Retirement Plan for the Employees' Retirement Fund of the City of Dallas

Actuarial Valuation Report
as of December 31, 2018

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June 6, 2019

Board of Trustees
Employees' Retirement Fund of the City of Dallas
1920 McKinney Avenue
10th Floor
Dallas, Texas 75201

Dear Members of the Board:

We are pleased to present our report of the actuarial valuation of the Employees' Retirement Fund of the City of Dallas ("ERF" or the "Fund") as of December 31, 2018.

This valuation provides information on the funding status of ERF. It includes a determination of the actuarially calculated contribution rates for the 2019 calendar year. In addition, it also contains the information necessary to determine the current total obligation rate and the current adjusted total obligation rate for the fiscal year beginning October 1, 2019 per City Ordinance. This rate is a function of the previous year's adjusted total obligation rate, this year's actuarially calculated contribution rate, and the rate necessary to make the debt service payment on the previously issued pension obligation bonds for fiscal year 2020.

In addition, the report provides various summaries of the data. A separate report is issued with regard to valuation results determined in accordance with Governmental Accounting Standards Board (GASB) Statements 67 and 68. Results of this report should not be used for any other purpose without consultation with the undersigned. Valuations are prepared annually as of December 31st, the last day of the ERF plan year. This report was prepared at the request of the Board and is intended for use by the ERF staff and those designated or approved by the Board. This report may be provided to parties other than ERF staff only in its entirety and only with the permission of the Board.

As authorized in Chapter 40A-4(a)(16) of the Dallas City Code, the actuarial assumptions and methods are set by the Board of Trustees, based upon recommendations made by the plan's actuary. An experience investigation was performed for the five year period ending December 31, 2014. As a result of that study, revised assumptions were adopted by the Board effective with the valuation as of December 31, 2014. These assumptions were further modified effective December 31, 2016. We believe the assumptions are internally consistent, reasonable, and, where appropriate, based on the actual experience of the ERF. All of the assumptions and methods used in this valuation were selected in compliance with the Actuarial Standards of Practice. All actuarial assumptions and methods are described under Section P of this report.

The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions.

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Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. Due to the limited scope of this assignment, GRS did not perform an analysis of the potential range of such possible future differences. The actuarial calculations are intended to provide information for rational decision making. Other than the sensitivity analysis shown in Section L, this report does not include a more robust assessment of the future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment.

This valuation is based on the provisions of ERF in effect as of the valuation date, data on the ERF membership and information on the asset values of the Fund as of December 31, 2018. The member, annuitant and asset data used in the valuation were all prepared and furnished by ERF staff. While certain checks for reasonableness were performed, the data used was not audited.

To the best of our knowledge, this report is complete and accurate and was conducted in accordance with the Actuarial Standards of Practice as set forth by the Actuarial Standards Board and in compliance with the provisions of the Dallas City Code. The undersigned are independent actuaries and consultants. Mr. Randall is an Enrolled Actuary and a Member of the American Academy of Actuaries and he meets the Qualification Standards of the American Academy of Actuaries. Both Mr. Randall and Mr. Ward have significant experience in performing valuations for large public retirement systems.

We would like to thank the ERF staff for their assistance in providing all necessary information to complete this valuation. Their courteous help is very much appreciated. We look forward to discussing this actuarial valuation report with you at your convenience. Please do not hesitate to let us know if you have any questions or need additional information.

Respectfully submitted,

Lewis Ward
Consultant

Mark R. Randall, MAAA, FCA, EA
Chief Executive Officer

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EXECUTIVE SUMMARY

($ in 000s)

The key results from the actuarial valuation of the Employees' Retirement Fund of the City of Dallas as of December 31, 2018 may be summarized as follows:

	December 31, 2017	December 31, 2018
· Members		
- Actives	7,838	7,584
- Benefit recipients	7,042	7,224
- Deferred vested*	793	819
- Other terminated*	455	673
- Total	16,128	16,300
· Covered payroll (including overtime)	$ 421,269	$ 423,723
· Normal cost	$ 82,871	$ 81,299
as % of expected payroll	20.04%	19.56%
· Actuarial accrued liability	$ 4,377,844	$ 4,526,996
· Actuarial value of assets	$ 3,601,612	$ 3,620,319
· Market value of assets	$ 3,601,612	$ 3,265,402
· Unfunded actuarial accrued liability (UAAL)	$ 776,232	$ 906,677
· Estimated yield on assets (market value basis)	12.34%	(5.15)%
· Estimated yield on assets (actuarial value basis)	8.99%	5.23%
· Contribution Rates		
- Prior Adjusted Total Obligation Rate	36.00%	36.00%
- Current Total Obligation Rate	41.41%	43.07%
- Current Adjusted Total Obligation Rate	36.00%	36.00%
· Actuarial gains/(losses)		
- Assets	$ 19,847	$ (88,729)
- Actuarial liability experience	$ 61,019	$ (11,356)
- Assumption and method changes	$ 21,916	$ -
· 30-year level % of pay funding cost	$ 139,484	$ 146,729
as % of payroll (Employee + City)	33.12%	34.59%
· Funded ratio		
- Based on actuarial value of assets	82.3%	80.0%
- Based on market value of assets	82.3%	72.1%

** Deferred vested are members who have applied for a deferred pension. Other terminations are other members who have terminated and still have contribution balances in the Fund.*

PURPOSES OF THE ACTUARIAL VALUATION

At your request, we have performed the actuarial valuation of the Employees' Retirement Fund of the City of Dallas ("ERF" or the "Fund") as of December 31, 2018.

The purposes of an actuarial valuation are as follows:

- To determine the funding status of ERF as of the valuation date;
- To develop the actuarially determined level of contributions for ERF for the 2019 calendar year; and
- To develop the current total obligation rate and the current adjusted total obligation rate for the fiscal year beginning October 1, 2019.

REPORT HIGHLIGHTS

($ in 000s)

The following is a set of key actuarial results from the prior year's valuation as compared to the current year:

	Valuation Date	
	December 31, 2017	**December 31, 2018**
Contribution Rates (% of Payroll)		
Normal Cost (including administrative expense)	21.40%	20.95%
Total Actuarial Contribution Rate	33.12%	34.59%
Total Projected Actuarial Contribution	$139,484	$146,729
Funded Status (on AVA basis)		
Actuarial Accrued Liability	$4,377,844	$4,526,996
Actuarial Value of Assets	3,601,612	3,620,319
Unfunded Actuarial Accrued Liability	$776,232	$906,677
Funded Ratio	82.27%	79.97%

FUNDING PROCESS

Based on the previous work of the Employees' Retirement Fund Study Committee, which was ratified by the ERF Board, the Dallas City Council and the voters of Dallas, a new funding process commenced October 1, 2005. From this date forward, a new "current adjusted total obligation rate" will be contributed jointly by the City (63%) and the Membership (37%). This current adjusted total obligation rate will cover both the debt service tied to the pension obligation bonds issued in 2005 and the contributions to the ERF. In subsequent years, the contribution rate changes only if the actuarial valuation develops a "current total obligation rate" which differs from the "prior adjusted total obligation rate" by more than 3.00% (plus or minus).

As shown in Table 3 (under Section N) and discussed later in this report, the "current total obligation rate" (Item 4 in Table 3) exceeds the "prior adjusted total obligation rate" (Item 1 in Table 3) as of December 31, 2018. This means that the "current adjusted total obligation rate" will remain at 36.00% of active member payroll for the fiscal year beginning October 1, 2019. It should be noted that under the contribution corridor methodology, the "current adjusted total obligation rate" would have been higher if not for the maximum rate of 36.00% allowed under Chapter 40A of the Dallas City Code.

ACTUARIAL CONTRIBUTIONS

The Actuarially Required Contribution Rate developed in this actuarial valuation is 34.59% of active member payroll. This rate excludes the amount needed to make the City's debt service payment on the pension obligation bonds in fiscal year 2020. As shown in Section N -Table 3 of this report, the debt service payment is determined to be 8.48% of projected payroll. The sum of these rates is 43.07% (the Current Total Obligation Rate), which is 7.07% more than the Prior Adjusted Total Obligation Rate of 36.00%. Because the total contribution rate cannot exceed 36.00%, the total contribution rate in fiscal year 2020 (the Current Adjusted Total Obligation Rate) to fund the ERF and make the debt service payment on the pension obligation bonds will be 36.00%, which is the maximum rate allowed under Chapter 40A of the Dallas City Code.

The members contribute 37% of the Current Adjusted Total Obligation Rate and the City contributes 63%. Hence, the members' portion of the 36.00% total contribution rate will be 13.32% and the City portion will be 22.68%. All of the member contribution rate will be contributed to the ERF. As noted above, 8.48% of the City's contribution rate will go towards the debt service on the pension obligation bonds and the remaining 14.20% will be contributed towards the ERF. This means a total contribution rate of 27.52% will be contributed to the ERF, which compares to the actuarially calculated rate of 34.59%.

ACTUARIAL ASSUMPTIONS

Section P of this report includes a summary of the actuarial assumptions and methods used in this valuation. In short, costs are determined using the Entry Age Normal actuarial cost method. The assumed annual investment return rate is 7.75% and includes an annual assumed rate of inflation of 2.75%.

All actuarial assumptions and methods are the same as in the prior valuation report. Please see Section P for a complete description of these assumptions and methods.

ERF BENEFITS

As the reader may be aware, City of Dallas voters approved a new tier of benefits for City of Dallas municipal employees hired after December 31, 2016.

There were no changes in the benefit provisions of ERF since the prior valuation. Please see Section Q for a summary description of the ERF benefits.

EXPERIENCE DURING PREVIOUS YEARS

An Actuarial (Gain)/Loss Analysis [(G)/L] reviews the effects of the actual experience that differs from the assumed experience based on the actual results for the year. If any difference increases assets or reduces liabilities, we have an actuarial gain. The reverse is an actuarial loss.

On a market value return basis, the Fund returned approximately -5.15% (calculated on a dollar-weighted basis, net of investment expenses). Given this return, the actual investment income was much lower than the expected investment income on the market value of assets; therefore, an investment shortfall occurred. This shortfall is recognized this year (1/5) and partially deferred into the near future (4/5). Please see Table 6 for the determination of the actuarial value of assets (AVA) and page 47 for a description of the AVA methodology. As developed on Table 9A, there was an $89 million loss on the actuarial value of assets as of December 31, 2018. The rate of return on the actuarial value of assets for 2018 was 5.23% (calculated on a dollar-weighted basis, net of investment expenses). This result was less than the investment return assumption of 7.75%.

As developed on Table 8, ERF experienced an overall actuarial loss in calendar year 2018 in the amount of $100.1 million. Since there was an $89 million loss on the actuarial value of assets, this implies there was a liability actuarial loss of about $11.4 million derived from demographic assumptions and non-investment economic assumptions (cost-of-living-adjustment). Please see Table 9B for an analysis of the experience loss by source.

The total (G)/L for the prior 5 years is broken down as follows ($ in millions):

		2014	2015	2016	2017	2018
1)	Actuarial (Gain)/Loss on Assets	($61.00)	$31.24	($16.41)	($19.85)	$88.73
2)	Actuarial (Gain)/Loss on Liabilities	(21.97)	(26.83)	(32.35)	(61.02)	11.35
3)	Total Actuarial (Gain) or Loss (1+2)	($82.97)	$4.41	($48.76)	($80.87)	$100.08

The unfunded actuarial accrued liability (UAAL) also increased $22.9 million due to the difference between the calculated contribution rate and the actual contributions during 2018.

ASSET INFORMATION

The assets of the Fund (on a market value basis) decreased from $3,602 million as of December 31, 2017 to $3,265 million as of December 31, 2018.

The assets recognized for actuarial valuation purposes (known as "the actuarial value of assets") were equal to the market value of assets in the December 31, 2017 valuation. Beginning with this valuation, a new smoothing method is now being used to recognize future asset gains and losses. The purpose of such a smoothing method is to allow the use of market values, but to dampen the effect of the typical year-to-year market fluctuations. Please see page 47 of this report for a description of the new smoothing method (actuarial value of asset method). See Table 6 in Section N of this report for the determination of the actuarial value of assets as of December 31, 2018.

The actuarial value of assets has increased from $3,602 million to $3,620 million during 2018. The actuarial assets are less than the expected actuarial assets, $3,709 million, due to investment losses during the year. This resulted in an actuarial loss on the actuarial assets of $88.7 million.

The rate of return on investments for 2018 on the actuarial value of assets was 5.23%, compared to 8.99% in 2017. The detailed determinations of asset values utilized in this valuation and the change in assets in the last year are exhibited in Tables 4 and 5 of Section N of this report.

FUNDED STATUS

The funded status of ERF is measured by the Funded Ratio and the Unfunded Actuarial Accrued Liability (UAAL). The Funded Ratio is the ratio of the actuarial value of assets available for benefits to the actuarial accrued liability (AAL) of the Fund on the valuation date. Therefore, it reflects the portion of the AAL that is covered by ERF assets. The UAAL is the difference between these two amounts.

A Funded Ratio of 100% means that the funding of ERF is precisely on schedule as of the particular valuation date. In addition, an increasing funded ratio from year-to-year may also mean that the funding of ERF is on schedule. By monitoring changes in the Funding Ratio each year, we can determine whether or not funding progress is being made.

Based on the market value of assets, the Funded Ratio of ERF decreased from 82.3% as of December 31, 2017 to 72.1% as of December 31, 2018. Based on the actuarial value of assets, the Funded Ratio of ERF decreased from 82.3% as of December 31, 2017 to 80.0% as of December 31, 2018.

The UAAL increased from $776.2 million as of December 31, 2017 to $906.7 million as of December 31, 2018. Since the UAAL is positive, this implies the actuarial accrued liabilities exceed the actuarial assets of the Fund as of December 31, 2018.

GASB DISCLOSURE

Governmental Accounting Standards Board (GASB) Statement Numbers 67 and 68 detail the current accounting standards for ERF and the Fund's sponsor, the City of Dallas, Texas. These new standards were effective with the plan year ending December 31, 2014 for the Fund and the fiscal year ending September 30, 2015 for the City. The new standards created a clear distinction between the funding requirements of a pension plan and the accounting requirements. Because of these changes, the GASB disclosure information will no longer be included in the actuarial valuation report, but will instead be provided under separate cover.

Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

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

Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (Continued)

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

The Current Adjusted Total Obligation Rate shown in the Executive Summary may be considered as a minimum contribution rate that complies with Chapter 40A of the Dallas City Code. However, due to the contribution rate cap, this is less than the actuarially calculated rate. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Several generally accepted plan maturity measures are described below and are followed by a table showing a 9-year history of the measurements for Dallas ERF.

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

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

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

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

Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (Continued)

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

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

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

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

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

DURATION OF PRESENT VALUE OF BENEFITS

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

ADDITIONAL RISK ASSESSMENT

Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability. While a robust measurement of additional risk assessment is outside the scope of the annual actuarial valuation, we have included a scenario test of a 1% increase or 1% decrease in the investment return assumption. The results of this test are shown at the end of this section.

Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions (Continued)

	2018	2017	2016	2015	2014	2013	2012	2011	2010
Ratio of the market value of assets to total payroll	7.71	8.55	8.13	8.12	9.34	9.72	9.01	8.87	8.90
Ratio of actuarial accrued liability to payroll	10.68	10.39	10.48	10.50	11.03	10.55	10.64	10.95	10.18
Ratio of actives to retirees and beneficiaries	1.05	1.11	1.10	1.11	1.09	1.08	1.09	1.09	1.17
Ratio of net cash flow to market value of assets	-5.1%	-4.3%	-4.4%	-4.5%	-4.2%	-4.4%	-5.1%	-5.3%	-4.6%
Duration of the actuarial present value of benefits*	12.37	NA	NA	NA	NA	NA	NA	NA	NA

*Duration measure not available prior to 2018

Impact on Funding Metrics of Investment Return Assumption +/- 1%

	Investment Return Assumption		
Cost Item	6.75%	7.75%	8.75%
Normal Cost % (excluding admin expenses)	24.03%	19.56%	16.21%
UAAL ($ in millions)	$1,433.0	$906.7	$463.1
30-year funding rate (employee + City)	44.94%	34.59%	25.03%
Funded Ratio	71.64%	79.97%	88.66%
Funding Period	Infinite*	46 years	30 years

*Assets expected to be depleted in 2069.

CLOSING COMMENTS

The unfunded actuarial accrued liability of the Fund has increased since the prior valuation primarily due to losses on the actuarial value of assets.

The calculated contribution rate necessary to pay the Fund's normal cost and amortize the UAAL over 30 years is 34.59% of pay. When the debt service payment on the Pension Obligation Bonds is considered, the total contribution rate is 43.07% of payroll. However, Chapter 40A of the Dallas City Code limits the contribution rate to 36.00% of payroll, therefore, the total rate to be contributed by the employees and the City for fiscal year 2019 will be 36.00% of pay.

Additionally, the calculated contribution rate is above the 36.00% of pay maximum. When the Pension Obligation Bond debt is repaid, the calculated contribution rate is expected to drop between 8.50% - 9.00% of pay. However, that is not expected to happen until fiscal year 2035.

Following adoption of the proposed changes by the ERF Board, the Dallas City Council, and approval by the City of Dallas voters, the new tier of benefits became effective for employees hired after December 31, 2016 and the outlook for the ERF improved. Based on our projections, reflecting the new tier of benefits and assuming the actuarial assumptions are exactly met (including a 7.75% return on the actuarial value of assets), ERF is expected to be fully funded in approximately 46 years.

ACTUARIAL TABLES

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Summary of Actuarial Values
As of December 31, 2018
($ in 000s)

		Entry Age Actuarial Values		
	APV* of Projected Benefits	**Actuarial Accrued Liability (AAL)**	**Normal Cost $**	**Normal Cost % of Pay****
1 Active Members				
a. Retirement	$ 1,717,720	$ 1,349,538	$ 55,228	13.29%
b. Death	39,595	24,204	2,339	0.56%
c. Disability	21,520	8,953	1,891	0.45%
d. Termination	147,977	12,353	19,324	4.65%
e. Health Subsidy	48,786	35,192	2,517	0.61%
Total	$ 1,975,598	$ 1,430,240	$ 81,299	19.56%
2 Benefit Recipients	2,989,597	2,989,597		
3 Other Inactive	107,159	107,159		
4 Total Actuarial Values of Benefits	$ 5,072,354	$ 4,526,996	$ 81,299	19.56%
5 Actuarial Value of Assets		$ 3,620,319		
6 Unfunded Actuarial Accrued Liability (4 - 5)		$ 906,677		
7 Funding Ratio		79.97%		
8 Market Value Measurements				
UAAL on market value		$ 1,261,594		
Funded Ratio on market value		72.13%		

* *APV – Actuarial Present Value*
** *Percentage of expected payroll for continuing active members.*

Development of Actuarially Required Contribution for FY 2020

($ in 000s)

	$	% of Pay
Actuarial Requirement		
a. Payment to Amortize UAAL over 30 years*	$ 59,385	13.64%
b. Normal Cost	81,299	19.56%
c. Administrative Expense	6,045	1.39%
Total	$ 146,729	34.59%

** Amortization is determined as a level percentage of projected payroll*

Information for Ordinance 25695

For the Fiscal Year Commencing October 1, 2019

1	**Prior Adjusted Total Obligation Rate**	36.00%
2	**Actuarially Required Contribution Rate**	34.59%
3	**Debt Service**	
	a Scheduled Debt Service Payment for FY 2020	$ 36,908,687
	b Projected Payroll	$ 435,375,357
	c Pension Obligation Bond Credit Rate (a/b)	8.48%
4	**Current Total Obligation Rate (2 + 3c)**	43.07%
5	**Current Adjusted Total Obligation Rate**	36.00% *
6	**Allocation of Contribution Rates Commencing October 1, 2019**	
	a Employee (5 x .37)	13.32%
	b City (5 x .63)	22.68%

* If the absolute value of the difference between the Prior Adjusted Total Obligation Rate (PATOR) and the Current Total Obligation Rate (CTOR) is less than or equal to 3.0% then:

Current Adjusted Total Obligation Rate (CATOR) = PATOR

otherwise:

1) If PATOR - CTOR > 3.00% then the CATOR is set equal to the greater of:
   a) the average of the Prior Adjusted Total Obligation Rate and the Current Total Obligation Rate; or
   b) 90% of the Prior Adjusted Total Obligation Rate

or

2) If PATOR - CTOR < -3.00% then the CATOR is set equal to the lesser of:
   a) the average of the Prior Adjusted Total Obligation Rate and the Current Total Obligation Rate; or
   b) 110% of the Prior Adjusted Total Obligation Rate

Additionally, the CATOR cannot exceed 36.00%.

Excerpts from City Ordinance 25695

ACTUARIALLY REQUIRED CONTRIBUTION RATE – means, for any fiscal year, a rate of contribution to the fund, expressed as a percentage of members' projected wages for such fiscal year, which is the sum of the following as determined in the actuarial valuation report for the preceding plan year:

(A) the actuarial present value of the pension plan benefits and expenses that are allocated to a valuation period by the actuarial cost method; and

(B) the contribution that will amortize the difference between the actuarial accrued liability of the fund and the actuarial value of the assets of the fund over the period of years required by generally accepted accounting principles.

CITY CONTRIBUTIONS – means, for each pay period ending during a transition year, the city shall contribute to the retirement fund an amount equal to:

(A) 63% times the current total obligation rate for that fiscal year times the members' wages for the pay period, minus

(B) The pension obligation bond credit rate for that fiscal year times the members' wages for the pay period;

and, for each pay period ending during each fiscal year, except for a transition year, the city shall contribute to the retirement fund an amount equal to:

(C) 63% times the current adjusted total obligation rate for that fiscal year times the members' wages for the pay period, minus

(D) The pension obligation bond credit rate for that fiscal year times the members' wages for the pay period.

EMPLOYEE CONTRIBUTIONS – means, for each pay period ending during a transition year, each member shall contribute to the retirement fund an amount equal to:

(A) 37% times the current total obligation rate for that fiscal year times the member's wages for the pay period;

and, for each pay period ending during each fiscal year, except for a transition year, the member shall contribute to the retirement fund an amount equal to:

(B) 37% times the current adjusted total obligation rate for that fiscal year times the member's wages for the pay period.

CURRENT ADJUSTED TOTAL OBLIGATION RATE – means, for any fiscal year, the rate determined by the board as follows, using whichever formula is applicable:

(A) If the current total obligation rate minus the prior adjusted total obligation rate is greater than three, then the current adjusted total obligation rate for such fiscal year is equal to the lesser of:

(i) the prior adjusted total obligation rate plus one-half times the difference of the current total obligation rate minus the prior adjusted total obligation rate; or

(ii) 110 percent times the prior adjusted total obligation rate; or

(iii) 36 percent.

(B) If the difference between the current total obligation rate and the prior adjusted total obligation rate is less than three, then the current adjusted total obligation rate for such fiscal year is equal to the prior adjusted total obligation rate.

(C) If the prior adjusted total obligation rate minus the current total obligation rate is greater than three, then the current adjusted total obligation rate for such fiscal year is equal to the greater of:

(i) the prior adjusted total obligation rate minus one-half times the difference of the prior adjusted total obligation rate minus the current total obligation rate; or

(ii) 90 percent times the prior adjusted total obligation rate.

CURRENT TOTAL OBLIGATION RATE – means, for any fiscal year, the rate adopted by the board that is equal to the sum of the pension obligation bond credit rate for such fiscal year plus the actuarially required contribution rate for such fiscal year.

PENSION OBLIGATION BOND CREDIT RATE – means, for any fiscal year, the rate adopted by the board that is a percentage calculated by dividing:

(A) the debt service due during such fiscal year on any pension obligation bonds, the proceeds of which have been deposited in the fund, by:

(B) the total members' projected wages for such fiscal year, as reported in the relevant actuarial valuation report.

PRIOR ADJUSTED TOTAL OBLIGATION RATE – means:

(A) for the fiscal year commencing October 1, 2006, the current total obligation rate that was effective for the prior fiscal year; and

(B) for each fiscal year commencing on or after October 1, 2007, the current adjusted total obligation rate that was effective for the prior fiscal year.

PROJECTED PAYROLL – means the covered payroll for the valuation proceeding the fiscal year multiplied by the payroll growth assumption.

TRANSITION YEAR – means each of the following:

(A) the first fiscal year in which debt service payments related to pension obligation bonds are due from the city;

(B) the first fiscal year in which no debt service payments related to pension obligation bonds are due from the city; and

(C) the fiscal year beginning October 1, 2005.

Net Assets Available for Benefits

($ in 000s)

	December 31, 2017	December 31, 2018
1 Assets		
a. Cash & Short-Term	$ 117,468	$ 102,781
2 Receivables		
a. Accrued Investment Income	$ 12,773	$ 14,201
b. Securities Sold	7,499	2,789
c. Employer Contribution	1,788	2,058
d. Employee Contribution	1,656	1,903
e. Pending Contracts	247	-
	$ 23,963	$ 20,951
3 Investments		
a. Index Funds	$ 163,761	$ 119,550
b. Fixed Income	930,414	911,461
c. Equities	1,885,899	1,871,968
d. Real Estate	307,854	232,171
e. Private Equity	195,068	27,111
	$ 3,482,996	$ 3,162,261
4 Total Assets	$ 3,624,427	$ 3,285,993
5 Liabilities		
a. Accounts Payable	$ 6,420	$ 7,434
b. Investment Transactions	16,395	13,157
	$ 22,815	$ 20,591
6 Net Assets Available For Benefits	$ 3,601,612	$ 3,265,402

Change in Assets Available for Benefits

Fiscal Year Ending December 31, 2018

($ in 000s)

	2017	2018
1 Assets Available at Beginning of Year	$ 3,327,681	$ 3,601,612
Adjustment *	24,361	10,647
	$ 3,352,042	$ 3,612,259
2 Revenues		
a. Employer Contributions	$ 58,966	$ 60,924
b. Employee Contributions	55,175	56,760
c. Investment Income	101,352	104,544
d. Investment Expense	(14,334)	(14,446)
e. Realized and Unrealized Gains (Losses)	314,318	(272,937)
f. Other (Security Lending)	1,508	1,381
Total Revenues	$ 516,985	$ (63,774)
3 Expenses		
a. Benefits	$ 253,534	$ 263,963
b. Refunds	8,156	8,443
c. Administration Expense	5,725	10,677
Total Expense	$ 267,415	$ 283,083
4 Assets Available at End of Year (1 + 2 - 3)	$ 3,601,612	$ 3,265,402

** Change due to difference between unaudited asset value used for prior valuation and audited asset value reported the following year.*

Development of Actuarial Value of Assets

($ in 000s)

		December 31, 2018
1.	Market value of assets at beginning of year	$ 3,601,612
2.	External cashflow	
	a. Contributions	$ 117,684
	b. Benefits and refunds paid	(272,406)
	c. Administrative and miscellaneous expenses	(10,677)
	d. Subtotal	(165,399)
3.	Assumed investment return rate for fiscal year	7.75%
4.	Assumed investment income for fiscal year	$ 272,835
5.	Expected Market Value at end of year (1+ 2 + 4)	$ 3,709,048
6.	Market value of assets at end of year	$ 3,265,402
7.	Difference (6 - 5)	$ (443,646)

8. Development of amounts to be recognized as of December 31, 2018:

Fiscal Year End	Remaining Deferrals of Excess (Shortfall) of Investment Income	Offsetting of Gains/(Losses)	Net Deferrals Remaining	Years Remaining	Recognized for this valuation	Remaining after this valuation
	(1)	(2)	(3) = (1) + (2)	(4)	(5) = (3) / (4)	(6) = (3) - (5)
2014	$ 0	$ 0	$ 0	1	$ 0	$ 0
2015	0	0	0	2	0	0
2016	0	0	0	3	0	0
2017	0	0	0	4	0	0
2018	(443,646)	0	(443,646)	5	(88,729)	(354,917)
Total	$ (443,646)	$ 0	$ (443,646)		$ (88,729)	$ (354,917)

9.	Final actuarial value of plan net assets, end of year (Item 6 - Item 8, Column 6)	$ 3,620,319
10.	Ratio of actuarial value to market value	110.9%

Notes: At the December 31, 2017 valuation, the actuarial value of assets was set equal to the market value of assets Therefore, there are no prior years remaining deferrals as of this valuation.

Historical Investment Performance

Dollar Weighted Basis Net of Investment Expenses

Calendar Year	On Market Value	On Actuarial Value
2000	-3.45%	9.59%
2001	-5.46%	2.76%
2002	-9.81%	-5.37%
2003	27.05%	2.03%
2004	15.22%	9.38%
2005	7.93%	13.71%
2006	16.90%	13.03%
2007	3.56%	9.58%
2008	-31.31%	-3.76%
2009	30.35%	6.79%
2010	15.77%	4.30%
2011	0.86%	1.15%
2012	14.29%	2.82%
2013	16.75%	10.65%
2014	6.14%	10.29%
2015	-1.83%	7.02%
2016	8.65%	8.51%
2017*	12.34%	8.99%
2018	-5.15%	5.23%
5-year average ending in 2018	3.82%	7.99%
10-year average ending in 2018	9.38%	6.53%

*The yield on the actuarial value of assets for 2017 includes the impact of the method change for the Actuarial Value of Assets.

Analysis of Change in Unfunded
Actuarial Accrued Liability
For the Year Ending December 31, 2018
($ in 000s)

1 UAAL as of December 31, 2017		$ 776,232
2 Expected Change in UAAL during 2018		
a. Expected Amortization Payment for CY 2018	(50,730)	
b. Interest adjustments on 1 & 2a to Year End @ 7.75%	58,229	
c. Expected change in UAAL		7,499
3 Increase/(Decrease) in UAAL Due to Difference Between Calculated Contribution Rate and Actual Contribution		22,861
4 Net Actuarial Experience (Gains) & Losses		100,085
5 Assumption and Method Changes		0
6 UAAL as of December 31, 2018		$ 906,677

Investment Experience (Gain) or Loss
($ in 000s)

Item		Valuation as of December 31, 2018
1.	**Actuarial assets, beginning of year**	$ 3,601,612
2.	**Contributions**	117,684
3.	**Benefits and refunds paid with administrative expenses**	(283,083)
4.	**Assumed net investment income at 7.75% on**	
	a. Beginning of year assets	279,125
	b. Contributions	4,475
	c. Benefits and refunds paid with administrative expenses	(10,765)
	d. Total	$ 272,835
5.	**Expected actuarial assets, end of year** (Sum of Items 1 through 4)	3,709,048
6.	**Actual actuarial assets, end of year**	3,620,319
7.	**Asset experience (gain)/loss for year**	88,729

Analysis of Actuarial (Gains) and Losses
For 2018
($ in 000s)

	2018
Investment Return	$ 88,729
Salary Increase	10,871
Age and Service Retirement	(5,097)
General Employment Termination	(1,349)
Disability Incidence	(335)
Active Mortality	(306)
Benefit Recipient Mortality	9,689
Actual vs. Expected Cost of Living Adjustment (COLA)*	(1,179)
Other	(938)
Total Actuarial (Gain)/ Loss	$ 100,085

* Actual COLA of 2.69% versus expected COLA of 2.75%

Schedule of Funding Status

($ in 000s)

End of Year	Actuarial Value of Assets (a)	AAL (b)	UAAL (b-a)	Funding Ratio (a/b)	Payroll* (c)	UAAL as % of Payroll ((b-a)/c)
1998	$1,617,468	$1,750,430	$132,962	92.40%	$275,547	48.30%
1999	1,862,644	1,873,998	11,353	99.39%	282,127	4.00%
2000	1,997,828	2,038,078	40,250	98.03%	298,355	13.50%
2001	2,017,041	2,276,488	259,447	88.60%	332,842	77.90%
2002	1,863,701	2,399,569	535,868	77.67%	324,615	165.08%
2003	1,843,099	2,489,071	645,972	74.05%	318,492	202.82%
2004	2,482,082	2,488,270	6,188	99.75%	331,201	1.87%
2005	2,739,269	2,606,173	(133,096)	105.11%	332,446	-40.04%
2006	2,998,099	2,761,404	(236,695)	108.57%	344,997	-68.61%
2007	3,183,260	2,915,164	(268,096)	109.20%	370,150	-72.43%
2008	2,957,506	3,075,385	117,879	96.17%	389,362	30.27%
2009	3,031,652	3,192,120	160,468	94.97%	375,164	42.77%
2010	3,027,439	3,282,126	254,687	92.24%	332,045	76.70%
2011	2,916,746	3,391,652	474,906	86.00%	318,972	148.89%
2012	2,846,124	3,518,356	672,232	80.89%	340,452	197.45%
2013	3,074,284	3,610,845	362,477	85.14%	352,486	102.83%
2014	3,241,053	4,004,055	763,002	80.94%	374,002	204.01%
2015	3,320,387	4,129,133	808,746	80.41%	404,981	199.70%
2016	3,451,463	4,291,802	840,339	80.42%	420,693	199.75%
2017	3,601,612	4,377,844	776,232	82.27%	432,854	179.33%
2018	3,620,319	4,526,996	906,677	79.97%	435,375	208.25%

* *Projected to following year.*

Summary of Data Characteristics

As of December 31,	2016	2017	2018
Active Members			
Number	7,619	7,838	7,584
Total Annualized Earnings of Members as of 12/31 (000s)	$ 409,433	$ 421,269	$ 423,723
Average Earnings	53,738	53,747	55,871
Benefit Recipients			
Number	6,903	7,042	7,224
Total Annual Retirement Income (000s)	$ 237,993	$ 244,768	$ 258,085
Total Annual Health Supplement (000s)	10,061	10,220	10,523
Average Total Annual Benefit	35,542	36,223	37,200
Inactive Members*			
Deferred Vested	768	793	819
Deferred Nonvested	447	455	673
Total	1,215	1,248	1,492

** The number of inactives on 12/31/2018 includes 819 members who have applied for a deferred pension and 673 other members who have terminated and still have contribution balances in the Fund.*

Distribution of Active Members and Payroll by Age and Years of Service

Age	Years of Service								
	Under 1	1-4	5-9	10-14	15-19	20-24	25-29	30 & Over	Totals
Under 20									0
									$0
20-24	96	89							185
	$3,155,508	$3,034,105							$6,189,613
25-29	148	395	51	1					595
	$5,828,110	$16,661,382	$2,555,746	$28,780					$25,074,018
30-34	147	393	170	69					779
	$6,171,103	$18,707,908	$8,904,426	$3,861,872					$37,645,309
35-39	113	319	196	162	30	3			823
	$5,328,873	$16,441,145	$11,638,805	$9,968,260	$1,873,908	$172,336			$45,423,327
40-44	97	294	176	199	114	54	1		935
	$4,694,166	$15,513,806	$10,927,910	$11,853,403	$7,321,190	$3,314,684	$74,835		$53,699,994
45-49	69	269	150	186	134	145	45	2	1,000
	$3,564,896	$14,612,525	$8,615,546	$11,353,146	$7,954,085	$9,422,401	$2,964,041	$175,236	$58,661,876
50-54	69	231	165	224	173	182	98	27	1,169
	$3,403,683	$11,496,579	$9,053,025	$13,908,774	$11,149,008	$12,208,311	$6,894,200	$1,966,738	$70,080,318
55-59	42	234	145	248	179	156	55	52	1,111
	$2,130,281	$12,173,813	$7,611,063	$14,447,131	$11,037,895	$9,990,719	$3,844,691	$4,170,166	$65,405,759
60-64	30	98	104	141	103	86	41	48	651
	$1,779,354	$4,966,171	$6,272,728	$8,120,216	$6,490,556	$5,423,816	$3,133,693	$3,808,121	$39,994,655
65&Over	7	33	51	82	54	53	20	36	336
	$418,912	$1,791,701	$2,980,740	$5,266,566	$3,716,969	$3,202,132	$1,515,943	$2,655,143	$21,548,106
Totals	818	2,355	1,208	1,312	787	679	260	165	7,584
	$36,474,886	$115,399,135	$68,559,989	$78,808,148	$49,543,611	$43,734,399	$18,427,403	$12,775,404	$423,722,975

Distribution of Benefit Recipients
as of December 31, 2018

Age	Number	Annual Benefit*	Annual Average Benefit*
Under 50	44	$ 751,775	$ 17,086
50-54	212	9,470,300	44,671
55-59	678	30,462,869	44,930
60-64	1,326	50,619,250	38,174
65-69	1,673	63,118,121	37,728
70-74	1,401	51,783,057	36,961
75-79	836	24,964,465	29,862
80-84	523	14,598,467	27,913
85-89	324	7,765,354	23,967
90 & Over	207	4,551,671	21,989
Total	7,224	$ 258,085,328	$ 35,726

** Does not include Health Benefit Supplement.*

Schedule of Active Member Valuation Data

Year Ending December 31,	Active Participants	Percent Change	Covered Payroll	Percent Change	Average Salary	Percent Change
2007	8,117	-	$ 359,369,000	-	$ 44,274	-
2008	8,371	3.1%	378,021,000	5.2%	45,158	2.0%
2009	7,654	-8.6%	364,237,000	-3.6%	47,588	5.4%
2010	7,034	-8.1%	322,374,000	-11.5%	45,831	-3.7%
2011	6,745	-4.1%	309,682,000	-3.9%	45,913	0.2%
2012	6,864	1.8%	330,536,000	6.7%	48,155	4.9%
2013	6,993	1.9%	342,219,000	3.5%	48,937	1.6%
2014	7,180	2.7%	363,109,000	6.1%	50,572	3.3%
2015	7,477	4.1%	393,186,000	8.3%	52,586	4.0%
2016	7,619	1.9%	409,433,000	4.1%	53,738	2.2%
2017	7,838	2.9%	421,269,000	2.9%	53,747	0.0%
2018	7,584	-3.2%	423,723,000	0.6%	55,871	4.0%

Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

	Added to Rolls		Removed from Rolls		Rolls-End of Year			
Year Ending December 31,	Number	Annual Allowances	Number	Annual Allowances	Number	Annual Allowances	% Increase in Annual Allowances	Average Annual Allowances
2007	239	$ 7,250,468	205	$ 4,551,742	5,304	$142,267,609	-	$ 26,823
2008	383	8,905,680	211	4,684,964	5,476	154,692,846	8.7%	28,249
2009	446	9,268,740	216	4,795,982	5,706	165,826,328	7.2%	29,062
2010	508	12,798,268	221	4,907,000	5,993	179,730,384	8.4%	29,990
2011	404	10,012,165	198	4,396,317	6,199	193,851,170	7.9%	31,271
2012	325	9,795,464	204	4,529,539	6,320	202,120,582	4.3%	31,981
2013	324	11,246,955	197	4,327,990	6,447	210,027,512	3.9%	32,578
2014	370	12,415,771	219	4,821,713	6,598	219,150,070	4.3%	33,215
2015	476	13,777,204	318	6,847,464	6,756	226,019,290	3.1%	33,455
2016	384	12,746,549	237	5,562,549	6,903	237,992,528	5.3%	34,477
2017	383	9,893,931	244	6,375,641	7,042	244,768,143	2.8%	34,758
2018	402	14,905,595	220	5,976,286	7,224	258,085,328	5.4%	35,726

Solvency Test
($ in 000s)

Valuation Date	Aggregated Accrued Liabilities for: Active and Inactive Members Contributions	Retirees and Beneficiaries	Active and Inactive Members (Employer Financed Portion)	Reported Assets	Portions of Accrued Liabilities Covered by Reported Assets: (5)/(2)	[(5)-(2)]/3	[(5)-(2)-(3)]/(4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
December 31, 2007	$ 206,090	$ 1,591,731	$ 1,117,343	$ 3,183,260	100.0%	100.0%	100.0%
December 31, 2008	221,667	1,707,599	1,146,119	2,957,506	100.0%	100.0%	89.7%
December 31, 2009	228,666	1,834,491	1,128,963	3,031,652	100.0%	100.0%	85.8%
December 31, 2010	232,727	2,041,322	1,008,077	3,027,439	100.0%	100.0%	74.7%
December 31, 2011	240,821	2,181,731	969,100	2,916,746	100.0%	100.0%	51.0%
December 31, 2012	257,716	2,250,533	1,010,107	2,846,124	100.0%	100.0%	33.4%
December 31, 2013	278,892	2,319,424	1,012,529	3,074,284	100.0%	100.0%	47.0%
December 31, 2014	301,567	2,578,071	1,124,417	3,241,053	100.0%	100.0%	32.1%
December 31, 2015	325,607	2,650,638	1,152,888	3,320,387	100.0%	100.0%	29.9%
December 31, 2016	350,646	2,770,533	1,170,623	3,451,463	100.0%	100.0%	28.2%
December 31, 2017	373,193	2,854,818	1,149,833	3,601,612	100.0%	100.0%	32.5%
December 31, 2018	392,004	2,989,597	1,145,395	3,620,319	100.0%	100.0%	20.8%

EXPERIENCE TABLES

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Pay Experience for Employees who are Active at Beginning and End of Year
Valuation Pay Analysis
Analyzed by Years of Service

Service Beginning of Year	Experience for 2018			
	Number	Expected Pay	Actual Pay	Ratio A/E
Under 5	2,166	$ 103,567,209	$ 104,744,363	101.14%
5-9	1,310	73,552,014	73,838,733	100.39%
10-14	1,298	77,337,750	77,757,306	100.54%
15-19	760	47,086,087	47,445,343	100.76%
20-24	766	48,819,016	49,296,400	100.98%
25-29	278	19,712,495	19,671,925	99.79%
30 & Over	181	13,757,007	13,830,037	100.53%
Total	6,759	$ 383,831,578	$ 386,584,107	100.72%
Over 10 Years	3,283	$ 206,712,355	$ 208,001,011	100.62%

Service Beginning of Year	Experience for 2015-2018			
	Number	Expected Pay	Actual Pay	Ratio A/E
Under 5	8,162	$ 381,360,592	$ 386,562,601	101.36%
5-9	5,266	286,115,340	287,557,457	100.50%
10-14	4,822	279,012,840	279,570,716	100.20%
15-19	3,706	217,504,104	218,705,898	100.55%
20-24	2,742	172,359,366	173,405,673	100.61%
25-29	1,171	81,591,157	81,983,559	100.48%
30 & Over	813	59,412,676	59,578,607	100.28%
Total	26,682	$ 1,477,356,075	$ 1,487,364,511	100.68%
Over 10 Years	13,254	$ 809,880,143	$ 813,244,453	100.42%

Analysis of Retirement Experience

Each Age

	2018 Retirement			2015-2018 Retirement		
Age	**Actual**	**Expected**	**Ratio A/E**	**Actual**	**Expected**	**Ratio A/E**
46	-	-	N/A	-	-	N/A
47	-	-	N/A	-	-	N/A
48	-	-	N/A	1	0.90	111.11%
49	1	0.50	200.00%	4	2.80	142.86%
50	8	7.20	111.11%	40	43.60	91.74%
51	6	7.85	76.43%	32	42.60	75.12%
52	10	9.44	105.93%	37	47.00	78.72%
53	10	10.35	96.62%	44	50.65	86.87%
54	12	10.09	118.93%	41	44.02	93.14%
55	9	9.24	97.40%	37	46.66	79.30%
56	17	16.61	102.35%	44	57.24	76.87%
57	13	12.85	101.17%	47	60.81	77.29%
58	8	17.08	46.84%	39	60.74	64.21%
59	13	18.79	69.19%	39	66.78	58.40%
60	25	28.28	88.40%	92	107.57	85.53%
61	16	24.94	64.15%	59	92.99	63.45%
62	12	21.15	56.74%	62	83.15	74.56%
63	14	20.80	67.31%	51	75.75	67.33%
64	15	15.25	98.36%	45	55.70	80.79%
65	17	16.36	103.91%	57	66.78	85.35%
66	12	16.65	72.07%	59	58.70	100.51%
67	3	7.70	38.96%	33	41.35	79.81%
68	12	9.25	129.73%	28	29.75	94.12%
69	7	5.20	134.62%	20	21.70	92.17%
70 & Over	15	92.00	16.30%	47	291.00	16.15%
Total	255	377.58	67.54%	958	1,448.24	66.15%
Total Under 70	240	285.58	84.04%	911	1,157.24	78.72%

Analysis of Retirement Experience

Age Groups

Age Group	2018 Retirements			2015-2018 Retirements		
	Actual	Expected	Ratio A/E	Actual	Expected	Ratio A/E
Under 55	47	45.43	103.46%	199	231.57	85.94%
55-59	60	74.57	80.46%	206	292.23	70.49%
60-64	82	110.42	74.26%	309	415.16	74.43%
65-69	51	55.16	92.46%	197	218.28	90.25%
70 & Over	15	92.00	16.30%	47	291.00	16.15%
Total	255	377.58	67.54%	958	1,448.24	66.15%
Total Under 70	240	285.58	84.04%	911	1,157.24	78.72%

Analysis of Turnover Experience

Years of Service	2018 Quits			2015-2018 Quits		
	Actual	Expected	Ratio A/E	Actual	Expected	Ratio A/E
0-4	605	404.97	149.40%	1,645	1,440.54	114.19%
5-9	112	88.35	126.76%	418	336.66	124.16%
10-14	65	44.68	145.49%	203	168.46	120.51%
15-19	15	15.92	94.20%	73	76.66	95.23%
20-24	1	8.92	11.21%	29	32.90	88.15%
25-29	1	0.63	158.73%	2	2.38	84.03%
Total	799	563.48	141.80%	2,370	2,057.60	115.18%

Analysis of Active Mortality Experience

Age	2018 Deaths			2015-2018 Deaths*		
	Actual	Expected	Ratio A/E	Actual	Expected	Ratio A/E
20-24	-	0.05	0.00%	1	0.18	558.58%
25-29	-	0.23	0.00%	1	0.80	124.65%
30-34	1	0.43	230.94%	1	1.56	64.00%
35-39	1	0.67	149.91%	3	2.58	116.29%
40-44	1	1.13	88.30%	7	4.28	163.68%
45-49	-	1.81	0.00%	3	7.61	39.42%
50-54	4	3.29	121.64%	12	13.52	88.75%
55-59	2	4.88	41.02%	10	18.49	54.07%
60 and Over	4	7.77	51.49%	20	29.26	68.36%
Total	13	20.25	64.20%	58	78.28	74.09%

Analysis of Disability Experience

Age	2018 Disabilities			2015-2018 Disabilities		
	Actual	Expected	Ratio A/E	Actual	Expected	Ratio A/E
20-24	-	0.03	0.00%	-	0.09	0.00%
25-29	-	0.15	0.00%	-	0.53	0.00%
30-34	-	0.26	0.00%	-	0.94	0.00%
35-39	-	0.40	0.00%	-	1.54	0.00%
40-44	-	0.80	0.00%	2	3.06	65.37%
45-49	-	1.79	0.00%	2	7.38	27.11%
50-54	1	3.47	28.82%	10	14.08	71.01%
55-59	-	4.28	0.00%	4	15.97	25.04%
60 and Over	2	1.35	147.92%	4	5.00	79.98%
Total	3	12.53	23.95%	22	48.60	45.27%

Analysis of Retiree Mortality Experience*

	2018 Experience			2015-2018 Experience		
Age	**Actual**	**Expected**	**Ratio A/E**	**Actual**	**Expected**	**Ratio A/E**
Under 60	3	3.04	98.82%	22	12.89	170.71%
60-64	11	9.26	118.79%	43	38.71	111.07%
65-69	19	21.41	88.74%	83	84.55	98.17%
70-74	22	26.05	84.46%	94	92.26	101.89%
75-79	30	24.84	120.77%	94	92.15	102.01%
80-84	16	23.22	68.91%	92	89.00	103.37%
85-89	18	23.05	78.09%	97	92.71	104.63%
90 & over	20	19.80	101.03%	92	80.17	114.75%
Total	139	150.66	92.26%	617	582.43	105.93%

**This analysis does not include beneficiary, QDRO, or disabled deaths.*

ACTUARIAL METHODS AND ASSUMPTIONS

The most recent experience study was completed in conjunction with the December 31, 2014 actuarial valuation. Please see our experience study dated May 2015 to see more detail of the rationale for the current assumptions. As authorized under Sec. 40A-9 of Chapter 40A, the actuarial assumptions and methods are established set by the Board of Trustees based upon recommendations from the Fund's actuary. The investment return assumption was modified again as of December 31, 2016.

Entry Age Normal Method.

The Entry Age Normal actuarial cost method is the actuarial valuation method used for all purposes under ERF. The concept of this method is that funding of benefits for each member should be effected as a, theoretically, level contribution (as a level percentage of pay) from entry into ERF to termination of active status.

The Normal Cost (NC) for a fiscal year under this method is determined as described in the prior paragraph for each member. The ERF NC for the year is the total of individual normal costs determined for each active member. The Actuarial Accrued Liability (AAL) under this method is the theoretical asset balance of the normal costs that would have accumulated to date based upon current actuarial assumptions. To the extent that the assets of the fund are insufficient to cover the AAL, an Unfunded Actuarial Accrued Liability (UAAL) develops.

The actuarially calculated contribution for a year is the Normal Cost for that year plus an amount to amortize the UAAL over 30 years as a level percentage of pay.

Actuarial Value of Asset Method.

The method for determining the actuarial value of assets in future years is equal to the market value of assets less a five-year phase in of the excess (shortfall) between expected investment return and actual income. The actual calculation is based on the difference between actual market value and the expected actuarial value of assets each year, and recognizes the cumulative excess return (or shortfall) at a minimum rate of 20% per year. Each year, a base is set up to reflect this difference. If the current year's base is of opposite sign to the deferred bases, then it is offset dollar for dollar against the deferred bases. Any remaining bases are then recognized over the remaining period for the base (5 less the number of years between the base year and the valuation year). This is intended to ensure the smoothed value of assets will converge towards the market value in a reasonable amount of time.

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Annual Rate of Investment Return: For all purposes under the Fund, the rate of investment return is assumed to be 7.75% per annum, net of investment expenses. This rate includes an annual assumed rate of inflation of 2.75%. In addition, annual cost-of-living adjustments are assumed to occur on average at the rate of 2.75% per annum for Tier A members and 2.35% for Tier B members (due to the lower maximum on cost-of-living-adjustments).

Annual Compensation Increases: Each member's compensation is assumed to increase in accordance with a table based on actual ERF experience. Sample rates follow:

Years of Service	Merit, Promotion, Longevity	General	Total
0	3.00 %	3.25 %	6.25 %
1	3.00	3.25	6.25
2	2.75	3.25	6.00
3	2.00	3.25	5.25
4	1.50	3.25	4.75
5	1.50	3.25	4.75
6	1.50	3.25	4.75
7	1.00	3.25	4.25
8	1.00	3.25	4.25
9	0.75	3.25	4.00
10	0.75	3.25	4.00
11	0.75	3.25	4.00
12	0.50	3.25	3.75
13	0.50	3.25	3.75
14	0.50	3.25	3.75
15	0.50	3.25	3.75
16	0.50	3.25	3.75
17	0.50	3.25	3.75
18	0.25	3.25	3.50
19 & Over	0.00	3.25	3.25

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Mortality:

Disabled Lives: RP-2000 Disabled Mortality Table for male annuitants, set forward one year.

Sample rates follow (rate per 1,000):

	Disability Mortality Rate	
Age	**Male**	**Female**
20	23	23
30	23	23
40	23	23
50	30	30
60	43	43
70	66	66
80	116	116
90	200	200

Other Benefit Recipients:

The gender-distinct RP-2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used, with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by Scale BB to account for future mortality improvements.

Sample rates follow (rate per 1,000), with projected mortality applied:

	Mortality Rate	
Age	**Male**	**Female**
30	0.7	0.3
40	1.4	0.9
50	2.5	1.9
60	7.9	4.3
70	22.2	15.4
80	58.6	40.6
90	162.3	115.4

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Mortality:

Active Members:

a. Males – RP-2000 Employee Mortality Table for males, set forward 4 years.

b. Females – RP2-000 Employee Mortality Table for females, set back 5 years.

Sample rates follow (rate per 1,000):

	Mortality Rate	
Age	**Male**	**Female**
30	0.7	0.2
40	1.4	0.5
50	2.8	1.1
60	7.0	2.5
70	33.9	5.8
80	99.8	28.1
90	250.7	77.4

10% of active deaths are assumed to be service related.

Disability: A client-specific table of disability incidence with sample rates follows (rate per 1,000):

Age	Disability Rate
30	0.3
40	0.6
50	2.4
60	6.0

20% of disabilities are assumed to be service related. There is a 0% assumption of disability for members who have over 10 years of service and are eligible for retirement.

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Retirement: Upon eligibility, active members are assumed to retire as follows (rate per 1,000):

Tier A:

Age	Male		Female	
	First Year Eligible	Thereafter	First Year Eligible	Thereafter
48-49	100	100	100	100
50	600	550	400	350
51	500	450	400	350
52	500	330	400	350
53	450	300	400	300
54	400	280	400	250
55	350	280	300	250
56	350	280	300	250
57	350	280	300	220
58-59	350	280	300	220
	Service < 18 yrs.	Service 18 yrs.+	Service < 18 yrs.	Service 18 yrs. +
60	80	250	100	300
61	90	250	150	220
62	100	250	150	200
63	150	250	150	150
64	150	250	100	100
65	180	250	200	200
66	200	250	250	250
67	200	250	250	250
68	200	250	150	250
69	200	250	150	250
70	1,000	1,000	1,000	1,000

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Retirement, Continued:
Upon eligibility, active members are assumed to retire as follows (rate per 1,000):

Tier B:

Age	Male		Female	
	Service < 40 yrs.	Service 40 yrs. +	Service < 40 yrs.	Service 40 yrs. +
<55	10	350	10	350
55-56	20	350	20	350
57-58	30	350	30	350
59-60	40	350	40	350
61-62	50	350	50	350
63-64	60	350	60	350
65	180	600	200	450
66	200	250	250	250
67	200	250	250	250
68	200	250	150	250
69	200	250	150	250
70	1,000	1,000	1,000	1,000

*For service < 40 yrs, rates shown are for those who met the rule of 80.

Retirement of Deferred Vested Members:
All deferred vested members are assumed to commence payment at their normal retirement age, which is age 60 for Tier A members and age 65 for Tier B members.

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

General Turnover: A table of termination rates based on ERF experience. A sample of the ultimate rates follows:

Years of Service	Terminations (per 1,000)
0	210.0
1	160.0
2	130.0
3	105.0
4	85.0
5	67.5
6	62.5
7	57.5
8	49.0
9	46.0
10-14	37.0
15-19	22.0
20 & Over	14.0

There is 0% assumption of termination for members eligible for retirement.

Mortality Improvement: Scale BB is used to project mortality improvements for Healthy Retirees on a fully generational basis. There is no projection of mortality improvement before or after the measurement date for disabled lives or active employees.

Refunds of Contributions: Members are assumed to choose the most valuable termination benefit.

Operational Expenses: The amount of estimated administrative expenses expected in the next year is assumed to be equal to the prior year's expenses and is incorporated in the Normal Cost.

Marital Status: 75% of active male members and 50% of active female employees are assumed to be married.

ACTUARIAL METHODS AND ASSUMPTIONS (cont.)

Vacation Leave Conversions: Members with 20 or more years of service are assumed to convert unused vacation leave to 1.5 months of service. Other members are assumed to convert unused vacation leave to 1 month of service. No vacation leave conversion is assumed for disability retirement.

Spouse Age: The female spouse is assumed to be 3 years younger than the male spouse.

Payroll Growth Rate: In determining the level percent amortization of UAAL rate, the payroll of the entire system is assumed to increase at 2.75% each year.

Member's Pay: In determining the member's valuation salary, the greater of the prior calendar year's gross pay and the member's rate of compensation is used.

Form of Payment: For Tier A it is assumed that 60% of married active male members and 84% of married active female employees will elect a Joint & 50% Survivor form of payment. Taking into consideration the marriage assumption and the inherent subsidy in the System's Joint & 100% Survivor factors, the male employees are valued with Joint and 29.0% Survivor annuities and the female employees are valued with Joint and 16.5% Survivor annuities. It is also assumed that 100% of Tier B employees will elect the normal form of payment under Tier B.

Data Adjustments: Certain records are missing spousal information. For these records we use the marital status assumption and spousal age difference assumption to value these records. No other adjustments are made to the data.

Actuarial Equivalence Assumptions: for form of payment conversion and Tier B early retirement factors are based on the following assumptions:

a. Interest Rate of 8.00%.

b. Mortality: Unisex blend (60% male and 40% female) of the following assumptions for males and females. 109% of the RP-2000 Combined Healthy Table for males with Blue Collar adjustment projected to 2026 using improvement scale BB for males. 103% of the RP-2000 Combined Healthy Table for females with Blue Collar adjustment projected to 2026 using improvement scale BB for females.

c. Cost-of-living-adjustments (COLA): a 3.0% COLA assumption for Tier A members and a 2.50% COLA assumption for Tier B members.

Changes in Assumptions and Methods Since Prior Valuation: None.

SUMMARY OF BENEFIT PROVISIONS

Employees' Retirement Fund of the City of Dallas

as of December 31, 2018

Membership

An employee becomes a member upon permanent employment and contributes to the Fund.

Tier A

A person who was employed by the City prior to January 1, 2017, or who was re-employed by the City on or after January 1, 2017 and whose pre January 1, 2017 credited service was not cancelled by withdrawal or forfeiture or was reinstated.

Tier B

A person who was employed by the City on or after January 1, 2017, or who was re-employed by the City on or after January 1, 2017 and whose pre January 1, 2017 credited service has been cancelled by withdrawal or forfeiture.

Contributions

Member: 37% of the current adjusted total obligation rate. New rates effective October 1 after the valuation date.

City: 63% of the current adjusted total obligation rate. New rates effective October 1 after the valuation date.

Definitions

Final Average Salary:

Tier A

Average monthly salary over the member's highest three years (or 36 months) of service.

Tier B

Average monthly salary over the member's highest five years (or 60 months) of service.

Credited Service: Length of time as an employee of the City of Dallas and while making contributions to the Fund.

SUMMARY OF BENEFIT PROVISIONS (cont.)

Retirement Pension

Eligibility:

Tier A

a. Attainment of age 60; or

b. Attainment of age 55 (if credited service began before May 9, 1972); or

c. At any age after completion of 30 years of credited service with a reduced benefit before age 50; or

d. Attainment of age 50, if the sum of an active member's age and credited service is at least equal to 78.

Tier B

a. Attainment of age 65 and 5 years of service; or

b. At any age after completion of 40 years of credited service; or

c. At any age if the sum of an active member's age and credited service is at least equal to 80 (under this eligibility the member's pension will be actuarially reduced for each year prior to the age of 65 that the member retires).

Retirement Benefits:

Tier A

The retirement benefit equals 2-3/4% multiplied by average monthly earnings multiplied by credited service limited to a maximum of 36.3636 years plus a monthly $125 health supplement (prorated for service less than 5 years).

Tier B

The retirement benefit equals 2-1/2% multiplied by average monthly earnings multiplied by credited service limited to a maximum of 40 years (no monthly health supplement).

Form of Payment:

Tier A

An unreduced pension benefit under a joint and one-half survivor option with 10 years guaranteed or a ten-year certain and life option. An actuarially equivalent joint and full survivor option is also available.

Tier B

An unreduced pension payable for life with 10 years guaranteed. Actuarially equivalent joint and survivor options (50% and 100%) are also available.

Early Retirement Factors:

Tier A

For members retiring prior to age 50 with 30 or more years of service the pension shall be multiplied by the following percentage:

Age	Percentage
49	93.3
48	87.2
47	81.5
46	76.3
45	71.5
44	67.0

Tier B

For members retiring prior to age 65 with less than 40 years of service, the pension shall be multiplied by the following percentage:

Age	Percentage	Age	Percentage
64	89.72	56	40.03
63	80.66	55	36.41
62	72.64	54	33.15
61	65.53	53	30.22
60	59.21	52	27.57
59	53.58	51	25.18
58	48.56	50	23.01
57	44.06	49	21.05

Deferred Retirement

Eligibility: Deferred retirement pension benefit commencing at age 60 for Tier A members or at age 65 for Tier B members, with at least five (5) years of credited service, and accumulated contributions are left on deposit with the Fund.

Monthly Benefit: The deferred retirement benefit is equal to the retirement pension based on earnings and credited service at the time of termination.

SUMMARY OF BENEFIT PROVISIONS (cont.)

Disability Retirement Pension

Non-Service Disability:

1. Eligibility: Five (5) years of service and totally and permanently incapacitated for duty.
2. Monthly Benefit: Computed based on average monthly earnings and credited service at time of disability but not less than 10 times the percentage multiplier multiplied by the average monthly earnings.

Service Disability:

1. Eligibility: Totally and permanently incapacitated from the further performance of duty as a result of injury while in the course of employment for the City.
2. Monthly Benefit: Calculated as a non-service disability pension but not less than $1,000 per month.

Death Benefits

Eligibility: active or inactive members who die prior to retirement

Benefit: For members with less than 2 years of service or inactive member with less than 5 years of service: refund of the members contributions.

Benefit: For members with more than 2 years of service but less than 15 years of service: an unreduced pension to designated beneficiary for 120 months or a one-half survivor option for life with 120 payments guaranteed.

Benefit: For members eligible for retirement or members and inactive members with more than 15 years of service: an unreduced pension to designated beneficiary for 120 months or a Full Survivor option for life with 120 payments guaranteed.

Form: Benefit paid in accordance with the option on file, or the eligible option, or if no eligible beneficiary, a lump sum equivalent of 10 years of benefit payments to the member's estate.

Minimum Benefit for Service Death: For job-related death a minimum of 10 years of service used in calculation of benefit. Benefit will not be less than $1,000 per month.

SUMMARY OF BENEFIT PROVISIONS (cont.)

Return of Accumulated Contributions

A member at the time of termination is entitled to be paid accumulated contributions without interest.

Cost-of-Living Adjustments

An annual cost-of-living adjustment to the base pension benefit shall be made based on the greater of:

Tier A

a. The percentage of change in the price index for October of the current year over October of the previous year, up to 5%, or

b. The percentage of annual average change in the price index for the 12-month period ending with the effective date of the adjustment, up to 5%.

Tier B

c. The percentage of change in the price index for October of the current year over October of the previous year, up to 3%, or

d. The percentage of annual average change in the price index for the 12-month period ending with the effective date of the adjustment, up to 3%.