GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

GASB STATEMENT NOS. 67 AND 68 ACCOUNTING AND FINANCIAL REPORTING FOR PENSIONS

JUNE 30, 2016

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December 1, 2016

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

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

This report complements the actuarial valuation report for funding purposes that was or will be provided to the System and should be considered in conjunction with that report. Please see the actuarial valuation report as of June 30, 2016 for additional discussion of the nature of actuarial calculations and more information related to participant data, economic and demographic assumptions, and benefit provisions.

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

Bonita J. Wurst

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

Brian B Murphy

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

BJW/BBM:sc

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SECTION A

EXECUTIVE SUMMARY

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

	2016
Actuarial Valuation Date	June 30, 2016
Measurement Date of the Net Pension Liability	June 30, 2016
Membership	
Number of	
- Service Retirements	844
- Survivors	151
- Disability Retirements	53
- Deferred Retirements	55
- Terminated other non-vested	20
- Active Members	892
- Total	2,015
Covered-employee Payroll [1]	$ 69,343
Net Pension Liability	
Total Pension Liability	$ 1,122,970
Plan Fiduciary Net Position	629,992
Net Pension Liability	$ 492,978
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	56.10%
Net Pension Liability as a Percentage of Covered-employee Payroll	710.93%
Development of the Single Discount Rate	
Single Discount Rate	5.31%
Long-Term Expected Rate of Investment Return	7.50%
Long-Term Municipal Bond Rate[2]	2.85%
Last year ending June 30 in the 2017 to 2116 projection period for which projected benefit payments are fully funded	2052
Total Pension Expense / (Income)	$ 68,951

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	$ -	$ 29,972
Changes in assumptions	251,348	-
Net difference between projected and actual earnings on pension plan investments	55,088	24,652
Totals	$ 306,436	$ 54,624

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

DISCUSSION

Accounting Standard

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

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

Financial Statements

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

Paragraph 57 of GASB Statement No. 68 states, "Contributions to the pension plan from the employer subsequent to the measurement date of the collective net pension liability and before the end of the employer's reporting period should be reported as a deferred outflow of resources related to pensions." The information contained in this report does not incorporate any contributions made to SPRF subsequent to the measurement date of June 30, 2016.

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, 2016 and a measurement date of June 30, 2016.

Single Discount Rate

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

For the purpose of this valuation, the expected rate of return on pension plan investments is 5.31%; the municipal bond rate is 2.85% (based on the weekly rate closest to but not later than the measurement date of the Bond Buyer 20-Year GO Index); and the resulting Single Discount Rate is 5.31%. The long-term expected rate of return is based on a review of inflation and investment assumptions, dated September 11, 2014, and a recent asset liability study obtained by the Minnesota Board of Investments.

Effective Date and Transition

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

SECTION B

FINANCIAL STATEMENTS

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

A. Expense			
1.	Service Cost	$	16,555
2.	Interest on the Total Pension Liability		64,592
3.	Current-Period Benefit Changes		0
4.	Employee Contributions (made negative for addition here)		(9,292)
5.	Projected Earnings on Plan Investments (made negative for addition here)		(51,164)
6.	Pension Plan Administrative Expense		220
7.	Other Changes in Plan Fiduciary Net Position		0
8.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Current Reporting Period		(3,704)
9.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Current Reporting Period		47,264
10.	Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.90%) and actual earnings on Pension Plan Investments		
	Arising from Current Reporting Period		10,388
11.	**Increases/(Decreases) from Experience in the Current Reporting Period**	**$**	**74,859**
12.	Recognition of Outflow (Inflow) of Resources due to differences between expected and actual experience in the measurement of the Total Pension Liability		
	Arising from Prior Reporting Periods		(3,105)
13.	Recognition of Outflow (Inflow) of Resources due to assumption changes		
	Arising from Prior Reporting Periods		5,010
14.	Recognition of Outflow (Inflow) of Resources due to the difference between projected (7.90%) and actual earnings on Pension Plan Investments		
	Arising from Prior Reporting Periods		(7,813)
15.	**Total Pension Expense / (Income)**	**$**	**68,951**

Statement of Outflows and Inflows Arising from Current Reporting Period Fiscal Year Ended June 30, 2016 (Dollars in Thousands)

A. Outflows (Inflows) of Resources due to Liabilities		
1. Difference between expected and actual experience of the Total Pension Liability (gains) or losses	$	(22,222)
2. Assumption Changes (gains) or losses	$	283,584
3. Recognition period for Liabilities: Average of the expected remaining service lives of all employees {in years, rounded to the nearest whole number}		6.0000
4. Outflow (Inflow) of Resources to be recognized in the current pension expense for the difference between expected and actual experience of the Total Pension Liability	$	(3,704)
5. Outflow (Inflow) of Resources to be recognized in the current pension expense for Assumption Changes	$	47,264
6. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Liabilities	$	43,560
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	$	(18,518)
8. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses for Assumption Changes	$	236,320
9. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Liabilities	$	217,802
B. Outflows (Inflows) of Resources due to Assets		
1. Net difference between projected and actual earnings on pension plan investments (gains) or losses	$	51,938
2. Recognition period for Assets {in years}		5.0000
3. Outflow (Inflow) of Resources to be recognized in the current pension expense due to Assets	$	10,388
4. Deferred Outflow (Inflow) of Resources to be recognized in future pension expenses due to Assets	$	41,550

STATEMENT OF OUTFLOWS AND INFLOWS ARISING FROM CURRENT AND PRIOR REPORTING PERIODS FISCAL YEAR ENDED JUNE 30, 2016 (DOLLARS IN THOUSANDS)

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

	Outflows of Resources	Inflows of Resources	Net Outflows/(Inflows) of Resources
1. Due to Liabilities	$ 52,274	$ 6,809	$ 45,465
2. Due to Assets	14,901	12,326	2,575
3. Total	$ 67,175	$ 19,135	$ 48,040

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	$ -	$ 6,809	$ (6,809)
2. Assumption Changes	52,274	-	52,274
3. Net Difference between projected and actual earnings on pension plan investments	$ 14,901	12,326	2,575
4. Total	$ 67,175	$ 19,135	$ 48,040

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	$ -	$ 29,972	$ (29,972)
2. Assumption Changes	251,348	-	251,348
3. Net Difference between projected and actual earnings on pension plan investments	55,088	24,652	30,436
4. Total	$ 306,436	$ 54,624	$ 251,812

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

Year Ending June 30	Net Deferred Outflows/ (Inflows) of Resources
2017	$ 48,040
2018	48,040
2019	60,364
2020	51,808
2021	43,560
Thereafter	-
Total	$ 251,812

Statement of Fiduciary Net Position as of June 30, 2016 (Dollars in Thousands)

Assets		**June 30, 2016**
Cash & Short-term Investments	$	14,684
Receivables		1,136
Investment Pools (at fair value)		614,571
Securities Lending Collateral		89,099
Capital Assets		0
Total Assets	**$**	**719,490**
Total Deferred Outflows of Resources	**$**	**0**
Total Liabilities	**$**	**(89,498)**
Total Deferred Inflows of Resources	**$**	**0**
Net Position Restricted for Pensions	**$**	**629,992**

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

1.	**Net Position at market value at beginning of year**	**$**	**664,530**
Additions			
2.	Contributions		
	a. Employee	$	9,292
	b. Employer		13,938
	c. Other sources - Supplemental State Aid		1,000
	d. Total contributions	$	24,230
3.	Investment income		
	a. Investment income/(loss)	$	73
	b. Investment expenses		(847)
	c. Net investment income/(loss)	$	(774)
4.	Other Additions		-
5.	**Total Additions** *(2.d.) + (3.c.) + (4.)*	**$**	**23,456**
Deductions			
6.	Benefits Paid		
	a. Annuity benefits	$	(57,695)
	b. Refunds	$	(79)
	c. Total benefits paid	$	(57,774)
7.	Expenses		
	a. Other deductions	$	-
	b. Administrative		(220)
	c. Total expenses	$	(220)
8.	**Total Deductions** *(6.c.) + (7.c.)*	**$**	**(57,994)**
9.	**Net increase/(decrease) in fiduciary net position** *(5.) + (8.)*	**$**	**(34,538)**
10.	**Net position at market value at end of year** *(1.) + (9.)*	**$**	**629,992**
11.	State Board of Investment calculated annual investment return		-0.1%

SECTION C

REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS CURRENT PERIOD

FISCAL YEAR ENDED JUNE 30, 2016 (DOLLARS IN THOUSANDS)

A. Total pension liability		
1. Service Cost	$	16,555
2. Interest on the Total Pension Liability		64,592
3. Changes of benefit terms		-
4. Difference between expected and actual experience of the Total Pension Liability (1)		(22,222)
5. Changes of assumptions		283,584
6. Benefit payments, including refunds of employee contributions		(57,774)
7. Net change in total pension liability	$	284,735
8. Total pension liability – beginning		838,235
9. Total pension liability – ending	**$**	**1,122,970**
B. Plan fiduciary net position		
1. Contributions – employer (2)	$	14,938
2. Contributions – employee		9,292
3. Net investment income		(774)
4. Benefit payments, including refunds of employee contributions		(57,774)
5. Pension Plan Administrative Expense		(220)
6. Other changes		-
7. Net change in plan fiduciary net position	$	(34,538)
8. Plan fiduciary net position – beginning		664,530
9. Plan fiduciary net position – ending	**$**	**629,992**
C. Net pension liability, *A.9. - B.9.*	**$**	**492,978**
D. Plan fiduciary net position as a percentage of the total pension liability, *B.9. / A.9.*		**56.10%**
E. Covered-employee payroll (3)	**$**	**69,343**
F. Net pension liability as a percentage of covered-employee payroll, *C. / E.*		**710.93%**

(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.

SCHEDULES OF REQUIRED SUPPLEMENTARY INFORMATION

SCHEDULE OF CHANGES IN NET PENSION LIABILITY AND RELATED RATIOS MULTIYEAR (DOLLARS IN THOUSANDS)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal year ending June 30,	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Total Pension Liability										
Service Cost	$ 16,555	$ 16,144	$ 14,514							
Interest on the Total Pension Liability	64,592	63,753	60,183							
Benefit Changes	0	0	0							
Difference between Expected and Actual Experience	(22,222)	(12,855)	(5,771)							
Assumption Changes	283,584	0	30,058							
Benefit Payments	(57,695)	(55,465)	(53,697)							
Refunds	(79)	(15)	(25)							
Net Change in Total Pension Liability	$ 284,735	$ 11,562	$ 45,262							
Total Pension Liability - Beginning	838,235	826,673	781,411							
Total Pension Liability - Ending (a)	**$ 1,122,970**	**$ 838,235**	**$ 826,673**							
Plan Fiduciary Net Position										
Employer Contributions [1]	$ 14,938	$ 14,763	$ 12,894							
Employee Contributions	9,292	9,174	7,930							
Pension Plan Net Investment Income	(774)	28,903	107,187							
Benefit Payments	(57,695)	(55,465)	(53,697)							
Refunds	(79)	(15)	(25)							
Pension Plan Administrative Expense	(220)	(170)	(150)							
Other	0	0	0							
Net Change in Plan Fiduciary Net Position	**$ (34,538)**	**$ (2,810)**	**$ 74,139**							
Plan Fiduciary Net Position - Beginning	**664,530**	**667,340**	**593,201**							
Plan Fiduciary Net Position - Ending (b)	**$ 629,992**	**$ 664,530**	**$ 667,340**							
Net Pension Liability - Ending (a) - (b)	**$ 492,978**	**$ 173,705**	**$ 159,333**							
Plan Fiduciary Net Position as a Percentage of Total Pension Liability	**56.10 %**	**79.28 %**	**80.73 %**							
Covered-Employee Payroll [2]	**$ 69,343**	**$ 68,463**	**$ 63,952**							
Net Pension Liability as a Percentage of Covered-Employee Payroll	**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.

SCHEDULES OF REQUIRED SUPPLEMENTARY INFORMATION
SCHEDULE OF NET PENSION LIABILITY MULTIYEAR
(DOLLARS IN THOUSANDS)

Last 10 Fiscal Years (which will be built prospectively)

Fiscal Year Ending June 30,	Total Pension Liability	Plan Net Position	Net Pension Liability	Plan Net Position as a % of Total Pension Liability	Covered-Employee Payroll	Net Pension Liability as a % of Covered-Employee Payroll
	(a)	(b)	(a) - (b) = (c)	(b) / (c)	(d)	(c) / (d)
2007						
2008						
2009						
2010						
2011						
2012						
2013						
2014	$ 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%

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)
2007	$ 11,427	$ 7,461	$ 3,966	$ 61,498	12.13%
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

Notes to Schedule of Contributions

Valuation Date:	June 30, 2016
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.
Methods and Assumptions Used to Determine Contribution Rates Reported in this Schedule:	
Actuarial Cost Method	Entry Age Normal
Amortization Method	Level Percentage of Payroll, Closed
Remaining Amortization Period	22 years
Asset Valuation Method	5-Year smoothed market; no corridor
Inflation	2.75%
Payroll Growth	3.50%
Salary Increases	Service based tables ranging from 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]
2007	
2008	
2009	
2010	
2011	
2012	
2013	
2014	18.69 %
2015	4.46
2016	(0.12)

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

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

Rate of Return

For the fiscal year ended June 30, 2016, the annual money-weighted rate of return for the State Patrol Retirement Fund was (0.12)%. 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, 2016, these best estimates are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return (Geometric)
Domestic Stocks	45.00%	5.50%
International Stocks	15.00%	6.00%
Bonds	18.00%	1.45%
Alternative Assets	20.00%	6.40%
Unallocated Cash	2.00%	0.50%
Total	100.00%	

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

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

Single Discount Rate

A Single Discount Rate of 5.31% 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 2.85%. The projection of cash flows used to determine this Single Discount Rate assumed that employee and employer contributions will be made at the current statutory contribution rates. Based on these assumptions, the pension plan's fiduciary net position and future contributions were sufficient to finance the benefit payments through the year ending June 30, 2052. 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, 2052, 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 5.31%, 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 (4.31%) or one percent higher (6.31%):

Sensitivity of Net Pension Liability
to the Single Discount Rate Assumption

(Dollars in Thousands)

	1% Decrease 4.31%	**Current Single Discount Rate Assumption 5.31%**	**1% Increase 6.31%**
Total Pension Liability	$1,278,614	$1,122,970	$995,912
Net Position Restricted for Pensions	629,992	629,992	629,992
Net Pension Liability	**$ 648,622**	**$ 492,978**	**$365,920**

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	**$ 838,235**	**$ 664,530**	**$ 173,705**	**$ 38,089**	**$ 51,537**	
Changes for the Year:						
Service Cost	$ 16,555		$ 16,555			$ 16,555
Interest on Total Pension Liability	64,592		64,592			64,592
Interest on Fiduciary Net Position (1)		$ 51,164	(51,164)			(51,164)
Changes in Benefit Terms						
Liability Experience Gains and Losses	(22,222)		(22,222)		$ 18,518	(3,704)
Changes in Assumptions	283,584		283,584	$ 236,320		47,264
Recognition of Deferred Outflows/(Inflows) of Resources Arising from Prior Reporting Periods						
Liability Experience Gains/(Losses)					(3,105)	(3,105)
Assumption Changes				(5,010)		5,010
Investment Gains/(Losses)				(4,513)	(12,326)	(7,813)
Contributions - Employer (2)		14,938	(14,938)			
Contributions - Employees		9,292	(9,292)			(9,292)
Asset Gain/(Loss) (1)		(51,938)	51,938	41,550		10,388
Benefit Payments and Refunds	(57,774)	(57,774)	-			
Administrative Expenses		(220)	220			220
Other changes		-	-			-
Net Changes	**$ 284,735**	**$ (34,538)**	**$ 319,273**	**$ 268,347**	**$ 3,087**	**$ 68,951**
Balance End of Year	**$ 1,122,970**	**$ 629,992**	**$ 492,978**	**$ 306,436**	**$ 54,624**	

(1) *The sum of these items equals the net investment income of $(774).*

(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 7/1/2015	**843**	**52**	**17**	**816**	**57**	**154**	**1,939**
New Members	94	0	0	0	0	0	**94**
Return to active	1	(1)	0	0	0	0	**0**
Terminated non-vested	(4)	0	4	0	0	0	**0**
Service retirements	(35)	(2)	0	37	0	0	**0**
Terminated deferred	(5)	5	0	0	0	0	**0**
Terminated refund/transfer	(2)	0	(2)	0	0	0	**(4)**
Deaths	0	0	0	(16)	(4)	(9)	**(29)**
New beneficiary	0	0	0	0	0	7	**7**
Disabled	0	0	0	0	0	0	**0**
Unexpected status change	0	1	1	7	0	(1)	**8**
Net change	49	3	3	28	(4)	(3)	**76**
Members on 6/30/2016	**892**	**55**	**20**	**844**	**53**	**151**	**2,015**

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, 2014 – June 30, 2016	13.40%	20.10%
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.

Early retirement benefit

Age/Service requirement	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement reduced by 1/10% for each month that the member is under age 55. If the effective date of retirement is after June 30, 2015, the reduction is 0.34% for each month that the member is under age 55 at the time of retirement.

SUMMARY OF PLAN PROVISIONS (CONTINUED)

Retirement (Concluded)	
Form of payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit increases	Since January 1, 2014, benefit recipients receive annual 1.0% benefit increases. When the funding ratio reaches 85% for two consecutive years, the benefit increase will increase to 1.5%; the benefit will revert to 2.5% when the funding ratio reaches 90% for two consecutive years (actuarial accrued liability funding ratio determined using Market Value of Assets). If, after reverting to a 1.5% increase, the funding ratio declines to less than 75% for one year or 80% for two consecutive years, the benefit increase will decrease to 1.0%. A benefit recipient who has been receiving a benefit for at least 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of the June 30 of the calendar year immediately before the adjustment will receive a pro rata increase.
Disability	
Occupational disability benefit	
Age/Service requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.
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 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.

SUMMARY OF PLAN PROVISIONS (CONTINUED)

Disability (continued)

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.

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.

SUMMARY OF PLAN PROVISIONS (CONTINUED)

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.
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 6.5% interest.
Combined service annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; 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 2.0% exists, member and employer contributions may be adjusted by the Board of Directors to a level necessary to maintain a 2.0% sufficiency. Member and employer contributions may not be less than the sum of normal cost and administrative expenses. Employer contributions must be equal to 60% of the sum of member and employer contributions. • If a contribution deficiency of at least 0.5% exists, member and employer contribution rates may be increased by the Board of Directors to eliminate the deficiency. Employer contributions must be equal to 60% of the sum of member and employer contributions. • Any adjustment to the contribution rates must be reported to the Legislative Commission on Pensions and Retirement (LCPR) by January 15 following the most recent valuation report. If the LCPR does not recommend against or alter the change in rates, the adjustment becomes effective on the first day of the first full payroll period of the next fiscal year.
Changes in plan provisions	There have been no changes in plan provisions since the prior valuation.

SECTION F

ACTUARIAL COST METHOD AND ACTUARIAL ASSUMPTIONS

ACTUARIAL METHODS USED FOR THE DETERMINATION OF TOTAL PENSION LIABILITY AND RELATED VALUES

Actuarial Cost Method

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

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

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

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

Valuation of Future Post-Retirement Benefit Increases

Benefit recipients receive a future annual 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 7.75% at year 1 declining to 3.75% at years 21 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 is not expected to attain the funding ratio threshold required to pay 1.50% or 2.50% postretirement benefit increases. This assumption is reflected in our calculations.

Asset Valuation Method

Fair value of assets.

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

The following assumptions were used in valuing the liabilities and benefits under the plan. The demographic assumptions are based on the last experience study, dated February 2012, prepared by a former actuary. The economic assumptions are based on a review of inflation and investment return assumptions dated September 11, 2014, and a recent asset liability study obtained by the SBI. An experience study for the 2011-2015 period was issued on July 26, 2016. This report recommended many changes to demographic assumptions, expected to be effective at a future date.

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

Investment return	7.50% per annum.
Single discount rate	5.31% per annum.
Benefit increases after retirement	1.00% per annum.
Salary increases	Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service.
Inflation	2.50% per year.
Payroll growth	3.25% per year.
Mortality rates	
Healthy pre-retirement	RP-2000 employee generational mortality table projected with mortality improvement scale AA, white collar adjustment.
Healthy post-retirement	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and set forward one year for females. The RP-2000 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 15 to 70 and the annuitant mortality table contains mortality rates for ages 50 to 95. We have applied the annuitant mortality table for active members beyond age 70 until the assumed retirement age and the employee mortality table for annuitants younger than age 50.
Disabled	RP-2000 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.
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 — 5% 2 — 2% 3 — 2%
Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for combined service annuity	Liabilities for former members are increased by 30.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative expenses	In the valuation year, equal to prior year administrative expenses expressed as a percentage of prior year projected payroll. In each subsequent year, equal to the initial administrative expense percentage applied to payroll for the closed group.
Refund of contributions	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 male spouses.
Eligible children	Each member may have two dependent children depending on member's age. Assumed first born child born at member's age 28 and second born 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: Males: 15% elect 50% Joint & Survivor option 25% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 25% elect 50% Joint & Survivor option 30% elect 75% Joint & Survivor option 5% elect 100% Joint & Survivor option Remaining married members 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.

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONTINUED)

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 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 birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: Data for active members: There were 2 members reported with missing salary and no members reported with missing service. We used prior year salary (2 members). There were no members reported with a missing or invalid date of birth or gender. 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 2 members reported with a missing gender. We assumed male gender. There was 1 member 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 survivors reported with an expired benefit. There were no retirees reported with a bounce back annuity and an unreasonable reduction factor. There were 10 retirees reported with a survivor option and a survivor date of death. We assumed no benefit was payable to the survivor, and the member benefit already reflected the increase to the life annuity value (i.e. "bounce back"), if applicable. For retirees that elected a survivor benefit option, we used the valuation assumptions if the survivor date of birth was missing or invalid (209 members) and/or the survivor gender was missing or invalid (225 members).
Changes in actuarial assumptions	The assumed post-retirement benefit increase rate was changed from 1.00% per year through 2031, 1.50% per year from 2032 to 2052, and 2.50% per year thereafter to 1.00% for all years. For accounting purposes, this change was treated as a difference between expected and actual experience. The assumed investment return was changed from 7.90% to 7.50%. The assumed future salary increases, payroll growth, and inflation were decreased by 0.25%. The Single Discount Rate changed from 7.90% to 5.31%.

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONTINUED)

	Rate (%)*					
	Healthy Post-Retirement Mortality**		Healthy Pre-Retirement Mortality**		Disability Mortality*	
Age	Male	Female	Male	Female	Male	Female
20	0.03%	0.02%	0.03%	0.02%	0.03%	0.02%
25	0.04	0.02	0.04	0.02	0.04	0.02
30	0.04	0.03	0.04	0.03	0.04	0.03
35	0.05	0.05	0.06	0.05	0.05	0.05
40	0.08	0.07	0.09	0.06	0.08	0.07
45	0.11	0.11	0.13	0.10	0.11	0.11
50	0.17	0.25	0.20	0.16	0.17	0.25
55	0.57	0.39	0.27	0.24	0.57	0.39
60	0.57	0.61	0.43	0.38	0.57	0.61
65	0.92	1.01	0.67	0.59	0.92	1.01
70	1.58	1.69	0.98	0.88	1.58	1.69

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

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

	Withdrawal Rates After Third Year		Disability Retirement	
Age	Male	Female	Male	Female
20	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	0.09	0.09
40	0.40	0.40	0.14	0.14
45	0.40	0.40	0.23	0.23
50	0.00	0.00	0.40	0.40
55	0.00	0.00	0.70	0.70
60	0.00	0.00	1.13	1.13
65	0.00	0.00	0.00	0.00

SUMMARY OF ACTUARIAL ASSUMPTIONS (CONCLUDED)

Age	Percent Retiring
50	7 %
51	6
52	6
53	6
54	3
55	65
56	50
57	30
58	20
59	20
60+	100

Salary Scale	
Year	Increase
1	7.50%
2	7.00
3	6.50
4	6.25
5	6.00
6	5.75
7	5.50
8	5.35
9	5.20
10	5.05
11	4.90
12	4.75
13	4.60
14	4.45
15	4.30
16	4.15
17	4.00
18	3.85
19	3.70
20	3.55
21+	3.50

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 2.85% (based on the 20-Bond GO rate as of June 30, 2016). **The resulting single discount rate as of July 1, 2016 is 5.31%.**

Benefit payments projected to occur up through June 30, 2052 were fully funded and benefit payments projected to occur in the year ended June 30, 2053 were partially funded. Assets were projected to be fully depleted by the fiscal year ending June 30, 2053. 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, 2052 to June 30, 2053 fiscal year, when benefit payments exceed the Plan’s Fiduciary Net Position, benefit payments were discounted at 2.85%, the municipal bond rate. An equivalent single discount rate was determined that produced approximately the same present value of projected benefits when applied to all years of projected benefits as the present value of projected benefits using 7.50% through the point of asset depletion and 2.85% after. For more information on the calculation of the equivalent present value of projected benefits, see pages 35 through 36 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)
2016	$ 69,343		$ 69,343					
2017	72,959		72,959	$ 10,506	$ 15,759		$ 1,000	$ 27,265
2018	72,404	$ 2,927	75,331	10,426	15,639	$ 336	1,000	27,401
2019	71,802	5,977	77,779	10,339	15,509	686	1,000	27,534
2020	71,517	8,790	80,307	10,298	15,448	1,009	1,000	27,755
2021	71,167	11,750	82,917	10,248	15,372	1,349	1,000	27,969
2022	70,950	14,661	85,611	10,217	15,325	1,683	1,000	28,225
2023	70,391	18,003	88,394	10,136	15,204	2,067	1,000	28,407
2024	69,221	22,046	91,267	9,968	14,952	2,531	1,000	28,451
2025	67,441	26,792	94,233	9,711	14,567	3,076	1,000	28,354
2026	65,283	32,012	97,295	9,401	14,101	3,675	1,000	28,177
2027	63,128	37,329	100,457	9,090	13,636	4,285	1,000	28,011
2028	60,713	43,009	103,722	8,743	13,114	4,937	1,000	27,794
2029	57,980	49,113	107,093	8,349	12,524	5,638	1,000	27,511
2030	55,068	55,506	110,574	7,930	11,895	6,372	1,000	27,197
2031	52,101	62,066	114,167	7,503	11,254	7,125	1,000	26,882
2032	49,013	68,865	117,878	7,058	10,587	7,906	1,000	26,551
2033	45,833	75,876	121,709	6,600	9,900	8,711	1,000	26,211
2034	42,817	82,847	125,664	6,166	9,248	9,511	1,000	25,925
2035	39,825	89,923	129,748	5,735	8,602	10,323	1,000	25,660
2036	36,789	97,176	133,965	5,298	7,947	11,156	1,000	25,401
2037	33,716	104,603	138,319	4,855	7,283	12,008	1,000	25,146
2038	30,810	112,005	142,815	4,437	6,655	12,858	1,000	24,950
2039	28,010	119,446	147,456	4,033	6,050	13,712	1,000	24,795
2040	24,846	127,402	152,248	3,578	5,367	14,626	1,000	24,571
2041	21,650	135,546	157,196	3,118	4,676	15,561	1,000	24,355
2042	18,405	143,900	162,305	2,650	3,975	16,520	1,000	24,145
2043	15,157	152,423	167,580	2,183	3,274	17,498	1,000	23,955
2044	12,399	160,628	173,027	1,785	2,678	18,440	1,000	23,903
2045	9,774	168,876	178,650	1,407	2,111	19,387	1,000	23,905
2046	7,100	177,356	184,456	1,022	1,534	20,360	1,000	23,916
2047	4,737	185,714	190,451	682	1,023	21,320	1,000	24,025
2048	2,858	193,783	196,641	412	617	22,246	1,000	24,275
2049	1,596	201,435	203,031	230	345	23,125	1,000	24,700
2050	926	208,704	209,630	133	200	23,959	1,000	25,292
2051	515	215,928	216,443	74	111	24,789	1,000	25,974
2052	262	223,215	223,477	38	57	25,625	1,000	26,720
2053	104	230,636	230,740	15	23	26,477	1,000	27,515
2054	23	238,216	238,239	3	5	27,347	1,000	28,355
2055	4	245,978	245,982	1	1	28,238	1,000	29,240
2056	0	253,976	253,976	0	0	29,156	1,000	30,156
2057	0	262,231	262,231	0	0	30,104	1,000	31,104
2058	0	270,753	270,753	0	0	31,082	1,000	32,082
2059	0	279,553	279,553	0	0	32,093	1,000	33,093
2060	0	288,638	288,638	0	0	33,136	1,000	34,136
2061	0	298,019	298,019	0	0	34,213	1,000	35,213
2062	0	307,704	307,704	0	0	35,324	1,000	36,324
2063	0	317,705	317,705	0	0	36,473	1,000	37,473
2064	0	328,030	328,030	0	0	37,658	1,000	38,658
2065	0	338,691	338,691	0	0	38,882	1,000	39,882
2066	0	349,699	349,699	0	0	40,145	1,000	41,145

**Contributions related to future employees in excess of normal cost and expenses of 24.52% of pay.*

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

	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)
2067	$ 0	$ 361,064	$ 361,064	$ 0	$ 0	$ 41,450	$ 1,000	$ 42,450
2068	0	372,799	372,799	0	0	42,797	1,000	43,797
2069	0	384,914	384,914	0	0	44,188	1,000	45,188
2070	0	397,424	397,424	0	0	45,624	1,000	46,624
2071	0	410,340	410,340	0	0	47,107	1,000	48,107
2072	0	423,677	423,677	0	0	48,638	1,000	49,638
2073	0	437,446	437,446	0	0	50,219	1,000	51,219
2074	0	451,663	451,663	0	0	51,851	1,000	52,851
2075	0	466,342	466,342	0	0	53,536	1,000	54,536
2076	0	481,498	481,498	0	0	55,276	1,000	56,276
2077	0	497,147	497,147	0	0	57,072	1,000	58,072
2078	0	513,304	513,304	0	0	58,927	1,000	59,927
2079	0	529,987	529,987	0	0	60,842	1,000	61,842
2080	0	547,211	547,211	0	0	62,820	1,000	63,820
2081	0	564,995	564,995	0	0	64,861	1,000	65,861
2082	0	583,358	583,358	0	0	66,969	1,000	67,969
2083	0	602,317	602,317	0	0	69,146	1,000	70,146
2084	0	621,892	621,892	0	0	71,393	1,000	72,393
2085	0	642,104	642,104	0	0	73,714	1,000	74,714
2086	0	662,972	662,972	0	0	76,109	1,000	77,109
2087	0	684,519	684,519	0	0	78,583	1,000	79,583
2088	0	706,766	706,766	0	0	81,137	1,000	82,137
2089	0	729,735	729,735	0	0	83,774	1,000	84,774
2090	0	753,452	753,452	0	0	86,496	1,000	87,496
2091	0	777,939	777,939	0	0	89,307	1,000	90,307
2092	0	803,222	803,222	0	0	92,210	1,000	93,210
2093	0	829,327	829,327	0	0	95,207	1,000	96,207
2094	0	856,280	856,280	0	0	98,301	1,000	99,301
2095	0	884,109	884,109	0	0	101,496	1,000	102,496
2096	0	912,843	912,843	0	0	104,794	1,000	105,794
2097	0	942,510	942,510	0	0	108,200	1,000	109,200
2098	0	973,142	973,142	0	0	111,717	1,000	112,717
2099	0	1,004,769	1,004,769	0	0	115,347	1,000	116,347
2100	0	1,037,424	1,037,424	0	0	119,096	1,000	120,096
2101	0	1,071,140	1,071,140	0	0	122,967	1,000	123,967
2102	0	1,105,952	1,105,952	0	0	126,963	1,000	127,963
2103	0	1,141,895	1,141,895	0	0	131,090	1,000	132,090
2104	0	1,179,007	1,179,007	0	0	135,350	1,000	136,350
2105	0	1,217,325	1,217,325	0	0	139,749	1,000	140,749
2106	0	1,256,888	1,256,888	0	0	144,291	1,000	145,291
2107	0	1,297,737	1,297,737	0	0	148,980	1,000	149,980
2108	0	1,339,913	1,339,913	0	0	153,822	1,000	154,822
2109	0	1,383,460	1,383,460	0	0	158,821	1,000	159,821
2110	0	1,428,423	1,428,423	0	0	163,983	1,000	164,983
2111	0	1,474,846	1,474,846	0	0	169,312	1,000	170,312
2112	0	1,522,779	1,522,779	0	0	174,815	1,000	175,815
2113	0	1,572,269	1,572,269	0	0	180,497	1,000	181,497
2114	0	1,623,368	1,623,368	0	0	186,363	1,000	187,363
2115	0	1,676,127	1,676,127	0	0	192,419	1,000	193,419
2116	0	1,730,602	1,730,602	0	0	198,673	1,000	199,673

**Contributions related to future employees in excess of normal cost and expenses of 24.52% 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)
2017	$ 629,992	$ 27,265	$ 58,659	$ 182	$ 46,087	$ 644,503
2018	644,503	27,401	60,045	181	47,129	658,807
2019	658,807	27,534	61,404	180	48,157	672,914
2020	672,914	27,755	62,683	179	49,176	686,983
2021	686,983	27,969	63,986	178	50,191	700,979
2022	700,979	28,225	65,144	177	51,208	715,091
2023	715,091	28,407	66,523	176	52,222	729,021
2024	729,021	28,451	68,070	173	53,211	742,440
2025	742,440	28,354	69,851	169	54,149	754,923
2026	754,923	28,177	71,804	163	55,007	766,140
2027	766,140	28,011	73,741	158	55,771	776,023
2028	776,023	27,794	75,839	152	56,427	784,253
2029	784,253	27,511	78,065	145	56,952	790,506
2030	790,506	27,197	80,356	138	57,326	794,535
2031	794,535	26,882	82,610	130	57,533	796,210
2032	796,210	26,551	85,078	123	57,556	795,116
2033	795,116	26,211	87,338	115	57,379	791,253
2034	791,253	25,925	89,374	107	57,004	784,701
2035	784,701	25,660	91,277	100	56,433	775,417
2036	775,417	25,401	93,157	92	55,658	763,227
2037	763,227	25,146	94,930	84	54,669	748,028
2038	748,028	24,950	96,486	77	53,465	729,880
2039	729,880	24,795	97,889	70	52,047	708,763
2040	708,763	24,571	99,498	62	50,396	684,170
2041	684,170	24,355	101,117	54	48,484	655,838
2042	655,838	24,145	102,788	46	46,290	623,439
2043	623,439	23,955	104,320	38	43,797	586,833
2044	586,833	23,903	105,399	31	41,010	546,316
2045	546,316	23,905	106,370	24	37,936	501,763
2046	501,763	23,916	107,324	18	34,560	452,897
2047	452,897	24,025	107,945	12	30,877	399,842
2048	399,842	24,275	108,077	7	26,902	342,935
2049	342,935	24,700	107,590	4	22,668	282,709
2050	282,709	25,292	106,522	2	18,212	219,689
2051	219,689	25,974	105,095	1	13,563	154,130
2052	154,130	26,720	103,419	1	8,736	86,166
2053	86,166	27,515	101,602	0	3,735	15,814
2054	15,814	28,355	99,597	0	-	-
2055	-	29,240	97,509	0	-	-
2056	-	30,156	95,342	0	-	-
2057	-	31,104	93,103	0	-	-
2058	-	32,082	90,787	0	-	-
2059	-	33,093	88,395	0	-	-
2060	-	34,136	85,925	0	-	-
2061	-	35,213	83,371	0	-	-
2062	-	36,324	80,733	0	-	-
2063	-	37,473	78,008	0	-	-
2064	-	38,658	75,193	0	-	-
2065	-	39,882	72,288	0	-	-
2066	-	41,145	69,298	0	-	-

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Total Contributions	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings at 7.50%	Projected Ending Plan Net Position
	(a)	(b)	(c)	(d)	(e)	(f)=(a)+(b)-(c)-(d)+(e)
2067	$ -	$ 42,450	$ 66,227	$ 0	$ -	$ -
2068	-	43,797	63,083	0	-	-
2069	-	45,188	59,877	0	-	-
2070	-	46,624	56,622	0	-	-
2071	-	48,107	53,338	0	-	-
2072	-	49,638	50,037	0	-	-
2073	-	51,219	46,737	0	165	4,647
2074	-	52,851	43,455	0	346	9,742
2075	-	54,536	40,202	0	528	14,862
2076	-	56,276	36,990	0	710	19,996
2077	-	58,072	33,831	0	893	25,134
2078	-	59,927	30,736	0	1,075	30,266
2079	-	61,842	27,717	0	1,257	35,382
2080	-	63,820	24,786	0	1,437	40,471
2081	-	65,861	21,960	0	1,617	45,518
2082	-	67,969	19,259	0	1,794	50,504
2083	-	70,146	16,699	0	1,968	55,415
2084	-	72,393	14,301	0	2,139	60,231
2085	-	74,714	12,088	0	2,306	64,932
2086	-	77,109	10,073	0	2,468	69,504
2087	-	79,583	8,268	0	2,626	73,941
2088	-	82,137	6,681	0	2,778	78,234
2089	-	84,774	5,311	0	2,926	82,389
2090	-	87,496	4,149	0	3,069	86,416
2091	-	90,307	3,186	0	3,208	90,329
2092	-	93,210	2,405	0	3,344	94,149
2093	-	96,207	1,784	0	3,477	97,900
2094	-	99,301	1,302	0	3,609	101,608
2095	-	102,496	935	0	3,740	105,301
2096	-	105,794	661	0	3,871	109,004
2097	-	109,200	461	0	4,004	112,743
2098	-	112,717	317	0	4,139	116,539
2099	-	116,347	215	0	4,276	120,408
2100	-	120,096	144	0	4,417	124,369
2101	-	123,967	95	0	4,561	128,433
2102	-	127,963	62	0	4,710	132,611
2103	-	132,090	40	0	4,862	136,912
2104	-	136,350	25	0	5,020	141,345
2105	-	140,749	16	0	5,182	145,915
2106	-	145,291	10	0	5,350	150,631
2107	-	149,980	6	0	5,522	155,496
2108	-	154,822	4	0	5,701	160,519
2109	-	159,821	2	0	5,885	165,704
2110	-	164,983	1	0	6,075	171,057
2111	-	170,312	1	0	6,271	176,582
2112	-	175,815	-	0	6,474	182,289
2113	-	181,497	0	0	6,683	188,180
2114	-	187,363	0	0	6,899	194,262
2115	-	193,419	0	0	7,122	200,541
2116	-	199,673	0	0	7,352	207,025

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+sdr)^(a-.5)
2017	$ 629,992	$ 58,659	$ 58,659	$ 0	$ 56,576	$ 0	$ 57,161
2018	644,503	60,045	60,045	0	53,873	0	55,561
2019	658,807	61,404	61,404	0	51,248	0	53,952
2020	672,914	62,683	62,683	0	48,666	0	52,299
2021	686,983	63,986	63,986	0	46,211	0	50,694
2022	700,979	65,144	65,144	0	43,765	0	49,008
2023	715,091	66,523	66,523	0	41,573	0	47,522
2024	729,021	68,070	68,070	0	39,573	0	46,175
2025	742,440	69,851	69,851	0	37,775	0	44,993
2026	754,923	71,804	71,804	0	36,122	0	43,919
2027	766,140	73,741	73,741	0	34,508	0	42,829
2028	776,023	75,839	75,839	0	33,014	0	41,826
2029	784,253	78,065	78,065	0	31,612	0	40,882
2030	790,506	80,356	80,356	0	30,270	0	39,960
2031	794,535	82,610	82,610	0	28,947	0	39,009
2032	796,210	85,078	85,078	0	27,732	0	38,148
2033	795,116	87,338	87,338	0	26,483	0	37,187
2034	791,253	89,374	89,374	0	25,209	0	36,134
2035	784,701	91,277	91,277	0	23,950	0	35,043
2036	775,417	93,157	93,157	0	22,738	0	33,961
2037	763,227	94,930	94,930	0	21,554	0	32,862
2038	748,028	96,486	96,486	0	20,379	0	31,716
2039	729,880	97,889	97,889	0	19,233	0	30,554
2040	708,763	99,498	99,498	0	18,185	0	29,491
2041	684,170	101,117	101,117	0	17,192	0	28,459
2042	655,838	102,788	102,788	0	16,256	0	27,470
2043	623,439	104,320	104,320	0	15,348	0	26,474
2044	586,833	105,399	105,399	0	14,425	0	25,399
2045	546,316	106,370	106,370	0	13,542	0	24,340
2046	501,763	107,324	107,324	0	12,710	0	23,320
2047	452,897	107,945	107,945	0	11,892	0	22,272
2048	399,842	108,077	108,077	0	11,076	0	21,175
2049	342,935	107,590	107,590	0	10,256	0	20,016
2050	282,709	106,522	106,522	0	9,446	0	18,818
2051	219,689	105,095	105,095	0	8,669	0	17,629
2052	154,130	103,419	103,419	0	7,936	0	16,474
2053	86,166	101,602	86,166	15,434	6,151	5,534	15,368
2054	15,814	99,597	15,814	83,783	1,050	29,207	14,305
2055	-	97,509	-	97,509	-	33,051	13,299
2056	-	95,342	-	95,342	-	31,421	12,347
2057	-	93,103	-	93,103	-	29,832	11,449
2058	-	90,787	-	90,787	-	28,284	10,602
2059	-	88,395	-	88,395	-	26,776	9,802
2060	-	85,925	-	85,925	-	25,306	9,047
2061	-	83,371	-	83,371	-	23,874	8,336
2062	-	80,733	-	80,733	-	22,478	7,665
2063	-	78,008	-	78,008	-	21,117	7,033
2064	-	75,193	-	75,193	-	19,791	6,437
2065	-	72,288	-	72,288	-	18,499	5,876
2066	-	69,298	-	69,298	-	17,243	5,349

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

Fiscal Year Ending	Projected Beginning Plan Fiduciary Net Position	Projected Benefit Payments	Funded Portion of Benefit Payments	Unfunded Portion of Benefit Payments	Present Value of Funded Benefit Payments using Expected Return Rate (v)	Present Value of Unfunded Benefit Payments using Municipal Bond Rate (vf)	Present Value of Benefit Payments using Single Discount Rate (sdr)
(a)	(b)	(c)	(d)	(e)	(f)=(d)*v^((a)-.5)	(g)=(e)*vf ^((a)-.5)	(h)=((c)/(1+sdr)^(a-.5)
2067	$ -	$ 66,227	$ -	66,227	$ -	16,022	$ 4,854
2068	-	63,083	-	63,083	-	14,839	4,391
2069	-	59,877	-	59,877	-	13,694	3,957
2070	-	56,622	-	56,622	-	12,591	3,553
2071	-	53,338	-	53,338	-	11,532	3,178
2072	-	50,037	-	50,037	-	10,519	2,831
2073	-	46,737	-	46,737	-	9,552	2,511
2074	-	43,455	-	43,455	-	8,636	2,217
2075	-	40,202	-	40,202	-	7,768	1,948
2076	-	36,990	-	36,990	-	6,949	1,702
2077	-	33,831	-	33,831	-	6,179	1,478
2078	-	30,736	-	30,736	-	5,459	1,275
2079	-	27,717	-	27,717	-	4,786	1,092
2080	-	24,786	-	24,786	-	4,161	927
2081	-	21,960	-	21,960	-	3,585	780
2082	-	19,259	-	19,259	-	3,057	650
2083	-	16,699	-	16,699	-	2,577	535
2084	-	14,301	-	14,301	-	2,146	435
2085	-	12,088	-	12,088	-	1,763	349
2086	-	10,073	-	10,073	-	1,429	276
2087	-	8,268	-	8,268	-	1,140	215
2088	-	6,681	-	6,681	-	896	165
2089	-	5,311	-	5,311	-	692	125
2090	-	4,149	-	4,149	-	526	93
2091	-	3,186	-	3,186	-	393	67
2092	-	2,405	-	2,405	-	288	48
2093	-	1,784	-	1,784	-	208	34
2094	-	1,302	-	1,302	-	147	24
2095	-	935	-	935	-	103	16
2096	-	661	-	661	-	71	11
2097	-	461	-	461	-	48	7
2098	-	317	-	317	-	32	5
2099	-	215	-	215	-	21	3
2100	-	144	-	144	0	14	2
2101	-	95	-	95	0	9	1
2102	-	62	-	62	0	6	1
2103	-	40	-	40	0	4	0
2104	-	25	-	25	0	2	0
2105	-	16	-	16	0	1	0
2106	-	10	-	10	0	0	0
2107	-	6	-	6	0	0	0
2108	-	4	-	4	0	0	0
2109	-	2	-	2	0	0	0
2110	-	1	-	1	0	0	0
2111	-	1	-	1	0	0	0
2112	-	-	-	0	0	0	0
2113	-	0	0	0	0	0	0
2114	-	0	0	0	0	0	0
2115	-	0	0	0	0	0	0
2116	-	0	0	0	0	0	0
				Totals	$ 975,143	$ 484,259	$ 1,459,402

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.

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

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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.