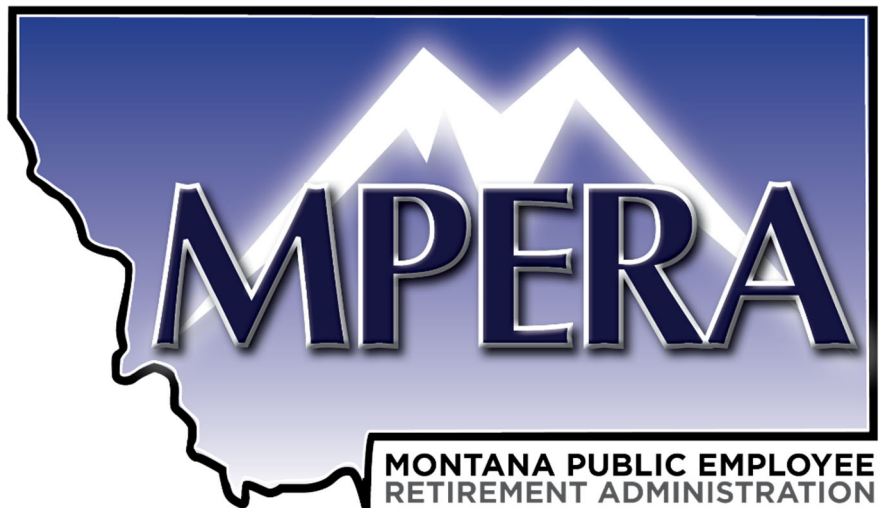




Cavanaugh Macdonald
CONSULTING, LLC

The experience and dedication you deserve

**Highway Patrol Officers' Retirement System
of the State of Montana**



**Actuarial Valuation
As of June 30, 2019**





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

October 10, 2019

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 Highway Patrol Officers' Retirement System of the State of Montana (HPORS), prepared as of June 30, 2019.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2019. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the statutory contribution rate reflecting all anticipated contribution increases are sufficient to amortize the unfunded accrued liability within a 42-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 as of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein. This also certifies that the undersigned has 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.



October 1, 2019
Public Employees' Retirement Board
Page 2

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,

A handwritten signature in blue ink that reads "Todd B. Green" followed by a horizontal line.

Todd B. Green, ASA, FCA, MAAA
President

A handwritten signature in blue ink that reads "Beverly V. Bailey".

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



Highway Patrol Officers' Retirement System of the State of Montana

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Section I: Summary of Results

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

VALUATION DATE	June 30, 2019	June 30, 2018
Active members*	232	233
Disabled Members**	6	7
Retirees and Beneficiaries**	336	331
Terminated Vested Members	18	14
Terminated Non-Vested Members	25	23
Total***	617	608
Annual Covered Payroll of Active Members	\$ 15,177,612	\$ 15,251,339
Average Salaries from Covered Payroll	\$ 65,421	\$ 65,456
Annual Retirement Allowances for Retired Members and Beneficiaries	\$ 11,970,804	\$ 11,470,062
Assets		
Actuarial value	\$ 152,850,886	\$ 147,143,742
Market value	152,777,627	149,198,868
Actuarial Accrued Liability (AAL)	\$ 236,805,027	\$ 229,821,775
Unfunded Actuarial Accrued Liability (UAAL)	\$ 83,954,141	\$ 82,678,033
Funded Ratio	64.55%	64.03%
Market Value Rate of Return	5.63%	8.86%
Annual Cost		
Statutory Funding Rate	51.38%	51.38%
Total Normal Rate	24.17%	24.14%
Employee Contribution Rate****	<u>13.05%</u>	<u>13.05%</u>
Employer Normal Rate	11.12%	11.09%
Employer Contribution Rate		
Normal Rate	11.12%	11.09%
Administrative Expense Load	0.18%	0.27%
UAAL Rate	<u>27.03%</u>	<u>26.97%</u>
Total Rate	38.33%	38.33%
Amortization Period	42 years	40 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	11.12%	11.09%
Administrative Expense Load	0.18%	0.27%
UAAL Rate (30-Year Rate)	<u>31.37%</u>	<u>30.69%</u>
Total Rate	42.67%	42.05%
Shortfall/(Surplus)	4.34%	3.72%

* Includes 13 DROP members as of June 30, 2018 and 18 DROP members as of June 30, 2019.

** Based on PERB categorization for the annual report. For actuarial purposes, 18 members in 2018 and 20 members in 2019 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.

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



Section I: Summary of Results

As a result of this actuarial valuation of the benefits in effect under the Highway Patrol Officers' Retirement System as of June 30, 2019, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 42 years. The Funded Ratio is 64.55%.

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, 2019 market value of assets is \$73,259 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 42 years, and the Funded Ratio would be 64.52%.

Additional Details

MCA 19-6-404 sets the employer contribution at 28.15% of salary, the state contribution at 10.18% and MCA 19-6-402 sets the employee contribution at 13% for non-GABA actives (effective July 1, 2016) and 13.05% for GABA actives (effective July 1, 2016).

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 5.63% net of investment expenses. As a result of prior years' unrecognized losses, the actuarial assets earned 7.18%, which is 0.47% less than the expected return of 7.65%. The return on the actuarial assets differs from the return on market assets because the actuarial value of assets spreads gains and losses over four years. The chart below shows the annual returns for the past ten years.

Year	Market Return	Actuarial Return	Assumed Investment Return	Market Return over Assumption	Actuarial Return over Assumption
7/1/2009 to 6/30/2010	13.04%	(1.16)%	7.75%	5.29%	(8.91)%
7/1/2010 to 6/30/2011	21.79	(0.04)	7.75	14.04	(7.79)
7/1/2011 to 6/30/2012	2.24	3.32	7.75	(5.51)	(4.43)
7/1/2012 to 6/30/2013	12.88	11.86	7.75	5.13	4.11
7/1/2013 to 6/30/2014	17.10	13.13	7.75	9.35	5.38
7/1/2014 to 6/30/2015	4.60	9.61	7.75	(3.15)	1.86
7/1/2015 to 6/30/2016	2.04	8.76	7.75	(5.71)	1.01
7/1/2016 to 6/30/2017	11.87	8.25	7.75	4.12	0.50
7/1/2017 to 6/30/2018	8.86	6.84	7.65	1.21	(0.81)
7/1/2018 to 6/30/2019	5.63	7.18	7.65	(2.02)	(0.47)

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



Section I: Summary of Results

Amortization of the UAAL

The June 30, 2018 actuarial valuation calculated a 40-year amortization period for the UAAL. The resulting amortization period at June 30, 2019 is 42 years.

Funding and Benefits Policy

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

1) Funding Requirement

a) The Funding and Benefits Policy states:

1. "The Entry Age Normal Cost Method shall be applied to the projected benefits in determining the Normal Cost and Actuarial Accrued Liability.
2. Asset smoothing can be used in the valuation process to spread the recognition of investment gains and losses over a four-year period.
3. The unfunded actuarial accrued liability should be amortized over a reasonable period of time and should not exceed 30 years on a rolling basis. Generally, the funding period should be constant or decreasing."

b) Analysis: The liabilities of the System are determined using the Entry Age Normal Cost Method and are compared to the actuarial value of assets, which are developed using asset smoothing that recognizes gains and losses over a four-year period. The amortization period as of June 30, 2019 is 42 years based on actuarial value of assets. The contributions provided for in statute are not sufficient to fully amortize the unfunded actuarially accrued liability within 30 years.

2) Funding Objectives

a) The Funding and Benefits Policy states: "The primary objectives are to: 1) ensure that the systems are financially sound and pay all benefits promised using assets accumulated from required employer and member contributions and investment income; and 2) achieve a well-funded status with a range of safety to absorb market volatility without creating a 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. It is important to note that the normal cost rate for new hires is less than the current active population. As terminate or retire, and are replaced with a member with a lower normal cost rate, more of the employer contribution will be available to amortize the unfunded accrued liability. As a result, the effective amortization period is less than the amortization period calculated in the actuarial valuation, which does not reflect new hires.



Section I: Summary of Results

3) Benefit Enhancements

- a) The Funding and Benefits Policy states: “Proposals must provide funding from sources sufficient to cover future costs. Unfunded liabilities created by the proposal must be amortized over a period of time appropriate to the retirement system, but not more than 30 years.”
- b) Analysis: Without supplemental funding, a benefit enhancement would increase the amortization period of the unfunded actuarial accrued liability and further delay the goal of achieving a well-funded status with a range of safety to absorb market volatility without creating additional UAAL.



Section I: Summary of Results

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			
	<u>Funded Ratio</u>	<u>Amortization Period</u>	<u>Actuarially Determined Employer Contribution (Millions \$)*</u>
Current Assumption 7.65%	64.55%	42 Years	\$5.9
Higher Assumption 8.65%	<u>72.56%</u>	<u>18 Years</u>	<u>4.3</u>
Change - Increase / (Decrease)	8.01%	(24) Years	(\$1.6)
Impact of Assuming 0.5% Higher Investment Return			
	<u>Funded Ratio</u>	<u>Amortization Period</u>	<u>Actuarially Determined Employer Contribution (Millions \$)*</u>
Current Assumption 7.65%	64.55%	42 Years	\$5.9
Higher Assumption 8.15%	<u>68.52%</u>	<u>27 Years</u>	<u>5.1</u>
Change - Increase / (Decrease)	3.97%	(15) Years	(\$0.8)
Impact of Assuming 0.5% Lower Investment Return			
	<u>Funded Ratio</u>	<u>Amortization Period</u>	<u>Actuarially Determined Employer Contribution (Millions \$)*</u>
Current Assumption 7.65%	64.55%	42 Years	\$5.9
Lower Assumption 7.15%	<u>60.64%</u>	<u>86 Years</u>	<u>6.8</u>
Change - Increase / (Decrease)	(3.91%)	44 Years	\$0.9
Impact of Assuming 1.0% Lower Investment Return			
	<u>Funded Ratio</u>	<u>Amortization Period</u>	<u>Actuarially Determined Employer Contribution (Millions \$)*</u>
Current Assumption 7.65%	64.55%	42 Years	\$5.9
Lower Assumption 6.65%	<u>56.80%</u>	<u>Does Not Amortize</u>	<u>7.8</u>
Change - Increase / (Decrease)	(7.75%)	N/A	\$1.9

* Amounts reflect estimated increase/(decrease) in FY2020 employer contributions only, in order to maintain the 42 year amortization period.



Section I: Summary of Results

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, 2018 Actuarial Valuation. Further detail can be found in Tables 10 and 11.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2018 Valuation UAAL	\$82,678,033
Normal Cost (Including Expenses)	3,335,079
Contributions	(8,080,367)
Interest	6,270,929
Expected June 30, 2019 UAAL	<u>\$84,203,674</u>
Experience (Gain) / Loss on Actuarial Liabilities	\$(927,335)
Experience (Gain) / Loss on Actuarial Assets	677,802
Assumption & Method Changes	0
Plan Changes	0
Total (Gain) / Loss	<u><u>\$(249,533)</u></u>
June 30, 2019 Valuation UAAL	\$83,954,141



Section I: Summary of Results

Summary

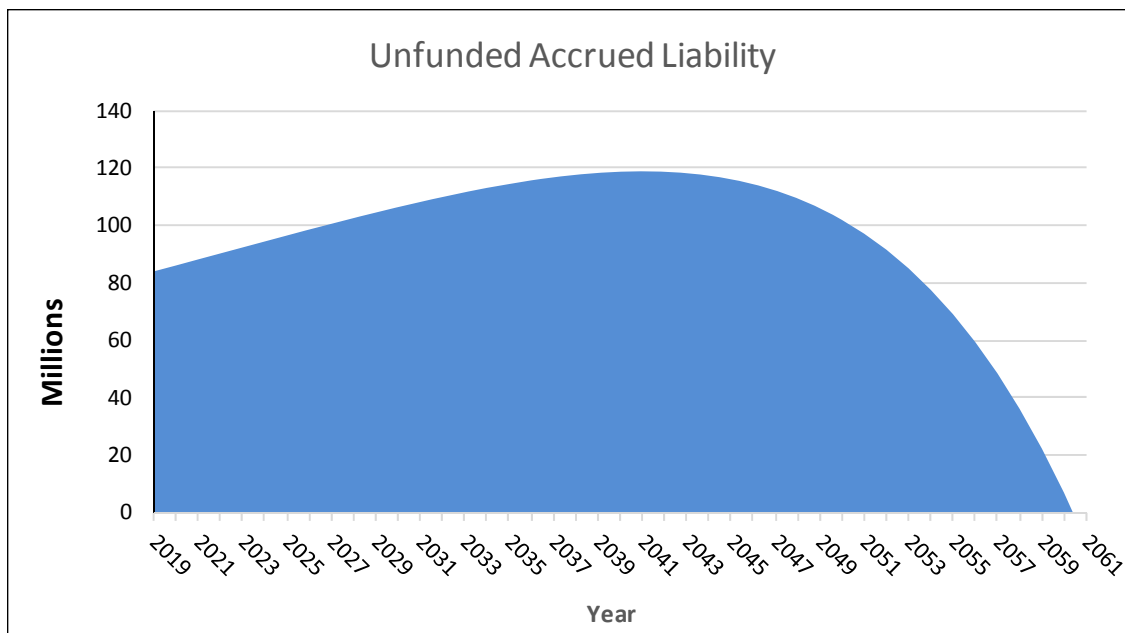
- * The System's actuarial value investment return of 7.18% for the year ended June 30, 2019 is 0.47% less than the expected return of 7.65%. This represents an asset loss of \$677,802 due to investment return being less than anticipated. As of June 30, 2019, the market value of assets was \$152,777,627. As of June 30, 2019 the actuarial value of assets was \$152,850,886. The June 30, 2019 market value of assets will be recognized in future actuarial valuations unless it is offset by returns less than the 7.65% assumption.
- * As of June 30, 2019, the amortization period of the UAAL is 42 years. Prior to this valuation, the funding period was 40 years. The increase in the amortization period is due to the lack of payroll growth from the previous year. The ultimate goal of the Board's Funding and Benefits Policy is to increase the funded status to a level such that the amortization period does not exceed 30 years. Absent 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%.



Section I: Summary of Results

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





Section II: Assets

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, 2019. 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.

**Section II: Assets**

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

	<u>2019</u>	<u>2018</u>
ASSETS		
Cash and Short Term Investments	\$ 5,549,201	\$ 3,398,346
Securities Lending Collateral	\$ 698,981	\$ 946,762
Receivables:		
Interest Receivable	\$ 9,377	\$ 5,783
Accounts Receivable	123,381	126,241
Due from Other Funds	-	-
Due from Primary Government	-	-
Notes Receivable	-	-
Total Receivables	<u>\$ 132,758</u>	<u>\$ 132,024</u>
Investments, at fair value:		
Investment Pools	147,047,314	145,456,514
Other Investments	-	-
Total Investments	<u>\$ 147,047,314</u>	<u>\$ 145,456,514</u>
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	\$ 311	\$ 311
Intangible Assets, at cost, net of Amortization Expense	302,560	348,399
Total Capital Assets	<u>\$ 302,871</u>	<u>\$ 348,710</u>
TOTAL ASSETS	<u>\$ 153,731,125</u>	<u>\$ 150,282,356</u>
LIABILITIES		
Securities Lending Liability	\$ 698,981	\$ 946,762
Accounts Payable	218,310	86,432
Unearned Revenue	7,768	7,735
Due to Other Funds	28,439	42,559
Compensated Absences	-	-
OPEB Implicit Rate Subsidy LT	-	-
TOTAL LIABILITIES	<u>\$ 953,498</u>	<u>\$ 1,083,488</u>
NET POSITION - RESTRICTED FOR PENSION BENEFITS	<u>\$ 152,777,627</u>	<u>\$ 149,198,868</u>

**Section II: Assets**

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

	<u>2019</u>	<u>2018</u>
ADDITIONS		
Contributions:		
Employer	\$ 5,844,909	\$ 5,858,493
Plan Member	2,002,319	2,386,526
Other	233,139	250,150
Total Contributions	<u>\$ 8,080,367</u>	<u>\$ 8,495,169</u>
Misc. Income	\$ -	\$ -
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ 8,222,552	\$ 12,766,752
Investment Earnings	954,347	402,085
Security Lending Income	37,416	28,413
Investment Income/(Loss)	<u>\$ 9,214,315</u>	<u>\$ 13,197,250</u>
Investment Expense	(926,708)	(903,088)
Security Lending Expense	(18,777)	(11,338)
Net Investment Income/(Loss)	<u>\$ 8,268,830</u>	<u>\$ 12,282,824</u>
Total Additions	<u>\$ 16,349,197</u>	<u>\$ 20,777,993</u>
DEDUCTIONS		
Benefit Payments	\$ 12,062,607	\$ 11,545,732
Refunds/Distributions	582,438	321,840
Refunds to Other Plans	-	-
Transfers to DCRP	-	-
Transfers to MUS-RP	-	-
OPEB Expense	-	-
Administrative Expense	127,400	256,309
Total Deductions	<u>\$ 12,772,445</u>	<u>\$ 12,123,881</u>
NET INCREASE (DECREASE) IN PLAN NET ASSETS	\$ 3,576,752	\$ 8,654,112
NET POSITION - RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR	\$ 149,198,868	\$ 140,536,689
ADJUSTMENT	2,007	\$ 8,067
END OF YEAR	<u>\$ 152,777,627</u>	<u>\$ 149,198,868</u>



Section II: Assets

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

Valuation Date June 30:	2018	2019	2020	2021	2022
A. Actuarial Value Beginning of Year	\$ 141,235,730	\$ 147,143,742			
B. Market Value End of Year	149,198,868	152,777,627			
C. Market Value of Beginning of Year	140,536,689	149,198,868			
D. Cash Flow					
D1. Contributions	8,495,169	8,080,367			
D2. Benefit Payments	(11,867,572)	(12,645,045)			
D3. Administrative Expenses	(256,309)	(127,400)			
D4. Investment Expenses	(914,426)	(945,485)			
D5. Net	\$ (4,543,138)	\$ (5,637,563)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	\$ 13,205,317	\$ 9,216,322			
E2. Assumed Rate	7.65%	7.65%			
E3. Amount for Immediate Recognition C.*E2. + ((D1.+D2.+D3.)*E2.*0.5) - D4.	11,526,684	12,179,726			
E4. Amount for Phased-in Recognition E1. - E3.	1,678,633	(2,963,404)			
F. Phased-in Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	\$ 419,658	\$ (740,851)	\$ -	\$ -	\$ -
F2. First Prior Year	1,309,978	419,658	(740,851)	-	-
F3. Second Prior Year	(1,823,804)	1,309,978	419,658	(740,851)	-
F4. Third Prior Year	(981,366)	(1,823,804)	1,309,978	419,658	(740,851)
F5. Total Recognized Investment Gain	\$ (1,075,534)	\$ (835,019)	\$ 988,785	\$ (321,193)	\$ (740,851)
G. Actuarial Value End of Year A. + D5. + E3. + F5.	\$ 147,143,742	\$ 152,850,886			



Section II: Assets

**Table 4:
Historical Investment Returns***

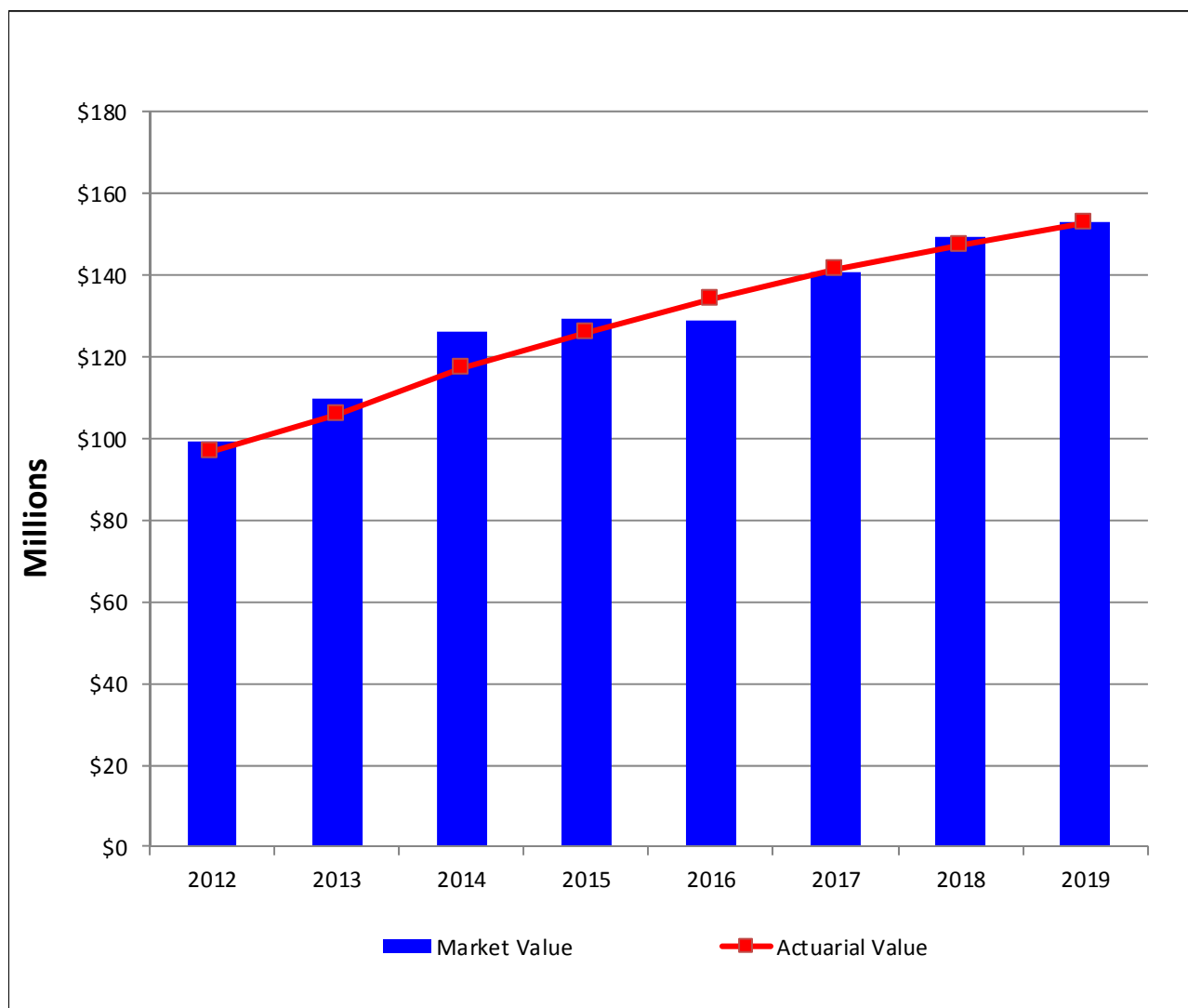
Fiscal Year Ending	Market Returns	Actuarial Returns	Assumed Rate of Return	Actuarial Return Over Assumption
June 30, 2010	13.04%	(1.16)%	7.75%	(8.91)%
June 30, 2011	21.79%	(0.04)%	7.75%	(7.79)%
June 30, 2012	2.24%	3.32%	7.75%	(4.43)%
June 30, 2013	12.88%	11.86%	7.75%	4.11%
June 30, 2014	17.10%	13.13%	7.75%	5.38%
June 30, 2015	4.60%	9.61%	7.75%	1.86%
June 30, 2016	2.04%	8.76%	7.75%	1.01%
June 30, 2017	11.87%	8.25%	7.75%	0.50%
June 30, 2018	8.86%	6.84%	7.65%	(0.81)%
June 30, 2019	5.63%	7.18%	7.65%	(0.47)%
10 Year Average	9.83%	6.68%		(1.06)%

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



Section II: Assets

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





Section III: Actuarial Present Value of Future Benefits

Actuarial Present Value of Future Benefits

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

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

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

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



Section III: Actuarial Present Value of Future Benefits

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

	<u>June 30, 2019</u> Total	<u>June 30, 2018</u> Total
A. Active Members Liability Due to Probability of		
Service Retirement	\$ 68,373,847	\$ 71,656,879
Disability Retirement	\$ 2,569,363	\$ 2,662,304
In-Service Death	\$ 1,122,512	\$ 1,168,278
Termination	\$ 2,681,956	\$ 2,677,786
Total	\$ 74,747,678	\$ 78,165,247
B. Inactive Members and Annuitants		
Service Retirement	\$ 151,467,043	\$ 141,589,961
Disability Retirement	\$ 12,734,536	\$ 11,963,728
Beneficiaries*	\$ 21,104,481	\$ 22,020,559
Vested Terminated Members	\$ 1,618,979	\$ 1,387,079
Refund of Member Contributions	\$ 260,552	\$ 226,008
Total	\$ 187,185,591	\$ 177,187,335
C. Grand Total	\$ 261,933,269	\$ 255,352,582

* Includes survivors of active and retired members



Section IV: Employer Contributions

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 7 indicates that there is a shortfall in current actuarial assets to meet the present value of all future benefits for current members and beneficiaries.

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

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

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

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

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

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

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

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



Section IV: Employer Contributions

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.



Section IV: Employer Contributions

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

	<u>June 30, 2019</u> <u>Total</u>	<u>June 30, 2018</u> <u>Total</u>
Service retirement	19.50%	19.52%
Disability retirement	1.66%	1.66%
In Service Death	0.67%	0.67%
Vested retirement	<u>2.34%</u>	<u>2.29%</u>
Total Normal Rate	<u><u>24.17%</u></u>	<u><u>24.14%</u></u>
Employee Normal Rate	13.05%	13.05%
Employer Normal Rate	11.12%	11.09%
Administrative Expense Load	0.18%	0.27%
Rate Available to Amortize Unfunded Actuarial Accrued Liability	<u><u>27.03%</u></u>	<u><u>26.97%</u></u>
Statutory Funding Rate*	51.38%	51.38%

* The rates shown are for the fiscal year following the valuation date.

Note: The normal cost rate for members hired on or after July 1, 2013 is 23.54%.



Section IV: Employer Contributions

**Table 8:
Unfunded Actuarial Accrued Liability**

	<u>June 30, 2019</u>	<u>June 30, 2018</u>
A. Actuarial present value of all future benefits for present members, retirees, and their survivors (Table 6)	\$ 261,933,269	\$255,352,582
B. Less actuarial present value of total future normal costs for present members	<u>\$ 25,128,242</u>	<u>\$ 25,530,807</u>
C. Actuarial accrued liability	\$ 236,805,027	\$229,821,775
D. Less assets available for benefits	<u>\$ 152,850,886</u>	<u>\$ 147,143,742</u>
E. Unfunded actuarial accrued liability	\$ 83,954,141	\$ 82,678,033



Section V: Cash Flows

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.

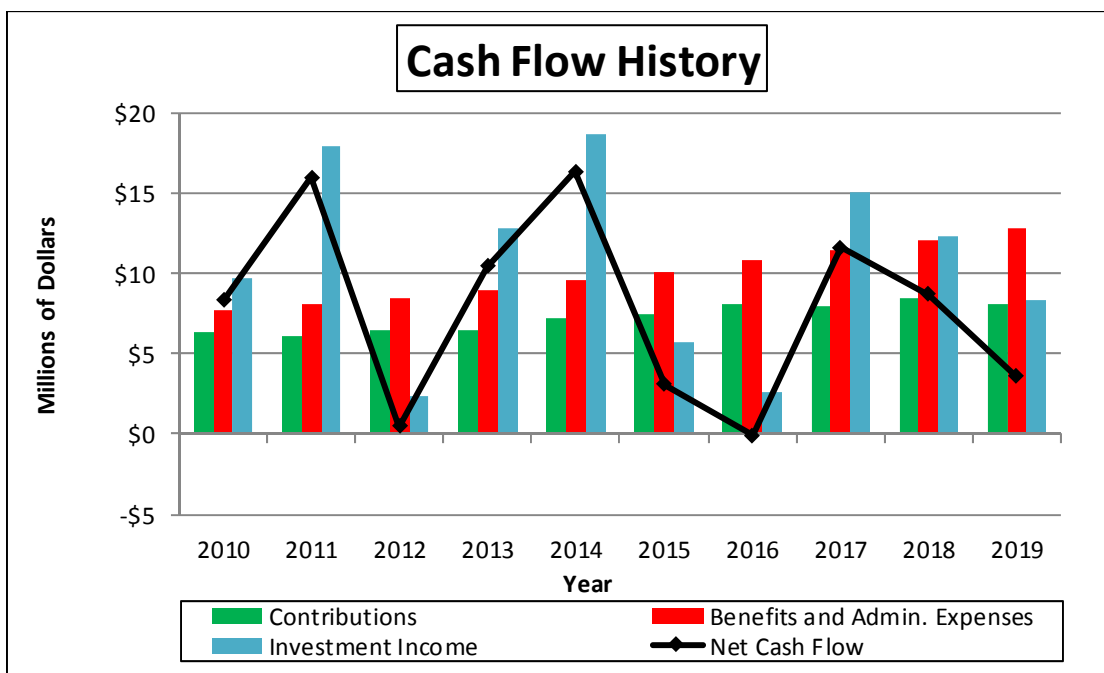
Table 9 shows the System had a positive cash flow for the year ended June 30, 2019. The System’s total cash flow including benefit payments, administrative expenses and investment earnings was \$3.6 million. Of the \$3.6 million, \$8.3 million was due to investment returns.

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



Section V: Cash Flows

**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
2010	\$ 6.3	\$ 7.7	\$ 9.7	\$ 8.3
2011	6.1	8.0	17.9	16.0
2012	6.5	8.4	2.3	0.4
2013	6.5	8.9	12.8	10.4
2014	7.2	9.6	18.7	16.3
2015	7.5	10.1	5.7	3.1
2016	8.1	10.8	2.6	(0.1)
2017	8.0	11.5	15.1	11.6
2018	8.5	12.1	12.3	8.7
2019	8.1	12.8	8.3	3.6



Section VI: Actuarial Gains of Losses

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 UAAL or Funding Reserve to change in the period since the previous actuarial valuation.

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

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



Section VI: Actuarial Gains of Losses

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

A. ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Actuarial Accrued Liability as of June 30, 2018:	\$ 229,821,775
2. Normal Cost for this Plan Year (Including Expenses)	3,335,079
3. Interest on items 1 and 2 [(1+2) x 7.65%]	17,836,499
4. Benefit Payments for this Plan Year (Including Expenses)	(12,772,445)
5. Interest on item [4 x 7.65% x .5]	(488,546)
6. Expected Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 237,732,362</u>
7. Changes due to:	
a. Assumption Changes	0
b. Plan Amendments	0
c. Funding Method	0
d. Actuarial (Gain) / Loss	\$ (927,335)
8. Actual Unfunded Actuarial Accrued Liability as of June 30, 2019:	<u>\$ 236,805,027</u>
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, 2018:	\$ 147,143,742
2. Interest on item [1 x 7.65%]	11,256,496
3. Contributions for this Plan Year	8,080,367
4. Interest on item [3. x 7.65% x .5]	309,074
5. Benefit Payments for this Plan Year (Including Expenses)	(12,772,445)
6. Interest on item [5. x 7.65% x .5]	(488,546)
7. Expected Actuarial Value of Assets as of June 30, 2019:	<u>\$ 153,528,688</u>
8. Actuarial Value of Assets as of June 30, 2019:	<u>\$ 152,850,886</u>
9. (Gain) / Loss	<u>\$ 677,802</u>
C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2018:	\$ 82,678,033
2. Normal Cost for this Plan Year (Including Expenses)	3,335,079
3. Contributions for this Plan Year:	(8,080,367)
4. Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]	6,270,929
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2019:	<u>\$ 84,203,674</u>
6. Changes due to:	
a. Assumption Changes	-
b. Plan Amendments	-
c. Funding Method	-
d. Actuarial (Gain) / Loss	\$ (249,533)
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2019:	<u>\$ 83,954,141</u>

* 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 VI: Actuarial Gains of Losses**

Table 11:
Historical Actuarial (Gains) or Losses*
(\$ in thousands)

	UAAL (Gain)/Loss		
	June 30, 2019	June 30, 2018	June 30, 2017
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ 677.8	\$ 1,129.0	\$ (663.8)
Pay Increases			
Pay increases were (less) greater than expected.	(911.3)	(381.8)	(2,547.8)
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	385.9	1,690.0	5,111.7
Disability Retirements			
Disability claims were (less) greater than expected	271.1	143.9	(479.8)
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	(32.2)	(33.6)	29.4
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	(122.4)	136.3	470.4
Death After Retirement			
Retirees (died younger) lived longer than expected	(188.1)	(55.9)	(730.7)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	(390.4)	1,005.5	(1,156.8)
Other			
Miscellaneous (gains) and losses	60.1	2.9	120.6
Total (Gain) or Loss During Period From Financial Experience	\$ (249.5)	\$ 3,636.3	\$ 153.2
Non-Recurring Items.			
Changes in actuarial assumptions and methods	-	-	7,880.6
Changes in benefits caused a (gain) loss	-	-	-
Composite (Gain) Loss During Period	\$ (249.5)	\$ 3,636.3	\$ 8,033.8

* 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

Actuarial Standards of Practice are issued by the Actuarial Standards Board and are binding on credentialed actuaries practicing in the United States. These standards generally identify what the actuary should consider, document and disclose when performing an actuarial assignment. In September, 2017, Actuarial Standard of Practice Number 51, *Assessment and Disclosure of Risk in Measuring Pension Obligations*, (ASOP 51) was issued as final with application to measurement dates on or after November 1, 2018. This ASOP, which applies to funding valuations, actuarial projections, and actuarial cost studies of proposed plan changes, is first applicable for the June 30, 2019 actuarial valuation for the System.

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

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

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

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

There is a direct correlation between healthy, well-funded retirement plans and contributions sufficient to provide promised benefits. 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 Plan. Due to the fixed nature of the contributions actuarial gains and losses are reflected in the amortization period. Generally, the largest source of actuarial gains and losses are caused by investment volatility. In addition, the unfunded liability is amortized as a level percentage of pay assuming payroll will grow by 3.50% per year. A key risk factor to the System’s funding is that over time, the Statutory Contribution Rates will be insufficient to accumulate enough funds, with investment income, to fund the promised benefits. The funding insufficiency can be caused by amortization periods that are too long or by payroll not growing at the assumed rate.



Section VII: Risk Considerations

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	129,067	14,503	8.90
6/30/2016	128,973	15,276	8.44
6/30/2017	140,537	14,779	9.51
6/30/2018	149,199	15,251	9.78
6/30/2019	152,778	15,178	10.07

The assets at June 30, 2019 are 1007% of payroll, so underperforming the investment return assumption by 1.00% (i.e., earn 6.65% for one year) is equivalent to 10.07% 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.



Section VII: Risk Considerations

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 trend of the System's negative cash flow has been gradually increasing. While there is no immediate concern, this trend should be monitored closely 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	129,067	7,464	10,145	(2,681)	(2.08%)
6/30/2016	128,973	8,076	10,773	(2,697)	(2.09%)
6/30/2017	140,537	7,995	11,530	(3,535)	(2.52%)
6/30/2018	149,199	8,495	12,124	(3,629)	(2.43%)
6/30/2019	152,778	8,080	12,772	(4,692)	(3.07%)



Section VII: Risk Considerations

Liability Maturity Measurement

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

Year End	Retiree Liability (a)	Total Actuarial Accrued Liability (b)	Retiree Liability Percentage (a) / (b)
6/30/2015	134,998,449	192,982,843	70.0%
6/30/2016	148,324,629	203,325,693	73.0%
6/30/2017	166,272,699	219,469,619	75.8%
6/30/2018	177,187,335	229,821,775	77.1%
6/30/2019	187,185,591	236,805,027	79.0%

Historical Member Statistics

Valuation Date	Number of		Active/Retired
	Active	Retired	
June 30, 2015	241	327	0.74
2016	228	329	0.69
2017	238	341	0.70
2018	233	351	0.66
2019	232	342	0.68



Appendix A: Actuarial Procedures and Methods

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-7 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment.

Actuarial Cost Method

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

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

Records and Data

The data used in the valuation consists of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data was supplied by the System and has been 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 0.18% 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.



Appendix A: Actuarial Procedures and Methods

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 3.5% annual rate of increase in the general wage level of the membership.

Service Retirement

Table B-3 shows the annual assumed rates of retirement among members eligible for service retirement. Separate rates are used when a member is eligible for reduced benefits, for the first year a member is eligible for full benefits, and for the years following the first year a member is eligible for full benefits.

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.

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.



Appendix A: Actuarial Procedures and Methods

Probability of Marriage & Dependent Children

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

Records with no Birth Date

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

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

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



Appendix B: Summary of Valuation Assumptions

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	0.18%
G. Interest on DROP accounts	7.65%
II. Demographic assumptions	
A. Individual salary increase due to promotion and longevity	Table B-2
B. Retirement	Table B-3
C. Disablement	Table B-4
D. Mortality among contributing members, service retired members, and beneficiaries. The tables include margins for mortality improvement which is expected to occur in the future. For Males and Females: RP 2000 Combined Employee and Annuitant Mortality Table projected to 2020 using Scale BB, males set back 1 year.	Table B-5
E. Mortality among disabled members For Males and Females: RP 2000 Combined Mortality Table.	Table B-5
F. Other terminations of employment	Table B-6
G. Probability of retaining membership in the System upon vested termination	Table B-7



Appendix B: Summary of Valuation Assumptions

Table B-2

Future Salaries

	(a)	(b)	(1+(a))*(1+(b))
Years of Service	Individual Merit & Longevity	General Wage Increase	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



Appendix B: Summary of Valuation Assumptions

Table B-3

**Retirement
Annual Rates**

Age	20 or More Years of Service
Less than 50	12.0%
50	16.0%
51	16.0
52	16.0
53	16.0
54	16.0
55	20.0
56	20.0
57	20.0
58	20.0
59	20.0
60 & Over	100.0

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

An additional 15% are assumed to retire and enter the DROP for each of the first six years following DROP eligibility.



Appendix B: Summary of Valuation Assumptions

Table B-4
Disablement
Annual Rates

<u>Age</u>	<u>All Members</u>
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.



Appendix B: Summary of Valuation Assumptions

Table B-5
Mortality
Annual Rates

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	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

70% of all member deaths are assumed to be duty-related.



Appendix B: Summary of Valuation Assumptions

Table B-6

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

<u>Years of Service</u>	<u>All Members</u>
0	12.0%
1	7.5
2	7.5
3	7.5
4	7.5
5	5.0
6	5.0
7	5.0
8	5.0
9	5.0
10	3.0
11	3.0
12	3.0
13	3.0
14	3.0
15	1.0
16	1.0
17	1.0
18	1.0
19	1.0



Appendix B: Summary of Valuation Assumptions

Table B-7

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

<u>Age</u>	<u>Probability of Retaining Membership</u>
Under 35	60%
35	60
36	60
37	60
38	60
39	60
40	60
41	60
42	60
43	60
44	60
45	70
46	70
47	70
48	70
49	70
50 & Over	100



Appendix C: Summary of Benefit Provisions

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



Appendix C: Summary of Benefit Provisions

Member contributions interest credited (regular interest)

- Interest is credited to member accounts at the rates determined by the Board.
- The current interest rate credited to member accounts is 2.02%.

Working Retiree Limitations -

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

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

NOTE: PERS has its own limits.



Appendix C: Summary of Benefit Provisions

Second Retirement Benefit

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

- If the member works more than 480 hours in a calendar year and accumulates less than 5 years of service credit before terminating again, the member:
 - is not awarded service credit for the period of reemployment;
 - is refunded the accumulated contributions associated with the period of reemployment;
 - starting the first month following termination of service, receives the same retirement benefit previously paid to the member; and
 - does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA in January immediately following second retirement.
- If the member works more than 480 hours in a calendar year and accumulates at least 5 years of service credit before terminating again, the member:
 - is awarded service credit for the period of reemployment;
 - starting the first month following termination of service, receives:
 - * the same retirement benefit previously paid to the member; **and**
 - * a second retirement benefit for the period of reemployment calculated based on the laws in effect as of the member's rehire date; **and**
 - does not accrue post-retirement benefit adjustments during the term of reemployment but receives a GABA:
 - * on the initial retirement benefit in January immediately following second retirement; **and**
 - * on the second retirement benefit starting in January after receiving that benefit for at least 12 months.
- A member who returns to covered service is **not** eligible for a disability benefit.



Appendix C: Summary of Benefit Provisions

- | | |
|--|---|
| Refunds | <ul style="list-style-type: none">• Terminating members eligible to retire may, in lieu of receiving a monthly retirement benefit, refund their accumulated contributions in a lump sum.• Terminating members with accumulated contributions between \$200 and \$1,000 who wish to rollover their refund must do so within 90 days of termination of service.• Trusts, estates, and charitable organizations listed as beneficiaries are entitled to receive only a lump sum payment. |
| Lump-sum payouts | <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• Single-employer defined benefit |
| Membership eligibility | <ul style="list-style-type: none">• All members of the Montana highway patrol including supervisors and assistant supervisors |
| Member contributions | <ul style="list-style-type: none">• 13% of member's compensation, not covered by GABA• 13.05% of member's compensation, covered by GABA• Effective July 1, 2014, member contributions increase 1% annually through the fiscal year ending 2017. |
| Employer contributions | <ul style="list-style-type: none">• 28.15% of member's compensation |
| State contributions | <ul style="list-style-type: none">• 10.18% of each member's compensation paid from the General Fund |
| Compensation period used in benefit calculation | <ul style="list-style-type: none">• HAC = Highest Average Compensation• HAC is average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to member.• Hired on or after July 1, 2013: 110% annual cap on compensation considered as part of a member's HAC. |
| Service retirement eligibility and benefit | <ul style="list-style-type: none">• 20 years of membership service• 2.6% of HAC x years of service credit |



Appendix C: Summary of Benefit Provisions

Early retirement eligibility and benefit

- Hired **prior to** July 1, 2013:
Any age with **5 years** of membership service; if discontinued from service other than for cause.
- Hired **on or after** July 1, 2013:
Any age with **10 years** of membership service; if discontinued from service other than for cause.
- Normal retirement benefit calculated using HAC and service credit at early retirement, and reduced to the actuarial equivalent of a service retirement benefit based on a retirement age of 60.

Disability eligibility and benefit

Duty-related disability:

- Any active member
- **Less than 20 years** of membership service:
50% of HAC, or
- **20 years or more** of membership service:
2.6% of HAC x years of service credit

Regular disability:

- Any vested member
- The actuarial equivalent of the normal retirement benefit based on retirement age of 60.

Survivor's eligibility and benefit

Duty-related deaths:

- Active member
- A monthly survivor benefit to the surviving spouse or dependent child: 50% of HAC of the member.

Non-duty-related death:

- Active or inactive member
- Member's spouse will receive (or, if there is no surviving spouse or after the surviving spouse dies, each dependent child for as long as they remain dependent children) will equally receive a benefit: The actuarial equivalent of the early retirement benefit.
- A beneficiary may elect to receive the present value of the benefit as a single lump sum.
- For retired members without a surviving spouse or dependent child, the member's designated beneficiary will receive a payment equal to the retired member's accumulated contributions reduced by any retirement benefits already paid.



Appendix C: Summary of Benefit Provisions

Vesting eligibility and benefit

- Hired **prior to** July 1, 2013:
5 years of membership service
- Hired **on or after** July 1, 2013:
10 years of membership service.
- Accrued normal retirement benefit, payable when eligible for retirement.
- In lieu of a pension, a member may receive a refund of accumulated contributions.
- Upon receipt of a refund of accumulated contributions, a member's vested right to a monthly benefit is forfeited.

Retirement benefits - Form of payment

- The retirement benefit is paid for the retired member's life.
- Upon the death of the retired member, the benefit is paid to the surviving spouse.
- If there is no surviving spouse, or after the death of a surviving spouse, benefits are paid to the dependent children, if any, for as long as they remain dependent children.

Post retirement benefit increases

- For retired members who either became active members **on or after** July 1, 1997 **and before** July 1, 2013, **or** who were hired **before** July 1, 1997 **and elected** to be covered under GABA, and who have been retired at least 12 months, a GABA will be paid each year in January equal to 3%.
- For retired members who were hired **prior to** July 1, 1997 **and did not elect** GABA, the minimum monthly benefit provided is equal to 2% x service credit x the current base compensation of a probationary highway patrol officer. Such benefit may not exceed 60% of the current base compensation of a probationary highway patrol officer and the annual increase may not exceed 5% of the current benefit.
- For retired members who became active members **on or after** July 1, 2013, **and** who have been retired at least 36 months, a GABA will be paid each year in January equal to 1.5%.
- For **non-GABA** members who retired **prior to** July 1, 1991 **and** meet eligibility requirements, a supplemental lump sum payment will be made each year based on the increase in the Consumer Price Index.



Appendix C: Summary of Benefit Provisions

- Changes since last valuation**
- None

HPORS Deferred Retirement Option Plan (DROP)

Effective October 1, 2015, eligible members of the Highway Patrol Officers' Retirement System (HPORS) have the opportunity to participate in the DROP. The DROP allows active HPORS members to begin accumulating their retirement benefit, without terminating employment, for up to 60 months. If a member chooses to join the DROP, their monthly retirement benefit and their employee contributions will go into their individual DROP account.

- | | |
|---|---|
| Eligibility | <ul style="list-style-type: none">• Active members of HPORS with at least 20 years of membership service. |
| Period | <ul style="list-style-type: none">• Minimum of one month up to a maximum of five years. The member will not earn additional membership service or service credit. |
| Member contributions | <ul style="list-style-type: none">• While a member is working, the member's contributions go into the DROP Participant's DROP Account. |
| Member contributions interest credited | <ul style="list-style-type: none">• A member's DROP account will earn an interest rate equal to the actuarial assumed rate of return. Currently the rate of return is 7.65%. |
| Employer contributions | <ul style="list-style-type: none">• While a member is working, the member's employer and the State will pay the regular contributions to HPORS. |
| Terminate employment | <ul style="list-style-type: none">• When the member terminates employment at the end of the DROP Period the member will begin receiving the HPORS monthly retirement benefit. At this time, members will receive the DROP Benefit as a lump sum payment or a direct rollover to another eligible retirement plan (as allowed by the IRS). If the member does not designate a distribution method within 60 days after termination of employment, the DROP Benefit will be paid in a taxable lump sum.• If a member's HPORS-covered employment is terminated during the DROP Period, the DROP Benefit will be distributed to the member and payment of the monthly service retirement benefit will begin. |



Appendix C: Summary of Benefit Provisions

- | | |
|--|--|
| Disability | <ul style="list-style-type: none">• If the member becomes disabled during the DROP Period, the member will not be eligible for HPORS disability benefits. If the member terminates service, the service retirement benefit will be paid to the member rather than to the monthly DROP Account. The member will also be eligible to receive the DROP Benefit. |
| Survivor Benefit | <ul style="list-style-type: none">• If a member dies before the end of the DROP Period, the member's surviving spouse or dependent children are entitled to the member's DROP Benefit and the benefit they would have received had the member retired.• If the member does not have a surviving spouse or dependent children, the member's designated beneficiary receives the balance of the member's retirement account and a lump-sum payment of the member's DROP Benefit. |
| Benefit | <ul style="list-style-type: none">• A member may continue to work after the DROP Period ends and remain vested in HPORS. The member will not receive the service retirement benefit or the DROP Benefit during the time the member continues working. The balance of the DROP Account will continue to earn interest.• Upon termination of employment, the member will receive the initial HPORS monthly retirement benefit; an additional benefit based on the member's service credit and highest average compensation earned after DROP participation; and the DROP Benefit. |
| Post retirement benefit increases | <ul style="list-style-type: none">• Members do not receive the Guaranteed Annual Benefit Adjustment (GABA) on the accrued DROP retirement benefit. GABA starts January 1 immediately following retirement for initial and subsequent retirement benefits. |
| Changes since last valuation | <ul style="list-style-type: none">• None |



Appendix D: Valuation Data

Valuation Data

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

	<u>Active</u>	<u>Disabled</u>	<u>Retirees and Beneficiaries</u>	<u>Terminated Vested Members</u>	<u>Terminated Non-Vested Members</u>	<u>Total</u>
Participant Counts Used for Valuation	213	26	334	17	25	615
Disabled Members having attained normal retirement age		(20)	20			
Beneficiaries of Disabled Members						
Beneficiaries with less than one year of certain payments remaining						
DROP Members	18		(18)			
Other Adjustments	1			1		2
Participant Counts shown in the Annual Financial Report	232	6	336	18	25	617



Appendix D: Valuation Data

This valuation is based upon the membership of the System as of June 30, 2019. Membership data was supplied by the System and has been accepted for valuation purposes without audit. However, tests were performed to ensure that the data was sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Summary 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	212	\$ 14,011,408
Part-Time Members	1	\$ 69,129
Total Active Members*	213	\$ 14,080,537

* Data from the 18 DROP participants are excluded from the table above.

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

Table D-2 presents distributions of the following:

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

Table D-3 is a reconciliation of membership data from June 30, 2018 to June 30, 2019.



Appendix D: Valuation Data

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

<u>Type of Annuitant</u>	<u>Number</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
Service Retirement	244	\$ 9,209,749	\$ 37,745
DROP Members	18	804,603	44,700
Total Service Retired Members	262	\$ 10,014,352	\$ 38,223
Survivors of Deceased Retired Members	60	\$ 1,766,299	\$ 29,438
Survivors of Deceased Active Members	12	254,641	21,220
Total Survivors and Beneficiaries	72	\$ 2,020,940	\$ 28,069
Disability Retirement	26	740,115	28,466
Total Annuitants	360	\$ 12,775,407	\$ 35,487

<u>Terminated Members with Contributions Not Withdrawn</u>	<u>Number</u>
Vested Terminated Members	17
Non-Vested Terminated Members	25
Total Terminated Members	42



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2019**

Number of Employees

Age	Completed Years of Service											Totals		
	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+	
<25	7	2	3											12
25 to 29	4	4	6	8	6									28
30 to 34	2	3	5	10	14	4								38
35 to 39	1	1	2	3	17	11	6							41
40 to 44			3	1	5	12	10	3						34
45 to 49				1	1	6	13	6						27
50 to 54					3	6	8	2	1					20
55 to 59						1	6	1						8
60 to 64						1	2							3
65 to 69					1									1
70 and up														
Totals	14	10	19	23	47	41	45	12	1					212

* Data from the 18 DROP participants is excluded from the table above.



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2019**

Annual Salaries in Thousands

Age	Completed Years of Service											Totals		
	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+	
<25	362	119	175											656
25 to 29	201	231	345	499	369									1,645
30 to 34	106	176	299	602	874	327								2,384
35 to 39	55	56	115	173	1,068	764	445							2,676
40 to 44			174	60	318	824	726	241						2,344
45 to 49				57	56	416	966	513						2,008
50 to 54					185	423	581	135	97					1,421
55 to 59						78	453	70						601
60 to 64						81	133							214
65 to 69					63									63
70 and up														
Totals	725	581	1,108	1,391	2,933	2,914	3,303	959	97					14,011

* Data from the 18 DROP participants is excluded from the table above.
The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2019**

Average Annual Salary

Age	Completed Years of Service												Totals	
	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+		
<25	51,745	59,274	58,467											54,680
25 to 29	50,369	57,630	57,577	62,368	61,492									58,763
30 to 34	53,198	58,557	59,714	60,240	62,435	81,771								62,742
35 to 39	54,673	56,174	57,450	57,524	62,845	69,480	74,106							65,259
40 to 44			57,975	59,839	63,682	68,690	72,631	80,376						68,938
45 to 49				57,061	55,834	69,289	74,278	85,553						74,354
50 to 54					61,664	70,553	72,587	67,702	96,619					71,051
55 to 59						78,439	75,424	69,595						75,072
60 to 64						80,805	66,690							71,395
65 to 69					62,843									62,843
70 and up														
Totals	51,769	58,091	58,329	60,470	62,415	71,072	73,404	79,954	96,619					66,092

* Data from the 18 DROP participants is excluded from the table above.
The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.



Appendix D: Valuation Data

Table D-1: Active Members Distribution of Part-Time Employees as of June 30, 2019

Number of Employees

Age	Completed Years of Service											Totals	
	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+
<25													
25 to 29													
30 to 34													
35 to 39													
40 to 44													
45 to 49													1
50 to 54													
55 to 59													
60 to 64													
65 to 69													
70 and up													
Totals													1



Appendix D: Valuation Data

**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 48 for an explanation of the number of annuitants used for valuation purposes.

Members Receiving Service Retirement Benefits as of June 30, 2019

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	12	\$ 430,249	\$ 35,854
50 to 54	28	1,110,197	39,650
55 to 59	34	1,199,639	35,284
60 to 64	18	677,260	37,626
65 to 69	30	1,296,603	43,220
70 to 74	42	1,733,165	41,266
75 to 79	33	1,250,720	37,901
80 to 84	29	995,846	34,340
85 to 89	17	448,490	26,382
90 and up	1	67,580	67,580
Totals	244	\$ 9,209,749	\$ 37,745

Members Receiving Disability Retirement Benefits as of June 30, 2019

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	6	\$ 185,771	\$ 30,962
50 to 54	3	80,017	26,672
55 to 59	6	160,302	26,717
60 to 64	3	93,802	31,267
65 to 69	3	82,107	27,369
70 to 74	2	56,349	28,174
75 to 79	3	81,767	27,256
80 to 84	-	-	-
85 to 89	-	-	-
90 and up	-	-	-
Totals	26	\$ 740,115	\$ 28,466



Appendix D: Valuation Data

**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 48 for an explanation of the number of annuitants used for valuation purposes.

Survivors of Deceased Retired Members as of June 30, 2019

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	-	\$ -	\$ -
50 to 54	1	44,809	44,809
55 to 59	3	106,415	35,472
60 to 64	5	133,184	26,637
65 to 69	6	228,397	38,066
70 to 74	9	233,334	25,926
75 to 79	11	296,878	26,989
80 to 84	15	472,580	31,505
85 to 89	4	95,996	23,999
90 and up	6	154,706	25,784
Totals	60	\$ 1,766,299	\$ 29,438

Survivors of Deceased Active Members as of June 30, 2019

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	6	\$ 109,905	\$ 18,317
50 to 54	1	6,617	6,617
55 to 59	2	36,354	18,177
60 to 64	-	-	-
65 to 69	1	14,185	14,185
70 to 74	1	50,952	50,952
75 to 79	1	36,628	36,628
80 to 84	-	-	-
85 to 89	-	-	-
90 and up	-	-	-
Totals	12	\$ 254,641	\$ 21,220



Appendix D: Valuation Data

**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 48 for an explanation of the number of annuitants used for valuation purposes.

DROP Members as of June 30, 2019

Age	Number of Persons	Annual Benefits	Average Annual Benefits
<50	6	\$ 246,016	\$ 41,003
50 to 54	8	383,713	47,964
55 to 59	4	174,874	43,719
60 to 64	-	-	-
65 to 69	-	-	-
70 to 74	-	-	-
75 to 79	-	-	-
80 to 84	-	-	-
85 to 89	-	-	-
90 and up	-	-	-
Totals	18	\$ 804,603	\$ 44,700

**Terminated Vested Members as of June 30, 2019
Number of Persons**

Age	Number
<25	
25 to 29	1
30 to 34	3
35 to 39	2
40 to 44	4
45 to 49	2
50 to 54	1
55 to 59	3
60 to 64	1
65 to 69	
70 and above	
Total	17



Appendix D: Valuation Data

**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.

	<u>Active Members*</u>	<u>Terminated Vested Members</u>	<u>Service Retired Members**</u>	<u>Disabled Members</u>	<u>Survivors and Beneficiaries</u>
June 30, 2018 Valuation	220	14	251	25	75
Refunds and Non-Vested Terminations	(2)	(2)			(4)
Vested Terminations	(5)	5			
Service Retirements	(13)		13		
Disability Retirements	(1)			1	
Deaths			(3)		(1)
New Entrants	14		1		2
Rehires					
Other					
June 30, 2019 Valuation	213	17	262	26	72

* Excludes members in DROP

** Includes members in DROP



Appendix E: Comparative Schedules

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**

<u>Valuation Date (June 30)</u>	<u>Actives</u>	<u>Annual Salaries in Thousands</u>	<u>Average Annual Salary</u>	<u>Average Age</u>	<u>Average Years of Service</u>	<u>Average Hire Age</u>
2019*	232	15,178	65,721	40.2	10.6	29.7
2018*	233	15,251	65,456	39.5	9.9	29.6
2017*	238	14,779	62,097	39.7	9.6	30.0
2016*	228	15,276	67,000	40.2	10.0	30.2
2015	241	14,503	60,176	40.4	10.0	30.4
2014	229	13,901	60,704			
2013	219	13,000	59,362			

* Number of actives members includes members in DROP



Appendix E: Comparative Schedules

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

Valuation Date (June 30)	Number	All Annuitants					Terminated Members	
		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
2019*	360	12,772	35,487	68.7	50.6	22.0	17	25
2018*	351	12,100	34,474	67.7	50.5	22.0	14	23
2017*	341	11,423	33,497	68.2	50.5	22.1	16	17
2016*	329	10,453	31,772	68.1	50.7	22.8	16	18
2015	327	9,892	30,251	67.6	48.8	22.2	11	13
2014	322	9,336	28,994				11	14
2013	310	8,782	28,329				14	11

* Number of members in receipt of annuities excludes members in DROP.



Appendix E: Comparative Schedules

**Table E-3:
Contribution Rates**

Valuation Date (June 30)	Contribution Rates***			Normal	UAAL
	Employee	Employer/State	Total	Cost Rate*	Rate**
2019	13.05%	38.33%	51.38%	24.35%	27.03%
2018	13.05	38.33	51.38	24.41	26.97
2017	13.05	38.33	51.38	25.09	26.29
2016	13.05	38.33	51.38	25.18	26.20
2015	12.05	38.33	50.38	25.49	24.89
2014	11.05	38.33	49.38	24.69	24.69
2013	10.05	38.33	48.38	25.23	23.15

* 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.

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



Appendix F: Financial Statement Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation as of June 30, 2019. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2019
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	42 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%



Appendix F: Financial Statement Information

Gain and Loss in Accrued Liability During Years Ended June 30 Resulting from Differences Between Assumed Experience and Actual Experience						
Type of Activity	Gain or (Loss) for Year Ending June 30, (expressed in thousands)					
	2014	2015	2016	2017	2018	2019
Investment Income on Actuarial Value of Assets	\$ 5,631	\$ 2,148	\$ 1,255	\$ 664	\$ (1,129)	\$ (678)
Combined Liability Experience	(267)	(181)	(2,779)	(817)	(2,507)	928
(Loss)/Gain During Year from Financial Experience	\$ 5,364	\$ 1,967	\$ (1,524)	\$ (153)	\$ (3,636)	\$ 250
Non-Recurring Items	0	(1,692)	0	(7,881)	0	0
Composite Gain or (Loss) During Year	\$ 5,364	\$ 275	\$ (1,524)	\$ (8,034)	\$ (3,636)	\$ 250

Schedule of Funding Progress (expressed in thousands)						
Valuation Date	Actuarial Value of Assets	Actuarial Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
June 30, 2019	\$ 152,851	\$ 236,805	65%	\$ 83,954	\$ 15,178	553%
2018	147,144	229,822	64%	82,678	15,251	542%
2017	141,236	219,470	64%	78,234	14,779	529%
2016	133,869	203,326	66%	69,457	15,276	455%
2015	125,676	192,983	65%	67,307	14,549	463%
2014	117,226	183,400	64%	66,174	14,149	468%



Appendix F: Financial Statement Information

Solvency Test								
Aggregate Accrued Liabilities for (expressed in thousands)								
Valuation Date June 30,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets			
					(1)	(2)	(3)	
2019	\$ 13,070	\$ 185,306	\$ 38,429	\$ 152,851	100%	75%	0%	
2018	12,976	175,574	41,271	147,144	100%	76%	0%	
2017	12,288	163,885	43,297	141,236	100%	79%	0%	
2016	12,535	146,267	44,524	133,869	100%	83%	0%	
2015	12,102	133,628	47,252	125,676	100%	85%	0%	
2014	11,507	126,478	45,416	117,226	100%	84%	0%	



Appendix G: Glossary

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 Highway Patrol Officers' Retirement System. Defined terms are capitalized throughout this Appendix.

Accrued Benefit

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

Actuarial Accrued Liability

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

Actuarial Assumptions

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

Actuarial Cost Method

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

Actuarial Gains and Losses

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.



Appendix G: Glossary

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.