



City of Aurora General Employees' Retirement Plan January 1, 2019 Actuarial Valuation

Prepared by:

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June 4, 2019

Board of Trustees
City of Aurora General Employees' Retirement Plan
12100 E. Iliff Avenue, Suite 108
Aurora, Colorado 80014

Dear Members of the Board:

As requested, we have performed an annual actuarial valuation of the City of Aurora General Employees' Retirement Plan as of January 1, 2019, for the plan year ending December 31, 2019. Our findings are set forth in this report. This report reflects the benefit provision and contribution rates in effect as of January 1, 2019.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the Plan's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the Plan have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the City and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the City. Further, in our opinion, each actuarial assumption used is reasonably related to the experience of the Plan and to reasonable expectations which, in combination, represent our best estimate of anticipated experience under the Plan.

This valuation report is only an estimate of the Plan's financial condition as of a single date. It can neither predict the Plan's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of Plan benefits, only the timing of Plan contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the Plan's funded ratio); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. The Board of Trustees has the final decision regarding the appropriateness of the assumptions and has adopted them.

Actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the Plan. Actuarial computations under GASB Statements No. 67 and No. 68 are for purposes of fulfilling financial accounting requirements. The calculations in the enclosed report have been made on a basis consistent with our understanding of the Plan's funding requirements and goals, and of GASB Statements No. 67 and 68. Results under GASB Statements No. 67 and 68 are not included in this

report, but this report will be the basis for determining these disclosures for the Measurement Period ending December 31, 2019 and the Employer Reporting Period ending December 31, 2020. The calculations in this report have been made on a basis consistent with our understanding of the plan provisions described in Appendix A of this report. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

Milliman's work is prepared solely for the internal business use of the City of Aurora General Employees' Retirement Plan ("Plan"). To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exception(s):

- (a) The Plan may provide a copy of Milliman's work, in its entirety, to the Plan's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit the Plan.
- (b) The Plan may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

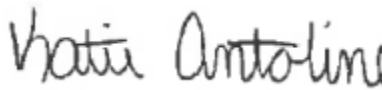
On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,



Joel E. Stewart, FSA, EA, MAAA
Principal and Consulting Actuary
JES:kea



Katie Antoline, FSA, EA, MAAA
Consulting Actuary

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EXECUTIVE SUMMARY

Overview

	Actuarial Valuation For Plan Year Beginning	
	January 1, 2018	January 1, 2019
Assets		
Market Value of Plan Assets	\$ 475,556,466	\$ 450,368,075
Actuarial Value of Plan Assets	\$ 457,124,471	\$ 474,289,088
Ratio of Actuarial Value to Market Value	96.1%	105.3%
Return on Market Value of Plan Assets	13.9%	-3.3%
Liabilities		
Actuarial Present Value of Future Benefits	\$ 564,322,916	\$ 596,459,972
Actuarial Liability	\$ 479,969,556	\$ 508,917,257
Assumed Average Annual Long-Term Future Investment Return (Discount Rate)	7.25%	7.25%
Unfunded Actuarial Liability (UAL) Relative to:		
Market Value of Plan Assets	\$ 4,413,090	\$ 58,549,182
Actuarial Value of Plan Assets	\$ 22,845,085	\$ 34,628,169
Funded Ratio Relative to:		
Market Value of Plan Assets	99.1%	88.5%
Actuarial Value of Plan Assets	95.2%	93.2%
Contribution Rates		
Total Normal Cost Rate	11.20%	11.00%
Employee Contribution Rate	7.00%	7.00%
Normal Cost Rate (Employer Portion)	4.20%	4.00%
UAL Rate	1.81%	2.53%
Employer-Paid Actuarially Determined Contribution Rate	6.01%	6.53%
Employer Contribution Rate	7.00%	7.00%
Participant Data		
Active Participants	1,755	1,754
Retired Participants and Beneficiaries	996	1,078
Vested Terminated Participants	255	250
Total Participants	3,006	3,082

The Actuarial Present Value of Future Benefits includes the effects of projected future service and pay increases for current active participants, stated in present value terms using the plan's investment return assumption as the discount rate. The Actuarial Accrued Liability is the portion of that amount that is allocated to service already completed as of the valuation date by participants.

Purpose of this Report

This report has been prepared for the City of Aurora General Employees' Retirement Plan as of January 1, 2019 to:

1. Review the experience for the plan year ending December 31, 2018. "Experience" encompasses the performance of the plan's assets during the year and changes in plan participant demographics that impact liabilities.
2. Review the plan's funded ratio.
3. Calculate the employer-paid Actuarially Determined Contribution (ADC) for the plan year ending December 31, 2019 in accordance with the actuarial methods and funding policy as adopted by the Board of Trustees and outlined in City Code.
4. Provide the basis for later financial reporting under Governmental Accounting Standards Board (GASB) Statements Nos. 67 and 68.

Plan Provisions

The valuation reflects our understanding of the plan provisions in effect as of January 1, 2019. Since the last valuation, the plan was amended in Ordinance No. 2018-04 to correct a clerical error made in Ordinance 2017-41 regarding the effective date. This correction had no impact on the liabilities of the Plan.

In addition, the Board granted a discretionary cost of living increase for the Base Benefit for Tier 2 Participants effective January 1, 2019 equal to 3.00%. This change increased the calculated Actuarial Liability by approximately \$4,000.

Please see Appendix A for a detailed summary of plan provisions.

Actuarial Methods and Assumptions

The methods and assumptions used in this valuation are detailed in Appendix B. The Board of Trustees reviewed and adopted the use of the assumptions for the January 1, 2019 actuarial valuation at their April 18, 2019 meeting.

There have been no assumption changes since the last valuation.

Plan Experience

Actuarial gains or losses arise when actual experience differs from actuarial assumptions used in the valuation. During the year ending December 31, 2018, the Plan experienced an overall actuarial loss of approximately \$13.2 million. The actuarial loss can be broken down as follows.

<u>Source of (Gain) or Loss</u>	<u>Amount in Millions</u>
Investment experience	\$ 6.1
Demographic experience	7.1
Total (gain)/loss	\$ 13.2

The investment experience was primarily due to the deferral of two-thirds of the 2018 market value investment loss of \$49.8 million and the recognition of one-third of the 2017 market value investment gain of \$27.9 million in the smoothed actuarial value of assets that is used to calculate the actuarially determined contribution rate. While the market value of assets for 2018 returned a negative 3.3%, which is approximately 10% less than the prior valuation's return assumption of 7.25% and resulted in the loss of \$49.8 million previously noted, the smoothing of gains and losses over three years in the actuarial value of assets resulted in an actuarial investment loss of \$6.1 million for the 2018 plan year.

The demographic experience was primarily due to retirements different than assumed, both in number and form of payment and salary increases greater than assumed during 2018. Also contributing to the demographic loss were new plan entrants, a 2018 Cost of Living Adjustment (COLA) higher than expected (3.00% compared to expected of 2.75%), as well as a loss on retiree mortality due to fewer retiree deaths than expected. This resulted in a loss of approximately \$7.1 million. Table 6 contains additional detail on the changes in the unfunded actuarial liability from January 1, 2018 to January 1, 2019.

Funding Analysis

Table 8 provides the detail on the calculation of the employer-paid Actuarially Determined Contribution (ADC) to the Plan based on the January 1, 2019 actuarial valuation and the funding policy described in the City Code. The ADC is calculated with each year's actuarial valuation.

Beginning in 2017, employees contribute 7.00% of pay. Per the current City Code, employee contribution rates beyond 2017 may increase or decrease 0.25% each year depending upon the funded ratio, but in no case would increase above 7.00% or decrease below 5.50%. Per the City Code, rate changes are based on a decision flowchart which increases rates (if permitted) when the funded ratio is less than 100% and decreases rates (if permitted) when the funded ratio is greater than 110%. One component used in determining the decision flowchart is the ADC. The City's current funding policy is to contribute the same rate of pay as employees.

The ADC calculated based on methodology adopted by the Board of Trustees consists of a rate related to the unfunded actuarial liability (UAL) and the normal cost rate calculated under the Entry Age Normal actuarial cost method. The normal cost rate includes a component for anticipated administrative expenses to be paid from plan assets.

The UAL-related portion of the ADC rate is determined via an open (i.e., rolling) 20-year level percent of projected payroll amortization calculation. Please note that under the assumptions adopted in this valuation, the rate so calculated pays approximately 97% of the interest on the UAL for 2019. If only the ADC was contributed, the contribution would not amortize any of the UAL's "principal". The normal cost component of the ADC should, when measured as a dollar amount, increase over time as the payroll for the active population increases (the normal cost is calculated as a level percentage of payroll).

Table 14 provides a 30-year projection of employee and City contributions, as well as the funded ratio of the plan and the total normal cost rate. This projection assumes an open population with plan payroll that grows at 3.25% annually, market value asset returns of 7.25% in all future years, and both employees and the City each contributing 7.00% of payroll in all future years.

As shown in Table 14, if all future experience follows assumptions, there are no changes to assumptions, plan provisions or funding policy, and the 7.00% City and employee contributions are made each year, the Plan's funded ratio is expected to improve over the projection period once the 2018 loss has been fully recognized in the actuarial value of assets. That improvement is due to contributions in excess of the

ADC, combined with the normal cost rate decreasing over time as new hire Tier 2 members replace departing Tier 1 members while the total contribution rate as a percent of payroll remains constant. As noted above, contributing only the ADC would not amortize any of the unfunded actuarial liability's "principal" if experience during that year matched the assumptions used in the actuarial valuation.

Risk Assessment and Disclosure

Appendix D contains a risk assessment and disclosure summary, as required by Actuarial Standard of Practice No. 51 (ASOP 51). This appendix uses the framework of ASOP 51 to communicate important information about significant risks to the Plan and the Plan's maturity.

VALUATION RESULTS

TABLE 1
STATEMENT OF PLAN NET ASSETS

	<u>December 31, 2017</u>	<u>December 31, 2018</u>
Cash and Cash Equivalents	\$ 120,605	\$ 91,499
Receivables		
Contributions	\$ 289,904	\$ 363,643
Interest and dividends	974,340	804,199
Investments sold	54,799	36,124
Other	<u>1,863</u>	<u>3,208</u>
Total receivables	\$ 1,320,906	\$ 1,207,174
Prepaid Expenses	\$ 29,886	\$ 36,617
Investments		
Short-term cash investments	\$ 10,547,072	\$ 6,101,113
Equity securities and funds	219,960,626	178,679,875
U.S. government and agency obligations	7,040,053	8,167,713
Corporate bonds and funds	95,328,300	105,926,655
Real estate funds	45,585,572	46,515,033
Alternative investments	<u>96,588,892</u>	<u>104,607,350</u>
Total Investments	\$ 475,050,515	\$ 449,997,739
Liabilities		
Accounts payable and accrued expenses	\$ 265,059	\$ 252,955
Securities purchased	592,356	625,499
Benefits and refunds payable	<u>108,031</u>	<u>86,500</u>
Total Liabilities	\$ 965,446	\$ 964,954
Plan Net Assets	\$ 475,556,466	\$ 450,368,075

TABLE 2
STATEMENT OF CHANGES IN PLAN NET ASSETS

	<u>2017</u>	<u>2018</u>
Net market value at beginning of year	\$ 425,231,226	\$ 475,556,466
Additions:		
Plan member contributions	\$ 7,326,872	\$ 7,638,089
City of Aurora contributions	7,321,152	7,632,330
Interest and dividends	7,942,591	8,207,080
Net realized and unrealized gains/(losses)	52,764,310	(21,636,658)
Other	<u>20,306</u>	<u>10,148</u>
Total	\$ 75,375,231	\$ 1,850,989
Deductions:		
Benefit payments	\$ 20,590,654	\$ 22,256,553
Contribution refunds	1,564,295	1,971,763
Administrative and miscellaneous expenses	574,823	555,220
Investment expenses	<u>2,320,219</u>	<u>2,255,844</u>
Total	\$ 25,049,991	\$ 27,039,380
Net change:	\$ 50,325,240	\$ (25,188,391)
Net market value at end of year	\$ 475,556,466	\$ 450,368,075

TABLE 3
DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

For funding purposes, the Plan's asset valuation method recognizes investment gains and losses over a three-year period. The resulting Actuarial Value of Assets may not be less than 80% or more than 120% of the Market Value of Assets. The Actuarial Value of Assets as of January 1, 2019 is determined below.

ASSET RECONCILIATION

<u>Year</u>	(1) Market Value of Assets Beginning of Year	(2) Contributions (City and Employee)	(3) Benefit Payments	(4) Administrative Expenses	(5) Cash Flow (2)+(3)+(4)	(6) Actual Investment Income	(7) Market Value of Assets End of Year (1)+(5)+(6)
2018	\$475,556,466	\$15,270,419	\$(24,228,316)	(555,220)	\$(9,513,117)	\$(15,675,274)	\$450,368,075
2017	425,231,226	14,648,024	(22,154,949)	(574,823)	(8,081,748)	58,406,988	475,556,466
2016	402,516,572	13,413,072	(21,163,587)	N/A*	(7,750,515)	30,465,169	425,231,226

* The Plan paid administrative expenses out of plan assets; however, the Plan's investment return assumption was net of all expenses for 2016 and prior.

GAIN/(LOSS) CALCULATION

<u>Year</u>	<u>Actual Investment Rate of Return</u>	<u>Actual Investment Return</u>	<u>Expected Investment Return</u>	<u>Difference between Actual and Expected</u>
2018	-3.3%	\$(15,675,274)	\$34,139,027	\$ (49,814,301)
2017	13.9	58,406,988	30,541,426	27,865,562
2016	7.6	30,465,169	30,900,306	(435,137)

Note, the Plan's investment return assumption was net of all expenses for 2016 and prior.

ASSET GAIN/(LOSS) DEFERRED FOR SYSTEMATIC RECOGNITION IN SUBSEQUENT YEARS

66⅔% of 2018 Gain/(Loss)	\$ (33,209,534)
33⅓% of 2017 Gain/(Loss)	<u>9,288,521</u>
	\$ (23,921,013)

ACTUARIAL VALUE OF ASSETS

1. Market value as of January 1, 2019	\$ 450,368,075
2. Prior gains/(losses) deferred	<u>(23,921,013)</u>
3. Preliminary Actuarial Value of Assets (1. - 2.)	\$ 474,289,088
4. Preliminary Actuarial Value of Assets as a Percentage of Market Value (3. ÷ 1.)	105.3%
5. Actuarial Value of Assets as of January 1, 2019 (3., limited to 80% - 120% of Market Value))	\$ 474,289,088

TABLE 4
ACTUARIAL BALANCE SHEET
AS OF JANUARY 1, 2019

Requirements

Present Value of Projected Benefits	Tier 1	Tier 2	Total
Retired Members			
Healthy Retirees	\$ 275,412,034	\$ 294,511	\$ 275,706,545
Disabled Retirees	4,235,262	0	4,235,262
Beneficiaries	<u>12,039,143</u>	<u>0</u>	<u>12,039,143</u>
Total	\$ 291,686,439	\$ 294,511	\$ 291,980,950
Vested Inactive Members			
Terminated Vested	\$ 17,511,938	\$ 325,937	\$ 17,837,875
Deferred Disabled	<u>2,231,073</u>	<u>101,922</u>	<u>2,332,995</u>
Total	\$ 19,743,011	\$ 427,859	\$ 20,170,870
Active Members			
Retirement	\$ 195,354,664	\$ 46,209,683	\$ 241,564,347
Withdrawal	11,856,370	16,344,781	28,201,151
Death	4,561,555	1,963,464	6,525,019
Disability	<u>5,234,226</u>	<u>2,783,409</u>	<u>8,017,635</u>
Total	217,006,815	67,301,337	284,308,152
Total Present Value of Projected Benefits	\$ 528,436,265	\$ 68,023,707	\$ 596,459,972

Resources

Actuarial Value of Assets	\$ 474,289,088
Present Value of Future Normal Costs	87,542,715
Unfunded Actuarial Liability	<u>34,628,169</u>
Total	\$ 596,459,972

TABLE 5
UNFUNDED ACTUARIAL LIABILITY (UAL)
AS OF JANUARY 1, 2019

Actuarial Liability	Tier 1	Tier 2	Total
Retired Members	\$ 291,686,439	\$ 294,511	\$ 291,980,950
Vested Inactive Members	19,743,011	427,859	20,170,870
Active Members	177,000,431	19,765,006	196,765,437
Total	\$ 488,429,881	\$ 20,487,376	\$ 508,917,257
Actuarial Value of Assets			\$ 474,289,088
Unfunded Actuarial Liability			\$ 34,628,169

TABLE 6
ANALYSIS OF EXPERIENCE (GAINS) AND LOSSES
PLAN YEAR

Expected Unfunded Actuarial Liability

Unfunded Actuarial Liability as of January 1, 2018	\$ 22,845,085
Normal Cost, including administrative expenses	11,877,027
Employee and Employer Contributions	(15,270,419)
Interest at 7.25%	<u>1,953,007</u>
Expected Unfunded Actuarial Liability as of January 1, 2019	\$ 21,404,700

Changes

Investment ¹ (Gain)/Loss on an Actuarial Value of Assets Basis		6,124,973
Demographic Experience (Gain)/Loss		
Salary (Gain)/Loss	\$ 3,420,224	
New Entrant Participants Loss	470,311	
Retirement (Gain)/Loss	1,383,125	
Pensioner Mortality (Gain)/Loss	655,502	
Cost of Living Adjustment (Below)/Above Assumed	666,358	
All Other Demographic Experience	<u>498,674</u>	
Total Demographic Experience (Gain)/Loss		7,094,194
Assumption Changes		0
Plan Changes ²		<u>4,302</u>
Unfunded Actuarial Liability on January 1, 2019		\$ 34,628,169

¹ The investment (gain)/loss is based on the return on the Actuarial Value of Assets, which recognizes market value returns in any given year that are different than the valuation's investment return assumption systematically over a three year period.

² Tier 2 retirees received a cost of living increase on the Base Benefit effective January 1, 2019 equal to 3.00%. City Code allows the Board to grant a discretionary cost of living increase for the Base Benefit for Tier 2 retirees.

TABLE 7
NORMAL COST
AS OF JANUARY 1, 2019

Entry Age Normal Cost	<u>Tier 1</u>	<u>Tier 2</u>	<u>Total</u>
Retirement	\$ 3,955,640	\$ 3,631,828	\$ 7,587,468
Vested Withdrawal	1,721,986	1,573,463	3,295,449
Death	139,011	153,856	292,867
Disability	<u>217,205</u>	<u>240,722</u>	<u>457,927</u>
Total Normal Cost for Benefits	\$ 6,033,842	\$ 5,599,869	\$ 11,633,711
Assumed Administrative Expenses			<u>585,000</u>
Total Normal Cost			\$ 12,218,711
As a Percentage of Valuation Salary*			11.00%

* Payroll for employees less than the assumed full retirement age (age 70 for Tier 1 and age 75 for Tier 2) as of the valuation date.

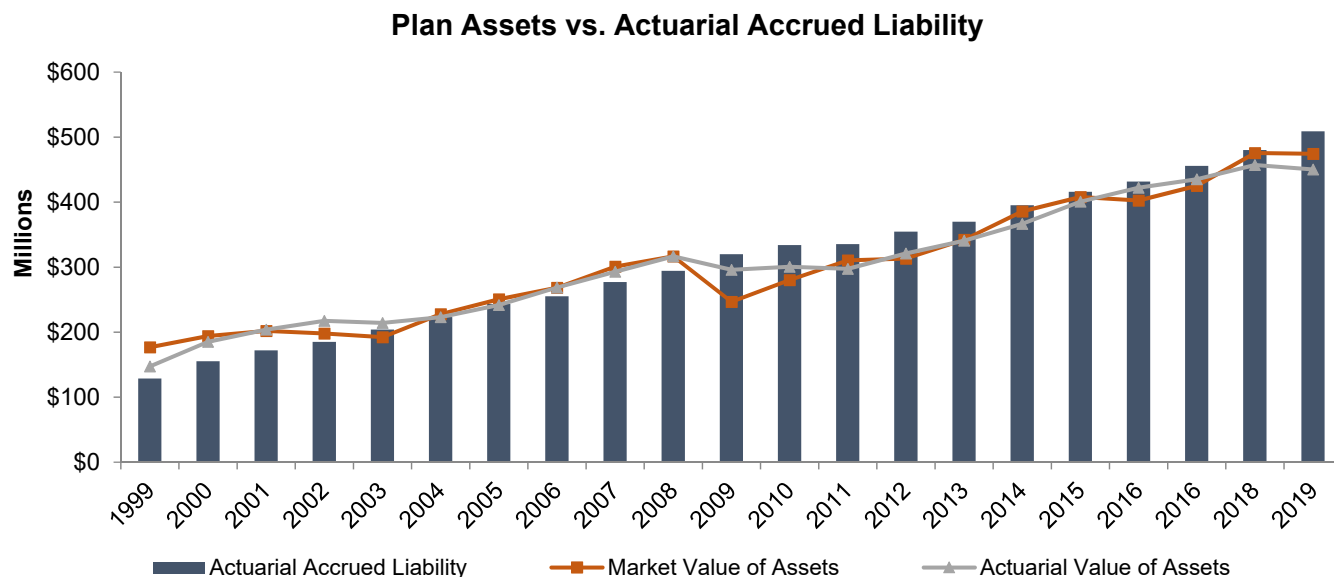
TABLE 8

DEVELOPMENT OF EMPLOYER-PAID ACTUARIALLY DETERMINED CONTRIBUTION

	<u>January 1, 2018</u>	<u>January 1, 2019</u>
1. Present Value of Projected Benefits		
a. Retirees and beneficiaries	\$ 262,374,215	\$ 291,980,950
b. Deferred vested members	20,335,947	20,170,870
c. Active members	<u>281,612,754</u>	<u>284,308,152</u>
d. Total [(a) + (b) + (c)]	\$ 564,322,916	\$ 596,459,972
2. Present Value of Future Normal Costs	<u>84,353,360</u>	<u>87,542,715</u>
3. Entry Age Normal Accrued Liability [(1) – (2)]	\$ 479,969,556	\$ 508,917,257
4. Actuarial Value of Assets	<u>457,124,471</u>	<u>474,289,088</u>
5. Unfunded Actuarial Liability (UAL): [(3) – (4)]	\$ 22,845,085	\$ 34,628,169
6. Amortization Period for UAL	20 years	20 years
7. Entry Age Normal Cost	\$ 11,906,807	\$ 12,218,711
8. Amortization of UAL	1,600,297	2,425,701
9. Interest to the middle of the year	<u>460,231</u>	<u>500,737</u>
10. Total Cost: [(7)+(8)+(9)]	\$ 13,967,335	\$ 15,145,149
11. Anticipated Employee Contributions	<u>(7,516,388)</u>	<u>(7,835,164)</u>
12. Employer-Paid Actuarially Determined Contribution: [(10)+(11)]	\$ 6,450,947	\$ 7,309,985
13. Anticipated Total Payroll	\$ 107,376,973	\$ 111,930,915
14. Employer-Paid Actuarially Determined Contribution as a Percent of Anticipated Total Payroll	6.01%	6.53%

HISTORICAL INFORMATION AND PROJECTIONS

TABLE 9
HISTORICAL FUNDING PROGRESS
PLAN ASSETS VS. ACTUARIAL ACCRUED LIABILITY



Jan. 1,	(A) Market Value of Assets (MVA)	(B) Actuarial Value of Assets (AVA)	(C) Actuarial Liability	(C) - (A) MVA Funding (Surplus)/ Shortfall	(A) / (C) MVA Funded Ratio	(C) - (B) AVA Funding (Surplus)/ Shortfall	(B) / (C) AVA Funded Ratio
1999	\$176,771,147	\$147,257,777	\$128,684,022	\$(48,087,125)	137%	\$(18,573,755)	114%
2000	193,982,980	185,264,480	155,169,044	(38,813,936)	125	(30,095,436)	119
2001	201,890,615	203,862,059	172,005,869	(29,884,746)	117	(31,856,190)	119
2002	198,007,236	217,476,110	184,999,951	(13,007,285)	107	(32,476,159)	118
2003	192,230,162	214,320,251	203,999,260	11,769,098	94	(10,320,991)	105
2004	227,797,938	223,140,793	223,126,549	(4,671,389)	102	(14,244)	100
2005	250,609,598	241,818,542	243,234,592	(7,375,006)	103	1,416,050	99
2006	268,374,886	268,566,265	255,005,107	(13,369,779)	105	(13,561,158)	105
2007	300,988,913	292,889,736	277,052,492	(23,936,421)	109	(15,837,244)	106
2008	316,737,760	316,567,579	294,142,225	(22,595,535)	108	(22,425,354)	108
2009	246,684,838	296,021,806	319,750,886	73,066,048	77	23,729,080	93
2010	280,221,050	300,704,227	333,831,950	53,610,900	84	33,127,723	90
2011	310,556,618	297,494,555	335,310,191	24,753,573	93	37,815,636	89
2012	313,281,809	320,996,231	354,416,941	41,135,132	88	33,420,710	91
2013	342,120,905	340,856,093	369,696,290	27,575,385	93	28,840,197	92
2014	385,882,442	366,577,369	395,063,666	9,181,224	98	28,486,297	93
2015	407,945,659	400,748,065	415,852,539	7,906,880	98	15,104,474	96
2016	402,516,572	422,124,860	431,659,846	29,143,274	93	9,534,986	98
2017	425,231,226	435,153,161	455,759,906	30,528,680	93	20,606,745	95
2018	475,556,466	457,124,471	479,969,556	4,413,090	99	22,845,085	95
2019	450,368,075	474,289,088	508,917,257	58,549,182	89	34,628,169	93

TABLE 10
ANALYSIS OF EXPERIENCE (GAINS) AND LOSSES
HISTORICAL

Plan Year Ending	Actuarial (Gains)/Losses			Changes in Plan Provisions	Changes in Assumption/Methods	Total (Gain)/Loss
	Asset Sources	Liability Sources	Total			
December 31, 2010	23,485,448	(8,080,563)	15,404,885	0	(15,247,082)*	157,803
December 31, 2011	(4,483,174)	(5,162,188)	(9,645,362)	0	975,975*	(8,669,387)
December 31, 2012	(1,064,320)	(6,771,318)	(7,835,638)	0	0	(7,835,638)
December 31, 2013	(5,791,149)	(5,712,203)	(11,503,352)	0	8,841,210*	(2,662,142)
December 31, 2014	(12,639,488)	(1,020,194)	(13,659,682)	0	0	(13,659,682)
December 31, 2015	1,452,303	(6,389,686)	(4,937,383)	0	956,983	(3,980,400)
December 31, 2016	11,641,132	(5,754,735)	5,886,397	0	6,996,522	12,882,919
December 31, 2017	1,207,709	2,378,124	3,585,833	(83,708)	0	3,502,125
December 31, 2018	6,124,973	7,094,194	13,219,167	4,302	0	13,223,469

Values for plan year ending December 31, 2015 and earlier as reported by the prior actuary.

* Net "non-recurring" changes. Prior actuary's report did not delineate between plan and assumption/method changes.

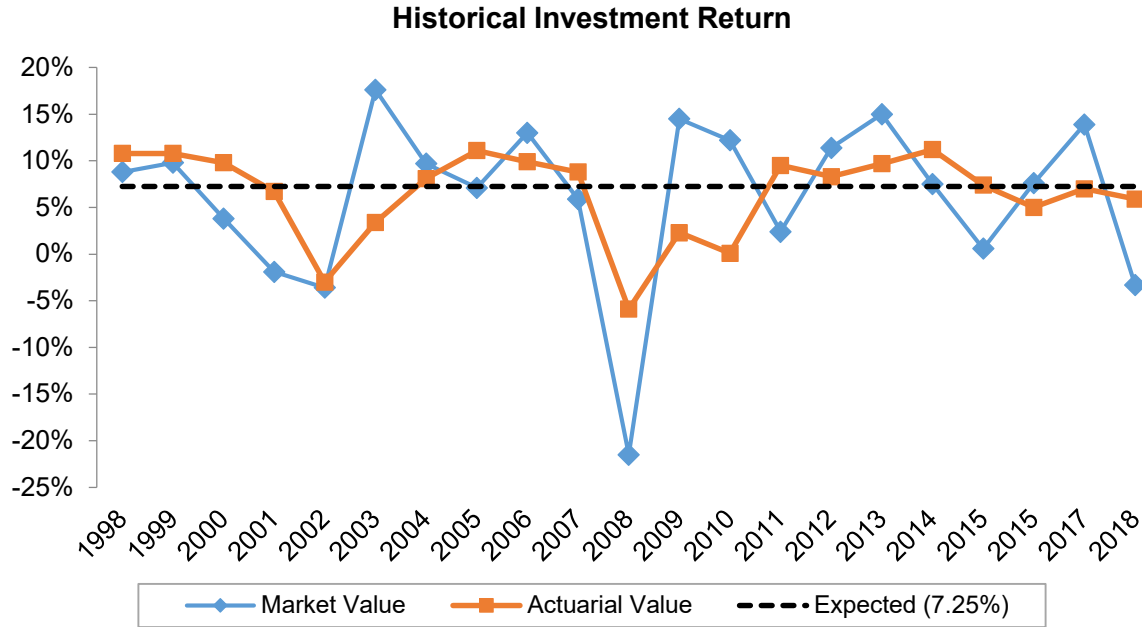
TABLE 11
SOLVENCY TEST

Valuation Date	Actuarial Accrued Liabilities for:			Valuation Assets	Portion of Accrued Liabilities Covered by Valuation Assets		
	(1) Active Member Contributions	(2) Inactive Members	(3) Active Members		(1)	(2)	(3)
January 1, 1999	36,370,601	43,901,137	48,412,284	147,257,777	100%	100%	100%
January 1, 2000	38,805,144	49,290,698	67,073,202	185,264,480	100%	100%	100%
January 1, 2001	41,631,805	56,856,612	73,517,451	203,862,059	100%	100%	100%
January 1, 2002	44,768,076	60,305,096	79,926,779	217,476,110	100%	100%	100%
January 1, 2003	48,736,137	66,075,645	89,187,478	214,320,251	100%	100%	100%
January 1, 2004	53,289,266	71,919,853	97,917,430	223,140,793	100%	100%	100%
January 1, 2005	58,118,119	80,238,773	104,877,700	241,818,542	100%	100%	99%
January 1, 2006	59,491,429	96,596,749	98,916,929	268,566,265	100%	100%	100%
January 1, 2007	61,700,894	108,083,741	107,267,857	292,889,736	100%	100%	100%
January 1, 2008	65,237,335	115,157,203	113,747,687	316,567,579	100%	100%	100%
January 1, 2009	68,764,295	131,939,654	119,046,937	296,021,806	100%	100%	80%
January 1, 2010	72,311,211	138,108,376	123,412,363	300,704,227	100%	100%	73%
January 1, 2011	74,768,249	142,446,528	118,095,414	297,494,555	100%	100%	68%
January 1, 2012	74,788,283	162,428,901	117,199,757	320,996,231	100%	100%	71%
January 1, 2013	74,453,807	179,793,207	115,449,276	340,856,093	100%	100%	75%
January 1, 2014	75,409,870	205,480,329	114,173,467	366,577,369	100%	100%	75%
January 1, 2015	74,299,208	226,648,240	114,905,091	400,748,065	100%	100%	87%
January 1, 2016	74,856,178	239,245,818	117,557,850	422,124,860	100%	100%	92%
January 1, 2017	73,701,869	261,377,011	120,681,026	435,153,161	100%	100%	83%
January 1, 2018	75,156,324	282,710,162	122,103,070	457,124,471	100%	100%	81%
January 1, 2019	74,072,180	312,151,820	122,693,257	474,289,088	100%	100%	72%

Values for January 1, 2016 and earlier as reported by the prior actuary.

TABLE 12

HISTORICAL INVESTMENT RETURN

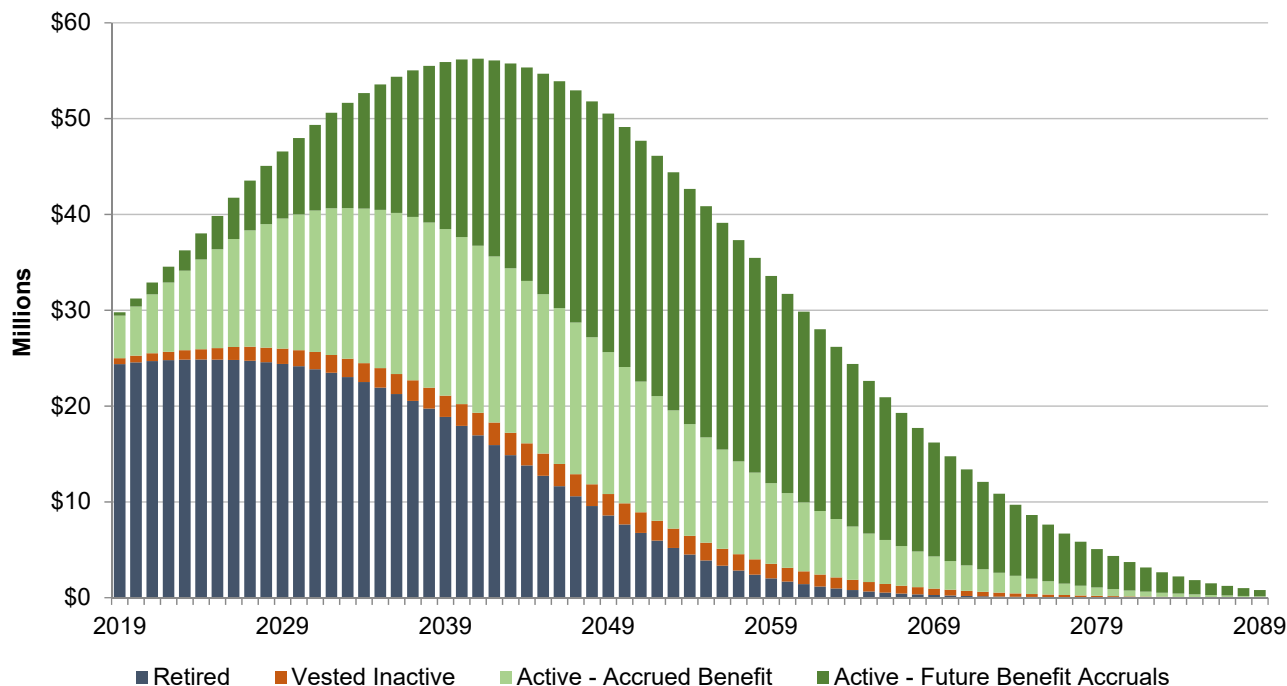


Annual Rate of Investment Return*					
For One-Year Period			For Period Ending December 31, 2018		
Plan Year Ending December 31,	Market	Actuarial	Period	Market	Actuarial
2018	-3.3%	5.9%	1 year	-3.3%	5.9%
2017	13.9%	7.0%	2 years	4.9%	6.4%
2016	7.6%	5.0%	3 years	5.8%	6.0%
2015	0.6%	7.4%	4 years	4.5%	6.3%
2014	7.5%	11.2%	5 years	5.1%	7.3%
2013	15.0%	9.7%	6 years	6.7%	7.7%
2012	11.4%	8.3%	7 years	7.3%	7.8%
2011	2.4%	9.5%	8 years	6.7%	8.0%
2010	12.2%	0.1%	9 years	7.3%	7.1%
2009	14.5%	2.3%	10 years	8.0%	6.6%
2008	-21.5%	-5.9%	11 years	4.9%	5.4%
2007	5.9%	8.8%	12 years	5.0%	5.7%
2006	13.0%	9.9%	13 years	5.6%	6.0%
2005	7.1%	11.1%	14 years	5.7%	6.3%
2004	9.7%	8.1%	15 years	6.0%	6.5%
2003	17.6%	3.4%	16 years	6.7%	6.3%
2002	-3.6%	-3.0%	17 years	6.0%	5.7%
2001	-1.9%	6.7%	18 years	5.6%	5.8%
2000	3.8%	9.8%	19 years	5.5%	6.0%
1999	9.8%	10.8%	20 years	5.7%	6.2%
1998	8.8%	10.8%	21 years	5.8%	6.4%

* For 2016 and prior, rates reflect total investment return, net of investment related and administrative expenses.

TABLE 13

TWENTY-YEAR PROJECTION OF BENEFIT PAYMENTS FOR CURRENT PARTICIPANTS



Detail of Total Projected Benefit Payments and Contribution Refunds for Next 20 Years*

<u>Plan Year</u>	<u>Projected Benefit Payments and Contribution Refunds</u>	<u>Plan Year</u>	<u>Projected Benefit Payments and Contribution Refunds</u>
2019	\$ 29,776,000	2029	\$ 46,564,000
2020	31,210,000	2030	47,970,000
2021	32,890,000	2031	49,342,000
2022	34,543,000	2032	50,611,000
2023	36,249,000	2033	51,645,000
2024	38,013,000	2034	52,653,000
2025	39,825,000	2035	53,564,000
2026	41,735,000	2036	54,356,000
2027	43,520,000	2037	55,023,000
2028	45,056,000	2038	55,497,000

* This valuation, including the projected benefit payments shown, reflects only participants as of the valuation date and does not reflect any projected payments to future new entrants.

TABLE 14
30-YEAR PROJECTION OF CONTRIBUTIONS AND FUNDED RATIO (MILLIONS)

(1) Valuation as of January 1,	(2) Employer Contribution	(3) Employee Contribution	(4) Total Payroll	(5) Actuarial Liability	(6) Actuarial Value of Assets	(7) Unfunded Actuarial Liability	(8) Normal Cost Rate (w/Exp.)	(9) Funded Ratio
2019	7.8	7.8	111.9	508.9	474.3	34.6	11.0%	93%
2020	8.1	8.1	115.6	527.4	484.4	43.0	10.9%	92%
2021	8.4	8.4	119.3	546.1	485.5	60.6	10.8%	89%
2022	8.6	8.6	123.2	564.8	503.3	61.5	10.8%	89%
2023	8.9	8.9	127.2	583.4	521.2	62.2	10.7%	89%
2024	9.2	9.2	131.3	602.0	539.2	62.8	10.7%	90%
2025	9.5	9.5	135.6	620.4	557.3	63.1	10.6%	90%
2026	9.8	9.8	140.0	638.7	575.4	63.3	10.6%	90%
2027	10.1	10.1	144.6	656.8	593.4	63.4	10.5%	90%
2028	10.4	10.4	149.3	674.7	611.6	63.1	10.5%	91%
2029	10.8	10.8	154.1	692.8	630.1	62.7	10.4%	91%
2030	11.1	11.1	159.1	711.1	649.1	62.0	10.4%	91%
2031	11.5	11.5	164.3	729.8	668.7	61.1	10.4%	92%
2032	11.9	11.9	169.6	748.9	689.0	59.9	10.4%	92%
2033	12.3	12.3	175.2	768.6	710.3	58.3	10.3%	92%
2034	12.7	12.7	180.8	789.1	732.8	56.3	10.3%	93%
2035	13.1	13.1	186.7	810.7	756.7	54.0	10.3%	93%
2036	13.5	13.5	192.8	833.5	782.2	51.3	10.3%	94%
2037	13.9	13.9	199.1	857.7	809.6	48.1	10.3%	94%
2038	14.4	14.4	205.5	883.6	839.2	44.4	10.2%	95%
2039	14.9	14.9	212.2	911.6	871.3	40.3	10.2%	96%
2040	15.3	15.3	219.1	941.8	906.3	35.5	10.2%	96%
2041	15.8	15.8	226.2	974.7	944.5	30.2	10.2%	97%
2042	16.4	16.4	233.6	1,010.5	986.4	24.1	10.2%	98%
2043	16.9	16.9	241.2	1,049.9	1,032.6	17.3	10.2%	98%
2044	17.4	17.4	249.0	1,093.3	1,083.5	9.8	10.2%	99%
2045	18.0	18.0	257.1	1,141.0	1,139.7	1.3	10.2%	100%
2046	18.6	18.6	265.4	1,193.7	1,201.7	(8.0)	10.2%	101%
2047	19.2	19.2	274.1	1,251.9	1,270.2	(18.3)	10.2%	101%
2048	19.8	19.8	283.0	1,316.1	1,345.9	(29.8)	10.2%	102%

Note: These projections are based on the actuarial methods, assumptions and plan provisions disclosed in this report, including the use of a 7.25% future return on the market value of assets and a 3.25% future wage inflation. In addition, the projections assume future experience follows assumptions, there are no changes to assumptions, plan provisions or funding policy, and employee and employer contributions of 7% of compensation are made each year.

APPENDIX A

PLAN SUMMARY

All actuarial calculations are based upon our understanding of the provisions of the City of Aurora General Employees' Retirement Plan, as amended through December 31, 2018. This summary does not attempt to cover all of the detailed provisions.

Plan Year

The Plan Year is the 12-month period beginning January 1 and ending December 31.

Effective Date

The original effective date of the Plan is March 1, 1967. The Plan was most recently amended by Ordinance No. 2018-04, effective April 7, 2018.

Employee

All full and part-time career service and Council-appointed employees of the City, other than police officers, firefighters, elected officials, certain executive-level personnel and temporary employees.

Participation

An Employee shall become a Participant upon completion of one hour of service.

Plan Tier

Participants in the plan prior to January 1, 2012 are Tier 1 participants. Participants who first enter the plan after December 31, 2011 are Tier 2 participants.

Final Average Monthly Compensation

An employee's compensation from the city during the 36 highest paid consecutive calendar months of the last ten years of credit service, divided by 36.

Compensation

Compensation means the total base pay, including acting pay, longevity credit, 414(h) and 457 contributions and Section 125 elective pre-tax employee contributions. Overtime, vacation and sick leave pay, and bonuses are excluded.

Compensation is limited under Internal Revenue Code Section 401(a)(17).

Credited Service

A participant's credited service is the elapsed time period from employment commencement date to the date of termination of such employment. Generally, one day of credited service shall be credited for each day in the elapsed period.

Employee Contributions

Beginning in 2017, employees contribute 7.00% of pay. Rates beyond 2017 may increase or decrease 0.25% each year upon the financial condition of the fund but in no case would the rate increase above 7.00% or decrease below 5.50%. Rate changes are based on a decision flowchart designed to keep the funded ratio between 100% and 110%. The employee's contribution account is credited with interest of 4.0% compounded biweekly.

Employer (City) Contributions

The city contributes to the trust an amount equal to the contributions of the employee. Currently, the City contributes 7.00% of payroll.

Normal Retirement Date

Tier 1 Participants: 65th Birthday

Tier 2 Participants: 67th Birthday

Normal Retirement Pension

Each participant who becomes eligible for a Normal Retirement Pension under the Plan will be entitled to receive a monthly retirement pension benefit beginning at the participant's Normal Retirement Date and payable in the Normal Benefit Form equal to 1.75% of Final Average Monthly Compensation multiplied by Years of Credited Service.

In lieu of a monthly pension, the participant may elect to receive a lump sum equal to the participant's contribution accumulated and vested city contributions.

Normal Benefit Form

Life Annuity

Early Retirement Pension

(a) Eligibility

Termination on or after age 50 with 10 or more years of credited service, and not eligible for Normal Retirement Pension or Special Early Retirement Pension

(b) Amount (Base Benefit)

A participant's Early Retirement Pension is a monthly pension benefit equal to his Normal Retirement Pension based on Final Average Monthly Compensation and Credited Service at his date of retirement, and reduced as follows:

Tier 1 Participants

- (i) After age 55: 2% per year prior to the earlier of age 65 (Normal Retirement) or Rule of 80 (age plus service equal to 80 or more)
- (ii) Under age 55 with less than 25 years of credited service: 2% per year for each year that the participant's years of credited service are less than 25 (up to a max of 20%), then further reduced by 6% per year for each year the commencement precedes age 55
- (iii) Under age 55 with at least 25 years of credited service: 6% per year prior to Rule of 80 (age plus service equal to 80 or more)

Tier 2 Participants: 6% per year prior to the earlier of age 67 (Normal Retirement) or Rule of 80 (age plus service equal to 80 or more)

For determining Rule of 80 date for early retirement reductions, service is determined at date of retirement and age is projected forward.

In lieu of a monthly pension, the participant may elect to receive a lump sum equal to the participant's contribution accumulated and vested city contributions.

Special Early Retirement Pension – Rule of 80

(a) Eligibility

Termination on or after age 50 with age plus credited service equal to 80 or more, and not eligible for Normal Retirement Pension

(b) Amount (Base Benefit)

A participant's Special Early Retirement Pension is a monthly pension benefit equal to his Normal Retirement Pension based on Final Average Monthly Compensation and Credited Service at his date of retirement, without reduction.

In lieu of a monthly pension, the participant may elect to receive a lump sum equal to the participant's contribution accumulated and vested city contributions.

Deferred Vested Pension

(a) Eligibility

5 or more years of Credited Service.

(b) Amount (Base Benefit)

A participant's Deferred Vested Pension shall be equal to the participant's Accrued Benefit, payable at Normal Retirement Date. If a participant terminates employment after completing 10 years of credited service, the participant may retire with an Early Retirement Benefit any time after attainment of age 50 and prior to the participant's normal retirement date.

In lieu of a monthly pension, the participant may elect to receive a lump sum equal to the participant's contribution accumulated and vested city contributions.

Money Purchase Pension

(a) Eligibility

Eligible for a Normal Retirement, Early Retirement, Special Early Retirement, or Deferred Vested Pension, and the monthly money purchase pension is greater than the monthly pension calculated pursuant to any of these pensions.

(b) Amount (Base Benefit)

A participant's Money Purchase Pension shall be a monthly amount equal to the Actuarial Equivalent of the participant's contribution accumulation and vested city contributions as of the date the pension commences. The Money Purchase Pension is payable in lieu of a Normal Retirement, Early Retirement, Special Early Retirement, or Deferred Vested Pension.

Disability Retirement Pension

(a) Eligibility

Termination due to Disability, and the Participant received long-term disability insurance payments from the City until his Normal Retirement Date.

(b) Amount (Base Benefit)

A participant's Disability Retirement Pension shall be equal to the participant's Normal Retirement Pension based on the higher of the Final Average Monthly Compensation or the monthly rate of compensation on the date of disablement, and Credited Service the participant would have accrued had he continued employment through his Normal Retirement Date (or date of discontinuance of disability benefits, if earlier).

Supplemental Benefit

(a) Eligibility

In receipt of a monthly benefit under a Normal Retirement, Early Retirement, Special Early Retirement, Deferred Vested, Disability Retirement, or Money Purchase Pension.

(b) Amount (Supplemental Benefit)

A monthly amount equal to \$176.00. This benefit is reduced proportionally if the years of credited service are less than 20.

Termination before Vested Benefit

If a participant terminates employment prior to 5 years of Credited Service, the participant will receive a refund of accumulated employee and vested employer contributions, if any.

Vesting Schedule

(a) For Defined Benefit:

<u>Years of Credited Service</u>	<u>Vested Percentage</u>
Less than 5	0%
5 or more	100%

Participants are fully vested at Normal Retirement Date.

(b) For Vesting in City Contributions:

Participants are vested in the City's contributions and interest according to the following schedule:

<u>Years of Credited Service</u>	<u>Tier 1 Vested Percentage</u>	<u>Tier 2 Vested Percentage</u>
0	25%	0%
1	30%	0%
2	35%	0%
3	40%	0%
4	45%	0%
5	50%	50%
6	55%	55%
7	60%	60%
8	65%	65%
9	70%	70%
10	75%	75%
11	80%	80%
12	85%	85%
13	90%	90%
14	95%	95%
15+	100%	100%

Participants are 100% vested in Employee contributions and interest immediately.

Optional Benefit Forms

Optional Benefit Forms are available for base benefits and equal to the Actuarial Equivalent of the Normal Benefit Form. Such distribution may be as a Joint & 50%, 75%, or 100% Survivor Annuity with Pop-up feature, a 10 or 15 Year Certain and Life Annuity or a Partial Lump Sum up to 20% of the actuarial equivalent of the accrued benefit.

The Supplemental Benefit is paid as a monthly benefit as long as a monthly Base Benefit is being received by a participant or a participant's beneficiary.

Pre-Retirement Death Benefit

If a participant dies prior to completing 5 years of service, the Participant's beneficiary will receive a refund of accumulated employee and vested employer contributions, if any. If a Participant dies after completing 5 years of service, the participant's beneficiary will receive a monthly benefit equal to the supplemental benefit plus the larger of the actuarial equivalent of 60% of the defined benefit formula benefit or the actuarial equivalent of the vested employee and employer contributions. Benefit payments may begin at any time after the date the participant would have attained the earliest retirement age.

Lump Sum Death Benefit

Upon the death of a Retired member receiving a monthly pension, \$6,250 shall be paid in a single sum to the member's designated beneficiary.

In addition, upon the last to die of a Retired member and any beneficiary receiving a monthly pension, a lump sum shall be paid to the estate. This amount shall be equal to the excess, if any, of the participant's contribution accumulation and vested city contributions on the date the pension commenced over the total monthly benefits paid from the time of pension commencement to the date of death.

Cost of Living Adjustment

Tier 1 Participants

- (a) Base Benefit: The monthly amount of the base benefit provided by the Plan shall be increased annually on the first day of each January by the change in the U.S. Consumer Price Index for Urban Wage Earners and Clerical Works (CPI-W) for the averages of the third quarter, rounded to the nearest ½%. The benefit cannot be decreased and annual increases may not exceed 5%.
- (b) Supplemental Benefit: Annual cost of living increases are discretionary and may be granted on an annual basis as determined by the board. The annual increase or decrease cannot exceed plus or minus 5%.

Tier 2 Participants

- (a) Base Benefit: Annual cost of living increases are discretionary and may be granted on an annual basis as determined by the Board. The annual increase cannot exceed the lesser of 5% or the increase which applies to Tier 1 participants.
- (b) Supplemental Benefit: Annual cost of living increases are discretionary and may be granted on an annual basis as determined by the Board. The annual increase or decrease cannot exceed plus or minus 5%.

Actuarial Equivalence

Actuarial Equivalence is calculated using the Society of Actuaries' RP-2000 (no collar) Combined Healthy Mortality Table, blended 50% male, 50% female, a 7.25% interest rate, and a Cost-of-Living assumption of 2.75% for Tier 1 benefits and 0.25% for Tier 2 benefits.

Plan Changes

The effective date of the cost of living assumption provision was updated per Ordinance No. 2018-04 to correct a clerical error made in Ordinance 2017-41 regarding the effective date.

In addition, the Board granted a discretionary cost of living increase for the Base Benefit for Tier 2 Participants effective January 1, 2019 equal to 3.00%.

APPENDIX B

ACTUARIAL PROCEDURES AND ASSUMPTIONS

The actuarial assumptions used in the valuation are intended to estimate future experience affecting projected benefit flow and investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of the Plan's benefits.

The tables in this section give rates of decrement, referred to in actuarial notation by the general symbol "q'." The underlying theory is described more fully in Jordan, *Life Contingencies*, Society of Actuaries (Second Edition, 1967), page 277. Any age referred to in a table is always the age of the person at his or her nearest birthday.

Actuarial Cost Method

The actuarial cost method we use to calculate the funding requirements of the Plan is called the **entry age normal actuarial cost method**.

Under this cost method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit age. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The portion of the actuarial present value not provided for at the valuation date by future Normal Costs is called the actuarial accrued liability.

Actuarial Value of Assets

The actuarial value of assets is determined by calculating the expected return on the prior year's market value of assets, adjusted for cash flows of contributions, administrative expenses, and benefit payments for the year, and assuming a 7.25% interest return for the 2018 and 2017 plan years and 7.75% for plan years prior to 2017. The difference between this expected value and the actual return for the plan year is recognized over 3 years. The actuarial value of assets is then the actual market value minus the gains and losses for prior years that are still deferred. The resulting value is limited to between 80% and 120% of the market value of assets.

Actuarially Determined Contribution (Adopted January 1, 2017)

The method for calculating the Actuarially Determined Contribution (ADC) was adopted by the Board of Trustees. The ADC is calculated using a 20-year amortization of the unfunded actuarial accrued liability or funding excess to determine the amortization component of the ADC. On each valuation date, the newly determined unfunded actuarial accrued liability or funding excess is amortized over an open (or rolling) 20-year amortization period as a level percent of projected pay.

Investment Earnings (Adopted January 1, 2017)

7.25% per annum, compounded annually, net of investment expenses.

The investment return assumption was selected based on the Plan's asset allocation and capital market assumptions from several sources, including published studies summarizing the expectations of various investment experts. This information was then used to develop forward looking long-term expected returns, producing a range of reasonable expectations according to industry experts. Based on the resulting range of potential assumptions, in our professional judgement the selected investment return assumption is reasonable and is not expected to have any significant bias.

Inflation (Adopted January 1, 2017)

2.75% per annum, compounded annually.

Several sources were considered in selecting the inflation assumption, and 2.75% is intended to be a reasonable forward-looking assumption.

Compensation Increase (Inflation and Real Wage Growth adopted January 1, 2017; Merit adopted January 1, 2014)

Annual salary increases are based on a table graded by service. Rates are as follows:

Years of Service	Percentage Increase at Age			
	Inflation	Real Wage Growth	Merit	Total
0-1	2.75%	0.50%	2.75%	6.00%
2	2.75	0.50	2.25	5.50
3	2.75	0.50	1.75	5.00
4-7	2.75	0.50	1.25	4.50
8	2.75	0.50	0.75	4.00
9	2.75	0.50	0.50	3.75
10+	2.75	0.50	0.00	3.25

Total Payroll Growth Rate (Adopted January 1, 2014)

3.25% per annum.

Expenses (Adopted January 1, 2018)

Expenses other than investment expenses are assumed to be \$585,000 per year, payable mid-year.

Employee Contribution Rate

7.00% of compensation, the current employee contribution rate for 2019.

Per guidance provided in the City Code, actual future rates may increase or decrease 0.25% each year depending upon the financial condition of the Plan. Per the City Code, the contribution rate may not exceed 7.00% or be less than 5.50%.

Contribution Accumulation Rate (Adopted January 1, 2010)

4.00% per annum, compounded biweekly.

The contribution accumulation rate is established by the Board at a rate of at least three percent per annum compounded annually. The current rate is 4.00% per annum, compounded biweekly. The Retirement Board reviews this rate in December of each year and has the authority to change it.

Mortality (Adopted January 1, 2014)

Healthy Lives (post-retirement) – RP-2000 Combined Healthy Mortality Tables projected to 2020 using Scale BB; males set forward 1 year, females with 85% multiplier

Healthy Lives (pre-retirement) – RP-2000 Healthy Non-Annuitant Mortality Table with no projection of future mortality improvements

Disabled Lives – RP-2000 Disabled Mortality table with no projection of future mortality improvements

The assumption included a margin for future mortality improvements at the time of the most recent experience study completed by the prior actuary as of December 31, 2012.

Retirement (Adopted January 1, 2014)

For active participants, table of rates by age, based on Tier and eligibility for unreduced retirement, as follows:

Age	Reduced		Unreduced	
	Tier 1	Tier 2	Tier 1	Tier 2
50	2.0%	1.5%	3.0%	3.0%
51	3.0	1.5	3.0	3.0
52	3.0	1.5	10.0	10.0
53	3.0	1.5	10.0	10.0
54	3.0	1.5	10.0	10.0
55	3.0	2.5	8.0	8.0
56	6.0	2.5	8.0	8.0
57	6.0	2.5	8.0	8.0
58	6.0	2.5	8.0	8.0
59	6.0	2.5	8.0	8.0
60	6.0	6.0	8.0	8.0
61	6.0	6.0	15.0	15.0
62	15.0	15.0	25.0	25.0
63	6.0	6.0	20.0	20.0
64	6.0	6.0	15.0	15.0
65	N/A	30.0	30.0	30.0
66	N/A	30.0	30.0	30.0
67	N/A	N/A	30.0	30.0
68	N/A	N/A	50.0	50.0
69	N/A	N/A	50.0	50.0
70-74	N/A	N/A	100.0	75.0
75+	N/A	N/A	100.0	100.0

Current and future vested inactive members are assumed to retire at the earliest age eligible for retirement benefits.

Disablement (Adopted January 1, 2014)

Graduated rates based on age and gender. Sample rates are as follows:

Age	Male	Female
30	0.03%	0.11%
35	0.05	0.16
40	0.06	0.21
45	0.10	0.35
50	0.14	0.48
55	0.25	0.87
60	0.36	1.26

Withdrawal Rates (Adopted January 1, 2005)

Graduated rates based on years of service, age and gender are used. Sample rates are as follows:

Years of Service	Male	Female
0-1	20.0%	23.0%
1-2	16.0	18.0
2-3	13.0	15.0
3-4	11.0	13.0
4-5	9.0	11.0
At Five or More Years of Service:		
Age		
30	7.7%	10.0%
40	5.3	6.5
50	3.4	3.5
60	2.1	1.5

Marital Assumptions

85% of active and deferred vested members not currently receiving benefits are assumed to be married. Male spouses are assumed to be three years older than their female spouses.

Form of Payment Election Assumption (Adopted in 2014)

Current inactive vested members are assumed to take a monthly annuity at retirement in lieu of a lump sum distribution (refund of contribution accumulation plus vested city contributions). 12% of retirements from active service and 50% of terminations from active service are assumed to take lump sums. 100% of members who opt for a monthly annuity are assumed to elect the normal form of payment.

Post Retirement Cost of Living Adjustment Assumption (Adopted January 1, 2017 for Tier 1 Base Benefits; Adopted January 1, 2011 for all other benefits)

Tier 1 Participants: 2.75% per annum for base benefits; 0.00% per annum for supplemental benefits

Tier 2 Participants: 0.00% per annum for base benefits; 0.00% per annum for supplemental benefits

Development of Demographic Assumptions

Demographic assumptions were reviewed at the April 18, 2019 meeting of the Board of Trustees. In addition, an experience study was performed based on data over the five year period ending December 31, 2012, as documented in the Experience Study report completed by GRS in 2014. The demographic assumptions are reviewed annually and refined as necessary based on demographic experience and expectations of future experience. Assumptions for which participant data are limited, such as retiree mortality, were also drawn from published actuarial tables. The assumptions used in this valuation are based on the Experience Study report completed by GRS in 2014, as approved by the Board of Trustees at their April 18, 2019 meeting.

Changes in Actuarial Assumptions and Methods as of January 1, 2019

- None

APPENDIX C

MEMBER DATA

Valuation Date	January 1, 2018	January 1, 2019	Percentage Change
Active Participants			
Number	1,755	1,754	-0.1%
<i>Tier 1</i>	856	758	
<i>Tier 2</i>	899	996	
Average Anticipated Total Payroll (for year following valuation date)	\$61,183	\$63,815	
<i>Tier 1</i>	\$67,337	\$71,606	
<i>Tier 2</i>	\$55,324	\$57,885	
Average Age	46.3	45.8	
<i>Tier 1</i>	52.6	52.9	
<i>Tier 2</i>	40.2	40.5	
Average Credited Service	9.5	9.1	
<i>Tier 1</i>	16.9	17.5	
<i>Tier 2</i>	2.4	2.7	
Vested Terminated Participants			
Number	228	231	1.3%
Average Final Average Compensation	\$48,405	\$49,904	
Average Age	50.4	50.9	
Retired Members and Beneficiaries			
Number	996	1,078	8.2%
Average Monthly Benefit	\$1,786	\$1,853	
Average Age	70.7	70.7	
Deferred Disabled			
Number	21	16	-23.8%
Average Monthly Benefit	\$1,856	\$2,018	
Average Age	55.9	54.7	
Deferred Beneficiaries			
Number	6	3	-50.0%
Average Monthly Benefit	\$581	\$436	
Average Age	47.1	38.0	
Total Participants	3,006	3,082	2.5%

TABLE C-1
RECONCILIATION OF MEMBER DATA
(January 1, 2018 to January 1, 2019)

	Actives	Inactive Deferred Participants	Retiree and Beneficiaries	Disabled Retirees	Total
Included in January 1, 2018 valuation:	1,755	255	972	24	3,006
Change due to:					
New entrants	250	0	0	N/A	250
Rehired	1	(1)	0	0	0
Termination					
Nonvested	(138)	N/A	N/A	N/A	(138)
Vested	(24)	24	0	N/A	0
Retirement	(81)	(17)	93	5	0
Disabled	(2)	2	0	0	0
Death with no Beneficiary	0	0	(17)	0	(17)
Death with a Beneficiary	0	0	0	0	0
Alternate Payee	0	0	1	0	1
Lump sum/Refund of Contributions	(7)	(13)	0	0	(20)
Other	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Net change	(1)	(5)	77	5	76
Included in January 1, 2019 valuation:	1,754	250	1,049*	29	3,082

* There are eight total participants as of January 1, 2019 who are both a retiree and a beneficiary.

TABLE C-2

SUMMARY OF ACTIVE MEMBERS AS OF JANUARY 1, 2019

Number of Members by Age and Service Groups

Age	Years of Service										Total	
	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40&Up		
0-24	33	28	1	-	-	-	-	-	-	-	-	62
25-29	59	97	14	-	-	-	-	-	-	-	-	170
30-34	43	95	33	22	1	-	-	-	-	-	-	194
35-39	37	77	43	38	7	-	-	-	-	-	-	202
40-44	21	77	29	33	21	6	-	-	-	-	-	187
45-49	23	64	34	45	38	14	6	-	-	-	-	224
50-54	18	53	26	49	33	21	7	3	3	-	-	213
55-59	9	56	20	47	35	20	19	16	11	1	-	234
60-64	4	33	22	40	36	21	14	13	11	5	-	199
65-69	3	10	9	10	11	5	2	2	2	-	-	54
70&Up	-	2	2	4	2	1	-	1	2	1	-	15
Total	250	592	233	288	184	88	48	35	29	7	-	1,754

Average Anticipated Total Payroll by Age and Service Groups

Age	Years of Service										Average	
	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40&Up		
0-24	38,825	45,010	49,275	-	-	-	-	-	-	-	-	41,787
25-29	48,928	53,892	57,497	-	-	-	-	-	-	-	-	52,467
30-34	55,422	56,237	59,666	62,588	72,703	-	-	-	-	-	-	57,445
35-39	51,719	60,045	64,678	64,928	70,713	-	-	-	-	-	-	60,794
40-44	55,609	64,830	66,991	76,554	65,804	62,267	-	-	-	-	-	66,226
45-49	52,122	63,813	62,757	69,175	72,109	66,673	68,353	-	-	-	-	65,237
50-54	56,523	64,389	69,100	78,339	69,081	71,800	69,613	65,532	84,064	-	-	69,431
55-59	57,265	65,383	58,250	75,461	63,532	80,460	84,370	75,122	85,716	73,106	-	70,694
60-64	63,236	72,871	65,030	70,154	69,832	66,124	76,229	85,398	76,234	77,561	-	71,361
65-69	25,125	43,529	76,158	69,177	64,849	66,861	95,801	78,726	86,374	-	-	64,024
70&Up	-	47,298	47,117	66,845	41,003	34,504	-	49,887	110,657	165,700	-	67,308
Average	50,770	60,031	63,746	71,646	67,947	70,243	78,317	77,602	83,714	89,516	-	63,815

HISTORICAL SUMMARY

	2015	2016	2017	2018	2019
Number	1,643	1,650	1,733	1,755	1,754
Anticipated Total Payroll		\$95,867,365	\$102,780,086	\$107,376,973	\$111,930,915
Average Total Payroll	\$56,021	\$58,101	\$59,308	\$61,183	\$63,815
Average Age	47.3	47.1	46.4	46.3	45.8
Average Service	10.5	10.4	9.6	9.5	9.1

TABLE C-3

**SUMMARY OF INACTIVE VESTED MEMBERS
AS OF JANUARY 1, 2019***

Number of Members by Age and Service Groups

Age	Years of Service									Total
	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40&Up	
0-29	-	1	-	-	-	-	-	-	-	1
30-34	-	8	-	-	-	-	-	-	-	8
35-39	-	18	8	1	-	-	-	1	-	28
40-44	-	19	8	3	1	1	-	-	1	33
45-49	-	30	6	4	1	-	-	-	-	41
50-54	-	25	9	5	1	1	-	1	1	43
55-59	-	31	2	3	1	2	-	-	1	40
60-64	-	38	4	2	4	-	-	-	-	48
65&Up	-	3	1	-	-	-	-	-	1	5
Total	-	173	38	18	8	4	-	2	4	247

Average Final Average Compensation by Age and Service Groups

Age	Years of Service									Average
	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40&Up	
0-29	-	50,903	-	-	-	-	-	-	-	50,903
30-34	-	43,559	-	-	-	-	-	-	-	43,559
35-39	-	48,126	50,439	55,839	-	-	-	28,909	-	48,376
40-44	-	60,414	58,148	46,490	61,756	65,010	-	-	39,068	58,132
45-49	-	54,871	62,559	54,360	37,921	-	-	-	-	55,533
50-54	-	47,909	54,911	49,073	111,216	56,408	-	22,596	50,151	50,643
55-59	-	43,384	55,133	48,118	34,323	36,817	-	-	48,159	43,891
60-64	-	45,883	42,478	38,935	35,057	-	-	-	-	44,407
65&Up	-	33,474	27,944	-	-	-	-	-	58,589	37,391
Average	-	48,822	53,852	48,907	48,180	48,763	-	25,752	48,992	49,396

HISTORICAL SUMMARY

	2016	2017	2018	2019
<u>Deferred Vested</u>				
Number	220	215	228	231
Average Final Average Compensation		\$46,648	\$48,405	\$49,904
Average Service		8.8	8.7	8.6
Average Age	50.6	50.2	50.4	50.9
<u>Deferred Disabled</u>				
Number	22	20	21	16
Average Final Average Compensation		\$43,428	\$42,974	\$42,070
Average Service		25.6	26.8	29.8
Average Age	58.4	56.5	55.9	54.7

* Does not include 3 deferred beneficiaries.

TABLE C-4
SUMMARY OF RETIREES AND BENEFICIARIES
AS OF JANUARY 1, 2019

Members in Pay Status

<u>Age</u>	<u>Number of Members</u>	<u>Monthly Benefit Amount</u>
< 55	13	\$14,948
55 - 59	84	153,650
60 - 64	166	353,259
65 - 69	274	569,354
70 - 74	244	426,269
75 - 79	138	240,958
80 - 84	79	132,416
85 - 89	57	75,944
90 & Up	<u>23</u>	<u>30,652</u>
Total	1,078*	\$1,997,450

HISTORICAL SUMMARY

	2016	2017	2018	2019
Number	858	945	996	1,078
Total Monthly Benefit	\$1,477,830	\$1,629,446	\$1,778,459	\$1,997,450
Average Monthly Benefit	\$1,722	\$1,724	\$1,786	\$1,853
Average Age	70.4	70.4	70.7	70.7

* There are eight total participants as of January 1, 2019 who are both a retiree and a beneficiary.

TABLE C-5

**SCHEDULE OF RETIREES AND BENEFICIARIES
ADDED TO AND REMOVED FROM ROLLS**

Plan Year Ending	Number Added to Rolls	Allowances Added to Rolls*	Number Removed from Rolls	Annual Allowances Removed from Rolls	Number of Annual Allowances	Annual Allowances	% Increase in Annual Allowances	Average Annual Allowances
12/31/1998	24	336,386	10	92,939	334	3,142,316	8.4	9,408
12/31/1999	26	494,602	12	86,138	348	3,550,780	13.0	10,204
12/31/2000	29	424,053	7	40,491	370	4,059,627	14.3	10,972
12/31/2001	34	522,592	19	141,937	385	4,440,282	9.4	11,533
12/31/2002	29	519,243	17	141,245	397	4,818,280	8.5	12,137
12/31/2003	16	439,456	17	114,998	396	5,142,738	6.7	12,987
12/31/2004	42	432,739	17	155,755	421	5,731,232	11.4	13,613
12/31/2005	53	1,360,120	12	148,221	462	6,943,131	21.1	15,028
12/31/2006	44	983,775	9	91,156	497	7,835,750	12.9	15,766
12/31/2007	36	797,303	19	196,227	514	8,436,826	7.7	16,414
12/31/2008	54	1,429,071	16	271,603	552	9,594,295	13.7	17,381
12/31/2009	41	604,010	19	213,688	574	9,984,617	4.1	17,395
12/31/2010	59	1,188,630	19	231,051	614	10,942,196	9.6	17,821
12/31/2011	67	1,844,967	19	255,630	662	12,531,532	14.5	18,930
12/31/2012	66	1,573,353	13	144,397	715	13,960,488	11.4	19,525
12/31/2013	55	1,246,991	13	180,841	757	15,026,638	7.6	19,850
12/31/2014	75	1,893,779	18	243,569	814	16,676,848	11.0	20,488
12/31/2015	65	1,496,283	21	439,176	858	17,733,955	6.3	20,669
12/31/2016	99	1,961,129	12	141,738	945**	19,553,346	10.3	20,691
12/31/2017	64	1,981,956	13	193,799	996**	21,341,503	9.1	21,427
12/31/2018	99	2,869,920	17	242,026	1,078**	23,969,397	12.3	22,235

* Includes Cost of Living adjustments

** There are eight total participants as of January 1, 2017, January 1, 2018, and January 1, 2019 who are both a retiree and a beneficiary.

APPENDIX D

RISK ASSESSMENT AND DISCLOSURE

The purpose of this appendix is to identify, assess, and provide illustrations of risks that are significant to the Plan. Historical data is included.

The results of the actuarial valuation are based on one set of reasonable assumptions. However, it is almost certain that future experience will not exactly match the assumptions. As an example, investments may perform better or worse than assumed in any single year and over any longer time horizon. It is therefore important to consider the potential impacts of these potential differences when making decisions that may affect the future financial health of the Plan, or of the Plan's participants.

In addition, as plans mature they accumulate larger pools of assets and liabilities. This increases the potential risk to plan funding and the finances of those who are responsible for plan funding. As an example, it is more difficult for a plan sponsor to deal with the effects of a 10% investment loss on a plan with \$1 Billion in assets and liabilities than if the same plan sponsor is responsible for a 10% investment loss on a plan with \$1 Million in assets and liabilities. Since pension plans make long-term promises and rely on long-term funding, it is important to consider how mature the plan is today, and how mature it may become in the future.

Actuarial Standard of Practice No. 51 (ASOP 51) addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed.

This appendix uses the framework of ASOP 51 to communicate important information about significant risks to the Plan, the Plan's maturity, and relevant historical Plan data.

A summary of maturity statistics and historical information is below.

	2017	2018	2019
Assets and Payroll			
Market Value of Assets (MVA)	\$425,231,226	\$475,556,466	\$450,368,075
Covered Payroll	\$102,780,086	\$107,376,973	\$111,930,915
Ratio, MVA to Covered Payroll	4.1	4.4	4.0
Actuarial Liability			
For Retirees and Beneficiaries	\$242,317,843	\$262,374,215	\$291,980,950
For Deferred Vested Participants	19,059,168	20,335,947	20,170,870
For Active Participants	<u>194,382,895</u>	<u>197,259,394</u>	<u>196,765,437</u>
Total	\$455,759,906	\$479,969,556	\$508,917,257
In Pay Liability as a % of Total	53.2%	54.7%	57.4%
Duration (years)			13.9
Cash Flow Measures			
Prior Year MVA	\$402,516,572	\$425,231,226	\$475,556,466
Benefit Payments	21,163,587	22,154,949	24,228,316
Contributions (City + Member)	13,413,072	14,648,024	15,270,419
Benefit Payments as a % of Contributions	157.8%	151.2%	158.7%
Benefit Payments as a % of Prior MVA	5.3%	5.2%	5.1%
Net Cash Flow as a % of Prior MVA	-1.9%	-1.8%	-1.9%

Liquidity Risk

- **Identification:** This is the potential that assets must be liquidated at a loss earlier than planned in order to pay for the plan's benefits and operating costs. This risk is heightened for plans with negative cash flow, in which contributions do not exceed annual benefit payments plus expenses.
- **Assessment:** This Plan has high cash flow requirements because benefit payments are approximately 158% of Plan contributions. As a result, there is liquidity risk that assets may need to be liquidated at a loss before planned in order to pay benefits.

Maturity Risk

- **Identification:** This is the potential for total plan liabilities to become more heavily weighted toward inactive liabilities over time.
- **Assessment:** The Plan is subject to maturity risk because as Plan assets and liabilities continue to grow, the impact of any gains or losses on the assets or liabilities also becomes larger. Currently assets are equal to 4.0 times payroll indicating a one-year loss of 10% would be equal to 40% of payroll. Last year's net cash flow was equal to -1.9% of the beginning of year assets, which means asset needed to return 1.9% last year to remain level.

Retirement Risk

- **Identification:** This is the potential for participants to retire and receive subsidized benefits more valuable than expected.
- **Assessment:** The plan has valuable early retirement subsidies, including unreduced benefits for Rule of 80 retirements. In addition, retiring participants have the option to take an annuity or receive a refund of contributions plus the City match. When participants retire earlier than expected or elect a

form of payment more valuable than the valuation form of payment assumption, the plan occurs a loss.

Contribution Risk

- **Identification:** This is the potential for the City to fail to fund less than the actuarially determined contribution for one or more years. Beginning in 2017, employees contribute 7.00% of pay. Per the current City Code, this contribution may increase or decrease depending on the funding ratio, but in no case would increase above 7.00% or decrease below 5.50%. Per the City Code, rate changes are based on a decision flowchart. The City's current funding policy is to contribute the same rate of pay as employees. The current employee plus City contribution rate is 14.00% of pay and is not able to be increased under current City Code, since 7.00% is the maximum allowable employee contribution rate.
- **Assessment:** The Plan is subject to the contribution risk that the actuarially determined contribution will not be met if it ever exceeds 14.00% (total City plus Employee contribution). If contributions are deferred to the future, investment income is lost in the intervening period and the Plan becomes more expensive. The City has made contributions at or in excess to the actuarially determined contribution for the last five years.

Investment Risk

- **Identification:** The potential that investment returns will be different than expected.
- **Assessment:** To the extent that actual investment returns differ from the assumed investment return, the plan's future assets, funding contributions and funded status may differ significantly from those presented in this valuation. In addition, as discussed under the liquidity and maturity risk assessments above, this risk will be exacerbated as the Plan matures and possibly needs to liquidate assets in a down market to pay benefits to participants, losing the recovery on those assets when the market goes back up.
- **Additional Assessment:** This is one of the most substantial risks the plan faces. You may wish to explore asset/liability modeling or other plan forecasts to see what impact investment volatility has on the Plan's funded status.

Interest Rate Risk

- **Identification:** The potential that interest rates will be different than expected.
- **Assessment:** The pension liabilities reported herein have been calculated by computing the present value of expected future benefit payments using the interest rate described in Appendix B. If interest rates in future valuations are different from that used in this valuation, future pension liabilities, funding contributions and funded status may differ significantly from those presented in this valuation. As a general rule, using a higher interest rate to compute the present value of future benefit payments will result in a lower pension liability, and vice versa. One aspect that can be used to estimate the impact of different interest rates is the plan's duration.

If the interest rate changes by 1%, the estimated percentage change in pension liability is the Plan's duration in years. The approximate duration of this Plan is 13.9 years. As such, if the interest rate changes by 1%, the estimated change in pension liability is 13.9%.

Demographic Risk

- **Identification:** The potential that mortality or other demographic experience will be different than expected.

- **Assessment:** The pension liabilities reported herein have been calculated by assuming that participants will follow patterns of demographic experience (e.g. mortality, withdrawal, disability, retirement, form of payment election, etc.) as described in Appendix B. If actual demographic experience or future demographic assumptions are different from what is assumed to occur in this valuation, future pension liabilities, funding contributions and funded status may differ significantly from those presented in this valuation.