
Denton Firemen's Relief and Retirement Fund

Actuarial Valuation as of December 31, 2023

September 16, 2024



W. Lee Bello, A.S.A.
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.
Christopher S. Johnson, F.S.A.
Oliver B. Kiel, F.S.A.
Dustin J. Kim, F.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.
Raymond W. Tilotta
Ronald W. Tobleman, F.S.A.
David G. Wilkes, F.S.A.

September 16, 2024

Board of Trustees
Denton Firemen's Relief
and Retirement Fund
P.O. Box 2375
Denton, TX 76202

Members of the Board of Trustees:

At the request of the Board of Trustees of the Denton Firemen's Relief and Retirement Fund, we have prepared this report of the results of the actuarial valuation of the fund as of December 31, 2023. This valuation was prepared (1) to determine the city's contribution rate under its current funding policy, which is a modified actuarially determined contribution rate funding policy, (2) to recommend a city contribution rate for the next two years, and (3) to highlight the fund's actuarial condition.

In a separate report dated July 26, 2024, 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, 2023. Similarly, we will provide a separate report later in the year containing the pension expense, net pension liability, and disclosure information for the city's compliance with GASB 68 for the fiscal year ending September 30, 2024. GASB 68 prescribes the city's accounting for your fund, while this actuarial valuation report reflects the assumed continuation of the current funding policy, first adopted in December 2017.

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,

A handwritten signature in black ink that reads 'Mark R. Fenlaw'.

Mark R. Fenlaw, F.S.A.

A handwritten signature in black ink that reads 'Rebecca B. Morris'.

Rebecca B. Morris, A.S.A.

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TABLE OF CONTENTS

Section I	Valuation Summary.....	1
Section II	Key Results of the Actuarial Valuation.....	7
Section III	Benefit Improvements	10
Exhibit 1	Distribution of Firefighters by Age and Service	11
Exhibit 2	Summary of Pensioner Data	12
Exhibit 3	Firefighter and Pensioner Reconciliation	13
Exhibit 4	Breakdown of Pensioners by Monthly Benefit Amounts	14
Exhibit 5	Historical Comparison of Actuarial Accrued Liability and Actuarial Value of Assets	15
Exhibit 6	Summary of Asset Data.....	16
Exhibit 7	Statement of Changes in Assets	17
Exhibit 8	Development of Actuarial Value of Assets	18
Exhibit 9	Historical Comparison of Market and Actuarial Value of Assets	19
Exhibit 10	Comparison of Market Value Asset Allocation as of the Prior and Current Actuarial Valuation Dates.....	20
Exhibit 11	Actuarial Methods and Assumptions	21
Exhibit 12	Disability Rates, Termination Rates, and Compensation Increases	25
Exhibit 13	Definitions	26
Exhibit 14	Summary of Present Plan.....	28
Appendix A	Review of the Actuarial Economic Assumptions	30
Appendix B	Other Disclosures as of December 31, 2023.....	33

Section I

Valuation Summary

An actuarial valuation of the assets and liabilities of the Denton Firemen's Relief and Retirement Fund as of December 31, 2023 has been completed. The valuation was based on the Present Plan (plan effective July 1, 2022) and the provisions of the Texas Local Fire Fighters' Retirement Act (TLFFRA) which were in effect on December 31, 2023. Section II shows the summary of key results of the actuarial valuation as of December 31, 2023 and discusses the significant changes since the prior valuation that we prepared as of December 31, 2021.

The city's funding policy for the fund, first adopted in December 2017, has been a part of the Meet and Confer Agreements effective October 1, 2019 and October 1, 2023. The funding policy is a modified actuarially determined contribution rate (ADCR). Under that policy, the city's initial contribution rate was set at 18.5% and is to be re-evaluated by the city council following every actuarial valuation. The funding policy has the intent of paying off the unfunded actuarial accrued liability (UAAL) over a closed 25-year period or sooner. The policy language implies that the rate should stay at 18.5% for at least the first five years, even if the ADCR is less than 18.5%, in order to pay down the UAAL. A key requirement of the policy is city approval of any change to the contribution level.

The funding policy begins with the 18.5% city contribution rate, has an ADCR over a closed 25-year period we assume began January 1, 2018, but in no event will the city contribution rate be less than the contribution rate to its TMRS plan for the other city employees. The ADCR over the 19 years remaining in the closed period as of December 31, 2023 is 13.33% based on this actuarial valuation. The TMRS rate for the year beginning January 1, 2024 is 18.94% and for the year beginning January 1, 2025 is 18.88%.

In spite of the city contribution rate somewhat above 18.5% in 2024 and 2025, we assumed the city would contribute a level 18.5% each year to actuarially determined the UAAL amortization period. With the assumed continuous future 18.5% city contribution rate, there would be a total contribution rate each year of 31.1%, comprised of 12.6% by the firefighters and 18.5% by the city. The total contribution rate of 31.1% exceeds the normal cost rate of 22.16%, leaving 8.94% available to amortize the UAAL of \$14,816,720. Assuming that the total payroll increases at the rate of 3% per year in the future, the contributions in excess of the normal cost **would be expected to amortize the UAAL in 6.5 years.**

There are several reasons that support the city planning to keep its contribution rate at no less than 18.5%:

- Continuing to contribute at least 18.5% each year would continue to accelerate both the amortization of the UAAL and increasing the funded ratio.
- It would hedge against potential future adverse experience, such as the investment experience in 2018 and in 2022, as well as all other experience losses such as the ones that have occurred in the last three actuarial valuations.
- It would better position the fund to provide another ad hoc increase in the monthly benefit for retirees at some future date without a rate increase.

The city should also consider contributing more to the retirement plan for its firefighters than to TMRS every year for these reasons:

1. **Low firefighter turnover** – Their lower turnover than other city employees means that a higher percent of firefighters will ultimately qualify for a retirement benefit than other city employees. As a result, their benefits cost more as a percent of pay.
2. **Physical demands of the job** – Because of this, firefighters tend to retire at earlier ages than other city employees. As a result, their benefits cost more as a percent of pay because they are paid over a longer period of retirement.
3. **Post-retirement increases** – Retirees in TMRS have for years been getting annual increases in their monthly benefits based on 70% of the CPI while retired firefighters have had only two increases since 2008, a modest 2% increase in 2008 and a modest tier of increases in 2022 (4% for those retired for 15 or more years, 3% for those retired for 10 to 15 years, and 2% for those retired 5 to 10 years).
4. **Employee contribution rates** – Firefighters contribute 12.6% of their pay to the fund while other city employees contribute only 7% to TMRS.

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 current Texas Pension Review Board (PRB) pension funding guidelines, our professional judgment, and the actuarial assumptions and methods used in making this valuation, we consider periods of 20 years or less to be preferable and 30 years to be the maximum acceptable period. Since the total assumed contributions are sufficient to pay the fund's normal cost and to amortize the fund's UAAL in 6.5 years, we are of the opinion that the fund, based on present levels of benefits and assumed contributions **has an adequate contribution arrangement. Section III presents considerations for future benefit improvements.**

Projected Actuarial Valuation Results

In addition to completing this actuarial valuation, we estimated the amortization periods as of December 31, 2025 and as of December 31, 2027 by making projections from the December 31, 2023 actuarial valuation and assuming a fixed city contribution rate of 18.5% until the UAAL is amortized. These projections examine the effect on the amortization period in the next two actuarial valuations of the actuarial investment gains and losses that the fund experienced in the four years prior to the valuation date (loss in 2022 and gains in 2020, 2021, and 2023) that have been only partially recognized as of December 31, 2023. 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 2020-2023 that the fund experienced. The AVA used in this valuation is \$152,516,894. The market value of assets (MVA) is \$152,072,995. The \$443,899 difference between the MVA and the AVA is the deferred net loss over the past four years that will be recognized in the next two 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. That exhibit shows that the \$14 million deferred net gain from two years ago greatly helped cushion the effect of the large investment loss in 2022.

For the purpose of projecting the amortization period through 2027 we used six scenarios of various assumed annual rates of investment return, net of investment-related expenses, over the 2024-2027 projection period. 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, 2023, and (2) of investment returns over the next four years different from the 6.75% assumption used in this valuation.

	Scenario					
	1	2	3	4	5	6
Assumed Investment Return for Calendar Year						
2024	6.75%	4.00%	4.00%	10.00%	10.00%	0.00%
2025	6.75	6.75	4.00	6.75	10.00	0.00
2026	6.75	6.75	10.00	6.75	6.75	10.00
2027	6.75	6.75	10.00	6.75	6.75	10.00
2028 and later	6.75	6.75	6.75	6.75	6.75	6.75
Amortization Period in Years as of December 31:						
2023 (actual)	6.5	6.5	6.5	6.5	6.5	6.5
2025 (projected)	4.0	4.8	5.2	3.0	2.5	7.4
2027 (projected)	2.7	4.4	4.2	0.9	0.0	9.1

The projected amortization period as of December 31, 2027 in Scenario 1 (no investment gains or losses) reveals that the expected decrease of four years from 6.5 years to 2.5 years is almost realized because of the very small effect of the \$443,899 deferred net loss.

Scenarios 2 and 3 assume modestly adverse investment experience that would not cause an increase in the amortization period. Scenario 6 assumes fairly adverse investment experience in 2024 and 2025, but because of the very low 6.5-year amortization period in the December 31, 2023 actuarial valuation, the projected amortization periods stay under 10 years. The favorable investment experience in 2024 and 2025 of Scenario 5 would accelerate the amortization of the unfunded liability so that it would be fully amortized by December 31, 2027.

We do not know what the investment experience will be for each of the next four calendar years. 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 will be the biggest influence on future actuarial valuations. In addition, the future investment experience in each of the next four years could be better or

worse than the assumed rates shown. These scenarios present a range of scenarios for the next two valuations assuming no changes in contribution rates or benefits or assumptions.

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 Gary Calmes, who provides administrative services for the board of trustees. We have not audited the data provided but have reviewed it for reasonableness and consistency relative to the data provided for the December 31, 2021 actuarial valuation. Exhibit 1 is a distribution of the active firefighters by age and service. The assumed 2024 compensation used for projecting future contributions and benefits for each active firefighter in the valuation was the actual compensation for calendar year 2023, adjusted by 6% to reflect the effect of the approximately 6% general pay increase effective in February 2024. The total of these assumed compensation amounts is our assumed annualized covered payroll for the plan year beginning January 1, 2024 and is used to determine the UAAL amortization period with the assumed 18.5% city contribution rate. The averages of the assumed compensation amounts for the 2024 plan year are shown in Exhibit 1.

Exhibit 2 contains summary information on the pensioners. The monthly benefit payments are generally based on the amounts paid in January 2024. Exhibit 3 is a reconciliation of firefighters and pensioners from December 31, 2021 to December 31, 2023. Exhibit 4 shows a breakdown of the dollar amount of the monthly benefits for retirees and surviving spouses. 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 December 31, 2023 market value of assets contained in the information received from the board. This exhibit also shows a comparison with the market values and actuarial values of assets as of December 31, 2021 and December 31, 2023. Exhibit 7 contains the statement of changes in assets for 2023 and 2022. 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 comparison of the market value asset allocation by asset class as of December 31, 2021 and December 31, 2023 is 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 and used 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 the valuation are:

1. 6.75% annual investment return net of investment-related expenses;
2. 3% annual general compensation increase combined with promotion, step, and longevity increases which average 1.98% per year over a 30-year career;
3. Retirement rates which result in an average expected age at retirement of 57.0; and

4. PubS-2010 (safety employees) total dataset mortality tables projected for mortality improvement using scale MP-2019.

No changes in actuarial assumptions have been made compared to those used in the December 31, 2021 valuation. 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.

Other 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 for the City

After negotiations in 2017 among representatives from the city manager's office, the board of trustees, and the Denton Fire Fighters Association, an agreement was reached to amend the prior Meet and Confer Agreement. Final approval by the city council occurred in December 2017. The same language was included in the Meet and Confer Agreements effective October 1, 2019 and October 1, 2023. The city's funding policy for the fund is a modified actuarially determined contribution rate (ADCR) policy summarized below.

- The funding policy is intended to fully pay off the UAAL over a closed 25-year amortization period that we assume began January 1, 2018.
- The city began contributing 18.5% of compensation in late December 2017.
- Each subsequent actuarial valuation for the board will include the modified ADCR for the city's review.
- If the actuarial valuation and modified ADCR are determined to be reasonable by the city, the city's contribution rate will be adjusted to the new modified ADCR beginning on the next October 1st.
- Two minimum constraints for the modified ADCR are that it will not be less than the city's TMRS rate or the minimum rate under TLFRA.
- Any change to the contribution level is subject to final approval by the city.

Variability in Future Actuarial Measurement

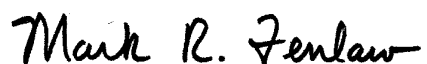
Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following:

- 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 the possible sources of measurement variability was provided 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 6.75% 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
Fellow, Society of Actuaries
Member, American Academy of Actuaries



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

Section II

Key Results of the Actuarial Valuation

	December 31, 2021 ¹	December 31, 2023
1. Actuarial present value of future benefits		
a. Those now receiving benefits or former firefighters entitled to receive benefits	\$ 50,741,710	\$ 57,450,474
b. Firefighters	<u>149,133,377</u>	<u>182,054,172</u>
c. Total	\$ 199,875,087	\$ 239,504,646
2. Actuarial present value of future normal cost contributions	\$ 57,435,441	\$ 72,171,032
3. Actuarial accrued liability (Item 1c – Item 2)	\$ 142,439,646	\$ 167,333,614
4. Actuarial value of assets	\$ 126,483,819	\$ 152,516,894
5. Unfunded actuarial accrued liability (UAAL) (Item 3 - Item 4)	\$ 15,955,827	\$ 14,816,720
6. Contributions (percent of pay)		
a. Firefighters	12.60%	12.60%
b. City of Denton ²	<u>18.50%</u>	<u>18.50%</u>
c. Total	31.10%	31.10%
7. Normal cost (percent of payroll)	22.23%	22.16%
8. Percent of payroll available to amortize the UAAL (Item 6c - Item 7)	8.87%	8.94%
9. Annualized covered payroll	\$ 23,631,852	\$ 28,955,532
10. Actuarially determined period to amortize the UAAL based on Item 6b continuing	9.1 years	6.5 years
11. Funded ratio (Item 4 ÷ Item 3) ³	88.8%	91.1%

¹ All items are from the December 31, 2021 actuarial valuation and reflect the Present Plan.

² For both actuarial valuations, 18.5% is the initial contribution rate in the current city funding policy, and was assumed to continue.

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 11 would have resulted in funded ratios of 98.7% as of December 31, 2021 and 90.9% as of December 31, 2023. **The best indicator of the fund's health is Item 10.**

Changes in the Unfunded Actuarial Accrued Liability

In comparing this actuarial valuation to the prior one, the UAAL decreased by \$1,139,107 from \$15,955,827 as of December 31, 2021 to \$14,816,720 as of December 31, 2023. The table below summarizes the reasons for the decrease.

Reason for Change	Amount
<ul style="list-style-type: none">Expected decrease (assumed amortization payments accumulated with interest exceeding interest on UAAL)	\$ (2,310,995)
<ul style="list-style-type: none">Investment gain for the two years (based on the AVA average annual return of 7.8%)	(2,887,166)
<ul style="list-style-type: none">Experience loss (net difference between actual experience and assumed experience for contributions, pay increases, retirements, mortality, and terminations, but primarily due to greater pay increases than expected)	<u>4,059,054</u>
Total	\$ (1,139,107)

Changes in the Actuarially Determined Amortization Period

The amortization period, based on the Present Plan provisions, was determined in the actuarial valuation as of December 31, 2021, to be 9.1 years. Since two years have passed since that valuation date, a 7.1-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 benefits or funding policy had been made. The amortization period is now 6.5 years based on the same assumptions, funding policy and plan provisions. The actual experience occurring between December 31, 2021 and December 31, 2023 differed from the expected experience, and the resulting amortization period is 6.5 years, which is 0.6 of a year less than the expected 7.1-year period for the following reasons:

1. The average annual rate of investment return, net of investment-related expenses, on the market value of assets during the two plan years 2022 and 2023 was 2.2%. 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 plan years 2022 and 2023 was 7.8% compared to the assumed rate of return for those years of 6.75%. This caused a **decrease** in the amortization period of 1.7 years.
2. The aggregate payroll increased at an average rate of 10.7% per year, compared to the assumed 3% per year rate, which caused the amortization period to **decrease** by 0.8 of a year.

3. The net result of all experience other than the investment experience and the aggregate payroll experience had the combined effect of **increasing** the amortization period by 1.9 years. This was the net result primarily of greater-than-expected pay increases in the last two years.

Section III

Benefit Improvements

The funding policy in the current Meet and Confer Agreement effective October 1, 2023 is silent on benefit improvements. The prior agreement effective October 1, 2019 said that there would be no benefit enhancements until after September 30, 2023. However, in May 2022, the city council agreed to a set of tiered post-retirement increases of 4%, 3%, or 2%, depending on the length of time since the initial benefit commenced. Perhaps they were influenced by the fact that there had been no prior ad hoc increase for the retirees since a 2% increase in 2008. In contrast, the retirees in the TMRS plan have received an increase each January for many years based on 70% of the increase in the CPI.

We understand that there is interest in determining the cost to the fund of adding an automatic annual increase in benefits for retirees (current and future retirees) that would be comparable to the annually repeating cost-of-living adjustment (COLA) for retirees in the TMRS plan for other city employees. Separately, we will provide a description of a COLA special study and fee quote.

In addition, the funding policy references the interest to place dispatchers in the TMRS plan. We have completed a special study report on the dispatchers dated December 9, 2021 and more recently November 29, 2023.

Exhibit 1

Distribution of Firefighters by Age and Service on December 31, 2023
with Average Annual Salary

Years of Service	Age									Total	Average Salary
	Under 25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 or Over		
0	5	7	5	0	0	0	0	0	0	17	\$ 82,824
1	5	7	5	2	0	0	0	0	0	19	83,044
2	3	5	4	4	0	0	0	0	0	16	93,747
3	0	4	4	5	0	0	0	0	0	13	99,922
4	0	0	0	1	0	0	0	0	0	1	117,009
5	0	2	3	3	1	0	0	0	0	9	108,073
6	0	2	4	4	0	0	0	0	0	10	114,497
7	0	1	3	5	2	0	0	0	0	11	121,204
8	0	0	3	3	3	0	0	0	0	9	118,886
9	0	0	0	0	2	0	0	0	0	2	149,033
10	0	0	4	4	0	0	0	0	0	8	129,559
11	0	0	2	1	7	0	0	0	0	10	123,692
12	0	0	1	4	2	0	0	0	0	7	122,811
13	0	0	0	1	1	0	0	0	0	2	152,499
14	0	0	0	0	1	0	0	0	0	1	170,312
15	0	0	0	0	3	1	1	0	0	5	128,266
16	0	0	0	0	1	1	0	0	0	2	131,210
17	0	0	0	2	5	4	4	0	0	15	132,746
18	0	0	0	0	4	5	2	0	0	11	144,043
19	0	0	0	0	1	2	1	0	0	4	149,411
20-24	0	0	0	0	4	13	15	6	0	38	141,077
25-29	0	0	0	0	0	1	7	9	0	17	156,468
30-34	0	0	0	0	0	0	4	4	0	8	170,516
35+	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>1</u>	164,391
Totals	13	28	38	39	37	27	34	20	0	236	\$122,693

Average	\$86,363	\$103,547	\$134,283	\$150,210		
Salary	\$94,173	\$115,328	\$141,328	\$143,597	\$122,693	

Average age	39.9
Average years of service	12.4
Average age at hire	27.5

Exhibit 2
Summary of Pensioner Data

Type of Benefit	Pensioner Data Used in December 31, 2023 Valuation	
	Number of Recipients	Total Monthly Benefit Payments
Service Retirement ¹	75	\$ 350,850
Disability Retirement	0	0
Vested Terminated (Deferred) ²	8	20,392
Surviving Spouse	20	62,060
Surviving Child	<u>1</u>	<u>1,028</u>
Total	104	\$ 434,330

Type of Benefit	Comparison of Pensioner Count by Type as of The Prior and Current Actuarial Valuations			
	December 31, 2021	New	Ceased	December 31, 2023
Service Retirement ¹	75	+7	(7)	75
Disability Retirement	0	0	0	0
Vested Terminated (Deferred)	7	+1	0	8
Surviving Spouse	15	+5	0	20
Surviving Child	<u>2</u>	<u>0</u>	<u>(1)</u>	<u>1</u>
Total	99	+13	(8)	104

¹ Includes three alternate payees receiving benefits according to the terms of a Qualified Domestic Relations Order.

² Monthly benefit payments are deferred to begin at terminated firefighter's future retirement date.

Exhibit 3
Firefighter and Pensioner Reconciliation

	Firefighters	Current Payment Status	Vested Terminated Firefighters	Total
1. As of December 31, 2021	211	92 ¹	7	310
2. Change of status				
a. retirement	(7)	7	0	0
b. disability	0	0	0	0
c. death	0	(7)	0	(7)
d. survivor payment begins	0	5	0	5
e. withdrawal	(10)	0	0	(10)
f. vested termination	(1)	0	1	0
g. completion of payment	0	(1)	0	(1)
h. QDRO alternate payee	0	0	0	0
i. correction	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
j. net changes	(18)	4	1	(13)
3. New firefighters	<u>43</u>	<u>0</u>	<u>0</u>	<u>43</u>
4. As of December 31, 2023	236	96 ¹	8	340

¹ Includes three alternate payees receiving benefits according to the terms of a Qualified Domestic Relations Order (QDRO).

Exhibit 4

Breakdown of Pensioners by Monthly Benefit Amounts as of December 31, 2023

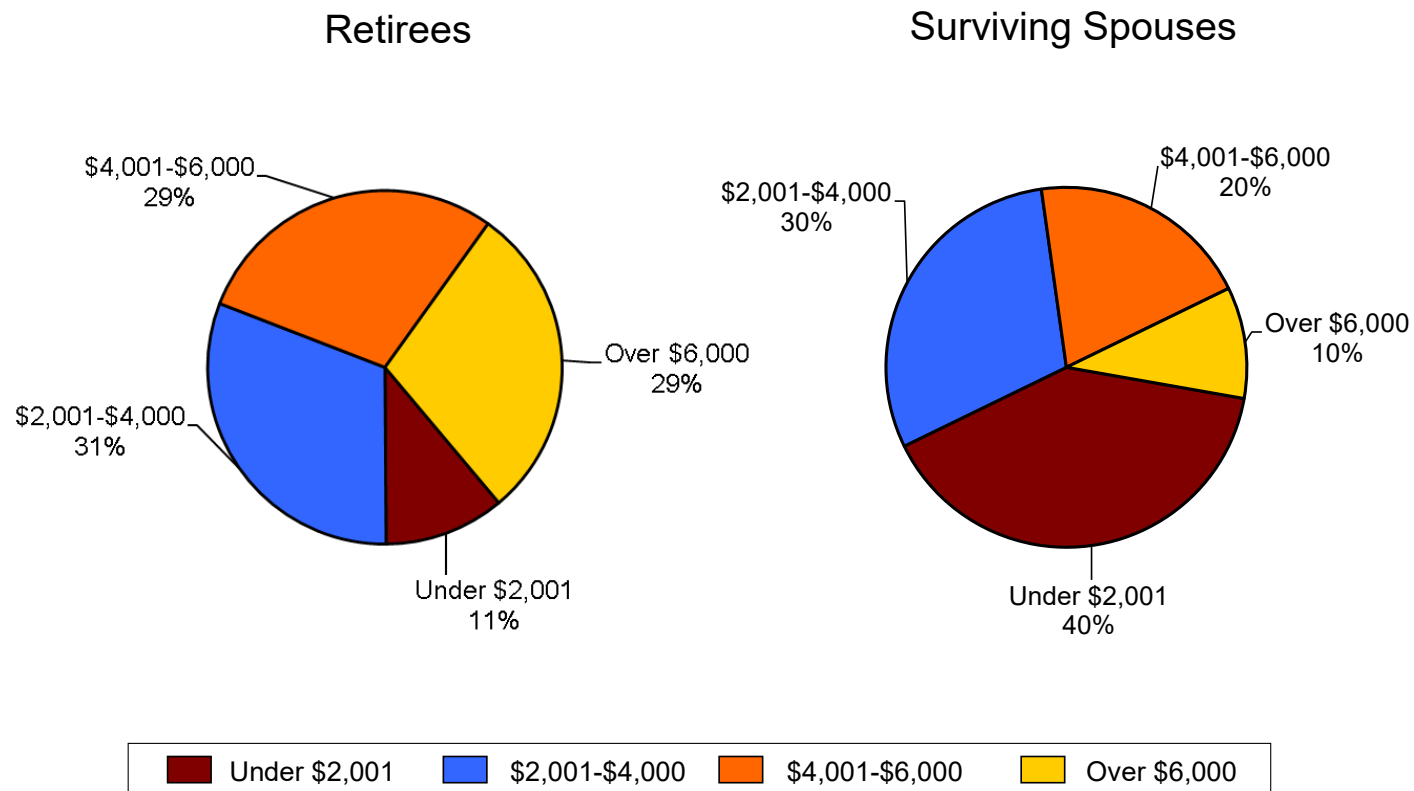


Exhibit 5

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

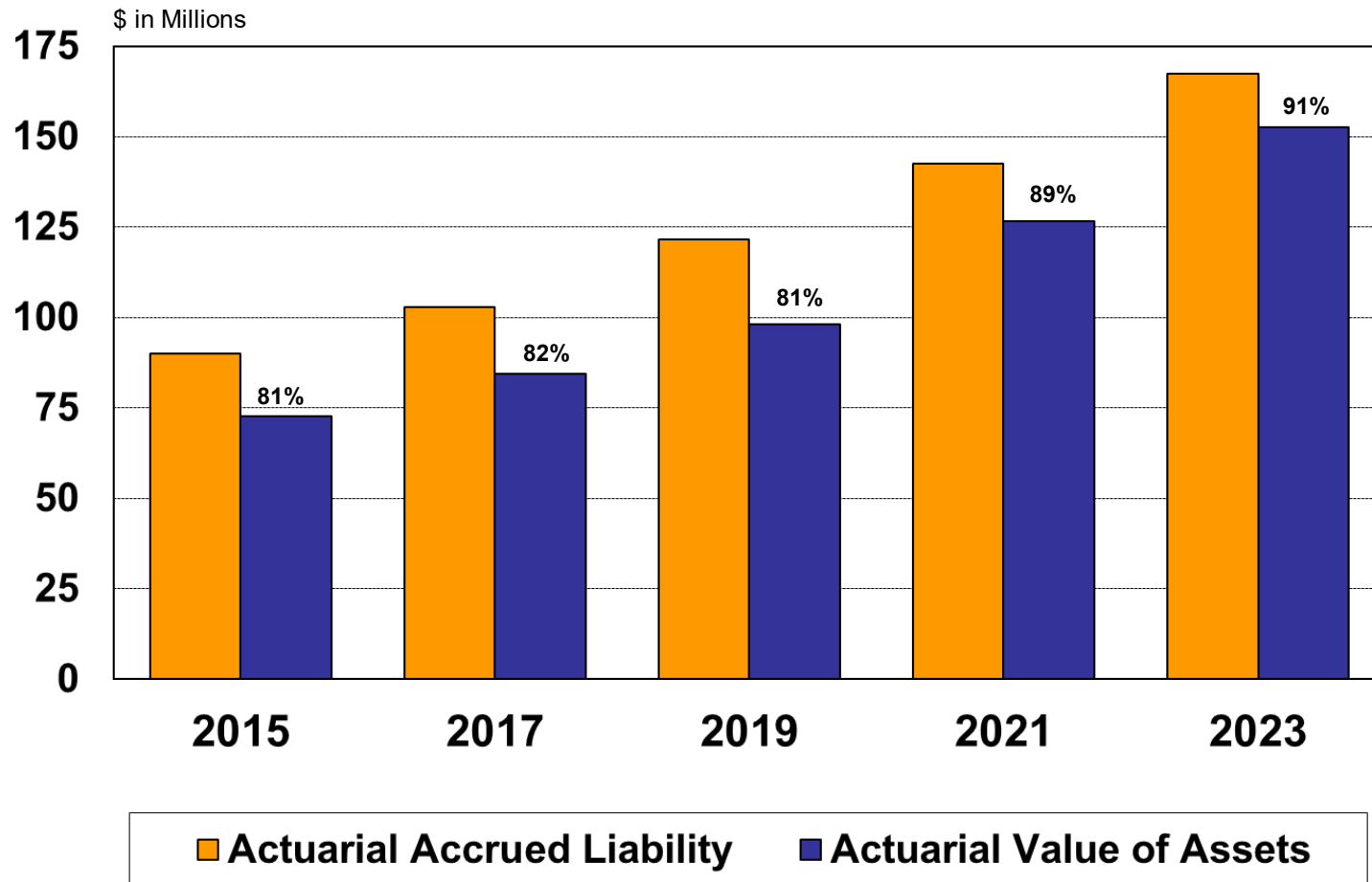


Exhibit 6
Summary of Asset Data

Asset Type	Market Value as of December 31, 2023	Allocation As a Percent of Grand Total
Equities		
U.S. Large Cap	\$56,259,000	37.0%
U.S. Small/Mid Cap	13,974,000	9.2
International	<u>12,556,000</u>	<u>8.2</u>
Total	82,789,000	54.4
Alternatives		
Real Estate	15,812,000	10.4
MLP's/Royal Trusts	<u>8,410,000</u>	<u>5.5</u>
Total	24,222,000	15.9
Fixed Income		
U.S. Core	25,829,000	17.2
Cash Equivalents	<u>19,232,995</u>	<u>12.7</u>
Grand Total	\$152,072,995 ¹	100.0%

¹ The grand total is the total in the audited financial report. All of the invested amounts were either from or estimated from the investment consultant's report, except for an updated value of real estate in the audited financial report. The cash equivalents amount is the balancing item.

Comparison of Asset Values as of the Prior and Current Actuarial Valuation Dates		
	<u>December 31, 2021</u>	<u>December 31, 2023</u>
Market Value	\$140,537,577	\$152,072,995
Actuarial Value	\$126,483,819	\$152,516,894
Actuarial Value as a Percent of Market Value	90.0%	100.3%

Exhibit 7

Statement of Changes in Assets
for the Years Ended December 31, 2023 and 2022

	<u>12/31/2023¹</u>	<u>12/31/2022¹</u>
Additions		
1. Contributions		
a. Employer	\$ 4,888,426	\$ 4,545,905
b. Employees	<u>3,329,414</u>	<u>3,096,130</u>
c. Total	\$ 8,217,840	\$ 7,642,035
2. Investment Income		
a. Interest and dividends	\$ 4,985,104	\$ 4,003,453
b. Net appreciation in fair value	<u>8,251,204</u>	<u>(10,096,927)</u>
c. Total	\$ 13,236,308	\$ (6,093,474)
3. Other Additions	<u>0</u>	<u>0</u>
Total Additions	\$ 21,454,148	\$ 1,548,561
Deductions		
4. Benefit Payments		
a. Monthly benefits	\$ 4,894,049	\$ 4,565,500
b. Lump-sum benefits	<u>815,516</u>	<u>250,972</u>
c. Total	\$ 5,709,565	\$ 4,816,472
5. Expenses		
a. Investment-related	\$ 386,740	\$ 352,587
b. General administrative	<u>87,648</u>	<u>114,279</u>
c. Total	\$ 474,388	\$ 466,866
Total Deductions	\$ 6,183,953	\$ 5,283,338
Net Increase in Assets	\$ 15,270,195	\$ (3,734,777)
Market Value of Assets (Fiduciary Net Position)		
Beginning of Year	\$ 136,802,800	\$ 140,537,577
End of Year	\$ 152,072,995	\$ 136,802,800
Rate of Return		
Net of All Expenses	9.24%	(4.62)%
Net of Investment-Related Expenses	9.31%	(4.54)%
Gross	9.60%	(4.30)%
Investment-Related Expenses (Direct)	0.29%	0.24%

¹Audited

Exhibit 8

Development of Actuarial Value of Assets

Calculation of Actuarial Investment Gain/(Loss) Based on Market Value for Plan Years Ending December 31				
	2023	2022	2021	2020
1. Market Value of Assets as of Beginning of Year	\$136,802,800	\$140,537,577	\$117,198,139	\$103,815,795
2. Firefighter Contributions	3,329,414	3,096,130	2,894,437	2,771,532
3. City Contributions	4,888,426	4,545,905	4,249,769	4,069,311
4. Benefit Payments and Administrative Expenses ¹	(5,797,213)	(4,930,751)	(5,011,139)	(5,772,448)
5. Expected Investment Return ²	9,315,885	9,577,792	7,982,865	7,043,624
6. Expected Market Value of Assets as of End of Year	148,539,312	152,826,653	127,314,071	111,927,814
7. Actual Market Value of Assets as of End of Year	<u>152,072,995</u>	<u>136,802,800</u>	<u>140,537,577</u>	<u>117,198,139</u>
8. Actuarial Investment Gain/(Loss)	3,533,683	(16,023,853)	13,223,506	5,270,325
9. Market Value Rate of Return Net of Expenses	9.31%	(4.54)%	17.93%	11.80%
10. Rate of Actuarial Investment Gain/(Loss)	2.56%	(11.29)%	11.18%	5.05%

¹ Administrative expenses are included because the investment return assumption was net of investment-related expenses for those years.

² Assuming uniform distribution of contributions and payments during the plan year; actuarially assumed investment return was 6.75%.

Deferred Actuarial Investment Gains/Losses to be Recognized in Future Years			
Plan Year	Investment Gain/(Loss)	Deferral Percentage	Deferred Gain/(Loss) as of 12/31/2023
2023	\$ 3,533,683	80%	\$ 2,826,946
2022	(16,023,853)	60%	(9,614,312)
2021	13,223,506	40%	5,289,402
2020	5,270,325	20%	1,054,065
Total			<u>\$ (443,899)</u>

Actuarial Value of Assets as of December 31, 2023	
11. Market Value of Assets as of December 31, 2023	\$152,072,995
12. Deferred Gain/(Loss) to be Recognized in Future	<u>(443,899)</u>
13. Preliminary Value (Item 11 – Item 12)	\$152,516,894
14. Corridor for Actuarial Value of Assets	
a. 90% of Market Value as of December 31, 2023 (minimum)	\$136,865,696
b. 110% of Market Value as of December 31, 2023 (maximum)	\$167,280,295
15. Actuarial Value as of December 31, 2023	\$152,516,894
16. Write Up/(Down) of Assets (Item 15 – Item 11)	<u>\$ 443,899</u>

Exhibit 9

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

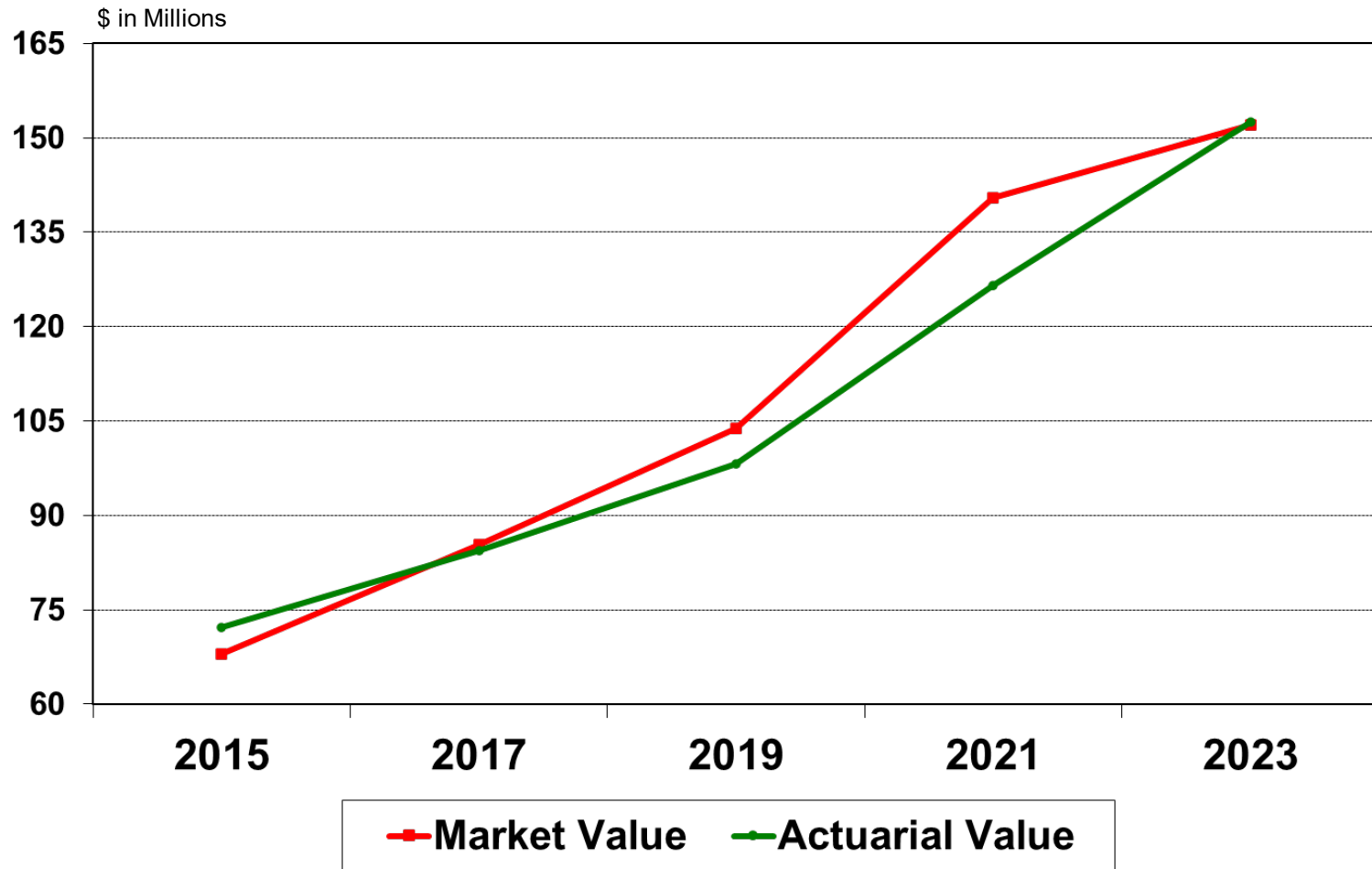
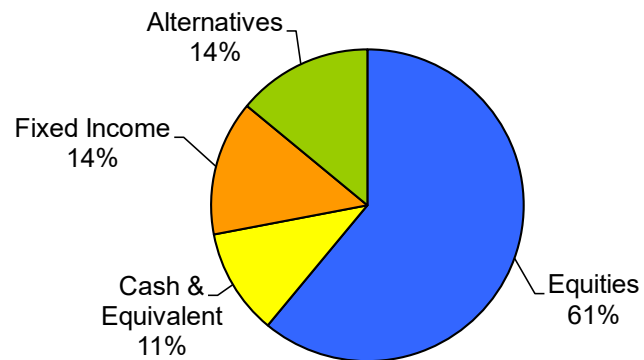


Exhibit 10

Comparison of Market Value Asset Allocation as of the Prior and Current Actuarial
Valuation Dates

December 31, 2021



December 31, 2023

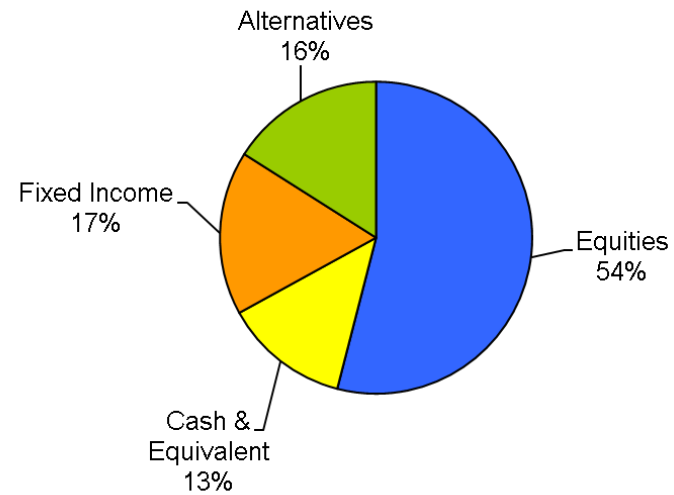


Exhibit 11

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 over the period from age at hire to the last age before 100% assumed retirement. 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, would fund his expected benefits. Each firefighter's normal cost is calculated to be a constant percentage of his expected compensation in each year 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, as does the actuarially determined UAAL amortization contribution rate with the closed amortization period.

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 90% of market value nor greater than 110% of market value. See Exhibit 8.

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 discuss them with the board as a part of the actuarial valuation. See our review of the economic assumptions in Appendix A.

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 for the fund for the long-term future.

1. Investment Return

6.75% per year net of investment-related expenses.

2. Inflation

2.5% 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 (2.5% inflation plus 0.5% productivity) in combination with promotion, step, and longevity increases that average 1.98% per year over a 30-year career. See Exhibit 12.

5. Retirement Rates

Age	Rate per Year for Firefighters Eligible to Retire
50-53	5%
54-58	15
59-61	30
62-64	50
65	100

The average expected retirement age for firefighters under age 50 based on these rates is 57.0.

6. RETRO DROP Election

- a. Percent of firefighters eligible electing RETRO DROP: 100% of service retirements eligible to elect at least a 12-month lump sum.
- b. Months assumed for lump sum: Maximum they are eligible for, up to 48 months.

7. Termination Rates

See Exhibit 12.

8. Disability Rates

See Exhibit 12.

9. Reduction in Benefit after 2½ Years of Disability Retirement

45% weighted average reduction in benefit.

10. Percent Married

90% of the firefighters are assumed to be married at retirement, disability, or death while employed, with male firefighters having a spouse four years younger and female firefighters having a spouse four years older. We use actual spouse data once a monthly benefit is being paid.

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

- Joint and 2/3 to surviving spouse for the 90% assumed to be married
- Life annuity for the 10% assumed to be single

To the extent optional forms of payment are elected and the amounts are determined under an actuarial basis which differs from the basis used in the valuation, actuarial gains or losses will occur. These gains or losses are expected to be very small and will be recognized through the valuation process for those retiring since the prior valuation who made an optional election.

12. Surviving Child's Death Benefit

None are assumed as a result of future deaths.

13. Firefighters' Contribution Rate

12.60% of covered pay.

14. City's Assumed Contribution Rate

For the scenarios with an actuarially determined amortization period for the UAAL, 18.50% of covered payroll for as long as the actuarially determined period.

15. Covered Payroll for First Year Following Valuation Date

Actual (or annualized) pay for 2023 with an adjustment of 6% for each firefighter to reflect the effect of the approximately 6% general pay increases effective in February 2024.

16. Administrative Expenses

The expenses paid by fund assets for other than investment-related expenses are assumed to be 0.50% of payroll. The normal cost rate as a percent of payroll is assumed to be 0.50% 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	Years of Service	Rate	Years of Service	Increase Percent
20	0.14	0	60	1	9.18%
21	0.15	1	54	2	9.18
22	0.16	2	48	3	9.18
23	0.17	3	42	4	9.18
24	0.18	4	37	5	9.18
25	0.19	5	32	6	6.09
26	0.21	6	27	7	6.09
27	0.23	7	24	8	6.09
28	0.25	8	21	9	6.09
29	0.28	9	19	10	6.09
30	0.31	10	17	11	6.09
31	0.35	11	14	12	6.09
32	0.40	12	12	13	6.09
33	0.45	13	11	14	6.09
34	0.49	14	10	15	6.09
35	0.52	15	9	16	3.00
36	0.54	16	9	17	3.00
37	0.57	17	8	18	3.00
38	0.62	18	8	19	3.00
39	0.73	19	8	20	3.00
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 & Over			3.00
51	3.92				
52	4.04				
53	4.24				
54	4.56				
55 & Over	0.00				

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 compensation over the period from age at hire to the last age before 100% assumed retirement. 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 Retirement Monthly Benefit as a Percent of Highest 36-Month Average Salary for Each Year of Service 2.59%
2. Normal Service Retirement Eligibility (Minimum) Age 50 and 20 Years
3. Retroactive Deferred Retirement Option Plan (RETRO DROP)
 - (a) Earliest RETRO DROP benefit calculation date Age 52 and 22 Years
 - (b) Maximum RETRO DROP benefit accumulation period 48 Months
 - (c) Earliest employment termination date with maximum RETRO DROP accumulation period Age 56 and 26 Years
 - (d) RETRO DROP lump sum includes
 - (i) Monthly benefits that would have been received between RETRO DROP benefit calculation date and end of month of termination of employment,
 - (ii) accumulated contributions made by the firefighter after the RETRO DROP benefit calculation date, and
 - (iii) no interest
4. Initial Disability Retirement Monthly Benefit as a Percentage of Highest 36-Month Average Salary
 - (a) Minimum percentage 51.80%
 - (b) Additional percentage for each year of service in excess of 20 years 2.59%
5. Disability Retirement Monthly Benefit for Firefighters Who Become Totally 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 monthly amount per year of service in excess of 20 years
 - (b) Following initial 30-month period, is the greater of (i) and (ii)
 - (i) Initial benefit reduced by the portion of the initial benefit equal to estimated annual residual earning capacity divided by annual base earnings
 - (ii) Initial benefit multiplied by percentage of disability
 - (c) Upon attaining eligibility for normal retirement, the member's vested retirement benefit becomes payable if the disability benefit has been reduced or terminated
6. Vested Terminated Benefit Eligibility (Benefit Deferred to Normal Retirement Age) 10 Years

7. Surviving Spouse's Monthly Death Benefit as a Percent of Highest 36-Month Average Salary for Each Year of Service for Death while an Active Firefighter
 - (a) Minimum percentage 34.53%
 - (b) Additional percentage for each year of service in excess of 20 years 1.73%
8. Surviving Spouse's Monthly Death Benefit as a Percent of Highest 36-Month Average Salary for Each Year of Service for Death while Eligible to Retire as an Active Firefighter 2.59% x 96%
9. Surviving Children's Monthly Benefit as a Percent of Surviving Spouse's Benefit
 - (a) When the spouse is receiving a benefit, for each child 20%
 - (b) When the spouse is not receiving a benefit or there is no spouse 100%
10. Contributions as a Percent of Payroll by:
 - (a) Firefighters 12.60%
 - (b) City of Denton Funding Policy
11. The normal form of annuity payment at retirement is a Joint and Two-Thirds to Surviving Spouse, and payment is the first day of each month.
12. A Social Security Leveling Option optional form of payment is available to firefighters eligible for a service retirement benefit and to surviving spouses of firefighters who die while employed where the surviving spouse is between ages 45-60. A Joint and 100% to Surviving Spouse Optional form of payment and a Joint and 50% to Surviving Spouse are also available to firefighters eligible for a service retirement benefit.
13. Salary used to determine the Highest 36-Month Average Salary includes all elements of pay except for (a) lump sum distributions upon termination for unused sick leave or vacation and (b) overtime pay earned after June 13, 2007 for special deployments in excess of \$2,000 per biweekly pay period. The average is based on the highest consecutive 78 biweekly pay periods during active participation in the fund.
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.
15. A lump sum death benefit will be payable upon the death of a participating member of the fund in an amount equal to the current annual salary of the participating member.

Appendix A

Review of the Actuarial Economic Assumptions
for the December 31, 2023 Actuarial Valuation

Asset Allocation and Investment Return Assumption Development

Asset Class	Gross Annual Real Rate of Investment Return (ROR) ¹	Asset Allocation			
		Actual 12/31/2021 ²	Actual 12/31/2023 ³	Current Target ⁴	More Fixed Income
Equities					
Domestic					
Large Cap	6.5	39%	37%	40%	40%
Small/Mid Cap	7.0	9	9	10	8
International	7.0	<u>13</u>	<u>8</u>	<u>10</u>	<u>7</u>
		61	54	60	55
Fixed Income	1.5	14	17	15	20
MPLs, Royalty Trusts	7.0	4	6	8	5
Real Estate	4.5	10	10	15	10
Cash	0.0	<u>11</u>	<u>13</u>	<u>2</u>	<u>10</u>
Total		100%	100%	100%	100%
<u>Weighted Average Gross Real ROR Assumption</u>			4.72%	5.46%	4.75%
<u>Weighted Average Net Real ROR Assumption⁵</u>			4.22%	4.96%	4.25%
Possible Theoretical Annual Investment Return Assumption:					
<u>Net Real ROR Plus Assumed Annual Rate of Inflation</u>					
Assumed 2.50% Inflation			6.72%	7.46%	6.75%

¹ A gross **real** rate of return is an assumed total annual rate of investment return, before 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 a combination of the investment consultant's 12/31/2021 report and the auditor's final 12/31/2021 draft.

³ This allocation is from a combination of the investment consultant's 12/31/2023 report and the 12/31/2023 audited financial report.

⁴ This allocation is from the investment consultant's 12/31/2023 report.

⁵ A weighted average Net Real ROR is an annual rate equal to the weighted average Gross Real ROR reduced by investment-related expenses of an assumed annual rate of 0.5%.

Appendix A (continued)**Price Inflation in the USA Average Annual Rates of Increase in the CPI-U**

<u>Years (Dec. to Dec.)</u>	<u>Number of Years</u>	<u>Average Annual Increase</u>
1958 – 2023	65	3.70%
1963 – 2023	60	3.90
1968 – 2023	55	4.00
1973 – 2023	50	3.86
1978 – 2023	45	3.41
1983 – 2023	40	2.81
1988 – 2023	35	2.71
1993 – 2023	30	2.51
1998 – 2023	25	2.54
2003 – 2023	20	2.58

Most inflation forecasts are for 10 years or less. For example, the average 10-year forecast in the June 2024 Livingston Survey published by the Federal Reserve Bank of Philadelphia was 2.25%. However, 10 years is too short a forecast period for a public employee defined benefit pension plan. In the 2024 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 3.00%.

Administrative Expenses Paid by the Fund

<u>Plan Year Ending 12/31</u>	<u>Administrative Expenses Paid by the Fund</u>	<u>Covered Payroll</u>	<u>% of Payroll (2) ÷ (3)</u>
(1)	(2)	(3)	(4)
2023	\$ 87,648	\$26,423,921	0.33%
2022	114,279	24,572,460	0.47
2021	87,866	22,971,722	0.38
2020	116,909	21,996,287	0.53
2020-2023	\$406,702	\$95,964,390	0.42%

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. For the December 31, 2023 actuarial valuation, we recommend 0.50%, the average developed above for the last four plan years, rounded up to a multiple of 0.10%. It is the same assumption we used for the December 31, 2021 actuarial valuation. (The covered payroll was determined as the firefighter contributions for the plan year divided by the firefighter contribution rate during the plan year.)

**Comparison of 12/31/2021 Actuarial Economic Assumptions
with 12/31/2023 Actuarial Economic Assumptions**

Actuarial Assumption ¹	12/31/2021 Actuarial Economic Assumptions	12/31/2023 Actuarial Economic Assumptions
Inflation (Price)	2.50%	2.50%
Net real rate of return ²	<u>4.25</u>	<u>4.25</u>
Net total investment return ²	6.75%	6.75%
Firefighter pay increase ³	4.98%	4.98%
Aggregate payroll increase	3.00%	3.00%
Administrative expenses	0.50% of payroll	0.50% of payroll

¹ All assumptions are annual rates.

² Net of investment-related expenses.

³ The 4.98% for 12/31/2021 and 12/31/2023 is comprised of a 3.00% annual general compensation increase combined with annual promotion, step, and longevity pay increases that vary by length of service (highest in early years) and that average 1.98% over a 30-year career.

Appendix B

Other Disclosures as of December 31, 2023

Negative Amortization

- As of this actuarial valuation, the fund has no negative amortization because the total contributions in each future year are expected to exceed the sum of the normal cost and interest on the Unfunded Actuarial Accrued Liability (UAAL), with the UAAL expected to be fully amortized in less than seven years.

Reasonable Actuarially Determined Contribution Rate

- The 2024 actuarially determined contribution (ADC) rate resulting from the city's current funding policy on page 1 is a reasonable ADC rate consistent with actuarial standards of practice.

Actuarial Valuation Software

- We have utilized software licensed from Winklevoss Technologies, LLC in the development of the liabilities summarized in the report. We have independently confirmed the model developed by Winklevoss and have sufficiently tested it to ensure the model is an accurate representation of the fund's liabilities.

Low-Default-Risk Obligation Measure (LDROM)

- The LDROM is a new required disclosure calculated as of the date of the actuarial valuation using a discount rate based on high quality bond yields instead of the expected return on the fund's diversified investment portfolio.

Low-Default-Risk Obligation Measure	\$266,294,086
Actuarial Accrued Liability	\$167,333,614

- The difference between the LDROM and the actuarial accrued liability determined in this actuarial valuation could be viewed as the expected savings from investing in the fund's diversified portfolio instead investing only in high quality bonds.
- For our calculation of the LDROM, we have used the same actuarial cost method and actuarial assumptions from this actuarial valuation summarized in Exhibits 11 and 12, except for an assumed discount rate of 3.26% instead of the investment return assumption of 6.75%. To determine the assumed discount rate, we used the Bond Buyer Index of general obligation bonds with 20 years to maturity, which has an average rating roughly equivalent to Moody's Investors Services' Aa2 rating and Standard and Poor's Corporation AA. The weekly index closest to the December 31, 2023 measurement date was 3.26%.
- Because the fund's assets are not invested only in high-quality bonds, the LDROM does not reflect the fund's actuarial condition, nor does it offer insights into the total contribution required for an adequate contribution arrangement or the security of participant benefits.