Minnesota State Retirement System

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

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December 1, 2017

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

Dear Board of Directors:

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

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

Our calculation of the liability associated with the benefits described in this report was performed for the purpose of providing financial reporting and disclosure information that satisfies the requirements of GASB Statements No. 67 and No. 68. The 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. MSRS is responsible for preparing the Schedule of Employer Allocations and the Schedule of Pension Amounts by Employer, as applicable. This report may be provided to parties other than the Minnesota State Retirement System (MSRS) only in its entirety and only with the permission of MSRS. GRS is not responsible for unauthorized use of this report.

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

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

To the best of our knowledge, the information contained within this report is accurate and fairly represents the actuarial position of the State Patrol 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:ah

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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	847
- Survivors	148
- Disability Retirements	57
- Deferred Retirements	59
- Terminated other non-vested	28
- Active Members	902
- Total	2,041
Covered-employee Payroll [(1)]	$ 73,056
Net Pension Liability	
Total Pension Liability	$ 1,037,916
Plan Fiduciary Net Position	691,599
Net Pension Liability	$ 346,317
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	66.63%
Net Pension Liability as a Percentage of Covered-employee Payroll	474.04%
Development of the Single Discount Rate	
Single Discount Rate	6.38%
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	2062
Total Pension Expense / (Income)	$ 51,695

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 Total Pension Liability	$ -	$ 25,178
Changes in assumptions	199,074	93,912
Net difference between projected and actual earnings on pension plan investments	40,187	49,932
Totals	$ 239,261	$ 169,022

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

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

Discussion

Accounting Standard

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

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

Financial Statements

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

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

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

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

Notes to Financial Statements

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

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

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

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

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

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

Required Supplementary Information

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

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

Measurement of the Net Pension Liability

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

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

Given the plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.50% on the actuarial value of assets), then the following outcomes are expected:

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

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

Limitations of Funded Status Measurements

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

1. The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words of transferring the obligations to an unrelated third party in an arm's length market value type transaction.
2. The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
3. The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitation of Project Scope

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

Timing of the Valuation

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

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

Single Discount Rate

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

For the purpose of this valuation, the 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 6.38%. 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	$	29,758
2. Interest on the Total Pension Liability		58,865
3. Current-Period Benefit Changes		-
4. Employee Contributions (made negative for addition here)		(10,520)
5. Projected Earnings on Plan Investments (made negative for addition here)		(46,069)
6. Pension Plan Administrative Expense		208
7. Other Changes in Plan Fiduciary Net Position		-
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		(403)
9. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Current Reporting Period		(18,782)
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		(9,402)
11. Increases/(Decreases) from Experience in the Current Reporting Period	**$**	**3,655**
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	$	(6,809)
13. Recognition of Outflow (Inflow) of Resources due to assumption changes		
Arising from Prior Reporting Periods		52,274
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		2,575
15. Total Pension Expense / (Income)	**$**	**51,695**

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	$	(2,418)
2. Assumption Changes (gains) or losses		(112,694)
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years, rounded to the nearest whole number}		6
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		(403)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes		(18,782)
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	(19,185)
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	$	(2,015)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes		(93,912)
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	(95,927)
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	(47,008)
2. Recognition period for Assets {in years}		5
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets		(9,402)
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	(37,606)

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	$ 52,274	$ 25,994	$ 26,280
2. Due to Assets	14,901	21,728	(6,827)
3. Total	$ 67,175	$ 47,722	$ 19,453

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	$ -	$ 7,212	$ (7,212)
2. Assumption Changes	52,274	18,782	33,492
3. Net Difference between projected and actual earnings on pension plan investments	14,901	21,728	(6,827)
4. Total	$ 67,175	$ 47,722	$ 19,453

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	$ -	$ 25,178	$ (25,178)
2. Assumption Changes	199,074	93,912	105,162
3. Net Difference between projected and actual earnings on pension plan investments*	40,187	49,932	(9,745)
4. Total	$ 239,261	$ 169,022	$ 70,239

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	$ 19,453
2019	31,777
2020	23,221
2021	14,973
2022	(19,185)
Thereafter	-
Total	$ 70,239

** 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	$	18,849
Receivables		1,391
Investment Pools (at fair value)		671,734
Securities Lending Collateral		71,169
Capital Assets		-
Total Assets	**$**	**763,143**
Total Deferred Outflows of Resources	**$**	**-**
Total Liabilities	**$**	**(71,544)**
Total Deferred Inflows of Resources	**$**	**-**
Net Position Restricted for Pensions	**$**	**691,599**

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**	**$**	**629,992**
Additions			
2.	Contributions		
	a. Employee	$	10,520
	b. Employer		15,783
	c. Other sources - Supplemental State Aid		1,000
	d. Total contributions	$	27,303
3.	Investment income		
	a. Investment income/(loss)	$	93,798
	b. Investment expenses		(721)
	c. Net investment income/(loss)	$	93,077
4.	Other Additions	$	-
5.	**Total Additions** *(2.d.) + (3.c.) + (4.)*	**$**	**120,380**
Deductions			
6.	Benefits Paid		
	a. Annuity benefits	$	(58,560)
	b. Refunds		(5)
	c. Total benefits paid	$	(58,565)
7.	Expenses		
	a. Other deductions	$	-
	b. Administrative		(208)
	c. Total expenses	$	(208)
8.	**Total Deductions** *(6.c.) + (7.c.)*	**$**	**(58,773)**
9.	**Net increase/(decrease) in fiduciary net position** *(5.) + (8.)*	**$**	**61,607**
10.	**Net position at market value at end of year** *(1.) + (9.)*	**$**	**691,599**
11.	State Board of Investment calculated annual investment return for the State Patrol 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	$	29,758
2. Interest on the Total Pension Liability		58,865
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability (1)		(2,418)
5. Changes of assumptions		(112,694)
6. Benefit payments, including refunds of employee contributions		(58,565)
7. Net change in total pension liability	$	(85,054)
8. Total pension liability – beginning		1,122,970
9. Total pension liability – ending	**$**	**1,037,916**
B. Plan fiduciary net position		
1. Contributions – employer (2)	$	16,783
2. Contributions – employee		10,520
3. Net investment income		93,077
4. Benefit payments, including refunds of employee contributions		(58,565)
5. Pension Plan Administrative Expense		(208)
6. Other changes		-
7. Net change in plan fiduciary net position	$	61,607
8. Plan fiduciary net position – beginning		629,992
9. Plan fiduciary net position – ending	**$**	**691,599**
C. Net pension liability, *A.9. - B.9.*	**$**	**346,317**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**66.63%**
E. Covered-employee payroll (3)	**$**	**73,056**
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**474.04%**

(1) Includes impact of changes in expected timing of future post-retirement benefit increases.
(2) Includes $1 million supplemental state aid.
(3) 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	$ 29,758	$ 16,555	$ 16,144	$ 14,514						
Interest on the Total Pension Liability	58,865	64,592	63,753	60,183						
Benefit Changes	-	-	-	-						
Difference between Expected and Actual Experience	(2,418)	(22,222)	(12,855)	(5,771)						
Assumption Changes	(112,694)	283,584	-	30,058						
Benefit Payments	(58,560)	(57,695)	(55,465)	(53,697)						
Refunds	(5)	(79)	(15)	(25)						
Net Change in Total Pension Liability	$ (85,054)	$ 284,735	$ 11,562	$ 45,262						
Total Pension Liability - Beginning	1,122,970	838,235	826,673	781,411						
Total Pension Liability - Ending (a)	**$ 1,037,916**	**$ 1,122,970**	**$ 838,235**	**$ 826,673**						
Plan Fiduciary Net Position										
Employer Contributions (1)	$ 16,783	$ 14,938	$ 14,763	$ 12,894						
Employee Contributions	10,520	9,292	9,174	7,930						
Pension Plan Net Investment Income	93,077	(774)	28,903	107,187						
Benefit Payments	(58,560)	(57,695)	(55,465)	(53,697)						
Refunds	(5)	(79)	(15)	(25)						
Pension Plan Administrative Expense	(208)	(220)	(170)	(150)						
Other	-	-	-	-						
Net Change in Plan Fiduciary Net Position	**$ 61,607**	**$ (34,538)**	**$ (2,810)**	**$ 74,139**						
Plan Fiduciary Net Position - Beginning	**629,992**	**664,530**	**667,340**	**593,201**						
Plan Fiduciary Net Position - Ending (b)	**$ 691,599**	**$ 629,992**	**$ 664,530**	**$ 667,340**						
Net Pension Liability - Ending (a) - (b)	**$ 346,317**	**$ 492,978**	**$ 173,705**	**$ 159,333**						
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**66.63 %**	**56.10 %**	**79.28 %**	**80.73 %**						
Covered-Employee Payroll (2)	**$ 73,056**	**$ 69,343**	**$ 68,463**	**$ 63,952**						
Net Pension Liability as a Percentage of Covered-Employee Payroll	**474.04 %**	**710.93 %**	**253.72 %**	**249.15 %**						

Notes to Schedule:

(1) Includes $1 million supplemental state aid.

(2) Assumed equal to actual 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	$ 826,673	$ 667,340	$ 159,333	80.73%	$ 63,952	249.14%
2015	838,235	664,530	173,705	79.28	68,463	253.72
2016	1,122,970	629,992	492,978	56.10	69,343	710.93
2017	1,037,916	691,599	346,317	66.63	73,056	474.04

Schedule of Contributions Multiyear (Dollars in Thousands)

Last 10 Fiscal Years

Fiscal Year Ending June 30,	Actuarially Determined Contribution [1]	Actual Contributions	Contribution Deficiency (Excess)	Covered-Employee Payroll	Actual Contribution as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(d)	(b) / (d)
2008	$ 12,355	$ 8,279	$ 4,076	$ 60,029	13.79%
2009	14,999	9,178	5,821	61,511	14.92
2010	17,410	10,104	7,306	63,250	15.97
2011	14,826	9,873	4,953	63,250	15.61
2012	14,912	11,620	3,292	62,524 [2]	18.58
2013	18,711	11,482	7,229	62,121 [2]	18.48
2014	18,444	12,894 [3]	5,550	63,952 [2]	20.16
2015	20,648	14,763 [3]	5,885	68,463 [2]	21.56
2016	20,463	14,938 [3]	5,525	69,343 [2]	21.54
2017	19,031	16,783 [3]	2,248	73,056 [2]	22.97

Notes to Schedule of Contributions

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

Notes	(1) Actuarially determined contribution rates are calculated as of each June 30 and apply to the fiscal year beginning on the day after the measurement date. (2) Assumed equal to actual member contributions divided by employee contribution rate. (3) Includes supplemental state aid of $1,000.
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 7.75% with one year of service to 3.75% with 21 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 back two years for males and set forward one year for females.

Other Information:

Benefit Increases After Retirement	The post-retirement benefit increase is assumed to be 1.00% through 2044, 1.50% from 2045 through 2061 and 2.50% thereafter. 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. The 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	18.69 %
2015	4.46
2016	(0.12)
2017	15.24

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

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

Rate of Return

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

10-Year Schedule of Money-Weighted Investment Return

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

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

SECTION D

ADDITIONAL FINANCIAL STATEMENT DISCLOSURES

Asset Allocation

Long-Term Expected Return on Plan Assets

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

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

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

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

Single Discount Rate

A Single Discount Rate of 6.38% was used to measure the total pension liability. This Single Discount Rate was based on the 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, 2062. 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, 2062, 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 6.38%, as well as what the plan's net pension liability would be if it were calculated using a Single Discount Rate that is one percent lower (5.38%) or one percent higher (7.38%):

Sensitivity of Net Pension Liability
to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 5.38%	Current Single Discount Rate Assumption 6.38%	1% Increase 7.38%
Total Pension Liability	$1,175,469	$1,037,916	$925,291
Net Position Restricted for Pensions	691,599	691,599	691,599
Net Pension Liability	**$ 483,870**	**$ 346,317**	**$233,692**

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

GASB Statement No. 68 Reconciliation (Dollars in Thousands)

	Total Pension Liability (a)	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)	Deferred Outflows	Deferred Inflows	Total Pension Expense
Balance Beginning of Year	**$ 1,122,970**	**$ 629,992**	**$ 492,978**	**$ 306,436**	**$ 54,624**	
Changes for the Year:						
Service Cost	$ 29,758		$ 29,758			$ 29,758
Interest on Total Pension Liability	58,865		58,865			58,865
Interest on Fiduciary Net Position [1]		$ 46,069	(46,069)			(46,069)
Changes in Benefit Terms						
Liability Experience Gains and Losses	(2,418)		(2,418)	$ -	$ 2,015	(403)
Changes in Assumptions	(112,694)		(112,694)	-	93,912	(18,782)
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)				-	(6,809)	(6,809)
Assumption Changes				(52,274)	-	52,274
Investment Gains/(Losses)				(14,901)	(12,326)	2,575
Contributions - Employer [2]		16,783	(16,783)			
Contributions - Employees		10,520	(10,520)			(10,520)
Asset Gain/(Loss)[1]		47,008	(47,008)	-	37,606	(9,402)
Benefit Payments and Refunds	(58,565)	(58,565)	-			
Administrative Expenses		(208)	208			208
Other changes		-	-			-
Net Changes	**$ (85,054)**	**$ 61,607**	**$ (146,661)**	**$ (67,175)**	**$ 114,398**	**$ 51,695**
Balance End of Year	**$ 1,037,916**	**$ 691,599**	**$ 346,317**	**$ 239,261**	**$ 169,022**	

[1] *The sum of these items in column (b) equals the net investment income of $93,077.*
[2] *Includes supplemental state aid of $1,000.*

Summary of Population Statistics

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

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

Summary of Plan Provisions (Continued)

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

Summary of Plan Provisions (Continued)

Disability (continued)

Occupational disability benefit (Continued)

Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 (age 55 if disabled after June 30, 2015) or the 5-year anniversary of the effective date of the disability benefit, whichever is later. Payments stop earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.

Non-duty disability benefit

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

Retirement after disability

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

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

Summary of Plan Provisions (Continued)

Death

Surviving spouse benefit

Age/Service requirement	Member who is active or receiving a disability benefit or former member.
Amount	50% of Average Salary if member was active or occupational disability and either had less than three years (five years if first hired after June 30, 2013) of Allowable Service or was under age 55. Annuity is paid for life. Surviving spouse receives the 100% joint and survivor benefit commencing on the member's 55th birthday if member was active or a disability with three years (five years if first hired after June 30, 2013) of Allowable Service. A spouse who had been receiving the 50% benefit shall be entitled to the greater benefit. The surviving spouse of a former member receives the 100% joint and survivor benefit commencing on the member's 55th birthday if former member had three years (five years if first hired after June 30, 2013) of Allowable Service.
Benefit increases	Same as for retirement.

Surviving dependent children's benefit

Age/Service requirement	Member who is active or receiving a disability benefit. Child must be unmarried, under age 18 (or 23 if full-time student) and dependent upon the member.
Amount	10% of Average Salary for each child and $20 per month prorated among all dependent children. Benefit must not be less than 50% nor exceed 70% of Average Salary.
Benefit increases	Same as for retirement.

Refund of contributions

Age/Service requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	Member contributions with 6.00% interest compounded daily until June 30, 2011, and 4.00% thereafter.

Termination

Refund of contributions

Age/service requirement	Termination of state service.
Amount	Member contributions with 6.00% interest compounded daily to June 30, 2011, and 4.00% thereafter. If a member is vested, a deferred annuity may be elected in lieu of a refund.

Summary of Plan Provisions (Continued)

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

Summary of Plan Provisions (Concluded)

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

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 1.00% post-retirement benefit increase. If the funding ratio (based on the market value of assets) reaches 85% (based on a 1.50% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will increase to 1.50%; if the funding ratio reaches 90% (based on a 2.50% post-retirement benefit increase assumption) for two consecutive years, the benefit increase revert to 2.50%. If, after reverting to a 1.50% benefit increase, the funding ratio declines to less than 75% for one year or less than 80% for two consecutive years, the benefit increase will decrease to 1.00%.

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 15.50% at year 1 declining to 3.50% at years 25 and later)
- Open group; stable active population (new member profile based on average new members hired in recent years).
- The postretirement benefit increase rate is assumed to be 1.00% per year until the funding ratio threshold required to pay a 1.50% postretirement benefit increase is reached and is then assumed to be 1.50% until the threshold required to pay a 2.50% post-retirement 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 expected to attain the funding ratio threshold required to pay 1.50% postretirement benefit increases in the year 2064 and is not expected to attain the funding ratio threshold required to pay 2.50% postretirement benefit increases. The assumption that the plan will begin paying 1.50% benefit increases on January 1, 2065 is reflected in our calculations.

Asset Valuation Method

Fair value of assets.

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

The following assumptions were used in valuing the liabilities and benefits under the plan. The assumptions are based on the last experience study, dated 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 Allowance for Combined Service Annuity was based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Investment return	7.50% per annum.
Single discount rate	6.38% per annum.
Benefit increases after retirement	1.00% per annum through 2064, 1.50% per annum thereafter.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2014 employee generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Healthy post-retirement	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
Disabled	RP-2014 annuitant generational mortality table projected with mortality improvement Scale MP-2015 from a base year of 2006, white collar adjustment.
	The RP-2014 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 18 to 80 and the annuitant mortality table contains mortality rates for ages 50 to 120. We have extended the annuitant mortality table as needed for members younger than age 50 who are receiving a benefit by deriving rates based on the employee table and the juvenile table. Similarly, we have extended the employee table as needed for members older than age 80 by deriving rates based on the annuitant table.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.

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: **Year** / **Select Withdrawal Rates** 1 — 2.50% 2 — 2.00% 3 — 1.50%
Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former, vested members are increased by 13.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
Refund of contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. Account balances for deferred members accumulate interest until normal retirement date and are discounted back to the valuation date.
Commencement of deferred benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of spouse	Females are assumed to be two years younger than their spouses, and males are assumed to be two years older than their spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first child is born at member's age 28 and second child at member's age 31.
Form of payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: 20% elect 50% Joint & Survivor option 10% elect 75% Joint & Survivor option 55% elect 100% Joint & Survivor option Remaining married and unmarried members are assumed to elect the Straight Life option.
Eligibility testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Decrement operation	Withdrawal decrements do not operate during retirement eligibility. Decrements are assumed to occur mid-fiscal year.
Service credit accruals	It is assumed that members accrue one year of service credit per year.
Pay increases	Pay increases are assumed to happen at the beginning of the fiscal year. This is equivalent to assuming that reported earnings are pensionable earnings for the year ending on the valuation date.

Summary of Actuarial Assumptions (Continued)

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

Summary of Actuarial Assumptions (Continued)

Changes in actuarial assumptions	Assumed salary increase rates were changed as recommended in the July 26, 2016, experience study. The net effect is proposed rates that average 0.26% greater than the previous rates. Assumed rates of retirement were changed; new rates result in slightly more unreduced (normal) retirements, and fewer early reduced retirements. Assumed rates of termination were changed. The new rates were decreased for the first three years of employment. Disability rates for ages 35 to 51 were increased. The base mortality table for healthy and disabled annuitants and employees was changed from the RP-2000 fully generational table to the RP-2014 fully generational table (with a base year of 2006), white collar adjustments. The mortality improvement scale was changed from Scale AA to Scale MP-2015. The assumed percentage of members electing joint and survivor annuities was increased. The form of payment assumptions are the same for males and females. The Combined Service Annuity (CSA) load was 30% for vested and non-vested deferred member liability. The CSA has been changed to 13% for vested deferred member liability and 0.00% for non-vested deferred member liability. The assumed post-retirement benefit increase rate was changed from 1.00% per year for all years to 1.00% per year through 2064, and 1.50% per year thereafter. For accounting purposes, this change was treated as a difference between expected and actual experience. The Single Discount Rate changed from 5.31% per annum to 6.38% per annum.

Summary of Actuarial Assumptions (Continued)

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

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

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

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

Summary of Actuarial Assumptions (Concluded)

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

Salary Scale	
Year	Increase
1	15.25%
2	9.25
3	7.75
4	7.25
5	6.75
6	6.25
7	6.00
8	5.75
9	5.50
10	5.25
11	5.00
12	4.75
13	4.50
14	4.25
15	4.25
16	4.25
17	4.00
18	4.00
19	3.75
20	3.75
21	3.65
22	3.55
23	3.45
24	3.35
25+	3.25

Section G

Calculation of the Single Discount Rate

Calculation of the Single Discount Rate

GASB Statement No. 67 includes a specific requirement for the discount rate that is used for the purpose of the measurement of the Total Pension Liability. This rate considers the ability of the fund to meet benefit obligations in the future. To make this determination, employer contributions, employee contributions, benefit payments, expenses and investment returns are projected into the future. The Plan Fiduciary Net Position (assets) in future years can then be determined and compared to its obligation to make benefit payments in those years. As long as assets are projected to be on hand in a future year, the long-term expected rate of return is used as the discount rate. In years where assets are not projected to be sufficient to meet benefit payments, the use of a “risk-free” municipal 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 plan 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). **The resulting single discount rate as of June 30, 2017 is 6.38%.** 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, 2062 were fully funded and benefit payments projected to occur in the year ended June 30, 2063 were partially funded. Assets were projected to be fully depleted by the fiscal year ending June 30, 2063. 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, 2062 to June 30, 2063 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 38 through 39 of this report.

The tables in this section provide background for the development of the single discount rate.

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

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

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

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

	Projected Covered-Employee Payroll			Projected Contributions				
Fiscal Year Ending	Payroll for Current Employees	Payroll for New Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees	Contributions on Future Payroll toward Current UAL*	Additional State Contributions	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f)	(g)	(h) = (d) + (e) + (f) + (g)
2017	$ 73,056		$ 73,056					
2018	76,351		76,351	$ 10,995	$ 16,492		$ 1,000	$ 28,487
2019	76,456	$ 2,376	78,832	11,010	16,515	$ 254	1,000	28,779
2020	76,509	4,885	81,394	11,017	16,526	523	1,000	29,066
2021	76,558	7,482	84,040	11,024	16,537	801	1,000	29,362
2022	76,663	10,108	86,771	11,040	16,559	1,083	1,000	29,682
2023	76,465	13,126	89,591	11,011	16,516	1,406	1,000	29,933
2024	75,640	16,863	92,503	10,892	16,338	1,806	1,000	30,036
2025	74,203	21,306	95,509	10,685	16,028	2,282	1,000	29,995
2026	72,479	26,134	98,613	10,437	15,656	2,799	1,000	29,892
2027	70,648	31,170	101,818	10,173	15,260	3,338	1,000	29,771
2028	68,430	36,697	105,127	9,854	14,781	3,930	1,000	29,565
2029	65,863	42,681	108,544	9,484	14,226	4,571	1,000	29,281
2030	63,051	49,020	112,071	9,079	13,619	5,250	1,000	28,948
2031	60,130	55,584	115,714	8,659	12,988	5,953	1,000	28,600
2032	57,072	62,402	119,474	8,218	12,328	6,683	1,000	28,229
2033	53,900	69,457	123,357	7,762	11,642	7,439	1,000	27,843
2034	50,888	76,478	127,366	7,328	10,992	8,191	1,000	27,511
2035	47,822	83,684	131,506	6,886	10,330	8,962	1,000	27,178
2036	44,628	91,152	135,780	6,426	9,640	9,762	1,000	26,828
2037	41,286	98,907	140,193	5,945	8,918	10,593	1,000	26,456
2038	38,099	106,650	144,749	5,486	8,229	11,422	1,000	26,137
2039	34,979	114,474	149,453	5,037	7,556	12,260	1,000	25,853
2040	31,474	122,836	154,310	4,532	6,798	13,156	1,000	25,486
2041	28,090	131,235	159,325	4,045	6,067	14,055	1,000	25,167
2042	24,480	140,024	164,504	3,525	5,288	14,996	1,000	24,809
2043	20,684	149,166	169,850	2,978	4,468	15,976	1,000	24,422
2044	17,388	157,982	175,370	2,504	3,756	16,920	1,000	24,180
2045	14,159	166,911	181,070	2,039	3,058	17,876	1,000	23,973
2046	10,899	176,055	186,954	1,569	2,354	18,856	1,000	23,779
2047	7,855	185,175	193,030	1,131	1,697	19,832	1,000	23,660
2048	5,115	194,189	199,304	737	1,105	20,798	1,000	23,640
2049	3,080	202,701	205,781	444	665	21,709	1,000	23,818
2050	1,819	210,650	212,469	262	393	22,561	1,000	24,216
2051	1,003	218,371	219,374	144	217	23,388	1,000	24,749
2052	549	225,955	226,504	79	118	24,200	1,000	25,397
2053	261	233,604	233,865	38	56	25,019	1,000	26,113
2054	98	241,368	241,466	14	21	25,850	1,000	26,885
2055	31	249,283	249,314	5	7	26,698	1,000	27,710
2056	3	257,413	257,416	-	1	27,569	1,000	28,570
2057	-	265,782	265,782	-	-	28,465	1,000	29,465
2058	-	274,420	274,420	-	-	29,390	1,000	30,390
2059	-	283,339	283,339	-	-	30,346	1,000	31,346
2060	-	292,547	292,547	-	-	31,332	1,000	32,332
2061	-	302,055	302,055	-	-	32,350	1,000	33,350
2062	-	311,872	311,872	-	-	33,401	1,000	34,401
2063	-	322,008	322,008	-	-	34,487	1,000	35,487
2064	-	332,473	332,473	-	-	35,608	1,000	36,608
2065	-	343,278	343,278	-	-	36,765	1,000	37,765
2066	-	354,435	354,435	-	-	37,960	1,000	38,960
2067	-	365,954	365,954	-	-	39,194	1,000	40,194

**Contributions related to future employees in excess of normal cost and expenses of 25.29% of pay.*

Single Discount Rate Development
Projection of Contributions (Concluded, 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*	Additional State Contributions	Total Contributions
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f)	(g)	(h) = (d) + (e) + (f) + (g)
2068	$ -	$ 377,848	$ 377,848	$ -	$ -	$ 40,467	$ 1,000	$ 41,467
2069	-	390,128	390,128	-	-	41,783	1,000	42,783
2070	-	402,807	402,807	-	-	43,141	1,000	44,141
2071	-	415,898	415,898	-	-	44,543	1,000	45,543
2072	-	429,415	429,415	-	-	45,990	1,000	46,990
2073	-	443,371	443,371	-	-	47,485	1,000	48,485
2074	-	457,780	457,780	-	-	49,028	1,000	50,028
2075	-	472,658	472,658	-	-	50,622	1,000	51,622
2076	-	488,020	488,020	-	-	52,267	1,000	53,267
2077	-	503,880	503,880	-	-	53,966	1,000	54,966
2078	-	520,256	520,256	-	-	55,719	1,000	56,719
2079	-	537,165	537,165	-	-	57,530	1,000	58,530
2080	-	554,622	554,622	-	-	59,400	1,000	60,400
2081	-	572,648	572,648	-	-	61,331	1,000	62,331
2082	-	591,259	591,259	-	-	63,324	1,000	64,324
2083	-	610,475	610,475	-	-	65,382	1,000	66,382
2084	-	630,315	630,315	-	-	67,507	1,000	68,507
2085	-	650,800	650,800	-	-	69,701	1,000	70,701
2086	-	671,951	671,951	-	-	71,966	1,000	72,966
2087	-	693,790	693,790	-	-	74,305	1,000	75,305
2088	-	716,338	716,338	-	-	76,720	1,000	77,720
2089	-	739,619	739,619	-	-	79,213	1,000	80,213
2090	-	763,657	763,657	-	-	81,788	1,000	82,788
2091	-	788,475	788,475	-	-	84,446	1,000	85,446
2092	-	814,101	814,101	-	-	87,190	1,000	88,190
2093	-	840,559	840,559	-	-	90,024	1,000	91,024
2094	-	867,877	867,877	-	-	92,950	1,000	93,950
2095	-	896,083	896,083	-	-	95,971	1,000	96,971
2096	-	925,206	925,206	-	-	99,090	1,000	100,090
2097	-	955,275	955,275	-	-	102,310	1,000	103,310
2098	-	986,322	986,322	-	-	105,635	1,000	106,635
2099	-	1,018,377	1,018,377	-	-	109,068	1,000	110,068
2100	-	1,051,474	1,051,474	-	-	112,613	1,000	113,613
2101	-	1,085,647	1,085,647	-	-	116,273	1,000	117,273
2102	-	1,120,931	1,120,931	-	-	120,052	1,000	121,052
2103	-	1,157,361	1,157,361	-	-	123,953	1,000	124,953
2104	-	1,194,975	1,194,975	-	-	127,982	1,000	128,982
2105	-	1,233,812	1,233,812	-	-	132,141	1,000	133,141
2106	-	1,273,911	1,273,911	-	-	136,436	1,000	137,436
2107	-	1,315,313	1,315,313	-	-	140,870	1,000	141,870
2108	-	1,358,061	1,358,061	-	-	145,448	1,000	146,448
2109	-	1,402,198	1,402,198	-	-	150,175	1,000	151,175
2110	-	1,447,769	1,447,769	-	-	155,056	1,000	156,056
2111	-	1,494,822	1,494,822	-	-	160,095	1,000	161,095
2112	-	1,543,403	1,543,403	-	-	165,298	1,000	166,298
2113	-	1,593,564	1,593,564	-	-	170,671	1,000	171,671
2114	-	1,645,355	1,645,355	-	-	176,217	1,000	177,217
2115	-	1,698,829	1,698,829	-	-	181,945	1,000	182,945
2116	-	1,754,041	1,754,041	-	-	187,858	1,000	188,858
2117	-	1,811,047	1,811,047	-	-	193,963	1,000	194,963

**Contributions related to future employees in excess of normal cost and expenses of 25.29% 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	$ 691,599	$ 28,487	$ 59,618	$ 221	$ 50,715	$ 710,962
2019	710,962	28,779	60,991	222	52,128	730,656
2020	730,656	29,066	62,428	222	53,562	750,634
2021	750,634	29,362	63,867	222	55,019	770,926
2022	770,926	29,682	65,195	222	56,504	791,695
2023	791,695	29,933	66,726	222	58,014	812,694
2024	812,694	30,036	68,400	219	59,531	833,642
2025	833,642	29,995	70,303	215	61,031	854,150
2026	854,150	29,892	72,317	210	62,491	874,006
2027	874,006	29,771	74,376	205	63,900	893,096
2028	893,096	29,565	76,685	198	65,240	911,018
2029	911,018	29,281	79,072	191	66,486	927,522
2030	927,522	28,948	81,556	183	67,620	942,351
2031	942,351	28,600	84,044	174	68,628	955,361
2032	955,361	28,229	86,791	166	69,490	966,123
2033	966,123	27,843	89,346	156	70,189	974,653
2034	974,653	27,511	91,696	148	70,730	981,050
2035	981,050	27,178	93,957	139	71,115	985,247
2036	985,247	26,828	96,235	129	71,333	987,044
2037	987,044	26,456	98,473	120	71,372	986,279
2038	986,279	26,137	100,508	110	71,229	983,027
2039	983,027	25,853	102,422	101	70,904	977,261
2040	977,261	25,486	104,543	91	70,380	968,493
2041	968,493	25,167	106,634	81	69,634	956,579
2042	956,579	24,809	108,863	71	68,646	941,100
2043	941,100	24,422	111,094	60	67,389	921,757
2044	921,757	24,180	112,878	50	65,864	898,873
2045	898,873	23,973	114,617	41	64,076	872,264
2046	872,264	23,779	116,346	32	62,010	841,675
2047	841,675	23,660	117,858	23	59,657	807,111
2048	807,111	23,640	119,051	15	57,020	768,705
2049	768,705	23,818	119,578	9	54,127	727,063
2050	727,063	24,216	119,404	5	51,025	682,895
2051	682,895	24,749	118,712	3	47,757	636,686
2052	636,686	25,397	117,589	2	44,357	588,849
2053	588,849	26,113	116,253	1	40,845	539,553
2054	539,553	26,885	114,680	-	37,234	488,992
2055	488,992	27,710	113,009	-	33,534	437,227
2056	437,227	28,570	111,215	-	29,749	384,331
2057	384,331	29,465	109,349	-	25,883	330,330
2058	330,330	30,390	107,404	-	21,939	275,255
2059	275,255	31,346	105,378	-	17,918	219,141
2060	219,141	32,332	103,268	-	13,824	162,029
2061	162,029	33,350	101,074	-	9,659	103,964
2062	103,964	34,401	98,793	-	5,426	44,998
2063	44,998	35,487	96,423	-	1,131	-
2064	-	36,608	93,962	-	-	-
2065	-	37,765	91,634	-	-	-
2066	-	38,960	89,422	-	-	-
2067	-	40,194	87,090	-	-	-

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	$ -	$ 41,467	$ 84,639	$ -	$ -	$ -
2069	-	42,783	82,069	-	-	-
2070	-	44,141	79,382	-	-	-
2071	-	45,543	76,582	-	-	-
2072	-	46,990	73,674	-	-	-
2073	-	48,485	70,668	-	-	-
2074	-	50,028	67,571	-	-	-
2075	-	51,622	64,394	-	-	-
2076	-	53,267	61,150	-	-	-
2077	-	54,966	57,852	-	-	-
2078	-	56,719	54,513	-	-	-
2079	-	58,530	51,147	-	-	-
2080	-	60,400	47,769	-	-	-
2081	-	62,331	44,395	-	-	-
2082	-	64,324	41,041	-	-	-
2083	-	66,382	37,720	-	-	-
2084	-	68,507	34,450	-	-	-
2085	-	70,701	31,246	-	-	-
2086	-	72,966	28,125	-	-	-
2087	-	75,305	25,105	-	-	-
2088	-	77,720	22,204	-	-	-
2089	-	80,213	19,439	-	-	-
2090	-	82,788	16,829	-	-	-
2091	-	85,446	14,389	-	-	-
2092	-	88,190	12,138	-	-	-
2093	-	91,024	10,089	-	-	-
2094	-	93,950	8,254	-	-	-
2095	-	96,971	6,639	-	-	-
2096	-	100,090	5,244	-	-	-
2097	-	103,310	4,062	-	-	-
2098	-	106,635	3,082	-	-	-
2099	-	110,068	2,288	-	-	-
2100	-	113,613	1,660	-	-	-
2101	-	117,273	1,175	-	-	-
2102	-	121,052	811	-	-	-
2103	-	124,953	545	-	-	-
2104	-	128,982	356	-	-	-
2105	-	133,141	227	-	-	-
2106	-	137,436	140	-	-	-
2107	-	141,870	84	-	-	-
2108	-	146,448	49	-	-	-
2109	-	151,175	28	-	-	-
2110	-	156,056	15	-	-	-
2111	-	161,095	8	-	-	-
2112	-	166,298	4	-	-	-
2113	-	171,671	2	-	-	-
2114	-	177,217	1	-	-	-
2115	-	182,945	-	-	-	-
2116	-	188,858	-	-	-	-
2117	-	194,963	-	-	-	-

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	$ 691,599	$ 59,618	$ 59,618	$ 0	$ 57,501	$ 0	$ 57,801
2019	710,962	60,991	60,991	0	54,721	0	55,583
2020	730,656	62,428	62,428	0	52,103	0	53,478
2021	750,634	63,867	63,867	0	49,584	0	51,426
2022	770,926	65,195	65,195	0	47,084	0	49,344
2023	791,695	66,726	66,726	0	44,828	0	47,472
2024	812,694	68,400	68,400	0	42,746	0	45,742
2025	833,642	70,303	70,303	0	40,870	0	44,192
2026	854,150	72,317	72,317	0	39,108	0	42,730
2027	874,006	74,376	74,376	0	37,416	0	41,309
2028	893,096	76,685	76,685	0	35,886	0	40,035
2029	911,018	79,072	79,072	0	34,421	0	38,803
2030	927,522	81,556	81,556	0	33,025	0	37,619
2031	942,351	84,044	84,044	0	31,659	0	36,440
2032	955,361	86,791	86,791	0	30,412	0	35,372
2033	966,123	89,346	89,346	0	29,123	0	34,228
2034	974,653	91,696	91,696	0	27,804	0	33,019
2035	981,050	93,957	93,957	0	26,502	0	31,803
2036	985,247	96,235	96,235	0	25,251	0	30,619
2037	987,044	98,473	98,473	0	24,035	0	29,450
2038	986,279	100,508	100,508	0	22,821	0	28,255
2039	983,027	102,422	102,422	0	21,633	0	27,064
2040	977,261	104,543	104,543	0	20,540	0	25,967
2041	968,493	106,634	106,634	0	19,489	0	24,896
2042	956,579	108,863	108,863	0	18,509	0	23,891
2043	941,100	111,094	111,094	0	17,570	0	22,917
2044	921,757	112,878	112,878	0	16,607	0	21,887
2045	898,873	114,617	114,617	0	15,686	0	20,891
2046	872,264	116,346	116,346	0	14,812	0	19,933
2047	841,675	117,858	117,858	0	13,958	0	18,980
2048	807,111	119,051	119,051	0	13,115	0	18,021
2049	768,705	119,578	119,578	0	12,254	0	17,015
2050	727,063	119,404	119,404	0	11,383	0	15,970
2051	682,895	118,712	118,712	0	10,527	0	14,924
2052	636,686	117,589	117,589	0	9,700	0	13,896
2053	588,849	116,253	116,253	0	8,921	0	12,913
2054	539,553	114,680	114,680	0	8,186	0	11,974
2055	488,992	113,009	113,009	0	7,504	0	11,091
2056	437,227	111,215	111,215	0	6,870	0	10,260
2057	384,331	109,349	109,349	0	6,283	0	9,482
2058	330,330	107,404	107,404	0	5,741	0	8,755
2059	275,255	105,378	105,378	0	5,240	0	8,074
2060	219,141	103,268	103,268	0	4,776	0	7,437
2061	162,029	101,074	101,074	0	4,349	0	6,842
2062	103,964	98,793	98,793	0	3,954	0	6,287
2063	44,998	96,423	44,998	51,421	1,675	10,469	5,767
2064	-	93,962	-	93,962	-	18,472	5,283
2065	-	91,634	-	91,634	-	17,395	4,843
2066	-	89,422	-	89,422	-	16,392	4,442
2067	-	87,090	-	87,090	-	15,416	4,067

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	$ -	$ 84,639	$ -	$ 84,639	$ -	$ 14,467	$ 3,715
2069	-	82,069	-	82,069	-	13,545	3,386
2070	-	79,382	-	79,382	-	12,651	3,078
2071	-	76,582	-	76,582	-	11,786	2,792
2072	-	73,674	-	73,674	-	10,948	2,524
2073	-	70,668	-	70,668	-	10,141	2,276
2074	-	67,571	-	67,571	-	9,363	2,046
2075	-	64,394	-	64,394	-	8,616	1,833
2076	-	61,150	-	61,150	-	7,901	1,636
2077	-	57,852	-	57,852	-	7,218	1,455
2078	-	54,513	-	54,513	-	6,567	1,288
2079	-	51,147	-	51,147	-	5,950	1,136
2080	-	47,769	-	47,769	-	5,366	998
2081	-	44,395	-	44,395	-	4,816	871
2082	-	41,041	-	41,041	-	4,299	757
2083	-	37,720	-	37,720	-	3,815	654
2084	-	34,450	-	34,450	-	3,364	562
2085	-	31,246	-	31,246	-	2,947	479
2086	-	28,125	-	28,125	-	2,561	405
2087	-	25,105	-	25,105	-	2,208	340
2088	-	22,204	-	22,204	-	1,885	283
2089	-	19,439	-	19,439	-	1,594	233
2090	-	16,829	-	16,829	-	1,332	189
2091	-	14,389	-	14,389	-	1,100	152
2092	-	12,138	-	12,138	-	896	121
2093	-	10,089	-	10,089	-	719	94
2094	-	8,254	-	8,254	-	568	72
2095	-	6,639	-	6,639	-	441	55
2096	-	5,244	-	5,244	-	337	41
2097	-	4,062	-	4,062	-	252	30
2098	-	3,082	-	3,082	-	184	21
2099	-	2,288	-	2,288	-	132	15
2100	-	1,660	-	1,660	-	93	10
2101	-	1,175	-	1,175	-	63	7
2102	-	811	-	811	-	42	4
2103	-	545	-	545	-	27	3
2104	-	356	-	356	-	17	2
2105	-	227	-	227	-	11	1
2106	-	140	-	140	-	6	1
2107	-	84	-	84	-	3	-
2108	-	49	-	49	-	2	-
2109	-	28	-	28	-	1	-
2110	-	15	-	15	-	1	-
2111	-	8	-	8	-	-	-
2112	-	4	-	4	-	-	-
2113	-	2	-	2	-	-	-
2114	-	1	-	1	-	-	-
2115	-	-	-	-	-	-	-
2116	-	-	-	-	-	-	-
2117	-	-	-	-	-	-	-
				Totals	$ 1,066,184	$ 236,380	$ 1,302,052

SECTION H

GLOSSARY OF TERMS

Glossary of Terms

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

Glossary of Terms

Amortization Payment — The amortization payment is the periodic payment required to pay off an interest-discounted amount with payments of interest and principal.

Amortization Method — The method used to determine the periodic amortization payment may be a level dollar amount, or a level percent of pay amount. The period will typically be expressed in years, and the method will either be "open" (meaning, reset each year) or "closed" (the number of years remaining will decline each year).

Cost-of-Living Adjustments — Postemployment benefit changes intended to adjust benefit payments for the effects of inflation.

Cost-Sharing Multiple-Employer Defined Benefit Pension Plan (cost-sharing pension plan) — A multiple-employer defined benefit pension plan in which the pension obligations to the employees of more than one employer are pooled and pension plan assets can be used to pay the benefits of the employees of any employer that provides pensions through the pension plan.

Covered-Employee Payroll — The payroll of covered employees, which is typically only the pensionable pay (meets the statutory salary definition) and does not include pay above any pay cap.

Deferred Inflows and Outflows of Resources — The deferred inflows and outflows of pension resources are amounts used under GASB Statement No. 68 in developing the annual pension expense. Deferred inflows and outflows arise with differences between expected and actual experiences; changes of assumptions. The portion of these amounts not included in pension expense should be included in the deferred inflows or outflows of resources.

Discount Rate or Single Discount Rate — For GASB purposes, the discount rate is the single rate of return that results in the present value of all projected benefit payments to be equal to the sum of the funded and unfunded projected benefit payments, specifically:

1. The benefit payments to be made while the pension plans' fiduciary net position is projected to be greater than the benefit payments that are projected to be made in the period; and
2. The present value of the benefit payments not in (1) above, discounted using the municipal bond rate.

Entry Age Actuarial Cost Method or Entry Age Normal (EAN) — The EAN is a funding method for allocating the costs of the plan between the normal cost and the accrued liability. The actuarial present value of the projected benefits of each individual included in an actuarial valuation is allocated on a level basis (either level dollar or level percent of pay) over the earnings or service of the individual between entry age and assumed exit ages(s). The portion of the actuarial present value allocated to a valuation year is the normal cost. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future normal costs is the actuarial accrued liability. The sum of the accrued liability plus the present value of all future normal costs is the present value of all benefits.

Glossary of Terms

Fiduciary Net Position	The fiduciary net position is the value of the net assets of the trust restricted for pension benefits.
GASB	The Governmental Accounting Standards Board is an organization that exists with authority to promulgate accounting standards for state and local governmental entities.
Long-Term Expected Rate of Return	The long-term rate of return is the expected return to be earned over the entire trust portfolio based on the asset allocation of the portfolio.
Money-Weighted Rate of Return	The money-weighted rate of return is a method of calculating the returns that adjusts for the changing amounts actually invested. For purposes of GASB Statement No. 67, money-weighted rate of return is calculated as the internal rate of return on pension plan investments, net of pension plan investment expense.
Multiple-Employer Defined Benefit Pension Plan	A multiple-employer plan is a defined benefit pension plan that is used to provide pensions to the employees of more than one employer.
Municipal Bond Rate	The Municipal Bond Rate is the discount rate to be used for those benefit payments that occur after the assets of the trust have been depleted.
Net Pension Liability (NPL)	The NPL is the liability of employers and non-employer contributing entities to plan members for benefits provided through a defined benefit pension plan.
Non-Employer Contributing Entities	Non-employer contributing entities are entities that make contributing 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.