Montana Teachers' Retirement System

2025 Actuarial Audit

Prepared by:

R. Ryan Falls, FSA, EA, MAAA
Principal & Consulting Actuary

Scott Preppernau, FSA, EA, MAAA
Principal & Consulting Actuary

Milliman, Inc.
12790 Merit Dr, Suite 800
Dallas, TX 75251
Tel +1 214 863 5056
milliman.com

Issued April 14, 2025

12790 Merit Drive
Suite 800
Dallas, TX 75251 USA

Tel +1 214 863 5056

milliman.com

April 14, 2025

Board of Trustees
Montana Teachers' Retirement System
100 N Park Avenue, Suite 110
Helena, MT 59620-0131

Re: Actuarial Audit of July 1, 2024 Valuation
Montana Teachers' Retirement System

Dear Members of the Board:

The enclosed report presents the findings from our actuarial audit of the July 1, 2024 actuarial valuation of the Montana Teachers' Retirement System (TRS) prepared by the retained actuary for TRS, Cavanaugh Macdonald Consulting. An overview of our major recommendations is included in the Executive Summary section of the report. More detailed commentary on our review process is included in the latter sections.

All calculations are based on the statutory benefit provisions and the actuarial assumptions adopted by the Board of Trustees. Our actuarial audit uses the same benefit provisions, assumptions and methods as those disclosed in the retained actuary's July 1, 2024 valuation report. As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable, taking into account the experience of TRS and reasonable expectations for future experience. 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. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- System experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the TRS funded status), and
- Changes in the benefit provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the TRS staff and the retained actuary. 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. Since the actuarial audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

Our replication of valuation results was developed using models intended for valuations that use standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice. When reviewing the long-term investment return assumption discussed in Section 6, we relied upon a model developed by Milliman colleagues who are credential investment professionals with expertise in capital market modeling.

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 and the *Code of Professional Conduct* and *Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States*, published by the American Academy of Actuaries.

Milliman's work product was prepared exclusively for TRS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning TRS's operations and uses 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.

The consultants who worked on this assignment are actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of TRS. We are not aware of any relationship that would impair the objectivity of our work.

We would like to express our appreciation to both Cavanaugh Macdonald Consulting and TRS staff for their assistance in supplying the data and information on which this report is based.

We 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.

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

Sincerely,

R. Ryan Falls, FSA, EA, MAAA
Consulting Actuary

Scott Preppernau, FSA, EA, MAAA
Consulting Actuary

Table of Contents

1. Summary of the Findings

Purpose and Scope of the Actuarial Audit

In this actuarial audit, we will review the July 1, 2024 actuarial valuation for the Montana Teachers' Retirement System (TRS) by the TRS retained actuary. This review will focus on the following areas:

- Determine if the retained actuary's valuation procedures are technically sound and based on generally accepted actuarial standards.
- Determine if the methodology used by the retained actuary to validate and "normalize" census data is technically sound and based on generally accepted actuarial standards.
- Determine if the retained actuary's determinations of demographic and economic actuarial assumptions are reasonable and are based on generally accepted actuarial standards.
- Determine if the actuarial cost method and actuarial asset valuation method used by the retained actuary are reasonable, including whether different methods may be more appropriate.
- Determine if the retained actuary's valuation results can be verified, including:
    - verification that appropriate mathematical calculations are being made accurately; and
    - verification that plan liabilities and assets are being appropriately valued.

Actuarial Audit Conclusion

Based on our review of the census data, experience study documents, liability replications, and actuarial valuation reports, we believe the July 1, 2024 actuarial valuation for TRS is reasonable, based on reasonable assumptions and methods, and the reports generally comply with the Actuarial Standards of Practice.

We offer the following observations and recommendations that we believe would further enhance the communication and funding of TRS going forward.

Membership Data

We performed tests on both the raw data supplied by TRS and the processed data used by the retained actuary in the actuarial valuation. Based on this review, we believe the individual member data used is appropriate. A summary is shown in Exhibit 2-1.

Actuarial Value of Assets

We have reviewed the calculation of the actuarial value of assets used in the July 1, 2024 actuarial valuation for TRS. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice. We recommend the retained actuary review how administrative expenses are incorporated into the allocation of investment returns between immediate recognition and deferred recognition in the asset smoothing methodology.

Actuarial Liabilities

We independently calculated the normal cost and actuarial liabilities of TRS for an individual sample set of participants as well as for the entire plan in total. In general, we found that all significant benefit provisions were accounted for in an accurate manner, the actuarial assumptions and methods are being applied correctly, and that our liability replications closely matched those calculated by the retained actuary.

Funding

We reviewed the calculations of the Funding Period and Actuarially Determined Employer Contribution (ADEC) for TRS. Additionally, we also evaluated the application of the Actuarial Cost Method. We have a recommendation for the Board to consider when they are next reviewing the Funding and Benefit Policy.

Actuarial Assumptions (Economic)

We reviewed the economic assumptions used in the July 1, 2024 actuarial valuation and found them to be reasonable. The economic assumptions used were adopted based on the retained actuary's Actuarial Experience Study for the period ending June 30, 2021.

In future experience study reports, we recommend that the retained actuary provide rationale for their recommendation of the payroll growth assumption.

Actuarial Assumptions (Demographic)

We completed a high-level review of the demographic assumptions that were adopted based on the retained actuary's Actuarial Experience Study for the period ending June 30, 2021. Based on this review, we believe the demographic assumptions used in the valuation are reasonable. We have the following recommendations for future actuarial experience studies:

- In order to follow a true "building block" approach to developing the merit, promotion and longevity salary increase assumption in future experience studies, the retained actuary should consider isolating the merit portion of the actual salary increases from the price inflation and/or wage inflation during the experience study period as part of the experience analysis.
- Based on the sustained retirement and termination decrement losses, it would appear that there is another source of the regular losses coming through as "age & service retirements" and "withdrawal from employment". We recommend that the retained actuary closely review the sources of the unexpected retirement and termination losses in the next actuarial experience study and formulate a method to anticipate the losses in the actuarial valuation.

Reports

The retained actuary's reports meet the applicable Standards of Practice. The discussion in Section 8 of this actuarial audit report includes recommended improvements for the next valuation that should enhance the overall communication and disclosure in the actuarial valuation report. These are all suggested improvements to the reporting and would not impact the results of the actuarial valuation.

2. Membership Data

Actuarial Audit Conclusion

We performed tests on both the raw data supplied by the TRS staff and the processed data used by the retained actuary in the valuation. Based on this review, we feel the individual member data used is appropriate and complete.

Comments

Overall, the data process appears to be thorough and accurate. We would add the following comments:

- **Raw Data:** We were provided with the same data that was given by the TRS staff to the retained actuary for use in the actuarial valuation.
- **Completeness:** The data contained all the necessary fields to perform the actuarial valuation.
- **Quality:** Although we did not audit the data at the source, we performed some independent checks to confirm the overall reasonableness of the data. We compared the total retiree and beneficiary benefit amounts on the plans' data with the actual benefit payments made, as reported in the TRS financial statements. We also compared the total active member compensation on the plans' data with the estimated active payroll for the prior year. Based on this analysis, we found the data to be reasonable.
- **Parallel Data Processing:** We performed independent edits on the raw data and then compared our results with the valuation data used by the retained actuary. We found our results to be consistent.

Our results did not match exactly; however, this is understandable since the retained actuary has more extensive data-editing procedures. Overall, each data key component matched within an acceptable level, and we believe the individual member data used by the retained actuary was appropriate for valuation purposes.

A summary of the data in aggregate is shown in Exhibit 2-1. The "Milliman" column reflects Milliman's review of the raw data provided by TRS. The "Retained Actuary" column reflects the actual data used in the retained actuary's valuation.

In our opinion, there was a very close match between the data provided by TRS and the valuation data used by the retained actuary.

Exhibit 2-1
Member Statistics as of July 1, 2024

	Retained Actuary	Milliman	Ratio of Milliman / Retained Actuary
Active			
Total number*	19,648	20,024	101.9%
Average age*	44.3	44.2	99.8%
Average service*	9.7	9.3	95.9%
Covered Payroll (in thousands)	$ 1,003,130	$ 1,009,766	100.7%
Terminated Members			
Non-Vested Terminated	6,116	6,263	102.4%
Vested Terminated	2,339	2,317	99.1%
Annuitants			
Total number	18,002	18,033	100.2%
Annual Benefits (in thousands)	$ 461,262	$ 461,751	100.1%

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

Parallel Data Processing Detail

TRS provided Milliman with files as of July 1, 2024 that contained the current active members, current annuitants (service retirees, beneficiaries, and disability annuitants), and inactive members due a future benefit. In addition to the files that TRS provided to Milliman, the retained actuary provided Milliman the processed data files containing the final data used in the retained actuary's actuarial valuation. The retained actuary provided an Excel file with all members included in the actuarial valuation. The retained actuary also provided a description of the files provided and a key to the codes used on the files.

We compared the data in the TRS files to those used by the retained actuary on both an individual and an aggregate level. We found the data to be consistent between the two sets of files. We only compared fields that were directly used in the valuation. Differences on an individual level are to be expected in some records with a plan of this size. We found no differences on an individual level that would have a noticeable effect on the valuation results.

For active members, we compared the following fields: Date of Birth, Sex, Hire Date, and Salary. Over 99% of the other fields for active members match on an individual level.

For terminated employees, we compared the following fields: Date of Birth, Sex, Retirement Date, and Retirement Benefit. Over 99% of the other fields for terminated members matched on an individual level.

For annuitants, we compared the following fields: Date of Birth, Sex, Option Elected, Date of Retirement, Retirement Benefit, and Retirement Type (Retired, Beneficiary, or Disabled). Over 99% of all fields for annuitants matched on an individual level.

Our independent edits on the raw data provided by TRS resulted in data consistent with the final data provided by the retained actuary.

3. Actuarial Value of Assets

Actuarial Audit Conclusion

We have reviewed the calculation of the actuarial value of assets (AVA) used in the July 1, 2024 actuarial valuation of TRS. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with actuarial standards of practice. We recommend that the retained actuary review how the Administrative Expenses are incorporated into the allocation of the investment returns between immediate recognition and deferred recognition in the asset smoothing methodology to ensure that is it the most appropriate.

Comments

The market value of assets can experience significant short-term swings, which can cause large fluctuations in the development of the contributions necessary to eliminate a system's Unfunded Actuarial Accrued Liability (UAAL). Thus, many systems use an asset valuation method which dampens the short-term volatility to achieve more stability in the employer contribution. A good asset valuation method places value on a retirement system's assets which are related to the current market value, but which will also produce a smoother pattern of contributions.

ASOP No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations, provides a framework for the determination of the actuarial value of assets (AVA), emphasizing that the method should: (1) bear a reasonable relationship to the market value of assets (MVA), (2) recognize investment gains and losses over an appropriate time period, and (3) avoid systematic bias that would overstate or understate the AVA in comparison to MVA.

The July 1, 2024 actuarial valuation of TRS determined the smoothed asset valuation method by spreading the difference between each year's expected return and actual return on the MVA over a four-year period. Specifically, the Actuarial Value of Assets is equal to the MVA at the actuarial valuation date, less the sum of the following:

1. 75% of the difference between the expected return and actual return in the first year preceding the valuation date,
2. 50% of the difference between the expected return and actual return in the second year preceding the valuation date, and
3. 25% of the difference between the expected return and actual return in the third year preceding the valuation date.

The Conference of Consulting Actuaries Public Plans Committee published a whitepaper on model actuarial funding policies which include guidelines for asset smoothing. In our opinion, the method used for TRS of smoothing over four years without a corridor falls in the "Acceptable Practice" category under these guidelines.

The stated investment return assumption is that the assets are assumed to return 7.30% per year net of administrative and investment expenses. We recommend that the retained actuary review the calculation of the Market Investment Income (Item E1) and the Amount for Immediate Recognition (Item E3) in the calculation of the AVA to confirm that the calculations are consistent with this stated assumption. Specifically, we would have expected the Administrative Expenses to be disregarded as an explicit component in the calculation of the Market Investment Income which would also impact the resulting Amount for Immediate Recognition. Enhancing the calculation of the Market Investment Income and the Amount for Immediate Recognition to be more consistent with the stated investment return assumption would clarify the exhibit in the report but would not be expected to cause any significant difference in the allocation of investment gains and losses in the AVA over time.

4. Actuarial Liabilities

Actuarial Audit Conclusion

One purpose of this actuarial review is to verify the benefits and liabilities. Included in the information provided to us by the retained actuary were the individual liability amounts for 15 participants (eight active participants, two terminated participants, and five annuitants). We prepared an independent replication of the liabilities for these participants based on the plan provisions, the valuation assumptions, and actuarial cost method. We also replicated the liability for all plan participants based on the same procedures.

Replication Process

We independently calculated the liabilities for the sample of participants, and the entire plan, based on the following:

Data: We used the same data used by the retained actuary in its valuation. As discussed in Section 2, we confirmed that this data was consistent with the data provided by the TRS staff.

Assumptions: We used the assumptions disclosed in the July 1, 2024 actuarial valuation report and tables of assumed rates provided to us electronically by the retained actuary.

Methods: We used the actuarial methods disclosed in the July 1, 2024 actuarial valuation report. This was supplemented by discussions between the retained actuary and Milliman on the technical application of these methods.

Note that there will always be differences in the calculated liabilities when different software is used by different actuaries; however, the results should not deviate significantly. Our findings show a high level of consistency between our independent results and the valuation, which should provide assurance that the results of the valuation reasonably reflect the aggregate liabilities of TRS based on the assumptions and methods.

Benefits: We obtained this information from the TRS website and the relevant law.

Comments

A comparison of the liabilities to those provided by the retained actuary is shown below. As shown, we believe the liability calculations are reasonable.

Exhibit 4-1: Sample Life Liability Comparison

Comparison of 8 Active Sample Lives			
	Retained Actuary	Milliman	Ratio
Present Value of Future Benefits	$ 1,263,877	$ 1,259,988	99.7%
Actuarial Accrued Liability	843,955	838,214	99.3%
Normal Cost	53,001	53,643	100.8%

Comparison of 7 Inactive and Annuitant Sample Lives			
	Retained Actuary	Milliman	Ratio
Present Value of Future Benefits	$ 1,043,017	$ 1,043,413	100.0%

In addition, we utilized the complete census files provided by the retained actuary to replicate the TRS liability for all plan participants. This process further confirmed that the liability calculations are reasonable.

Exhibit 4-2: Total Liability Comparison

Comparison of Total Actuarial Accrued Liability (in millions)			
	Retained Actuary	Milliman	Ratio
Active participants	$ 2,045.2	$ 2,035.5	99.5%
Terminated members	187.5	184.4	98.3%
Annuitants	4,792.9	4,845.8	101.1%
Total	**$7,025.6**	**$7,065.6**	**100.6%**

5. Funding

Actuarial Audit Conclusion

We have reviewed the calculations of the Funding Period and Actuarially Determined Employer Contribution (ADEC) for TRS. Additionally, we have also evaluated the application of the Actuarial Cost Method. In this section, we have a recommendation for the TRS Board to consider when next reviewing the Funding and Benefits Policy.

TRS Board's Funding and Benefits Policy

The TRS Board most recently updated the Funding and Benefit Policy on May 13, 2016. The key aspects of the Policy pertaining to the unfunded liability include:

Purpose: It is the goal of the Board to eliminate the unfunded actuarial accrued liability of the retirement system and to establish a stabilization reserve equal to at least 10% of the actuarial accrued liability.

Policy: It is the desire of the Board to fully fund TRS. However, until the system becomes fully funded, any unfunded liability 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 a 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.

The policy goes on to address many other issues, including the most appropriate time to enhance benefits. In general, we believe this is a reasonably constructed Funding and Benefits Policy. It is important to note that the actual contributions for TRS are not determined based on this policy. This policy provides the Board with a benchmark to compare the actual contributions.

The next time the Board reviews the Policy, we encourage the Board to work closely with the retained actuary to consider whether to reduce the high end of the most reasonable amortization period for the UAAL to be incorporated into the Policy. The "30-year and projected to decline" standard is outlined in the Policy is currently scheduled to apply until the System "becomes fully funded and has a stabilization reserve of at least 10% of the actuarial accrued liability," at which time the allowed amortization period is scheduled to be reduced to not more than 20 years. Generally speaking, a plan with a 30-year funding period will be expected to have an increasing UAAL (in dollar terms) for at least 5-10 more years in most cases, even if all assumptions are met and all expected contributions are received. While a 30-year amortization period was used more commonly in the past, recent evolutions in pension funding best practices have encouraged Boards of Trustees and other stakeholders to identify funding goals of eliminating of UAAL over a shorter period of time, with 15 to 20 years often cited as a best practice. The Board's ambition to reduce the maximum UAAL amortization period to 20 years is consistent with this practice. With the new Policy review, the Board could consider making this transition prior to fully funding the plan with a 10% reserve. For example, the step down in maximum period could occur when the actual UAAL amortization period first falls below 10 years, or such a threshold could trigger an intermediate step such as a decrease to 25 years.

Funding Results

Current Sources of Contributions

TRS receives contributions from three primary sources:

1. *Employers currently contribute 11.96% of pay*. For State and University Employers, this contribution consists of an 11.85% of pay statutory employer contribution plus a general fund contribution of 0.11% of pay. For School District and other employers, this contribution consists of a 9.47% of pay statutory

employer contribution plus a general fund contribution of 2.49% of pay. The general fund contribution will decrease by 0.11% of pay when the amortization period of the System's UAAL is 10 years or less.
2. *Members currently contribute 8.15% of pay*.
3. *The State makes a statutory appropriation for TRS each year equal to $25 million*.
4. *The universities contribute 4.72% of pay for members of the Montana University System Retirement Program (MUS-RP).* According to the valuation report, it was previously assumed that this contribution would cease in 2033, but the current understanding is that the contribution will not stop unless legislative action is taken.
5. *Employers contribute 11.85% of re-employed retiree compensation*.

Funding Period Calculation

The TRS July 1, 2024 actuarial valuation report indicates that the funding period, the period until the UAAL is expected to be eliminated, is 21 years. This funding period is calculated assuming all the contributions described above continue throughout the projection period, except that the general fund contribution is projected to decrease by 0.11% of pay when the System's UAAL amortization period is 10 years or less. Under this assumption, 21 years is a reasonable expectation for the elimination of the UAAL.

Actuarially Determined Employer Contribution (ADEC)

The Summary of Results in the actuarial valuation report indicates that a reasonable ADEC rate of 12.23% of pay would be necessary to amortize the UAAL over 20 years. Since TRS is funded through statutory fixed contribution rates, this ADEC is provided for illustration purposes and comparison to the statutory contribution rates. We understand that the ADEC rate of 12.23% is best compared to the 11.96% sum of employer plus general fund contributions under the current statutory contribution rates, and the ADEC calculation assumes current member contributions and State appropriations continue.

Actuarial Cost Method

The July 1, 2024 actuarial valuation for TRS prepared by the retained actuary uses the Entry Age Actuarial Cost Method. This actuarial cost method is consistent with the guidance in the Board's Funding and Benefit Policy. We agree that it is appropriate for valuing the costs and liabilities of TRS and is the cost method that we usually recommend.

Purpose of a Cost Method: The purpose of any cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided.

Most Common Public Plan Cost Method (Entry Age): The most common cost method used by public plans is the Entry Age Actuarial Cost Method. The focus of the Entry Age Cost Method is the level allocation of costs over the member's working lifetime. For a public plan, this means current taxpayers pay their fair share of the pensions of the public employees who are currently providing services. Current taxpayers are not expected to pay for services received by a past generation, nor are they expected to pay for the services that will be received by a future generation. The cost method does not anticipate increases or decreases in allocated costs. We believe that the use of this cost method is reasonable.

For GASB Statements No. 67 and No. 68, the Entry Age Actuarial Cost Method is the only permissible cost method for financial reporting purposes.

6. Actuarial Assumptions (Economic)

Actuarial Audit Conclusion

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the plans administered by TRS. To provide the best estimate of the long-term funded status of the plan, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the plans in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the TRS plan, or to the operation of the plan itself. Demographic assumptions are based on the emergence of the specific experience of plan members. This section of the report will focus on economic assumptions. The next section will address the demographic assumptions.

We reviewed the economic assumptions used in the July 1, 2024 actuarial valuation and found them to be reasonable. The economic assumptions used were adopted based on the retained actuary's Actuarial Experience Study for the period ending June 30, 2021.

In future experience study reports, we recommend that the retained actuary provide further documentation of the rationale for their recommendation of the payroll growth assumption.

The following portion of this report discusses some of the key economic assumptions.

Please note that effective January 1, 2025, the Actuarial Standards Board adopted a revised Actuarial Standards of Practice (ASOP) that affected the citations relevant for pension plan valuations, but which left the substance of the guidance materially unchanged. After that date, an updated version of ASOP No. 27 now governs both economic and demographic assumption and the existing ASOP No. 35, which previously governed demographic assumptions, was eliminated. For purposes of the discussion in this report we have continued to refer to the previous versions of ASOP No. 27 and No. 35, since those were the standards that applied as of the July 1, 2024 valuation date.

Actuarial Standard of Practice No. 27: Selection of Economic Assumptions

As of the valuation date, the governing Actuarial Standard of Practice (ASOP) adopted by the Actuarial Standards Board related to economic assumptions was ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans, such as TRS. As the future is unknown, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. ASOP 27 explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this Standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

After completing the selection process, the actuary should review the set of economic assumptions for consistency. For example, this may entail the actuary using the same inflation component in each of the economic assumptions selected.

An actuary's estimate with respect to a particular measurement of pension obligations may change from time to time due to changing conditions or emerging plan experiences. Even if assumptions are not changed, we believe

that the actuary should be satisfied that each of the economic assumptions selected for a particular measurement complies with ASOP 27, unless that assumption has been prescribed by someone with the authority to do so.

Inflation

Use in the Valuation: Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and wage growth.

There is expected to be a long-term relationship between inflation and the investment return assumption. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run. Due to the application of the building block approach, it is important not to select an inflation assumption that is unreasonably high compared to long-term expectations, as doing so may lead to an investment return assumption that is too optimistic.

Historical Perspective: The data for inflation discussed below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

There are numerous ways to review historical data, with significantly differing results. The retained actuary points to this by showing many different lengths of historical periods, ending with June 30, 2021. Inflation has been very high for the past few years; however, we do not believe adding the experience of the past few years would meaningfully change the historical perspective. In their recommendation to increase the inflation assumption from 2.50% to 2.75% with the most recent experience study, the retained actuary appears to have also considered the recent high inflation at that time (citing 8.5% annual inflation for the year to March 31, 2022).

Forecasts of Inflation: As noted by the retained actuary, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. As cited in the experience study report, as of March 31, 2022, the yield for 20-year inflation indexed Treasury bonds implied inflation of 2.79% per year. However, it is worth noting that this measure is sensitive to the particular date considered, and March 31, 2022 market conditions were somewhat anomalous, with inflation-indexed bonds were offering a negative yield at that time. By the end of 2022, inflation-indexed bonds had a positive yield and the 20-year implied inflation was 2.52%. In future studies, the retained actuary could consider providing additional perspective on the sensitivity of the implied inflation analysis, especially in times of market disruption.

Additionally, the retained actuary noted that the "Survey of Professional Forecasters" published by the Philadelphia Federal Reserve Bank set the median expected annual rate of inflation for 10-years to be 2.50% as of January 1, 2022.

Although most investment consultants and economists forecast lower inflation, they are generally looking at a shorter time horizon than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2022, 2023, and 2024 Trustees reports, the projected ultimate average increase under the intermediate cost assumptions was 2.40%.

Peer System Comparison: Although assumptions should not be set based on what other systems are doing, it is informative to see how TRS compares.

According to the National Association of State Retirement Administrators (NASRA) Public Fund Survey (a survey of approximately 130 large municipal and statewide systems), the average inflation assumption for statewide

systems has been steadily declining. In the March 2024 NASRA Issue Brief, the average inflation assumption was 2.47%.

Conclusion: We believe that a 2.75% assumption is reasonable for a July 1, 2024 actuarial valuation of a retirement system. However, this assumption will warrant continued monitoring at the next experience study as some of the circumstances that led to an increase in the assumption in the last study have changed. In addition, the current assumption is somewhat higher than projected by other relevant sources and higher than the average assumption used by peers.

General Wage Inflation

Use in the Valuation: Estimates of future salaries are based on two types of assumptions. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity (referred to as the merit scale) occur even in the absence of inflation. This section will address the general wage inflation assumption (inflation plus productivity increases). The merit, promotion, and longevity increase assumption is discussed in Section 7 of this report (demographic assumptions).

The General Wage Inflation assumption was 3.50% for the July 1, 2024 actuarial valuation. This growth includes increases in wages through inflation of 2.75% plus a component for productivity of 0.75%.

Historical Perspective: As with inflation, historical measures for general wage inflation vary widely depending upon the data source, consideration of mean vs. median, and how far back it is measured. We have used statistics from the Social Security Administration on the National Average Wage. Using this data implies real wage growth of about 0.6% over the past 50 years. The retained actuary presents a similar statistic for multiple historical time periods.

Forecasts for Future Wage Growth: Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2024 Trustees Report, the long-term ultimate annual increase in the National Average Wage was estimated to be 1.14% higher than the Social Security intermediate ultimate inflation assumption of 2.40% per year.

Conclusion: We believe that the current estimate of wage growth of 0.75% above inflation falls within multiple data points for this assumption and serves as a reasonable estimate of future real wage growth. Combined with price inflation assumption of 2.75%, this results in a total general wage inflation assumption of 3.50%.

Payroll Increase Assumption

Payroll is projected to grow in the development of the years to fund the Unfunded Actuarial Accrued Liability. The current payroll increase assumption is equal to 3.25%, which is noted as being set 0.25% below general wage inflation. From our perspective, the payroll increase assumption should generally be more than that inflation assumption and less than, or equal to, the general wage inflation assumption. As a result, this assumption appears reasonable. However, the retained actuary does not include an analysis of this assumption in the experience study report beyond a brief mention in the executive summary that the payroll increase assumptions was adjusted “to better reflect recent experience and the short-term expectations.” In future experience study reports, we recommend that the retained actuary provide documentation of that recent experience or additional rationale for its recommendation of the payroll growth assumption.

Investment Return (Discount Rate)

Use in the Valuation: The investment return assumption is one of the primary determinants of the stated results of the annual actuarial valuation, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities, normal cost rate, and period necessary to eliminate the UAAL.

The discount rate is the rate used to discount future benefit payments into an actuarial present value. The traditional actuarial approach used for public sector funding sets the discount rate equal to the expected investment return. Under current standards set by the GASB, the "discount rate" should reflect the long-term expected rate of return on pension fund investments to the extent that the pension fund's assets are expected to be sufficient to pay benefits.

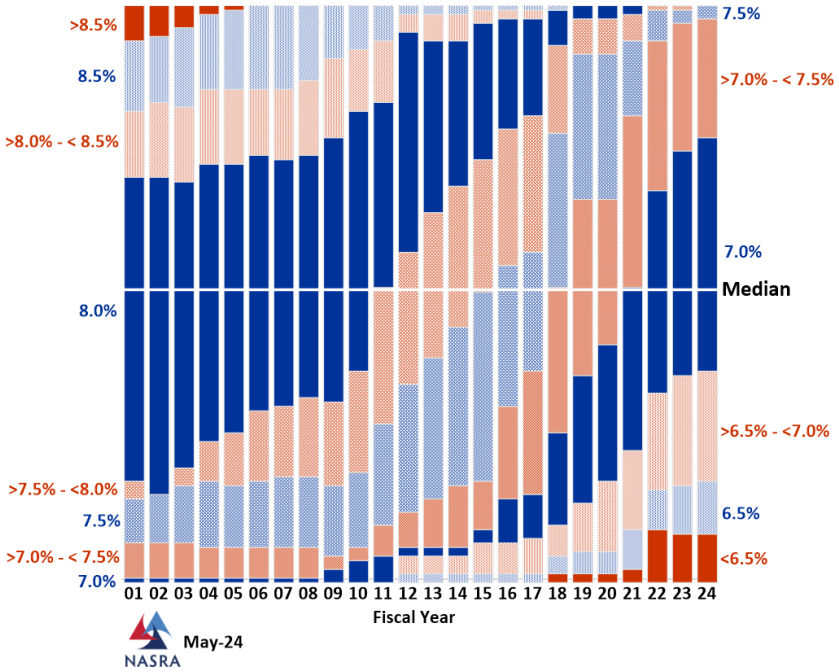
The most recent recommendation for the net investment return assumption of 7.30% per year includes two components: (1) inflation of 2.75%, and (2) a real rate of return equal to 4.55%. This approach of splitting the net return into separate pieces is called the "building block" method.

Long-term Expected Investment Return: The assets for TRS are invested by the Montana Board of Investments. To develop an analytical basis for assessing the investment return assumption, the retained actuary used capital market expectations published in the *Survey of Capital Market Assumptions: 2021 Edition* which includes information from 39 investment advisors. Based on this analysis, the 50th percentile geometric annual real return was 4.66%. We agree that the geometric annual return is the appropriate measure. This is a reasonable approach to the analyses.

To provide some additional perspective on this assumption, the chart below shows the assumptions used by over 130 of the largest US public sector systems in a regularly updated survey published by the National Association of State Retirement Administrators (NASRA). As can be seen from the chart, the trend over time has been for systems to lower their investment return assumptions.

NASRA Public Fund Survey

Change in Distribution of Nominal Public Pension Investment Return Assumptions, FY 01 to FY 24



Based on Milliman's current capital market assumption model as of June 30, 2024 and the Montana Board of Investment's Target Asset Allocation from the experience study report, we would expect a 10-year geometric median assumed real return of 4.39% and a 20-year geometric assumed real return of 4.82%.

Administrative and Investment-Related Expenses: Since the trust fund pays investment and administrative expenses from plan assets, it is necessary to incorporate the expected expenses into the actuarial valuation. Plan expenses may be explicitly assumed as a direct increase to the annual normal cost or implicitly assumed by developing an investment return assumption as a net return after payment of plan expenses. The 2024 actuarial valuation includes an implicit expense assumption for both administrative and investment-related expenses.

The forward-looking capital market assumptions and return forecasts developed by investment consulting firms generally reflect expected investment expenses. Their return estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. Investment return expectations for the alternative asset class such as private equity and hedge funds are also generally reported as net of investment expenses. Therefore, it is generally not necessary to make additional adjustments to the investment return assumption to account for investment related expenses. This perspective also assumes that investment managers will generate enough “alpha” to cover the cost of the active management.

Based on data shown in the most recent actuarial experience study, the retained actuary recommended an assumed expense ratio for administrative expenses 0.09%. The retained actuary appropriately reduces the expected return of the investment portfolio in the building block analysis of the investment return assumption.

We believe that these are appropriate methods for the actuarial valuation.

Conclusion: We find the 4.55% real rate of return investment return assumption is reasonable for funding and financial reporting purposes. The 7.30% total investment return assumption is higher than the median investment return assumption in industry surveys which is primarily due to a somewhat higher assumption for inflation. The inflation assumption is consistently applied as a building block component of the other economic assumptions, so we believe the overall investment return assumption is reasonable. We recommend TRS continue to monitor and review both inflation and real return assumptions in the coming years.

7. Actuarial Assumptions (Demographic)

Actuarial Audit Conclusion

We completed a review of the demographic assumptions that were adopted based on the retained actuary's Actuarial Experience Study for the period ending June 30, 2021. Based on this review, we believe the demographic assumptions used in the valuations are reasonable. In this section, we provide recommendations for setting and monitoring the mortality, termination and retirement assumptions in future actuarial studies.

Note that we did not independently replicate the detailed analysis completed by the retained actuary as it was outside the scope of this actuarial audit.

We understand that the analysis of demographic assumptions in the Actuarial Experience Study was based on experience from the period July 1, 2016 through June 30, 2021. Because this period includes time periods that were affected by the COVID pandemic, we would have expected to see a discussion from the retained actuary assessing whether any part of the analysis or experience considered should be adjusted. For example, if the final year of the 5-year period experienced unusually high mortality or retirement rates that could have been related to the pandemic, it may not be appropriate to consider these predictive of long-term future experience. In any future experience studies that contain the potential for outlier results, it would be helpful to include a discussion of these considerations within the report.

Overview of Actuarial Experience Studies

Actuarial experience studies are studies of demographic experience involving a detailed comparison of actual and expected experience. If the actual experience differs significantly from the overall expected results, or if the actual pattern does not follow the expected pattern, new assumptions are considered. Recommended revisions normally are not an exact representation of the experience during the observation period. Judgment is required to predict future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

In an experience study, the actuary first determines the number of actual occurrences (i.e., deaths, terminations, retirements, etc.) that occurred during the experience period. Then the actuary determines the number that were expected to occur, based on the current actuarial assumptions. A comparison of the "actual occurrences" to the "expected occurrences" can determine the appropriateness of a particular assumption and is generally referred to as a "headcount-weighted" experience analysis. Selecting an assumption based on a headcount-weighed analysis is consistent with determining the *expected number of occurrences* in the actuarial valuation.

An actuary can enhance the "headcount-weighted" analysis by considering an "amount-weighted" experience analysis. An amount-weighted analysis will generally use an amount that is relevant to the plan, such as benefits or liabilities, to "weight" the occurrences reviewed as part of the analysis. By weighting the data, the actuary gives more weight to members who have larger benefits (and thus have larger liabilities). Selecting an assumption based on an amount-weighted analysis is consistent with *minimizing actuarial gains and losses* associated with a particular assumption in the actuarial valuation.

We noted that the retained actuary used an "amount-weighted" approach when analyzing the mortality, retirement and termination assumptions in the most recent experience study. The retained actuary discusses the appropriateness of each assumption, both before and after the recommended change, on an amount-weighted basis in the experience study report. We recommend that the retained actuary note in the experience study report the number of active members who terminated employment for each cause and the number of annuitants who died, especially for the mortality analysis. We believe this additional detail would provide additional context to the assumption analysis and enhance the readers ability to judge the credibility of the underlying data.

We did not independently perform the detailed calculations of the actual and expected rates that the retained actuary did, but we reviewed the assumptions based on our experience with similar systems.

Actuarial Standard of Practice No. 35: Selection of Demographic Assumptions

Actuarial Standard of Practice No. 35 (ASOP 35) governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

Please note that effective January 1, 2025, the Actuarial Standards Board adopted a revised Actuarial Standards of Practice (ASOP) that affected the citations relevant for pension plan valuations, but which left the substance of the guidance materially unchanged. After that date, an updated version of ASOP No. 27 now governs both economic and demographic assumption and the existing ASOP No. 35, which previously governed demographic assumptions, was eliminated. For purposes of the discussion in this report we have continued to refer to the previous versions of ASOP No. 27 and No. 35, since those were the standards that applied as of the July 1, 2024 valuation date.

Post-Retirement Mortality

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. The selection of a mortality assumption affects plan liabilities because the estimated value of retiree benefits depends on how long the benefit payments are expected to continue. There are clear differences in the mortality rates by gender, job categorization, non-annuitant versus annuitant, and non-disabled versus disabled retired members.

Base Mortality Tables: The Retirement Plans Experience Committee (RPEC) of the Society of Actuaries (SoA) issued the “Pub-2010” family of static base mortality tables in 2019. The ‘2010’ in the title refers to the central year of collected study data. These are the first tables published by the RPEC based solely on public sector experience. The RPEC created separate tables for public safety, teachers, and general employees.

The retained actuary recommended the PUB-2010 Teacher Amount Weighted Healthy Retiree mortality table projected to 2021 adjusted 102% for males and 103% for females where the adjustments were determined following the procedures outlined in the Credibility Educational Resource for Pension Actuaries, Application of Credibility Theory to Mortality Assumption published by the Society of Actuaries (utilizing a 90% confidence interval on the benefit weighted basis). According to the experience study report, the resulting actual/expected ratios under the proposed mortality assumption are 100% and 102% for males and females, respectively.

Mortality Improvement Scale: It is difficult to predict how much future mortality will improve compared to mortality today. The SoA has created very precise projections of mortality improvement in “MP” tables that are generally updated each year. The SoA’s calculations feature a two-dimensional assumption to allow for varying improvements by age and calendar year. The SoA created new tables in 2014 through 2021. The retained actuary recommended the use of the MP-2021 version of the mortality improvement scale.

Beneficiary Mortality: The retained actuary identified the assumption for beneficiary mortality as the “PUB-2010 Contingent Survivor mortality table” without any adjustments. The retained actuary also recommended the use of the MP-2021 version of the mortality improvement scale.

After reviewing the selection and application of these assumptions, we have one note for future consideration. We understand the retained actuary applies the Contingent Survivor mortality tables to the contingent annuitants of living retirees who are receiving a joint and survivor form of payment. As described in the Pub-2010 study, we understand these tables were developed based exclusively on experience after the death of the retired member

and, as a result, the mortality rates are likely to be higher than if experience for contingent annuitants with living spouses were included due to what is sometimes known as the "grieving widow(er) effect." The Pub-2010 study report discussed three possible alternatives for calculating the liability associated with joint and survivor annuities. The retained actuary's approach of applying the Contingent Survivor mortality prior to the retiree death is one of the approaches discussed, but it is generally not an approach we recommend since it presents a risk of understating the liability for retirees with survivor forms of payment.

In January, RPEC issued an exposure draft of a "Pub-2016" family of static base mortality tables which is currently under review by the actuarial community. The updated base mortality tables released with this exposure draft generally show a slightly shorter life expectancy for retired teachers than the "Pub-2010" mortality tables. We expect that the final "Pub-2016" mortality tables will be available for the next experience study for TRS and an option for the retained actuary.

Conclusion: The retained actuary recommended mortality assumptions based on published mortality studies of applicable public sector employees. As noted above, we recommend the retained actuary review their assumptions related to Contingent Survivor mortality tables (in particular the choice to apply a survivor mortality table prior to retiree death) in the next experience study. In total, we believe the base mortality and mortality improvement assumptions are reasonable.

Merit, Promotion, and Longevity Salary Increases

The individual salary increase assumptions due to merit (longevity and promotion) are intended to anticipate the salary increases in addition to the assumed increases due to general wage inflation. The retained actuary differentiates the salary increase assumption for non-university members and university members.

The experience study report notes that the actual/expected ratio for the expected salary increases was 100% and 99% for non-university members and university members, respectively over the experience study period. However, this analysis was based on the gross salary increases (general wage inflation plus merit). If the actual inflation and/or wage inflation during the experience study period were different than the assumption, then this analysis on the total increase may not provide the most reasonable analysis for the merit portion of the salary increase assumption.

In order to follow a true "building block" approach to developing the merit, promotion and longevity salary increase assumption in future experience studies, the retained actuary should consider isolating the merit portion of the actual salary increases during the experience study period. This can be done by subtracting an estimate for the actual inflation and the actual wage inflation from the actual pay increases during the experience study period. Once the merit portion of the salary increases have been isolated, the increases can be compared to the merit increase assumption to determine the reasonability.

It should be noted that we looked at the magnitude of the assumed increases and they are in line with what we have seen with similar plans.

In total, we believe that the assumptions for merit salary increases are reasonable.

Rates of Service Retirement

We reviewed the rates of service retirement. The current assumptions vary by age and by whether the member is eligible for reduced or full benefits. There is an additional adjustment in the year that the member is first eligible for full benefits. This assumption and the analysis in the experience study report seem reasonable.

The retained actuary currently applies one set of retirement rate assumptions to all members. However, members hired on or after July 1, 2013 have lower benefits and later retirement eligibility thresholds than members hired prior to that date. As a result, their retirement behavior can be expected to differ from patterns observed for pre-July 1, 2013 members. The current assumption framework distinguishes between eligibility for reduced or full

benefits and has a specific adjustment for retirement in the first year of full eligibility, which provides some degree of customization in how the assumption applies between tiers. However, analyzing the experience for both tiers together could fail to identify emerging differences in experience between these groups. While there is limited retirement experience to this point for such members, in the next experience study the retained actuary could consider whether it would be warranted to introduce a separate assumption for the more recent group based on reasonable expectations about how their retirement patterns might differ. It may also make it easier to monitor and refine the assumption for this group in the future if they are considered separately.

Rates of Termination (Refund and Vested Termination)

We reviewed the rates of termination of employment. The current assumption varies by length of service and whether the member is full-time or part-time. We agree that service is generally the most significant in anticipating termination rates. The retained actuary "weighted" the experience analysis by each individual's salary and service which we believe is reasonable. Based on the retained actuary's analysis, the termination rates are aligned with actual experience and the assumptions appear reasonable.

Systemic Actuarial Losses on Decrements

Actuarial gains and losses in an actuarial valuation occur when actual behavior differs from the actuarial assumptions. Small and generally offsetting differences are always expected with a reasonable set of actuarial assumptions on a year-to-year basis. If any particular "category" of actuarial gains and losses does not average out to, roughly, zero over time then the retained actuary should examine the specific assumption to determine what adjustments to the assumptions can be made to eliminate this apparent bias in the valuation process.

We noted from *Table 13: Historical Actuarial (Gains) and Losses* in the actuarial valuation report that the regular actuarial losses from "age & service retirements" and "withdrawal from employment" have been notable each of the last seven years as a percentage of the beginning of year UAAL:

Year	Actuarial Loss from Retirement	Actuarial Loss from Termination	BOY UAAL	Combined Loss as % of UAAL
FY2024	$ 28.0	$ 17.0	$ 1,886	2.4%
FY2023	26.9	16.4	1,892	2.3%
FY2022	27.0	17.6	1,847	2.4%
FY2021	22.1	17.4	1,966	2.0%
FY2020	28.6	14.9	1,929	2.3%
FY2019	22.1	16.7	1,910	2.0%
FY2018	22.4	8.0	1,663	1.8%

Amounts in millions

Essentially, this indicates that the UAAL unexpectedly increased by $285 million over the prior seven years due to the current application of the retirement and termination assumptions when this amount should be roughly zero. Based on the sustained retirement and termination decrement losses, it would appear that there are other sources of the recurring losses coming through in the analysis as "age & service retirements" and "withdrawal from employment". We recommend that the retained actuary closely review the sources of the retirement and termination losses in the next actuarial experience study and formulate a method to anticipate the losses in the actuarial valuation.

Rates of Disability Retirement

We reviewed the rates of disability retirement. The current assumptions are low and increase with age. The low probabilities are supported by the data, and based on the retained actuary's analysis, the disability assumptions appear reasonable.

8. Content of the Valuation Report

Actuarial Audit Conclusion

ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, and ASOP No. 41, *Actuarial Communications*, provide guidance for measuring pension obligations and communicating the results. These Standards list specific elements to be included, either directly or by references to prior communication, in pension actuarial communications. The retained actuary's reports meet the applicable Standards. We are recommending improvements for the next valuation that will enhance the overall communication and disclosure in the actuarial valuation report. These are all improvements to the reporting and would not impact the results of the valuation.

Comments

Following our review of the retained actuary's actuarial valuation report, we have the following comments and recommendations for future actuarial valuation reports:

Certification Letter

In the second paragraph of the certification letter, the only purpose the retained actuary provides for the report "is to provide a summary of the funded status of the System". Additionally, Page 32 of the report notes that "the purpose of the valuation is to determine if these contributions are sufficient to fund the System". We recommend that the retained actuary thoughtfully consider the main purposes for the actuarial valuation and coordinate the discussions in the report. Additional possibilities for the purposes of the valuation include: to provide the Actuarially Determined Employer Contribution (ADEC) rates, to project the adequacy of the System's funding policy set by statute, to review the experience under the plan for the valuation year, and/or to assess the funded position of the plan.

Section 1 – Summary of Findings

On page 3, the retained actuary notes that ASOP 4 requires the disclosure of a "reasonable actuarially determined contribution" and the retained actuary notes that a reasonable actuarially determined contribution for TRS is 12.23% based on a closed 20-year funding period. We believe this is a reasonable basis for this requirement. Based on our understanding, the calculated contribution rate of 12.23% is best compared to the 11.96% sum of employer plus general fund contributions under the current statutory contribution rates and the contribution calculation assumes current member contributions and State appropriations continue. We recommend that the retained actuary expand the discussion to clarify that this is the reasonable employer contribution rate in addition to the member contributions and State appropriations.

Appendix A: Actuarial Procedures and Assumptions

The description of the Actuarial Cost Method states: "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."

Read literally, this description would imply that the normal cost is calculated for every active member on the valuation date (including a partial normal cost for those members expected to terminate during the year) and the payroll is the expected full-year pay for every active member on the valuation date (including full-year pay for members after they are expected to terminate).

For a plan receiving a fixed contribution (i.e., not an actuarially determined contribution), it is very important that the calculation of the funding period incorporates the cost of members expected to be hired throughout the upcoming year to replace the members expected to leave active service. If the cost of these new members is

disregarded in the calculation of the ADEC and the funding period then subsequent annual valuations will have guaranteed actuarial losses each year (i.e., unexpected increases in UAAL) and the funding period will ultimately be longer than expected.

Based on an exchange with the retained actuary, it is our understanding that the current procedure is actually to divide the sum of the individual normal costs by the sum of the expected pay for each individual (incorporating expected terminations) which we believe is the most appropriate procedure. We encourage the retained actuary to update the description of the normal cost rate to better reflect this procedure.

Appendix B: Summary of Valuation Assumptions

We believe it would enhance the description of the assumptions in the actuarial valuation report if the retained actuary made the following enhancements:

- note that deferred vested members are assumed to commence their benefit at age 60, and
- clarify that the base mortality tables are the “amount-weighted” versions of the tables.