



Dallas Police and Fire Pension System

**Actuarial Valuation and Review as of
January 1, 2019**

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October 4, 2019

Board of Trustees
Dallas Police and Fire Pension System
4100 Harry Hines Blvd., Suite 100
Dallas, TX 75219-3207

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2019. It summarizes the actuarial data used in the valuation, analyzes the preceding year's experience, and establishes the actuarially determined funding requirements for fiscal 2019; actual funding is determined by State law.

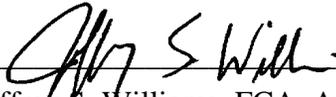
This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Pension System. The census information on which our calculations were based was prepared by the System's IT Department, under the supervision of John Holt, and the financial information was provided by the System's Finance Department. That assistance is gratefully acknowledged.

The actuarial calculations were directed under our supervision. We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of our knowledge, the information supplied in this actuarial valuation is complete and accurate. Further, in our opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the System.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,

Segal Consulting, a Member of The Segal Group, Inc.

By: 
Jeffrey S. Williams, FCA, ASA, MAAA, EA
Vice President and Consulting Actuary

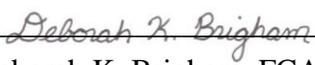

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Senior Vice President and Consulting Actuary

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Section 1: Actuarial Valuation Summary

Purpose and Basis

This report was prepared by Segal Consulting to present a valuation of the Plan as of January 1, 2019. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits and to provide information for required disclosures under Governmental Accounting Standards Board (GASB) Statement No. 67. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of Plan assets to cover the estimated cost of settling the Plan's benefit obligations. 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; and changes in plan provisions or applicable law.

The contribution requirements presented in this report are based on:

- The benefit provisions of the Pension Plan, as administered by the Board;
- The characteristics of covered active members, inactive vested members, inactive members due a refund of contributions, and retired members and beneficiaries as of December 31, 2018, provided by the System's IT Department;
- The assets of the Plan as of December 31, 2018, provided by the System's Finance Department;
- Economic assumptions regarding future salary increases and investment earnings;
- Other actuarial assumptions regarding employee terminations, retirement, death, etc. and
- The requirements of House Bill 3158 (HB 3158), signed into law by the Governor of Texas on May 31, 2017.

The majority of the assumptions and methods used to value the Plan were set by the Board based on recommendations made by Segal Consulting following a five-year experience study for the period ended December 31, 2014. Additional assumption changes were made as part of the plan changes effective September 1, 2017. The salary scale assumption was updated in this valuation to reflect the 2016 Meet and Confer Agreement, as amended in 2018. In addition, the COLA assumption is updated annually. Assumptions are reviewed and updated annually as needed.

Certain disclosure information required by GASB Statement No. 68 as of September 30, 2019 for the City is provided in a separate report.

Significant Issues

1. Segal Consulting (“Segal”) strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and the principal balance. The funding policy adopted by the State in HB 3158 meets this standard, if future payroll matches the City’s Hiring Plan payroll projection. Assuming the City’s Hiring Plan payroll projection materializes, the expected full-funding date is 2057 (last year’s projected date was 2063). The City’s Hiring Plan payroll projection is shown in Exhibit I of Section 4 of the report. From 2017 through 2019, valuation payroll based on participant data is projected to be cumulatively \$52.4 million less than the City’s projection, or 4.69% lower. Member contributions are projected to be approximately \$6.2 million less than they would have been during this time had the City’s Hiring Plan payroll projections materialized. This is an area of concern that needs to be carefully monitored.
2. Actual contributions made by the City during the plan year ending December 31, 2018 were \$149.4 million, or 95.07% of the actuarially determined contribution. In 2017, actual contributions were \$126.3 million, or 74.80% of the prior year actuarially determined contribution.
3. The total contributions made during the plan year ending December 31, 2018 were insufficient to reduce the unfunded actuarial accrued liability. While the unfunded actuarial accrued liability is lower than in the prior valuation, the decrease is due to experience gains and assumption changes as described below. The Board was advised previously that, because the funding policy contributions result in a long effective amortization period, it could be 20 years before the unfunded liability starts to decline.
4. The funded ratio (the ratio of the actuarial value of assets to actuarial accrued liability) is 48.10%, compared to the prior year funded ratio of 47.74%. This ratio is one measure of funding status, and its history is a measure of funding progress. Using the market value of assets, the funded ratio is 45.43%, compared to 46.68% as of the prior valuation date.
5. The projected year of full funding is 2057, but this may vary on an annual basis due to actuarial experience and contributions other than assumed. Through 2024 there is a floor on the City’s contribution levels, which is expected to override the long-term contribution rate of 34.50% of computation pay. Beginning in 2025, when the City is expected to contribute based solely on computation pay, differences between actual payroll and the City’s Hiring Plan payroll will have an impact on when the System is projected to become fully funded. The City’s plan reflects significant growth in payroll over 20 years, from \$372 million in 2017 to \$684 million in 2037. The average annual growth in the City’s Hiring Plan payroll projections is 3.09%, compared to the valuation assumption of 2.75%. If payroll growth is more modest, or if there is adverse actuarial experience, the period required to achieve 100% funding could be significantly longer.
6. If the City’s Hiring Plan projections are not met and instead the current valuation payroll of \$363.1 million increases by the assumed payroll growth of 2.75% each year, and City and member contributions are based on this projected payroll beginning in 2025, the System is projected to be only 30% funded in 2057, rather than 100% funded.

7. Although it is important for the System to meet its 7.25% rate of return assumption on an annual basis, the assets currently cover a relatively low percentage of the liabilities and investment returns alone cannot close the funding gap. It is therefore vital that the City's payroll projections are accurate, or that the long-term level of contributions is at least 34.50% of those payroll projections, for the System to achieve full funding.
8. Texas Code Section 802.101 requires the actuarial valuations of public retirement systems to include a recommended contribution rate based on an amortization period that does not exceed 30 years. The City's actuarially determined contribution (ADC) for the 2019 plan year, based on a 30-year amortization of the unfunded actuarial accrued liability, is \$152.1 million, a decrease of \$5.0 million from last year. The City's ADC as a percentage of payroll decreased from 45.40% of computation pay to 41.88% of computation pay. This decrease is the result of demographic experience gains and assumption changes, offset by an investment experience loss.
9. The System's normal cost plus expenses is 16.69% of computation pay. Members contribute 13.50% of computation pay, and the City contributes the balance. All remaining City contributions are used to pay down the actuarial accrued liability.
10. There was a net experience gain for the year of \$22.0 million, or 0.49% of the actuarial accrued liability. This gain was primarily due to fewer retirements than expected, partially offset by an investment loss. The magnitude of the gain as a percentage of total plan liability is not considered significant for actuarial purposes.
11. The rate of return on the market value of assets was 2.09% for the 2018 plan year. This return was on target with short-term expectations as the System continues to rebalance its investment portfolio. As shown in Exhibit E of Section 3, the System reduced the percentage of the invested portfolio exposed to real assets from 40% to 35% and liquidated all alternative investments over the last year. The reduction of the invested portfolio exposure to real assets and alternative investments led to an increase in the fixed income exposure of over 50%, from 16% to 26% of holdings.
12. The return on the actuarial value of assets was 5.48% for 2018. This resulted in an actuarial loss when measured against the assumed rate of return of 7.25%. This actuarial investment loss increased the actuarially determined contribution by \$2.3 million. Given the low fixed income interest rate environment, target asset allocation and expectations of future investment returns for various classes, we advise the Board to continue to monitor actual and anticipated investment returns relative to their assumed long-term rate of return on investments of 7.25%.
13. The actuarial value of assets is 105.88% of the market value of assets. The investment experience in the past three years has only been partially recognized in the actuarial value of assets. As the deferred loss is recognized in future years, the System's actuarially determined contribution is likely to increase unless the loss is offset by future experience. The recognition of the market losses of \$120.0 million will also have an impact on the future funded ratio. If the deferred losses were recognized immediately in the actuarial value of assets, the actuarially determined contribution would increase from 41.88% to about 43.87% of computation pay.

14. The following actuarial assumptions were changed with this valuation:

- The salary scale assumption was updated to reflect the 2016 Meet and Confer Agreement, as amended in 2018.
- The ad-hoc COLA assumption was updated to begin October 1, 2050 based on the updated projection of the unfunded actuarial accrued liability; last year, the COLA was assumed to begin October 1, 2053.

As a result of these assumption changes, the actuarially determined contribution decreased by \$7.6 million.

15. Since the actuarial valuation results are dependent on a given set of assumptions, there is a risk that emerging results may differ significantly as actual experience proves to be different from the assumptions. We have not been engaged to perform a detailed analysis of the potential range of the impact of risk relative to the System's future financial condition, but have included a brief discussion of some risks that may affect the System in Section 2. A more detailed assessment of the risks would provide the Board with a better understanding of the inherent risks. This could be important because retired participants account for a substantial portion of the System's liabilities, leaving limited options for reducing costs in the event of adverse experience, and actual payroll has been less than the City's Hiring Plan payroll projections to date, which may result in additional funding challenges in the future.
16. This report constitutes an actuarial valuation for the purpose of determining the actuarially determined contribution (ADC) under the System's funding policy. The information contained in Section 5 provides the accounting information for Governmental Accounting Standards Board (GASB) Statement No. 67, for inclusion in the plan and employer's financial statements as of December 31, 2018. The Net Pension Liability (NPL) and Pension Expense under GASB Statement No. 68, for inclusion in the plan and employer's financial statements as of September 30, 2019, will be provided separately.
17. The Net Pension Liability (NPL) is equal to the difference between the Total Pension Liability (TPL) and the Plan's fiduciary net position (equal to the market value of assets). The NPL as of December 31, 2018 is \$2.5 billion, an increase from \$2.4 billion as of December 31, 2018.
18. This actuarial report as of January 1, 2019 is based on financial and demographic data as of December 31, 2018. Changes subsequent to that date are not reflected and will affect future actuarial costs of the plan.

Summary of Key Valuation Results

		2019	2018
Contributions for plan year beginning January 1, adjusted for timing:	• Total actuarially determined contribution (City and member)	\$202,851,063	\$205,478,870
	• Expected member contributions	50,766,766	48,378,742
	• City's actuarially determined contribution (ADC)	152,084,297	157,100,128
	• City's ADC as a percent of computation pay	41.88%	45.40%
	• Actual City contributions	--	\$149,356,565
	• Amortization period for determination of ADC	30 years	30 years
Actuarial accrued liability for plan year beginning January 1:	• Retired members and beneficiaries	\$3,098,053,613	\$2,989,814,931
	• Inactive vested participants	30,007,756	27,386,552
	• Active participants	1,365,339,051	1,487,227,604
	• Inactive participants due a refund of employee contributions	1,422,084	1,008,098
	• Total	4,494,822,504	4,505,437,185
	• Employer normal cost including administrative expenses	11,579,396	15,177,500
Assets for plan year beginning January 1:	• Market value of assets (MVA)	\$2,041,914,130	\$2,103,345,471
	• Actuarial value of assets (AVA)	2,161,899,662	2,151,039,343
	• Actuarial value of assets as a percentage of market value of assets	105.88%	102.27%
Funded status for plan year beginning January 1:	• Unfunded actuarial accrued liability on market value of assets	\$2,452,908,374	\$2,402,091,714
	• Funded percentage on MVA basis	45.43%	46.68%
	• Unfunded actuarial accrued liability on actuarial value of assets	\$2,332,922,842	\$2,354,397,842
	• Funded percentage on AVA basis	48.10%	47.74%
	• Projected year of full funding based on City's Hiring Plan payroll projections	2057	2063
Key assumptions:	• Net investment return	7.25%	7.25%
	• Inflation rate/payroll increase	2.75%	2.75%
GASB information	• Discount rate	7.25%	7.25%
	• Total pension liability	\$4,501,670,375	\$4,497,347,017
	• Plan fiduciary net position	2,041,914,130	2,103,345,471
	• Net pension liability	2,459,756,245	2,394,001,546
	• Plan fiduciary net position as a percentage of total pension liability	45.36%	46.77%
Demographic data for plan year beginning January 1	• Number of retired members and beneficiaries	4,849	4,748
	• Number of inactive vested members	230	226
	• Number of active members	5,012	4,952
	• Number of inactive participants entitled to a refund of employee contributions	431	399
	• Total computation pay ¹	\$363,117,415	\$346,036,690
	• Average computation pay	72,450	69,878

¹Total computation pay, or valuation pay, is the active members' actual payroll for the preceding year, increased by the salary scale applicable for each member to account for their anticipated salary increases in the upcoming year.

Important Information About Actuarial Valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal Consulting (“Segal”) relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by the System. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the market value of assets as of the valuation date, as provided by the System. The System uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results, which does not mean that the previous assumptions were unreasonable.

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

- The actuarial valuation is prepared at the request of the Board. Segal is not responsible for the use or misuse of its report, particularly by any other party.
- An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.
- Actuarial results in this report are not rounded, but that does not imply precision.
- If the Board is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.
- Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The Board should look to their other advisors for expertise in these areas.

As Segal Consulting has no discretionary authority with respect to the management or assets of the System, it is not a fiduciary in its capacity as actuaries and consultants with respect to the System.

Section 2: Actuarial Valuation Results

Member Data

The Actuarial Valuation and Review considers the number and demographic characteristics of covered members, including active members, inactive vested members, retired members and beneficiaries. This section presents a summary of significant statistical data on these member groups.

The average number of active employees in the most recent three years is about 8% less than the average for the preceding seven years, and the number of retirees and beneficiaries has climbed by nearly 15% in the last three years.

More detailed information for this valuation year and the preceding valuation can be found in *Section 3, Exhibits A, B, and C.*

MEMBER POPULATION: 2009 – 2018

Year Ended December 31	Active Members	Inactive Vested Members ¹	Retired Members and Beneficiaries	Total Non-Actives	Ratio of Non-Actives to Actives
2009	5,476	144	3,450	3,594	0.66
2010	5,482	135	3,535	3,670	0.67
2011	5,376	128	3,669	3,797	0.71
2012	5,400	96	3,783	3,879	0.72
2013	5,397	122	3,890	4,012	0.74
2014	5,487	157	4,069	4,226	0.77
2015	5,415	200	4,230	4,430	0.82
2016	5,104	215	4,456	4,671	0.92
2017	4,952	226	4,748	4,974	1.00
2018	5,012	230	4,849	5,079	1.01

¹Excludes non-vested terminated members due a refund of employee contributions

Active Members

Plan costs are affected by the age, years of service and covered compensation of active members. In this year’s valuation, there were 5,012 active members with an average age of 40.1, average years of service of 12.8 years and average computation pay of \$72,450. The 4,952 active members in the prior valuation had an average age of 40.6, average service of 13.4 years and average computation pay of \$69,878.

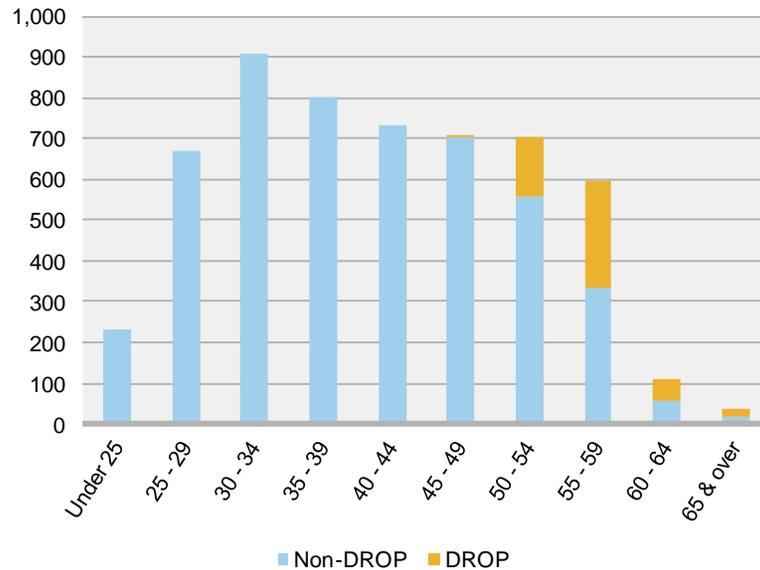
The number of Firefighters increased from 1,884 to 1,996 as of December 31, 2018. The average age of this group is 39.5, the average years of service is 11.9, and the average computation pay is \$71,424. Last year these averages were 40.5, 13.0 and \$70,049, respectively.

The number of Police Officers decreased from 3,068 to 3,016 as of December 31, 2018. The average age of this group is 40.5, the average years of service is 13.3, and the average computation pay is \$73,128. Last year these averages were 40.7, 13.6 and \$69,773, respectively.

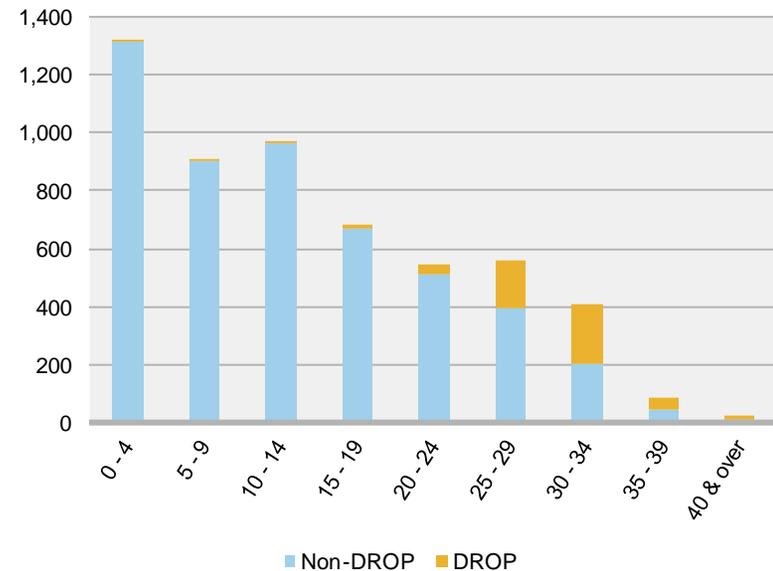
The number of active participants participating in DROP decreased from 626 at the end of 2017 to 483 at the end of 2018.

Distribution of Active Participants as of December 31, 2018

ACTIVES BY AGE



ACTIVES BY YEARS OF SERVICE



Inactive Members

In this year's valuation, there were 230 members with a vested right to a deferred or immediate vested benefit. In addition, there were 431 members entitled to a return of their member contributions.

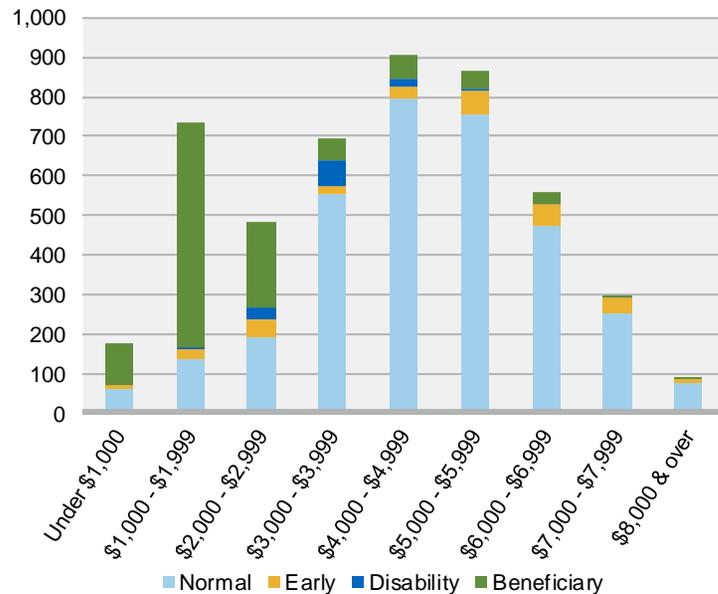
Retired Members and Beneficiaries

As of December 31, 2018, 3,717 retired members and 1,132 beneficiaries were receiving total monthly benefits of \$20,449,452. For comparison, in the previous valuation, there were 3,598 retired members and 1,108 beneficiaries receiving monthly benefits of \$19,629,490. These amounts do not include 70 beneficiaries with annuitized DROP accounts only and no lifetime annuity; there were 50 last year.

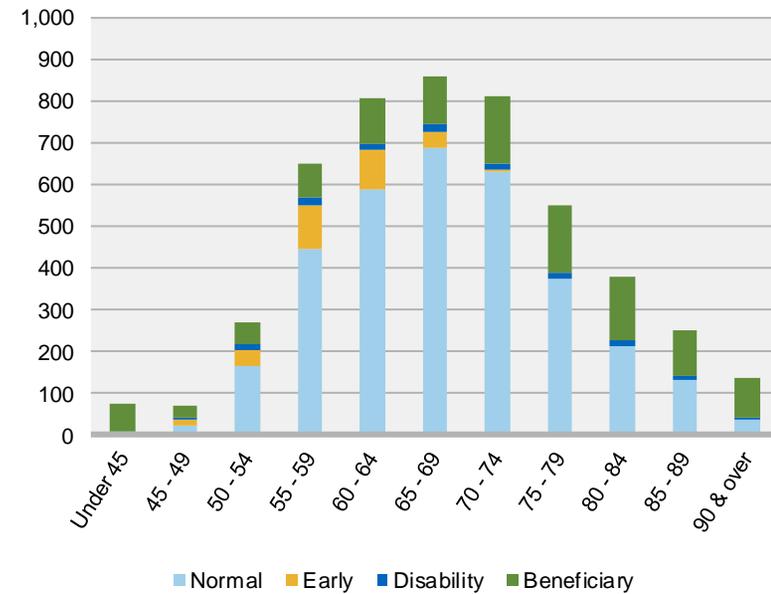
As of December 31, 2018, the average monthly benefit for retired members is \$4,217, compared to \$4,171 in the previous valuation. The average age for retired members is 68.4 in the current valuation, compared with 67.7 in the prior valuation.

Distribution of Pensioners as of December 31, 2018

PENSIONERS BY TYPE AND MONTHLY AMOUNT



PENSIONERS BY TYPE AND AGE



Historical Plan Population

The chart below demonstrates the progression of the active population over the last ten years. The chart also shows the growth among the retired population over the same time period.

MEMBER DATA STATISTICS: 2009 – 2018

Year Ended December 31	Active Participants			Retired Members and Beneficiaries		
	Count	Average Age	Average Service	Count	Average Age ¹	Average Monthly Amount ²
2009	5,476	40.9	14.3	3,450	--	\$3,137
2010	5,482	41.1	14.4	3,535	--	3,251
2011	5,376	41.3	14.5	3,669	--	3,380
2012	5,400	41.3	14.5	3,783	--	3,429
2013	5,397	41.3	14.4	3,890	--	3,543
2014	5,487	41.2	14.2	4,069	68.8	3,699
2015	5,415	41.4	14.3	4,182	69.0	3,826
2016	5,104	41.4	13.0	4,414	68.7	4,102
2017	4,952	40.6	13.4	4,706	67.7	4,171
2018	5,012	40.1	12.8	4,849	68.4	4,217

¹ Information for December 31, 2013 and earlier is not available.

² Average benefits for December 31, 2013 and earlier include terminated vested members; average benefits for December 31, 2014 and later include the benefit supplement.

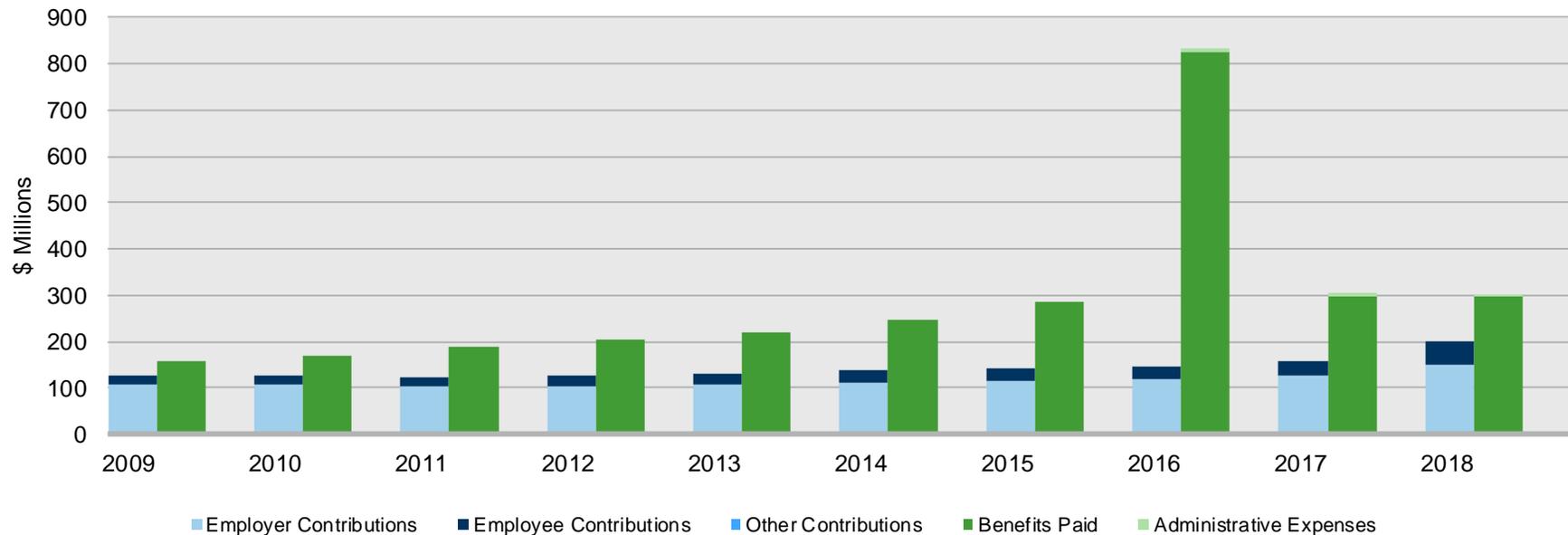
Financial Information

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Benefit payments in 2016 totaled \$825.1 million, of which \$606.3 million were DROP lump-sum payments. This was a one-time event, as members reacted to pending changes in the plan provisions. DROP balances have been annuitized, resulting in more stable projected benefit payment levels in the future.

Additional financial information, including a summary of transactions for the valuation year, is presented in *Section 3, Exhibits D, E and F*.

**COMPARISON OF CONTRIBUTIONS MADE WITH BENEFITS AND EXPENSES PAID
FOR YEARS ENDED DECEMBER 31, 2009 – 2018**



It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value. The actuarial value of assets was reset to market value as of December 31, 2015, with future gains and losses after that date amortized on a straight-line basis over five years.

DETERMINATION OF ACTUARIAL VALUE OF ASSETS FOR YEAR ENDED DECEMBER 31, 2018

1. Market value of assets, December 31, 2018			\$2,041,914,130
2. Calculation of unrecognized return	Original Amount¹	Percent Deferred	Unrecognized Amount²
(a) Year ended December 31, 2018	-\$105,891,055	80%	-\$84,712,844
(b) Year ended December 31, 2017	-52,151,589	60	-31,290,954
(c) Year ended December 31, 2016	-9,954,337	40	<u>-3,981,734</u>
(d) Total unrecognized return			-119,985,532
3. Preliminary actuarial value: (1) - (2d)			\$2,161,899,662
4. Adjustment to be within 20% corridor			0
5. Final actuarial value of assets as of December 31, 2018: (3) + (4)			<u>2,161,899,662</u>
6. Actuarial value as a percentage of market value: (5) ÷ (1)			105.9%
7. Amount deferred for future recognition ³ : (1) - (5)			-\$119,985,532

¹Total return minus expected return on a market value basis

²Recognition at 20% per year over five years

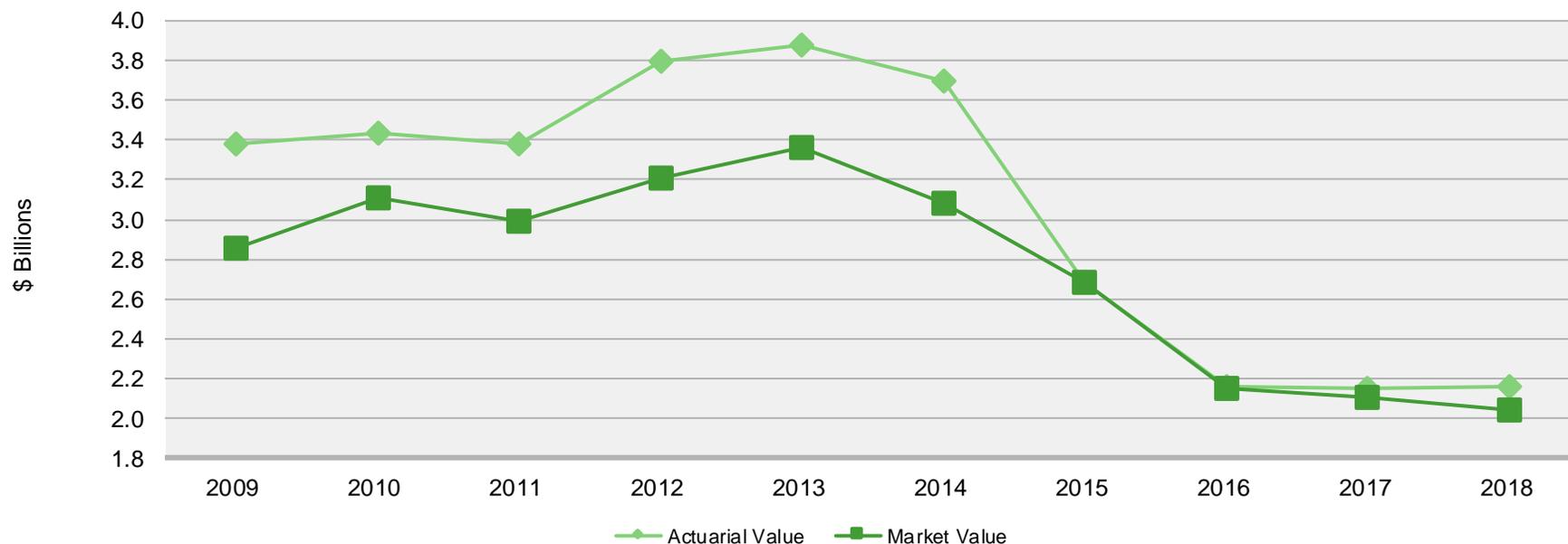
³Deferred return as of December 31, 2018 recognized in each of the next four years:

(a) Amount recognized on December 31, 2019	-\$33,599,396
(b) Amount recognized on December 31, 2020	-33,599,396
(c) Amount recognized on December 31, 2021	-31,608,529
(d) Amount recognized on December 31, 2022	-21,178,211

Both the actuarial value and market value of assets are representations of the Plan’s financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the Plan’s liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

The decline in asset values from 2013 to 2015 was primarily the result of significant write-downs in the System’s asset holdings. The decline from 2015 to 2016 reflects the unusually large number of DROP payments made in 2016.

ACTUARIAL VALUE OF ASSETS VS. MARKET VALUE OF ASSETS AS OF DECEMBER 31, 2009 – 2018



Actuarial Experience

To calculate any actuarially determined contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), any contribution requirement will decrease from the previous year. On the other hand, any contribution requirement will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single years' experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

The total gain is \$22,048,914, which includes \$37,057,201 from investment losses and \$59,106,115 in gains from all other sources. The net experience variation from individual sources other than investments was 1.3% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

ACTUARIAL EXPERIENCE FOR YEAR ENDED DECEMBER 31, 2018

1	Net loss from investments ¹	-\$37,057,201
2	Net gain from administrative expenses	2,732,565
3	Net gain from other experience	56,373,550
4	Net experience gain: 1 + 2 + 3	\$22,048,914

¹Details on next page.

Investment Experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Plan's investment policy. The rate of return on the market value of assets was 2.09% for the year ended December 31, 2018.

For valuation purposes, the assumed rate of return on the actuarial value of assets is 7.25%. The actual rate of return on an actuarial basis for the 2018 plan year was 5.48%. Since the actual return for the year was less than the assumed return, the Plan experienced an actuarial loss during the year ended December 31, 2018 with regard to its investments.

INVESTMENT EXPERIENCE

	Year Ended December 31, 2018		Year Ended December 31, 2017	
	Market Value	Actuarial Value	Market Value	Actuarial Value
1 Net investment income	\$42,822,297	\$115,113,957	\$98,457,176	\$138,187,578
2 Average value of assets	2,051,218,652	2,098,912,524	2,077,362,278	2,085,325,748
3 Rate of return: 1 ÷ 2	2.09%	5.48%	4.74%	6.63%
4 Assumed rate of return	7.25%	7.25%	7.25%	7.25%
5 Expected investment income: 2 x 4	148,713,352	152,171,158	150,608,765	151,186,117
6 Actuarial gain/(loss): 1 – 5	<u>-\$105,891,055</u>	<u>-\$37,057,201</u>	<u>-\$52,151,589</u>	<u>-\$12,998,539</u>

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 11 years, including averages over select time periods.

INVESTMENT RETURN – ACTUARIAL VALUE VS. MARKET VALUE: 2008 - 2018

Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount ¹	Percent	Amount ²	Percent
2008	-\$199,538,242	-6.14%	-\$838,497,127	-24.80%
2009	371,704,709	12.29	347,054,071	13.78
2010	90,332,398	2.69	303,461,949	10.72
2011	14,561,313	0.43	-54,844,275	-1.78
2012	493,841,725	14.79	292,719,981	9.92
2013	169,425,156	4.52	243,514,011	7.70
2014	-75,632,075	-1.98	-176,940,296	-5.35
2015	-1,406,733,309	-24.03	-254,829,470	-8.47
2016	167,318,581	7.16	159,355,111	6.82
2017	138,187,578	6.63	98,457,176	4.74
2018	115,113,957	5.48	42,822,297	2.09
Total	-\$121,418,209		\$162,273,428	
Most recent five-year average return		-7.60%		-1.03%
Most recent ten-year average return		0.27%		3.66%
Most recent 11-year average return		-0.38%		0.53%

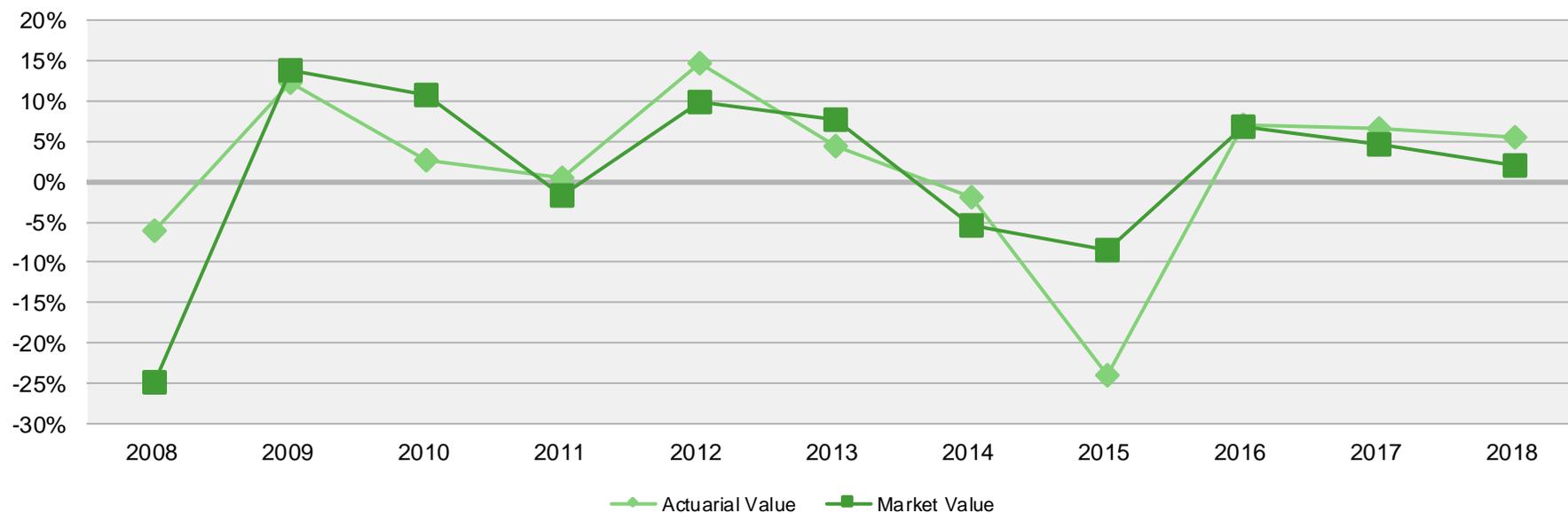
Note: Each year's yield is weighted by the average asset value in that year.

¹Includes a change in asset method for plan years 2012 and 2015.

²Return for years 2014 and 2015 includes significant write-downs for Plan's assets.

As described earlier in this section, the actuarial asset valuation method gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

MARKET AND ACTUARIAL RATES OF RETURN FOR YEARS ENDED DECEMBER 31, 2008 - 2018



Administrative Expenses

Administrative expenses for the year ended December 31, 2018 totaled \$5,861,410, compared to the assumption of \$8,500,000. This resulted in a gain of \$2,732,565 for the year, when adjusted for timing. Because it is expected that these expenses will increase, we have maintained the assumption of \$8,500,000 for the current year.

Other Experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- mortality (more or fewer deaths than projected),
- the number of disability retirements (more or fewer than projected), and
- salary increases (greater or smaller than projected).

The net gain from this other experience for the year ended December 31, 2018 amounted to \$56,373,550 which is 1.2% of the actuarial accrued liability.

Changes in the Actuarial Accrued Liability

The actuarial accrued liability as of January 1, 2019 is \$4,494,822,504, a decrease of \$10,614,681, or 0.2%, from the actuarial accrued liability as of the prior valuation date. The liability is expected to grow each year with normal cost and interest, and to decline due to benefit payments made. Additional fluctuations can occur due to actual experience that differs from expected (as discussed in the previous subsection). It also includes the impact of actuarial assumption and plan provision changes, if any.

Actuarial Assumptions

- The assumption changes reflected in this report are:
 - The salary scale assumption was updated to reflect the 2016 Meet and Confer Agreement, as amended in 2018.
 - The COLA is assumed to begin October 1, 2050 based on the year the System is projected to be 70% funded on a market value basis; last year's assumption was that the COLA would begin October 1, 2053.
- These changes decreased the actuarial accrued liability by 0.89% and decreased the normal cost by 11.95%.
- Details on actuarial assumptions and methods are in *Section 4, Exhibit I*.

Plan Provisions

- There were no changes in plan provisions since the prior valuation.
- A summary of plan provisions is in *Section 4, Exhibit II*.

Development of Unfunded Actuarial Accrued Liability

DEVELOPMENT FOR YEAR ENDED DECEMBER 31, 2018

1	Unfunded actuarial accrued liability at beginning of year	\$2,354,397,842
2	Normal cost at beginning of year, including administrative expenses	61,892,453
3	Total contributions	-198,688,827
4	Interest	
	• For whole year on 1 + 2	\$175,181,046
	• For half year on 3	<u>-7,118,165</u>
	Total interest	<u>168,062,881</u>
5	Expected unfunded actuarial accrued liability	\$2,385,664,349
6	Changes due to:	
	• Net experience gain	-\$22,048,914
	• Assumptions	<u>-30,692,593</u>
	Total changes	<u>-52,741,507</u>
7	Unfunded actuarial accrued liability at end of year	<u>\$2,332,922,842</u>

Actuarially Determined Contribution

The actuarially determined contribution is equal to the employer normal cost payment and a payment on the unfunded actuarial accrued liability. As of January 1, 2019, the actuarially determined contribution is \$152,084,297, or 41.88% of computation pay.

Texas Code Section 802.101 requires the actuarial valuations of public retirement systems to include a recommended contribution rate based on an amortization period that does not exceed 30 years. On this basis, the actuarially determined employer contribution is 41.88% of computation pay. Under the provisions of HB 3158, the City contributes mandated biweekly amounts through 2024 (but no less than 34.50% of computation pay), plus \$13 million per year. Beginning January 1, 2025, the City will contribute 34.50% of computation pay. The effective amortization period, based on the City's Hiring Plan payroll projections, is 38 years.

The contribution requirement as of January 1, 2019 are based on the data previously described, the actuarial assumptions and Plan provisions described in *Section 4*, including all changes affecting future costs adopted at the time of the actuarial valuation, actuarial gains and losses, and changes in the actuarial assumptions.

ACTUARIALLY DETERMINED CONTRIBUTION FOR YEAR BEGINNING JANUARY 1

	2019		2018	
	Amount	% of Total Computation Pay	Amount	% of Total Computation Pay
1. Total normal cost	\$52,392,570	14.43%	\$53,684,776	15.52%
2. Administrative expenses	8,207,677	2.26%	8,207,677	2.37%
3. Expected member contributions	<u>-49,020,851</u>	<u>-13.50%</u>	<u>-46,714,953</u>	<u>-13.50%</u>
4. Employer normal cost: (1) + (2) + (3)	\$11,579,396	3.19%	\$15,177,500	4.39%
5. Actuarial accrued liability	\$4,494,822,504		\$4,505,437,185	
6. Actuarial value of assets	<u>2,161,899,662</u>		<u>2,151,039,343</u>	
7. Unfunded actuarial accrued liability: (5) - (6)	\$2,332,922,842		\$2,354,397,842	
8. Payment on unfunded actuarial accrued liability, 30-year amortization	135,274,585	37.25%	136,519,813	39.45%
9. Adjustment for timing ¹	<u>5,230,316</u>	<u>1.44%</u>	<u>5,402,815</u>	<u>1.56%</u>
10. Actuarial determined employer contribution: (4) + (8) + (9)	<u>\$152,084,297</u>	<u>41.88%</u>	<u>\$157,100,128</u>	<u>45.40%</u>
11. Total computation pay ²	\$363,117,415		\$346,036,690	

¹Actuarially determined contributions are assumed to be paid at the middle of every year.

²Total computation pay, or valuation pay, is the active members' actual payroll for the preceding year, increased by the salary scale applicable for each member to account for their anticipated salary increases in the upcoming year.

Reconciliation of Actuarially Determined Contribution

The chart below details the changes in the actuarially determined contribution from the prior valuation to the current year's valuation.

RECONCILIATION OF ACTUARIALLY DETERMINED CONTRIBUTION FROM JANUARY 1, 2018 TO JANUARY 1, 2019

	Amount
Actuarially Determined Contribution as of January 1, 2018	\$157,100,128
• Effect of expected change in amortization payment due to payroll growth	3,888,007
• Effect of maintaining 30-year amortization period	-2,414,823
• Effect of investment loss	2,263,153
• Effect of other gains and losses on accrued liability	-3,609,721
• Effect of changes in actuarial assumptions	-7,626,915
• Effect of contributions less than actuarially determined contribution	426,902
• Net effect of other changes, including composition and number of participants	<u>2,057,566</u>
Total change	-\$5,015,831
Actuarially Determined Contribution as of January 1, 2019	\$152,084,297

History of Employer Contributions

A history of the most recent years of contributions is shown below.

HISTORY OF EMPLOYER CONTRIBUTIONS: 2016 – 2019

Fiscal Year Ended December 31	Actuarially Determined Employer Contribution (ADEC)		Actual Employer Contribution		Percent Contributed
	Amount	Percentage of Covered Compensation	Amount	Percentage of Covered Compensation	
2016	\$261,859,079	71.70%	\$119,423,106	32.70%	45.61%
2017	168,865,484	47.25%	126,318,005	35.34%	74.80%
2018	157,100,128	45.40%	149,356,565	43.16%	95.07%
2019	152,084,297	41.88%	N/A	N/A	N/A

Risk

Since the actuarial valuation results are dependent on a given set of assumptions and data as of a specific date, there is a risk that emerging results may differ significantly as actual experience differs from the assumptions.

This report does not contain a detailed analysis of the potential range of future measurements, but does include a brief discussion of some risks that may affect the System. Upon request, a more detailed assessment of the risks can be provided to enable a better understanding of the risks inherent in the Plan. This assessment may include scenario testing, sensitivity testing, stress testing and stochastic modeling.

➤ **Investment Risk** (the risk that returns will be different than expected)

The System has experienced some of the challenges associated with investment risk, and has had to write down the value of its assets significantly in recent years. Recognized market returns have been well below the long-term assumption as the System rebalances the investment portfolio, and are expected to continue to be below average in the short-term.

The market value rate of return over the last ten years has ranged from a low of -8.47% to a high of 13.78%.

➤ **Contribution Risk** (the risk that actual contributions will be different than expected)

Plan contributions are set by statute. Periodic projections are prepared by the actuary to determine if expected statutory contributions are sufficient to fund the System and ensure the payment of promised benefits.

Although State law establishes minimums on the City contributions through 2024, the contribution is scheduled to be a flat 34.50% of computation pay beginning in 2025. If the payroll growth matches the City's Hiring Plan projections, and if all other assumptions are met, the System is projected to be fully funded by 2057. The City's plan reflects significant growth in payroll over 20 years, from \$372 million in 2017 to \$684 million in 2037. The annual average growth in the City Hiring Plan is 3.09%, compared to the valuation assumption of 2.75%. If payroll growth is more modest, or if there is adverse experience in the System that leads to losses, the period required to achieve 100% funding could be significantly longer.

Through the first three years of the policy (2017 through 2019), valuation payroll based on participant data is cumulatively \$52.4 million less than the City's projections. If the City's Hiring Plan projections are not met and instead the current valuation payroll of \$363 million increases by the assumed payroll growth of 2.75% each year, and City and member contributions are based on this projected payroll beginning in 2025, the System is projected to be only 30% funded in 2057, rather than 100% funded.

➤ **Longevity Risk** (the risk that mortality experience will be different than expected)

The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution.

➤ **Demographic Risk** (the risk that participant experience will be different than assumed)

Examples of this risk include:

- Actual retirements occurring earlier or later than assumed. The value of retirement plan benefits is sensitive to the rate of benefit accruals and any early retirement subsidies that apply.
- More or less active participant turnover than assumed.

➤ **Actual Experience Over the Last Ten years and Implications for the Future**

Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience. Over the past ten years:

- The annual market value investment experience has ranged from a loss of \$473 million (including write-downs) to a gain of \$133 million. If all investment returns were equal to the assumed rates of return over the last ten years, the market value of assets as of the current valuation date would be approximately \$4.2 billion as opposed to the actual value of \$2.0 billion.
- The funded percentage on the actuarial value of assets has ranged from a low of 45.1% to a high of 81.9% since 2010.

➤ **Maturity Measures**

As pension plans mature, the cash needed to fulfill benefit obligations will increase over time. Therefore, cash flow projections and analysis should be performed to assure that the Plan's asset allocation is aligned to meet emerging pension liabilities.

Currently the Plan has a non-active to active participant ratio of 1.01. For the prior year, benefits paid were \$98.4 million more than contributions received. As the Plan matures, more cash will be needed from the investment portfolio to meet benefit payments.

GFOA Solvency Test

The Actuarial Accrued Liability represents the present value of benefits earned, calculated using the plan’s actuarial cost method. The Actuarial Value of Assets reflects the financial resources available to liquidate the liability. The portion of the liability covered by assets reflects the extent to which accumulated plan assets are sufficient to pay future benefits, and is shown for liabilities associated with employee contributions, pensioner liabilities, and other liabilities.

The Government Finance Officers Association (GFOA) recommends that the funding policy aim to achieve a funded ratio of 100 percent. As noted previously, the funding policy adopted by the State in HB 3158 meets this standard, with full funding projected in 2057, if the City’s Hiring Plan payroll projections come to fruition. City and member contributions, as well as investment returns, will be necessary to increase the assets sufficiently to cover the System’s liabilities.

GFOA SOLVENCY TEST AS OF DECEMBER 31

	2019	2018
Actuarial accrued liability (AAL)		
• Active member contributions	\$292,370,335	\$280,965,388
• Retirees and beneficiaries	3,098,053,613	2,989,814,931
• Active and inactive members (employer-financed)	1,104,398,556	1,234,656,866
Total	\$4,494,822,504	\$4,505,437,185
Actuarial value of assets	\$2,161,899,662	\$2,151,039,343
Cumulative portion of AAL covered		
• Active member contributions	100.00%	100.00%
• Retirees and beneficiaries	60.35%	62.55%
• Active and inactive members (employer-financed)	0.00%	0.00%

Actuarial Balance Sheet

An overview of the Plan’s funding is given by an Actuarial Balance Sheet. In this approach, first the amount and timing of all future payments that will be made by the Plan for current participants is determined. Then these payments are discounted at the valuation interest rate to the date of the valuation, thereby determining the present value, referred to as the “liability” of the Plan.

Second, this liability is compared to the assets. The “assets” for this purpose include the net amount of assets already accumulated by the Plan, the present value of future member contributions, the present value of future employer normal cost contributions, and the present value of future employer amortization payments for the unfunded actuarial accrued liability.

ACTUARIAL BALANCE SHEET

	Year Ended	
	December 31, 2018	December 31, 2017
Liabilities		
• Present value of benefits for retired members and beneficiaries (non-DROP)	\$2,269,533,590	\$2,180,228,938
• Present value of benefits for retired members and beneficiaries (DROP)	828,520,023	809,585,993
• Present value of benefits for inactive vested members	31,429,840	28,394,650
• Present value of benefits for active members	<u>1,805,794,095</u>	<u>1,972,348,070</u>
Total liabilities	\$4,935,277,548	\$4,990,557,651
Assets		
• Total valuation value of assets	\$2,161,899,662	\$2,151,039,343
• Present value of future contributions by members	408,403,137	416,859,565
• Present value of future employer contributions for:		
» Entry age cost	32,051,907	68,260,901
» Unfunded actuarial accrued liability	<u>2,332,922,842</u>	<u>2,354,397,842</u>
Total of current and future assets	<u>\$4,935,277,548</u>	<u>\$4,990,557,651</u>

Section 3: Supplemental Information

EXHIBIT A – TABLE OF PLAN COVERAGE

Category	Year Ended December 31		Change From Prior Year
	2018	2017	
Active members in valuation:			
• Number	5,012	4,952	1.2%
• Average age	40.1	40.6	-0.5
• Average years of service	12.8	13.4	-0.6
• Total computation pay	\$363,117,415	\$346,036,690	4.9%
• Average computation pay	72,450	69,878	3.7%
• Accumulated contribution balances	292,370,335	280,965,388	4.1%
• Total active vested members	3,677	3,757	-2.1%
Active members (excluding DROP):			
• Number	4,529	4,326	4.7%
• Average age	38.3	38.3	0.0
• Average years of service	10.9	11.0	-0.1
• Total computation pay	\$319,183,812	\$292,533,861	9.1%
• Average computation pay	70,476	67,622	4.2%
Active members in valuation (DROP only):			
• Number	483	626	-22.8%
• Average age	56.8	56.1	0.7
• Average years of service	30.1	29.7	0.4
• Total computation pay	\$43,933,603	\$53,502,829	-17.9%
• Average computation pay	90,960	85,468	6.4%
• DROP account balances	192,374,548	241,364,638	-20.3%
Inactive vested members:			
• Number	230	226	1.8%
• Average age	40.6	39.8	0.8
• Average monthly benefit	\$1,247	\$1,164	7.1%
Terminated members due a refund of contributions:			
• Number	431	399	8.0%
• Accumulated contribution balance	\$1,422,084	\$1,008,098	41.1%

Retired members:			
• Number in pay status	3,583	3,455	3.7%
• Average age	67.2	67.1	0.1
• Average monthly benefit	\$4,862	\$4,831	0.6%
Disabled members:			
• Number in pay status	134	143	-6.3%
• Average age	67.6	66.8	0.8
• Average monthly benefit	\$3,591	\$3,570	0.6%
Beneficiaries:			
• Number in pay status	1,132	1,108	2.2%
• Average age	72.4	72.5	-0.1
• Average monthly benefit	\$2,250	\$2,191	2.7%
Beneficiaries with DROP only:			
• Number	70	50	40.0%

**EXHIBIT B-1 – TOTAL MEMBERS IN ACTIVE SERVICE AS OF DECEMBER 31, 2018
BY AGE, YEARS OF SERVICE, AND AVERAGE COVERED COMPENSATION**

Age	Total	Years of Service								
		0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	230	230	--	--	--	--	--	--	--	--
	\$50,956	\$50,956	--	--	--	--	--	--	--	--
25 - 29	670	561	108	1	--	--	--	--	--	--
	54,727	52,852	\$64,356	\$66,475	--	--	--	--	--	--
30 - 34	908	342	392	174	--	--	--	--	--	--
	62,055	53,645	66,002	69,692	--	--	--	--	--	--
35 - 39	802	125	239	371	67	--	--	--	--	--
	68,136	54,472	65,497	71,936	\$82,001	--	--	--	--	--
40 - 44	735	36	100	245	286	68	--	--	--	--
	77,953	55,716	65,145	72,709	86,746	\$90,466	--	--	--	--
45 - 49	703	15	37	106	221	248	76	--	--	--
	86,022	74,013	65,094	72,444	85,983	93,285	\$93,930	--	--	--
50 - 54	556	3	13	42	68	154	215	61	--	--
	88,731	57,163	68,899	74,374	85,401	90,059	92,560	\$91,254	--	--
55 - 59	332	4	8	20	25	34	87	126	28	--
	89,834	63,908	76,032	78,315	86,503	90,463	90,701	92,585	\$92,847	--
60 - 64	58	--	2	4	3	5	13	14	13	4
	88,138	--	78,116	68,886	86,126	96,387	84,987	91,082	90,564	\$95,651
65 - 69	14	--	2	1	--	--	1	2	2	6
	89,899	--	76,675	83,701	--	--	73,376	86,684	103,066	94,776
70 & over	4	--	--	--	--	--	1	--	--	3
	110,318	--	--	--	--	--	100,123	--	--	113,716
Total	5,012	1,316	901	964	670	509	393	203	43	13
	\$72,450	\$53,244	\$65,720	\$72,016	\$85,872	\$91,775	\$92,134	\$92,023	\$92,632	\$99,416

**EXHIBIT B-2 – POLICE MEMBERS IN ACTIVE SERVICE AS OF DECEMBER 31, 2018
BY AGE, YEARS OF SERVICE, AND AVERAGE COVERED COMPENSATION**

Age	Total	Years of Service								
		0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	138	138	--	--	--	--	--	--	--	--
	\$52,143	\$52,143	--	--	--	--	--	--	--	--
25 - 29	389	306	83	--	--	--	--	--	--	--
	55,797	53,510	\$64,230	--	--	--	--	--	--	--
30 - 34	503	144	243	116	--	--	--	--	--	--
	63,215	55,326	64,975	\$69,322	--	--	--	--	--	--
35 - 39	467	50	120	246	51	--	--	--	--	--
	69,231	55,970	64,694	71,644	\$81,270	--	--	--	--	--
40 - 44	433	21	56	146	167	43	--	--	--	--
	76,575	56,466	64,217	71,820	84,061	\$89,566	--	--	--	--
45 - 49	469	12	33	79	130	165	50	--	--	--
	84,444	77,289	65,063	72,559	84,138	92,440	\$92,136	--	--	--
50 - 54	392	1	13	30	39	101	179	29	--	--
	88,276	63,563	68,899	73,260	85,729	89,659	91,964	\$89,196	--	--
55 - 59	187	--	4	13	19	22	57	60	12	--
	89,792	--	73,630	75,057	85,313	93,730	91,105	92,145	\$93,020	--
60 - 64	30	--	1	3	3	3	9	7	4	--
	87,419	--	84,081	71,403	86,126	90,367	85,922	91,626	95,028	--
65 - 69	6	--	1	1	--	--	--	--	1	3
	88,005	--	81,411	83,701	--	--	--	--	88,359	\$91,519
70 & over	2	--	--	--	--	--	1	--	--	1
	109,420	--	--	--	--	--	100,123	--	--	118,718
Total	3,016	672	554	634	409	334	296	96	17	4
	\$73,128	\$54,333	\$64,950	\$71,538	\$83,970	\$91,295	\$91,672	\$91,216	\$93,219	\$98,319

**EXHIBIT B-3 – FIRE MEMBERS IN ACTIVE SERVICE AS OF DECEMBER 31, 2018
BY AGE, YEARS OF SERVICE, AND AVERAGE COVERED COMPENSATION**

Age	Total	Years of Service								
		0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	92	92	--	--	--	--	--	--	--	--
	\$49,176	\$49,176	--	--	--	--	--	--	--	--
25 - 29	281	255	25	1	--	--	--	--	--	--
	53,245	52,063	\$64,775	\$66,475	--	--	--	--	--	--
30 - 34	405	198	149	58	--	--	--	--	--	--
	60,614	52,423	67,678	70,430	--	--	--	--	--	--
35 - 39	335	75	119	125	16	--	--	--	--	--
	66,609	53,474	66,307	72,510	\$84,329	--	--	--	--	--
40 - 44	302	15	44	99	119	25	--	--	--	--
	79,928	54,666	66,325	74,021	90,516	\$92,014	--	--	--	--
45 - 49	234	3	4	27	91	83	26	--	--	--
	89,185	60,911	65,343	72,106	88,618	94,967	\$97,380	--	--	--
50 - 54	164	2	--	12	29	53	36	32	--	--
	89,816	53,963	--	77,159	84,960	90,821	95,525	\$93,119	--	--
55 - 59	145	4	4	7	6	12	30	66	16	--
	89,888	63,908	78,434	84,365	90,274	84,473	89,933	92,986	\$92,717	--
60 - 64	28	--	1	1	--	2	4	7	9	4
	88,909	--	72,150	61,331	--	105,417	82,884	90,538	88,581	\$95,651
65 - 69	8	--	1	--	--	--	1	2	1	3
	91,319	--	71,938	--	--	--	73,376	86,683	117,773	98,033
70 & over	2	--	--	--	--	--	--	--	--	2
	111,215	--	--	--	--	--	--	--	--	111,215
Total	1,996	644	347	330	261	175	97	107	26	9
	\$71,424	\$52,107	\$66,949	\$72,933	\$88,852	\$92,689	\$93,543	\$92,748	\$92,249	\$99,904

EXHIBIT C – RECONCILIATION OF MEMBER DATA

	Active Members	Inactive Vested Members ¹	Disableds	Retired Members	Beneficiaries ²	Total
Number as of January 1, 2018	4,952	226	143	3,455	1,108	9,884
• New members	410	N/A	N/A	N/A	N/A	410
• Terminations – with vested rights	-38	38	0	0	0	0
• Terminations – without vested rights	-37	N/A	N/A	N/A	N/A	-37
• Retirements	-187	-6	N/A	193	N/A	0
• New disabilities	0	0	0	N/A	N/A	0
• Return to work	12	-2	0	0	N/A	10
• Deceased	-12	0	-9	-65	-45	-131
• New beneficiaries	0	0	0	0	75	75
• Lump sum payouts ³	-88	-26	0	0	0	-114
• Certain period expired	<u>N/A</u>	<u>N/A</u>	<u>0</u>	<u>0</u>	<u>-6</u>	<u>-6</u>
Number as of January 1, 2019	5,012	230	134	3,583	1,132	10,091

¹ Excludes terminated members due a refund of contributions.

² Excludes beneficiaries with a DROP only

³ Members who terminated and requested a refund of member contributions.

EXHIBIT D – SUMMARY STATEMENT OF INCOME AND EXPENSES ON A MARKET VALUE BASIS

	Year Ended December 31, 2018	Year Ended December 31, 2017
Net assets at market value at the beginning of the year ¹	\$2,103,345,471	\$2,149,836,260
Contribution income:		
• Employer contributions	\$149,356,565	\$126,318,005
• Member contributions	49,332,262	32,977,425
• Less administrative expenses	<u>-5,861,410</u>	<u>-8,089,584</u>
<i>Net contribution income</i>	<i>\$192,827,417</i>	<i>\$151,205,846</i>
Investment income:		
• Interest, dividends and other income	\$45,250,992	\$33,099,632
• Recognition of capital appreciation	5,588,891	74,836,102
• Less interest expense	0	-1,279,517
• Adjustment to beginning of year value ²	0	825,543
• Less investment fees	<u>-8,017,586</u>	<u>-9,024,584</u>
<i>Net investment income</i>	<i><u>\$42,822,297</u></i>	<i><u>\$98,457,176</u></i>
Total income available for benefits	\$235,649,714	\$249,663,022
Less benefit payments:		
• Benefit payments	-\$294,447,006	-\$292,576,281
• Refunds	<u>-2,634,049</u>	<u>-3,577,530</u>
<i>Net benefit payments</i>	<i>-\$297,081,055</i>	<i>-\$296,153,811</i>
Change in market value of assets	-\$61,431,341	-\$46,490,789
Net assets at market value at the end of the year	\$2,041,914,130	\$2,103,345,471

¹ Based on preliminary unaudited assets

² Adjustment from draft financials used in the prior valuation to the final audited statements

EXHIBIT E – SUMMARY STATEMENT OF PLAN ASSETS

	December 31, 2018	December 31, 2017
Cash equivalents and prepaid expenses	\$50,053,963	\$118,022,612
Invested securities lending collateral	20,376,453	12,050,625
Capital assets	12,377,791	12,608,396
Total accounts receivable	42,282,571	34,359,460
Investments:		
• Real assets	\$695,162,373	\$794,476,173
• Equity securities	432,055,193	466,132,328
• Fixed income securities	511,184,404	325,258,334
• Private equity	310,090,215	220,240,515
• Alternative investments	0	143,709,605
• Other	<u>40,680,894</u>	<u>24,064,096</u>
Total investments at market value	\$1,989,173,079	\$1,973,881,051
Total assets	\$2,114,263,857	\$2,150,922,144
Total liabilities	-72,349,727	-47,576,673
Net assets at market value	\$2,041,914,130	\$2,103,345,471
Net assets at actuarial value	\$2,161,899,662	\$2,151,039,343

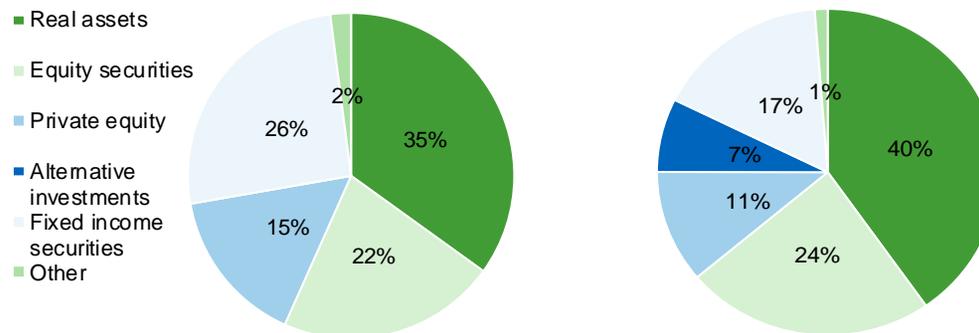


EXHIBIT F – DEVELOPMENT OF THE FUND THROUGH DECEMBER 31, 2018

Year Ended December 31	Employer Contributions	Member Contributions	Net Investment Return ¹	Admin. Expenses ²	Benefit Payments	Market Value of Assets at Year-End	Actuarial Value of Assets at Year-End	Actuarial Value as a Percent of Market Value
2009	\$107,699,648	\$19,584,241	\$347,054,071	\$0	\$155,747,987	\$2,851,645,944	\$3,382,907,776	118.6%
2010	108,060,956	19,790,189	303,461,949	0	170,272,496	3,112,686,542	3,430,818,823	110.2%
2011	102,437,115	19,493,460	-54,844,275	0	188,829,489	2,990,943,353	3,378,481,222	113.0%
2012	103,310,264	22,490,884	292,719,981	0	203,099,511	3,206,364,971	3,795,024,584	118.4%
2013	105,711,435	26,044,579	243,514,011	0	218,884,493	3,362,750,503	3,877,321,261	115.3%
2014	109,791,512	28,969,429	-176,940,296	0	245,176,251	3,079,394,897	3,695,273,876	120.0%
2015	114,885,723	25,676,327	-254,829,470	0	285,003,174	2,680,124,303	2,680,124,303	100.0%
2016 ³	119,423,106	25,518,317	159,355,111	9,492,445	825,092,132	2,149,836,260	2,157,799,730	100.4%
2017	126,318,005	32,977,425	98,457,176	8,089,584	296,153,811	2,103,345,471	2,151,039,343	102.3%
2018	149,356,565	49,332,262	42,822,297	5,861,410	297,081,055	2,041,914,130	2,161,899,662	105.9%

¹On a market basis, net of investment fees

²Administrative expenses were subtracted from net investment return prior to the 2016 valuation

³Unaudited assets were used for the January 1, 2017 actuarial valuation. When the audited financial statements were completed, there were updates to the employer contributions and investment return amounts, resulting in a revision to the market value of assets. Thus, the amounts shown above as of December 31, 2016 differ from the System's and City's Comprehensive Annual Financial Reports. The difference are immaterial to the System's actuarial results.

EXHIBIT G – DEFINITION OF PENSION TERMS

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The equivalent of the accumulated normal costs allocated to the years before the valuation date.
Actuarial Accrued Liability for Pensioners and Beneficiaries:	The single-sum value of lifetime benefits to existing pensioners and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the actuarially determined contribution.
Actuarial Gain or 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. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results yield in actuarial liabilities that are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.
Actuarially Equivalent:	Of equal actuarial present value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions. Each such amount or series of amounts is: Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.) Multiplied by the probability of the occurrence of an event (such as survival, death, disability, withdrawal, etc.) on which the payment is conditioned, and Discounted according to an assumed rate (or rates) of return to reflect the time value of money.

Actuarial Present Value of Future Plan Benefits:	The Actuarial Present Value of benefit amounts expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age, anticipated future compensation, and future service credits. The Actuarial Present Value of Future Plan Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive members entitled to either a refund or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
Actuarial Valuation:	The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB, such as the Actuarially Determined Contribution (ADC) and the Net Pension Liability (NPL).
Actuarial Value of Assets (AVA):	The value of the Fund's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the ADC.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the law.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the Employer Normal Cost and the Amortization Payment.
Amortization Method:	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the Amortization Payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the UAAL. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Assumptions or Actuarial Assumptions:	<p>The estimates upon which the cost of the Fund is calculated, including:</p> <p><u>Investment return</u> - the rate of investment yield that the Fund will earn over the long-term future;</p> <p><u>Mortality rates</u> - the death rates of employees and pensioners; life expectancy is based on these rates;</p> <p><u>Retirement rates</u> - the rate or probability of retirement at a given age or service;</p> <p><u>Disability rates</u> – the probability of disability retirement at a given age;</p> <p><u>Withdrawal rates</u> - the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement;</p> <p><u>Salary increase rates</u> - the rates of salary increase due to inflation and productivity growth.</p>
Closed Amortization Period:	A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Open Amortization Period.
Decrements:	Those causes/events due to which a member’s status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or withdrawal.
Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula applied to the member’s compensation and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan’s earnings are allocated to each account, and each member’s benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Fund that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.
Funded Ratio:	The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.

GASB 67 and GASB 68:	Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.
Investment Return:	The rate of earnings of the Fund from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.
Net Pension Liability (NPL):	The Net Pension Liability is equal to the Total Pension Liability minus the Plan Fiduciary Net Position.
Normal Cost:	That portion of the Actuarial Present Value of pension plan benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated.
Open Amortization Period:	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period with level percentage of payroll is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never decrease, but will become smaller each year, in relation to covered payroll, if the actuarial assumptions are realized.
Plan Fiduciary Net Position:	Market value of assets.
Total Pension Liability (TPL):	The actuarial accrued liability under the entry age normal cost method and based on the blended discount rate as described in GASB 67 and 68.
Unfunded Actuarial Accrued Liability:	The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.
Valuation Date or Actuarial Valuation Date:	The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.

Section 4: Actuarial Valuation Basis

EXHIBIT I – ACTUARIAL ASSUMPTIONS AND ACTUARIAL COST METHOD

Rationale for Assumptions:	The information and analysis used by the Board in selecting each assumption that has a significant effect on this actuarial valuation is shown in the Experience Study Report for the five-year period ended December 31, 2014, with subsequent changes related to the plan changes and modifications based on the 2016 Meet and Confer Agreement, as amended in 2018.																																																																																	
Net Investment Return:	7.25% The net investment return assumption was chosen by the System's Board of Trustees, with input from the actuary. This assumption is a long-term estimate derived from historical data, current and recent market expectations, and professional judgment. As part of the analysis, a building block approach was used that reflects inflation expectations and anticipated risk premiums for each of the portfolio's asset classes, as well as the System's target asset allocation.																																																																																	
Salary Scale:	<table border="1"> <thead> <tr> <th rowspan="2">Years of Service</th> <th colspan="6">Rate (%)</th> </tr> <tr> <th>Officers & Officer Trainees</th> <th>Corporals, Drivers & Senior Officers</th> <th>Sergeants, Lieutenants, Captains & Majors</th> <th>Deputy Chiefs</th> <th>Assistant Chiefs</th> <th>Chiefs</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0.00</td> <td>0.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>2</td> <td>0.00</td> <td>2.75</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>3</td> <td>2.75</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>4-6</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>7</td> <td>5.00</td> <td>5.00</td> <td>5.00</td> <td>2.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>8</td> <td>2.00</td> <td>5.00</td> <td>2.00</td> <td>2.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>9-11</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>5.00</td> <td>5.00</td> </tr> <tr> <td>12-14</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>5.00</td> </tr> <tr> <td>15+</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> <td>2.00</td> </tr> </tbody> </table> <p><i>Rates above include allowance for inflation of 2.75% per year.</i></p> <p>The salary scale assumption is based on the City's pay plan, along with analysis completed in conjunction with an Experience Study Report for the five-year period ended December 31, 2014 and the 2016 Meet and Confer Agreement, as amended in 2018.</p>						Years of Service	Rate (%)						Officers & Officer Trainees	Corporals, Drivers & Senior Officers	Sergeants, Lieutenants, Captains & Majors	Deputy Chiefs	Assistant Chiefs	Chiefs	1	0.00	0.00	5.00	5.00	5.00	5.00	2	0.00	2.75	5.00	5.00	5.00	5.00	3	2.75	5.00	5.00	5.00	5.00	5.00	4-6	5.00	5.00	5.00	5.00	5.00	5.00	7	5.00	5.00	5.00	2.00	5.00	5.00	8	2.00	5.00	2.00	2.00	5.00	5.00	9-11	2.00	2.00	2.00	2.00	5.00	5.00	12-14	2.00	2.00	2.00	2.00	2.00	5.00	15+	2.00	2.00	2.00	2.00	2.00	2.00
Years of Service	Rate (%)																																																																																	
	Officers & Officer Trainees	Corporals, Drivers & Senior Officers	Sergeants, Lieutenants, Captains & Majors	Deputy Chiefs	Assistant Chiefs	Chiefs																																																																												
1	0.00	0.00	5.00	5.00	5.00	5.00																																																																												
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4-6	5.00	5.00	5.00	5.00	5.00	5.00																																																																												
7	5.00	5.00	5.00	2.00	5.00	5.00																																																																												
8	2.00	5.00	2.00	2.00	5.00	5.00																																																																												
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12-14	2.00	2.00	2.00	2.00	2.00	5.00																																																																												
15+	2.00	2.00	2.00	2.00	2.00	2.00																																																																												

	Between October 1, 2018 and September 30, 2019, members received or are scheduled to receive two step raises based on their anniversary date. Members with anniversary dates between October 1 and December 31 had their two step raises accounted for in the valuation payroll. Members with anniversary dates between January 1 and September 30 are assumed to receive two step raises in 2019.																																																				
Payroll Growth:	2.75%, used to amortize the unfunded actuarial accrued liability as a level percentage of payroll.																																																				
Cost-of-Living Adjustments:																																																					
<i>Prior to October 1, 2050</i>	0.00%																																																				
<i>Beginning October 1, 2050</i>	2.00%, on original benefit																																																				
	The assumption for the year the COLA begins will be updated on an annual basis and set equal to the year the System is projected to be 70% funded on a market value basis after the COLA is reflected.																																																				
Funding Projections:																																																					
<i>Payroll Growth</i>	For purposes of projecting the System's funded status to project when the System will reach 70% funded on a market value basis (and therefore meet COLA requirements), City contributions beginning January 1, 2025 are assumed to be 34.50% of the City's Hiring Plan projections. Beginning in 2038, after the end of the City's Hiring Plan projection, payroll is assumed to increase by 2.75%.																																																				
	<table border="1"> <thead> <tr> <th colspan="4">City's Hiring Plan Payroll Projection (in millions)</th> </tr> <tr> <th>Year</th> <th>Payroll</th> <th>Year</th> <th>Payroll</th> </tr> </thead> <tbody> <tr> <td>2017</td> <td>\$372</td> <td>2028</td> <td>\$525</td> </tr> <tr> <td>2018</td> <td>364</td> <td>2029</td> <td>545</td> </tr> <tr> <td>2019</td> <td>383</td> <td>2030</td> <td>565</td> </tr> <tr> <td>2020</td> <td>396</td> <td>2031</td> <td>581</td> </tr> <tr> <td>2021</td> <td>408</td> <td>2032</td> <td>597</td> </tr> <tr> <td>2022</td> <td>422</td> <td>2033</td> <td>614</td> </tr> <tr> <td>2023</td> <td>438</td> <td>2034</td> <td>631</td> </tr> <tr> <td>2024</td> <td>454</td> <td>2035</td> <td>648</td> </tr> <tr> <td>2025</td> <td>471</td> <td>2036</td> <td>666</td> </tr> <tr> <td>2026</td> <td>488</td> <td>2037</td> <td>684</td> </tr> <tr> <td>2027</td> <td>507</td> <td></td> <td></td> </tr> </tbody> </table>	City's Hiring Plan Payroll Projection (in millions)				Year	Payroll	Year	Payroll	2017	\$372	2028	\$525	2018	364	2029	545	2019	383	2030	565	2020	396	2031	581	2021	408	2032	597	2022	422	2033	614	2023	438	2034	631	2024	454	2035	648	2025	471	2036	666	2026	488	2037	684	2027	507		
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<i>Market Value Asset Returns</i>	5.25% in 2019, 5.75% in 2020, 6.25% in 2021, 6.75% in 2022 and 7.25% annually thereafter																																																				

Administrative Expenses:	\$8,500,000 per year, payable monthly (equivalent to \$8,207,677 at the beginning of the year) or 1% of computation pay, if greater																																																																																		
Mortality Rates:	<p><i>Pre-retirement</i> <i>Healthy annuitants</i></p> <p>RP-2014 Employee Mortality Table, set back two years for males, projected generationally using Scale MP-2015</p> <p>RP-2014 Blue Collar Healthy Annuitant Mortality Table, set forward two years for females, projected generationally using Scale MP-2015</p> <p><i>Disabled annuitants</i></p> <p>RP-2014 Disabled Retiree Mortality Table, set back three years for males and females, projected generationally using Scale MP-2015</p> <p>The tables above, with adjustments as shown, reasonably reflect the mortality experience of the System as of the measurement date. The mortality tables were then generationally projected using Scale MP-2015 to anticipate future mortality improvement.</p>																																																																																		
Mortality and Disability Rates Before Retirement:	<table border="1"> <thead> <tr> <th rowspan="3">Age</th> <th colspan="4">Rate (%)</th> </tr> <tr> <th colspan="2">Mortality¹</th> <th colspan="2">Disability²</th> </tr> <tr> <th>Male</th> <th>Female</th> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>0.03</td> <td>0.02</td> <td>0.010</td> <td>0.010</td> </tr> <tr> <td>25</td> <td>0.05</td> <td>0.02</td> <td>0.015</td> <td>0.015</td> </tr> <tr> <td>30</td> <td>0.04</td> <td>0.02</td> <td>0.020</td> <td>0.020</td> </tr> <tr> <td>35</td> <td>0.05</td> <td>0.03</td> <td>0.025</td> <td>0.025</td> </tr> <tr> <td>40</td> <td>0.06</td> <td>0.04</td> <td>0.030</td> <td>0.030</td> </tr> <tr> <td>45</td> <td>0.08</td> <td>0.07</td> <td>0.035</td> <td>0.035</td> </tr> <tr> <td>50</td> <td>0.14</td> <td>0.11</td> <td>0.040</td> <td>0.040</td> </tr> <tr> <td>55</td> <td>0.23</td> <td>0.17</td> <td>--</td> <td>--</td> </tr> <tr> <td>60</td> <td>0.38</td> <td>0.24</td> <td>--</td> <td>--</td> </tr> <tr> <td>65</td> <td>1.26</td> <td>1.05</td> <td>--</td> <td>--</td> </tr> <tr> <td>70</td> <td>1.97</td> <td>1.70</td> <td>--</td> <td>--</td> </tr> <tr> <td>75</td> <td>3.15</td> <td>2.81</td> <td>--</td> <td>--</td> </tr> <tr> <td>80</td> <td>5.19</td> <td>4.71</td> <td>--</td> <td>--</td> </tr> </tbody> </table> <p>¹Rates shown do not include generational projection; rates beginning at age 65 are for healthy annuitants ²100% of disabilities are assumed to be service-related</p>					Age	Rate (%)				Mortality ¹		Disability ²		Male	Female	Male	Female	20	0.03	0.02	0.010	0.010	25	0.05	0.02	0.015	0.015	30	0.04	0.02	0.020	0.020	35	0.05	0.03	0.025	0.025	40	0.06	0.04	0.030	0.030	45	0.08	0.07	0.035	0.035	50	0.14	0.11	0.040	0.040	55	0.23	0.17	--	--	60	0.38	0.24	--	--	65	1.26	1.05	--	--	70	1.97	1.70	--	--	75	3.15	2.81	--	--	80	5.19	4.71	--	--
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Withdrawal Rates Before Retirement:

Years of Service	Rate (%)		Years of Service	Rate (%)	
	Police	Fire		Police	Fire
0	14.00	5.50	6	3.50	1.00
1	6.00	4.50	7	3.00	0.75
2	5.50	4.00	8	2.50	0.50
3	5.00	3.50	9	2.00	0.50
4	4.50	3.00	10-37	1.00	0.50
5	4.00	1.50	38 & over	0.00	0.00

Retirement Rates:
DROP Active Members

Police		Fire	
Age	Rate (%)	Age	Rate (%)
Under 50	1.00	Under 50	0.75
50-52	3.00	50-54	2.50
53-54	7.00	55-58	12.00
55	15.00	59-64	25.00
56-57	20.00	65-66	30.00
58-64	25.00	67	100.00
65-66	50.00		
67	100.00		

Non-DROP Active Members

Members hired prior to March 1, 2011 with less than 20 years of service as of September 1, 2017		Members hired prior to March 1, 2011 with at least 20 years of service as of September 1, 2017		Members hired on or after March 1, 2011	
Age	Rate (%)	Age	Rate (%)	Age	Rate (%)
Under 50	0	Under 50	1	Under 50	1
50	10	50	20	50	5
51	5	51	10	51	5
52	5	52	10	52	5
53	5	53	10	53	5
54	5	54	20	54	10
55	15	55	40	55	20
56	10	56	50	56	30
57	5	57	50	57	40
58	60	58	60	58	50
59	50	59	60	59	50
60	50	60	60	60	50
61	50	61	60	61	50
62 & over	100	62 & over	100	62 & over	100

100% retirement rate once benefit multiplier hits 90% maximum.

Weighted Average Retirement Age: Age 56, determined as follows: The weighted average retirement age for each participant is calculated as the sum of the product of each potential current or future retirement age times the probability of surviving from current age to that age and then retiring at that age, assuming no other decrements. The overall weighted retirement age is the average of the individual retirement ages based on all the active participants included in the January 1, 2019 actuarial valuation.

Retirement Rates for Inactive Vested Participants: Terminated vested members who terminated prior to September 1, 2017 are assumed to retire at age 50
 Terminated vested members who terminated on or after September 1, 2017 are assumed to retire at age 58

DROP Utilization:	No members are assumed to elect to enter the DROP
Interest on DROP Accounts:	3.00% on account balances as of September 1, 2017, payable upon retirement 0.0% on account balances accrued after September 1, 2017
DROP Payment Period:	Based on expected lifetime as of the later of September 1, 2017 or retirement date. Expected lifetime determined based on an 85% male/15% female blend of the current healthy annuitant mortality tables.
DROP Annuitization Interest:	3.00%. Based on United States Department of Commerce Daily Treasury Yield Curve Rates for durations between 5 and 30 years.
Actuarial Equivalence:	Actuarial equivalence for optional forms of benefit payments are based on an 85% male/15% female blend of the current healthy annuitant mortality tables, along with an interest rate of 7.25%
Unknown Data for Participants:	Same age and service as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Family Composition:	75% of participants are assumed to be married. Females are assumed to be three years younger than males. The youngest child is assumed to be ten years old.
Benefit Election:	Married participants are assumed to receive the Joint and Survivor annuity form of payment and non-married participants are assumed to receive a Life Only annuity.
Actuarial Value of Assets:	Set to market value of assets as of December 31, 2015. Thereafter, market value of assets less unrecognized returns in each of the last five years beginning with 2016. Unrecognized return is equal to the difference between the actual market return and the expected return on the market value, and is recognized over a five-year period, further adjusted, if necessary, to be within 20% of the market value.
Actuarial Cost Method:	Entry Age Normal Actuarial Cost Method. Entry Age is the age at the time the member commenced employment. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis, with Normal Cost determined using the plan of benefits applicable to each participant. Actuarial Liability is allocated by salary.
Amortization Methodology:	The actuarially determined contribution is calculated using a 30-year amortization of unfunded actuarially accrued liability.
Justification for Changes in Actuarial Assumptions:	The following assumptions were updated with this valuation: <ul style="list-style-type: none"> ➤ The salary scale assumption was updated to reflect the 2016 Meet and Confer Agreement, as amended in 2018. ➤ Annual 2.00% COLAs are assumed to be payable beginning October 1, 2050, based on an updated projection of unfunded actuarial accrued liability. In the prior valuation, these COLAs were assumed to begin October 1, 2053.

EXHIBIT II – SUMMARY OF PLAN PROVISIONS

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

MEMBERS WHOSE PARTICIPATION BEGAN BEFORE MARCH 1, 2011

Plan Year:	January 1 through December 31
Plan Status:	Ongoing
Normal Retirement:	
<i>Benefit Earned Prior to September 1, 2017</i>	
<i>Age Requirement</i>	50
<i>Service Requirement</i>	5
<i>Amount</i>	Greater of 3.0% of Average Computation Pay times years of Pension Service (maximum 96.0%) and \$2,200 per month. The \$2,200 per month minimum benefit is prorated if the Member retires with less than 20 years of service.
<i>Average Computation Pay</i>	36 consecutive months that reflect the highest civil service rank held by a member, plus Educational Incentive Pay, Longevity Pay and City Service Incentive Pay
<i>Benefit Earned Beginning September 1, 2017</i>	
<i>Age Requirement</i>	
<i>Service Requirement</i>	58
<i>Amount</i>	5
<i>Average Computation Pay</i>	Greater of 2.5% of Average Computation Pay times years of Pension Service (maximum 90.0%) and \$2,200 per month. The \$2,200 per month minimum benefit is prorated if the Member retires with less than 20 years of service. 60 consecutive months that reflects the highest civil service rank held by a member, plus Educational Incentive Pay, Longevity Pay and City Service Incentive Pay

20 and Out Reduced Retirement:

If Eligible as of September 1, 2017

Age Requirement

Service Requirement

Amount

None

20 years

20 & Out Multiplier times 36-month (Table 1 Benefit) or 60-month (Table 2 Benefit) Average Computation Pay times years of Pension Service

Benefit Accrued Before September 1, 2017 20 & Out Table 1		Benefit Accrued Beginning September 1, 2017 20 & Out Table 2	
Age	20 & Out Multiplier	Age	20 & Out Multiplier
45 & under	2.00%	53 & under	2.00%
46	2.25%	54	2.10%
47	2.50%	55	2.20%
48	2.75%	56	2.30%
49	2.75%	57	2.40%
50 & above	3.00%	58 & above	2.50%

If Not Eligible as of September 1, 2017

Age Requirement

Service Requirement

Amount

None

20 years

20 & Out Multiplier times 60-month Average Computation Pay times years of Pension Service

20 & Out Table 2	
Age	20 & Out Multiplier
53 & under	2.00%
54	2.10%
55	2.20%
56	2.30%
57	2.40%
58 & above	2.50%

Early Retirement:	
<i>If at least age 45 as of September 1, 2017 and less than age 50</i>	
<i>Age Requirement</i>	45
<i>Service Requirement</i>	5
<i>Amount</i>	Normal pension accrued prior to September 1, 2017 plus the benefit accrued based on the 20 & Out Table 2 for service beginning September 1, 2017, reduced by 2/3 of 1% for each whole month by which the benefit commencement date precedes age 50.
Non-Service Connected Disability:	
<i>Eligibility</i>	Injury or illness (lasting more than 90 days) not related to or incurred while in the performance of the member's job, preventing the member from performing their departmental duties.
<i>Amount</i>	3% of Average Computation Pay for service earned prior to September 1, 2017 and the applicable benefit multiplier from 20 & Out Table 2 times Average Computation Pay for service earned beginning September 1, 2017
Service Connected Disability:	
<i>Eligibility</i>	Injury or illness (lasting more than 90 days) obtained while on duty in the performance of the member's job.
<i>Amount</i>	3% of Average Computation Pay for service earned prior to September 1, 2017 and the applicable benefit multiplier from 20 & Out Table 2 times Average Computation Pay for service earned beginning September 1, 2017; if the member has less than 20 years of service, the benefit will be calculated as if they had 20 years at the time of disability.
Benefit Supplement:	
<i>Age Requirement</i>	55
<i>Service Requirement</i>	20 years, waived if member is receiving a service-connected disability
<i>Amount</i>	3% of the total monthly benefit (including any applicable COLA's) payable to the Member when the Member attains age 55. The benefit supplement shall not be less than \$75 per month. Beginning September 1, 2017, only those annuitants already receiving the supplement will be eligible to maintain their current supplement, which will not change ongoing; no additional retirees will be eligible for the supplement.

Survivor Benefit if No Qualified Surviving Spouse:	A lump sum that is the actuarial equivalent of 120 monthly payments of the greater of: 50% of the Member's pension benefit at the time of their death, or a benefit based on 20 years of the Member's service.
DROP:	
<i>Eligibility</i>	Members in active service who are retirement eligible may elect to enter the Deferred Retirement Option Plan (DROP).
<i>Distribution</i>	The DROP account balance will be paid over the expected future lifetime of annuitants.
<i>Interest</i>	Based on United States Department of Commerce Daily Treasury Yield Curve Rates for durations between 5 and 30 years; interest rate is based on the expected lifetime of the members at the time they retire. Interest is only paid on DROP account balances as of September 1, 2017.
Cost of Living:	The Board may grant an ad hoc COLA based on the actual market return over the prior five years less 5%, not to exceed 4% of the base benefit, if, after granting a COLA, the funded ratio on a market value of assets basis is no less than 70%.
Member Contributions:	13.5% of computation pay for all members
City Contributions:	The City will contribute 34.5% of computation payroll each year. However, in no case shall the City's total contribution amount be less than: \$5,173,000 for the biweekly pay periods beginning with the first biweekly pay period that begins after September 1, 2017 and ends on the last day of the first biweekly pay period that ends after December 31, 2017; \$5,344,000 for the following 26 pay periods; \$5,571,000 for the following 26 pay periods; \$5,724,000 for the following 26 pay periods; \$5,882,000 for the following 26 pay periods; \$6,043,000 for the following 26 pay periods; \$5,812,000 for the following 26 pay periods; and \$6,024,000 for the following 26 pay periods. An additional 1/26th of \$13 Million will be paid biweekly beginning with the first biweekly pay period that begins after September 1, 2017 and ending with the last biweekly pay period that ends after December 31, 2024.
Optional Forms of Benefits:	Life Only Annuity, 50% or 100% Joint and Survivor Pension
Changes in Plan Provisions:	None

MEMBERS WHOSE PARTICIPATION BEGAN ON OR AFTER MARCH 1, 2011

Normal Retirement:																	
<i>Age Requirement</i>	58																
<i>Service Requirement</i>	5																
<i>Amount</i>	2.5% of Average Computation Pay for each year of Pension Service, maximum 90% The minimum monthly benefit is \$110 times the number of years of Pension Service at retirement, but not greater than \$2,200.																
<i>Average Computation Pay</i>	Average Computation Pay uses the 60 consecutive months that reflects the highest civil service rank held by a member plus Educational Incentive Pay plus Longevity Pay plus City Service Incentive Pay.																
Early Retirement:																	
<i>Age Requirement</i>	53																
<i>Service Requirement</i>	5																
<i>Amount</i>	Normal pension accrued, reduced by 2/3 of 1% for each whole month by which the benefit commencement date precedes the normal retirement date.																
20 and Out Reduced Retirement:																	
<i>Age Requirement</i>	None																
<i>Service Requirement</i>	20 years																
<i>Amount</i>	20 & Out Multiplier times Average Computation Pay times years of Pension Service																
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<p>Non-Service Connected Disability:</p> <p><i>Eligibility</i></p> <p><i>Amount</i></p>	<p>Injury or illness (lasting more than 90 days) not related to or incurred while in the performance of the member's job, preventing the member from performing their departmental duties.</p> <p>The Member's accrued benefit, but not less than a pro-rated minimum benefit.</p>
<p>Service-Connected Disability:</p> <p><i>Eligibility</i></p> <p><i>Amount</i></p>	<p>Injury or illness (lasting more than 90 days) obtained while on duty in the performance of the member's job.</p> <p>The greater of 50% of Average Computation Pay and the Member's accrued benefit.</p>
<p>Termination Benefit:</p> <p><i>With less than five years of service</i></p> <p><i>With at least five years of service</i></p>	<p>Upon request, the member's contributions will be returned without interest.</p> <p>The member may either withdraw contributions or leave contributions in the Plan and receive a monthly benefit to commence no earlier than the member's earliest eligibility for retirement benefits. Retirement benefit is equal to the accrued benefit as of the date of termination.</p>
<p>Pre-Retirement Death Benefit:</p> <p><i>While in active service</i></p> <p><i>After leaving active service, with less than five years</i></p> <p><i>After leaving active service, with at least five years</i></p>	<p>The greater of 50% of the Member's accrued benefit or a benefit based on 20 years of service. The benefit may not exceed 45% of Average Computation Pay.</p> <p>A lump sum benefit equal to the return of member contributions without interest.</p> <p>50% of the Member's accrued benefit, with no early retirement reduction, or a refund of member contributions</p>
<p>Post-Retirement Death Benefit:</p>	<p>50% or 100% of the pension the Member was receiving at the time of their death, depending on the form of joint and survivor annuity chosen; if a life only annuity was chosen, no further benefits will be paid</p>
<p>Qualified Surviving Children Benefit:</p>	<p>50% of the pension the Member was receiving at the time of their death, divided equally among the children, paid until the youngest child is 19 years old or for life if the child becomes handicapped prior to age 23</p>
<p>Minimum Survivor Benefit:</p>	<p>\$1,100 per month, not to exceed the actual amount the Member was receiving upon their death. If there are no Qualified Surviving Children, the minimum benefit to a spouse who is a Qualified Survivor shall be \$1,200 per month. If the Member had less than 20 years of Pension Service, the minimum benefit will be prorated based on actual years of Pension Service.</p>

Special Survivor Benefit:	
<i>Eligibility</i>	Upon leaving active service or joining DROP: a) the Member was at least 55 years old with at least 20 years of pension service, or b) the sum of the Member's age plus Pension Service was at least 78; and Has no Qualified Surviving Children or handicapped children currently eligible for survivor benefits; and Whose Qualified Surviving Spouse is at least 55 years old. The Qualified Surviving Spouse does not have to be 55 years old at the time of the Member's death.
<i>Amount</i>	Once all the eligibility conditions are met, the amount the Qualified Surviving Spouse will receive increases from 50% of the Member's pension benefit to a percentage of the Member's pension benefit based on 2.5% times the number of years of Pension Service the Member worked.
Survivor Benefit if No Qualified Surviving Spouse:	A lump sum that is the actuarial equivalent of 120 monthly payments of the greater of: 50% of the Member's pension benefit at the time of their death, or a benefit based on 20 years of the Member's service.
DROP:	
<i>Eligibility</i>	Members in active service who are retirement eligible may elect to enter the Deferred Retirement Option Plan (DROP).
<i>Distribution</i>	The DROP account balance will be paid over the expected future lifetime of annuitants.
<i>Interest</i>	Based on United States Department of Commerce Daily Treasury Yield Curve Rates for durations between 5 and 30 years; interest rate is based on the expected lifetime of the members at the time they retire. Interest is only paid on DROP account balances as of September 1, 2017.
Cost of Living:	The Board may grant an ad hoc COLA based on the actual market return over the prior five years less 5%, not to exceed 4% of the base benefit, if, after granting a COLA, the funded ratio on a market value of assets basis is no less than 70%.
Member Contributions:	13.5% of computation pay for all members
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Optional Forms of Benefits:	Life Only Annuity, 50% or 100% Joint and Survivor Pension
Changes in Plan Provisions:	None

Section 5: GASB 67 Information

EXHIBIT 1 – NET PENSION LIABILITY

The components of the net pension liability at December 31, 2018 were as follows:

Total pension liability	\$4,501,670,375
Plan fiduciary net position	2,041,914,130
Net pension liability	2,459,756,245
Plan fiduciary net position as a percentage of the total pension liability	45.36%

Actuarial assumptions. The total pension liability was determined by an actuarial valuation as of January 1, 2019, using the following actuarial assumptions, applied to all periods included in the measurement:

Inflation	2.75%
Real rate of return	4.50%
Investment rate of return	7.25%, net of pension plan investment expense, including inflation

The actuarial assumptions used in the January 1, 2019 valuation were based on the results of an experience study for the period January 1, 2010 to December 31, 2014, plus assumption changes included in the January 1, 2017, 2018 and 2019 valuations. Assumptions are detailed in Section 4, Exhibit I of this report.

The long-term expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class. These ranges are combined to produce the long-term expected rate of return by weighting the expected future real rates of return by the target asset allocation percentage and by adding expected inflation. Best estimates of arithmetic real rates of return for each major asset class included in the pension plan's target asset allocation as of December 31, 2018 are summarized in the following table:

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return ¹
Global Equity	40%	6.40%
Emerging Market Equity	10%	9.47%
Private Equity	5%	10.00%
Short-Term Investment Grade Bonds	12%	1.31%
Investment Grade Bonds	4%	1.89%
High Yield Bonds	4%	4.00%
Bank Loans	4%	3.52%
Global Bonds	4%	1.69%
Emerging Market Debt	4%	4.48%
Real Estate	5%	4.58%
Natural Resources	5%	7.44%
Cash	<u>3%</u>	1.12%
Total	100%	
¹ The real rates of return are net of inflation provided by Segal Marco Advisors, a member of The Segal Group.		

Discount rate: The discount rate used to measure the total pension liability was 7.25%. The projection of cash flows used to determine the discount rate assumed City contributions will be made in accordance with the provisions of House Bill 3158, including statutory minimums through 2024 and 34.50% of computation pay thereafter. Members are expected to contribute 13.50% of computation pay. For cash flow purposes, projected payroll is based on 90% of the City’s Hiring Plan payroll projections through 2037, increasing by 2.75% per year thereafter. This payroll projection is used for cash flow purposes only and does not impact the Total Pension Liability. The normal cost rate for future members is assumed to be 13.07% for all years. Based on these assumptions, the System’s fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Therefore, the long-term expected rate of return on pension plan investments was applied to all periods of projected benefit payments to determine the total pension liability.

Actuarial cost method: In accordance with GASB 67, the Total Pension Liability for active members is valued as the total present value of benefits once they enter the DROP. For the funding valuation, the liability for these members accumulates from their entry age until they are assumed to leave active service.

Sensitivity of the net pension liability to changes in the discount rate. The following presents the net pension liability, calculated using the discount rate of 7.25%, as well as what the net pension liability would be if it were calculated using a discount rate that is one-percentage-point lower (6.25%) or one-percentage-point higher (8.25%) than the current rate:

	1% Decrease (6.25%)	Current Discount (7.25%)	1% Increase (8.25%)
Net pension liability	\$2,953,141,258	\$2,459,756,245	\$2,046,452,228

EXHIBIT 2 – SCHEDULE OF CHANGES IN NET PENSION LIABILITY

	2018	2017
Total pension liability		
• Service cost	\$44,792,454	\$148,551,831
• Interest	318,535,923	348,171,140
• Change of benefit terms	16,091,390	-1,167,597,186
• Differences between expected and actual experience	-46,555,548	-134,664,749
• Changes of assumptions	-31,459,806	-2,851,241,104
• Benefit payments, including refunds of employee contributions	<u>-297,081,055</u>	<u>-296,153,811</u>
Net change in total pension liability	\$4,323,358	-\$3,952,933,879
Total pension liability – beginning	<u>4,497,347,017</u>	<u>8,450,280,896</u>
Total pension liability – ending (a)	<u>\$4,501,670,375</u>	<u>\$4,497,347,017</u>
Plan fiduciary net position		
• Contributions – employer	\$149,356,565	\$126,318,005
• Contributions – employee	49,332,262	32,977,425
• Net investment income	42,822,297	98,911,150
• Benefit payments, including refunds of employee contributions	-297,081,055	-296,153,811
• Administrative expense	-5,861,410	-8,089,584
• Interest expense	<u>0</u>	<u>-1,279,517</u>
Net change in plan fiduciary net position	-\$61,431,341	-\$47,316,332
Plan fiduciary net position – beginning	2,103,345,471	2,150,661,803
Plan fiduciary net position – ending (b)	<u>\$2,041,914,130</u>	<u>\$2,103,345,471</u>
Net pension liability – ending (a) – (b)	<u>\$2,459,756,245</u>	<u>\$2,394,001,546</u>
Plan fiduciary net position as a percentage of the total pension liability	45.36%	46.77%
Covered employee payroll	\$363,117,415	\$346,036,690
Net pension liability as percentage of covered employee payroll	677.40%	691.83%

Notes to Schedule:

Benefit changes: Plan changes effective September 1, 2017 that were signed into law May 31, 2017 as HB 3158 are reflected for the first time in the December 31, 2017 total pension liability, along with assumption changes that were implemented as part of the plan changes. The provision allowing members who entered DROP before June 1, 2017 to revoke the DROP election during a window from September 1, 2017 through February 28, 2018 is reflected in the December 31, 2018 total pension liability.

Change of Assumptions: The blended discount rate increased from 4.12% to 7.25% as of December 31, 2017. The assumption changes in 2018 include updates to the salary scale to reflect the 2016 Meet and Confer Agreement, as amended in 2018, and a change in the expected COLA date from October 1, 2053 to October 1, 2050.

EXHIBIT 3 – SCHEDULE OF EMPLOYER CONTRIBUTIONS

Year Ended December 31	Actuarially Determined Contribution	Contributions in Relation to the Actuarially Determined Contribution ¹	Contribution Deficiency (Excess)	Covered-Employee Payroll	Contributions as a Percentage of Covered Employee Payroll
2015 ²	--	\$114,885,723	--	\$383,006,330	30.00%
2016	\$261,859,079	119,345,000	\$142,514,079	365,210,426	32.68%
2017	168,865,484	126,318,005	42,547,479	357,414,472	35.34%
2018	157,100,128	149,356,565	7,743,563	346,036,690	43.16%

¹The City's contributions are based on statutory rates set by State law and not on Actuarially Determined Contributions.

²The Actuarially Determined Contribution was not directly calculated as a dollar amount by the prior actuary for the year ended 2015.

Notes to Schedule:

Methods and assumptions used to determine contribution rates for the year ended December 31, 2018:

Valuation date	Actuarially determined contribution is calculated using a January 1, 2018 valuation date as of the beginning of the year in which contributions are reported
Actuarial cost method	Entry age
Amortization method	30-year level percent of payroll, using 2.75% annual increases
Remaining amortization period	45 years as of January 1, 2018
Asset valuation method	Market value of assets less unrecognized returns in each of the last five years. Unrecognized return is equal to the difference between the actual market return and the expected return on the actuarial value, and is recognized over a five-year period, further adjusted, if necessary, to be within 20% of the market value.
Investment rate of return	7.25%, including inflation, net of pension plan investment expense
Inflation rate	2.75%
Projected salary increases	Inflation plus merit increases, varying by group and service
Retirement rates	Group-specific rates based on age
Cost-of-living adjustments	2.00% simple increases starting October 1, 2053

Mortality:	
<i>Pre-retirement</i>	Sex-distinct RP-2014 Employee Mortality Table, set back two years for males, projected generationally using Scale MP-2015
<i>Healthy annuitant</i>	Sex-distinct RP-2014 Healthy Annuitant Mortality Table, set forward two years for females, projected generationally using Scale MP-2015
<i>Disabled</i>	Sex-distinct RP-2014 Disabled Retiree Mortality Table, set back three years for males and females, projected generationally using Scale MP-2015
Other information	See Section 4 of the January 1, 2018 actuarial valuation for a full outline of assumptions. See Exhibit 2 of this Section for the history of changes to plan provisions and assumptions over the last two years.
<i>DROP utilization</i>	0% of Police and Fire members are assumed to elect to enter DROP
<i>Interest on DROP Accounts</i>	<p>Beginning September 1, 2017:</p> <ul style="list-style-type: none"> - 2.75% on annuitant account balances - 2.75% payable upon retirement on active account balances as of September 1, 2017 - 0.00% on active account balances accrued after September 1, 2017 <p>Beginning January 1, 2018:</p> <ul style="list-style-type: none"> - 3.00% payable upon retirement on active account balances as of September 1, 2017

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