Fire and Police Pension Association

Statewide Death & Disability Plan

Actuarial Valuation Report
for the Year Beginning January 1, 2020

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June 30, 2020

Board of Directors
Fire and Police Pension Association
5290 DTC Parkway, Suite 100
Greenwood Village, Colorado 80111

Re: Actuarial Valuation of the FPPA Statewide Death & Disability Plan (the Plan) as of January 1, 2020

Dear Members of the Board:

We are pleased to present our Report on the actuarial valuation of the Statewide Death & Disability Plan for the Fire and Police Pension Association (FPPA) as of January 1, 2020.

We certify that the information included herein and contained in our 2020 Actuarial Valuation Report is accurate and fairly presents the actuarial position of the FPPA Statewide Death & Disability Plan as of January 1, 2020.

Our report presents the results of the January 1, 2020 actuarial valuation of the FPPA Statewide Death & Disability Plan (D&D). The report describes the current actuarial condition of the D&D, determines the appropriateness of the contribution rate for certain members, and analyzes changes since the last valuation. The results presented herein may not be applicable for other purposes.

Valuations are prepared annually, as of January 1st, the first day of the FPPA plan year.

Financing Objectives

Contribution rates are established by law as a percentage of payroll. The contributions are intended to finance the future benefits payable from the Plan using a modified version of the aggregate actuarial cost method.

House Bill 20-1044

House Bill 20-1044 increased the Board's ability to change contribution levels. Prior to its passage, the Board could move the contribution rate by 0.1% every two years. With the passage of House Bill 20-1044, the Board can now move the contribution rate by 0.2% every year. In addition, the bill automatically increased the 2021 rate to 3.0%.

Progress toward Realization of Financing Objectives

The unfunded actuarial accrued liability and the funded ratio (ratio of the actuarial value of assets to the net present value of benefits) illustrate the progress toward the realization of certain financing objectives. Based on our actuarial valuation as of January 1, 2020, the Plan has current liabilities greater than current assets by $166.6 million assuming no allowance for future discretionary benefit

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adjustments for non-totally disabled benefit recipients. After taking into account House Bill 20-1044 and increasing contribution levels to 3.0% starting in 2021, this amount is reduced to $146.8 million. This does not take into account any increases beyond the 3.0% level which the Board may adopt starting in 2022.

The Board increased the annual contribution rate for members hired on or after January 1, 1997 to 2.80% effective January 1, 2019, and House Bill 20-1044 will increase rates to 3.00% starting in 2021. Based on smoothed assets, the cost of providing benefits is 4.34%, therefore, the current contribution rates are inadequate to provide any level of future discretionary benefit adjustments, or even to fund base benefits. We recommend that the Board maximize use of the contribution flexibility granted by the House Bill and increase rates by the 0.2% allowed when they are allowed to do so.

Benefit provisions

All of the benefit provisions reflected in this valuation are those which were in effect on January 1, 2020. There were no changes in provisions since the prior valuation. The benefit provisions are summarized in Appendix B of our Report.

Assumptions and methods

The current actuarial methods and assumptions were selected by the Board of Directors of FPPA based upon the actuary's analysis and recommendations from the 2018 Experience Study, for first use in the actuarial valuation as of January 1, 2019. For information regarding the rationale for the assumptions chosen, please see the experience study report dated September 21, 2018.

The assumptions and methods are detailed in Appendix A of our Report. The Board of Directors has sole authority to determine the actuarial assumptions used for the Plan. The assumptions that are based upon the actuary's recommendations are internally consistent and are reasonably based on the actual past experience of the Plan.

The actuarial assumptions represent estimates of future experience and are not market measures. The results of any actuarial valuation are dependent upon the actuarial assumptions used. Actual results (and future measures) can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. The actuarial calculations presented in this Report are intended to provide information for rational decision making.

Data

FPPA supplied data for active and disabled members as of January 1, 2020. We did not audit this data, but we did apply a number of tests to the data, and we have concluded that the data is reasonable and consistent with the prior year's data. FPPA also supplied asset data as of January 1, 2020.

GASB Accounting

The Governmental Accounting Standards Board (GASB) Statement No. 74, Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans (Issued 6/2015), has replaced the requirements under GASB Statement No. 43, effective for financial statements for fiscal years beginning after June 15, 2016. GASB Statement No. 75, Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions (Issued 6/2015), has replaced GASB Statement No. 45, effective for fiscal years beginning after June 15, 2017. Plan reporting information for GASB Statement No. 74 can be found in the FPPA Comprehensive Annual Financial Report at FPPA's website - FPPAco.org. There will be no employer reporting for GASB Statement No. 75 as all contributions to the FPPA Statewide Death & Disability Plan are made by members or on behalf of members.

Projected Actuarial Results

The following table shows the Funded Ratio (FR) and Annual Required Contribution (ARC) projected over the next five years given alternative investment returns on the market value of assets. With the exception of the market value investment returns, the projections beyond 2020 are based on the same assumptions, methods and provisions used for the January 1, 2020 valuation. These projections assume 2.8% contributions during 2020 and 3.0% thereafter.

5-Year Deterministic Projection						
January 1,	Market Value Investment Return					
	3.00%		7.00%		11.00%	
	FR	ARC	FR	ARC	FR	ARC
2020	72.2%	4.34%	72.2%	4.34%	72.2%	4.34%
2021	73.1%	4.40%	73.7%	4.36%	74.3%	4.33%
2022	71.3%	4.52%	73.2%	4.43%	74.9%	4.34%
2023	69.0%	4.69%	72.5%	4.50%	76.0%	4.31%
2024	66.3%	4.88%	71.9%	4.57%	77.6%	4.25%
2025	63.0%	5.11%	70.8%	4.67%	79.5%	4.17%

Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future actuarial measurements other than that shown above.

Certification

All of our work conforms with generally accepted actuarial principles and practices, and to the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of Colorado state law and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board.

The undersigned are independent actuaries and consultants. Joseph Newton and Dana Woolfrey are Enrolled Actuaries and all are Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, all of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Joseph P. Newton, FSA, EA, MAAA Pension Market Leader and Actuary	Dana Woolfrey, FSA, EA, MAAA Senior Consultant and Actuary	Linna Ye, ASA, MAAA Actuary

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SECTION I

EXECUTIVE SUMMARY

Executive Summary

Item	January 1, 2020	January 1, 2019
Membership		
• Number of:		
- Active members	13,283	12,747
- Total disabled members & beneficiaries	162	157
- Occupational disabled members & beneficiaries	987	949
- Survivors of deceased active members	135	132
- Total	14,567	13,985
• Annualized payroll supplied by FPPA	$ 1,112,893	$ 1,012,667
Recommended contribution rates for members hired on or after January 1, 1997 and members covered by Social Security	2.80%	2.80%
Assets		
• Market value	$ 442,442	$ 394,247
• Actuarial value	$ 432,227	$ 409,327
• Rate of return on market value	14.4%	0.0%
• Rate of return on actuarial value	7.6%	6.0%
• Contribution for prior year	$ 26,150	$ 22,685
• Ratio of actuarial value to market value	97.7%	103.8%
Actuarial Information		
• Unfunded actuarial accrued liability/(surplus)	$ 166,602	$ 153,496
• GASB funded ratio (2.8% Contributions)	72.2%	72.7%
• GASB funded ratio (2.8% Contributions FY 2020, 3.0% Thereafter)	74.6%	N/A

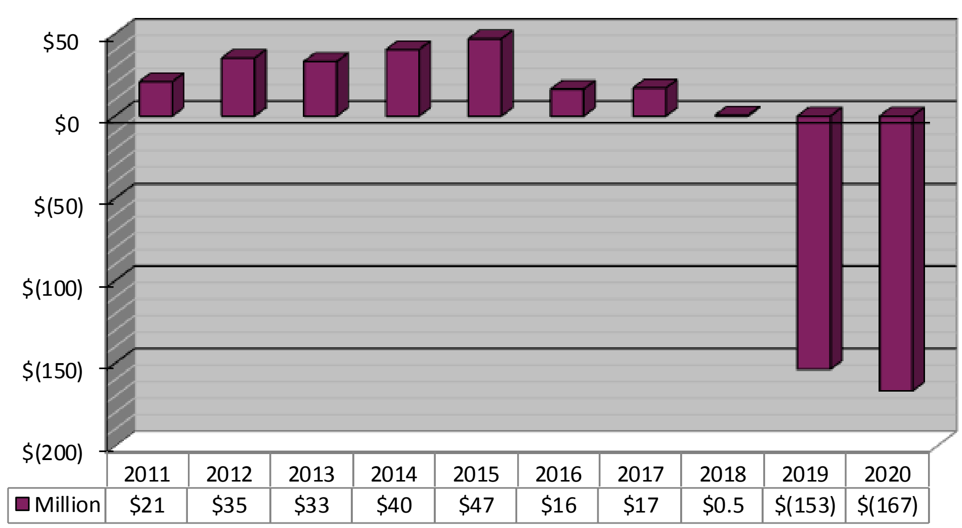
Note: Dollar amounts in $000

Executive Summary

1. The annual contribution rate for members hired on or after January 1, 1997 and for members covered by Social Security is 2.8% as of January 1, 2020.
2. This rate was last increased from 2.7% to 2.8% as of January 1, 2019.
3. House Bill 20-1044 will automatically increase the rate to 3.0% effective January 1, 2021.
4. The number of total members increased from 13,985 in 2019 to 14,567 in 2020, an increase of 4.2%.
5. Current plan benefits provide an automatic annual 3.0% benefit adjustment to totally disabled members and their beneficiaries but assume no future benefit adjustments for other members. Based on actuarial estimations, the current 2.8% contribution rate is inadequate to provide any permanent annual benefit adjustment.
6. The present value of future benefits and expenses at the valuation date is in excess of the plan assets and the present value of future contributions by $166.6 million. This unfunded position compares to the $153 million unfunded position last year. The Plan is “unfunded” assuming no future discretionary benefit adjustments for non-totally disabled benefit recipients.
7. Assets earned 14.4% on a market basis and 7.6% on an actuarial basis in 2019, producing an actuarial gain of $2.6 million.
8. The funded ratio decreased from 72.7% to 72.2% as of January 1, 2020.

The following chart shows the history of the (Unfunded Actuarial Accrued Liability)/Surplus as of past historical valuation dates. The dollar values are in millions.

Historical (UAAL)/Surplus



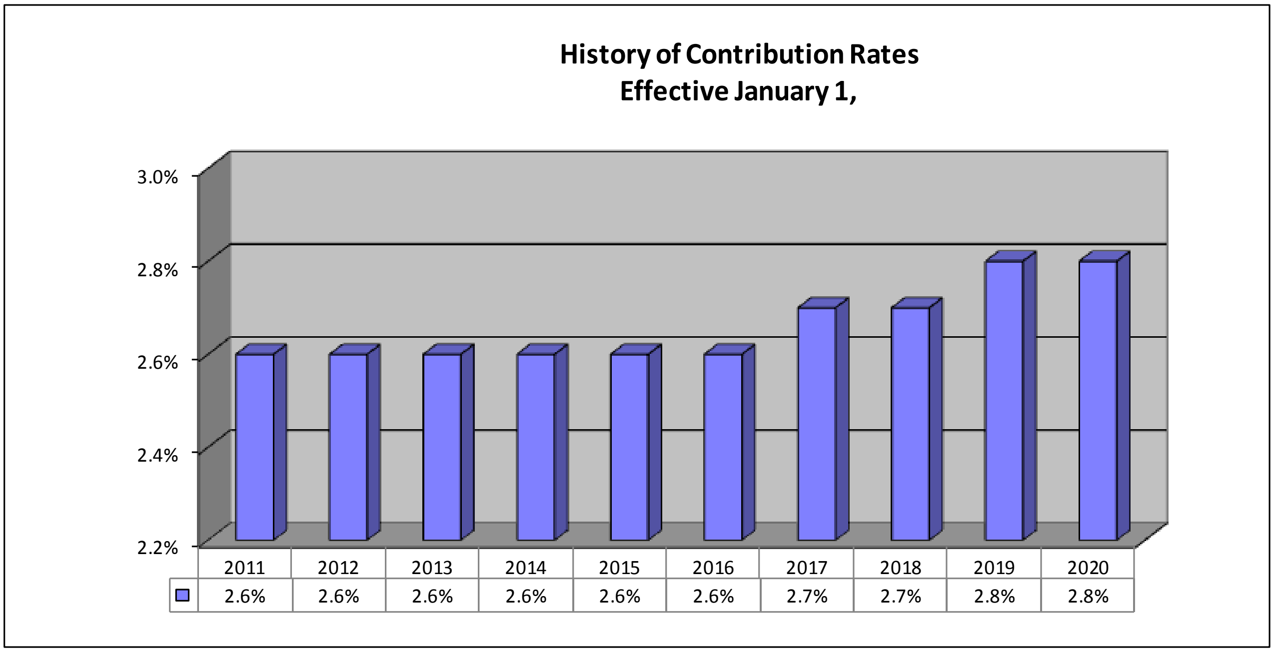
SECTION II

DISCUSSION

Contribution Requirements

The valuation of the Fire and Police Pension Association Statewide Death & Disability Plan (D&D) as of January 1, 2020, reflects a current employee contribution rate of 2.8% for members hired on or after January 1, 1997. By statute, this rate can change only every two years.

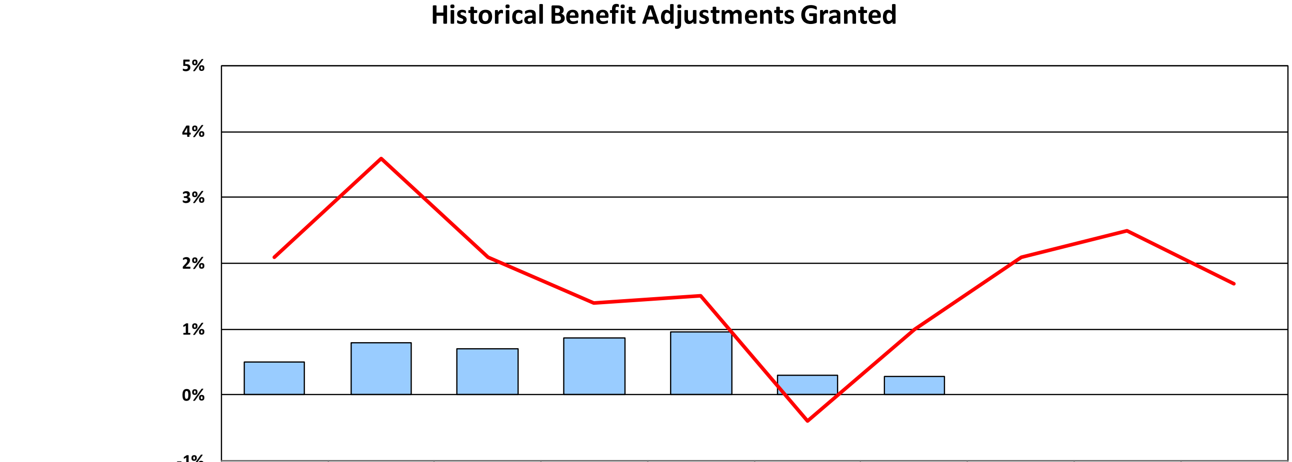
The following graph shows the historical contribution rates for employees hired on or after January 1, 1997 and for members covered by Social Security.



The cost of providing benefits is 4.34% (with no future benefit adjustments for non-totally disabled benefit recipients), therefore, the current 2.80% contribution rate is inadequate to provide any level of future benefit adjustments, or even to fund base benefits. House Bill 20-1044 will increase the contribution rate to 3.0% effective January 1, 2021, and allow the Board to increase rates by 0.2% per year starting January 1, 2022. We recommend the Board make maximum use of that discretion until the plan's funding outlook is significantly improved.

Discretionary Benefit Adjustments

On October 1st of each year, annuitants may receive a benefit increase at the discretion of the Board of Directors. Totally disabled members and their beneficiaries receive an automatic increase each year of 3%. For other annuitants, the increase may reflect CPI, but in no case may be higher than 3%. Because the increases are purely discretionary, the valuation results in the report are shown assuming no discretionary benefit adjustments are granted to annuitants other than total disability retirees. The current 2.80% contribution is inadequate to provide any permanent annual benefit adjustment, or even to fund base benefits. We recommend the Board not make any discretionary benefit adjustments until base benefits are adequately funded and additional funding is available for the discretionary adjustments.



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Granted Adjustment*	0.50%	0.80%	0.70%	0.86%	0.96%	0.30%	0.29%	0.00%	0.00%	0.00%
Prior Year CPI-W	2.10%	3.60%	2.10%	1.40%	1.50%	-0.40%	1.00%	2.10%	2.50%	1.70%

**Total disability annuitants and their survivors receive an automatic annual Benefit Adjustment of 3.0%.*

Financial Data and Experience

This section provides an analysis of the change in Plan Net Assets during the year and an estimate of the yield on mean assets of D&D. FPPA provided GRS with a summary of plan assets as of January 1, 2020. The market value of assets reported was $442.4 million as of January 1, 2020, as compared to $394.2 million as of January 1, 2019. Table 6 shows data from some of the tables included in the annual financial statements of the Plan. Table 8 shows the estimated yield on a market value basis and on the actuarial asset valuation method.

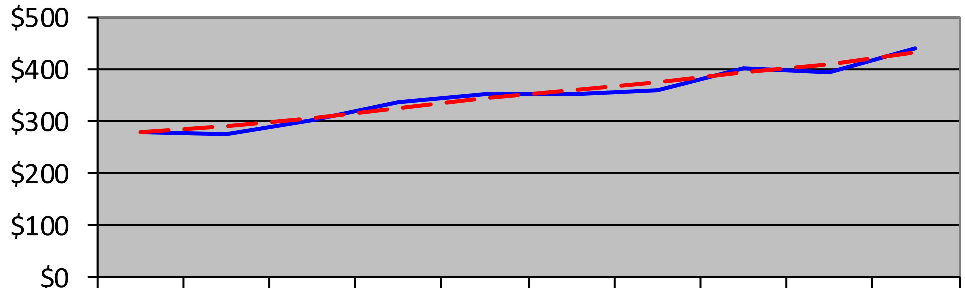
The asset valuation method uses a five-year phase in of the excess/(shortfall) between expected investment return and actual income. Expected earnings used to project the actuarial value are determined using the assumed investment return rate and the beginning of year actuarial value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of administrative and investment expenses.

Table 7 shows the development of the actuarial value of assets. The actuarial value of assets increased from $409.3 million to $432.2 million since the prior valuation. This increase was more than expected and produced a gain of approximately $2.6 million.

Effective January 1, 2019, the valuation assumed investment return was reduced from 7.5% to 7.0% per year. As indicated by item 6b of Table 8, the estimated return on mean market value was 14.41% in 2019; higher than the assumed 7.0% return. The actuarial asset value returned 7.63%. This difference in the estimated return on market value and actuarial value illustrates the smoothing effect of the asset valuation method.

History of MVA vs AVA

As of the valuation date January 1,



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MVA	$280	$276	$302	$339	$354	$352	$361	$404	$394	$442
AVA	$282	$291	$305	$325	$345	$361	$375	$395	$409	$432

$ in millions

MVA — AVA

AVA: Actuarial (Smoothed) Value of Assets
MVA: Market Value of Assets

Demographic Experience

During the year, the plan had less disablements than expected (57 actual vs. 67.3 expected) and less active member deaths than expected (5 actual vs. 8.2 expected). The plan had more annuitant deaths than expected (23 actual vs. 15.7 expected). The primary component of the liability loss shown in Table 3 is from new hires to the plan. The 2.8% contribution rate is not sufficient to support the expected costs of the plan, and because of this, a new active member comes onto the plan with an unfunded liability at date of hire.

Member Data

FPPA supplied member data as of January 1, 2020. While we did not audit this data, we did perform various tests to ensure that it was internally consistent, consistent with the prior year's data, and was reasonable overall. Information provided for active members includes: name, member ID, sex, a code indicating whether the member was active or inactive, date of birth, service, salary, accumulated member contribution, and the accumulated stabilization reserve account. For retired members, data includes: name, member ID, sex, date of birth, date of retirement, amount of benefit, a code indicating the option elected and the type of retiree (total disability retirees, occupational disability retirees, beneficiary), and if applicable, the joint pensioner's date of birth and sex.

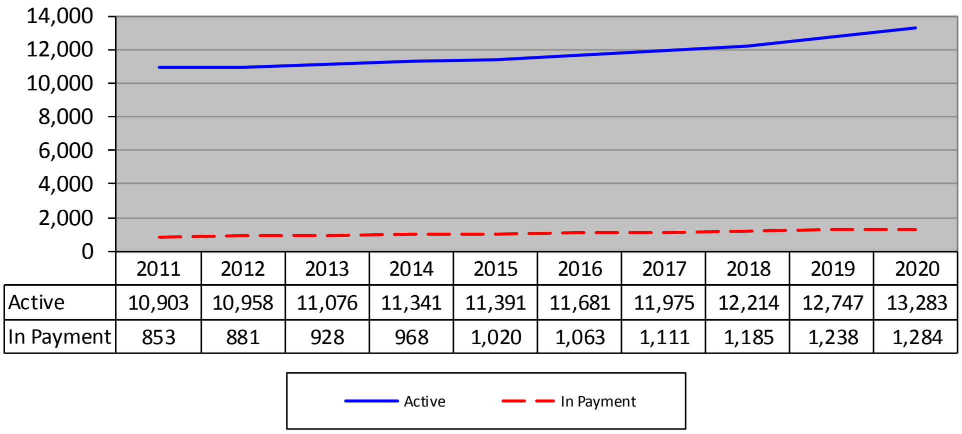
For local Money Purchase members, an array based on service was used to estimate each member's Money Purchase balance. For missing salary in the data, an array of salaries based on service was used to estimate the salary.

Table 17 shows the number of members by category (active, inactive, retired, etc.). Table 18 shows a historical summary of active member statistics, and Table 19 shows the distribution of active members by age and service.

The total payroll shown on the statistical tables is the amount that was supplied by FPPA. For the cost calculations, the pays were adjusted in accordance with the actuarial assumptions to reflect one year's salary increase.

History of Counts: Active vs In Payment

As of the valuation date January 1,



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Active	10,903	10,958	11,076	11,341	11,391	11,681	11,975	12,214	12,747	13,283
In Payment	853	881	928	968	1,020	1,063	1,111	1,185	1,238	1,284

Benefit Provisions

Appendix B in Section IV includes a summary of the benefit provisions for FPPA. Highlights include:

- Pre-Retirement Death Benefits:
    - Off-duty: 40% of the base salary paid to the member prior to death, with an additional 10% of base salary if a surviving spouse has two or more dependent children.
    - On-duty: 70% of the base salary paid to the member prior to death.
- Disability Benefits:
    - Total Disability: 70% of the base salary preceding disability.
    - Permanent Occupational Disability: 50% of the base salary preceding disability.
    - Temporary Occupational Disability: 40% of the base salary preceding disability for up to 5 years.

- Contributions: Members hired after January 1, 1997 and members covered by Social Security currently contribute 2.8% of pay.

- Benefit adjustments are granted periodically at the discretion of the FPPA Board. Total disability retirees receive an automatic increase of 3%. For other annuitants, the increase may reflect CPI, but in no case may be higher than 3%.

There are no ancillary benefits—e.g., cost of living benefits—that are currently provided by a source independent of FPPA but that might be deemed an FPPA liability if continued beyond the availability of funding by the current funding source.

Actuarial Methods and Assumptions

The valuation was prepared using the Aggregate Method. This is the same funding method that has been used in prior years. The asset valuation method uses a five-year phase in of the excess (shortfall) between expected investment return and actual income. See Appendix A for a complete description of this method.

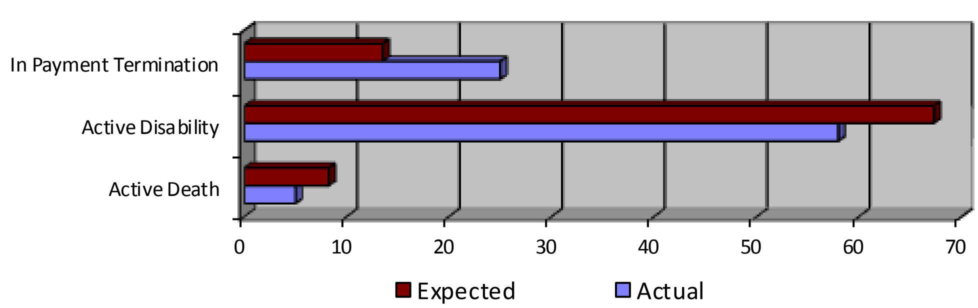
The actuarial value of future benefits from the Plan is based on several economic and non-economic assumptions. These are summarized in Appendix A as well. The economic assumptions include investment return and salary increases. Non-economic assumptions include rates of mortality, disability, and separation.

There were no changes to the assumptions and methods since the prior valuation.

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

For FY2019, the actual salary increases were 102.4% of expected. The following charts provide a comparison of the actual experience versus the expected experience for selected assumptions.

Demographic Experience - FY2019



The In Payment Terminations above include deaths and benefits that were canceled for other reasons such as recovery.

GASB and Funding Progress

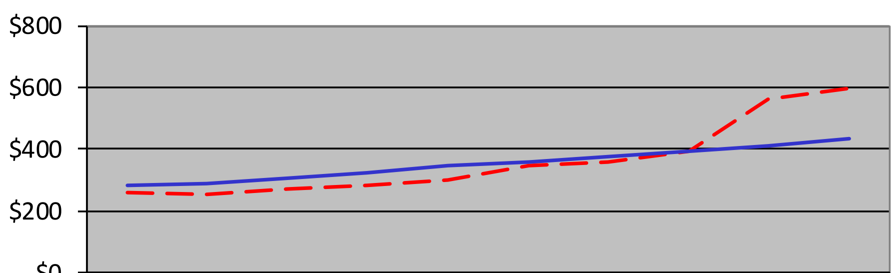
The governmental Accounting Standards Board (GASB) Statement No.74, *Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans (GASB 74),* has replaced the requirements under GASB Statement No. 43, *Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans (GASB 43),* effective for financial statements for fiscal years beginning after June 15, 2016. The governmental Accounting Standards Board (GASB) Statement No.75, *Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans (GASB 75),* has replaced the requirements under GASB Statement No. 45, *Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans (GASB 45),* effective for financial statements for fiscal years beginning after June 15, 2017.

Plan reporting information for GASB 74 can be found in the FPPA Comprehensive Annual Financial Report at FPPAco.org. There will be no employer reporting for GASB 75 as all contributions to the FPPA Statewide Death & Disability Plan are made by members or on behalf of members. Although it will no longer be required for financial reporting purpose, we have continued to include Table 11a (shows a historical summary of the funded ratios and other information for FPPA). In addition, we have included a Schedule of Funding Progress in Table 11b based on the Entry Age Normal cost method as required for plans using the Aggregate Cost Method.

For FPPA, the employer Annual Required Contribution for 2019 is 0%. For members hired on or after 1/1/97 and for members covered by Social Security the member contribution rate is 2.8% of pay. The 2.8% became effective January 1, 2019.

History of AAL vs AVA

As of the valuation date January 1,



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
AAL	$261	$256	$272	$285	$298	$345	$358	$395	$563	$599
AVA	$282	$291	$305	$325	$345	$361	$375	$395	$409	$432

$ in millions

AAL AVA

The AAL referenced in the chart is the Actuarial Accrued Liability as referenced throughout the report.

Significant Factors Affecting Trends in Actuarial Information

With the recognition of significant increases in utilization of the disability benefits of this plan, the funding outlook of the plan notably deteriorated. In response to this poor funding outlook, House Bill 20-1044 provided relief by allowing the Board increased flexibility in increasing contributions to the plan. If the Board maximizes the use of the contribution increases allowed, it is anticipated that the plan will return to an expectation of sustainability.

Risk Metrics

The Statewide Death and Disability Plan provides death and disability benefits to members covered under the Statewide Death & Disability Plan, Statewide Hybrid Plan, Colorado Springs New Hire Plans, the Statewide Money Purchase Plan and Local Money Purchase and Defined Benefit Plans. The Plan is funded through payroll contributions on active member payroll for members hired on or after January 1, 1997. Benefits for members hired before 1997 were previously funded by the State. The contributions made for this group were considered to fulfill the State's funding obligation, and no further contributions are anticipated. Accordingly, the Calculated Contribution is calculated as a percentage of contributory (post-1996 hire) payroll. As pre-1997 hires terminate and are replaced by contributory members, the contributory portion of the active population grows. This results in the contributory payroll growing faster than the liabilities and assets. This deleveraging can be observed in the historical data. Although the Plan's contributory payroll is growing, because the Plan is funded through employee contributions, there is less tolerance for contribution rate volatility. Eventually the active population will become largely contributory and the contributory payroll will not grow at the same rate. At that point (expected to be about 10 years out), the trend will reverse and the Plan will start to become more leveraged.

Valuation Year	AVA as % of Contributory Payroll	AAL (EAN) as % of Contributory Payroll	Calculated Contribution % of Contributory Payroll	Increase in ADC if Assets Decrease 10%	Funded Ratio (EAN)	Change in Funded Ratio if Assets Decrease 10%
2009	61%	48%	2.31%	0.63%	126.3%	-12.6%
2010	58%	47%	2.32%	0.47%	123.3%	-12.3%
2011	60%	49%	2.23%	0.48%	122.4%	-12.2%
2012	59%	52%	1.98%	0.50%	114.6%	-11.5%
2013	58%	52%	2.05%	0.51%	111.5%	-11.1%
2014	58%	52%	1.97%	0.51%	112.3%	-11.2%
2015	58%	52%	1.89%	0.52%	110.8%	-11.1%
2016	55%	53%	2.37%	0.51%	104.0%	-10.4%
2017	54%	53%	2.48%	0.49%	100.7%	-10.1%
2018	50%	52%	2.69%	0.49%	95.8%	-9.6%
2019	47%	56%	4.40%	0.43%	84.2%	-8.4%
2020	43%	51%	4.34%	0.40%	83.9%	-8.4%

Market Value Results

Investment gains or losses are smoothed over five years, and currently, the smoothed or actuarial value of assets is 97.69% of the market value. If the Funded Ratio and Calculated Contribution had been measured using the Market Value of Assets, they would be 73.9% and 4.24% of payroll, respectively.

SECTION III

TABLES

Table 1 - Development of Unfunded Actuarial Accrued Liability

			January 1, 2020	January 1, 2019
1.		Covered payroll for upcoming year	$ 1,143,563,487	$ 1,043,406,755
2.		Present value of future pay		
	a.	Total	$ 11,181,231,817	$ 10,071,765,811
	b.	Contributory (Hired on or after January 1, 1997)	10,849,819,604	9,616,060,914
3.		Present value of benefits for active members		
	a.	Future occupational disabilities	$ 360,754,487	$ 325,012,589
	b.	Future total disabilities	63,915,842	57,323,006
	c.	Future active deaths	46,800,321	42,447,914
	d.	Total for actives	$ 471,470,650	$ 424,783,509
4.		Total present value of benefits		
	a.	Current disabled members	$ 371,814,355	$ 350,578,423
	b.	Current beneficiaries of deceased members	36,554,718	34,594,145
	c.	Active members (Item 3d)	471,470,650	424,783,509
	d.	Total	$ 879,839,723	$ 809,956,077
5.		Unfunded actuarial accrued liability (UAAL)/(surplus)		
	a.	Present value of benefits	$ 879,839,723	$ 809,956,077
	b.	Present value of administrative costs	22,784,621	22,116,940
	c.	Less present value of future contributions (2.8%/2.8%)	(303,794,949)	(269,249,706)
	d.	Less actuarial value of assets	(432,227,330)	(409,326,924)
	e.	UAAL/(surplus)	$ 166,602,065	$ 153,496,388
6.	a.	Current Contribution	2.80%	2.80%
	b.	Calculated Contribution (Aggregate Funding) [(5.a + 5.b + 5.d)/2.b]	4.34%	4.40%
	c.	Difference (a. - b.)	-1.54%	-1.60%

Table 2 - Actuarial Present Value of Future Benefits

			January 1, 2020	January 1, 2019
1.	Active members			
	a.	Total disability	$ 63,915,842	$ 57,323,006
	b.	Occupational disability	360,754,487	325,012,589
	c.	Off-duty death	32,436,131	29,577,255
	d.	On-duty death	14,364,190	12,870,659
	e.	Total	$ 471,470,650	$ 424,783,509
2.	Members in pay status			
	a.	Total disabled	$ 100,306,717	$ 93,362,408
	b.	Occupationally disabled	271,507,638	257,216,015
	c.	Survivors	36,554,718	34,594,145
	d.	Total	$ 408,369,073	$ 385,172,568
3.	Total actuarial present value of future benefits		$ 879,839,723	$ 809,956,077

Table 3 - Actuarial Gain/(Loss) on UAAL

	For the year ending December 31,	2019	2018
1.	Unfunded actuarial accrued liability (UAAL) as of January 1	$ 153,496,388	$ (527,737)
2.	Interest on UAAL for one year	10,744,747	(36,942)
3.	Expected UAAL as of December 31 (1 + 2)	164,241,135	(564,679)
4.	Change in Unfunded Liability due to:		
	a. Benefit Changes *	0	(8,653,295)
	b. Provision or Assumption Changes**	0	144,844,824
5.	Expected UAAL as of December 31 after changes in assumption, methods and plan provisions	164,241,135	135,626,850
6.	Actual UAAL as of December 31	166,602,066	153,496,388
7.	Actuarial gain/(loss) for the period (5 - 6)	(2,360,931)	(17,869,538)
	SOURCE OF GAINS/(LOSSES)		
8.	Asset gain/(loss) (See Table 9)	2,553,581	(3,770,103)
9.	Salary liability gain/(loss) for the period	(4,385,814)	1,796,643
10.	Benefit adjustment granted as of October 1 (0.00% in 2019, 0.00% in 2018)	0	0
11.	Net liability gain/(loss) for the period (7- 8 - 9 - 10)	(528,698)	(15,896,078)

* Change in the Unfunded Liability due to Benefit Changes for the year ending December 31, 2018 reflects the change in member contribution rate from 2.7% to 2.8%.

** 2017 Change in Unfunded Liability due to Provisions or Assumption Changes reflects a change in allocation of administrative expenses. 2018 reflects assumption changes adopted following an experience study.

Table 4 - Summary of Historical Valuation Results

As of the Valuation Date January 1,

	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
1. Number of members										
a. Active	13,283	12,747	12,214	11,975	11,681	11,391	11,341	11,076	10,958	10,903
b. Disabled	1,149	1,106	1,058	991	944	904	851	814	774	747
c. Survivor	135	132	127	120	119	116	117	114	107	106
d. Total	14,567	13,985	13,399	13,086	12,744	12,411	12,309	12,004	11,839	11,756
2. Covered payroll (prior year)	$ 1,112,893	$ 1,012,667	$ 947,520	$ 917,100	$ 863,106	$ 827,633	$ 810,578	$ 787,010	$ 755,952	$ 750,497
3. Average compensation	$ 83,783	$ 79,444	$ 77,577	$ 76,585	$ 73,890	$ 72,657	$ 71,473	$ 71,055	$ 68,986	$ 68,834
4. Covered payroll for upcoming year	$ 1,143,563	$ 1,043,407	$ 976,603	$ 942,822	$ 886,802	$ 844,536	$ 834,268	$ 833,177	$ 801,017	$ 802,802
5. Actuarial value of assets	$ 432,227	$ 409,327	$ 395,302	$ 374,944	$ 361,070	$ 345,009	$ 325,181	$ 305,455	$ 290,988	$ 281,577
6. Market value of assets	$ 442,442	$ 394,247	$ 403,693	$ 360,747	$ 351,520	$ 353,776	$ 339,347	$ 301,653	$ 275,873	$ 279,882
7. Present value of benefits										
a. Actives	$ 471,471	$ 424,784	$ 246,318	$ 238,978	$ 225,012	$ 201,711	$ 203,254	$ 198,232	$ 192,101	$ 214,708
b. Disabled	371,814	350,578	315,103	287,456	265,786	243,179	221,357	204,847	189,203	169,063
c. Survivors	36,555	34,594	31,490	30,923	30,430	25,703	26,290	25,700	23,036	22,180
d. Total	$ 879,840	$ 809,956	$ 592,911	$ 557,357	$ 521,228	$ 470,593	$ 450,900	$ 428,778	$ 404,340	$ 405,952
8. Calculated Contribution	4.34%	4.40%	2.69%	2.48%	2.37%	1.89%	1.97%	2.05%	1.98%	2.23%

$ amounts in '000s

Table 5 - Allocation of Plan Assets at Fair Value

	Actual Allocation January 1, 2020	Target Allocation
1. Global Equity	39.9%	38.0%
2. Equity Long/Short	8.1%	8.0%
3. Absolute Return	7.9%	8.0%
4. Illiquid Alternatives	24.7%	25.0%
5. Managed Futures	3.7%	4.0%
6. Fixed Income	14.9%	15.0%
7. Cash	0.8%	2.0%
	100.0%	100.0%

Asset Allocation as of January 1, 2020

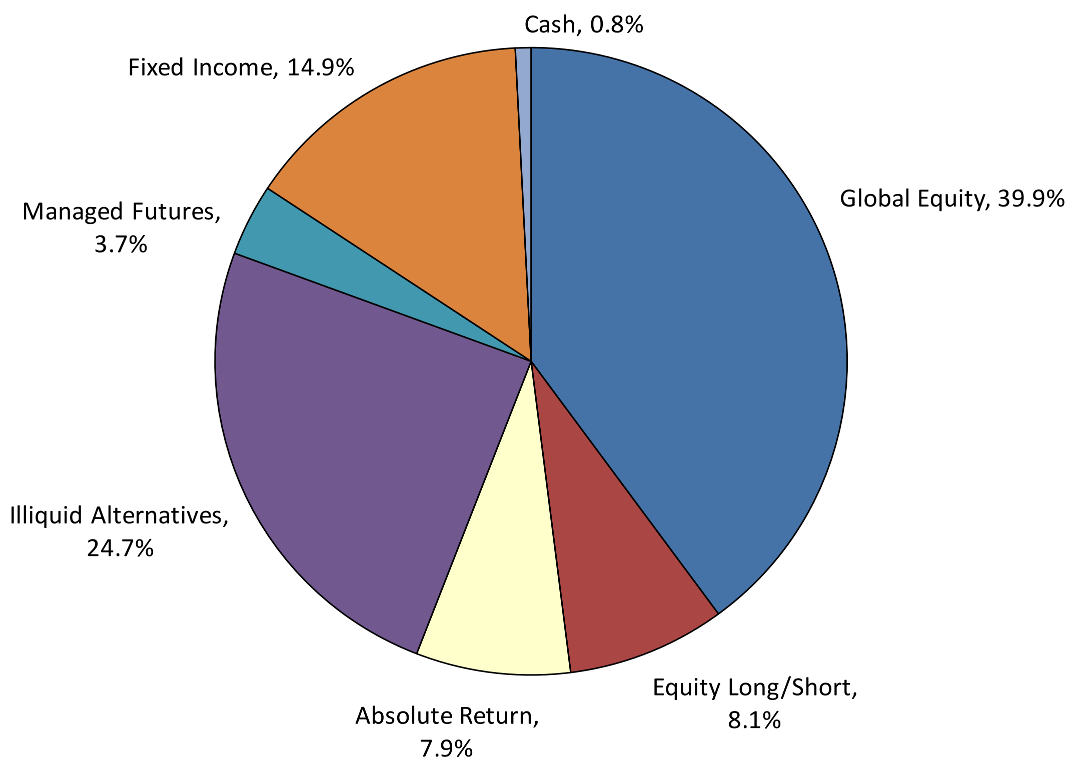


Table 6 - Reconciliation of Plan Net Assets

		Year Ending	
		December 31, 2019	December 31, 2018
1.	Market value of assets at January 1	$ 394,246,510	$ 403,693,032
2.	Revenue for the year		
	a. Contributions		
	i. Member contributions	$ 4,249,903	$ 3,780,098
	ii. Employer contributions *	21,899,808	18,904,415
	iii. Contributions from the SWDD Plan	0	0
	b. Net investment income		
	i. Interest	$ 1,999,949	$ 1,674,393
	ii. Dividends	2,617,900	3,080,972
	iii. Net change in accrued income	90,788	197,091
	iv. Unrealized gain/(loss)	17,811,720	(23,015,123)
	v. Realized gain/(loss)	35,580,870	19,447,005
	vi. Investment expense	(3,511,067)	(3,542,433)
	vii. Other Income	1,630,160	2,254,201
	c. Total revenue	$ 82,370,031	$ 22,780,619
3.	Expenditures for the year		
	a. Benefit payments and refunds	$ (32,232,860)	$ (30,273,489)
	b. Administrative expense	(1,942,028)	(1,953,652)
	c. Total expenditures	$ (34,174,888)	$ (32,227,141)
4.	Increase in net assets (Item 2c + Item 3c)	$ 48,195,143	$ (9,446,522)
5.	Market value of assets at December 31 (Item 1 + Item 4)	$ 442,441,653	$ 394,246,510

*All contributions are made by members or on behalf of members

Table 7 - Development of Actuarial Value of Assets

1.	Actuarial value of assets at beginning of year	$	409,326,924
2.	Net new investments		
	a. Contributions	$	26,149,710
	b. Benefit payments		(32,232,860)
	c. Administrative expenses		(1,942,028)
	d. Net cash flow	$	(8,025,178)
3.	Assumed investment return rate for fiscal year		7.0%
4.	Assumed investment return for fiscal year	$	28,372,003
5.	Expected Actuarial Value at end of year	$	429,673,749
6.	Market value of assets at end of year	$	442,441,653
7.	Excess return (6-5)	$	12,767,904
8.	Development of amounts to be recognized as of December 31, 2019:		

Fiscal Year End	Remaining Deferrals of Excess/(Shortfall) of Investment Income	Offsetting of Gains/(Losses)	Net Deferrals Remaining	Years Remaining	Recognized for this valuation	Remaining after this valuation
	(1)	(2)	(3) = (1) + (2)	(4)	(5) = (3) / (4)	(6) = (3) - (5)
2015	$ 0	$ 0	$ 0	1	$ 0	$ 0
2016	0	0	0	2	0	0
2017	0	0	0	3	0	0
2018	(15,080,414)	15,080,414	0	4	0	0
2019	27,848,318	(15,080,414)	12,767,904	5	2,553,581	10,214,323
Total	$ 12,767,904	$ 0	$ 12,767,904		$ 2,553,581	$ 10,214,323

9.	Actuarial value of assets as of December 31, 2019 (Item 6 - Item 8)	$	432,227,330
10.	Ratio of actuarial value to market value		97.7%

Amounts in column (1) for fiscal years ending 2015 through 2018 are from the prior valuation. The column (1) amount for fiscal year 2019 is developed using item 7 less the total of column (1) for fiscal years ending 2015 through 2018. To the extent possible, the 2019 excess or shortfall is used to reduce prior bases. In this case, the 2018 base was offset by the gains in 2019. The fiscal year 2015 through 2017 bases are $0 because they were previously offset.

Table 8 - Investment Yields

Item	Market Value	Actuarial Value
1. Assets as of January 1, 2019 (A)	$ 394,246,510	$ 409,326,924
2. Contributions during FY19	26,149,710	26,149,710
3. Benefit payments and administrative expenses during FY19	(34,174,888)	(34,174,888)
4. Investment return during FY19	56,220,321	30,925,584
5. Assets as of January 1, 2020 (B): (1 + 2 + 3 + 4)	$ 442,441,653	$ 432,227,330
6. Approximate rate of return on average invested assets		
a. Net investment income (I)	$ 56,220,321	$ 30,925,584
b. Estimated return based on (2I / (A + B - I))	14.41%	7.63%

Table 9 - Gain/(Loss) on Actuarial Value of Assets

Item	Valuation as of January 1, 2020	Valuation as of January 1, 2019
1. Actuarial assets, prior valuation	$ 409,326,924	$ 395,302,474
2. Total contributions since prior valuation	$ 26,149,710	$ 22,684,513
3. Benefit payments and administrative expenses since prior valuation	$ (34,174,888)	$ (32,227,141)
4. Assumed net investment income at actuarial rate%*		
a. Beginning assets	$ 28,652,884	$ 27,671,173
b. Contributions	915,240	793,958
c. Benefit payments and administrative expenses	(1,196,121)	(1,127,950)
d. Total	$ 28,372,003	$ 27,337,181
5. Expected actuarial assets (1 + 2 + 3 + 4d)	$ 429,673,749	$ 413,097,027
6. Actual actuarial assets, this valuation	$ 432,227,330	$ 409,326,924
7. Asset gain/(loss) since prior valuation (6 - 5)	$ 2,553,581 Gain	$ (3,770,103) Loss

**7.5% beginning at January 1, 2012.*
7.0% beginning at January 1, 2019

Table 10 - History of Investment Return Rates

For Fiscal Year Ending	Market Value	Actuarial Value
December 31, 2010	13.29%	7.68%
December 31, 2011	0.52%	5.33%
December 31, 2012	11.60%	7.06%
December 31, 2013	14.80%	8.67%
December 31, 2014	6.45%	8.41%
December 31, 2015	1.40%	6.80%
December 31, 2016	5.17%	6.34%
December 31, 2017	14.73%	8.07%
December 31, 2018	0.02%	6.03%
December 31, 2019	14.41%	7.63%
Average Returns		
Last 5 Years	6.96%	6.97%
Last 10 Years	8.08%	7.20%

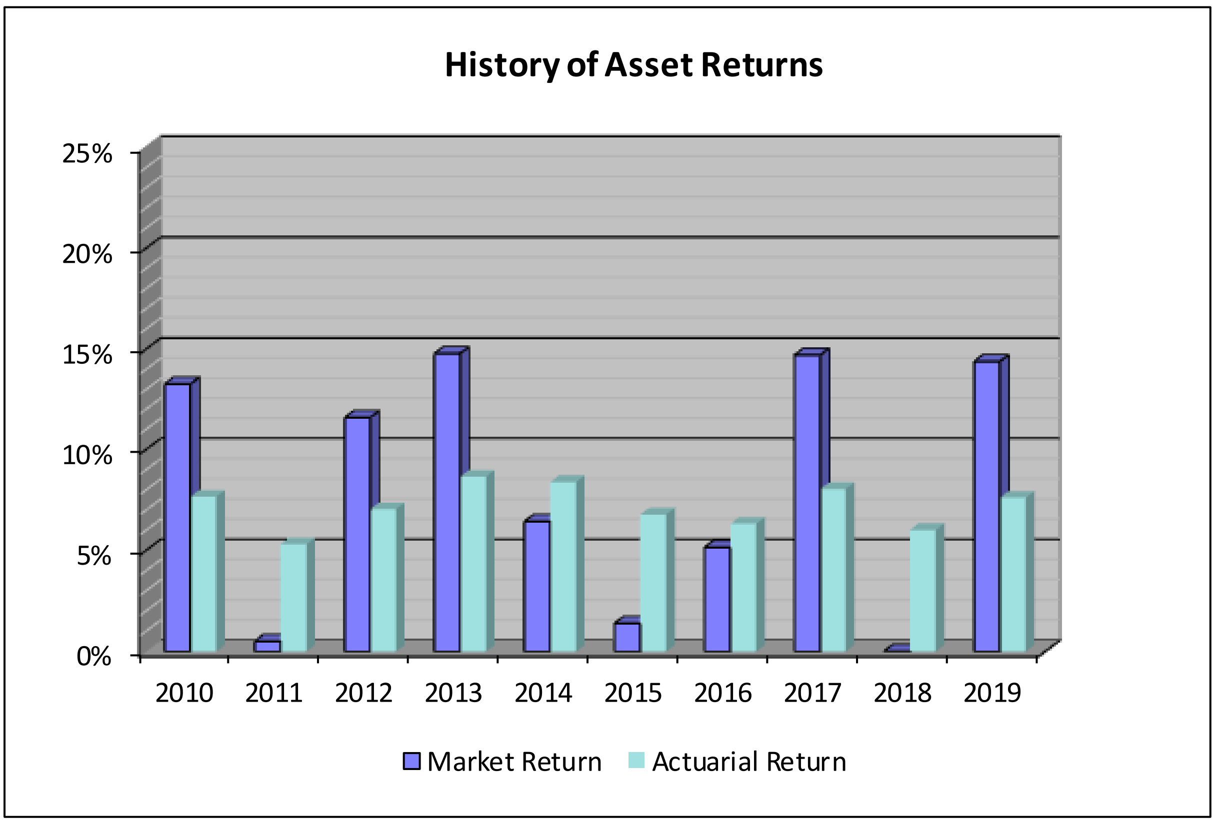


Table 11a - Schedule of Funding Progress

Based on the Aggregate Funding Method

Date	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
January 1, 2009	$ 257,279,496	$ 241,813,411	$ (15,466,086)	106.4%	$ 740,172,854	(2.1%)
January 1, 2010	266,477,875	250,709,436	(15,768,440)	106.3%	758,113,476	(2.1%)
January 1, 2011	281,577,454	260,688,472	(20,888,983)	108.0%	750,497,200	(2.8%)
January 1, 2012	290,988,339	255,841,269	(35,147,071)	113.7%	755,952,497	(4.6%)
January 1, 2013	305,454,945	272,350,253	(33,104,693)	112.2%	787,009,650	(4.2%)
January 1, 2014	325,180,768	284,820,249	(40,360,519)	114.2%	810,578,220	(5.0%)
January 1, 2015	345,009,408	298,128,930	(46,880,478)	115.7%	827,633,440	(5.7%)
January 1, 2016	361,070,410	344,781,994	(16,288,416)	104.7%	863,105,687	(1.9%)
January 1, 2017	374,943,903	357,915,920	(17,027,983)	104.8%	917,099,955	(1.9%)
January 1, 2018	395,302,474	394,774,736	(527,738)	100.1%	947,520,430	(0.1%)
January 1, 2019	409,326,924	562,823,312	153,496,388	72.7%	1,012,666,543	15.2%
January 1, 2020	432,227,330	598,829,395	166,602,065	72.2%	1,112,892,992	15.0%

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. With regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.
(2) The measurement alone is inappropriate for assessing the need for or the amount of future employer contributions.
(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Table 11b - Schedule of Funding Progress

Based on the Entry Age Normal Funding Method

Date	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)	Annual Payroll	UAAL as % of Payroll (4)/(6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
January 1, 2011	$ 281,577,454	$ 229,959,016	$ (51,618,438)	122.4%	$ 750,497,200	(6.9%)
January 1, 2012	290,988,339	253,869,640	(37,118,699)	114.6%	755,952,497	(4.9%)
January 1, 2013	305,454,945	274,068,253	(31,386,692)	111.5%	787,009,650	(4.0%)
January 1, 2014	325,180,768	289,577,412	(35,603,356)	112.3%	810,578,220	(4.4%)
January 1, 2015	345,009,408	311,334,019	(33,675,389)	110.8%	827,633,440	(4.1%)
January 1, 2016	361,070,410	347,242,942	(13,827,468)	104.0%	863,105,687	(1.6%)
January 1, 2017	374,943,903	372,201,460	(2,742,443)	100.7%	917,099,955	(0.3%)
January 1, 2018	395,302,474	412,597,445	17,294,972	95.8%	947,520,430	1.8%
January 1, 2019	409,326,924	486,023,181	76,696,257	84.2%	1,012,666,543	7.6%
January 1, 2020	432,227,330	514,918,489	82,691,159	83.9%	1,112,892,992	7.4%

Limitations of Funded Status Measurements

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. With regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.
(2) The measurement alone is inappropriate for assessing the need for or the amount of future employer contributions.
(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

Table 12 - Solvency Test

Valuation Date	Aggregated Accrued Liabilities for: Active Members Contribution	Retirees Beneficiaries and Vested Terminations	Members (Employer Financed Portion)	Actuarial Value of Assets	Portion of Accrued Liabilities Covered by Reported Assets: (5)/(2)	[(5)-(2)]/(3)	[(5)-(2)-(3)]/(4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
January 1, 2008	$ 0	$ 154,614	$ 69,386	$ 300,643	100%	100%	100%
January 1, 2009	0	165,740	76,074	257,279	100%	100%	100%
January 1, 2010	0	178,039	72,671	266,478	100%	100%	100%
January 1, 2011	0	191,243	69,445	281,577	100%	100%	100%
January 1, 2012	0	212,239	43,602	290,988	100%	100%	100%
January 1, 2013	0	230,546	41,804	305,455	100%	100%	100%
January 1, 2014	0	247,646	37,174	325,181	100%	100%	100%
January 1, 2015	0	268,883	29,246	345,009	100%	100%	100%
January 1, 2016	0	296,216	48,566	361,070	100%	100%	100%
January 1, 2017	0	318,379	39,537	374,944	100%	100%	100%
January 1, 2018	0	346,593	48,182	395,302	100%	100%	100%
January 1, 2019	0	385,173	177,651	409,327	100%	100%	14%
January 1, 2020	0	408,369	190,460	432,227	100%	100%	13%

$ amounts in ‘000s

Table 13 - Cash Flow Analysis

Year Ending December 31,	Contributions for the Year	Expenditures During the Year: Benefit Payments	Expenditures During the Year: Refund of Contributions	Expenditures During the Year: Expenses	Expenditures During the Year: Total	External Cash Flow for the Year	Market Value of Assets	External Cash Flow as Percent of Market Value
2008	$ 10,963	$ (14,887)	$ 0	$ (2,192)	$ (17,079)	$ (6,116)	$ 214,400	(2.9%)
2009	11,957	(16,010)	0	(1,756)	(17,766)	(5,809)	251,923	(2.3%)
2010	12,259	(17,435)	0	(1,963)	(19,398)	(7,139)	279,882	(2.6%)
2011	12,813	(18,265)	0	(2,175)	(20,439)	(7,627)	275,873	(2.8%)
2012	13,612	(19,482)	0	(2,616)	(22,098)	(8,486)	301,653	(2.8%)
2013	14,570	(21,052)	0	(3,669)	(24,721)	(10,151)	339,347	(3.0%)
2014	15,509	(22,720)	0	(3,791)	(26,511)	(11,003)	353,776	(3.1%)
2015	16,938	(24,097)	0	(4,247)	(28,344)	(11,406)	351,520	(3.2%)
2016	18,216	(26,188)	0	(4,456)	(30,643)	(12,427)	360,747	(3.4%)
2017	20,535	(28,157)	0	(5,604)	(33,761)	(13,226)	403,693	(3.3%)
2018	22,685	(30,273)	0	(5,496)	(35,770)	(13,085)	394,247	(3.3%)
2019	26,150	(32,233)	0	(5,453)	(37,686)	(11,536)	442,442	(2.6%)
2020*	28,747	(34,499)	0	(5,644)	(40,143)	(11,396)	463,801	(2.5%)
2021*	32,108	(37,587)	0	(5,841)	(43,428)	(11,320)	486,842	(2.3%)
2022*	33,358	(40,759)	0	(6,046)	(46,805)	(13,447)	509,404	(2.6%)

Results for 2020, 2021, & 2022 are based on expected contributions, expected benefit payments, and assumed investment return of 7.0%
Expected contributions are based on applicable employee rate of 2.8% in 2020, 3.0% thereafter and 3.5% annual payroll growth
Expected benefit payments are based on the current plan benefits and expected retirements, terminations, and mortality
Assets are assumed to increase at the annual return of 7.0% with all cash flow occurring in the middle of the year
$ amounts in '000s

Table 14 - Membership Data

	January 1, 2020	January 1, 2019	January 1, 2018
1. Active members			
a. Number	13,283	12,747	12,214
b. Total payroll	$ 1,112,892,992	$ 1,012,666,543	$ 947,520,430
c. Average annual salary	$ 83,783	$ 79,444	$ 77,577
d. Average age	40.9	41.1	41.4
e. Average service	10.4	10.6	11.0
2. Disabled members and beneficiaries			
a. Number	1,149	1,106	1,058
b. Total annual benefits	$ 29,576,339	$ 27,860,403	$ 26,013,174
c. Average annual benefit	$ 25,741	$ 25,190	$ 24,587
d. Average age	58.8	58.5	58.0
3. Survivors of deceased active members			
a. Number	135	132	127
b. Total annual benefits	$ 3,409,409	$ 3,226,681	$ 3,046,277
c. Average annual benefit	$ 25,255	$ 24,445	$ 23,986
d. Average age	54.2	53.7	54.1

Table 15 - Historical Summary of Active Member Data

Valuation Date	Active Count	Average Age	Average Service	Covered Payroll	Average Annual Salary	Percent Change in Average Salary
January 1, 2008	10,971	40.0	10.1	$ 668,502,284	$60,934	3.56%
January 1, 2009	11,157	40.3	10.4	729,723,656	65,405	7.34%
January 1, 2010	11,077	40.8	10.9	751,781,464	67,869	3.77%
January 1, 2011	10,903	41.4	11.3	750,497,200	68,834	1.42%
January 1, 2012	10,958	41.6	11.5	755,952,497	68,986	0.22%
January 1, 2013	11,076	41.8	11.7	787,009,650	71,055	3.00%
January 1, 2014	11,341	41.7	11.5	810,578,220	71,473	0.59%
January 1, 2015	11,391	41.8	11.5	827,633,440	72,657	1.66%
January 1, 2016	11,681	41.7	11.3	863,105,687	73,890	1.70%
January 1, 2017	11,975	41.5	11.1	917,099,955	76,585	3.65%
January 1, 2018	12,214	41.4	11.0	947,520,430	77,577	1.30%
January 1, 2019	12,747	41.1	10.6	1,012,666,543	79,444	2.41%
January 1, 2020	13,283	40.9	10.4	1,112,892,992	83,783	5.46%

Table 16 - Distribution of Active Members by Age and by Years of Service

As of December 31, 2019

	Years of Credited Service												
	Less than 1	1-2	2-3	3-4	4-5	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	Total
Attained Age	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 25	240	92	36	9									377
	$51,843	$58,805	$58,284	$57,215									$54,372
25-29	500	368	310	216	110	122							1,626
	$55,394	$60,566	$65,686	$72,451	$74,801	$81,358							$64,054
30-34	428	307	295	305	212	548	68						2,163
	$59,438	$61,480	$68,007	$75,216	$78,159	$83,627	$88,053						$71,984
35-39	203	173	163	189	168	595	549	108					2,148
	$61,336	$63,670	$68,872	$77,147	$80,755	$84,454	$92,117	$97,852					$81,113
40-44	106	79	81	74	76	357	554	509	84				1,920
	$63,593	$63,998	$69,137	$74,262	$80,951	$85,149	$92,728	$98,378	$107,202				$88,486
45-49	92	51	36	53	41	198	372	693	489	45			2,070
	$64,277	$67,295	$87,069	$73,701	$82,330	$83,506	$91,921	$96,069	$104,017	$114,453			$93,276
50-54	46	33	20	31	36	121	212	409	492	249	37		1,686
	$77,822	$80,661	$82,079	$85,455	$84,278	$86,962	$91,774	$95,840	$103,652	$107,844	$114,610		$97,766
55-59	24	13	12	7	11	61	70	136	203	181	115	17	850
	$87,656	$93,846	$85,791	$81,806	$94,851	$90,913	$92,163	$96,192	$100,711	$105,131	$120,321	$115,471	$101,554
60-64	8	11	5	6	8	20	25	56	57	45	52	52	345
	$74,146	$78,614	$96,609	$65,234	$92,926	$91,120	$90,529	$96,107	$103,912	$102,324	$111,159	$111,035	$100,362
65 & Over	1	3	1	1	3	13	10	8	12	8	7	31	98
	$70,195	$91,529	$53,674	$99,664	$96,777	$83,734	$81,134	$88,430	$95,334	$108,146	$127,951	$106,119	$97,860
Total	1,648	1,130	959	891	665	2,035	1,860	1,919	1,337	528	211	100	13,283
	$58,878	$62,917	$68,500	$74,972	$79,704	$84,479	$91,993	$96,711	$103,498	$107,011	$117,315	$110,265	$83,783

Average:	Age:	40.9	Number of participants:	Males:	11,862
	Service:	10.4		Females:	1,421

Table 17 - Schedule of Retirants & Annuitants Added to & Removed from Rolls*

	Added to Rolls*		Removed from Rolls		Rolls-End of Year			
Year Ended	Number	Annual Benefit	Number	Annual Benefit	Number	Annual Benefit	% Increase in Annual Benefit	Average Annual Benefit
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
December 31, 2007	39	$ 1,264,925	16	$ 258,356	747	$ 14,281,152	7.58%	$ 19,118
December 31, 2008	45	1,259,221	20	339,442	772	15,200,931	6.44%	19,690
December 31, 2009	54	1,537,193	14	312,334	812	16,425,790	8.06%	20,229
December 31, 2010	50	1,366,173	9	185,774	853	17,606,189	7.19%	20,640
December 31, 2011	46	1,239,908	18	414,489	881	18,431,608	4.69%	20,921
December 31, 2012	56	1,721,508	9	166,231	928	19,986,885	8.44%	21,538
December 31, 2013	56	1,853,252	16	341,854	968	21,498,284	7.56%	22,209
December 31, 2014	67	2,082,872	15	299,192	1,020	23,281,964	8.30%	22,825
December 31, 2015	52	1,797,136	9	184,015	1,063	24,895,085	6.93%	23,420
December 31, 2016	68	2,098,542	20	413,487	1,111	26,580,140	6.77%	23,925
December 31, 2017	92	2,807,643	18	328,332	1,185	29,059,451	9.33%	24,523
December 31, 2018	76	2,443,624	23	415,991	1,238	31,087,084	6.98%	25,111
December 31, 2019	71	2,483,559	25	584,895	1,284	32,985,748	6.11%	25,690

*Includes benefit adjustments

Table 18 - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
550	ADAMS COUNTY FPD	0	$ 0	100	$ 9,251,504	100	$ 9,251,504
3	ALAMOSA	24	1,299,168	0	0	24	1,299,168
4	ALMA	2	97,000	0	0	2	97,000
5	ANTONITO	1	38,895	0	0	1	38,895
7	ARVADA	185	16,624,021	0	0	185	16,624,021
501	ARVADA FPD	0	0	161	14,740,375	161	14,740,375
8	ASPEN	25	1,968,026	0	0	25	1,968,026
711	ASPEN FPD	0	0	3	337,077	3	337,077
9	AULT	5	259,496	0	0	5	259,496
712	AULT FPD	0	0	7	254,129	7	254,129
10	AURORA	741	66,818,199	415	32,097,337	1,156	98,915,536
11	AVON	19	1,547,635	0	0	19	1,547,635
12	BASALT	9	795,056	0	0	9	795,056
13	BAYFIELD	6	373,770	0	0	6	373,770
718	BENNETT FPD #7	0	0	24	1,229,916	24	1,229,916
503	BERTHOUD FPD	0	0	24	1,769,369	24	1,769,369
5030	BERTHOUD FPD	0	0	2	266,976	2	266,976
538	BEULAH FIRE PROTECTION & AMBULANCE DISTRICT	0	0	2	91,443	2	91,443
7331	BIG SANDY FPD	0	0	1	39,815	1	39,815
580	BLACK FOREST FIRE RESCUE	0	0	17	990,750	17	990,750
723	BLACK HAWK	0	0	22	1,882,186	22	1,882,186
18	BLANCA	1	41,285	0	0	1	41,285
22	BOULDER	188	17,122,889	113	11,292,693	301	28,415,582
726	BOULDER MOUNTAIN FPD	0	0	5	272,355	5	272,355
730	BOULDER RURAL FPD	0	0	15	1,368,774	15	1,368,774
7700	BRIGGSDALE FPD	0	0	1	52,000	1	52,000
3260	BRIGHTON	1	126,605	0	0	1	126,605
326	BRIGHTON	77	5,867,136	0	0	77	5,867,136
26	BRIGHTON (GREATER) FPD	0	0	69	5,807,293	69	5,807,293
504	BROADMOOR FPD	0	0	4	316,387	4	316,387

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
27	BROOMFIELD	166	$ 15,400,917	0	$ 0	166	$ 15,400,917
28	BRUSH	12	594,504	0	0	12	594,504
29	BUENA VISTA	10	611,271	4	162,888	14	774,159
735	BYERS FPD #9	0	0	1	44,084	1	44,084
33	CANON CITY	34	1,777,614	0	0	34	1,777,614
533	CANON CITY AREA FPD	0	0	33	2,307,292	33	2,307,292
740	CARBONDALE & RURAL FPD	0	0	20	1,584,636	20	1,584,636
35	CASTLE ROCK	0	0	92	8,137,801	92	8,137,801
37	CENTER	7	291,734	0	0	7	291,734
38	CENTRAL CITY	0	0	2	137,177	2	137,177
749	CHAFFEE COUNTY FPD	0	0	5	271,417	5	271,417
40	CHERRY HILLS VILLAGE	23	2,181,859	0	0	23	2,181,859
754	CIMARRON HILLS FPD	0	0	16	1,074,247	16	1,074,247
7125	CLEAR CREEK FIRE AUTHORITY	0	0	2	165,085	2	165,085
509	CLIFTON FPD	0	0	18	1,187,286	18	1,187,286
757	COAL CREEK CANYON FPD	0	0	1	69,525	1	69,525
44	COLLBRAN MARSHALS	2	98,435	0	0	2	98,435
531	COLORADO RIVER FPD	0	0	51	3,164,767	51	3,164,767
45	COLORADO SPRINGS	712	58,556,504	414	37,106,015	1,126	95,662,519
46	COLUMBINE VALLEY	5	341,978	0	0	5	341,978
47	COMMERCE CITY	109	9,333,115	0	0	109	9,333,115
48	CORTEZ	31	1,590,650	0	0	31	1,590,650
765	CORTEZ FPD	0	0	14	625,505	14	625,505
772	CRESTED BUTTE FPD	0	0	19	1,255,245	19	1,255,245
774	CRIPPLE CREEK	0	0	13	783,718	13	783,718
57	DACONO	12	865,288	0	0	12	865,288
58	DEBEQUE	4	242,519	0	0	4	242,519
779	DEBEQUE FPD	0	0	7	516,976	7	516,976
60	DEL NORTE	2	88,268	0	0	2	88,268
61	DELTA	20	1,278,517	0	0	20	1,278,517

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City		Police		Fire		Total	
Code	City Name	No.	Earnings	No.	Earnings	No.	Earnings
783	DELTA COUNTY FPD #1	0	$ 0	2	$ 74,880	2	$ 74,880
62	DENVER	1,521	142,892,765	963	91,627,379	2,484	234,520,144
63	DILLON	10	729,891	0	0	10	729,891
64	DINOSAUR	2	87,999	0	0	2	87,999
566	DONALD WESCOTT FPD	0	0	20	1,261,318	20	1,261,318
67	DURANGO	51	3,735,960	0	0	51	3,735,960
567	DURANGO FPD	0	0	79	5,562,277	79	5,562,277
522	EAGLE RIVER FPD	0	0	69	5,433,625	69	5,433,625
507	EAST GRAND FPD #4	0	0	5	324,571	5	324,571
795	EATON FPD	0	0	17	953,034	17	953,034
73	EDGEWATER	16	1,161,674	0	0	16	1,161,674
74	ELIZABETH	8	484,971	0	0	8	484,971
515	ELIZABETH FPD	0	0	19	1,268,733	19	1,268,733
7102	ELK CREEK FPD	0	0	10	611,225	10	611,225
75	EMPIRE	2	108,000	0	0	2	108,000
76	ENGLEWOOD	76	6,806,216	0	0	76	6,806,216
77	ERIE	37	2,848,332	0	0	37	2,848,332
523	ESTES VALLEY FPD	0	0	3	243,964	3	243,964
79	EVANS	35	2,736,348	0	0	35	2,736,348
579	EVANS FPD	0	0	20	1,259,914	20	1,259,914
7109	EVERGREEN FPD	0	0	5	375,380	5	375,380
510	FAIRMOUNT FPD	0	0	26	1,796,866	26	1,796,866
80	FAIRPLAY MARSHALLS	4	231,213	0	0	4	231,213
7112	FALCON FPD	0	0	47	2,580,080	47	2,580,080
81	FEDERAL HEIGHTS	22	1,647,818	15	966,941	37	2,614,759
810	FEDERAL HEIGHTS FIRE	0	0	1	109,990	1	109,990
82	FIRESTONE	30	2,418,350	0	0	30	2,418,350
85	FLORENCE	12	556,869	0	0	12	556,869
7222	FOOTHILLS FIRE & RESCUE	0	0	3	224,653	3	224,653
86	FORT COLLINS	260	23,270,066	1	96,013	261	23,366,079

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
7122	FORT LEWIS MESA FPD	0	$ 0	2	$ 128,000	2	$ 128,000
87	FORT LUPTON	22	1,496,347	0	0	22	1,496,347
7123	FORT LUPTON FPD	0	0	29	1,826,066	29	1,826,066
88	FORT MORGAN	27	1,630,318	0	0	27	1,630,318
89	FOUNTAIN	55	3,843,208	28	1,920,644	83	5,763,852
90	FOWLER POLICE	3	105,594	0	0	3	105,594
511	FRANKTOWN FPD	0	0	20	1,272,945	20	1,272,945
592	FREDERICK FIRESTONE FPD	0	0	41	3,760,570	41	3,760,570
5920	FREDERICK FIRESTONE FPD	0	0	6	567,945	6	567,945
93	FRISCO	11	675,565	0	0	11	675,565
7131	FRONT RANGE FIRE RESCUE FPD	0	0	31	2,302,071	31	2,302,071
94	FRUITA	15	893,085	0	0	15	893,085
7132	GALETON FPD	0	0	2	152,996	2	152,996
95	GARDEN CITY	4	209,416	0	0	4	209,416
7135	GATEWAY-UNAWEEP FPD	0	0	6	150,119	6	150,119
7136	GENESEE FPD	0	0	2	169,599	2	169,599
97	GEORGETOWN	3	195,434	0	0	3	195,434
99	GLENDALE	30	2,400,513	0	0	30	2,400,513
100	GLENWOOD SPRINGS	23	1,642,962	26	1,861,585	49	3,504,547
101	GOLDEN	48	4,266,168	13	975,683	61	5,241,851
102	GRANADA	1	32,868	0	0	1	32,868
7147	GRAND FPD #1	0	0	3	169,102	3	169,102
104	GRAND JUNCTION	123	9,270,161	127	9,102,270	250	18,372,431
7149	GRAND LAKE FPD	0	0	14	757,896	14	757,896
7150	GRAND VALLEY FPD	0	0	25	1,616,310	25	1,616,310
7153	GREATER EAGLE FPD	0	0	16	1,009,428	16	1,009,428
107	GREELEY	154	13,497,299	116	9,472,366	270	22,969,665
512	GREEN MOUNTAIN FALLS-CHIPITA PARK FPD	0	0	1	54,750	1	54,750
109	GREENWOOD VILLAGE	62	5,340,309	0	0	62	5,340,309
7156	GYPSUM FPD	0	0	8	503,651	8	503,651

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
7158	HARTSEL FPD	0	$ 0	1	$ 72,235	1	$ 72,235
115	HAXTUN	3	146,263	0	0	3	146,263
119	HOLYOKE	3	151,426	0	0	3	151,426
7176	HUDSON FPD	0	0	27	1,688,724	27	1,688,724
124	HUGO	2	103,379	0	0	2	103,379
125	IDAHO SPRINGS	10	572,602	0	0	10	572,602
126	IGNACIO	8	525,576	0	0	8	525,576
7185	INDIAN HILLS FPD	0	0	1	43,260	1	43,260
7187	INTER-CANYON FPD	0	0	4	285,638	4	285,638
7191	JEFFERSON-COMO FPD	0	0	6	315,540	6	315,540
129	JOHNSTOWN	22	1,509,015	0	0	22	1,509,015
132	KERSEY	3	196,769	0	0	3	196,769
7198	KIOWA FPD	0	0	3	165,423	3	165,423
5136	KREMMLING FPD	0	0	2	117,756	2	117,756
138	LA JARA	4	205,117	0	0	4	205,117
139	LA JUNTA	11	529,691	13	621,490	24	1,151,181
144	LA SALLE	7	448,592	0	0	7	448,592
7211	LA SALLE FPD	0	0	11	797,259	11	797,259
146	LA VETA	2	78,337	0	0	2	78,337
137	LAFAYETTE	39	3,468,709	31	2,367,406	70	5,836,115
7206	LAKE GEORGE FPD	0	0	1	47,700	1	47,700
263	LAKESIDE	4	220,480	0	0	4	220,480
143	LAMAR	15	741,647	9	403,774	24	1,145,421
141	LARKSPUR FPD	0	0	17	1,064,032	17	1,064,032
147	LEADVILLE	9	414,475	11	630,701	20	1,045,176
574	LEFTHAND FPD	0	0	3	249,999	3	249,999
149	LITTLETON	81	7,462,639	0	0	81	7,462,639
150	LOCHBUIE	11	722,770	0	0	11	722,770
214	LOG LANE VILLAGE	2	64,401	0	0	2	64,401
268	LONE TREE	51	4,242,501	0	0	51	4,242,501

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
151	LONGMONT	159	$ 13,854,500	84	$ 8,068,338	243	$ 21,922,838
578	LOS PINOS FPD	0	0	20	1,107,728	20	1,107,728
153	LOVELAND	113	9,913,440	0	0	113	9,913,440
2153	LOVELAND FRA	0	0	94	7,445,934	94	7,445,934
7226	LOWER VALLEY FPD	0	0	17	1,018,618	17	1,018,618
7227	LYONS FPD	0	0	4	204,442	4	204,442
157	MANITOU SPRINGS	16	968,967	6	438,664	22	1,407,631
160	MEAD	8	546,490	0	0	8	546,490
163	MILLIKEN	11	695,298	0	0	11	695,298
166	MONTE VISTA	13	584,547	0	0	13	584,547
167	MONTROSE	38	2,308,993	0	0	38	2,308,993
537	MONTROSE FPD	0	0	33	2,444,833	33	2,444,833
168	MONUMENT	17	1,100,845	0	0	17	1,100,845
170	MOUNTAIN VIEW	10	621,505	0	0	10	621,505
516	MOUNTAIN VIEW FPD	0	0	96	9,088,080	96	9,088,080
266	MOUNTAIN VILLAGE	7	455,675	0	0	7	455,675
7246	NEDERLAND FPD	0	0	5	339,729	5	339,729
7251	NORTH FORK FPD	0	0	1	69,000	1	69,000
532	NORTH METRO FIRE RESCUE	0	0	123	11,043,094	123	11,043,094
7253	NORTH ROUTT FPD	0	0	2	128,144	2	128,144
7255	NORTHEAST TELLER COUNTY FPD	0	0	13	814,763	13	814,763
175	NORTHGLENN	68	5,275,952	0	0	68	5,275,952
7259	NORTH-WEST FPD	0	0	14	758,889	14	758,889
178	NUNN	2	94,364	0	0	2	94,364
179	OAK CREEK	2	111,766	0	0	2	111,766
7263	OAK CREEK FPD	0	0	4	206,693	4	206,693
1790	OAK CREEK POLICE	1	77,345	0	0	1	77,345
180	OLATHE	5	243,674	0	0	5	243,674
588	PAGOSA FPD	0	0	16	735,070	16	735,070
188	PAGOSA SPRINGS	8	432,128	0	0	8	432,128

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
189	PALISADE	10	$ 545,260	2	$ 116,344	12	$ 661,604
190	PALMER LAKE	2	124,588	3	138,277	5	262,865
192	PAONIA	5	185,615	0	0	5	185,615
106	PARACHUTE	5	268,773	0	0	5	268,773
191	PARKER	72	6,276,985	0	0	72	6,276,985
7281	PEYTON FPD	0	0	1	29,993	1	29,993
7481	PLATEAU VALLEY FPD	0	0	6	400,870	6	400,870
7285	PLATTE CANYON FPD	0	0	17	1,054,998	17	1,054,998
7286	PLATTE VALLEY FPD	0	0	18	1,381,204	18	1,381,204
7287	PLATTE VALLEY FPD	0	0	3	325,350	3	325,350
196	PLATTEVILLE	9	482,795	0	0	9	482,795
513	PLATTEVILLE/GILCREST FPD	0	0	34	2,453,554	34	2,453,554
7289	PLEASANT VIEW METRO FIRE DISTRICT	0	0	7	385,395	7	385,395
518	POUDRE FIRE AUTHORITY	0	0	188	16,072,758	188	16,072,758
199	PUEBLO	214	15,039,971	139	9,999,363	353	25,039,334
519	PUEBLO RURAL FPD	0	0	26	1,335,957	26	1,335,957
7294	PUEBLO WEST METRO FPD	0	0	24	1,377,854	24	1,377,854
201	RANGELY	5	312227	0	0	5	312,227
7298	RATTLESNAKE FPD	0	0	4	247,372	4	247,372
521	RED WHITE & BLUE FPD	0	0	52	4,379,950	52	4,379,950
206	RIFLE	20	1279896	0	0	20	1,279,896
551	ROARING FORK FRA	0	0	30	2,733,747	30	2,733,747
208	ROCKY FORD	8	298976	5	183,185	13	482,161
752	ROCKY MOUNTAIN FPD	0	0	46	3,994,385	46	3,994,385
7314	RYE FPD	0	0	6	280,556	6	280,556
542	SABLE-ALTURA FPD	0	0	7	331,902	7	331,902
213	SALIDA	18	1134126	12	862,619	30	1,996,745
215	SANFORD	1	32000	0	0	1	32,000
543	SECURITY FPD	0	0	36	1,730,618	36	1,730,618
219	SEVERANCE POLICE	6	366020	0	0	6	366,020

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City Code	City Name	Police No.	Police Earnings	Fire No.	Fire Earnings	Total No.	Total Earnings
220	SHERIDAN	33	$ 2,617,608	0	$ 0	33	$ 2,617,608
222	SILT	7	352,207	0	0	7	352,207
228	SNOWMASS VILLAGE	9	731,802	0	0	9	731,802
525	SOUTH ADAMS COUNTY FPD	0	0	75	5,980,728	75	5,980,728
7339	SOUTH FORK	3	128,559	0	0	3	128,559
5339	SOUTH FORK FPD	0	0	5	237,905	5	237,905
540	SOUTH METRO FIRE RESCUE FPD	0	0	574	57,835,775	574	57,835,775
7340	SOUTHEAST WELD FPD	0	0	24	1,063,772	24	1,063,772
7341	SOUTHEAST WELD FPD	0	0	1	125,000	1	125,000
548	SOUTHERN PARK COUNTY FPD	0	0	1	43,599	1	43,599
229	SPRINGFIELD	3	95,441	0	0	3	95,441
231	STEAMBOAT SPRINGS	29	2,148,816	30	2,117,811	59	4,266,627
232	STERLING	21	1,082,971	22	1,036,582	43	2,119,553
7348	STRASBURG FPD #8	0	0	3	166,455	3	166,455
7349	STRATMOOR HILLS FPD	0	0	7	370,252	7	370,252
549	SUMMIT FIRE & EMS AUTHORITY	0	0	64	5,061,527	64	5,061,527
237	TELLURIDE	10	810,175	0	0	10	810,175
545	TELLURIDE FPD	0	0	8	633,989	8	633,989
238	THORNTON	0	0	134	12,455,615	134	12,455,615
338	THORNTON	235	19,931,379	0	0	235	19,931,379
7354	TIMBERLINE FPD	0	0	5	248,198	5	248,198
2557	TRI-LAKES MONUMENT FPD	0	0	49	4,114,216	49	4,114,216
2400	TRINIDAD	0	0	1	54,493	1	54,493
240	TRINIDAD	26	1,279,441	16	903,097	42	2,182,538
595	UPPER PINE RIVER FPD	0	0	30	1,659,950	30	1,659,950
242	VAIL	31	2,611,886	37	2,825,540	68	5,437,426
7369	WELLINGTON FPD	0	0	20	1,185,610	20	1,185,610
7370	WELLINGTON FPD	0	0	5	432,919	5	432,919
7373	WEST DOUGLAS COUNTY FPD	0	0	1	95,817	1	95,817
534	WEST METRO FPD	0	0	347	33,053,306	347	33,053,306

Table 18 (continued) - Summary of Members and Adjusted Payroll by Employer

City		Police		Fire		Total	
Code	City Name	No.	Earnings	No.	Earnings	No.	Earnings
5340	WEST METRO FPD	0	0	24	2,919,843	24	2,919,843
7375	WEST ROUTT FPD	0	0	9	282,634	9	282,634
2520	WESTMINSTER	0	0	2	202,895	2	202,895
252	WESTMINSTER	0	0	124	11,083,374	124	11,083,374
253	WHEAT RIDGE	83	6,771,821	0	0	83	6,771,821
254	WIGGINS	2	94,788	0	0	2	94,788
7384	WINDSOR SEVERANCE FPD	0	0	44	3,550,453	44	3,550,453
259	WOODLAND PARK	20	1,190,383	0	0	20	1,190,383
260	WRAY	5	271,815	0	0	5	271,815
262	YUMA	8	349,273	0	0	8	349,273
	Totals	6,765	$ 567,353,548	6,518	$ 545,539,444	13,283	$ 1,112,892,992

Table 19 - Summary of Inactive Members

	Count	Average Age	Average Monthly Benefit
Totally Disabled Members*	162	59.1	$3,479
Occupationally Disabled Members*	987	58.7	$1,926
Beneficiaries of Deceased Active Members	135	54.2	$2,105

* Including beneficiaries of deceased retirees

SECTION IV

APPENDICES

SUMMARY OF ACTUARIAL METHODS AND ASSUMPTIONS

I. Valuation Date

The valuation date is January 1st of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation uses the Aggregate Funding Method. Under this method, the contribution rate is calculated to fully fund the present value of all benefits over the remaining working career of the active employees. The contribution rate is determined as a percentage of increasing payroll.

1. The valuation is prepared on the projected benefit basis. The present value of each participant's expected benefit payable at retirement or termination is determined, based on age, service, sex, compensation, and the interest rate assumed to be earned in the future (7.0%). The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his terminating with a service benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

2. The actuarial value of assets is subtracted from the present value of all expected benefits to determine the present value of future normal costs. The future normal costs are spread across the future value of salaries to be paid to the current active population to determine a contribution rate.

III. Actuarial Value of Assets

Effective January 1, 2013, the actuarial value of assets is equal to the market value of assets less a five-year phase in of the excess (shortfall) between expected investment return and actual income. The actual calculation is based on the difference between actual earnings and expected earnings each year, and recognizes the cumulative excess return (or shortfall) over at a minimum rate of 20% per year. The speed of the recognition will increase if the Plan continues to be in the same net deferred position (net gain or net loss) from one year to the next. This is intended to ensure the smoothed value of assets will converge towards the market value in a reasonable amount of time. In addition, a gain or loss that is in the opposite direction of the current net position will be immediately recognized.

Expected earnings are determined using the assumed investment return rate and the beginning of year actuarial value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of administrative and investment expenses.

IV. Actuarial Assumptions

The current assumptions were adopted by the Board in 2018 for first use in this valuation following a regularly scheduled experience study. The rationale for all of the current assumptions is included in that report, dated September 21, 2018.

A. Economic Assumptions

1. Investment return: 7.00% per annum, compounded annually, composed of an assumed 2.50% inflation rate and a 4.50% real rate of return. This rate represents the assumed return, net of investment expenses.

2. Salary increase rate: Inflation rate of 2.50%, plus productivity component of 1.75%, plus step-rate/ promotional component as shown:

Years of Service	Annual Step-rate/ Promotional Rate	Total Annual Rate of Increase Including 2.50% Inflation Component and 1.75% Productivity Component
(1)	(2)	(4)
1	7.00%	11.25%
2	7.00%	11.25%
3	6.50%	10.75%
4	6.00%	10.25%
5	3.50%	7.75%
6	1.50%	5.75%
7	1.50%	5.75%
8	1.00%	5.25%
9	1.00%	5.25%
10	0.75%	5.00%
11	0.75%	5.00%
12	0.50%	4.75%
13	0.50%	4.75%
14	0.25%	4.50%
15	0.00%	4.25%

Salary increases are assumed to occur once a year, on January 1. Therefore the pay used for the period between the valuation date and the first anniversary of the valuation date is equal to the reported pay for the prior year, annualized if necessary, and then increased by the salary increase assumption.

3. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 3.50% per year. This increase rate is primarily due to the effect of inflation on salaries, with no allowance for future membership growth.

B. Demographic Assumptions

1. Mortality rates (members in payment status) –

a. Healthy retirees and beneficiaries: 2006 central rates from the RP-2014 Annuitant Mortality Tables for males and females projected to 2018 using the MP-2017 projection scales, and then projected prospectively using the ultimate rates of the scale for all years.

	Annual Rate per 1,000 Members				
Attained Age in 2020	Males	Females	Attained Age in 2020 (cont.)	Males	Females
(1)	(2)	(3)	(4)	(5)	(6)
50	3.98	2.68	70	17.00	12.87
55	5.71	3.77	75	27.15	21.14
60	8.01	5.64	80	45.85	36.18
65	11.47	8.32	85	80.33	64.64

The following table provides the life expectancy for an individual age 55 at retirement in a given year based on the assumption with full generational projection:

	Year of Retirement			
Gender	2020	2025	2030	2035
Male	29.9	30.4	30.9	31.4
Female	32.4	32.8	33.3	33.7

b. Occupationally disabled retirees: Healthy retiree tables set forward three years.

	Annual Rate per 1,000 Members				
Attained Age in 2020	Males	Females	Attained Age in 2020 (cont.)	Males	Females
(1)	(2)	(3)	(4)	(5)	(6)
50	5.00	3.24	70	22.34	17.25
55	6.97	4.80	75	36.98	29.01
60	9.92	7.12	80	63.99	51.09
65	14.40	10.71	85	113.06	91.90

c. Totally disabled retirees: RP-2014 Disabled Mortality Tables, projected with Scale BB, with minimum probability of 3% for males and 2% for females.

	Annual Rate per 1,000 Members				
Attained Age in 2020	Males	Females	Attained Age in 2020 (cont.)	Males	Females
(1)	(2)	(3)	(4)	(5)	(6)
50	30.00	20.00	70	40.91	28.21
55	30.00	20.00	75	54.94	41.44
60	30.00	20.00	80	78.55	63.37
65	32.99	21.57	85	117.45	96.61

2. Mortality rates (active members) – 2006 central rates from the RP-2014 Employee Mortality Tables for males and females projected to 2018 using the MP-2017 projection scales, and then projected prospectively using the ultimate rates of the scale for all years, 50% multiplier for off-duty mortality. Increased by 0.00015 for on-duty related Fire and Police experience. Sample rates are shown below:

	Annual Rate per 1,000 Members				
Attained Age in 2020	Males	Females	Attained Age in 2020 (cont.)	Males	Females
(1)	(2)	(3)	(4)	(5)	(6)
20	0.34	0.23	40	0.49	0.37
25	0.39	0.24	45	0.64	0.48
30	0.40	0.26	50	0.98	0.68
35	0.45	0.31	55	1.54	1.02

3. Disability rates: Sample rates are shown below.

	Annual Rate per 1,000 Members			
Age	Occupational Disability Rates (MP)	Occupational Disability Rates (SWDB)	Total Disability Rates (MP)	Total Disability Rates (SWDB)
(1)	(2)	(3)	(4)	(5)
25	0.25	0.48	0.01	0.02
30	1.18	2.26	0.11	0.17
35	1.60	3.05	0.23	0.34
40	2.35	4.48	0.35	0.52
45	4.09	5.53	0.48	0.72
50	8.86	8.22	0.63	0.94
55	15.53	11.56	0.78	1.17

4. Termination rates (for causes other than death, disability or retirement): Termination rates are based on service. Termination rates are not applied after a member becomes eligible for a retirement benefit. Rates at selected ages are shown:

	Annual Rate per 1,000 Members				
Service	Rates	Service (cont.)	Rates	Service (cont.)	Rates
0	98.5	8	25.5	16	9.4
1	84.6	9	21.3	17	9.1
2	72.3	10	17.9	18	8.8
3	61.4	11	15.3	19	8.5
4	51.9	12	13.3	20	8.1
5	43.6	13	11.7	21	7.5
6	36.5	14	10.7	22	6.5
7	30.5	15	9.9	23	5.2

5. Retirement rates: Members are assumed to retire at the time of attaining:

   A. Statewide Defined Benefit Plan Members and other New Hire Plan Members: Age 55 with 22 years of service or current age, if greater.

   B. Money Purchase Plan Members: The earliest of Age 65 or Age 55 with 25 years of service; or current age, if greater. For members age 55 with less than 25 years of service, service-based rates consistent with the SWDB service-based rates shown below.

   C. All Other Plan members: Age 52 or current age, if greater.

C. Other Assumptions

1. Family status: 85% of employees are assumed to be married or in a civil union. Those assumed to be married or in a civil union are assumed to have two or more dependent children until age 51.

2. Age difference: Male members are assumed to be two years older than their spouses, and female members are assumed to be two years younger than their spouses.

3. Post-retirement benefit adjustments: Totally disabled 3.0%; All others 0.0%.

4. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.

5. There will be no recoveries once disabled.

6. No surviving spouse will remarry.

7. Earned income: It is assumed that there are no offsets for Worker's Compensation or other current income.

8. Dependent children: Dependency status assumed to terminate at age 21.

9. Combined spouse/dependent records: In cases, where an annuitant record includes benefits for both a spouse and a dependent child, the total benefit was assumed to be payable for the life of the spouse.

10. Administrative expenses: Based on actual administrative expenses paid in the prior year, adjusted by wage inflation.

11. Money Purchase Offset: For members where no data is available, the current money purchase balance is estimated using current pay, estimated pay histories, actual plan investment returns, and the current money purchase contribution rate specific by employer. The balance is projected forward using 7.00% investment returns, and the current money purchase contribution rate specific by employer. The money purchase account used for offset is limited based on the specific money purchase contribution rate by employer and the contribution rate requirements for the Statewide Death & Disability Plan. At decrement, the limited account is converted to an annuity using current actuarial equivalence factors.

12. SRA Offset: The SRA balances are projected forward using 7.00% investment returns. For reentry members, the assumed annual contribution to the account is 4% less the surcharge determined as of the prior valuation. At decrement, the account is converted to an annuity using current actuarial equivalence factors.

13. Decrement timing: Decrements of all types are assumed to occur mid-year.

14. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

15. Decrement relativity: Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

16. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

D. Participant Data

Participant data was supplied on electronic files in the form of spreadsheets. There were separate tabs for (i) active and non-vested inactive members, and (ii) members and beneficiaries receiving benefits or vested inactives.

The data for an active members included birthdate, sex, service, salary and employee contribution account balance. For retired members and beneficiaries, the data included date of birth, sex, spouse's date of birth (where applicable), amount of monthly benefit, date of retirement, and a form of payment code.

Salary supplied for the current year was based on the following:

- If the YTD service credit is at least 12, then use the earnings for the year preceding the valuation date
- If the YTD service credit is less than 12, then use the greater of the earnings for the year preceding the valuation date or the annual salary.
- If the YTD service credit is less than 12, greater than 0 and the Member DD Flag is N, then use the annualized earnings for the year preceding the valuation date.
- If both Salary YTD and Annual Salary are zero, an array of salaries based on service will be used to estimate the salary.
- Finally, the prior salaries are used to prevent the valuation salary from decreasing.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

E. Changes to the assumptions:

There were no changes to assumptions since the prior valuation.

SUMMARY OF BENEFIT PROVISIONS

Plan Description

The Fire & Police Pension Association Statewide Death & Disability Plan ("Plan") is a cost-sharing multiple-employer defined benefit death and disability plan covering full-time employees of substantially all fire and police departments in Colorado. As of August 5, 2003, the Plan may include part-time police and fire employees. Contributions to the Plan are used for the payment of death and disability benefits. Employers who are covered by Social Security may elect supplementary coverage by the Plan. As of January 1, 2020, Colorado police and sheriff departments who participate in Social Security have the option of affiliating for coverage under the Defined Benefit System and the Statewide Death and Disability Plan. The Plan was established in 1980 pursuant to Colorado Revised Statutes. The Plan assets are included in the Fire & Police Members' Benefit Investment Fund Long-Term Pool.

Plan benefits provide 24-hour coverage, both on and off duty and are available for members not eligible for normal retirement under a defined benefit plan, or members who have not met 25 years of accumulated service and age 55 under a money purchase plan.

In the case of an on-duty death, benefits may be payable to the surviving spouse or dependent children of active members who were eligible to retire, but were still working. Death and disability benefits are free from state and federal taxes in the event that a member's disability is determined to be the result of an on-duty injury or an occupational disease.

Plan Year

A twelve-month period ending December 31.

Members Included

Members included are active full-time salaried employees of a participating municipality or fire protection district normally serving at least 1,600 hours in a calendar year and whose duties are directly involved with the provision of police or fire protection. As of August 5, 2003, the Plan may include part-time police and fire employees. A department chief who elects to be exempted from the Fire & Police Pension Association Defined Benefit System and covered under Social Security or Colorado Public Employees Retirement Association shall not be covered by the Plan.

Also included are employees of any employer that covers members under the federal Social Security Act or any county that chooses to affiliate with the Fire & Police Pension Association and includes all personnel employed by a sheriff expected to work 1,600 hours or more in a calendar year who are directly involved with the provision of law enforcement or fire protection, as certified by the county, except that personnel whose position does not require passage of a fitness for duty test shall not be eligible for participation in the Statewide Death & Disability Plan.

Compensation Considered (Base Salary)
Base salary, also known as Pensionable Earnings, means the total base rate of pay including Member Contributions to the Statewide Defined Benefit Plan or Statewide Money Purchase Plan (or contributions to any alternate retirement plan) which are “picked up” by the employer:

1) And shall also include longevity pay, sick leave pay taken in the normal course of employment, vacation leave pay taken in the normal course of employment, shift differential, and mandatory overtime that is part of the Member’s fixed, periodic compensation.

2) Accumulated vacation leave pay will also be included if a Member completes their service requirement for purposes of Normal retirement while exhausting accumulated vacation leave.

3) In the event an employer has established or does establish a Deferred Compensation Plan, the amount of the Member's salary that is deferred shall be included in the Member's base salary.

4) Any amounts voluntarily contributed to an Internal Revenue Code Section 125 “Cafeteria Plan” shall be included in the Member's base salary.

5) Base salary shall not include overtime pay (except as noted in 1) above), step-up pay or other pay for temporarily acting in a higher rank (a Member is deemed temporarily acting in a higher rank if the appointment to the rank is anticipated to last less than six months), uniform allowances, accumulated sick leave pay, accumulated vacation leave pay (except as noted in 2) above), and other forms of extra pay (including Member Contributions which are paid by the employer and not deducted from the Member's salary).

6) The base salary under the Plan for each Member of the Colorado Springs New Hire Pension Plan shall be the same as the basic salary as defined in the Colorado Springs New Hire Pension Plan.

Contribution Rates
Prior to 1997, the Plan was primarily funded by the State of Colorado, whose contributions were established by Colorado statute. In 1997 the State made a one-time contribution of $39,000,000 to fund past and future service costs for all firefighters and police officers hired prior to January 1, 1997. As of January 1, 1997, the Board could adjust the annual rate of contribution by 0.1 percent of base salary every other year. Effective January 1, 2021, the Board can adjust the annual rate of contribution by 0.2 percent of base salary every year.

Members hired on or after January 1, 1997 and members covered by Social Security, began contributing 2.4 percent of base salary to this Plan as of January 1, 1997. The contribution increased to 2.6 percent of base salary as of January 1, 2007. The contribution rate increased to 2.7 percent of base salary as of January 1, 2017. The contribution rate increased to 2.8 percent of base salary as of January 1, 2019. The contribution rate will increase to 3.0 percent of base salary as of January 1, 2021. This percentage can vary depending on actuarial experience. All contributions are made by members or on behalf of members. The contribution may be paid entirely by the employer or member, or it may be split between the employer and the member.

Pre-Retirement Death Benefits
If a member dies prior to normal retirement eligibility while off-duty, the surviving spouse shall receive a benefit equal to 40 percent of the monthly base salary paid to the member prior to death. An additional 10 percent of base salary is payable if a surviving spouse has two or more dependent children. If there is no surviving spouse, but the member had one or two dependent children, the benefit payable is 40 percent of the member's monthly base salary. If there is no spouse but three or more dependent children, the benefit equals 50 percent of the member's monthly base salary.

As of October 15, 2002, if a member dies prior to retirement while on-duty; the surviving spouse shall receive a benefit equal to 70 percent of the member's monthly base salary regardless of the number of dependent children. If there is no spouse but one or more dependent children living in the member's household the benefit equals 70 percent of the member's monthly base salary. If there are dependent children without a surviving spouse, and they do not live in the household, the benefit is 40 percent for the first child and 15 percent for each additional child, but not greater than 70 percent in total of the member's monthly base salary. Benefits will be paid to the spouse until death and to dependent children until age 23, death, marriage or other termination of dependency. Benefits may be extended for an incapacitated child.

For purposes of this Plan, a spouse includes a partner in a civil union. These benefits are offset by Money Purchase account balances, Stabilization Reserve Accounts ("SRA") and Deferred Retirement Option Plan ("DROP") accounts, converted to annuities.

Disability Benefits
The Plan provides the members with two types of disability: occupational and total.

Occupational Disability means a member is unable to perform their assigned duties due to a medical condition that is expected to last at least 1 year. Assigned duties are those specific tasks or job duties that a member is required to regularly perform. Within the Occupational Disability category, there are two sub-categories: Temporary Occupational Disability and Permanent Occupational Disability.

Temporary Occupational Disability is an occupational disability for which there is prognosis for improvement or recovery through surgical treatment, counseling, medication, therapy or other means.

Permanent Occupational Disability is an occupational disability caused by a condition that is permanent or degenerative and for which there is no prognosis for improvement or recovery through surgical treatment, counseling, medication, therapy or other means.

Total Disability means the member is unable to engage in any substantial gainful activity due to a medically determined physical or mental impairment that may be expected to result in death or that has lasted or is expected to last at least 1 year.

A member who becomes disabled prior to normal retirement eligibility shall be eligible for disability benefits.

If the member is totally disabled, the member shall receive 70 percent of their base salary preceding disability.

If the member is occupationally disabled and their disability is determined to be a permanent occupational disability, the member shall receive 50 percent of their base salary preceding disability regardless of their family status. If the member is occupationally disabled and the disability is determined to be a temporary occupational disability, the member shall receive 40 percent of their base salary preceding disability regardless of their family status for up to five years.

Total disability and permanent occupational disability benefits are offset by the Money Purchase, SRA or DROP balances, converted to annuities. For member's who also participate in Social Security, disability benefits are reduced by Social Security disability benefits derived from employment as a member, if applicable.

Temporary Occupational Disability benefits are payable for a maximum of five years. Permanent Occupational and Total Disability benefits are payable as long as the member remains disabled.

Offsets for Money Purchase Balances, SRA, and DROP
Plan benefits are reduced by the actuarially equivalent annuities of the Money Purchase, SRA, and DROP account balances. A blended rate based on the annual required contributions, as defined in the Statewide Defined Benefit Plan, is used to calculate the offset for Money Purchase Plans. Benefits provided by the Plan are also offset by any defined benefit that the member may have received due to work as a Colorado firefighter or police officer.

Spousal income, IRAs, insurance benefits, legal awards, and other investment incomes are not subject to any offset. Deferred compensation accounts are generally not subject to an offset. However, if a department chief has contributions directed to a deferred compensation plan in lieu of a pension plan, the benefit award is offset based on the amount in the deferred compensation account. The amount of the offset is calculated in the same manner as the money purchase offset.

Actuarial equivalence is based on tables adopted by the Fire & Police Pension Association Board of Directors.

Optional Forms of Payment
The Plan provides four choices for receipt of the Permanent Occupational and Total Disability benefits.

Normal Option – The disabled retiree receives an unreduced benefit, payable for as long as the disability exists and as long as the member remains eligible. Upon the death of the retiree, the benefit is discontinued.

Option 1 (Joint and 100% Survivor) - The disabled retiree's benefit amount is reduced on an actuarially equivalent basis, payable for as long as the disability exists and as long as the member remains eligible. Upon the death of the retiree, the designated beneficiary receives 100 percent of the retiree's actuarially equivalent reduced benefit for life.

Option 2 (Joint and 50% Survivor) - The disabled retiree's benefit amount is reduced on an actuarially equivalent basis, payable for as long as the disability exists and as long as the member remains eligible. Upon the death of the retiree, the designated beneficiary receives 50 percent of the retiree's actuarially equivalent reduced benefit for life.

Option 3 (Family Benefit) - The disabled retiree's benefit amount is reduced on an actuarially equivalent basis, payable for as long as the disability exists and as long as the member remains eligible. Upon the death of the retiree, the actuarially equivalent reduced benefit amount is paid to the surviving spouse* and dependent children, if any, until the death of the surviving spouse, the death of any incapacitated child, or until the youngest child reaches age 23, whichever is later.

*Per FPPA Rule 402.10(c) 'Spouse' for the purposes of Payment Option 3 means the Member's spouse at the time the first benefit payment is negotiated. If the spouse beneficiary is removed by the Member, or dies, the Member is not permitted to add a subsequent spouse.

Actuarial equivalence is based on tables adopted by the Fire & Police Pension Association Board of Directors.

Benefit Adjustments for Benefits in Pay Status
A benefit adjustment of up to 3 percent may be granted to members and survivors by the Fire & Police Pension Association Board of Directors annually. Totally disabled members and their beneficiaries receive an automatic benefit adjustment each year of 3 percent. The benefit adjustment is effective October 1. A benefit adjustment may begin after receiving benefits for at least 12 calendar months prior to October 1.

Investment Pool
The Statewide Death & Disability Plan is invested in the Long-Term Pool. The Long-Term Pool is designed primarily for open plans with a longer time horizon, higher risk tolerance, and lower liquidity needs. The investment return assumption is 7.0%.

RISKS ASSOCIATED WITH MEASURING THE ACCRUED LIABILITY AND ACTUARIALLY DETERMINED CONTRIBUTION

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

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

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

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

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

The computed contribution rates shown in this report may be considered as a minimum contribution rate that complies with the Board's funding policy and state statute. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

With each valuation there is a presentation of the summary of findings to the Board. Included are various discussions and scenarios of potential risks.

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	2020	2019	2018
Ratio of the market value of assets to total payroll	0.4	0.4	0.4
Ratio of actuarial accrued liability to payroll	0.5	0.5	0.4
Ratio of actives to retirees and beneficiaries	10.3	10.3	10.3
Net cash flow as a percentage of market value of assets	-2.6%	-3.3%	-3.3%
Duration of the actuarial accrued liability	21.4	20.7	17.9

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL:

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 0.4 times the payroll, a return on assets 5% different than assumed would equal 2% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL:

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 0.5 times the payroll, a change in liability 2% other than assumed would equal 1% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

The relationship between the actuarial accrued liability and payroll is a useful indicator of the potential longer term asset-related volatility once the current UAAL is fully amortized. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES:

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

NET CASH FLOW AS A PERCENTAGE OF MARKET VALUE OF ASSETS:

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

DURATION OF LIABILITIES:

The duration of the present value of future benefits may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the present value of future benefits would increase approximately 10% if the assumed rate of return were lowered 1%. This also is an approximation of the discount-weighted average time horizon of the liability.