Minnesota State Retirement System
Correctional 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
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 reporting and disclosure information that satisfies the requirements of GASB Statements No. 67 and No. 68. The Net Pension Liability is not an appropriate measure for measuring the sufficiency of plan assets to cover the estimated cost of settling the employer's benefit obligation. The Net Pension Liability is not an appropriate measure for assessing the need for or amount of future employer contributions. 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. The Minnesota State Retirement System (MSRS) is responsible for preparing the Schedule of Employer Allocations and the Schedule of Pension Amounts by Employer. This report may be provided to parties other than 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.

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,

Brian B. Murphy

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

Bonita J. Wurst

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

BBM/BJW:bd

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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	2,576
- Survivors	216
- Disability Retirements	292
- Deferred Retirements	1,310
- Terminated other non-vested	818
- Active Members	4,579
- Total	9,791
Covered-employee Payroll [(1)]	$ 248,879
Net Pension Liability	
Total Pension Liability	$ 2,151,931
Plan Fiduciary Net Position	1,023,817
Net Pension Liability	$ 1,128,114
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	47.58%
Net Pension Liability as a Percentage of Covered-Employee Payroll	453.28%
Development of the Single Discount Rate	
Single Discount Rate	5.02%
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	2048
Total Pension Expense/ (Income)	$ 163,904

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	$ 10,177	$ 458
Changes in assumptions	405,132	219,550
Net difference between projected and actual earnings on pension plan investments	55,146	70,405
Total	$ 470,455	$ 290,413

(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 municpal 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 CERF subsequent to the measurement date of June 30, 2017.

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, 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 5.02%. 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

1. Service Cost	$	95,522
2. Interest on the Total Pension Liability		95,307
3. Current-Period Benefit Changes		-
4. Employee Contributions (made negative for addition here)		(22,648)
5. Projected Earnings on Plan Investments (made negative for addition here)		(67,052)
6. Pension Plan Administrative Expense		856
7. Other Changes in Plan Fiduciary Net Position		2
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		1,313
9. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Current Reporting Period		(42,632)
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		(13,661)
11. **Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**47,007**
12. Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
Arising from Prior Reporting Periods		1,717
13. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Prior Reporting Periods		110,532
14. Recognition of Outflow (Inflow) of Resources due to the difference between projected and actual earnings on Pension Plan Investments		
Arising from Prior Reporting Periods		4,648
15. **Total Pension Expense / (Income)**	**$**	**163,904**

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	$	6,566
2. Assumption Changes (gains) or losses		(213,159)
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years}		5
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*		1,313
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		(42,632)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	(41,319)
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	$	5,253
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		(170,527)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	(165,274)
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	(68,307)
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		(13,661)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	(54,646)

* *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, 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	$ 138,226	$ 67,296	$ 70,930
2. Due to Assets	20,408	29,421	(9,013)
3. Totals	$ 158,634	$ 96,717	$ 61,917

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	$ 3,183	$ 153	$ 3,030
2. Assumption Changes	135,043	67,143	67,900
3. Net Difference between projected and actual earnings on pension plan investments	20,408	29,421	(9,013)
4. Totals	$ 158,634	$ 96,717	$ 61,917

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	$ 10,177	$ 458	$ 9,719
2. Assumption Changes	405,132	219,550	185,582
3. Net Difference between projected and actual earnings on pension plan investments*	55,146	70,405	(15,259)
4. Total	$ 470,455	$ 290,413	$ 180,042

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	$ 61,918
2019	77,675
2020	95,429
2021	(54,980)
2022	-
Thereafter	-
Total	$ 180,042

** 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	$	30,093
Receivables		2,780
Investment Pools (at fair value)		992,464
Securities Lending Collateral		105,151
Capital Assets		-
Total Assets	**$**	**1,130,488**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(106,671)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**1,023,817**

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	**$**	**899,592**
Additions		
2. Contributions		
a. Employee	$	22,648
b. Employer		31,763
c. Other sources		-
d. Total contributions	$	54,411
3. Investment income		
a. Investment income/(loss)	$	136,409
b. Investment expenses		(1,050)
c. Net investment income/(loss)	$	135,359
4. Other Additions		-
5. Total Additions *(2.d.) + (3.c.) + (4.)*	**$**	**189,770**
Deductions		
6. Benefits Paid		
a. Annuity benefits	$	(63,221)
b. Refunds		(1,466)
c. Total benefits paid	$	(64,687)
7. Expenses		
a. Other deductions	$	(2)
b. Administrative		(856)
c. Total expenses	$	(858)
8. Total deductions *(6.c.) + (7.c.)*	**$**	**(65,545)**
9. Net increase/(decrease) in fiduciary net position *(5.) + (8.)*	**$**	**124,225**
10. Net position at market value at end of year *(1.) + (9.)*	**$**	**1,023,817**
11. State Board of Investment calculated annual investment return for the Correctional 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	$	95,522	
2. Interest on the Total Pension Liability		95,307	
3. Changes of benefit terms		-	
4. Difference between expected and actual experience of the Total Pension Liability		6,566	
5. Changes of assumptions		(213,159)	[1]
6. Benefit payments, including refunds of employee contributions		(64,687)	
7. Net change in Total Pension Liability	$	(80,451)	
8. Total Pension Liability – Beginning		2,232,382	
9. Total Pension Liability – Ending	**$**	**2,151,931**	
B. Plan Fiduciary Net Position			
1. Contributions – Employer	$	31,763	
2. Contributions – Employee		22,648	
3. Net investment income		135,359	
4. Benefit payments, including refunds of employee contributions		(64,687)	
5. Pension Plan Administrative Expense		(856)	
6. Other changes		(2)	
7. Net change in Plan Fiduciary Net Position	$	124,225	
8. Plan Fiduciary Net Position – Beginning		899,592	
9. Plan Fiduciary Net Position – Ending	**$**	**1,023,817**	
C. Net Pension Liability, *A.9 - B.9.*	**$**	**1,128,114**	
D. Plan Fiduciary Net Position as a percentage of the Total Pension Liability, *B.9 / A.9.*		**47.58%**	
E. Covered-Employee payroll	**$**	**248,879**	[2]
F. Net Pension Liability as a percentage of Covered-Employee payroll, *C. / E.*		**453.28%**	

[1] *Assumption changes are summarized on page 32.*

[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	$ 95,522	$ 56,718	$ 48,805	$ 54,443						
Interest on the Total Pension Liability	95,307	97,571	92,039	85,702						
Benefit Changes	-	-	-	-						
Difference between Expected and Actual Experience	6,566	(764)	7,115	4,103						
Assumption Changes	(213,159) (1)	576,552	118,399	(147,067)						
Benefit Payments	(63,221)	(59,045)	(54,909)	(50,842)						
Refunds	(1,466)	(1,895)	(1,590)	(1,447)						
Net Change in Total Pension Liability	**$ (80,451)**	**$ 669,137**	**$ 209,859**	**$ (55,108)**						
Total Pension Liability - Beginning	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**	**$ 1,408,494**						
Total Pension Liability - Ending (a)	**$ 2,151,931**	**$ 2,232,382**	**$ 1,563,245**	**$ 1,353,386**						
Plan Fiduciary Net Position										
Employer Contributions	$ 31,763	$ 30,678	$ 29,480	$ 26,468						
Employee Contributions	22,648	21,953	21,061	18,855						
Pension Plan Net Investment Income	135,359	(195)	38,624	137,523						
Benefit Payments	(63,221)	(59,045)	(54,909)	(50,842)						
Refunds	(1,466)	(1,895)	(1,590)	(1,447)						
Pension Plan Administrative Expense	(856)	(906)	(720)	(657)						
Other Changes	(2)	-	-	(1)						
Net Change in Plan Fiduciary Net Position	**$ 124,225**	**$ (9,410)**	**$ 31,946**	**$ 129,899**						
Plan Fiduciary Net Position - Beginning	**$ 899,592**	**$ 909,002**	**$ 877,056**	**$ 747,157**						
Plan Fiduciary Net Position - Ending (b)	**$ 1,023,817**	**$ 899,592**	**$ 909,002**	**$ 877,056**						
Net Pension Liability - Ending (a) - (b)	**$ 1,128,114**	**$ 1,332,790**	**$ 654,243**	**$ 476,330**						
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**47.58 %**	**40.30 %**	**58.15 %**	**64.80 %**						
Covered-Employee Payroll (2)	**$ 248,879**	**$ 241,242**	**$ 231,440**	**$ 219,244**						
Net Pension Liability as a Percentage of Covered-Employee Payroll	**453.28 %**	**552.47 %**	**282.68 %**	**217.26 %**						

Notes to Schedule:

(1) Assumption changes are summarized on page 32.

(2) Assumed equal to plan member contributions 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 (a)	Plan Net Position (b)	Net Pension Liability (a) - (b) = (c)	Plan Net Position as a % of Total Pension Liability (b)/(c)	Covered-Employee Payroll (d)	Net Pension Liability as a % of Covered-Employee Payroll (c)/(d)
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
2017	2,151,931	1,023,817	1,128,114	47.58	248,879	453.28

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)
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
2017	45,943	31,763	14,180	248,879	12.76

Notes to Schedule of Contributions

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

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.
Valuation Date:	June 30, 2016
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]
2008	
2009	
2010	
2011	
2012	
2013	
2014	18.62 %
2015	4.44
2016	(0.02)
2017	15.23

[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 Correctional Employees Retirement Fund was 15.23%. 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, 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.

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

Single Discount Rate

A Single Discount Rate of 5.02% 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, 2048. 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, 2048, 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 5.02%, 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 (4.02%) or 1-percentage-point higher (6.02%) than the current rate.

Sensitivity of Net Pension Liability to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 4.02%	Current Single Discount Rate Assumption 5.02%	1% Increase 6.02%
Total Pension Liability	$ 2,537,552	$ 2,151,931	$ 1,846,878
Net Position Restricted for Pensions	1,023,817	1,023,817	1,023,817
Net Pension Liability	**$ 1,513,735**	**$ 1,128,114**	**$ 823,061**

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	**$ 2,232,382**	**$ 899,592**	**$ 1,332,790**	**$ 622,523**	**$ 105,664**	
Changes for the Year:						
Service Cost	$ 95,522		$ 95,522			$ 95,522
Interest on Total Pension Liability	95,307		95,307			95,307
Interest on Plan Fiduciary Net Position [1]		$ 67,052	(67,052)			(67,052)
Changes in Benefit Terms						
Liability Experience Gains and Losses	6,566		6,566	$ 5,253	$ -	1,313
Changes in Assumptions	(213,159)		(213,159)	-	170,527	(42,632)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				(1,870)	(153)	1,717
Assumption Changes				(135,043)	(24,511)	110,532
Investment Gains/(Losses)				(20,408)	(15,760)	4,648
Contributions - Employer		31,763	(31,763)			
Contributions - Employees		22,648	(22,648)			(22,648)
Asset Gain/(Loss) [1]		68,307	(68,307)	-	54,646	(13,661)
Benefit Payment and Refunds	(64,687)	(64,687)				
Administrative Expenses		(856)	856			856
Other Changes		(2)	2			2
Net Changes	**$ (80,451)**	**$ 124,225**	**$ (204,676)**	**$ (152,068)**	**$ 184,749**	**$ 163,904**
Balance End of Year	**$ 2,151,931**	**$ 1,023,817**	**$ 1,128,114**	**$ 470,455**	**$ 290,413**	

[1] *The sum of these items in column (b) equals the net investment income of $135,359.*

Summary of Population Statistics

		Terminated		Recipients			
	Actives	Deferred Retirement	Other Non-Vested	Service Retirement	Disability Retirement	Survivor	Total
Members on 7/1/2016	**4,521**	**1,316**	**661**	**2,426**	**284**	**208**	**9,416**
New members	506	0	0	0	0	0	**506**
Return to active	30	(22)	(8)	0	0	0	**0**
Terminated non-vested	(161)	0	161	0	0	0	**0**
Service retirements	(126)	(54)	0	180	0	0	**0**
Terminated deferred	(83)	83	0	0	0	0	**0**
Terminated refund/transfer	(97)	(14)	(44)	0	0	0	**(155)**
Deaths	(4)	(2)	(3)	(32)	(5)	(4)	**(50)**
New beneficiary	0	0	0	0	0	12	**12**
Disabled	(7)	0	0	0	7	0	**0**
Unexpected status changes	0	3	51	2	6	0	**62**
Net change	58	(6)	157	150	8	8	**375**
Members on 6/30/2017	**4,579**	**1,310**	**818**	**2,576**	**292**	**216**	**9,791**

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: Member: 9.10% Employer: 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; 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.

Summary of Plan Provisions (Continued)

Retirement (Continued)

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.
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 2.00% benefit increases. If 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 declines to 80% or less for one year or 85% or less for two consecutive years, the benefit increase will decrease to 2.00%. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.

Disability

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).

Disability (Continued)

Duty Disability Continued

Amount (Continued)	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.
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.

Summary of Plan Provisions (Continued)

Death (Continued)	
<u>**Surviving spouse benefit Continued)**</u>	
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.
<u>**Surviving dependent children's benefit**</u>	
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 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.
<u>**Refund of contributions with interest**</u>	
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.
Amount	Member's contributions with 6.00% interest compounded daily until July 1, 2011, and 4.00% thereafter.
Termination	
<u>**Refund of contributions**</u>	
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.

Summary of Plan Provisions (Continued)

Termination (Continued)

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 6.50% post-retirement interest.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; (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; and (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 1.00% 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. Employer contributions must be equal to 60% of the sum of member and employer contributions. • If a contribution deficiency of at least 0.50% exists, member and employer contribution rates may be increased by the MSRS Board of Directors to eliminate the deficiency. Employer contributions must be equal to 60% of the sum of member and employer contributions. • Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the first day of the first full payroll period of the next fiscal year.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

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; and

(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 12.50% at year 1 declining to 3.50% at years 24 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 July 26, 2016, 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 Allowances for Combined Service Annuity are 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	5.02% 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-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment, set forward two years for males and set forward one year for females.
Disabled	RP-2014 disabled mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006.
	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.

Summary of Actuarial Assumptions (Continued)

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:

	Select Withdrawal Rates	
Year	**Male**	**Female**
1	10%	12%
2	10%	12%
3	10%	12%

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 17.0% for vested members and 6.0% for non-vested members 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

75% of active members are assumed to be married. Actual marital status is used for members in payment status.

Age of spouse

Females are assumed to be two years younger than their 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:
- 15% elect 50% Joint & Survivor option
- 15% elect 75% Joint & Survivor option
- 50% elect 100% Joint & Survivor option

Females:
- 10% elect 50% Joint & Survivor option
- 10% elect 75% Joint & Survivor option
- 35% 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.

Summary of Actuarial Assumptions (Continued)

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.
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 5 members reported without a gender and 2 members reported with an invalid date of birth. We assumed members were hired at age 33 and male gender. There were 3 members reported with zero or invalid salary. We used prior year salary (2 members), if available, otherwise, high five salary with a 10% load to account for salary increases (1 member). There were 2 members reported with zero service. Due to the small number of members with zero service, and based on direction from MSRS, we used service of 0 years for these members. Data for terminated members: There were 47 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 (17 members), we assumed a value of $30,000. If Credited Service was not reported (0 members), we assumed a value of 7.5 years. There were no members reported without a Termination Date. There were 53 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.

Unknown data for certain members	<u>Data for members receiving benefits</u>: There were 2 members 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. There were no retirees reported with a survivor option and a survivor date of death. There were no retirees reported with a bounce back annuity and an unreasonable reduction factor. 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 (368 members) and/or survivor date of birth (303 members). We used the valuation assumptions if the survivor gender or date of birth was missing or invalid.

Summary of Actuarial Assumptions (Continued)

Changes in actuarial assumptions	Assumed salary increase rates were changed as recommended in the June 30, 2016, experience study. The net effect is proposed rates that average 0.60% greater than the previous rates. Assumed rates of retirement were changed, resulting in fewer expected unreduced (normal) retirements. Assumed termination rates were decreased for the first two years of service and increased for the third year of service. For rates beyond the select period of three years, male rates for ages less than 43 were increased; female rates for ages less than 35 and ages 42-44 were increased. Rates of disability incidence were decreased for ages 39 and older. The base mortality table for healthy annuitants and employees was changed from the RP-2000 fully generational table to the RP-2014 fully generational table (with a base year of 2006), white collar adjustments, with age adjustments. The mortality improvement scale was changed from Scale AA to Scale MP-2015. The base mortality table for disabled annuitants was changed from the RP-2000 disabled mortality table (no projection for future mortality improvement) to the RP-2014 disabled annuitant mortality table (with future mortality improvement according to MP-2015). Assumed percentage of married members was changed from 85% to 75%. Assumed age difference for members and their spouse was lowered from 3 years to 2 years. The assumed percentage of members electing joint and survivor annuities were increased and the assumed percentage of members electing the single life annuity was decreased. The Combined Service Annuity (CSA) load was 30% for vested and non-vested deferred member liability. The CSA has been changed to 17% for vested deferred member liability and 6% for non-vested deferred member liability. The single discount rate changed from 4.24% per annum to 5.02% per annum.

Summary of Actuarial Assumptions (Continued)

	Percentage 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%	0.02%	0.01%	0.04%	0.02%
25	0.04	0.03	0.03	0.01	0.17	0.08
30	0.06	0.05	0.03	0.02	0.43	0.22
35	0.09	0.09	0.03	0.03	0.79	0.44
40	0.14	0.12	0.04	0.03	1.15	0.66
45	0.19	0.15	0.06	0.05	1.49	0.85
50	0.28	0.20	0.11	0.09	1.87	1.12
55	0.41	0.30	0.19	0.14	2.24	1.46
60	0.61	0.45	0.32	0.21	2.61	1.72
65	0.91	0.71	0.56	0.31	3.08	2.04
70	1.52	1.14	1.00	0.53	3.94	2.76

* *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.*

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

	Percent of Members Decrementing Each Year			
	Termination (Withdrawal) Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
20	10.00%	12.00%	0.05%	0.05%
25	10.00	11.50	0.08	0.08
30	5.00	9.10	0.11	0.11
35	4.50	7.10	0.15	0.15
40	3.50	5.70	0.22	0.22
45	1.95	3.50	0.35	0.35
50	0.00	0.00	0.54	0.54
55	0.00	0.00	0.00	0.00
60	0.00	0.00	0.00	0.00
65	0.00	0.00	0.00	0.00
70	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	45
56	20
57	15
58	15
59	15
60	15
61	15
62	25
63	25
64	25
65	30
66	30
67	25
68	25
69	40
70+	100

Salary Scale	
Year	Increase
1	12.25%
2	8.75
3	5.75
4	5.25
5	5.00
6	4.75
7	4.75
8	4.75
9	4.75
10	4.75
11	4.75
12	4.50
13	4.25
14	4.25
15	4.00
16	4.00
17	4.00
18	3.75
19	3.75
20	3.75
21	3.50
22	3.50
23	3.50
24+	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 5.02%**. In describing their 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, 2048 were fully funded and benefit payments projected to occur in the year ended June 30, 2049 were partially funded. Assets were projected to be fully depleted by the fiscal year ending June 30, 2049. 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, 2048 to June 30, 2049 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 40 and 41 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)
2017	$ 248,879		$ 248,879				
2018	257,392		257,392	$ 23,423	$ 33,075		$ 56,498
2019	247,351	$ 18,406	265,757	22,509	31,785	$ 631	54,925
2020	237,582	36,812	274,394	21,620	30,529	1,263	53,412
2021	227,945	55,367	283,312	20,743	29,291	1,899	51,933
2022	218,020	74,500	292,520	19,840	28,016	2,555	50,411
2023	208,136	93,891	302,027	18,940	26,745	3,220	48,905
2024	198,867	112,975	311,842	18,097	25,554	3,875	47,526
2025	190,093	131,884	321,977	17,298	24,427	4,524	46,249
2026	181,111	151,331	332,442	16,481	23,273	5,191	44,945
2027	172,138	171,108	343,246	15,665	22,120	5,869	43,654
2028	163,827	190,574	354,401	14,908	21,052	6,537	42,497
2029	155,883	210,036	365,919	14,185	20,031	7,204	41,420
2030	147,935	229,877	377,812	13,462	19,010	7,885	40,357
2031	140,097	249,994	390,091	12,749	18,002	8,575	39,326
2032	132,293	270,476	402,769	12,039	17,000	9,277	38,316
2033	124,492	291,367	415,859	11,329	15,997	9,994	37,320
2034	116,721	312,653	429,374	10,622	14,999	10,724	36,345
2035	108,872	334,457	443,329	9,907	13,990	11,472	35,369
2036	100,513	357,224	457,737	9,147	12,916	12,253	34,316
2037	91,768	380,845	472,613	8,351	11,792	13,063	33,206
2038	83,294	404,679	487,973	7,580	10,703	13,881	32,164
2039	75,252	428,580	503,832	6,848	9,670	14,700	31,218
2040	67,222	452,985	520,207	6,117	8,638	15,537	30,292
2041	59,275	477,839	537,114	5,394	7,617	16,390	29,401
2042	51,857	502,713	554,570	4,719	6,664	17,243	28,626
2043	45,031	527,562	572,593	4,098	5,786	18,095	27,979
2044	38,850	552,353	591,203	3,535	4,992	18,946	27,473
2045	33,096	577,321	610,417	3,012	4,253	19,802	27,067
2046	27,681	602,574	630,255	2,519	3,557	20,668	26,744
2047	22,825	627,914	650,739	2,077	2,933	21,537	26,547
2048	18,634	653,254	671,888	1,696	2,394	22,407	26,497
2049	15,054	678,670	693,724	1,370	1,934	23,278	26,582
2050	12,038	704,232	716,270	1,095	1,547	24,155	26,797
2051	9,558	729,991	739,549	870	1,228	25,039	27,137
2052	7,505	756,079	763,584	683	964	25,934	27,581
2053	5,828	782,572	788,400	530	749	26,842	28,121
2054	4,464	809,559	814,023	406	574	27,768	28,748
2055	3,355	837,124	840,479	305	431	28,713	29,449
2056	2,460	865,335	867,795	224	316	29,681	30,221
2057	1,764	894,234	895,998	161	227	30,672	31,060
2058	1,240	923,878	925,118	113	159	31,689	31,961
2059	855	954,329	955,184	78	110	32,734	32,922
2060	566	985,662	986,228	52	73	33,808	33,933
2061	353	1,017,927	1,018,280	32	45	34,915	34,992
2062	209	1,051,165	1,051,374	19	27	36,055	36,101
2063	117	1,085,427	1,085,544	11	15	37,230	37,256
2064	60	1,120,764	1,120,824	5	8	38,442	38,455
2065	28	1,157,223	1,157,251	3	4	39,693	39,700
2066	12	1,194,850	1,194,862	1	2	40,983	40,986
2067	4	1,233,691	1,233,695	-	1	42,316	42,317

** Contributions related to future employees in excess of normal cost and expenses of 18.52% of pay.*

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

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) x 9.10%	(e) = (a) x 12.85%	(f)	(g) = (d) + (e) + (f)
2068	$ 1	$ 1,273,789	$ 1,273,790	$ -	$ -	$ 43,691	$ 43,691
2069	-	1,315,188	1,315,188	-	-	45,111	45,111
2070	-	1,357,932	1,357,932	-	-	46,577	46,577
2071	-	1,402,064	1,402,064	-	-	48,091	48,091
2072	-	1,447,632	1,447,632	-	-	49,654	49,654
2073	-	1,494,680	1,494,680	-	-	51,268	51,268
2074	-	1,543,257	1,543,257	-	-	52,934	52,934
2075	-	1,593,412	1,593,412	-	-	54,654	54,654
2076	-	1,645,198	1,645,198	-	-	56,430	56,430
2077	-	1,698,667	1,698,667	-	-	58,264	58,264
2078	-	1,753,874	1,753,874	-	-	60,158	60,158
2079	-	1,810,875	1,810,875	-	-	62,113	62,113
2080	-	1,869,728	1,869,728	-	-	64,132	64,132
2081	-	1,930,495	1,930,495	-	-	66,216	66,216
2082	-	1,993,236	1,993,236	-	-	68,368	68,368
2083	-	2,058,016	2,058,016	-	-	70,590	70,590
2084	-	2,124,901	2,124,901	-	-	72,884	72,884
2085	-	2,193,961	2,193,961	-	-	75,253	75,253
2086	-	2,265,264	2,265,264	-	-	77,699	77,699
2087	-	2,338,885	2,338,885	-	-	80,224	80,224
2088	-	2,414,899	2,414,899	-	-	82,831	82,831
2089	-	2,493,383	2,493,383	-	-	85,523	85,523
2090	-	2,574,418	2,574,418	-	-	88,303	88,303
2091	-	2,658,087	2,658,087	-	-	91,172	91,172
2092	-	2,744,475	2,744,475	-	-	94,135	94,135
2093	-	2,833,670	2,833,670	-	-	97,195	97,195
2094	-	2,925,764	2,925,764	-	-	100,354	100,354
2095	-	3,020,852	3,020,852	-	-	103,615	103,615
2096	-	3,119,029	3,119,029	-	-	106,983	106,983
2097	-	3,220,398	3,220,398	-	-	110,460	110,460
2098	-	3,325,061	3,325,061	-	-	114,050	114,050
2099	-	3,433,125	3,433,125	-	-	117,756	117,756
2100	-	3,544,702	3,544,702	-	-	121,583	121,583
2101	-	3,659,905	3,659,905	-	-	125,535	125,535
2102	-	3,778,852	3,778,852	-	-	129,615	129,615
2103	-	3,901,664	3,901,664	-	-	133,827	133,827
2104	-	4,028,468	4,028,468	-	-	138,176	138,176
2105	-	4,159,394	4,159,394	-	-	142,667	142,667
2106	-	4,294,574	4,294,574	-	-	147,304	147,304
2107	-	4,434,148	4,434,148	-	-	152,091	152,091
2108	-	4,578,257	4,578,257	-	-	157,034	157,034
2109	-	4,727,051	4,727,051	-	-	162,138	162,138
2110	-	4,880,680	4,880,680	-	-	167,407	167,407
2111	-	5,039,302	5,039,302	-	-	172,848	172,848
2112	-	5,203,079	5,203,079	-	-	178,466	178,466
2113	-	5,372,179	5,372,179	-	-	184,266	184,266
2114	-	5,546,775	5,546,775	-	-	190,254	190,254
2115	-	5,727,045	5,727,045	-	-	196,438	196,438
2116	-	5,913,174	5,913,174	-	-	202,822	202,822
2117	-	6,105,352	6,105,352	-	-	209,414	209,414

** Contributions related to future employees in excess of normal cost and expenses of 18.52% 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)
2018	$ 1,023,817	$ 56,498	$ 70,569	$ 927	$ 76,234	$ 1,085,053
2019	1,085,053	54,925	74,357	890	80,631	1,145,362
2020	1,145,362	53,412	78,006	855	84,965	1,204,878
2021	1,204,878	51,933	82,603	821	89,206	1,262,593
2022	1,262,593	50,411	87,743	785	93,291	1,317,767
2023	1,317,767	48,905	93,194	749	97,174	1,369,903
2024	1,369,903	47,526	98,657	716	100,834	1,418,890
2025	1,418,890	46,249	104,459	684	104,248	1,464,244
2026	1,464,244	44,945	110,570	652	107,378	1,505,345
2027	1,505,345	43,654	117,165	620	110,171	1,541,385
2028	1,541,385	42,497	123,795	590	112,589	1,572,086
2029	1,572,086	41,420	130,410	561	114,609	1,597,144
2030	1,597,144	40,357	137,200	533	116,200	1,615,968
2031	1,615,968	39,326	144,188	504	117,318	1,627,920
2032	1,627,920	38,316	151,118	476	117,923	1,632,565
2033	1,632,565	37,320	158,309	448	117,971	1,629,099
2034	1,629,099	36,345	165,464	420	117,413	1,616,973
2035	1,616,973	35,369	172,946	392	116,193	1,595,197
2036	1,595,197	34,316	180,906	362	114,229	1,562,474
2037	1,562,474	33,206	189,412	330	111,421	1,517,359
2038	1,517,359	32,164	197,688	300	107,696	1,459,231
2039	1,459,231	31,218	205,571	271	103,012	1,387,619
2040	1,387,619	30,292	213,437	242	97,319	1,301,551
2041	1,301,551	29,401	220,892	213	90,557	1,200,404
2042	1,200,404	28,626	227,521	187	82,699	1,084,021
2043	1,084,021	27,979	233,553	162	73,726	952,011
2044	952,011	27,473	238,775	140	63,615	804,184
2045	804,184	27,067	243,440	119	52,342	640,034
2046	640,034	26,744	247,653	100	39,864	458,889
2047	458,889	26,547	251,150	82	26,143	260,347
2048	260,347	26,497	253,682	67	11,158	44,253
2049	44,253	26,582	255,370	54	-	-
2050	-	26,797	256,204	43	-	-
2051	-	27,137	256,136	34	-	-
2052	-	27,581	255,322	27	-	-
2053	-	28,121	253,830	21	-	-
2054	-	28,748	251,728	16	-	-
2055	-	29,449	249,075	12	-	-
2056	-	30,221	245,930	9	-	-
2057	-	31,060	242,308	6	-	-
2058	-	31,961	238,241	4	-	-
2059	-	32,922	233,763	3	-	-
2060	-	33,933	228,915	2	-	-
2061	-	34,992	223,724	1	-	-
2062	-	36,101	218,205	1	-	-
2063	-	37,256	212,381	-	-	-
2064	-	38,455	206,274	-	-	-
2065	-	39,700	199,900	-	-	-
2066	-	40,986	193,274	-	-	-
2067	-	42,317	186,412	-	-	-

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)
2068	$ -	$ 43,691	$ 179,324	$ -	$ -	$ -
2069	-	45,111	172,023	-	-	-
2070	-	46,577	164,520	-	-	-
2071	-	48,091	156,832	-	-	-
2072	-	49,654	148,976	-	-	-
2073	-	51,268	140,975	-	-	-
2074	-	52,934	132,855	-	-	-
2075	-	54,654	124,650	-	-	-
2076	-	56,430	116,394	-	-	-
2077	-	58,264	108,127	-	-	-
2078	-	60,158	99,892	-	-	-
2079	-	62,113	91,736	-	-	-
2080	-	64,132	83,709	-	-	-
2081	-	66,216	75,864	-	-	-
2082	-	68,368	68,256	-	-	-
2083	-	70,590	60,939	-	-	-
2084	-	72,884	53,965	-	-	-
2085	-	75,253	47,381	-	-	-
2086	-	77,699	41,228	-	-	-
2087	-	80,224	35,536	-	-	-
2088	-	82,831	30,327	-	-	-
2089	-	85,523	25,610	-	-	-
2090	-	88,303	21,388	-	-	-
2091	-	91,172	17,654	-	-	-
2092	-	94,135	14,393	-	-	-
2093	-	97,195	11,581	-	-	-
2094	-	100,354	9,191	-	-	-
2095	-	103,615	7,189	-	-	-
2096	-	106,983	5,538	-	-	-
2097	-	110,460	4,199	-	-	-
2098	-	114,050	3,130	-	-	-
2099	-	117,756	2,293	-	-	-
2100	-	121,583	1,650	-	-	-
2101	-	125,535	1,166	-	-	-
2102	-	129,615	810	-	-	-
2103	-	133,827	552	-	-	-
2104	-	138,176	371	-	-	-
2105	-	142,667	246	-	-	-
2106	-	147,304	162	-	-	-
2107	-	152,091	106	-	-	-
2108	-	157,034	70	-	-	-
2109	-	162,138	46	-	-	-
2110	-	167,407	31	-	-	-
2111	-	172,848	22	-	-	-
2112	-	178,466	15	-	-	-
2113	-	184,266	11	-	-	-
2114	-	190,254	8	-	-	-
2115	-	196,438	6	-	-	-
2116	-	202,822	4	-	-	-
2117	-	209,414	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	$ 1,023,816	$ 70,569	$ 70,569	$ -	$ 68,063	$ -	$ 68,862
2019	1,085,053	74,357	74,357	-	66,713	-	69,091
2020	1,145,362	78,006	78,006	-	65,104	-	69,017
2021	1,204,878	82,603	82,603	-	64,131	-	69,592
2022	1,262,593	87,743	87,743	-	63,369	-	70,390
2023	1,317,767	93,194	93,194	-	62,610	-	71,190
2024	1,369,903	98,657	98,657	-	61,656	-	71,762
2025	1,418,890	104,459	104,459	-	60,727	-	72,350
2026	1,464,244	110,570	110,570	-	59,795	-	72,923
2027	1,505,345	117,165	117,165	-	58,941	-	73,580
2028	1,541,385	123,795	123,795	-	57,931	-	74,028
2029	1,572,086	130,410	130,410	-	56,769	-	74,257
2030	1,597,144	137,200	137,200	-	55,558	-	74,390
2031	1,615,968	144,188	144,188	-	54,314	-	74,442
2032	1,627,920	151,118	151,118	-	52,953	-	74,292
2033	1,632,565	158,309	158,309	-	51,603	-	74,108
2034	1,629,099	165,464	165,464	-	50,172	-	73,756
2035	1,616,973	172,946	172,946	-	48,782	-	73,407
2036	1,595,197	180,906	180,906	-	47,468	-	73,116
2037	1,562,474	189,412	189,412	-	46,232	-	72,895
2038	1,517,359	197,688	197,688	-	44,886	-	72,444
2039	1,459,231	205,571	205,571	-	43,419	-	71,733
2040	1,387,619	213,437	213,437	-	41,935	-	70,918
2041	1,301,551	220,892	220,892	-	40,372	-	69,888
2042	1,200,404	227,521	227,521	-	38,683	-	68,545
2043	1,084,021	233,553	233,553	-	36,938	-	67,000
2044	952,011	238,775	238,775	-	35,129	-	65,224
2045	804,184	243,440	243,440	-	33,316	-	63,321
2046	640,034	247,653	247,653	-	31,528	-	61,338
2047	458,889	251,150	251,150	-	29,743	-	59,231
2048	260,347	253,682	253,682	-	27,947	-	56,969
2049	44,253	255,370	44,253	211,117	4,535	70,142	54,608
2050	-	256,204	-	256,204	-	82,195	52,168
2051	-	256,136	-	256,136	-	79,348	49,662
2052	-	255,322	-	255,322	-	76,377	47,138
2053	-	253,830	-	253,830	-	73,320	44,623
2054	-	251,728	-	251,728	-	70,214	42,139
2055	-	249,075	-	249,075	-	67,086	39,702
2056	-	245,930	-	245,930	-	63,961	37,327
2057	-	242,308	-	242,308	-	60,853	35,020
2058	-	238,241	-	238,241	-	57,775	32,787
2059	-	233,763	-	233,763	-	54,740	30,633
2060	-	228,915	-	228,915	-	51,762	28,564
2061	-	223,724	-	223,724	-	48,849	26,582
2062	-	218,205	-	218,205	-	46,007	24,687
2063	-	212,381	-	212,381	-	43,239	22,880
2064	-	206,274	-	206,274	-	40,552	21,160
2065	-	199,900	-	199,900	-	37,948	19,526
2066	-	193,274	-	193,274	-	35,429	17,977
2067	-	186,412	-	186,412	-	32,996	16,510

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)
2068	$ -	$ 179,324	$ -	$ 179,324	$ -	$ 30,651	$ 15,123
2069	-	172,023	-	172,023	-	28,392	13,814
2070	-	164,520	-	164,520	-	26,220	12,580
2071	-	156,832	-	156,832	-	24,136	11,419
2072	-	148,976	-	148,976	-	22,139	10,329
2073	-	140,975	-	140,975	-	20,229	9,307
2074	-	132,855	-	132,855	-	18,409	8,352
2075	-	124,650	-	124,650	-	16,678	7,462
2076	-	116,394	-	116,394	-	15,038	6,634
2077	-	108,127	-	108,127	-	13,490	5,869
2078	-	99,892	-	99,892	-	12,034	5,163
2079	-	91,736	-	91,736	-	10,672	4,514
2080	-	83,709	-	83,709	-	9,403	3,923
2081	-	75,864	-	75,864	-	8,229	3,385
2082	-	68,256	-	68,256	-	7,149	2,900
2083	-	60,939	-	60,939	-	6,163	2,465
2084	-	53,965	-	53,965	-	5,270	2,079
2085	-	47,381	-	47,381	-	4,468	1,738
2086	-	41,228	-	41,228	-	3,754	1,440
2087	-	35,536	-	35,536	-	3,125	1,182
2088	-	30,327	-	30,327	-	2,575	960
2089	-	25,610	-	25,610	-	2,100	772
2090	-	21,388	-	21,388	-	1,693	614
2091	-	17,654	-	17,654	-	1,350	483
2092	-	14,393	-	14,393	-	1,063	375
2093	-	11,581	-	11,581	-	826	287
2094	-	9,191	-	9,191	-	633	217
2095	-	7,189	-	7,189	-	478	162
2096	-	5,538	-	5,538	-	355	119
2097	-	4,199	-	4,199	-	260	86
2098	-	3,130	-	3,130	-	187	61
2099	-	2,293	-	2,293	-	133	42
2100	-	1,650	-	1,650	-	92	29
2101	-	1,166	-	1,166	-	63	20
2102	-	810	-	810	-	42	13
2103	-	552	-	552	-	28	8
2104	-	371	-	371	-	18	5
2105	-	246	-	246	-	12	3
2106	-	162	-	162	-	7	2
2107	-	106	-	106	-	5	1
2108	-	70	-	70	-	3	1
2109	-	46	-	46	-	2	1
2110	-	31	-	31	-	1	-
2111	-	22	-	22	-	1	-
2112	-	15	-	15	-	1	-
2113	-	11	-	11	-	-	-
2114	-	8	-	8	-	-	-
2115	-	6	-	6	-	-	-
2116	-	4	-	4	-	-	-
2117	-	3	-	3	-	-	-
				Totals	$ 1,561,321	$ 1,390,371	$ 2,951,693

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.

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 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.