Travis Co. ESD No. 6 Firefighters' Relief and Retirement Fund

Actuarial Valuation as of December 31, 2019

December 31, 2020

Rudd and Wisdom, Inc.

CONSULTING ACTUARIES

Mitchell L. Bilbe, F.S.A.
Evan L. Dial, F.S.A.
Philip S. Dial, F.S.A.
Charles V. Faerber, F.S.A., A.C.A.S.
Mark R. Fenlaw, F.S.A.
Brandon L. Fuller, F.S.A.
Shannon R. Hatfield, A.S.A.
Christopher S. Johnson, F.S.A.
Oliver B. Kiel, F.S.A.
Dustin J. Kim, A.S.A.
Edward A. Mire, F.S.A.
Rebecca B. Morris, A.S.A.
Amanda L. Murphy, F.S.A.
Michael J. Muth, F.S.A.
Khiem Ngo, F.S.A., A.C.A.S.
Timothy B. Seifert, F.S.A.
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David G. Wilkes, F.S.A.

December 31, 2020

Board of Trustees
Travis Co. ESD No. 6 Firefighters' Relief
and Retirement Fund
c/o Mr. Scott Falltrick, Chairman
P.O. Box 340196
Austin, TX 78734

Members of the Board of Trustees:

At your request, we have prepared this report of the results of the actuarial valuation of the fund as of December 31, 2019. This valuation was prepared to determine whether the fund has an adequate contribution arrangement.

In a separate May 28, 2020 report, we provided the necessary disclosures for the fund's compliance with the Governmental Accounting Standards Board (GASB) Statement No. 67 for the plan year ending December 31, 2019. We will also provide a separate report later containing the pension expense, net pension liability, and disclosure information for the district's compliance with GASB 68 for the fiscal year ending September 30, 2020. GASB 68 prescribes the district's accounting for your fund, while this actuarial valuation report reflects the assumed contribution policy described in this report.

We certify that we are members of the American Academy of Actuaries who meet Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report.

Sincerely,

Mark R. Fenlaw

Mark R. Fenlaw, F.S.A.

Rebecca B. Morris

Rebecca B. Morris, A.S.A.

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Section I

Valuation Summary

An actuarial valuation of the assets and liabilities of the Travis Co. ESD No. 6 Firefighters' Relief and Retirement Fund as of December 31, 2019 has been completed. The valuation was based on the Present Plan (plan effective August 14, 2019) and the provisions of the Texas Local Fire Fighters' Retirement Act (TLFFRA) which were in effect on December 31, 2019. Section II shows the key results of the actuarial valuation as of December 31, 2019 and discusses the changes since the special study of the Present Plan based on the prior valuation as of December 31, 2017 prepared by your prior actuary.

This valuation reflects an actuarially assumed total contribution rate of 39.2%, comprised of 20% by the firefighters and an assumed 19.2% by the district. The total contribution rate of 39.2% exceeds the normal cost rate of 27.59%, leaving 11.61% available to amortize the unfunded actuarial accrued liability (UAAL) of $3,417,649. Assuming that the total payroll increases at the rate of 3% per year in the future, the contributions in excess of the normal cost **will amortize the UAAL in 4.6 years.**

In order for a retirement plan to have an adequate contribution arrangement, contributions must be made that are sufficient to pay the plan's normal cost and to amortize the plan's UAAL over a reasonable period of time. Based on the Texas State Pension Review Board guidelines for pension funding, our professional judgment, and the actuarial assumptions and methods used in making this valuation, we consider periods of 10 years to 25 years to be preferable and 40 years to be the current maximum acceptable period. The PRB guidelines will be changing to a maximum of 30 years allowing for phase in through 2025. Since the total contributions are sufficient to pay the fund's normal cost and to amortize the fund's UAAL within the maximum acceptable period, we are of the opinion that the fund, based on present levels of benefits and contributions, **has an adequate contribution arrangement.** Section III has considerations for benefit improvements.

Projected Actuarial Valuation Results

In addition to completing this actuarial valuation, we estimated the amortization periods as of December 31, 2021 and as of December 31, 2023 by making projections from the December 31, 2019 actuarial valuation. These projections examine the effect on the amortization period in the next two biennial actuarial valuations of the actuarial investment gains and losses that the fund experienced in the four years prior to the valuation date (gains in 2017 and 2019 and losses in 2016 and 2018) that have been only partially recognized as of December 31, 2019. As shown in Exhibit 8, a smoothing method is used to determine the actuarial value of assets (AVA) for this valuation. This method phases in over a five-year period any investment gains or losses (net actual investment return greater or less than the actuarially assumed investment return) that the fund has had. The AVA used in this

current valuation is deferring recognition of various portions of the gains and losses in 2016-2019 that the fund experienced. The AVA used in this valuation is $26,598,293. The market value of assets (MVA) is $28,086,052. The $1.49 million difference between the MVA and the AVA is the net deferred gain over the past four years that will be recognized in the next two biennial actuarial valuations.

The theory behind the AVA method is to allow time for investment gains and losses to partially offset each other and thereby dampen the volatility associated with the progression of the MVA over time. In practice, the timing and amounts of investment gains and losses can result in irregular effects on the AVA in a given year. However, as intended, the pattern of the AVA is smoother over time than the pattern of the MVA, as seen in Exhibit 9.

For the purpose of projecting the amortization period through 2023 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses. These projections show the expected effects over the next four years after the valuation date (1) of the recognition of the portions of the investment gains and losses over the past four years that are deferred as of December 31, 2019, and (2) of investment returns over the next four years different from the 7% assumption used in this valuation.

	Scenario					
	1	2	3	4	5	6
Assumed Investment Return for Calendar Year						
2020	7%	4%	0%	7%	5%	5%
2021	7	4	0	10	15	20
2022	7	4	7	10	10	7
2023	7	4	7	7	7	7
2024 and later	7	7	7	7	7	7
Amortization Period in Years as of December 31:						
2019 (actual)	4.6	4.6	4.6	4.6	4.6	4.6
2021 (projected)	1.4	2.2	3.2	1.1	1.1	0.7
2023 (projected)	0.0	1.2	2.8	0.0	0.0	0.0

The projected future December 31, 2021 valuation in Scenario 1 reveals that instead of decreasing by the expected two years to 2.6 years, the amortization period is projected to decrease by 3.2 years to 1.4 years because of the recognition of some of the net deferred gain. However, the losses due to the returns in Scenario 2 or Scenario 3 would more than offset the effect of the $1.49 million net deferred gain to accelerate the amortization of the unfunded liability. With losses exactly offsetting the net deferred gain, the expected four-year reduction between December 31, 2019 and December 31, 2023 would result in a 0.6-year amortization period. However in Scenario 2 and Scenario 3, the December 31, 2023 amortization period is shown to be 1.2 and 2.8 years, respectively.

We do not know what the investment experience will be for each of the four calendar years in the projections. Variations in experience from the underlying assumptions, other than investment return, will cause the actual amortization periods to be different from the periods shown above, but investment experience is the biggest influence on future actuarial valuations. In addition, the future investment experience in each of the four years could be better or worse than the assumed rates shown. These scenarios present a range of scenarios for the next four years assuming no increases in the total contribution rate and no changes in benefits.

Participant and Asset Data

We have relied on and based our valuation on the active firefighter data, pensioner data, and asset data provided on behalf of the board of trustees by Ms. Ana Tinsley, the board's plan administrator. We have not audited the data provided but have reviewed it for reasonableness and consistency relative to the data provided for the December 31, 2017 actuarial valuation. Exhibit 1 is a distribution of the active firefighters by age and service. The assumed 2020 compensation used for projecting future contributions and benefits for each active firefighter in the valuation was the actual pay for calendar year 2019 increased by 2%. This increase was to reflect the effect of the general pay increase of 2.5% effective September 27, 2019. The total of these assumed compensation amounts is our assumed annualized covered payroll for the plan year beginning January 1, 2020 and is used in the valuation to determine the UAAL amortization period. The averages of the assumed compensation amounts for the 2020 plan year are shown in Exhibit 1.

Exhibits 2 and 4 are omitted since there are no retirees yet. Exhibit 3 is a reconciliation of firefighters from December 31, 2017 to December 31, 2019. Exhibit 5 shows a historical comparison of the actuarial accrued liability and the actuarial value of assets.

The summary of assets contained in Exhibit 6 is based on the allocation of the December 31, 2019 market value of assets in the December 31, 2019 report from the fund's investment consultant. This exhibit also shows a comparison with the market values and actuarial values of assets as of December 31, 2017 and December 31, 2019. Exhibit 7 contains the statement of changes in assets for 2019 and 2018. Exhibit 8 shows the development of the actuarial value of assets. Exhibit 9 shows a historical comparison between the market value and actuarial value of assets. A market value asset allocation by major asset class as of December 31, 2019 is in a pie chart shown in Exhibit 10.

Assumptions

As a part of each actuarial valuation, we review the actuarial assumptions used in the prior actuarial valuation. As a result of our review, we have selected actuarial assumptions we consider to be reasonable and appropriate estimates of future experience for the fund for

the long-term future. Their selection complies with the applicable actuarial standards of practice. Significant actuarial assumptions used in this valuation are:

1. 7% annual investment return net of investment-related expenses;

2. 3% general annual compensation increase plus an average of 1.89% per year for pay increases due to promotions and longevity over a 30-year career;

3. 3% aggregate payroll growth (for the purpose of amortizing the UAAL); and

4. PubS-2010 (public safety employees) total dataset mortality tables for employees and for retirees, projected for mortality improvement generationally using the projection scale MP-2019.

A summary of all the assumptions and methods used in the valuation is shown in Exhibits 11 and 12. In our opinion, the assumptions used, both in the aggregate and individually, are reasonably related to the experience of the fund and to reasonable expectations. The assumptions represent a reasonable estimate of anticipated experience of the fund over the long-term future.

The following actuarial assumption changes have been made, and the new assumptions are compared to those used in the December 31, 2017 valuation by the prior actuary:

1. The mortality assumption was changed from the RP-2000 Combined Healthy Mortality Tables projected to 2024 with Scale AA to the PubS-2010 (safety employees) total dataset mortality tables for employees and for retirees, projected for mortality improvement generationally using the projection scale MP-2019. The rationale for the change is to use the results of a new, first-ever study of the mortality of public employee pension plan participants by the Society of Actuaries. The new mortality assumption is more appropriate for the fund for the long-term future than the prior assumption.

2. We changed the aggregate payroll increase assumption used for determining the UAAL amortization period from 3.25% to 3%. The 3% assumption is more reasonable for the fund for the long-term future, and is the same as the general compensation increase assumption in item 4 below.

3. We changed the investment return assumption from 7% net of all expenses to 7% net of investment-related expenses. Administrative expenses are now recognized explicitly as required for GASB 67 and 68 and are assumed to be equal to 0.6% of payroll. This percentage is based on the average historical relationship in the last four years, as shown in Appendix A, and is added to the normal cost. We believe these assumptions are more reasonable for the long-term future.

4. We changed the compensation increase assumption for projecting future benefits to assumed general increases of 3% per year combined with assumed promotion, step,

and longevity increases that vary by year of service, and average 1.89% per year over a 30-year career. The assumption in the prior actuarial valuation was simply 5.5% per year for every year of service. This change had a decreasing effect on projected compensation and benefits. We believe this compensation increase assumption is more reasonable for the long-term future.

5. We changed the demographic assumptions of termination and disability to ones which we believe are somewhat more appropriate. However, the aggregate effect was similar to the assumptions of the prior actuary.

The effects of these changes in assumptions in the UAAL amortization period are mentioned in Section II. A summary of all the assumptions and methods used in the valuation is shown in Exhibits 11 and 12. In our opinion, the assumptions used, both in the aggregate and individually, are reasonably related to the experience of the fund and to reasonable expectations. The assumptions represent a reasonable estimate of anticipated experience of the fund over the long-term future.

Supporting Exhibits

Exhibit 13 contains definitions of terms used in this actuarial valuation report. Exhibit 14 summarizes the plan provisions of the Present Plan. Appendix A documents our review of the economic assumptions.

Funding Policy

The funding policy adopted by the board of trustees at its January 29, 2020 board meeting says that each actuarial valuation report will include a benchmark actuarially determined contribution (ADC) rate beginning January 1, 2020. Then the fund's actuary is to compare the benchmark ADC rate and the total contribution rate. The table below shows the actuarial valuation results in the two key metrics, the amortization period and the total contribution rate.

	Amortization Period	Total Contribution Rate
Benchmark ADC rate	30 years	30.34%
Actuarial valuation	4.6 years	39.20%
Difference	-25.4 years	+8.86%

Variability in Future Actuarial Measurement

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 current economic or demographic assumptions;
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements;
- Changes in economic or demographic assumptions; and
- Changes in plan provisions.

Analysis of the potential range of such future measurements resulting from possible sources of measurement variability was provided on pages 1-3 in the projected amortization periods for the next two biennial actuarial valuations under six scenarios. These projections were designed to assess the risk of variance of potential future investment rates of return in the four years following the actuarial valuation date from the assumed 7% rate and the potential effect on the amortization period. Additional or other sensitivity analysis could be performed in a subsequent report if desired by the board of trustees.

Respectfully submitted,
RUDD AND WISDOM, INC.

Mark R. Fenlaw

Mark R. Fenlaw
Fellow, Society of Actuaries
Member, American Academy of Actuaries

Rebecca B. Morris

Rebecca B. Morris
Associate Society of Actuaries
Member, American Academy of Actuaries

Section II

Key Results of the Actuarial Valuation

	December 31, 2017[1]	December 31, 2019
1. Actuarial present value of future benefits		
a. Those now receiving benefits or former firefighters entitled to receive benefits	$ 0	$ 0
b. Firefighters	43,266,773	51,202,970
c. Total	$ 43,266,773	$ 51,202,970
2. Actuarial present value of future normal cost contributions	$ 17,905,619	$ 21,187,028
3. Actuarial accrued liability (Item 1c – Item 2)	$ 25,361,154	$ 30,015,942
4. Actuarial value of assets	$ 19,010,963	$ 26,598,293
5. Unfunded actuarial accrued liability (UAAL) (Item 3 - Item 4)	$ 6,350,191	$ 3,417,649
6. Contributions (percent of pay)		
a. Firefighters	20.00%	20.00%
b. Travis Co. ESD No. 6	19.20%	19.20%
c. Total	39.20%	39.20%
7. Normal cost (percent of payroll)	27.56%	27.59%
8. Percent of payroll available to amortize the UAAL (Item 6c - Item 7)	11.64%	11.61%
9. Annualized covered payroll	$ 5,670,318	$ 7,050,634
10. Present annual amount available to amortize the UAAL (Item 8 x Item 9)	$ 660,025	$ 818,579
11. Years to amortize the UAAL	14.7 years[2]	4.6 years
12. Funded ratio (Item 4 ÷ Item 3)[3]	75.0%	88.6%

[1] All items are from the study of proposed plans as of December 31, 2017 by the prior actuary reflecting the Present Plan.

[2] The prior actuary determined the amortization period assuming a total contribution rate of 37.2%, which is 2% less than the actual total of 39.2%.

[3] The funded ratio is not appropriate for assessing either the need for or the amount of future contributions or the adequacy of the assumed contribution rates. Using the market value of assets instead of the actuarial value of assets for Item 12 would have resulted in funded ratios of 77.6% as of December 31, 2017 and 93.6% as of December 31, 2019. **The best indicator of the fund's health is Item 11.**

Changes in the Unfunded Actuarial Accrued Liability

In comparing this actuarial valuation to the prior one, the UAAL decreased by $2,932,542 from $6,350,191 as of December 31, 2017 to $3,417,649 as of December 31, 2019. The table below summarizes the reasons for the decrease.

Reason for Change	Amount
• Change in actuarial firm (different software and details of methodology)	$ (545,450)
• Expected decrease (interest on UAAL less than expected amortization payments accumulated with interest)	(577,402)
• Investment loss for the two years (based on the AVA average annual return of 6.2%)	346,910
• Experience gain (net difference between actual experience and assumed experience such as pay increases, retirements, mortality, terminations but primarily due to pay increases less than assumed)	(446,458)
• Change in assumptions (net effect of all changes)	(1,710,142)
Total	$ (2,932,542)

Changes in the Amortization Period

The amortization period, based on the Present Plan provisions (except for the changes in contribution rates), was determined in the special study of the Present Plan based on the prior actuarial valuation as of December 31, 2017 to be 14.7 years. Since two years have passed since that valuation date, a 12.7-year amortization period would be expected if all actuarial assumptions had been exactly met, no changes had occurred (other than those expected) in the firefighter and pensioner data, and no changes in assumptions or methods had been made. The amortization period is now 4.6 years based on the same plan provisions. The actual experience occurring between December 31, 2017 and December 31, 2019 differed from the expected experience, and in combination with the changes in actuarial firms and in assumptions, the resulting amortization period is 4.6 years for the following reasons:

1. There were differences in the determination of the actuarial liabilities and the normal cost that resulted from the change in actuarial firms. It is not uncommon that the calculation of the liabilities varies somewhat between actuarial firms because of a range

of accepted practices, methods, valuation software, etc. The replication of the December 31, 2017 actuarial valuation using all of the prior actuary's assumptions resulted in a **decrease** in the amortization period of 3.8 years.

2. The average annual rate of investment return, net of investment-related expenses, on the market value of assets during the two years 2018 and 2019 was 7.1%. However, the actuarial value of assets (AVA) used in the valuation and the determination of the amortization period is based on an adjusted market value. The average annual rate of return on the AVA, net of investment-related expenses, for years 2018 and 2019 was 6.2%, less than the assumed rate of return of 7%. This resulted in an **increase** in the amortization period of 0.7 of a year.

3. The aggregate payroll increased at an average rate of 11.5% per year instead of the assumed 3.25% per year rate, which caused the amortization period to **decrease** by 1.6 years.

4. The net result of all experience other than the investment experience and the aggregate payroll experience had the combined effect of **decreasing** the amortization period by 1.1 years. This was primarily the result of less-than-assumed pay increases.

5. The prior valuation special study amortization period of 14.7 was determined using contributions of 2% less than actual (19% for firefighters and 18.2% for the district) in order to be conservative when determining the benefit increases. The change to reflect the full contributions of 20% by the firefighters and 19.2% by the district, resulted in a 1.1 year **decrease** in the amortization period.

6. The change in the methodology for recognizing the timing of contributions from once a year on January 1 to biweekly had the effect of **increasing** the amortization period by 0.5 of a year.

7. The changes in the assumptions had the effect of **decreasing** the amortization period by 1.7 years. There were two significant and largely offsetting assumption changes, the change in mortality and the individual future compensation increases. The mortality change increased the amortization period by 1.1 while the lowering of the compensation increases caused a decrease in the amortization period of 3.1 years.

Section III

Benefit Improvements

The results of this actuarial valuation as of December 31, 2019 reveal that the fund, based on the Present Plan of benefits, has an adequate contribution arrangement. As disclosed in both Sections I and II, the amortization period of the UAAL is 4.6 years. With an amortization period of 4.6 years, we are usually willing to give the actuarial approval required by the provisions of Section 7 of the Texas Local Fire Fighters' Retirement Act (TLFFRA) to improve benefit provisions. However, because the current benefit formula, retirement eligibility, and DROP provisions were improved less than two years ago, we recommend that no additional changes be made at this time. We would also recommend when benefit increases are evaluated that a lower investment return assumption (e.g., to 6.75%) should be used to better position the fund before changing any plan provisions.

The board probably has some ideas for potential benefit improvements. We are available to discuss these ideas before any decisions are made on what potential benefit improvements to study in the future. We would also recommend a maximum amortization period of 10 years when adopting benefit improvements in order to provide a cushion for future adverse experience. Over time, the amortization period is expected to decrease. This would provide the board additional opportunities for considering benefit improvements.

It is a challenge to manage expectations when your fund is in such a good position compared to other funds. All the interested parties should want your fund to provide reasonable, competitive benefits that are sustainable for the long-term future for everyone without increasing the contribution rates.

Exhibit 1

Distribution of Firefighters by Age and Service on December 31, 2019 with Average Annual Compensation

Years of Service	Age									Total	Average Compen-sation
	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 or Over		
0	0	0	0	0	0	0	0	0	0	0	$ 0
1	2	9	4	1	0	0	0	0	0	16	51,642
2	0	0	0	0	0	0	0	0	0	0	0
3	0	2	2	0	0	0	0	0	0	4	57,495
4	0	1	4	2	1	0	0	0	0	8	58,090
5	0	0	0	0	0	0	0	0	0	0	0
6	0	2	3	0	0	0	0	0	0	5	61,270
7	0	0	1	3	2	0	0	0	0	6	65,270
8	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0
11	0	0	1	1	0	0	0	0	0	2	73,914
12	0	0	1	1	0	1	0	0	0	3	75,983
13	0	0	1	1	5	0	0	0	0	7	74,097
14	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	1	2	1	0	0	0	4	84,325
16	0	0	0	2	0	0	0	0	0	2	89,764
17	0	0	0	3	2	1	0	0	0	6	89,637
18	0	0	0	3	4	0	0	0	0	7	93,384
19	0	0	0	0	2	3	1	0	0	6	86,143
20-24	0	0	0	0	9	5	0	2	0	16	107,003
25-29	0	0	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0	0	0
35+	0	0	0	0	0	0	0	0	0	0	0
Totals	2	14	17	18	27	11	1	2	0	92	$ 76,637

Average Compensation	$51,998	$60,662	$90,044	$81,614	$ 0	
	$54,225	$77,316	$94,179	$107,887	$76,637	

Average age	37.8
Average years of service	11.5
Average age at hire	26.3

Exhibit 3

Firefighter and Pensioner Reconciliation

	Firefighters	Current Payment Status	Vested Terminated Firefighters	Total
1. As of December 31, 2017	79	0	0	79
2. Change of status				
a. retirement	0	0	0	0
b. disability	0	0	0	0
c. death	0	0	0	0
d. survivor payment begins	0	0	0	0
e. withdrawal	(3)	0	0	(3)
f. vested termination	0	0	0	0
g. QDRO alternate payee	0	0	0	0
h. child benefit ceases	0	0	0	0
i. net changes	(3)	0	0	(3)
3. New firefighters	16	0	0	16
4. As of December 31, 2019	92	0	0	92

Exhibit 5

Historical Comparison of Actuarial Accrued Liability and Actuarial Value of Assets (Present Plan Valuations as of December 31)

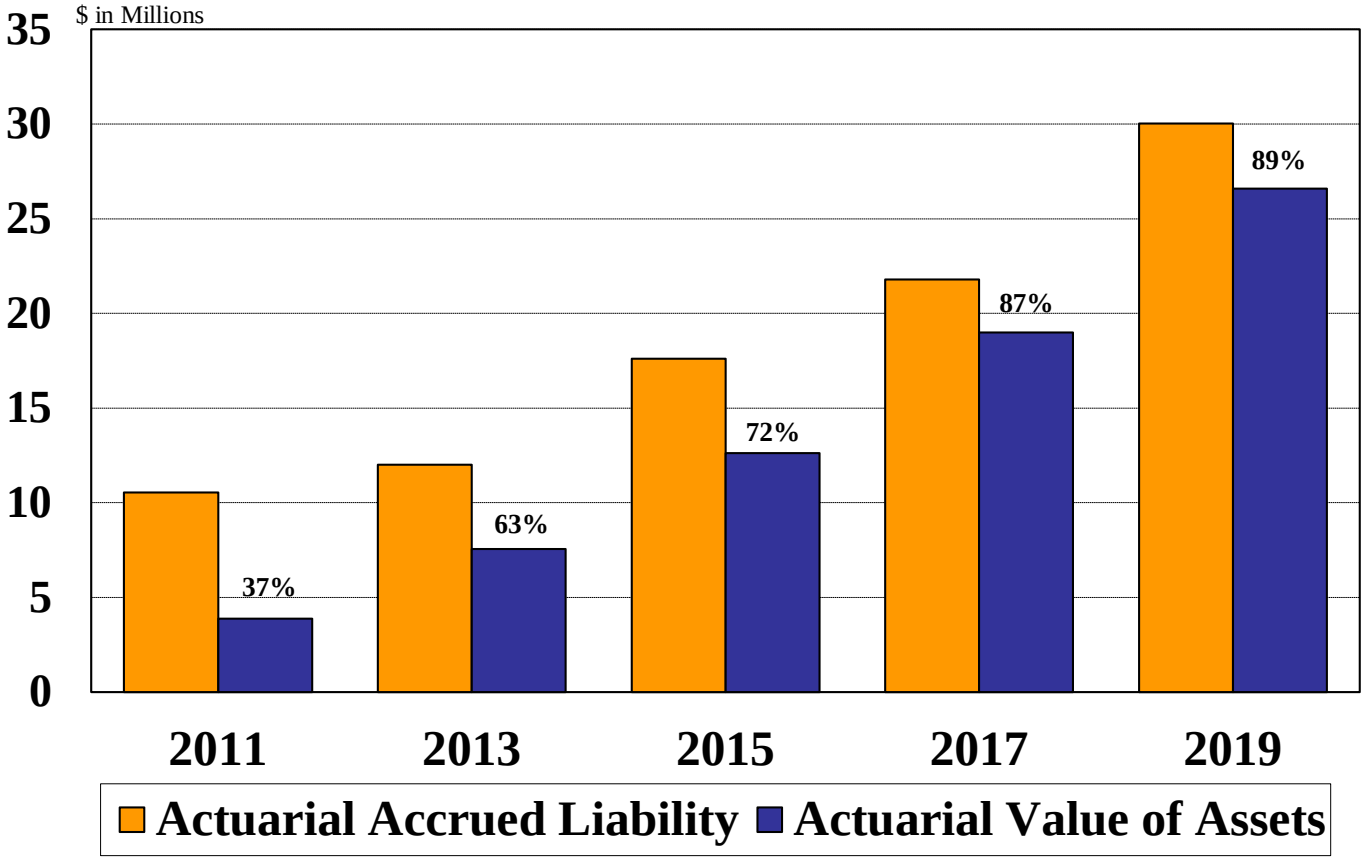

Exhibit 6

Summary of Asset Data

Asset Type	Market Value as of December 31, 2019	Allocation As a Percent of Grand Total
Equities		
Domestic large cap	$ 9,829,535	35.0%
Domestic small/mid cap	3,437,640	12.3
International developed	2,239,502	8.0
Emerging markets	1,410,532	5.0
	16,917,209	60.3
Real estate	1,097,130	3.9
Fixed income	9,246,470	32.9
Cash and receivables	825,243	2.9
Grand Total	$28,086,052 [1]	100.0%

[1] The grand total is the audited amount. All of the invested amounts are from the December 31, 2019 report from the investment consultant. The cash and receivables amount is from the audited financial report.

Comparison of Asset Values as of the Prior and Current Actuarial Valuation Dates		
	December 31, 2017	December 31, 2019
Market Value	$19,688,064	$28,086,052
Actuarial Value	$19,010,963	$26,598,293
Actuarial Value as a Percent of Market Value	96.6%	94.7%

Exhibit 7

Statement of Changes in Audited Assets for the Years Ended December 31, 2019 and 2018

	12/31/2019	12/31/2018
Additions		
1. Contributions		
a. Employer	$ 1,337,310	$ 1,166,370
b. Employees	1,393,040	1,214,970
c. Total	$ 2,730,350	$ 2,381,340
2. Investment Income		
a. Interest and dividends	$ 794,318	$ 832,077
b. Net appreciation in fair value	3,913,912	(1,778,041)
c. Total	$ 4,708,230	$ (945,964)
3. Other Additions	0	0
Total Additions	**$ 7,438,580**	**$ 1,435,376**
Deductions		
4. Benefit Payments	$ 89,480	$ 89,393
5. Expenses		
a. Investment-related	$ 110,054	$ 100,914
b. Administrative	47,153	38,974
c. Total	$ 157,207	$ 139,888
Total Deductions	**$ 246,687**	**$ 229,281**
Net Increase in Assets	**$ 7,191,893**	**$ 1,206,095**
Market Value of Assets (Fiduciary Net Position)		
Beginning of Year	$ 20,894,159	$ 19,688,064
End of Year	$ 28,086,052	$ 20,894,159
Rate of Return		
Net of All Expenses	20.49%	(5.21)%
Net of Investment-Related Expenses	20.72%	(5.03)%
Gross	21.27%	(4.56)%
Direct Investment-Related Expenses	0.55%	0.47%

Exhibit 8

Development of Actuarial Value of Assets

Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31				
	2019	2018	2017	2016
1. Market Value of Assets as of beginning of year	$20,894,159	$19,688,064	$15,043,500	$12,260,151
2. Firefighter Contributions	1,393,040	1,214,970	1,168,507	1,122,061
3. City Contributions	1,337,310	1,166,370	1,121,761	1,077,176
4. Benefit Payments and Administrative Expenses[1]	(136,633)	(128,367)	(296,037)	(65,079)
5. Expected Investment Return[2]	1,553,371	1,457,019	1,122,843	932,906
6. Expected Market Value of Assets as of end of year	25,041,247	23,398,056	18,160,574	15,327,215
7. Actual Market Value of Assets as of end of year	28,086,052	20,894,159	19,688,064	15,043,500
8. Actuarial Investment Gain/(Loss)	3,044,805	(2,503,897)	1,527,490	(283,715)
9. Market Value Rate of Return Net of Expenses	20.72%	(5.03)%	16.52%	4.87%
10. Rate of Actuarial Investment Gain/(Loss)	13.72%	(12.03)%	9.52%	(2.13)%

[1] Administrative expenses are included for all years to retroactively make the investment return assumption net of investment-related expenses.
[2] Assuming uniform distribution of contributions and payments during the plan year; investment return assumption was 7% per year.

Plan Year	Investment Gain/(Loss)	Deferral Percentage	Deferred Gain/(Loss) as of 12/31/2019
2019	$ 3,044,805	80%	$ 2,435,844
2018	(2,503,897)	60%	(1,502,338)
2017	1,527,490	40%	610,996
2016	(283,715)	20%	(56,743)
Total			$ 1,487,759

Actuarial Value of Assets as of December 31, 2019	
11. Market Value of Assets as of December 31, 2019	$ 28,086,052
12. Deferred Gain/(Loss) to be Recognized in Future	1,487,759
13. Preliminary Value (Item 11 – Item 12)	$ 26,598,293
14. Corridor for Actuarial Value of Assets	
a. 80% of Market Value as of December 31, 2019 (minimum)	$ 22,468,842
b. 120% of Market Value as of December 31, 2019 (maximum)	$ 33,703,262
15. Actuarial Value as of December 31, 2019	$ 26,598,293
16. Write Up/(Down) of Assets (Item 15 – Item 11)	$ (1,487,759)

Exhibit 9

Historical Comparison of Market and Actuarial Value of Assets (Valuation as of December 31)

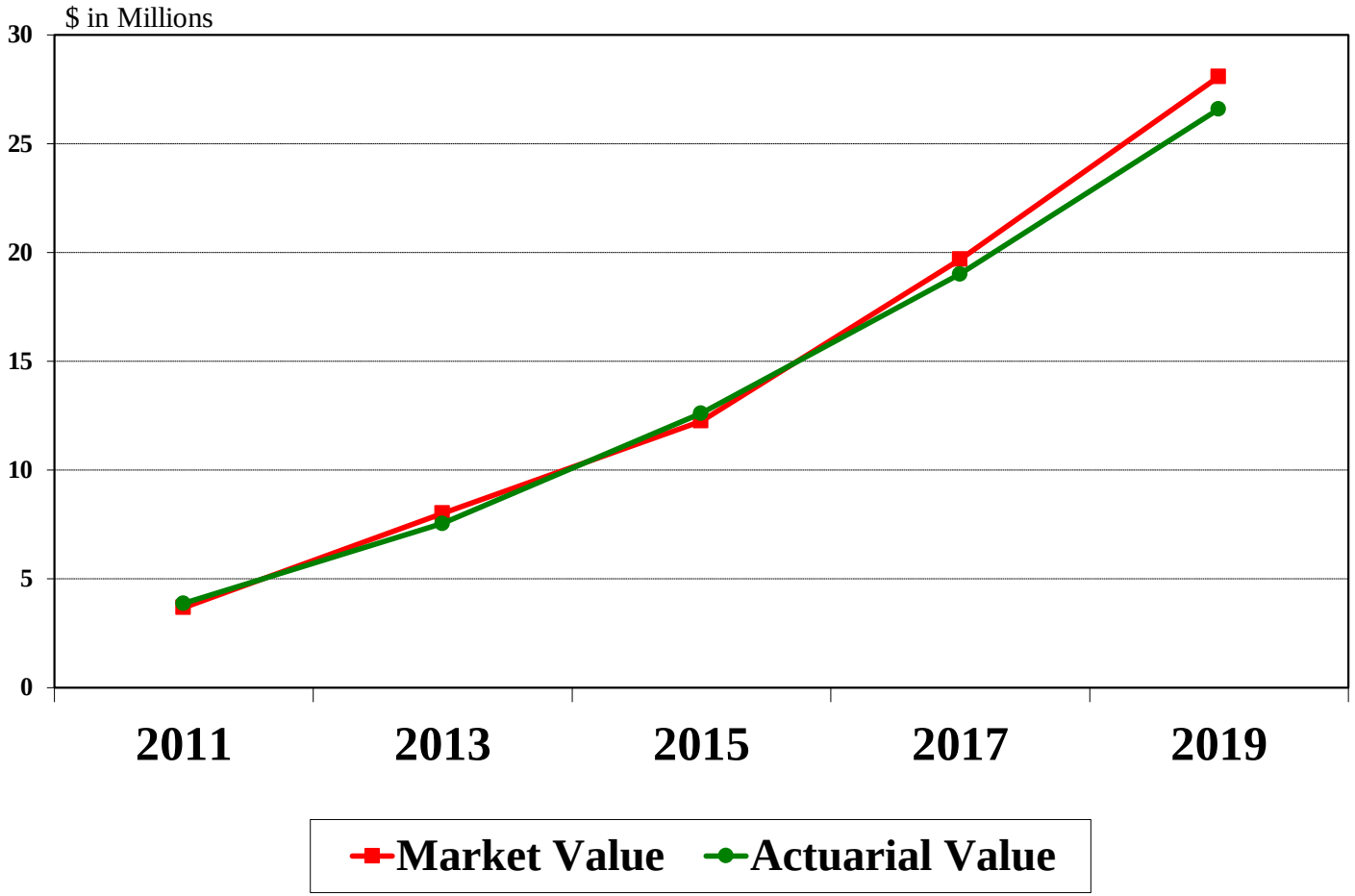

Exhibit 10

Market Value Asset Allocation as of the Current Actuarial Valuation Date

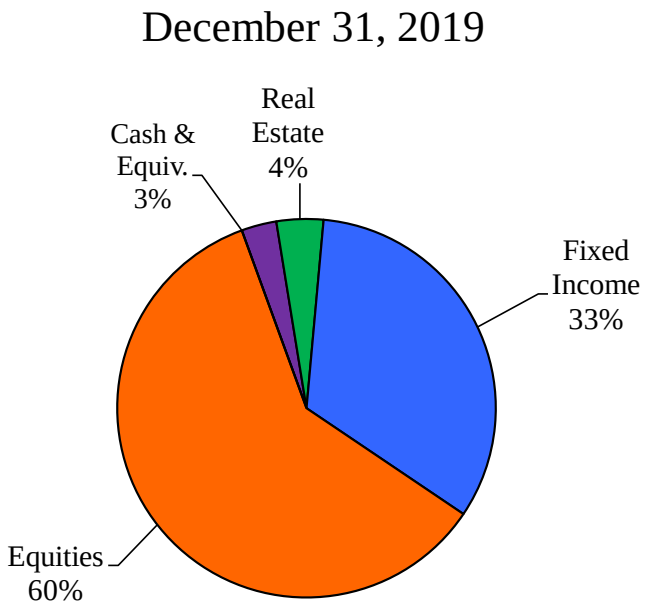

Exhibit 11

Actuarial Methods and Assumptions

A. Actuarial Methods

1. Actuarial Cost Method

The Entry Age Actuarial Cost Method is an actuarial cost method in which the actuarial present value of projected benefits of each active firefighter included in the valuation is allocated as a level percentage of compensation between age at hire and assumed termination. Each active firefighter's normal cost is the current annual contribution in a series of annual contributions which, if made throughout the firefighter's total period of employment. The normal cost for the fund is the sum of the normal costs for each active firefighter for the year following the valuation date. The normal cost as a percent of payroll reflects that contributions are made biweekly.

The fund's actuarial accrued liability is the excess of the actuarial present value of projected benefits over the actuarial present value of all future remaining normal cost contributions. The unfunded actuarial accrued liability (UAAL) is the amount by which the actuarial accrued liability exceeds the actuarial value of assets. The UAAL is recalculated each time a valuation is performed. Experience gains and losses, which represent deviations of the UAAL from its expected value based on the prior valuation, are determined at each valuation and are amortized as part of the newly calculated UAAL.

2. Amortization Method

The UAAL is assumed to be amortized with level percentage of payroll contributions (total assumed contribution rate less normal cost contribution rate) based on assumed payroll growth of 3% per year. The actuarial determination of the amortization period reflects that contributions are made biweekly.

3. Actuarial Value of Assets Method

All assets are valued at market value with an adjustment made to uniformly spread actuarial gains or losses (as measured by actual market value investment return vs. expected market value investment return) over a five-year period. The total adjustment amount shall be limited as necessary such that the actuarial value of assets shall not be less than 80% of market value nor greater than 120% of market value.

B. Actuarial Assumptions

As a part of each actuarial valuation, we review the actuarial assumptions used in the prior actuarial valuation. The investment return assumption is reviewed using the building block approach that includes several asset allocations, assumed real rates of return for each asset class, an assumed rate of investment-related expenses, and an assumed rate of inflation, with all assumptions for the long-term future. Our economic assumptions are influenced both by long-term historical experience and by future expectations of investment consultants and economists, but we select the economic assumptions and normally discuss them with the board before completing the actuarial valuation. See Appendix A for our review of the economic assumptions.

We review the termination and retirement experience since the prior valuation and periodically look back more than two years. We also periodically review the average salaries by years of service to get insights into the promotion, step, and longevity compensation patterns for the purpose of reviewing our compensation increase assumption. For the mortality assumptions, we use an appropriate published mortality table with projections for improvement beyond the valuation date. We are guided in our review and selection of assumptions by the relevant actuarial standards of practice. As a result of our review, we have selected actuarial assumptions we consider to be reasonable and appropriate estimates of future experience for the fund for the long-term future.

1. Investment Return

   7% per year net of investment-related expenses.

2. Inflation

   2.75% per year included in compensation increases and investment return assumptions.

3. Mortality Rates

   PubS-2010 (public safety) total dataset mortality tables for employees and for retirees (sex distinct), projected for mortality improvement generationally using the projection scale MP-2019.

4. Compensation Increases

   General increases of 3% per year combined with promotion, step, and longevity increases that average 1.89% per year over a 30-year career. See Exhibit 12.

5. Retirement Rates and DROP Election

   We assume firefighters will retire when first eligible (age 53 with 20 years for those hired at ages 33 and under, the attainment of 20 years of service for those hired at ages above 33) and that all will elect the maximum two-year DROP lump sum.

6. Termination Rates

   See Exhibit 12.

7. Disability Rates

   See Exhibit 12.

8. Reduction in Benefit after 1½ Years of Disability Retirement

   15% weighted average reduction in benefit.

9. Percent Married

   100% of the active firefighters are assumed to be married at retirement, disability, or death while employed, with male firefighters having a spouse three years younger and female firefighters having a spouse three years older. Actual marital status and spouse date of birth are used for retirees.

10. Payment Form for Retirement Benefits Due to Service Retirement, Disability Retirement, or Vested Termination

    - Joint and two-thirds to surviving spouse

11. Surviving Child's Death Benefit

    None are assumed as a result of future deaths.

12. Firefighters' Contribution Rate

    20.0% of covered compensation.

13. District's Assumed Contribution Rate

    19.2% of covered compensation for at least as long as the period required to amortize the UAAL.

14. Covered Payroll for First Year Following Valuation Date

    Actual (or annualized) pay for 2019 increased 2% for each firefighter to fully reflect the effect of the general pay increase of 2.5% effective September 27, 2019.

15. Administrative Expenses

The expenses paid by fund assets for other than investment-related expenses are assumed to be 0.6% of payroll. The normal cost rate as a percent of payroll is assumed to be 0.6% of payroll higher to reflect these expenses.

Exhibit 12
Disability and Termination Rates per 1,000 Active Members
Compensation Increases by Years of Service

Disability Rates		Termination Rates		Compensation Increases	
Attained Age	Rate per 1,000	Years of Service	Rate per 1,000	Years of Service	Increase Percent
20	0.14	0	30	1	9.70%
21	0.15	1	27	2	9.70
22	0.16	2	24	3	6.09
23	0.17	3	21	4	6.09
24	0.18	4	18	5	6.09
25	0.19	5	16	6	6.09
26	0.21	6	14	7	6.09
27	0.23	7	12	8	6.09
28	0.25	8	11	9	6.09
29	0.28	9	10	10	6.09
30	0.31	10	8	11	5.06
31	0.35	11	7	12	5.06
32	0.40	12	6	13	5.06
33	0.45	13	5	14	5.06
34	0.49	14	5	15	5.06
35	0.52	15	5	16	5.06
36	0.54	16	5	17	5.06
37	0.57	17	4	18	5.06
38	0.62	18	4	19	5.06
39	0.73	19	4	20	5.06
40	0.92	20 & Over	0	21	3.00
41	1.14			22	3.00
42	1.32			23	3.00
43	1.48			24	3.00
44	1.73			25	3.00
45	2.09			26	3.00
46	2.55			27	3.00
47	2.98			28	3.00
48	3.34			29	3.00
49	3.62			30	3.00
50	3.79			31	3.00
51	3.92			32	3.00
52	4.04			33	3.00
53	4.24			34	3.00
54	4.56			35	3.00
55	0.00			36	3.00
56	0.00			37	3.00
57	0.00			38	3.00
58	0.00			39	3.00
59	0.00			40	3.00

Exhibit 13

Definitions

1. Actuarial Accrued Liability	That portion, as determined by the particular actuarial cost method used, of the Actuarial Present Value of future pension plan benefits as of the Valuation Date that is not provided for by the Actuarial Present Value of future Normal Costs.
2. Actuarial Assumptions	Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, termination, disablement and retirement; changes in compensation; rates of investment earnings and asset appreciation; and other relevant items.
3. Actuarially Equivalent	Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.
4. Actuarial Gain (Loss)	A measure of the difference between actual experience and that expected based on the Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with the particular actuarial cost method used.
5. Actuarial Present Value	The value of an amount or series of amounts payable or receivable at various times, determined as of a given date (the Valuation Date) by the application of the Actuarial Assumptions.
6. 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 pension plan.
7. Actuarial Value of Assets	The value of cash, investments and other property belonging to a pension plan, as determined by a method and used by the actuary for the purpose of an Actuarial Valuation.

8. Entry Age Actuarial Cost Method	An actuarial cost method under which the Actuarial Present Value of the Projected Benefits of each individual included in the Actuarial Valuation is allocated as a level percentage of earnings between entry age and assumed termination. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a Valuation Date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability. Under this method, Actuarial Gains (Losses), as they occur, reduce (increase) the Unfunded Actuarial Accrued Liability.
9. Plan Year	A 12-month period beginning January 1 and ending December 31.
10. Normal Cost	That portion of the Actuarial Present Value of pension plan benefits that is allocated to a valuation year by the actuarial cost method.
11. Projected Benefits	Those pension plan benefit amounts that are expected to be paid at various future times according to the Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future qualified service.
12. Overfunded Actuarial Accrued Liability	The excess, if any, of the Actuarial Value of Assets over the Actuarial Accrued Liability.
13. Unfunded Actuarial Accrued Liability	The excess, if any, of the Actuarial Accrued Liability over the Actuarial Value of Assets.
14. Valuation Date	The date upon which the Normal Cost, Actuarial Accrued Liability and Actuarial Value of Assets are determined. Generally, the Valuation Date will coincide with the end of a Plan Year.
15. Years to Amortize the Unfunded Actuarial Accrued Liability	The period is determined in each Actuarial Valuation as the number of years, beginning with the Valuation Date, to amortize the Unfunded Actuarial Accrued Liability with a level percent of payroll that is the difference between the expected total contribution rate and the Normal Cost contribution rate.

Exhibit 14

Summary of Present Plan

1.	Normal Service or Disability Retirement Monthly Benefit - Percentage of Highest Average Monthly Salary	
	(a) for each of the first 20 years of service	3.4%
	(b) for each year in excess of 20 years	2.2%
2.	Normal Service Retirement Eligibility (Minimum)	Age 53 and 20 Years
3.	Deferred Retirement Option Plan (DROP)	
	(a) Earliest DROP benefit calculation date	Age 51 and 18 Years
	(b) Earliest employment termination date with maximum DROP benefit accumulation period	Age 53 and 20 Years
4.	Maximum DROP Benefit Accumulation Period	24 Months
5.	DROP lump sum includes	
	(a) Monthly benefit determined at the DROP date multiplied by number of months between DROP benefit calculation date and termination of employment,	
	(b) accumulated contributions made by the firefighter after the DROP benefit calculation date, and	
	(c) no interest	
6.	Vested Terminated Benefit	
	(a) Eligibility for firefighters (minimum service)	10 Years
	(b) Benefit is based on formula in item 1	
	(c) Benefit is deferred to date person would have satisfied normal service retirement eligibility date	

7. Disability Retirement Monthly Benefit for Firefighters Who Become Disabled while Employed
   (a) For initial 30-month period is (i) plus (ii) if not able to perform job in fire department
      (i) Minimum monthly amount based on 20 years
      (ii) Additional amount per year of service over 20 years
   (b) Following initial 30-month period is (i), or (ii), or (iii), depending upon status at that time and annually thereafter
      (i) Initial benefit
      (ii) Initial benefit reduced
      (iii) Zero
   (c) Upon attaining eligibility for normal retirement if the member would have remained employed by the fire department, the board may modify or waive the yearly review of status

8. Surviving Spouse's Monthly Death Benefit for a Firefighter with Under 20 Years of Service as a Percent of Highest Average Monthly Salary 45.4%

9. Surviving Spouse's Monthly Death Benefit for a firefighter who dies with at least 20 years of service will be equal to two-thirds of the monthly benefit the firefighter could have received on the date of death if the firefighter had otherwise been eligible for normal service retirement.

10. Surviving Children's Monthly Death Benefit
   (a) Where the spouse is receiving a benefit - 7.47% of Highest Average Monthly Salary
   (b) Where the spouse is not receiving a benefit or there is no spouse - same as surviving spouse benefit per item 8 or 9, as appropriate

11. Contributions as a Percent of Compensation by:
   (a) Firefighters 20.0%
   (b) ESD 19.2%

12. The normal form of annuity payment at retirement is a Joint and Two-Thirds to Surviving Spouse, and payment is on the first day of each month. No optional forms of annuity payments are available.

13. Compensation used to determine contributions and the Highest Average Monthly Salary includes all pay but excluding (1) lump sum distribution of termination pay for unused sick leave and vacation, (2) pay due to overtime other than standard overtime pay and "step-up" service, and (3) incentive pay as a result of certain degree status or classification. The average is based on the 60 consecutive months with the fire department which yields the highest monthly average.

14. Refund of firefighters' accumulated contributions without interest will be made to firefighters who terminate employment and either are not eligible for any other benefit from the fund or request a refund from the fund.

Appendix A

Review of the Actuarial Economic Assumptions for the December 31, 2019 Actuarial Valuation

Theoretical Investment Return Assumption Development

Asset Class	Gross Annual Real Rate of Return (ROR)[1]	Asset Allocation 12/31/2019 Actual[2]	Asset Allocation 8/3/2020 Actual[3]	Asset Allocation Implied Target
Equity				
Domestic large cap	6.5%	35.1%	36.2%	36%
Domestic small/mid cap	7.0	12.2	14.8	13
Developed international	7.0	8.0	7.8	8
Emerging markets	8.5	5.0	4.6	5
Real estate	4.5	3.9	4.0	4
Fixed income	2.2	32.9	31.9	32
Cash and receivables	0.0	2.9	0.7	2
Total		100.0%	100.0%	100%
Weighted Average Gross Real ROR Assumption		5.02%	5.21%	5.12%
Weighted Average Net Real ROR Assumption[4]		4.27%	4.46%	4.37%
Theoretical Annual Investment Return Assumption: Net Real ROR Plus Assumed Annual Rate of Inflation				
Assumed 2.75% Inflation		7.02%	7.21%	7.12%
Assumed 2.50% Inflation		6.77%	6.96%	6.87%

[1] A gross annual real rate of investment return is the total annual rate of investment return, before any expenses, that is in excess of the assumed annual inflation rate. These are long-term assumptions made by Rudd and Wisdom, Inc.

[2] This allocation is from the December 31, 2019 report from Frost Bank, adjusted for audited amount of cash and receivables.

[3] This allocation is from the Frost Bank June 30, 2020 report, but the report showed detailed amounts as of August 3, 2020.

[4] The investment-related expenses, for both direct and indirect expenses, are assumed to be 0.75% of assets, 0.45% for direct expenses and 0.30% for indirect expenses for the mutual funds that are used for some of the asset classes.

Appendix A (continued)

Price Inflation in the USA - Average Annual Rates of Increase in the CPI-U

Years (Dec. to Dec.)	Number of Years	Average Annual Increase
1954 – 2019	65	3.54%
1959 – 2019	60	3.68
1964 – 2019	55	3.91
1969 – 2019	50	3.91
1974 – 2019	45	3.62
1979 – 2019	40	3.07
1984 – 2019	35	2.58
1989 – 2019	30	2.40
1994 – 2019	25	2.18
1999 – 2019	20	2.14

Most inflation forecasts are for 10 years or less. For example, the average 10-year forecast in the June 2020 Livingston Survey published by the Federal Reserve Bank of Philadelphia was 2.0%. Similarly, the 2020 Wall Street Consensus Survey for the next decade included an average inflation forecast of 2.1%. However, 10 years is much too short a forecast period for a public employee defined benefit pension plan. In the 2020 annual report of the OASDI Trust Funds (Social Security), the ultimate inflation assumptions for their 75-year projections are 3.0%, 2.4%, and 1.8% for the low-cost, intermediate, and high-cost assumptions, respectively. Looking at the average annual increase in the CPI-U over historical periods of 30 to 65 years above and considering the Social Security forecasts, we believe that reasonable assumed rates of inflation for the long-term future would range from 2.25% to 3.25%. Shorter term considerations make the bottom half of that range more desirable.

Direct Investment Expenses Paid from Fund

Plan Year Ending 12/31	Beginning of Year Assets	End of Year Assets	Average	Direct Investment Expenses	Expenses as a % of Assets (5) ÷ (4)
(1)	(2)	(3)	(4)	(5)	(6)
2019	$20,894,159	$28,086,052	$24,490,106	$110,054	0.45%
2018	19,688,064	20,894,159	20,291,112	100,914	0.50
2017	15,043,500	19,688,064	17,365,782	89,028	0.51
2016	12,260,151	15,043,500	13,651,826	71,374	0.52

Appendix A (continued)

Administrative Expenses Paid by the Fund

Plan Year Ending 12/31 (1)	Administrative Expenses Paid by the Fund (2)	Covered Payroll (3)	% of Payroll (2) ÷ (3) (4)
2019	$ 47,153	$ 6,965,200	0.68%
2018	38,974	6,074,844	0.64
2017	35,457	5,842,505	0.61
2016	26,134	5,610,292	0.47
2016-2019	$147,718	$24,492,841	0.60%

For the December 31, 2019 actuarial valuation, the administrative expenses are not reflected in the investment return assumption but are reflected as a percent of payroll that is added to the normal cost contribution rate. We recommend 0.6%, the average developed above for the last four plan years. (The covered payroll was determined as the district contributions for the plan year divided by the district contribution rate during the plan year.)

Comparison of 12/31/2017 Actuarial Economic Assumptions with 12/31/2019 Actuarial Economic Assumptions

Actuarial Assumption[1]	12/31/2017 Actuarial Economic Assumptions	12/31/2019 Actuarial Economic Assumptions
Inflation (Price)	2.50%	2.75%
Net real rate of return[2]	4.50	4.25
Net total investment return[2]	7.00%	7.00%
Firefighter pay increase[3]	5.50%	4.89%
Aggregate payroll increase	3.25%	3.00%
Administrative expenses[4]	netted out of return	0.6% of payroll

[1] All assumptions are annual rates.

[2] Net of all expenses for the prior actuary's 12/31/2017 assumption, and net of all investment-related expenses for the 12/31/2019 assumption.

[3] For 12/31/2017, a level assumed pay increase of 5.5%. For 12/31/2019, a 3% annual general pay increase combined with an average annual promotion, step, and longevity pay increase of 1.89% over a 30-year career.

[4] The prior actuary's recognition of administrative expenses was through using an investment return assumption that was net of all expenses. For 12/31/2019, administrative expenses are reflected as a percent of payroll that is added to the normal cost contribution rate. Administrative expenses are more likely to be relatively consistent over time as a percent of payroll than as a percent of assets. In addition, the recognition of administrative expenses separate from the investment return assumption is consistent with the requirement of GASB 67 and 68 for accounting disc

Appendix B

Alternative Measure as of December 31, 2019

At your request, we have determined the actuarial present value of accumulated plan benefits as of December 31, 2019, and compared it to the market value of assets. Accumulated plan benefits are based on the service and compensation history as of December 31, 2019 for each fund member. The measurement is not appropriate for an ongoing plan, but could be appropriate if the plan had been frozen as of December 31, 2019. The total actuarial present value of accumulated plan benefits as of December 31, 2019 was $20,591,223. The market value of assets (fiduciary net position) as of that date was $28,086,052 (page 15). The ratio of the assets to the present value of accumulated plan benefits was 136%.