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Municipal Police Officers' Retirement System of the State of Montana

MPERA
MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

Actuarial Valuation
As of June 30, 2021

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September 30, 2021

Public Employees' Retirement Board
100 North Park, Suite 200
Helena, MT 59620-0139

Members of the Board:

In this report are submitted the results of the annual valuation of the assets and liabilities of the Municipal Police Officers' Retirement System of the State of Montana (MPORS), prepared as of June 30, 2021.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2021. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rate is sufficient to amortize the unfunded accrued liability within a 15-year period. The asset values used to determine unfunded liabilities are not market values but less volatile market related values. A smoothing technique is applied to market values to determine the market related values. The unfunded liability amounts using the market value of assets would be different. The interest rate used for determining liabilities is based on the expected return on assets. Therefore, liability amounts in the report cannot be used to assess a settlement of the obligation.

The promised benefits of the System are included in the actuarially calculated contribution rates, which are developed using the Entry Age Normal Cost Method. Four-year market related value of assets is used for actuarial valuation purposes. Gains and losses are reflected in the unfunded accrued liability that is being amortized by regular annual contributions as a level percentage of payroll, on the assumption that payroll will increase by 3.50% annually. The assumptions recommended by the actuary and adopted by the Board are, in the aggregate, reasonably related to the experience under the Fund and to reasonable expectations of anticipated experience under the Fund.

In order to prepare the results in this report we have utilized appropriate actuarial models that were developed for this purpose. These models use assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.

We note that as we are preparing this report, the world is in the midst of a pandemic. We have considered available information, but do not believe that there is yet sufficient data to warrant the modification of any of our assumptions. We will continue to monitor the situation and advise the Board in the future of any adjustments that we believe would be appropriate.

3550 Busbee Pkwy, Suite 250, Kennesaw, GA 30144
Phone (678) 388-1700 • Fax (678) 388-1730
www.CavMacConsulting.com
Offices in Kennesaw, GA • Bellevue, NE

This is to certify that Todd Green, President, and Beverly Bailey, Senior Actuary, for Cavanaugh Macdonald Consulting, are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. This also certifies that the undersigned have experience in performing valuations for public retirement systems, that the valuation was prepared in accordance with principles of practice prescribed by the Actuarial Standards Board, and that the actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures, based on the current provisions of the retirement system and on actuarial assumptions that are internally consistent and reasonably based on the actual experience of the System.

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (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. Since the potential impact of such factors is outside the scope of a normal annual actuarial valuation, an analysis of the range of results is not presented herein.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Respectfully submitted,

Todd B. Green, ASA, EA, FCA, MAAA
President

Beverly V. Bailey, ASA, EA, FCA, MAAA
Senior Actuary

Municipal Police Officers' Retirement System
State of Montana

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Section I: Summary of Results

For convenience of reference, the principal results of the valuation and a comparison with the preceding year's results are summarized below:

VALUATION DATE	**June 30, 2021**	**June 30, 2020**
Participant Counts		
Active Members*	823	829
Retirees and Beneficiaries**	886	843
Disabled Members**	24	27
Terminated Vested Members	107	95
Terminated Non-Vested Members	199	181
Total***	2,039	1,975
Annual Covered Payroll of Active Members	$ 59,216,593	$ 56,783,680
Average Salaries from Covered Payroll	$ 71,952	$ 68,497
Annual Retirement Allowances for Retired Members and Beneficiaries	$ 30,598,624	$ 28,195,856
Assets		
Actuarial value	$ 516,143,647	$ 471,328,235
Market value	568,215,062	451,150,482
Actuarial Accrued Liability (AAL)	$ 694,610,661	$ 666,098,580
Unfunded Actuarial Accrued Liability (UAAL)	$ 178,467,014	$ 194,770,345
Funded Ratio	74.31%	70.76%
Market Value Rate of Return	27.07%	2.65%
Annual Cost		
Statutory Funding Rate	52.78%	52.78%
Total Normal Rate	25.78%	25.57%
Employee Contribution Rate	9.00%	9.00%
Employer Normal Rate	16.78%	16.57%
Employer Statutory Contribution Rate		
Normal Rate	16.78%	16.57%
Administrative Expense Load	0.17%	0.18%
UAAL Rate	26.83%	27.03%
Total Rate	43.78%	43.78%
Amortization Period	15 years	16 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	16.78%	16.57%
Administrative Expense Load	0.17%	0.18%
UAAL Rate (30-Year Rate)	17.18%	18.54%
Total Rate	34.13%	35.29%
Shortfall/(Surplus)	(9.65%)	(8.49%)

* Includes 66 DROP members as of June 30, 2020 and 53 DROP members as of June 30, 2021.

** Based on PERB categorization for the annual report. For actuarial purposes, 99 members in 2020 and 101 members in 2021 were valued as disabled members with offsetting reductions to the number of retired members.

*** A reconciliation between participant counts used for the annual report and counts for the valuation appears at the beginning of Appendix D.

As a result of this actuarial valuation of the benefits in effect under the Municipal Police Officers' Retirement System as of June 30, 2021, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 15 years. The Funded Ratio is 74.31%.

Calculations based on the Market Value of Assets

MCA 19-2-407 requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The June 30, 2021, market value of assets is $52,071,415 more than the actuarial value of assets. This is due to the smoothing of investment gains and losses over a four-year period. If the market value of assets was used, the amortization period would be 10 years, and the Funded Ratio would be 81.80%.

Additional Details

MCA 19-9 sets the employer contribution at 14.41% of salary, the state contribution at 29.37% and the employee contribution at 9.00% for both non-GABA actives and GABA actives. Non-GABA actives hired between June 30, 1979 and prior to July 1, 1997 contribute 8.50% and those hired after June 30, 1975 and prior to July 1, 1979, contribute 7.00%.

The actuarial costs are calculated using the entry age actuarial cost method. This is the method used by most public plans. It is designed to provide a stable contribution rate as a percent of member pay. This actuarial valuation measures the adequacy of the contribution rates set in Montana State Law.

Investment Experience

The market assets earned 27.07% net of investment and operating expenses. As a result of prior years' unrecognized losses, the actuarial assets earned 10.50%, which is 2.85% greater than the actuarial assumption of 7.65%. The return on the actuarial assets differs from the return on market assets because the actuarial value of assets spreads gains and losses over four years. The chart below shows the annual returns for the past ten years.

Year	Market Return	Actuarial Return	Assumed Investment Return	Market Return over Assumption	Actuarial Return over Assumption
7/1/2011 to 6/30/2012	2.40%	3.71%	7.75%	(5.35)%	(4.04)%
7/1/2012 to 6/30/2013	12.42	11.08	7.75	4.67	3.33
7/1/2013 to 6/30/2014	16.53	12.46	7.75	8.78	4.71
7/1/2014 to 6/30/2015	4.52	9.32	7.75	(3.23)	1.57
7/1/2015 to 6/30/2016	2.13	8.37	7.75	(5.62)	0.62
7/1/2016 to 6/30/2017	11.56	8.01	7.75	3.81	0.26
7/1/2017 to 6/30/2018	8.65	6.81	7.65	1.00	(0.84)
7/1/2018 to 6/30/2019	5.42	7.05	7.65	(2.23)	(0.60)
7/1/2019 to 6/30/2020	2.65	6.81	7.65	(5.00)	(0.84)
7/1/2020 to 6/30/2021	27.07	10.50	7.65	19.42	2.85

Asset gains or losses result when the return on the actuarial value of assets differs from the assumed actuarial investment return.

Amortization of the UAAL

The June 30, 2020, actuarial valuation calculated a 16-year amortization period for the UAAL. The resulting amortization period at June 30, 2021 is 15 years.

Funding and Benefits Policy

The Montana Public Employees' Retirement Board has adopted a Funding and Benefits Policy to provide general guidelines to help ensure decisions are made based on sound, consistent, and thoroughly examined criteria. The Funding and Benefits Policy includes guidance on the following topics:

1) Funding Requirement
   a) The Funding and Benefits Policy states:
      1. The Entry Age Normal Cost Method shall be applied to the projected benefits in determining the Normal Cost and Actuarial Accrued Liability.
      2. Asset smoothing can be used in the valuation process to spread the recognition of investment gains and losses over a four-year period.
      3. The unfunded actuarial accrued liability should be amortized over a reasonable period of time and should not exceed 30 years on a rolling basis. Generally, the funding period should be constant or decreasing.
   b) Analysis: The liabilities of the System are determined using the Entry Age Normal Cost Method and are compared to the actuarial value of assets, which are developed using asset smoothing that recognizes gains and losses over a four-year period. Finally, the amortization period as of June 30, 2021, is 15 years based on actuarial value of assets. The current employer and employee statutory rates keep the System's funding within Board policy guidelines.
2) Funding Objectives
   a) The Funding and Benefits Policy states: "The primary objectives are to: 1) ensure that the systems are financially sound and pay all benefits promised using assets accumulated from required employer and member contributions and investment income; and 2) achieve a well-funded status with a range of safety to absorb market volatility without creating a UAAL."
   b) Analysis: The employer and employee contributions provided for in statute are sufficient to amortize the unfunded actuarial accrued liability within a 30-year period. This ensures that the System is financially sound and will be able to pay all promised benefits and eventually achieve a well-funded status with a range of safety to absorb market volatility without creating a UAAL.
3) Benefit Enhancements
   a) The Funding and Benefits Policy states: "Proposals must provide funding from sources sufficient to cover future costs. Unfunded liabilities created by the proposal must be amortized over a period of time appropriate to the retirement system, but not more than 30 years."
   b) Analysis: Without supplemental funding, a benefit enhancement would increase the amortization period of the unfunded actuarial accrued liability and further delay the goal of achieving a well-funded status with a range of safety to absorb market volatility without creating a UAAL.

Sensitivity to Future Experience

The valuation results are projections based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing the ultimate cost. The following illustrations provide simple analyses on how the costs are sensitive to changes in the assumed rate of return.

Investment Return – The investment return generally has the largest impact on the funding of the System.

Impact of Assuming 1.0% Higher Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)*
Current Assumption 7.65%	74.31%	15 Years	26.3$
Higher Assumption 8.65%	84.12%	6 Years	16.3$
Increase / (Decrease)	9.81%	(9) Years	(10.0)$

Impact of Assuming 0.5% Higher Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.65%	74.31%	15 Years	26.3$
Higher Assumption 8.15%	79.17%	10 Years	21.0$
Increase / (Decrease)	4.86%	(5) Years	(5.3)$

Impact of Assuming 0.5% Lower Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.65%	74.31%	15 Years	26.3$
Lower Assumption 7.15%	69.54%	23 Years	31.8$
Increase / (Decrease)	(4.77)%	8 Years	5.5$

Impact of Assuming 1.0% Lower Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.65%	74.31%	15 Years	26.3$
Lower Assumption 6.65%	64.87%	40 Years	38.0$
Increase / (Decrease)	(9.44)%	25 Years	11.7$

* Amounts reflect estimated increase/(decrease) in FY2022 employer contributions only, in order to maintain the 15 year amortization period.

The future funding status of the System will be determined by the System's experience. The System's actual asset returns and retirement rates, as well as member longevity, salary increases, withdrawal rates, disability rates and future legislation will all impact the funding status of the System. The entry age normal cost method and four-year smoothing of asset gains and losses will help to provide a more orderly funding of the System's liabilities, but will not change the actual experience. The amortization period of the UAAL is not likely to decrease by the expected 1.0 year with each passing actuarial valuation. Instead, the amortization period is expected to decrease more or less than 1.0 years each year, reflecting gains and losses due to experience different than the actuarial assumptions.

Assumption Changes

There have been no assumption changes since the previous valuation.

Benefit Changes

There have been no benefit changes since the previous valuation.

Contribution Changes

There have been no contribution changes since the previous valuation.

Method Changes

There have been no method changes since the previous valuation.

Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2020 Actuarial Valuation. Further detail can be found in Table 10.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2020 Valuation UAAL	$194,770,345
Normal Cost (Including Expenses)	12,486,294
Contributions	(31,335,420)
Interest	14,656,553
Expected UAAL	$190,577,772
Experience (Gain) / Loss on Actuarial Liabilities	$1,278,067
Experience (Gain) / Loss on Actuarial Assets	(13,388,825)
Assumption & Method Changes	0
Plan Changes	0
Total (Gain) / Loss	$(12,110,758)
June 30, 2021 Valuation UAAL	$178,467,014

Summary

- The System's actuarial value investment return of 10.50% for the year ended June 30, 2021, is 2.85% greater than the actuarial assumption of 7.65%. This represents an asset gain of $13,388,825 due to investment return being more than anticipated. As of June 30, 2021, the market value of assets was $568,215,062. As of June 30, 2021, the actuarial value of assets was $516,143,647. The June 30, 2021, market value of assets will be recognized in future actuarial valuations unless it is offset by returns less than the 7.65% assumption.

- As of June 30, 2021, the amortization period of the UAAL is 15 years. Prior to this valuation, the funding period was 16 years. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period is below 30 years. The System is currently being funded within the parameters defined by the Board.

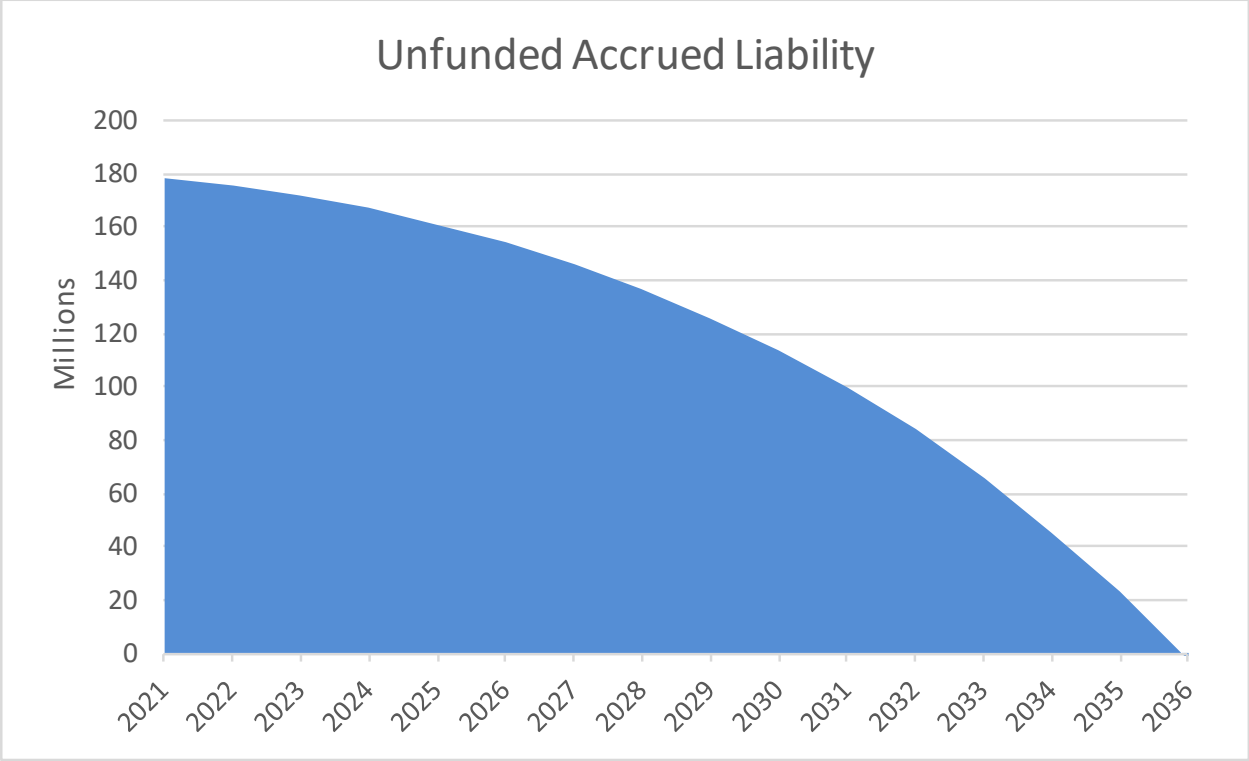
- The funding of the retirement system will be impacted by future experience which will sometimes be more favorable than the actuarial assumptions and sometimes less favorable. In particular, investment returns larger and smaller than the 7.65% assumption are expected to have significant impacts on the System's funding progress. In the long term, the favorable experience is needed to offset the less favorable experience. This is the reason for using an actuarial value of assets that allows gains and losses to be smoothed over four years.

- The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period. Under the level percentage of payroll method, amortization payments will not be large enough to cover interest on the UAAL in the beginning of the amortization schedule, which means that as a dollar amount the UAAL is expected to grow. After a period of time, amortization payments will be large enough that the amortization payments will cover both interest and principal, and the UAAL as a dollar amount will be projected to decrease in each subsequent year. The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. The payroll growth assumption is 3.50%.

- The Board-adopted rate of return assumption of 7.65% does not, in our professional judgment, conflict with what would constitute a reasonable assumption for the purpose of the measurement Actuarial Standard of Practice No. 27 (ASOP 27). The basis for this opinion is the average long-term capital market assumptions published in the Survey of Capital Market Assumptions 2021 Edition by Horizon Actuarial Service, LLC, which yield a median real return of 4.66% and assumed inflation based on the intermediate inflation assumption of 2.4% in the 2021 OASDI Trustees Report used by the Chief Actuary for Social Security to produce 75 year cost projections. Combining these two results yields a nominal return of 7.06%. The Board's adopted assumption of 7.65% is sufficiently close to our calculated reasonable assumption of 7.06%. Note our report discloses the Systems Funded Ratio and Amortization Period based on an assumed rate of return of 7.65%. In the *Sensitivity to Future Experience* section, results are also presented based on an assumed rate of return of 7.15% and 6.65%. The results of the valuation using an assumed rate of return of 7.06% would include a funded ratio and amortization period between the results shown at 7.15% and 6.65%.

Projected Progress toward 100% Funding

The table below shows the projected progress toward reaching 100%. When the System is 100% funded, the Unfunded Actuarial Accrued Liability will be fully amortized. This is scheduled to occur within 15 years. The ultimate goal of the MPORS System is to become at least 100% funded and to establish a reserve equal to 10% of the System's Actuarial Accrued Liability.



Assets

In many respects, an actuarial valuation can be regarded as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is June 30, 2021. On that date, the assets available for the payment of benefits are appraised. These assets are compared with the actuarial liabilities. The actuarial process thus leads to a method of determining what contributions by members and their employers are needed to strike a balance.

The asset valuation method being used is a four-year smoothing method. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

Table 1 lists the assets held and their market value for the past two years. Table 2 summarizes the fund's activity during the past two years. Table 3 summarizes the determination of the actuarial value of assets. Table 4 summarizes historical asset returns for the last 10 years including the amount recognized by the actuarial asset valuation method which was greater or lesser than the actuarial investment return assumption. Table 5 summarizes the historical asset values on a market value and actuarial value basis, to the extent it was available. Additional data can be included in this table for future reports, if provided by the System.

Table 1:
Statement of Fiduciary Net Position
Fiscal Year Ended June 30,

	2021	2020
ASSETS		
Cash and Short Term Investments	$ 5,826,240	$ 4,727,491
Securities Lending Collateral	$ 3,155,754	$ 2,290,598
Receivables:		
Interest Receivable	$ 397	$ 2,070
Accounts Receivable	249,370	423,187
Due from Other Funds	-	-
Due from Primary Government	17,387,352	16,636,173
Notes Receivable	-	-
Total Receivables	$ 17,637,119	$ 17,061,430
Investments, at fair value:		
Investment Pools	544,954,485	429,317,602
Other Investments	-	-
Total Investments	$ 544,954,485	$ 429,317,602
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	$ 328	$ 328
Intangible Assets, at cost, net of Amortization Expense	222,437	270,788
Total Capital Assets	$ 222,765	$ 271,116
TOTAL ASSETS	$ 571,796,363	$ 453,668,237
LIABILITIES		
Securities Lending Liability	$ 3,155,754	$ 2,290,598
Accounts Payable	317,706	16,001
Unearned Revenue	8,723	102,898
Due to Other Funds	99,118	108,258
Compensated Absences	-	-
OPEB Implicit Rate Subsidy LT	-	-
TOTAL LIABILITIES	$ 3,581,301	$ 2,517,755
NET POSITION - RESTRICTED FOR PENSION BENEFITS	$ 568,215,062	$ 451,150,482

Table 2:
Statement of Changes in Fiduciary Net Position
Fiscal Year Ended June 30,

	2021	2020
ADDITIONS		
Contributions:		
Employer	$ 8,534,618	$ 8,272,676
Plan Member	5,453,705	5,214,262
Other	17,347,097	16,685,125
Total Contributions	$ 31,335,420	$ 30,172,063
Misc Income	$ -	$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	$ 124,656,947	$ 13,809,753
Investment Earnings	12,971	140,825
Security Lending Income	38,036	49,493
Investment Income/(Loss)	$ 124,707,954	$ 14,000,071
Investment Expense	(3,106,950)	(2,315,913)
Security Lending Expense	(7,466)	(26,378)
Net Investment Income/(Loss)	$ 121,593,538	$ 11,657,780
Total Additions	$ 152,928,958	$ 41,829,843
DEDUCTIONS		
Benefit Payments	$ 29,790,973	$ 27,866,365
Refunds/Distributions	5,797,580	2,327,658
Refunds to Other Plans	1,497	23,062
Transfers to DCRP	-	-
Transfers to MUS-RP	-	-
OPEB Expense	-	-
Administrative Expense	204,819	240,967
Total Deductions	$ 35,794,869	$ 30,458,052
NET INCREASE (DECREASE) IN PLAN NET ASSETS	$ 117,134,089	$ 11,371,791
NET POSITION - RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR	$ 451,150,482	$ 439,777,930
ADJUSTMENT	$ (69,509)	$ 761
END OF YEAR	$ 568,215,062	$ 451,150,482

Table 3:
Determination of Actuarial Value of Assets

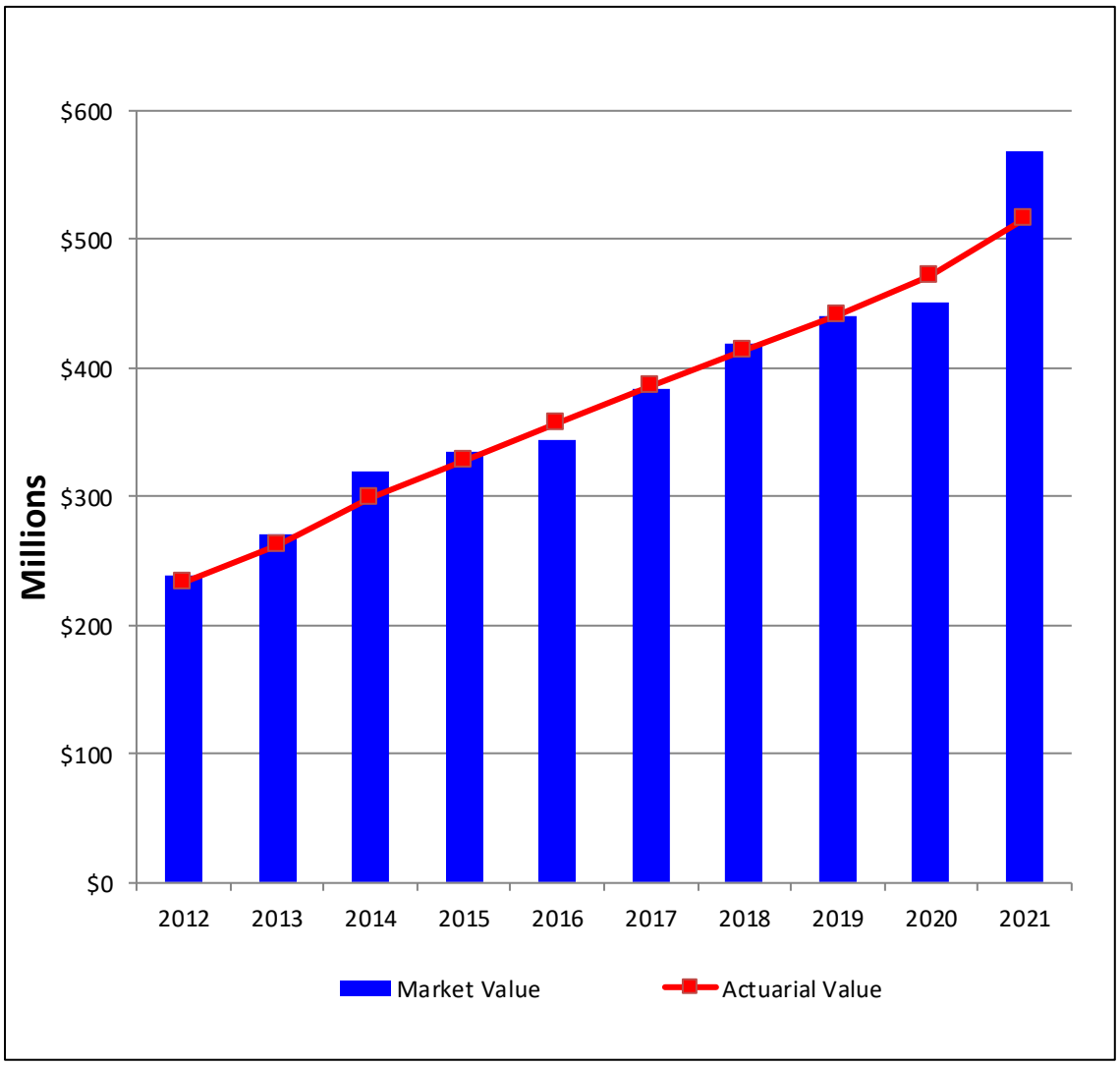
Valuation Date June 30:	2020	2021	2022	2023	2024
A. Actuarial Value Beginning of Year	$ 441,565,469	$ 471,328,235			
B. Market Value End of Year	$ 451,150,482	$ 568,215,062			
C. Market Value of Beginning of Year	$ 439,777,930	$ 451,150,482			
D. Cash Flow					
D1. Contributions	$ 30,172,063	$ 31,335,420			
D2. Benefit Payments	(30,217,085)	(35,590,050)			
D3. Administrative Expenses	(240,967)	(204,819)			
D4. Investment Expenses	(2,342,291)	(3,114,416)			
D5. Net	$ (2,628,280)	$ (7,573,865)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	$ 14,000,832	$ 124,638,445			
E2. Assumed Rate	7.65%	7.65%			
E3. Amount for Immediate Recognition C*E2. + ((D1. +D2. + D3.) * E2. * 0.5) - D4.	35,974,364	37,456,854			
E4. Amount for Phased-in Recognition E1. = E3.	(21,973,532)	87,181,591			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	$ (5,493,383)	$ 21,795,398	$ -	$ -	$ -
F2. First Prior Year	(2,328,008)	(5,493,383)	21,795,398	-	-
F3. Second Prior Year	958,416	(2,328,008)	(5,493,383)	21,795,398	-
F4. Third Prior Year	3,279,657	958,416	(2,328,008)	(5,493,383)	21,795,398
F5. Total Recognized Investment Gain	$ (3,583,318)	$ 14,932,423	$ 13,974,007	$ 16,302,015	$ 21,795,398
G. Actuarial Value End of Year A. + D5. + E3. + F5.	$ 471,328,235	$ 516,143,647			

Table 4:
Historical Investment Returns*

Fiscal Year Ending	Market Returns	Actuarial Returns	Assumed Rate of Return	Actuarial Return Over Assumption
June 30, 2012	2.40%	3.71%	7.75%	(4.04)%
June 30, 2013	12.42%	11.08%	7.75%	3.33%
June 30, 2014	16.53%	12.46%	7.75%	4.71%
June 30, 2015	4.52%	9.32%	7.75%	1.57%
June 30, 2016	2.13%	8.37%	7.75%	0.62%
June 30, 2017	11.56%	8.01%	7.75%	0.26%
June 30, 2018	8.65%	6.81%	7.65%	(0.84)%
June 30, 2019	5.42%	7.05%	7.65%	(0.60)%
June 30, 2020	2.65%	6.81%	7.65%	(0.84)%
June 30, 2021	27.07%	10.50%	7.65%	2.85%
10 Year Average	9.09%	8.39%		0.67%

* Returns reflect all investment returns, including investment income and realized and unrealized investment gains and losses, and are net of investment expenses and administrative expenses paid by the System.

Table 5:
Market Value of Assets vs. Actuarial Value of Assets



Actuarial Present Value of Future Benefits

In the previous section, an actuarial valuation was related to an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date. In this section, the discussion will focus on the commitments of the System, which will be referred to as its actuarial liabilities.

Table 6 contains an analysis of the actuarial present value of all future benefits for active members, for retirees, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 6 include the actuarial present value of all future benefits expected to be paid with respect to each member covered as of the valuation date. For an active member, this value includes a measure of both benefits already earned and future benefits to be earned. Thus, for all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of their surviving beneficiaries.

The actuarial valuation does not recognize liabilities for employees who become members and participate in the System after the valuation date.

Table 6:
Actuarial Present Value of Future Benefits for Actives, Retirees, and Beneficiaries

	June 30, 2021 Total	June 30, 2020 Total
A. Active Members Liability Due to Probability of		
Retirement	$ 290,638,735	$ 294,467,113
Disability	$ 15,452,203	$ 14,981,368
In-Service Death	$ 5,076,208	$ 4,909,171
Termination	$ 25,444,630	$ 24,530,486
Total	$ 336,611,776	$ 338,888,138
B. Inactive Members and Annuitants		
Service Retirement	$ 344,217,683	$ 314,444,982
Disability Retirement	$ 51,509,631	$ 48,350,116
Beneficiaries	$ 51,508,657	$ 49,572,297
Vested Terminated Members	$ 12,313,654	$ 12,289,858
Refund of Member Contributions	$ 1,620,408	$ 1,542,185
Total	$ 461,170,033	$ 426,199,438
C. Grand Total	$ 797,781,809	$ 765,087,576

Employer Contributions

In the previous two sections, attention has been focused on the assets and the present value of all future benefits of the System. A comparison of Tables 3 and 6 indicates that there is a shortfall in current actuarial assets to meet the present value of all future benefits for current members and beneficiaries.

In an active system, there will always be a difference between the assets and the present value of all future benefits. An actuarial valuation sets a schedule of future contributions that will deal with this funding in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. For this valuation, the entry age actuarial cost method has been used. A description of the entry age actuarial cost method is provided in Appendix A. Under this method, or essentially any actuarial cost method, the contributions required to meet the difference between current assets and the present value of all future benefits are allocated each year between three elements:

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years;
- A load for administrative expenses; and
- An amount which is used to amortize the UAAL.

The two items described above, normal cost and UAAL, are the keys to understanding the actuarial cost method. Let us first discuss the normal cost.

The normal cost is the theoretical contribution rate, which will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees were covered under a separate fund from which all benefits and to which all contributions and associated investment return were to be paid. Under the entry age actuarial cost method, the normal cost contribution rate is that level percentage of pay which would be exactly right to maintain this fund on a stable basis. If experience were to follow the actuarial assumptions exactly, the fund would be completely liquidated with the last payment to the last survivor of the group.

The assumed investment rate of return is 7.65%, net of investment expenses only. As a result, the actuarially determined contribution must include an amount for administrative expenses expected to occur during the year.

We have determined the normal cost rates separately by type of benefit under the System. These are summarized in Table 7. In Table 7 we also provide a summary of the member and employer statutory contributions.

The term "fully funded" is often applied to a system where contributions for everyone at the normal cost rate will fully pay for the benefits of existing as well as new employees. Often, systems are not fully funded, either because of benefit improvements in the past that have not been completely paid for or actuarial deficiencies that have occurred because experience has not been as anticipated. Under these circumstances, a UAAL exists.

Table 8 shows how the UAAL was derived for the System. Lines A and B show, respectively, the total present value of future benefits and the portion of the future liability that is expected to be paid from future normal cost contributions, both employer and employee. The future normal cost contributions are the portion of the present value of future benefits that are attributed to future years of service that have not been earned yet by the active membership. Line C shows the actuarial accrued liability. Line D shows the amount of assets available for benefits. Line E shows the UAAL.

The UAAL at any date after establishment of a system is affected by any actuarial gains or losses arising when the actual experience of the system varies from the experience anticipated by the actuarial assumptions used in the valuations. To the extent actual experience as it develops differs from the assumptions used, so also will the actual emerging costs differ from the estimated costs. The impact of these differences in actual experience from the assumptions is included in Section 1, the Summary of Findings.

Table 7:
Normal Cost Contribution Rates
As Percentages of Salary

	June 30, 2021 Total	June 30, 2020 Total
Service retirements	17.10%	16.96%
Disability retirements	3.06%	3.04%
Survivors' benefits	0.84%	0.82%
Termination Benefits	4.78%	4.75%
Total Normal Rate	25.78%	25.57%
Employee Normal Rate	9.00%	9.00%
Employer Normal Rate	16.78%	16.57%
Administrative Expense Load	0.17%	0.18%
Amount Available to Amortize the Unfunded Actuarial Accrued Liability	26.83%	27.03%
Statutory Funding Rate	52.78%	52.78%

Table 8:
Unfunded Actuarial Accrued Liability

	June 30, 2021	June 30, 2020
A. Actuarial present value of all future benefits for present members, retirees and their survivors (Table 6)	$ 797,781,809	$ 765,087,576
B. Less actuarial present value of total future normal costs for present members	$ 103,171,148	$ 98,988,996
C. Actuarial accrued liability	$ 694,610,661	$ 666,098,580
D. Less assets available for benefits	$ 516,143,647	$ 471,328,235
E. Unfunded actuarial accrued liability	$ 178,467,014	$ 194,770,345

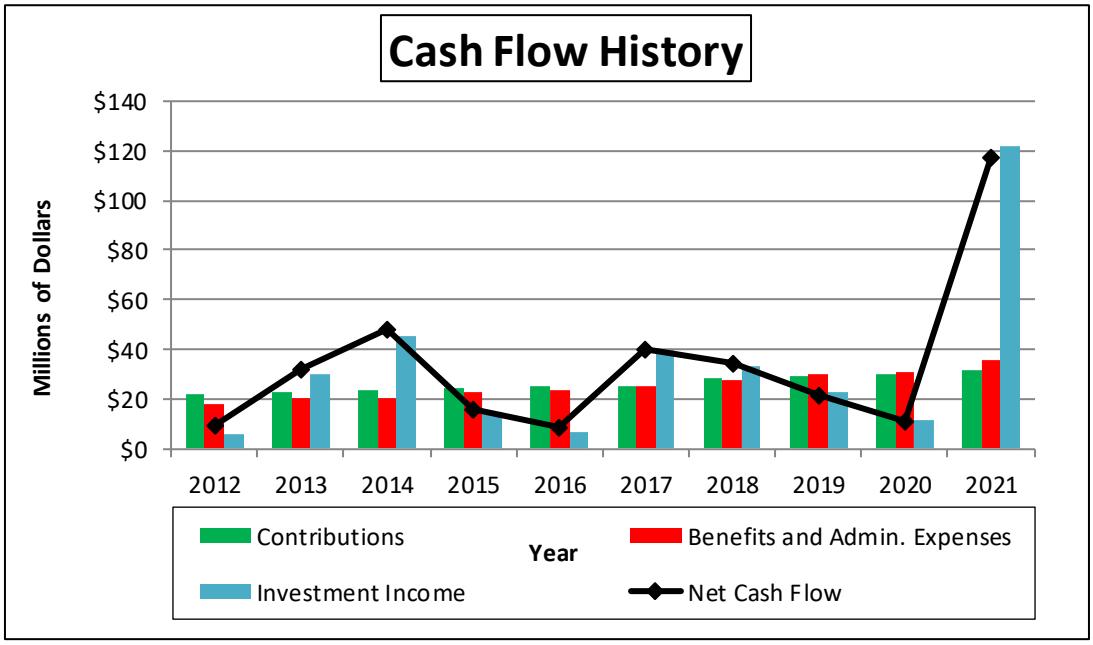
Cash Flows

The fundamental equation for funding a retirement system is that benefits and administrative expenses must be provided for by contributions (past and future) and investment income. When a retirement system matures, benefits and administrative expenses often exceed contributions. In this case we say the system has a "negative cash flow." Mature systems are characterized by negative cash flows and large pools of assets. This is natural. Actuarial funding is designed to accumulate large pools of assets which will in turn provide investment income and finance negative cash flows when systems mature. If the fund is looked at as a whole, investment income is usually larger than the difference between contributions and benefit payments. The retirement system's investment strategy should maximize potential returns at a prudent level of risk while providing for needed cash flows.

Table 9 shows the System had a positive cash flow for the year ended June 30, 2021. The System's total cash flow including benefit payments, administrative expenses and investment earnings was $117.1 million. Of the $117.1 million, $121.6 million was due to investment returns.

As long as the System had a positive cash flow, there was no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and contributions.

Table 9:
Cash Flow History
(Dollar amounts in millions)



	Historical Cash Flows			
Year Ended June 30	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2012	$ 22.1	$ 18.2	$ 5.7	$ 9.6
2013	22.9	20.5	30.0	32.4
2014	23.6	20.7	45.2	48.2
2015	24.4	23.0	14.5	15.9
2016	25.1	23.6	7.1	8.6
2017	25.5	24.9	39.8	40.4
2018	28.6	27.6	33.2	34.2
2019	28.9	30.1	22.6	21.4
2020	30.2	30.5	11.7	11.4
2021	31.3	35.8	121.6	117.1

Actuarial Gains or Losses

An analysis of actuarial gains or losses is performed in conjunction with all regularly scheduled valuations.

The developments of the gains or losses related to the actuarial liability and the assets are shown in Table 10. The results of our analysis of the financial experience of the System in the three most recent regular actuarial valuations are presented in Table 11. Each gain or loss shown represents our estimate of how much the given type of experience caused the Unfunded Actuarial Accrued Liability or Funding Reserve to change in the period since the previous actuarial valuation.

Gains and losses shown due to demographic sources are approximate. Demographic experience is analyzed in greater detail in our periodic experience studies.

Non-recurring gains and losses result from changes in the actuarial assumptions and benefit improvements.

Table 10:
Analysis of Actuarial (Gains) or Losses*

A. ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Actuarial Accrued Liability as of June 30, 2020:	$ 666,098,580
2. Normal Cost for this Plan Year (Including Expenses):	12,486,294
3. Interest on items 1 and 2 [(1+2) x 7.65%]:	51,911,743
4. Benefit Payments for this Plan Year (Including Expenses):	(35,794,869)
5. Interest on item [4 x 7.65% x .5]:	(1,369,154)
6. Expected Actuarial Accrued Liability as of June 30, 2021:	$ 693,332,594
7. Changes due to:	
a. Assumption Changes:	0
b. Plan Amendments:	0
c. Funding Method:	0
d. Actuarial (Gain) / Loss:	$ 1,278,067
8. Actual Actuarial Accrued Liability as of June 30, 2021:	$ 694,610,661
9. Items Affecting Calculation of Actuarial Accrued Liability:	
a. Benefit provisions reflected in the unfunded accrued liability (see Appendix C)	
b. Actuarial assumptions and methods used to determine actuarial accrued liability (see Appendix B)	
B. ASSET (GAIN) / LOSS ANALYSIS	
1. Actuarial Value of Assets as of June 30, 2020:	$ 471,328,235
2. Interest on item [1 x 7.65%]:	36,056,610
3. Contributions for this Plan Year:	31,335,420
4. Interest on item [3. x 7.65% x .5]	1,198,580
5. Benefit Payments for this Plan Year (Including Expenses):	(35,794,869)
6. Interest on item [5. x 7.65% x .5]	(1,369,154)
7. Expected Actuarial Value of Assets as of June 30, 2021:	$ 502,754,822
8. Actuarial Value of Assets as of June 30, 2021:	$ 516,143,647
9. (Gain) / Loss:	$ (13,388,825)
C. UNFUNDED ACCRUED ACTUARIAL LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Accrued Actuarial Liability as of June 30, 2020:	$ 194,770,345
2. Normal Cost for this Plan Year (Including Expenses):	12,486,294
3. Contributions for this Plan Year:	(31,335,420)
4. Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]:	14,656,553
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2021:	$ 190,577,772
6. Changes due to:	
a. Assumption Changes:	0
b. Plan Amendments:	0
c. Funding Method:	0
d. Actuarial (Gain) / Loss:	$ (12,110,758)
7. Actual Unfunded Accrued Actuarial Liability as of June 30, 2021:	$ 178,467,014

* Effects related to gains are shown in parentheses. Numerical results are expressed as a (decrease) increase in the Unfunded Actuarial Accrued Liability (UAAL). Gains decrease the UAAL and losses increase the UAAL.

Table 11:
Historical Actuarial (Gains) or Losses*

(Dollar amounts in thousands)

	UAAL (Gain)/Loss		
	June 30, 2021	June 30, 2020	June 30, 2019
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	$ (13,388.8)	$ 3,720.1	$ 2,458.2
Pay Increases			
Pay increases were (less) greater than expected.	1,876.8	3,352.3	2,854.7
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	729.4	1,750.1	(1,829.4)
Disability Retirements			
Disability claims were (less) greater than expected	667.7	(900.0)	2,176.2
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	(221.3)	(209.0)	(196.4)
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	(510.5)	501.6	(82.2)
Death After Retirement			
Retirees (died younger) lived longer than expected	(260.4)	(4,204.6)	(1,606.1)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	(932.6)	(2,167.5)	(2,099.1)
Other			
Miscellaneous (gains) and losses	(71.1)	(33.2)	(166.3)
Total (Gain) or Loss During Period From Financial Experience	$ (12,110.8)	$ 1,809.8	$ 1,509.6
Non-Recurring Items.			
Changes in actuarial assumptions and methods	-	-	-
Changes in benefits caused a (gain) loss	-	-	-
Composite (Gain) Loss During Period	$ (12,110.8)	$ 1,809.8	$ 1,509.6

* Effects related to gains are shown in parentheses. Numerical results are expressed as a (decrease) increase in the Unfunded Actuarial Accrued Liability (UAAL). Gains decrease the UAAL and losses increase the UAAL.

A typical retirement plan faces many different risks, but the greatest risk is the inability to make benefit payments when due. If plan assets are depleted, benefits may not be paid which could create legal and litigation risk or the plan could become "pay as you go". The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world, risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. ASOP 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that is different than the actuarial assumptions.

The various risk factors for a given plan can have a significant impact – positive or negative – on the actuarial projection of liability and contribution rates.

There are a number of risks inherent in the funding of a defined benefit plan. These include:

- economic risks, such as investment return and price inflation;
- demographic risks such as mortality, payroll growth, aging population including impact of baby boomers, and retirement ages;
- contribution risk, i.e., the potential for contribution rates to be too high for the plan sponsor/employer to pay and
- external risks such as the regulatory and political environment.

There is a direct correlation between healthy, well-funded retirement plans and consistent contributions equal to the full actuarial contribution rate each year. The System is primarily funded by member and employer contributions to the trust fund, together with the earnings on these accumulated contributions. These contributions fund benefit accruals for current active members and administrative expenses. The remainder of the contributions amortizes the unfunded actuarial accrued liability. The contribution rates are set by state statute and intended to provide the needed amounts to fund the system over time. The purpose of the valuation is to determine if the fixed employer and member contributions are sufficient to fund the Plan. Due to the fixed nature of the contributions actuarial gains and losses are reflected in the amortization period. Generally, the largest source of actuarial gains and losses are caused by investment volatility. In addition, the unfunded liability is amortized as a level percentage of pay assuming payroll will grow by 3.50% per year. A key risk factor to the System's funding is that over time, the Statutory Contribution Rates will be insufficient to accumulate enough funds, with investment income, to fund the promised benefits. The funding insufficiency can be caused by amortization periods that are too long or by payroll not growing at the assumed rate.

The other significant risk factor for the System is investment return because of the volatility of returns and the size of plan assets compared to payroll. This is to be expected, given the underlying capital market assumptions and the System's asset allocation. To the extent market rates of interest affect the expected return on assets, there is a risk of change to the discount rate which determines the present value of liabilities and actuarial valuation results. Please see the summary of results of this report which demonstrates the sensitivity of valuation results to differing discount rates.

A key demographic risk for the Retirement System is improvements in mortality (longevity) greater than anticipated. While the actuarial assumptions reflect a margin for improvement in mortality experience these assumptions are refined every experience study, the risk arises because there is a possibility of some sudden shift, perhaps from a significant medical breakthrough that could quickly increase liabilities. Likewise, there is some possibility of a significant public health crisis that could result in a significant number of additional deaths in a short time period, which would also be significant, although more easily absorbed. While either of these events could happen, it represents a small probability and thus represents much less risk than the volatility associated with investment returns.

The exhibits on the following pages summarize some historical information that helps indicate how certain key risk metrics have changed over time. Many are due to the maturing of the retirement system.

Historical Asset Volatility Ratios
(in 1,000's)

As a retirement system matures, the size of the market value of assets increases relative to the covered payroll of active members, on which the System is funded. The size of the plan assets relative to covered payroll, sometimes referred to as the asset volatility ratio, is an important indicator of the contribution risk for the System. The higher this ratio, the more sensitive a plan's contribution rate is to investment return volatility. In other words, it will be harder to recover from investment losses with increased contributions.

Actuarial Valuation Date	Market Value of Assets	Estimated Plan Year Payroll	Asset Volatility Ratio
6/30/2015	335,057	45,162	7.42
6/30/2016	343,627	47,234	7.27
6/30/2017	384,062	48,604	7.90
6/30/2018	418,314	52,036	8.04
6/30/2019	439,778	54,282	8.10
6/30/2020	451,150	56,784	7.95
6/30/2021	568,215	59,217	9.60

The assets at June 30, 2021 are 960% of payroll, so underperforming the investment return assumption by 1.00% (i.e., earn 6.65% for one year) is equivalent to 9.60% of payroll. While the actual impact in the first year is mitigated by the asset smoothing method and amortization of the UAAL, this illustrates the risk associated with volatile investment returns.

Historical Cash Flows
(in 1,000's)

Plans with negative cash flows will experience increased sensitivity to investment return volatility. Cash flows, for this purpose, are measured as contributions less benefit payments and administrative expenses. If the System has negative cash flows and then experiences returns below the assumed rate, there are fewer assets to be reinvested to earn the higher returns that typically follow. While any negative cash flow will produce such a result, it is typically a negative cash flow of more than 5% of MVA that may cause significant concerns. The System had positive cash flow up until June 30, 2019 when cash flows switched from positive to negative.

Year End	Market Value of Assets (MVA)	Contributions	Benefit Payments	Net Cash Flow	Net Cash Flow as a Percent of MVA
6/30/2015	335,057	24,355	22,956	1,399	0.42%
6/30/2016	343,627	25,064	23,604	1,460	0.42%
6/30/2017	384,062	25,517	24,857	660	0.17%
6/30/2018	418,314	28,644	27,645	999	0.24%
6/30/2019	439,778	28,882	30,062	(1,180)	(0.27%)
6/30/2020	451,150	30,172	30,458	(286)	(0.06%)
6/30/2021	568,215	31,335	35,795	(4,460)	(0.78%)

Liability Maturity Measurement

Most public sector retirement systems have been in operation for many years. As a result, they have aging plan populations, and in some cases declining active populations, resulting in an increasing ratio of retirees to active members and a growing percentage of retiree liability. The retirement of the remaining baby boomers over the next decade is expected to further exacerbate the aging of the retirement system population. With more of the total liability residing with retirees, investment volatility has a greater impact on the funding of the system since it is more difficult to restore the system financially after losses occur when there is comparatively less payroll over which to spread costs. Below are two tables which demonstrate the ratio of the System's retiree liability compared to the total accrued liability and the ratio of the number of retirees and beneficiaries to the number of active members.

Year End	Retiree Liability (a)	Total Actuarial Accrued Liability (b)	Retiree Percentage (a) / (b)
6/30/2015	308,057,608	497,185,719	62.0%
6/30/2016	318,876,308	518,946,395	61.4%
6/30/2017	357,778,610	562,570,270	63.6%
6/30/2018	386,470,903	611,055,584	63.2%
6/30/2019	410,691,713	637,865,852	64.4%
6/30/2020	426,199,438	666,098,580	64.0%
6/30/2021	461,170,033	694,610,661	66.4%

Historical Member Statistics

Valuation Date June 30,	Number of Active	Number of Retired	Active/ Retired
2015	694	744	0.93
2016	762	768	0.99
2017	775	791	0.98
2018	787	812	0.97
2019	806	850	0.95
2020	829	870	0.95
2021	823	910	0.90

The assumptions and methods utilized in the valuation were developed in the six-year experience study for the period ending June 30, 2016.

Tables B-3 through B-6 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment.

Actuarial Cost Method

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the normal cost. The normal cost was first calculated for each individual member. The normal cost rate is defined to equal the total of the individual normal costs, divided by the total pay rate.

The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets and (b) the actuarial present value of future normal costs is called the UAAL. The UAAL is amortized as a level percentage of the projected salaries of present and future members of the System.

Records and Data

The data used in the valuation consists of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data has been supplied by the System and was accepted for valuation purposes without audit.

Replacement of Terminated Members

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the normal cost rates for active members will not vary with the termination of present members.

Administrative and Investment Expenses

The investment expenses of the System are assumed to be funded by investment earnings in excess of 7.65% per year.

Administrative expenses are assumed to equal 0.17% of payroll.

Valuation of Assets

The actuarial asset valuation method spreads asset gains and losses over four years. The expected return is determined each year based on the beginning of year market value and actual cash flows during the year. Any difference between the expected market value return and the actual market value return is recognized evenly over a period of four years.

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 7.65% per year net of investment expenses, compounded annually.

Interest on Member Contributions

Interest on member contributions is assumed to accrue at a rate of 2.75% per annum, compounded annually.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table B-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 3.50% annual rate of increase in the general wage level of the membership.

Service Retirement

Table B-3 shows the annual assumed rates of retirement for actives members meeting the service retirement eligibilities.

Disablement

The rates of disablement used in this valuation are illustrated in Table B-4.

Mortality

The mortality rates used in this valuation are illustrated in Table B-5. A written description of each table used is included in Table B-1.

There is sufficient margin in the current mortality tables for possible future improvement in mortality rates and that margin will be reviewed again when the next experience investigation is conducted.

Other Terminations of Employment

The rates of assumed future withdrawal from active service for reasons other than death, disability or retirement are shown for representative ages in Table B-6.

Benefits for Terminating Members

Members terminating with less than five years of service are assumed to request an immediate withdrawal of their contributions with interest. Table B-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service.

We estimated the present value of future benefits for terminated vested members based on the greater of the present value of their deferred benefit at age 60 or their available contribution account.

Probability of Marriage & Dependent Children

If death occurs in active status, all members are assumed to have an eligible surviving spouse with no dependent children. Female spouses are assumed to be three years younger the their male spouse.

Records with no Birth Date

New records with no birth date are assumed to be 37 years old. Records that are not new and have no birth date used the same birth date as the prior year's valuation.

Active Records with a Salary Less than $1,000

These members are included in the active headcounts, however the pay of these members is not included in the Valuation Projected Salaries summarized in Appendix D. The liability for these members is their accumulated member contributions payable on the valuation date.

Table B-1

Summary of Valuation Assumptions

I.	Economic assumptions	
	A. General wage increases	3.50%
	B. Investment return	7.65%
	C. Price inflation assumption	2.75%
	D. Growth in membership	0.00%
	E. Interest on member accounts	2.75%
	E. Administrative Expenses as a percentage of payroll	0.17%
II.	Demographic assumptions	
	A. Individual salary increase due to promotion and longevity	Table B-2
	B. Retirement	Table B-3
	C. Disablement	Table B-4
	D. Mortality among contributing members, service retired members, and beneficiaries. The tables include margins for mortality improvement which is expected to occur in the future. For Males and Females: RP 2000 Combined Employee and Annuitant Mortality Table projected to 2020 using Scale BB, set back one year for males.	Table B-5
	E. Mortality among disabled members For Males and Females: RP 2000 Combined Mortality Table.	Table B-5
	F. Other terminations of employment	Table B-6
	G. Probability of retaining membership in the System upon vested termination	Table B-7

Table B-2

Future Salaries

Years of Service	(a) Individual Merit & Longevity	(b) General Wage Increase	(1+(a))*(1+(b)) Total Salary Increase
1	6.60%	3.50%	10.33%
2	4.90	3.50	8.57
3	3.70	3.50	7.33
4	2.80	3.50	6.40
5	2.10	3.50	5.67
6	1.50	3.50	5.05
7	1.00	3.50	4.54
8	0.60	3.50	4.12
9	0.20	3.50	3.71
10 & Up	0.00	3.50	3.50

Table B-3

Retirement
Annual Rates

Age	Less than 20 Years of Service	20 or More Years of Service
Less than 50	0.0%	12.0%
50	0.0	15.0
51	0.0	15.0
52	0.0	15.0
53	0.0	15.0
54	0.0	15.0
55	0.0	20.0
56	0.0	20.0
57	0.0	20.0
58	0.0	20.0
59	0.0	20.0
60	0.0	20.0
61	0.0	20.0
62	0.0	100.0
63	0.0	100.0
64	0.0	100.0
65 & Over	100.0	100.0

Vested terminations are assumed to retire at their earliest unreduced eligibility.

15% of active members are assumed to enter the DROP for each of the first six years following DROP eligibility. These members are assumed to elect to participate in the DROP for five years.

Table B-4

Disablement
Annual Rates

Age	All Members
22	.00%
27	.25
32	.25
37	.50
42	.50
47	.50
52	.50
57	.50
62	.00

All disabilities are assumed to be permanent and without recovery.

Table B-5

Mortality
Annual Rates

	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
Age	Men	Women	Men	Women
25	0.0354%	0.0195%	0.0376%	0.0207%
30	0.0388	0.0249	0.0444	0.0264
35	0.0661	0.0447	0.0773	0.0475
40	0.0961	0.0665	0.1079	0.0706
45	0.1316	0.1058	0.1508	0.1124
50	0.1879	0.1578	0.2138	0.1676
55	0.3010	0.2458	0.3624	0.2717
60	0.5271	0.4135	0.6747	0.5055
65	0.9041	0.7624	1.2737	0.9706
70	1.4636	1.3151	2.2206	1.6742
75	2.5057	2.2077	3.7834	2.8106
80	4.2816	3.6037	6.4368	4.5879
85	7.3750	6.0833	11.0757	7.7446
90	13.0721	10.5549	18.3408	13.1682
95	21.7835	17.2452	26.7491	19.4509

Table B-6

Other Terminations of Employment
Among Members Not Eligible to Retire
Annual Rates

Years of Service	All Members
0	16.0%
1	13.0
2	11.0
3	9.0
4	7.0
5	7.0
6	7.0
7	7.0
8	5.0
9	5.0
10 & Over	2.0

Table B-7

Probability of Retaining Membership in the System Upon Vested Termination

Age	Probability of Retaining Membership
Under 35	40%
35	90
36	90
37	90
38	90
39	90
40	90
41	90
42	90
43	90
44	90
45	90
46	90
47	90
48	90
49	90
50 & Over	100

Family Composition
Female spouses are assumed to be three years younger than males. 100% of active members are assumed to be married. Actual marital characteristics are used for pensioners.

Vested Benefits for Termination Members
Vested benefits for members who terminated during years ending June 30, 2009 and later were estimated based upon compensation and service information in the census data. For members who terminated prior to June 30, 2008, vested benefits valued were the same as had been calculated by the prior actuary for the June 30, 2008 actuarial valuation.

Appendix C: Summary of Benefit Provisions

Service credit	• Service credit is used to determine the amount of a member's retirement benefit. • One month of service credit is earned for each month where the member is paid for 160 hours. This includes certain transferred and purchased service.
Membership service	• Membership service is used to determine eligibility for vesting, retirement or other benefits. • One month of membership service is earned for any month member contributions are made, regardless of the number of hours worked. • Eligible members in all systems may purchase service that counts toward membership service. • Additionally, eligible active and inactive Sheriffs' Retirement System (SRS) members may purchase 1 for 5 (additional) service that will count as membership service.
Contributions	• Member contributions are made through an "employer pick-up" arrangement which results in deferral of taxes on the contributions.
Compensation	• Compensation generally means all remuneration paid, excluding certain allowances, benefits, and lump sum payments. Compensation is specifically defined in law and differs amongst the systems. • Bonuses paid **on or after** July 1, 2013 to any member will not be treated as compensation for retirement purposes. No member or employer contributions will be paid on bonuses.
Withdrawal of employee contributions	• A member is eligible for a withdrawal of their contributions when they terminate service and are either not eligible for or have not taken a retirement benefit. • The member receives the accumulated member contributions, which consists of member contributions and regular interest. • Upon receipt of a refund of accumulated contributions a member's vested right to a monthly benefit is forfeited.
Member contributions interest credited (regular interest)	• Interest is credited to member accounts at the rates determined by the Board. • The current interest rate credited to member accounts is 0.55%.

Working Retiree Limitations

Applies to retirement system members who return **on or after** July 1, 2017 to covered employment in the system from which they retired. These limits already applied to SRS members before July 1, 2017.

- Members who return for **less than 480 hours** in a **calendar** year:
  - may not become an active member in the system; and
  - are subject to a $1 reduction in their retirement benefit for each $3 earned in excess of $5,000 in the calendar year.
- Members who return for **480 or more hours** in a **calendar** year;
  - must become an active member of the system;
  - will stop receiving a retirement benefit from the system; and
  - will be eligible for a second retirement benefit if they earn 5 or more years of service credit through their second employment.
- Employee, employer and state contributions apply as follows:
  - Employer contributions and state contributions (if any) must be paid on all working retirees;
  - Employee contributions must be paid on working retirees who return to covered employment for 480 or more hours in a calendar year.

NOTE: PERS has its own limits.

Second Retirement Benefit

Applies to retirement system members who return on or after July 1, 2017 to active service covered by the system from which they retired.

- If the member works more than 480 hours in a calendar year and accumulates less than 5 years of service credit before terminating again, the member:
  - is not awarded service credit for the period of reemployment;
  - is refunded the accumulated contributions associated with the period of reemployment;
  - starting the first month following termination of service, receives the same retirement benefit previously paid to the member; and
  - does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA in January immediately following second retirement.

- If the member works more than 480 hours in a calendar year and accumulates at least 5 years of service credit before terminating again, the member:
  - is awarded service credit for the period of reemployment;
  - starting the first month following termination of service, receives:

the same retirement benefit previously paid to the member; **and**

* a second retirement benefit for the period of reemployment calculated based on the laws in effect as of the member's rehire date; **and**

○ does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA:

* on the initial retirement benefit in January immediately following second retirement; **and**
* on the second retirement benefit starting in January after receiving that benefit for at least 12 months.

- A member who returns to covered service is **not** eligible for a disability benefit.

Refunds

- Terminating members eligible to retire may, in lieu of receiving a monthly retirement benefit, refund their accumulated contributions in a lump sum.
- Terminating members with accumulated contributions between $200 and $1,000 who wish to rollover their refund must do so within 90 days of termination of service.
- Trusts, estates, and charitable organizations listed as beneficiaries are entitled to receive only a lump sum payment.

Lump-sum payouts

- Effective July 1, 2017, lump sum payouts in all systems are limited to the member's accumulated contributions rather than the present value of the member's benefit.

Type of plan

- Multiple-employer cost sharing

Membership eligibility

- Police officers of first- and second-class cities, and
- Police officers of other cities with the state that adopt the plan, other than those cities which maintain a separate local police fund

Member contributions

Members **not electing** GABA:

- Hired **after** June 30, 1975 but **on or before** June 30, 1979: 7.0% of member's compensation
- Hired **after June 30, 1979** but **before** July 1, 1997: 8.5% of member's compensation
- Hired **on or after** July 1, 1997: 9.0% of member's compensation

Members **electing** GABA:

- 9.0% of member's compensation

Appendix C: Summary of Benefit Provisions

Employer contributions	• 14.41% of each member's compensation
State contributions	• 29.37% of each member's compensation
Compensation period used in benefit calculation	• FAC = Final Average Compensation • FAC is the average over the last 36 months (or shorter period of total service) of compensation paid to the member. • Hired **on or after** July 1, 2013: 110% annual cap on compensation considered as part of a member's FAC.
Service retirement eligibility and benefit formula	• **Age 50** with **5 years** of membership service, or • **Any age** with **20 years** of membership service • 2.5% of FAC x years of service credit
Second retirement eligibility and benefit formula	• **Re-employed** in a **MPORS position** and **at least age 50** **Re-calculated** using criteria below: • **Less than 20 years** of membership service: a. Initial retirement benefit will cease; b. The retiree becomes a vested active MPORS member; c. The member must repay all initial benefits received plus interest at the actuarially assumed rate of return; d. The second retirement will be based on total MPORS service; **and** e. The member will be treated as a new retiree who after having been retired at least 12 months, will receive a 3% GABA each year in January. This applies only to members who were GABA members initially. • **More than 20 years** of membership service: a. The initial retirement benefit will cease; b. The retiree becomes a vested active MPORS member; c. At second retirement the initial benefit resumes and a new benefit will be calculated on new service credit and FAC after re-employment; and d. The retiree will receive GABA on their first benefit in January immediately following second retirement but waits 12 months for GABA on the second retirement benefit. If not initially retired 12 months, the retiree will wait 12 months for GABA on both parts of benefit. This applies only to members who were GABA members initially.
Disability retirement eligibility and benefit formula	• Any active member • **Before completing 20 years** of membership service: 50% of FAC • **After completing 20 years or more** of membership service: 2.5% of FAC for each year of service credit

Appendix C: Summary of Benefit Provisions

Survivor's eligibility and benefit formula	• Any active member • **Before completing 20 years** of membership service: 50% of member's FAC • **After completing 20 years or more** of membership service: 2.5% of member's FAC for each year of service credit • Benefits are paid to the surviving spouse (or equally to dependent children if there is no surviving spouse or after a surviving spouse dies, for as long as they remain dependent children). • In the absence of a spouse or child, the accumulated contributions minus any benefits already paid will be paid to the member's designated beneficiary.
Vesting eligibility and benefit	• 5 years of membership service • Accrued normal retirement benefit, payable when eligible for retirement. • In lieu of a pension, a member may receive a refund of accumulated contributions. • Upon receipt of a refund of accumulated contributions, a member's vested right to a monthly benefit is forfeited.
Retirement benefits - Form of payment	• The normal form of payment is a life annuity, with 100% continuation after death to a surviving spouse. • If there is no surviving spouse, or after the death of a surviving spouse, benefits are paid to the dependent children, if any, for as long as they remain dependent children.
Post retirement benefit increases	• For retired members who became active members **on or after** July 1, 1997, **or** those who elected to be **covered under GABA** and who have been retired at least 12 months, a GABA will be made each year in January equal to 3%. • For retired members who were hired **prior to** July 1, 1997 **and** who did **not elect GABA**, the minimum benefit adjustment provided should not be less than 50% of the current base compensation of a newly confirmed police officer of the employer that last employed the member as a police officer.
Changes since last valuation	• None

MPORS Deferred Retirement Option Plan (DROP)

Eligibility	• 20 years of membership service
DROP period	• Maximum of five years. • Member may not receive membership service or service credit during the DROP Period.
Contributions	• State, employer and member contributions continue during the DROP Period and are made to the retirement system.
Disability	• If a member becomes disabled during the DROP Period, the member will not be eligible for MPORS disability benefits. • If the member must terminate service, the member's service retirement benefit will be paid to the member rather than to the member's monthly DROP Account. The member will also be eligible to receive the DROP Account.
Survivor benefit	• If a member dies before the end of the DROP Period, the surviving spouse or dependent children are entitled to receive a lump-sum payment equal to the member's DROP Benefit and a survivorship benefit equal to the benefit the member would have received had the member retired rather than elected to participate in the DROP. • If the member does not have a surviving spouse or dependent children, then the member's designated beneficiary receives the balance of the member's retirement account and a lump-sum payment of the member's DROP Benefit. • The DROP Benefit paid must include interest credited to the participant's account as follows: (a) through June 30, 2009, interest must be credited every fiscal year end at a rate reflecting the retirement system's annual investment earnings for the applicable fiscal year. (b) after June 30, 2009, interest must be credited every fiscal year end at the actuarially assumed rate of return. Proportionate interest must be credited for distributions taking place at other than a fiscal year end.

DROP benefit	• Member receives DROP accruals equal to the retirement benefit calculated at DROP commencement and added each month during the DROP Period, including any post retirement adjustments (GABA), plus interest reflecting the retirement system's annual investment earnings. • Effective July 1, 2009, the interest rate credited to DROP Accounts was changed to the actuarial assumed rate of 8%. • As a result of the experience study performed during fiscal year 2010, the interest rate credited to DROP Accounts was changed to the actuarial assumed rate of 7.75%. • As a result of the experience study performed during fiscal year 2017, the interest rate credited to DROP Accounts was changed to the actuarial assumed rate of 7.65%.
Changes in DROP since last valuation	• None

Valuation Data

This chart is presented for informational purposes only. The counts shown in the valuation line were used for preparation of the liabilities disclosed within this report. The counts disclosed for the Annual Financial Report and the Summary (page 1) match the CAFR at the request of the Board. The differences between counts, if any, have no material effect upon the liability calculation.

	Active	Disabled	Retirees and Beneficiaries	Terminated Vested Members	Terminated Non-Vested Members	Total
Participant Counts Used for Valuation	766	101	862	89	199	2,017
Disabled Members having attained normal retirement age		(77)	77			
Beneficiaries of Disabled Members						
Beneficiaries with less than one year of certain payments remaining						
DROP Members	53		(53)			
Other Adjustments	4			18		22
Participant Counts shown in the Annual Financial Report	823	24	886	107	199	2,039

This valuation is based upon the membership of the System as of June 30, 2021. Membership data were supplied by the System and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data was sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Summary on page 1. The valuation projected salaries to be paid for the following fiscal year, whereas the Summary, salaries are applicable in the year ending on the valuation date.

Active Members	Number	Valuation Projected Salaries
Full-Time Members	705	$ 52,658,795
Part-Time Members	61	$ 1,685,088
Total Active Members*	766	$ 54,343,883

* Data from the 53 DROP participants are excluded from the table above.

Table D-1 contains summaries of the data for active members. For full-time members, values shown in the tables are the numbers of members and their total and average annual salaries. For part-time members, only the numbers of members are shown.

Table D-2 presents distributions of the following:

- Members receiving service retirement benefits.
- Members receiving disability retirement benefits.
- Survivors of deceased retired members receiving benefits.
- Survivors of deceased active members.
- Terminated vested members.

Table D-3 is a reconciliation of membership data from June 30, 2020 to June 30, 2021.

Appendix D: Valuation Data

The following is a summary of retired members and beneficiaries currently receiving benefits. The chart reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 48 for an explanation of the number of annuitants used for valuation purposes.

Type of Annuitant	Number	Annual Benefits	Average Annual Benefits
Service Retirement	648	$ 22,414,591	$ 34,590
DROP Members	53	2,758,448	52,046
Total Service Retired Members	701	$ 25,173,039	$ 35,910
Survivors of Deceased Retired Members	132	4,235,817	32,090
Survivors of Deceased Active Members	29	853,711	29,438
Total Survivors and Beneficiaries	161	$ 5,089,528	$ 31,612
Disability Retirement	101	3,094,505	30,639
Total Annuitants	963	$ 33,357,072	$ 34,639

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	89
Non-Vested Terminated Members	199
Total Terminated Members	288

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2021

Number of Employees

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	7	17	5		1								30
25 to 29	18	14	18	32	21								103
30 to 34	10	14	26	34	49	19							152
35 to 39	5	12	10	13	50	54	12						156
40 to 44	3	4	6	8	19	33	26	4					103
45 to 49	2	1	3	2	11	25	27	11	1				83
50 to 54		2	3	5	4	8	17	13	3				55
55 to 59	1	1	1		3	2	5	3	1				17
60 to 64							2	1					3
65 to 69							1			1			2
70 and up							1						1
Totals	46	65	72	94	158	141	91	32	5	1		-	705

Data for the 53 DROP participants are excluded from the table above.

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2021

Annual Salaries in Thousands

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	410	988	290		54								1,742
25 to 29	1,089	842	1,139	2,164	1,596								6,831
30 to 34	649	943	1,708	2,224	3,699	1,557							10,779
35 to 39	277	768	669	752	3,643	4,558	1,124						11,792
40 to 44	134	282	367	573	1,258	2,767	2,341	339					8,062
45 to 49	112	73	227	95	828	1,962	2,445	1,063	91				6,896
50 to 54		203	189	324	298	704	1,474	1,175	355				4,723
55 to 59	85	50	50		168	168	440	262	106				1,329
60 to 64							121	63					185
65 to 69							90			100			191
70 and up							129						129
Totals	2,755	4,150	4,639	6,133	11,545	11,717	8,165	2,902	553	100		-	52,659

Data for the 53 DROP participants are excluded from the table above.
The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2021

Average Annual Salary

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	58,535	58,110	58,068		54,394								58,078
25 to 29	60,484	60,178	63,301	67,628	76,009								66,319
30 to 34	64,880	67,332	65,679	65,412	75,492	81,957							70,917
35 to 39	55,398	64,035	66,856	57,829	72,869	84,413	93,697						75,589
40 to 44	44,692	70,539	61,214	71,655	66,198	83,858	90,041	84,675					78,268
45 to 49	55,870	73,277	75,527	47,729	75,313	78,472	90,548	96,607	91,246				83,084
50 to 54		101,745	63,042	64,802	74,585	88,046	86,680	90,417	118,371				85,880
55 to 59	84,983	49,654	50,239		55,837	84,084	87,980	87,299	106,488				78,167
60 to 64							60,749	63,344					61,614
65 to 69							90,403			100,174			95,289
70 and up							128,984						128,984
Totals	59,892	63,846	64,433	65,240	73,071	83,100	89,720	90,689	110,570	100,174			74,693

Data for the 53 DROP participants are excluded from the table above.
The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

Table D-1:
Active Members Distribution of
Part-Time Employees
as of June 30, 2021

Number of Employees

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	12	1											13
25 to 29	14				2								16
30 to 34	5	2		2	1								10
35 to 39	4	3			3								10
40 to 44	3	2		1	1								7
45 to 49	2	1											3
50 to 54		1		1									2
55 to 59													-
60 to 64													
65 to 69													
70 and up													
Totals	40	10	-	4	7	-	-	-					61

Table D-2:
Distribution of Inactive Lives

Please refer to the chart on page 48 for an explanation of the number of annuitants used for valuation purposes.

Members Receiving Service Retirement Benefits as of June 30, 2021

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	23	$ 918,965	$ 39,955
50 to 54	98	3,227,626	32,935
55 to 59	111	3,399,694	30,628
60 to 64	109	3,624,224	33,250
65 to 69	112	3,856,054	34,429
70 to 74	102	4,141,153	40,600
75 to 79	46	1,752,867	38,106
80 to 84	23	741,847	32,254
85 to 89	15	452,643	30,176
90 and up	9	299,518	33,280
Totals	648	$ 22,414,591	$ 34,590

Members Receiving Disability Retirement Benefits as of June 30, 2021

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	24	$ 839,669	$ 34,986
50 to 54	18	590,410	32,801
55 to 59	12	384,064	32,005
60 to 64	7	199,461	28,494
65 to 69	14	373,919	26,708
70 to 74	13	357,268	27,482
75 to 79	4	104,562	26,141
80 to 84	7	187,286	26,755
85 to 89	1	32,274	32,274
90 and up	1	25,592	25,592
Totals	101	$ 3,094,505	$ 30,639

Table D-2:
Distribution of Inactive Lives

Please refer to the chart on page 48 for an explanation of the number of annuitants used for valuation purposes.

Survivors of Deceased Retired Members as of June 30, 2021

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	3	$ 106,058	$ 35,353
50 to 54	1	35,214	35,214
55 to 59	7	249,724	35,675
60 to 64	5	133,637	26,727
65 to 69	16	531,383	33,211
70 to 74	25	763,888	30,556
75 to 79	19	703,130	37,007
80 to 84	21	635,136	30,245
85 to 89	19	587,850	30,939
90 and up	16	489,797	30,612
Totals	132	$ 4,235,817	$ 32,090

Survivors of Deceased Active Members as of June 30, 2021

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<45	4	$ 90,175	$ 22,544
45 to 49	2	68,532	34,266
50 to 54	1	39,187	39,187
55 to 59	2	55,113	27,557
60 to 64	5	147,547	29,509
65 to 69	2	56,997	28,499
70 to 74	6	191,214	31,869
75 to 79	1	27,040	27,040
80 to 84	1	43,949	43,949
85 to 89	3	83,491	27,830
90 and up	2	50,466	25,233
Totals	29	$ 853,711	$ 29,438

Table D-2:
Distribution of Inactive Lives

Please refer to the chart on page 48 for an explanation of the number of annuitants used for valuation purposes.

DROP Members as of June 30, 2021

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	8	$ 428,459	$ 53,557
50 to 54	27	1,462,449	54,165
55 to 59	10	472,623	47,262
60 to 64	8	394,917	49,365
65 to 69	-	-	-
70 to 74	-	-	-
75 to 79	-	-	-
80 to 84	-	-	-
85 to 89	-	-	-
90 and up	-	-	-
Totals	53	$ 2,758,448	$ 52,046

Terminated Vested Members as of June 30, 2021
Number of Persons

Age	Number
<25	
25 to 29	1
30 to 34	12
35 to 39	21
40 to 44	32
45 to 49	16
50 to 54	5
55 to 59	2
60 to 64	
65 to 69	
70 and above	
Total	89

Table D-3:
Data Reconciliation

The following table shows a reconciliation of the participants used in the previous valuation to this valuation. This chart reflects the counts used for valuation purposes as a result of data processing.

	Active Members*	Terminated Vested Members	Service Retired Members**	Disabled Members	Survivors and Beneficiaries
June 30, 2020 Valuation	761	79	680	99	157
Refunds and Non-Vested Terminations	(41)	(3)		2	(7)
Vested Terminations	(21)	21			
Service Retirements	(18)	(6)	24		
Disability Retirements	(2)	(2)		2	
Deaths			(10)	(2)	(4)
New Entrants	86				15
Rehires	1				
Other			7		
June 30, 2021 Valuation	766	89	701	101	161

* Excludes members in DROP
** Includes members in DROP

Comparative Schedules

This section contains tables that summarize the experience of the System shown in present and past valuation reports.

Table E-1 shows a summary of the active members covered as of the various valuation dates.

Table E-2 shows a summary of the retired and inactive members as of the various valuation dates.

Table E-3 summarizes the contribution rates determined by each annual actuarial valuation.

Table E-1:
Active Membership Data

Valuation Date June 30,	Actives	Annual Salaries in Thousands	Average Annual Salary	Average Age	Average Years of Service	Average Hire Age
2021*	823	59,217	71,952	38.8	8.7	30.1
2020*	829	56,784	68,497	38.9	8.8	30.1
2019*	806	54,282	67,348	39.0	9.0	30.0
2018*	787	52,036	66,119	39.3	9.4	29.9
2017*	775	48,604	62,715	38.2	8.5	29.5
2016*	762	47,234	61,987	38.4	8.6	29.8
2015	694	45,162	60,783	38.7	8.8	29.9
2014	743	44,454	59,830			
2013	734	42,324	57,662			
2012	701	41,584	56,500			

* Includes members in DROP

Table E-2:
Retired and Inactive Membership Data

Valuation Date June 30,	Number	All Annuitants: Annual Benefits in Thousands	All Annuitants: Average Annual Benefit	All Annuitants: Average Current Age	All Annuitants: Average Age at Retirement	All Annuitants: Average Service at Retirement	Terminated Members: Number Vested Terminated	Terminated Members: Number Non-Vested Terminated
2021*	910	30,599	33,625	61.3	49.9	21.0	89	199
2020*	870	28,196	32,409	65.8	49.9	21.0	79	181
2019*	850	26,903	31,650	65.6	49.8	21.1	77	164
2018*	812	25,032	30,827	65.9	48.9	18.4	78	153
2017*	791	23,809	30,099	65.8	47.5	18.6	75	143
2016*	768	22,539	29,347	66.0	47.4	19.0	61	112
2015	744	21,203	28,499	66.6	47.9	19.4	60	103
2014	716	19,815	27,675				55	90
2013	710	18,948	26,687				52	77
2012	676	17,665	26,132				49	76

* Retired members excludes members in DROP

Table E-3:
Contribution Rates

Valuation Date June 30,	Contribution Rates			Normal Cost Rate*	UAAL Rate**
	Employee	Employer/State	Total		
2021	9.00 %	43.78 %	52.78 %	25.95 %	26.83 %
2020	9.00	43.78	52.78	25.75	27.03
2019	9.00	43.78	52.78	25.92	26.86
2018	9.00	43.78	52.78	26.01	26.77
2017	9.00	43.78	52.78	25.70	27.08
2016	9.00	43.78	52.78	27.92	24.86
2015	9.00	43.78	52.78	26.04	26.74
2014	9.00	43.78	52.78	25.85	26.93
2013	9.00	43.78	52.78	26.29	26.49
2012	9.00	43.78	52.78	26.26	26.52

* Includes administrative expenses starting with the 2014 Valuation Date
** The UAAL rate is the amount available to amortize the UAAL. It is equal to the total contribution rate, minus the normal cost rate.

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2021. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2021
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	15 Years
Asset valuation method	Four-year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.65%
General wage growth*	3.50%
Merit salary increases	0.0% - 6.6%
*Includes inflation	2.75%

Gain and Loss in Accrued Liability During Years Ended June 30 Resulting from Differences Between Assumed Experience and Actual Experience						
	Gain or (Loss) for Year Ending June 30, (expressed in thousands)					
Type of Activity	2016	2017	2018	2019	2020	2021
Investment Income on Actuarial Value of Assets	$ 2,022	$ 922	$ (3,238)	$ (2,458)	$ (3,720)	$ 13,389
Combined Liability Experience	4,379	(485)	(21,525)	949	1,910	(1,278)
(Loss)/Gain During Year from Financial Experier	$ 6,401	$ 437	$ (24,763)	$ (1,510)	$ (1,810)	$ 12,111
Non-Recurring Items	0	(16,473)	0	0	0	0
Composite Gain or (Loss) During Year	$ 6,401	$ (16,037)	$ (24,763)	$ (1,510)	$ (1,810)	$ 12,111

Schedule of Funding Progress (expressed in thousands)						
Valuation Date June 30,	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2021	$ 516,144	$ 694,611	74%	$ 178,467	$ 59,217	301%
2020	471,328	666,099	71%	194,770	56,784	343%
2019	441,565	637,866	69%	196,300	54,282	362%
2018	413,608	611,056	68%	197,448	52,036	379%
2017	386,259	562,570	69%	176,311	48,604	363%
2016	356,985	518,946	69%	161,961	47,234	343%

Solvency Test
Aggregate Accrued Liabilities for
(expressed in thousands)

Valuation Date June 30,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets (1)	(2)	(3)
2021	$ 42,904	$ 447,236	$ 204,471	$ 516,144	100%	100%	13%
2020	42,767	412,367	210,964	471,328	100%	100%	8%
2019	43,542	397,171	197,153	441,565	100%	100%	0%
2018	43,686	374,355	193,014	413,608	100%	99%	0%
2017	42,364	346,374	173,832	386,259	100%	99%	0%
2016	38,543	308,635	171,768	356,985	100%	100%	6%

The following definitions are largely excerpts from a list adopted in 1981 by the major actuarial organizations in the United States. In some cases the definitions have been modified for specific applicability to the Municipal Police Officers' Retirement System. Defined terms are capitalized throughout this Appendix.

Accrued Benefit

The amount of an individual's benefit (whether or not vested) as of a specific date, determined in accordance with the terms of a pension plan and based on compensation and service to that date.

Actuarial Accrued Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disablement, and retirement; changes in compensation, rates of investment earnings, and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; and other relevant items.

Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Gains and Loss

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Valuation

The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

Amortization Payment

That portion of the pension plan contribution which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Entry Age Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

Market Value of Assets

The fair value of cash, investments and other property belonging to a pension plan that could be acquired by exchanging them on the open market.

Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Projected Benefits

Those pension plan benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits.

Unaccrued Benefit

The excess of an individual's Projected Benefits over the Accrued Benefits as of a specified date.

Unfunded Actuarial Accrued Liability

The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.