



Cavanaugh Macdonald
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**Judges' Retirement System
of the State of Montana**



**Actuarial Valuation
As of June 30, 2018**





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

October 1, 2018

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 Judges' Retirement System of State of Montana (JRS), prepared as of June 30, 2018.

The purpose of this report is to provide a summary of the funded status of the System as of June 30, 2018. While not verifying the data at source, the actuary performed tests for consistency and reasonability. The valuation indicates that the System's funded ratio is 161.29% which indicates that the System's assets on an actuarial basis exceed the actuarial accrued liabilities of the System. Therefore, the System has no unfunded actuarial accrued liability. 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.

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.

This is to certify that Edward Macdonald and Todd Green, Principal and Consulting Actuaries 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,

A handwritten signature in blue ink, appearing to read 'Edward Macdonald', with a stylized flourish at the end.

Edward A. Macdonald, ASA, FCA, MAAA
President

A handwritten signature in blue ink, appearing to read 'Todd B. Green', with a horizontal line extending to the right.

Todd B. Green, ASA, FCA, MAAA
Principal and Consulting Actuary

A handwritten signature in blue ink, appearing to read 'Matthew Yonz', with a stylized flourish at the end.

Matthew Yonz, ASA, FCA, MAAA
Actuary



**Judges' Retirement System
State of Montana**

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Section I: Summary of Results

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

VALUATION DATE	June 30, 2018	June 30, 2017
Participant Counts		
Active Members	55	56
Retirees and Beneficiaries	69	67
Disabled Members	1	1
Terminated Vested Members	3	2
Terminated Non-Vested Members	1	1
Total	<u>129</u>	<u>127</u>
Covered Payroll of Active Members	\$ 7,290,904	\$ 6,974,470
Average Salaries from Covered Payroll	\$ 132,562	\$ 124,544
Annual Retirement Allowances for Retired Members and Beneficiaries	\$ 3,754,615	\$ 3,503,014
Assets		
Actuarial value	\$ 101,192,093	\$ 97,065,992
Market value	102,650,688	96,653,635
Actuarial Accrued Liability (AAL)	\$ 62,740,689	\$ 58,103,656
Unfunded Actuarial Accrued Liability (UAAL)	(38,451,404)	(38,962,336)
Funded Ratio	161.29%	167.06%
Market Value Rate of Return	8.88%	11.91%
Annual Cost		
Statutory Funding Rate	32.81%	32.81%
Total Normal Rate	24.25%	24.24%
Employee Contribution Rate	<u>7.00%</u>	<u>7.00%</u>
Employer Normal Rate	17.25%	17.24%
Employer Contribution Rate		
Normal Rate	17.25%	17.24%
Administrative Expense Load	0.17%	0.18%
UAAL Rate	<u>8.39%</u>	<u>8.39%</u>
Total Rate	25.81%	25.81%
Amortization Period	0 years	0 years
Employer Contribution Rate Necessary to Amortize UAAL over 30 Years		
Normal Rate	17.25%	17.24%
Administrative Expense Load	0.17%	0.18%
UAAL Rate (30-Year Rate)	<u>(29.27%)</u>	<u>(30.46%)</u>
Total Rate	(11.85%)	(13.04%)
Shortfall/(Surplus)	(37.66%)	(38.85%)



Section I: Summary of Results

As a result of this actuarial valuation of the benefits in effect under the Judges' Retirement System as of June 30, 2018, the Retirement System is fully funded. The Funded Ratio is 161.29%.

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, 2018, market value of assets is \$1,458,595 more than the actuarial value of assets. This is due to the smoothing of investment gains and losses over a four-year period. If the market value of assets was used, the Retirement System would be fully funded, and the Funded Ratio would be 163.61%.

Additional Details

MCA 19-5-402 and MCA 19-5-404 sets the employer contribution at 25.81% of salary and the employee contribution at 7.00% respectively.

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 8.88%, net of investment expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 6.89%, which is 0.76% 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
7/1/2008 to 6/30/2009	(20.61)	(0.11)	8.00	(28.61)	(8.11)
7/1/2009 to 6/30/2010	12.82	(0.96)	7.75	5.07	(8.71)
7/1/2010 to 6/30/2011	21.65	0.42	7.75	13.90	(7.33)
7/1/2011 to 6/30/2012	2.20	3.63	7.75	(5.55)	(4.12)
7/1/2012 to 6/30/2013	12.72	11.60	7.75	4.97	3.85
7/1/2013 to 6/30/2014	17.03	12.92	7.75	9.28	5.17
7/1/2014 to 6/30/2015	4.59	9.53	7.75	(3.16)	1.78
7/1/2015 to 6/30/2016	2.06	8.64	7.75	(5.69)	0.89
7/1/2016 to 6/30/2017	11.91	8.22	7.75	4.16	0.47
7/1/2017 to 6/30/2018	8.88	6.89	7.65	1.23	(0.76)

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

Amortization of the UAAL

The System's assets exceed the System's actuarial accrued liability as of both the June 30, 2018, actuarial valuation and the June 30, 2017, actuarial valuation. As a result there is no unfunded actuarial accrued liability. Therefore no amortization payment of the UAAL is necessary.



Section I: Summary of Results

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. Finally, the System's assets exceed the actuarial value assets, therefore the System has no unfunded actuarial accrued liability.

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 System currently has obtained a funded ratio that exceeds 161.29%, therefore the System has significant excess assets to absorb market volatility.

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: Benefit enhancements without separate financing will increase the System's unfunded actuarial accrued liability and reduce the excess assets the System is using to absorbing market volatility.



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 1.00% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	161.29%
Lower Assumption 6.65%	<u>146.80%</u>
Increase / (Decrease)	(14.49)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	0 Years
Lower Assumption 6.65%	<u>0 Years</u>
Increase / (Decrease)	No Change
Impact of Assuming 0.50% Lower Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	161.29%
Lower Assumption 7.15%	<u>153.97%</u>
Increase / (Decrease)	(7.32)%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	0 Years
Lower Assumption 7.15%	<u>0 Years</u>
Increase / (Decrease)	No Change



Section I: Summary of Results

Impact of Assuming 0.50% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	161.29%
Lower Assumption 8.15%	<u>168.73%</u>
Increase / (Decrease)	7.44%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	0 Years
Lower Assumption 8.15%	<u>0 Years</u>
Increase / (Decrease)	No Change
Impact of Assuming 1.00% Higher Investment Return	
	<u>Funded Ratio</u>
Current Assumption 7.65%	161.29%
Lower Assumption 8.65%	<u>176.29%</u>
Increase / (Decrease)	15.00%
	<u>Amortization Period</u>
	<u>Increase / (Decrease)</u>
Current Assumption 7.65%	0 Years
Lower Assumption 8.65%	<u>0 Years</u>
Increase / (Decrease)	No Change

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.



Section I: Summary of Results

Impact of Changes

The following table summarizes how experience has changed the UAAL since the June 30, 2017, Actuarial Valuation. Further detail can be found in Table 10.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

June 30, 2017 Valuation UAAL	\$(38,962,336)
Normal Cost (Including Expenses)	1,810,282
Contributions	(1,659,930)
Interest	(2,905,624)
Expected June 30, 2018 UAAL	<u>\$(41,717,608)</u>
Experience (Gain)/Loss on Actuarial Liabilities	\$2,538,386
Experience (Gain)/Loss on Actuarial Assets	727,818
Assumption & Method Changes	0
Plan Changes	0
Total (Gain) / Loss	<u>\$3,266,204</u>
June 30, 2018 Valuation UAAL	<u>\$(38,451,404)</u>



Section I: Summary of Results

Summary

- * The System's actuarial value investment return of 6.89% for the year ended June 30, 2018, is 0.76% less than the actuarial assumption of 7.65%. This represents an asset loss of \$727,818 due to a lower investment return than anticipated. As of June 30, 2018, the market value of assets was \$102,650,688. As of June 30, 2018, the actuarial value of assets was \$101,192,093. The June 30, 2018, 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, 2018, the UAAL is negative as the assets exceed the AAL. The assets exceeded the AAL last year as well. The ultimate goal of the Board's Funding and Benefits Policy is to become 100% funded. Once the System's has obtained 100%, there needs to be a range of safety to absorb market volatility without creating an unfunded actuarial accrued liability. Currently the System has significant excess assets for this purpose. The System is currently being funded within the parameters defined by the Board.

- * The funding of the retirement system will be impacted by future experience, which will sometimes be more favorable than the actuarial assumptions and sometimes less favorable. In particular, investment returns larger and smaller than the 7.65% assumption are expected to have significant impacts on the System's funding progress. In the long term, favorable experience is needed to offset 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.



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, 2018. 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 less 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>2018</u>	<u>2017</u>
ASSETS		
Cash and Short Term Investments	\$ 2,072,452	\$ 2,405,344
Securities Lending Collateral	652,642	549,614
Receivables:		
Interest Receivable	3,487	2,197
Accounts Receivable	5,091	229
Due from Other Funds	-	-
Due from Primary Government	-	-
Notes Receivable	-	-
Total Receivables	<u>\$ 8,578</u>	<u>\$ 2,426</u>
Investments, at fair value:		
Investment Pools	100,269,124	93,937,764
Other Investments	-	-
Total Investments	<u>\$ 100,269,124</u>	<u>\$ 93,937,764</u>
Capital Assets		
Property and Equipment, at cost, net of Accumulated Depreciation	\$ 366	\$ 366
Intangible Assets, at cost, net of Amortization Expense	410,443	380,981
Total Capital Assets	<u>\$ 410,809</u>	<u>\$ 381,347</u>
TOTAL ASSETS	<u>\$ 103,413,605</u>	<u>\$ 97,276,495</u>
LIABILITIES		
Securities Lending Liability	\$ 652,642	\$ 549,614
Accounts Payable	97,007	53,209
Unearned Revenue	589	589
Due to Other Funds	12,679	14,046
Compensated Absences	-	53
OPEB Implicit Rate Subsidy LT	-	5,349
TOTAL LIABILITIES	<u>\$ 762,917</u>	<u>\$ 622,860</u>
NET POSITION - RESTRICTED FOR PENSION BENEFITS	<u>\$ 102,650,688</u>	<u>\$ 96,653,635</u>



Section II: Assets

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

Table with 3 columns: Description, 2018, and 2017. Rows include ADDITIONS (Contributions, Misc Income, Investment Income), DEDUCTIONS (Benefit Payments, Refunds, etc.), and NET INCREASE (DECREASE) IN PLAN NET ASSETS. Final row shows NET POSITION - RESTRICTED FOR PENSION BENEFITS BEGINNING OF YEAR and END OF YEAR.



Section II: Assets

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

Valuation Date June 30:	2017	2018	2019	2020	2021
A. Actuarial Value Beginning of Year	\$ 91,151,584	\$ 97,065,992			
B. Market Value End of Year	96,653,635	102,650,688			
C. Market Value of Beginning of Year	87,805,718	96,653,635			
D. Cash Flow					
D1. Contributions	2,288,313	1,659,930			
D2. Benefit Payments	(3,554,335)	(3,872,322)			
D3. Administrative Expenses	(253,789)	(264,496)			
D4. Investment Expenses	(496,008)	(632,235)			
D5. Net	\$ (2,015,819)	\$ (3,109,123)			
E. Investment Income					
E1. Market Total: B. - C. - D5.	\$ 10,863,736	\$ 9,106,176			
E2. Assumed Rate	7.75%	7.65%			
E3. Amount for Immediate Recognition C.*E2. + ((D1.+D2.+D3.)*E2.*0.5) - D4.	7,242,058	7,931,497			
E4. Amount for Phased-in Recognition E1. - E3.	3,621,678	1,174,679			
F. Excluded Gain/(Loss)					
F1. Current Year: 0.25 * E4.	\$ 905,420	\$ 293,670	\$ -	\$ -	\$ -
F2. First Prior Year	(1,233,256)	905,420	293,670	-	-
F3. Second Prior Year	(662,107)	(1,233,256)	905,420	293,670	-
F4. Third Prior Year	1,678,112	(662,107)	(1,233,256)	905,420	293,670
F5. Total Excluded Investment Gain/(Loss)	\$ 688,169	\$ (696,273)	\$ (34,166)	\$ 1,199,090	\$ 293,670
G. Actuarial Value End of Year A. + D5. + E3. + F5.	\$ 97,065,992	\$ 101,192,093			



Section II: Assets

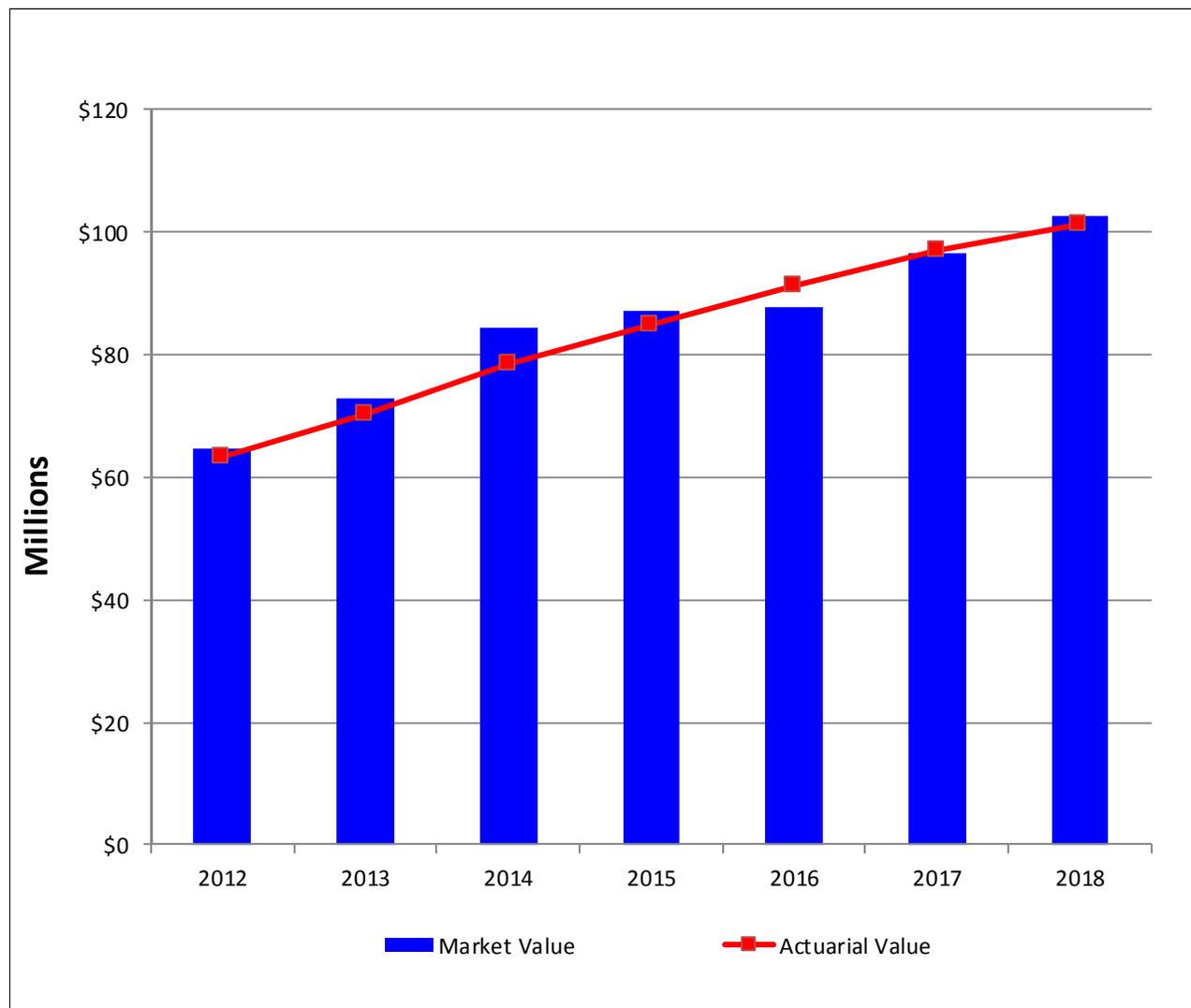
**Table 4:
Historical Investment Returns***

Fiscal Year Ending	Market Returns	Actuarial Returns	Assumed Rate of Return	Actuarial Return Over Assumed Rate*
June 30, 2009	(20.61)%	(0.11)%	8.00%	(8.11)%
June 30, 2010	12.82%	(0.96)%	7.75%	(8.71)%
June 30, 2011	21.65%	0.42%	7.75%	(7.33)%
June 30, 2012	2.20%	3.63%	7.75%	(4.12)%
June 30, 2013	12.72%	11.60%	7.75%	3.85%
June 30, 2014	17.03%	12.92%	7.75%	5.17%
June 30, 2015	4.59%	9.53%	7.75%	1.78%
June 30, 2016	2.06%	8.64%	7.75%	0.89%
June 30, 2017	11.91%	8.22%	7.75%	0.47%
June 30, 2018	8.88%	6.89%	7.65%	(0.76)%
10 Year Average	6.69%	5.97%		(1.80)%

* 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**





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, 2018</u> Total	<u>June 30, 2017</u> Total
A. Active Members Liability Due to Probability of		
Retirement	\$ 29,119,361	\$ 28,329,793
Disability	248,755	245,406
In-Service Death	1,771,727	1,770,978
Termination	-	-
Total	<u>\$ 31,139,843</u>	<u>\$ 30,346,177</u>
B. Inactive Members and Annuitants		
Service Retirement	\$ 30,296,907	\$ 27,733,140
Disability Retirement	897,460	889,167
Beneficiaries	8,519,369	9,729,139
Vested Terminated Members	3,836,927	1,141,896
Refund of Member Contributions	4,015	12,786
Total	<u>\$ 43,554,678</u>	<u>\$ 39,506,128</u>
C. Grand Total	\$ 74,694,521	\$ 69,852,305



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. 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, 2018</u> <u>Total</u>	<u>June 30, 2017</u> <u>Total</u>
Service retirement	22.16%	22.12%
Disability retirement	0.39%	0.39%
Survivors' benefits	1.70%	1.73%
Termination benefits	<u>0.00%</u>	<u>0.00%</u>
Total Normal Rate	<u>24.25%</u>	<u>24.24%</u>
Employee Normal Rate	7.00%	7.00%
Employer Normal Rate	17.25%	17.24%
Administrative Expense Load	0.17%	0.18%
Rate Available to Amortize Unfunded Actuarial Accrued Liability	<u>8.39%</u>	<u>8.39%</u>
Statutory Funding Rate	32.81%	32.81%



Section IV: Employer Contributions

**Table 8:
Unfunded Actuarial Accrued Liability**

	<u>June 30, 2018</u>	<u>June 30, 2017</u>
A. Actuarial present value of all future benefits for present members, retirees, and their survivors (Table 6)	\$ 74,694,521	\$ 69,852,305
B. Less actuarial present value of total future normal costs for present members	<u>\$ 11,953,832</u>	<u>\$ 11,748,649</u>
C. Actuarial accrued liability	\$ 62,740,689	\$ 58,103,656
D. Less assets available for benefits	<u>\$ 101,192,093</u>	<u>\$ 97,065,992</u>
E. Unfunded actuarial accrued liability	\$ (38,451,404)	\$ (38,962,336)



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.

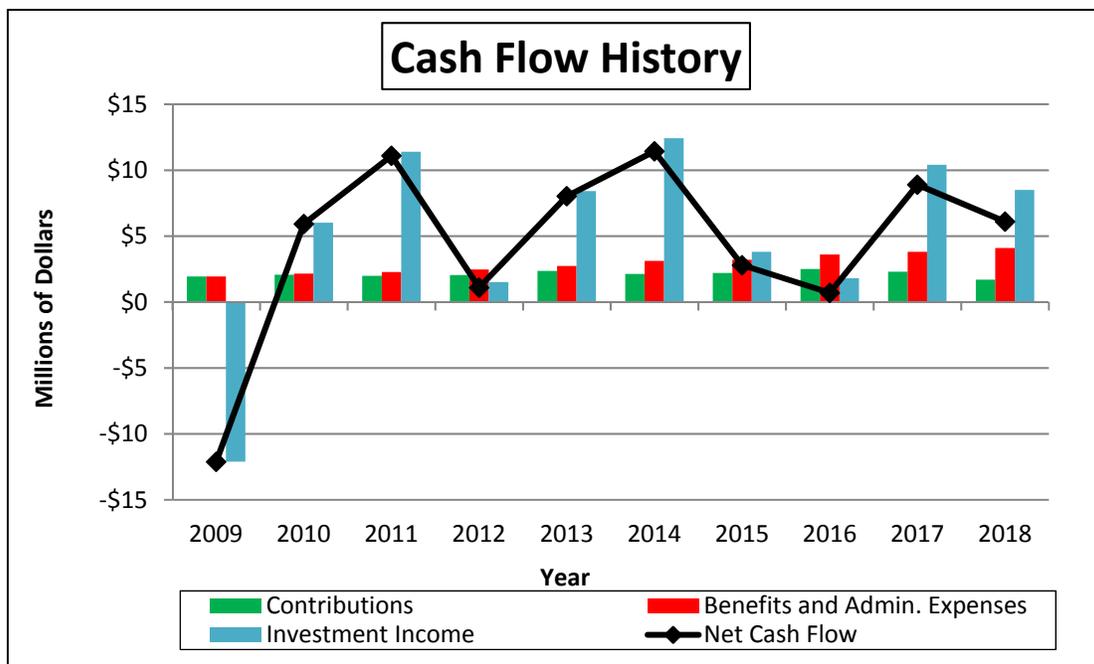
Table 10 shows the System had a positive cash flow for the year ended June 30, 2018. The System’s total cash flow including benefits payments, administrative expenses and investment earnings was \$6.1 million. Of the \$6.1 million, \$8.5 million was due to investment returns.

If the System has a positive cash flow, there is no need to plan where the funds would come from to pay benefits since the 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
2009	\$ 1.9	\$ 1.9	\$ (12.1)	\$ (12.1)
2010	2.1	2.2	6.0	5.9
2011	2.0	2.3	11.4	11.1
2012	2.0	2.5	1.5	1.1
2013	2.4	2.7	8.4	8.0
2014	2.1	3.1	12.4	11.4
2015	2.2	3.2	3.8	2.8
2016	2.5	3.6	1.8	0.7
2017	2.3	3.8	10.4	8.9
2018	1.7	4.1	8.5	6.1



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 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.



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, 2017:	\$ 58,103,656
2. Normal Cost for this Plan Year (Including Expenses):	1,810,282
3. Interest on items 1 and 2 [(1+2) x 7.65%]:	4,583,416
4. Benefit Payments for this Plan Year (Including Expenses):	(4,136,818)
5. Interest on item [4 x 7.65% x .5]:	(158,233)
6. Expected Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 60,202,303</u>
7. Changes due to:	
a. Assumption Changes:	-
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	\$ 2,538,386
8. Actual Actuarial Accrued Liability as of June 30, 2018:	<u>\$ 62,740,689</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, 2017:	\$ 97,065,992
2. Interest on item [1 x 7.65%]:	7,425,548
3. Contributions for this Plan Year:	1,659,930
4. Interest on item [3. x 7.65% x .5]:	63,492
5. Benefit Payments for this Plan Year (Including Expenses):	(4,136,818)
6. Interest on item [5. x 7.65% x .5]:	(158,233)
7. Expected Actuarial Value of Assets as of June 30, 2018:	<u>\$ 101,919,911</u>
8. Actuarial Value of Assets as of June 30, 2018:	\$ 101,192,093
9. (Gain) / Loss:	<u>\$ 727,818</u>
C. UNFUNDED ACTUARIAL ACCRUED LIABILITY (GAIN) / LOSS ANALYSIS	
1. Actual Unfunded Actuarial Accrued Liability as of June 30, 2017:	\$ (38,962,336)
2. Normal Cost for this Plan Year (Including Expenses):	1,810,282
3. Contributions for this Plan Year:	(1,659,930)
4. Interest on items 1 - 3: [(1+2) x 7.65% + (3 x 7.65% x .5)]:	(2,905,624)
5. Expected Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ (41,717,608)</u>
6. Changes due to:	
a. Assumption Changes:	-
b. Plan Amendments:	-
c. Funding Method:	-
d. Actuarial (Gain) / Loss:	\$ 3,266,204
7. Actual Unfunded Actuarial Accrued Liability as of June 30, 2018:	<u>\$ (38,451,404)</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*
(Dollar amounts in thousands)**

	UAAL (Gain)/Loss		
	June 30, 2018	June 30, 2017	June 30, 2016
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	\$ 727.8	\$ (428.9)	\$ (754.1)
Pay Increases			
Pay increases were (less) greater than expected.	276.6	(496.9)	462.4
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	(234.7)	(386.8)	834.5
Disability Retirements			
Disability claims were (less) greater than expected	(6.8)	50.6	402.6
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	(40.6)	(47.6)	(44.9)
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	1,548.7	(30.6)	(1.5)
Death After Retirement			
Retirees (died younger) lived longer than expected	(4.2)	(1,188.4)	(94.6)
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	1,009.6	(141.4)	14.0
Other			
Miscellaneous (gains) and losses	(10.2)	100.0	(569.1)
Total (Gain) or Loss During Period From Financial Experience	\$ 3,266.2	\$ (2,570.0)	\$ 249.3
Non-Recurring Items.			
Changes in actuarial assumptions and methods	-	3,575.2	-
Changes in benefits caused a (gain) loss	-	-	-
Composite (Gain) Loss During Period	\$ 3,266.2	\$ 1,005.2	\$ 249.3

* 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.



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-2 through B-4 give rates of decrement for service retirement, disablement and mortality.

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 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 0.17% of payroll.

Valuation of Assets

Market value of assets

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.



Appendix A: Actuarial Procedures and Methods

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 an assumed 3.50% annual rate of increase in the general wage level of the membership. There are no separate merit and seniority increases assumed.

Service Retirement

Table B-2 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-3.

Mortality

The mortality rates used in this valuation are illustrated in Table B-4. A written description of each table used is included in Table B-1.

Other Terminations of Employment

No terminations are assumed other than for retirement, death and disability.

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 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.



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	0.17%
II. Demographic assumptions	
A. Retirement	Table B-2
B. Disablement	Table B-3
C. 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 Tables Projected to 2020 using Scale BB, set back one year for males.	Table B-4
D. Mortality among disabled members For Males and Females: RP 2000 Combined Employee and Annuitant Mortality Tables with no projections.	Table B-4



Appendix B: Summary of Valuation Assumptions

Table B-2

**Retirement
Annual Rates**

<u>Age</u>	<u>Rate</u>
60	15.0%
61	5.0
62	5.0
63	5.0
64	5.0
65	15.0
66	5.0
67	5.0
68	5.0
69	5.0
70 & Over	100.0

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



Appendix B: Summary of Valuation Assumptions

Table B-3
Disablement
Annual Rates

<u>Age</u>	<u>All Members</u>
22	.00%
27	.00
32	.01
37	.04
42	.10
47	.13
52	.25
57	.36
62	.00

10% of disabilities are assumed to be duty-related and 90% are assumed to be non-duty related. All disabilities are assumed to be permanent without recovery.



Appendix B: Summary of Valuation Assumptions

Table B-4
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



Appendix C: Summary of Benefit Provisions

- | | |
|--|---|
| Service credit | <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• Member contributions are made through an "employer pick-up" arrangement which results in deferral of taxes on the contributions. |
| Compensation | <ul style="list-style-type: none">• 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 | <ul style="list-style-type: none">• A member is eligible for a withdrawal of their contributions when they terminate service and are either not eligible for or have not taken a retirement benefit.• The member receives the accumulated member contributions, which consists of member contributions and regular interest.• Upon receipt of a refund of accumulated contributions a member's vested right to a monthly benefit is forfeited. |
| Member contributions interest credited (regular interest) | <ul style="list-style-type: none">• Interest is credited to member accounts at the rates determined by the Board.• The current interest rate credited to member accounts is 0.77%. |
| 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. |



Appendix C: Summary of Benefit Provisions

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">• Judges of district courts• Justices of supreme court• Chief water judge• Associate water judge (effective July 1, 2011)
Member contributions	<ul style="list-style-type: none">• 7% of member's compensation
Employer contributions	<ul style="list-style-type: none">• 25.81% of each member's compensation
Compensation period used in benefit calculation	<ul style="list-style-type: none">• Current salary or HAC = Highest Average Compensation• Hired prior to July 1, 1997, and did not elect GABA, benefits are calculated using current salary of the office from which the member retired.• Hired on or after July 1, 1997, or hired prior to July 1, 1997 and elected GABA, benefits are calculated using HAC, the average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to the member.• Hired on or after July 1, 2013: 110% annual cap on compensation considered as part of a member's HAC.
Service retirement eligibility and benefit	<ul style="list-style-type: none">• Age 60 with 5 years of membership service• First 15 years of service credit: 3$\frac{1}{3}$% per year of current salary or HAC, and• Over 15 years of service credit: 1.785% per year of current salary or HAC
Disability eligibility and benefit	<p>Non-duty disability:</p> <ul style="list-style-type: none">• 5 years membership service• Regular disability benefit: Actuarial equivalent of the normal retirement benefit available at the time of disability. <p>Duty-related disability:</p> <ul style="list-style-type: none">• Any amount of membership service• Duty-related disability benefit: Greater of 50% of current salary or 50% of HAC



Appendix C: Summary of Benefit Provisions

Survivor's eligibility and benefit

Duty-related death:

- Active or retired member
- Member's service retirement benefit on the date of the death.

Non-duty-related death:

- Vested member
- Refund of the member's accumulated contributions, **or**
- Actuarial equivalent of the member's service retirement benefit on date of death.
- A beneficiary may elect to receive the present value of the benefit as a single lump sum
- For retired members without a contingent annuitant, a payment will be made to the member's designated beneficiary equal to the accumulated contributions reduced by any retirement benefits already paid.

Vesting eligibility and benefit

- 5 years of membership service
- Accrued normal retirement benefit, payable when eligible for retirement.
- In lieu of a pension, a member may receive a refund of accumulated contributions.
- Upon receipt of a refund of accumulated contributions, a member's vested right to a monthly benefit is forfeited.

Retirement benefits - Form of payment

Option 1, the normal form of payment is a single life annuity with a refund of any remaining accumulated contributions (account balance) to a designated beneficiary.

Optional Benefits:

- Option 2, a life annuity and joint 100% survivor benefit,
- Option 3, a life annuity and joint 50% survivor benefit, and
- Option 4, a life annuity with a period certain.

If a retiring member selects Option 2 or 3 and the contingent annuitant predeceases or is divorced from the member, the retiree may, within 18 months of the death or divorce, choose to revert to the higher Option 1 benefit available at retirement or the retiree may select a different contingent annuitant and/or a different option.

Post retirement benefit increases

- For retired members who have been retired for at least 12 months and who were either hired **after** June 30, 1997 **or** hired **prior to** July 1, 1997 **and elected** GABA, a GABA will be made January 1 of each year equal to 3%.
- For retired members who were hired **prior to** July 1, 1997 **and did not elect** GABA, the current salary of an active member in the same position is used to recalculate the monthly benefit.

Changes since last valuation

- None



Appendix D: Valuation Data

Valuation Data

This valuation is based upon the membership of the System as of June 30, 2018. Membership data was supplied by the System and accepted for valuation purposes without audit. However, tests were performed to ensure that the data is sufficiently accurate for valuation purposes.

The salaries used in the tables and charts which follow are different than the salaries used for the Summary of Results on page 1. The valuation projected salaries 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	55	\$ 7,587,860
Part-Time Members	0	\$ -
Total Members	55	\$ 7,587,860

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, 2017 to June 30, 2018.



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.

Type of Annuitant	Number	Annual Benefits	Average Annual Benefits
Service Retirement	48	\$ 2,697,683	\$ 56,202
Survivors of Deceased Retired Members	16	844,426	52,777
Survivors of Deceased Active Members	5	150,770	30,154
Total Retirees and Beneficiaries	69	\$ 3,692,879	\$ 53,520
Disability Retirement	1	61,736	61,736
Total Annuitants	70	\$ 3,754,615	\$ 53,637

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	3
Non-Vested Terminated Members	1
Total Terminated Members	4



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

Number of Employees

Age	<u>Completed Years of Service</u>											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	2	1											3
40 to 44			1	1	1								3
45 to 49		2											2
50 to 54		3	1	2	3		1						10
55 to 59		1		1	3	4	2		1				12
60 to 64			1		3	3	1	1					9
65 to 69	1		1	3	2	3	3	1	2				13
70 and up					2	1							3
Totals	3	7	4	7	14	8	7	2	3	-	-	-	55



Appendix D: Valuation Data

**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

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													
25 to 29													
30 to 34													
35 to 39	260	137											396
40 to 44			137	137	137								410
45 to 49		274											274
50 to 54		410	137	285	410		137						1,380
55 to 59		137		137	410	576	285		137				1,682
60 to 64			137		410	410	149	137					1,243
65 to 69	136		137	410	274		410	137	274				1,778
70 and up					287	137							424
Totals	396	958	547	970	1,929	1,123	981	274	410	-	-	-	7,588

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



**Table D-1:
Active Members Distribution of
Full-Time Employees and Salaries
as of June 30, 2018**

Average Annual Salary

Age	<u>Completed Years of Service</u>											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	129,795	136,814											132,134
40 to 44			136,814	136,814	136,814								136,814
45 to 49		136,814											136,814
50 to 54		136,814	136,814	142,723	136,814		136,814						137,996
55 to 59		136,814		136,814	136,814	143,982	142,723		136,814				140,188
60 to 64			136,814		136,814	136,814	148,632	136,814					138,127
65 to 69	136,386		136,814	136,814	136,814	136,814	136,814	136,814	136,814				136,781
70 and up					143,525	136,814							141,288
Totals	131,992	136,814	136,814	138,502	137,773	140,398	140,191	136,814	136,814				137,961

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, 2018**

Number of Employees

Age	<u>Completed Years of Service</u>										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													
50 to 54													
55 to 59													
60 to 64													
65 to 69													
70 and up													
Totals	-	-	-	-	-	-	-	-	-	-	-	-	-



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

Members Receiving Service Retirement Benefits as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	-	\$ -	\$ -
50 to 54	-	\$ -	-
55 to 59	-	-	-
60 to 64	1	20,021	20,021
65 to 69	12	664,352	55,363
70 to 74	16	990,335	61,896
75 to 79	9	529,569	58,841
80 to 84	2	83,183	41,592
85 to 89	4	252,774	63,193
90 and up	4	157,449	39,362
Totals	48	\$ 2,697,683	\$ 56,202

Members Receiving Disability Retirement Benefits as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	-	\$ -	\$ -
50 to 54	-	-	-
55 to 59	1	61,736	61,736
60 to 64	-	-	-
65 to 69	-	-	-
70 to 74	-	-	-
75 to 79	-	-	-
80 to 84	-	-	-
85 to 89	-	-	-
90 and up	-	-	-
Totals	1	\$ 61,736	\$ 61,736



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

Survivors of Deceased Retired Members as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	-	\$ -	\$ -
50 to 54	-	-	-
55 to 59	1	19,610	19,610
60 to 64	-	-	-
65 to 69	3	184,067	61,356
70 to 74	-	-	-
75 to 79	-	-	-
80 to 84	4	301,068	75,267
85 to 89	3	120,482	40,161
90 and up	5	219,199	43,840
Totals	16	\$ 844,426	\$ 52,777

Survivors of Deceased Active Members as of June 30, 2018

<u>Age</u>	<u>Number of Persons</u>	<u>Annual Benefits</u>	<u>Average Annual Benefits</u>
<50	-	\$ -	\$ -
50 to 54	-	-	-
55 to 59	-	-	-
60 to 64	1	64,632	64,632
65 to 69	2	34,098	17,049
70 to 74	1	17,361	17,361
75 to 79	-	-	-
80 to 84	-	-	-
85 to 89	1	34,679	34,679
90 and up	-	-	-
Totals	5	\$ 150,770	\$ 30,154



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

**Terminated Vested Members as of June 30, 2018
Number of Persons**

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



**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 and the Annual Financial Statements.

	<u>Active Contributing Members</u>	<u>Terminated Vested Members</u>	<u>Service Retired Members</u>	<u>Disabled Members</u>	<u>Survivors and Beneficiaries</u>
June 30, 2017 Valuation	56	2	47	1	21
Refunds and Non-Vested Terminations	(1)				(1)
Vested Terminations	(1)	1			
Service Retirements	(2)		2		
Disability Retirements					
Deaths			(2)		(1)
Payment Stopped					
New Entrants	3				2
Rehires					
Other			1		
June 30, 2018 Valuation	55	3	48	1	21



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</u>	<u>Average Annual Salary</u>	<u>Average Age</u>	<u>Average Years of Service</u>	<u>Average Hire Age</u>
2018	55	7,290,904	132,562	58.3	8.8	49.6
2017	56	6,974,470	124,544	58.5	9.0	49.5
2016	55	6,920,367	125,825	58.9	9.2	49.7
2015	55	6,521,161	118,567	59.6	9.8	49.8
2014	55	6,495,104	118,093			
2013	54	6,212,209	115,041			
2012	54	6,192,316	114,673			



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	Average Annual Benefit	Average Current Age	Average Age at Retirement	Average Service at Retirement	Number Vested Terminated	Number Non-Vested Terminated
2018	70	3,754,615	53,637	76.1	65.3	16.8	3	1
2017	68	3,503,014	51,515	75.6	65.9	17.3	2	1
2016	68	3,466,289	50,975	76.3	63.9	17.4	2	0
2015	67	3,133,947	46,175	76.5	62.6	17.1	0	2
2014	67	3,021,244	45,093				0	1
2013	65	2,855,061	43,924				0	0
2012	56	2,326,801	41,550				0	0



Appendix E: Comparative Schedules

**Table E-3:
Contribution Rates**

Valuation Date (June 30)	Contribution Rates			Normal	UAAL
	Employee	Employer	Total	Cost Rate*	Rate**
2018	7.00%	25.81%	32.81%	24.42%	8.39%
2017	7.00	25.81	32.81	24.42	8.39
2016	7.00	25.81	32.81	24.29	8.52
2015	7.00	25.81	32.81	24.50	8.31
2014	7.00	25.81	32.81	24.62	8.19
2013	7.00	25.81	32.81	24.67	8.14
2012	7.00	25.81	32.81	23.80	9.01

* 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.



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, 2018. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2018
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period	0 Years
Asset valuation method	Four-year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.65%
General wage growth*	3.50%
Merit salary increases	0.00%
*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)					
	2013	2014	2015	2016	2017	2018
Investment Income on Actuarial Value of Assets	\$ 2,427	\$ 3,614	\$ 1,385	\$ 754	\$ 429	\$ (728)
Combined Liability Experience	(675)	1,032	1,245	(1,003)	2,141	(2,538)
(Loss)/Gain During Year from Financial Experience	\$ 1,752	\$ 4,646	\$ 2,630	\$ (249)	\$ 2,570	\$ (3,266)
Non-Recurring Items	0	0	0	0	(3,575)	0
Composite Gain or (Loss) During Year	\$ 1,752	\$ 4,646	\$ 2,630	\$ (249)	\$ (1,005)	\$ (3,266)

Schedule of Funding Progress (expressed in thousands)						
Valuation Date June 30,	Actuarial Value of Assets	Actuarial Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2018	\$ 101,192	\$ 62,741	161%	\$(38,451)	\$ 7,291	(527)%
2017	97,066	58,104	167%	(38,962)	6,974	(559)%
2016	91,152	54,754	166%	(36,398)	6,920	(526)%
2015	84,934	51,901	164%	(33,033)	6,525	(506)%
2014	78,463	50,600	155%	(27,863)	6,355	(438)%
2013	70,323	49,236	143%	(21,087)	6,276	(336)%



Appendix F: Financial Statement Information

Solvency Test Aggregate Accrued Liabilities for (expressed in thousands)								
Valuation Date June 30,	Active Member	Retirees & Beneficiaries	Active Member Employer Financed	Actuarial Value of Reported Assets	Portion of Accrued Liability Covered by Reported Assets			
	(1)	(2)	(3)		(1)	(2)	(3)	
2018	\$ 4,329	\$ 39,714	\$ 18,698	\$ 101,192	100%	100%	306%	
2017	4,372	38,351	15,380	97,066	100%	100%	353%	
2016	4,494	35,673	14,587	91,152	100%	100%	350%	
2015	4,667	33,210	14,024	84,934	100%	100%	336%	
2014	4,623	32,776	13,201	78,463	100%	100%	311%	
2013	4,733	31,709	12,795	70,323	100%	100%	265%	



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 Judges' 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.