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city of CINCINNATI RETIREMENT

Report of the Actuary on the Annual Valuation of the Retirement System for Employees of the City of Cincinnati

Pension Report

Prepared as of December 31, 2017 and Approved by the Board of Trustees on June 7, 2018

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CONSULTING, LLC
The experience and dedication you deserve

June 7, 2018

Board of Trustees
Cincinnati Retirement System
801 Plum Street, Suite 328
Cincinnati, OH 45202

Members of the Board:

We are pleased to submit the results of the pension actuarial valuation of the Retirement System for Employees of the City of Cincinnati (CRS) prepared as of December 31, 2017. The purpose of this report is to provide a summary of the funded status of the System as of December 31, 2017 and to recommend actuarially determined contribution rates for the fiscal year ending June 30, 2019. The information needed for the City under Governmental Accounting Standards Board Statements No. 67 and 68 (GASB 67 and 68) will be provided in a separate report. However, for informational purposes, we have also provided accounting information in Section VI.

On the basis of the valuation, it is recommended that employer contributions to the System be set at a rate of 28.51% of payroll (approximately $52,709,000) for the City's fiscal year ending June 30, 2019. The benefits of the System are included in the calculated contribution rate which is developed using the entry age cost method. Five-year smoothed market value of plan assets is used for the actuarial value of assets. Gains and losses are reflected in the unfunded accrued liability that is being amortized by regular annual contributions within a 30-year period.

Since the previous valuation, several changes were made to the actuarial assumptions and methods per the findings of the Experience Investigation for the Five-Year Period Ending December 31, 2016. No changes were made to the plan provisions.

Per the Collaborative Settlement Agreement (CSA), the City contribution to CRS is expected to be 16.25% of payroll each year. Contributions at this level will never amortize the Unfunded Accrued Liability (UAL) of $574 million as of December 31, 2017. However, members who began membership on or after January 1, 2010 are covered by a different benefit structure with a lower normal cost rate, so, as members who began membership prior to January 1, 2010 leave covered employment and are replaced by members in the lower cost benefit structure, the total normal cost rate is expected to decline. As a result, the portion of the 16.25% available to pay off the UAL is expected to increase each year in the future until all active members in the valuation are covered by the provision in the most recent benefit tier. While this is expected to improve the System's financial health in future years, it is impossible to anticipate the long-term funding progress without performing an open group projection of future valuation results. Such projections are performed to assist the Board in evaluating the long-term funding of the System, but the projections are completed after the valuation report is issued.

3550 Busbee Pkwy, Suite 250, Kennesaw, GA 30144
Phone (678) 388-1700 • Fax (678) 388-1730
www.CavMacConsulting.com
Offices in Kennesaw, GA • Bellevue, NE

This is to certify that the independent consulting actuary is a Member of the American Academy of Actuaries and has experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the System and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the System. While not verifying the data at source, the actuary performed tests for consistency and reasonability.

Future actuarial results may differ significantly from the current results 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. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

The actuarial computations presented in this report are for purposes of determining the recommended funding amount for the System. Use of these computations for purposes other than meeting these requirements may not be appropriate.

We trust that the report will meet the approval of the Board and will furnish the desired information concerning the financial condition of the System.

Respectfully submitted,

Edward J. Koebel

Edward J. Koebel, EA, FCA, MAAA
Principal and Consulting Actuary

Jeffrey Gann, FSA, MAAA, EA
Senior Actuary

Ben Mobley

Ben Mobley, ASA, FCA, MAAA
Senior Actuary

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Section I – Summary of Principal Results

1. For convenience of reference, the principal results of the current and preceding valuations are summarized below.

Valuation Date	December 31, 2017	December 31, 2016
Active members:		
Number*	3,029	3,020
Annualized covered compensation	$ 184,878,822	$ 171,899,952
Retired members and beneficiaries receiving benefits:		
Number**	4,233	4,272
Annual allowances	$ 162,447,578	$ 162,162,901
Number of members and beneficiaries entitled to deferred benefits	211	191
Assets:		
Market Value	$ 1,834,979,000	$ 1,708,843,000
Actuarial Value	1,772,494,062	1,732,053,076
Unfunded accrued liability	$ 574,411,803	$ 520,821,984
Amortization Period	30 years	30 years
Funded Ratio		
Market Value	78.2%	75.9%
Actuarial Value	75.5%	76.9%
City's Fiscal Year Ending	**June 30, 2019**	**June 30, 2018**
City actuarially determined contribution rate (ADC):		
Normal Cost***	4.32%	4.16%
Unfunded Accrued Liability	24.19	23.79
Total	28.51%	27.95%
City estimated actuarially determined contribution in dollars (ADC):		
Normal Cost	$ 7,987,000	$ 7,151,000
Unfunded Accrued Liability	44,722,000	40,895,000
Total	$ 52,709,000	$ 48,046,000

*In addition, there are 742 part-time employees as of December 31, 2017 and 992 as of December 31, 2016.

**Includes 108 members participating in the Deferred Retirement Option Plan (DROP) as of December 31, 2017 and 49 as of December 31, 2016.

***The normal cost rate includes administrative expenses.

2. The major benefit and contribution provisions of the System as reflected in the valuation are summarized in Schedule G. No changes were made since the previous valuation.

3. Schedule E of this report outlines the full set of actuarial assumptions and methods used in the valuation. The following changes were made to the assumptions or methods since the previous valuation:

    - The price inflation assumption was decreased from 3.00% to 2.75%.
    - Retirement, withdrawal, and disability rates were changed to more closely reflect recent experience.
    - Mortality rates for all members were changed to a generational approach using the RP-2014 mortality tables.
    - Merit salary scale was changed to more closely reflect recent experience.
    - Assumed administrative expense as a percentage of payroll added to the total normal cost was increased from 0.75% to 0.80%.
    - The assumed proportion of deferred vested members who will elect to receive a deferred benefit and who will elect to withdraw their contributions was changed to more closely reflect recent experience.
    - The assumed percentage of members who are married for the purposes of valuing pre-retirement survivor benefits was changed.

4. Schedule C shows the development of the actuarial value of assets and Schedule F contains a brief description of the actuarial cost method.

5. Comments on the valuation results as of December 31, 2017 are given in Section IV, comments on the experience and actuarial gains and losses during the valuation year are given in Section VII and further discussion of the contributions is set out in Section V.

6. As shown in the Summary of Principal Results, the funded ratio is the ratio of assets to the accrued liability and is different based on market value of assets. The funded ratio is an indication of progress in funding the promised benefits. Since the ratio is less than 100%, there is a need for additional contributions toward payment of the unfunded accrued liability. In addition, this funded ratio does not have any relationship to measuring sufficiency if the plan had to settle its liabilities.

Section II – Membership Data

1. Data regarding the membership of the System for use as a basis of the valuation were furnished by the System. The valuation included 3,029 active members with annualized compensation totaling $184,878,822. In addition, there are 742 part-time employees as of December 31, 2017. The majority of these part-time employees are seasonal employees that have a minimal impact on the liabilities of the System.

2. The following table shows the number of retired members in receipt of a benefit and those members with a deferred benefit as of December 31, 2017 together with the amount of their annual retirement benefits payable under the System as of that date.

THE NUMBER AND ANNUAL BENEFITS OF RETIRED MEMBERS AND BENEFICIARIES AS OF DECEMBER 31, 2017

GROUP	NUMBER*	ANNUAL RETIREMENT BENEFITS
Participants Receiving Benefits**	4,233	$ 162,447,578
Participants with a Deferred Benefit	211	3,382,761
Total	4,444	$ 165,830,339

*In addition, there are 8,472 inactive participants who are former employees who have an employee account balance in the plan but are not otherwise vested in an employer provided benefit.

**Includes 108 members participating in the Deferred Retirement Option Plan (DROP) as of December 31, 2017.

3. Table 1 in Schedule H shows a reconciliation of participating members for the past plan year; Table 2 in Schedule H shows the distribution by age and years of membership service of the number of active members included in the valuation; and Table 3 shows the number and annual benefits of retired members and beneficiaries included in the valuation, distributed by age.

Section III – Assets

1. As of December 31, 2017, the total market value of assets amounted to $2,339,373,000, as reported by the System, of which $1,834,979,000 has been allocated for pension purposes. The estimated investment return for the plan year was 14.51%. Schedule D shows the receipts and disbursements of the System for the year preceding the valuation date and a reconciliation of the System balances at market value.

2. The market-related actuarial value of assets using a 5-year smoothing technique of investment gains and losses is $1,772,494,062. The estimated investment return for the plan year ending December 31, 2017 on an actuarial value of assets basis was 9.19%, which can be compared to the investment return assumed for the period of 7.50%. Schedule C shows the development of the actuarial value of assets as of December 31, 2017.

Section IV – Comments on Valuation

1. Schedule B of this report contains the valuation balance sheet which shows the present and prospective assets and liabilities of the System as of December 31, 2017. The valuation was prepared in accordance with the actuarial assumptions set forth in Schedule E and the actuarial cost method which is described in Schedule F.

2. The valuation balance sheet shows that the System has total prospective liabilities of $2,547,123,825, of which $1,773,568,467 is for the prospective benefits payable on account of present retired members, beneficiaries of deceased members, and terminated members entitled to deferred benefits, and $773,555,358 is for the prospective benefits payable on account of present active members. Against these liabilities, the System has a total present actuarial value of assets of $1,772,494,062 as of December 31, 2017. The difference of $774,629,763 between the total liabilities and the total present assets represents the present value of future contributions.

3. The contributions to the System consist of normal contributions and accrued liability contributions. The normal cost rate is equal to the actuarial present value of benefits accruing during the current year divided by the annual active members' payroll. Estimated budgeted administrative expenses are included in the normal cost rate. The expenses for the fiscal year ending June 30, 2019 are estimated to be 0.80% of payroll. The valuation indicates that normal contributions at the rate of 13.32% of payroll are required under the entry age method. Of this amount, 9.00% will be paid by the members and the remaining 4.32% is payable by the City.

4. Prospective normal contributions at the rate of 13.32% have a present value of $200,217,960 net of administrative expenses. When this amount is subtracted from $774,629,763, which is the present value of the total future contributions to be made, there remains $574,411,803 as the amount of unfunded accrued liability contributions. The development of the unfunded accrued liability is shown in Schedule A.

Section IV – Comments on Valuation

5. As can be seen from Schedule I of our report, the System had a total actuarial loss of about $43.6 million for the year. There was a $48.3 million loss from the actuarial assumption and method changes. As for the actuarial demographic and economic experience of CRS for the valuation year, there was a $4.7 million net gain. This was mainly due to gains from a higher than expected return on investments for the year as well as more deaths than expected. These gains were partially offset primarily by losses from higher than expected increases in salary as well as retirement and withdrawal experience during the year.

Section V – Contributions Payable

1. The contributions consist of a normal contribution and an accrued liability contribution as determined by actuarial valuation.

2. The normal contribution rate is calculated as the level percentage of payroll which, if applied for the average new member during the entire period of his anticipated covered service, would be required to meet the cost of all benefits payable on his behalf. On the basis of the valuation, the normal contribution rate was determined to be 13.32%. Of this amount, 9.00% will be paid by the members and the remaining 4.32% is payable by the City.

3. A contribution of 24.19% of payroll will liquidate the portion of the unfunded accrued liability of $574,411,803 within a 30-year period.

4. The total contribution rate required for the City's fiscal year ending June 30, 2019 is, therefore, 28.51% of payroll.

5. The following table summarizes the employer contributions which were determined by the December 31, 2017 valuation and are recommended for use.

CITY ACTUARIALLY DETERMINED CONTRIBUTIONS (ADC)
FOR CITY FISCAL YEAR ENDING JUNE 30, 2019

	PERCENTAGE OF ACTIVE MEMBERS' COMPENSATION	EMPLOYER ACTUARIALLY DETERMINED CONTRIBUTION (ADC)
Normal Cost	4.32%	$ 7,987,000
Unfunded Accrued Liability	24.19	44,722,000
Total	28.51%	$ 52,709,000

Section VI – Accounting Information

Governmental Accounting Standards Board Statements (GASB) has issued Statements No. 67 and 68 which replaced Statement No. 25 and 27 for plan years beginning after June 15, 2013. The information required under the new GASB Statements will be issued in separate reports. The following information is provided for informational purposes only.

1. The following is a distribution of the number of employees by type of membership:

NUMBER OF ACTIVE AND RETIRED PARTICIPANTS
AS OF DECEMBER 31, 2017

GROUP	TOTAL
Retired participants and beneficiaries currently receiving benefits	4,233
Terminated participants and beneficiaries entitled to benefits but not yet receiving benefits	211
Inactive participants*	8,472
Active Participants	
Full-Time	3,029
Part-Time	742
Total	16,687

* Participants who are former employees who have an employee account balance in the plan but are not otherwise vested in an employer provided benefit.

Section VI – Accounting Information

2. The schedule of funding progress as shown below.

SCHEDULE OF FUNDING PROGRESS
Dollar Amounts in Thousands

Actuarial Valuation Date	Actuarial Value of Assets (a)	Accrued Liability (AL) Entry Age (b)	Unfunded AL (UAL) (b – a)	Funded Ratio (a / b)	Covered Payroll* (c)	UAL as a Percentage of Covered Payroll ((b – a) / c)
12/31/2012	$1,367,695	$2,229,818	$862,123	61.3%	$167,148	515.8%
12/31/2013	1,424,933	2,254,121	829,188	63.2	163,477	507.2
12/31/2014	1,453,922	2,259,822	805,900	64.3	164,575	489.7
12/31/2015	1,703,002	2,207,484	504,482	77.1	174,963	288.3
12/31/2016	1,732,053	2,252,875	520,822	76.9	179,463	290.2
12/31/2017#	1,772,494	2,346,906	574,412	75.5	191,806	299.5

#Reflects changes in assumptions.

*Includes part-time active employee compensation.

3. Additional information as of December 31, 2017 follows:

Valuation date	12/31/2017
Actuarial cost method	Entry age
Amortization period	Level dollar open
Remaining amortization period	30 years
Asset valuation method	Five-year smoothed market value
Actuarial assumptions:	
Investment rate of return (includes inflation)	7.50%
Projected salary increases (includes inflation)	3.75% - 7.50%
Inflation	2.75%
Cost-of-living adjustments	3.00%

Section VII – Experience

Actual experience will never (except by coincidence) coincide exactly with assumed experience. It is assumed that gains and losses will be in balance over a period of years, but sizable year to year fluctuations are common. Detail on the derivation of the experience gain/(loss) for the year ended December 31, 2017 is shown below.

			$ Thousands
(1)	UAL* as of December 31, 2016	$	520,822
(2)	Total normal cost from December 31, 2016 valuation		22,622
(3)	Total actual contributions		50,600
(4)	Interest accrual: [(1) x 0.075] – {[(2) – (3)] x 0.0375}		38,012
(5)	Expected UAL before changes: (1) + (2) – (3) + (4)	$	530,856
(6)	Change due to plan amendments		0
(7)	Change due to actuarial assumptions or methods		48,308
(8)	Expected UAL after changes: (5) + (6) + (7)	$	579,165
(9)	Actual UAL as of December 31, 2017	$	574,412
(10)	Gain/(loss): (8) – (9)	$	4,753
(11)	Gain/(loss) as percent of accrued liabilities at start of year ($2,252,875)		0.2%

*Unfunded accrued liability.

Valuation Date December 31	Actuarial Gain/(Loss) as a % of Beginning Accrued Liabilities
2013	2.8%
2014	2.3%
2015	(0.0)%
2016	0.7%
2017	0.2%

Schedule A – Development of the Unfunded Accrued Liability

	December 31, 2017	December 31, 2016
(1) Present value of prospective benefits:		
(a) Present active full time members	$ 769,904,307	$ 734,274,020
(b) Present active part time and seasonal members	3,651,051	4,037,285
(c) Present retired members, beneficiaries, former members entitled to deferred vested benefits and inactive members	1,773,568,467	1,695,810,628
(d) Total	$ 2,547,123,825	$ 2,434,121,933
(2) Present value of future normal contributions	200,217,960	181,246,873
(3) Actuarial accrued liabilities: 1(d) – (2)	$ 2,346,905,865	$ 2,252,875,060
(4) Actuarial value of assets	1,772,494,062	1,732,053,076
(5) Unfunded accrued liability (UAL): (3) – (4)	$ 574,411,803	$ 520,821,984
(6) Actuarially Determined Contribution Rate as a % of Payroll		
(a) Normal Cost*	4.32%	4.16%
(b) UAL	24.19%	23.79%
(c) Total	28.51%	27.95%
(7) Estimated Contribution in dollars		
(a) Normal Cost	$ 7,987,000	$ 7,151,000
(b) UAL	44,722,000	40,895,000
(c) Total	$ 52,709,000	$ 48,046,000

*The normal cost rate includes administrative expenses.

Schedule B – Valuation Balance Sheet

Present and prospective assets and liabilities as of December 31, 2017:

ACTUARIAL LIABILITIES		
Present value of prospective benefits payable on account of present retired members, beneficiaries of deceased members, terminated members entitled to deferred benefits and inactive members		$1,773,568,467
Present value of prospective benefits payable on account of present active members		773,555,358
Total liabilities		$2,547,123,825
PRESENT AND PROSPECTIVE ASSETS		
Actuarial value of assets		$1,772,494,062
Present value of future contributions		
City and Member Normal contributions	$ 200,217,960	
Unfunded accrued liability contributions	574,411,803	
Total prospective contributions		$ 774,629,763
Total assets		$2,547,123,825

Schedule C – Development of the Actuarial Value of Assets

(1)	Actuarial Value of Assets as of December 31, 2016		$ 1,732,053,076
(2)	Market Value of Assets as of December 31, 2017		$ 1,834,979,000
(3)	Market Value of Assets as of December 31, 2016		$ 1,708,843,000
(4)	Net Cash Flow During Plan Year		
	(a)	Contributions	$ 50,600,000
	(b)	Benefit Payments and Net Transfers	(162,722,000)
	(c)	Administrative Expenses	(1,443,000)
	(d)	Investment Expenses	(8,088,000)
	(e)	Net Cash Flow: (a) + (b) + (c) + (d)	$ (121,653,000)
(5)	Investment Income		
	(a)	Market Total: (2) – (3) – (4)(e)	$ 247,789,000
	(b)	Assumed Rate	7.50%
	(c)	Amount for Immediate Recognition	
	[(3) x (5)(b)] + [[(4)(a) + (4)(b) + (4)(c)] x (5)(b) x 0.5] - (4)(d)		$ 131,992,538
	(d)	Amount for Phased-In Recognition: (5)(a) – (5)(c)	$ 115,796,462
(6)	Recognized Amounts for Plan Year		
	(a)	Current Year: 0.20 x (5)(d)	$ 23,159,292
	(b)	First Prior Year	5,620,802
	(c)	Second Prior Year	(22,563,358)
	(d)	Third Prior Year	(1,887,920)
	(e)	Fourth Prior Year	25,772,632
	(f)	Total Recognized Investment Gain/(Loss)	$ 30,101,448
(7)	Actuarial Value of Assets as of December 31, 2017		
	(1) + (4)(e) + (5)(c) + (6)(f)		$ 1,772,494,062
		80% of Market Value EOY	1,467,983,200
		120% of Market Value EOY	2,201,974,800
(8)	Final Actuarial Value of Assets as of December 31, 2017		$ 1,772,494,062
(9)	Rate of Return on Actuarial Value		9.19%

Schedule D –Asset Information

CURRENT ASSET INFORMATION

Receipts		
(1) Contributions		$ 50,600,000
(2) Investment Income		
• Net Appreciation (Depreciation) in Fair Value of Investments	$ 214,536,000	
• Dividends	28,900,000	
• Interest	4,171,000	
• Miscellaneous Income	182,000	
• Investment Expenses	(8,088,000)	
Total Investment Income		$ 239,701,000
(3) Total Receipts		$ 290,301,000
Disbursements		
(4) Benefits Paid	$ 162,613,000	
(5) Administrative Expenses	1,443,000	
(6) Net Transfers	109,000	
(7) Total Disbursements		$ 164,165,000
(8) Excess of Receipts Over Disbursements: (3) - (6)		$ 126,136,000
Reconciliation of Asset Balances		
(9) Market Value at December 31, 2016		$1,708,843,000
(10)Excess of Receipts Over Disbursements		126,136,000
(11)Market Value at December 31, 2017		$1,834,979,000
(12)Estimated Rate of Return on Market Value of Assets		14.51%

Schedule D –Asset Information

HISTORICAL ASSET INFORMATION
($ in thousands)

Valuation Date	Actuarial Value of Assets		Market Value of Assets	
	Amount	Rate of Return	Amount	Rate of Return
12/31/2012	$1,367,695	0.25%	$1,409,032	12.06%
12/31/2013	1,424,933	12.11	1,537,511	16.99
12/31/2014	1,453,922	10.18	1,522,851	6.46
12/31/2015	1,703,002	7.51	1,670,524	(0.11)
12/31/2016	1,732,053	8.50	1,708,843	9.24
12/31/2017	1,772,494	9.19	1,834,979	14.51

Schedule E – Outline of Actuarial Assumptions and Methods

Actuarial assumptions and methods adopted by the Board March 1, 2018.

INVESTMENT RATE OF RETURN: 7.50% per year, net of investment expenses.

INFLATION ASSUMPTION: 2.75% per annum.

SALARY INCREASES: Salary increases are assumed to vary by service. Representative rates are as follows:

Service	Annual Increase
0	7.50%
5	5.00
10	4.50
15	4.00
21+	3.75

SEPARATIONS FROM ACTIVE SERVICE: For death rates, RP-2014 Employees Mortality Table with a generational approach using the MP-2017 projection scale was used. Representative values of the assumed annual rates of separation from active service are as follows:

	Annual Rate of Withdrawal			
Age	Less than One Year of Service	Between One and Three Years of Service	Between Three and Five Years of Service	Five or More Years of Service
20	22.00%	10.00%	8.00%	4.00%
25	22.00	10.00	8.00	4.00
30	22.00	10.00	8.00	4.00
35	22.00	10.00	4.00	4.00
40	22.00	10.00	4.00	2.75
45	22.00	10.00	4.00	1.25
50	22.00	10.00	4.00	1.25
55	22.00	10.00	4.00	1.25
60	22.00	10.00	4.00	1.25
65	22.00	10.00	4.00	1.25
70	22.00	10.00	4.00	1.25

Schedule E – Outline of Actuarial Assumptions and Methods

Age	Annual Rate of Disability*
20	0.005%
25	0.010
30	0.015
35	0.025
40	0.045
45	0.075
50	0.135
55	0.210
60	0.250
65	0.250

* Rates are 0% when member is eligible for normal retirement

	Annual Rate of Retirement Groups C, E, and F*				
Age	5 Years of Service	6-24 Years of Service	25-29 Years of Service	30 Years of Service	31+ Years of Service
50				55.0	30.0
55			6.0%	55.0	30.0
56			8.0	55.0	30.0
57			10.0	55.0	30.0
58			10.0	55.0	30.0
59			10.0	55.0	30.0
60	25.0%	25.0%	25.0	55.0	25.0
61	25.0	18.0	18.0	55.0	25.0
62	25.0	18.0	18.0	55.0	25.0
63	25.0	18.0	18.0	55.0	25.0
64	25.0	18.0	18.0	55.0	25.0
65	25.0	18.0	18.0	55.0	25.0
70	100.0	100.0	100.0	100.0	100.0

* For purposes of valuing CSA Employee members eligible for DROP benefits, an additional 10% is added to rates for 30 years of service and an additional 5% is added to rates for 31+ years of service.

	Annual Rate of Retirement Group G				
Age	5 Years of Service	6-14 Years of Service	15-29 Years of Service	30 Years of Service	31+ Years of Service
57			6.0%	6.0%	6.0%
58			6.0	6.0	6.0
59			8.0	8.0	8.0
60			8.0	8.0	8.0
61			10.0	10.0	10.0
62			10.0	25.0	25.0
63			10.0	25.0	18.0
64			10.0	25.0	18.0
65			10.0	25.0	18.0
66			10.0	25.0	18.0
67	25.0%	25.0%	25.0	25.0	18.0
68	25.0	18.0	18.0	18.0	18.0
69	25.0	18.0	18.0	18.0	18.0
70	100.0	100.0	100.0	100.0	100.0

DEATHS AFTER RETIREMENT: The RP-2014 Mortality Table with a generational approach using the MP-2017 projection scale and set forward two years for both males and females is used for the period after retirement and for dependent beneficiaries. The RP-2014 Disabled Retiree Mortality Table with a generational approach using the MP-2017 projection scale is used for the period after disability.

EXPENSES: Estimated budgeted administrative expenses of 0.80% of payroll are added to the normal cost rate.

WITHDRAWAL ASSUMPTION: It is assumed that 60% of vested members who terminate elect to leave their contributions in the plan in order to be eligible for a benefit at their normal retirement date while the remaining 40% elect to withdraw their contributions.

PERCENT MARRIED: 80% of members are assumed to be married for the purposes of valuing pre-retirement survivor benefits.

SPOUSE AGE DIFFERENCE: Unless otherwise reported in the data, males are assumed to be three years older than his spouse.

ASSETS: Actuarial value, as developed in Schedule C. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value. In addition, the actuarial value of assets cannot be less than 80% or more than 120% of the market value of assets.

Schedule E – Outline of Actuarial Assumptions and Methods

PART-TIME ACTIVE MEMBERS: All part-time active members are assumed to receive a refund of their employee contributions with interest upon leaving the System.

DROP PARTICIPATION: 60% of eligible CSA Employee members eligible for DROP benefits are assumed to decline participation and 40% are assumed to elect participation. Those electing to participate are assumed to remain in the DROP for 3 years.

DROP CREDITING RATE: 3.25% annually.

VALUATION METHOD: Entry age actuarial cost method. See Schedule F for a brief description of this method.

Schedule F – Actuarial Cost Method

1. The valuation is prepared on the projected benefit basis, under which the present value, at the interest rate assumed to be earned in the future (currently 7.50%), of each member's expected benefits at retirement or death is determined, based on age, service and sex. The calculations take into account the probability of a member's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service, disability or survivor's benefit. The present value of the expected benefits payable on account of the active members is added to the present value of the expected future payments to retired members and beneficiaries to obtain the present value of all expected benefits payable from the System on account of the present group of members and beneficiaries.
2. The employer contributions required to support the benefits of the System are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.
3. The normal contribution is determined using the entry age actuarial cost method. Under this method, a calculation is made to determine the level percentage of payroll which, if applied for the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.
4. The unfunded accrued liability is determined by subtracting the present value of prospective employer normal contributions and member contributions, together with the current actuarial value of assets held, from the present value of expected benefits to be paid from the System.

Schedule G – Summary of Main System Provisions

SUMMARY OF MAIN SYSTEM PROVISIONS
AS INTERPRETED FOR VALUATION PURPOSES

Membership

All employees of the City shall be members of the System except for the following:

- Members of the Police and Fireman's Disability and Pension Fund of Ohio.
- Elected City officials.
- Employees for whom the City contributes to PERS.
- Members of the faculties, teaching staffs, research staffs, and administrative staff of the University of Cincinnati appointed to positions covered by the Teachers Insurance and Annuity Association Social Security Plan.
- Persons becoming employees after June 1, 1961, who are employed in any of the following employment classifications: bricklayer, carpenter, carpenter foreman, cement finisher, electrician, electrician foreman, painter, painter foreman, plasterer, plumber, sign painter, steamfitter and pipefitter, tinsmith, or composition roofer.
- Persons hired as police recruits who are not currently enrolled as a member of the System prior to their date of hire.
- Current contributing members of the School Employees Retirement System (SERS) or the State Teachers Retirement System (STRS) who are hired by the City on a seasonal, temporary, or part-time basis.

Members of the System are divided into the following groups:

Group	Criteria
A, B	Any member who has retired prior to 7/1/2011.
C	Any member who, as of June 30, 2011, was an active or deferred vested member and had either: a) Completed at least 30 years of service, or b) Reached age 60 and completed at least 5 years of service.

Schedule G – Summary of Main System Provisions

Group	Criteria
D	Any active member who, between July 1, 2011 and December 31, 2013: 1) Either a) Completed at least 30 years of service, or b) Reached age 60 and completed at least 5 years of service; and 2) Retired prior to January 1, 2014.
E	Any active member who: 1) Between July 1, 2011 and December 31, 2013 either: a) Completed at least 30 years of service, or b) Reached age 60 and completed at least 5 years of service; and 2) Retires on or after January 1, 2014.
F	Any active member whose most recent membership enrollment date was prior to January 1, 2010 and who is not in groups A through E. Any deferred vested member whose most recent membership enrollment date was prior to January 1, 2010, is not in groups A through E, and has at least five years of service prior to the date they separate from employment.
G	Any member whose most recent membership enrollment date is on or after January 1, 2010, or Any member rehired on or after January 1, 2010, who has fewer than 5 years of service as of June 30, 2011, or Any retiree of the System who is receiving a service retirement allowance and is re-employed on or after April 1, 2013.

Schedule G – Summary of Main System Provisions

Members in the System are further classified as follows:

Class	Criteria
CSA Retiree (CSA participants corresponding to Retirees Class)	Group A and B members and their designated optionees.
CSA Employee (CSA participants corresponding to Current Employees Class)	Group C, D, E, and F members (and their designated optionees) that were vested and employed on 7/1/2011.
CMC Employee (Non-CSA participants)	Group E and F members (and their designated optionees) that were either vested or employed on 7/1/2011 and no break in employment service since 1/1/2010 and prior to becoming vested.
Non-CSA	Group G members and their designated optionees.

Service Retirement Benefit

<u>Groups A, B, C and D:</u>

Normal Retirement Eligibility — Age 60 with 5 years of service or 30 years of service.

Early Retirement Eligibility — Age 55 with 25 years of service.

Benefit Formula Multiplier — Members hired prior to July 12, 1998 were given a one-time irrevocable option to choose either the benefit formula using a 2.22% multiplier or the benefit formula using a 2.50% multiplier. For members hired on or after July 12, 1998, benefits are calculated using a 2.50% multiplier.

Average Highest Compensation	Average of the highest three consecutive years of compensation.
Years of Service	Years or fractional years of full-time service rendered to the plan sponsor.
Benefit	a) An annuity which is actuarially equivalent to the accumulated contributions of the member at the time of retirement. b) A pension which together with the annuity produces a total annual retirement allowance equal to the product of the applicable benefit formula multiplier, the member's average highest compensation, and the number of years of service. Early Retirement Benefit is actuarially reduced from normal retirement age.

Group E:

Normal Retirement Eligibility	Age 60 with 5 years of service or 30 years of service.
Early Retirement Eligibility	Age 55 with 25 years of service.

Retirement benefit is composed of as many as three components:

Part A Benefit: for service earned through December 31, 2013

Part B Benefit: for service earned on and after January 1, 2014 up to a combined (Part A and B) 20 years of service

Part C Benefit: for service earned on or after January 1, 2014 in excess of a combined (Part A and B) 20 years of service.

Benefit Formula Multiplier	**Part A Benefit:** Members hired prior to July 12, 1998 were given a one-time irrevocable option to choose either the benefit formula using a 2.22% multiplier or the benefit formula using a 2.50% multiplier. For members hired on or after July 12, 1998, benefits are calculated using a 2.50% multiplier. **Part B Benefit:** Members hired prior to July 12, 1998 were given a one-time irrevocable option to choose either the benefit formula using a 2.22% multiplier or the benefit formula using a 2.50% multiplier. For members hired on or after July 12, 1998, benefits are calculated using a 2.50% multiplier.

	Part C Benefit: 2.20% multiplier
Average Highest Compensation	**Part A Benefit:** Average of the highest three consecutive years of compensation
	Part B Benefit: Average of the highest five consecutive years of compensation
	Part C Benefit: Average of the highest five consecutive years of compensation
Years of Service	Years or fractional years of full-time service rendered to the plan sponsor.
Benefit	a) An annuity which is actuarially equivalent to the accumulated contributions of the member at the time of retirement. b) A pension which together with the annuity produces a total annual retirement allowance equal to the sum of Part A, Part B, and Part C benefits each of which is the product of the applicable benefit formula multiplier, the applicable average highest compensation, and the applicable number of years of service. Early Retirement Benefit is actuarially reduced from normal retirement age.

Group F:

Normal Retirement Eligibility	Age 60 with 5 years of service or 30 years of service.
Early Retirement Eligibility	Age 55 with 25 years of service.

Retirement benefit is composed of as many as three components:

Part A Benefit: for service earned through June 30, 2011

Part B Benefit: for service earned on and after July 1, 2011 up to a combined (Part A and B) 20 years of service

Part C Benefit: for service earned on or after July 1, 2011 in excess of a combined (Part A and B) 20 years of service.

Benefit Formula Multiplier	**Part A Benefit:** Members hired prior to July 12, 1998 were given a one-time irrevocable option to choose either the benefit formula using a 2.22% multiplier or the benefit formula using a 2.50% multiplier. For members hired on or after July 12, 1998, benefits are calculated using a 2.50% multiplier. **Part B Benefit:** Members hired prior to July 12, 1998 were given a one-time irrevocable option to choose either the benefit formula using a 2.22% multiplier or the benefit formula using a 2.50% multiplier. For members hired on or after July 12, 1998, benefits are calculated using a 2.50% multiplier. **Part C Benefit:** 2.20% multiplier
Average Highest Compensation	**Part A Benefit:** Average of the highest three consecutive years of compensation **Part B Benefit:** Average of the highest five consecutive years of compensation **Part C Benefit:** Average of the highest five consecutive years of compensation
Years of Service	Years or fractional years of full-time service rendered to the plan sponsor.
Benefit	a) An annuity which is actuarially equivalent to the accumulated contributions of the member at the time of retirement. b) A pension which together with the annuity produces a total annual retirement allowance equal to the sum of Part A, Part B, and Part C benefits each of which is the product of the applicable benefit formula multiplier, the applicable average highest compensation, and the applicable number of years of service. Early Retirement Benefit is actuarially reduced from normal retirement age.

Group G

Normal Retirement Eligibility	Age 67 with 5 years of service or age 62 with 30 years of service.
Early Retirement Eligibility	Age 57 with 15 years of service.

Schedule G – Summary of Main System Provisions

Benefit Formula Multiplier	Benefit is calculated using a 2.20% multiplier for all years of service up to 30 years and a 2.00% multiplier for all service in excess of 30 years.
Average Highest Compensation	Average of the highest five consecutive years of compensation.
Years of Service	Years or fractional years of full-time service rendered to the plan sponsor.
Benefit	a) An annuity which is actuarially equivalent to the accumulated contributions of the member at the time of retirement. b) A pension which together with the annuity produces a total annual retirement allowance equal to the product of the applicable benefit formula multiplier, the member's average highest compensation, and the number of years of service. Early Retirement Benefit is actuarially reduced from normal retirement age.

Miscellany for All Groups

In no event shall the retirement allowance be greater than 90% of a member's average highest compensation.

In no event shall the retirement allowance be greater than that permitted by Section 415 of the Internal Revenue Code.

The average highest compensation used in the calculation of benefits depends on which benefit formula applies to the member. The formula that uses the 2.22% multiplier includes overtime compensation and the lump sum payment for unused vacation, unused sick-pay, etc. The formulas that use all other multipliers do not include overtime or the lump sum payment.

Disability Retirement Benefit

Eligibility	5 years of service.
Benefit	90% of normal retirement benefit at disability date but not less than the smaller of: (1) 25% of average highest compensation (2) 90% of the retirement benefit member would have become entitled to had he continued in service to normal retirement age without further change in average highest compensation.

Schedule G – Summary of Main System Provisions

Deferred Vested Retirement Benefit

Eligibility	5 years of service.
Benefit	Normal retirement benefit beginning at normal retirement age.

Preretirement Death Benefit

(1) Refund of contributions with interest.

(2) Survivor Benefits according to type of survivors if member has at least 18 months of service.

Postretirement Death Benefit

(1) Lump sum $5,000 for group AB only.

(2) If no Joint and Survivor Option is selected, balance of member contributions not received back in retirement benefit payments prior to death.

Optional Forms of Benefit

(1) Joint and 100% Survivor Payment

(2) Joint and 50% Survivor Payment

(3) 66 2/3% Joint and Survivor Payment

(4) 80% Joint and Survivor Payment

COLA Increases

Group A and B:

3% simple COLA based on the participant's benefit on January 1, 2016 including all previously granted COLA's. Effective January 1, 2016 the COLA will be suspended for a 3-year period.

In the third year of the COLA suspension (calendar year 2018), members will receive a one-time payment that is the lesser of 3% of their base pension benefit or $1,000. This payment will be made on January 1, or the anniversary date of the member's retirement according to when the member normally receives a COLA.

Group C, D, E, F, and G:

3% simple COLA based on initial gross monthly benefit with a 3-year delay following each participant's date of retirement.

Poverty Exception:	Any member of the Retirees Class or Current Employees Class who retired or retires with at least 5-years of service and whose household income is below 150% of federal poverty guidelines will receive a 3% compounding COLA until such time income exceeds 150% of federal poverty guidelines at which point the participant will receive a 3% simple COLA.

Contributions

By Members:	Each member, commencing January 1, 1978, contributes at a rate of 7.0% of the salary used to compute retirement benefits until his retirement. Beginning January 1, 2010, the employee contribution rate was increased 0.5% per year over 4 years to reach 9.0% of pay. The CSA establishes the contribution rate for members shall not exceed 9.0% of pay for the term of the agreement.
By Employers:	The sponsoring employer makes annual contributions based on members' salaries so that, when members become eligible for benefits, reserves will have been accumulated adequate to provide the pension and other benefits payable by the plan on account of creditable service.

Deferred Retirement Option Plan (DROP)

Eligibility	Current Employees Class members with at least 30 years of service.
Maximum Participation Period	5 years.
Minimum Participation Period	Participation in DROP for less than 2 years results in forfeiture of all interest earnings credited to the member's DROP account.
Benefit	Monthly pension benefit calculated as if eligible member actually retired on their DROP effective date, including any adjustments for an assigned optionee. The monthly pension benefit will be contributed to the member's DROP account in the CRS Pension Trust and paid out as a lump sum upon termination from the DROP.
Employee Contributions	Members continue to contribute 9% of pay while participating in DROP. A portion (75%) of the contribution is credited to the member's DROP account and the remaining portion (25%) of the contribution is paid to the CRS Pension Trust to offset the costs of administering the DROP.

Schedule G – Summary of Main System Provisions

Employer Contributions	Employer contributions to the CRS Pension Trust continue to apply in the same manner as for other actively employed members who are not participating in the DROP. Employer contributions are not credited to the member's DROP account.
Interest	DROP account balances are credited each month at a rate equal to the 10-year U.S. Treasury Note Business Day Series adjusted quarterly with a cap of 5% but not less than 0%.

Schedule H – Tables of Membership Data

TABLE 1

STATUS RECONCILIATION OF PARTICIPATING MEMBERS

	Active Full Time	Active Part Time	Receiving Benefits*	Deferred Benefits	Total
Participants as of December 31, 2016	3,020	992	4,272	191	8,475
A. Receiving Benefits	(124)	(2)	131	(5)	
B. Terminated Vested	(21)	(8)		29	
C. Terminated Non-Vested	(46)	(414)			(460)
D. Deaths	(5)	(3)	(209)	(2)	(219)
E. Rehires	9	54			63
F. New Participants	218	186			404
G. New Member Due to Death of Participant			41		41
H. Part Time to Full Time	58	(58)			
I. Full Time to Part Time	(46)	46			
J. Refunds	(34)	(51)		(5)	(90)
K. Benefits Expired			(2)	(1)	(3)
L. Data Corrections				4	4
Participants as of December 31, 2017	3,029	742	4,233	211	8,215

*Includes 108 members participating in the Deferred Retirement Option Plan (DROP) as of December 31, 2017.

In addition, there are 8,472 inactive participants who are former employees who have an employee account balance in the plan but are not otherwise vested in an employer provided benefit.

TABLE 2

SCHEDULE OF ACTIVE MEMBERS BY AGE AND SERVICE
AS OF DECEMBER 31, 2017

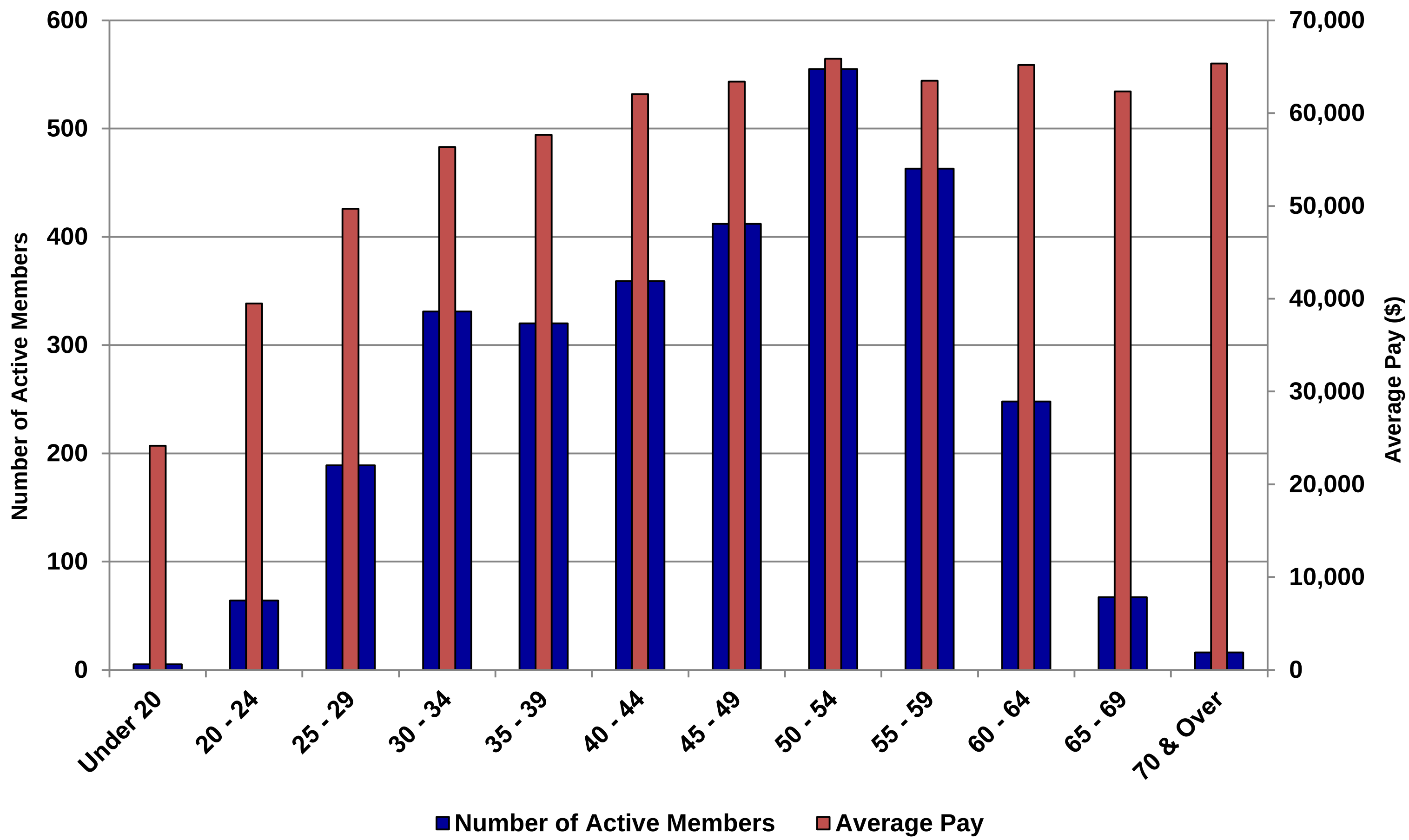
Age	Completed Years of Service							
	0 – 4	5 – 9	10 – 14	15 – 19	20 – 24	25 – 29	30+	Total
Under 20	5							5
Avg Pay	24,160							24,160
20 - 24	63	1						64
Avg Pay	39,176	58,435						39,477
25 - 29	160	28	1					189
Avg Pay	49,529	50,382	58,313					49,702
30 - 34	197	99	34	1				331
Avg Pay	55,157	58,438	57,630	40,381				56,348
35 - 39	146	91	47	35	1			320
Avg Pay	55,026	61,133	55,876	62,101	62,077			57,684
40 - 44	136	79	64	56	24			359
Avg Pay	55,927	66,554	64,122	65,528	68,201			62,044
45 - 49	75	77	75	80	53	51	1	412
Avg Pay	56,111	62,494	65,590	62,998	67,480	68,866	51,658	63,397
50 - 54	86	57	49	79	78	191	15	555
Avg Pay	63,870	59,442	58,462	63,790	69,357	69,418	72,949	65,852
55 - 59	51	38	47	69	63	177	18	463
Avg Pay	56,280	64,849	61,423	58,915	60,836	68,027	68,756	63,494
60 - 64	38	27	30	34	32	70	17	248
Avg Pay	62,395	66,702	70,911	57,953	66,171	65,344	70,782	65,180
65 - 69	6	7	10	15	11	12	6	67
Avg Pay	76,179	81,709	52,345	64,223	57,919	52,043	66,782	62,360
70 & Over		2	4	3	3	3	1	16
Avg Pay		79,995	92,386	49,572	54,734	47,993	59,407	65,365
Total	963	506	361	372	265	504	58	3,029
Avg Pay	54,433	61,804	62,157	62,124	65,799	67,767	69,774	61,036

Average Age 46.63 Average Service 12.72

Schedule H – Tables of Membership Data

CHART 1

DISTRIBUTION OF ACTIVE MEMBERS BY AGE
AS OF DECEMBER 31, 2017



Schedule H – Tables of Membership Data

TABLE 3

SCHEDULE OF RETIRED MEMBERS AND BENEFICIARIES
AS OF DECEMBER 31, 2017

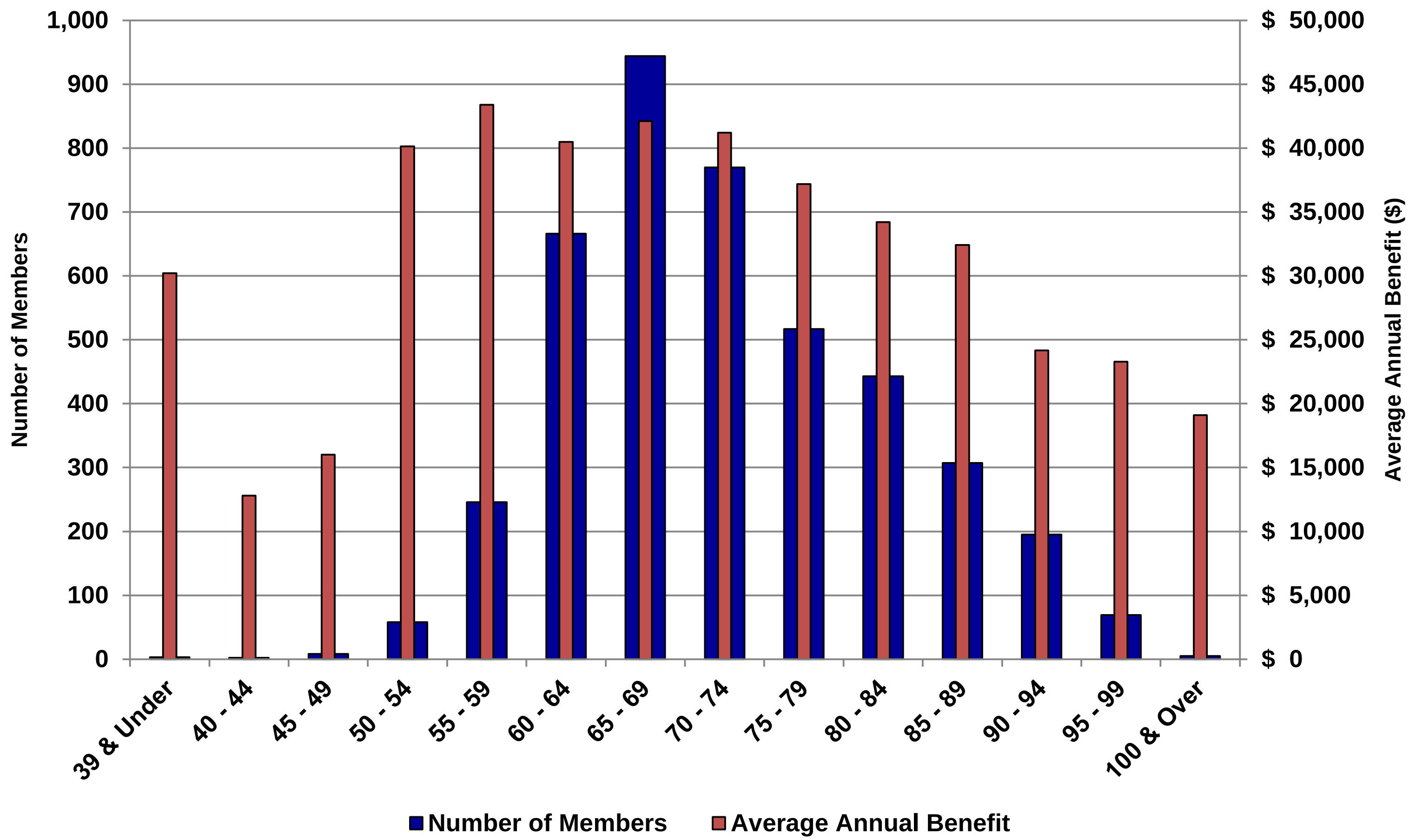
Attained Age	Number of Members	Total Annual Benefits	Average Annual Benefit
39 & Under	3	$ 90,625	$ 30,208
40 - 44	2	25,614	12,807
45 - 49	8	127,989	15,999
50 - 54	58	2,327,812	40,135
55 - 59	246	10,673,036	43,386
60 - 64	666	26,969,162	40,494
65 - 69	944	39,760,076	42,119
70 - 74	770	31,727,662	41,205
75 - 79	517	19,220,477	37,177
80 - 84	443	15,153,460	34,206
85 - 89	307	9,953,945	32,423
90 - 94	195	4,715,272	24,181
95 - 99	69	1,606,912	23,289
100 & Over	5	95,536	19,107
Total	**4,233**	**$ 162,447,578**	**$ 38,376**

In addition, there are 211 deferred vested employees and beneficiaries entitled to deferred annual benefits totaling $3,382,761.

Schedule H – Tables of Membership Data

CHART 2

DISTRIBUTION OF RETIRED MEMBERS AND BENEFICIARIES
AS OF DECEMBER 31, 2017



Schedule I – Analysis of Financial Experience

Gains & Losses in Unfunded Accrued Liabilities
Resulting from Difference Between
Assumed Experience & Actual Experience
($ Thousands)

Type of Activity	$ Gain (or Loss) For Year Ending 12/31/2017	$ Gain (or Loss) For Year Ending 12/31/2016
Age & Service Retirements. If members retire at older ages, there is a gain. If younger ages, a loss.	$ (4,978)	$ (2,687)
Disability Retirements. If disability claims are less than assumed, there is a gain. If more claims, a loss.	(322)	(365)
Death-in-Service Benefits. If survivor claims are less than assumed, there is a gain. If more claims, there is a loss.	60	655
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	(3,939)	(3,302)
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	(21,143)	(638)
New Members. Additional unfunded accrued liability will produce a loss.	(766)	(859)
Investment Income. If there is a greater investment income than assumed, there is a gain. If less income, a loss.	28,361	16,400
Death After Retirement. If retirants live longer than assumed, there is a loss. If not as long, a gain.	8,106	6,179
Other. Miscellaneous gains and losses resulting from changes in valuation software, data adjustments, timing of financial transactions, etc.	(627)	(407)
Gain (or Loss) During Year From Experience	$ 4,752	$ 14,976
Non-Recurring Items. Adjustments for plan amendments, asset transfers, assumption changes, or method changes.	(48,308)	(27,754)
Composite Gain (or Loss) During Year	$ (43,556)	$ (12,778)