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Teachers' Retirement System
State of Montana

Actuarial Valuation
As of July 1, 2017

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October 6, 2017

Teachers' Retirement Board
State of Montana
1500 Sixth Avenue
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 Teachers' Retirement System of Montana (TRS), prepared as of July 1, 2017.

The purpose of this report is to provide a summary of the funded status of the System as of July 1, 2017. 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 22 year period.

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 4.00% 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,

Edward A. Macdonald, ASA, FCA, MAAA
President

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

EAM:TBG/jw

Teachers' Retirement System
State of Montana

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Section I

Summary of Findings

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

(Dollar amounts in thousands)

VALUATION DATE	**July 1, 2017**	**July 1, 2016**
Active members		
Number		
Full-Time Members	12,808	12,769
Part-Time Members	6,109	6,279
Annual valuation compensation	$ 818,123	$ 795,921
Retired members and beneficiaries		
Number	15,566	15,164
Annual allowances	$ 352,005	$ 336,465
Inactive Members		
Vested Terminated Members	1,779	1,704
Non-Vested Terminated Members	13,712	12,888
Assets		
Actuarial value	$ 3,973,519	$ 3,798,944
Market value	3,950,705	3,656,831
Actuarial Accrued Liability (AAL)	$ 5,636,842	$ 5,483,674
Unfunded Actuarial Accrued Liability	$ 1,663,323	$ 1,684,730
Funded Ratio	70.49%	69.28%
Market Value Rate of Return	11.92%	2.08%
Annual Cost		
Total Normal Rate	9.82%	9.87%
Employee Contribution Rate	8.15%	8.15%
Employer Normal Rate	1.67%	1.72%
Employer Statutory Contribution Rate		
Normal Rate	1.67%	1.72%
Administrative Expense Load	0.33%	0.31%
UAAL Rate	9.36%	9.23%
Total Rate	11.36%	11.26%
Amortization Period*	22 Years	24 Years

* Reflects anticipated increases in employer contribution rates.

As a result of this actuarial valuation of the benefits in effect under the Montana Teachers' Retirement System as of July 1, 2017, the statutory employer contributions are sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the Retirement System within 22 years. The Funded Ratio is 70.49%.

The table below shows a history of the legislated contribution rates as a percent of pay. In addition to these contributions the State will contribute $25 million annually to the System payable July 1st of each year.

Finally, MCA 19-20-605 requires each employer to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. Pursuant to MCA 19-20-609, this amount shall increase by 1.00% for fiscal year 2014 and increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.

History of Legislated Contributions
(as a Percent of Pay)

School District and Other Employers

	Members	Employers	General fund	Total employee & employer
Prior to July 1, 2007	7.15%	7.47%	0.11%	14.73%
July 1, 2007 to June 30, 2009	7.15%	7.47%	2.11%	16.73%
July 1, 2009 to June 30, 2013	7.15%	7.47%	2.49%	17.11%
July 1, 2013 to June 30, 2014	8.15%	8.47%	2.49%	19.11%
July 1, 2014 to June 30, 2015	8.15%	8.57%	2.49%	19.21%
July 1, 2015 to June 30, 2016	8.15%	8.67%	2.49%	19.31%
July 1, 2016 to June 30, 2017	8.15%	8.77%	2.49%	19.41%
July 1, 2017 to June 30, 2018	8.15%	8.87%	2.49%	19.51%
July 1, 2018 to June 30, 2019	8.15%	8.97%	2.49%	19.61%
July 1, 2019 to June 30, 2020	8.15%	9.07%	2.49%	19.71%
July 1, 2020 to June 30, 2021	8.15%	9.17%	2.49%	19.81%
July 1, 2021 to June 30, 2022	8.15%	9.27%	2.49%	19.91%
July 1, 2022 to June 30, 2023	8.15%	9.37%	2.49%	20.01%
July 1, 2023 to June 30, 2024	8.15%	9.47%	2.49%	20.11%

State and University Employers

	Members	Employers	General fund	Total employee & employer
Prior to July 1, 2007	7.15%	7.47%	0.11%	14.73%
July 1, 2007 to June 30, 2009	7.15%	9.47%	0.11%	16.73%
July 1, 2009 to June 30, 2013	7.15%	9.85%	0.11%	17.11%
July 1, 2013 to June 30, 2014	8.15%	10.85%	0.11%	19.11%
July 1, 2014 to June 30, 2015	8.15%	10.95%	0.11%	19.21%
July 1, 2015 to June 30, 2016	8.15%	11.05%	0.11%	19.31%
July 1, 2016 to June 30, 2017	8.15%	11.15%	0.11%	19.41%
July 1, 2017 to June 30, 2018	8.15%	11.25%	0.11%	19.51%
July 1, 2018 to June 30, 2019	8.15%	11.35%	0.11%	19.61%
July 1, 2019 to June 30, 2020	8.15%	11.45%	0.11%	19.71%
July 1, 2020 to June 30, 2021	8.15%	11.55%	0.11%	19.81%
July 1, 2021 to June 30, 2022	8.15%	11.65%	0.11%	19.91%
July 1, 2022 to June 30, 2023	8.15%	11.75%	0.11%	20.01%
July 1, 2023 to June 30, 2024	8.15%	11.85%	0.11%	20.11%

Calculations based on the Market Value of Assets

MCA 19-20-201 requires this report to show how market performance is affecting the actuarial funding of the Retirement System. The July 1, 2017 market value of assets is $22.8 million 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 23 years, and the Funded Ratio would be 70.09%.

Additional Details

MCA 19-20-604 states that the contribution from the State General Fund will be reduced by 0.11% when the amortization period of the System's UAAL is 10 years or less according to the System's latest actuarial valuation.

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 11.92% net of investment and operating expenses. As a result of prior years' unrecognized gains, the actuarial assets earned 8.24% which is 0.49% greater than the actuarial assumption of 7.75%. 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	Market Return over Assumption	Actuarial Return over Assumption
7/1/2007 to 6/30/2008	(4.88)%	7.18%	(12.63)%	(0.57)%
7/1/2008 to 6/30/2009	(20.80)%	(10.26)%	(28.55)%	(18.01)%
7/1/2009 to 6/30/2010	12.87%	9.78%	5.12%	2.03%
7/1/2010 to 6/30/2011	21.67%	(0.13)%	13.92%	(7.88)%
7/1/2011 to 6/30/2012	2.21%	3.21%	(5.54)%	(4.54)%
7/1/2012 to 6/30/2013	12.94%	11.99%	5.19%	4.24%
7/1/2013 to 6/30/2014	17.09%	13.21%	9.34%	5.46%
7/1/2014 to 6/30/2015	4.57%	9.59%	(3.18)%	1.84%
7/1/2015 to 6/30/2016	2.08%	8.79%	(5.67)%	1.04%
7/1/2016 to 6/30/2017	11.92%	8.24%	4.17%	0.49%

Asset gains or losses result when the return on the actuarial value of assets differs from the actuarial investment return assumption of 7.75%.

On a market value basis the System earned $211.3 million less than anticipated by the 7.75% assumption in the year ended June 30, 2016 and $148.5 million more than anticipated by the 7.75% assumption in the year ended June 30, 2017. The net result as of July 1, 2017 is that the market value of assets is $22.8 million less than the actuarial value of assets. This $22.8 million in unrecognized asset losses will either offset any future investment gains or if there are none, increase the amortization period of the UAAL in future valuations.

Recent Contribution Increases

The Montana University System Retirement Program (MUS-RP) supplemental contribution ensures university member benefits are funded by university employers. The supplemental contribution was increased from 4.04% to 4.72% of MUS-RP member pay at July 1, 2007. The valuation that determined the 4.72% contribution rate of MUS-RP member pay was based on the valuation completed as of July 1, 2006. The most recent MUS-RP valuation completed as of July 1, 2016 indicated an increase is needed in the supplemental contribution rate from 4.72% to 10.22% of MUS-RP member compensation rate.

MCA 19-20-608 and MCA 19-20-609 dictate that employers and members are required to make supplemental contributions if the funded ratio of the System is less than 90%. Since the funded ratio is currently 70.49%, Tier One Members are required to contribute an additional 1% of compensation. The individual employers are required to contribute an additional 1% of compensation. The employer contribution shall increase by an additional 0.1% each year following July 1, 2013 until the total employer supplemental contribution is equal to 2% of compensation.

MCA 19-20-605 requires each employer to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. Pursuant to MCA 19-20-609, this amount shall increase by 1.00% for fiscal year 2014 and increase by 0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.

Amortization of the UAAL

The July 1, 2016 actuarial valuation calculated a 24 year amortization period for the UAAL. The resulting amortization period at July 1, 2017 is 22 years. The amortization period anticipates future increases in employer supplemental contributions. In addition, it anticipates future State General Fund contributions will decrease by 0.11% when the amortization period of the System's UAAL is 10 years or less. Future decreases in the Employer and Member Supplemental Contributions are not anticipated.

Funding and Benefits Policy

The Teachers' Retirement System 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) Additional Funding

   a) The Funding and Benefits Policy states:

      "1. If the amortization period is greater than 30 years, the actuary will recommend the single contribution rate increase that can reasonably expect to fully amortize the UAAL over a closed 30-year period effective July 1, following the next regular legislative session.

      2. If the amortization period is less than 30 years, but greater than 0, and it is projected to continue to decline over the remainder of the closed period, the actuary will not recommend a change in the statutory contribution rates.

      3. If the amortization period is less than 30 years, but has increased over prior valuations and is projected to continue to grow, the actuary will recommend a contribution rate increase that is reasonably expected to reverse the recent trend and reestablish a closed amortization period equal to that of the last valuation."

2) Analysis: The amortization period as of July 1, 2017 is 22 years based on actuarial assets and 23 years based on market assets. Assuming experience follows the actuarial assumptions, the amortization period is projected to decline. Therefore additional funding is not necessary at this time.

3) Ultimate Goal

   a) The Funding and Benefits Policy states: "It is the desire of the Board to fully fund the System. However, until the System becomes fully funded, any unfunded liabilities will be amortized over a closed period of no more than 30 years and funded as a level percent of pay. At such time as the System becomes fully funded and has as stabilization reserve of at least 10% of the actuarial accrued liability, the allowed amortization period for any subsequent unfunded liabilities will be reduced to a closed period of not greater than 20 years."

   b) Analysis: The amortization period on an actuarial value of asset basis is 22 years and is anticipated to decline. This is within the parameters of the ultimate goal of the Retirement System.

4) Benefit Enhancements

   a) The Funding and Benefits Policy states: "Any recommendation for a benefit enhancement must include recommendations for necessary additional funding or other benefit reduction to cover any increase in normal cost arising from the recommended enhancement and to amortize any increase in the unfunded actuarial accrued liabilities arising from the recommended enhancement over a period not to exceed 25 years.

      The Board will determine its position with respect to supporting or opposing legislation, on a case-by-case basis, and will apply this policy, actuarial funding standards, and other industry-standard information and resources it finds persuasive, as decision guides. The Board may not support legislation to enhance benefits if the funded ratio is less than 85%, and the amortization period is greater than 20 years."

   b) Analysis: Since the funded ratio at July 1, 2017 of 70.49% is below 80% the Board's Funding and Benefits policy does not currently support enhanced benefits.

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 and changes to the GABA.

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

Impact of Assuming 0.5% Lower Investment Return	
	Funded Ratio
Current Assumption 7.75%	70.49%
Lower Assumption 7.25%	66.88%
Change	(3.61)%
	Amortization Period Increase / (Decrease)
Current Assumption 7.75%	22 Years
Lower Assumption 7.25%	32 Years
Increase	10 Years
Impact of Assuming 1.0% Lower Investment Return	
	Funded Ratio
Current Assumption 7.75%	70.49%
Lower Assumption 6.75%	63.33%
Change	(7.16)%
	Amortization Period Increase / (Decrease)
Current Assumption 7.75%	22 Years
Lower Assumption 6.75%	47 Years
Increase	25 Years
Impact of Assuming 1.5% Lower Investment Return	
	Funded Ratio
Current Assumption 7.75%	70.49%
Lower Assumption 6.25%	59.86%
Change	(10.63)%
	Amortization Period Increase / (Decrease)
Current Assumption 7.75%	22 Years
Lower Assumption 6.25%	77 Years
Increase	55 Years

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 that would have a material effect on the liabilities of the System.

Contribution Changes

An employer supplemental contribution of 1% of compensation is required beginning in fiscal year 2014 which will increase by 0.10% each subsequent fiscal year through 2024. For fiscal years beginning after June 30, 2024, the supplemental employer contribution will equal 2.00% of compensation.

Method Changes

There have been no method changes since the previous valuation.

Impact of Changes

The following table summarizes how experience has changed the UAAL since the July 1, 2016 Actuarial Valuation. Further detail can be found in Table 12.

Changes in the Unfunded Actuarial Accrued Liability (UAAL)

(In millions)

July 1, 2016 Valuation UAAL	$ 1,684.7
Expected Increase	(8.2)
Expected July 1, 2017 UAAL	$ 1,676.5
Experience Loss on Actuarial Liabilities	$ 5.0
Experience Gain on Actuarial Assets	(18.2)
Assumption & Method Changes	0.0
Plan Changes	0.0
Total Gain	$ (13.2)
July 1, 2017 Valuation UAAL	$ 1,663.3

Summary

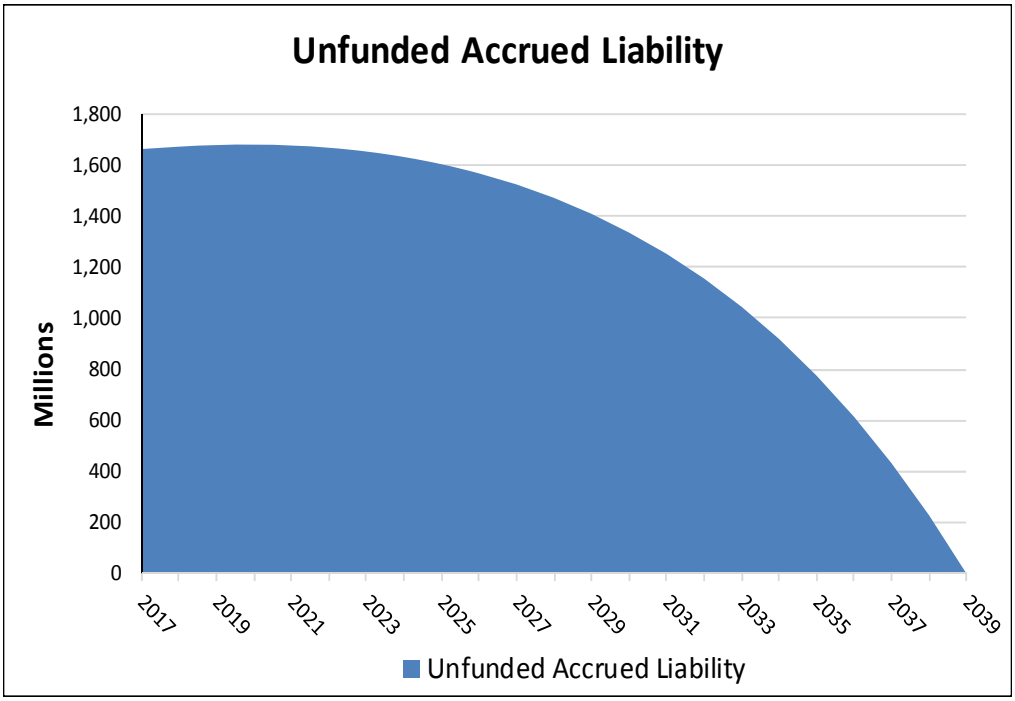
- The System's actuarial value investment return of 8.24% for the year ended June 30, 2017 is 0.49% more than the actuarial assumption of 7.75%. This represents an asset gain of 18.2 million due to investment return greater than anticipated. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market value of assets. As of July 1, 2017, the market value of assets was $3,950.7 million. As of July 1, 2017 the preliminary actuarial value of assets was $3,973.5 million. Since the preliminary actuarial value is within the corridor no adjustment is required to the preliminary actuarial value of assets. The July 1, 2017 market value of assets is $22.8 million less than the actuarial value of assets. This $22.8 million loss will be recognized in future actuarial valuations unless it is offset by returns greater than the 7.75% assumption.

- As of July 1, 2017 the amortization period of the UAAL is 22 years. Prior to this valuation the funding period was 24 years. Asset gains account for the decrease in the amortization period. Prior to the July 1, 2016 valuation, the Supplemental Contribution of 4.72% of MUS-RP payroll was assumed to cease in 2033. It is our understanding the contribution will not stop unless legislative action is taken. The additional Supplemental Contributions and experience gains have contributed to the decrease in the amortization period from 24 years to 22 years. The ultimate goal of the Board's Funding and Benefits Policy is to increase the current net funded ratio of 70.49% above 110% to encourage stable contribution rates.

- 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 7.75% 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 smoothes gains and losses over four years.

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 22 years. The ultimate goal of the TRS System is to become at least 100% funded and to establish a reserve equal to 10% of the Systems Actuarial Accrued Liability.



Section 2

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 July 1, 2017. 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. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market value of assets.

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 15 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 returns since 1995 on market value and actuarial value basis. Table 5 also shows the assumed rate of return since 1995 which was reduced from 8.00% to 7.75% in the FYE 2005. Table 6 summarizes the historical asset values on a market value and actuarial value basis.

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Table 1

Statement of Fiduciary Net Assets

	TOTAL TRS 2017	TOTAL TRS 2016
ASSETS		
Cash/Cash Equivalents-Short Term		
Investment Pool	$ 108,492,708	$ 106,788,491
Receivables:		
Accounts Receivable	20,953,774	22,096,228
Interest Receivable	99,189	4,934,351
Total Receivables	$ 21,052,963	$ 27,030,579
Investments, at fair value:		
Investment Pools	3,820,401,750	3,522,665,695
Other Investments	-	-
Securities Lending Collateral	22,352,540	100,939,896
Total Investments	$ 3,842,754,290	$ 3,623,605,591
Assets Used in Plan Operations:		
Land and Buildings	$ 193,844	$ 193,844
Less: Accumulated Depreciation	(150,545)	(150,545)
Equipment	2,380,990	229,000
Less: Accumulated Depreciation	(16,286)	(177,354)
Construction Work in Progress	224,557	2,062,527
Intangible Assets, net of amortization	-	-
Total Other Assets	2,632,560	2,157,472
TOTAL ASSETS	$ 3,974,932,520	$ 3,759,582,133
Pension Deferred Outflows	$ 311,169	$ 128,277
LIABILITIES		
Accounts Payable	$ 117,052	$ 148,655
Securities Lending Liability	22,352,540	100,939,896
Compensated Absences	192,956	175,277
OPEB Implicit Rate Subsidy	369,209	327,604
Net Pension Liability	1,502,397	1,177,820
TOTAL LIABILITIES	$ 24,534,153	$ 102,769,251
Pension Deferred Inflows	$ 4,974	$ 110,361
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS	**$ 3,950,704,563**	**$ 3,656,830,798**

Teachers' Retirement System
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Table 2

Statement of Changes in Fiduciary Net Assets

	TOTAL TRS 2017	TOTAL TRS 2016
ADDITIONS		
Contributions:		
Employer	$ 91,853,678	$ 88,643,646
Plan Member	74,253,046	72,740,665
Other	44,414,109	43,902,606
Total Contributions	$ 210,520,833	$ 205,286,917
Misc Income	$ 27,504	$ 29,123
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	$ 232,277,627	$ (84,549,668)
Investment Earnings	213,998,273	177,329,931
Security Lending Income	1,134,799	1,056,684
Investment Income/(Loss)	$ 447,410,698	$ 93,836,947
Less: Investment Expense	19,978,359	22,014,737
Less: Security Lending Expense	446,861	334,549
Net Investment Income/(Loss)	$ 426,985,479	$ 71,487,661
Total Additions	$ 637,533,815	$ 276,803,701
DEDUCTIONS		
Benefit Payments	$ 333,633,717	$ 320,810,259
Withdrawals	7,355,344	5,086,816
Administrative Expense	2,459,458	2,318,818
OPEB Expenses	55,181	54,594
Pension Expense	156,351	88,255
Total Deductions	$ 343,660,051	$ 328,358,741
NET INCREASE (DECREASE) IN PLAN NET ASSETS	$ 293,873,764	$ (51,555,040)
NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR	$ 3,656,830,798	$ 3,708,385,838
ADJUSTMENT	-	-
END OF YEAR	$ 3,950,704,563	$ 3,656,830,798

Teachers' Retirement System
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Table 3
Determination of Actuarial Value of Assets

Valuation Date July 1:	2016	2017	2018	2019	2020
A. Actuarial Value Beginning of Year	$ 3,609,847,020	$ 3,798,943,990			
B. Market Value End of Year	3,656,830,798	3,950,704,563			
C. Market Value of Beginning of Year	3,708,385,838	3,656,830,798			
D. Cash Flow					
D1. Contributions	205,286,917	210,520,833			
D2. Benefit Payments	(325,897,074)	(340,989,061)			
D3. Administrative Expenses	(2,318,818)	(2,459,458)			
D4. Pension and OPEB Expenses	(142,849)	(211,532)			
D5. Net	$ (123,071,824)	$ (133,139,218)			
E. Investment Income					
E1. Market Total: B. - C. - D3.	$ 71,516,784	$ 427,012,983			
E2. Assumed Rate	7.75%	7.75%			
E3. Amount for Immediate Recognition	282,779,254	278,464,971			
E4. Amount for Phased-in Recognition	(211,262,470)	148,548,012			
F. Phased-In Recognition of Investment Income					
F1. Current Year: 0.25 * E4.	$ (52,815,617)	$ 37,137,003	$ -	$ -	$ -
F2. First Prior Year	(28,594,387)	(52,815,617)	37,137,003	-	-
F3. Second Prior Year	73,522,441	(28,594,387)	(52,815,617)	37,137,003	-
F4. Third Prior Year	37,277,103	73,522,441	(28,594,387)	(52,815,617)	37,137,003
F5. Total Recognized Investment Gain	$ 29,389,540	$ 29,249,440	$ (44,273,001)	$ (15,678,614)	$ 37,137,003
G. Preliminary Actuarial Value End of Year A. + D5. + E3. + F5.	$ 3,798,943,990	$ 3,973,519,183			
H. Corridor					
H1. 80% of Market Value	$ 2,925,464,639	$ 3,160,563,650			
H2. 120% of Market Value	4,388,196,958	4,740,845,476			
I. Actuarial Value End of Year G. Not Less than H1. or Not Greater than H2.	$ 3,798,943,990	$ 3,973,519,183			
J. Difference Between Market & Actuarial Values	$ (142,113,192)	$ (22,814,620)			

Teachers' Retirement System
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Table 4

Historical Investment Returns*

Fiscal Year Ending	Market Returns	Actuarial Returns	Actuarial Return Over 8.00% Assumption
June 30, 2003	6.2%	1.6%	(6.4)%
June 30, 2004	13.3%	2.1%	(5.9)%

Fiscal Year Ending	Market Returns	Actuarial Returns	Actuarial Return Over 7.75% Assumption
June 30, 2005	8.0%	2.7%	(5.0)%
June 30, 2006	8.9%	8.5%	0.7%
June 30, 2007	17.6%	10.2%	2.5%
June 30, 2008	(4.9)%	7.2%	(0.6)%
June 30, 2009	(20.8)%	(10.3)%	(18.0)%
June 30, 2010	12.9%	9.8%	2.0%
June 30, 2011	21.7%	(0.1)%	(7.9)%
June 30, 2012	2.2%	3.2%	(4.6)%
June 30, 2013	12.9%	12.0%	4.3%
June 30, 2014	17.1%	13.2%	5.5%
June 30, 2015	4.6%	9.6%	1.8%
June 30, 2016	2.1%	8.8%	1.0%
June 30, 2017	11.9%	8.2%	0.5%
15 Year Average	7.1%	5.6%	(2.2)%

* 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.

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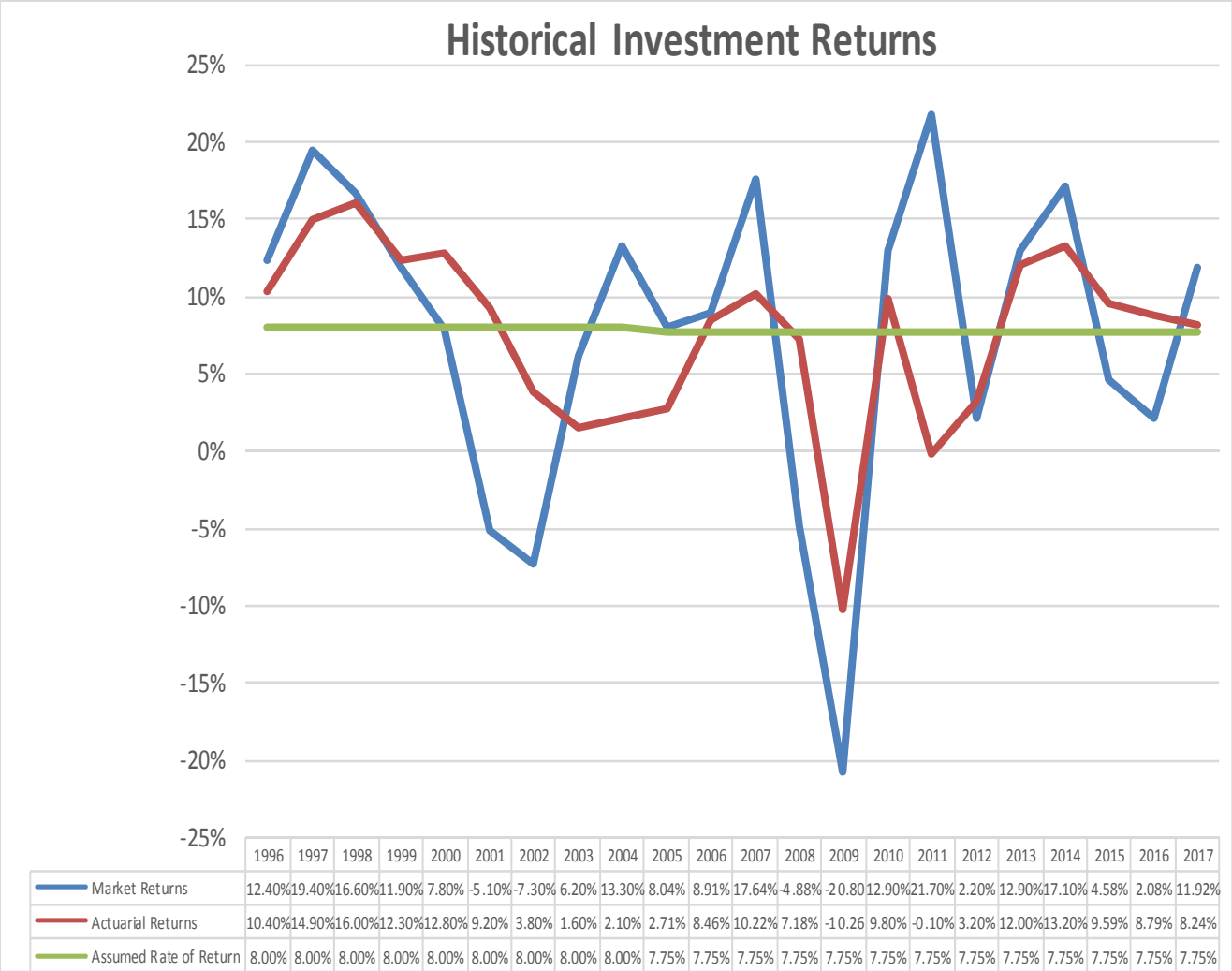
Table 5



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Market Returns	12.40%	19.40%	16.60%	11.90%	7.80%	-5.10%	-7.30%	6.20%	13.30%	8.04%	8.91%	17.64%	-4.88%	-20.80	12.90%	21.70%	2.20%	12.90%	17.10%	4.58%	2.08%	11.92%
Actuarial Returns	10.40%	14.90%	16.00%	12.30%	12.80%	9.20%	3.80%	1.60%	2.10%	2.71%	8.46%	10.22%	7.18%	-10.26	9.80%	-0.10%	3.20%	12.00%	13.20%	9.59%	8.79%	8.24%
Assumed Rate of Return	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%

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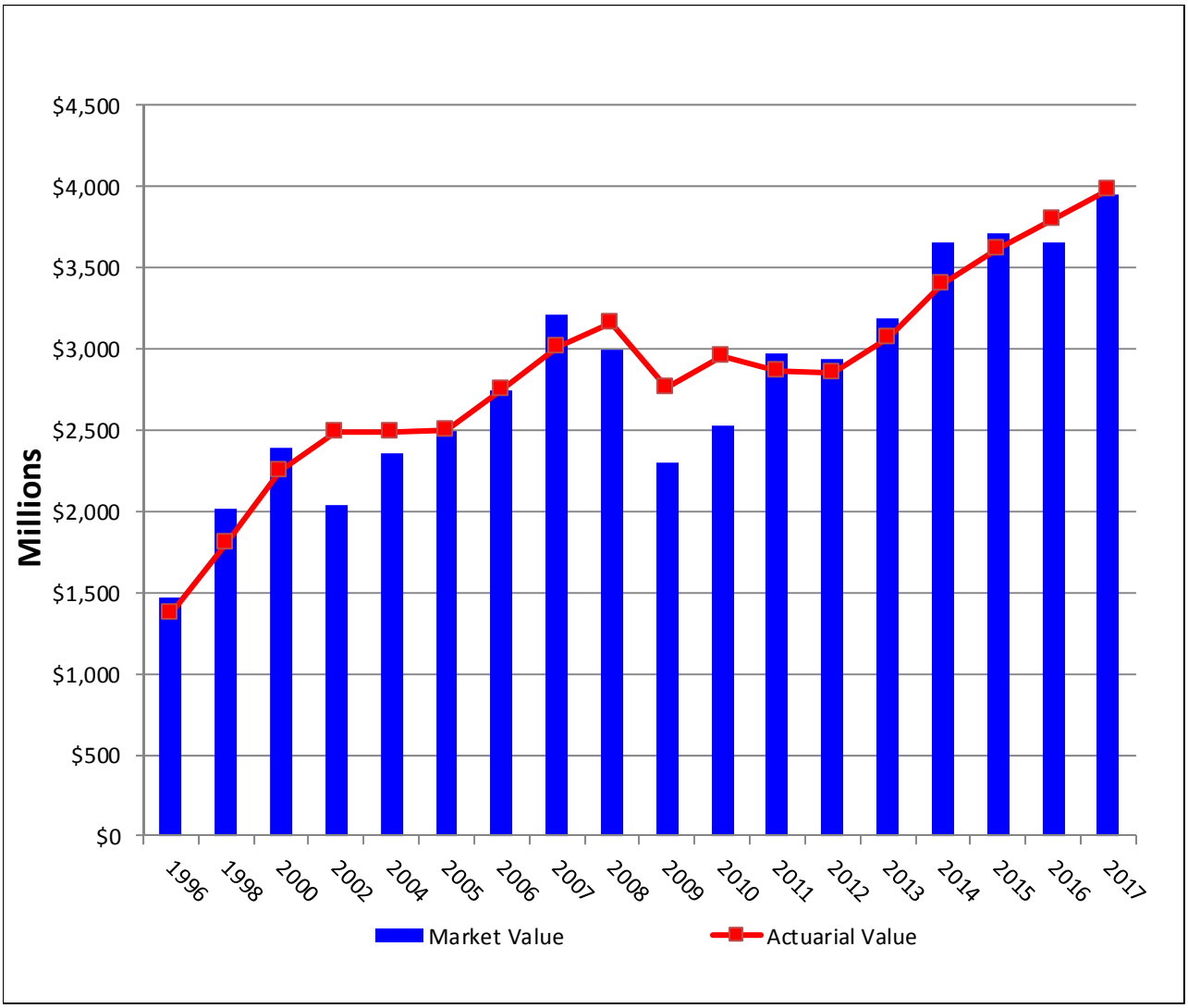
Table 6

Market Value of Assets vs. Actuarial Value of Assets



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Section 3

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 7 contains an analysis of the actuarial present value of all future benefits for contributing members, for former contributing members, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Table 7 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.

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Table 7

Actuarial Present Value of Future Benefits for Contributing Members, Former Contributing Members, and Beneficiaries

(All amounts are actuarial present values in millions)

	July 1, 2017 Total	July 1, 2016 Total
A. Active Members		
Service Retirement	$ 2,203.2	$ 2,178.2
Disability Retirement	13.7	13.4
Survivors' Benefits	61.0	60.0
Vested Retirement	40.6	37.6
Refund of Member Contributions	44.5	42.1
Total	$ 2,363.0	$ 2,331.3
B. Inactive Members and Annuitants		
Service Retirement	$ 3,544.0	$ 3,420.7
Disability Retirement	23.3	23.3
Beneficiaries*	230.5	218.2
Vested Terminated Members	68.4	64.8
Refund of Member Contributions	22.3	21.2
Total	$ 3,888.5	$ 3,748.2
C. Grand Total	$ 6,251.5	$ 6,079.5

* Includes survivors of active and retired members and children's benefits

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Section 4

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 7.75%, net of investment expenses. 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 8. In Table 8 we also provide a summary of the member and employer statutory contributions.

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

Table 9 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. Line C shows the actuarial accrued liability. Line D shows the amount of assets available for benefits. Line E shows the UAAL.

The amortization of the UAAL assumes university supplemental contributions are made as a percent of pay for members of the Montana University System Retirement Program (MUS-RP). Under Section 19-20-621, periodic separate valuations are to be performed to measure the liabilities of benefits to be paid under the Teachers' Retirement System (TRS) for MUS-RP members. The MUS-RP valuations calculate contribution rates that finance the university member benefits with university contributions and reflect actual experience including investment returns. In the prior valuations, the Supplemental Contribution of 4.72% of MUS-RP payroll was assumed to cease in 2033. It is our understanding the contribution will not stop unless legislative action is taken. The university supplemental contribution rate has varied from time to time. Recently it has varied as follows:

Supplemental University Contribution Rate	Fiscal Years Ending
2.81%	June 30, 1998
3.12%	June 30, 1999
3.42%	June 30, 2000
3.73%	June 30, 2001
4.04%	June 30, 2002 to June 30, 2007
4.72%	After June 30, 2007

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.

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Table 8

Normal Cost Contribution Rates
As Percentages of Salary

	July 1, 2017 Total	July 1, 2016 Total
Service retirement	7.66%	7.72%
Disability retirement	0.08%	0.08%
Survivors' benefits	0.31%	0.31%
Vested retirement	0.50%	0.49%
Refund of member contributions	1.27%	1.27%
Total Normal Rate	9.82%	9.87%
Employee Normal Rate	8.15%	8.15%
Employer Normal Rate	1.67%	1.72%
Administrative Expense Load	0.33%	0.31%

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Table 9

Unfunded Actuarial Accrued Liability
(Dollar amounts in millions)

	July 1, 2017	July 1, 2016
A. Actuarial present value of all future benefits for present and former members and their survivors (Table 7)	$ 6,251.5	$ 6,079.5
B. Less actuarial present value of total future normal costs for present members	614.7	595.8
C. Actuarial accrued liability	$ 5,636.8	$ 5,483.7
D. Less assets available for benefits	3,973.5	3,798.9
E. Unfunded actuarial accrued liability	$ 1,663.3	$ 1,684.8

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Section 5

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, 2017. The System's total cash flow including benefits payments, administrative expenses and investment earnings was $293.8 million. Of the $293.8 million, ($343.7) million was due to benefit payments and expenses, which were offset by $210.5 in contributions and $427.0 in investment returns. Table 11 shows the System is projected to have a positive cash flow in all future years.

As long as the System had a positive cash flow, there was no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and contributions. We are providing these projections to aid in developing the investment strategy for the System's assets.

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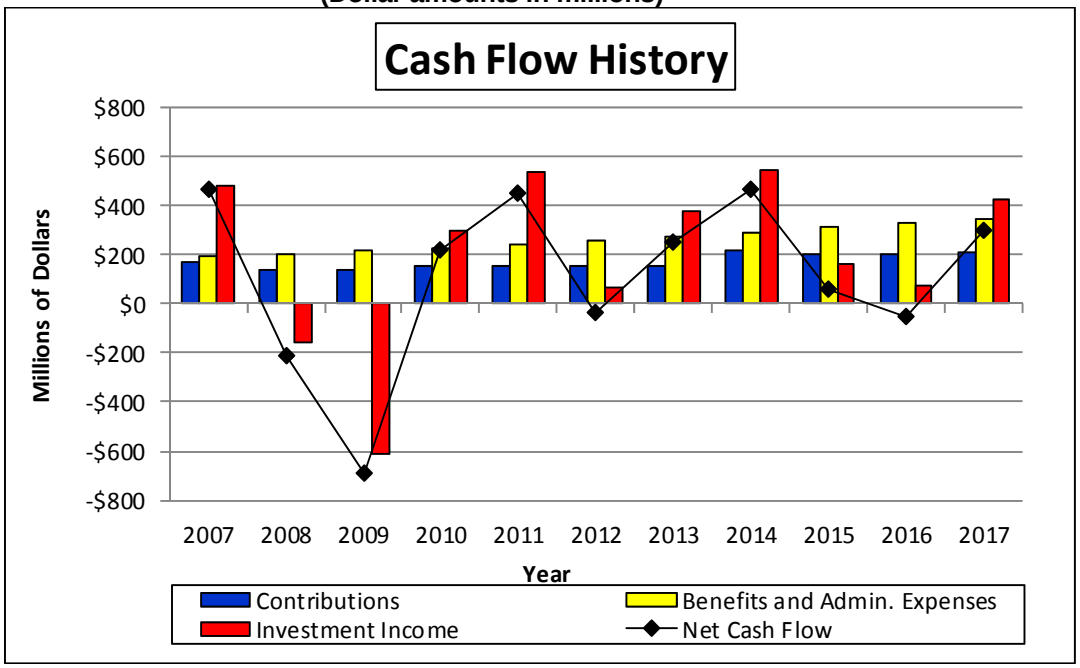
Table 10

Cash Flow History
(Dollar amounts in millions)



Historical Cash Flows

Year Ended June 30	Contributions	Benefits & Administrative Expenses	Investment Income	Net Cash Flow
2007	$ 169.2 *	$ 190.4	$ 484.5	$ 463.3
2008	141.0	203.6	(153.3)	(215.9)
2009	138.3	217.0	(612.8)	(691.5)
2010	152.3	226.3	295.0	221.0
2011	153.3	241.4	539.0	450.9
2012	152.0	258.6	66.3	(40.3)
2013	154.5	275.4	373.7	252.8
2014	218.8	292.1	540.3	467.0
2015	202.9	311.2	165.7	57.4
2016	205.3	328.4	71.5	(51.6)
2017	210.5	343.7	427.0	293.8

* Reflects $50 million transfer to TRS

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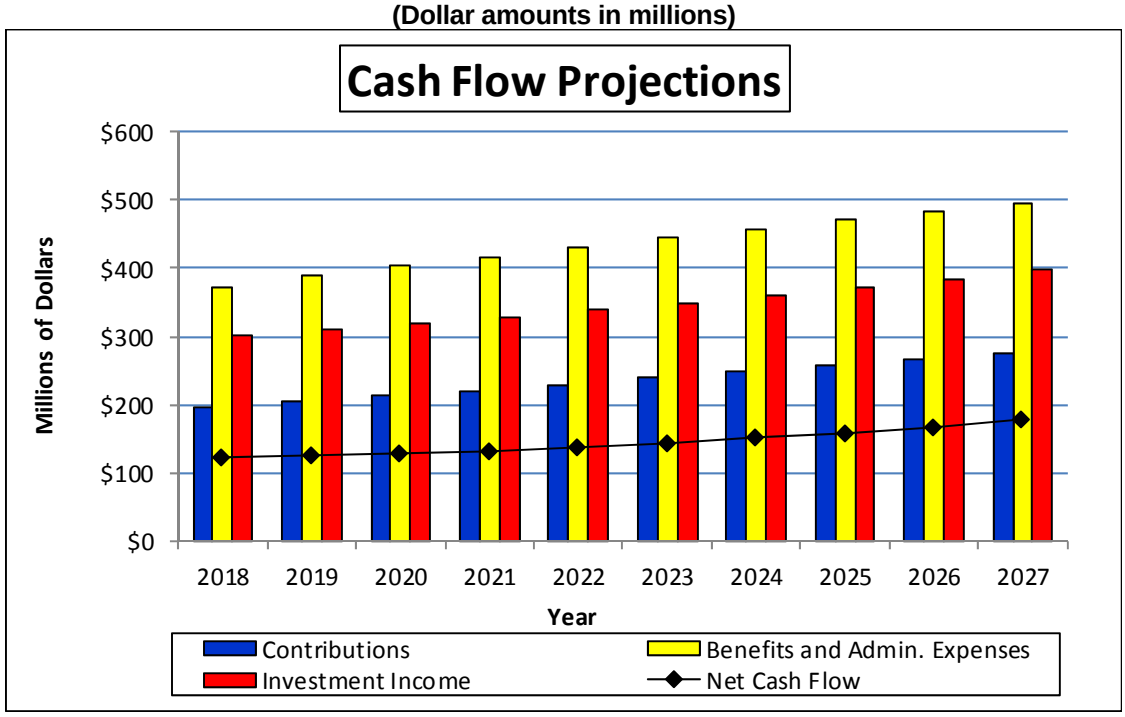
Table 11

Cash Flow Projections
(Dollar amounts in millions)



Year Ended June 30	Projected Cash Flows: Contributions	Benefits & Administrative Expenses	Assumed Investment Income	Net Cash Flow
2018	$ 196.8	$ 373.2	$ 300.3	$ 123.9
2019	204.5	388.4	309.6	125.7
2020	212.6	402.9	319.1	128.8
2021	221.0	417.0	328.9	132.9
2022	229.8	430.8	339.0	138.0
2023	239.0	444.8	349.5	143.7
2024	248.6	458.2	360.5	150.9
2025	257.5	470.8	372.0	158.7
2026	266.8	482.7	384.3	168.4
2027	276.5	493.8	397.2	179.9

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Section 6

Actuarial Gains or Losses

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

The developments of the gains or losses related to the actuarial liability and the assets are shown in Table 12. The results of our analysis of the financial experience of the System in the three most recent regular actuarial valuations are presented in Table 13. 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 assumption studies.

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

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Table 12

Analysis of Actuarial Gains or Losses*

A. UNFUNDED ACCRUED ACTUARIAL LIABILITY (GAIN) / LOSS ANALYSIS

1. Actual Unfunded Accrued Actuarial Liability as of June 30, :	$ 1,684,729,787
2. Normal Cost for this Plan Year	74,145,350
3. Interest on items 1 and 2 [(1+2) x 7.75%]	136,312,823
4. Contributions for this Plan Year:	(210,520,833)
5. Interest on item [4 x 7.75% x .5]	(8,157,682)
6. Changes due to:	
a. Assumption changes	-
b. Plan amendments	-
c. Funding Method	-
d. Actuarial (Gain) / Loss	$ (13,186,728)
7. Actual Unfunded Accrued Actuarial Liability as of June 30, : (1. + 2. + 3. + 4. + 5. + 6.)	**$ 1,663,322,717**

8. 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, :	$ 3,798,943,990
2. Interest on item [1 x 7.75%]	294,418,159
3. Contributions for the 2016/2017 Plan Year	210,520,833
4. Interest on item [3. x 7.75% x .5]	8,157,682
5. Benefit Payments for 2016/2017 Plan Year (Including Admin Expenses)	(343,448,519)
6. Interest on item [5. x 7.75% x .5]	(13,308,630)
7. Expected Actuarial Value of Assets as of June 30, 2017:	3,955,283,515
8. Actuarial Value of Assets as of June 30, 2017:	$ 3,973,519,183
9. (Gain) / Loss	**$ (18,235,668)**

* 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.

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Table 13

Historical Actuarial Gains or Losses*
(Dollar amounts in millions)

	UAAL (Gain)/Loss		
	June 30, 2017	**June 30, 2016**	**June 30, 2015**
Investment Income			
Investment income was (greater) less than expected based on actuarial value of assets.	$ (18.2)	$ (36.9)	$ (61.4)
Pay Increases			
Pay increases were (less) greater than expected.	(14.6)	(16.1)	(10.3)
Age & Service Retirements			
Members retired at (older) younger ages or with (less) greater final average pay than expected	4.8	5.3	8.3
Disability Retirements			
Disability claims were (less) greater than expected	0.6	0.4	0.6
Death-in-Service Benefits			
Survivor claims were (less) greater than expected	(3.9)	(3.3)	(2.8)
Withdrawal From Employment			
(More) less reserves were released by withdrawals than expected	6.5	5.7	5.1
Death After Retirement			
Retirees (died younger) lived longer than expected	13.8	9.1	9.0
Data Adjustments and Benefit Payment Timing			
Service purchases, data corrections, etc.	(1.3)	(5.3)	0.7
Other			
Miscellaneous (gains) and losses	(0.9)	(1.5)	1.2
Total (Gain) or Loss During Period From Financial Experience	$ (13.2)	$ (42.6)	$ (49.6)
Non-Recurring Items.			
Changes in actuarial assumptions and methods	-	(12.4)	(4.7)
Changes in benefits caused a (gain) loss	-	-	-
Composite (Gain) Loss During Period	$ (13.2)	$ (55.0)	$ (54.3)

* 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.

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Appendix A

Actuarial Procedures and Assumptions

Retirement, disablement and termination of employment assumptions reflect the five-year experience study for the period ending 2009 adopted by the Board on May 13, 2010.

The assumed rates of mortality are based a five-year experience study for the period ending 2013 adopted by the Board on May 13, 2014.

The current asset valuation method was adopted for the July 1, 2007 valuation.

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

Actuarial Cost Method

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

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

Records and Data

The data used in the valuation consist of financial information; records of age, sex, service, salary, contribution rates, and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data were supplied by the System and are 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.

Employer Contributions

At the time of this valuation, the total employer contribution rate for normal costs and amortization of the UAAL was 11.36% of members' salaries. The employer contribution rate will increase by 0.10% each year beginning July 1, 2014 until the total employer contribution rate equals 11.96%.

Administrative and Investment Expenses

The investment expenses of the System are assumed to be funded by investment earnings in excess of 7.75% per year.

Administrative expenses are assumed to equal 0.33% of covered payroll.

Valuation of Assets - Actuarial Basis

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. The actuarial value of assets is not allowed to be greater than 120% or less than 80% of the market assets. (Adopted effective July 1, 2007.)

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 7.75% per year net of investment expenses, compounded annually. (Adopted effective July 1, 2014)

Interest on Member Contributions

Interest on member contributions is assumed to accrue at a rate of 5% per annum, compounded annually. This assumption was set as of July 1, 2004.

Postretirement Benefit Increases

Tier 1 Members:

> On January 1 of each year, the retirement allowance payable is increased by 1.5% if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made.

Tier 2 Members:

> On January 1 of each year, the retirement allowance payable is assumed to increase by 0.5% if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-2. In addition to increases in salary due to merit and longevity, this scale includes an assumed 4.0% annual rate of increase in the general wage level of the membership. The merit and longevity increases for the MUS members did not show a pattern of increasing or decreasing with service at the time of our most recent study. Therefore, the MUS members have a flat 1% merit and longevity assumption. The general wage increase assumption was adopted July 1, 2004 and the merit and longevity scales were adopted July 1, 2002.

Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.

Service Retirement

Table A-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. The rates for General Members were adopted May 13, 2010. The rates for University Members were adopted May 13, 2010.

Disablement

The rates of disablement used in this valuation are illustrated in Table A-4. These rates were adopted May 13, 2010.

Mortality

The mortality rates used in this valuation are illustrated in Table A-5. A written description of each table used is included in Table A-1. These rates were adopted July 1, 2014.

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 A-6. These rates were adopted May 13, 2010.

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 A-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service. These rates were adopted July 1, 2002.

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.

Part-Time Employees

The valuation data for active members identify part-time members. For part-time members earning more than $1,000, total credited service is adjusted based on the ratio of actual earnings to annualized earnings. The liability and normal cost calculations for these members are based on the adjusted service and actual earnings for the prior year.

Part-time members earning less than $1,000 during the last year were valued at their current member contribution balance.

Montana University System Retirement Program (MUS-RP)

MUS-RP payroll as of June 30, 2017 was $248,229,370.

Effective for fiscal years after June 30, 2007, the MUS-RP contribution rate is 4.72%, pursuant to MCA 19-20-621. In the prior valuations, the Supplemental Contribution of 4.72% of MUS-RP payroll was assumed to cease in 2033. It is our understanding the contribution will not stop unless legislative action is taken.

Buybacks, Purchase of Service, and Military Service

The active liabilities and normal cost (excluding liabilities and normal cost in respect of Return of Employee Contributions) were increased to 100.5% of their original value to fund this additional service based on a study of the System's experience for the five calendar years 1995 through 1999. Effective July 1, 2008.

Probability of Marriage & Dependent Children

If death occurs in active status, all members are assumed to have an eligible surviving spouse and two children. The spouse is assumed to be the same age as the member. For members who die prior to age 50, dependent children are assumed to be eight years old. For members who die after age 50 but prior to age 55, children are assumed to be 13 years old. Members who die after age 55 are assumed to have no dependent children under the age of 18.

Records with no Birth Date

New records with no birth date are assumed to be 25 years old. Records that are not new and have no birth date used the same birth date as the prior year's valuation.

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Table A-1
Summary of Valuation Assumptions

I.	Economic assumptions		
	A.	General wage increases* (Adopted July 1, 2014)	4.00%
	B.	Investment return (Adopted July 1, 2004)	7.75%
	C.	Price Inflation Assumption (Adopted July 1, 2014)	3.25%
	D.	Growth in membership	0.00%
	E.	Postretirement benefit increases (Starting three years after retirement)	
		Tier One	1.50%
		Tier Two	0.50%
	F.	Interest on member accounts (Adopted July 1, 2004)	5.00%
II.	Demographic assumptions		
	A.	Individual salary increase due to promotion and longevity (General Member assumptions adopted July 1, 2002) (University Member assumptions adopted July 1, 2000)	Table A-2
	B.	Retirement (adopted May 13, 2010)	Table A-3
	C.	Disablement (adopted May 13, 2010)	Table A-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.	Table A-5
		For Males: 1992 Base Rates from the RP 2000 Healthy Annuitant Mortality Table for ages 50 and above and 1992 Base Rates from the RP 2000 Combined Healthy Annuitant Mortality Table for ages below 50, set back four years, with mortality improvements projected by Scale BB to 2018 (adopted July 1, 2014). For Females: 1992 Base Rates from the RP 2000 Healthy Annuitant Mortality Table for ages 50 and above and 1992 Base Rates from the RP 2000 Combined Healthy Annuitant Mortality Table for ages below 50, set back two years, with mortality improvements projected by Scale BB to 2018 (adopted July 1, 2014).	
	E.	Mortality among disabled members	Table A-5
		For Males: RP 2000 Disabled Mortality Table for Males, set forward one year, with mortality improvements projected by Scale BB to 2018 (adopted July 1, 2014). For Females: RP 2000 Disabled Mortality Table for Females, set forward five years, with mortality improvements projected by Scale BB to 2018 (adopted July 1, 2014).	
	F.	Other terminations of employment (adopted May 13, 2010)	Table A-6
	G.	Probability of retaining membership in the System upon vested termination (adopted July 1, 2002)	Table A-7

* Montana University System (MUS) members are assumed to have a 0.63% higher average final compensation to account for the larger than average annual compensation increases observed in the years immediately preceding retirement.

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Table A-2

Future Salaries

Years of Service	General Members			University Members		
	Individual Merit & Longevity	General Wage Increase	Total Salary Increase	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	4.51%	4.00%	8.51%	1.00%	4.00%	5.00%
2	4.09	4.00	8.09	1.00	4.00	5.00
3	3.46	4.00	7.46	1.00	4.00	5.00
4	2.94	4.00	6.94	1.00	4.00	5.00
5	2.52	4.00	6.52	1.00	4.00	5.00
6	2.21	4.00	6.21	1.00	4.00	5.00
7	1.89	4.00	5.89	1.00	4.00	5.00
8	1.68	4.00	5.68	1.00	4.00	5.00
9	1.47	4.00	5.47	1.00	4.00	5.00
10	1.31	4.00	5.31	1.00	4.00	5.00
11	1.16	4.00	5.16	1.00	4.00	5.00
12	1.00	4.00	5.00	1.00	4.00	5.00
13	0.84	4.00	4.84	1.00	4.00	5.00
14	0.68	4.00	4.68	1.00	4.00	5.00
15	0.58	4.00	4.58	1.00	4.00	5.00
16	0.47	4.00	4.47	1.00	4.00	5.00
17	0.37	4.00	4.37	1.00	4.00	5.00
18	0.26	4.00	4.26	1.00	4.00	5.00
19	0.21	4.00	4.21	1.00	4.00	5.00
20	0.16	4.00	4.16	1.00	4.00	5.00
21	0.11	4.00	4.11	1.00	4.00	5.00
22 & Up	0.00	4.00	4.00	1.00	4.00	5.00

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Table A-3

Retirement
Annual Rates

	General Members			University Members		
Age	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter
45		8.0%	5.5%		17.0%	8.0%
46		8.0	5.5		17.0	8.0
47		8.0	5.5		17.0	8.0
48		8.0	5.5		17.0	8.0
49	*	8.0	5.5	*	17.0	8.0
50	5.0%	8.0	5.5	7.0%	17.0	8.0
51	5.0	8.0	6.3	7.0	17.0	8.0
52	5.0	8.0	8.0	7.0	17.0	8.0
53	5.0	9.0	7.3	7.0	17.0	8.0
54	5.0	9.0	8.2	7.0	17.0	8.0
55	7.0	9.0	9.8	7.0	15.0	8.0
56	7.0	12.0	11.3	7.0	15.0	8.0
57	7.0	11.8	12.5	7.0	15.0	8.0
58	7.0	14.8	13.1	7.0	15.0	8.0
59	7.0	17.4	14.8	7.0	15.0	8.0
60	*	14.6	17.0	*	15.0	8.5
61		21.3	25.0		14.0	14.5
62		23.8	25.0		20.0	19.0
63		11.4	25.0		14.0	14.5
64		19.0	25.0		20.0	18.0
65		40.0	35.0		28.0	26.0
66		8.0	20.0		21.0	21.0
67		30.0	20.0		21.0	24.5
68		6.0	20.0		21.0	19.5
69		6.0	20.0		21.0	30.0
70		**	**		**	**

* All benefits are unreduced after attaining age 60. Reduced benefits are not available before age 50.
** Immediate retirement is assumed at age 70 or over.

Teachers' Retirement System
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Table A-4

Disablement
Annual Rates

Age	All Members
25	.005%
30	.005
35	.008
40	.028
45	.044
50	.063
55	.084
60	.100

Teachers' Retirement System
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Table A-5

Mortality
Annual Rates

	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
Age	Men	Women	Men	Women
25	0.03%	0.02%	2.14%	0.71%
30	0.04	0.02	2.14	0.71
35	0.05	0.04	2.14	0.71
40	0.08	0.06	2.14	0.71
45	0.11	0.09	2.26	1.09
50	0.15	0.14	2.87	1.57
55	0.55	0.26	3.48	2.00
60	0.58	0.41	3.83	2.34
65	0.79	0.68	4.20	3.03
70	1.23	1.11	5.02	4.20
75	2.03	1.85	6.62	5.82
80	3.48	3.03	8.80	8.06
85	5.90	5.03	11.30	11.27
90	10.39	8.79	16.37	15.94
95	17.93	15.29	25.48	21.31

Teachers' Retirement System
State of Montana

Table A-6

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

Years of Service	All Members
1	36.5%
2	20.5
3	14.6
4	10.5
5	8.5
6	7.0
7	6.4
8	5.8
9	5.4
10	5.0
11	4.3
12	3.9
13	3.5
14	3.2
15	2.9
16	2.6
17	2.3
18	2.0
19	1.9
20	1.8
21	1.7
22	1.6
23	1.5
24	1.5

Teachers' Retirement System
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Table A-7

Probability of Retaining Membership in the System Upon Vested Termination

Age	Probability of Retaining Membership
25	54%
30	54
35	58
40	58
45	60
50	70
55	75

Teachers' Retirement System
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Appendix B

Summary of Benefit Provisions

Effective Date

September 1, 1937.

Vesting Period

Five years. No benefits are payable unless the member has a vested right, except the return of employee contributions with interest.

Tier One Member

A person who became a member before July 1, 2013 and who has not withdrawn the member's account balance.

Tier Two Member

A person who became a member on or after July 1, 2013, or who after withdrawing the member's account balance, became a member again after July 1, 2013.

Final Compensation

Tier One Members

Average of highest three consecutive years of earned compensation.

Tier Two Members

Average of highest five consecutive years of earned compensation.

Normal Form of Benefits

Life only annuity. All benefits cease upon death; however, in no event will the member receive less than the amount of employee contributions with interest.

Normal Retirement Benefits

Tier One Members

Eligibility: 25 years of service or age 60 with five years of service.

Benefit: The retirement benefit is equal to 1/60 of final compensation for each year of service.

Tier Two Members

Eligibility: Age 55 with 30 years of service or age 60 with five years of service.

Benefit: A member age 60 with at least 30 years of creditable service will receive a retirement allowance equal to 1.85% of final compensation for each year of service. Otherwise, the multiplier used to calculate the retirement allowance will equal 1/60 of final compensation for each year of service.

Early Retirement Benefits

Tier One Member

Eligibility: Five years of service and age 50.

Benefit: The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is actuarially reduced by the lesser of the number of years equal to the age of the participant at the early retirement subtracted from age 60 or the number of years of service at early retirement subtracted from 25 years of service.

Tier Two Member

Eligibility: Five years of service and age 55.

Benefit: The retirement benefit is calculated in the same manner as described for normal retirement, but the benefit is actuarially reduced by the lesser of the number of years equal to the age of the participant at the early retirement subtracted from age 60 or the number of years of service at early retirement subtracted from 30 years of service.

Death Benefit

Eligibility:	Five years of service.
Benefit:	The death benefit is equal to 1/60 of final compensation for each year of service accrued at date of death, with an actuarial adjustment based on the relation of the member's age at death to the beneficiary's age. A monthly benefit of $200 is paid to each child until age 18. In addition, a lump-sum benefit of $500 is paid upon the death of an active or retired member.

Disability Benefit

Eligibility:	Five years of service.
Benefit:	The disability benefit is equal to 1/60 of final compensation for each year of service accrued at date of disability. The minimum benefit is 1/4 of the final compensation. A Tier Two Member is not eligible for a disability retirement if the member is or will be eligible for a service retirement on or before the member's date of determination.

Withdrawal Benefits	With less than five years of service, the accumulated employee contributions with interest are returned. With more than five years, the member may elect a refund of contributions with interest or leave the contributions and interest in the System and retain a vested right to retirement benefits.
Contributions	Tier One Member: 7.15% of compensation. Tier One members are required to contribute a Supplemental Contribution equal to an additional 1% of compensation. The Board may decrease the Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or greater than 90% and the period necessary to amortize the unfunded liabilities of the System based on the most recent actuarial valuation is less than 15 years. Following one or more decreases in the supplemental contribution the Board may increase the supplemental contribution to a rate not to exceed 1% if the average funded ratio of the System based on the last three annual actuarial valuations is equal to or less than 80% and the period necessary to amortize all liabilities of the System based on the most recent annual actuarial valuation is greater than 20 years.

Tier Two Member: 8.15% of compensation. The Board may require a Tier Two member to contribute a Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or less than 80% and the period necessary to amortize the unfunded actuarial accrued liability is greater than 20 years and a State or employer contribution rate increase or a flat dollar contribution to the System has been enacted which is equivalent to or greater than the Supplemental Contribution Rate imposed by the Board. A singe Tier Two Supplemental Contribution Rate increase cannot exceed 0.5% of compensation and in total cannot exceed 9.15% of compensation. The Board may decrease the Supplemental Contribution if the average funded ratio of the System based on the previous three annual actuarial valuations is equal to or greater than 90%; and the period necessary to amortize the unfunded actuarial accrued liability is less than 15 years.

Employer: 9.96% of compensation. Employers are required to contribute a supplemental contribution equal to 1% for fiscal year 2014 and increase by 0.1% each fiscal year through 2024. The Board may decrease the Employer Supplemental Contribution if the average funded ratio of the System based on the last three actuarial valuations is equal to or greater than 90% and the period necessary to amortize the unfunded actuarial accrued liability based on the most recent valuation is less than 15 years and the GABA has been increased to the maximum allowable. Following one or more decreases in the Supplemental Contribution Rate the Board may increase the Supplemental Contribution Rate to a rate not to exceed 1% if the average funded ratio of the System based on the last three actuarial valuations is equal to or less than 80% and the period necessary to amortize the unfunded actuarial accrued liability is greater than 20 years.

MCA 19-20-604 specifies that the employer contribution rate will be reduced by 0.11% when the amortization period of the System's UAAL is 10 years or less according to the System's latest actuarial valuation.

State Supplemental Contribution: $25 million per year on an annual basis payable on July 1st of each year.

Re-employed Retirees: Each employer is required to contribute 9.85% of total compensation paid to all re-employed TRS retirees employed in a TRS reportable position. This amount shall increase by 1.00% for fiscal year 2014 and increase by

	0.10% each fiscal year through 2024 until the total employer contribution is equal to 11.85% of re-employed retiree compensation.
Interest on Member contributions	Effective July 1, 2017, the interest credited on member contributions increased from 0.55% to 0.75% per annum.
Guaranteed Annual Benefit Adjustment (GABA)	On January 1 of each year, if the retiree has received benefits for at least 36 months prior to January 1 of the year in which the adjustment is to be made, for Tier One Members, the retirement allowance will be increased by 1.5%. For Tier Two Members, the retirement allowance will be increased by an amount equal to or greater than 0.5% but no more than 1.5% if the most recent actuarial valuation shows the System to be at least 90% funded and the provisions of the increase is not projected to cause the funded ratio to be less than 85%.

Teachers' Retirement System
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Appendix C

Valuation Data

This valuation is based upon the membership of the System as of July 1, 2017. Membership data were supplied by the System and accepted for valuation purposes without audit. However, tests were performed to ensure that the data are sufficiently accurate for valuation purposes.

Active Members	Number	Annual Salaries in Millions
Full-Time Members	12,808	$ 689.6
Part-Time Members*	5,576	86.3
Total Contributing Members*	18,384	$ 775.9
Active Members with Annual Compensation less than $1,000	533	
Total Active Members	18,917	

* Excludes part-time members with annual compensation less than $1,000.

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

Table C-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.
- Child beneficiaries.
- Terminated vested members.

Table C-3 is a reconciliation of membership data from July 1, 2016 to July 1, 2017.

The following is a summary of retired members and beneficiaries currently receiving benefits:

Type of Annuitant	Number	Annual Benefits in Thousands	Average Annual Benefits
Service Retirement	13,630	$ 324,151	$ 23,782
Survivors of Deceased Retired Members	1,248	20,262	16,235
Total Service Retirement (including survivors)	14,878	$ 344,413	$ 23,149
Disability Retirement	203	2,390	11,781
Survivors of Deceased Active Members	468	5,161	11,028
Child Beneficiaries	17	41	2,400
Total Annuitants	15,566	$ 352,005	$ 22,614

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	1,779
Non-Vested Terminated Members	13,712
Total Terminated Members	15,491

Teachers' Retirement System
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Table C-1

Active Members Distribution of Full-Time Employees and Salaries as of July 1, 2017

Number of Employees

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	38	170	61	5	1								275
25 to 29	38	244	271	514	271								1,338
30 to 34	35	116	160	289	694	187	1						1,482
35 to 39	26	119	126	211	500	642	149						1,773
40 to 44	23	81	94	154	355	413	532	103					1,755
45 to 49	11	70	69	115	256	287	381	514	108				1,811
50 to 54	12	54	52	85	161	198	242	309	380	79			1,572
55 to 59	10	40	41	55	131	177	225	246	252	257	78		1,512
60 to 64	8	23	26	32	66	96	128	162	153	124	131	26	975
65 to 69	6	12	5	8	14	21	33	20	42	34	30	29	254
70 and up	2	5	2	3	3	6	3	3	6	9	5	14	61
Totals	209	934	907	1,471	2,452	2,027	1,694	1,357	941	503	244	69	12,808

Teachers' Retirement System
State of Montana

Table C-1

Active Members Distribution of Full-Time Employees and Salaries as of July 1, 2017

Annual Salaries in Thousands

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	932	5,544	2,179	183	53								8,892
25 to 29	1,007	8,450	9,747	20,169	11,482								50,856
30 to 34	897	4,431	6,366	12,545	31,989	9,649	41						65,917
35 to 39	755	4,620	5,280	9,020	24,696	36,213	9,088						89,671
40 to 44	579	3,355	4,071	6,653	18,117	24,025	33,725	6,748					97,273
45 to 49	283	2,735	2,887	5,293	12,872	16,462	24,081	34,406	7,472				106,490
50 to 54	289	2,226	2,025	4,212	8,268	10,831	14,862	20,770	26,525	5,358			95,367
55 to 59	736	1,595	1,737	2,531	6,623	9,764	13,652	15,635	17,156	17,808	5,479		92,718
60 to 64	246	978	1,269	1,479	3,499	5,023	7,936	10,729	10,208	8,783	9,099	2,001	61,249
65 to 69	185	523	225	497	967	1,050	2,027	1,227	2,819	2,415	2,349	2,276	16,560
70 and up	323	317	64	108	215	314	153	185	446	759	443	1,318	4,645
Totals	6,233	34,775	35,850	62,691	118,782	113,330	105,565	89,700	64,625	35,123	17,370	5,595	689,638

Teachers' Retirement System
State of Montana

Table C-1

Active Members Distribution of Full-Time Employees and Salaries as of July 1, 2017

Average Annual Salary

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	24,534	32,613	35,716	36,657	53,446								32,334
25 to 29	26,507	34,630	35,968	39,239	42,370								38,009
30 to 34	25,617	38,202	39,785	43,407	46,094	51,598	40,632						44,478
35 to 39	29,034	38,821	41,906	42,749	49,392	56,406	60,990						50,576
40 to 44	25,168	41,425	43,310	43,204	51,033	58,173	63,393	65,510					55,426
45 to 49	25,741	39,076	41,846	46,023	50,280	57,358	63,204	66,937	69,182				58,802
50 to 54	24,069	41,218	38,951	49,552	51,357	54,702	61,414	67,217	69,803	67,823			60,666
55 to 59	73,622	39,887	42,375	46,024	50,561	55,162	60,677	63,559	68,079	69,292	70,244		61,322
60 to 64	30,770	42,525	48,805	46,217	53,015	52,318	62,002	66,226	66,717	70,828	69,459	76,954	62,819
65 to 69	30,818	43,617	44,929	62,164	69,046	49,999	61,419	61,368	67,120	71,030	78,314	78,477	65,198
70 and up	161,690	63,335	31,891	36,105	71,647	52,347	51,147	61,809	74,277	84,298	88,509	94,171	76,153
Totals	29,821	37,233	39,526	42,618	48,443	55,910	62,317	66,102	68,677	69,826	71,189	81,088	53,844

Teachers' Retirement System
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Table C-1

Active Members Distribution of Part-Time Employees
as of July 1, 2017

Number of Employees

	Completed Years of Service												
Age	0	1	2	3 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40+	Totals
<25	229	74	25	5									333
25 to 29	217	131	62	53	20								483
30 to 34	155	124	47	58	70	16							470
35 to 39	164	151	86	96	99	55	11						662
40 to 44	160	120	73	102	115	51	39	7					667
45 to 49	122	108	66	93	157	67	34	20	4				671
50 to 54	77	71	46	85	122	113	71	20	14	1			620
55 to 59	68	63	56	78	121	119	98	58	28	9	2		700
60 to 64	65	54	38	53	87	81	77	62	20	5	2		544
65 to 69	35	25	24	32	50	27	25	21	9	4	3		255
70 and up	20	18	15	28	36	25	17	4	5	2		1	171
Totals	1,312	939	538	683	877	554	372	192	80	21	7	1	5,576

Teachers' Retirement System
State of Montana

Table C-2

Distribution of Inactive Lives

Members Receiving Service Retirement Benefits as of July 1, 2017

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	21	$ 570	$ 27,141
50 to 54	154	4,049	26,293
55 to 59	627	16,991	27,098
60 to 64	2,101	51,377	24,454
65 to 69	3,701	91,981	24,853
70 to 74	2,980	73,400	24,631
75 to 79	1,896	45,097	23,785
80 to 84	1,142	24,249	21,234
85 to 89	641	11,364	17,729
90 and up	367	5,073	13,824
Totals	13,630	$ 324,151	$ 23,782

Members Receiving Disability Retirement Benefits as of July 1, 2017

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	10	$ 110	$ 11,046
50 to 54	15	227	15,159
55 to 59	25	335	13,403
60 to 64	31	395	12,737
65 to 69	44	493	11,194
70 to 74	31	376	12,136
75 to 79	18	188	10,466
80 to 84	14	127	9,092
85 to 89	9	90	10,028
90 and up	6	49	8,186
Totals	203	$ 2,390	$ 11,781

Teachers' Retirement System
State of Montana

Table C-2

Distribution of Inactive Lives

Survivors of Deceased Retired Members as of July 1, 2017

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	63	$ 609	$ 9,668
50 to 54	30	230	7,679
55 to 59	44	618	14,034
60 to 64	74	977	13,208
65 to 69	134	2,321	17,319
70 to 74	200	3,751	18,753
75 to 79	210	4,135	19,691
80 to 84	198	3,299	16,662
85 to 89	162	2,613	16,129
90 and up	133	1,709	12,847
Totals	1,248	$ 20,262	$ 16,235

Survivors of Deceased Active Members as of July 1, 2017

Age	Number of Persons	Annual Benefits in Thousands	Average Annual Benefits
<50	103	$ 779	$ 7,568
50 to 54	21	238	11,338
55 to 59	44	360	8,181
60 to 64	61	712	11,673
65 to 69	70	1,012	14,456
70 to 74	64	755	11,796
75 to 79	40	588	14,700
80 to 84	24	222	9,232
85 to 89	27	355	13,155
90 and up	14	140	9,986
Totals	468	$ 5,161	$ 11,028

Teachers' Retirement System
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Table C-2

Distribution of Inactive Lives

Terminated Vested Members as of July 1, 2017

Age	Number of Persons
<25	
25 to 29	9
30 to 34	93
35 to 39	183
40 to 44	211
45 to 49	258
50 to 54	330
55 to 59	401
60 to 64	213
65 to 69	72
70 and above	9
Total	1,779

Child Beneficiaries as of July 1, 2017

Age	Number of Persons
<5	1
5 to 6	2
7 to 8	1
9 to 10	
11 to 12	1
13 to 14	4
15 to 16	6
17 to 18	2
Total	17

Teachers' Retirement System
State of Montana

Table C-3

Data Reconciliation

	Active Contributing Members*	Terminated Vested Members	Service Retired Members	Disabled Members	Survivors and Beneficiaries
July 1, 2016 Valuation	18,332	1,704	13,271	206	1,687
Refunds and Non-Vested Terminations	(1,417)	(35)			
Change to Annual Pay Under $1,000	41	18			
Vested Terminations	(263)	263			
Service Retirements	(558)	(89)	647		
Disability Retirements	(6)	(2)		8	
Deaths with Beneficiary	(14)	(1)	(87)	(4)	106
Deaths without Beneficiary			(196)	(7)	(73)
New Entrants	1,800				
Rehires	454	(79)	(10)		
Other	15		5		13
July 1, 2017 Valuation	18,384	1,779	13,630	203	1,733

* Excludes active members with annual compensation less than $1,000

Teachers' Retirement System
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Appendix D

Comparative Schedules

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

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

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

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

Teachers' Retirement System
State of Montana

Table D-1

Active Membership Data

Valuation Date (July 1)	Full-Time Members	Part-Time Members**	Total Contributing Members**	Part-Time Members Annual Compensation less than $1,000	Annual Full-Time Salaries in Thousands	Average Full-Time Annual Salary	Average Age**	Average Years of Service**	Average Hire Age**
1996	13,251	5,444	18,695	1,295	424,085	32,004	43.3	11.6	31.7
1998	13,545	4,647	18,192	776	459,191	33,901	44.0	12.1	31.9
2000	13,289	4,245	17,534	886	477,160	35,906	44.5	12.2	32.3
2002	12,796	4,650	17,446	723	486,204	37,997	45.0	12.2	32.8
2004	12,601	5,013	17,614	637	510,808	40,537	45.6	12.2	33.4
2005	12,523	5,019	17,542	697	523,909	41,836	45.8	12.4	33.4
2006	12,715	4,840	17,555	544	549,268	43,198	46.0	12.5	33.5
2007	12,634	4,994	17,628	548	568,351	44,986	46.2	12.5	33.7
2008	12,694	5,077	17,771	521	592,514	46,677	46.1	12.3	33.8
2009	12,673	5,270	17,943	513	613,077	48,377	46.2	12.4	33.8
2010	12,711	5,642	18,353	600	630,444	49,598	45.9	12.2	33.8
2011	12,506	5,400	17,906	578	633,005	50,616	46.2	12.4	33.8
2012	12,202	5,534	17,736	636	622,140	50,987	46.0	12.4	33.6
2013	12,229	5,387	17,616	633	628,832	51,421	45.8	12.2	33.6
2014	12,286	5,428	17,714	558	712,802	51,967	45.6	11.6	34.0
2015	12,468	5,337	17,805	511	729,653	52,551	45.4	11.3	34.1
2016	12,769	5,563	18,332	716	673,891	52,776	45.2	10.9	34.3
2017	12,808	5,576	18,917	533	689,638	53,844	45.0	10.8	34.2

* Not available.

** Excludes part-time active members with annual compensation less than $1,000.

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Table D-2

Retired and Inactive Membership Data

		All Annuitants					Terminated Members	
Valuation Date (July 1)	Number	Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Average Service at Retirement	Number Vested Terminated	Number Non-Vested Terminated
1996	7,896	87,351	11,063	*	*	*	1,152	6,479
1998	8,362	99,040	11,844	69.6	57.3	*	1,190	8,158
2000	9,021	117,227	12,995	69.3	57.0	*	1,256	9,308
2002	9,768	139,131	14,244	69.1	56.8	*	1,485	8,231
2004	10,375	159,776	15,400	69.1	56.7	*	1,620	7,861
2005	10,664	170,129	15,954	69.3	56.7	*	1,649	8,569
2006	11,019	181,114	16,436	69.3	56.5	*	1,684	8,542
2007	11,356	195,237	17,192	69.3	56.6	*	1,671	8,963
2008	11,788	208,985	17,729	69.4	56.7	*	1,649	9,574
2009	12,036	219,267	18,218	69.7	57.5	25.5	1,640	9,868
2010	12,440	234,048	18,814	69.9	57.6	25.5	1,553	10,304
2011	12,899	250,500	19,420	70.0	57.8	25.5	1,580	10,727
2012	13,363	267,851	20,044	70.2	57.9	25.5	1,566	11,172
2013	13,868	284,333	20,503	70.4	58.0	25.5	1,566	11,710
2014	14,349	302,272	21,066	70.6	58.2	25.5	1,654	12,308
2015	14,839	321,511	21,667	70.9	58.3	25.4	1,664	12,839
2016	15,164	336,465	22,188	71.1	58.5	25.4	1,704	12,888
2017	15,566	352,005	22,614	71.4	58.6	25.3	1,779	13,712

* Not available.

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Table D-3

Contribution Rates

Valuation Date	Contribution Rates			Normal	UAAL
(July 1)	Employee	Employer	Total	Cost Rate[1]	Rate[2]
2000	7.15	7.58	14.73	9.71	5.02
2002	7.15	7.58[3]	14.73	10.33	4.40
2004	7.15	7.58	14.73	10.34	4.39
2005	7.15	7.58	14.73	10.35	4.38
2006	7.15	7.58	14.73	10.37	4.36
2007	7.15	9.58	16.73	10.40	6.33
2008	7.15	9.58	16.73	10.87	5.86
2009	7.15	9.96	17.11	10.69	6.42
2010	7.15	9.96	17.11	9.74	7.37
2011	7.15	9.96	17.11	9.64	7.47
2012	7.15	9.96	17.11	9.64	7.47
2013	8.15	10.96	19.11	9.20	9.91
2014	8.15	11.06	19.21	9.44	9.77
2015	8.15	11.16	19.31	9.49	9.82
2016	8.15	11.26	19.41	10.18	9.23
2017	8.15	11.36	19.51	10.15	9.36

1 Effective July 1, 2014, the Normal Cost Rate includes the administrative expense load.
2 The UAAL rate is the amount available to amortize the UAAL. It is equal to the total contribution rate, minus the normal cost rate.
3 The 1999 Legislation which passed the 1.5% GABA, also added a 0.11% state general fund contribution.

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Appendix E

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 Montana Teachers' Retirement System. Defined terms are capitalized throughout this Appendix.

Accrued Benefit

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

Actuarial Accrued Liability

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

Actuarial Assumptions

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

Actuarial Cost Method

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

Actuarial Gain (Loss)

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

Actuarial Present Value

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

Actuarial Valuation

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

Actuarial Value of Assets

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

Actuarially Equivalent

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

Amortization Payment

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

Entry Age Actuarial Cost Method

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

Market Value of Assets

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

Normal Cost

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

Projected Benefits

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

Unaccrued Benefit

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

Unfunded Actuarial Accrued Liability

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