$ 177,512	$ 880,846
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)			
1. Actuarial accrued liability			$ 880,846
2. Current assets (AVA)			685,077
3. Unfunded actuarial accrued liability			$ 195,769
C. Determination of Supplemental Contribution Rate**			
1. Present value of future payrolls through the amortization date of June 30, 2039			$ 1,070,843
2. Supplemental contribution rate: *(B.3.) / (C.1.)*			18.28% ***

* *Includes non-vested refunds and non-married survivor benefits only.*

** *The amortization of the Unfunded Actuarial Accrued Liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.*

*** *The amortization factor as of June 30, 2017 is 13.99209.*

Development of Costs

Changes in Unfunded Actuarial Accrued Liability (UAAL) *(Dollars in Thousands)*

	Year Ending June 30, 2017		
	Actuarial Accrued Liability	Current Assets	Unfunded Actuarial Accrued Liability
A. Unfunded Actuarial Accrued Liability at beginning of year	$ 833,886	$ 654,842	$ 179,044
B. Changes due to interest requirements and current rate of funding			
1. Normal cost, including expenses	16,765	-	16,765
2. Benefit payments	(58,565)	(58,565)	-
3. Contributions	-	27,303	(27,303)
4. Interest on A., B.1., B.2. and B.3.	65,039	51,137	13,902
5. Total *(B.1. + B.2. + B.3. + B.4.)*	$ 23,239	$ 19,875	$ 3,364
C. Expected Unfunded Actuarial Accrued Liability at end of year *(A. + B.5.)*	$ 857,125	$ 674,717	$ 182,408
D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected			
1. Age and service retirements			$ (334)
2. Disability retirements			1,437
3. Death-in-service benefits			(208)
4. Withdrawals			(84)
5. Salary increases			(4,903)
6. Investment income			(10,359)
7. Mortality of annuitants			(551)
8. Other items			1,398
9. Total			$ (13,604)
E. Unfunded Actuarial Accrued Liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.9.)*			$ 168,804
F. Change in Unfunded Actuarial Accrued Liability due to changes in plan provisions			-
G. Change in Unfunded Actuarial Accrued Liability due to changes in actuarial assumptions			26,965
H. Change in Unfunded Actuarial Accrued Liability due to changes in actuarial methods			-
I. Unfunded Actuarial Accrued Liability at end of year *(E. + F. + G. + H.)**			$ 195,769

** The Unfunded Actuarial Accrued Liability on a market value of assets basis is $189,247.*

Development of Costs

Determination of Contribution Sufficiency/(Deficiency) *(Dollars in Thousands)*

The required contribution is defined in Minnesota Statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses. The dollar amounts shown are for illustrative purposes and equal percent of payroll multiplied by projected annual payroll.

	Percent of Payroll	Dollar Amount
A. Statutory contributions - Chapter 352B		
1. Employee contributions	14.40%	$ 11,021
2. Employer contributions	21.60%	16,531
3. State contributions***	1.31%	1,000
4. Total	37.31%	$ 28,552
B. Required contributions - Chapter 356		
1. Normal cost		
a. Retirement benefits	21.17%	$ 16,202
b. Disability benefits	1.89%	1,446
c. Survivors	0.40%	306
d. Deferred retirement benefits	0.53%	406
e. Refunds*	0.09%	69
f. Total	24.08%	$ 18,429
2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2039	18.28%	$ 13,990
3. Allowance for expenses	0.28%	$ 214
4. Total	42.64% **	$ 32,633
C. Contribution Sufficiency/(Deficiency) *(A.4. - B.4.)*	(5.33)%	$ (4,081)

Note: Projected annual payroll for fiscal year beginning on the valuation date: $76,532 (based on methods prescribed in the LCPR Standards for Actuarial Work).

* *Includes non-vested refunds and non-married survivor benefits only.*
** *The required contribution on a Market Value of Assets basis is 42.03% of payroll.*
*** *Contributions paid until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund reach 90% funding (on a Market Value of Assets basis).*

Actuarial Basis

Actuarial Methods

All actuarial methods are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement, or the MSRS Board of Directors. Different methodologies may also be reasonable and results based on other methodologies would be different.

Actuarial Cost Method

Actuarial Accrued Liability and required contributions in this report are computed using the Entry Age Normal Cost Method. This method is prescribed by Minnesota Statute. Under this method, a normal cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination. Age as of the valuation date was calculated based on the dates of birth provided by the Fund. Entry age for valuation purposes was calculated as the age on the valuation date minus the provided years of service on the valuation date.

To the extent that current assets and future normal costs do not support participants' expected future benefits, an Unfunded Actuarial Accrued Liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases. The total contribution developed under this method is the sum of normal cost, expenses, and the payment toward the UAAL.

Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the accrued liability funding ratio threshold (determined on a market value of assets basis) required to pay a 1.50% or 2.50% benefit increase, Minnesota Statutes require the 1.50% or 2.50% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the accrued liability funding ratio threshold required to pay a 1.50% or 2.50% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the accrued liability funding ratio thresholds, and the expected payment of 1.50% or 2.50% benefit increases must be reflected in the liability calculations.

Funding Objective

The fundamental financing objective of the Fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

Actuarial Basis

Actuarial Methods (Concluded)

Asset Valuation Method

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year; and
- The asset value is the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Payment on the Unfunded Actuarial Accrued Liability

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2039 assuming payroll increases of 3.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date may be extended. Projected payroll is multiplied by 0.959 in the determination of the present value of future payroll to account for timing differences (as required by the Standards for Actuarial Work).

Changes in Methods since Prior Valuation

There have been no changes in actuarial methods since the prior valuation.

Actuarial Basis

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the MSRS Board of Directors. These parties are responsible for selecting the assumptions used for this valuation. Unless noted otherwise, the assumptions prescribed are based on the last experience study, dated July 26, 2016. The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	8.00% per annum.
Benefit increases after retirement	1.00% per annum through 2034, 1.50% per annum from 2035 to 2053, and 2.50% per annum thereafter.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.75% per year.
Payroll growth	3.50% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are:

Year	Select Withdrawal Rates
1	2.50%
2	2.00%
3	1.50%

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former, vested members are increased by 13.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. Account balances for deferred members accumulate interest until normal retirement date and are discounted back to the valuation date.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their spouses, and males are assumed to be two years older than their spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first child is born at member's age 28 and second child at member's age 31.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: 20% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 55% elect 100% Joint & Survivor option Remaining married and unmarried members are assumed to elect the Straight Life option.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility. Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided. There are no members reported with missing gender or birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: **Data for active members:** There was 1 member reported with missing salary and no members reported with missing service. Prior year salary was not reported, so high five salary with a 10% load to account for salary increases was used. **Data for terminated members:** There was 1 member reported without a benefit. We calculated benefits for this member using the reported Credited Service and Termination Date. Average Salary was not reported, so we assumed a value of $35,000. **Data for members receiving benefits:** There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were no retirees reported with a bounce back annuity and an unreasonable reduction factor. There were no retirees reported with a survivor option and a survivor date of death. For retirees who elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing or invalid (199 members) and/or the survivor gender was missing or invalid (215 members).

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Changes in actuarial assumptions	Assumed salary increase rates were changed as recommended in the July 26, 2016, experience study. The net effect is proposed rates that average 0.26% greater than the previous rates. Assumed rates of retirement were changed; new rates result in slightly more unreduced (normal) retirements, and fewer early reduced retirements. Assumed rates of termination were changed. The new rates were decreased for the first three years of employment. Disability rates for ages 35 to 51 were increased. The base mortality table for healthy and disabled annuitants and employees was changed from the RP-2000 fully generational table to the RP-2014 fully generational table (with a base year of 2006), white collar adjustments. The mortality improvement scale was changed from Scale AA to Scale MP-2015. The assumed percentage of members electing joint and survivor annuities was increased. The form of payment assumptions are the same for males and females. The Combined Service Annuity (CSA) load was 30% for vested and non-vested deferred member liability. The CSA has been changed to 13% for vested deferred member liability and 0.00% for non-vested deferred member liability. The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2044, 1.50% per year from 2045 through 2061, and 2.50% thereafter to 1.00% per year through 2034, 1.50% per year from 2035 through 2053, and 2.50% thereafter.

Actuarial Basis

Summary of Actuarial Assumptions (Continued)

Age in 2017	Percentage of Members Dying each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
	Male	Female	Male	Female	Male	Female
20	0.02%	0.01%	0.02%	0.01%	0.02%	0.01%
25	0.04	0.02	0.03	0.01	0.04	0.02
30	0.05	0.05	0.03	0.02	0.05	0.05
35	0.08	0.08	0.03	0.03	0.08	0.08
40	0.11	0.12	0.04	0.03	0.11	0.12
45	0.17	0.15	0.06	0.05	0.17	0.15
50	0.25	0.20	0.11	0.09	0.25	0.20
55	0.38	0.27	0.19	0.14	0.38	0.27
60	0.51	0.39	0.32	0.21	0.51	0.39
65	0.74	0.64	0.56	0.31	0.74	0.64
70	1.21	1.03	1.00	0.53	1.21	1.03

* *Generally, mortality rates are expected to increase as age increases. These standard mortality rates have been adjusted slightly to prevent decreasing mortality rates. If the rates were not adjusted as described, we would not expect the valuation results to be materially different.*

** *Rates are adjusted for mortality improvements using Scale MP-2015 from a base year of 2006.*

Age	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
	Male	Female	Male	Female
20	1.47%	1.47%	0.03%	0.03%
25	1.13	1.13	0.05	0.05
30	0.80	0.80	0.06	0.06
35	0.47	0.47	0.11	0.11
40	0.40	0.40	0.18	0.18
45	0.40	0.40	0.30	0.30
50	0.00	0.00	0.48	0.48
55	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
65	0.00	0.00	0.00	0.00

Summary of Actuarial Assumptions (Concluded)

Age	Percent Retiring
50	5 %
51	5
52	5
53	5
54	5
55	65
56	50
57	30
58	20
59	30
60+	100

Salary Scale	
Year	Increase
1	15.50%
2	9.50
3	8.00
4	7.50
5	7.00
6	6.50
7	6.25
8	6.00
9	5.75
10	5.50
11	5.25
12	5.00
13	4.75
14	4.50
15	4.50
16	4.50
17	4.25
18	4.25
19	4.00
20	4.00
21	3.90
22	3.80
23	3.70
24	3.60
25+	3.50

Actuarial Basis

Summary of Plan Provisions

Following is a summary of the major plan provisions used in the valuation of this report. MSRS is solely responsible for the validity, accuracy and comprehensiveness of this information. If any of the plan provisions shown below are not accurate and complete, the valuation results may differ significantly from those shown in this report and may require a revision of this report.

Plan year	July 1 through June 30
Eligibility	State troopers, conservation officers, certain crime bureau and gambling enforcement officers, and certain other persons listed in Minnesota Statutes 352B.011 subdivision 10.
Contributions	Percent of Salary <u>Effective Date</u> / <u>Member</u> / <u>Employer</u> July 1, 2016 and later / 14.40% / 21.60% Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
State Contributions	$1 million paid annually on October 1 until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Retirement Fund become 90% funded (on a Market Value of Assets basis).
Allowable service	Service during which member contributions were deducted. Includes period receiving temporary Worker's Compensation and reduced salary from employer. See Normal Retirement benefit definition below for information about service limits.
Salary	Salaries excluding lump sum payments at separation.
Average salary	Average of the five highest years of Salary. Average Salary is based on all Allowable Service if less than five years. Average Salary is based on all years without regard to any service limits.
Retirement	
<u>**Normal retirement benefit**</u>	
Age/Service requirement	Age 55 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	3.00% of Average Salary for each year of Allowable Service up to 33 years. Members with at least 28 years of service as of July 1, 2013, are not subject to this service limit. Member contributions made after the service cap will be refunded at retirement.

Actuarial Basis

Summary of Plan Provisions (Continued)

Retirement (Continued)	
Early retirement benefit	
Age/Service requirement	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement reduced by 1/10% for each month that the member is under age 55. If the effective date of retirement is after June 30, 2015, the reduction is 0.34% for each month that the member is under age 55 at the time of retirement.
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	Since January 1, 2014, benefit recipients receive annual 1.00% benefit increases. When the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 85% for two consecutive years, the benefit increase will increase to 1.50%; the benefit will revert to 2.50% when the accrued liability funding ratio (determined on a market value of assets basis) reaches or exceeds 90% for two consecutive years. If, after reverting to a 1.50% increase, the accrued liability funding ratio declines to 75% or less for the most recent valuation year or 80% or less for two consecutive years, the benefit increase will decrease to 1.00%. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Occupational disability benefit	
Age/Service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.

Summary of Plan Provisions (Continued)

Disability (continued)

Occupational disability benefit (Continued)

Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-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 paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Non-duty disability benefit

Age/Service requirement	At least one year of Allowable Service and disability not related to covered employment.
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 15 years) and Average Salary at disability without reduction for commencement before age 55. Payments cease at age 65 (age 55 if disabled after June 30, 2015) or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Retirement after disability

Age/Service requirement	Age 65 (age 55 if disabled after June 30, 2015) with continued disability.
Amount	Optional annuity continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.

Form of payment	Same as for retirement.
Benefit increases	Same as for retirement.

Summary of Plan Provisions (Continued)

Death	
Surviving spouse benefit	
Age/Service requirement	Member who is active or receiving a disability benefit or former member.
Amount	50% of Average Salary if member was active or occupational disability and either had less than three years (five years if first hired after June 30, 2013) of Allowable Service or was under age 55. Annuity is paid for life. Surviving spouse receives the 100% joint and survivor benefit commencing on the member's 55th birthday if member was active or a disability with three years (five years if first hired after June 30, 2013) of Allowable Service. A spouse who had been receiving the 50% benefit shall be entitled to the greater benefit. The surviving spouse of a former member receives the 100% joint and survivor benefit commencing on the member's 55th birthday if former member had three years (five years if first hired after June 30, 2013) of Allowable Service.
Benefit increases	Same as for retirement.
Surviving dependent children's benefit	
Age/Service requirement	Member who is active or receiving a disability benefit. Child must be unmarried, under age 18 (or 23 if full-time student) and dependent upon the member.
Amount	10% of Average Salary for each child and $20 per month prorated among all dependent children. Benefit must not be less than 50% nor exceed 70% of Average Salary.
Benefit increases	Same as for retirement.
Refund of contributions	
Age/Service requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	Member contributions with 6.00% interest compounded daily until June 30, 2011, and 4.00% thereafter.
Termination	
Refund of contributions	
Age/service requirement	Termination of state service.
Amount	Member contributions with 6.00% interest compounded daily to June 30, 2011, and 4.00% thereafter. If a member is vested, a deferred annuity may be elected in lieu of a refund.

Summary of Plan Provisions (Continued)

Termination (Continued)	
Deferred benefit	
Age/service requirement	Three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971, to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; and (d.) 2.00% after December 31, 2011, until the annuity begins. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997, but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Optional form conversion factors	Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set back two years for males and set forward one year for females, blended 95% males, 6.50% post-retirement interest, and 8.50% pre-retirement interest.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; and (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.

Actuarial Basis

Summary of Plan Provisions (Concluded)

Contribution stabilizer	The following is a summary of the contribution stabilizer provisions in Minnesota Statute 352.045: ▪ If a contribution sufficiency of at least 2.00% exists, member and employer contributions may be adjusted by the MSRS Board of Directors to a level necessary to maintain a 2.00% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. Employer contributions must be equal to 60% of the sum of member and employer contributions. ▪ If a contribution deficiency of at least 0.50% exists, member and employer contribution rates may be increased by the MSRS Board of Directors to eliminate the deficiency. Employer contributions must be equal to 60% of the sum of member and employer contributions. ▪ Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the first day of the first full payroll period of the next fiscal year.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

Additional Schedules

Schedule of Funding Progress[1] *(Dollars in Thousands)*

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded (Overfunded) AAL (UAAL) (b) - (a)	Funded Ratio (a)/(b)	Actual Covered Payroll (Previous FY) (c)	UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c)
7-1-1991	$ 200,068	$ 224,033	$ 23,965	89.30%	$ 32,365	74.05 %
7-1-1992	222,314	233,656	11,342	95.15	32,882	34.49
7-1-1993	244,352	258,202	13,850	94.64	35,765	38.73
7-1-1994	262,570	275,377	12,807	95.35	35,341	36.24
7-1-1995	284,918	283,078	(1,840)	100.65	37,518	(4.90)
7-1-1996	323,868	303,941	(19,927)	106.56	41,476	(48.04)
7-1-1997	375,650	332,427	(43,223)	113.00	41,996	(102.92)
7-1-1998	430,011	371,369	(58,642)	115.79	43,456	(134.95)
7-1-1999	472,687	406,215	(66,472)	116.36	45,333	(146.63)
7-1-2000	528,573	458,384	(70,189)	115.31	48,167	(145.72)
7-1-2001	572,815	489,483	(83,332)	117.02	48,935	(170.29)
7-1-2002	591,383	510,344	(81,039)	115.88	49,278	(164.45)
7-1-2003	591,521	538,980	(52,541)	109.75	54,175	(96.98)
7-1-2004	594,785	545,244	(49,542)	109.09	51,619	(95.98)
7-1-2005	601,220	566,764	(34,456)	106.08	55,142	(62.49)
7-1-2006	618,990	641,479	22,489	96.49	57,765	38.93
7-1-2007	617,901	673,444	55,543	91.75	61,498	90.32
7-1-2008	595,082	693,686	98,604	85.79	60,029	164.26
7-1-2009	584,501	725,334	140,833	80.58	61,511	228.96
7-1-2010	567,211	683,360	116,149	83.00	63,250	183.63
7-1-2011	563,046	700,898	137,852	80.33	63,250	217.95
7-1-2012	554,244	760,955	206,711	72.84	62,524 [2]	330.61
7-1-2013	552,319	741,850	189,531	74.45	62,121 [2]	305.10
7-1-2014	597,870	800,421	202,551	74.69	63,952 [2]	316.72
7-1-2015	639,863	833,033	193,170	76.81	68,463 [3]	282.15
7-1-2016	654,842	833,886	179,044	78.53	69,343 [3]	258.20
7-1-2017	685,077	880,846	195,769	77.77	73,056 [4]	267.97

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 12.4%.*
[3] *Assumed equal to actual member contributions divided by 13.4%.*
[4] *Assumed equal to actual member contributions divided by 14.4%.*

Additional Schedules

Schedule of Contributions from the Employer and Other Contributing Entities[1]

(Dollars in Thousands)

Plan Year Ended June 30	Actuarially Required Contribution Rate (a)	Actual Covered Payroll (b)	Actual Member Contributions (c)	Annual Required Contributions [(a)x(b)] - (c) = (d)	Actual Employer Contributions[2] (e)	Percentage Contributed (e)/(d)
1991	22.15%	$ 32,365	$ 2,751	$ 4,418	$ 4,825	109.21%
1992	22.58	32,882	2,795	4,630	4,893	105.68
1993	22.27	35,765	3,040	4,925	5,288	107.37
1994	21.94	35,341	3,004	4,750	5,159	108.61
1995	21.79	37,518	3,189	4,986	5,583	111.97
1996	21.34	41,476	3,484	5,367	5,742	106.99
1997	21.33	41,996	3,746	5,212	6,151	118.02
1998	15.67	43,456	3,634	3,176	5,475	172.39
1999	14.14	45,333	3,850	2,560	5,712	223.13
2000	15.17	48,167	4,044	3,263	6,069	185.99
2001	15.48	48,935	4,145	3,430	6,166	179.77
2002	14.00	49,278	4,215	2,684	6,209	231.33
2003	14.34	54,175	4,555	3,214	6,826	212.38
2004	17.81	51,619	4,493	4,700	6,504	138.39
2005	18.15	55,142	4,517	5,491	6,670	121.47
2006	19.84	57,765	4,719	6,741	7,055	104.66
2007	26.69	61,498	4,987	11,427	7,461	65.30
2008	29.90	60,029	5,594	12,355	8,279	67.01
2009	34.49	61,511	6,216	14,999	9,178	61.19
2010	38.16	63,250	6,726	17,410	10,104	58.04
2011	33.84	63,250	6,578	14,826	9,873	66.59
2012	36.25	62,524 [3]	7,753	14,912	11,620	77.92
2013	42.52	62,121 [3]	7,703	18,711	11,482	61.37
2014	41.24	63,952 [3]	7,930	18,444	12,894	69.91
2015	43.56	68,463 [4]	9,174	20,648	14,763	71.50
2016	42.91	69,343 [4]	9,292	20,463	14,938	73.00
2017	40.45	73,056 [5]	10,520	19,031	16,783	88.19
2018	42.64	N/A	N/A	N/A	N/A	N/A

[1] Information prior to 2012 provided by prior actuary. See prior reports for additional detail.
[2] Includes contributions from other sources (if applicable).
[3] Assumed equal to actual member contributions divided by 12.4%.
[4] Assumed equal to actual member contributions divided by 13.4%.
[5] Assumed equal to actual member contributions divided by 14.4%.

Glossary of Terms

Accrued Benefit Funding Ratio	The ratio of assets to Current Benefit Obligations.
Accrued Liability Funding Ratio	The ratio of assets to Actuarial Accrued Liability.
Actuarial Accrued Liability (AAL)	The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.
Actuarial Assumptions	Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.
Actuarial Cost Method	A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of future Normal Costs and the Actuarial Accrued Liability.
Actuarial Equivalent	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV)	The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.
Actuarial Present Value of Projected Benefits	The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for developing and monitoring a retirement system's funding policy, such as the Funded Ratio and the Annual Required Contribution (ARC).

Glossary of Terms (Continued)

Actuarial Value of Assets	The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).
Amortization Method	A method for determining the Amortization Payment. Under the Level Percentage of Pay method, the Amortization payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.
Amortization Payment	That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.
Amortization Period	The period used in calculating the Amortization Payment.
Annual Required Contribution (ARC)	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation. The ARC consists of the Employer Normal Cost and Amortization Payment.
Augmentation	Annual increases to deferred benefits.
Closed Amortization Period	A specific number of years that is reduced by one each year, and declines to zero with the passage of time. For example, if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc.
Current Benefit Obligations	The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement (comparable to a Projected Unit Credit measurement).
Employer Normal Cost	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Expected Assets	The present value of anticipated future contributions intended to fund benefits for current members.

Glossary of Terms (Continued)

Experience Gain/Loss	A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.
GASB	Governmental Accounting Standards Board.
GASB Statements No. 25 and No. 27	These are the governmental accounting standards that set the accounting and financial reporting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves. These statements remain in effect only for pension plans that are not administered as trusts or equivalent arrangements. Please refer to the definition for GASB Statements No. 67 and No. 68 below.
GASB Statement No. 50	The accounting standard governing a state or local governmental employer's accounting for pensions. This statement remains in effect for pension plans that are not administered as trusts. Please refer to the definition of GASB Statements No. 67 and No. 68 below.
GASB Statements No. 67 and No. 68	Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25, No. 27 and No. 50, respectively, for pension plans administered as trusts. Statement No. 68 sets the accounting and financial reporting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves. Accounting and financial reporting information prepared according to Statements No. 67 and No. 68 is provided in a separate report beginning with the June 30, 2014 actuarial valuation.
GASB Statement No. 82	Statement No. 82, issued in March 2016, is an amendment to Statements No. 67, No. 68, and No. 73, and is intended to improve consistency in the application of the accounting statements.

Glossary of Terms (Concluded)

Normal Cost	The annual cost assigned, under the Actuarial Cost Method, to the current plan year.
Projected Benefit Funding Ratio	The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits. A Ratio less than 100% indicates that contributions are insufficient.
Unfunded Actuarial Accrued Liability	The difference between the Actuarial Accrued Liability and Actuarial Value of Assets.
Valuation Date	The date as of which the Actuarial Present Value of Future Benefits is determined. The benefits expected to be paid in the future are discounted to this date.