Gabriel Roeder Smith & Company
Consultants & Actuaries

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES RETIREMENT FUND

GASB STATEMENT NOS. 67 AND 68 ACCOUNTING AND FINANCIAL REPORTING FOR PENSIONS
JUNE 30, 2016

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December 1, 2016

Minnesota State Retirement System
Correctional 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 Correctional Employees Retirement Fund ("CERF"), 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 funding purposes of the plan. A calculation of the plan's liability for purposes other than satisfying the requirements of GASB Statement No. 67 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, 2016 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

To the best of our knowledge, the information contained within this report is accurate and fairly represents the actuarial position of the Correctional 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,

By Bonita J. Wurst	By Brian B. Murphy
Bonita J. Wurst, ASA, EA, FCA, MAAA	Brian B. Murphy, FSA, EA, FCA, MAAA

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SECTION A

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY
AS OF JUNE 30, 2016 (DOLLARS IN THOUSANDS)

		2016
Actuarial Valuation Date		June 30, 2016
Measurement Date of the Net Pension Liability		June 30, 2016
Membership		
Number of		
- Service Retirements		2,426
- Survivors		208
- Disability Retirements		284
- Deferred Retirements		1,316
- Terminated other non-vested		661
- Active Members		4,521
- Total		9,416
Covered-employee Payroll [1]	$	241,242
Net Pension Liability		
Total Pension Liability	$	2,232,382
Plan Fiduciary Net Position		899,592
Net Pension Liability	$	1,332,790
Plan Fiduciary Net Position as a Percentage of Total Pension Liability		40.30%
Net Pension Liability as a Percentage of Covered-Employee Payroll		552.47%
Development of the Single Discount Rate		
Single Discount Rate		4.24%
Long-Term Expected Rate of Investment Return		7.50%
Long-Term Municipal Bond Rate [2]		2.85%
Last year ending June 30 in the 2017 to 2116 projection period for which projected benefit payments are fully funded		2045
Total Pension Expense/ (Income)	$	178,692

Deferred Outflows and Deferred Inflows of Resources 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	$	6,794	$	611
Changes in assumptions		540,175		73,534
Net difference between projected and actual earnings on pension plan investments	$	75,554		31,519
Total	$	622,523	$	105,664

[1] *Assumed equal to actual member contributions divided by employee contribution rate*
[2] *Based on the Bond Buyer 20-Bond Index of general obligation municipal bonds as of June 30, 2016*

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. Governmental Accounting Standards Board (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 CERF subsequent to the measurement date of June 30, 2016.

The pension expense 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 Correctional 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 Statement 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, 2016 and a measurement date of June 30, 2016.

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 2.85% (based on the weekly rate closest to but not later than the measurement date of the "20-Bond GO Index"); and the resulting single discount rate is 4.24%. The long-term expected rate of return is based on a review of inflation and investment assumptions, dated September 11, 2014, and a recent asset liability study obtained by the Minnesota State Board of Investment.

Effective Date and Transition

GASB Statements No. 67 and No. 68 are effective for fiscal years beginning after June 15, 2013, and June 15, 2014 respectively. Earlier application is encouraged by the GASB. MSRS first implemented GASB Statement No. 67 for fiscal year 2014.

SECTION B

FINANCIAL STATEMENTS

PENSION EXPENSE UNDER GASB STATEMENT NO. 68
FISCAL YEAR ENDED JUNE 30, 2016 (DOLLARS IN THOUSANDS)

A. Expense

1.	Service Cost	$	56,718
2.	Interest on the Total Pension Liability		97,571
3.	Current-Period Benefit Changes		0
4.	Employee Contributions (made negative for addition here)		(21,953)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(71,447)
6.	Pension Plan Administrative Expense		906
7.	Other Changes in Plan Fiduciary Net Position		0
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		(153)
9.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Current Reporting Period		115,310
10.	Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.90%) and actual earnings on Pension Plan Investments		
	Arising from Current Reporting Period		14,328
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**191,280**
12.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Prior Reporting Periods		1,870
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		(4,778)
14.	Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.90%) and actual earnings on Pension Plan Investments		
	Arising from Prior Reporting Periods		(9,680)
15.	**Total Pension Expense / (Income)**	**$**	**178,692**

STATEMENT OF OUTFLOWS AND INFLOWS ARISING FROM CURRENT REPORTING PERIOD FISCAL YEAR ENDED JUNE 30, 2016 (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	$	(764)
2. Assumption Changes (gains) or losses	$	576,552
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		5.0000
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability*	$	(153)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes	$	115,310
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	115,157
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	$	(611)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes	$	461,242
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	460,631
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	71,642
2. Recognition period for Assets {in years}		5.0000
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	$	14,328
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	57,314

* *Includes impact of changes in expected timing of future post-retirement benefit increases, if applicable.*

STATEMENT OF OUTFLOWS AND INFLOWS ARISING FROM CURRENT AND PRIOR REPORTING PERIODS FISCAL YEAR ENDED JUNE 30, 2016 (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	$ 136,913	$ 24,664	$ 112,249
2. Due to Assets	20,408	15,760	4,648
3. Totals	$ 157,321	$ 40,424	$ 116,897

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	$ 1,870	$ 153	$ 1,717
2. Assumption Changes	135,043	24,511	110,532
3. Net Difference between projected and actual earnings on pension plan investments	20,408	15,760	4,648
4. Totals	$ 157,321	$ 40,424	$ 116,897

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	$ 6,794	$ 611	$ 6,183
2. Assumption Changes	540,175	73,534	466,641
3. Net Difference between projected and actual earnings on pension plan investments	75,554	31,519	44,035
4. Total	$ 622,523	$ 105,664	$ 516,859

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
2017	$ 116,897
2018	116,898
2019	132,655
2020	150,409
2021	0
Thereafter	0
Total	$ 516,859

STATEMENT OF FIDUCIARY NET POSITION AS OF JUNE 30, 2016 (DOLLARS IN THOUSANDS)

Assets		**June 30, 2016**
Cash & Short-term Investments	$	23,048
Receivables		2,447
Investment Pools (at fair value)		875,584
Securities Lending Collateral		126,970
Capital Assets		0
Total Assets	**$**	**1,028,049**
Total Deferred Outflows of Resources	**$**	**0**
Total Liabilities	**$**	**(128,457)**
Total Deferred Inflows of Resources	**$**	**0**
Net Position Restricted for Pensions	**$**	**899,592**

STATEMENT OF CHANGES IN FIDUCIARY NET POSITION FOR YEAR ENDED JUNE 30, 2016 (DOLLARS IN THOUSANDS)

1. Net position at market value at beginning of year	**$**	**909,002**
Additions		
2. Contributions		
a. Employee	$	21,953
b. Employer		30,678
c. Other sources		0
d. Total contributions	$	52,631
3. Investment income		
a. Investment income/(loss)	$	993
b. Investment expenses		(1,188)
c. Net investment income/(loss)	$	(195)
4. Other Additions		0
5. Total Additions *(2.d.) + (3.c.) + (4.)*	**$**	**52,436**
Deductions		
6. Benefits Paid		
a. Annuity benefits	$	(59,045)
b. Refunds		(1,895)
c. Total benefits paid	$	(60,940)
7. Expenses		
a. Other deductions	$	0
b. Administrative		(906)
c. Total expenses	$	(906)
8. Total deductions *(6.c.) + (7.c.)*	**$**	**(61,846)**
9. Net increase/(decrease) in fiduciary net position *(5.) + (8.)*	**$**	**(9,410)**
10. Net position at market value at end of year *(1.) + (9.)*	**$**	**899,592**
11. State Board of Investment calculated annual investment return		(0.1)%

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

Schedule of Changes in Net Pension Liability and Related Ratios
Current Period
Fiscal Year Ended June 30, 2016 (Dollars in Thousands)

A. Total Pension Liability			
1. Service Cost	$	56,718	
2. Interest on the Total Pension Liability		97,571	
3. Changes of benefit terms		0	
4. Difference between expected and actual experience of the Total Pension Liability		(764)	
5. Changes of assumptions		576,552	(1)
6. Benefit payments, including refunds of employee contributions		(60,940)	
7. Net change in Total Pension Liability	$	669,137	
8. Total Pension Liability – Beginning		1,563,245	
9. Total Pension Liability – Ending	**$**	**2,232,382**	
B. Plan Fiduciary Net Position			
1. Contributions – Employer	$	30,678	
2. Contributions – Employee		21,953	
3. Net investment income		(195)	
4. Benefit payments, including refunds of employee contributions		(60,940)	
5. Pension Plan Administrative Expense		(906)	
6. Other changes		0	
7. Net change in Plan Fiduciary Net Position	$	(9,410)	
8. Plan Fiduciary Net Position – Beginning		909,002	
9. Plan Fiduciary Net Position – Ending	**$**	**899,592**	
C. Net Pension Liability, *A.9 - B.9.*	**$**	**1,332,790**	
D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability, *B.9 / A.9.*		**40.30%**	
E. Covered-Employee payroll	**$**	**241,242**	(2)
F. Net Pension Liability as a percentage of Covered-Employee payroll, *C. / E.*		**552.47%**	

(1) *Assumption changes are summarized on page 30.*

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

Schedules of Required Supplementary Information

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,	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Total Pension Liability										
Service Cost	$ 56,718	$ 48,805	$ 54,443							
Interest on the Total Pension Liability	97,571	92,039	85,702							
Benefit Changes	0	0	0							
Difference between Expected and Actual Experience	(764)	7,115	4,103							
Assumption Changes	576,552 (1)	118,399	(147,067)							
Benefit Payments	(59,045)	(54,909)	(50,842)							
Refunds	(1,895)	(1,590)	(1,447)							
Net Change in Total Pension Liability	$ 669,137	$ 209,859	$ (55,108)							
Total Pension Liability - Beginning	1,563,245	1,353,386	1,408,494							
Total Pension Liability - Ending (a)	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**							
Plan Fiduciary Net Position										
Employer Contributions	$ 30,678	$ 29,480	$ 26,468							
Employee Contributions	21,953	21,061	18,855							
Pension Plan Net Investment Income	(195)	38,624	137,523							
Benefit Payments	(59,045)	(54,909)	(50,842)							
Refunds	(1,895)	(1,590)	(1,447)							
Pension Plan Administrative Expense	(906)	(720)	(657)							
Other Changes	0	0	(1)							
Net Change in Plan Fiduciary Net Position	**$ (9,410)**	**$ 31,946**	**$ 129,899**							
Plan Fiduciary Net Position - Beginning	**909,002**	**877,056**	**747,157**							
Plan Fiduciary Net Position - Ending (b)	**$ 899,592**	**$ 909,002**	**$ 877,056**							
Net Pension Liability - Ending (a) - (b)	**$ 1,332,790**	**$ 654,243**	**$ 476,330**							
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**40.30 %**	**58.15 %**	**64.80 %**							
Covered-Employee Payroll (2)	**$ 241,242**	**$ 231,440**	**$ 219,244**							
Net Pension Liability as a Percentage of Covered-Employee Payroll	**552.47 %**	**282.68 %**	**217.26 %**							

Notes to Schedule:

(1) Assumption changes are summarized on page 30.

(2) Assumed equal to plan member contributions divided by employee contribution rate.

Schedules of Required Supplementary Information
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)/(c)	(d)	(c)/(d)
2007						
2008						
2009						
2010						
2011						
2012						
2013						
2014	$ 1,353,386	$ 877,056	$ 476,330	64.80%	$ 219,244	217.26%
2015	1,563,245	909,002	654,243	58.15%	231,440	282.68%
2016	2,232,382	899,592	1,332,790	40.30%	241,242	552.47%

Schedule of Contributions Multiyear (Dollars in Thousands)

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Actuarially Determined Contribution	Actual Contributions	Contribution Deficiency (Excess)	Covered-Employee Payroll	Actual Contribution as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(d)	(b)/(d)
2007	$ 29,115	$ 13,927	$ 15,188	$ 167,727	8.30%
2008	34,734	18,623	16,111	194,391	9.58
2009	31,738	20,126	11,612	193,445	10.40
2010	32,557	21,988	10,569	192,450	11.43
2011	33,274	23,892	9,382	197,702	12.08
2012	34,806	24,188	10,618	200,035	12.09
2013	34,060	24,632	9,428	204,198	12.06
2014	38,390	26,468	11,922	219,244	12.07
2015	40,109	29,480	10,629	231,440	12.74
2016	44,171	30,678	13,493	241,242	12.72

NOTES TO SCHEDULE OF CONTRIBUTIONS

Valuation Date:	June 30, 2016
Notes	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.

Methods and Assumptions Used to Determine Contribution Rates Reported in this Schedule:

Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	22 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based tables ranging from 5.75% with one year of service to 3.50% with 19 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. Last updated for the 2012 valuation pursuant to an experience study of the period 2006 - 2011, prepared by a former actuary.
Healthy Post-Retirement Mortality	RP-2000 annuitant generational mortality table, projected with mortality improvement scale AA, white collar adjustment, set forward one year for males and set back one year for females.

Other Information:

Benefit Increases After Retirement	The post-retirement increase is assumed to stay at 2.0% indefinitely. See separate funding actuarial valuation report as of July 1, 2016 for additional detail. To obtain this report, contact MSRS as noted on page 3. This report is also available 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]
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	18.62 %
2015	4.44
2016	(0.02)

[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, 2016, the annual money-weighted rate of return for the Correctional Employees Retirement Fund was (0.02)%. 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 real 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, 2016, 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	45.00%	5.50%
International Stocks	15.00	6.00
Bonds	18.00	1.45
Alternative Assets	20.00	6.40
Unallocated Cash	2.00	0.50
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.

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

SENSITIVITY OF NET PENSION LIABILITY TO THE SINGLE DISCOUNT RATE ASSUMPTION

Single Discount Rate

A Single Discount Rate of 4.24% 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 2.85%. 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, 2045. 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, 2045, 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 4.24%, 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 (3.24%) or 1-percentage-point higher (5.24%) than the current rate.

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 3.24%	Current Single Discount Rate Assumption 4.24%	1% Increase 5.24%
Total Pension Liability	$ 2,641,770	$ 2,232,382	$ 1,908,798
Net Position Restricted for Pensions	899,592	899,592	899,592
Net Pension Liability	**$1,742,178**	**$1,332,790**	**$1,009,206**

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	**$ 1,563,245**	**$ 909,002**	**$ 654,243**	**$ 131,650**	**$ 145,324**	
Changes for the Year:						
Service Cost	$ 56,718		$ 56,718			$ 56,718
Interest on Total Pension Liability	97,571		97,571			97,571
Interest on Plan Fiduciary Net Position [1]		$ 71,447	(71,447)			(71,447)
Changes in Benefit Terms						
Liability Experience Gains and Losses	(764)		(764)	$ -	$ 611	(153)
Changes in Assumptions	576,552		576,552	461,242	-	115,310
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(1,870)	-	1,870
Assumption Changes				(19,733)	(24,511)	(4,778)
Investment Gains/(Losses)				(6,080)	(15,760)	(9,680)
Contributions - Employer		30,678	(30,678)			
Contributions - Employees		21,953	(21,953)			(21,953)
Asset Gain/(Loss) [1]		(71,642)	71,642	57,314	-	14,328
Benefit Payment and Refunds	(60,940)	(60,940)				
Administrative Expenses		(906)	906			906
Other Changes						
Net Changes	**$ 669,137**	**$ (9,410)**	**$ 678,547**	**$ 490,873**	**$ (39,660)**	**$ 178,692**
Balance End of Year	**$ 2,232,382**	**$ 899,592**	**$ 1,332,790**	**$ 622,523**	**$ 105,664**	

[1] *The sum of these items equals the net investment income of $(195).*

SUMMARY OF POPULATION STATISTICS

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2015	**4,449**	**1,276**	**531**	**2,292**	**279**	**198**	**9,025**
New members	541	0	0	0	0	0	**541**
Return to active	20	(10)	(10)	0	0	0	**0**
Terminated non-vested	(156)	0	156	0	0	0	**0**
Service retirements	(125)	(37)	0	162	0	0	**0**
Terminated deferred	(92)	92	0	0	0	0	**0**
Terminated refund/transfer	(106)	(9)	(59)	0	0	0	**(174)**
Deaths	(3)	(3)	0	(32)	(5)	(6)	**(49)**
New beneficiary	0	0	0	0	0	17	**17**
Disabled	(7)	0	0	0	7	0	**0**
Unexpected status changes	0	7	43	4	3	(1)	**56**
Net change	72	40	130	134	5	10	**391**
Members on 6/30/2016	**4,521**	**1,316**	**661**	**2,426**	**284**	**208**	**9,416**

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 in covered correctional service. Certain state employees with 75 percent working time spent in direct contact with inmates or patients are also eligible.	
Contributions	Shown as a percent of salary:	
Effective date	**Member**	**Employer**
July 1, 2014	9.10%	12.85%
	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 leave of absence, military service and periods while temporary Worker's Compensation is paid.	
Salary	Includes wages, allowances and fees. Excludes lump sum payments of separation and reduced salary while receiving Worker's Compensation benefits.	
Average salary	Average of the five highest successive years of Salary. Average Salary is based on all Allowable Service if less than five years.	
Vesting	Hired before July 1, 2010:	100% vested after 3 years of Allowable Service.
	Hired after June 30, 2010:	50% vested after 5 years of Allowable Service; 60% vested after 6 years of Allowable Service; 70% vested after 7 years of Allowable Service; 80% vested after 8 years of Allowable Service; 90% vested after 9 years of Allowable Service; and 100% vested after 10 years of Allowable Service.
Retirement		
Normal retirement benefit		
Age/Service requirement	Age 55 and vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.	
Amount	2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year of Allowable Service, pro-rata for completed months.	
Early retirement		
Age/Service requirement	Age 50 and vested.	
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date reduced by 2/10% (5/12% if first hired after June 30, 2010 or if hired before July 1, 2010 and retire after June 30, 2015) per month for each month that the member is under age 55.	

SUMMARY OF PLAN PROVISIONS (CONTINUED)

Retirement (Continued)	
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	Since 2011, benefit recipients have received annual 2.0% benefit increases. If the accrued liability funding ratio reaches 90% (actuarial accrued liability ratio on a Market Value of Assets basis) for two consecutive years, the benefit increase will revert to 2.5%. If, after reverting to a 2.5% increase, the funding ratio declines to less than 80% for one year or 85% for two consecutive years, the benefit increase will decrease to 2.0%. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Duty Disability	
Age/Service requirement	Physically or mentally unable to perform normal job duties as a direct result of a disability relating to an incident while performing the duties of the job which present inherent dangers to the employee. Members who become disabled after June 30, 2009 will have disability benefits converted to retirement benefits at age 55 instead of age 65.
Amount	50.00% of Average Salary plus 2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year in excess of 20 years and 10 months of Allowable Service (pro rata for completed months). Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) or the five-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Regular Disability	
Age/Service requirement	At least one year of covered Correctional service for employees hired before July 1, 2009, or a vested Correctional employee hired after June 30, 2009, and the employee is determined to have a regular disability not related to an incident while performing the duties of the job.

SUMMARY OF PLAN PROVISIONS (CONTINUED)

Disability (Continued)	
Amount	Normal retirement benefit based on covered Correctional Service (minimum of 15 years if hired prior to July 1, 2009) and Average Salary at disability. Payment begins at disability and ends at age 55 (age 65 if disabled prior to July 1, 2009) or the five-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability. Member is reclassified from disabled to retired at age 55 (age 65 if disabled prior to July 1, 2009). Optional amount continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Benefit Increases	Same as for retirement.
Death	
Surviving spouse benefit	
Age/Service requirement	Member at any age or former member age 50 or older who dies before retirement or disability benefit commences and was vested. 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 50 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 (lump sum payable to estate at death).
Benefit increases	Same as for retirement.
Surviving dependent children's benefit	
Age/service requirement	If no surviving spouse, all dependent children (biological or adopted) below age 20 who are dependent for more than half of their support on deceased member.
Amount	Actuarially equivalent to surviving spouse 100% joint and survivor annuity payable to the later of age 20 or five years. The amount is to be proportionally divided among surviving children.
Benefit increases	Same as for retirement.
Refund of contributions with interest	
Age/service requirement	Active employee dies and survivor benefits are not payable or a former employee dies before annuity begins. If accumulated member contributions with interest exceed total payments to the surviving spouse and children, then the remainder is paid out.

SUMMARY OF PLAN PROVISIONS (CONTINUED)

Death (Continued) Amount	Member's contributions with 6.00% interest compounded daily until July 1, 2011 and 4.00% thereafter.
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 will 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	Partially or fully vested.
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; and (e.) 2.00% from January 1, 2012 thereafter. Amount is payable at normal or early retirement.
Optional form conversion factors	Actuarially equivalent factors based on RP-2000 mortality for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set forward one year for males and set back one year for females, blended 70% males, and 6.5% interest.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.

SUMMARY OF PLAN PROVISIONS (CONCLUDED)

Contribution Stabilizer	The following is a summary of the contribution stabilizer provisions in Minnesota Statute 352.045: • If a contribution sufficiency of at least 1.0% exists, member and employer contributions may be adjusted by the Board of Directors to a level necessary to maintain a 1.0% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. Employer contributions must be equal to 60% of the sum of member and employer contributions. • If a contribution deficiency of at least 0.5% exists, member and employer contribution rates may be increased by the Board of Directors to eliminate the deficiency. Employer contributions must be equal to 60% of the sum of member and employer contributions. • Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the first day of the first full payroll period of the next fiscal year.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

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 5.75% at year 1 declining to 3.50% at years 19 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. This assumption is reflected in our calculations.

Asset Valuation Method

Fair value of assets.

SUMMARY OF ACTUARIAL ASSUMPTIONS USED IN 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 February 2012, prepared by a former actuary, a review of inflation and investment return assumptions, dated September 11, 2014, and a recent asset liability study obtained by the SBI. An experience study for the 2011-2015 period was issued on July 26, 2016. This report recommended many changes to demographic assumptions, expected to be effective at a future date.

The Allowance for Combined Service Annuity was also based on a recommendation by a former actuary. We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of the assignment. We note that the LCPR Actuary has recently completed a review of this assumption. This review recommended changes to this assumption, expected to be effective at a future date.

Investment return	7.50% per annum.
Single discount rate	4.24% 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.
Payroll growth	3.25% per year.
Inflation	2.50% per year.
Mortality rates	
Healthy pre-retirement	RP-2000 employee generational mortality table projected with mortality improvement scale AA, white collar adjustment.
Healthy post-retirement	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set forward one year for males and set back one year for females. The RP-2000 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 15 to 70 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have applied the annuitant mortality table for active members beyond age 70 until the assumed retirement age and the employee mortality table for annuitants younger than age 50.
Disabled	RP-2000 disabled mortality table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are:

Year	Select Withdrawal Rates
1	20%
2	15%
3	8%

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONTINUED)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 30.00% 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 a 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 age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be three years younger than their male spouses.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 10% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 40% elect 100% Joint & Survivor option Females: 10% 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 straight life annuity, except that current terminated deferred members who terminated prior to July 1, 1997 are assumed to receive the Level Social Security option to age 62.
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.

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONTINUED)

Unknown data for certain members	To prepare this report, GRS has used and relied on participant data supplied by MSRS. 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: Data for active members: There were 11 members reported with zero or invalid salary. We used prior year salary (9 members), if available, otherwise, high five salary with a 10% load to account for salary increases (1 member). If neither pay nor high five salary were available, we assumed a value of $35,000 (1 member). There were 2 members reported without a gender and 1 member reported with a missing date of birth. We assumed members were hired at age 33 and male gender. There was 1 member reported with zero service. Due to the small number of members with zero service, and based on direction from MSRS, we used service of zero years for this member. Data for terminated members: There were 54 members reported without a 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 (20 members), we assumed a value of $30,000. If Credited Service was not reported (2 members), we assumed a value of 7.5 years. There were no members reported without a Termination Date. There were 62 members who terminated after June 30, 1997 and who were reported with a benefit in the Accelerated to Age 62 option. Based on direction from MSRS, we adjusted benefits for these members to reflect the assumed life annuity election. There were no members reported with missing or invalid gender or birth dates. Data for members receiving benefits: There was 1 member reported with a missing gender. We assumed male gender. There were no members reported with a missing or invalid birth date. There were no survivors reported on the data file with an expired benefit. There were 2 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	Data for members receiving benefits: There were no retirees reported with a survivor option and a survivor date of death. There were 15 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 7 retired members with an accelerated benefit election and a missing accelerated benefit amount and end date. We assumed the accelerated period has ended. There were retired members reported with a survivor option and an invalid or missing survivor gender (377 members) and/or survivor date of birth (310 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.
Change in actuarial assumptions	The single discount rate changed from 6.25% as of July 1, 2015 to 4.24% as of July 1, 2016. The long-term expected rate of return on pension plan investments has been reduced from 7.90% to 7.50% as of July 1, 2016. The inflation assumption has been reduced from 2.75% to 2.50%, the payroll growth assumption was reduced from 3.50% to 3.25%, and the salary scale rates have been reduced by 0.25% at each age.

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONTINUED)

	Rate (%)*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality	
Age	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
20	0.04%	0.02%	0.03%	0.02%	2.26%	0.75%
25	0.04	0.02	0.04	0.02	2.26	0.75
30	0.04	0.02	0.04	0.03	2.26	0.75
35	0.06	0.04	0.06	0.05	2.26	0.75
40	0.10	0.06	0.09	0.06	2.26	0.75
45	0.15	0.09	0.13	0.10	2.26	0.75
50	0.60	0.15	0.20	0.16	2.90	1.15
55	0.54	0.32	0.27	0.24	3.54	1.65
60	0.73	0.51	0.43	0.38	4.20	2.18
65	1.30	0.82	0.67	0.59	5.02	2.80
70	2.14	1.37	0.98	0.88	6.26	3.76

* *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.*

** *These rates were adjusted for mortality improvements using projection scale AA.*

	Withdrawal Rates After Third Year		Disability Retirement	
Age	**Male**	**Female**	**Male**	**Female**
20	13.20%	8.80%	0.05%	0.05%
25	8.10	7.80	0.08	0.08
30	5.00	7.45	0.11	0.11
35	3.45	7.10	0.15	0.15
40	2.55	5.70	0.24	0.24
45	1.95	3.50	0.39	0.39
50	0.00	0.00	0.67	0.67
55	0.00	0.00	1.17	1.17
60	0.00	0.00	1.88	1.88
65	0.00	0.00	0.00	0.00

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONCLUDED)

Age	Percent Retiring
50	5%
51	3
52	3
53	3
54	5
55	55
56	12
57	12
58	10
59	10
60	10
61	10
62	30
63	30
64	30
65	50
66	50
67	50
68	50
69	50
70+	100

Salary Scale	
Year	Increase
1	5.50%
2	5.35
3	5.20
4	5.05
5	4.90
6	4.75
7	4.60
8	4.45
9	4.30
10	4.15
11	4.05
12	3.95
13	3.85
14	3.75
15	3.65
16	3.55
17	3.45
18	3.35
19+	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 (which is published by the Federal Reserve Board (FRB)) 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 2.85% (based on the FRB rate as of June 30, 2016). **The resulting single discount rate as of July 1, 2016 is 4.24%.**

Benefit payments projected to occur up through June 30, 2044 were fully funded and benefit payments projected to occur in the year ended June 30, 2045 were partially funded. Assets were projected to be fully depleted by the fiscal year ending June 30, 2045. 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, 2044 to June 30, 2045 fiscal year, when benefit payments exceed the Plan’s Fiduciary Net Position, benefit payments were discounted at 2.85%, 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 2.85% after. For more information on the calculation of the equivalent present value of projected benefits, see pages 38 and 39 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) x 9.10%	(e) = (a) x 12.85%	(f)	(g) = (d) + (e) + (f)
2016	$ 241,242		$ 241,242				
2017	247,282		247,282	$ 22,503	$ 31,776		$ 54,279
2018	234,860	$ 20,459	255,319	21,372	30,180	$ 779	52,331
2019	224,631	38,986	263,617	20,441	28,865	1,485	50,791
2020	215,459	56,725	272,184	19,607	27,686	2,161	49,454
2021	205,901	75,129	281,030	18,737	26,458	2,862	48,057
2022	196,085	94,079	290,164	17,844	25,197	3,584	46,625
2023	186,256	113,338	299,594	16,949	23,934	4,318	45,201
2024	176,910	132,421	309,331	16,099	22,733	5,045	43,877
2025	168,241	151,143	319,384	15,310	21,619	5,759	42,688
2026	159,325	170,439	329,764	14,499	20,473	6,494	41,466
2027	150,579	189,902	340,481	13,703	19,349	7,235	40,287
2028	142,716	208,831	351,547	12,987	18,339	7,956	39,282
2029	135,232	227,740	362,972	12,306	17,377	8,677	38,360
2030	127,767	247,002	374,769	11,627	16,418	9,411	37,456
2031	120,449	266,500	386,949	10,961	15,478	10,154	36,593
2032	113,180	286,345	399,525	10,299	14,544	10,910	35,753
2033	105,873	306,636	412,509	9,634	13,605	11,683	34,922
2034	98,620	327,296	425,916	8,974	12,673	12,470	34,117
2035	91,294	348,464	439,758	8,308	11,731	13,276	33,315
2036	83,475	370,575	454,050	7,596	10,727	14,119	32,442
2037	75,424	393,383	468,807	6,864	9,692	14,988	31,544
2038	67,811	416,232	484,043	6,171	8,714	15,858	30,743
2039	60,560	439,214	499,774	5,511	7,782	16,734	30,027
2040	53,281	462,736	516,017	4,849	6,847	17,630	29,326
2041	46,386	486,402	532,788	4,221	5,961	18,532	28,714
2042	40,084	510,019	550,103	3,648	5,151	19,432	28,231
2043	34,132	533,850	567,982	3,106	4,386	20,340	27,832
2044	28,781	557,660	586,441	2,619	3,698	21,247	27,564
2045	23,952	581,548	605,500	2,180	3,078	22,157	27,415
2046	19,502	605,677	625,179	1,775	2,506	23,076	27,357
2047	15,618	629,879	645,497	1,421	2,007	23,998	27,426
2048	12,442	654,034	666,476	1,132	1,599	24,919	27,650
2049	9,786	678,351	688,137	891	1,257	25,845	27,993
2050	7,551	702,950	710,501	687	970	26,782	28,439
2051	5,784	727,808	733,592	526	743	27,729	28,998
2052	4,358	753,076	757,434	397	560	28,692	29,649
2053	3,205	778,846	782,051	292	412	29,674	30,378
2054	2,289	805,178	807,467	208	294	30,677	31,179
2055	1,584	832,126	833,710	144	204	31,704	32,052
2056	1,051	859,754	860,805	96	135	32,757	32,988
2057	661	888,121	888,782	60	85	33,837	33,982
2058	399	917,268	917,667	36	51	34,948	35,035
2059	229	947,262	947,491	21	29	36,091	36,141
2060	123	978,162	978,285	11	16	37,268	37,295
2061	62	1,010,017	1,010,079	6	8	38,482	38,496
2062	29	1,042,878	1,042,907	3	4	39,734	39,741
2063	13	1,076,788	1,076,801	1	2	41,026	41,029
2064	5	1,111,792	1,111,797	0	1	42,359	42,360
2065	2	1,147,928	1,147,930	0	0	43,736	43,736
2066	0	1,185,238	1,185,238	0	0	45,158	45,158

**Contributions related to future employees in excess of normal cost and expenses of 18.14% of pay.*

SINGLE DISCOUNT RATE DEVELOPMENT
PROJECTION OF CONTRIBUTIONS (DOLLARS IN THOUSANDS) (CONCLUDED)

	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) x 9.10%	(e) = (a) x 12.85%	(f)	(g) = (d) + (e) + (f)
2067	$ 0	$ 1,223,758	$ 1,223,758	$ 0	$ 0	$ 46,625	$ 46,625
2068	0	1,263,531	1,263,531	0	0	48,141	48,141
2069	0	1,304,595	1,304,595	0	0	49,705	49,705
2070	0	1,346,995	1,346,995	0	0	51,320	51,320
2071	0	1,390,772	1,390,772	0	0	52,988	52,988
2072	0	1,435,972	1,435,972	0	0	54,711	54,711
2073	0	1,482,641	1,482,641	0	0	56,489	56,489
2074	0	1,530,827	1,530,827	0	0	58,325	58,325
2075	0	1,580,579	1,580,579	0	0	60,220	60,220
2076	0	1,631,948	1,631,948	0	0	62,177	62,177
2077	0	1,684,986	1,684,986	0	0	64,198	64,198
2078	0	1,739,748	1,739,748	0	0	66,284	66,284
2079	0	1,796,290	1,796,290	0	0	68,439	68,439
2080	0	1,854,669	1,854,669	0	0	70,663	70,663
2081	0	1,914,946	1,914,946	0	0	72,959	72,959
2082	0	1,977,182	1,977,182	0	0	75,331	75,331
2083	0	2,041,440	2,041,440	0	0	77,779	77,779
2084	0	2,107,787	2,107,787	0	0	80,307	80,307
2085	0	2,176,290	2,176,290	0	0	82,917	82,917
2086	0	2,247,019	2,247,019	0	0	85,611	85,611
2087	0	2,320,048	2,320,048	0	0	88,394	88,394
2088	0	2,395,449	2,395,449	0	0	91,267	91,267
2089	0	2,473,301	2,473,301	0	0	94,233	94,233
2090	0	2,553,684	2,553,684	0	0	97,295	97,295
2091	0	2,636,678	2,636,678	0	0	100,457	100,457
2092	0	2,722,370	2,722,370	0	0	103,722	103,722
2093	0	2,810,847	2,810,847	0	0	107,093	107,093
2094	0	2,902,200	2,902,200	0	0	110,574	110,574
2095	0	2,996,521	2,996,521	0	0	114,167	114,167
2096	0	3,093,908	3,093,908	0	0	117,878	117,878
2097	0	3,194,460	3,194,460	0	0	121,709	121,709
2098	0	3,298,280	3,298,280	0	0	125,664	125,664
2099	0	3,405,474	3,405,474	0	0	129,749	129,749
2100	0	3,516,152	3,516,152	0	0	133,965	133,965
2101	0	3,630,427	3,630,427	0	0	138,319	138,319
2102	0	3,748,416	3,748,416	0	0	142,815	142,815
2103	0	3,870,240	3,870,240	0	0	147,456	147,456
2104	0	3,996,022	3,996,022	0	0	152,248	152,248
2105	0	4,125,893	4,125,893	0	0	157,197	157,197
2106	0	4,259,985	4,259,985	0	0	162,305	162,305
2107	0	4,398,434	4,398,434	0	0	167,580	167,580
2108	0	4,541,383	4,541,383	0	0	173,027	173,027
2109	0	4,688,978	4,688,978	0	0	178,650	178,650
2110	0	4,841,370	4,841,370	0	0	184,456	184,456
2111	0	4,998,715	4,998,715	0	0	190,451	190,451
2112	0	5,161,173	5,161,173	0	0	196,641	196,641
2113	0	5,328,911	5,328,911	0	0	203,032	203,032
2114	0	5,502,101	5,502,101	0	0	209,630	209,630
2115	0	5,680,919	5,680,919	0	0	216,443	216,443
2116	0	5,865,549	5,865,549	0	0	223,477	223,477

**Contributions related to future employees in excess of normal cost and expenses of 18.14% of pay.*

SINGLE DISCOUNT RATE DEVELOPMENT
PROJECTION OF PLAN FIDUCIARY NET POSITION (DOLLARS IN THOUSANDS)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2017	$ 899,592	$ 54,279	$ 66,631	$ 940	$ 66,980	$ 953,280
2018	953,280	52,331	70,579	892	70,791	1,004,931
2019	1,004,931	50,791	74,542	854	74,464	1,054,790
2020	1,054,790	49,454	78,550	819	78,008	1,102,883
2021	1,102,883	48,057	83,393	782	81,386	1,148,151
2022	1,148,151	46,625	88,877	745	84,528	1,189,682
2023	1,189,682	45,201	94,406	708	87,388	1,227,157
2024	1,227,157	43,877	100,127	672	89,941	1,260,176
2025	1,260,176	42,688	105,823	639	92,165	1,288,567
2026	1,288,567	41,466	111,669	605	94,035	1,311,794
2027	1,311,794	40,287	118,028	572	95,501	1,328,982
2028	1,328,982	39,282	124,170	542	96,528	1,340,080
2029	1,340,080	38,360	130,175	514	97,107	1,344,858
2030	1,344,858	37,456	136,331	486	97,206	1,342,703
2031	1,342,703	36,593	142,505	458	96,786	1,333,119
2032	1,333,119	35,753	148,627	430	95,812	1,315,627
2033	1,315,627	34,922	154,884	402	94,240	1,289,503
2034	1,289,503	34,117	161,071	375	92,024	1,254,198
2035	1,254,198	33,315	167,482	347	89,112	1,208,796
2036	1,208,796	32,442	174,326	317	85,424	1,152,019
2037	1,152,019	31,544	181,570	287	80,867	1,082,573
2038	1,082,573	30,743	188,390	258	75,379	1,000,047
2039	1,000,047	30,027	194,804	230	68,928	903,968
2040	903,968	29,326	201,167	202	61,463	793,388
2041	793,388	28,714	206,918	176	52,936	667,944
2042	667,944	28,231	211,715	152	43,334	527,642
2043	527,642	27,832	216,029	130	32,639	371,954
2044	371,954	27,564	219,511	109	20,825	200,723
2045	200,723	27,415	222,313	91	7,874	13,608
2046	13,608	27,357	224,562	74	0	0
2047	0	27,426	226,029	59	0	0
2048	0	27,650	226,462	47	0	0
2049	0	27,993	226,117	37	0	0
2050	0	28,439	225,054	29	0	0
2051	0	28,998	223,182	22	0	0
2052	0	29,649	220,690	17	0	0
2053	0	30,378	217,661	12	0	0
2054	0	31,179	214,161	9	0	0
2055	0	32,052	210,235	6	0	0
2056	0	32,988	205,925	4	0	0
2057	0	33,982	201,264	3	0	0
2058	0	35,035	196,278	2	0	0
2059	0	36,141	191,004	1	0	0
2060	0	37,295	185,472	0	0	0
2061	0	38,496	179,706	0	0	0
2062	0	39,741	173,731	0	0	0
2063	0	41,029	167,558	0	0	0
2064	0	42,360	161,199	0	0	0
2065	0	43,736	154,663	0	0	0
2066	0	45,158	147,961	0	0	0

**Contributions related to future employees in excess of normal cost and expenses of 18.14% of pay.*

SINGLE DISCOUNT RATE DEVELOPMENT
PROJECTION OF PLAN FIDUCIARY NET POSITION
(DOLLARS IN THOUSANDS) (CONCLUDED)

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2067	$ 0	$ 46,625	$ 141,098	$ 0	$ 0	$ 0
2068	0	48,141	134,079	0	0	0
2069	0	49,705	126,917	0	0	0
2070	0	51,320	119,627	0	0	0
2071	0	52,988	112,229	0	0	0
2072	0	54,711	104,747	0	0	0
2073	0	56,489	97,217	0	0	0
2074	0	58,325	89,689	0	0	0
2075	0	60,220	82,209	0	0	0
2076	0	62,177	74,832	0	0	0
2077	0	64,198	67,615	0	0	0
2078	0	66,284	60,620	0	0	0
2079	0	68,439	53,902	0	0	0
2080	0	70,663	47,514	0	0	0
2081	0	72,959	41,506	0	0	0
2082	0	75,331	35,922	0	0	0
2083	0	77,779	30,790	0	0	0
2084	0	80,307	26,129	0	0	0
2085	0	82,917	21,952	0	0	0
2086	0	85,611	18,253	0	0	0
2087	0	88,394	15,018	0	0	0
2088	0	91,267	12,224	0	0	0
2089	0	94,233	9,841	0	0	0
2090	0	97,295	7,835	0	0	0
2091	0	100,457	6,169	0	0	0
2092	0	103,722	4,803	0	0	0
2093	0	107,093	3,697	0	0	0
2094	0	110,574	2,814	0	0	0
2095	0	114,167	2,119	0	0	0
2096	0	117,878	1,577	0	0	0
2097	0	121,709	1,161	0	0	0
2098	0	125,664	844	0	0	0
2099	0	129,749	606	0	0	0
2100	0	133,965	430	0	0	0
2101	0	138,319	301	0	0	0
2102	0	142,815	208	0	0	0
2103	0	147,456	141	0	0	0
2104	0	152,248	95	0	0	0
2105	0	157,197	62	0	0	0
2106	0	162,305	40	0	0	0
2107	0	167,580	26	0	0	0
2108	0	173,027	16	0	0	0
2109	0	178,650	10	0	0	0
2110	0	184,456	6	0	0	0
2111	0	190,451	4	0	0	0
2112	0	196,641	2	0	0	0
2113	0	203,032	1	0	0	0
2114	0	209,630	1	0	0	0
2115	0	216,443	0	0	0	0
2116	0	223,477	0	0	0	0

**Contributions related to future employees in excess of normal cost and expenses of 18.14% of pay.*

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)
2017	$ 899,592	$ 66,631	$ 66,631	$ 0	$ 64,265	$ 0	$ 65,260
2018	953,280	70,579	70,579	0	63,323	0	66,313
2019	1,004,931	74,542	74,542	0	62,213	0	67,185
2020	1,054,790	78,550	78,550	0	60,984	0	67,915
2021	1,102,883	83,393	83,393	0	60,227	0	69,166
2022	1,148,151	88,877	88,877	0	59,709	0	70,713
2023	1,189,682	94,406	94,406	0	58,999	0	72,054
2024	1,227,157	100,127	100,127	0	58,209	0	73,309
2025	1,260,176	105,823	105,823	0	57,228	0	74,325
2026	1,288,567	111,669	111,669	0	56,176	0	75,238
2027	1,311,794	118,028	118,028	0	55,232	0	76,284
2028	1,328,982	124,170	124,170	0	54,053	0	76,986
2029	1,340,080	130,175	130,175	0	52,714	0	77,424
2030	1,344,858	136,331	136,331	0	51,355	0	77,783
2031	1,342,703	142,505	142,505	0	49,935	0	77,996
2032	1,333,119	148,627	148,627	0	48,447	0	78,034
2033	1,315,627	154,884	154,884	0	46,964	0	78,009
2034	1,289,503	161,071	161,071	0	45,433	0	77,822
2035	1,254,198	167,482	167,482	0	43,945	0	77,625
2036	1,208,796	174,326	174,326	0	42,550	0	77,507
2037	1,152,019	181,570	181,570	0	41,226	0	77,441
2038	1,082,573	188,390	188,390	0	39,790	0	77,078
2039	1,000,047	194,804	194,804	0	38,274	0	76,457
2040	903,968	201,167	201,167	0	36,767	0	75,740
2041	793,388	206,918	206,918	0	35,180	0	74,734
2042	667,944	211,715	211,715	0	33,484	0	73,353
2043	527,642	216,029	216,029	0	31,782	0	71,800
2044	371,954	219,511	219,511	0	30,042	0	69,987
2045	200,723	222,313	200,723	21,590	25,554	9,693	67,994
2046	13,608	224,562	13,608	210,954	1,611	92,080	65,886
2047	0	226,029	0	226,029	0	95,925	63,616
2048	0	226,462	0	226,462	0	93,446	61,143
2049	0	226,117	0	226,117	0	90,718	58,564
2050	0	225,054	0	225,054	0	87,790	55,916
2051	0	223,182	0	223,182	0	84,647	53,193
2052	0	220,690	0	220,690	0	81,382	50,457
2053	0	217,661	0	217,661	0	78,041	47,739
2054	0	214,161	0	214,161	0	74,659	45,059
2055	0	210,235	0	210,235	0	71,259	42,432
2056	0	205,925	0	205,925	0	67,864	39,870
2057	0	201,264	0	201,264	0	64,490	37,381
2058	0	196,278	0	196,278	0	61,150	34,970
2059	0	191,004	0	191,004	0	57,858	32,645
2060	0	185,472	0	185,472	0	54,625	30,409
2061	0	179,706	0	179,706	0	51,460	28,264
2062	0	173,731	0	173,731	0	48,371	26,212
2063	0	167,558	0	167,558	0	45,359	24,251
2064	0	161,199	0	161,199	0	42,428	22,381
2065	0	154,663	0	154,663	0	39,580	20,599
2066	0	147,961	0	147,961	0	36,816	18,904

SINGLE DISCOUNT RATE DEVELOPMENT
PRESENT VALUES OF PROJECTED BENEFITS
(DOLLARS IN THOUSANDS) (CONCLUDED)

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)
2067	$ 0	$ 141,098	$ 0	$ 141,098	$ 0	$ 34,135	$ 17,293
2068	0	134,079	0	134,079	0	31,538	15,764
2069	0	126,917	0	126,917	0	29,027	14,314
2070	0	119,627	0	119,627	0	26,601	12,943
2071	0	112,229	0	112,229	0	24,264	11,648
2072	0	104,747	0	104,747	0	22,019	10,429
2073	0	97,217	0	97,217	0	19,870	9,285
2074	0	89,689	0	89,689	0	17,823	8,217
2075	0	82,209	0	82,209	0	15,884	7,225
2076	0	74,832	0	74,832	0	14,058	6,309
2077	0	67,615	0	67,615	0	12,351	5,469
2078	0	60,620	0	60,620	0	10,766	4,703
2079	0	53,902	0	53,902	0	9,308	4,012
2080	0	47,514	0	47,514	0	7,977	3,392
2081	0	41,506	0	41,506	0	6,775	2,843
2082	0	35,922	0	35,922	0	5,701	2,360
2083	0	30,790	0	30,790	0	4,751	1,941
2084	0	26,129	0	26,129	0	3,920	1,580
2085	0	21,952	0	21,952	0	3,202	1,273
2086	0	18,253	0	18,253	0	2,589	1,016
2087	0	15,018	0	15,018	0	2,071	802
2088	0	12,224	0	12,224	0	1,639	626
2089	0	9,841	0	9,841	0	1,283	483
2090	0	7,835	0	7,835	0	993	369
2091	0	6,169	0	6,169	0	760	279
2092	0	4,803	0	4,803	0	576	208
2093	0	3,697	0	3,697	0	431	154
2094	0	2,814	0	2,814	0	319	112
2095	0	2,119	0	2,119	0	233	81
2096	0	1,577	0	1,577	0	169	58
2097	0	1,161	0	1,161	0	121	41
2098	0	844	0	844	0	85	29
2099	0	606	0	606	0	60	20
2100	0	430	0	430	0	41	13
2101	0	301	0	301	0	28	9
2102	0	208	0	208	0	19	6
2103	0	141	0	141	0	12	4
2104	0	95	0	95	0	8	2
2105	0	62	0	62	0	5	2
2106	0	40	0	40	0	3	1
2107	0	26	0	26	0	2	1
2108	0	16	0	16	0	1	0
2109	0	10	0	10	0	1	0
2110	0	6	0	6	0	0	0
2111	0	4	0	4	0	0	0
2112	0	2	0	2	0	0	0
2113	0	1	0	1	0	0	0
2114	0	1	0	1	0	0	0
2115	0	0	0	0	0	0	0
2116	0	0	0	0	0	0	0
				Totals	$ 1,405,671	$ 1,741,065	$ 3,146,736

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 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 (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.

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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 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 position liability of the plan. For purposes of the GASB Statement No. 67, the asset valuation method is equal to the market value of assets.