

City of Manchester Employees'
Contributory Retirement System
Annual Actuarial Valuation Report
December 31, 2018



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April 4, 2019

Board of Trustees
City of Manchester Employees'
Contributory Retirement System
1045 Elm Street, Suite 403
Manchester, New Hampshire 03101-1824

Dear Board Members:

The results of the December 31, 2018 **Annual Actuarial Valuation of the City of Manchester Employees' Contributory Retirement System (MECRS)** are presented in this report. The purposes of the valuation were:

- to measure the System's funding progress; and
- to calculate the employer contribution rate for the City's fiscal year 2020.

This report 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 valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to: actual plan experience differing from assumed; changes in economic or demographic assumptions; changes in funding policy; changes in plan provisions or applicable law; etc. An analysis of the potential range of such future measurements was beyond the scope of this valuation.

This report replaces our preliminary report dated March 4, 2019. Results presented in this report are unchanged from those presented in the preliminary report.

Information required for GASB Statements No. 67 and No. 74 will be provided in separate reports.

This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different.

If there is other information that you need in order to make an informed decision regarding the matters discussed in this report, please contact us.

The contribution rate in this report is determined using the actuarial assumptions and methods disclosed in Section C of this report. This report includes risk metrics on page A-15 but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

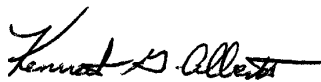
This valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

The findings in this report are based on data and other information through December 31, 2018. The valuation was based upon information, furnished by the Retirement System, concerning Retirement System benefits, financial transactions, and individual members, terminated members, retirees and beneficiaries. Data was checked for year-to-year consistency, but was not audited.

This report has been prepared by individuals who have substantial experience valuing public employee retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board of the American Academy of Actuaries. The actuarial assumptions used for the valuation produce results which, individually and in the aggregate, are reasonable. We certify that the information contained in this report is accurate and fairly presents the actuarial position of MECRS as of December 31, 2018. GRS is not responsible for unauthorized use of this report.

Heidi G. Barry is a Member of the American Academy of Actuaries (MAAA), and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. The signing individuals are independent of the plan sponsors.

Respectfully submitted,



Kenneth G. Alberts



Heidi G. Barry, ASA, FCA, MAAA

KGA/HGB:ah



SECTION A

VALUATION RESULTS

Executive Summary

Funding Objective

The funding objective of the Retirement System is to establish and receive contributions which, when expressed as percents of active member payroll, will remain approximately level from year to year and will accumulate sufficient assets over each member's working lifetime to finance promised benefits throughout retirement.

Contribution Rates

The Retirement System is supported by member contributions, City contributions and investment income from Retirement System assets.

Contributions which satisfy the funding objective are determined by the annual actuarial valuation and are sufficient to:

- Cover the actuarial present value of benefits allocated to the current year by the actuarial cost method described in Section C (the normal cost); and
- Finance over a period of future years the actuarial present value of benefits not covered by valuation assets and anticipated future normal costs (unfunded actuarial accrued liability).

The computed pension contribution rate for the City's fiscal year 2020 is 27.13% of covered payroll.

The computed health subsidy contribution rate for the City's fiscal year 2020 is 2.20% of covered payroll.

The details of these contribution rates are shown on pages A-7 and A-8.

The contribution rates are sufficient to finance the employer normal cost and to amortize the unfunded pension actuarial accrued liability (full funding credit) as a level percent-of-payroll over a period of 21 years for pension benefits, and 21 years for health subsidy benefits.

Summary Statement of System Resources and Obligations

December 31, 2018

Present Resources and Expected Future Resources

	Pension	Health
A. Actuarial value of System assets:		
1. Net assets from System financial statements	\$203,944,654	\$12,268,459
2. Funding value adjustment	16,897,659	1,016,493
3. Valuation assets	220,842,313	13,284,952
B. Present value of expected future employer contributions:		
1. For normal costs	35,525,375	107,097
2. For unfunded actuarial accrued liabilities	135,105,903	15,427,174
3. Totals	170,631,278	15,534,271
C. Present value of expected future member contributions:	17,213,778	5,737,926
D. Total Present and Expected Future Resources	\$408,687,369	\$34,557,149

Actuarial Present Value of Expected Future Benefit Payments

	Pension	Health
A. To retirees and beneficiaries:	\$198,418,034	\$15,050,104
B. To vested terminated members:	6,306,149	511,951
C. To present active members:		
1. Allocated to service rendered prior to valuation date	151,224,033	13,150,071
2. Allocated to service likely to be rendered after valuation date	52,739,153	5,845,023
3. Total	203,963,186	18,995,094
D. Total Actuarial Present Value of Expected Future Benefit Payments	\$408,687,369	\$34,557,149

Summary of Current Asset Information Furnished for the Valuation

Balance Sheet

Reported Assets - Actuarial Value as of December 31		
	2018	2017
Cash & Equivalents	\$ 4,745,085	\$ 4,556,531
Investments	211,751,042	227,878,034
Receivables	413,399	319,096
Property, Plant, Equipment	1,669	2,504
Accrued Interest & Dividends	35,816	28,887
Receivable for Add'l Contribution Calculator	(1,000)	50
Payable for Investments Purchased	(5,093)	(1,680)
Accounts Payable	(137,034)	(381,113)
Benefits Payable	(1,540,025)	(1,423,563)
Additional Contribution Account	949,254	834,763
Other	0	0
Market Value Total	216,213,113	231,813,509
Funding Value Adjustment	17,914,152	(2,319,458)
Total Valuation Assets	\$234,127,265	\$229,494,051

Revenues and Expenditures

	2018	2017
Funding Value - January 1	\$229,494,051	\$216,265,885
Revenues		
Employees' Contributions*	3,061,590	3,022,314
Employer Contributions	13,970,044	12,937,285
Recognized Investment Income	8,616,280	16,713,431
Total	25,647,914	32,673,030
Expenditures		
Benefit Payments	18,846,947	17,560,065
Refund of Member Contributions	567,039	229,271
Expenses and Fees	1,600,714	1,655,528
Total	21,014,700	19,444,864
Funding Value - December 31	\$234,127,265	\$229,494,051
Rate of Return Recognized	3.4 %	7.4 %

*Includes service upgrades.

Development of Funding Value of Assets

Year Ended December 31:	2016	2017	2018	2019	2020	2021	2022
A. Funding Value Beginning of Year	\$209,192,563	\$216,265,885	\$229,494,051				
B. Market Value End of Year	202,386,937	231,813,509	216,213,113				
C. Market Value Beginning of Year	196,110,677	202,386,937	231,769,735				
D. Non-Investment Net Cash Flow	(5,811,550)	(2,631,657)	(3,121,996)				
D1. Post-Valuation Adjustment	0	0	43,774				
E. Investment Income							
E1. Market Total: B - C - D - D1	12,087,810	32,058,229	(12,478,400)				
E2. Amount for Immediate Recognition (7.00%)	14,955,792	15,583,879	15,955,314				
E3. Amount for Phased-In Recognition: E1-E2	(2,867,982)	16,474,350	(28,433,714)				
F. Phased-In Recognition of Investment Income							
F1. Current Year: 0.20 x E3	(573,596)	3,294,870	(5,686,743)				
F2. First Prior Year	(3,904,599)	(573,596)	3,294,870	\$ (5,686,743)			
F3. Second Prior Year	(1,330,034)	(3,904,599)	(573,596)	3,294,870	\$ (5,686,743)		
F4. Third Prior Year	2,789,301	(1,330,034)	(3,904,599)	(573,596)	3,294,870	\$ (5,686,743)	
F5. Fourth Prior Year	948,008	2,789,303	(1,330,036)	(3,904,597)	(573,598)	3,294,870	\$ (5,686,742)
F6. Total Recognized Investment Gain	(2,070,920)	275,944	(8,200,104)	(6,870,066)	(2,965,471)	(2,391,873)	(5,686,742)
G. Preliminary Funding Value End of Year: A + D + E2 + F6	216,265,885	229,494,051	234,127,265				
H. Actuarial Value after Application of 20% Corridor Limit	216,265,885	229,494,051	234,127,265				
I. Difference between Market & Funding Value	(13,878,948)	2,319,458	(17,914,152)				
J. Recognized Rate of Return	6.3 %	7.4 %	3.4 %				
K. Market Rate of Return	6.3 %	15.9 %	(5.4)%				
L. Ratio of Funding Value to Market Value	106.9 %	99.0 %	108.3 %				

The Funding Value of Assets recognizes assumed investment income (line E2) fully each year. Differences between actual and assumed investment income (line E3) are phased-in over a closed 5-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. The Funding Value of Assets is unbiased with respect to Market Value. At any time it may be either greater or less than Market Value. If actual and assumed rates of retirement income are exactly equal for four consecutive years, the Funding Value will become equal to Market Value.

Allocation of Funding Value of Assets Year Ended December 31, 2018

(A) Total Market Value	\$216,213,113
(B) Pension Market Value	\$203,944,654
(C) Ratio: (B)/(A)	94.3258%
(D) Total Funding Value	\$234,127,265
(E) Pension Funding Value: (D) x (C)	\$220,842,313
(F) Health Funding Value: (D) - (E)	\$ 13,284,952

Development of Unfunded Actuarial Accrued Liability Year Ended December 31, 2018

	Pension	Health
Present Value of Future Benefits - Retirees	\$198,418,034	\$15,050,104
Present Value of Future Benefits - Deferreds	6,306,149	511,951
Present Value of Future Benefits - Actives	203,963,186	18,995,094
Total Present Value of Future Benefits	\$408,687,369	\$34,557,149
Present Value of Future Normal Cost	52,739,153	5,845,023
Actuarial Accrued Liability	\$355,948,216	\$28,712,126
Actuarial Value of Assets	220,842,313	13,284,952
Unfunded Actuarial Accrued Liability	\$135,105,903	\$15,427,174
Funded Ratio	62.0%	46.3%

Derivation of Experience Gain (Loss) Year Ended December 31, 2018

Actual experience will never (except by coincidence) match exactly with assumed experience. Gains and losses often cancel each other over a period of years, but sizable year-to-year fluctuations are common. Detail on the derivation of the experience gain (loss) is shown below, along with a year-by-year comparative schedule.

	Pension	Health
(1) UAAL* at start of year	\$127,334,354	\$13,995,069
(2) Total normal cost from last valuation	6,894,698	667,057
(3) Actual contributions (employer & employee)	15,306,781	1,530,688
(4) Interest accrual: $[(1) + 1/2 ((2) - (3))] \times 0.0700$	8,618,982	949,428
(5) Expected UAAL before changes: (1) + (2) - (3) + (4)	127,541,253	14,080,866
(6) Change from new assumptions and methodology	0	0
(7) Change from ad-hoc COLA increases (above or below assumed)	0	N/A
(8) Change from Chapter 159 service upgrade	194,165	N/A
(9) Expected UAAL after changes: (5) + (6) + (7) + (8)	127,735,418	14,080,866
(10) Actual UAAL at end of year	135,105,903	15,427,174
(11) Gain (loss): (9) - (10)	(7,370,485)	(1,346,308)
(12) Gain (loss) as percent of actuarial accrued liabilities at start of year	(2.1)%	(5.1)%

* *Unfunded Actuarial Accrued Liability.*

Valuation Date	Experience Gain (Loss) as % of Beginning Accrued Liability	
	Pension	Health
December 31		
2009	(0.3)%	2.8 %
2010	(0.2)%	1.9 %
2011	(2.6)%	(2.8)%
2012	(4.2)%	(3.1)%
2013	(0.1)%	(0.1)%
2014	(0.8)%	(1.1)%
2015	(2.9)%	(6.2)%
2016	0.4 %	(0.8)%
2017	0.0 %	0.6 %
2018	(2.1)%	(5.1)%

Computed Contributions for the City's Fiscal Year 2020

Contributions For	Contributions Expressed as % of Active Member Payroll
Total Normal Cost	12.92%
Member Contributions	<u>3.75%</u>
Employer Normal Cost	9.17%
Unfunded Actuarial Accrued Liabilities*	17.96%
Employer Pension Total	27.13%
Health Contribution**	<u>2.20%</u>
Employer Total	29.33%
Valuation Payroll	\$ 51,787,265
Projected Payroll	\$ 53,938,110
Estimated Contribution Dollars	\$ 15,820,048
<u>Pension</u>	
Unfunded Actuarial Accrued Liabilities	\$135,105,903
Funded Status	62.0%
<u>Health</u>	
Unfunded Actuarial Accrued Liabilities	\$ 15,427,174
Funded Status	46.3%

* Unfunded actuarial accrued liabilities for pension are currently financed as a level percent of payroll over a remaining amortization period of 21 years.

** Currently based on a remaining 21-year amortization of unfunded actuarial accrued liabilities for Health.

Note: For each 1% ad-hoc COLA increase above the assumed COLA, the UAAL will increase by approximately \$1,984,000 and the employer contribution rate will increase by approximately 0.27% (based on current payroll and a 21-year amortization period). In developing these costs for the ad-hoc COLA increase, it was assumed that the increase would be a one-time permanent increase to all members retired as of December 31, 2018 and the additional liability would be amortized over 21 years. It was also assumed that the increase would be effective on January 1, 2019.

The computed contributed rate shown above is in compliance with the Board's funding policy. Users of this report should be aware that contributions made at that rate do not guarantee benefit security. Given the importance of benefit security to any retirement system, we recommend benefit security be considered when adopting a contribution rate. The Board is free to adopt a larger contribution rate than shown herein, if they believe it to be appropriate and if such larger contribution is based on sound actuarial funding, methods and assumptions.

Computed Contributions for the City's Fiscal Year 2020

Contribution Rate Reconciliation	% of Payroll		
	Pension	Health	Total
Last Year's Rate	25.12 %	1.75 %	26.87 %
Normal Cost Change*	0.00 %	N/A	0.00 %
Miscellaneous Changes in Group Demographics	(0.05)%	0.14 %	0.09 %
Assumption and Methodology Changes	0.00 %	0.00 %	0.00 %
Employer Portion of SB 402 Purchases (change in liability)	0.01 %	0.00 %	0.01 %
COLA (portion above/(below) the assumption)	0.00 %	0.00 %	0.00 %
Payroll Growth Less Than Expected	1.06 %	0.13 %	1.19 %
Experience (Gain) Loss	0.99 %	0.18 %	1.17 %
This Year's Rate	27.13%	2.20 %	29.33%

**Approximate change in normal cost due to SB 402 purchases.*

Comments

Comment A

Results: The Retirement System is 62.0% funded for pension benefits and 46.3% funded for health subsidy benefits as of December 31, 2018. The pension Unfunded Actuarial Accrued Liability (UAAL) of \$135,105,903 is amortized over a closed 21-year period; the health subsidy UAAL of \$15,427,174 is amortized over a closed 21-year period.

Comment B

Experience: Experience during the year ended December 31, 2018 was less favorable than assumed for both pension benefits and the health subsidy.

Pension: The primary source of losses was investment return on a funding value basis (7.0% assumed versus 3.4% recognized). These losses were only partially offset by gains resulting from salary increases being less than assumed. Overall, the pension experience loss was approximately 2.1% of beginning of year liabilities. The pension funding status decreased from 63.0% to 62.0% during the year.

Health: The primary source of experience loss for health was investment return (7.0% assumed versus 3.4% recognized). Overall, the health experience loss was approximately 5.1% of beginning of year liabilities. The health funding status decreased from 47.0% to 46.3% during the year. In addition to the investment losses, the Health Subsidy portion of the trust incurred other losses due to changes in member's electing coverage. Thirty-one (31) new retirees were expected to elect coverage, 34 retirees did elect coverage. In addition, 6 existing retirees elected to start coverage.

The recognized rate of return was 3.4%, despite the fact that the return on a market value basis was (5.4)% (net of expenses). Due to the fact that investment experience above or below assumed is spread over 5 years, one fifth of this year's loss was added to the portion of gains and losses from the previous 4 years scheduled to be recognized this year, resulting in an overall loss. It is important to note that next year, we anticipate recognizing a market loss in total if the market rate of return is below 23% (after accounting for the gains and losses scheduled to be recognized next year), resulting in upward pressure on contributions.

Comments (Continued)

Comment C

Benefit Changes:

1. The previously adopted SB 402 allows for members to upgrade their benefit multiplier under Chapter 159 from 1.5% to 2.0% per year of service rendered prior to 1999 when they choose. Liabilities increased by \$388,330 as a result of members electing to purchase this benefit during 2018. An additional \$194,165 in member contributions was contributed as a result of these elections.
2. COLA increases during 2018 were assumed to be 1.00% of current pensions. In 2018, actual increases were 1.00% of current pensions.

Comment D

Retiree Health Benefits: Post-retirement health care benefits are funded in part by retired members (via co-pays, deductibles, etc.), but mostly by employer contributions to the Retirement System that are permitted (up to certain limits) by §401(h) of the U.S. Internal Revenue Code. IRC §401(h) permits a defined benefit plan to provide medical benefits for retired employees if, among other things:

- A separate medical care account is maintained.
- The benefits satisfy non-discrimination rules.
- The medical benefits, along with any life insurance provided by the plan, are subordinate to the retirement benefits. Benefits are considered subordinate if they do not exceed 25% of the aggregate contributions other than contributions to fund past service liabilities.

The health care contribution rate was determined to pass the 25% test for the 2020 City fiscal year as follows:

Employer Pension Rate (not more than normal cost)	9.17%
Employee Pension Rate	3.75%
Total Pension Rate*	<u>12.92%</u>
Maximum Health Rate (1/3 x Pension Rate)	4.31%
Employee Health Rate	1.25%
Maximum Employer Health Rate	<u>3.06%</u>
Actual Employer Health Rate	2.20%

* *Smaller of actual contribution or projected unit credit normal cost rate.*

Although the IRC §401(h) allows for a much more complicated test, the results of the simplified approach illustrated above indicate that the more complicated test is not warranted.

Comments (Continued)

Comment E

Health Valuation: Post-retirement health subsidy valuation results were included in this valuation. Effective with the December 31, 2007 valuation, we set the utilization assumption at 60%. Effective with the December 31, 2012 valuation, this assumption is 55%.

New Retirements in Year	New Retirees	New Recipients Electing Health Care Subsidy	Election %
2006	35	17	48.6%
2007	38	19	50.0%
2008	36	20	55.6%
2009	39	18	46.2%
2010	34	18	52.9%
2011	50	28	56.0%
2012	55	30	54.5%
2013	51	26	51.0%
2014	52	29	55.8%
2015	89	55	61.8%
2016	53	27	50.9%
2017	55	32	58.2%
2018*	57	34	59.6%

* Six existing retirees also electing coverage.

Comment F

Health Valuation: The calculations contained herein were not intended to satisfy the parameters of GASB Statement No. 74 and should not be used for that purpose. Separate calculations are needed for GASB Statement No. 74 which will be provided in a separate report.

Comments (Concluded)

Comment G

Increase in Final Average Earnings: The load for end of career payments affecting the final average compensation is currently 10%. Below is a historical schedule of these increases over the last 10 years.

Year Ended December 31,	Average Increase in Final Average Earnings from Expected Amount
2009	8.8%
2010	9.3%
2011	11.0%
2012	13.8%
2013	14.5%
2014	15.4%
2015*	17.4%
2016	10.1%
2017	11.9%
2018	10.2%
5-year Average	13.0%
10-year Average	12.2%

* *Final Average Earnings before and after lump sums in 2015 were calculated based on member data as well as option factors from the previous actuary. For all other years, this lump sum information was provided.*

Certification: We certify that the valuation is complete and accurate and was made in accordance with generally recognized actuarial methods. The actuarial assumptions summarized in Section C, are in aggregate, a reasonable representation of the past and anticipated future experience of the System.

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 7.00% on the actuarial value of assets), it is expected that:

- 1) The employer normal cost as a percentage of pay will remain approximately level year to year*;
- 2) The unfunded actuarial accrued liability will be fully amortized after 21 years; and
- 3) The funded status of the plan will increase gradually toward a 100% funded ratio.

Limitations of Funded Status Measurement

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.
- 2) The measurement is inappropriate for assessing the need for or the amount of future employer contributions.
- 3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Limitation of Project Scope

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

* *Service rendered after 2000 has a higher benefit multiplier than service rendered before 2000, unless members elect to upgrade their pre-2000 service. Normal Costs are gradually increasing to the post-2000 benefit level as members with pre-2000 service are replaced or upgrade their service.*

Risks Associated with Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution 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 the accrued liability and the actuarially determined contribution that result 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** – actual investment returns may differ from the expected returns;
2. **Asset/Liability Mismatch Risk** – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. **Contribution Risk** – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. **Salary and Payroll Risk** – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. **Longevity Risk** – members may live longer or shorter than expected and receive pensions for a period of time other than assumed; and
6. **Other Demographic Risks** – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	Pension		Health	
	2018	2017	2018	2017
Ratio of the market value of assets to total payroll	3.94	4.11	0.24	0.23
Ratio of actuarial accrued liability to payroll	6.87	6.45	0.55	0.23
Ratio of actives to retirees and beneficiaries	1.25	1.33	3.23	3.62
Ratio of net cash flow to market value of assets	-1.7%	-1.4%	3.5%	3.2%
Duration of the actuarial accrued liability	13.31	13.66	15.3	15.63

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll, a change in liability 2% other than assumed would equal 5% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability.

Comparative Statement

Valuation Date December 31	Active Members				
	Number	Ratio to Retired	Valuation Payroll		% Increase
			Total	Average	
2009	1,300	2.08	\$ 50,547,690	\$ 38,883	1.4%
2010	1,285	2.01	51,399,670	40,000	2.9%
2011	1,228	1.83	51,117,552	41,627	4.1%
2012	1,200	1.70	51,881,338	43,234	3.9%
2013	1,194	1.64	53,315,564	44,653	3.3%
2014	1,200	1.59	54,267,183	45,223	1.3%
2015	1,195	1.46	52,953,903	44,313	(2.0)%
2016	1,180	1.38	52,888,074	44,820	1.1 %
2017	1,176	1.33	53,364,536	45,378	1.2 %
2018	1,142	1.25	51,787,265	45,348	(0.1)%

Valuation Date December 31	Retirees & Beneficiaries						Annual Contributions as a Percent-of-Payroll				
	Pension			Health			Member		Employer		Total
	Number	Annual Benefits	% of Payroll	Number	Annual Benefits	% of Payroll	Pension	Health	Pension	Health	
2009#	625	\$ 8,460,381	16.7%	166	\$ 275,852	0.5%	3.75%	1.25%	17.65%	0.85%	23.50%
2010	638	8,730,024	17.0%	177	309,902	0.6%	3.75%	1.25%	17.71%	0.87%	23.58%
2011	672	9,551,437	18.7%	197	375,224	0.7%	3.75%	1.25%	18.75%	0.97%	24.72%
2012#	707	10,526,696	20.3%	218	458,179	0.9%	3.75%	1.25%	20.03%	0.93%	25.96%
2013	729	11,612,189	21.8%	232	529,007	1.0%	3.75%	1.25%	20.20%	0.93%	26.13%
2014	756	12,906,232	23.8%	242	607,239	1.1%	3.75%	1.25%	20.72%	0.99%	26.71%
2015	821	15,493,622	29.3%	291	791,658	1.5%	3.75%	1.25%	22.48%	1.26%	28.74%
2016	856	16,071,550	30.4%	310	880,155	1.7%	3.75%	1.25%	23.05%	1.40%	29.45%
2017#	882	17,033,836	31.9%	325	975,855	1.8%	3.75%	1.25%	25.12%	1.75%	31.87%
2018	914	18,461,964	35.6%	354	1,109,526	2.1%	3.75%	1.25%	27.13%	2.20%	34.33%

After changes in methods and/or assumptions.

Actuarial Accrued Liabilities and Valuation Assets Comparative Statement – Pension Only

Valuation Date December 31	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Present Assets to AAL*	Ratio of UAAL to Valuation Payroll
2005#	\$ 147,915,666	\$ 113,856,253	\$ 34,059,413	77.0 %	72.1 %
2006#	172,538,747	126,293,879	46,244,869	73.2 %	97.3 %
2007#	187,625,784	139,240,661	48,385,123	74.2 %	99.6 %
2008#	201,439,017	125,991,904	75,447,113	62.5 %	148.7 %
2009#	222,904,634	134,782,503	88,122,131	60.5 %	174.3 %
2010	234,039,084	145,933,282	88,105,802	62.4 %	171.4 %
2011	248,441,353	153,033,601	95,407,752	61.6 %	186.6 %
2012#	262,682,042	161,864,937	100,817,105	61.6 %	194.3 %
2013	280,332,480	177,961,782	102,370,698	63.5 %	192.0 %
2014	297,090,927	191,145,542	105,945,385	64.3 %	195.2 %
2015	314,355,740	198,932,682	115,423,058	63.3 %	218.0 %
2016	321,887,981	205,115,203	116,772,778	63.7 %	220.8 %
2017#	344,418,296	217,083,942	127,334,354	63.0 %	238.6 %
2018	355,948,216	220,842,313	135,105,903	62.0 %	260.9 %

After changes in methods and/or assumptions.

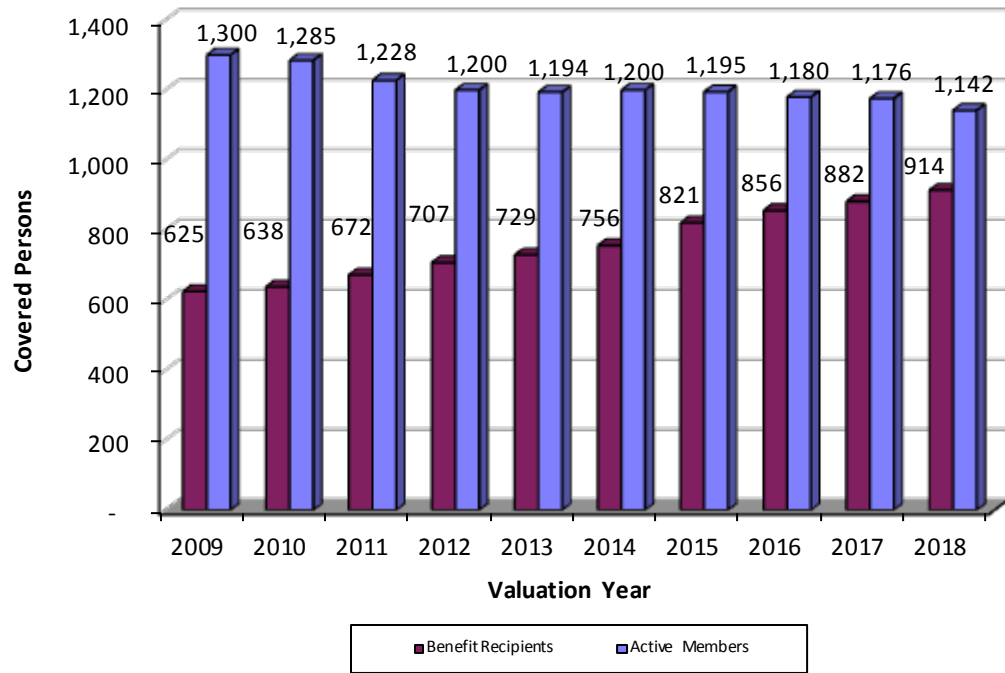
* The funded ratio shown herein is not appropriate for estimating the cost or ability to settle the Plan's obligations. A funded status of 100% or greater is not an indication of the need for future employer contribution. A funded status below 100% is an indication that future employer contributions are needed.

Actuarial Accrued Liabilities & Valuation Assets Comparative Statement – Health Subsidy Only

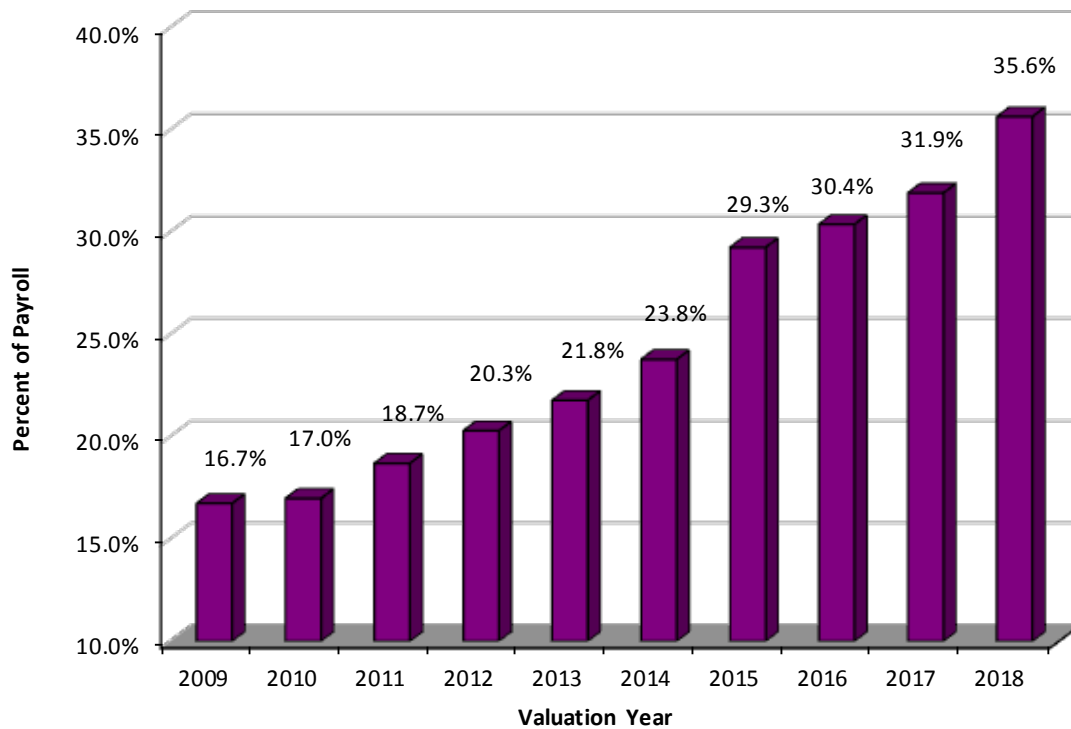
Valuation Date December 31	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Present Assets to AAL	Ratio of UAAL to Valuation Payroll
2007#	\$ 11,306,516	\$ 1,908,457	\$ 9,398,059	16.9 %	19.4 %
2008	12,425,929	2,605,141	9,820,788	21.0 %	19.4 %
2009#	13,090,488	3,748,342	9,342,146	28.6 %	18.5 %
2010	14,095,129	4,875,596	9,219,533	34.6 %	17.9 %
2011	15,600,362	5,837,021	9,763,341	37.4 %	19.1 %
2012#	16,595,623	6,870,093	9,725,530	41.4 %	18.7 %
2013	17,979,266	8,145,055	9,834,211	45.3 %	18.4 %
2014	19,426,059	9,433,100	9,992,959	48.6 %	18.4 %
2015	21,646,019	10,259,881	11,386,138	47.4 %	21.5 %
2016	23,023,666	11,150,682	11,872,984	48.4 %	22.4 %
2017#	26,405,178	12,410,109	13,995,069	47.0 %	26.2 %
2018	28,712,126	13,284,952	15,427,174	46.3 %	29.8 %

After changes in methods and/or assumptions.

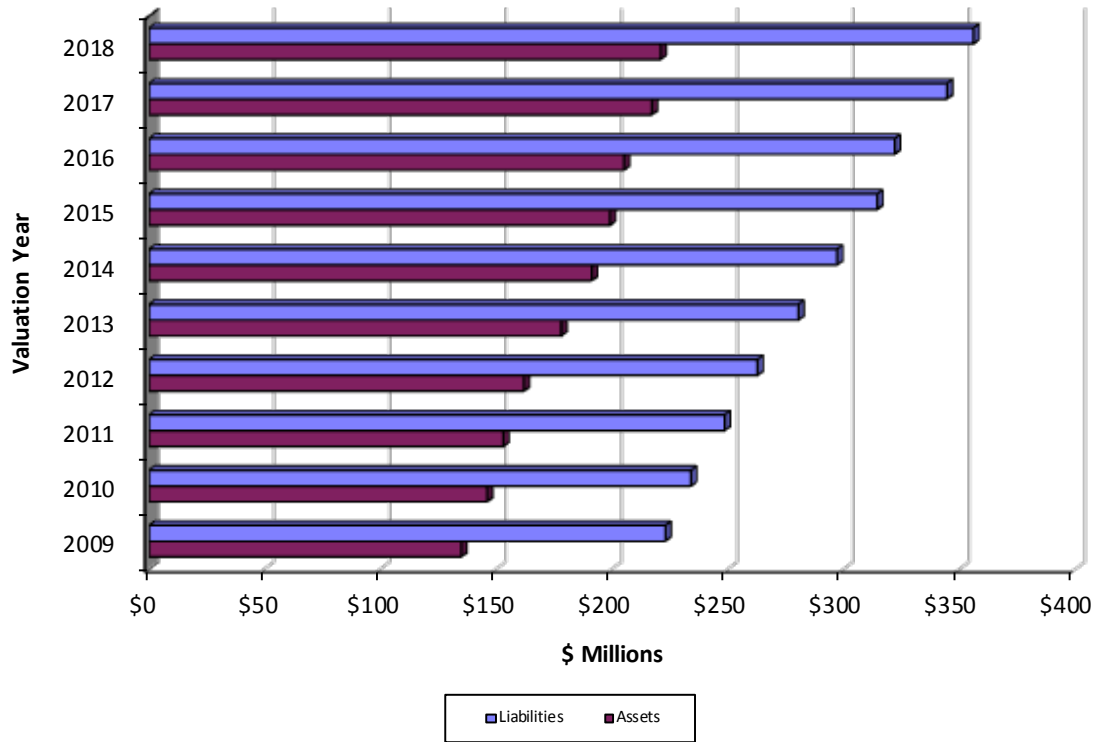
Active Members and Benefit Recipients



Pension Benefits as a Percent of Payroll



Assets and Accrued Liabilities (Pension Only)



Schedule of Changes in Unfunded Actuarial Accrued Liability Other than Annual Gains (Losses) (Pension Only)

Schedule of Changes in Pension UAAL Other than Gains (Losses)

Date Established	Original Amount	Description
01/01/1991	\$ 2,656,461	Initial Unfunded
01/01/1997	32,202	Plan Amendment
01/01/1997	588,165	1996 COLA
01/01/1998	602,888	1997 COLA
01/01/1999	4,750,497	Plan Amendment
01/01/1999	62,532	Assumption Change
01/01/1999	866,215	1998 COLA
01/01/2000	847,614	1999 COLA
01/01/2001	958,172	2000 COLA
01/01/2002	1,047,075	2001 COLA
01/01/2003	1,214,958	2002 COLA
01/01/2003	(3,319,777)	Assumption Change
01/01/2003	6,317,683	Plan Amendment
12/31/2004	231,803	Assumption Change
12/31/2004	1,809,405	2004 COLA
12/31/2005	1,310,995	2005 COLA
12/31/2005	5,368,777	Phase-in of COLA Assumption
12/31/2005	1,205,702	Chapter 159 Upgrade (Employer)
12/31/2006	787,237	2006 COLA
12/31/2006	7,794,903	Phase-in of COLA Assumption
12/31/2006	1,313,426	Chapter 159 Upgrade (Employer)
12/31/2006	2,025,864	Severance Load
12/31/2007	330,568	2007 COLA
12/31/2007	4,220,982	Phase-in of COLA Assumption
12/31/2007	223,538	Chapter 159 Upgrade (Employer)
12/31/2008	469,373	2008 COLA
12/31/2008	(839,918)	Miscellaneous Technical Change in Treatment of COLA Assumption
12/31/2008	193,614	Chapter 159 Upgrade (Employer)
12/31/2008	(122,243)	Retirement Eligibility Correction
12/31/2009	307,468	Chapter 159 Upgrade (Employer)
12/31/2009	10,706,101	Assumption and Methodology Change
12/31/2010	188,526	Chapter 159 Upgrade (Employer)
12/31/2010	(1,566,250)	No Ad-Hoc COLA this Year
12/31/2011	80,224	Chapter 159 Upgrade (Employer)
12/31/2012	(1,704,580)	No Ad-Hoc COLA this Year
12/31/2012	376,519	Chapter 159 Upgrade (Employer)
12/31/2012	(3,760,147)	Assumption and Methodology Change
12/31/2013	261,306	2013 COLA
12/31/2013	297,764	Chapter 159 Upgrade (Employer)
12/31/2014	293,410	2014 COLA
12/31/2014	373,599	Chapter 159 Upgrade (Employer)

Positive numbers indicate an increase in UAAL; negative numbers indicate a decrease in UAAL.

Schedule of Changes in Unfunded Actuarial Accrued Liability Other than Annual Gains (Losses) – Concluded

(Pension Only)

Schedule of Changes in Pension UAAL Other than Gains (Losses)

Date Established	Original Amount	Description
12/31/2015	\$ 498,682	Chapter 159 Upgrade (Employer)
12/31/2016	(1,979,746)	2016 COLA
12/31/2016	217,611	Chapter 159 Upgrade (Employer)
12/31/2017	(409,476)	2017 COLA
12/31/2017	203,132	Chapter 159 Upgrade (Employer)
12/31/2017	9,866,319	Assumption and Methodology Change
12/31/2018	194,165	Chapter 159 Upgrade (Employer)

Positive numbers indicate an increase in UAAL; negative numbers indicate a decrease in UAAL.

Unfunded Actuarial Accrued Liability (UAAL) Amortization Schedule and Projected Funded Status (Pension Only)

Fiscal Year	Employer Contribution Rates			Projected Active Member Payroll	Beginning of Year	
	Total Contribution	Employer Normal Cost	UAAL Payment		UAAL	Funded Status
2019*	25.12%	9.17%	15.95%	\$ 52,494,511	\$135,105,903	62.0%
2020	27.13%	9.17%	17.96%	53,938,110	135,496,781	61.5%
2021	27.13%	9.17%	17.96%	55,421,408	134,960,951	62.8%
2022	27.13%	9.17%	17.96%	56,945,496	134,112,046	64.2%
2023	27.13%	9.17%	17.96%	58,511,497	132,920,573	65.5%
2024	27.13%	9.17%	17.96%	60,120,564	131,354,765	66.8%
2025	27.13%	9.17%	17.96%	61,773,879	129,380,419	68.1%
2026	27.13%	9.17%	17.96%	63,472,661	126,960,717	69.5%
2027	27.13%	9.17%	17.96%	65,218,159	124,056,036	70.9%
2028	27.13%	9.17%	17.96%	67,011,658	120,623,750	72.3%
2029	27.13%	9.17%	17.96%	68,854,479	116,618,007	73.8%
2030	27.13%	9.17%	17.96%	70,747,977	111,989,505	75.3%
2031	27.13%	9.17%	17.96%	72,693,547	106,685,233	77.0%
2032	27.13%	9.17%	17.96%	74,692,619	100,648,215	78.7%
2033	27.13%	9.17%	17.96%	76,746,666	93,817,219	80.5%
2034	27.13%	9.17%	17.96%	78,857,199	86,126,453	82.5%
2035	27.13%	9.17%	17.96%	81,025,772	77,505,239	84.6%
2036	27.13%	9.17%	17.96%	83,253,981	67,877,663	86.8%
2037	27.13%	9.17%	17.96%	85,543,466	57,162,201	89.1%
2038	27.13%	9.17%	17.96%	87,895,911	45,271,317	91.6%
2039	27.13%	9.17%	17.96%	90,313,048	32,111,035	94.2%
2040	27.13%	9.17%	17.96%	92,796,657	17,580,478	96.9%
2041	27.13%	9.17%	17.96%	95,348,565	1,571,378	99.7%
2042	27.13%	9.17%	17.96%	97,970,651	-	100.0%

* Represents a 6-month period from December 31, 2018 through June 30, 2019.

SECTION B

BENEFIT PROVISIONS AND VALUATION DATA

Summary of Benefit Provisions as of December 31, 2018

Eligibility

Amount

NORMAL RETIREMENT

Members are eligible to retire at age 60.

Straight life pension equals 2.0% of 3-year Final Average Earnings (FAE) times service on and after January 1, 1999 *plus* 1.5% of FAE times service before January 1, 1999.

Members with at least 20 years of service at retirement are eligible for a minimum benefit if employed on or before January 1, 1974.

Minimum benefit for eligible members is 50% of FAE.

EARLY RETIREMENT

Members are eligible to retire early if the sum of age and service is at least 80, or at age 55 with at least 20 years of service.

Computed as a normal retirement pension. If the early retirement occurs prior to the member attaining age 60, the benefit is reduced by 1/6 of 1% for each month that the early retirement precedes age 60.

DEFERRED RETIREMENT

Members are eligible to retire with a deferred benefit after attaining at least 5 years of service, provided they do not take a refund of member contributions.

Pension is computed as a normal retirement pension, based on service and FAE on date of termination. Commencement of benefits begins at age 60.

NON-DUTY DISABILITY

Members are eligible upon attainment of 15 years of service.

Pension is computed as a normal retirement pension based on service and FAE as of date of disability.

DUTY DISABILITY

No age or service requirement.

Pension is computed as a normal retirement pension based on service and FAE as of date of disability. Minimum duty disability benefit is 50% of FAE.

Summary of Benefit Provisions as of December 31, 2018

Eligibility

Amount

ORDINARY DEATH-IN-SERVICE

- | | |
|--|--|
| (1) Any age with less than 5 years of service. | Beneficiary receives member's contributions and accumulated interest, and an additional lump sum equal to one year's salary. |
| (2) Any age with 5 or more years of service. | Beneficiary receives the option of (1) the greater of (a) 50% of the accrued service retirement benefit (without any early retirement reduction); or (b) pension computed as normal or early retirement benefit (depending on eligibility), actuarially reduced as if the member had elected the 100% Joint & Survivor benefit; or (2) lump sum equal to 100% of base salary plus the member's accumulated contributions (including interest). |

DUTY DEATH-IN-SERVICE

- | | |
|--|--|
| Death as a result of a work-related accident; not caused by willful neglect of the member. | The option of (1) the greater of (a) 50% of FAE, or (b) pension computed as an early retirement benefit actuarially reduced as if the member had elected the 100% Joint & Survivor benefit; or (2) a lump sum as described below; options payable to the spouse or child(ren) under age 18. If no spouse or child(ren) are alive at the time of the member's death, a lump sum is payable to the member's estate in the amount of 100% of base salary plus the member's accumulated contributions (including interest) plus accrued fringe benefits not paid at the time of death. |
|--|--|

MEMBER CONTRIBUTIONS

3.75% of pay for service on and after January 1, 1999. 2.5% of pay for service prior to January 1, 1999. Contributions are credited with 5.0% interest per annum. Members may elect to contribute additional contributions which are accounted for separately. At retirement, the additional contribution balance is annuitized to provide an additional benefit within certain limits.

Summary of Benefit Provisions as of December 31, 2018

OPTIONAL FORMS OF PAYMENT

In lieu of the straight life benefit, a member may elect an actuarially reduced benefit in one of the following forms:

- 100% Joint & Survivor with pop-up
- 66 2/3 % Joint & Survivor with pop-up
- 50% Joint & Survivor with pop-up
- 10-year Certain & Life Option

The actuarial factors for optional forms of payment are based on the 1983 Group Annuity Mortality Table and 7.5% interest.

SERVICE UPGRADE

Members may elect to purchase an increase in their benefit multiplier for service rendered before 1999 under Chapter 159 (or Senate Bill 402). The cost to the member is ½ of the actuarially determined increase in System costs and results in a benefit based on 2% of FAE for the time purchased.

HEALTH SUBSIDY

Current and future retired members who are in receipt of an annuity benefit may elect to participate in a monthly health insurance subsidy. Spouses, dependents, and/or beneficiaries are not eligible for any subsidy. The full amount of the monthly health insurance subsidy is \$200 as of January 1, 2006 and increases by 4% annually beginning January 1, 2007. The full \$200 is prorated based on the member's service at retirement, as shown in the schedule below. Members who were already retired as of March 2006 are entitled to 50% of the subsidy available to members retired after March 2006. Active members must contribute 1.25% of pay. Member contributions for the health subsidy are non-refundable.

Service at Retirement	% of Full Subsidy Payable	
	Active on or after March 1, 2006	Terminated Vested or Retired on March 1, 2006
Less than 10 years	25.0%	12.5%
10 years or more, but less than 15 years	50.0%	25.0%
15 years or more, but less than 20 years	75.0%	37.5%
20 years or more	100.0%	50.0%

Retirees and Beneficiaries Comparative Statement

Year Ended December 31	Added to Rolls		Removed from Rolls		Rolls End of Year		Average Pension
	No.	Annual Pensions*	No.	Annual Pensions	No.	Annual Pensions	
2008	46	\$ 1,053,112	21	\$210,203	594	\$ 8,170,348	\$ 13,755
2009	47	511,404	16	221,371	625	8,460,381	13,537
2010	36	598,600	23	328,957	638	8,730,024	13,683
2011	63	914,086	29	92,673	672	9,551,437	14,213
2012	55	1,205,310	20	230,051	707	10,526,696	14,889
2013	51	1,416,661	29	331,168	729	11,612,189	15,929
2014	60	1,589,379	33	295,337	756	12,906,232	17,072
2015	89	2,910,593	24	323,204	821	15,493,622	18,872
2016	53	818,730	18	240,803	856	16,071,550	18,775
2017	55	1,372,546	29	410,260	882	17,033,836	19,313
2018	60	1,838,388	28	410,260	914	18,461,964	20,199

* Includes adjustments due to COLA.

Retirees and Beneficiaries December 31, 2018 Tabulated by Type of Pensions Being Paid

Type of Pensions Being Paid	Number	Annual Pensions
Age and Service Pensions		
Regular Pension - Benefit terminating at death of retiree	473	\$ 8,267,973
For life of member, but not less than 10 years	49	723,934
100% Joint & Survivor	172	3,782,687
66 2/3% Joint & Survivor	61	2,131,805
50% Joint & Survivor	61	1,783,323
Survivor Beneficiary	60	977,386
Total age and service pensions	876	\$ 17,667,108
Casualty Pensions		
Duty Disability	24	\$ 517,160
Non-Duty Disability	13	269,262
Duty Death - Survivor Benefits	0	0
Non-Duty Death - Survivor Benefits	1	8,434
Total casualty pensions	38	\$ 794,856
Total Pensions Being Paid	914	\$ 18,461,964

Each member is counted only once in the above table. Members who have purchased an additional annuity may elect a different payment option for the additional purchased benefits. All benefit payments are included in the table.

Retirees and Beneficiaries December 31, 2018 Pension Benefits Tabulated by Attained Ages

Attained Age	Age and Service		Casualty		Totals	
	Number	Annual Pensions	Number	Annual Pensions	Number	Annual Pensions
30-34	2	\$ 32,036			2	\$ 32,036
35-39	2	13,524	1	\$ 26,844	3	40,368
40-44	2	11,608			2	11,608
45-49			2	49,137	2	49,137
50-54	6	159,206	1	17,246	7	176,452
55-59	24	842,078	5	120,563	29	962,641
60-64	144	3,288,678	13	275,748	157	3,564,426
65-69	211	5,499,035	8	185,326	219	5,684,361
70-74	176	3,528,967	3	51,099	179	3,580,066
75-79	126	2,099,025	3	38,606	129	2,137,631
80-84	92	1,270,521	1	11,897	93	1,282,418
85-89	51	521,498			51	521,498
90-94	28	322,158	1	18,390	29	340,548
95-100	12	78,774			12	78,774
Totals	876	\$ 17,667,108	38	\$ 794,856	914	\$ 18,461,964

Retirees and Beneficiaries December 31, 2018 Health Subsidy Benefits Tabulated by Attained Ages

Attained Age	Health Subsidy	
	Number	Annual Amount
50-54	2	\$ 6,724
55-59	13	49,953
60-64	65	219,504
65-69	115	388,575
70-74	81	257,448
75-79	37	99,905
80-84	26	55,716
85-89	9	22,575
90-94	5	7,685
95+	1	1,441
Totals	354	\$1,109,526

Average Age at Retirement: 62.8 years

Average Age Now: 70.3 years

Retirees and Beneficiaries December 31, 2018 Tabulated by Year of Retirement

Year of Retirement	Number	Annual Pensions	
		Totals	Average
1980	1	\$ 463	\$ 463
1981	1	15,261	15,261
1982	1	17,046	17,046
1983	1	1,937	1,937
1984	2	16,275	8,138
1985	1	2,004	2,004
1986	1	18,390	18,390
1987	4	59,513	14,878
1988	3	25,349	8,450
1989	6	97,008	16,168
1990	6	65,164	10,861
1991	7	39,533	5,648
1992	8	133,648	16,706
1993	13	235,872	18,144
1994	17	175,308	10,312
1995	17	172,507	10,147
1996	18	289,326	16,074
1997	13	203,621	15,663
1998	11	142,205	12,928
1999	28	524,622	18,737
2000	21	337,708	16,081
2001	18	298,494	16,583
2002	29	324,338	11,184
2003	16	240,733	15,046
2004	21	172,400	8,210
2005	31	568,692	18,345
2006	34	715,838	21,054
2007	40	896,043	22,401
2008	39	952,237	24,416
2009	29	405,833	13,994
2010	34	601,255	17,684
2011	49	850,932	17,366
2012	50	1,135,351	22,707
2013	46	1,228,583	26,708
2014	53	1,409,640	26,597
2015	86	2,740,536	31,867
2016	54	780,007	14,445
2017	47	1,074,355	22,859
2018	58	1,493,937	25,758
Totals	914	\$18,461,964	\$ 20,199

Average Age at Retirement: 61.9 years

Average Age Now: 72.0 years

Inactive Vested Members December 31, 2018 Tabulated by Attained Age

Attained Age	Number	Estimated Annual Pensions
30-34	6	\$ 42,020
35-39	12	61,234
40-44	8	69,939
45-49	15	198,645
50-54	27	200,526
55-59	40	327,386
60+	1	2,490
Totals	109	\$902,239

Average Age at Termination: 45.0 years

Average Age Now: 51.1 years

Active Members Added to and Removed From Rolls

Valuation Date	Number Added During Year		Terminations During Year										Active Members End of Year
			Retirement		Disability		Died-in-Service		Withdrawals				
	Vested								Other		Totals		
	A	E	A	E	A	E	A	A	A	E			
2009	91	114	27	62.3	1	1.1	1	2.1	13	72	85	64.4	1,300
2010	87	102	25	45.7	2	1.0	0	2.5	9	66	75	77.7	1,285
2011	57	114	34	48.8	2	1.0	3	2.6	7	68	75	72.5	1,228
2012	76	104	41	54.0	2	0.4	3	2.7	16	42	58	60.6	1,200
2013	96	102	41	49.8	1	0.6	1	2.5	11	48	59	56.5	1,194
2014	113	107	44	53.9	0	0.6	0	2.6	15	48	63	58.5	1,200
2015	145	150	75	56.3	1	0.6	4	2.6	19	51	70	65.3	1,195
2016	109	124	44	51.4	0	0.6	1	2.3	12	67	79	75.3	1,180
2017	129	133	40	51.5	0	0.6	0	2.4	12	81	93	71.8	1,176
2018	130	164	46	53.6	3	0.6	0	1.1	22	93	115	74.2	1,142
5-Year Totals	626	678	249	267	4	3	5	11	80	340	420	345	
10-Year Totals	1,033	1,214	417	527	12	7	13	23	136	636	772	677	
Since Last Exp. Study (2 years)	259	297	86	105	3	1	0	4	34	174	208	146	

A = Actual
E = Expected

27 retirees/beneficiaries and \$398,559 in benefits were expected to come off the rolls for the December 31, 2018 valuation; 29 retirees/beneficiaries and \$312,406 in benefits were actually removed from the rolls.

Active Members December 31, 2018 by Attained Age and Years of Service

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Number	Valuation Payroll
20-24	35							35	\$ 1,032,607
25-29	85	5						90	3,094,420
30-34	50	14	11					75	3,064,193
35-39	40	12	20	8				80	3,196,392
40-44	42	18	18	23	1			102	4,494,051
45-49	41	15	22	17	13	8		116	5,792,182
50-54	35	25	42	32	26	9	15	184	9,228,591
55-59	37	22	45	53	25	11	29	222	11,065,736
60-64	20	11	25	34	23	14	26	153	7,500,283
65-69	12	4	9	14	9	8	9	65	2,839,859
70-74	5	2	1	3	2			13	311,736
75 & over	3		2	1			1	7	167,215
Totals	405	128	195	185	99	50	80	1,142	\$51,787,265

While not used in the financial computations, the following group averages are computed and shown because of their general interest.

Age: 48.9 years
Service: 11.9 years
Annual Pay: \$45,348

SECTION C

VALUATION METHODS AND ASSUMPTIONS

Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date was determined using the *individual entry-age actuarial cost method* having the following characteristics:

- the annual normal cost for each individual active member, payable from the date of employment to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement; and
- each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

MECRS currently has a tiered benefit structure with the ultimate tier being more costly than the initial tier. The normal cost is computed based on this tiered structure. As a result, the normal cost rate is expected to increase as the members affected by the initial tier are replaced by new members, or when members upgrade their prior service.

Financing of Unfunded Actuarial Accrued Liabilities. Unfunded Actuarial Accrued Liabilities were amortized by level (principal and interest combined) percent-of-payroll contributions assuming 2.75% wage inflation over 21 future years for pension benefits, and over 21 future years for health subsidy benefits. The amortization period is closed for both pension benefits and health subsidy benefits.

Asset Valuation Method. Last year's valuation assets are increased by contributions and reduced by refunds, benefit payments and expenses. An amount equal to the assumed investment return for the year is then added. Differences between actual return on a market value basis and an assumed return are phased-in over a five-year period.

Actuarial Assumptions Used for the Valuation

The contribution requirements and benefit values of the System are calculated by applying actuarial assumptions to the benefit provisions and member information furnished, using the actuarial cost method described on the previous page.

The principal areas of financial risk which require assumptions about future experience are:

- long-term rates of investment return to be generated by the assets of the System,
- patterns of pay increases to members,
- rates of mortality among members, retirees and beneficiaries,
- rates of withdrawal of active members,
- rates of disability among members, and
- the age patterns of actual retirement.

In a valuation, the monetary effect of each assumption is calculated for as long as a present covered person survives - - - a period of time which can be as long as a century.

Actual experience of the System will not coincide exactly with assumed experience, regardless of the accuracy of the assumptions, or the skill of the actuary and the precision of the many calculations made. Each valuation provides a complete recalculation of assumed future experience and takes into account all past differences between assumed and actual experience. The result is a continual series of adjustments (usually small) to the computed contribution rate.

From time to time it becomes appropriate to modify one or more of the assumptions, to reflect experience trends (but not random year-to-year fluctuations). The Board has established a policy of performing an Experience Study every 3-5 years to evaluate/modify valuation assumptions. Assumptions used in this report are based on the January 1, 2012 – December 31, 2016 experience study of the MECRS and were adopted by the Board. These assumptions were first used in the December 31, 2017 actuarial valuation. We believe the assumptions are reasonable individually and in the aggregate.

Valuation Assumptions

The rate of investment return was 7.00% per year, compounded annually (net of investment expenses). This assumption is used to make money payable at one point in time equal in value to a different amount of money payable at another point in time. The assumed real rate of return (the net return in excess of the wage inflation rate) is 4.25%. Experience over the last 5 years has been as follows:

	Year Ended December 31					5-Year Average
	2018	2017	2016	2015	2014	
1) Nominal rate of return#	3.4 %	7.4 %	6.3 %	4.8 %	7.4 %	5.8 %
2) Increase in CPI	1.9 %	2.1 %	2.1 %	0.7 %	0.8 %	1.5 %
3) Average Salary Increase (ASI)	(0.1)%	1.2 %	1.1 %	(2.0)%	1.3 %	0.3 %
4) Real Return						
- Total: CPI (1) - (2)						4.3 %
- Total: ASI (1) - (3)						5.5 %
- Assumption	4.25 %	4.25 %	4.25 %	4.25 %	4.25 %	4.3 %

The nominal rate of return was computed using the approximate formula: $i = I$ divided by $\frac{1}{2}(A+B-I)$, where I is realized investment income net of expenses, A is the beginning of year asset funding value and B is the end of year funding asset value.

The rate of assumed price inflation was 2.25% per year. This results in a real rate of return over price inflation of 4.75%.

These economic assumptions were updated for the December 31, 2017 valuation.

Valuation Assumptions (Continued)

The rates of salary increase used for individual members are in accordance with the following table. This assumption is used to project a member's current salary to the salaries upon which benefit amounts will be based.

Service	Salary Increase Assumptions for an Individual Member		
	Merit & Seniority	Base (Economic)	Increase Next Year
1	3.71%	2.75%	6.46%
2	4.68%	2.75%	7.43%
3	4.47%	2.75%	7.22%
4	3.95%	2.75%	6.70%
5	3.63%	2.75%	6.38%
6	3.18%	2.75%	5.93%
7	2.80%	2.75%	5.55%
8	2.51%	2.75%	5.26%
9	2.31%	2.75%	5.06%
10	2.10%	2.75%	4.85%
15	1.33%	2.75%	4.08%
20	1.02%	2.75%	3.77%
25	1.00%	2.75%	3.75%
30	1.00%	2.75%	3.75%
35	1.00%	2.75%	3.75%
40	1.00%	2.75%	3.75%
Ref:	733		

If the number of active members remains constant, then the total active member payroll will increase 2.75% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities.

Rates of salary increase were updated for the December 31, 2017 valuation.

Valuation Assumptions (Continued)

The rates of retirement used to measure the probability of eligible members retiring during the next year were updated for the December 31, 2017 valuation and are as follows:

Active Members Retiring Next Year Under Normal Retirement			Active Members Retiring Next Year Under Early Retirement			
Ages	% Retiring		Ages	% Retiring		
	Men	Women		Age and Service		Rule of 80
				Men	Women	
60	10%	10%	50			10%
61	13%	15%	51			4%
62	25%	25%	52			7%
63	15%	12%	53			5%
64	16%	12%	54			5%
65	22%	20%	55	5%	10%	5%
66	30%	25%	56	5%	15%	4%
67	18%	27%	57	5%	8%	8%
68	20%	13%	58	5%	7%	8%
69	20%	20%	59	5%	7%	10%
70	20%	22%				
71	60%	23%				
72	50%	23%				
73	50%	23%				
74	50%	23%				
75	100%	23%				
76	100%	23%				
77	100%	23%				
78	100%	23%				
79	100%	23%				
80	100%	100%				
Ref.	2757	2756		2357	2754	2755

A member was assumed to be eligible for normal retirement after attaining age 60 regardless of service. A member was assumed to be eligible for early retirement after attaining age 55 with at least 20 years of service or if the sum of age and service is at least 80.

Valuation Assumptions (Continued)

The post-retirement healthy mortality table was the RP-2014 Mortality Table projected to 2026 using projection scale MP-2017.

Sample Attained Ages	Single Life Retirement Values					
	Present Value of \$1 Monthly for Life		Percent Dying Next Year		Future Life Expectancy (years)	
	Men	Women	Men	Women	Men	Women
50	\$152.48	\$156.61	0.3826%	0.2596%	35.07	37.62
55	145.39	150.10	0.5366%	0.3600%	30.31	32.68
60	136.49	141.81	0.7607%	0.5462%	25.72	27.88
65	125.58	131.52	1.1113%	0.8176%	21.33	23.29
70	112.43	118.88	1.6572%	1.2451%	17.20	18.93
75	97.02	103.77	2.6043%	2.0005%	13.39	14.86
80	79.85	86.49	4.3403%	3.4148%	9.98	11.18
Ref:	2135 x 1.00 sb 0	2136 x 1.00 sb 0				

This assumption is used to measure the probabilities of members dying after retirement. The projection to 2026 is the margin for mortality improvement.

Post-retirement disabled mortality table is the RP-2014 Disabled Retiree Annuitant Table projected to 2026 using projection scale MP-2017.

Pre-retirement mortality is modeled using the RP-2014 Employee Mortality Table projected to 2026 using projection scale MP-2017 and multiplied by a factor of 80%.

These tables were updated for the December 31, 2017 valuation in accordance with an experience study for the System of the 5-year period ended December 31, 2016.

Valuation Assumptions (Concluded)

Rates of separation from active membership are shown below (rates do not apply to members eligible to retire and do not include separation on account of death or disability). This assumption measures the probabilities of members remaining in employment. These rates were updated for the December 31, 2017 valuation.

Sample Ages	Service	% of Active Members Separating within Next Year	
		Men	Women
	0-1	22.00%	32.00%
	1-2	17.00%	20.00%
	2-3	12.00%	15.00%
	3-4	8.00%	12.00%
	4-5	8.00%	11.00%
	5-6	n/a	9.00%
30	5 & Up (Men)	4.88%	5.57%
35	6 & Up (Women)	3.61%	4.67%
40		2.85%	4.04%
45		2.45%	3.57%
50		2.28%	3.10%
Ref.		1106 77 x 0.4275	1105 37 x 1.05

Rates of disability are divided two-thirds toward duty and one-third toward non-duty disability and are as follows:

Sample Ages	% of Active Members Becoming Disabled within Next Year	
	Male	Female
20	0.002%	0.002%
25	0.002%	0.002%
30	0.002%	0.002%
35	0.011%	0.011%
40	0.043%	0.043%
45	0.088%	0.088%
50	0.144%	0.144%
55	0.214%	0.214%
60	0.318%	0.318%
Ref.	37 x 0.30	37 x 0.30

Miscellaneous and Technical Assumptions

December 31, 2018

Marriage Assumption:	75% of males and 75% of females are assumed to be married for purposes of death-in-service benefits. Male spouses are assumed to be three years older than female spouses.
Pay Increase Timing:	Beginning of the year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and exact fractional service 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 withdrawal decrements do not operate after member reaches retirement eligibility.
Administrative Expense Load:	1.00% of payroll.
Normal Form of Benefit:	The assumed normal form of benefit is the straight life form.
Benefit Service:	Exact fractional service as of the valuation date is used to determine the amount of benefit payable.
Incidence of Contributions:	Contributions are assumed to be received continuously throughout the year based upon the actual payroll payable at the time contributions are made.
COLA Assumption:	1.00% compounded annually.
Adjustments:	Normal and Early retirement costs were increased by 10% to reflect lump sums that are payable at retirement but not available in the active data. Retiree liabilities were increased 1% to account for pop-up retiree benefits.
Post-Retirement Subsidy:	55% of current actives and 25% of current terminated vested members were assumed to elect to receive the post-retirement health subsidy upon retirement.

SECTION D

OPERATION OF THE RETIREMENT SYSTEM

Basic Financial Objective and Operation of the Retirement System

Benefit Promises Made Which Must Be Paid For. A retirement system is an orderly means of handing out, keeping track of, and financing contingent pension promises to a group of employees. As each member of the retirement system acquires a unit of service credit they are, in effect, handed an “IOU” which reads: “The Employees Retirement System promises to pay you one unit of retirement benefits, payments in cash commencing when you retire.”

The principal related financial question is: **When shall the money required to cover the “IOU” be contributed?** This year, when the benefit of the member’s service is received? Or, some future year when the “IOU” becomes a cash demand?

This Retirement System meets the requirement of funding future benefits during the year by having the following **Financial Objective: To establish and receive contributions, expressed as percents of active member payroll, which will remain approximately level from year to year** and will not have to be increased for future generations of taxpayers.

Translated into actuarial terminology, a level percent-of-payroll contribution objective means that the contribution rate must be at least:

Normal Cost (the current value of benefits likely to be paid on account of members’ service being rendered in the current year)

... plus ...

Interest on the Unfunded Actuarial Accrued Liability (the difference between the actuarial accrued liability and current system assets).

If contributions to the Retirement System are less than the preceding amount, the difference, plus investment earnings not realized thereon, will have to be contributed at some later time, or, benefits will have to be reduced, to satisfy the fundamental fiscal equation under which all retirement systems must operate; that is:

$$B = C + I - E$$

Benefit payments to any group of members and their beneficiaries cannot exceed the sum of:

Contributions received on behalf of the group

... plus ...

Investment earnings on contributions received

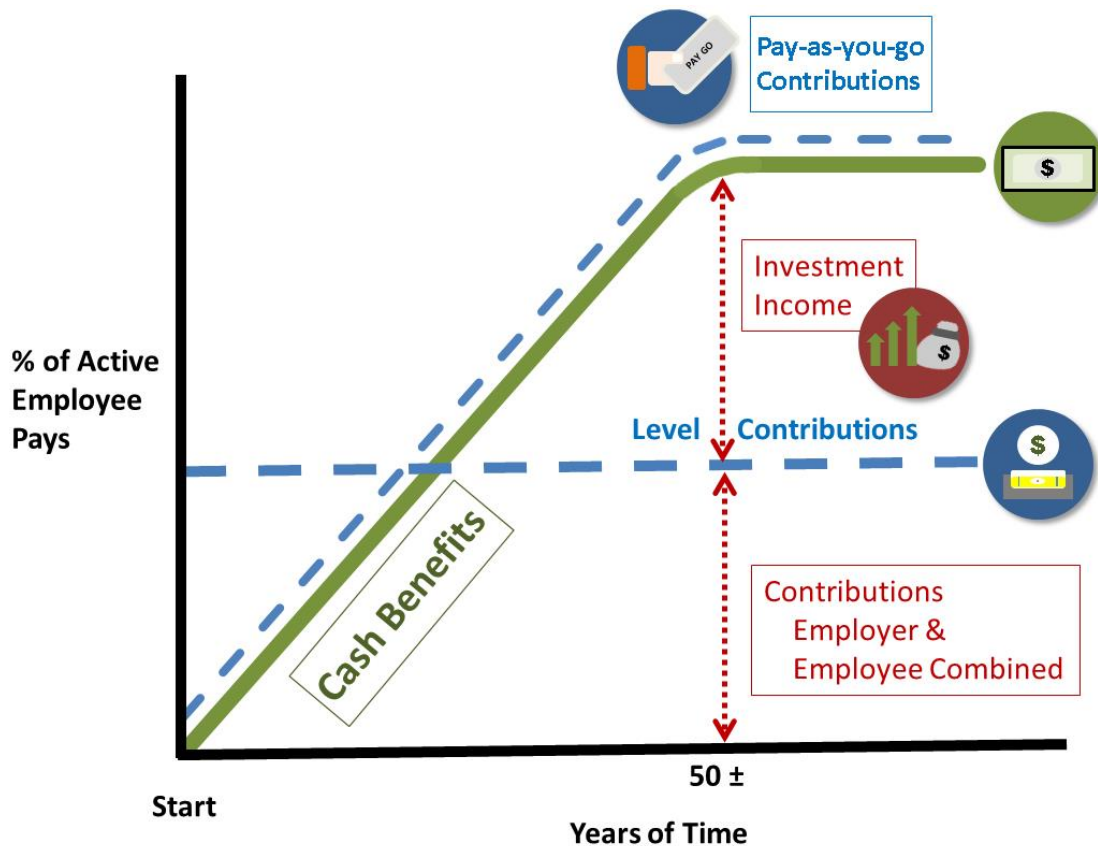
... minus ...

Expenses incurred in the operation of the system.

There are retirement systems designed to defer the bulk of contributions far into the future. They are lured by artificially low present contributions, but the inevitable consequence is a relentlessly increasing contribution rate to a level greatly in excess of the level percent-of-payroll rate.

A by-product of the level percent-of-payroll contribution objective is the accumulation of invested assets for varying periods of time. Investment income becomes a major contributor to the Retirement System and the amount is directly related to the amount of contributions and investment performance.

Computed Contribution Rate Needed to Finance Benefits. From a given schedule of benefits and from the data furnished, the contribution rate is calculated ***by means of an actuarial valuation*** - the technique of assigning monetary values to the risks assumed in operating a retirement system.

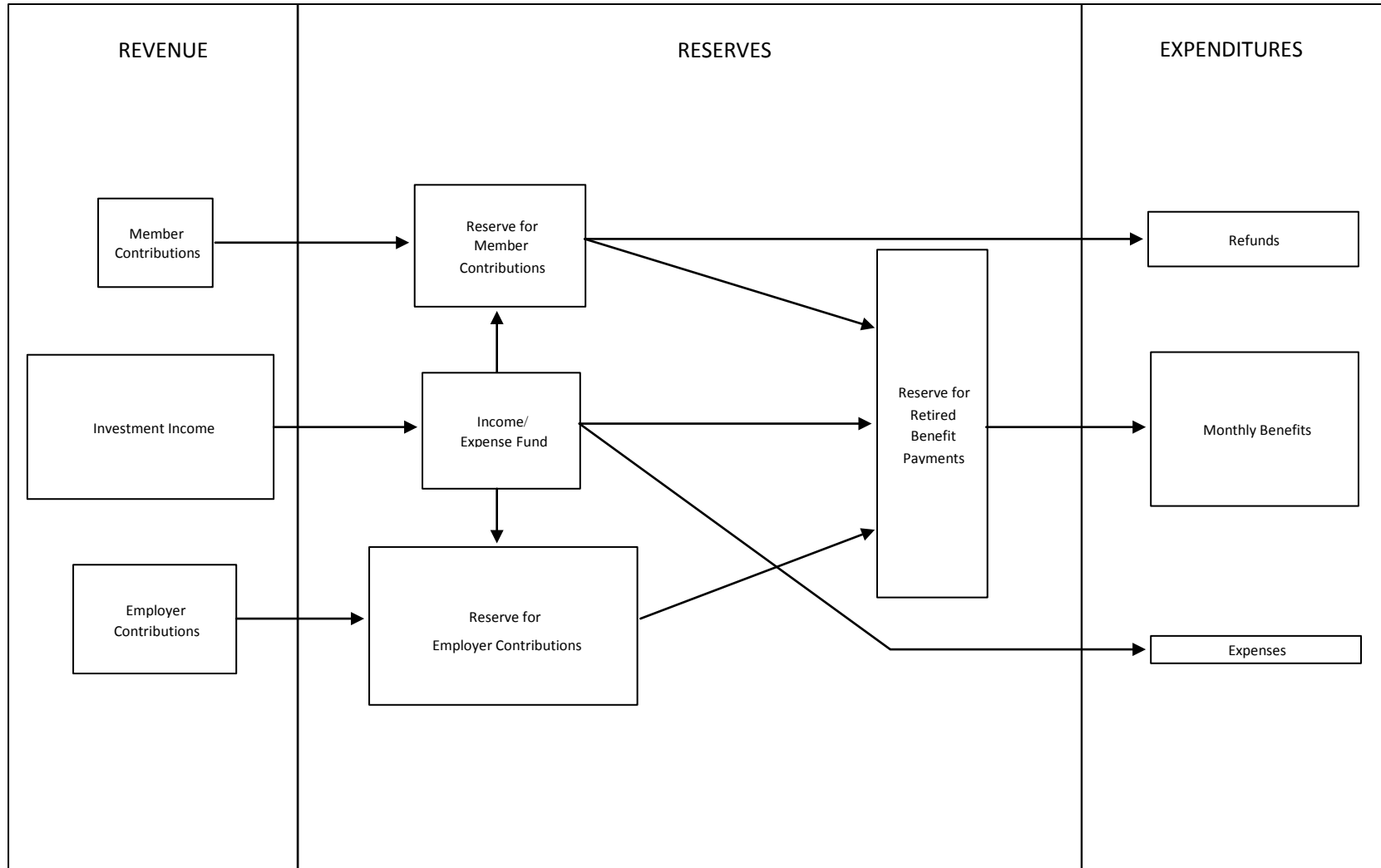


CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

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

Flow of Money Through the Retirement System



Glossary

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.”

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

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.

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.

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.

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 Liabilities. The difference between the actuarial accrued liability and valuation assets. Sometimes referred to as “unfunded accrued liability.”

Valuation Assets. The value of current plan assets recognized for valuation purposes.