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# Game Wardens' and Peace Officers' Retirement System of the State of Montana

MPERA
MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

**Actuarial Valuation**
**As of June 30, 2020**

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September 30, 2020

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 Game Wardens' and Peace Officers' Retirement System of the State of Montana (GWPORS), prepared as of June 30, 2020.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2020. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rates are sufficient to amortize the unfunded accrued liability over a 40-year period. The asset values used to determine unfunded liabilities are not market values but less volatile market related values. A smoothing technique is applied to market values to determine the market related values. The unfunded liability amounts using the market value of assets would be different. The interest rate used for determining liabilities is based on the expected return on assets. Therefore, liability amounts in the report cannot be used to assess a settlement of the obligation.

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

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

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

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

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

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

Respectfully submitted,

Todd B. Green, ASA, FCA, MAAA
President

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

**Game Wardens' and Peace Officers' Retirement System of the State of Montana**

## Table of Contents

## 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, 2020** | **June 30, 2019** |
|---|---|---|
| Participant Counts | | |
| Active Members | 1,033 | 1,021 |
| Retirees and Beneficiaries | 382 | 342 |
| Disabled Members* | 2 | 4 |
| Terminated Vested Members | 135 | 138 |
| Terminated Non-Vested Members | 495 | 447 |
| Total** | 2,047 | 1,952 |
| Annual Covered Payroll of Active Members | $ 53,825,163 | $ 51,676,963 |
| Average Salaries from Covered Payroll | $ 52,106 | $ 50,614 |
| Annual Retirement Allowances for Retired Members and Beneficiaries | $ 8,614,752 | $ 7,623,935 |
| Assets | | |
| Actuarial value | $ 221,948,510 | $ 206,503,838 |
| Market value | 212,910,191 | 206,346,965 |
| Actuarial Accrued Liability (AAL) | $ 264,744,609 | $ 245,129,744 |
| Unfunded Actuarial Accrued Liability (UAAL) | $ 42,796,099 | $ 38,625,906 |
| Funded Ratio | 83.83% | 84.24% |
| Market Value Rate of Return | 2.70% | 5.72% |
| **Annual Cost** | | |
| Statutory Funding Rate | 19.56% | 19.56% |
| Total Normal Rate | 15.44% | 16.00% |
| Employee Contribution Rate | 10.56% | 10.56% |
| Employer Normal Rate | 4.88% | 5.44% |
| Employer Contribution Rate | | |
| Normal Rate | 4.88% | 5.44% |
| Administrative Expense Load | 0.17% | 0.16% |
| UAAL Rate | 3.95% | 3.40% |
| Total Rate | 9.00% | 9.00% |
| Amortization Period | 40 Years | 53 Years |
| Employer Contribution Rate Necessary to Amortize UAAL over 30 Years | | |
| Normal Rate | 4.88% | 5.44% |
| Administrative Expense Load | 0.17% | 0.16% |
| UAAL Rate (30-Year Rate) | 4.52% | 4.29% |
| Total Rate | 9.57% | 9.89% |
| Shortfall/(Surplus) | 0.57% | 0.89% |

* Based on PERB categorization for the annual report. For actuarial purposes, 19 members in 2019 and 19 members in 2020 were valued as disabled members with offsetting reductions to the number of retired members.

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

As a result of this actuarial valuation of the benefits in effect under the Game Wardens' and Peace Officers' Retirement System as of June 30, 2020, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 40 years. The Funded Ratio is 83.83%.

### 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, 2020, market value of assets is $9,038,319 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 82 years, and the Funded Ratio would be 80.42%.

### Additional Details

MCA 19-8 sets the employer contribution at 9.00% of salary and the employee contribution at 10.56%.

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

### Investment Experience

The market assets earned 2.70% net of investment and operating expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 6.99%, which is 0.66% less than the actuarial assumption of 7.65%. The return on the actuarial assets differs from the return on market assets because the actuarial value of assets spreads gains and losses over four years. The chart below shows the annual returns for the past ten years.

| Year | Market Return | Actuarial Return | Assumed Investment Return | Market Return over Assumption | Actuarial Return over Assumption |
|---|---|---|---|---|---|
| 7/1/2010 to 6/30/2011 | 21.36 | 1.63 | 7.75 | 13.61 | (6.12) |
| 7/1/2011 to 6/30/2012 | 2.31 | 4.43 | 7.75 | (5.44) | (3.32) |
| 7/1/2012 to 6/30/2013 | 12.69 | 11.13 | 7.75 | 4.94 | 3.38 |
| 7/1/2013 to 6/30/2014 | 16.97 | 12.62 | 7.75 | 9.22 | 4.87 |
| 7/1/2014 to 6/30/2015 | 4.58 | 9.47 | 7.75 | (3.17) | 1.72 |
| 7/1/2015 to 6/30/2016 | 2.11 | 8.42 | 7.75 | (5.64) | 0.67 |
| 7/1/2016 to 6/30/2017 | 11.92 | 8.15 | 7.75 | 4.17 | 0.40 |
| 7/1/2017 to 6/30/2018 | 8.81 | 7.01 | 7.65 | 1.16 | (0.64) |
| 7/1/2018 to 6/30/2019 | 5.72 | 7.28 | 7.65 | (1.93) | (0.37) |
| 7/1/2019 to 6/30/2020 | 2.70 | 6.99 | 7.65 | (4.95) | (0.66) |

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

### Amortization of the UAAL

The statutory contributions are sufficient to amortize the UAAL over a 53-year period at June 30, 2019, and are sufficient to amortize the UAAL over a 40-year period as of June 30, 2020.

### 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 assets smoothing that recognizes gains and losses over a four-year period. The contributions provided for in statute are sufficient to fully amortize the unfunded actuarially accrued liability over a 40-year period. Currently this exceeds the Boards stated Funding Policy.
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 UAL."
   b) Analysis: The contributions provided for in statute are not sufficient to fully amortize the unfunded actuarially accrued liability within 30 years. Absent significant investment return, the System is in danger of not ensuring the System will remain financially sound and is risking the ability to pay all benefits promised in the future. In addition, the System is putting at risk the ability to achieve a well-funded status with a range of safety to absorb market volatility without creating additional UAAL.
3) Benefit Enhancements
   a) The Funding and Benefits Policy states: "Proposals must provide funding from sources sufficient to cover future costs. Unfunded liabilities created by the proposal must be amortized over a period of time appropriate to the retirement system, but not more than 30 years."
   b) Analysis: Without the supplemental funding, a benefit enhancement would increase the amortization period of the unfunded actuarial accrued liability and further delay the goal of achieving a well-funded status with a range of safety to absorb market volatility without creating a UAAL.

### Sensitivity to Future Experience

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

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

| Impact of Assuming 1.0% Higher Investment Return | | | |
|---|---|---|---|
| | Funded Ratio | Amortization Period | Actuarially Determined Employer Contribution (Millions $)* |
| Current Assumption 7.65% | 83.83% | 40 Years | $4.9 |
| Higher Assumption 8.65% | 95.42% | 4 Years | 1.9 |
| Change - Increase / (Decrease) | 11.59% | (36) Years | ($3.0) |

| Impact of Assuming 0.5% Higher Investment Return | | | |
|---|---|---|---|
| | Funded Ratio | Amortization Period | Actuarially Determined Employer Contribution (Millions $)* |
| Current Assumption 7.65% | 83.83% | 40 Years | $4.9 |
| Higher Assumption 8.15% | 89.54% | 12 Years | 3.4 |
| Change - Increase / (Decrease) | 5.71% | (28) Years | ($1.5) |

| Impact of Assuming 0.5% Lower Investment Return | | | |
|---|---|---|---|
| | Funded Ratio | Amortization Period | Actuarially Determined Employer Contribution (Millions $)* |
| Current Assumption 7.65% | 83.83% | 40 Years | $4.9 |
| Lower Assumption 7.15% | 78.32% | Does not amortize | 6.5 |
| Change - Increase / (Decrease) | (5.51%) | N/A | $1.6 |

| Impact of Assuming 1.0% Lower Investment Return | | | |
|---|---|---|---|
| | Funded Ratio | Amortization Period | Actuarially Determined Employer Contribution (Millions $)* |
| Current Assumption 7.65% | 83.83% | 40 Years | $4.9 |
| Lower Assumption 6.65% | 72.99% | Does not amortize | 8.3 |
| Change - Increase / (Decrease) | (10.84%) | N/A | $3.4 |

* Amounts reflect estimated increase/(decrease) in FY2020 employer contributions only, in order to maintain the 40 year amortization period.

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

**Assumption Changes**

There have been no assumption changes since the previous valuation.

**Benefit Changes**

There have been no benefit changes since the previous valuation.

**Contribution Changes**

There have been no contribution changes since the previous valuation.

**Method Changes**

There have been no method changes since the previous valuation.

### Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2019, Actuarial Valuation. Further detail can be found in Table 10.

**Changes in the Unfunded Actuarial Accrued Liability (UAAL)**

| | |
|---|---|
| June 30, 2019 Valuation UAAL | $38,625,906 |
| Normal Cost (Including Expenses) | 7,699,106 |
| Contributions | (10,671,657) |
| Interest | 3,135,672 |
| Expected June 30, 2020 UAAL | $38,789,027 |
| | |
| Experience (Gain)/Loss on Actuarial Liabilities | $2,637,740 |
| Experience (Gain)/Loss on Actuarial Assets | 1,369,332 |
| Assumption & Method Changes | 0 |
| Plan Changes | 0 |
| Total (Gain) / Loss | $4,007,072 |
| June 30, 2020 Valuation UAAL | $42,796,099 |

## Summary

- The System's actuarial value investment return of 6.99% for the year ended June 30, 2020, is 0.66% less than the actuarial assumption of 7.65%. This represents an asset loss of $1,369,332 due to investment return less than anticipated. As of June 30, 2020, the market value of assets was $212,910,191. As of June 30, 2020, the actuarial value of assets was $221,948,510. The June 30, 2020, market value of assets will be recognized in future actuarial valuations unless it is offset by returns greater than the 7.65% assumption.

- As of June 30, 2020, the amortization period of the UAAL is 40 years. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period is below 30. Absent of significant good investment experience this goal cannot be achieved without increasing employer contributions, member contributions or a combination of the two.

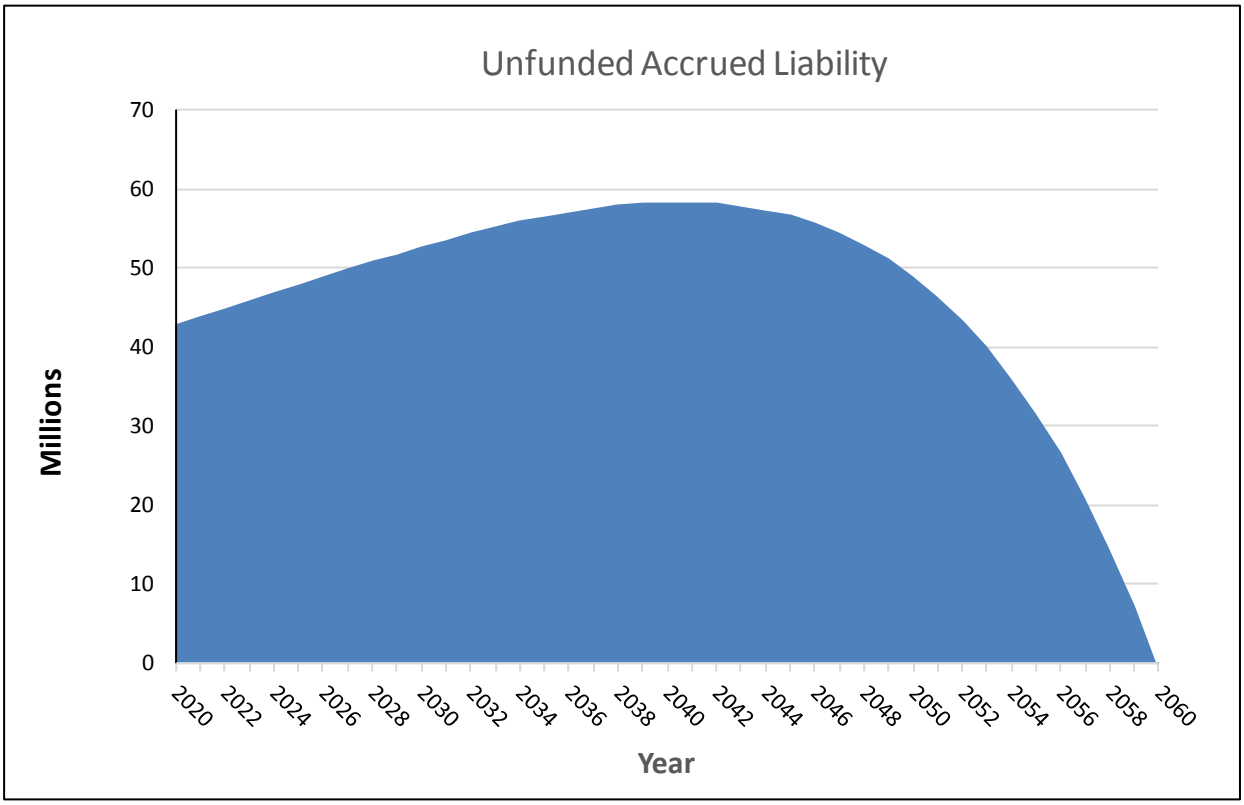
- The funding of the retirement system will be impacted by future experience, which will sometimes be more favorable than the actuarial assumptions and sometimes less favorable. In particular, investment returns larger and smaller than the 7.65% assumption are expected to have significant impacts on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

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

- The Board-adopted rate of return assumption of 7.65% does not, in our professional judgment, conflict with what would constitute a reasonable assumption for the purpose of the measurement Actuarial Standard of Practice No. 27 (ASOP 27). The basis for this opinion is the average long-term capital market assumptions published in the Survey of Capital Market Assumptions 2020 Edition by Horizon Actuarial Service, LLC, which yield a median real return of 4.94% and assumed inflation based on the intermediate inflation assumption of 2.4% in the 2020 OASDI Trustees Report used by the Chief Actuary for Social Security to produce 75 year cost projections. Combining these two results yields a nominal return of 7.34%. The Board's adopted assumption of 7.65% is sufficiently close to our calculated reasonable assumption of 7.34%. Note our report discloses the Systems Funded Ratio and Amortization Period based on an assumed rate of return of 7.65%. In the *Sensitivity to Future Experience* section, results are also presented based on an assumed rate of return of 7.15%. The results of the valuation using an assumed rate of return of 7.34% would include a funded ratio and amortization period between the results shown at 7.65% and 7.15%.

### 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 40 years. The ultimate goal of the GWPORS System is to become at least 100% funded and to establish a reserve.



## 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, 2020. 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 Ending June 30,

| | 2020 | 2019 |
|---|---|---|
| **ASSETS** | | |
| Cash and Short Term Investments | $ 2,613,315 | $ 6,577,519 |
| Securities Lending Collateral | $ 1,120,758 | $ 948,151 |
| Receivables: | | |
| Interest Receivable | $ 1,150 | $ 12,908 |
| Accounts Receivable | 43,755 | 35,968 |
| Due from Other Funds | - | - |
| Due from Primary Government | - | - |
| Notes Receivable | - | - |
| Total Receivables | $ 44,906 | $ 48,876 |
| Investments, at fair value: | | |
| Investment Pools | 210,059,084 | 199,466,319 |
| Other Investments | - | - |
| Total Investments | $ 210,059,084 | $ 199,466,319 |
| Capital Assets | | |
| Property and Equipment, at cost, net of Accumulated Depreciation | $ 366 | $ 366 |
| Intangible Assets, at cost, net of Amortization Expense | 302,439 | 356,441 |
| Total Capital Assets | $ 302,805 | $ 356,807 |
| **TOTAL ASSETS** | $ 214,140,867 | $ 207,397,672 |
| **LIABILITIES** | | |
| Securities Lending Liability | $ 1,120,758 | $ 948,151 |
| Accounts Payable | 14,242 | 10,649 |
| Unearned Revenue | 3,643 | 6,450 |
| Due to Other Funds | 92,033 | 85,457 |
| Compensated Absences | - | - |
| OPEB Implicit Rate Subsidy LT | - | - |
| **TOTAL LIABILITIES** | $ 1,230,676 | $ 1,050,707 |
| **NET POSITION-RESTRICTED FOR PENSION BENEFITS** | $ 212,910,191 | $ 206,346,965 |

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

| | 2020 | 2019 |
|---|---|---|
| **ADDITIONS** | | |
| Contributions: | | |
| Employer | $ 4,868,538 | $ 4,686,260 |
| Plan Member | 5,803,119 | 5,565,627 |
| Other | - | - |
| Total Contributions | $ 10,671,657 | $ 10,251,887 |
| Misc Income | $ - | $ - |
| Investment Income: | | |
| Net Appreciation/(Depreciation) in Fair Value of Investments | $ 6,620,065 | $ 11,870,105 |
| Investment Earnings | 69,333 | 461,237 |
| Security Lending Income | 23,880 | 49,718 |
| Investment Income/(Loss) | $ 6,713,278 | $ 12,381,060 |
| Investment Expense | (1,117,480) | (1,231,417) |
| Security Lending Expense | (12,727) | (24,950) |
| Net Investment Income/(Loss) | $ 5,583,071 | $ 11,124,693 |
| Total Additions | $ 16,254,728 | $ 21,376,580 |
| **DEDUCTIONS** | | |
| Benefit Payments | $ 8,247,117 | $ 7,349,795 |
| Refunds/Distributions | 1,200,125 | 1,000,919 |
| Refunds to Other Plans | 5,148 | (611) |
| Transfers to DCRP | - | - |
| Transfers to MUS-RP | - | - |
| OPEB Expense | - | - |
| Administrative Expense | 240,254 | 202,040 |
| Total Deductions | $ 9,692,644 | $ 8,552,143 |
| **NET INCREASE (DECREASE) IN PLAN NET ASSETS** | $ 6,562,084 | $ 12,824,437 |
| **NET POSITION-RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR** | $ 206,346,965 | $ 193,522,528 |
| **ADJUSTMENT** | 1,142 | - |
| **END OF YEAR** | $ 212,910,191 | $ 206,346,965 |

## Table 3:
## Determination of Actuarial Value of Assets

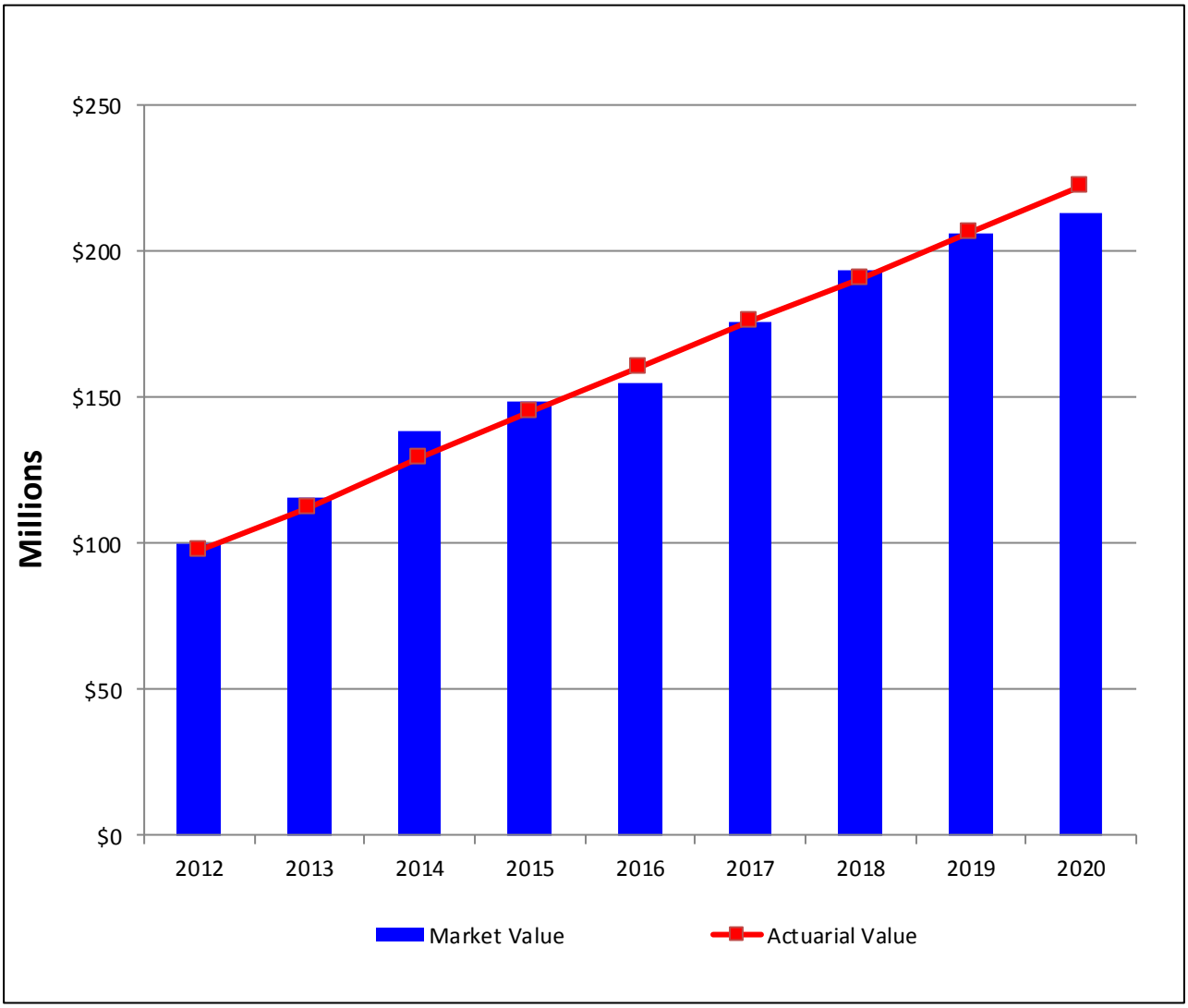
| Valuation Date June 30: | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| A. Actuarial Value Beginning of Year | $ 190,849,036 | $ 206,503,838 | | | |
| B. Market Value End of Year | 206,346,965 | 212,910,191 | | | |
| C. Market Value of Beginning of Year | 193,522,528 | 206,346,965 | | | |
| D. Cash Flow | | | | | |
| D1. Contributions | 10,251,887 | 10,671,657 | | | |
| D2. Benefit Payments | (8,350,103) | (9,452,390) | | | |
| D3. Administrative Expenses | (202,040) | (240,254) | | | |
| D4. Investment Expenses | (1,256,367) | (1,130,207) | | | |
| D5. Net | $ 443,377 | $ (151,194) | | | |
| E. Investment Income | | | | | |
| E1. Market Total: B. - C. - D5. | $ 12,381,060 | $ 6,714,420 | | | |
| E2. Assumed Rate | 7.65% | 7.65% | | | |
| E3. Amount for Immediate Recognition C*E2. + ((D1. + D2. + D3.)*E2.*0.5) - D4. | 16,125,855 | 16,953,197 | | | |
| E4. Amount for Phased-in Recognition E1. - E3. | (3,744,795) | (10,238,777) | | | |
| F. Phased-in Recognition of Investment Income | | | | | |
| F1. Current Year: 0.25 * E4. | $ (936,199) | $ (2,559,694) | $ - | $ - | $ - |
| F2. First Prior Year | 513,164 | (936,199) | (2,559,694) | - | - |
| F3. Second Prior Year | 1,625,398 | 513,164 | (936,199) | (2,559,694) | - |
| F4. Third Prior Year | (2,116,793) | 1,625,398 | 513,164 | (936,199) | (2,559,694) |
| F5. Total Excluded Investment Gain/(Loss) | $ (914,430) | $ (1,357,331) | $ (2,982,729) | $ (3,495,893) | $ (2,559,694) |
| G. Actuarial Value End of Year A. + D5. + E3. + F5. | $ 206,503,838 | $ 221,948,510 | | | |

**Table 4:**
**Historical Investment Returns***

| Fiscal Year Ending | Market Returns | Actuarial Returns | Assumed Rate of Return | Actuarial Return Over Assumption |
|---|---|---|---|---|
| June 30, 2011 | 21.36% | 1.63% | 7.75% | (6.12)% |
| June 30, 2012 | 2.31% | 4.43% | 7.75% | (3.32)% |
| June 30, 2013 | 12.69% | 11.13% | 7.75% | 3.38% |
| June 30, 2014 | 16.97% | 12.62% | 7.75% | 4.87% |
| June 30, 2015 | 4.58% | 9.47% | 7.75% | 1.72% |
| June 30, 2016 | 2.11% | 8.42% | 7.75% | 0.67% |
| June 30, 2017 | 11.92% | 8.15% | 7.75% | 0.40% |
| June 30, 2018 | 8.81% | 7.01% | 7.65% | (0.64)% |
| June 30, 2019 | 5.72% | 7.28% | 7.65% | (0.37)% |
| June 30, 2020 | 2.70% | 6.99% | 7.65% | (0.66)% |
| 10 Year Average | 8.74% | 7.67% | | (0.05)% |

* Returns reflect all investment returns, including investment income and realized and unrealized investment gains and losses, and are net of investment 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 for active members, for retirees, and for beneficiaries. The analysis is given by type of benefit.

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

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

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

| | June 30, 2020 Total | June 30, 2019 Total |
|---|---|---|
| **A. Active Members Liability Due to Probability of** | | |
| Retirement | $ 160,351,221 | $ 154,343,982 |
| Disability | $ 7,026,212 | $ 6,623,430 |
| In-Service Death | $ 3,782,434 | $ 3,650,482 |
| Termination | $ 18,098,912 | $ 17,255,641 |
| Total | $ 189,258,779 | $ 181,873,535 |
| **B. Inactive Members and Annuitants** | | |
| Service Retirement | $ 102,403,874 | $ 89,002,338 |
| Disability Retirement | $ 5,373,290 | $ 5,528,880 |
| Beneficiaries* | $ 6,023,387 | $ 5,492,350 |
| Vested Terminated Members | $ 13,967,041 | $ 13,850,507 |
| Refund of Member Contributions | $ 1,779,971 | $ 1,586,549 |
| Total | $ 129,547,563 | $ 115,460,624 |
| **C. Grand Total** | $ 318,806,342 | $ 297,334,159 |

***** 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 three elements:

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

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

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

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

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

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

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

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

**Table 7:**
**Normal Cost Contribution Rates**
**As Percentages of Salary**

| | June 30, 2020 Total | June 30, 2019 Total |
|---|---|---|
| Service retirements | 9.79% | 10.26% |
| Disability retirements | 0.88% | 0.89% |
| In Service Death | 0.37% | 0.39% |
| Terminations | 4.40% | 4.46% |
| Total Normal Rate | 15.44% | 16.00% |
| Employee Normal Rate | 10.56% | 10.56% |
| Employer Normal Rate | 4.88% | 5.44% |
| Administrative Expense Load | 0.17% | 0.16% |
| Rate Available to Amortize Unfunded Actuarial Accrued Liability | 3.95% | 3.40% |
| Statutory Funding Rate | 19.56% | 19.56% |

Note: The normal cost rate for members hired on or after July 1, 2011 is 15.23%.

## Table 8:
## Unfunded Actuarial Accrued Liability

| | June 30, 2020 | June 30, 2019 |
|---|---|---|
| A. Actuarial present value of all future benefits for present members and former members and their survivors (Table 6) | $ 318,806,342 | $ 297,334,159 |
| B. Less actuarial present value of total future normal costs for present members | $ 54,061,733 | $ 52,204,415 |
| C. Actuarial accrued liability | $ 264,744,609 | $ 245,129,744 |
| D. Less assets available for benefits | $ 221,948,510 | $ 206,503,838 |
| E. Unfunded actuarial accrued liability | $ 42,796,099 | $ 38,625,906 |

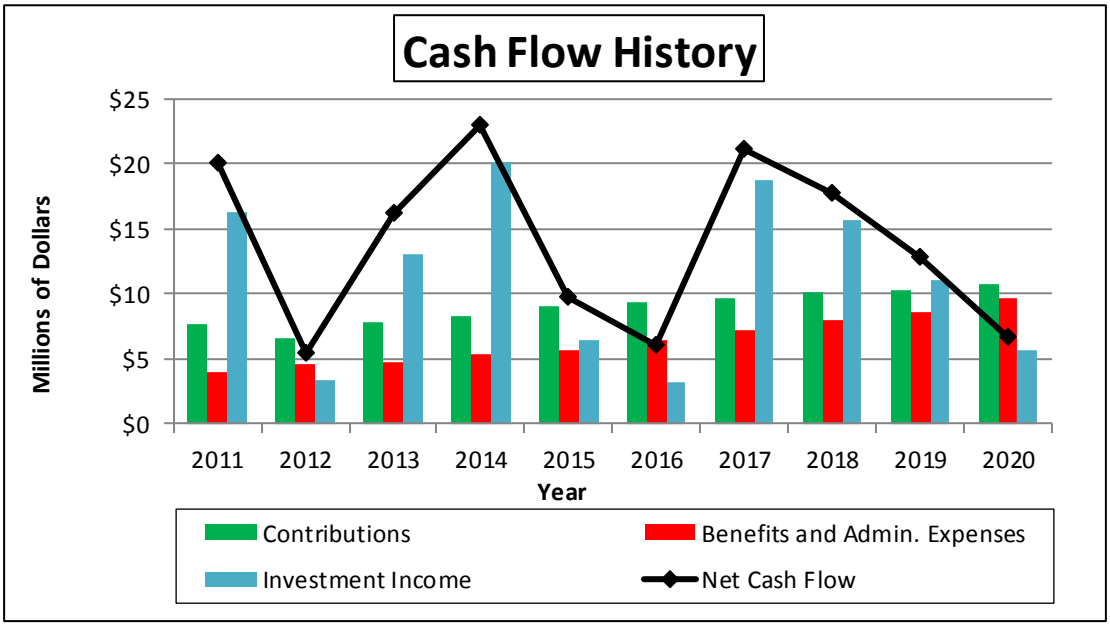
## Cash Flows

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

Table 9 shows the System had a positive cash flow for the year ended June 30, 2020. The System's total cash flow including benefit payments, administrative expenses and investment earnings was $6.6 million. Of the $6.6 million, $5.6 million was due to investment returns.

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

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




| Year Ended June 30 | Historical Cash Flows | | | |
|---|---|---|---|---|
| | Contributions | Benefits & Administrative Expenses | Investment Income | Net Cash Flow |
| 2011 | $ 7.7 | $ 3.9 | $ 16.3 | $ 20.1 |
| 2012 | 6.6 | 4.6 | 3.4 | 5.4 |
| 2013 | 7.8 | 4.7 | 13.1 | 16.2 |
| 2014 | 8.2 | 5.4 | 20.1 | 22.9 |
| 2015 | 9.0 | 5.6 | 6.4 | 9.8 |
| 2016 | 9.3 | 6.4 | 3.2 | 6.1 |
| 2017 | 9.7 | 7.2 | 18.7 | 21.2 |
| 2018 | 10.1 | 8.0 | 15.6 | 17.7 |
| 2019 | 10.3 | 8.6 | 11.1 | 12.8 |
| 2020 | 10.7 | 9.7 | 5.6 | 6.6 |

## Actuarial Gains or Losses

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

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

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

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

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

| | | |
|---|---|---|
| A. | ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS | |
| **1.** | Actual Actuarial Accrued Liability as of June 30, 2019: | $ 245,129,744 |
| **2.** | Normal Cost for this Plan Year (Including Expenses): | 7,699,106 |
| **3.** | Interest on items 1 and 2 [(1+2) x 7.65%]: | 19,341,407 |
| **4.** | Benefit Payments for this Plan Year (Including Expenses): | (9,692,644) |
| **5.** | Interest on item [4 x 7.65% x .5]: | (370,744) |
| **6.** | Expected Actuarial Accrued Liability as of June 30, 2020: | 262,106,869 |
| **7.** | Changes due to: | |
| | a. Assumption Changes: | - |
| | b. Plan Amendments: | - |
| | c. Funding Method: | - |
| | d. Actuarial (Gain) / Loss: | $ 2,637,740 |
| **8.** | **Actual Actuarial Accrued Liability as of June 30, 2020:** | **$ 264,744,609** |
| **9.** | Items Affecting Calculation of Unfunded Accrued Actuarial Liability: | |
| | a. Benefit provisions reflected in the unfunded accrued liability (see Appendix C) | |
| | b. Actuarial assumptions and methods used to determine actuarial accrued liability (see Appendix B) | |
| B. | ASSET (GAIN) / LOSS ANALYSIS | |
| **1.** | Actuarial Value of Assets as of June 30, 2019: | $ 206,503,838 |
| **2.** | Interest on item [1 x 7.65%]: | 15,797,544 |
| **3.** | Contributions for this Plan Year: | 10,671,657 |
| **4.** | Interest on item [3. x 7.65% x .5]: | 408,191 |
| **5.** | Benefit Payments for this Plan Year (Including Expenses): | (9,692,644) |
| **6.** | Interest on item [5. x 7.65% x .5]: | (370,744) |
| **7.** | Expected Actuarial Value of Assets as of June 30, 2020: | $ 223,317,842 |
| **8.** | Actuarial Value of Assets as of June 30, 2020: | $ 221,948,510 |
| **9.** | **(Gain) / Loss** | **$ 1,369,332** |
| C. | UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS | |
| **1.** | Actual Unfunded Actuarial Accrued Liability as of June 30, 2019: | $ 38,625,906 |
| **2.** | Normal Cost for this Plan Year (Including Expenses): | 7,699,106 |
| **3.** | Contributions for this Plan Year: | (10,671,657) |
| **4.** | Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]: | 3,135,672 |
| **5.** | Expected Unfunded Actuarial Accrued Liability as of June 30, 2020: | $ 38,789,027 |
| **6.** | Changes due to: | |
| | a. Assumption Changes: | - |
| | b. Plan Amendments: | - |
| | c. Funding Method: | - |
| | d. Actuarial (Gain) / Loss: | $ 4,007,072 |
| **7.** | **Actual Unfunded Actuarial Accrued Liability as of June 30, 2020:** | **$ 42,796,099** |

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

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

| | UAAL (Gain)/Loss | | |
|---|---|---|---|
| | June 30, 2020 | June 30, 2019 | June 30, 2018 |
| **Investment Income** | | | |
| Investment income was (greater) less than expected based on actuarial value of assets. | $ 1,369.3 | $ 709.9 | $ $ 1,126.5 |
| **Pay Increases** | | | |
| Pay increases were (less) greater than expected. | $ 1,474.1 | $ (1,885.9) | $ (2,967.0) |
| **Age & Service Retirements** | | | |
| Members retired at (older) younger ages or with (less) greater final average pay than expected | $ 284.0 | $ 581.7 | $ (2,132.4) |
| **Disability Retirements** | | | |
| Disability claims were (less) greater than expected | $ (216.8) | $ (16.8) | $ (219.3) |
| **Death-in-Service Benefits** | | | |
| Survivor claims were (less) greater than expected | $ (216.6) | $ (31.5) | $ (22.4) |
| **Withdrawal From Employment** | | | |
| (More) less reserves were released by withdrawals than expected | $ 1,192.4 | $ 74.3 | $ (412.2) |
| **Death After Retirement** | | | |
| Retirees (died younger) lived longer than expected | $ (1,670.4) | $ (560.7) | $ 244.1 |
| **Data Adjustments and Benefit Payment Timing** | | | |
| Service purchases, data corrections, etc. | $ 1,800.3 | $ (44.3) | $ 1,148.9 |
| **Other** | | | |
| Miscellaneous (gains) and losses | $ (9.2) | $ (7.8) | $ (14.1) |
| **Total (Gain) or Loss During Period From Financial Experience** | $ 4,007.1 | $ (1,181.1) | $ (3,247.9) |
| **Non-Recurring Items.** | | | |
| Changes in actuarial assumptions and methods | $ - | $ - | $ - |
| Changes in benefits caused a (gain) loss | $ - | $ - | $ - |
| **Composite (Gain) Loss During Period** | $ 4,007.1 | $ (1,181.1) | $ (3,247.9) |

* 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.

## Section VII: Risk Considerations

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

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

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

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

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

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

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

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

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

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

| Actuarial Valuation Date | Market Value of Assets | Estimated Plan Year Payroll | Asset Volatility Ratio |
|---|---|---|---|
| 6/30/2015 | 148,638 | 44,713 | 3.32 |
| 6/30/2016 | 154,685 | 47,108 | 3.28 |
| 6/30/2017 | 175,841 | 49,381 | 3.56 |
| 6/30/2018 | 193,523 | 50,823 | 3.81 |
| 6/30/2019 | 206,347 | 51,677 | 3.99 |
| 6/30/2020 | 212,910 | 53,825 | 3.96 |

The assets at June 30, 2020 are 396% of payroll, so underperforming the investment return assumption by 1.00% (i.e., earn 6.65% for one year) is equivalent to 3.96% 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 currently has positive cash flow. It appears that the System's net cash flow is trending from positive to negative. While there are no immediate concerns, this should be continued to 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 | 148,638 | 9,012 | 5,553 | 3,459 | 2.33% |
| 6/30/2016 | 154,685 | 9,314 | 6,431 | 2,883 | 1.86% |
| 6/30/2017 | 175,841 | 9,742 | 7,175 | 2,567 | 1.46% |
| 6/30/2018 | 193,523 | 10,125 | 8,028 | 2,097 | 1.08% |
| 6/30/2019 | 206,347 | 10,252 | 8,552 | 1,700 | 0.82% |
| 6/30/2020 | 212,910 | 10,672 | 9,693 | 979 | 0.46% |

### 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. Retiree liability as a percentage of the total actuarial accrued liability has been growing over the last five years. As more of the total liability begins to reside 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 | 67,112,776 | 172,159,908 | 39.0% |
| 6/30/2016 | 77,744,132 | 191,007,338 | 40.7% |
| 6/30/2017 | 90,203,382 | 217,642,368 | 41.4% |
| 6/30/2018 | 101,651,278 | 230,077,307 | 44.2% |
| 6/30/2019 | 115,460,624 | 245,129,744 | 47.1% |
| 6/30/2020 | 129,547,563 | 264,744,609 | 48.9% |

### Historical Member Statistics

| Valuation Date June 30, | Number of Active | Number of Retired | Active/ Retired |
|---|---|---|---|
| 2015 | 993 | 231 | 4.30 |
| 2016 | 989 | 250 | 3.96 |
| 2017 | 1,012 | 276 | 3.67 |
| 2018 | 1,010 | 312 | 3.24 |
| 2019 | 1,021 | 346 | 2.95 |
| 2020 | 1,033 | 384 | 2.69 |

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

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

### Actuarial Cost Method

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

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

### Records and Data

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

Administrative expenses are assumed to equal 0.17% of payroll.

### Valuation of Assets

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

### Investment Earnings

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

### Interest on Member Contributions

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

### Future Salaries

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

### Service Retirement

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

### Disablement

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

### Mortality

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

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

### Other Terminations of Employment

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

### Benefits for Terminating Members

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

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

### Probability of Marriage & Dependent Children

If death occurs in active status, all members are assumed to have an eligible surviving spouse with no dependent children.

### Records with no Birth Date

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

### Active Records with a Salary Less than $1,000

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

**Table B-1**

**Summary of Valuation Assumptions**

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

## Table B-2

## Future Salaries

| Years of Service | (a) Individual Merit & Longevity | (b) General Wage Increase | (1+(a))*(1+(b)) Total Salary Increase |
|---|---|---|---|
| 1 | 6.30% | 3.50% | 10.02% |
| 2 | 4.70 | 3.50 | 8.36 |
| 3 | 3.50 | 3.50 | 7.12 |
| 4 | 2.70 | 3.50 | 6.29 |
| 5 | 2.00 | 3.50 | 5.57 |
| 6 | 1.40 | 3.50 | 4.95 |
| 7 | 0.90 | 3.50 | 4.43 |
| 8 | 0.50 | 3.50 | 4.02 |
| 9 | 0.20 | 3.50 | 3.71 |
| 10 & Up | 0.00 | 3.50 | 3.50 |

**Table B-3**

**Retirement**
**Annual Rates**

| Age | Age 55 with 5 Years of Service | Age 50 with 20 Years of Service |
|---|---|---|
| Less than 50 | N/A | 0% |
| 50 | N/A | 15.0 |
| 51 | N/A | 15.0 |
| 52 | N/A | 15.0 |
| 53 | N/A | 15.0 |
| 54 | N/A | 15.0 |
| 55 | 15.0 | 25.0 |
| 56 | 5.0 | 25.0 |
| 57 | 5.0 | 25.0 |
| 58 | 5.0 | 25.0 |
| 59 | 5.0 | 25.0 |
| 60 | 15.0 | 15.0 |
| 61 | 15.0 | 15.0 |
| 62 | 40.0 | 40.0 |
| 63 | 15.0 | 15.0 |
| 64 | 15.0 | 15.0 |
| 65 & Over | 100.0 | 100.0 |

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

## Table B-4

## Disablement
## Annual Rates

| Age | All Members |
|---|---|
| 22 | .00% |
| 27 | .10 |
| 32 | .10 |
| 37 | .10 |
| 42 | .40 |
| 47 | .40 |
| 52 | .40 |
| 57 | .40 |
| 62 | .00 |

75% of disabilities are assumed to be duty-related. All disabilities are assumed to be permanent and without recovery.

## Table B-5

## Mortality
## Annual Rates

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

10% of all member deaths are assumed to be duty-related.

## Table B-6

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

| Years of Service | All Members |
|---|---|
| 0 | 27.0% |
| 1 | 22.5 |
| 2 | 18.0 |
| 3 | 13.0 |
| 4 | 13.0 |
| 5 | 7.5 |
| 6 | 7.5 |
| 7 | 7.5 |
| 8 | 7.5 |
| 9 | 7.5 |
| 10 | 4.0 |
| 11 | 4.0 |
| 12 | 4.0 |
| 13 | 4.0 |
| 14 | 4.0 |
| 15 | 3.0 |
| 16 | 3.0 |
| 17 | 3.0 |
| 18 | 3.0 |
| 19 | 3.0 |
| 20 & Over | 2.0 |

## Table B-7

## Probability of Retaining Membership in the System Upon Vested Termination

| Age | Probability of Retaining Membership |
|---|---|
| Under 35 | 30% |
| 35 | 40 |
| 36 | 40 |
| 37 | 40 |
| 38 | 40 |
| 39 | 40 |
| 40 | 50 |
| 41 | 50 |
| 42 | 50 |
| 43 | 50 |
| 44 | 50 |
| 45 | 60 |
| 46 | 60 |
| 47 | 60 |
| 48 | 60 |
| 49 | 60 |
| 50 & Over | 100 |

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

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

| | |
|---|---|
| **Service credit** | • Service credit is used to determine the amount of a member's retirement benefit.<br>• 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.<br>• One month of membership service is earned for any month member contributions are made, regardless of the number of hours worked.<br>• Eligible members in all systems may purchase service that counts toward membership service.<br>• 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.<br>• 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.<br>• The member receives the accumulated member contributions, which consists of member contributions and regular interest.<br>• 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.<br>• The current interest rate credited to member accounts is 2.39%. |
| **Working Retiree Limitations** | Applies to retirement system members who return **on or after** July 1, 2017 to covered employment in the system from which they retired. These limits already applied to SRS members before July 1, 2017.<br>• Members who return for **less than 480 hours** in a **calendar** year:<br>  ○ may not become an active member in the system; and<br>  ○ are subject to a $1 reduction in their retirement benefit for each $3 earned in excess of $5,000 in the calendar year. |

- Members who return for **480 or more hours** in a **calendar** year;
  - must become an active member of the system;
  - will stop receiving a retirement benefit from the system; **and**
  - will be eligible for a second retirement benefit if they earn 5 or more years of service credit through their second employment.
- Employee, employer and state contributions apply as follows:
  - Employer contributions and state contributions (if any) must be paid on all working retirees;
  - Employee contributions must be paid on working retirees who return to covered employment for 480 or more hours in a calendar year.

NOTE: PERS has its own limits.

**Second Retirement Benefit -**

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

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

- If the member works more than 480 hours in a calendar year and accumulates at least 5 years of service credit before terminating again, the member:
  - is awarded service credit for the period of reemployment;
  - starting the first month following termination of service, receives:
    * the same retirement benefit previously paid to the member; **and**
    * a second retirement benefit for the period of reemployment calculated based on the laws in effect as of the member's rehire date; **and**
  - does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA:
    * on the initial retirement benefit in January immediately following second retirement; **and**

| | |
|---|---|
| | * on the second retirement benefit starting in January after receiving that benefit for at least 12 months.<br>• A member who returns to covered service is **not** eligible for a disability benefit. |
| **Refunds** | • Terminating members eligible to retire may, in lieu of receiving a monthly retirement benefit, refund their accumulated contributions in a lump sum.<br>• 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.<br>• 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** | • Game wardens<br>• Warden supervisor<br>• State peace officers |
| **Member contributions** | • 10.56% of member's compensation |
| **Employer contributions** | • 9.0% of each member's compensation |
| **Compensation period used in benefit calculation** | • HAC = Highest Average Compensation<br>• Hired **prior to** July 1, 2011: HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to member.<br>• 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.<br>• Hired **on or after** July 1, 2013: 110% annual cap on compensation considered as part of a member's HAC. |
| **Service retirement eligibility and benefit formula** | • Age 50 with 20 years of membership service<br>• 2.5% of HAC x years of service credit |
| **Early retirement eligibility and benefit** | • Age 55 with 5 years of membership service<br>• A reduced retirement benefit calculated using the HAC and service credit at early retirement. |

| | |
|---|---|
| **Disability retirement eligibility and benefit formula** | **Duty-related** disability:<br>• Vested active member<br>• 5 years of membership service<br>• **Less than 20 years** of membership:<br>50% or HAC, or<br>• **20 years or more** of membership service:<br>2.5% of HAC x years of service credit<br>**Regular** disability:<br>• Vested member<br>• The actuarial equivalent of the accrued normal retirement benefit at the time of disability. |
| **Survivor's eligibility and benefit formula** | **Duty-related** deaths: **(active member)**, a monthly survivor benefit to the designated beneficiary equal to:<br>• **25 years or less** of membership service:<br>50% of HAC, or<br>• **More than 25 years** of membership service:<br>2.5% of HAC x years of service credit.<br>**Non-duty-related** deaths:<br>• Active or inactive member<br>• Lump-sum refund of the member's accumulated contributions; **or**<br>• Actuarial equivalent of the service benefit.<br><br>• Effective July 1, 2017, beneficiaries of GWPORS members who die prior to retirement are eligible for either a lump-sum benefit or a monthly survivor benefit. The monthly survivor benefit may be paid out as an option 1, 2, 3 or 4, at the survivor's discretion. Previously, statute provided for lump-sum payments only. |
| **Vested eligibility and benefit** | • 5 years of membership service<br>• Accrued normal retirement benefit, payable when eligible for retirement.<br>• In lieu of a pension, a member may receive a refund of accumulated contributions.<br>• 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 accumulated contributions (account balance) to a designated beneficiary.<br>• Optional Benefits:<br>  • Option 2, a life annuity and joint 100% survivor benefit,<br>  • Option 3, a life annuity and joint 50 % survivor benefit, and<br>  • Option 4, a life annuity with a period certain.<br>• 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 who have been retired at least 12 months, a Guaranteed Annual Benefit Adjustment (GABA) will be made each year in January equal to:<br>• 3% for members hired **before** July 1, 2007, and<br>• 1.5% for members hired **on or after** July 1, 2007 |
| **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 Board Summary (page 1) match the CAFR at the request of the Board. The differences between counts, if any, have no material effect upon the liability calculation.

| | Active | Disabled | Retirees and Beneficiaries | Terminated Vested Members | Terminated Non-Vested Members | Total |
|---|---|---|---|---|---|---|
| **Participant Counts Used for Valuation** | 1,033 | 21 | 363 | 135 | 494 | 2,046 |
| Disabled Members having attained normal retirement age | | (19) | 19 | | | |
| Beneficiaries of Disabled Members | | | | | | |
| Beneficiaries with less than one year of certain payments remaining | | | | | | |
| Other Adjustments | | | | | 1 | 1 |
| **Participant Counts shown in the Annual Financial Report** | 1,033 | 2 | 382 | 135 | 495 | 2,047 |

This valuation is based upon the membership of the System as of June 30, 2020. Membership data were supplied by the System and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data are sufficiently accurate for valuation purposes.

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

| Active Members | Number | Valuation Projected Salaries |
|---|---|---|
| Full-Time Members | 941 | $ 53,094,107 |
| Part-Time Members | 92 | $ 1,641,674 |
| Total Active Members | 1,033 | $ 54,735,781 |

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, 2019 to June 30, 2020.

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 **Error! Bookmark not defined.** for an explanation of the number of annuitants used for valuation purposes.

| Type of Annuitant | Number | Annual Benefits | Average Annual Benefits |
|---|---|---|---|
| Service Retirement | 333 | $ 7,574,973 | $ 22,748 |
| Survivors of Deceased Retired Members | 19 | 471,948 | 24,839 |
| Survivors of Deceased Active Members | 11 | 138,650 | 12,605 |
| Total Retirees and Beneficiaries | 363 | $ 8,185,571 | $ 22,550 |
| Disability Retirement | 21 | 429,181 | 20,437 |
| Total Annuitants | 384 | $ 8,614,752 | $ 22,434 |

| Terminated Members with Contributions Not Withdrawn | Number |
|---|---|
| Vested Terminated Members | 135 |
| Non-Vested Terminated Members | 494 |
| Total Terminated Members | 629 |

## Table D-1:
## Active Members Distribution of
## Full-Time Employees and Salaries
## as of June 30, 2020

### 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 | 24 | 19 | 9 | 5 | 1 | | | | | | | | 58 |
| 25 to 29 | 22 | 33 | 18 | 32 | 19 | | | | | | | | 124 |
| 30 to 34 | 7 | 20 | 21 | 14 | 43 | 18 | | | | | | | 123 |
| 35 to 39 | 10 | 11 | 6 | 20 | 42 | 32 | 8 | | | | | | 129 |
| 40 to 44 | 8 | 6 | 7 | 13 | 26 | 31 | 18 | 8 | | | | | 117 |
| 45 to 49 | 5 | 9 | 11 | 15 | 22 | 28 | 31 | 18 | 5 | | | | 144 |
| 50 to 54 | 3 | 7 | 7 | 6 | 16 | 17 | 25 | 10 | 4 | | | | 95 |
| 55 to 59 | 2 | 4 | 6 | 9 | 19 | 19 | 16 | 13 | 1 | 4 | 1 | | 94 |
| 60 to 64 | 2 | 2 | 5 | 2 | 7 | 11 | 10 | 4 | 3 | 1 | 1 | | 48 |
| 65 to 69 | | 1 | | | 3 | 3 | | 1 | | | | | 8 |
| 70 and up | | | | | | | 1 | | | | | | 1 |
| Totals | 83 | 112 | 90 | 116 | 198 | 159 | 109 | 54 | 13 | 5 | 2 | - | 941 |

## Table D-1:
## Active Members Distribution of
## Full-Time Employees and Salaries
## as of June 30, 2020

### 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 | 1,018 | 836 | 423 | 274 | 55 | | | | | | | | 2,607 |
| 25 to 29 | 907 | 1,491 | 896 | 1,661 | 1,059 | | | | | | | | 6,013 |
| 30 to 34 | 264 | 979 | 1,036 | 749 | 2,426 | 1,041 | | | | | | | 6,494 |
| 35 to 39 | 467 | 482 | 276 | 1,076 | 2,356 | 2,020 | 510 | | | | | | 7,188 |
| 40 to 44 | 355 | 279 | 319 | 688 | 1,484 | 1,863 | 1,226 | 557 | | | | | 6,772 |
| 45 to 49 | 220 | 486 | 597 | 810 | 1,305 | 1,799 | 2,079 | 1,345 | 374 | | | | 9,014 |
| 50 to 54 | 75 | 402 | 396 | 318 | 931 | 1,063 | 1,599 | 672 | 298 | | | | 5,753 |
| 55 to 59 | 81 | 208 | 335 | 550 | 1,146 | 1,152 | 1,037 | 900 | 80 | 329 | 80 | | 5,898 |
| 60 to 64 | 79 | 97 | 248 | 137 | 426 | 615 | 605 | 309 | 175 | 39 | 69 | | 2,800 |
| 65 to 69 | | 40 | | | 192 | 185 | | 71 | | | | | 488 |
| 70 and up | | | | | | | 67 | | | | | | 67 |
| Totals | 3,466 | 5,301 | 4,526 | 6,261 | 11,379 | 9,738 | 7,123 | 3,855 | 927 | 368 | 149 | - | 53,094 |

## Table D-1:
## Active Members Distribution of
## Full-Time Employees and Salaries
## as of June 30, 2020

### 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 | 42,423 | 44,002 | 47,028 | 54,791 | 55,324 | | | | | | | | 44,944 |
| 25 to 29 | 41,216 | 45,186 | 49,752 | 51,904 | 55,713 | | | | | | | | 48,491 |
| 30 to 34 | 37,686 | 48,952 | 49,326 | 53,468 | 56,430 | 57,812 | | | | | | | 52,800 |
| 35 to 39 | 46,727 | 43,860 | 46,000 | 53,797 | 56,097 | 63,138 | 63,740 | | | | | | 55,722 |
| 40 to 44 | 44,388 | 46,528 | 45,597 | 52,909 | 57,083 | 60,105 | 68,115 | 69,661 | | | | | 57,881 |
| 45 to 49 | 43,927 | 53,973 | 54,242 | 53,981 | 59,333 | 64,257 | 67,062 | 74,729 | 74,755 | | | | 62,598 |
| 50 to 54 | 25,075 | 57,431 | 56,623 | 53,015 | 58,157 | 62,510 | 63,954 | 67,202 | 74,421 | | | | 60,562 |
| 55 to 59 | 40,477 | 52,046 | 55,833 | 61,072 | 60,292 | 60,624 | 64,814 | 69,228 | 79,921 | 82,283 | 80,448 | | 62,741 |
| 60 to 64 | 39,640 | 48,654 | 49,691 | 68,392 | 60,815 | 55,923 | 60,505 | 77,369 | 58,449 | 38,758 | 68,909 | | 58,338 |
| 65 to 69 | | 39,710 | | | 63,908 | 61,640 | | 71,216 | | | | | 60,946 |
| 70 and up | | | | | | | 66,992 | | | | | | 66,992 |
| Totals | 41,761 | 47,329 | 50,292 | 53,978 | 57,472 | 61,246 | 65,347 | 71,390 | 71,287 | 73,578 | 74,679 | | 56,423 |

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

## Table D-1:
## Active Members Distribution of
## Part-Time Employees
## as of June 30, 2020

### 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 | 16 | 2 | 2 | | | | | | | | | | 20 |
| 25 to 29 | 10 | 2 | 1 | | 1 | | | | | | | | 14 |
| 30 to 34 | 8 | 1 | 1 | | 3 | | | | | | | | 13 |
| 35 to 39 | 5 | 3 | 2 | | 2 | | | | | | | | 12 |
| 40 to 44 | 7 | 1 | | 1 | 1 | | | | | | | | 10 |
| 45 to 49 | 4 | 3 | | | | 1 | | | | | | | 8 |
| 50 to 54 | 4 | 1 | | 2 | | | 1 | | | | | | 8 |
| 55 to 59 | 3 | | 1 | 1 | | | 1 | | | | | | 6 |
| 60 to 64 | | | | | | | 1 | | | | | | 1 |
| 65 to 69 | | | | | | | | | | | | | |
| 70 and up | | | | | | | | | | | | | |
| Totals | 57 | 13 | 7 | 4 | 7 | 1 | 3 | - | - | - | - | - | 92 |

## 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 **Error! Bookmark not defined.** for an explanation of the number of annuitants used for valuation purposes.

### Members Receiving Service Retirement Benefits as of June 30, 2020

| Age | Number of Persons | Annual Benefits | Average Annual Benefits |
|---|---|---|---|
| <50 | - | $ - | $ - |
| 50 to 54 | 21 | 678,955 | 32,331 |
| 55 to 59 | 67 | 1,303,302 | 19,452 |
| 60 to 64 | 81 | 1,929,359 | 23,819 |
| 65 to 69 | 67 | 1,534,684 | 22,906 |
| 70 to 74 | 59 | 1,095,130 | 18,562 |
| 75 to 79 | 17 | 380,101 | 22,359 |
| 80 to 84 | 12 | 373,979 | 31,165 |
| 85 to 89 | 5 | 162,754 | 32,551 |
| 90 and up | 4 | 116,709 | 29,177 |
| Totals | 333 | $ 7,574,973 | $ 22,748 |

### Members Receiving Disability Retirement Benefits as of June 30, 2020

| Age | Number of Persons | Annual Benefits | Average Annual Benefits |
|---|---|---|---|
| <50 | 2 | $ 25,973 | $ 12,987 |
| 50 to 54 | 1 | 25,588 | 25,588 |
| 55 to 59 | 3 | 51,174 | 17,058 |
| 60 to 64 | 4 | 76,017 | 19,004 |
| 65 to 69 | 6 | 122,997 | 20,499 |
| 70 to 74 | 1 | 26,874 | 26,874 |
| 75 to 79 | 2 | 48,583 | 24,291 |
| 80 to 84 | 2 | 51,975 | 25,988 |
| 85 to 89 | - | - | - |
| 90 and up | - | - | - |
| Totals | 21 | $ 429,181 | $ 20,437 |

## 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 **Error! Bookmark not defined.** for an explanation of the number of annuitants used for valuation purposes.

### Survivors of Deceased Retired Members as of June 30, 2020

| Age | Number of Persons | Annual Benefits | Average Annual Benefits |
|---|---|---|---|
| <50 | 1 | $ 6,032 | $ 6,032 |
| 50 to 54 | - | - | - |
| 55 to 59 | - | - | - |
| 60 to 64 | 1 | 9,921 | 9,921 |
| 65 to 69 | 4 | 82,369 | 20,592 |
| 70 to 74 | - | - | - |
| 75 to 79 | 3 | 97,450 | 32,483 |
| 80 to 84 | 2 | 70,377 | 35,189 |
| 85 to 89 | 5 | 128,340 | 25,668 |
| 90 and up | 3 | 77,459 | 25,820 |
| Totals | 19 | $ 471,948 | $ 24,839 |

### Survivors of Deceased Active Members as of June 30, 2020

| Age | Number of Persons | Annual Benefits | Average Annual Benefits |
|---|---|---|---|
| <50 | 4 | $ 52,896 | $ 13,224 |
| 50 to 54 | 1 | 3,834 | 3,834 |
| 55 to 59 | - | - | - |
| 60 to 64 | 2 | 47,913 | 23,957 |
| 65 to 69 | 2 | 15,583 | 7,792 |
| 70 to 74 | 2 | 18,424 | 9,212 |
| 75 to 79 | - | - | - |
| 80 to 84 | - | - | - |
| 85 to 89 | - | - | - |
| 90 and up | - | - | - |
| Totals | 11 | $ 138,650 | $ 12,605 |

## Table D-2:
## Distribution of Inactive Lives

The chart reflects the counts and benefits used for valuation purposes as a result of data processing. Please refer to the chart on page **Error! Bookmark not defined.** for an explanation of the number of annuitants used for valuation purposes.

**Terminated Vested Members as of June 30, 2020**
**Number of Persons**

| Age | Number |
|---|---|
| <25 | |
| 25 to 29 | 4 |
| 30 to 34 | 7 |
| 35 to 39 | 25 |
| 40 to 44 | 22 |
| 45 to 49 | 35 |
| 50 to 54 | 28 |
| 55 to 59 | 9 |
| 60 to 64 | 4 |
| 65 to 69 | 1 |
| 70 and above | |
| Total | 135 |

## 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, 2019 Valuation** | 1,021 | 138 | 296 | 23 | 27 |
| Refunds and Non-Vested Terminations | (87) | (8) | | | |
| Vested Terminations | (14) | 14 | | | |
| Service Retirements | (31) | (7) | 38 | | |
| Disability Retirements | | | | | |
| Deaths | (1) | | (5) | (2) | |
| New Entrants | 129 | | 4 | | 3 |
| Rehires | 16 | (2) | | | |
| Other | | | | | |
| **June 30, 2020 Valuation** | 1,033 | 135 | 333 | 21 | 30 |

## 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 |
|---|---|---|---|---|---|---|
| 2020 | 1,033 | 53,825 | 52,106 | 41.4 | 7.9 | 33.4 |
| 2019 | 1,021 | 51,677 | 50,614 | 41.7 | 8.0 | 33.8 |
| 2018 | 1,010 | 50,823 | 50,320 | 42.0 | 8.1 | 34.0 |
| 2017 | 1,012 | 49,381 | 48,795 | 42.0 | 8.1 | 33.9 |
| 2016 | 989 | 47,108 | 47,632 | 40.2 | 7.9 | 32.3 |
| 2015 | 993 | 44,713 | 45,029 | 42.2 | 7.6 | 34.6 |
| 2014 | 955 | 40,458 | 42,365 | | | |
| 2013 | 971 | 39,155 | 40,324 | | | |
| 2012 | 972 | 38,317 | 39,421 | | | |

## 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 |
| 2020 | 384 | 8,615 | 22,434 | 64.7 | 57.8 | 18.8 | 135 | 494 |
| 2019 | 346 | 7,624 | 22,034 | 64.4 | 57.7 | 18.5 | 138 | 447 |
| 2018 | 312 | 6,792 | 21,768 | 66.0 | 56.4 | 17.0 | 123 | 381 |
| 2017 | 276 | 5,958 | 21,586 | 66.3 | 56.3 | 17.8 | 114 | 304 |
| 2016 | 250 | 5,286 | 21,144 | 66.3 | 57.8 | 18.3 | 105 | 278 |
| 2015 | 231 | 4,721 | 20,437 | 66.3 | 56.4 | 18.5 | 95 | 235 |
| 2014 | 203 | 4,106 | 20,227 | | | | 87 | 175 |
| 2013 | 180 | 3,606 | 20,033 | | | | 69 | 148 |
| 2012 | 163 | 3,317 | 20,350 | | | | 64 | 146 |

## Table E-3:
## Contribution Rates

| Valuation Date (June 30) | Contribution Rates | | | Normal Cost Rate* | UAAL Rate** |
|---|---|---|---|---|---|
| | Employee | Employer/State | Total | | |
| 2020 | 9.00 % | 10.56 % | 19.56 % | 15.61 % | 3.95 % |
| 2019 | 9.00 | 10.56 | 19.56 | 16.16 | 3.40 |
| 2018 | 9.00 | 10.56 | 19.56 | 16.32 | 3.24 |
| 2017 | 9.00 | 10.56 | 19.56 | 16.19 | 3.37 |
| 2016 | 9.00 | 10.56 | 19.56 | 18.23 | 1.33 |
| 2015 | 9.00 | 10.56 | 19.56 | 18.41 | 1.15 |
| 2014 | 9.00 | 10.56 | 19.56 | 18.58 | 0.98 |
| 2013 | 9.00 | 10.56 | 19.56 | 18.82 | 0.74 |
| 2012 | 9.00 | 10.56 | 19.56 | 18.98 | 0.58 |

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

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2020. Additional information as of the latest actuarial valuation follows.

| | |
|---|---|
| Valuation date | June 30, 2020 |
| 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* | 7.65% |
| 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<br>Resulting from Differences Between Assumed Experience and Actual Experience | | | | | | |
|---|---|---|---|---|---|---|
| | Gain or (Loss) for Year Ending June 30,<br>(expressed in thousands) | | | | | |
| Type of Activity | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Investment Income on Actuarial Value of Assets | $ 2,264 | $ 985 | $ 645 | $ (1,127) | $ (710) | $ (1,369) |
| Combined Liability Experience | (2,511) | (3,782) | (5,352) | 4,375 | 1,891 | (2,638) |
| (Loss)/Gain During Year from Financial Experier | $ (247) | $ (2,797) | $ (4,707) | $ 3,248 | $ 1,181 | $ (4,007) |
| Non-Recurring Items | 0 | 0 | (5,308) | 0 | 0 | 0 |
| Composite Gain or (Loss) During Year | $ (247) | $ (2,797) | $ (10,015) | $ 3,248 | $ 1,181 | $ (4,007) |

| Schedule of Funding Progress<br>(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 |
| 2020 | $ 221,949 | $ 264,745 | 84% | $ 42,796 | $ 53,825 | 80% |
| 2019 | 206,504 | 245,130 | 84% | 38,626 | 51,677 | 75% |
| 2018 | 190,849 | 230,077 | 83% | 39,228 | 50,823 | 77% |
| 2017 | 176,311 | 217,642 | 81% | 41,332 | 49,381 | 84% |
| 2016 | 160,555 | 191,007 | 84% | 30,452 | 47,108 | 65% |
| 2015 | 145,314 | 172,160 | 84% | 26,846 | 44,885 | 60% |

| Solvency Test<br>Aggregate Accrued Liabilities for<br>(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) |
| 2020 | $ 43,619 | $ 113,801 | $ 107,325 | $ 221,949 | 100% | 100% | 60% |
| 2019 | 41,429 | 100,024 | 103,677 | 206,504 | 100% | 100% | 63% |
| 2018 | 39,605 | 88,621 | 101,851 | 190,849 | 100% | 100% | 61% |
| 2017 | 39,205 | 77,897 | 100,540 | 176,311 | 100% | 100% | 59% |
| 2016 | 36,111 | 65,912 | 88,984 | 160,555 | 100% | 100% | 66% |
| 2015 | 34,396 | 58,648 | 79,116 | 145,314 | 100% | 100% | 66% |

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 Game Wardens' and Peace Officers' Retirement System. Defined terms are capitalized throughout this Appendix.

**Accrued Benefit**

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

**Actuarial Accrued Liability**

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

**Actuarial Assumptions**

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

**Actuarial Cost Method**

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

**Actuarial 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.