New Hampshire Retirement System

2023 Actuarial Audit

Prepared by:

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July 28, 2025

Board of Trustees
New Hampshire Retirement System
54 Regional Drive
Concord, NH 03301

Re: **Actuarial Audit of June 30, 2023 Valuation**
New Hampshire Retirement System

Dear Members of the Board:

The enclosed report presents the findings from our actuarial audit of the June 30, 2023 actuarial valuation of the New Hampshire Retirement System (NHRS) prepared by the retained actuary for NHRS, Gabriel, Roeder, Smith & Company (GRS). 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 June 30, 2023 valuation report. As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable, taking into account the experience of NHRS 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 NHRS 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.

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In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the NHRS 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 credentialed 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 NHRS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning NHRS' 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 NHRS. We are not aware of any relationship that would impair the objectivity of our work.

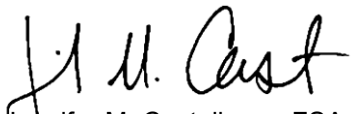
We would like to express our appreciation to both GRS and NHRS staff for their assistance in supplying the data and information on which this report is based.

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
Principal & Consulting Actuary



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1. Summary of the Findings

Purpose and Scope of the Actuarial Audit

In this actuarial audit, we reviewed the June 30, 2023 actuarial valuation and experience study for the New Hampshire Retirement System (NHRS) by the NHRS retained actuary. This review is focused on whether:

- The demographic and financial information used by the retained actuary are appropriate in the NHRS June 30, 2023 actuarial valuation report and most recent actuarial experience study.
- The actuarial valuation assumptions are reasonable and consistent with generally accepted actuarial standards and practices, are reasonable based on NHRS' experience, and are appropriate for NHRS' structure and funding objectives.
- The retained actuary's valuation methods and procedures are reasonable and consistent with generally accepted actuarial standards and practices, and are appropriate for NHRS' structure and funding objectives.
- The retained actuary's valuation results reflect the requirements set forth in State statutes and Board policies.
- The retained actuary's valuation results are reasonable, including analysis of contribution rates and accrued liabilities.
- The recommended assumption changes in the latest experience study are reasonable and in compliance with Actuarial Standards of Practice.
- The valuations were performed by qualified actuaries and were performed in accordance with principles and practices prescribed by the Actuarial Standards Board.

Actuarial Audit Conclusion

Based on our review of the census data, experience study documents, liability replications, and actuarial valuation reports, we believe the June 30, 2023 actuarial valuation and experience study for NHRS are 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 NHRS going forward.

Membership Data

We performed tests on both the raw data supplied by NHRS 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 June 30, 2023 actuarial valuation for NHRS. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice.

Actuarial Liabilities

We independently calculated the normal cost and actuarial liabilities of NHRS for an individual sample set of participants. In general, we found that all significant benefit provisions were accounted for in an accurate manner,

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the actuarial assumptions and methods are being applied correctly, and that our liability replications closely matched those calculated by the retained actuary. A summary is shown in Exhibit 4-1.

Funding

We reviewed the calculations of the Actuarially Determined Employer Contribution (ADEC) Rates for the groups participating in NHRS. Additionally, we evaluated the application of the Actuarial Cost Method. We believe the calculation of the Actuarially Determined Employer Contribution Rate and the application of the Actuarial Cost Method are reasonable. We recommend that the retained actuary consider aligning the two calculations of gain/loss in the report to enhance the report's ability to communicate the sources of gain/loss.

Actuarial Assumptions (Economic)

We reviewed the economic assumptions used in the June 30, 2023 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, 2023.

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, 2023. Based on this review, we believe the demographic assumptions used in the valuation are reasonable. We offer the following recommendations for monitoring assumptions and the next actuarial experience study:

- We recommend that the retained actuary note the number of annuitants who died in the next mortality experience analysis to provide additional context to the analysis and enhance the readers' ability to judge the credibility of the underlying data.
- We recommend that the retained actuary provide additional justification in future experience study reports when adjusting the experience for certain groups during potentially anomalous experience periods.
- We recommend the retained actuary comment on the beneficiary mortality assumption in future experience study reports, considering the appropriateness of the Contingent Survivor mortality tables for beneficiaries following the death of the primary annuitant, and provide rationale for the final tables selected.
- We recommend that the retained actuary closely monitor the Teachers' select period withdrawal assumption to ensure that the assumption continues to be reasonable.
- We recommend not "rounding down" the recommendation for the End of Career Payment assumption at the conclusion of the analysis to avoid any perceived bias in the assumption.

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.

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2. Membership Data

Actuarial Audit Conclusion

We performed tests on the raw data supplied by NHRS staff to the retained actuary that was processed and used 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 NHRS 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 NHRS 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 NHRS. 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 NHRS and the valuation data used by the retained actuary.

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Exhibit 2-1
Member Statistics as of June 30, 2023

	Retained Actuary	Milliman	Ratio of Milliman / Retained Actuary
Active			
Total number*	48,589	48,586	100.0%
Average age*	46.3	46.3	100.0%
Average service*	11.3	11.3	100.0%
Covered Payroll (in thousands)	$ 3,178,096	$ 3,185,178	100.2%
Terminated Members			
Non-Vested Terminated	18,826	18,826	100.0%
Vested Terminated	3,266	3,266	100.0%
Annuitants			
Total number	43,603	43,598	100.0%
Annual Benefits (in thousands)	$ 968,769	$ 967,503	99.9%

** Excludes active members with reported pays being $0 and active members with reported service less than 0.*

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3. Actuarial Value of Assets

Actuarial Audit Conclusion

We have reviewed the calculation of the actuarial value of assets (AVA) used in the June 30, 2023 actuarial valuation of NHRS. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with actuarial standards of practice.

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 June 30, 2023 actuarial valuation of NHRS determined the smoothed asset valuation method by spreading the difference between each year's expected return on the AVA and actual return on the MVA over a five-year period. Specifically, the Actuarial Value of Assets is equal to the AVA at the beginning of the year, adjusted for the non-investment net cash flow, plus the expected return on the AVA, plus the sum of the following:

1. 20% of the difference between the actual return on the MVA and the expected return on the AVA in the first year preceding the valuation date,
2. 20% of the difference between the actual return on the MVA and the expected return on the AVA in the second year preceding the valuation date,
3. 20% of the difference between the actual return on the MVA and the expected return on the AVA in the third year preceding the valuation date,
4. 20% of the difference between the actual return on the MVA and the expected return on the AVA in the fourth year preceding the valuation date, and
5. 20% of the difference between the actual return on the MVA and the expected return on the AVA in the fifth year preceding the valuation date.

The final Actuarial Value of Assets may not be less than 80% nor more than 120% of Market Value of Assets. The Conference of Consulting Actuaries Public Plans Committee published a white paper on model actuarial funding policies which include guidelines for asset smoothing. In our opinion, the method used for NHRS of smoothing over five years with a 20% corridor falls in the "Model Practice" category under these guidelines.

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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 pension liability amounts for 28 participants (12 active participants, four terminated participants, and 12 annuitants) and individual medical subsidy liability amounts for two annuitants. We prepared an independent replication of the liabilities for these participants based on the plan provisions, the valuation assumptions, and actuarial cost method.

Replication Process

We independently calculated the liabilities for the sample of participants 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 NHRS staff.

Assumptions: We used the assumptions disclosed in the June 30, 2023 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 June 30, 2023 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 NHRS based on the assumptions and methods.

Benefits: We obtained this information from the NHRS 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 30 Individual Participants

	Retained Actuary	Milliman	Ratio of Retained Actuary/ Milliman
Active Sample Lives			
Present Value of Future Benefits	$ 4,069,000	$ 4,097,000	99.3%
Actuarial Accrued Liability	3,198,000	3,211,000	99.6%
Inactive and Annuitant Sample Lives			
Present Value of Future Benefits	$ 4,809,000	4,825,000	100.3%
Medical Subsidy Annuitant Sample Lives			
Present Value of Future Benefits	$ 197,000	198,000	100.5%

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5. Funding

Actuarial Audit Conclusion

We have reviewed the calculations of the Actuarially Determined Employer Contribution Rates for the groups participating in NHRS. Additionally, we have also evaluated the application of the Actuarial Cost Method. We believe the calculation of the Actuarially Determined Employer Contribution Rate and the application of the Actuarial Cost Method are reasonable. We recommend that the retained actuary consider aligning the two calculations of gain/loss in the report in order to enhance the report's ability to communicate the sources of gain/loss.

NHRS Board's Funding Policy

The NHRS Board most recently updated the Funding Policy on March 10, 2020. The statute that establishes the pension funding policy for NHRS is RSA 100-A:16. The key aspects of the Policy pertaining to the unfunded liability include:

Purpose: The main financial objective of the funding policy is to fund the long-term cost of benefits provided by statute to plan members and beneficiaries.

Policy: The funding objective is to achieve 100% funding. For this purpose, 100% funding means that the Actuarial Value of Assets equals the Actuarial Accrued Liability. The amortization objective is to reach 100% funding by June 30, 2039 for the Unfunded Accrued Actuarial Liability as of June 30, 2017.

The policy goes on to address other issues, including risk management. In general, we believe this is a reasonably constructed Funding Policy. The actual contributions for NHRS are determined based on this policy.

Funding Results

Amortization of UAAL

Pursuant to the Laws of 2018, Chapter 48, RSA 100-A:16, II(e), was revised in June 2018 and stipulates that the Unfunded Accrued Actuarial Liability (UAAL) as of June 30, 2017 shall be amortized through 2039. It further states that each subsequent change in liability as calculated in odd-numbered years will be amortized as a level percentage of pay for no longer than 20 years. For each Actuarial Valuation in the subsequent odd-numbered years, a new 20-year amortization, as a level percentage of payroll, of the actuarial gain or loss will be created in that actuarial valuation.

The NHRS June 30, 2023 actuarial valuation report indicates that the remaining amortization period of the initial UAAL as of June 30, 2017, the period until the UAAL is expected to be eliminated, is 14 years as of June 30, 2025 for each covered group. This is consistent with the initial UAAL being fully amortized by 2039. Each subsequent change in liability as calculated in odd-numbered years has a separate closed amortization period of 20 years.

We believe that the scheduled amortization payments are reasonable and consistent with RSA 100-A:16 II(e).

Actuarially Determined Employer Contribution Rate

The Summary of Results in the actuarial valuation report indicates that the average Employer Pension Contribution Rate is 14.67% and 18.07% of pay for State members and Political Subdivision members, respectively. The Total Contribution Rate consists of two pieces: the Normal Cost Rate and the UAAL Payment Rate. The Employer Contribution Rate is equal to the Total Contribution Rate minus the Member Contribution Rate.

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The NHRS June 30, 2023 actuarial valuation report indicates that Normal Cost Rates from the first year of the rate setting biennium are projected forward to better reflect the impact of the changing benefit tiers and generational mortality. The total normal cost for the active populations of the four member classifications is expected to trend each year towards the rates for new hires. The retained actuary developed projected Normal Cost Rates based on a new entrant profile determined by the current active population with 3-8 years of service. In addition, the retained actuary included an adjustment to the Normal Cost Rate to reflect administrative expenses expected to be paid from plan assets. We believe the approach used to develop the Normal Cost Rate is reasonable. The retained actuary could consider showing the Normal Cost Rates both as of the valuation date as well as at the beginning of the next biennium to demonstrate the effect and reasonability of this adjustment.

Contribution Lag

The June 30, 2023 actuarial valuation determines the employer contribution rates for fiscal years 2026 and 2027. Currently, the UAAL amortization schedules are designed to pay every dollar of the projected UAAL as of June 30, 2025 over the established amortization periods. Additionally, the normal cost is projected to the beginning of the 2026 fiscal year to better reflect the impact of the changing benefit tiers and generational mortality.

The recent revisions to ASOP No. 4 directly address the concept of the timing lag:

> *3.20 CONTRIBUTION LAG*
>
> *When calculating an actuarially determined contribution, the actuary should consider reflecting the passage of time between the measurement date and the expected timing of actual contributions.*

We believe the retained actuary's procedure for incorporating the contribution lag into the contribution calculation is reasonable and consistent with the guidance in ASOP No. 4.

Analysis of Gain/Loss

A key component of an actuarial valuation is the Gain and Loss Analysis. According to ASOP No. 4, the definition of Gain and Loss Analysis is: "*An analysis of the effect on the plan's funded status between two measurement dates resulting from the difference between expected experience based upon a set of assumptions and actual experience.*" Essentially, the analysis reconciles the unexpected changes in the UAAL from one valuation to the next.

Section 3.22 of ASOP No. 4 goes on to state, in part: *When performing a funding valuation, the actuary should perform a gain and loss analysis for the period between the prior measurement date and the current measurement date […] If a gain and loss analysis is performed, the actuary should at least separate the total gain or loss into investment gain or loss and other gain or loss.*

Page 21 of the June 30, 2023 valuation report presents an allocation of the sources of gain/loss in the UAAL for each group. The following tables restates the original table from the report (in millions).

	Employees	Teachers	Police	Fire	Total
Impact of Experience (Gain)/Loss	(6.6)	8.9	48.3	32.6	83.2
Impact of Assumption Change	(66.3)	(11.0)	5.1	(2.4)	(74.6)
Impact of Plan Change	18.7	25.2	(6.4)	(3.8)	33.7

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Similarly, the "Amortization of Unfunded Actuarial Accrued Liability Schedule" for each group (pages 46, 51, 56, and 61) present the similar categories for gain/loss in the UAAL based on the results of the same June 30, 2023 actuarial valuation. There is a two-year timing difference for the stated dollar amounts but the gains and losses should be attributed to the same sources so the magnitude of the amounts should be similar.

	Employees	Teachers	Police	Fire	Total
Impact of Experience (Gain)/Loss	22.9	(19.1)	57.2	5.4	66.4
Impact of Assumption Change	(77.7)	(7.5)	8.3	(1.3)	(78.2)
Impact of Plan Change	21.3	28.7	(7.3)	(4.3)	38.4

We believe it would enhance the overall understanding of the actuarial valuation and the identified sources of gain/loss for these two disclosures of gain/loss to be better harmonized.

For the table on page 21, it appears that the "expected UAAL" is calculated based on the actual contributions for the year based on the accompanying calculations on page 32. It appears that the "expected UAAL" is calculated based on the expected contributions for the year for the second set of gain/loss sources. This difference could explain a portion of the apparent differences.

There is a comment on page 25 that may be attempting to generally address these differences. Regardless, we believe the overall communication of unexpected changes in the UAAL would be enhanced by aligning these gain/loss calculations associated with the results of the June 30, 2023 valuation.

Actuarial Cost Method

The June 30, 2023 actuarial valuation for NHRS prepared by the retained actuary uses the Entry Age Normal Actuarial Cost Method. This actuarial cost method is consistent with the guidance in the Board's Funding Policy. The law stipulates under RSA 100-A:16 the use of the Entry Age Normal Actuarial Cost Method for each of the four member classifications. We agree that it is appropriate for valuing the costs and liabilities of NHRS 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 Normal Actuarial Cost Method. The focus of the Entry Age Normal Actuarial 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 Normal Actuarial Cost Method is the only permissible cost method for financial reporting purposes.

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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 benefits administered by NHRS. 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 NHRS 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 June 30, 2023 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, 2023.

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 Nos. 27 and 35, since those were the standards that applied as of the June 30, 2023 valuation date and experience study.

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 NHRS. 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 No. 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 No. 27, unless that assumption has been prescribed by someone with the authority to do so.

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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. The inflation assumption was increased from 2.00% to 2.25% for the June 30, 2023 actuarial valuation based on the results of the most recent experience study.

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, U.S. 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. 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.

Forecasts of Inflation: As noted by the retained actuary, the assumed rate of inflation must be based on a forward-looking expectation of future experience.

The retained actuary presents price inflation expectations over the next 30 years from many sources in the most recent actuarial experience study report. For example, 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 2.40% as of November 13, 2023.

Most investment consultants and economists look 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 and 2023 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 NHRS 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 was 2.47% in the March 2024 NASRA Issue Brief.

Conclusion: We believe that a 2.25% assumption is reasonable for a June 30, 2023 actuarial valuation of a retirement system.

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).

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The General Wage Inflation assumption was increased from 2.75% to 3.00% for the June 30, 2023 actuarial valuation as a result of the most recent actuarial experience study. This growth includes increases in wages through inflation of 2.25% 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 versus 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 notes that this data implies real wage growth of about 0.9% over the past 10 years.

Forecasts for Future Wage Growth: Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2023 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 2.25%, this results in a total general wage inflation assumption of 3.00%.

Payroll Growth Assumption

Payroll is projected to grow in the development of the years to fund the Unfunded Actuarial Accrued Liability. The current payroll growth assumption is equal to 2.50% for Teachers and 3.00% for all other groups. The assumption for Teachers is lower because it incorporates the assumption that the active member population is assumed to decrease 0.5% per year. 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.

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 6.75% per year includes two components: (1) inflation of 2.25%, and (2) a real rate of return equal to 4.50%. This approach of splitting the net return into separate pieces is called the “building block” method.

Long-term Expected Investment Return: To develop an analytical basis for assessing the investment return assumption, the retained actuary used capital market expectations from the GRS 2023 Capital Market Assumption Modeler (CMAM), which includes information from 11 investment advisors. Based on this analysis, the 10-year average 50th percentile geometric annual real return was 4.50%. We agree that the geometric annual return is the appropriate measure. This is a reasonable approach to the analysis.

To provide some additional perspective on this assumption, the chart below shows the assumptions used by over 130 of the largest U.S. public sector systems in a regularly updated survey published by the National Association

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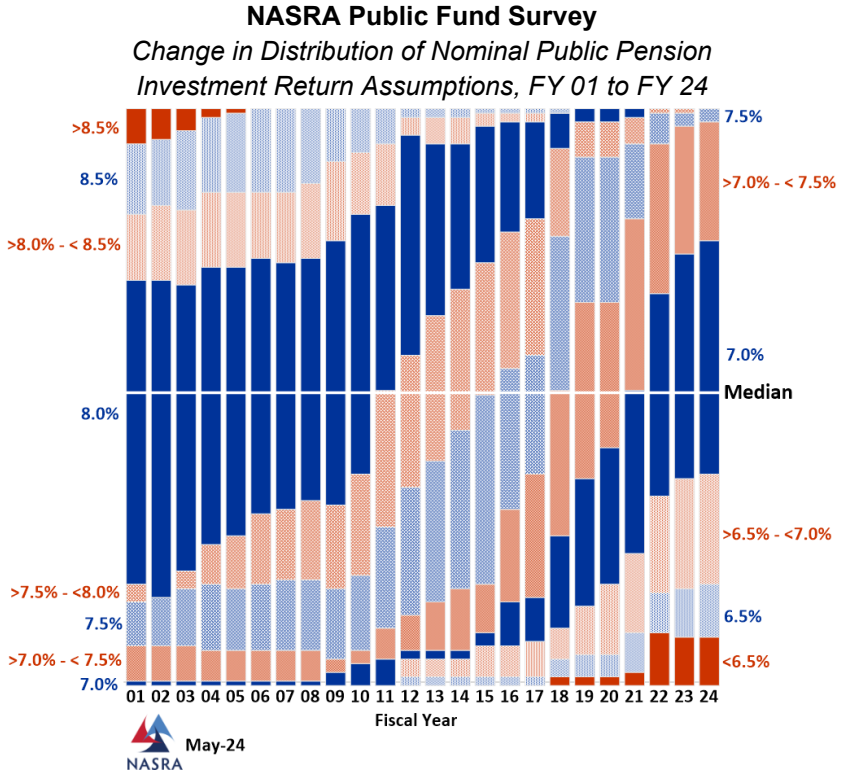
of State Retirement Administrators (NASRA). As can be seen from the chart, the trend over time has been for systems to lower their investment return assumptions.



Based on Milliman's current capital market assumption model as of June 30, 2024 and NHRS' Target Asset Allocation from the experience study report, we would expect a 10-year geometric median assumed real return of 4.19% and a 20-year geometric assumed real return of 4.62%.

Conclusion: We find the 6.75% investment return assumption is reasonable for funding and financial reporting purposes.

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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, 2023. 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, 2019 through June 30, 2023. Because this period includes time periods that were affected by the COVID pandemic, the retained actuary extended the analysis to cover the period of 2016 through 2023, where necessary. We believe this was a reasonable approach.

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-weighted 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 assumption in the most recent experience study. The retained actuary discusses the appropriateness of the 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 annuitants who died 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. A "headcount-weighted" approach was used to analyze the remaining decrements.

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

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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 June 30, 2023 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.

The retained actuary stated that they observed significant excess mortality for males in the Employee group during the latter part of the period resulting in the exclusion of 2022 and 2023 experience from the analysis for this group. While this was understandably an anomalous period with respect to mortality, we recommend that the retained actuary provide additional justification in future experience study reports when adjusting certain groups during potentially anomalous experience periods. In this case, additional context about how much data was excluded for these periods, what the adjustment factor might have been without excluding the data, and why adjustments were not made to other groups could have provided additional context and improved the readers' ability to judge the credibility of the underlying data.

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 Amount Weighted Healthy Retiree mortality table for public safety, teachers, and general employees with partial credibility adjustment as shown below. The credibility adjustments for Police and Fire are combined.

	Employees	Teachers	Police/Fire
Male	102%	106%	101%
Female*	107%	104%	101%

**Proposed mortality table for Females in the Employee group is the below-median income table.*

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.

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The employee and disabled retiree mortality experience during the study period was not sufficient to be fully credible. Therefore, the retained actuary recommended the continued use of the group-specific Pub-2010 Employee and Disabled Retiree mortality tables with no adjustments.

We reviewed the retained actuary's results for the probability of death for employees and healthy and disabled retired members and found them to be reasonable.

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. We believe this assumption is reasonable for funding and financial reporting purposes.

Beneficiary Mortality: The retained actuary does not currently reflect different mortality assumptions for beneficiaries. Further, the retained actuary did not review the beneficiary mortality assumption in the most recent actuarial experience study and the valuation report does not disclosure the mortality assumption for beneficiaries. The SoA issued "Pub-2010 Contingent Survivor mortality tables" as part of its Pub-2010 study. 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 experience for contingent annuitants with living spouses due to what is sometimes known as the "grieving widow(er) effect." The retained actuary appears to have elected not to recommend this standard Contingent Survivor tables for beneficiaries. We recommend the retained actuary comment on the beneficiary mortality assumption in future experience study reports, considering the appropriateness of the Contingent Survivor mortality tables for beneficiaries following the death of the primary annuitant, and provide rationale for the final tables selected.

In May, RPEC issued a new study of a "Pub-2016" family of static base mortality tables. The updated base mortality tables generally show a slightly shorter life expectancy for retired teachers than the Pub-2010 mortality tables. We expect that the retained actuary will consider the "Pub-2016" mortality tables as part of the next experience study for NHRS.

Conclusion: The retained actuary recommended mortality assumptions based on published mortality studies of applicable public sector employees with appropriate adjustments for credibility. In total, we believe the base mortality and mortality improvement assumptions are reasonable. We recommend that the retained actuary note the number of annuitants who died in the next mortality experience analysis to provide additional context to the analysis and enhance the readers' ability to judge the credibility of the underlying data. Additionally, we recommend that the retained actuary provide additional justification in future experience study reports when adjusting the experience for certain groups during potentially anomalous experience periods. Finally, we recommend the retained actuary comment on the beneficiary mortality assumption in future experience study reports, considering the appropriateness of the Contingent Survivor mortality tables for beneficiaries following the death of the primary annuitant, and provide rationale for the final tables selected.

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 Employees, Teachers, Police, and Fire members.

The retained actuary reviewed the merit and seniority pay increases experienced by member classification during the 4-year period of the experience study. The 4-year average increase in total pay was subtracted from the actual pay increases, calculated for each year of service, to obtain the merit/seniority portion of the pay increases. Based on the summary of the recommendations in the experience study report, it appears that the recommended

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rate of merit and seniority pay stayed the same or increased for each group at almost every year of service. We believe that this approach is reasonable.

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 for similar groups.

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

Rates of Service Retirement

We reviewed the assumed rates of service retirement. The current assumptions for the Employee and Teacher groups vary by age and by whether the member is eligible for reduced or full benefits. The current assumptions for the Police and Fire groups vary by age and service.

The retained actuary currently applies separate retirement rate assumptions to members hired before and after July 1, 2011. Members hired on or after July 1, 2011 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, 2011 members. Analyzing the experience for both tiers separately allows the retained actuary to identify emerging differences in experience between these groups. We believe separate assumptions for these groups is appropriate. Overall, we believe the assumptions and the analysis in the experience study report are reasonable.

In future experience study reports, it would be helpful to the readers of the report if the retained actuary included in the Development of Proposed Retirement Rates for Fire in Section J, similar to the summary provided for each of the other groups.

Rates of Termination (Refund and Vested Termination)

We reviewed the rates of termination of employment. The current assumption varies by length of service for members with fewer than five years of credited service and by age for members with five or more years of credited service. We agree that service is generally the most significant in anticipating termination rate, especially during earlier years of service. Based on the retained actuary's analysis, the termination rates are aligned with actual experience and the assumptions appear reasonable. The select withdrawal assumption for Teachers with less than five years of service is set at a level where the valuation is anticipating notably more terminations than the recent experience would indicate, even after the recommended assumption changes. When the termination assumption is set too high, actuarial losses in the annual actuarial valuation are more likely to occur. We recommend that the retained actuary closely monitor this assumption to ensure that the assumption continues to be reasonable. Each of the other recommended withdrawal and retirement assumptions for each group were set at a more reasonable range where experience is more likely to produce actuarial gains.

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.

End of Career Payments

The analysis for End of Career Payments in the experience study report generally seems reasonable. The procedures noted in the analysis indicate that the final recommended assumption is "rounded down to nearest 0.50%." Given that this assumption can be impactful for certain groups of plan members, we recommend not "rounding down" this amount at the conclusion of the analysis to avoid any perceived bias in the assumption.

Medical Subsidy Opt-Out Assumption

The medical subsidy benefits provided by statute are fixed amounts for a declining population. Not all members eligible for the medical subsidy are currently receiving it. The opt-out assumption represents the percent of

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members who are ultimately expected to opt in to the medical subsidy benefit. Beginning with the June 30, 2020 actuarial valuation, NHRS staff provided additional data to the retained actuary to more easily determine if a new opt-in record belongs to a survivor of a member or a member who previously opted out of the benefit. For this reason, the retained actuary excluded a comparison of the 2019-2020 data in their analysis. We reviewed the medical subsidy opt-out assumption and it appears reasonable.

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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 first paragraph of the certification letter, the purposes the retained actuary provides for the report are "to measure the System's funding progress and to calculate employer contribution rates for Fiscal Years 2026 and 2027." Additionally, Page 12 of the report notes that "the primary purposes of this valuation report are to measure the plan's liabilities, to analyze changes in NHRS' actuarial position and to determine employer contribution rates." We recommend that the retained actuary thoughtfully consider the main purposes for the actuarial valuation and coordinate these discussions in the report.

Section A: Introduction

Results of the Valuation

On page 17 of the valuation report, the second sentence of the second paragraph states: "The funded status is appropriate for assessing the need for additional UAAL contributions." We recommend that the retained actuary provide more context to this statement. Is the statement intending to say: (1) that the Plan currently needs additional UAAL contributions in excess of the current funding policy, or (2) the Plan generally needs further UAAL contributions in the future?

On page 18 of the valuation report, the second sentence under "Mortality rates" states: "The SoA also published the MP-2021 projection scales to reflect mortality improvements after 2021." We recommend that the retained actuary provide more context to this statement because the MP-2021 projection scale can be used to reflect mortality improvements for periods prior to 2021. For example, MP-2021 is being used to reflect mortality improvements after 2010 just in this valuation.

Comments

The June 30, 2023 valuation report indicates that the normal cost rates are projected forward to better reflect the impact of the changing benefit tiers and generational mortality in the contribution rate setting. Specifically, the normal cost rates are projected forward to the applicable fiscal year of the contribution rate, so the biennial rates for FY 2026/2027 incorporate the normal cost projected to FY 2026. Additionally, Page 23 of the valuation report presents the average employer normal cost rates "as of June 30, 2023" and the same normal cost rates are included in the development of the FY 2026 and FY 2027 employer contribution rates on pages 26 and 27. Based on an email exchange with the retained actuary, it is our understanding that the normal cost rates stated on pages 23, 26 and 27 are actually the projected FY 2026 rates. We recommend that the retained actuary

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enhance the description of these normal cost rates, especially on page 23, to appropriately identify them as projected to FY 2026.

Section B: Funding Results

Page 30 of the valuation report includes a "hypothetical illustration" of the projected UAAL based on level dollar amortization. This projection provides an interesting perspective but there is no context for this projection in the valuation report. Since a level dollar amortization is contrary to the discussions in all of the other sections of the valuation report, we recommend that the retained actuary provide more context to this project to indicate how this illustration fits into the larger discussion about the health of the Plan and the current funding policy.

Section E: Methods and 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 first eligibility for normal unreduced retirement,
- Update the rates of retirement on page 84 of the report to reflect the correct early retirement rates used in the June 30, 2023 actuarial valuation, and
- State the mortality assumption for beneficiaries.

Section G: Summary of Plan Provisions

On page 109 of the valuation report, remove the parenthetical in the sixth paragraph that states: "(1/66th of AFC times creditable service for members who commence service on or after July 1, 2011)."

Labeling of Payroll Amounts

Throughout the June 30, 2023 valuation report, similar payroll amounts are referred to as many different names, including: "Covered Annual Payroll," "Valuation Payroll," "Covered Payroll," "Total payroll supplied, annualized," and "Total Payroll." We recommend that the retained actuary use more consistent labeling of the payroll amounts to make it clear that the amounts are intended to be consistent. If they are not consistent, then the retained actuary may want to consider defining the different payroll amounts within the valuation report.

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