

Ohio Public Employees Retirement System

Actuarial Valuation Of Defined Benefit Allowances –
Traditional, Combined and Member Directed Plans
December 31, 2018



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September 3, 2019

The Retirement Board
Ohio Public Employees Retirement System
Columbus, Ohio

Ladies and Gentlemen:

The results of the **December 31, 2018 Annual Actuarial Valuation of Defined Benefit Allowances** of the Ohio Public Employees Retirement System (OPERS), based upon Chapter 145 of the Code as amended, are presented in this report. The gain/loss analysis of experience by division, the annual actuarial valuation of retiree health and Medicare benefits, projections of defined benefit allowances and projections of retiree health and Medicare benefits are covered in separate reports. The purposes of the valuation are as follows:

- Measure the financial position of OPERS,
- Assist the Board in establishing employer and employee contribution rates necessary to fund the pension defined benefits provided by OPERS,
- Determine the number of years required to amortize the unfunded actuarial accrued liabilities based upon established contribution rates,
- Provide actuarial reporting and disclosure information for the System's financial report; and
- Analyze the experience of the System over the past year.

This report should not be relied on for any purpose other than those described above. It was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

The signing actuaries are independent of the plan sponsor.

The individual member statistical data required for the valuations was furnished by your Executive Director and Staff, together with pertinent data on financial operations. Their cooperation in furnishing these materials is acknowledged with appreciation. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the data.

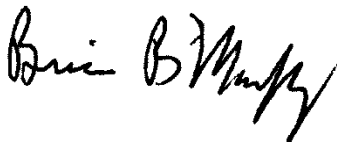
Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law.

The actuarial assumptions used in the valuations are summarized in Section X of this report. The assumptions are established by the Retirement Board after consulting with the actuary.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the Ohio Public Employees Retirement System as of the valuation date. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

Brian B. Murphy and Mita D. Drazilov 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, FSA, EA, FCA, MAAA, PhD



Mita D. Drazilov, ASA, FCA, MAAA

BBM/MDD:sc

SECTION I

EXECUTIVE SUMMARY

Introduction

Section 145.22 of the Revised Code of Ohio (ORC) provides in part as follows:

“(A) The public employees retirement board shall have prepared annually by or under the supervision of an actuary an actuarial valuation of the pension assets, liabilities, and funding requirements of the public employees retirement system as established pursuant to this chapter.”

This report presents the results of the December 31, 2018 annual actuarial valuation of the Ohio Public Employees Retirement System (OPERS) Defined Benefit Allowances of the Traditional, Combined and Member Directed Plans. In conjunction with Chapter 145 of the ORC, the purposes of performing the annual valuation are as follows:

- Measure the financial position of OPERS,
- Assist the Board in establishing employer and employee contribution rates necessary to fund the pension defined benefits provided by OPERS,
 - Employer contribution rates for the State are established for a two-year period based upon the results of odd-year valuations. The December 31, 2017 valuation was used to establish the contribution rates for the two-year period beginning July 1, 2019
 - Employer contribution rates for local governments are established annually. The December 31, 2018 valuation establishes employer contribution rates for calendar year 2021.
- Determine the number of years required to amortize the unfunded actuarial accrued liabilities based upon established contribution rates,
- Provide actuarial reporting and disclosure information for the System’s financial report; and
- Analyze the experience of the System over the past year.

The report is presented as follows:

Section I	-	Executive Summary
Section II	-	Financial Information
Section III	-	Benefits and Conditions Evaluated
Section IV	-	Recommendations for Reserve Transfers
Section V	-	Active and Inactive Vested Valuation Results for State
Section VI	-	Active and Inactive Vested Valuation Results for Local Government
Section VII	-	Active and Inactive Vested Valuation Results for Public Safety
Section VIII	-	Active and Inactive Vested Valuation Results for Law Enforcement
Section IX	-	Allowances Being Paid to Retirees and Beneficiaries
Section X	-	Actuarial Methods and Assumptions
Section XI	-	Financial Principles
Section XII	-	Governmental Accounting Standards Board (GASB) Reporting

There have been no significant benefit changes since the last valuation. Please see Section III for a detailed description of the benefit provisions.

A summary of the primary valuation results as of December 31, 2018 are presented on the following pages.

Summary of Pension Defined Benefit Valuation Results

Traditional, Combined, and Member Directed Plans

December 31

(\$ in Millions)

	2018						2017		
	General			Law			7.20%	7.50%	
	State	Local	Total	Public Safety	Law Enforcement	Total	Grand Total	Grand Total	
A. Demographic Information									
1. Number Counts									
a. Active Members									
i. Traditional Plan (TP)	99,337	177,395	276,732	61	8,015	8,076	284,808	323,318	323,318
ii. Combined Plan (CP)	2,828	4,911	7,739	0	0	0	7,739	7,948	7,948
iii. Member Directed Plan (MD)	3,905	6,944	10,849	0	0	0	10,849	11,682	11,682
iv. Total	106,070	189,250	295,320	61	8,015	8,076	303,396	342,948	342,948
b. Retired Number Counts									
i. Traditional Plan (TP)	74,914	138,687	213,601	187	5,287	5,474	219,075	216,978	216,978
c. Deferred/Inactive Number Counts	278,300	331,784	610,084	46	1,210	1,256	611,340	545,794	545,794
d. Total Number Counts	459,284	659,721	1,119,005	294	14,512	14,806	1,133,811	1,105,720	1,105,720
2. Active Payroll									
a. DB Active Members									
i. Traditional Plan (TP)	\$ 5,012	\$ 7,584	\$ 12,596	\$ 3	\$ 544	\$ 547	\$ 13,143	\$ 13,328	\$ 13,328
ii. Combined Plan (CP)	177	252	429	0	0	0	429	419	419
B. Defined Benefit Assets									
1. Market Value (MV)	\$ 31,137	\$ 46,436	\$ 77,572	\$ 37	\$ 3,819	\$ 3,855	\$ 81,427	\$ 87,105	\$ 87,105
2. Rate of Return on MV							(2.97)%	16.71 %	16.71 %
3. Funding Value (FV)	\$ 32,230	\$ 48,066	\$ 80,296	\$ 38	\$ 3,953	\$ 3,991	\$ 84,287	\$ 83,292	\$ 83,292
4. Rate of Return on FV							5.06 %	7.76 %	7.76 %
5. Ratio of FV to MV							103.5%	95.6%	95.6%
C. Defined Benefit Actuarial Results									
1. TP & CP Normal Cost as a % of Payroll	14.38%	14.27%	14.33%	18.51%	21.09%	21.08%	14.60%	14.60%	13.83%
2. Actuarial Accrued Liability (AAL)									
a. Active	\$ 14,166	\$ 21,357	\$ 35,522	\$ 8	\$ 2,005	\$ 2,013	\$ 37,536	\$ 36,740	\$ 35,043
b. Retired	27,448	38,195	65,643	53	2,734	2,787	68,430	66,586	64,874
c. Deferred/Inactive	1,113	1,583	2,696	1	43	43	2,739	2,763	2,739
d. Total	\$ 42,726	\$ 61,135	\$ 103,861	\$ 61	\$ 4,782	\$ 4,844	\$ 108,705	\$ 106,090	\$ 102,656
3. Unfunded AAL (UAAL) (FV Basis)	\$ 10,496	\$ 13,068	\$ 23,565	\$ 24	\$ 829	\$ 853	\$ 24,418	\$ 22,797	\$ 19,364
4. Unfunded AAL (UAAL) (MV Basis)	\$ 11,589	\$ 14,699	\$ 26,289	\$ 24	\$ 963	\$ 989	\$ 27,278	\$ 18,985	\$ 15,551
5. Funded Ratio (FV Basis)	75.4 %	78.6 %	77.3 %	61.6 %	82.7 %	82.4 %	77.5 %	78.5 %	81.1 %
D. Amortization Years to Fully Amortize UAAL *									
	35	24	28	N/A	20	21	27	25	18
E. Defined Benefit Contribution Rates									
1. Pension Contributions									
a. Employer Normal Cost	4.78%	4.64%	4.71%	6.51%	8.09%	8.08%	4.85%	4.84%	4.07%
b. Member Contribution Rate #	9.60%	9.63%	9.62%	12.00%	13.00%	13.00%	9.75%	9.76%	9.76%
c. UAAL Contribution Rate	9.22%	9.36%	9.29%	11.59%	10.01%	10.02%	9.32%	9.32%	10.09%
d. Total	23.60%	23.63%	23.62%	30.10%	31.10%	31.10%	23.92%	23.92%	23.92%
2. Retiree Health Contribution Rate									
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3. Total Employer Contribution Rate									
	14.00%	14.00%	14.00%	18.10%	18.10%	18.10%	14.17%	14.16%	14.16%

* Based on i) schedule of employer and member contribution rates shown on page III-3. For the 2018 results, the amortization years shown are from December 31, 2019. For Actuarially Determined Employer Contribution (ADEC) purposes, amortization years are determined based upon scheduled contribution rate changes, if any, through 2021. See page XII-10 for additional explanation, and ii) Entry age actuarial cost method reflecting additional future normal cost savings anticipated to occur as Group A and Group B members are replaced by new hires subject to Group C benefit provisions.

2017 and 2018 results reflect 0% for Combined Plan members.

Summary of Pension Defined Benefit Valuation Results

Traditional Plan

December 31

(\$ in Millions)

	2018						2017		
	General			Law			7.20%	7.50%	
	State	Local	Total	Public Safety	Law Enforcement	Total	Grand Total	Grand Total	
A. Demographic Information									
1. Number Counts									
a. Active Members	99,337	177,395	276,732	61	8,015	8,076	284,808	323,318	323,318
b. Retired Number Counts	74,678	138,074	212,752	187	5,287	5,474	218,226	216,260	216,260
c. Deferred/Inactive Number Counts	277,394	330,584	607,978	46	1,210	1,256	609,234	543,982	543,982
d. Total Number Counts	451,409	646,053	1,097,462	294	14,512	14,806	1,112,268	1,083,560	1,083,560
2. Active Payroll									
a. DB Active Members	\$ 5,012	\$ 7,584	\$ 12,596	\$ 3	\$ 544	\$ 547	\$ 13,143	\$ 13,328	\$ 13,328
b. Other Payroll									
i. Reemployed Retirees	\$ 88	\$ 312	\$ 400	\$ 0	\$ 0	\$ 0	\$ 401		
ii. Member Directed Plan (MD)	223	362	585	0	0	0	585		
iii. Alternative Retirement Plan (ARP)	554	0	554	0	0	0	554		
B. Defined Benefit Assets									
1. Market Value (MV)	\$ 30,912	\$ 46,110	\$ 77,021	\$ 37	\$ 3,819	\$ 3,855	\$ 80,877	\$ 86,586	\$ 86,586
2. Rate of Return on MV							(2.97)%	16.71 %	16.71 %
3. Funding Value (FV)	\$ 31,997	\$ 47,728	\$ 79,725	\$ 38	\$ 3,953	\$ 3,991	\$ 83,715	\$ 82,797	\$ 82,797
4. Rate of Return on FV							5.05 %	7.76 %	7.76 %
5. Ratio of FV to MV							103.5%	95.6%	95.6%
C. Defined Benefit Actuarial Results									
1. Normal Cost as a % of Payroll	14.63%	14.50%	14.55%	18.51%	21.09%	21.08%	14.84%	14.83%	14.04%
2. Actuarial Accrued Liability (AAL)									
a. Active	\$ 14,007	\$ 21,144	\$ 35,151	\$ 8	\$ 2,005	\$ 2,013	\$ 37,164	\$ 36,398	\$ 34,716
b. Retired	27,431	38,162	65,593	53	2,734	2,787	68,379	66,546	64,834
c. Deferred/Inactive	1,104	1,574	2,678	1	43	43	2,721	2,747	2,723
d. Total	\$ 42,542	\$ 60,879	\$ 103,421	\$ 61	\$ 4,782	\$ 4,844	\$ 108,265	\$ 105,691	\$ 102,274
3. Unfunded AAL (UAAL) (FV Basis)	\$ 10,545	\$ 13,151	\$ 23,696	\$ 24	\$ 829	\$ 853	\$ 24,549	\$ 22,894	\$ 19,477
4. Unfunded AAL (UAAL) (MV Basis)	\$ 11,630	\$ 14,769	\$ 26,400	\$ 24	\$ 963	\$ 989	\$ 27,388	\$ 19,105	\$ 15,688
5. Funded Ratio (FV Basis)	75.2 %	78.4 %	77.1 %	61.6 %	82.7 %	82.4 %	77.3 %	78.3 %	81.0 %
D. Amortization Years to Fully Amortize UAAL *	36	25	28	N/A	20	21	28	26	19
E. Contribution Rates									
	CY 2021						CY 2020		
1. Pension Contributions									
a. Employer Normal Cost	4.63%	4.50%	4.55%	6.51%	8.09%	8.08%	4.72%	4.71%	3.92%
b. Member Contribution Rate	10.00%	10.00%	10.00%	12.00%	13.00%	13.00%	10.12%	10.12%	10.12%
c. UAAL Contribution Rate	9.37%	9.50%	9.45%	11.59%	10.01%	10.02%	9.46%	9.46%	10.25%
d. Total	24.00%	24.00%	24.00%	30.10%	31.10%	31.10%	24.30%	24.29%	24.29%
2. Retiree Health Contribution Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3. Total Employer Contribution Rate	14.00%	14.00%	14.00%	18.10%	18.10%	18.10%	14.18%	14.17%	14.17%

* Based on i) schedule of employer and member contribution rates shown on page III-3. For the 2018 results, the amortization years shown are from December 31, 2019. For Actuarially Determined Employer Contribution (ADEC) purposes, amortization years are determined based upon scheduled contribution rate changes, if any, through 2021. See page XII-10 for additional explanation, and ii) Entry age actuarial cost method reflecting additional future normal cost savings anticipated to occur as Group A and Group B members are replaced by new hires subject to Group C benefit provisions.

Summary of Pension Defined Benefit Valuation Results

Combined Plan

December 31

(\$ in Millions)

	2018			2017	
	General		Grand Total	7.20%	7.50%
	State	Local		Grand Total	Grand Total
A. Demographic Information					
1. Number Counts					
a. Active Members	2,828	4,911	7,739	7,948	7,948
b. Retired Number Counts	159	410	569	476	476
c. Deferred/Inactive Number Counts	906	1,200	2,106	1,812	1,812
d. Total Number Counts	3,893	6,521	10,414	10,236	10,236
2. Active Payroll	\$ 177	\$ 252	\$ 429	\$ 419	\$ 419
B. Defined Benefit Assets					
1. Market Value (MV)	\$ 218	\$ 314	\$ 532	\$ 501	\$ 501
2. Rate of Return on MV			(3.03)%	16.65 %	16.65 %
3. Funding Value (FV)	\$ 226	\$ 325	\$ 552	\$ 479	\$ 479
4. Rate of Return on FV			5.36 %	8.44 %	8.44 %
5. Ratio of FV to MV			104%	96%	96%
C. Defined Benefit Actuarial Results					
1. Normal Cost as a % of Payroll	7.49%	7.61%	7.55%	7.51%	7.22%
2. Actuarial Accrued Liability (AAL)					
a. Active	\$ 159	\$ 213	\$ 372	\$ 342	\$ 326
b. Retired	10	20	30	24	23
c. Deferred/Inactive	8	9	18	16	16
d. Total	\$ 177	\$ 243	\$ 420	\$ 382	\$ 365
3. Unfunded AAL (UAAL) (FV Basis)	\$ (49)	\$ (83)	\$ (132)	\$ (97)	\$ (113)
4. Unfunded AAL (UAAL) (MV Basis)	\$ (41)	\$ (71)	\$ (112)	\$ (119)	\$ (136)
5. Funded Ratio (FV Basis)	127.6 %	134.0 %	131.3 %	125.3 %	131.0 %
D. Amortization Years to Fully Amortize UAAL *					
	0	0	0	0	0
E. Contribution Rates					
	CY 2021			CY 2020	
1. Total Normal Cost	7.49%	7.61%	7.55%	7.51%	7.22%
2. Member Contribution Rate	0.00%	0.00%	0.00%	0.00%	0.00%
3. Employer Normal Cost	7.49%	7.61%	7.55%	7.51%	7.22%
4. Other Contributions #	6.51%	6.39%	6.45%	6.49%	6.78%
5. Total Employer Contribution Rate	14.00%	14.00%	14.00%	14.00%	14.00%

* Based on i) schedule of employer and member contribution rates shown on page III-3. For the 2018 results, the amortization years shown are from December 31, 2019. For Actuarially Determined Employer Contribution (ADEC) purposes, amortization years are determined based upon scheduled contribution rate changes, if any, through 2021. See page XII-10 for additional explanation, and ii) Entry age actuarial cost method reflecting additional future normal cost savings anticipated to occur as Group A and Group B members are replaced by new hires subject to Group C benefit provisions.

Other contributions include: amortization payments for the pension UAAL, mitigating contributions, and contributions to the retiree health care fund.

Summary of Pension Defined Benefit Valuation Results

Member Directed Plan

December 31

	2018				2017	
	General			Grand Total	7.20%	7.50%
	State	Local	Total General		Grand Total	Grand Total
A. Demographic Information						
1. Number Counts						
a. Active Members	3,905	6,944	10,849	10,849	11,682	11,682
b. Retired Number Counts	77	203	280	280	242	242
c. Deferred/Inactive Number Counts	0	0	0	0	0	0
d. Total Number Counts	3,982	7,147	11,129	11,129	11,924	11,924
2. Active Payroll	\$ 223	\$ 362	\$ 585	\$ 585		
B. Defined Benefit Assets						
1. Market Value (MV)	\$ 6,997,829	\$ 12,262,599	\$ 19,260,428	\$ 19,260,428	\$ 17,759,008	\$ 17,759,008
2. Rate of Return on MV				(3.24)%	18.32 %	18.32 %
3. Funding Value (FV)	\$ 7,236,312	\$ 12,680,503	\$ 19,916,815	\$ 19,916,815	\$ 16,770,041	\$ 16,770,041
4. Rate of Return on FV				5.81 %	8.91 %	8.91 %
5. Ratio of FV to MV				103.4%	94.4%	94.4%
C. Defined Benefit Actuarial Results						
1. Normal Cost as a % of Payroll						
2. Actuarial Accrued Liability (AAL)						
a. Active	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
b. Retired	7,236,312	12,680,503	19,916,815	19,916,815	16,770,041	16,770,041
c. Deferred/Inactive	0	0	0	0	0	0
d. Total	\$ 7,236,312	\$ 12,680,503	\$ 19,916,815	\$ 19,916,815	\$ 16,770,041	\$ 16,770,041
3. Unfunded AAL (UAAL) (FV Basis)	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
4. Unfunded AAL (UAAL) (MV Basis)	\$ 238,483	\$ 417,904	\$ 656,387	\$ 656,387	\$ (988,967)	\$ (988,967)
5. Funded Ratio (FV Basis)				100.0 %	100.0 %	100.0 %

Comments and Conclusion

The December 31, 2018 actuarial valuations of members indicate the following about the portion of employer contribution rates allocated to financing retirement allowances:

- The employer rates are sufficient to fully fund the cost of benefit commitments being made to members for service currently being rendered.
- After satisfying current cost requirements, the remaining portion of the employer rates provides sufficient funds to amortize unfunded actuarial accrued liabilities over a period of 27 years for the System in total.

The assumed investment rate of return was reduced from 7.50% to 7.20% in conjunction with the Investment Return Assumption review performed in between the December 31, 2017 and December 31, 2018 Actuarial Valuations.

Experience. The computed amortization period, taking into account all scheduled increases in contribution rates (currently none), is 27 years compared with the 18-year period that had been reported in the December 31, 2017 valuation. Based upon a 7.20% assumed investment rate of return, the December 31, 2017 computed amortization period was 25 years. In aggregate, experience was less favorable than expectations during the 2018 calendar year. Primary factors which typically would contribute to changes in the amortization years were:

- Measured on a market value basis, investment return was -2.97%. This figure is based upon an actuarial calculation and may not agree with figures reported elsewhere. The return on the funding value was 5.06%. It was higher than the 2018 market rate of return due to smoothing of the market loss during the 2018 calendar year. Since the return on funding value of assets was lower than the 7.20% assumed return, there was upward pressure on the computed amortization period.
- The number of members who left active membership as a result of retirement, disability, and death-in-service was less than expected during calendar year 2018 resulting in an overall liability gain, placing downward pressure on the computed amortization period.
- The number of retiree deaths was slightly greater than expectations during calendar year 2018 resulting in a liability gain, placing downward pressure on the computed amortization period.
- Retirees who retired after 1/7/2013 are expected to receive a 3.00% Cost-of-Living Adjustment (COLA) for the calendar year 2019 which is greater than the 2.15% COLA increase assumption. This resulted in a liability loss, placing upward pressure on the computed amortization period.

Beginning with the December 31, 2018 valuation, certain members were reclassified from active status to inactive status based upon a change in OPERS processing. This resulted in approximately 30,000 to 40,000 members being reclassified as inactive instead of active. This had a minor impact on valuation results.

Information concerning 2018 experience including other sources of gains and losses is presented on pages I-15 through I-18.

Conclusion. Based on the results of the December 31, 2018 regular annual actuarial valuation, it is our opinion that the Ohio Public Employees Retirement System continues to operate in accordance with actuarial principles of level percent of payroll financing.

Other Observations

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 7.20% on the actuarial value of assets), it is expected that:

- (1) The employer normal cost as a percentage of pay will decrease to the level of the Group C normal cost as time passes as the majority of the active population is comprised of Group C members,
- (2) The unfunded actuarial accrued liabilities will be fully amortized after 27 years, and
- (3) The funded status of the plan will increase gradually towards a 100% funded ratio.

When selecting a contribution allocation procedure, the following three items should be considered, including the balance amongst the three items: (1) benefit security, (2) intergenerational equity, and (3) contribution stability and predictability. Generally, given the nature of public employee retirement systems (e.g., level contribution financing objective and perceived ongoing nature of the plan or plan sponsor), intergenerational equity and contribution stability and predictability have received more consideration than benefit security when contribution allocation procedures are selected. However, given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

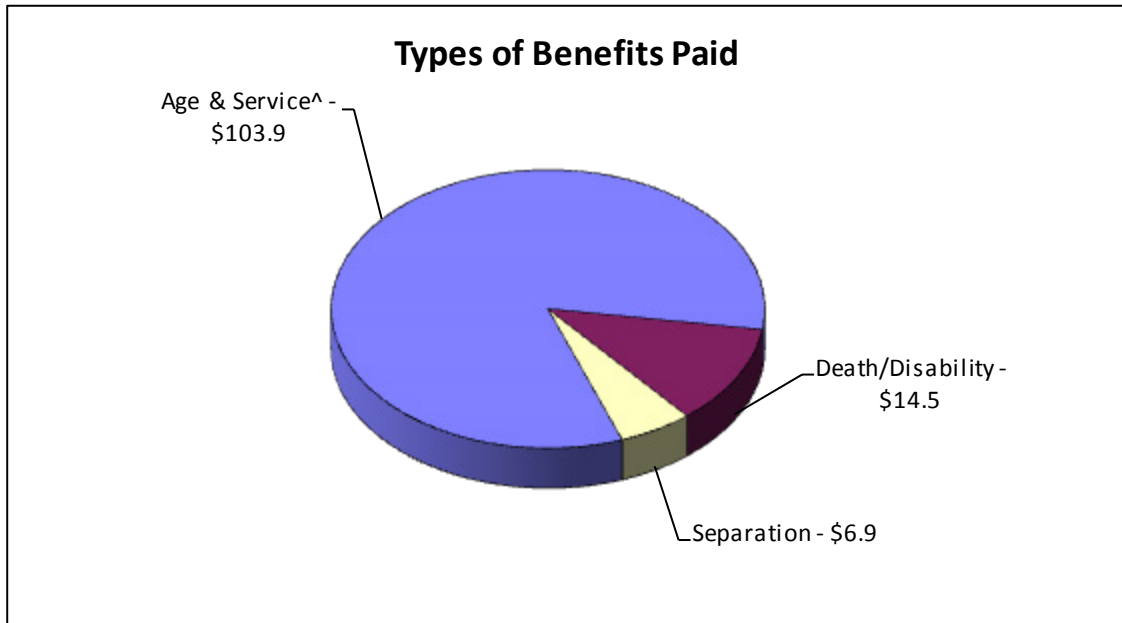
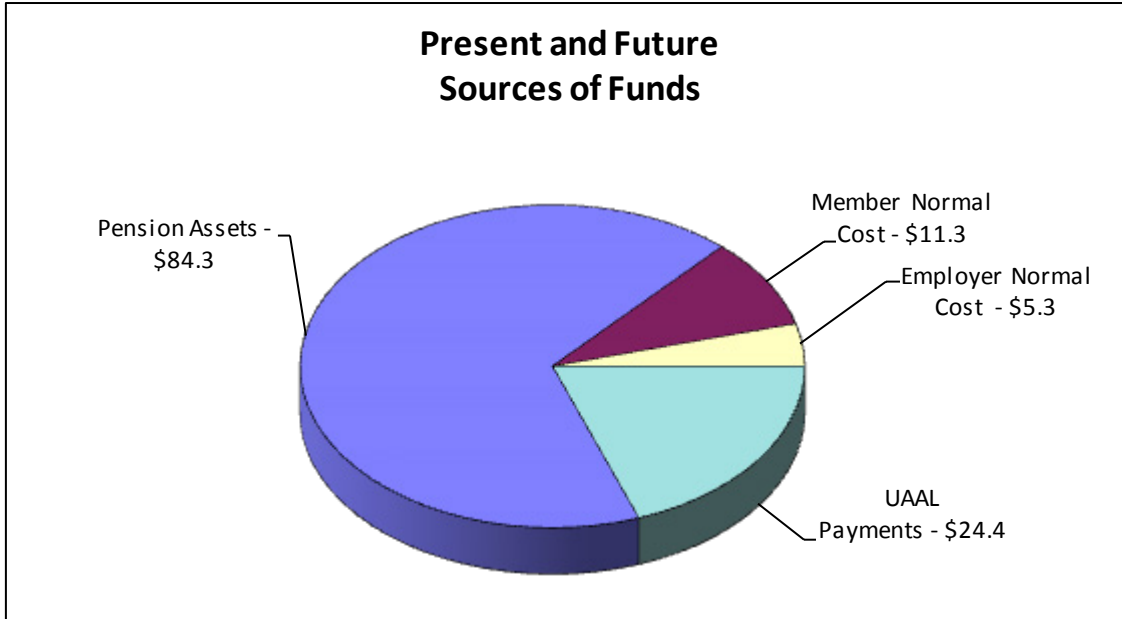
This valuation assumes the continuing ability of the System to make the contributions necessary to fund the System. A determination regarding whether or not the System is actually able to do so is outside our scope of expertise and was not performed.

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, for transferring the obligations to an unrelated third party (e.g., insurance company) in a market value type transaction. In addition, the measurement is inappropriate for assessing benefit security for the membership.
- (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.

Financing \$125.3 Billion* of Defined Benefit Promises for Present Active and Retired Members December 31, 2018 (Dollar Amounts in Billions)



* Present value of future benefits – all divisions combined.

^ Includes administrative expenses.

Defined Benefit Active Members in Valuation Group Averages - Comparative Statement

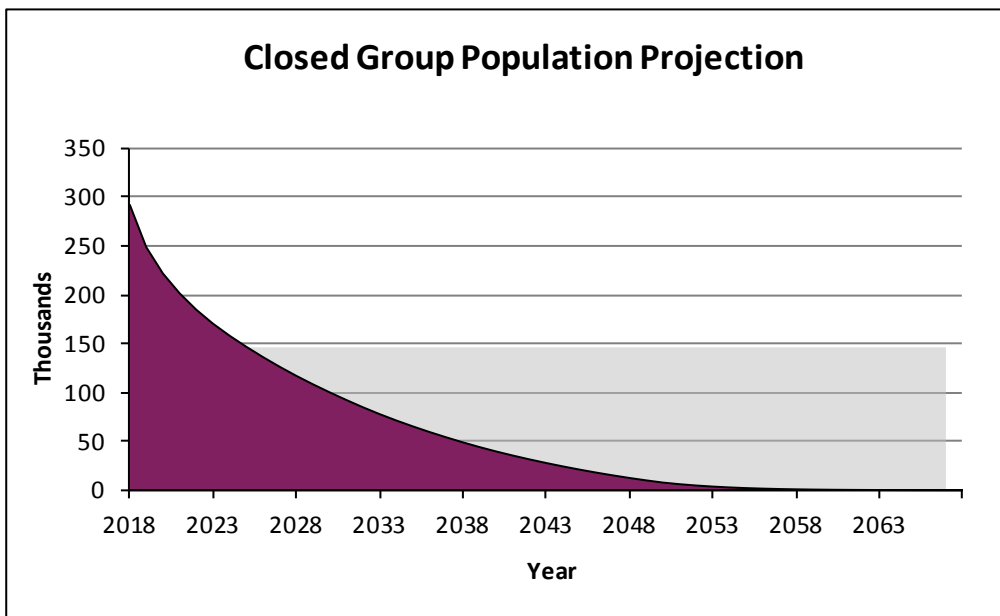
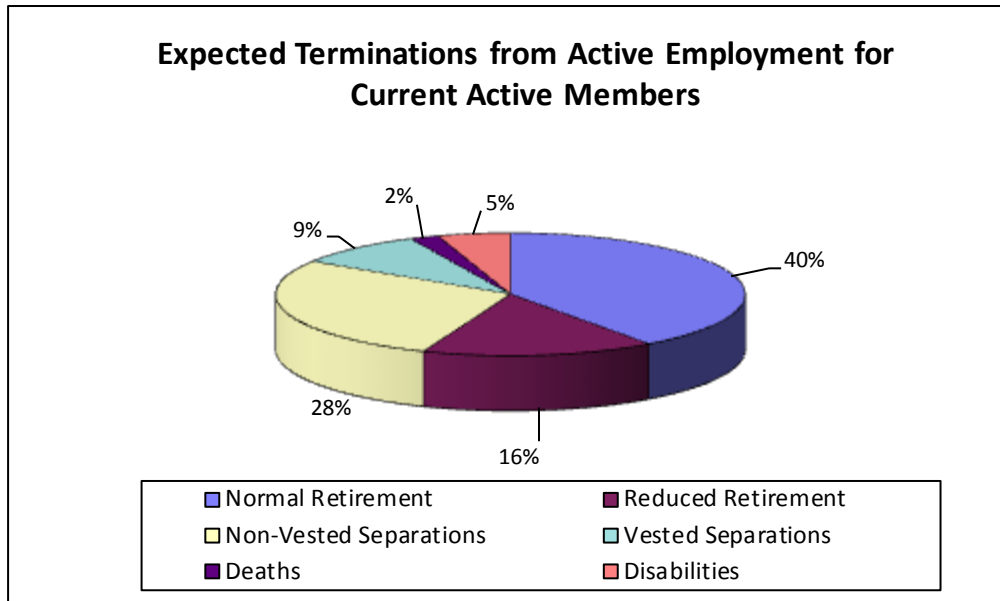
Valuation Group	Dec. 31	No. of Active Members	Group Averages				
			Attained Age	Accrued Service Yrs.	Annual Payroll		
					Average	Increase	
STATE	1975	83,220	40.6 yrs.	6.5 yrs.	\$ 9,441	6.4 %	@
	1980	92,872	39.4	7.3	13,934	8.1 %	@
	1985	89,256	39.2	8.4	18,677	6.0 %	@
	1990	98,939	40.7	8.1	25,281	6.2 %	@
	1995	114,596	40.4	8.8	27,962	2.0 %	@
	2000	113,099	41.6	9.7	34,201	4.1 %	@
	2005	114,620	42.0	10.1	37,858	2.1 %	@
	2010	118,240	41.0	9.6	40,691	1.5 %	@
	2015	118,372	39.9	8.9	41,911	0.6 %	@
	2016	119,223	39.8	8.8	43,037	2.7 %	
2017	121,199	39.5	8.6	43,610	1.3 %		
2018	102,165	42.0	10.0	50,795	16.5 %	#	
LOCAL GOV'T	1975	149,557	40.8 yrs.	6.1 yrs.	8,771	4.3 %	@
	1980	160,797	40.7	7.4	13,035	8.2 %	@
	1985	158,285	40.1	8.3	15,983	4.2 %	@
	1990	173,220	41.5	7.9	19,506	4.1 %	@
	1995	223,431	41.2	7.6	20,384	0.9 %	@
	2000	245,831	41.8	8.1	24,401	3.7 %	@
	2005	236,073	43.3	9.2	29,933	4.2 %	@
	2010	215,144	44.6	10.1	33,447	2.2 %	@
	2015	202,779	44.4	10.0	37,008	2.0 %	@
	2016	203,767	44.4	9.9	38,279	3.4 %	
2017	201,953	44.4	9.9	39,263	2.6 %		
2018	182,306	46.2	10.7	42,984	9.5 %	#	
LAW * (Includes Public Safety and Law Enforcement)	1975	2,111	35.0 yrs.	4.9 yrs.	10,467	-	
	1980	3,019	36.1	6.8	16,846	10.0 %	@
	1985	4,207	36.5	8.4	20,103	3.6 %	@
	1990	5,804	38.6	9.9	26,936	6.0 %	@
	1995	6,605	39.3	11.1	32,441	3.8 %	@
	2000	8,045	39.3	11.7	40,387	4.5 %	@
	2005	8,111	39.9	12.6	49,472	4.1 %	@
	2010	7,790	41.2	14.0	56,801	2.8 %	@
	2015	7,858	41.3	14.2	61,710	1.7 %	@
	2016	7,992	41.4	14.3	64,422	4.4 %	
2017	8,114	41.2	14.1	65,522	1.7 %		
2018	8,076	41.3	14.3	67,689	3.3 %	#	
TOTAL	2005	358,804	42.8 yrs.	9.5 yrs.	32,906	3.5 %	@
	2010	341,174	43.3	10.0	36,491	2.1 %	@
	2015	329,009	42.7	9.7	39,362	1.5 %	@
	2016	330,982	42.7	9.6	40,624	3.2 %	
	2017	331,266	42.6	9.5	41,497	2.1 %	
	2018	292,547	44.6	10.6	46,394	11.8 %	#

@ 5-year annual compound rate.

* Beginning with the December 31, 2005 valuation report, valuation results for the Law division are shown separately for Public Safety and Law Enforcement.

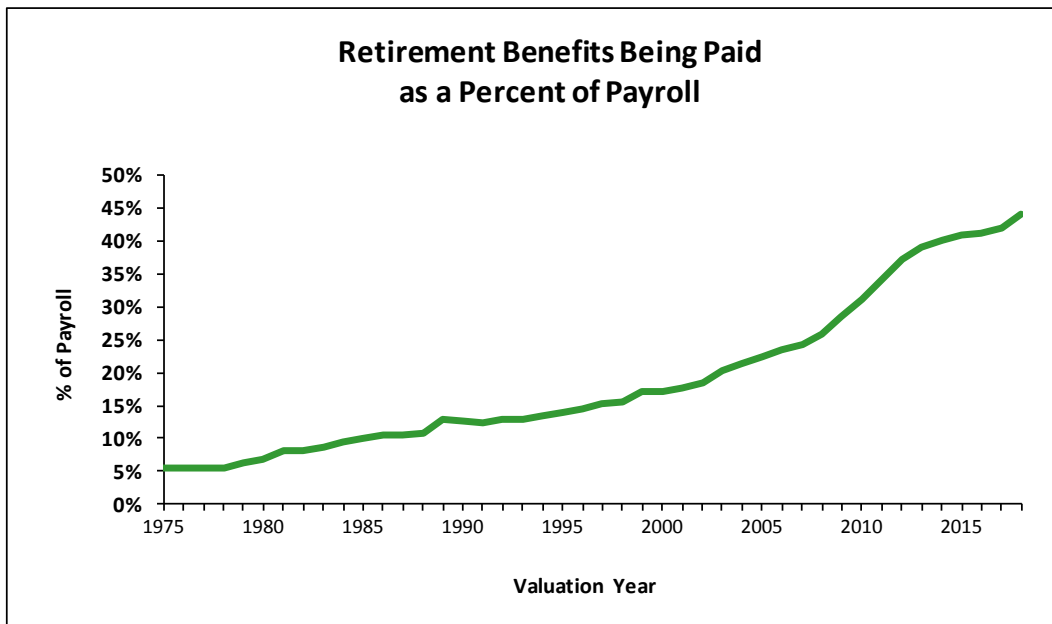
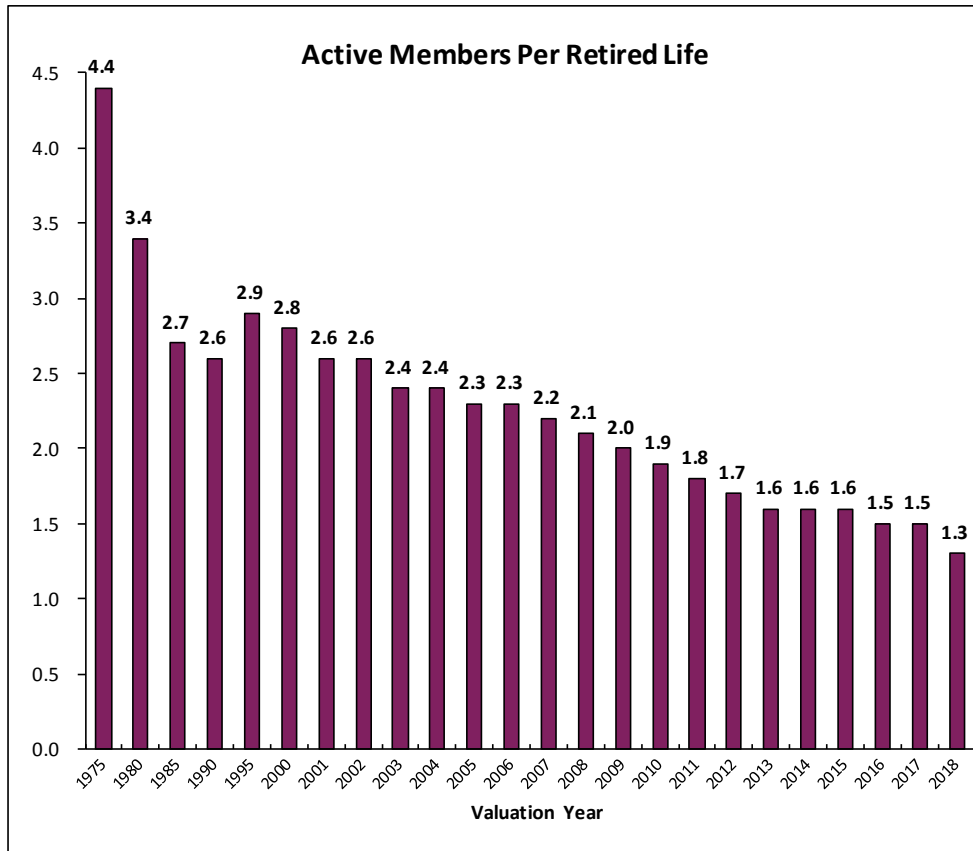
Reflects approximately 30,000 to 40,000 actives members reclassified as inactive.

Development of Present Defined Benefit Population December 31, 2018

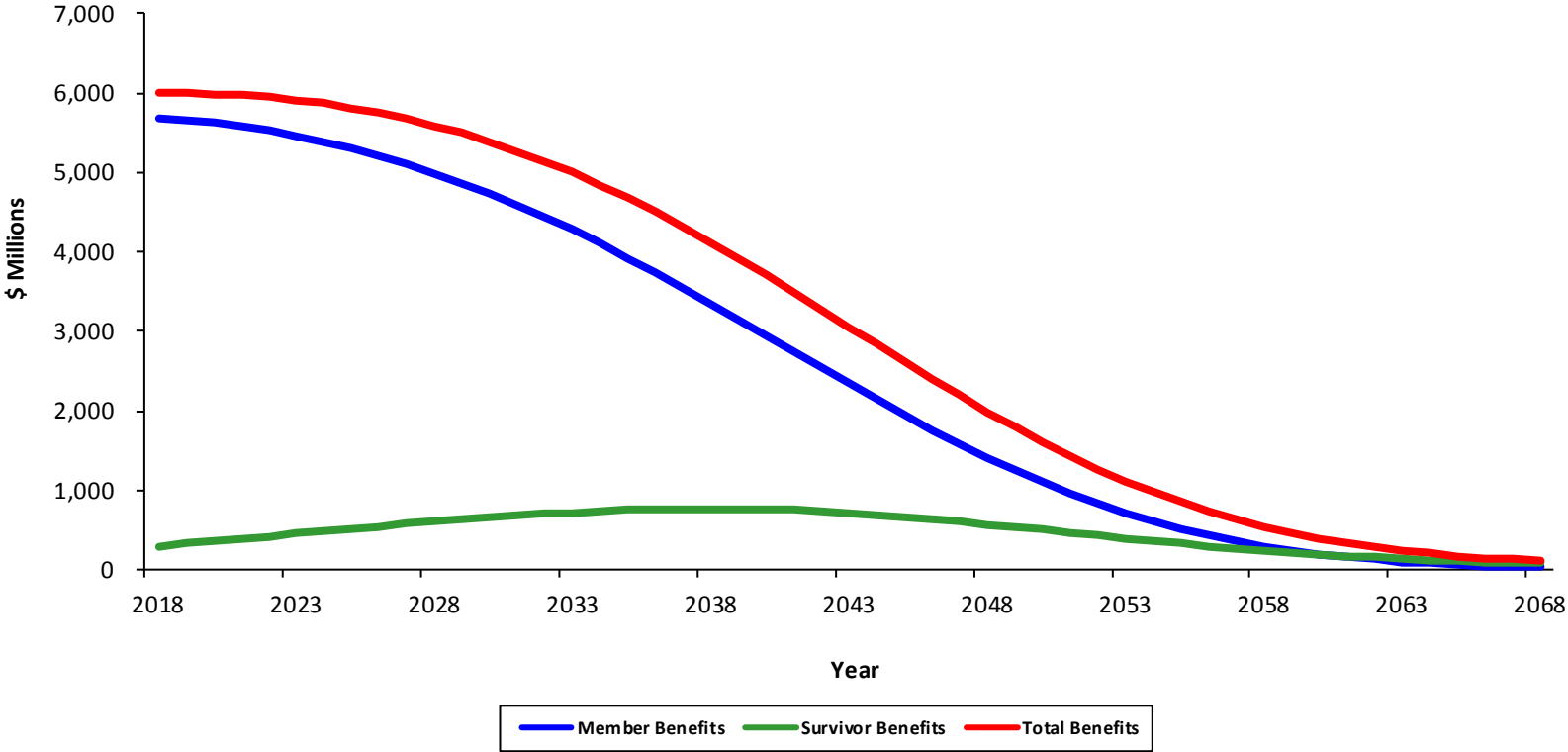


The charts above show the expected future development of the present population in simplified terms. The defined benefit portion of the Retirement System presently covers 292,547 active members. Eventually, 28% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for a monthly benefit. 65% of the present population is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service without withdrawing contributions. 7% of the present population is expected to become eligible for death-in-service or disability benefits. Within 8 years, over half of the covered membership is expected to consist of new hires (e.g., please see the shaded region).

Active/Retired Member Statistics December 31, 2018



Projected Future Benefit Payments on Behalf of Present Retired Lives



Total future payments: \$157.2 billion
 From present assets: \$ 68.4 billion
 From future earnings: \$ 88.8 billion

All Divisions
Defined Benefit Active Members in Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19	5,528							5,528
Tot. Pay	\$53,811,957							\$53,811,957
Avg. Pay	\$9,734							\$9,734
20-24	20,983	172						21,155
Tot. Pay	\$403,257,781	\$5,417,796						\$408,675,577
Avg. Pay	\$19,218	\$31,499						\$19,318
25-29	21,913	3,860	144					25,917
Tot. Pay	\$769,928,541	\$174,575,941	\$6,384,809					\$950,889,291
Avg. Pay	\$35,136	\$45,227	\$44,339					\$36,690
30-34	16,209	8,698	2,930	152				27,989
Tot. Pay	\$620,014,500	\$445,487,986	\$159,471,081	\$7,676,604				\$1,232,650,171
Avg. Pay	\$38,251	\$51,217	\$54,427	\$50,504				\$44,041
35-39	11,912	6,611	7,136	2,868	178			28,705
Tot. Pay	\$468,799,147	\$346,329,900	\$415,683,565	\$169,410,568	\$9,676,944			\$1,409,900,124
Avg. Pay	\$39,355	\$52,387	\$58,252	\$59,069	\$54,365			\$49,117
40-44	9,587	5,183	5,721	6,614	2,548	123		29,776
Tot. Pay	\$368,934,218	\$271,158,017	\$333,698,842	\$418,873,950	\$160,559,928	\$7,589,661		\$1,560,814,616
Avg. Pay	\$38,483	\$52,317	\$58,329	\$63,331	\$63,014	\$61,705		\$52,419
45-49	9,232	5,047	5,261	6,197	7,049	2,674	110	35,570
Tot. Pay	\$343,787,488	\$256,865,742	\$298,848,663	\$387,637,576	\$470,712,882	\$180,590,365	\$6,903,844	\$1,945,346,560
Avg. Pay	\$37,239	\$50,895	\$56,805	\$62,552	\$66,777	\$67,536	\$62,762	\$54,691
50-54	7,638	4,636	4,857	5,326	5,922	6,340	1,908	36,627
Tot. Pay	\$271,453,455	\$226,216,133	\$261,913,517	\$314,803,162	\$384,129,041	\$444,406,564	\$132,814,713	\$2,035,736,585
Avg. Pay	\$35,540	\$48,796	\$53,925	\$59,107	\$64,865	\$70,096	\$69,609	\$55,580
55-59	6,564	4,226	4,856	5,446	5,535	5,449	3,770	35,846
Tot. Pay	\$216,950,000	\$194,564,957	\$248,409,746	\$298,726,912	\$331,043,140	\$362,623,703	\$274,022,154	\$1,926,340,612
Avg. Pay	\$33,051	\$46,040	\$51,155	\$54,853	\$59,809	\$66,549	\$72,685	\$53,739
60-64	4,820	3,225	3,748	4,490	4,449	3,855	2,675	27,262
Tot. Pay	\$134,930,099	\$134,894,223	\$181,194,757	\$232,856,754	\$254,880,494	\$239,781,409	\$189,861,280	\$1,368,399,016
Avg. Pay	\$27,994	\$41,828	\$48,344	\$51,861	\$57,289	\$62,200	\$70,976	\$50,194
65-69	2,919	1,461	1,593	1,719	1,491	1,317	1,157	11,657
Tot. Pay	\$51,929,367	\$53,146,047	\$72,685,722	\$87,951,386	\$82,291,500	\$79,169,183	\$81,032,809	\$508,206,014
Avg. Pay	\$17,790	\$36,376	\$45,628	\$51,164	\$55,192	\$60,113	\$70,037	\$43,597
70 & Over	2,502	1,079	790	675	527	425	517	6,515
Tot. Pay	\$32,580,011	\$20,201,873	\$21,158,034	\$24,464,647	\$22,545,714	\$20,504,246	\$30,120,012	\$171,574,537
Avg. Pay	\$13,022	\$18,723	\$26,782	\$36,244	\$42,781	\$48,245	\$58,259	\$26,335
Totals	119,807	44,198	37,036	33,487	27,699	20,183	10,137	292,547
Tot. Pay	\$3,736,376,564	\$2,128,858,615	\$1,999,448,736	\$1,942,401,559	\$1,715,839,643	\$1,334,665,131	\$714,754,812	\$13,572,345,060
Avg. Pay	\$31,187	\$48,166	\$53,987	\$58,005	\$61,946	\$66,128	\$70,510	\$46,394

All Divisions
Defined Benefit Active Members in Valuation
December 31, 2018
by Gender and Years of Service

Service Years	Active Member Count			Active Member Pays	
	Males	Females	Total	Total	Average
0	20,247	24,530	44,777	\$ 958,933,671	\$21,416
1	11,762	14,138	25,900	818,648,540	31,608
2	8,654	10,999	19,653	733,317,558	37,313
3	7,274	8,945	16,219	652,871,994	40,254
4	6,223	7,035	13,258	572,604,801	43,189
5	5,644	6,394	12,038	542,701,838	45,082
6	4,785	5,690	10,475	499,283,557	47,664
7	4,106	4,240	8,346	411,630,859	49,321
8	3,510	3,852	7,362	373,569,539	50,743
9	3,005	2,972	5,977	301,672,822	50,472
10	3,136	3,895	7,031	362,564,229	51,567
11	3,748	4,293	8,041	422,733,015	52,572
12	3,715	4,270	7,985	438,804,706	54,954
13	3,330	3,977	7,307	399,592,323	54,686
14	3,096	3,576	6,672	375,754,463	56,318
15 & Up	44,171	47,335	91,506	5,707,661,145	62,375
Totals	136,406	156,141	292,547	\$ 13,572,345,060	\$46,394

Summary of Pension Experience Traditional, Combined, and Member Directed Plans (\$ in Millions)

	2018		2017	
	Total \$	% of Accrued Liabilities	Total \$	% of Accrued Liabilities
Beginning of Year				
1. Total Actuarial Accrued Liabilities (AAL)*	\$106,089.67	100.0 %	\$100,167.12	100.00 %
2. Valuation Assets	83,292.23	78.5 %	80,279.74	80.10 %
3. Unfunded Actuarial Accrued Liabilities	\$22,797.44	21.5 %	\$19,887.38	19.90 %
2018 Experience Gains (Losses)				
4. Gains (losses) in economic risk areas				
a. Pay increases	\$186.40	0.18 %	\$420.47	0.42 %
b. Investment return	(1,752.98)	(1.65)%	207.71	0.21 %
c. Total	\$(1,566.58)	(1.47)%	\$628.18	0.63 %
5. Gains (losses) from active member decrement experience				
a. Service retirement	\$51.22	0.05 %	\$62.43	0.06 %
b. Disability retirement	83.89	0.08 %	77.08	0.08 %
c. Death-in-service	46.45	0.04 %	35.93	0.04 %
d. Other separations	31.10	0.03 %	(7.21)	(0.01)%
e. Total	\$212.66	0.20 %	\$168.23	0.17 %
6. Gains (losses) from retiree COLA experience	\$(104.80)	(0.10)%	\$0.00	0.00 %
7. Gains (losses) from retiree mortality	\$122.07	0.12 %	\$82.38	0.08 %
8. Total experience gains (losses): (4c) + (5e) + (6) + (7)	\$(1,336.65)	(1.25)%	\$878.79	0.88 %
End of Year				
9. Total Actuarial Accrued Liabilities	\$108,704.61	100.00 %	\$102,656.14	100.00 %
10. Valuation Assets	84,286.99	77.54 %	83,292.23	81.14 %
11. Unfunded Actuarial Accrued Liabilities	\$24,417.62	22.46 %	\$19,363.91	18.86 %

* Beginning of year total actuarial accrued liability for 2018 is based on new assumptions adopted after the completion of the December 31, 2017 valuation.

Summary of Pension Experience Traditional Plan (\$ in Millions)

	2018		2017	
	Total \$	% of Accrued Liabilities	Total \$	% of Accrued Liabilities
Beginning of Year				
1. Total Actuarial Accrued Liabilities (AAL)*	\$105,690.89	100.0 %	\$99,817.93	100.00 %
2. Valuation Assets	82,796.83	78.3 %	79,864.58	80.00 %
3. Unfunded Actuarial Accrued Liabilities	\$22,894.06	21.7 %	\$19,953.35	20.00 %
2018 Experience Gains (Losses)				
4. Gains (losses) in economic risk areas				
a. Pay increases	\$182.98	0.17 %	\$410.58	0.41 %
b. Investment return	(1,743.51)	(1.65)%	203.52	0.20 %
c. Total	\$(1,560.53)	(1.48)%	\$614.10	0.61 %
5. Gains (losses) from active member decrement experience				
a. Service retirement	\$51.17	0.05 %	\$62.21	0.06 %
b. Disability retirement	79.58	0.08 %	72.78	0.07 %
c. Death-in-service	45.91	0.04 %	35.98	0.04 %
d. Other separations	31.14	0.03 %	(6.05)	(0.01)%
e. Total	\$207.80	0.20 %	\$164.92	0.16 %
6. Gains (losses) from retiree COLA experience	\$(104.61)	(0.10)%	\$0.00	0.00 %
7. Gains (losses) from retiree mortality	\$121.82	0.12 %	\$82.40	0.08 %
8. Total experience gains (losses): (4c) + (5e) + (6) + (7)	\$(1,335.52)	(1.3)%	\$861.42	0.85 %
End of Year				
9. Total Actuarial Accrued Liabilities	\$108,264.57	100.0 %	\$102,273.91	100.00 %
10. Valuation Assets	83,715.40	77.3 %	82,796.83	80.96 %
11. Unfunded Actuarial Accrued Liabilities	\$24,549.17	22.7 %	\$19,477.08	19.04 %

* Beginning of year total actuarial accrued liability for 2018 is based on new assumptions adopted after the completion of the December 31, 2017 valuation.

Summary of Pension Experience Combined Plan (\$ in Millions)

	2018		2017	
	Total \$	% of Accrued Liabilities	Total \$	% of Accrued Liabilities
Beginning of Year				
1. Total Actuarial Accrued Liabilities (AAL)*	\$382.01	100.00 %	\$336.23	100.00 %
2. Valuation Assets	478.63	125.29 %	402.20	119.60 %
3. Unfunded Actuarial Accrued Liabilities	\$(96.62)	(25.29)%	\$(65.97)	(19.60)%
2018 Experience Gains (Losses)				
4. Gains (losses) in economic risk areas				
a. Pay increases	\$3.42	0.90 %	\$9.89	2.94 %
b. Investment return	(9.22)	(2.41)%	3.99	1.19 %
c. Total	\$(5.80)	(1.51)%	\$13.88	4.13 %
5. Gains (losses) from active member decrement experience				
a. Service retirement	\$0.05	0.01 %	\$0.21	0.06 %
b. Disability retirement	4.32	1.13 %	4.30	1.28 %
c. Death-in-service	0.53	0.14 %	(0.04)	(0.01)%
d. Other separations	(0.04)	(0.01)%	(1.16)	(0.35)%
e. Total	\$4.86	1.27 %	\$3.31	0.98 %
6. Gains (losses) from retiree COLA experience	\$(0.12)	(0.03)%	\$0.00	0.00 %
7. Gains (losses) from retiree mortality	\$0.16	0.04 %	\$0.02	0.01 %
8. Total experience gains (losses): (4c) + (5e) + (6) + (7)	\$(0.90)	(0.23)%	\$17.21	5.12 %
End of Year				
9. Total Actuarial Accrued Liabilities	\$420.12	100.00 %	\$365.46	100.00 %
10. Valuation Assets	551.67	131.31 %	478.63	130.97 %
11. Unfunded Actuarial Accrued Liabilities	\$(131.55)	(31.31)%	\$(113.17)	(30.97)%

* Beginning of year total actuarial accrued liability for 2018 is based on new assumptions adopted after the completion of the December 31, 2017 valuation.

Summary of Pension Experience Member Directed Plan (\$ in Millions)

	2018		2017	
	Total \$	% of Accrued Liabilities	Total \$	% of Accrued Liabilities
Beginning of Year				
1. Total Actuarial Accrued Liabilities (AAL)*	\$16.77	100.00 %	\$12.96	100.00 %
2. Valuation Assets	16.77	100.00 %	12.96	100.00 %
3. Unfunded Actuarial Accrued Liabilities	\$0.00	0.00 %	\$(0.00)	0.00 %
2018 Experience Gains (Losses)				
4. Gains (losses) in economic risk areas				
a. Pay increases				0.00 %
b. Investment return	\$(0.25)	(1.49)%	\$0.20	1.54 %
c. Total	\$(0.25)	(1.49)%	\$0.20	1.54 %
5. Gains (losses) from active member decrement experience				
a. Service retirement				
b. Disability retirement				
c. Death-in-service				
d. Other separations				
e. Total	N/A	N/A	N/A	N/A
6. Gains (losses) from retiree COLA experience	\$(0.07)	(0.42)%	\$0.00	0.00 %
7. Gains (losses) from retiree mortality	\$0.10	0.60 %	\$(0.04)	(0.31)%
8. Total experience gains (losses): (4c) + (5e) + (6) + (7)	\$(0.22)	(1.31)%	\$0.16	1.23 %
End of Year				
9. Total Actuarial Accrued Liabilities	\$19.92	100.00 %	\$16.77	100.00 %
10. Valuation Assets	19.92	100.00 %	16.77	100.00 %
11. Unfunded Actuarial Accrued Liabilities	\$0.00	0.00 %	\$(0.00)	0.00 %

* Beginning of year total actuarial accrued liability for 2018 is based on new assumptions adopted after the completion of the December 31, 2017 valuation.

Risk Commentary

Determination of the actuarial accrued liability, the computed amortization period, and the funded ratio requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in actuarial measurements that results from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the Plan's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

- (1) Investment Risk – The risk that actual investment returns may differ from the expected investment returns. For OPERS, this risk is enhanced since members of OPERS do not participate in Social Security resulting in a larger asset base.
- (2) Contribution Risk – OPERS is a plan that has fixed maximum employer and employee contribution rates in the ORC. The Board may establish employer and employee contribution rates up to the maximums. Currently, OPERS is at the maximum employer and employee contributions rates. In addition, the Board makes the determination of how much of the contributions are allocated to the pension and retiree health portions of OPERS. Currently, all of the contributions are allocated to the pension program. Contribution risk is the risk that the current level of contributions may be insufficient to fund the current pension benefit structure of OPERS while maintaining the ROC requirement of an amortization period of no greater than 30 years.
- (3) Participation Risk – The risk that a significant portion of the active population participates in the Member Directed Plan as opposed to the Traditional Plan. This would likely result in less contributions to finance the UAAL of the Traditional Plan and therefore resulting in a longer amortization period to finance the UAAL of the Traditional Plan.

Plan maturity measures are presented on pages I-11 and I-20 of this section.

Summary of Risk/Maturity Measures

Traditional Plan

Valuation Year	Funded Ratio		UAAL	Funding Value		Standard Deviation of	
	Based on FVA	Based on MVA	Amortization Period	UAAL / Total Payroll	of Assets / Total Payroll	Total AAL / Total Payroll	Investment Return / Total Payroll
2009	75 %	75 %	30	1.5	4.7	6.2	47 %
2010	79	79	25	1.4	5.2	6.6	56
2011	77	73	30	1.6	5.4	7.0	57
2012	81	81	26	1.3	5.7	7.0	74
2013	82	86	25	1.3	5.9	7.2	80
2014	84	86	21	1.2	6.1	7.2	83
2015	80	77	20	1.5	6.2	7.7	83
2016	80	77	20	1.5	6.1	7.7	72
2017	81	85	19	1.5	6.2	7.7	78
2018	77	75	28	1.9	6.4	8.2	75

Combined Plan

Valuation Year	Funded Ratio		UAAL	Funding Value		Standard Deviation of	
	Based on FVA	Based on MVA	Amortization Period	UAAL / Total Payroll	of Assets / Total Payroll	Total AAL / Total Payroll	Investment Return / Total Payroll
2009	74 %	70 %	3	0.1	0.4	0.6	4 %
2010	76	75	3	0.2	0.5	0.6	5
2011	79	75	2	0.1	0.5	0.7	6
2012	86	87	1	0.1	0.6	0.7	8
2013	100	105	0	0.0	0.7	0.7	9
2014	111	115	0	-0.1	0.8	0.7	11
2015	116	111	0	-0.1	0.9	0.8	13
2016	120	117	0	-0.2	1.0	0.8	12
2017	131	137	0	-0.3	1.1	0.9	14
2018	131	127	0	-0.3	1.3	1.0	15

DB Portion of Member Directed Plan

Valuation Year	Funded Ratio		UAAL	Funding Value		Standard Deviation of	
	Based on FVA	Based on MVA	Amortization Period	UAAL / Total Payroll	of Assets / Total Payroll	Total AAL / Total Payroll	Investment Return / Total Payroll
2009	81 %	82 %	N/A	0.0	0.0	0.0	N/A
2010	92	92	N/A	0.0	0.0	0.0	N/A
2011	99	95	N/A	0.0	0.0	0.0	N/A
2012	95	97	N/A	0.0	0.0	0.0	N/A
2013	99	103	N/A	0.0	0.0	0.0	N/A
2014	106	107	N/A	0.0	0.0	0.0	N/A
2015	103	99	N/A	0.0	0.0	0.0	N/A
2016	100	98	N/A	0.0	0.0	0.0	N/A
2017	100	106	N/A	0.0	0.0	0.0	N/A
2018	100	97	N/A	0.0	0.0	0.0	N/A

Summary of Risk/Maturity Measures (Concluded)

An explanation of the significance of the risk metrics presented on the preceding page follows:

- (1) **Funded Ratio (Funding Value of Assets basis)** – This is the most widely known measure of a plan's financial strength. The trend in the funded ratio is much more important than the absolute ratio. A trend approaching 100% is desirable.
- (2) **Funded Ratio (Market Value of Assets basis)** – This is similar to the above, except that the asset value used is the market value.
- (3) **UAAL Amortization Period** – Periods above about 17 to 20 years indicate that the UAAL payment is less than the interest on the UAAL. This situation is referred to as “negative amortization.” Negative amortization is increasingly viewed as undesirable.
- (4) **UAAL / Total Payroll** – The ratio of UAAL to payroll gives an indication of the plan sponsor's ability to pay off the UAAL. A declining ratio is desirable. A ratio above approximately 3.0 or 4.0 may indicate difficulty in discharging the unfunded liability in some circumstances.
- (5) **Funding Value of Assets / Total Payroll** – The ratio of assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 5.0 and 7.0. Social Security Replacement Plans may fall above that range. A high ratio can indicate volatility of contribution rates or amortization period.
- (6) **Total AAL / Total Payroll** – This is similar to above. It illustrates the expected ratio of assets to payroll when the plan has a funded ratio of 100%.
- (7) **Standard Deviation of Investment Return / Total Payroll** – The portfolio standard deviation measures the volatility of investment return. When divided by payroll it gives the effect of a one standard deviation asset gain or loss as a percent of payroll. This theoretically may happen once every 6 years.

SECTION II

FINANCIAL INFORMATION

Financial Data for Calendar Year 2018

Consolidated Asset Reconciliation

All Plans, All Divisions

	Traditional Pension Plan	DB Portion of Combined Pension Plan	DB Portion of Member-Directed Plan	2018 Total Defined Pension Benefit	Total Health Care	DC Portion of Combined Pension Plan	Member Directed	2018 Total Defined Contribution	Total 2018
Beginning Market Value @ 12/31/17									
Assets Held in Trust for Benefits	\$ 86,450,534,446	\$ 501,203,506	\$ 17,757,657	\$ 86,969,495,609	\$ 12,818,833,665	\$ 521,166,145	\$ 980,958,110	\$ 1,502,124,255	\$ 101,290,453,529
Gain/Loss on Security Lending	13,053,314	48,378	1,351	13,103,043	-	-	-	-	13,103,043
Rounding	-	-	-	-	-	-	-	-	-
Assets Held for Upcoming Year Budget	122,263,264	-	-	122,263,264	-	-	-	-	122,263,264
Total Beginning Market Value @ 12/31/18	86,585,851,024	501,251,884	17,759,008	87,104,861,916	12,818,833,665	521,166,145	980,958,110	1,502,124,255	101,425,819,836
External Cash Flows:									
Revenues:									
Member Contributions / Deposits	1,354,235,298	-	-	1,354,235,298	-	43,054,163	58,482,168	101,536,331	1,455,771,629
Employer Contributions	1,895,462,837	60,249,275	-	1,955,712,112	23,441,668	-	55,558,056	55,558,056	2,034,711,836
Employer Contributions - Administrative Expenses	-	-	2,924,135	2,924,135	-	-	-	-	2,924,135
Contract and Other Receipts	79,562,553	184,123	-	79,746,676	279,178	331,441	812,423	1,143,864	81,169,718
Refund from HC Vendors (Guarantees)	-	-	-	-	30,000	-	-	-	30,000
Other Income / Cancelled Warrants	2,112,353	25,380	-	2,137,733	702,193	(25,383)	-	(25,383)	2,814,543
Total Revenues	3,331,373,041	60,458,778	2,924,135	3,394,755,954	24,453,039	43,360,221	114,852,647	158,212,868	3,577,421,861
Disbursements:									
Refunds of Member Accounts	(388,067,394)	(3,732,159)	(1,279,010)	(393,078,563)	-	(13,075,921)	(47,286,536)	(60,362,457)	(453,441,020)
Retirement Benefits	(6,101,603,747)	(2,362,506)	(1,331,881)	(6,105,298,134)	-	(2,127,305)	(1,811,841)	(3,939,146)	(6,109,237,280)
Health Care Expenses	-	-	-	-	(689,179,896)	-	-	-	(689,179,896)
Retiree-Paid Health Care & Formulary Rebates	-	-	-	-	249,161,764	-	-	-	249,161,764
Federal Subsidies	-	-	-	-	378,007	-	-	-	378,007
ER Paid PCORI	-	-	-	-	(391,308)	-	-	-	(391,308)
ER Paid Medicare	-	-	-	-	(25,719,123)	-	-	-	(25,719,123)
Wellness RMA Claims	-	-	-	-	(1,150,477)	-	-	-	(1,150,477)
MD-RMA Claims	-	-	-	-	(4,092,019)	-	-	-	(4,092,019)
HRA Claims	-	-	-	-	(399,291,867)	-	-	-	(399,291,867)
Non-Investment Related Expenses	(51,791,090)	-	-	(51,791,090)	(19,606,403)	(2,731,547)	(2,746,263)	(5,477,810)	(76,875,303)
Investment Administrative Expense	(36,784,131)	-	-	(36,784,131)	(5,824,547)	(377,283)	-	(377,283)	(42,985,961)
Total Disbursements	(6,578,246,362)	(6,094,665)	(2,610,891)	(6,586,951,918)	(895,715,869)	(18,312,056)	(51,844,640)	(70,156,696)	(7,552,824,483)
Net External Cash Flow	(3,246,873,321)	54,364,113	313,244	(3,192,195,964)	(871,262,830)	25,048,165	63,008,007	88,056,172	(3,975,402,622)
Inter-Plan Activity									
Member Balance Transfers & Plan Switches	5,140,249	(2,163,312)	-	2,976,937	-	(726,037)	(2,250,900)	(2,976,937)	-
Mitigation Rate	20,295,011	(8,606,527)	-	11,688,484	-	-	(11,688,484)	(11,688,484)	-
Intraplan Transfer (DC to DB)	-	2,549,060	1,797,837	4,346,897	-	(2,549,060)	(1,797,837)	(4,346,897)	-
Total Inter-Plan Activity	25,435,260	(8,220,779)	1,797,837	19,012,318	-	(3,275,097)	(15,737,221)	(19,012,318)	-
Investment Income:									
Gross Investment Income	(2,393,167,424)	(15,315,487)	(587,442)	(2,409,070,353)	(679,835,310)	(38,148,714)	(69,731,931)	(107,880,645)	(3,196,786,308)
Unrealized Income on Security Lending	603,890	9,656	384	613,930	-	-	-	-	613,930
External Asset Management Fees	(95,244,375)	(588,808)	(22,603)	(95,855,786)	(14,749,823)	(201,117)	(380,499)	(581,616)	(111,187,225)
Net Investment Income	(2,487,807,909)	(15,894,639)	(609,661)	(2,504,312,209)	(694,585,133)	(38,349,831)	(70,112,430)	(108,462,261)	(3,307,359,603)
Ending Market Value @ 12/31/18	80,876,605,054	531,500,579	19,260,428	81,427,366,061	11,252,985,702	504,589,382	958,116,466	1,462,705,848	94,143,057,611

Development of Funding Value of Pension Defined Benefit Assets Traditional, Combined, and Member Directed Plans

Year Ended December 31	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$ 80,279,739,832	\$ 83,292,231,053			
B. Market Value End of Year	87,104,861,916	81,427,366,061			
C. Market Value Beginning of Year	77,514,180,960	87,104,861,916			
D. Non-Investment/Administrative Net Cash Flow					
D1. Member Contributions	1,324,457,501	1,354,235,298			
D2. Employer and other Non-Member Contributions Net of Admin Expenses	1,881,718,831	2,052,209,140			
D3. Refund of Member Accounts	(389,425,168)	(393,078,563)			
D4. Retirement Benefits	(5,838,171,538)	(6,105,298,134)			
D5. Member Balance Transfers / Intraplan Transfers	6,643,160	7,323,834			
D6. Admin Expenses	(85,175,581)	(51,791,090)			
D7. Total Net Cash Flow: D1+D2+D3+D4+D5+D6	(3,099,952,795)	(3,136,399,515)			
E. Investment Return					
E1. Market Total: B-C-D7	12,690,633,751	(2,541,096,340)			
E2. Assumed Rate of Return	7.50%	7.20%			
E3. Assumed Amount of Return	5,904,732,258	5,884,130,253			
E4. Amount Subject to Phase-In: E1-E3	6,785,901,493	(8,425,226,593)			
F. Phased-In Recognition of Investment Return					
F1. Current Year: 0.25 x E4	1,696,475,373	(2,106,306,648)			
F2. First Prior Year	66,349,925	1,696,475,373	\$ (2,106,306,648)		
F3. Second Prior Year	(1,409,495,105)	66,349,925	1,696,475,373	\$ (2,106,306,648)	
F4. Third Prior Year	(145,618,435)	(1,409,495,105)	66,349,923	1,696,475,374	\$ (2,106,306,649)
F5. Total Phase-Ins	207,711,758	(1,752,976,455)	(343,481,352)	(409,831,274)	(2,106,306,649)
G. Funding Value End of Year					
G1. Preliminary Funding Value End of Year: A+D7+E3+F5	\$ 83,292,231,053	\$ 84,286,985,336			
G2. Upper Corridor Limit: 112% x B	97,557,445,346	91,198,649,987			
G3. Lower Corridor Limit: 88% x B	76,652,278,486	71,656,082,135			
G4. Funding Value End of Year	\$ 83,292,231,053	\$ 84,286,985,336			
H. Difference Between Market and Funding Value	3,812,630,863	(2,859,619,275)	(2,516,137,923)	(2,106,306,649)	-
I. Recognized Rate of Return	7.76 %	5.06 %			
J. Market Rate of Return	16.71 %	(2.97)%			
K. Ratio of Funding Value to Market Value	96 %	104 %			

The Funding Value of Assets recognizes assumed investment return (line E3) fully each year. Differences between actual and assumed investment return (line E4) are phased in over a closed 4-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than market value. If assumed rates are exactly realized for 3 consecutive years, funding value will become equal to market value.

Development of Funding Value of Pension Defined Benefit Assets Traditional Plan

Year Ended December 31	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$ 79,864,578,167	\$ 82,796,832,824			
B. Market Value End of Year	86,585,851,024	80,876,605,054			
C. Market Value Beginning of Year	77,109,633,485	86,585,851,024			
D. Non-Investment/Administrative Net Cash Flow					
D1. Member Contributions	1,324,457,501	1,354,235,298			
D2. Employer and other Non-Member Contributions Net of Admin Expenses	1,830,891,279	1,997,432,754			
D3. Refund of Member Accounts	(384,615,309)	(388,067,394)			
D4. Retirement Benefits	(5,835,175,379)	(6,101,603,747)			
D5. Member Balance Transfers / Intraplan Transfers	6,381,123	5,140,249			
D6. Admin Expenses	(85,175,581)	(51,791,090)			
D7. Total Net Cash Flow: D1+D2+D3+D4+D5+D6	(3,143,236,366)	(3,184,653,930)			
E. Investment Return					
E1. Market Total: B-C-D7	12,619,453,905	(\$2,524,592,040)			
E2. Assumed Rate of Return	7.50%	7.20%			
E3. Assumed Amount of Return	5,871,972,000	5,846,724,421			
E4. Amount Subject to Phase-In: E1-E3	6,747,481,905	(\$8,371,316,461)			
F. Phased-In Recognition of Investment Return					
F1. Current Year: 0.25 x E4	1,686,870,476	(\$2,092,829,115)			
F2. First Prior Year	65,954,091	1,686,870,476	\$ (2,092,829,115)		
F3. Second Prior Year	(1,403,501,407)	65,954,091	1,686,870,476	\$ (2,092,829,115)	
F4. Third Prior Year	(145,804,137)	(1,403,501,410)	65,954,090	1,686,870,477	\$ (2,092,829,116)
F5. Total Phase-Ins	203,519,023	(1,743,505,958)	(340,004,549)	(405,958,638)	(2,092,829,116)
G. Funding Value End of Year					
G1. Preliminary Funding Value End of Year: A+D7+E3+F5	\$ 82,796,832,824	\$ 83,715,397,357			
G2. Upper Corridor Limit: 112% x B	96,976,153,147	90,581,797,660			
G3. Lower Corridor Limit: 88% x B	76,195,548,901	71,171,412,448			
G4. Funding Value End of Year	\$ 82,796,832,824	\$ 83,715,397,357			
H. Difference Between Market and Funding Value	3,789,018,200	(2,838,792,303)	(2,498,787,754)	(2,092,829,116)	-
I. Recognized Rate of Return	7.76 %	5.05 %			
J. Market Rate of Return	16.71 %	(2.97)%			
K. Ratio of Funding Value to Market Value	96 %	104 %			

The Funding Value of Assets recognizes assumed investment return (line E3) fully each year. Differences between actual and assumed investment return (line E4) are phased in over a closed 4-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than market value. If assumed rates are exactly realized for 3 consecutive years, funding value will become equal to market value.

Development of Funding Value of Pension Defined Benefit Assets Combined Plan

Year Ended December 31	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$ 402,200,560	\$ 478,628,188			
B. Market Value End of Year	501,251,884	531,500,579			
C. Market Value Beginning of Year	391,882,196	501,251,884			
D. Non-Investment/Administrative Net Cash Flow					
D1. Member Contributions	-	-			
D2. Employer and other Non-Member Contributions Net of Admin Expenses	47,736,821	51,852,251			
D3. Refund of Member Accounts	(3,690,814)	(3,732,159)			
D4. Retirement Benefits	(1,864,006)	(2,362,506)			
D5. Member Balance Transfers / Intraplan Transfers	(1,438,950)	385,748			
D6. Admin Expenses	-	-			
D7. Total Net Cash Flow: D1+D2+D3+D4+D5+D6	40,743,051	46,143,334			
E. Investment Return					
E1. Market Total: B-C-D7	68,626,637	(15,894,639)			
E2. Assumed Rate of Return	7.50%	7.20%			
E3. Assumed Amount of Return	31,692,906	36,122,390			
E4. Amount Subject to Phase-In: E1-E3	36,933,731	(52,017,029)			
F. Phased-In Recognition of Investment Return					
F1. Current Year: 0.25 x E4	9,233,433	(13,004,257)			
F2. First Prior Year	375,321	9,233,433	\$ (13,004,257)		
F3. Second Prior Year	(5,827,247)	375,321	9,233,433	\$ (13,004,257)	
F4. Third Prior Year	210,164	(5,827,245)	375,322	9,233,432	\$ (13,004,258)
F5. Total Phase-Ins	3,991,671	(9,222,748)	(3,395,502)	(3,770,825)	(13,004,258)
G. Funding Value End of Year					
G1. Preliminary Funding Value End of Year: A+D7+E3+F5	\$ 478,628,188	\$ 551,671,164			
G2. Upper Corridor Limit: 112% x B	561,402,110	595,280,648			
G3. Lower Corridor Limit: 88% x B	441,101,658	467,720,510			
G4. Funding Value End of Year	\$ 478,628,188	\$ 551,671,164			
H. Difference Between Market and Funding Value	22,623,696	(20,170,585)	(16,775,083)	(13,004,258)	-
I. Recognized Rate of Return	8.44 %	5.36 %			
J. Market Rate of Return	16.65 %	(3.03)%			
K. Ratio of Funding Value to Market Value	95 %	104 %			

The Funding Value of Assets recognizes assumed investment return (line E3) fully each year. Differences between actual and assumed investment return (line E4) are phased in over a closed 4-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than market value. If assumed rates are exactly realized for 3 consecutive years, funding value will become equal to market value.

Development of Funding Value of Pension Defined Benefit Assets DB Portion of Member Directed Plan

Year Ended December 31	2017	2018	2019	2020	2021
A. Funding Value Beginning of Year	\$ 12,961,105	\$ 16,770,041			
B. Market Value End of Year	17,759,008	19,260,428			
C. Market Value Beginning of Year	12,665,279	17,759,008			
D. Non-Investment/Administrative Net Cash Flow					
D1. Member Contributions	-	-			
D2. Employer and other Non-Member Contributions Net of Admin Expenses	3,090,731	2,924,135			
D3. Refund of Member Accounts	(1,119,045)	(1,279,010)			
D4. Retirement Benefits	(1,132,153)	(1,331,881)			
D5. Member Balance Transfers / Intraplan Transfers	1,700,987	1,797,837			
D6. Admin Expenses	-	-			
D7. Total Net Cash Flow: D1+D2+D3+D4+D5+D6	2,540,520	2,111,081			
E. Investment Return					
E1. Market Total: B-C-D7	2,553,209	(609,661)			
E2. Assumed Rate of Return	7.50%	7.20%			
E3. Assumed Amount of Return	1,067,352	1,283,442			
E4. Amount Subject to Phase-In: E1-E3	1,485,857	(1,893,103)			
F. Phased-In Recognition of Investment Return					
F1. Current Year: 0.25 x E4	371,464	(473,276)			
F2. First Prior Year	20,513	371,464	\$ (473,276)		
F3. Second Prior Year	(166,451)	20,513	371,464	\$ (473,276)	
F4. Third Prior Year	(24,462)	(166,450)	20,511	371,465	\$ (473,275)
F5. Total Phase-Ins	201,064	(247,749)	(81,301)	(101,811)	(473,275)
G. Funding Value End of Year					
G1. Preliminary Funding Value End of Year: A+D7+E3+F5	\$ 16,770,041	\$ 19,916,815			
G2. Upper Corridor Limit: 112% x B	19,890,089	21,571,679			
G3. Lower Corridor Limit: 88% x B	15,627,927	16,949,177			
G4. Funding Value End of Year	\$ 16,770,041	\$ 19,916,815			
H. Difference Between Market and Funding Value	988,967	(656,387)	(575,086)	(473,275)	-
I. Recognized Rate of Return	8.91 %	5.81 %			
J. Market Rate of Return	18.32 %	(3.24)%			
K. Ratio of Funding Value to Market Value	94 %	103 %			

The Funding Value of Assets recognizes assumed investment return (line E3) fully each year. Differences between actual and assumed investment return (line E4) are phased in over a closed 4-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than market value. If assumed rates are exactly realized for 3 consecutive years, funding value will become equal to market value.

Allocation of Funding Value of Assets Among Divisions

December 31, 2018

Traditional, Combined and Member Directed Plans

	Total DB System				
	State	Local	Public Safety	Law Enforcement	Total
(1) Employer Accumulation Fund					
(a) Allocated Amounts	\$ 978,988,707	\$ 3,619,247,872	\$ (12,153,792)	\$ 658,563,112	\$ 5,244,645,899
(b) Unallocated Amounts Allocated by (1)(a)	8,570,889	36,931,214	(134,850)	7,306,934	52,674,187
(c) OPERS Directed Asset Reallocation	0	0	0	0	0
(d) Total EAF (1)(a) + (1)(b) + (1)(c)	\$ 987,559,596	\$ 3,656,179,086	\$ (12,288,642)	\$ 665,870,046	\$ 5,297,320,086
(2) Employee Savings Fund (ESF)					
(a) Total Member Deposits	\$ 5,890,520,039	\$ 9,024,858,400	\$ 3,688,818	\$ 760,558,281	\$ 15,679,625,537
(b) ESF Allocated by (2)(a)	\$ 5,547,861,512	\$ 8,500,145,853	\$ 3,473,666	\$ 716,198,382	\$ 14,767,679,413
(3) Retired Assets					
(a) Allocated Amounts	\$ 24,552,479,601	\$ 34,149,052,951	\$ 45,312,429	\$ 2,430,654,308	\$ 61,177,499,289
(b) Additional and DC Annuities	180,915	57,999,664	0	0	58,180,579
(c) Total Retiree Assets	\$ 24,552,660,516	\$ 34,207,052,615	\$ 45,312,429	\$ 2,430,654,308	\$ 61,235,679,868
(4) Subtotal: (1)(d) + (2)(b) + (3)(c)	\$ 31,088,081,624	\$ 46,363,377,554	\$ 36,497,453	\$ 3,812,722,736	\$ 81,300,679,367
(5) Assets Held for Upcoming Year Budget Allocated According to (4)	48,420,413	72,227,328	57,260	5,981,693	126,686,694
(6) Total Employer + Employee Defined Benefit Assets: (4)+(5)	\$ 31,136,502,037	\$ 46,435,604,882	\$ 36,554,713	\$ 3,818,704,429	\$ 81,427,366,061
(7) Market Value Adjustment Allocated According to (6)	1,093,514,352	1,630,784,209	1,283,081	134,037,633	2,859,619,275
(8) Funding Value of Defined Benefit Assets (6)+(7)	\$ 32,230,016,389	\$ 48,066,389,091	\$ 37,837,794	\$ 3,952,742,062	\$ 84,286,985,336

Allocation of Funding Value of Assets Among Divisions

December 31, 2018

Traditional Plan

	Traditional Plan				
	State	Local	Public Safety	Law Enforcement	Total
(1) Employer Accumulation Fund (EAF)					
(a) Allocated Amounts	\$ 770,467,951	\$ 3,325,620,089	\$ (12,153,792)	\$ 658,563,112	\$ 4,742,497,360
(b) Unallocated Amounts Allocated by (1)(a)	8,548,548	36,898,645	(134,850)	7,306,934	52,619,277
(c) OPERS Directed Asset Reallocation	0	0	0	0	0
(d) Total EAF (1)(a) + (1)(b) + (1)(c)	<u>\$ 779,016,499</u>	<u>\$ 3,362,518,734</u>	<u>\$ (12,288,642)</u>	<u>\$ 665,870,046</u>	<u>\$ 4,795,116,637</u>
(2) Employee Savings Fund (ESF)					
(a) Total Member Deposits	\$ 5,890,064,851	\$ 9,024,398,435	\$ 3,688,818	\$ 760,558,281	\$ 15,678,710,385
(b) ESF Allocated by (2)(a)	\$ 5,546,524,207	\$ 8,498,046,395	\$ 3,473,666	\$ 716,198,382	\$ 14,764,242,650
(3) Retired Assets					
(a) Allocated Amounts	\$ 24,537,380,922	\$ 34,119,030,835	\$ 45,312,429	\$ 2,430,654,308	\$ 61,132,378,494
(b) Additional Annuities	180,915	57,999,664	0	0	58,180,579
(c) Total Retiree Assets	<u>\$ 24,537,561,837</u>	<u>\$ 34,177,030,499</u>	<u>\$ 45,312,429</u>	<u>\$ 2,430,654,308</u>	<u>\$ 61,190,559,073</u>
(4) Subtotal: (1)(d) + (2)(b) + (3)(c)	<u>\$ 30,863,102,543</u>	<u>\$ 46,037,595,628</u>	<u>\$ 36,497,453</u>	<u>\$ 3,812,722,736</u>	<u>\$ 80,749,918,360</u>
(5) Assets Held for Upcoming Year Budget Allocated According to (4)	48,420,413	72,227,328	57,260	5,981,693	126,686,694
(6) Total Employer + Employee Defined Benefit Assets: (4)+(5)	<u>\$ 30,911,522,956</u>	<u>\$ 46,109,822,956</u>	<u>\$ 36,554,713</u>	<u>\$ 3,818,704,429</u>	<u>\$ 80,876,605,054</u>
(7) Market Value Adjustment Allocated According to (6)	1,085,003,424	1,618,468,165	1,283,081	134,037,633	2,838,792,303
(8) Funding Value of Defined Benefit Assets (6)+(7)	<u>\$ 31,996,526,380</u>	<u>\$ 47,728,291,121</u>	<u>\$ 37,837,794</u>	<u>\$ 3,952,742,062</u>	<u>\$ 83,715,397,357</u>

Allocation of Funding Value of Assets Among Divisions

December 31, 2018

Combined Plan

	Combined Plan				
	State	Local	Public Safety	Law Enforcement	Total
(1) Employer Accumulation Fund					
(a) Allocated Amounts	\$ 207,450,531	\$ 292,470,248	\$0	\$0	\$ 499,920,779
(b) Unallocated Amounts Allocated by (1)(a)	25,602	36,096	0	0	61,698
(c) OPERS Directed Asset Reallocation	0	0	0	0	0
(d) Total EAF (1)(a) + (1)(b) + (1)(c)	<u>\$ 207,476,133</u>	<u>\$ 292,506,344</u>	<u>\$0</u>	<u>\$0</u>	<u>\$ 499,982,477</u>
(2) Employee Savings Fund					
(a) Total Member Deposits	\$ 664,593	\$ 1,028,557	\$0	\$0	\$ 1,693,149
(b) ESF Allocated by (2)(a)	\$ 1,311,802	\$ 2,030,211	\$0	\$0	\$ 3,342,013
(3) Retired Assets					
(a) Allocated Amounts	\$ 9,193,317	\$ 18,982,772	\$0	\$0	\$ 28,176,089
(b) DC Annuities	0	0	0	0	0
(c) Total Retiree Assets	<u>\$ 9,193,317</u>	<u>\$ 18,982,772</u>	<u>\$0</u>	<u>\$0</u>	<u>\$ 28,176,089</u>
(4) Subtotal: (1)(d) + (2)(b) + (3)(c)	<u>\$ 217,981,252</u>	<u>\$ 313,519,327</u>	<u>\$0</u>	<u>\$0</u>	<u>\$ 531,500,579</u>
(5) Assets Held for Upcoming Year Budget Allocated According to (4)	0	0	0	0	0
(6) Total Employer + Employee Defined Benefit Assets: (4)+(5)	<u>\$ 217,981,252</u>	<u>\$ 313,519,327</u>	<u>\$0</u>	<u>\$0</u>	<u>\$ 531,500,579</u>
(7) Market Value Adjustment Allocated According to (6)	8,272,445	11,898,140	0	0	20,170,585
(8) Funding Value of Defined Benefit Assets (6)+(7)	<u>\$ 226,253,697</u>	<u>\$ 325,417,467</u>	<u>\$0</u>	<u>\$0</u>	<u>\$ 551,671,164</u>

Allocation of Funding Value of Assets Among Divisions

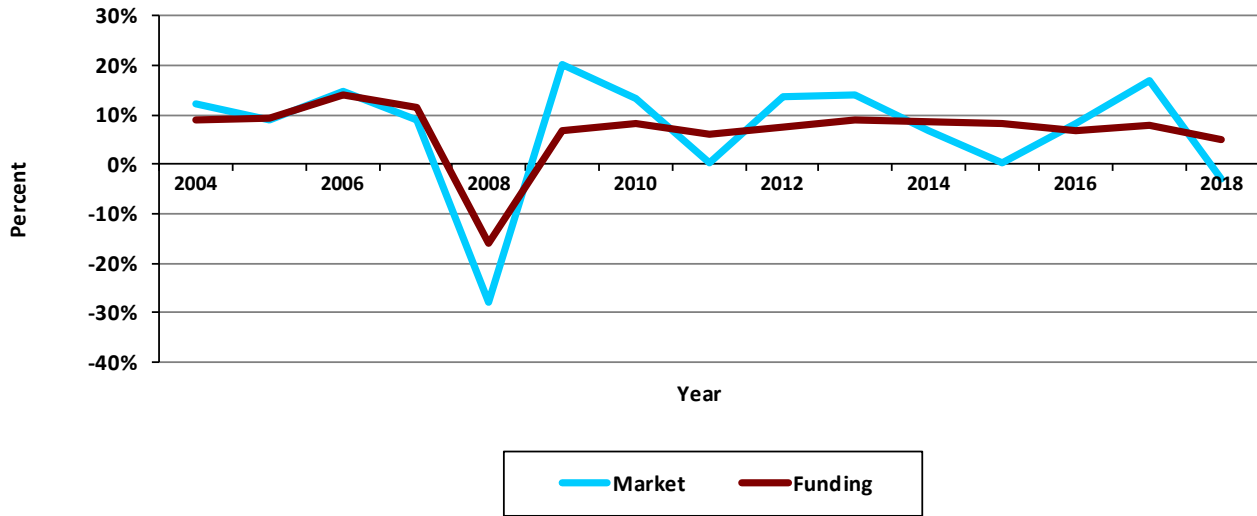
December 31, 2018

Member Directed Plan

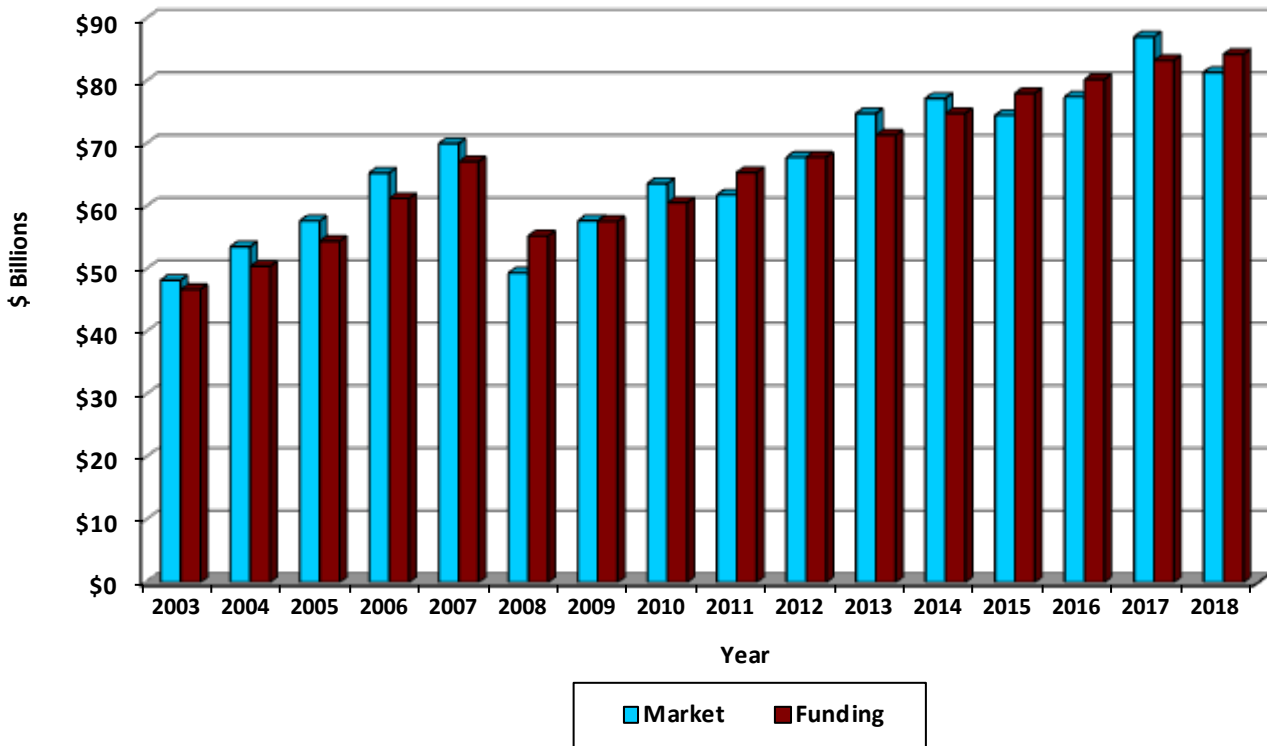
	Member-Directed Plan				Total
	State	Local	Public Safety	Law Enforcement	
(1) Employer Accumulation Fund					
(a) Allocated Amounts	\$ 1,070,225	\$ 1,157,535	\$0	\$0	\$ 2,227,760
(b) Unallocated Amounts Allocated by 1(a)	(3,261)	(3,527)	0	0	(6,788)
(c) OPERS Directed Asset Reallocation	0	0	0	0	0
(d) Total EAF (1)(a) + (1)(b) + (1)(c)	\$ 1,066,964	\$ 1,154,008	\$0	\$0	\$ 2,220,972
(2) Employee Savings Fund					
(a) Total Member Deposits	\$ (209,405)	\$ (568,592)	\$0	\$0	\$ (777,997)
(b) ESF Allocated by (2)(a)	\$ 25,503	\$ 69,247	\$0	\$0	\$ 94,750
(3) Retired Assets					
(a) Allocated Amounts	\$ 5,905,362	\$ 11,039,344	\$0	\$0	\$ 16,944,706
(b) No Division	0	0	0	0	0
(c) Total Retiree Assets	\$ 5,905,362	\$ 11,039,344	\$0	\$0	\$ 16,944,706
(4) Subtotal: (1)(d) + (2)(b) + (3)(c)	\$ 6,997,829	\$ 12,262,599	\$0	\$0	\$ 19,260,428
(5) Assets Held for Upcoming Year Budget Allocated According to (4)	0	0	0	0	0
(6) Total Employer + Employee Defined Benefit Assets: (4)+(5)	\$ 6,997,829	\$ 12,262,599	\$0	\$0	\$ 19,260,428

Comparison of Defined Benefit Pension Assets

Comparison of Rates of Return



Comparison of Defined Benefit Pension Asset Values



SECTION III

BENEFITS AND CONDITIONS EVALUATED

Benefits and Conditions Evaluated

Plans

Traditional Pension Plan. The Traditional Pension Plan is a defined benefit plan under which a member's retirement benefit is based on a formula. The formula is determined by years of contributing service and the average of the three (or five if a member of Group C as defined on page III-4) highest years of earnable salary (or final average salary). OPERS investment professionals manage the investment of employee and employer contributions to ensure that funds are available to pay the formula benefit.

Combined Plan. The Combined Plan is a retirement plan with both a defined benefit and a defined contribution component. Under the defined benefit portion of the Combined Plan, the member's benefit is determined by a reduced formula (similar to the Traditional Pension Plan). OPERS investment professionals manage the investment of employer contributions to ensure that funds are available to pay the reduced formula benefit. Under the defined contribution portion of the Combined Plan, employee contributions are deposited into the member's individual defined contribution account and invested as directed by the member. The member's retirement benefit under this portion of the Combined Plan is based on employee contributions and the gains and losses on those contributions. The member directs the investment by selecting from among the nine professionally-managed OPERS Investment Options.

Member-Directed Plan. The Member-Directed Plan is a defined contribution plan under which employee and employer contributions are deposited into a member's individual defined contribution account and invested as directed by the member. The member's retirement benefit is based on employee and employer contributions and the gains and losses on those contributions. Under the Member-Directed Plan, the member directs the investment by selecting from several professionally-managed OPERS Investment Options.

Benefits and Conditions Evaluated

Terms

Final Average Salary (“FAS”) means the average of the annual earnings for the 3 highest calendar years of compensation for Transition Group A and B members. The highest 5 calendar years is used for Transition Group C members.

Participant Contribution Account is the account for each Participant in the Combined or Member-Directed Plan to which shall be credited the employee contributions.

Miscellaneous Contribution Account is the account to which shall be credited any voluntary after-tax contributions for members in the Combined and Member-Directed Plans.

Rollover Account is the account to which shall be credited any rollover amounts for members in the Combined or Member-Directed Plans.

Employers’ Accumulation Fund is the fund to which shall be credited employer contributions for members in the Traditional or Combined Plan. There are separate accounts in the Employers’ Accumulation Fund for the Combined Plan and the Traditional Pension Plan.

Employer Contribution Account is the fund to which shall be credited a portion of the employer contributions for members in the Member-Directed Plan.

Contributions

Member Contributions. Member contribution rates as a % of earnable salary are presented on page III-3.

Employer Contributions. Each employer contributes the remaining amounts necessary to finance OPERS benefits. Employer contributions are expressed as percents of member-covered payroll. The maximum statutory rate for state and local government employers is 14.0%. The maximum statutory rate for law enforcement employers is 18.1% (H.B. 416, effective 1/1/2001).

Benefits and Conditions Evaluated

Contributions (Concluded)

Health Care Preservation Plan (HCPP). The following table shows total scheduled employer contribution rates (includes contributions for both the pension and retiree health programs):

Year	State	Local Government	Law Enforcement	Public Safety
2019 and Thereafter	14.00%	14.00%	18.10%	18.10%

The portion of the above employer contribution rates scheduled to be allocated to the retiree health program are as follows:

Year	All Divisions
2019 and Thereafter	0.0%

Health care funding portion of contribution rates are according to the Board adopted schedule.

Member contribution rates scheduled to be allocated to the pension program are as follows:

Year	State	Local Government	Law Enforcement	Public Safety
2019 and Thereafter	10.00%	10.00%	13.00%	12.00%

Senate Bill 343

Senate Bill 343. Senate Bill (SB) 343 became effective January 7, 2013. The benefit changes enacted by SB 343 do not apply to members who retired with an effective date of January 1, 2013 or earlier. The benefit provisions enumerated on pages III-9 through the end of Section III are the provisions that were applicable prior to the enactment of SB 343. Changes to the benefit provisions resulting from Senate Bill 343 are enumerated on pages III-4 through III-8.

Transition Groups. A transition plan was developed as part of the SB 343 benefit changes. The transition group to which a member belongs is dependent upon the date at which that member is first eligible to retire with a reduced or unreduced benefit.

A member is in Group A if the member is eligible to retire under the retirement eligibility conditions in place prior to the passage of SB 343 on or before January 7, 2018.

A member is in Group B if the member is not in Group A and satisfies either of the following conditions:

- (1) The member has 20 years of service credit as of January 7, 2013, or
- (2) The member is eligible to retire under the retirement eligibility conditions in place prior to the passage of SB 343 on or before January 7, 2023.

A member is in Group C if the member satisfies either of the following conditions:

- (1) The member was hired prior to January 7, 2013 but was not in Group A or Group B, or
- (2) The member was hired on or after January 7, 2013.

Key Benefit Changes. There are five key components that were affected by SB 343:

- (1) Age and service retirement eligibility conditions,
- (2) Benefit formula,
- (3) Cost-of-living Allowance (COLA),
- (4) Final Average Salary (FAS) period, and
- (5) Early retirement reduction factors

Senate Bill 343

Key Benefit Changes for Transition Group A

COLAs. COLAs provided up to December 31, 2018 will be based upon a simple (i.e., not compound), 3 percent COLA. COLAs provided after December 31, 2018 continue to be simple, but the simple COLA percentage applicable in a year will be based upon the annual percentage change in the Consumer Price Index (CPI), but not greater than 3%.

Key Benefit Changes for Transition Group B

Retirement Eligibility. The table below shows retirement eligibility conditions for Group B members:

Valuation Group	Unreduced		Reduced	
	Age	Service	Age	Service
State / Local Government	52	31	55	25
	Any	32		
	66	5	60	5
Law Enforcement	50	25	48	25
	64	15	52	15
Public Safety	54	25	48	25
	64	15	52	15

Early Retirement Reduction Factors. Presented below are the reduction factors, expressed as a percentage of the base amount, applicable to a Group B member who retires with a reduced benefit:

State and Local Government:

Service	Ages											
	55	56	57	58	59	60	61	62	63	64	65	
30	75%	76%	78%	79%	80%	82%	83%	85%	86%	88%	89%	
29	69	70	72	73	74	75	76	78	79	80	89	
28	64	65	66	67	68	69	70	71	72	80	89	
27	59	60	61	62	62	63	64	65	72	80	89	
26	55	55	56	57	57	58	59	65	72	80	89	
25	50	51	51	52	52	53	59	65	72	80	89	
24 & Under						53	59	65	72	80	89	

Senate Bill 343

Law Enforcement and Public Safety:

Law Enforcement		Public Safety	
Age	Factor	Age	Factor
48	84%	48	58%
49	92	49	64
50	100	50	70
		51	76
		52	83
		53	91
		54	100

COLAs. COLAs continue to be simple (i.e., not compound), but the simple COLA percentage applicable in a year will be based upon the annual percentage change in the June to June Consumer Price Index (CPI-W), but not greater than 3%.

Key Benefit Changes for Transition Group C

Retirement Eligibility. The table below shows retirement eligibility conditions for Group C members:

Valuation Group	Unreduced		Reduced	
	Age	Service	Age	Service
State / Local Government	55	32	57	25
	67	5	62	5
Law Enforcement	52	25	48	25
	64	15	56	15
Public Safety	56	25	52	25
	64	15	56	15

Senate Bill 343

Early Retirement Reduction Factors. Presented below are the reduction factors, expressed as a percentage of the base amount, applicable to a Group C member that retires with a reduced benefit:

State and Local Government:

Service	Ages									
	57	58	59	60	61	62	63	64	65	66
31	80%	80%	81%	82%	83%	85%	86%	87%	88%	89%
30	73	74	75	75	76	77	78	79	80	89
29	67	68	68	69	70	70	71	72	80	89
28	61	62	62	63	63	64	64	72	80	89
27	56	57	57	57	58	58	64	72	80	89
26	51	52	52	52	52	58	64	72	80	89
25	47	47	47	47	52	58	64	72	80	89
24 & Under						58	64	72	80	89

Law Enforcement and Public Safety:

Law Enforcement		Public Safety	
Age	Factor	Age	Factor
48	70%	52	69%
49	76	53	76
50	84	54	83
51	91	55	91
52	100	56	100

COLAs. COLAs continue to be simple (i.e., not compound), but the simple COLA percentage applicable in a year will be based upon the annual percentage change in the June to June Consumer Price Index (CPI-W), but not greater than 3%.

Senate Bill 343

FAS Period. Final average salary is based on the average of the annual earnings for the 5 highest calendar years of compensation.

Benefit Formula. Service breakpoint for the 2.50% benefit multiplier in the Traditional Plan or 1.25% benefit multiplier in the Combined Plan for State and Local Government members increased from 30 years to 35 years.

Other Benefit Changes for All Transition Groups

Minimum Benefit. The \$86 minimum benefit provision has been eliminated.

Long Interest Calculation. The minimum allowance calculation based upon twice the member's savings funding balance at retirement together with interest credits, annuitized with unisex factors that reflect plan interest and mortality assumptions, but not the plan's COLA, has been eliminated.

Disability Program. The definition of disability was changed to a more restrictive definition which is expected to result in a reduction in future disability cases.

Traditional Pension Plan – Pre Senate Bill 343

Age & Service Benefits - State and Local Government Members

Age and service eligibility. A member who (i) has attained age 60 years and has 5 or more years of service credit or 60 contributing months, or (ii) has attained age 55 years and has 25 or more years of service credit, or (iii) has 30 or more years of service credit, may retire with an age and service retirement allowance.

Age and service allowance. A retiring member’s age and service allowance is equal to Ohio service credit times the greater of \$86, or 2.2% of FAS for the first 30 years of service plus 2.5% for years of service over 30 years (H.B. 628). The allowance is then adjusted by factors based on attained age or years of service (whichever yields the higher percentage) as determined in the following schedule:

Attained Age	OR	Years of Service Credit	Percentage of Base Amount
58		25	75%
59		26	80
60		27	85
61		N/A	88
N/A		28	90
62		N/A	91
63		N/A	94
N/A		29	95
64		N/A	97
65		30 or more	100

Maximum allowance is 100% of FAS or the limits under IRC Section 415(b). Minimum allowance is based upon twice the member’s savings funding balance at retirement together with interest credits, annuitized with unisex factors that reflect plan interest and mortality assumptions, but not the plan’s COLA.

Traditional Pension Plan – Pre Senate Bill 343

Age & Service Benefits – Law Members (Public Safety) Eligible to Retire under Ohio Revised Code Section 145.33(B)(2)(b)

Age and service eligibility. A law member whose secondary duties are to preserve the peace, to protect life and property, and to enforce the laws of the state and who (i) has attained age 52 and has 25 or more years of credited service, or (ii) has attained age 62 and has 15 or more years of credited service, or (iii) has attained age 52 and has 15 or more years of credited service, may retire with an age and service allowance. A member covered by these provisions may retire early at age 48 with 25 or more years of service and receive the following percentage of the base benefit: 75%, 80%, 86%, or 93% at retirement ages 48, 49, 50 and 51 respectively.

Age and service allowance. A retiring member's age and service allowance under eligibility (i) or (ii) above is equal to 2.5% of FAS times the first 25 years of service credit plus 2.1% of FAS times service credit in excess of 25 years (H.B. 628). Maximum allowance is 90% of FAS or the limits under IRC Section 415(b). A retiring member's age and service allowance under eligibility (iii) above is equal to 1.5% of FAS times years of service credit. Minimum allowance for all law members is based upon twice the member's savings fund balance at retirement together with interest credits.

Age & Service Benefits - Law Members (Law Enforcement) Eligible to Retire under Ohio Revised Code Section 145.33(B)(2)(a)

Age and service eligibility. A law member whose primary duties are to preserve the peace, to protect life and property, and to enforce the laws of the state and who (i) has attained age 48 and has 25 or more years of credited service, or (ii) has attained age 62 and has 15 or more years of credited service, or (iii) has attained age 52 and has 15 or more years of credited service, may retire with an age and service allowance.

Age and service allowance. A retiring member's age and service allowance under eligibility (i) or (ii) above is equal to 2.5% of FAS times the first 25 years of service credit plus 2.1% of FAS times service credit in excess of 25 years (H.B. 628). Maximum allowance is 90% of FAS or the limits under IRC Section 415(b). A retiring member's age and service allowance under eligibility (iii) above is equal to 1.5% of FAS times years of service credit. Minimum allowance for all law members is based upon twice the member's savings fund balance at retirement together with interest credits.

Traditional Pension Plan – Pre Senate Bill 343

Disability Retirement

The disability program was revised in 1992, in order to comply with the Older Workers Benefit Protection Act. Employees becoming members after July 29, 1992 are covered by the post July 29, 1992 program. Other members were able to elect coverage under the pre July 29, 1992 program (original plan) or elect to be covered by the post July 29, 1992 program (revised plan).

Features of the original plan are:

- a) Upon becoming permanently disabled after completion of at least 5 years or 60 contributing months of service but before attaining age 60, a member is eligible for a disability allowance. The service requirement is waived for Law Enforcement members with an on-duty illness or injury.
- b) The amount of the allowance is the service the member would have had if employment had continued to age 60 times (i) 2.2% of FAS (H.B. 628), or (ii) \$86, whichever produces the greater benefit.
- c) Maximum allowance is 75% of FAS, minimum allowance is 30% of FAS.

Features of the revised plan are:

- a) A member may apply at any age after completion of 5 years or 60 contributing months of service. The service requirement is waived for Law Enforcement members with an on-duty illness or injury.
- b) A disability benefit equal to the greater of 45% of FAS or the actual service credit times 2.2% of FAS (H.B. 628) with no early retirement reduction (maximum 60% of FAS). The disability benefit period is to age 65 if the member is disabled prior to age 60. The benefit period declines gradually from 60 months for members disabled at ages 60 and 61, to 12 months for members disabled at age 69 or older.
- c) After the disability benefit ends, a service retirement benefit equal to the greater of (i) the accrued benefit based on actual service, or (ii) 2.2% of FAS (H.B. 628) times service credit including the period of disability (maximum 45% of FAS). In addition, an amount equal to the cost-of-living increases the member would have received had the member retired on the basis of age and service is paid.

Traditional Pension Plan – Pre Senate Bill 343

Survivor Benefits

Death while eligible to retire. If a member dies in service after becoming eligible to retire with an age and service allowance and leaves a surviving spouse or other sole dependent beneficiary, the survivor receives the same amount that would have been paid had the member retired the last day of the month of death and elected the 100% joint and survivor form of payment.

Survivor (death-in-service) allowances. If a deceased member had at least 1-1/2 years of contributing service credit, with at least 1/4 year of such service occurring within the 2-1/2 years prior to death, or was receiving a disability benefit, qualified survivors may receive the following monthly benefits. The benefit paid will be the greater of the applicable benefits paid under the following two schedules (H.B. 628):

Schedule 1

Number of Qualified Survivors Affecting the Benefit	Annual Benefit as a % of Deceased Member's FAS	Minimum Monthly Benefit
1	25%	\$250
2	40%	\$400
3	50%	\$500
4	55%	\$500
5 or more	60%	\$500

Schedule 2

Years of Service	Annual Benefit as a % of Deceased Member's FAS
20	29%
21	33%
22	37%
23	41%
24	45%
25	48%
26	51%
27	54%
28	57%
29 or more	60%

Qualifying survivors who are paid benefits under Schedule 2 share equally in the benefits, except that if there is a surviving spouse, the spouse receives the greater of 25% of FAS or \$250.

Traditional Pension Plan – Pre Senate Bill 343

A **qualified spouse** is the surviving spouse of a deceased member who is age 62 or at any age if the deceased member had 10 or more years of Ohio service credit or if the surviving spouse is caring for a qualified child or is adjudged physically or mentally incompetent.

A **qualified child** is a child who has never been married and under the age of 18 (or 22 if attending an approved school), or regardless of age is adjudged physically or mentally incompetent at the time of the member's death.

A **qualified parent** is a dependent parent aged 65 or older (earlier if mentally or physically incompetent) who received at least one-half support from the member during the 12-month period immediately preceding the member's death.

Qualified **survivors of disability benefit recipients** have the FAS used in calculating their benefits adjusted for each year between the effective date of the disability benefit and the recipient's date of death. The FAS is adjusted by the lesser of (1) 3% or (2) the actual average percentage change in the CPI.

Benefits at Retirement

Optional Benefit Forms. Retiring members may elect to have benefits paid in straight life form, in a form that guarantees a minimum number of monthly payments, or in a form that provides a continuation of all or a portion of the monthly benefit to a beneficiary after the death of the retiree. If a retiring member elects benefits in other than straight life form, the monthly amount is adjusted. The adjustment is based upon interest, COLA, and mortality assumptions (with a blend of male and female mortality rates to produce unisex election factors consistent with the gender distribution of members electing optional forms of payment).

Traditional Pension Plan – Pre Senate Bill 343

PLOP. Effective 01/01/2004, retiring members may also elect to receive a Partial Lump Sum Option Payment (PLOP) (S.B.247). The PLOP is an option that allows a retiree to initially receive a partial lump sum benefit payment along with a reduced monthly retirement allowance. The lump sum payment cannot be less than 6 times or more than 36 times the monthly amount that would be payable to the member under the plan of payment selected and shall not result in a monthly allowance that is less than 50% of the monthly benefit. The total amount paid as a lump sum and monthly benefit shall be the actuarial equivalent of the amount that would have been paid had the lump sum not been selected.

QEBA. Qualified Excess Benefit Arrangement was established 01/01/2004 (H.B.190). The QEBA is operated in accordance with Internal Revenue Code Section 415(m). Under this arrangement the recipient may be paid the portion of his/her retirement benefit that was previously limited due to IRC Section 415(b).

Post-retirement increases. Each July after June 30, 1971 or the annual anniversary established 12 months after the initial date of retirement, each allowance is increased by 3.0% of the corresponding base allowance, except that no allowance shall exceed the limits established by Section 415 of the Internal Revenue Code.

Post-retirement death benefit. Upon the death of an age and service or disability retiree, a death benefit in the following amount is payable:

Service Credit at Retirement	Amount of Death Benefit
5 to 9 years	\$ 500
10 to 14 years	1,000
15 to 19 years	1,500
20 to 24 years	2,000
25 or more years	2,500

Deferred benefits. A member with at least 5 years of service credit who leaves service before being eligible for an immediate allowance and who does not withdraw accumulated contributions will be entitled to a deferred allowance at age 60. For law members, the age at which benefits commence depends on the amount of service credit. The amount of the allowance will be based on credited service and final average salary at time of leaving service.

Traditional Pension Plan – Pre Senate Bill 343

Refund of Members Accumulated Contributions

In the event a member leaves service prior to retirement, the member may elect to receive a refund of contributions with interest and may be eligible to receive an additional amount as described below. These refund provisions are available to all members. If a member dies prior to retirement and survivor benefits are not payable, the member's contributions with interest are paid to a designated beneficiary or other survivor. Interest is credited annually to member contribution balances. The rate of interest credited is determined by the OPERS Board and will not be greater than 6%. At the present time, 1% interest is credited to member contribution balances.

If the member has, or had at the time of death, at least 5 years but less than 10 years of qualified service, an additional 33% of the member's eligible contributions will be paid to the member or survivor. If the member has, or had at the time of death, at least 10 years of qualified service credit, an additional 67% of the member's eligible contributions will be paid to the member or survivor. The additional amount is not paid if the member is a re-employed retiree, or in the case of a deceased member, was receiving disability benefits at the time of death.

Supplemental Benefits

Health Care Coverage. Health care coverage is available to persons meeting retiree health care eligibility requirements. Members retiring with a normal or early service retirement allowance after January 1, 2015 must have 20 or more years of qualified service credit to be eligible for this benefit.

Traditional Pension Plan – Pre Senate Bill 343

Additional Annuity Program

The additional annuity program provides Traditional Plan and re-employed retiree members the opportunity of supplementing their retirement income. Members make additional contributions (independent of the contributions described on page III-2) to an account that earns investment income based upon the return of the OPERS Stable Value Fund. At termination, the member may take the additional annuity account balance either as a lump sum or annuitized in monthly payments.

Re-Employed Retirees

Re-employed age and service retirees contribute to the “Money Purchase Plan”. In most instances, re-employed retirees will continue to receive their retirement allowance during re-employment. Upon termination of re-employment, members are eligible to apply for either a refund of contributions prior to age 65 or a Money Purchase Plan benefit as a lump sum or annuity after age 65. The Money Purchase Plan benefit is equal to member contributions and allowable interest plus an additional 67% matching amount. If monthly benefits are elected, joint and survivor options are also available.

Combined Plan – Pre Senate Bill 343

Age & Service Benefits - State and Local Government Members*

Eligibility. A member who (i) has attained age 60 years and has 5 or more years of service credit in the Plan or 60 contributing months in the Plan, or (ii) has attained age 55 years and has 25 or more years of service credit, or (iii) has 30 or more years of service credit, may retire under the Combined Plan with an age and service retirement allowance under the defined benefit portion of the Plan and with a retirement benefit under the defined contribution portion of the Plan.

**Law Enforcement and Public Safety members must contribute to the Traditional Pension Plan only.*

Age and service retirement allowance (Defined Benefit portion of the Plan). A retiring member’s age and service retirement allowance is equal to Ohio service credit in the Plan times 1.0% of FAS for the first 30 years of service plus 1.25% for years of service over 30 years. The allowance is then adjusted by factors based on attained age or years of service (whichever yields the higher percentage) as determined in the following schedule:

Attained Age	OR	Years of Service Credit	Percentage of Base Amount
58		25	75%
59		26	80
60		27	85
61		N/A	88
N/A		28	90
62		N/A	91
63		N/A	94
N/A		29	95
64		N/A	97
65		30 or more	100

Maximum allowance is 100% of FAS or the limits under IRC Section 415(b).

Retirement benefit (Defined Contribution portion of the Plan). The member’s retirement benefit under this portion of the Combined Plan is based on the amounts credited to the Participant Contribution Account, Rollover Account, and Miscellaneous Account and the gains and losses on the amounts in those Accounts.

Combined Plan – Pre Senate Bill 343

Disability Retirement

A Combined Plan member may apply after completion of 5 years in the Plan or 60 contributing months of service in the Plan. Combined Plan members may be covered under the original or revised disability plan. Combined Plan members who apply for disability may:

- 1) Take a lump sum distribution of the Participant Contribution Account, Rollover Account, and Miscellaneous Account and any additional amount they are entitled to from the Employers' Accumulation Fund, or
- 2) Transfer all service credit and the Participant's Accounts (as listed above) in the Combined Plan to the Traditional Pension Plan to be paid a disability benefit under the Traditional Pension Plan guidelines.

Survivor Benefits

Combined Plan members are eligible for the same survivor benefits as those listed under the Traditional Pension Plan and must qualify for survivor benefits under the same guidelines as those members in the Traditional Pension Plan.

Benefits at Retirement

Optional Benefit Forms under the Defined Benefit portion of the Plan. Retiring members may elect to have their age and service retirement allowance in straight life form, in a form that guarantees a minimum number of monthly payments, or in a form that provides a continuation of all or a portion of the monthly benefit to a beneficiary after the death of the retiree. If a retiring member elects benefits in other than straight life form, the monthly amount is adjusted. The adjustment is based upon interest, COLA, and mortality assumptions (with a blend of male and female mortality rates to produce unisex election factors consistent with the gender distribution of members electing optional forms of payment).

Combined Plan – Pre Senate Bill 343

Optional Benefit Forms under the Defined Contribution portion of the Plan. Retiring members may elect to have retirement benefits paid in a partial lump sum, subject to any rules adopted by the Board; monthly annuity payments (with joint and survivor options) similar to those offered under the defined benefit portion of the Plan; periodic payments over a period certain; periodic payments of a specific monthly amount; payments with a deferred start date; or a combination of these options.

QEBA. Qualified Excess Benefit Arrangement was established 01/01/2004 (H.B.190). The QEBA is operated in accordance with Internal Revenue Code Section 415(m). Under this arrangement the recipient may be paid the portion of his/her retirement benefit that was previously limited due to IRC Section 415(b). The QEBA is available to Combined Plan members for the age and service retirement allowance under the defined benefit portion of the Plan.

Post-retirement increases. Each July after June 30, 1971 or the annual anniversary established 12 months after the initial date of retirement, each age and service retirement allowance under the defined benefit portion of the plan is increased by 3.0% of the corresponding base allowance, except that no allowance shall exceed the limits established by Section 415 of the Internal Revenue Code.

Post-retirement death benefit. Upon the death of an age and service retiree, a death benefit in the following amount is payable:

Service Credit at Retirement	Amount of Death Benefit
5 to 9 years	\$ 500
10 to 14 years	1,000
15 to 19 years	1,500
20 to 24 years	2,000
25 or more years	2,500

Combined Plan – Pre Senate Bill 343

Refunds and Vesting

A participant in the Combined Plan shall at all times be 100% vested in the Participant Contribution Account, Miscellaneous Contribution Account, and the Rollover Account.

If the member has at least 5 years but less than 10 years of qualified service credit in the Plan, an additional 33% of the member's eligible contributions will be paid from the Employers' Accumulation Fund. If the member has at least 10 years of qualified service credit in the Plan, an additional 67% of the member's eligible contributions will be paid to the member. Amounts paid to purchase service credit earn interest at the same rates as the Traditional Pension Plan and are payable as a refund.

In the event a member leaves service prior to retirement, the member may elect to receive a refund of their Participant Contribution Account, the Rollover Account, the Miscellaneous Account, and any additional amounts they are entitled to from the Employers' Accumulation Fund (as described above).

Supplemental Benefits

Health Care Coverage. Health care coverage is available to persons meeting retiree health care eligibility requirements. Members retiring with a normal or early service retirement allowance after January 1, 2015 must have 20 or more years of qualified service credit to be eligible for this benefit.

Member-Directed Plan

Age & Service Benefits - State and Local Government Members. (Law Enforcement and Public Safety members must contribute to the Traditional Pension Plan Only.)

Eligibility. A participant who has attained age fifty-five (55) may retire under the Member-Directed Plan.

Retirement Benefits. The member's retirement benefit is based on the value of the Participant Contribution Account, the Rollover Account, the Miscellaneous Account, and any vested portion of the Employer Contribution Account.

Disability Retirement

Not available under the Member-Directed Plan. Members may:

- 1) If age fifty-five (55), terminate employment and begin receiving retirement benefits, or
- 2) Take a lump sum distribution of their Participant Contribution Account, Rollover Account, Miscellaneous Account and any vested portion of the Employer Contribution Account.

Survivor Benefits

Not available under the Member-Directed Plan. Survivors must take a lump sum distribution of the member's Participant Contribution Account, Rollover Account, Miscellaneous Account and any vested portion of the Employer Contribution Account.

Benefits at Retirement

Optional Benefit Forms. Retiring members may elect to have retirement benefits paid in a partial lump sum, subject to any rules adopted by the Board; monthly annuity payments (with joint and survivor options) similar to those offered under the defined benefit portion of the Combined Plan; periodic payments over a period certain; periodic payments of a specific monthly amount; payments with a deferred start date; or a combination of these options.

Member-Directed Plan

Refunds and Vesting.

A participant shall at all times be 100% vested in the Participant Contribution Account, Miscellaneous Contribution Account, and the Rollover Account. A participant shall vest in the Employer Contribution Account according to the Participant's attained years of participation in the Plan as follows:

One year of participation	20%
Two years of participation	40%
Three years of participation	60%
Four years of participation	80%
Five years of participation	100%

In the event a member leaves service prior to retirement, the member may elect to receive a refund of their Participant Contribution Account, Rollover Account, and Miscellaneous Account and any vested amounts in the Employer Contribution Account (as described above).

Supplemental Benefits

Health Care Coverage. A portion of the employer contribution for Member-Directed participants is credited to a Retiree Medical Account (RMA). Amounts contributed to the RMA may be used after separation from service and a refund or retirement distribution is made to pay qualified health, dental and vision care expenses. Beginning January 1, 2009, members vest in their RMA based on their attained years of participation in the Plan as follows:

Less than 1 year	0%
1 year	20%
2 years	40%
3 years	60%
4 years	80%
5 years	100%

Sample Benefit Computation – Traditional Plan State or Local Member (Transition Group A) - Normal Retirement Retiring December 31, 2018 Under Benefit Provisions Evaluated

Data:

A.	<u>\$32,000</u>	Final Average Earnings
B.	<u>33</u>	Years of Credited Service
C.	<u>59</u>	Age of Retiree
D.	<u>56</u>	Age of Spouse
E.	<u>100%</u>	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)

Computations:

F.	Formula Benefit: $(0.022 \times 30 \text{ years} + 0.025 \times 3 \text{ years}) \times \$32,000 =$	\$ 23,520
G.	Reduction for Line E Election: $\# (1 - 0.84697) \times (F) =$	<u>3,599</u>
H.	Benefit Payable to Retiree while Spouse is Alive: $(F) - (G) =$	19,921
I.	Benefit Payable to Spouse after Retiree's Death	19,921
J.	Benefit Payable to Retiree after Spouse's Death	23,520

Projected Benefits:*

Year Ended December 31,	Retiree's Benefit (Both Alive)	Spouse's Benefit (After Retiree's Death)	Retiree's Benefit (After Spouse's Death)
2019	\$ 19,921	\$ 19,921	\$ 23,520
2020	20,519	20,519	24,226
2021	21,116	21,116	24,931
2022	21,714	21,714	25,637
2023	22,312	22,312	26,342
2024	22,909	22,909	27,048
2025	23,507	23,507	27,754
2026	24,104	24,104	28,459
2027	24,702	24,702	29,165
2028	25,300	25,300	29,870

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.
Based on conversion factors for optional forms of payment in effect December 31, 2018.

Sample Benefit Computation – Traditional Plan State or Local Member (Transition Group A) - Early Retirement Retiring December 31, 2018 Under Benefit Provisions Evaluated

Data:

A.	\$32,000	Final Average Earnings
B.	26	Years of Credited Service
C.	59	Age of Retiree
D.	56	Age of Spouse
E.	100%	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)

Computations:

F. Formula Benefit: $0.022 \times 26 \text{ years} \times \$32,000 =$	\$ 18,304
G. Adjustment Factor for Early Retirement (from schedule)	80%
H. Adjusted Benefit: (F) x (G) =	14,643
I. Reduction for Line E Election: $\# (1 - 0.84697) \times (H) =$	2,241
J. Benefit Payable to Retiree while Spouse is Alive: (H) - (I)	12,402
K. Benefit Payable to Spouse after Retiree's Death	12,402
L. Benefit Payable to Retiree after Spouse's Death	14,643

Projected Benefits:*

Year Ended December 31,	Retiree's Benefit (Both Alive)	Spouse's Benefit (After Retiree's Death)	Retiree's Benefit (After Spouse's Death)
2019	\$ 12,402	\$ 12,402	\$ 14,643
2020	12,774	12,774	15,082
2021	13,146	13,146	15,522
2022	13,518	13,518	15,961
2023	13,890	13,890	16,400
2024	14,263	14,263	16,840
2025	14,635	14,635	17,279
2026	15,007	15,007	17,718
2027	15,379	15,379	18,158
2028	15,751	15,751	18,597

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.

Based on conversion factors for optional forms of payment in effect December 31, 2018.

**Sample Benefit Computation – Traditional Plan
Section 145.33 (B)(2)(b) Public Safety
Member (Transition Group A) - Normal Retirement
Retiring December 31, 2018
Under Benefit Provisions Evaluated**

Data:

A.	<u>\$38,000</u>	Final Average Earnings
B.	<u>28</u>	Years of Credited Service
C.	<u>49</u>	Age of Retiree
D.	<u>46</u>	Age of Spouse
E.	<u>100%</u>	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)

Computations:

F.	Formula Benefit: $(0.025 \times 25 \text{ years} + 0.021 \times 3 \text{ years}) \times \$38,000 \times 80\% =$	\$ 20,915
G.	Reduction for Line E Election: $\# (1 - 0.89936) \times (F) =$	<u>2,105</u>
H.	Benefit Payable to Retiree while Spouse is Alive: $(F) - (G) =$	18,810
I.	Benefit Payable to Spouse after Retiree's Death	18,810
J.	Benefit Payable to Retiree after Spouse's Death	20,915

Projected Benefits:*

<u>Year Ended December 31,</u>	<u>Retiree's Benefit (Both Alive)</u>	<u>Spouse's Benefit (After Retiree's Death)</u>	<u>Retiree's Benefit (After Spouse's Death)</u>
2019	\$ 18,810	\$ 18,810	\$ 20,915
2020	19,374	19,374	21,542
2021	19,939	19,939	22,170
2022	20,503	20,503	22,797
2023	21,067	21,067	23,425
2024	21,632	21,632	24,052
2025	22,196	22,196	24,680
2026	22,760	22,760	25,307
2027	23,324	23,324	25,935
2028	23,889	23,889	26,562

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.

Based on conversion factors for optional forms of payment in effect December 31, 2018.

Sample Benefit Computation – Traditional Plan Section 145.33 (B)(2)(a) Law Enforcement Member (Transition Group A) - Normal Retirement Retiring December 31, 2018 Under Benefit Provisions Evaluated

Data:

A.	\$38,000	Final Average Earnings
B.	28	Years of Credited Service
C.	49	Age of Retiree
D.	46	Age of Spouse
E.	100%	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)

Computations:

F.	Formula Benefit: $(0.025 \times 25 \text{ years} + 0.021 \times 3 \text{ years}) \times \$38,000 =$	\$ 26,144
G.	Reduction for Line E Election: $\# (1 - 0.89936) \times (F) =$	<u>2,631</u>
H.	Benefit Payable to Retiree while Spouse is Alive: $(F) - (G) =$	23,513
I.	Benefit Payable to Spouse after Retiree's Death	23,513
J.	Benefit Payable to Retiree after Spouse's Death	26,144

Projected Benefits:*

Year Ended December 31,	Retiree's Benefit (Both Alive)	Spouse's Benefit (After Retiree's Death)	Retiree's Benefit (After Spouse's Death)
2019	\$ 23,513	\$ 23,513	\$ 26,144
2020	24,218	24,218	26,928
2021	24,924	24,924	27,713
2022	25,629	25,629	28,497
2023	26,335	26,335	29,281
2024	27,040	27,040	30,066
2025	27,745	27,745	30,850
2026	28,451	28,451	31,634
2027	29,156	29,156	32,419
2028	29,862	29,862	33,203

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.

Based on conversion factors for optional forms of payment in effect December 31, 2018.

Sample Benefit Computation – Traditional Plan

State or Local Member (Transition Group C) – Termination Benefit

Terminating December 31, 2018

Under Benefit Provisions Evaluated

Data:

A.	\$32,000	Final Average Earnings
B.	15	Years of Credited Service
C.	45	Age of Member
D.	42	Age of Spouse
E.	62:59	Ages at Which Benefits are Payable
F.	100%	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)
G.	\$44,000	Accumulated Contributions with Interest at Termination Date

Computations:

H.	Formula Benefit: $(0.022 \times 15 \text{ years} + 0.025 \times 0 \text{ years}) \times \$32,000 =$	\$ 10,560
I.	Adjustment Factor for Early Retirement (from schedule)	58%
J.	Adjusted Benefit: $(H) \times (I) =$	6,125
K.	Reduction for Line F Election: $\# (1 - 0.82672) \times (J) =$	<u>1,061</u>
L.	Benefit Payable to Retiree while Spouse is Alive: $(J) - (K) =$	5,064
M.	Benefit Payable to Spouse after Member's Death	5,064
N.	Benefit Payable to Retiree after Spouse's Death	6,125
O.	In lieu of a lifetime benefit, terminee may elect to receive a refund of accumulated contributions with interest plus an additional 67% of eligible accumulated contributions because terminee had more than 10 years of service.	73,480

Projected Benefits:*

Year Ended December 31,	Member's Benefit (Both Alive)	Spouse's Benefit (After Retiree's Death)	Member's Benefit (After Spouse's Death)
2036	\$ 5,064	\$ 5,064	\$ 6,125
2037	5,216	5,216	6,309
2038	5,368	5,368	6,492
2039	5,520	5,520	6,676
2040	5,671	5,671	6,860
2041	5,823	5,823	7,044
2042	5,975	5,975	7,227
2043	6,127	6,127	7,411
2044	6,279	6,279	7,595
2045	6,431	6,431	7,778

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.

Based on conversion factors for optional forms of payment in effect December 31, 2018.

**Sample Benefit Computation – Traditional Plan
Section 145.33 (B)(2)(a) Public Safety/Law Enforcement Member
(Transition Group C) – Termination Benefit
Terminating December 31, 2018
Under Benefit Provisions Evaluated**

Data:

A.	\$38,000	Final Average Earnings
B.	15	Years of Credited Service
C.	37	Age of Member
D.	34	Age of Spouse
E.	56:53	Ages at Which Benefits are Payable
F.	100%	Percentage of Pension to Continue to Spouse after retiree's death (Retiree makes the choice of 100% Joint and Survivor with Pop-Up)
G.	\$46,000	Accumulated Contributions at Termination Date

Computations:

H.	Formula Benefit: $(0.015 \times 15 \text{ years}) \times \$38,000 =$	\$ 8,550
I.	Reduction for Line F Election: $\# (1 - 0.86503) \times (H) =$	<u>1,154</u>
J.	Benefit Payable to Retiree while Spouse is Alive: $(H) - (I) =$	7,396
K.	Benefit Payable to Spouse after Member's Death	7,396
L.	Benefit Payable to Retiree after Spouse's Death	8,550
M.	In lieu of a lifetime benefit, terminee may elect to receive a refund of accumulated contributions with interest plus an additional 67% of eligible accumulated contributions because terminee had more than 10 years of service.	76,820

Projected Benefits:*

Year Ended December 31,	Member's Benefit (Both Alive)	Spouse's Benefit (After Retiree's Death)	Member's Benefit (After Spouse's Death)
2038	\$ 7,396	\$ 7,396	\$ 8,550
2039	7,618	7,618	8,807
2040	7,840	7,840	9,063
2041	8,062	8,062	9,320
2042	8,284	8,284	9,576
2043	8,505	8,505	9,833
2044	8,727	8,727	10,089
2045	8,949	8,949	10,346
2046	9,171	9,171	10,602
2047	9,393	9,393	10,859

* Assumes the annual percentage change in the Consumer Price Index (CPI) is 3% or greater in all future years.

Based on conversion factors for optional forms of payment in effect December 31, 2018.

SECTION IV

RECOMMENDATIONS FOR RESERVE TRANSFERS

December 31, 2018 Retired Life Valuation Reserve Transfers

Reserve transfers from the Employer Accumulation Fund to the A & PR Fund and/or Survivor Benefit Funds are recommended in the following instances.

- Whenever the December 31 valuation shows unfunded accrued liabilities or assets in excess of computed liabilities in any of the retired life funds.
- To cover the cost of ad-hoc postretirement benefit increases.
- To adjust retired life reserves for any changes in computed liabilities resulting from assumption changes.

By making these annual adjustments in addition to the regular transfers when allowances are added to the rolls, the ratio of assets to liabilities for retired members and beneficiaries will stay at 100%. Year to year changes in this ratio before recommended transfers will normally be isolated to mortality experience within the retired life group.

In 1992, OPERS began making interim benefit payments for certain retirements to shorten the delay between the retirement effective date and receipt of the first monthly check. However, reserve transfers are not made until benefit amounts are final. Transfers for these cases have been accrued based upon supplemental information supplied by OPERS staff and are shown on the following page. The accruals, when added to other assets, are intended to put retired life reserves in the same position they would have been in if reserve transfers for the interim benefit cases had been coincident with benefit commencement.

It is recommended that the transfers shown on the following page be made from the Employer Accumulation Fund to the Annuity & Pension Reserve Fund and Survivor Benefit Funds as indicated. The Accrued Transfers is an estimate of pending future transfers for interim cases, and does not require a year end transfer. Any accrued transfers that have been made prior to OPERS' extract date and hence are not included in the "Accrued Transfers" column on pages IV-2 through IV-5 should be netted off the "Other" column on pages IV-2 through IV-5.

Traditional Plan

Reserve Transfers Affecting the Employer Accumulation Fund

December 31, 2018

	Assets Before Transfers	Transfers		Assets After Transfers	Liabilities	Ratio
		Accrued	Other			
State						
A&PR FUND						
SR	\$ 20,968,891,731	\$ 198,488,855	\$ 2,286,600,368	\$ 23,453,980,954	\$ 23,453,980,954	
MP	57,444,075	0	3,985,643	61,429,718	61,429,718	
AA	180,915	0	9,134	190,049	190,049	
JR	214	0	(214)	0	0	
CR	143,827,253	0	36,447,004	180,274,257	180,274,257	
DR	2,113,636,939	883,783	199,412,694	2,313,933,416	2,313,933,416	
BD	612,519,955	4,892,423	60,286,374	677,698,752	677,698,752	
TOTAL A&PR	\$ 23,896,501,082	\$ 204,265,061	\$ 2,586,741,003	\$ 26,687,507,146	\$ 26,687,507,146	100.0%
SBF						
AA	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
S-1	117,551,355	13,236,551	15,550,290	146,338,196	146,338,196	
S-2	523,509,401	18,355,306	55,209,229	597,073,936	597,073,936	
TOTAL SBF	\$ 641,060,756	\$ 31,591,857	\$ 70,759,519	\$ 743,412,132	\$ 743,412,132	100.0%
TOTAL STATE	\$ 24,537,561,838	\$ 235,856,918	\$ 2,657,500,522	\$ 27,430,919,278	\$ 27,430,919,278	100.0%
Local						
A&PR FUND						
SR	\$ 29,409,482,454	\$ 277,122,710	\$ 3,195,113,057	\$ 32,881,718,221	\$ 32,881,718,221	
MP	146,696,366	219,589	11,143,256	158,059,211	158,059,211	
AA	57,999,664	35,190	6,676,893	64,711,747	64,711,747	
JR	9,931	0	(9,931)	0	0	
CR	195,157,729	0	47,674,509	242,832,238	242,832,238	
DR	2,583,863,371	2,006,538	240,016,876	2,825,886,785	2,825,886,785	
BD	733,864,525	7,416,039	45,597,658	786,878,222	786,878,222	
TOTAL A&PR	\$ 33,127,074,040	\$ 286,800,066	\$ 3,546,212,318	\$ 36,960,086,424	\$ 36,960,086,424	100.0%
SBF						
AA	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
S-1	180,545,503	19,541,675	18,694,096	218,781,274	218,781,274	
S-2	869,410,956	24,482,013	88,866,155	982,759,124	982,759,124	
TOTAL SBF	\$ 1,049,956,459	\$ 44,023,688	\$ 107,560,251	\$ 1,201,540,398	\$ 1,201,540,398	100.0%
TOTAL LOCAL	\$ 34,177,030,499	\$ 330,823,754	\$ 3,653,772,569	\$ 38,161,626,822	\$ 38,161,626,822	100.0%

Traditional Plan

Reserve Transfers Affecting the Employer Accumulation Fund

December 31, 2018

	Assets Before Transfers	Transfers		Assets After Transfers	Liabilities	Ratio
		Accrued	Other			
Public Safety						
A&PR FUND						
SR	\$ 9,055,366	\$ 0	\$ 1,007,562	\$ 10,062,928	\$ 10,062,928	
MP	25	0	(25)	0	0	
AA	0	0	0	0	0	
JR	0	0	0	0	0	
CR	353	0	(353)	0	0	
DR	14,186,459	0	1,463,850	15,650,309	15,650,309	
BD	1,901,451	254,381	331,093	2,486,925	2,486,925	
TOTAL A&PR	\$ 25,143,654	\$ 254,381	\$ 2,802,127	\$ 28,200,162	\$ 28,200,162	100.0%
SBF						
AA	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
S-1	1,829,801	1,729,935	(549,015)	3,010,721	3,010,721	
S-2	18,338,974	0	2,957,382	21,296,356	21,296,356	
TOTAL SBF	\$ 20,168,775	\$ 1,729,935	\$ 2,408,367	\$ 24,307,077	\$ 24,307,077	100.0%
TOTAL PUBLIC SAFETY	\$ 45,312,429	\$ 1,984,316	\$ 5,210,494	\$ 52,507,239	\$ 52,507,239	100.0%
Law Enforcement						
A&PR FUND						
SR	\$ 1,680,490,460	\$ 20,179,758	\$ 188,961,535	\$ 1,889,631,753	\$ 1,889,631,753	
MP	0	0	0	0	0	
AA	0	0	0	0	0	
JR	0	0	0	0	0	
CR	1,716,180	0	(58,405)	1,657,775	1,657,775	
DR	551,126,650	0	62,360,703	613,487,353	613,487,353	
BD	141,946,481	875,824	21,753,230	164,575,535	164,575,535	
TOTAL A&PR	\$ 2,375,279,771	\$ 21,055,582	\$ 273,017,063	\$ 2,669,352,416	\$ 2,669,352,416	100.0%
SBF						
AA	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	
S-1	11,985,476	59,388	810,732	12,855,596	12,855,596	
S-2	43,389,061	2,753,272	5,853,472	51,995,805	51,995,805	
TOTAL SBF	\$ 55,374,537	\$ 2,812,660	\$ 6,664,204	\$ 64,851,401	\$ 64,851,401	100.0%
TOTAL LAW ENFORCEMENT	\$ 2,430,654,308	\$ 23,868,242	\$ 279,681,267	\$ 2,734,203,817	\$ 2,734,203,817	100.0%
GRAND TOTAL	\$ 61,190,559,074	\$ 592,533,230	\$ 6,596,164,852	\$ 68,379,257,156	\$ 68,379,257,156	100.0%

Combined Plan
Reserve Transfers Affecting the Employer Accumulation Fund
December 31, 2018

	Assets	Transfers		Assets After	Liabilities	Ratio
	Before Transfers	Accrued	Other	Transfers		
State						
A&PR FUND						
CA	\$ 3,513,277	\$ 0	\$ (79,361)	\$ 3,433,916	\$ 3,433,916	
CA RESERVE FOR FUTURE ADVERSE EXPERIENCE	0	0	79,361	79,361	79,361	
CA TOTAL (DC)	\$ 3,513,277	\$ 0	\$ 0	\$ 3,513,277	\$ 3,513,277	
CB TOTAL (DB)	5,680,039	211,071	638,934	6,530,044	6,530,044	
TOTAL A&PR	\$ 9,193,316	\$ 211,071	\$ 638,934	\$ 10,043,321	\$ 10,043,321	100.0%
TOTAL STATE	\$ 9,193,316	\$ 211,071	\$ 638,934	\$ 10,043,321	\$ 10,043,321	100.0%
Local						
A&PR FUND						
CA	\$ 7,608,148	\$ 0	\$ (361,270)	\$ 7,246,878	\$ 7,246,878	
CA RESERVE FOR FUTURE ADVERSE EXPERIENCE	0	0	361,270	361,270	361,270	
CA TOTAL (DC)	\$ 7,608,148	\$ 0	\$ 0	\$ 7,608,148	\$ 7,608,148	
CB TOTAL (DB)	11,374,625	180,720	1,292,710	12,848,055	12,848,055	
TOTAL A&PR	\$ 18,982,773	\$ 180,720	\$ 1,292,710	\$ 20,456,203	\$ 20,456,203	100.0%
TOTAL LOCAL	\$ 18,982,773	\$ 180,720	\$ 1,292,710	\$ 20,456,203	\$ 20,456,203	100.0%
GRAND TOTAL	\$ 28,176,089	\$ 391,791	\$ 1,931,644	\$ 30,499,524	\$ 30,499,524	100.0%

Member Directed Plan
Reserve Transfers Affecting the Employer Accumulation Fund
December 31, 2018

	Assets Before Transfers	Transfers		Assets After Transfers	Liabilities	Ratio
		Accrued	Other			
State						
A&PR FUND						
MD	\$ 5,905,362	\$ 153,926	\$ (235,603)	\$ 5,823,685	\$ 5,823,685	
RESERVE FOR FUTURE ADVERSE EXPERIENCE*	1,330,950	0	81,677	1,412,627	1,412,627	
TOTAL STATE	\$ 7,236,312	\$ 153,926	\$ (153,926)	\$ 7,236,312	\$ 7,236,312	100.0%
Local						
A&PR FUND						
MD	\$ 11,039,344	\$ 0	\$ 118,910	\$ 11,158,254	\$ 11,158,254	
RESERVE FOR FUTURE ADVERSE EXPERIENCE*	1,641,159	0	(118,910)	1,522,249	1,522,249	
TOTAL LOCAL	\$ 12,680,503	\$ 0	\$ 0	\$ 12,680,503	\$ 12,680,503	100.0%
GRAND TOTAL	\$ 19,916,815	\$ 153,926	\$ (153,926)	\$ 19,916,815	\$ 19,916,815	100.0%

* Includes funds for pending retirements.

SECTION V

STATE DIVISION

STATE DIVISION

Data on active, inactive, retired and money purchase members that was used in the valuation is tabulated briefly below.

Defined Benefit Active Members in Valuation December 31, 2018

Groups	Number	Annual Payroll	Average		
			Pay	Age	Service
Traditional Plan					
Men	44,684	\$ 2,314,670,381	\$ 51,801	42.4 yrs.	10.4 yrs.
Women	54,653	2,697,775,930	49,362	41.6	9.7
Traditional Plan Total	99,337	\$ 5,012,446,311	\$ 50,459	42.0 yrs.	10.1 yrs.
Combined Plan					
Men	1,115	\$ 70,864,524	\$ 63,556	43.8 yrs.	8.6 yrs.
Women	1,713	106,146,620	61,965	43.5	8.1
Combined Plan Total	2,828	\$ 177,011,144	\$ 62,592	43.6 yrs.	8.3 yrs.
Grand Total	102,165	\$ 5,189,457,455	\$ 50,795	42.0 yrs.	10.0 yrs.

Also included in the valuation were 278,300 inactive members and 4,145 members active in the money purchase plan.

Retired Members in Valuation December 31, 2018

Fund/Type of Allowance	Number	Current Monthly Benefits	Actuarial Liabilities
Traditional Plan			
A & PR Fund			
Superannuation Retirement	61,160	\$ 172,073,333	\$ 23,634,445,260
Disability Retirement	8,033	21,439,276	2,991,632,168
Money Purchase	967	499,247	61,429,718
Total A & PR Fund	70,160	\$ 194,011,856	\$ 26,687,507,146
Total SBF	4,518	6,045,459	743,412,132
Traditional Plan Total	74,678	\$ 200,057,315	\$ 27,430,919,278
Combined Plan			
A & PR Fund			
CB (DB)	98	\$ 44,956	\$ 6,530,044
CA (DC)	61	23,847	3,513,277
Total A & PR Fund	159	\$ 68,803	\$ 10,043,321
Combined Plan Total	159	\$ 68,803	\$ 10,043,321
Member Directed Plan			
A & PR Fund	77	\$ 38,910	\$ 5,823,685
Reserve for Future Adverse Experience			1,412,627
Member Directed Plan Total	77	\$ 38,910	\$ 7,236,312
Grand Total	74,914	\$ 200,165,028	\$ 27,448,198,911

STATE DIVISION
Employer Contributions to Support
Defined Benefit Retirement Allowances
Expressed as Percents of Active Member Payroll

Valuation Date December 31	2018			2017
Contributions for	2021			2020
Normal Cost	<u>Traditional Plan</u>	<u>Combined Plan</u>	<u>Traditional and Combined Plans</u>	<u>Traditional and Combined Plans</u>
Age and Service Allowances*	8.32 %	4.64 %	8.20 %	7.76 %
Disability Allowances	1.70 %	1.60 %	1.69 %	1.59 %
Survivor's Benefits	0.34 %	0.28 %	0.34 %	0.32 %
Separation Benefits	4.27 %	0.97 %	4.15 %	4.01 %
Total Normal Cost	14.63 %	7.49 %	14.38 %	13.68 %
(Member Contributions)	10.00 %	0.00 %	9.60 %	9.61 %
Employer Normal Cost	4.63 %	7.49 %	4.78 %	4.07 %
Unfunded Actuarial Accrued Liabilities				
Total Available Contribution	9.37 %	6.51 %	9.22 %	9.93 %
Amortization Years	36	0	35	23
Total Pension Employer Contribution Rate	14.00 %	14.00 %	14.00 %	14.00 %

**Includes contributions for administrative expenses.*

The term "Amortization Years" refers to the period sufficient to produce the Total Employer Contribution Rate for retirement allowances and survivor benefits and incorporates all scheduled employer and member contribution rate increases and scheduled employer rate reallocations between the pension and retiree health programs.

STATE DIVISION Comparative Statement

Valuation Date December 31	Contribution Rate Effective January 1	Defined Benefit Active Members in Valuation				Computed Employer Contributions as % of Payroll				
		No.	Annual Payroll			Normal Cost	Unfunded Accrued Liability	Pension Total	Retiree Health	Grand Total
			Total	Average	Increase					
			(\$Millions)							
2004	2007	110,207	\$ 4,165	\$ 37,794	0.3 %	5.67 %	2.60 %	8.27 %	5.50 %	13.77 %
2005@	2008	114,620	4,339	37,858	0.2 %	5.43 %	1.57 %	7.00 %	7.00 %	14.00 %
2006	2009	115,930	4,522	39,005	3.0 %	4.97 %	2.03 %	7.00 %	7.00 %	14.00 %
2007	2010	118,466	4,703	39,695	1.8 %	5.44 %	1.56 %	7.00 %	7.00 %	14.00 %
2008	2011	114,925	4,780	41,590	4.8 %	5.44 %	4.56 %	10.00 %	4.00 %	14.00 %
2009	2012	117,008	4,763	40,704	(2.1)%	5.45 %	4.55 %	10.00 %	4.00 %	14.00 %
2010@	2013	118,240	4,811	40,691	0.0 %	5.36 %	7.64 %	13.00 %	1.00 %	14.00 %
2011	2014	118,273	4,844	40,952	0.6 %	5.37 %	8.63 %	14.00 %	0.00 %	14.00 %
2012#	2015	117,430	4,690	39,938	(2.5)%	3.49 %	7.51 %	11.00 %	3.00 %	14.00 %
2013	2016	117,370	4,746	40,433	1.2 %	3.49 %	6.51 %	10.00 %	4.00 %	14.00 %
2014	2017	118,114	4,826	40,862	1.1 %	3.40 %	6.60 %	10.00 %	4.00 %	14.00 %
2015@	2018	118,372	4,961	41,911	2.6 %	4.09 %	9.91 %	14.00 %	0.00 %	14.00 %
2016	2019	119,223	5,131	43,037	2.7 %	4.03 %	9.97 %	14.00 %	0.00 %	14.00 %
2017	2020	121,199	5,285	43,610	1.3 %	4.07 %	9.93 %	14.00 %	0.00 %	14.00 %
2018	2021	102,165	5,189	50,795	16.5 %	4.78 %	9.22 %	14.00 %	0.00 %	14.00 %

After benefit changes.

@ Revised actuarial assumptions.

STATE DIVISION
Development of Unfunded Actuarial Accrued Liabilities
December 31, 2018

Actuarial Present Value	(1) Total Actuarial Present Value	Allocation by Entry Age	
		(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1)-(2)
Allowances currently being paid from the Annuity & Pension Reserve Fund	\$ 26,704,786,779	\$ -	\$ 26,704,786,779
Allowances currently being paid from the Survivors Benefit Fund	743,412,132	-	743,412,132
Age and service allowances based on service rendered before and likely to be rendered after valuation date*	16,741,207,853	3,488,421,198	13,252,786,655
Disability allowances likely to be paid present active members who become permanently disabled	1,602,317,933	716,842,261	885,475,672
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	411,157,711	136,555,223	274,602,488
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active and inactive members	2,696,771,994	1,831,385,584	865,386,410
Total	\$ 48,899,654,402	\$ 6,173,204,266	\$ 42,726,450,136
Actuarial Value of Assets			32,230,016,389
Unfunded Actuarial Accrued Liability			\$ 10,496,433,747

**Includes contributions for administrative expenses.*

STATE DIVISION
Development of Unfunded Actuarial Accrued Liabilities
Comparative Statement
(\$ in Millions Except Averages)

Dec. 31	Defined Benefit Active Payroll		Active and Inactive Member Accrued Liabilities for Retirement Allowances				Unfunded /Payroll
			Computed Total	Valuation Assets	Unfunded	Amortization Years	
	Total	Average					
2004	4,165	\$37,794	\$ 12,441	\$ 9,664	\$ 2,777	34	0.67
2005@	4,339	37,858	13,326	10,296	3,030	39	0.70
2006	4,522	39,005	14,006	12,131	1,875	35	0.41
2007	4,703	39,695	14,526	13,442	1,084	20	0.23
2008	4,780	41,590	14,872	7,488	7,384	N/A	1.54
2009	4,763	40,704	14,843	6,648	8,195	N/A	1.71
2010@	4,811	40,691	14,903	7,113	7,790	48	1.62
2011	4,844	40,952	14,754	6,616	8,138	37	1.68
2012#	4,690	39,938	13,135	5,270	7,865	37	1.68
2013	4,746	40,433	13,125	6,572	6,553	32	1.38
2014	4,826	40,862	12,951	5,631	7,320	40	1.52
2015@	4,961	41,911	13,788	5,550	8,238	24	1.66
2016	5,131	43,037	14,090	5,587	8,503	24	1.66
2017	5,285	43,610	14,300	5,899	8,401	23	1.59
2018	5,189	50,795	15,280	4,784	10,496	35	2.02

After benefit changes.

@ Revised actuarial assumptions.

While no one or two numeric indices can fully describe the financial condition of a retirement plan, the ratio of unfunded actuarial accrued liabilities divided by active member payroll ("UNFUNDED/PAYROLL" above) is significant. Unfunded actuarial accrued liabilities represent plan debt, while active member payroll represents the plan's capacity to collect contributions to pay toward debt --- thus the ratio is a relative index of condition. The lower the ratio, the greater the financial strength, and vice-versa.

STATE DIVISION
Male Active Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19	651							651
Tot. Pay	\$6,324,873							\$6,324,873
Avg. Pay	\$9,716							\$9,716
20-24	5,237	16						5,253
Tot. Pay	\$89,119,435	\$520,470						\$89,639,905
Avg. Pay	\$17,017	\$32,529						\$17,065
25-29	4,101	614	8					4,723
Tot. Pay	\$146,020,565	\$29,688,258	\$315,296					\$176,024,119
Avg. Pay	\$35,606	\$48,352	\$39,412					\$37,270
30-34	2,801	1,541	449	16				4,807
Tot. Pay	\$115,106,195	\$86,443,707	\$26,324,045	\$793,652				\$228,667,599
Avg. Pay	\$41,095	\$56,096	\$58,628	\$49,603				\$47,570
35-39	1,804	1,112	1,252	418	13			4,599
Tot. Pay	\$78,809,549	\$65,749,594	\$80,679,458	\$27,255,438	\$799,326			\$253,293,365
Avg. Pay	\$43,686	\$59,127	\$64,440	\$65,204	\$61,487			\$55,076
40-44	1,330	849	853	976	355	8		4,371
Tot. Pay	\$57,927,668	\$51,123,583	\$56,281,593	\$67,976,896	\$24,134,371	\$640,329		\$258,084,440
Avg. Pay	\$43,555	\$60,216	\$65,981	\$69,648	\$67,984	\$80,041		\$59,045
45-49	1,150	747	786	905	1,190	394	10	5,182
Tot. Pay	\$50,142,020	\$43,692,271	\$53,363,710	\$63,849,751	\$86,135,467	\$30,616,616	\$704,566	\$328,504,401
Avg. Pay	\$43,602	\$58,490	\$67,893	\$70,552	\$72,383	\$77,707	\$70,457	\$63,393
50-54	964	715	653	733	948	1,228	345	5,586
Tot. Pay	\$39,844,157	\$42,748,960	\$43,430,723	\$49,709,616	\$68,211,428	\$97,125,219	\$28,317,737	\$369,387,840
Avg. Pay	\$41,332	\$59,789	\$66,510	\$67,817	\$71,953	\$79,092	\$82,080	\$66,127
55-59	795	531	593	667	807	916	810	5,119
Tot. Pay	\$30,083,220	\$32,118,148	\$38,711,647	\$43,812,407	\$55,515,995	\$69,962,283	\$65,488,565	\$335,692,265
Avg. Pay	\$37,841	\$60,486	\$65,281	\$65,686	\$68,793	\$76,378	\$80,850	\$65,578
60-64	527	380	438	522	562	544	515	3,488
Tot. Pay	\$17,626,834	\$22,268,243	\$28,167,188	\$34,153,200	\$39,433,180	\$41,032,783	\$43,092,815	\$225,774,243
Avg. Pay	\$33,448	\$58,601	\$64,309	\$65,428	\$70,166	\$75,428	\$83,675	\$64,729
65-69	316	154	175	187	173	180	235	1,420
Tot. Pay	\$7,604,014	\$8,681,805	\$11,942,563	\$13,211,915	\$12,730,827	\$13,305,945	\$19,677,204	\$87,154,273
Avg. Pay	\$24,063	\$56,375	\$68,243	\$70,652	\$73,589	\$73,922	\$83,733	\$61,376
70 & Over	235	70	53	52	66	56	68	600
Tot. Pay	\$3,107,884	\$3,090,448	\$2,554,208	\$3,399,807	\$4,511,802	\$4,339,822	\$5,983,611	\$26,987,582
Avg. Pay	\$13,225	\$44,149	\$48,193	\$65,381	\$68,361	\$77,497	\$87,994	\$44,979
Totals	19,911	6,729	5,260	4,476	4,114	3,326	1,983	45,799
Tot. Pay	\$641,716,414	\$386,125,487	\$341,770,431	\$304,162,682	\$291,472,396	\$257,022,997	\$163,264,498	\$2,385,534,905
Avg. Pay	\$32,229	\$57,382	\$64,975	\$67,954	\$70,849	\$77,277	\$82,332	\$52,087

STATE DIVISION
Female Active Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19	1,109							1,109
Tot. Pay	\$9,918,318							\$9,918,318
Avg. Pay	\$8,943							\$8,943
20-24	6,860	18						6,878
Tot. Pay	\$115,428,229	\$658,422						\$116,086,651
Avg. Pay	\$16,826	\$36,579						\$16,878
25-29	5,108	774	15					5,897
Tot. Pay	\$190,421,625	\$38,740,683	\$700,708					\$229,863,016
Avg. Pay	\$37,279	\$50,053	\$46,714					\$38,980
30-34	3,618	1,963	515	10				6,106
Tot. Pay	\$149,720,118	\$107,807,290	\$30,604,902	\$555,506				\$288,687,816
Avg. Pay	\$41,382	\$54,920	\$59,427	\$55,551				\$47,279
35-39	2,336	1,446	1,453	462	16			5,713
Tot. Pay	\$106,318,565	\$82,413,885	\$91,034,713	\$29,818,692	\$914,002			\$310,499,857
Avg. Pay	\$45,513	\$56,994	\$62,653	\$64,543	\$57,125			\$54,350
40-44	1,829	1,041	1,125	1,111	328	18		5,452
Tot. Pay	\$83,163,500	\$61,049,745	\$72,907,884	\$75,888,195	\$22,262,782	\$1,209,162		\$316,481,268
Avg. Pay	\$45,469	\$58,645	\$64,807	\$68,306	\$67,874	\$67,176		\$58,049
45-49	1,678	1,001	989	994	1,116	409	18	6,205
Tot. Pay	\$74,732,088	\$60,873,874	\$63,052,128	\$66,841,767	\$80,083,086	\$29,995,599	\$1,147,479	\$376,726,021
Avg. Pay	\$44,536	\$60,813	\$63,753	\$67,245	\$71,759	\$73,339	\$63,749	\$60,713
50-54	1,223	869	945	890	995	1,149	396	6,467
Tot. Pay	\$54,215,926	\$51,390,737	\$59,477,613	\$58,148,010	\$66,296,423	\$86,142,296	\$29,031,851	\$404,702,856
Avg. Pay	\$44,330	\$59,138	\$62,939	\$65,335	\$66,630	\$74,972	\$73,313	\$62,580
55-59	963	757	969	930	943	1,012	759	6,333
Tot. Pay	\$41,317,332	\$44,192,230	\$57,635,315	\$56,513,687	\$59,578,793	\$70,984,881	\$58,421,442	\$388,643,680
Avg. Pay	\$42,905	\$58,378	\$59,479	\$60,767	\$63,180	\$70,143	\$76,972	\$61,368
60-64	517	479	706	760	723	684	435	4,304
Tot. Pay	\$19,655,606	\$27,026,287	\$41,579,772	\$44,795,833	\$45,138,398	\$46,339,062	\$30,945,729	\$255,480,687
Avg. Pay	\$38,019	\$56,422	\$58,895	\$58,942	\$62,432	\$67,747	\$71,140	\$59,359
65-69	146	138	245	280	231	215	190	1,445
Tot. Pay	\$3,543,378	\$8,071,815	\$14,214,957	\$17,598,657	\$14,298,761	\$13,838,130	\$14,500,176	\$86,065,874
Avg. Pay	\$24,270	\$58,491	\$58,020	\$62,852	\$61,899	\$64,363	\$76,317	\$59,561
70 & Over	100	42	50	76	50	57	82	457
Tot. Pay	\$1,926,093	\$1,430,405	\$2,324,697	\$3,663,155	\$2,750,019	\$3,566,640	\$5,105,497	\$20,766,506
Avg. Pay	\$19,261	\$34,057	\$46,494	\$48,199	\$55,000	\$62,573	\$62,262	\$45,441
Totals	25,487	8,528	7,012	5,513	4,402	3,544	1,880	56,366
Tot. Pay	\$850,360,778	\$483,655,373	\$433,532,689	\$353,823,502	\$291,322,264	\$252,075,770	\$139,152,174	\$2,803,922,550
Avg. Pay	\$33,364	\$56,714	\$61,827	\$64,180	\$66,180	\$71,127	\$74,017	\$49,745

STATE DIVISION
Inactive Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service to Valuation Date							Total Number
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
Under 20	778							778
20-24	34,396	1						34,397
25-29	49,883	243						50,126
30-34	63,577	938	52	2				64,569
35-39	36,761	1,199	328	41				38,329
40-44	28,189	978	377	116	6			29,666
45-49	20,108	953	465	206	80	11		21,823
50-54	11,212	1,002	567	248	138	56	3	13,226
55-59	8,563	1,118	734	387	204	47	8	11,061
60-64	6,793	791	527	275	112	18	4	8,520
65-69	3,867	275	109	59	23	7	4	4,344
70 & Over	1,348	67	26	11	2	4	3	1,461
Totals	265,475	7,565	3,185	1,345	565	143	22	278,300

SECTION VI

LOCAL GOVERNMENT DIVISION

LOCAL GOVERNMENT DIVISION

Data on active, inactive, retired and money purchase members that was used in the valuation is tabulated briefly below.

Defined Benefit Active Members in Valuation December 31, 2018

Groups	Number	Annual Payroll	Average		
			Pay	Age	Service
Traditional Plan					
Men	81,352	\$ 3,696,220,443	\$ 45,435	46.7 yrs.	10.9 yrs.
Women	96,043	3,887,727,572	40,479	45.7	10.7
Traditional Plan Total	177,395	\$ 7,583,948,015	\$ 42,752	46.2 yrs.	10.8 yrs.
Combined Plan					
Men	2,150	\$ 119,182,947	\$ 55,434	46.5 yrs.	8.9 yrs.
Women	2,761	133,103,268	48,208	45.5	8.6
Combined Plan Total	4,911	\$ 252,286,215	\$ 51,372	45.9 yrs.	8.7 yrs.
Grand Total	182,306	\$ 7,836,234,230	\$ 42,984	46.2 yrs.	10.7 yrs.

Also included in the valuation were 331,784 inactive members and 16,628 members active in the money purchase plan.

Retired Members in Valuation December 31, 2018

Fund/Type of Allowance	Number	Current Monthly Benefits	Actuarial Liabilities
Traditional Plan			
A & PR Fund			
Superannuation Retirement	114,393	\$ 242,682,204	\$ 33,189,262,206
Disability Retirement	11,023	26,514,751	3,612,765,007
Money Purchase	3,096	1,289,079	158,059,211
Total A & PR Fund	128,512	\$ 270,486,034	\$ 36,960,086,424
Total SBF	9,562	9,892,433	1,201,540,398
Traditional Plan Total	138,074	\$ 280,378,467	\$ 38,161,626,822
Combined Plan			
A & PR Fund			
CB (DB)	241	\$ 87,743	\$ 12,848,055
CA (DC)	169	49,752	7,608,148
Total A & PR Fund	410	\$ 137,495	\$ 20,456,203
Combined Plan Total	410	\$ 137,495	\$ 20,456,203
Member Directed Plan			
A & PR Fund	203	\$ 76,534	\$ 11,158,254
Reserve for Future Adverse Experience			1,522,249
Member Directed Plan Total	203	\$ 76,534	\$ 12,680,503
Grand Total	138,687	\$ 280,592,496	\$ 38,194,763,528

LOCAL GOVERNMENT DIVISION
Employer Contributions to Support
Defined Benefit Retirement Allowances
Expressed as Percents of Active Member Payroll

Valuation Date December 31	2018			2017
Contributions for	2021			2020
Normal Cost	<u>Traditional Plan</u>	<u>Combined Plan</u>	<u>Traditional and Combined Plans</u>	<u>Traditional and Combined Plans</u>
Age and Service Allowances*	8.80 %	4.92 %	8.67 %	8.21 %
Disability Allowances	1.39 %	1.28 %	1.38 %	1.30 %
Survivor's Benefits	0.43 %	0.36 %	0.43 %	0.40 %
Separation Benefits	3.88 %	1.05 %	3.79 %	3.62 %
Total Normal Cost	14.50 %	7.61 %	14.27 %	13.53 %
(Member Contributions)	10.00 %	0.00 %	9.63 %	9.64 %
Employer Normal Cost	4.50 %	7.61 %	4.64 %	3.89 %
Unfunded Actuarial Accrued Liabilities				
Total Available Contribution	9.50 %	6.39 %	9.36 %	10.11 %
Amortization Years	25	0	24	16
Total Pension Employer Contribution Rate	14.00 %	14.00 %	14.00 %	14.00 %

*Includes contributions for administrative expenses.

The term "Amortization Years" refers to the period sufficient to produce the Total Employer Contribution Rate for retirement allowances and survivor benefits and incorporates all scheduled employer and member contribution rate increases and scheduled employer rate reallocations between the pension and retiree health programs.

LOCAL GOVERNMENT DIVISION Comparative Statement

Valuation Date December 31	Contribution Rate Effective January 1	Defined Benefit Active Members in Valuation				Computed Employer Contributions as % of Payroll				
		No.	Annual Payroll			Normal Cost	Unfunded Accrued Liability	Pension Total	Retiree Health	Grand Total
			Total	Average	Increase					
			(\$Millions)							
2004	2007	236,907	\$ 6,896	\$ 29,110	3.0 %	5.57 %	2.78 %	8.35 %	5.50 %	13.85 %
2005@	2008	236,073	7,066	29,933	2.8 %	5.00 %	2.00 %	7.00 %	7.00 %	14.00 %
2006	2009	237,981	7,234	30,399	1.6 %	4.53 %	2.47 %	7.00 %	7.00 %	14.00 %
2007	2010	237,225	7,438	31,354	3.1 %	5.12 %	1.88 %	7.00 %	7.00 %	14.00 %
2008	2011	233,163	7,566	32,451	3.5 %	5.14 %	4.86 %	10.00 %	4.00 %	14.00 %
2009	2012	223,004	7,334	32,889	1.3 %	5.14 %	4.86 %	10.00 %	4.00 %	14.00 %
2010@	2013	215,144	7,196	33,447	1.7 %	5.12 %	7.88 %	13.00 %	1.00 %	14.00 %
2011	2014	209,452	7,115	33,968	1.6 %	5.14 %	8.86 %	14.00 %	0.00 %	14.00 %
2012#	2015	208,188	7,061	33,918	(0.1)%	3.13 %	7.87 %	11.00 %	3.00 %	14.00 %
2013	2016	207,416	7,134	34,396	1.4 %	3.16 %	6.84 %	10.00 %	4.00 %	14.00 %
2014	2017	203,955	7,360	36,087	4.9 %	3.06 %	6.94 %	10.00 %	4.00 %	14.00 %
2015@	2018	202,779	7,505	37,008	2.6 %	3.91 %	10.09 %	14.00 %	0.00 %	14.00 %
2016	2019	203,767	7,800	38,279	3.4 %	3.85 %	10.15 %	14.00 %	0.00 %	14.00 %
2017	2020	201,953	7,929	39,263	2.6 %	3.89 %	10.11 %	14.00 %	0.00 %	14.00 %
2018	2021	182,306	7,836	42,984	9.5 %	4.64 %	9.36 %	14.00 %	0.00 %	14.00 %

After benefit changes.

@ Revised actuarial assumptions.

LOCAL GOVERNMENT DIVISION
Development of Unfunded Actuarial Accrued Liabilities
December 31, 2018

Actuarial Present Value	(1) Total Actuarial Present Value	Allocation by Entry Age	
		(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1)-(2)
Allowances currently being paid from the Annuity & Pension Reserve Fund	\$ 36,993,223,130	\$ -	\$ 36,993,223,130
Allowances currently being paid from the Survivors Benefit Fund	1,201,540,398	-	1,201,540,398
Age and service allowances based on service rendered before and likely to be rendered after valuation date*	25,655,021,147	5,626,280,453	20,028,740,694
Disability allowances likely to be paid present active members who become permanently disabled	1,868,362,241	892,595,599	975,766,642
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	742,520,029	258,466,000	484,054,029
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active and inactive members	4,032,056,446	2,580,725,103	1,451,331,343
Total	\$ 70,492,723,391	\$ 9,358,067,155	\$ 61,134,656,236
Actuarial Value of Assets			48,066,389,091
Unfunded Actuarial Accrued Liability			\$ 13,068,267,145

**Includes contributions for administrative expenses.*

LOCAL GOVERNMENT DIVISION
Development of Unfunded Actuarial Accrued Liabilities
Comparative Statement
(\$ in Millions Except Averages)

Dec. 31	Defined Benefit Active Payroll		Active and Inactive Member Accrued Liabilities for Retirement Allowances				Unfunded /Payroll
			Computed	Valuation	Unfunded	Amortization	
	Total	Average	Total	Assets		Years	
2004	\$ 6,896	\$29,110	\$ 18,269	\$ 14,223	\$4,046	23	0.59
2005@	7,066	29,933	19,484	14,921	4,563	25	0.65
2006	7,234	30,399	20,147	17,523	2,624	19	0.36
2007	7,438	31,354	20,838	19,656	1,182	9	0.16
2008	7,566	32,451	21,590	11,561	10,029	N/A	1.33
2009	7,334	32,889	21,620	11,599	10,021	N/A	1.37
2010@	7,196	33,447	21,668	13,212	8,456	22	1.18
2011	7,115	33,968	21,631	11,418	10,213	25	1.44
2012#	7,061	33,918	19,583	11,981	7,602	15	1.08
2013	7,134	34,396	19,586	11,440	8,146	20	1.14
2014	7,360	36,087	19,656	13,066	6,590	13	0.90
2015@	7,505	37,008	20,867	10,620	10,247	16	1.37
2016	7,800	38,279	21,422	10,699	10,723	17	1.37
2017	7,929	39,263	21,605	11,273	10,332	16	1.30
2018	7,836	42,984	22,942	9,874	13,068	24	1.67

After benefit changes.

@ Revised actuarial assumptions.

While no one or two numeric indices can fully describe the financial condition of a retirement plan, the ratio of unfunded actuarial accrued liabilities divided by active member payroll (“UNFUNDED/PAYROLL” above) is significant. Unfunded accrued liabilities represent plan debt, while active member payroll represents the plan’s capacity to collect contributions to pay toward debt --- thus the ratio is a relative index of condition. The lower the ratio, the greater the financial strength, and vice-versa.

LOCAL GOVERNMENT DIVISION
Male Active Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19	1,768							1,768
Tot. Pay	\$18,730,491							\$18,730,491
Avg. Pay	\$10,594							\$10,594
20-24	4,112	70						4,182
Tot. Pay	\$94,681,711	\$2,497,653						\$97,179,364
Avg. Pay	\$23,026	\$35,681						\$23,238
25-29	5,111	1,072	58					6,241
Tot. Pay	\$171,764,048	\$47,232,773	\$2,951,051					\$221,947,872
Avg. Pay	\$33,607	\$44,060	\$50,880					\$35,563
30-34	4,060	2,085	909	60				7,114
Tot. Pay	\$152,069,457	\$102,415,702	\$49,103,431	\$3,214,300				\$306,802,890
Avg. Pay	\$37,456	\$49,120	\$54,019	\$53,572				\$43,127
35-39	3,205	1,750	1,762	866	69			7,652
Tot. Pay	\$122,954,030	\$88,726,719	\$100,131,935	\$50,204,478	\$4,099,504			\$366,116,666
Avg. Pay	\$38,363	\$50,701	\$56,829	\$57,973	\$59,413			\$47,846
40-44	2,665	1,462	1,561	1,734	729	36		8,187
Tot. Pay	\$98,531,355	\$73,524,921	\$88,446,576	\$109,969,196	\$45,398,231	\$2,265,988		\$418,136,267
Avg. Pay	\$36,972	\$50,291	\$56,660	\$63,419	\$62,275	\$62,944		\$51,073
45-49	2,651	1,508	1,502	1,766	1,792	725	29	9,973
Tot. Pay	\$95,523,250	\$74,093,491	\$83,854,310	\$111,918,238	\$118,509,858	\$48,418,371	\$1,961,223	\$534,278,741
Avg. Pay	\$36,033	\$49,134	\$55,828	\$63,374	\$66,133	\$66,784	\$67,628	\$53,573
50-54	2,313	1,363	1,386	1,628	1,718	1,720	499	10,627
Tot. Pay	\$79,207,306	\$63,749,246	\$73,063,170	\$97,983,748	\$115,820,126	\$119,431,087	\$35,062,426	\$584,317,109
Avg. Pay	\$34,244	\$46,771	\$52,715	\$60,187	\$67,416	\$69,437	\$70,265	\$54,984
55-59	2,087	1,304	1,393	1,624	1,641	1,676	1,081	10,806
Tot. Pay	\$68,024,310	\$57,209,601	\$71,097,069	\$90,180,108	\$103,199,779	\$113,393,545	\$77,626,086	\$580,730,498
Avg. Pay	\$32,594	\$43,872	\$51,039	\$55,530	\$62,888	\$67,657	\$71,810	\$53,741
60-64	1,857	1,195	1,128	1,308	1,328	1,165	910	8,891
Tot. Pay	\$49,078,764	\$44,792,566	\$53,320,459	\$69,301,894	\$79,561,903	\$73,660,414	\$65,408,032	\$435,124,032
Avg. Pay	\$26,429	\$37,483	\$47,270	\$52,983	\$59,911	\$63,228	\$71,877	\$48,940
65-69	1,513	678	576	552	477	417	392	4,605
Tot. Pay	\$25,549,627	\$21,194,660	\$24,076,613	\$26,928,142	\$26,926,386	\$25,981,335	\$27,180,881	\$177,837,644
Avg. Pay	\$16,887	\$31,261	\$41,800	\$48,783	\$56,449	\$62,305	\$69,339	\$38,618
70 & Over	1,491	670	451	331	190	145	178	3,456
Tot. Pay	\$19,624,099	\$11,241,031	\$10,490,712	\$10,444,916	\$7,204,235	\$5,566,048	\$9,630,775	\$74,201,816
Avg. Pay	\$13,162	\$16,778	\$23,261	\$31,556	\$37,917	\$38,387	\$54,105	\$21,470
Totals	32,833	13,157	10,726	9,869	7,944	5,884	3,089	83,502
Tot. Pay	\$995,738,448	\$586,678,363	\$556,535,326	\$570,145,020	\$500,720,022	\$388,716,788	\$216,869,423	\$3,815,403,390
Avg. Pay	\$30,327	\$44,591	\$51,887	\$57,771	\$63,031	\$66,063	\$70,207	\$45,692

LOCAL GOVERNMENT DIVISION
Female Active Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19	2,000							2,000
Tot. Pay	\$18,838,275							\$18,838,275
Avg. Pay	\$9,419							\$9,419
20-24	4,526	63						4,589
Tot. Pay	\$93,437,629	\$1,414,067						\$94,851,696
Avg. Pay	\$20,645	\$22,446						\$20,669
25-29	6,910	1,151	59					8,120
Tot. Pay	\$225,195,468	\$43,668,808	\$2,116,382					\$270,980,658
Avg. Pay	\$32,590	\$37,940	\$35,871					\$33,372
30-34	5,377	2,577	841	60				8,855
Tot. Pay	\$183,815,262	\$114,931,309	\$38,559,822	\$2,675,232				\$339,981,625
Avg. Pay	\$34,185	\$44,599	\$45,850	\$44,587				\$38,394
35-39	4,412	2,066	2,226	895	78			9,677
Tot. Pay	\$152,414,784	\$94,012,040	\$112,747,943	\$45,431,242	\$3,729,425			\$408,335,434
Avg. Pay	\$34,546	\$45,504	\$50,650	\$50,761	\$47,813			\$42,196
40-44	3,666	1,698	1,916	2,215	850	56		10,401
Tot. Pay	\$124,337,937	\$76,790,690	\$97,645,263	\$122,842,517	\$46,766,119	\$3,126,709		\$471,509,235
Avg. Pay	\$33,917	\$45,224	\$50,963	\$55,459	\$55,019	\$55,834		\$45,333
45-49	3,693	1,698	1,834	2,170	2,179	876	48	12,498
Tot. Pay	\$120,123,345	\$72,354,325	\$88,124,512	\$118,829,977	\$126,855,107	\$49,913,317	\$2,729,242	\$578,929,825
Avg. Pay	\$32,527	\$42,611	\$48,050	\$54,760	\$58,217	\$56,979	\$56,859	\$46,322
50-54	3,110	1,656	1,817	1,935	1,929	1,952	610	13,009
Tot. Pay	\$96,735,572	\$66,254,923	\$82,133,471	\$99,372,174	\$108,781,707	\$118,419,044	\$35,411,219	\$607,108,110
Avg. Pay	\$31,105	\$40,009	\$45,203	\$51,355	\$56,393	\$60,665	\$58,051	\$46,668
55-59	2,705	1,616	1,864	2,161	2,026	1,710	1,061	13,143
Tot. Pay	\$76,881,862	\$60,028,144	\$78,728,855	\$103,698,542	\$104,261,066	\$98,125,375	\$67,761,505	\$589,485,349
Avg. Pay	\$28,422	\$37,146	\$42,237	\$47,986	\$51,462	\$57,383	\$63,866	\$44,852
60-64	1,916	1,163	1,465	1,881	1,773	1,420	770	10,388
Tot. Pay	\$48,463,704	\$40,339,416	\$57,481,562	\$83,247,721	\$86,241,972	\$75,961,499	\$46,691,836	\$438,427,710
Avg. Pay	\$25,294	\$34,686	\$39,237	\$44,257	\$48,642	\$53,494	\$60,639	\$42,205
65-69	941	487	590	692	600	496	324	4,130
Tot. Pay	\$15,140,629	\$14,879,542	\$21,944,591	\$29,658,600	\$27,700,510	\$25,467,302	\$18,432,888	\$153,224,062
Avg. Pay	\$16,090	\$30,553	\$37,194	\$42,859	\$46,168	\$51,345	\$56,892	\$37,100
70 & Over	675	296	235	215	219	167	187	1,994
Tot. Pay	\$7,872,541	\$4,397,663	\$5,748,193	\$6,909,670	\$7,950,913	\$7,031,736	\$9,248,145	\$49,158,861
Avg. Pay	\$11,663	\$14,857	\$24,460	\$32,138	\$36,306	\$42,106	\$49,455	\$24,653
Totals	39,931	14,471	12,847	12,224	9,654	6,677	3,000	98,804
Tot. Pay	\$1,163,257,008	\$589,070,927	\$585,230,594	\$612,665,675	\$512,286,819	\$378,044,982	\$180,274,835	\$4,020,830,840
Avg. Pay	\$29,132	\$40,707	\$45,554	\$50,120	\$53,065	\$56,619	\$60,092	\$40,695

LOCAL GOVERNMENT DIVISION
Inactive Members in Defined Benefit Valuation
December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service to Valuation Date							Total Number
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
Under 20	5,450							5,450
20-24	37,570	16						37,586
25-29	40,198	435	7					40,640
30-34	44,896	1,164	137	3				46,200
35-39	40,186	1,542	481	94	1			42,304
40-44	34,902	1,561	707	263	41			37,474
45-49	29,092	1,817	888	474	186	25		32,482
50-54	21,684	1,914	1,152	558	303	123	4	25,738
55-59	20,252	2,238	1,457	807	421	88	14	25,277
60-64	18,141	1,855	1,260	606	275	59	12	22,208
65-69	10,965	799	264	114	56	21	5	12,224
70 & Over	3,823	219	83	49	14	6	7	4,201
Totals	307,159	13,560	6,436	2,968	1,297	322	42	331,784

SECTION VII

PUBLIC SAFETY DIVISION

PUBLIC SAFETY DIVISION

Data on active, inactive, retired and money purchase members that was used in the valuation is tabulated briefly below.

Active Members in Valuation December 31, 2018

Groups	Number	Annual Payroll	Average		
			Pay	Age	Service
Men	48	\$ 2,389,612	\$ 49,784	40.5 yrs.	11.2 yrs.
Women	13	614,827	47,294	40.6	10.0
Totals	61	\$ 3,004,439	\$ 49,253	40.6 yrs.	10.9 yrs.

Also included in the valuation were 46 inactive members and 0 members active in the money purchase plan.

Retired Members in Valuation December 31, 2018

Fund/Type of Allowance	Number	Current Monthly Benefits	Actuarial Liabilities
A & PR Fund			
Superannuation Retirement	33	\$ 63,559	\$ 10,062,928
Disability Retirement	36	121,900	18,137,234
Money Purchase	0	0	0
Total A & PR Fund	69	\$ 185,459	\$ 28,200,162
Total SBF	118	170,893	24,307,077
Grand Total	187	\$ 356,352	\$ 52,507,239

PUBLIC SAFETY DIVISION
Employer Contributions to Support
Retirement Allowances
Expressed as Percents of Active Member Payroll

Valuation Date December 31	2018	2017
Contributions for	2021	2020
Normal Cost		
Age and Service Allowances*	9.57 %	8.98 %
Disability Allowances	3.25 %	3.04 %
Survivor's Benefits	0.47 %	0.44 %
Separation Benefits	5.22 %	4.96 %
Total Normal Cost	18.51 %	17.42 %
(Member Contributions)	12.00 %	12.00 %
Employer Normal Cost	6.51 %	5.42 %
Unfunded Actuarial Accrued Liabilities		
Total Available Contribution	11.59 %	12.68 %
Amortization Years	N/A	N/A
Total Pension Employer Contribution Rate	18.10 %	18.10 %

* Includes contributions for administrative expenses.

N/A The unfunded actuarial accrued liabilities are unable to be amortized based upon the total pension contribution rate.

The term "Amortization Years" refers to the period sufficient to produce the Total Employer Contribution Rate for retirement allowances and survivor benefits and incorporates all scheduled employer and member contribution rate increases and scheduled employer rate reallocations between the pension and retiree health programs.

PUBLIC SAFETY DIVISION Comparative Statement *

Valuation Date December 31	Contribution Rate Effective January 1	Active Members in Valuation				Computed Employer Contributions as % of Payroll				
		No.	Annual Payroll			Normal Cost	Unfunded Accrued Liability	Pension Total	Retiree Health	Grand Total
			Total	Average	Increase					
			(\$Thousands)							
2009	2012	94	\$ 4,061	\$ 43,205	(11.8)%	7.77 %	6.33 %	14.10 %	4.00 %	18.10 %
2010@	2013	88	3,650	41,480	(4.0)%	6.22 %	10.88 %	17.10 %	1.00 %	18.10 %
2011	2014	84	3,629	43,202	4.2 %	6.12 %	11.98 %	18.10 %	0.00 %	18.10 %
2012#	2015	87	3,751	43,119	(0.2)%	3.96 %	11.14 %	15.10 %	3.00 %	18.10 %
2013	2016	85	3,684	43,338	0.5 %	4.11 %	9.99 %	14.10 %	4.00 %	18.10 %
2014	2017	86	3,823	44,452	2.6 %	4.16 %	9.94 %	14.10 %	4.00 %	18.10 %
2015@	2018	79	3,620	45,817	3.1 %	5.24 %	12.86 %	18.10 %	0.00 %	18.10 %
2016	2019	76	3,401	44,752	(2.3)%	5.45 %	12.65 %	18.10 %	0.00 %	18.10 %
2017	2020	75	3,640	48,539	8.5 %	5.42 %	12.68 %	18.10 %	0.00 %	18.10 %
2018	2021	61	3,004	49,253	1.5 %	6.51 %	11.59 %	18.10 %	0.00 %	18.10 %

After benefit changes.

* Prior to 2005, Public Safety and Law Enforcement results were reported together. Historical information prior to 2005 may be found on page VIII-3.

@Revised actuarial assumptions.

PUBLIC SAFETY DIVISION
Development of Unfunded Actuarial Accrued Liabilities
December 31, 2018

Actuarial Present Value	(1) Total Actuarial Present Value	Allocation by Entry Age	
		(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1)-(2)
Allowances currently being paid from the Annuity & Pension Reserve Fund	\$ 28,200,162	\$ -	\$ 28,200,162
Allowances currently being paid from the Survivors Benefit Fund	24,307,077	-	24,307,077
Age and service allowances based on service rendered before and likely to be rendered after valuation date*	9,266,632	2,404,120	6,862,512
Disability allowances likely to be paid present active members who become permanently disabled	1,751,229	787,193	964,036
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	260,774	105,139	155,635
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active and inactive members	2,252,394	1,355,955	896,439
Total	\$ 66,038,268	\$ 4,652,407	\$ 61,385,861
Actuarial Value of Assets			37,837,794
Unfunded Actuarial Accrued Liability			\$ 23,548,067

* Includes contributions for administrative expenses.

PUBLIC SAFETY DIVISION
Development of Unfunded Actuarial Accrued Liabilities
Comparative Statement *
(\$ in Millions Except Averages)

Dec. 31	Defined Benefit		Active and Inactive Member Accrued Liabilities for Retirement Allowances				Unfunded /Payroll
	Active Payroll		Computed Total	Valuation Assets	Unfunded	Amortization Years	
	Total	Average					
2009	\$ 4	\$43,205	\$12	\$ 0	\$ 12	N/A	3.00
2010@	4	41,480	7	(7)	14	N/A	3.50
2011	4	43,202	8	(1)	9	45	2.25
2012#	4	43,119	7	(14)	21	N/A	5.25
2013	4	43,338	7	1	6	19	1.50
2014	4	44,452	8	(15)	23	N/A	5.75
2015@	4	45,817	8	(4)	12	82	3.00
2016	3	44,752	8	(7)	15	N/A	5.00
2017	4	48,539	9	(9)	18	N/A	4.50
2018	3	49,253	9	(15)	24	N/A	8.00

After benefit changes.

N/A The unfunded actuarial accrued liabilities are unable to be amortized based upon the total pension contribution rate.

* Prior to 2005, Public Safety and Law Enforcement results were reported together. Historical information prior to 2005 may be found on page VIII-5.

@ Revised actuarial assumptions.

While no one or two numeric indices can fully describe the financial condition of a retirement plan, the ratio of unfunded actuarial accrued liabilities divided by active member payroll (“UNFUNDED/PAYROLL” above) is significant. Unfunded accrued liabilities represent plan debt, while active member payroll represents the plan’s capacity to collect contributions to pay toward debt --- thus the ratio is a relative index of condition. The lower the ratio, the greater the financial strength, and vice-versa.

PUBLIC SAFETY DIVISION
Male Active Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date						Total	
	0-4	5-9	10-14	15-19	20-24	25-29		30+
15-19								
Tot. Pay								
Avg. Pay								
20-24	4							4
Tot. Pay	\$144,374							\$144,374
Avg. Pay	\$36,094							\$36,094
25-29	6							6
Tot. Pay	\$307,154							\$307,154
Avg. Pay	\$51,192							\$51,192
30-34	4	4						8
Tot. Pay	\$207,210	\$233,756						\$440,966
Avg. Pay	\$51,803	\$58,439						\$55,121
35-39			2	1				3
Tot. Pay			\$75,465	\$56,086				\$131,551
Avg. Pay			\$37,733	\$56,086				\$43,850
40-44	1	1	4	3	1			10
Tot. Pay	\$37,828	\$55,431	\$155,164	\$174,131	\$55,193			\$477,747
Avg. Pay	\$37,828	\$55,431	\$38,791	\$58,044	\$55,193			\$47,775
45-49		1		4	3			8
Tot. Pay		\$38,221		\$179,501	\$172,028			\$389,750
Avg. Pay		\$38,221		\$44,875	\$57,343			\$48,719
50-54				1		1		2
Tot. Pay				\$48,309		\$65,017		\$113,326
Avg. Pay				\$48,309		\$65,017		\$56,663
55-59			1	1		1		3
Tot. Pay			\$70,482	\$67,272		\$38,321		\$176,075
Avg. Pay			\$70,482	\$67,272		\$38,321		\$58,692
60-64	1				1			2
Tot. Pay	\$37,828				\$63,882			\$101,710
Avg. Pay	\$37,828				\$63,882			\$50,855
65-69			1					1
Tot. Pay			\$66,735					\$66,735
Avg. Pay			\$66,735					\$66,735
70 & Over			1					1
Tot. Pay			\$40,224					\$40,224
Avg. Pay			\$40,224					\$40,224
Totals	16	6	9	10	5	2		48
Tot. Pay	\$734,394	\$327,408	\$408,070	\$525,299	\$291,103	\$103,338		\$2,389,612
Avg. Pay	\$45,900	\$54,568	\$45,341	\$52,530	\$58,221	\$51,669		\$49,784

PUBLIC SAFETY DIVISION
Female Active Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19								
Tot. Pay								
Avg. Pay								
20-24								
Tot. Pay								
Avg. Pay								
25-29	3							3
Tot. Pay	\$149,533							\$149,533
Avg. Pay	\$49,844							\$49,844
30-34	2	1						3
Tot. Pay	\$68,120	\$56,395						\$124,515
Avg. Pay	\$34,060	\$56,395						\$41,505
35-39			1					1
Tot. Pay			\$37,418					\$37,418
Avg. Pay			\$37,418					\$37,418
40-44	1							1
Tot. Pay	\$37,828							\$37,828
Avg. Pay	\$37,828							\$37,828
45-49								
Tot. Pay								
Avg. Pay								
50-54						2		2
Tot. Pay						\$150,986		\$150,986
Avg. Pay						\$75,493		\$75,493
55-59		1					1	2
Tot. Pay		\$38,221					\$40,224	\$78,445
Avg. Pay		\$38,221					\$40,224	\$39,223
60-64		1						1
Tot. Pay		\$36,102						\$36,102
Avg. Pay		\$36,102						\$36,102
65-69								
Tot. Pay								
Avg. Pay								
70 & Over								
Tot. Pay								
Avg. Pay								
Totals	6	3	1			2	1	13
Tot. Pay	\$255,481	\$130,718	\$37,418			\$150,986	\$40,224	\$614,827
Avg. Pay	\$42,580	\$43,573	\$37,418			\$75,493	\$40,224	\$47,294

PUBLIC SAFETY DIVISION
Inactive Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service to Valuation Date							Total Number
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
Under 20								
20-24	3							3
25-29	5							5
30-34	13	1						14
35-39	8	1						9
40-44	5	1						6
45-49	5							5
50-54	1		1					2
55-59								
60-64	1			1				2
65-69								
70 & Over								
Totals	41	3	1	1				46

SECTION VIII

LAW ENFORCEMENT DIVISION

LAW ENFORCEMENT DIVISION

Data on active, inactive, retired and money purchase members that was used in the valuation is tabulated briefly below.

Active Members in Valuation December 31, 2018

Groups	Number	Annual Payroll	Average		
			Pay	Age	Service
Men	7,057	\$ 482,371,149	\$ 68,354	41.4 yrs.	14.4 yrs.
Women	958	61,277,787	63,964	40.9	13.6
Totals	8,015	\$ 543,648,936	\$ 67,829	41.3 yrs.	14.3 yrs.

Also included in the valuation were 1,210 inactive members and 30 members active in the money purchase plan.

Retired Members in Valuation December 31, 2018

Fund/Type of Allowance	Number	Current Monthly Benefits	Actuarial Liabilities
A & PR Fund			
Superannuation Retirement	3,290	\$ 12,144,739	\$ 1,891,289,528
Disability Retirement	1,599	5,415,536	778,062,888
Money Purchase	0	0	0
Total A & PR Fund	4,889	\$ 17,560,275	\$ 2,669,352,416
Total SBF	398	496,963	64,851,401
Grand Total	5,287	\$ 18,057,238	\$ 2,734,203,817

LAW ENFORCEMENT DIVISION
Employer Contributions to Support
Retirement Allowances
Expressed as Percents of Active Member Payroll

Valuation Date December 31	2018	2017
Contributions for	2021	2020
Normal Cost		
Age and Service Allowances*	14.47 %	13.58 %
Disability Allowances	3.51 %	3.32 %
Survivor's Benefits	0.50 %	0.48 %
Separation Benefits	2.61 %	2.41 %
Total Normal Cost	21.09 %	19.79 %
(Member Contributions)	13.00 %	13.00 %
Employer Normal Cost	8.09 %	6.79 %
Unfunded Actuarial Accrued Liabilities		
Total Available Contribution	10.01 %	11.31 %
Amortization Years	20	12
Total Pension Employer Contribution Rate	18.10 %	18.10 %

**Includes contributions for administrative expenses.*

The term "Amortization Years" refers to the period sufficient to produce the Total Employer Contribution Rate for retirement allowances and survivor benefits and incorporates all scheduled employer and member contribution rate increases and scheduled employer rate reallocations between the pension and retiree health programs.

LAW ENFORCEMENT DIVISION Comparative Statement *

Valuation Date December 31	Contribution Rate Effective January 1	Active Members in Valuation				Computed Employer Contributions as % of Payroll				
		No.	Annual Payroll		Normal Cost	Unfunded Accrued Liability	Pension Total	Retiree Health	Grand Total	
			Total	Average						Increase
			(\$Thousands)							
2004	2007	8,173	\$ 392,672	\$ 48,045	3.2 %	8.63 %	3.04 %	11.67 %	5.50 %	17.17 %
2005@	2008	7,976	395,189	49,547	3.0 %	9.65 %	0.75 %	10.40 %	7.00 %	17.40 %
2006	2009	8,092	413,182	51,061	3.1 %	9.65 %	0.98 %	10.63 %	7.00 %	17.63 %
2007	2010	8,265	437,223	52,901	3.6 %	9.95 %	0.92 %	10.87 %	7.00 %	17.87 %
2008	2011	8,173	448,694	54,900	3.8 %	8.43 %	5.67 %	14.10 %	4.00 %	18.10 %
2009	2012	8,006	447,232	55,862	1.8 %	8.16 %	5.94 %	14.10 %	4.00 %	18.10 %
2010@	2013	7,702	438,830	56,976	2.0 %	7.56 %	9.54 %	17.10 %	1.00 %	18.10 %
2011	2014	7,545	437,605	57,999	1.8 %	7.18 %	10.92 %	18.10 %	0.00 %	18.10 %
2012#	2015	7,470	438,500	58,702	1.2 %	5.43 %	9.67 %	15.10 %	3.00 %	18.10 %
2013	2016	7,549	447,612	59,294	1.0 %	5.44 %	8.66 %	14.10 %	4.00 %	18.10 %
2014	2017	7,618	463,653	60,863	2.6 %	5.34 %	8.76 %	14.10 %	4.00 %	18.10 %
2015@	2018	7,779	481,296	61,871	1.7 %	6.70 %	11.40 %	18.10 %	0.00 %	18.10 %
2016	2019	7,916	511,457	64,610	4.4 %	6.75 %	11.35 %	18.10 %	0.00 %	18.10 %
2017	2020	8,039	528,004	65,680	1.7 %	6.79 %	11.31 %	18.10 %	0.00 %	18.10 %
2018	2021	8,015	543,649	67,829	3.3 %	8.09 %	10.01 %	18.10 %	0.00 %	18.10 %

After benefit changes.

@ Revised actuarial assumptions.

* Prior to 2005, Law Enforcement and Public Safety are combined for purposes of this schedule.

LAW ENFORCEMENT DIVISION
Development of Unfunded Actuarial Accrued Liabilities
December 31, 2018

Actuarial Present Value	(1) Total Actuarial Present Value	Allocation by Entry Age	
		(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1)-(2)
Allowances currently being paid from the Annuity & Pension Reserve Fund	\$ 2,669,352,416	\$ -	\$ 2,669,352,416
Allowances currently being paid from the Survivors Benefit Fund	64,851,401	-	64,851,401
Age and service allowances based on service rendered before and likely to be rendered after valuation date*	2,552,023,388	757,179,153	1,794,844,235
Disability allowances likely to be paid present active members who become permanently disabled	368,183,093	180,672,014	187,511,079
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	57,098,706	24,807,028	32,291,678
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active and inactive members	170,216,889	136,946,728	33,270,161
Total	\$ 5,881,725,893	\$ 1,099,604,923	\$ 4,782,120,970
Actuarial Value of Assets			3,952,742,062
Unfunded Actuarial Accrued Liability			\$ 829,378,908

*Includes contributions for administrative expenses.

LAW ENFORCEMENT DIVISION
Development of Unfunded Actuarial Accrued Liabilities
Comparative Statement *
(\$ in Millions Except Averages)

Dec. 31	Defined Benefit Active Payroll		Active and Inactive Member Accrued Liabilities for Retirement Allowances				Unfunded /Payroll
			Computed Total	Valuation Assets	Unfunded	Amortization Years	
	Total	Average					
2004	\$393	\$48,045	\$ 1,197	\$ 868	\$ 329	43	0.84
2005@	395	49,547	1,298	926	372	N/A	0.94
2006	413	51,061	1,356	1,069	287	N/A	0.69
2007	437	52,901	1,430	1,214	216	N/A	0.49
2008	449	54,900	1,500	771	729	N/A	1.62
2009	447	55,862	1,534	807	727	N/A	1.63
2010@	439	56,976	1,542	966	576	19	1.31
2011	438	57,999	1,546	813	733	23	1.67
2012#	439	58,702	1,480	945	535	14	1.22
2013	448	59,294	1,510	981	529	15	1.18
2014	464	60,863	1,550	1,062	488	13	1.05
2015@	481	61,871	1,706	1,087	619	13	1.29
2016	511	64,610	1,818	1,172	646	13	1.26
2017	528	65,680	1,871	1,258	613	12	1.16
2018	544	67,829	2,048	1,219	829	20	1.52

After benefit changes.

@ Revised actuarial assumptions.

* Prior to 2005, Law Enforcement and Public Safety are combined for purposes of this schedule.

While no one or two numeric indices can fully describe the financial condition of a retirement plan, the ratio of unfunded actuarial accrued liabilities divided by active member payroll ("UNFUNDED/PAYROLL" above) is significant. Unfunded accrued liabilities represent plan debt, while active member payroll represents the plan's capacity to collect contributions to pay toward debt --- thus the ratio is a relative index of condition. The lower the ratio, the greater the financial strength, and vice-versa.

LAW ENFORCEMENT DIVISION
Male Active Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
15-19								
Tot. Pay								
Avg. Pay								
20-24	202	4						206
Tot. Pay	\$8,712,470	\$279,343						\$8,991,813
Avg. Pay	\$43,131	\$69,836						\$43,650
25-29	579	219	4					802
Tot. Pay	\$31,288,971	\$13,464,833	\$301,372					\$45,055,176
Avg. Pay	\$54,040	\$61,483	\$75,343					\$56,179
30-34	308	469	197	4				978
Tot. Pay	\$16,871,370	\$29,978,784	\$13,592,067	\$316,316				\$60,758,537
Avg. Pay	\$54,777	\$63,921	\$68,995	\$79,079				\$62,125
35-39	128	216	385	201	1			931
Tot. Pay	\$6,915,358	\$13,959,800	\$27,094,831	\$15,025,989	\$74,045			\$63,070,023
Avg. Pay	\$54,026	\$64,629	\$70,376	\$74,756	\$74,045			\$67,744
40-44	88	118	226	499	259	4		1,194
Tot. Pay	\$4,572,763	\$7,741,921	\$15,845,710	\$36,656,180	\$19,970,100	\$296,409		\$85,083,083
Avg. Pay	\$51,963	\$65,610	\$70,114	\$73,459	\$77,105	\$74,102		\$71,259
45-49	51	74	129	327	680	252	3	1,516
Tot. Pay	\$2,794,904	\$4,628,253	\$9,000,904	\$23,910,058	\$52,609,491	\$20,053,796	\$243,611	\$113,241,017
Avg. Pay	\$54,802	\$62,544	\$69,774	\$73,119	\$77,367	\$79,579	\$81,204	\$74,697
50-54	25	30	45	119	291	259	54	823
Tot. Pay	\$1,332,431	\$1,836,763	\$3,086,922	\$8,385,913	\$22,208,656	\$20,928,234	\$4,586,506	\$62,365,425
Avg. Pay	\$53,297	\$61,225	\$68,598	\$70,470	\$76,318	\$80,804	\$84,935	\$75,778
55-59	13	16	29	53	99	123	55	388
Tot. Pay	\$570,311	\$927,774	\$1,787,343	\$3,842,936	\$7,153,619	\$9,390,637	\$4,489,638	\$28,162,258
Avg. Pay	\$43,870	\$57,986	\$61,633	\$72,508	\$72,259	\$76,347	\$81,630	\$72,583
60-64	2	7	9	14	53	34	40	159
Tot. Pay	\$67,363	\$431,609	\$560,336	\$1,079,393	\$3,793,018	\$2,247,447	\$3,368,947	\$11,548,113
Avg. Pay	\$33,682	\$61,658	\$62,260	\$77,100	\$71,566	\$66,101	\$84,224	\$72,630
65-69	3	4	6	7	10	8	15	53
Tot. Pay	\$91,719	\$318,225	\$440,263	\$475,301	\$635,016	\$520,931	\$1,194,701	\$3,676,156
Avg. Pay	\$30,573	\$79,556	\$73,377	\$67,900	\$63,502	\$65,116	\$79,647	\$69,361
70 & Over	1	1		1	2		2	7
Tot. Pay	\$49,394	\$42,326		\$47,099	\$128,745		\$151,984	\$419,548
Avg. Pay	\$49,394	\$42,326		\$47,099	\$64,373		\$75,992	\$59,935
Totals	1,400	1,158	1,030	1,225	1,395	680	169	7,057
Tot. Pay	\$73,267,054	\$73,609,631	\$71,709,748	\$89,739,185	\$106,572,690	\$53,437,454	\$14,035,387	\$482,371,149
Avg. Pay	\$52,334	\$63,566	\$69,621	\$73,256	\$76,396	\$78,584	\$83,050	\$68,354

LAW ENFORCEMENT DIVISION
Female Active Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service To Valuation Date						Total	
	0-4	5-9	10-14	15-19	20-24	25-29		30+
15-19								
Tot. Pay								
Avg. Pay								
20-24	42	1						43
Tot. Pay	\$1,733,933	\$47,841						\$1,781,774
Avg. Pay	\$41,284	\$47,841						\$41,437
25-29	95	30						125
Tot. Pay	\$4,781,177	\$1,780,586						\$6,561,763
Avg. Pay	\$50,328	\$59,353						\$52,494
30-34	39	58	19	2				118
Tot. Pay	\$2,156,768	\$3,621,043	\$1,286,814	\$121,598				\$7,186,223
Avg. Pay	\$55,302	\$62,432	\$67,727	\$60,799				\$60,900
35-39	27	21	55	25	1			129
Tot. Pay	\$1,386,861	\$1,467,862	\$3,881,802	\$1,618,643	\$60,642			\$8,415,810
Avg. Pay	\$51,365	\$69,898	\$70,578	\$64,746	\$60,642			\$65,239
40-44	7	14	36	76	26	1		160
Tot. Pay	\$325,339	\$871,726	\$2,416,652	\$5,366,835	\$1,973,132	\$51,064		\$11,004,748
Avg. Pay	\$46,477	\$62,266	\$67,129	\$70,616	\$75,890	\$51,064		\$68,780
45-49	9	18	21	31	89	18	2	188
Tot. Pay	\$471,881	\$1,185,307	\$1,453,099	\$2,108,284	\$6,347,845	\$1,592,666	\$117,723	\$13,276,805
Avg. Pay	\$52,431	\$65,850	\$69,195	\$68,009	\$71,324	\$88,481	\$58,862	\$70,621
50-54	3	3	11	20	41	29	4	111
Tot. Pay	\$118,063	\$235,504	\$721,618	\$1,155,392	\$2,810,701	\$2,144,681	\$404,974	\$7,590,933
Avg. Pay	\$39,354	\$78,501	\$65,602	\$57,770	\$68,554	\$73,955	\$101,244	\$68,387
55-59	1	1	7	10	19	11	3	52
Tot. Pay	\$72,965	\$50,839	\$379,035	\$611,960	\$1,333,888	\$728,661	\$194,694	\$3,372,042
Avg. Pay	\$72,965	\$50,839	\$54,148	\$61,196	\$70,205	\$66,242	\$64,898	\$64,847
60-64			2	5	9	8	5	29
Tot. Pay			\$85,440	\$278,713	\$648,141	\$540,204	\$353,921	\$1,906,419
Avg. Pay			\$42,720	\$55,743	\$72,016	\$67,526	\$70,784	\$65,739
65-69				1		1	1	3
Tot. Pay				\$78,771		\$55,540	\$46,959	\$181,270
Avg. Pay				\$78,771		\$55,540	\$46,959	\$60,423
70 & Over								
Tot. Pay								
Avg. Pay								
Totals	223	146	151	170	185	68	15	958
Tot. Pay	\$11,046,987	\$9,260,708	\$10,224,460	\$11,340,196	\$13,174,349	\$5,112,816	\$1,118,271	\$61,277,787
Avg. Pay	\$49,538	\$63,430	\$67,712	\$66,707	\$71,213	\$75,188	\$74,551	\$63,964

LAW ENFORCEMENT DIVISION
Inactive Members in Valuation December 31, 2018
by Attained Age and Years of Service

Attained Ages	Years of Service to Valuation Date							Total Number
	0-4	5-9	10-14	15-19	20-24	25-29	30+	
Under 20								
20-24	22							22
25-29	129	16						145
30-34	139	44	6					189
35-39	102	40	17	7				166
40-44	89	30	21	21	6			167
45-49	111	25	26	22	21	3		208
50-54	89	15	17	12	14	4		151
55-59	54	7	9	7	3	1		81
60-64	30	5	5	3	1		1	45
65-69	23	1		1			1	26
70 & Over	9			1				10
Totals	797	183	101	74	45	8	2	1,210

SECTION IX

ALLOWANCES BEING PAID TO RETIREES AND BENEFICIARIES

Monthly Allowances of Retired Lives by Year of Retirement as of December 31, 2018

Year of Retirement	No.	Initial	Post-Ret. Increase	Total	Average
2018	8,371	\$18,585,451	\$ 95,812	\$ 18,681,263	\$ 2,232
2017	9,237	20,474,586	710,152	21,184,738	2,293
2016	8,355	17,727,264	1,171,797	18,899,061	2,262
2015	7,525	15,339,741	1,478,781	16,818,522	2,235
2014	11,908	21,585,075	2,663,671	24,248,746	2,036
2013	11,730	22,969,634	3,699,558	26,669,192	2,274
2012	10,727	22,090,531	4,037,673	26,128,204	2,436
2011	11,785	26,256,377	5,594,854	31,851,231	2,703
2010	10,542	21,555,364	5,233,480	26,788,844	2,541
2009	10,307	21,608,321	5,855,222	27,463,543	2,665
2008	8,920	17,129,850	5,160,801	22,290,651	2,499
2007	8,508	15,733,190	5,215,871	20,949,061	2,462
2006	8,957	15,771,424	5,682,463	21,453,887	2,395
2005	8,255	14,983,884	5,840,114	20,823,998	2,523
2004	7,699	13,150,055	5,514,017	18,664,072	2,424
2003	7,214	12,456,303	5,578,178	18,034,481	2,500
2002	7,900	13,351,558	6,386,867	19,738,425	2,499
1997-2001	26,972	38,847,674	21,087,990	59,935,664	2,222
1992-1996	16,685	18,962,780	12,553,590	31,516,370	1,889
1987-1991	9,952	9,730,562	8,148,909	17,879,471	1,797
1982-1986	4,742	3,156,465	3,113,384	6,269,849	1,322
1977-1981	1,935	921,205	1,203,700	2,124,905	1,098
1972-1976	626	196,163	351,100	547,263	874
1967-1971	145	34,016	97,912	131,928	910
Before 1967	78	17,307	60,438	77,745	997
TOTAL	219,075	\$382,634,780	\$116,536,334	\$499,171,114	\$2,279

Monthly Allowances of Retired Lives by Years of Service as of December 31, 2018

Years of Service	No.	Initial	Post-Ret. Increase	Total	Average
<5 or n/a	8,696	\$ 3,226,902	\$ 492,050	\$ 3,718,952	\$ 428
5	4,065	1,575,817	530,690	2,106,507	518
6	3,370	1,493,245	480,291	1,973,536	586
7	3,280	1,587,518	487,096	2,074,614	633
8	3,203	1,718,539	528,400	2,246,939	702
9	2,538	1,553,613	413,021	1,966,634	775
10	9,236	4,844,325	1,614,899	6,459,224	699
11	5,746	3,636,642	1,111,060	4,747,702	826
12	5,793	3,900,948	1,171,578	5,072,526	876
13	5,508	4,212,688	1,254,805	5,467,493	993
14	5,278	4,285,176	1,257,567	5,542,743	1,050
15	5,687	4,995,994	1,489,623	6,485,617	1,140
16	5,433	5,007,812	1,530,017	6,537,829	1,203
17	5,025	5,140,161	1,538,035	6,678,196	1,329
18	5,020	5,314,678	1,639,756	6,954,434	1,385
19	4,706	5,254,328	1,693,228	6,947,556	1,476
20	6,524	8,233,663	2,328,477	10,562,140	1,619
21	5,365	7,121,090	2,163,859	9,284,949	1,731
22	5,158	7,370,777	2,248,863	9,619,640	1,865
23	5,078	7,708,069	2,333,054	10,041,123	1,977
24	4,822	7,808,663	2,349,831	10,158,494	2,107
25	10,400	18,467,161	5,734,332	24,201,493	2,327
26	6,196	11,828,868	3,777,443	15,606,311	2,519
27	6,147	12,530,497	4,144,464	16,674,961	2,713
28	6,751	15,216,775	5,241,779	20,458,554	3,030
29	6,402	15,574,743	5,139,000	20,713,743	3,236
30	33,282	89,260,855	25,311,245	114,572,100	3,442
31	9,425	26,474,352	7,957,295	34,431,647	3,653
32	7,220	21,091,363	6,399,638	27,491,001	3,808
33	5,455	16,585,439	5,050,557	21,635,996	3,966
34	4,226	13,168,338	4,212,243	17,380,581	4,113
35	3,854	12,241,839	3,925,970	16,167,809	4,195
36	2,727	8,801,183	2,767,955	11,569,138	4,242
37	2,151	6,997,995	2,248,052	9,246,047	4,298
38	1,535	4,981,133	1,601,040	6,582,173	4,288
39	1,176	3,799,341	1,321,718	5,121,059	4,355
40 & Over	2,597	9,624,250	3,047,403	12,671,653	4,879
TOTAL	219,075	\$382,634,780	\$116,536,334	\$499,171,114	\$2,279

Annuity and Pension Reserve Fund

Annual Allowance, Reported Assets and Actuarial Liabilities

Comparative Statement

(\$ Millions)

Valuation Date	Annual Allowances			Reported Assets*	Actuarial Liabilities	Ratio of Assets to Liabilities	Ratio of DB Active to Retired
	No.	\$ Millions	% of DB Payroll				
12/31/1989@	92,504	\$ 661	12.4 % **	\$ 6,985	\$ 6,911	101.1 %	2.9
12/31/1990	94,088	706	11.7 % **	7,438	7,338	101.4 %	3.0
12/31/1991	95,843	762	11.5 % **	8,014	7,904	101.4 %	3.4
12/31/1992	98,609	835	12.1 % **	8,814	8,692	101.4 %	3.4
12/31/1993	100,651	901	12.5 % **	9,390	9,356	100.4 %	3.4
12/31/1994	102,587	958	12.6 % **	9,964	9,893	100.7 %	3.3
12/31/1995	104,806	1,036	13.0 % **	10,808	10,737	100.7 %	3.3
12/31/1996@	107,617	1,141	13.7 % **	11,819	11,762	100.5 %	3.3
12/31/1997	110,470	1,233	14.3 % **	12,843	12,755	100.7 %	3.2
12/13/1998	113,000	1,327	14.7 % **	13,885	13,751	101.0 %	3.1
12/31/1999+	115,431	1,530	16.1 % **	14,978	16,139	92.8 %	3.1
12/31/2000	118,620	1,641	16.1 % **	16,980	16,980	100.0 %	3.1
12/31/2001@	121,875	1,775	16.5 % **	18,001	18,001	100.0 %	3.0
12/31/2002	126,409	1,958	17.5 % **	20,085	20,085	100.0 %	2.9
12/31/2003	130,433	2,136	19.1 % **	22,535	22,535	100.0 %	2.7
12/31/2004	134,535	2,311	20.2 % **	24,470	24,470	100.0 %	2.6
12/31/2005@	138,996	2,508	21.2 % **	27,084	27,084	100.0 %	2.6
12/31/2006	144,037	2,710	22.3 % **	29,304	29,304	100.0 %	2.5
12/31/2007	148,493	2,916	23.2 % **	31,547	31,547	100.0 %	2.5
12/31/2008	153,931	3,148	24.6 % **	34,060	34,060	100.0 %	2.3
12/31/2009	159,518	3,419	27.2 % **	37,098	37,098	100.0 %	2.2
12/31/2010@	166,247	3,705	29.8 % **	40,184	40,818	100.0 %	2.1
12/31/2011	174,679	4,065	32.8 % **	45,001	45,001	100.0 %	1.9
12/31/2012	180,759	4,352	35.7 % **	48,044	48,044	100.0 %	1.8
12/31/2013	187,198	4,629	37.5 % **	50,754	50,754	100.0 %	1.8
12/31/2014	194,096	4,908	38.8 % **	53,432	53,432	100.0 %	1.7
12/31/2015@	196,709	5,115	39.5 % **	55,117	55,117	100.0 %	1.7
12/31/2016	199,662	5,344	39.7 % **	60,949	60,949	100.0 %	1.7
12/31/2017	202,292	5,575	40.6 % **	62,931	62,931	100.0 %	1.6
12/31/2018	204,479	5,791	42.7 % **	66,395	66,395	100.0 %	1.4

* Including certain recommended transfers and accrued transfers.

@ Revised actuarial assumptions.

** Excluding health insurance and Medicare payments.

+ Including estimated effect of legislated benefit changes.

Annuity and Pension Reserve Fund
Retirees and Beneficiaries December 31, 2018
Type of Benefit, Monthly Amount and Actuarial Liabilities

Type of Allowance	Number	Current Total	Actuarial Liabilities
Superannuation Retirement			
Plan A - Joint & 50%	18,169	\$ 51,450,964	\$ 7,188,285,382
Plan B - Straight Life / Straight Life Plan	89,025	199,655,229	25,198,971,377
Plan C - Special Joint & Survivor*	31,871	89,540,587	13,738,512,542
Plan D - Joint & 100%	20,533	56,767,191	9,253,471,228
Plan E - Life & 0 to 5 Years Guaranteed	292	635,627	78,890,027
- Life & 6 to 10 Years Guaranteed	424	905,390	111,647,615
- Life & 11 to 15 Years Guaranteed	604	1,117,147	139,947,610
- Life & 16 to 20 Years Guaranteed	62	161,693	24,455,805
Plan F - Multiple Continuing Beneficiaries (Includes Multiple Life Plan)	1,257	3,402,912	661,892,180
Reserve for Combined Plan Future Adverse Experience			440,631
Reserve for Member Directed Future Adverse Experience			2,934,876
Money Purchase	4,063	1,788,326	219,488,931
Survivor Beneficiary - Life Benefit	17,410	23,531,418	2,370,763,919
Survivor Beneficiary - Temporary Benefit	78	117,419	5,263,067
Total Superannuation	183,788	\$ 429,073,903	\$ 58,994,965,190
Disability Retirement	20,691	\$ 53,491,463	\$ 7,400,597,297
Total from A & PR	204,479	\$ 482,565,366	\$ 66,395,562,487

**Includes post September 1, 2013 retirements that elected the Joint Life Plan.*

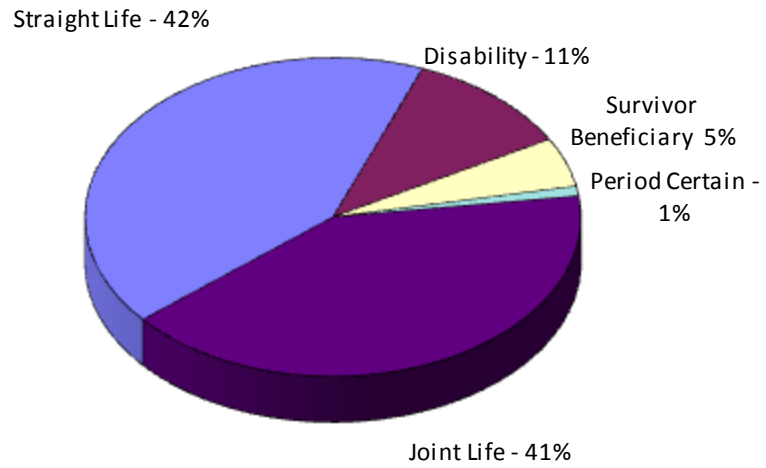
Annuity and Pension Reserve Fund
Retirees and Beneficiaries December 31, 2018
Type of Benefit and Amount by Gender of Recipient

Type of Allowance	Men		Women		Total	
	Number	Monthly Allowances	Number	Monthly Allowances	Number	Monthly Allowances
Superannuation Retirement						
Plan A - Joint & 50%	11,804	\$ 35,765,143	6,365	\$ 15,685,821	18,169	\$ 51,450,964
Plan B - Straight Life / Straight Life Plan	27,524	69,464,238	61,501	130,190,991	89,025	199,655,229
Plan C - Special Joint & Survivor*	17,249	52,997,830	14,622	36,542,757	31,871	89,540,587
Plan D - Joint & 100%	16,262	47,080,335	4,271	9,686,856	20,533	56,767,191
Plan E - Life & 0 to 5 Years Guaranteed	118	282,685	174	352,942	292	635,627
- Life & 6 to 10 Years Guaranteed	207	443,587	217	461,803	424	905,390
- Life & 11 to 15 Years Guaranteed	322	584,525	282	532,622	604	1,117,147
- Life & 16 to 20 Years Guaranteed	42	99,802	20	61,891	62	161,693
Plan F - Multiple Continuing Beneficiaries (Includes Multiple Life Plan)	479	1,549,566	778	1,853,346	1,257	3,402,912
Money Purchase	2,536	1,346,654	1,527	441,672	4,063	1,788,326
Survivor Beneficiary - Life Benefit	2,347	2,029,500	15,063	21,501,918	17,410	23,531,418
Survivor Beneficiary - Temporary Benefit	20	41,893	58	75,526	78	117,419
Total Superannuation	78,910	\$ 211,685,758	104,878	\$ 217,388,145	183,788	\$ 429,073,903
Disability Retirement	10,484	\$ 29,785,388	10,207	\$ 23,706,075	20,691	\$ 53,491,463
Total from A & PR	89,394	\$ 241,471,146	115,085	\$ 241,094,220	204,479	\$ 482,565,366

*Includes post September 1, 2013 retirements that elected the Joint Life Plan.

Annuities Being Paid by Type December 31, 2018

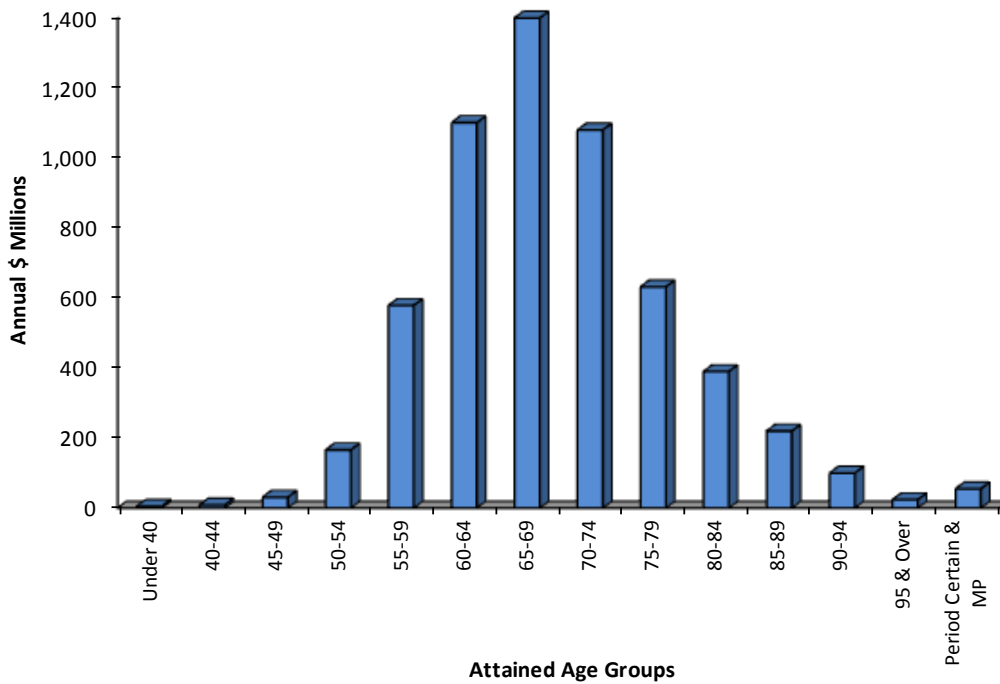
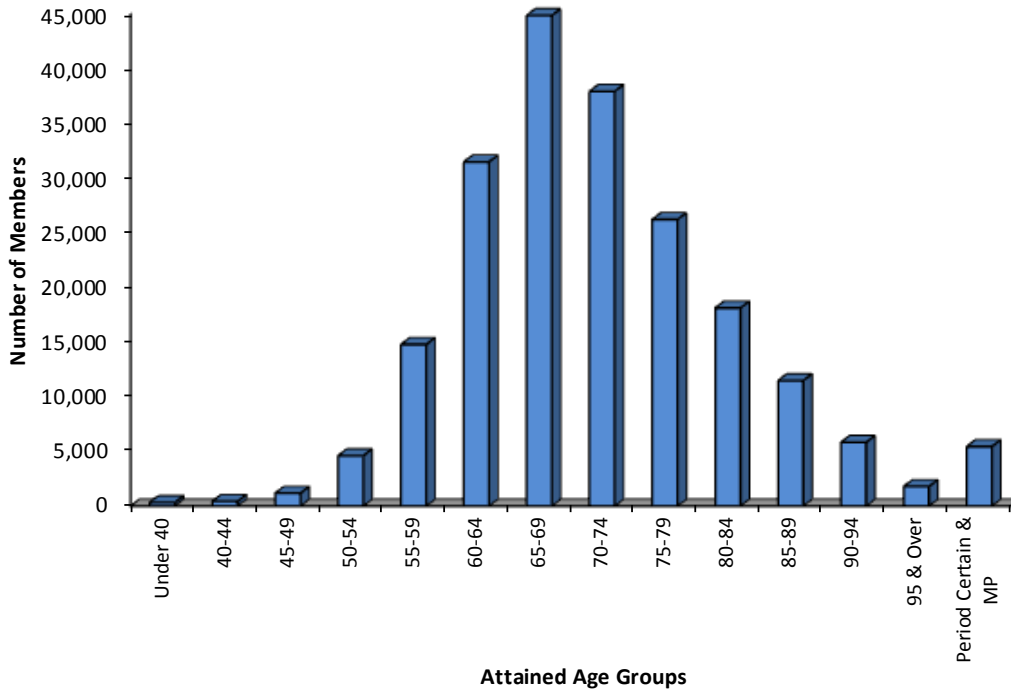
Annuity and Pension Reserve Fund



**Annuity and Pension Reserve Fund
Retirees and Beneficiaries December 31, 2018
Current Monthly Total \$ by Attained Ages**

Attained Ages	Superannuation		Disability		Totals	
	No.	Monthly Total	No.	Monthly Total	No.	Monthly Total
Under 20	14	\$ 15,107			14	\$ 15,107
20-24	20	19,728			20	19,728
25-29	40	24,558	1	\$ 1,420	41	25,978
30-34	43	36,465	22	35,548	65	72,013
35-39	54	50,810	124	214,052	178	264,862
40-44	67	39,665	365	730,239	432	769,904
45-49	185	309,857	996	2,311,922	1,181	2,621,779
50-54	2,443	7,868,345	2,164	5,934,310	4,607	13,802,655
55-59	10,883	37,187,851	3,896	11,039,326	14,779	48,227,177
60-64	26,217	77,648,053	5,259	14,062,285	31,476	91,710,338
65-69	41,378	107,022,157	3,497	9,654,011	44,875	116,676,168
70-74	35,609	84,284,842	2,321	5,719,962	37,930	90,004,804
75-79	25,021	50,198,883	1,198	2,432,234	26,219	52,631,117
80-84	17,590	31,530,373	525	930,693	18,115	32,461,066
85-89	11,265	18,009,602	212	292,592	11,477	18,302,194
90-94	5,738	8,208,361	94	111,959	5,832	8,320,320
95 & Over	1,776	2,011,063	17	20,910	1,793	2,031,973
Period Certain & Money Purchase	5,445	4,608,183			5,445	4,608,183
Totals	183,788	\$429,073,903	20,691	\$53,491,463	204,479	\$482,565,366

Annuity and Pension Reserve Fund Benefits Being Paid by Attained Ages December 31, 2018



Annuity and Pension Reserve Fund Percent of Recipients by Age Groups and Year

Attained Age Group	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004
Under 30	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30-39	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.4%	0.4%	0.5%	0.5%	0.5%
40-49	0.8%	0.9%	1.1%	1.1%	1.3%	1.5%	1.8%	2.0%	2.2%	2.5%	2.7%	2.9%	3.1%	3.3%	3.4%
50-59	9.5%	10.6%	11.5%	12.5%	13.7%	14.6%	15.4%	15.9%	15.9%	16.0%	15.9%	15.9%	16.1%	15.8%	14.7%
60-69	37.3%	37.9%	38.6%	38.8%	37.9%	36.5%	35.5%	34.8%	33.5%	32.6%	31.4%	30.7%	29.6%	28.9%	28.8%
70-79	31.4%	29.8%	27.9%	26.7%	26.2%	26.1%	25.8%	25.4%	25.7%	26.2%	26.7%	27.2%	27.7%	28.5%	29.4%
80-89	14.5%	14.3%	14.4%	14.4%	14.4%	14.8%	15.3%	15.8%	16.6%	16.9%	17.4%	17.7%	17.9%	18.0%	18.2%
90 & Over	3.7%	3.7%	3.7%	3.6%	3.6%	3.6%	3.6%	3.6%	3.6%	3.4%	3.4%	3.3%	3.2%	3.2%	3.2%
Period Certain & MP	2.7%	2.7%	2.7%	2.7%	2.7%	2.7%	2.4%	2.3%	2.2%	2.1%	2.1%	1.9%	1.9%	1.8%	1.8%
TOTALS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average Age	70.9	70.9	70.6	70.4	70.2	70.0	69.9	69.9	70.0	70.0	70.1	70.1	70.2	70.2	70.4

STATE DIVISION
Survivor Benefit Fund Tabulated by
Type of Benefit Being Paid and Monthly Amount
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
S-1 - Survivor Benefit to Beneficiary of Deceased Member Joint and Survivor Computation			
Men	204	\$ 256,672	\$ 28,429,171
Women	606	1,027,600	117,909,025
Totals	810	\$ 1,284,272	\$ 146,338,196
S-2 - Survivor Benefit to Beneficiary of Deceased Member Fixed Rate Amount			
Males			
Widower	736	\$ 975,028	\$ 126,533,958
Parent	0	0	0
Other	2	1,407	268,870
Child	293	250,405	15,695,071
Subtotals - Male	1,031	\$ 1,226,840	\$ 142,497,899
Females			
Widow	2,140	\$ 3,064,822	\$ 417,718,268
Parent	0	0	0
Other	4	4,383	550,415
Child	312	261,615	14,754,595
Subtotals - Female	2,456	\$ 3,330,820	\$ 433,023,278
Totals	3,487	\$ 4,557,660	\$ 575,521,177
Total Benefits Being Paid from Survivor Benefit Fund			
Men	1,235	\$ 1,483,512	\$ 170,927,070
Women	3,062	4,358,420	550,932,303
Totals	4,297	\$ 5,841,932	\$ 721,859,373

LOCAL GOVERNMENT DIVISION
Survivor Benefit Fund Tabulated by
Type of Benefit Being Paid and Monthly Amount
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
S-1 - Survivor Benefit to Beneficiary of Deceased Member Joint and Survivor Computation			
Men	303	\$ 310,666	\$ 33,875,729
Women	1,271	1,656,477	184,905,545
Totals	1,574	\$ 1,967,143	\$ 218,781,274
S-2 - Survivor Benefit to Beneficiary of Deceased Member Fixed Rate Amount			
Males			
Widower	1,213	\$ 1,176,386	\$ 149,628,355
Parent	0	0	0
Other	0	0	0
Child	597	414,816	27,969,870
Subtotals - Male	1,810	\$ 1,591,202	\$ 177,598,225
Females			
Widow	5,144	\$ 5,611,165	\$ 741,722,864
Parent	0	0	0
Other	13	11,447	1,137,039
Child	545	378,392	22,877,309
Subtotals - Female	5,702	\$ 6,001,004	\$ 765,737,212
Totals	7,512	\$ 7,592,206	\$ 943,335,437
Total Benefits Being Paid from Survivor Benefit Fund			
Men	2,113	\$ 1,901,868	\$ 211,473,954
Women	6,973	7,657,481	950,642,757
Totals	9,086	\$ 9,559,349	\$ 1,162,116,711

PUBLIC SAFETY DIVISION
Survivor Benefit Fund Tabulated by
Type of Benefit Being Paid and Monthly Amount
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
S-1 - Survivor Benefit to Beneficiary of Deceased Member Joint and Survivor Computation			
Men	1	\$ 1,365	\$ 195,142
Women	12	20,267	2,815,578
Totals	13	\$ 21,632	\$ 3,010,720
S-2 - Survivor Benefit to Beneficiary of Deceased Member Fixed Rate Amount			
Males			
Widower	3	\$ 3,963	\$ 327,496
Other	0	0	0
Child	2	1,426	37,110
Subtotals - Male	5	\$ 5,389	\$ 364,606
Females			
Widow	89	\$ 136,294	\$ 19,939,273
Other	0	0	0
Child	4	3,468	506,654
Subtotals - Female	93	\$ 139,762	\$ 20,445,927
Totals	98	\$ 145,151	\$ 20,810,533
Total Benefits Being Paid from Survivor Benefit Fund			
Men	6	\$ 6,754	\$ 559,748
Women	105	160,029	23,261,505
Totals	111	\$ 166,783	\$ 23,821,253

LAW ENFORCEMENT DIVISION
Survivor Benefit Fund Tabulated by
Type of Benefit Being Paid and Monthly Amount
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
S-1 - Survivor Benefit to Beneficiary of Deceased Member Joint and Survivor Computation			
Men	1	\$ 1,372	\$ 170,522
Women	52	104,703	12,685,075
Totals	53	\$ 106,075	\$ 12,855,597
S-2 - Survivor Benefit to Beneficiary of Deceased Member Fixed Rate Amount			
Males			
Widower	12	\$ 11,895	\$ 1,781,095
Other	0	0	0
Child	65	52,335	2,824,823
Subtotals - Male	77	\$ 64,230	\$ 4,605,918
Females			
Widow	209	\$ 280,530	\$ 44,886,777
Other	0	0	0
Child	57	44,480	2,345,023
Subtotals - Female	266	\$ 325,010	\$ 47,231,800
Totals	343	\$ 389,240	\$ 51,837,718
Total Benefits Being Paid from Survivor Benefit Fund			
Men	78	\$ 65,602	\$ 4,776,440
Women	318	429,713	59,916,875
Totals	396	\$ 495,315	\$ 64,693,315

STATE DIVISION
Deferred Survivor Beneficiaries
Tabulated by Gender and Deferred Age
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
Widowers - Male			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	59	71,648	6,980,844
Deferred to age 65	0	0	0
Total - Male	59	\$ 71,648	\$ 6,980,844
Widows - Female			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	162	131,879	14,571,915
Deferred to age 65	0	0	0
Total - Female	162	\$ 131,879	\$ 14,571,915
Totals	221	\$ 203,527	\$ 21,552,759

LOCAL GOVERNMENT DIVISION
Deferred Survivor Beneficiaries
Tabulated by Gender and Deferred Age
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
Widowers - Males			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	118	83,636	9,258,392
Deferred to age 65	0	0	0
Total - Male	118	\$ 83,636	\$ 9,258,392
Widows - Female			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	358	249,448	30,165,295
Deferred to age 65	0	0	0
Total - Female	358	\$ 249,448	\$ 30,165,295
Totals	476	\$ 333,084	\$ 39,423,687

PUBLIC SAFETY DIVISION
Deferred Survivor Beneficiaries
Tabulated by Gender and Deferred Age
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
Widowers - Males			
Deferred to age 50	0	\$ 0	\$ 0
Total - Male	0	\$ 0	\$ 0
Widows - Females			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	7	4,110	485,824
Total - Female	7	\$ 4,110	\$ 485,824
Totals	7	\$ 4,110	\$ 485,824

LAW ENFORCEMENT DIVISION
Deferred Survivor Beneficiaries
Tabulated by Gender and Deferred Age
December 31, 2018

Group	Number	Current Total	Actuarial Liabilities
Widowers - Males			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	0	0	0
Total - Male	0	\$ 0	\$ 0
Widows - Females			
Deferred to age 50	0	\$ 0	\$ 0
Deferred to age 62	2	1,648	158,086
Total - Female	2	\$ 1,648	\$ 158,086
Totals	2	\$ 1,648	\$ 158,086

Survivor Benefit Fund Reported Assets and Liabilities Divisions Combined

Valuation Date	Monthly Allowances				\$ Millions		Ratio of Assets to Liabilities
	Current		Deferred		Reported Assets+	Actuarial Liabilities	
	No.	Amount	No.	Amount			
12/31/1984*	11,819	\$ 3,119,531	990	\$ 248,373	\$ 492.2	\$ 451.1	109 %
12/31/1985	11,889	3,278,253	979	259,842	532.8	469.6	113 %
12/31/1986	12,054	3,489,915	960	268,931	575.5	451.2	128 %
12/31/1987	12,153	3,656,420	933	279,327	626.1	472.9	132 %
12/31/1988	12,237	3,822,085	941	283,026	490.8	490.8	100 %
12/31/1989@	12,198	4,177,540	941	320,792	525.3	522.1	101 %
12/31/1990	12,182	4,330,622	907	321,218	542.5	537.1	101 %
12/31/1991	12,268	4,528,326	860	314,414	567.9	557.1	102 %
12/31/1992	12,318	4,750,848	852	329,509	589.8	583.3	101 %
12/31/1993	12,437	4,985,681	862	345,937	620.7	607.7	102 %
12/31/1994	12,569	5,207,186	845	347,178	641.5	628.5	102 %
12/31/1995	12,608	5,408,577	866	376,573	668.9	652.4	103 %
12/31/1996@	12,724	5,822,113	878	395,594	711.6	710.6	100 %
12/31/1997	12,856	6,074,566	932	433,430	743.0	740.5	100 %
12/13/1998	13,079	6,337,739	1,060	500,514	780.2	779.6	100 %
12/31/1999#	13,236	7,345,740	989	550,153	801.4	910.9	88 %
12/31/2000	13,317	9,026,315	666	348,886	1,037.4	1,037.4	100 %
12/31/2001@	13,588	9,449,543	993	490,441	1,086.4	1,086.4	100 %
12/31/2002	13,708	9,764,826	902	470,284	1,120.2	1,120.2	100 %
12/31/2003	13,988	10,246,174	842	493,329	1,193.1	1,193.1	100 %
12/31/2004	13,903	10,503,169	858	524,733	1,227.1	1,227.1	100 %
12/31/2005@	14,108	10,948,727	831	528,162	1,289.3	1,289.3	100 %
12/31/2006	14,172	11,333,735	832	508,430	1,332.6	1,332.6	100 %
12/31/2007	14,186	11,714,551	832	510,846	1,375.9	1,375.9	100 %
12/31/2008	14,238	12,122,501	847	526,623	1,425.6	1,425.6	100 %
12/31/2009	14,301	12,576,956	840	527,032	1,479.4	1,479.4	100 %
12/31/2010@	14,407	13,047,857	829	524,242	1,545.7	1,545.7	100 %
12/31/2011	14,370	13,424,237	800	505,111	1,589.7	1,589.7	100 %
12/31/2012#	14,224	13,769,795	796	519,459	1,629.3	1,629.3	100 %
12/31/2013	14,187	14,152,417	751	480,335	1,663.5	1,663.5	100 %
12/31/2014	13,974	14,406,311	739	474,837	1,688.7	1,688.7	100 %
12/31/2015@	13,842	14,728,606	750	479,666	1,838.1	1,838.1	100 %
12/31/2016	13,790	15,119,687	715	462,896	1,881.1	1,881.1	100 %
12/31/2017	13,960	15,655,980	726	553,126	1,942.9	1,942.9	100 %
12/31/2018	13,890	16,063,379	706	542,369	2,034.1	2,034.1	100 %

@ Revised actuarial assumptions.

* Benefits increased.

After benefit changes.

+ Includes certain recommended transfers and accrued transfers.

Retirees and Beneficiaries December 31, 2018

Historical Averages

All Retirees								
December 31	Number Count	Average Age at Retirement	Average Service at Retirement	Average Pension at Retirement	Average Age on Valuation Date	Average Pension on Valuation Date	Median Pension on Valuation Date	Average FAS at Retirement
2018	219,075	57.8	23.1	\$21,429	70.7	\$27,944	\$24,408	\$43,395
2017	216,978	57.7	23.0	20,993	70.4	27,161	23,652	42,486
2016	214,167	57.6	22.9	20,526	70.2	26,370	22,848	41,524
2015	211,301	57.6	22.8	20,076	69.9	25,579	22,056	40,604
2014	208,809	57.6	22.8	19,673	69.7	24,833	21,348	39,753
2013	202,136	57.4	22.8	19,290	69.5	24,209	20,784	38,763
2012	195,779	57.4	22.7	18,827	69.3	23,461	20,088	37,743
2011	189,849	57.3	22.6	18,218	69.3	22,611	19,212	36,552
2010	181,483	57.2	22.4	17,379	69.3	21,598	18,144	35,025
2009	174,659	57.2	22.2	16,724	69.3	20,730	17,256	33,808
2008	169,016	57.2	22.0	15,942	69.4	19,750	16,284	32,401
2007	163,511	57.2	21.9	15,318	69.4	18,917	15,480	31,214
2006	159,041	57.3	21.7	14,711	69.4	18,096	14,700	29,975
Traditional Plan								
December 31	Number Count	Average Age at Retirement	Average Service at Retirement	Average Pension at Retirement	Average Age on Valuation Date	Average Pension on Valuation Date	Median Pension on Valuation Date	Average FAS at Retirement
2018	218,226	57.8	23.2	\$21,456	70.7	\$27,981	\$24,444	\$43,386
2017	216,260	57.7	23.1	21,016	70.4	27,192	23,688	42,479
2016	213,550	57.6	23.0	20,545	70.2	26,396	22,884	41,519
2015	210,792	57.6	22.9	20,092	69.9	25,600	22,080	40,600
2014	208,395	57.6	22.8	19,686	69.7	24,849	21,372	39,749
2013	201,841	57.4	22.8	19,299	69.5	24,220	20,796	38,760
2012	195,622	57.4	22.7	18,832	69.3	23,468	20,088	37,741
2011	189,753	57.3	22.6	18,221	69.3	22,614	19,224	36,549
2010	181,433	57.2	22.4	17,380	69.3	21,600	18,144	35,025
2009	174,637	57.2	22.2	16,725	69.3	20,731	17,256	33,808
2008	169,000	57.2	22.0	15,942	69.4	19,751	16,284	32,401
2007	163,505	57.2	21.9	15,318	69.4	18,917	15,480	31,214
2006	159,039	57.3	21.7	14,711	69.4	18,096	14,700	29,974
Combined Plan								
December 31	Number Count	Average Age at Retirement	Average Service at Retirement	Average Pension at Retirement	Average Age on Valuation Date	Average Pension on Valuation Date	Median Pension on Valuation Date	Average FAS at Retirement
2018	569	64.8	10.6	\$4,338	68.7	\$4,697	\$4,020	\$49,007
2017	476	64.7	10.3	4,000	68.2	4,304	3,816	47,455
2016	398	64.8	10.0	3,709	67.9	3,956	3,528	46,614
2015	324	64.6	9.8	3,401	67.3	3,596	3,186	45,141
2014	259	64.7	9.7	3,284	66.8	3,421	3,030	44,349
2013	164	64.9	8.7	2,839	67.0	2,962	2,682	43,403
2012	95	64.2	8.5	2,785	66.2	2,891	2,556	45,218
2011	58	64.2	7.9	2,757	66.0	2,828	2,202	49,751
2010	32	64.3	7.9	2,158	65.9	2,219	1,962	40,548
2009	12	65.0	7.6	1,590	66.6	1,635	1,740	35,139
2008	12	64.0	7.4	1,239	64.8	1,260	1,092	29,454
2007	4	61.1	4.8	1,620	62.0	1,644	1,644	43,743
2006	2	62.1	3.8	1,656	62.3	1,656	1,656	50,116
DB Portion of Member Directed Plan								
December 31	Number Count	Average Age at Retirement	Average Service at Retirement	Average Pension at Retirement	Average Age on Valuation Date	Average Pension on Valuation Date	Median Pension on Valuation Date	Average FAS at Retirement
2018	280	NA	NA	NA	NA	NA	NA	NA
2017	242	NA	NA	NA	NA	NA	NA	NA
2016	219	NA	NA	NA	NA	NA	NA	NA
2015	185	NA	NA	NA	NA	NA	NA	NA
2014	155	NA	NA	NA	NA	NA	NA	NA
2013	131	NA	NA	NA	NA	NA	NA	NA
2012	62	NA	NA	NA	NA	NA	NA	NA
2011	38	NA	NA	NA	NA	NA	NA	NA
2010	18	NA	NA	NA	NA	NA	NA	NA
2009	10	NA	NA	NA	NA	NA	NA	NA
2008	4	NA	NA	NA	NA	NA	NA	NA
2007	2	NA	NA	NA	NA	NA	NA	NA
2006	NA	NA	NA	NA	NA	NA	NA	NA

SECTION X

ACTUARIAL METHODS AND ASSUMPTIONS

Summary of Actuarial Methods and Assumptions used for OPERS Actuarial Valuations Assumptions Adopted by the Retirement Board After Consulting with the Actuary

The individual entry age actuarial cost method of valuation was used in determining liabilities and normal cost. Differences in the past between assumed experience and actual experience (“actuarial gains and losses”) become part of actuarial accrued liabilities.

Unfunded actuarial accrued liabilities are amortized to produce payments (principal & interest) which are level percent of payroll contributions.

The actuarial assumptions used in the valuation are shown in this Section. Assumptions were established following the December 31, 2015 actuarial valuation based upon an Experience Study covering the period January 1, 2011 through December 31, 2015 and updated in conjunction with an Investment Return Assumption review performed in between the December 31, 2017 and December 31, 2018 Actuarial Valuations. The actuarial assumptions represent estimates of future experience.

ECONOMIC ASSUMPTIONS

The investment return rate assumed in the valuations was 7.20% per year, compounded annually (net after investment expenses).

The wage inflation rate assumed in this valuation was 3.25% per year. The wage inflation rate is defined to be the portion of total pay increases for an individual that are due to macroeconomic forces including productivity, price inflation, and labor market conditions. The wage inflation rate does not include pay changes related to individual merit and seniority effects.

The price inflation component of the investment return rate and the wage inflation rate is assumed to be 2.50%.

The assumed real rate of return over wage inflation is defined to be the portion of total investment return that is more than the assumed total wage growth rate. Considering other economic assumptions, the 7.20% investment return rate translates to an assumed real rate of return over wage inflation of 3.95%. The assumed real rate of return over price inflation is 4.70%.

The active member population (the sum of the Traditional and Combined Plan active members) is assumed to remain constant. For purposes of financing the unfunded actuarial accrued liabilities, total payroll (the sum of the Traditional and Combined Plan active payroll) is assumed to grow at the wage inflation rate – 3.25% per year.

Pay increase assumptions for individual active members are shown for sample ages on pages X-8 through X-11. Part of the assumption for each age is for merit and/or seniority increase, and the other 3.25% recognizes wage inflation, including price inflation, productivity increases, and other macroeconomic forces.

Non-Economic Assumptions

The pre-retirement mortality tables, for pre-retirement mortality, used in evaluating allowances to be paid were the RP-2014 Employees mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for males and females was then established to be 2015 and 2010 respectively. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables.

The healthy retiree mortality tables, for post-retirement mortality, used in evaluating allowances to be paid were the RP-2014 Healthy Annuitant mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for males and females was then established to be 2015 and 2010 respectively. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables.

The disabled retiree mortality tables, for post-retirement mortality, used in evaluating allowances to be paid were the RP-2014 Disabled mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for males and females was then established to be 2015 and 2010 respectively. Mortality rates for a particular calendar year are determined by applying the MP-2015 mortality improvement scale to the above described tables.

The probabilities of unreduced and reduced age and service retirement are shown on pages X-3 through X-7. For State and Local Government members that satisfy the 30-year (31 & 32 years for Transition Groups B & C) unreduced retirement condition prior to age 65 (66 & 67 for Transition Groups B & C), the service-based unreduced retirement probabilities are used. For State and Local Government members that satisfy the 30-year (31 & 32 years for Transition Groups B & C) unreduced retirement condition on or after age 65 (66 & 67 for Transition Groups B & C), the age-based unreduced retirement probabilities are used.

The probabilities of withdrawal from service, disability and death-in-service are shown for sample ages on pages X-8 through X-11. For withdrawal from service it was assumed that members terminating before age 35, members terminating with less than 5 years of service, and a percentage of all other members would withdraw their contributions and forfeit their entitlement to an employer financed benefit. The percentage is 100% at age 35 and is reduced for each year of age after 35, becoming 0% at age 55 (age 45 for law members).

For purposes of death-in-service and disability benefits, it is assumed that Combined Plan members will take a benefit from the Traditional Plan, unless a lump sum distribution from the Combined Plan would have a greater value. It is assumed death-in-service members have 2 qualified survivor beneficiaries.

The funding value of defined benefit assets recognizes assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over a closed 4-year period. Funding value is not permitted to deviate from market value by more than 12%. Traditional and Combined Plan retiree health funding values of assets are developed independently beginning with the December 31, 2004 valuation.

Present assets (cash & investments) at funding value are shown on pages II-2 through II-9.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA). Great care was taken in the production of this report, but there may be cases where schedules do not add, or where they do not exactly balance to other related schedules due to rounding.

Probabilities of Unreduced Age and Service Retirement

Transition Group A

Ages	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
65	22%	22%	20%	20%
66	22%	22%	20%	20%
67	20%	20%	15%	20%
68	20%	20%	15%	17%
69	20%	20%	15%	17%
70	20%	20%	15%	17%
71	20%	20%	15%	17%
72	15%	20%	15%	17%
73	15%	20%	15%	17%
74	15%	20%	15%	17%
75	15%	20%	15%	17%
76	15%	20%	15%	17%
77	15%	25%	15%	17%
78	15%	25%	15%	17%
79	15%	25%	15%	22%
80	25%	25%	20%	22%
81	25%	25%	20%	22%
82	25%	25%	20%	22%
83	25%	25%	20%	22%
84	25%	25%	20%	22%
85 & Over	100%	100%	100%	100%
Ref	2094	2095	2096	2097

Ages	Percent of Eligible Active Members Retiring Within Next Year	
	Public Safety	Law Enforcement
	48	
49		20%
50		20%
51		20%
52	30%	20%
53	30%	20%
54	25%	20%
55	25%	20%
56	25%	23%
57	25%	23%
58	20%	25%
59	20%	25%
60	35%	30%
61	35%	25%
62	35%	25%
63	35%	25%
64	35%	25%
65	35%	25%
66	35%	25%
67	35%	25%
68	35%	25%
69	35%	25%
70 & Over	100%	100%
Ref	1334	2084

Service	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
30	37%	40%	35%	35%
31	28%	33%	26%	30%
32-39	24%	26%	23%	24%
40	35%	33%	32%	24%
41	35%	33%	32%	24%
42	35%	33%	32%	24%
43	35%	33%	32%	20%
44	35%	33%	32%	20%
45	25%	25%	32%	20%
46	25%	25%	25%	20%
47	25%	25%	25%	20%
48	25%	25%	25%	20%
49	25%	25%	25%	20%
50 & Over	100%	100%	100%	100%
Ref	2091	2093	2098	2099

Probabilities of Unreduced Age and Service Retirement

Transition Group B

Ages	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
66	22%	22%	20%	20%
67	22%	22%	20%	20%
68	20%	20%	15%	20%
69	20%	20%	15%	17%
70	20%	20%	15%	17%
71	20%	20%	15%	17%
72	20%	20%	15%	17%
73	15%	20%	15%	17%
74	15%	20%	15%	17%
75	15%	20%	15%	17%
76	15%	20%	15%	17%
77	15%	20%	15%	17%
78	15%	25%	15%	17%
79	15%	25%	15%	17%
80	15%	25%	15%	22%
81	25%	25%	20%	22%
82	25%	25%	20%	22%
83	25%	25%	20%	22%
84	25%	25%	20%	22%
85 & Over	100%	100%	100%	100%
Ref	2094	2095	2096	2097

Ages	Percent of Eligible Active Members Retiring Within Next Year	
	Public Safety	Law Enforcement
	50	
51		20%
52		20%
53		20%
54	25%	20%
55	25%	20%
56	25%	20%
57	25%	20%
58	20%	23%
59	20%	23%
60	35%	25%
61	35%	25%
62	35%	30%
63	35%	25%
64	35%	25%
65	35%	25%
66	35%	25%
67	35%	25%
68	35%	25%
69	35%	25%
70	100%	25%
71	100%	25%
72 & Over	100%	100%
Ref	1334	2084

Service	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
31	37%	40%	35%	35%
32	28%	33%	26%	30%
33-40	24%	26%	23%	24%
41	35%	33%	32%	24%
42	35%	33%	32%	24%
43	35%	33%	32%	24%
44	35%	33%	32%	20%
45	35%	33%	32%	20%
46	25%	25%	32%	20%
47	25%	25%	25%	20%
48	25%	25%	25%	20%
49	25%	25%	25%	20%
50	25%	25%	25%	20%
51 & Over	100%	100%	100%	100%
Ref	2091	2093	2098	2099

Probabilities of Unreduced Age and Service Retirement

Transition Group C

67 & 5 Condition	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
Age	Men	Women	Men	Women
67	22%	22%	20%	20%
68	22%	22%	20%	20%
69	20%	20%	15%	20%
70	20%	20%	15%	17%
71	20%	20%	15%	17%
72	20%	20%	15%	17%
73	20%	20%	15%	17%
74	15%	20%	15%	17%
75	15%	20%	15%	17%
76	15%	20%	15%	17%
77	15%	20%	15%	17%
78	15%	20%	15%	17%
79	15%	25%	15%	17%
80	15%	25%	15%	17%
81	15%	25%	15%	22%
82	25%	25%	20%	22%
83	25%	25%	20%	22%
84	25%	25%	20%	22%
85 & Over	100%	100%	100%	100%
Ref	2094	2095	2096	2097

Ages	Percent of Eligible Active Members Retiring Within Next Year	
	Public Safety	Law Enforcement
	52	
53		20%
54		20%
55		20%
56	25%	20%
57	25%	20%
58	20%	20%
59	20%	20%
60	35%	23%
61	35%	23%
62	35%	25%
63	35%	25%
64	35%	30%
65	35%	25%
66	35%	25%
67	35%	25%
68	35%	25%
69	35%	25%
70	100%	25%
71	100%	25%
72	100%	25%
73	100%	25%
74 & Over	100%	100%
Ref	1334	2084

55 & 32 Condition	Percent of Eligible Active Members Retiring Within Next Year			
	State		Local Government	
	Men	Women	Men	Women
Year of Eligibility	Men	Women	Men	Women
1	37%	40%	35%	35%
2	28%	33%	26%	30%
3-10	24%	26%	23%	24%
11	35%	33%	32%	24%
12	35%	33%	32%	24%
13	35%	33%	32%	24%
14	35%	33%	32%	20%
15	35%	33%	32%	20%
16	25%	25%	32%	20%
17	25%	25%	25%	20%
18	25%	25%	25%	20%
19	25%	25%	25%	20%
20	25%	25%	25%	20%
21 & over	100%	100%	100%	100%
Ref	2091	2093	2098	2099

Probabilities of Reduced Retirement

Transition Group A

Ages	Percent of Eligible Active Members Retiring Within Next Year				
	State		Local Government		Public Safety
	Men	Women	Men	Women	
48					8%
49					8%
50					8%
51					8%
52					
53					
54					
55	10%	10%	9%	11%	
56	10%	10%	9%	11%	
57	10%	10%	9%	11%	
58	10%	10%	9%	11%	
59	10%	11%	9%	11%	
60	10%	12%	9%	11%	
61	10%	13%	9%	12%	
62	15%	15%	13%	13%	
63	15%	15%	14%	14%	
64	15%	15%	12%	15%	
Ref	2085	2086	2087	2088	1496

Transition Group B

Ages	Percent of Eligible Active Members Retiring Within Next Year					
	State		Local Government		Public Safety	Law Enforcement
	Men	Women	Men	Women		
48					8%	8%
49					8%	8%
50					8%	
51					8%	
52					8%	
53					8%	
54						
55	10%	10%	9%	11%		
56	10%	10%	9%	11%		
57	10%	10%	9%	11%		
58	10%	10%	9%	11%		
59	10%	11%	9%	11%		
60	10%	12%	9%	11%		
61	10%	13%	9%	12%		
62	15%	15%	13%	13%		
63	15%	15%	14%	14%		
64	15%	15%	12%	15%		
65	15%	15%	12%	15%		
Ref	2085	2086	2087	2088	469	1496

Probabilities of Reduced Retirement

Transition Group C

Ages	Percent of Eligible Active Members Retiring Within Next Year					
	State		Local Government		Public Safety	Law Enforcement
	Men	Women	Men	Women		
48						8%
49						8%
50						8%
51						8%
52					8%	
53					8%	
54					8%	
55					8%	
56						
57	10%	10%	9%	11%		
58	10%	10%	9%	11%		
59	10%	10%	9%	11%		
60	10%	10%	9%	11%		
61	10%	11%	9%	11%		
62	10%	12%	9%	11%		
63	10%	13%	9%	12%		
64	15%	15%	13%	13%		
65	15%	15%	14%	14%		
66	15%	15%	12%	15%		
Ref	2085	2086	2087	2088	1496	1496

STATE

Separations from Active Employment Before Age & Service Retirement & Individual Pay Increase Assumptions

Sample Ages	Years of Service	Percent of Active Members Separating Within the Next Year						Pay Increase Assumptions for an Individual Employee		
		Death*		Withdrawal		Disability		Merit & Seniority	Base (Economy)	Increase Next Year
		Men	Women	Men	Women	Men	Women			
	0			50.00%	50.00%					
	1			35.00%	35.00%					
	2			20.00%	20.00%					
	3			15.00%	15.00%					
	4			12.00%	12.00%					
20	5 & Over	0.0454%	0.0150%	10.00%	10.00%	0.10%	0.10%	5.00%	3.25%	8.25%
25		0.0495%	0.0157%	8.20%	9.28%	0.10%	0.10%	4.64%	3.25%	7.89%
30		0.0436%	0.0206%	5.80%	7.30%	0.10%	0.10%	3.38%	3.25%	6.63%
35		0.0527%	0.0306%	4.28%	5.10%	0.16%	0.16%	2.40%	3.25%	5.65%
40		0.0703%	0.0428%	3.14%	3.46%	0.29%	0.29%	1.90%	3.25%	5.15%
45		0.1113%	0.0636%	2.22%	2.42%	0.47%	0.47%	1.34%	3.25%	4.59%
50		0.1824%	0.1030%	1.84%	2.10%	0.67%	0.67%	0.92%	3.25%	4.17%
55		0.2833%	0.1702%	1.80%	2.10%	1.05%	1.05%	0.68%	3.25%	3.93%
60		0.4845%	0.2636%	1.80%	2.10%	1.25%	1.25%	0.42%	3.25%	3.67%
65		0.9240%	0.3923%	1.80%	2.10%	1.25%	1.25%	0.12%	3.25%	3.37%
70	1.6090%	0.6616%	1.80%	2.10%	1.25%	1.25%	0.00%	3.25%	3.25%	
Ref		#2133x1sb0	#2134x1sb0	1034 #1387x1	1034 #1389x1	#1092x1	#1092x1	476		

*Applicable rates during the 2018 Calendar Year. Rates in future years are determined by the above rates and the MP-2015 projection scale.

The pay increase assumptions are age based only, and not service based.

LOCAL GOVERNMENT

Separations from Active Employment Before Age & Service Retirement & Individual Pay Increase Assumptions

Sample Ages	Years of Service	Percent of Active Members Separating Within the Next Year						Pay Increase Assumptions for an Individual Employee		
		Death*		Withdrawal		Disability		Merit & Seniority	Base (Economy)	Increase Next Year
		Men	Women	Men	Women	Men	Women			
	0			40.00%	40.00%					
	1			27.00%	27.00%					
	2			18.00%	18.00%					
	3			13.00%	13.00%					
	4			11.00%	11.00%					
20	5 & Over	0.0454%	0.0150%	10.00%	11.00%	0.10%	0.10%	5.00%	3.25%	8.25%
25		0.0495%	0.0157%	7.78%	9.32%	0.10%	0.10%	4.64%	3.25%	7.89%
30		0.0436%	0.0206%	5.34%	6.94%	0.10%	0.10%	3.38%	3.25%	6.63%
35		0.0527%	0.0306%	3.86%	5.02%	0.13%	0.10%	2.34%	3.25%	5.59%
40		0.0703%	0.0428%	2.82%	3.52%	0.21%	0.16%	1.77%	3.25%	5.02%
45		0.1113%	0.0636%	2.26%	2.70%	0.37%	0.26%	1.28%	3.25%	4.53%
50		0.1824%	0.1030%	2.04%	2.50%	0.63%	0.42%	0.92%	3.25%	4.17%
55		0.2833%	0.1702%	2.00%	2.50%	0.90%	0.71%	0.68%	3.25%	3.93%
60		0.4845%	0.2636%	2.00%	2.50%	1.00%	0.85%	0.42%	3.25%	3.67%
65		0.9240%	0.3923%	2.00%	2.50%	1.00%	0.85%	0.12%	3.25%	3.37%
70	1.6090%	0.6616%	2.00%	2.50%	1.00%	0.85%	0.00%	3.25%	3.25%	
Ref		#2133x1sb0	#2134x1sb0	1035 #1391x1	1035 #1393x1	#1093x1	#1094x1	477		

*Applicable rates during the 2018 Calendar Year. Rates in future years are determined by the above rates and the MP-2015 projection scale.

The pay increase assumptions are age based only, and not service based.

PUBLIC SAFETY

Separations from Active Employment Before Age & Service Retirement & Individual Pay Increase Assumptions

Sample Ages	Years of Service	Percent of Active Members Separating Within the Next Year						Pay Increase Assumptions for an Individual Employee		
		Death*		Withdrawal		Disability		Merit & Seniority	Base (Economy)	Increase Next Year
		Men	Women	Men	Women	Men	Women			
	0			20.00%	20.00%					
	1			19.00%	19.00%					
	2			15.00%	15.00%					
	3			15.00%	15.00%					
	4			10.00%	10.00%					
20	5 & Over	0.0454%	0.0150%	10.00%	10.00%	0.20%	0.60%	7.50%	3.25%	10.75%
25		0.0495%	0.0157%	10.00%	10.00%	0.20%	0.60%	6.30%	3.25%	9.55%
30		0.0436%	0.0206%	8.80%	8.80%	0.23%	0.60%	3.70%	3.25%	6.95%
35		0.0527%	0.0306%	6.20%	6.20%	0.34%	0.60%	2.02%	3.25%	5.27%
40		0.0703%	0.0428%	3.50%	3.50%	0.52%	0.87%	1.46%	3.25%	4.71%
45		0.1113%	0.0636%	2.20%	2.20%	0.78%	1.38%	1.12%	3.25%	4.37%
50		0.1824%	0.1030%	2.00%	2.00%	1.50%	2.14%	0.94%	3.25%	4.19%
55		0.2833%	0.1702%	2.00%	2.00%	2.32%	2.65%	0.60%	3.25%	3.85%
60		0.4845%	0.2636%	2.00%	2.00%	2.60%	2.75%	0.40%	3.25%	3.65%
65		0.9240%	0.3923%	2.00%	2.00%	2.60%	2.75%	0.16%	3.25%	3.41%
70	1.6090%	0.6616%	2.00%	2.00%	2.60%	2.75%	0.00%	3.25%	3.25%	
Ref		#2133x1sb0	#2134x1sb0	1036 #1211x1	1036 #1211x1	#1095x1	#1096x1	485		

*Applicable rates during the 2018 Calendar Year. Rates in future years are determined by the above rates and the MP-2015 projection scale.

The pay increase assumptions are age based only, and not service based.

LAW ENFORCEMENT

Separations from Active Employment Before Age & Service Retirement & Individual Pay Increase Assumptions

Sample Ages	Years of Service	Percent of Active Members Separating Within the Next Year						Pay Increase Assumptions for an Individual Employee		
		Death*		Withdrawal		Disability		Merit & Seniority	Base (Economy)	Increase Next Year
		Men	Women	Men	Women	Men	Women			
	0			16.00%	20.00%					
	1			10.00%	12.00%					
	2			8.00%	9.00%					
	3			6.00%	6.00%					
	4			5.00%	6.00%					
20	5 & Over	0.0454%	0.0150%	4.50%	5.00%	0.20%	0.60%	7.50%	3.25%	10.75%
25		0.0495%	0.0157%	3.54%	3.80%	0.20%	0.60%	6.30%	3.25%	9.55%
30		0.0436%	0.0206%	2.66%	2.90%	0.23%	0.60%	3.70%	3.25%	6.95%
35		0.0527%	0.0306%	2.14%	2.30%	0.34%	0.60%	2.02%	3.25%	5.27%
40		0.0703%	0.0428%	1.48%	1.50%	0.52%	0.87%	1.46%	3.25%	4.71%
45		0.1113%	0.0636%	1.20%	1.30%	0.78%	1.38%	1.12%	3.25%	4.37%
50		0.1824%	0.1030%	1.20%	1.20%	1.50%	2.14%	0.94%	3.25%	4.19%
55		0.2833%	0.1702%	1.20%	1.20%	2.32%	2.65%	0.60%	3.25%	3.85%
60		0.4845%	0.2636%	1.20%	1.20%	2.60%	2.75%	0.40%	3.25%	3.65%
65		0.9240%	0.3923%	1.20%	1.20%	2.60%	2.75%	0.16%	3.25%	3.41%
70	1.6090%	0.6616%	1.20%	1.20%	2.60%	2.75%	0.00%	3.25%	3.25%	
Ref		#2133x1sb0	#2134x1sb0	753 #876x1	1037 #575x1	#1095x1	#1096x1	485		

*Applicable rates during the 2018 Calendar Year. Rates in future years are determined by the above rates and the MP-2015 projection scale.

The pay increase assumptions are age based only, and not service based.

Single Life Retirement Values

Sample Attained Ages*	Present Value of \$1 Monthly for Life Increasing 3.0% Annually (First Increase After 1 Year)		Future Life Expectancy (Years)	
	Males	Females	Males	Females
50	\$193.18	\$202.07	33.74	37.21
55	180.55	190.51	29.01	32.25
60	165.27	176.53	24.42	27.46
65	147.42	160.01	20.05	22.87
70	127.44	140.86	16.00	18.53
75	105.91	119.50	12.32	14.52
80	84.00	96.92	9.12	10.93
Ref:	:#2135x1sb0	:#2136x1sb0		

**Attained Age during the 2018 Calendar Year.*

Miscellaneous and Technical Assumptions

December 31, 2018

Marriage Assumption:	70% of males and 60% of females are assumed to be married for purposes of death-in-service benefits for State and Local members. 90% of males and 90% of females are assumed to be married for purposes of death-in-service benefits for Law members. Male spouses are assumed to be three years older than female spouses for active member valuation purposes. In retired or inactive cases where spouse information is needed, but not available, the three year age difference is also assumed.
Pay Increase Timing:	Beginning of year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Final Average Salary:	For present value of future benefit purposes, final average salary was calculated in accordance with pay increase assumptions, but was not permitted to fall below the final average salary reported in the data.
Decrement Timing:	Decrements are assumed to occur mid-year.
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 Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Decrement Operation:	Disability and mortality decrements do not operate during the first 5 years of service.
Death after Disability:	Death after disability benefits were approximated by assuming that the disability benefit would be paid as a joint and 35% survivor benefit for people in the original disability plan and as a joint and 20% survivor benefit for people in the post 1992 plan.
Service Credit Accruals:	It is assumed that members accrue one year of service credit per year. A (0.40)% factor is applied to State active member liabilities (other than for refunds) and a (0.50)% factor is applied to Local active member liabilities (other than for refunds) to recognize that a portion of the membership is part time.

Miscellaneous and Technical Assumptions

December 31, 2018 (Concluded)

Miscellaneous Loads:	<ul style="list-style-type: none">• A load of approximately 0.49% of payroll is included in the computed normal cost to recognize subsidized service purchases.• Law active accrued liabilities for retirement are reduced by 10% to recognize that total service reported is not entirely Law service, and that non-Law service cannot be used to satisfy Law eligibility conditions.• A load of approximately 0.40% of Traditional Plan and 1.00% of Combined Plan payroll is included in the Traditional and Combined Plan computed normal costs to recognize expected administrative expenses.
Transition Groups Under Senate Bill #343:	A member's transition group (i.e., Group A, Group B, or Group C) was determined as of the valuation date based upon the assumption (for transition group determination only) that active members would continue in active service.
Cost-of-Living Adjustments:	For individuals retiring after January 7, 2013, cost-of-living adjustments were assumed to be 3.00% for calendar year 2019 and 2.15% thereafter.
Incidence of Contributions:	Contributions are assumed to be received continuously throughout the year based upon contribution rates presented in the Summary of Benefits, and the actual payroll payable at the time contributions are made.
Other Contributions:	For amortization purposes, it was assumed that payroll for mitigating contributions (i.e., 2.44% from the Combined, Member Directed and Alternate Retirement Plans) and payroll for reemployed retirees will grow at the assumed 3.25% wage inflation assumption.
Benefit Service:	Exact fractional service is used to determine the amount of benefit payable.
Normal Form of Benefit:	The assumed normal form of benefit is a straight life benefit, except where otherwise noted.
Missing Member Data and Member Data Adjustments:	Active and inactive records with missing dates of birth, if any, were given dates of birth that resulted in an entry age of 30 based upon the reported service. Active and inactive records with missing gender codes, if any, were assumed to be female. For active members with less than 6 months of service credit and a reported annualized salary greater than \$200,000, the annual salary used for valuation purposes was the greater of the member's reported FAS and non-annualized gross salary.

SECTION XI

FINANCIAL PRINCIPLES

Financial Principles and Operational Techniques of OPERS

Promises Made, and To Be Paid For. As each year is completed, OPERS in effect hands an “IOU” to each member then acquiring a year of service credit --- the “IOU” says: “The Ohio Public Employees Retirement System owes you one year’s worth of retirement benefits, payments in cash commencing when you qualify for retirement.”

The related **key financial questions** are:

Which generation of taxpayers contributes the money to cover the IOU?

The present taxpayers, who receive the benefit of the member’s present year of service? **Or the future taxpayers**, who happen to be in Ohio at the time the IOU becomes a cash demand, years and often decades later?

The law governing OPERS financing intends that this year’s taxpayers contribute the money to cover the IOUs being handed out this year. With this financial objective, **the employer contribution rate is expected to remain approximately level from generation to generation of taxpayers.**

There are systems which have a design for deferring contributions to future taxpayers. Lured by a lower contribution rate now, they put aside the consequence that the contribution rate must then relentlessly grow to a level much higher than would be required if a level contribution pattern were followed.

An inevitable by-product of the level-cost design is the accumulation of reserve assets, for decades, and the income produced when the assets are invested. **Investment income** becomes **the 3rd and largest contributor** for benefits to employees, and is interlocked with the contribution amounts required from employees and employers.

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

Normal Cost (the cost of members’ service being rendered this year)

... plus ...

Interest on Unfunded Actuarial Accrued Liabilities (unfunded actuarial accrued liabilities are the difference between: liabilities for service already rendered; and the accrued assets of OPERS).

Computing Contributions to Support Fund Benefits. From a given schedule of benefits and from employee and asset data, the actuary calculates the contribution rates to support the benefits by means of ***an actuarial valuation and a funding method.***

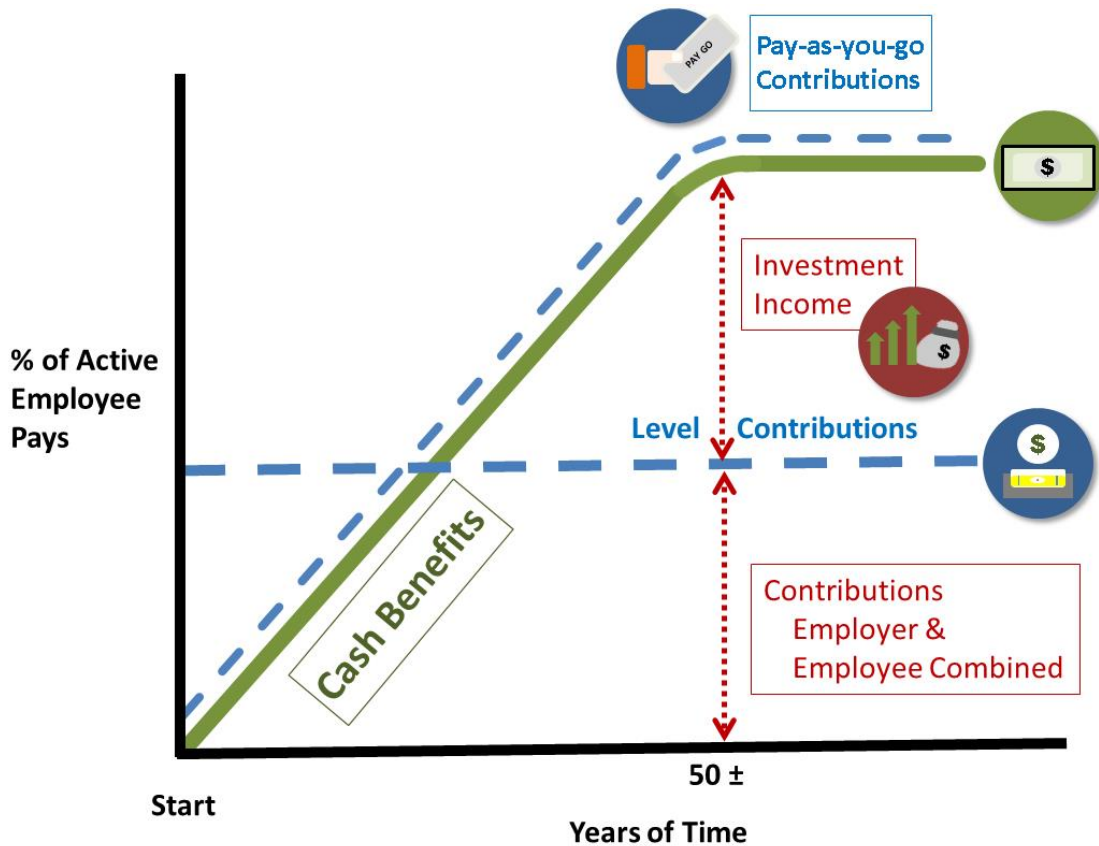
An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets will earn; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of pay increases; and the assumed age or ages at actual retirement.

In an actuarial valuation, assumptions must be made as to what the above rates will be for the next year and for decades in the future. The assumptions are established by the Retirement Board after receiving the advice of the actuary.

Reconciling Differences Between Assumed Experience and Actual Experience. Once actual experience has occurred and has been observed, it will not coincide exactly with assumed experience, regardless of the skill of the actuary and the many calculations made. The future cannot be predicted with 100% precision.

OPERS copes with these continually changing differences by having annual actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is ***continuing adjustments in financial position.***

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CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

LEVEL CONTRIBUTION LINE. Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

- **Economic Risk Areas**
 - Rates of investment return
 - Rates of pay increase
 - Changes in active member group size
- **Non-Economic Risk Areas**
 - Ages at actual retirement
 - Rates of mortality
 - Rates of withdrawal of active members (turnover)
 - Rates of disability

The Actuarial Valuation Process

The financing diagram on the opposite page shows the relationship between *the two fundamentally different philosophies of paying* for retirement benefits: the method where contributions match cash benefit payments (or barely exceed cash benefit payments, as in the Federal Social Security program) which is thus an *increasing contribution method*; and, the *level contribution method* which attempts to equalize contributions between the generations.

The actuarial valuation is the mathematical process by which the level contribution rate is determined. The activity constituting the valuation may be summarized as follows:

- A. **Census Data**, including:
 - Retired lives now receiving benefits
 - Former employees with vested benefits not yet payable
 - Active employees

- B. + **Asset data** (cash & investments)

- C. + **Benefit provisions** that establish eligibility and amounts of payments to members

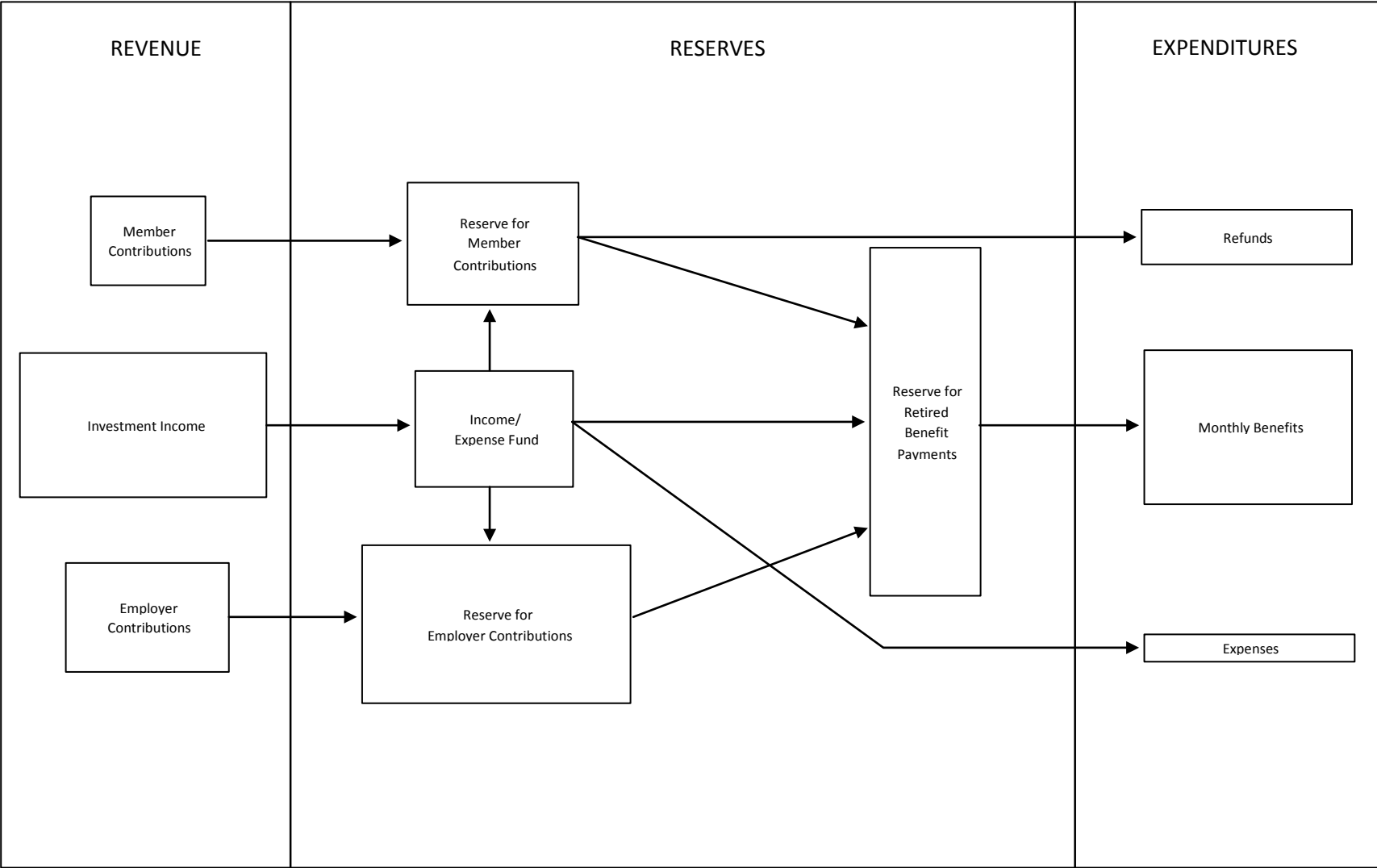
- D. + **Assumptions concerning future experience** in various risk areas

- E. + **The funding method** for employer contributions (the long-term, planned pattern for employer contributions)

- F. + **Mathematically combining the assumptions, the funding method, and the data**

- G. = Determination of:
 - Plan Financial Position; and/or
 - New Employer Contribution Rate

Flow of Money Through the Retirement System



Glossary

Accrued Service. The service credited under the plan which was rendered before the date of the actuarial valuation.

Accumulated Benefit Obligation. The actuarial present value of vested and non-vested benefits based on service to date and past and current salary levels.

Actuarial Accrued Liability. The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as “accrued liability” or “past service liability.”

Actuarial Assumptions. Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

Actuarial Cost Method. A mathematical budgeting procedure for allocating the dollar amount of the “actuarial present value of future plan benefits” between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the “actuarial funding method.”

Actuarial Equivalent. A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.

Actuarial Present Value. The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Actuary. A person who is trained in the applications of probability and compound interest to problems in business and finance that involve payment of money in the future, contingent upon the occurrence of future events. Most actuaries in the United States are Members of the American Academy of Actuaries (MAAA). The Society of Actuaries is an international research, education and membership organization for actuaries in the life and health insurance, employee benefits, and pension fields. It administers a series of examinations leading initially to Associateship and the designation ASA and ultimately to Fellowship with the designation FSA.

Amortization. Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

Experience Gain (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

Funding Value of Assets. The value of current plan assets recognized for valuation purposes. Generally based on a phased-in recognition of all or a portion of market related investment return. Sometimes referred to as Actuarial Value of Assets.

Normal Cost. The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

Plan Termination Liability. The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for future service and salary. The termination liability will generally be less than the liabilities computed on a “going concern” basis and is not normally determined in a routine actuarial valuation.

Reserve Account. An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability. The difference between the actuarial accrued liability and valuation assets. Sometimes referred to as “unfunded accrued liability.”

Meaning of “Unfunded Actuarial Accrued Liabilities”

“Actuarial accrued liabilities” are **the present value of the portions of promised benefits that are not covered by future normal cost contributions** --- a liability has been established (“accrued”) because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future.

If “actuarial accrued liabilities” at any time exceed the plan’s accrued assets (cash & investments), the difference is **“unfunded actuarial accrued liabilities.”** This is the common condition. If the plan’s assets equaled the plan’s “actuarial accrued liabilities”, the plan would be termed “fully funded.” This is an unusual condition.

Each time a plan adds a new benefit which applies to service already rendered, an “actuarial accrued liability” is created, which is also an “unfunded actuarial accrued liability” because the plan can’t print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years, commonly in the 15-30 year range.

Unfunded actuarial accrued liabilities can occur in another way: if actual plan experience is less favorable than assumed, the difference is added to unfunded actuarial accrued liabilities. For example, in plans where benefits are directly related to an employee’s pay near time of retirement, unfunded actuarial accrued liabilities increased rapidly during the 1970’s because unexpected rates of pay increase created additional actuarial accrued liabilities which could not be matched by reasonable investment results. Most of the unexpected pay increases were the direct result of inflation, which is a very destructive force on financial stability.

The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important--- “bad” or “good” or somewhere in between.

Nor are unfunded actuarial accrued liabilities a bill payable immediately, but it is important that policy-makers prevent the amount from becoming unreasonably high and ***it is vital for plans to have a sound method for making payments toward them*** so that they are controlled.

SECTION XII

ADDITIONAL SCHEDULES

This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements.

Schedule of Defined Benefit Funding Progress (\$ Amounts in Millions) Traditional, Combined, and Member Directed Plans

The schedule below measures the funding progress with respect to the **retirement allowance** portion of OPERS benefits. Assets and liabilities related to post-employment health care benefits are specifically excluded from the schedule. Assets do, however, include market value adjustments.

Valuation Year	Actuarial Accrued Liabilities (AAL) @	Valuation Assets	Unfunded Actuarial Accrued Liabilities (UAAL)	Ratio of Assets to AAL	Covered Payroll^	UAAL as a % of Covered Payroll
1998	\$37,714	\$38,360	\$ (646)	102 %	\$ 9,017	0 %
1999	43,070	43,060	10	100 %	9,477	0 %
2000	46,347	46,844	(497)	101 %	10,192	0 %
2001	49,095	48,748	347	99 %	10,782	3 %
2001*	47,492	48,748	(1,256)	103 %	10,782	0 %
2002	50,872	43,706	7,166	86 %	11,207	64 %
2003	54,774	46,746	8,028	85 %	11,165	72 %
2004	57,604	50,452	7,152	88 %	11,454	62 %
2005	61,146	54,473	6,673	89 %	11,807	57 %
2005*	62,498	54,473	8,025	87 %	11,807	68 %
2006	66,161	61,296	4,865	93 %	12,175	40 %
2007	69,734	67,151	2,583	96 %	12,583	21 %
2008	73,466	55,315	18,150	75 %	12,801	142 %
2009	76,555	57,629	18,926	75 %	12,548	151 %
2010	79,630	60,600	19,031	76 %	12,450	153 %
2010*	80,485	63,649	16,836	79 %	12,450	135 %
2011	84,530	65,436	19,094	77 %	12,399	154 %
2012	87,105	67,855	19,250	78 %	12,193	158 %
2012#	83,878	67,855	16,023	81 %	12,193	131 %
2013	86,645	71,411	15,234	82 %	12,331	124 %
2014	89,285	74,865	14,420	84 %	12,486	114 %
2015	91,832	78,061	13,771	85 %	12,688	106 %
2015*	97,177	78,061	19,116	80 %	12,688	148 %
2016	100,167	80,280	19,887	80 %	13,186	151 %
2017	102,656	83,292	19,364	81 %	13,498	143 %
2017*	106,090	83,292	22,797	79 %	13,498	169 %
2018	108,705	84,287	24,418	78 %	13,807	177 %

@ Excludes reserve for Member Directed future adverse experience.

^ In 2014 and thereafter reported by the OPERS Staff to GRS. Prior to 2014, valuation payroll is presented. The payroll amounts exclude Member Directed payroll.

* Revised actuarial assumptions.

After benefit changes.

Schedule of Defined Benefit Funding Progress (\$ Amounts in Millions) Traditional Plan

The schedule below measures the funding progress with respect to the **retirement allowance** portion of OPERS benefits. Assets and liabilities related to post-employment health care benefits are specifically excluded from the schedule. Assets do, however, include market value adjustments.

Valuation Year	Actuarial Accrued Liabilities (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liabilities (UAAL)	Ratio of Assets to AAL	Covered Payroll [^]	UAAL as a % of Covered Payroll
1998	\$37,714	\$38,360	\$(646)	102 %	\$ 9,017	0 %
1999	43,070	43,060	10	100 %	9,477	0 %
2000	46,347	46,844	(497)	101 %	10,192	0 %
2001	49,095	48,748	347	99 %	10,782	3 %
2001*	47,492	48,748	(1,256)	103 %	10,782	0 %
2002	50,872	43,706	7,166	86 %	11,207	64 %
2003	54,756	46,737	8,019	85 %	11,056	73 %
2004	57,573	50,430	7,143	88 %	11,313	63 %
2005	61,099	54,433	6,666	89 %	11,633	57 %
2005*	62,447	54,433	8,014	87 %	11,633	69 %
2006	66,089	61,235	4,854	93 %	11,971	41 %
2007	69,639	67,067	2,572	96 %	12,347	21 %
2008	73,346	55,230	18,116	75 %	12,546	144 %
2009	76,407	57,519	18,888	75 %	12,290	154 %
2010	79,459	60,461	18,997	76 %	12,165	156 %
2010*	80,307	63,515	16,792	79 %	12,165	138 %
2011	84,325	65,274	19,052	77 %	12,103	157 %
2012	86,876	67,670	19,206	78 %	11,884	162 %
2012#	83,664	67,670	15,994	81 %	11,884	135 %
2013	86,407	71,175	15,232	82 %	12,000	127 %
2014	89,017	74,567	14,450	84 %	12,140	117 %
2015	91,535	77,700	13,835	85 %	12,321	110 %
2015*	96,863	77,700	19,163	80 %	12,321	152 %
2016	99,818	79,865	19,953	80 %	12,794	156 %
2017	102,274	82,797	19,477	81 %	13,085	149 %
2017*	105,691	82,797	22,894	78 %	13,085	175 %
2018	108,265	83,715	24,549	77 %	13,376	184 %

[^] In 2014 and thereafter reported by the OPERS Staff to GRS. Prior to 2014, valuation payroll is presented.

* Revised actuarial assumptions.

After benefit changes.

Schedule of Defined Benefit Funding Progress (\$ Amounts in Millions) Combined Plan

The schedule below measures the funding progress with respect to the **retirement allowance** portion of OPERS benefits. Assets and liabilities related to post-employment health care benefits are specifically excluded from the schedule. Assets do, however, include market value adjustments.

Valuation Year	Actuarial Accrued Liabilities (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liabilities (UAAL)	Ratio of Assets to AAL	Covered Payroll [^]	UAAL as a % of Covered Payroll
1998						
1999						
2000						
2001						
2001						
2002						
2003	\$ 18	\$ 9	\$ 9	50 %	\$109	8 %
2004	31	22	9	71 %	141	6 %
2005	47	40	7	85 %	174	4 %
2005*	51	40	11	78 %	174	6 %
2006	72	61	11	85 %	205	5 %
2007	95	84	11	88 %	236	5 %
2008	120	85	35	71 %	255	14 %
2009	148	110	38	74 %	258	15 %
2010	171	138	33	81 %	284	12 %
2010*	177	134	43	76 %	284	15 %
2011	203	161	42	79 %	296	14 %
2012	226	183	43	81 %	310	14 %
2012#	212	183	29	86 %	310	9 %
2013	230	229	1	100 %	331	0 %
2014	260	289	(29)	111 %	346	0 %
2015	288	350	(62)	122 %	367	0 %
2015*	303	350	(47)	116 %	367	0 %
2016	336	402	(66)	120 %	392	0 %
2017	365	479	(113)	131 %	413	0 %
2017*	382	479	(97)	125 %	413	0 %
2018	420	552	(132)	131 %	431	0 %

[^] In 2014 and thereafter reported by the OPERS Staff to GRS. Prior to 2014, valuation payroll is presented.

* Revised actuarial assumptions.

After benefit changes.

Schedule of Defined Benefit Funding Progress (\$ Amounts) Member Directed Plan

The schedule below measures the funding progress with respect to the **retirement allowance** portion of OPERS benefits. Assets and liabilities related to post-employment health care benefits are specifically excluded from the schedule. Assets do, however, include market value adjustments.

Valuation Year	Actuarial Accrued Liabilities (AAL) @	Valuation Assets	Unfunded Actuarial Accrued Liabilities (UAAL)	Ratio of Assets to AAL	Covered Payroll	UAAL as a % of Covered Payroll
1998						
1999						
2000						
2001						
2001						
2002						
2003						
2004						
2005						
2005*						
2006						
2007						
2008	\$ 166,354	\$ 147,976	\$ 18,378	89 %	NA	NA
2009	252,670	205,639	47,031	81 %	NA	NA
2010	489,792	438,982	50,810	90 %	NA	NA
2010*	496,004	454,025	41,979	92 %	NA	NA
2011	1,172,900	1,156,151	16,749	99 %	NA	NA
2012	2,665,552	2,523,879	141,673	95 %	NA	NA
2013	6,884,231	6,826,536	57,695	99 %	NA	NA
2014	8,291,077	8,771,712	(480,635)	106 %	NA	NA
2015	9,767,164	10,622,057	(854,893)	109 %	NA	NA
2015*	10,290,582	10,622,057	(331,475)	103 %	NA	NA
2016	12,961,105	12,961,105	0	100 %	NA	NA
2017	16,770,041	16,770,041	0	100 %	NA	NA
2017*	16,770,041	16,770,041	0	100 %	NA	NA
2018	19,916,815	19,916,815	0	100 %	NA	NA

@ Excludes reserve for future adverse experience.

* Revised actuarial assumptions.

Schedule of Employer Contributions*

Traditional Plan		
Valuation Date December 31	Year Ended December 31	Annual Required Contributions
2004	2006	8.44%
2005	2008	7.12%
2006	2009	7.13%
2007	2010	7.14%
2008	2011	13.33%
2009	2012	13.64%
2010	2013	13.52%
2011	2014	14.15%
2012	2015	11.16%
2013	2016	10.16%
2014	2017	10.16%
2015	2018	14.16%
2016	2019	14.17%
2017	2020	14.17%
2018	2021	14.18%

Combined Plan		
Valuation Date December 31	Year Ended December 31	Annual Required Contributions
2004	2006	8.33%
2005	2008	7.29%
2006	2009	7.33%
2007	2010	7.22%
2008	2011	10.00%
2009	2012	10.00%
2010	2013	13.00%
2011	2014	14.00%
2012	2015	11.00%
2013	2016	10.00%
2014	2017	10.00%
2015	2018	14.00%
2016	2019	14.00%
2017	2020	14.00%
2018	2021	14.00%

Member Directed Plan		
Valuation Date December 31	Year Ended December 31	Annual Required Contributions
2008	2011	\$ 1,570
2009	2012	4,019
2010	2013	4,342
2011	2014	1,669
2012	2015	14,121
2013	2016	5,751
2014	2017	0
2015	2018	0
2016	2019	0
2017	2020	0
2018	2021	0

* The amounts reported in this schedule do not include contributions for post-employment healthcare benefits.

Schedule of Unfunded Actuarial Accrued Liability@ Traditional, Combined and Member Directed Plans

	December 31, 2018					
	General			Public Safety	Law Enforcement	Grand Total
	State	Local	Total			
Accrued Liabilities						
Active and Inactive Members	\$ 15,278,251,225	\$ 22,939,892,708	\$ 38,218,143,933	\$ 8,878,622	\$ 2,047,917,153	\$ 40,274,939,708
Retirees and Beneficiaries [#]	27,448,198,911	38,194,763,528	65,642,962,439	52,507,239	2,734,203,817	68,429,673,495
Total Accrued Liabilities	\$ 42,726,450,136	\$ 61,134,656,236	\$ 103,861,106,372	\$ 61,385,861	\$ 4,782,120,970	\$ 108,704,613,203
Assets						
Active and Inactive Members						
EAF*	\$ (1,907,978,799)	\$ (331,531,827)	\$ (2,239,510,626)	\$ (19,483,452)	\$ 362,320,537	\$ (1,896,673,541)
ESF	5,547,861,512	8,500,145,853	14,048,007,365	3,473,666	716,198,382	14,767,679,413
Unallocated	48,420,413	72,227,328	120,647,741	57,260	5,981,693	126,686,694
Funding Value of Assets Adjustment	1,093,514,352	1,630,784,209	2,724,298,561	1,283,081	134,037,633	2,859,619,275
Total Active and Inactive Assets	\$ 4,781,817,478	\$ 9,871,625,563	\$ 14,653,443,041	\$ (14,669,445)	\$ 1,218,538,245	\$ 15,857,311,841
Retirees and Beneficiaries						
A & PR Fund*	\$ 26,703,374,152	\$ 36,991,700,881	\$ 63,695,075,033	\$ 28,200,162	\$ 2,669,352,416	\$ 66,392,627,611
SBF Fund*	743,412,132	1,201,540,398	1,944,952,530	24,307,077	64,851,401	2,034,111,008
Reserve for Future MD Adverse Experience [^]	1,412,627	1,522,249	2,934,876	0	0	2,934,876
Total R&B Assets	\$ 27,448,198,911	\$ 38,194,763,528	\$ 65,642,962,439	\$ 52,507,239	\$ 2,734,203,817	\$ 68,429,673,495
Total Assets	\$ 32,230,016,389	\$ 48,066,389,091	\$ 80,296,405,480	\$ 37,837,794	\$ 3,952,742,062	\$ 84,286,985,336
Unfunded Actuarial Accrued Liability	\$ 10,496,433,747	\$ 13,068,267,145	\$ 23,564,700,892	\$ 23,548,067	\$ 829,378,908	\$ 24,417,627,867

@ The amounts reported in this schedule do not include contributions for post-employment healthcare benefits.

Excludes reserve for Member Directed future adverse experience.

* After reserve transfers.

^ Includes funds for pending Member Directed retirements.

Schedule of Unfunded Actuarial Accrued Liability@ Traditional Plan

	December 31, 2018					
	General			Public Safety	Law Enforcement	Grand Total
	State	Local	Total			
Accrued Liabilities						
Active and Inactive Members	\$ 15,110,946,830	\$22,717,577,886	\$37,828,524,716	\$ 8,878,622	\$2,047,917,153	\$39,885,320,491
Retirees and Beneficiaries	27,430,919,278	38,161,626,822	65,592,546,100	52,507,239	2,734,203,817	68,379,257,156
Total Accrued Liabilities	\$ 42,541,866,108	\$60,879,204,708	\$103,421,070,816	\$ 61,385,861	\$4,782,120,970	\$108,264,577,647
Assets						
Active and Inactive Members						
EAF*	\$ (2,114,340,942)	(\$622,077,589)	\$ (2,736,418,531)	\$ (19,483,452)	\$ 362,320,537	\$ (2,393,581,446)
ESF	5,546,524,207	8,498,046,395	14,044,570,602	3,473,666	716,198,382	14,764,242,650
Unallocated	48,420,413	72,227,328	120,647,741	57,260	5,981,693	126,686,694
Funding Value of Assets Adjustment	1,085,003,424	1,618,468,165	2,703,471,589	1,283,081	134,037,633	2,838,792,303
Total Active and Inactive Assets	\$ 4,565,607,102	\$9,566,664,299	\$14,132,271,401	\$ (14,669,445)	\$ 1,218,538,245	\$15,336,140,201
Retirees and Beneficiaries						
A & PR Fund*	\$26,687,507,146	\$36,960,086,424	\$63,647,593,570	\$ 28,200,162	\$2,669,352,416	\$66,345,146,148
SBF Fund*	743,412,132	1,201,540,398	1,944,952,530	24,307,077	64,851,401	2,034,111,008
Total R&B Assets	\$27,430,919,278	\$38,161,626,822	\$65,592,546,100	\$ 52,507,239	\$2,734,203,817	\$68,379,257,156
Total Assets	\$31,996,526,380	\$47,728,291,121	\$79,724,817,501	\$ 37,837,794	\$3,952,742,062	\$83,715,397,357
Unfunded Actuarial Accrued Liability	\$ 10,545,339,728	\$ 13,150,913,587	\$23,696,253,315	\$ 23,548,067	\$ 829,378,908	\$24,549,180,290

@ The amounts reported in this schedule do not include contributions for post-employment healthcare benefits.

* After reserve transfers.

Schedule of Unfunded Actuarial Accrued Liability@ Combined Plan

	December 31, 2018					
	General			Public Safety	Law Enforcement	Grand Total
	State	Local	Total			
Accrued Liabilities						
Active and Inactive Members	\$ 167,304,395	\$222,314,822	\$389,619,217			\$389,619,217
Retirees and Beneficiaries	10,043,321	20,456,203	30,499,524			30,499,524
Total Accrued Liabilities	\$ 177,347,716	\$242,771,025	\$420,118,741			\$420,118,741
Assets						
Active and Inactive Members						
EAF*	\$ 206,626,129	\$291,032,913	\$497,659,042			\$497,659,042
ESF	1,311,802	2,030,211	3,342,013			3,342,013
Unallocated	0	0	0			0
Funding Value of Assets Adjustment	8,272,445	11,898,140	20,170,585			20,170,585
Total Active and Inactive Assets	\$ 216,210,376	\$304,961,264	\$521,171,640			\$521,171,640
Retirees and Beneficiaries						
A & PR Fund*	\$ 10,043,321	\$ 20,456,203	\$ 30,499,524			\$ 30,499,524
SBF Fund*	0	0	0			0
Total R&B Assets	\$ 10,043,321	\$ 20,456,203	\$ 30,499,524			\$ 30,499,524
Total Assets	\$ 226,253,697	\$325,417,467	\$551,671,164			\$551,671,164
Unfunded Actuarial Accrued Liability	\$ (48,905,981)	\$ (82,646,442)	\$(131,552,423)			\$ (131,552,423)

@ The amounts reported in this schedule do not include contributions for post-employment healthcare benefits.

* After reserve transfers.

Schedule of Unfunded Actuarial Accrued Liability[@] DB Portion of Member Directed Plan

	December 31, 2018					
	General			Public Safety	Law Enforcement	Grand Total
	State	Local	Total			
Accrued Liabilities						
Active and Inactive Members	\$ 0	\$ 0	\$ 0			\$ 0
Retirees and Beneficiaries [#]	7,236,312	12,680,503	19,916,815			19,916,815
Total Accrued Liabilities	\$ 7,236,312	\$ 12,680,503	\$ 19,916,815			\$ 19,916,815
Assets						
Active and Inactive Members						
EAF*	\$ (263,986)	\$ (487,151)	\$ (751,137)			\$ (751,137)
ESF	25,503	69,247	94,750			94,750
Unallocated	0	0	0			0
Funding Value of Assets Adjustment	238,483	417,904	656,387			656,387
Total Active and Inactive Assets	\$ 0	\$ 0	\$ 0			\$ 0
Retirees and Beneficiaries						
A & PR Fund*	\$ 5,823,685	\$ 11,158,254	\$ 16,981,939			\$ 16,981,939
SBF Fund*	0	0	0			0
Reserve for Future Adverse Experience [^]	1,412,627	1,522,249	2,934,876			2,934,876
Total R&B Assets	\$ 7,236,312	\$ 12,680,503	\$ 19,916,815			\$ 19,916,815
Total Assets	\$ 7,236,312	\$ 12,680,503	\$ 19,916,815			\$ 19,916,815
Unfunded Actuarial Accrued Liability	\$ 0	\$ 0	\$ 0			\$ 0

[@] The amounts reported in this schedule do not include contributions for post-employment healthcare benefits.

[#] Excludes reserve for future adverse experience.

^{*} After reserve transfers.

[^] Includes funds for pending Member Directed retirements.

Supplementary Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuations at the dates indicated. Additional information as of the latest valuation date follows:

Valuation date	December 31, 2018		
Actuarial cost method	Individual entry age		
Amortization method for unfunded actuarial accrued liabilities	Level percent closed - Traditional and Combined Level dollar closed - Member-Directed		
Equivalent Single Amortization Period (Years from December 31, 2020)			
Traditional Plan	27		
Combined Plan	N/A	(Plan has funded ratio of at least 100%)	
Member-Directed Plan	N/A	(Plan has funded ratio of at least 100%)	
Asset valuation method	4-year smoothed market		
Actuarial assumptions:			
Investment rate of return	7.20%		
Projected salary increases including wage inflation at 3.25%	3.25% - 10.75%		
Cost-of-living adjustments	Pre 1/7/2013 Retirees: 3.0% simple Post 1/7/2013 Retirees: 3.0% for calendar year 2019, then 2.15% simple		

	Traditional	Member Combined	Directed	Total
Retirees and beneficiaries receiving benefits	218,226	569	280	219,075
Terminated plan members entitled to but not yet receiving benefits				
Less than 5 years of service	572,240	1,327	0	573,567
5 or more years of service	36,994	779	0	37,773
Total	609,234	2,106	0	611,340
Active plan members				
Less than 5 years of service	117,011	2,796	0	119,807
5 or more years of service	167,797	4,943	0	172,740
Total	284,808	7,739	0	292,547
Total				
Less than 5 years of service	689,251	4,123	0	693,374
5 or more years of service	423,017	6,291	280	429,588
Total	1,112,268	10,414	280	1,122,962



September 3, 2019

Ms. Karen E. Carraher
Executive Director
Ohio Public Employees Retirement System
277 East Town Street
Columbus, Ohio 43215

Re: Report of the December 31, 2018 Actuarial Valuation

Dear Karen:

Enclosed are the 20 bound copies of the final report.

Sincerely,

A handwritten signature in black ink that reads "Brian B. Murphy". The signature is written in a cursive, flowing style.

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

MD:sc
Enclosures

cc: Ms. Tonia Wildasin
CliftonLarsonAllen LLP