

**TEACHERS' RETIREMENT SYSTEM OF MONTANA**  
REPORT OF AN ACTUARIAL AUDIT  
APRIL 8, 2015

April 8, 2015

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

Members of the Board:

Gabriel, Roeder, Smith & Company (GRS) is pleased to present this report of an actuarial audit of the July 1, 2014 actuarial valuation of the Teachers' Retirement System of Montana (MTRS). We are grateful to the MTRS staff and Cavanaugh Macdonald Consulting, the retained actuary, for their cooperation throughout the actuarial audit process.

This actuarial audit involves an independent verification and analysis of the assumptions, procedures, methods, and conclusions used by the retained actuary for MTRS, in the actuarial valuations of MTRS as of July 1, 2014, to ensure that the conclusions are reasonable and conform to the appropriate Standards of Practice as promulgated by the Actuarial Standards Board.

The scope of our actuarial audit focused on the primary actuarial valuation prepared for MTRS and the actuarial factors for plan administration provided to MTRS. The scope expressly excluded a full replication, actuarial work related to compliance with GASB Statements 67 and 68, and any valuation versions based on a different guaranteed annual benefit adjustment (GABA) percentage.

GRS is pleased to report to the Board, in our professional opinion, the July 1, 2014 actuarial valuation prepared by the retained actuary provides a fair and reasonable assessment of the financial position of MTRS.

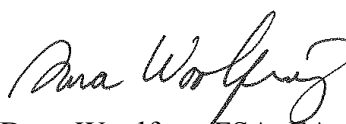
Throughout this report we make a number of suggestions for ways to improve the work product. We hope that the retained actuary and MTRS find these items helpful. Thank you for the opportunity to work on this assignment.

The signing actuaries are independent of the plan sponsor. They are Enrolled Actuaries, Fellows of the Society of Actuaries, and Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,  
Gabriel, Roeder, Smith & Company



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## **SECTION I**

### **EXECUTIVE SUMMARY**

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## Executive Summary

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The Teachers' Retirement System of Montana (MTRS) engaged Gabriel, Roeder, Smith & Company (GRS) for an actuarial audit of the recent actuarial valuation prepared for MTRS and the actuarial factors provided to MTRS for plan administration purposes. The scope expressly excluded a full replication, actuarial work related to compliance with GASB Statements 67 and 68, and any valuation versions based on a different guaranteed annual benefit adjustment (GABA) percentage.

The scope of this actuarial audit includes the following:

- Review and analyze the results of the actuarial valuation as of July 1, 2014, including an evaluation of the data used, for reasonableness and consistency as well as a review of the mathematical calculations for completeness and accuracy, based on a detailed review of a representative sample of the current plan participants.
- Evaluate the actuarial cost method and the actuarial asset valuation method in use and whether other methods may be more appropriate for MTRS.
- Review the demographic and economic actuarial assumptions for consistency, reasonableness and compatibility. Such assumptions shall include, but are not limited to: mortality, retirement and separation rates, levels of pay adjustments, rates of investment return, inflation, and disability rates.
- Confirm that the actuarial valuations are performed by qualified actuaries and assess the adherence to Actuarial Standards of Practice (ASOPs) published by the Actuarial Standards Board.
- Evaluate the adequacy of the actuarial factors provided to MTRS by the retained actuary to calculate the benefits for service and disability retirements, service purchases, early retirement, and survivorships.

### ***Summary of Findings***

Based on our review of the census data, experience study documents, liability calculations for a sample of members, and the actuarial valuation reports, we believe the July 1, 2014 actuarial valuation of MTRS is reasonable, based on appropriate assumptions and methods, and the reports generally comply with the Actuarial Standards of Practice.

It should be noted that that we reasonably matched the liability calculations for a sample of member test lives and, therefore, infer that the valuation results are reasonable based on this sample. A more definitive statement of the reasonableness of the valuation results would require a full replication valuation because the sampling does not preclude the possibility of large differences in valuation results resulting from a full replication valuation.

We offer the following recommendations based on the valuation methods and assumptions used by the retained actuary in the July 1, 2014 actuarial valuation of MTRS.

**Actuarial Assumptions**

1. We recommend that the retained actuary include more detail regarding the “exposures” underlying the assumptions as part of the next experience study. This additional detail will allow the reader to better understand the credibility of the proposed assumption changes.
2. We recommend that the retained actuary analyze the demographic experience separately for males and females in future experience studies to demonstrate that gender-neutral assumptions are appropriate for MTRS or provide a rationale for combining the groups.
3. The retained actuary needs to correct the statement of the mortality assumption for healthy male annuitants in one of the following ways: (1) correct the statement of the mortality assumption in future actuarial communications to appropriately identify the underlying mortality rates, or (2) perform a corrected mortality analysis based on the correct underlying mortality rates.
4. As part of the next actuarial experience study, we recommend that the retained actuary consider the applicability and appropriateness of a “generational” mortality assumption to eliminate the need to periodically update the “static” mortality assumption to include margin for future mortality improvement.
5. In light of the recent increases in member contribution rates and the introduction of less valuable benefits for new members, we recommend that the retained actuary closely monitor the assumption for “Retaining Membership in the System Upon Vested Termination” and include a detailed analysis in the next actuarial experience study report.

**Actuarial Methods and Funding Policy**

6. In general, we believe that the actuarial methods and funding policy are reasonable for MTRS and appropriately applied. We do recommend that the retained actuary update the application of the actuarial cost method to align the calculation of the projected compensation and the total present value of plan benefits so that the normal cost rate reflects the most appropriate allocation of plan costs over future compensation.

**Actuarial Valuation Results**

7. Given the conditional nature of portions of the contributions to MTRS, we recommend that the retained actuary clearly state the level of contributions included in the calculation of the amortization period including which contributions are assumed to change, if any, during the calculated period.
8. In the next actuarial valuation, we recommend that the retained actuary incorporate the following enhancements into their valuation of active participants: correctly reflect the proportion of members that are assumed to take a refund of contributions upon termination and appropriately reflect the three-year COLA deferral period for Tier 2 members.

**Content of Valuation Report**

9. In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the actuarial valuation of MTRS, we recommend that the retained actuary incorporate the noted enhancements to future actuarial valuation reports.

**Adequacy of Actuarial Factors**

10. In general, the actuarial factors provided to MTRS by the retained actuary are reasonable and consistent with the actuarial valuation assumptions adopted by the Board on May 13, 2010. We recommend incorporating salary increases that are assumed to occur between the purchase date and the projected retirement date into the cost of service purchases in order to align the cost of service purchases better with the actuarial valuation assumptions. We also recommend that the Certain and Life Optional Form factor methodology be verified before releasing the updated factors based on the newly adopted assumptions.

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## **SECTION II**

### **GENERAL ACTUARIAL AUDIT PROCEDURE**

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## General Actuarial Audit Procedure

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At the commencement of this engagement, GRS requested the information necessary to thoroughly review the work product of the retained actuary. Specifically, GRS received and reviewed the following items:

- Actuarial valuation report as of July 1, 2014,
- Actuarial Experience Study for the five-year period ending July 1, 2013,
- Actuarial Experience Study for the five-year period ending July 1, 2009,
- MTRS Investment Policy Statement, most recently approved April 8, 2014,
- A preliminary set of census data for plan participants and beneficiaries as of July 1, 2014 originally provided by MTRS to the retained actuary for the actuarial valuation,
- A final set of census data for plan participants and beneficiaries as of July 1, 2014 used by the retained actuary for the actuarial valuation, and
- Detailed liability calculations from the retained actuary for a sampling of 32 members as of July 1, 2014.

In performing our review, we:

- Reviewed member handbooks and applicable statutes to understand the benefits provided by MTRS,
- Reviewed the appropriateness of the actuarial assumptions and methods,
- Reviewed actuarial valuation reports, and
- Reviewed the detailed liability calculation of the sample lives, to ensure that the calculations were consistent with the stated plan provisions, actuarial methods and assumptions.

The actuarial audit findings, which follow, are based on our review of this information and subsequent correspondence with the retained actuary for clarification and further documentation.

### ***Key Actuarial Concepts***

An actuarial valuation is a detailed statistical simulation of the future operation of a retirement plan using the set of actuarial assumptions adopted by the governing board. It is designed to simulate all of the dynamics of such a retirement plan for each current participant of the plan, including:

- Accrual of future service,
- Changes in compensation,
- Leaving the plan through retirement, disability, withdrawal, or death, and
- Determination of and payment of benefits from the plan.

This simulated dynamic is applied to each active member in the plan and results in a set of expected future benefit payments for that member. Discounting those future payments for the likelihood of survival at the assumed rate of investment return produces the Total Present Value of Plan Benefits (TPV) for that participant. The actuarial cost method will allocate this TPV between the participant's past service (actuarial accrued liability) and future service (future normal costs).

We believe that an actuarial audit should not focus on finding differences in actuarial processes and procedures utilized by the consulting actuary and the auditing actuary. Rather, our intent is to identify and suggest improvements to the process and procedures utilized by MTRS's retained actuary. In performing this actuarial audit, we attempted to limit our discussions regarding opinion differences and focus our attention on the accuracy of the calculations of the liability and costs, completeness and reliability of reporting, and compliance with the Actuarial Standards of Practice that apply to the work performed by MTRS's retained actuary

These key actuarial concepts will be discussed in more detail throughout this report.

### *Actuarial Qualifications*

The July 1, 2014 actuarial valuation report for MTRS was signed by Mr. Edward A. Macdonald, ASA, FCA, MAAA and Mr. Todd B. Green, ASA, FCA, MAAA. Based on the information provided by the online actuarial directory sponsored by the Society of Actuaries, both Mr. Macdonald and Mr. Green have attained the actuarial credentials noted on the signature line of the actuarial valuation report and are compliant with Society of Actuaries Continuing Professional Development requirement. The actuarial valuation report does not directly reference whether the signing actuaries meet the Qualification Standards of the American Academy of Actuaries; however, the most recent actuarial experience study report (dated May 1, 2014) clearly indicates that the signing actuaries meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions.

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**SECTION III**  
**ACTUARIAL ASSUMPTIONS**

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## Actuarial Assumptions

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### *Overview*

For any pension plan, actuarial assumptions are selected that are intended to provide reasonable estimates of future expected events, such as retirement, turnover, and mortality. These assumptions, along with an actuarial cost method, the employee census data, and the plan's provisions are used to determine the actuarial liabilities and overall actuarially determined funding requirements for the plan. The true cost to the plan over time will be the actual benefit payments and expenses required by the plan's provisions for the participant group under the plan. To the extent the actual experience deviates from the assumptions, experience gains and losses will occur. These gains (losses) then serve to reduce (increase) future actuarially determined contributions and increase (reduce) the funded ratio. The actuarial assumptions should be individually reasonable and consistent in the aggregate, and should be reviewed periodically to ensure that they remain appropriate.

The Actuarial Standards Board ("ASB") provides guidance on establishing actuarial assumptions for a retirement program through the following Actuarial Standards of Practices (ASOP):

- (1) ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*
- (2) ASOP No. 23, *Data Quality*
- (3) ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*
- (4) ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*
- (5) ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*

We generally reviewed the application of the ASOPs applicable on the valuation date of the July 1, 2014 actuarial valuation report. Subsequent changes to the ASOPs will have to be reflected in future actuarial valuation reports.

The actuarial valuation report for MTRS contains descriptions of the actuarial assumptions which were used in the actuarial valuation as of July 1, 2014. Additionally, the retained actuary recently published an actuarial experience study report, dated May 1, 2014. We conducted a thorough review of these documents in order to assess the reasonableness of the assumptions used in the actuarial valuation.

Actuarial assumptions for the valuation of retirement programs are of two types: (i) demographic assumptions, and (ii) economic assumptions. We have assessed the reasonableness of both types as part of this actuarial audit.

## ***Demographic Assumptions***

### **General**

These assumptions simulate the movement of participants into and out of plan coverage and between status types. Key demographic assumptions are:

- turnover among active members,
- retirement patterns among active members, and
- healthy retiree mortality.

In addition, there are a number of other demographic assumptions with less substantial impact on the results of the process, such as:

- disability incidence and mortality among disabled benefit recipients,
- mortality among active members,
- percent of active members who are married and the relationship of the ages of participants and spouses, and
- benefit elections upon retirement or termination.

Demographic assumptions for retirement programs are normally established by statistical studies of recent actual experience, called experience studies. Such studies underlie the assumptions used in the valuations.

Once it is determined whether or not an assumption needs adjustment, setting the new assumption depends upon the extent to which the current experience is an indicator of the long-term future. The measurement of experience is normally affected by simply counting occurrences of an event. For example, in reviewing retirement patterns, an actuary might count the number of actual retirees among males aged 50 with 20 years of service. These retirements would be compared against the number of total people in that group to generate a raw rate of retirement for that group.

- Full credibility may be given to the current experience. Under this approach the new assumptions are set very close to recent experience.
- Alternatively, the recent experience might be given only partial credibility. Thus, the new assumptions may be set by blending the recent experience with the prior assumption.
- If recent experience is believed to be atypical of the future, such knowledge is taken into account.

Finally, it may be determined that the size of the plan does not provide a large enough sample to make the data credible. In such cases, the experience of the plan may be disregarded and the assumption is set based upon industry standards for similar groups.

### **Experience Study Report – Demographic Assumptions**

We believe that, in general, the descriptions of each assumption in the most recent actuarial experience study report, dated May 1, 2014, were adequate, provided context for the basis of each assumption, and outlined the reason for the proposed assumption going forward.

### ***Detailed Exposures***

The report contained detailed information about the actual number of members that left active service during the experience period (actuals) and the expected number of members (expecteds) based on the current and proposed assumptions.

However, the report contained no information concerning the number of members that were exposed to the forces that cause members to leave active service (exposures). Without the context of these numbers it is difficult to analyze some of the changes made to the assumptions.

We recommend that the retained actuary include more detail regarding the “exposures” underlying the actual experience as part of the next experience study. This additional detail will allow the reader to better understand the credibility of the proposed assumption changes.

### ***Gender-Specific Experience***

The retained actuary states in their experience study report that they did not analyze any demographic assumptions separately for males and females (except for mortality). In our experience, females can have notably different termination and retirement experience when compared to similarly situated males.

We recommend that the retained actuary analyze the demographic experience separately for males and females in future experience studies to demonstrate that gender-neutral assumptions are appropriate for MTRS or provide a rationale for combining the groups (e.g., male exposures did not support full credibility).

We have additional comments related to the mortality rates and the assumptions relating to terminating members. These comments will be discussed in the following sections.

### **Observations on Assumptions**

Overall, it appears that the current demographic assumptions are reasonable. Below, we offer general observations and considerations for the retained actuary based on our experiences with similar plans.

### ***Healthy Post-Retirement Mortality***

The most important demographic assumption is post-retirement mortality because this assumption is a predictor of how long pension payments will be made. The stated post-retirement mortality assumption is based on the RP-2000 Healthy Mortality tables with mortality improvements projected to 2018 using projection scale BB. The stated assumption also outlines a few other minor adjustments that were made to the base tables in order to provide an assumption that was more appropriate based on the actual experience of MTRS.

#### **Healthy Male Mortality over age 50**

Based on a review of the inputs to the actuarial valuation, we determined that the rates of mortality for healthy male annuitants after age 50 did not correspond to the stated mortality assumption. Further, we determined that the actual mortality rates used in the July 1, 2014 actuarial valuation for healthy male annuitants after age 50 were consistent with the “1992 Base Year Rates” shown in Table 3-1 of the RP-

2000 Mortality Table Study published by the Society of Actuaries in July 2000. It is our understanding that these rates were developed as an intermediate step in the development of the final RP-2000 tables.

Even though these mortality rates were mis-identified, we believe that the mortality analysis (performed on the unintended mortality rates) summarized in the actuarial experience study report, dated May 1, 2014, produced a reasonable mortality assumption that reflects the actual experience of MTRS.

It should be noted that the mortality rates in the "1992 Base Year Rates" table were centered on the year 1992. As a result, the 18 years of mortality improvements that were applied to this table for the actuarial valuation resulted in mortality rates that were projected to the year 2010 (not 2018).

In order to remedy this issue, the retained actuary could: (1) correct the statement of the mortality assumption in future actuarial communications to appropriately identify the underlying mortality rates as based on the "1992 Base Year Rates" from the RP-2000 Mortality Table Study, or (2) perform a corrected mortality analysis based on the correct underlying mortality rates and have the Board adopt an updated mortality assumption. It should be noted that a corrected mortality analysis should produce a mortality assumption somewhat similar to the current valuation assumption (resulting from a different set of adjustments to the base rates) as well as a plan liability very similar to the current valuation results. As a result, each of these remedies would be reasonable and not have a noticeable (if any) impact on the results of the actuarial valuation, but each remedy would require an update to the description of the mortality assumption in future actuarial communications.

#### Mortality Improvement for Healthy Annuitants

The current assumption applies mortality improvements to a published set of mortality tables for a fixed number of years (e.g., 18 years) and the resulting set of mortality rates is used for every future year in the valuation projection. This approach is referred to as a "static" mortality projection and is a commonly accepted approach to setting mortality assumptions. Since this approach does not assume continuing mortality improvement beyond the fixed number of years at the valuation date, the assumption must include a margin of conservatism to allow for future improvements in mortality rates. As long as the mortality of MTRS annuitants continues to improve, this margin will periodically need to be reestablished.

The need for this periodic adjustment can be seen through the past two experience studies. According to the prior actuarial experience study report, dated May 3, 2010, the mortality assumption at that time was expected to provide margin for future mortality improvement (13% for males and 9% for females). When this assumption was reevaluated as part of the most recent actuarial experience study, the previous margin had been completely eliminated based on the plan experience of the five years ending July 1, 2013. As a result, the mortality assumption was updated (improvements projected 10 more years with a more current projection scale) to provide additional margin for future mortality improvement (17% for males and 11% for females). If the same level of actual mortality improvement occurs over the next four years, then it is likely that the mortality assumption will need to be updated during the next experience study to, once again, provide margin for future mortality improvement.

The proposed mortality assumptions in the past two actuarial experience studies were each reasonable based on the experience and were established in accordance with ASOP No. 35. However, the actuarial liabilities will increase each time that the mortality assumption is updated to add margin for future mortality improvement.

The other commonly accepted approach to incorporating mortality improvement into an actuarial valuation of a pension plan is referred to as “generational” mortality projection. A generational mortality projection does not build in a margin up front, but the mortality is assumed to improve every future year in the valuation projection. Since this form of mortality projection assumes continual mortality improvements, there should be no need to periodically reestablish margin for future mortality improvements in the mortality assumption. It should be noted that there may still be times when minor adjustments to the mortality assumption are necessary due to changes in the plan’s mortality experience.

As part of the next actuarial experience study, we recommend that the retained actuary consider the applicability and appropriateness of a “generational” mortality assumption to reduce the need to periodically update the “static” mortality assumption to include margin for future mortality improvement.

### ***Turnover and the Probability of Retaining Membership in the System Upon Vested Termination***

The rates at which members are assumed to turnover (or leave active service) prior to eligibility for retirement are based on the member’s service. The current assumption was developed to be consistent with the actual experience of the MTRS members over the most recent experience study period. In our experience, most often turnover rates are more closely associated with service than with age and, therefore, we agree with the retained actuary’s decision to use service based rates. We believe that the turnover rate assumption is reasonable for the MTRS retirement program.

When a member with a vested benefit leaves active service prior to eligibility for retirement, they have a choice to: (1) retain their membership in the system and wait for the deferred annuity, or (2) request a refund of their contribution balance and cease membership in MTRS. There is currently an assumption pertaining to the percentage of vested members that choose to retain their membership when they leave active service (e.g., 54% at age 30, 58% at age 40, 70% at age 50, etc). This is a reasonable assumption based on our experience with similar retirement systems. However, the last two experience study reports (encompassing nine years of plan experience) did not include a detailed review of this assumption.

Due to the recent increases in member contribution rates and the introduction of less valuable benefits for new members, more terminating members could begin electing a refund of their contribution balance. As a result, we recommend that the retained actuary closely monitor this assumption and also include a detailed analysis in the next actuarial experience study report.

During our review of the detailed liability calculations for active members, we determined that this assumption was not being appropriately used in calculating the plan liabilities for those vested members that are assumed to take a refund of contributions upon termination. In particular, the sample of liability calculations that we reviewed indicated that the valuation was not appropriately applying the proportion of terminated vested members that are assumed to take a refund of contributions. This is discussed further in Section V.

### ***Observations on Other Pertinent Assumptions***

*Retirement* – Members are eligible to retire with a reduced benefit at age 50 (age 55, if hired after July 1, 2013). Additionally, members are eligible to retire with an unreduced benefit at age 60 or 25 years of service (age 60 or age 55 with 25 years of service, if hired after July 1, 2013). The rates at



which participants are assumed to retire are based on the member's age with a special higher rate established for the member's first year of retirement eligibility. Separate rates were also established for general employees and university employees. The current assumption was developed to be consistent with the actual experience over the most recent experience study period. We believe that the current retirement assumption is reasonable for the MTRS membership.

*Pre-Retirement Mortality* – The current pre-retirement mortality assumption for active members is based on the same assumption as the healthy annuitants. Due to the relatively low number of pre-retirement deaths, this is a common approach to this assumption. The current assumption for pre-retirement mortality is reasonable for this purpose.

*Disability Incidence* – The current assumption for disability incidence is based on a member's age. The rate of disability incidence is studied during each actuarial experience study but very little retirement plan experience generally exists in order to set a reasonable assumption based on actual retirement plan experience. The current assumption for disability incidence is reasonable for this purpose.

## ***Economic Assumptions***

### **General**

Economic assumptions simulate the impact of economic forces on the amounts and values of future benefits. Key economic assumptions are the assumed rate of investment return and assumed rates of future salary increase. All economic assumptions are built upon an underlying inflation assumption.

### **Actuarial Experience Study Report – Economic Assumptions**

In September 2013, the Actuarial Standard Board adopted changes to ASOP No. 27 which significantly reduced the reasonable range for an acceptable investment return assumption. The effective date for this new standard is for measurement dates on or after September 30, 2014. Generally speaking, the recently adopted version of the ASOP indicates that economic assumptions should be based on the actuary's estimate of future experience and no longer includes the "best-estimate range" standard.

In the most recent actuarial experience study report, dated May 1, 2014, the retained actuary generally followed the "best-estimate range" standard to assess the investment return assumption for MTRS. This approach was reasonable given that the experience study was conducted prior to the effective date of the newer version of ASOP No. 27. However, the analysis may not be appropriate to justify the investment return assumption for measurement dates on or after September 30, 2014.

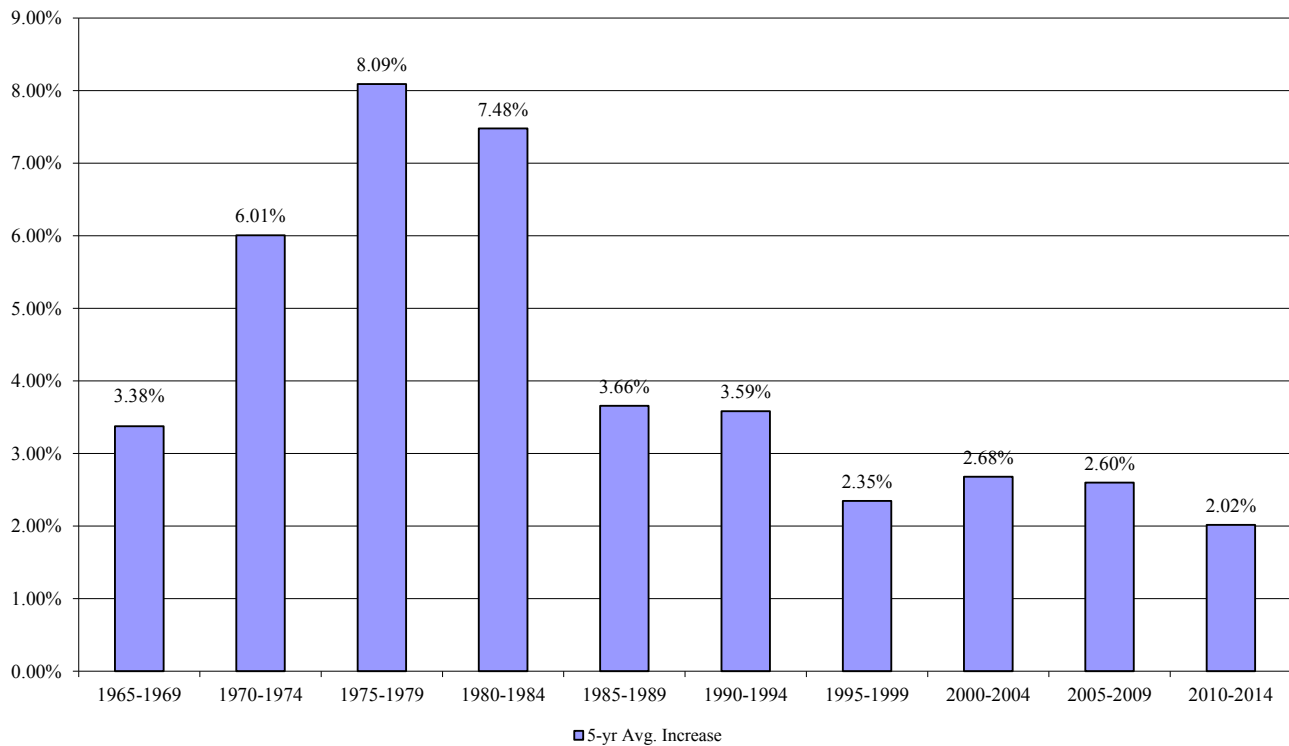
We recommend that the retained actuary update the assessment of the investment return assumption in the next experience study report to better reflect the requirements of the newly adopted ASOP No. 27. The retained actuary may also want to consider updating the assessment of the investment return assumption prior to preparing any actuarial communications with measurement dates on or after September 30, 2014 to ensure that the current assumption complies with the requirements of the newly adopted ASOP No. 27.

**Inflation**

By “inflation,” we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It primarily impacts investment return, salary increases, and payroll growth. The current annual inflation assumption for MTRS is 3.25%.

The chart on the next page shows the average annual inflation in each of the ten consecutive five-year periods over the last fifty years:

Average Annual Inflation  
CPI-U, Five-Calendar-Year Averages



Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

The table below shows the average inflation over various periods, ending June 2014:

Periods Ending June 2014	Average Annual Increase in CPI-U
Last five (5) years	2.02%
Last ten (10) years	2.31%
Last fifteen (15) years	2.43%
Last twenty (20) years	2.41%
Last thirty (25) years	2.64%
Last thirty (30) years	2.81%
Since 1913 (first available year)	3.19%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

As you can see, inflation has been relatively low over the last thirty years.

Most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the 2014 capital market assumption sets for eight investment consulting firms: BNY Mellon, PCA, NEPC, Mercer, Hewitt EnnisKnupp, JP Morgan, R.V. Kuhns, and Towers Watson. The average assumption for inflation was 2.50%, with a range of 2.25% to 3.25%. It should be noted that five of these investment consulting firms set their assumptions based on approximately a ten-year outlook, while actuaries must make much longer projections. The remaining three firms set their assumptions based on a 20- or 30-year outlook.

In the Social Security Administration's 2014 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.7% under the intermediate cost assumption. (The low cost assumption was 2.0% and the high cost assumption was 3.4%.) These inflation assumptions forecasts have not materially changed for several years.

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. In their forecast immediately preceding the July 1, 2014 actuarial valuation, second quarter of 2014, was for inflation over the next ten years to average 2.25%. Most observers expect inflation to continue to be low as the economy works out of the recession. However, the society of Professional Forecasters are predicting inflation to average 1.90% for the calendar year 2014 and 2.10% for the 2015 calendar year, so it is not just the next two years that is depressing inflation forecasts.

Another source of information is the Public Funds Survey that is prepared on behalf of the National Association of State Retirement Administrators (NASRA) and the National Council on Teacher Retirement Systems (NCTR). This report includes responses from 126 plans, including all of the largest public funds covering state employees or teachers. The current survey, published in January 2015, shows that the median inflation rate assumed for large public retirement systems in the U.S. is 3.00%, the average inflation rate is 3.16%, and 50 retirement systems in the survey have an inflation assumption at, or above, 3.25% (the current inflation assumption for MTRS).

The current explicit inflation assumption is 3.25% which was lowered from 3.50% as part of the most recent experience study. Many economists forecast inflation rates lower than the current 3.25% assumption, but these forecasts are often for shorter periods than are necessary in preparing an

actuarial valuation. We consider this assumption to be reasonable but we recommend that the retained actuary monitor this assumption closely. If actual inflation remains at the current low levels then the retained actuary may need to consider recommending a further change to this assumption in the next experience study.

### **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 current actuarial valuation includes an explicit expense assumption for administrative expenses in the normal cost and implicit expense assumption for investment expenses. We believe that these are appropriate methods for the actuarial valuation of MTRS.

Based on the actual administrative expenses and actual payroll from the past few years, the current assumption of 0.31% of payroll seems reasonable for the administrative expenses.

The following section will analyze how the investment expenses are incorporated into the investment return assumption.

### **Investment Return**

The investment return assumption is one of the principal assumptions in any actuarial valuation. It is used to discount future expected benefit payments to the valuation date to determine the liabilities of the retirement plan. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

MTRS participates in the Unified Investment Program that is overseen by the Montana Board of Investments. This Program is responsible for investing the state funds, including the public retirement plans in accordance with state law and the state constitution. The investment policy statement for the Program indicates that it seeks to generate long term investment performance that will exceed an annual target rate of return of 7.75%, net of expenses.

The current investment return assumption for MTRS is 7.75% which is consistent with the objective of the Unified Investment Program. We have analyzed the assumption based on a 3.25% inflation assumption plus an annual real rate of return of 4.50%, net of investment expenses paid from the trust.

We believe an appropriate approach to reviewing an investment return assumption is to determine the median expected portfolio return given the retirement plan's target allocation and a given set of capital market assumptions. Per the Target Allocation stated in the MTRS CAFR for the 2014 fiscal year, the target asset allocation for MTRS is:

Asset Class	Target
Broad US Equity	36.0%
Broad International Equity	18.0%
Private Equity	12.0%
Intermediate Bonds	23.4%
Core Real Estate	4.0%
High Yield Bonds	2.6%
Non-Core Real Estate	4.0%
<b>Total</b>	<b>100.0%</b>

Because GRS does not develop or maintain its own capital market assumptions, we reviewed assumptions developed and published by the following investment consulting firms:

- JP Morgan
- NEPC
- PCA
- Mercer
- RV Kuhns
- Towers Watson
- BNY Mellon
- Hewitt EnnisKnupp

These investment consulting firms issue reports that describe their capital market assumptions, which include their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-term expectations.

Given the current strategic target asset allocation set for MTRS and the investment firms' capital market assumptions for 2014, the development of the average nominal return, net of investment expenses paid from the trust, is provided in the table below:

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)-(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	7.39%	2.75%	4.64%	3.25%	7.89%	13.50%
2	7.20%	2.50%	4.70%	3.25%	7.95%	13.60%
3	7.19%	2.22%	4.97%	3.25%	8.22%	12.40%
4	8.74%	3.25%	5.49%	3.25%	8.74%	13.50%
5	7.85%	2.26%	5.59%	3.25%	8.84%	12.30%
6	7.91%	2.25%	5.66%	3.25%	8.91%	14.30%
7	8.33%	2.50%	5.83%	3.25%	9.08%	14.20%
8	8.39%	2.30%	6.09%	3.25%	9.34%	14.20%
<b>Average</b>	<b>7.88%</b>	<b>2.50%</b>	<b>5.37%</b>	<b>3.25%</b>	<b>8.62%</b>	<b>13.50%</b>

We determined, for each firm, the expected nominal return rate based on MTRS's target allocation and then subtracted that investment consulting firm's expected inflation to arrive at their expected real return in column (4). Then we added back MTRS's current 3.25% inflation to arrive at an expected

nominal return net of investment expenses. As the table shows, the resulting average arithmetic one-year return of the eight firms is 8.62%.

The forward-looking capital market assumptions and return forecasts developed by investment consulting firms already 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 net of investment expenses. Therefore, we did not make any additional adjustments to account for investment related expenses. This analysis also assumes that investment managers will generate enough alpha to at least cover the cost of the active management. No additional alpha for active management has been considered.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and understand the range of long-term net returns that could be expected to be produced by the investment portfolio. Therefore, the following table provides the 25<sup>th</sup>, 50<sup>th</sup>, and 75<sup>th</sup> percentiles of the 20-year geometric average of the expected nominal return, net of investment expenses paid from the trust, as well as the probability of exceeding the current 7.75% assumption.

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding 7.75% *
	25th	50th	75th	
(1)	(2)	(3)	(4)	(5)
1	5.03%	7.03%	9.06%	40.4%
2	5.08%	7.08%	9.13%	41.2%
3	5.65%	7.49%	9.36%	46.3%
4	5.89%	7.88%	9.92%	51.8%
5	6.31%	8.13%	9.98%	55.6%
6	5.86%	7.96%	10.11%	52.7%
7	6.07%	8.15%	10.28%	55.1%
8	6.32%	8.41%	10.54%	58.4%
<b>Average</b>	<b>5.78%</b>	<b>7.77%</b>	<b>9.80%</b>	<b>50.2%</b>

\*Plan's current return assumption net of expenses.

The table above documents that the average probability of exceeding the current 7.75% investment return assumption over a 20-year period is 50.2%.

As a point of reference, the Public Funds Survey published in January 2015 of 126 large public retirement systems reflects the nominal assumption in use, or announced for use, as of the date of the survey. The average investment return assumption for responding systems was 7.72%.

There are eight other public retirement systems (all administered by the State of Montana Public Employees' Retirement Board) that also participate in the Unified Investment Program along with MTRS. The current investment return assumption for these eight systems is 7.75% which is comprised of a 3.00% inflation assumption plus an annual real rate of return of 4.75%, net of investment expenses.

Based on this analysis, we believe that the current 7.75% investment return assumption satisfies the best-estimate assumption requirement under ASOP No. 27 as revised and adopted in September 2013 for measurement dates on or after September 30, 2014.

### **Earnings Progression**

Generally, assumed rates of pay increase are constructed as the total of three main components:

- Price Inflation – currently 3.25%
- Economic Productivity Increases (base pay increases above price inflation) – currently 0.75%
- Merit, Promotion, and Longevity – This portion of the salary increase assumption reflects components such as merit and promotional increases as well as “step” increases and longevity pay. This portion of the assumption varies based on member’s service and is not related to inflation.

In the context of a typical employer pay scale, pay levels are set for various employment grades, or “steps”. In general, this pay scale is adjusted as follows:

- The inflation and economic productivity assumptions, collectively referred to as wage inflation, reflect the overall increases of the entire pay scale, and
- The Merit, Promotion, and Longevity increase assumption reflects movement of members through the pay scale.

During the five-year period covered by the experience study, the country suffered through what is generally referred to as the “Great Recession”. The Great Recession caused severe financial hardship for many state and municipal governments which was passed onto employees in the form of very small pay increases, reductions in force, and furloughs. Given these financial hardships, the retained actuary opted to not make any changes to the merit portion of the salary increase assumption during the most recent experience study.

The current earnings progression assumption is reasonable and appropriate for this purpose.

### ***Summary***

The set of actuarial assumptions and methods, taken in combination, is reasonable and generally established in accordance with ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, and ASOP No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

We have the following recommendations regarding the actuarial assumptions:

- We recommend that the retained actuary include more detail regarding the “exposures” underlying the assumptions as part of the next experience study. This additional detail will allow the reader to better understand the credibility of the proposed assumption changes.

- We recommend that the retained actuary analyze the demographic experience separately for males and females in future experience studies to demonstrate that gender-neutral assumptions are appropriate for MTRS or provide a rationale for combining the groups.
- The retained actuary needs to correct the statement of the mortality assumption for healthy male annuitants in one of the following ways: (1) correct the statement of the mortality assumption in future actuarial communications to appropriately identify the underlying mortality rates, or (2) perform a corrected mortality analysis based on the correct underlying mortality rates.
- As part of the next actuarial experience study, we recommend that the retained actuary consider the applicability and appropriateness of a “generational” mortality assumption to eliminate the need to periodically update the “static” mortality assumption to include margin for future mortality improvement.
- In light of the recent increases in member contribution rates and the introduction of less valuable benefits for new members, we recommend that the retained actuary closely monitor the assumption for “Retaining Membership in the System Upon Vested Termination” and include a detailed analysis in the next actuarial experience study report.



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**SECTION IV**

**ACTUARIAL METHODS AND FUNDING POLICY**

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## Actuarial Methods and Funding Policy

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The ultimate cost of the retirement program administered by MTRS is equal to the benefits paid plus the expenses related to operating MTRS. This cost is funded through contributions to MTRS plus the investment return on accumulated contributions which are not immediately needed to pay benefits or expenses. The projected level and timing of the contributions needed to fund the ultimate cost are determined by the actuarial assumptions, plan provisions, participant characteristics, investment experience, and the actuarial cost method.

### *Actuarial Cost Methods*

An actuarial cost method is a mathematical process for allocating the dollar amount of the total present value of plan benefits (TPV) between future normal costs and actuarial accrued liability (AAL). The retained actuary uses the Entry Age Normal actuarial cost method (EAN Method), characterized by:

- (1) Normal Cost – the level percent of payroll contribution, paid from each participant's date of hire to date of retirement, which will accumulate enough assets at retirement to fund the participant's projected benefits from retirement to death.
- (2) Actuarial Accrued Liability – the assets which would have accumulated to date had contributions been made at the level of the normal cost since the date of the first benefit accrual, if all actuarial assumptions had been exactly realized, and there had been no benefit changes.

The EAN Method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain stable as a percentage of payroll over time, resulting in intergenerational equity for taxpayers. The recent Public Fund Survey, published in January 2015, surveyed 126 retirement systems (mostly statewide). Over 75% of the plans reported using the EAN Method. Therefore, the retained actuary's stated methods for allocating the liabilities of MTRS are certainly in line with national trends.

### **Application of Cost Method**

We believe that there is a more appropriate application of the EAN Method.

In order to determine the normal cost as a level percentage of pay, the valuation must first determine the future compensation that each individual member is expected to receive over the course of their career (which is also the compensation that the plan will receive contributions on). The calculation of this projected compensation should be determined in the same manner as the TPV. Specifically, the projection of the future compensation should be based on the salary that the participant is expected to receive according to the timing of the expected departures from active service (or, decrements).

Based on the sample test lives we reviewed, the TPV was developed assuming that participants leave active service (retirement, disability, withdrawal or death) in the middle of the year (i.e., receive a half-year of pay and service) in the year the member is expected to decrement. However, the future compensation was developed assuming members leave active service at the end of the year (i.e., receive a full year of pay) in the year the member is expected to decrement.

This difference in decrement timing creates a disconnect between the TPV and future compensation that can overstate the future compensation and understate the normal cost rate. In other words, the cost of plan benefits (i.e., TPV) was allocated across more projected compensation than the member is expected to receive. Consequently, this disconnect could mean that the system is receiving less contributions to eliminate the unfunded liability than is currently anticipated by the actuarial valuation.

Since the scope of the actuarial audit only included the review of a sample of individual member calculations, we cannot comment on the impact that this proposed procedure would have on MTRS in total. However, the following table illustrates the impact of the proposed enhancement to the actuarial cost method on the sample of members that we reviewed as part of the actuarial audit.

Test Case	Current Valuation Procedure				Proposed Valuation Procedure			
	PV of Benefits	Actuarial Accrued Liability	Normal Cost Rate	PV of Future Salary	PV of Benefits	Actuarial Accrued Liability	Normal Cost Rate	PV of Future Salary
1	94,653	81,867	11.16%	114,564	94,653	82,346	12.64%	97,354
2	43,986	7,589	11.09%	328,342	43,986	6,714	12.70%	293,586
3	31,981	5,518	11.09%	238,665	31,981	4,882	12.70%	213,402
4	65,926	16,976	11.77%	416,027	65,926	15,480	13.33%	378,335
5	174,910	136,266	8.67%	445,942	174,910	135,453	9.62%	410,283
6	65,588	22,014	8.54%	510,435	65,588	20,479	9.42%	478,801
7	28,256	3,051	7.65%	329,676	28,256	2,550	8.42%	305,217
8	4,719	1,016	11.09%	33,401	4,719	927	13.06%	29,034
9	153,651	101,545	9.27%	562,350	153,651	99,683	10.28%	524,829
10	31,863	11,156	8.68%	238,696	31,863	10,439	9.65%	222,104
TOTAL	695,533	384,614	9.66%	3,218,098	695,533	376,528	10.80%	2,952,944
Change					0	(8,086)	1.14%	(265,154)

It should be noted that the total shown in the table only represents the total of the 10 sample member calculations reviewed and it may not be representative of the impact on MTRS in total. Additionally, the results presented for the "Proposed Valuation Procedure" only reflect the change in the actuarial cost method and do not reflect any of the other proposed enhancements noted in this report.

A retirement system's ability to amortize the unfunded actuarial accrued liability (and the resulting calculation of the amortization period) is based on the amount of contributions that the retirement system receives above, and beyond, the normal cost. As a result, it is important that the normal cost rate be calculated in the most appropriate manner so that all stakeholders understand the cost of the benefits for current plan members as well as the amount of contributions available to amortize the unfunded actuarial accrued liability.

We recommend that the retained actuary update the application of the actuarial cost method to align the calculation of the projected compensation and the TPV so that the normal cost rate reflects the most appropriate allocation of plan costs over future compensation.

## ***Asset Valuation Method***

The market value of assets can experience significant short-term swings, which can cause large fluctuations in the development of the actuarially determined contributions required to fund the retirement systems. Thus, many systems use an asset valuation method which dampens these short-term volatilities to achieve more stability in the employer contribution. A good asset valuation method places values on a retirement plan's assets which are related to the current market value, but which will also produce a smoother pattern of costs.

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 actuarial valuation of MTRS currently utilizes a smoothed asset valuation method that immediately recognizes income equal to the expected return on market value of assets, based on the assumed valuation interest rate (7.75%). Differences between the assumed investment return and the actual market investment return are recognized over a four-year period. Further, the AVA cannot exceed 120% or be less than 80% of the market value of assets. This current method was first adopted for the July 1, 2007 actuarial valuation.

The smoothing method used for the actuarial valuation of MTRS is common among public employee retirement systems. We feel that this method complies with ASOP No. 44. Additionally, this method is reasonable and appropriately applied for the valuation.

## ***Funding Policy***

The recent recession and significant changes in accounting for public employee pension plans have resulted in a renewed focus on formal funding policies for public pension plans. Now, more than ever, public retirement systems need to have a sound, written funding policy to secure member benefits and mitigate the risks to the plan sponsor.

There have been reports issued by actuaries, governmental associations, and others to assist with the development of guidelines for funding policies, including:

- Report from the Pension Funding Task Force 2013 (convened by the Center for State and Local Government Excellence), titled "Pension Funding: A Guide for Elected Officials";
- GFOA Best Practice, titled "Core Elements of a Pension Funding Policy"; and
- Report in 2014 from the Conference of Consulting Actuaries Public Plans Community, titled "Actuarial Funding Policies and Practices for Public Pension Plans".

Developing a clear, written funding policy can help decision makers understand the tradeoffs related to reaching specified goals and document the reasoning that underlies the decisions. Through this process, decision-makers can come to a better understanding of the principles and practices that help sustain benefits over the long-term.

### **Current Contribution Rates**

The member, employer and State contribution rates are generally established by Title 19, Chapter 20, Part 6 of the Montana Code Annotated. For the fiscal year ending June 30, 2015, the statutory levels of contributions are the following:

- Member contribution of 8.15% of payroll,
- Employer contribution of 11.06% of payroll (increasing annually by 0.10% until reaching 11.96%),
- \$25 million contribution from the State, and
- University supplemental contributions of 4.72% of payroll for members of the Optional Retirement Plan.

Based on the results of the July 1, 2014 actuarial valuation, these statutory contribution levels are sufficient to amortize the unfunded actuarial accrued liability of MTRS within 28 years.

### **Formal Written Policy**

In May 2002, the MTRS Board adopted the first version of their Funding and Benefits Policy. As part of the Policy itself, this Policy is reviewed by the Board at least every two years.

The most recent version of the Policy, adopted September 28, 2012, is a very well-written and thorough policy that directs the Board of MTRS on how to manage the retirement plan “in a manner that best maintains the long-term stability of the retirement fund through a systematic and disciplined accumulation of resources for the purpose of paying promised benefits to plan participants over their lifetimes.”

For example, the Policy includes the following policies pertaining to actuarial funding and benefit modifications:

- Regularly scheduled actuarial valuations and experience studies,
- Circumstances where the actuary will recommend higher or lower fixed contribution rates,
- Circumstances where the Board will recommend to the Governor and legislature that funding should be increased and/or liabilities of the system be reduced, or
- Alternatively, circumstances where the Board will recommend contribution reductions and/or benefit modifications (until June 30, 2033).

The Board's Funding and Benefit Policy is a thorough document that thoughtfully monitors the health of MTRS from many perspectives. We believe that this funding policy could serve as a model to other retirement systems and we applaud MTRS for establishing and maintaining this Policy.

### ***Summary***

In general, we believe that the actuarial methods and funding policy are reasonable for MTRS and appropriately applied. We do recommend that the retained actuary update the application of the actuarial cost method to align the calculation of the projected compensation and the TPV so that the normal cost rate reflects the most appropriate allocation of plan costs over future compensation.

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**SECTION V**

**ACTUARIAL VALUATION RESULTS**

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## Actuarial Valuation Results

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### *Benefits*

Every employer is different and every employer's retirement plan is different. Each employer has a set of workforce and financial needs that dictate the type of retirement benefit that is most appropriate for their employees. Additionally, the amount of resources available to allocate to the retirement plan will dictate the level of benefits provided by the retirement plan. Regardless of the reasons for the benefit design, the employer must understand the liability and contribution requirements associated with the benefits promised. As a result, the actuarial valuation and the resulting funding policy contribution must properly reflect the benefit structure of the retirement plan.

In general, the benefits promised by MTRS were reasonably incorporated in the actuarial valuation of MTRS.

### *Data*

As part of our actuarial audit, we received a preliminary set of census data for plan participants and beneficiaries as of July 1, 2014 originally provided by MTRS to the retained actuary for the actuarial valuation. Additionally, we received a final set of census data for plan participants and beneficiaries as of July 1, 2014 used by the retained actuary for the actuarial valuation.

We used this data, along with the census summaries included the valuation report, to review the valuation data process. In total, we believe that the final valuation data used by the retained actuary is reasonable and valid for its purpose.

### *Actuarial Valuation Results*

#### **Calculation of the Amortization Period**

As stated in the previous section of the report, MTRS is scheduled to receive contributions from the following sources for the fiscal year ending June 30, 2015:

- Member contributions of 8.15% of payroll,
- Employer contributions of 11.06% of payroll (increasing annually by 0.10% until reaching 11.96%),
- \$25 million contribution from the State, and
- University supplemental contributions of 4.72% of payroll for members of the Optional Retirement Plan (until June 30, 2033).

Portions of these contributions are considered "supplemental" and can change over time based on factors such as the funded level of MTRS and the discretion of the Board.

The July 1, 2014 actuarial valuation indicates that the amortization period of MTRS is 28 years. We were able to replicate this calculation and we believe that it is an appropriate representation of the amortization period of MTRS based on the stated assumptions.

Given the conditional nature of portions of the contributions to MTRS, we recommend that the retained actuary clearly state the level of contributions included in the calculation of the amortization period including which contributions are assumed to change, if any, during the calculated period.

### **Review of Sample Liability Calculations**

As part of the actuarial audit, we requested sample member calculations from the retained actuary to ensure that the retained actuary valued the correct benefit levels, used the correct assumptions, and calculated the liabilities correctly on an individual basis.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and framework for calculating the actuarial results. When it comes to applying those actuarial standards to complex calculations, differences may exist due to individual opinion on the best way to make those complex calculations or other differences may occur due to nuances in the valuation software programming. This may lead to differences in the calculated results, but these differences should not be material.

**Active Participants.** At the onset of the review, we requested that the retained actuary provide sample liability calculations that show probabilities of decrement by age, estimated pay and benefits by age, and values of benefits or pay by age for each decrement in sufficient detail to verify the calculation of the present value of benefits, present value of pay, accrued liability and normal cost for 10 active participants. The retained actuary provided all of the requested detail for all 10 members.

We have previously noted our comments on the application of the actuarial cost method (Section IV) and the assumptions (Section III). We identified a few additional elements of the actuarial valuation of active participants that should be corrected for the next valuation.

Retaining Membership in the System Upon Vested Termination – The actuarial valuation report states the assumption for the percentage of vested terminations that are assumed to wait for their deferred benefit and not take a refund of contributions. Specifically, Table A-7 provides the following sample rates for the assumed “Probability of Retaining Membership in the System Upon Vested Termination”:

[1] Age	[2] Probability of Retaining Membership in the System	[3] <i>Implied Probability of Refund (100% minus Column 2)</i>	[4] Probability of Refund Applied
25	54 %	46 %	54 %
30	54	46	54
35	58	42	58
40	58	42	58
45	60	40	60
50	70	30	70
55	75	25	75



This assumption is appropriately used to calculate the plan liabilities for those members that are assumed to wait for their deferred benefit. However, this assumption is not being appropriately used in calculating the plan liabilities for those vested members that are assumed to take a refund of contributions. Specifically, the actuarial valuation is currently using the stated percentage to calculate the liability for vested members that are assumed to take a refund of contributions; however, the calculation should be based on "1 minus" the stated rates.

The actuarial valuation should be corrected to reflect the appropriate proportion of members that are assumed to take a refund of contributions upon termination.

*Postretirement Benefit Increases for Tier 2 Members* – All retirees are eligible for postretirement benefit increases after being retired for three years. This three-year deferral was appropriately incorporated into the actuarial valuation for Tier 1 members. However, the postretirement benefit increases were assumed to commence immediately following retirement in the actuarial valuation for Tier 2 members. The actuarial valuation should be corrected to appropriately reflect the three-year COLA deferral period for Tier 2 members.

*Minor Updates to Valuation Coding* – We noted a few additional corrections that we believe should be incorporated into the next actuarial valuation by the retained actuary. Each of these changes should have very little impact on the results of the actuarial valuation:

- The 0.63% load applied to the projected retirement benefits of university members "to account for the larger than average annual compensation increases observed in the years immediately preceding retirement" should not be applied to benefits expected to be paid to university members on account of death, disability and termination (prior to retirement eligibility).
- The actuarial valuation should be updated so that the assumed rate of retirement for university members at age 60 is 8.50% as stated in the actuarial valuation report.
- The actuarial valuation should be updated to reflect the fact that vested terminations are only covered by the \$500 death benefit for the one year following their termination and, once again, when the terminated member commences their deferred retirement annuity (they are not covered during the deferral period). Additionally, only the portion of the terminated members that are assumed to "retain membership in the system" should be covered by the \$500 death benefit after termination.
- The current valuation coding is using a benefit multiplier of 1.67% to calculate the plan benefits, where applicable. We recommend that the retained actuary update the valuation coding to use a benefit multiplier closer to the true multiplier of "one-sixtieth".

Based on our review of the other aspects of the actuarial valuation, the liability determination of active participants was reasonable and appropriately determined.

***Terminated Members and Annuitants.*** At the onset of the review, we requested that the retained actuary provide liability amount, benefit amount, form of benefit, age of participant, and age of beneficiary (where applicable) for 21 terminated members and annuitants. The retained actuary provided all of the information we requested regarding the terminated members and annuitants.

Based on our review, the liability determination of the terminated members and annuitants was reasonable and consistent with the stated assumptions and methods.

***Summary***

We believe that the valuation results were developed in a reasonable manner. In the next actuarial valuation, we recommend that the retained actuary incorporate the following enhancements into their actuarial valuation:

- Given the conditional nature of portions of the contributions to MTRS, we recommend that the retained actuary clearly state the level of contributions included in the calculation of the amortization period including which contributions are assumed to change, if any, during the calculated period.
- In the next actuarial valuation, we recommend that the retained actuary incorporate the following enhancements into their valuation of active participants: correctly reflect the proportion of members that are assumed to take a refund of contributions upon termination and appropriately reflect the three-year COLA deferral period for Tier 2 members.

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**SECTION VI**

**CONTENT OF THE VALUATION REPORT**

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## Content of the Valuation Report

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ASOP No. 4, Measuring Pension Obligations and Determining Pension Plan Costs, 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 pertinent items that should be included in an actuarial valuation report on a pension plan should include:

- The name of the person or firm retaining the actuary and the purposes that the communication is intended to serve.
- A statement as to the effective date of the calculations, the date as of which the participant and financial information were compiled, and the sources and adequacy of such information.
- An outline of the benefits being discussed or valued and of any significant benefits not included in the actuarial determinations.
- A summary of the participant information, separated into significant categories such as active, retired, and terminated with future benefits payable. Actuaries are encouraged to include a detailed display of the characteristics of each category and reconciliation with prior reported data.
- A description of the actuarial assumptions, the cost method and the asset valuation method used. Changes in assumptions and methods from those used in previous communications should be stated and their effects noted. If the actuary expects that the long-term trend of costs resulting from the continued use of present assumptions and methods would result in a significantly increased or decreased cost basis, this should also be communicated.
- A summary of asset information and derivation of the actuarial value of assets. Actuaries are encouraged to include an asset summary by category of investment and reconciliation with prior reported assets showing total contributions, benefits, investment return, and any other reconciliation items.
- A statement of the findings, conclusions, or recommendations necessary to satisfy the purpose of the communication and a summary of the actuarial determinations upon which these are based. The communication should include applicable actuarial information regarding financial reporting. Actuaries are encouraged to include derivation of the items underlying these actuarial determinations.
- A disclosure of any facts which, if not disclosed, might reasonably be expected to lead to an incomplete understanding of the communication.

We have reviewed the actuarial valuation report prepared by the retained actuary and we have noted a few modifications to the report that would allow the report to adhere more closely with ASOP Nos. 4 and 41.

### **Actuarial Certification**

The cover letter of the actuarial valuation report includes a certification of the actuarial credentials for the actuaries that prepared the actuarial valuation. The current certification is reasonable. However, we would recommend this certification be enhanced to directly reference the Qualification Standards of the American Academy of Actuaries. Specifically, the Section 5 of the Qualification Standards indicates that Statements of Actuarial Opinion should include an appropriate acknowledgment of qualification, such as the following:

*I, [Name], am [Position] for [Company]. I am a member of the American Academy of Actuaries [or other organization] and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.*

It should be noted that Section 4.1.3 of ASOP No. 41 also requires that all actuarial communications include an acknowledgement of the actuary's qualification as specified in the Qualification Standards.

### **Body of the Report**

The "GABA" acronym is used frequently throughout the report but this acronym is never described in the report. The Guaranteed Annual Benefit Adjustment (GABA) is obviously an important component of the actuarial valuation, so it is no surprise that this provision is frequently referenced. We recommend that a description of the acronym be added to the body of the actuarial valuation report or defined in the Glossary.

### **Appendix A, Actuarial Procedures and Assumptions**

The presentation of actuarial methods and assumptions is generally complete and understandable. The methods described in this section are reasonable and appropriate for public retirement plans.

We do have the following suggestions to improve the overall communication of the valuation assumptions.

**Postretirement Benefit Increases** – The summary of assumptions in the actuarial valuation report currently includes a thorough description of the assumed postretirement benefit increases for Tier 1 members. We recommend that the summary of assumptions be enhanced to also describe the assumed postretirement benefit increases for Tier 2 members.

**Part-time Employees** – The retained actuary modifies the data for part-time employees (those that earn more than \$1,000) in order to calculate a more reasonable actuarial liability for these members. We believe that the retained actuary's methods are reasonable. However, we recommend that the summary of assumptions be enhanced to describe the modifications made to the data for part-time employees.

**Mortality among service retired members and beneficiaries (Table A-1, Item II.D.)** – As discussed in Section III of this report, the rates of mortality for healthy male annuitants after age 50 stated in Table A-5 of the actuarial valuation report do not correspond to the stated mortality assumption. The actual mortality rates used in the actuarial valuation for healthy male annuitants after age 50 were consistent with the "1992 Base Year Rates" shown in Table 3-1 of the RP-2000 Mortality Table Study published by the Society of Actuaries in July 2000. Future actuarial communications should be updated to include an appropriate description of the mortality assumption for healthy male annuitants after age 50.

Even though these mortality rates were mis-identified, we believe that the mortality analysis (performed on the unintended mortality rates) summarized in the actuarial experience study report, dated May 1, 2014, produced a reasonable mortality assumption that reflects the actual experience of MTRS.

Additionally, we recommend that the retained actuary explicitly state the level of conservatism that is included in the current mortality assumption to account for future mortality improvement. The current summary in the actuarial valuation report complies with ASOP No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations, which instructs the actuary to disclose the mortality assumption in sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. However, the retained actuary clearly states the level of conservatism (17% for healthy males and 11% for healthy females) in the actuarial experience study report. It would improve the overall communication of mortality assumption in the actuarial valuation report if the retained actuary included the actual level of conservatism that is included in the current mortality assumption to account for future mortality improvement.

**Mortality Annual Rates (Table A-5)** – Table A-5 provides a summary of assumed mortality rates at selected ages. The mortality rates stated in this table are the rates associated with the base mortality table (prior to the stated mortality improvements). Since the mortality assumption used in the actuarial valuation is static (rates do not change in future calendar years) we believe that it would improve the overall communication of the actuarial valuation report if Table A-5 provided the assumed mortality rates reflecting the stated mortality improvements.

**Ages of Dependent Children** – The actuarial valuation currently assumes that members who die prior to age 50 have a dependent child that is eight years old. Additionally, the actuarial valuation currently assumes that members who die after age 50, but prior to age 55, have a dependent child that is 13 years old. We recommend that Appendix A of the actuarial valuation report be enhanced to include a statement about the assumed ages of dependent children.

### **Appendix B, Summary of Benefit Provisions**

The presentation of the major plan provisions is generally complete and understandable. We do have the following suggestion to improve the overall communication of the plan provisions.

**Normal Retirement Benefits** – The valuation report currently indicates that Tier 2 members receive a retirement allowance equal to “185/100 of final compensation for each year of service.” This statement does not communicate the appropriate proportion for the rate of benefit accruals for Tier 2 members. The rate of benefit accrual for Tier 2 members should be updated to state that the retirement allowance is equal to “1.85% of final compensation for each year of service.”

### ***Summary***

In general, the actuarial valuation report complied with the applicable Actuarial Standards of Practice. In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the July 1, 2014 actuarial valuation, we recommend that the retained actuary incorporate the noted enhancements in future actuarial valuation reports.

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**SECTION VII**

**ADEQUACY OF ACTUARIAL FACTORS**

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## Adequacy of Actuarial Factors

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It is generally considered good practice for a retirement system to periodically update the factors used for the administration of the retirement system so that all of the optional forms of payment and service available to plan members are equivalent, in value, as provided for by statute (19-20-702, MCA).

The current actuarial factors in use by MTRS are based on the assumptions adopted by the Board on May 13, 2010. It is our understanding that the retained actuary is currently updating the actuarial factors to reflect the assumptions adopted by the Board on May 13, 2014.

As part of the actuarial audit, we evaluated the methodology used by the retained actuary to establish the actuarial factors provided to MTRS. Our evaluation focused on the current actuarial factors in use by MTRS (based on the assumptions adopted by the Board on May 13, 2010).

### **Optional Allowances and Early Retirement Reduction Factors**

An optional form of benefit, where payments are expected to continue after the member dies, is a form of life insurance. The retirement system is the insurer. If the retired member dies before the beneficiary, the benefit will be continued throughout the life of the beneficiary if a joint and 100% survivor option is elected. If the retired member elects a straight life benefit, it will terminate at death of the retired member (except possibly for a refund of member contributions if death occurs soon after retirement). The monthly payments to the beneficiary under the option constitute the insurance settlement.

According to statute (19-20-702, MCA), optional benefits are intended to be "actuarial equivalent" to the straight life benefit. This means that if the straight life benefit is \$1,000, any optional benefit must also be worth \$1,000. However, under an option, not all of the benefit is provided in cash. Some of it is provided as survivor insurance. The retirement system subtracts the insurance premium from the \$1,000 to get the net amount payable.

The primary Optional Allowances available to MTRS members at retirement are:

- Joint and Full to the Joint Annuitant (Option A)
- Joint and One-Half to the Joint Annuitant (Option B)
- Joint and Two-Thirds to the Joint Annuitant (Option C)
- 10-Year Certain & Life
- 20-Year Certain & Life

Also according to statute (19-20-802, MCA), early retirement allowances are also reduced using "actuarial equivalent" factors. These Early Retirement Reduction Factors produce a benefit reduction such that a smaller benefit commencing at an earlier age has the same value as a benefit deferred to a later age.

Based on the assumptions adopted by the Board on May 13, 2010, we were able to replicate all Joint and Survivor Optional Form Factors as well as the Early Retirement Reduction Factors provided by the retained actuary to MTRS, and believe that the methods used to produce these factors are reasonable.

Using these same methods, we were unable to replicate the 10-Year and 20-Year Certain & Life Factors. As of the date of this report, we were unable to ascertain the source of the difference and are unable to



opine on the method used. Factors at retirement ages of 65 and younger were within 1%; however differences increased in magnitude at older ages. We recommend that this difference be resolved prior to the release of the factors based on the assumptions adopted by the Board on May 16, 2014.

### **Service Purchases**

The goal in the development of the service purchase methodology is to set the cost of purchasing service at a level which should make the retirement system indifferent as to whether a member makes the purchase. Therefore, the service purchase cost is generally determined from the retirement system's perspective and not necessarily from the member's perspective.

In order for the retirement system to be indifferent about the service purchase, the cost of the service purchase must be approximately equal to the expected increase in the present value of the retirement system's obligation to that member following the service purchase. Therefore, the cost of service purchase must incorporate the actuarial assumptions adopted by the Board for purposes of preparing the annual actuarial valuation.

We have reviewed the Excel-based tool prepared by the retained actuary that is used by MTRS for calculating the cost of purchasing service credit. In general, the tool follows acceptable actuarial methods by comparing the present value of benefits both before and after the service purchase. However, the tool does not incorporate salary increases that are assumed to occur between the purchase date and the projected retirement date.

In our experience, it is more common to incorporate the assumed salary increases into the cost of service purchase. Further, we believe this procedure would result in a more stable service purchase cost. In some instances the workbook (which only considers the member's salary at the time of purchase) produces costs we would consider too high and, in other instances, it produces costs we would consider too low. Because the cost of future benefits are being discounted back to the purchase date at the valuation interest rate, it is our opinion that the lack of assumed salary increases causes a disconnect. This disconnect is especially evident in cases where a service purchase changes the expected retirement date and in cases where the purchase is made earlier in an employee's career (where the employee is still many years from retirement eligibility). We recommend using a salary increase assumption that is at least as much as the value of assumed wage inflation (currently 4.00%). This enhanced procedure would align that the cost of service purchases better with the actuarial valuation assumptions.

Additionally, there are a few technical issues with formulas contained within the workbook where the tool uses an incorrect Early Retirement Reduction Factor (ERF). In some circumstances, the tool produces a missing ERF which causes an error and the tool is unable to produce a cost. These issues are primarily related to the rounding of the ages that are used in the "lookup" functions for referencing the ERF table.

In some cases, the ERF factor is actually available through the lookup, however the service-based (highlighted in yellow in the Excel-based tool) retirement section of the ERF lookup table does not appear to be appropriately interpolated across retirement ages. As an example, all ERF factors for service-based retirements where the member has 20 years of service at retirement assume the member retires at age 55, rather than the age specifically calculated.

We can provide more detail to the retained actuary on both the lookup and age interpolation issues, if necessary.

It should be noted that there are many different procedures that actuaries can use to calculate the cost of service purchase and these procedures can vary significantly from actuary to actuary. Our comments are based on our preferred methods for calculating service purchases, but there could be other reasonable procedures to calculate the cost of service purchases.

### ***Summary***

In general, the actuarial factors provided to MTRS by the retained actuary are reasonable and consistent with the actuarial valuation assumptions adopted by the Board on May 13, 2010. We recommend incorporating salary increases that are assumed to occur between the purchase date and the projected retirement date into the cost of service purchases in order to align the cost of service purchases better with the actuarial valuation assumptions. We also recommend that the Certain and Life Optional Form Factor Methodology be verified before releasing the updated factors.

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**SECTION VIII**  
**FINAL REMARKS**

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## Final Remarks

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The auditing actuarial firm, Gabriel, Roeder, Smith & Company (GRS), is independent of the retained actuarial firm. The auditing actuaries are not aware of any conflict of interest that would impair the objectivity of this work.

We have presented many suggestions for areas where we believe the product can be improved. The retained actuary has access to information and a long history of retirement plans similar to MTRS. We understand that the retained actuary may agree with some of our recommendations, while rejecting others. We ask that the retained actuary and MTRS consider our recommendations carefully. We hope that the retained actuary and MTRS find these suggestions useful.