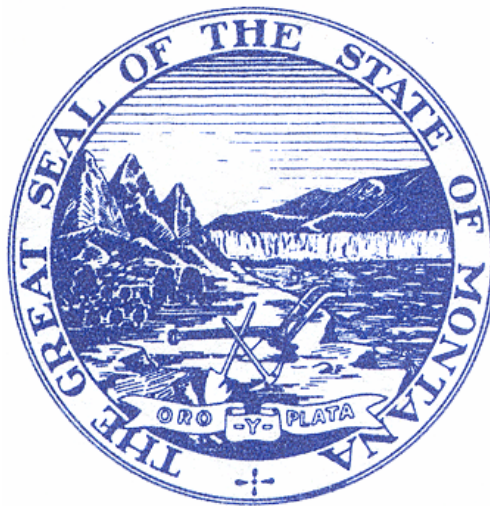


**Teachers' Retirement System  
State of Montana**

**ACTUARIAL VALUATION  
(As of July 1, 2005)**



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October 4, 2005

Teachers' Retirement Board  
State of Montana  
1500 Sixth Avenue  
Helena, MT 59620-0139

Dear Members of the Board:

As requested, we have made an actuarial valuation of the Teachers' Retirement System of the State of Montana. The major findings of the valuation are contained in this report. They are summarized in Section 1. This report reflects the benefit provisions and contribution rates in effect as of July 1, 2005.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. It should be noted that if any data or other information is inaccurate or incomplete, our calculations might need to be revised.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that all costs, liabilities, rates of interest, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations); and which, in combination, offer our best estimate of anticipated experience affecting the System. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. The Board of Trustees has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix A.



Actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the System. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System's funding requirements and goals. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

Milliman's work product was prepared exclusively for the System for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the System's operations, and uses the System's data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs. Any distribution of this report must be in its entirety including this cover letter, unless prior written consent from Milliman is obtained.

We would like to express our appreciation to Mr. David L. Senn, Executive Director of the System, and to members of his staff, who gave substantial assistance in supplying the data on which this report is based.

We, Mark C. Olleman and Karen I. Steffen, are members of the American Academy of Actuaries and Fellows of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Respectfully submitted,

Mark C. Olleman, FSA, EA, MAAA  
Consulting Actuary

Karen I. Steffen, FSA, EA, MAAA  
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MCO/KIS/mlm

# Teachers' Retirement System State of Montana

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# Teachers' Retirement System State of Montana

## Section 1

### Summary of Findings

As a result of the actuarial valuation of the benefits in effect under the Montana Teachers' Retirement System as of July 1, 2005, we recommend that the current employer contribution rate, 7.58% of members' salaries, be increased. The System does not currently meet the requirements of actuarial soundness because the contributions do not amortize the Unfunded Actuarial Accrued Liability over a reasonable period. The 7.58% employer contribution is composed of 7.47% from participating employers and 0.11% from the State General Fund. MCA 19-20-604 states that the employer contribution rate will be reduced by 0.11% when the amortization period of the System's unfunded actuarial accrued liability is 10 years or less according to the System's latest actuarial valuation.

An increase in the employer contribution rate of 4.06% (7.58% to 11.64%) as of July 1, 2006 is projected to maintain an amortization of the unfunded actuarial accrued liability over the 30 years beginning July 1, 2005. A 30-year amortization period is the maximum acceptable amortization period specified in Statements No. 25 and 27 of the Governmental Accounting Standards Board (GASB). It is also the trigger in the Retirement Board's funding policy for recommending to the legislature that funding be increased. The contribution increase could also be phased in over a number of years, or lessened by lowering the value of benefits provided for future members. Note that in a "contract rights" state such as Montana it is unlikely that any decrease in the value of future benefits could be made for current members.

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 2005 actuarial valuation indicates that an actuarial loss occurred during the preceding fiscal year. The loss is primarily due to lower returns on the assets than expected by the actuarial assumptions, and is reflected in the 2.7% net investment return on an actuarial basis for the past year. The following chart compares the annual returns for the past five years.

Year	Market Return	Actuarial Return	Actuarial Return over Assumption*
7/1/2000 to 6/30/2001	(5.1)%	9.2%	1.2%
7/1/2001 to 6/30/2002	(7.3)%	3.8%	(4.2)%
7/1/2002 to 6/30/2003	6.2%	1.6%	(6.4)%
7/1/2003 to 6/30/2004	13.3%	2.1%	(5.9)%
7/1/2004 to 6/30/2005	8.0%	2.7%	(5.0)%

\* The actuarial assumption was 8.0% through 6/30/2004 and 7.75% thereafter.

Asset gains or losses result when the return on the actuarial value of assets differs from the actuarial investment return assumption of 7.75% (8.0% before July 1, 2004). The actuarial



return on assets has under performed the assumption by over 20% in the last five years (combined) as shown in the last column of the chart. Over these five years, the asset losses have increased the unfunded actuarial accrued liability (UAAL) by about \$500 million.

The root of these losses is the low market returns of (5.1)% and (7.3)% in the years ending 6/30/2001 and 6/30/2002. The asset valuation method spreads any market value gains or losses evenly over the five years after they occur. Therefore the first fifth of the loss for the year ending 6/30/2002 was recognized at 6/30/2002 and the last fifth will be recognized at 6/30/2006. At July 1, 2002 the System had \$443 million in unrecognized asset losses. At July 1, 2005 the System has \$10 million in unrecognized asset losses. Therefore, the Actuarial Value of Assets is \$10 million larger than the Market Value of Assets. However, \$51.6 million of past market value losses are currently scheduled to be recognized at July 1, 2006 as shown in Table 4. The impact of recognizing this loss can be expected to increase the required contribution rate by 0.50% to 0.60% in the 2006 actuarial valuation. However, at July 1, 2006 the gains from FY2004 will not yet be completely recognized. Gains and losses in the year preceding the July 1, 2006 actuarial valuation may also have an impact. In the past, the legislature has suggested phasing in increases in the contribution rate. This might allow time for the gains from the past two years to offset some of the losses scheduled to be recognized in the next year. However there is no guarantee future investment returns will meet the actuarial assumption of 7.75%.

### **Future Experience**

The future funding status of the System and any changes in future contribution rates will be determined by the System's experience. In the future, the System's actual asset returns, salary increases, and retirement, withdrawal, disability and death rates will all impact the funding status of the System. The current actuarial asset valuation method and the entry age normal cost method will help to provide a more orderly funding of the System's liabilities, but will not change the actual experience. The actuarially determined contribution rate may not be stable, and will reflect the gains and losses.

### **Summary**

The System does not currently meet the requirements of actuarial soundness because the contributions do not amortize the Unfunded Actuarial Accrued Liability over a reasonable period. To stay financially sound in the future, the System will need either (1) future gains such as asset returns well over the 7.75% assumption, or (2) an increase in contribution rates. Contribution increases could be scheduled as either a one time event, or graded over a number of years. Both options are shown in Table 9 and its footnotes.

### **Assumption Changes**

No assumptions were changed for this 2005 valuation.

### **Benefit Changes**

No benefit changes since the July 1, 2004 valuation are reflected in this valuation.

### **Contribution Changes**

There have been no contribution changes since the July 1, 2000 actuarial valuation.



## Impact of Changes

The following table summarizes how experience has changed the Unfunded Actuarial Accrued Liability since the July 1, 2004 Actuarial Valuation.

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

(In millions)

July 1, 2004 Valuation UAAL funded by TRS contributions	\$757.8
Expected Increase	<u>32.0</u>
Expected July 1, 2005 UAAL	\$789.8
Retired Mortality Loss	0.9
Active Member Experience	
Salary Gain	(\$12.8)
Withdrawal Loss	1.6
Retirement Loss	18.3
Active Member Mortality Gain	(3.0)
Active Member Disability Gain	(0.8)
Total Active Member Experience Loss	\$3.3
Gain from Other Causes	(14.6)
Experience Loss on Actuarial Assets	<u>123.9</u>
July 1, 2005 Valuation UAAL funded by TRS contributions	\$903.3



# Teachers' Retirement System State of Montana

## Section 2

### Scope of the Report

This report presents the actuarial valuation of the Montana Teachers' Retirement System as of July 1, 2005.

A summary of the findings resulting from this valuation is presented in the previous section. Section 3 describes the assets of the System. Sections 4 and 5 describe how the obligations of the System are to be met under the actuarial cost method in use.

The actuarial procedures and assumptions used in this valuation are described in Appendix A. The current benefit structure, as determined by the provisions of the governing law on July 1, 2005, is summarized in Appendix B. Schedules of valuation data classifying the data used in the valuation by various categories of contributing members, former contributing members, and beneficiaries make up Appendix C. Appendix D provides a brief summary of the System's recent experience. Comparative statistics are presented on the System's membership and contribution rates. Appendix E is a glossary of actuarial terms used in this report.



# Teachers' Retirement System State of Montana

## Section 3

### 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, 2005. 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 five-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 five 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 shows when asset gains or losses will be recognized in the actuarial value of assets. Table 5 summarizes historical asset returns since July 1, 1994 including the amount recognized by the actuarial asset valuation method which was greater or lesser than the actuarial investment return assumption.

**Teachers' Retirement System  
State of Montana**

**Table 1**

**Statement of Fiduciary Net Assets  
June 30, 2005 and June 30, 2004**

	<b>TOTAL TRS 2005</b>	<b>TOTAL TRS 2004</b>
<b>ASSETS</b>		
Cash/Cash Equivalents-Short Term		
Investment Pool (Note A)	\$ 31,855,506	\$ 78,154,124
Receivables:		
Accounts Receivable	15,321,348	14,337,374
Interest Receivable	5,709,232	8,055,656
Due from Primary Government	165,768	80,195
Total Receivables	<u>\$ 21,196,348</u>	<u>\$ 22,473,225</u>
Investments, at fair value (Note A):		
Mortgages	\$ 43,153,151	\$ 54,989,718
Investment Pools	2,382,433,759	2,189,335,826
Other Investments	7,949,031	9,708,721
Securities Lending Collateral (Note A)	107,020,752	108,506,737
Total Investments	<u>\$ 2,540,556,693</u>	<u>\$ 2,362,541,002</u>
Assets Used in Plan Operations:		
Land and Buildings	\$ 193,844	\$ 193,844
Less: Accumulated Depreciation	(132,354)	(128,591)
Equipment	147,087	147,087
Less: Accumulated Depreciation	(127,921)	(126,281)
Prepaid Expense	3,126	3,517
Intangible Assets, net of amortization (Note D)	691,795	776,505
Total Other Assets	<u>\$ 775,577</u>	<u>\$ 866,081</u>
<b>TOTAL ASSETS</b>	<u><b>\$ 2,594,384,124</b></u>	<u><b>\$ 2,464,034,432</b></u>
<b>LIABILITIES</b>		
Accounts Payable	\$ 77,551	\$ 247,108
Due to Primary Government	32,212	327,761
Securities Lending Liability (Note A)	107,020,752	108,506,737
Compensated Absences (Note A)	117,069	108,627
<b>TOTAL LIABILITIES</b>	<u><b>\$ 107,247,584</b></u>	<u><b>\$ 109,190,233</b></u>
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS</b>	<u><b>\$ 2,487,136,540</b></u>	<u><b>\$ 2,354,844,199</b></u>



**Teachers' Retirement System  
State of Montana**

**Table 2**

**Statement of Changes in Fiduciary Net Assets  
Fiscal Year Ended June 30, 2005 and 2004**

	<b>TOTAL TRS 2005</b>	<b>TOTAL TRS 2004</b>
<b>ADDITIONS</b>		
Contributions:		
Employer	\$ 57,150,364	\$ 55,773,716
Plan Member	52,900,262	51,382,941
Other	655,812	770,379
Total Contributions	<u>\$ 110,706,438</u>	<u>\$ 107,927,036</u>
Misc Income	\$ 9	\$ 0
Workers Comp. Dividend	0	199
Taxes	89	53
Investment Income:		
Net Appreciation/(Depreciation) in Fair Value of Investments	\$ 112,888,982	\$ 152,473,601
Investment Earnings	79,373,616	132,052,991
Security Lending Income (Note A)	2,460,271	1,153,276
Investment Income/(Loss)	<u>\$ 194,722,869</u>	<u>\$ 285,679,868</u>
Less: Investment Expense	3,701,090	2,948,793
Less: Security Lending Expense (Note A)	2,287,406	938,082
Net Investment Income/(Loss)	<u>\$ 188,734,373</u>	<u>\$ 281,792,993</u>
Total Additions	<u>\$ 299,440,909</u>	<u>\$ 389,720,281</u>
<b>DEDUCTIONS</b>		
Benefit Payments	\$ 161,247,366	\$ 150,270,797
Withdrawals	4,340,382	5,843,069
Administrative Expense (Note D)	1,560,820	1,506,694
Loss on Intangible Asset	0	889,782
Total Deductions	<u>\$ 167,148,568</u>	<u>\$ 158,510,342</u>
<b>NET INCREASE (DECREASE) IN PLAN NET ASSETS</b>	<b>\$ 132,292,341</b>	<b>\$ 231,209,939</b>
<b>NET ASSETS HELD IN TRUST FOR PENSION BENEFITS BEGINNING OF YEAR</b>		
	2,354,844,199	2,123,634,260
<b>END OF YEAR</b>	<u><u>\$ 2,487,136,540</u></u>	<u><u>\$ 2,354,844,199</u></u>



**Teachers' Retirement System  
State of Montana**

**Table 3**

**Determination of Actuarial Value of Assets  
July 1, 2005**

**Determination of Recognized Investment Gains and Losses - Five-Year Smoothing**

A. Expected investment return – Year Ended 6/30/2005	\$ 180,373,775
B. Actual investment return – Year Ended 6/30/2005	\$ 187,173,652
C. Gains/(losses) – 2005 [B – A]	\$ 6,799,877
D. Gains/(losses) – 2004	\$ 111,433,500
E. Gains/(losses) – 2003	\$ (37,239,499)
F. Gains/(losses) – 2002	\$ (338,875,181)
G. Gains/(losses) – 2001	\$ (310,524,198)
H. Gains/(losses) recognized at July 1, 2005* [1/5 C + 1/5 D + 1/5 E + 1/5 F + 1/5 G]	\$ (113,681,099)

**Determination of Actuarial Assets**

Actuarial value of assets July 1, 2004	\$ 2,485,696,010
Contributions less benefits	\$ (50,881,310)
Expected investment return	180,373,775
Recognized investment gains/(losses)	<u>(113,681,099)</u>
	<u>11,811,366</u>

**Actuarial value of assets July 1, 2005**

Unrecognized Loss	<u>(10,370,836)</u>
Market Value of Assets July 1, 2005 (Actuarial Value + Unrecognized Gain)	\$ 2,487,136,540

Note: The actuarial value of assets is equal to the expected value plus a five-year smoothing of market value gains and losses. The actuarial asset method was adopted for the July 1, 2000 actuarial valuation with actuarial value of assets set equal to market value of assets at July 1, 1996.

*\*Includes rounding adjustment.*

**Teachers' Retirement System  
State of Montana**

**Table 4**

**Schedule of Investment Gain/(Loss) Recognition**

Year Ending 06/30	Market Value Investment Gain/(Loss) Over Expected	Investment Gain/(Loss) Recognized in Past Years				Investment Gain/(Loss) Recognized in Current Year 2005	Investment Gain/(Loss) to be Recognized in Future Years			
		2001	2002	2003	2004		2006	2007	2008	2009
1997	\$166.1	\$33.2								
1998	\$147.9	\$29.6	\$29.6							
1999	\$78.9	\$15.8	\$15.8	\$15.8						
2000	(\$3.7)	(\$0.7)	(\$0.7)	(\$0.7)	(\$0.7)					
2001	(\$310.5)	(\$62.1)	(\$62.1)	(\$62.1)	(\$62.1)	(\$62.1)				
2002	(\$338.9)		(\$67.8)	(\$67.8)	(\$67.8)	(\$67.8)	(\$67.8)			
2003	(\$37.2)			(\$7.4)	(\$7.4)	(\$7.4)	(\$7.4)	(\$7.4)		
2004	\$111.4				\$22.3	\$22.3	\$22.3	\$22.3		
2005	\$6.8				\$1.4	\$1.4	\$1.4	\$1.4	\$1.4	\$1.4
2006	\$0.0							\$0.0	\$0.0	\$0.0
2007	\$0.0								\$0.0	\$0.0
2008	\$0.0									\$0.0
2009	\$0.0									\$0.0

**Total Gain/(Loss) Recognized at Each Valuation Date**

Recognized				Scheduled to be Recognized*				
\$15.7	(\$85.3)	(\$122.3)	(\$115.8)	(\$113.7)	(\$51.6)	\$16.2	\$23.6	\$1.4

**Unrecognized Gain/(Loss) Remaining**

(\$10.4)	\$41.2	\$25.0	\$1.4	(\$0.0)
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\* The total gain/(loss) actually recognized in each future year will include additional amortizations of future gains and/or losses.



This work product was prepared solely for the Montana Teachers' Retirement System. It may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

**Teachers' Retirement System  
State of Montana**

**Table 5**

**Historical Investment Returns\***

<b>Fiscal Year Ending</b>	<b>Market Returns</b>	<b>Actuarial Return</b>	<b>Actuarial Return Over 8.0% Assumption</b>
June 30, 1995	15.7%	8.9%	0.9%
June 30, 1996	12.4	10.4	2.4
June 30, 1997	19.4	14.9	6.9
June 30, 1998	16.6	16.0	8.0
June 30, 1999	11.9	12.3	4.3
June 30, 2000	7.8	12.8	4.8
June 30, 2001	(5.1)	9.2	1.2
June 30, 2002	(7.3)	3.8	(4.2)
June 30, 2003	6.2	1.6	(6.4)
June 30, 2004	13.3	2.1	(5.9)
<b>Fiscal Year Ending</b>	<b>Market Returns</b>	<b>Actuarial Return</b>	<b>Actuarial Return Over 7.75% Assumption</b>
June 30, 2005	8.04	2.71	(5.04)

*\* 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.*



# Teachers' Retirement System State of Montana

## Section 4

### 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, July 1, 2005. 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 contributing members, for former contributing members, 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.

**Teachers' Retirement System  
State of Montana**

**Table 6**

**Actuarial Present Value of Future Benefits  
for Contributing Members, Former Contributing  
Members, and Beneficiaries  
(All amounts are actuarial present values in millions)**

	<b>July 1, 2005</b>	<b>July 1, 2004</b>
	<b>Total</b>	<b>Total</b>
<b>A. Active members</b>		
Service retirement	\$ 1,870.9	\$ 1,813.3
Disability retirement	22.1	21.5
Survivors' benefits	43.5	42.7
Vested Retirement	31.9	31.5
Refund of Member Contributions	32.0	31.7
Total	\$ 2,000.4	\$ 1,940.7
<b>B. Inactive members and annuitants</b>		
Service retirement	\$ 1,780.3	\$ 1,675.1
Disability retirement	17.7	17.1
Beneficiaries*	111.3	107.2
Vested terminated members	57.0	54.6
Nonvested terminated members	12.9	11.3
Total	\$ 1,979.2	\$ 1,865.3
<b>C. Grand Total</b>	<b>\$ 3,979.6</b>	<b>\$ 3,806.0</b>

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



# Teachers' Retirement System State of Montana

## Section 5

### Employer Contributions

In the previous two sections, attention has been focused on the assets and the present value of all future benefits of the System. A comparison of Tables 3 and 6 indicates that there is a shortfall in current actuarial assets to meet the present value of all future benefits for current members and beneficiaries. This is the universal experience in all but a fully closed-down fund where no further contributions of any sort are anticipated.

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

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

- A normal cost amount, which ideally is relatively stable as a percentage of salary over the years; and
- Whatever amount is left over, which is used to amortize what is called the unfunded actuarial accrued liability.

The two items described above, normal cost and unfunded actuarial accrued liability, 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.

We have determined the normal cost rates separately by type of benefit under the System. These are summarized in Table 7.



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 favorable as anticipated. Under these circumstances, an unfunded actuarial accrued liability (UAAL) exists.

Table 8 shows how the UAAL was derived for the System. Lines A and B show, respectively, the total present value of future benefits and the portion of the future liability that is expected to be paid from future normal cost contributions, both employer and employee. Line C shows the actuarial accrued liability: the portion of the present value of future benefits not provided by future normal cost contributions. Line D shows the actuarial value of assets available for benefits. Line E shows the unfunded actuarial accrued liability. Lines F and G show the impact of the present value of future scheduled university supplemental contributions (described below) on the unfunded actuarial accrued liability.

As can be seen from this discussion, a key consideration in the adequacy of the funding of the System is how the UAAL is being amortized. Table 9 shows that the current employer and member contribution rates are adequate to pay the total normal cost rate (10.35% of pay), but do not have enough left over to amortize the UAAL over a reasonable period. Therefore, the current basis is not sufficient to meet future requirements.

An increase in the employer contribution rate of 4.06% (7.58% to 11.64%) as of July 1, 2006 is projected to maintain an amortization of the unfunded actuarial accrued liability over the 30 years beginning July 1, 2005. A 30 year amortization period is the maximum acceptable amortization period specified in Statements No. 25 and 27 of the Governmental Accounting Standards Board (GASB). It is also the trigger in the Retirement Board's funding policy for recommending to the legislature that funding be increased.

The amortization of the UAAL assumes university supplemental contributions are made as a percent of pay for members of the Optional Retirement Plan (ORP) until June 30, 2033. 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 Montana University System (MUS) members. As of the 1996 valuation, there was a \$98.0 million difference, or shortfall, which is to be funded as a level percentage of future ORP salaries from July 1, 1997 to June 30, 2033. The single contribution rate determined as of July 1, 1997 was 3.97%. However, the following graded schedule for increasing the supplemental university contributions was adopted:

<b>Supplemental University Contribution Rate</b>	<b>Fiscal Years Ending</b>
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, 2033

The July 1, 2004 actuarial valuation of the MUS calculated a \$144.4 million difference or shortfall between the value of MUS member benefits (not including GABA) and the value of MUS assets and future MUS member contributions. The contribution schedule has not been changed. The value of future supplemental university contributions included in the July 1, 2005 TRS valuation is \$126.2 million based on the assumed 4.04% contribution rate.

Table 10 illustrates the pattern of the total TRS contribution rate needed to amortize the unfunded actuarial accrued liability over the next 30 years. The amortization payments for each year and their present values are also shown.

The unfunded actuarial accrued liability 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.

**Teachers' Retirement System  
State of Montana**

**Table 7**

**Normal Cost Contribution Rates  
As Percentages of Salary**

	<b>July 1, 2005</b>	<b>July 1, 2004</b>
	<u><b>Total</b></u>	<u><b>Total</b></u>
Service retirement	7.87%	7.87%
Disability retirement	0.16	0.15
Survivors' benefits	0.26	0.26
Vested retirement	0.63	0.63
Refund of member contributions	<u>1.43</u>	<u>1.43</u>
Total	10.35%	10.34%

**Teachers' Retirement System  
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**Table 8**

**Unfunded Actuarial Accrued Liability  
(All dollar amounts in millions)**

	<u>July 1, 2005</u>	<u>July 1, 2004</u>
A. Actuarial present value of all future benefits for present and former members and their survivors (Table 4)	\$ 3,979.6	\$ 3,806.0
B. Less actuarial present value of total future normal costs for present members	<u>452.6</u>	<u>446.8</u>
C. Actuarial accrued liability	\$ 3,527.0	\$ 3,359.2
D. Less actuarial value of assets available for benefits (Table 3)	<u>2,497.5</u>	<u>2,485.7</u>
E. Unfunded actuarial accrued liability	\$ 1,029.5	\$ 873.5
F. Less present value of future university supplemental contributions*	<u>126.2</u>	<u>115.7</u>
G. Unfunded actuarial accrued liability funded by TRS contributions	\$ 903.3	\$ 757.8

*\*Paid by contributions to TRS made as a percentage of the salaries of the participants in the Optional Retirement Plan (ORP) to fund Montana University System member benefits. The percentage of salary will be a level 4.04% for the Fiscal Years through 2033.*

**Teachers' Retirement System  
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**Table 9**

**Recommended Contribution Rates  
As Percentages of Salary**

	<u>July 1, 2005</u>	<u>July 1, 2004</u>
A. Employer contribution rate*	7.58%	7.58%
B. Member contribution rate	<u>7.15</u>	<u>7.15</u>
C. Total contribution rate	14.73%	14.73%
D. Less total normal cost rate (Table 7)	<u>10.35</u>	<u>10.34</u>
E. Amount available to amortize unfunded actuarial accrued liability** (C – D)	4.38%	4.39%
F. Amortization period from Valuation Date**	N/A	N/A
G. 30 year amortization contribution rate increase**	4.06%	2.87%
H. Total 30 year UAAL amortization rate (E + G)	8.44%	7.26%
I. Total 30 year contribution rate (D + H)	18.79%	17.60%

\* *In accordance with MCA 19-20-604, the employer contribution rate will be reduced by 0.11% when the amortization period of the System's unfunded actuarial accrued liability is 10 years or less according to the System's latest actuarial valuation. This is reflected in all relevant calculations in this report.*

\*\* *As of July 1, 2004, the unfunded actuarial accrued liability does not amortize over a reasonable period. The employer contribution rate would have to be increased by 4.06% starting July 1, 2006 to maintain an amortization of the unfunded actuarial accrued liability over the 30-year period starting July 1, 2005. Alternatively, the employer contribution rate could be increased by 1.20% on July 1, of 2006, 2008, 2010 and 2012 for a total increase of 4.80%. This graded increase would achieve the same 30-year amortization.*

## Teachers' Retirement System State of Montana

**Table 10**

### Illustration of TRS Contribution Rates Needed to Meet a 30-Year Amortization Policy

Investment Assumption: 7.75%  
 General Wage Increases: 4.50%  
 Contribution Increase effective July 1, 2006: 4.06%

Fiscal Year	TRS Payroll			Total TRS Contribution	Normal Cost	Amortization	Amortization Payment	Amortization Payment Discounted to Valuation Date
	non-MUS	MUS	Total					
2006	560,955,198	41,350,437	602,305,635	14.73%	10.35%	4.38%	26,380,987	25,414,548
2007	586,198,182	38,743,885	624,942,067	18.79%	10.35%	8.44%	52,745,110	47,158,099
2008	612,577,100	35,890,074	648,467,174	18.79%	10.35%	8.44%	54,730,630	45,413,738
2009	640,143,070	33,158,646	673,301,716	18.79%	10.35%	8.44%	56,826,665	43,761,449
2010	668,949,508	30,361,724	699,311,232	18.79%	10.35%	8.44%	59,021,868	42,182,780
2011	699,052,236	27,479,238	726,531,474	18.79%	10.35%	8.44%	61,319,256	40,672,592
2012	730,509,586	24,851,205	755,360,791	18.79%	10.35%	8.44%	63,752,451	39,245,022
2013	763,382,518	22,127,790	785,510,308	18.79%	10.35%	8.44%	66,297,070	37,876,055
2014	797,734,731	19,623,170	817,357,901	18.79%	10.35%	8.44%	68,985,007	36,576,980
2015	833,632,794	17,257,801	850,890,595	18.79%	10.35%	8.44%	71,815,166	35,338,818
2016	871,146,270	15,072,626	886,218,896	18.79%	10.35%	8.44%	74,796,875	34,158,754
2017	910,347,852	13,028,623	923,376,475	18.79%	10.35%	8.44%	77,932,974	33,031,063
2018	951,313,505	11,012,210	962,325,715	18.79%	10.35%	8.44%	81,220,290	31,948,359
2019	994,122,613	9,282,627	1,003,405,240	18.79%	10.35%	8.44%	84,687,402	30,916,160
2020	1,038,858,130	7,744,407	1,046,602,537	18.79%	10.35%	8.44%	88,333,254	29,927,724
2021	1,085,606,746	6,460,927	1,092,067,673	18.79%	10.35%	8.44%	92,170,512	28,981,721
2022	1,134,459,050	5,414,886	1,139,873,936	18.79%	10.35%	8.44%	96,205,360	28,074,638
2023	1,185,509,707	4,448,153	1,189,957,860	18.79%	10.35%	8.44%	100,432,443	27,200,172
2024	1,238,857,644	3,654,129	1,242,511,773	18.79%	10.35%	8.44%	104,867,994	26,358,658
2025	1,294,606,238	3,001,404	1,297,607,642	18.79%	10.35%	8.44%	109,518,085	25,547,529
2026	1,352,863,519	2,384,225	1,355,247,744	18.68%	10.35%	8.33%	112,892,137	24,440,466
2027	1,413,742,377	1,931,294	1,415,673,671	18.68%	10.35%	8.33%	117,925,617	23,693,906
2028	1,477,360,784	1,498,867	1,478,859,651	18.68%	10.35%	8.33%	123,189,009	22,971,174
2029	1,543,842,019	1,221,484	1,545,063,503	18.68%	10.35%	8.33%	128,703,790	22,273,337
2030	1,613,314,910	979,400	1,614,294,310	18.68%	10.35%	8.33%	134,470,716	21,597,545
2031	1,685,914,081	748,285	1,686,662,366	18.68%	10.35%	8.33%	140,498,975	20,942,694
2032	1,761,780,215	603,262	1,762,383,477	18.68%	10.35%	8.33%	146,806,544	20,308,953
2033	1,841,060,324	486,237	1,841,546,561	18.68%	10.35%	8.33%	153,400,829	19,694,844
2034	1,923,908,039	360,973	1,924,269,012	18.68%	10.35%	8.33%	160,291,609	19,099,339
2035	2,010,483,901	262,682	2,010,746,583	18.68%	10.35%	8.33%	167,495,190	18,522,202

Present Value of Future Amortization Payments: 903,329,317



# Teachers' Retirement System State of Montana

## Section 6

### 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.

The Table 10 shows that in 1996 the System had a small negative cash flow. In the year ended June 30, 2005 the System's benefits and administrative expenses exceeded contributions by \$56 million. At the current contribution rates this is projected to increase to \$151 million for the year ending June 30, 2015.

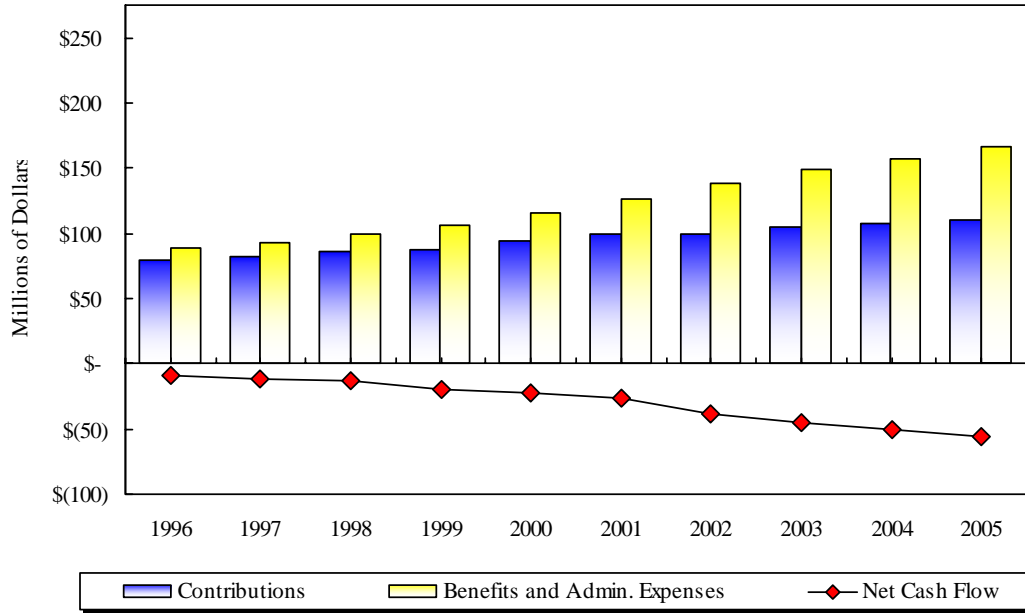
As long as the System had a positive cash flow, there was no need to plan where the funds would come from to pay benefits since benefits could be paid by incoming contributions. A negative cash flow, as defined above, requires planning what funds will be used to pay the difference between benefits and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

The projected contributions and administrative expenses are based on the actual amounts for the year ended June 30, 2005. Contributions are assumed to increase at the general wage increase assumption of 4.5%. Expenses are assumed to increase at the underlying inflation assumption of 3.5%. The future employer contribution rate is assumed to stay at 7.58% for the purpose of these projections.

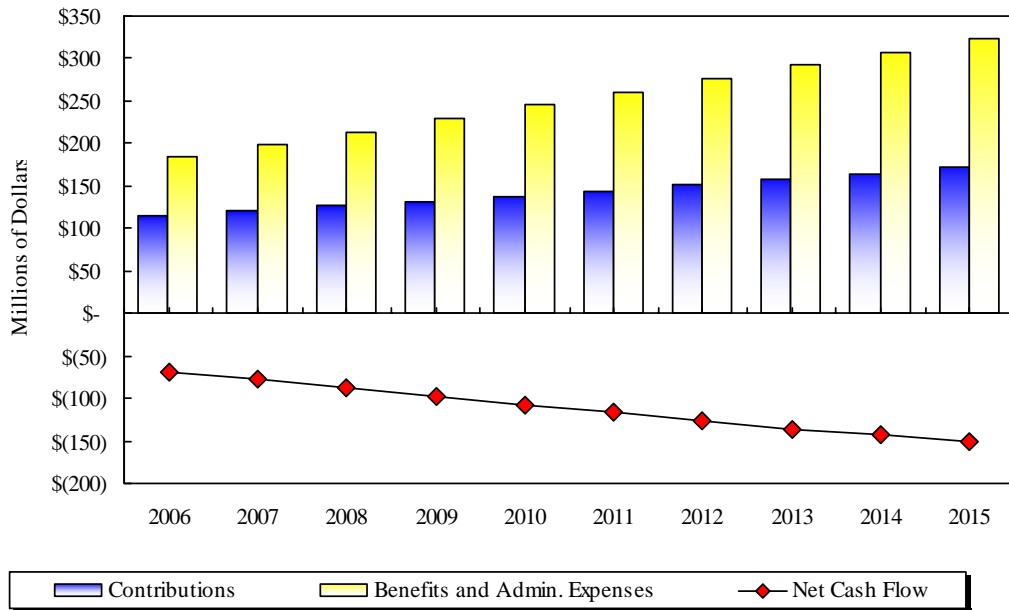


## Teachers' Retirement System State of Montana

### Cash Flow History



### Cash Flow Projections



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**Teachers' Retirement System  
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**Table 11**

**Cash Flow History and Projections**

Year Ended <u>June 30,</u>	<b>Historical Cash Flows*</b>		
		Benefits & Administrative	Net
	<u>Contributions</u>	<u>Expenses</u>	<u>Cash Flow</u>
1996	\$ 80	\$ 89	\$ (9)
1997	82	93	(11)
1998	87	100	(13)
1999	88	107	(19)
2000	94	116	(22)
2001	100	126	(26)
2002	100	138	(38)
2003	104	149	(45)
2004	108	158	(50)
2005	111	167	(56)

Year Ending <u>June 30,</u>	<b>Projected Cash Flows*</b>		
		Benefits & Administrative	Net
	<u>Contributions</u>	<u>Expenses</u>	<u>Cash Flow</u>
2006	\$ 116	\$ 185	\$ (69)
2007	121	199	(78)
2008	126	214	(88)
2009	132	229	(97)
2010	138	245	(107)
2011	144	261	(117)
2012	151	277	(126)
2013	157	293	(136)
2014	165	308	(143)
2015	172	323	(151)

\* Millions of Dollars



# Teachers' Retirement System State of Montana

## Appendix A

### Actuarial Procedures and Assumptions

The actuarial assumptions used in this valuation were adopted by the Board for the July 1, 2004 Actuarial Valuation. The Board adopted new economic assumptions at the May 14, 2004 Retirement Board Meeting. Active demographic assumptions were reviewed in the 2002 Investigation of Experience Study. Retired demographic assumptions were last reviewed in the 2000 Investigation of Experience Study.

Tables A-3 through A-6 give rates of decrement for service retirement, disablement, mortality, and other terminations of employment. These rates of decrement are referred to in actuarial literature as the absolute rate of decrement, or  $q'_x$ . Table A-7 shows the assumed probability of retaining membership in the System among members terminating with five or more years of service.

#### 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 unfunded actuarial accrued liability. The unfunded actuarial accrued liability 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 unfunded actuarial accrued liability was 7.58% of members' salaries. In accordance with MCA 19-20-604, the employer contribution rate will be reduced by 0.11% when the amortization period of the System's unfunded actuarial accrued liability is 10 years or less according to the System's latest actuarial valuation.

### **Administrative and Investment Expenses**

The administrative and investment expenses of the System are assumed to be funded by investment earnings in excess of 7.75% per year. (Adopted effective July 1, 2004)

### **Valuation of Assets - Actuarial Basis**

The actuarial asset valuation method spreads asset gains and losses over five 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 five years. The gains and losses are measured starting with the year ended June 30, 1997. Adopted in the July 1, 2000 actuarial valuation.

### **Investment Earnings**

The annual rate of investment earnings of the assets of the System is assumed to be 7.75% per year, compounded annually. (Adopted effective July 1, 2004)

### **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**

On January 1 of each year, the retirement allowance payable must be increased by 1.5% if the retiree's most recent retirement effective date is 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 4.5% 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 July 1, 2002. The rates for University Members were adopted July 1, 2002.

### **Disablement**

The rates of disablement used in this valuation are illustrated in Table A-4. The rates for General Members were adopted July 1, 2002. The rates for University Members were adopted July 1, 1996.

### **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, 2000.

### **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 July 1, 2002.

### **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 or their available contribution account.



### **Part-Time Employees**

The valuation data for active members identify part-time members, but give no indication as to the number of hours worked. As done in the past, we imputed a "part-time percentage" by comparing the pay received with their annual equivalent full-time salary. Their accumulated service was divided by this percentage to reflect their full benefit. Part-time members earning less than \$1,000 during the last year were valued at their current member contribution balance.

### **Optional Retirement Program**

The total contribution received for the fiscal year ending June 30, 2005 was \$5,404,913. Based on a contribution rate of 4.04%, we assumed the total ORP payroll for the fiscal year to be \$133,784,975 (\$5,404,913 divided by 4.04%).

### **Buybacks, Purchase of Service, and Military Service**

The active liabilities and normal cost 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, 2000.

### **Probability of Marriage**

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.

### **Blank or Missing Data**

There were 150 cases where the Date of Birth for an active participant was missing in the 2005 data. In these cases, the participant was assumed to have been hired at age 25.

There was 1 active member record in the 2005 data with a blank sex field. Sex was assigned randomly based on the male/female percentage of the entire active population.



# Teachers' Retirement System State of Montana

## Table A-1

### Summary of Valuation Assumptions (July 1, 2005)

I. Economic assumptions		
A.	General wage increases* (Adopted July 1, 2004)	4.50%
B.	Investment return (Adopted July 1, 2004)	7.75%
C.	Price Inflation Assumption (Adopted July 1, 2004)	3.50%
D.	Growth in membership	0.00%
E.	Postretirement benefit increases (Starting three years after retirement)	1.50%
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 July 1, 2002)	Table A-3
C.	Disablement (adopted July 1, 2002) (General Member assumptions adopted July 1, 2002) (University Member assumptions adopted July 1, 1996)	Table A-4
D.	Mortality among contributing members, service retired members, and beneficiaries 1994 Group Annuity Mortality Table, with ages set back 3 years for males and ages set back 1 year for females. (adopted July 1, 2000)	Table A-5
E.	Mortality among disabled members Based on the IRS Social Security Disabled Mortality Tables published in Revenue Ruling 96-7. Males are 70% of the Male IRS table to age 80, grading into the 1983 Group Annuity Mortality Table for Males between ages 80 and 85. Females are 85% of the IRS table at all ages. (adopted July 1, 2000)	Table A-5
F.	Other terminations of employment (adopted July 1, 2002)	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%	4.50%	9.01%	1.00%	4.50%	5.50%
2	4.09	4.50	8.59	1.00	4.50	5.50
3	3.46	4.50	7.96	1.00	4.50	5.50
4	2.94	4.50	7.44	1.00	4.50	5.50
5	2.52	4.50	7.02	1.00	4.50	5.50
6	2.21	4.50	6.71	1.00	4.50	5.50
7	1.89	4.50	6.39	1.00	4.50	5.50
8	1.68	4.50	6.18	1.00	4.50	5.50
9	1.47	4.50	5.97	1.00	4.50	5.50
10	1.31	4.50	5.81	1.00	4.50	5.50
11	1.16	4.50	5.66	1.00	4.50	5.50
12	1.00	4.50	5.50	1.00	4.50	5.50
13	0.84	4.50	5.34	1.00	4.50	5.50
14	0.68	4.50	5.18	1.00	4.50	5.50
15	0.58	4.50	5.08	1.00	4.50	5.50
16	0.47	4.50	4.97	1.00	4.50	5.50
17	0.37	4.50	4.87	1.00	4.50	5.50
18	0.26	4.50	4.76	1.00	4.50	5.50
19	0.21	4.50	4.71	1.00	4.50	5.50
20	0.16	4.50	4.66	1.00	4.50	5.50
21	0.11	4.50	4.61	1.00	4.50	5.50
22 & Up	0.00	4.50	4.50	1.00	4.50	5.50





**Teachers' Retirement System  
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**Table A-3**

**Retirement  
Annual Rates**

Age	General Members			University Members		
	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter	Eligible for Reduced Benefits	First Year Eligible for Full Benefits	Thereafter
45		18.0%	9.5%		5.0%	4.9%
46		18.0	9.5		5.0	4.9
47		12.5	9.5		5.0	4.9
48		12.5	9.5		5.0	4.9
49	*	12.5	9.5	*	5.0	4.9
50	4.0%	12.5	9.5	1.9%	8.0	4.9
51	4.0	16.0	9.5	2.2	8.0	4.9
52	4.5	16.0	9.5	2.5	8.0	6.0
53	4.5	16.0	9.5	2.8	8.0	6.0
54	5.0	16.0	9.5	3.1	12.0	6.0
55	5.5	22.0	14.0	3.4	15.0	6.0
56	6.0	22.0	14.0	3.7	15.0	6.0
57	6.5	22.0	14.0	4.0	15.0	7.0
58	6.5	22.0	15.0	4.3	15.0	7.0
59	7.0	22.0	18.0	4.7	15.0	9.0
60	*	22.0	22.0	*	19.0	10.0
61		22.0	22.0		19.0	14.0
62		27.0	27.0		24.0	24.0
63		22.0	22.0		14.0	14.0
64		25.0	25.0		20.0	20.0
65		35.0	35.0		33.0	33.0
66		30.0	30.0		23.0	23.0
67		24.0	24.0		23.0	23.0
68		22.0	22.0		23.0	23.0
69		22.0	22.0		23.0	23.0
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**

<u>Age</u>	<u>General Members</u>	<u>University Members</u>
25	.010%	.003%
30	.010	.006
35	.020	.012
40	.040	.021
45	.080	.036
50	.130	.055
55	.180	.083
60	.260	.126



**Teachers' Retirement System  
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**Table A-5**

**Mortality  
Annual Rates**

Age	Contributing Members, Service Retired Members and Beneficiaries		Disabled Members	
	Men	Women	Men	Women
25	.06%	.03%	1.92%	1.02%
30	.07	.03	2.15	1.26
35	.08	.04	2.39	1.50
40	.09	.07	2.69	1.75
45	.13	.09	3.01	2.04
50	.19	.13	3.36	2.38
55	.32	.21	3.72	2.77
60	.56	.39	4.07	3.23
65	1.01	.76	4.46	3.76
70	1.80	1.27	5.13	4.36
75	2.85	2.04	6.22	5.32
80	4.52	3.54	7.50	6.84
85	7.55	6.10	11.48	9.30

**Teachers' Retirement System  
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**Table A-6**

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

<u>Years of Service</u>	<u>General Members</u>	<u>University Members</u>
1	30.0%	33.0%
2	16.0	17.0
3	11.0	13.0
4	9.0	11.0
5	8.0	9.0
6	7.7	8.3
7	7.3	7.7
8	7.0	7.0
9	6.6	6.6
10	6.2	6.2
11	5.8	5.8
12	5.4	5.4
13	5.0	5.0
14	4.6	4.6
15	4.2	4.2
16	3.8	3.8
17	3.4	3.4
18 and up	3.0	3.0



**Teachers' Retirement System  
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**Table A-7**

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

<u>Age</u>	<u>Probability of Retaining Membership</u>
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	5 years. No benefits are payable unless the member has a vested right, except the return of employee contributions with interest.
Final Compensation	Average of highest 3 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	
Eligibility:	25 years of service or age 60 and 5 years of service.
Benefit:	The retirement benefit is equal to 1/60 of final compensation for each year of service.
Early Retirement Benefits	
Eligibility:	5 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 reduced 1/2 of 1% for each of the first 60 months early and 3/10 of 1% for each of the next 60 months early.

**Death Benefit**

**Eligibility:** 5 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:** 5 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.

**Withdrawal Benefits**

With less than 5 years of service, the accumulated employee contributions with interest are returned. With more than 5 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**

**Member:** 7.15% of compensation.  
**Employer:** 7.58% of compensation.

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

**Interest on Member  
Contributions**

Interest on member contributions is currently being credited at a rate of 4.0% per annum.

**Cost-of-Living Adjustments**

On January 1 of each year, the retirement allowance payable must be increased by 1.5% if the retiree's most recent retirement effective date is at least 36 months prior to January 1 of the year in which the adjustment is to be made.

**Teachers' Retirement System  
State of Montana**

**Appendix C**

**Valuation Data**

This valuation is based upon the membership of the System as of July 1, 2005. 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.

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.

Active Members	Number	Annual Salaries in Millions
Full-Time Members	12,523	\$ 523.9
Part-Time Members*	<u>5,019</u>	<u>62.0</u>
Total Contributing Members*	17,542	\$ 585.9
Active Members with Annual Compensation less than \$1,000	<u>697</u>	
Total Active Members	18,239	

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

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, 2004 to July 1, 2005.





**Appendix C  
(continued)**

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	9,242	\$ 156,658	\$ 16,951
Survivors of Deceased Retired Members	<u>794</u>	<u>8,430</u>	<u>10,617</u>
Total Service Retirement (including survivors)	10,036	165,088	16,450
Disability Retirement	200	1,759	8,794
Survivors of Deceased Active Members	405	3,227	7,967
Child Beneficiaries	<u>23</u>	<u>55</u>	<u>2,400</u>
Total Annuitants	10,664	\$ 170,129	\$ 15,954

Terminated Members with Contributions Not Withdrawn	Number
Vested Terminated Members	1,649
Non-Vested Terminated Members	<u>8,569</u>
Total Terminated Members	10,218



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2005**

**Number of Employees - By Age Group - All Members**

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	16	90	12	1	-	-	-	-	-	-	-	-	-	119
25 to 29	33	230	214	327	132	-	-	-	-	-	-	-	-	936
30 to 34	9	98	102	222	627	83	-	-	-	-	-	-	-	1,141
35 to 39	7	69	75	136	397	536	85	-	-	-	-	-	-	1,305
40 to 44	11	71	70	133	279	380	424	137	-	-	-	-	-	1,505
45 to 49	9	51	40	108	272	371	388	562	135	-	-	-	-	1,936
50 to 54	10	42	43	100	271	345	456	461	605	184	-	-	-	2,517
55 to 59	8	29	32	68	166	235	336	347	368	476	93	-	-	2,158
60 to 64	2	12	13	21	47	56	92	115	112	134	116	10	-	730
65 to 69	-	1	1	5	9	11	25	13	14	25	20	22	-	146
70 and up	1	1	1	2	4	2	3	3	4	4	3	2	-	30
Totals	106	694	603	1,123	2,204	2,019	1,809	1,638	1,238	823	232	34	-	12,523



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2005**

**Annual Salaries in Thousands - By Age Group - All Members**

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	168	2,199	283	29	-	-	-	-	-	-	-	-	-	2,679
25 to 29	364	6,017	5,704	9,132	4,011	-	-	-	-	-	-	-	-	25,228
30 to 34	101	2,793	2,975	6,816	21,038	3,246	-	-	-	-	-	-	-	36,969
35 to 39	83	2,031	2,330	4,159	14,119	21,925	3,708	-	-	-	-	-	-	48,355
40 to 44	155	2,096	2,169	4,231	9,892	16,086	19,191	6,600	-	-	-	-	-	60,420
45 to 49	97	1,530	1,386	3,501	9,414	15,458	18,071	27,459	6,640	-	-	-	-	83,556
50 to 54	160	1,331	1,515	3,311	9,816	14,638	21,132	22,776	30,876	9,372	-	-	-	114,927
55 to 59	122	902	1,109	2,368	6,356	10,203	15,641	18,049	19,608	25,785	5,086	-	-	105,229
60 to 64	12	388	390	901	1,992	2,379	4,286	5,924	6,162	7,558	6,546	500	-	37,038
65 to 69	-	47	41	209	350	495	1,183	744	862	1,366	1,337	1,472	-	8,106
70 and up	14	33	9	21	106	48	265	194	212	205	179	116	-	1,402
Totals	1,276	19,367	17,911	34,678	77,094	84,478	83,477	81,746	64,360	44,286	13,148	2,088	-	523,909



This work product was prepared solely for the Montana Teachers' Retirement System. It may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Full-Time Employees and Salaries  
as of July 1, 2005**

**Average Annual Salary - By Age Group - All Members**

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	10,479	24,436	23,582	29,069	-	-	-	-	-	-	-	-	-	22,512
25 to 29	11,032	26,162	26,656	27,925	30,384	-	-	-	-	-	-	-	-	26,953
30 to 34	11,270	28,504	29,170	30,702	33,553	39,107	-	-	-	-	-	-	-	32,401
35 to 39	11,856	29,429	31,065	30,583	35,565	40,905	43,628	-	-	-	-	-	-	37,054
40 to 44	14,093	29,524	30,992	31,813	35,457	42,331	45,262	48,173	-	-	-	-	-	40,147
45 to 49	10,791	29,991	34,648	32,416	34,609	41,665	46,574	48,860	49,184	-	-	-	-	43,158
50 to 54	15,998	31,700	35,233	33,113	36,221	42,430	46,343	49,406	51,035	50,933	-	-	-	45,661
55 to 59	15,245	31,121	34,664	34,826	38,290	43,417	46,550	52,013	53,282	54,171	54,690	-	-	48,762
60 to 64	6,107	32,363	29,976	42,912	42,373	42,486	46,582	51,515	55,021	56,406	56,433	49,997	-	50,738
65 to 69	-	47,329	41,260	41,748	38,884	45,028	47,323	57,253	61,584	54,641	66,834	66,894	-	55,524
70 and up	14,359	32,874	9,329	10,537	26,428	23,956	88,174	64,527	53,009	51,155	59,747	57,936	-	46,704
Totals	12,045	27,909	29,706	30,880	34,979	41,842	46,145	49,906	51,987	53,810	56,673	61,398	-	41,836



**Teachers' Retirement System  
State of Montana**

**Table C-1**

**Active Members Distribution of  
Part-Time Employees  
as of July 1, 2005**

**Number of Employees - By Age Group - All Members**

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	103	40	5	11	1	-	-	-	-	-	-	-	-	160
25 to 29	213	140	56	46	23	-	-	-	-	-	-	-	-	478
30 to 34	87	88	46	74	92	33	-	-	-	-	-	-	-	420
35 to 39	106	88	56	64	90	68	29	-	-	-	-	-	-	501
40 to 44	90	116	93	125	145	57	26	24	-	-	-	-	-	676
45 to 49	94	108	87	155	232	118	51	40	16	-	-	-	-	901
50 to 54	64	78	95	132	210	143	60	32	34	9	-	-	-	857
55 to 59	51	48	52	65	117	109	60	27	18	26	8	-	-	581
60 to 64	17	34	23	45	55	38	31	16	16	11	4	1	-	291
65 to 69	8	6	9	18	31	13	13	3	3	1	2	-	-	107
70 and up	3	6	6	5	14	4	7	-	1	1	-	-	-	47
Totals	836	752	528	740	1,010	583	277	142	88	48	14	1	-	5,019



**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive Lives**

**Members Receiving Service Retirement Benefits as of July 1, 2005**

<u>Age</u>	<u>Number of Persons</u>		<u>Annual Benefits in Thousands</u>		<u>Average Annual Benefits</u>
<50	29	\$	564	\$	19,444
50 to 54	387		7,497		19,372
55 to 59	1,255		25,232		20,105
60 to 64	1,899		38,016		20,019
65 to 69	1,678		31,389		18,706
70 to 74	1,388		24,145		17,395
75 to 79	977		13,907		14,235
80 to 84	703		8,409		11,961
85 to 89	510		4,646		9,111
90 and up	416		2,854		6,861
<b>Total</b>	<b>9,242</b>		<b>156,658</b>		<b>16,951</b>

**Members Receiving Disability Retirement Benefits as of July 1, 2005**

<u>Age</u>	<u>Number of Persons</u>		<u>Annual Benefits in Thousands</u>		<u>Average Annual Benefits</u>
<50	12	\$	103	\$	8,609
50 to 54	21		180		8,567
55 to 59	42		407		9,684
60 to 64	33		329		9,979
65 to 69	28		248		8,846
70 to 74	19		167		8,806
75 to 79	22		175		7,945
80 to 84	11		77		6,988
85 to 89	10		63		6,292
90 and up	2		10		5,014
<b>Total</b>	<b>200</b>		<b>1,759</b>		<b>8,794</b>

**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive**

**Survivors of Deceased Retired Members as of July 1, 2005**

<u>Age</u>	<u>Number of Persons</u>		<u>Annual Benefits in Thousands</u>		<u>Average Annual Benefits</u>
<50	28	\$	197	\$	7,045
50 to 54	24		258		10,734
55 to 59	46		503		10,930
60 to 64	66		782		11,854
65 to 69	86		1,086		12,623
70 to 74	107		1,450		13,549
75 to 79	117		1,364		11,655
80 to 84	149		1,396		9,367
85 to 89	105		934		8,900
90 and up	66		461		6,984
Total	794		8,430		10,617

**Survivors of Deceased Active Members as of July 1, 2005**

<u>Age</u>	<u>Number of Persons</u>		<u>Annual Benefits in Thousands</u>		<u>Average Annual Benefits</u>
<50	78	\$	412	\$	5,280
50 to 54	33		229		6,945
55 to 59	63		526		8,343
60 to 64	46		519		11,278
65 to 69	40		372		9,307
70 to 74	34		296		8,699
75 to 79	41		418		10,205
80 to 84	33		284		8,599
85 to 89	24		122		5,094
90 and up	13		49		3,758
Total	405		3,227		7,967



**Teachers' Retirement System  
State of Montana**

**Table C-2**

**Distribution of Inactive Lives**

**Terminated Vested Members as of July 1, 2005  
Number of Persons**

<u>Age</u>	<u>Number</u>
<25	-
25 to 29	6
30 to 34	81
35 to 39	165
40 to 44	215
45 to 49	304
50 to 54	385
55 to 69	357
60 to 64	118
65 to 69	18
70 & above	-
Total	1,649

**Child Beneficiaries as of July 1, 2005  
Number of Persons**

<u>Age</u>	<u>Number</u>
<5	-
5 to 6	2
7 to 8	1
9 to 10	2
11 to 12	3
13 to 14	6
15 to 16	5
17 to 18	4
Total	23



**Teachers' Retirement System  
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**Table C-3**

**Data Reconciliation**

	Active Contributing <u>Members</u>	Vested Terminated <u>Members</u>	Service Retired <u>Members</u>	Disabled <u>Members</u>	Survivors and <u>Beneficiaries</u>
July 1, 2004 Valuation	17,614	1,620	8,969	199	1,207
Refunds and NonVested Terminations	(1,350)	(72)			
Vested Terminations	(226)	226			
Service Retirements	(424)	(41)	465		
Disability Retirements	(5)	(3)		8	
Deaths with Beneficiary	(3)	(1)	(83)	(5)	92
Deaths without Beneficiary			(149)	(4)	(50)
New Entrants	1,838				
Rehires	98	(92)	(6)	-	
Other	-	12	46	2	(27)
July 1, 2005 Valuation	17,542	1,649	9,242	200	1,222



**Teachers' Retirement System  
State of Montana**

**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)	Active Members								
	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**
1987	13,105	1,955	15,060	*	\$340,481	\$25,981	*	*	*
1989	12,546	2,541	15,087	*	339,866	27,090	*	*	*
1992	13,502	3,141	16,643	*	401,092	29,706	42.4	11.6	30.8
1994	14,938	2,637	17,575	377	416,968	27,914	42.5	11.0	31.5
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

\* *Not available.*

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



**Teachers' Retirement System  
State of Montana**

**Table D-2**

**Retired and Inactive Membership Data**

Valuation Date (July 1)	All Annuitants				Terminated Members		
	Number	Annual Benefits in Thousands	Average Annual Benefit	Average Current Age	Average Age at Retirement	Number Vested Terminated	Number Non-Vested Terminated
1987	6,036	\$ 43,236	\$ 7,163	*	*	*	*
1989	6,330	49,546	7,827	*	*	*	*
1992	6,927	63,483	9,165	*	*	*	*
1994	7,530	78,183	10,383	*	*	1,105	5,722
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

\* *Not available.*

## Teachers' Retirement System State of Montana

**Table D-3**

### Contribution Rates

Valuation Date (July 1)	Contribution Rates			Normal Cost Rate	UAAL Rate*
	Employee	Employer	Total		
1992	7.044%	7.459%	14.503%	9.876	4.627%
1994	7.044%	7.470%	14.514%	9.494	5.020%
1996	7.044%	7.470%	14.514%	9.328	5.186%
1998	7.044%	7.470%	14.514%	8.880	5.634%
2000	7.15%	7.58%**	14.73%	9.71	5.02%
2002	7.15%	7.58%	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%

\* The unfunded actuarial accrued liability rate is the amount available to amortize the unfunded actuarial accrued liability. It is equal to the total contribution rate, minus the normal cost rate.

\*\* The 1999 Legislation which passed the 1.5% GABA, also added a 0.11% state general fund contribution.

# Teachers' Retirement System State of Montana

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

#### **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.

**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.

**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.

**Unfunded Actuarial Accrued Liability**

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

**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.



**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.

