Minnesota State Retirement System

State Employees Retirement Fund
GASB Statement Nos. 67 and 68
Accounting and Financial Reporting for Pensions
June 30, 2017

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December 1, 2017

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

Dear Board of Directors:

This report provides accounting and financial reporting information that is intended to comply with the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 for the State Employees Retirement Fund ("SERF"), as amended by Statement No. 82. These calculations have been made on a basis that is consistent with our understanding of these accounting standards.

GASB Statement No. 67 is the accounting standard that applies to the financial reports issued by retirement systems. GASB Statement No. 68 establishes accounting and financial reporting for state and local government employers who provide their employees (including former employees) pension benefits through a trust. GASB Statement No. 82 is an amendment to Statements No. 67, No. 68, and No. 73, intended to improve consistency in the application of the accounting statements.

Our calculation of the liability associated with the benefits described in this report was performed for the purpose of providing financial reporting and disclosure information that satisfies the requirements of GASB Statements No. 67 and No. 68. The calculation of the plan's liability for this report may not be applicable for purposes of funding the plan. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB Statement No. 67 and No. 68 may produce significantly different results. The information in this report is calculated on a total plan basis. MSRS is responsible for preparing the Schedule of Employer Allocations and the Schedule of Pension Amounts by Employer, as applicable. This report may be provided to parties other than the Minnesota State Retirement System (MSRS) only in its entirety and only with the permission of MSRS. GRS is not responsible for unauthorized use of this report.

This report is based upon information, furnished to us by MSRS, concerning retirement and ancillary benefits, active members, deferred vested members, retirees and beneficiaries, and financial data. If your understanding of this information is different, please let us know. This information was checked for internal consistency, but it was not audited.

This report complements the actuarial valuation report for funding purposes that was or will be provided to the System and should be considered in conjunction with that report. Please see the actuarial valuation report as of June 30, 2017 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

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To the best of our knowledge, the information contained within this report is accurate and fairly represents the actuarial position of the State Employees Retirement Fund as of the measurement date. All calculations have been made in conformity with generally accepted actuarial principles and practices as well as with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

The signing actuaries are independent of the plan sponsor.

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.

Respectfully submitted,

Brian B. Murphy

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

Bonita J. Wurst

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

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SECTION A

EXECUTIVE SUMMARY

Executive Summary
as of June 30, 2017 (Dollars in Thousands)

	2017
Actuarial Valuation Date	June 30, 2017
Measurement Date of the Net Pension Liability	June 30, 2017
Membership	
Number of	
- Service Retirements	33,563
- Survivors	3,940
- Disability Retirements	1,830
- Deferred Retirements	17,006
- Terminated other non-vested	9,467
- Active Members	50,578
- Total	116,384
Covered-employee Payroll	$ 2,939,455 [1]
Net Pension Liability	
Total Pension Liability	$ 19,903,520
Plan Fiduciary Net Position	12,485,614
Net Pension Liability	$ 7,417,906
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	62.73%
Net Pension Liability as a Percentage of Covered-employee Payroll	252.36%
Development of the Single Discount Rate	
Single Discount Rate	5.42%
Long-Term Expected Rate of Investment Return	7.50%
Long-Term Municipal Bond Rate[2]	3.56%
Last year ending June 30 in the 2018 to 2117 projection period for which projected benefit payments are fully funded	2049
Total Pension Expense/ (Income)	$ 1,197,948

Deferred Outflows and Deferred Inflows by Source Arising from Current and Prior Periods to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources
Difference between expected and actual experience in the measurement of the Total Pension Liability	$ 52,452	$ 206,083
Changes in assumptions	5,946,791	4,048,427
Net difference between projected and actual earnings on pension plan investments	704,994	883,093
Totals	$ 6,704,237	$ 5,137,603

(1) *Assumed equal to actual member contributions divided by employee contribution rate*

(2) *Fixed-income municipal bonds with 20 years to maturity that include only federally tax-exempt municipal bonds as reported in Fidelity Index's '20-Year Municipal GO AA Index' as of June 30, 2017. See Section G for additional detail.*

Discussion

Accounting Standard

For pension plans that are administered through trusts or equivalent arrangements, Governmental Accounting Standards Board (GASB) Statement No. 67, *Financial Reporting for Pension Plans,* establishes standards of financial reporting for separately issued financial reports and specifies the required approach for measuring the pension liability. Similarly, GASB Statement No. 68, *Accounting and Financial Reporting for Pensions,* establishes standards for state and local government employers (as well as non-employer contributing entities) to account for and disclose the net pension liability, pension expense, and other information associated with providing retirement benefits to their employees (and former employees) on their basic financial statements. GASB Statement No. 82, Pension Issues, is an amendment to Statements No. 67, No. 68, and No. 73, intended to improve consistency in the application of the accounting standards.

The following discussion provides a summary of the information that is required to be disclosed under these accounting standards. A number of these disclosure items are provided in this report. However, certain information, such as notes regarding accounting policies and investments, is not included in this report and the retirement system and/or plan sponsor will be responsible for preparing and disclosing that information to comply with these accounting standards.

Financial Statements

GASB Statement No. 68 requires state and local governmental employers to recognize the net pension liability and the pension expense on their financial statements. The net pension liability is the difference between the total pension liability and the plan's fiduciary net position. In traditional actuarial terms, this is analogous to the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

Paragraph 57 of GASB Statement No. 68 states, "Contributions to the pension plan from the employer subsequent to the measurement date of the collective net pension liability and before the end of the employer's reporting period should be reported as a deferred outflow of resources related to pensions." The information contained in this report does not incorporate any contributions made to SERF subsequent to the measurement date of June 30, 2017.

The pension expense or income recognized each fiscal year is equal to the change in the net pension liability from the beginning of the year to the end of the year, adjusted for deferred recognition of the difference between expected and actual experience in the measurement of the total pension liability, assumption changes, and investment experience.

Pension plans that prepare their own, stand-alone financial statements are required to present two financial statements – a Statement of Fiduciary Net Position and a Statement of Changes in Fiduciary Net Position in accordance with GASB Statement No. 67. The *Statement of Fiduciary Net Position* presents the assets and liabilities of the pension plan at the end of the pension plan's reporting period. The *Statement of Changes in Fiduciary Net Position* presents the additions, such as contributions and investment income, and deductions, such as benefit payments and expenses, and net increase or decrease in the fiduciary net position.

Notes to Financial Statements

GASB Statement No. 68 requires the notes of the employer's financial statements to disclose the total pension expense, the pension plan's liabilities and assets, and deferred outflows and inflows of resources related to pensions.

GASB Statement Nos. 67 and 68 require the notes of the financial statements for the employers and pension plans to include certain descriptive information about the pension plans through which the pension benefits are provided. The list of disclosure items should include:

- a description of benefits provided by the plan;
- the classes of employees and number of members covered by the pension plan;
- a description of the plan's funding policy, which includes member and employer contribution requirements;
- the pension plan's investment policies;
- the pension plan's fiduciary net position, net pension liability, and the pension plan's fiduciary net position as a percentage of the total pension liability;
- the net pension liability using a discount rate that is 1% higher and 1% lower than the current discount rate used to calculate the total pension liability and net pension liability for financial reporting purposes;
- significant assumptions and methods used to calculate the total pension liability;
- inputs to the discount rates; and
- certain information about mortality assumptions and the dates of experience studies.

Retirement systems that issue stand-alone financial statements are required to disclose additional information in accordance with GASB Statement No. 67. This information includes:

- the composition of the pension plan's Board and the authority under which benefit terms may be amended;
- a description of how fair value is determined;
- information regarding certain reserves and investments, which include concentrations of investments greater than or equal to 5%, receivables, and insurance contracts excluded from plan assets; and
- annual money-weighted rate of return.

MSRS' comprehensive annual financial report, which contains the basic financial statements and related note disclosures for the State Employees Retirement Fund can be found online at www.msrs.state.mn.us/financial-information or obtained from MSRS at 60 Empire Drive, Suite 300, St. Paul, MN, 55103 or requested via email at info@msrs.us or telephone at 1-800-657-5757.

Required Supplementary Information

GASB Statement No. 67 requires a 10-year fiscal history of:

- sources of changes in the net pension liability;
- information about the components of the net pension liability and related ratios, including the pension plan's fiduciary net position as a percentage of the total pension liability, and the net pension liability as a percent of covered-employee payroll; and
- a comparison of the actual employer contributions to the actuarially determined contributions based on the plan's funding policy.

Measurement of the Net Pension Liability

The net pension liability is to be measured as the total pension liability, less the amount of the pension plan's fiduciary net position. In actuarial terms, this will be the accrued liability less the market value of assets (not the smoothed actuarial value of assets that is often encountered in actuarial valuations performed to determine the employer's contribution requirement).

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 all actuarial assumptions are met (including the assumption of the plan earning 7.50% on the actuarial value of assets), then the following outcomes are expected:

1. The employer normal cost as a percentage of pay is expected to remain approximately level as a percentage of payroll.
2. The unfunded actuarial accrued liabilities will increase and not be eliminated.
3. The funded status of the plan will decrease.
4. The plan may eventually become insolvent and unable to pay benefits.

The projections in this report are strictly for the purpose of determining the GASB single discount rate and are different from a funding projection for the ongoing plan.

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, unless the market value of assets is used in the measurement.

Limitation 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.

Timing of the Valuation

GASB Statements Nos. 67 and 68 require that an actuarial valuation to determine the total pension liability be performed at least every two years. The net pension liability and pension expense should be measured as of the pension plan's fiscal year end (measurement date) on a date that is within the employer's prior fiscal year. If the actuarial valuation used to determine the total pension liability is not calculated as of the measurement date, the total pension liability is required to be rolled forward from the actuarial valuation date to the measurement date.

The total pension liability shown in this report is based on an actuarial valuation performed as of June 30, 2017 and a measurement date of June 30, 2017.

Single Discount Rate

Projected benefit payments are required to be discounted to their actuarial present values using a Single Discount Rate that reflects (1) a long-term expected rate of return on pension plan investments (to the extent that the plan's fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the long-term expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 3.56% (based on Fidelity Index's 20-Year Municipal GO AA Index as of June 30, 2017); and the resulting single discount rate is 5.42%. The long-term expected rate of return is based on reviews of inflation and investment assumptions, dated September 11, 2014 and September 11, 2017, and a recent asset liability study obtained by the Minnesota State Board of Investment.

SECTION B

FINANCIAL STATEMENTS

Statement of Pension Expense Under GASB Statement No. 68
Fiscal Year Ended June 30, 2017 (Dollars in Thousands)

A. Expense/(Income)		
1. Service Cost	$	619,666
2. Interest on the Total Pension Liability		982,066
3. Current-Period Benefit Changes		83,490
4. Employee Contributions (made negative for addition here)		(161,670)
5. Projected Earnings on Plan Investments (made negative for addition here)		(826,541)
6. Pension Plan Administrative Expense		10,165
7. Other Changes in Plan Fiduciary Net Position		(47,232)
8. Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
Arising from Current Reporting Period		9,932
9. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Current Reporting Period		(938,242)
10. Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.50%) and actual earnings on Pension Plan Investments		
Arising from Current Reporting Period		(168,204)
11. Increases/(Decreases) from Experience in the Current Reporting Period	**$**	**(436,570)**
12. Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
Arising from Prior Reporting Periods	$	(103,202)
13. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Prior Reporting Periods		1,686,802
14. Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on Pension Plan Investments		
Arising from Prior Reporting Periods		50,918
15. Total Pension Expense/ (Income)	**$**	**1,197,948**

Statement of Outflows and Inflows
Arising from Current Reporting Period
Fiscal Year Ended June 30, 2017 (Dollars in Thousands)

A. Outflows (Inflows) of Resources due to Liabilities	
1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$ 49,659
2. Assumption Changes (gains) or losses	(4,691,209)
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years, rounded to the nearest whole number}	5
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience in the measurement of the Total Pension Liability*	9,932
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes	(938,242)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$ (928,310)
7. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for the difference between expected and actual experience of the Total Pension Liability	$ 39,727
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes	(3,752,967)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$ (3,713,240)
B. Outflows (Inflows) of Resources due to Assets	
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$ (841,021)
2. Recognition period for Assets {in years}	5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	(168,204)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$ (672,817)

* *Includes impact of changes in expected timing of future COLA increases, if applicable.*

Statement of Outflows and Inflows
Arising from Current and Prior Reporting Periods
Fiscal Year Ended June 30, 2017 (Dollars in Thousands)

A. Outflows and Inflows of Resources due to Liabilities and Assets to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Due to Liabilities	$ 1,996,438	$ 1,341,148	$ 655,290
2. Due to Assets	261,193	378,479	(117,286)
3. Total	$ 2,257,631	$ 1,719,627	$ 538,004

B. Outflows and Inflows of Resources by Source to be Recognized in Current Pension Expense

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Differences between expected and actual experience	$ 14,174	$ 107,444	$ (93,270)
2. Assumption Changes	1,982,264	1,233,704	748,560
3. Net Difference between projected and actual earnings on pension plan investments	261,193	378,479	(117,286)
4. Total	$ 2,257,631	$ 1,719,627	$ 538,004

C. Deferred Outflows and Deferred Inflows of Resources by Source to be Recognized in Future Pension Expenses

	Deferred Outflows of Resources	Deferred Inflows of Resources	Net Deferred Outflows/ (Inflows) of Resources
1. Differences between expected and actual experience	$ 52,452	$ 206,083	$ (153,631)
2. Assumption Changes	5,946,791	4,048,427	1,898,364
3. Net Difference between projected and actual earnings on pension plan investments*	704,994	883,093	(178,099)
4. Total	$ 6,704,237	$ 5,137,603	$ 1,566,634

D. Deferred Outflows and Deferred Inflows of Resources by Year to be Recognized in Future Pension Expenses

Year Ending June 30	Net Deferred Outflows/ (Inflows) of Resources
2018	$ 538,004
2019	1,052,546
2020	1,072,596
2021	(1,096,512)
2022	-
Thereafter	-
Total	$ 1,566,634

** Paragraph 71(b) of GASB Statement No. 68 requires deferred outflows and inflows arising from differences between projected and actual earnings on pension plan investments to be aggregated and shown as a net amount. For purposes of this valuation, amounts are shown separately for calculation purposes.*

Statement of Fiduciary Net Position
as of June 30, 2017 (Dollars in Thousands)

Assets		**June 30, 2017**
Cash & Short-term Investments	$	329,906
Receivables		23,944
Investment Pools (at fair value)		12,123,763
Securities Lending Collateral		1,284,498
Capital Assets		18,456
Total Assets	**$**	**13,780,567**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(1,294,953)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**12,485,614**

Statement of Changes in Fiduciary Net Position for Year Ended June 30, 2017 (Dollars in Thousands)

1.	**Net Position at market value at beginning of year**	**$ 11,223,065**
Additions		
2.	Contributions	
	a. Employee	$ 161,670
	b. Employer	158,352
	c. Other sources	-
	d. Total contributions	$ 320,022
3.	Investment income	
	a. Investment income/(loss)	$ 1,680,494
	b. Investment expenses	(12,932)
	c. Net investment income/(loss)	$ 1,667,562
4.	Other Additions	47,287
5.	**Total Additions (2.d.) + (3.c.) + (4.)**	**$ 2,034,871**
Deductions		
6.	Benefits Paid	
	a. Annuity benefits	$ (750,526)
	b. Refunds	(11,576)
	c. Total benefits paid	$ (762,102)
7.	Expenses	
	a. Other deductions	$ (55)
	b. Administrative	(10,165)
	c. Total expenses	$ (10,220)
8.	**Total deductions (6.c.) + (7.c.)**	**$ (772,322)**
9.	**Net increase/(decrease) in fiduciary net position (5.) + (8.)**	**$ 1,262,549**
10.	**Net position at market value at end of year (1.) + (9.)**	**$ 12,485,614**
11.	State Board of Investment calculated annual investment return for the State Employees Retirement Fund*	15.2%

** The fiscal year 2017 investment return for the Combined Funds is 15.1%.*

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios
Current Period
Fiscal Year Ended June 30, 2017 (Dollars in Thousands)

A. Total pension liability		
1. Service Cost	$	619,666
2. Interest on the Total Pension Liability		982,066
3. Changes of benefit terms		83,490
4. Difference between expected and actual experience of the Total Pension Liability[1]		49,659
5. Changes of assumptions		(4,691,209)
6. Benefit payments, including refunds of employee contributions		(762,102)
7. Net change in total pension liability	$	(3,718,430)
8. Total pension liability – beginning		23,621,950
9. Total pension liability – ending	**$**	**19,903,520**
B. Plan fiduciary net position		
1. Contributions – employer	$	158,352
2. Contributions – employee		161,670
3. Net investment income		1,667,562
4. Benefit payments, including refunds of employee contributions		(762,102)
5. Pension Plan Administrative Expense		(10,165)
6. Other changes		47,232
7. Net change in plan fiduciary net position	$	1,262,549
8. Plan fiduciary net position – beginning		11,223,065
9. Plan fiduciary net position – ending	**$**	**12,485,614**
C. Net pension liability, *A.9. - B.9.*	**$**	**7,417,906**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**62.73%**
E. Covered-employee payroll	**$**	**2,939,455** [2]
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**252.36%**

[1] *Includes impact of changes in expected timing of future COLA increases, if applicable.*

[2] *Assumed equal to actual member contributions divided by employee contribution rate.*

Schedule of Changes in Net Pension Liability and Related Ratios Multiyear (Dollars in Thousands)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal year ending June 30,	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Pension Liability										
Service Cost	$ 619,666	$ 211,491	$ 210,545	$ 256,155						
Interest on the Total Pension Liability	982,066	1,020,925	1,018,035	922,181						
Benefit Changes	83,490	-	-	-						
Difference between Expected and Actual Experience	49,659	21,209	(493,197)	(44,023)						
Assumption Changes	(4,691,209)	9,911,319	-	(1,477,308)						
Benefit Payments	(750,526)	(707,361)	(665,821)	(623,942)						
Refunds	(11,576)	(13,345)	(12,026)	(11,986)						
Net Change in Total Pension Liability	$ (3,718,430)	$10,444,238	$ 57,536	$ (978,923)						
Total Pension Liability - Beginning	23,621,950	13,177,712	13,120,176	14,099,099						
Total Pension Liability - Ending (a)	**$19,903,520**	**$23,621,950**	**$13,177,712**	**$13,120,176**						
Plan Fiduciary Net Position										
Employer Contributions	$ 158,352	$ 151,168	$ 146,333	$ 128,037						
Employee Contributions	161,670	153,854	149,293	131,033						
Pension Plan Net Investment Income	1,667,562	(9,633)	501,185	1,829,621						
Benefit Payments	(750,526)	(707,361)	(665,821)	(623,942)						
Refunds	(11,576)	(13,345)	(12,026)	(11,986)						
Pension Plan Administrative Expense	(10,165)	(10,196)	(8,719)	(8,125)						
Other Changes	47,232	20,259	29,470	20,528						
Net Change in Plan Fiduciary Net Position	$ 1,262,549	$ (415,254)	$ 139,715	$ 1,465,166						
Plan Fiduciary Net Position - Beginning	11,223,065	11,638,319	11,498,604	10,033,438						
Plan Fiduciary Net Position - Ending (b)	**$12,485,614**	**$11,223,065**	**$11,638,319**	**$11,498,604**						
Net Pension Liability - Ending (a) - (b)	**$ 7,417,906**	**$12,398,885**	**$ 1,539,393**	**$ 1,621,572**						
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**62.73 %**	**47.51 %**	**88.32 %**	**87.64 %**						
Covered-Employee Payroll [(1)]	**$ 2,939,455**	**$ 2,797,345**	**$ 2,714,418**	**$ 2,620,660**						
Net Pension Liability as a Percentage of Covered-Employee Payroll	**252.36 %**	**443.24 %**	**56.71 %**	**61.88 %**						

Notes to Schedule:

(1) Assumed equal to actual member contribution divided by employee contribution rate.

Schedule of Net Pension Liability Multiyear
(Dollars in Thousands)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal Year Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered-employee Payroll	Net Pension Liability as a % of Covered-employee Payroll
	(a)	(b)	(a) - (b) = (c)	(b) / (a)	(d)	(c) / (d)
2008						
2009						
2010						
2011						
2012						
2013						
2014	$ 13,120,176	$ 11,498,604	$ 1,621,572	87.64%	$ 2,620,660	61.88%
2015	13,177,712	11,638,319	1,539,393	88.32	2,714,418	56.71
2016	23,621,950	11,223,065	12,398,885	47.51	2,797,345	443.24
2017	19,903,520	12,485,614	7,417,906	62.73	2,939,455	252.36

Schedule of Contributions Multiyear (Dollars in Thousands)

Last 10 Fiscal Years

FY Ending June 30,	Actuarially Determined Contribution [1]	Actual Contributions	Contribution Deficiency (Excess)	Covered-employee Payroll	Actual Contribution as a % of Covered-employee Payroll
	(a)	(b)	(a) - (b) = (c)	(d)	(b) / (d)
2008	$ 166,088	$ 96,746	$ 69,342	$ 2,256,528	4.29%
2009	179,759	107,211	72,548	2,329,499	4.60
2010	230,439	113,716	116,723	2,327,398	4.89
2011	146,191	118,563	27,628	2,440,580	4.86
2012	142,740	115,159	27,581	2,367,160	4.86
2013	181,756	121,673	60,083	2,483,000 [2]	4.90
2014	195,239	128,037	67,202	2,620,660 [2]	4.89
2015	198,695	146,333	52,362	2,714,418 [2]	5.39
2016	194,136	151,168	42,968	2,797,345 [2]	5.40
2017	264,257	158,352	105,905	2,939,455 [2]	5.39

Notes to Schedule of Contributions

Methods and Assumptions Used to Determine Fiscal Year Ending June 30, 2017 Contribution Rates Reported in this Schedule:

Notes	(1) Actuarially determined contribution rates are calculated as of each June 30 and apply to the fiscal year beginning on the day after the measurement date. (2) Assumed equal to actual member contributions divided by employee contribution rate.
Valuation Date:	June 30, 2016
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	26 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based table of rates ranging from 14.00% with one year of service to 3.50% with 25 or more years of service, including inflation
Investment Rate of Return	8.00%
Retirement Age	Experience-based table of rates that are specific to the type of eligibility condition.
Healthy Post-retirement Mortality	RP-2014 annuitant generational mortality table, projected with mortality improvement scale MP-2015 from a base year of 2014, white collar adjustment, set forward 2-years for males and no age adjustment for females.

Other Information:

Benefit Increases After Retirement	The post-retirement increase is assumed to remain at 2.00% indefinitely. See separate funding actuarial valuation report as of July 1, 2016 for additional detail. To obtain this report, contact MSRS at 60 Empire Drive, Suite 300, St. Paul, MN, 55103 or request via email at info@msrs.us or telephone at 1-800-651-5757. This report can be found online at www.msrs.state.mn.us/actuarial-reports.

Schedule of Investment Returns Multiyear

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Annual Return[1]
2008	
2009	
2010	
2011	
2012	
2013	
2014	18.67%
2015	4.45
2016	-0.08
2017	15.24

[1] *Annual money-weighted rate of return, net of investment expenses.*

The Minnesota State Board of Investment (SBI) compiled this data and the related investment notes and provided it to MSRS for GASB-compliance purposes. MSRS furnished this information to us for inclusion within this report. We did not audit this information. We are not responsible for its accuracy or completeness.

Rate of Return

For the fiscal year ended June 30, 2017, the annual money-weighted rate of return for the State Employees Retirement Fund was 15.24%. The money-weighted rate of return is a method of calculating period-by-period returns on pension plan investments that adjusts for the changing amounts actually invested. For purposes of this schedule, the money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.

10-Year Schedule of Money-Weighted Investment Return

Ten-year data is not available. Additional years will be provided when they become available.

To request additional information about the computation of the annual money-weighted rate of return and the investments for the Minnesota Retirement Systems (including the investments for MSRS' defined benefit retirement funds), contact SBI at 60 Empire Drive, Suite 355, St. Paul, Minnesota, 55103, via email at minn.sbi@state.mn.us or telephone at (651) 296-3328.

SECTION D

ADDITIONAL FINANCIAL STATEMENT DISCLOSURES

Asset Allocation

Long-Term Expected Return on Plan Assets

The long-term expected rate of return on pension plan investments was determined using a building-block method. Best estimates for expected future real rates of return (expected returns, net of inflation) were developed for each asset class using both long-term historical returns and long-term capital market expectation from a number of investment management and consulting organizations. The asset class estimates and the target allocations were then combined to produce a geometric, long-term expected rate of return for the portfolio. Inflation expectations were applied to derive the nominal rate of return for the portfolio. For each major asset class that is included in the pension fund's target asset allocation as of June 30, 2017, these best estimates are summarized in the following table:

Asset Allocation

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return (Geometric)
Domestic Stocks	39.00%	5.10%
International Stocks	19.00	5.30
Bonds	20.00	0.75
Alternative Assets	20.00	5.90
Unallocated Cash	2.00	0.00
Total	100.00%	

The Minnesota State Board of Investment (SBI) compiled this data and the related investment notes and provided it to MSRS for GASB-compliance purposes. MSRS furnished this information to us for inclusion within this report. We did not audit this information. We are not responsible for its accuracy or completeness.

For purposes of this valuation, the long-term expected rate of return assumption is 7.50%. This assumption is based on reviews of inflation and investment return assumptions dated September 11, 2014 and September 11, 2017, and a recent asset liability study obtained by the SBI.

Single Discount Rate

A Single Discount Rate of 5.42% was used to measure the total pension liability. This Single Discount Rate was based on an expected rate of return on pension plan investments of 7.50% and a municipal bond rate of 3.56%. The projection of cash flows used to determine this Single Discount Rate assumed that employee and employer contributions will be made at the current statutory contribution rates. Based on these assumptions, the pension plan's fiduciary net position and future contributions were sufficient to finance the benefit payments through the year ending June 30, 2049. As a result, the long-term expected rate of return on pension plan investments was applied to projected benefit payments through the year ending June 30, 2049, and the municipal bond rate was applied to all benefit payments after the point of asset depletion.

Regarding the sensitivity of the net pension liability to changes in the Single Discount Rate, the following presents the plan's net pension liability, calculated using a Single Discount Rate of 5.42%, as well as what the fund's net pension liability would be if it were calculated using a single discount rate that is 1-percentage-point lower (4.42%) or 1-percentage-point higher (6.42%) than the current rate.

Sensitivity of Net Pension Liability

to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 4.42%	Current Single Discount Rate Assumption 5.42%	1% Increase 6.42%
Total Pension Liability	$ 22,878,995	$ 19,903,520	$ 17,472,141
Net Position Restricted for Pensions	12,485,614	12,485,614	12,485,614
Net Pension Liability	**$ 10,393,381**	**$ 7,417,906**	**$ 4,986,527**

For more information on the calculation of the single discount rate, refer to Section G of this report.

GASB Statement No. 68 Reconciliation (Dollars in Thousands)

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)	Deferred Outflows	Deferred Inflows	Total Pension Expense
Balance Beginning of Year	**$ 23,621,950**	**$ 11,223,065**	**$ 12,398,885**	**$ 8,912,209**	**$ 1,325,000**	
Changes for the Year:						
Service Cost	$ 619,666		$ 619,666			$ 619,666
Interest on Total Pension Liability	982,066		982,066			982,066
Interest on Fiduciary Net Position [1]		$ 826,541	(826,541)			(826,541)
Changes in Benefit Terms	83,490		83,490			83,490
Liability Experience Gains and Losses	49,659		49,659	$ 39,727	$ -	9,932
Changes in Assumptions	(4,691,209)		(4,691,209)	-	3,752,967	(938,242)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(4,242)	(107,444)	(103,202)
Assumption Changes				(1,982,264)	(295,462)	1,686,802
Investment Gains/(Losses)				(261,193)	(210,275)	50,918
Contributions - Employer		158,352	(158,352)			
Contributions - Employees		161,670	(161,670)			(161,670)
Asset Gain/(Loss) [1]		841,021	(841,021)	-	672,817	(168,204)
Benefit Payments and Refunds	(762,102)	(762,102)	-			
Administrative Expenses		(10,165)	10,165			10,165
Other changes		47,232	(47,232)			(47,232)
Net Changes	**$ (3,718,430)**	**$ 1,262,549**	**$ (4,980,979)**	**$ (2,207,972)**	**$ 3,812,603**	**$ 1,197,948**
Balance End of Year	**$ 19,903,520**	**$ 12,485,614**	**$ 7,417,906**	**$ 6,704,237**	**$ 5,137,603**	

(1) The sum of these items in column (b) equals the net investment income of $1,667,562.

Summary of Population Statistics

		Terminated*		Recipients**			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on July 1, 2016	**49,472**	**17,019**	**7,571**	**32,241**	**1,843**	**3,868**	**112,014**
New members	5,845	0	0	0	0	0	**5,845**
Return to active	316	(168)	(148)	0	0	0	**0**
Terminated non-vested	(1,943)	0	1,943	0	0	0	**0**
Service retirements	(1,345)	(627)	0	1,972	0	0	**0**
Unclassified retirements	0	0	0	100	0	0	**100**
Terminated deferred	(978)	978	0	0	0	0	**0**
Terminated refund/transfer	(683)	(168)	(379)	0	0	0	**(1,230)**
Deaths	(68)	(27)	(12)	(820)	(76)	(186)	**(1,189)**
New beneficiary	0	0	0	0	0	273	**273**
Disabled	(36)	0	0	0	36	0	**0**
Data adjustments	(2)	(1)	493	70	27	(15)	**572**
Net change	1,106	(13)	1,897	1,322	(13)	72	**4,371**
Members on July 1, 2017	**50,578**	**17,006**	**9,468**	**33,563**	**1,830**	**3,940**	**116,385**

* *Includes members in the General or Military Affairs Plans.*

** *Includes members in the General, Military Affairs or Unclassified Plans.*

SECTION E

SUMMARY OF BENEFITS

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 employees, non-academic staff of the University of Minnesota and employees of certain Metro level government units, unless excluded by law.
Contributions	Shown as a percent of salary: **Member** — 5.50% **Employer** — 5.50% Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
Allowable Service	Service during which member contributions were made. May also include certain leaves of absence, military service and periods while temporary Worker's Compensation is paid. Excludes lump sum vacation and severance pay at termination.
Average Salary	Average of the five highest successive years of Salary. Average Salary is based on all Allowable Service if less than five years.
Salary	Includes wages, allowances and fees. Excludes lump sum payments at separation, employer contributions to deferred compensation and tax-sheltered annuity plans and benevolent vacation and sick leave donation programs.
Retirement	
Normal retirement benefit	
Age/Service requirement	First hired before July 1, 1989: (a.) Age 65 and three years of Allowable Service. (b.) Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service. First hired after June 30, 1989: (a.) The greater of age 65 or the age eligible for full Social Security retirement benefits (but not higher than age 66) and three years of Allowable Service (five years if hired after June 30, 2010). (b.) Proportionate Retirement Annuity is available at normal retirement age and one year of Allowable Service.
Amount	1.70% of Average Salary for each year of Allowable Service.

Summary of Plan Provisions (Continued)

Retirement (Continued)

Early retirement

Age/Service requirement	First hired before July 1, 1989: (a.) Age 55 and three years of Allowable Service. (b.) Any age with 30 years of Allowable Service. (c.) Rule of 90: Age plus Allowable Service totals 90. First hired after June 30, 1989: (a.) Age 55 and three years (five years if hired after June 30, 2010) of Allowable Service.
Amount	First hired before July 1, 1989: The greater of (a) or (b): (a.) 1.20% of Average Salary for each of the first ten years of Allowable Service and 1.70% of Average Salary for each subsequent year with reduction of 0.25% for each month the member is under age 65 at time of retirement or under age 62 if 30 or more years of Allowable Service. No reduction if age plus years of Allowable Service totals 90. (b.) 1.70% of Average Salary for each year of Allowable Service assuming augmentation to age 65 at 3.00% per year and actuarial reduction for each month the member is under age 65. First hired after June 30, 1989: 1.70% of Average Salary for each year of Allowable Service assuming augmentation to the age eligible for full Social Security retirement benefit (but not higher than age 66) at 3.00% (2.50% if hired after June 30, 2006) per year and actuarial reduction for each month the member is under the normal retirement age.
Form of payment	Life annuity with return on death of any balance of member contributions over aggregate monthly payments. Actuarially equivalent options are: (a.) 50%, 75%, or 100% Joint and Survivor with bounce back feature without additional reduction. (b.) 15-year Certain and Life.
Benefit increases	Since 2011, benefit recipients have received annual 2.00% benefit increases. When the accrued liability funding ratio reaches or exceeds 90% (determined on a market value of assets basis) for two consecutive years, the benefit increase will revert to 2.50%. If, after reverting to a 2.50% increase, the accrued liability funding ratio (determined on a market value of assets basis) declines to 80% or less for the most recent actuarial valuation year or 85% or less for two consecutive years, the benefit increase will decrease to 2.00%.

Summary of Plan Provisions (Continued)

Retirement (Continued)	
<u>Benefit increases (Continued)</u>	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.
	Prior to 2002, members who retired under the laws in effect before July 1, 1973, received an additional lump sum payment each year. In 1989, this lump sum payment was the greater of $25 times each full year of Allowable Service or $400 per full year of service less any Social Security benefits received or annuity from a Minnesota public employee pension plan. In each following year, the lump sum payment was increased by the same percentage increase that was applied to regular annuities paid from the Minnesota Post Retirement Investment Fund. Effective January 1, 2002, the annual lump sum payment was divided by 12 and paid as a monthly life annuity in the annuity form elected.
Disability	
<u>Disability benefit</u>	
Age/Service requirement	Total and permanent disability before normal retirement age with three years of Allowable Service (five years if hired after June 30, 2010).
Amount	Normal Retirement benefit based on Allowable Service and Average Salary at disability without reduction for commencement before normal retirement age.
	Payments stop if disability ceases or death occurs. Payments revert to a retirement annuity at normal retirement age. Benefits may be reduced on resumption of partial employment.
<u>Retirement after disability</u>	
Age/Service requirement	Normal retirement age with continued disability.
Amount	Any optional annuity continues. Otherwise, a normal retirement benefit equal to the disability benefit paid before normal retirement age, or an actuarially equivalent optional annuity.
<u>Form of payment</u>	Same as for retirement.
<u>Benefit Increases</u>	Same as for retirement.

Summary of Plan Provisions (Continued)

Death

Surviving spouse optional benefit

Age/Service requirement	Member or former member who dies before retirement or disability benefits commence with three years of Allowable Service (five years if hired after June 30, 2010). If a former member dies before age 55 and has less than 30 years of Allowable Service, benefits commence when the former member would have been age 55. If an active member dies, benefits may commence immediately, regardless of age.
Amount	Surviving spouse receives the 100% joint and survivor benefits using the Normal Retirement formula above. If commencement is prior to age 55, the appropriate early retirement formula described above applies except that one-half the monthly reduction factor is used from age 55 to the commencement age and the Rule of 90 does not apply. In lieu of this benefit, the surviving spouse may elect a refund of member contributions with interest or an actuarially equivalent term certain annuity.
Benefit increases	If a member dies prior to July 1, 1997, and the beneficiary was not eligible to commence a survivor benefit as of July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. Same as for retirement.

Surviving dependent children's benefit

Age/Service requirement	If no surviving spouse, all children (biological or adopted) below age 20 who are dependent for more than half of their support on deceased member.
Amount	Actuarially equivalent 100% joint and survivor annuity to surviving spouse payable to the later of age 20 or five years. The amount is proportionally divided among surviving children.
Benefit increases	Same as for retirement.

Refund of contributions

Age/Service requirement	Active member dies and survivor benefits are not payable or a former member dies before annuity begins or former member who is not entitled to an annuity dies.
Amount	Member's contributions with 6.00% interest through June 30, 2011, compounded daily. Beginning July 1, 2011, a member's contributions increase at 4.00% interest compounded daily.

Summary of Plan Provisions (Continued)

Death (Continued)	
__**Refund of contributions (Continued)**__	
Age/Service requirement	Retired or disabled annuitant who did not select an optional annuity dies, or the remaining recipient of an option dies.
Amount	The excess of the member's contributions over all benefits paid.
Unclassified Plan Provision	Eligible members credited with employee shares in the Unclassified Plan may elect to terminate participation in the Unclassified Plan and be covered by the State Employees Retirement Fund prior to termination of covered employment assuming that the member has acquired at least 10 years of allowable state service (no more than seven years of service if hired after June 30, 2010).
Termination	
__**Refund of contributions**__	
Age/Service requirement	Termination of state service.
Amount	Member's contributions with 6.00% interest through June 30, 2011, compounded daily. Beginning July 1, 2011, a member's contributions increase at 4.00% interest compounded daily. If a member is vested, a deferred annuity may be elected in lieu of a refund.
__**Deferred benefit**__	
Age/Service requirement	Three years of Allowable Service if hired prior to June 30, 2010, five years of Allowable Service if hired after June 30, 2010.
Amount	Benefit 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 of the year following attainment of age 55 or January 1, 2012, whichever is earlier; (d.) 5.00% thereafter until the annuity begins (2.50% if hired after June 30, 2006), but before January 1, 2012. Amount is payable as a normal or early retirement; and (e.) 2.00% from January 1, 2012, thereafter. 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%.

Summary of Plan Provisions (Concluded)

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; (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 is 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 Equivalent Factors	Actuarially equivalent factors based on RP-2014 mortality for healthy annuitants, white collar adjustment, male rates set forward two years, projected to 2019 using Scale MP-2015, blended 50% males, 5.88% post-retirement interest, and 8.00% pre-retirement interest. Based upon statutory requirements, joint and survivor factors are based on an interest assumption of 6.50%.
Contribution Stabilizer	The following is a summary of the contribution stabilizer provisions in Minnesota Statute 352.045: If a contribution sufficiency of at least 1.00% of covered payroll exists, member and employer contributions may be adjusted by the MSRS Board of Directors to a level necessary to maintain a 1.00% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. If a contribution deficiency of at least 0.50% of covered payroll exists, the member and employer contribution rates may be increased equally by the MSRS Board of Directors to eliminate the deficiency. 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 fiscal year following receipt of the actuarial valuation that gave rise to the adjustment.
Changes in Plan Provisions	Actuarial equivalent factors were updated to reflect current mortality and interest assumptions, effective January 1, 2017.

SECTION F

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

Actuarial Methods Used for the Determination of Total Pension Liability and Related Values

Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date were determined using an **Individual Entry-Age Actuarial Cost Method** having the following characteristics:

(i) the annual normal cost for each individual active member, payable from the date of employment to the date of retirement, is sufficient to accumulate the value of the member's benefit at the time of retirement;

(ii) each annual normal cost is a constant percentage of the member's year by year projected covered pay.

Actuarial gains/(losses), as they occur, reduce (increase) the Total Pension Liability.

Valuation of Future Post-Retirement Benefit Increases

Benefit recipients receive a future annual 2.00% post-retirement benefit increase. If the funding ratio (determined on a market value of assets basis) reaches 90% (based on a 2.50% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will revert to 2.50%. If, after reverting to a 2.50% benefit increase, the funding ratio declines to less than 80% for one year or less than 85% for two consecutive years, the benefit increase will decrease to 2.00%.

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

- Future investment returns of 7.50%
- Liabilities and normal cost based on statutory funding assumptions
  - Discount rate of 8.00%
  - Statutory salary increases (rate of 14.00% at year 1 declining to 3.50% at years 25 and later)
- Open group; stable active population (new member profile based on average new members hired in recent years)
- The postretirement benefit increase rate is assumed to be 2.00% per year until the funding ratio threshold required to pay a 2.50% postretirement benefit increase is reached
- Current statutory contributions (i.e., not including potential contribution increases under the contribution stabilizer statutes) as directed by MSRS

Based on these assumptions and methods, the projection indicates that this plan is not expected to attain the funding ratio threshold required to pay a 2.50% postretirement benefit increase. This assumption is reflected in our calculations.

Asset Valuation Method

Fair value of assets.

Summary of Actuarial Assumptions Used for the Determination of Total Pension Liability and Related Values

The following assumptions were used in valuing the liabilities and benefits under the plan. The assumptions are based on the last experience study, dated June 30, 2015, reviews of inflation and investment return assumptions, dated September 11, 2014 and September 11, 2017, and a recent asset liability study obtained by the SBI.

The Allowance for Combined Service Annuity was based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	7.50% per annum.
Single Discount Rate	5.42% per annum.
Benefit increases after retirement	2.00% per annum
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	2.50% per year.
Payroll growth	3.25% 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 2014, white collar adjustment, set forward one year for males and no age adjustment for females.
Healthy Post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2014, white collar adjustment, set forward two years for males and no age adjustment for females.
Disabled	RP-2014 disabled mortality table projected with mortality improvement Scale MP-2015 from a base year of 2014, set forward two years for males and four years for females. 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	Service-related rates based on experience; see table of sample rates.
Disability	Age-related rates based on experience; see table of sample rates.

Summary of Actuarial Assumptions (Continued)

Allowance for Combined Service Annuity	Liabilities for former, vested members are increased by 4.00%, and liabilities for former, non-vested members are increased by 5.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
Refund of contributions	Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. 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.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at normal retirement age.
Percentage married	80% of active male members and 65% of female members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Male members are assumed to have a beneficiary three years younger and female members are assumed to have a beneficiary two years older.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 15% elect 50% Joint & Survivor option 15% elect 75% Joint & Survivor option 50% elect 100% Joint & Survivor option Females: 15% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 30% elect 100% Joint & Survivor option Remaining married members and unmarried members are assumed to elect the Straight Life option. Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a life annuity.
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.
Unclassified Plan Reversion	Liabilities for active members are increased by 0.16% (0.26% as of July 1, 2016) to account for the effect of Unclassified members who elect coverage under the State Employees Retirement Fund.

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. In cases where submitted data was missing or incomplete, the following assumptions were applied: <u>Data for active members:</u> There were 146 members reported with zero or invalid salary (<$100). We used prior year salary (73 members), if available, otherwise, high five salary with a 10% load to account for salary increases (67 members). If neither pay or high five salary was available, we assumed a value of $35,000 (6 members). There were 8 members reported with 0 or negative service. Due to the small number of members with 0 service, and based on direction from MSRS, we used service of 0 years for these members. There were also 108 members reported without a gender and 47 members reported with an invalid date of birth. We assumed the member was hired at age 37 and female gender. <u>Data for terminated members:</u> There were 462 members reported with a missing or invalid benefit. If available, we calculated benefits for these members using the reported Average Salary, Credited Service and Termination Date provided. If Average Salary was not reported or invalid (446 members), we assumed a value of $30,000. If termination date was not reported (11 members), we assumed the member terminated at age 40 (or current age if younger than 40). If credited service was either not reported or invalid (12 members), we assumed a value of 7.5 years. There were no members with a missing date of birth, and no members with an invalid gender. <u>Data for members receiving benefits:</u> There were 16 members reported without a gender. We assumed female gender for the valuation. No retired members were reported with an invalid date of birth. There were 5 members reported without a benefit. Due to the small number of members with missing benefits, we made no adjustment to the reported data for members receiving benefits.

Summary of Actuarial Assumptions (Continued)

Unknown data for certain members	<u>Data for members receiving benefits:</u> There were 8 survivor members reported with a certain end date prior to the valuation date. These members were excluded from the valuation. There were 110 retirees reported with a survivor option and a survivor date of death. We assumed no benefit was payable to the survivor, and the member benefit already reflected the increase to the life annuity (i.e., “bounce back”), if applicable. There were 122 retirees reported with a bounce back annuity but were not reported with a reasonable reduction factor. A factor of 0.80, 0.85 and 0.90 was assumed for the 100%, 75% and 50% joint and survivor annuity, respectively. There were retired members reported with a survivor option and an invalid or missing survivor gender (4,276 members) and/or survivor date of birth (3,765 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.
Changes in actuarial assumptions	The Combined Service Annuity (CSA) loads were 1.20% for active member liability and 40% for vested and non-vested deferred member liability. The revised CSA loads are now 0.00% for active member liability, 4.00% for vested deferred member liability, and 5.00% for non-vested deferred member liability. The Single Discount Rate was changed from 4.17% per annum to 5.42% per annum.

Summary of Actuarial Assumptions (Continued)

	Percent of Members Dying Each Year*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality**	
Age in 2017	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.03%	0.01%	0.08%	0.06%
25	0.04	0.02	0.03	0.01	0.28	0.18
30	0.06	0.05	0.03	0.02	0.59	0.38
35	0.09	0.08	0.04	0.02	0.97	0.61
40	0.14	0.11	0.04	0.03	1.34	0.84
45	0.20	0.15	0.07	0.05	1.68	1.07
50	0.29	0.20	0.12	0.09	1.99	1.33
55	0.42	0.27	0.21	0.14	2.35	1.63
60	0.59	0.38	0.36	0.20	2.78	1.96
65	0.89	0.63	0.63	0.30	3.37	2.53
70	1.47	1.00	1.10	0.52	4.32	3.60

* *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 2014.*

	Percent of Members Decrementing Each Year	
	Disability Retirement	
Age	Male	Female
20	0.00%	0.00%
25	0.01	0.01
30	0.01	0.01
35	0.02	0.02
40	0.06	0.06
45	0.11	0.11
50	0.22	0.22
55	0.32	0.32
60	0.47	0.47
65	0.00	0.00

Summary of Actuarial Assumptions (Continued)

Age	Percent Retiring Each Year: Rule of 90 Eligible	Hired prior to 7/1/1989	Hired after 6/30/1989
55	15.0%	4.0%	4.0%
56	15.0	4.0	4.0
57	12.5	4.0	4.0
58	12.5	4.0	4.0
59	15.0	6.0	5.0
60	15.0	8.0	5.0
61	20.0	10.0	10.0
62	30.0	20.0	15.0
63	25.0	18.0	15.0
64	25.0	18.0	15.0
65	35.0	35.0	20.0
66	30.0	30.0	30.0
67	25.0	25.0	25.0
68	25.0	25.0	25.0
69	22.0	22.0	22.0
70	30.0	30.0	30.0
71+	100.0	100.0	100.0

Summary of Actuarial Assumptions (Concluded)

Percent of Members Terminating (Withdrawing) Each Year		
Year	Males	Females
1	20.00%	24.00%
2	15.00	18.00
3	11.00	13.00
4	8.50	11.00
5	7.75	9.00
6	6.50	8.50
7	5.75	7.50
8	5.00	5.75
9	4.00	5.00
10	3.25	4.50
11	3.00	4.00
12	2.75	4.00
13	2.50	3.00
14	2.50	2.75
15	2.50	2.50
16	2.00	2.25
17	2.00	2.25
18	2.00	2.25
19	2.00	2.25
20	1.50	2.25
21	1.50	2.00
22	1.50	2.00
23	1.00	1.50
24	1.00	1.50
25	1.00	1.50
26	1.00	1.50
27	1.00	1.25
28	1.00	1.25
29	1.00	1.25
30+	1.00	1.00

Salary Scale	
Year	Increase
1	13.75%
2	11.25
3	6.00
4	5.25
5	5.00
6	4.90
7	4.75
8	4.50
9	4.25
10	4.00
11	3.95
12	3.90
13	3.85
14	3.80
15	3.75
16	3.70
17	3.65
18	3.60
19	3.55
20	3.50
21	3.45
22	3.40
23	3.35
24	3.30
25+	3.25

SECTION G

CALCULATION OF THE SINGLE DISCOUNT RATE

Calculation of the Single Discount Rate

GASB Statement No. 67 includes a specific requirement for the discount rate that is used for the purpose of the measurement of the Total Pension Liability. This rate considers the ability of the fund to meet benefit obligations in the future. To make this determination, employer contributions, employee contributions, benefit payments, expenses and investment returns are projected into the future. The Plan Fiduciary Net Position (assets) in future years can then be determined and compared to its obligation to make benefit payments in those years. As long as assets are projected to be on hand in a future year, the long-term expected rate of return is used as the discount rate. In years where assets are not projected to be sufficient to meet benefit payments, the use of a "risk-free" municipal bond rate is required, as described in the following paragraph.

The Single Discount Rate (SDR) is equivalent to applying these two rates to the benefits that are projected to be paid during the different time periods. The SDR reflects (1) the long-term expected rate of return on pension plan investments (during the period in which the fiduciary net position is projected to be sufficient to pay benefits) and (2) tax-exempt municipal bond rate based on an index of 20-year general obligation bonds with an average AA credit rating as of the measurement date (to the extent that the contributions for use with the long-term expected rate of return are not met).

For the purpose of this valuation, the expected rate of return on pension plan investments is 7.50%; the municipal bond rate is 3.56% (based on Fidelity Index's 20-Year Municipal GO AA Index as of June 30, 2017). **The resulting single discount rate as of July 1, 2017 is 5.42%.** In describing this index, Fidelity notes that the municipal curves are constructed using option-adjusted analytics of a diverse population of over 10,000 tax-exempt securities.

Benefit payments projected to occur up through June 30, 2049 were fully funded and benefit payments projected to occur in the year ended June 30, 2050 were partially funded. Assets were projected to be fully depleted by the fiscal year ending June 30, 2050. Benefit payments were discounted using 7.50%, the long-term expected rate of return on pension plan investments, as long as assets were sufficient to fund the benefit payments. Beginning in the July 1, 2049 to June 30, 2050 fiscal year, when benefit payments exceed the Plan's Fiduciary Net Position, benefit payments were discounted at 3.56%, the municipal bond rate. An equivalent single discount rate was determined that produced approximately the same present value of projected benefits when applied to all years of projected benefits as the present value of projected benefits using 7.50% through the point of asset depletion and 3.56% after. For more information on the calculation of the equivalent present value of projected benefits, see pages 39 through 40 of this report.

The tables in this section provide background for the development of the Single Discount Rate.

The **Projection of Contributions** table shows the development of expected contributions in future years. Normal Cost contributions for future hires are not included (nor are their liabilities).

The **Projection of Plan Fiduciary Net Position** table shows the development of expected asset levels in future years.

The **Present Values of Projected Benefit Payments** table shows the development of the Single Discount Rate. It breaks down the benefit payments into present values for funded and unfunded portions and shows the equivalent total at the SDR.

Single Discount Rate Development
Projection of Contributions (Dollars in Thousands)

	Projected Covered-Employee Payroll			Projected Contributions			
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) * 5.5%	(e) = (a) * 5.5%	(f)	(g) = (d) + (e) + (f)
2017	$ 2,939,455		$ 2,939,455				
2018	3,016,278		3,016,278	$ 165,895	$ 165,895		$ 331,790
2019	2,852,008	$ 262,299	3,114,307	156,860	156,860	$ 4,538	318,258
2020	2,696,846	518,676	3,215,522	148,327	148,327	8,973	305,627
2021	2,564,661	755,365	3,320,026	141,056	141,056	13,068	295,180
2022	2,443,143	984,784	3,427,927	134,373	134,373	17,037	285,783
2023	2,330,888	1,208,447	3,539,335	128,199	128,199	20,906	277,304
2024	2,227,064	1,427,299	3,654,363	122,489	122,489	24,692	269,670
2025	2,129,960	1,643,170	3,773,130	117,148	117,148	28,427	262,723
2026	2,038,424	1,857,333	3,895,757	112,113	112,113	32,132	256,358
2027	1,951,924	2,070,445	4,022,369	107,356	107,356	35,819	250,531
2028	1,870,372	2,282,724	4,153,096	102,870	102,870	39,491	245,231
2029	1,793,219	2,494,852	4,288,071	98,627	98,627	43,161	240,415
2030	1,718,955	2,708,479	4,427,434	94,543	94,543	46,857	235,943
2031	1,646,749	2,924,576	4,571,325	90,571	90,571	50,595	231,737
2032	1,576,412	3,143,481	4,719,893	86,703	86,703	54,382	227,788
2033	1,507,775	3,365,515	4,873,290	82,928	82,928	58,223	224,079
2034	1,440,379	3,591,293	5,031,672	79,221	79,221	62,129	220,571
2035	1,373,991	3,821,210	5,195,201	75,570	75,570	66,107	217,247
2036	1,308,485	4,055,560	5,364,045	71,967	71,967	70,161	214,095
2037	1,243,975	4,294,402	5,538,377	68,419	68,419	74,293	211,131
2038	1,180,624	4,537,750	5,718,374	64,934	64,934	78,503	208,371
2039	1,117,843	4,786,378	5,904,221	61,481	61,481	82,804	205,766
2040	1,054,631	5,041,477	6,096,108	58,005	58,005	87,218	203,228
2041	990,127	5,304,105	6,294,232	54,457	54,457	91,761	200,675
2042	924,736	5,574,058	6,498,794	50,860	50,860	96,431	198,151
2043	859,428	5,850,577	6,710,005	47,269	47,269	101,215	195,753
2044	793,994	6,134,086	6,928,080	43,670	43,670	106,120	193,460
2045	727,979	6,425,264	7,153,243	40,039	40,039	111,157	191,235
2046	661,436	6,724,287	7,385,723	36,379	36,379	116,330	189,088
2047	595,107	7,030,652	7,625,759	32,731	32,731	121,630	187,092
2048	530,201	7,343,395	7,873,596	29,161	29,161	127,041	185,363
2049	466,989	7,662,499	8,129,488	25,684	25,684	132,561	183,929
2050	405,676	7,988,020	8,393,696	22,312	22,312	138,193	182,817
2051	347,204	8,319,288	8,666,492	19,096	19,096	143,924	182,116
2052	292,644	8,655,509	8,948,153	16,095	16,095	149,740	181,930
2053	242,686	8,996,282	9,238,968	13,348	13,348	155,636	182,332
2054	197,836	9,341,398	9,539,234	10,881	10,881	161,606	183,368
2055	158,027	9,691,232	9,849,259	8,691	8,691	167,658	185,040
2056	123,202	10,046,158	10,169,360	6,776	6,776	173,799	187,351
2057	93,749	10,406,115	10,499,864	5,156	5,156	180,026	190,338
2058	69,718	10,771,392	10,841,110	3,835	3,835	186,345	194,015
2059	50,515	11,142,931	11,193,446	2,778	2,778	192,773	198,329
2060	35,373	11,521,860	11,557,233	1,946	1,946	199,328	203,220
2061	23,735	11,909,108	11,932,843	1,305	1,305	206,028	208,638
2062	15,157	12,305,503	12,320,660	834	834	212,885	214,553
2063	9,236	12,711,846	12,721,082	508	508	219,915	220,931
2064	5,309	13,129,208	13,134,517	292	292	227,135	227,719
2065	2,683	13,558,706	13,561,389	148	148	234,566	234,862
2066	1,119	14,001,015	14,002,134	62	62	242,218	242,342
2067	459	14,456,744	14,457,203	25	25	250,102	250,152

**Contributions related to future employees in excess of normal cost and expenses of 9.27% of pay.*

Single Discount Rate Development
Projection of Contributions (Dollars in Thousands)

Fiscal Year Ending	Projected Covered-Employee Payroll: Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Projected Contributions: Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward current UAL*	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d) = (a) * 5.5%	(e) = (a) * 5.5%	(f)	(g) = (d) + (e) + (f)
2068	$ 195	$ 14,926,867	$ 14,927,062	$ 11	$ 11	$ 258,235	$ 258,257
2069	75	15,412,117	15,412,192	4	4	266,630	266,638
2070	31	15,913,057	15,913,088	2	2	275,296	275,300
2071	8	16,430,255	16,430,263	-	-	284,243	284,243
2072	-	16,964,247	16,964,247	-	-	293,481	293,481
2073	-	17,515,585	17,515,585	-	-	303,020	303,020
2074	-	18,084,842	18,084,842	-	-	312,868	312,868
2075	-	18,672,599	18,672,599	-	-	323,036	323,036
2076	-	19,279,458	19,279,458	-	-	333,535	333,535
2077	-	19,906,041	19,906,041	-	-	344,375	344,375
2078	-	20,552,987	20,552,987	-	-	355,567	355,567
2079	-	21,220,959	21,220,959	-	-	367,123	367,123
2080	-	21,910,640	21,910,640	-	-	379,054	379,054
2081	-	22,622,736	22,622,736	-	-	391,373	391,373
2082	-	23,357,975	23,357,975	-	-	404,093	404,093
2083	-	24,117,109	24,117,109	-	-	417,226	417,226
2084	-	24,900,915	24,900,915	-	-	430,786	430,786
2085	-	25,710,195	25,710,195	-	-	444,786	444,786
2086	-	26,545,776	26,545,776	-	-	459,242	459,242
2087	-	27,408,514	27,408,514	-	-	474,167	474,167
2088	-	28,299,291	28,299,291	-	-	489,578	489,578
2089	-	29,219,018	29,219,018	-	-	505,489	505,489
2090	-	30,168,636	30,168,636	-	-	521,917	521,917
2091	-	31,149,117	31,149,117	-	-	538,880	538,880
2092	-	32,161,463	32,161,463	-	-	556,393	556,393
2093	-	33,206,710	33,206,710	-	-	574,476	574,476
2094	-	34,285,928	34,285,928	-	-	593,147	593,147
2095	-	35,400,221	35,400,221	-	-	612,424	612,424
2096	-	36,550,728	36,550,728	-	-	632,328	632,328
2097	-	37,738,627	37,738,627	-	-	652,878	652,878
2098	-	38,965,132	38,965,132	-	-	674,097	674,097
2099	-	40,231,499	40,231,499	-	-	696,005	696,005
2100	-	41,539,023	41,539,023	-	-	718,625	718,625
2101	-	42,889,041	42,889,041	-	-	741,980	741,980
2102	-	44,282,935	44,282,935	-	-	766,095	766,095
2103	-	45,722,130	45,722,130	-	-	790,993	790,993
2104	-	47,208,100	47,208,100	-	-	816,700	816,700
2105	-	48,742,363	48,742,363	-	-	843,243	843,243
2106	-	50,326,490	50,326,490	-	-	870,648	870,648
2107	-	51,962,101	51,962,101	-	-	898,944	898,944
2108	-	53,650,869	53,650,869	-	-	928,160	928,160
2109	-	55,394,522	55,394,522	-	-	958,325	958,325
2110	-	57,194,844	57,194,844	-	-	989,471	989,471
2111	-	59,053,676	59,053,676	-	-	1,021,629	1,021,629
2112	-	60,972,921	60,972,921	-	-	1,054,832	1,054,832
2113	-	62,954,541	62,954,541	-	-	1,089,114	1,089,114
2114	-	65,000,563	65,000,563	-	-	1,124,510	1,124,510
2115	-	67,113,082	67,113,082	-	-	1,161,056	1,161,056
2116	-	69,294,257	69,294,257	-	-	1,198,791	1,198,791
2117	-	71,546,320	71,546,320	-	-	1,237,751	1,237,751

**Contributions related to future employees in excess of normal cost and expenses of 9.27% of pay.*

Single Discount Rate Development
Projection of Plan Fiduciary Net Position (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Net Fiduciary Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Fiduciary Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2018	$ 12,485,614	$ 331,790	$ 816,593	$ 10,557	$ 918,181	$ 12,908,435
2019	12,908,435	318,258	872,085	9,982	947,372	13,291,998
2020	13,291,998	305,627	929,158	9,439	973,593	13,632,621
2021	13,632,621	295,180	980,336	8,976	996,887	13,935,377
2022	13,935,377	285,783	1,032,175	8,551	1,017,355	14,197,788
2023	14,197,788	277,304	1,083,752	8,158	1,034,839	14,418,021
2024	14,418,021	269,670	1,135,203	7,795	1,049,194	14,593,886
2025	14,593,886	262,723	1,184,002	7,455	1,060,344	14,725,495
2026	14,725,495	256,358	1,231,388	7,134	1,068,247	14,811,578
2027	14,811,578	250,531	1,276,059	6,832	1,072,855	14,852,072
2028	14,852,072	245,231	1,318,436	6,546	1,074,147	14,846,469
2029	14,846,469	240,415	1,358,297	6,276	1,072,091	14,794,403
2030	14,794,403	235,943	1,396,401	6,016	1,066,628	14,694,555
2031	14,694,555	231,737	1,431,589	5,764	1,057,698	14,546,638
2032	14,546,638	227,788	1,465,459	5,517	1,045,221	14,348,670
2033	14,348,670	224,079	1,496,733	5,277	1,029,094	14,099,833
2034	14,099,833	220,571	1,526,420	5,041	1,009,218	13,798,161
2035	13,798,161	217,247	1,554,556	4,809	985,442	13,441,484
2036	13,441,484	214,095	1,581,251	4,580	957,601	13,027,349
2037	13,027,349	211,131	1,605,658	4,354	925,541	12,554,009
2038	12,554,009	208,371	1,627,257	4,132	889,152	12,020,144
2039	12,020,144	205,766	1,645,461	3,912	848,354	11,424,892
2040	11,424,892	203,228	1,661,176	3,691	803,046	10,766,298
2041	10,766,298	200,675	1,675,565	3,465	753,036	10,040,979
2042	10,040,979	198,151	1,688,408	3,237	698,080	9,245,566
2043	9,245,566	195,753	1,698,909	3,008	637,957	8,377,359
2044	8,377,359	193,460	1,707,135	2,779	572,463	7,433,367
2045	7,433,367	191,235	1,714,107	2,548	501,333	6,409,280
2046	6,409,280	189,088	1,719,923	2,315	424,242	5,300,372
2047	5,300,372	187,092	1,724,668	2,083	340,834	4,101,548
2048	4,101,548	185,363	1,726,981	1,856	250,782	2,808,856
2049	2,808,856	183,929	1,727,127	1,634	153,780	1,417,804
2050	1,417,804	182,817	1,725,497	1,420	49,478	-
2051	-	182,116	1,721,272	1,215	-	-
2052	-	181,930	1,714,487	1,024	-	-
2053	-	182,332	1,704,285	849	-	-
2054	-	183,368	1,690,293	692	-	-
2055	-	185,040	1,673,141	553	-	-
2056	-	187,351	1,652,834	431	-	-
2057	-	190,338	1,629,023	328	-	-
2058	-	194,015	1,601,139	244	-	-
2059	-	198,329	1,569,225	177	-	-
2060	-	203,220	1,533,874	124	-	-
2061	-	208,638	1,495,189	83	-	-
2062	-	214,553	1,453,270	53	-	-
2063	-	220,931	1,409,133	32	-	-
2064	-	227,719	1,363,640	19	-	-
2065	-	234,862	1,317,280	9	-	-
2066	-	242,342	1,270,237	4	-	-
2067	-	250,152	1,222,557	2	-	-

Single Discount Rate Development
Projection of Plan Fiduciary Net Position (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Net Fiduciary Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Fiduciary Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2068	$ -	$ 258,257	$ 1,174,512	$ 1	$ -	$ -
2069	-	266,638	1,126,224	-	-	-
2070	-	275,300	1,077,679	-	-	-
2071	-	284,243	1,028,864	-	-	-
2072	-	293,481	979,750	-	-	-
2073	-	303,020	930,329	-	-	-
2074	-	312,868	880,624	-	-	-
2075	-	323,036	830,679	-	-	-
2076	-	333,535	780,573	-	-	-
2077	-	344,375	730,418	-	-	-
2078	-	355,567	680,362	-	-	-
2079	-	367,123	630,588	-	-	-
2080	-	379,054	581,314	-	-	-
2081	-	391,373	532,781	-	-	-
2082	-	404,093	485,254	-	-	-
2083	-	417,226	439,011	-	-	-
2084	-	430,786	394,336	-	-	-
2085	-	444,786	351,505	-	-	-
2086	-	459,242	310,776	-	-	-
2087	-	474,167	272,382	-	-	-
2088	-	489,578	236,522	-	-	-
2089	-	505,489	203,356	-	-	-
2090	-	521,917	173,001	-	-	-
2091	-	538,880	145,523	-	-	-
2092	-	556,393	120,944	-	-	-
2093	-	574,476	99,237	-	-	-
2094	-	593,147	80,326	-	-	-
2095	-	612,424	64,089	-	-	-
2096	-	632,328	50,360	-	-	-
2097	-	652,878	38,938	-	-	-
2098	-	674,097	29,597	-	-	-
2099	-	696,005	22,096	-	-	-
2100	-	718,625	16,186	-	-	-
2101	-	741,980	11,622	-	-	-
2102	-	766,095	8,172	-	-	-
2103	-	790,993	5,622	-	-	-
2104	-	816,700	3,780	-	-	-
2105	-	843,243	2,482	-	-	-
2106	-	870,648	1,590	-	-	-
2107	-	898,944	992	-	-	-
2108	-	928,160	604	-	-	-
2109	-	958,325	357	-	-	-
2110	-	989,471	206	-	-	-
2111	-	1,021,629	115	-	-	-
2112	-	1,054,832	62	-	-	-
2113	-	1,089,114	33	-	-	-
2114	-	1,124,510	16	-	-	-
2115	-	1,161,056	8	-	-	-
2116	-	1,198,791	4	-	-	-
2117	-	1,237,751	3	-	-	-

Single Discount Rate Development
Present Values of Projected Benefits (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+sdr)^(a-.5)
2018	$ 12,485,614	$ 816,593	$ 816,593	$ -	$ 787,592	$ -	$ 795,309
2019	12,908,435	872,085	872,085	-	782,431	-	805,654
2020	13,291,998	929,158	929,158	-	775,476	-	814,214
2021	13,632,621	980,336	980,336	-	761,106	-	814,862
2022	13,935,377	1,032,175	1,032,175	-	745,444	-	813,809
2023	14,197,788	1,083,752	1,083,752	-	728,087	-	810,510
2024	14,418,021	1,135,203	1,135,203	-	709,445	-	805,308
2025	14,593,886	1,184,002	1,184,002	-	688,318	-	796,711
2026	14,725,495	1,231,388	1,231,388	-	665,921	-	785,965
2027	14,811,578	1,276,059	1,276,059	-	641,934	-	772,572
2028	14,852,072	1,318,436	1,318,436	-	616,979	-	757,158
2029	14,846,469	1,358,297	1,358,297	-	591,286	-	739,915
2030	14,794,403	1,396,401	1,396,401	-	565,463	-	721,535
2031	14,694,555	1,431,589	1,431,589	-	539,267	-	701,658
2032	14,546,638	1,465,459	1,465,459	-	513,512	-	681,303
2033	14,348,670	1,496,733	1,496,733	-	487,880	-	660,041
2034	14,099,833	1,526,420	1,526,420	-	462,844	-	638,499
2035	13,798,161	1,554,556	1,554,556	-	438,489	-	616,812
2036	13,441,484	1,581,251	1,581,251	-	414,901	-	595,123
2037	13,027,349	1,605,658	1,605,658	-	391,912	-	573,217
2038	12,554,009	1,627,257	1,627,257	-	369,473	-	551,038
2039	12,020,144	1,645,461	1,645,461	-	347,541	-	528,534
2040	11,424,892	1,661,176	1,661,176	-	326,381	-	506,128
2041	10,766,298	1,675,565	1,675,565	-	306,240	-	484,246
2042	10,040,979	1,688,408	1,688,408	-	287,058	-	462,852
2043	9,245,566	1,698,909	1,698,909	-	268,692	-	441,768
2044	8,377,359	1,707,135	1,707,135	-	251,156	-	421,068
2045	7,433,367	1,714,107	1,714,107	-	234,588	-	401,035
2046	6,409,280	1,719,923	1,719,923	-	218,962	-	381,692
2047	5,300,372	1,724,668	1,724,668	-	204,247	-	363,052
2048	4,101,548	1,726,981	1,726,981	-	190,252	-	344,835
2049	2,808,856	1,727,127	1,727,127	-	176,994	-	327,120
2050	1,417,804	1,725,497	1,417,804	307,693	135,158	98,713	309,997
2051	-	1,721,272	-	1,721,272	-	533,232	293,327
2052	-	1,714,487	-	1,714,487	-	512,872	277,138
2053	-	1,704,285	-	1,704,285	-	492,294	261,315
2054	-	1,690,293	-	1,690,293	-	471,468	245,835
2055	-	1,673,141	-	1,673,141	-	450,641	230,820
2056	-	1,652,834	-	1,652,834	-	429,869	216,287
2057	-	1,629,023	-	1,629,023	-	409,111	202,203
2058	-	1,601,139	-	1,601,139	-	388,286	188,517
2059	-	1,569,225	-	1,569,225	-	367,465	175,253
2060	-	1,533,874	-	1,533,874	-	346,839	162,491
2061	-	1,495,189	-	1,495,189	-	326,469	150,244
2062	-	1,453,270	-	1,453,270	-	306,408	138,518
2063	-	1,409,133	-	1,409,133	-	286,889	127,401
2064	-	1,363,640	-	1,363,640	-	268,083	116,944
2065	-	1,317,280	-	1,317,280	-	250,067	107,156
2066	-	1,270,237	-	1,270,237	-	232,847	98,013
2067	-	1,222,557	-	1,222,557	-	216,403	89,481

Single Discount Rate Development
Present Values of Projected Benefits (Dollars in Thousands)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+sdr)^(a-.5)
2068	$ -	$ 1,174,512	$ -	$ 1,174,512	$ -	$ 200,752	$ 81,541
2069	-	1,126,224	-	1,126,224	-	185,881	74,166
2070	-	1,077,679	-	1,077,679	-	171,754	67,317
2071	-	1,028,864	-	1,028,864	-	158,337	60,962
2072	-	979,750	-	979,750	-	145,596	55,065
2073	-	930,329	-	930,329	-	133,499	49,597
2074	-	880,624	-	880,624	-	122,023	44,532
2075	-	830,679	-	830,679	-	111,145	39,845
2076	-	780,573	-	780,573	-	100,851	35,515
2077	-	730,418	-	730,418	-	91,127	31,523
2078	-	680,362	-	680,362	-	81,964	27,852
2079	-	630,588	-	630,588	-	73,356	24,486
2080	-	581,314	-	581,314	-	65,299	21,411
2081	-	532,781	-	532,781	-	57,790	18,614
2082	-	485,254	-	485,254	-	50,826	16,081
2083	-	439,011	-	439,011	-	44,401	13,800
2084	-	394,336	-	394,336	-	38,512	11,758
2085	-	351,505	-	351,505	-	33,149	9,942
2086	-	310,776	-	310,776	-	28,300	8,338
2087	-	272,382	-	272,382	-	23,951	6,932
2088	-	236,522	-	236,522	-	20,083	5,709
2089	-	203,356	-	203,356	-	16,673	4,656
2090	-	173,001	-	173,001	-	13,697	3,757
2091	-	145,523	-	145,523	-	11,125	2,998
2092	-	120,944	-	120,944	-	8,928	2,363
2093	-	99,237	-	99,237	-	7,074	1,839
2094	-	80,326	-	80,326	-	5,529	1,412
2095	-	64,089	-	64,089	-	4,260	1,069
2096	-	50,360	-	50,360	-	3,232	797
2097	-	38,938	-	38,938	-	2,413	584
2098	-	29,597	-	29,597	-	1,771	421
2099	-	22,096	-	22,096	-	1,277	298
2100	-	16,186	-	16,186	-	903	207
2101	-	11,622	-	11,622	-	626	141
2102	-	8,172	-	8,172	-	425	94
2103	-	5,622	-	5,622	-	282	61
2104	-	3,780	-	3,780	-	183	39
2105	-	2,482	-	2,482	-	116	24
2106	-	1,590	-	1,590	-	72	15
2107	-	992	-	992	-	43	9
2108	-	604	-	604	-	25	5
2109	-	357	-	357	-	15	3
2110	-	206	-	206	-	8	2
2111	-	115	-	115	-	4	1
2112	-	62	-	62	-	2	-
2113	-	33	-	33	-	1	-
2114	-	16	-	16	-	1	-
2115	-	8	-	8	-	-	-
2116	-	4	-	4	-	-	-
2117	-	3	-	3	-	-	-
				Totals	$ 15,625,027	$ 8,405,243	$ 24,030,270

SECTION H

GLOSSARY OF TERMS

Glossary of Terms

Actuarial Accrued Liability (AAL)	The AAL is the difference between the actuarial present value of all benefits and the actuarial value of future normal costs. The definition comes from the fundamental equation of funding which states that the present value of all benefits is the sum of the Actuarial Accrued Liability and the present value of future normal costs. The AAL may also be referred to as "accrued liability" or "actuarial liability."
Actuarial Assumptions	These assumptions are estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and compensation increases. Actuarial assumptions are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (compensation increases, payroll growth, inflation and investment return) consist of an underlying real rate of return plus an assumption for a long-term average rate of inflation.
Accrued Service	Service credited under the system which was rendered before the date of the actuarial valuation.
Actuarial Equivalent	A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate actuarial assumptions.
Actuarial Cost Method	A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of the pension trust benefits between future normal cost and actuarial accrued liability. The actuarial cost method may also be referred to as the actuarial funding method.
Actuarial Gain (Loss)	The difference in liabilities between actual experience and expected experience during the period between two actuarial valuations is the gain (loss) on the accrued liabilities.
Actuarial Present Value (APV)	The amount of funds currently required to provide a payment or series of payments in the future. The present value is determined by discounting future benefit payments at predetermined rates of interest to reflect the expected effects of the time value (present value) of money and the probabilities of payment.
Actuarial Valuation	The actuarial valuation report determines, as of the actuarial valuation date, the service cost, total pension liability, and related actuarial present value of projected benefit payments for pensions performed in conformity with Actuarial Standards of Practice unless otherwise specified by the GASB.
Actuarial Valuation Date	The date as of which an actuarial valuation is performed.
Actuarially Determined Contribution (ADC)	A calculated contribution into a defined benefit pension plan for the reporting period, most often determined based on the funding policy of the plan. Typically the Actuarially Determined Contribution has a normal cost payment and an amortization payment.

Glossary of Terms

Amortization Payment	The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.
Amortization Method	The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be "open" (meaning, reset each year) or "closed" (the number of years remaining will decline each year).
Cost-of-Living Adjustments	Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.
Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan)	A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.
Covered-Employee Payroll	The payroll of covered employees, which is typically only the pensionable pay (meets the statutory salary definition) and does not include pay above any pay cap.
Deferred Inflows and Outflows of Resources	The deferred inflows and outflows of pension resources are amounts used under GASB Statement No. 68 in developing the annual pension expense. Deferred inflows and outflows arise with differences between expected and actual experiences; changes of assumptions. The portion of these amounts not included in pension expense should be included in the deferred inflows or outflows of resources.
Discount Rate or Single Discount Rate	For GASB purposes, the discount rate is the single rate of return that results in the present value of all projected benefit payments to be equal to the sum of the funded and unfunded projected benefit payments, specifically: 1) The benefit payments to be made while the pension plans' fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period and; 2) The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.
Entry Age Actuarial Cost Method or Entry Age Normal (EAN)	The EAN is a funding method for allocating the costs of the plan between the normal cost and the accrued liability. The actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis (either level dollar or level percent of pay) over the earnings or service of the individual between entry age and assumed exit ages(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.

Glossary of Terms

Fiduciary Net Position	The fiduciary net position is the value of the net assets of the trust restricted for pension benefits.
GASB	The Governmental Accounting Standards Board is an organization that exists with authority to promulgate accounting standards for state and local governmental entities.
Long-Term Expected Rate of Return	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
Money-Weighted Rate of Return	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
Multiple-Employer Defined Benefit Pension Plan	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Municipal Bond Rate	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
Net Pension Liability (NPL)	The NPL is the liability of employers and non-employer contributing entities to plan members for benefits provided through a defined benefit pension plan.
Non-Employer Contributing Entities	Non-employer contributing entities are entities that make contributions to a pension plan that is used to provide pensions to the employees of other entities. For purposes of the GASB Accounting Statements No. 67 and No. 68 plan members are not considered non-employer contributing entities.
Normal Cost	The actuarial present value of the pension trust benefits allocated to the current year by the actuarial cost method.
Other Postemployment Benefits (OPEB)	All postemployment benefits other than retirement income (such as death benefits, life insurance, disability, and long-term care) that are provided separately from a pension plan, as well as postemployment healthcare benefits regardless of the manner in which they are provided. Other post-employment benefits do not include termination benefits.
Real Rate of Return	The real rate of return is the rate of return on an investment after adjustment to eliminate inflation.
Service Cost	The service cost is the portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.

Glossary of Terms

Total Pension Expense	The total pension expense is the sum of the following items that are recognized at the end of the employer's fiscal year: 1. Service Cost 2. Interest on the Total Pension Liability 3. Current-Period Changes in Benefit Terms 4. Employee Contributions 5. Projected Earnings on Plan Investments 6. Pension Plan Administrative Expense 7. Other Changes in Plan Fiduciary Net Position 8. Recognition of Outflow (Inflow) of Resources due to the difference between expected and actual experience in measurement of the Total Pension Liability 9. Recognition of Outflow (Inflow) of Resources due to assumption changes 10. Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on pension plan investments
Total Pension Liability (TPL)	The TPL is the portion of the actuarial present value of projected benefit payments that is attributed to past periods of member service.
Unfunded Actuarial Accrued Liability (UAAL)	The UAAL is the difference between actuarial accrued liability and valuation assets.
Valuation Assets	The valuation assets are the plan fiduciary net position used in determining the net pension liability of the fund. For purposes of the GASB Statement No. 67, the asset valuation method is equal to the market value of assets.