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Public Employees' Retirement System of the State of Montana

MPERA
MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

Actuarial Valuation
As of June 30, 2022

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Cavanaugh Macdonald
CONSULTING, LLC
The experience and dedication you deserve

September 26, 2022

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 Public Employees' Retirement System of the State of Montana (PERS), prepared as of June 30, 2022.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2022. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rate reflecting all anticipated contribution increases are sufficient to amortize the unfunded accrued liability within a 32-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 3.25% 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 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.

This is to certify that the undersigned 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

Bryan Hoge, FSA, EA, FCA, MAAA
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Senior Actuary

Public Employees' 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, 2022	June 30, 2021
Active Members	28,508	29,028
Retirees and Beneficiaries	25,026	24,276
Disabled Members*	102	127
Terminated Vested Members	4,790	4,390
Terminated Non-Vested Members	23,110	21,760
Total**	81,536	79,581
Covered Payroll of Active Members	$ 1,349,882,543	$ 1,361,589,739
Average Salaries from Covered Payroll	$ 47,351	$ 46,906
Annual Retirement Allowances for Retired Members and Beneficiaries	$ 516,970,781	$ 484,770,107
Assets		
Actuarial value	$ 6,770,813,514	$ 6,514,976,330
Market value	6,648,898,896	7,210,026,882
Actuarial Accrued Liability (AAL)	$ 9,026,784,090	$ 8,534,628,711
Unfunded Actuarial Accrued Liability (UAAL)	$ 2,255,970,576	$ 2,019,652,381
Funded Ratio	75.01%	76.34%
Market Value Rate of Return	(4.18%)	27.80%
Annual Cost		
Statutory Funding Rate	16.97%	16.87%
Total Normal Rate	9.72%	9.71%
Employee Contribution Rate	7.90%	7.90%
Employer Normal Rate	1.82%	1.81%
Employer Contribution Rate		
Normal Rate	1.82%	1.81%
Administrative Expense Load	0.00%	0.29%
UAAL Rate	7.21%	6.83%
Transfer to DB Education Fund	0.04%	0.04%
Total Rate***	9.07%	8.97%
Amortization Period****	32 years	28 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	1.82%	1.81%
Administrative Expense Load	0.00%	0.29%
UAAL Rate (30-Year Rate)****	7.43%	6.42%
Transfer to DB Education Fund	0.04%	0.04%
Total Rate	9.29%	8.56%
Shortfall/(Surplus)	0.22%	(0.41%)

* Based on PERS categorization for the annual report. For actuarial purposes, 513 members in 2021 and 497 members in 2022 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.

*** The rates shown are for the fiscal year immediately following the valuation date. The schedule on page 3 highlights the statutory contribution rates payable in each fiscal year including scheduled increases.

**** Reflects anticipated increases in employer contribution rates and General Fund Revenue.

As a result of this actuarial valuation of the benefits in effect under the Public Employees' Retirement System as of June 30, 2022, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 32 years. The Funded Ratio is 75.01%.

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, 2022, market value of assets is $121,914,618 less 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 34 years, and the Funded Ratio would be 73.66%.

Additional Details

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.

MCA 19-3-316 requires each employer to contribute 6.90% of total compensation paid to all members employed in a PERS reportable position. This amount increased by 1.27% for fiscal year 2014 and will increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 9.17% of member compensation. The employer contribution increases may terminate on January 1 following the board's receipt of the system's actuarial valuation if the actuarial valuation determines that terminating the additional employer contribution would not cause the amortization period of the unfunded actuarial accrued liability to exceed 25 years.

MCA 19-3-315 requires each member to contribute 7.90% compensation. Each member's contribution must be reduced to 6.90% on January 1 following the system's annual actuarial valuation if the valuation determines that reducing the employee contribution and reducing the employer contribution would not cause the system's amortization period of the unfunded actuarial accrued liability to exceed 25 years.

HB 648 and HB 2 requires the State statutory appropriation from the state to be $33,035,000 for the fiscal year beginning July 1, 2017, and $33,615,000 for the fiscal year beginning July 1, 2018. Starting in the fiscal year beginning July 1, 2019, the state will contribute 101% of the previous year's contribution.

Beginning July 1, 2013, employers who hire PERS retirees who work less than 960 hours in the calendar year, but do not become active members, contribute the employer's contribution rate on the working retiree's compensation.

The table below summarizes the legislated contribution increases for both the members and the employers.

History of Legislated Contributions
(as a Percent of Pay)

	Members	Employers
July 1, 1999 to June 30, 2007	6.90%	6.90%
July 1, 2007 to June 30, 2009	6.90	7.035
July 1, 2009 to June 30, 2013	6.90	7.17
July 1, 2013 to June 30, 2014	7.90	8.17
July 1, 2014 to June 30, 2015	7.90	8.27
July 1, 2015 to June 30, 2016	7.90	8.37
July 1, 2016 to June 30, 2017	7.90	8.47
July 1, 2017 to June 30, 2018	7.90	8.57
July 1, 2018 to June 30, 2019	7.90	8.67
July 1, 2019 to June 30, 2020	7.90	8.77
July 1, 2020 to June 30, 2021	7.90	8.87
July 1, 2021 to June 30, 2022	7.90	8.97
July 1, 2022 to June 30, 2023	7.90	9.07
July 1, 2023 to June 30, 2024	7.90	9.17

Based on MCA 19-3-1605, for Members hired on or after July 1, 2013, the GABA as of January 1st will be 1.50%, but must be reduced if the funded ratio is less than 90% as of the prior actuarial valuation date. The funded ratio for this purpose is 75.01%. For each full 2% that the unrounded funded ratio is less than 90%, the GABA must be reduced by 0.1%. As a result, the Guaranteed Annual Benefit Adjustment (GABA) rate for those hired on or after July 1, 2013, is 0.80%. In addition, if the amortization period of the unfunded actuarial accrued liability is equal to or exceeds 40 years, the GABA for members hired on or after July 1, 2013, would be equal to 0.00%, regardless of the funded ratio. Since the System amortizes within 32 years which is less than 40 years, the GABA for members hired on or after July 1, 2013 will be 0.80%.

Investment Experience

The market assets earned (4.18)% net of investment and operating expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 8.16%, which is 0.51% greater than the expected return 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
7/1/2012 to 6/30/2013	12.99%	11.91%	7.75%	5.24%	4.16%
7/1/2013 to 6/30/2014	17.12	13.21	7.75	9.37	5.46
7/1/2014 to 6/30/2015	4.60	9.63	7.75	(3.15)	1.88
7/1/2015 to 6/30/2016	2.02	9.27	7.75	(5.73)	1.52
7/1/2016 to 6/30/2017	11.93	8.08	7.75	4.18	0.33
7/1/2017 to 6/30/2018	8.90	6.69	7.65	1.25	(0.96)
7/1/2018 to 6/30/2019	5.65	7.06	7.65	(2.00)	(0.59)
7/1/2019 to 6/30/2020	2.73	7.11	7.65	(4.92)	(0.54)
7/1/2020 to 6/30/2021	27.80	10.76	7.65	20.15	3.11
7/1/2021 to 6/30/2022	(4.18)	8.16	7.65	(11.83)	0.51

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

Recent Contribution Increases

MCA 19-3-316 and MCA 19-3-315 dictate that employers and members are required to make supplemental contributions until the January 1st following an actuarial valuation shows the unfunded actuarial accrued liability can be amortized over a period of no more than 25 years (without considering the supplemental employee and employer contributions). The individual employers are required to contribute an additional 1.27% of compensation. The employer contribution shall increase by an additional 0.10% each year following June 30, 2013, until the total employer supplemental contribution is equal to 2.27% of compensation.

Each member's contribution must be reduced to 6.90% on January 1 following the system's annual actuarial valuation if the valuation determines that reducing the employee contribution would not cause the system's amortization period to exceed 25 years.

Amortization of the UAAL

The June 30, 2021 actuarial valuation calculated a 28-year amortization period for the UAAL. The resulting amortization period at June 30, 2022 is 32 years. The amortization period anticipates future increases in employer supplemental contributions and future General Fund Revenue as projected by the Office of Budget and Program Planning.

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, 2022 is 32 years based on actuarial value of assets. The contributions provided for in statute are not sufficient to fully amortize the unfunded actuarially accrued liability within 30 years.
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 contributions provided for in statute are not sufficient to fully amortize the unfunded actuarially accrued liability within a 30-year period. It is important to note, that the normal cost rate for new hires is lower than the current active population. As members terminate or retire, and are replaced with a member with a lower normal cost rate, more of the employer contribution will be available to amortize the unfunded accrued liability. As a result the effective amortization period is less than the amortization period calculated in the actuarial valuation which does not reflect new hires.
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.

State Debt

Under HB 553, passed during the 2019 Legislative Session, the amount of pension system debt that amortizes over 30 years is to be included in the definition of “state debt”. The funding period for the current valuation is 32 years, so a state debt amount must be disclosed. Assuming a one-time payment is made on January 1, 2023, the state debt is $52.7 million. Based on the current valuation, this payment would reduce the funding period to 30 years.

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 7.30%	75.01%	32 Years	$121.7
Higher Assumption 8.30%	83.12%	12 Years	56.0
Increase / (Decrease)	8.11%	(20) Years	$ (65.7)

Impact of Assuming 0.5% Higher Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.30%	75.01%	32 Years	$121.7
Higher Assumption 7.80%	79.03%	19 Years	88.0
Increase / (Decrease)	4.02%	(13) Years	$ (33.7)

Impact of Assuming 0.5% Lower Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.30%	75.01%	32 Years	$121.7
Lower Assumption 6.80%	71.06%	59 Years	153.5
Increase / (Decrease)	(3.95)%	27 Years	$ 31.8

Impact of Assuming 1.0% Lower Investment Return			
	Funded Ratio	Amortization Period	Actuarially Determined Employer Contribution (Millions $)
Current Assumption 7.30%	75.01%	32 Years	$121.7
Lower Assumption 6.30%	67.19%	Does not amortize	190.2
Increase / (Decrease)	(7.82)%	N/A	$ 68.5

*Amounts reflect estimated increase/(decrease) in FY2022 employer contributions in order to maintain 32 year amortization.

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

Since the June 30, 2021 valuation, the Montana Public Employee Retirement Administration (MPERA) adopted the recommendations made in the experience study for the five-year period ending June 30, 2021. The assumption changes outlined below are effective July 1, 2022:

- Lowered the investment return assumption from 7.65% to 7.30%.
- Updated all mortality tables to the PUB2010 tables for general employees.
- Updated the rates of withdrawal, retirement and disability.
- Lowered the payroll growth assumption from 3.50% to 3.25%.

Benefit Changes

There have been no benefit changes since the previous valuation.

Contribution Changes

An employer supplemental contribution of 1.27% of compensation is required beginning in fiscal year 2014 which will increase by 0.10% each subsequent fiscal year through 2024. For fiscal years beginning after June 30, 2024, the supplemental employer contribution will equal 2.27% of compensation.

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, 2021 Actuarial Valuation. Further detail can be found in Tables 10 and 11.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2021 Valuation UAAL	$2,019,652,381
Normal Cost (Including Expenses)	122,998,698
Contributions	(266,891,492)
Interest	153,704,208
Expected June 30, 2022 UAAL	$2,029,463,795
Experience (Gain) / Loss on Actuarial Liabilities	$(37,112,163)
Experience (Gain) / Loss on Actuarial Assets	(32,812,348)
Assumption & Method Changes	296,431,292
Plan Changes	0
Total (Gain) / Loss	$226,506,781
June 30, 2022 Valuation UAAL	$2,255,970,576

Summary

- The System's actuarial value investment return of 8.16% for the year ended June 30, 2022 is 0.51% greater than the expected return of 7.65%. This represents an asset gain of $32,812,348 due to investment return being more than anticipated. As of June 30, 2022, the market value of assets was $6,648,898,896. As of June 30, 2022, the actuarial value of assets was $6,770,813,514. The June 30, 2022 market value of assets will be recognized in future actuarial valuations unless it is offset by returns greater than the 7.30% assumption.

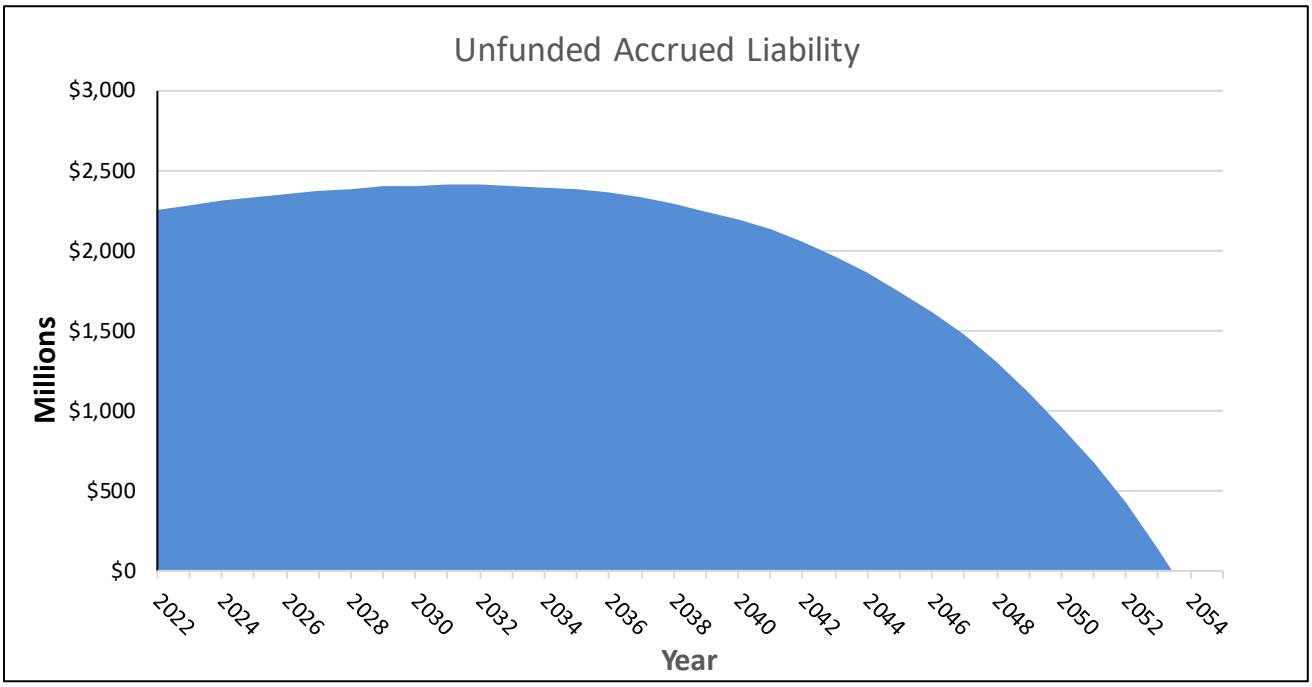
- As of June 30, 2022, the amortization period of the UAAL is 32 years. Prior to this valuation, the funding period was 28 years. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period does not exceed 30 years.

- 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 7.30% 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 3.25%.

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 32 years. The ultimate goal of the System is to achieve a well-funded status with a range of safety to absorb market volatility without creating an unfunded 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, 2022. 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,

	2022	2021
ASSETS		
Cash and Short Term Investments	$ 74,471,066	$ 83,221,651
Securities Lending Collateral	$ 67,988,359	$ 41,244,577
Receivables:		
Interest Receivable	$ 71,557	$ 6,196
Accounts Receivable	2,612,498	2,718,591
Due from Other Funds	848,360	1,734,326
Due from Primary Government	-	-
Notes Receivable	5,874	7,558
OPEB Def Outflow of Resources	250,096	274,933
Total Receivables	$ 3,788,385	$ 4,741,604
Investments, at fair value:		
Investment Pools	6,571,252,176	7,122,359,943
Other Investments	-	-
Total Investments	$ 6,571,252,176	$ 7,122,359,943
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	$ 48,027	$ 58,251
Intangible Assets, at cost, net of Amortization Expense	3,300,279	846,416
Total Capital Assets	$ 3,348,306	$ 904,667
TOTAL ASSETS	$ 6,720,848,292	$ 7,252,472,442
LIABILITIES		
Securities Lending Liability	$ 67,988,359	$ 41,244,577
Accounts Payable	3,097,361	429,351
Unearned Revenue	59,675	51,620
Due to Other Funds	-	-
Compensated Absences	410,320	349,957
OPEB Def Inflow of Resources	115,171	35,666
OPEB Implicit Rate Subsidy LT	278,510	334,389
TOTAL LIABILITIES	$ 71,949,396	$ 42,445,560
NET POSITION-RESTRICTED FOR PENSION BENEFITS	$ 6,648,898,896	$ 7,210,026,882

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

	2022	2021
ADDITIONS		
Contributions:		
Employer	$ 120,533,342	$ 121,135,718
Plan Member	110,597,557	111,246,724
Other	35,760,593	35,389,005
Total Contributions	$ 266,891,492	$ 267,771,447
Misc Income	$ -	$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	$ (248,521,436)	$ 1,633,349,863
Investment Earnings	293,484	180,633
Security Lending Income	715,690	499,975
Investment Income/(Loss)	$ (247,512,262)	$ 1,634,030,471
Investment Expense	(48,232,987)	(40,822,219)
Security Lending Expense	(157,248)	(98,134)
Net Investment Income/(Loss)	$ (295,902,497)	$ 1,593,110,118
Total Additions	$ (29,011,005)	$ 1,860,881,565
DEDUCTIONS		
Benefit Payments	$ 509,232,157	$ 476,443,132
Refunds/Distributions	15,343,596	12,712,759
Refunds to Other Plans	194,392	221,765
Transfers to DCRP	2,385,425	2,328,041
Transfers to MUS-RP	230,772	263,455
OPEB Expense	42,253	25,231
Administrative Expense	4,688,857	4,397,338
Total Deductions	$ 532,117,452	$ 496,391,721
NET INCREASE (DECREASE) IN PLAN NET ASSETS	$ (561,128,457)	$ 1,364,489,844
NET POSITION-RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR	$ 7,210,026,882	$ 5,845,474,024
ADJUSTMENT	471	63,014
END OF YEAR	$ 6,648,898,896	$ 7,210,026,882

Table 3:
Determination of Actuarial Value of Assets

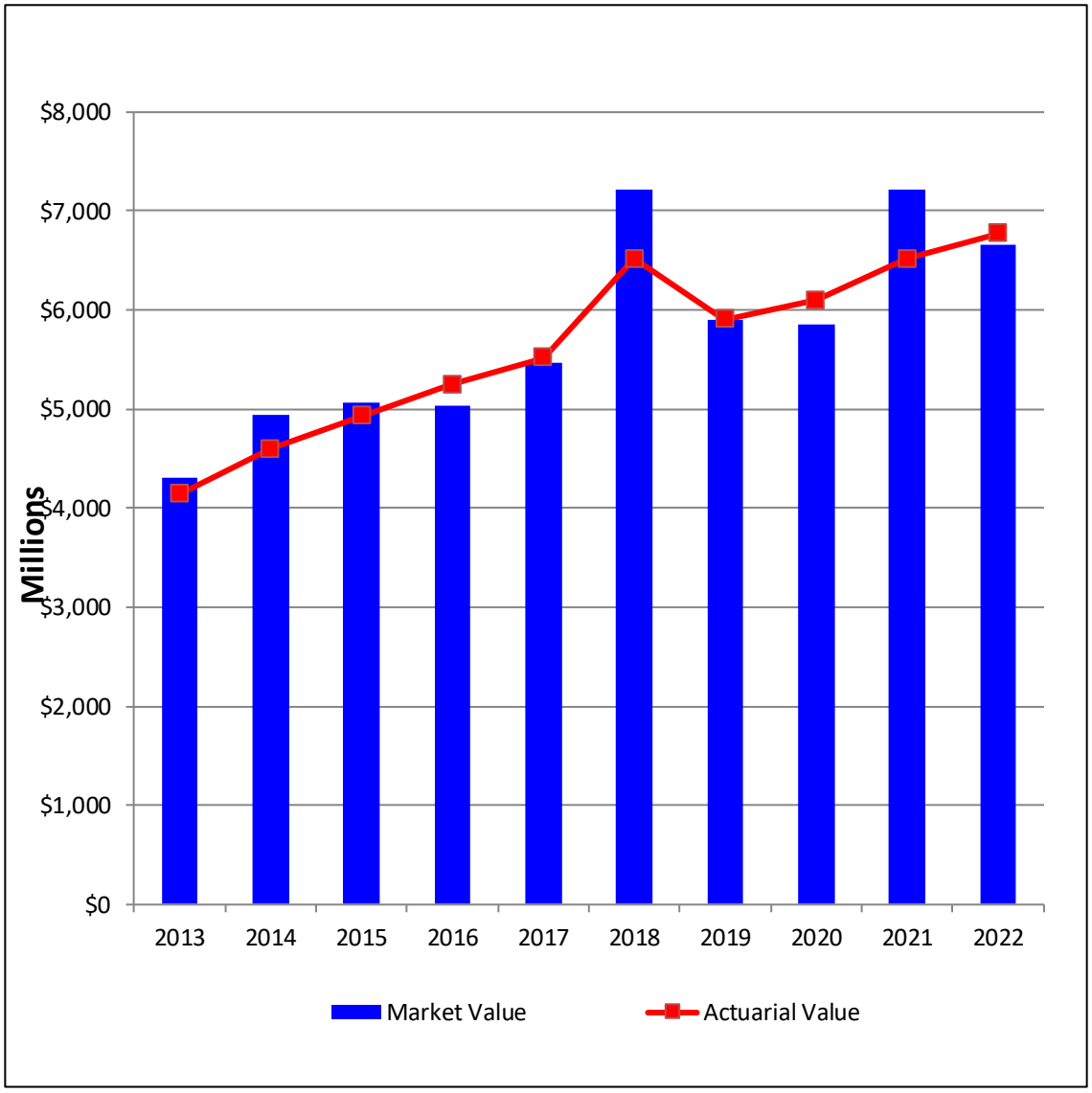
Valuation Date June 30:	2021	2022	2023	2024	2025
A. Actuarial Value Beginning of Year	$6,099,398,162	$6,514,976,330			
B. Market Value End of Year	7,210,026,882	6,648,898,896			
C. Market Value of Beginning of Year	5,845,474,024	7,210,026,882			
D. Cash Flow					
D1. Contributions	267,771,447	266,891,492			
D2. Benefit Payments	(491,994,383)	(527,386,342)			
D3. Administrative Expenses	(4,397,338)	(4,731,110)			
D4. Investment Expenses	(40,920,353)	(48,390,235)			
D5. Net	$ (269,540,627)	$ (313,616,195)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	$1,634,093,485	$ (247,511,791)			
E2. Assumed Rate	7.65%	7.65%			
E3. Amount for Immediate Recognition C.*E2. + ((D1.+D2.+D3.)*E2.*0.5) - D4.	479,354,390	589,812,399			
E4. Amount for Phased-in Recognition E1. - E3.	1,154,739,095	(837,324,190)			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	$ 288,684,774	$ (209,331,048)	$ -	$ -	$ -
F2. First Prior Year	(71,291,023)	288,684,774	(209,331,048)	-	-
F3. Second Prior Year	(28,421,723)	(71,291,023)	288,684,774	(209,331,048)	-
F4. Third Prior Year	16,792,377	(28,421,723)	(71,291,023)	288,684,774	(209,331,048)
F5. Total Recognized Investment Gain	$ 205,764,405	$ (20,359,020)	$ 8,062,703	$ 79,353,726	$(209,331,048)
G. Actuarial Value End of Year A. + D5. + E3. + F5.	$6,514,976,330	$6,770,813,514			

Table 4:
Historical Investment Returns*

Fiscal Year Ending	Market Returns	Actuarial Returns	Assumed Rate of Return	Actuarial Return Over Assumption
June 30, 2013	12.99%	11.91%	7.75%	4.16%
June 30, 2014	17.12%	13.21%	7.75%	5.46%
June 30, 2015	4.60%	9.63%	7.75%	1.88%
June 30, 2016	2.02%	9.27%	7.75%	1.52%
June 30, 2017	11.93%	8.08%	7.75%	0.33%
June 30, 2018	8.90%	6.69%	7.65%	(0.96)%
June 30, 2019	5.65%	7.06%	7.65%	(0.59)%
June 30, 2020	2.73%	7.11%	7.65%	(0.54)%
June 30, 2021	27.80%	10.76%	7.65%	3.11%
June 30, 2022	(4.18)%	8.16%	7.65%	0.51%
10 Year Average	8.63%	9.17%		1.47%

* 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 actives, 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, 2022 Total	June 30, 2021 Total
A. Active Members Liability Due to Probability of		
Retirement	$ 3,294,516,080	$ 3,204,166,514
Disability	$ 20,255,044	$ 59,429,999
In-Service Death	$ 52,767,128	$ 117,700,156
Termination	$ 148,064,941	$ 138,274,096
Total	$ 3,515,603,193	$ 3,519,570,765
B. Inactive Members and Annuitants		
Service Retirement	$ 5,544,790,658	$ 5,138,040,346
Disability Retirement	$ 85,971,474	$ 95,556,481
Beneficiaries*	$ 336,400,780	$ 315,060,936
Vested Terminated Members	$ 268,815,856	$ 238,745,680
Refund of Member Contributions	$ 73,542,652	$ 66,930,337
Total	$ 6,309,521,420	$ 5,854,333,780
C. Grand Total	$ 9,825,124,613	$ 9,373,904,545

*Includes survivors of active and retired members.

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 two elements:

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years; 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 7.30%, net of investment and administrative expenses.

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 Results.

Table 7:
Normal Cost Contribution Rates
As Percentages of Salary

	June 30, 2022 Total	June 30, 2021 Total
Service retirement	7.20%	7.08%
Disability retirement	0.08%	0.25%
In Service death	0.15%	0.32%
Vested retirement	2.29%	2.06%
Total Normal Rate	9.72%	9.71%
Employee Normal Rate	7.90%	7.90%
Employer Normal Rate	1.82%	1.81%
Administrative Expense Load	0.00%	0.29%
Transfer to DB Education Fund	0.04%	0.04%
Rate Available to Amortize Unfunded Actuarial Accrued Liability	7.21%	6.83%
Statutory Funding Rate*	16.97%	16.87%

* Rates shown are for the fiscal year following the valuation date.

Note: The normal cost rate for members hired on or after July 1, 2011 is 8.80%.

Table 8:
Unfunded Actuarial Accrued Liability

	June 30, 2022	June 30, 2021
A. Actuarial present value of all future benefits for actives and retirees and their survivors (Table 6)	$ 9,825,124,613	$ 9,373,904,545
B. Less actuarial present value of total future normal costs for present members	$ 798,340,523	$ 839,275,834
C. Actuarial accrued liability	$ 9,026,784,090	$ 8,534,628,711
D. Less assets available for benefits	$ 6,770,813,514	$ 6,514,976,330
E. Unfunded actuarial accrued liability	$ 2,255,970,576	$ 2,019,652,381

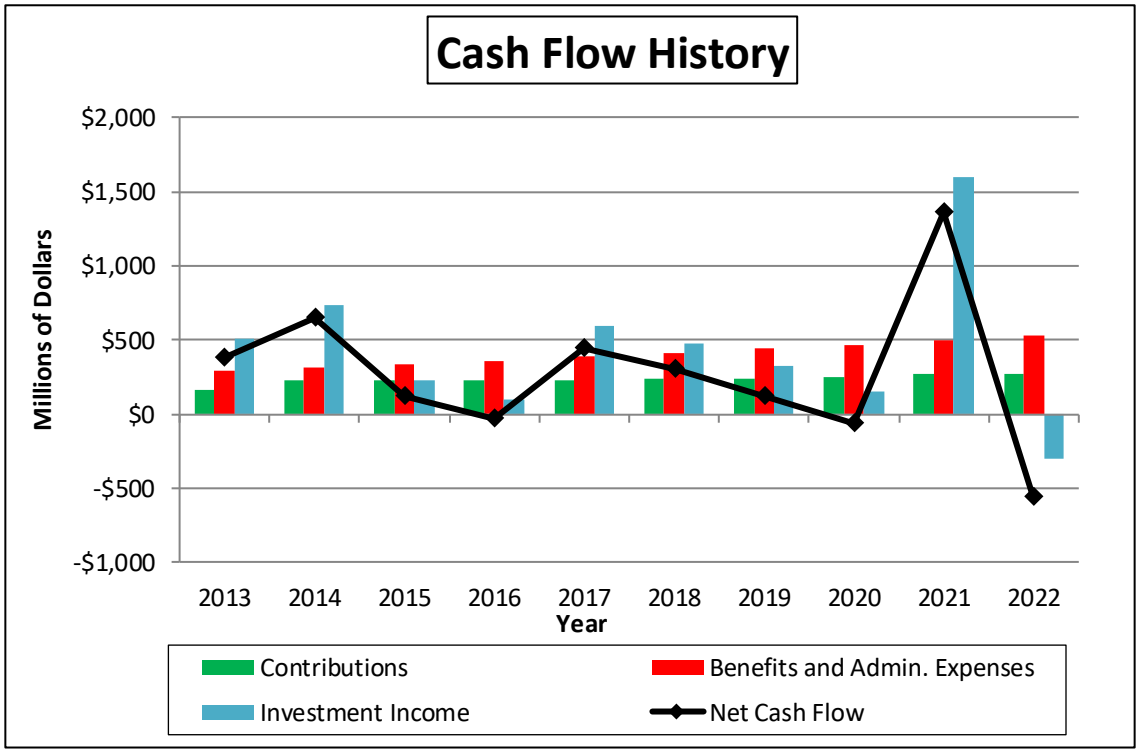
Cash Flows

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 negative cash flow for the year ended June 30, 2022. The System's total cash flow including benefit payments, administrative expenses and investment earnings was $(561.1) million. Of the $(561.1) million, $(295.9) million was due to investment returns.

If the System had a positive cash flow, there would be 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
2013	$ 163.3	$ 290.7	$ 505.0	$ 377.6
2014	223.0	311.5	732.4	643.9
2015	230.1	337.0	225.1	118.2
2016	230.5	359.9	101.2	(28.2)
2017	233.1	384.8	591.4	439.7
2018	243.4	415.2	478.7	306.9
2019	243.6	441.2	320.9	123.3
2020	252.0	468.0	158.0	(58.0)
2021	267.8	496.4	1,593.1	1,364.5
2022	266.9	532.1	(295.9)	(561.1)

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.

Each gain or loss shown represents our estimate of how much the given type of experience caused the UAAL 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, 2021:	$ 8,534,628,711
2. Normal Cost for this Plan Year (Including Expenses):	122,998,698
3. Interest on items 1 and 2 [(1+2) x 7.65%]:	662,308,497
4. Benefit Payments for this Plan Year (Including Expenses):	(532,117,452)
5. Interest on item [4 x 7.65% x .5]:	(20,353,493)
6. Expected Actuarial Accrued Liability as of June 30, 2022:	$ 8,767,464,961
7. Changes due to:	
a. Assumption Changes:	$ 296,431,292
b. Plan Amendments:	0
c. Funding Method:	0
d. Actuarial (Gain) / Loss:	$ (37,112,163)
8. Actual Actuarial Accrued Liability as of June 30, 2022:	$ 9,026,784,090
9. Items Affecting Calculation of Actuarial Accrued Liability:	
a. Benefit provisions reflected in the actuarial 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, 2021:	$ 6,514,976,330
2. Interest on item [1 x 7.65%]:	498,395,689
3. Contributions for this Plan Year:	266,891,492
4. Interest on item [3. x 7.65% x .5]:	10,208,600
5. Benefit Payments for this Plan Year (Including Expenses):	(532,117,452)
6. Interest on item [5. x 7.65% x .5]:	(20,353,493)
7. Expected Actuarial Value of Assets as of June 30, 2022:	$ 6,738,001,166
8. Actuarial Value of Assets as of June 30, 2022:	$ 6,770,813,514
9. (Gain) / Loss	$ (32,812,348)
C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2021:	$ 2,019,652,381
2. Normal Cost for this Plan Year (Including Expenses):	122,998,698
3. Contributions for this Plan Year:	(266,891,492)
4. Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]:	153,704,208
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2022:	$ 2,029,463,795
6. Changes due to:	
a. Assumption Changes:	296,431,292
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	$ (69,924,511)
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2022:	$ 2,255,970,576

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

Table 11:
Historical Actuarial (Gains) or Losses*
(Dollar amounts in thousands)

	UAAL (Gain)/Loss		
	June 30, 2022	June 30, 2021	June 30, 2020
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	$ (32,812.3)	$ (186,339.2)	$ 31,115.8
Pay Increases			
Pay increases were (less) greater than expected.	$ (39,735.0)	$ 75,510.3	$ 4,107.2
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	$ 15,580.1	$ 11,457.9	$ (58,386.7)
Disability Retirements			
Disability claims were (less) greater than expected	$ (693.0)	$ 662.0	$ 204.0
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	$ (635.1)	$ (580.9)	$ (426.5)
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	$ (3,636.1)	$ 719.1	$ 67,544.8
Death After Retirement			
Retirees (died younger) lived longer than expected	$ (10,744.6)	$ (19,161.7)	$ (12,025.4)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	$ 2,976.4	$ (8,792.7)	$ 25,856.0
Other			
Miscellaneous (gains) and losses	$ (224.9)	$ (97.5)	$ (155.2)
Total (Gain) or Loss During Period From Financial Experience	$ (69,924.5)	$ (126,622.7)	$ 57,834.0
Non-Recurring Items.			
Changes in actuarial assumptions and methods	$ 296,431.3	$ -	$ -
Changes in benefits caused a (gain) loss	$ -	$ -	$ -
Composite (Gain) Loss During Period	$ 226,506.8	$ (126,622.7)	$ 57,834.0

* 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 contributions that are sufficient to provide the promised benefits. The System is primarily funded by member, employer and state 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 in statute and are intended to provide the needed amounts to fund the system over time. The purpose of the valuation is to determine if the fixed contributions are sufficient to fund the System. 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 3.25% 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	Plan Year Payroll	Asset Volatility Ratio
6/30/2015	$ 5,061,058	$ 1,156,855	4.37
6/30/2016	5,032,807	1,185,646	4.24
6/30/2017	5,472,519	1,232,067	4.44
6/30/2018	5,779,994	1,230,105	4.70
6/30/2019	5,903,306	1,247,344	4.73
6/30/2020	5,845,474	1,280,557	4.56
6/30/2021	7,210,027	1,361,590	5.30
6/30/2022	6,648,899	1,349,883	4.93

The assets at June 30, 2022 are 493% of payroll, so underperforming the investment return assumption by 1.00% (i.e., earn 6.30% for one year) is equivalent to 4.93% of payroll. While the actual impact in the first year is mitigated by the asset smoothing method and amortization of the UAL, 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 has negative cash flows which ranged from 2% to 4% for previous years. Although, there are no immediate concerns, the trend in the growth of the negative cash flow should be monitored going forward.

Year End	Market Value of Assets (MVA)	Contributions	Benefit Payments	Net Cash Flow	Net Cash Flow as a Percent of MVA
6/30/2015	$ 5,061,058	$ 230,067	$ 336,885	$ (106,818)	(2.11%)
6/30/2016	5,032,807	230,471	359,842	(129,371)	(2.57%)
6/30/2017	5,472,519	233,063	384,700	(151,637)	(2.77%)
6/30/2018	5,779,994	243,385	415,158	(171,772)	(2.97%)
6/30/2019	5,903,306	243,613	441,225	(197,612)	(3.35%)
6/30/2020	5,845,474	252,009	468,018	(216,009)	(3.70%)
6/30/2021	7,210,027	267,771	496,392	(228,620)	(3.17%)
6/30/2022	6,648,899	266,891	532,117	(265,226)	(3.99%)

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	$ 3,880,797,329	$ 6,470,303,179	60.0%
6/30/2016	4,149,716,390	6,787,923,154	61.1%
6/30/2017	4,720,749,061	7,578,384,779	62.3%
6/30/2018	5,018,408,743	7,730,084,077	64.9%
6/30/2019	5,284,851,700	7,957,037,808	66.4%
6/30/2020	5,569,669,547	8,234,002,983	67.6%
6/30/2021	5,854,333,780	8,534,628,711	68.6%
6/30/2022	6,309,521,420	9,026,784,090	69.9%

Historical Member Statistics

Valuation Date June 30,	Number of Active	Number of Retired	Active/ Retired
2015	28,237	20,681	1.37
2016	28,390	21,333	1.33
2017	29,395	21,805	1.35
2018	28,646	22,555	1.27
2019	28,908	23,245	1.24
2020	29,039	23,856	1.22
2021	29,028	24,403	1.19
2022	28,508	25,128	1.13

The assumptions and methods utilized in the valuation were developed in the five-year experience study for the period ending June 30, 2021.

Tables B-3 through B-5 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 consist 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 administrative and investment expenses of the System are assumed to be funded by investment earnings in excess of 7.30% per year.

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 7.30% per year net of investment and administrative expenses, compounded annually.

Interest on Member Contributions

Interest on member contributions is assumed to accrue at the most recent actual rate granted, or a rate of 0.22% 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 described in Table B-1.

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-5.

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.

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	7.30%
	C. Price inflation assumption	2.75%
	D. Payroll growth	3.25%
	E. Growth in membership	0.00%
	F. Interest on member accounts	0.22%
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 Active Participants PUB-2010 General Amount Weighted Employee Mortality projected to 2021 for males and females. Projected generationally using MP-2021.	
	E. Mortality among Disabled pensioners PUB-2010 General Amount Weighted Disabled Retiree mortality table set forward 1 year for both males and females.	
	F. Mortality among Contingent Survivor pensioners PUB-2010 General Amount Weighted Contingent Survivor Mortality projected to 2021 with ages set forward 1 year for males and females. Projected generationally using MP-2021.	
	G. Mortality among Healthy pensioners PUB-2010 General Amount Weighted Healthy Retiree Mortality Table projected to 2021, with ages set forward one year and adjusted 104% for males and 103% for females. Projected generationally using MP-2021.	
	H. Other terminations of employment	Table B-5

Table B-2

Future Salaries

Years of Service	(a) Individual Merit & Longevity	(b) General Wage Increase	(1+(a))*(1+(b)) Total Salary Increase
1	4.80%	3.50%	8.47%
2	3.80	3.50	7.43
3	2.80	3.50	6.40
4	2.00	3.50	5.57
5	1.40	3.50	4.95
6	0.80	3.50	4.33
7	0.40	3.50	3.91
8	0.00	3.50	3.50
8 & Up	0.00	3.50	3.50

Table B-3

Retirement
Annual Rates

Age	Less than 30 Years of Service	30 Years or more of Service and age 60 with 25 Years of Service
Less than 45		10.0%
45		10.0
46		10.0
47		10.0
48		10.0
49		10.0
50	4.5%	15.8
51	4.5	15.8
52	4.5	15.8
53	4.5	15.8
54	4.5	15.8
55	5.5	15.8
56	6.0	15.8
57	6.0	15.8
58	6.0	15.8
59	7.0	15.8
60	9.0	15.8
61	9.0	15.8
62	15.0	22.0
63	15.0	22.0
64	15.0	22.0
65	30.0	35.0
66	30.0	35.0
67	25.0	35.0
68	25.0	30.0
69	25.0	30.0
70 & Over	100.0	100.0

Table B-4

Disablement
Annual Rates

Age	All Members
22	0.00%
27	0.04
32	0.04
37	0.04
42	0.16
47	0.40
52	0.71
57	1.00
60	1.44
62	0.00

All disabilities are assumed to be permanent and without recovery.

Table B-5

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

Years of Service	All Members
0	35.0%
1	27.0
2	18.0
3	14.0
4	11.0
5	11.0
6	10.0
7	9.0
8	8.0
9	7.0
10	6.0
11	6.0
12	5.0
13	5.0
14	4.5
15 & Over	3.0

Family Composition
Female spouses are assumed to be three years younger than males. 100% of non-retired employees are assumed married for both male and female employees. Actual marital characteristics are used for retirees.

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.

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 0.22%.
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	• Employees of the State and local governments that have contracted for PERS coverage. • Certain employees of the university system and school districts, not covered by a separate retirement system governed by Title 19 of the Montana Code Annotated.
Member contributions	• 7.9% of member's compensation. • Temporary 1% increase for all members effective July 1, 2011. • Reduced to 6.9% when amortization period drops below 25 years and remains below 25 years following the termination of the temporary 1% increase and the additional employer contribution rate.
Employer contributions	• 8.97% of each member's compensation for state and university. Reduced when amortization period drops below 25 years and remains below 25 years following the termination of the additional employer contribution rate and the member's temporary 1% increase. • 8.87% of each member's compensation for local governments • 8.6% of each member's compensation for school districts • Contribution going into the PERS Defined Benefit Plan is reduced by 0.04% of compensation paid into the Educational Fund. • Employers who hire PERS retirees who work less than 960 hours in the calendar year in a PERS-covered position, but do not become active members, contribute the employer's contribution rate on the working retiree's compensation.
State contributions	• 0.1% of compensation from the State for local governments • 0.37% of compensation from State for School Districts • Contributions are also made to the system from the State General Fund through a statutory appropriation.
Compensation period used in benefit calculation	• HAC = Highest Average Compensation • Hired **prior to** July 1, 2011**:** HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid by member. • Hired **on or after** July 1, 2011**:** HAC is average of the highest 60 consecutive months (or shorter period of total service) of compensation paid to member. • Hired **on or after** July 1, 2013**:** 110% annual cap on compensation considered as part of a member's HAC.

Service retirement eligibility

Members hired **prior to** July 1, 2011**:**

- Age 60, 5 years membership service
- Age 65, regardless of membership service
- Any age, 30 years membership service

Members hired **on or after** July 1, 2011:

- Age 65, 5 years of membership service
- Age 70, regardless of service

Service retirement benefit formula

Members hired **prior to** July 1, 2011**:**

- Less than 25 years of membership service:
  1.785% of HAC x years of service credit
- 25 years or more of membership service:
  2% of HAC x years of service credit
- **OR,** if greater than either of the above:
  the actuarial equivalent of 2 times the member's regular contributions and interest plus the actuarial equivalent of any additional contributions and interest.

Members hired **on or after** July 1, 2011:

- Less than 10 years of membership service:
  1.5% of HAC x years of service credit
- Between 10 and 30 years of membership service:
  1.785% of HAC x years of service credit
- 30 years or more of membership service:
  2% of HAC x years of service credit
- **OR,** if greater than any of the above:
  the actuarial equivalent of 2 times the member's regular contributions and interest plus the actuarial equivalent of any additional contributions and interest.

Second retirement benefit

Members who retire **before January 1, 2016, return to PERS-covered employment, and accumulate less than 2 years of additional service credit receive:**

- A refund of the member's contributions plus regular interest;
- No service credit for second employment;
- The same benefit amount starting the month following termination; **and**
- The member's Guaranteed Annual Benefit Adjustment (GABA) increasing again in January immediately following the member's second retirement.

Members who retire **before January 1, 2016 and return to PERS-covered employment for at least 2 years of additional service credit receive:**

- A re-calculated retirement benefit based on provisions in effect after member's initial retirement; **and**
- GABA on member's re-calculated benefit starting in January after receiving the re-calculated benefit for 12 months.

Members who retire **on or after January 1, 2016, return to PERS service, and accumulate less than 5 years of additional service credit receive:**

- A refund of a member's contributions plus regular interest;
- No service credit for second employment;
- The same benefit amount starting the month following termination; **and**
- The member's GABA increasing again in January immediately following the member's second retirement.

Members who retire **on or after January 1, 2016, return to PERS service, and accumulate 5 or more years of additional service credit receive:**

- The same retirement benefit paid immediately prior to member's return to service;
- A second retirement benefit for member's second period of service based on laws in effect upon the member's rehire date; **and**
- The member's GABA on both benefits starting in January after receiving the original and new benefit for 12 months.

Early retirement eligibility

Members hired **prior to** July 1, 2011:

- Age 50 with 5 years of membership service; or
- Any age under age 60 with 25 years of membership service

Members hired **on or after** July 1, 2011:

- Age 55 with 5 years of membership service.

Early retirement benefit formula

Members hired **prior to** July 1, 2011 **and**

- who retire **prior to** October 1, 2011

The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 60 or upon completion of 30 years of membership service. The service retirement benefit is reduced by a factor resulting from multiplying 0.5% (for first five years from service retirement eligibility) and 0.3% (for six to 10 years from service retirement eligibility) by the number of months by which the retirement date precedes the date at which the member would have attained age 60 or completed 30 years of membership service.

- who retire **on or after** October 1, 2011

The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 60 or upon completion of 30 years of membership service. The service retirement benefit must be reduced using actuarially equivalent factors based on the most recent valuation.

Members hired **on or after** July 1, 2011:

The actuarial equivalent of the accrued portion of the service retirement benefit that would have been payable to the member commencing at age 65. The service retirement benefit must be reduced using actuarially equivalent factors based on the most recent valuation.

Disability eligibility and benefit formula

- 5 years of membership service

If hired **on or before** February 24, 1991 **and** did not make a contrary election, the greater of:

- (90% of 1.785% of HAC) x service credit, or
- 25% of HAC

If hired **after** February 24, 1991 **and prior to** July 1, 2011, **or** hired **on or before** February 24, 1991 **and** so elected:

- Less than 25 years of membership service:
  1.785% of HAC x service credit, or
- At least 25 years of membership service:
  2% of HAC x service credit

If hired **on or after** July 1, 2011:

- Less than 10 years of membership:
  1.5% of HAC x years of service credit
- Between 10 and 30 years of membership service:
  1.785% of HAC x years of service credit
- 30 years or more of membership service:
  2% of HAC x years of service credit

Survivor's benefit eligibility

Member's status at time of death:

- active;
- receiving disability benefit for less than six months;
- continuously disabled without receiving a disability benefit; **or**
- inactive

Death payment benefit formula	• Accumulated contributions + (monthly compensation x lesser of years of service credit **or** 6) + interest until benefit paid. • However, a survivor of an inactive member who was inactive for more than 6 months will receive only accumulated contributions and interest from the date of death until payment. • A survivor may elect to receive the payment as a non-increasing annuity that is the actuarial equivalent of the death payment amount.
Survivor benefit formula	Members hired **prior to** July 1, 2011: • The survivorship benefit payable to a vested member's survivor is: ○ the actuarial equivalent of the member's accrued retirement benefit at the time of death; **or**, • If the member dies **prior to** age 50 **or** 25 years of membership service: ○ the actuarial equivalent of the accrued portion of the early retirement benefit that would have been paid to the member at age 50. Members hired **on or after** July 1, 2011: • The survivorship benefit payable to an active vested member's survivor is: ○ the actuarial equivalent of the member's accrued retirement benefit at the time of death; **or** • If the member dies **prior to** age 55: ○ the actuarial equivalent of the accrued portion of the early retirement benefit that would have been paid to the member at age 55.
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	Option 1, the normal form of payment is a single life annuity with a refund of any remaining account balance to a designated beneficiary. Optional Benefits: • Option 2, a life annuity and joint 100% survivor benefit, • Option 3, a life annuity and joint 50% survivor benefit, and • Option 4, a life annuity with a period certain. If a retiring member selects Option 2 or 3 and the contingent annuitant predeceases or is divorced from the member, the retiree may, within 18 months of the death or divorce, choose to revert to the higher Option 1 benefit available at retirement or the retiree may select a different contingent annuitant and/or a different option.
Post retirement benefit increases	For retired members hired **before** July 1, 2013 who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made January 1 of each year equal to: • 3% for members hired **before** July 1, 2007, and • 1.5% for members hired **on or after** July 1, 2007 and **prior to** July 1, 2013. For retired members who were hired **on or after** July 1, 2013 and who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made January 1 of each year equal to: • A maximum of 1.5% for each year PERS is funded at or above 90%, subject to a 0.1% reduction for each 2% PERS is funded below 90%; or • 0% whenever the amortization period for PERS is 40 years or more.
Changes 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 of Results (page 1) match the ACFR 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	28,496	599	24,528	4,776	23,009	81,408
Disabled Members having attained normal retirement age		(497)	497			-
Receiving Benefit Payments	9			11	11	31
Actively Working			1	1	19	21
Other Adjustments	3			2	71	76
Participant Counts shown in the Annual Financial Report	28,508	102	25,026	4,790	23,110	81,536

Valuation Data

This valuation is based upon the membership of the System as of June 30, 2022. Membership data was supplied by the System and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data is sufficiently accurate for valuation purposes.

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

Active Members	Number	Valuation Projected Salaries
Full-Time Members	20,650	$ 1,210,945,231
Part-Time Members	7,846	$ 136,479,516
Total Active Members	28,496	$ 1,347,424,747

Table D-1 contains summaries of the data for contributing 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, 2021 to June 30, 2022.

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 50 for an explanation of the number of annuitants used for valuation purposes.

Type of Annuitant	Number	Annual Benefits	Average Annual Benefits
Service Retirement	22,301	$ 474,056,162	$ 21,257
Survivors of Deceased Retired Members	1,682	27,906,690	16,591
Survivors of Deceased Active Members	545	7,122,419	13,069
Total Retirees and Beneficiaries	24,528	$ 509,085,271	$ 20,755
Disability Retirement	599	7,885,510	13,164
Total Annuitants	25,127	$ 516,970,781	$ 20,574

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	4,776
Non-Vested Terminated Members	23,009
Total Terminated Members	27,785

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2022

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	336	163	71	62	5								637
25 to 29	386	277	214	359	200	3							1,439
30 to 34	341	277	200	418	660	115	6						2,017
35 to 39	298	242	216	383	700	407	107	3					2,356
40 to 44	231	204	162	310	651	430	324	100	2				2,414
45 to 49	225	142	177	288	538	361	347	258	61	3			2,400
50 to 54	224	165	131	271	547	421	363	315	230	64	1		2,732
55 to 59	162	142	122	248	574	449	377	385	279	160	44		2,942
60 to 64	85	90	76	202	503	392	375	368	242	200	97	38	2,668
65 to 69	29	23	19	68	165	133	95	104	71	54	26	31	818
70 and up	11	8	8	18	42	38	31	21	17	4	10	19	227
Totals	2,328	1,733	1,396	2,627	4,585	2,749	2,025	1,554	902	485	178	88	20,650

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2022

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	14,082	6,913	3,021	2,795	264								27,076
25 to 29	17,925	12,732	10,574	18,234	10,615	152							70,232
30 to 34	17,476	14,023	10,550	21,585	38,581	6,839	360						109,415
35 to 39	14,913	12,708	11,459	21,523	43,952	26,594	7,355	217					138,720
40 to 44	11,832	10,136	9,191	16,894	40,183	28,571	22,852	6,966	118				146,743
45 to 49	10,806	7,985	9,247	15,506	32,120	23,604	24,917	19,601	5,191	220			149,198
50 to 54	11,288	8,356	6,775	14,332	31,126	26,317	24,506	22,463	18,334	5,261	89		168,848
55 to 59	7,918	6,920	5,937	13,138	31,699	26,375	24,045	25,696	20,306	12,809	3,092		177,937
60 to 64	3,809	4,288	3,734	10,153	27,917	22,848	22,150	24,815	17,112	14,621	6,833	2,457	160,735
65 to 69	1,658	1,177	950	3,490	8,997	7,343	5,957	6,833	4,628	3,883	1,886	2,383	49,184
70 and up	503	383	402	875	2,047	2,226	1,756	1,259	1,104	268	630	1,406	12,858
Totals	112,210	85,621	71,840	138,526	267,502	170,868	133,897	107,850	66,794	37,062	12,530	6,246	1,210,945

Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2022

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	41,910	42,413	42,553	45,082	52,849								42,505
25 to 29	46,439	45,964	49,412	50,791	53,075	50,535							48,806
30 to 34	51,250	50,623	52,750	51,639	58,456	59,472	60,061						54,246
35 to 39	50,045	52,512	53,050	56,195	62,788	65,342	68,736	72,189					58,880
40 to 44	51,220	49,686	56,736	54,497	61,725	66,443	70,531	69,658	59,081				60,788
45 to 49	48,027	56,233	52,244	53,841	59,702	65,384	71,808	75,972	85,104	73,419			62,166
50 to 54	50,393	50,643	51,715	52,887	56,904	62,511	67,508	71,311	79,715	82,202	88,984		61,804
55 to 59	48,874	48,731	48,664	52,977	55,226	58,742	63,781	66,742	72,783	80,059	70,274		60,482
60 to 64	44,813	47,641	49,125	50,261	55,502	58,285	59,065	67,432	70,709	73,106	70,445	64,650	60,246
65 to 69	57,170	51,191	50,007	51,321	54,526	55,209	62,701	65,703	65,181	71,898	72,539	76,883	60,128
70 and up	45,683	47,852	50,203	48,598	48,739	58,576	56,632	59,971	64,955	66,907	63,028	73,996	56,642
Totals	48,200	49,406	51,461	52,731	58,343	62,157	66,122	69,401	74,051	76,416	70,396	70,977	58,641

Table D-1:
Active Members Distribution of
Part-Time Employees
as of June 30, 2022

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	390	128	52	25	1								596
25 to 29	299	112	68	70	29								578
30 to 34	288	119	78	103	99	10							697
35 to 39	258	123	86	144	143	43	4						801
40 to 44	230	132	83	132	173	52	20	7					829
45 to 49	187	95	65	115	171	62	37	15	2				749
50 to 54	215	106	72	102	176	93	59	22	9	2			856
55 to 59	166	94	77	120	203	105	74	60	18	8	1		926
60 to 64	111	97	76	123	175	117	82	54	37	21	11	3	907
65 to 69	75	43	42	70	120	61	42	30	20	12	8	2	525
70 and up	55	30	33	50	83	44	25	23	17	10	7	5	382
Totals	2,274	1,079	732	1,054	1,373	587	343	211	103	53	27	10	7,846

Table D-2:
Distribution of Inactive Lives

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 50 for an explanation of the number of annuitants used for valuation purposes.

Members Receiving Service Retirement Benefits as of June 30, 2022

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	5	$ 194,539	$ 38,908
50 to 54	136	4,170,860	30,668
55 to 59	549	16,070,745	29,273
60 to 64	2,582	60,593,385	23,468
65 to 69	5,549	124,536,266	22,443
70 to 74	5,596	123,033,089	21,986
75 to 79	3,827	78,279,188	20,454
80 to 84	2,251	40,154,745	17,839
85 to 89	1,166	18,515,251	15,879
90 and up	640	8,508,094	13,294
Totals	22,301	$ 474,056,162	$ 21,257

Members Receiving Disability Retirement Benefits as of June 30, 2022

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	14	$ 116,991	$ 8,356
50 to 54	23	346,226	15,053
55 to 59	61	870,913	14,277
60 to 64	101	1,585,587	15,699
65 to 69	126	1,643,577	13,044
70 to 74	125	1,603,236	12,826
75 to 79	77	922,242	11,977
80 to 84	46	491,804	10,691
85 to 89	16	164,058	10,254
90 and up	10	140,876	14,088
Totals	599	$ 7,885,510	$ 13,164

Table D-2:
Distribution of Inactive Lives

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 50 for an explanation of the number of annuitants used for valuation purposes.

Survivors of Deceased Retired Members as of June 30, 2022

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	63	$ 449,748	$ 7,139
50 to 54	34	449,855	13,231
55 to 59	39	614,509	15,757
60 to 64	83	1,432,611	17,260
65 to 69	165	2,869,991	17,394
70 to 74	270	5,204,392	19,276
75 to 79	265	4,447,603	16,783
80 to 84	287	4,810,974	16,763
85 to 89	257	4,244,486	16,516
90 and up	219	3,382,521	15,445
Totals	1,682	$ 27,906,690	$ 16,591

Survivors of Deceased Active Members as of June 30, 2022

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	94	$ 692,114	$ 7,363
50 to 54	28	351,304	12,547
55 to 59	46	505,663	10,993
60 to 64	83	1,024,404	12,342
65 to 69	88	1,335,996	15,182
70 to 74	80	1,235,479	15,443
75 to 79	50	768,264	15,365
80 to 84	41	508,095	12,393
85 to 89	20	404,617	20,231
90 and up	15	296,483	19,766
Totals	545	$ 7,122,419	$ 13,069

Table D-2:
Distribution of Inactive Lives

The charts reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page 50 for an explanation of the number of annuitants used for valuation purposes.

Terminated Vested Members as of June 30, 2022
Number of Persons

Age	Number
<25	2
25 to 29	59
30 to 34	255
35 to 39	501
40 to 44	580
45 to 49	586
50 to 54	752
55 to 59	909
60 to 64	719
65 to 69	323
70 and above	90
Total	4,776

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, 2021 Valuation	29,012	4,372	21,570	640	2,193
Refunds and Non-Vested Terminations	(2,083)	(2)	(14)		
Vested Terminations	(974)	983			
Service Retirements	(1,068)	(319)	1,390		
Disability Retirements	(3)	(1)		4	
Deaths	(20)	(8)	(574)	(42)	(5)
New Entrants	4,170				182
Rehires	626	(153)	(5)		
Benefits Suspended / Expired	(852)	(101)	(85)	(3)	(143)
Transfer to DC Plan	(312)				
Other		5	19		
June 30, 2022 Valuation	28,496	4,776	22,301	599	2,227

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
2022	28,508	1,349,883	47,351	47.3	8.7	38.6
2021	29,028	1,361,590	46,906	47.5	8.9	38.6
2020	29,039	1,280,557	44,098	47.7	9.1	38.6
2019	28,908	1,247,344	43,149	47.9	9.3	38.6
2018	28,646	1,230,105	42,942	48.3	9.8	38.5
2017	29,395	1,232,067	41,914	48.1	9.5	38.5
2016	28,390	1,185,646	41,763	48.3	9.3	39.0
2015	28,237	1,156,855	40,696	48.7	9.6	39.1
2014	28,229	1,129,939	39,709			
2013	28,401	1,098,341	38,673			
2012	28,548	1,078,710	37,786			

Table E-2:
Members in Receipt of Annuities and Inactive Membership Data

		All Annuitants					Terminated Members	
Valuation Date June 30,	Number	Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Average Service at Retirement	Number Vested Terminated	Number Non-Vested Terminated
2022	25,128	516,971	20,573	72.1	61.2	21.6	4,776	23,016
2021	24,403	484,770	19,865	71.8	61.1	21.5	4,372	21,719
2020	23,856	457,520	19,178	71.5	61.0	21.4	4,053	20,504
2019	23,245	430,545	18,522	71.1	60.9	21.3	3,930	19,272
2018	22,555	402,969	17,866	71.3	60.6	21.1	3,785	17,943
2017	21,805	375,071	17,201	72.0	60.7	21.1	3,674	16,641
2016	21,333	351,708	16,487	72.0	59.5	20.1	3,062	10,031
2015	20,681	331,190	15,782	71.8	58.5	19.9	2,925	8,839
2014	20,081	302,758	15,077				2,825	7,666
2013	19,451	281,466	14,470				2,686	6,712
2012	18,738	258,469	13,794				2,560	6,164

Table E-3:
Contribution Rates

Valuation Date June 30,	Contribution Rates****			Normal Cost Rate**	UAAL Rate***
	Employee	Employer*	Total		
2022	7.90 %	9.07 %	16.97 %	9.76 %	7.21 %
2021	7.90	8.97	16.87	10.04	6.83
2020	7.90	8.87	16.77	10.13	6.64
2019	7.90	8.77	16.67	10.43	6.24
2018	7.90	8.67	16.57	10.57	6.00
2017	7.90	8.57	16.47	10.16	6.31
2016	7.90	8.47	16.37	11.65	4.72
2015	7.90	8.37	16.27	11.49	4.78
2014	7.90	8.27	16.17	11.94	4.23
2013	7.90	8.17	16.07	10.94	5.13
2012*****	7.01	7.17	14.18	11.84	2.34

* Does not include State Statutory Appropriation.
** Includes DB Educational Fund contribution. Includes Administrative expenses for the 2014 through 2021 Valuation Dates.
*** 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 rates shown are for the fiscal year following the valuation date.
***** Employees hired prior to July 1, 2011 contributed 6.9%. Employees hired on or after July 1, 2011 contributed 7.90%.

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2022. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2022
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	30 Years
Asset valuation method	Four-year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.30%
General wage growth*	3.50%
Merit salary increases	0.0% - 6.3%
*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	2017	2018	2019	2020	2021	2022
Investment Income on Actuarial Value of Assets	$ (17,159)	$ 52,272	$ (33,325)	$ (31,116)	$ 186,339	$ 32,812
Combined Liability Experience	(153,660)	(134,065)	34,010	(26,718)	(59,716)	37,112
(Loss)/Gain During Year from Financial Experience	$ (170,819)	$ (81,793)	$ 685	$ (57,834)	$ 126,623	$ 69,924
Non-Recurring Items	(365,869)	0	0	0	0	(296,431)
Composite Gain or (Loss) During Year	$ (536,688)	$ (81,793)	$ 685	$ (57,834)	$ 126,623	$ (226,507)

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
2022	$ 6,770,814	$ 9,026,784	75%	$ 2,255,971	$ 1,349,883	167%
2021	6,514,976	8,534,629	76%	2,019,652	1,361,590	148%
2020	6,099,398	8,234,003	74%	2,134,605	1,280,557	167%
2019	5,903,191	7,957,038	74%	2,053,847	1,247,344	165%
2018	5,705,236	7,730,084	74%	2,024,848	1,230,105	165%
2017	5,514,027	7,578,385	73%	2,064,358	1,232,067	168%

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)
2022	$ 916,114	$ 5,967,163	$ 2,143,507	$ 6,770,814	100%	98%	0%
2021	928,430	5,548,658	2,057,541	6,514,976	100%	100%	2%
2020	924,143	5,289,852	2,020,008	6,099,398	100%	98%	0%
2019	898,554	5,028,352	2,030,132	5,903,191	100%	100%	0%
2018	876,608	4,718,929	2,134,547	5,705,236	100%	100%	5%
2017	882,835	4,423,430	2,272,120	5,514,027	100%	100%	9%

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 Public Employees' 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 Gain (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.