

**CITY OF MANCHESTER EMPLOYEES' CONTRIBUTORY RETIREMENT SYSTEM**  
**ANNUAL ACTUARIAL VALUATION REPORT**  
**DECEMBER 31, 2016**

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May 4, 2017

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, 2016 **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;
- to calculate the employer contribution rate for the City's fiscal year 2018; and
- to determine actuarial information for reporting purposes in compliance with Governmental Accounting Standards Board (GASB) Statement No. 43 for the plan's 2016 fiscal year. (Information required for GASB Statement No. 67 is provided in a separate report.)

The results of this valuation may not be applicable for other purposes.

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 measurement was beyond the scope of this valuation.

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 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.

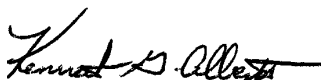
This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board of the American 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, 2016. GRS is not responsible for unauthorized use of this report.

This report replaces our preliminary report dated March 8, 2017. Results presented in this report are unchanged from those presented in the preliminary report.

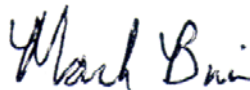
After the preliminary report was issued and presented, an audit adjustment resulted in moving approximately \$20,000 from the pension assets to the post-retirement health subsidy assets. Given the timing and materiality of this adjustment, the System elected to reflect this change in the December 31, 2017 valuation. We believe this is a reasonable approach.

Mark Buis 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



Mark Buis, FSA, EA, MAAA

KGA/MB:mrp

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**SECTION A**

**VALUATION RESULTS**

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## EXECUTIVE SUMMARY

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### 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 2018 is 23.05% of covered payroll.

***The computed health subsidy contribution rate*** for the City's fiscal year 2018 is 1.40% of covered payroll. The details of these contribution rates are shown on page A-7.

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 23 years for pension benefits, and 23 years for health subsidy benefits.

**SUMMARY STATEMENT OF SYSTEM RESOURCES AND OBLIGATIONS**  
**DECEMBER 31, 2016**

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*Present Resources and Expected Future Resources*

	<b>Pension</b>	<b>Health</b>
A. Actuarial value of System assets:		
1. Net assets from System financial statements	\$191,951,854	\$10,435,083
2. Funding value adjustment	13,163,349	715,599
3. Valuation assets	205,115,203	11,150,682
B. Present value of expected future employer contributions:		
1. For normal costs	38,050,302	0
2. For unfunded actuarial accrued liabilities	116,772,778	11,085,665
3. Totals	154,823,080	11,085,665
C. Present value of expected future member contributions:	18,252,779	6,084,260
<b>D. Total Present and Expected Future Resources</b>	<b>\$378,191,062</b>	<b>\$28,320,607</b>

*Actuarial Present Value of Expected Future Benefit Payments*

	<b>Pension</b>	<b>Health</b>
A. To retirees and beneficiaries:	\$169,340,013	\$ 11,411,189
B. To vested terminated members:	6,115,895	407,835
C. To present active members:		
1. Allocated to service rendered prior to valuation date	146,432,073	11,204,642
2. Allocated to service likely to be rendered after valuation date	56,303,081	5,296,941
3. Total	202,735,154	16,501,583
<b>D. Total Actuarial Present Value of Expected Future Benefit Payments</b>	<b>\$378,191,062</b>	<b>\$28,320,607</b>

**SUMMARY OF CURRENT ASSET INFORMATION  
FURNISHED FOR THE VALUATION**

*Balance Sheet*

<b>Reported Assets - Actuarial Value as of December 31</b>		
	<b>2016</b>	<b>2015</b>
Cash & Equivalents	\$ 3,158,371	\$ 5,061,139
Investments	199,669,533	191,820,900
Receivables	307,775	2,493
Property, Plant, Equipment	3,338	33,603
Accrued Interest & Dividends	35,853	27,694
Receivable for Add'l Contribution Calculator	500	850
Payable for Investments Purchased	(93,985)	(66,531)
Accounts Payable	(248,656)	(258,159)
Benefits Payable	(1,340,095)	(1,296,350)
Additional Contribution Account	894,303	783,434
Other	0	1,604
Market Value Total	202,386,937	196,110,677
Funding Value Adjustment	13,878,948	13,081,886
<b>Total Valuation Assets</b>	<b>\$216,265,885</b>	<b>\$209,192,563</b>

*Revenues and Expenditures*

	<b>2016</b>	<b>2015</b>
Funding Value - January 1	\$209,192,563	\$200,578,642
Revenues		
Employees' Contributions	3,068,947	2,802,113
Employer Contributions	8,841,353	12,536,782
Recognized Investment Income	13,737,690	10,559,870
Total	25,647,990	25,898,765
Expenditures		
Benefit Payments	16,668,123	15,245,156
Refund of Member Contributions	220,469	446,590
Expenses and Fees	1,686,076	1,593,098
Total	18,574,668	17,284,844
Funding Value - December 31	\$216,265,885	\$209,192,563
Rate of Return Recognized	6.3 %	4.8 %



## DEVELOPMENT OF FUNDING VALUE OF ASSETS

Year Ended December 31:	2014	2015	2016	2017	2018	2019	2020
A. Funding Value Beginning of Year	\$186,106,837	\$200,578,642	\$209,192,563				
B. Market Value End of Year	202,065,700	196,110,677	202,386,937				
C. Market Value Beginning of Year	194,373,638	202,146,990	196,110,677				
D. Non-Investment Net Cash Flow	706,384	(939,910)	(5,811,550)				
D1. Post-Valuation Adjustment	117,498	(81,290)	0				
E. Investment Income							
E1. Market Total: B - C - D - D1	6,868,180	(5,015,113)	12,087,810				
E2. Amount for Immediate Recognition (7.25%)	13,518,352	14,507,880	14,955,792				
E3. Amount for Phased-In Recognition: E1-E2	(6,650,172)	(19,522,993)	(2,867,982)				
F. Phased-In Recognition of Investment Income							
F1. Current Year: 0.20 x E3	(1,330,034)	(3,904,599)	(573,596)				
F2. First Prior Year	2,789,301	(1,330,034)	(3,904,599)	\$ (573,596)			
F3. Second Prior Year	948,010	2,789,301	(1,330,034)	(3,904,599)	\$ (573,596)		
F4. Third Prior Year	(3,456,728)	948,010	2,789,301	(1,330,034)	(3,904,599)	\$ (573,596)	
F5. Fourth Prior Year	1,296,520	(3,456,727)	948,008	2,789,303	(1,330,036)	(3,904,597)	\$ (573,598)
F6. Total Recognized Investment Gain	247,069	(4,954,049)	(2,070,920)	(3,018,926)	(5,808,231)	(4,478,193)	(573,598)
G. Preliminary Funding Value End of Year: A + D + E2 + F6	200,578,642	209,192,563	216,265,885				
H. Actuarial Value after Application of 20% Corridor Limit	200,578,642	209,192,563	216,265,885				
I. Difference between Market & Funding Value	1,487,058	(13,081,886)	(13,878,948)				
J. Recognized Rate of Return	7.4 %	4.8 %	6.3 %				
K. Market Rate of Return	3.6 %	(2.5)%	6.3 %				
L. Ratio of Funding Value to Market Value	99.3 %	106.7 %	106.9 %				

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, 2016**

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(A) Total Market Value	\$202,386,937
(B) Pension Market Value	\$191,951,854
(C) Ratio: (B)/(A)	94.8440%
(D) Total Funding Value	\$216,265,885
<b>(E) Pension Funding Value: (D) x (C)</b>	<b>\$205,115,203</b>
<b>(F) Health Funding Value: (D) - (E)</b>	<b>\$ 11,150,682</b>

**DEVELOPMENT OF UNFUNDED ACTUARIAL ACCRUED LIABILITY  
YEAR ENDED DECEMBER 31, 2016**

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	<b>Pension</b>	<b>Health</b>
Present Value of Future Benefits - Retirees	\$169,340,013	\$11,411,189
Present Value of Future Benefits - Deferreds	6,115,895	407,835
Present Value of Future Benefits - Actives	202,735,154	16,501,583
Total Present Value of Future Benefits	\$378,191,062	\$28,320,607
Present Value of Future Normal Cost	56,303,081	5,296,941
<b>Actuarial Accrued Liability</b>	<b>\$321,887,981</b>	<b>\$23,023,666</b>
Actuarial Value of Assets	205,115,203	11,150,682
<b>Unfunded Actuarial Accrued Liability</b>	<b>\$116,772,778</b>	<b>\$11,872,984</b>
<b>Funded Ratio</b>	<b>63.7%</b>	<b>48.4%</b>

**DERIVATION OF EXPERIENCE GAIN (LOSS)  
YEAR ENDED DECEMBER 31, 2016**

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.

	<b>Pension</b>	<b>Health</b>
(1) UAAL* at start of year	\$115,423,058	\$11,386,138
(2) Total normal cost from last valuation	6,592,761	608,970
(3) Actual contributions (employer & employee)	10,585,309	1,107,380
(4) Interest accrual: [(1) + 1/2 ((2) - (3))] x 0.0725	8,223,442	807,428
(5) Expected UAAL before changes: (1) + (2) - (3) + (4)	119,653,952	11,695,156
(6) Change from new assumptions and methodology	0	0
(7) Change from ad-hoc COLA increases (above or below assumed)	(1,979,746)	N/A
(8) Change from Chapter 159 service upgrade	217,611	N/A
(9) Expected UAAL after changes: (5) + (6) + (7) + (8)	117,891,817	11,695,156
(10) Actual UAAL at end of year	116,772,778	11,872,984
(11) Gain (loss): (9) - (10)	1,119,039	(177,828)
(12) Gain (loss) as percent of actuarial accrued liabilities at start of year	0.4 %	(0.8)%

\* *Unfunded Actuarial Accrued Liability.*

<b>Valuation Date</b>	<b>Experience Gain (Loss) as % of Beginning Accrued Liability</b>	
	<b>Pension</b>	<b>Health</b>
<b>December 31</b>		
2007	2.3 %	2.4 %
2008	(14.3)%	(2.8)%
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)%

## COMPUTED CONTRIBUTIONS FOR THE CITY'S FISCAL YEAR 2018

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<b>Contributions For</b>	<b>Contributions Expressed as % of Active Member Payroll</b>
Total Normal Cost	12.49%
Member Contributions	<u>3.75%</u>
Employer Normal Cost	8.74%
Unfunded Actuarial Accrued Liabilities*	14.31%
<b>Employer Pension Total</b>	<b>23.05%</b>
Health Contribution**	1.40%
Employer Total	24.45%
Valuation Payroll	\$ 52,888,074
Projected Payroll	\$ 55,285,799
Estimated Contribution Dollars	\$ 13,517,378
<b><u>Pension</u></b>	
Unfunded Actuarial Accrued Liabilities	\$116,772,778
Funded Status	63.7%
<b><u>Health</u></b>	
Unfunded Actuarial Accrued Liabilities	\$ 11,872,984
Funded Status	48.4%

\* *Unfunded actuarial accrued liabilities for pension are currently financed as a level percent of payroll over a remaining amortization period of 23 years.*

\*\* *Currently based on a remaining 23-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 \$1,693,000 and the employer contribution rate will increase by approximately 0.21% (based on current payroll and a 23-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, 2016 and the additional liability would be amortized over 23 years. It was also assumed that the increase would be effective on January 1, 2017.*

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 2018

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<b>Contribution Rate Reconciliation</b>	<b>% of Payroll</b>		
	<b>Pension</b>	<b>Health</b>	<b>Total</b>
Last Year's Rate	22.48 %	1.26 %	23.74 %
Normal Cost Change	0.04 %	0.04 %	0.08 %
Miscellaneous Changes in Group Demographics	0.46 %	0.04 %	0.50 %
Assumption and Methodology Changes <sup>#</sup>	0.00 %	0.00 %	0.00 %
Employer Portion of SB 402 Purchases	0.01 %	0.00 %	0.01 %
COLA (portion above/(below) the assumption)	(0.25)%	0.00 %	(0.25)%
Payroll growth less than expected	0.45 %	0.04 %	0.49 %
Experience (Gain) Loss	(0.14)%	0.02 %	(0.12)%
This Year's Rate	23.05%	1.40 %	24.45%

# See Comments.

**FY 2016 CITY TRUE-UP CONTRIBUTIONS PAYABLE  
DURING CITY'S FISCAL YEAR 2018**

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	City Non-EPD and Parking	City EPD and Parking	Total City
<b>(1) Projected Fiscal Year 2016 Payroll</b>	\$31,207,150	\$2,624,554	\$33,831,704
<b>(2) Actual Fiscal Year 2016 Payroll #</b>	30,425,911	2,753,544	33,179,455
<b>(3) True-Up Rate (2)/(1) - 1.00</b>	(2.50)%	4.91%	(1.93)%
<b>(4) FY 2016 Semi-Annual Contribution (Actual)</b>			
Pension	\$ 3,176,494	\$ 267,147	\$ 3,443,641
Health	151,773	12,764	164,537
Total	\$ 3,328,267	\$ 279,911	\$ 3,608,178
<b>(5) Semi-Annual Shortfall/(Overage)</b>			
Pension	\$ (79,412)	\$ 13,117	\$ (66,295)
Health	(3,794)	627	(3,167)
Total	\$ (83,206)	\$ 13,744	\$ (69,462)
<b>(6) Fiscal Year 2016 True-Up as of July 1, 2017</b>			
(5) x 1.0725 + (5) x 1.03625			
Pension	\$ (167,460)	\$ 27,660	\$ (139,800)
Health	(8,001)	1,322	(6,679)
Total	\$ (175,461)	\$ 28,982	\$ (146,479)

# This information was provided by the System in aggregate, by group, independent of the member data.

\* The December 31, 2017 valuation will show figures for one semi-annual true-up contribution payment after which this information will no longer be accounted for.

The true-up is to account for the differences in actual and assumed payroll that would have affected the contribution had the City been making contributions on a payroll period basis.

## COMMENTS

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**COMMENT A – RESULTS:** The Retirement System is 63.7% funded for pension benefits and 48.4% funded for health subsidy benefits as of December 31, 2016. The pension Unfunded Actuarial Accrued Liability (UAAL) of \$116,772,778 is amortized over a closed 23-year period; the health subsidy UAAL of \$11,872,984 is amortized over a closed 23-year period.

**COMMENT B – EXPERIENCE:** Experience during the year ended December 31, 2016 was more favorable than assumed for pension benefits and less favorable than assumed for the health subsidy, resulting in a net experience gain for pensions and an experience loss for the health subsidy. The primary source of experience loss was recognized investment return lower than assumed (7.25% assumed versus 6.3% recognized). For pension benefits, the losses were offset by no ad-hoc COLA being paid during 2016 (versus 1.25% assumed) and pay increases less than assumed. Overall, the pension experience gain was approximately 0.4% of beginning of year liabilities. The pension funding status increased from 63.3% to 63.7% during the year. The primary source of experience loss for health was investment return (7.25% assumed versus 6.3% recognized). Overall, the health experience loss was approximately 0.8% of beginning of year liabilities. The health funding status increased from 47.4% to 48.4% during the year.

The recognized rate of return was 6.3%, as well as the return on a market value basis. 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 15% (after accounting for the gains and losses scheduled to be recognized next year), resulting in upward pressure on contributions.

## COMMENTS

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### COMMENT C – BENEFIT CHANGES:

1. The previously adopted SB402 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 approximately \$435,222 as a result of members electing to purchase this benefit during 2016. An additional \$217,611 in member contributions was contributed as a result of these elections.
2. COLA increases were assumed to be 1.25% of current pensions. In 2016, actual increases were 0.00% 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 2018 City fiscal year as follows:

Employer Pension Rate (not more than normal cost)	8.74%
Employee Pension Rate	3.75%
Total Pension Rate*	<hr/> 12.49%
Maximum Health Rate (1/3 x Pension Rate)	4.16%
Employee Health Rate	1.25%
Maximum Employer Health Rate	<hr/> 2.91%
Actual Employer Health Rate	1.40%

\* *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 (CONCLUDED)

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**COMMENT E** – There were no changes in actuarial assumptions for the December 31, 2016 valuation.

**COMMENT F – 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%.

<b>New Retirements in Year</b>	<b>New Retirees</b>	<b>New Retirees Electing Post-Ret.</b>	
		<b>Health Care</b>	<b>Election %</b>
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%

**COMMENT G – HEALTH VALUATION:** The methods and assumptions used in this valuation, in our opinion, satisfy the parameters of GASB Statement No. 43 and adequately measure the Plan’s liability and required contribution. However, the calculations contained herein were not intended to satisfy the parameters of GASB Statement No. 45 and should not be used for that purpose. Separate calculations may be needed once GASB Statement No. 74 is adopted. We believe MECRS will need calculations in accordance with GASB Statement No. 74 for its 2017 financial report. We recommend consulting with your auditors to confirm.

**COMMENT H – POST VALUATION CHANGES:** After the publication of the Preliminary December 31, 2016 Valuation Report, December 31, 2016 assets were changed due to an audit adjustment that resulted in moving approximately \$20,000 from Pension assets to Health Subsidy assets. This change will be reflected in the 2017 valuation. Had it been reflected in this report, it would not have produced results that are materially different.

**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

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**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 7.25% 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 23 years, and
- 3) The funded status of the plan will increase gradually toward a 100% funded ratio.

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

- 1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.
- 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.

## COMPARATIVE STATEMENT

Valuation Date December 31	Active Members				
	Number	Ratio to Retired	Valuation Payroll		% Increase
			Total	Average	
2007	1,325	2.33	\$ 48,556,218	\$ 36,646	2.4%
2008	1,323	2.23	50,740,516	38,353	4.7%
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 %

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	
2007#	569	\$ 7,327,439	15.1%	155	\$ 206,045	0.4%	3.75%	1.25%	13.84%	0.91%	19.75%
2008#	594	8,170,348	16.1%	162	245,670	0.5%	3.75%	1.25%	17.17%	0.93%	23.10%
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%

# After changes in methods and/or assumptions.

**ACTUARIAL ACCRUED LIABILITIES AND VALUATION ASSETS  
COMPARATIVE STATEMENT – PENSION ONLY**

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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 %

# 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.

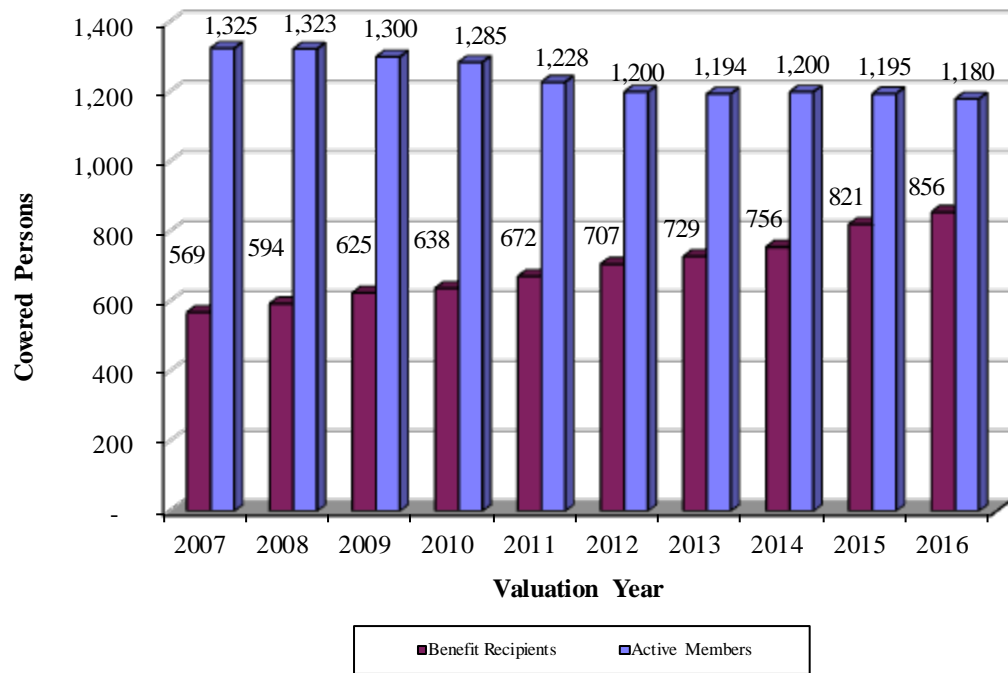
**ACTUARIAL ACCRUED LIABILITIES & VALUATION ASSETS  
COMPARATIVE STATEMENT – HEALTH SUBSIDY ONLY**

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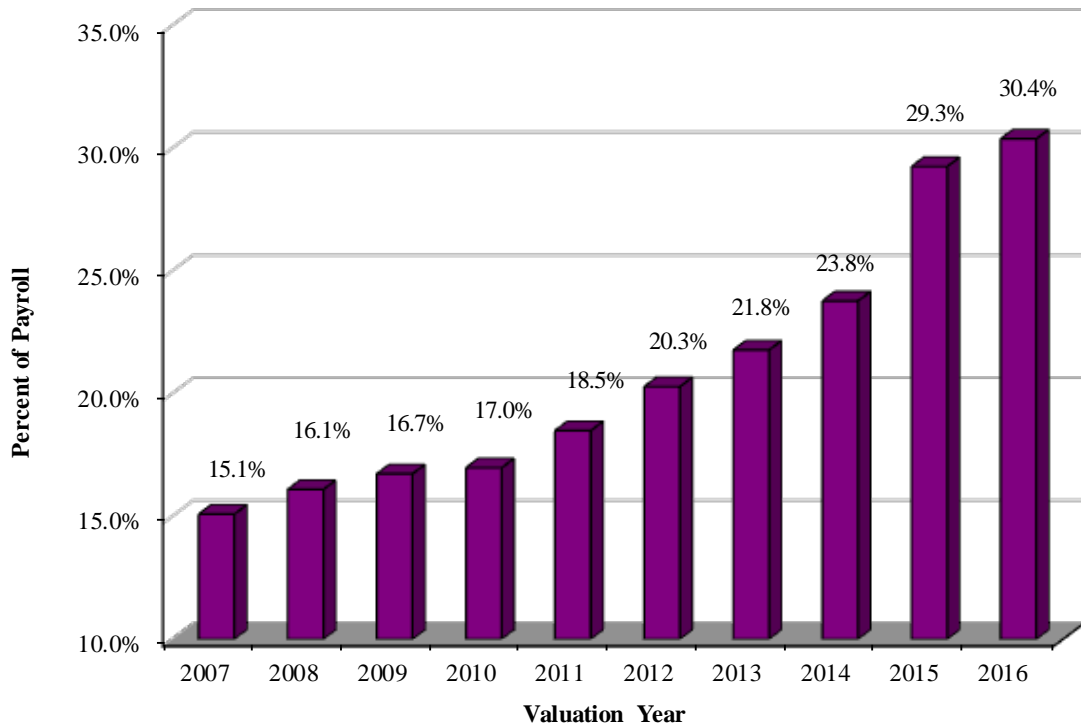
Valuation Date December 31	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Present Assets to AAL	Ratio of UAAL to Valuation Payroll
2007#	\$ 11,306,516	\$ 1,908,457	\$ 9,398,059	16.9 %	19.4 %
2008	12,425,929	2,605,141	9,820,788	21.0 %	19.4 %
2009#	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 %

# After changes in methods and/or assumptions.

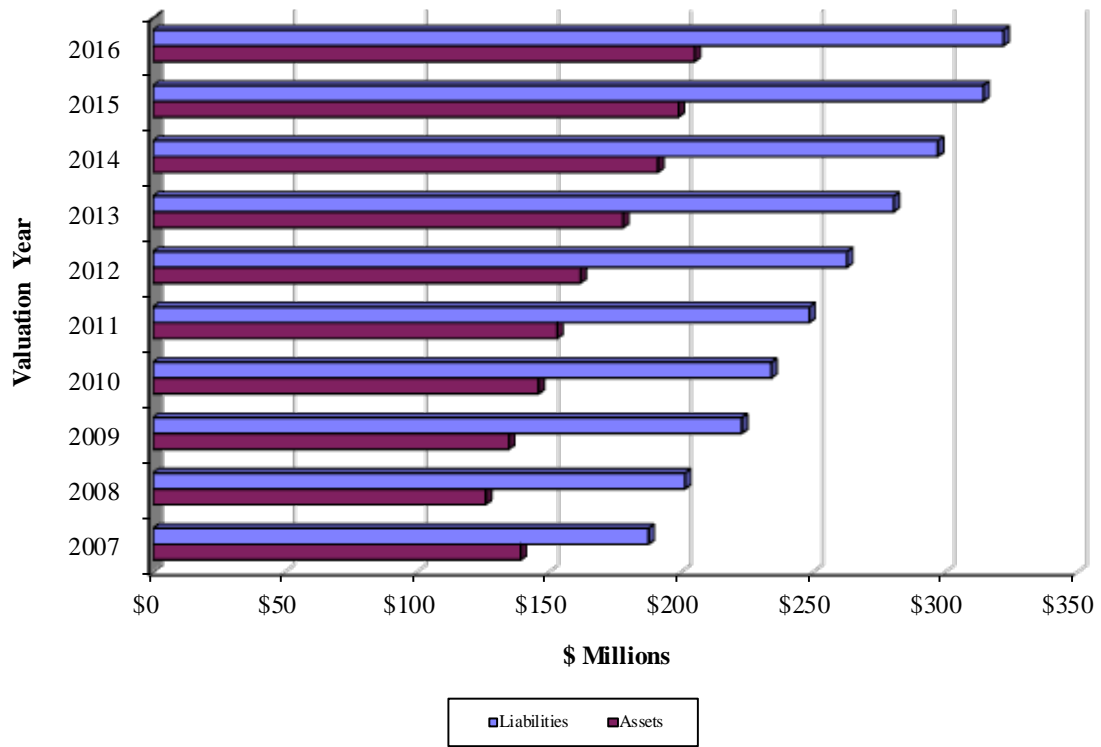
## Active Members and Benefit Recipients



## 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)

## 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**

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

<b>Date Established</b>	<b>Original Amount</b>	<b>Description</b>
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)
12/31/2016	0	Assumption and Methodology Change

*# 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**

Fiscal Year	Employer Contribution Rates			Projected Active Member Payroll	Beginning of Year	
	Total Contribution	Employer Normal Cost	UAAL Payment		UAAL	Funded Status
2017*	22.48%	8.70%	13.78%	\$ 53,675,533	\$116,772,778	63.7%
2018	23.05%	8.74%	14.31%	55,285,799	117,168,203	63.4%
2019	23.05%	8.74%	14.31%	56,944,373	117,469,730	64.6%
2020	23.05%	8.74%	14.31%	58,652,704	117,547,322	65.8%
2021	23.05%	8.74%	14.31%	60,412,285	117,377,370	67.0%
2022	23.05%	8.74%	14.31%	62,224,654	116,934,334	68.2%
2023	23.05%	8.74%	14.31%	64,091,393	116,190,590	69.5%
2024	23.05%	8.74%	14.31%	66,014,135	115,116,280	70.7%
2025	23.05%	8.74%	14.31%	67,994,559	113,679,139	71.9%
2026	23.05%	8.74%	14.31%	70,034,396	111,844,313	73.1%
2027	23.05%	8.74%	14.31%	72,135,428	109,574,165	74.4%
2028	23.05%	8.74%	14.31%	74,299,491	106,828,066	75.6%
2029	23.05%	8.74%	14.31%	76,528,475	103,562,168	77.0%
2030	23.05%	8.74%	14.31%	78,824,330	99,729,164	78.4%
2031	23.05%	8.74%	14.31%	81,189,059	95,278,030	79.8%
2032	23.05%	8.74%	14.31%	83,624,731	90,153,743	81.4%
2033	23.05%	8.74%	14.31%	86,133,473	84,296,987	83.0%
2034	23.05%	8.74%	14.31%	88,717,477	77,643,830	84.7%
2035	23.05%	8.74%	14.31%	91,379,002	70,125,377	86.5%
2036	23.05%	8.74%	14.31%	94,120,372	61,667,409	88.4%
2037	23.05%	8.74%	14.31%	96,943,983	52,189,975	90.5%
2038	23.05%	8.74%	14.31%	99,852,302	41,606,978	92.6%
2039	23.05%	8.74%	14.31%	102,847,871	29,825,711	94.9%
2040	23.05%	8.74%	14.31%	105,933,308	16,746,369	97.2%
2041	23.05%	8.74%	14.31%	109,111,307	2,261,523	99.6%
2042	23.05%	8.74%	14.31%	112,384,646	-	100.0%

\* Represents a 6-month period from December 31, 2016 through June 30, 2017.

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**SECTION B**

**BENEFIT PROVISIONS AND VALUATION DATA**

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**SUMMARY OF BENEFIT PROVISIONS  
AS OF DECEMBER 31, 2016**

---

**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, 2016**

---

**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, 2016

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### 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	
2006	41	\$ 898,189	28	\$186,217	544	\$ 6,515,157	\$ 11,976
2007	49	1,109,288	24	297,006	569	7,327,439	12,878
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

\* Includes adjustments due to COLA.

**RETIREES AND BENEFICIARIES DECEMBER 31, 2016**  
**TABULATED BY TYPE OF PENSIONS BEING PAID**

---

Type of Pensions Being Paid	Number	Annual Pensions
<b>Age and Service Pensions</b>		
Regular Pension - Benefit terminating at death of retiree	452	\$ 7,196,757
For life of member, but not less than 10 years	47	762,827
100% Joint & Survivor	162	3,294,936
66 2/3% Joint & Survivor	58	1,942,981
50% Joint & Survivor	57	1,494,865
Survivor Beneficiary	40	614,312
Total age and service pensions	816	\$ 15,306,678
<b>Casualty Pensions</b>		
Duty Disability	24	\$ 479,058
Non-Duty Disability	10	214,402
Duty Death - Survivor Benefits	0	0
Non-Duty Death - Survivor Benefits	6	71,412
Total casualty pensions	40	\$ 764,872
<b>Total Pensions Being Paid</b>	<b>856</b>	<b>\$ 16,071,550</b>

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, 2016**  
**PENSION BENEFITS TABULATED BY ATTAINED AGES**

---

Attained Age	Age and Service		Casualty		Totals	
	Number	Annual Pensions	Number	Annual Pensions	Number	Annual Pensions
20-24						
25-29	2	\$ 31,327			2	\$ 31,327
30-34	1	3,838			1	3,838
35-39	2	11,351			2	11,351
40-44			1	\$ 16,434	1	16,434
45-49						-
50-54	11	276,973	2	40,179	13	317,152
55-59	46	1,240,934	13	283,821	59	1,524,755
60-64	165	4,248,454	9	171,139	174	4,419,593
65-69	193	3,819,539	6	116,961	199	3,936,500
70-74	132	2,470,674	2	38,750	134	2,509,424
75-79	99	1,431,351	4	56,410	103	1,487,761
80-84	85	972,725	1	11,634	86	984,359
85-89	48	466,855	1	17,983	49	484,838
90-94	27	291,017	1	11,561	28	302,578
95-100	5	41,640			5	41,640
<b>Totals</b>	<b>816</b>	<b>\$ 15,306,678</b>	<b>40</b>	<b>\$ 764,872</b>	<b>856</b>	<b>\$ 16,071,550</b>

**RETIREES AND BENEFICIARIES DECEMBER 31, 2016**  
**HEALTH SUBSIDY BENEFITS TABULATED BY ATTAINED AGES**

---

Attained Age	Health Subsidy	
	Number	Annual Amount
50-54	3	\$ 9,770
55-59	14	47,960
60-64	67	214,488
65-69	103	316,626
70-74	56	153,650
75-79	19	47,516
80-84	26	53,732
85-89	15	25,756
90-94	6	8,881
95+	1	1,776
<b>Totals</b>	<b>310</b>	<b>\$880,155</b>

Average Age at Retirement: 62.7 years

Average Age Now: 70.2 years

**RETIREES AND BENEFICIARIES DECEMBER 31, 2016**  
**TABULATED BY YEAR OF RETIREMENT**

---

Year of Retirement	Number	Annual Pensions	
		Totals	Average
1980	1	\$ 453	\$ 453
1981	2	26,485	13,243
1982	2	17,612	8,806
1983	2	7,141	3,571
1984	3	23,476	7,825
1985	3	22,989	7,663
1986	2	27,491	13,746
1987	5	67,682	13,536
1988	5	54,349	10,870
1989	9	119,458	13,273
1990	9	100,519	11,169
1991	7	38,658	5,523
1992	10	147,861	14,786
1993	16	249,803	15,613
1994	22	209,787	9,536
1995	19	180,174	9,483
1996	22	318,188	14,463
1997	14	204,668	14,619
1998	11	139,058	12,642
1999	29	520,198	17,938
2000	23	384,147	16,702
2001	19	298,708	15,721
2002	31	347,991	11,226
2003	17	241,742	14,220
2004	24	186,970	7,790
2005	31	556,110	17,939
2006	35	727,631	20,789
2007	42	947,921	22,570
2008	39	938,638	24,068
2009	30	406,238	13,541
2010	35	597,340	17,067
2011	49	831,482	16,969
2012	50	1,105,309	22,106
2013	47	1,232,442	26,222
2014	53	1,367,300	25,798
2015	86	2,678,770	31,148
2016	52	746,761	14,361
<b>Totals</b>	<b>856</b>	<b>\$16,071,550</b>	<b>\$ 18,775</b>

Average Age at Retirement: 61.8 years

Average Age Now: 72.0 years

**INACTIVE VESTED MEMBERS DECEMBER 31, 2016**  
**TABULATED BY ATTAINED AGE**

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<b>Attained Age</b>	<b>Number</b>	<b>Estimated Annual Pensions</b>
25-29	1	\$ 3,351
30-34	5	24,315
35-39	7	35,659
40-44	2	24,375
45-49	17	174,063
50-54	26	242,160
55-59	36	296,886
60	2	10,102
<b>Totals</b>	<b>96</b>	<b>\$810,911</b>

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				
	A	E	A	E	A	E	A	A	Totals				
									A	E	A	E	
2007	178	181	37	52.4	0	1.1	0	2.1	23	121	144	63.3	1,325
2008	128	130	35	53.9	1	1.1	0	2.1	9	85	94	65.3	1,323
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
5-Year Totals	539	587	245	265	4	3	9	13	73	256	329	316	
10-Year Totals	1080	1228	403	529	10	8	13	24	134	668	802	659	
Since Last Exp. Study (5 years)	539	587	245	265.4	4	2.8	9	12.7	73	256	329	316.2	

A = Actual

E = Expected

28 retirees/beneficiaries and \$388,742 in benefits were expected to come off the rolls for the December 31, 2016 valuation; 18 retirees/beneficiaries and \$240,803 in benefits were actually removed from the rolls.

**ACTIVE MEMBERS DECEMBER 31, 2016**  
**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
15-19	2							2	\$ 82,419
20-24	26							26	879,180
25-29	71	4						75	2,254,119
30-34	43	18	11					72	2,822,724
35-39	34	31	19	4				88	3,756,271
40-44	41	20	24	17	1			103	4,626,949
45-49	40	30	19	22	21	6		138	6,738,626
50-54	51	46	41	45	15	19	14	231	10,818,085
55-59	35	25	40	64	18	15	29	226	10,787,583
60-64	19	23	16	40	18	14	16	146	6,944,396
65-69	9	7	5	11	9	4	10	55	2,485,642
70-74	2	2	3	2	2			11	391,030
75 & over		2		2	1		2	7	301,050
<b>Totals</b>	<b>373</b>	<b>208</b>	<b>178</b>	<b>207</b>	<b>85</b>	<b>58</b>	<b>71</b>	<b>1,180</b>	<b>\$52,888,074</b>

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

Age: 49.1 years  
Service: 11.8 years  
Annual Pay: \$44,820

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**SECTION C**

**VALUATION METHODS AND ASSUMPTIONS**

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## ACTUARIAL COST METHOD

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*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 over 23 future years for pension benefits, and over 23 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

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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.

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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, 2007 – December 31, 2011 experience study of the MECRS and were adopted by the Board. These assumptions were first used in the December 31, 2012 actuarial valuation. We believe the assumptions are reasonable individually and in the aggregate.

## VALUATION ASSUMPTIONS

**The rate of investment return was 7.25% 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
	2016	2015	2014	2013	2012	
1) Nominal rate of return#	6.3 %	4.8 %	7.4 %	9.3 %	3.8 %	6.3 %
2) Increase in CPI	2.1 %	0.7 %	0.8 %	1.5 %	1.7 %	1.4 %
3) Average Salary Increase (ASI)	1.1 %	(2.0)%	1.3 %	3.3 %	3.9 %	1.5 %
4) Real Return						
- Total: CPI (1) - (2)						4.9 %
- Total: ASI (1) - (3)						4.8 %
- Assumption	4.25 %	4.25 %	4.25 %	4.25 %	4.3 %	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 2.75% per year. This results in a real rate of return over price inflation of 4.5%.

**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	3.96%	3.00%	6.96%
2	4.93%	3.00%	7.93%
3	4.72%	3.00%	7.72%
4	4.20%	3.00%	7.20%
5	3.88%	3.00%	6.88%
6	3.43%	3.00%	6.43%
7	3.05%	3.00%	6.05%
8	2.76%	3.00%	5.76%
9	2.56%	3.00%	5.56%
10	2.35%	3.00%	5.35%
15	1.58%	3.00%	4.58%
20	1.27%	3.00%	4.27%
25	1.25%	3.00%	4.25%
30	1.25%	3.00%	4.25%
35	1.25%	3.00%	4.25%
40	1.25%	3.00%	4.25%
Ref:	280		

If the number of active members remains constant, then the total active member payroll will increase 3.0% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities.

## VALUATION ASSUMPTIONS

*The mortality table* was the RP 2000 Mortality Table projected to 2020.

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	\$148.84	\$150.73	0.1487%	0.1189%	32.77	34.63
55	140.89	143.37	0.2469%	0.2314%	28.04	29.88
60	130.74	134.14	0.4887%	0.4573%	23.47	25.31
65	118.50	123.10	0.9607%	0.8780%	19.17	21.02
70	104.41	110.47	1.6413%	1.5145%	15.22	17.06
75	88.00	96.22	2.8538%	2.3935%	11.58	13.47
80	70.35	80.35	5.2647%	3.9866%	8.42	10.23
Ref:	454 x 1.00 sb 0	455 x 1.00 sb 0				

This assumption is used to measure the probabilities of members dying after retirement. Ninety percent of these rates are used to measure the probability of dying before retirement. The projection to 2020 is the margin for mortality improvement.

Post-retirement disabled mortality rates are based on the health mortality rates, set forward 10 years.

*The rates of retirement* used to measure the probability of eligible members retiring during the next year were as follows:

Active Members Retiring Next Year Under Normal Retirement			Active Members Retiring Next Year Under Early Retirement			
Ages	% Retiring		Ages	% Retiring		Rule of 80
	Men	Women		Age and Service		
	Men	Women	Men	Women		
60	10%	13%	50			5%
61	10%	15%	51			5%
62	20%	28%	52			5%
63	20%	15%	53			5%
64	15%	10%	54			5%
65	25%	25%	55	5%	7%	5%
66	20%	25%	56	5%	7%	5%
67	15%	25%	57	5%	7%	5%
68	15%	10%	58	5%	7%	5%
69	15%	20%	59	5%	7%	5%
70	15%	20%				
71	50%	20%				
72	50%	20%				
73	50%	20%				
74	50%	20%				
75	100%	20%				
76	100%	20%				
77	100%	20%				
78	100%	20%				
79	100%	20%				
80	100%	100%				
Ref.	2355	2356		2357	2358	2359

## VALUATION ASSUMPTIONS

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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.

*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.

Sample Ages	Service	% of Active Members Separating within Next Year	
		Men	Women
	0-1	20.00%	30.00%
	1-2	17.00%	20.00%
	2-3	11.50%	15.00%
	3-4	9.00%	12.50%
	4-5	8.00%	11.00%
	5-6	n/a	8.00%
30	5 & Up (Men)		
35	6 & Up (Women)	5.14%	5.30%
40		3.80%	4.45%
45		3.00%	3.85%
50		2.57%	3.40%
		2.40%	2.95%
Ref.		830 77 x 0.45	831 37 x 1

*Rates of disability* were divided equally between duty and 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, 2016

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<b>Marriage Assumption:</b>	100% of males and 100% 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.
<b>Pay Increase Timing:</b>	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.
<b>Decrement Timing:</b>	Decrements of all types are assumed to occur mid-year.
<b>Eligibility Testing:</b>	Eligibility for benefits is determined based upon the age nearest birthday and exact fractional service on the date the decrement is assumed to occur.
<b>Decrement Relativity:</b>	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
<b>Decrement Operation:</b>	Disability and withdrawal decrements do not operate after member reaches retirement eligibility.
<b>Expense Load:</b>	0.50% of payroll.
<b>Normal Form of Benefit:</b>	The assumed normal form of benefit is the straight life form.
<b>Benefit Service:</b>	Exact fractional service as of the valuation date is used to determine the amount of benefit payable.
<b>Incidence of Contributions:</b>	For Manchester School District and enterprise funds of the City (Airport, Water Works, and the MECRS), contributions are assumed to be received continuously throughout the year based upon the actual payroll payable at the time contributions are made. For the remaining City group, contributions are assumed to be received on a semiannual basis in December and July.
<b>COLA Assumption:</b>	1.25% compounded annually.
<b>Adjustments:</b>	Normal and Early retirement costs were increased by 9% 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.
<b>Post-Retirement Subsidy:</b>	55% of current actives and 25% of current terminated vested members were assumed to elect to receive the post-retirement health subsidy upon retirement.

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## SECTION D

### GASB STATEMENT NO. 43

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**This information is presented in draft form for review by the System's auditor. Please let us know if there are any items that the auditor changes so that we may maintain consistency with the System's financial statements. Information needed for compliance with GASB Statement No. 67 and No. 68 is presented in a separate report.**

**GASB STATEMENT NO. 43**  
**REQUIRED SUPPLEMENTARY INFORMATION**

**Schedule of Funding Progress for Health Subsidy Program**

<b>Actuarial Valuation Date</b>	<b>Actuarial Value of Assets \$Millions (a)</b>	<b>Actuarial Accrued Liability (AAL) Entry Age \$Millions (b)</b>	<b>Unfunded AAL (UAAL) \$Millions (b) - (a)</b>	<b>Funded Ratio (a)/(b)</b>	<b>Covered Payroll (\$ Millions) (c)</b>	<b>UAAL as a Percent of Covered Payroll [(b) - (a)] / (c)</b>
12/31/2006	\$0.8	\$11.7	\$10.9	6.7 %	\$47.5	23.1 %
12/31/2007#	1.9	11.3	9.4	16.8 %	48.6	19.3 %
12/31/2008	2.6	12.4	9.8	21.0 %	50.7	19.3 %
12/31/2009#*	3.7	13.1	9.3	28.6 %	50.5	18.5 %
12/31/2010	4.9	14.1	9.2	34.6 %	51.4	17.9 %
12/31/2011	5.8	15.6	9.8	37.4 %	51.1	19.1 %
12/31/2012#	6.9	16.6	9.7	41.4 %	51.9	18.7 %
12/31/2013	8.1	18.0	9.8	45.3 %	53.3	18.4 %
12/31/2014	9.4	19.4	10.0	48.6 %	54.3	18.4 %
12/31/2015	10.3	21.6	11.4	47.4 %	53.0	21.5 %
12/31/2016	11.2	23.0	11.9	48.4 %	52.9	22.4 %

# After changes in methods and/or assumptions.

Note: Assets plus UAAL may not equal Accrued Liability in this exhibit due to rounding.

**Schedule of Employer Contributions for Health Subsidy Program**

<b>City Fiscal Year Ended June 30</b>	<b>Annual Required Contribution (ARC) as a Percent of Valuation Payroll</b>	<b>Plan Fiscal Year/ Valuation Year Ended December 31</b>	<b>Actual Contributions</b>
2008	1.24%	2006	\$ 333,028
2009	0.91%	2007	641,197
2010	0.93%	2008	487,909
2011	0.93%	2009	461,074
2012	0.87%	2010	457,292
2013	0.97%	2011	451,122
2014	0.93%	2012	526,321
2015	0.93%	2013	462,201
2016	0.99%	2014	613,606
2017	1.26%	2015	425,306
2018	1.40%	2016	428,315

**GASB STATEMENT NO. 43**  
**REQUIRED SUPPLEMENTARY INFORMATION – HEALTH SUBSIDY**

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

Health Subsidy Program implementation date	March 1, 2006
Valuation date	December 31, 2016
Actuarial cost method	Entry Age Normal
Amortization method	Level percent-of-payroll, closed
Remaining amortization period	23 years
Asset valuation method	5-year smoothed market
Actuarial assumptions:	
Investment net rate of return*	7.25%
Projected salary increases*	3.0%-7.93%
Future annual increases in subsidy amount	4.0%
*Includes price inflation at	2.75%

Membership of the plan consisted of the following at December 31, 2016, the date of the latest actuarial valuation:

Retirees and Beneficiaries receiving benefits	310
Terminated plan members entitled to but not yet receiving benefits	96
Active plan members	<u>1,180</u>
Total	1,586



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**SECTION E**

**OPERATION OF THE RETIREMENT SYSTEM**

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## BASIC FINANCIAL OBJECTIVE AND OPERATION OF THE RETIREMENT SYSTEM

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***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:

$$\mathbf{B = C + I - E}$$

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

**Contributions** received on behalf of the group

... plus ...

**Interest** earnings on contributions received

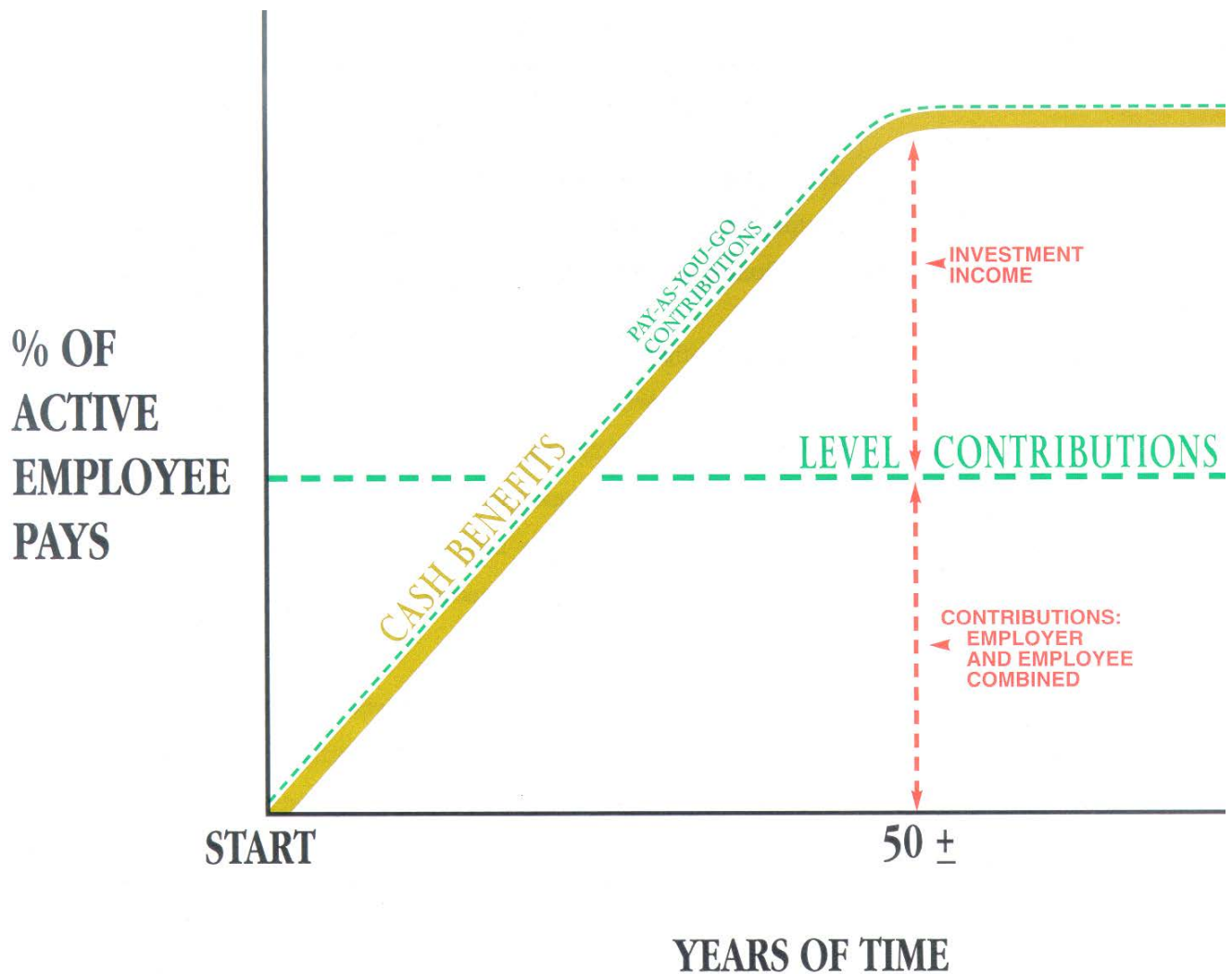
... minus ...

**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:

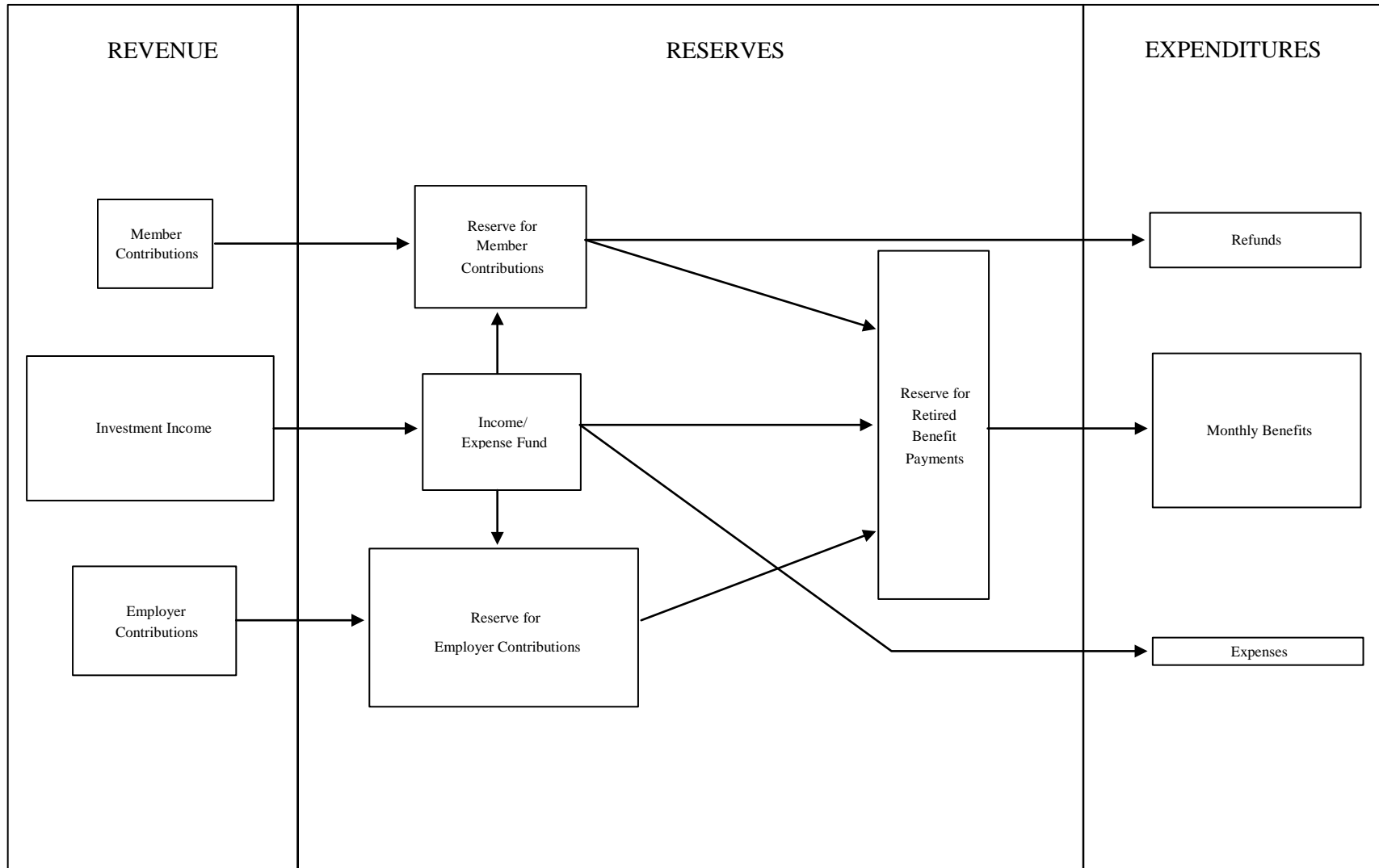
Economic Risk Areas

- 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

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***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.

## **GLOSSARY (CONCLUDED)**

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***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.

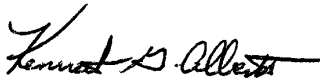
May 4, 2017

Mr. Gerard Fleury  
Executive Director  
City of Manchester Employees'  
Contributory Retirement System  
1045 Elm Street, Suite 403  
Manchester, New Hampshire 03101-1824

Dear Mr. Fleury:

Please find enclosed 15 copies of the report of the Actuarial Valuation of the City of Manchester Employees' Contributory Retirement System.

Sincerely,



Kenneth G. Alberts

KGA:mr  
Enclosures